

NAVELEX 0969-LP-170-4010

TECHNICAL MANUAL

**OPERATION AND MAINTENANCE INSTRUCTIONS
WITH PARTS LIST**

**TELETYPEWRITER SET
COMPACT KEYBOARD SEND-RECEIVE
MODEL 28 AN/UGC-20B**

Manufactured by
Teletype Corporation

Manual Prepared by
Western Technical Associates
N00039-76-C-0153

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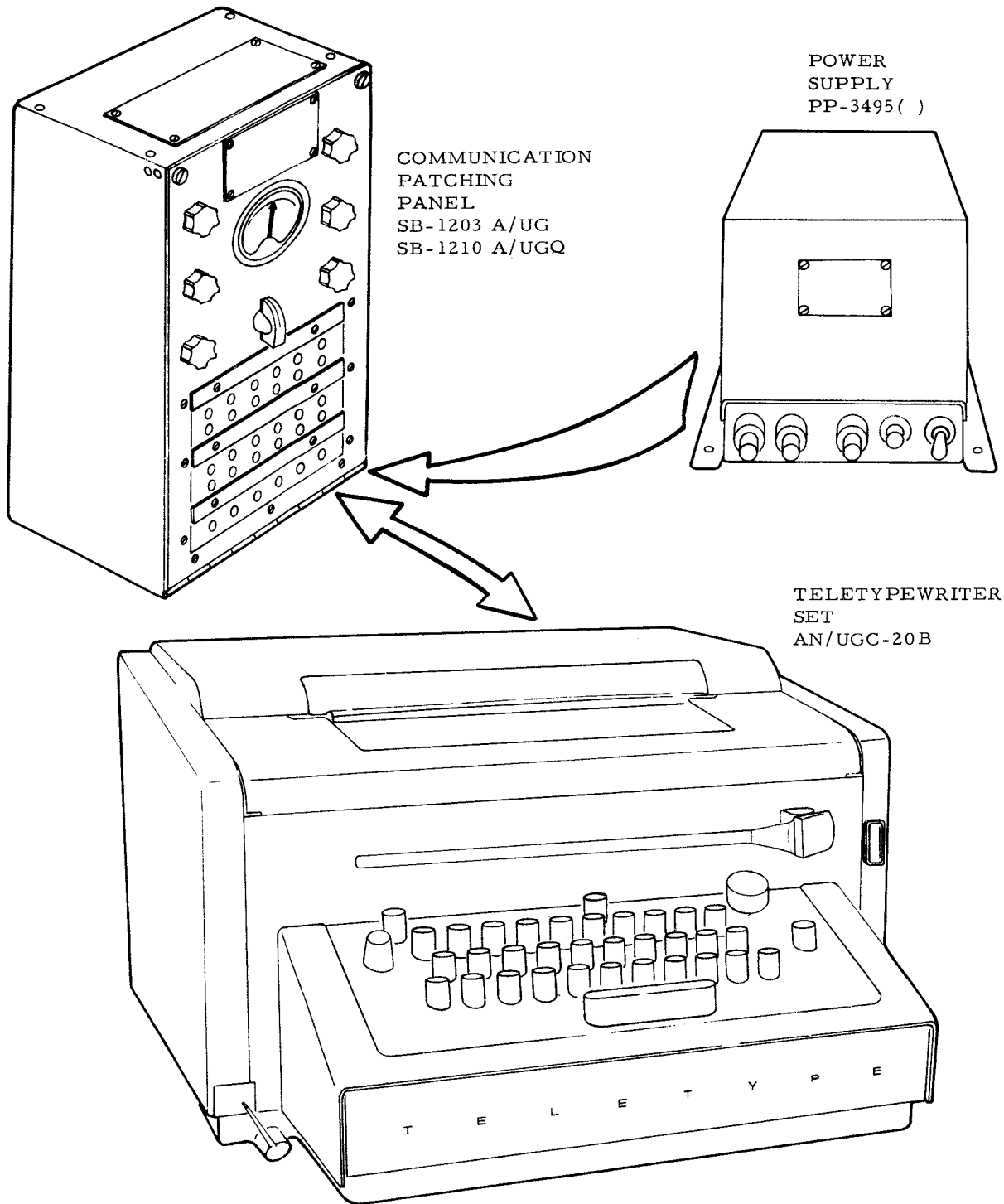


Figure 1-1. Model 28 Compact Keyboard and Send-Receive Teletypewriter Set AN/UGC-20B

CHAPTER 1
GENERAL INFORMATION
AND SAFETY PRECAUTIONS

1-1. SAFETY PRECAUTIONS. To stress the importance of employing proper safety techniques while performing maintenance procedures on the equipment involved, the user of this manual is directed to thoroughly familiarize himself with the safety precautions described in Chapter 4, paragraph 4-4. Specific CAUTIONS concerning possible damage to equipment and WARNINGS concerning danger to personnel are referenced below and should be strictly observed.

CAUTION
Paragraphs

4-5a
4-5a(4)
4-5d(2)
4-7d
4-8b(2)
4-8b(5)
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Paragraphs

4-6c
4-8a

1-2. INTRODUCTION. This manual provides information and instructions for the installation, operation, and maintenance of Model 28 Compact Keyboard Send-Receive (KSR) Teletypewriter Set AN/UGC-20B (figure 1-1). Maintenance information includes instructions for testing, performing preventive maintenance and adjustments, troubleshooting, and repairing. A parts list is also included. Interfacing equipment is shown in figure 1-1 for information only and is not a part of Teletypewriter Set AN/UGC-20B.

a. Model 28 compact teletypewriter sets are designed to provide manual teletypewriter service in mobile and fixed stations where minimum equipment size is desired. Equipment size has been reduced by using a modified model 32 keyboard with a model 28 typing unit.

b. A keyboard send-receive (KSR) teletypewriter set is an electro-mechanical apparatus that provides terminal facilities for exchanging page-printed messages over appropriate transmission facilities including telegraph lines, telephone networks, and radio channels. The characters or functions which form a message are originated by depressing individual keys on a keyboard. The resulting message is monitored by a local typing unit and a selected typing unit in a network.

c. A KSR teletypewriter set translates the message to a serial start-stop Baudot telegraphic code transmission, and converts the code to printed characters or machine functions at the point of reception.

d. Intelligence is transmitted and received serially by means of a five-level binary permutation code (Baudot). In addition to the five code bits, there is a start bit and a stop bit. The start bit precedes the code bits to initiate operation of the typing unit, and a stop bit follows the code bits to secure the typing unit. Variations of KSR teletypewriter sets generate 7.00 and 7.42 units per character. The first (start)

bit (1 unit) is always spacing; the next five bits (5 units total) are either marking or spacing code levels, and the final (stop) bit (1 or 1.42 units) is always marking. The signal line remains energized by a remote dc power source during marking intervals and becomes de-energized during spacing intervals. In the AN/UGC-20B Compact Page Printer (CPP) teletypewriter sets, keying of the dc power source (either 120 vdc, 60 mA or 1.5 vdc, 70 microamps) is accomplished by an electronic signal control circuit card activated by a photoelectric distributor.

1-3. EQUIPMENT DESCRIPTION. Teletypewriter Set AN/UGC-20B, shown in figures 1-2 and 1-3, consists of five major units; a typing unit, a keyboard unit, an amplifier assembly, a motor unit, and a cover.

a. Typing Unit. The typing unit, shown in figures 1-4 and 1-5, contains the mechanisms necessary for translating electrical input signals (signal code) into printed alpha-numerical characters or functional control operations. The major mechanisms are the selector mechanism, code bar mechanism, function mechanism, and printing and spacing mechanism. The typing unit will accommodate a five-inch diameter roll of paper. The printed copy is friction fed through the platen. Signal line and ac power connections to the typing unit are made through an electrical connector. The signal code current on the signal line controls selector magnets in the selector mechanism. The ac power is used to operate the signal bell, mounted on the typing unit, when the signal bell function is initiated.

b. Keyboard Unit. The keyboard unit consists of a keyboard transmitter, base, distributor, and gear shift assembly.

(1) Keyboard Transmitter. The keyboard transmitter (figure 1-3) contains the operating controls including the character keys and function keys. The character and function keys, when pressed, mechanically set up the keyboard code bar mechanism for the signal code to be transmitted. The electrical signal is generated using photoelectric cells instead of a contact mechanism. Refer to figure 1-6. A lamp assembly provides the necessary light source to activate the photoelectric cells. A mechanical shutter assembly, linked with the keyboard code bar mechanism, and located between the photoelectric and lamp assembly, provides windows to either allow light from the light assembly to pass and activate the photocells (mark) or block the light and not activate the photocells (space). The photocells generate a parallel electrical signal of approximately 300 microamperes. The generated signal travels along a shielded cable to a photoelectric distributor (paragraph 1-3b(3)).

(2) Base. The keyboard base (figure 1-3) provides mounting facilities for the typing unit, distributor, gear shift assembly, amplifier assembly, motor unit, and cover. The signal line and ac power cord is connected to terminal blocks mounted on the base. Signal current and ac power is distributed from the terminal blocks to electrical components in the set by means of cables and connectors.

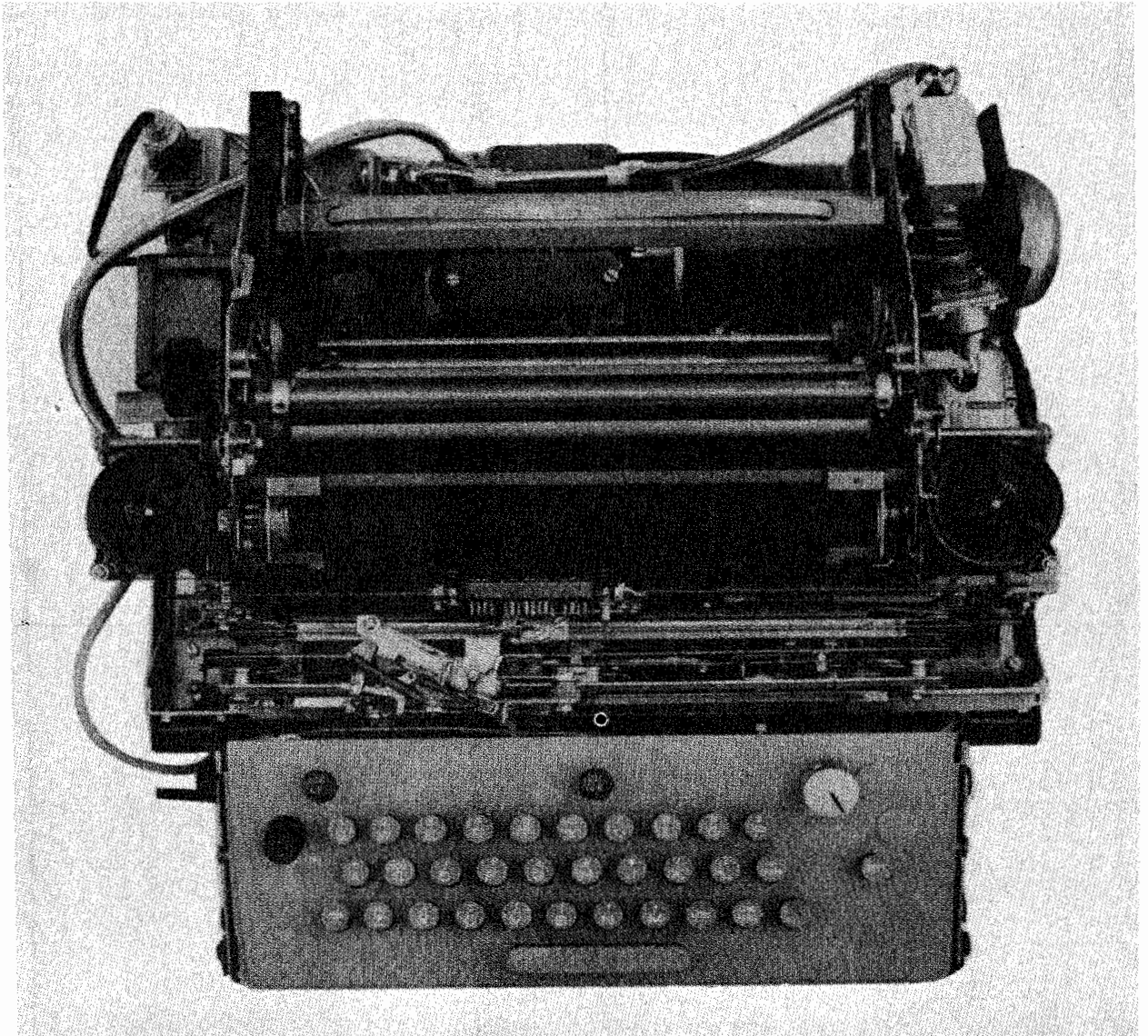


Figure 1-2. Teletypewriter Set AN/UGC-20B
(Cover Removed)

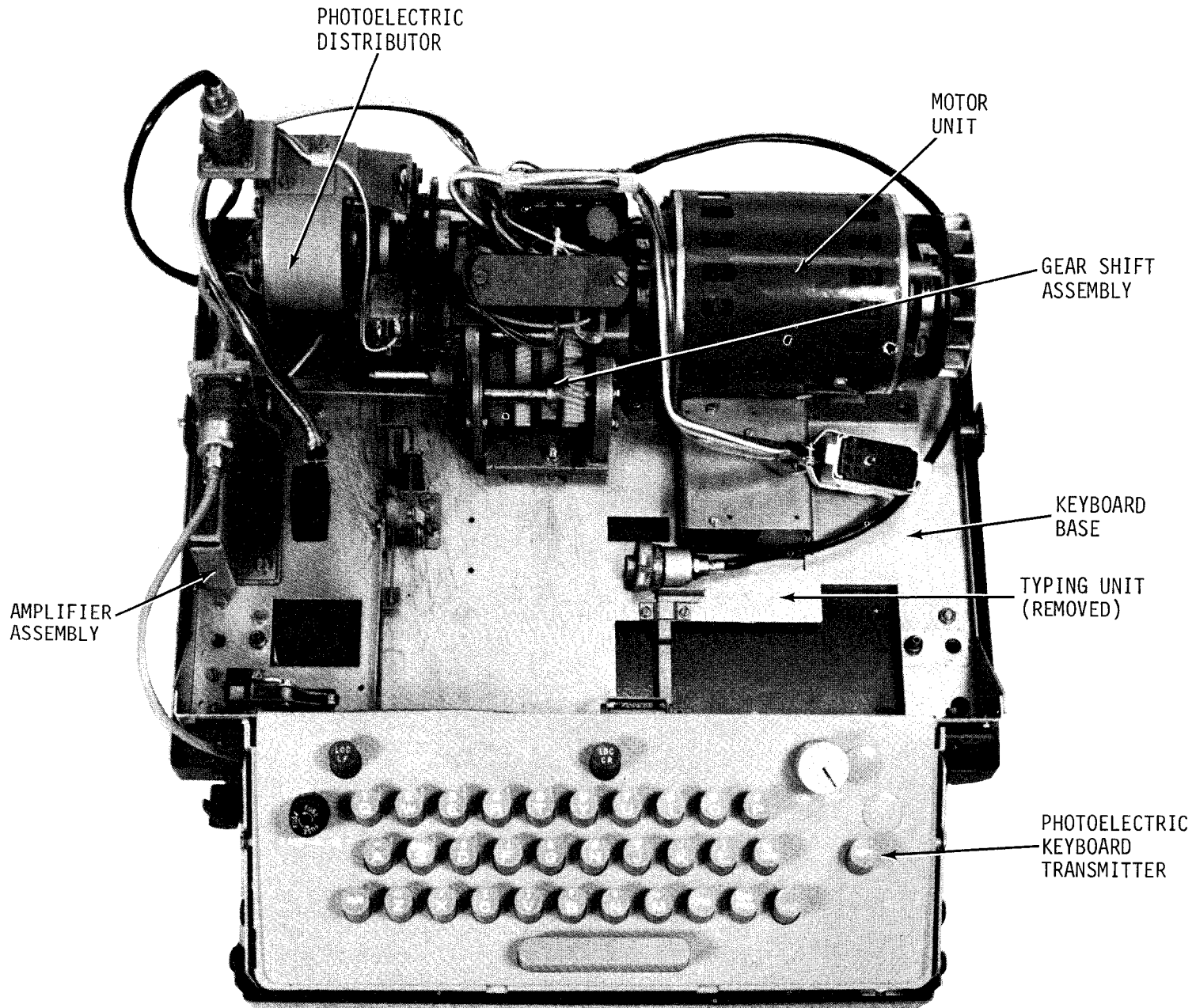


Figure 1-3. Teletypewriter Set AN/ UGC-20B
(Typing Unit Removed)

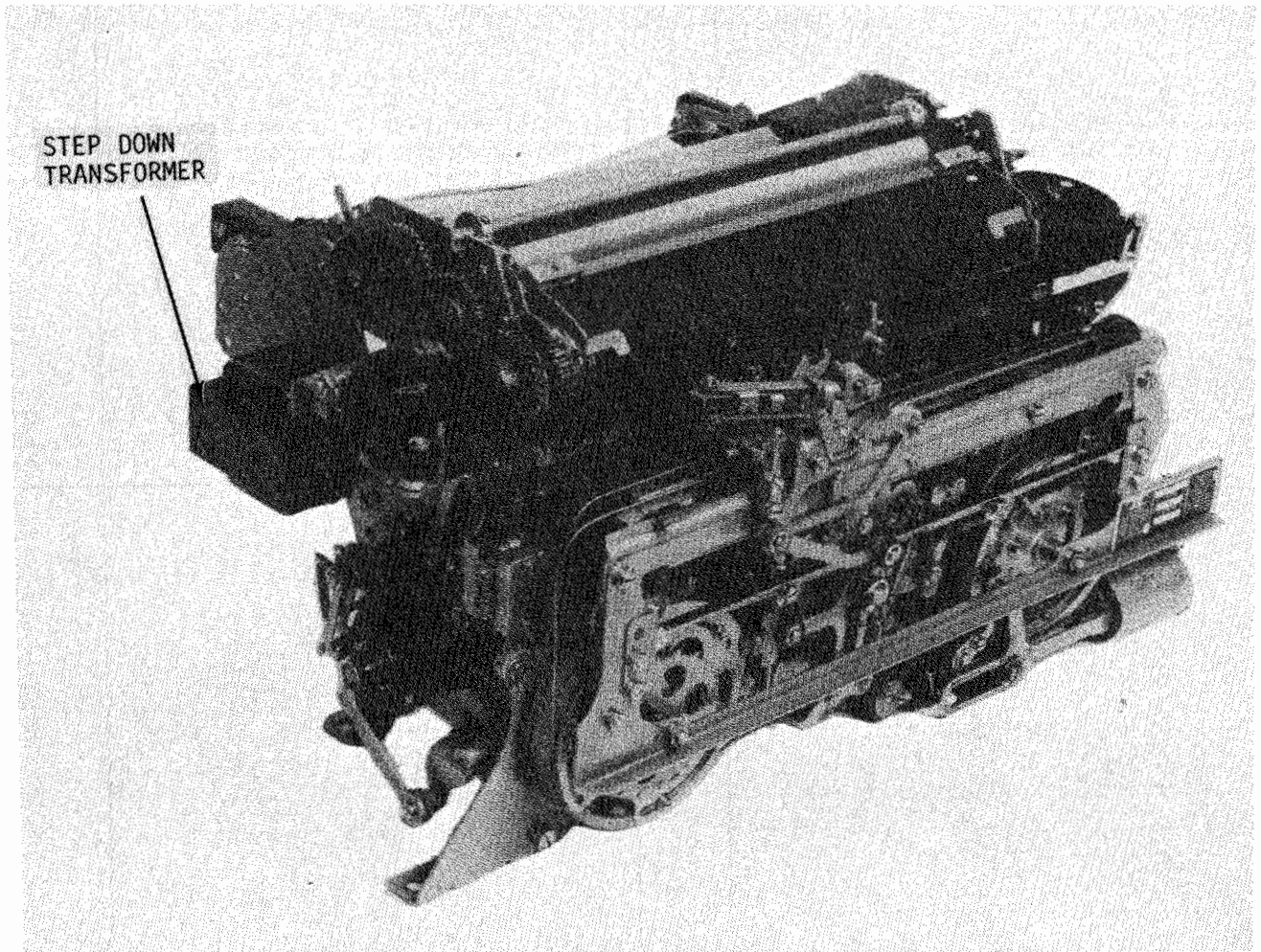


Figure 1-4. Typing Unit (Left Front View)

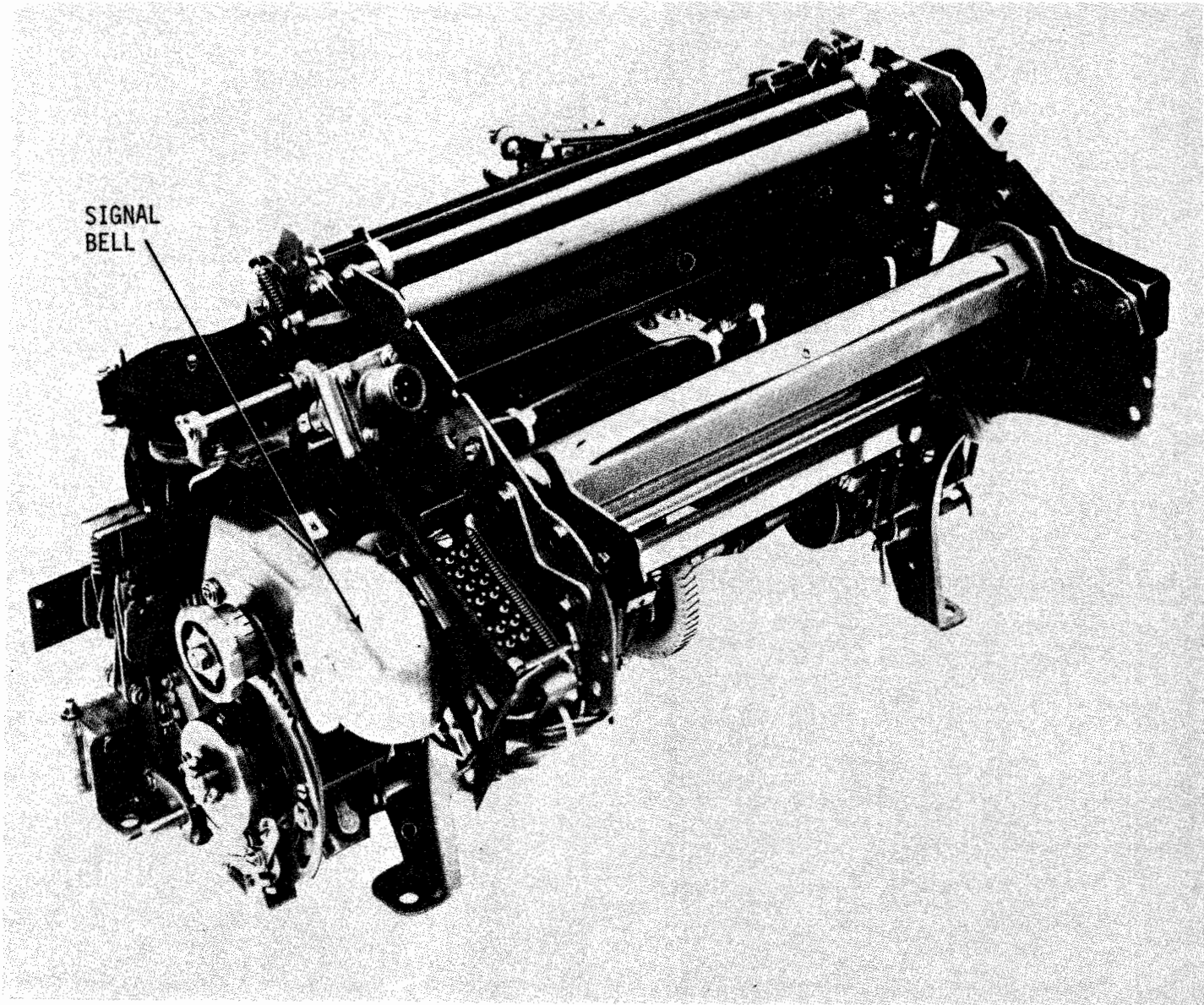


Figure 1-5. Typing Unit (Right Rear View)



Figure 1-6. Keyboard Transmitter Photoelectric Assembly
(Right View)

(3) Distributor.

The distributor (figure 1-3) shapes the signal code to be transmitted using photoelectric cells. The photoelectric distributor (see figure 1-7) serializes the signal, and by means of shielded cable, routes it to the input of a signal control circuit card located in the amplifier assembly (paragraph 1-3c).

(4) Gear Shift

Assembly. The teletypewriter set is equipped with a 3-speed gear shift assembly (figure 1-3). The operating speed of the set is controlled by a sliding key which is positioned by means of a selector switch and gear shift linkage. When operated, the sliding key engages one of three speed gears with the drive shaft of the gear shift assembly. The Baud (speed) selector switch is located to the left of the keyboard with the selector switch mounted on the base and the speed indicator plate attached to the cover. The Baud can be changed with the motor unit in either idle or running condition. The AN/UGC-20B which uses a 60 Hz motor unit operates at Bauds of 45.5, 50.0, and 74.2 bits per second. With a unit code of 7.42, and assuming six characters per word, the equivalent words per minute are 60, 75, and 100, respectively.

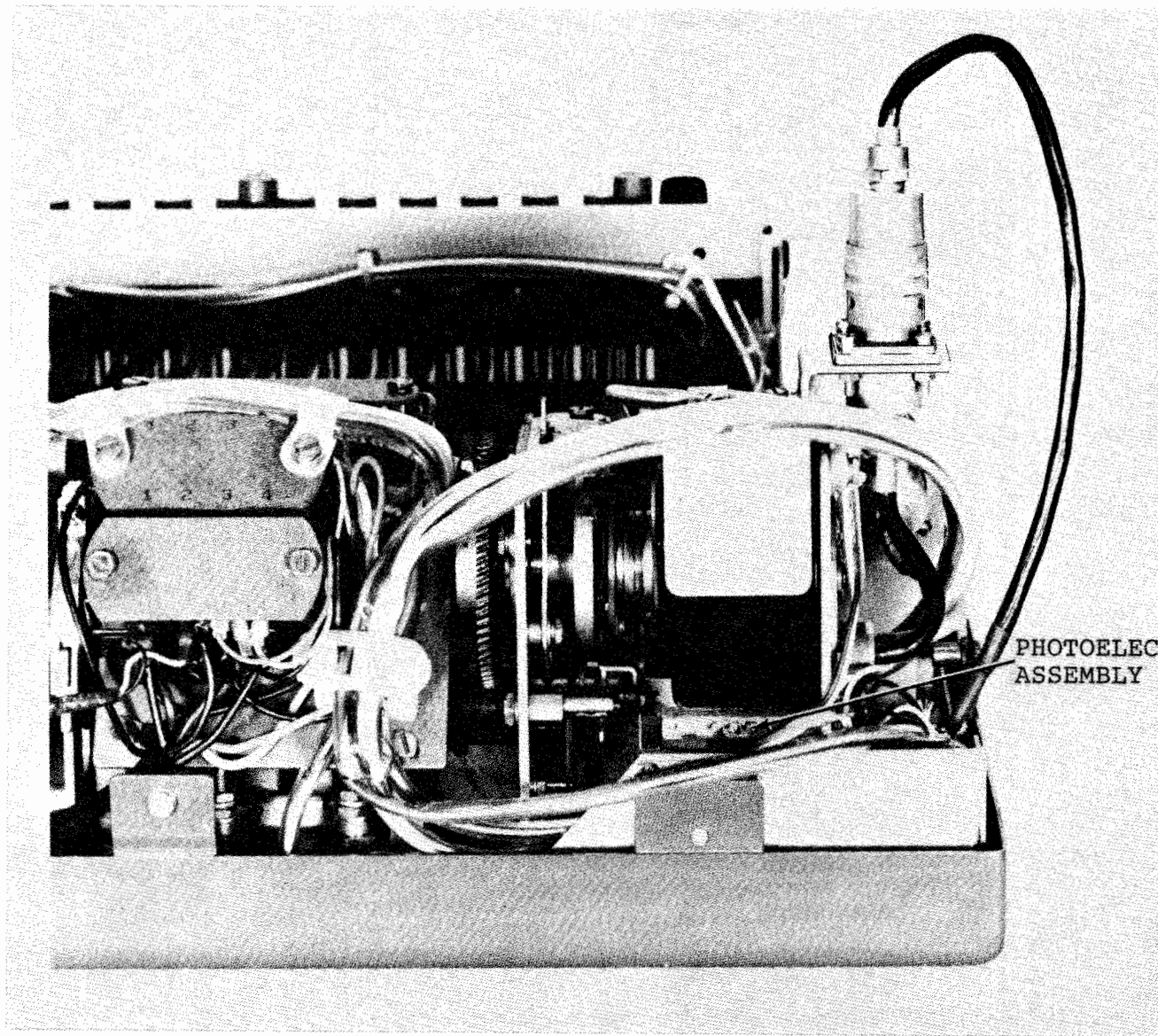
c. Amplifier Assembly.

The amplifier assembly (figure 1-3) contains the signal control circuit card. The signal control circuit is basically an electronic switch for controlling signal line currents of either 60 mA (120-volts dc) or 70 microamperes (1.5-volts dc).

d. Motor Unit. The motor unit, shown in figure 1-8,

rests in the cradle of a mounting bracket and is held in place by a strap at each end. The cradle is isolated from the motor by resilient mounts to reduce vibration. A small fan is mounted at each end of the rotor within the motor housing, and a combination handwheel and fan is mounted on the rear of the shaft. A start relay and start capacitor are mounted in front of the motor. A thermal cutout switch, which provides protection against overload, is located in the rear of the motor. The motor unit in the AN/UGC-20B uses a 1/20 horsepower, two-pole, single-phase, synchronous motor. The motor operates from a 115-volt +10%, 60-Hz ac source at a speed of 3600 rpm.

e. Cover. The cover, shown in figure 1-9, provides a protective enclosure for the teletypewriter set. The cover is positioned on the base by three retainers and is locked to the base by two spring-loaded latches. The latches are attached to the inside surfaces of the cover and are accessible through the dome. The dome is released by depressing the plunger on the left and right sides. When raised, the dome is supported in an open position by the stop arm. A line guide assembly is attached to the cover to hold copy during message transmission. Copy lights are mounted inside the cover and operate from a 5.6-volt ac source supplied by the secondary of a transformer mounted on the typing unit. A window at the top of the cover permits visual observation of the printed copy. A margin indicator, mounted on the cover, illuminates to inform the operator that the end of a line is approaching and to be prepared to initiate the



PHOTOELECTRIC
ASSEMBLY

Figure 1-7. Photoelectric Distributor
(Rear View)

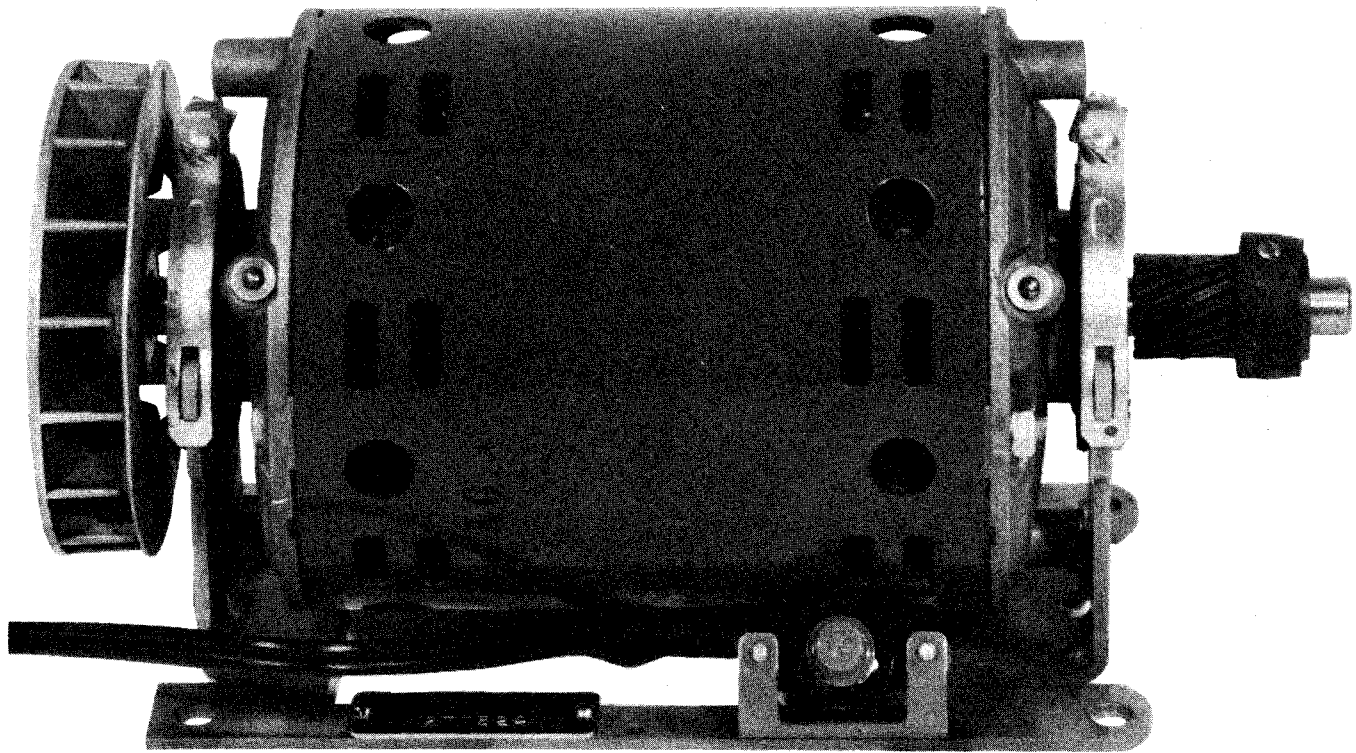


Figure 1-8. Motor Unit

carriage return and line feed functions.

1-4. RELATIONSHIP OF UNITS. Figure 1-1 shows the relationship between Teletypewriter Set AN/UGC-20B and external interfacing equipment. The communication patching panel is for shipboard use to facilitate interconnection and transfer of teletypewriter sets and various types of terminal equipments. (Refer to NAVSHIPS 0967-LP-874-1010.) The power supply is used as a dc loop current supply for operation of teletypewriter

sets. (Refer to NAVSHIPS 0967-LP-425-1010.)

1-5. REFERENCE DATA. Reference data pertinent to Teletypewriter Set AN/UGC-20B is provided in table 1-1.

1-6. EQUIPMENT SUPPLIED. Table 1-2 lists equipment supplied.

1-7. EQUIPMENT REQUIRED BUT NOT SUPPLIED. Table 1-3 lists tools and test equipment not supplied but required for performance of maintenance and troubleshooting procedures.

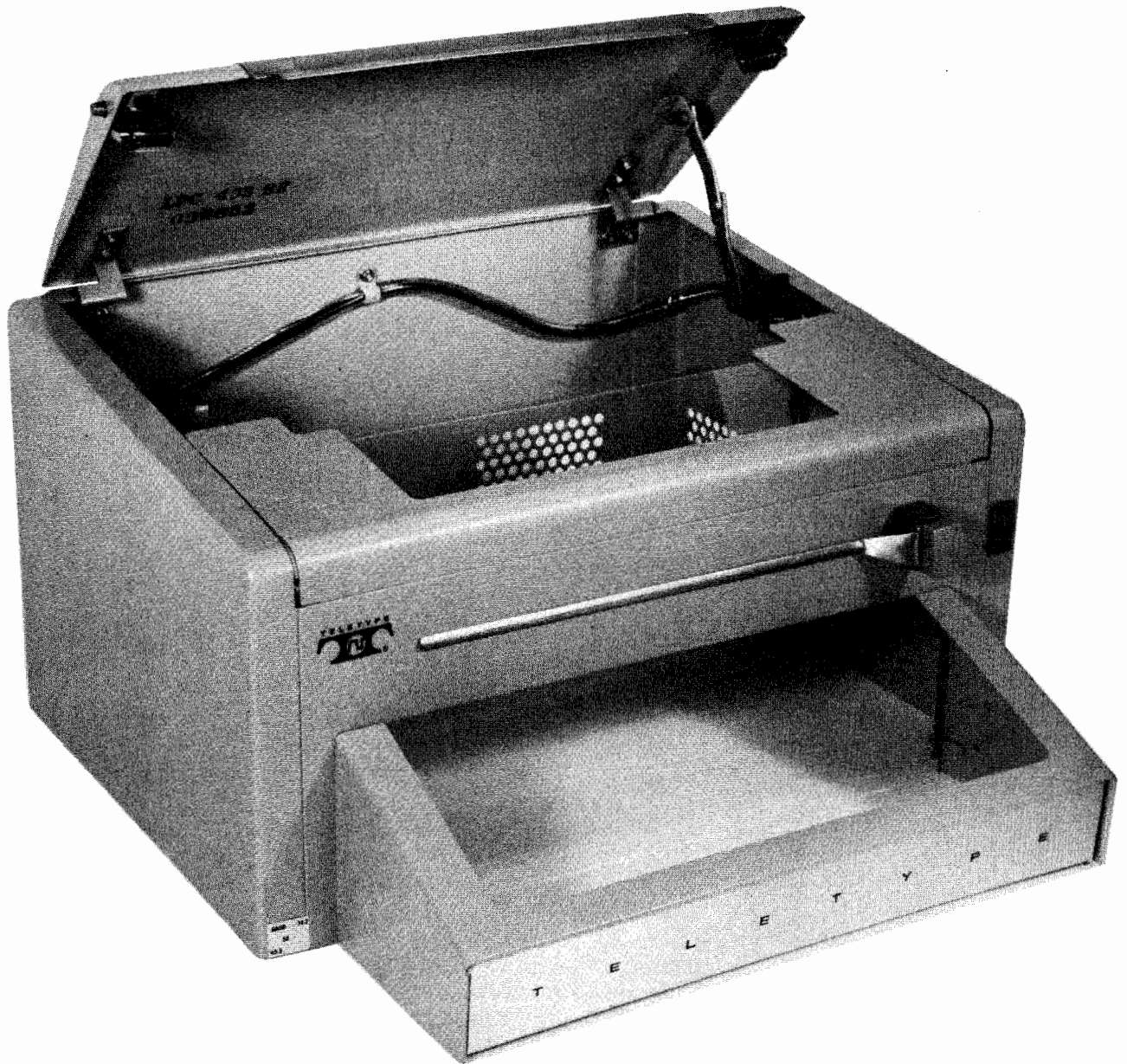


Figure 1-9. Cover

Table 1-1. Reference Data

Description:

Nameplate data:	AN/UGC-20B Teletypewriter Set
Manufacturer:	Teletype Corporation
Weight:	59 lbs.
Depth:	16 inches
Width:	16-1/2 inches
Height	10 inches

Functional Characteristics

Power requirements:	115 Vac, single phase, 60 Hz
Motor Unit:	60 Hz synchronous motor
Input voltage:	115 Vac, single phase
Input current:	
Starting;	9 Amps
Running;	1.9 Amps
Power output:	1/20 HP @ 3600 RPM
Power consumption:	65 watts
Heat dissipation:	50 watts
Protection:	Thermal Cutout
Operating speed:	
Unit code;	7.42
Baud (bits per second);	45.5, 50.0, 74.2
Words per minute;	61.3, 67.3, 100
Signal line requirements:	
Half duplex;	20 - 60 ma @ 120 VDC
Full duplex;	70 microamps @ 1.5 VDC (Send) 60 mA @ 120 VDC (Receive)

Table 1-2. Equipment Supplied

Qty	Nomenclature	Teletype Corp. Code Number
1	Model 28 Compact Keyboard Send-Receive Teletypewriter Set AN/UGC-20B, consisting of:	28 RFH8002A/ 003/AAA/BR
1	Typing Unit	LP156/WY/AJG
1	Keyboard Unit	LLK4CRS
1	Amplifier Assembly	334439
1	Motor Unit	LMU37
1	Cover	LPC403BR

Table 1-3. Equipment Required But Not Supplied

Category	Recommended Equipment	Alternate	Equipment Test Parameters	Application
Telegraph Signal Generator	Test Set, Telegraph AN/UGM-8B (V)	Equivalent	Provides controlled signals, both distorted and undistorted, at all commonly used transmission speeds and code formats. Refer to NAVSHIPS 0967-378-4010	Maintenance, Troubleshooting
Telegraph Signal Analyzer	Test Set, Telegraph TS-2616/UGC	Equivalent	Measures timing distortion in start/stop and synchronous data telegraph signals. Refer to NAVSHIPS 0969-125-8010.	Maintenance, Troubleshooting
Volt-ohm-milliammeter	Multimeter AN/USM-311	Equivalent	AC voltage - 115, 5.6 DC voltages - 120, 7.5, 1.5 Direct Current - 60 mA, 70 microamps Resistance - Continuity measurements	Maintenance, Troubleshooting
Tools	Teletype Repair Kit TK-188/U	Equivalent		Maintenance, Repair

CHAPTER 2
OPERATION

2-1. INTRODUCTION. This chapter describes the operation of Teletypewriter Set AN/UGC-20B from a maintenance standpoint. Operation of the teletypewriter set when installed as part of a system is covered in the appropriate system manual.

2-2. CONTROLS AND INDICATORS. AN/UGC-20B teletypewriter set controls and indicators are shown in figure 2-1, and their functions briefly described in table 2-1.

2-3. OPERATING PROCEDURES. Procedures for operating the teletypewriter set are provided in table 2-2. If abnormal indications are encountered, refer to Chapter 5 for troubleshooting information.

2-4. OPERATOR MAINTENANCE. Operator maintenance is limited to replacing paper and installing a new ribbon. Refer to paragraphs 8-4f and 8-4g.

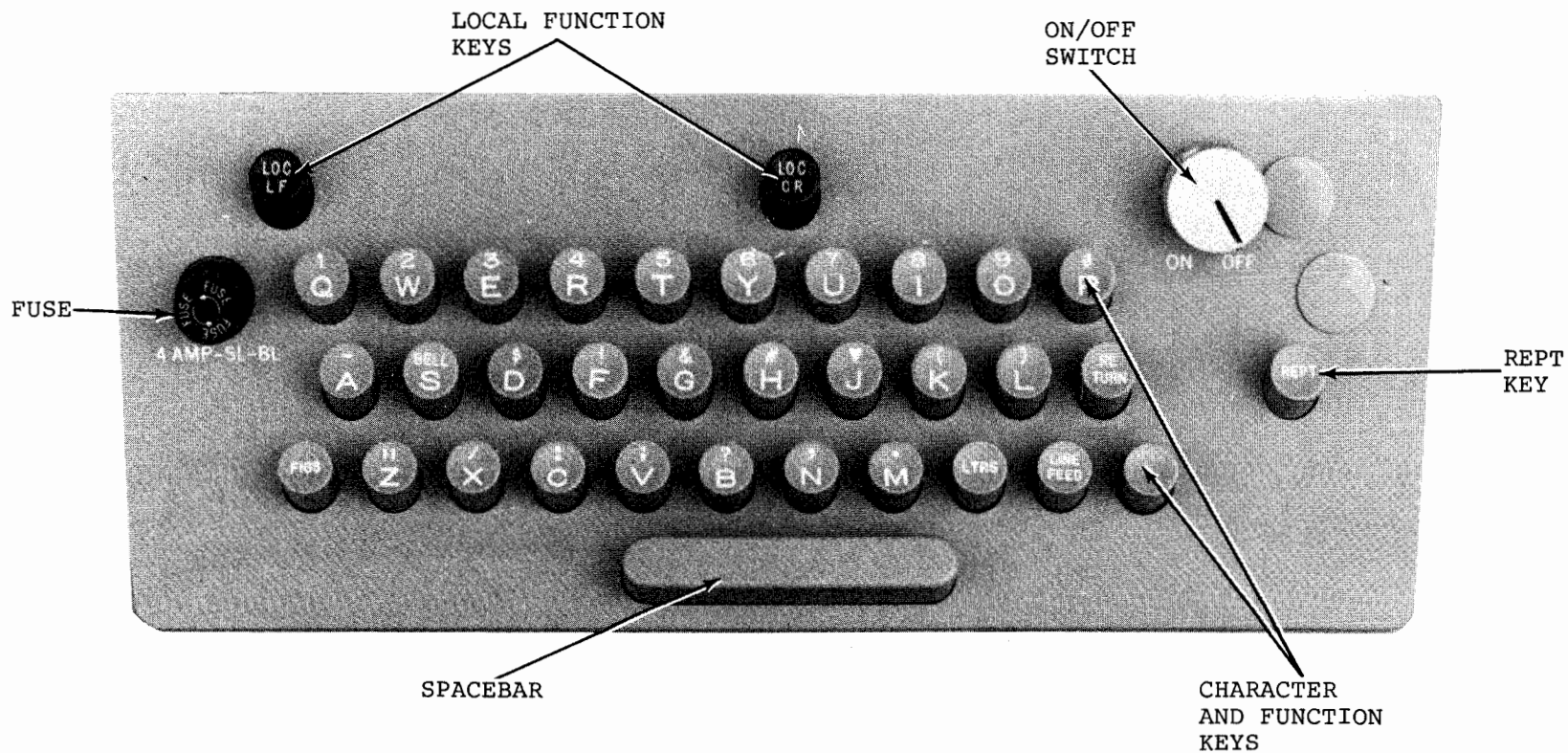


Figure 2-1. AN/UGC 20B Controls and Indicators

Table 2-1. Control and Indicator Functions

Control/Indicator	Function
4AMP-SL-BL fuse	Provides electrical circuit overload protection.
ON/OFF Switch	Applies primary ac power to motor unit and margin indicator circuit. Refer to paragraph 3-3a for additional power distribution information.
Function keys	When pressed, manually sets codebar mechanism to signal code combination for function selected. Signal code combination is photoelectrically distributed to signal line. Signal code is transmitted to local typing unit, for monitoring, and to remote typing unit. Signal code combination, received by typing units, activates mechanism corresponding to function selected.
FIGS key	Selects figures signal code combination. Figures shift function initiated at typing units. Results in positioning of type box, through related mechanisms, for printing of figures.
LTRS key	Selects letters signal code combination. Letters shift function initiated at typing units. Results in positioning of type box, through related mechanisms, for printing of letters.
RETURN key	Selects carriage return signal code combination. Carriage return function initiated at typing units. Results in returning printing type box carriage, through related mechanisms, toward left side of typing unit.
LINE FEED key	Selects line feed signal code combination. Line feed function initiated at typing units. Results in advancing platen, through related mechanisms, either one line or two lines depending on position of single-double line feed lever.
Signal bell key	"S" character key becomes signal bell key when figures shift function is activated. Signal bell rings each time "S" key is pressed.

Table 2-1. Control and Indicator Functions
(cont)

Control/Indicator	Function
Local function keys	Linked directly to typing unit. Mechanically initiates functions normally initiated by signal code combination.
LOC LF key	When pressed, operates line feed mechanism with same results as described for LINE FEED key.
LOC CR key	When pressed, operates carriage return mechanism.
Character keys	When pressed, manually sets codebar mechanism to code combination for character selected. Signal code combination is photoelectrically distributed to signal line. Signal code is transmitted to local typing unit, for monitoring, and to remote typing unit. Signal code combination, received by typing units, activates printing mechanism to print letter or figure character selected, depending on which shift function has been previously selected.
REPT key	When pressed, together with any other key (except local function keys), causes repeated transmission of function or character selected.
Space bar	Manually sets code bar mechanism to space signal code combination. Signal code combination received by typing unit activates spacing mechanism.
Margin indicator	Illuminates when typing unit carriage reaches preset end of line and activates margin indicator switch on base.
BAUD-45.5-50-74.2 selector switch	Selects operating speed of teletypewriter set. Manually operates gear shift assembly.

Table 2-2. Operating Procedures

Step	Action	Normal Indication
	<p>1. <u>Turn-On.</u> To turn-on teletypewriter set, proceed as follows:</p> <p>a. Ensure primary power cord is plugged-in to ac outlet.</p> <p>b. Rotate ON/OFF switch to ON position.</p> <p>2. <u>Operating Tests.</u> Check for proper operation of teletypewriter set as follows:</p> <p>a. Press LOC CR key.</p>	<p>Copy lights and photocell lamps are illuminated.</p> <p>Motor starts running.</p> <p>Type box carriage returns to left margin.</p>
	<p>NOTE</p>	
	<p>In following step, paper should advance approximately three times faster than when LINE FEED key is pressed repeatedly.</p>	
	<p>b. Press LOC LF key.</p>	<p>Paper advances and continues to advance as long as LOC LF key is held pressed.</p>
	<p>c. Press LTRS key and type several lines of test sentence "The quick brown fox jumps over the lazy dog."</p>	<p>Printing is accurate; spaced equally horizontally; vertically positioned evenly. Margin indicator operates properly.</p>
	<p>d. Press FIGS key and type.</p>	<p>Figures characters are printed.</p>
	<p>e. Press BELL(S) key repeatedly.</p>	<p>Bell rings clearly on single or repeated operations of BELL key.</p>

Table 2-2. Operating Procedures
(cont)

Step	Action	Normal Indication
f.	Press LTRS key and type test sentence again.	Letters characters are printed.
g.	Press REPT key along with any other key (except local function keys).	Character prints or function occurs, repetitively.
h.	Press RETURN function key.	Type box carriage returns to left margin and line feed occurs.
i.	Press LINE FEED key.	Paper advances one or two lines depending on position of single-double line feed lever (located inside).
<p>3. <u>Turn-Off</u>. To turn-off the teletypewriter set, proceed as follows:</p>		
a.	Press LOC CR and LOC LF keys.	
b.	Rotate ON/OFF switch to OFF.	Motor stops running.
<p style="text-align: center;">NOTE</p> <p>If set is to be secured for any length of time, unplug power cord or set primary power circuit breaker to off position.</p>		

CHAPTER 3 FUNCTIONAL DESCRIPTION

3-1. INTRODUCTION. This chapter provides a functional description of the teletypewriter set presented in a three-level format. The first-level discussion is a brief overall functional description based on a simplified block diagram. The second-level description is a detailed functional description supported by a pictorial functional diagram. The third-level discussion provides detailed descriptions of electrical circuits and mechanical assemblies. Electrical circuit discussions are supported by schematic and wiring diagrams included in Chapter 5, Troubleshooting.

3-2. OVERALL FUNCTIONAL DESCRIPTION. Figure 3-1 shows significant electrical signal and mechanical energy paths between units of the teletypewriter set. Primary power (115 volts ac, 60 Hz) is supplied directly to the primary of a step-down transformer mounted on the typing unit and is also supplied, through the power switch, to the motor unit. The 5.6-volt ac output of the transformer is routed to the cover to supply power to the copy lights. The 5.6-volt ac is also used to supply the lamp assemblies in the photoelectric keyboard transmitter and distributor, and to provide operating voltage for circuit card 336650. The motor unit drives mechanisms in the typing unit and the photoelectric distributor through the gear shift assembly which determines the speed of a main shaft. Speed of operation is controlled by the speed selector switch, mechanically linked to the gear

shift assembly. Local line feed (LOC LF) and local carriage return (LOC CR) function keys on the keyboard are mechanically linked to the typing unit and initiate their respective functions when pressed. Character or function keys on the keyboard are mechanically linked to a codebar mechanism in the photoelectric keyboard transmitter. The mechanical signal code on the codebar mechanism is converted to a parallel, 5-bit electrical signal code by the photoelectric assembly in the keyboard transmitter. The photoelectric distributor serializes the 5-bit signal code which is applied to the input of the signal control circuit card in the amplifier assembly. The signal control circuit card functions as an electronic switch to key the dc loop current power supply to generate mark/space signals. The mark/space signal code is applied to selector magnets in the local typing unit and sent out on the signal line to a remote typing unit. The typing units print the character or perform the function previously selected at the keyboard.

3-3. DETAILED FUNCTIONAL DESCRIPTION. As shown in figure 3-2, basic functions of the teletypewriter set, when used as part of a telegraphic communications network, are the transmission and reception of telegraphic coded signals, and printing of messages represented by the coded signals. The power distribution function supports both electrical and mechanical functions.

a. Power Distribution.
Distribution of electrical power

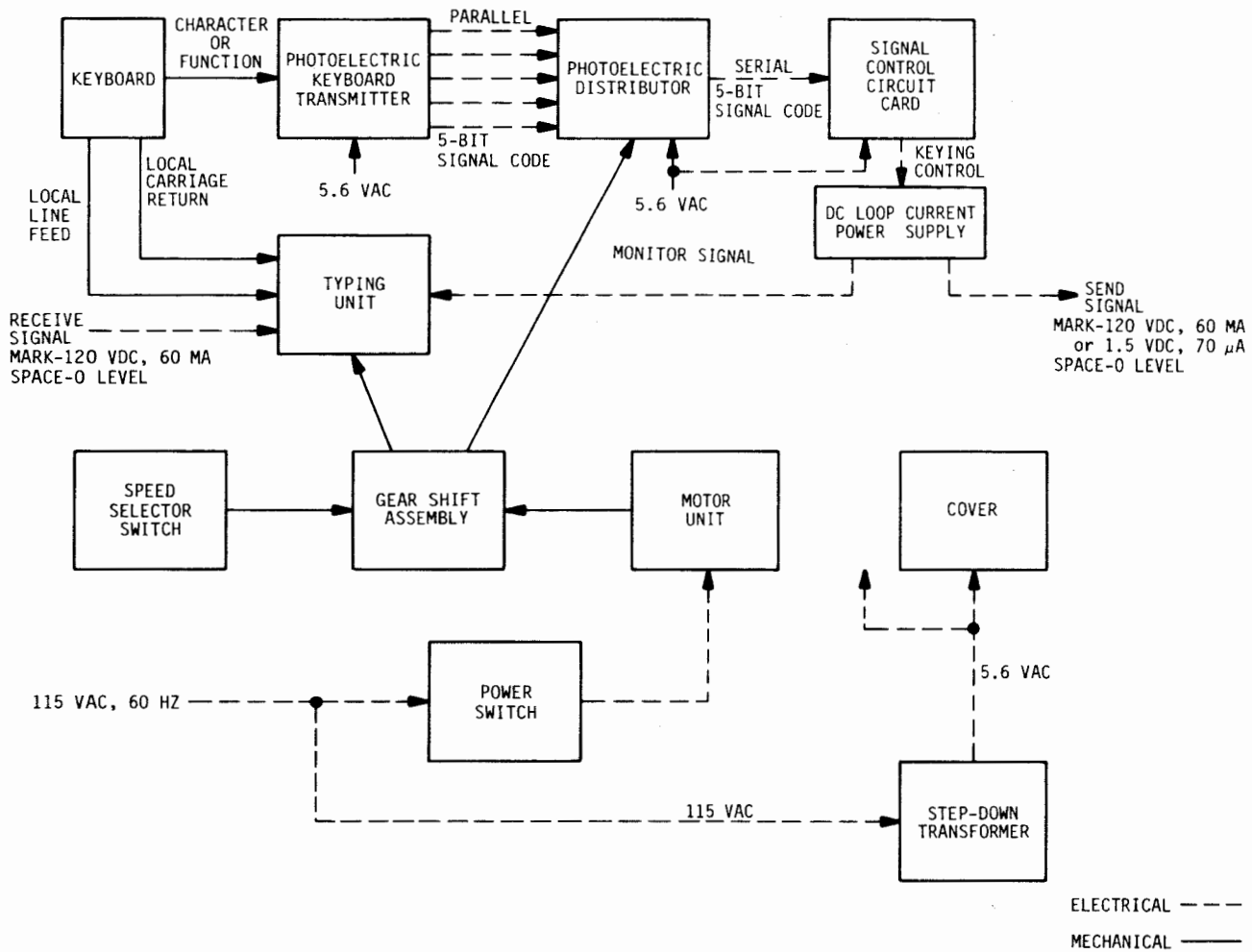


Figure 3-1. Overall Functional Block Diagram

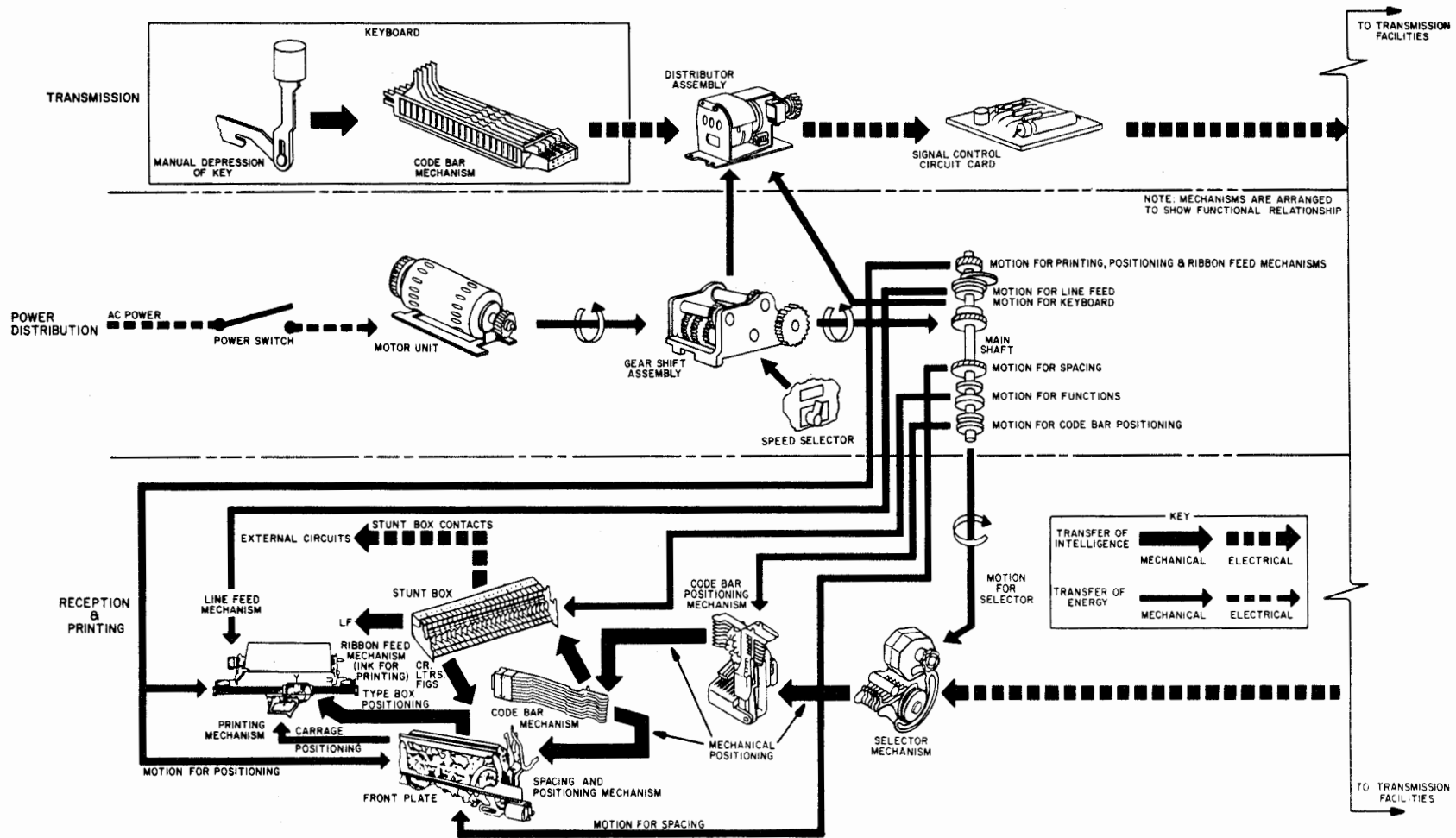


Figure 3-2. AN/UGC 20B Detailed Functional Diagram

is shown in the AN/UGC-20B schematic diagram, figure 5-1, and discussed in detail in paragraph 3-4a. Distribution of mechanical power is discussed in the following paragraphs.

(1) Motor Unit.

Mechanical motion for driving the typing unit and distributor through the gear shift assembly is provided by a 1/20 horsepower, two-pole, single-phase, synchronous motor unit.

(2) Gear Shift

Assembly. The three-speed gear shift assembly transfers rotational motion from the motor unit to the distributor mechanism and to the main shaft in the typing unit. The output speed of the gear shift assembly can be manually selected, by the speed selector switch, while the motor unit is in the idle or running condition.

(3) Main Shaft.

Motive power for the main shaft is applied to the driven gear centrally located on the shaft. The main shaft rotates at the output speed of the gear shift assembly. Six all-steel internal expansion clutches convert the rotary motion of the main shaft to the linear mechanical requirements for operation of the teletypewriter set. The clutches rotate with the main shaft when engaged and do not rotate when disengaged (latched). From left to right in their installed position on the main shaft, the clutches control the type box, line feed, spacing, function, code bar, and selecting mechanism.

b. Transmission. The transmission function (figure 3-2) is accomplished by the keyboard unit and the signal control circuit card.

(1) Keyboard Unit.

The keyboard unit consists of the keyboard transmitter and the distributor assembly. The keyboard transmitter provides a means for selecting a character or function, presetting photoelectric shutter assembly windows and initiating transmission. The selected character is then sequentially distributed to the signal control circuit card by the distributor assembly. A second character cannot be selected until the first character has been distributed. The output of the distributor assembly is routed to the input of the signal control circuit card. The keys on the keyboard transmitter are arranged in a conventional manner with numerals, punctuation marks, and special symbols in upper case positions. Standard keys for local line feed and local carriage return are located above the character keytops. Line break and repeat keys are located to the right of the character keys. When a character or function key is pressed, a code combination is mechanically set up on the codebar mechanism. The codebar mechanism is mechanically linked to shutter windows in the keyboard transmitter photoelectric assembly. The photoelectric assembly forms the code combination into a parallel, 5-bit electrical signal which is photoelectrically converted in the distributor assembly to a serial, 5-bit electrical signal. The serial output of the distributor assembly is applied to the input of the signal control circuit which keys an external dc loop current supply to produce the transmitter mark/space signals.

c. Reception and Printing. Reception and printing functions (figure 3-2) are accomplished by mechanisms in the typing unit. The basic function of the typing unit (figures 3-3 and 3-4) is to record in page printed form information received from a signal line in the form of a signaling code combination which represents characters or functions. Character representations, or graphics, are the alphabetic, numeral or symbol intelligence equivalent of the input code combinations. Function representations are the coded equivalent of non-typing operations auxiliary to reception of the graphics, such as line feed, carriage return, or signal bell. The typing unit translates these electrical code combination into mechanical motions which imprint the message or initiate the indicated function, such as line feed, carriage return, or signal bell. Printing is accomplished through an inked ribbon upon paper rolled around a horizontally stationary platen while the type and printing mechanism moves from left to right across the page. All operations of the typing unit are performed automatically in response to input signal code combinations. A few local off-line functions such as line feed or carriage return may be initiated independently of the signal line from the local keyboard or base mechanism. The speed of operation of the equipment is usually given in operations per minute. Speed in words per minute is roughly one-sixth of the operations per minute. The typing unit is designed to operate at 60, 75, or 100 words per minute, depending on the gear ratio used on associated equipment. Rotary mechanical motion for its

operation and information in the form of the signaling code comes from external sources. A front plate and side plates provide mounting facilities for the various assemblies and mechanisms that make up the unit. Rotary motion from the gear shift assembly is applied to the main shaft, which turns constantly as long as the associated unit is under power. A signal applied to the selector magnets initiates operating sequences. The application of voltage to the stunt box and to various switches and controls is dependent upon external circuitry and associated equipment. With the main shaft under power (associated equipment main power supply on), the typing unit is described as running closed when a steady current (marking) condition is maintained in the signal line and no signal intelligence is received. It is described as running open when a no current (spacing) condition is maintained through an interruption in signal line current.

(1) Selecting Mechanism. A selecting mechanism translates the signaling code combinations into corresponding mechanical arrangements which control code bars in a code bar mechanism. It includes a two-coil magnet that connects in series with the external signal line. The coils may be wired in either series or parallel to accommodate 0.020 ampere or 0.060 ampere line currents. A range finder is used to refine the mechanical orientation of the selector to the signaling code. The signaling code combinations are applied to the selecting mechanism through a cable connector located just above the selector magnets. The start

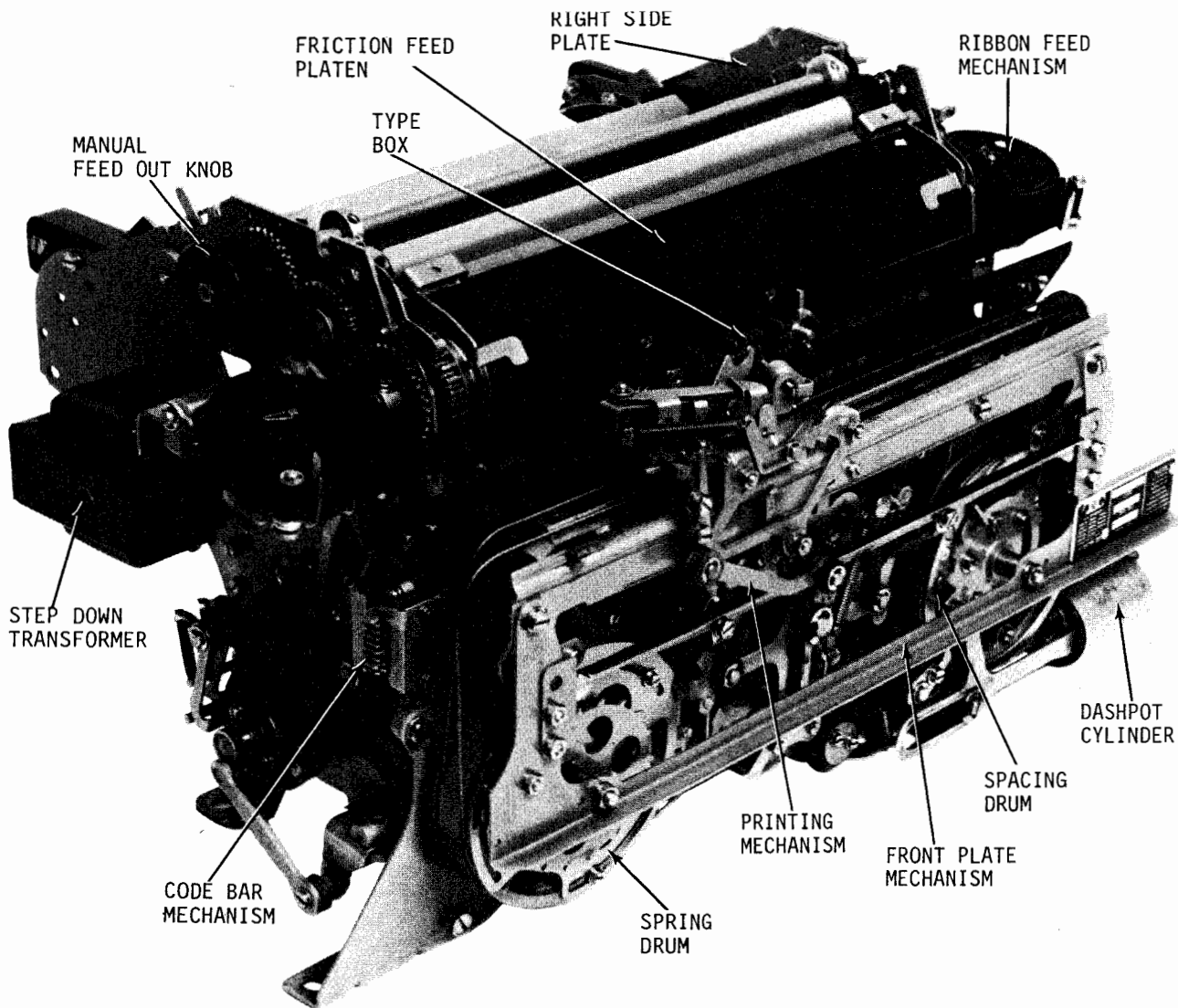


Figure 3-3. Typing Unit (Front View)

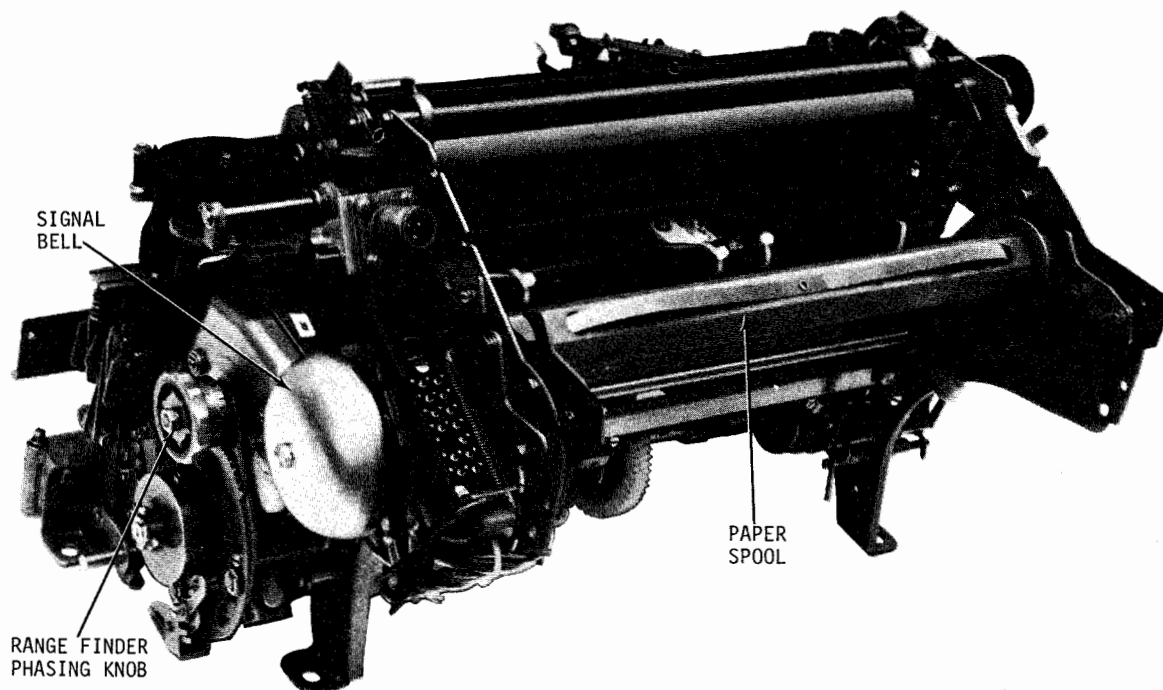


Figure 3-4. Typing Unit (Left Rear View)

pulse (spacing) of each code combination permits the start lever to fall to the rear behind the magnet armature and rotate to trip the selector cam clutch. The range finder mechanism permits adjustment of the angular relationship of the trip-off point to the optimum quality incoming line signal. The selector cam clutch, driven by the main shaft, converts the incoming signal into mechanical marking or spacing equivalents of each pulse in the signal code. A cam on the selector cam clutch engages the code bar clutch when a signal code combination has been translated and locked in a mechanical arrangement in the selecting mechanism.

(2) Code Bar Mechanism. The code bar mechanism, when positioned by the selecting mechanism to correspond to the input code intelligence, sets up mechanical requirements for type box positioning, printing, and stunt

box operation. The code bar clutch initiates mechanical actions which position the code bars in patterns determined by the selecting mechanism (marking-left, spacing-right), and condition the typing unit for type box positioning, function selection, and printing. A cam operated by the code bar clutch operates the function clutch and type box clutch trip mechanisms.

(3) Printing Mechanism. When mechanically conditioned by the code bar mechanism, the printing mechanism prints the selected character and spaces to the next printing area on the paper, or spaces without printing, or on units so equipped, tabulates horizontally, or returns the type box to the left hand printing margin. The mechanism includes the horizontal positioning mechanism operated by the code bars, spacing mechanisms and carriage return, and the print hammer mechanism.

The code bar mechanism and the code bar clutch operate in combination to trip the type box clutch. When the type box clutch is tripped, it initiates mechanisms involved in vertical positioning of the type box, horizontal type box positioning, ribbon feed and printing. The main rocker bail provides power from the type box clutch (and main shaft), and the code bars determine the specific application of that power required for each input signal code combination representing a graphic. A cam plate on the main rocker bail trips the spacing clutch stop mechanism to engage the spacing clutch, except when spacing is suppressed. The type box, positioned by the printing and spacing mechanisms in accordance with intelligence set up in the code bars, presents a single graphic in printing position for each operating cycle. To prevent printing during a function selection, the type box is positioned to present a vacant type-pallet position. At the proper moment, with the type box locked in printing position, a spring loaded print hammer is released to tap the selected type pallet sharply against the inked ribbon and the paper. A cleanly imprinted graphic character corresponding to the input signal code combination results, and the printing mechanism trips the spacing clutch to move both the type box and the print hammer to the next horizontal printing position to the right. The type box is capable of vertical and horizontal positioning in response to the permutations set up by the codebar mechanism. When positioned to correspond to the input code intelligence, the type box presents a single type pallet with the embossed graphic equivalent of the selected code

for printing. Printing is accomplished when this pallet is struck by the print hammer to press an inked ribbon against the paper, which is supported by the typing unit platen.

(4) Spacing Mechanism. The spacing mechanism moves the type box and printing mechanism one character to the right each time a graphic character is received and imprinted. A suppression mechanism prevents spacing on receipt of certain non-typing functions. The spacing clutch, when tripped by the cam plate on the printing mechanism main rocker bail, advances the type box and printing hammer one character space to the right across the paper. Spacing suppression may be initiated by the function mechanism to permit execution of a non-typing function without interference with the page printed message by the carriage return mechanism, or by the printing mechanism when the type box reaches the end of a printed line.

(5) Line Feed Mechanism. The line feed mechanism permits single or double line advance of paper in the platen mechanism when the code combination for this function is received. The function may also be initiated locally through mechanical linkage with the base or keyboard base. The line feed clutch operates mechanical linkages which advance the paper one or two spaces by rotating the platen. The function clutch controls the function bail and the stripper bail. The function reset bail permits transfer of intelligence from the code bars to the function mechanism and, upon receipt of a function code, operates the function linkage or switch or contact corresponding

to the input signal code. The stripper bail resets selected function mechanisms. When the input signal calls for carriage return function, direct mechanical linkage between the stunt box and the spacing mechanism initiates this function. When the input signal calls for line feed, the function mechanism trips the line feed mechanism, engaging the line feed clutch.

(6) Stunt Box. The stunt box (figure 3-5) is a compact, self-contained device with memory storage capabilities that provide the typing unit with the facilities of a built-in sequence selector. In effect, it allows the 32 available letters and figures character combinations to be used again for special, non-printing operations, without the sacrifice of printed characters. It operates in response to combinations set up on the code bar mechanism, with a single character or several characters

in sequential combination used to initiate a single function. In general, the stunt box may be programmed to perform three basic types of operation: mechanical initiation of internal functions within the typing unit, electrical control of functions within the teletypewriter set, and electrical control of external equipment.

(7) Ribbon Feed Mechanism. A ribbon feed mechanism passes an inked fabric ribbon between the type box and the paper. The mechanism advances the ribbon horizontally when each character has been printed, and automatically reverses the direction of ribbon feed when one of the two ribbon spools has been emptied.

(8) Paper Feed Mechanism. The platen and paper feed mechanisms are located at the top of the printer, between the two side plates. A manual paper or form feed out knob is

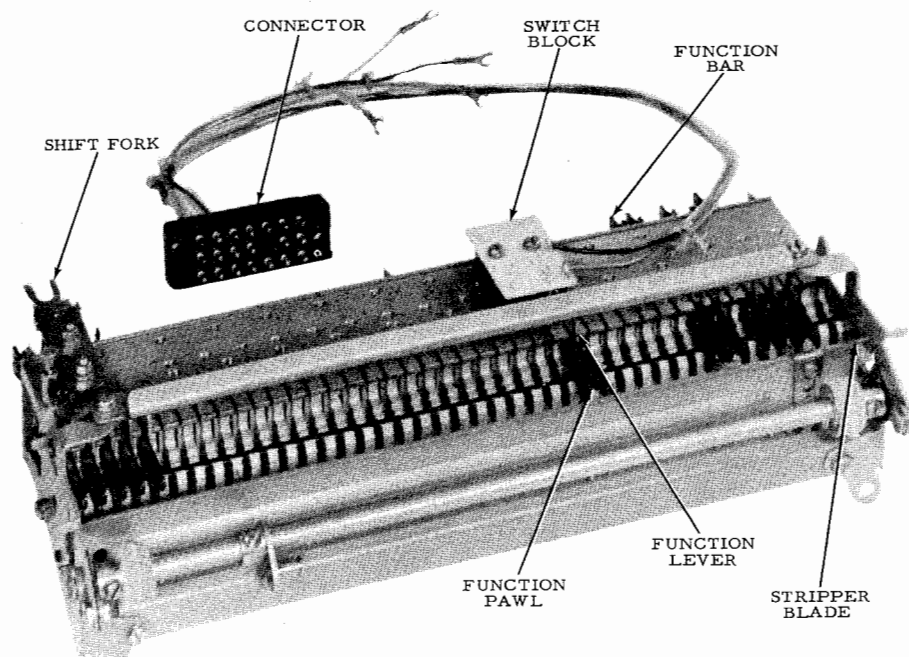


Figure 3-5. Stunt Box

located at the top of the left side plate. Paper is fed from a supply at the rear of the printer by friction feed.

(9) Signaling Code.

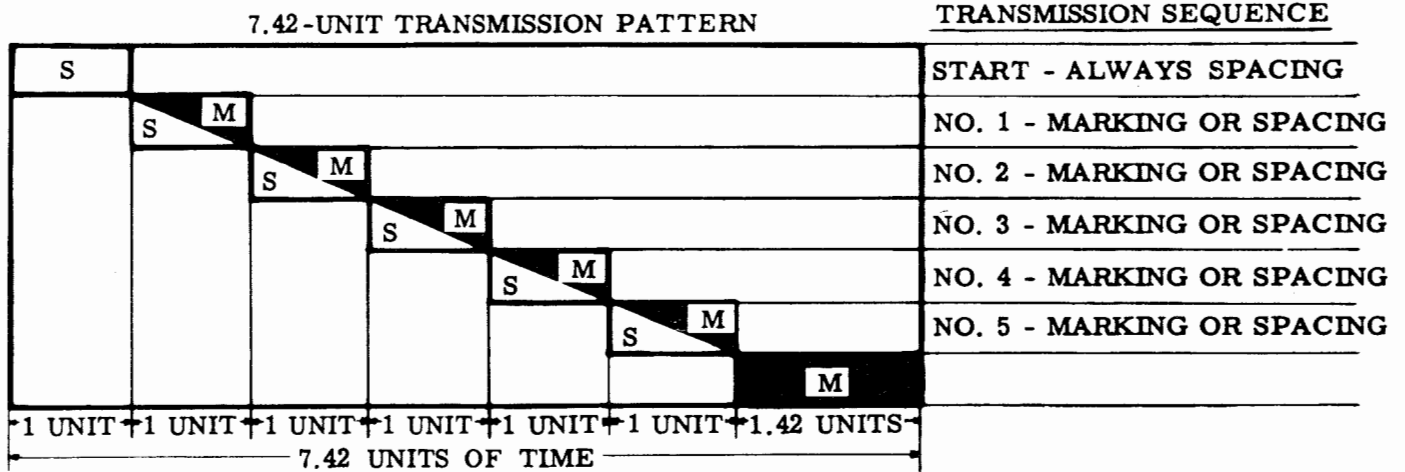
Information is received by the typing unit in the form of a 7.42 unit start-stop signaling code (figure 3-6) in which each character (graphic) or function is represented by a sequential combination of current and no-current time intervals. Intervals during which current flows in the signal circuit are referred to as marking and those in which no current flows are spacing. Every combination includes five pulses (also referred to as levels) that carry the intelligence, each of which may be either marking or spacing. To ensure synchronization between the transmitting and receiving equipment, a start pulse which is always spacing is added at the beginning of each combination of intelligence pulses, and a stop pulse which is always marking is added at the end. The code representation for the graphics R and Y are shown in figure 3-7. In these combinations, alternate marking and spacing conditions for the intelligence pulses are required. In different signaling codes used with Model 28 teletypewriter equipment, the length of the stop pulse may vary. For example, in the code shown in figure 3-6, the length of the stop pulse is 1.42 times the other pulses. Thus, the transmission of a graphic requires 7.42 units of time. It is therefore said to have a 7.42 unit transmission pattern. The stop pulse may be equal in duration to the other pulses in some applications, in which case the transmission code would have a 7.0 unit transmission pattern. The total number of permutations

of a five level (5 intelligence pulses) code is two to the fifth power, or 32. To accommodate more than 32 graphics, a letters-figures shift is designed into the typing unit. This is similar to the lower and upper case of a typewriter and permits each code combination, excluding the two used to shift the equipment, to represent two characters. A typical character arrangement is shown in figure 3-6. The black circles represent marking pulses, the blank squares spacing pulses. When the letters code combination (12345) is transmitted, it conditions all typing units connected to the circuit to print, at the receipt of all following code combinations, the characters in the letters (lower case) line on the chart. Similarly, when the figures code combination 12-45) is transmitted, it conditions the typing units to print the character, or perform functions in the figure (upper case) line on the chart.

3-4. ELECTRICAL CIRCUIT DESCRIPTIONS.

a. AC Power Circuits.

Refer to schematic diagram (figure 5-1) and wiring diagram (sheet 1 of figure 5-3). Primary 115-volt, 60-Hz, ac power is connected to terminals 2 and 4 of terminal block S located at the rear of the set. The power cord ground lead is connected to a ground screw on the terminal block bracket. The 115-volt ac power is distributed through fuses (W) and power switch (N) to the motor unit and through margin indicator switch (J) to the margin indicator light (AC). When the power switch is set to ON, the motor starts running and the margin indicator function is activated. Power is supplied directly from



a.

FIGURES	-	?	:	\$	3	!	@	#	8	'	(	)	.	,	9	ø	1	4	Δ	5	7	;	2	/	6	"	∞	<	≡	■	∇	∧	
LETTERS	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	BLANK	C.R.	L.F.	SPACE	LTR	FIG.		
1	●	●		●	●	●				●	●					●	●		●	●	●	●	●	●	●	●						●	●	
2	●		●				●		●	●	●	●				●	●	●		●	●	●	●						●				●	●
FEED HOLES	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
3			●			●		●	●		●	●	●		●	●	●		●	●	●	●	●	●	●						●	●		
4	●	●	●		●	●			●	●		●	●	●		●					●	●	●	●				●				●	●	
5	●						●	●				●	●		●	●	●			●	●	●	●	●	●	●						●	●	

(TYPICAL CHARACTER ARRANGEMENT)

b.

Figure 3-6. Signaling Code

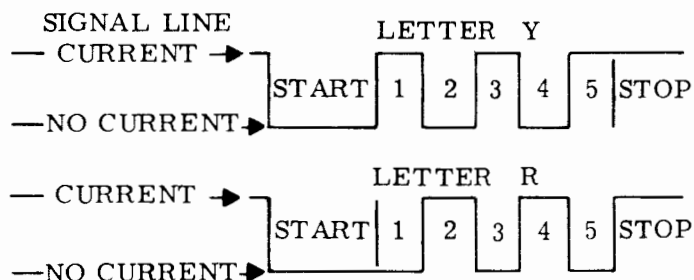


Figure 3-7. Code Representation of Letters R and Y

the fuse to the signal bell (C) circuit and to the primary of step-down transformer (E). Stunt box contact (D), in series with the signal bell, closes when the FIGS and S key are pressed, causing the signal bell to ring. The 5.5-volts ac appearing across the secondary of the step-down transformer supplies operating voltages to the copylights (AB) in the cover, to lamp assembly (B) in the distributor assembly, to lamp assembly (V) in the keyboard transmitter assembly, and to circuit card assembly 336650. Since the lamp assemblies require only 4.5-volts ac, the voltage is dropped approximately one volt through diode assembly 329272.

b. Signal Line Circuits. Refer to schematic diagram (figure 5-1) and wiring diagram (sheet 1 of figure 5-3). Signal lines are connected to terminals 1, 2, 3, and 4 on terminal block SS in either a half-duplex or a full-duplex configuration.

(1) Half-Duplex. For half-duplex operation the signal line connected to terminals 2 and 3 is used for either sending or receiving, not both at the same time. With the strap connected between terminals 1 and 4, the transmitted message is connected to the selector magnets and is monitored on the local typing unit. During the receive cycle, a short appears across terminals T4 and T3 of circuit card assembly 336651, routing the received signal to the selector magnets.

(2) Full-Duplex. For full-duplex operation, the strap is removed between terminals 1 and 4 of terminal block SS. The receive line (terminals 1 and 2) is separate from the send line (terminals 3 and 4) thus allowing sending and receiving at the same time. The transmitted message, however, will not be monitored on the local typing unit since the

selector magnets are connected only to the receive line.

c. Signal Control Circuit Card 336650. Refer to figure 5-2. The 336650 circuit card assembly is basically an electronic switch for controlling signal line currents of either 60 milliamperes (120-volts dc) or 70 microamperes (1.5-volts dc). DC power for the circuit is supplied by a half-wave rectifier and filter (CR1 and C1) which converts approximately 5.5-volts ac to approximately 7.5-volts dc. The 5.5-volts ac, connected between wiring points 2 and 4, is supplied from the secondary of the step-down transformer which also supplies voltage to the lamps in the photoelectric assemblies. The input to the circuit card from the photoelectric distributor is connected to the base of transistor Q1 through wiring points 1 and 4. When the input is an open circuit, transistor Q1 is biased on by sinking current through resistor R1, turning transistor Q2 off, which effectively opens the signal line between wiring points 3 and 4. Diode CR3 suppresses any inductive kickback on the signal line. CR2 prevents component damage if improper signal line connections are made during 60-milliampere (120-volts dc) operation. A strap across CR2 is added for 70-microampere (1.5-volts dc) operation.

3-5. TYPING UNIT MECHANICAL MOTION DESCRIPTIONS. The following paragraphs provide a detailed functional description of the mechanical assemblies used to perform the various functions of the typing unit.

a. Distribution of Motion. Refer to figure 3-8. Motion derived from the main

shaft is distributed throughout the teletypewriter set as described in the following paragraphs.

(1) General. The main shaft is located in the lower rear portion of the typing unit, supported between the two side frames by ball bearings. It extends the full width of the unit. Centrally located on the shaft are two driving gears. The larger gear meshes with the gear mechanism of the gear shift assembly to transmit power from the motor to the typing unit. Power take-off from the constantly rotating main shaft is controlled by six clutches, each of which, when tripped (engaged, or unlatched) drives its associated mechanism. From the right end of the shaft, these clutches may be identified as the selector clutch (with cam sleeve), the code bar clutch, the function clutch, the spacing clutch, the line feed clutch and the type box clutch. The sequence in which these clutches are tripped is, selector, code bar, function, type box, spacing and line feed. However, the type box and spacing clutch engagement may be suppressed under certain operating conditions, and the line feed clutch is operative only upon a specific set of input signal code combinations. The spacing and line feed clutches are three stop clutches (figure 3-9), each permitting their associated mechanism to operate through one-third of a revolution of the main shaft. All other clutches are one stop clutches (figures 3-10 and 3-11), operating through an entire revolution of the main shaft.

(2) One-Stop Clutches. The clutch drums are attached to and rotate with the

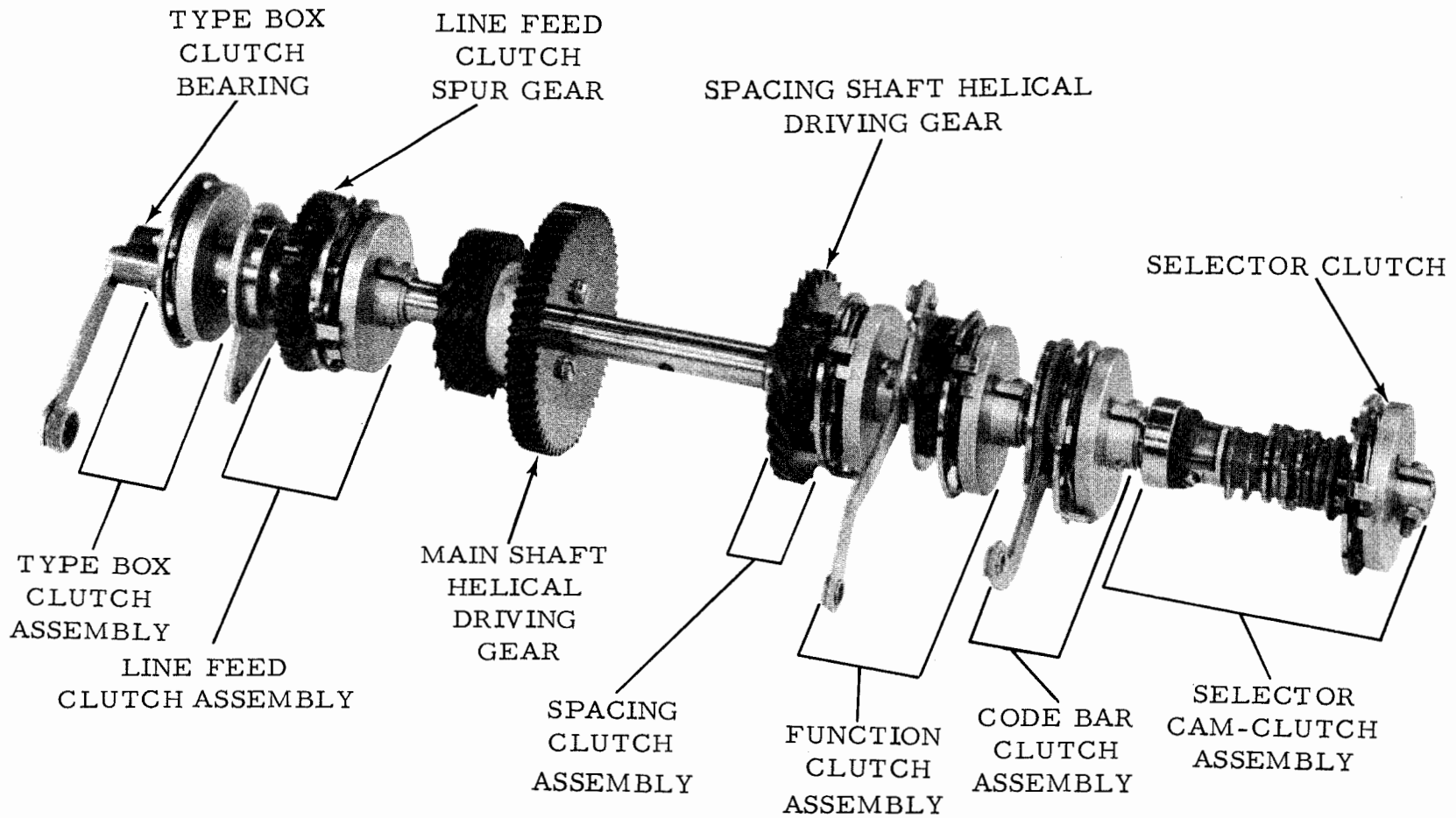


Figure 3-8. Main Shaft (Right Front View)

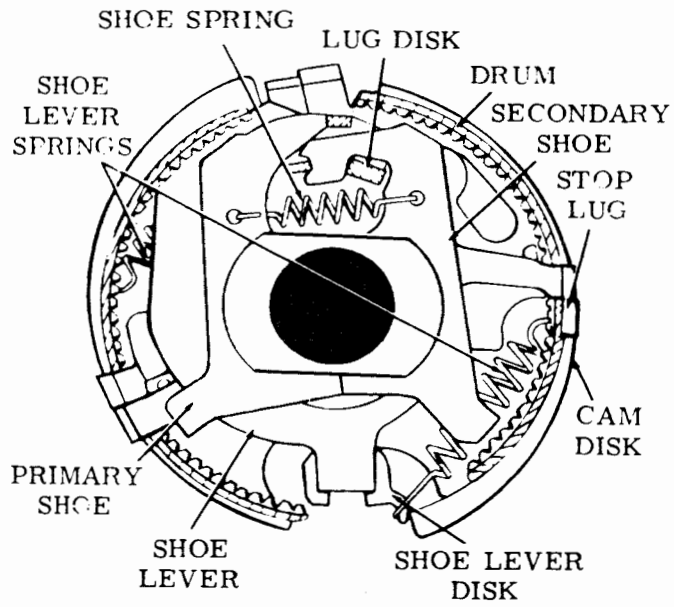


Figure 3-9. Three-Stop Clutch

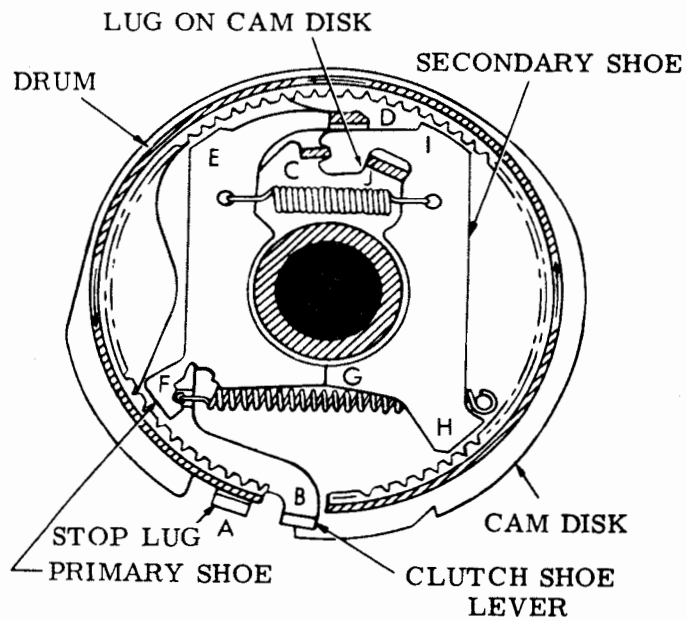


Figure 3-10. One-Stop Clutch (Disengaged)

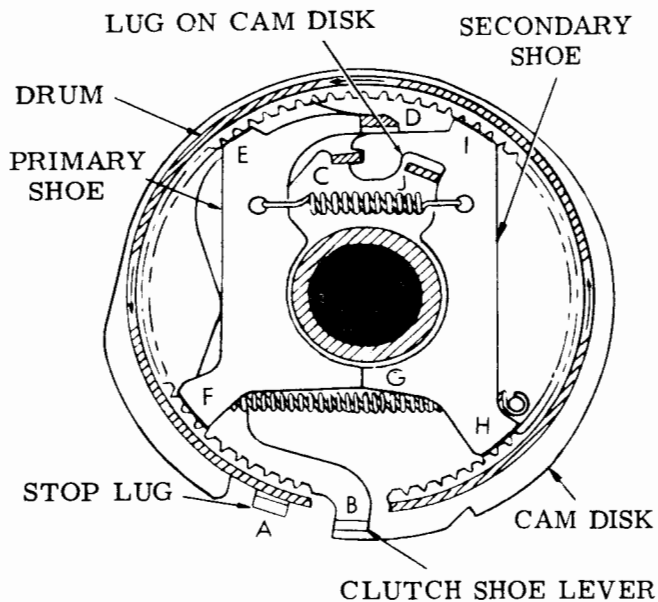


Figure 3-11. One-Stop Clutch (Engaged)

main shaft (figure 3-8). In the disengaged position, as shown in figure 3-10, the clutch shoes do not contact the drum, and the shoes and cam disk are held stationary. Engagement is accomplished by moving the stop arm (figure 3-11) toward the rear of the typing unit, away from the clutch, thus releasing stop lug A and the lower end of shoe lever B. (figure 3-11). The upper end of lever B pivots around its ear C, which bears against the upper end of the secondary shoe and moves its ear D and the upper end of the primary shoe toward the left until the shoe makes contact with the notched inner surface of the rotating drum at point E. As the drum turns counterclockwise, it drives the primary shoe downward so that it again makes contact with the drum at point F. There, the combined forces acting on the primary shoe cause it to push against the secondary shoe at point G. The lower end of the secondary shoe then bears

against the drum at point I. The forces involved are multiplied at each of the preceding steps. The aggregate force is applied through the shoes to the lug J on the clutch cam disk, and the disk and attached cam turn in unison with the drum. Disengagement is effected when the lower end of shoe lever B strikes the stop arm. Lug A and the lower end of the shoe lever are brought together (figure 3-10), and the upper end of lever B pivots about its ear C and allows its other ear D to move toward the right. The upper spring then pulls the two shoes together and away from the drum. The latch lever seats in the indent in the cam disk, and the cam is held in its stop position until the clutch is again engaged.

(3) Three-Stop Clutches. Two of the clutches, spacing and line feed (figure 3-9), have three sets of lugs equally spaced about their periphery. The action is as

described in paragraph (2) above, but the clutch is permitted to rotate through only one-third revolution before the stop lever and latch lever halt its motion.

b. Selection. The selection function is described in the following paragraphs.

(1) General. The selecting mechanism consists of two magnet coils, an armature, a selector cam clutch, and the associated levers, arms, bails and slides necessary to convert the electrical pulses of the start-stop code to the mechanical arrangements which govern the character to be printed and the function to be performed.

(2) Selector Mechanism. Refer to figures 3-12 and 3-13. The selector cam clutch comprises, from right to left (figure 3-8), the clutch, the stop arm bail cam, the fifth, fourth, and third selector lever cams, the cam for spacing and marking lock levers, the second and first selector lever cams, the push lever reset bail cam, and the code bar clutch trip cam. During the time in which a closed line circuit (marking) condition exists, the selector magnet coils are energized and hold the selector armature against the selector magnet pole pieces. In this stop position, the selector armature blocks the start lever (figure 3-12). While the signal for any character or function is being received, the start (spacing) pulse releases the selector armature which, under the tension of its spring, moves away from the magnet cores, and thus unlatches the start lever. The start lever rotates clockwise (as viewed from the

right) under tension of its spring, moving the stop arm bail into the indent of the first cam. As the stop arm bail rotates about its pivot point, the attached stop arm is moved out of engagement with the clutch shoe lever. The selector cam clutch engages and begins to rotate. The stop arm bail immediately rides to the high part of its cam, where it remains to hold the start lever away from the selector armature during the reception of the signal code combination. When the stop pulse at the end of the signal code combination is received, the selector armature is pulled up to block the start lever. Thus, the stop arm bail is prevented from dropping into the indent of its cam, and the attached stop arm is held so as to stop the clutch shoe lever. The clutch cam disk upon which the latch lever rides has an indent as its stop position. When the clutch shoe lever strikes the stop arm, the inertia of the cam disk assembly causes it to continue to turn until its lug makes contact with the lug on the clutch shoe lever. At this point, the latch lever drops into the indent in the cam disk, and the clutch is held disengaged until the next start bit is received. The series of five selecting levers and a marking lock lever ride their respective cams on the selector cam clutch. As the marking or spacing signal pulses are applied to the selector magnets, the selector cam clutch rotates and actuates the selector levers. When a spacing pulse is received, the marking lock lever is blocked by the end of the armature, and the spacing lock lever swings toward the rear, above the armature, and locks it in the spacing position until the next signal pulse is received. Extensions on the

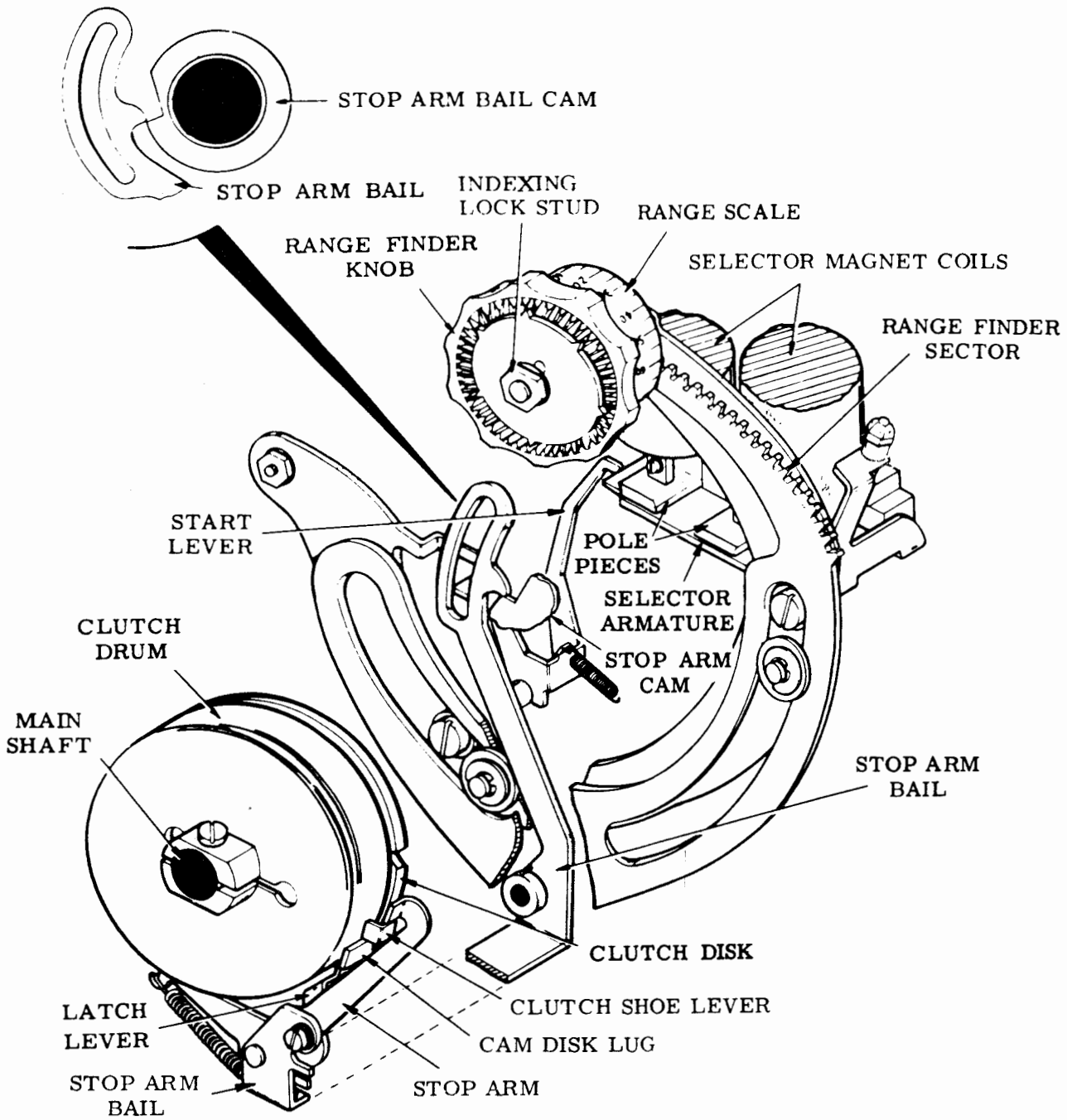


Figure 3-12. Selector Clutch and Range Finder (Right Front View)

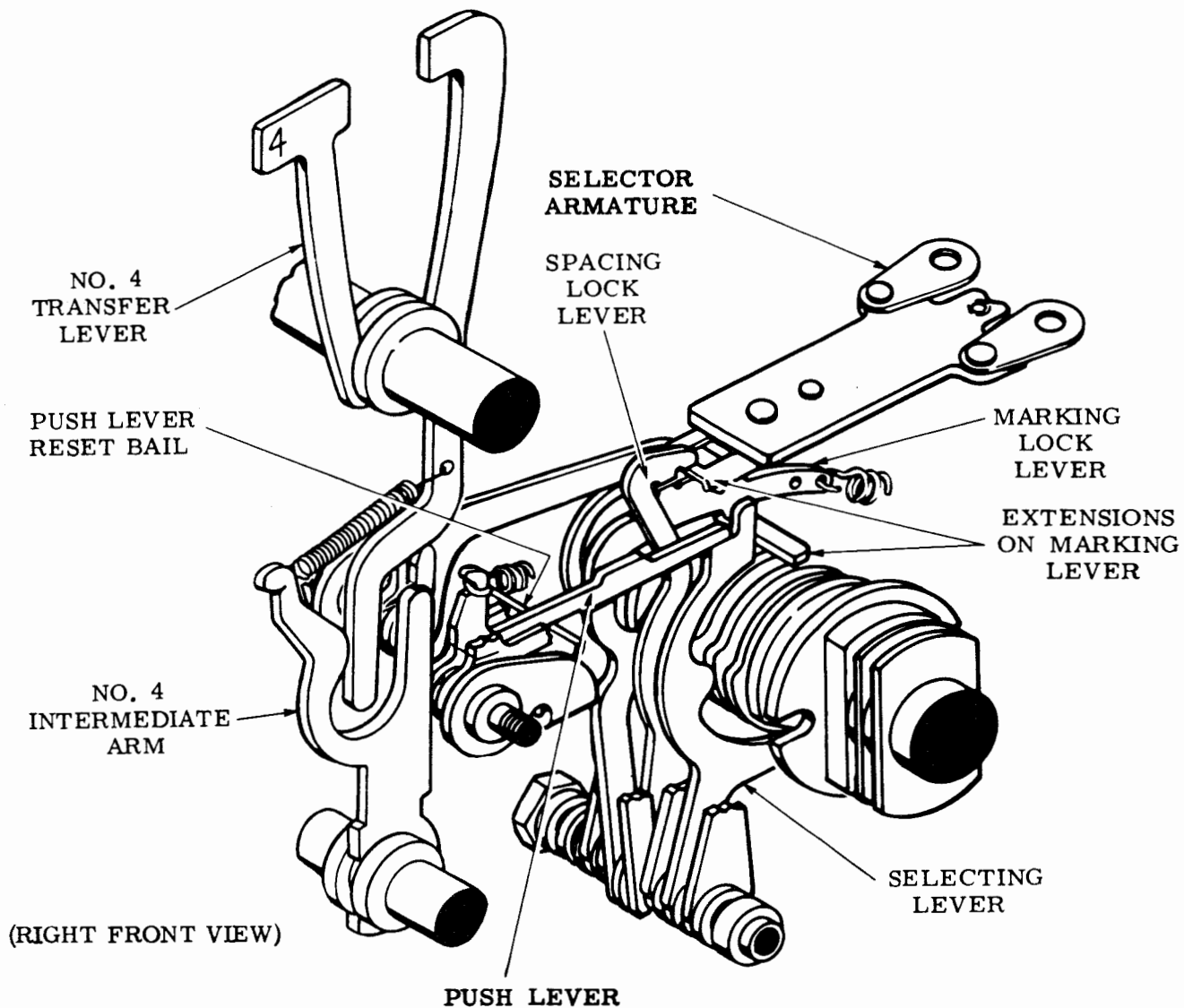


Figure 3-13. Selecting Mechanism and Transfer Mechanism

marking lock lever prevent the selector levers from following their cams (figure 3-13). When a marking pulse is received, the spacing lock lever is blocked by the end of the armature, and the marking lock lever swings to the rear, below the armature, to lock it in the marking position until the next signal pulse is received. During this marking condition, the selector levers are not blocked by the marking lock lever and are permitted to move against their respective cams. The selecting lever that is opposite the indent in its cam while the armature is locked in marking condition swings to the rear, or selected, position momentarily. Each selecting lever has an associated push lever which drops into a notch on the top of the selecting lever when the selecting lever falls into the indent in its cam. As the selector cam clutch rotates, each selecting lever is moved forward as it rides to the high part of its cam. Selected (dropped) push bars are also moved forward. Unselected push bars remain in the rear position, on top of the notch of the selecting lever. When all five code pulses have been received, push levers are held in their selected or unselected position until the next start bit is received. When the subsequent start pulse is received, the cam clutch is again engaged. The push lever reset bail, following its cam, unlatches the selected push levers. The push levers then return to their unselected (rear) position under their spring tension.

(3) Orientation.

For optimum performance, the selecting mechanism should sample the code elements at the most favorable time. Manual operation of the range finder

varies the time of sampling between the operating margins. Adjusting the range finder is called orientation. When the range finder knob (figure 3-12) is pushed inward and rotated, its attached range finder gear moves the range finder sector (which mounts the stop arm bail, stop arm and latch lever) either clockwise or counterclockwise about the selector cam clutch. This changes the angular position at which the selector cam clutch stops with respect to the selecting levers. When an optimum setting is obtained, the range finder knob is released. Its inner teeth engage the teeth of the indexing lock stud to lock the range finder mechanism in position. The setting may be read on the range finder scale opposite the fixed index mark.

c. Position the Code Bars. Positioning of the code bars is accomplished as described in the following paragraphs.

(1) Code Bar Mechanism. Refer to figure 3-14. The character printed or the function performed by the typing unit is basically determined by the code bar mechanism, to which the input signal intelligence, translated into mechanical form, is transmitted from the selecting mechanism push bars. The code bars are positioned by code bar shift bars which move to the left for marking and to the right for spacing. The shift bars, positioned to the rear for marking and forward for spacing, are pushed into marking position by selected push bars through a mechanical linkage, intermediate arms, and transfer levers. Power to position the selected code bar levers, and through them the code bars, is supplied by the code bar clutch.

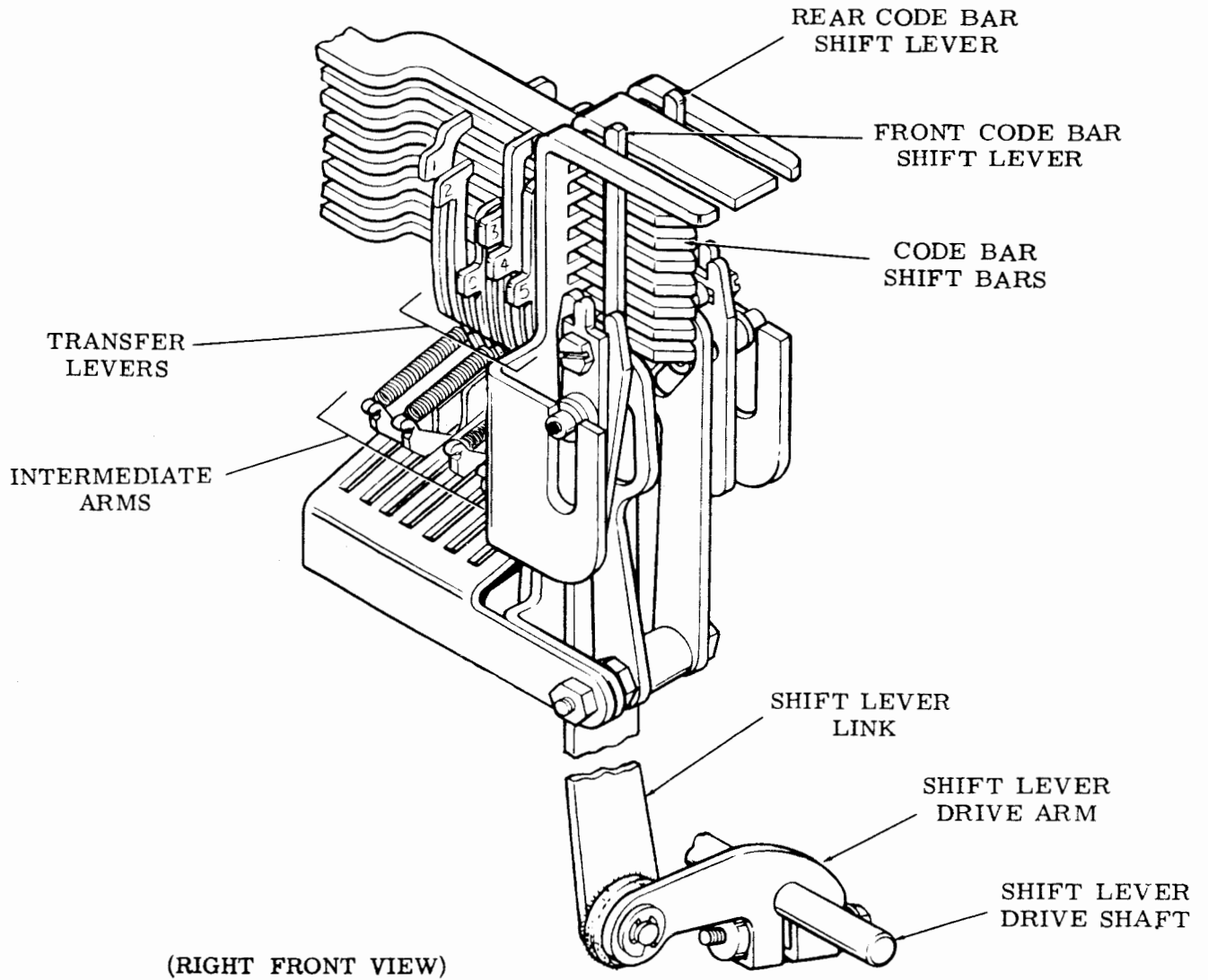


Figure 3-14. Code Bar Mechanism

The code bar clutch is engaged by its cam on the selector cam clutch.

(2) Code Bar

Operation. Refer to figures 3-14, 3-15, and 3-16. Each selector push lever has an associated intermediate arm, transfer lever, and code bar shift bar (figure 3-14). In addition, there is a common transfer lever with its code bar shift bar. When a push lever is toward the rear (spacing) its associated intermediate arm and transfer lever are pulled toward each other by a spring. The upper end of the transfer lever is held forward (spacing), holding the code bar shift bar in spacing position. When a push lever is moved forward (marking), it rotates the intermediate arm counterclockwise, positioning the transfer lever to the rear (marking) and holding the code bar shift bar in marking position. The common transfer lever (third from left, operating the common code bar, third from bottom) has an extension which passes behind the number 1 and 2 transfer levers. There is no connection between the common transfer lever and the selecting mechanism, but when either the number 1 or number 2 push bar is selected, the associated transfer levers position the common code bar shift bar to the rear (marking). The right ends of these code bars determine vertical positioning of the type box (figure 3-16). As the selector cam clutch completes its revolution, the trip shaft operating lever rides to the peak of the code bar clutch trip cam (figure 3-8). This causes the shaft to turn slightly (counterclockwise, viewed from the right) to move the code bar clutch trip lever away from the

clutch stop lug and engage the clutch. Rotation of the clutch operates an eccentric and the shift lever drive shaft, shift lever drive arm, and shift lever drive link. The drive link moves two code bar shift levers in a scissors-like action, the front lever moving to the left, the rear lever moving to the right. Any code bar shift bar in marking position (left) during the previous operating cycle is moved to spacing position (right) by the forward shift lever, unless the transfer lever is once again holding that bar to the rear (marking). The rear shift bar, as it moves to the left (figure 3-15) carries with it any code bar shift bar held in the marking position, completing the transfer of intelligence from the selecting mechanism to the code bars. At the end of one revolution, the code bar clutch trip lever strikes the clutch shoe lever. Inertia of the cam disk assembly causes it to continue to turn to permit the latch lever to drop into the indent in the cam disk, and the clutch is held disengaged. The code bars, code bar shift bars and shift levers are held in the selected position, but the transfer levers and intermediate arms are free to position the shift bars forward or to the rear in response to new input signal intelligence from the selector.

(3) Code Bar

Arrangement. Refer to figure 3-16. A total of nine code bars in marking (left) or spacing (right) position convey mechanically translated signal intelligence to the typing and function mechanisms. The code bars are arranged from top to bottom as follows: suppression, number 4, number 1, number 5, number 2, number 3, common,

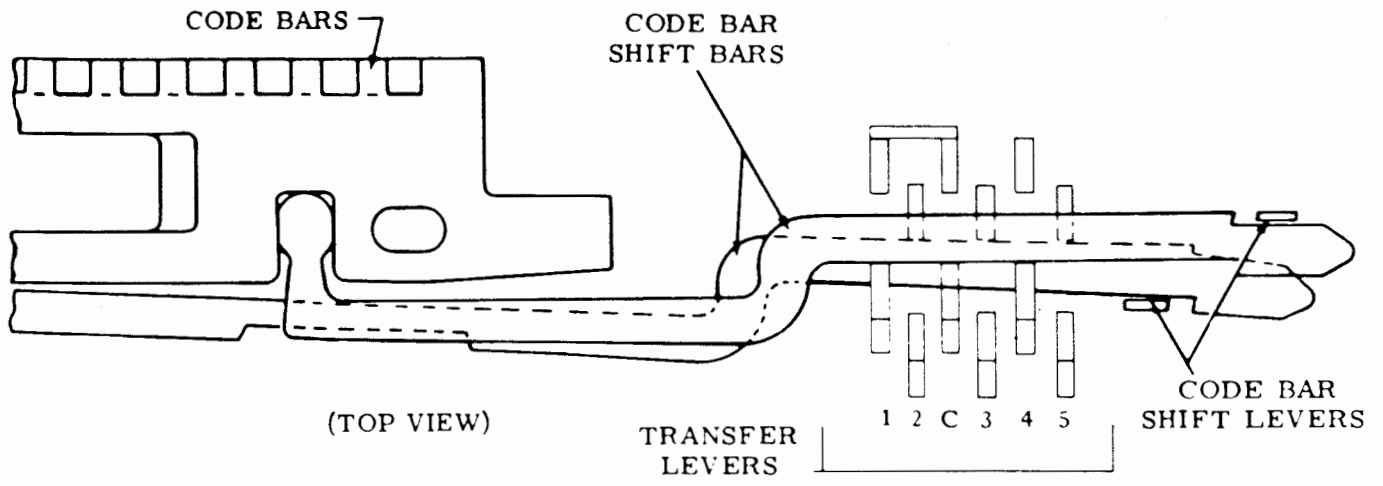


Figure 3-15. Code Bar Shift Bar Positioning

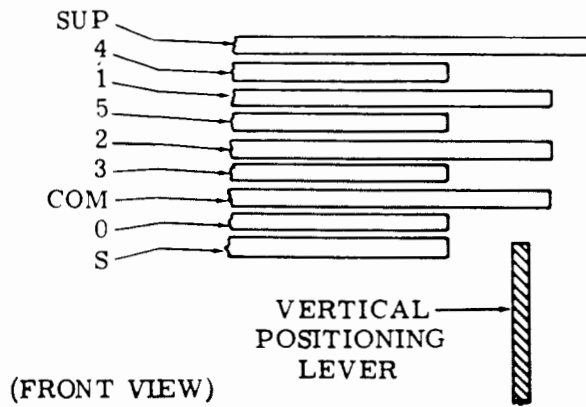


Figure 3-16. Vertical Arrangement of Code Bars

zero (0) and letters-figures shift (S).

d. Positioning the Type Box. Type box positioning is accomplished as described in the following paragraphs.

(1) General. All of the characters (graphics) that may be printed by the typing unit are formed by type pallets which are arranged in a type box. The type box is mounted in a carriage from which it may be removed for cleaning or replacement. In order to print any selected character, the type box carriage is so positioned that the character on the pallet is directly over the desired location on the paper. Since the pallets are arranged in four horizontal rows and sixteen vertical rows, it is necessary to position the type box carriage both horizontally and vertically. See figure 3-17 for arrangement of graphics which are represented on the type box pallets. See figure 3-6 for input signal code permutations equivalent to each graphic representation. The type box carriage rides on rollers over a track which is moved vertically for positioning in that particular plane. The carriage is positioned horizontally on its track by the oscillating rail slide and type box carriage link. The slide rides the oscillating rail and is clamped to the rear section of the upper draw wire rope. The link provides a flexible connection to permit the type box carriage to follow both the vertical movement of the type box carriage track and the horizontal movement of the oscillating rail slide. The lower right rear end of the upper draw wire rope is fastened to the spacing drum. From this point, it passes part way around

the spacing drum, upward and around the right rail pulley and downward to the spring drum. After passing part way around the spring drum, the upper draw wire rope is doubled backward around it and passes upward to the left printing carriage rail pulley over to the right printing carriage rail pulley, and downward to the spacing drum to which it is again fastened. The lower draw wire rope is fastened at its left end to the spring drum and, at its right end, to the spacing drum. It acts in opposition to the upper draw wire rope and holds the two drums in phase (figure 3-18). A tensioning pulley rides the under side of the lower draw wire rope, to take up any slack which may occur due to stretching of the upper and lower draw wire ropes. The oscillating rail is supported by pivoted arms at each end. These arms which extend downward are pivoted on the typing unit frame at their lower ends. Thus, the oscillating rail and draw wire rope that it carries with it may be shifted to the left or right with no change in position relative to each other. The oscillating rail shift slide and two oscillating rail shift links are used to accomplish the horizontal positioning of the oscillating rail and also connect it with the oscillating rail shift slide. The links are pivoted and are such a length that only one at a time may be fully extended.

(2) Letters-Figures Shift. Refer to figure 3-19. Mechanical limitations restrict the selection from the type box pallets to four horizontal rows and eight vertical rows. With a total of sixteen vertical rows in the type box, it is necessary to determine which of two fields, letters (left half of

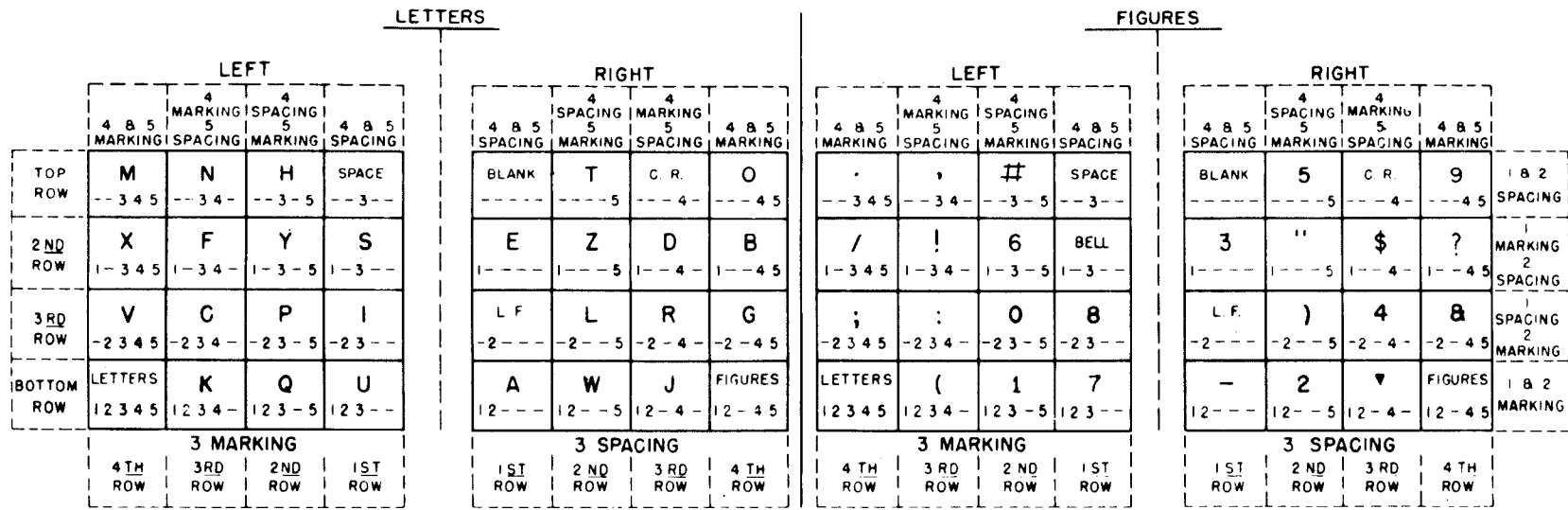


Figure 3-17. Typical Type Box Pallet Arrangement

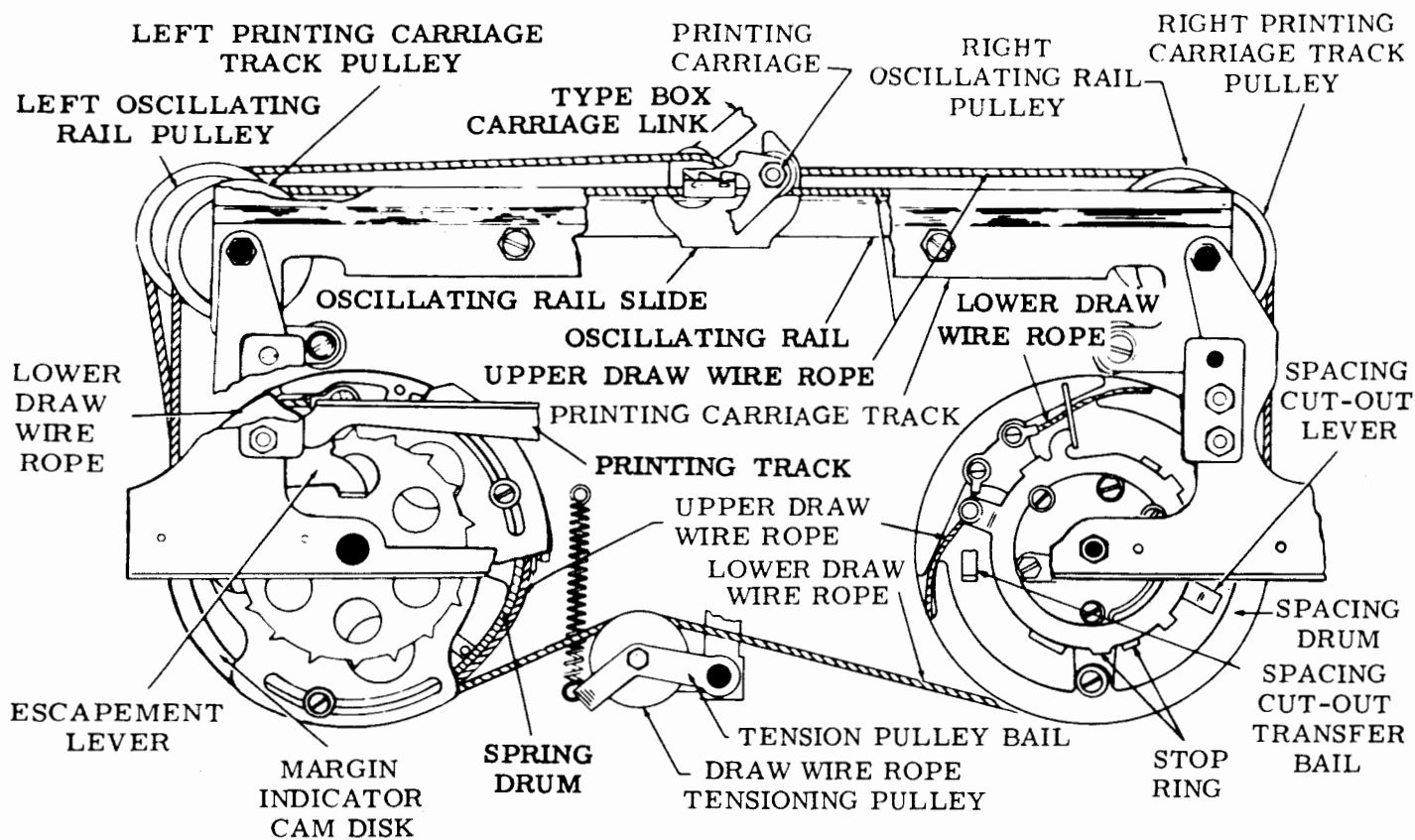


Figure 3-18. Draw-Wire Rope and Drums

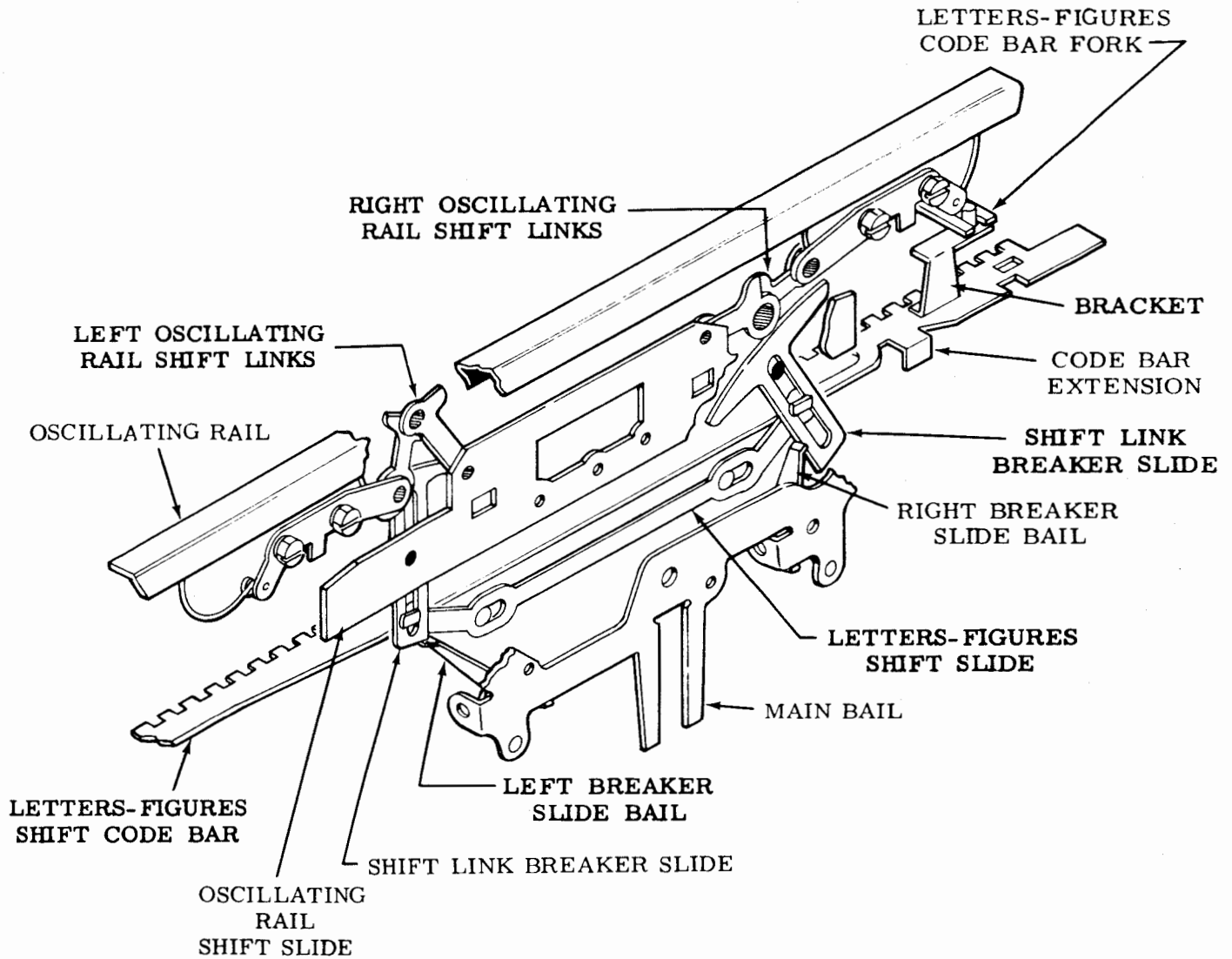


Figure 3-19. Letters-Figures Shift Mechanism
(Left Front View)

type box) or figures (right half of type box) will be presented for printing. To accomplish this, a special non-printing signal combination is used for each shift operation. Upon receipt of the letters or figures shift signal, mechanisms provided in the stunt box initiate the shifting operation. This, as are other non-printing operations, is described under Functions. The operation of the mechanisms that perform the actual shifting of the type box, however, are as follows: The lowermost code bar, designated S, contains a pin near its right end that projects upward to permit engagement with the stunt box. The code bar is positioned to the left (the figures position) or to the right (the letters position). A slotted extension of the S code bar engages a tongue from the right end of the letters-figures shift slide and causes it to follow the S code bar movements. Pins at the end of the shift slide serve as lower guides for the right and left shift link breaker slides. Pins which project from the front plate serve as upper guides and pivot points. The main bail has left and right breaker slide bails mounted on its ends. Upon receipt of the signal code for the letters shift operation, the shift slide is moved to the right. This positions the left shift link vertically with its lower end over the left breaker slide bail. The right breaker slide is positioned so that its lower end is to the right of the right breaker slide bail. As the main bail moves upward, the right breaker slide bail clears the right breaker slide, but the left breaker slide bail engages the left breaker slide and moves it upward. As a result of this action, the left oscillating rail shift links open and the

oscillating rail is permitted to be moved to the right. This action presents the letters field in line for printing. In a similar manner, when the signal code for the figures shift is received, the right oscillating rail shift links are opened, the oscillating rail shifts left, and the figures field of the type box is in line for printing.

