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BULLETIN 269B

TECHNICAL MANUAL

MODEL 28 PROJECTOR SET

APPARATUS NOT USED BY,  
BELL SYSTEM

**TELETYPE<sup>®</sup>**  
**CORPORATION**  
SUBSIDIARY OF *Western Electric Company* INC.  
SKOKIE, ILLINOIS, U. S. A.

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BULLETIN 269B

TECHNICAL MANUAL

MODEL 28 PROJECTOR SET

SECTIONS

1. GENERAL DESCRIPTION
2. THEORY OF OPERATION
3. INSTALLATION
4. OPERATOR'S SECTION
5. ADJUSTMENTS AND TROUBLE SHOOTING
6. LUBRICATION AND PREVENTIVE MAINTENANCE
7. PARTS

**TELETYPE<sup>®</sup>**  
**CORPORATION**  
 SUBSIDIARY OF *Western Electric Company* INC.  
 SKOKIE, ILLINOIS, U. S. A.

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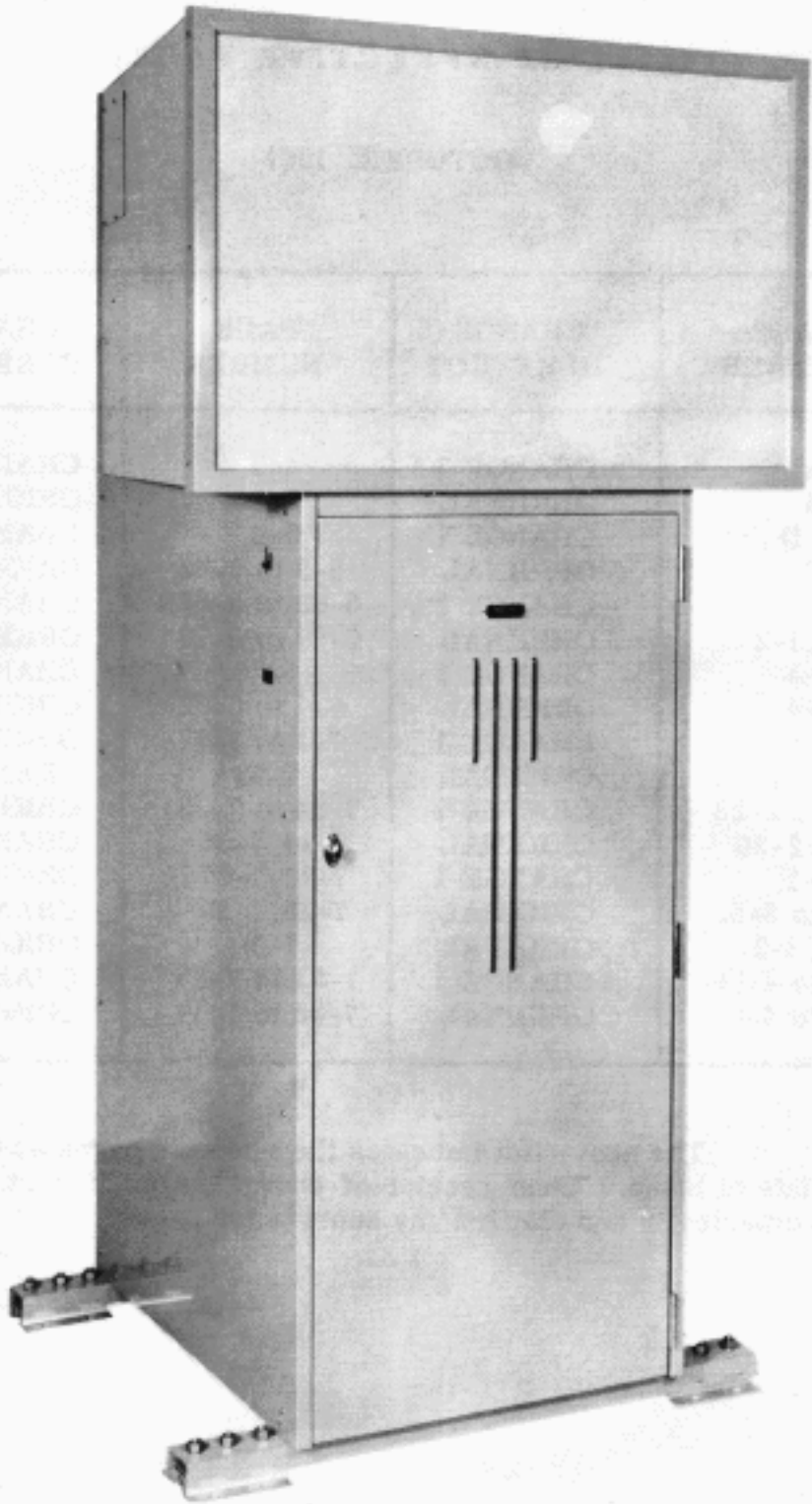
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**MODEL 28 RECEIVER PROJECTOR STATION**



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## SECTION 1 - GENERAL DESCRIPTION

## 1. GENERAL

a. The Model 28 Receiver Projector Set is an essential unit of an electrical character transmission system consisting of a sending station and one or more receiver-projector stations. Messages transmitted from the sending station are recorded and projected simultaneously at all receiver-projector stations in the system.

b. The Receiver Projector Set is a unit designed to receive Teletype messages in the form of five unit code impulses from the sending station and type the messages in successive lines on a continuous transparent web, from which it is projected onto the rear of a translucent rectangular screen approximately two feet high and three feet wide.

c. The Receiver Projector Station consists of a projector cabinet, the upper section of which is open

in front and across which a translucent screen is mounted, and the lower section, which houses the projector frame supporting a Model 28 Projector Typing Unit and the optical equipment. See Frontispiece.

d. The motor for the Projector Typing Unit is energized by way of contacts on a control relay located in the lower section of the projector cabinet (figure 1-1). The windings of the control relays of all Receiver Projector Stations are interconnected and energized by operation of the manual switch at the sending station. In this way the Projector Typing Units may be started or stopped simultaneously under control of the sending station switch.

e. The projector lamp, exhaust blower and transparent web rewind motor in the projector cabinet at each receiver projector station are controlled by means of a manual switch located on the left side of each projector cabinet.

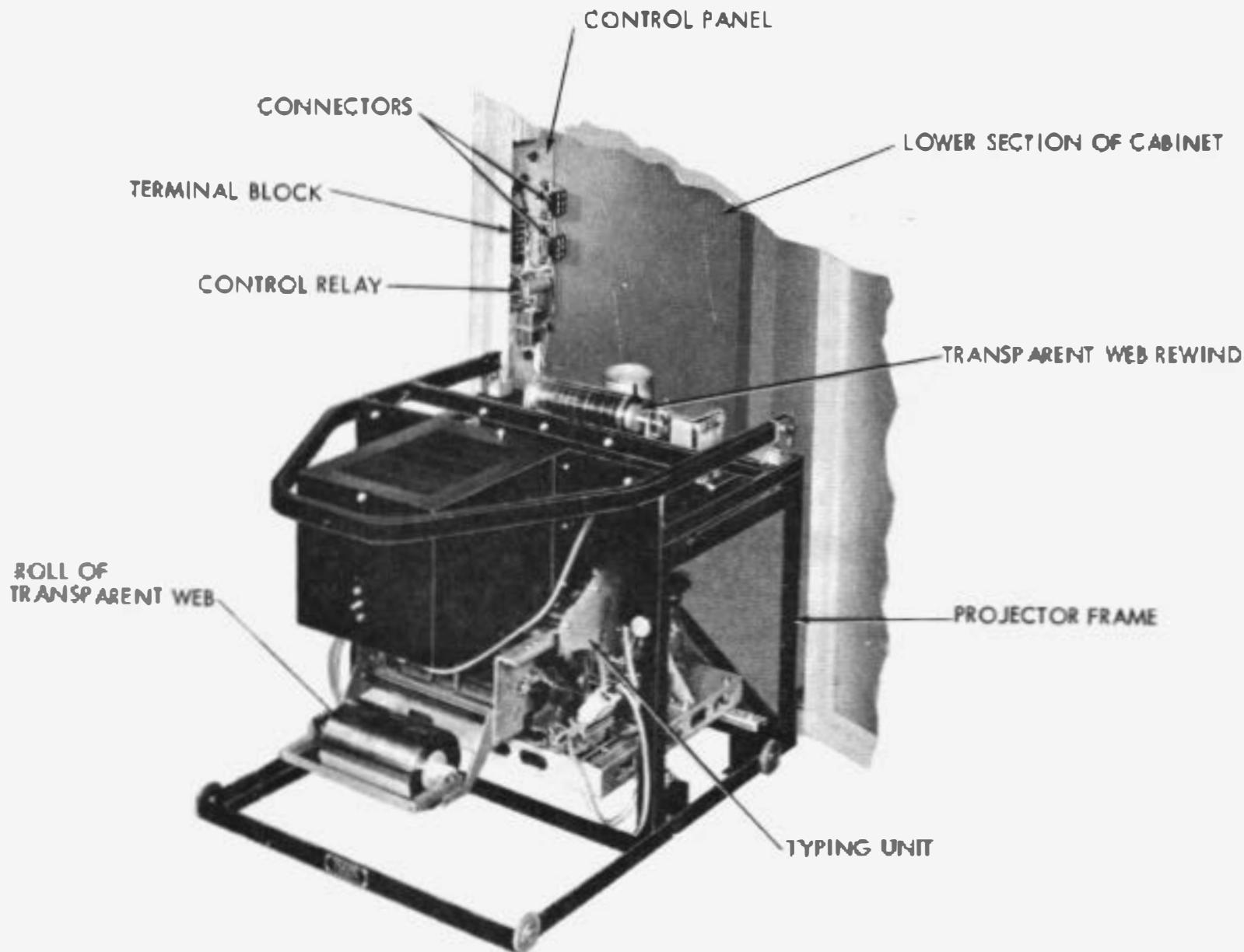


Figure 1-1 Projector Frame Assembly, In Front of Cabinet



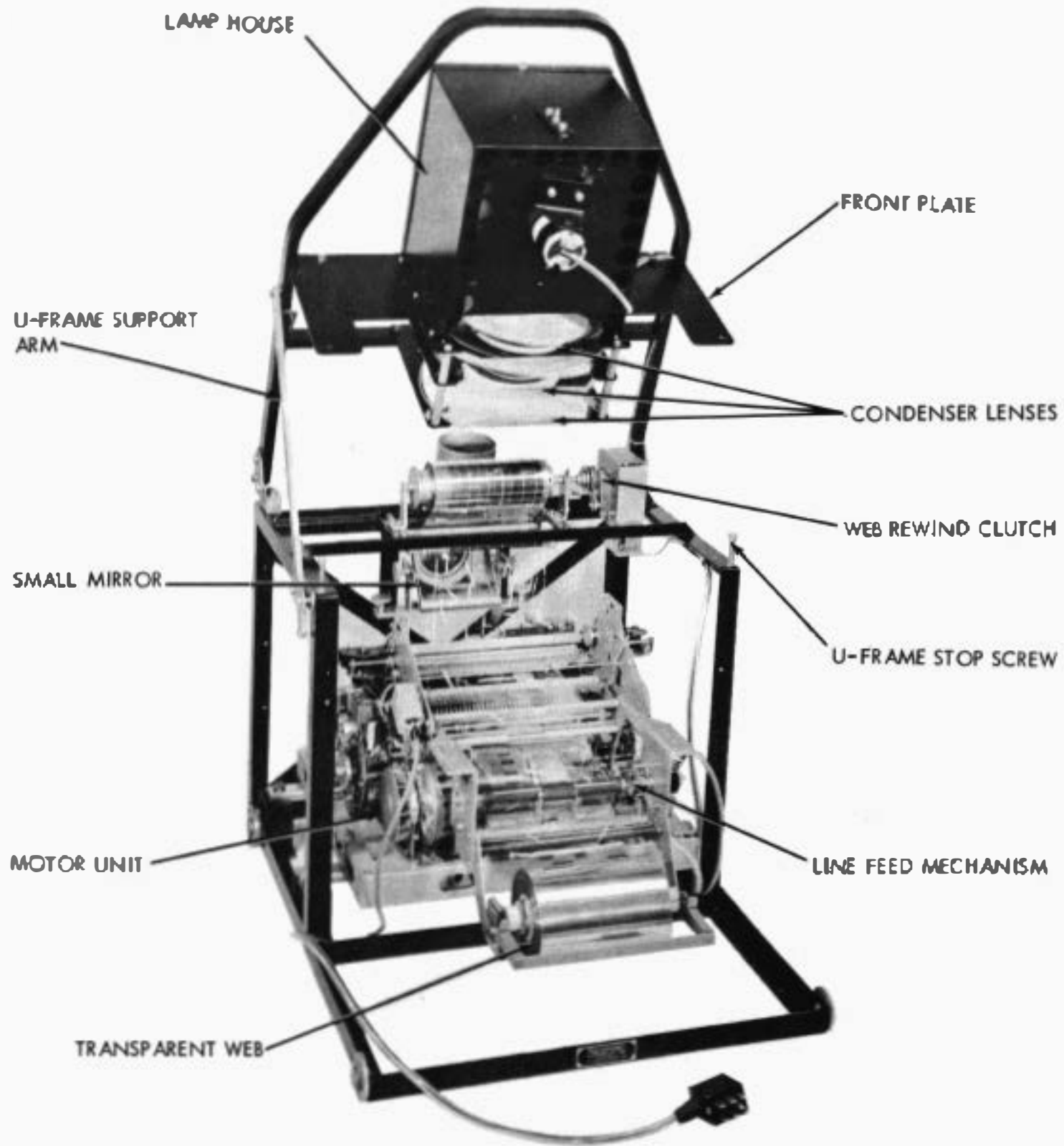


Figure 1-2 Projector Frame Assembly - U-Frame Open As Seen From Front of Cabinet

f. The selector magnets of all the Teletype Printers in the system are connected in series with the transmitting contacts of the sending station. The signaling code used to transmit characters is the "start-stop" five-unit code, which consists of five selecting impulses, used in various combinations of current and no-current intervals, and two synchronizing impulses. Each group of five selecting impulses is preceded by a start impulse and followed by a stop impulse. The start and stop impulses are used to maintain synchronism between all stations in the circuit.

g. The operating speed of the Typing Units may be 60 WPM (368 OPM), 75 WPM (460 OPM) or 100 WPM (600 OPM) depending on the set of speed change gears used. The Model 28 Receiver Projector Set, as supplied, is equipped for 100 WPM operation. Gears for other speeds of operation can be supplied as optional equipment. All Projector Typing Units in a system must be equipped to operate at the same speed as the sending station.

## 2. DESCRIPTION OF COMPONENTS

### a. TYPING UNIT

(1) The Typing Unit incorporates the necessary electrical and mechanical features for translating the code signals into mechanical action in order to record the message and perform the usual functions incident thereto.

(2) Code signals are applied to a two coil magnet associated with a selecting mechanism which interprets the signals and controls the motions involved in typing a character or performing a required function. Means are provided for orientating the selector to the received signal. The motor is geared to the main shaft of the typing unit. The typing and various functional sections of the Typing Unit are activated by individual clutches on the main shaft. The clutches completely disengage at the termination of each operating cycle thus reducing the motor load to a minimum when idling.

(3) Typing is accomplished when the printing hammer strikes the type pallet. The type pallets are arranged in a compact, lightweight type box which may be easily detached for cleaning or for replacement by another type box. In operation, the type box keeps step with a printing carriage and presents the proper type pallets to the printing hammer to receive its strokes as the printing carriage advances along the printing track. A special platen is provided which oscillates in step with the ribbon so that the character being printed on the transparent web is readable, when projected on the screen, before the next character is printed.

(4) The roll of transparent web is mounted on a roller between two brackets at the rear of the Model 28 Projector Typing Unit (figure 1-3). The web passes forward around a series of guide rollers and a feed roller that advances the web in response to the line feed mechanism, up between the platen and the

ribbon then around the upper guide rollers where it is returned on a motor driven spindle.

### NOTE

Reference to FRONT, REAR, RIGHT or LEFT apply to the unit as viewed from the operator's position in front of the set. However, this does not apply to the Projector Base, Typing Unit and Motor since they are mounted facing the rear of the cabinet in order to simplify servicing the unit. For purposes of this manual the FRONT of the Typing Unit and Base is that side from which the type box and platen can be viewed.

### b. MOTOR UNITS

#### (1) Synchronous Motor

(a) This motor is of the two pole, single phase, capacitor start type. A combination handwheel and fan is mounted on one end of the motor shaft. A motor-starting relay and capacitor, together with a thermal cutout switch, are mounted in a compartment under the motor proper. The thermal cutout switch (manually reset) serves to protect the motor windings from excessive heating.

(b) The motor is supported by a cradle to which it is held by straps at each end. Resilient mounts on the hubs of the motor end bells reduce transmission of vibration to the base.

#### (2) Series or Governed Motor

(a) This unit is a series motor which runs at a governed speed of 3600 rpm. The combined governor and fan are mounted on the motor shaft, which is supported on ball bearings.

(b) The electro-mechanical governor is wired in series with the armature and two field windings. Targets for speed checking are marked on the governor cover.

(c) The entire motor is shielded to minimize radio interference. A shielded compartment on the underside of the motor houses the governor resistor and capacitor, as well as an electrical noise suppressor across the power leads.

c. RECEIVING-ONLY BASE -- supports the Motor Unit, Typing Unit and the Intermediate (speed change) Gear Bracket and is mounted in the Projector Frame.

### d. PROJECTOR FRAME

(1) The Projector Frame is designed to provide mounting facilities for the Model 28 Projector Base and Typing Unit, projection lamp, small mirror, condenser lenses, enlarging lens, winder spool and motor (figures 1-2 and 1-3).

(2) The frame consists of an angle iron box-like structure equipped with rollers that ride on two tracks in the cabinet. This permits the projector frame and its mounted equipment to be rolled forward

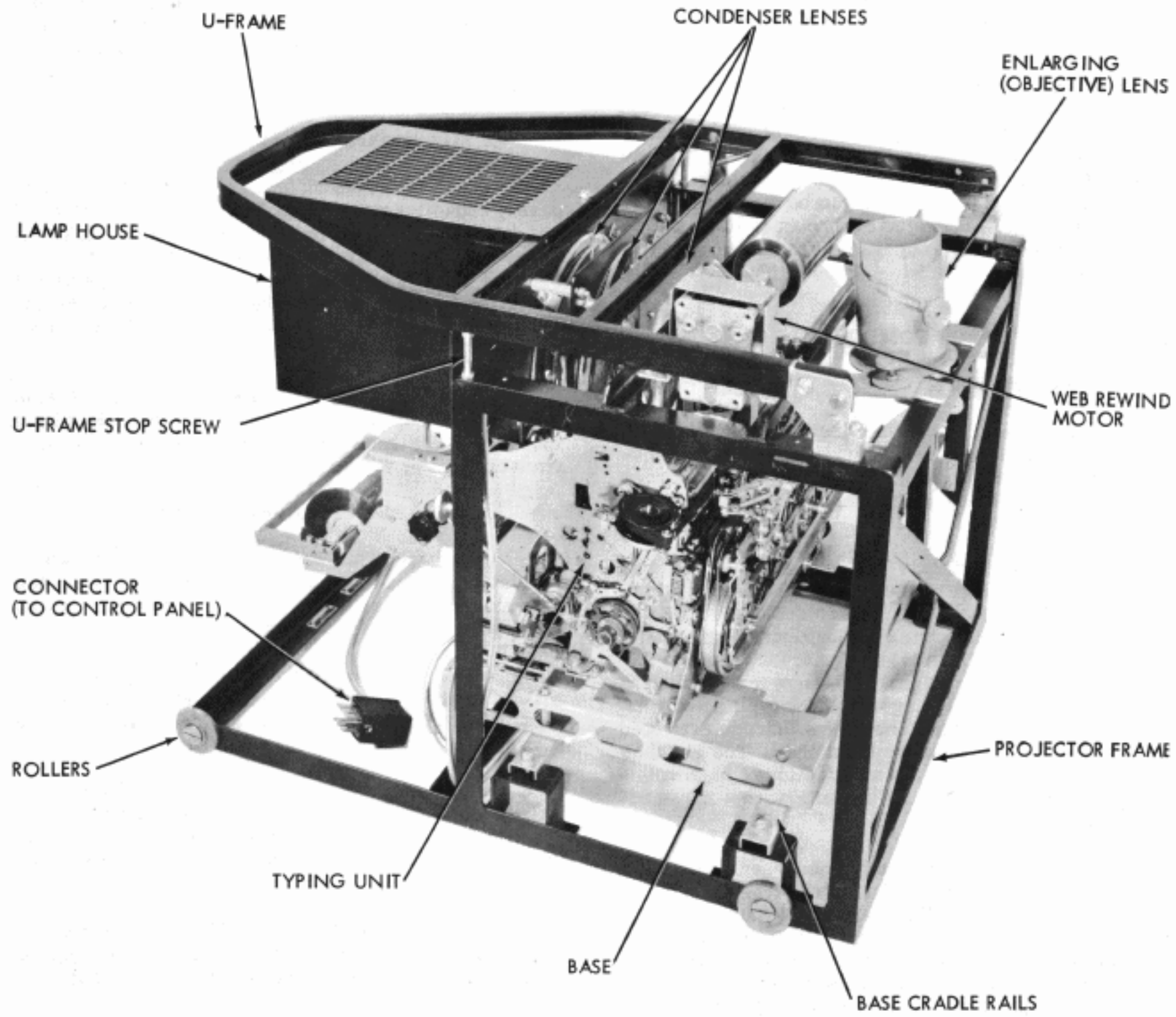


Figure 1-3 Projector Frame Assembly, Right Rear View



for greater accessibility. When the frame is in operating position, the wheels drop into recesses in the tracks. In this position, the frame is secured by bolts.

(3) The Model 28 Projector Base, with the Typing Unit and Motor, is mounted on two cradle rails that extend across brackets in the lower section of the projector frame.

(4) A lamp housing, which contains a 500 watt lamp and a concave focusing mirror, and three condenser lenses (one double-convex and two plano-convex) are mounted to the U-shaped Channel which is hinged to the frame so that it can be raised for servicing the Projector Typing Unit (figure 1-3). The condenser lens system collects the light and concentrates it on the transparent web where the web emerges from the Typing Unit, to provide maximum illumination of the portion of the message to be projected.

(5) A small plane mirror is mounted on brackets at the rear of the frame directly in line with the lamp and condenser lenses and at such an angle that the objective lens directly above it will cover the area of the message to be projected.

(6) The objective lens, mounted directly above the small mirror, magnifies the message and focuses it onto the translucent screen. A large plane mirror (figure 3-1) is mounted in the upper section of the cabinet at such an angle as to direct the message image onto the screen. A red filter assembly is provided, which, when its use is required, is inserted in the objective lens housing on top of the objective lens. The filter is used to give the projected light a red color for preserving the adaptation to darkness of persons viewing the screen. When not in use, the filter assembly is placed in a holder on the right wall inside the lower section of the projector cabinet.

(7) A spool assembly and winder motor are

mounted to the top rear of the projector frame. A slip clutch on this rewind assembly keeps the transparent web taut during printing and takes up the slack of the web simultaneously with line feed.

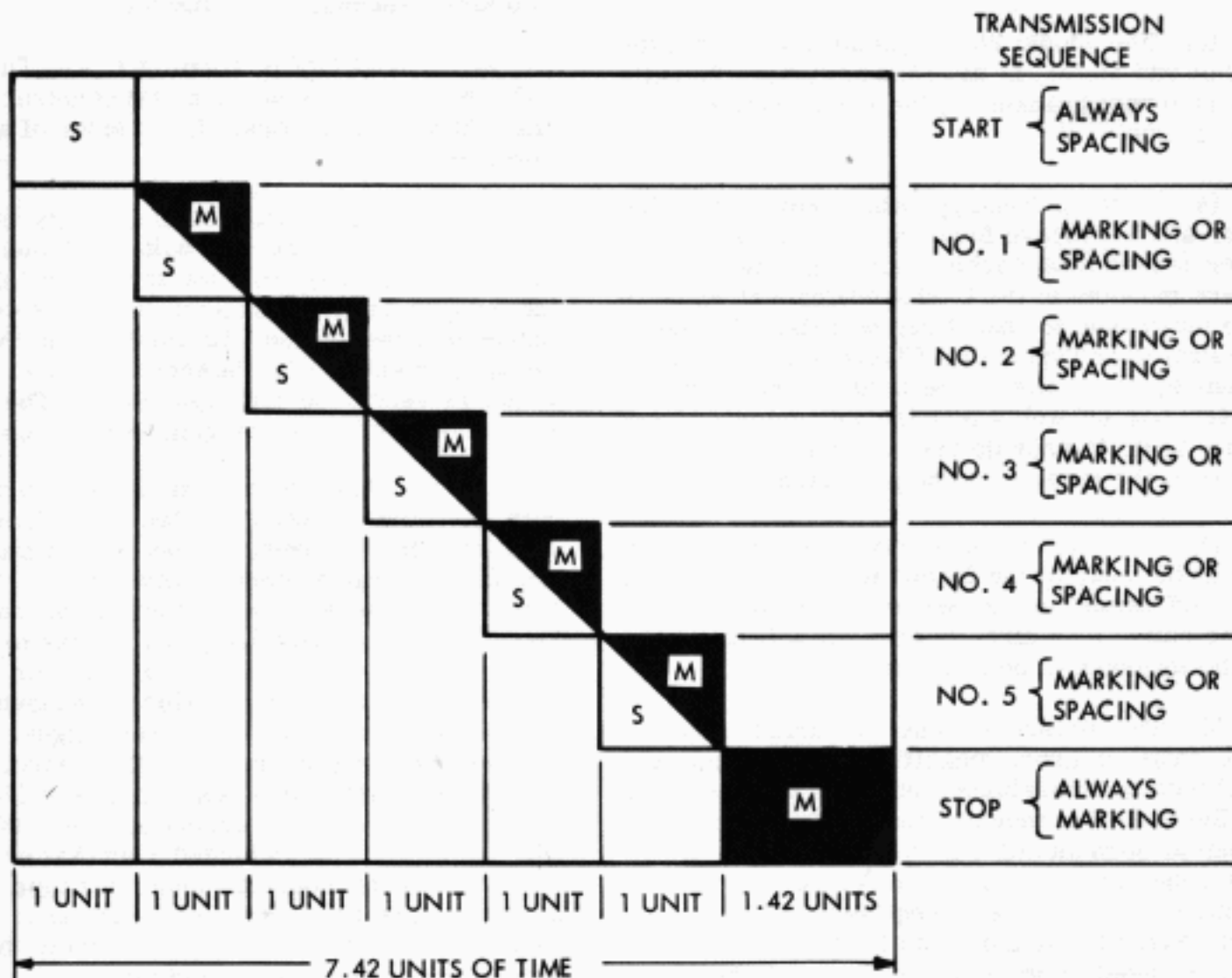
e. PROJECTOR CABINET -- The Projector Cabinet is of heavy sheet metal construction over an angle iron frame work. It consists of an upper and lower section.

(1) The upper section rests on top of the lower section to which it is bolted. A plane mirror is mounted diagonally from top to rear of this section at the proper angle to reflect the projected message image onto the screen. Located behind the mirror on the upper right side of the section is an exhaust blower which is vented on the right side. The translucent screen is laced over the open front of the top section.

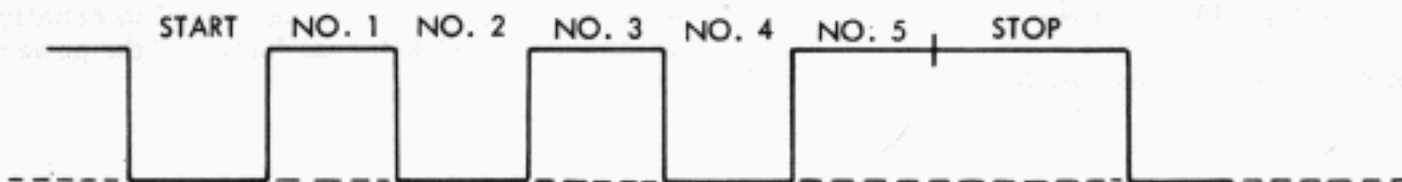
(2) The lower section rests on two channels with resilient mountings. Two angle iron tracks extend from front to back across the bottom of the section in which the projector frame rides. Two holes in bottom provide for ventilation of the cabinet. The large front door provides ready access to the interior of the cabinet. Inside, under a cover on the left side of the cabinet is a panel on which are mounted the control relay, a terminal for power, signal and control lines and two plug connectors. The control relay winding has a resistance of approximately 355 ohms and requires an operating current of about .060 amperes. Also on the left side is hinged a bracket or shelf which may be used to mount a monitoring tape printer (not a part of this set). As mentioned before, a manual switch on the left side (outside) controls the projection lamp, blower and web rewind motor.

#### NOTE

The Receiver Projector Set is not fused internally. It is recommended that external fusing of the power line be provided.



a. SIGNALING CODE



b. GRAPHIC REPRESENTATION OF LETTER "Y"

FIGURES	-	?	:	\$	3	!	B	#	B	'	(	)	.	,	9	0	1	4	0	5	7	;	2	/	6	"	R	<	≡	■	v	^	
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	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

c. CODE HOLE COMBINATIONS OF TYPICAL CHARACTER ARRANGEMENT

Figure 2-1 Start-Stop Signaling Code

## SECTION 2 - THEORY OF OPERATION

## 1. GENERAL

This section covers the operating principles and circuit descriptions of the Model 28 Receiver Projector Set. The equipment serves as a receiving only Projector Typing Unit when connected to the terminal facilities of a sending station, and will operate on signal line current of 60 milliamperes without a line relay. The signals received by the Projector Typing Unit are of the start-stop type. The synchronous motor requires a power supply of 115 volts, plus or minus 10 percent, at 60 cycles, single phase alternating current. To avoid loss in receiving margin, the frequency regulation must be within plus or minus 0.75 per cent.

## 2. SIGNALING CODE

The signaling code is a five unit start-stop code of current and no-current intervals. Intervals during which the selector magnet is energized are known as marking impulses, and those during which the magnet is not energized are known as spacing intervals. The transmission pattern for a complete character consists of a start impulse (always spacing), five code impulses (any one of which may be either marking or spacing)

and a stop impulse (always marking). The start and stop impulses are necessary to keep the receiving apparatus in synchronism with the transmitting apparatus (figure 2-1).

## 3. PROJECTOR TYPING UNIT

## a. GENERAL

(1) The Projector Typing Unit is a standard Model 28 Typing Unit whose side frames have been modified to provide mounting and feeding facilities for the roll of transparent web, and a special oscillating platen making it possible for the last printed character to be projected on the screen (figure 2-2).

(2) The receiving circuit of the Typing Unit consists of two 132 ohm selector magnet coils (figure 2-3) wired to a connector mounted on its right \* frame. At the time the Typing Unit is installed on its base in the projector frame, a plug on the plastic covered cable tied to the frame is plugged into this connector.

\* See NOTE - Section I - Paragraph 2.a.(4)