(3) Vertical Positioning. Refer to figure 3-20. The selection of the various characters from the four horizontal rows and eight vertical rows in either field (figures or letters) and the printing of those characters take place as follows: The number 1 and number 2 code bars determine selection of the horizontal row. The number 3 code bar determine whether the selection is to be made from the left four vertical rows or the right four vertical rows (in either the figures or the letters field). The number 4 and number 5 code bars determine the selection of one row from the four vertical rows predetermined by the number 3 code bar. Four code bars (longer than the others) extend through the right code bar bracket and serve as stops for the right vertical positioning levers. They are (from top to bottom) the suppression, number 1, number 2 and common code bars. Notches are arranged in the left ends of these code bars so that the left side vertical positioning levers are stopped, in each case, by the same bar that blocks the right side levers. After all code bars have been positioned by the code bar positioning mechanism, the code bar clutch cam follower arm and its roller, in traversing the sloping indent on the code bar clutch cam, rotates the

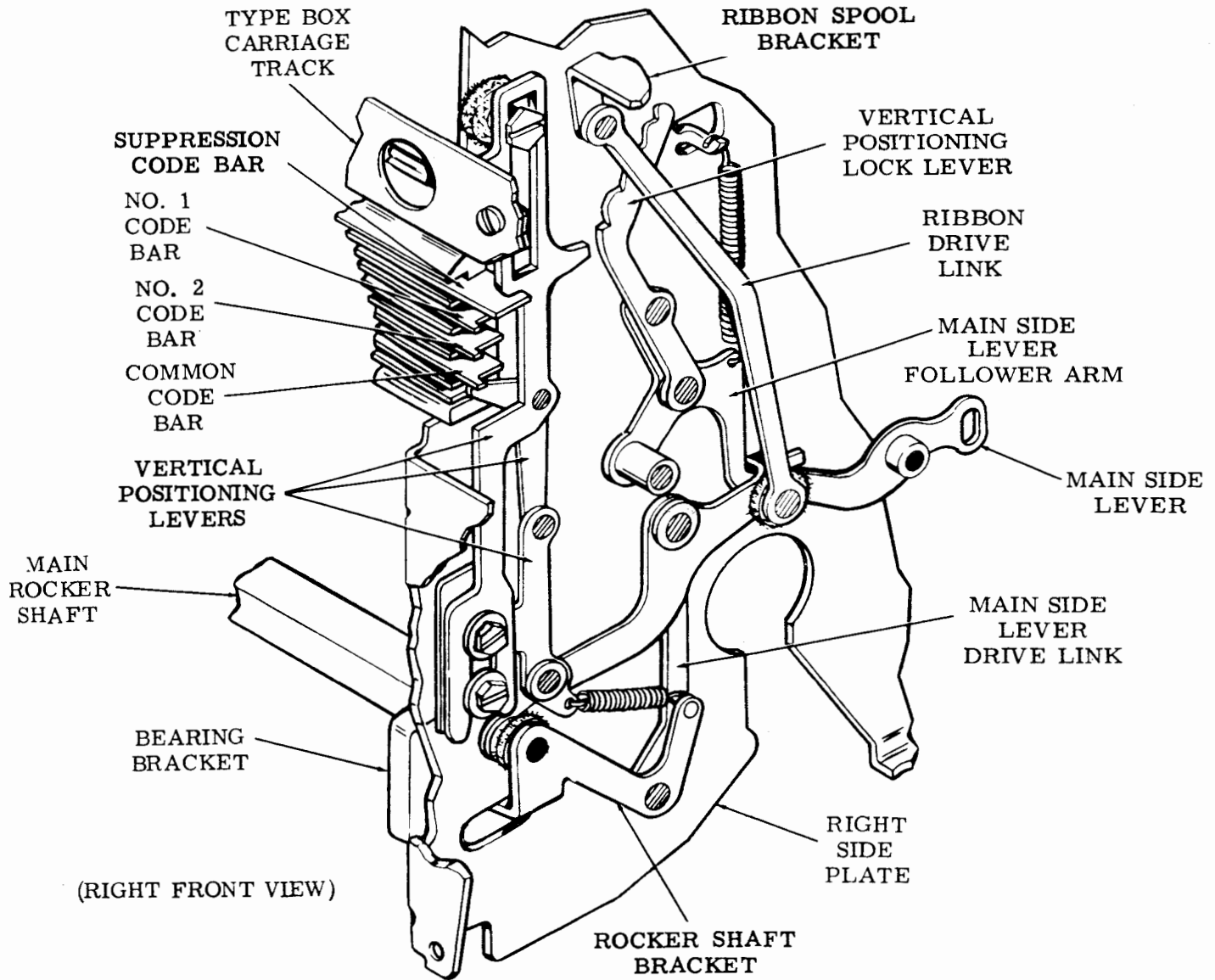


Figure 3-20. Vertical Positioning Mechanism

clutch trip lever shaft. As the shaft turns, it first causes the function clutch lever to release the function clutch (figure 3-21) and then causes the type box clutch trip arm to engage its trip lever and release the type box clutch. When the type box clutch completes its revolution, it is disengaged by its trip lever and latch lever in the same manner as was the code bar clutch. During its rotation, the type box clutch operates a drive link and a bracket to cause the main rocker shaft to oscillate. This, in turn, through its left and right brackets and the main side drive links, extends the motion to the vertical positioning levers (figure 3-20). These levers are driven upward until they strike a projecting code bar, which causes them to buckle. The type box carriage track is mounted between the vertical positioning levers, and its vertical motion is controlled by them. When the number 1 and number 2 code bars are toward the right (spacing), the common code bar is also toward the right, where it blocks the vertical positioning levers. The top row of pallets in the type box are then in line for printing. When the number 1 code bar is toward the left (marking), the common code bar is toward the left. If the number 2 code bar is toward the right (spacing), it blocks the vertical positioning levers, and the second row of pallets (from the top) are then in line for printing. When the number 1 code bar is toward the right (spacing), and the number 2 code bar is toward the left (marking), the common code bar is toward the left. The number 1 code bar blocks the vertical positioning levers and the third row of pallets is in line for printing. When both the number

1 and number 2 code bars are to the left (marking), the common code bar is also to the left. The suppression code bar blocks the vertical positioning levers and the fourth (bottom) row of pallets in the type box are then in line for printing. At each of the four levels at which the vertical positioning levers may be stopped, they are locked momentarily by lock levers controlled by the main side lever follower arms.

(4) Horizontal Positioning. Refer to figures 3-22 and 3-23. A bracket attached to the main rocker shaft applies vertical motion to the main bail by means of two main bail links (figure 3-22). Attached to each end of the oscillating rail shift slide are pivoted, buckling-type drive links which extend downward to each end of the main bail. As the main bail moves downward under impetus of the type box clutch, the left shift slide links, if not buckled, will try to shift the oscillating rail shift slide links to the left. When the number 3 code bar is shifted toward the left (marking), the horizontal motion reversing slide is shifted toward the left by the reversing slide shift lever, and is held there by detent levers. A bracket near the right end of the reversing slide will then make contact with the right shift slide drive links and cause them to buckle. As the main bail is driven downward, the unbuckled left shift slide drive links will start to shift the oscillating rail shift slide toward the right. This positions the type box so that the characters to be printed will be located in the left half of the figures or the letters field. In a similar manner, when the number 3 code

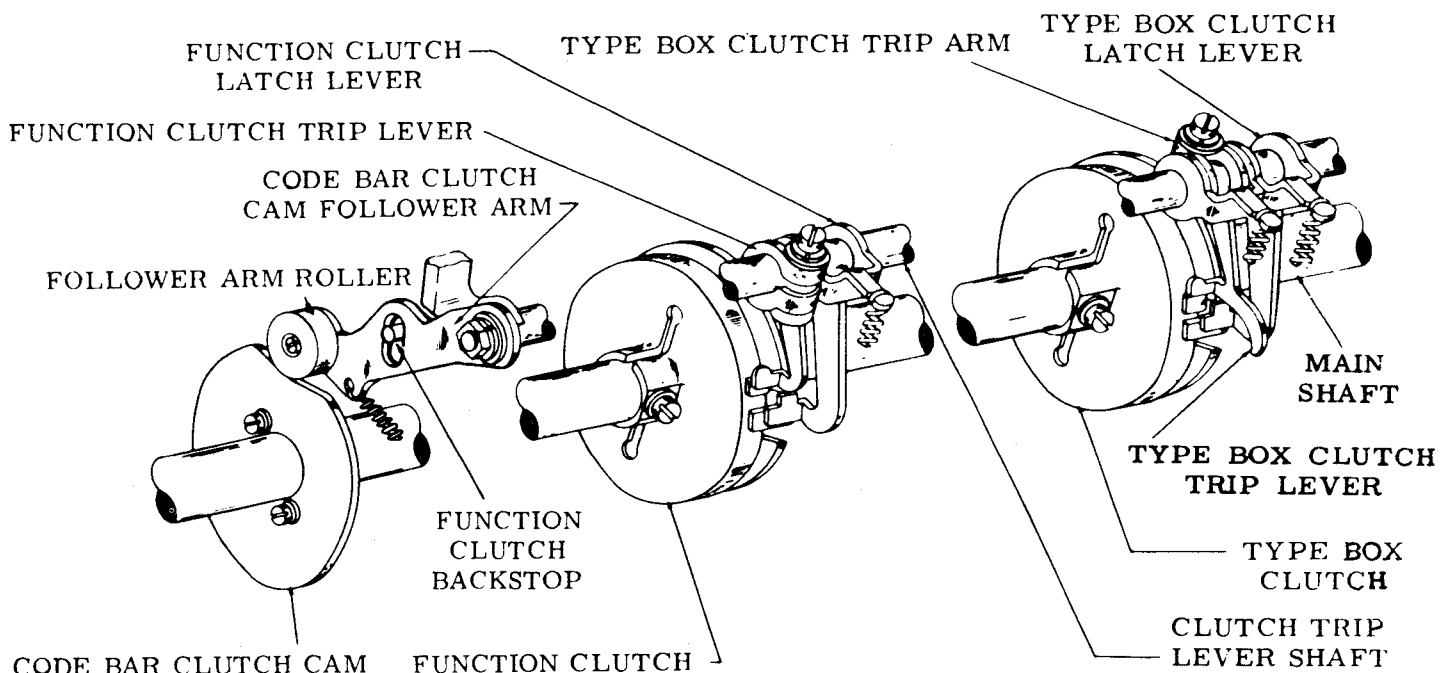


Figure 3-21. Vertical Positioning Mechanism

bar is shifted toward the right (spacing), the horizontal motion reversing slide is also shifted toward the right by the shift lever and is held there by the detent levers. A bracket near the left end of the horizontal motion reversing slide then makes contact with the left shift slide drive links and causes them to buckle. As the main bail is driven downward, the unbuckled right shift slide drive links will start to shift the oscillating rail shift slide toward the left. This positions the type box so that the characters to be printed will be located in the right half of the figures or the letters field. After determination of the field (figures or letters) and the group of vertical rows in which the character to be printed is located, the number 4 and number 5 code bars operate three horizontal motion stop slides to determine the row in that group in which the character is to be found (figure 3-23). A wedge shaped horizontal positioning

lock lever which is pulled downward by the main bail through a yield spring bears against the horizontal positioning lock lever arm. This arm drives the oscillating rail shift slide in the direction in which it was started (by the number 3 code bar selection) until one of two decelerating slides which are mounted on the oscillating rail shift slide strikes an unselected horizontal motion stop slide. A camming surface on the unbuckled shift slide drives the decelerating slide and causes the drive links to buckle. The oscillating rail shift slide finally comes to rest when it strikes the blocked decelerating slide. This, in turn, ends the downward excursion of the lock lever, and the yield spring extends until the main bail reaches the lowest point of its oscillation. As the main bail returns upward, it centers the oscillating rail shift slide. It is during this time that the horizontal motion

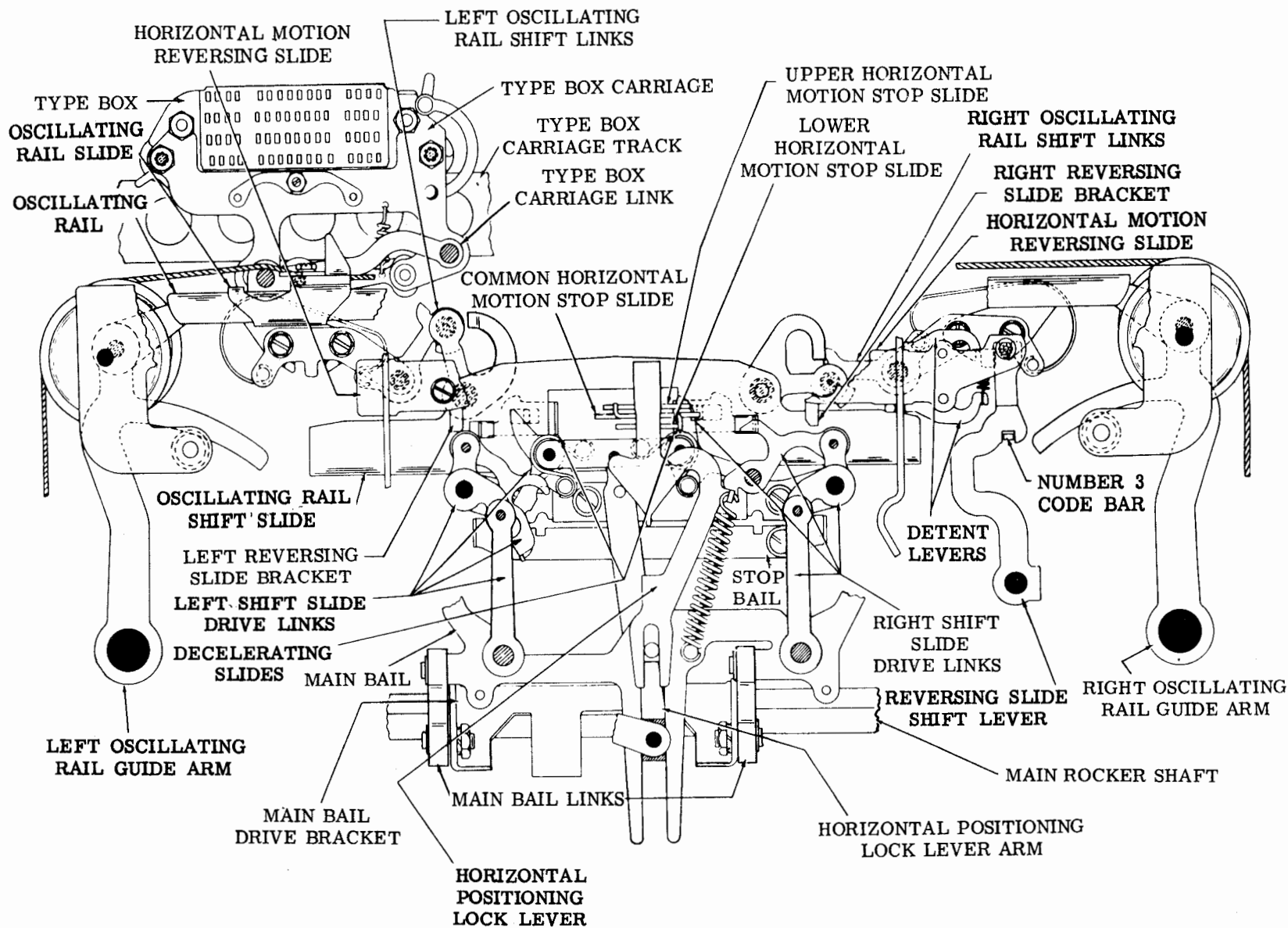


Figure 3-22. Horizontal Positioning Mechanism (Front View)

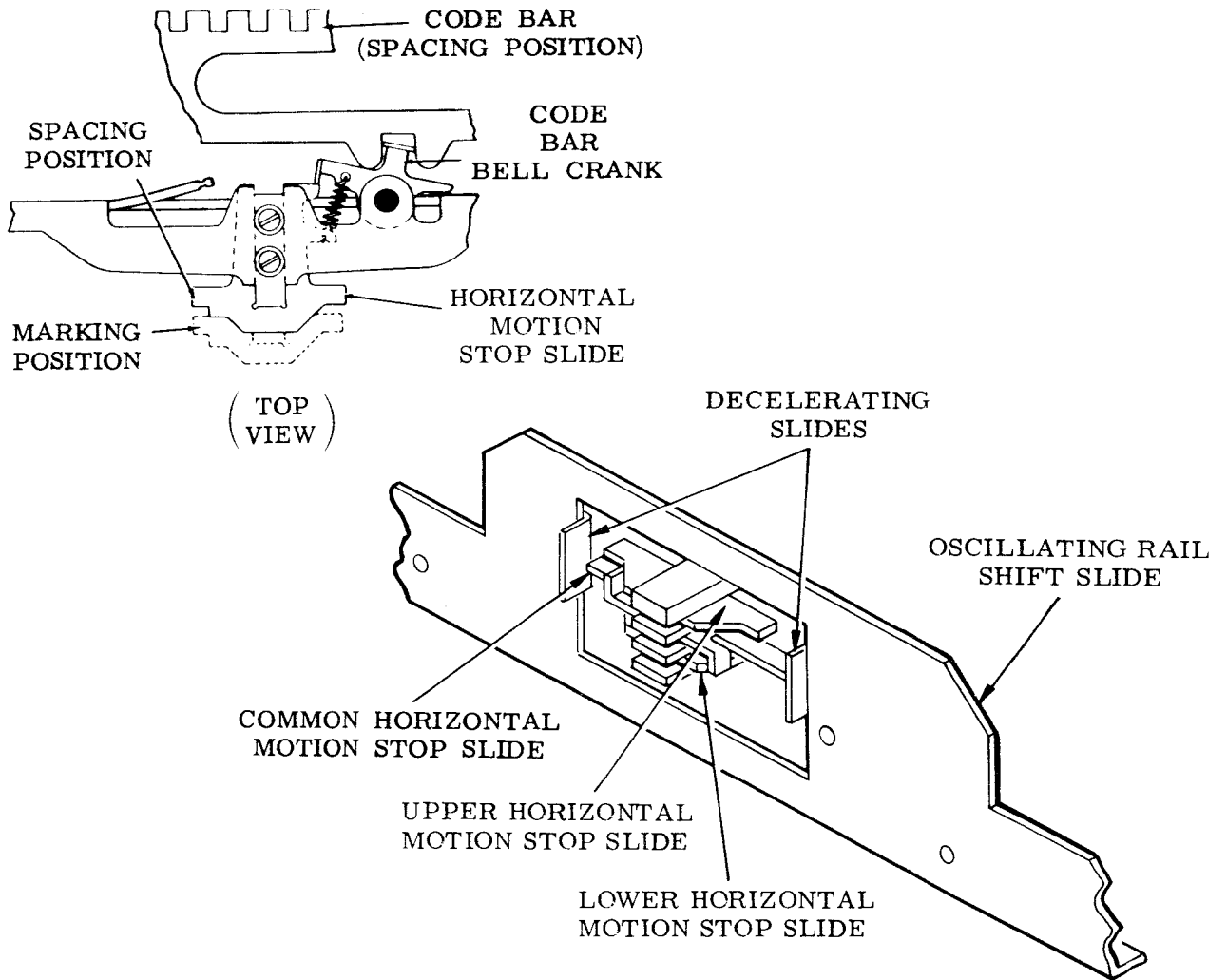


Figure 3-23. Horizontal Motion Stop Slides
(Right Front View)

stop slides are positioned for the selection of the next character. The number 4 and number 5 code bars each operate a code bar bell crank. Each, in turn, moves a horizontal motion stop slide toward the front (marking) or toward the rear (spacing) (figure 3-23). A third (common) stop slide (spring tensioned toward the rear) is located between the upper and lower stop slides and has projections which pass across the front edges of these slides (figure 3-22). Each stop slide is of a different length. The common stop slide, which is the longest stop, has an additional stop on its shank, so that it serves as the shortest stop when all the slides are moved forward. The upper slide (operated from the number 4 code bar) is the second longest stop, and the lower slide (operated from the number 5 code bar) is the third longest stop. When both the number 4 and number 5 code bars are moved toward the right (spacing), their respective horizontal motion stop slides are toward the rear. The oscillating rail shift slide is moved to the right or left of its central position (determined by the number 3 code bar) until it is stopped by one end of the common horizontal motion stop slide. This positions the first vertical row (right or left of the center of the figures field or the letter field) in line for printing. When the number 4 code bar is toward the right (spacing), and the number 5 code bar is toward the left (marking), the lower and the common stop slides are toward the front, and the upper stop slide is toward the rear. The oscillating rail shift slide is moved to the right or left of its central position until it is stopped by one end of the upper stop slide. This positions the

second vertical row (right or left of the center of the figures field or the letters field) in line for printing. When the number 4 code bar is toward the left (marking) and the number 5 code bar is toward the right (spacing), the upper and the common stop slides are toward the rear. The oscillating rail shift slide is moved toward the right or left of its central position until it is stopped by one end of the lower stop slide. This positions the third vertical row (right or left of the center of the figures field or the letters field) in line for printing. When both the number 4 and the number 5 code bars are toward the left (marking), their respective horizontal motion stop slides and the common stop slide are toward the front. The oscillating rail shift slide is moved toward the right or left of its central position until it is stopped by one side of the shank of the common stop slide. This positions the fourth vertical row (right or left of the center of the figures field or the letters field) in line for printing.

(5) Printing. After the type box has been moved so that the selected type pallet is in its proper position, it must be struck by a print hammer in order to print. This is accomplished by the action of the printing carriage located on the printing carriage track at the top of the front plate mechanism.

(6) Positioning. Refer to figures 3-22 and 3-24. The printing carriage rides on rollers on the printing carriage track, which is rigidly attached to the typing unit front plate. The carriage is clamped to the forward section of the upper

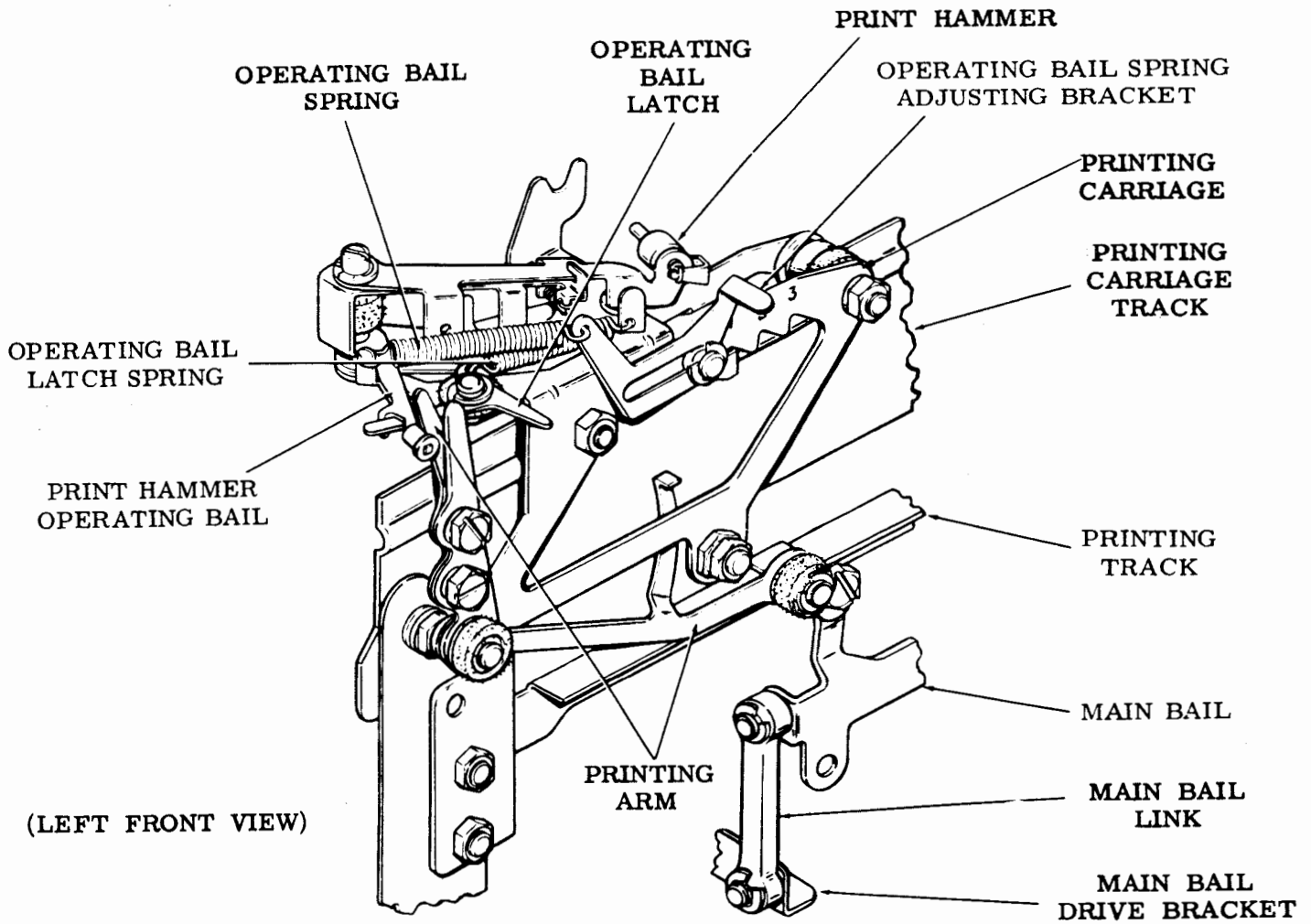


Figure 3-24. Print Hammer and Carriage

draw wire rope. This moves the carriage along its track in such a manner that the hammer advances to the next printing position after each character (graphic) is imprinted.

(7) Operation. The printing track which is located on the front of the typing unit (figure 3-24) is fastened to an extension at each end of the main bail. As the main bail reciprocates vertically, it extends the motion through the printing track, which travels in guides located at each end of the track. The printing arm, which extends downward from the printing carriage, rides the printing track. As the arm follows the reciprocating motion of the track, its upper end moves first toward the left and then toward the right. When the upper end of the arm moves toward the left, it rotates the print hammer operating bail clockwise against its spring tension until it becomes latched by the operating bail latch. The print hammer operating bail draws the print hammer away from the type box by means of the print hammer bail spring. When the upper end of the printing arm moves to its extreme right position, it makes contact with the latch and causes it to release the print hammer operating bail. The operating bail is swung in a counterclockwise direction by the operating bail spring until it strikes its stop. The print hammer bail, in being driven by the operating bail, is swung toward the type box. When the operating bail is stopped, momentum causes the print hammer bail to continue its travel against the tension of the print hammer bail spring until the printing hammer strikes the selected type pallet. The force with which the hammer strikes is

adjustable to three positions marked on the carriage.

e. Spacing.

(1) General. Refer to figures 3-24 and 3-25. To space the printed characters properly, the type box and printing carriages must be advanced with each character printed. The spacing must also be accomplished when the input signal code combination represents a letter space. As shown in figure 3-18, the carriages are connected to a draw wire rope which, in turn, is fastened to the spring drum and the spacing drum. The purpose of the spring drum, which contains a torsion spring, is to tension the draw wire rope and pull the carriages to the left. The spacing drum has ratchet teeth about its perimeter which are engaged by the eccentric driven spacing drum feed pawls (figure 3-25). The spacing shaft which mounts the spacing eccentrics is driven through its helical gear attached to the three stop spacing clutch on the main shaft. The gear ratio of 1-1/2 to 1 causes the spacing shaft to turn one-half a revolution each time the spacing clutch is tripped. This allows the feed pawls to advance the spacing drum by one ratchet tooth. The same trip shaft which, through a cam on the code bar clutch trips the function clutch, also rotates the type box clutch trip lever counterclockwise (viewed from the left). Unless movement of this lever is blocked by the print suppression mechanism, the type box clutch is engaged, oscillating the main rocker shaft, which drives the printing mechanism. A cam plate (figure 3-25) fastened to the bottom of the rocker shaft is moved upward by the shaft as it

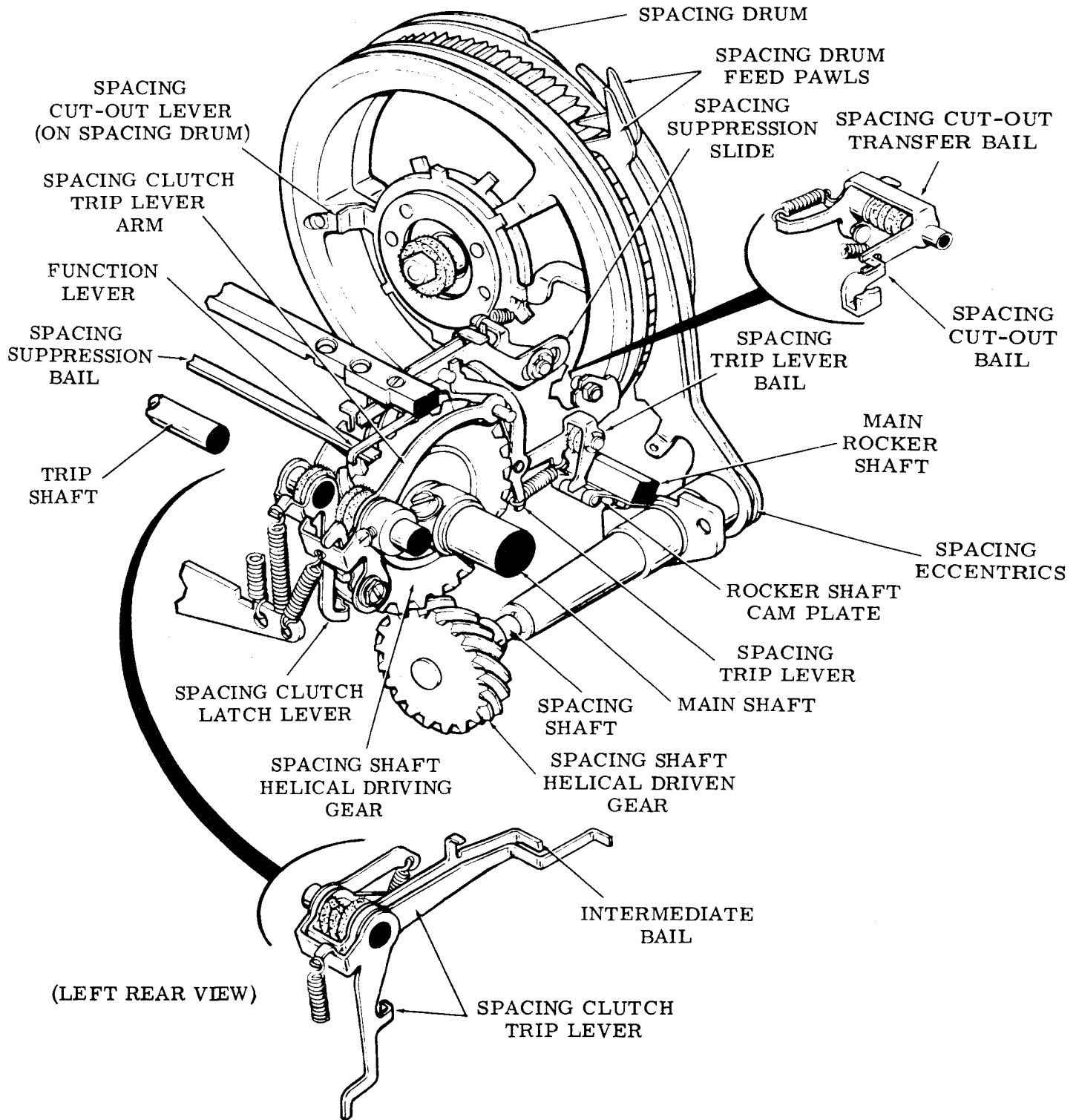


Figure 3-25. Spacing Mechanisms

begins its movement. The cam plate operates the spacing trip lever bail. As this bail is rotated, it raises the spacing trip lever until it latches onto the spacing clutch trip lever arm. As the rocker shaft reverses its direction of rotation, the spacing trip lever bail and the trip lever move downward under spring tension, causing the latched up spacing clutch trip lever arm to operate the spacing clutch trip lever and engage the spacing clutch. Before the spacing clutch completes one-third of a revolution, its restoring cam moves the spacing trip lever about its pivot point until it releases the spacing clutch trip lever, which returns to its normal position in time to stop the spacing clutch after one-third of a revolution. The spacing clutch three-stop cam disk upon which the latch lever rides has an indent at each stop position. When one of the three lugs on the clutch shoe lever disk strikes the spacing clutch trip lever, the inertia of the cam disk assembly causes it to turn until its lugs make contact with the lugs on the clutch shoe lever disk. The latch lever drops into an indent in the cam disk, and the clutch is held disengaged until the trip lever is again operated.

(2) Space Function.

The non-typing function, by which spacing between words or any spacing other than that which accompanies printing is accomplished, is initiated when the code bars are set in a combination equivalent to the spacing code combination (all spacing except third pulse marking). The function is executed through the code bar clutch, tripping the type box clutch, and the spacing clutch. For this function, the type box

is positioned so that a vacant pallet (top horizontal row, first right row in the figure and letter fields) is presented beneath the type hammer. No printing occurs when the type hammer is tripped in its normal fashion. The stunt box is not involved in the execution of this function.

(3) Space

Suppression. Refer to figure 3-25. When certain non-typing functions are selected or when the carriages reach their extreme right position, it is necessary to suppress spacing to avoid interference with the page-printed message or damage to the equipment. This is accomplished by moving the spacing suppression slide forward to a point at which it will hold the upper end of the spacing trip lever forward and prevent it from engaging the spacing clutch trip lever. In the case of spacing suppression on selection of a function code combination, the spacing suppression slide is shifted forward by the spacing suppression bail, mounted beneath the function box. When space suppressing function levers are selected, they engage the bail and, when the function mechanism is operated, move the bail forward. Moved forward with the bail, the suppression slide prevents engagement of the spacing clutch. When the carriages are near their extreme right position, a cut-out ring on the spacing drum engages the spacing cut-out transfer bail, which in turn operates the spacing cut-out bail. The ring and the end of the spacing cut-out transfer bail are shown in figure 3-18. The spacing cut-out bail shifts the spacing suppression slide forward and prevents engagement of the spacing clutch until the

carriages are returned. The maximum number of characters which the typing unit may print is eighty-five, including spacing function spaces. In order to prevent spacing beyond this point, and subsequent damage to the equipment, several teeth are omitted from the spacing drum ratchet wheel.

(4) Margin

Indicator. Refer to figure 3-18. When used in conjunction with a keyboard base, the typing unit actuates a margin indicator switch (base mounted). Before the type box carriage reaches the end of its travel, an actuator mounted on the face of the spring drum operates the switch contact. The angular position of the cam disk with respect to the spring drum may be altered to change the point at which the indicator contact will be closed.

f. Ribbon Feeding.

(1) General. Refer to figure 3-26. The left and right ribbon feed mechanisms oscillate in a vertical plane with each revolution of the type box clutch. They are driven by ribbon drive links attached to the main side levers (figure 3-20). At their uppermost position, the ribbon mechanisms position the ribbon relative to the horizontal type box row being printed. After each character is printed, the ribbon mechanisms are dropped downward together with and behind the type box, to permit viewing of the last printed character. The ribbon is held in place at the point of printing by a ribbon guide fastened to the rear of the type box carriage. Each of the ribbon mechanisms consists of a bracket which is hinged at its rear end, and upon which is

mounted a ribbon spool shaft. A ribbon tension bracket is keyed to the lower end of the ribbon spool shaft. A ribbon ratchet wheel is mounted freely on the ribbon spool shaft just below the ribbon spool bracket, from which it is separated by a friction washer. This applies a constant drag to the ratchet wheel.

(2) Operation. A

ribbon tension plate which is keyed to the hub of the ribbon ratchet wheel has two projecting lugs (A and B, figure 3-26) which straddle the lug on the ribbon tension bracket. A ribbon tension spring tends to maintain the ribbon tension bracket against lug A of the ribbon tension plate. In operation, the ribbon spool bracket, driven by the ribbon drive link, pivots about point C. The ratchet feed and ratchet detent levers pivot about points D and E respectively and are held against the teeth on the ribbon wheel by their springs. As the ribbon spool bracket is moved upward, the ratchet wheel feed lever skips over one tooth, while the ratchet detent lever holds the ribbon ratchet wheel from turning backward. When the ribbon spool bracket is moved downward, the ratchet feed lever engages a ratchet tooth and pushes the ratchet wheel. A tooth on the ribbon ratchet wheel then skips over the ratchet detent lever. The teeth on the left and right ribbon ratchet wheels face in opposite directions so that when their feed levers are engaged, the left ribbon ratchet wheel turns counterclockwise (viewed from the top). In order for the ribbon to be pulled from one ribbon spool to the other, only one of the ribbon mechanisms can have its ratchet feed and ratchet detent levers engaged

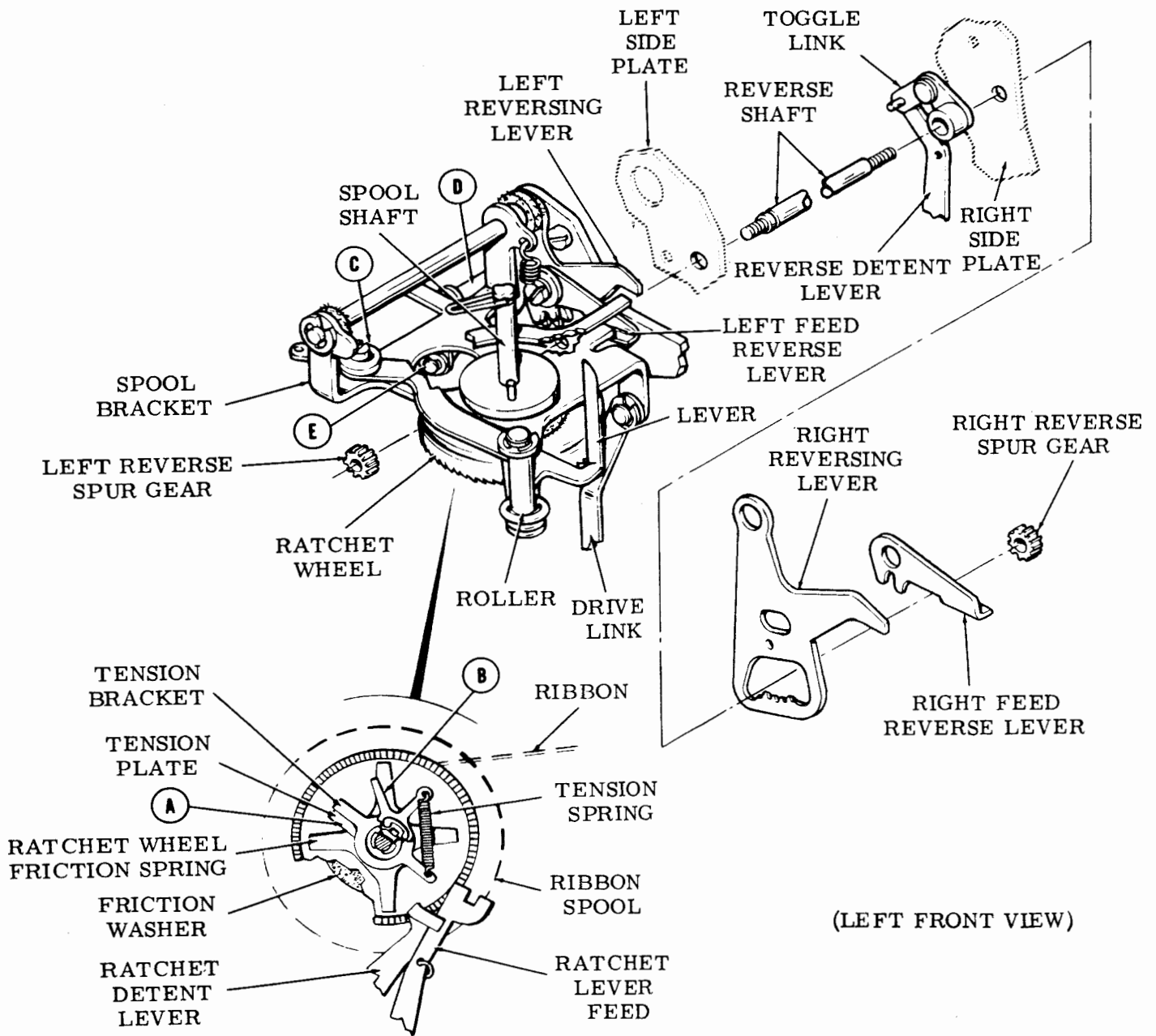


Figure 3-26. Ribbon Feeding Mechanism

with its ribbon ratchet wheel at a time. As the ribbon ratchet wheel turns, the ribbon tension plate also turns, and extends the ribbon tension spring. When the lug B of the ribbon tension plate makes contact with the ribbon tension bracket, the ribbon spool shaft is made to turn, and the ribbon is wound on the ribbon spool.

(3) Ribbon

Reversing. When the ribbon has been completely unwound from one spool, it is necessary to reverse its direction so it can rewind. This is accomplished automatically by disengaging one set of ratchet feed and ratchet detent levers and engaging the other set. While the ribbon is passing from the left spool to the right spool, the right set of levers is engaged. The left set is held disengaged against the tension of the springs by the left ribbon feed reverse lever, which is in its downward position (figure 3-26). The lever is held in this position by means of the ribbon reverse detent lever through the intervening ribbon reverse detent cam, ribbon reverse shaft, and ribbon reverse spur gear. As the ribbon unwinds from the ribbon spool, it passes around the ribbon roller and through the slot in the end of the ribbon lever. When the ribbon nears its end of the ribbon spool, an eyelet which is fastened to the ribbon catches in the ribbon lever slot and pulls the lever toward the right. The next time the ribbon mechanism is moved upward, the displaced ribbon lever engages the end of the left ribbon reversing lever and causes it to move to the position shown in figure 3-26. As the lever moves, its teeth rotate the left spur gear which, through the ribbon reverse shaft, turns the

detent cam and the right spur gear. As the right spur gear moves the right ribbon reversing lever downward, a pin on the lever drives the right ribbon feed lever downward to disengage the ratchet feed and wheel. At the same time a pin on the left ribbon reversing lever moves the left ribbon feed reversing lever upward to permit the left ratchet feed and detent levers to engage the left ribbon ratchet wheel. Thus, the ribbon mechanisms are positioned to rewind the ribbon on the left ribbon spool. When it nears its end on the right ribbon spool, the ribbon is again reversed in a manner similar to that just described. During the reversing cycle, the ribbon is held taut by the previously extended ribbon tension spring.

g. Paper Feeding

(Friction Feed). Paper for the page printed message is stored on a roll 8-1/2 inches wide, mounted on a paper spindle suspended between two side plates at the rear of the typing unit. From the roll, the paper passes over a paper straightener shaft, downward behind the platen (figure 3-27) and between the platen and the pressure rollers. A paper pressure bail at the front of the platen equalizes pressure brought to bear on the paper by the pressure rollers. The pressure bail can be released by rotating the paper release lever at the top of the right side plate to the rear (clockwise, viewed from the right) when it is necessary to straighten the paper or to remove paper from the platen. Two paper fingers operated on a spring tensioned shaft across the front of the platen hold copy paper firmly against the plate, in position for printing.

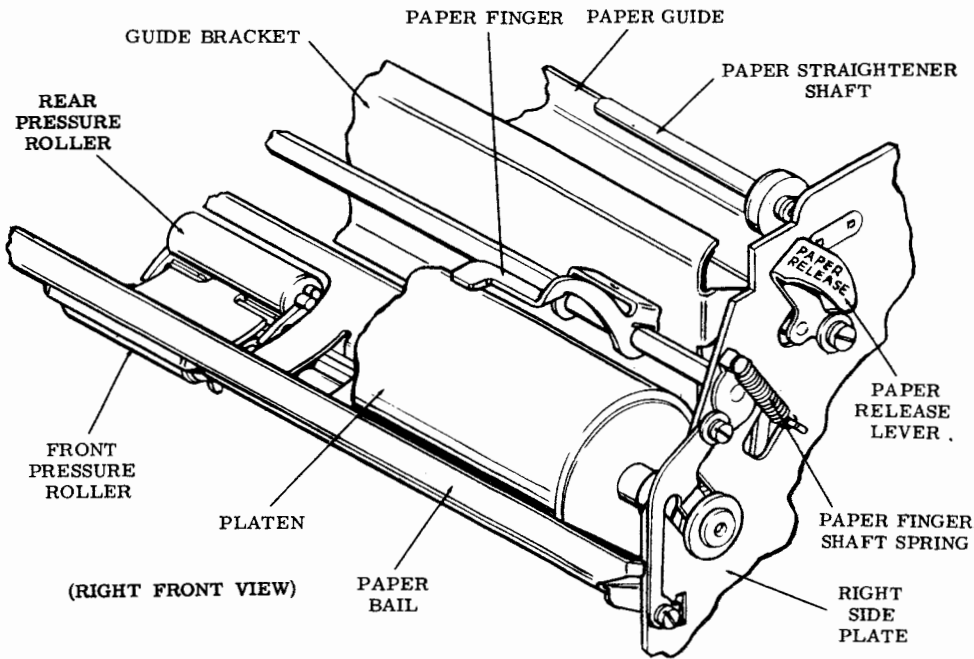


Figure 3-27. Friction Feed Platen Mechanism

h. Stunt Box Operation.

(1) Functions.

Refer to figure 3-28. There are two types of operation which can be performed by the typing unit. The first embodies those mechanical actions which are directly necessary to the actual printing of a character (or space function). The second embodies mechanical action which alters the positions of the various mechanisms or activates external devices or circuits through switching contacts. The latter are known as functions. Spacing may technically be considered a function, but it is mechanically associated with the printing operation, except when suppressed by function mechanisms. As in printing, the reception of function codes results in the positioning of the code bars. The back edges of the code bars are notches (figure 3-29). Positioned directly behind the code bars is a stunt box, which contains the function bars for the various

functions (figure 3-28 and 3-29). Each function bar has a series of tines on its end, offset to one side or the other to correspond with the marking and spacing elements of the particular input signal code combination to which it is to respond. Tines positioned to the right are spacing; those to the left are marking. When the function clutch is engaged (figure 3-21), it rotates and extends motion to the function bar reset bail (through the intervening cam and follower arm and function rocker shaft) to cause the function bar reset bail with its attached reset bail blade to release the function bars momentarily (figure 3-30). As the spring-tensioned function bars are released, they move forward to bear against the code bars. If the code bars are positioned for a function, each tine on the function bar for that function will be opposite a notch in the code bar. This will permit the selected function bar to

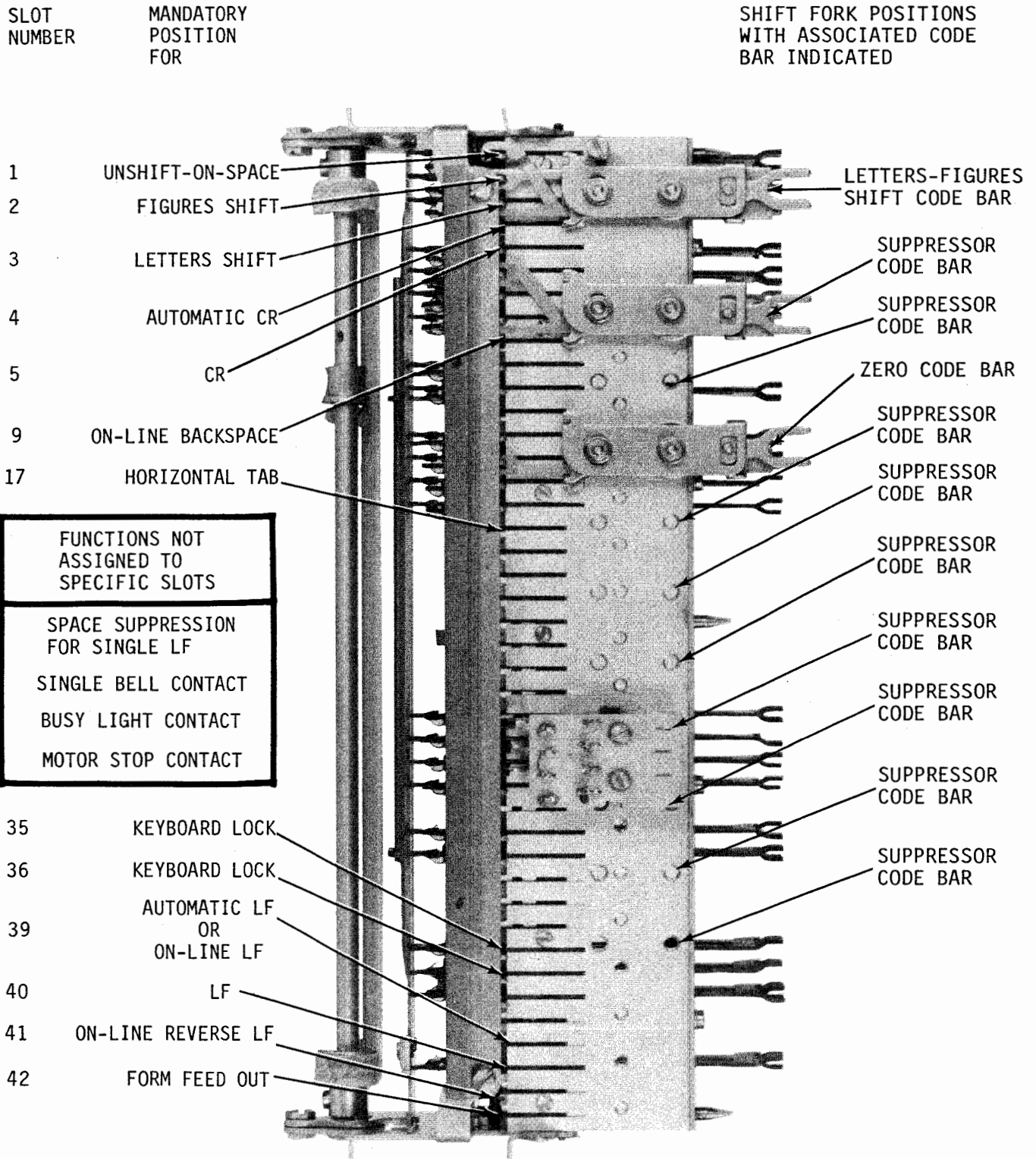


Figure 3-28. Stunt Box (Top View)

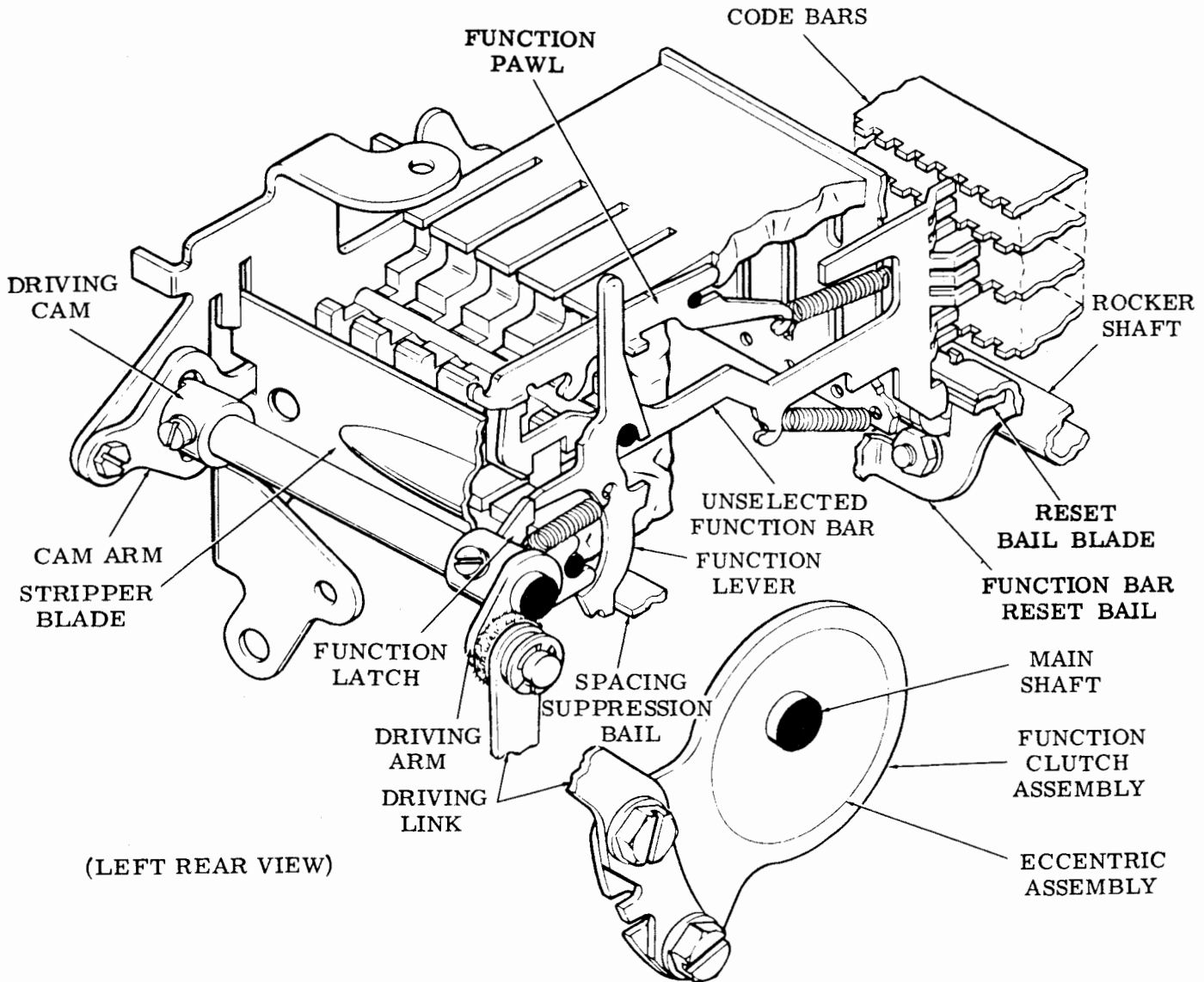


Figure 3-29. Stunt Box
(Function Linkage Unselected)

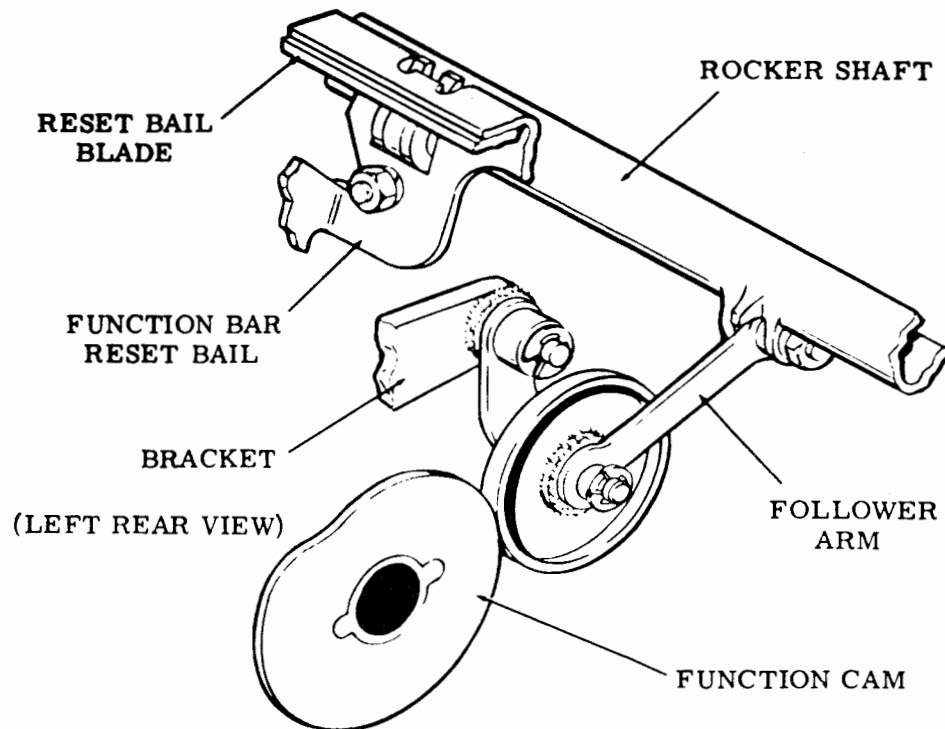


Figure 3-30. Reset Bail Mechanism

continue to move forward into the code bars, while the other function bars are blocked by one or more code bars (figure 3-31). Associated with each function bar in the stunt box is a function pawl and a function lever. In the unselected position, the function bar is not latched with its function pawl (figure 3-32). When the function bar reset bail blade releases the function bars, any selected bar will move sufficiently forward (to the left, in figure 3-33) to permit it to engage its function pawl. Then, as the reset bail blade returns the function bar to its initial position, the function bar carries the function pawl to the rear (to the right, figure 3-32). The function pawl, in turn, moves the function lever clockwise about its pivot point. A projection at the lower end of most function levers operates the spacing suppression bail, and the selected levers move the bail forward. Either the upper

or the lower end operates the indicated function. Near the end of the function cycle, a stripper blade (figure 3-29) operated by a cam on the function clutch assembly rises to engage any selected function pawl and strip it from its function bar. Springs return the released function pawl and the function lever to their original position. The function clutch is disengaged upon completion of one revolution when its latch lever falls into the indent of the clutch cam, in the same manner as described in connection with the code bar clutch.

(2) Carriage Return Function. Refer to figures 3-34 and 3-35. The carriage return function mechanism is located in the right end of the typing unit. Reception of the input signal code combination for the function causes the function bar, pawl, and lever to operate (figure 3-34). The lower end of the function lever engages the

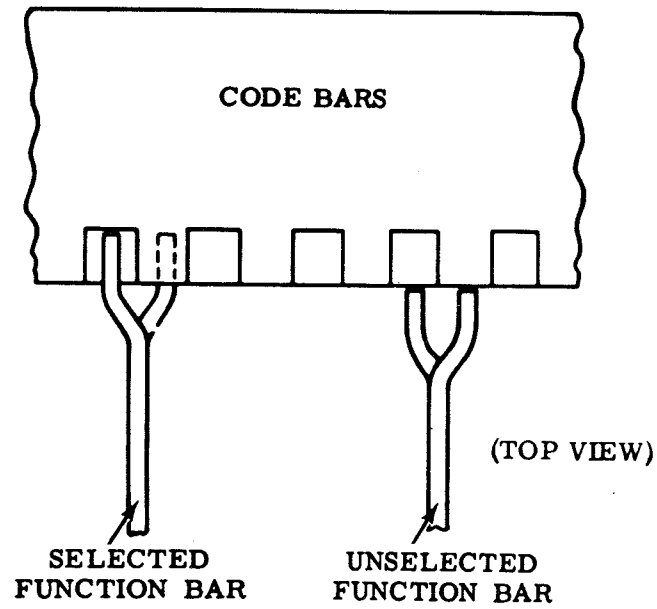


Figure 3-31. Function Bar Selection

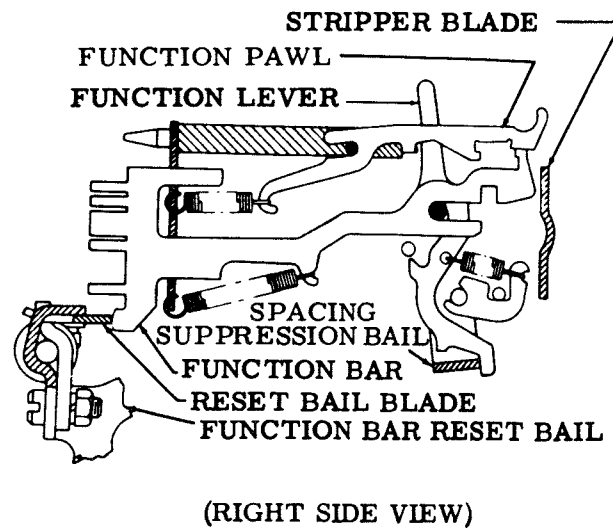


Figure 3-32. Typical Function Linkage (Unselected)

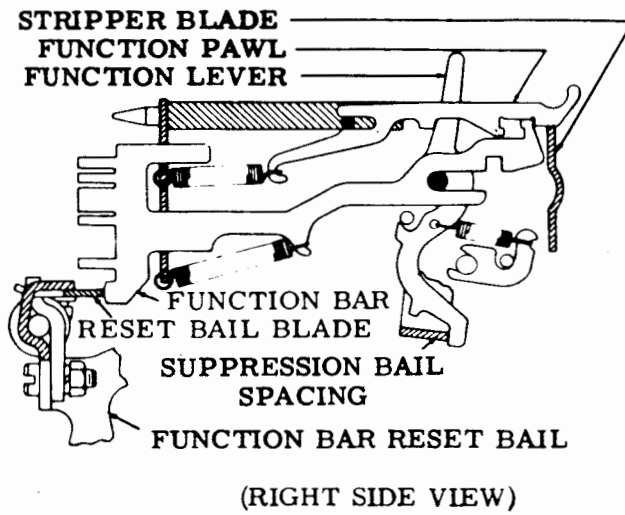


Figure 3-33. Typical Function Linkage (Selected)

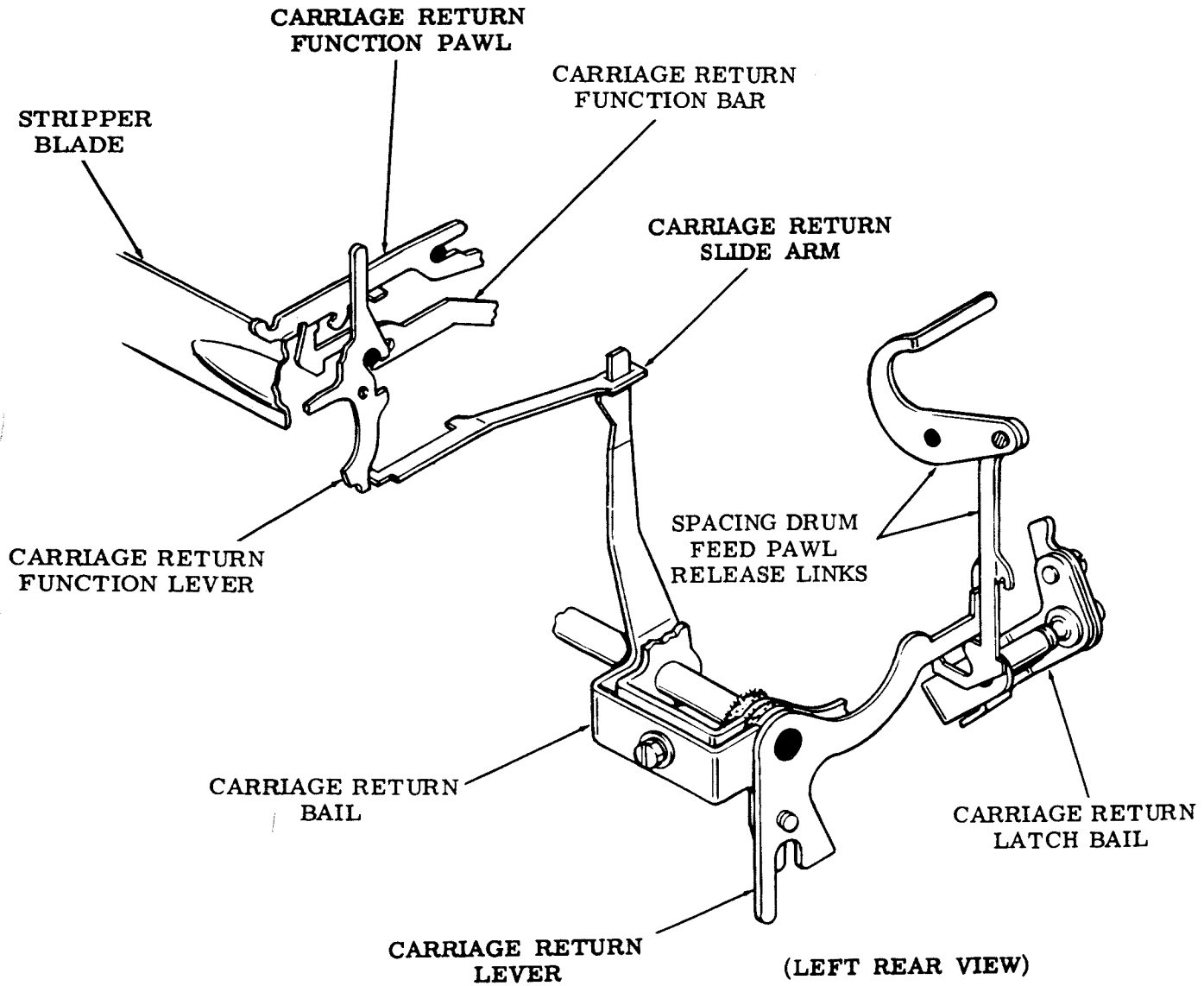


Figure 3-34. Carriage Return Function Mechanism

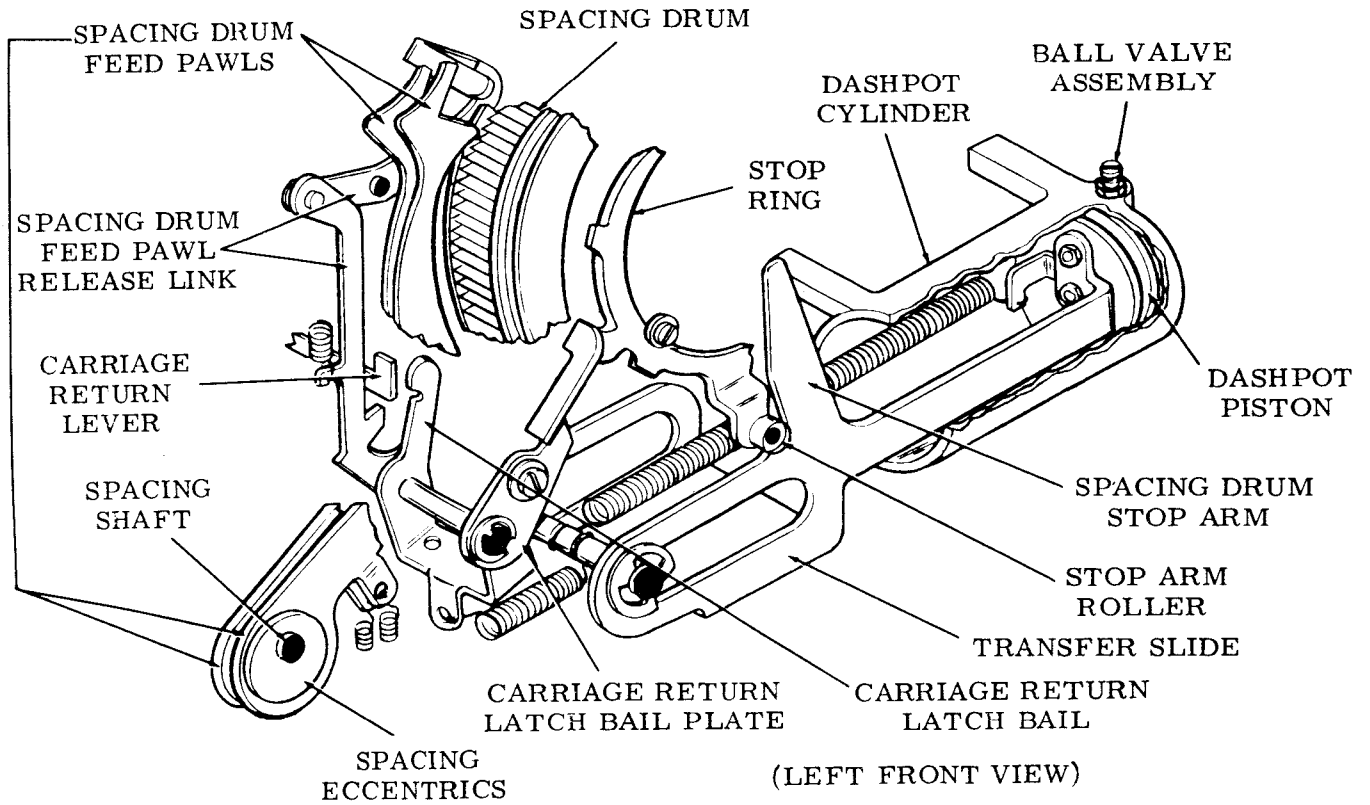


Figure 3-35. Carriage Return Mechanism

carriage return slide arm and pushes it forward. The slide arm, in turn, moves the carriage return bail and its lever about their pivot point. As the front portion of the lever moves downward, it takes with it the lower section of the spacing drum feed pawl release link. This causes the upper portion of the link to turn and disengage the spacing drum feed pawls from the spacing drum (figure 3-35). When the carriage return lever reaches the lowest point, the carriage return latch bail locks it there. The disengagement of the spacing drum feed pawls from the spacing drum permits the spring drum to return the printing and type box carriages toward the left side of the typing unit. As the spacing drum nears the end of its counterclockwise rotation, the roller on the stop arm contacts the transfer slide which, in turn, drives the dashpot piston into the dashpot cylinder. A small passageway with an inlet from the inside of the cylinder and three outlets to the outside is incorporated in the end of the cylinder. Two of the openings to the outside are closed by a steel ball, which is held in its seat by means of a compression spring. A set screw which may be locked in place with a nut is used to regulate the spring pressure on the ball. The rate of deceleration provided by the cushioning effect of the trapped air is automatically regulated for various lengths of line by means of the ball valve. This, together with the direct opening to the outside, determines the rate at which the air may escape from the cylinder. When the spacing drum reaches its extreme counterclockwise position, an extension on the stop arm trips the carriage return latch bail plate, which is fastened to the

carriage return latch bail. The latch bail disengages the carriage return lever, and the feed pawls are again permitted to engage the spacing drum. Local (off-line) operation of the carriage return mechanism may be obtained from the keyboard base or base on which the typing unit is mounted. A projection beneath the carriage return lever (figure 3-34) when rotated to the rear (counterclockwise, viewed from the right), operates the carriage return mechanism in the same way as when this lever is operated by the stunt box.

(3) Line Feed

Function. Refer to figures 3-36 and 3-37. The line feed function mechanism is located in the left end of the typing unit. The code bar mechanism, set to correspond to an input signal code combination for spacing, permits two line feed function bars, pawls, and levers to operate. The function linkage at the far left of the stunt box (figure 3-36) operates the line feed mechanism. The lower end of the line feed function lever engages the line feed slide arm and pushes it forward. The slide arm, in turn, moves the line feed clutch trip arm and the trip lever above their pivot until the trip lever releases the three-stop line feed clutch. The line feed gearing is such that each one-third revolution of the clutch will advance the platen by one line. Therefore, the length of time that the line feed clutch trip lever is held away from the clutch will determine the number of line feeds that occur. The timing relationship between the stripper blade cycle and the main shaft rotation is such that the function pawl is not stripped from a function bar until after more than one-third

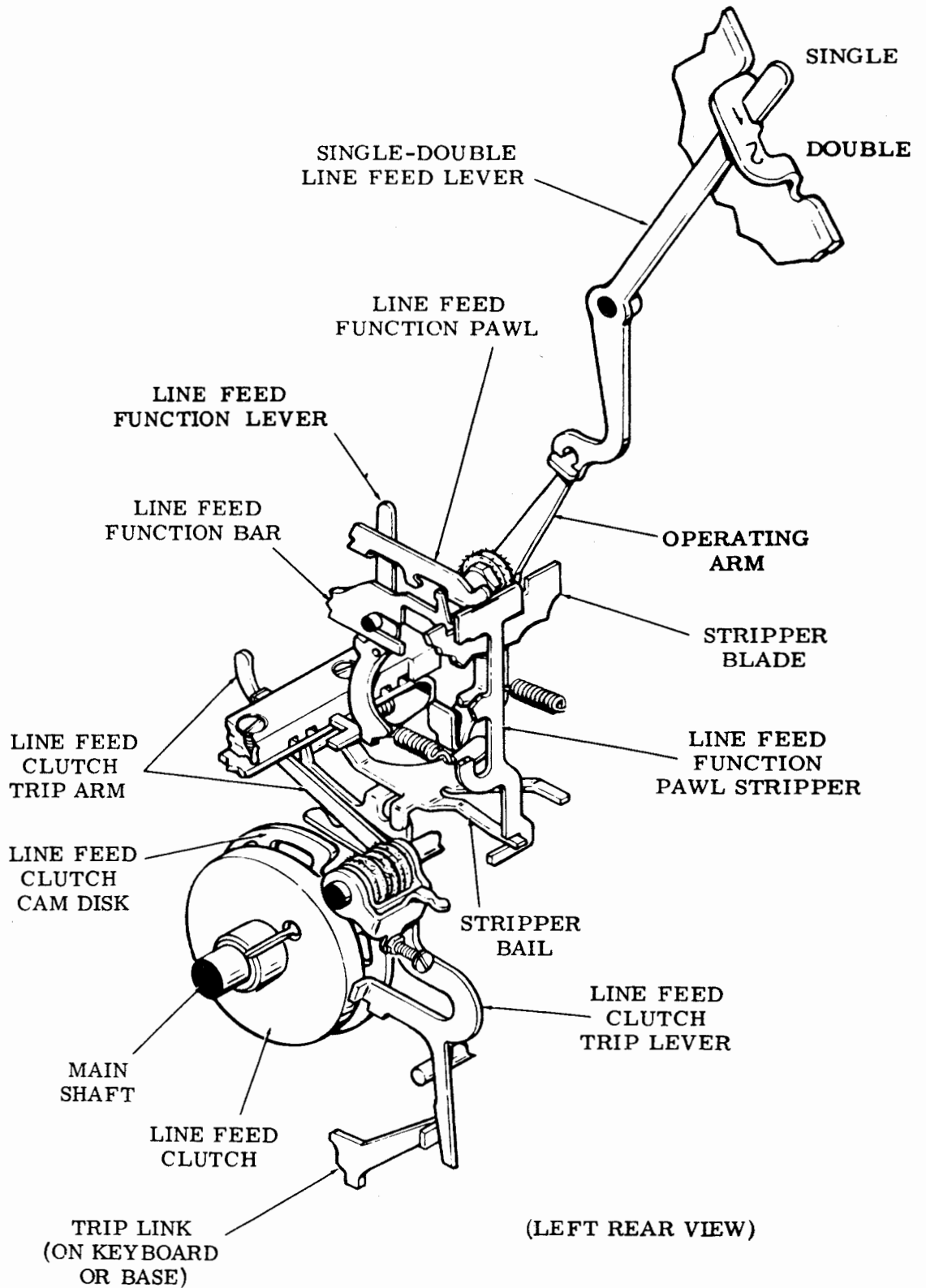


Figure 3-36. Line Feed Mechanism (Left Rear View)

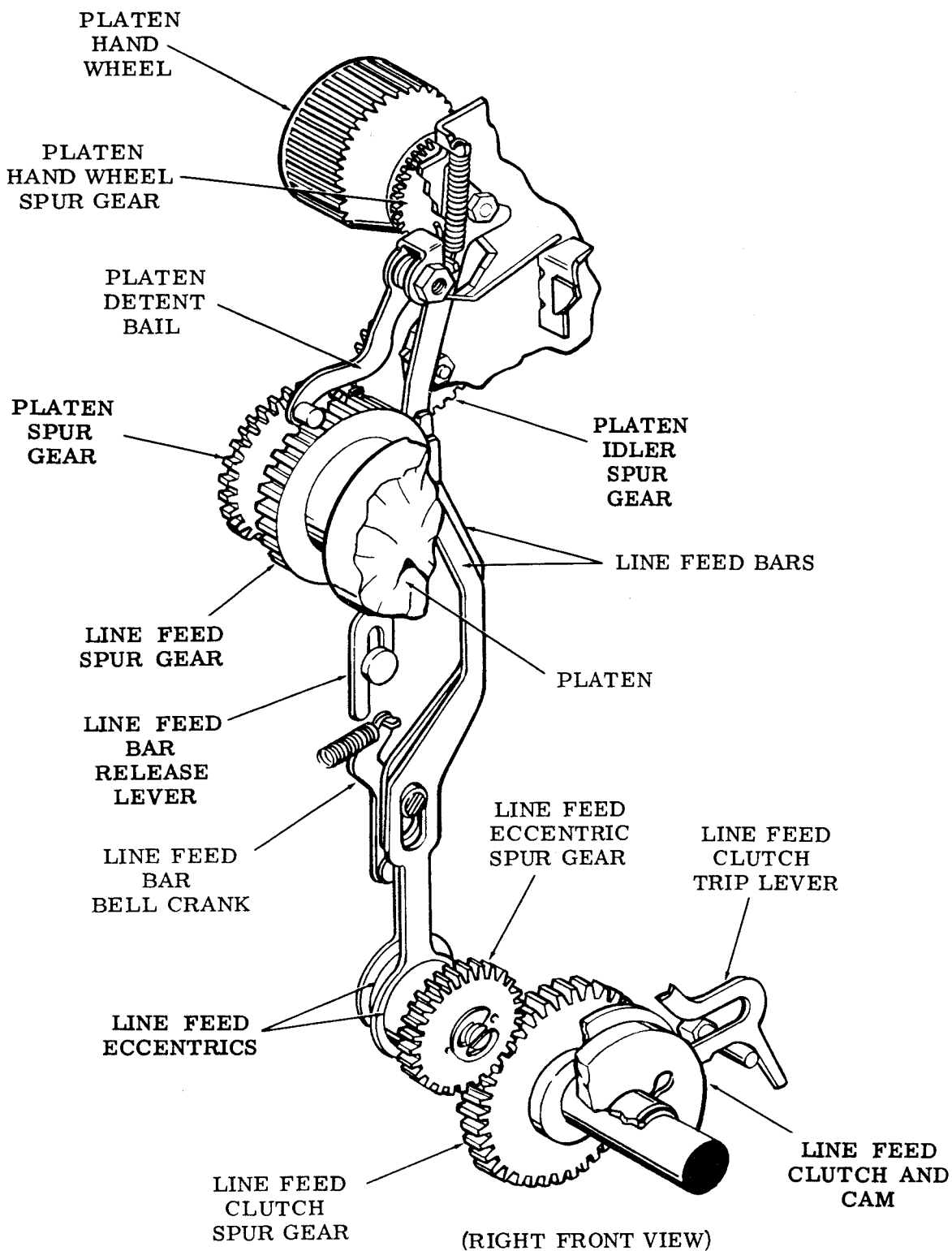


Figure 3-37. Line Feed Mechanism (Right Front View)

of a revolution of the clutch has occurred. Thus, the line feed clutch trip lever will stop the clutch after two-thirds of a revolution, or double line feed, has occurred. When single line feed is desired, it is necessary to strip the function pawl from the line feed function bar before the line feed clutch completes one-third of a revolution. This is accomplished by the use of an auxiliary function pawl stripper which is attached to the left end of the stripper bail. The cam disk on the three-stop line feed clutch provides the motive force to operate the stripper bail once each one-third revolution of the line feed clutch. The stripper bail on which the slotted line feed function pawl stripper rides may be shifted toward the right (double) or to the left (single) by action of the single or double line feed lever (figure 3-36). The upper end of the pivoted single or double line feed lever protrudes from the upper left of the left side plate of the typing unit, where it rides in the two position side frame detent extension. When the lever is in position 1, the stripper bail engages the line feed function stripper to raise it into contact with the function pawl before the stripper blade would strike it. When the lever is moved to the rear (position 2), the bail is disengaged from the blade, and the stripper blade strikes the function pawl in the normal cycling of the function box stripper blade. When single line feed is being used, the line feed function lever is released too soon (by the line feed function pawl stripper) to prevent spacing. Therefore, an additional line feed function bar, pawl, and lever are installed in a slot of the stunt

box for the purpose of suppressing spacing on single line feed function. This mechanism, which always operates on the line feed function code bar arrangement, is released only by the stunt box stripper blade and, therefore, holds the spacing suppression bail operated (forward) until the spacing cycle is completed. After the line feed clutch is stopped by its trip lever, it is disengaged when the latch lever drops into the indent in the clutch cam, in the same manner as described in connection with the code bar clutch. Each one-third revolution of the line feed clutch causes its attached spur gear (figure 3-37) to rotate the line feed eccentric spur gear and its attached eccentrics one-half of a revolution. The eccentrics, which are offset in opposite directions, each carry a line feed bar. These bars are guided by the line feed bar bell crank and alternately engage the line feed spur gear on the platen, advancing the platen one line for each one-half turn of the eccentrics. A platen detent bail engages the line feed spur gear to retain the platen at each setting. When it is desired to position the platen manually, this may be accomplished by bearing down on and rotating the platen handwheel at the top of the right side plate. This causes the platen handwheel spur gear to engage the platen idler gear, which in turn is engaged with the platen spur gear on the platen shaft. At the same time, the line feed bar release lever (figure 3-37) bears on the line feed bar bell crank and causes it to disengage the line feed bars from the line feed spur gear. Local (off-line) operation of the line feed mechanism may be obtained from

the keyboard base or base on which the typing unit is mounted. A projection beneath the line feed clutch trip lever (figure 3-36), when rotated to the rear (counterclockwise, viewed from the right), operates the line feed mechanism in the same way as when this lever is operated by the function box. Since the clutch is manually engaged, line feed is continuous until released at the keyboard or base.

(4) Letters-Figures Shift Function. Refer to figure 3-19. Upon reception of the letters or figures signal code, the letters and figures function bars, pawls, and levers initiate the letters or figures shift. The upper ends of the function levers engage the letters and figures function slides. The front ends of these function slides have camming surfaces which, when a slide is shifted to the rear by its function lever, move the letters-figures code bar fork to the right (letters position) or to the left (figures position). The fork engages a pin on the bracket which is fastened to the letters-figures shift code bar, and positions the code bar to the right or left. Movement of the letters-figures code bar results in the positioning of the type box, through related mechanisms, for printing of letters or figures.

(5) Stunt Box Contacts. Refer to figures 3-38 and 3-39. For external circuit control and switching functions, the function levers may be positioned to operate normally open, normally closed, or SPDT switches mounted on the top of the stunt box. In general, the function contacts are similar except for electrical connections, which are

determined by external requirements. The contact arm configuration is changed as required to either make or break the contact when the associated function lever is in selected (rear) position. All contacts are wired through the cable connector located on the right side plate. A typical contact (NO) is illustrated in unselected (figure 3-32) and selected (figure 3-33) condition.

3-6. KEYBOARD UNIT MECHANICAL MOTION DESCRIPTIONS. The following paragraphs provide a detailed description of the mechanical and photoelectrical assemblies used to perform the various functions of the keyboard unit. The keyboard unit consists of the keyboard transmitter and the distributor.

a. Keyboard Transmitter. The operation of the keyboard transmitter is discussed in the order in which the mechanisms operate.

(1) Code Bar Mechanism. Refer to figures 3-40 and 3-41. The purpose of the codebar mechanism (figure 3-40) is to preset the necessary code level shutter windows (figure 3-41) for transmission of each character or function. For each code level there is a corresponding codebar submechanism. They are numbered one through five, rear to front, to correspond to the five level code. The code bar submechanism consists of a front bar, rear bar, tie link, and two T-levers.

(a) Positioning for a Mark. To initiate transmission of a mark, a key is pressed moving the keylever down. The keylever moving down strikes the code bar

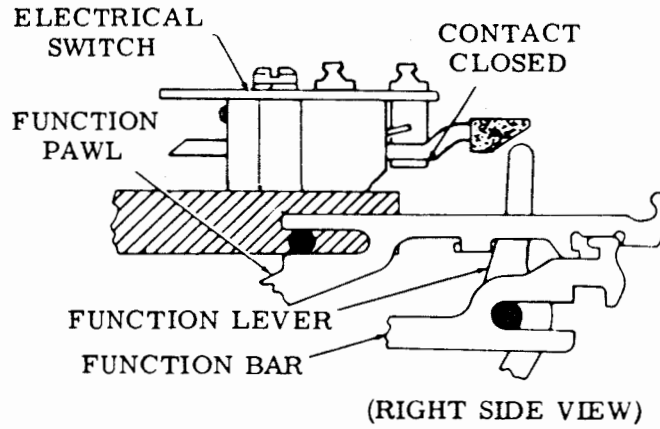


Figure 3-38. Typical Stunt Box Contact (Unoperated)

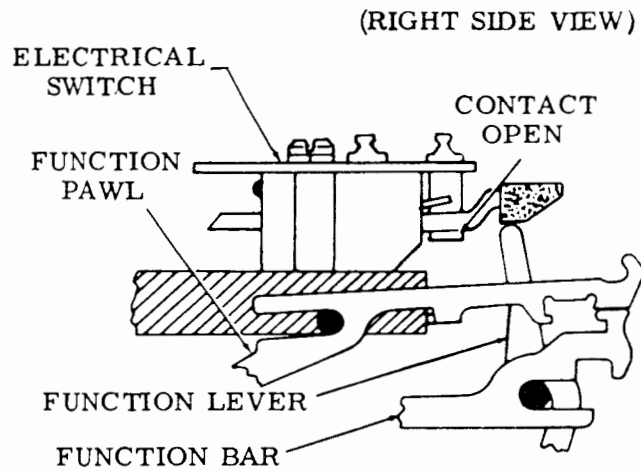


Figure 3-39. Typical Stunt Box Contact (Operated)

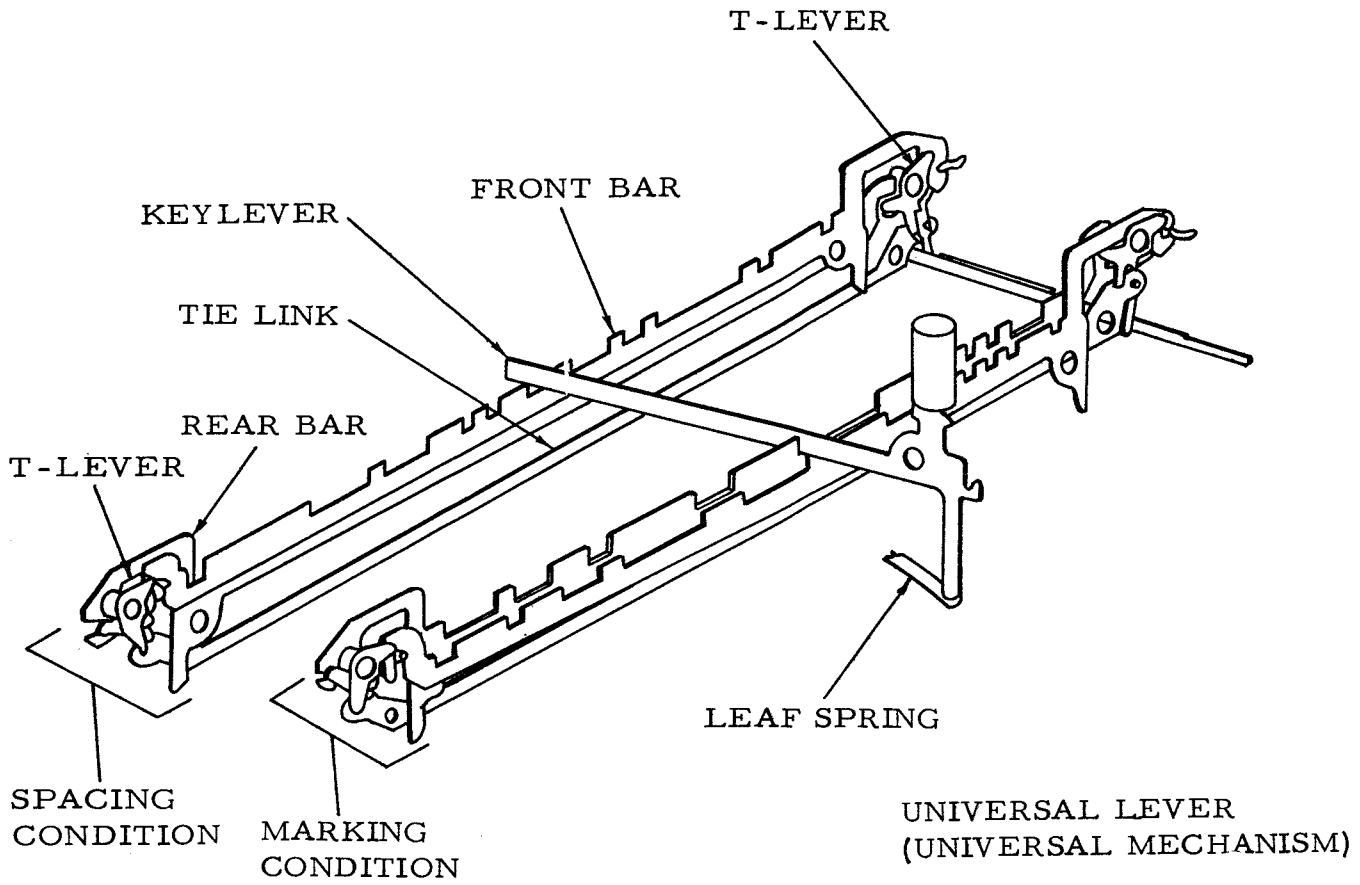
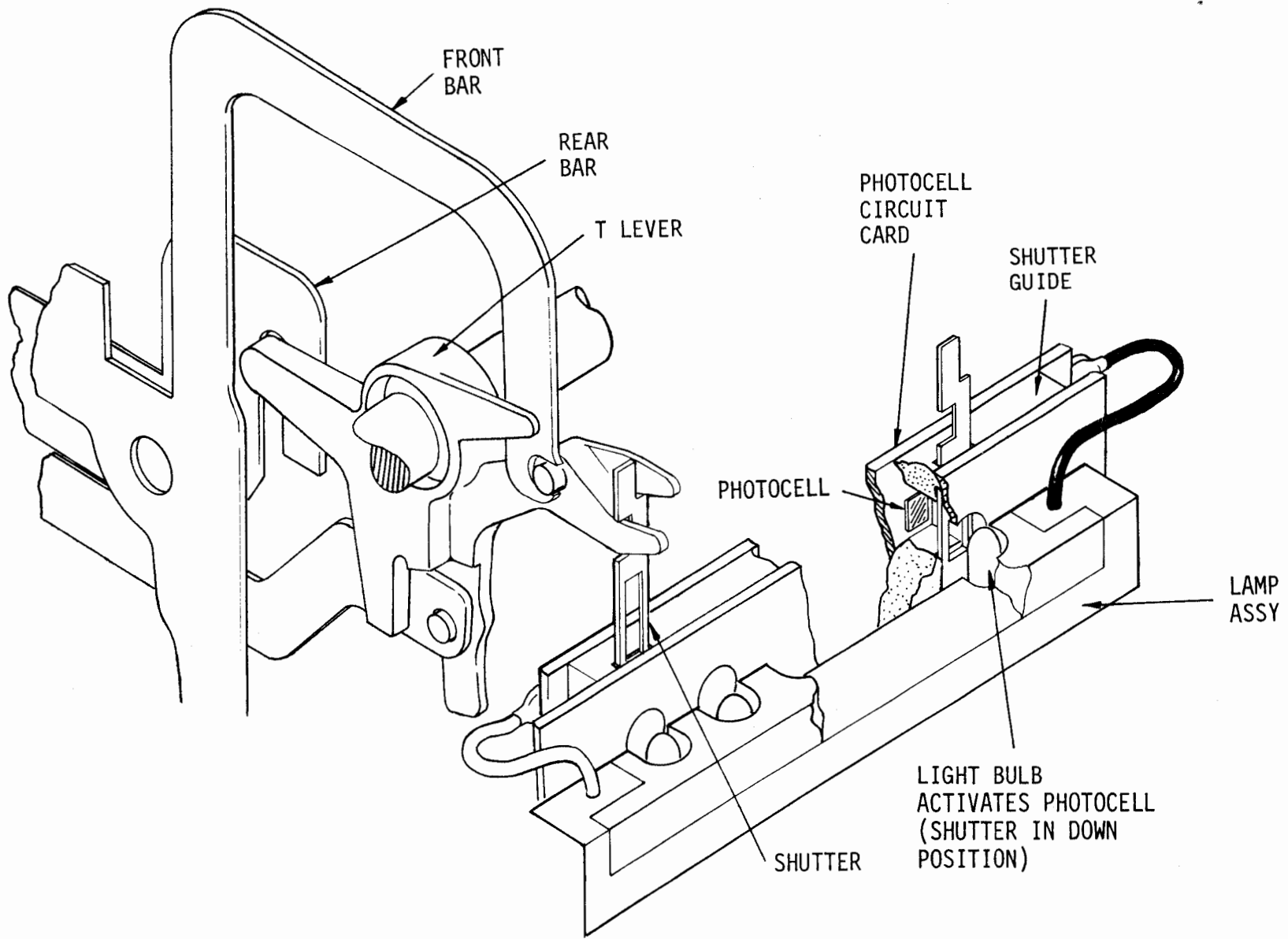


Figure 3-40. Code Bar Mechanism



submechanism moving the front bar down to a marking condition. The front bar, when moving down, moves the T-levers in a clockwise direction. The right T-lever moves the shutter down allowing light to pass through the shutter window to a photoelectric cell. The T-levers when rotating clockwise move the tie-link to the left. When the key is released, the leaf spring moves the keylever up, moving the key up to the normal stop position.

(b) Positioning for a Space. To initiate transmission of a space, a key is pressed moving the keylever down. The keylever moving down strikes the code bar submechanism moving the rear bar down for a space. The rear bar, when moving down, moves the T-levers in a counterclockwise direction. The right T-lever moves the shutter up, which blocks the light from going to the photocell. The T-levers when rotating counterclockwise move the tie link to the right. When the key is released, the leaf spring moves the keylever up, moving the key up to the normal stop position.

NOTE

The Tie-link serves to hold the T-levers in the proper relationship to each other and facilitates the up and down movement of the front and rear bars.

(2) Universal Mechanism. Refer to figures 3-42 and 3-43. The purpose of the universal mechanism is to lock the T-levers in the selected position during transmission of a character or function. When a

key or the spacebar is pressed, it moves the keylever down. Near the bottom of the keylever travel it comes into contact with the universal code bar and moves it down. When the universal code bar moves down, it causes the right universal T-lever to rotate clockwise. When the right universal T-lever is rotated clockwise, the tie link moves to the left. The tie link extension comes into contact with the non-repeat lever tab and rotates it clockwise. The non-repeat lever tab, in moving to the left, rotates the latch lever clockwise out of the path of the universal lever. With the latch lever out of the way, the universal lever rotates counterclockwise, or the front end will move up, to lift up on the non-repeat lever. When the non-repeat lever moves up, it takes the non-repeat lever tab up and moves away from the tie link extension allowing the non-repeat lever to rotate counterclockwise. This allows the latch lever to rotate counterclockwise against the universal lever. In the operated condition, the universal lever holds the T-lever extensions (code bar submechanism) either left or right, thus preventing another key from being pressed until the universal lever is reset.

(a) Keyboard Reset. The purpose of the keyboard reset is to reset the universal mechanism in preparation for the next character or function. Near the end of the fifth code-level pulse the clutch cam disk roller moves the distributor link to the rear, which rotates the reset shaft clockwise (figure 3-43). As the reset shaft rotates clockwise it will move the universal lever down in

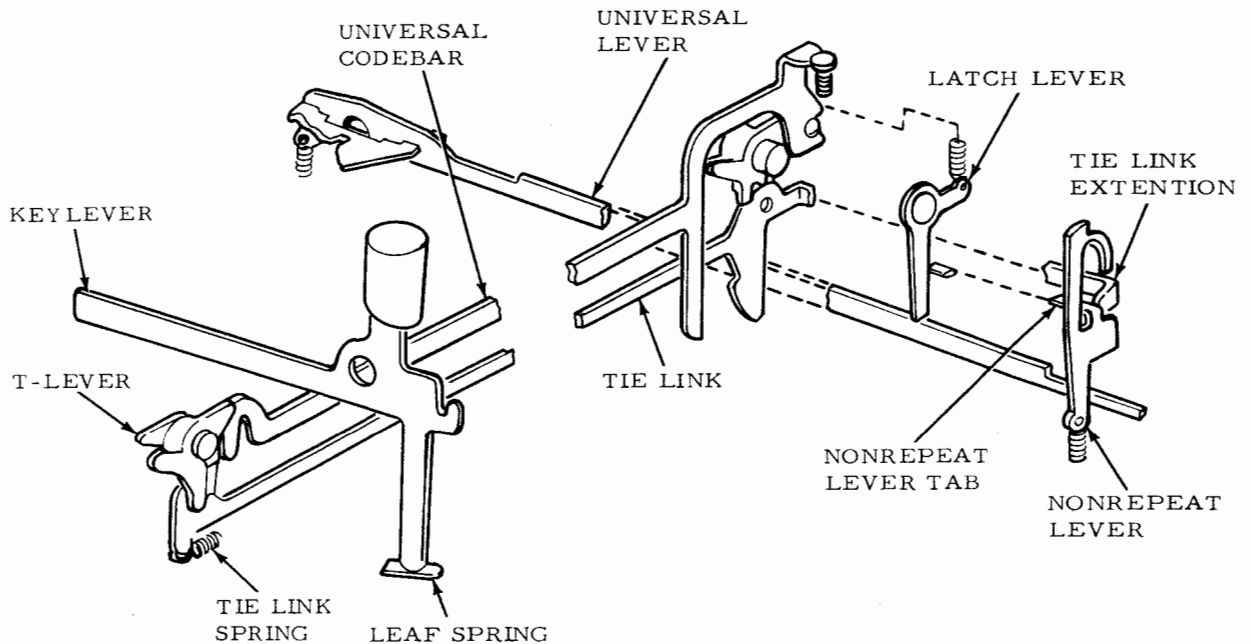


Figure 3-42. Universal Mechanism (Left Front View)

front. As the universal lever moves down in front it allows the latch lever spring to move the latch lever counterclockwise, over the top of the universal lever. As the universal lever moves down in front it also moves away from the non-repeat lever allowing the non-repeat lever spring to move the non-repeat lever down, moving the non-repeat lever tab down between the universal tie link extension and the latch lever.

(b) Non-Repeat Mechanism. Should a keylever remain pressed beyond the end of the distributor cycle, the tie link extension prevents the non-repeat lever from returning to its reset condition. The non-repeat lever tab hangs on top of the tie link extension. The latch lever, unaffected by the tie link or non-repeat lever, moves to the right, over the top of the universal lever when it moves down, and blocks it, not allowing the universal lever to

move up until the keylever is released. At this time, the tie link extension moves back to the right, and the non-repeat lever shifts downward allowing the non-repeat lever tab to fall between the latch lever and the tie link extension (the normal stop position).

b. Distributor Mechanism. The operation of the distributor mechanism is discussed in the following paragraphs. Refer to figure 3-44.

(1) General. Mounted on the distributor clutch is a drive arm, which engages with a drum that has slots cut into it. The slots are arranged in a predetermined interval around the drum. Mounted below the drum are six lamps, and mounted in the drum are photoelectric cells which correspond to the five character or function code-level pulses and the stop pulse. As the distributor clutch engages and

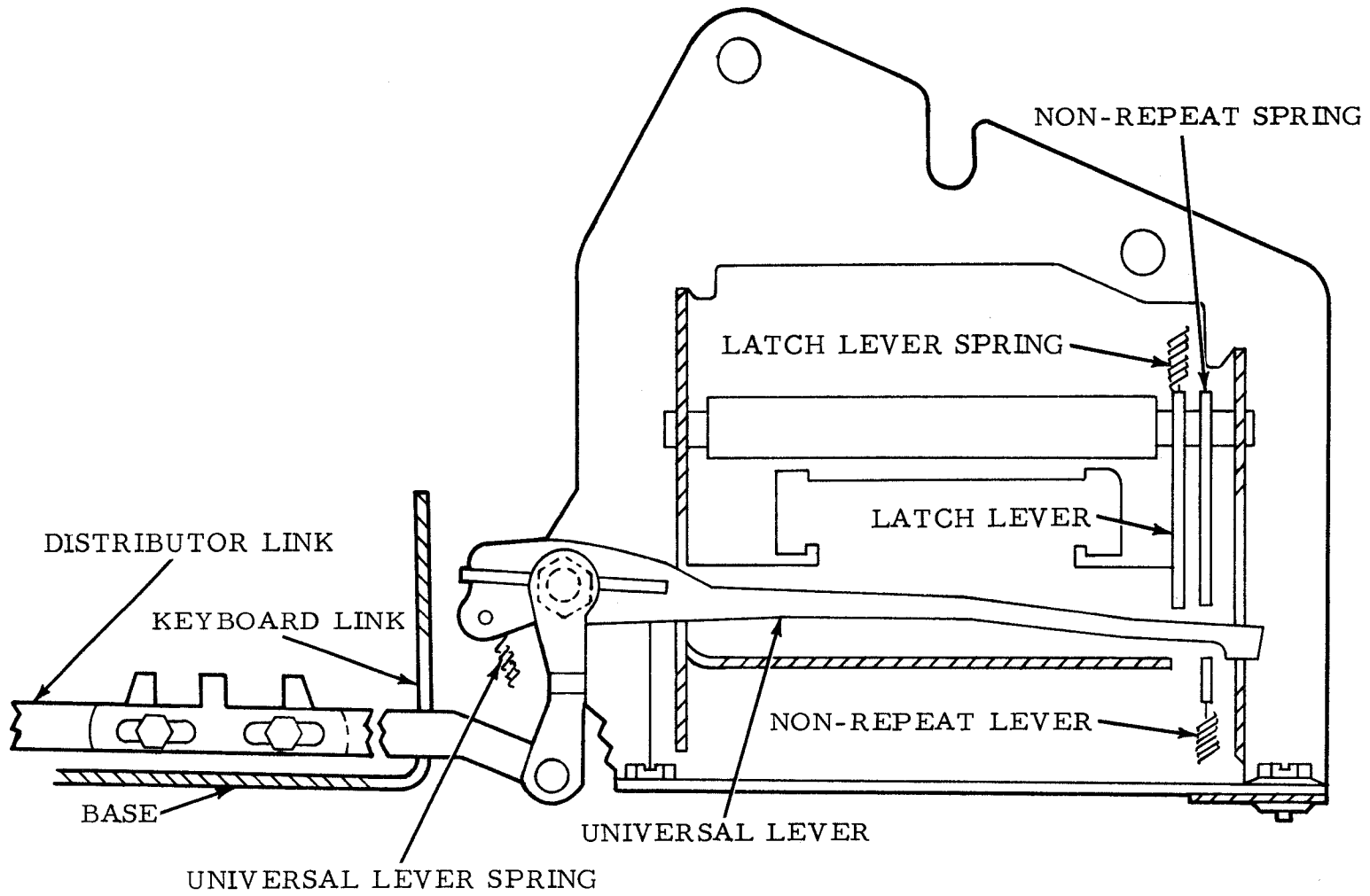


Figure 3-43. Universal Mechanism (Left Side View)

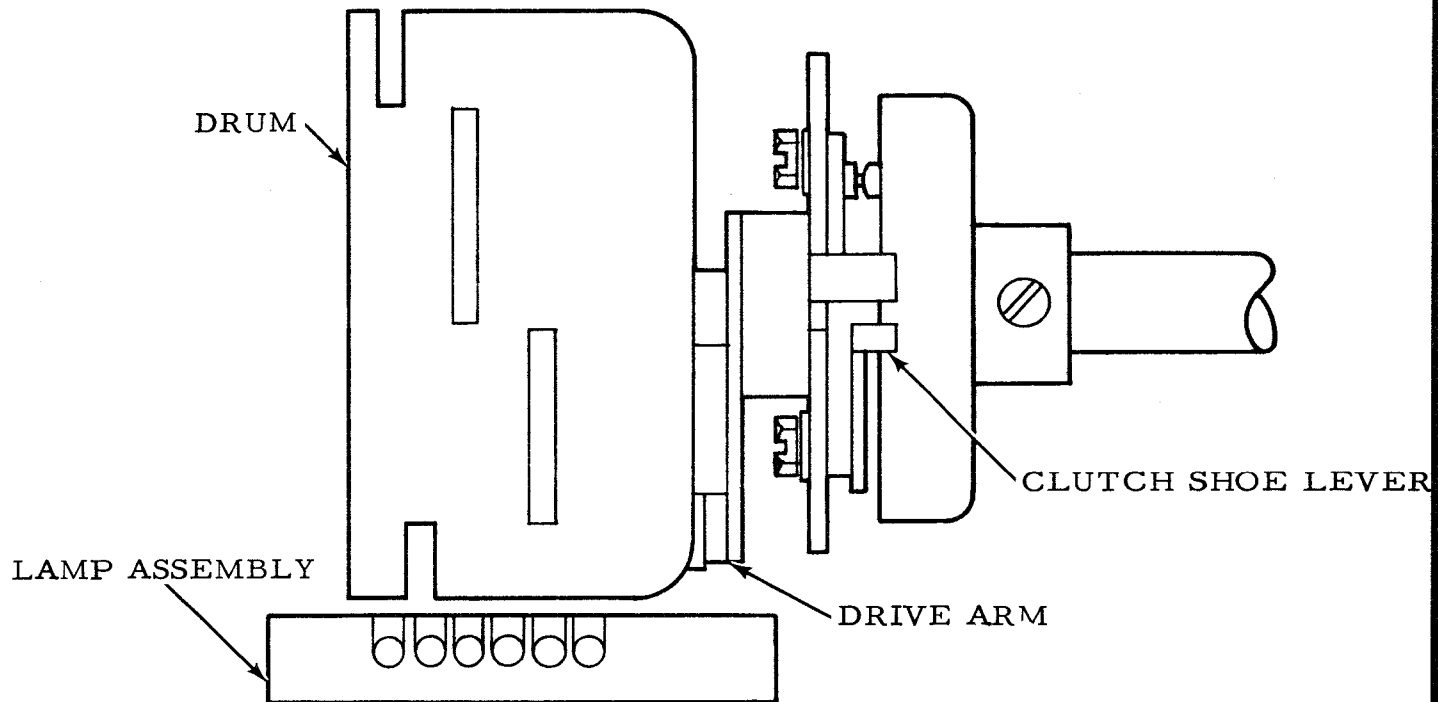


Figure 3-44. Photoelectric Distributor Mechanism

rotates the drum, a slot corresponding to the stop pulse moves past the lamp that produces the start pulse. 13.5 milliseconds after the start pulse, as the drum continues to rotate, another slot presents itself to the next lamp. If the shutter is down in the keyboard transmitter, current flows through photoelectric cells in both the keyboard transmitter and the distributor, causing the first code-level pulse to be a mark. If the shutter is up, no current flows and the pulse is a space. The same thing happens for the next four code-level pulses. Then, the slot in the drum corresponding to the stop pulse presents itself causing current to flow, producing the stop pulse as the distributor disengages and the drum is approaching the end of its rotation.

(2) Engaging and Disengaging Distributor Clutch.

(a) Engaging.

As the universal lever moves up in front, the rear moves the reset shaft counterclockwise, which pulls the keyboard link to the front, causing the reset bail to rotate counterclockwise, moving away from the adjusting plate on the latch bail. At this time, the latch bail spring moves the latch bail counterclockwise. A tab on the latch bail moves against the trip lever, moving it away from the distributor clutch, engaging the clutch.

(b) Disengaging. As the clutch cam disk roller moves the reset bail clockwise, the reset bail moves against the adjusting plate on the latch bail and moves the latch bail clockwise, moving the tab away from the trip lever,

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allowing the trip lever spring
to move the trip lever back into
the path of the clutch shoe
lever, disengaging the
distributor clutch.

CHAPTER 4 SCHEDULED MAINTENANCE

4-1. INTRODUCTION. This chapter contains preventive maintenance and performance test procedures, for teletypewriter set AN/UGC-20B, to be accomplished on a scheduled basis. The purpose of scheduled maintenance is to anticipate and eliminate potential trouble sources in an effort to minimize interruptions to service. Recommended preventive maintenance actions are tabulated in a scheduled maintenance action index along with suggested intervals of performance and references to paragraphs containing specific instructions for performing maintenance actions. The scheduled maintenance actions in this manual are cancelled when the Planned Maintenance System (PMS) is implemented for this equipment aboard your ship or station.

4-2. SCHEDULED MAINTENANCE ACTION INDEX. Table 4-1 lists scheduled maintenance actions to be performed on teletypewriter set AN/UGC-20B. The periodicity column indicates the interval and sequence of maintenance action performance. D denotes daily, W denotes weekly, M denotes monthly, Q denotes quarterly, and R denotes as required. The Maintenance Action column briefly describes the maintenance action to be performed. The Reference column lists the paragraph describing the maintenance action in further detail.

4-3. EQUIPMENT AND MATERIALS REQUIRED. The following equipment and materials are required to accomplish preventive maintenance and

performance test procedures included in this chapter.

Clean, lint-free cloths.

Cleaning solvent: Trichloroethane O-T-620.

Lubricants: oil, MIL-L-17672; grease, MIL-G-23827

Test equipment and tools listed in table 1-4.

4-4. SAFETY PRECAUTIONS. The following are general safety precautions that are not related to any specific procedures and therefore do not appear elsewhere in this publication. These are recommended precautions that personnel must understand and apply during many phases of operation and maintenance.

a. Keep Away From Live Circuits. Operating personnel must at all times observe all safety regulations. Do not replace components or make adjustments inside the equipment with the primary power applied. Under certain conditions, dangerous potentials may exist when the power control is in the off position due to charges retained by capacitors. To avoid casualties, always remove power and discharge and ground a circuit before touching it.

b. Do Not Service Or Adjust Alone. Under no circumstances should any person reach into or enter the enclosure for the purpose of servicing or adjusting the equipment except in the presence of someone who is capable of rendering aid.

Table 4-1. Scheduled Maintenance Action Index

Periodicity	Maintenance Action	Reference
D	Inspect and clean as necessary.	4-5a
D	Check paper supply.	4-5a (7)
D	Inspect and lubricate if necessary.	4-6, 4-7
W	Check points of range	4-5b (1)
W	Clean selector magnet pole faces.	4-5b (2)
W	Lubricate.	4-6, 4-7
W	Check operation of keyboard.	2-3
M	Disassemble and inspect.	4-5c
M	Inspect main shaft.	4-5c (2)
M	Inspect function box.	4-5c (3)
M	Inspect keyboard	4-5c (4)
M	Inspect selector mechanism	4-5c (5)
M	Reassemble.	4-5c (6)
M	Check left margin.	4-5c (7)
M	Check right margin.	4-5c (8)
Q	Disassemble and clean in cleaning solvent.	4-5d
Q	Lubricate.	4-6, 4-7
Q	Check adjustments.	4-5d (6)
Q	Inspect selector mechanism.	4-5c (5)
Q or R	Conduct performance tests.	4-8

c. Resuscitation.

Personnel working with or near high voltage should be familiar with modern methods of resuscitation. Such information may be obtained from the Bureau of Medicine and Surgery.

4-5. PREVENTIVE MAINTENANCE PROCEDURES. The following paragraphs contain scheduled preventive maintenance procedures referenced in table 4-1. Personnel with a skill level of RM3 NEC-2342/2345/2346, or higher, are authorized to perform the following procedures.

a. Daily Inspection and Cleaning. Daily inspection and cleaning of the teletype machine is performed as follows:

CAUTION

Never increase tension on print hammer for darker print; replace the ribbon. When replacing typebox, ensure that it is properly positioned and securely fastened. Ensure that ribbon is correctly installed.

(1) Inspect ribbon for wear and frayed edges; replace if required.

(2) Inspect wire rope for frayed ends, cuts, and broken strands; replace if required.

(3) Inspect type and typebox for excessive wear on pallets; clean with stiff brush if smudging is evident.

(4) Inspect machine for loose, broken, or worn parts.

CAUTION

While cleaning teletype machine, ensure that springs and adjustable parts are not disturbed.

(5) Inspect machine for dust, lint, and paper shavings.

(6) Wipe inside and outside of machine with soft, lint-free cloth.

(7) Check paper supply: ensure paper roll is correctly installed; ensure that sufficient paper is provided on roll.

(8) Perform operating tests described in table 2-2.

b. Weekly Inspection and Cleaning. Weekly inspection and cleaning of the teletype machine is performed as follows:

NOTE

When a signal test set is not available, the orientation range can be determined while receiving the characters RY from the keyboard or a distant station.

(1) Check orientation range as follows:

(a) Set POWER switch to ON.

(b) Supply loop current and test signal.

(c) Rotate range finder knob in one direction until errors appear in copy.

(d) Retract range finder setting slowly until errors disappear. Note number of points indicated.

(e) Rotate range finder knob in opposite direction and determine points indicated as described in steps (c) and (d) above. Note number of points indicated.

(f) Difference between number of points indicated in steps (d) and (e) above should be 72 points (minimum).

(2) Clean selector magnet pole faces by running a clean piece of bond paper between them. Do Not use teletype paper.

c. Monthly Inspection and Cleaning. Monthly inspection and cleaning of the teletype machine is performed as follows:

(1) Disassemble major units from machine; remove cover, typing unit, keyboard, and motor unit from keyboard base. (Refer to applicable disassembly procedures in Section II of Chapter 6.)

(2) Inspect main shaft. Check all clutches and wicks, paying particular attention to evidence of wear on clutches.

(3) Inspect function box. Check alignment of function pawls and spring tensions. Check adjustment of stripper blade. Check rear of function box for bits of paper or accumulations of dirt. Clean as required.

(4) Inspect keyboard. Inspect gear shift assembly for worn or cracked

teeth on gears. Check for accumulations of dirt or grease, and clean as required. Pay particular attention to evidence of loose parts from automatic typer. Check local off-line functions for proper operation.

(5) Inspect selector mechanism for missing springs.

(6) Reassemble machine. (Refer to applicable reassembly procedures in Section II of Chapter 6.) Prior to reassembly, replace all worn, broken, or missing parts as required. Ensure that typing unit seats properly on keyboard base. Set gears by turning fan on rear of motor in a counterclockwise direction, as viewed from the fan end.

(7) Check left margin. With typebox clutch disengaged, spacing drum in its return position, and typebox shifted to letters position, the clearance between the left edge of platen and letters print indicator should be between 15/16 inch and 1-1/16 inches.

(8) Check right margin. Observe that carriage return and line feed occur after 74th character, with a slight overprint.

d. Quarterly Inspection and Cleaning. Quarterly inspection and cleaning of the teletype machine is performed as follows:

(1) Set power switch to OFF; disconnect power cord from primary ac power source; remove loop current.

(2) Disassemble components as described in paragraph 4-5c(1); remove platen, typebox, and selector assembly.

CAUTION

Ensure that springs are not disengaged, or other parts disturbed in cleaning. Avoid getting dust or dirt into bearings or other moving parts. Cleaning with air hose should be avoided.

(3) Clean machine thoroughly using approved cleaning solvent (Trichloroethane O-T-620) and clean, soft, lint-free cloths.

(4) Relubricate machine. Refer to lubrication procedures in paragraphs 4-6 and 4-7.

(5) Reassemble machine. (Refer to applicable assembly procedures in Section II, Chapter 6.)

(6) Check following adjustments and readjust if necessary:

(a) Left margin (paragraph 6-4am).

(b) Right margin (paragraph 6-4ax).

(c) Dash-Pot (paragraph 6-4az).

(d) Carriage draw-wire rope (paragraph 6-4aa).

NOTE

Adjust clutches to the high side of 100-wpm operation.

(e) All clutches.

4-6. TYPING UNIT LUBRICATION. The following paragraphs provide

typing unit lubrication instructions and specify lubrication intervals (table 4-2) which depend on the amount of daily operation and the speed of operation. Lubrication methods for the typing unit are presented in lubrication charts located at the end of this chapter and indexed in table 4-3. The lubrication charts consist of photographs and line drawings. Photographs show the general area to be lubricated. Callouts on the photographs refer to line drawings indicating each specific mechanism to be lubricated and method of lubrication.

a. References to front, rear, left, right, etc., in the lubrication charts, apply to the typing unit as viewed by the operator facing the unit.

b. Lubricate the typing unit just prior to placing it in service. After 300 to 500 operating hours, relubricate the typing unit. Recheck all clutch gaps; reset if necessary. Thereafter, use the lubrication intervals specified in table 4-2.

WARNING

Disconnect power before applying any lubricant.

c. Apply a thick film of grease to all gears and the spacing clutch trip cam plate. Apply oil to all cams, including the camming surfaces of each clutch disc. The following symbols apply to the specific lubrication instructions indicated in the line drawings.

Table 4-2. Lubrication Interval

(Based on 5-Day Week)*

Speed (wpm)	Daily Operation of Keyboard		
	0-8 hrs	8-16 hrs	16-24 hrs
60	52 wks	39 wks	26 wks
66	52 wks	39 wks	26 wks
75	52 wks	39 wks	26 wks
100	39 wks	26 wks	13 wks
Newly Installed Equipments (All Speeds)	3 wks	2 wks	1 wk

*For a 6-day week operation, reduce lubrication intervals 15 percent.
 For a 7-day week operation, reduce lubrication intervals 30-percent.

Table 4-3. Typing Unit Lubrication
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4-5	Paper Feed Area	4-39
4-6	Paper Feed Mechanism	4-40
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4-9	Code Bar Mechanism	4-42
4-10	Ribbon Area	4-43
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4-17	Selector Area	4-50
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Table 4-3. Typing Unit Lubrication
Chart Index (cont)

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Table 4-3. Typing Unit Lubrication
Chart Index (cont)

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<u>Symbol</u>	<u>Meaning</u>
O	- Apply MIL-L-17672 oil
G	- Apply MIL-G-23827 Grease
SAT	- Saturate with MIL-L-17672 oil

d. Apply MIL-L-17672 oil wherever the use of oil is indicated. Apply MIL-G-23827 grease on all surfaces wherever indicated. Whenever clutches are disassembled, apply a thin coat of grease to the shoe lever spring loops, and oil to the lubricator reservoir at indicated intervals.

e. Lubricate the typing unit thoroughly. Saturate all felt washers and oilers, and apply oil to each end of all springs. Apply oil to points where it will adhere and not run off. Avoid overlubrication. Keep electrical contacts and wire insulations free of lubricants. In general, apply oil to all bearings, wicks and locations where parts rub, slide, or move with respect to each other. Apply grease to gear teeth and points of heavy pressure.

4-7. KEYBOARD UNIT LUBRICATION. The following paragraphs provide keyboard unit lubrication instructions and specify lubrication intervals (table 4-2) which depend on the amount of daily operation and the speed of operation. Lubrication methods for the keyboard, base, cover, and motor are presented in lubrication charts located at the end of this chapter and indexed in table 4-4. The lubrication charts consist of photographs and line drawings. Photographs show the general area to be lubricated. Callouts on the photographs refer to line drawings indicating each

specific mechanism to be lubricated and method of lubrication.

a. References in the lubrication charts made to left or right, top or bottom, and front or rear, apply to the mechanism in its normal operating position as viewed by the operator facing the unit.

b. All felt lubricating washers and all moving surfaces should be thoroughly lubricated. However, over lubrication which would allow oil to drip, or grease to be thrown, on other parts should be avoided. Exercise special care to avoid getting oil or grease on electrical contact surfaces.

c. Lubricate the keyboard, base, motor, and cover before putting the set into service or before placing it in storage. After a short period of service, relubricate the set to make certain that no areas have been missed. Thereafter, lubricate the mechanisms and units according to the schedule in table 4-2.

d. The following list of symbols applies to the specific lubrication instructions indicated in the line drawings.

- D Keep dry - no lubricant permitted.
- G Apply thin coat of grease.
- O Apply 1 drop of oil.
- O2 Apply 2 drops of oil.
- O3 Apply 3 drops of oil, etc.
- OS Oil sparingly (1 or 2 drops only).
- OSD Oil sparingly or leave dry. (See NOTE below.)

Table 4-4. Keyboard, Base, Cover, and Motor Lubrication Chart Index

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OSL Oil sparingly or liberally.

SAT Saturate with oil.

NOTE

Applies to all areas not contacted by other parts.

CAUTION

Do not allow oil or grease to obstruct the light path between lamp assemblies and photoelectric cells in the keyboard transmitter and distributor.

e. Use MIL-L-17672 oil at all locations where the use of oil is indicated. Use MIL-G-23827 grease on all surfaces where grease is indicated.

4-8. SCHEDULED PERFORMANCE TESTS. Performance tests consist of mechanical adjustment checks, described in paragraphs 4-8b and 4-8c, and operational tests described in paragraph 4-8d.

a. Preliminary Instructions. Prior to performing mechanical adjustment checks, disassemble machine as follows:

WARNING

Disconnect power from unit. Failure to comply can cause serious injury.

(1) Remove cover:

(a) Depress plungers on sides of dome.

(b) Open window door by lifting from rear.

(c) Disconnect copy light plug.

(d) Push cover latches toward rear and lift cover.

(2) Remove typing unit:

(a) Disconnect J103 from P103.

(b) Remove B plug by pushing clips together at bottom.

(c) Remove four screws which mount typing unit on base.

(d) With left hand under rear frame and right hand on side of front plate above dash pot, lift typing unit from base.

b. Keyboard Unit Adjustment Checks. The following paragraphs describe procedures for checking keyboard unit adjustments.

(1) Check keyboard shutter window gap as follows:

(a) Refer to figure 6-1.

(b) Depress LTRS key to move all T levers to their lowest position.

(c) Lift first and last shutter with approximately one ounce of force.

(d) Measure clearance between upper edge of shutter window and shutter plate.

(e) Clearance should be between 0.065 inch and 0.075 inch. If clearance is not within specified limits, perform adjustment procedure described in paragraph 6-3a.

CAUTION

Use care to ensure no wires are broken when removing keyboard transmitter.

(2) Remove keyboard transmitter as follows:

(a) Rotate LA plug clamp nut counterclockwise and withdraw the plug.

(b) Disengage reset linkage from reset lever.

(c) Remove four mounting screws.

(d) Lift keyboard transmitter from base.

(3) Check keyboard universal link clearance as follows:

(a) Refer to figure 6-2.

(b) Push universal lever down until latched by latch lever.

(c) Measure clearance between universal link and frame.

(d) Clearance should be between 0.089 inch and 0.103 inch. If the clearance is not within the specified limits, perform adjustment procedure described in paragraph 6-3b.

(4) Replace and position keyboard transmitter as follows:

(a) Position keyboard transmitter on base so that slot ends in left and right brackets are against rear mounting screws.

(b) Secure transmitter with four mounting screws.

(c) Engage reset linkage with reset lever.

(5) Check distributor clutch drum as follows:

(a) Refer to figure 6-3.

(b) With clutch manually disengaged, and pressed against clutch drum, measure gap between ring and hub protrusion.

CAUTION

Do not distort ring while measuring gap.

(c) Gap should be between 0.005 inch and 0.010 inch. If gap is not within specified limits, perform adjustment procedure described in paragraph 6-3c.

(d) Visually inspect distributor clutch drum to determine drive arm is parallel to surface of drum assembly. If they are not parallel, manually bend drive arm until they become parallel as gauged by eye.

(6) Check distributor clutch lever gap as follows:

(a) Refer to figure 6-4.

(b) Disengage clutch.

(c) Measure gap between clutch shoe lever and stop lug and record the value.

(d) Engage clutch.

(e) Repeat step (c).

(f) Subtract the value obtained in step (c) from that obtained in step (e).

(g) The measurement in step (e) should be 0.055 to 0.085 inch greater than the measurement in step (c). If the difference is not within the specified limits, perform adjustment procedure described in paragraph 6-3d.

(7) Check distributor clutch trip lever engagement as follows:

(a) Refer to figure 6-5.

(b) Ensure that clutch trip lever engages clutch shoe lever by full thickness of clutch shoe lever.

(c) If full engagement does not exist, perform the adjustment procedure described in paragraph 6-3e.

(8) Check distributor clutch magnet plate as follows:

(a) Refer to figure 6-6.

(b) Disengage clutch.

(c) Set the control lever to REMOTE position.

(d) Ensure latch bail is against armature.

(e) Gap should be between 0.020 inch and 0.040 inch. If gap is not within specified limits, perform adjustment procedure described in paragraph 6-3f.

(f) Set control lever to LOCAL position.

(9) Check distributor gear backlash as follows:

(a) Refer to figure 6-7.

(b) Hold pinion gear stationary.

(c) Rotate driven gear back and forth while observing amount of backlash between pinion gear and driven gear at point in travel where clearance is minimum. As gauged by eye and feel, backlash should be barely perceptible (0.002 to 0.005).

(d) If backlash adjustment is necessary, perform procedures described in paragraph 6-3g.

(10) Check distributor reset lever clearances as follows:

(a) Refer to figure 6-8.

(b) Engage distributor clutch and rotate until reset lever is at lowest point.

(c) Measure clearance between latch lever and reset lever, and between the base and the distributor and keyboard links.

(d) Clearance between latch lever and reset lever should not be less than 0.030 inch nor more than 0.045 inch. Clearance between the base and the distributor and keyboard links should not be less than 0.050 inch nor more than 0.090 inch. If either clearance exceeds specified limits, perform adjustment procedure described in paragraph 6-3h.

(11) Check distributor latch bail clearance as follows:

- (a) Refer to figure 6-9.
- (b) Disengage clutch.
- (c) Ensure keyboard is reset.
- (d) Set control lever to REMOTE position.
- (e) Insert a 0.015-inch gauge between bottom of armature and latch bail.
- (f) Measure clearance between front of tab on armature and rear of tab on latch bail.
- (g) Clearance should be between 0.010 inch and 0.018 inch. If clearance is not within specified limits, perform adjustment procedure described in paragraph 6-3i.
- (h) Return control lever to LOCAL position.

(12) Check distributor clutch trip armature air gap as follows:

- (a) Refer to figure 6-10.

(b) Hold armature flush against magnet core.

(c) Measure clearance between armature and magnet assembly bracket.

(d) Clearance should be between 0.004 inch and 0.008 inch. If clearance is not within specified limits, perform adjustment procedure described in paragraph 6-3j.

c. Typing Unit Mechanical Adjustment Checks.
The following paragraphs describe procedures for checking typing unit adjustments.

(1) Check range finder knob phasing as follows:

- (a) Refer to figure 6-18.
- (b) Rotate range finder knob either clockwise or counterclockwise to the stop.
- (c) Zero on range scale should be within 3 points of index mark. If zero is more than 3 points away from index, perform adjustment procedure described in paragraph 6-4a.
- (d) Rotate knob to set 60 on range scale at index.

(2) Check selector clutch stop arm as follows:

- (a) Refer to figure 6-18.
- (b) Set range scale at 60.
- (c) With selector clutch disengaged and armature in marking position,

clutch stop arm should engage clutch shoe lever by approximately the full thickness of shoe lever. If not, perform adjustment procedure described in paragraph 6-4b.

(3) Check selector clutch drum end play as follows:

(a) Refer to figure 6-24.

(b) With clutch latched in stop position, measure cam-clutch assembly end play.

(c) Cam-clutch assembly should have some end play, but not to exceed 0.010 inch. If end play adjustment is necessary, perform procedure described in paragraph 6-4h.

(4) Check code bar clutch trip lever end play as follows:

(a) Refer to figure 6-25.

(b) Disengage selector clutch and code bar clutch.

(c) Code bar clutch trip lever should engage clutch shoe lever by full thickness of clutch shoe lever, and trip shaft should have some end play, but not to exceed 0.006 inch.

(d) If either engagement or end play adjustment is necessary, perform procedure described in paragraph 6-4i.

(5) Check function clutch trip lever end play as follows:

(a) Refer to figure 6-26.

(b) Disengage code bar clutch and function clutch.

(c) Function clutch trip lever should engage clutch shoe lever by full thickness of clutch shoe lever. (Check at lug with least bite on three stop clutches) and trip lever shaft should have some end play, but not to exceed 0.006 inch.

(d) If either engagement or end play adjustment is necessary, perform procedure described in paragraph 6-4j.

(6) Check clutch trip shaft set collars as follows:

(a) Refer to figure 6-27.

(b) Measure spacing cut-out lever end play.

(c) Lever should have some end play, not to exceed 0.008 inch.

(d) Measure line feed clutch latch lever end play.

(e) Lever should have some side play, not to exceed 0.008 inch.

(f) If side play adjustment is required, perform procedure described in paragraph 6-4k.

(7) Check typebox clutch trip lever eccentric post as follows:

(a) Refer to figure 6-28.

(b) Disengage typebox clutch.

(c) Ensure that trip lever engages clutch shoe lever by full thickness of shoe lever.

(d) If full engagement does not exist, perform adjustment procedure described in paragraph 6-41.

(8) Check spacing clutch trip lever as follows:

(a) Refer to figure 6-29.

(b) Disengage clutch.

(c) Trip clutch trip lever and rotate main shaft until trip lever is over shoe lever. Take up play of shoe lever inward by snapping trip lever over shoe lever.

(d) Check clearance between shoe lever and drum at each of three stop positions to determine which stop yields greatest clearance.

(e) With trip lever at stop position which yields greatest clearance, rotate main shaft slowly until trip lever just falls off stop lug. Check clearance between trip lever and drum. Clearance should be from 0.018 to 0.035 inch less than clearance between shoe lever and drum.

(f) If clearance adjustment is necessary, perform procedure described in paragraph 6-4m.

(9) Check line feed clutch trip lever eccentric post as follows:

(a) Refer to figure 6-30.

(b) Disengage clutch.

(c) Trip clutch trip lever and rotate main shaft until trip lever is over shoe lever. Take up play of shoe lever inward by snapping trip lever over shoe lever.

(d) Check clearance between shoe lever and drum of each of three stop positions to determine which stop yields greatest clearance.

(e) With trip lever at stop position which yields greatest clearance, rotate main shaft slowly until trip lever just falls off stop lug. Check clearance between trip lever and drum. Clearance should be from 0.018 to 0.035 inch less than clearance between shoe lever and drum.

(f) If clearance adjustment is necessary, perform procedure described in paragraph 6-4n.

(10) Check line feed clutch trip lever adjusting screw as follows:

(a) Refer to figure 6-30.

(b) Set line feed function slide arm in rear position and clutch trip lever against its eccentric post.

(c) Hold trip arm against the function slide arm and measure clearance between end of trip lever adjusting screw and trip arm. Clearance should not exceed 0.006 inch.

(d) If clearance adjustment is necessary, perform procedure described in paragraph 6-4o.

(11) Check line feed spur gear detent eccentric as follows:

(a) Refer to figure 6-31.

(b) Disengage line feed clutch.

(c) Rotate platen until detent stud is seated between two teeth on line feed spur gear.

(d) When hand wheel is released, manually set the teeth on the feed bars into engagement with the teeth on the line feed spur gear.

(e) The detent stud should contact one gear tooth and be not more than 0.010 inch from other tooth. If adjustment is necessary, perform procedure described in paragraph 6-4p.

(12) Check line feed clutch phasing as follows:

(a) Refer to figure 6-32.

(b) Disengage line feed clutch.

(c) Both line feed bars should engage teeth of line feed spur gear and be flush with each other.

(d) If adjustment is necessary, perform procedure described in paragraph 6-4q.

(13) Check spacing gear clearance as follows:

(a) Refer to figure 6-33.

(b) With carriage fully returned, hold spacing driving gear stationary and gently rotate driven gear back and forth.

(c) Ensure backlash between gears is barely perceptible, without bind, at closest point in travel. If backlash adjustment is necessary, perform procedure described in paragraph 6-4r.

(14) Check spacing gear phasing as follows:

(a) Refer to figure 6-33.

(b) Engage spacing clutch.

(c) Observe index line on spacing pawl is midway between the two lines on pawl retaining washer. If adjustment is necessary, perform procedure in paragraph 6-4s.

(15) Check rocker shaft bracket eccentric post as follows:

(a) Refer to figure 6-34.

(b) Disengage typebox clutch and take up play toward front.

(c) Measure gap between lower side of lock lever roller and top edge of shoulder on horizontal positioning lock lever. Gap should be between 0.055 inch and 0.090 inch. If not, perform adjustment procedure described in paragraph 6-4t.

(16) Check clutch shoe levers as follows:

(a) Refer to figure 6-35.

(b) Disengage clutch and measure gap between clutch shoe lever and its stop lug. Record measurement.

(c) Engage and rotate clutch until clutch shoe lever is toward bottom of unit.

(d) With clutch engaged, again measure gap between clutch shoe lever and its stop lug. Measurement should be 0.055 inch to 0.085 inch greater than measurement obtained in step (b) above. If adjustment is necessary, perform procedure described in paragraph 6-4u.

(e) Repeat steps (a) through (d) for each clutch.

(17) Check code bar shift lever drive arm as follows:

(a) Refer to figure 6-36.

(b) Engage and rotate code bar clutch until code bar shift lever link is in uppermost position.

(c) There should be some clearance, but not to exceed 0.025 inch, between top of code bar shift lever link roller and top of cam slots in top of code bar shift levers. If adjustment is necessary, perform procedure described in paragraph 6-4q.

(d) Code bar shift lever link shaft should have some end play but not to exceed 0.006 inch. If adjustment is necessary, perform procedure described in paragraph 6-4v.

(18) Check transfer lever eccentric as follows:

(a) Refer to figure 6-37.

(b) Set up a letters (12345) code combination.

(c) Disengage selector clutch.

(d) Engage and rotate code bar clutch until code bar shift lever link is in uppermost position.

(e) With play of shift bar taken up for maximum clearance, measure clearance between rear code bar shift lever and code bar shift bar farthest from shift lever.

(f) Clearance should be 0.010 to 0.025. If not, perform adjustment procedure described in paragraph 6-4w.

(19) Check intermediate arm back stop bracket as follows:

(a) See figure 6-38.

(b) Set up a blank (-----) code combination.

(c) Disengage selector and code bar clutches.

(d) Take up play to obtain maximum clearance between front code bar shift lever and inner step of code bar shift bar farthest from shift lever, then measure clearance.

(e) Clearance should be from 0.010 inch to 0.025 inch. If not, perform adjustment procedure described in paragraph 6-4x.

(20) Check code bar shift lever link brackets as follows:

- (a) Refer to figure 6-39.
- (b) Set up a letters (12345) code combination.
- (c) Engage and rotate code bar clutch until code bar shift lever link is in uppermost position.
- (d) Ensure code bars are detented.
- (e) With play taken up for maximum clearance, measure clearance between right side of front code bar shift lever and shoulder of closest code bar shift bar. Clearance should be between 0.002 inch and 0.025 inch.

(f) Set up a blank (-----) code combination.

(g) Repeat steps (c) and (d).

(h) With play taken up for maximum clearance, measure clearance between left side of rear code bar shift lever and shoulder of closest code bar shift bar. Clearance should be between 0.002 inch and 0.025 inch.

(i) If clearance in either step (e) or (h) above is not within specified limits, perform adjustment procedure described in paragraph 6-4y.

(21) Check typebox clutch trip lever as follows:

(a) Refer to figure 6-40.

(b) Engage and rotate code bar clutch until trip shaft cam follower roller is on lowest surface of code bar clutch cam.

(c) Align typebox clutch disc stop lug with trip lever.

(d) Measure clearance between trip lever and stop lug. Clearance should be from 0.025 inch to 0.045 inch.

(e) Measure typebox clutch latch lever side play. There should be some side play but it should not exceed 0.008 inch.

(f) If clearance measured in step (d) or side play measured in step (e) exceed specified limits, perform adjustment procedure described in paragraph 6-4z.

(22) Check carriage draw-wire rope as follows:

(a) Refer to figure 6-41.

(b) Engage and rotate typebox clutch 180 degrees.

(c) As gauged by feel, rear upper cable should have slightly greater tension than front cable.

(d) Measure clearance between lower draw-wire rope and carriage return latch bail post. Clearance should be 0.006 inch minimum.

(e) Measure clearance between lower draw-wire rope and left horizontal positioning drive linkage. Clearance should be 0.030 inch minimum.

(f) If either clearance is insufficient, perform adjustment procedure described in paragraph 6-4aa.

(23) Check oscillating rail slide position as follows:

(a) Refer to figure 6-42.

(b) Move typebox carriage to right until feed pawl farthest advanced engages tooth immediately above cut-away section on spacing drum ratchet.

(c) Measure clearance between oscillating rail slide and right rear draw-wire pulley at point on pulley where clearance is minimal.

(d) Clearance should be between 0.025 inch and 0.050 inch. If clearance is not within the specified limits, perform adjustment procedure described in paragraph 6-4ab.

(24) Check printing carriage lower roller as follows:

(a) Refer to figure 6-43.

(b) Move printing carriage to right.

(c) Operate manual carriage return while holding printing carriage to right. Allow carriage to slowly return.

(d) Observe play of carriage on track is minimal over full length of track.

(e) If adjustment of eccentric bushing of sliding screw is necessary,

perform procedure described in paragraph 6-4ac.

(25) Check printing carriage position as follows:

(a) Refer to figure 6-44.

(b) Set up M (--345) code combination.

(c) Position printing carriage at approximate midpoint of platen.

(d) Engage and rotate typebox clutch 180 degrees.

(e) From top view, as gauged by eye, ensure that M type pallet is centered on printing hammer when hammer is touching pallet.

(f) If adjustment is necessary, perform procedure described in paragraph 6-4ad.

(26) Check printing hammer bearing stud as follows:

(a) Refer to figure 6-45.

(b) Set up a period (--345) code combination in upper case.

(c) Position printing carriage at approximate midpoint of platen.

(d) Engage and rotate typebox clutch 180 degrees.

(e) From right view, as gauged by eye, ensure that period type pallet fully engages printing hammer when hammer is touching pallet.

(f) If adjustment is necessary, perform procedure described in paragraph 6-4ae.

(27) Check spacing trip lever bail cam plate as follows:

(a) Refer to figure 6-46.

(b) With spacing trip lever arm in upward position, engage and rotate typebox clutch 180 degrees.

(c) Disengage all function pawls from function bars.

(d) Measure clearance between top surface of trip lever arm extension and spacing trip lever shoulder.

(e) Clearance should be between 0.010 inch and 0.040 inch. If clearance exceeds specified limits, perform adjustment procedure described in paragraph 6-4af.

(28) Check printing track as follows:

(a) Refer to figure 6-47.

(b) Set up blank (-----) code combination in figures.

(c) Position printing arm slide alternately over each printing track mounting screw.

(d) Position printing hammer operating bail latching extension in line with left face of latch shoulder.

(e) Measure clearance between latching extension and latch shoulder.

(f) Clearance should be between 0.015 inch and 0.040 inch. If clearance exceeds specified limits, perform adjustment procedure described in paragraph 6-4ag. Hold clearance to maximum.

NOTE

Cycle unit between each check.

(29) Check printing hammer stop bracket as follows:

(a) Refer to figure 6-48.

(b) Set up M (--345) code combination.

(c) Engage and rotate typebox clutch 180 degrees.

(d) Hold printing hammer stop bracket towards type pallet with 8 ounces of force.

(e) Measure clearance between printing hammer and M type pallet across entire length of pallet.

(f) Clearance should be between 0.005 inch and 0.035 inch. If clearance is not within specified limits, perform adjustment procedure described in paragraph 6-4ah.

(30) Check printing arm as follows:

(a) Refer to figure 6-48.

(b) Position printing track in its extreme downward position.

(c) Set printing hammer operating bail against its stop.

(d) Take up play for maximum by lightly pressing down on printing arm slide and measure clearance between secondary printing arm and forward extension of printing hammer operating bail.

(e) There should be some clearance, not to exceed 0.015 inch.

(f) Position printing track in its extreme upward position.

(g) Disengage typebox clutch.

(h) Measure clearance between right face of operating bail latching extension and left face of latch surface. Check right and left positions.

(i) Clearance should be 0.006 inch minimum.

(j) If clearance measured in steps (e) or (i) is not within specified limits, perform adjustment procedure described in figure 6-4ai.

(31) Check function reset bail blade as follows:

(a) Refer to figure 6-49.

(b) Engage and rotate code bar clutch until shoe lever just touches trip lever.

(c) Disengage all function pawls from function bars.

(d) Unlatch all function lever latches from function levers.

(e) Using spring puller, pull each function bar to rear and measure clearance between each function bar and function reset bail blade.

(f) Clearance should be between 0.018 and 0.035 inch. If clearance is not within specified limits, perform adjustment procedure described in paragraph 6-4aj.

(32) Check carriage return latch bail as follows:

(a) Refer to figure 6-50.

(b) Manually return carriage.

(c) Take up play in carriage return bail to right by holding right side against retainer.

(d) Measure clearance between carriage return lever and carriage return latch bail.

(e) Clearance should be between 0.004 inch and 0.040 inch. If clearance is not within specified limits, perform adjustment procedure described in paragraph 6-4ak.

(33) Check carriage return lever as follows:

(a) Refer to figure 6-51.

(b) Set up carriage return (---4-) code combination.

(c) Engage and rotate function clutch until

stop lug is toward bottom of unit.

(d) Rotate spacing drum clockwise until carriage return latch bail over-travels carriage return lever.

(e) Measure clearance between latching surface of carriage return latch bail and top of carriage return lever.

(f) Clearance should be between 0.006 inch and 0.035 inch. If clearance is not within specified limits, perform adjustment procedure described in paragraph 6-4a1.

(34) Check left margin as follows:

(a) Refer to figure 6-52.

(b) Manually return carriage.

(c) Shift typebox to letters condition.

(d) Ensure front feed pawl is farthest advanced.

(e) Measure clearance between left edge of platen and letters print indicator.

(f) Clearance should be between 15/16 inch and 1-1/16 inch. If clearance is not within the specified limits, perform adjustment procedure described in paragraph 6-4am, steps (1) through (7).

(g) Take up play in spacing shaft by rotating driven gear clockwise from a front view.

(h) Measure clearance between feed pawl and shoulder of ratchet tooth immediately above pawl. There should be some clearance, not to exceed 0.008 inch.

(i) Engage and rotate spacing clutch until rear feed pawl is farthest advanced and clutch is disengaged.

(j) Manually return carriage.

(k) Observe rear feed pawl drops into indentation between ratchet wheel teeth, and bottoms firmly in notch. If adjustment is necessary, perform procedure described in paragraph 6-4am, steps (8) through (10).

(35) Check shift linkage as follows:

(a) Refer to figure 6-53.

(b) Position carriage near midpoint at platen.

(c) Set up 0 (not zero) (---45) code combination.

(d) Engage and rotate typebox clutch 180 degrees.

(e) Note position of printing hammer in relation to 0 (not zero) type pallet when hammer is pushed in to touch pallet.

(f) Manually buckle right shift linkage.

(g) Position of printing hammer in relation to 9 type pallet should be same as it was in relation to 0 (not zero) type pallet in step (e).

(h) Repeat steps (b) through (g) using W and 2 type pallets and (12--5) code combination.

(36) Check stripper blade drive cam position as follows:

(a) Refer to figure 6-54.

(b) Note amount of over-travel between upper high of stripper blade drive cam and stripper blade drive arm.

(c) Engage and rotate function clutch 180 degrees.

(d) Note amount of over-travel between lower high of stripper blade drive cam and stripper blade drive arm.

(e) Amount of over-travel in steps (b) and (d) should be equal as gauged by eye. If adjustment is necessary, perform procedure described in paragraph 6-4ao.

d. Operational Tests.
Operational tests are described in table 4-5. Figure 4-1 shows test setup required. If abnormal indications are encountered during a test, refer to the Troubleshooting Index, table 5-1, in chapter 5. Prior to conducting the tests, perform the following initial control settings on the two test sets:

AN/UGM-8B(V)

POWER ON OFF switch to OFF.

DISTORTION SELECT switch to MARK BIAS.

NAVELEX 0969-LP-170-4010

PERCENT DISTORTION switch to 0.

STOP LENGTH SYNC-START/STOP switch to S/S 1.42.

CHARACTER RELEASE switch to FREE RUN.

SIGNAL PATTERN switch to STDY MK.

RATE switch to 74.2.

LOOP POLARITY switch to either + or - to cause meter to deflect to right.

LOOP ADJ control fully counterclockwise.

HIGH LEVEL OUTPUT MODE switch to EXT NEUT.

MARK SPACE switches to any position.

TS-2616/UGM

AC POWER switch to off (down) position.

PEAK RESET switch to AUTO.

RATE-BAUDS switch to 74.2.

CODE LEVEL switch to 5.

DISTORTION SELECT switch to PEAK-TOTAL

TRANSITION SELECT switch to ALL.

INPUT POLARITY switch to either + or - to cause meter to deflect to right.

INPUT SELECT switch to NEUTRAL 60.

INPUT FILTER switch to IN.

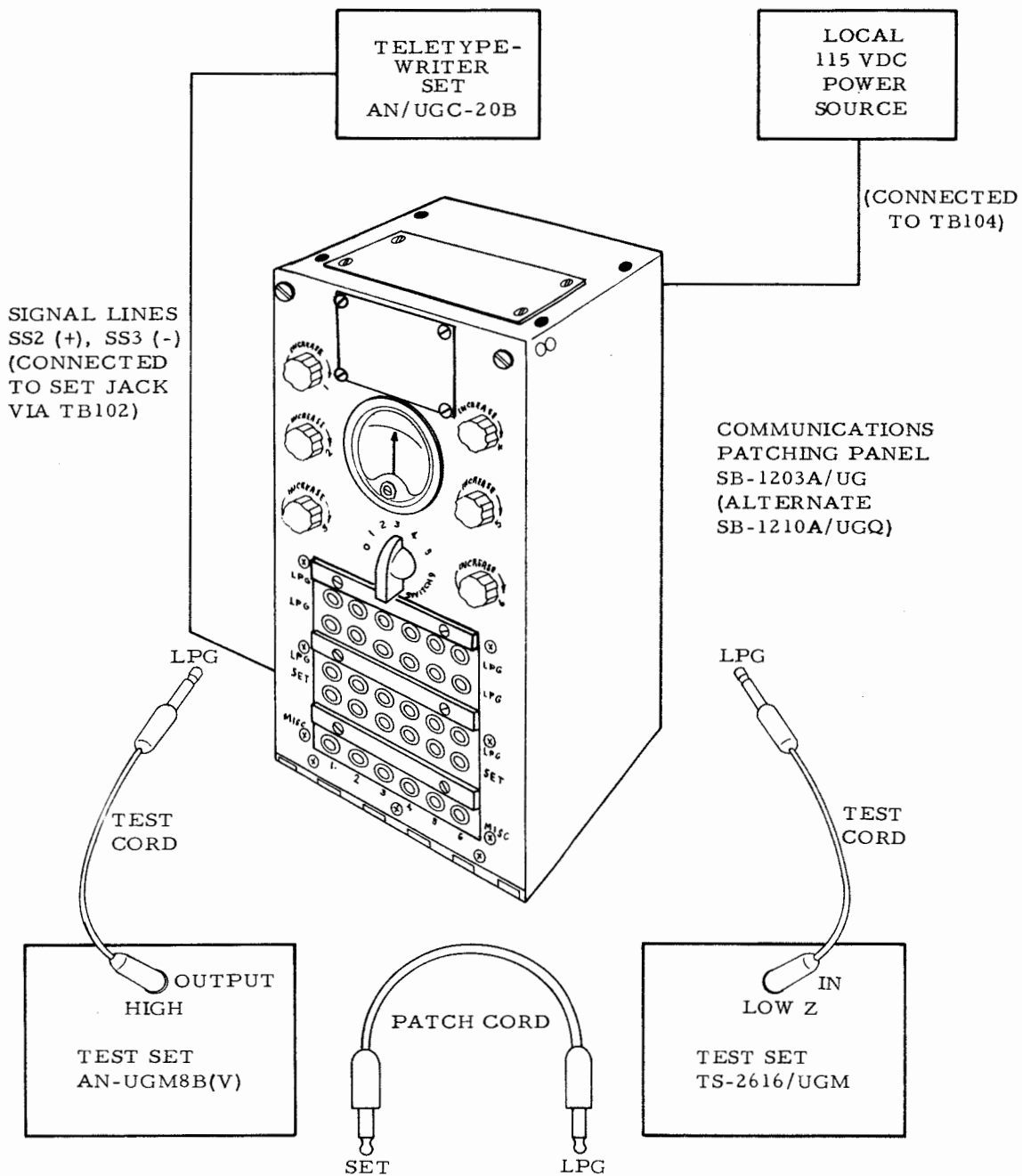


Figure 4-1. AN/UGC-20B Test Setup

Table 4-5. Operational Test Procedures

Step	Action	Normal Indication	Reference Table 5-1
	<p>1. <u>Preliminary</u></p> <p>a. Ensure test set controls are set as indicated in paragraph 4-8d.</p> <p>b. Ensure power switch on AN/UGC-20B is set to OFF.</p> <p>c. Refer to figure 4-1.</p> <p>d. Ensure AN/UGC-20B and local 115 VDC power source are correctly connected to patching panel (See NAVSHIPS 0967-874-1010, formerly NAVSHIPS 95718.)</p> <p>e. Plug test cords into OUTPUT HIGH jack on AN/UGM-8B (V) and IN LOW Z jack on TS-2616/UGM.</p> <p>f. Plug test set power cords into 115-vac power outlets.</p> <p>g. Plug test cord from AN/UGM-8B (V) into LPG jack (top row) in same channel as SET jack for AN/UGC-20B is located.</p>		

Table 4-5. Operational Test Procedures
(cont)

Step	Action	Normal Indication	Reference Table 5-1
h.	On patching panel, set current meter SWITCH to AN/UGC-20B channel. Rotate current ADJUSTMENT control fully counterclockwise.		
	2. <u>Typing Unit Range Check.</u>		
a.	Set POWER ON/OFF switch on AN/UGM-8B(V) to ON.		
b.	Set power switch on AN/UGC-20B to ON.		
c.	On patching panel, rotate channel current ADJUSTMENT control for reading of 60 on current meter.		
d.	Press LOC IF and LOC CR keys on AN/UGC-20B keyboard.		
e.	Set SIGNAL PATTERN switch on AN/UGM-8 (V) to FOX.	<p>(1) Typing unit types test message.</p> <p>(2) Letters-figures shift and figures-letters shift operate properly.</p> <p>(3) Normal carriage return and line feed operate properly.</p>	<p>Items 9 and 10</p> <p>Items 11 and 13.</p>

Table 4-5. Operational Test Procedures
(cont)

Step	Action	Normal Indication	Reference Table 5-1
f.	Adjust range finder knob on selector assembly to determine minimum and maximum settings at which message is typed without error.		
g.	Note difference between minimum and maximum settings obtained in step f.	72 (minimum difference)	Item 1
h.	<p>Place range finder on optimum setting as follows:</p> <p>(1) Add low and high readings obtained in step f.</p> <p>(2) Divide by 2.</p> <p>(3) Resulting number is optimum setting.</p>		
3.	<u>Typing Unit Quality of Print Check.</u>		
a.	While typing unit is receiving test message, observe quality of printed copy.	<p>(1) Characters are positioned on straight vertical line.</p> <p>(2) Uniform spacing between characters.</p>	<p>Item 2</p> <p>Item 3</p>

Table 4-5. Operational Test Procedures
(cont)

Step	Action	Normal Indication	Reference Table 5-1
		<p>(3) Clear type.</p> <p>(4) Proper, error-free test pattern typed.</p> <p>(5) Proper ribbon feed.</p>	<p>Item 4</p> <p>Item 5</p> <p>Item 6</p>
b.	Manually operate ribbon lever inward, on side where ribbon is being unwound.	Ribbon reverses.	Item 7
c.	Repeat step b, using other ribbon lever.	Ribbon reverses.	Item 7
d.	Set SIG PATTERN switch on AN/UGM-8B(V) to STDY MK.		
	<p>4. <u>Typing Unit Distorted Signal Check.</u></p> <p>NOTE</p> <p>This test checks the ability of the typing unit to copy a distorted signal.</p>		
a.	Ensure DISTORTION SELECT switch on AN/UGM-8B(V) is set to MARK BIAS.		

Table 4-5. Operational Test Procedures
(cont)

Step	Action	Normal Indication	Reference Table 5-1
b.	Set PERCENT DISTORTION switches as follows: (1) TENS: 40 (2) UNITS: 0		
c.	Set SIGNAL PATTERN switch on AN/UGM-8B(V) to FOX.	Must copy one line with not more than one error.	
d.	Set DISTORTION SELECT switch to SPACE BIAS.	Same as step c.	
e.	Set DISTORTION SELECT switch to MARK END.	Same as step c.	
f.	Set PERCENT DISTORTION switches as follows: (1) TENS: 30 (2) UNITS: 5		
g.	Set DISTORTION SELECT switch to SPACE END.	Same as step c.	
h.	Set DISTORTION SELECT switch to SWITCH BIAS.	Same as step c.	
i.	Set POWER ON OFF switch on AN/UGM-8B(V) to OFF.		

Table 4-5. Operational Test Procedures
(cont)

Step	Action	Normal Indication	Reference Table 5-1
j.	Set power switch on AN/UGC-20B to OFF.		
	5. <u>Typing Unit Proper Function Operation Check.</u>		
a.	Unplug AN/UGM-8B(V) test cord from patching panel.		
b.	Remove patch cord connected between SET and LPG jacks.		
c.	Set power switch on AN/UGC-20B to ON.		
d.	Adjust channel current ADJUSTMENT control for reading of 60 on current meter.		
e.	Press FIGS key.		
f.	Press S key.	Signal bell rings.	Item 12
g.	Set single/double line feed lever (inside) to number 1 position.		
h.	Press LINE FEED key.	Typing unit single line feeds.	Item 14

Table 4-5. Operational Test Procedures
(cont)

Step	Action	Normal Indication	Reference Table 5-1
i.	Set single/double line feed lever to number 2 position.		
j.	Repeat step h.	Typing unit double line feeds.	Item 14
k.	Press LOC CR key to return carriage.		
l.	Press M and REPT keys simultaneously until full line of Ms has been printed, carriage has returned, and printing has started on next line. Count characters.	<p>(1) There shall be 72 clear characters.</p> <p>(2) The 74th character shall strike over the 73rd character.</p> <p>(3) The 75th character shall print approximately in center of page, beneath 32nd through 42nd character.</p> <p>(4) The 76th character shall print exactly under 1st character.</p> <p>(5) The 77th character shall print exactly under 2nd character.</p>	<p>Items 15 and 16</p> <p>Items 15 and 16</p> <p>Items 15 and 16</p> <p>Items 15 and 16</p> <p>Items 15 and 16</p>
m.	Press RETURN key.	Carriage returns and line feeds.	Items 17 and 20

Table 4-5. Operational Test Procedures
(cont)

Step	Action	Normal Indication	Reference Table 5-1
n.	Press LINE FEED key.	No line feed occurs.	Items 17 and 20
o.	Repeat step n.	No line feed occurs.	Items 17 and 20
p.	Repeat step n.	Line feed occurs.	Items 17 and 20
	6. <u>Local Functions Check.</u>		
a.	Press LOC CR key.	Carriage returns.	Item 18
b.	Press and hold LOC LF key.	Line feed occurs continuously until key is released.	Item 19
	7. <u>Keyboard Proper Operation Check.</u>		
a.	Press each character and function key.	Selected character prints or selected function operates. (Keys operate easily.)	Item 22
b.	Set power switch on AN/UGC-20B to OFF.		
	8. <u>Keyboard Distortion Check.</u>		
a.	Refer to figure 4-1.		

Table 4-5. Operational Test Procedures
(cont)

Step	Action	Normal Indication	Reference Table 5-1
b.	On patching panel, connect patch cord between AN/UGC-20B channel SET jack and LPG (top row) jack.		
c.	Plug TS-2616/UGM test cord into AN/UGC-20B channel LPG (2nd row) jack.		
d.	Set POWER switch on TS-2616/UGM to ON.		
e.	Set power switch on AN/UGC-20B to ON.		
f.	<p>Observe reading on PERCENT DISTORTION meter on TS-2616/UGM while pressing the following keys:</p> <ul style="list-style-type: none"> (1) REPT and E (2) REPT and LF (3) REPT and Space (4) REPT and CR (5) REPT and T (6) REPT and R 	5-percent (maximum).	Item 21

Table 4-5. Operational Test Procedures
(cont)

Step	Action	Normal Indication	Reference Table 5-1
g.	(7) REPT and Y (8) REPT and A (9) REPT and M (10) REPT and LTRS Set DISTORTION SELECT switch on TS-2616/UGM to BIAS.		
h.	Repeat step f.	5-percent (maximum).	Item 21

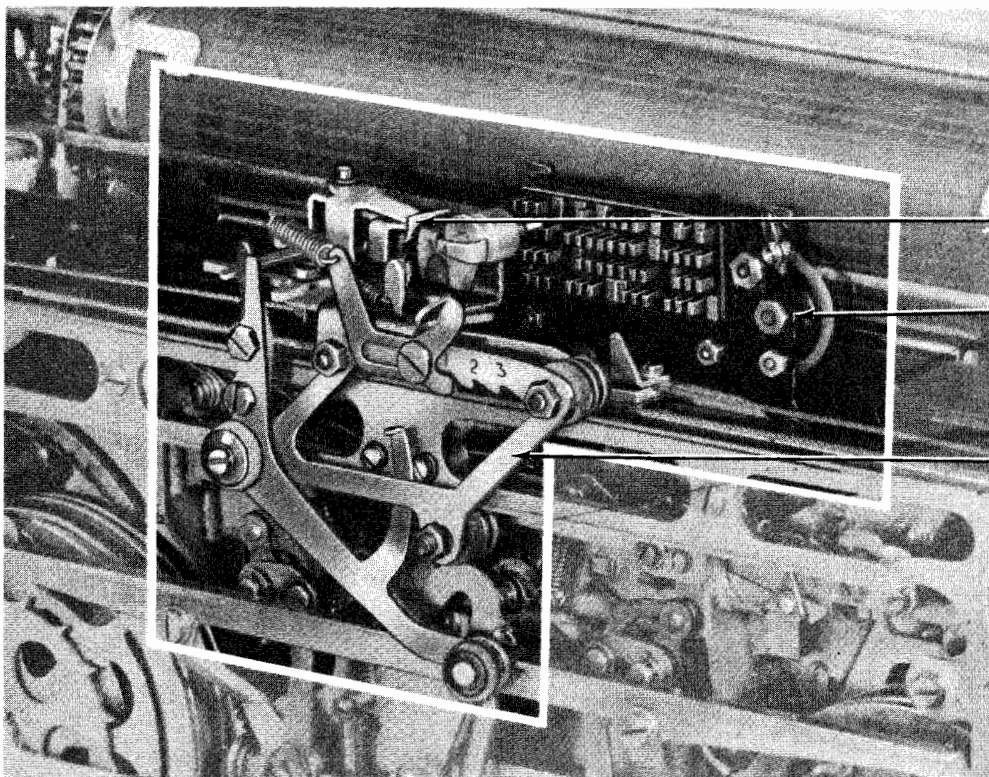


FIGURE 4-3
PRINTING MECHANISM
(TOP VIEW)

FIGURE 4-3
PRINTING MECHANISM
(FRONT VIEW)

FIGURE 4-4
TYPEBOX CARRIAGE
MECHANISM

(FRONT VIEW)

Figure 4-2. Printing Area

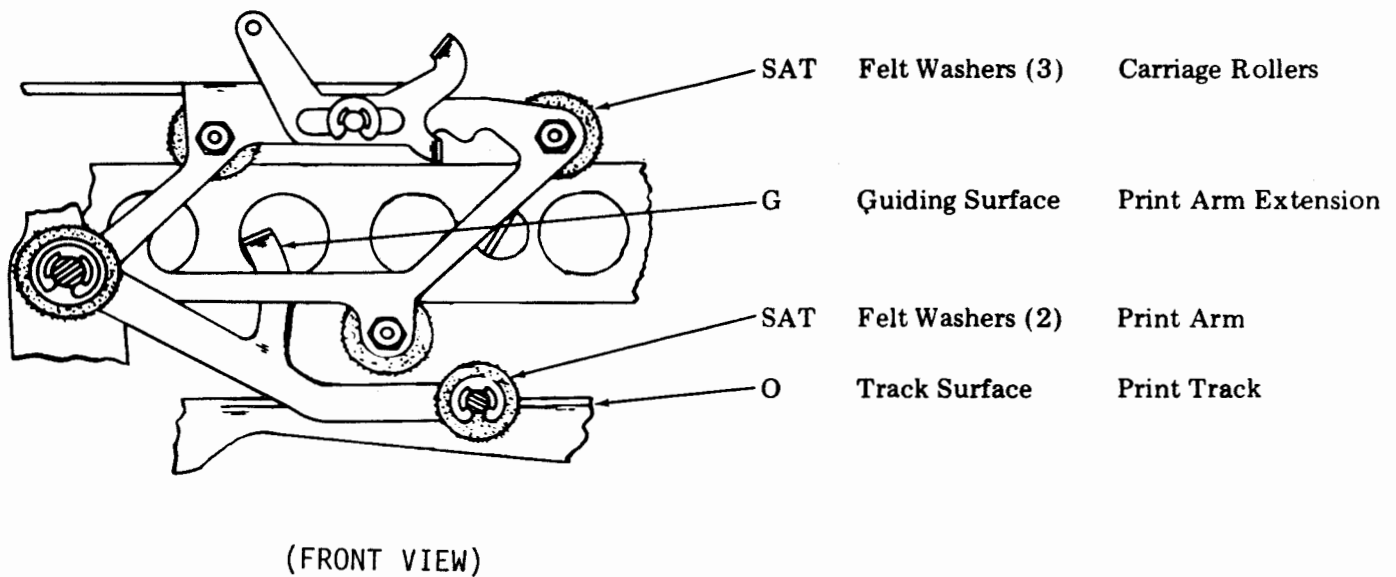
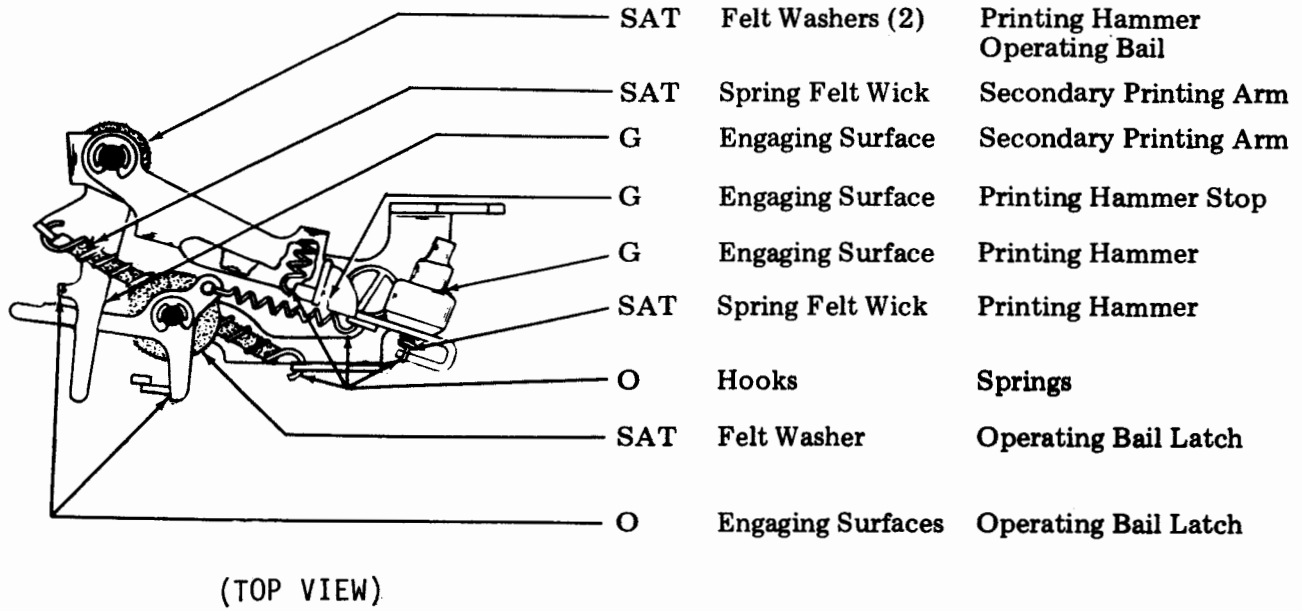


Figure 4-3. Printing Mechanism

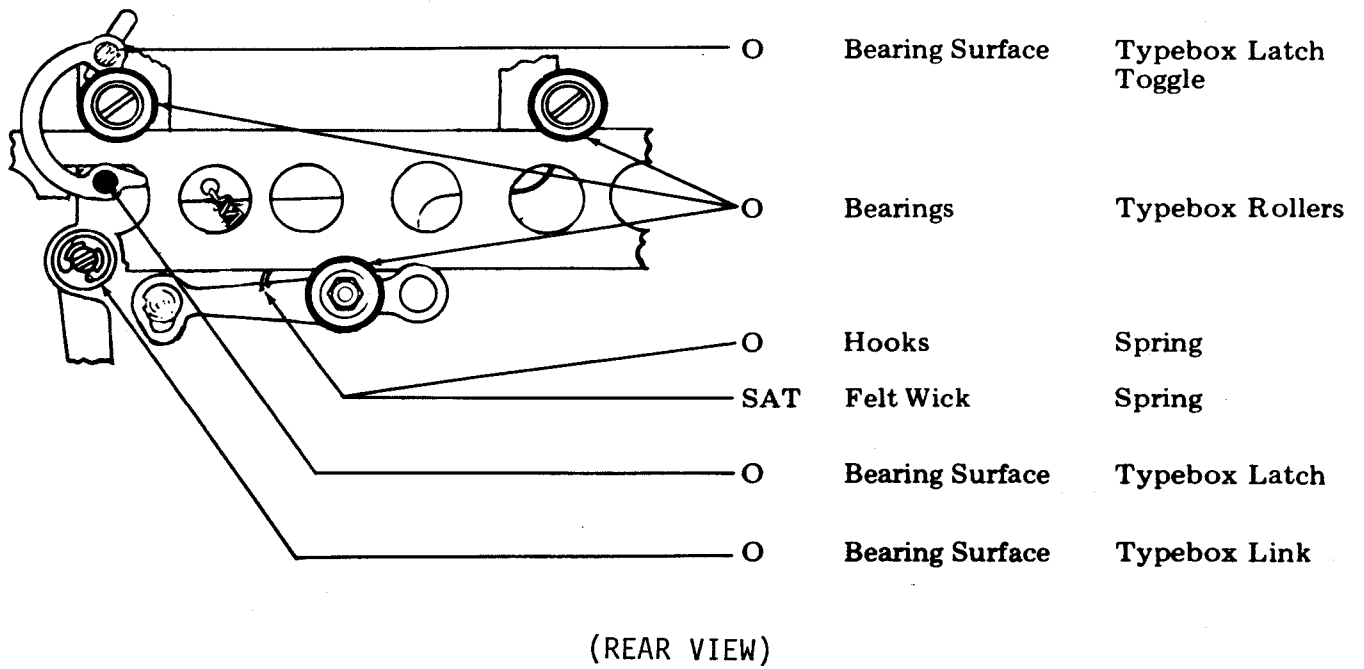


Figure 4-4. Typebox Carriage Mechanism

FIGURE 4-6
PAPER FEED
MECHANISM

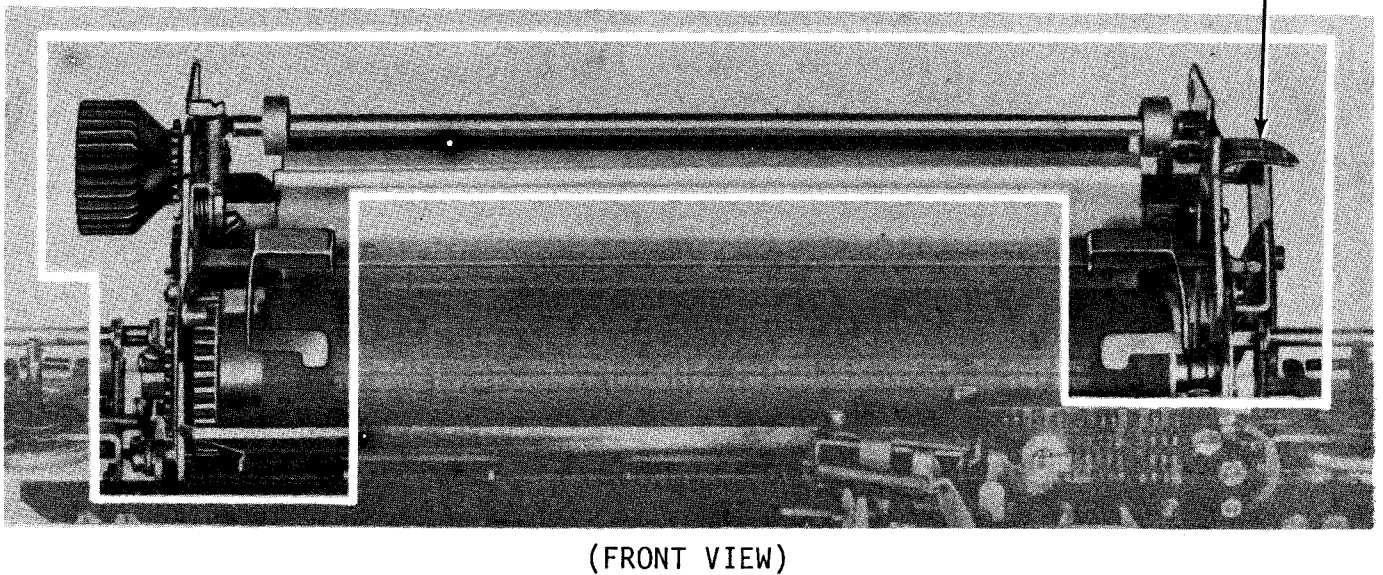


Figure 4-5. Paper Feed Area

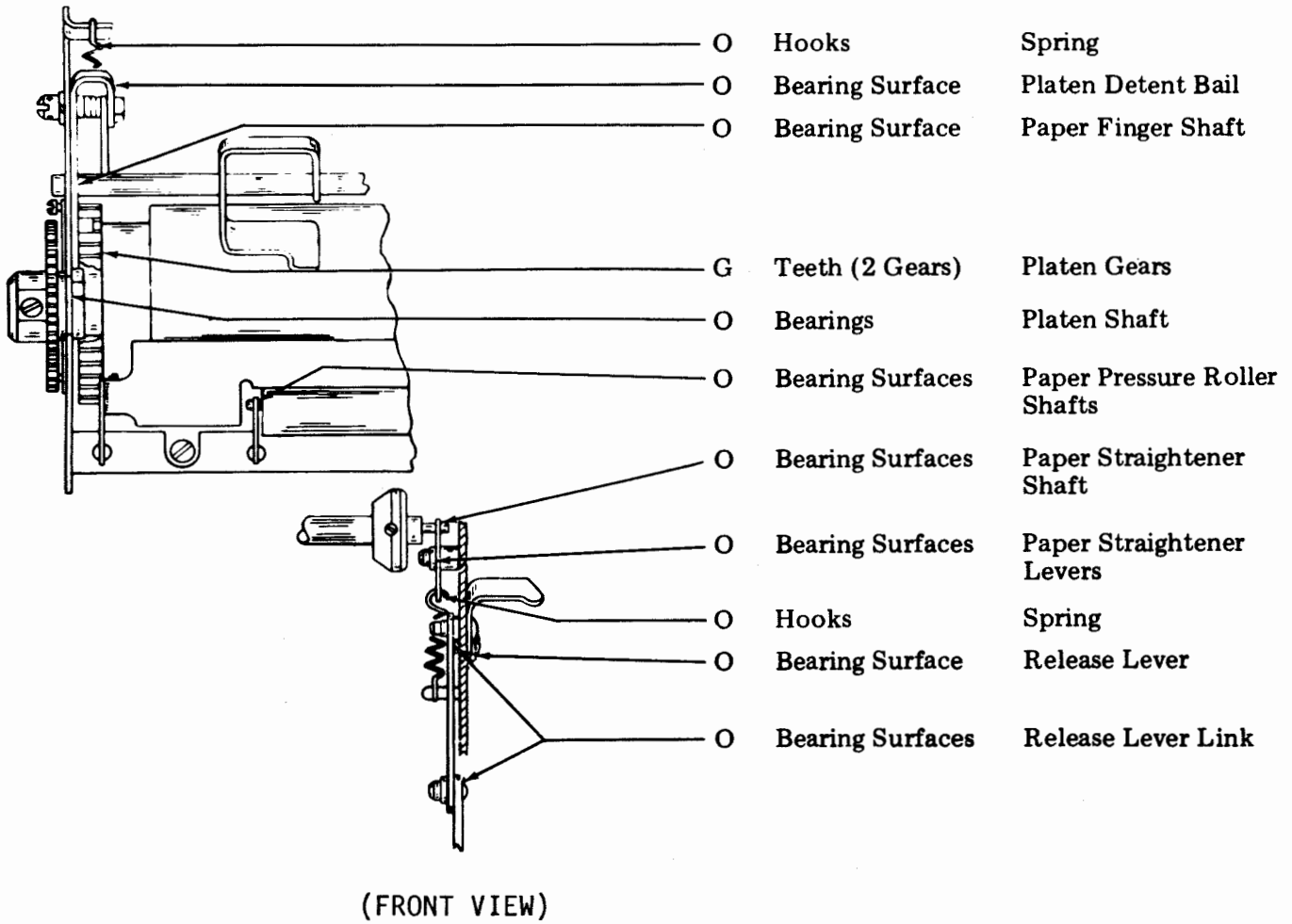
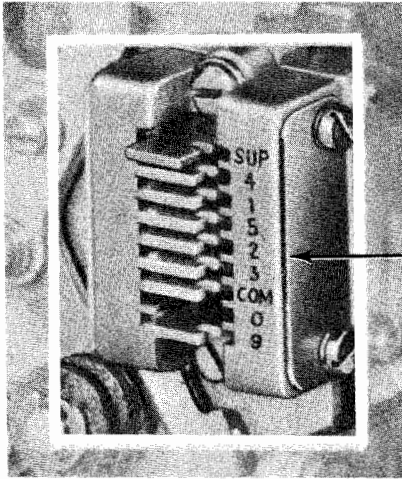


Figure 4-6. Paper Feed Mechanism



(LEFT FRONT VIEW)

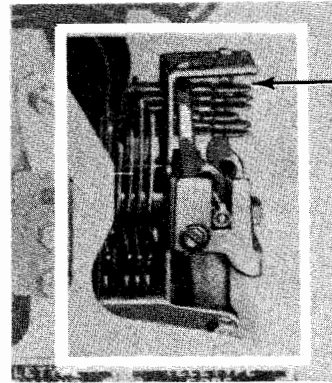
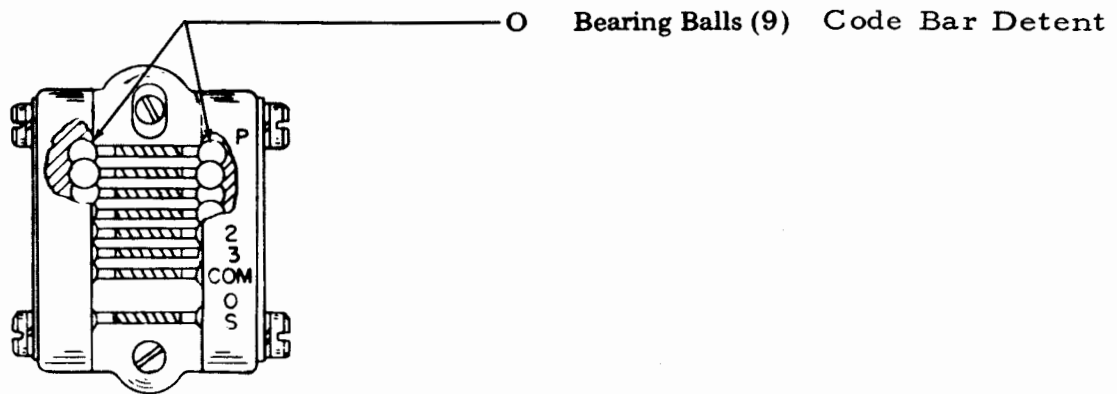


FIGURE 4-9
CODE BAR
MECHANISM

(FRONT VIEW)

Figure 4-7. Code Bar Area



(LEFT SIDE VIEW)

Figure 4-8. Code Bar Detents

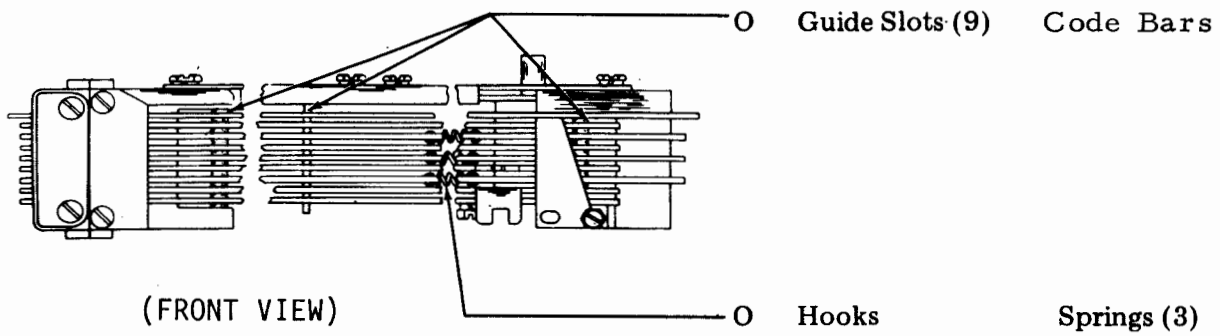


Figure 4-9. Code Bar Mechanism

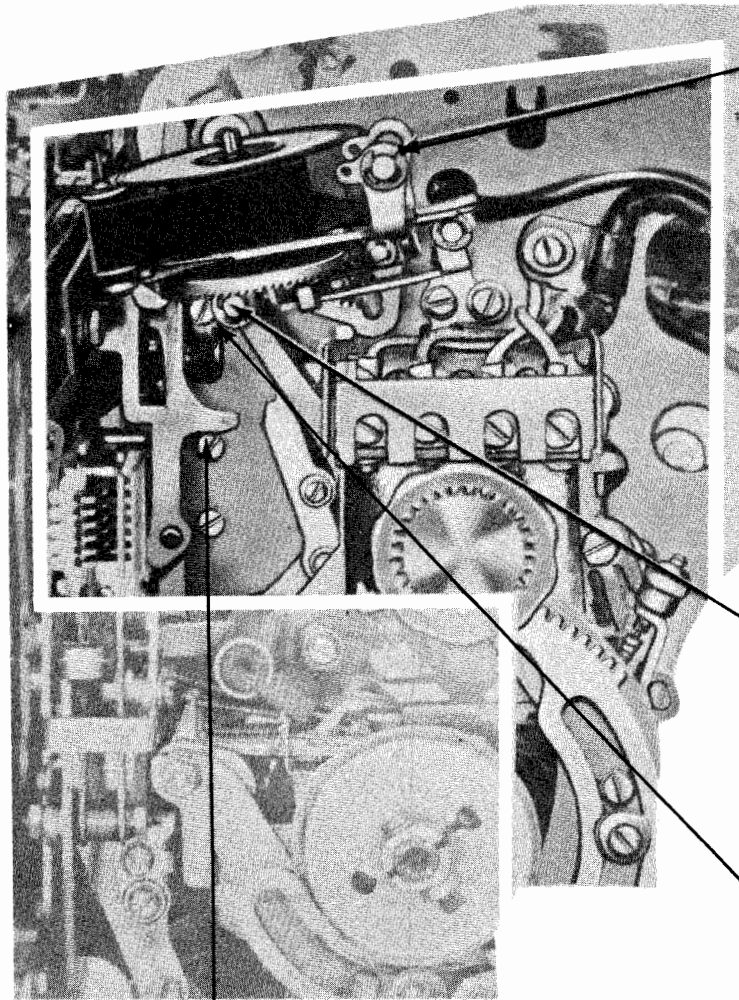


FIGURE 4-11
RIBBON FEED
MECHANISM (A)

FIGURE 4-12
RIBBON FEED
MECHANISM (B)
(REAR VIEW)

FIGURE 4-12
RIBBON FEED
MECHANISM (B)
(RIGHT SIDE VIEW)

FIGURE 4-13
VERTICAL POSITIONING
MECHANISM

(RIGHT SIDE VIEW)

Figure 4-10. Ribbon Area

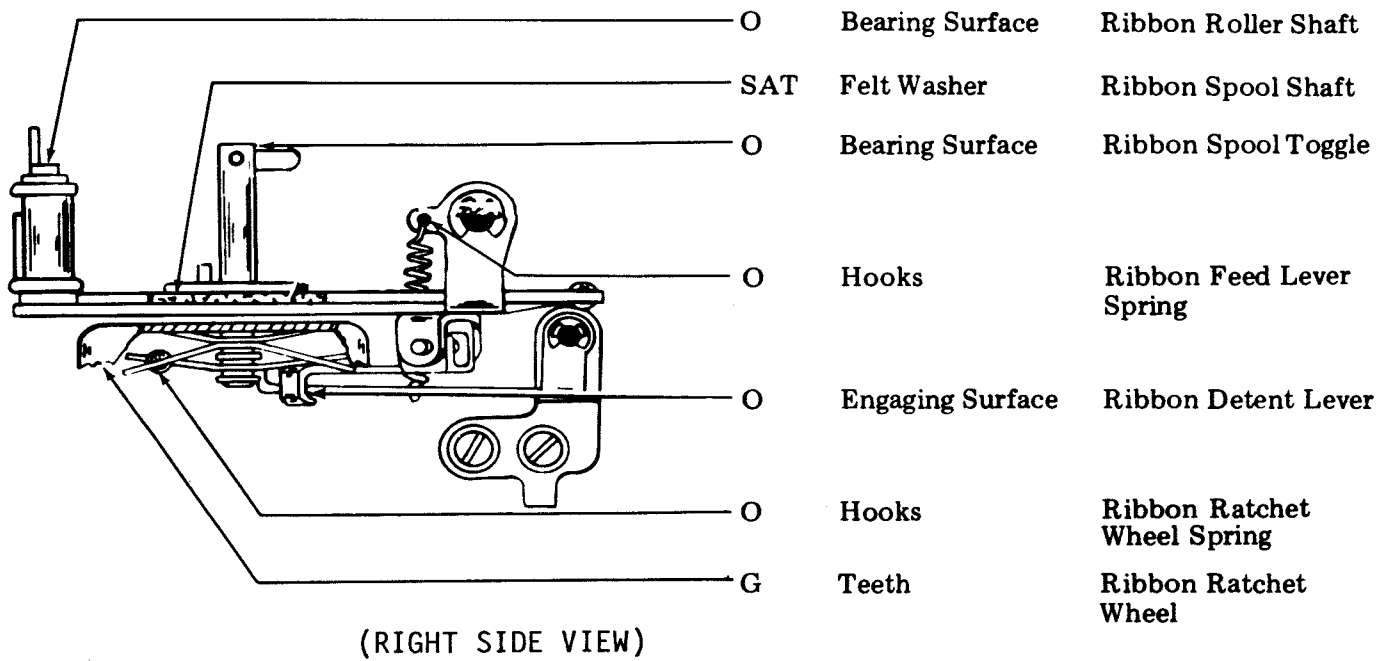


Figure 4-11. Ribbon Feed Mechanism

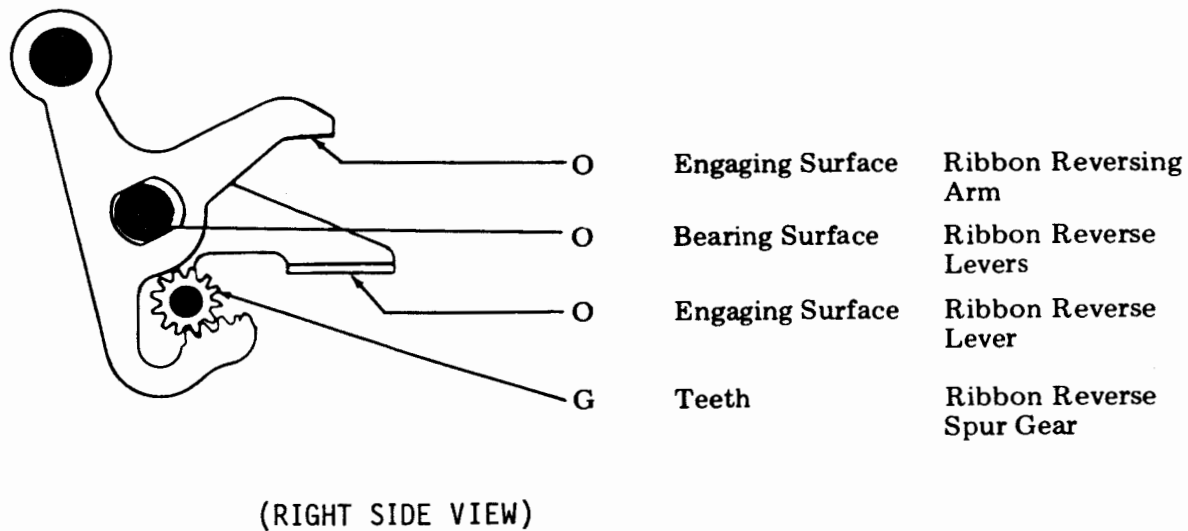
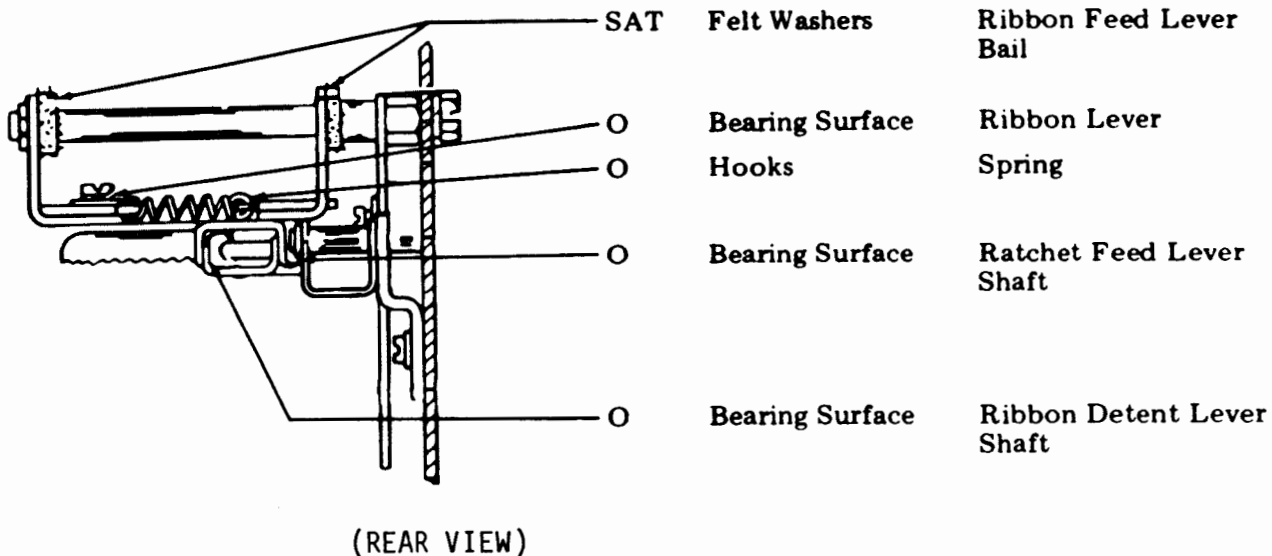
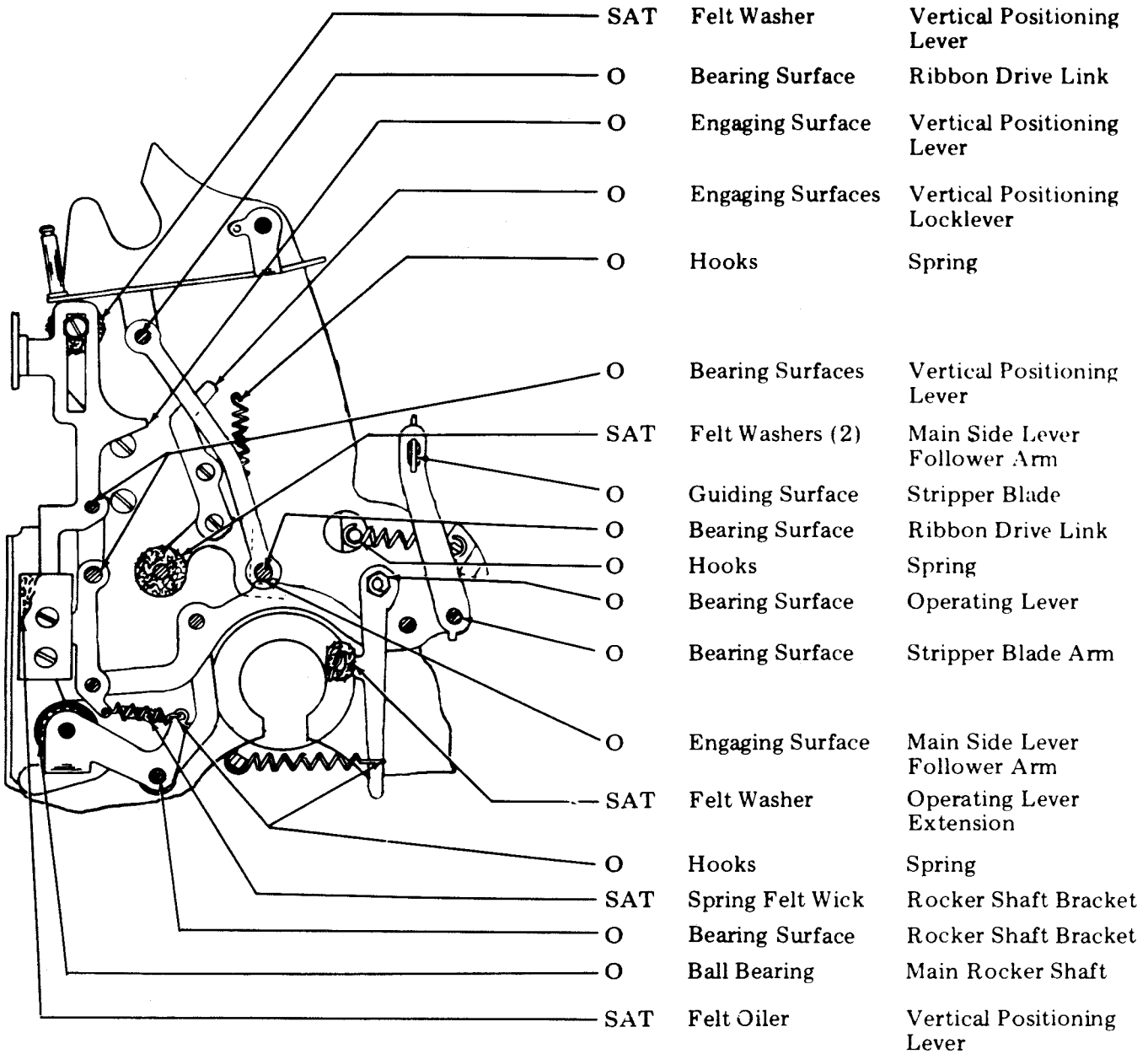


Figure 4-12. Ribbon Feed Mechanism (B)



(RIGHT SIDE VIEW)

Figure 4-13. Vertical Positioning Mechanism (A)

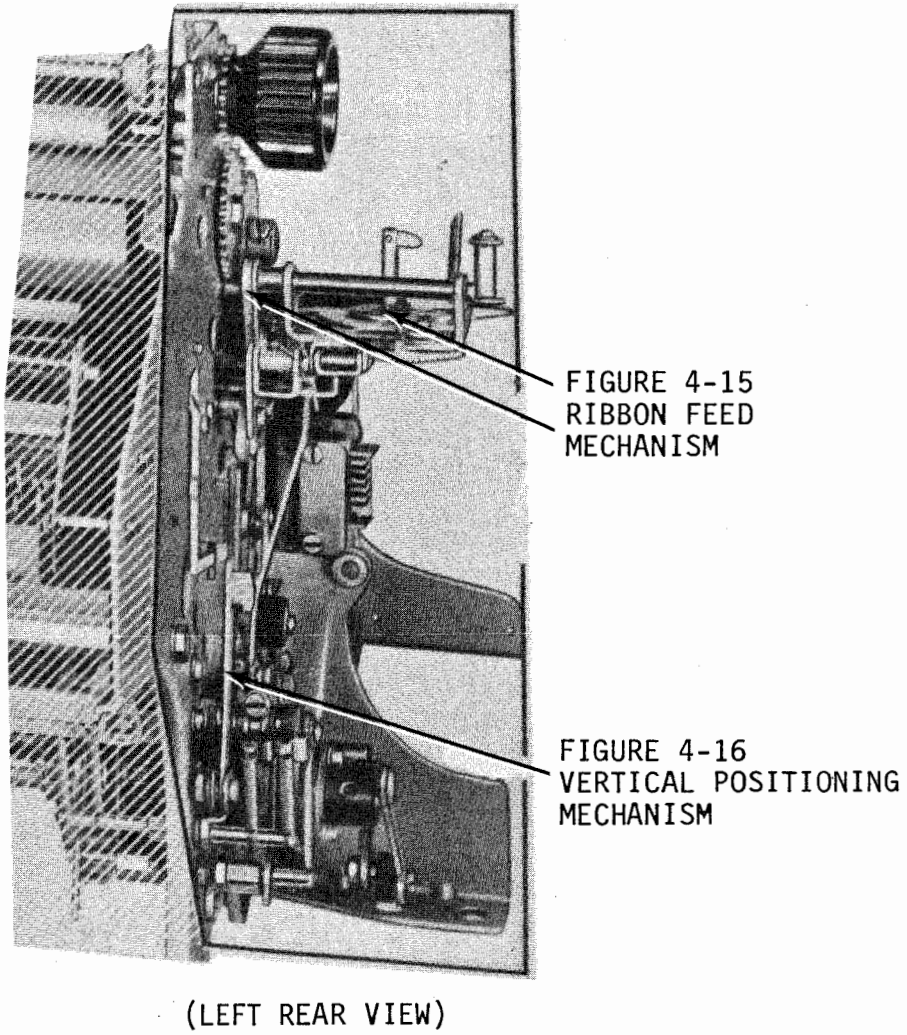
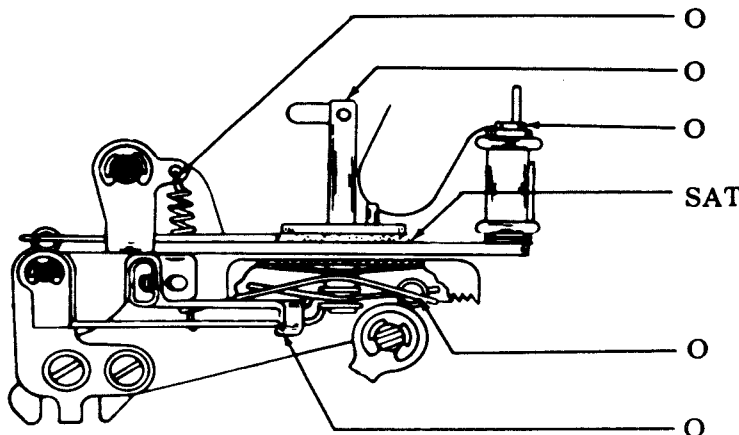
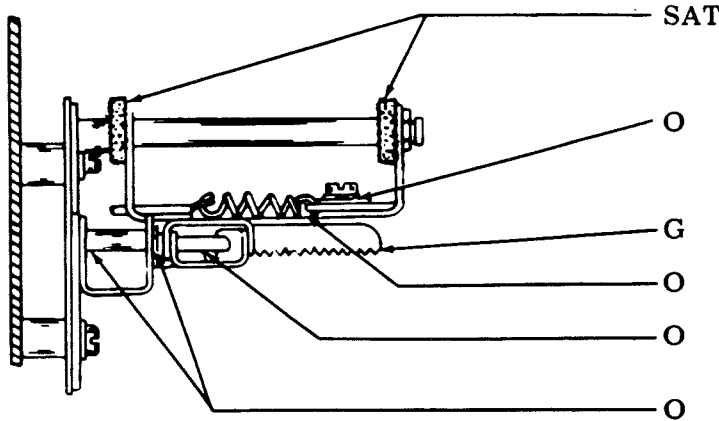


Figure 4-14. Ribbon Area



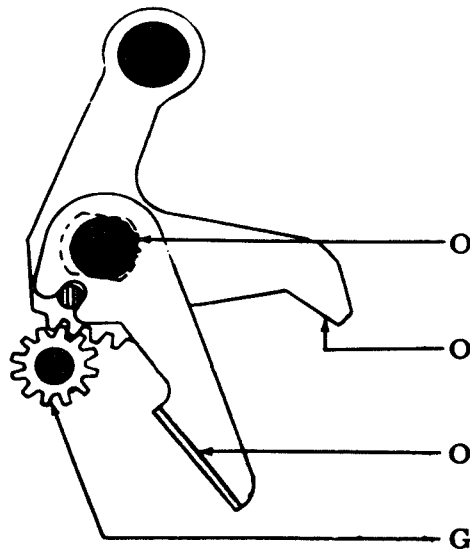
- O Hooks Spring
- O Bearing Surface Ribbon Spool Shaft
- O Bearing Surface Ribbon Roller Shaft
- SAT Felt Washer Ribbon Spool Shaft
- O Hooks Spring
- O Engaging Surface Ribbon Detent Lever

(LEFT SIDE VIEW)



- SAT Felt Washers Ribbon Feed Lever Bail
- O Bearing Surface Ribbon Reverse Lever
- G Teeth Ribbon Ratchet Wheel
- O Hooks Spring
- O Engaging Surface Ribbon Detent Lever Shaft
- O Bearing Surfaces Ratchet Feed Lever Shaft

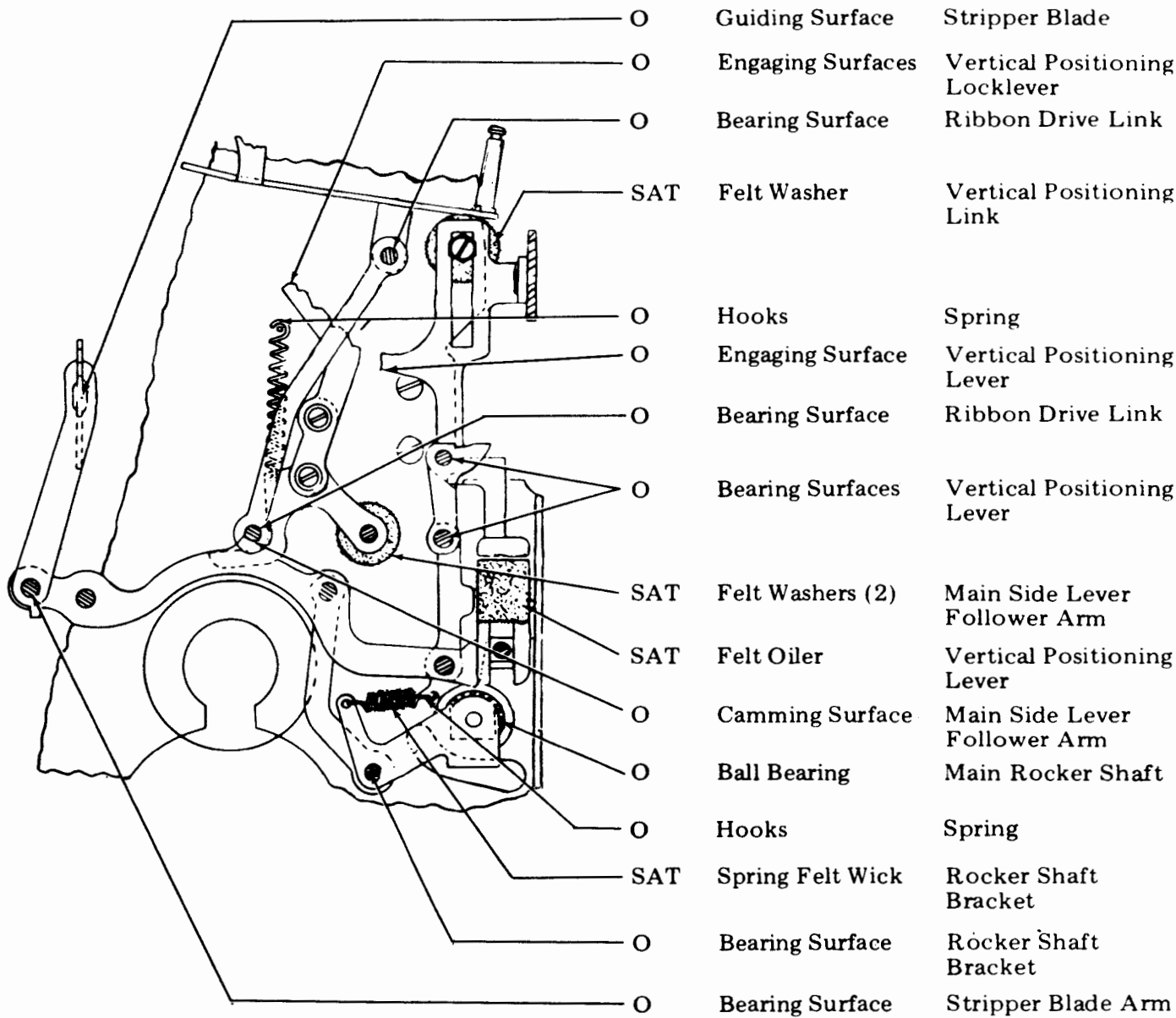
(REAR VIEW)



- O Bearing Surface Ribbon Reverse Lever
- O Engaging Surface Ribbon Reversing Lever
- O Engaging Surface Ribbon Reverse Lever
- G Teeth Ribbon Reverse Spur Gear

(LEFT SIDE VIEW)

Figure 4-15 Ribbon Feed Mechanism



(LEFT SIDE VIEW)

Figure 4-16. Vertical Positioning Mechanism (B)

FIGURE 4-18.
CODE BAR
MECHANISM

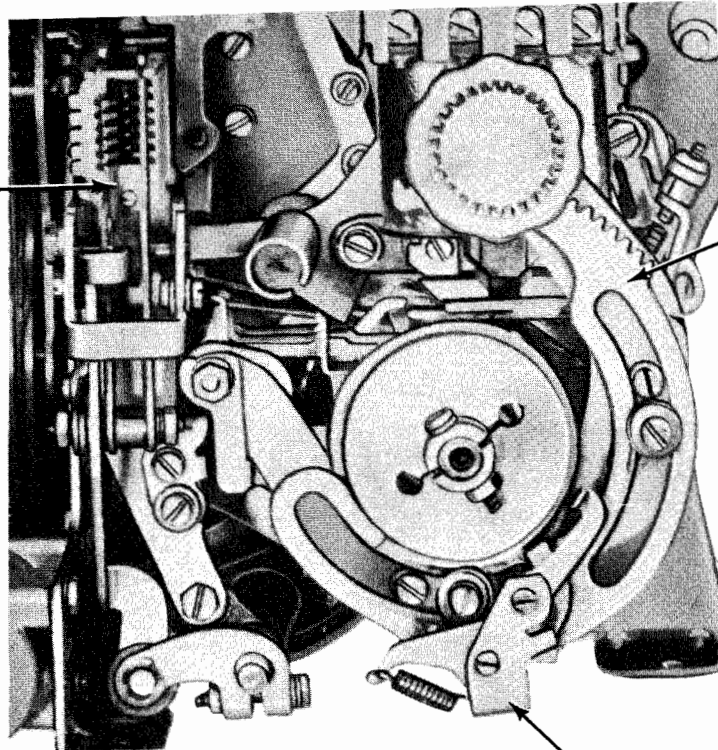
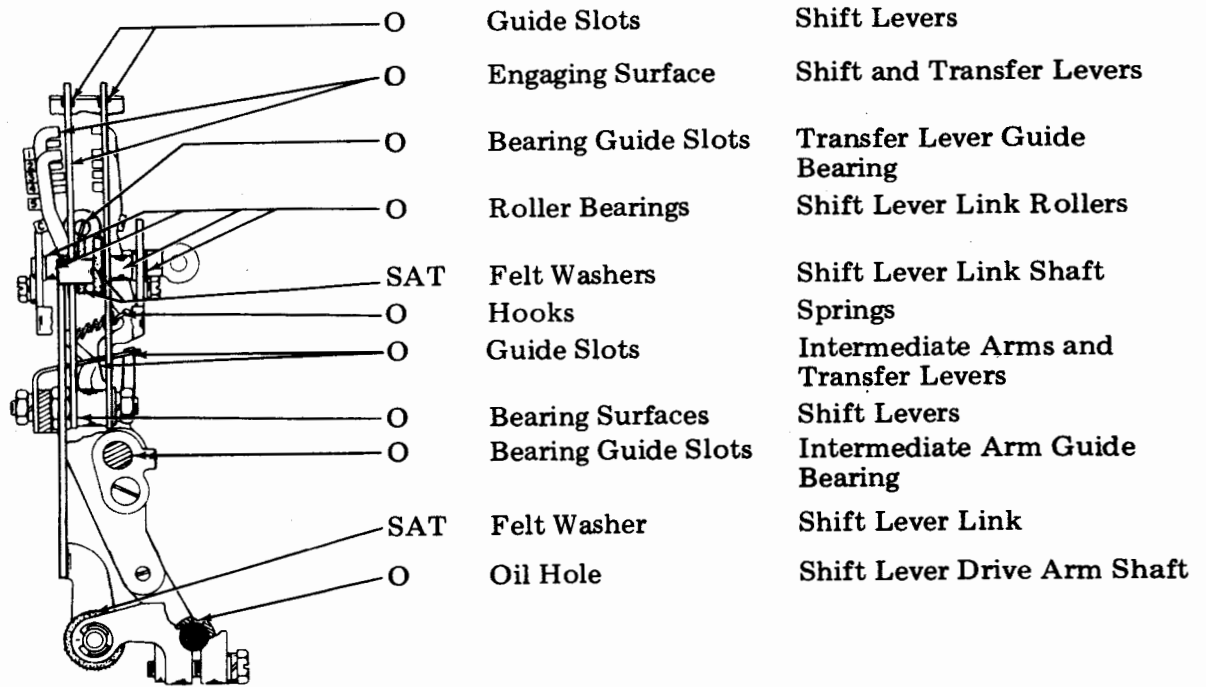


FIGURE 4-19(A).
SELECTOR MECHANISM

(RIGHT SIDE VIEW)

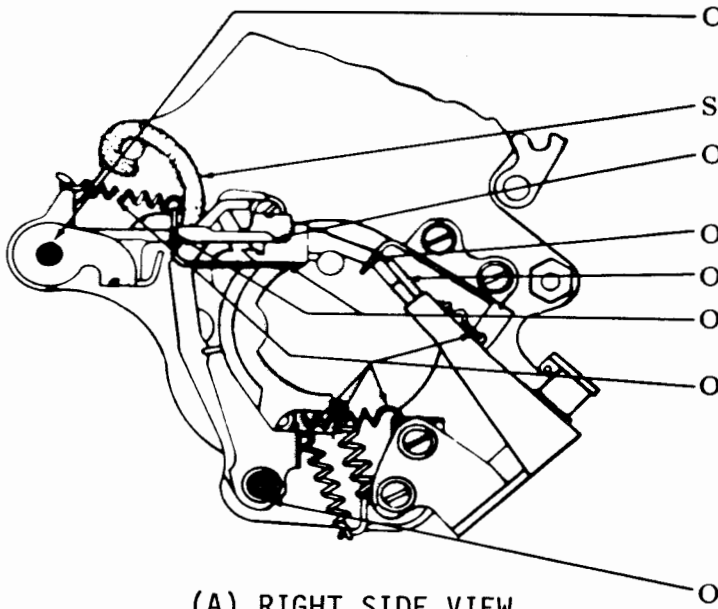
FIGURE 4-19(B)
SELECTOR
MECHANISM

Figure 4-17. Selector Area



(RIGHT SIDE VIEW)

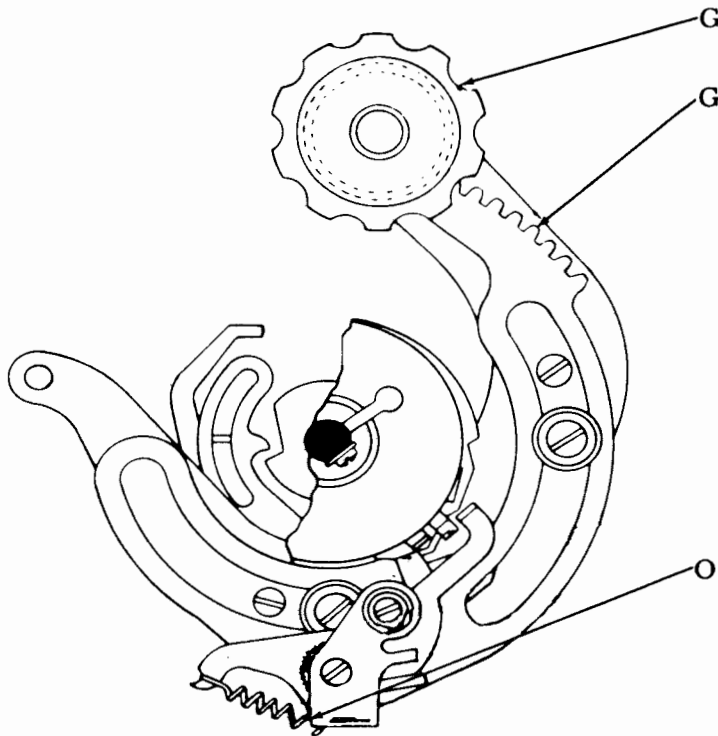
Figure 4-18. Code Bar Mechanism



(A) RIGHT SIDE VIEW

- | | | |
|-----|---------------------|--------------------------|
| O | Bearing Guide Slots | Push Lever Guide Bearing |
| SAT | Felt Wick | Selector Wick |
| O | Engaging Surfaces | Push Levers |
| O | Guide Slot | Marking Locklever |
| O | Wick | Lubricator Wick |
| O | Guide Slots | Selector and Push Levers |
| O | Hooks | Springs |

- | | | |
|---|---------------------|------------------------------|
| O | Bearing Guide Slots | Selector Lever Guide Bearing |
|---|---------------------|------------------------------|

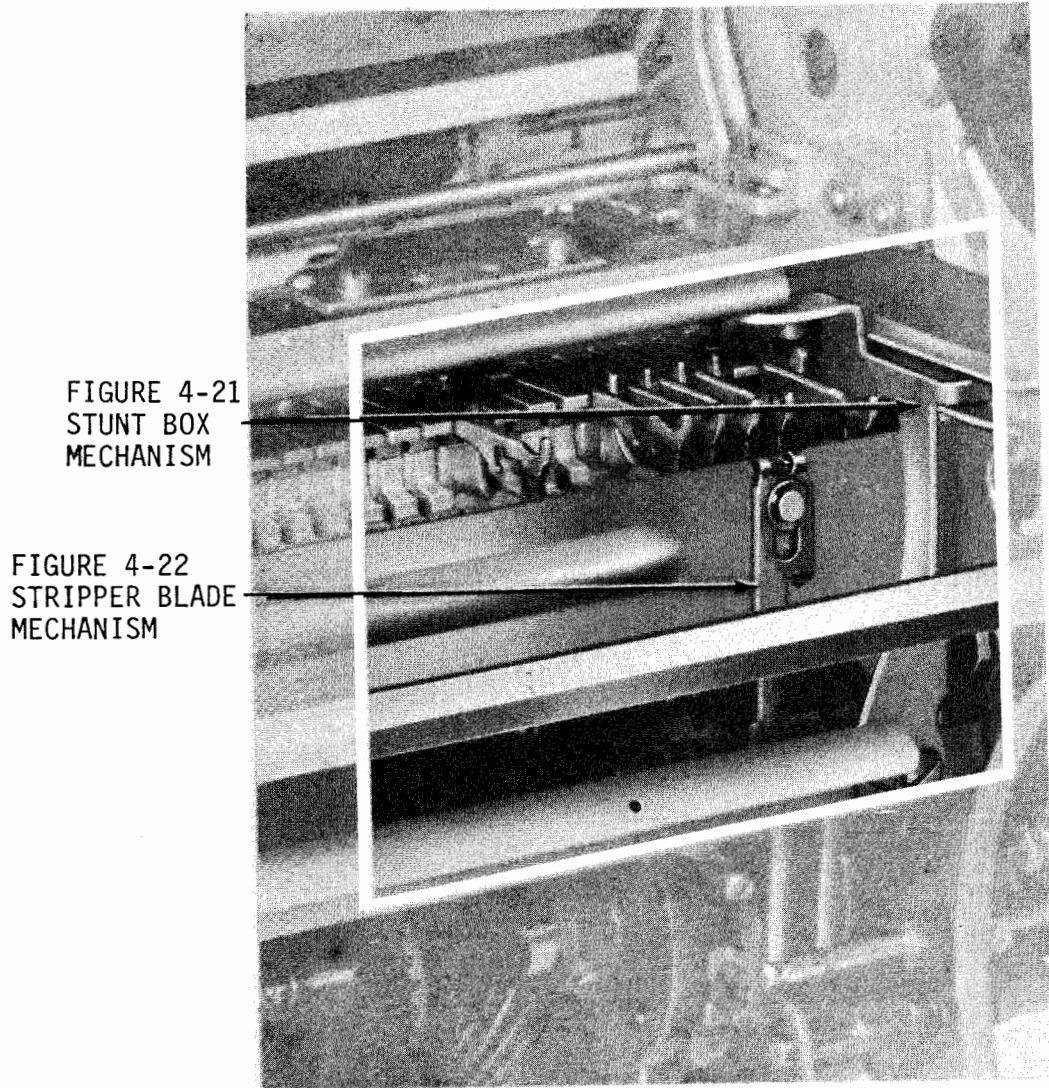


(B) RIGHT SIDE VIEW

- | | | |
|---|-------|------|
| G | Teeth | Knob |
| G | Teeth | Gear |

- | | | |
|---|-------|--------|
| O | Hooks | Spring |
|---|-------|--------|

Figure 4-19. Selector Mechanism



(REAR VIEW)

Figure 4-20. Function Area

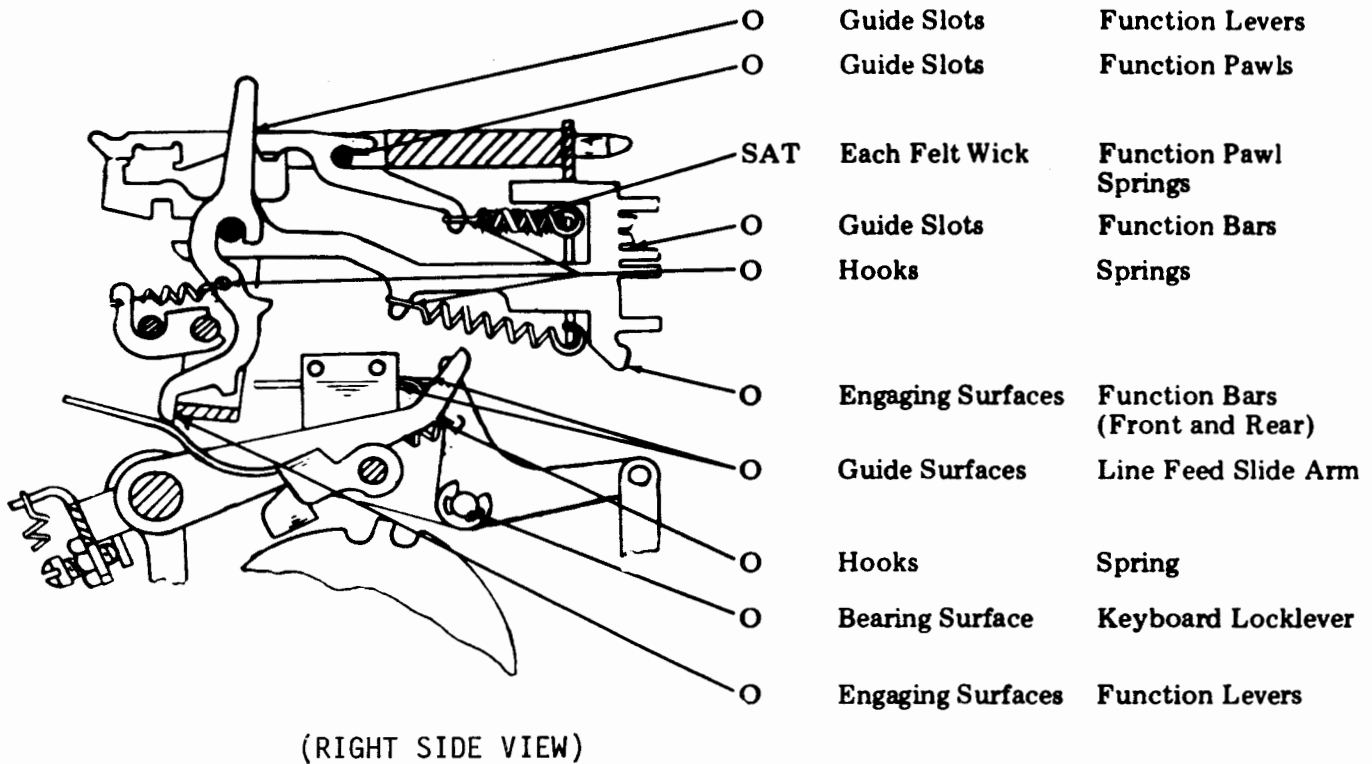


Figure 4-21. Stunt Box Mechanism

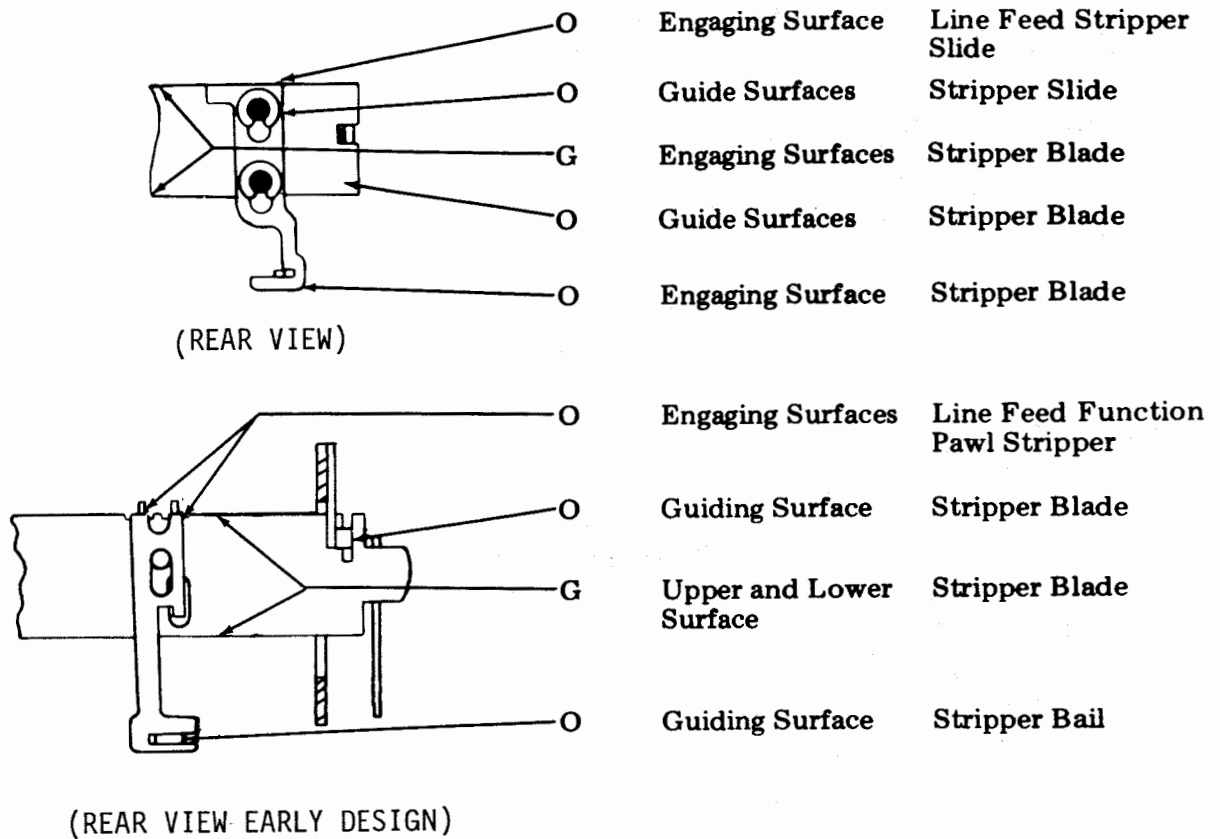


Figure 4-22. Stripper Blade Mechanism

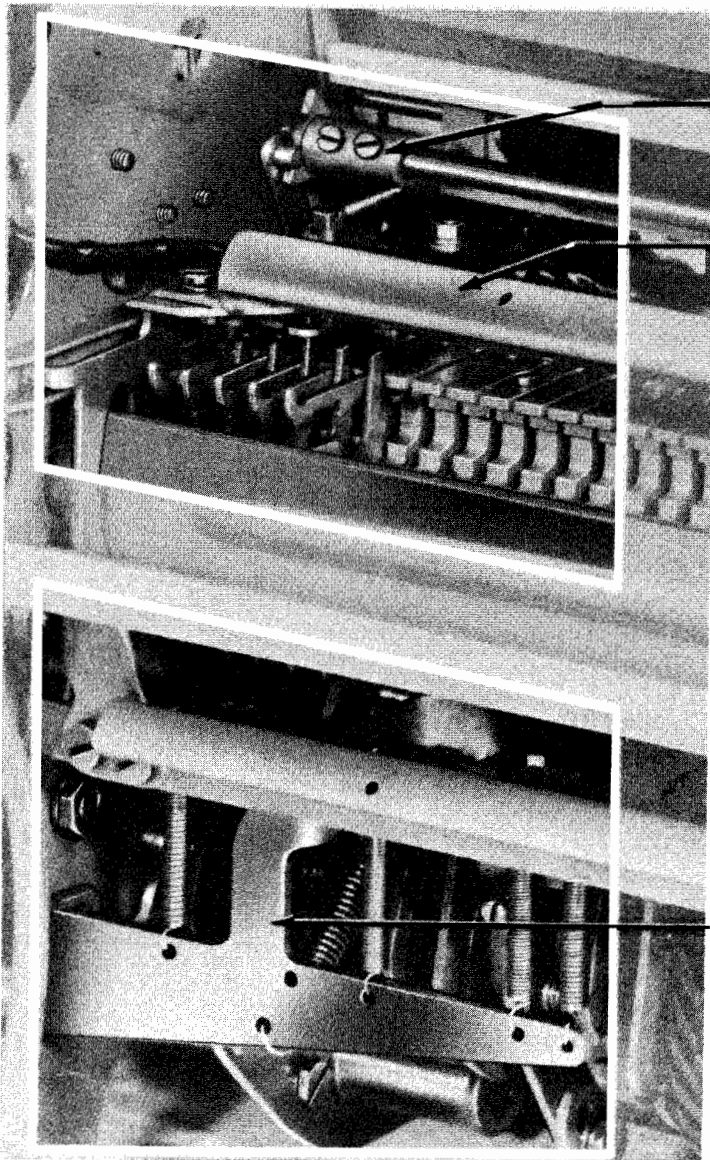


FIGURE 4-24
RIBBON REVERSE
MECHANISM

FIGURE 4-25
SHIFT MECHANISM

FIGURE 4-26
FUNCTION ROCKER
SHAFT MECHANISM

(REAR VIEW)

Figure 4-23. Function Area (B)

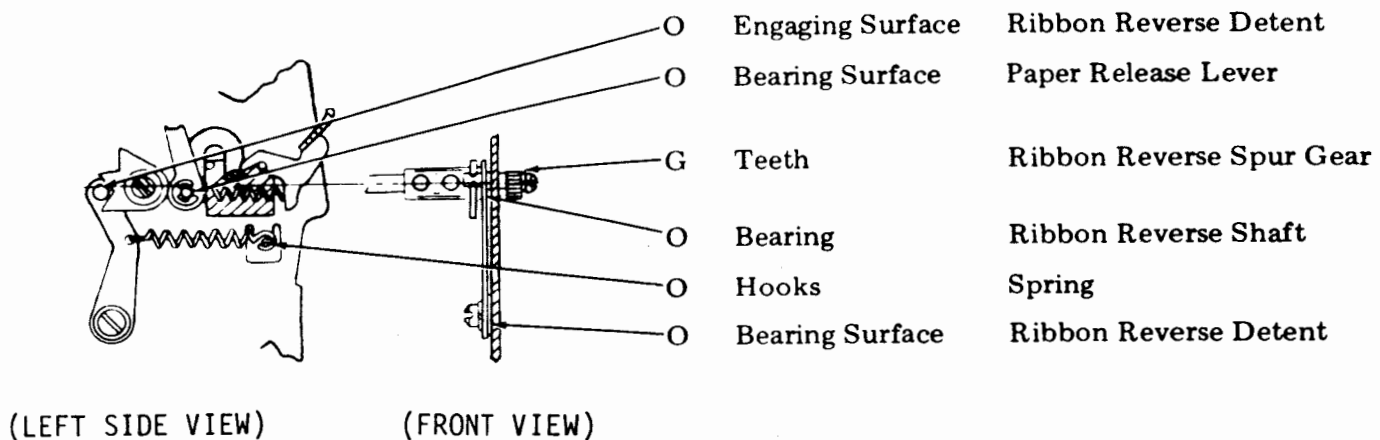


Figure 4-24. Ribbon Reverse Mechanism

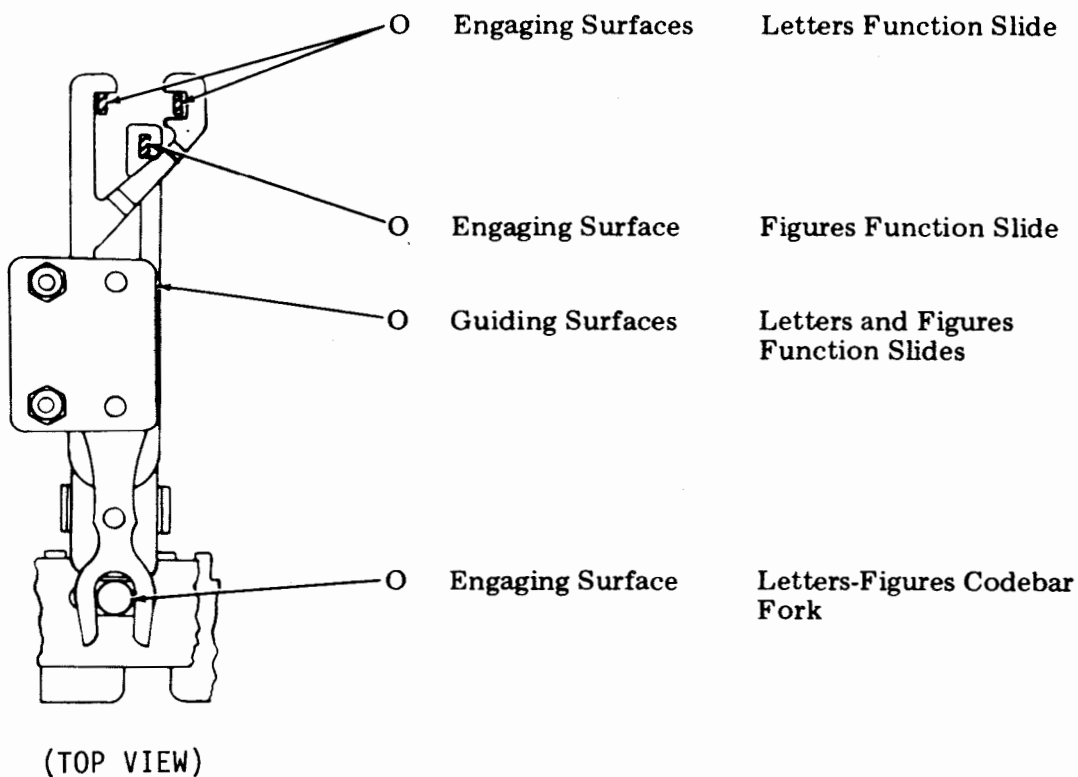


Figure 4-25. Shift Mechanism

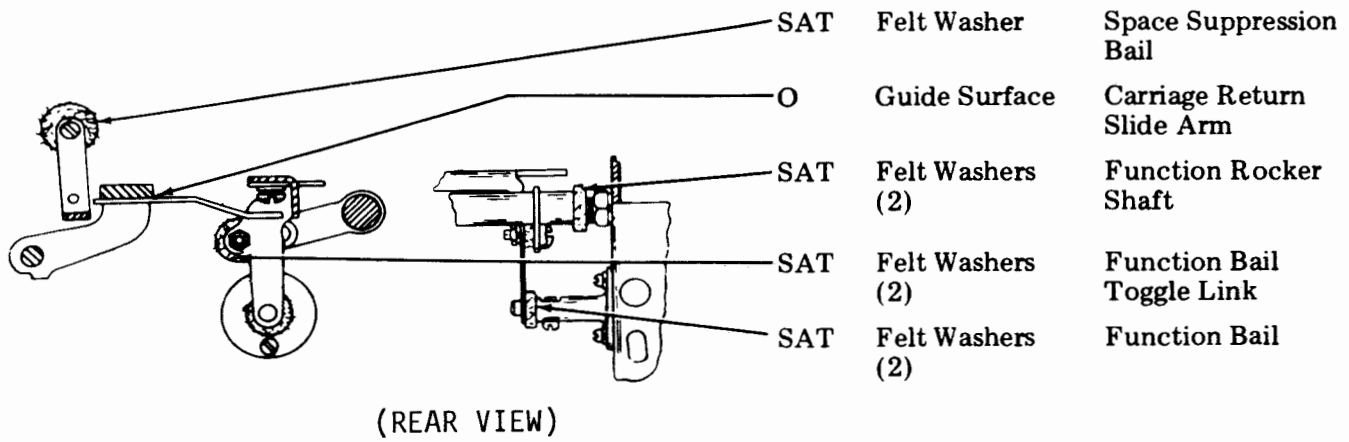


Figure 4-26. Function Rocker Shaft Mechanism

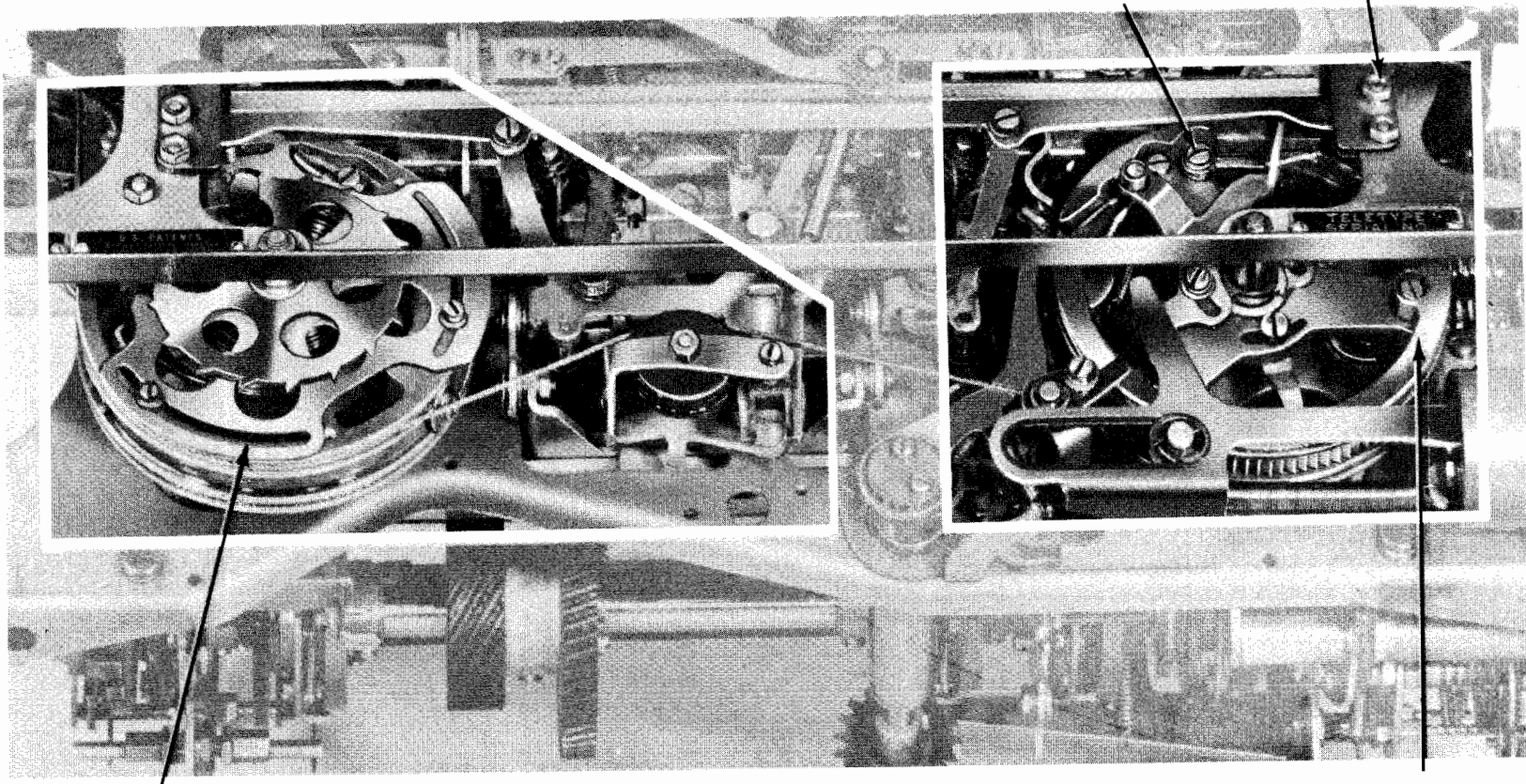


FIGURE 4-30
SPACING DRUM
FEED MECHANISM

FIGURE 4-31
TRACK GUIDE
MECHANISM

FIGURE 4-29
CARRIAGE RETURN
MECHANISM

FIGURE 4-28
SPACING DRUM
DRIVE MECHANISM

Figure 4-27. Spacing Area

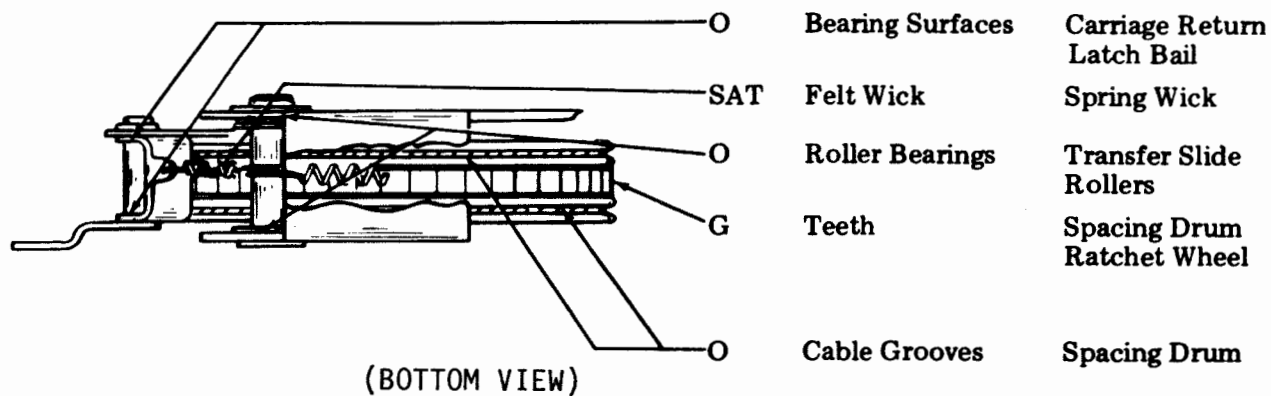
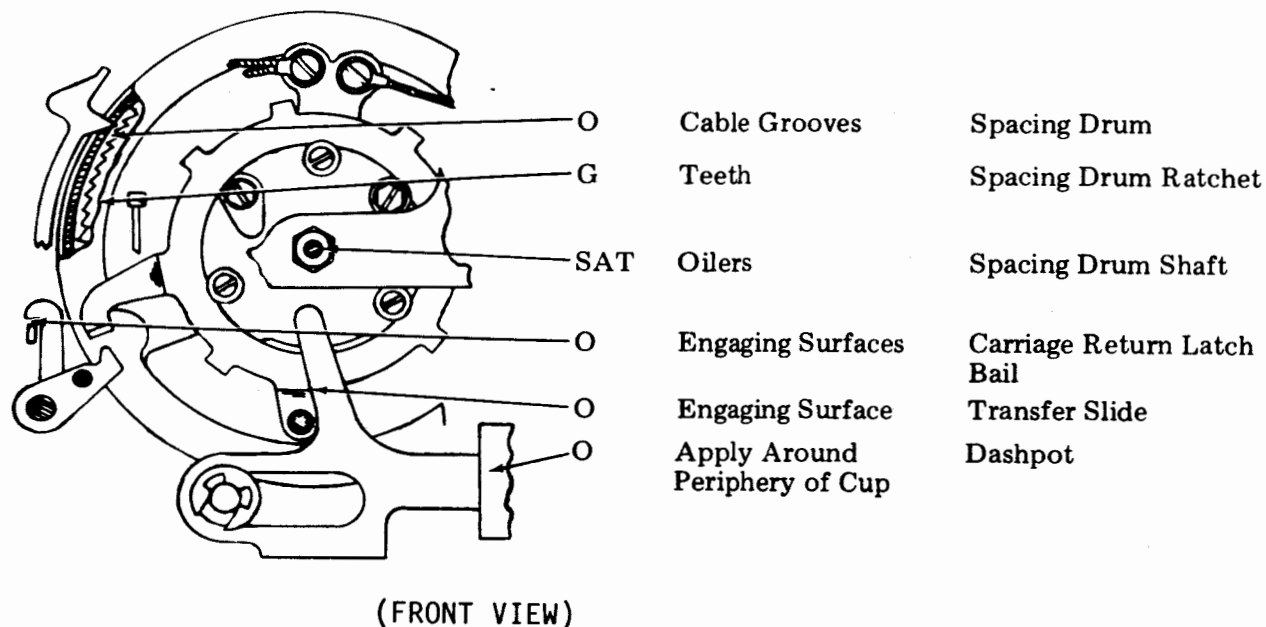


Figure 4-28. Spacing Drum Drive Mechanism

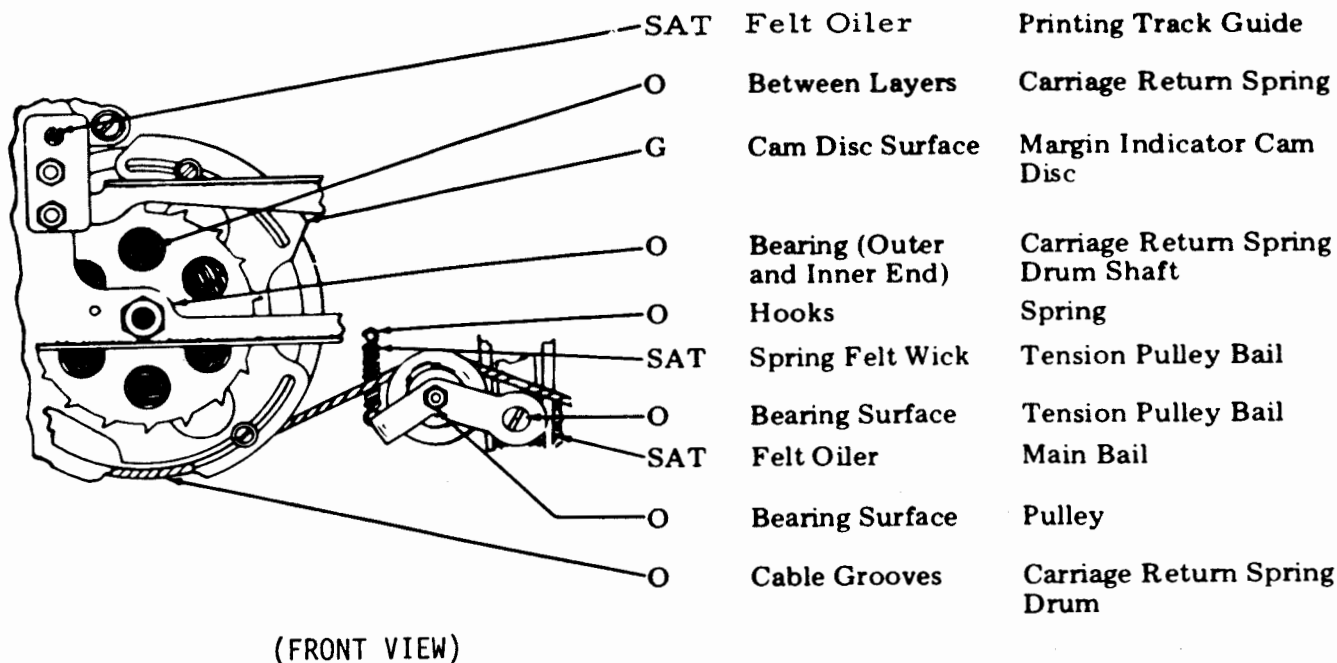


Figure 4-29. Carriage Return Mechanism

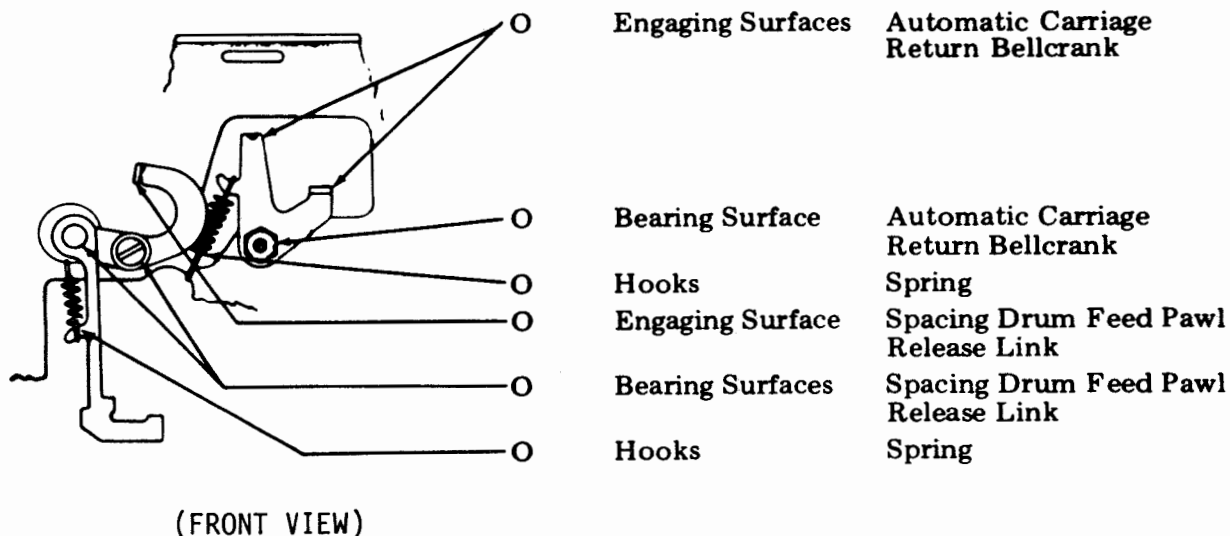


Figure 4-30. Spacing Drum Feed Mechanism

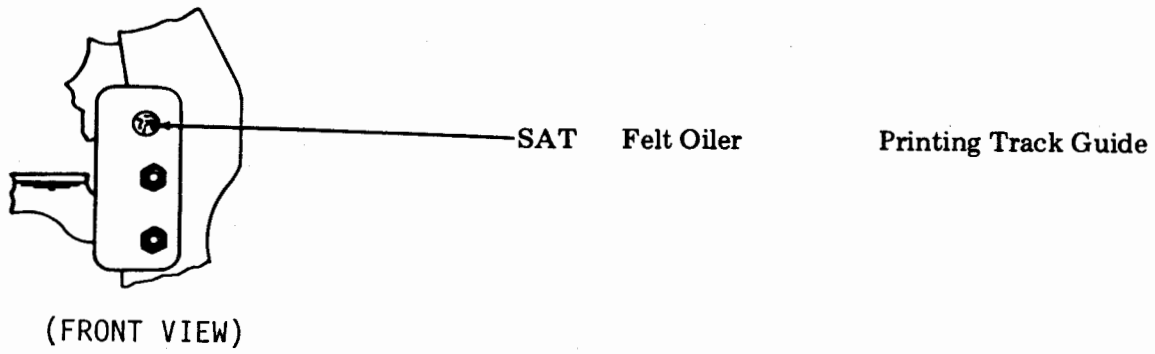
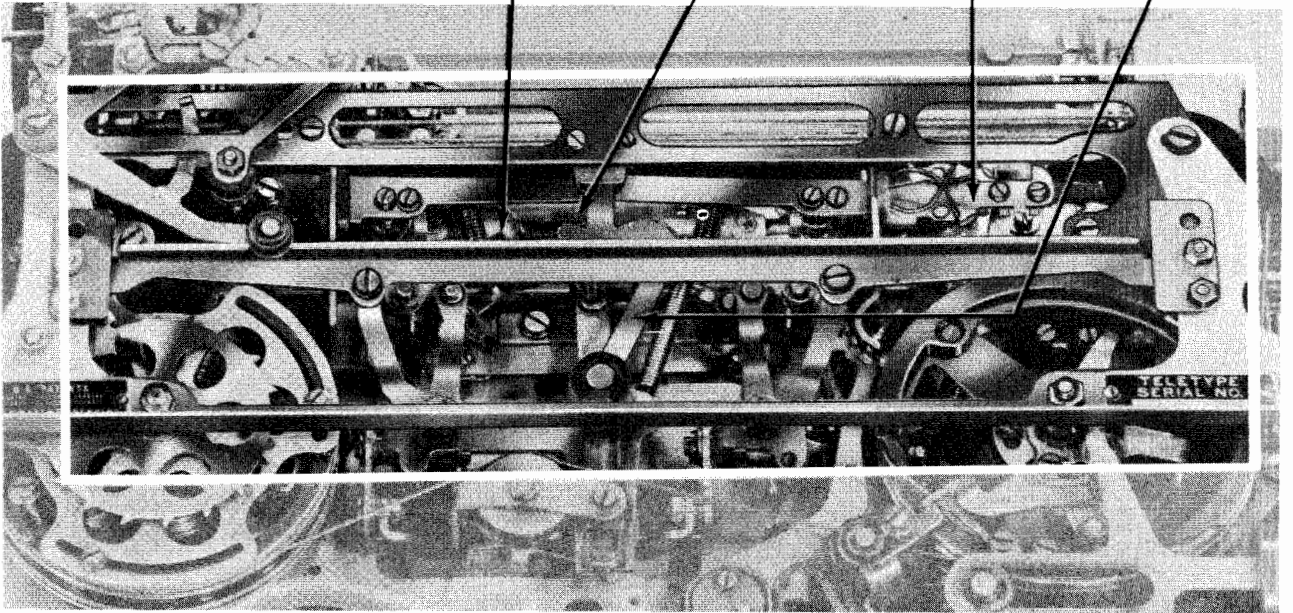


Figure 4-31. Track Guide Mechanism

FIGURE 4-33
HORIZONTAL
POSITIONING
MECHANISM (A)

FIGURE 4-34
HORIZONTAL
POSITIONING
MECHANISM(B)



(FRONT VIEW)

Figure 4-32. Horizontal Positioning Area

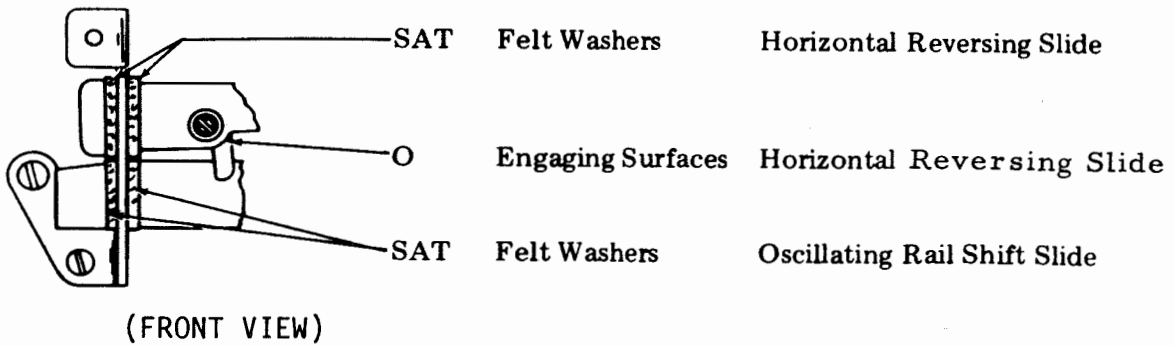
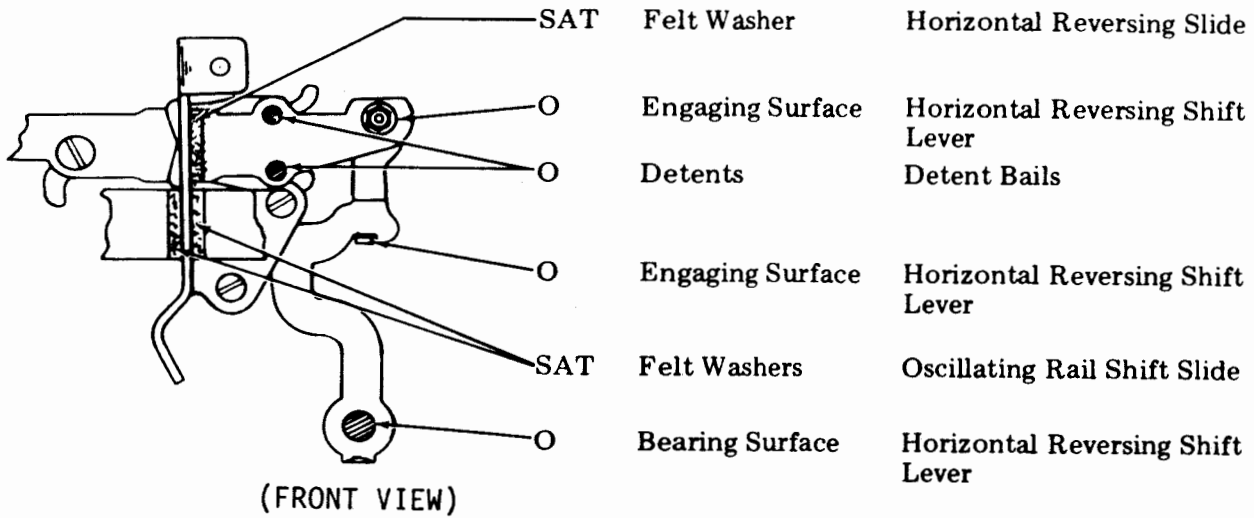


Figure 4-33. Horizontal Positioning Mechanism (A)

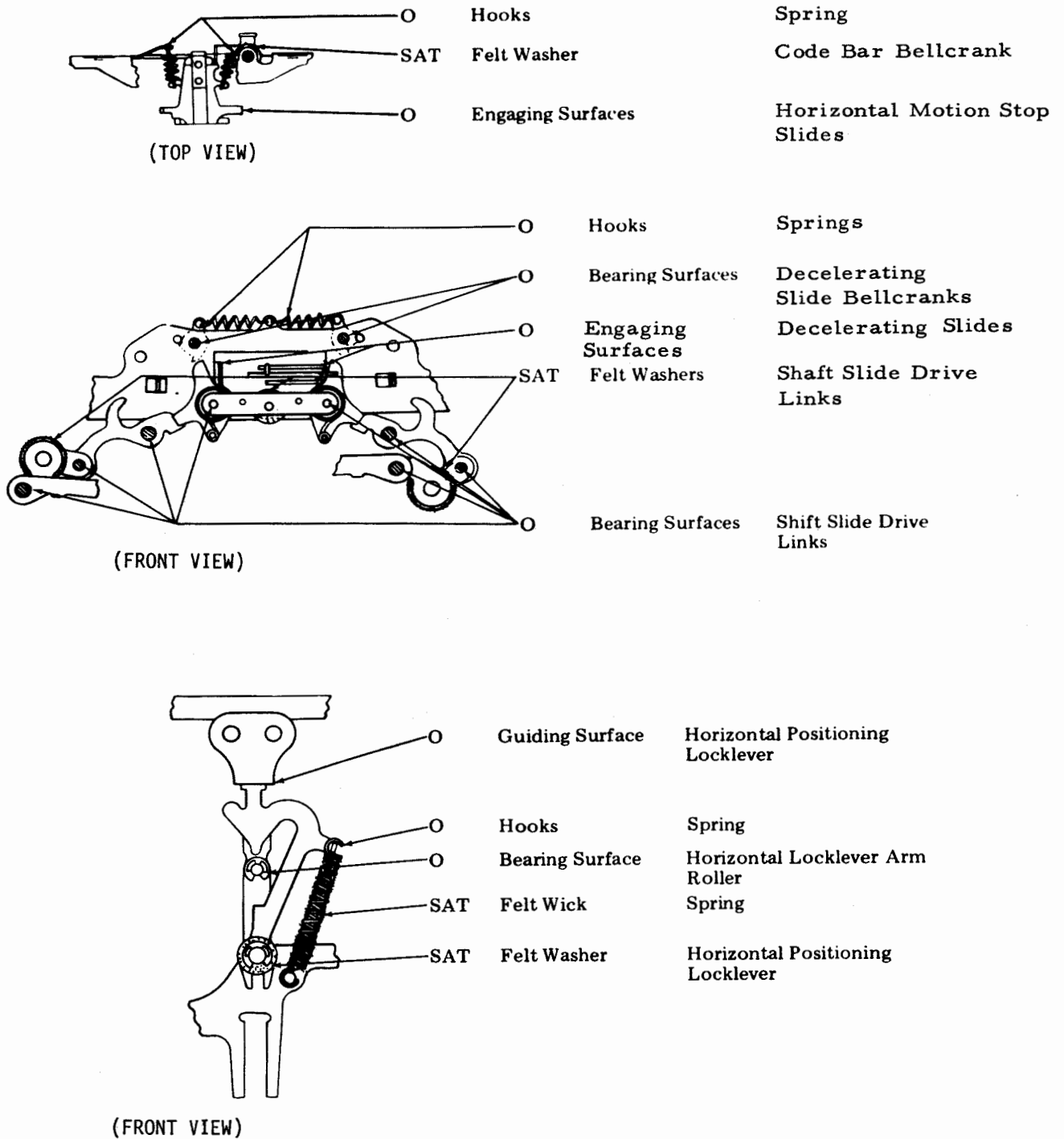


Figure 4-34. Horizontal Positioning Mechanism (B)

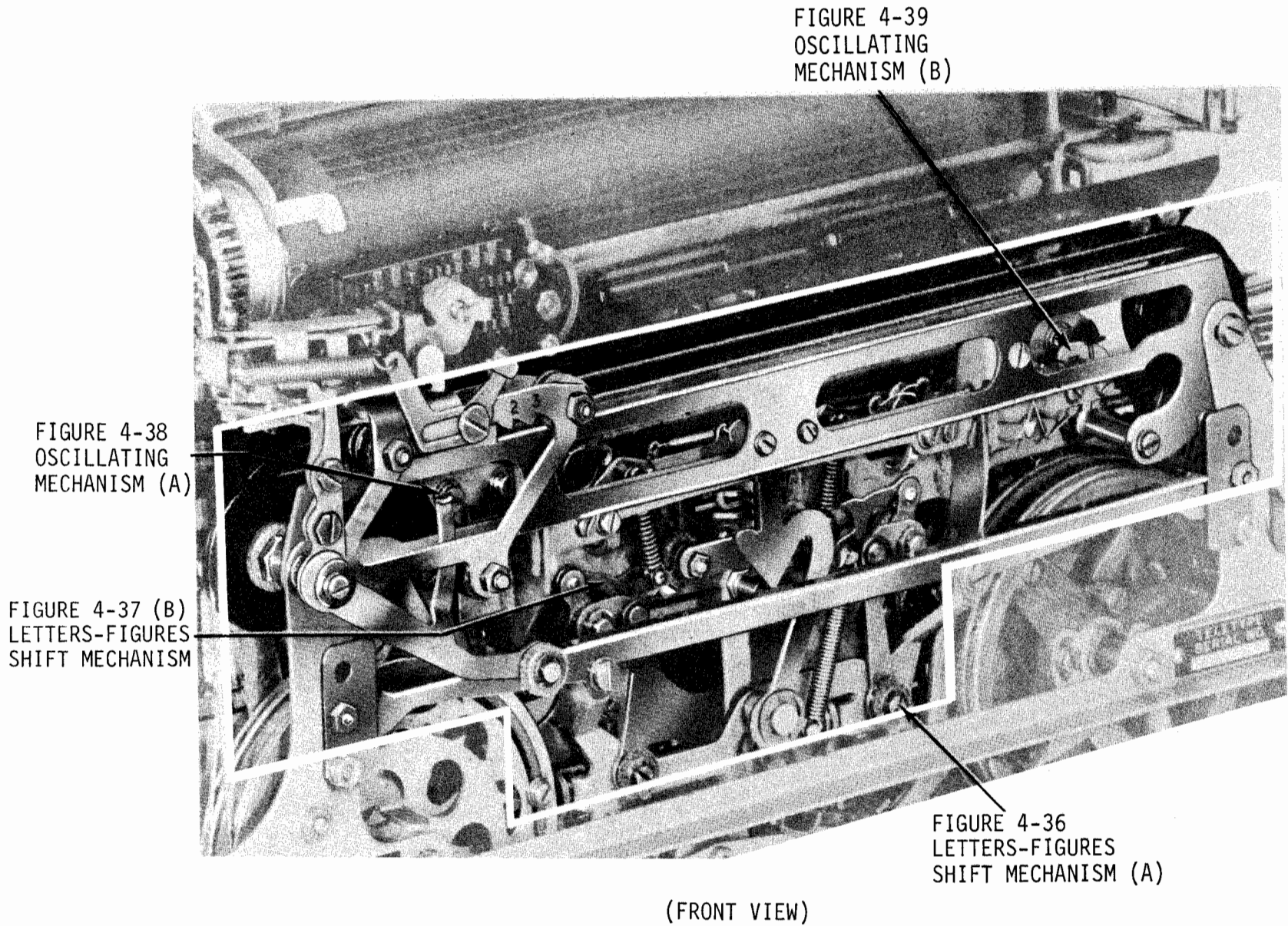


Figure 4-35. Letters-Figures Shift Area

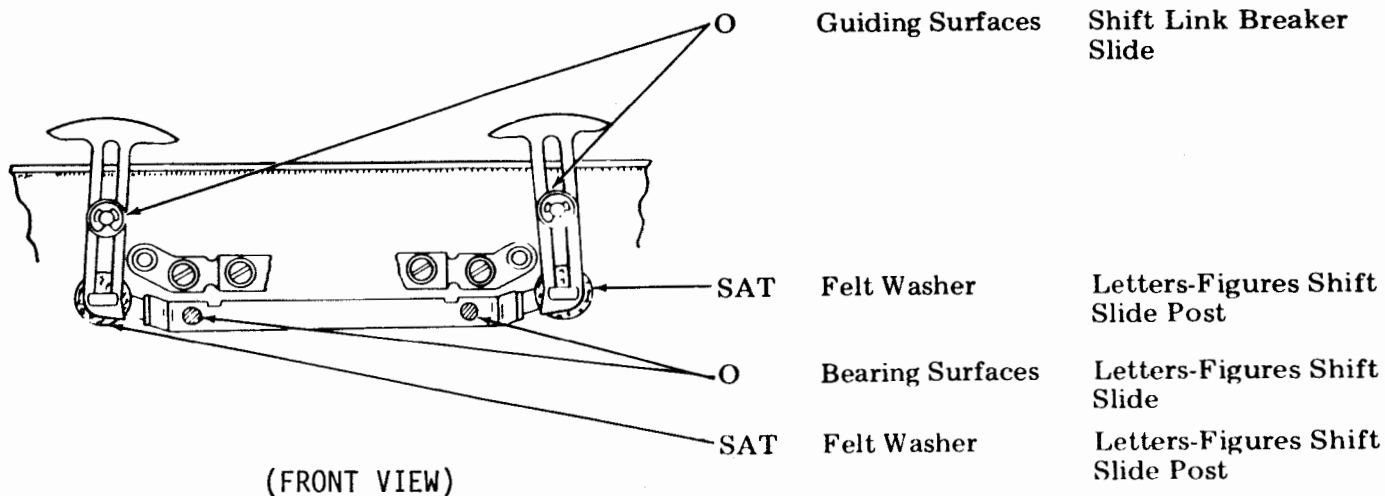


Figure 4-36. Letters-Figures Shift Mechanism (A)