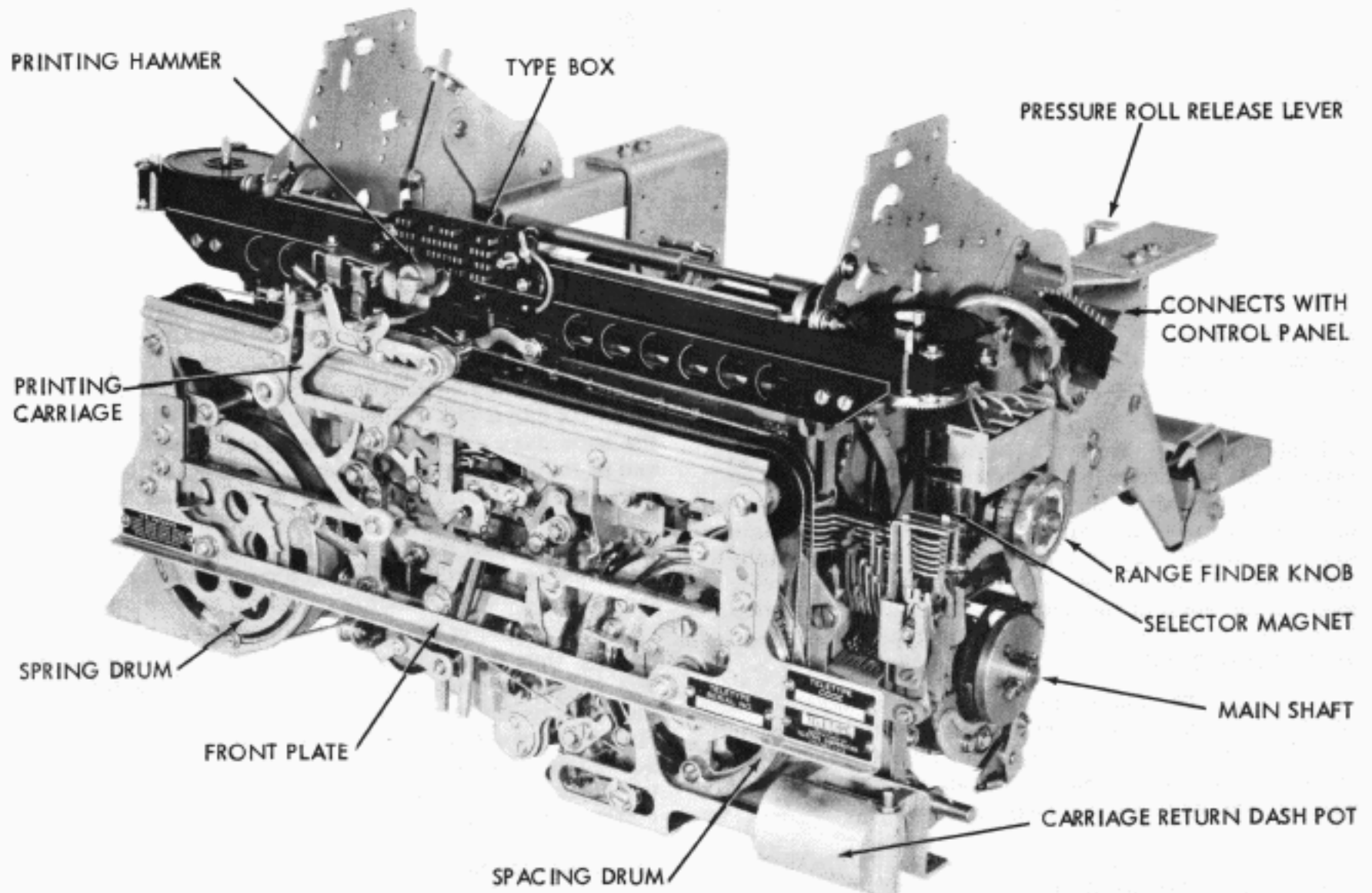


Figure 4-2 Projector Typing Unit, Front View

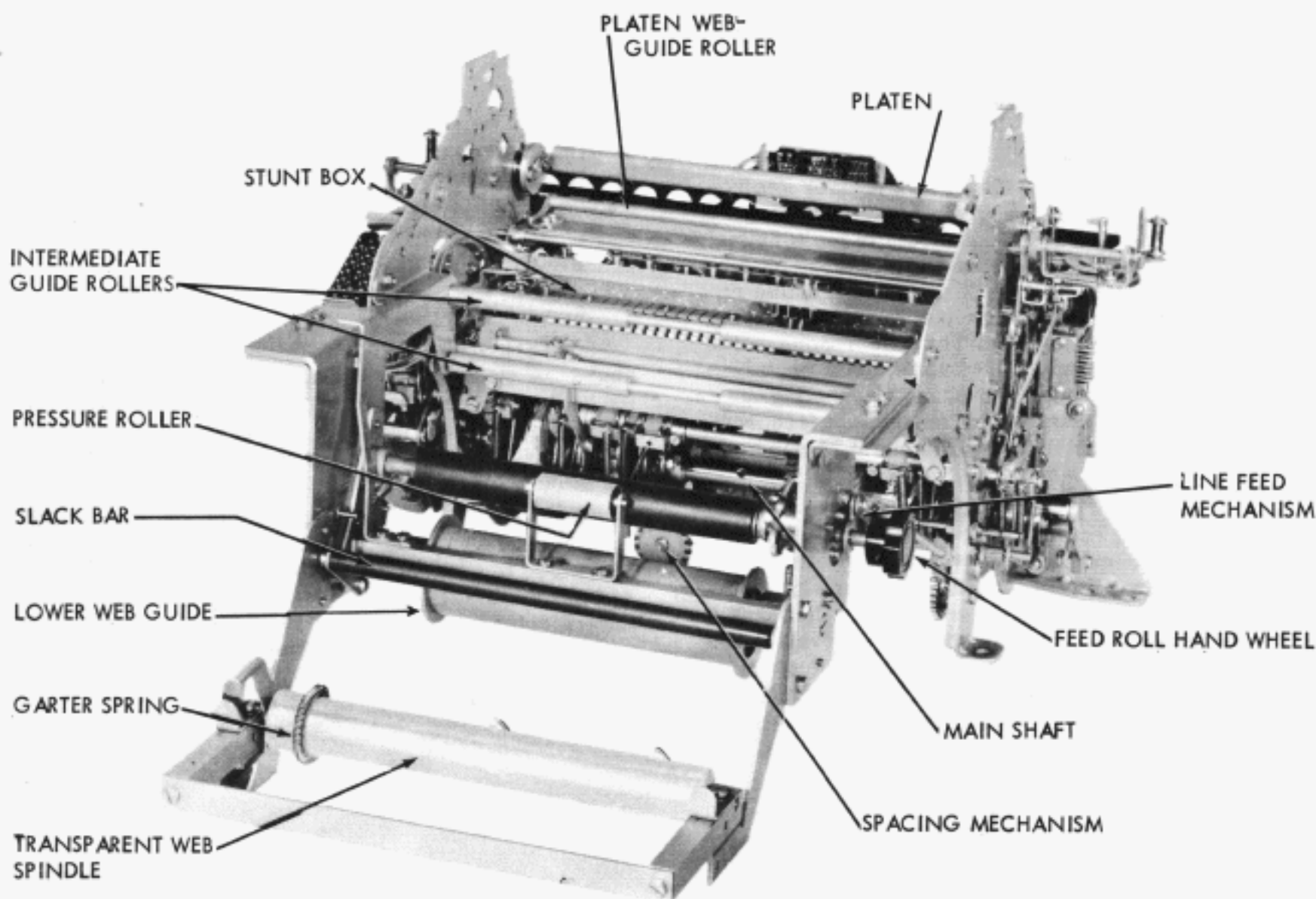


Figure 2-3 Projector Typing Unit, Rear View

b. MAIN SHAFT

(1) The Main Shaft is located in the lower rear portion of the Typing Unit and extends the full length of the unit. It is supported by a ball bearing assembly mounted in each side frame (figure 2-4).

(2) At the time a Typing Unit is mounted on a Projector Base the typing unit driven gear on the main shaft meshes with the typing unit driving gear located on a shaft in the intermediate bracket on the base just behind the typing unit. The intermediate driven gear, located on the same shaft with the typing unit driving gear, meshes with the intermediate driving gear on the shaft of the motor. Thus, rotary motion is extended from the motor to the typing unit main shaft (figure 2-48).

(3) The main shaft includes six clutches each of which, when tripped, drives its associated mechanism. These clutches have two shoes which bear against the inside surface of a drum which, in turn, is keyed to the main shaft. They operate as follows:

(a) Figure 2-5 shows a clutch disengaged. Disengagement is accomplished by bringing together lug A on the clutch cam disk, and the lower end of clutch shoe lever B. 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.

(b) Figure 2-6 shows the same clutch engaged. This is accomplished by releasing lug A and lower end of lever B. The upper end of lever B pivots about 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 drum at point E. As the drum turns counterclockwise, it drives the primary shoe downward so that it again makes contact with the drum, this time 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 H. The revolving drum acts to drive this shoe upward so that it again makes contact with the drum at point I. Since the forces involved are multiplied at each of the successive steps, the final force developed at point I is very great. This force is applied to the lug J on the clutch cam disk to cause it to turn in step with the drum. The cam disk on each clutch is connected with the particular mechanism involved.

(c) Two of the clutches (namely the line feed and the spacing clutches) have three sets of lugs equally spaced about their periphery for controlling



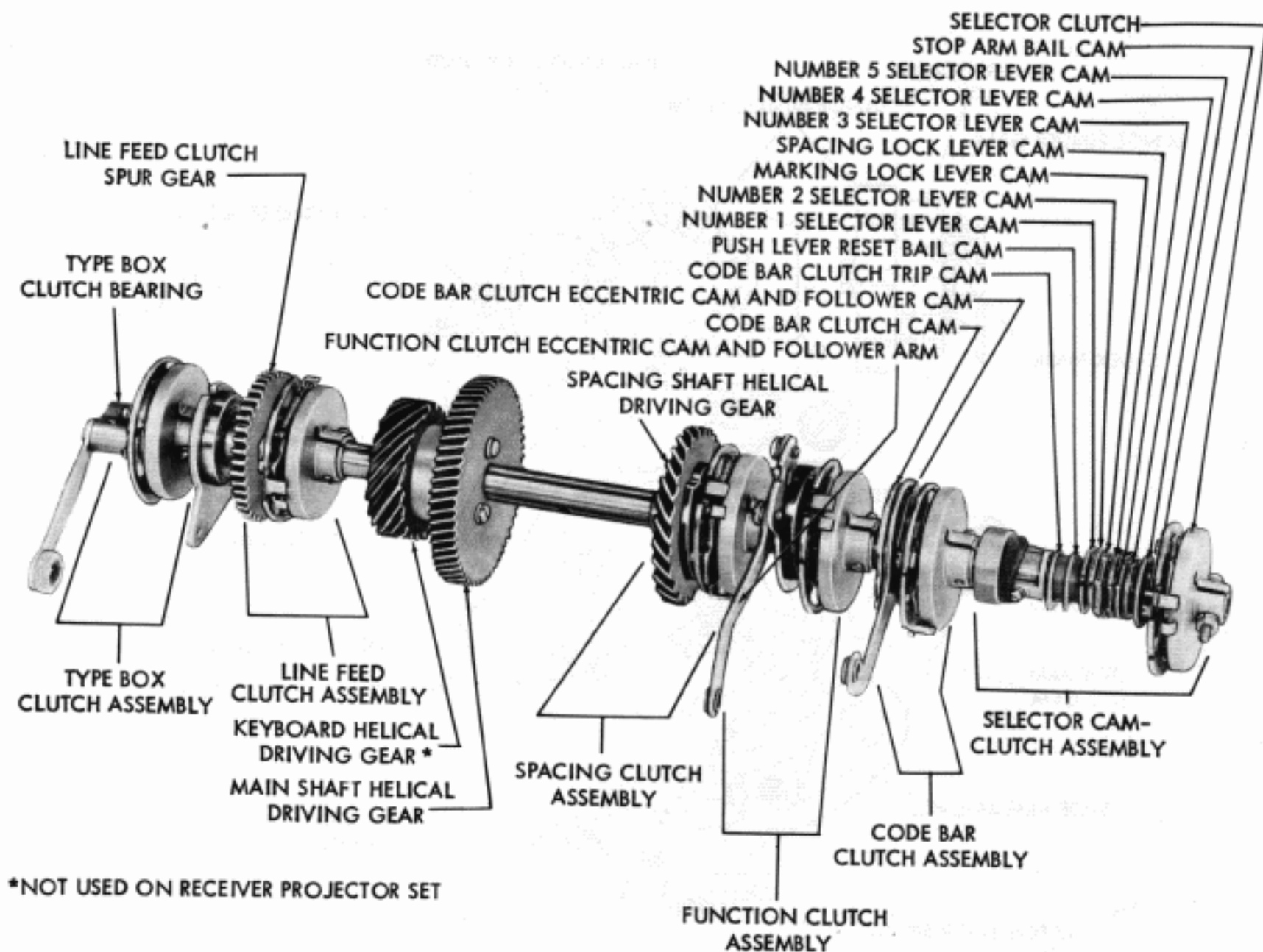


Figure 2-4 Projector Typing Unit Main Shaft

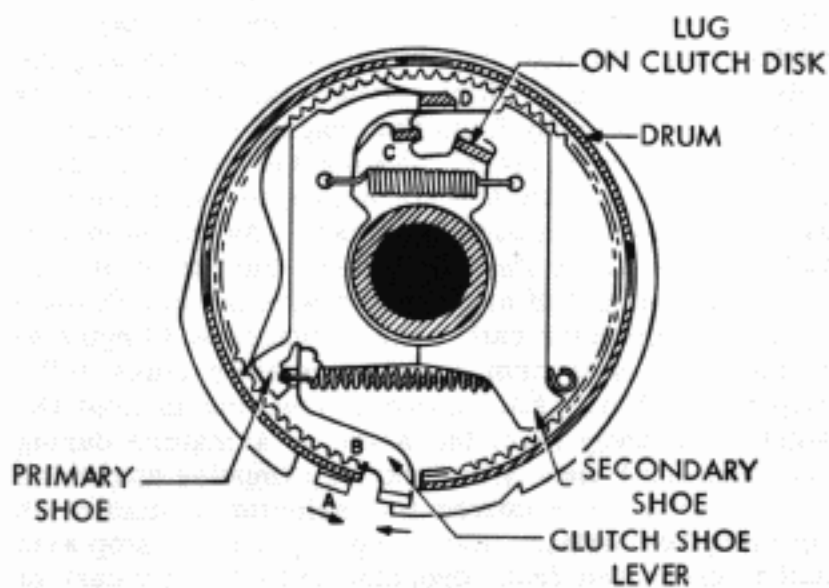


Figure 2-5 Clutch Disengaged

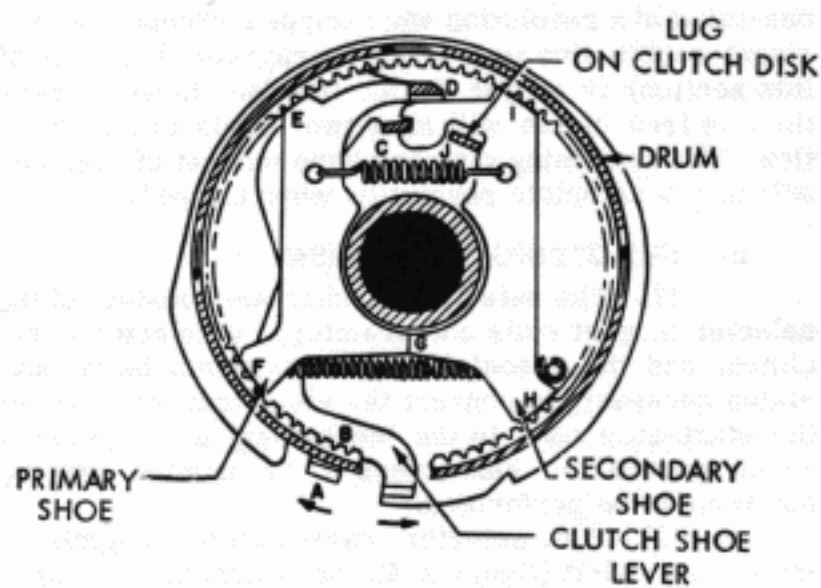


Figure 2-6 Clutch Engaged

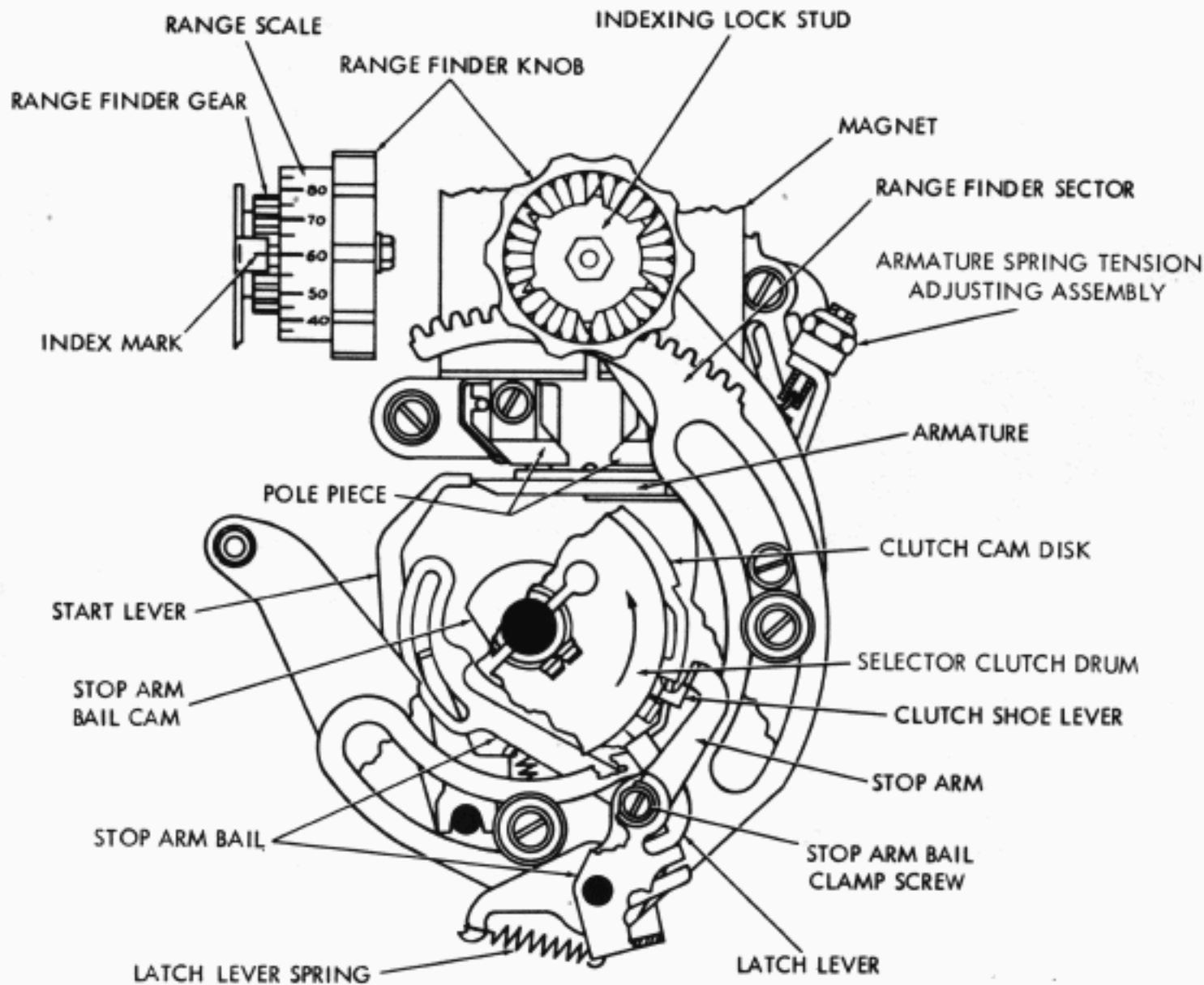


Figure 2-7 Selector Cam Clutch Trip Mechanism

the engagement and disengagement of the clutch shoes with the drum. Thus, these clutches will turn only one-third of a revolution when tripped, except when the single-double line feed lever (paragraph 3.1.(5)(a) of this section) is set for double line feed in which case the line feed clutch will turn two-thirds of a revolution. The remaining clutches have one set of lugs and will turn a complete revolution when tripped.

#### c. SELECTING MECHANISM

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

(2) The selector cam-clutch comprises, from right to left (figure 2-4), the clutch, the stop arm bail cam, the fifth, the fourth, and the third selector lever cams, the cams for the spacing and the marking lock levers, the second and the first selector lever cams, the push lever reset bail cam, and the code bar clutch trip cam.

(3) 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 2-7). At the start of a signal for any character or function, the start (spacing) interval 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 turns clockwise under the tension of its spring to move the stop arm bail into the indent of its 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 point of its cam where it remains to hold the start lever away from the selector armature during the signaling time. When the stop impulse at the end of the signal is received the selector armature is pulled up to block the start lever. Thus, the stop arm bail is prevented from dropping onto the low part of its cam (stop position of cam-clutch), and the attached stop arm is held so as to stop the clutch shoe lever. The selector cam-clutch disk upon which the latch lever rides has an indent at 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 interval is received.