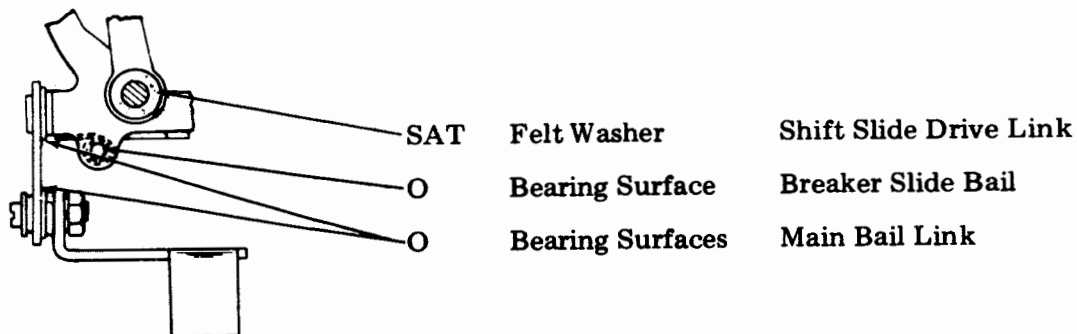
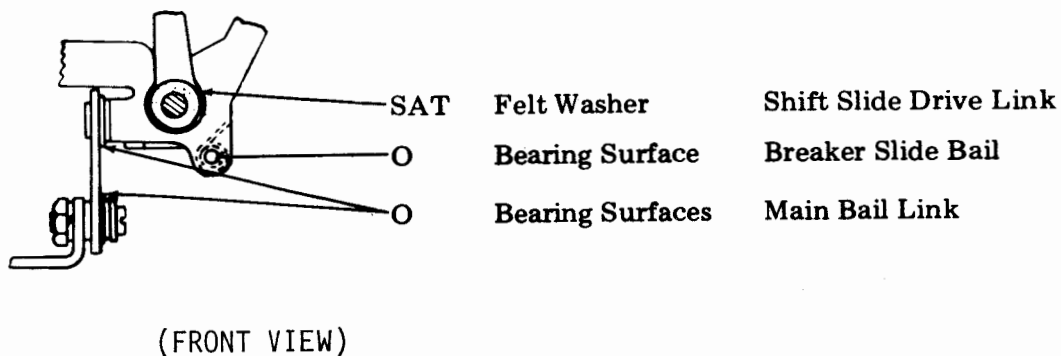


Figure 4-37. Letters-Figures Shift Mechanism (B)

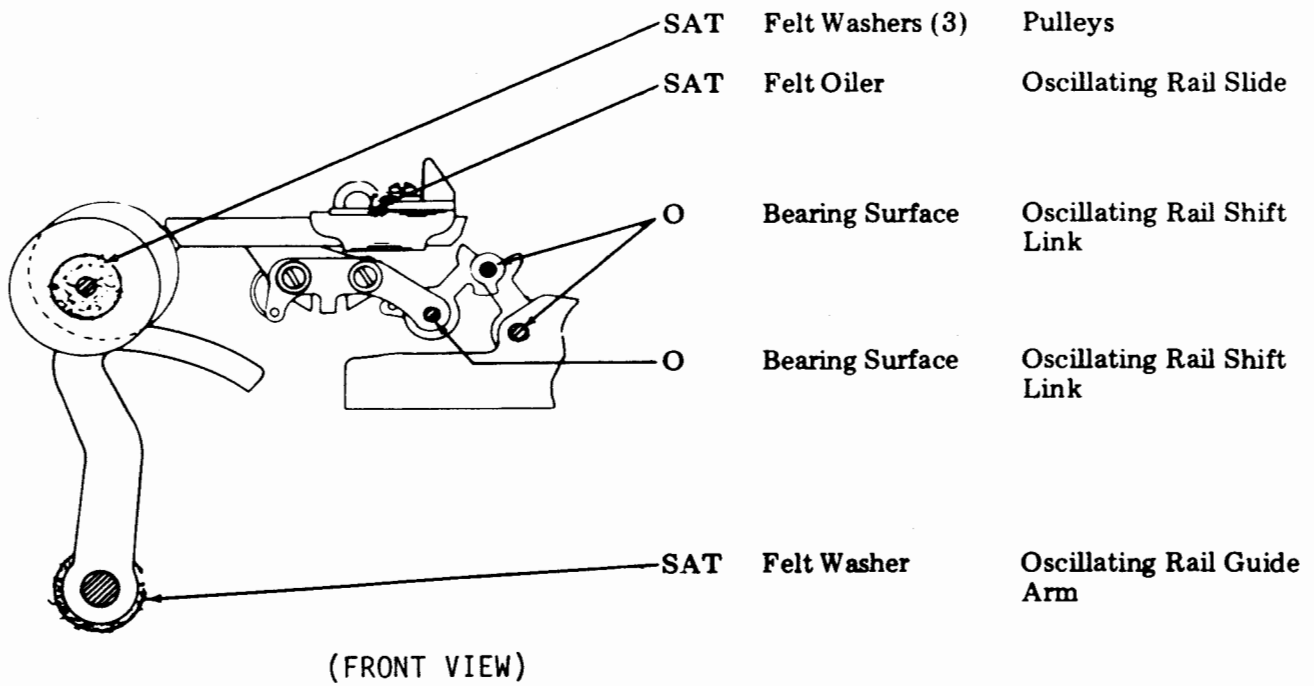


Figure 4-38. Oscillating Mechanism (A)

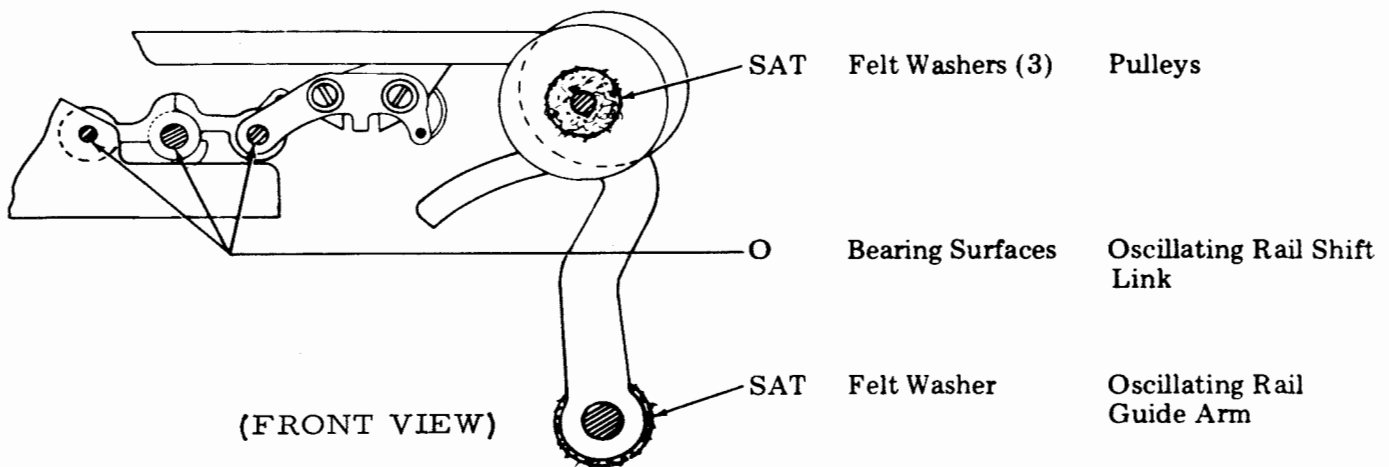
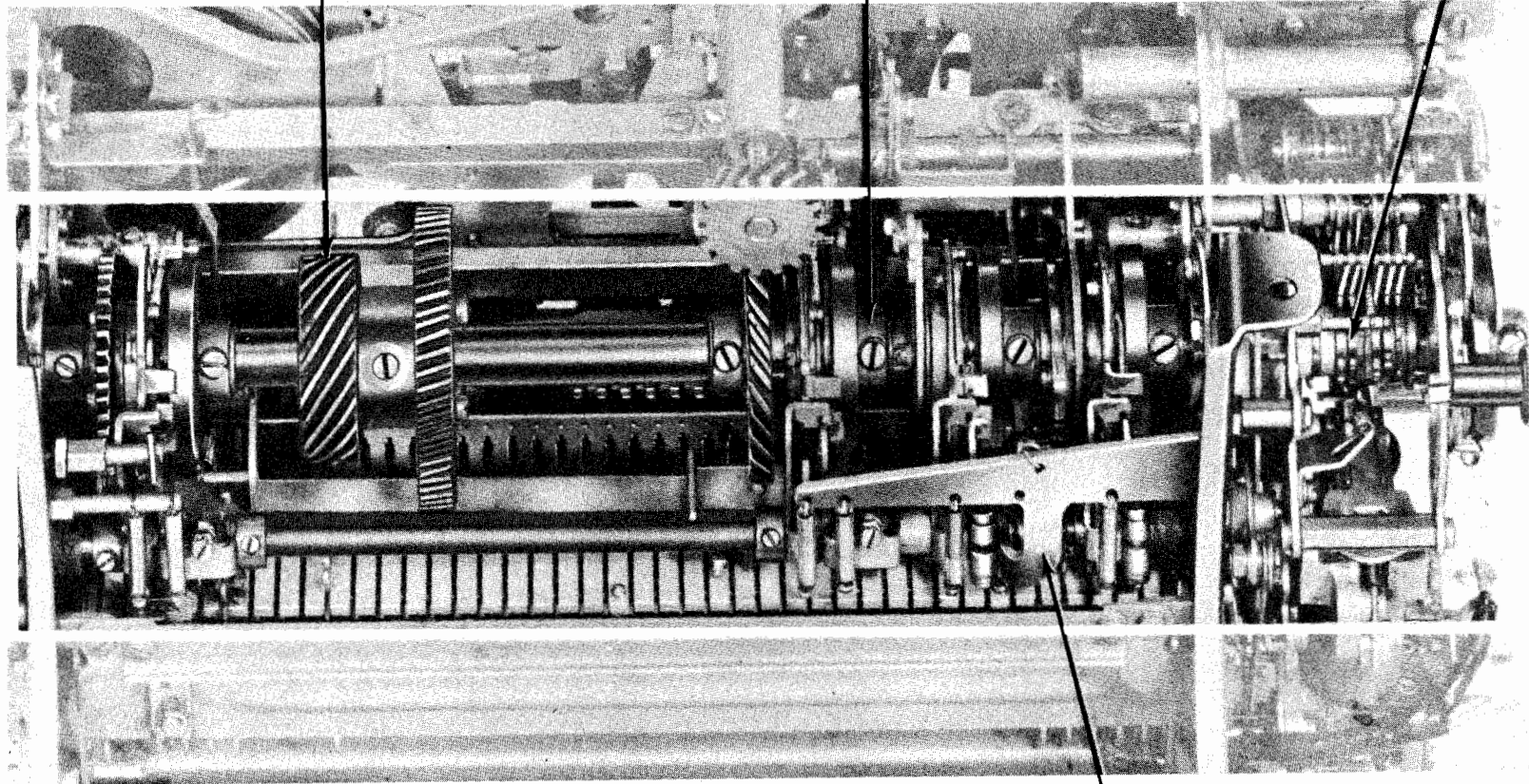


Figure 4-39. Oscillating Mechanism (B)

FIGURE 4-41
MAIN SHAFT
CLUTCHES;
GEARS (A)

FIGURE 4-42
MAIN SHAFT
MECHANISM

FIGURE 4-43
SELECTOR CAM
CLUTCH ASSEMBLY



(BOTTOM VIEW)

FIGURE 4-44
MAIN SHAFT
CLUTCHES;
GEARS (B)

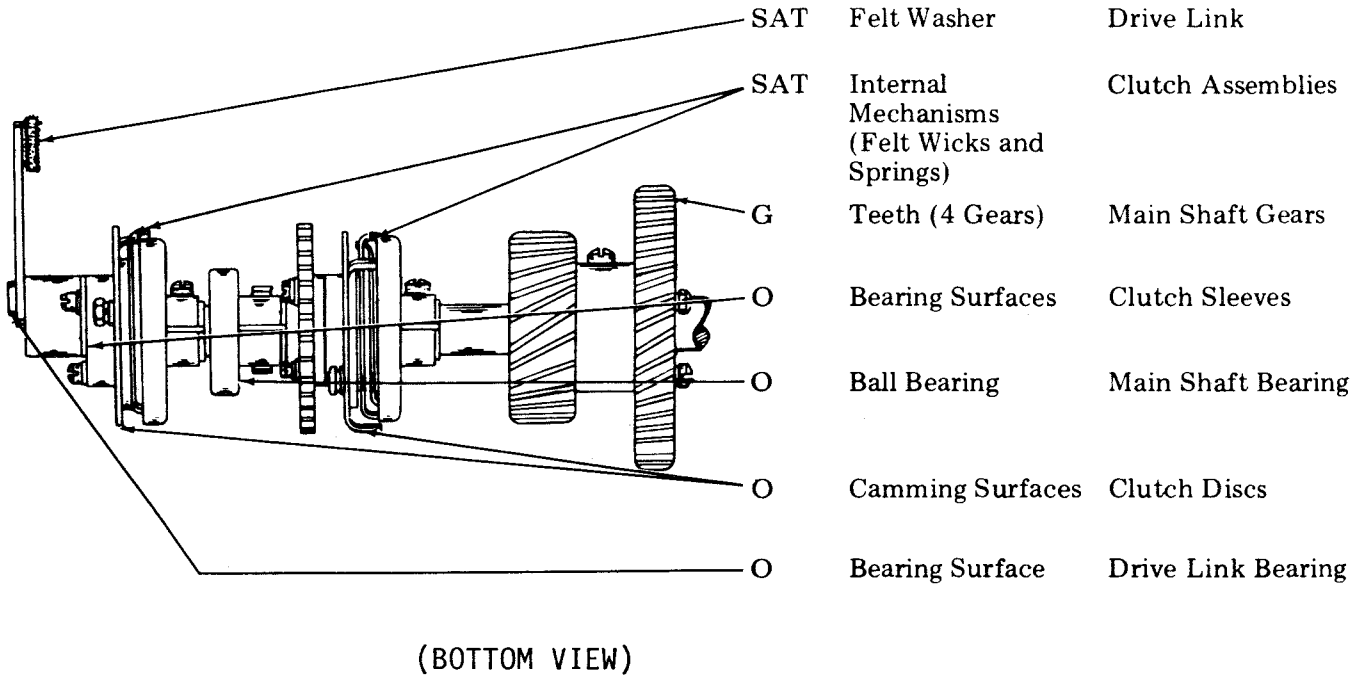


Figure 4-41. Main Shaft-Clutches; Gears (A)

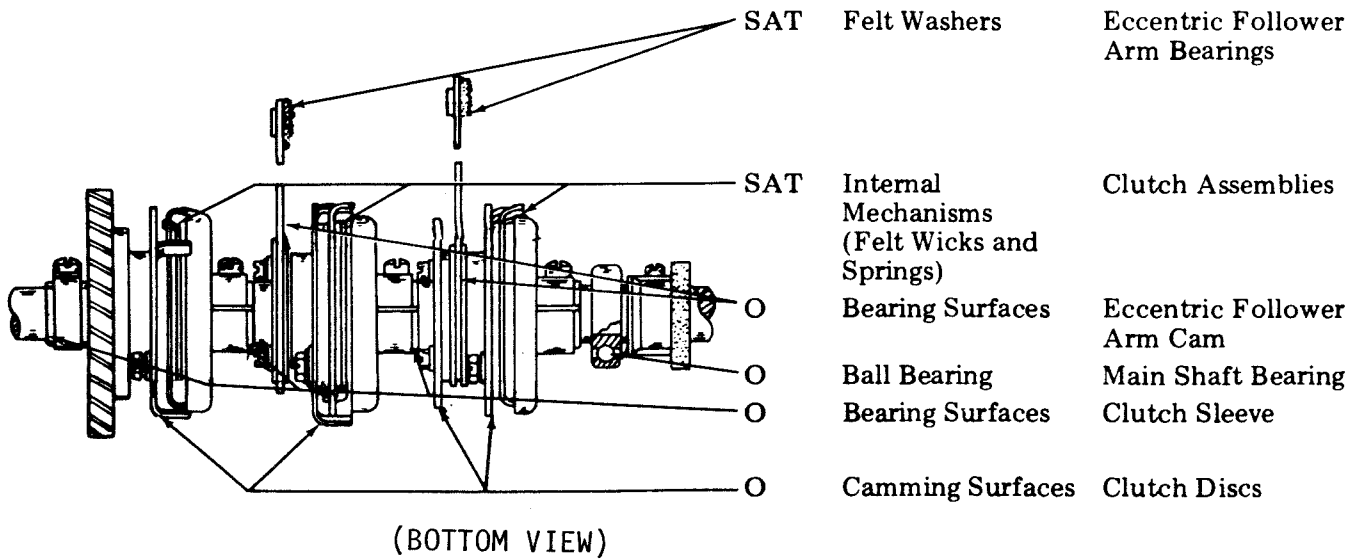


Figure 4-42. Main Shaft Mechanism

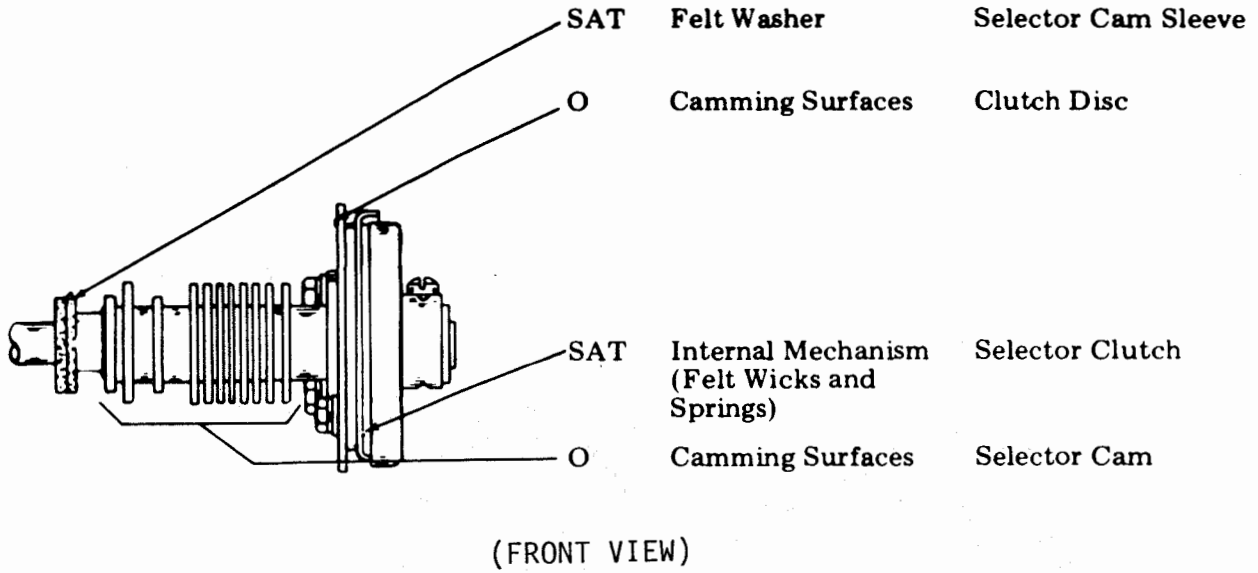


Figure 4-43. Selector Cam Clutch Assembly

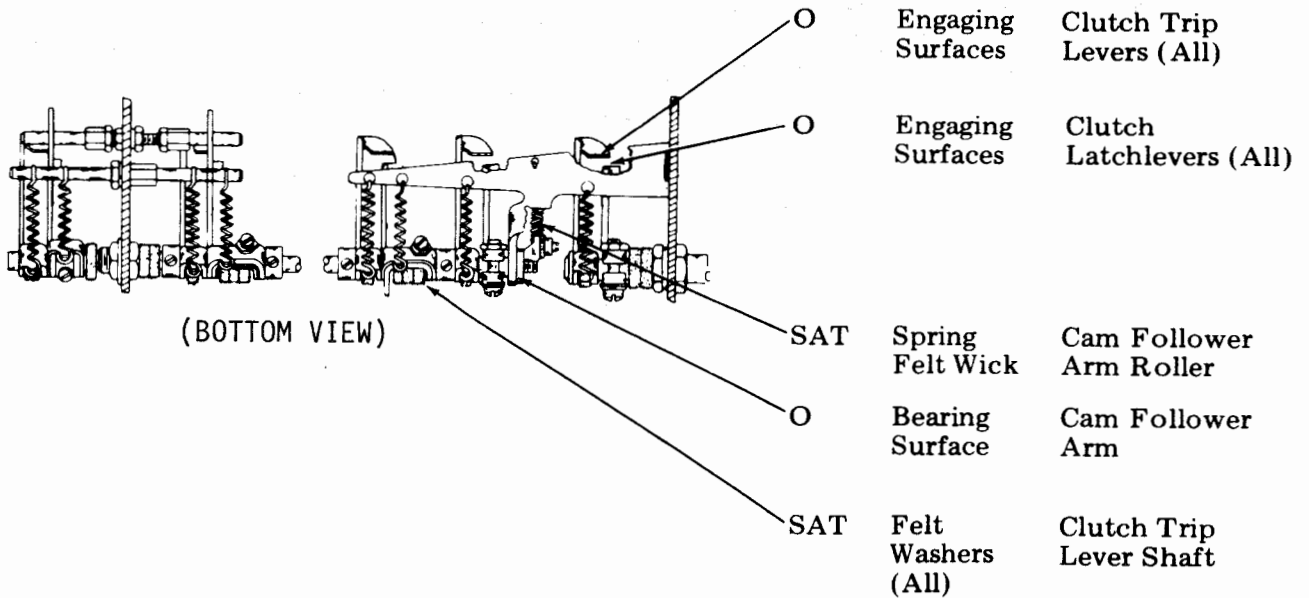
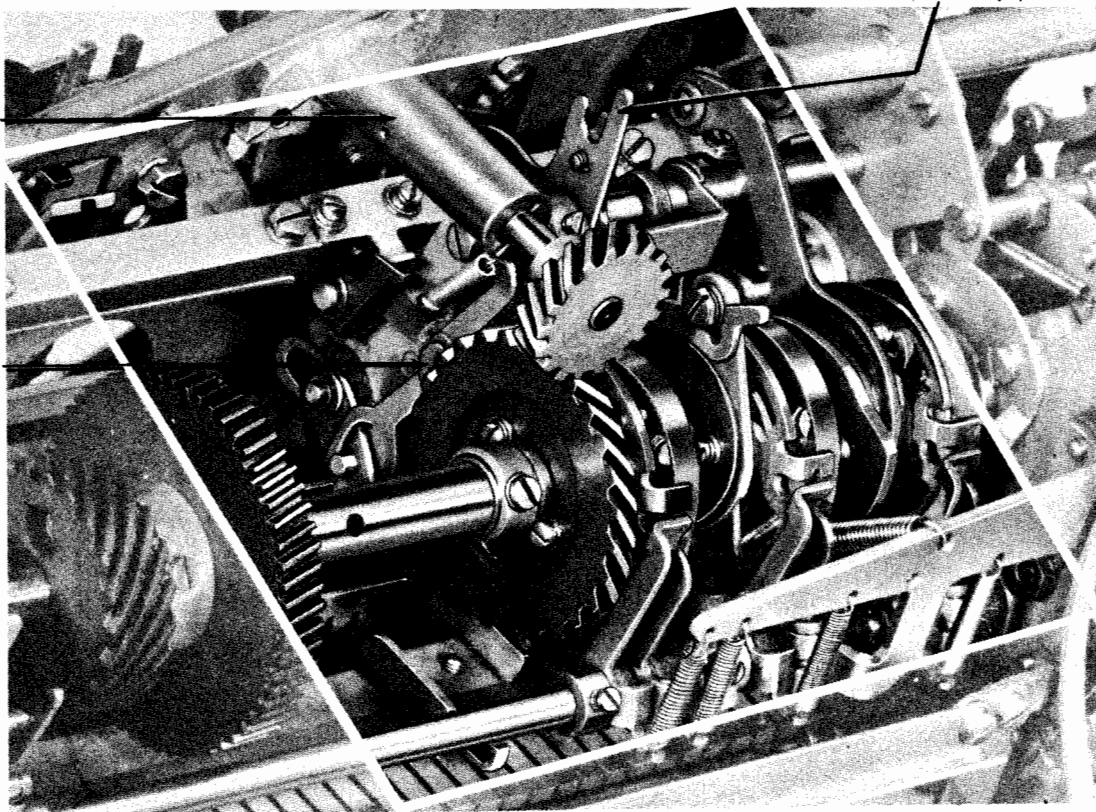


Figure 4-44. Main Shaft-Clutches; Gears (B)

FIGURE 4-46
SPACING
MECHANISM (C)

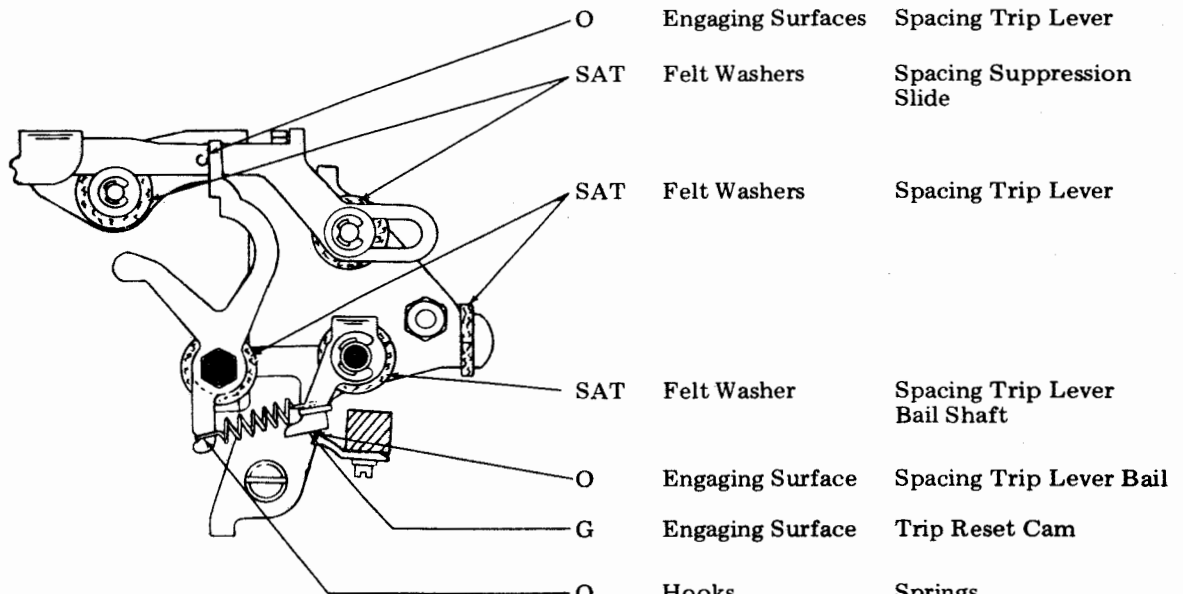
FIGURE 4-46
SPACING
MECHANISM (B)

FIGURE 4-46
SPACING
MECHANISM (A)

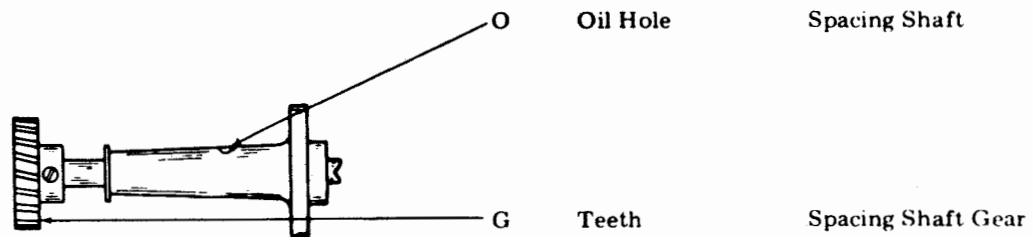


(BOTTOM VIEW)

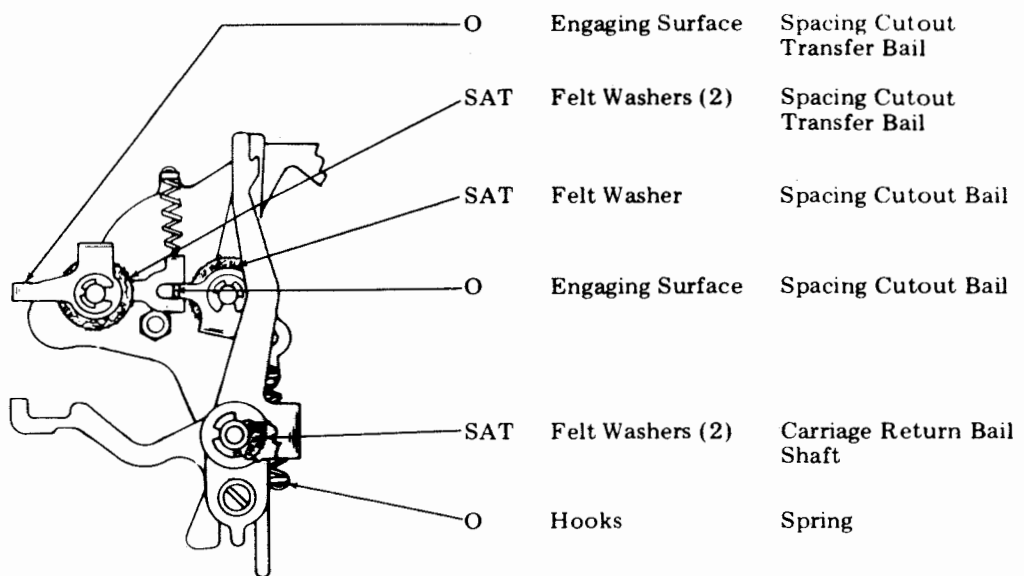
Figure 4-45. Spacing Area



(A) LEFT SIDE VIEW



(B) LEFT SIDE VIEW



(C) RIGHT SIDE VIEW

Figure 4-46. Spacing Mechanism

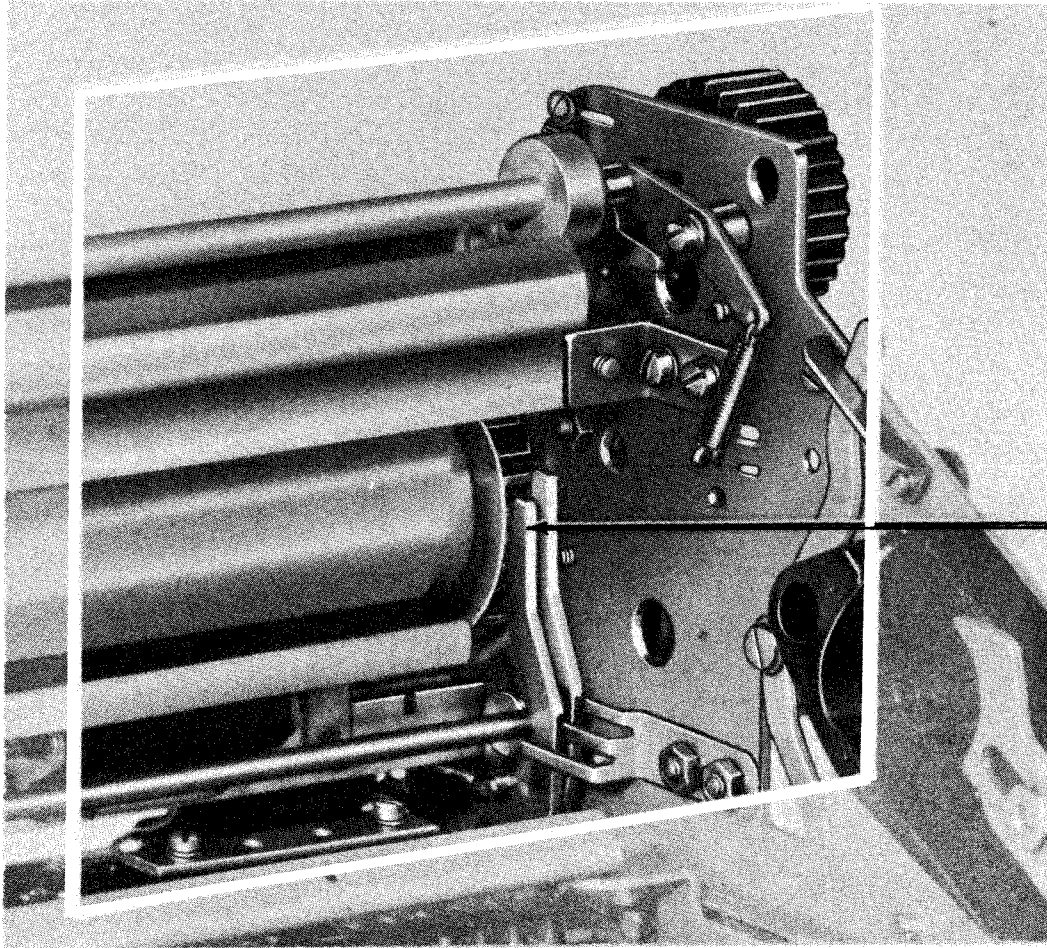


FIGURE 4-48
LINE FEED
MECHANISM

(REAR VIEW)

Figure 4-47. Line Feed Area

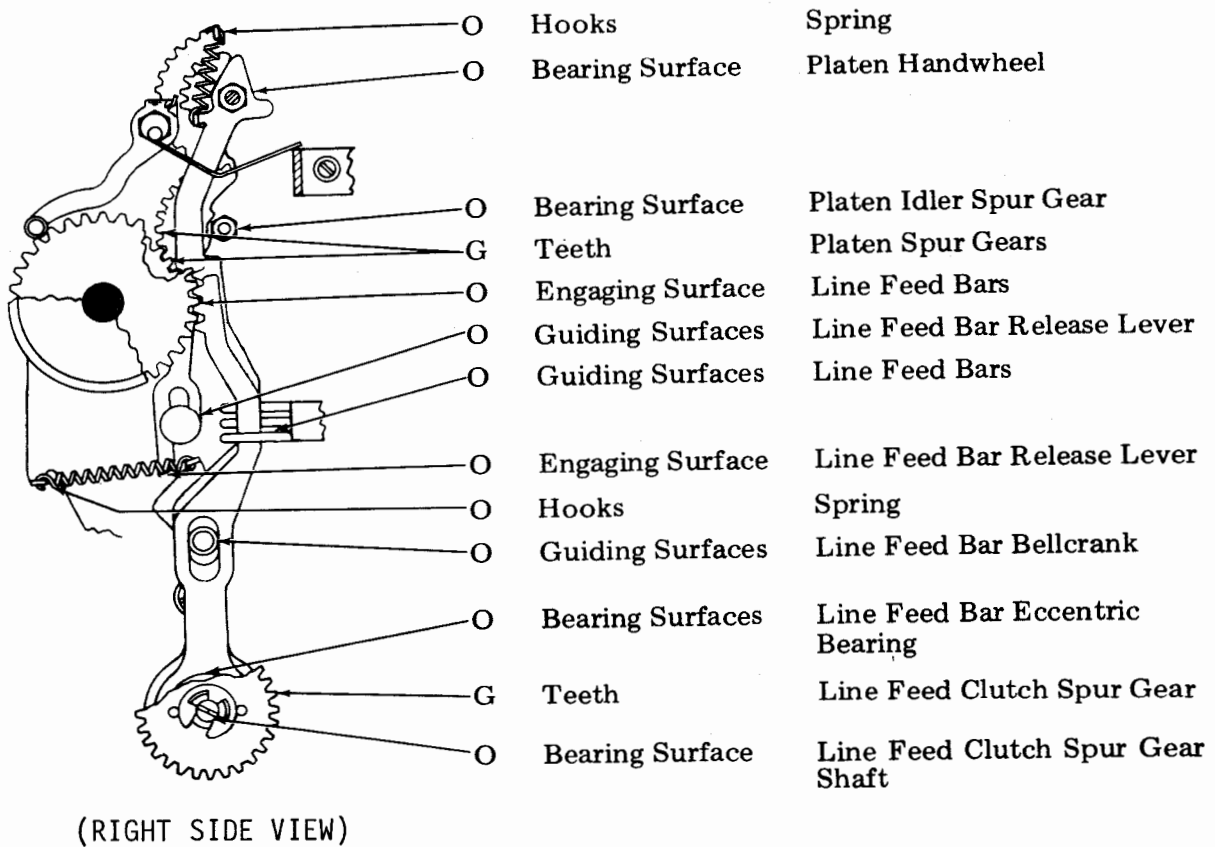
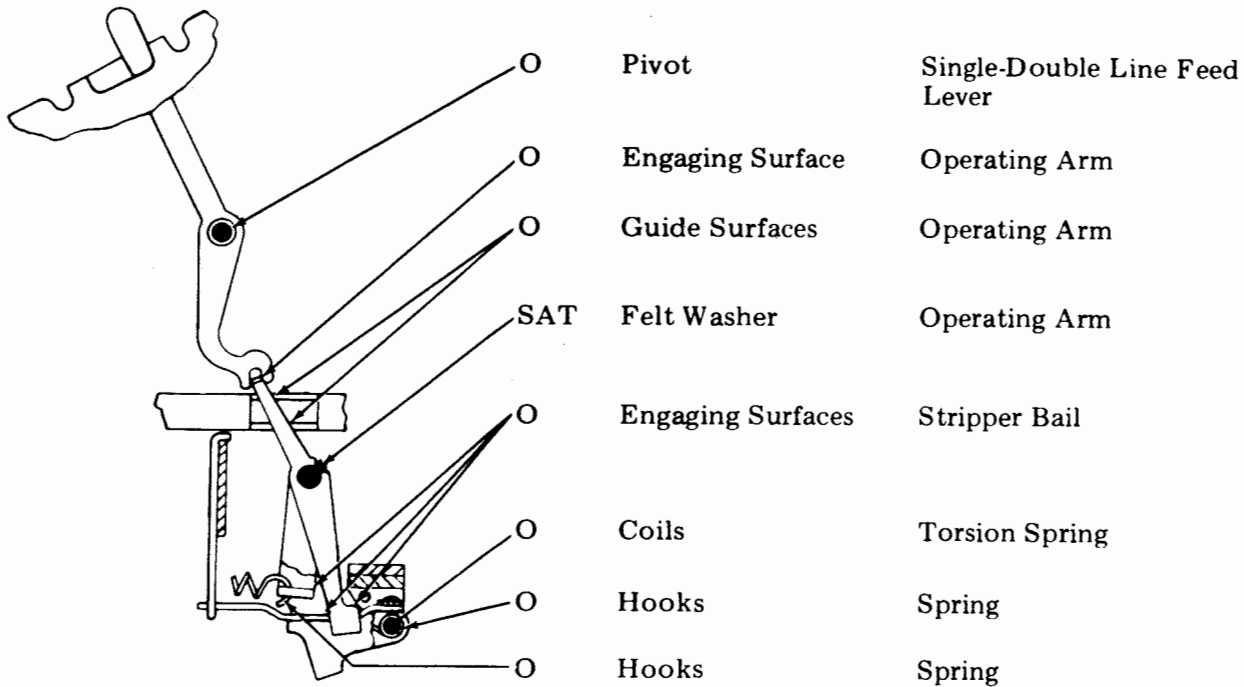
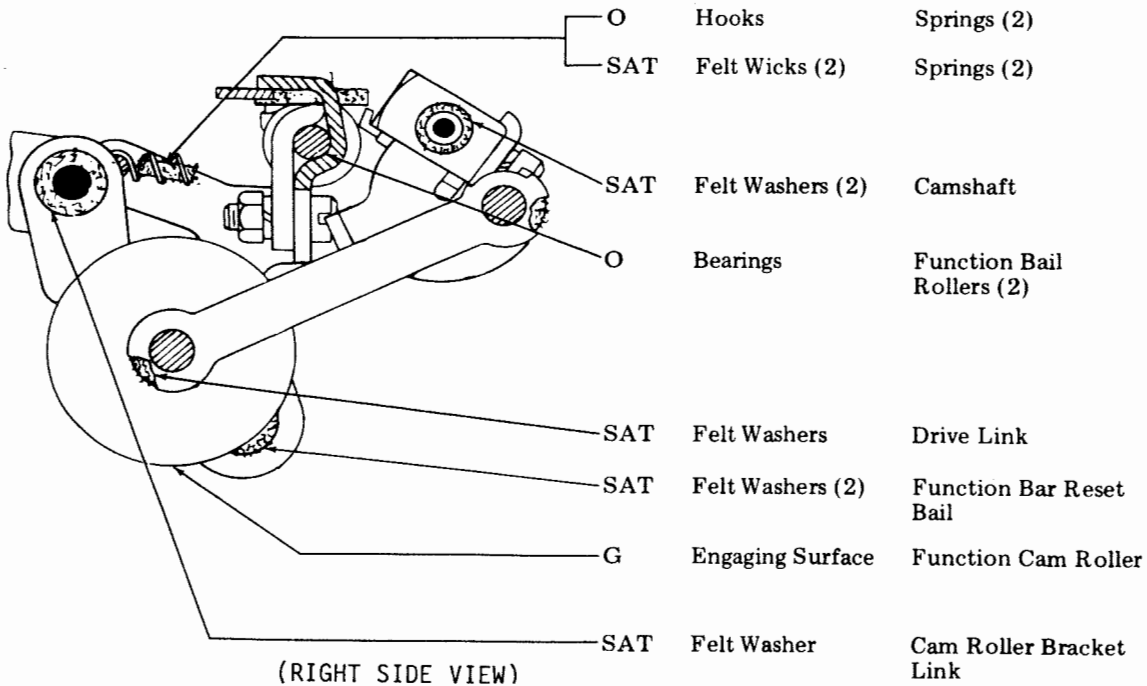


Figure 4-48. Line Feed Mechanism (A)



(RIGHT SIDE VIEW)

Figure 4-49. Single-Double Line Feed Mechanism



(RIGHT SIDE VIEW)

Figure 4-50. Function Reset Bail Mechanism

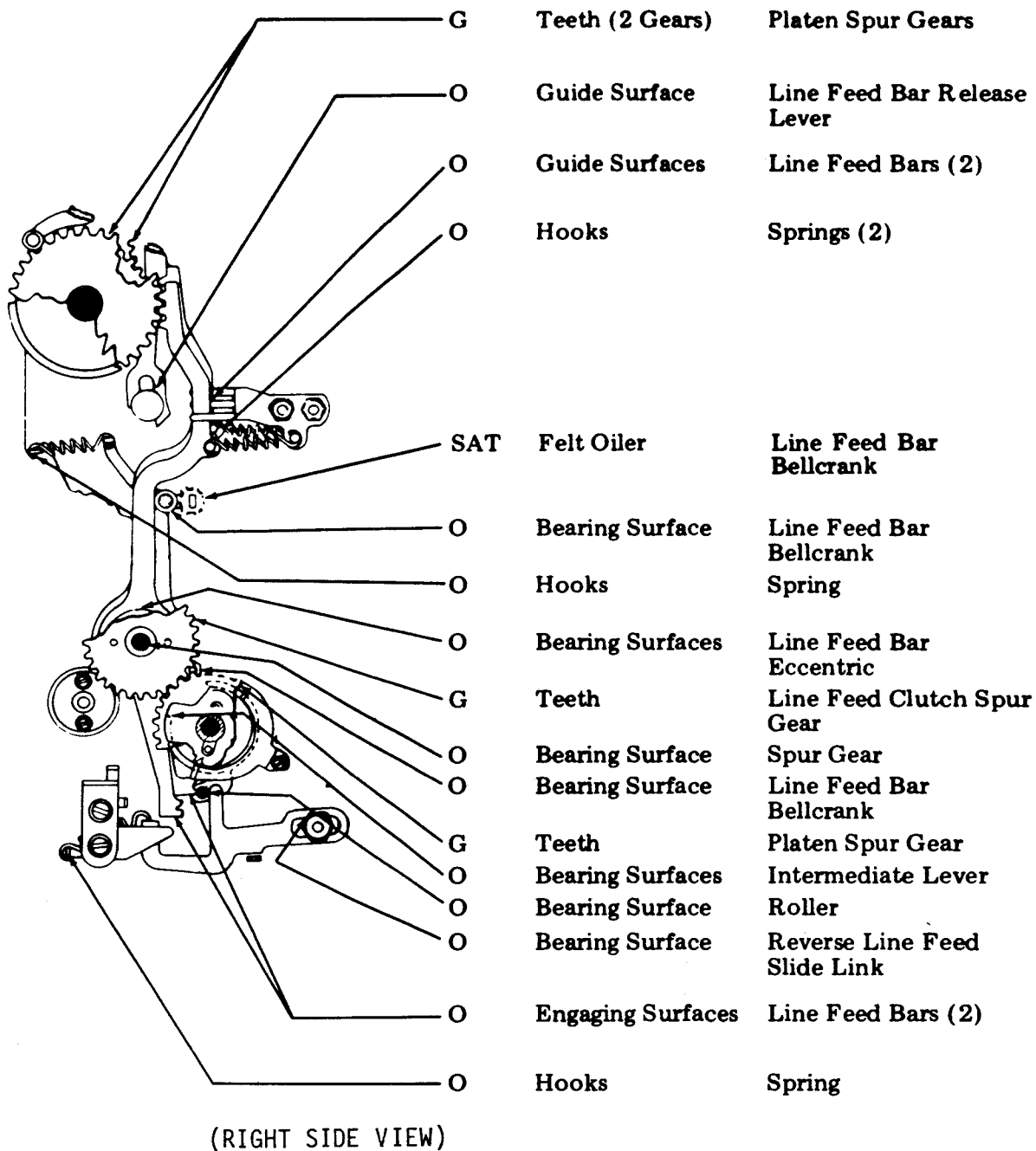


Figure 4-51. Line Feed Mechanism (B)

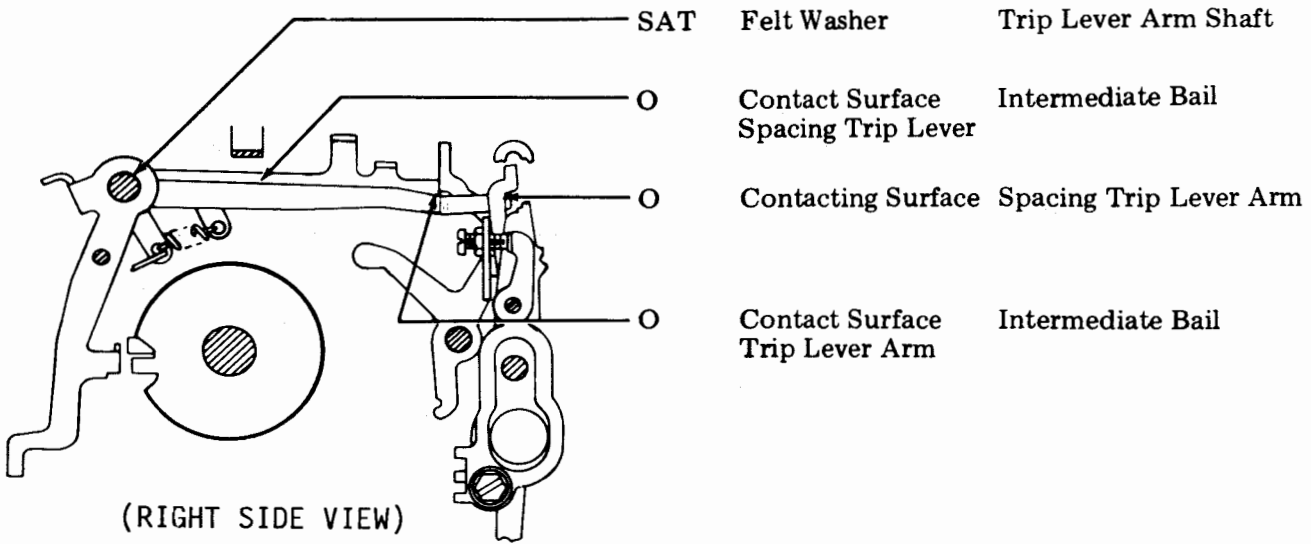


Figure 4-52. Intermediate Bail

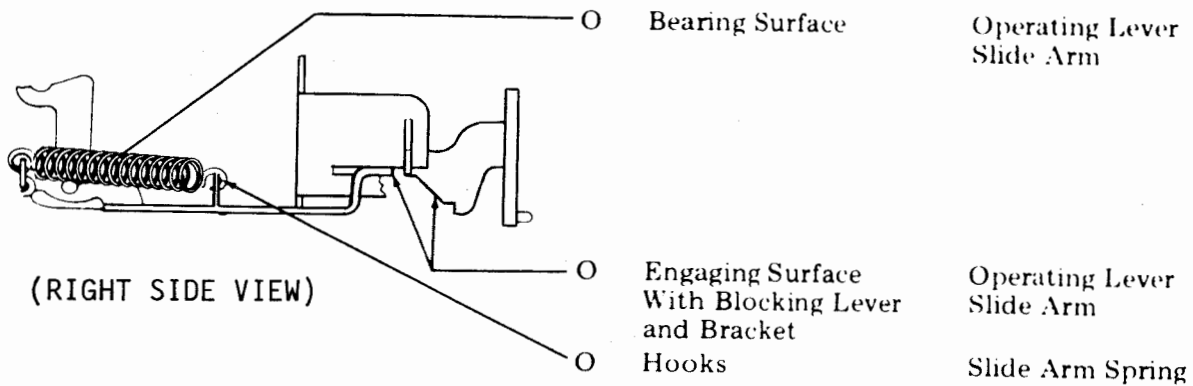


Figure 4-53. Slide Arm

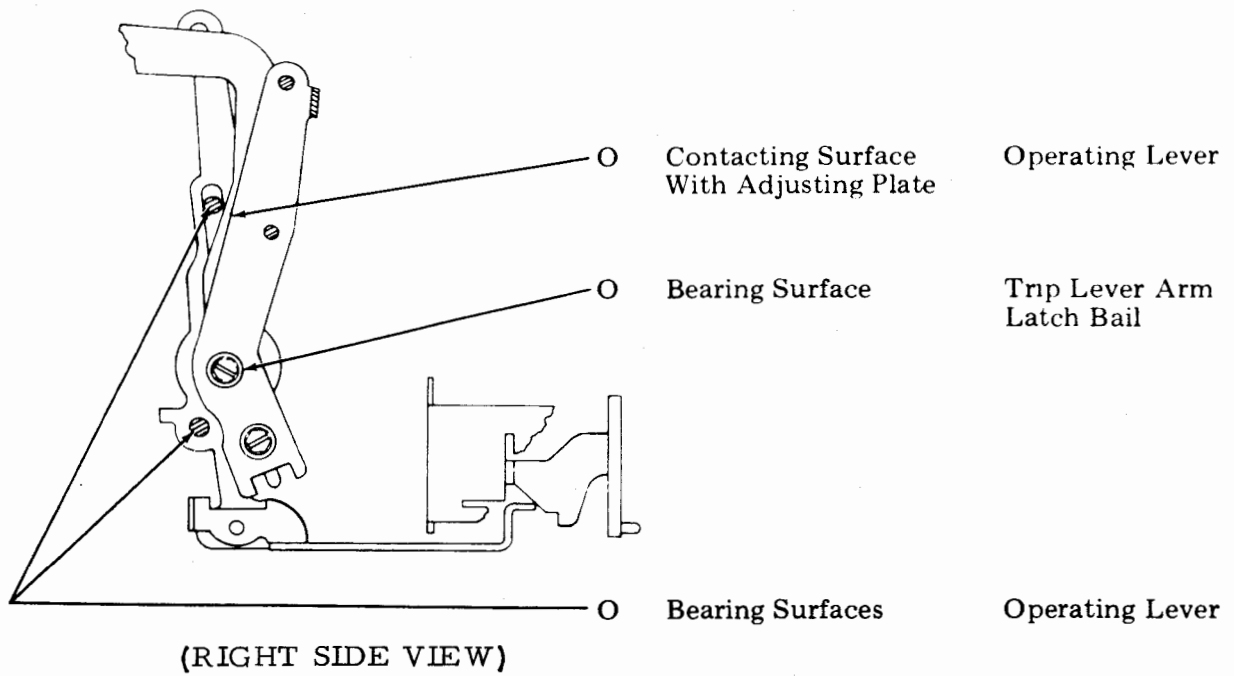


Figure 4-54. Operating Lever

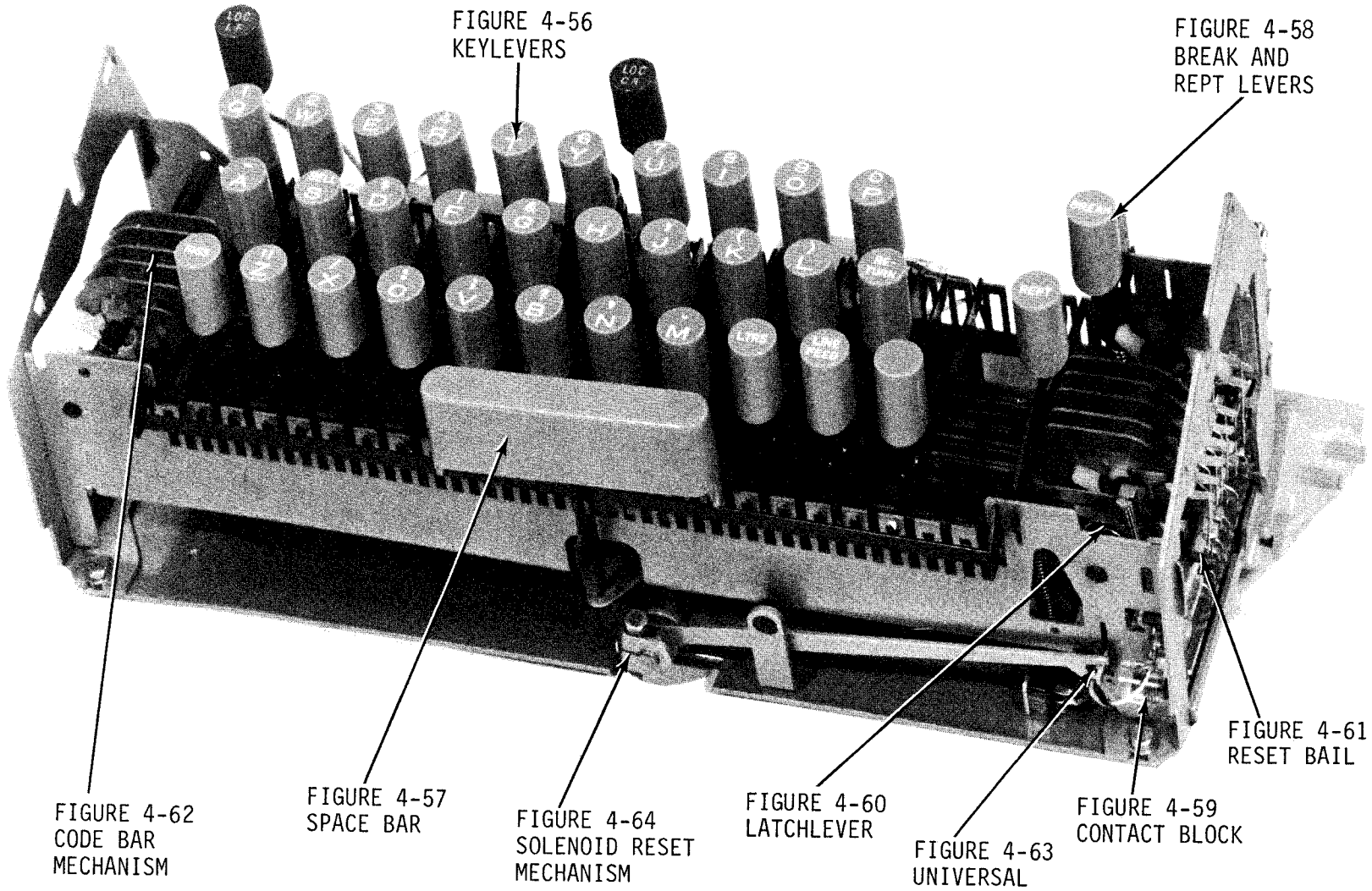


Figure 4-55. Keyboard Transmitter Mechanism

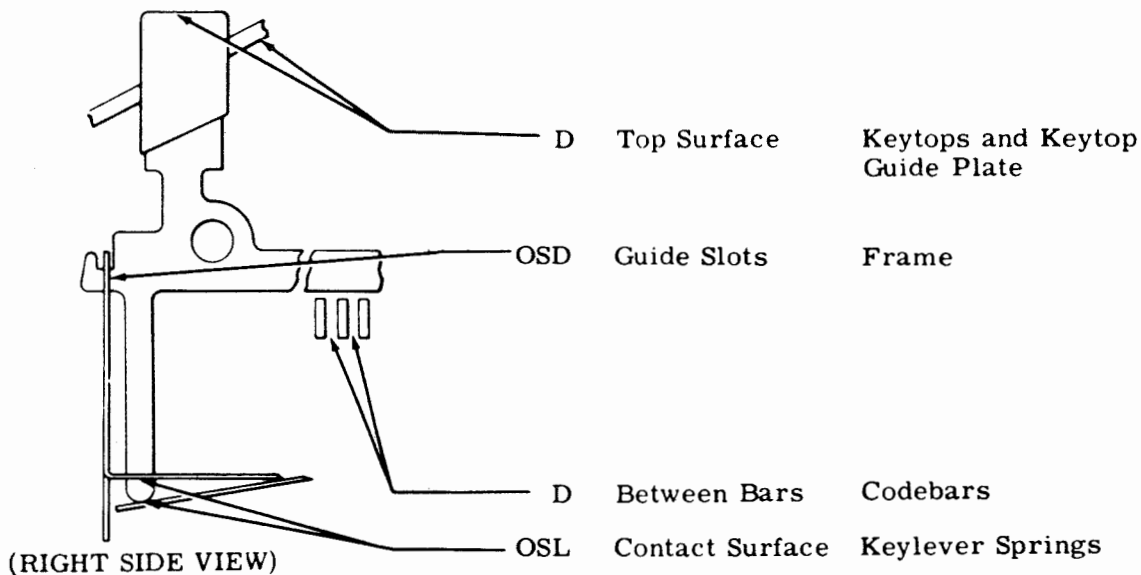


Figure 4-56. Keylevers

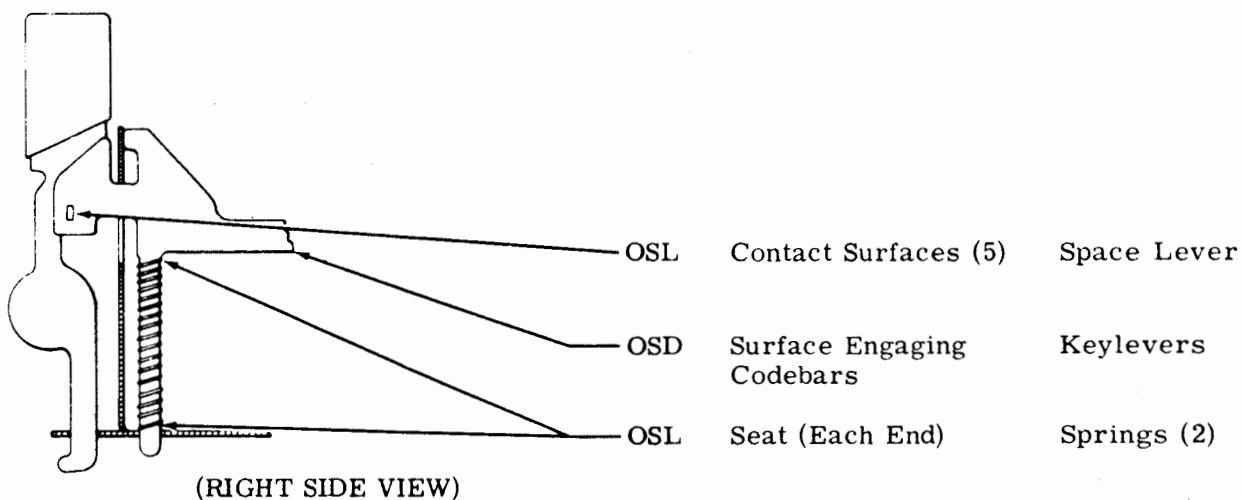


Figure 4-57. Spacebar

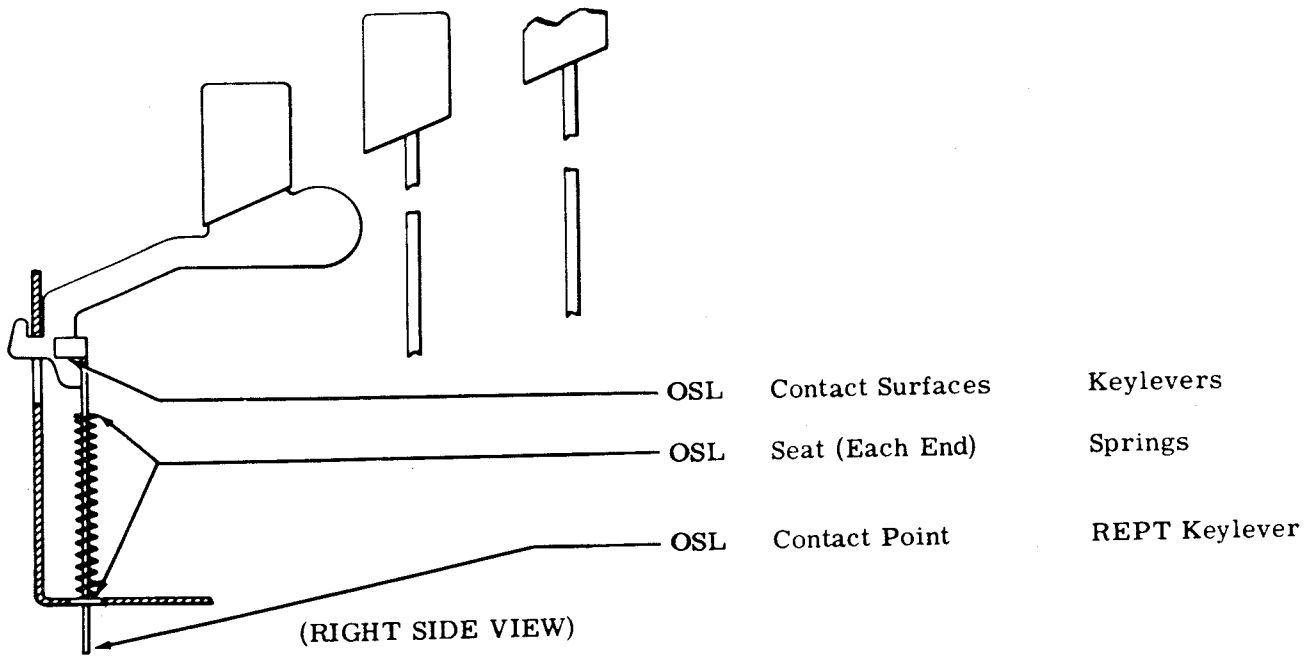


Figure 4-58. Break and REPT Levers

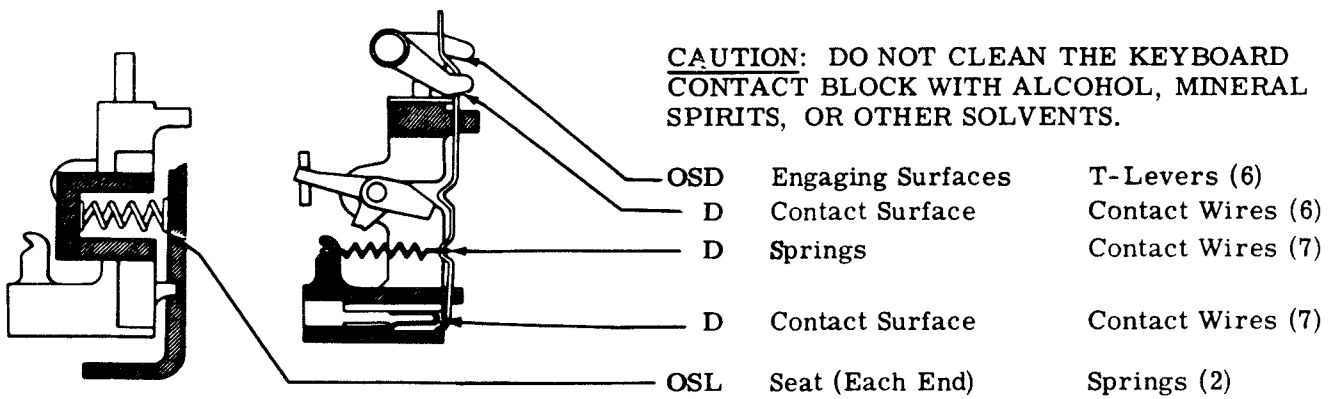


Figure 4-59. Contact Block

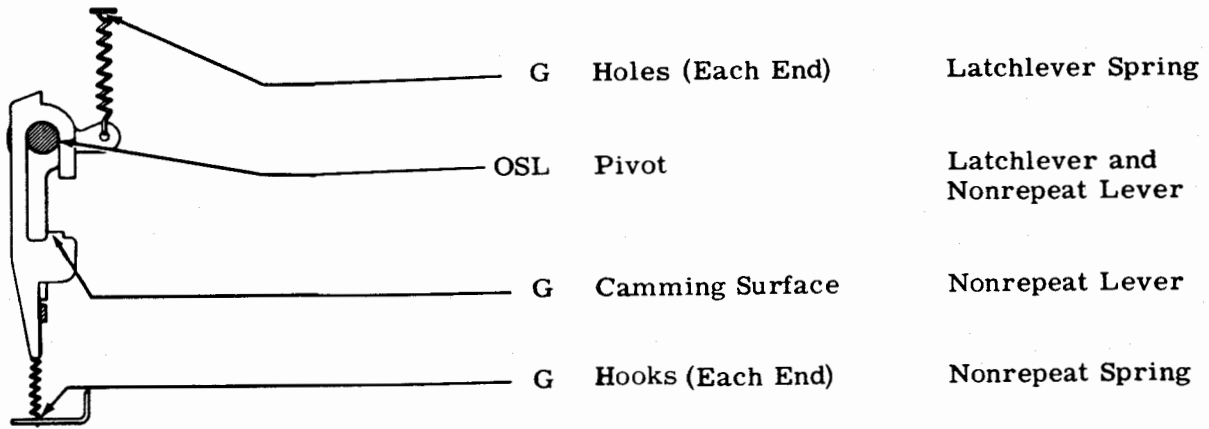


Figure 4-60. Latchlever

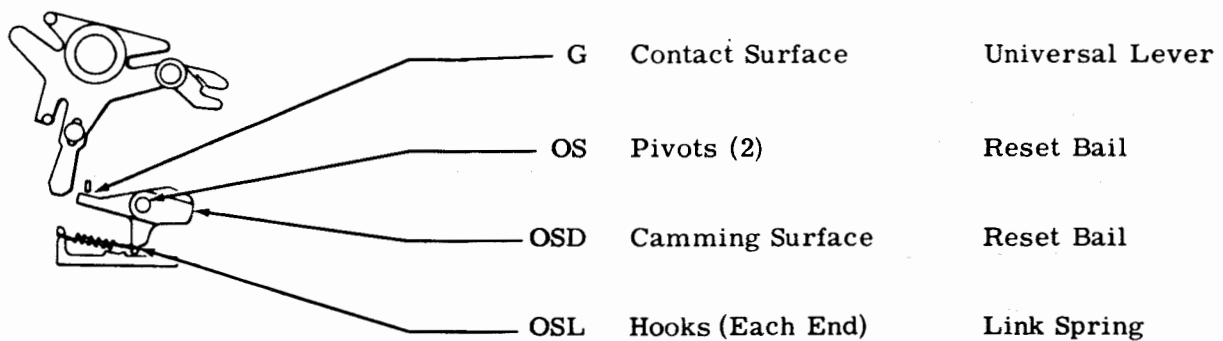


Figure 4-61. Reset Bail

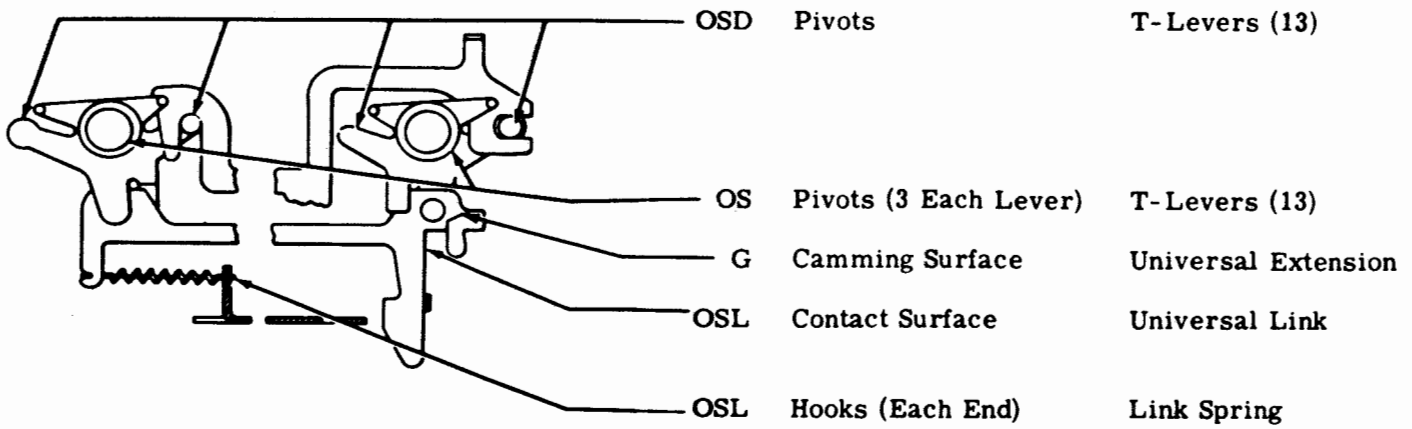


Figure 4-62. Code Bar Mechanism

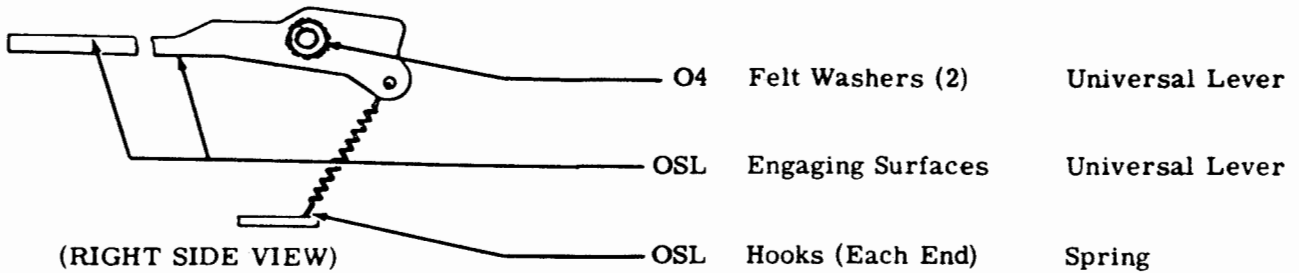


Figure 4-63. Universal Lever

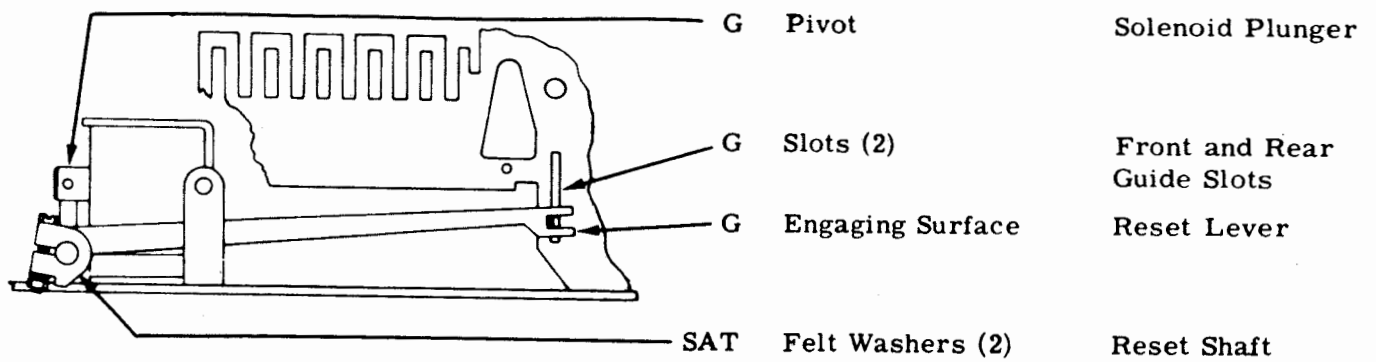


Figure 4-64. Solenoid Reset Mechanism

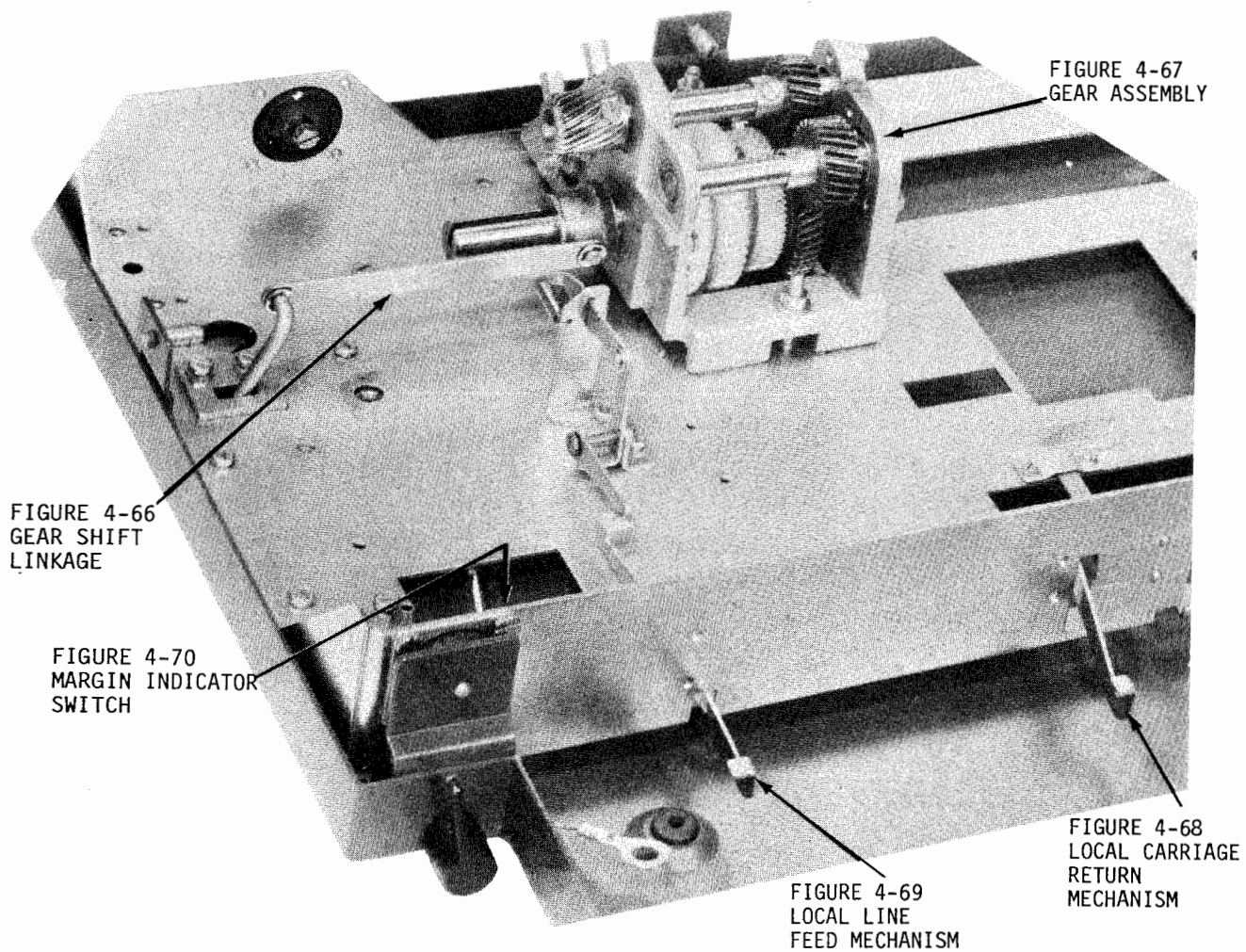


Figure 4-65. Gear Shift Assembly

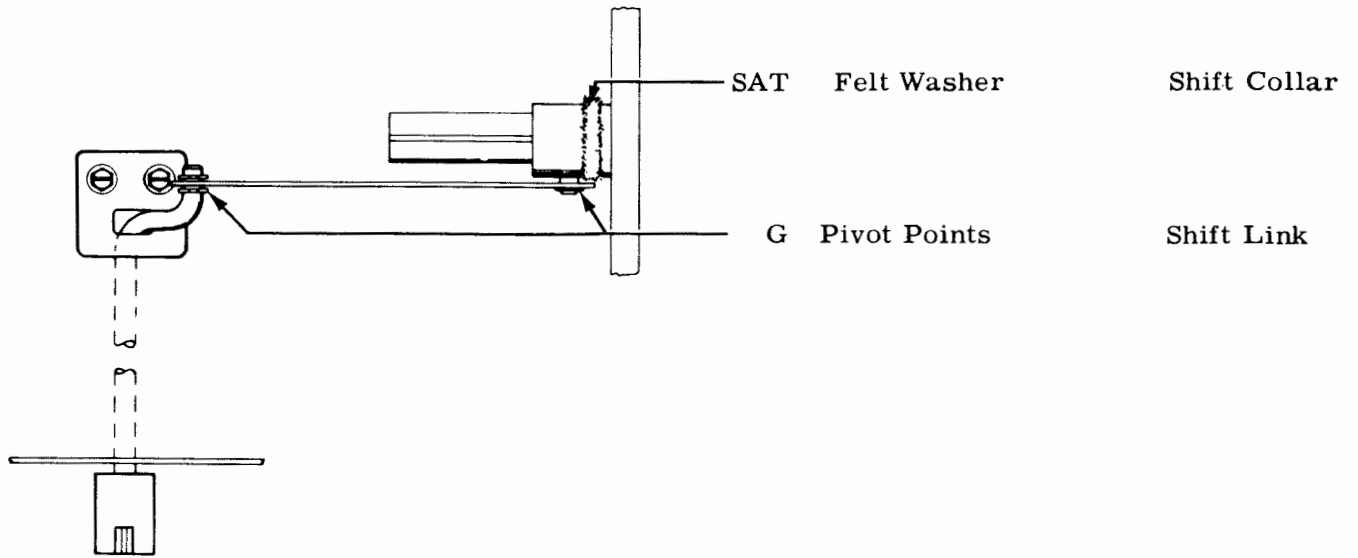


Figure 4-66. Gear Shift Linkage

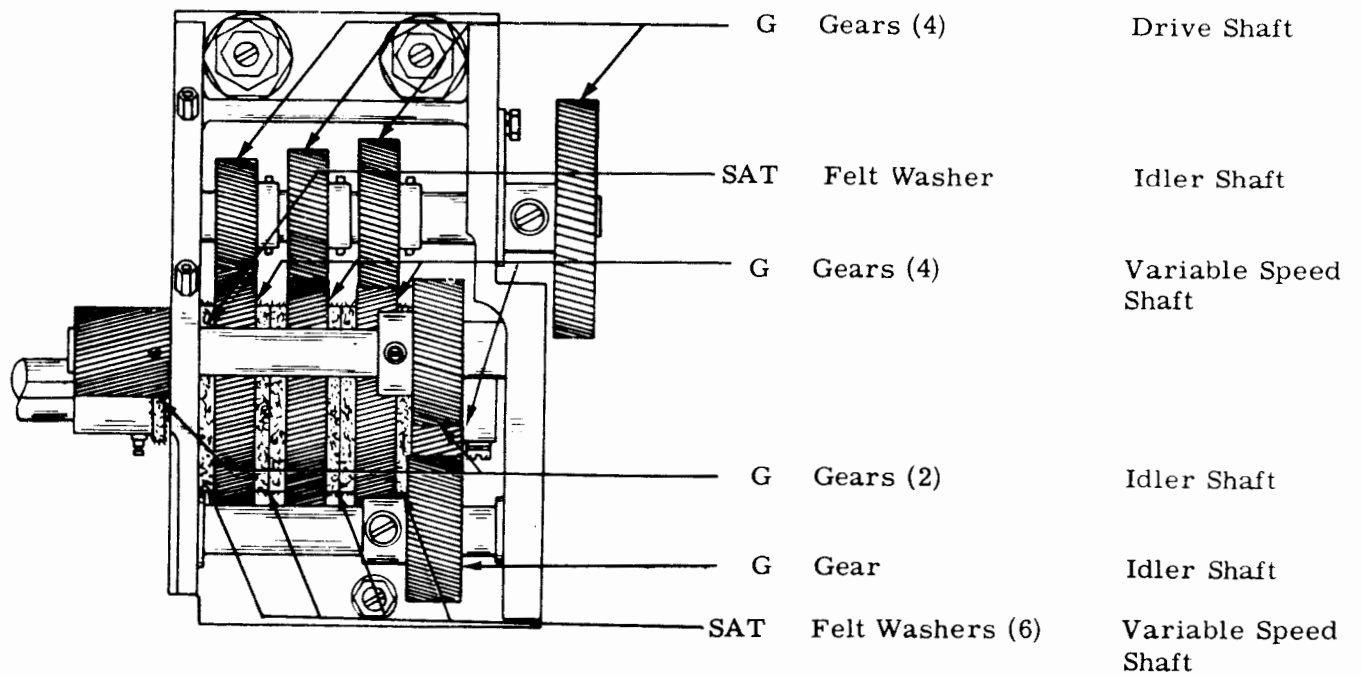


Figure 4-67. Gear Assembly

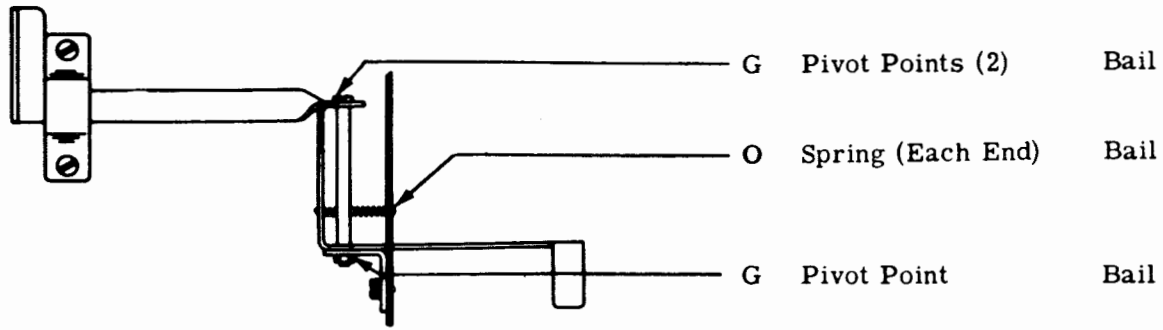


Figure 4-68. Local Carriage Return Mechanism

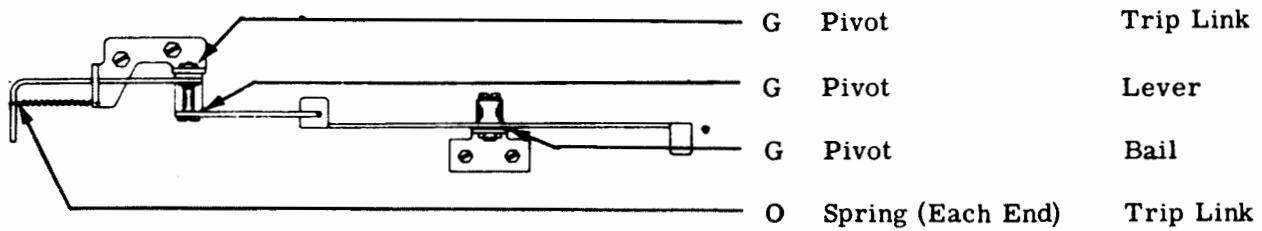


Figure 4-69. Local Line Feed Mechanism

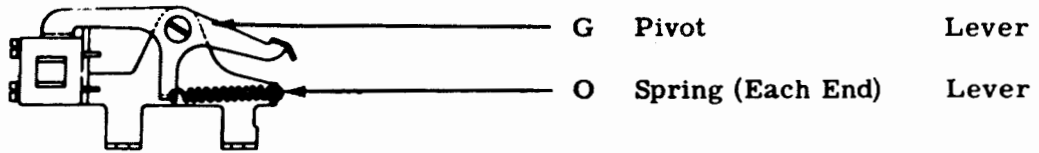


Figure 4-70. Margin Indicator Switch

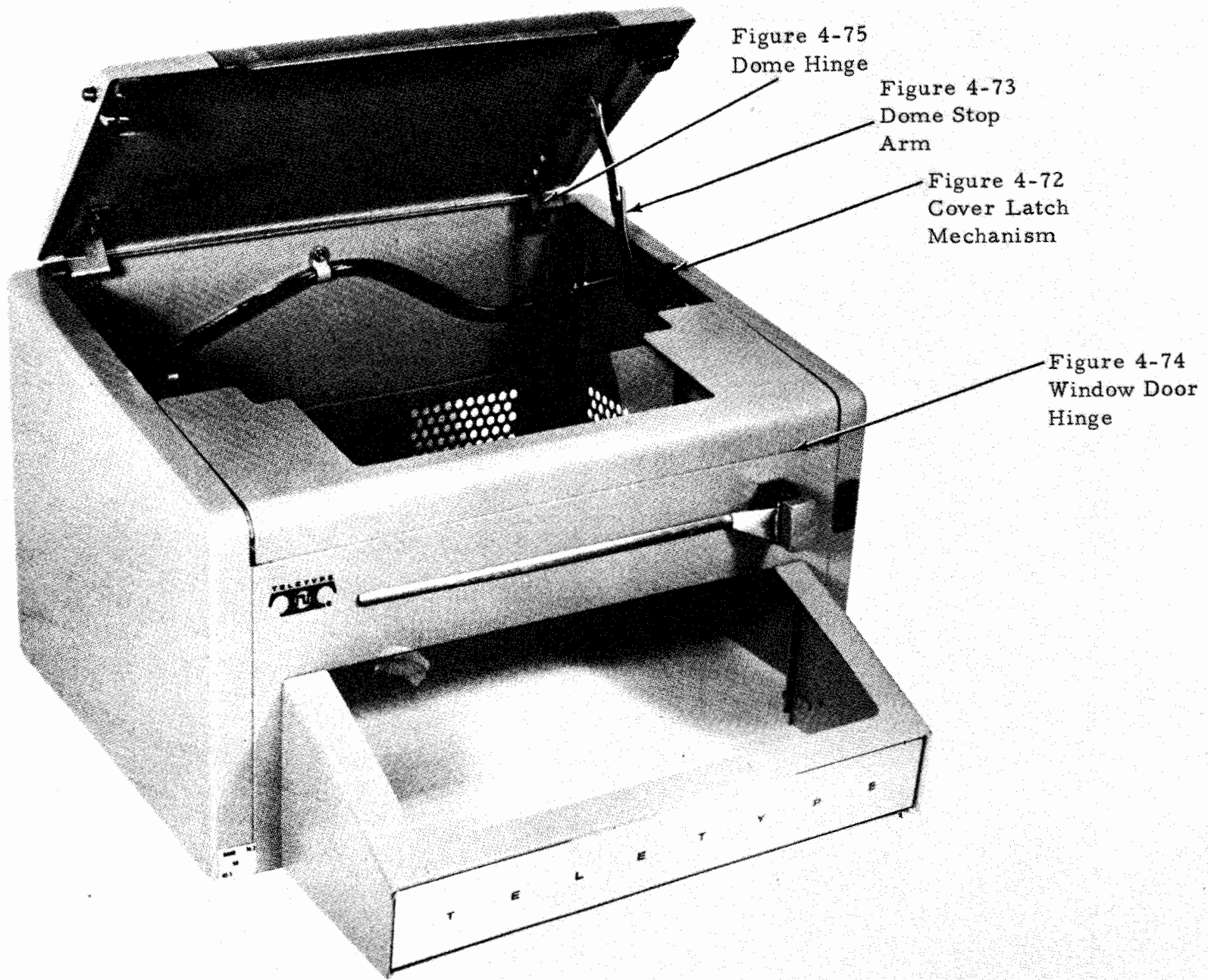


Figure 4-71. Cover Unit

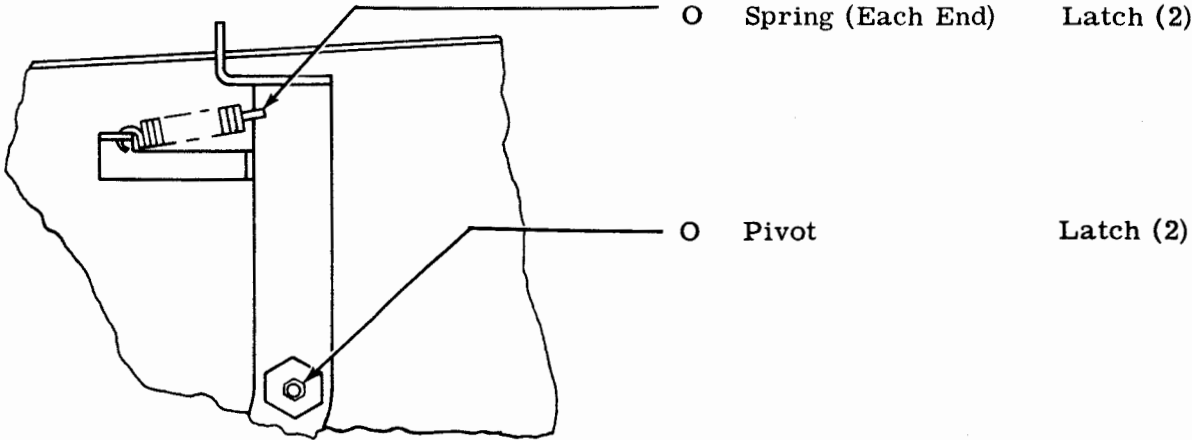


Figure 4-72. Cover Latch Mechanism

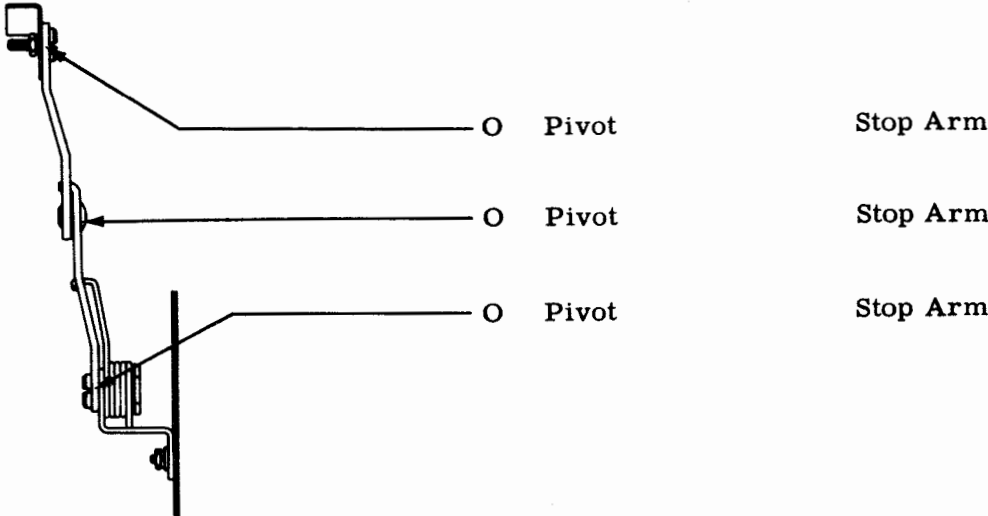


Figure 4-73. Dome Stop Arm

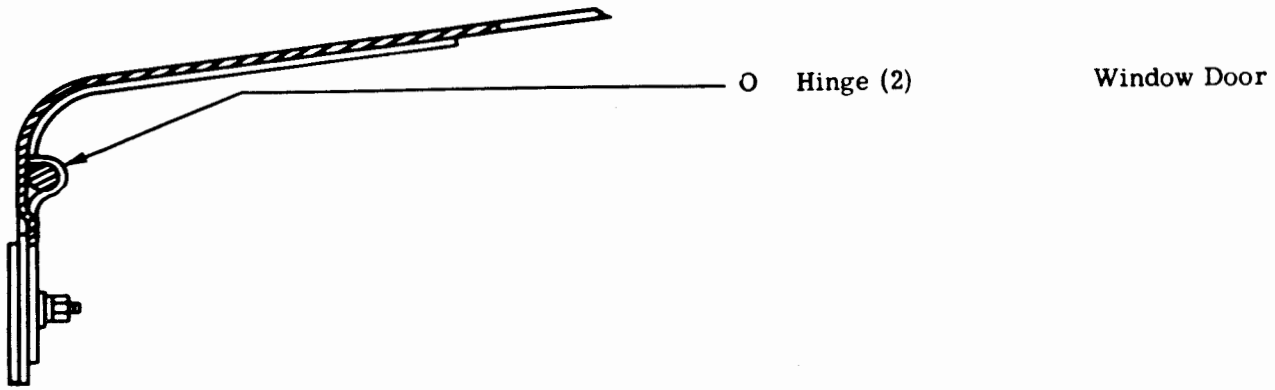


Figure 4-74. Window Door Hinge

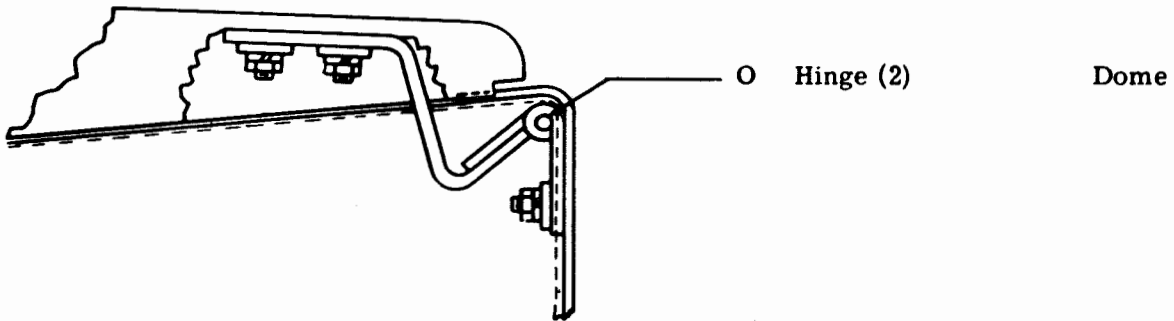


Figure 4-75. Dome Hinge

FIGURE 4-78
CAM FOLLOWER
AND FEED
MECHANISM

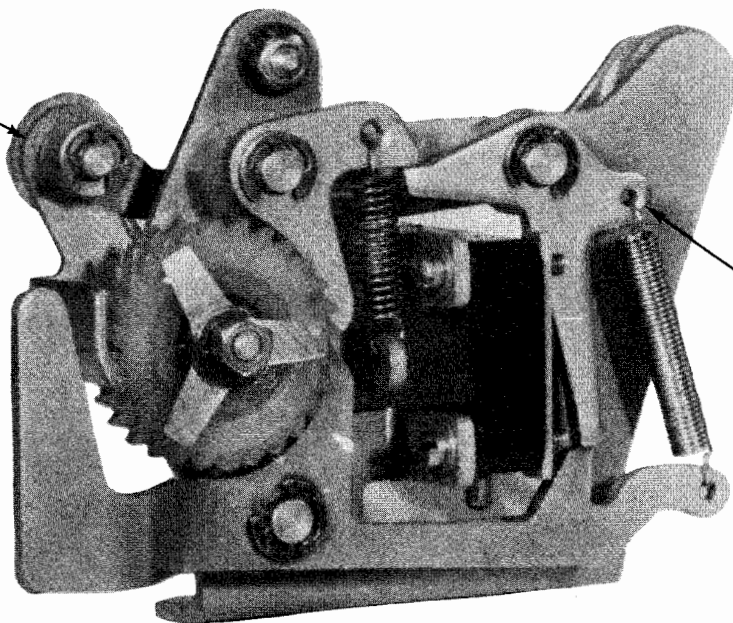


FIGURE 4-77
TRIP AND RESET
MECHANISM

Figure 4-76. Time Delay Mechanism

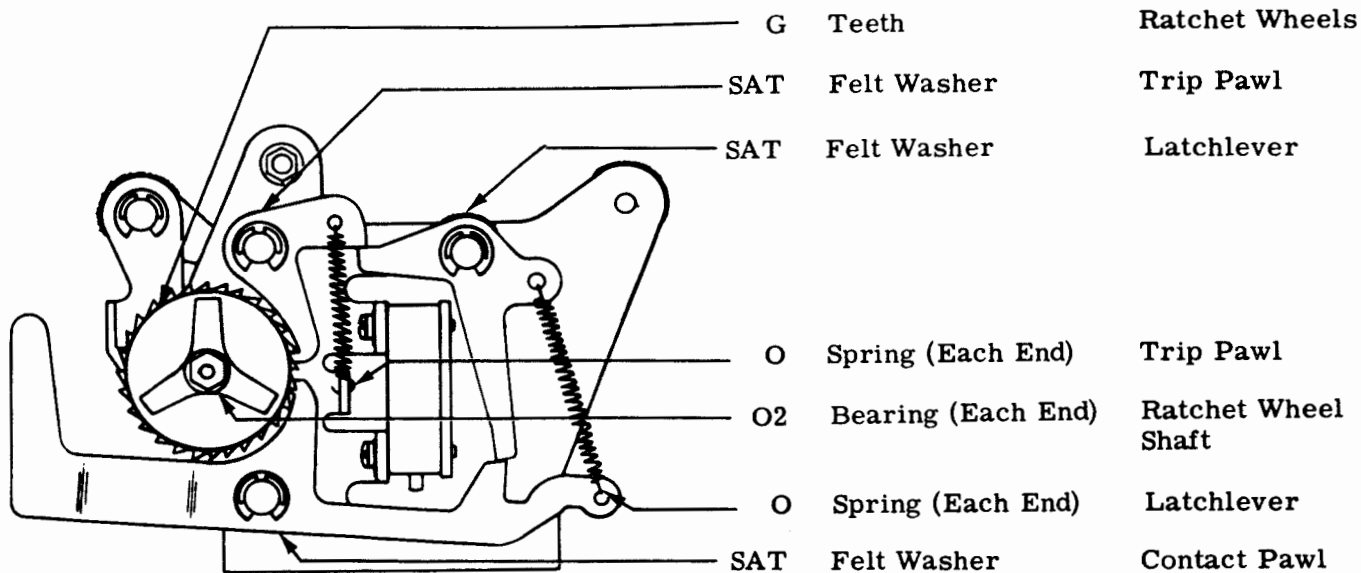


Figure 4-77. Trip and Reset Mechanism

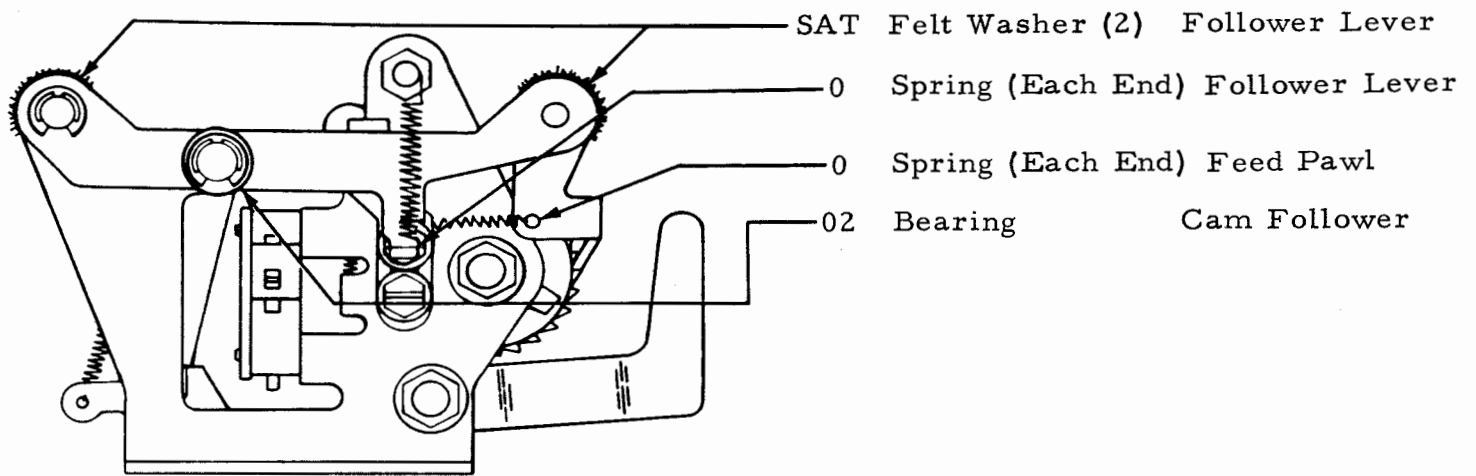


Figure 4-78. Cam Follower and Feed Mechanism

CHAPTER 5 TROUBLESHOOTING

5-1. INTRODUCTION. This chapter provides information required to isolate a malfunction in the teletypewriter set to a misadjusted mechanism or a defective component. Troubleshooting is based on the results of operational tests described in paragraph 4-8d of Chapter 4.

5-2. TROUBLESHOOTING INDEX. The troubleshooting index, table 5-1, contains the items referenced in table 4-5, operational test procedures. If an abnormal indication is encountered, the technician is directed to a fault isolation paragraph describing remedies for symptoms related to the abnormal test results.

5-3. LAMP, PHOTOCCELL, FUSE, AND SEMICONDUCTOR INDEX. Table 5-2 provides a list of lamps, photocells, fuses and semiconductors used in the teletypewriter set. The above active components constitute the most probable cause of failure.

5-4. FAULT ISOLATION. The following paragraphs provide fault isolation procedures referenced in table 5-1.

a. If unequal spacing between characters is observed, proceed as follows:

(1) Check horizontal positioning drive linkage adjustment (paragraph 6-4ap).

(2) Check reversing slide brackets adjustment (paragraph 6-4aq).

(3) If adjustments are required in both steps (1)

and (2), check rocker shaft bracket eccentric stud adjustment (paragraph 4-8c(15)).

b. If type is not clear, proceed as follows:

(1) Check ribbon.

(2) Check type box.

(3) Check printing track adjustment (paragraph 4-8c(28)).

(4) Check printing hammer stop bracket adjustment (paragraph 4-8c(29)).

(5) Check printing arm adjustment (paragraph 4-8c(30)).

c. If printing is unequal vertically, proceed as follows:

(1) Check right and left vertical positioning lever eccentric stud adjustments (paragraph 6-4r and 6-4s).

(2) Check right and left vertical positioning lock lever adjustment (paragraph 6-4t).

(3) If adjustments are required in step (1), check rocker bracket eccentric stud adjustment.

d. If a garbled test message is typed, proceed as follows:

(1) Check range setting.

(2) Check selector magnet bracket adjustment (paragraph 6-4e).

Table 5-1. Troubleshooting Index

Item	Test/Step	Symptom	Fault Isolation Paragraph
1	2/g	Low range span.	5-4t
2	3/a(1)	Printing unequal vertically.	5-4c
3	3/a(2)	Unequal spacing between characters.	5-4a
4	3/a(3)	Unclear type.	5-4b
5	3/a(4)	Garbled test pattern.	5-4d
6	3/a(5)	Improper ribbon feed.	5-4e
7	3/b,c	Improper ribbon reverse.	5-4f
8	4/e,f,g, i,j	Machine does not meet requirements for copying a distorted signal.	5-4t
9	2/e(2)	Figures-letters shift inoperative.	5-4g
10	2/e(2)	Letters-figures shift inoperative.	5-4h
11	2/e(3)	Normal carriage return inoperative.	5-6g
12	5/f	Signal bell inoperative.	5-4l
13	2/e(3)	Normal line feed inoperative.	5-4m
14	5/h,j	Single/double line feed improper operation.	5-4n
15	5/l (1)thru (5)	Automatic carriage return-line feed inoperative.	5-4o
16	5/l (1)thru (5)	Automatic carriage return-line feed improper operation.	5-4p
17	5/l thru 5/p	Automatic line feed on selected carriage return inoperative.	5-4r

Table 5-1. Troubleshooting Index
(cont)

Item	Test/Step	Symptom	Fault Isolation Paragraph
18	6/a	Local carriage return function inoperative.	5-4h
19	6/b	Local line feed function inoperative.	5-4i
20	5/m thru 5/p	Line feed blocking after carriage return inoperative.	5-4s
21	8/f, 8/h	High percentage of distortion.	5-4u
22	7/a	One or more keys hard to press.	5-4v

Table 5-2. Lamp, Photocell, Fuse,
and Semiconductor Index

Qty	Name, Type, Part Number	Function, Location	Energizing Voltage
5	Lamps, Incandescent, 329266.	Photocell light source, Keyboard Transmitter.	4.5VAC
6	Lamps, Incandescent, 329266.	Photocell light source, Distri- butor.	4.5VAC
2	Lamps, Incandescent, 151982.	Copylights, cover.	5.5VAC
1	Photocell Assembly 5 cells, 333094 (See Note).	Light sensors, Keyboard Trans- mitter.	--
1	Photocell Assembly, 6 cells, 333148 (See Note).	Light sensors, Distributor	--
1	Fuse, 4 Amp Slo-Blo, 129919.	Electrical Circuit protection, Key- board.	--
NOTE			
If photocell problems are encountered, replace entire assembly. It is not recommended that photocells be re- placed individually.			
1	Diode Assembly, 329272.	Voltage dropping network for lamp assemblies, Keyboard Base.	--
1	DIODE, 1N4004, CR2, 312341.	Circuit protection, Circuit card 336650.	--
1	DIODE, 1N4001, CR1, 311023.	Part of filter network (CR1, C1), Circuit card 336650.	--

Table 5-2. Lamp, Photocell, Fuse,
and Semiconductor Index
(cont)

Qty	Name, Type, Part Number	Function, Location	Energizing Voltage
1	DIODE, ZENER 1N989A, CR3, 336799	Inductive kickback suppression, Circuit Card 336650.	--
1	Transistor, 2N3569, Q1, 324656.	Switch driver, Cir- cuit card 336650.	
1	Transistor, MM2259, Q2, 315932.	Switch, Circuit card 336650.	--

(3) Check selector armature spring adjustment (paragraph 6-4d).

e. If ribbon does not feed properly, proceed as follows:

(1) Check ribbon feed lever bracket adjustment (paragraph 6-4au).

(2) Check ribbon feed lever spring.

f. If ribbon does not reverse properly, proceed as follows:

(1) Check ribbon reverse spur gear adjustment (paragraph 6-4aw).

g. If repeating characters are observed, proceed as follows:

(1) Check code bar clutch trip lever adjustment (paragraph 4-8c(4)).

(2) Check type box clutch trip lever adjustment (paragraph 4-8c(21)).

h. If local carriage return function is inoperative, proceed as follows:

(1) Press LOC CR key; verify local carriage return function bail moves top to rear; if not, check train of parts (located on keyboard) from key to bail.

(2) Ensure bail is operating carriage return lever; if not, remount typing unit.

i. If local line feed function is inoperative, proceed as follows:

(1) Press LOC LF key; verify local line feed trip

key moves to rear; if not, check train of parts (located on keyboard) from key to trip link.

(2) Ensure trip link is operating clutch trip lever; if not, remount typing unit.

j. If figures-letters shift function is inoperative, proceed as follows:

(1) Set up code combination for letters (12345).

(2) Engage and rotate function clutch 180 degrees; observe the following

(a) Letters function lever should be top to rear; if not, check function bar through lever.

(b) Right shift link breaker slide should be rotated clockwise over breaker slide bail; if not, check parts from function lever to breaker slide bail.

(3) Rotate main shaft 180 degrees while observing the following:

(a) Right breaker slide bail moves shift link breaker slide up.

(b) Breaker slide buckles right oscillating rail shift link.

(c) Oscillating rail moves left until left oscillating rail shift link completely straightens.

k. If letters-figures shift function is inoperative, proceed as follows:

(1) Set up code combination for figures (12-45).

(2) Engage and rotate function clutch 180 degrees; observe the following:

(a) Figures function lever should be top to rear; if not, check function bar through lever.

(b) Left shift link breaker slide should be rotated counterclockwise over breaker slide bail; if not, check parts from function lever to slide bail.

(3) Rotate main shaft 180 degrees while observing the following:

(a) Left breaker slide bail moves shift link breaker slide up.

(b) Breaker slide buckles left oscillating rail shift link.

(c) Oscillating rail moves right until right oscillating rail shift link completely straightens.

1. If signal bell is inoperative, proceed as follows:

(1) Place typeing unit in figures.

(2) Set up code combination for S (1-3--).

(3) Engage and rotate function clutch 180 degrees; signal bell function lever should be top to rear; if not, check function bar through lever.

(4) If signal bell function lever is properly positioned, trouble is electrical.

m. If normal line feed function is inoperative, proceed as follows:

(1) Set up code combination for line feed (-2---).

(2) Engage and rotate function clutch 180 degrees.

(3) Rotate main shaft 180 degrees; observe the following:

(a) Line feed function lever should be top to rear; if not, check function bar through lever.

(b) Check that line feed function pawl stripper is down and in proper engagement with stripper bail.

(c) Check that clutch trip lever is out of path of shoe lever; if not, check bottom of function lever through trip lever.

(d) Line feed bars should be in engagement with spur gear; if not, check line feed bar bell crank spring.

(e) Rotate main shaft while observing that one line feed bar moves to rear and up while other line feed bar is moving down and rotating spur gear.

n. If single/double line feed operates improperly, proceed as follows:

(1) Set single/double line feed lever in position 1.

(2) Observe that stripper bail is rotated counterclockwise (top view) in engagement with slot in line

feed function pawl stripper; if not, check parts between lever and bail and stripper bail spring.

(3) Set single/double line feed lever in position 2.

(4) Observe that stripper bail is rotated clockwise (top view) out of engagement with slot in line feed function pawl stripper; if not, check parts between lever and bail.

o. If automatic carriage return line feed is inoperative, proceed as follows:

(1) Rotate spacing drum clockwise while observing the following:

(a) Lug on spacing drum rear stop spring should strike and rotate automatic carriage return-line feed bell crank clockwise; if not, check for broken or bent lug or bell crank; check right margin adjustment (paragraph 6-4ax).

(b) 0 (zero) code bar should move right; if not, check engagement of bell crank with code bar.

(2) Engage and rotate function clutch 180 degrees; observe the following:

(a) Automatic carriage return and automatic line feed function levers should be top to rear; if not, check function bar through levers.

(b) Normal line feed function lever should be top to rear; if not, check tab on automatic line feed function pawl.

(3) Check engagement of bottom of automatic carriage return and normal line feed function levers with respective slide arms.

p. If automatic carriage return-line feed function operates improperly, proceed as follows:

(1) If carriage does not return when 74th character is printed, check right margin adjustment (paragraph 6-4ax).

(2) If 75th character is not printed in center of page, increase tension on carriage return spring to move it to left, or decrease tension to move it to right.

(3) If carriage return spring tension was adjusted in step (2), above, readjust dash-pot vent screw (paragraph 6-4az).

(4) If 76th and 77th characters are not positioned under 1st and 2nd, respectively, proceed as follows:

(a) Check dash-pot vent screw adjustment (paragraph 6-4au).

(b) Check left margin adjustment (paragraph 6-4ah).

q. If normal carriage return is inoperative, proceed as follows:

(1) Set up code combination for carriage return (---4-).

(2) Engage and rotate function clutch 180 degrees, observe the following:

(a) Carriage return function lever should be top to rear; if not, check function bar through lever.

(b) Carriage return feed pawl release link should be rotated counterclockwise holding feed pawls out of engagement with spacing drum, if not, check bottom of function lever through release link including carriage return lever adjustment (paragraph 4-8c(33)).

(c) Carriage should be to left; if not, check for bind in spacing drum, draw-wire rope, carriage return spring drum, and printing and type-box carriages. Check tension on carriage return spring.

r. If automatic line feed on selected carriage return function is inoperative, proceed as follows:

(1) Set up code combination for carriage return (---4-).

(2) Engage and rotate function clutch 180 degrees; observe the following:

(a) Line feed on carriage return function lever should be top to rear; if not, check function bar through lever.

(b) Check engagement of bottom of function lever with slide arm.

s. If line feed blocking after carriage return function is inoperative, proceed as follows:

(1) Set up code combination for carriage return (---4-).

(2) Engage and rotate function clutch 180 degrees; observe the following:

(a) Line feed on carriage return blocking function lever should be top to rear; if not, check function bar through lever.

(b) Blocking slide should be to right with extensions in front of function bars in slots 39 and 40; if not, check top of function lever through blocking slide.

(3) Disengage function clutch.

(4) Set up code combination for line feed (-2---).

(5) Engage and rotate function clutch 180 degrees; observe the following:

(a) Blocking function lever should be top to rear; if not, check blocking function lever latch.

(b) Universal number 1 function lever should be top to rear; if not, check function bar through lever.

(6) Repeat steps (3) through (5); observe the following:

(a) Universal number 1 and 2 function levers should be top to rear; if number 2 is not to rear, check function bar through lever.

(b) Blocking slide should be to left; if not, check blocking function lever latch through blocking slide and shift plate post spring.

t. If difference between range settings (range span) is

too low or machine does not meet requirements for copying a distorted signal, proceed as follows:

(1) Check selector armature adjustment (paragraph 6-3t).

(2) Check selector magnet bracket adjustment (paragraph 6-3t).

(3) Check selector magnet bracket vertical adjustment (paragraph 6-3t).

(4) Check for wear on armature extension, marking and spacing lock lever, and spring tensions.

(5) Check that range spans are centered on scale; if not, increase or decrease tension on selector armature spring to raise or lower range span.

u. If percentage of distortion is too high, check keyboard shutter window gap adjustment (paragraph 4-8b(1)).

(1) Remove keyboard transmitter top plate.

(2) Check that keylevers are in proper slots.

(3) Check that keylevers are properly seated in slots.

5-5. MAINTENANCE SCHEMATIC DIAGRAMS. Schematic diagrams are provided in figures 5-1 and 5-2 to serve as a useful aid in troubleshooting the electrical circuits of the teletypewriter set.

5-6. WIRING DIAGRAMS. Wiring diagrams, shown in figure 5-3, are provided as an additional aid to troubleshooting and maintenance.

NO.	NOTE
1.	<p>INDICATES FEMALE TERMINAL</p> <p>INDICATES MALE TERMINAL</p>
2.	<p>INDICATES SINGLE SHIELDING</p> <p>INDICATES DOUBLE SHIELDING</p>
3.	SL-BL INDICATES SLOW BLOWING
4.	TERMINAL DESIGNATIONS ENCLOSED IN PARENTHESES ARE FOR REFERENCE ONLY AND ARE NOT MARKED ON COMPONENT.
5.	<p>ASSOCIATED WIRING DIAGRAMS</p> <p>2900WD ACTUAL OF LMJ37</p> <p>8764WD ACTUAL OF LPC403</p> <p>8763WD ACTUAL OF LP166</p> <p>8299WD ACTUAL AND SCHEMATIC OF S19204 SELECTOR</p>
6.	RESISTANCE VALUES IN OHMS UNLESS OTHERWISE SPECIFIED.
7. (A)	151819 STRAP REQUIRED FOR HALF DUPLEX OPERATION ONLY STRAP SS1 TO SS4 SIGNAL LINE SS2(+), SS3(-)
(B)	REMOVE STRAP FROM SS1 TO SS4 FOR FULL DUPLEX OPERATION. CONNECT SEND LINE TO SS3(-) AND SS4(+). CONNECT RECEIVE LINE TO SS1(-) AND SS2(+).
8.	FOR SYNCHRONOUS PULSE OPERATION EXTERNAL POWER (45 MA \pm 10%) MUST BE PROVIDED.

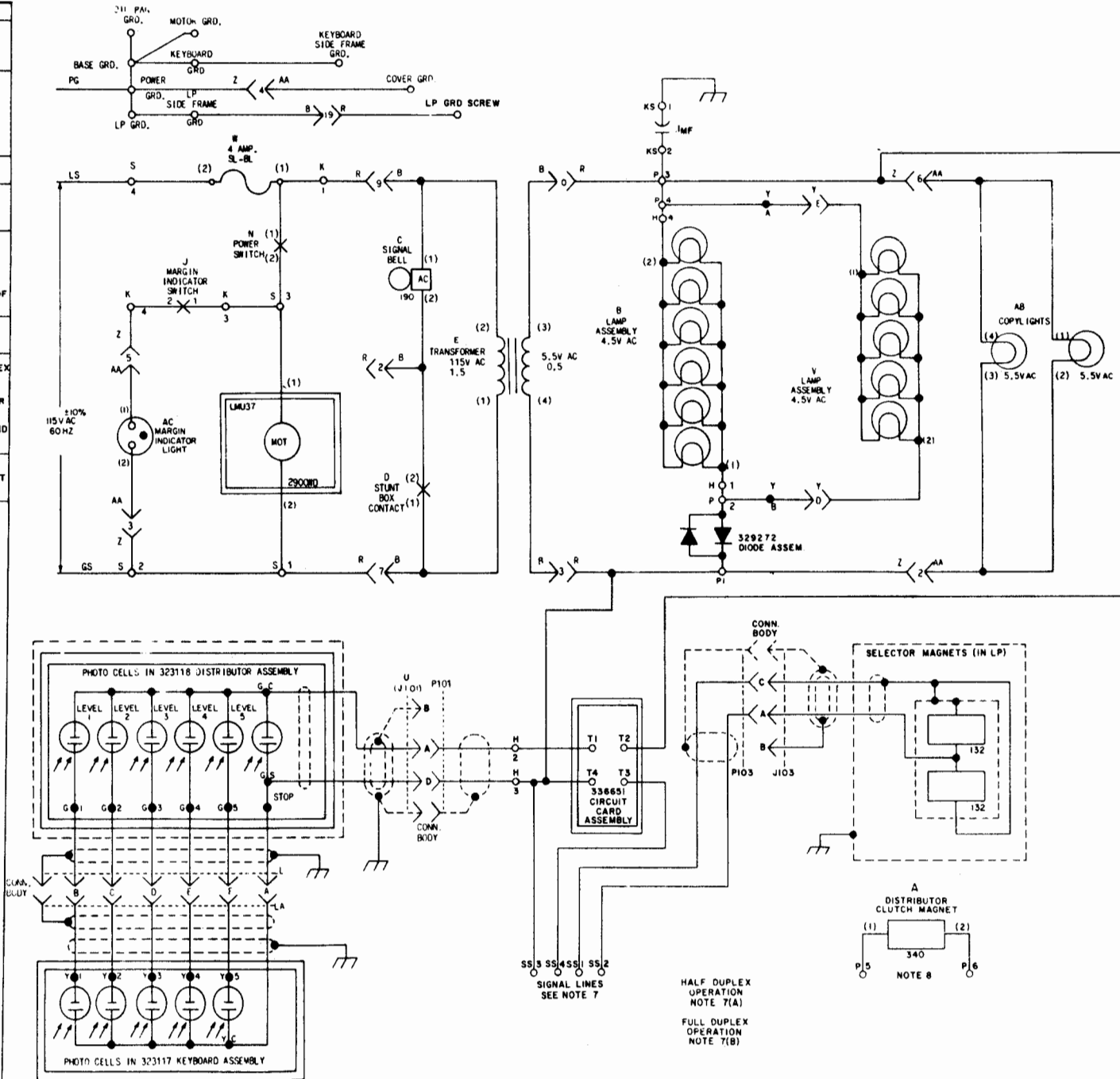


Figure 5-1. AN/UGC-20B Schematic Diagram

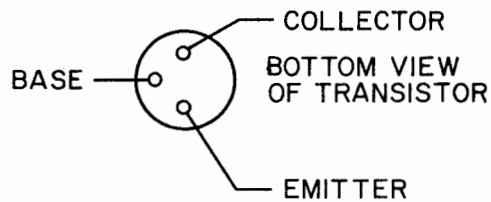
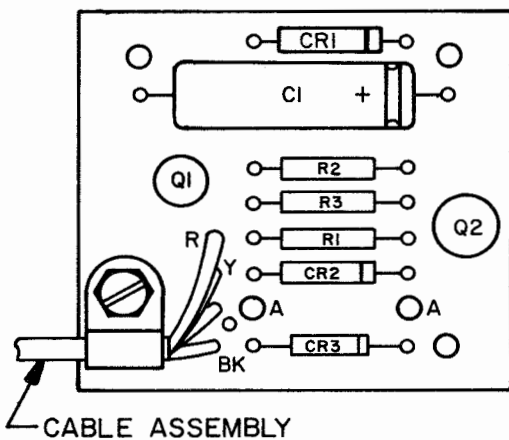
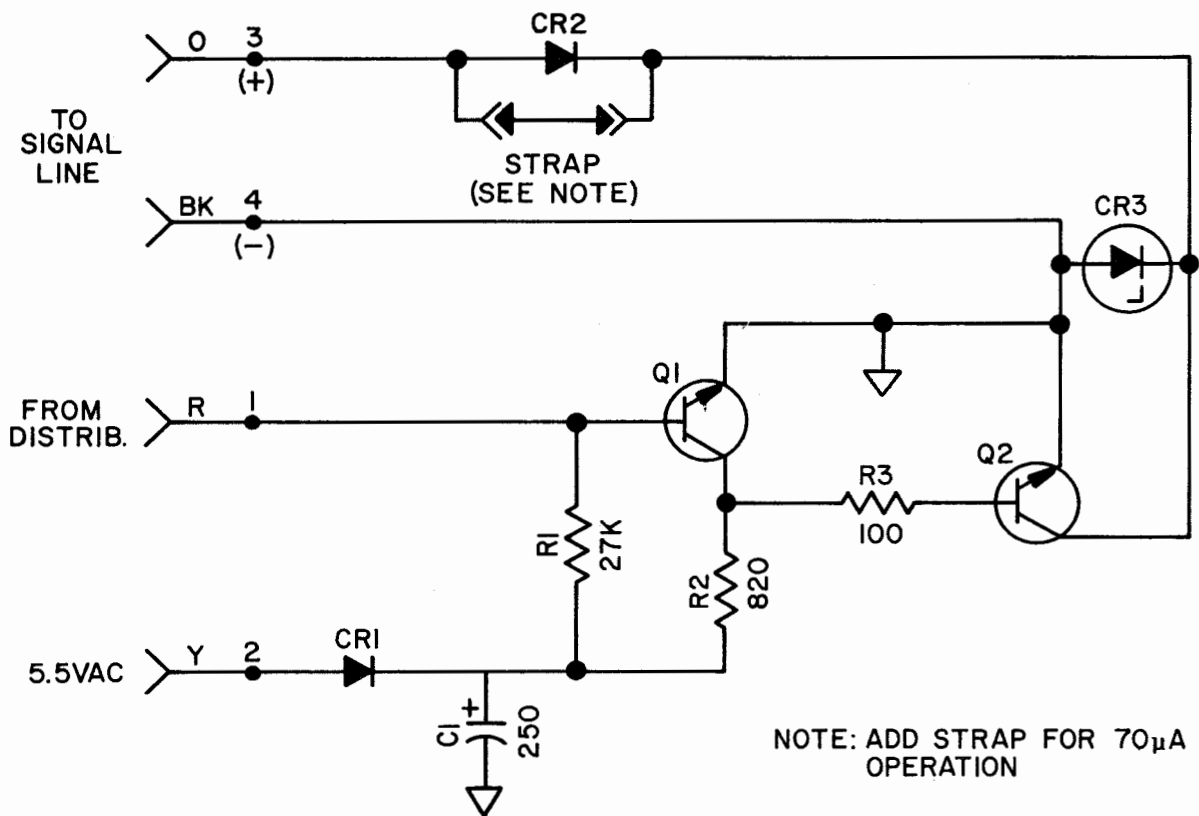




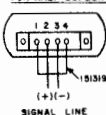
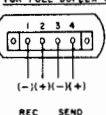
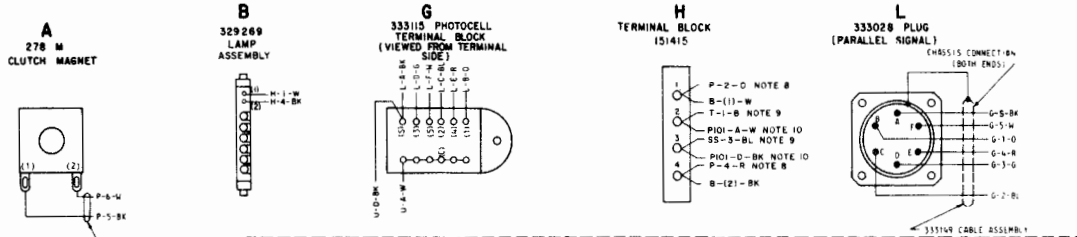


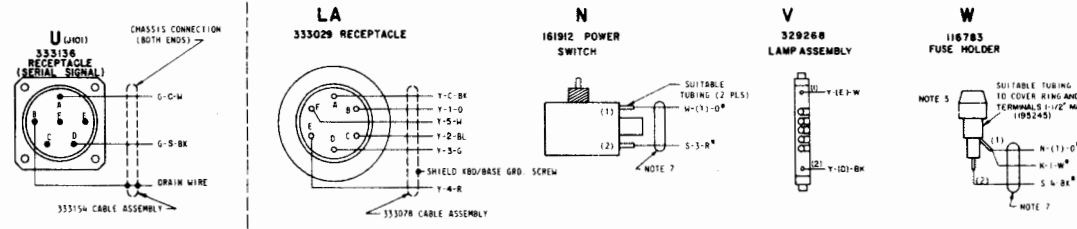
Figure 5-2. Signal Control Circuit Card
336650 Schematic Diagram and Pictorial

NO.	NOTES
1.	WIRING LEGEND:  DISTANT TERMINATING AREA  DISTANT TERMINATING DESIGNATION  WIRE COLOR CODE
2.	COLOR CODE: BK - BLACK G - GREEN BR - BROWN BL - BLUE R - RED P - PURPLE O - ORANGE S - SLATE Y - YELLOW W - WHITE
3.	CONNECTORS VIEWED FROM SOLDER TERMINAL SIDE
4.	* INDICATES 18 GA. WIRE.
5.	USE 4 AMP. SL-BL FUSE.
6.	TERMINAL DESIGNATIONS ENCLOSED IN PARENTHESES ARE FOR REFERENCE AND ARE NOT MARKED ON COMPONENT.
7.	333079 CABLE ASSEMBLY
8.	333151 CABLE ASSEMBLY
9.	336652 CABLE ASSEMBLY
10.	336655 CABLE ASSEMBLY
11.	336654 CABLE ASSEMBLY
12.	ASSOCIATED WD'S 2900WD FOR LMU37 8764WD FOR LPC403 8763WD FOR LP156 8230WD FOR 518204 SELECTOR
13.	ADD 151819 STRAP FOR HALF DUPLEX OPERATION ONLY.
14.	FOR SYNCHRONOUS PULSE OPERATION EXTERNAL POWER (46 MA ±10%) MUST BE PROVIDED BY CUSTOMER.
15.	 INDICATES SHIELDED WIRE.
16.	SIGNAL LINE CONNECTIONS FOR 50 MA (±20 VDC) OR 70µA (1.5 VDC) FOLLOWS: FOR HALF DUPLEX OPERATION  151819 STRAP SIGNAL LINE FOR FULL DUPLEX OPERATION  REC SEND LINE LINE

DISTRIBUTOR WIRING



KEYBOARD WIRING



BASE WIRING

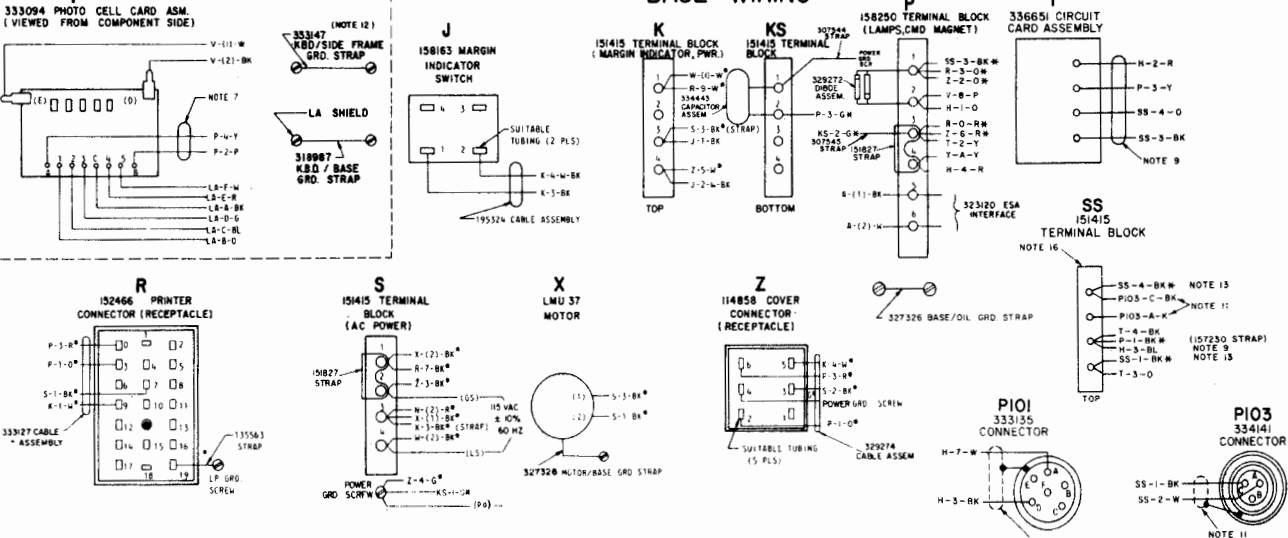
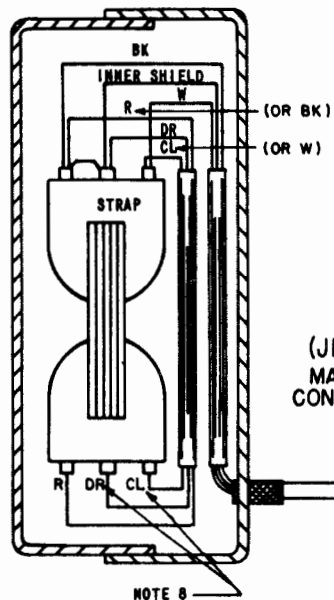


Figure 5-3. AN/UGC-20B Wiring Diagram (Sheet 1 of 4)

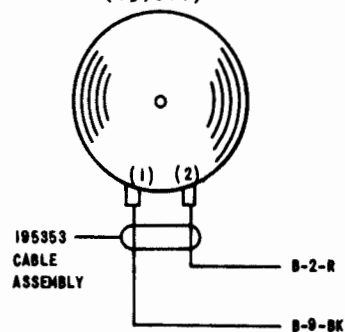
NO.	NOTES																												
1.	<p>AREA DESIGNATION TERMINATING DESIGNATION G-3-BK COLOR CORE</p>																												
2.	<p>COLOR CODE:</p> <table border="0"> <tr> <td>BK-BLACK</td> <td>BL-BLUE</td> </tr> <tr> <td>W-WHITE</td> <td>R-RED</td> </tr> <tr> <td>Y-YELLOW</td> <td>BR-BROWN</td> </tr> <tr> <td>P-PURPLE</td> <td>O-ORANGE</td> </tr> <tr> <td>S-SLATE</td> <td>G-GREEN</td> </tr> </table>	BK-BLACK	BL-BLUE	W-WHITE	R-RED	Y-YELLOW	BR-BROWN	P-PURPLE	O-ORANGE	S-SLATE	G-GREEN																		
BK-BLACK	BL-BLUE																												
W-WHITE	R-RED																												
Y-YELLOW	BR-BROWN																												
P-PURPLE	O-ORANGE																												
S-SLATE	G-GREEN																												
3.	CONNECTOR VIEWED FROM SOLDERED TERMINAL ENDS.																												
4.	* DENOTES 18 GA., ALL OTHER WIRES 24 GA.																												
5.	<p>NORMALLY OPEN CONTACT</p> <p>NORMALLY CLOSED CONTACT</p>																												
6.	<p>ASSOCIATED WIRING DIAGRAMS:</p> <table border="0"> <tr><td>8724WD</td><td>323120</td><td>ESA</td><td>ACTUAL</td></tr> <tr><td>8725WD</td><td>323120</td><td>ESA</td><td>SCHEMATIC</td></tr> <tr><td>8726WD</td><td>323121</td><td>ESA</td><td>ACTUAL</td></tr> <tr><td>8727WD</td><td>323121</td><td>ESA</td><td>SCHEMATIC</td></tr> <tr><td>8728WD</td><td>323116</td><td>MOD. KIT</td><td>ACTUAL</td></tr> <tr><td>8729WD</td><td>323116</td><td>MOD. KIT</td><td>SCHEMATIC</td></tr> <tr><td>8764WD</td><td>1PCN03</td><td>ACTUAL</td><td></td></tr> </table>	8724WD	323120	ESA	ACTUAL	8725WD	323120	ESA	SCHEMATIC	8726WD	323121	ESA	ACTUAL	8727WD	323121	ESA	SCHEMATIC	8728WD	323116	MOD. KIT	ACTUAL	8729WD	323116	MOD. KIT	SCHEMATIC	8764WD	1PCN03	ACTUAL	
8724WD	323120	ESA	ACTUAL																										
8725WD	323120	ESA	SCHEMATIC																										
8726WD	323121	ESA	ACTUAL																										
8727WD	323121	ESA	SCHEMATIC																										
8728WD	323116	MOD. KIT	ACTUAL																										
8729WD	323116	MOD. KIT	SCHEMATIC																										
8764WD	1PCN03	ACTUAL																											
7.	<p>ASSOCIATED CABLES:</p> <table border="0"> <tr><td>155066</td><td>-</td><td>CABLE ASSEMBLY</td></tr> <tr><td>195353</td><td>-</td><td>CABLE ASSEMBLY</td></tr> <tr><td>333118</td><td>-</td><td>CABLE ASSEMBLY</td></tr> </table>	155066	-	CABLE ASSEMBLY	195353	-	CABLE ASSEMBLY	333118	-	CABLE ASSEMBLY																			
155066	-	CABLE ASSEMBLY																											
195353	-	CABLE ASSEMBLY																											
333118	-	CABLE ASSEMBLY																											
8.	<p>LEGEND:</p> <p>CL - CLEAR INSULATION</p> <p>DR - DRAIN LEAD</p>																												
9.	<p>S NUMBERS 61,351S 61,600S</p>																												
10.	X INDICATES SPLICE																												
11.	TERMINAL DESIGNATIONS ENCLOSED IN PARENTHESIS ARE FOR REFERENCE ONLY AND ARE NOT MARKED ON COMPONENTS																												
12.	USE SUITABLE TUBING OVER TERMINALS.																												
13.	CABLE 152468 (PART OF STUNT BOX) MAY BE CLIPPED AND DISCARDED.																												