(4) The series of five selecting levers and a marking lock lever ride their respective cams on the selector cam-clutch. As the marking and spacing signal intervals are applied to the selector magnet, the selector cam-clutch rotates and actuates the selector levers. When a spacing interval 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 transition is due. Extensions on the marking lock lever prevent the selector levers from following their cams (figure 2-8). When a marking impulse of the signal 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 transition is due. During the marking condition, the selector levers are not blocked by the marking lock lever extensions but are permitted to move against their respective cams. The selecting lever that is opposite the indent in its cam, while the armature maintains a 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 it falls into its cam indent. As the selector cam-clutch turns, each selecting lever together with its latched push lever is moved toward the front and held there until all five code intervals have been received. At that time, all selected push levers have been positioned to the front and all unselected push levers have been positioned to the rear in which positions they are held until the next start interval is received. When the subsequent start interval again causes the selector cam-clutch to rotate, the push lever reset bail, in following its cam, unlatches the selected push levers. The push levers then return to the unselected (rear) position under their spring tension.

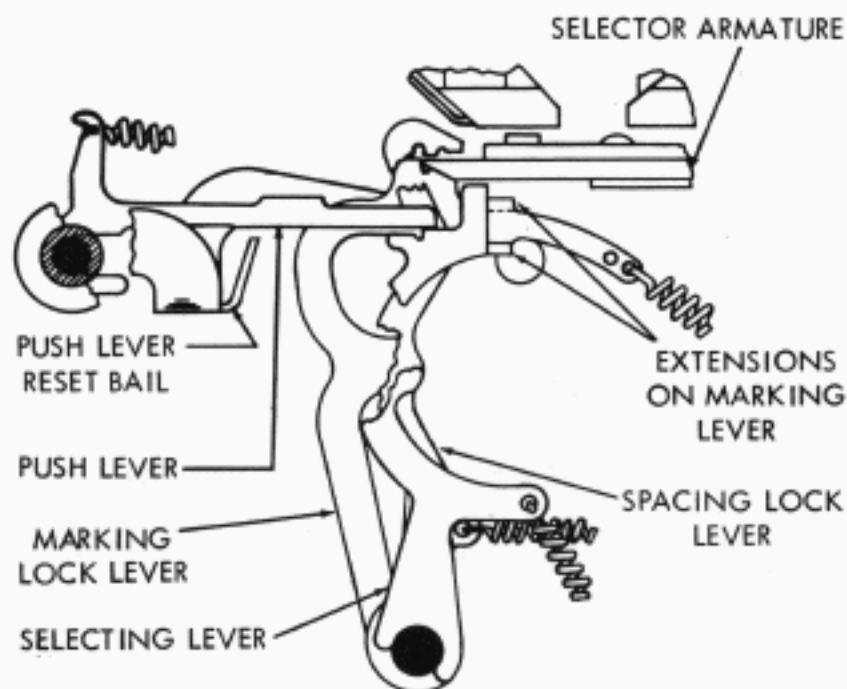


Figure 2-8 Selecting Mechanism, Right Side View

#### d. ORIENTATION

(1) In order to establish the operating margins for the Typing Units, it is necessary that the sampling of the signal by the selecting mechanism occur at the most favorable portion of the signal intervals. This is referred to as orientation.

(2) When the range finder knob (figure 2-7) is pushed inward and rotated, its attached range finder gear moves the range finder sector (which supports the stop arm bail, stop arm and latch lever) either clockwise or counter-clockwise 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 scale opposite the fixed index mark.

#### e. PRINTING MECHANISM

##### (1) CODE BAR MECHANISM

(a) General - The character which is to be printed is determined basically by the combination set up on the six code bars which are operated by the code bar positioning mechanism. In order to position the code bars, their associated shift bars must first be individually positioned toward the front or rear of the Typing Unit by transfer levers which respond to action of the selecting mechanism. While held in these positions, the code bar shift bars are acted upon by code bar shift levers to which motion is extended from the code bar clutch when activated by the code bar clutch trip cam. Detailed functioning of the coordinated mechanism follows:

(b) Code Bar Positioning - Each push lever (paragraph 3c(4) of this section) has an associated intermediate arm, transfer lever, and code bar shift bar (figure 2-9). In addition, there is a "common" transfer lever with its code bar shift bar. When a push lever is toward the right (space position) its associated intermediate arm and transfer lever are pulled toward each other by a spring. This causes the transfer lever to turn counter-clockwise about its pivot point (right end view) and position its code bar shift bar toward the front of the Typing Unit (space position). When a push lever is to the left (mark position), it moves the intermediate arm toward the left. This causes the transfer lever to turn clockwise about its pivot point and position its code bar shift bar toward the rear of the Typing Unit (mark position). The common transfer lever (front view - third from the left) has an extension which passes behind the number 1 and number 2 transfer levers (figures 2-10 and 2-11). When either or both of these transfer levers are moved to the rear (mark position), they move the common transfer lever to the rear. This, in turn, moves the common code bar shift bar toward the rear of the Typing Unit (mark position). As the selector cam-clutch completes its revolution, the trip shaft operating lever (fastened to the code bar clutch trip shaft) rides to the peak of the code bar clutch trip cam (figure 2-4). This causes the shaft to turn slightly and



its attached code bar clutch trip lever releases the code bar clutch. Rotation of the clutch actuates the code bar shift levers through the intervening shift lever drive shaft, drive arm, and shift lever link (figure 2-10). Code bar shift bars which have been moved toward the rear position by their transfer levers are engaged by the rear code bar shift lever and are shifted to the left. Code bar shift bars which have been moved toward the front position are engaged by the front code bar shift lever and are shifted toward the right (figure 2-11). Thus, the six code bar shift bars shift their

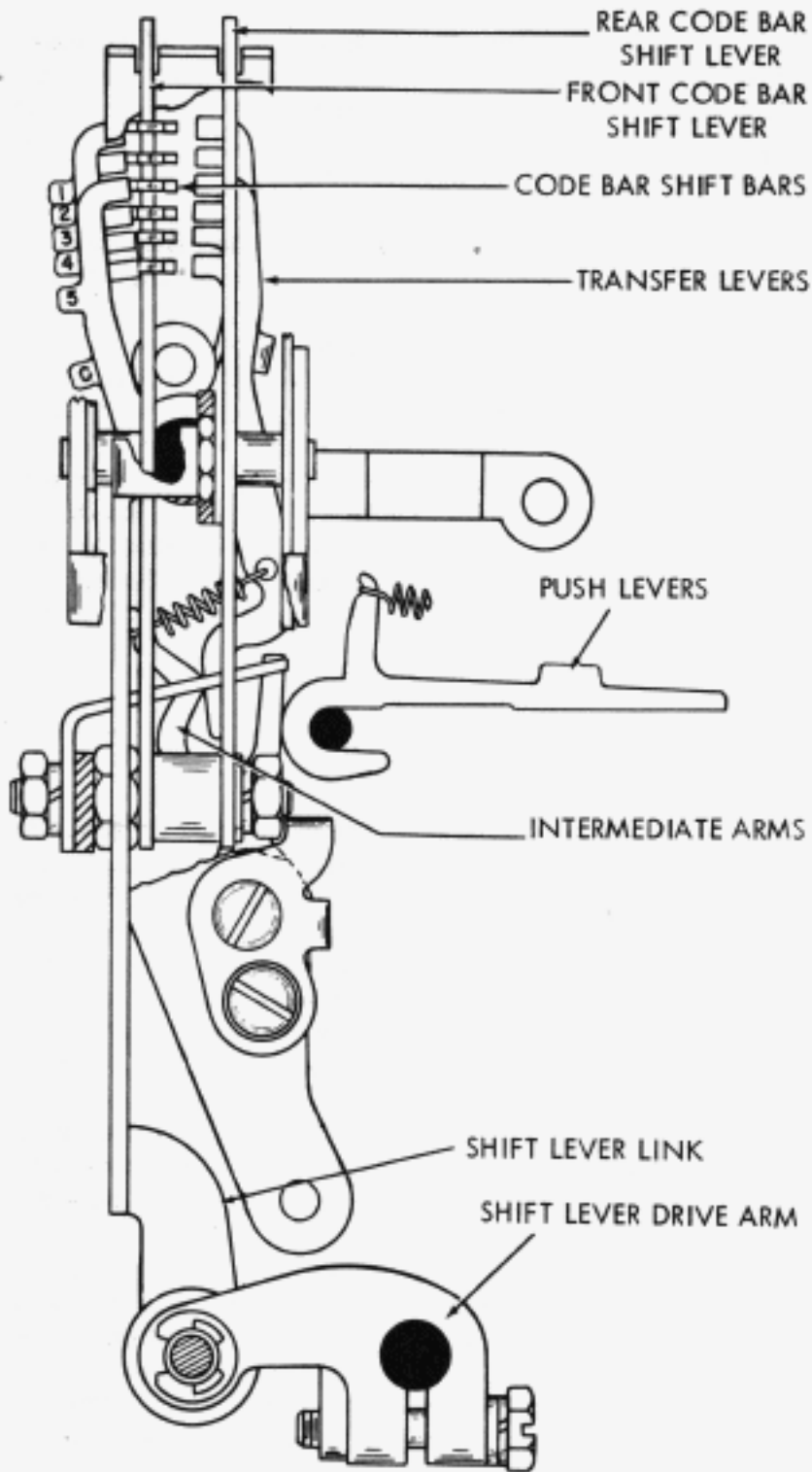


Figure 2-9 Code Bar Positioning Mechanism

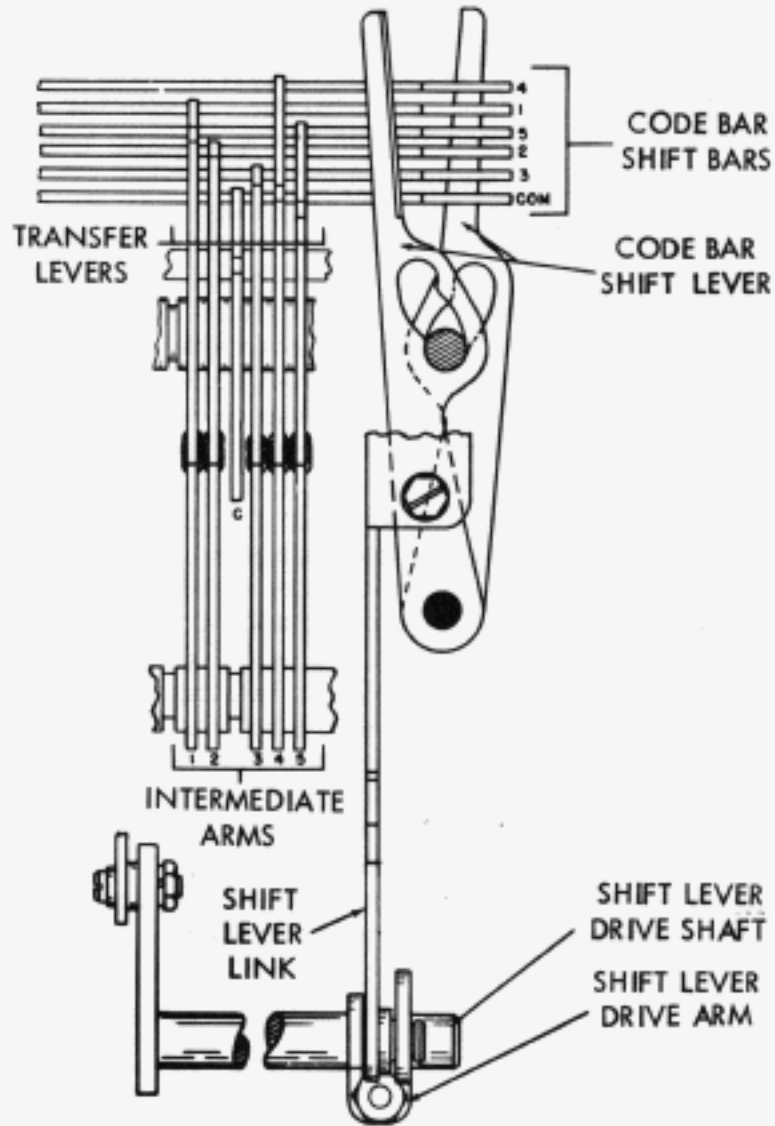


Figure 2-10 Code Bar Positioning Mechanism, Front View

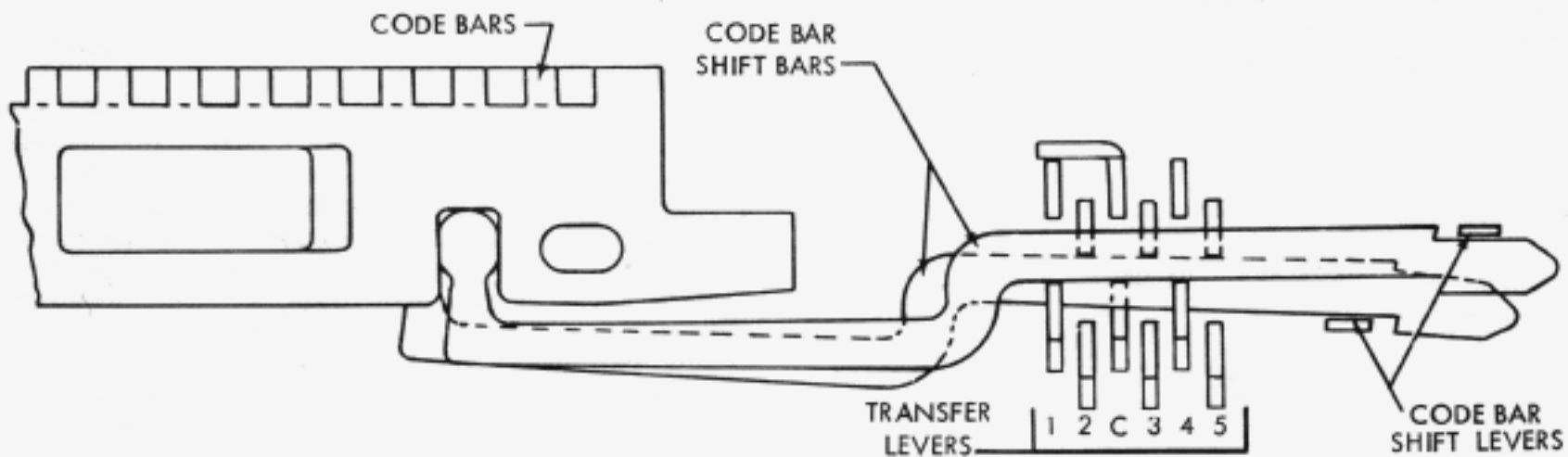


Figure 2-11 Code Bar Positioning Mechanism, Top View



respective code bars toward the right or left where they are retained by a detenting mechanism. The code bar clutch one-stop cam disk, upon which the latch lever rides has an indent at its stop position. When the clutch shoe lever strikes the code bar clutch trip lever, 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 trip lever is again operated.

(c) Arrangement of Code Bars - Three additional code bars bring the total number of code bars to nine. They are arranged from top to bottom as follows: Suppression, number 4, number 1, number 5, number 2, number 3, common, automatic carriage return and line feed, and shift-unshift (figure 2-12). In the equipment as furnished, the suppression code bar has no connection with a shifting mechanism, and the automatic carriage return and line feed code bars have no associated function bar in the stunt-box, since these features are not required. The shift-unshift code bar is actuated by mechanisms which will be discussed under FUNCTIONS.