MAGNET AND BASE ASSEMBLY (319230)

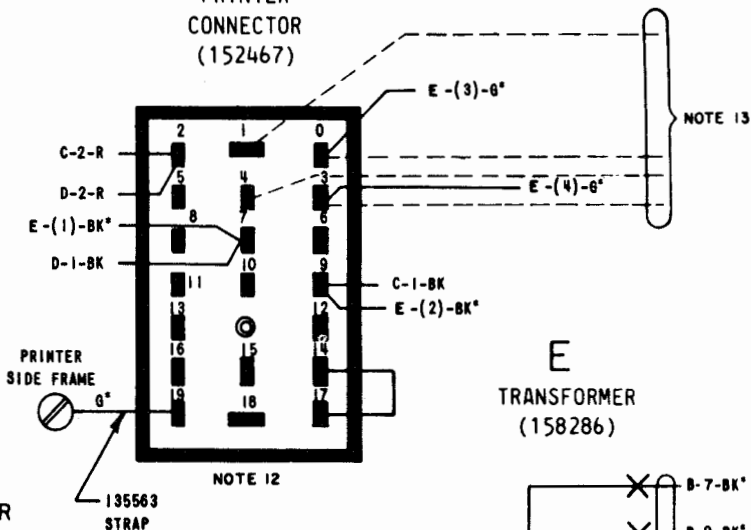


NOTE 8

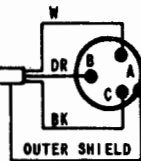
(B) SIGNAL BELL (159611)



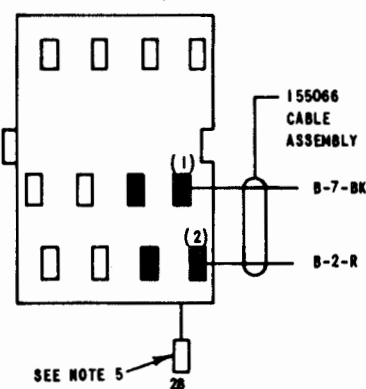
(F) PRINTER CONNECTOR (152467)



(A) (J103) MAGNET CONNECTOR



(C) STUNT BOX CONTACT ARRANGEMENT AY, AJG (172502)



(E) TRANSFORMER (158286)

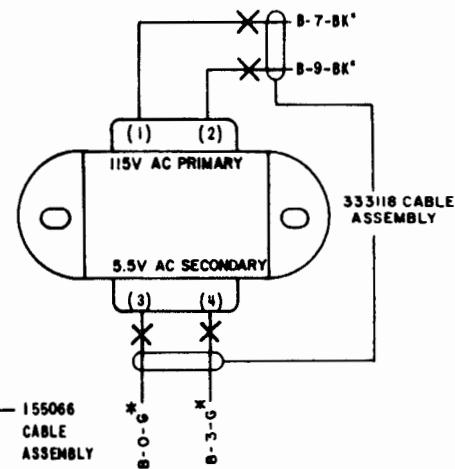
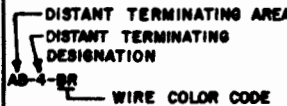



Figure 5-3. AN/UGC-20B Wiring Diagram (Sheet 2 of 4)

NO.	NOTES
1.	WIRING LEGEND : 
2.	COLOR CODE: BK - BLACK R - RED BL - BLUE Y - YELLOW BR - BROWN G - GREEN O - ORANGE W - WHITE S - SLATE P - PURPLE
3.	ASSOCIATED WIRING DIAGRAMS 8724 WD 323120 ESA ACTUAL 8725 WD 323120 ESA SCHEMATIC 8726 WD 323121 ESA ACTUAL 8727 WD 323121 ESA SCHEMATIC 8728 WD 323116 MOD KIT ACTUAL 8729 WD 323116 MOD KIT SCHEMATIC 8763 WD LP 156 ACTUAL
4.	 INDICATES SPLICE SOLDER AND TAPE
5.	CONNECTOR VIEWED FROM SOLDER END.
6.	USE 155755 INSULATING SLEEVE ON THE CONNECTOR TERMINALS AFTER SOLDERING.
7.	S NUMBER 61600S
8.	* DENOTES 18GA. ALL OTHER WIRES 24GA.
9.	151982 INCANDESCENT LAMP
10.	TERMINAL DESIGNATIONS ENCLOSED IN PARENTHESIS ARE FOR REFERENCE ONLY AND ARE NOT MARKED ON COMPONENTS.

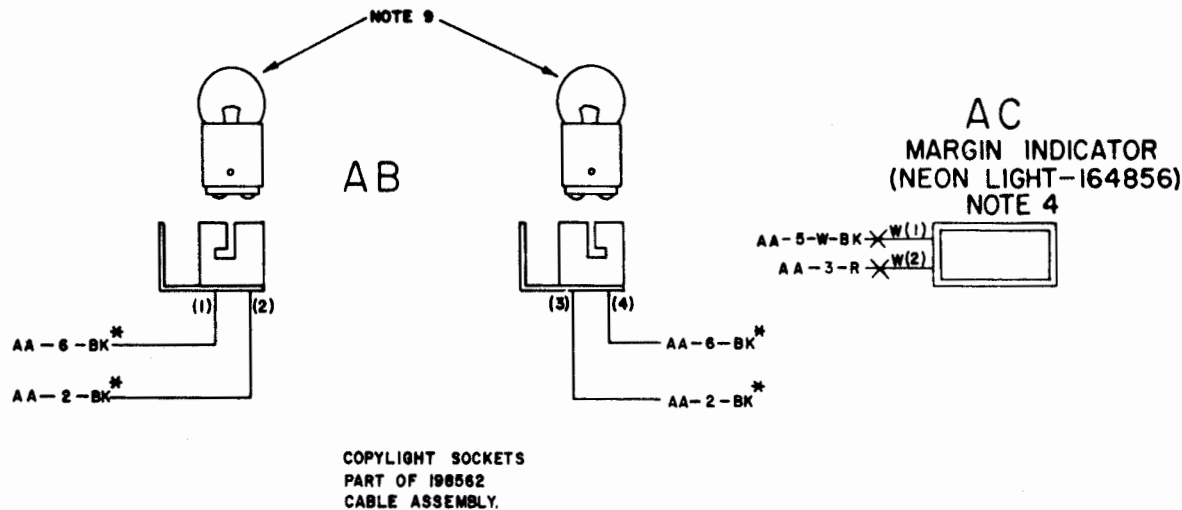
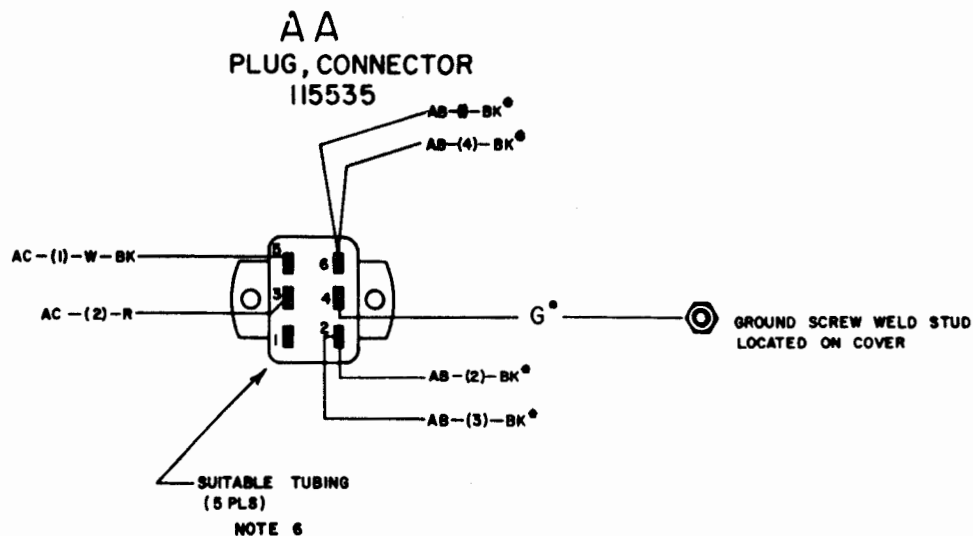
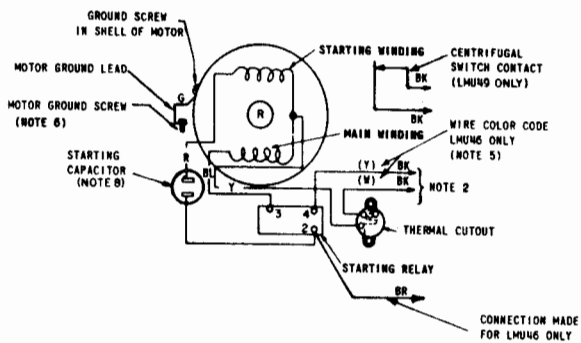


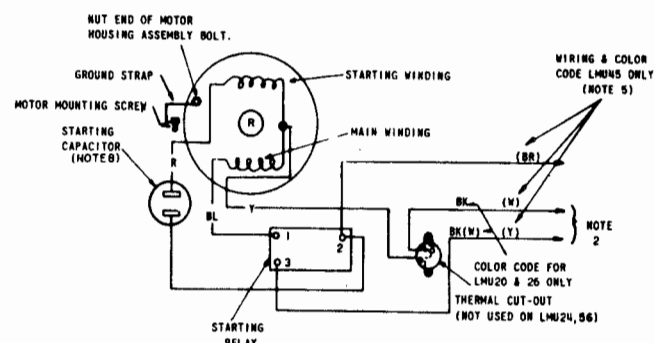
Figure 5-3. AN/UGC-20B Wiring Diagram
(Sheet 3 of 4)

SYNCHRONOUS MOTOR UNITS

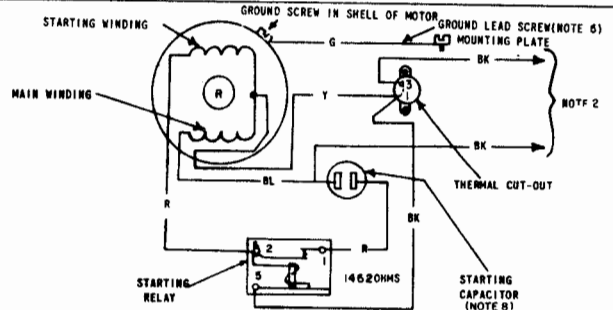
NO.	NOTES														
1.	SYNCHRONOUS MOTOR OPERATES ON REGULATED FREQUENCY ($\pm 0.75\%$) MAXIMUM AC ONLY.														
2.	CONNECT EITHER WIRE TO DESIGNATED TERMINALS OF UNIT TERMINAL BLOCK, PER WIRING DIAGRAM OF ASSOCIATED UNIT														
3.	MOTOR LEADS OF SAME COLOR ARE INTERCHANGEABLE.														
5.	EXTERNAL NOISE SUPPRESSION NETWORK CONSISTING OF 100 OHM, 1/2 WATT RESISTOR IN SERIES WITH 0.25 MFD 1K V CAPACITOR CONNECTED ACROSS YELLOW AND BROWN WIRES. (FOR LMUN5, N6)														
6.	MOTOR GROUND LEAD (GREEN) TERMINAL MUST BE FASTENED TO MOUNTING CRADLE OF MOTOR UNDER A SEPARATE GROUND SCREW ONLY. A SCREW USED FOR ANOTHER PURPOSE CANNOT BE USED FOR GROUNDING (UNDERWRITERS LABORATORIES REQUIREMENT).														
7.	WIRE COLOR CODE: BK - BLACK R - RED BL - BLUE O - ORANGE BR - BROWN Y - YELLOW P - PURPLE S - SLATE W - WHITE G - GREEN														
8.	<table border="1"> <thead> <tr> <th>LMU</th> <th>STARTING CAPACITOR VALUE</th> </tr> </thead> <tbody> <tr> <td>3, 15, 21, 30, 33, 36, 37, 38, 42, 46, 49, 54, 52</td> <td>43-48 MFD</td> </tr> <tr> <td>11, 12</td> <td>170-226 MFD</td> </tr> <tr> <td>35</td> <td>64-77 MFD</td> </tr> <tr> <td>55</td> <td>15-18 MFD</td> </tr> <tr> <td>19, 20, 24, 26, 31, 45, 56</td> <td>88-108 MFD</td> </tr> <tr> <td>50</td> <td>161-193 MFD</td> </tr> </tbody> </table>	LMU	STARTING CAPACITOR VALUE	3, 15, 21, 30, 33, 36, 37, 38, 42, 46, 49, 54, 52	43-48 MFD	11, 12	170-226 MFD	35	64-77 MFD	55	15-18 MFD	19, 20, 24, 26, 31, 45, 56	88-108 MFD	50	161-193 MFD
LMU	STARTING CAPACITOR VALUE														
3, 15, 21, 30, 33, 36, 37, 38, 42, 46, 49, 54, 52	43-48 MFD														
11, 12	170-226 MFD														
35	64-77 MFD														
55	15-18 MFD														
19, 20, 24, 26, 31, 45, 56	88-108 MFD														
50	161-193 MFD														



LMU 3, 11, 12, 15, 21, 30, 37, 42, 46, 49
 FOR USE WITH 115V AC 60~POWER SUPPLY
LMU 33, 36, 38, 51, 52
 FOR 115V AC 50~POWER SUPPLY
LMU 55
 FOR 230V AC 50~POWER SUPPLY



LMU 19, 20, 24, 26, 31, 45, 56
 FOR USE WITH 115V AC 60~POWER SUPPLY ONLY



LMU 50,
 FOR USE WITH 115V AC 50~POWER SUPPLY ONLY

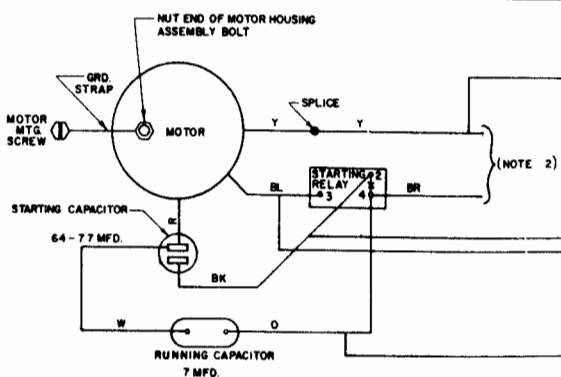
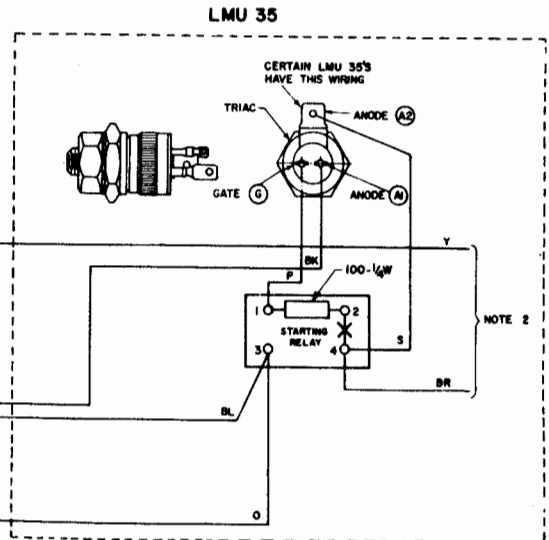


Figure 5-3. AN/UGC-20B Wiring Diagram (Sheet 4 of 4)

CHAPTER 6
CORRECTIVE MAINTENANCE

6-1. INTRODUCTION. This chapter provides information regarding adjustment and repair of the teletypewriter set.

SECTION I. ADJUSTMENTS

6-2. GENERAL. Adjustment procedures provided in this section are those required to be performed as a result of an abnormal indication in a mechanical check performance test (chapter 4), to correct a fault discovered during troubleshooting (chapter 5), or to be performed after reassembly (section II of this chapter).

6-3. KEYBOARD UNIT ADJUSTMENTS. The following paragraphs describe adjustments for the keyboard, base, distributor, and gears.

a. Shutter Window Gap.

Adjust shutter window gap as follows:

- (1) Refer to figure 6-1.
- (2) Press letters keytop to move all T levers to lowermost position.
- (3) Loosen two adjusting screws on shutter plate.
- (4) Lift up first and last shutter and adjust gap between upper edge of shutter windows and shutter plate (tolerance 0.065 to 0.075 inch).
- (5) Tighten two adjusting screws.

b. Universal Link Clearance. Adjust universal link clearance as follows:

(1) Refer to figure 6-2.

(2) Insert a screwdriver through the opening in front portion of frame and bend tab to obtain 0.096 inch clearance between universal link and frame (tolerance 0.089 to 0.103 inch).

c. Distributor Clutch Drum. Adjust distributor clutch drum as follows:

(1) Refer to figure 6-3.

(2) Loosen clutch drum mounting screw.

(3) Position clutch drum on its shaft to obtain 0.007 inch gap between ring and hub protrusion (tolerance 0.005 to 0.010 inch).

(4) Tighten clutch drum mounting screw.

(5) Manually bend drive arm until it is parallel to surface of drum assembly as gauged visually.

NOTE

Clutch shoe should fully engage drum after adjustment.

d. Distributor Clutch Shoe Lever Gap. Adjust clutch shoe lever gap as follows:

(1) Refer to figure 6-4.

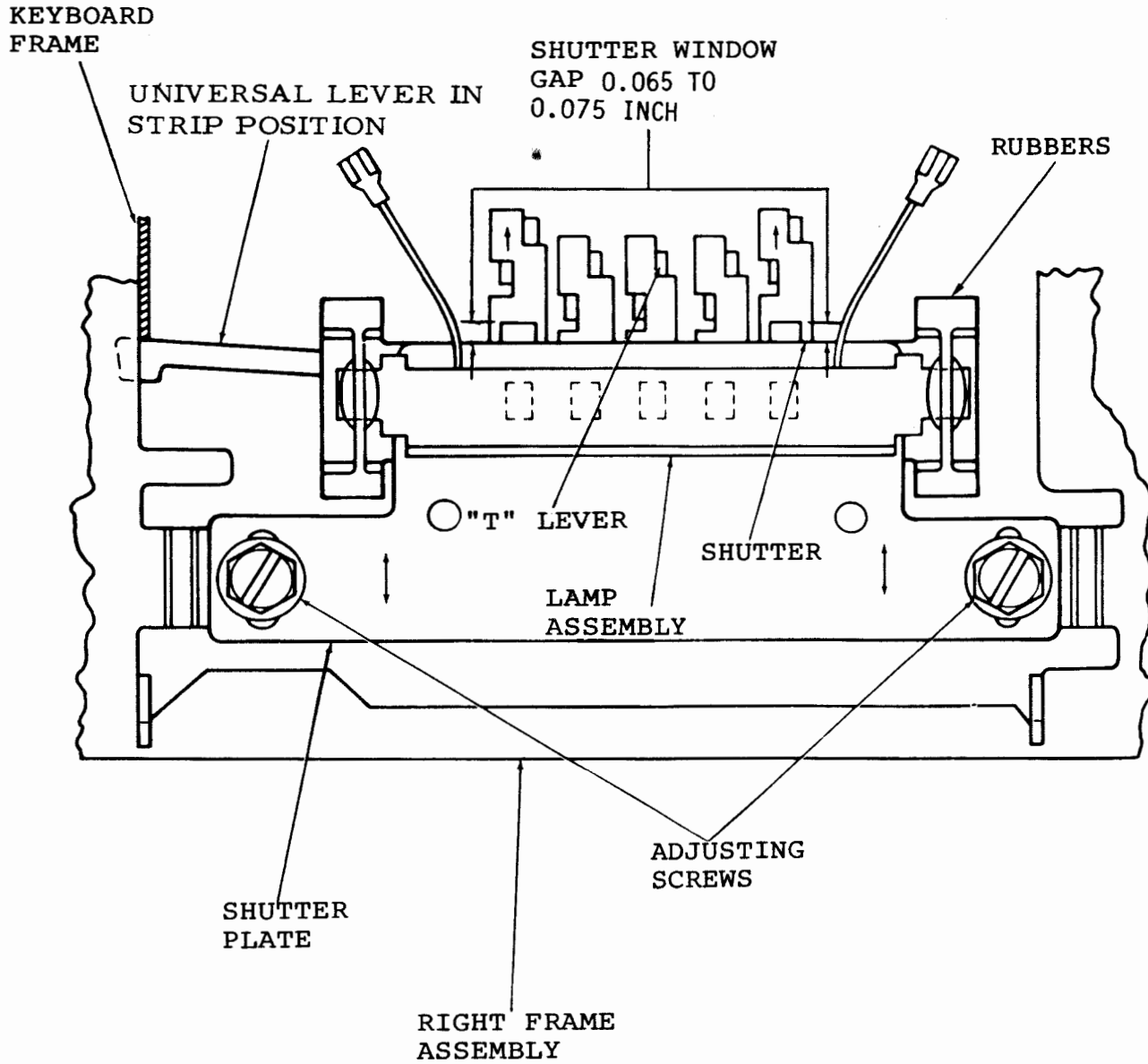


Figure 6-1. Keyboard Shutter Window Gap Adjustment

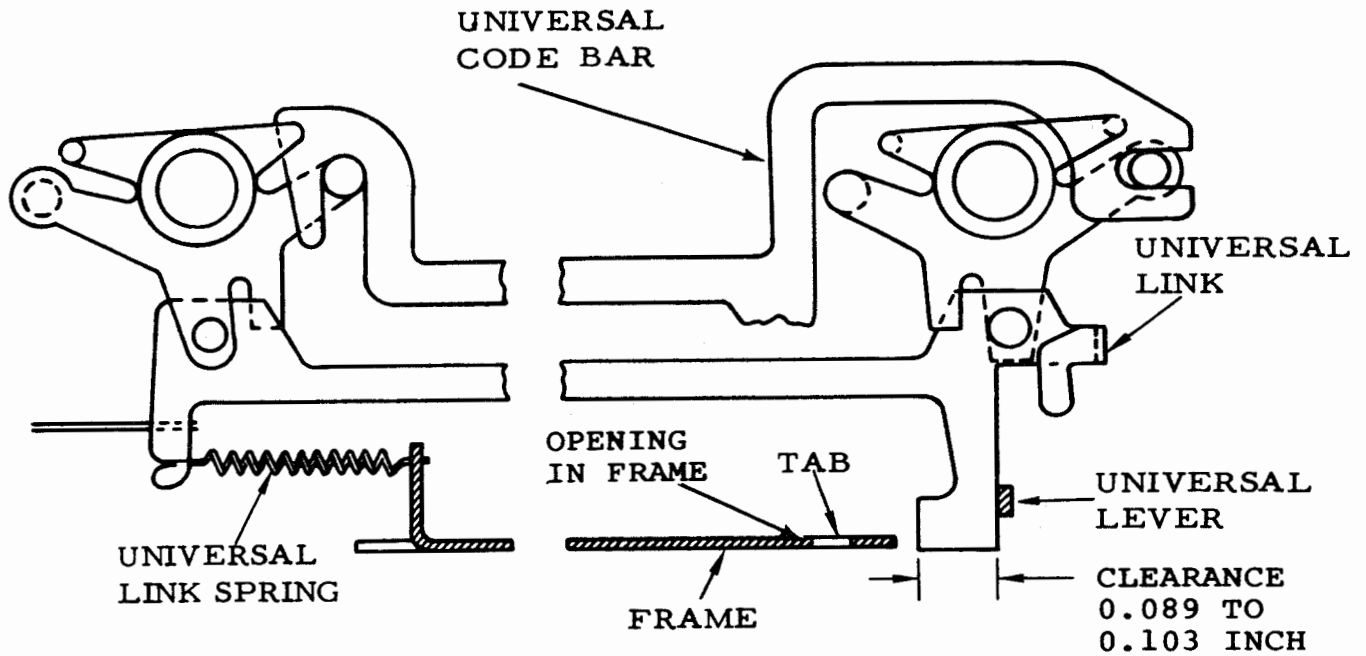


Figure 6-2. Keyboard Universal Link Clearance Adjustment

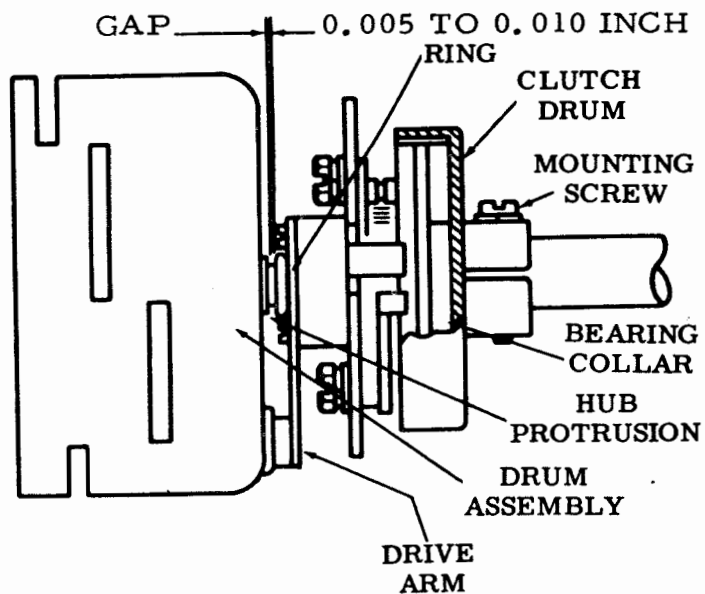


Figure 6-3. Distributor Clutch Drum Adjustment

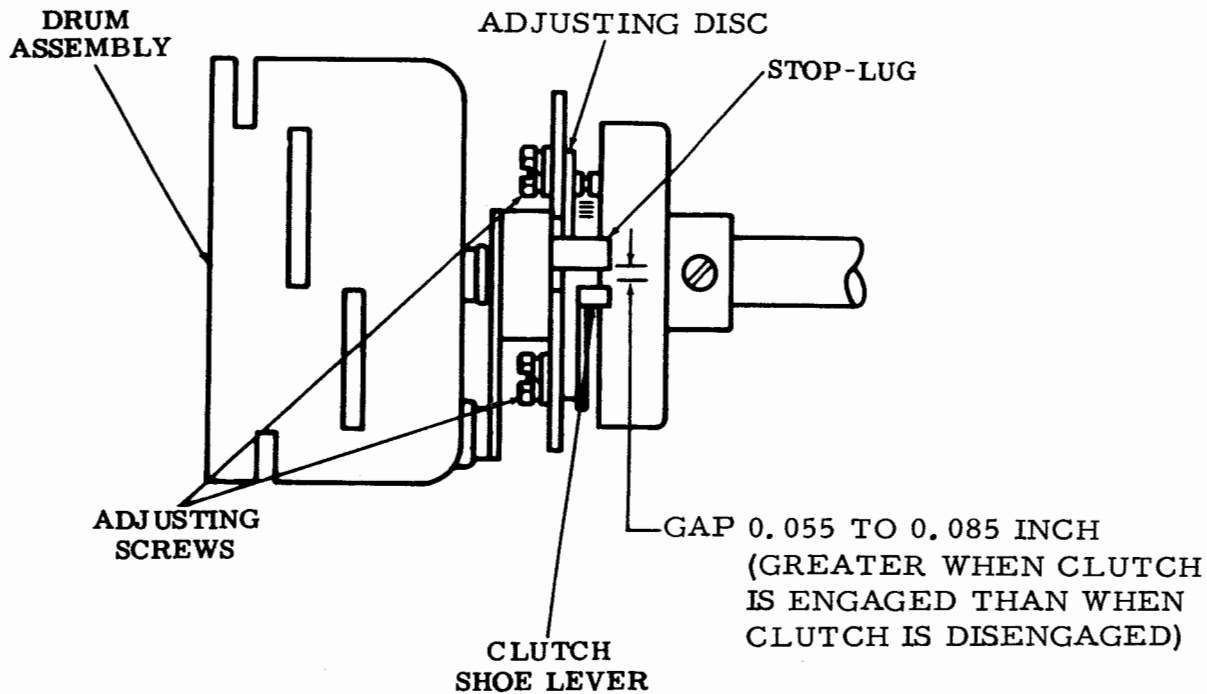


Figure 6-4. Distributor Clutch Shoe Lever Adjustment

(2) Disengage clutch and measure gap between clutch shoe lever and its stop lug.

(3) Engage clutch; loosen both adjusting screws, and rotate adjusting disc until gap measures 0.055 inch to 0.085 inch greater than measurement in step (2).

(4) Tighten both adjusting screws.

NOTE

For 100 wpm operation the gap must be set to 0.075 inch.

e. Distributor Clutch Trip Lever Engagement. Adjust clutch trip lever as follows:

(1) Refer to figure 6-5.

(2) Disengage distributor clutch.

(3) Rotate eccentric post until clutch trip lever engages clutch shoe lever by full thickness of clutch shoe lever.

f. Distributor Clutch Magnet Plate. Adjust gap between latch bail and trip lever on magnet plate as follows:

(1) Refer to figure 6-6.

(2) Disengage distributor clutch.

(3) Set control lever in REMOTE position.

(4) Ensure latch bail is against armature.

(5) Loosen both mounting screws.

(6) By moving pry points, adjust gap between latch bail and trip lever to

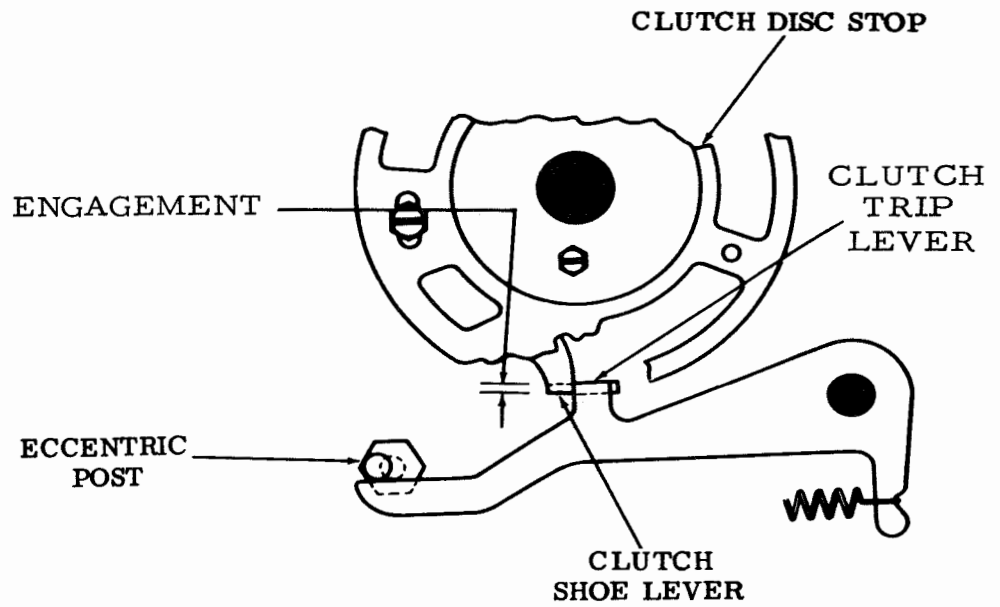


Figure 6-5. Distributor Clutch Trip Lever Engagement

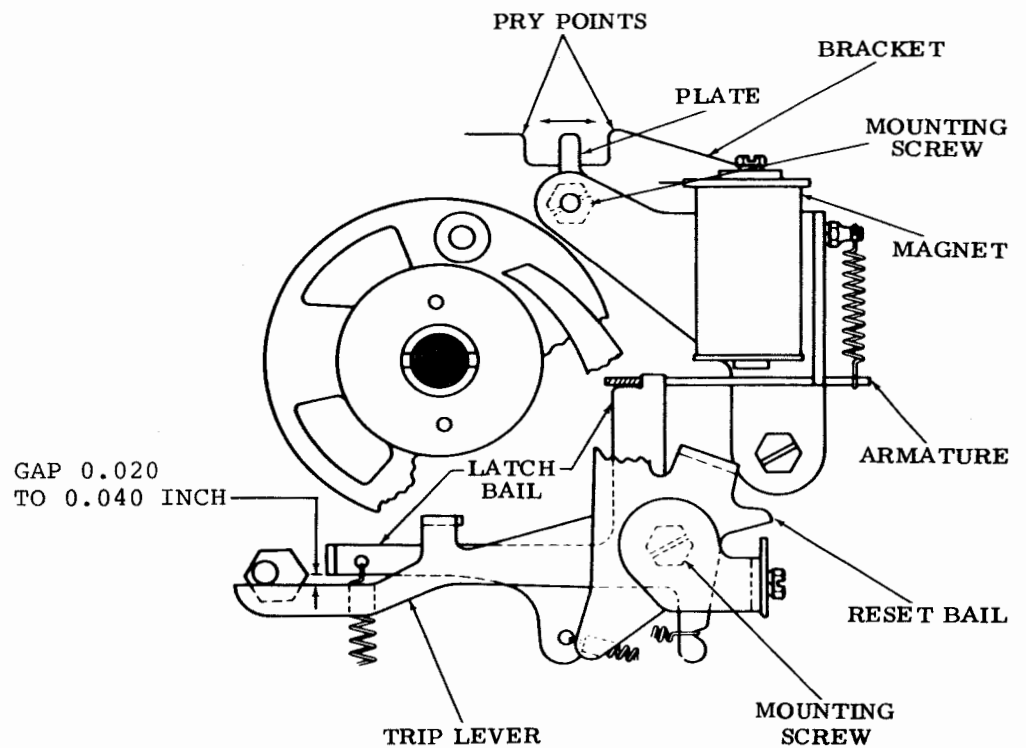


Figure 6-6. Distributor Clutch Magnet Plate Adjustment

0.030 inch (tolerance 0.020 to 0.040 inch).

g. Distributor Gear Backlash. Adjust backlash between pinion gear and driven gear as follows:

- (1) Refer to figure 6-7.
- (2) Loosen four adjusting screws.
- (3) Position distributor assembly so that backlash between pinion gear and driven gear is barely perceptible when driven gear is rotated back and forth.

NOTE

When making backlash adjustment, distributor shaft and pinion gear shaft should be kept parallel.

(4) Tighten four adjusting screws.

h. Distributor Reset Lever Clearance. Adjust clearance between latch lever and reset lever and between the base and the distributor and keyboard links as follows:

- (1) Refer to figure 6-8.
- (2) With distributor rotated so that roller contacts reset bail at high point of travel, measure gaps between latch lever and reset lever, and between base and links.
- (3) Loosen two adjusting screws.
- (4) Position the distributor and keyboard links so that clearance between the base and links is 0.070 inch (tolerance 0.050 to 0.090 inch) and clearance between latch lever and reset lever is

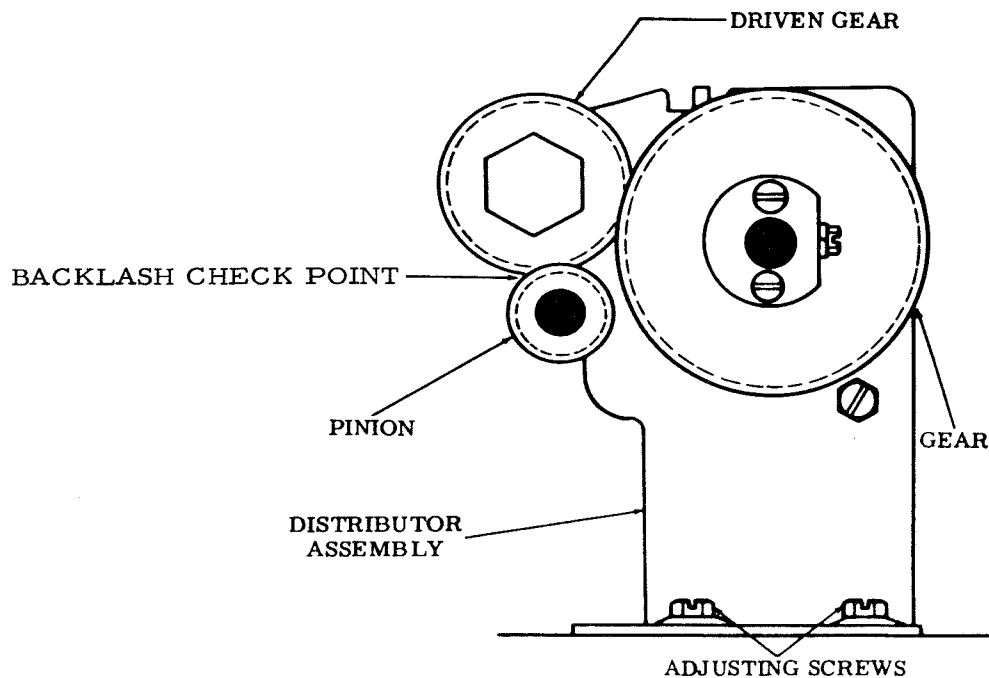


Figure 6-7. Distributor Gear Backlash Adjustment

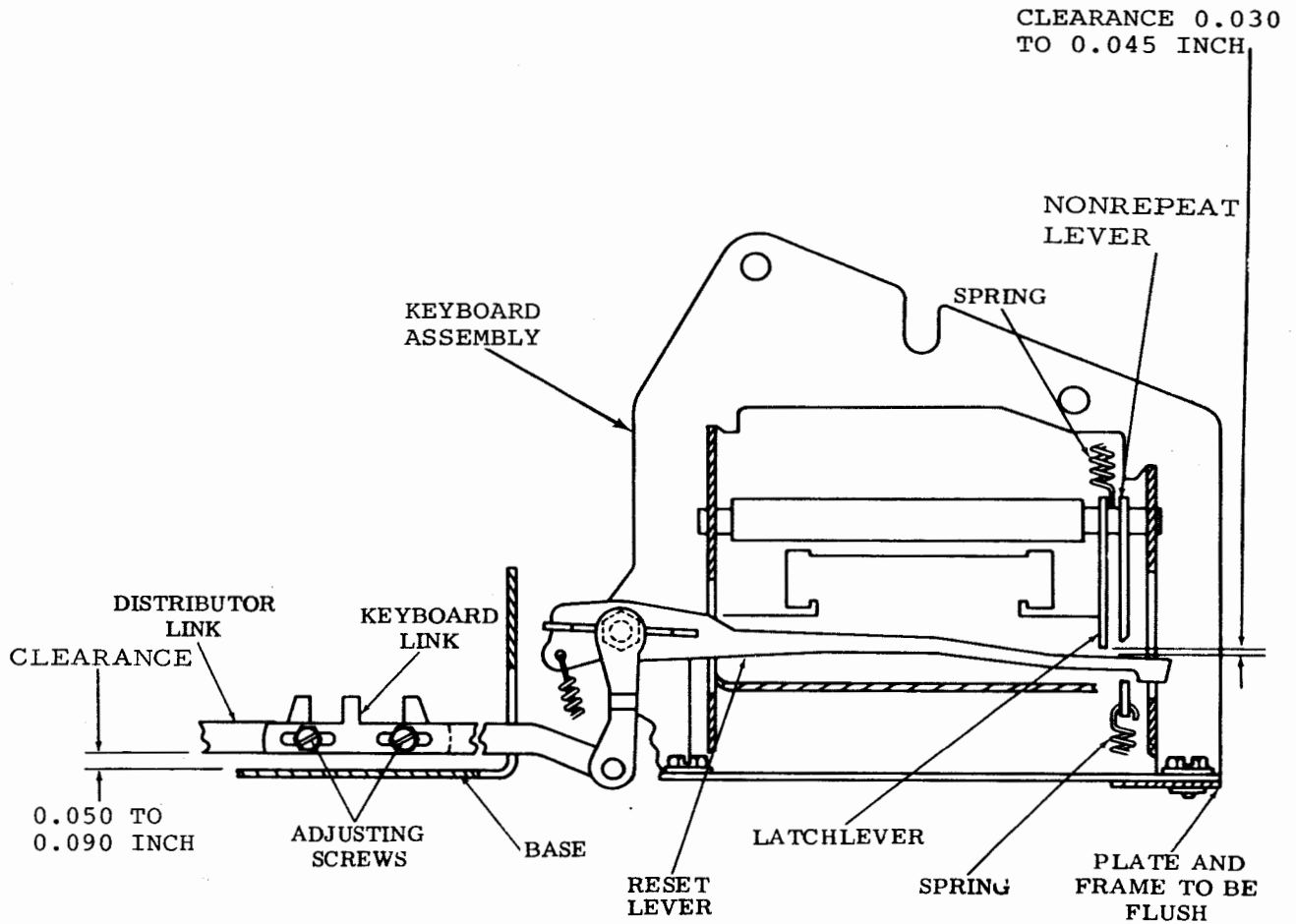


Figure 6-8. Distributor Reset Lever Clearance Adjustment

0.037 inch (tolerance 0.030 to 0.045 inch).

(5) Tighten two adjusting screws.

i. Distributor Latch Bail Clearance. Adjust clearance between armature tab and latch bail as follows:

- (1) Refer to figure 6-9.
- (2) Disengage clutch.
- (3) Ensure keyboard is reset.
- (4) Set control lever in REMOTE position.
- (5) Insert a 0.015 inch gage between bottom of armature and latch bail (tolerance 0.010 to 0.018 inch).
- (6) Loosen mounting screw.
- (7) Move adjusting plate to contact reset bail.
- (8) Tighten mounting screw.

j. Distributor Clutch Trip Armature Air Gap. Adjust clutch trip armature air gap as follows:

- (1) Refer to figure 6-10.
- (2) Loosen spring post and hinge mounting screw.
- (3) Position hinge bracket to attain 0.006 inch clearance between armature and magnet bracket. (Tolerance 0.004 to 0.008 inch.)

k. Distributor Latch Bail Spring. Adjust latch bail spring as follows:

- (1) Refer to figure 6-11.
- (2) Attach spring scale to latch bail: it should require from 3 ounces to 4 ounces force to induce movement; if not, replace spring.

l. Distributor Latchlever Spring. Adjust latchlever spring as follows:

- (1) Refer to figure 6-11.
- (2) Attach spring scale hook as shown; it should take from 2-1/2 ounces to 4 ounces pressure to move latchlever; if not, replace spring.

m. Distributor Magnet Blocking Lever Spring. Adjust magnet blocking lever spring as follows:

- (1) Refer to figure 6-12.
- (2) Attach spring scale hook to magnet blocking lever and measure force required to start blocking lever moving.
- (3) The force should be between 20 and 26 ounces.
- (4) If not within limits, replace spring.

n. Distributor Armature Spring. Adjust distributor armature spring as follows:

- (1) Refer to figure 6-13.
- (2) Unhook spring from post.

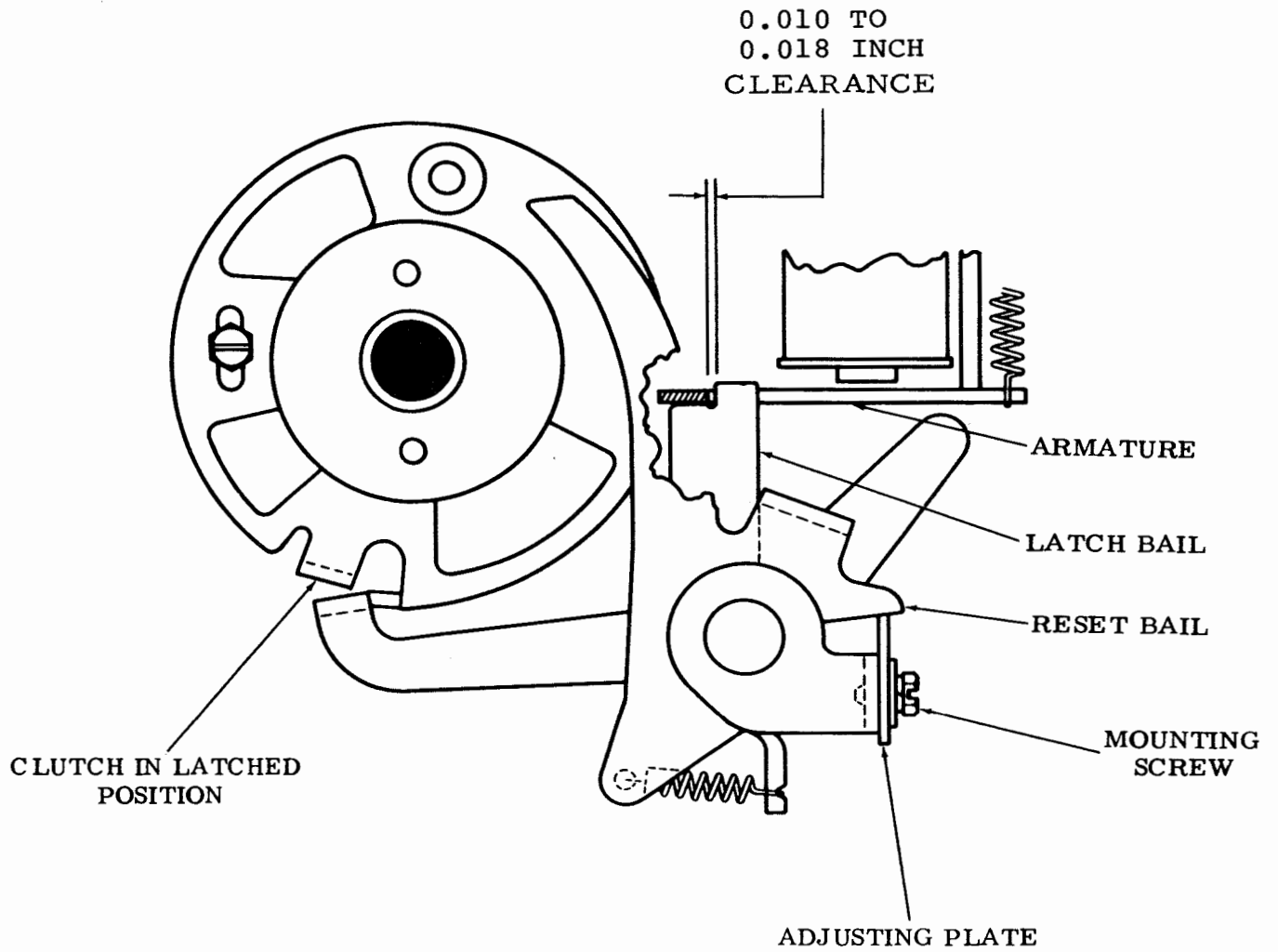
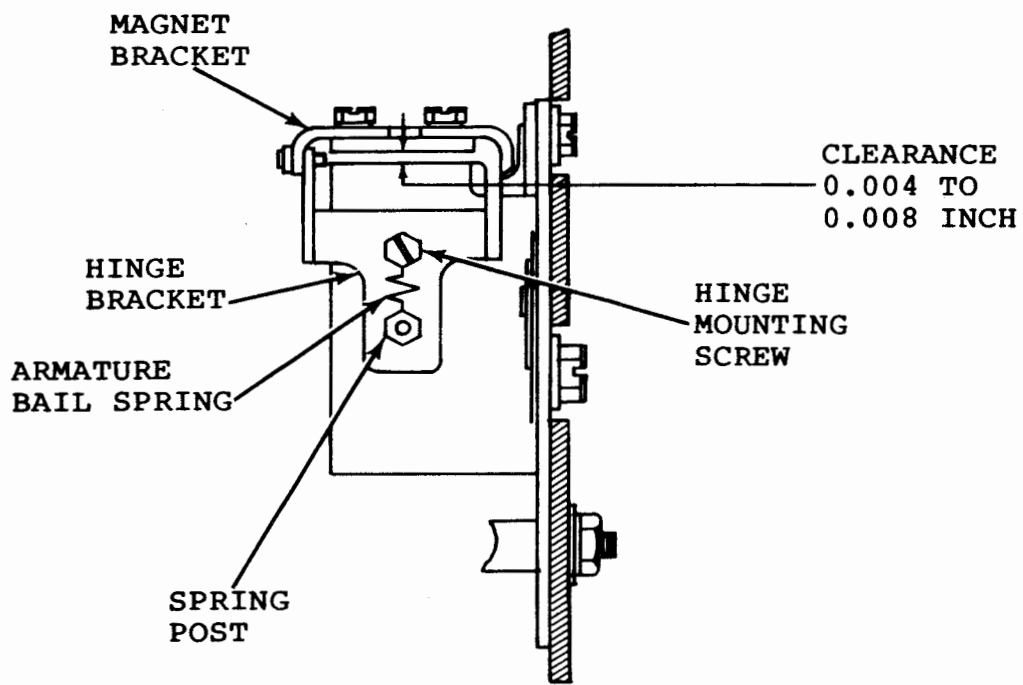


Figure 6-9. Distributor Latch Bail
Clearance Adjustments



(REAR VIEW)

Figure 6-10. Distributor Clutch Trip Armature Air Gap

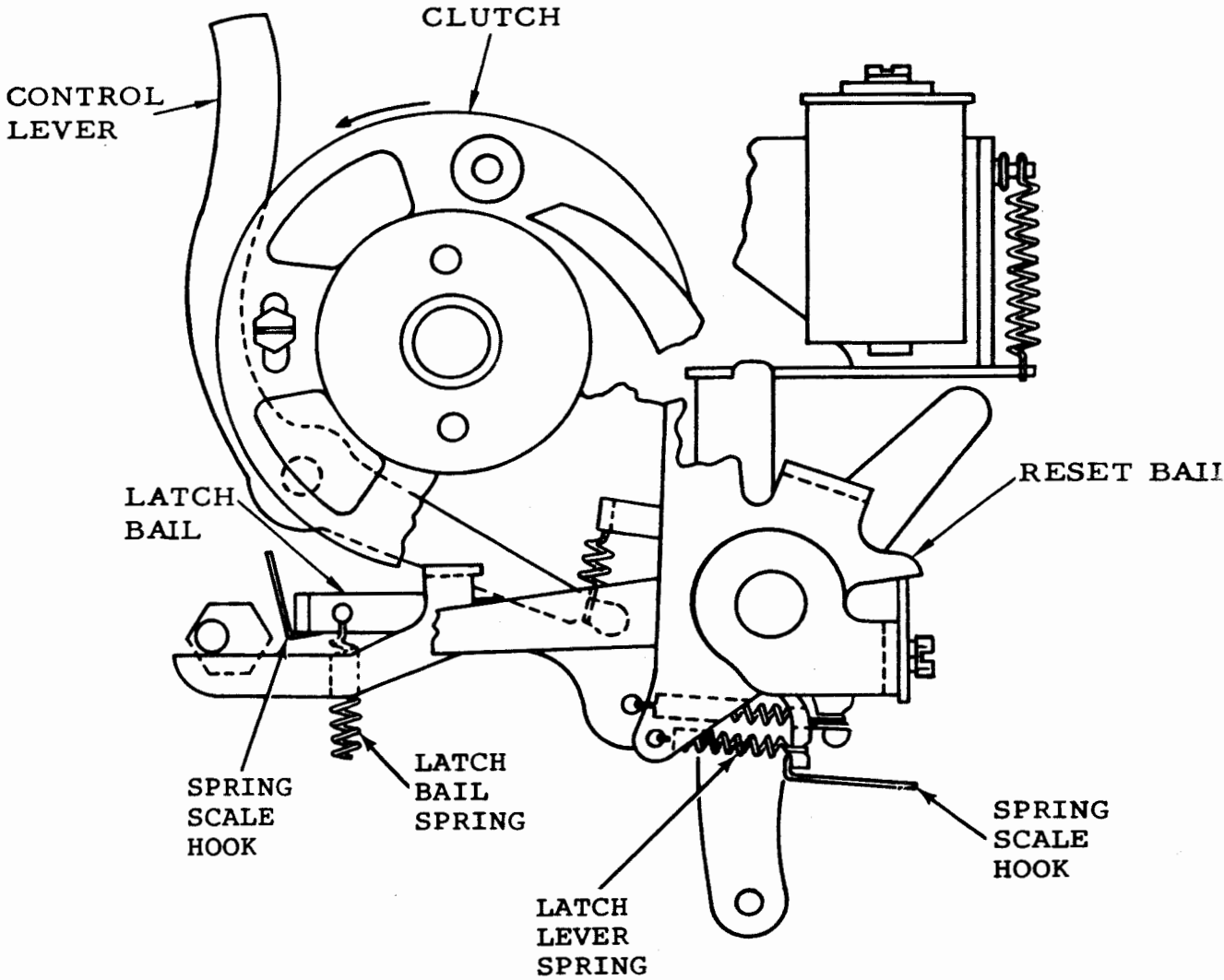


Figure 6-11. Latch Bail and Latch Lever Spring Adjustment

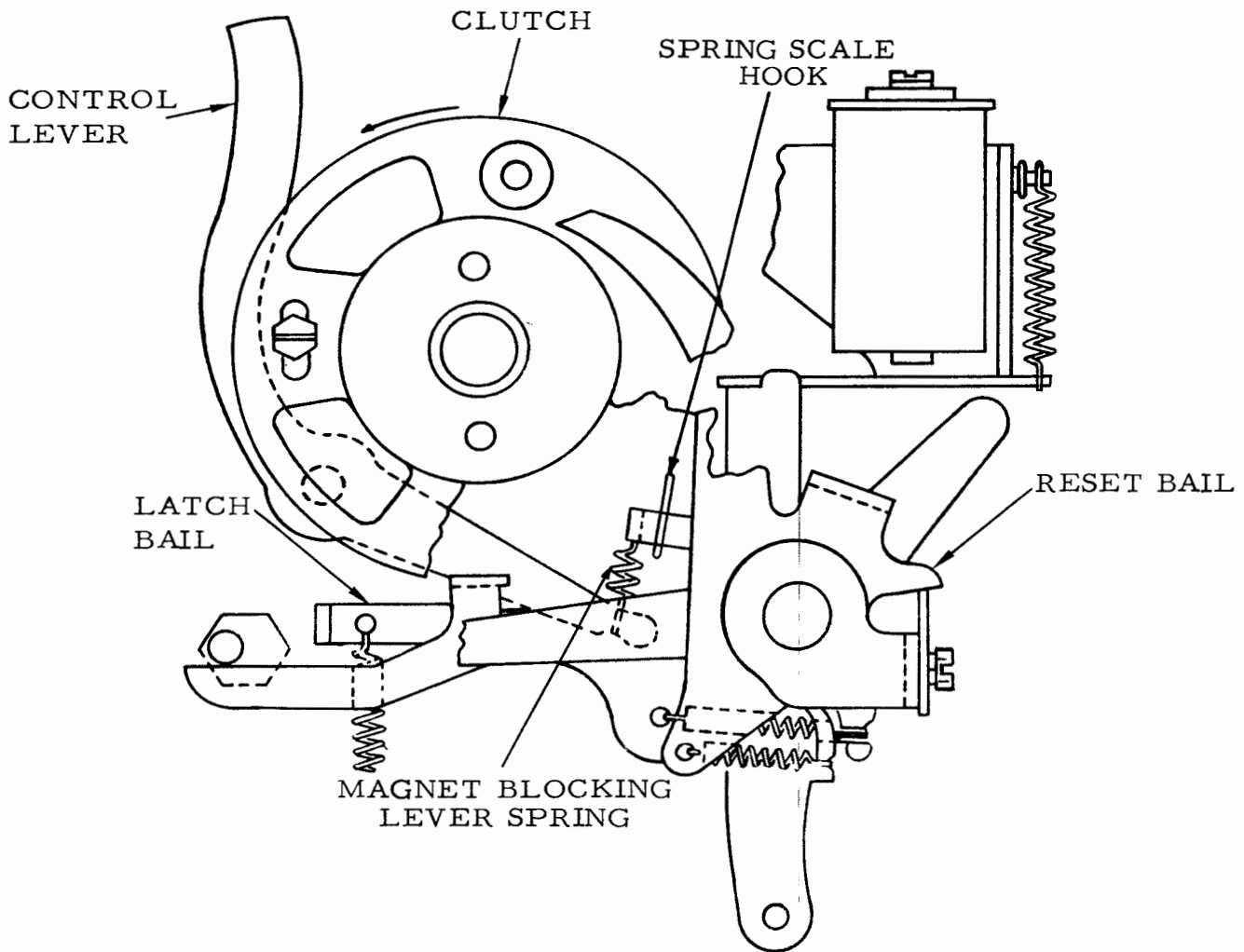


Figure 6-12. Distributor Magnet Blocking Lever Spring Adjustment

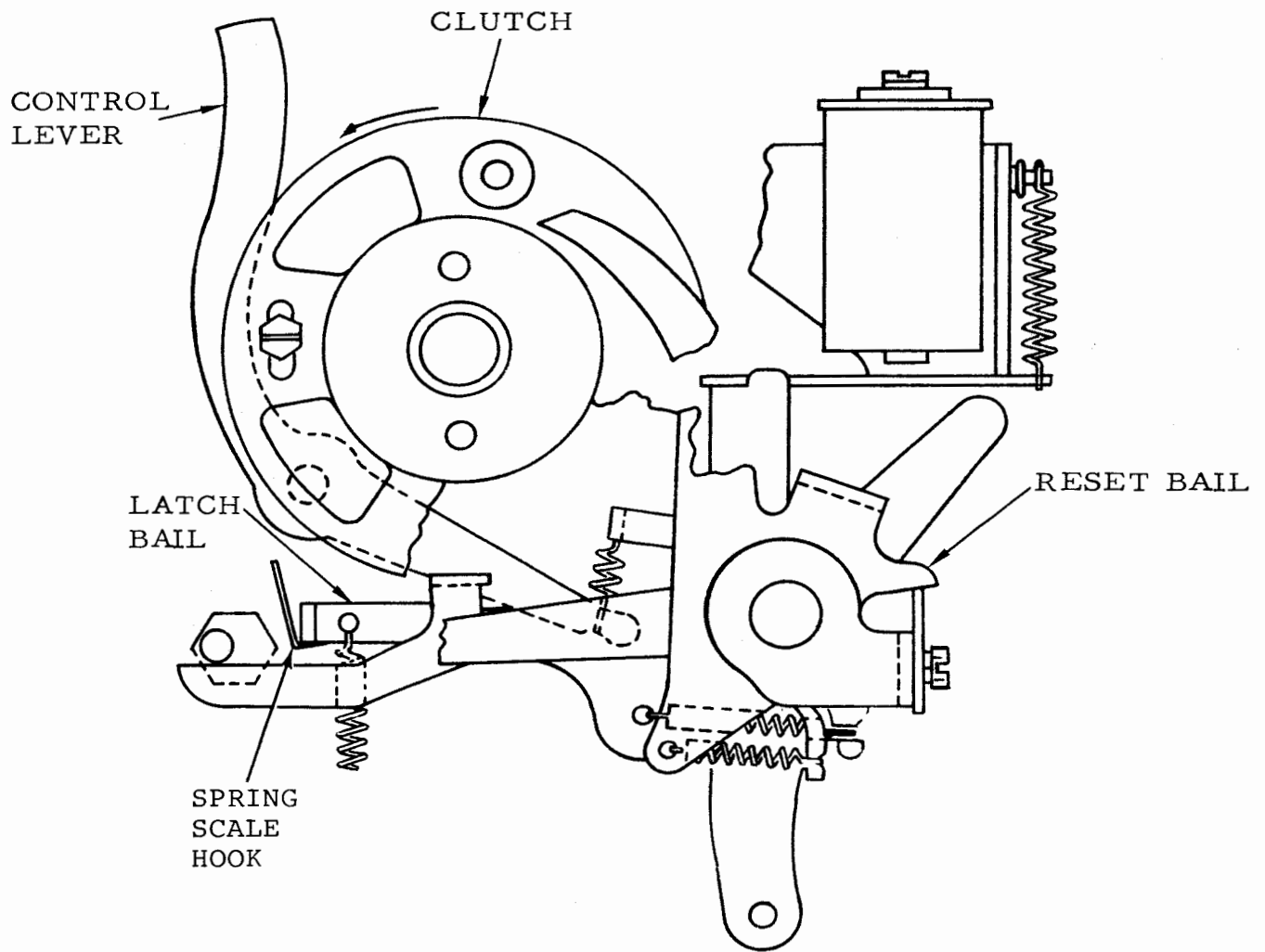


Figure 6-13. Distributor Armature Spring Adjustment

(3) To pull spring to installed length should require 6 ounces minimum to 7-1/2 ounces maximum.

o. Distributor Clutch Shoe Lever Spring. Adjust clutch shoe lever spring as follows:

(1) Refer to figure 6-14.

(2) With clutch engaged, hold cam disc to prevent turning.

(3) With spring scale pulled at tangent to clutch, it should require from 15 ounces to 20 ounces force to move shoe lever into contact with lug on clutch disc.

p. Distributor Clutch Shoe Spring. Adjust clutch shoe spring as follows:

NOTE

The following adjustment should not be made unless there is good reason to suspect maladjustment, since adjustment requires removal of clutch from shaft.

(1) Refer to figure 6-15.

(2) Remove clutch drum from shaft.

(3) Attach spring scale to primary shoe tangent to friction surface: it should require from 3 ounces to 5 ounces force to move primary shoe from contact with secondary shoe.

q. Distributor Trip Lever Spring. Adjust trip lever spring as follows:

(1) Refer to figure 6-16.

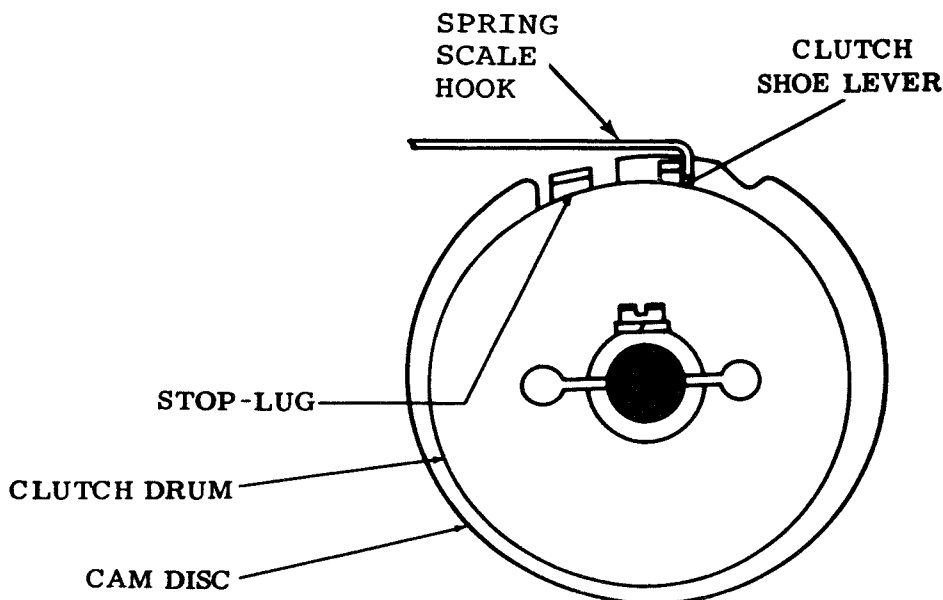


Figure 6-14. Distributor Clutch Shoe Lever Spring Adjustment

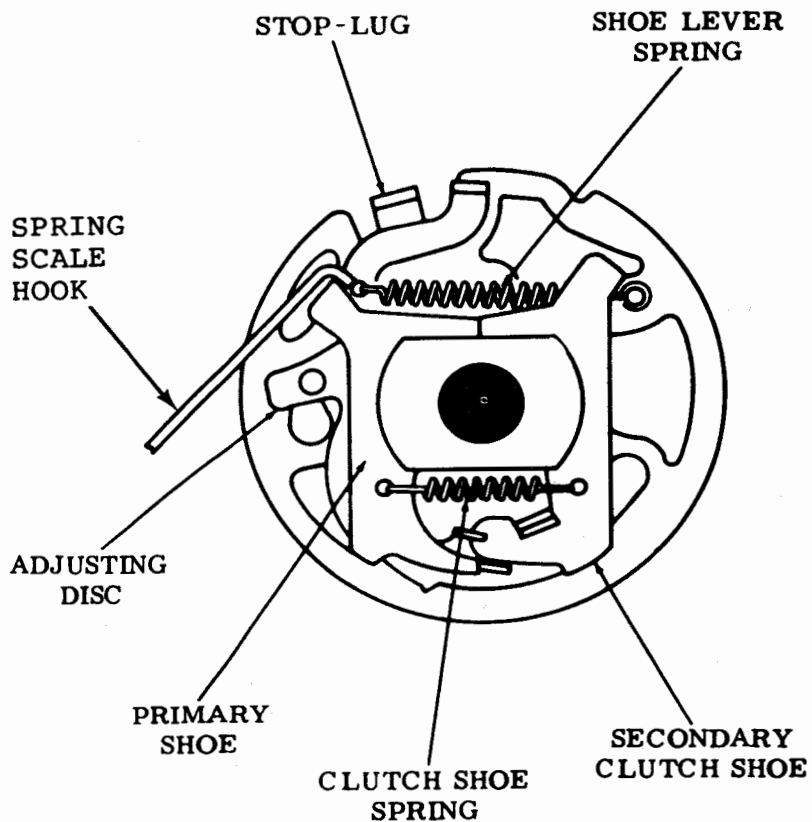


Figure 6-15. Distributor Clutch Shoe Spring Adjustment

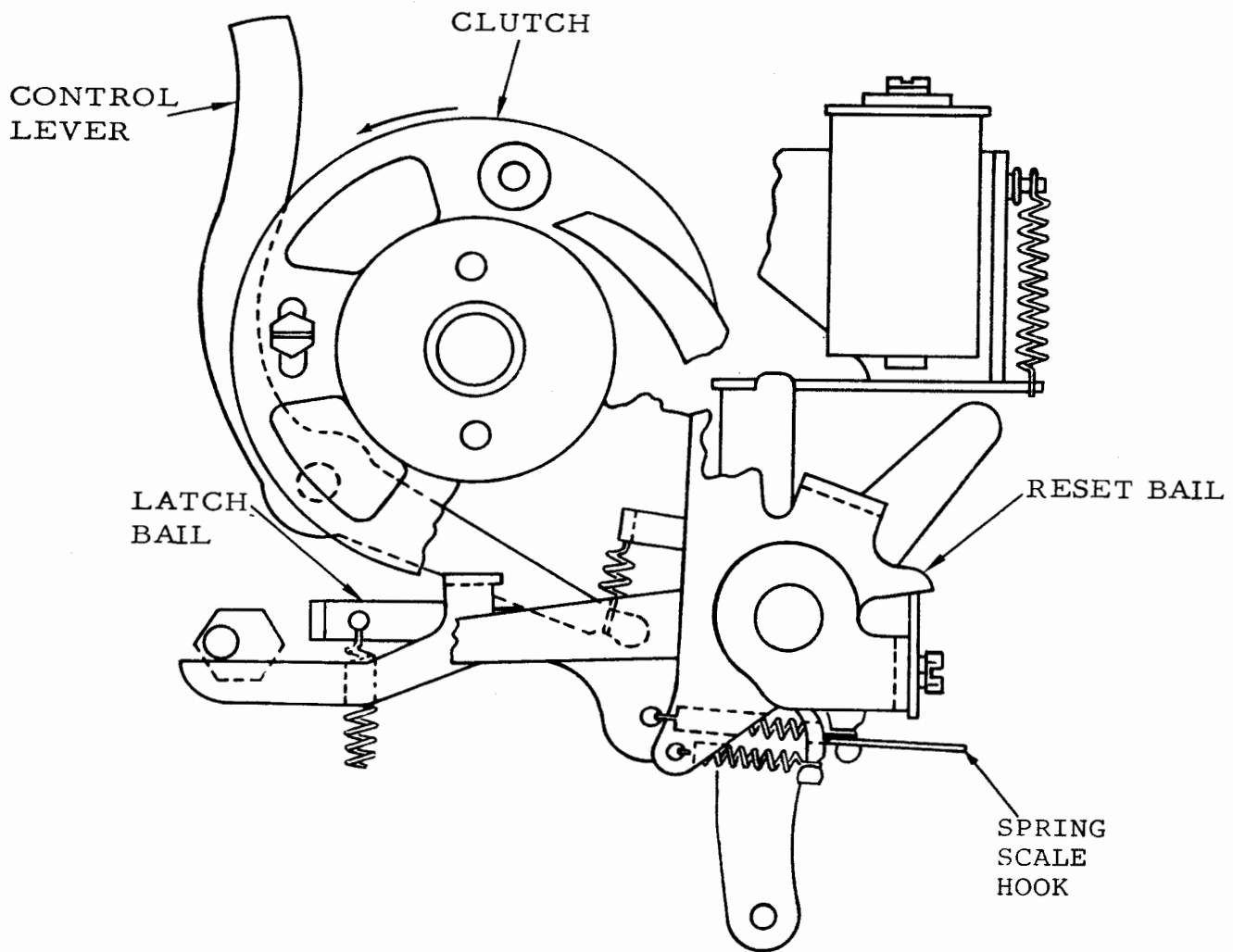


Figure 6-16. Distributor Trip Lever Spring Adjustment

(2) Attach spring scale as shown; it should require from 3 ounces to 5 ounces to move trip lever.

r. Keyboard Universal Link Spring. Adjust universal link spring as follows:

(1) Refer to figure 6-17.

(2) With keyboard tripped, attach spring scale as shown; it should require from 1/2 ounces to 1-1/4 ounces to move universal link.

6-4. TYPING UNIT ADJUSTMENTS.
The following paragraphs describe the adjustments for the typing unit.

NOTE

At the start of each of the following adjustments, completely disengage all clutches, using an armature clip on selector armature.

a. Range Finder Knob Phasing. Adjust range finder knob phasing as follows:

(1) Refer to figure 6-18.

(2) Rotate knob to either counterclockwise or clockwise stop point.

(3) Remove mounting nut and disengage knob from rack.

(4) Position knob so that 0 on range scale is at index.

(5) Engage knob with rack and replace mounting nut.

(6) Rotate knob to set 60 on range scale at index.

b. Selector Clutch Stop Arm. Adjust selector clutch stop arm as follows:

(1) Refer to figure 6-18.

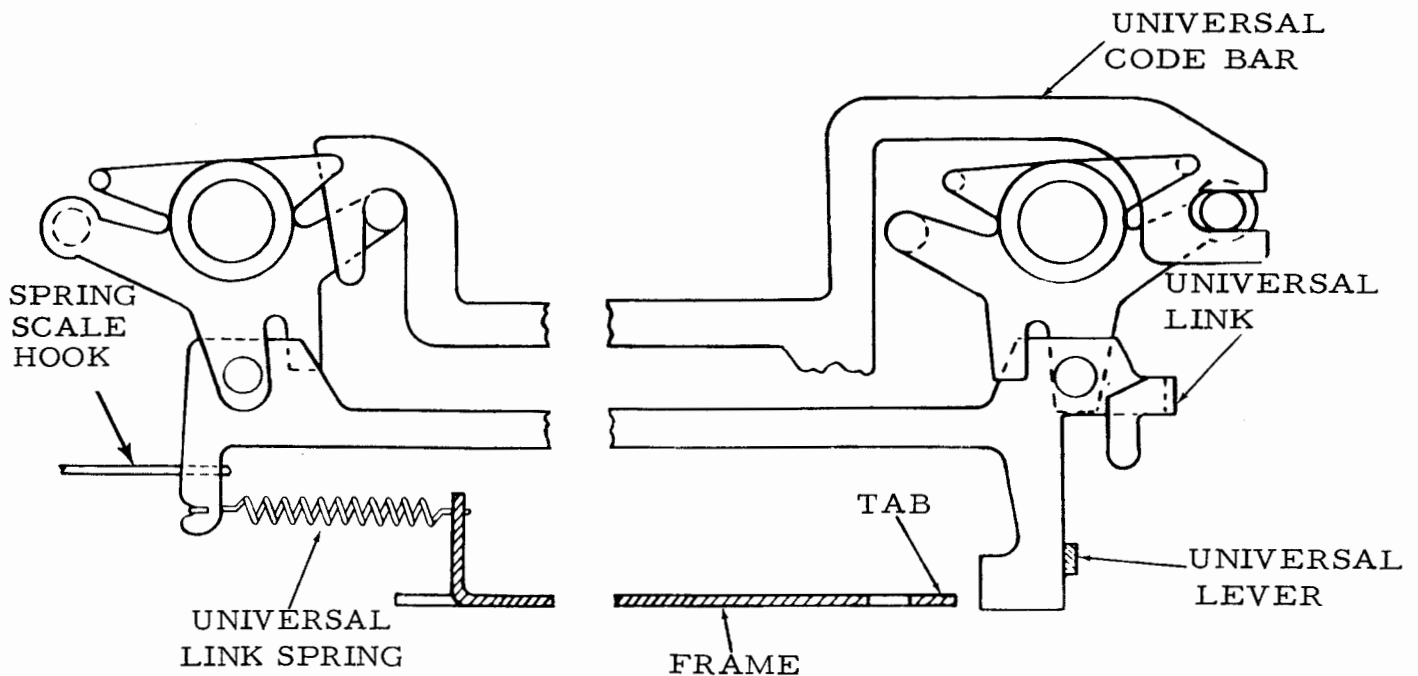


Figure 6-17. Keyboard Universal Link Spring Adjustment

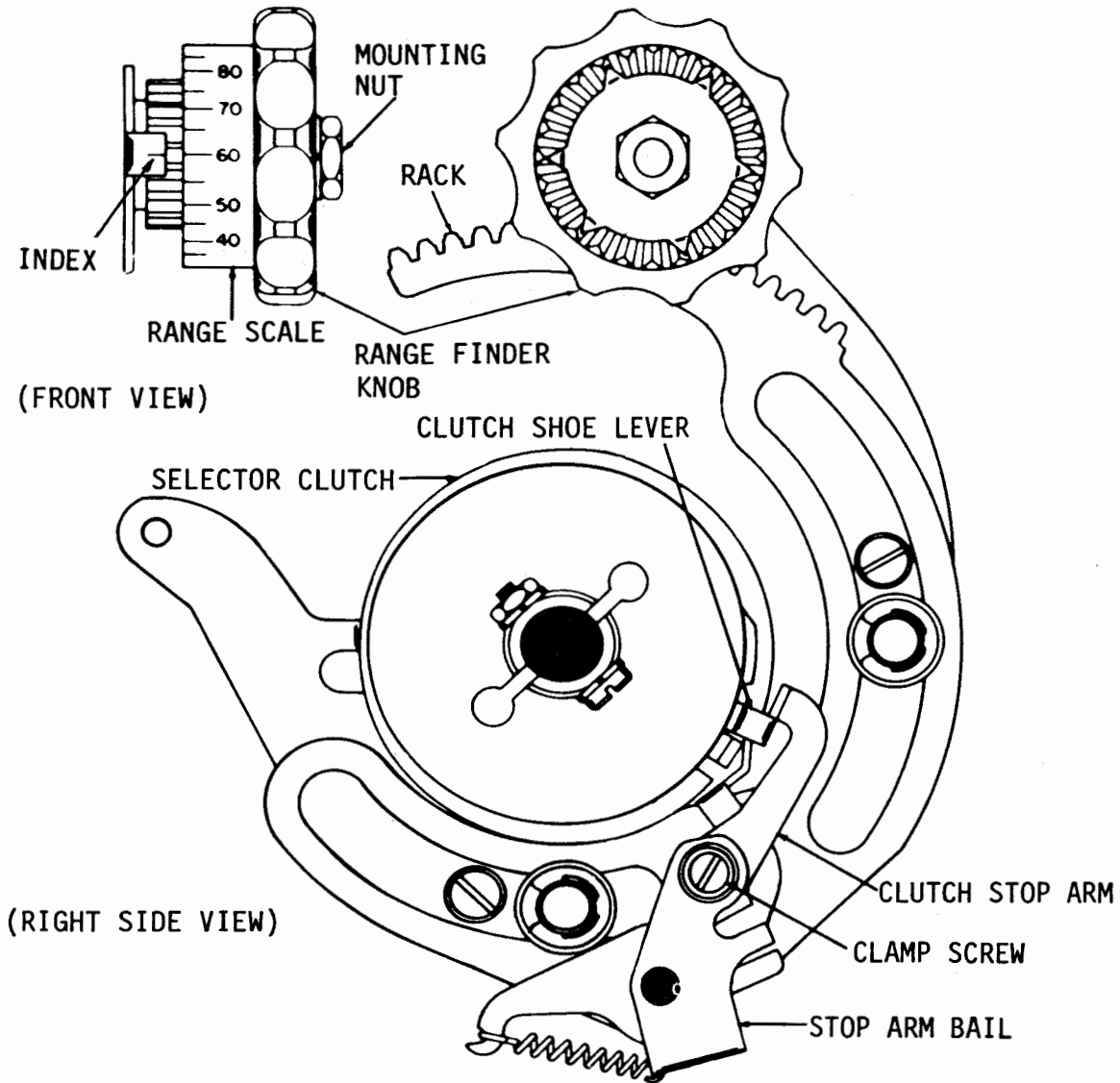


Figure 6-18. Range Finder Knob Phasing and Selector Clutch Stop Arm Adjustment

- (2) Loosen clamp screw.
- (3) Position stop arm bail so that stop arm engages clutch shoe lever by approximately the full thickness of shoe lever.

- (4) Tighten clamp screw.

c. Selector Armature Alignment. Align selector armature as follows:

- (1) Refer to figure 6-19.
- (2) Armature spring should have enough initial tension to hold armature against pivot edge of casting.
- (3) Loosen mounting screws.
- (4) Position armature so that clearance between front edge of armature

and pole piece, and inside of downstop bracket is 0.010 inch.

- (5) Rear edge of armature should be flush (within 0.010 inch) with rear edge of pole pieces.

d. Selector Armature Spring. Adjust selector armature spring as follows:

- (1) Refer to figure 6-20.
- (2) Apply spring scale as nearly vertical as possible to end of armature extension. It should require from 1-3/4 ounces to 2-1/4 ounces pressure to pull armature to marking position.
- (3) Adjust by rotating adjusting screw: clockwise to increase spring tension; counterclockwise to decrease tension.

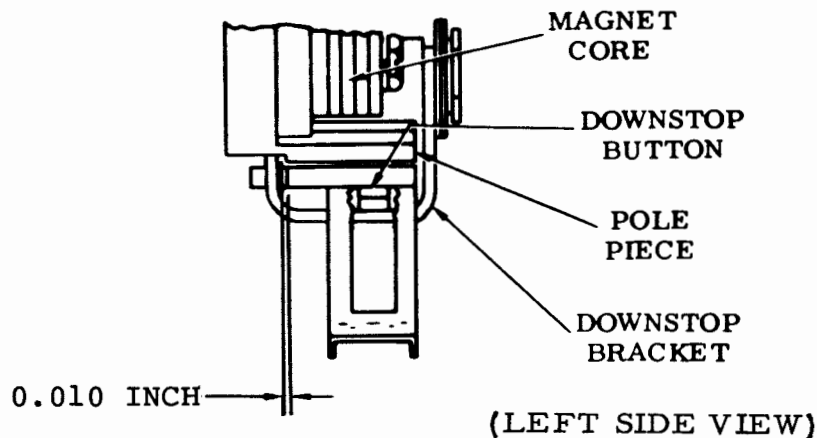


Figure 6-19. Selector Armature Alignment

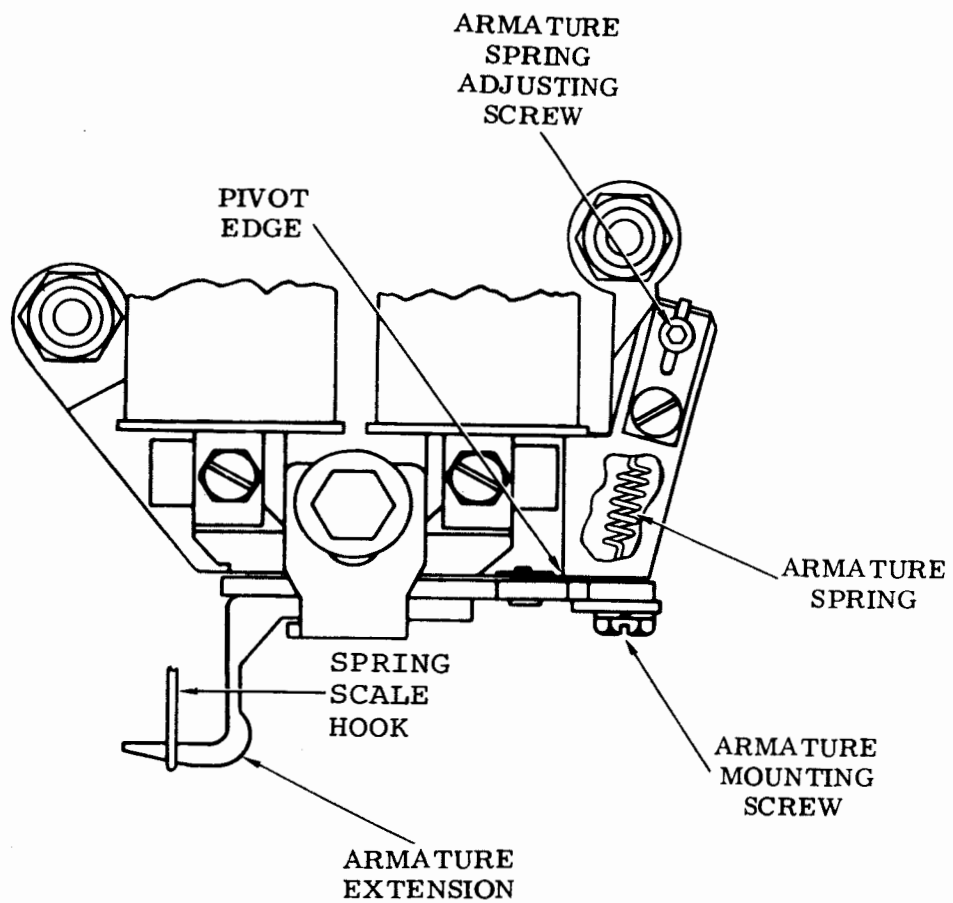


Figure 6-20. Selector Armature Spring Adjustment

NOTE

Spring tensions given will permit operation of printer prior to measurement of receiving margins. Refine spring tension for maximum selector performance with unit connected to specific circuit in which it is to function (operating at desired speed and line current).

e. Selector Mechanism.

To facilitate selector mechanism adjustments, proceed as follows:

(1) Refer to figure 6-21.

(2) Remove the selector cam-clutch assembly and range finder assembly in accordance with disassembly and reassembly procedures in paragraph 6-61(8).

(3) Remove the metallic container (base and cover) which houses the selector magnets by unscrewing the magnet and base assembly mounting post from its associated nut plate (figure 6-21).

(4) The metallic container and enclosed selector magnets will detach from the selector mounting plate as an assembly.

(5) Detach the coil mounting bracket from the base by removing the coil mounting bracket nuts.

f. Selector Armature.

Adjust the selector armature as follows:

(1) Refer to figure 6-22.

(2) With the magnet assembly deenergized and removed

from its base, and the armature resting against its downstop, loosen downstop mounting screw friction tight.

(3) Position downstop to establish clearance between the end of armature and left edge of left pole piece: 0.025 inch minimum to 0.030 inch maximum.

(4) Loosen mounting screws.

(5) Position armature so that its left edge is flush (within 0.010 inch) with the left edge of the left pole piece.

g. Selector Base (Magnets Energized). Adjust selector base as follows:

(1) Refer to figure 6-23.

(2) With the spacing locklever on high part of cam, and armature in contact with left pole piece, loosen two magnet and base mounting posts friction tight. (Use a 1/16 inch hex wrench.)

(3) Adjust lower right eccentric so that clearance between end of armature extension and shoulder of spacing locklever should be between 0.020 inch minimum and 0.035 inch maximum.

(4) Adjust upper left eccentric so that clearance between upper surface of armature extension and upper step of spacing locklever is some (minimum) to 0.003 (maximum), when locklever is held downward.

h. Selector Clutch Drum End Play. Adjust selector clutch drum end play as follows:

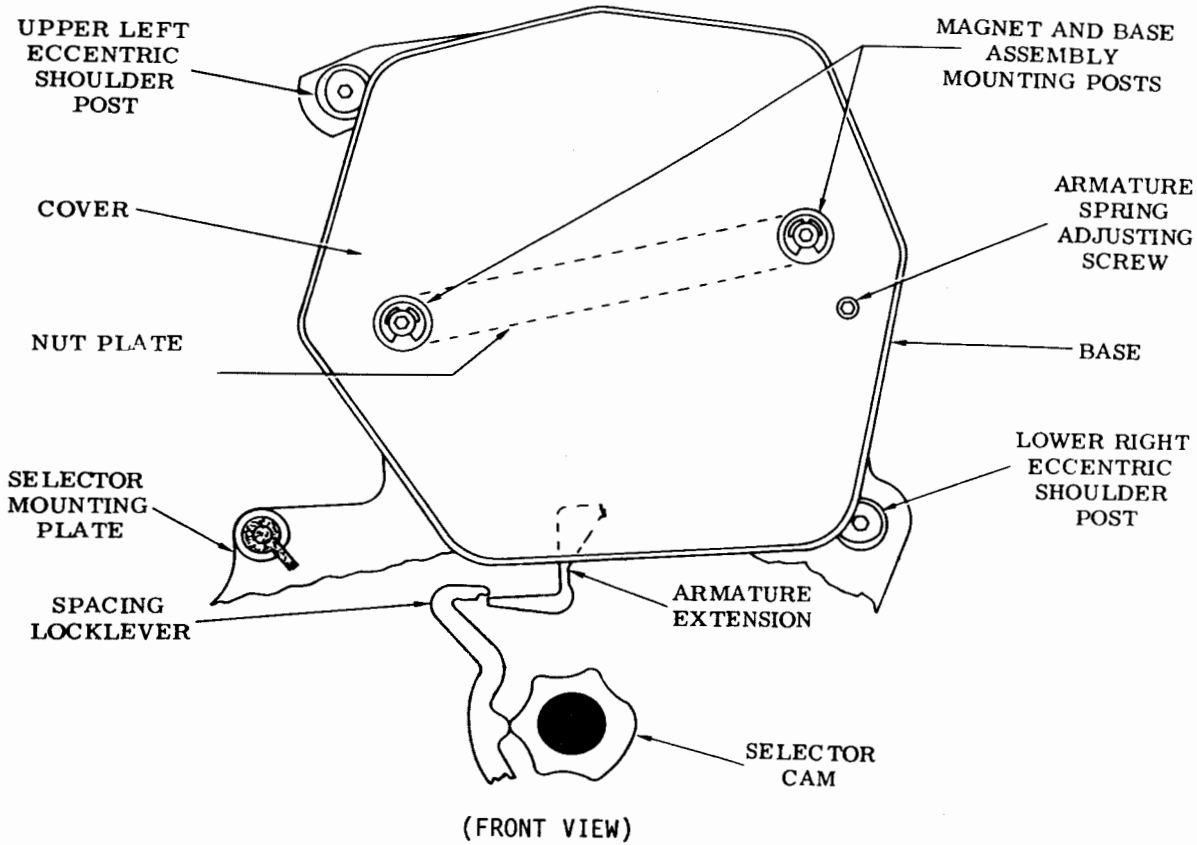


Figure 6-21. Selector Mechanism Adjustment

TOLERANCE 0.025
TO 0.030 INCH

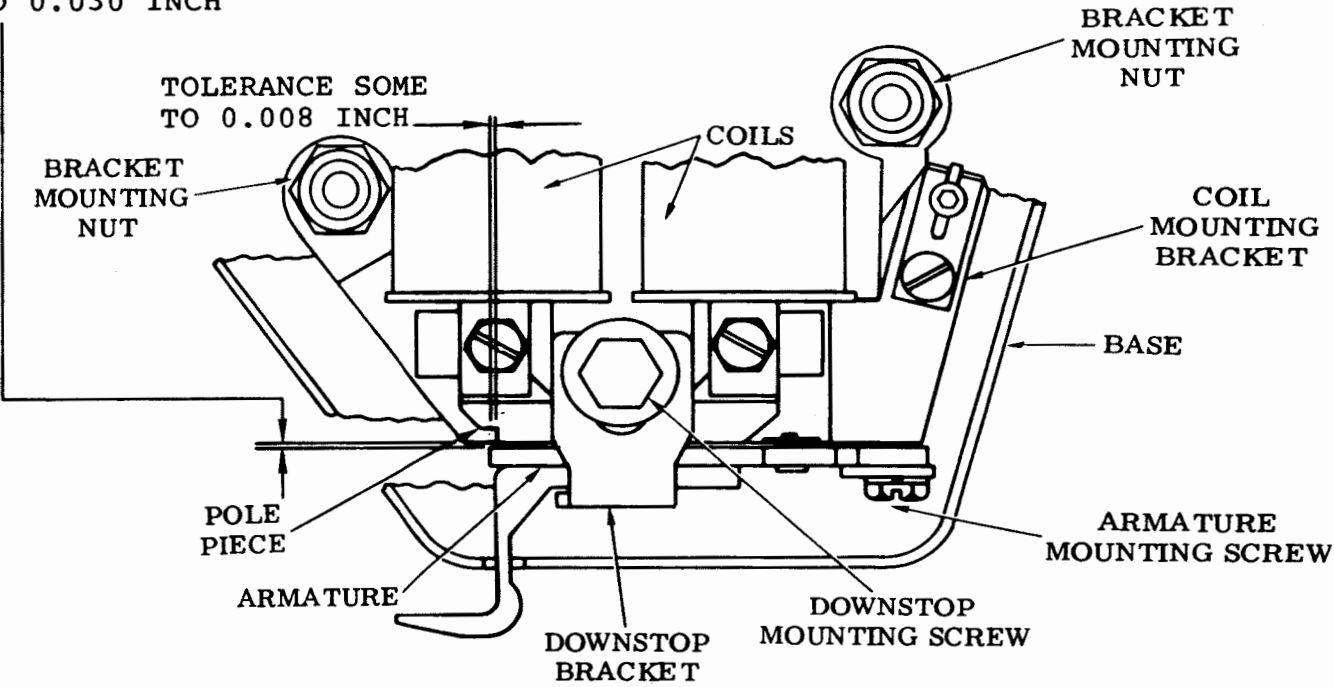


Figure 6-22. Selector Armature Adjustment

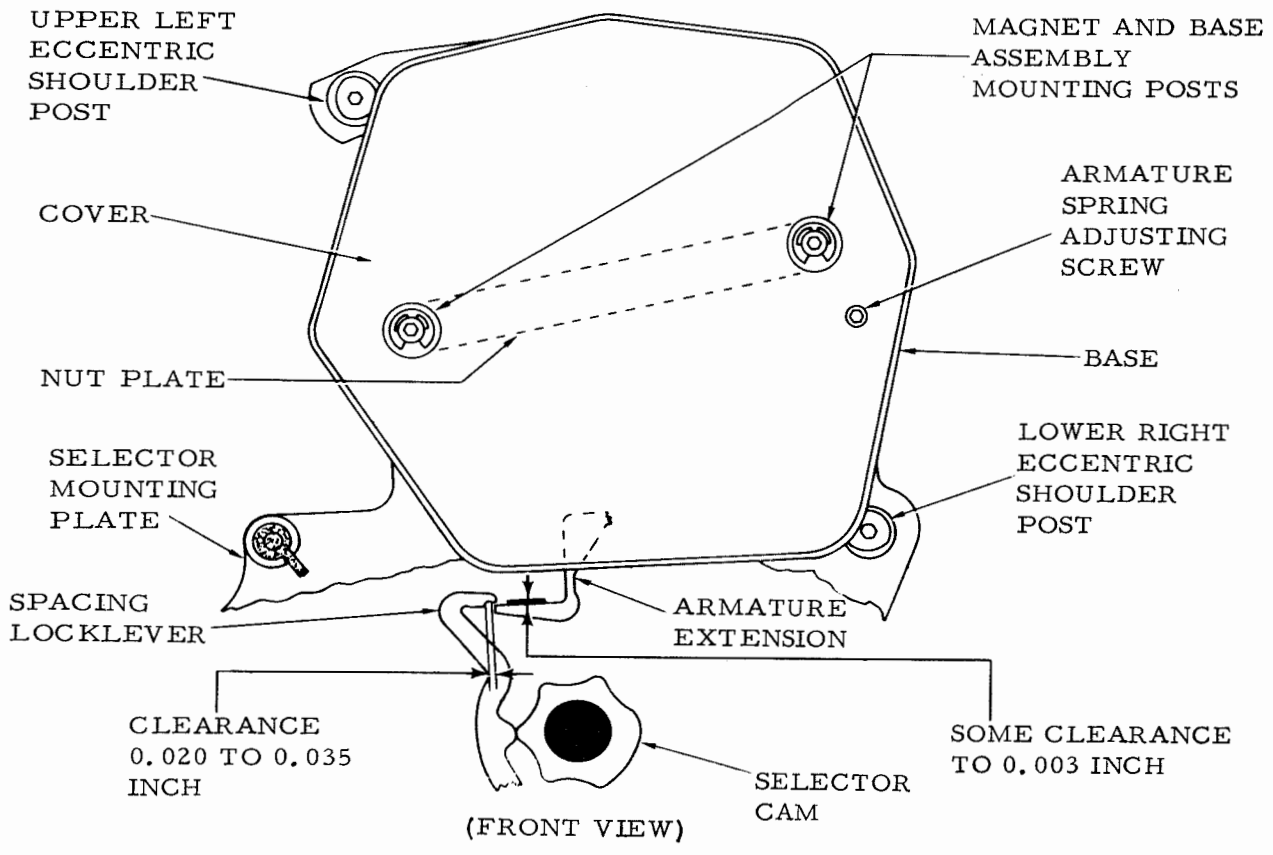


Figure 6-23. Selector Base Adjustment

- (1) Refer to figure 6-24.
- (2) Loosen mounting screw on clutch arm.
- (3) Position clutch to obtain end play not to exceed 0.010 inch.
- (4) Tighten mounting screw.

i. Code Bar Clutch Trip Lever End Play. Adjust code bar clutch trip lever end play as follows:

- (1) Refer to figure 6-25.
- (2) Loosen clamp screw.
- (3) Position trip lever on its shaft to obtain end play not to exceed 0.006 inch.
- (4) Tighten clamp screw.

j. Function Clutch Trip Lever End Play. Adjust function clutch trip lever end play as follows:

- (1) Refer to figure 6-26.
- (2) Loosen clamp screw.
- (3) Position trip lever on its shaft to obtain end play not to exceed 0.006 inch.
- (4) Tighten clamp screw.

k. Clutch Trip Shaft Set Collars. Adjust clutch trip shaft set collars as follows:

- (1) Refer to figure 6-27.
- (2) Loosen screw on spacing cut-out lever set collar.
- (3) Position spacing cut-out lever set collar to

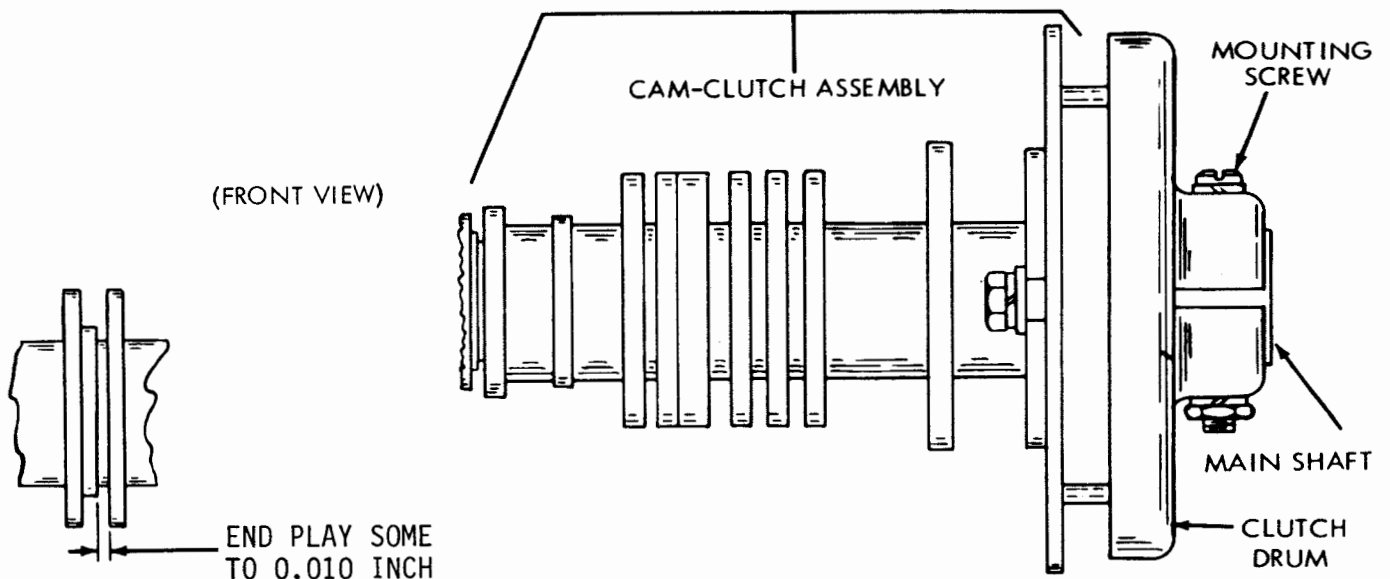


Figure 6-24. Selector Clutch Drum End Play Adjustment

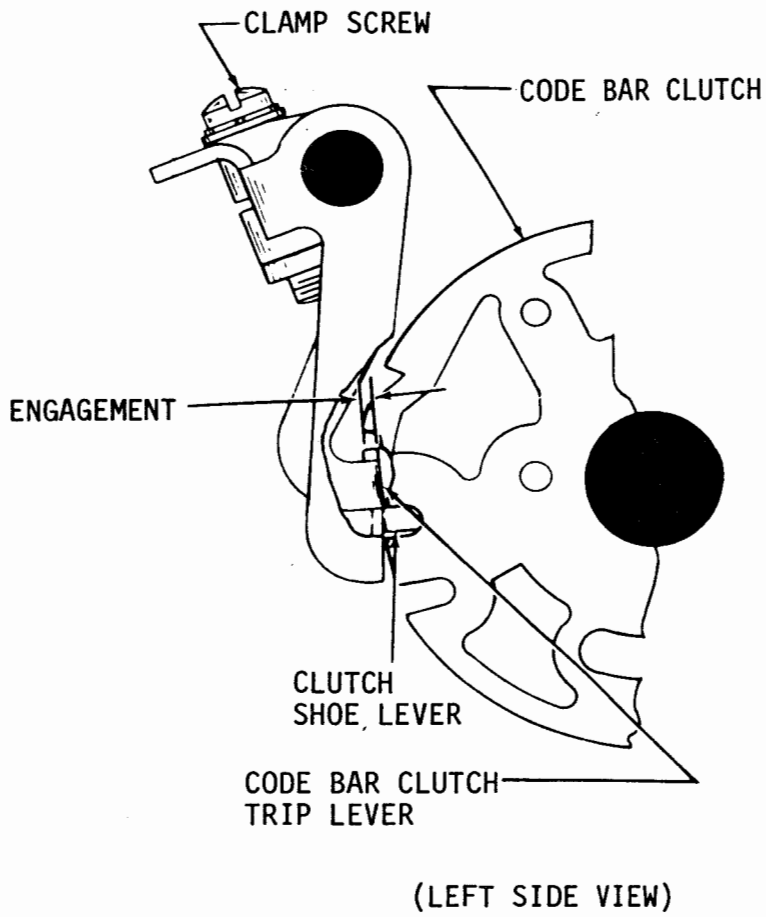


Figure 6-25. Code Bar Clutch Trip Lever End Play Adjustment

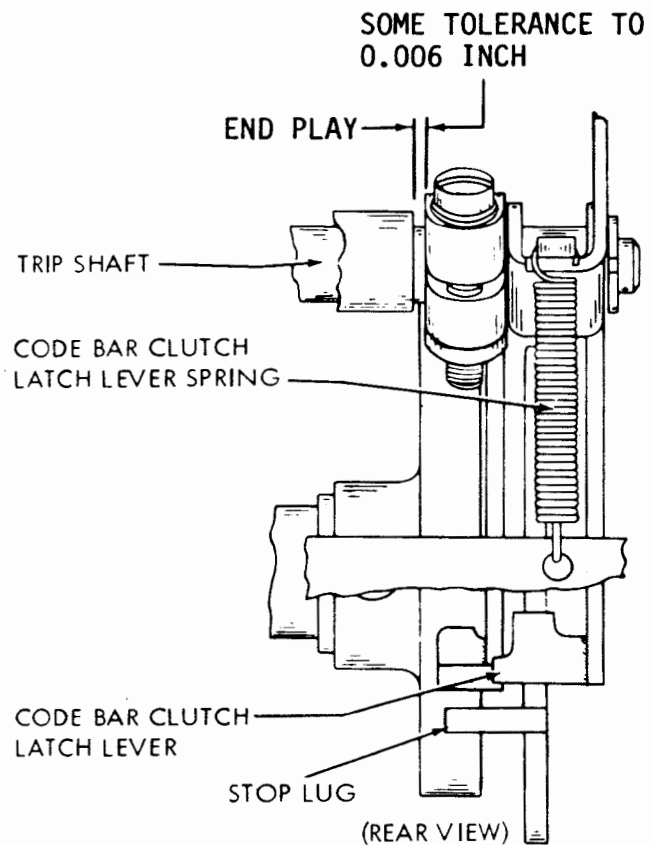


Figure 6-26. Function Clutch Trip Lever End Play Adjustment

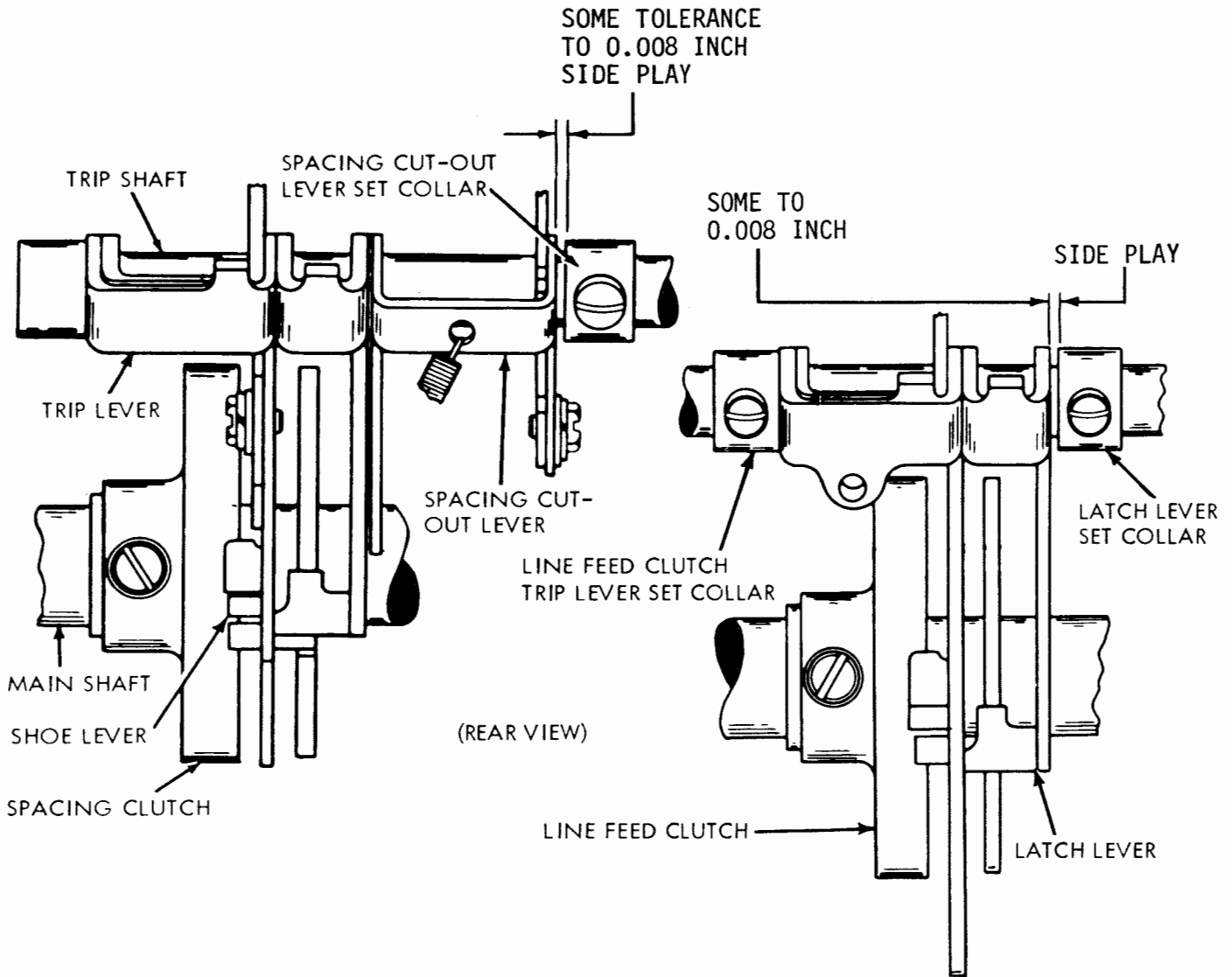


Figure 6-27. Clutch Trip Shaft Set Collars Adjustment

obtain some end play, not to exceed 0.008 inch.

(4) Tighten screw.

(5) Loosen screw on latch lever set collar.

(6) Position latch lever set collar to obtain some end play not to exceed 0.008 inch.

(7) Tighten screw.

1. Type Box Clutch Trip Lever Eccentric Post. Adjust engagement of trip lever and clutch shoe lever as follows:

(1) Refer to figure 6-28.

(2) Loosen nut on trip lever eccentric post.

(3) Position trip lever eccentric post to obtain full engagement of trip lever and clutch shoe lever.

(4) Tighten nut.

m. Spacing Clutch Trip Lever. Adjust spacing clutch trip lever clearance as follows:

(1) Refer to figure 6-29.

(2) Disengage clutch.

(3) Trip clutch trip lever and rotate main shaft until trip lever is over shoe lever. Take up play of shoe lever inward by snapping trip lever over shoe lever.

(4) Check clearance between shoe lever and drum at each of three stop positions to determine which stop yields greatest clearance.

(5) With trip lever at stop which yields greatest clearance, rotate main shaft slowly until trip lever just falls off stop lug.

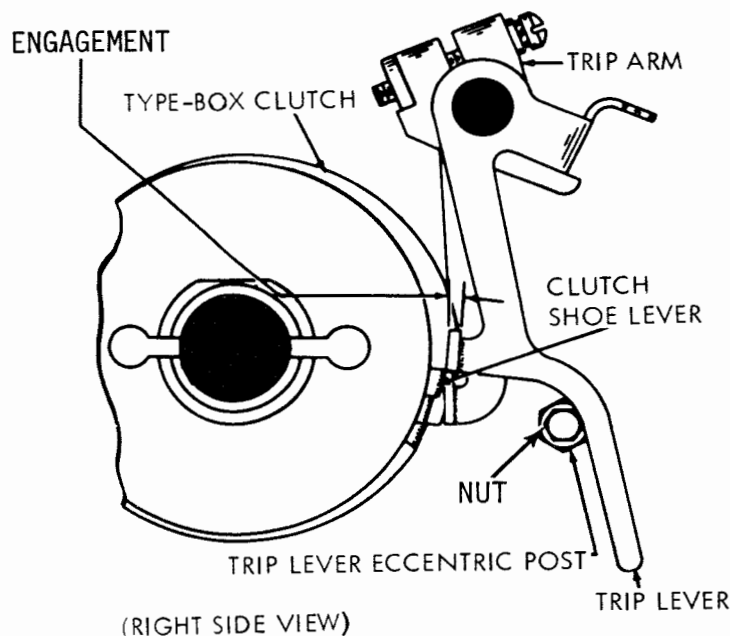


Figure 6-28. Type Box Clutch Trip Lever Eccentric Post Adjustment

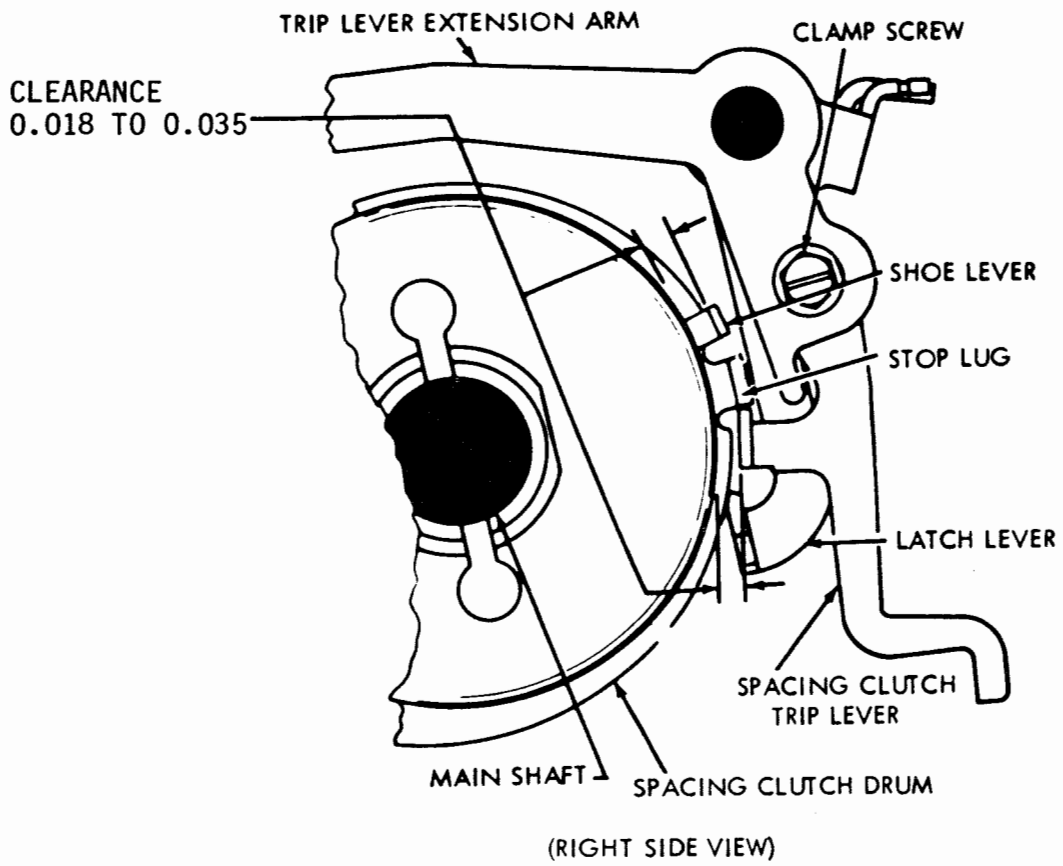


Figure 6-29. Spacing Clutch Trip Lever Clearance Adjustment

(6) Loosen clamp screw and position trip lever so that clearance between trip lever and drum is 0.027 inch less than clearance between shoe lever and drum.

(7) Tighten clamp screw.

n. Line Feed Clutch Trip Lever Eccentric Post. Adjust line feed clutch trip lever clearance as follows:

(1) Refer to figure 6-30.

(2) Disengage clutch.

(3) Trip clutch trip lever and rotate main shaft until trip lever is over shoe lever. Take up play of shoe lever inward by snapping trip lever over shoe lever.

(4) Check clearance between shoe lever and drum at each of three stop positions to determine which stop yields greatest clearance.

(5) With trip lever at stop which yields greatest clearance, rotate main shaft slowly until trip lever just falls off stop lug.

(6) Loosen trip lever adjusting screw locknut and trip lever adjusting screw; position trip lever so that clearance between trip lever and drum is 0.027 inch (tolerance 0.018 to 0.035 inch) less than clearance between shoe lever and drum.

(7) Tighten adjusting screw.

o. Line Feed Clutch Trip Lever Adjusting Screw. Adjust the line feed trip lever

adjusting screw clearance as follows:

(1) Refer to figure 6-30.

(2) Set line feed function slide arm in rear position and clutch trip lever against its eccentric post.

(3) Hold trip arm against its function slide arm.

(4) Loosen nut on adjusting screw and position adjusting screw to obtain some clearance, not to exceed 0.006 inch, between adjusting screw and trip arm.

(5) Tighten nut.

p. Line Feed Spur Gear Detent Eccentric. Adjust line feed spur gear detent eccentric as follows:

(1) Refer to figure 6-31.

(2) Disengage line feed clutch.

(3) Rotate platen until detent stud is seated between two teeth on line feed spur gear.

(4) When hand wheel is released, manually set teeth on feed bar into engagement with teeth on line feed spur gear.

(5) Loosen detent eccentric mounting screw.

(6) Rotate the detent eccentric, keeping high part of eccentric upward until detent stud is in contact with one gear tooth and is not more than 0.010 inch from other tooth.

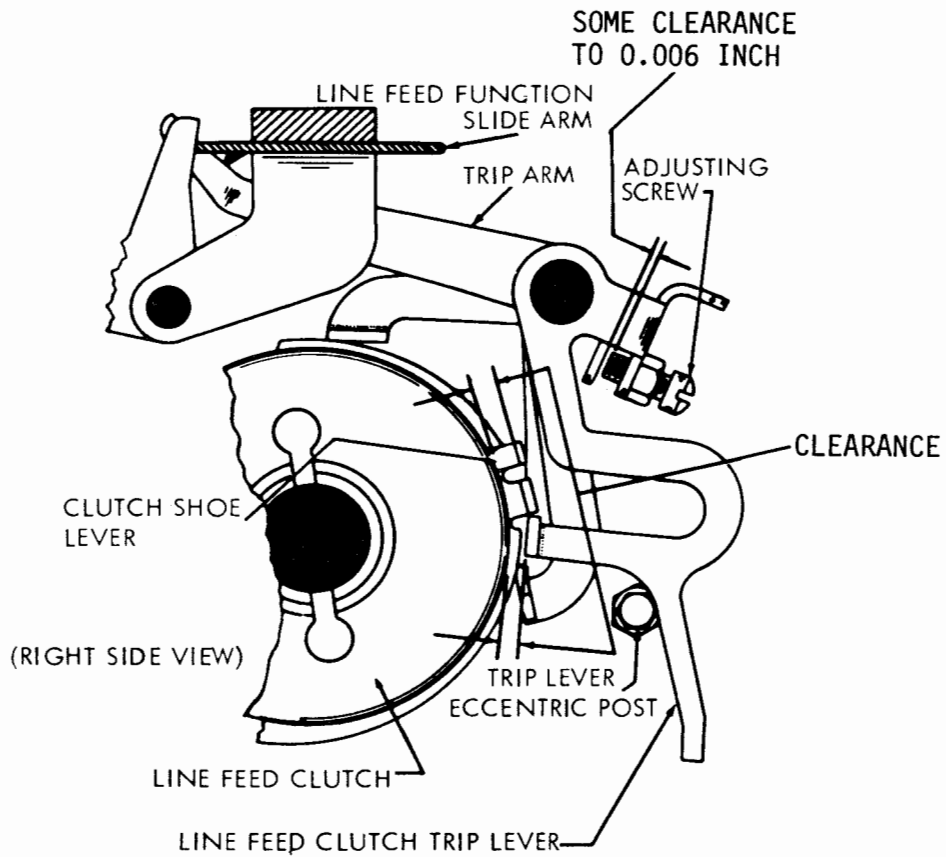


Figure 6-30. Line Feed Clutch Trip Lever Eccentric Post Adjustment and Adjusting Screw

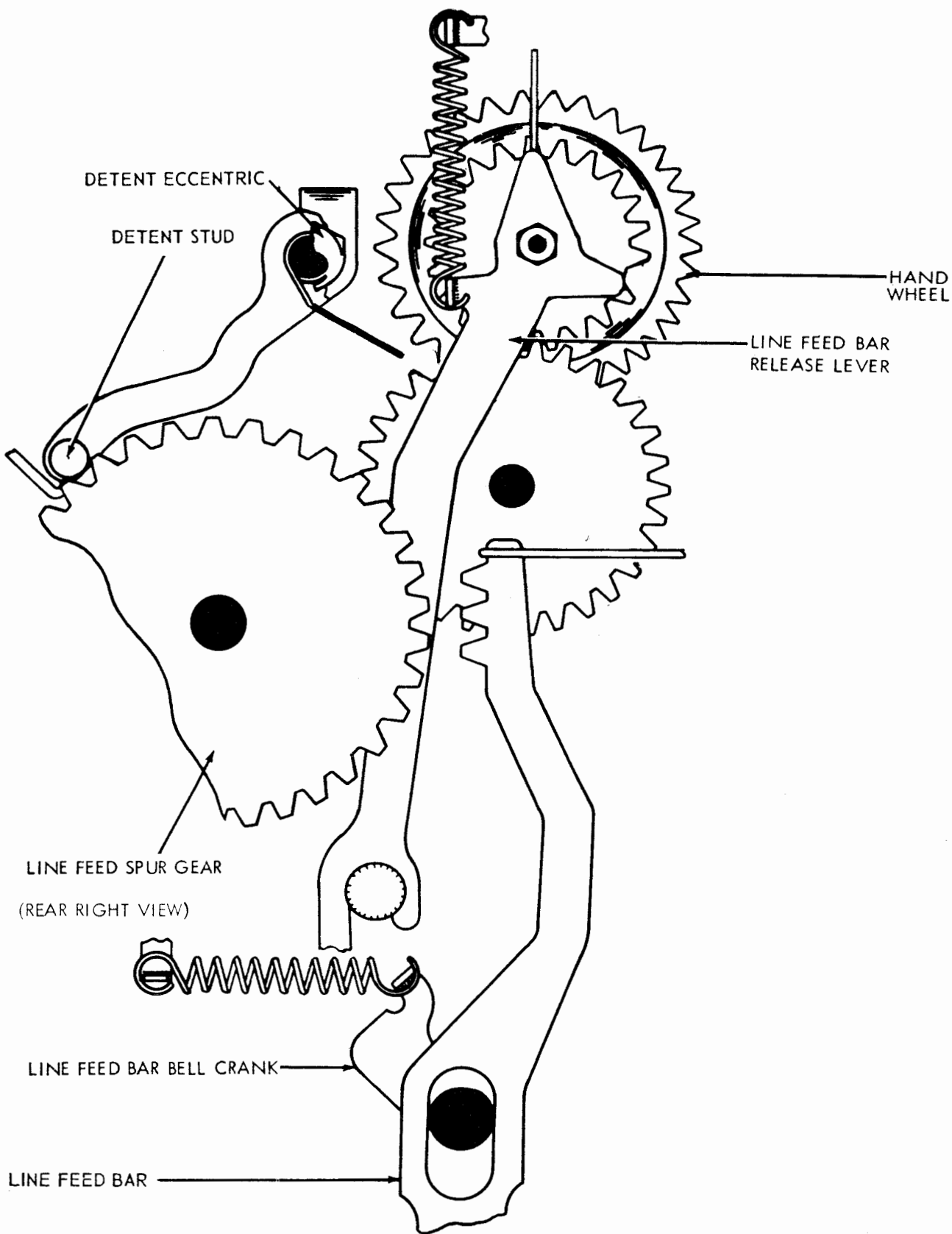


Figure 6-31. Line Feed Spur Gear Detent Eccentric Adjustment

(7) Tighten detent eccentric mounting screw.

q. Line Feed Clutch Phasing. Adjust line feed clutch phasing as follows:

- (1) Refer to figure 6-32.
- (2) Disengage line feed clutch.
- (3) Loosen assembly bearing post.
- (4) Re-mesh line feed eccentric spur gear with clutch gear.
- (5) Tighten assembly bearing post.

r. Spacing Gear Clearance Adjustment. Adjust spacing gear clearance as follows:

- (1) Refer to figure 6-33. With carriage fully returned, perform steps (2) through (4) to achieve minimum backlash of spacing gears without bind.
- (2) Loosen upper and lower mounting screw.
- (3) Insert shims between spacing shaft bearing and front plate at upper mounting screw to increase clearance, and at lower mounting screw to decrease backlash.
- (4) Tighten upper and lower mounting screws.

s. Spacing Gear Phasing. Adjust spacing gear phasing as follows:

- (1) Refer to figure 6-33.

(2) Remove mounting screw from spacing shaft gear.

(3) Hold pawls in alignment and engage spacing shaft gear with clutch gear at a point where spacing shaft gear mounting screw hole is in line with tapped hole in spacing shaft.

(4) Insert and tighten mounting screw.

t. Rocker Shaft Bracket Eccentric Stud. Adjust rocker shaft bracket eccentric stud as follows:

- (1) Refer to figure 6-34.
- (2) With type box clutch disengaged and play in locking arm taken up toward front, measure gap between lower side of lock lever roller and top edge shoulder on horizontal positioning lock lever.
- (3) Gap should be 0.070 inch (tolerance 0.055 to 0.090 inch).
- (4) Rocker shaft drive link should be free in its bearings (not under load) when clutch is in stop position and when rotated 180 degrees from stop position.
- (5) To adjust, loosen nut, reposition eccentric stud in lower end of rocker shaft left bracket, and tighten nut.

NOTE

If the above adjustment is made, related adjustments listed below must be rechecked as described in Chapter 4.