(2) TYPE BOX AND TYPE BOX CARRIAGE

(a) General - All of the characters 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 required 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 2-13 for character arrangement. 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

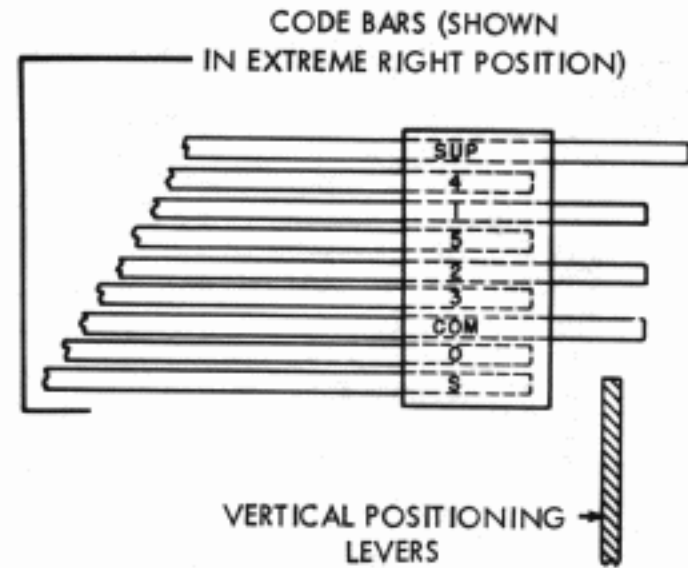


Figure 2-12 Code Bar Arrangement

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 oscillating rail pulley, over to the left oscillating 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 2-14). 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 oscil-

LETTERS																FIGURES																			
LEFT								RIGHT								LEFT								RIGHT											
4 8 5 MARKING				4 MARKING				5 SPACING				4 8 5 MARKING				4 8 5 SPACING				4 8 5 SPACING				4 MARKING				4 8 5 MARKING							
MARKING				SPACING				MARKING				SPACING				MARKING				SPACING				MARKING				SPACING							
TOP ROW	M	N	H	SPACE	BLANK	T	C. R.	O	.	'	##	SPACE	BLANK	5	C. R.	9	1 8 2 SPACING																		
2ND ROW	X	F	Y	S	E	Z	D	B	/	!	6	BELL	3	"	\$	?	MARKING 2 SPACING																		
3RD ROW	V	C	P	I	L.F.	L	R	G	;	:	ø	8	L.F.	)	4	8	SPACING 2 MARKING																		
BOTTOM ROW	LETTERS	K	Q	U	A	W	J	FIGURES	LETTERS	(	1	7	-	2	∇	FIGURES	1 8 2 MARKING																		
4TH ROW				3 MARKING				1ST ROW				3 MARKING				1ST ROW				3 SPACING				2ND ROW				3RD ROW				4TH ROW			

Figure 2-13 Type Box Arrangement, Viewed from Front of Typing Unit

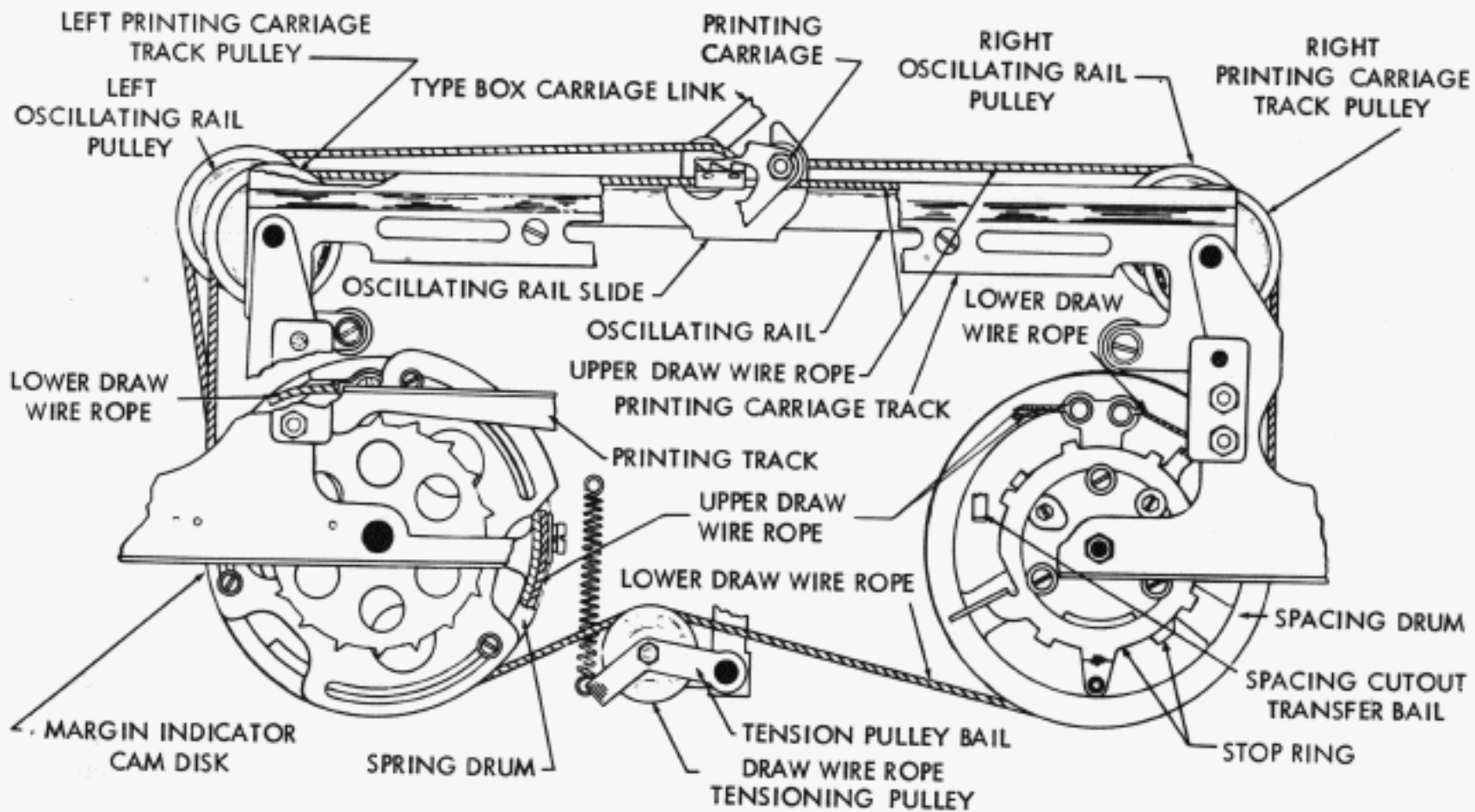


Figure 2-14 Draw Wire Rope Mechanism

lating 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 the draw wire rope that it carries may be shifted to the left or right with no change in position relative to each other. The oscillating rail shift slide and the two oscillating rail shift links are used to accomplish the horizontal positioning of the oscil-

lating rail and also connect it with the oscillating rail shift slide. The links are pivoted and are of such a length that only one at a time may be fully extended. As will be shown later under FUNCTIONS, the oscillating rail shift links are used to position the oscillating rail and thus the type box, so that either the left side (letters characters) or the right side (figures characters) of the type box is selected.

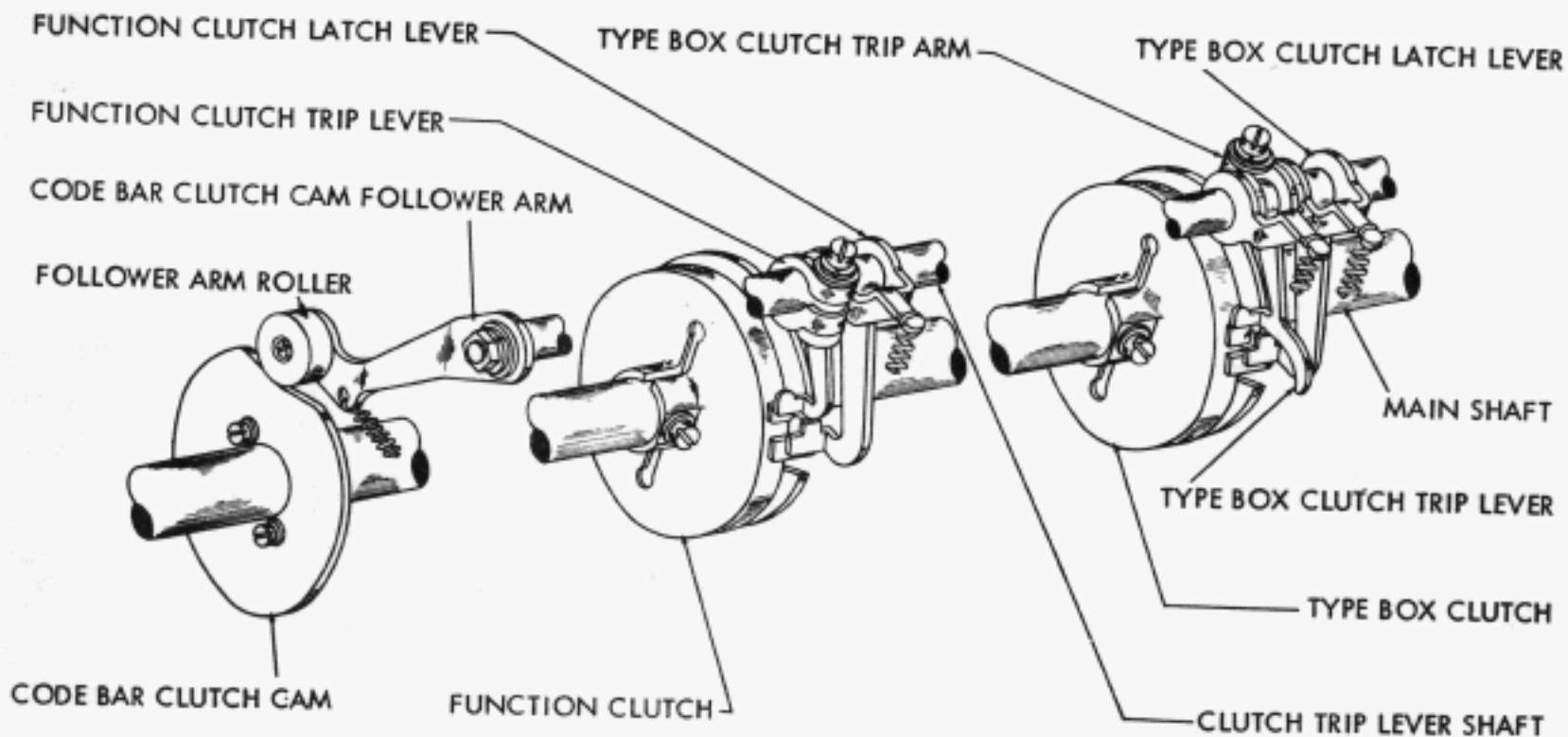


Figure 2-15 Trip Mechanism for Function and Type Box Clutches

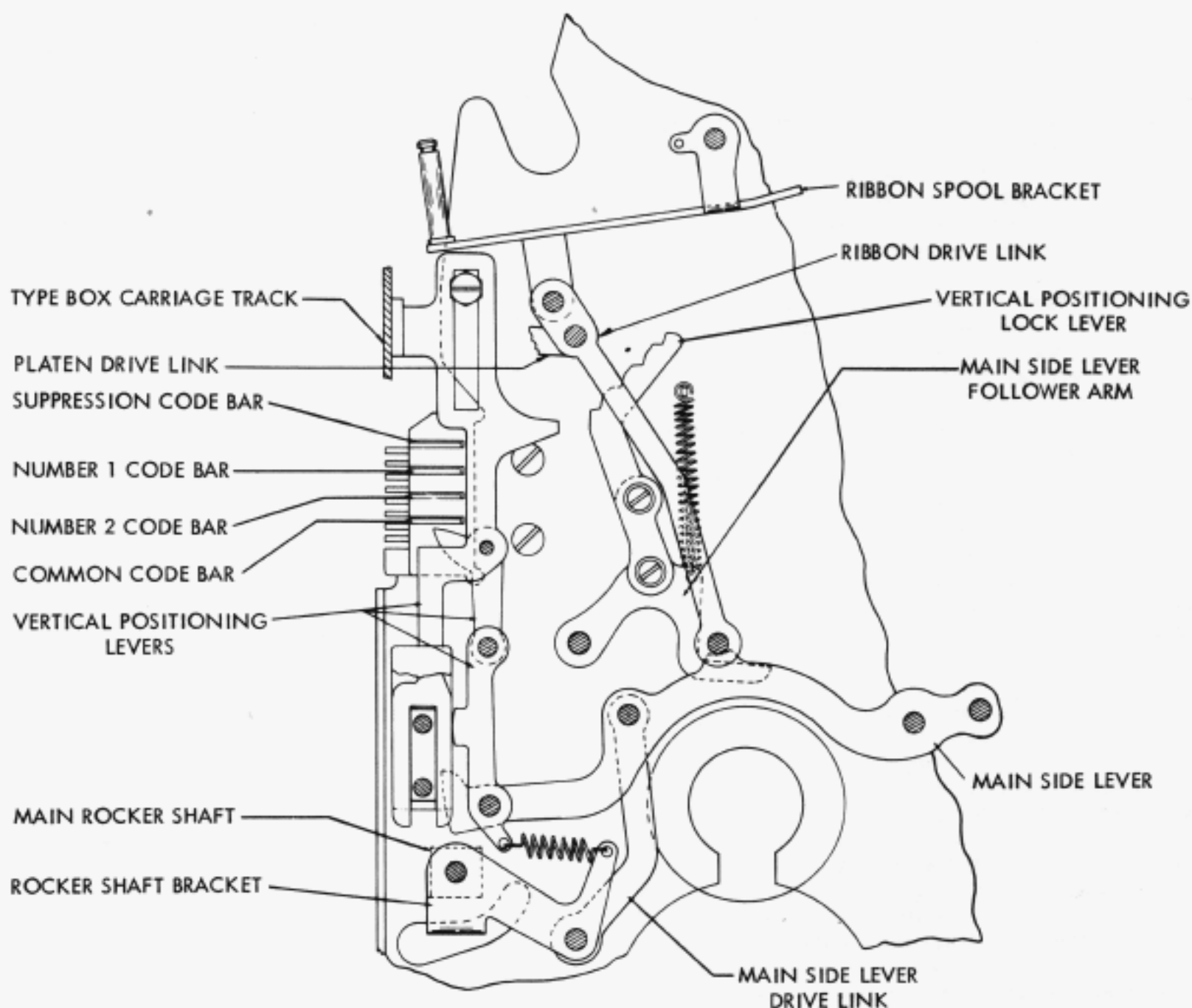


Figure 2-16 Right Side Mechanism

(b) Positioning - The selection of the various characters from the four horizontal rows and the eight vertical rows in either the left (LTRS) side or the right (FIGS) side of the type box and printing of those characters take place as follows:

1. Briefly, the number 1 and number 2 code bars determine the selection of the horizontal row. The number 3 code bar determines whether the selection is to be made from the left four vertical rows or right four vertical rows (in either the letters or figures side). 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.

2. Four code bars (longer than the others), extend through the right code bar bracket and serve as stops for the right "knee action" vertical positioning levers. They are (from top to bottom), suppression, number 1, number 2, and common (figure 2-12). Notches are arranged in the left ends of the code bars so that the left side "knee action" vertical positioning levers are stopped, in each case, by the

same code bar that blocks the right side vertical positioning levers. After all the 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 clutch trip lever shaft. As the shaft turns, it first causes the function clutch trip lever to release the function clutch (figure 2-15) 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, described in paragraph 3e(1)(b) of this section. 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 lever drive links, extends the motion to the main side levers to operate the "knee action" vertical positioning levers (figure 2-16). 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 ver-



tical 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), and the number 2 code bar is toward the right (spacing), the common code bar is toward the left. The number 2 code bar blocks the vertical positioning levers, and the second row of pallets in the type box 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 in the type box are then in line for printing. When the number 1 and number 2 code bars are toward the left (marking), the common code bar is also toward the left. The suppression code bar blocks the vertical positioning levers, and the fourth or 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 which are controlled by the main side lever follower arms.

3. A bracket attached to the main rocker shaft applies vertical motion to the main bail by means of two main bail links (figure 2-17). 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, the left shift slide drive links, if not buckled, will try to shift the oscillating rail shift slide toward the right while the right shift slide drive links, if not buckled, will try to shift the oscillating rail shift slide toward 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 character to be printed will be found in the left half of the LTRS or FIGS side. In a similar manner, when the number 3 code 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 character to be printed will be found in the right half of the LTRS or FIGS side.

4. After it has been thus determined in which group of four vertical rows 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 char-

acter is to be found (figure 2-17). 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 the 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 drive links make contact with and rolls down the face of 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 movement of the lock lever, and the yield spring is extended 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 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 2-18). 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 2-17). Each stop slide is of a different length. The common stop slide, which is the longest stop, has an additional step 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.

5. When both the number 4 and number 5 code bars are toward the right (spacing), their respective horizontal motion stop slides and the common stop slide 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 FIGS center or LTRS center) 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 FIGS center or LTRS center) 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 front and the lower stop slide is 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 FIGS center or LTRS center) in line for printing. When both the number 4 and number 5 code bars are toward the left (marking), their respective horizontal motion stop slides and the common stop slide are to-





ward 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 FIGS center or LTRS center) in line for printing.

### (3) PRINTING HAMMER AND PRINTING CARRIAGE

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

(b) Positioning - 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 draw wire rope. This moves the carriage along its track in such a manner that the hammer advances to the next print position.