Spacing Trip Lever Bail Cam

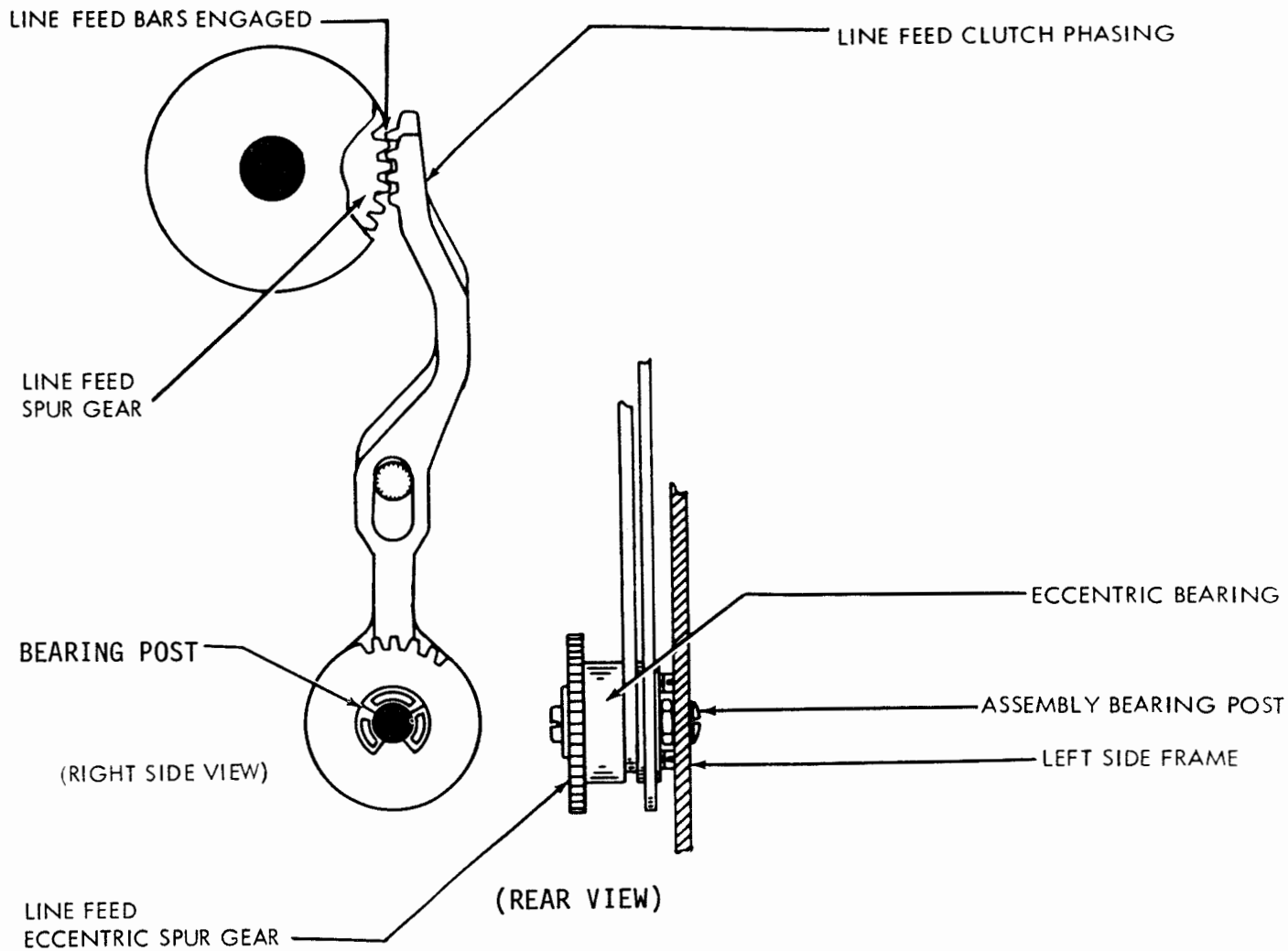


Figure 6-32. Line Feed Clutch Phasing

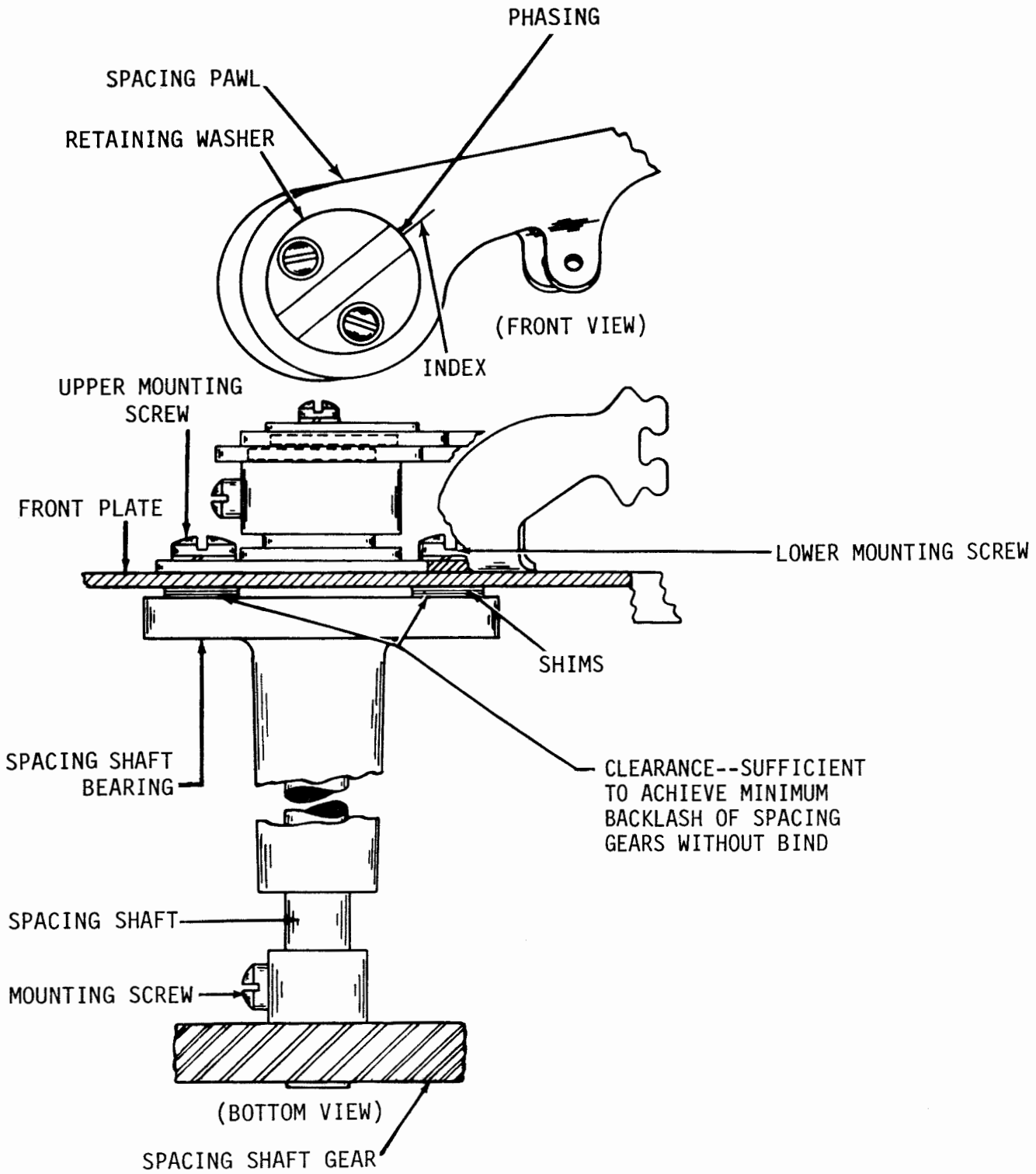


Figure 6-33. Spacing Gear Clearance Adjustment and Phasing

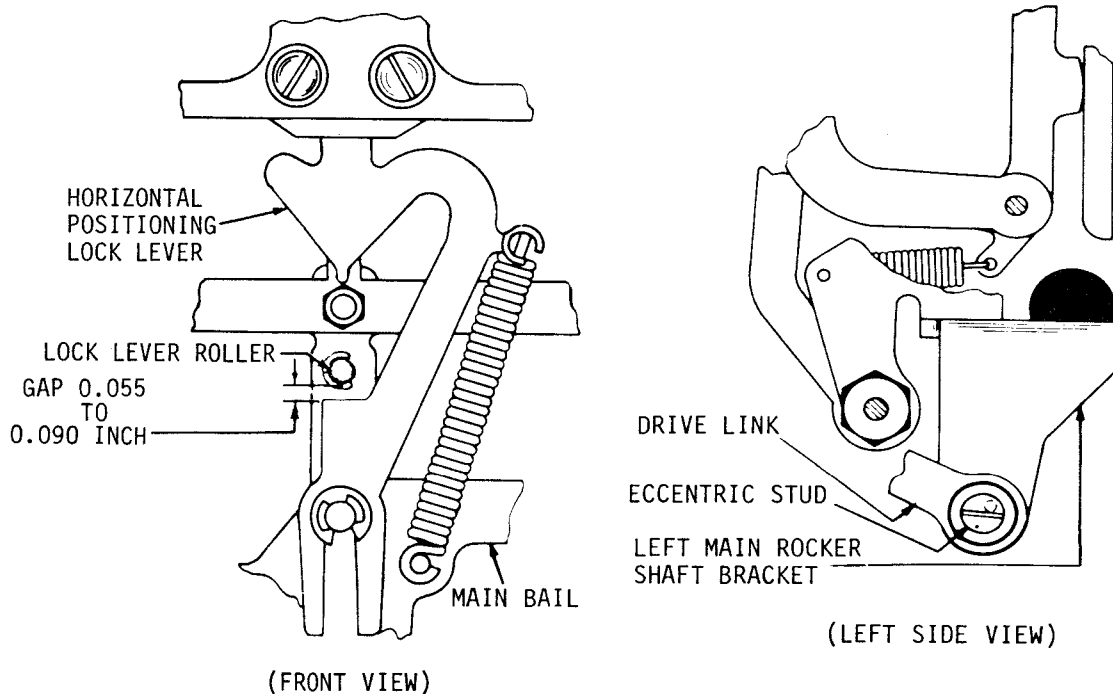


Figure 6-34. Rocker Shaft Bracket Eccentric Stud Adjustment

Plate, paragraph 4-5d(27)

Printing Track, paragraph 4-5d(28)

Printing Hammer Stop Bracket, paragraph 4-5d(29)

Printing Arm, paragraph 4-5d(30)

(5) Engage a wrench or screwdriver on the lug of the adjusting disc and rotate disc to obtain a gap of 0.055 to 0.085 inch greater when the clutch is engaged than when the clutch is disengaged between clutch shoe lever and its stop lug.

NOTE

For 100 wpm adjust the gap to high side approximately 0.075 inch.

u. Clutch Shoe Lever.
Adjust clutch shoe lever as follows:

- (1) Refer to figure 6-35.
- (2) Disengage clutch and measure gap between clutch shoe lever and its stop lug. Record measurement.
- (3) Engage and rotate clutch until clutch shoe lever is toward bottom of unit.
- (4) Loosen two clamp screws on clutch disc.

- (6) Tighten two clamp screws.
- (7) Repeat steps (1) through (6) for each clutch.

v. Code Bar Shift Lever Drive Arm. Adjust code bar shift lever drive arm as follows:

- (1) Refer to figure 6-36.

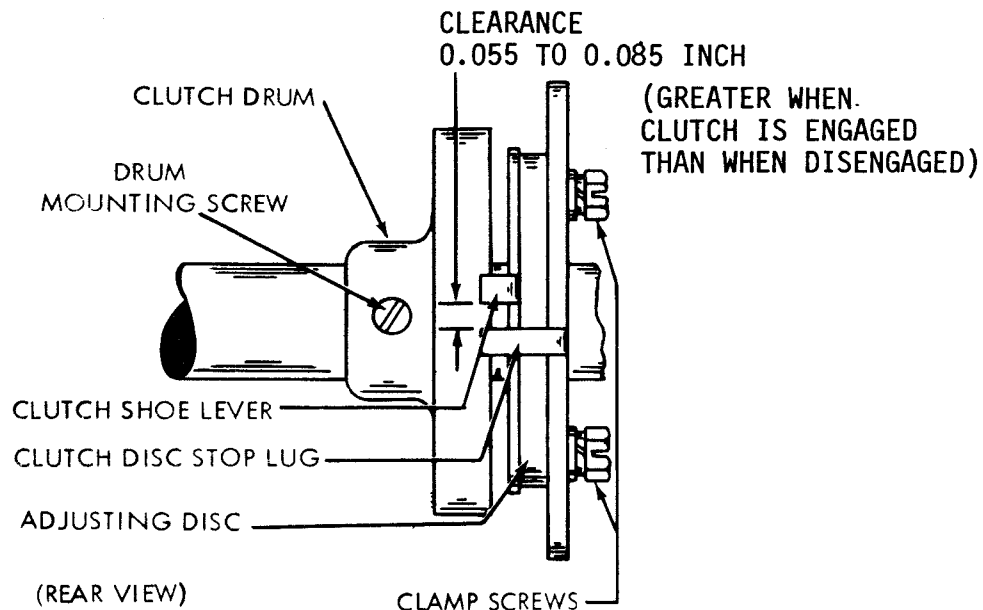


Figure 6-35. Clutch Shoe Lever Adjustment

(2) Engage and rotate code bar clutch until code bar shift lever is in uppermost position.

(3) Loosen clamp screw.

(4) Position code bar shift lever drive arm on its shaft to obtain some clearance, not to exceed 0.025 inch, between top of rollers and top of cam slots in code bar shift levers, and to obtain some end play not to exceed 0.006 inch.

(5) Tighten clamp screw.

w. Transfer Lever Eccentric. Adjust transfer lever eccentric as follows:

(1) Refer to figure 6-37.

(2) Loosen eccentric bushing clamp screw and rotate eccentric bushing so that high

part of eccentric is above horizontal centerline.

(3) Adjust clearance between rear code bar shift levers and code bar shift bar farthest from rear code bar shift lever to 0.017 inch.

NOTE

One or more code bar shift bars can touch code bar shift levers.

(4) Tighten eccentric bushing clamp screw.

x. Intermediate Arm Backstop Bracket. Adjust intermediate arm backstop bracket as follows:

(1) Refer to figure 6-38.

(2) Set up a blank (-----) code combination.

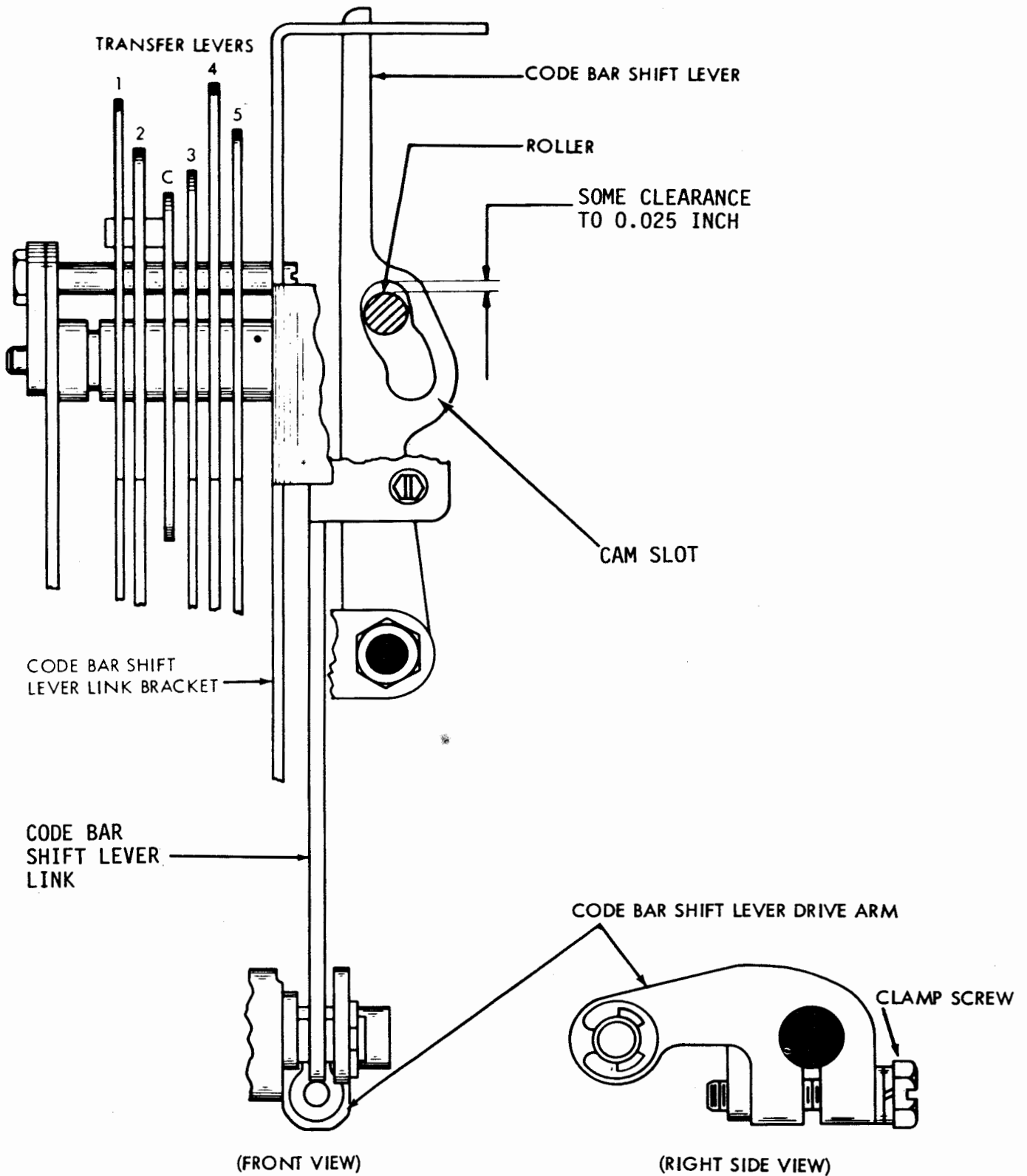


Figure 6-36. Code Bar Shift Lever Drive Arm Adjustment

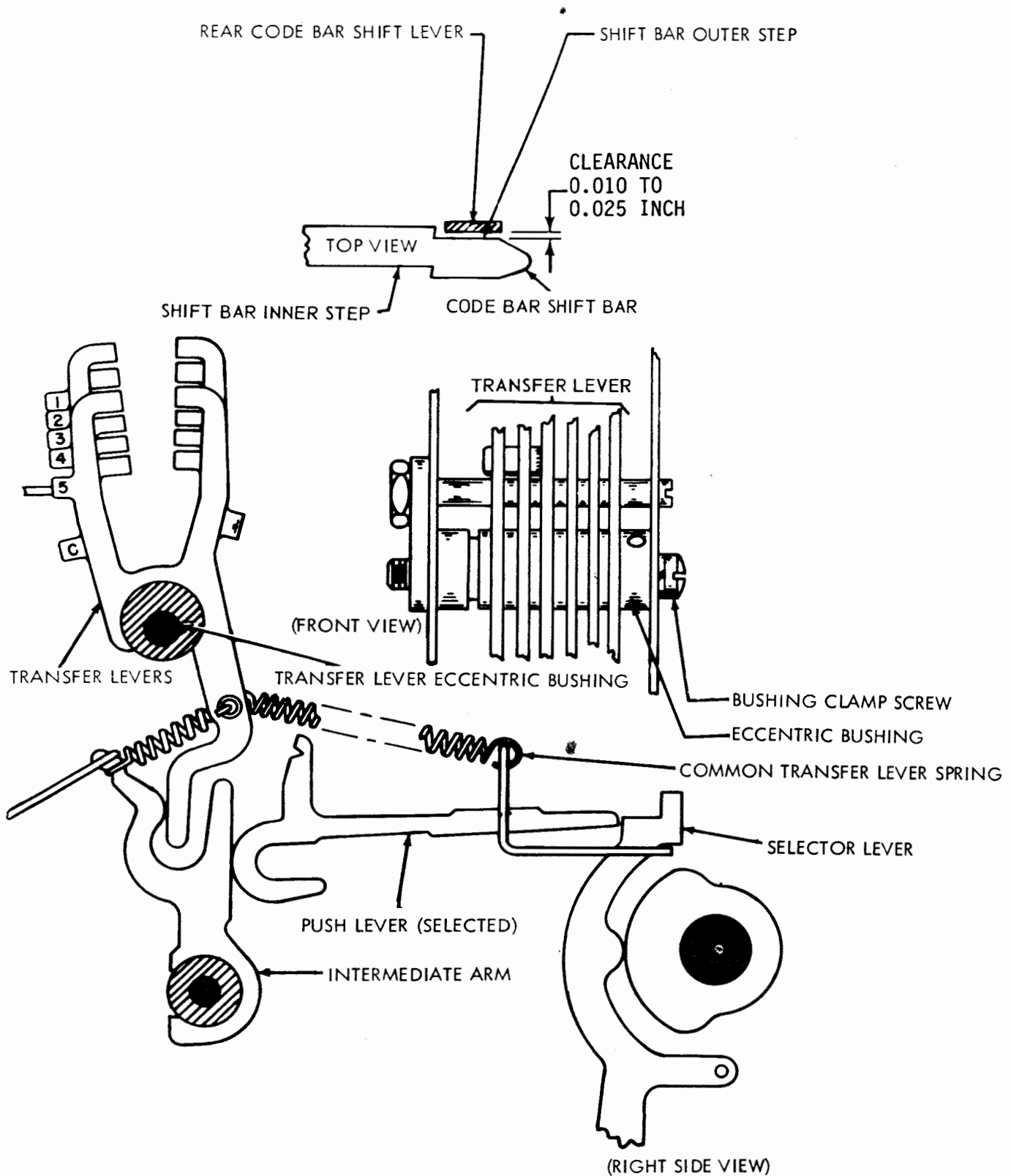


Figure 6-37. Transfer Lever Eccentric Adjustment

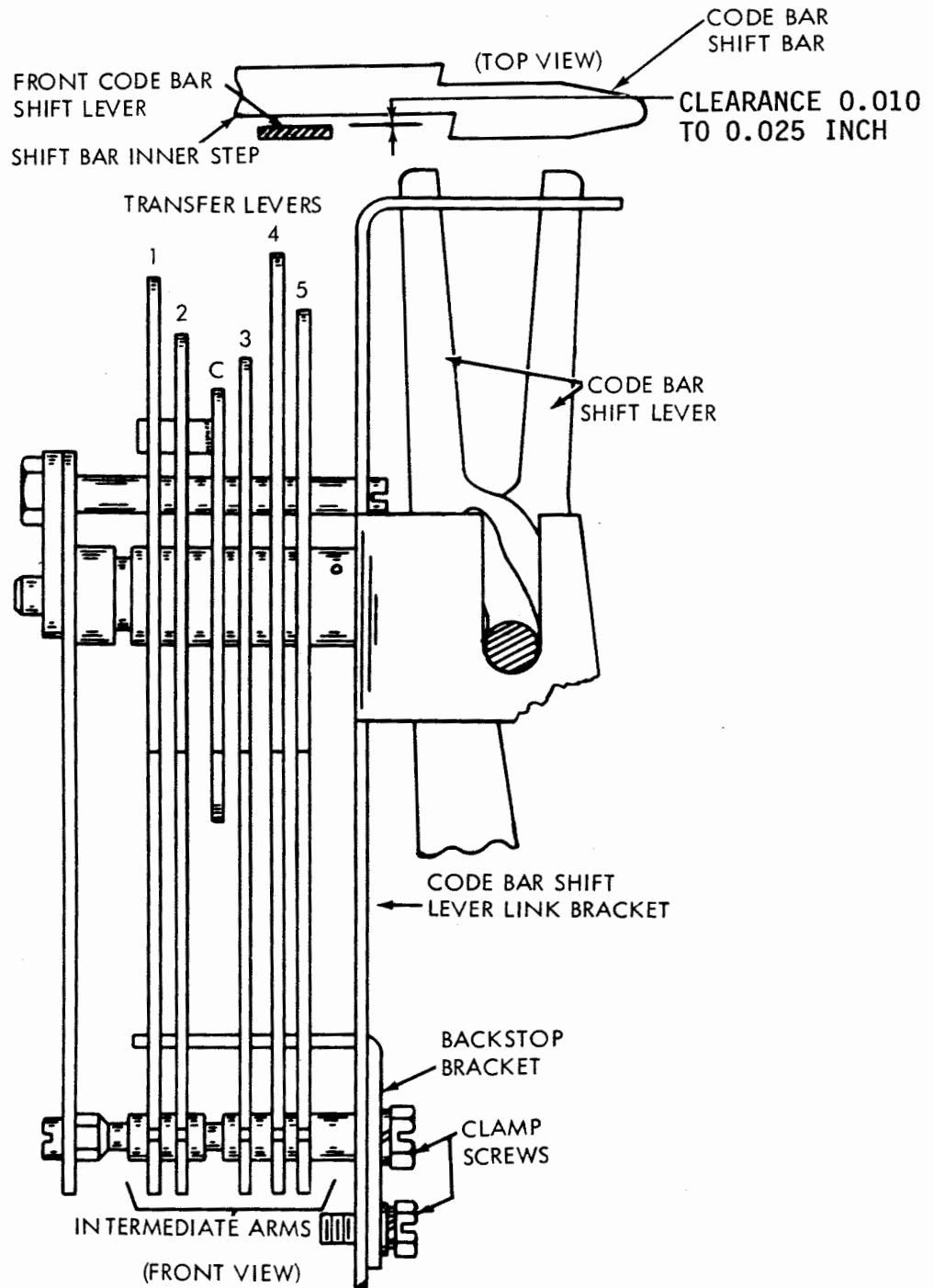


Figure 6-38. Intermediate Arm Backstop Bracket Adjustment

(3) Disengage selector and code bar clutches.

(4) Loosen two clamp screws.

(5) Position backstop bracket to obtain 0.017 inch clearance (tolerance 0.010 to 0.025 inch).

(6) Tighten two clamp screws.

y. Code Bar Shift Lever Link Brackets. Adjust code bar shift lever link brackets as follows:

(1) Refer to figure 6-39.

(2) Loosen front or rear adjusting plate clamp screw as necessary.

(3) Position adjusting plate to obtain 0.012 inch (tolerance 0.002 to 0.025 inch) clearance between front or rear code bar shift lever and shoulder on closest code shift bar.

(4) Tighten adjusting plate clamp screw.

z. Typebox Clutch Trip Lever. Adjust typebox clutch lever as follows:

(1) Refer to figure 6-40.

(2) Loosen clamp screw.

(3) Position clutch disk stop to obtain 0.035 inch (tolerance 0.025 to 0.045 inch) clearance between inner face of typebox clutch trip lever and clutch disc stop lug, and some side play not to exceed 0.008 inch for the latch lever.

(4) Tighten clamp screw.

aa. Carriage Draw-Wire Rope. Adjust carriage draw-wire rope as follows:

(1) Refer to figure 6-41.

(2) Advance printing carriage to extreme right-hand position.

(3) Rotate type box clutch 180 degrees.

(4) Loosen rope clamp screw one turn maximum.

(5) Loosen two pulley bearing stud mounting screws.

(6) Position two pulley bearing studs to obtain 0.006 inch minimum clearance between lower draw-wire rope and carriage return latch bail post, and 0.030 inch minimum clearance between lower draw-wire rope and left horizontal positioning drive linkage.

(7) Tighten two pulley bearing stud mounting screws and rope clamp screw.

ab. Oscillating Rail Slide Position. Adjust the oscillating rail slide position as follows:

(1) Refer to figure 6-42.

(2) Loosen pulley wire rope clamp screws.

(3) Position oscillating rail slide to obtain 0.037 inch clearance (tolerance 0.025 to 0.050 inch) between slide and pulley.

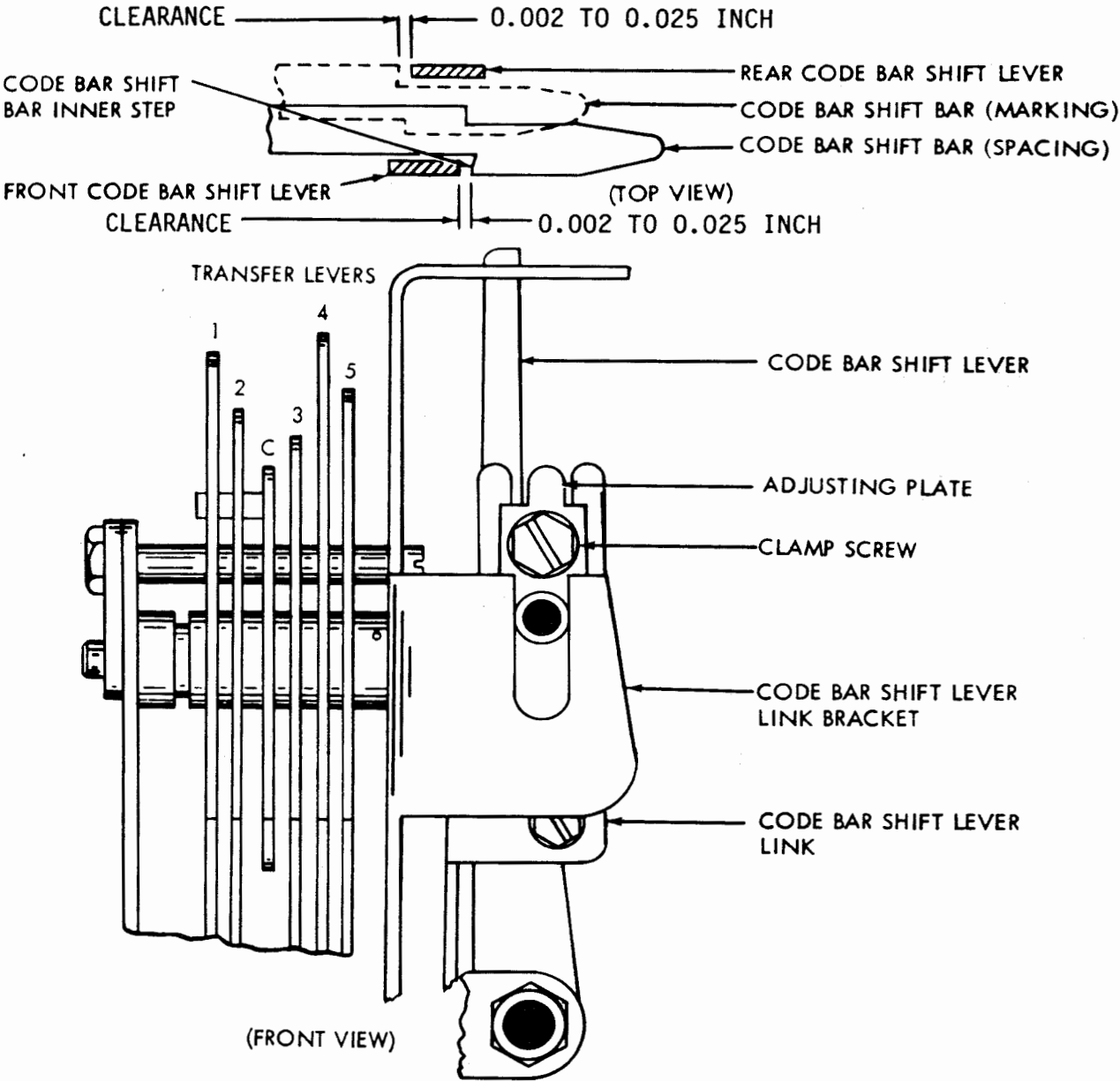


Figure 6-39. Code Bar Shift Lever Link Brackets Adjustment

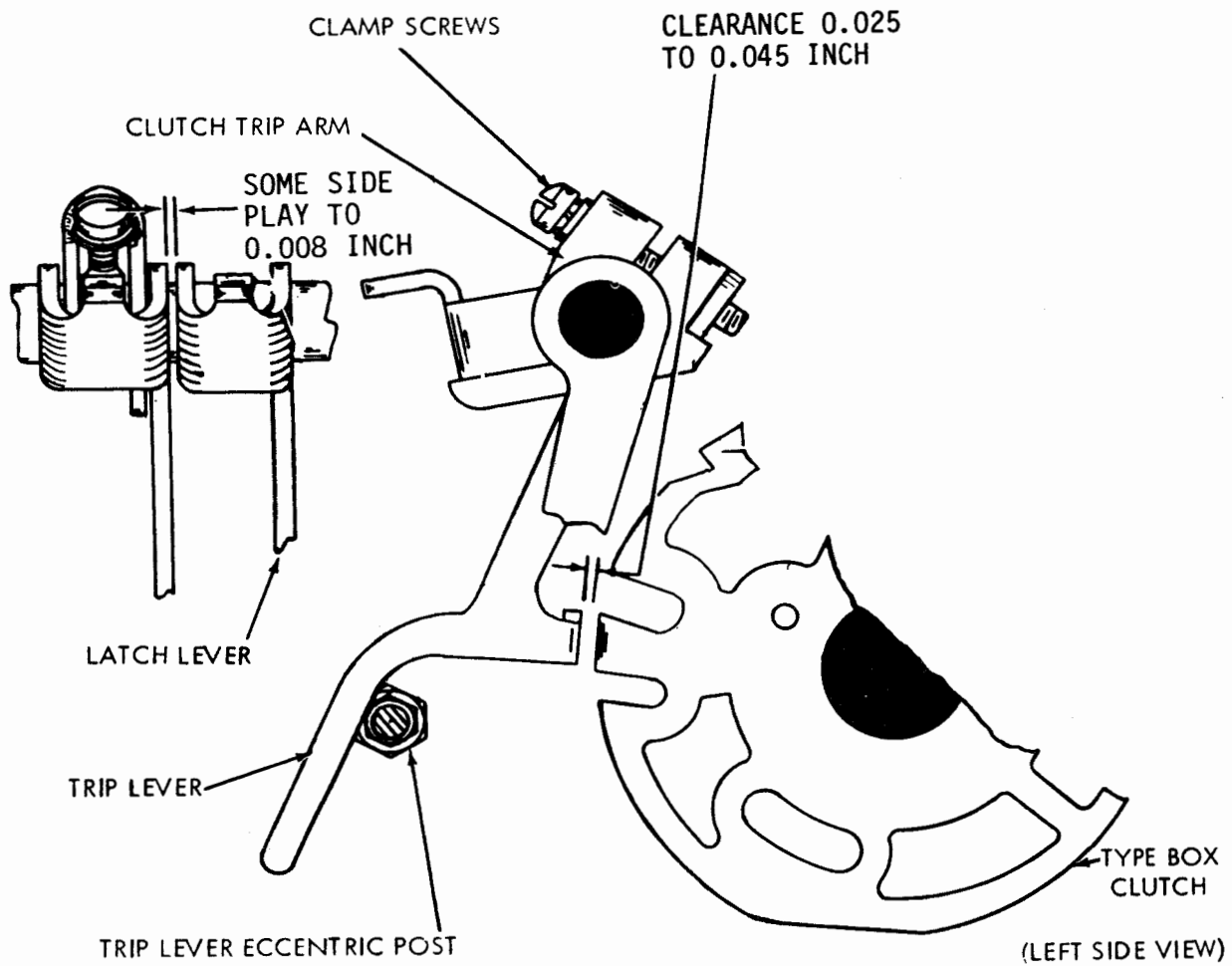


Figure 6-40. Typebox Clutch Trip Lever Adjustment

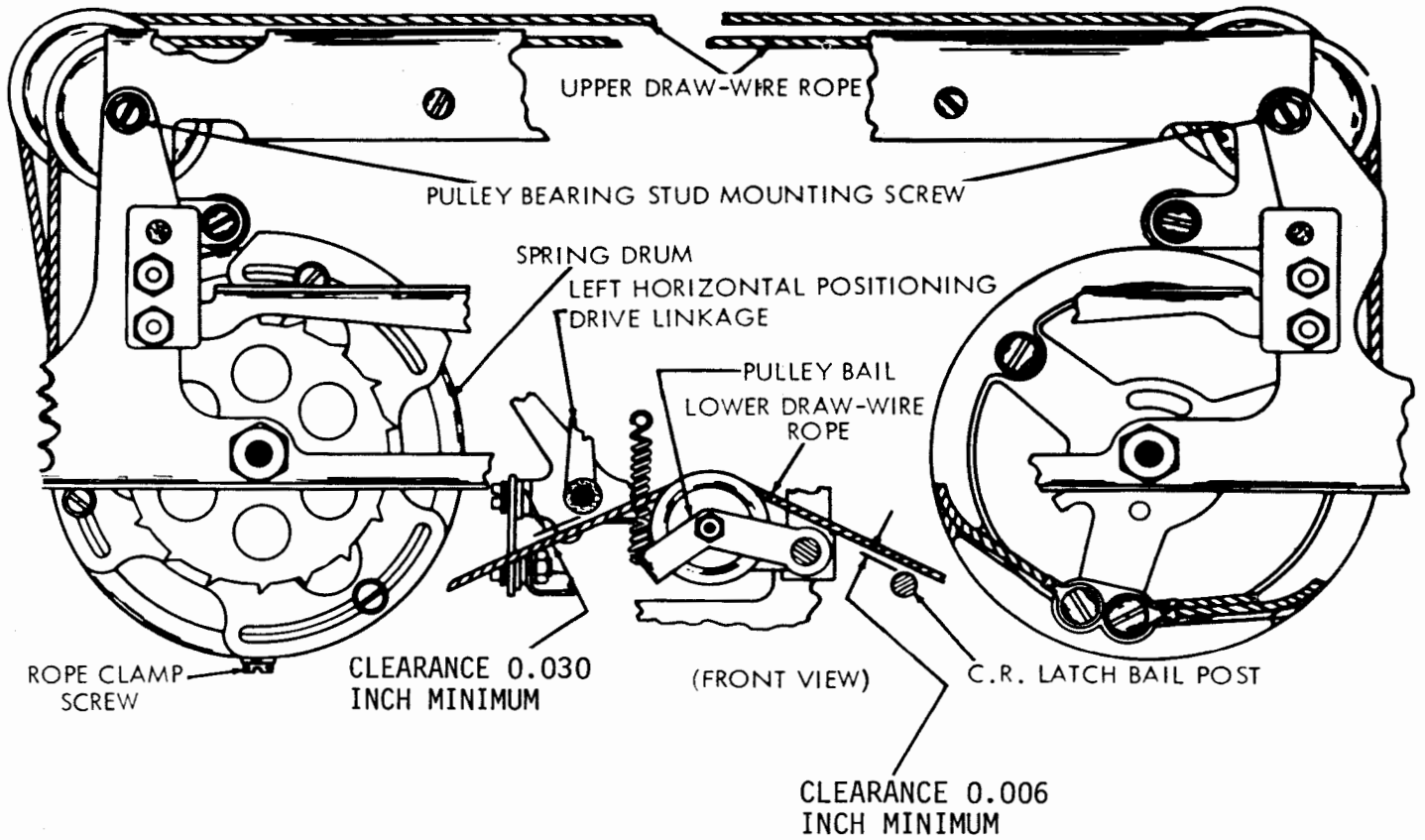


Figure 6-41. Carriage Draw-Wire Rope Adjustment

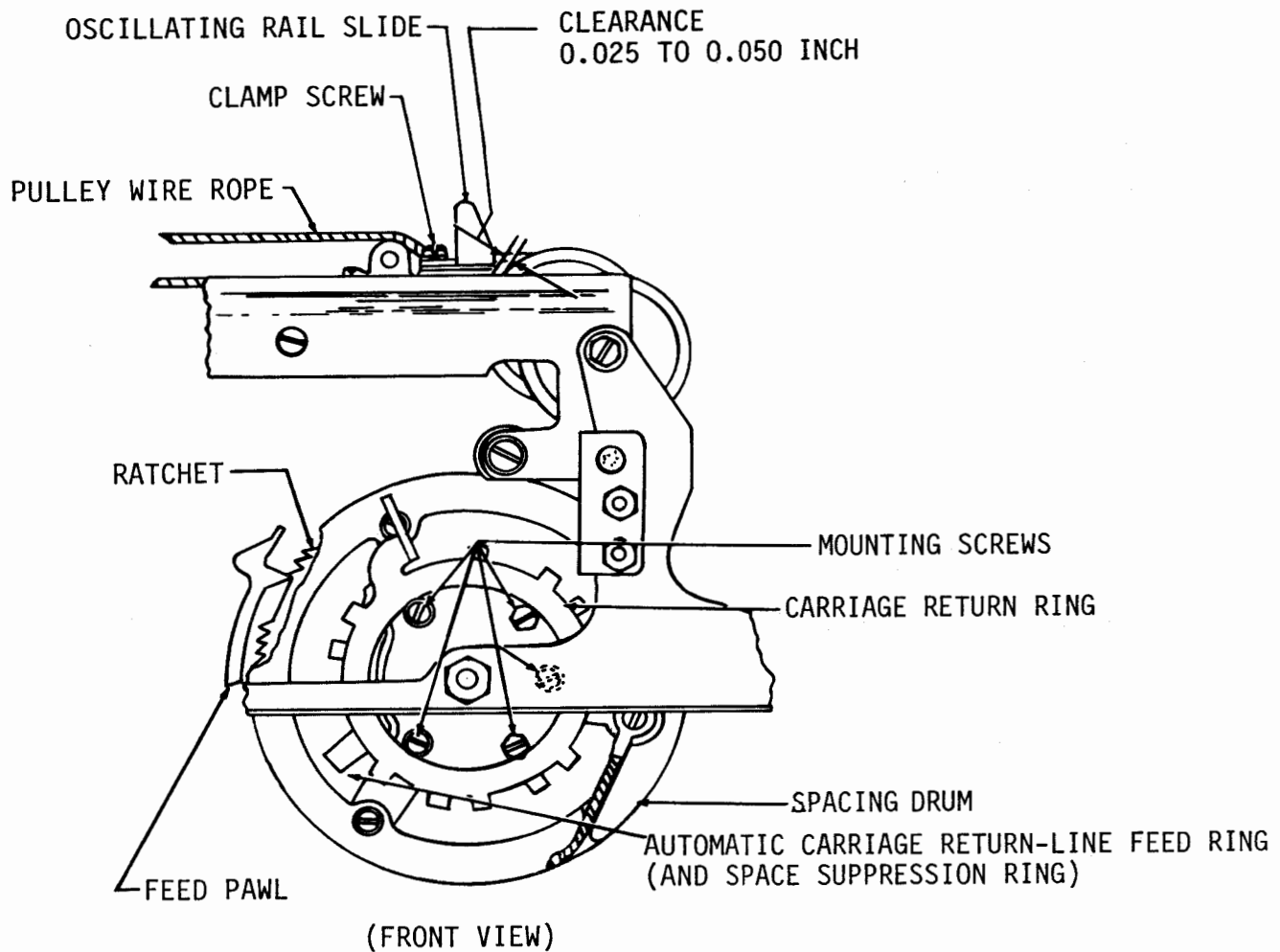


Figure 6-42. Oscillating Rail Slide
Position Adjustment

(4) Tighten clamp screws.

NOTE

If the above adjustment is made, related adjustments listed below must be rechecked as described in Chapter 4.

Left Margin, paragraph 4-5d(34)

Printing Carriage Position, paragraph 4-5d(25)

ac. Printing Carriage Lower Roller. Adjust printing carriage lower roller as follows:

- (1) Refer to figure 6-43.
- (2) Loosen screw nut.
- (3) Position lower roller, keeping high part of eccentric toward the right.
- (4) Tighten screw nut.
- (5) Loosen mounting screw.
- (6) Position lower roller.
- (7) Tighten mounting screw.

ad. Printing Carriage Position. Adjust printing carriage position as follows:

- (1) Refer to figure 6-44.
- (2) Loosen clamp screws.

(3) Position printing carriage on wire rope so that from top view M type pallet is centered on printing hammer when hammer is touching pallet.

(4) Tighten clamp screws.

NOTE

Prior to performing this adjustment, verify that oscillating rail slide position (paragraph 4-8c(23) and left margin (paragraph 4-8c(34) adjustments meet the specified requirements.

ae. Printing Hammer Bearing Stud. Adjust printing hammer bearing stud as follows:

- (1) Refer to figure 6-45.
- (2) Loosen nut.
- (3) Add or remove shims between shoulder on bearing post and stop bracket.
- (4) Tighten nut.

af. Spacing Trip Lever Bail Cam Plate. Adjust spacing trip lever bail cam plate as follows:

- (1) Refer to figure 6-46.
- (2) Loosen cam plate mounting screws.
- (3) Position cam plate on rocker plate and maintain forward edge of cam plate parallel to shaft.
- (4) Adjust clearance between top surface of trip lever arm extension and spacing

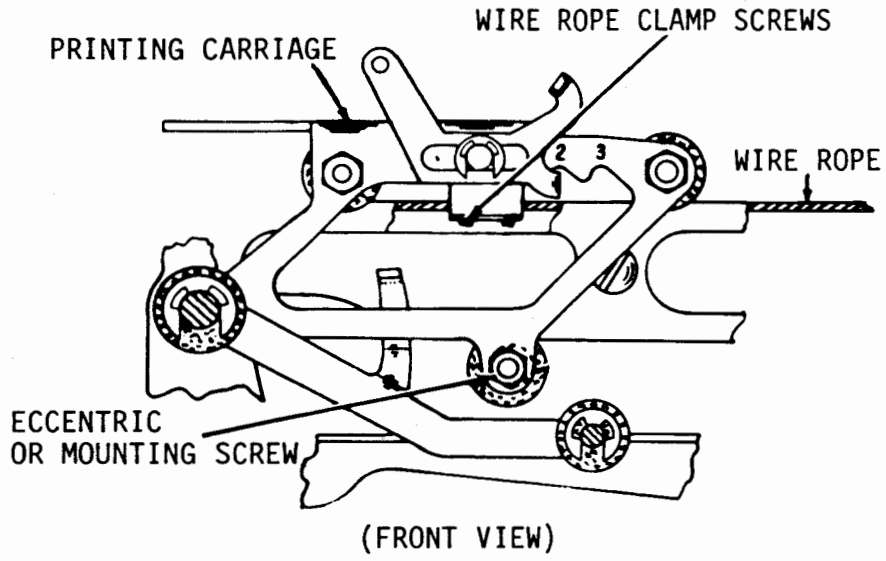


Figure 6-43. Printing Carriage Lower Roller Arrangement

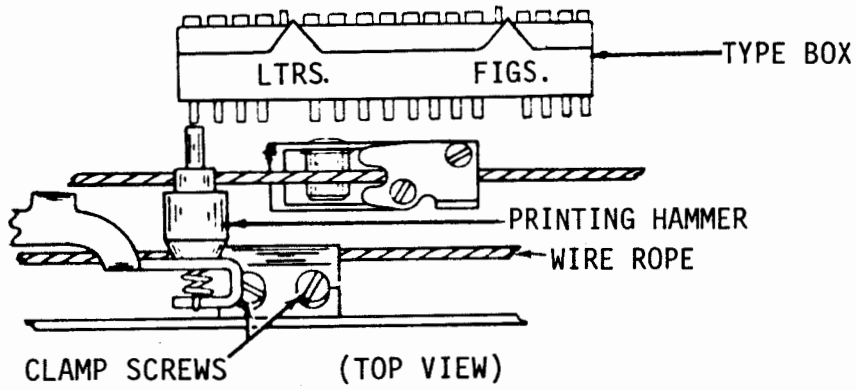
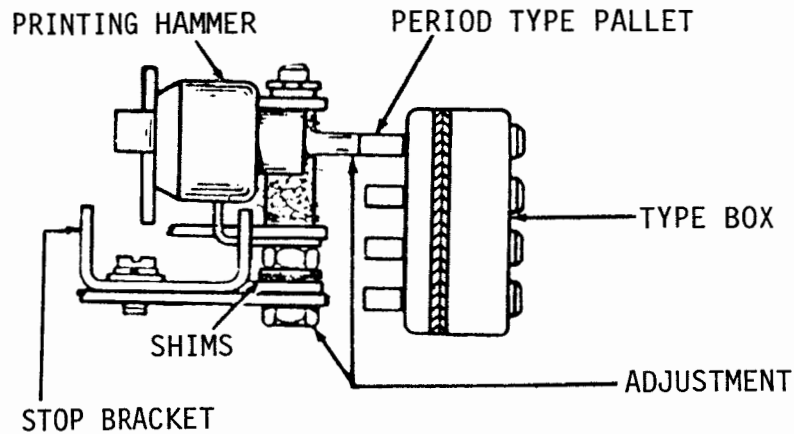


Figure 6-44. Printing Carriage Position Adjustment



(RIGHT SIDE VIEW)

Figure 6-45. Printing Hammer Bearing Stud Adjustment

trip lever shoulder to 0.025 inch (tolerance 0.010 to 0.040 inch).

(5) Tighten cam plate mounting screws.

ag. Printing Track. Adjust printing track as follows:

(1) Refer to figure 6-47.

(2) Loosen printing track mounting screws.

(3) Position printing track up or down to obtain 0.027 inch clearance (tolerance 0.015 to 0.040 inch) between latching extension and operating bail latch.

(4) Tighten printing track mounting screws.

ah. Printing Hammer Stop Bracket. Adjust printing hammer stop bracket as follows:

(1) Refer to figure 6-48.

(2) Set up M (--345) code combination.

(3) Engage and rotate type box clutch 180 degrees.

(4) Move printing hammer stop bracket toward type pallet and hold with 8 ounces of force.

(5) Loosen stop bracket mounting screw and position stop bracket to obtain 0.020 inch clearance (tolerance 0.005 to 0.050 inch) between printing hammer and M type pallet across entire length of pallet.

(6) Tighten stop bracket mounting screw.

ai. Printing Arm Adjustment. Adjust printing arm as follows:

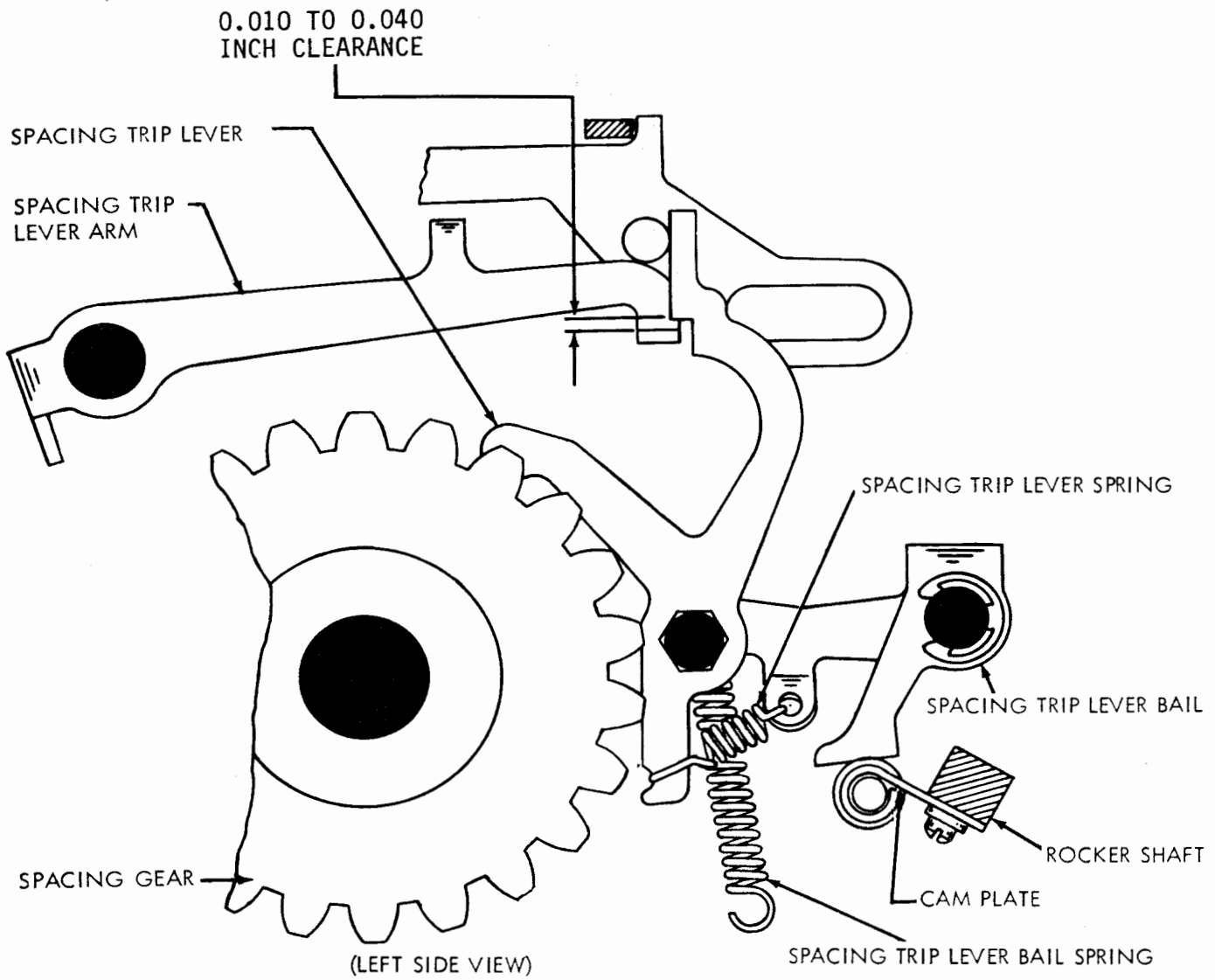


Figure 6-46. Spacing Trip Lever Bail Cam Plate Adjustment

CLEARANCE 0.015
TO 0.040 INCH

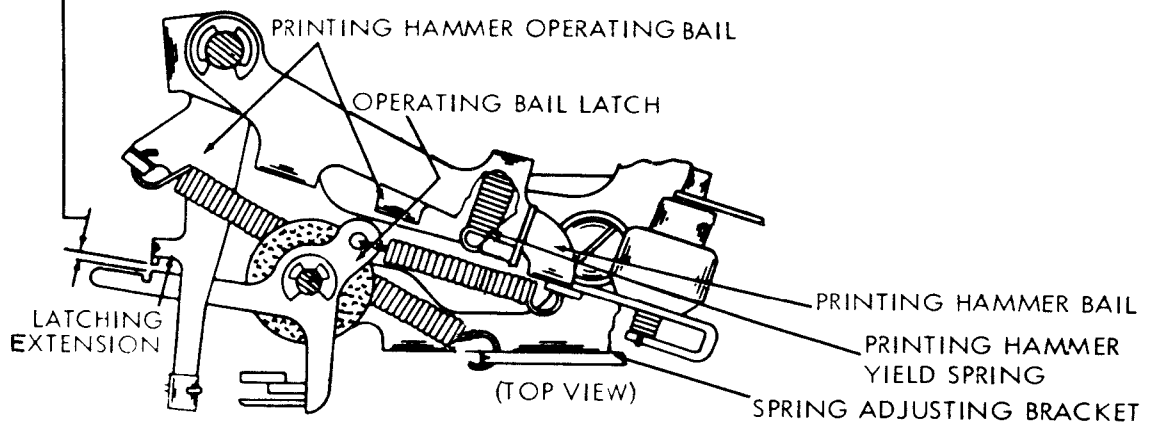


Figure 6-47. Printing Track Adjustment

(1) Refer to figure 6-48.

(2) Loosen printing arm clamp screws.

(3) Position secondary printing arm to obtain some clearance, not to exceed 0.015 inch, between secondary printing arm and forward extension of printing hammer operating bail, and a minimum clearance of 0.006 inch between right face of operating bail latching extension and left face of latch surface.

NOTE

Printing arm adjustment should always be made with printing hammer operating bail spring bracket in position 1. Positions 2 and 3 are to be used only for making multiple copies.

aj. Function Reset Bail Blade. Adjust function reset bail blade as follows:

(1) Refer to figure 6-49.

(2) Engage and rotate code bar clutch until shoe lever just touches trip lever.

(3) Disengage all function pawls from function bars.

(4) Unlatch all function lever latches from function levers.

(5) Loosen reset bail blade mounting screws so that they are friction tight.

(6) Position function reset bail blade so that clearance between blade and each function bar is 0.026 inch (tolerance 0.018 to 0.035 inch).

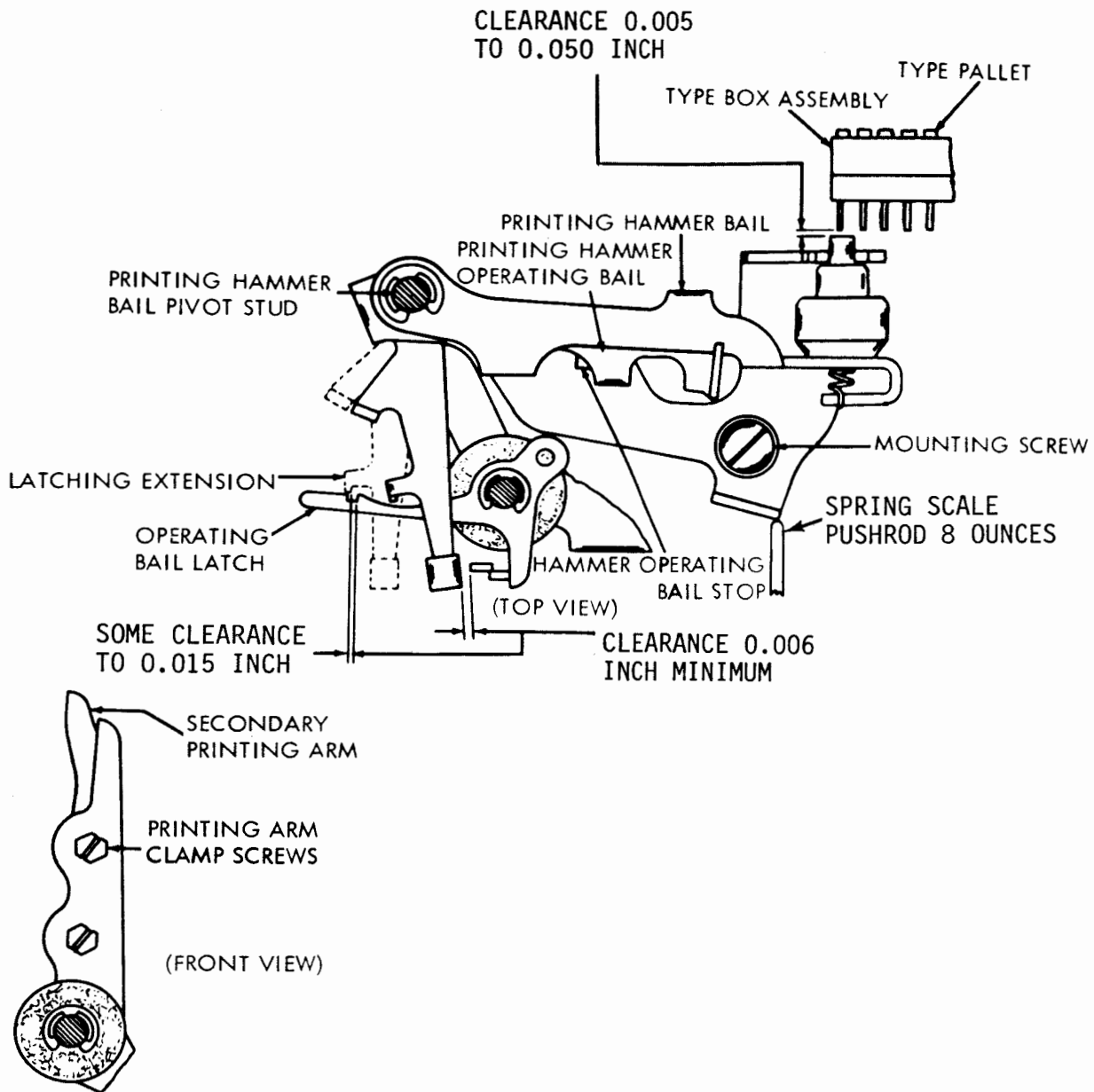


Figure 6-48. Printing Hammer Stop Bracket and Printing Arm Adjustments

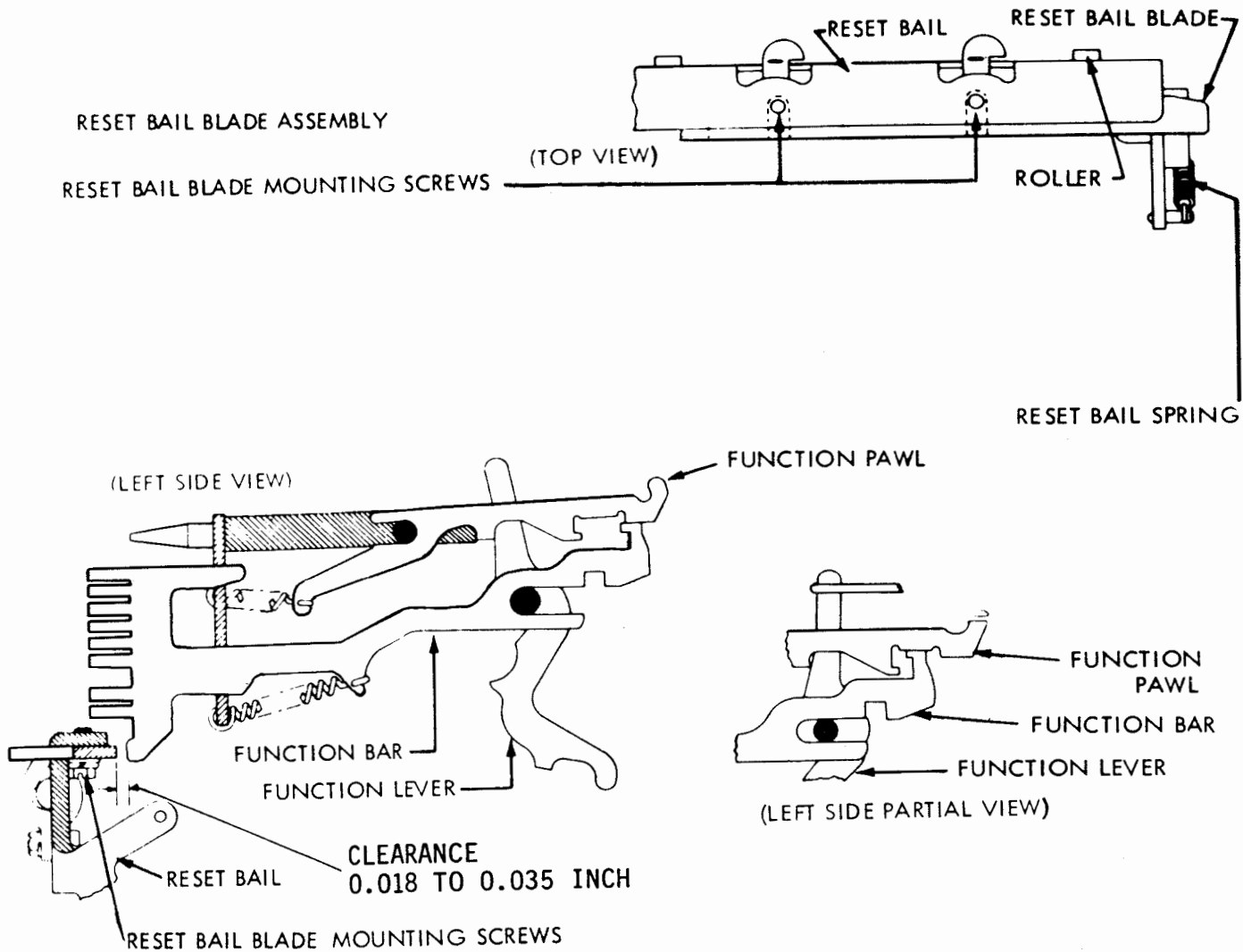


Figure 6-49. Function Reset Bail Blade Adjustment

(7) Tighten mounting screws.

ak. Carriage Return Latch Bail. Adjust carriage return latch bail as follows:

(1) Refer to figure 6-50.

(2) Manually return carriage.

(3) Take up play in carriage return bail to right by holding right side against retainer.

(4) Loosen latch bail plate clamp screw.

(5) Adjust clearance between carriage return lever and carriage return latch bail to 0.022 inch (tolerance 0.004 to 0.040 inch)..

(6) Tighten clamp screw.

al. Carriage Return Lever. Adjust carriage return lever as follows:

(1) Refer to figure 6-51.

(2) Set up carriage return (---4-).

(3) Engage and rotate function clutch until stop lug is toward bottom of unit.

(4) Rotate spacing drum clockwise until carriage return latch bail over-travels carriage return lever.

(5) Loosen carriage return bail clamp screw.

(6) Position carriage return lever on carriage return bail to obtain

clearance of 0.023 inch (tolerance 0.006 to 0.035 inch) between latch bail and carriage return lever.

(7) Tighten clamp screw.

NOTE

If the above adjustment is made, related adjustments listed below must be rechecked as described in Chapter 4.

Oscillating Rail Slide Position, paragraph 4-5d(23)

Printing Carriage Position, paragraph 4-5d(25)

am. Left Margin. Adjust left margin as follows:

(1) Refer to figure 6-52.

(2) Manually return carriage.

(3) Shift type box to letters condition.

(4) Ensure front feed pawl is farthest advanced.

(5) Loosen spacing drum clamp screws.

(6) Position stop arm of spacing drum to obtain 1 inch clearance (tolerance 15/16 to 1-1/16 inch) between left edge of platen and letters print indicator.

NOTE

Left margin may be varied as required from 0 to 1 inch. Maximum range of adjustments for mechanisms with standard (10 characters per inch)

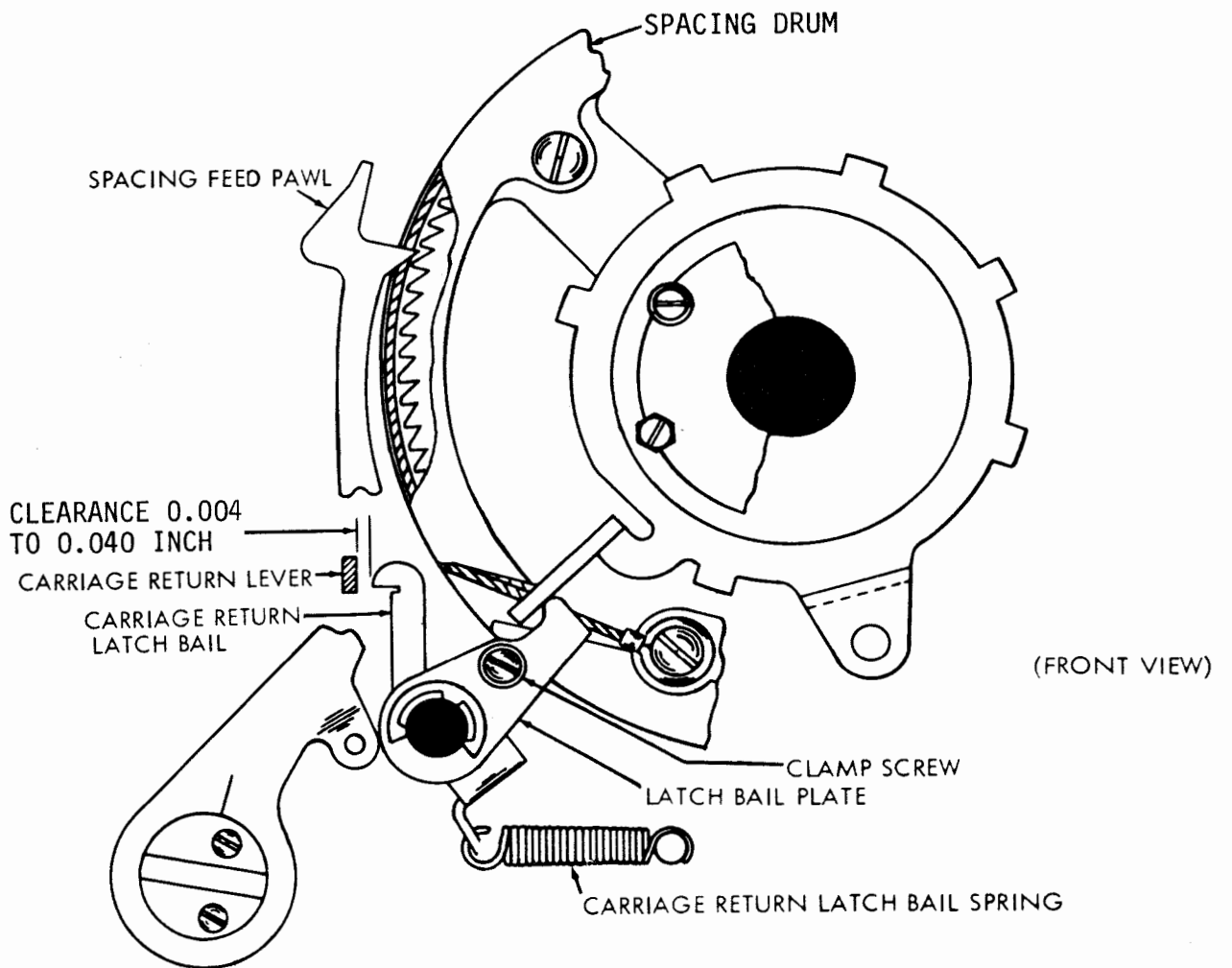


Figure 6-50. Carriage Return Latch Bail Adjustment

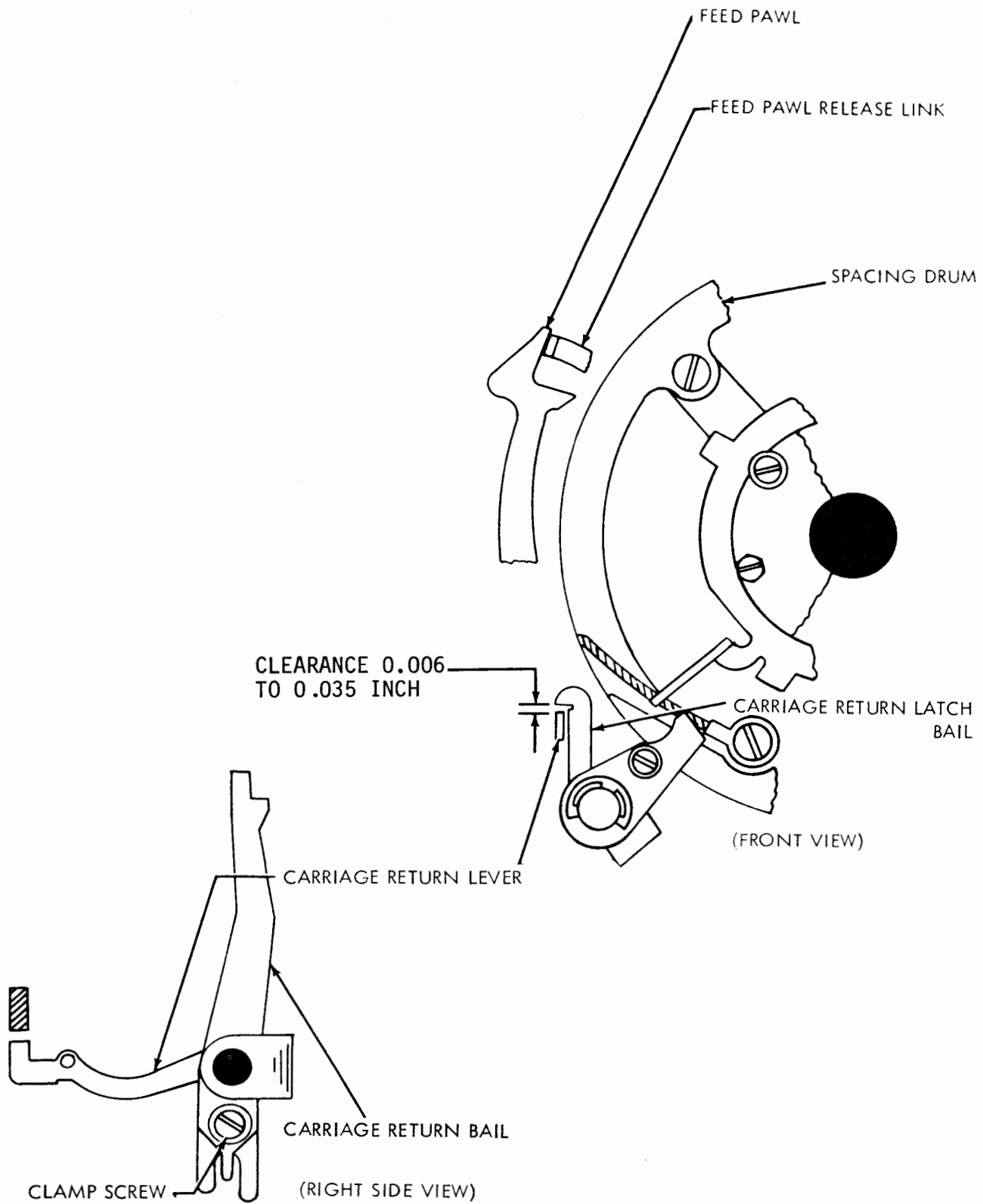


Figure 6-51. Carriage Return Lever Adjustment

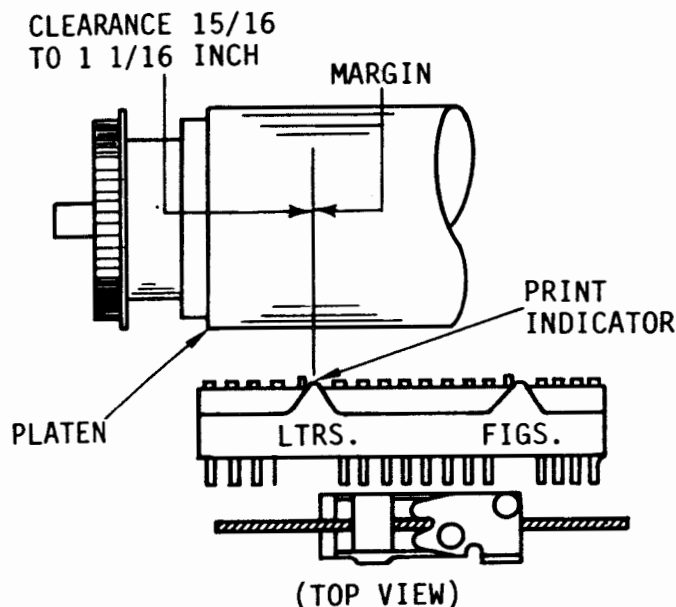


Figure 6-52. Left Margin Adjustment

spacing is as follows:

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. Friction feed plate - 85 characters. 2. Sprocket feed platen - 79 characters. | <ol style="list-style-type: none"> (2) Position carriage near midpoint of platen. (3) Set up 0 (---45) code combination. (4) Engage and rotate type box 180 degrees. (5) Note position of printing hammer in relation to "0" type pallet when hammer is pushed in to touch pallet. (6) Manually buckle right shift linkage. (7) Loosen two left shift linkage clamp screws. (8) Position left shift linkage on oscillator rail by shifting alternately from "W" to "2" and taking up play in each direction. (9) Tighten two clamping screws. |
| <ol style="list-style-type: none"> (7) Tighten clamp screws. (8) Loosen four carriage return ring mounting screws. (9) Hold carriage ring in its counterclockwise position and align type box LTRS indicator with required margin. (10) Tighten four mounting screws. <p>an. <u>Shift Linkage.</u>
Adjust shift linkage as follows:</p> <ol style="list-style-type: none"> (1) Refer to figure 6-53. | |

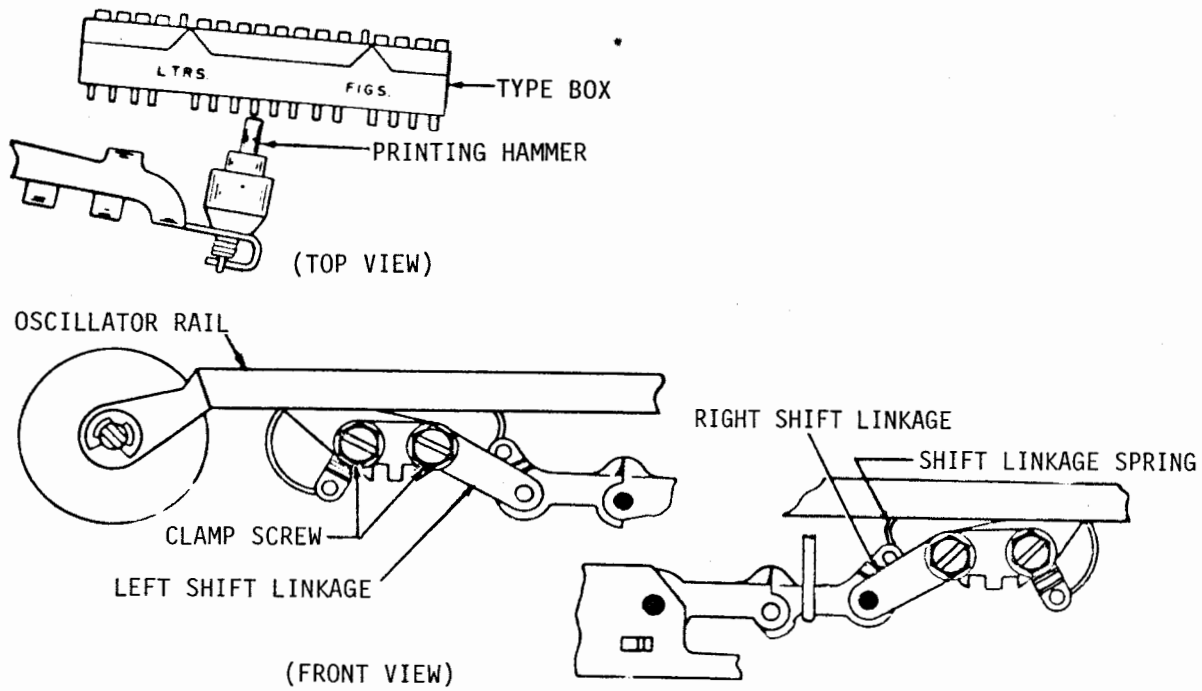


Figure 6-53. Shift Linkage Adjustment

ao. Stripper Blade Drive Cam Position. Adjust stripper blade drive cam position as follows:

- (1) Refer to figure 6-54.
- (2) Note amount of over-travel between upper high of stripper blade drive cam and stripper blade drive arm.
- (3) Engage and rotate function clutch 180 degrees.
- (4) Note amount of over-travel between lower high of stripper blade drive cam and stripper blade drive arm.
- (5) Loosen stripper blade drive arm mounting screws.
- (6) Equalize over-travel of each cam peak.
- (7) Tighten mounting screws.

ap. Horizontal Positioning Drive Linkage. Adjust horizontal positioning drive linkage as follows:

- (1) Refer to figure 6-55.
- (2) Loosen bearing stud mounting screws and connecting strip mounting screws friction tight.
- (3) Position one or both bearing studs on the connecting strip to provide 0.090 inch to 0.110 inch between the center horizontal slide and the decelerating slide on the side where the linkage is not buckled.
- (4) Tighten the two inner mounting screws.

(5) Change position of reversing slide and check opposite clearance. Equalize by shifting both studs and connecting strip as a unit.

(6) Clearance between each side of center horizontal stop slide and decelerating slides, on side where knee linkage is straight, should be equal (within 0.008 inch) (clearance 0.090 to 0.110 inch).

(7) Hold the drive linkage hub against the lever vertical link of the drive linkage.

(8) Tighten the two outer bearing stud mounting screws.

(9) Check the linkage for freeness throughout a complete cycle. The type box clutch disc should have some movement in the normal direction of rotation in the stop position.

aq. Reversing Slide Brackets. Adjust reversing slide brackets as follows:

- (1) Refer to figure 6-56.
- (2) Disengage type box clutch, code bar clutch, and function clutch.
- (3) Right and left movement of reversing slide should buckle opposite positioning drive linkages. The amount of buckling should be between 0.030 inch (minimum) and 0.050 inch (maximum)
- (4) Loosen clamp screw; position each reversing slide bracket.
- (5) Tighten screw.

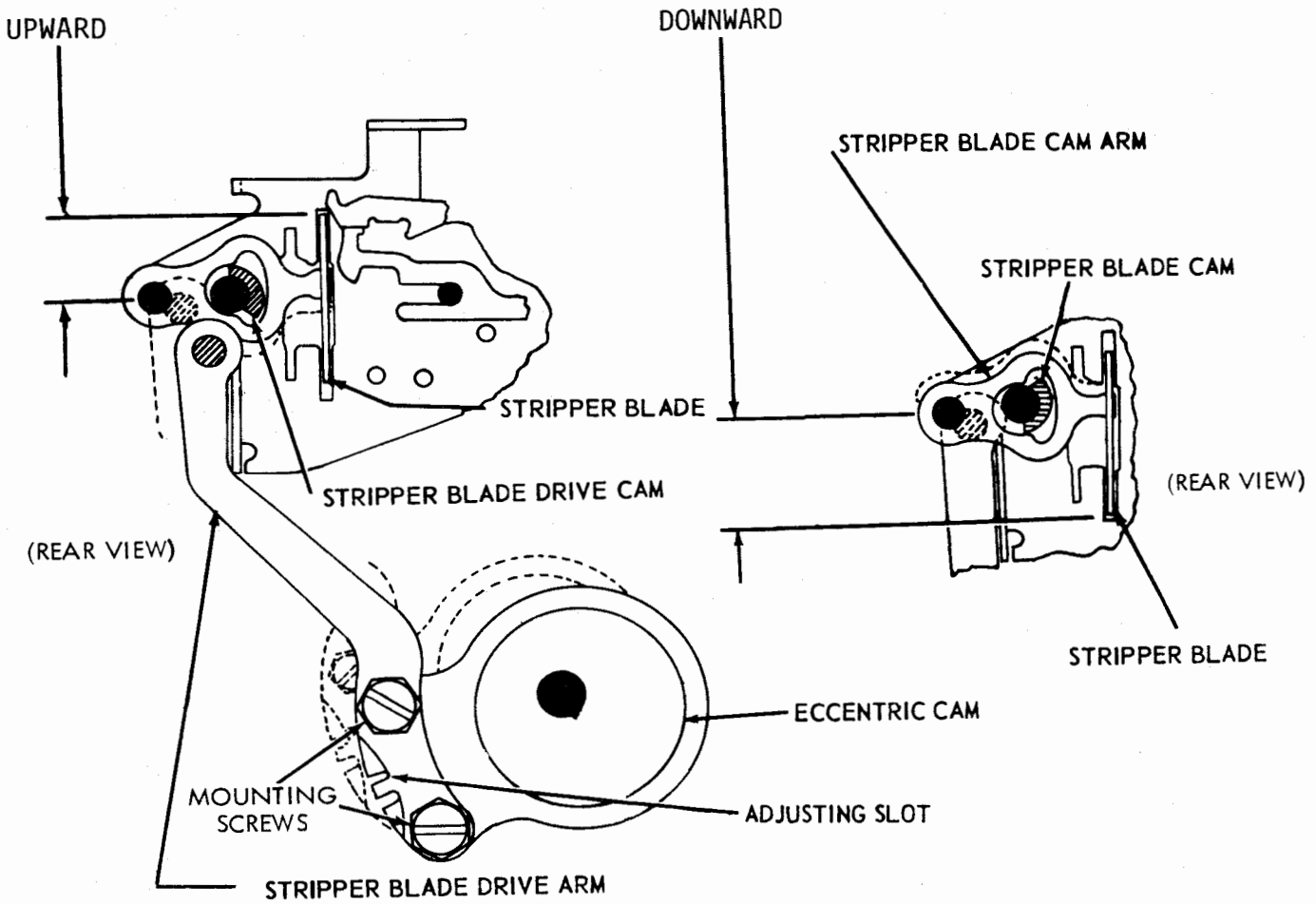


Figure 6-54. Stripper Blade Drive Cam Position Adjustment

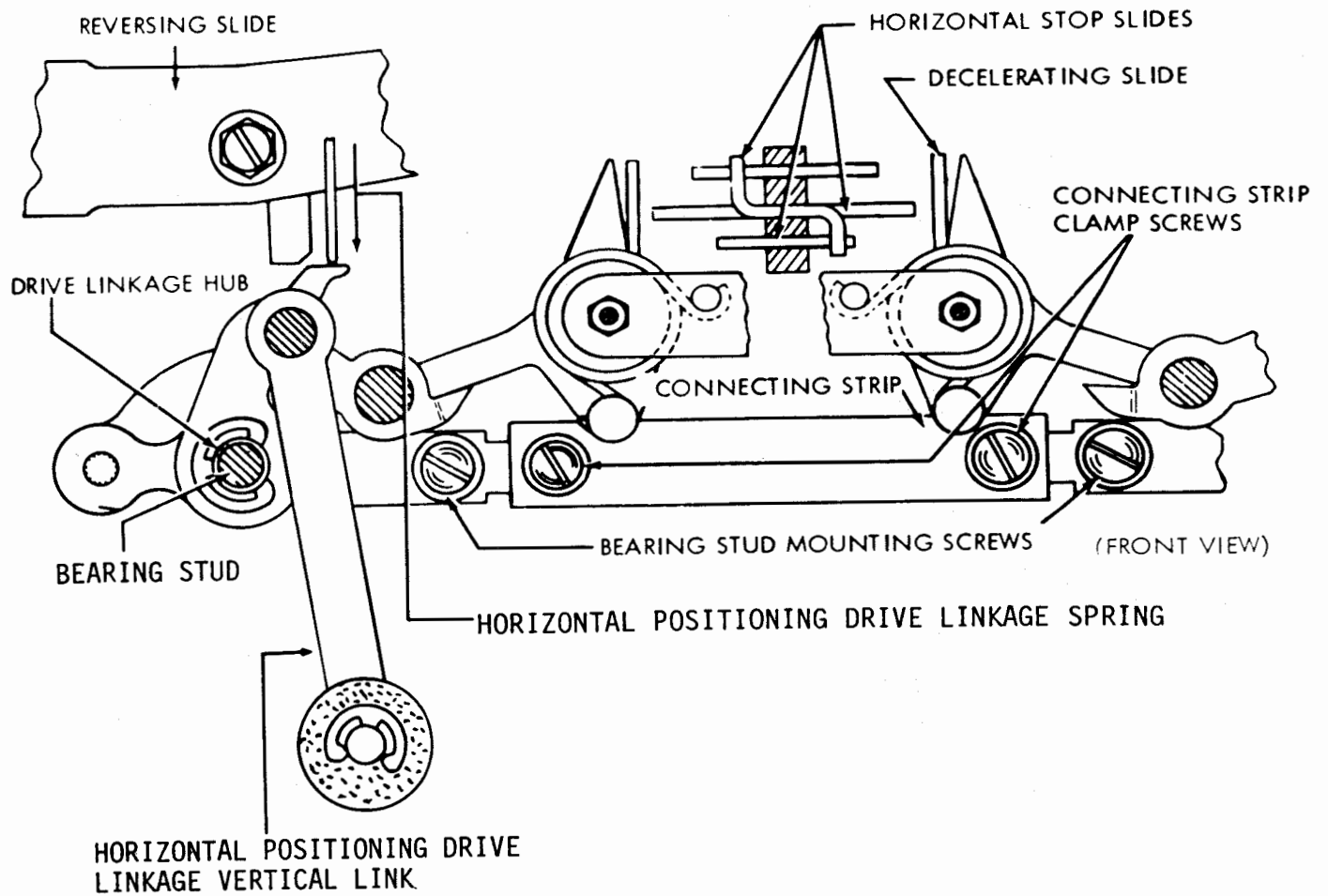


Figure 6-55. Horizontal Positioning Drive Linkage Adjustment

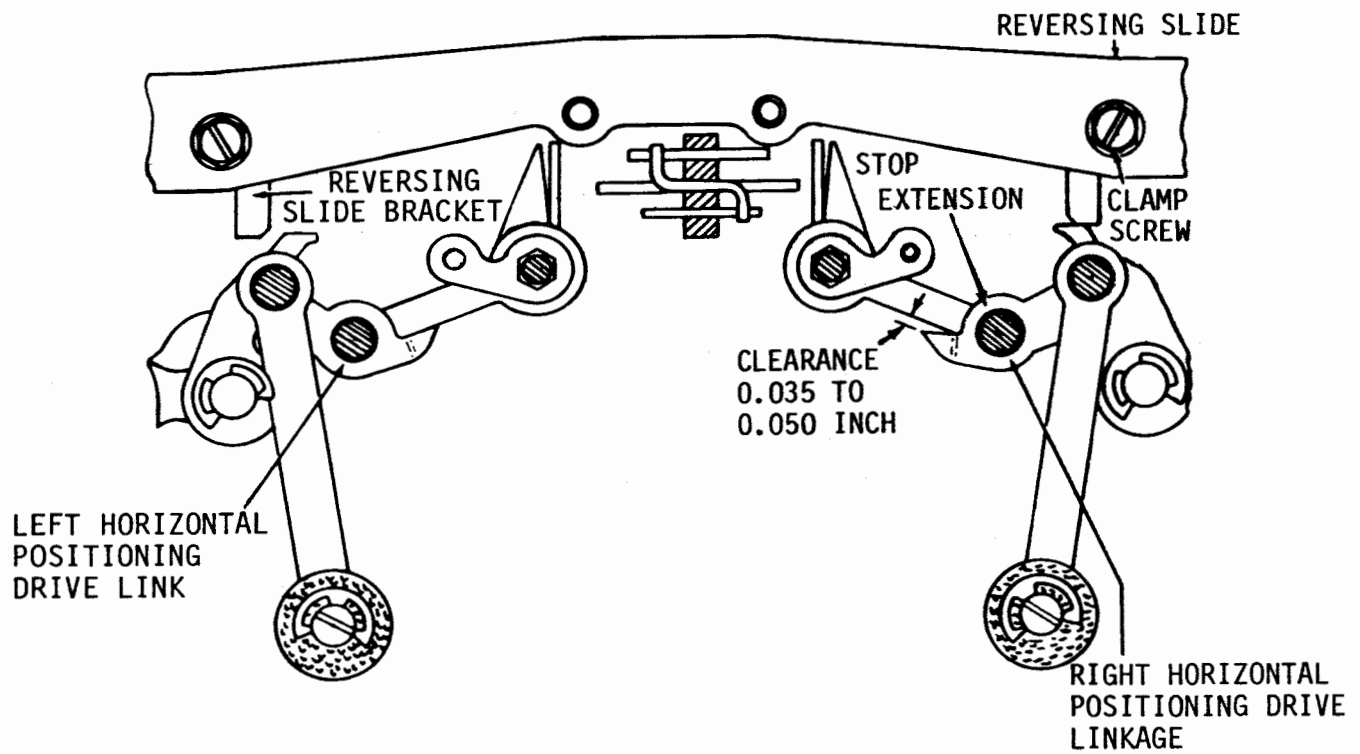


Figure 6-56. Reversing Slide Brackets Adjustment

ar. Right Vertical Positioning Lever Eccentric Stud. Adjust right vertical positioning lever eccentric stud as follows:

- (1) Refer to figure 6-57.
- (2) With type box clutch disengaged, and common code bar in spacing position, take up play by pressing down on common code bar at guide block.

(3) Clearance between the top of vertical positioning lever and the bottom of common code bar should be between 0.030 inch (minimum) and 0.050 inch (maximum).

- (4) Loosen nut.
- (5) Position the eccentric stud in the right rocker shaft bracket. Position high part of eccentric (marked with dot) toward the rear.

(6) Tighten nut.

as. Left Vertical Positioning Lever Eccentric Stud. Adjust left vertical positioning lever eccentric stud as follows:

- (1) Refer to figure 6-58.
- (2) With common code bar in spacing position, and type box clutch tripped, rotate main shaft until right vertical positioning lever top touches common code bar.

(3) Lower link should buckle a maximum 0.008 inch.

(4) Left vertical positioning lever top should touch common code bar, buckling its lower link equally to right

vertical positioning lever lower link.

(5) Loosen nut.

(6) Position eccentric stud on rocker shaft left bracket inner arm. Position high part of cam (marked with dot) toward rear.

(7) Tighten nut.

at. Vertical Positioning Lock Lever. Adjust vertical positioning lock lever as follows:

(1) Refer to figure 6-59.

(2) Set up letters combination on code bars, with main side operating levers at upper end of travel.

(3) Upper notch of vertical positioning lock lever should be fully engaged with vertical slide projection. If necessary set manually.

(4) Upper surface of follower arm near extension should be either in contact with inner extension of main side lever, or no more than a maximum 0.004 inch away.

(5) Vertical surfaces of positioning lock lever and slide projection should be either in contact, or no more than 0.012 inch apart.

(6) Loosen clamp screws.

(7) Position vertical positioning lock levers.

(8) Tighten screws.

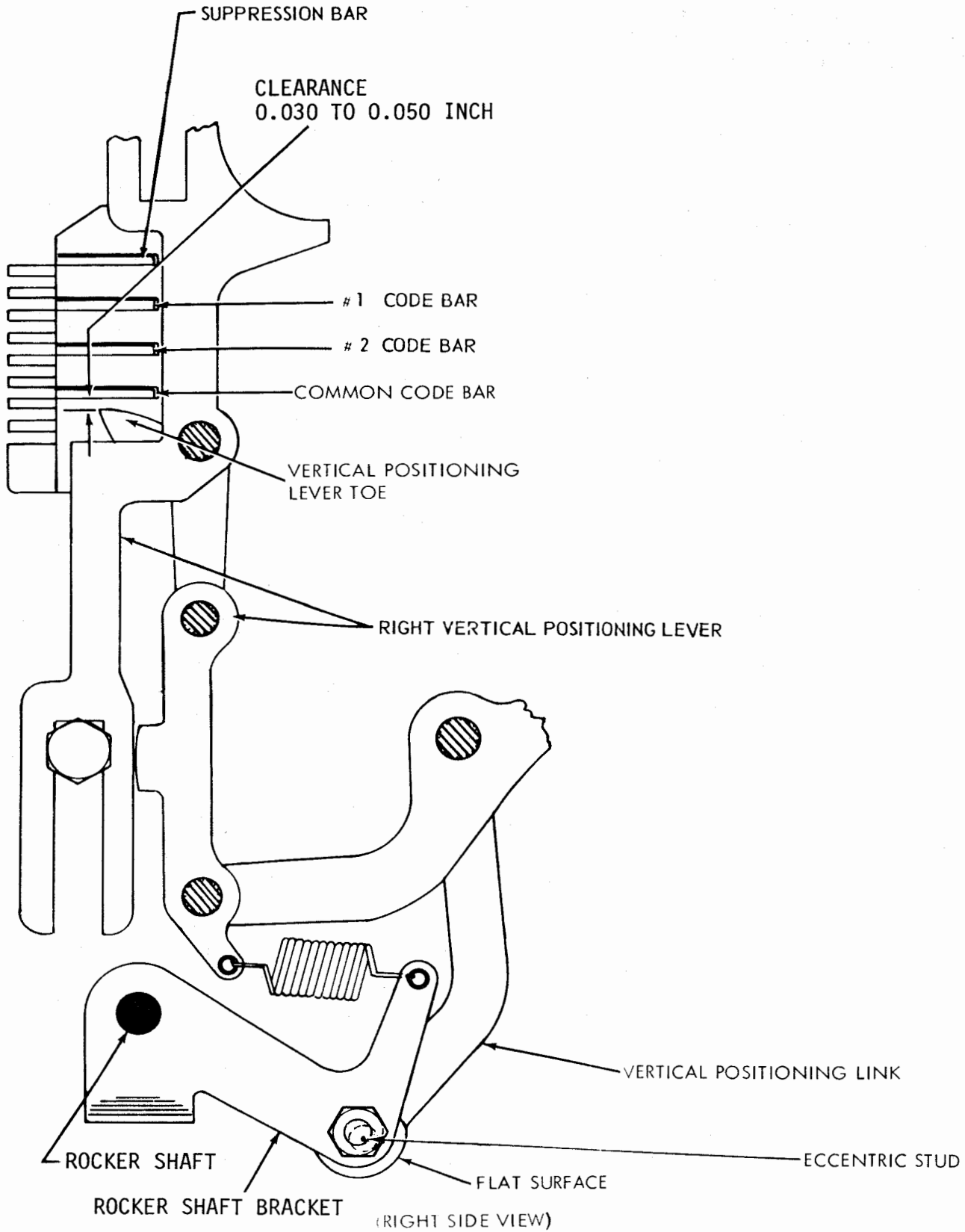


Figure 6-57. Right Vertical Positioning Lever
Eccentric Stud Adjustment

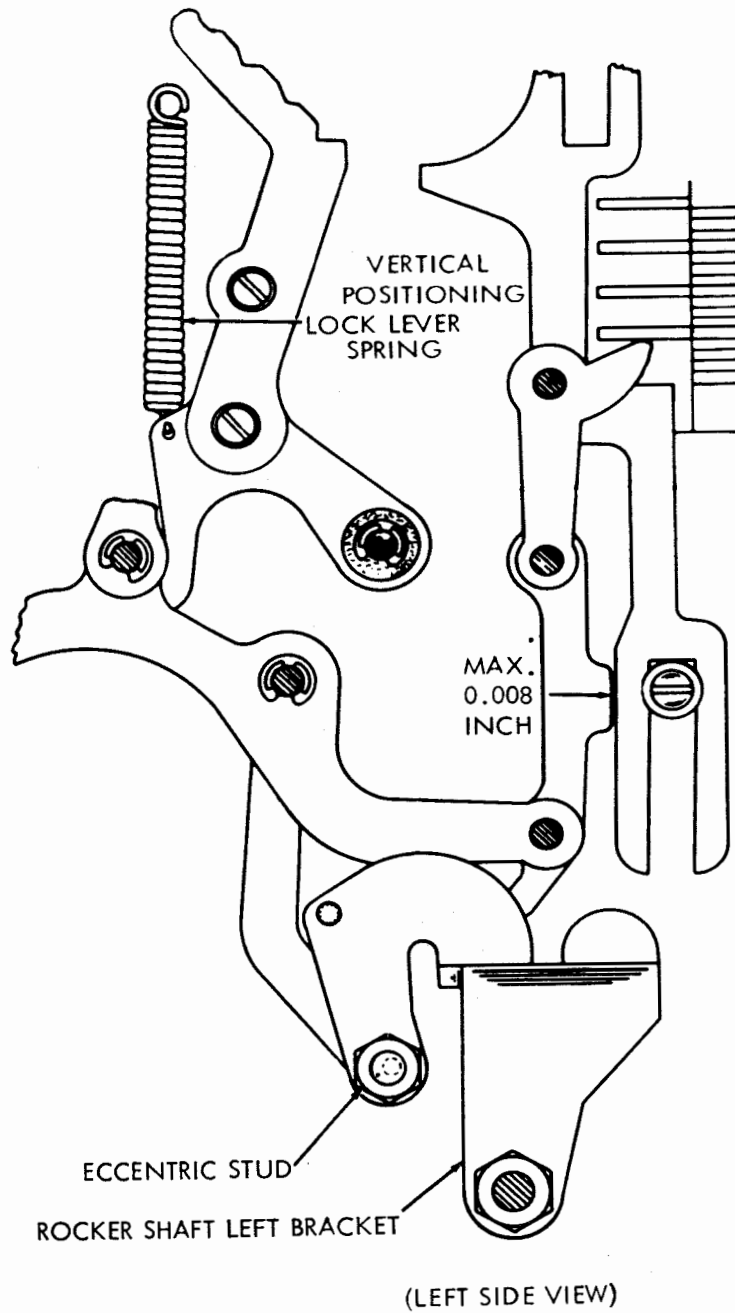


Figure 6-58. Left Vertical Positioning Lever Eccentric Stud Adjustment

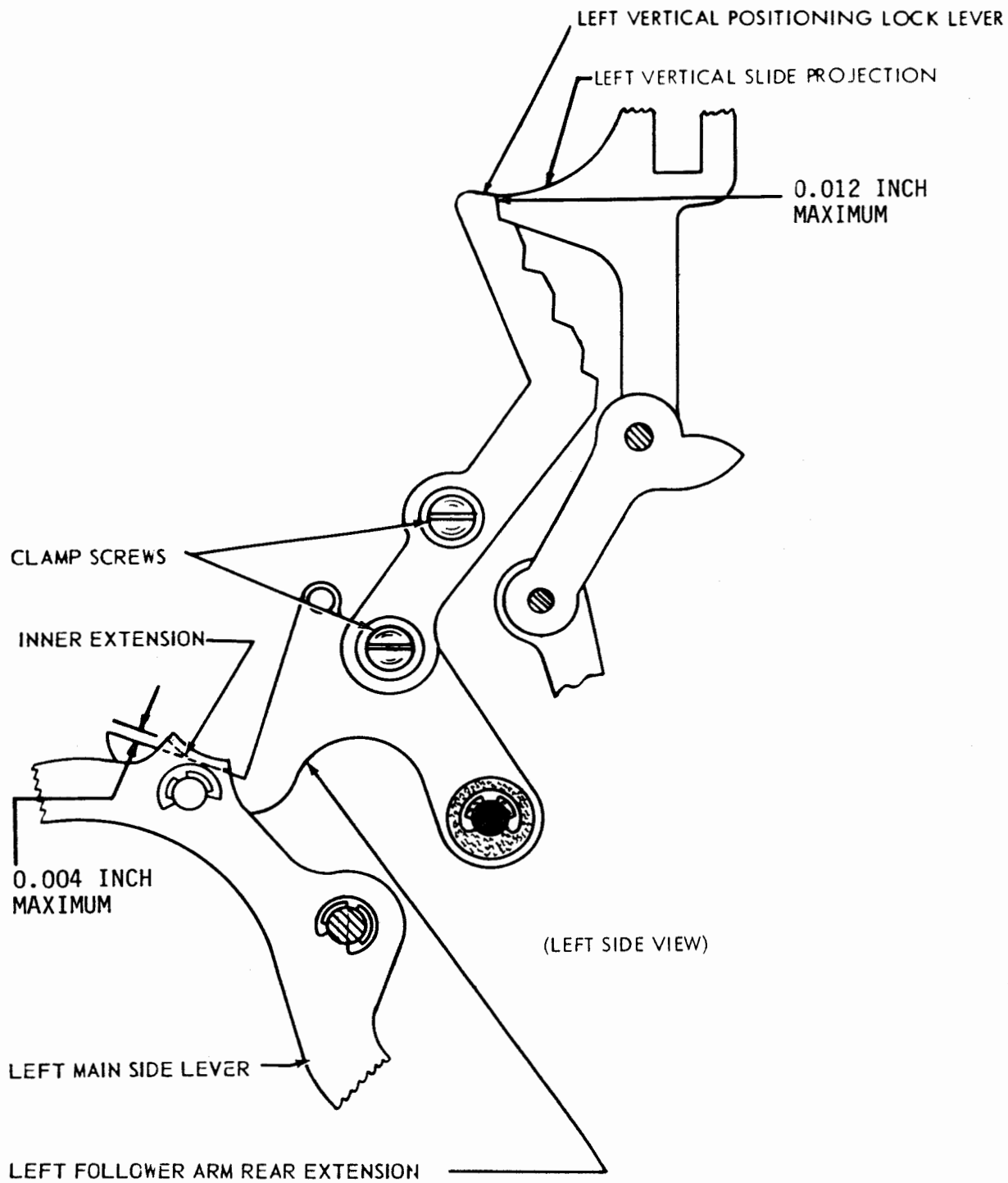


Figure 6-59. Vertical Positioning Lock
Lever Adjustment

au. Ribbon Feed Lever Bracket. Adjust ribbon feed lever bracket as follows:

- (1) Refer to figure 6-60.
- (2) For left-hand mechanism:
 - (a) With left reversing lever and ribbon mechanism in upward position, and ratchet wheel held against the detent lever, clearance between front face of the feed lever and the shoulder of a tooth on the ratchet wheel should be 0.015 inch minimum to 0.035 inch maximum.
 - (b) To adjust, loosen mounting screws; position feed lever bracket; tighten screws.

- (3) For right-hand mechanism:
 - (a) With right reversing lever and ribbon mechanism in upward position, loosen mounting screws, and position the feed lever bracket. Clearance should be the same as for left-hand mechanism: 0.015 inch minimum to 0.035 inch maximum.

- (b) Tighten bracket mounting screws.

NOTE

Rotate the main shaft. The ratchet wheel should step one tooth only with each operation.

av. Ribbon Reverse Spur Gear. Adjust ribbon reverse spur gear as follows:

- (1) Refer to figure 6-61.

- (2) When right reversing lever is at maximum downward, left reversing lever should be at maximum upward. To adjust:

- (a) Loosen the set screws in the detent cam.
- (b) Loosen the left spur gear nut.
- (c) Tighten the right spur gear nut.
- (d) Holding the left reversing lever in maximum upward, move the right reversing lever to maximum downward.
- (e) Tighten left spur gear nut.

NOTE

Tighten type box clutch 1/2 turn and move right reversing lever under the segment: there should be some clearance between segment and lever.

aw. Ribbon Reverse Detent. Adjust ribbon reverse detent as follows:

- (1) Refer to figure 6-62
- (2) With ribbon reverse detent link buckled in its downward position, and play in the lever taken up lightly towards the right side of the printer, clearance between detent link and detent lever should be from some (minimum) to 0.055 inch (maximum).

- (3) To adjust:
 - (a) Loosen set screws.

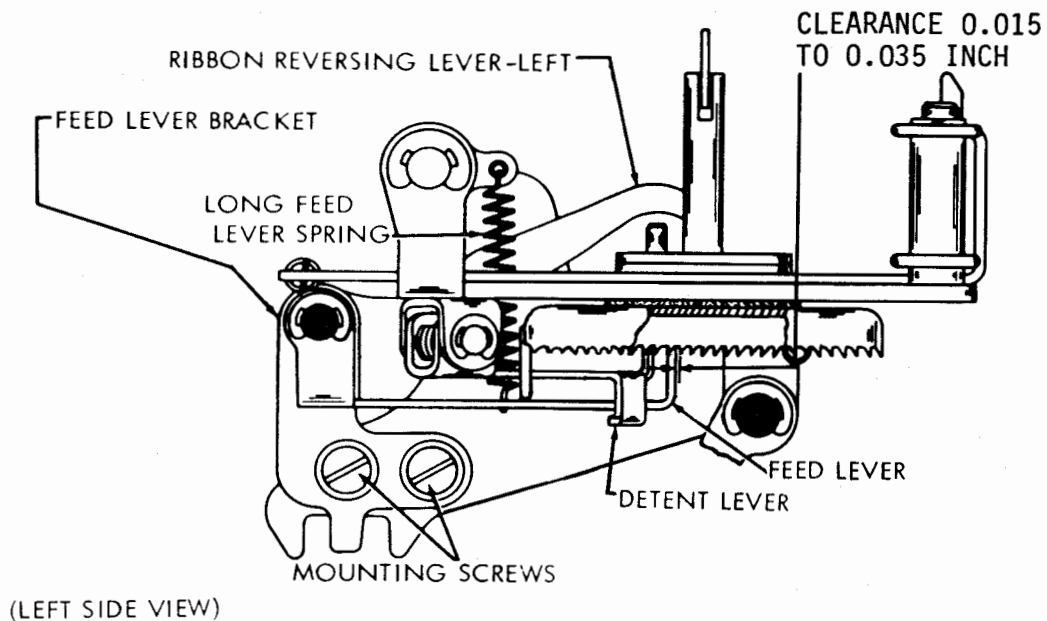


Figure 6-60. Ribbon Feed Lever Bracket Adjustment

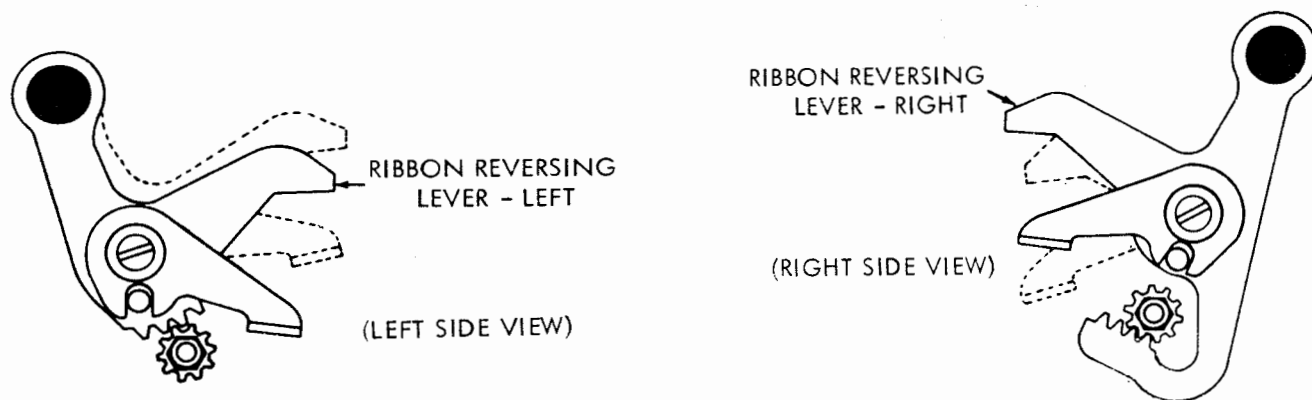


Figure 6-61. Ribbon Reverse Spur Gear Adjustment

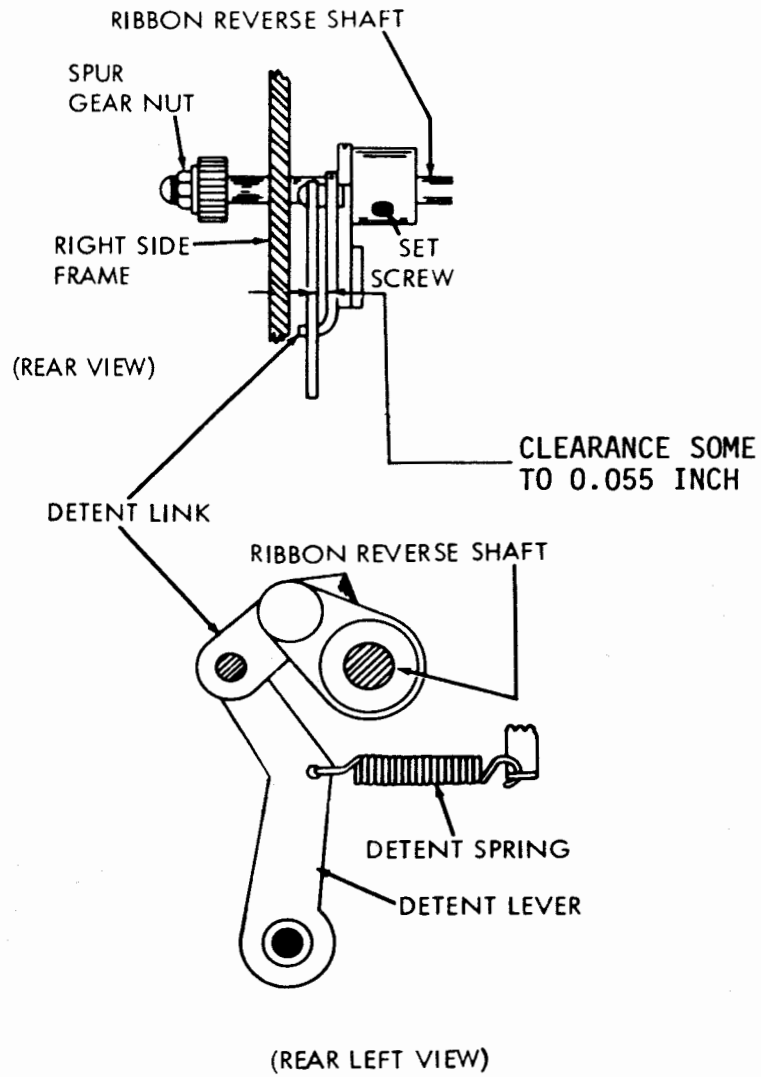


Figure 6-62. Ribbon Reverse Detent Adjustment

(b) Hold left ribbon reversing lever downward, position detent link, and tighten the upper set screw.

(c) Buckle the detent link upward, and tighten the lower set screw.

ax. Right Margin. Adjust right margin as follows:

NOTE

Check adjustments in paragraphs 6-4w, 6-4ah, 6-4y, and 6-4az if the following adjustments are made.

(1) Refer to figure 6-63.

(2) Disengage type box.

(3) Position carriage to print character on which spacing cutout is to occur.

(4) Advance front feed pawls to farthest position.

(5) Push cutout bail towards rear of unit through hole in front plate.

(6) Loosen four mounting screws.

(7) Position space suppression ring. Clearance between transfer bail and extension on space suppression ring should be 0.006 inch minimum to 0.025 inch maximum.

(8) Tighten mounting screws.

ay. Right Margin (With Automatic Carriage Return-Line Feed Ring). Adjust as follows:

(1) Refer to figure 6-64.

(2) Disengage type box.

(3) Position carriage two spaces before character on which automatic carriage return-line feed is to occur.

(4) Advance front feed pawl to farthest position.

(5) Loosen four mounting screws.

(6) Position ring. Clearance between extension on ring and automatic carriage return-line feed bell crank should be from 0.040 inch minimum to 0.055 inch maximum.

(7) Tighten mounting screws.

az. Dash Pot Vent Screw. Adjust dash pot vent screw as follows:

(1) Refer to figure 6-65.

(2) Operate printer at any speed from automatic transmission with one CR and one LF signal between lines.

(3) First character of each line should be printed in same location as if unit were manually operated at a slow rate.

(4) Turn down vent screw until slight pneumatic bounce is perceptible. Back off screw until bounce disappears.

(5) For dashpot with one vent hole, back off screw an additional full turn; then tighten nut.

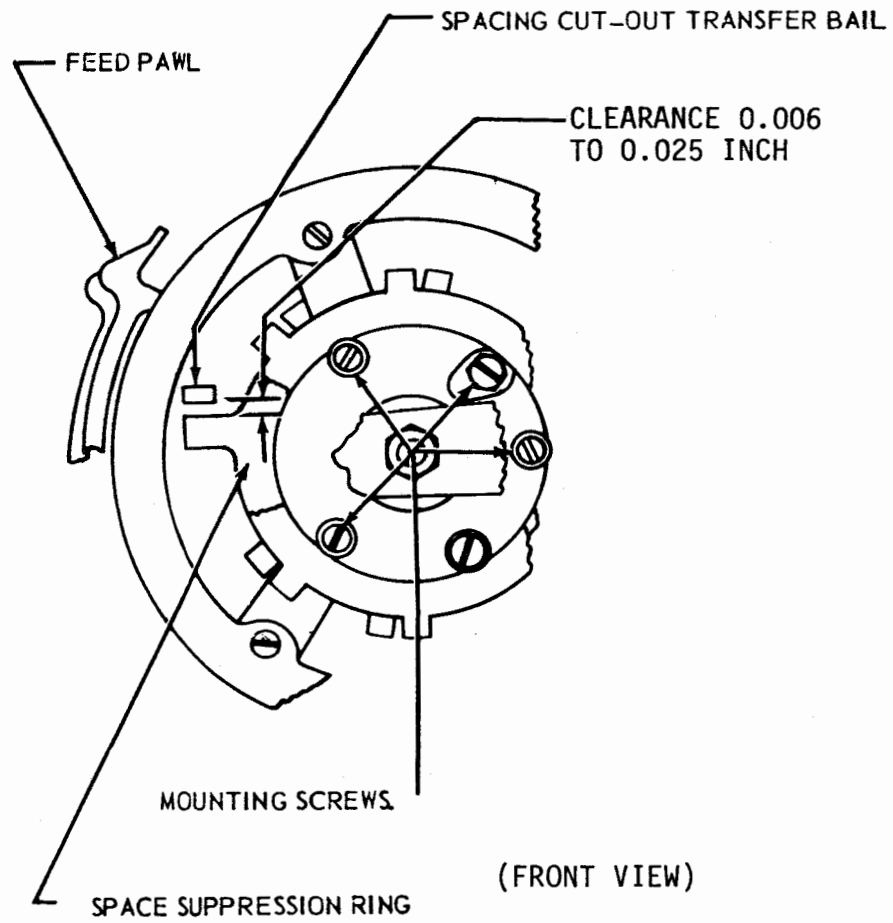


Figure 6-63. Right Margin Adjustment

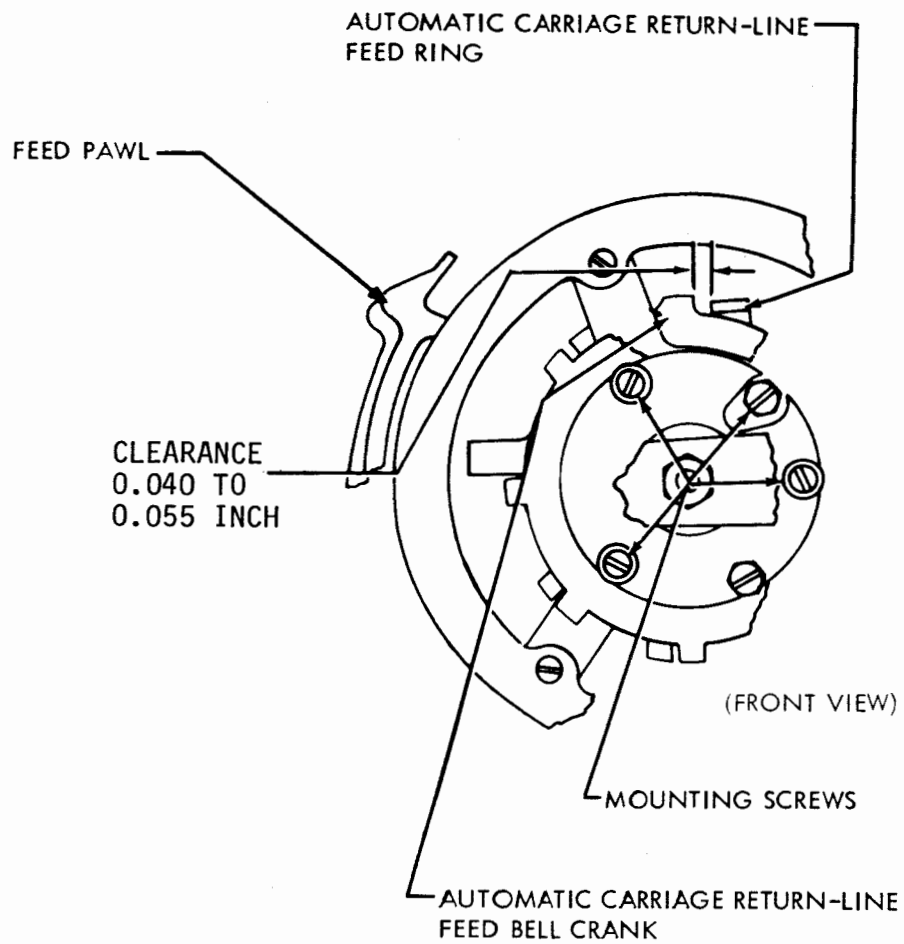


Figure 6-64. Right Margin Adjustment (With Automatic Carriage Return-Line Feed Ring)

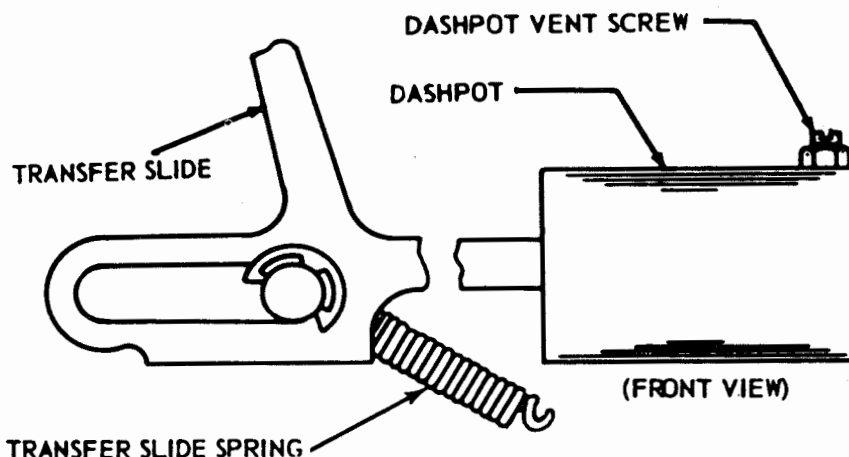


Figure 6-65. Dashpot Vent Screw

(6) For dashpot with two vent holes, back off screw an additional quarter-turn; then tighten nut.

return latch to prevent interference with spacing drum.

(5) Loosen spring drum nut.

NOTE

At the altitudes over 2000 feet, it may also be necessary to reduce the carriage return spring requirement towards minimum.

(6) To increase tension, rotate spring drum ratchet wheel. To decrease tension, operate escapement lever.

(7) Tighten nut.

ba. Carriage Return Spring. Adjust carriage return spring as follows:

(1) Refer to figure 6-66.

(2) Place spacing drum in returned position; printing track in lower position.

(3) Remove lower cable roller spring.

(4) Hold spacing pawl, buffer slide, and carriage

6-5. GENERAL. After a fault has been isolated to a specific mechanical function, and the trouble cannot be corrected by performing an adjustment, a defective mechanical part is indicated. Repair action will then consist of removal and replacement of the defective component.

6-6. DISASSEMBLY AND REASSEMBLY PROCEDURES. The following procedures are provided to enable the technician to disassemble the teletypewriter set to gain access to a

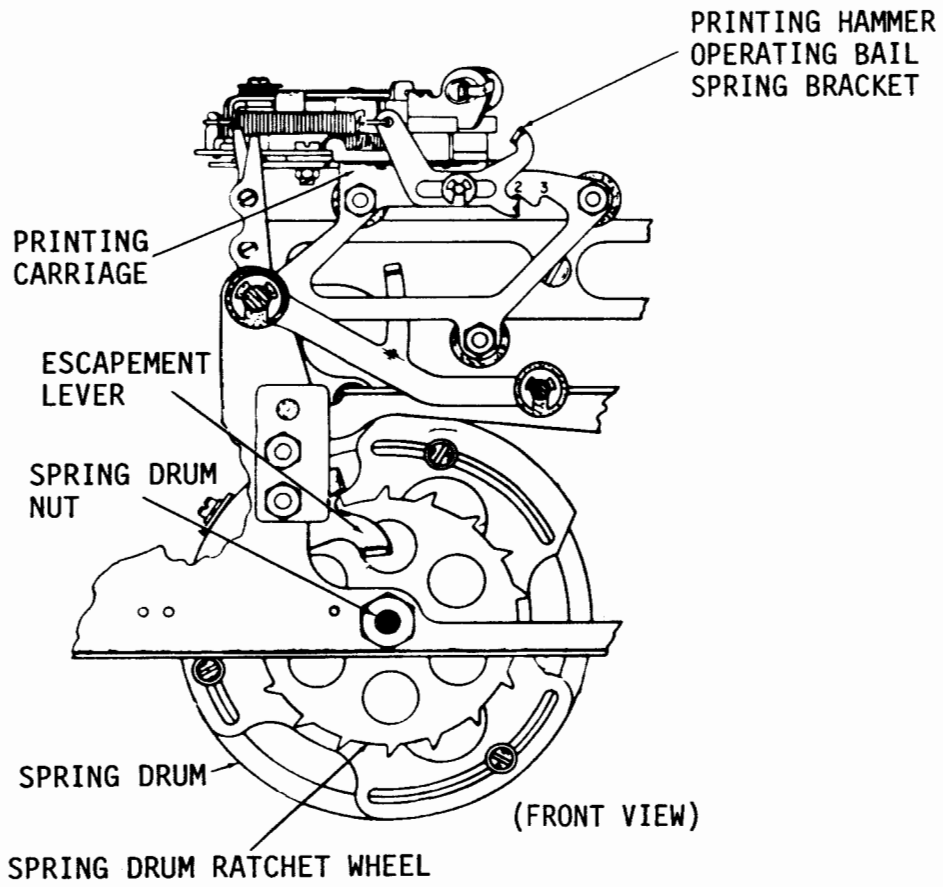


Figure 6-66. Carriage Return Spring Adjustment

defective component and to reassemble the set after a defective component has been replaced. The procedures are also provided to aid the technician when disassembly is required for inspection, cleaning, and lubrication.

a. Removing Cover. To remove cover, proceed as follows:

(1) Depress plungers (111345) on both sides of dome.

(2) Open window door by lifting on rear.

(3) Disconnect copy light plug.

(4) Push latches on sides of cover toward rear and lift cover from base.

b. Removing Typing Unit. To remove typing unit, proceed as follows:

(1) Disconnect J103 from P103.

(2) Spread spring clips which hold R plug by pushing clips together at bottom; remove R plug from mounting unit.

(3) Remove four mounting screws which hold typing unit to base.

(4) Place left hand under rear of left frame and right hand under right side at front plate above dash pot; lift typing unit from base.

c. Removing Keyboard Transmitter. To remove keyboard transmitter, proceed as follows:

(1) Rotate LA plug clamp nut counterclockwise and withdraw plug.

(2) Disconnect wires from P-2, P-4, K-1, S-4, and S-3.

(3) Disengage reset linkage from reset lever.

(4) Remove screw which holds ground strap to base.

(5) Remove four screws which hold keyboard transmitter to pan.

(6) Lift keyboard transmitter from pan.

d. Removing Distributor Mechanism. To remove distributor mechanism, proceed as follows (figures 7-33 and 7-34):

(1) Remove four screws (151631) which hold distributor to base.

(2) Disconnect wires from P-6, P-5, H-1, H-2, H-3, and H-4.

(3) Remove two screws which hold L plug mounting bracket to base.

(4) Rotate U plug clamp nut counterclockwise and withdraw plug.

(5) Remove retaining clip from reset drive link and slide reset drive link off post..

(6) Lift distributor mechanism from base.

e. Removing Motor. To remove motor, proceed as follows (figure 7-38):

(1) Disconnect power leads from terminal block on gear shift assembly (figure 31).

(2) Remove four screws which hold motor to base.

(3) Lift motor from base.

f. Removing Base from Pan. To remove base from pan, proceed as follows (figures 7-25 and 7-26):

(1) Remove four shock mounting screws (99082).

(2) Loosen two set screws (107256) in speed selector knob and remove knob.

(3) Remove three cover guide screws.

(4) Remove ground strap screw from pan.

(5) Lift base from pan.

(6) Remove all wiring clamps.

(7) Remove wiring harness.

g. Removing Gear Assembly. To remove gear assembly, proceed as follows (figures 7-31 and 7-32):

(1) Remove retainer ring which holds shift link to speed selector shaft and disconnect link from shaft.

(2) Remove two screws which hold terminal block mounting bracket to gear shift assembly and remove bracket.

(3) Remove clamp nut from front adjusting screw.

(4) Remove two screws which hold gear assembly rear adjusting mechanism to base (access from bottom).

(5) Lift gear assembly from base.

h. Disassembling Gear Assembly. To disassemble gear assembly, proceed as follows (figure 7-32):

(1) Remove screw which holds distributor drive gear to shaft.

(2) Remove three screws which retain idler shaft right bearing.

(3) Remove screw which clamps idler gear to shaft.

(4) Remove bearing.

(5) Slide idler shaft out left side.

(6) Slide collar off shaft. Ensure pin and spring are retained.

(7) Remove three right bearing screws.

(8) Remove pin which holds variable-speed shaft gear to shaft.

(9) Slide variable-speed shaft out left side.

(10) Remove felts.

(11) Remove screw which holds assembly driven gear to assembly drive shaft.

i. Disassembling Motor Unit. To disassemble motor unit, proceed as follows (figure 7-38):

(1) Remove set screw which holds fan to shaft.

(2) Remove two screws which hold motor pinion

to shaft and remove pinion (figure 32).

(3) Loosen two resilient mount clamp screws and remove clamps.

(4) Lift motor from mount.

(5) Remove two nut-and-bolt sets which secure end shields to stator.

(6) Remove end shields, springs, and washers.

(7) Remove rotor from stator.

j. Disassembling Distributor Mechanism. To disassemble distributor mechanism, proceed as follows (figure 7-33 through 7-36):

(1) Remove screw (151659) which holds distributor shaft driven gear to shaft, and remove gear.

(2) Remove four screws from distributor drum cover plate and remove cover plate.

(3) Remove wires from H-1 and H-4.

(4) Remove three screws from photocell mounting bracket on left frame and remove mechanism.

(5) Remove two screws from clutch magnet bracket on right frame and remove bracket.

(6) Remove two screws, two washers, and two spacers from left bearing retainer.

(7) Remove screw from bearing retainer on right frame and remove retainer.

(8) Remove nut which holds left bearing to shaft and remove bearing.

(9) Remove screw from clutch drum.

(10) Slide shaft through right side of frame.

(11) Remove clutch and distributor drum.

(12) Disassemble clutch.

(13) Remove distributor shaft idler gear shaft by rotating clockwise.

CAUTION

Distributor shaft idler gear shaft has a left-hand thread.

k. Disassembling Keyboard Transmitter. To disassemble keyboard transmitter, proceed as follows (figures 7-27 and 7-29):

(1) Loosen Allen screw which holds power switch control knob (148157) to shaft.

(2) Remove nut (178839) which fastens power switch to top plate. Push switch out of top plate.

(3) Remove two retainer rings (119652) which hold top plate to side frames.

(4) Spread side frames and lift top plate.

(5) Unsolder three wires from fuseholder (116783).

(6) Remove retainers which hold wiring harness to top plate.

(7) Disconnect two photocell leads and withdraw cells.

1. Disassembling Typing Unit. The following paragraphs describe the procedure for disassembling the typing unit.

(1) Removing Paper. To remove paper, proceed as follows:

(a) Push paper release to rear.

(b) Push paper spindle holders to rear.

(c) Remove paper.

(2) Removing Ribbon. To remove ribbon, proceed as follows (figure 7-19 and 7-20):

(a) Move ribbon spool clips to upward position.

(b) Lift ribbon spools from machine.

(3) Removing Type Box. To remove type box, proceed as follows (figure 7-24):

(a) Trip type box latch to right.

(b) Lift right end of type box and pull toward right to disengage it from left-hand bearing stud.

(4) Disconnecting Type Box Carriage Link from Carriage. To disconnect type box link from carriage, proceed as follows (figure 7-8):

(a) Set up letters combination.

(b) Engage and rotate type box clutch 180 degrees.

(c) Move type box carriage to extreme right.

(d) Remove retainer ring from type box carriage link.

(5) Removing Front Plate. To remove front plate, proceed as follows (figures 7-13 through 7-15):

(a) Remove two screws which hold main bail drive bracket to main rocker shaft (figure 7-15).

(b) Remove screw which holds spacing shaft helical driven gear to spacing shaft and remove gear.

(c) Remove four screws (151723) which hold front plate assembly to left and right side frame and lift front plate.

(d) Set front plate aside to be disassembled later.

(6) Removing Code Bar Shift Bars. To remove code bar shift bars, proceed as follows (figure 7-21):

(a) Remove two screws (151152) from retaining plate and remove plate.

(b) Remove and discard three code bar shift bar springs (152257).

(c) Pull left end shift bars forward and work right end out of guide.

(7) Removing Code Bar Basket. To remove code bar basket, proceed as follows (figure 7-21):

(a) Remove four mounting screws which hold basket to right and left side frames.

(b) Pull code bar basket forward and remove.

(8) Removing Selector Clutch and Cam Sleeve Assembly. To remove selector clutch and cam sleeve assembly, proceed as follows (figures 7-10 and 7-17):

(a) Remove selector clutch drum clamp screw (151642) and lock nut (3598).

(b) Lock push lever reset bail in raised position by lifting and pushing in.

(c) Pull marking lock lever toward machine front.

(d) Insert straightened paper clip in hole forward of guide plate.

(e) Rotate clutch cam disk counterclockwise and pull gently outward, using caution to clear the following items:

Selector clutch stop arm

Selector clutch latch lever

Stop arm bail

Push lever reset bail

Trip shaft lever

CAUTION

Use no more force than necessary.

(f) Remove drum from clutch.

(9) Removing Selector Mechanism. To remove selector mechanism, proceed as follows (figures 7-17 and 7-18):

(a) Remove four nuts and lockwashers which hold J103 receptacle to its mount.

(b) Unhook common transfer lever spring at spring bracket.

(c) Remove four selector unit assembly back plate mounting screws and remove assembly.

(10) Removing Type Box Clutch. To remove type box clutch, proceed as follows (figure 7-9):

(a) Remove retainer plate.

(b) Withdraw type box clutch drive link.

(c) Remove and discard trip and latch lever springs.

(d) Remove screw which holds clutch drum to main shaft.

(e) Pull clutch cam disc gently outward.

(11) Removing Main Shaft. To remove main shaft, proceed as follows (figures 7-9 and 7-10):

(a) Remove all trip and latch lever springs.

(b) Remove code bar clutch cam follower arm spring.

(c) Remove code bar clutch trip shaft lever spring.

(d) Remove two springs (150241 and 181284) from function bar reset bail.

(e) Remove screw from right main shaft bearing retainer.

(f) Remove two screws from left main shaft bearing retainer and remove retainer.

(g) Remove two function clutch eccentric follower arm screws.

(h) Remove retainer ring from cam shaft driving arm.

(i) Remove eccentric follower.

(j) Remove screw from right main shaft bearing collar. Slide collar from shaft.

(k) Remove two screws which hold left main rocker shaft drive bracket to main rocker shaft.

(l) Move main shaft to left to free code bar clutch eccentric follower arm from shift lever drive shaft extension and clear main shaft bearings from side frames.

NOTE

Rotating function rocker shaft box to rear will move function cam follower arm

roller to front and aid in removal of mail shaft.

(m) Lift out main shaft.

(12) Disassembling Main Shaft. To disassemble main shaft, proceed as follows (figures 7-9 and 7-10):

(a) Remove all clutch and gear mounting screws.

(b) Slide clutches and gears from main shaft.

(c) Remove drums from clutches.

(13) Removing B Plug Mounting Bracket, Signal Bell, and Signal Bell Contacts. To remove B plug mounting bracket, signal bell and signal bell contacts, proceed as follows (figures 7-1, 7-2, and 7-31):

(a) Remove two screws from signal bell contacts.

(b) Remove contact assembly.

(c) Remove two screws from signal bell mount.

(d) Remove signal bell mount.

(e) Remove two screws from B plug receptacle mounting bracket and remove bracket.

(f) Remove two screws which hold copy light transformer to left frame and remove transformer.

(14) Removing Stunt Box. To remove the stunt box, proceed as follows (figure 7-23):

(a) Remove two mounting screws from rear tie bar. Remove tie bar.

(b) Remove two screws (151688) which secure stunt box assembly. To remove stunt box, lift slightly and pull to rear.

(15) Remove Platen.
To remove platen, proceed as follows (figure 7-6):

(a) Remove screw (151346) which holds platen spur gear to shaft and remove gear.

(b) Remove paper guide spring (152871).

(c) Remove two screws (150652) from right platen bearing retainer.

(d) Remove paper guides and shaft.

(e) Remove two screws from left platen bearing retainer and remove retainer.

(f) Hold detent up and lift platen from side frame.

(16) Removing Code Bar Positioning Mechanism. To remove code bar positioning mechanism, proceed as follows (figure 7-16):

(a) Loosen clamp screw on shift lever drive arm.