(c) Printing - The printing track which is located on the front of the Typing Unit (figure 2-19)

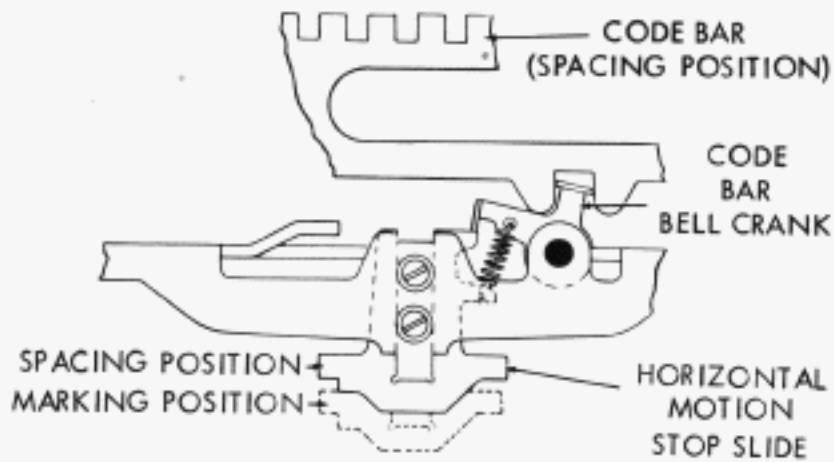


Figure 2-18 Stop Slide Positioning

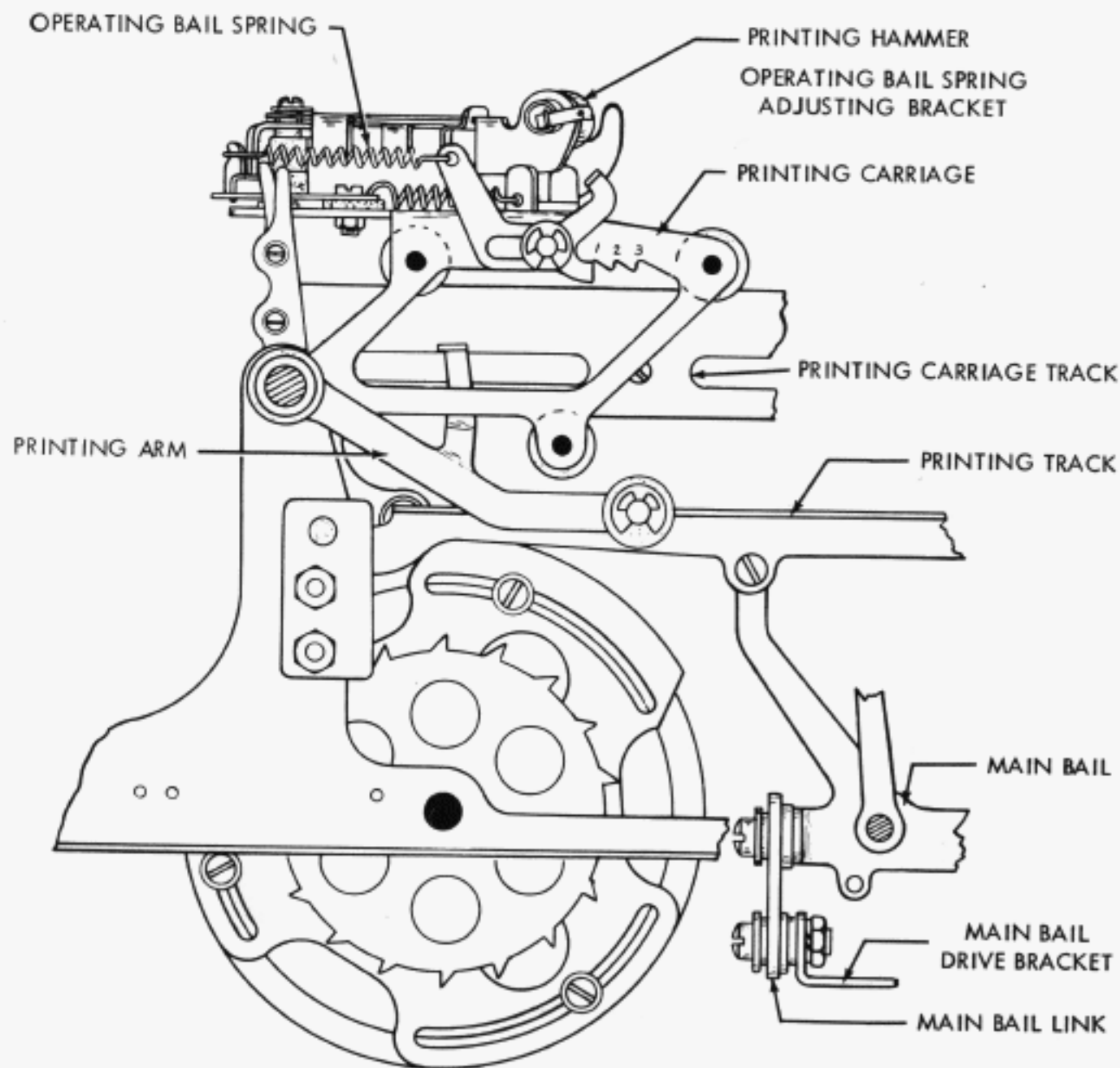


Figure 2-19 Printing Hammer Mechanism, Front View

is fastened to an extension at each end of the main bail. As the main bail reciprocates vertically, it extends the motion to 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 printing hammer operating bail clockwise against its spring tension until it becomes latched by the operating bail latch (figure 2-20). The printing hammer operating bail draws the printing hammer bail away from the type box by means of the printing 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 printing hammer operating bail. The operating bail is swung in a counterclockwise direction by the operating bail spring until it strikes its stop. The printing hammer bail, in being driven by the operating bail, is swung toward the type box. When the operating bail is stopped, momentum causes the printing hammer bail to continue its travel against the tension of the printing hammer bail spring until the printing hammer strikes the selected type pallet.

#### f. SPACING

(1) General - To properly space the printed characters, the type box and printing carriage must be advanced with each character printed. As was shown in paragraph 3e(2)(a) of this section and in figure 2-14, 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 thus the carriages to the left. The spacing drum has ratchet teeth about its periphery which are engaged by the eccentric driven spacing drum feed pawls (figure 2-21). The spacing shaft, on which the spacing eccentrics are mounted, is driven through its helical gear by the helical driving 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 of a revolution each time the spacing clutch is tripped. This allows the feed pawls to advance the spacing drum by the amount of one ratchet tooth. As shown earlier, each time the Typing Unit operates, the main rocker shaft is made to oscillate about its center. A cam plate which is fastened to the lower side of the rocker shaft is in its lowest position during the rest time. During the time that printing is to take place, the cam plate is moved upward by the shaft and operates the spacing trip lever bail. As this bail is rotated about its pivot point, it raises the spacing trip lever until it latches onto the spacing clutch trip lever arm (figure 2-22). As the rocker shaft reverses its direction of rotation, the spacing trip lever bail and the trip lever move downward thus causing the latched-up spacing clutch trip lever arm to operate the spacing clutch trip lever and release 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 arm. This, in turn, 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 continue to turn until its lugs make contact with the lugs on the clutch shoe lever disk. At this point, the latch lever drops into an indent in the cam disk and the clutch is held disengaged until the trip lever is again operated.

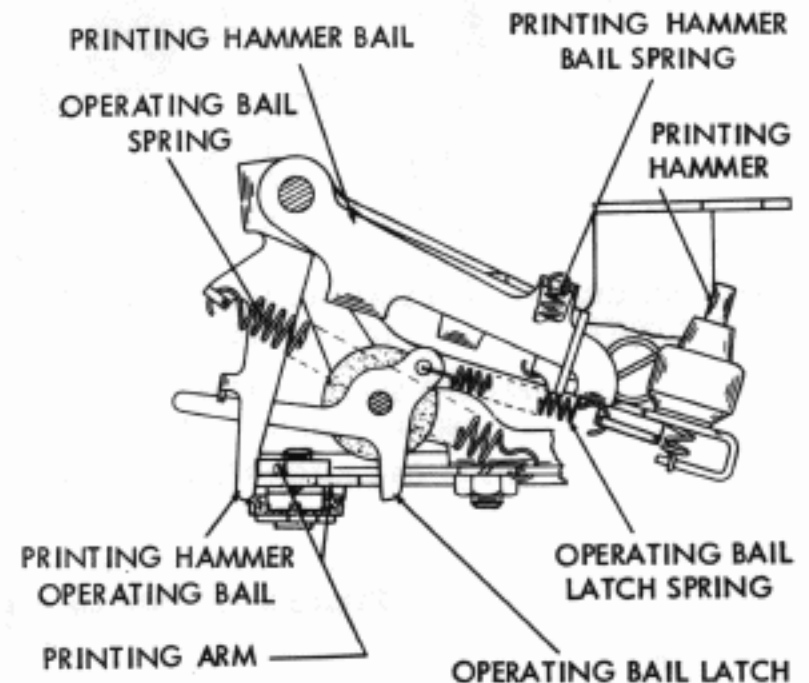


Figure 2-20 Printing Hammer Mechanism,  
Top View

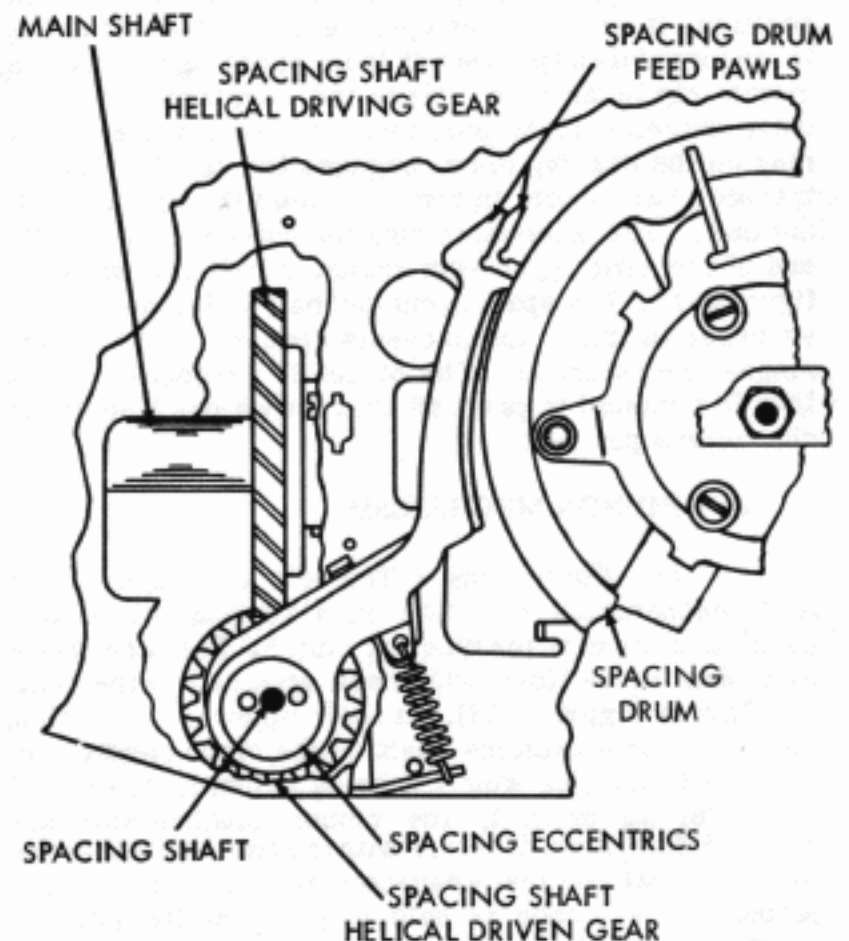


Figure 2-21 Spacing Drum Drive Mechanism.

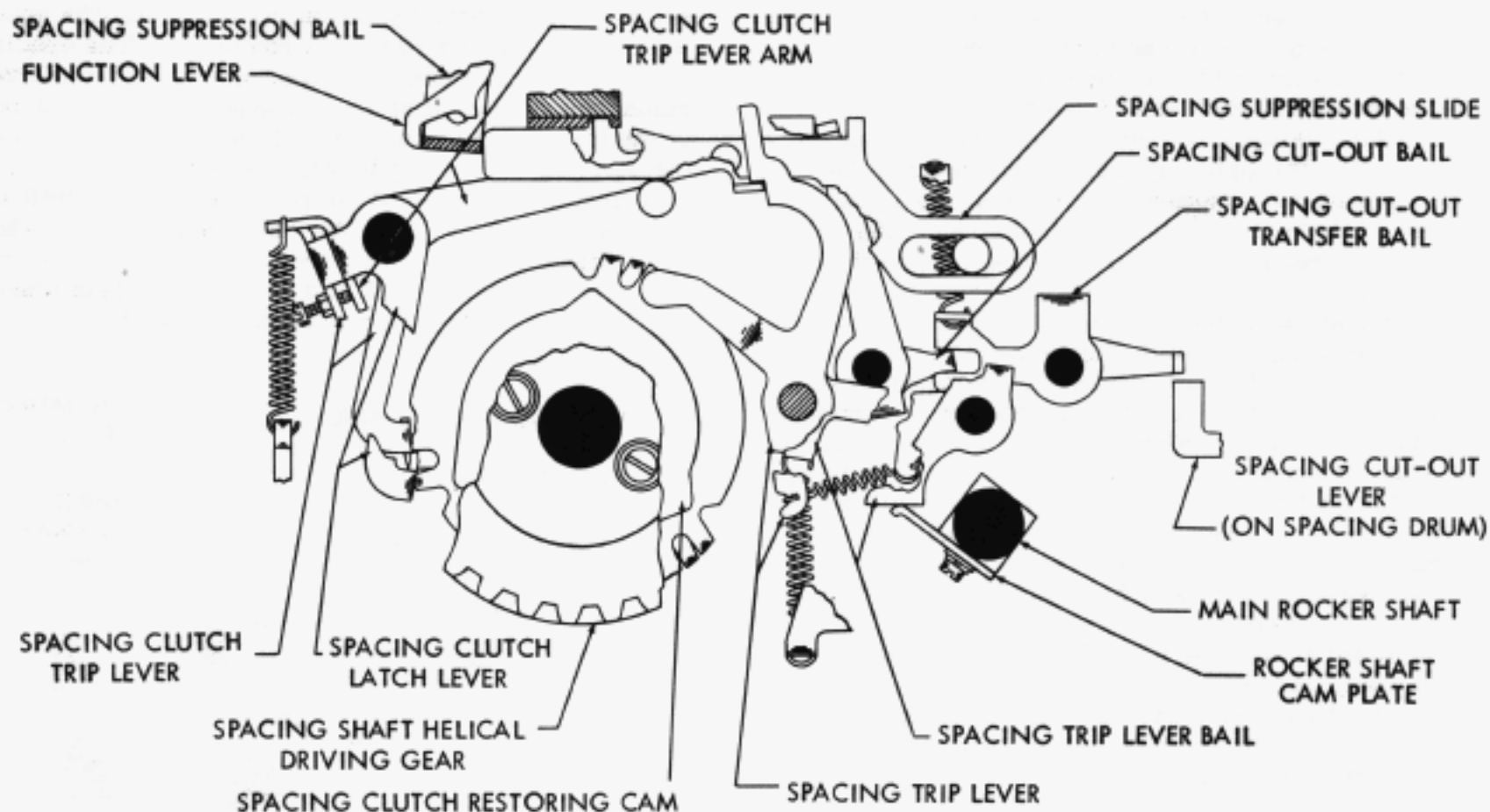


Figure 2-22 Spacing and Spacing Suppression Mechanisms

(2) Spacing Suppression: - When the carriages reach their extreme right positions, it is necessary to suppress spacing. This is accomplished by moving the spacing suppression slide forward. In this position, it will hold the upper end of the spacing trip lever forward and prevent it from engaging the spacing clutch trip lever arm. When the carriages are near their extreme right positions, an adjustable cutout ring on the spacing drum engages the spacing cut-out transfer bail which, in turn, operates the spacing cut-out bail. The adjustable spacing cut-out ring and the end of the spacing cut-out transfer bail are shown in figure 2-14. The spacing cut-out bail shifts the spacing suppression slide and prevents spacing until the carriages are returned. The Model 28 Projector Typing Unit is adjusted to print 46 characters per line at ten characters per inch.

g. RIBBON MECHANISM

(1) Positioning - 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 which are attached to the main side levers (figure 2-23). At their uppermost position, the ribbon mechanisms position the ribbon and platen relative to the line which is being printed. After each character is printed, the ribbon mechanisms are dropped downward together with the type box and platen in order that the last character printed may be projected. The ribbon is held in place at the point of printing by a ribbon guide which is fastened to the rear of the type box carriage.

(2) Feeding - Each of the ribbon mechanisms consists of a bracket which is hinged at its rear end, and upon which a ribbon spool shaft is mounted (figures 2-23 and 2-24). 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

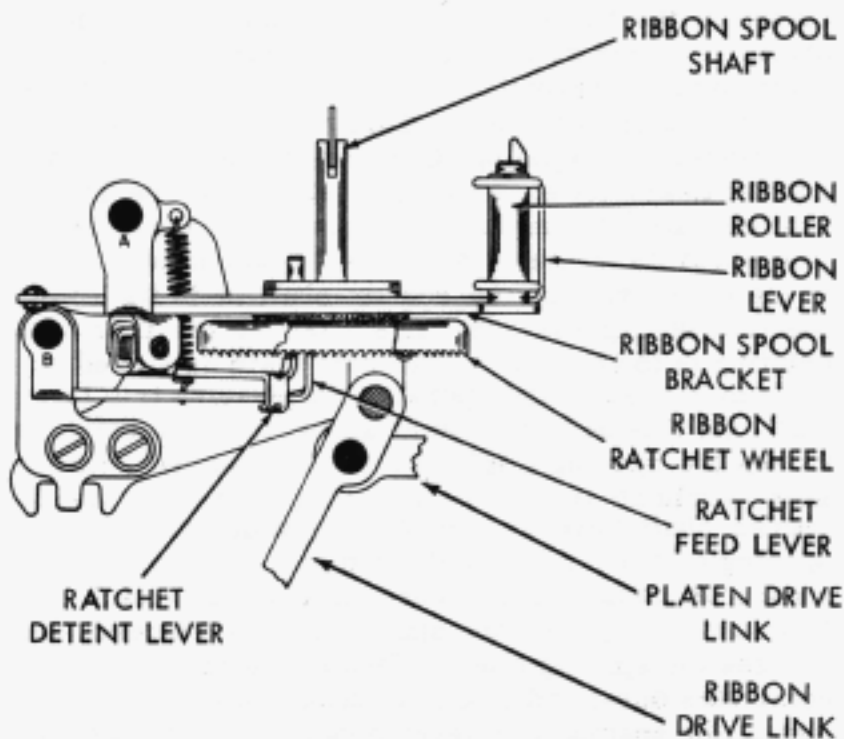


Figure 2-23 Ribbon Mechanism, Left Side



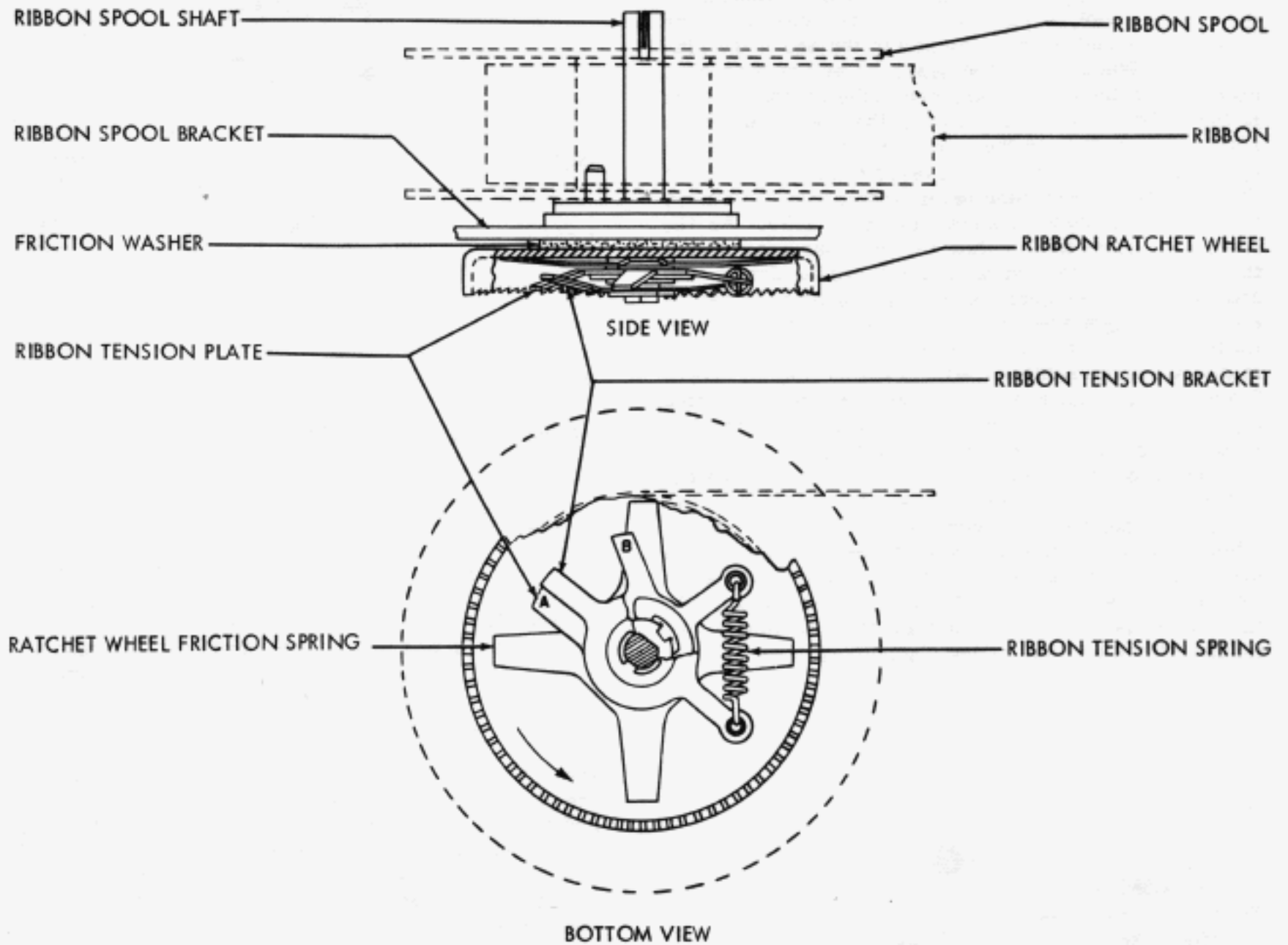


Figure 2-24 Ribbon Tension Mechanism

shaft just below the ribbon spool bracket from which it is separated by a friction washer. The ratchet wheel friction spring on the under side of the ribbon ratchet wheel causes the ratchet wheel to bear against the felt friction washer. This applies a constant drag to the ratchet wheel. A ribbon tension plate which is keyed to the hub of the ribbon ratchet wheel has two projecting lugs (A and B in figure 2-24) that 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 A in figure 2-23. The ratchet feed and ratchet detent levers pivot about points B and C respectively, and are held against the saw-tooth shaped teeth on the ribbon ratchet 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 clockwise and the right 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 with its ribbon ratchet wheel at a time. As the ribbon ratchet wheel turns (figure 2-24), 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 thus wound on the ribbon spool. When the ribbon has become 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 are engaged. The left set are held disengaged against the tension of their springs by the left ribbon feed reverse lever which is in its downward position (figure 2-25). 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 (figure 2-26) and through the slot in the end of the ribbon lever. When the ribbon nears its end on 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 dashed position shown in figure 2-25. 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 feed reverse lever downward to disengage the ratchet feed and ratchet detent levers from the right ribbon ratchet wheel. At the same time a pin on the left ribbon reversing lever moves the left ribbon feed reverse lever upward to permit the left ratchet feed and ratchet 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 ribbon spool, the ribbon is again reversed in a manner similar to that just described. During the reversing cycle the ribbon is maintained taut by the previously extended ribbon tension spring (figure 2-24).

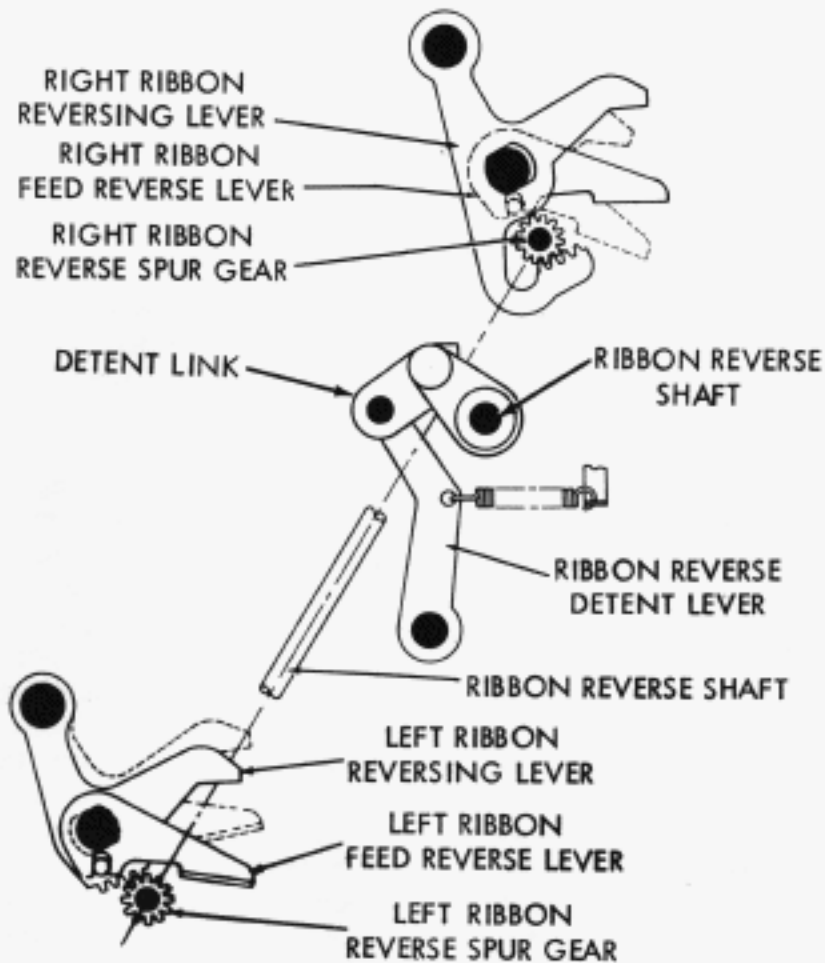


Figure 2-25 Ribbon Reversing Mechanism

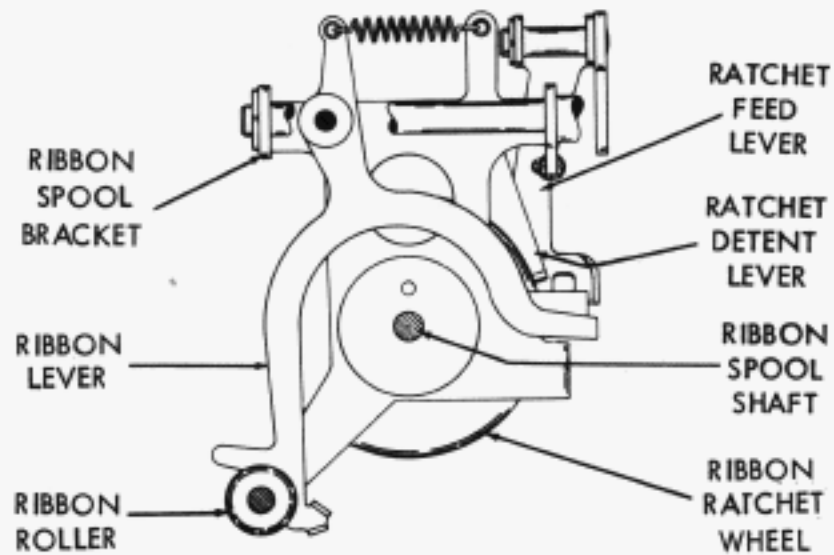


Figure 2-26 Ribbon Mechanism, Left, Top View

h. PLATEN

(1) The platen, which is located behind the type box and extends across the front of the typing unit between the right and left frames (figure 2-2), is pivoted at either end in a bronze bushing. This mounting permits the platen to move in an arc just behind the ribbon.

(2) Connected to the right and left platen hubs, which extend through the bronze bushings, are the platen drive links, two on each end pivoted together and to the ribbon drive links below the right and left ribbon feed assemblies (figure 2-27). In this way the motion of the ribbon drive links, described in paragraph 3g(1), is set-up in the platen drive links resulting in the oscillating motion of the platen simultaneously and in step with the motion of the ribbon and type box.

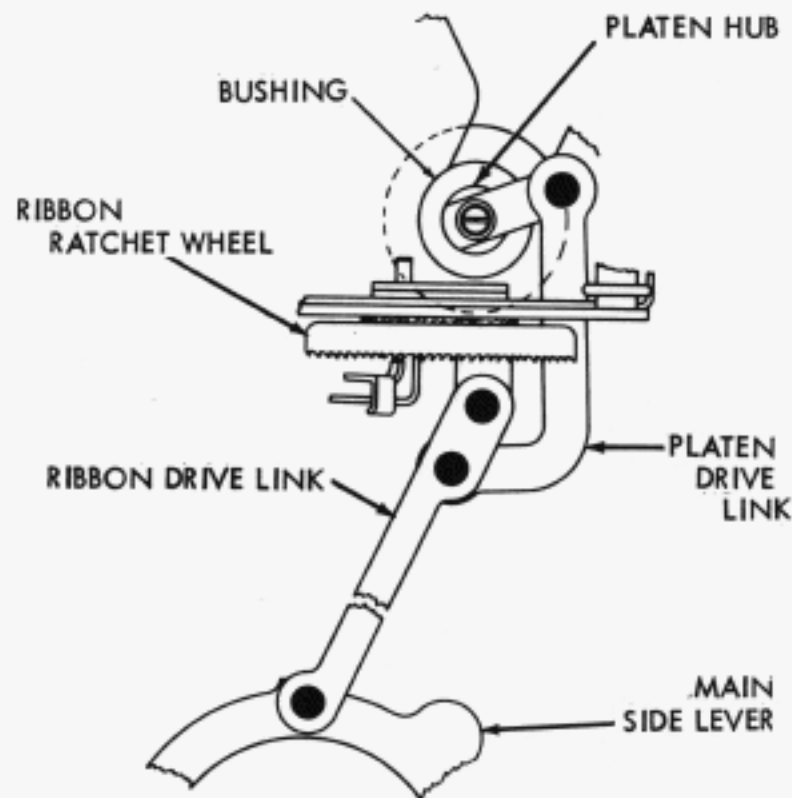


Figure 2-27 Platen Drive Mechanism

## 1. FUNCTIONS

## (1) GENERAL

(a) There are two types of operations which are performed by the Typing Unit. The first embodies those mechanical actions which are directly necessary to the actual printing of a character. The second embodies mechanical action which alters the positions of the various mechanisms and is known as a function.

(b) As in printing, the reception of the function codes results in the positioning of the code bars. The back edges of the code bars are notched. Positioned directly behind the code bars is the stunt box which contains the function bars for the various functions (figures 2-28 and 2-29). Each function bar has a series of lugs or tines on one end which are offset to one side or the other to correspond with the marking and spacing intervals of the particular code to which it is to respond. When the function clutch is tripped (paragraph 3e(2)(b)2 of this section, and figure 2-15), it rotates and extends motion to the function bar reset bail (through the intervening cam and follower arm, function rocker shaft, and reset bail drive links) to cause the function bar reset bail with its attached reset bail blade to release the function bars momentarily (figure 2-30). As the spring tensioned function bars are released, they move forward to make contact with the code bars. If the code bars are posi-

tioned for a function, each lug on the function bar for that function will be opposite a slot in a code bar. This will permit the selected function bar to move forward into the code bars while the other function bars are blocked by one or more code bars (figure 2-31). 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 2-32). When the function bar reset bail blade releases the function bars, any bar which may be selected will move sufficiently far forward (to the left in the figure) 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 in figure 2-33). 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 (paragraph 3f(2) of this section) and either the upper or lower ends of the levers operate the various functions. Near the completion of the function cycle, a stripper blade (operated by a cam on the function clutch assembly, figure 2-34) 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 positions (figure 2-32). It should be noted here that, to prevent printing during the function cycle, whenever a function selection occurs the type box is positioned such that the printing hammer will strike where there is no type pallet. The function clutch cam disk upon