(b) Remove two screws which hold mechanism and remove mechanism.

(17) Removing Left and Right Ribbon Feeding Mechanisms. To remove left and right ribbon feeding mechanisms,

proceed as follows (figures 7-19 and 7-20):

(a) Remove retainer ring from mounting shaft.

(b) Remove lower retainer ring from drive link.

(c) Remove ribbon ratchet lever spring.

(d) Slide ribbon feed mechanism off shaft.

(e) Repeat steps (a) through (d) on remaining mechanism.

(18) Removing Trip Shaft. To remove trip shaft, proceed as follows (figure 7-11):

(a) Remove retainer ring which holds type box clutch latch lever on shaft.

(b) Loosen clamp screw from type box clutch trip arm.

(c) Remove trip lever, latch lever, and trip arm.

(d) Loosen three set collar clamp screws.

(e) Loosen function clutch trip lever clamp screw.

(f) Remove clamp nut from code bar clutch follower arm.

(g) Remove follower arm.

(h) Pull trip shaft to left and remove.

(19) Removing Vertical Positioning Levers and Type Box Carriage Track. To remove vertical positioning levers and type box carriage track, proceed as follows (figures 7-7 and 7-8):

(a) Slide type box carriage off track.

(b) Remove four nuts and screws which hold type box carriage track to vertical positioning levers and remove track.

(c) Remove three nuts and guide screws from each lever.

(d) Remove and discard one vertical positioning lever spring from each lever.

(e) Remove one retainer ring from each lever.

(f) Disconnect levers from main side levers.

(g) Remove vertical positioning levers.

CAUTION

Do not use excessive force.

(h) Check levers for excessive play. If either lever is loose, replace both levers.

(20) Removing Main Rocker Shaft. To remove main rocker shaft, proceed as follows (figures 7-7 and 7-8):

(a) Remove retainer ring from left main rocker shaft and remove bracket.

(b) Remove mounting screws from right main rocker shaft bracket.

(c) Remove two screws from left bearing retainer and remove retainer.

(d) Pull shaft out to left.

CAUTION

Right bearing contains needle bearings which may fall out.

(e) Remove two screws from right bearing and remove bearing.

(21) Removing Spacing Suppression Mechanism. To remove spacing suppression mechanism, proceed as follows (figure 7-4):

(a) Remove screw (151657) from right end of shaft.

(b) Remove screw (151346) which holds bracket to crossbar.

(c) Work mechanism out gently.

CAUTION

Do not use excessive force.

(d) Use diagonal wire cutters to remove all felt washers from mechanism. Discard felt washers.

(22) Removing and Disassembling Code Bar Clutch Trip Shaft. To remove and disassemble code bar clutch trip shaft, proceed as follows (figure 7-10 and 7-11):

(a) Remove retainer ring from left end of shaft.

(b) Loosen code bar clutch trip lever clamp screw.

(c) Slide shaft out to right.

(23) Disassembling Selector Mechanism. To disassemble selector mechanism, proceed as follows (figures 7-17 and 7-18):

(a) Remove two mounting screws and two nuts from range finder.

(b) Lift off range finder.

(c) Remove range finder knob clamp nut.

(d) Remove knob, detent, and spring.

(e) Remove retainer ring from stop arm bail shaft.

(f) Remove shaft.

(g) Remove two retainer rings from rack.

(h) Remove rack.

(i) Remove two retainer rings, cup washers, and four flat washers holding dust cover over magnets.

(j) Remove cover.

(24) Disassembling Front Plate. To disassemble front plate, proceed as follows (figures 7-12 through 7-15):

(a) Loosen clamp screws which hold printing carriage to upper draw-wire rope.

(b) Move carriage to left extremity, and disengage it from its track and draw-wire rope.

(c) Loosen carriage return spring drum lock nut 1-1/2 turns.

(d) Operate ratchet escapement lever to unwind carriage return spring drum spring until all tension is released.

(e) Unhook tension roller spring.

(f) Unhook transfer slide spring.

(g) Remove screw which holds upper draw-wire rope to spacing drum.

(h) Loosen clamp screw which holds upper draw-wire rope to carriage return spring drum.

(i) Loosen rear clamp screw on oscillating rail slide.

(j) Remove front clamp screw on oscillating rail slide.

(k) Remove upper draw-wire rope.

(l) Remove screw on spacing drum securing lower draw-wire.

(m) Remove screw on carriage return spring drum which secures lower draw wire rope.

(n) Remove lower draw-wire rope.

(o) Remove tension pulley shaft mounting screw (on back).

(p) Remove pulley bracket and shaft.

(q) Remove two mounting screws from printing track and remove printing track.

(r) Remove one mounting screw from each front upper draw-wire roller and remove rollers.

(s) Remove spacing drum clamp nut.

(t) Remove carriage return spring drum clamp nut.

(u) Lift off plate (150554).

(v) Remove three dashpot mounting screws (on back).

(w) Slide dashpot off transfer slide.

(x) Remove carriage return latch bail spring.

(y) Remove nut which screws transfer slide mounting post to front plate (on back).

(z) Remove transfer slide and spacer post.

(aa) Unhook two feed pawl springs.

(ab) Remove set screw from feed pawl eccentric.

(ac) Remove spacing shaft from rear.

(ad) Remove feed pawls.

(ae) Lift off spacing drum.

(af) Lift off carriage return spring drum.

(ag) Remove horizontal positioning lock lever spring.

(ah) Remove six printing carriage track mounting screws.

(ai) Lift and disengage printing carriage track from horizontal positioning lock lever.

(aj) Remove retainer ring which holds horizontal positioning lock lever.

(ak) Remove lock lever.

(al) Remove two oscillating rail shift link springs.

(am) Remove two guide arm clamp screws (on back).

(an) Remove two retainer rings from oscillating rail shift links (on back).

(ao) Lift off oscillating rail and guides.

(ap) Unhook two shift slide drive link springs.

(aq) Remove two plate mounting nuts from plate (153335) and remove plate.

(ar) Remove four shift slide drive link retainer rings (two on each link).

(as) Lift off links.

(at) Remove four screws from reversing slide mounting brackets.

(au) Remove brackets, reversing slide, and oscillating rail shift slide.

(av) Remove two top retainer rings from main bail drive links.

(aw) Remove main bail.

(ay) Remove two nuts from shift link breaker slide posts.

(az) Lift off shift slide and breaker slides.

(ba) Remove two connecting strip mounting screws and lift off strip.

(bb) Remove two bearing stud mounting screws and lift off studs.

(bc) Use diagonal wire cutters to remove remaining felt washers.

(25) Disassembling Stunt Box. To disassemble stunt box, proceed as follows (figure 7-23):

(a) Remove two retainer rings from stripper blade cam shaft.

(b) Remove two screws from stripper blade cams.

(c) Remove screw from stripper blade cam shaft drive arm.

(d) Slide shaft out through stunt box side frame.

(26) Disassembling Code Bar Detent Mechanism. To disassemble code bar detent mechanism, proceed as follows (figure 7-21):

(a) Remove two screws from front code bar detent plate.

(b) Remove plate and suppression code bar latch.

(c) Note all holes in detent have springs and balls (except top outside and bottom inside).

(d) Remove detent springs and balls.

(e) Remove two screws from rear code bar detent plate.

(f) Remove plate.

(g) Note all holes in detent have springs and balls (except top outside and bottom inside).

(h) Remove seven springs and balls.

m. Reassembling Gear Assembly. To reassemble gear assembly, proceed as follows (figure 7-32):

(1) Pack bearings.

(2) Position assembly driven gear, secure with lockwasher and screw.

(3) Slide variable speed shaft in from left while mounting gears, felts, spacers and bearings; secure with three flat washers, lockwashers and screws.

(4) Secure variable speed shaft gear to shaft with roll pin.

(5) Position pin, spring, key and collar on variable speed shaft.

(6) Install idler shaft from left side while mounting idler gear.

(7) Secure gear to idler shaft with lockwasher and screw.

(8) Install right bearing and secure with three retaining mechanisms.

(9) Install distributor drive gear secure with lockwasher and screw.

n. Mounting Gear Assembly on Base. To mount gear assembly on base, proceed as follows (figure 7-32):

(1) Position gear assembly on three adjusting mechanisms; secure with one flat washer, three lockwashers, and three nuts.

(2) Connect shift link to speed selector shaft and secure with retainer ring.

o. Mounting Base on Pan. To mount base on pan, proceed as follows:

(1) Position base on pan, secure with four lockwashers and screws.

(2) Install five pan mounting bolts (for shipping).

(3) Position ground on pan, secure with lockwasher and screw.

(4) Replace three cover guide screws and rollers.

(5) Position speed selector knob and secure with two set screws.

(6) Grease and lubricate local carriage return and line feed mechanisms.

p. Reassembling Motor Unit. To reassemble motor unit, proceed as follows:

(1) Replace two bearings on rotor shaft.

(2) Replace stator on rotor.

(3) Replace end shields, springs, and washer.

(4) Secure end shields to stator with two nuts and two bolts.

(5) Place motor on mounts.

(6) Replace clamps.

(7) Replace two resilient mount clamp screws.

(8) Replace two screws which hold motor pinion to shaft.

(9) Replace fan on shaft.

(10) Replace set screw which holds fan to shaft.

(11) Remove two screws which hold relay clamp to its bracket; lift clamp and relay off.

(12) Remove screw which holds relay cover to relay, and lift cover off.

(13) Inspect relay for cleanliness and burned contacts.

(14) Replace cover on relay, secure with lockwasher and screw.

(15) Position relay and clamp, secure with two lockwashers and two screws.

q. Mounting Motor on Base. To mount motor on base, proceed as follows:

(1) Position motor; secure with four lockwashers and four screws.

(2) Mount typing unit on base.

(3) Adjust gear assembly backlash as described in paragraph 6-3k.

(4) Remove typing unit.

r. Reassembling Distributor Mechanism. To reassemble distributor mechanism, proceed as follows:

(1) Lubricate and reassemble clutch.

(2) Replace felt and two springs.

(3) Clean and unpack bearings.

(4) Position clutch and distributor drum.

(5) Insert shaft from right side.

(6) Replace spacer collar on left end of shaft.

(7) Replace left bearing on shaft and secure with lockwasher and nut.

(8) Position clutch drum and secure with lockwasher and screw.

(9) Secure left bearing with two retaining assemblies.

(10) Position right bearing retainer and secure with lockwasher and screw.

(11) Position clutch magnet bracket, secure with flat washer, two lockwashers, and two screws.

(12) Position distributor shaft driven gear; secure with lockwasher and screw.

(13) Position photocell and mounting bracket; secure with three lockwashers and screws.

(14) Route and connect two photocell wires as follows:

Black wire to H-4
White wire to H-1

(15) Position cover plate over distributor drum; secure to side frames with flat washer, four lockwashers and four screws. Use left rear screw to hold wire clamp.

(16) Position distributor shaft idler gear on its shaft.

NOTE

Shaft has left-hand thread.

Secure shaft to right side frame by screwing in counterclockwise direction.

(17) Perform the following adjustment:

(a) Adjust clutch drum as described in 6-3c.

(b) Adjust clutch shoe lever as described in 6-3d.

(c) Adjust trip lever as described in 6-3e.

(d) Adjust magnet plate as described in 6-3f.

s. Mounting Distributor on Base. To mount distributor on base, proceed as follows:

(1) Position distributor mechanism on base.

(2) Connect U plug and tighten clamp nut.

(3) Position circuit card mounting bracket and L plug mounting bracket and secure with two screws. Position L plug.

(4) Connect wires to terminal blocks H and P in accordance with figure 5-3, Wiring Diagram.

(5) Adjust distributor gear backlash as described in paragraph 6-2g.

(6) Secure mounting bracket to base with four flat washers, four lockwashers, and four screws.

(7) Replace reset drive link and retaining ring.

t. Reassembling Keyboard Transmitter. To reassemble keyboard transmitter, proceed as follows:

(1) Position photocells. Plug in two leads.

(2) Position REPT key and its spring.

(3) Position wiring harness on top plate, secure with retainers.

(4) Solder three wires to fuseholder as shown in figure 5- , Wiring Diagram.

(5) Position top plate, push side frames in, and secure with two retainer rings.

(6) Position power switch on top plate and secure with nut.

(7) Tighten Allen screw which holds power switch control knob on shaft.

u. Mounting Keyboard Transmitter. To mount keyboard transmitter proceed as follows:

(1) Position keyboard transmitter on pan and secure with four screws.

(2) Position ground strap on base and secure with screws.

(3) Connect wires to terminal blocks S, K, and P in accordance with figure 5-3, Wiring Diagram.

(4) Connect L plug to LA plug.

(5) Replace reset assembly into reset lever on keyboard.

(6) Adjust reset lever clearance as described in paragraph 6-3h.

(7) Adjust latch bail clearance as described in paragraph 6-3i.

v. Reassembling Typing Unit. The following paragraphs describe the procedure for reassembling the typing unit.

(1) Replacing Felts and Parts Attached to Side Plates. To replace eleven felts in side plates and parts still attached to side plates, proceed as follows (figures 7-4, 7-5, 7-7 and 7-8):

(a) Remove lock nut from stud which holds follower arm to function rocker shaft.

(b) Remove stud.

(c) Remove lock nut from one rocker shaft bushing.

(d) Unscrew bushing until rocker shaft can be removed.

(e) Remove retainer ring which holds follower arm to roller.

(f) Remove follower arm.

(g) Remove retainer ring which holds roller guide arm to bracket.

(h) Remove guide arm.

(i) Install new felt washers while reassembling by reversing procedures in steps (a) through (h).

(j) Remove screws holding each pivot shaft in reset bail pivot studs.

(k) Push shafts back into studs.

(l) Install felt washers.

(m) Push shafts back into place.

(n) Replace screws.

(o) Remove lock nut from shoulder screw which holds left side of spacing suppression bail.

(p) Remove screw, install felt, and replace screw.

(q) Replace lockwasher and nut.

(r) Remove lock nut from guide post on right side of spacing suppression bail.

(s) Remove guide post, install felt, and replace post.

(t) Replace lockwasher and nut.

(u) Remove retainer rings from rear of each main side lever.

(v) Pull rear of lever out.

(w) Install two felts, reposition, and secure with retainer rings.

(2) Replacing Eight Felts on Space Suppression Mechanism. To replace eight felts on space suppression mechanism, proceed as follows (figure 7-4):

(a) Remove retainer ring which holds carriage return bail on shaft.

(b) Install felts; replace bail and retainer ring.

(c) Remove spacing cut-out transfer bail spring.

(d) Remove spacing cut-out bail spring.

(e) Remove retainer ring which holds spacing cut-out transfer bail.

(f) Loosen clamp screw in set collar.

(g) Remove transfer bail, install two felts, and replace transfer bail.

(h) Position set collar and tighten screw.

(i) Replace retainer ring.

(j) Remove retainer ring which holds spacing cut-out bail on shaft.

(k) Remove bail, install felt, and replace bail. Ensure top of bail is to rear of tab on spacing suppression slide.

(l) Replace retainer ring.

(m) Replace two bail springs.

(n) Remove spacing trip lever bail spring.

(o) Remove retainer ring which holds spacing trip lever to bail.

(p) Remove trip lever from bail, install felt, replace lever on bail, and replace retainer ring.

(q) Remove retainer ring which holds spacing trip lever to bail shaft.

(r) Remove lever; install felt; replace lever and retainer ring.

(s) Replace bail springs.

(t) Install felt on front of plate.

(3) Installing Space Suppression Mechanism on Typing Unit. To install space suppression mechanism on typing unit, proceed as follows (figure 7-4):

CAUTION

Do not use excessive force when positioning space suppression mechanism on crossbar.

(a) Gently position space suppression mechanism on crossbar. Ensure carriage return bail is in slot in slide arm and spacing suppression bail is on bracket.

(b) Secure bracket to crossbar with screw and lockwasher.

(c) Secure right end of shaft to side frame with screw and lockwasher.

(4) Installing Code Bar Clutch Trip Shaft. To install code bar clutch trip shaft, proceed as follows (figures 7-10 and 7-11):

(a) Insert shaft through bushing in right side frame.

(b) Mount parts on shaft.

(c) Secure with retainer ring.

(5) Installing Trip Shaft Mechanism. To install trip shaft mechanism, proceed as follows (figure 7-11):

(a) Push shaft through bushing on left side frame while mounting parts between bushing and right shaft

mounting bracket. Ensure line feed function stripper bail arm is above shaft.

(b) Mount code bar clutch cam follower arm on right end of shaft, secure with flat washer, lockwasher, and lock nut.

(c) Position and secure set collars.

(d) Install parts on left end of shaft and secure with retainer ring.

(6) Reassembling Main Shaft. To reassemble main shaft, proceed as follows (figures 7-9 and 7-10):

NOTE

Prior to mounting any clutch on main shaft, perform the following procedures:

- a. Replace all springs and felts,
- b. Inspect clutch drums, shoe levers, clutch shoes, bearings and cams, gear or eccentric assemblies, and replace as necessary.
- c. Grease and lubricate all clutches during re-assembly.
- d. Clutches having cams and disks marked 0 for identification should have marked side of parts face away from the clutch side of assembly.
- e. Check clutch shoe spring adjustment as described in paragraph 6-3r, and clutch shoe lever spring adjustment as described in paragraph 6-3d.

f. While mounting each clutch (except selector clutch) on main shaft, perform clutch drum end play adjustment.

(a) Pack left bearing.

(b) Position left bearing on shaft; secure with screw and lockwasher.

(c) Mount line feed clutch drum on clutch.

(d) Lubricate fiber gear.

(e) Position clutch on shaft from right end; secure with screw and lockwasher.

(f) Position time delay mechanism drive cam on shaft from right end; secure with screw and lockwasher.

(g) Position main shaft drive gear on shaft from right end; secure with three screws and lockwashers.

(h) Position collar on shaft from right end; secure with screw and lockwasher.

(i) Remove two screws which hold spacing gear to clutch cam disk.

(j) Remove gear and check for wear.

(k) Replace gear, secure with two lockwashers and two screws.

(l) Lubricate fiber gear.

(m) Mount spacing clutch drum on clutch.

(n) Position clutch on shaft from right end; secure with screw and lockwasher.

(o) Place spacer (153323) on main shaft from right end.

(p) Check function clutch eccentric and its follower for wear; replace as necessary.

(q) Mount function clutch drum on clutch.

(r) Position clutch on shaft from right end; secure with screw and lockwasher.

(s) Check code bar clutch eccentric and its follower for wear; replace as necessary.

(t) Mount code bar clutch drum on clutch.

(u) Position clutch on shaft from right end; secure with screw and lockwasher.

(v) Pack right bearing.

(w) Position bearing on shaft from right end.

(x) Position driving link on function clutch eccentric; secure friction tight with two flat washers, two lockwashers and two screws.

(7) Installing Main Shaft. To install main shaft, proceed as follows (figures 7-7 through 7-10):

(a) Rotate function rocker shaft top to rear. Ensure all clutch trip and latch levers are to rear.

(b) Insert main shaft with right bearing slightly to left of right side frame and left bearing slightly to left side of left side frame.

(c) Align bearings with their holes in side frames. Position high part of function clutch eccentric follower towards bottom of unit.

(d) Slide main shaft to right to its proper position.

CAUTION

Do not use excessive force. Ensure that code bar clutch eccentric follower seats properly on its stud.

(e) Install right bearing retainer; secure with screw and lockwasher.

(f) Install left bearing retainer, secure with two screws and two lockwashers.

(g) Install two function reset bail springs.

(h) Position right bearing retainer; secure with screw and lockwasher.

(8) Installing Vertical Positioning Levers and Type Box Carriage Track. To install vertical positioning levers and type box carriage track, proceed as follows (figures 7-7 and 7-8):

(a) Position levers; secure each with one retainer ring, two guide mechanisms, three lockwashers, and three screws.

NOTE

Ensure wider spacers are on right side.

(b) Position type box carriage track; secure with four screws and nuts.

(9) Reassembling Code Bar Detent Mechanism. To reassemble code bar detent mechanism, proceed as follows (figure 7-21):

(a) Replace seven balls and seven springs in holes in rear of detent mechanism (top outside and bottom inside holes should be empty).

(b) Lubricate each spring with one drop of oil.

(c) Replace and secure retaining plate with two screws and two lockwashers.

(d) Repeat steps (a) through (c) on front detent mechanism.

(e) Lubricate code bar basket.

(10) Installing Code Bar Basket. To install code bar basket, proceed as follows (figure 7-21):

(a) Position basket between side frames.

(b) Secure with four mounting screws and four lockwashers.

(11) Installing Main Rocker Shaft. To install main rocker shaft, proceed as follows (figure 7-7 and 7-8):

(a) Pack both bearings.

(b) Slide right end of main rocker shaft through left side frame.

(c) Install right bearing on shaft.

(d) Position shaft.

(e) Install left bearing.

(f) Secure right bearing with two lockwashers and two screws.

(g) Position three left bearing retainers; secure with two lockwashers and two screws.

(h) Position right rocker shaft bracket; secure with two flat washers, two lockwashers, and two screws.

(i) Position left rocker shaft bracket; secure with two flat washers, two lockwashers, two screws, and one retainer ring.

(j) Install vertical positioning lever springs.

(12) Installing Type Box Clutch. To install type box clutch, proceed as follows (figure 7-9):

(a) Mount clutch drum on clutch.

(b) Mount clutch on main shaft.

(c) Install type box clutch drive link.

(d) Position and secure retainer plate with lockwasher and screws.

(13) Installing Ribbon Feed Mechanism. To install ribbon feed mechanism, proceed as follows (figures 7-19 and 7-20):

(a) Remove two retainer rings from bottom of ribbon spool shaft, to disassemble mechanism.

(b) Replace felt.

(c) Install 42661 Spring.

(d) Remove retainer ring from ribbon guide roller.

(e) Remove roller, clean shaft, install roller and secure with retainer ring. Replace felt on ribbon drive link lower mounting post on main side lever and mount inner retainer ring.

(f) Slide ribbon feed mechanism on shaft. At the same time ensure ratchet lever is in proper engagement with detent lever, install two felt washers on shaft, and ensure bottom of ribbon drive link engages mounting post on main side lever.

(g) Secure feed mechanism with retainer ring.

(h) Secure drive link with retainer ring.

(i) Install ratchet feed lever spring.

(j) Repeat steps (a) through (i) on remaining feed mechanism.

(14) Installing Code Bar Positioning Mechanism. To install code bar positioning mechanism, proceed as follows (figures 7-7, 7-8, and 7-16):

(a) Install two main side lever follower arm springs.

(b) Grease and lubricate positioning mechanism.

(c) Position mechanism; secure with two lockwashers and two screws.

(d) Connect shift lever link to shift lever drive arm and secure with retainer ring.

(15) Installing Code Bar Shift Bars. To install code bar shift bars, proceed as follows (figure 7-21):

(a) Place right end of bars in guides and engage left end with code bars.

(b) Install three springs with long ends attached to code bar shift bars.

(c) Position retaining plate; secure with two lockwashers and two screws.

(16) Reassembling Selector Mechanism. To reassemble selector mechanism, proceed as follows (figures 7-17 and 7-18):

NOTE

Visually inspect selector, marking and spacing lock levers, armature and associated springs for excessive wear. If excessive wear is apparent, replace the worn part.

(a) Check armature down stop bracket as described in paragraph 4-5d(39), and if adjustment is necessary, perform procedure described in paragraph 6-4a1.

(b) Position dust cover; secure with four flat washers, two spring washers, and two retainer rings.

(c) Position rack on range finder; secure with four flat washers, two spring washers, and two retainer rings.

(d) Position stop arm bail mechanism; secure with retainer ring.

(e) Mount range finder knob, spring, and detent; secure with lockwasher and nut.

(f) Position range finder mechanism on selector mechanism; secure with three lockwashers, one flat washer, two screws, and one nut.

(g) Install range finder knob.

(h) Perform range finder knob phasing adjustment described in 6-3a.

(17) Installing Selector Mechanism. To install selector mechanism, proceed as follows (figures 7-17 and 7-18);

(a) Position selector mechanism on right side frame; secure friction tight with one flat washer, three lockwashers, and three screws.

(b) Position wick holder; secure with flat washer, lockwasher, and screw.

(c) Install wick in holder.

(d) Securely tighten screws left friction tight in step (a).

(e) Connect common transfer lever spring to spring bracket.

(18) Installing Selector Clutch and Cam Sleeve Assembly. To install selector clutch and cam sleeve assembly, proceed as follows (figures 7-10 and 7-17):

(a) Mount clutch drum on clutch.

(b) Position cam assembly on main shaft by rotating counterclockwise, pushing gently inward, using caution to clear the following items:

- Selector clutch stop arm
- Selector clutch latch lever
- Stop arm bail
- Push lever reset bail
- Code bar clutch trip shaft lever

(c) Ensure clutch drum is aligned with main shaft to prevent its becoming disengaged from clutch.

(d) Perform selector clutch drum end play adjustment as described in paragraph 6-4c.

(e) Secure drum to main shaft with screw, nut, and two lockwashers.

(f) Release marking lock lever.

(g) Release push lever reset bail.

(19) Installing Control Springs for Main Shaft. To install control springs for

main shaft, proceed as follows (figure 7-11):

(a) Install code bar clutch cam follower arm spring.

(b) Install code bar clutch trip shaft lever spring.

(c) Install clutch trip, stop, and latch lever springs.

(20) Performing Typing Unit Adjustments. Perform typing unit adjustment described in the following paragraphs:

Selector Clutch Stop Arm, 6-4b

Armature Extension and Spacing Locklever, 6-4m

Code Bar Clutch Trip Lever, 6-4d

Function Clutch Trip Lever, 6-4e

Spacing Clutch Trip Lever, 6-4h

Clutch Trip Shaft Set Collars, 6-4f

Line Feed Clutch Trip Lever Eccentric Post, 6-4i

Line Feed Clutch Trip Lever Adjusting Screw, 6-4j

Type Box Clutch Trip Lever Eccentric Post, 6-4g

Type Box Clutch Trip Lever, 6-4u

Line Feed Clutch Phasing, 6-4l

Clutch Shoe Levers, 6-4p

(21) Reassembling Typing Unit Components. To install components (B plug receptacle, printer connector mounting bracket, signal bell mounting bracket, and copy light transformer), proceed as follows (figures 7-1 and 7-2):

(a) Position B Plug Receptacle; secure with two flat washers, two lockwashers and two screws.

(b) Position signal bell mounting bracket; secure with two flat washers, two lockwashers, and two screws.

(c) Position printer connector mounting bracket; secure with two lockwashers and two screws.

(d) Position terminal end of ground strap; secure with screw, flat washer, lockwasher, and nut.

(e) Position copy light transformer, secure with two flat washers, two lockwashers and two screws.

(22) Installing Platen. To install platen, proceed as follows (figure 7-6):

(a) Hold detent up and position platen in side frames.

(b) Install paper guides and shaft.

(c) Position right retainer; secure with one spacer, one flat washer, two lockwashers, and two set screws.

(d) Position left retainer; secure with two lockwashers and two screws.

(e) Install paper guide spring.

(f) Position platen spur gear on shaft; secure with lockwasher and screw.

(23) Reassembling Stunt Box. To reassemble stunt box, proceed as follows (figure 7-23):

(a) Slide shaft through stunt box side frames while mounting parts on shaft.

(b) Secure shaft and stripper blade cams with two screws and two lockwashers.

(c) Position three felt washers around each cam; secure with retainer rings.

(d) Lubricate stunt box.

(24) Installing Signal Bell Contacts on Stunt Box. To install signal bell contacts on stunt proceed as follows (figure 7-23):

(a) Assemble contact mechanism.

(b) Position contact mechanism over slot 28 in function box; secure with two flat washers, two lockwashers, and two screws.

(25) Installing Stunt Box. To install stunt box, proceed as follows (figure 7-23):

(a) Using guides, slide stunt box into rear of typing unit.

(b) Apply slight pressure to ensure proper seating.

(c) Strip off all function pawls.

(d) Ensure carriage return and line feed slide arms are free.

(e) Ensure stripper bail is in slot of line feed function pawl stripper.

(f) Secure stunt box with two screws and two lockwashers.

(g) Position cam shaft driving arm in engagement with driving link, secure with retainer ring, lockwasher and screw.

(26) Reassembling Front Plate. To reassemble front plate, proceed as follows (figures 7-12 through 7-15 and 7-22):

(a) Unhook code bar bell crank springs.

(b) Remove retainer ring and bell cranks.

(c) Install new felt.

(d) Replace bell cranks; secure with retainer ring.

(e) Connect springs.

(f) Position left shift slide drive link mounting plate; secure friction tight with flat washer, lockwasher and screw.

(g) Position right shift slide drive link mounting plate; secure friction tight with flat washer, lockwasher, and screw.

(h) Position connecting strip; secure friction tight with two flat

washers, two lockwashers and two screws.

(i) Position shift link breaker slides, two springs, two spacers, and shift slide on their post.

(j) Secure breaker slides with two flat washers, two lockwashers and two lock nuts (151880).

(k) Position bail (170062) and spacers; secure with two lockwashers and two screws.

(l) Position main bail; secure with two retainer rings.

(m) Position studs through oscillating rail shift slide.

(n) Mount shift slide drive link mechanisms on oscillating rail shift slide.

(o) Position plate (153335); secure with two lockwashers and two nuts.

(p) Position two reversing slide mounting brackets, reversing slide, oscillating rail shift slide, two shift slide drive links; secure with four lockwashers and four screws. Ensure parts are positioned on their mounting posts.

(q) Install four shift slide drive link felts; secure drive links to main bail and guide posts with four retainer rings.

(r) Position tension pulley shaft, bracket, and horizontal positioning lock lever arm; secure with lockwasher and screw (from back).

(s) Install tension pulley spring.

(t) Install spacing shaft from rear.

(u) Install spacing feed pawls and eccentric on spacing shaft; secure with set screw and lockwasher.

(v) Unhook automatic carriage return/line feed bell crank spring.

(w) Remove shoulder nut holding bell crank.

(x) Remove mounting shaft holding reversing slide shift lever.

(y) Replace two felts on shaft and reassemble by reversing procedures in steps (w) through (y).

(z) Secure oscillating rail shift links to oscillating rail shift slide with two retainer rings (on back).

(aa) Secure guide arms with two clamp screws and lockwashers (on back).

(ab) Install and position carriage return spring drum.

(ac) Install and position spacing drum and bushing.

(ad) Install two feed pawl springs.

(ae) Remove two nuts holding printing track guide; lift off front guide and remove felt wick.

(af) Install new wick; reassemble and secure.

(ag) Repeat steps ae and af on other guide.

(ah) Install plate (150554); secure with two lockwashers and two nuts.

(ai) Position horizontal positioning lock lever; secure with retainer ring.

(aj) Position printing carriage track, two spacers, and two pulleys; secure with six lockwashers and six screws. Ensure track is in proper engagement with horizontal positioning lock lever.

(ak) Install horizontal positioning lock lever spring.

(al) Install oscillating rail shift link springs.

(am) Connect shift slide drive link springs.

(an) Position center of upper draw-wire rope on clamp screw on carriage return spring drum; secure screw friction tight.

(ao) Position rope; secure both ends to spacing drum with lockwasher and screw.

(ap) Secure one end of lower draw-wire rope to spacing drum with lockwasher and screw.

(aq) Position rope; secure other end of carriage return spring drum with lockwasher and screw.

(ar) Install transfer slide and mounting

post; secure with lockwasher and nut.

(as) Install carriage return latch bail spring.

(at) Position dashpot on transfer slide; secure with three clamp screws and three lockwashers.

(au) Install transfer slide spring.

(av) Position printing track; secure friction tight with two flat washers, two lockwashers, and two screws.

(aw) Replace eight felts on printing mechanism.

(ax) Position printing mechanism on its track; secure friction tight.

(ay) Position and secure oscillating rail slide with type box carriage link friction tight to upper draw-wire rope, with two lock nuts and two screws.

(27) Installing Front Plate. To install front plate, proceed as follows (figures 7-8, and 7-13 through 7-15):

(a) Mount type box carriage on its track.

(b) Position front plate while ensuring the following are in their proper connections:

Number three code bar projection.

Numbers four and five code bar bell cranks seated in notches in their code bars.

Projection on automatic carriage return-line feed bell crank engaged with notch on 0 code bar.

Carriage return lever positioned to left of carriage return latch bail.

Main bail drive bracket on top of rocker shaft.

Type box carriage link in type box carriage.

Space suppression frame in slot in front plate.

(c) Secure front plate with four lockwashers and four screws.

(d) Secure type box carriage to its link with retainer ring.

(e) Secure main bail drive bracket to main rocker shaft with two lockwashers and two screws.

(f) Mount spacing shaft helical driven gear on spacing shaft.

(g) Perform spacing gear clearance and phasing adjustment procedures as described in paragraphs 6-3m and 6-3n.

(28) Installing Typebox. To install typebox, proceed as follows (figure 7-24):

(a) Hold typebox left end down at approximately a 45 degree angle; then insert left end on bearing stud and lower right end into place.

(b) Latch typebox into place.

(29) Installing Ribbon. To install ribbon, proceed as follows (figures 7-19 and 7-20):

(a) Install new ribbon on either feed mechanism.

(b) Thread ribbon across front of unit and attach end to empty spool.

(c) Install spool on remaining feed mechanism.

(d) Lock spools in place with their slips.

w. Reinstalling Typing Unit.

(1) With left hand under rear of side frame and right hand under right side of front plate above dashpot, lift typing unit from work bench and place on base.

(2) Install four mounting screws which hold typing unit to base.

(3) Connect R plug to typing unit.

(4) Connect J103 to P103.

CHAPTER 7
PARTS LIST

7-1. SCOPE. This chapter provides a list of maintenance parts and parts location diagrams for Model 28 Teletypewriter Set AN/UGC-20B.

7-2. MAINTENANCE PARTS LIST. Maintenance parts are listed by major units, in tables 7-1 through 7-5. The parts are listed for each unit in numerical part number sequence. Reference to the applicable parts location diagram is included for each part listed.

7-3. LIST OF MANUFACTURERS. Model 28 Teletypewriter Set

AN/UGC-20B is manufactured by Teletype Corporation, Skokie, Illinois.

7-4. PARTS LOCATION DIAGRAMS. Figures 7-1 through 7-39 show location of all parts listed in tables 7-1 through 7-5. The parts location diagrams are used to locate and identify a particular part which is indexed by part number. The user then refers to the part number in the applicable table to obtain a description of the part to be ordered.

Table 7-1. Typing Unit, LP156/WY/AJG

Part Number	Figure Number (s)	Description	Notes
298M	7-18	Coil, Magnet	
1036	7-4	Nut, 6-40 Hex	
1214	7-14	Setscrew, 10-32	
1293	7-20	Screw, 4-40 x 1/8 Fil	
2034	7-17	Washer, Flat	
2191	7-1 thru -23	Lockwasher	
2201	7-1	Nut, 5/16-32 Hex	
2539	7-5,-11	Nut, 3/8-32 Hex	
2669	7-1 thru -5,-7, -8,-12,-14,-17	Lockwasher	
3598	7-1,-3 thru -11, -13 thru -17, -22,-23	Nut, 6-40 Hex	
3599	7-1,-2,-3,-11, -13 thru -16, -18,-20,-23	Nut, 4-40 Hex	
3603	7-18	Nut, 1/4-32 Hex	
3606	7-23	Nut, 6-40 Hex	
3640	7-4,-9,-13,-14	Lockwasher	
3646	7-1	Lockwasher	
3649	7-16	Washer, Flat	
4586	7-4	Washer, Felt	
4703	7-23	Spring	
5599	7-1	Nut, 8-32 Hex	
5740	7-23	Screw, 2-56 x 1/4 Fil	
6800	7-11	Screw, 6-40 Shoulder	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number (s)	Description	Notes
7002	7-1,-2,-3,-7,-8, -10 thru -17, -19,-20,-22	Washer, Flat	
7036	7-4	Collar, Locking	
7603	7-11,-13	Spring	
7655	7-4	Spring	
7835	7-20	Ribbon w/Spool, Black	
8330	7-11,-16,-17,-22	Washer, Flat	
8449	7-11,-20	Spacer, 0.094" Thk	
22015	7-20	Spring	
27425	7-8	Screw, 2-56 x 5/32 Fil	
31636	7-21	Spring	
33038	7-4	Spring	
33828	7-7,-8,-15	Spring	
36273	7-1,-15,-17	Washer, Flat	
41382	7-17	Spring	
42661	7-13,-19,-20,-23	Spring	
42823	7-9,-10	Washer, Flat	
42827	7-21	Screw, 3-48 x 1/4 Fil	
45027	7-14	Spring	
49420	7-22	Spring	
70388	7-11	Spring	
71681	7-19	Spool, Ribbon	
72468	7-3	Spring	
72522	7-23	Wick, Felt	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number (s)	Description	Notes
72579	7-1	Washer, Flat	
73175	7-5,-11	Lockwasher	
73520	7-14	Wick, Felt	
74283	7-17	Washer, Spring	
74536	7-4	Setscrew, 6-40	
74547	7-11	Collar	
74553	7-8	Wick, Felt	
74701	7-3,-11	Spring	
74722	7-4,-6	Washer, Flat	
74755	7-12	Washer, Felt	
74785	7-11	Roller	
74882	7-8	Spring	
76461	7-13	Washer, Felt	
78533	7-17	Spring	
80342	7-23	Screw, 6-40 x 23/64 Hex	
80516	7-17	Pin, Cotter	
80581	7-4,-14	Spring	
81731	7-14	Spring	
82442	7-4	Spring	
82463	7-4,-19,-20	Spring	
84575	7-4	Spring	
85407	7-5	Spring, Compression	
85816	7-13	Wick, Felt	
86304	7-4	Spring	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number (s)	Description	Notes
86835	7-1,-15	Spring	
89096	7-13	Washer, Felt	
89897	7-14	Nut, 10-32 Hex	
90361	7-4,-7,-8,-19, -20	Washer, Felt	
90490	7-4	Shim, 0.005" Thk	
90504	7-13,-23	Washer, Felt	
90517	7-23	Spring	
90599	7-22	Shim, 0.008" Thk	
90679	7-4	Washer, Felt	
90791	7-8	Lockwasher	
90819	7-5,-11	Washer, Felt	
91198	7-7,-8	Wick, Felt	
92682	7-16	Nut, 4-40 Spl	
93356	7-5,-8,-9,-11, -15,-22	Washer, Felt	
93507	7-23	Screw, 4-40 x 3/4 Hex	
93758	7-4,-11	Washer, Felt	
93879	7-4	Oiler, Felt	
94674	7-17,-18,-22	Washer, Cup	
95030	7-5	Nut, 6-40 Shoulder	
95428	7-23	Spring	
95827	7-14	Bushing	
97481	7-5	Wick, Felt	
101386	7-1	Spring	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number (s)	Description	Notes
101796	7-4,-8,-14,-22	Washer, Felt	
103863	7-23	Spacer, 0.005" Thk	
105028	7-15	Wick, Felt	
107116	7-2,-9	Lockwasher	
108199	7-11,-15,-22	Wick, Felt	
110434	7-2,-9,-13,-14, -17,-21,-24	Screw, 4-40 x 3/16 Fil	
110435	7-16	Nut, 4-40 Hex	
110437	7-11	Spring	
110743	7-1,-2,-3, -5 thru -10, -12 thru -24	Lockwasher	
110872	7-14	Spring, Compression	
111355	7-4	Spring, Compression	
112626	7-2,-4,-7,-8, -12,-14,-17	Nut, 10-32 Hex	
112634	7-19,-20	Spring	
114215	7-1	Post, Spring	
115122	7-7,-8	Washer, Felt	
119648	7-8,-15,-17	Ring, Retaining	
119649	7-4,-13,-14, -19,-20	Ring, Retaining	
119651	7-3,-4,-7,-8, -13,-15,-17, -18,-19,-20, -22,-23	Ring, Retaining	
119652	7-4,-5,-7,-8, -10,-11, -13 thru -17, -19,-20,-22	Ring, Retaining	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number (s)	Description	Notes
119653	7-4,-6,-14,-15, -19,-20,-23	Ring, Retaining	
119935	7-1	Lockwasher	
120824	7-10	Washer, Felt	
121243	7-23	Clamp, 3/16 ID Cable	
124177	7-18	Washer, Flat	
124681	7-3	Setscrew, 6-40	
125011	7-1,-3 thru -8, -12,-13,-14, -17,-18,-22, -23,-24	Washer, Flat	
125015	7-1,-4,-5,-8, -23	Washer, Flat	
125238	7-14	Spring	
125802	7-6,-14	Washer, Flat	
126241	7-18	Washer, Lock	
130667	7-18	Washer, Lock	
130683	7-17	Washer, Lock	
135563	7-1	Jumper, Green, 2-3/4" lg	
135716	7-11	Spring	
139555	7-14	Spring	
150000	7-9,-10	Drum, Clutch	
150001	7-10	Drum, Clutch	
150004	7-10	Cam, Codebar Clutch	
150010	7-9	Plate, Retaining	
150013	7-9,-10	Disc, Adjusting	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number (s)	Description	Notes
150014	7-9	Disc, Adjusting	
150021	7-10	Clutch Assembly, Codebar	
150025	7-9	Clutch Assembly, Typebox	
150026	7-9,-10	Lever, Shoe Release	
150027	7-9	Lever, Shoe Release	
150029	7-9,-10	Wick, Felt	
150030	7-22	Roller, Bearing	
150033	7-9	Disc, 3 Stop	
150035	7-9	Disc, 3 Stop	
150038	7-22	Latch	
150039	7-22	Slide, Printing Arm	
150040	7-11	Screw, 5-40 x 5/8 Fil	
150043	7-9,-10	Shoe, Secondary Clutch	
150044	7-9,-10	Shoe, Primary Clutch	
150045	7-9	Bearing, Clutch Sleeve	
150046	7-9	Bearing, Typebox Clutch	
150047	7-10	Bearing, Codebar Clutch	
150048	7-17	Spring	
150050	7-10	Spacer, Clutch	
150051	7-10	Cam, Eccentric	
150053	7-22	Bracket	
150054	7-22	Bail w/Roller	
150056	7-10	Arm	
150059	7-22	Bail	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number (s)	Description	Notes
150064	7-22	Stud	
150065	7-22	Bracket, Stop	
150068	7-22	Arm	
150078	7-24	Nut, 4-40 Shoulder Hex	
150079	7-24	Stud	
150089	7-14	Screw, 4-40 x 1/2 Fil	
150096	7-3	Roller Arm, Pressure	
150175	7-15	Stud	
150184	7-14	Link	
150193	7-14	Hub	
150194	7-14	Plate	
150196	7-14	Bail	
150197	7-12	Stud	
150202	7-14	Gear, 18T	
150203	7-14	Retainer	
150206	7-12	Spacer, 0.412"	
150208	7-15	Bail, Left	
150214	7-4	Stud, Bearing	
150215	7-15	Block, Guide	
150218	7-15	Bushing	
150219	7-13	Screw, 4-40 x 1/2 Sq	
150224	7-13	Pulley	
150225	7-12	Rope, Draw Wire	
150228	7-14	Spacer, 0.035" Thk	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number (s)	Description	Notes
150229	7-14	Retainer	
150230	7-22	Plate	
150232	7-15	Retainer, Oil	
150233	7-14	Roller	
150234	7-14	Roller	
150235	7-14	Slide, Transfer	
150237	7-13	Lever, Escapement	
150241	7-9,-10	Spring	
150244	7-9	Link	
150245	7-15	Bracket, Main Bail Drive	
150247	7-15	Link, Main Bail	
150251	7-12	Wheel, Ratchet	
150255	7-13	Bushing	
150263	7-15	Bail, Main	
150265	7-3	Shaft	
150266	7-3	Lever, Guide	
150267	7-3	Clamp	
150269	7-3	Roller, Pressure	
150270	7-3	Link	
150271	7-3	Arm, Release	
150274	7-3	Bracket, Clamp	
150288	7-21	Bracket	
150289	7-21	Stud	
150293	7-21	Plate, Retaining	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number (s)	Description	Notes
150301	7-21	Plate, Retaining	
150302	7-21	Shim, 0.006" Thk	
150304	7-21	Bracket, Guide	
150310	7-20	Lever, Ribbon	
150311	7-19	Lever, Ribbon	
150318	7-6	Stud	
150335	7-20	Gear, 12T	
150336	7-14,-19,-20	Bushing	
150341	7-2	Post, Spring	
150342	7-6	Screw, 6-40 Shoulder	
150343	7-20	Lever	
150344	7-19	Lever	
150348	7-11	Shaft	
150349	7-11	Arm, Follower	
150350	7-11	Shaft	
150351	7-2	Stud, Eccentric	
150352	7-11	Bushing	
150353	7-2	Stud	
150355	7-11	Lever, Latch	
150356	7-11	Lever, Trip	
150358	7-11	Lever, Trip	
150361	7-11	Spacer, 0.277" Thk	
150363	7-7	Plate	
150364	7-9	Stud, Eccentric	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number (s)	Description	Notes
150365	7-7	Shaft, Rocker	
150366	7-7	Bracket	
150367	7-8	Bracket	
150369	7-7	Link, Left	
150370	7-8	Link, Right	
150377	7-4	Arm	
150380	7-8	Stud	
150382	7-7,-8	Block, Guide	
150383	7-7	Spacer, 0.149" Thk	
150384	7-8	Spacer, 0.245" Thk	
150386	7-7	Link, Left Ribbon Drive	
150387	7-8	Link, Right Ribbon Drive	
150392	7-4	Bail	
150395	7-7,-8	Screw, 6-40 Shoulder	
150396	7-7	Lever, Left	
150397	7-8	Lever, Right	
150398	7-5	Stud, Pivot	
150399	7-4	Shaft	
150401	7-7	Clamp	
150410	7-7	Stud	
150411	7-8	Washer, Flat	
150412	7-7	Arm, Left Follower	
150413	7-8	Arm, Right Follower	
150414	7-5	Bushing	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number(s)	Description	Notes
150419	7-5	Shaft	
150420	7-8	Lever, Right	
150423	7-5	Stud, Pivot	
150425	7-7,-8	Lever, Lock	
150428	7-7	Lever, Left	
150429	7-7,-8	Stud, Eccentric	
150431	7-11	Lever, Trip	
150436	7-1,-14,-20	Bushing	
150444	7-11	Lever, Trip Shaft	
150447	7-16	Arm	
150450	7-16	Arm	
150452	7-16	Bearing	
150471	7-16	Stud	
150479	7-17	Stud	
150481	7-16	Shaft	
150482	7-16	Plate	
150507	7-16	Spring	
150535	7-21	Spring, Compression	
150536	7-14	Spring	
150537	7-14,-21	Ball, Bearing	
150538	7-14	Cylinder, Dashpot	
150543	7-23	Screw, 3-48 x 13/32 Fil	
150544	7-23	Handle	
150545	7-2	Bracket, Right	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number(s)	Description	Notes
150546	7-2	Bracket, Left	
150547	7-23	Shaft	
150549	7-9	Collar	
150554	7-13	Plate	
150558	7-15	Spring, Torsion	
150559	7-15	Spring, Torsion	
150561	7-4	Arm	
150563	7-16	Spring	
150585	7-6	Bar, Line Feed	
150598	7-15	Track, Printing	
150642	7-6	Bellcrank	
150646	7-6	Screw	
150647	7-6	Eccentric	
150648	7-6	Eccentric	
150649	7-6	Washer, Spacing	
150650	7-6	Bushing	
150651	7-6	Gear, 28T	
150652	7-6	Screw, 4-40 x 37/64 Fil	
150654	7-1	Guide	
150666	7-6	Gear, 28T	
150668	7-14	Collar, Spacing	
150669	7-14	Shim, 0.002" Thk	
150670	7-14	Shim, 0.004" Thk	
150672	7-14	Bearing	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number (s)	Description	Notes
150673	7-14	Shaft, Spacing	
150677	7-14	Pawl, Feed	
150678	7-14	Pawl, Feed	
150685	7-3	Plate	
150687	7-17	Stud	
150689	7-23	Block, Guide	
150694	7-14	Slide, Breaker	
150705	7-13	Bushing	
150709	7-13	Spacer	
150710	7-13	Screw, 6-40 x 1-1/4 Fil	
150712	7-12	Rope, Draw Wire	
150714	7-6	Bearing, Sleeve	
150715	7-6	Gear, 32T	
150718	7-6	Platen	
150719	7-6	Retainer	
150720	7-6	Retainer	
150721	7-13	Arm	
150722	7-13	Arm	
150728	7-13	Rail	
150731	7-14	Slide	
150732	7-14	Slide, Bottom	
150733	7-14	Slide, Top	
150738	7-14	Guide	
150746	7-14	Bushing	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number(s)	Description	Notes
150748	7-15	Stud	
150750	7-13	Plate	
150751	7-13	Block, Guide	
150752	7-15	Stud	
150753	7-15	Roller	
150754	7-15	Roller	
150758	7-15	Pulley	
150770	7-14	Bellcrank	
150771	7-14	Bellcrank	
150776	7-15	Lock Lever, Horizontal Positioning	
150777	7-15	Bail, Right	
150781	7-4	Stud	
150796	7-12	Disc	
150798	7-12	Ratchet	
150800	7-13	Stud	
150803	7-3	Spring, Flat	
150804	7-3	Guide, Right Paper	
150805	7-13	Shim, 0.012" Thk	
150806	7-13	Plate	
150807	7-13	Oiler, Felt	
150809	7-6	Gear, 32T	
150811	7-8	Stud	
150815	7-3	Bushing	
150816	7-3	Lever	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number (s)	Description	Notes
150821	7-19	Spacer, 0.156" Thk	
150824	7-8	Track	
150826	7-3	Guide, Left Paper	
150827	7-12	Drum, Spring	
150830	7-9	Bushing, Shoulder	
150831	7-9	Ring, Retaining	
150833	7-6	Platen Assembly	
150838	7-12	Ring, Retaining	
150841	7-9	Bearing	
150842	7-12	Drum Assembly, Spring	
150843	7-12	Plate, Hook	
150891	7-8	Block	
150895	7-11	Arm, Trip	
150903	7-5	Block, Left Paper Spindle	
150904	7-5	Block, Right Paper Spindle	
150907	7-5	Spindle, Paper	
150909	7-13	Screw, 6-40 Shoulder	
150910	7-5	Latch, Right	
150923	7-11,-15,-22	Washer, Felt	
150926	7-13	Washer, Felt	
150927	7-13	Oiler, Felt	
150929	7-13	Oiler, Felt	
150930	7-4	Washer, Felt	
150932	7-19,-20	Bushing, Shoulder	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number(s)	Description	Notes
150935	7-5	Latch	
150937	7-20	Lever	
150961	7-1	Bushing, Eccentric	
150970	7-9	Bearing, Ball	
150975	7-14	Cup, Dashpot	
150978	7-16	Screw, 6-40 x 1-1/8 Fil	
150986	7-14	Pawl Assembly, Spacing	
150987	7-14	Spacer, 0.090" Thk	
150990	7-5,-16	Washer, Felt	
150992	7-3	Stud	
150998	7-6	Spacer, 0.020" Thk	
151073	7-6	Screw, 4-40 x 5/32 Fil	
151103	7-17	Spring	
151152	7-13,-16,-21,-22	Screw, 4-40 x 3/16 Hex	
151222	7-16,-23	Washer, Felt	
151346	7-4,-5,-6,-9, -12,-14,-19	Screw, 6-40 x 3/8 Fil	
151442	7-7	Screw, 6-40 x 1/2 Hex	
151443	7-22	Eccentric	
151453	7-1	Nut, 10-32 Hex	
151602	7-7,-8	Plate	
151603	7-8	Spacer	
151604	7-7,-8	Block, Guide	
151606	7-14	Screw, 10-32 x 1/4 Hex	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number (s)	Description	Notes
151610	7-1,-9	Washer, Flat	
151611	7-22	Bushing	
151612	7-22	Spacer	
151618	7-12,-21	Screw, 6-40 x 7/16 Fil	
151619	7-12	Bushing	
151625	7-15	Strip	
151627	7-5	Rod	
151629	7-11,-16	Nut, 6-40 Lug	
151630	7-1,-2,-4,-5, -8,-9,-10, -13 thru -17, -19,-21	Screw, 6-40 x 1/4 Hex	
151631	7-1,-12,-16	Screw, 6-40 x 5/16 Hex	
151632	7-7,-8,-9,-13	Screw, 6-40 x 3/8 Hex	
151637	7-2,-5,-6,-7, -12,-14,-19, -20,-23	Screw, 4-40 x 1/4 Fil	
151640	7-10	Lever, Shoe Release	
151642	7-9,-10	Screw, 6-40 x 3/4 Fil	
151657	7-1,-2,-3,-4,-6, -8,-13,-14,-16, -17,-19,-20 -21,-23	Screw, 6-40 x 1/4 Fil	
151658	7-1,-7,-12,-14 -16,-20	Screw, 6-40 x 5/16 Fil	
151659	7-2,-20	Screw, 6-40 x 1/2 Fil	
151661	7-14	Screw, 6-40 x 1 Fil	
151668	7-16	Roller	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number (s)	Description	Notes
151685	7-5,-8,-9,-11 -12,-14	Screw, 6-40 x 5/16 Fil	
151686	7-3,-14	Screw, 4-40 x 3/8 Fil	
151687	7-18	Screw, 4-40 x 7/16 Fil	
151688	7-9,-23	Screw, 4-40 x 5/8 Fil	
151689	7-3,-10,-23	Screw, 4-40 x 3/4 Fil	
151690	7-9	Screw, 10-32 x 5/16 Fil	
151692	7-2,-3,-4,-5, -11,-13,-14, -19,-22,-23	Screw, 6-40 x 3/16 Fil	
151693	7-20	Screw, 6-40 x 9/16 Fil	
151695	7-22	Screw, 6-40 x 5/8 Fil	
151700	7-15	Screw, 6-40 Shoulder	
151701	7-17	Spring, Torsion	
151702	7-23	Nut, 4-40 Hex	
151703	7-3	Pin	
151709	7-22	Arm	
151714	7-17	Spring	
151721	7-5,-16	Screw, 6-40 x 3/4 Hex	
151722	7-1,-2,-11,-13	Screw, 6-40 x 3/16 Hex	
151723	7-14	Screw, 10-32 x 3/8 Hex	
151728	7-10	Spring	
151732	7-9,-18	Screw, 4-40 x 11/32 Fil	
151734	7-8	Screw, 4-40 x 3/8 Hex	
151736	7-9	Spring	
151737	7-9,-10	Screw, 4-40 x 11/64 Hex	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number (s)	Description	Notes
151738	7-24	Screw (Identification)	
151739	7-23	Screw	
151880	7-8,-14	Nut, 4-40 Hex	
152089	7-23	Latch	
152121	7-23	Lever, Function	
152129	7-22	Spring	
152140	7-4	Bail	
152147	7-8	Bearing, Ball	
152255	7-21	Bar w/Retainer	
152256	7-21	Codebar	
152257	7-21	Spring	
152298	7-23	Lever, Function	
152357	7-23	Stud	
152359	7-4	Arm	
152401	7-17	Guide	
152402	7-17	Guide, Selector Lever	
152404	7-17	Bracket, Guide	
152406	7-17	Bracket, Spring	
152407	7-17	Lever, Spacing Lock	
152409	7-17	Lever, Selecting	
152410	7-17	Bail, Reset	
152411	7-17	Lever, Push	
152427	7-17	Latch w/Hub	
152429	7-17	Rack, Sector	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number(s)	Description	Notes
152430	7-17	Plate Assembly, Range Finder	
152432	7-17	Arm, Stop	
152436	7-17	Knob, Range Scale	
152438	7-17	Bail, Stop Arm	
152441	7-17	Washer, Flat	
152445	7-17	Spring, Compression	
152450	7-10	Cam, Selector	
152453	7-10	Clutch Assembly, Selector Cam	
152456	7-16	Holder, Wick	
152457	7-16	Wick, Felt	
152461	7-1	Bracket	
152462	7-1	Latch, Right	
152463	7-1	Latch, Left	
152464	7-1	Insulator, 0.062" Thk	
152467	7-1	Connector, Printer, 20 pt rept (B)	
152505	7-13	Stud	
152507	7-13	Roller, Detent	
152508	7-13	Bracket, Right	
152509	7-13	Bracket, Left	
152510	7-13	Lever, Detent	
152511	7-13	Guide	
152514	7-4	Bail	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number(s)	Description	Notes
152515	7-4	Lever, Space Trip	
152516	7-4	Slide	
152518	7-4	Bail	
152523	7-19,-20	Spring, Washer	
152524	7-19,-20	Bracket	
152525	7-19,-20	Hub	
152526	7-19	Plate, Right	
152527	7-20	Plate, Left	
152528	7-20	Ratchet, Left Ribbon	
152529	7-19	Ratchet, Right Ribbon	
152536	7-15	Bail	
152537	7-9	Clamp	
152538	7-14	Plate, Front	
152539	7-3	Guide	
152545	7-4	Lever	
152547	7-23	Shaft	
152548	7-21	Bar, Shift	
152550	7-7	Clamp	
152551	7-21	Codebar, No. 4 & No. 5	
152552	7-21	Codebar, No. 3	
152563	7-4	Bracket	
152571	7-20	Spacer	
152572	7-21	Bracket	
152573	7-10	Retainer	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number (s)	Description	Notes
152574	7-21	Plate	
152575	7-21	Bracket	
152576	7-21	Bracket	
152579	7-13	Track	
152582	7-20	Shaft	
152583	7-16	Bearing, Sleeve	
152584	7-16	Lever	
152585	7-16	Lever	
152586	7-14	Bracket	
152589	7-7	Clamp	
152592	7-13	Guide	
152593	7-8	Housing, Bearing	
152594	7-12	Terminal	
152595	7-13	Slide	
152596	7-14	Slide, Shift	
152603	7-8	Carriage Assembly	
152606	7-13	Rail Assembly, Oscillating	
152614	7-13	Track Assembly, Print Carriage	
152629	7-19,-20	Washer, Friction	
152634	7-14	Washer, Flat	
152635	7-16	Lever, No. 1 Transfer	
152636	7-16	Lever, No. 2 Transfer	
152637	7-16	Lever, No. 3 Transfer	
152638	7-16	Lever, No. 4 Transfer	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number (s)	Description	Notes
152639	7-16	Lever, No. 5 Transfer	
152640	7-16	Lever, No. 6 Transfer	
152641	7-23	Lever, Function	
152642	7-23	Lever, Function	
152644	7-20	Bracket	
152646	7-20	Lever, Left Reversing	
152647	7-19	Lever, Right Reversing	
152648	7-19	Stud	
152651	7-23	Plate, Guide	
152652	7-23	Bar, Guide	
152653	7-23	Pawl, Function	
152659	7-23	Lever, Function	
152660	7-23	Plate, Spring	
152662	7-16	Shaft	
152663	7-16	Guide	
152665	7-23	Bar, Function	
152666	7-23	Bar, Function	
152667	7-23	Bar, Function	
152668	7-23	Bar, Function	
152669	7-23	Bar, Function	
152671	7-23	Bar, Function	
152704	7-23	Bar, Function	
152723	7-3	Spring	
152725	7-3	Spring	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number(s)	Description	Notes
152726	7-11	Bushing	
152818	7-20	Lever, Left Detent	
152819	7-19	Lever, Right Detent	
152820	7-20	Lever, Left Feed	
152821	7-19	Lever, Right Feed	
152823	7-20	Bracket, Left	
152824	7-19	Bracket, Right	
152826	7-19,-20	Pin, Detent	
152827	7-20	Bracket, Left Spool	
152828	7-19	Bracket, Right Spool	
152831	7-2	Clip	
152832	7-3	Shaft	
152834	7-19,-20	Spring, Torsion	
152871	7-6	Spring	
152887	7-10	Screw, 4-40 x 1/2 Hex	
152889	7-23	Plate, Retaining	
152890	7-14,-18	Washer, Flat	
152891	7-17	Spring	
152893	7-4,-7,-17	Screw, 4-40 x 1/4 Hex	
153172	7-13	Spring	
153173	7-13	Plate, Clamp	
153174	7-13	Link, Left	
153175	7-13	Link, Right	
153180	7-13	Link, Right	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number (s)	Description	Notes
153181	7-13	Link, Left	
153183	7-13	Slide, Shift	
153235	7-9	Plate	
153236	7-9	Gear, 42T	
153255	7-4	Bail	
153256	7-14	Bracket	
153291	7-23	Arm	
153292	7-10	Plate	
153293	7-10	Spacer, Clutch	
153294	7-23	Cam	
153295	7-23	Shaft	
153296	7-10	Eccentric	
153298	7-23	Bracket, Right	
153299	7-23	Bracket, Left	
153300	7-10	Arm	
153301	7-23	Arm	
153302	7-23	Blade, Stripper	
153303	7-23	Slide, Stripper	
153304	7-2	Bushing, Shoulder	
153305	7-4	Spring, Torsion	
153310	7-4	Bail	
153311	7-4	Arm	
153312	7-2	Lever	
153314	7-4	Bracket	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number (s)	Description	Notes
153315	7-21	Bracket	
153319	7-21	Codebar	
153321	7-21	Bracket, Tie	
153322	7-23	Guide	
153323	7-10	Ring, Spacer	
153335	7-15	Plate	
153337	7-15	Bushing	
153340	7-15	Spring, Left Torsion	
153341	7-15	Spring, Right Torsion	
153367	7-11	Arm	
153368	7-11	Bail, Follower	
153382	7-4	Bail, Transfer	
153383	7-4	Arm, Bail Extension	
153437	7-23	Bar, Function	
153442	7-5	Screw, 10-32 x 7/16 Hex	
153489	7-17	Detent	
153530	7-8	Plate	
153531	7-8	Plate, Adjusting	
153532	7-8	Screw	
153550	7-5	Link	
153553	7-5	Roller	
153558	7-5	Link	
153569	7-11	Arm, Trip	
153573	7-5	Bail, Function Bar Reset	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number (s)	Description	Notes
153576	7-10	Cam, Function	
153577	7-5	Washer, Felt	
153581	7-23	Handle	
153582	7-4	Screw	
153583	7-11	Lever, Trip	
153584	7-11	Lever, Latch	
153586	7-2	Guide	
153587	7-2	Guide	
153598	7-23	Pawl, Function	
153600	7-21	Bracket, Spring	
153601	7-23	Bushing, Shoulder	
153602	7-23	Plate	
153604	7-23	Pawl, Function	
153609	7-23	Roller	
153634	7-3	Collar	
153644	7-23	Stud	
153670	7-23	Lever, Function	
153799	7-9,-18	Screw, 4-40 x 21/64 Hex	
153806	7-11	Spring	
153810	7-8	Guide, Ribbon	
153815	7-10	Clutch Assembly, Function	
153817	7-13,-14	Screw, 4-40 x 3/8 Hex	
153819	7-21	Lockwasher	
153820	7-22	Frame, Printing Carriage	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number (s)	Description	Notes
153823	7-10	Collar	
153824	7-10	Clamp	
153839	7-1,-5,-8,-11	Screw, 6-40 x 3/8 Hex	
153841	7-7	Screw, 6-40 x 9/16 Hex	
153944	7-12	Drum Assembly, Universal Spacing	
154127	7-1	Nut, 6-40 Hex	
154253	7-14	Stud	
154310	7-12	Spring	
154332	7-19,-20	Shaft	
154333	7-19,-20	Roller	
154354	7-13	Slide	
154356	7-8	Bail	
154380	7-21	Bracket w/Post	
154389	7-14	Cam, Eccentric	
154613	7-23	Latch	
154620	7-17	Wick, Leather	
154621	7-17	Retainer, Wick	
154622	7-17	Lubricator	
154623	7-12	Ring, Retaining	
154624	7-12	Ring w/Roller, Stop	
154626	7-12	Ring	
154627	7-12	Drum, Spacing	
154638	7-22	Spring	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number (s)	Description	Notes
154645	7-5	Spacer	
154650	7-21	Clip	
154688	7-5	Spring	
154694	7-9,-10	Disc, Clutch Cam	
154872	7-2	Bracket	
155044	7-10	Spacer	
155047	7-10	Disc	
155066	7-23	Cable	
155081	7-14	Post, Spring	
155090	7-17	Lubricator Assembly	
155096	7-17	Plate, Range Finder Mtg	
155099	7-23	Screw, 6-40 Shoulder	
155129	7-23	Bar, Function	
155586	7-16	Bracket	
155587	7-16	Link w/Stud	
155589	7-16	Plate w/Stud	
155701	7-24	Typebox Assembly, WY	
155751	7-2,-23	Sleeve, 1/8 ID x 1" Lg Insulating	
155755	7-2	Sleeve, 11/64 ID x 5/8" Lg Insulating	
155796	7-16	Shaft	
155864	7-5	Shaft, Cam	
155865	7-5	Stud	
155933	7-23	Plate, Guide	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number(s)	Description	Notes
155934	7-23	Plate	
155935	7-23	Fork w/Post	
155938	7-23	Slide	
155939	7-23	Slide	
156093	7-6	Washer, Felt	
156536	7-17	Screw, 4-40 x 1/8 Fil	
156572	7-22	Washer, Felt	
156574	7-1	Post, Spring	
156632	7-12	Screw, 6-40 x 13/32 Hex	
156880	7-2	Jumper, 2-3/8" Black	
156881	7-2	Jumper, 1-1/2" Black	
157238	7-24	Spring	
157240	7-23	Spring	
157241	7-5	Bracket, Roller	
157261	7-17	Shaft, Stop Arm	
157274	7-23	Clip	
157289	7-3	Bar, Cross	
157290	7-3	Bail, Pressure	
157291	7-3	Guide, Rear Paper	
157506	7-9	Clutch Assembly, Line Feed	
157512	7-21	Bracket Assembly, Detent	
157600 thru 157649	7-24	Pallet, Type	
157659	7-24	Pallet, Type	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number (s)	Description	Notes
157887	7-23	Arm, No Contact	
157972	7-14	Bellcrank	
157973	7-14	Extension, Transfer	
157979	7-20	Link, Toggle	
157990	7-4	Bracket w/Bearing	
157991	7-4	Stud	
158286	7-1	Transformer (E)	
158335	7-14	Stud	
158352	7-11	Bail, Trip	
158353	7-11	Bail, Stop	
158354	7-11	Arm, Extension	
158365	7-5	Blade, Reset Bail	
158777	7-18	Holder, Screw	
159341	7-7,-10	Bearing, Ball	
159611	7-2	Bell, Signal (C)	
160843	7-11	Spring	
160944	7-15	Washer, Felt	
161342	7-17	Lever, Start	
161346	7-19,-20	Washer, Felt	
161347	7-5,-14,-15	Washer, Felt	
162059	7-23	Lever, Function	
162573	7-9	Retainer	
162728	7-4	Arm	
162729	7-4	Bar, Guide	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number(s)	Description	Notes
162765	7-17	Bracket	
163590	7-9	Gear, 60T	
163776	7-1	Stop	
163778	7-1	Stud	
163783	7-1	Lever w/Stud	
163787	7-1	Bail, Detent	
163788	7-3	Bracket, Guide	
163790	7-1,-2	Frame, Right	
163791	7-1,-2	Frame, Left	
163948	7-1	Gear, 28T	
163949	7-1	Bushing	
163958	7-1	Washer, Flat	
163960	7-1	Bushing	
164220	7-1	Spring, Torsion	
164313	7-22	Bracket	
164316	7-13	Plate, Clamp	
164611	7-1	Guard	
164958	7-18	Screw, 4-40 x 1/2 Hex	
170062	7-14	Bail	
170063	7-14	Lever	
170066	7-21	Codebar	
170067	7-10	Washer, Spacing	
170078	7-15	Arm Assembly, Locklever	
170118	7-16	Bracket	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number(s)	Description	Notes
170123	7-16	Bracket, Retaining	
171954	7-18	Connector, Blue Inner Shielding	
172502	7-23	Switch Assembly (D)	
172591	7-23	Spring, Contact Arm	
172593	7-23	Plate, Contact	
172597	7-23	Block, Contact	
179396	7-24	Plate, Front Typebox	
179397	7-24	Plate, Rear Typebox	
179451	7-15	Plate, Right	
179452	7-15	Plate, Left	
179999	7-19,-20	Bail, Spring	
180717	7-18	Spring	
181204	7-18	Washer, Flat	
181284	7-9,-10	Spring	
183104	7-7,-8	Spring	
192518	7-21	Codebar, Suppression	
192567	7-15	Link, Drive	
193937	7-23	Plate, Shift	
193938	7-23	Slide, Blocking	
194144	7-9	Clutch Assembly, Spacing	
194152	7-9	Plate, Clamp	
195351	7-10	Shaft, Main	
195353	7-2	Cable	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number (s)	Description	Notes
195354	7-9	Cam, Eccentric	
195593	7-1	Lever	
195594	7-1	Lever	
197845	7-23	Stunt Box Assembly	
198584	7-2	Insulator, Bell	
199410	7-15	Arm	
199437	7-9	Cam	
199438	7-9	Hub	
199439	7-9	Bearing	
199440	7-9,-10	Screw, 6-40 x 5/8 Fil	
199823	7-23	Plate, Identification	
304396	7-1	Plate, Stop	
304740	7-22	Head, Print Hammer	
305031	7-1	Gear w/Shaft, 28T	
305033	7-1	Handwheel	
305034	7-1	Arm w/Hub	
305050	7-1	Handwheel Assembly	
306755	7-17	Lever, Marking Lock	
311718	7-18	Bushing, Shoulder	
319204	7-17,-18	Selector Mechanism (A)	
319207	7-18	Cover, Dust	
319208	7-18	Post	
319209	7-18	Plate, Nut	
319211	7-18	Bracket, Coil Mounting	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number (s)	Description	Notes
319212	7-18	Bracket w/Button	
319213	7-18	Bushing	
319214	7-18	Screw, 6-40 Spl	
319215	7-18	Anchor, Spring	
319216	7-18	Wedge	
319217	7-18	Screw, Adjusting	
319219	7-18	Base w/Bushing	
319220	7-18	Armature	
319223	7-18	Lamination, Magnet	
319224	7-17	Plate, Tie	
319225	7-17,-18	Plate, Selector Mounting	
319226	7-17	Link	
319227	7-17	Link	
319228	7-17	Post	
319229	7-17	Screw, 4-40 Shoulder	
319231	7-17	Post	
319238	7-18	Nut, 12-32 Hex	
319240	7-2,-18	Cable Assembly	
319241	7-18	Washer, Captive	
319242	7-18	Bushing, Slotted	
319243	7-18	Strap, 5" Shielded	
319246	7-18	Bushing	
319248	7-18	Strap	
320408	7-2	Terminal, Spade Type	

Table 7-1. Typing Unit, LP156/WY/AJG
(cont)

Part Number	Figure Number (s)	Description	Notes
320418	7-1	Terminal, Ring Type	
321234	7-2,-18	Bracket, Connector Mtg	
321236	7-18	Coupling, Connector	
321237	7-18	Nut, 3/8-32 Spl	
321238	7-18	Sleeve	
324142	7-18	Connector, 3 Pt Rcpt (J103)	
324498	7-2	Bracket, Signal Bell	
330530	7-2	Bracket	
333118	7-1	Cable Assembly	
333132	7-1	Plate, Transformer Mtg	
343938	7-4	Arm, Slide	
343939	7-4	Bracket, Spring	
344287	7-4	Set of Parts	
344958	7-22	Spring	

Table 7-2. Keyboard Unit, LLK4CRS

Part Number	Figure Number (s)	Description	Notes
278M	7-36	Coil, Magnet (A)	
1157	7-26	Screw, 8-32 x 1/2 Fil	
1210	7-25	Screw, 2-56 x 5/8 Fil	
2191	7-13,-25,-26, -31,-32,-33, -34,-36	Lockwasher	
2422	7-26	Lockwasher	
2669	7-25,-26,-34	Lockwasher	
3438	7-25	Washer, Flat	
3595	7-34	Nut, 1/4-32 Hex	
3598	7-25,-26,-31	Nut, 6-40 Hex	
3599	7-25,-33	Nut, 4-40 Hex	
3640	7-25,-26,-36	Lockwasher	
3646	7-25,-26	Lockwasher	
4703	7-34,-36	Spring	
6970	7-32	Nut, 3/8-32 Hex	
7002	7-25,-26,-27, -31,-33,-34	Washer, Flat	
7603	7-36	Spring	
7965	7-25	Spring	
8449	7-25	Spacer, 0.094" Thk	
27425	7-28	Screw, 2-56 x 5/32 Fil	
41663	7-29	Washer, Flat	
42823	7-35	Washer, Flat	
45815	7-27	Lockwasher	
55669	7-25	Spring	

Table 7-2. Keyboard Unit, LLK4CRS
(cont)

Part Number	Figure Number (s)	Description	Notes
71073	7-33	Washer, Flat	
73175	7-26	Lockwasher	
76099	7-32	Washer, Flat	
76474	7-26	Nut, 10-32 Hex	
80581	7-29	Spring	
82392	7-36	Shim, 0.004" Thk	
84551	7-31	Strap	
84575	7-28	Spring	
86774	7-31	Screw, 6-40 Shoulder	
90790	7-32	Washer, Flat	
91228	7-25	Strap, 2-1/2" Braided	
93117	7-25,-28	Lockwasher	
93118	7-33	Lockwasher	
97394	7-25	Screw, 6-40 Shoulder	
99082	7-25	Screw, 8-32 x 11/16 Hex	
99222	7-26	Spring, Compression	
101633	7-34	Washer, Flat	
101796	7-27	Washer, Felt	
102057	7-25	Screw, 4-40 Shoulder	
107256	7-25	Setscrew, 4-40	
110435	7-25	Nut, 4-40 Hex	
110743	7-33,-35,-36	Lockwasher	
111017	7-31,-34	Screw, 6-40 x 5/16 Fil	
112626	7-25	Nut, 10-32 Hex	

Table 7-2. Keyboard Unit, LLK4CRS
(cont)

Part Number	Figure Number (s)	Description	Notes
112627	7-26	Nut, 2-56 Hex	
114858	7-31	Connector, 6 Pt Plug (Z)	
116549	7-35	Pin	
116783	7-29	Fuseholder (W)	
117608	7-29	Nut, Speed	
119649	7-26	Ring, Retaining	
119651	7-25,-26	Ring, Retaining	
119653	7-28,-36	Ring, Retaining	
119652	7-25,-29,-32	Ring, Retaining	
119655	7-32	Ring, Retaining	
121242	7-31,-33,-34	Clamp, 1/8 ID Cable	
121243	7-31	Clamp, 3/16 ID Cable	
121244	7-31,-34	Clamp, 1/4 ID Cable	
124516	7-26	Grommet, Rubber	
125011	7-26,-36	Washer, Flat	
125015	7-34,-36	Washer, Flat	
125112	7-33	Screw, 2-56 x 1/8 Fil	
125126	7-26	Screw, 2-56 x 9/32 Fil	
125178	7-27	Screw, 6-40 Shoulder	
125181	7-25	Screw, 2-56 x 3/8 Fil	
125268	7-25	Spring	
126241	7-33	Lockwasher	
128357	7-26	Ring, Retaining	
129290	7-35	Disc, Adjusting	

Table 7-2. Keyboard Unit, LLK4CRS
(cont)

Part Number	Figure Number (s)	Description	Notes
129292	7-35	Lever, Clutch Shoe	
129661	7-34	Hub	
129919	7-29	Fuse, SL-BL 4 Amp	
130130	7-25	Screw, 4-40 Shoulder	
130499	7-32,-34	Bearing, Ball	
130667	7-34	Lockwasher	
135563	7-31	Jumper, 2-3/4" Lg Green	
142379	7-32	Pin, Roll	
143097	7-35	Ring, Retaining	
145313	7-32	Washer, Felt	
145365	7-32	Pinion, 20T	
145366	7-32	Gear, 56T	
145367	7-32	Shaft, Drive	
145368	7-32	Gear, 27T	
145370	7-32	Gear, 42T	
145372	7-32	Shaft	
145373	7-32	Gear, 66T	
145375	7-32	Gear, 63T	
145376	7-32	Gear, 48T	
145381	7-32	Washer, Thrust	
145383	7-32	Key	
145384	7-32	Pin, Guide	
145385	7-32	Spring, Compression	

Table 7-2. Keyboard Unit, LLK4CRS
(cont)

Part Number	Figure Number (s)	Description	Notes
145386	7-32	Collar	
145389	7-32	Shaft, Idler	
145390	7-32	Pinion, 25T	
145393	7-32	Bushing	
148157	7-29	Knob, Gray	
150000	7-35	Drum, Clutch	
150029	7-35	Wick, Felt	
150043	7-35	Shoe, Secondary Clutch	
150044	7-35	Shoe, Primary Clutch	
150241	7-35	Spring	
150351	7-34	Stud, Eccentric	
150966	7-31,-34	Insulator, Terminal	
151080	7-25	Washer, Flat	
151113	7-25	Strip, Mounting	
151146	7-25	Strap, Mounting	
151152	7-36	Screw, 4-40 x 3/16 Hex	
151245	7-32	Washer, Felt	
151249	7-30	Keytop	
151250	7-30	Keytop	
151335	7-31	Stud	
151415	7-31,-34	Terminal Block (H-Fig 34) (K, KS, S, SS-Fig 31)	
151416	7-31,-34	Nut, 6-40 Hex	
151572	7-34	Lockwasher	
151574	7-27	Grommet, Rubber	

Table 7-2. Keyboard Unit, LLK4CRS
(cont)

Part Number	Figure Number(s)	Description	Notes
151606	7-34	Screw, 10-32 x 1/4 Hex	
151610	7-32,-34	Washer, Flat	
151630	7-25,-31,-32, -34,-36	Screw, 6-40 x 1/4 Hex	
151631	7-31,-32,-33, -34,-36	Screw, 6-40 x 5/16 Hex	
151632	7-26,-32,-34	Screw, 6-40 x 3/8 Hex	
151637	7-25	Screw, 4-40 x 1/4 Fil	
151657	7-34	Screw, 6-40 x 1/4 Fil	
151658	7-32	Screw, 6-40 x 5/16 Fil	
151659	7-34	Screw, 6-50 x 1/2 Fil	
151694	7-31	Screw, 6-40 x 11/32 Fil	
151722	7-25,-33	Screw, 6-50 x 3/16 Hex	
151723	7-25	Screw, 10-32 x 3/8 Hex	
151728	7-35	Spring	
151737	7-35	Screw, 4-40 x 11/64 Hex	
151819	7-31	Strap (Half Duplex)	
151827	7-31	Strap, Terminal	
152466	7-31	Connector, 20 Pt Plug (R)	
152887	7-35	Screw, 4-40 x 1/2 Hex	
152891	7-36	Spring	
153304	7-34	Bushing, Shoulder	
153577	7-32	Washer, Felt	
154047	7-34	Post, Spring	

Table 7-2. Keyboard Unit, LLK4CRS
(cont)

Part Number	Figure Number(s)	Description	Notes
154208	7-25	Bracket, Switch	
155750	7-31	Sleeve, 3/32 ID x 1/2" Lg Insulating	
155753	7-31	Sleeve, 1/8 ID x 1/2" Lg Insulating	
155755	7-31	Sleeve, 11/64 ID x 5/8" Lg Insulating	
155859	7-31	Screw, 4-40 Spl	
155861	7-31	Lockwasher	
156740	7-34	Screw, 6-40 x 7/32 Hex	
157184	7-34	Washer, Felt	
157195	7-34	Stud	
157230	7-31	Strap	
157987	7-27	Washer, Insulating	
158163	7-25	Switch, Sensitive (J)	
158164	7-25	Lever w/Hub	
158250	7-31	Block, Terminal (P)	
158252	7-31	Insulator, Terminal Block	
158745	7-32,-34	Clamp, Bearing	
159003	7-36	Core	
159287	7-32	Retainer, Pinion	
159341	7-32	Bearing, Ball	
160087	7-36	Post, Spring	
161301	7-32	Post	
161440	7-36	Spring	
161912	7-29	Switch, Spst (N)	

Table 7-2. Keyboard Unit, LLK4CRS
(cont)

Part Number	Figure Number (s)	Description	Notes
161922	7-31	Post	
162333	7-25	Stud, Locating	
162659	7-32	Retainer	
162886	7-26	Screw, 4-40 x 7/32 Hex	
163327	7-28	Ring, Retaining	
165082	7-31	Clamp, Cable	
165083	7-31	Keeper, Clamp	
174250	7-32	Pin, Roll	
174452	7-34	Spacer, 0.085" Thk	
176326	7-34	Screw, 10-32 Shoulder	
178839	7-29	Nut, 11/32-32 Hex	
180000	7-28	Frame, Keyboard	
180002	7-28	Codebar, No. 1 Rear	
180003	7-28	Codebar, No. 1 Front	
180004	7-28	Codebar, No. 2 Rear	
180005	7-28	Codebar, No. 2 Front	
180006	7-28	Codebar, No. 3 Rear	
180007	7-28	Codebar, No. 3 Front	
180008	7-28	Codebar, No. 4 Rear	
180009	7-28	Codebar, No. 4 Front	
180010	7-28	Codebar, No. 5 Rear	
180011	7-28	Codebar, No. 5 Front	
180029	7-28	Lever	

Table 7-2. Keyboard Unit, LLK4CRS
(cont)

Part Number	Figure Number (s)	Description	Notes
180030	7-28	Lever, Latch	
180032	7-28	Lever, Non-Repeat	
180033	7-28	Shaft	
180048	7-29	Keylever	
180049	7-29	Keylever	
180050	7-29	Keylever	
180054	7-29	Keylever, Space Bar	
180055	7-28	Keylever, Space	
180056	7-28	Link, Space	
180057	7-29	Bar, Space	
180064	7-29	Keylever, Repeat	
180069	7-29	Keylever, Line Break	
180077	7-28	Link	
180078	7-28,-29	Spring, Compression	
180096	7-28	Link	
180100	7-28	Guide	
180186	7-30	Keytop	
180202	7-30	Keytop	
180203	7-30	Keytop	
180208	7-30	Keytop	
180210	7-30	Keytop	
180211	7-30	Keytop	
180213 thru 180221	7-30	Keytop	

Table 7-2. Keyboard Unit, LLK4CRS
(cont)

Part Number	Figure Number (s)	Description	Notes
180223	7-30	Keytop	
180230	7-30	Keytop	
180231	7-30	Keytop	
180233	7-30	Keytop	
180234	7-30	Keytop	
180236 thru 180240	7-30	Keytop	
180242	7-30	Keytop	
180246	7-30	Keytop	
180299	7-30	Keytop	
180342	7-30	Keytop	
180343	7-30	Keytop	
180389	7-30	Keytop	
180390	7-30	Keytop	
182285	7-26	Bumper, Rubber	
182726	7-27	Terminal, Receptacle Type	
185798	7-28	Spring	
186253	7-27	Lever w/Hub	
186342	7-28	Codebar, Universal	
192025	7-32	Washer, Flat	
192538	7-29	Plug, Button	
195158	7-31,-32	Bracket w/Bearings	
195160	7-32	Pinion, 20T	

Table 7-2. Keyboard Unit, LLK4CRS
(cont)

Part Number	Figure Number (s)	Description	Notes
195263	7-32	Gear, 22T	
195264	7-32	Gear, 49T	
195284	7-33	O-Ring	
195300	7-25	Base, Mounting	
195301	7-25	Mount, Vibration	
195303	7-29	Top Plate, Keyboard	
195304	7-29	Keylever	
195308	7-28	Spring	
195324	7-25	Cable Assembly	
195325	7-26	Pan w/Bracket	
195327	7-31	Bracket, Terminal Block	
195329	7-25	Plate, Distributor Mounting	
195331	7-25	Screw w/Lockwasher, 1/4-32 Hex	
195334	7-25	Plate, Nut	
195335	7-25	Shaft, Gear Shift	
195336	7-25	Clamp	
195337	7-25	Plate, Stop	
195338	7-25	Link, Gear Shift	
195341	7-25	Bracket, Guide	
195343	7-25	Bail w/Stud	
195344	7-25	Bail w/Stud	
195345	7-25	Link, LOC LF Function	
195346	7-25	Link, LOC CR Function	
195347	7-25	Guide, Function Link	

Table 7-2. Keyboard Unit, LLK4CRS
(cont)

Part Number	Figure Number (s)	Description	Notes
195348	7-25	Bracket, LOC CR	
195349	7-25	Knob, Speed Selector	
195364	7-32	Shaft, Drive	
195375	7-25	Plate (45.5-50-74.2)	
197845	7-23	Stunt Box Assembly	
198576	7-34	Gear, 40T	
198577	7-34	Gear, 72T	
198580	7-32	Gear, 21T	
198670	7-26	Screw w/Lockwasher, 6-40 x 5/16 Hex	
198679	7-25	Bracket, Bolt Retaining	
198680	7-25	Screw, 10-32 Spl	
305051	7-26	Stud	
307544	7-31	Jumper, 6" Green	
307545	7-31	Jumper, 2" Green	
318987	7-27	Strap, 3-1/2" Braided	
319238	7-33	Nut, 12-32 Hex	
320410	7-31,-33,-36	Terminal, Spade Type	
320418	7-31,-36	Terminal, Ring Type	
320419	7-25	Terminal, Ring Type	
320420	7-27	Terminal, Ring Type	
320421	7-25	Terminal, Ring Type	
323117	7-27	Keyboard Assembly	
323118	7-33,-34	Distributor Mechanism	

Table 7-2. Keyboard Unit, LLK4CRS
(cont)

Part Number	Figure Number (s)	Description	Notes
325970	7-31	Pin	
329266	7-27,-33	Lamp, Incandescent	
329267	7-27,-33	Mount, Shock	
329268	7-27	Lamp Assembly (V)	
329269	7-33	Lamp Assembly (B)	
329271	7-26	Shaft Assembly, Trip	
329272	7-31	Diode w/Terminals	
329274	7-31	Cable Assembly (Z)	
330861	7-26	Nut, 8-32 Shoulder	
333028	7-33	Connector, 6 pt Rcpt (L)	
333029	7-33	Connector, 6 pt Plug (LA)	
333057	7-27	Plate	
333058	7-27	Guide, Shutter	
333059	7-27	Shutter	
333060	7-27	Plate	
333066	7-27	Bracket, Left Keyboard	
333067	7-27	Bracket, Right Keyboard	
333068	7-35	Roller	
333078	7-33	Cable Assembly (LA)	
333079	7-31	Cable Assembly	
333081	7-36	Plate, Adjusting	
333085	7-33	Bracket	
333086	7-36	Plate	
333087	7-36	Bracket, Clutch Magnet	

Table 7-2. Keyboard Unit, LLK4CRS
(cont)

Part Number	Figure Number (s)	Description	Notes
333088	7-33	Plate, Photo Cell Mtg	
333089	7-34	O-Ring	
333091	7-34	Drum	
333092	7-33,-34,-36	Bracket	
333093	7-35	Bearing	
333094	7-27	Photo Cell (Y)	
333096	7-34	Spacer, 0.435" Thk	
333098	7-33,-34	Cover Plate	
333099	7-34	Lever	
333100	7-35	Spacer, 0.289" Thk	
333101	7-28	Plate, Stop	
333103	7-35	Disc	
333105	7-26	Plate	
333106	7-26	Guide w/Post	
333108	7-26	Bail, Function	
333109	7-26	Shaft w/Lever	
333110	7-26	Bracket	
333111	7-26	Link	
333112	7-26	Link	
333113	7-26	Spacer, 0.060" Thk	
333116	7-33	Cover, Photo Cell	
333117	7-35	Arm, Drive	
333119	7-36	Armature	

Table 7-2. Keyboard Unit, LLK4CRS
(cont)

Part Number	Figure Number (s)	Description	Notes
333120	7-36	Lever	
333121	7-36	Bail, Latch	
333122	7-26,-36	Bail, Reset	
333123	7-36	Lever, Latch	
333124	7-36	Lever, Trip	
333126	7-28	Lever	
333127	7-31	Cable Assembly (R)	
333133	7-33	Bracket	
333135	7-33	Connector, 6 Pt Plug (P101)	
333136	7-33	Connector, 6 Pt Rcpt (J101)	
333138	7-35	Bushing	
333147	7-31	Strap, Wire	
333148	7-33	Photo Cell (G)	
333149	7-33	Cable Assembly (L)	
333150	7-33	Pick-up Assembly, Photo	
333151	7-36	Cable Assembly	
333152	7-36	Trip Assembly, Clutch	
333153	7-34	Shaft	
333154	7-33	Cable Assembly (U)	
333155	7-35	Clutch Assembly, Distributor	
334141	7-31	Connector, 3 Pt Plug (P103)	
334443	7-31	Capacitor w/Terminals	
336653	7-33	Cable Assembly (P101)	
336654	7-31	Cable Assembly (P103)	

Table 7-3 Amplifier Assembly, 336651

Part Number	Figure Number (s)	Description	Notes
2191	7-37	Lockwasher	
3598		Nut, 6-40 Hex	
7002		Washer, Flat	
110743		Lockwasher	
121242		Clamp, 1/8 ID Cable	
125229		Nut, 6-32 Hex	
137471		Lug, Terminal	
150868		Bushing, Insulating	
151632		Screw, 6-40 x 3/8 Hex	
156536		Screw, 4-40 x 1/8 Fil	
156632		Screw, 6-40 x 13/32 Hex	
304123		Capacitor, 12 WVDC, 250 MFD (C1)	
311023		Diode, 1N4001 (CR1)	
312341		Diode, 1N4004 (CR2)	
315932		Transistor, MM2259 (Q2)	
315948		Resistor, 1/4 W, 100 Ohm PORM 5 Pct (R3)	
315952		Resistor, 1/4 W, 820 Ohm PORM 5 Pct (R2)	
315988		Resistor, 1/4 W, 27 Kohm PORM 5 Pct (R1)	
324656		Transistor, 2N3569 (Q1)	
333133		Bracket, Cable Support	
336190		Insulator, Circuit Card Assembly	
336191		Bracket, Circuit Card Assy	

Table 7-3. Amplifier Assembly, 336651
(cont)

Part Number	Figure Number (s)	Description	Notes
336649	7-37	Circuit Board, Etched	
336650		Circuit Card Assembly	
336651		Amplifier Assembly	
336652		Cable Assembly	
336799		Diode, Zener, 150 V, 1N989A (CR3)	

Table 7-4. Motor Unit, LMU37

Part Number	Figure Number (s)	Description	Notes
2191	7-38	Lockwasher	
2263		Nut, 8-32 Hex	
3640		Lockwasher	
71999		Spring, Motor Thrust	
87334		Washer, Insulating	
96264R		Jumper, 5" Red	
102203		Bushing	
103160		Strap, Ground, Green	
122201		Bearing, Ball	
122207		Strap Assembly, Motor Mtg	
122211		Washer, Pull	
122220		Oiler, Ball	
122229		Bolt, 8-32 x 4-11/16 Fil	
122245		Capacitor, Fixed, 43 to 48 MFD	
122249		Switch, Thermostatic	
122251		Stator, Motor	
122252		Shield Assembly, End	
123769		Fan, Motor (Early Design)	
125011		Washer, Flat	
128874		Rotor, Motor	
150040		Screw, 6-40 x 5/8 Fil	
151620		Strap, Motor Mounting	
151621		Screw, 6-32 x 3/4 Rd	
151622		Nut, 6-32 Sq	

Table 7-4. Motor Unit, LMU37
(cont)

Part Number	Figure Number (s)	Description	Notes
151637	7-38	Screw, 4-40 x 1/4 Fil	
151642		Screw, 6-40 x 3/4 Fil	
151687		Screw, 4-40 x 7/16 Fil	
151795		Motor Assembly, Std, CCW, AC Synchronous, 1/2 HP, 115 V/60 HZ/3600 RPM	
151922		Clamp, Capacitor	
151923		Relay, Motor Starting	
151925		Clamp, Capacitor	
152297		Washer, Bearing	
153030		Mount, Vibration	
153049		Washer, Insulating	
194897		Bracket w/Cradle, Motor	
194899		Cable w/Terminals	
310341		Insulator, Relay	
332865		Fan, Motor	

Table 7-5. Cover Unit, LPC403BR

Part Number	Figure Number(s)	Description	Notes
2034	7-39	Washer, Flat	
2191		Lockwasher	
3598		Nut, 6-40 Hex	
3599		Nut, 4-40 Hex	
3639		Lockwasher	
3640		Lockwasher	
7002		Washer, Flat	
34432		Washer, Flat	
36463		Spring	
70314		Washer, Flat	
72254		Washer, Flat	
80531		Washer, Flat	
86457		Screw, 10-32 Shoulder	
90790		Washer, Flat	
92260		Lockwasher	
102751		Nut, 10-32 Shoulder Hex	
107116		Lockwasher	
110434		Screw, 4-40 x 3/16 Fil	
110743		Lockwasher	
111345		Bolt	
111346		Spring, Compression	
112626		Nut, 10-32 Hex	
115241		Bushing, Eccentric	
115535		Connector, 6 Pt Rcpt (AA)	
117883		Spacer	

Table 7-5. Cover Unit, LPC403BR
(cont)

Part Number	Figure Number (s)	Description	Notes
119652	7-39	Ring, Retaining	
121244		Clamp, 1/4 ID Cable	
121246		Clamp, 3/8 ID Cable	
125015		Washer, Flat	
125229		Nut, 6-32 Hex	
151152		Screw, 4-40 x 3/16 Hex	
151540		Lampholder	
151576		Arm, Stop	
151722		Screw, 6-40 x 3/16 Hex	
151731		Screw, 4-40 x 7/8 Fil	
151982		Lamp, 6 V Incandescent (AB)	
152893		Screw, 4-40 x 1/4 Hex	
153020		Guide, Line	
153021		Spring, Torsion	
153022		Bushing	
153042		Window, Plastic	
154433		Clamp	
155755		Sleeve, 11/16 ID x 5/8" Lg Insulating	
160341BR		Hinge, Left	
160349BR		Hinge, Right	
164856		Indicator, Red Neon (AC)	
178707		Bumper, Rubber	
192191		Knob	

Table 7-5. Cover Unit, LPC403BR
(cont)

Part Number	Figure Number (s)	Description	Notes
195572	7-39	Guide Assembly, Line	
195575		Bracket	
195576		Shaft	
195577BR		Frame, Window	
195578		Latch, Right	
195579		Latch, Left	
198550BR		Cover	
198551BR		Dome	
198554		Bracket, Right Latch	
198555		Bracket, Left Latch	
198556		Plunger	
198557		Bracket	
198558		Spring, Torsion	
198559		Bracket, Right	
198560		Bracket, Left	
198561		Bracket, Transformer	
198562		Cable Assembly	
198563BR		Hood	
199268		Nameplate	
320268		Guide, Paper	
320418		Terminal, Ring Type	
324148		Label, CAUTION	
325971		Bracket, Connector	
327911		Plate, Identification	

Table 7-5. Cover Unit, LPC403BR
(cont)

Part Number	Figure Number (s)	Description	Notes
329266 333140	7-39	Lamp, Incandescent (Spare) Holder, Spare Lamps	

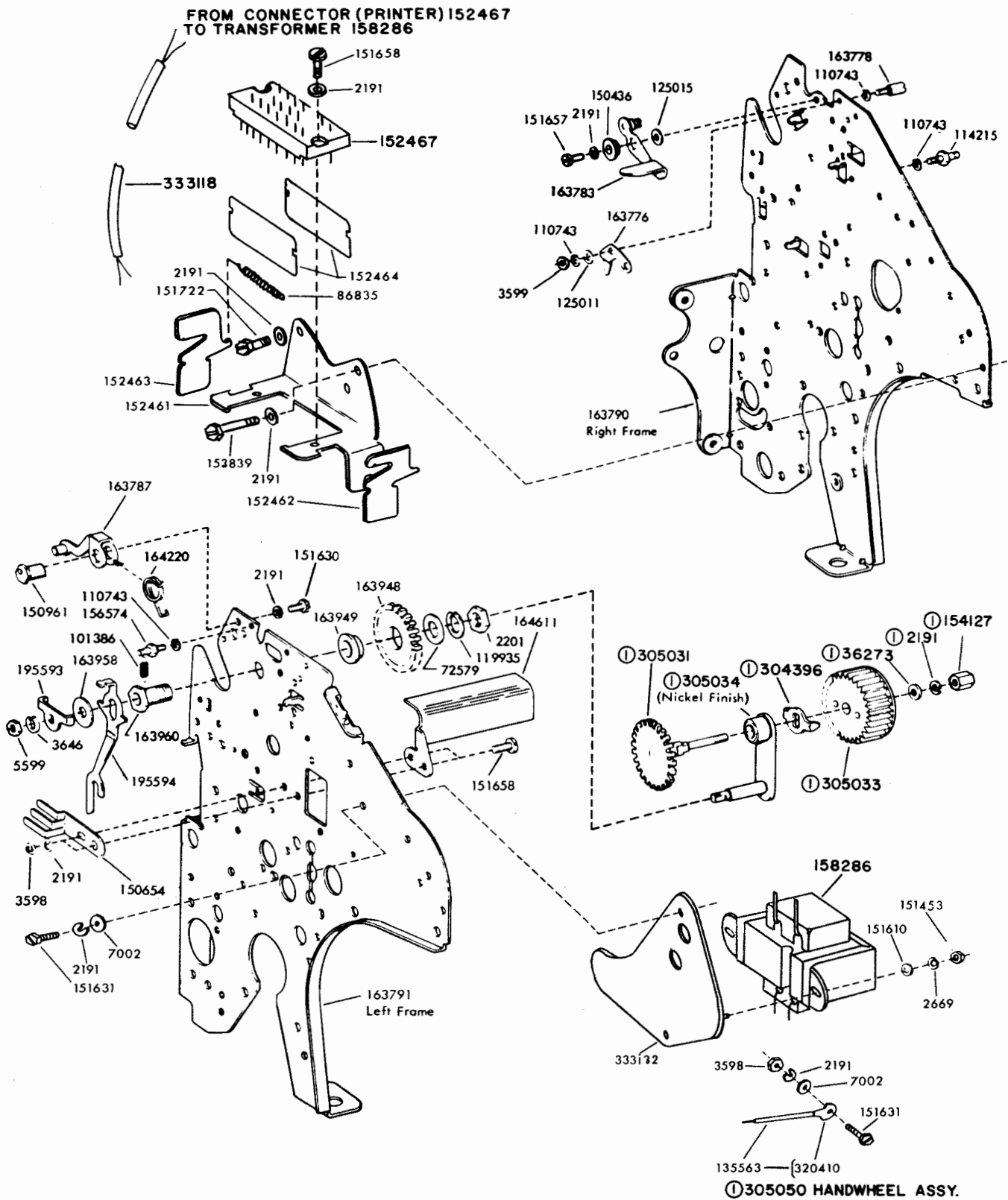


Figure 7-1. Left and Right Side Frame

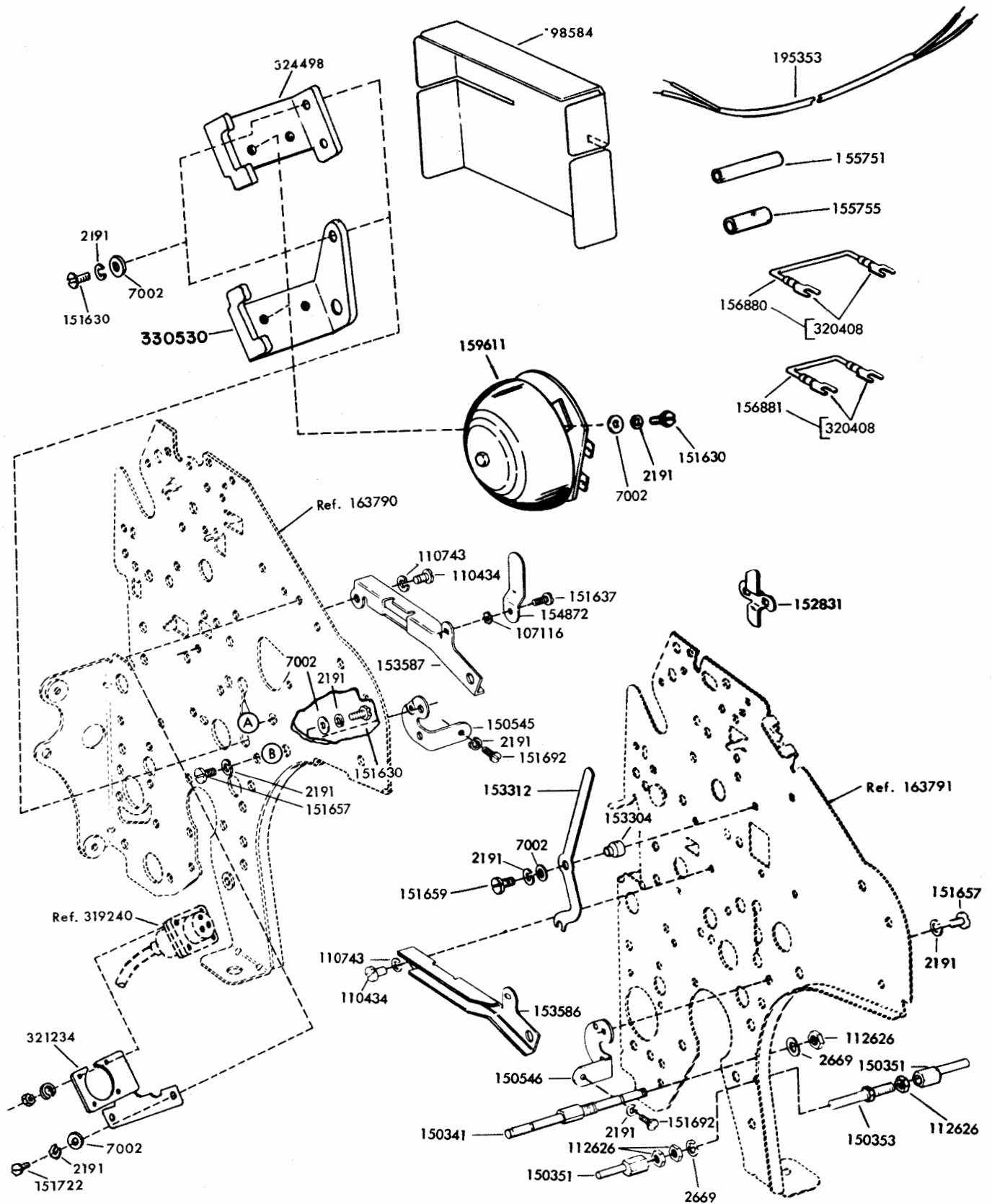
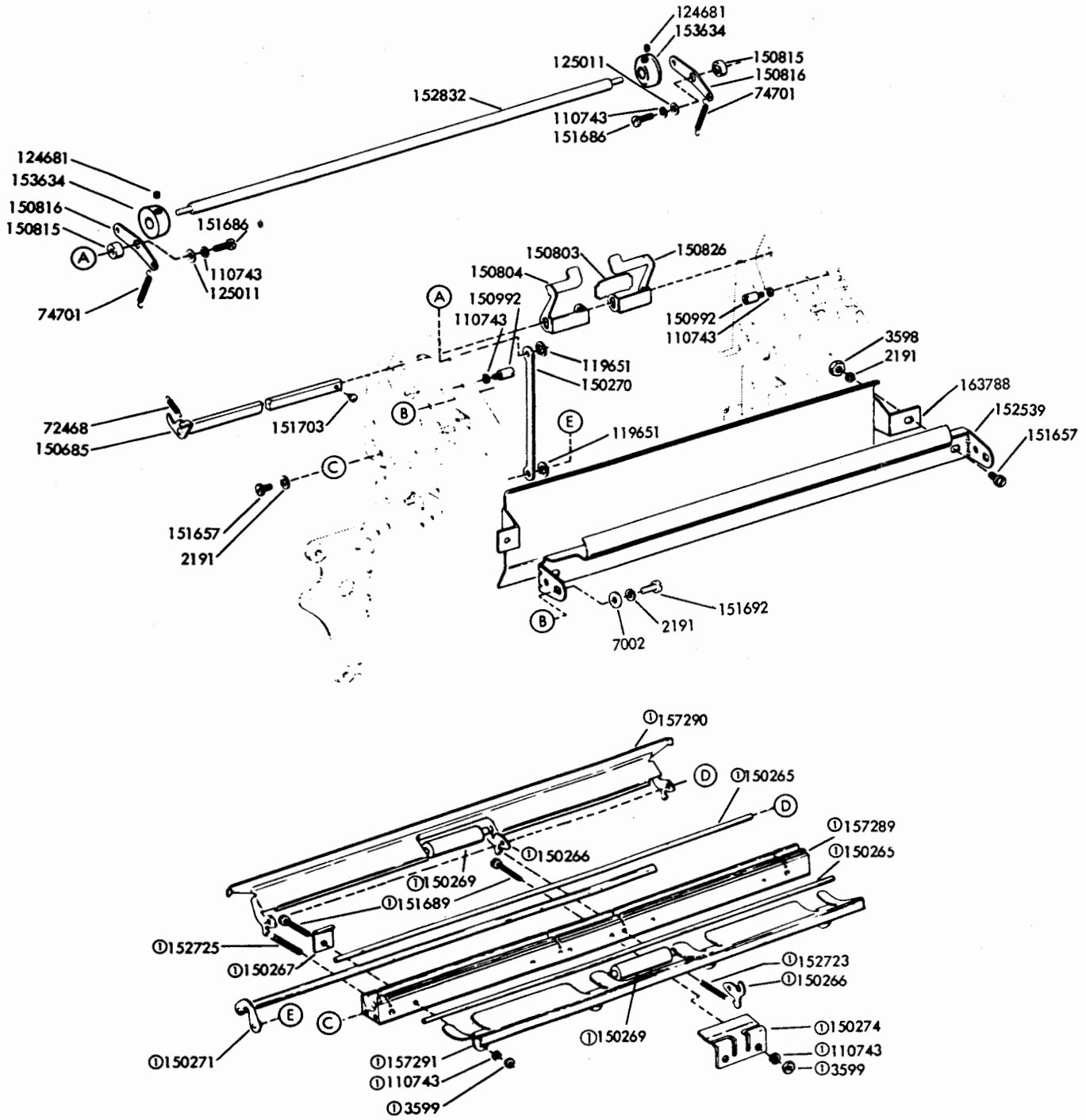


Figure 7-2. Left and Right Side Frame



Ⓢ150096 Pressure Roller Assembly

Figure 7-3. Pressure Roller Mechanism

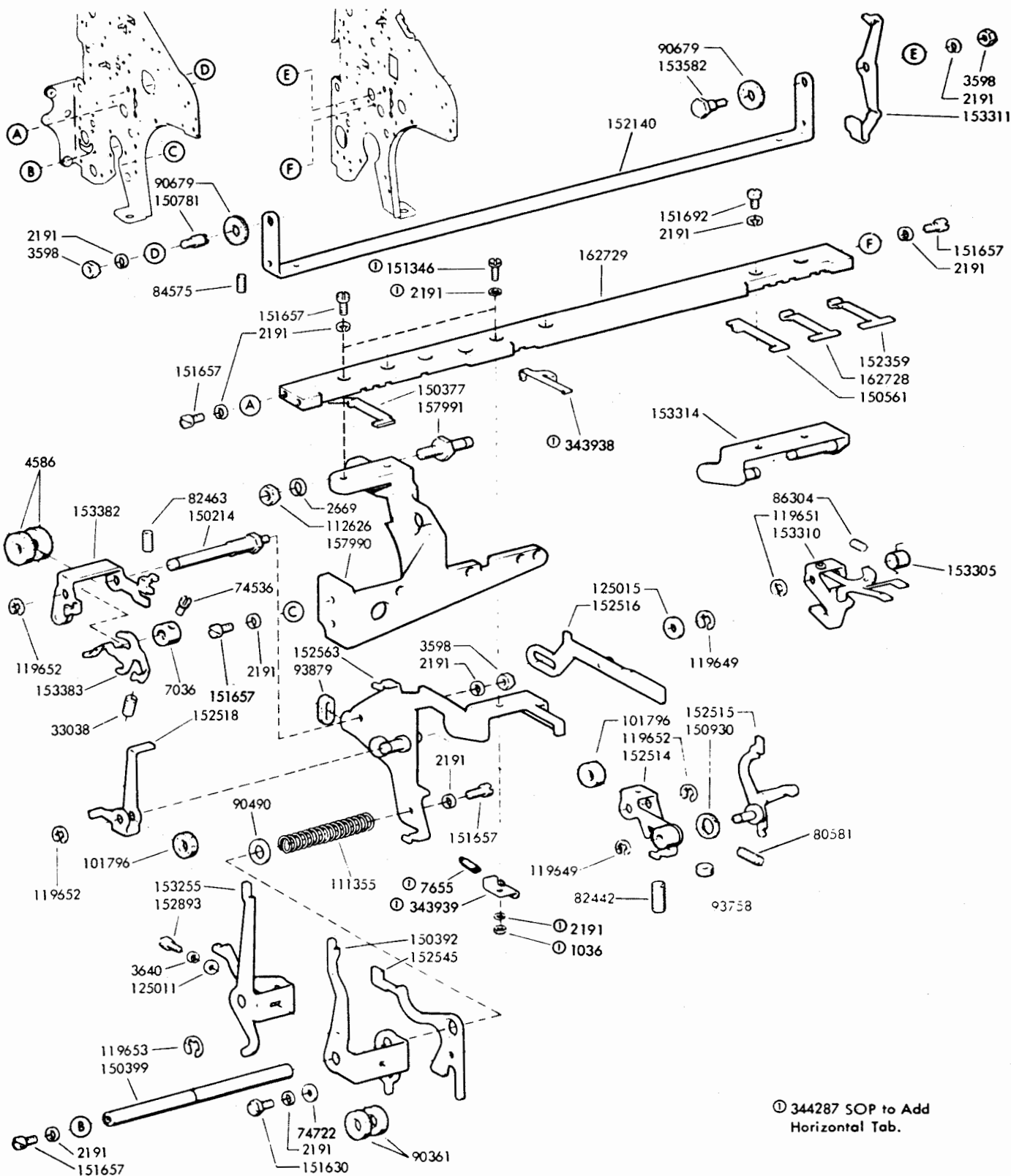


Figure 7-4. Space Suppression Mechanism

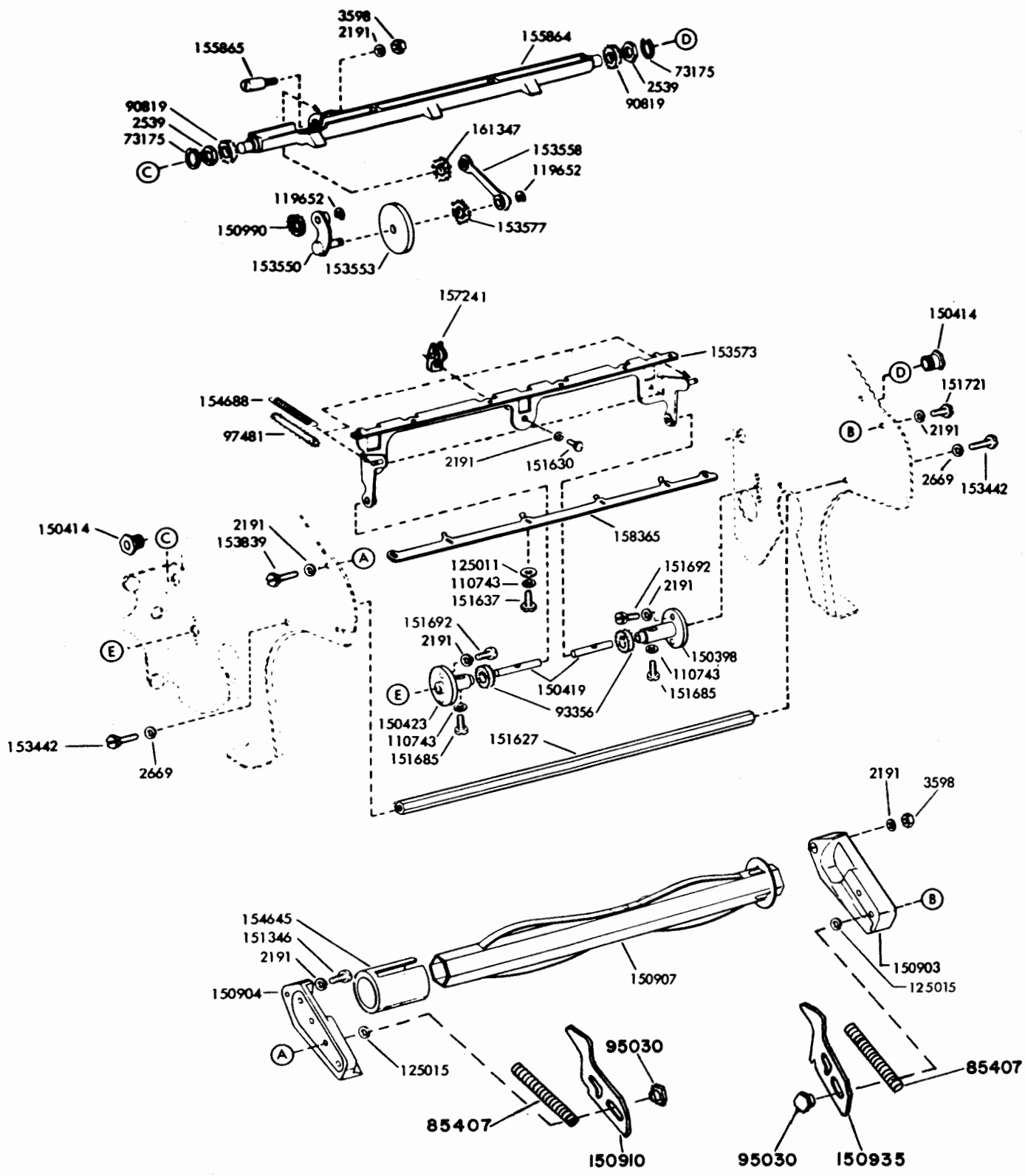
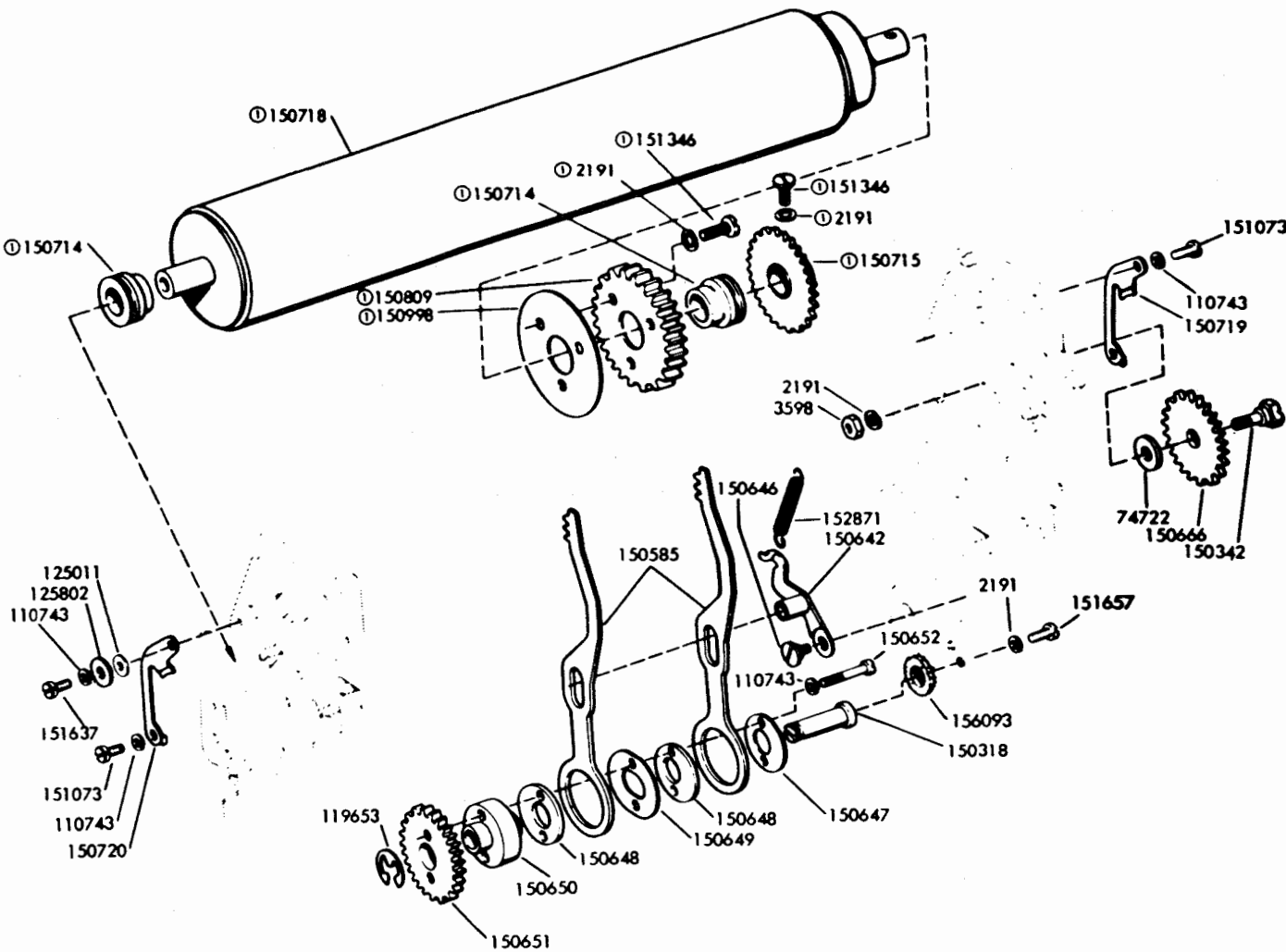


Figure 7-5. Paper Spindle and Reset Bail Mechanism



©150833 Platen Assembly

Figure 7-6. Line Feed and Platen Mechanism

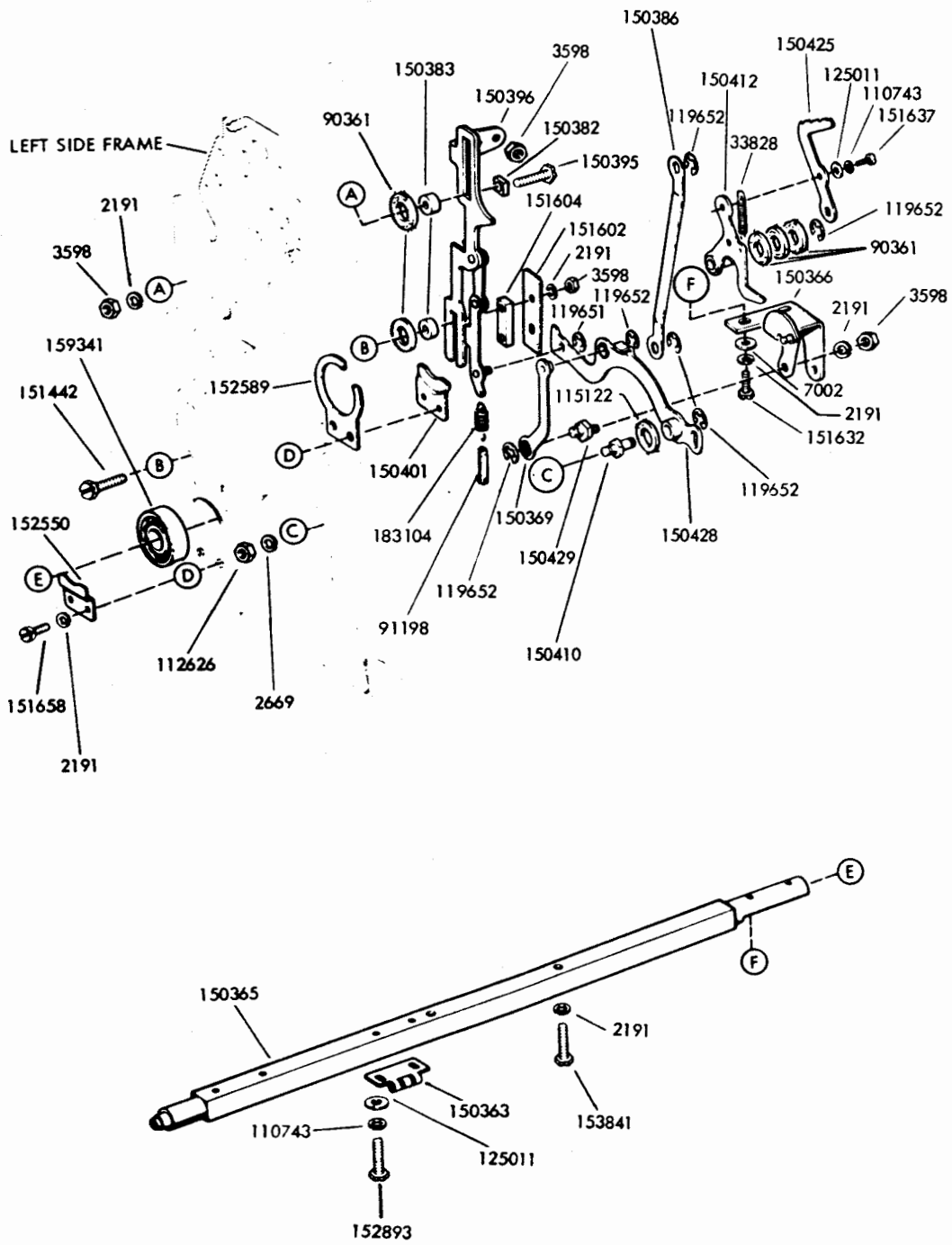
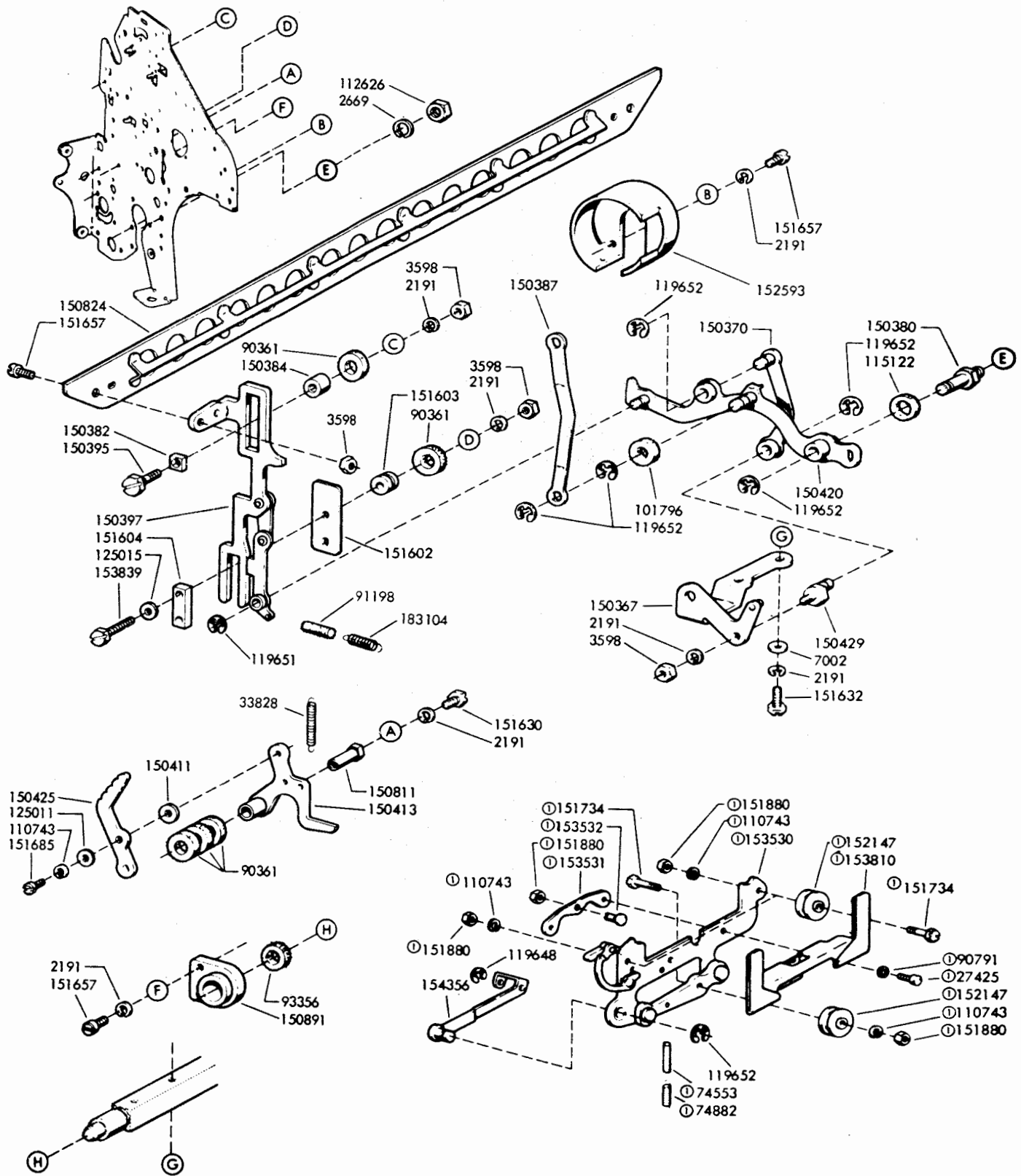


Figure 7-7. Left Side Linkage and Rocker Shaft



Ⓞ 152603 Carriage Assembly

Figure 7-8. Right Side Linkage and Typebox Carriage Mechanism

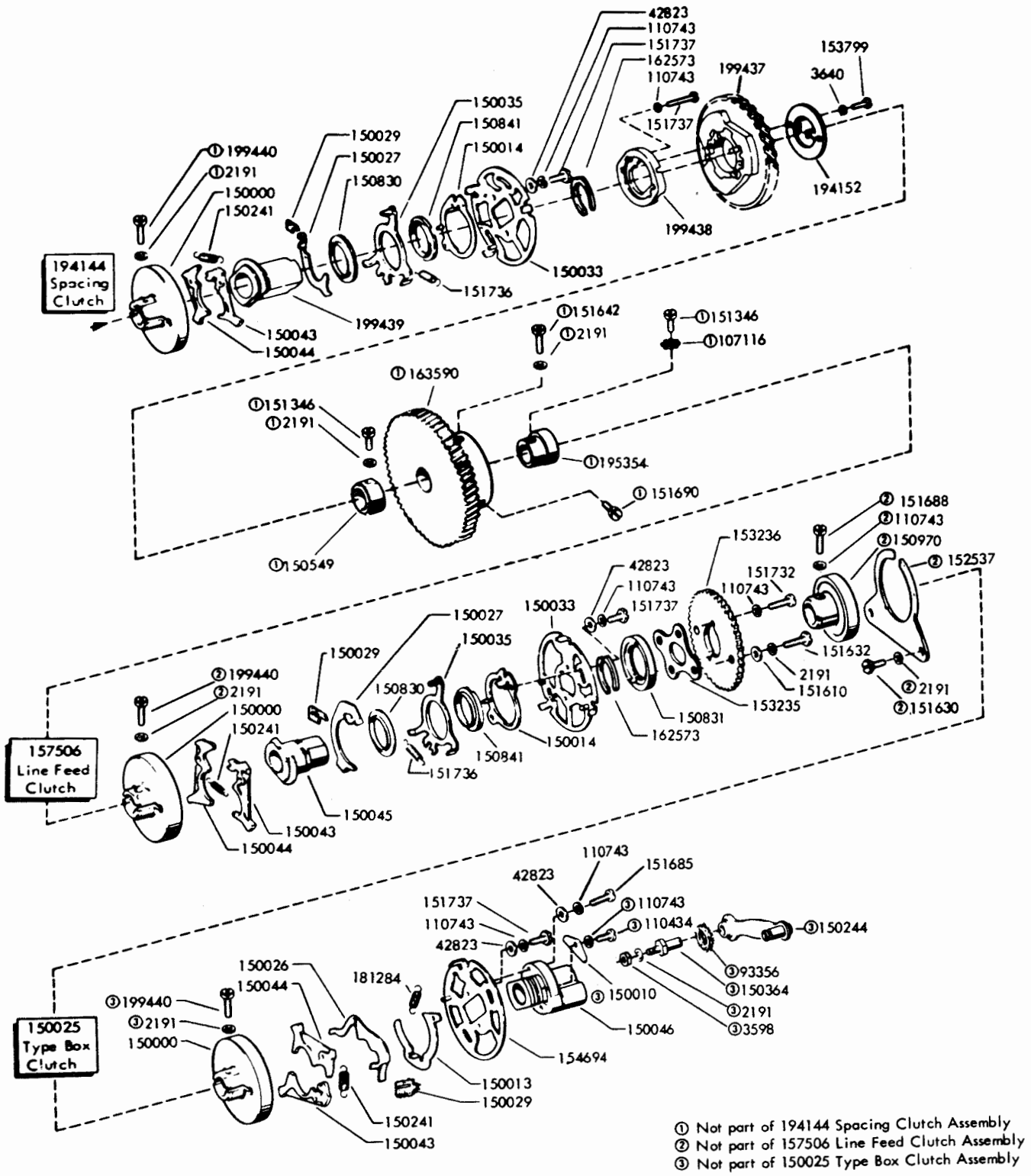
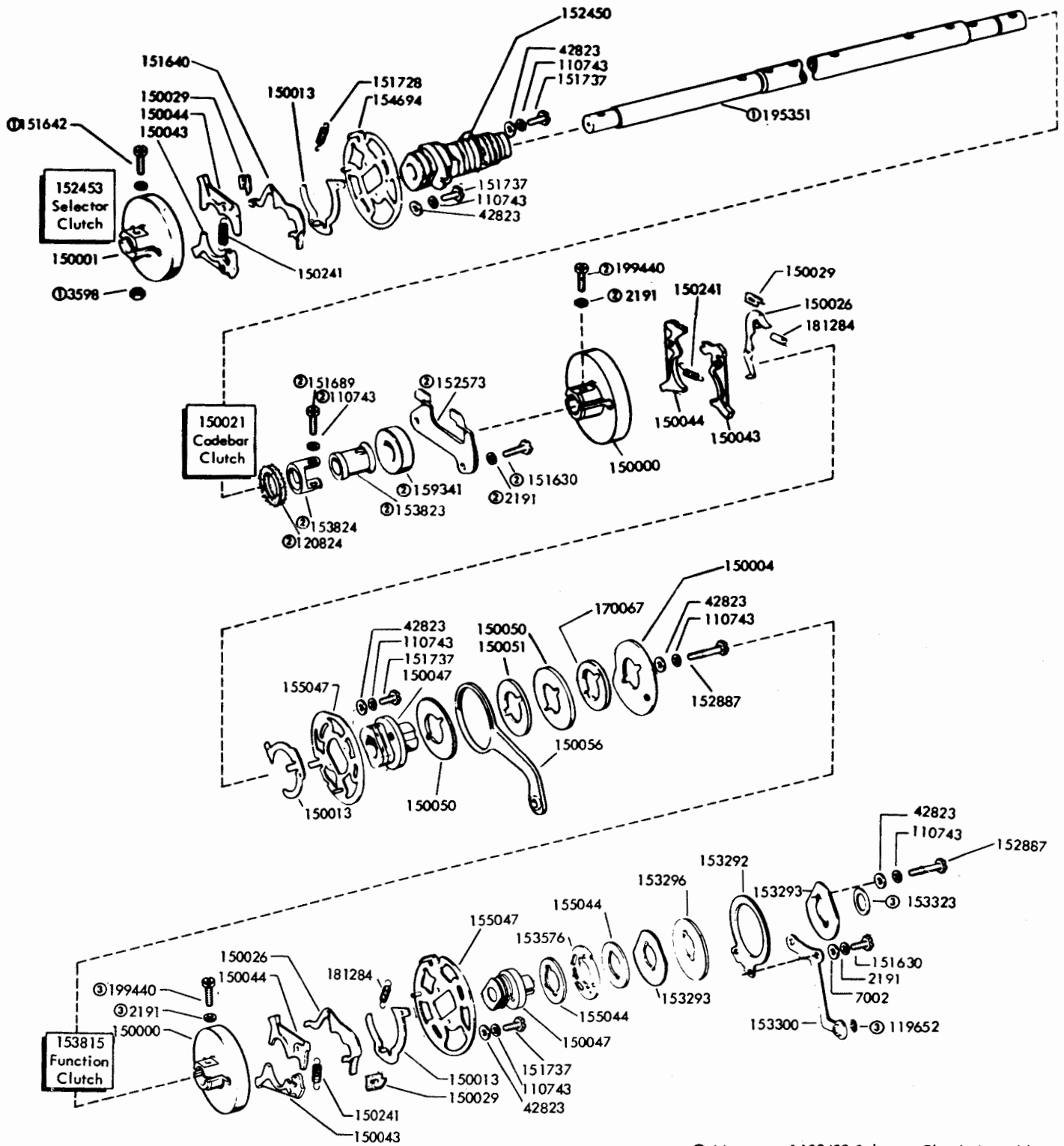


Figure 7-9. Main Shaft



- ① Not part of 152453 Selector Clutch Assembly
- ② Not part of 150021 Codebar Clutch Assembly
- ③ Not part of 153815 Function Clutch Assembly

Figure 7-10. Main Shaft

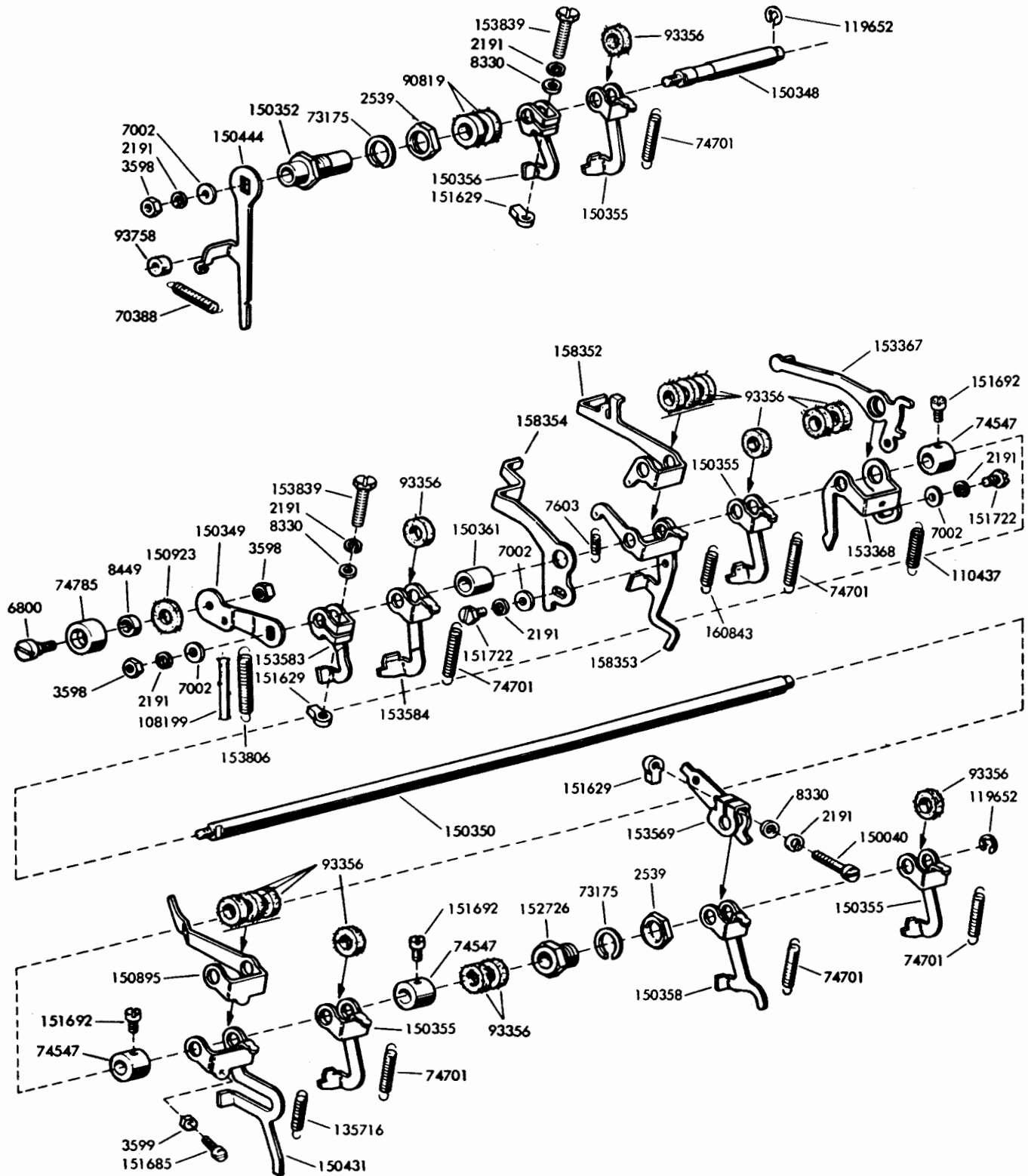


Figure 7-11. Trip Shaft Mechanism

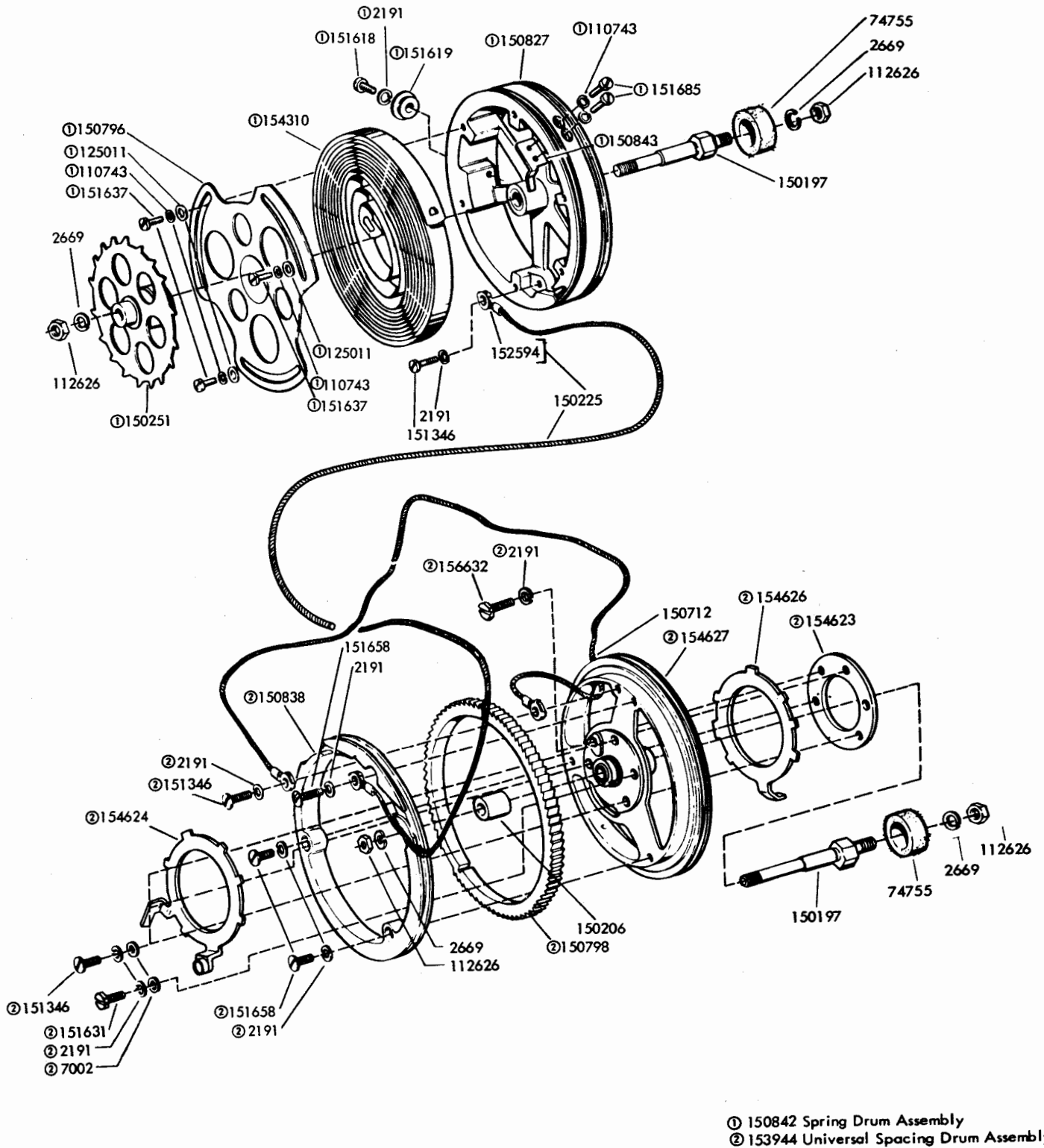


Figure 7-12. Carriage Return and Spacing Drum Mechanism

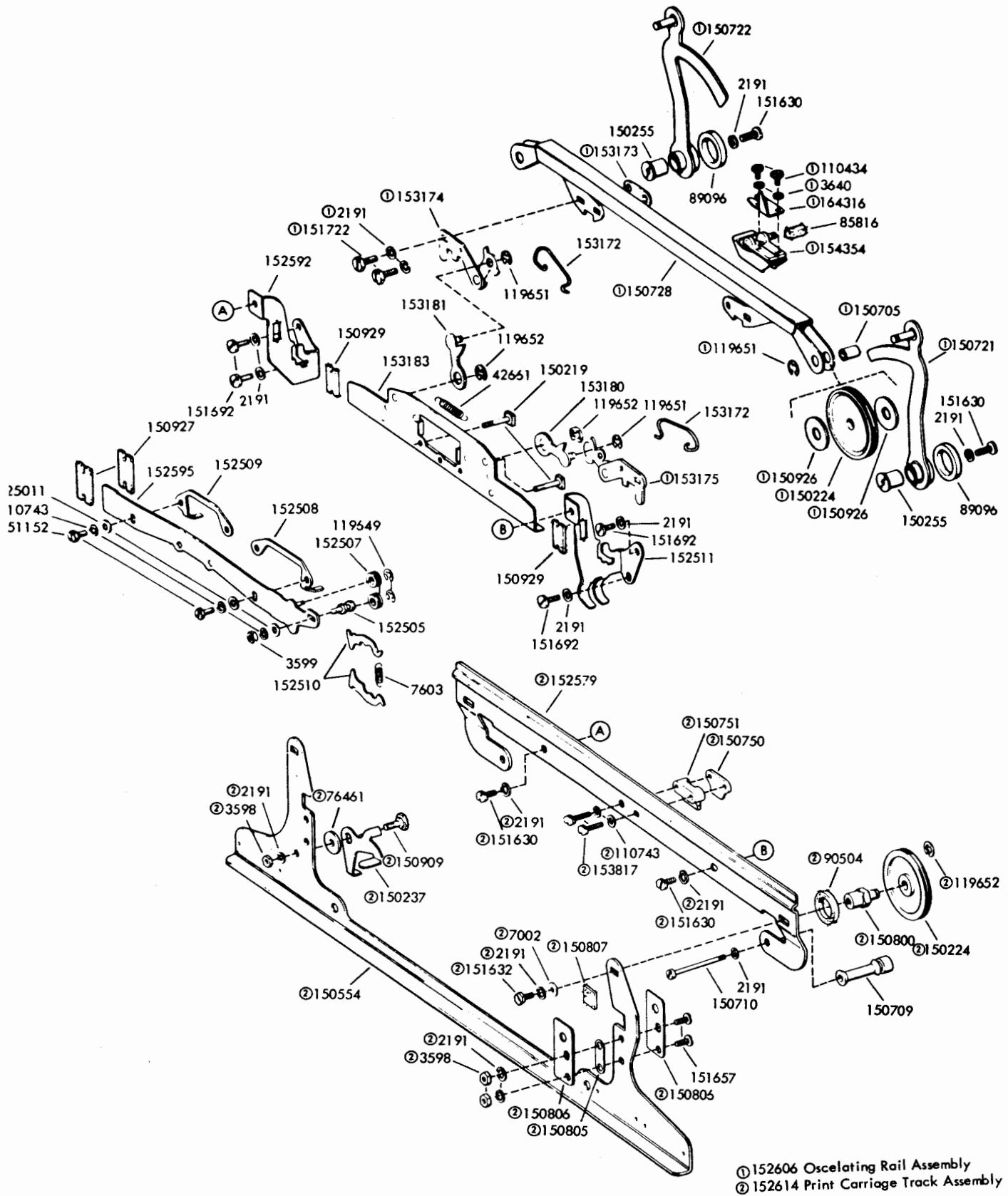


Figure 7-13. Front Plate Mechanism

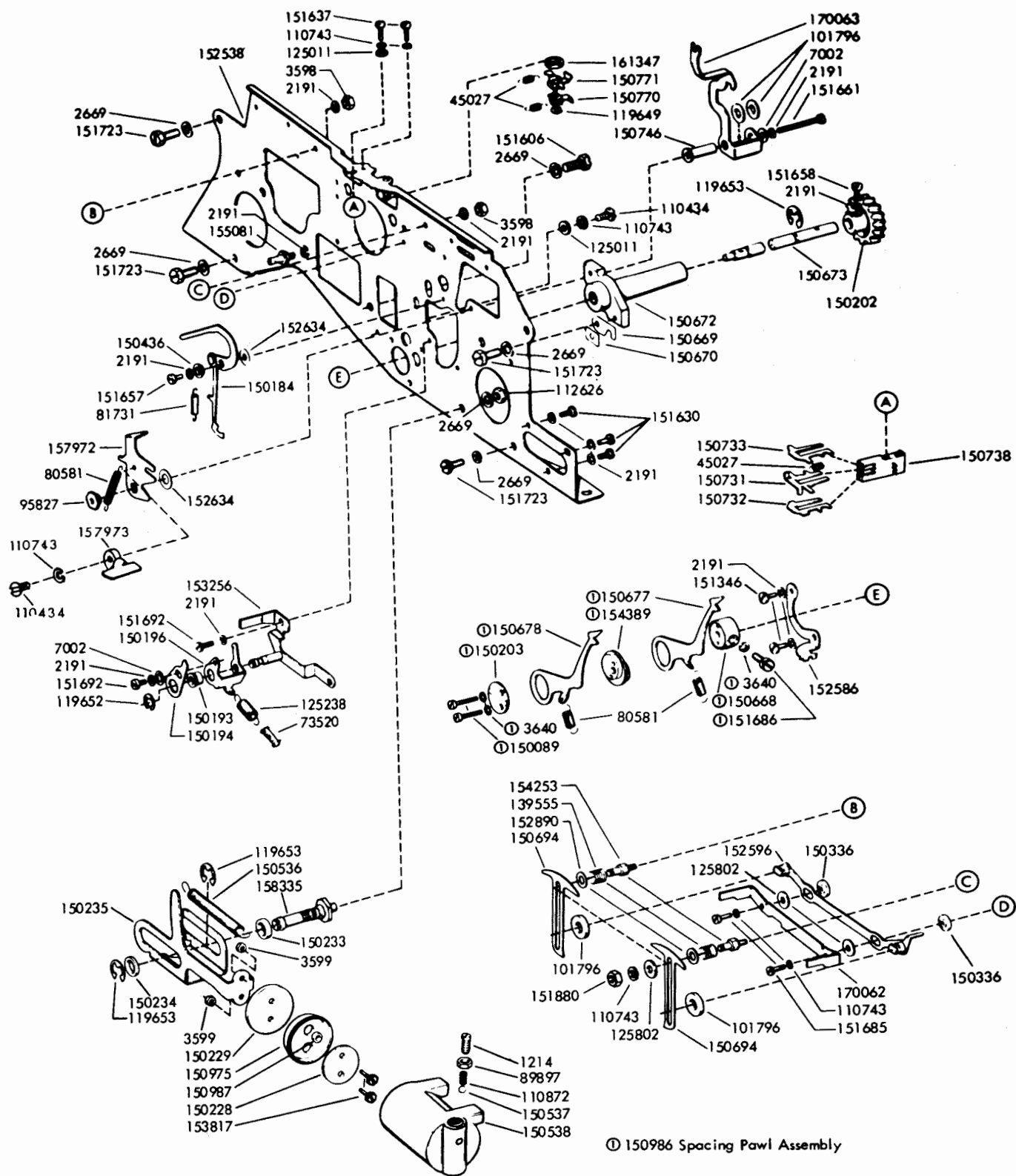
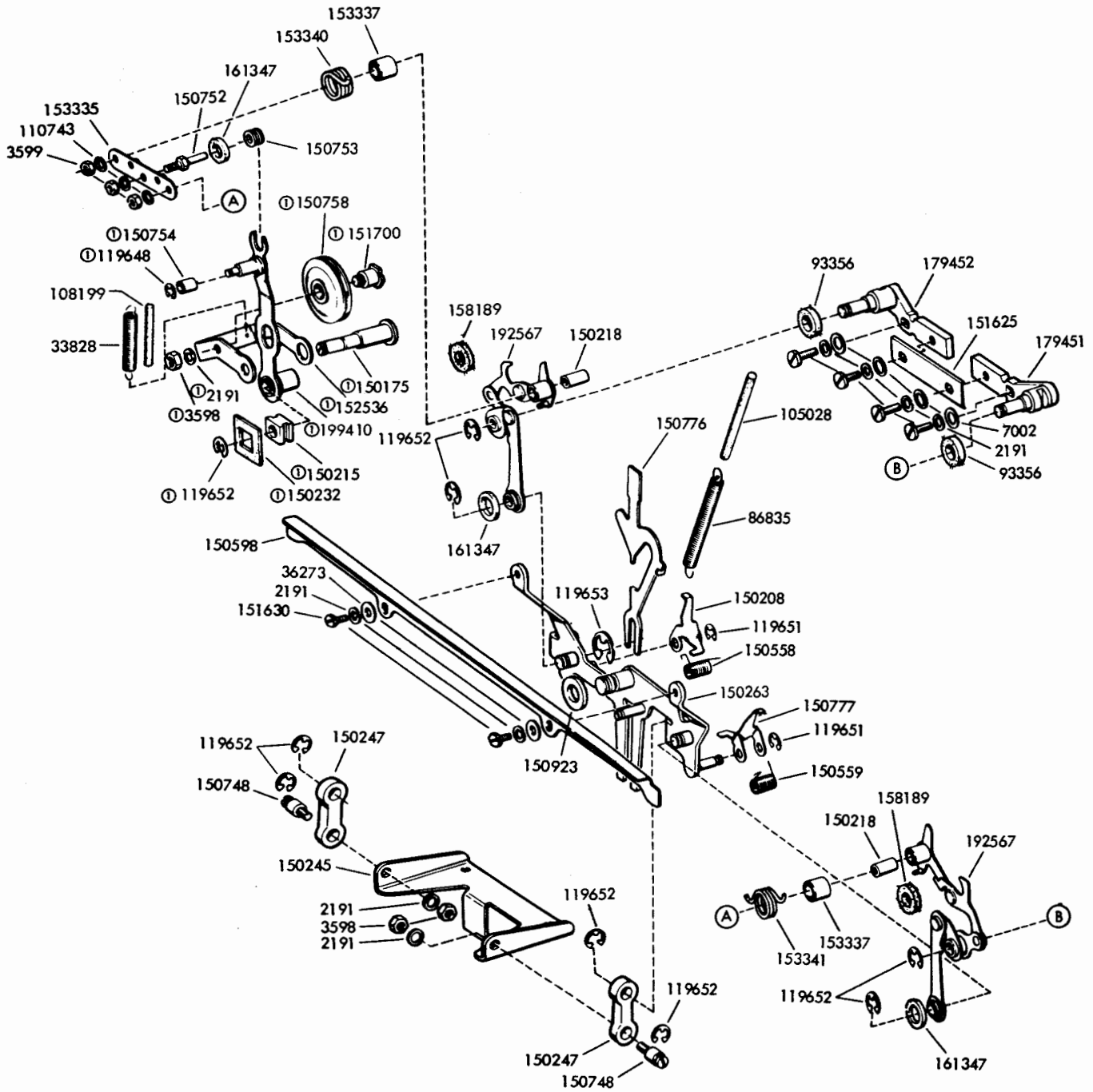


Figure 7-14. Front Plate Mechanism (A)



©170078 Locklever Arm Assembly

Figure 7-15. Front Plate Mechanism (B)

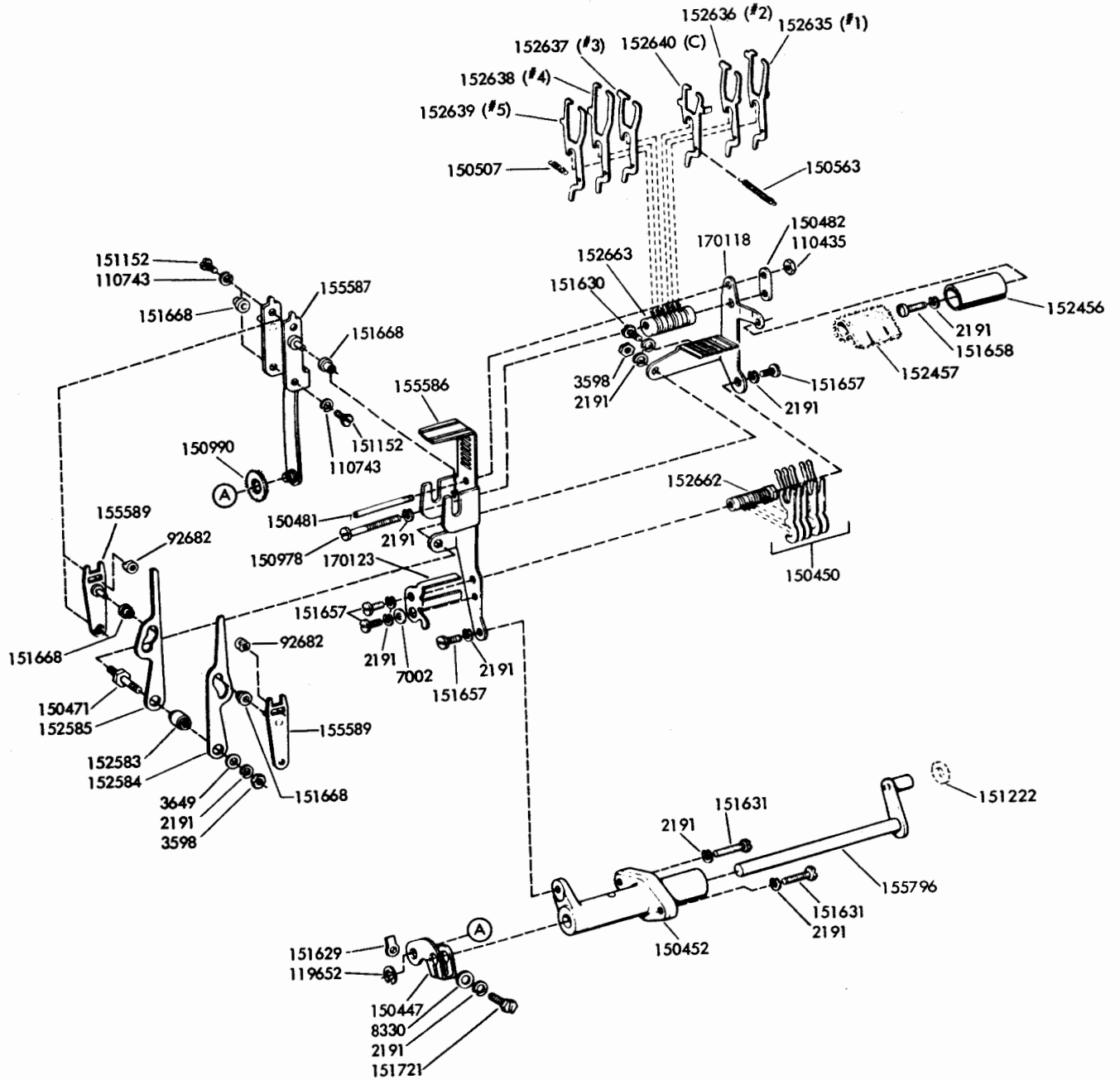


Figure 7-16. Code Bar Positioning Mechanism

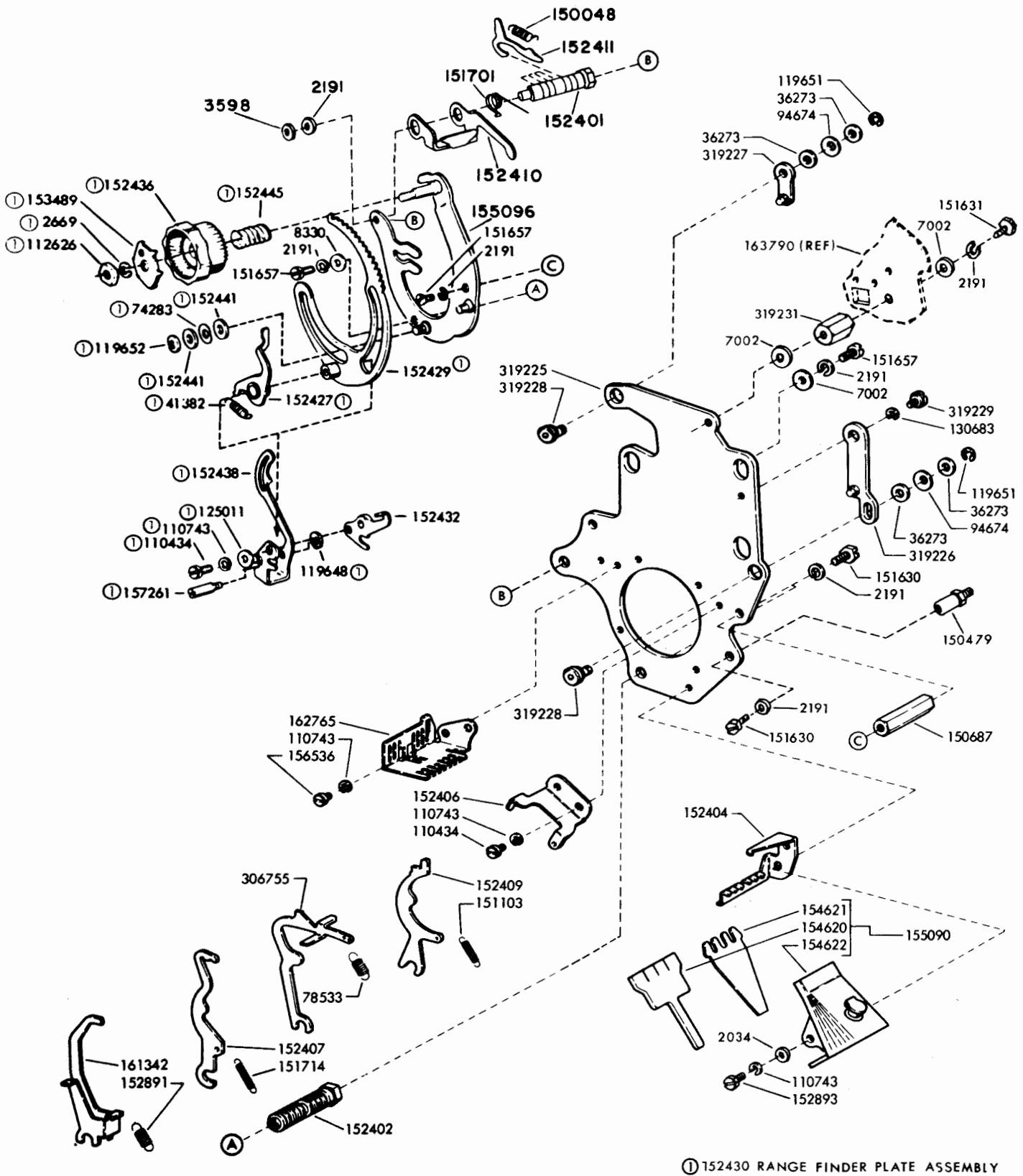


Figure 7-17. Selector Mechanism, 319204

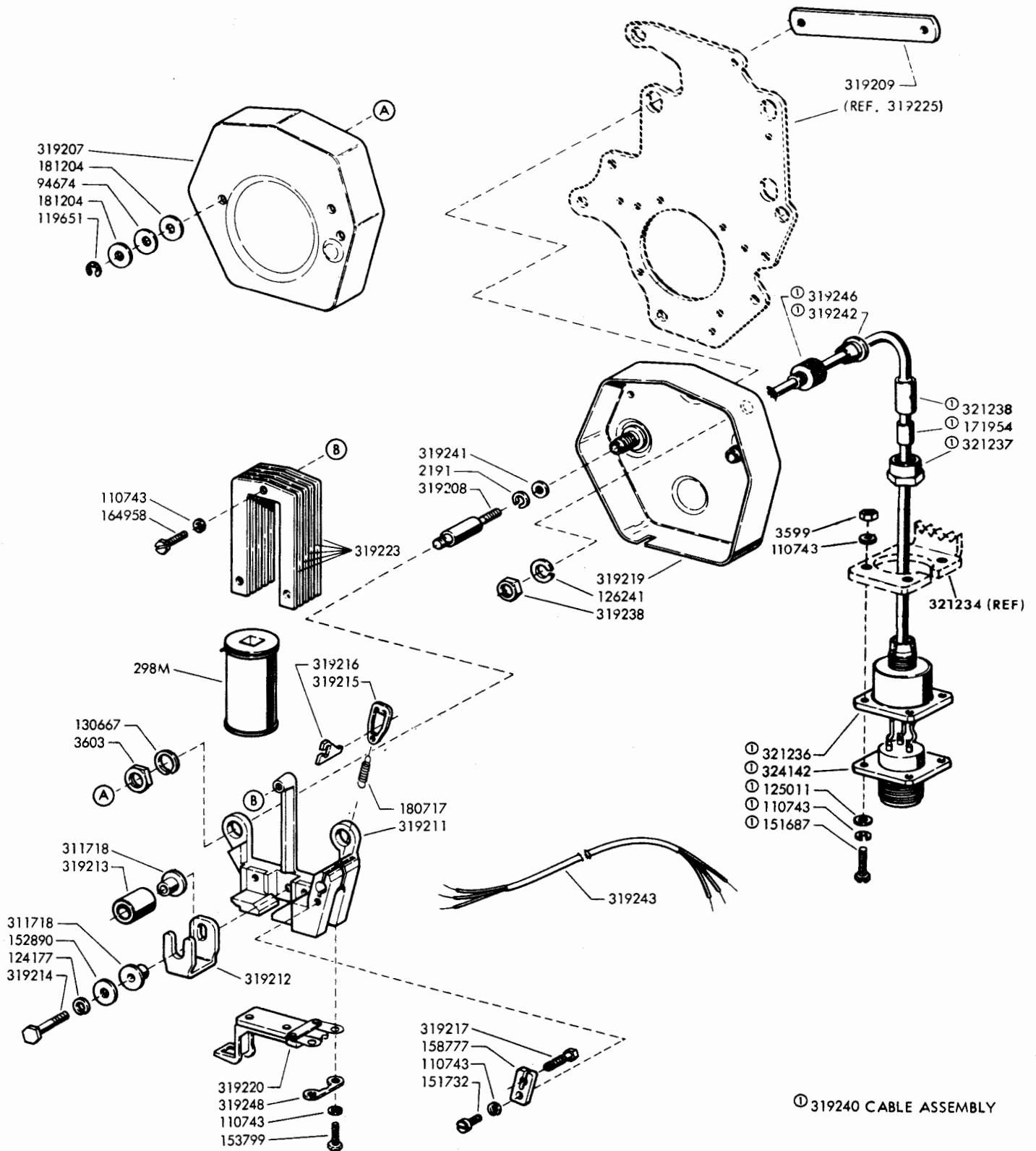


Figure 7-18. Selector Mechanism, 319204

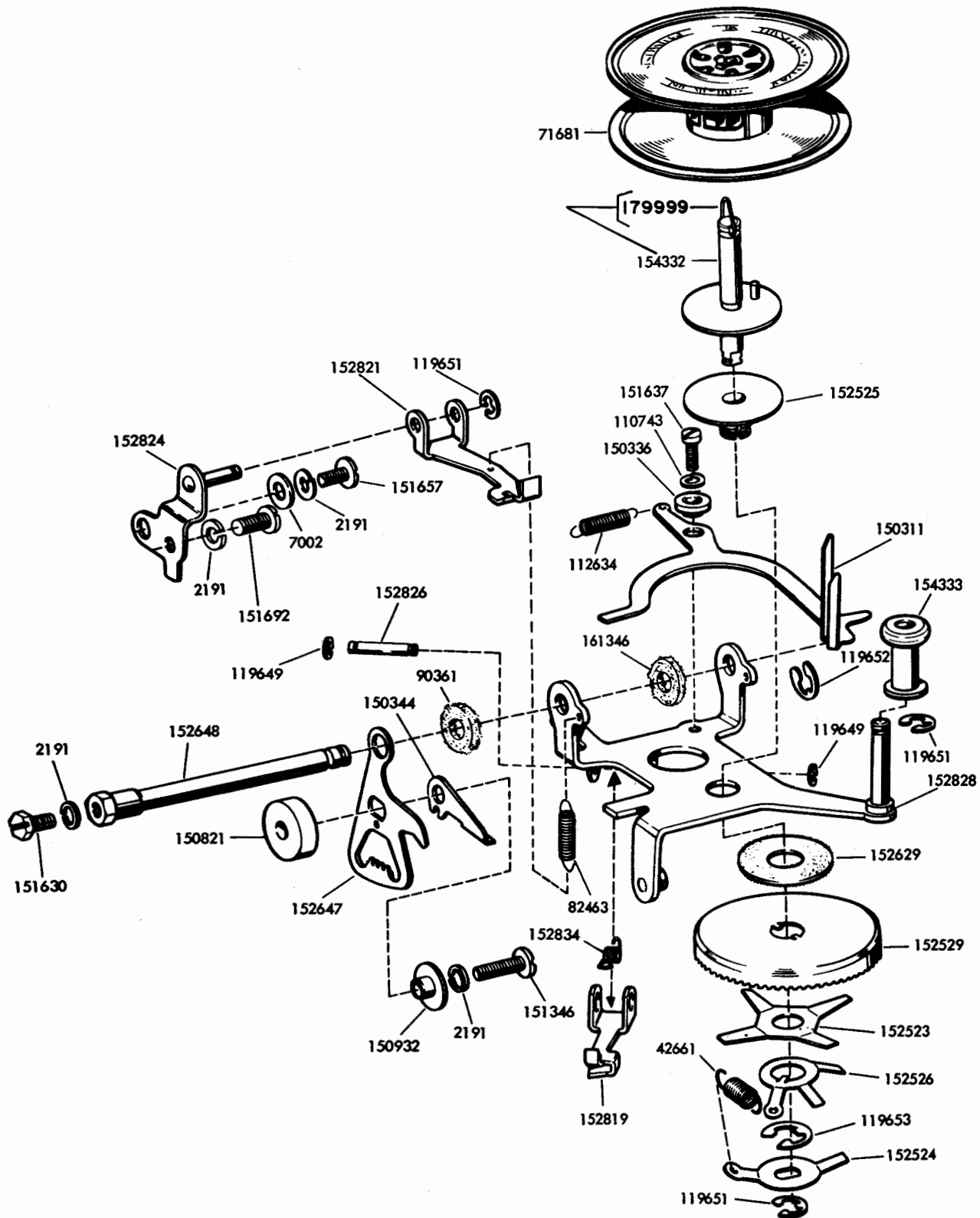


Figure 7-19. Right Ribbon Feed Mechanism

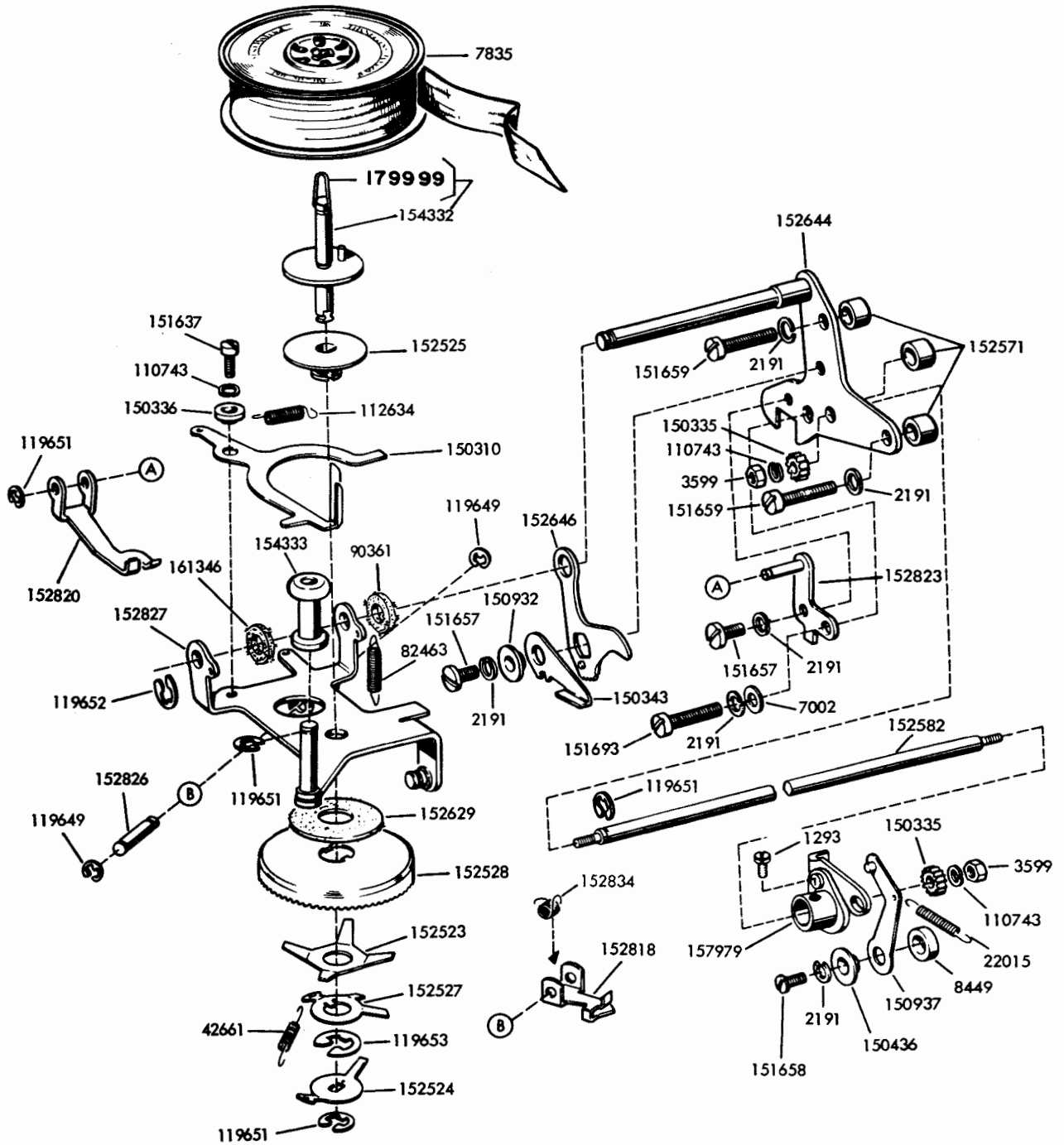
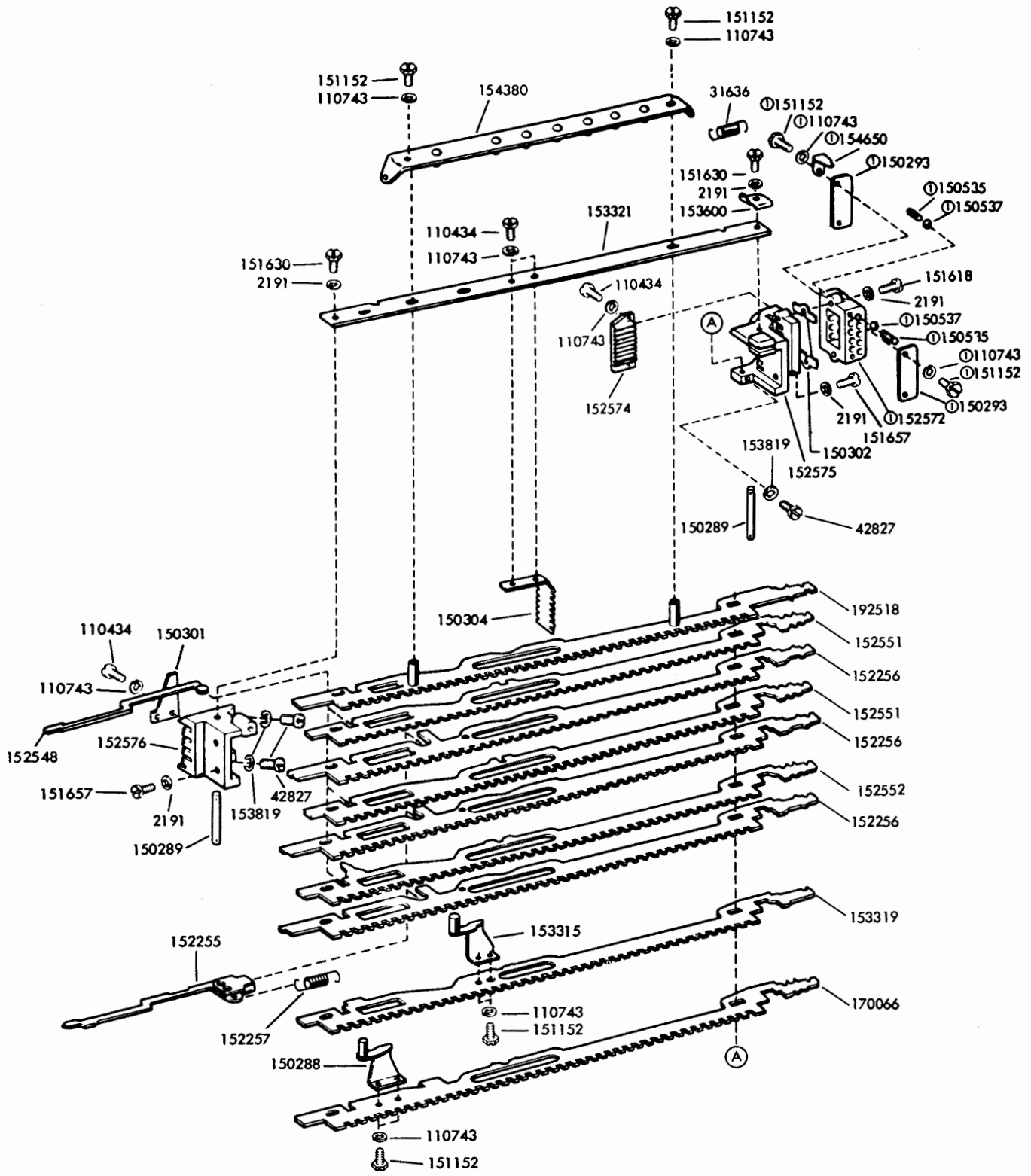


Figure 7-20. Left Ribbon Mechanism



ⓐ 157512 Detent Bracket Assembly

Figure 7-21. Code Bar Mechanism

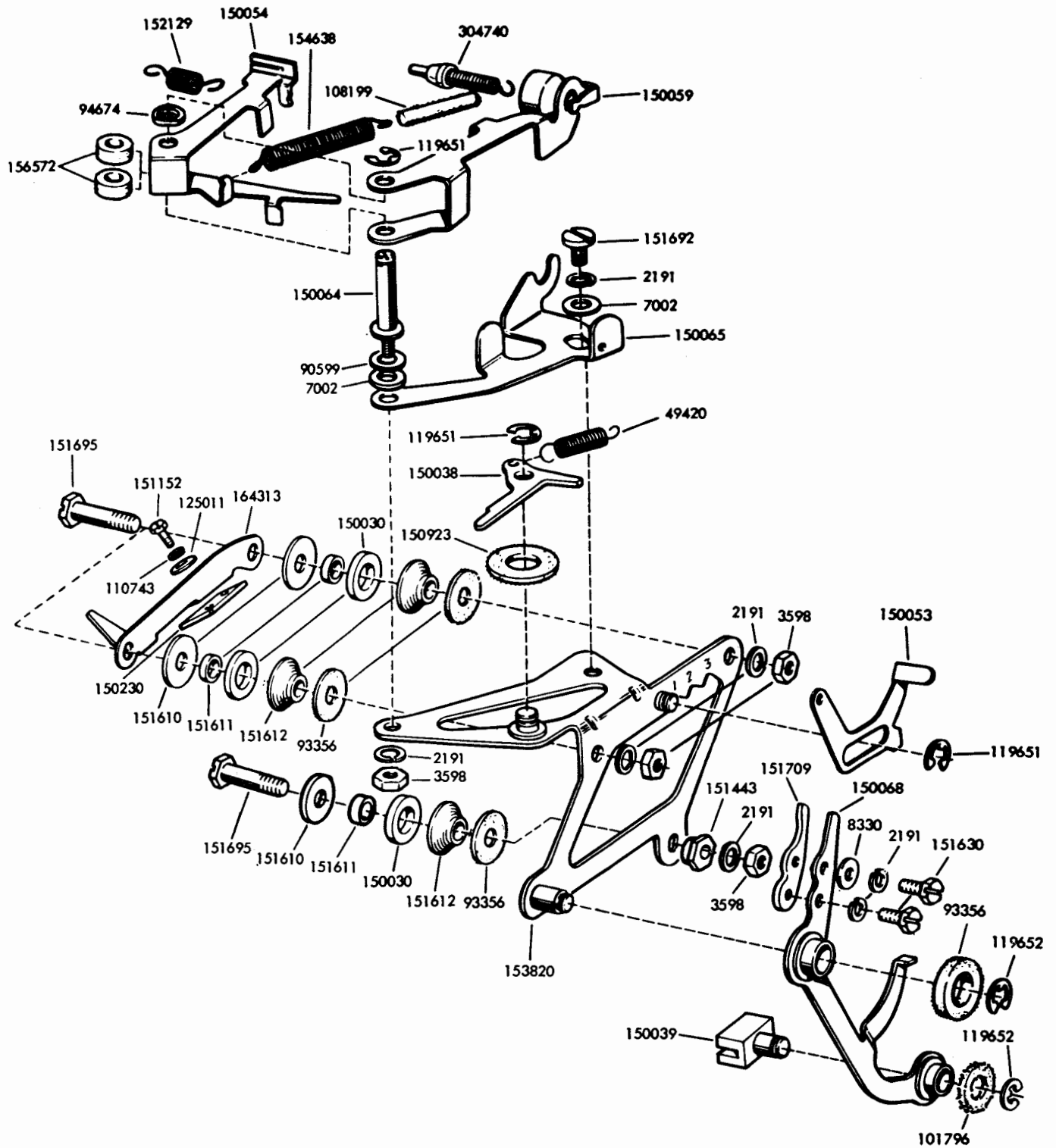


Figure 7-22. Printing Carriage Mechanism

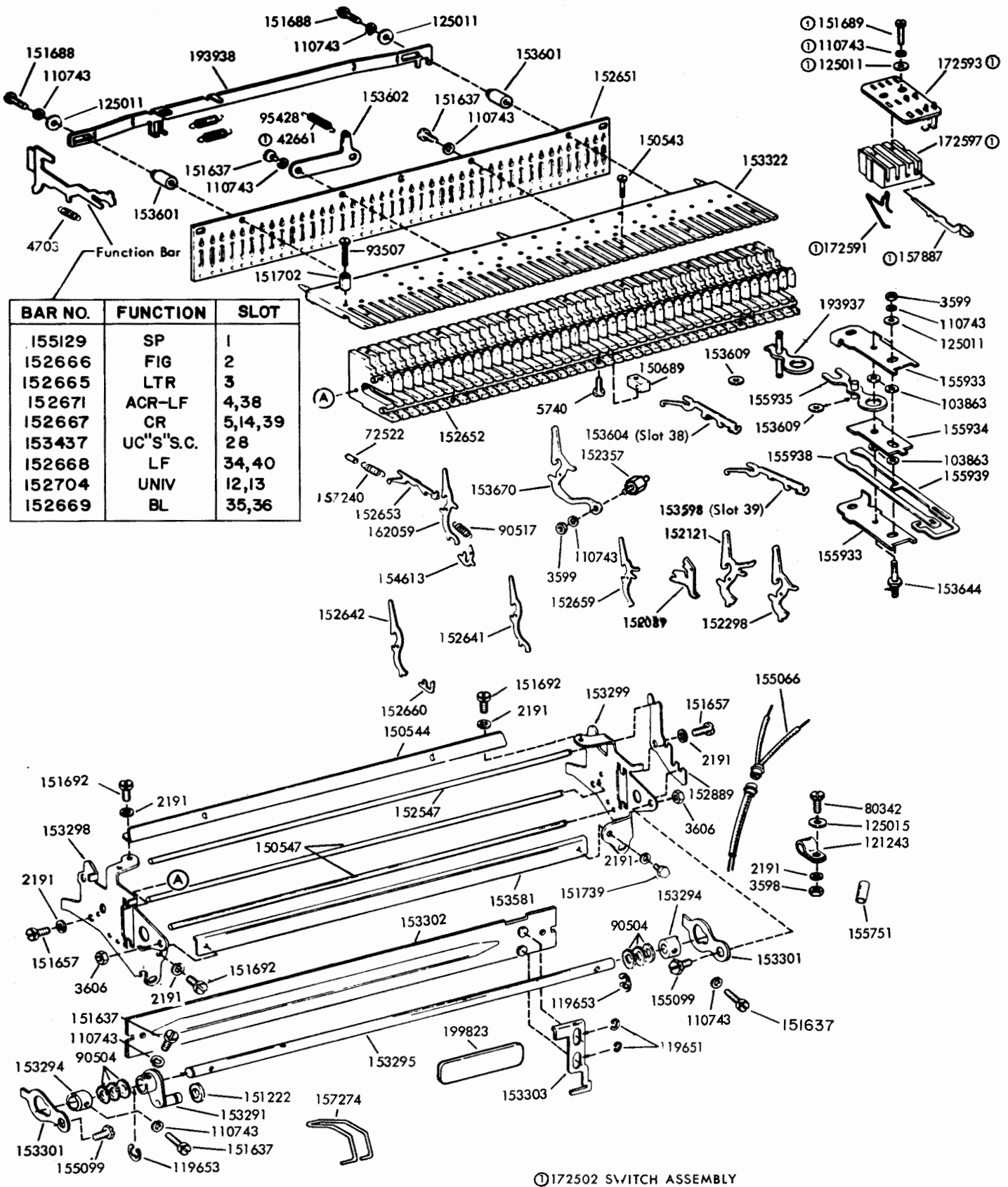
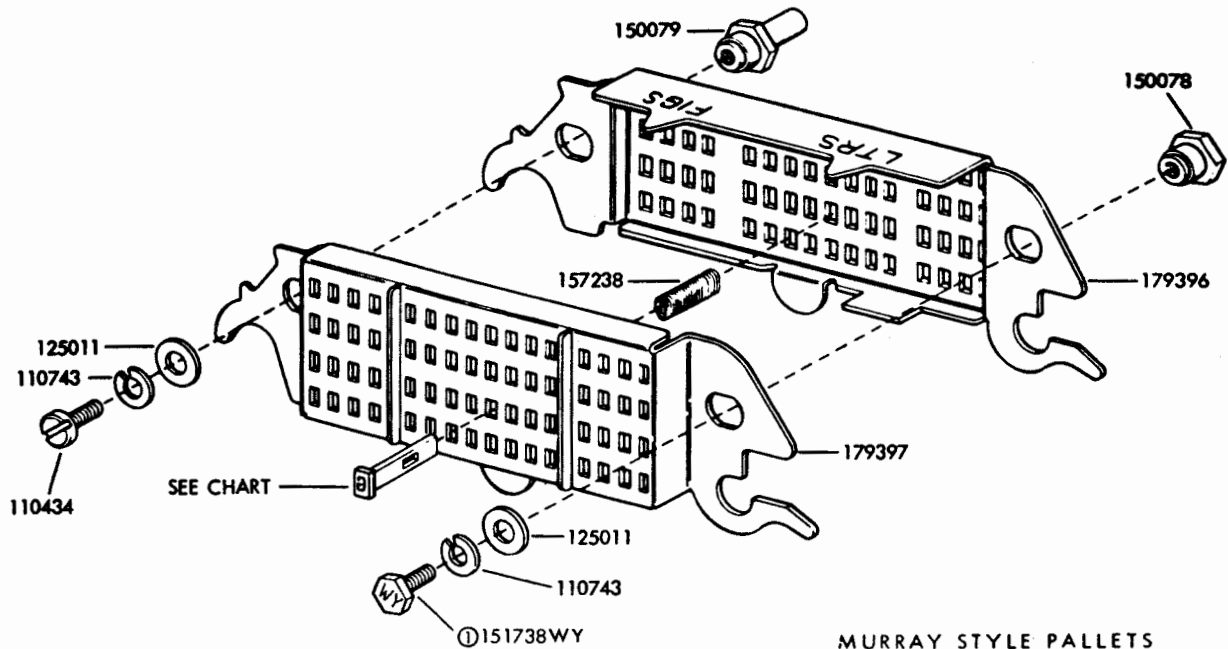


Figure 7-23. Stunt Box Assembly (AJG), 197845



① The two letter suffix indicates a specific type pallet arrangement.

MURRAY STYLE PALLETS
(10 Characters Per Inch Spacing)



MURRAY STYLE PALLETS

PALLET	NUMBER	PALLET	NUMBER
A	157600	S	157618
B	157601	T	157619
C	157602	U	157620
D	157603	V	157621
E	157604	W	157622
F	157605	X	157623
G	157606	Y	157624
H	157607	Z	157625
I	157608	1	157626
J	157609	2	157627
K	157610	3	157628
L	157611	4	157629
M	157612	5	157630
N	157613	6	157631
O	157614	7	157632
P	157615	8	157633
Q	157616	9	157634
R	157617	-	157642

The Above Pallets are Common to all Murray Style Arrangements

TYPEBOX ARRANGEMENTS
155 701 "WY"
(Murray Style Pallets)

PALLET	NUMBER
∅	157635
.	157636
,	157637
"	157638
'	157639
;	157640
:	157641
/	157643
?	157644
)	157645
(	157646
!	157647
\$	157648
&	157649
#	157659

Figure 7-24. Typebox and Pallets

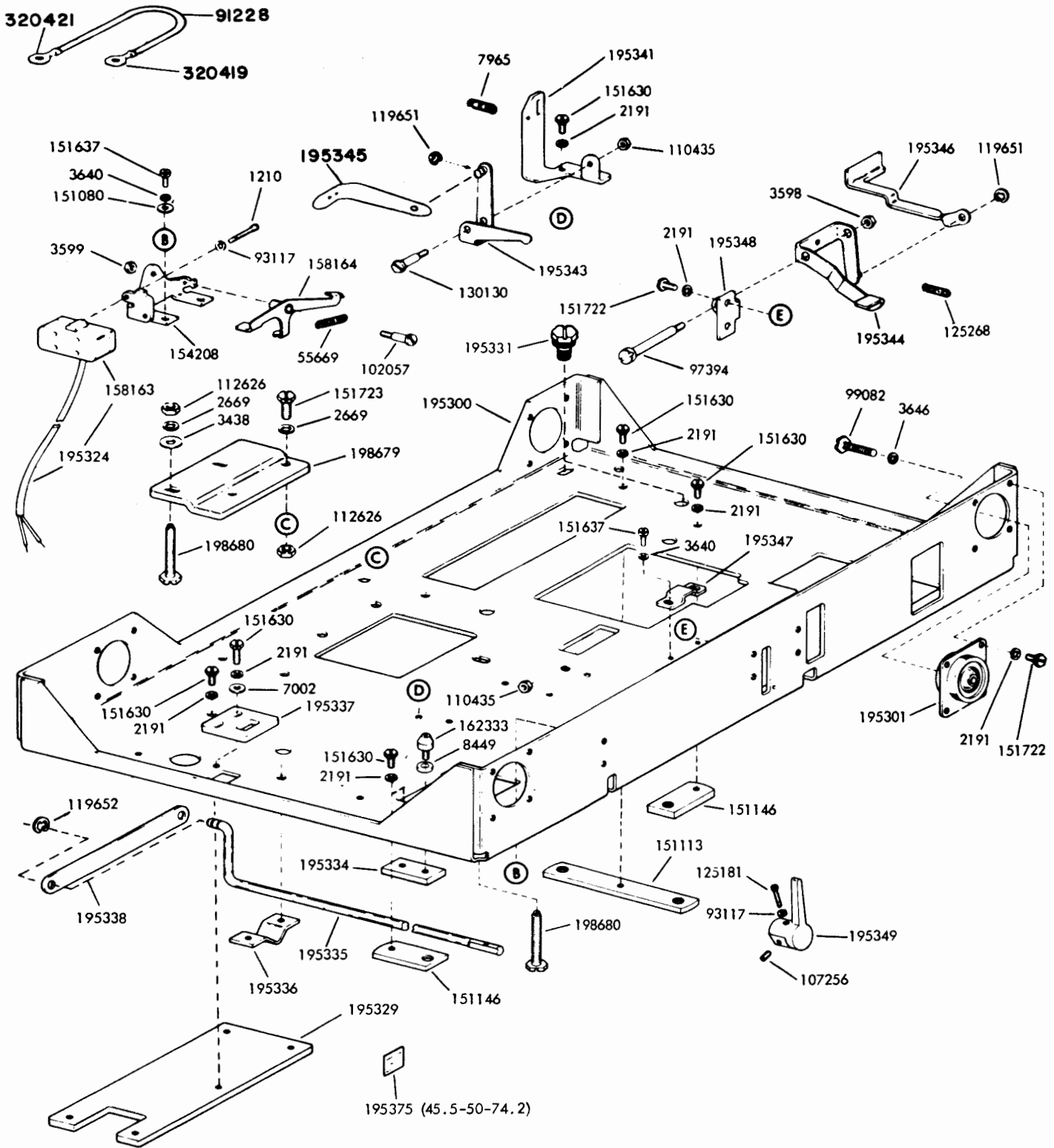


Figure 7-25. Send-Receive Mounting Base and Components

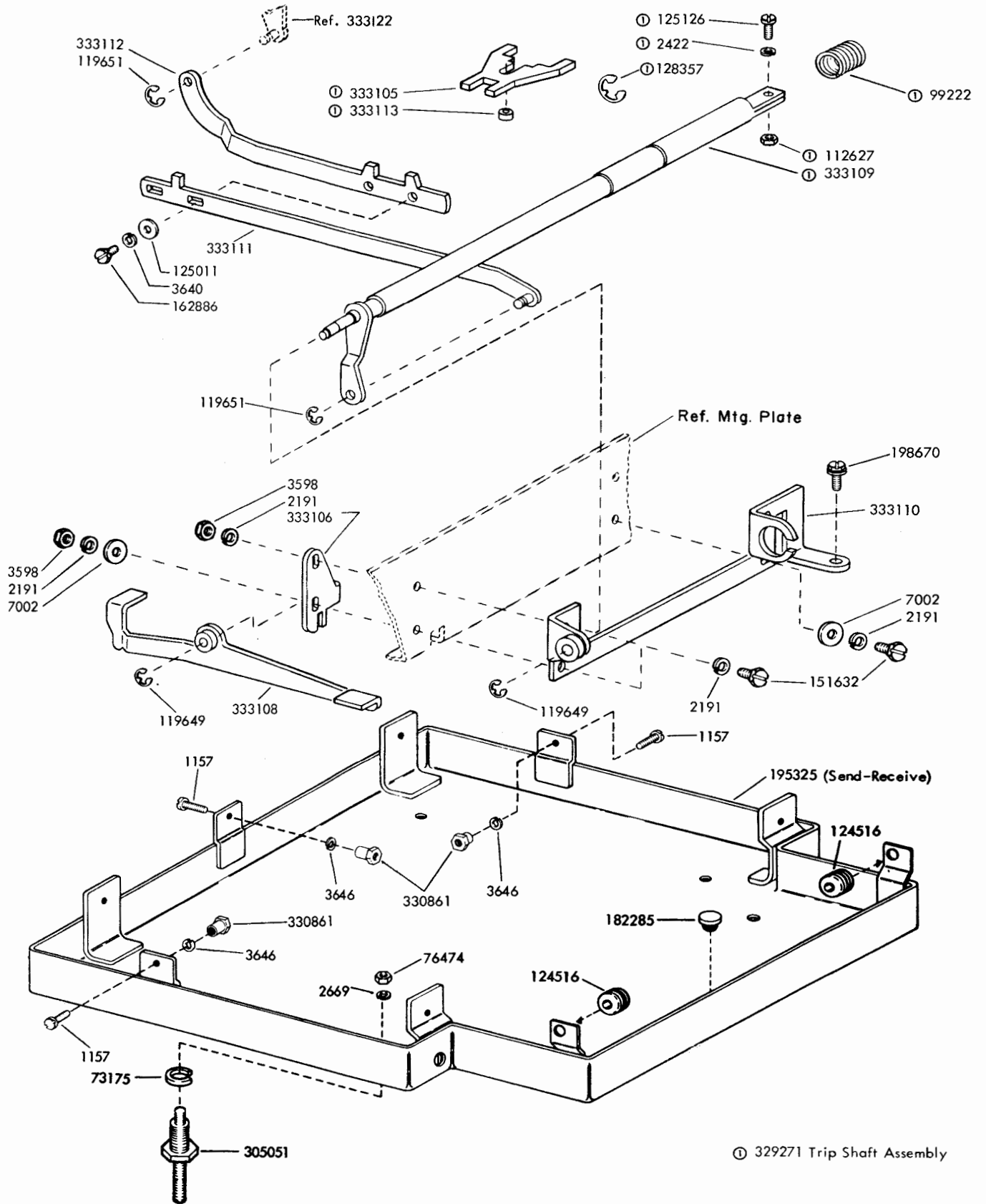


Figure 7-26. Trip Shaft Assembly and Mounting Pan

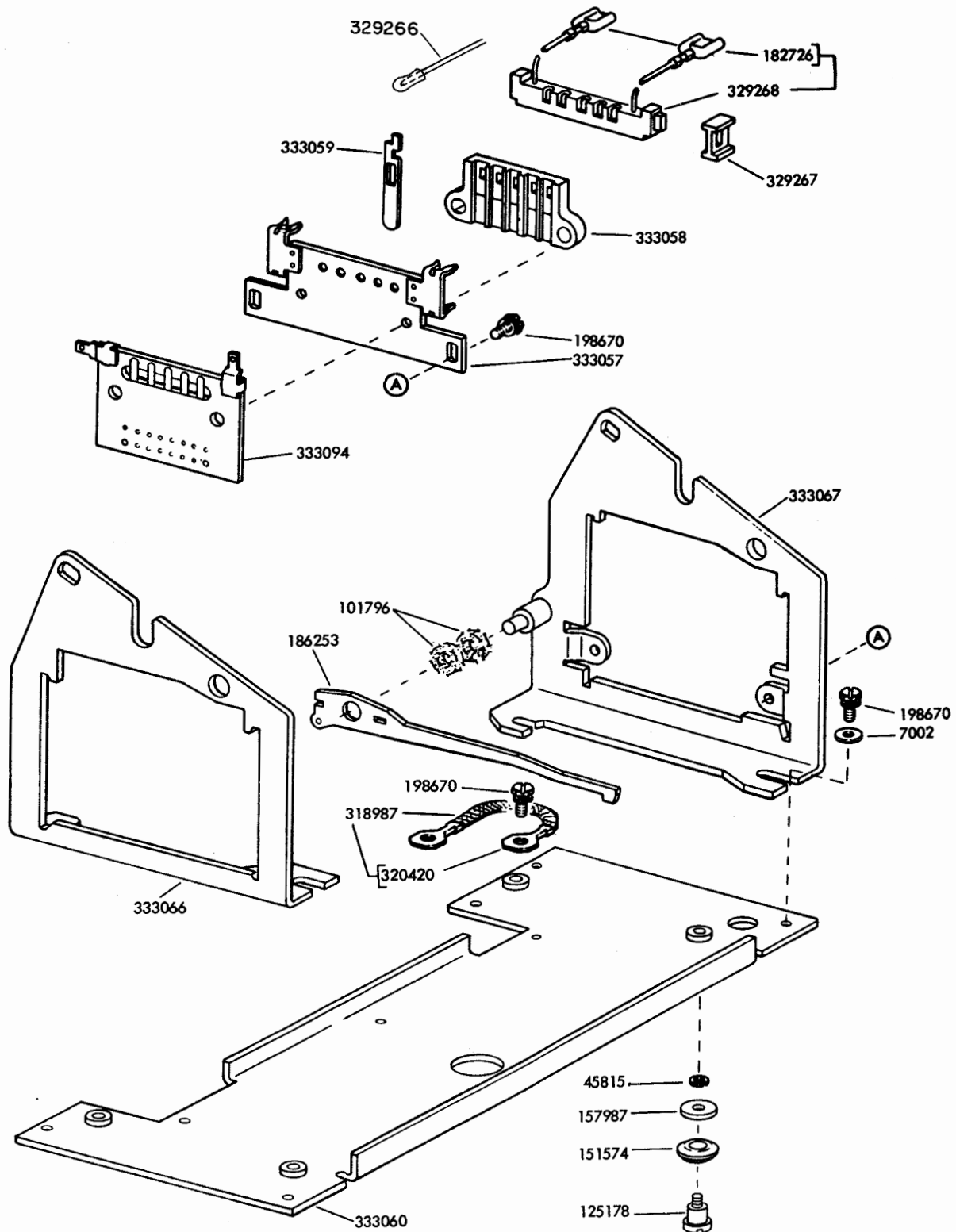
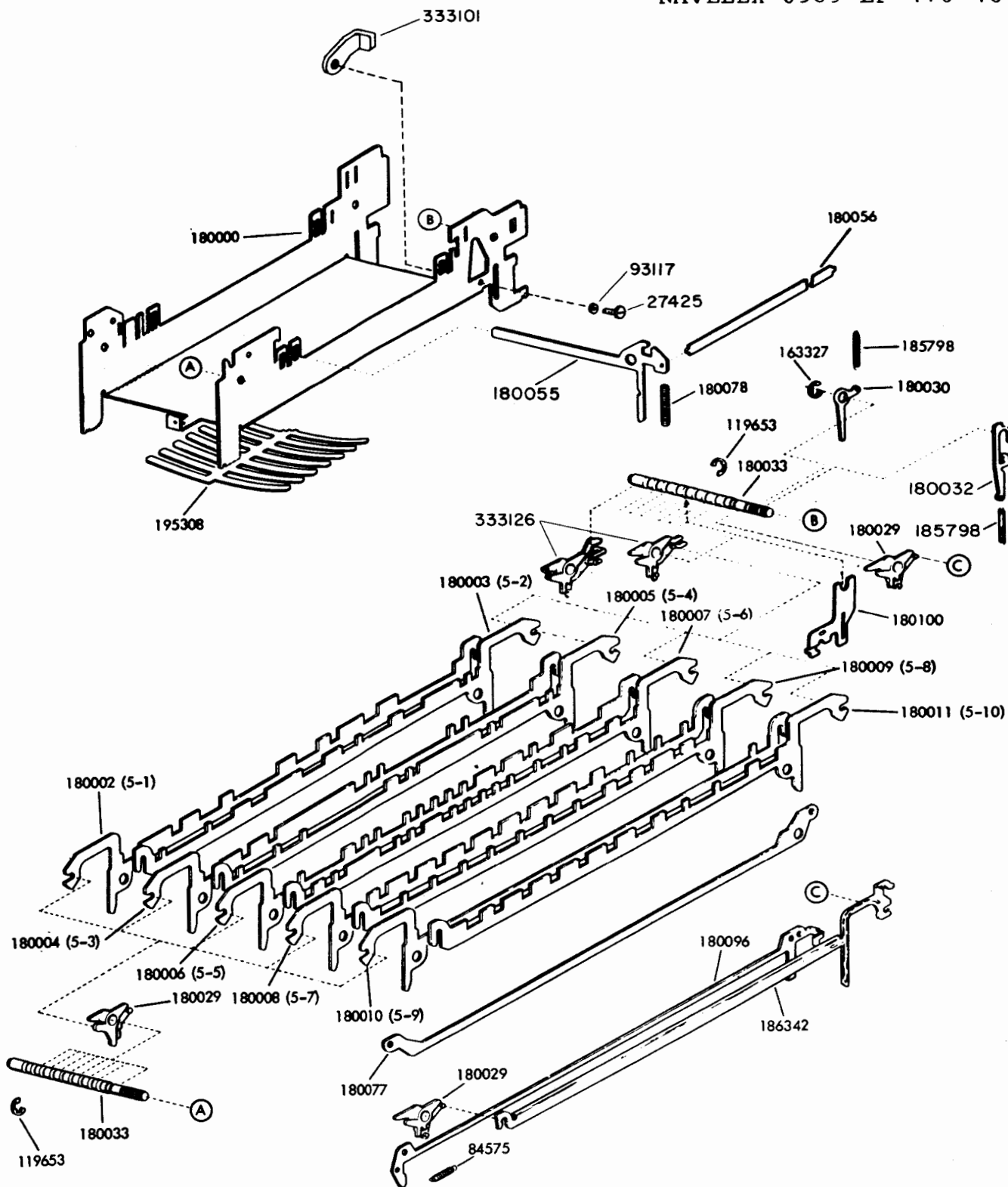


Figure 7-27. Keyboard Assembly, 323117



Numbers in parentheses indicates number stamped on bar.

ⓐ Early Design Parts

Figure 7-28. Keyboard Frame and Code Bar Mechanism

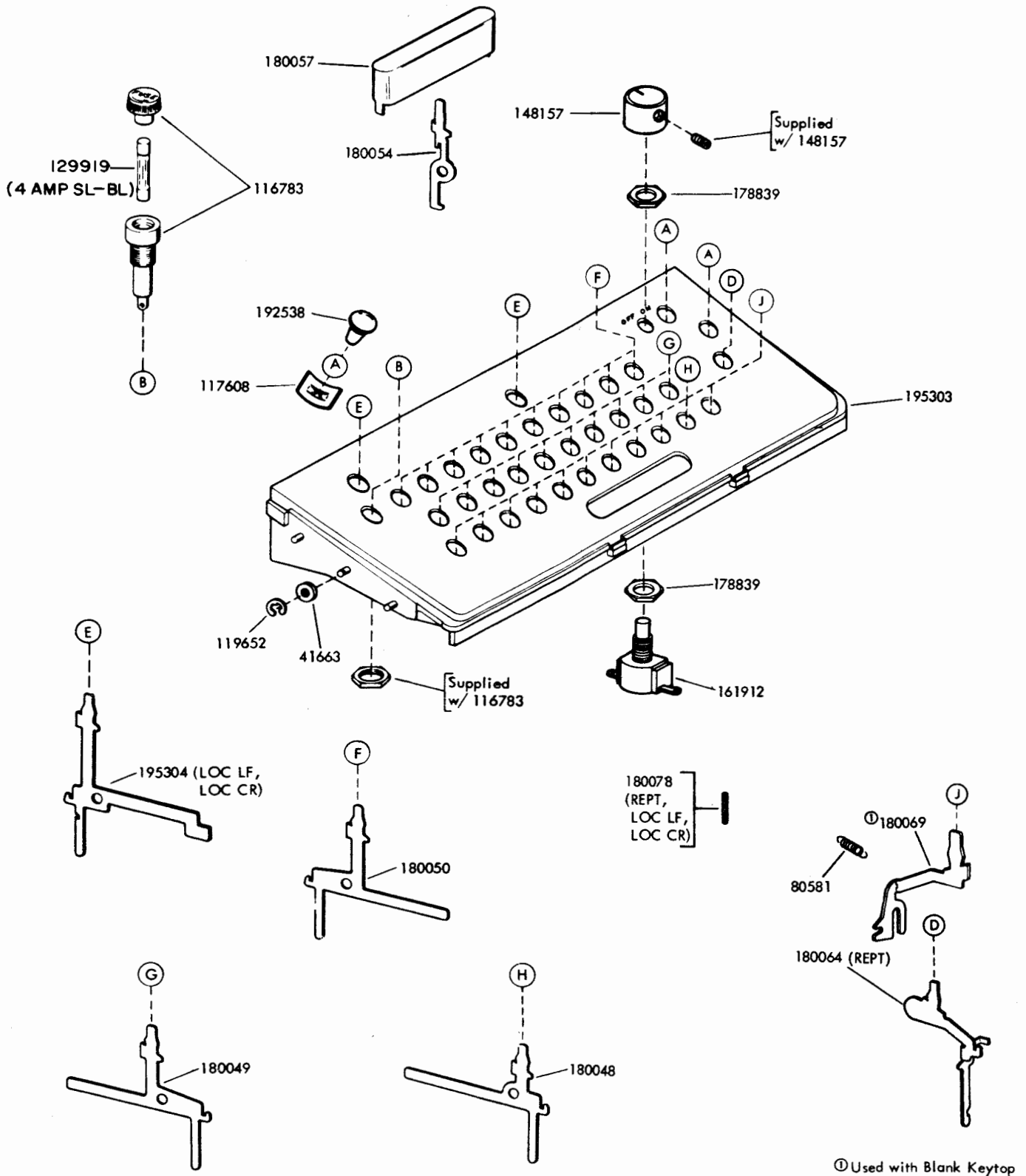
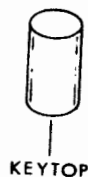


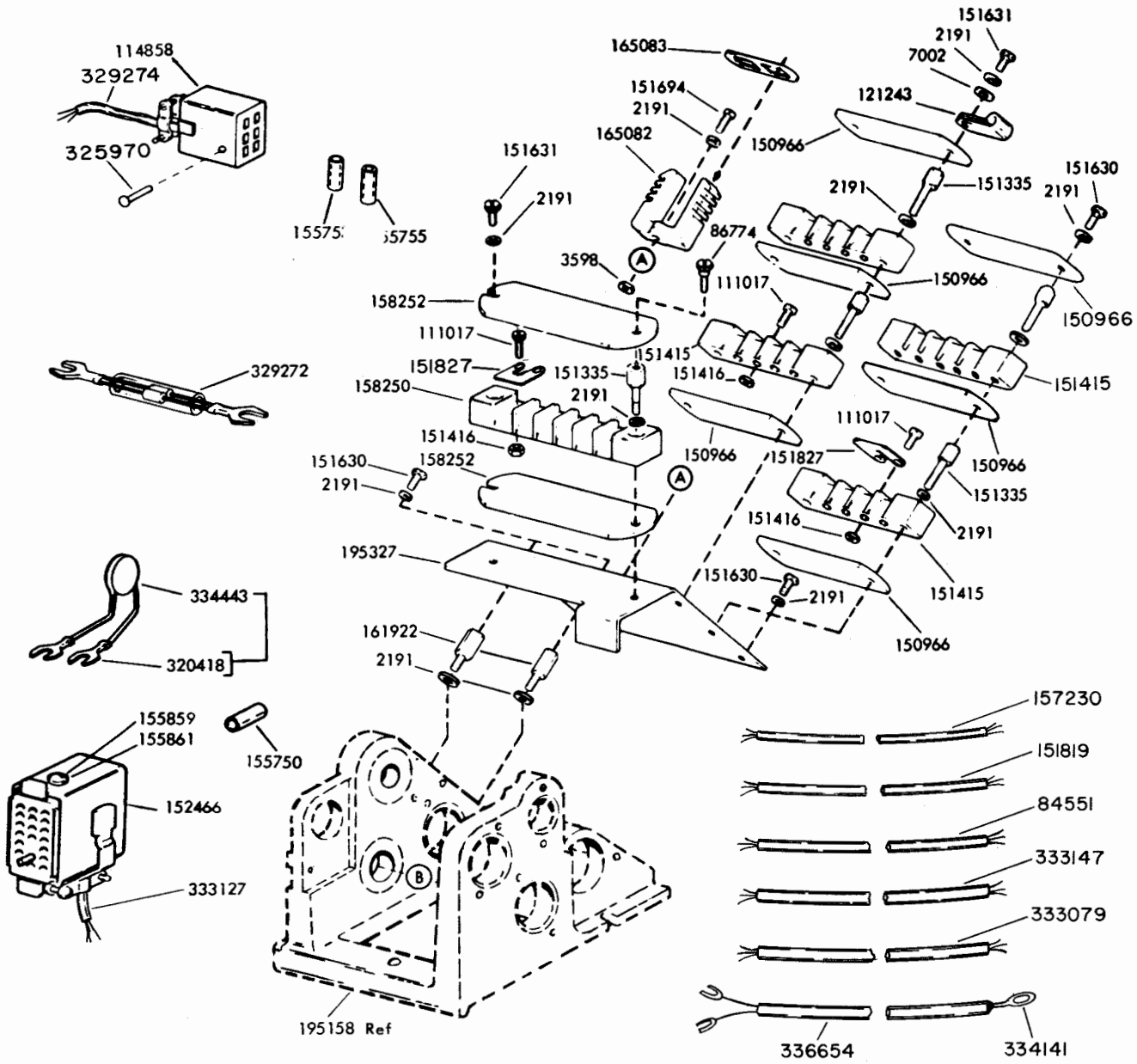
Figure 7-29. Keyboard Cover and Keylever Arrangement




Keytop Description			Part Number	Keytop Description		
Lower Case	Upper Case	Lower Case		Upper Case	Part Number	
	LOC LF	①	151249	P	∅	180389
	LOC CR	①	151250	Q	1	180213
A	-		180223	R	4	180216
B	?		180236	S	BELL	180239
C	:		180234	T	5	180217
D	\$		180240	U	7	180219
E	3		180215	V	;	180342
F	!		180343	W	2	180214
G	&		180242	X	/	180233
H	#		180186	Y	6	180218
I	8		180220	Z	"	180246
J	∇		180390		RETURN	180202
K	(		180230		LINE FEED	180203
L	)		180231		REPT	180208
M	·		180238		FIGS	180210
N	,		180237		LTRS	180211
O	9		180221		(No Symbol)	180299

① Red Keytops With White Characters.

Figure 7-30. Keytops



	Dim. A
Cable Clamp	Dim. A
121242	5/16"
121244	13/32"

Jumper	Length	Color	Terminal
135563	2-3/4"	Green	320410 (One)
307544	6"	Green	320410 (Two)
307545	2"	Green	320410 (Two)

Figure 7-31. Terminal Block Installation

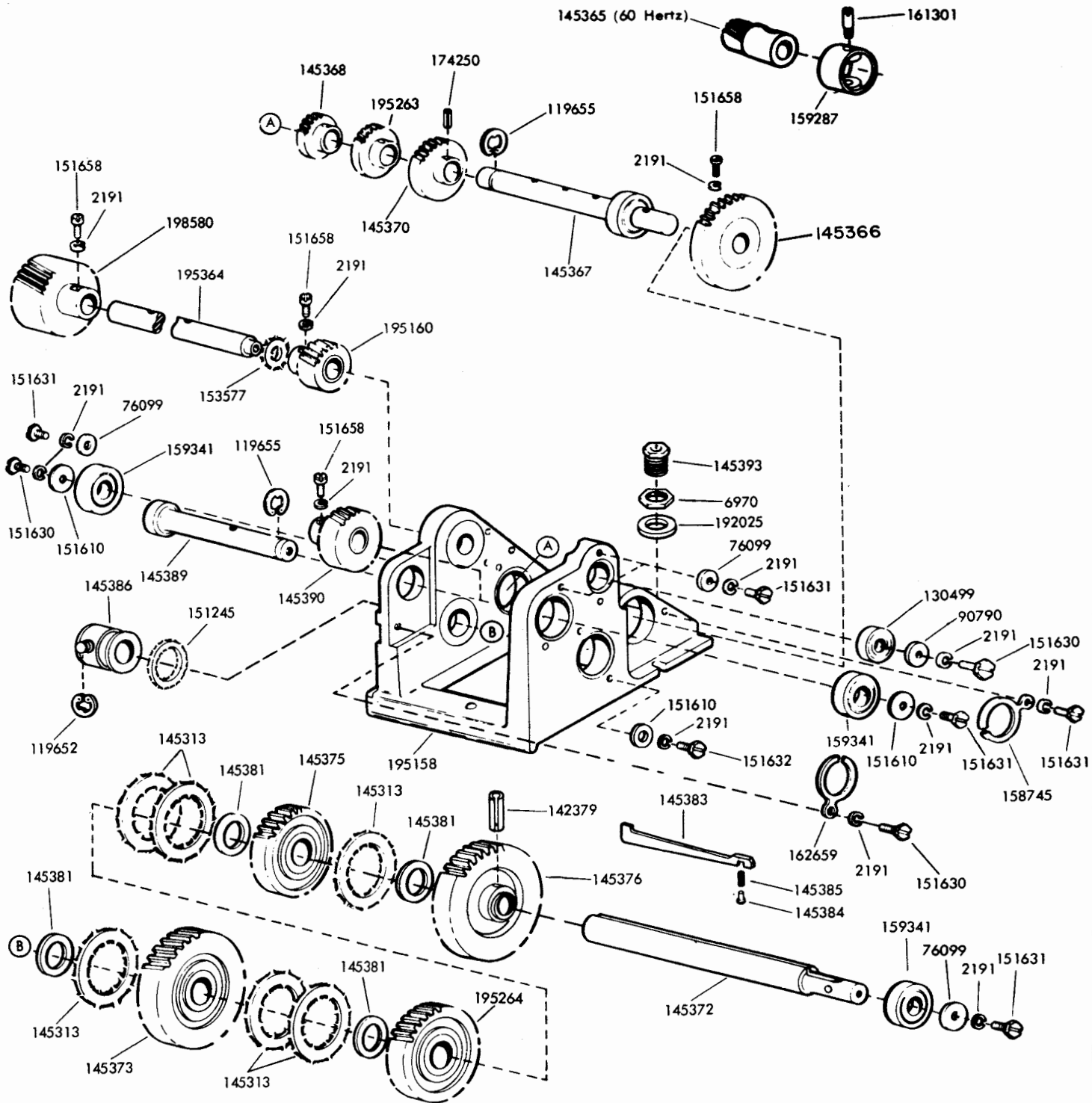
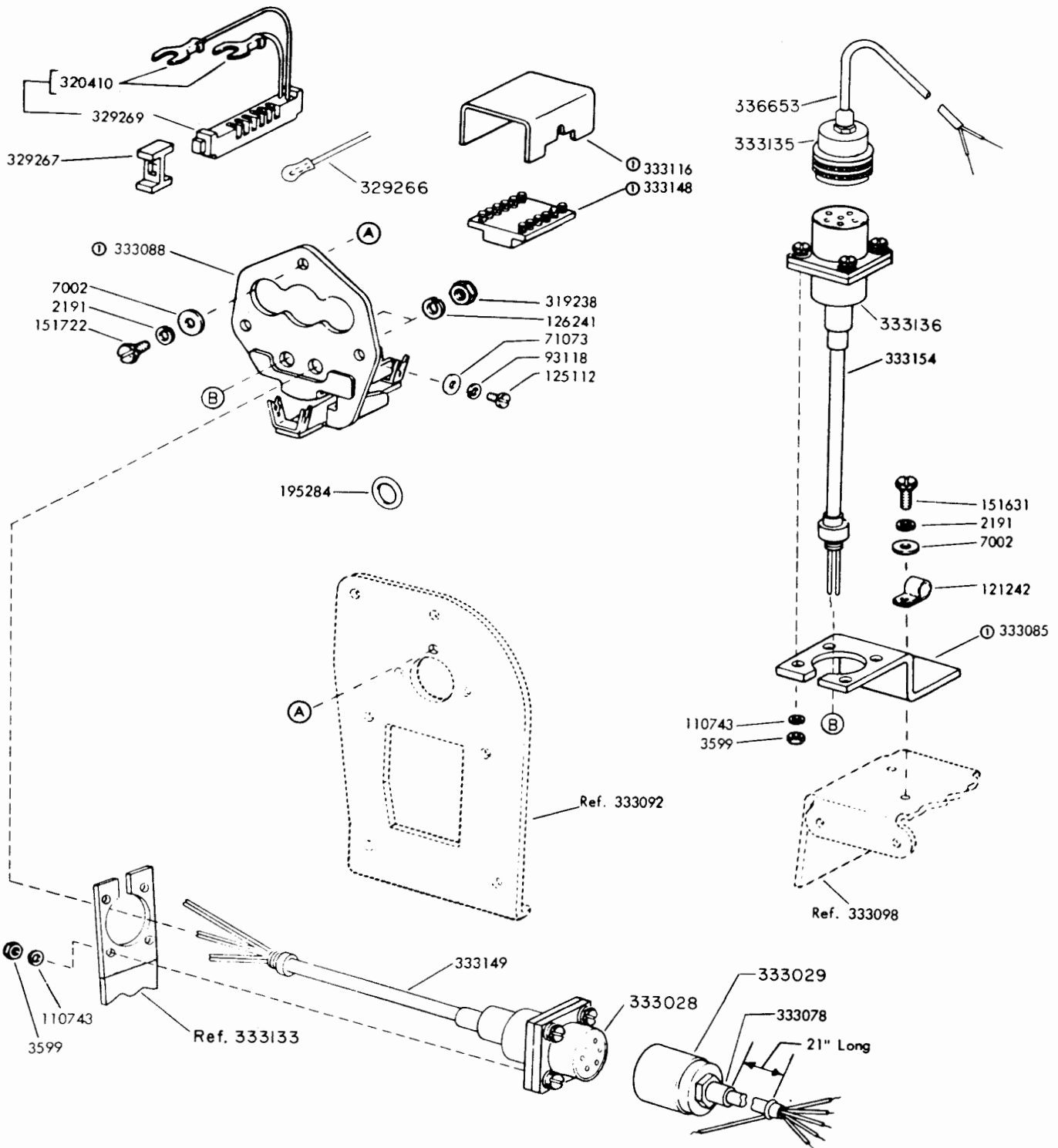


Figure 7-32. Gear Shift Mechanism



Ⓢ 333150 Photo Pick-Up Assembly

Figure 7-33. Distributor Mechanism, 323118

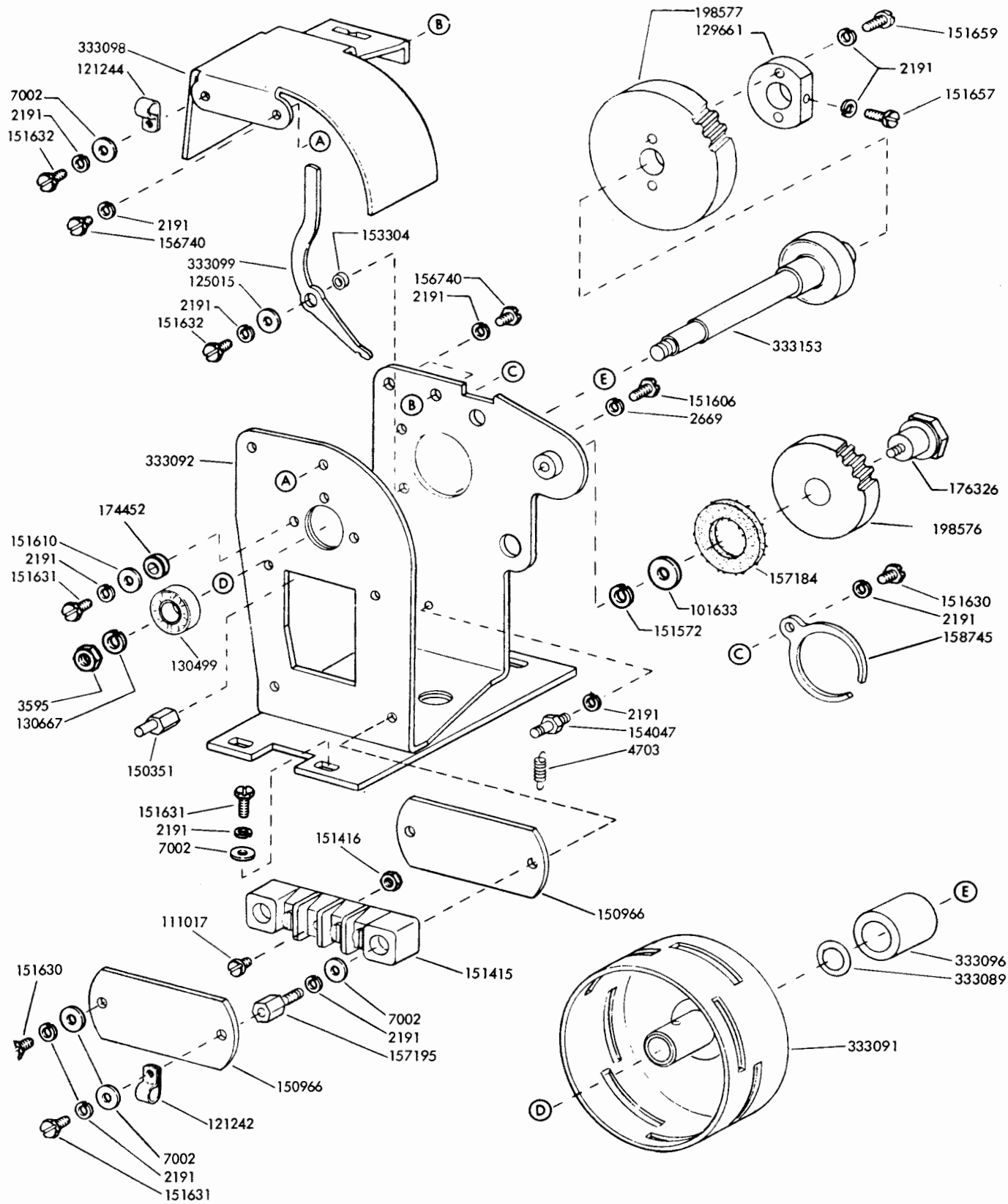


Figure 7-34. Distributor Mechanism, 323118

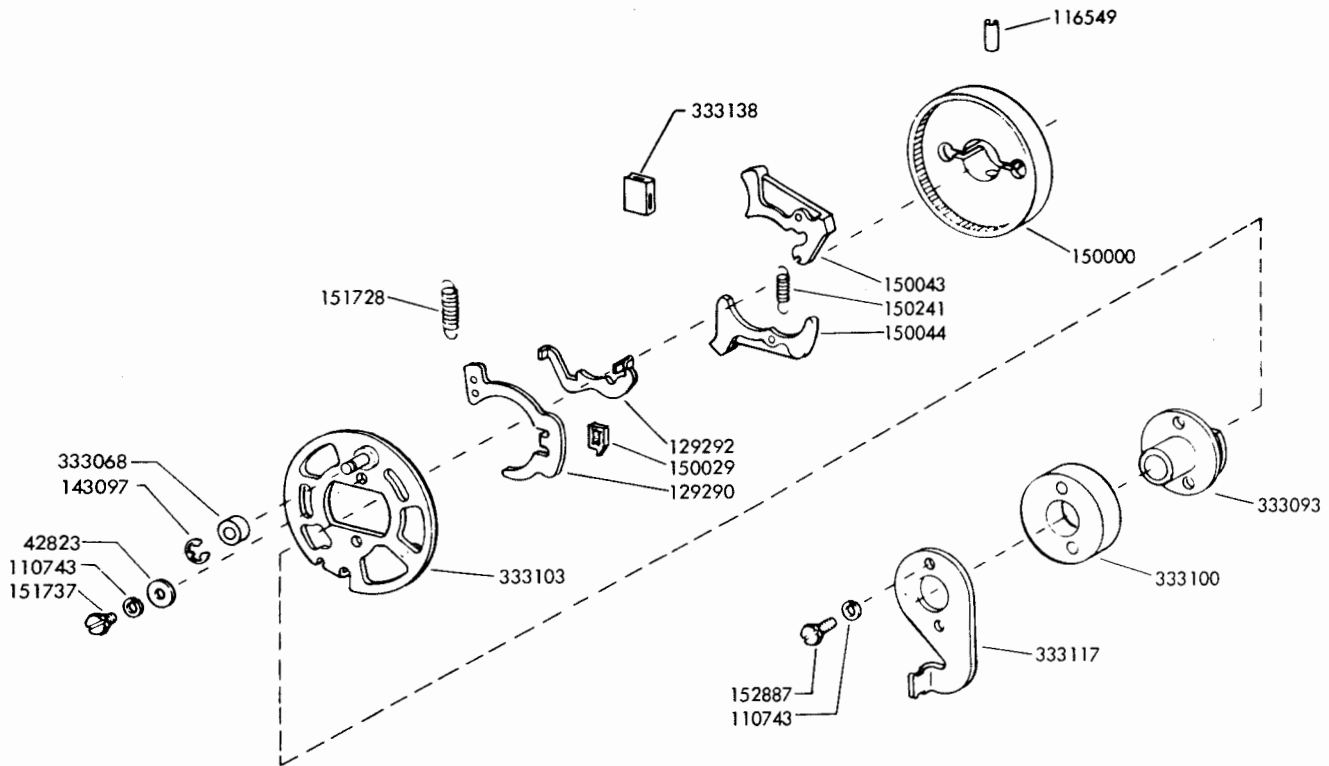


Figure 7-35. Distributor Clutch Assembly, 333155

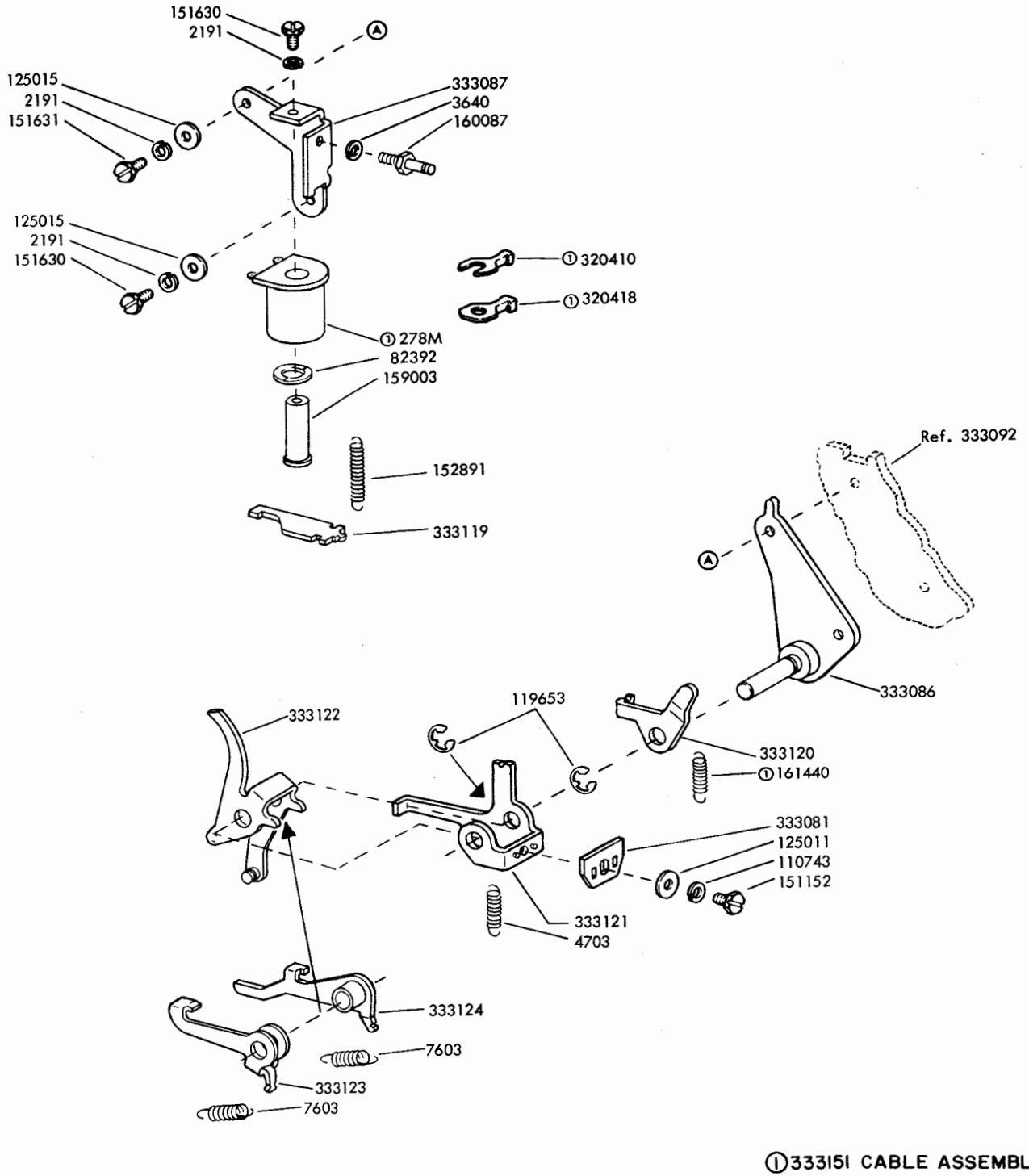


Figure 7-36. Distributor Clutch Trip Assembly, 333152

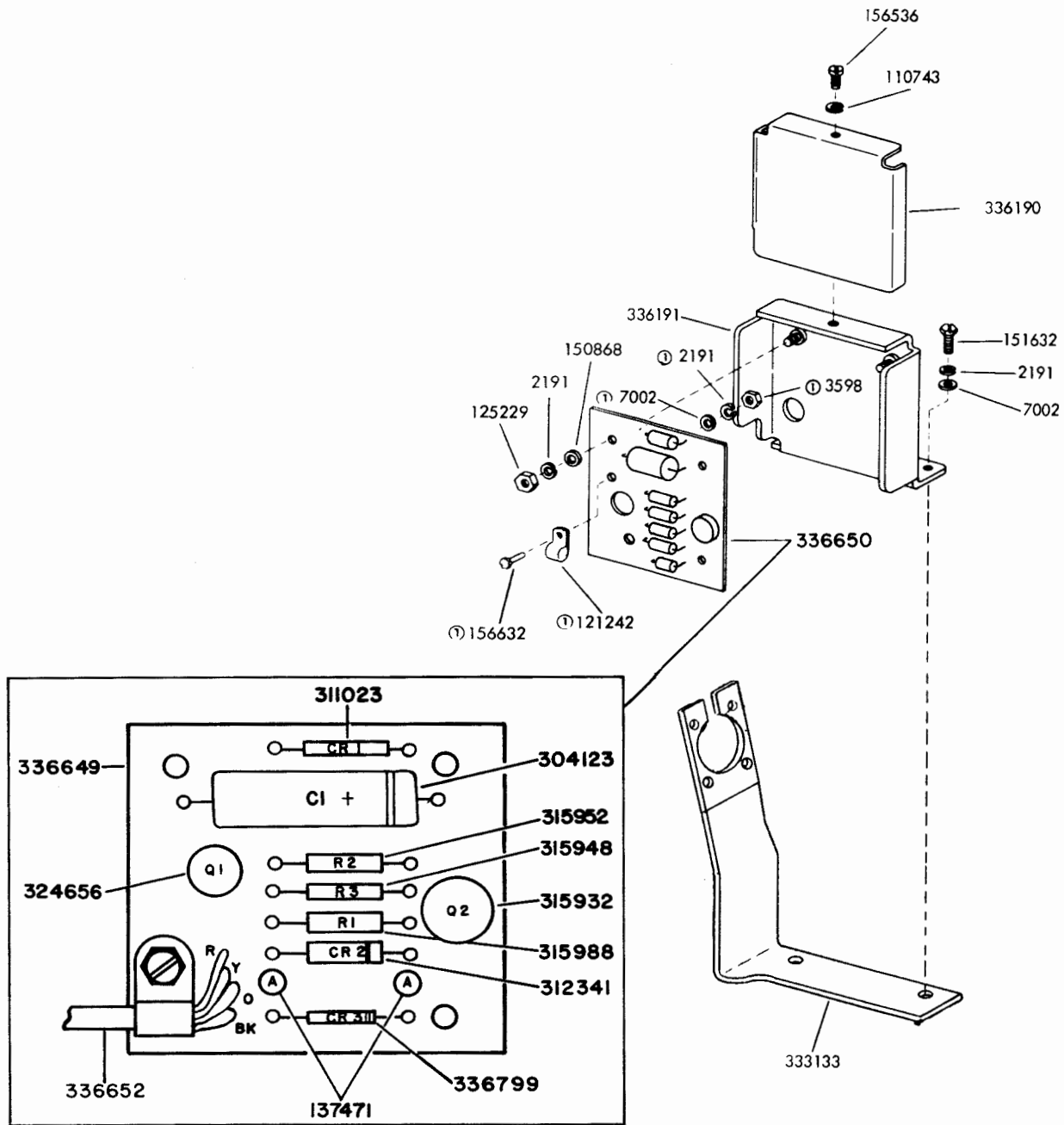


Figure 7-37. Amplifier Assembly, 336651

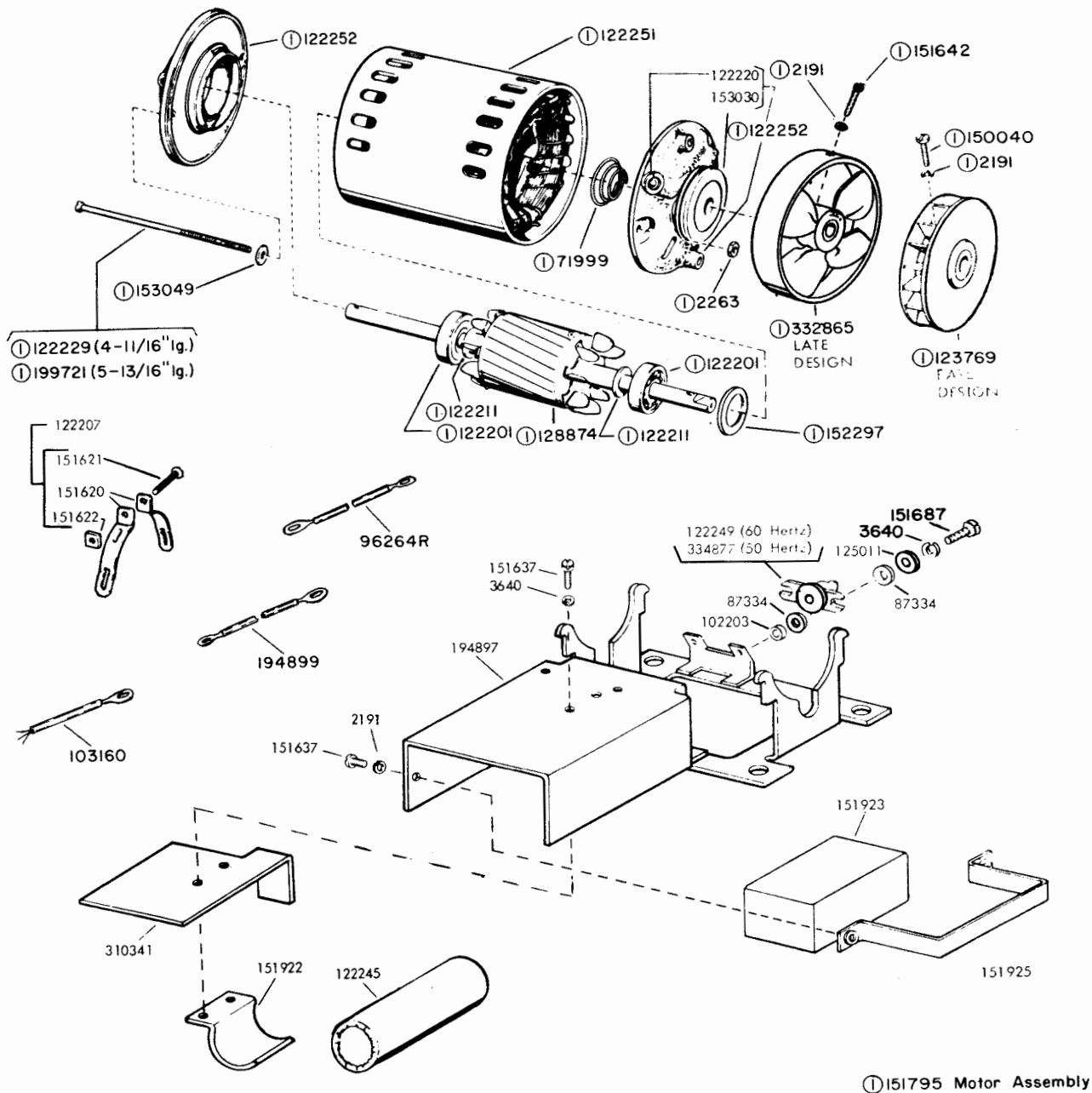


Figure 7-38. Motor Assembly and Relay/Capacitor Mounting

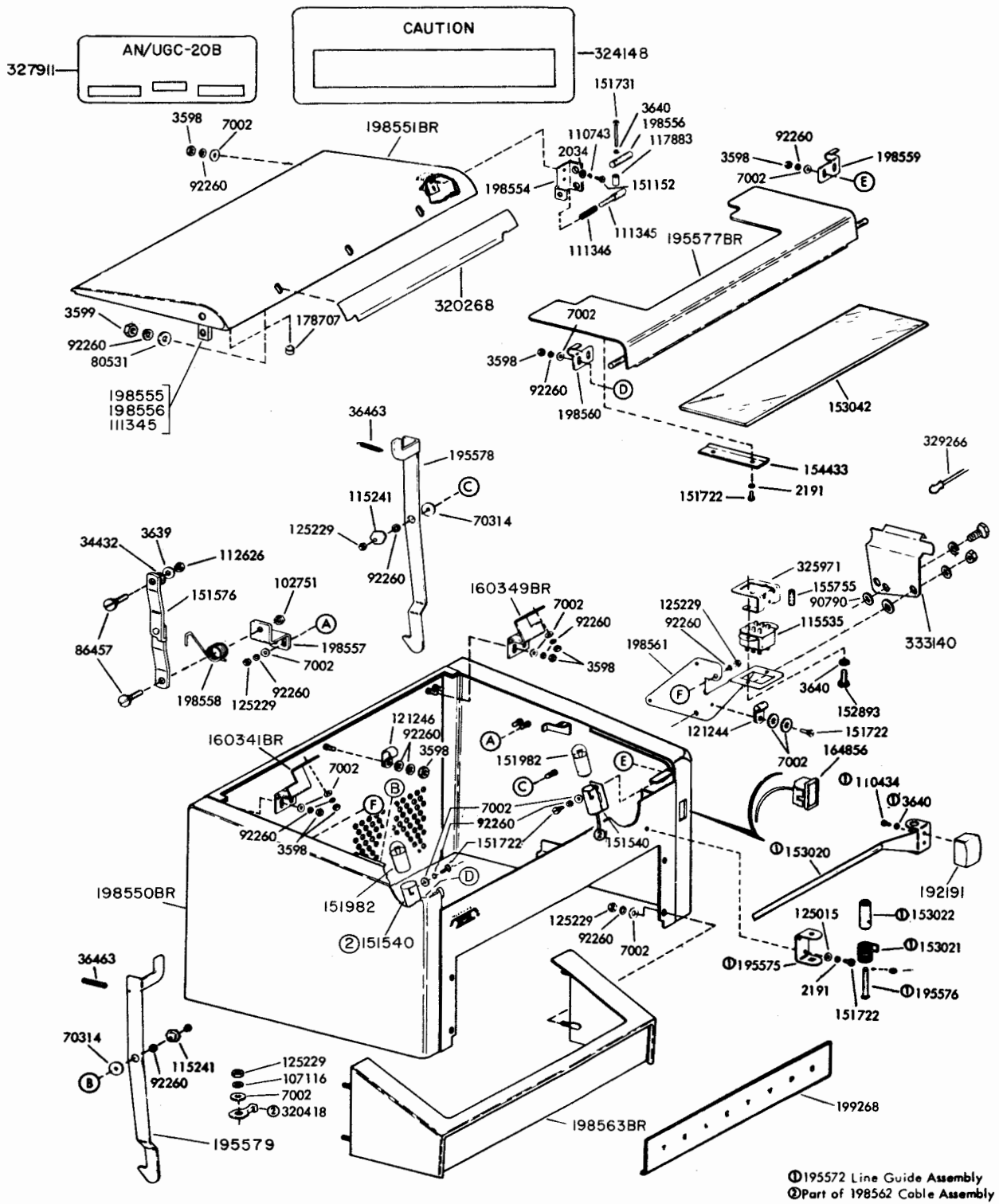


Figure 7-39. Cover and Components

CHAPTER 8 INSTALLATION

8-1. INTRODUCTION. This chapter provides instructions for installation and checkout of teletypewriter set AN/UGC-20B.

8-2. UNPACKING. Each teletypewriter set is shipped completely assembled in a single container. As shown in figure 8-1, the set is attached to a wooden pallet, with shipping studs and nuts, in such a manner as to disable the vibration mounts during shipment. Exercise care when unpacking. To remove set from container, proceed as follows:

- a. Cut tape sealing upper flaps of outer carton.
- b. Remove styrofoam blocks from upper corners.
- c. Remove inner lining from top of set.
- d. Remove set by lifting wooden pallet out of carton.
- e. Remove all packing tape from cover.

8-3. SPACE REQUIREMENTS. The overall dimensions of teletype set AN/UGC-20B are approximately: Depth, 16"; Width, 16-1/2"; Height, 10". Detailed dimensions are shown in figure 8-2 along with location of shipping stud holes. Shipping studs must be removed for normal installation and use. If special vibration isolation is desired, the studs may be left in place and special shock mounts fastened to the 1/4-20 threads.

8-4. INSTALLATION PROCEDURES. The following paragraphs provide information for mounting,

connecting power and signal lines, and generally preparing the teletypewriter set for use.

a. Normal Mounting. The teletypewriter set is normally mounted as follows:

- (1) Refer to figure 8-1.
- (2) Remove cover to gain access to upper ends of shipping studs.
- (3) Remove five nuts and lockwashers from upper ends of shipping studs.
- (4) With wooden pallet raised, remove five sets of nuts, lockwashers, and flat washers from bottom ends of shipping studs.
- (5) With pallet flat, lift each end of set and unscrew shipping studs from pan.

NOTE

The teletypewriter set can now be mounted on a table or any other flat surface. Shock mount action is provided by rubber bumpers inserted between the base and the pan.

b. Special Shock Mounting. The teletypewriter set can be mounted using special shock mounts. The wooden pallet can serve as a temporary fixture for supporting the set and protecting the studs until the special shock mounts are attached. Proceed as follows:

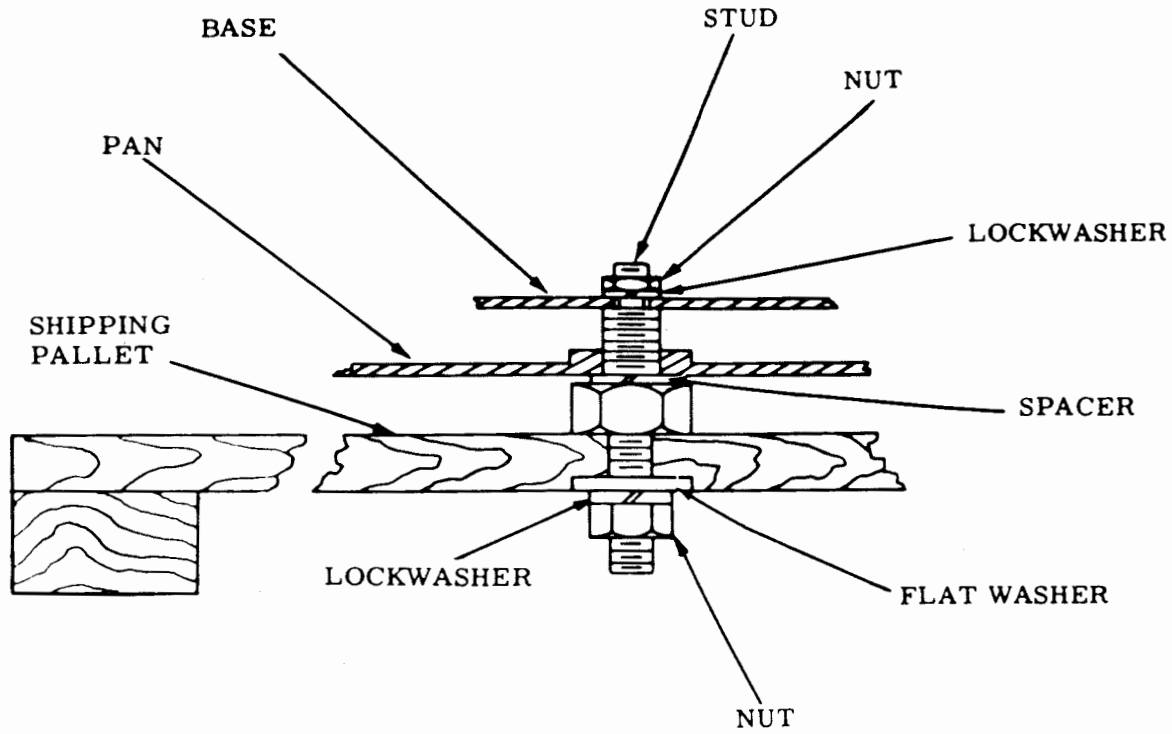


Figure 8-1. Shipping Stud Details

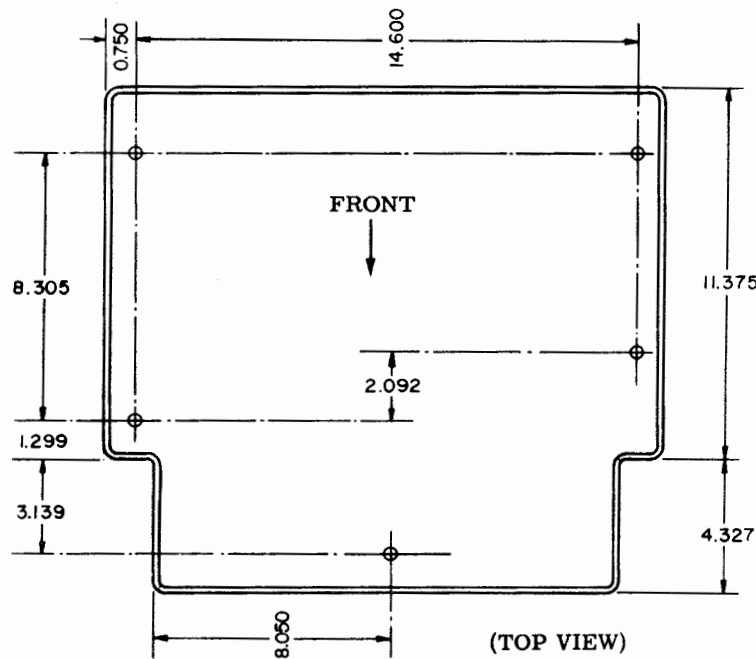


Figure 8-2. AN/UGC-20B Dimensions and Shipping Stud Locations

(1) Refer to figure 8-1.

(2) With pallet raised, remove five sets of nuts, lockwasher, and flat washer from bottom ends of shipping studs.

NOTE

Shipping studs will accept a 1/4-20 thread.

(3) With pallet flat, lift each end of set and fasten special shock mounts to exposed studs.

c. Attaching Speed Indicator Plate. In certain cases, the speed indicator plate has not been installed on the cover. If not installed, the speed indicator plate will be enclosed in a bag attached to the base or keyboard and should be installed as shown in figure 8-3.

d. Enabling Time Delay Mechanism. If the set is equipped with a time delay mechanism, the upstop bracket (figure 8-4) must be raised before the mechanism will function properly. Instructions for disabling and enabling time delay mechanism are as follows:

(1) Remove cover and typing unit.

(2) Refer to figure 8-4.

(3) To disable: loosen two mounting screws on upstop bracket; lower upstop bracket to its bottom position; tighten mounting screws.

(4) To enable: loosen two mounting screws on

upstop bracket; raise upstop bracket to its upper position; tighten mounting screws.

(5) Replace typing unit and cover.

e. Electrical Connections. External electrical connections are made to terminals on terminal blocks located at the rear of the set. Terminal blocks are shown in figure 8-5. Connections are indicated in AN/UGC-20B schematic and wiring diagrams included in chapter 5. Proceed as follows:

(1) Connect 115 vac, 60 Hz, power to terminals 2 and 4 (figure 5-3, Sheet 1) on terminal block "S".

(2) Connect power cord ground wire (green) to grounding screw on terminal block mounting bracket.

NOTE

In the following step, see notes 13 and 16 on figure 5-3, Sheet 1, in regard to connections for full-duplex and half-duplex operation. For half-duplex operation, a 60 milliamper line must be used. For full-duplex operation, the receive line must be 60 milliamperes while the send line can be either 60 milliamperes or 70 microamperes.

(3) Connect signal lines to terminals 1, 2, 3, and 4 of terminal block "SS" as indicated on figure 5-3, Sheet 1.

(4) Refer to figure 5- and ensure that proper strapping is installed on the signal control circuit card

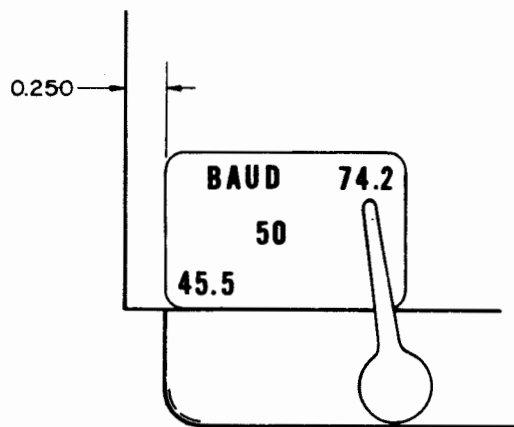


Figure 8-3. Speed Indicator Plate

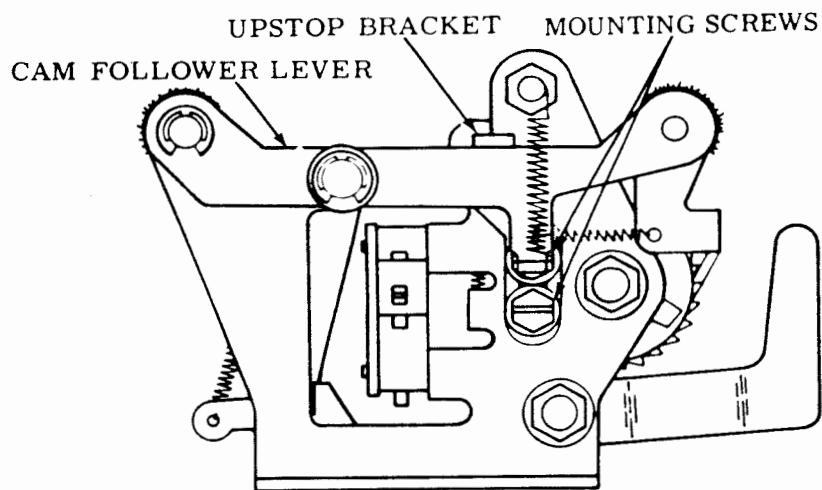


Figure 8-4. Time Delay Mechanism

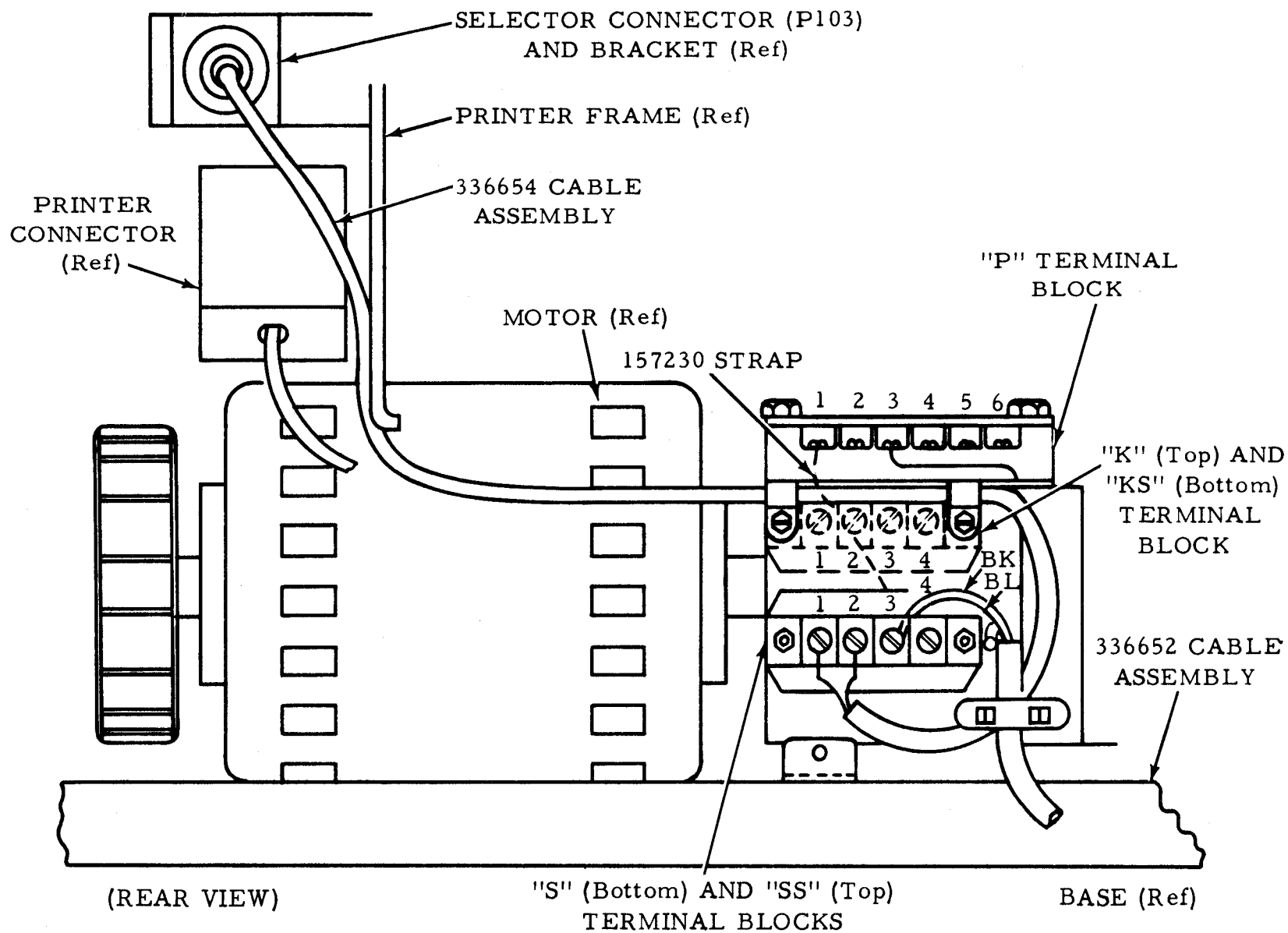


Figure 8-5. Location of Terminal Blocks

if 70 microampere operation is used.

f. Installing Paper. To insert paper, proceed as follows:

(1) Insert spindle (supplied with typing unit) in a roll of paper.

(2) Mount spindle in spindle retainers so that paper unwinds from underneath.

(3) Route paper over straightener shaft, under platen, between paper fingers, and through opening between window door and dome.

g. Installing Ribbon. To thread ribbon, proceed as follows:

(1) Refer to figure 8-6.

(2) Remove both spools from ribbon spool shafts.

(3) Engage hook, on end of new ribbon, in hub of new spool.

(4) Wind a few turns of ribbon onto empty spool in same direction it comes off full spool.

(5) Ensure that reversing eyelet has been wound up on empty spool.

(6) Place spools on spool shafts so that ribbon on right spool unwinds from right side and ribbon on left spool unwinds from left side without twisting.

(7) Thread ribbon around and through reverse lever slots.

8-5. INSTALLATION CHECKOUT. Installation checkout consists of performing reference standards tests and performance tests.

a. Reference Standards Test. After installation is satisfactorily completed, perform the following procedures to determine that the teletypewriter set is properly assembled to meet specified reference standards.

(1) Check printing carriage position as follows:

(a) With type box in printing position, select "M" type pallet.

(b) Observe to make sure that "M" type pallet is in center of printing hammer when touching.

(2) Check printing hammer stud as follows:

(a) Move box to midpoint of platen in position to print period.

(b) Place printing hammer in contact with type pallet and pressed down to bearing post.

(c) Observe hammer face to make sure it is positioned on end of type pallet.

(3) Record draw wire rope clearances as follows: (Use feeler gauge.)

(a) Measure clearance between carriage return latch bail post and lower wire rope. Record clearance. Standard: .006 inch minimum.

(b) With horizontal positioning mechanism

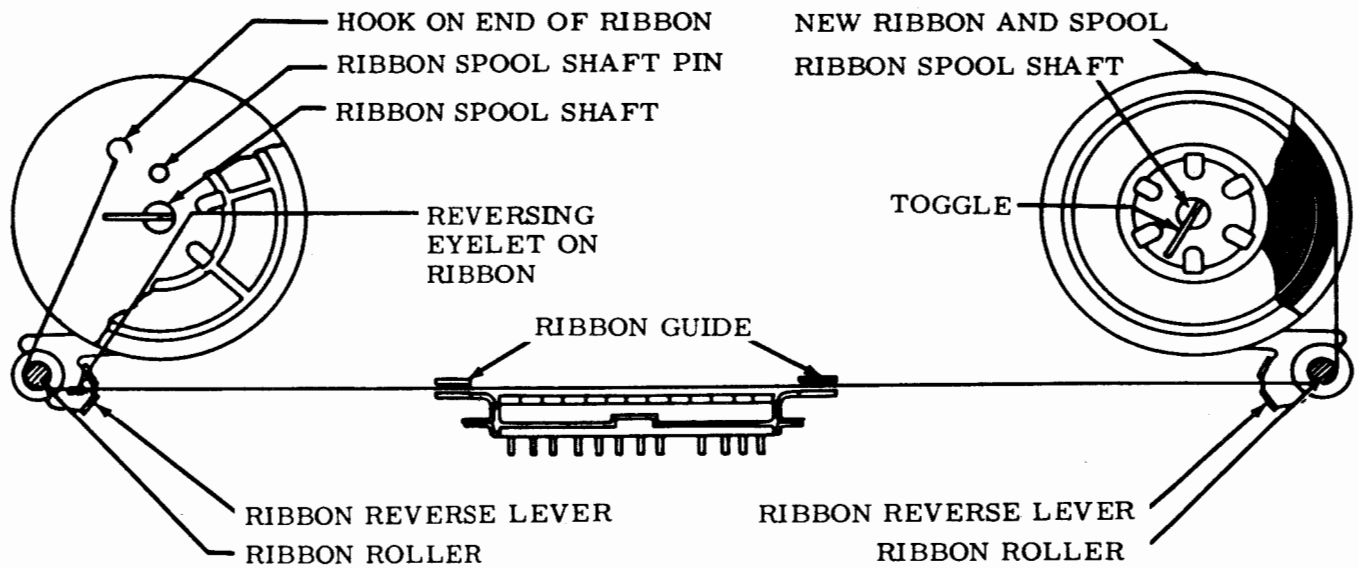


Figure 8-6. Path of Ribbon

in lowest position, measure clearance between lower wire rope and left horizontal positioning drive linkage. Record clearance. Standard: 0.30 inch minimum.

(4) Record printing arm clearance as follows: (Use feeler gauge.)

(a) Place printing hammer track at maximum downward; printing hammer operating bail against its stop.

(b) Measure clearance between secondary printing arm and forward extension of hammer operating bail. Standard: some clearance; not to exceed 0.15 inch.

(c) With printing track in uppermost position, latching extensions of printing hammer operating bail should over-travel surface of operating bail latch. Check and

record clearance, both sides. Standard: .006 inch minimum.

(5) Record printing hammer stop bracket clearance as follows: (Use feeler gauge).

(a) Move type box to "M" position; position printing track to maximum downward.

(b) Press (8 ounces) printing hammer stop bracket toward platen.

(c) At end of pallet with least clearance, measure clearance between printing hammer and "M" pallet.

(6) Record rocker shaft eccentric stud clearance as follows: (Use feeler gauge).

(a) Disengage type box clutch.

(b) Move locking arm toward front.

(c) Measure clearance between lower side lock lever roller and top edge of horizontal positioning lock lever shoulder. Standard: 0.55 inch minimum - 0.90 inch maximum.

NOTE

If adjustments are required and made, re-check adjustments (see Chapter 4) to the following items:

Horizontal positioning drive linkage.

Right vertical positioning lever eccentric stud.

Left vertical positioning lever eccentric stud.

Vertical positioning lock lever.

Ribbon feed lever bracket.

Function stripper blade arms.

Spacing trip lever bail cam plate.

Reversing slide brackets.

Ribbon reverse space gear.

Printing track.

Printing arm.

(7) Measure clutch shoe lever clearance as follows: (Use feeler gauge).

(a) Trip clutch. Rotate until clutch shoe lever is toward bottom of unit.

(b) Align clutch drum mounting screw head with stop lug.

(c) Compress shoe lever against stop lug, allowing to snap apart.

(d) Measure and record gap with clutch thus engaged.

(e) Measure and record gap with clutch disengaged.

NOTE

Step f reading (differential between engaged and disengaged clutch) must be .075 inch for 100 WPM operation.

(f) Compare two readings in steps (d) and (e). The difference between the two must fall within .055 and .085 inches.

(8) Check dash-pot vent screw as follows:

(a) Set POWER switch to ON.

(b) With letter "M" depressed, operate printer on local loop.

(c) First character should print in same location as in slow manual operation.

(d) Type box carriage should return without bouncing.

(9) Check solenoid contact gap as follows: (Use feeler gauge).

(a) With distributor clutch in latched or stop position, check and record solenoid contact gap. Standard: .025 inch minimum - .030 inch maximum.

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