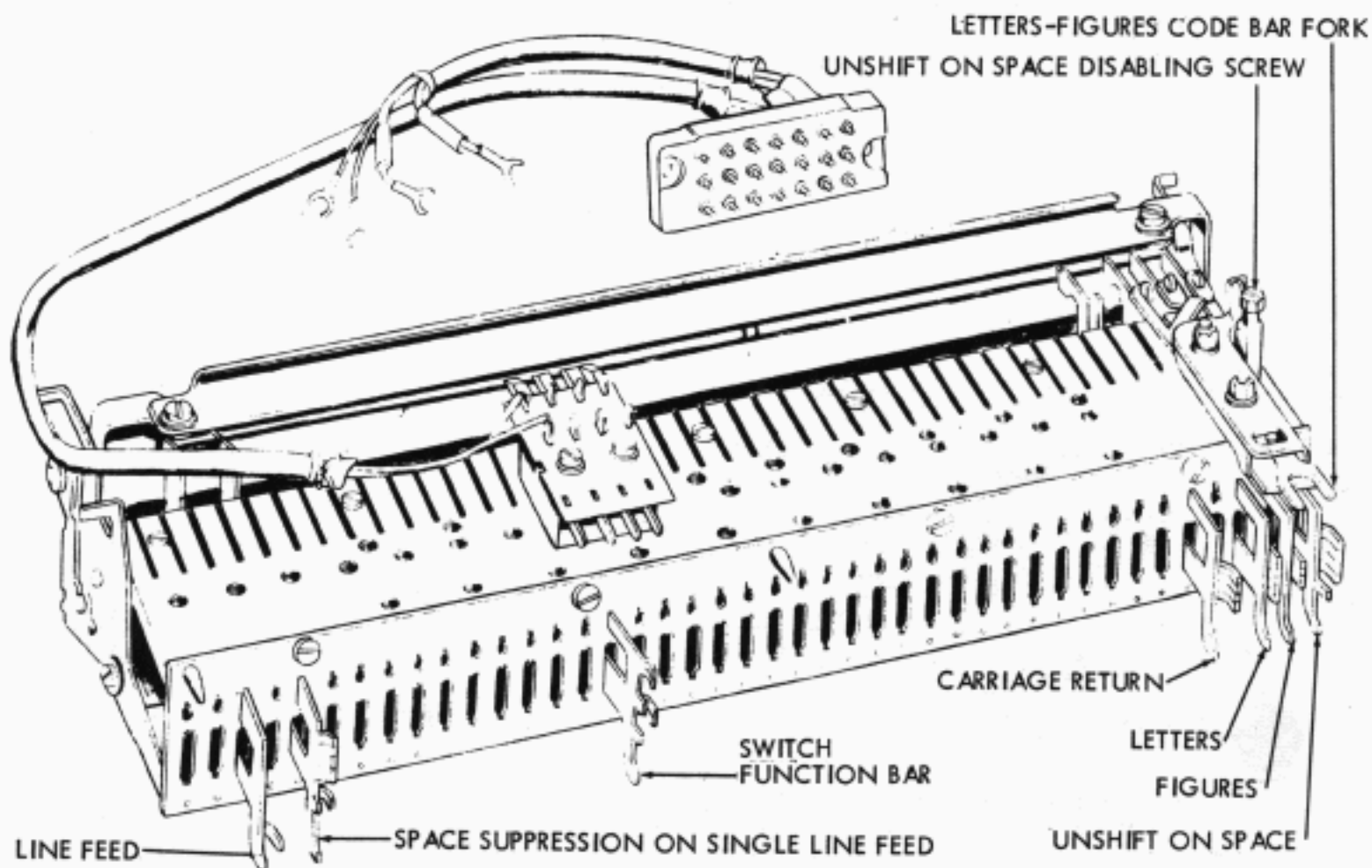


Figure 2-28 Stunt Box Showing Function Bars, Front View

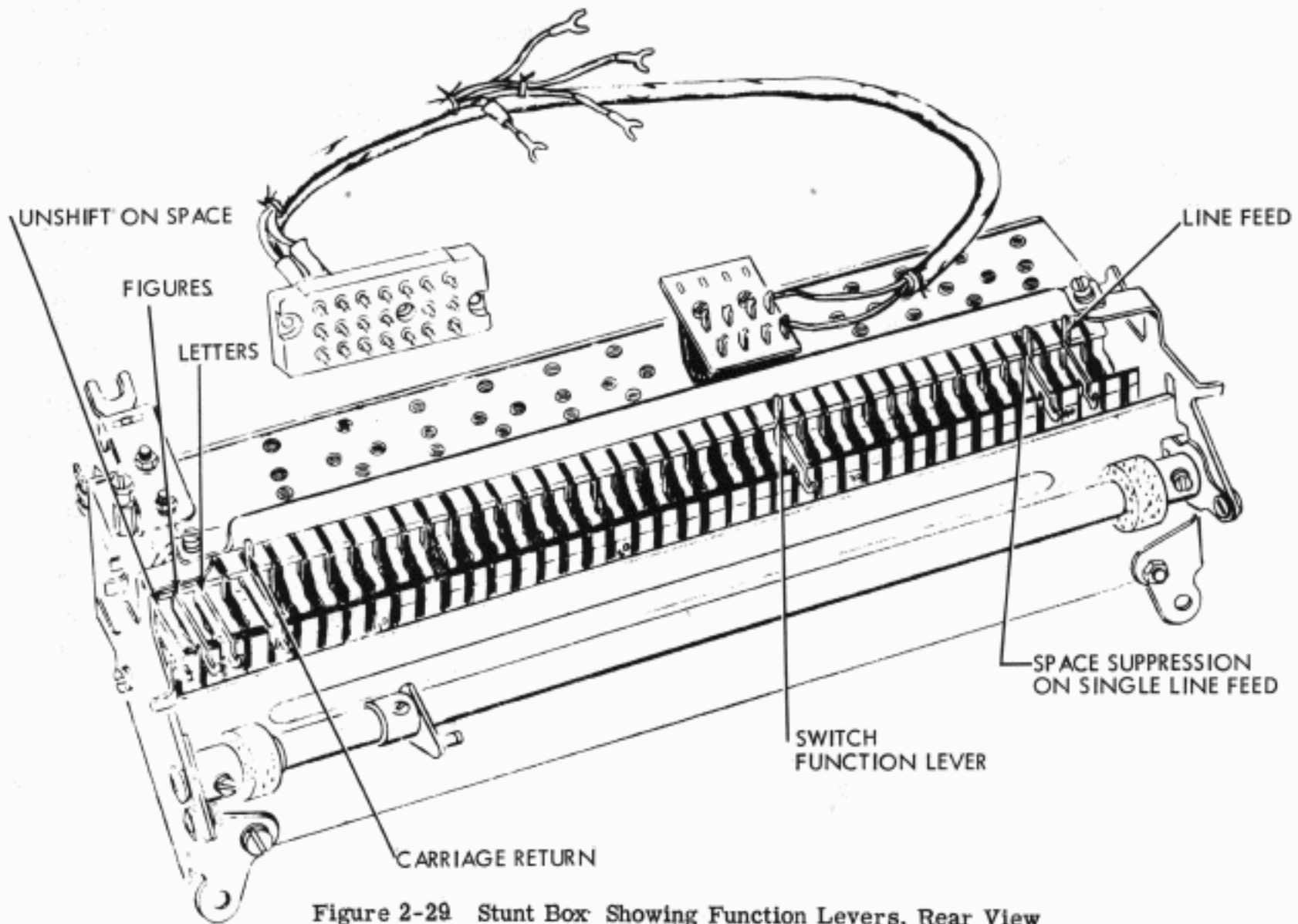


Figure 2-29 Stunt Box Showing Function Levers, Rear View

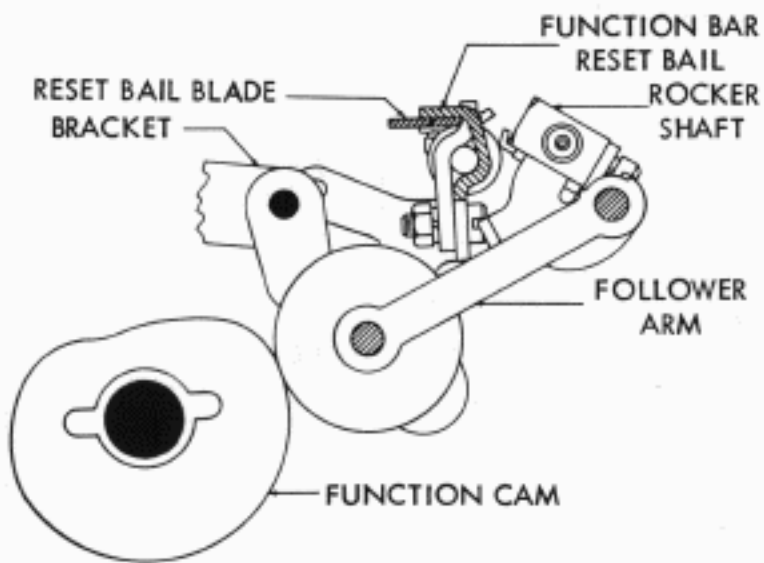


Figure 2-30 Function Reset Ball Mechanism

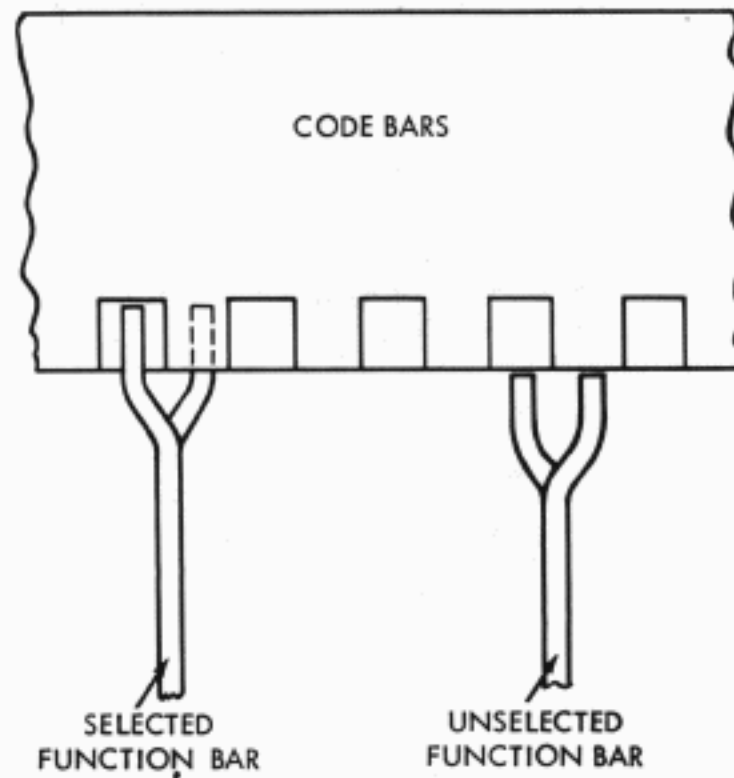


Figure 2-31 Function Selection, Top View



which the latch lever rides has an indent at the stop position. When the lug on the clutch shoe lever disk strikes the function clutch trip lever, 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 disk. At this point, 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) LETTERS AND FIGURES SHIFT FUNCTION

(a) The letters and figures function bars, pawls, and levers which are located near the right end of the stunt box operate on letters and figures codes

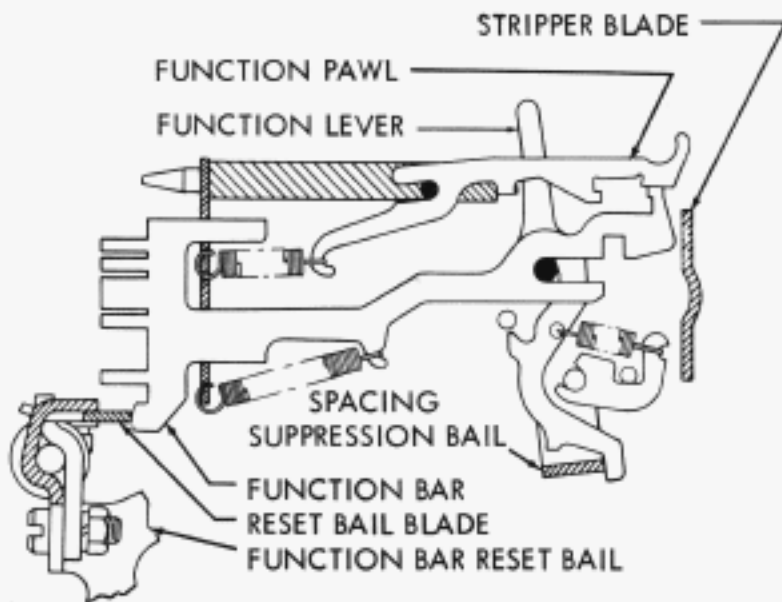


Figure 2-32 Typical Function Box Mechanism, Unselected

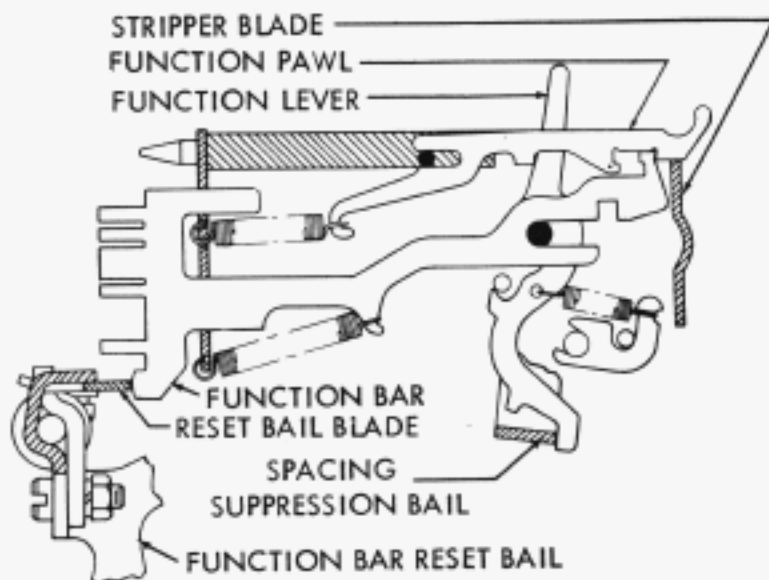


Figure 2-33 Typical Function Box Mechanism, Selected

respectively. The upper ends of the function levers engage the letters and figures function slides (figures 2-35 and 2-36). The front ends of these function slides have camming surfaces which, when a slide is shifted

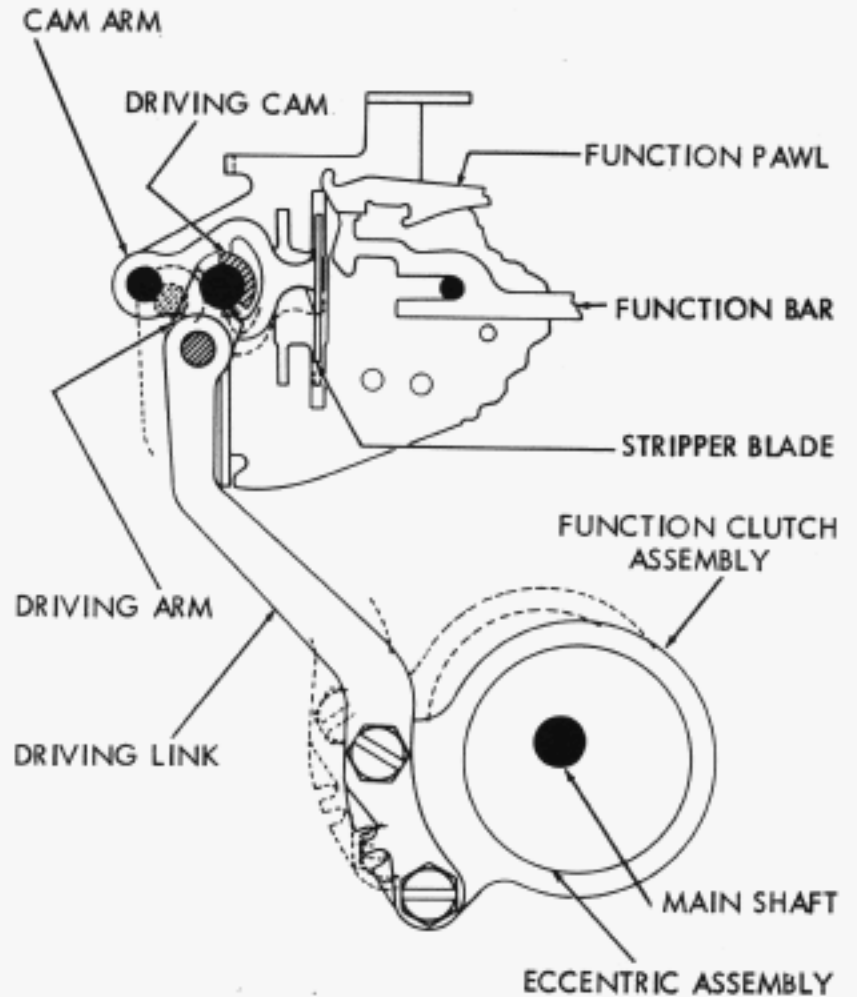


Figure 2-34 Stripper Blade Mechanism

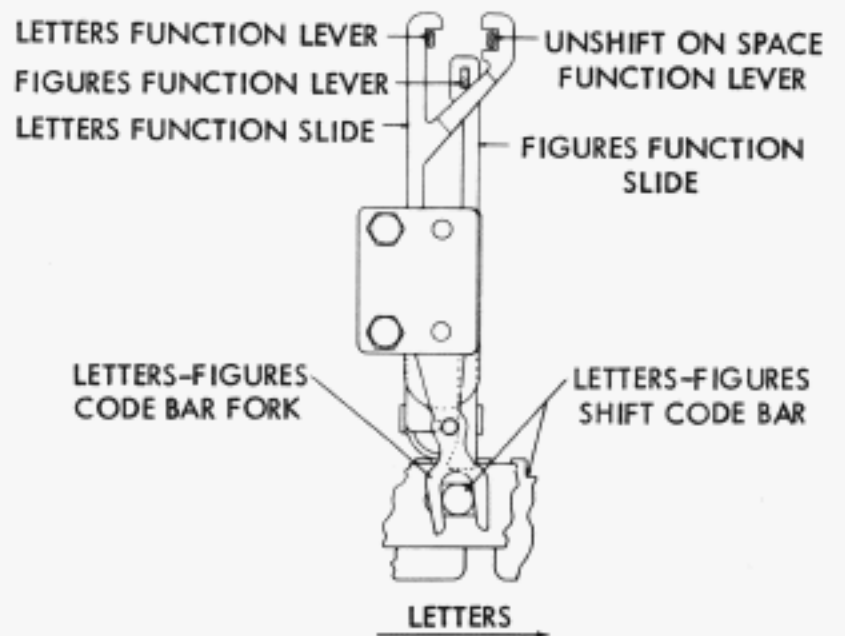


Figure 2-35 Letters-Figures Function Slides, Letters Position

to the rear by its function lever, move the letters-figures code bar fork to the right (letters position - figure 2-35) or to the left (figures position - figure 2-36). The letters-figures code bar fork engages a pin on the bracket which is fastened to the letters-figures shift code bar, and positions the code bar toward the right for letters function or toward the left for figures function (figure 2-37). A slotted extension of the code bar engages a tongue from the right end of the letters-figures shift slide and causes the shift slide to follow the movements of the code bar. 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. Mounted on the ends of the main bail are the left and right breaker slide bails. When letters function code is received, the shift slide is shifted to the right as shown. This places the left shift link breaker slide in a vertical position with its lower end over the left breaker slide bail. The right breaker slide is positioned such 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 while the left breaker slide bail engages the left breaker slide and moves it upward. This action causes the left oscillating rail shift links to break and shift the oscillating rail to the right for the printing of LTRS characters. In a similar manner, when figures function code is received, the right oscillating rail shift links are broken and the rail is shifted to the left for the printing of FIGS characters.

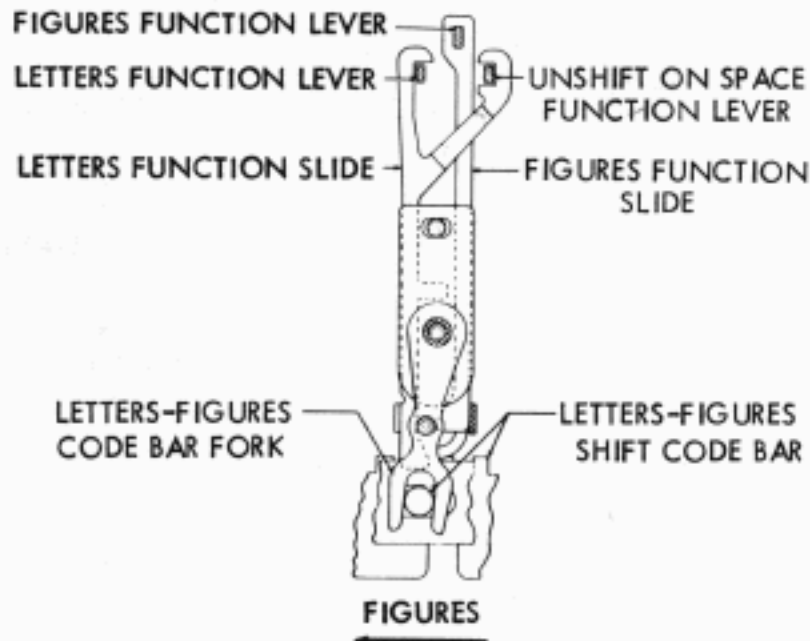


Figure 2-36 Letters-Figures Function Slides, Figures Position

(3) SPACING FUNCTION

(a) SPACING - Spacing between words or any spacing other than that which accompanies printing occurs in response to number 3 marking pulse in the Selector, whether the unit is in the FIGS or LETTERS position. The function operates in the manner described under SPACING, paragraph 3f(1), of this section. However, as in all the functions, printing does not occur.

(b) UNSHIFT ON SPACE (If Present) - A function bar which operates on spacing code is located at the right end of the stunt box. Its associated function lever engages an extension of the letters func-

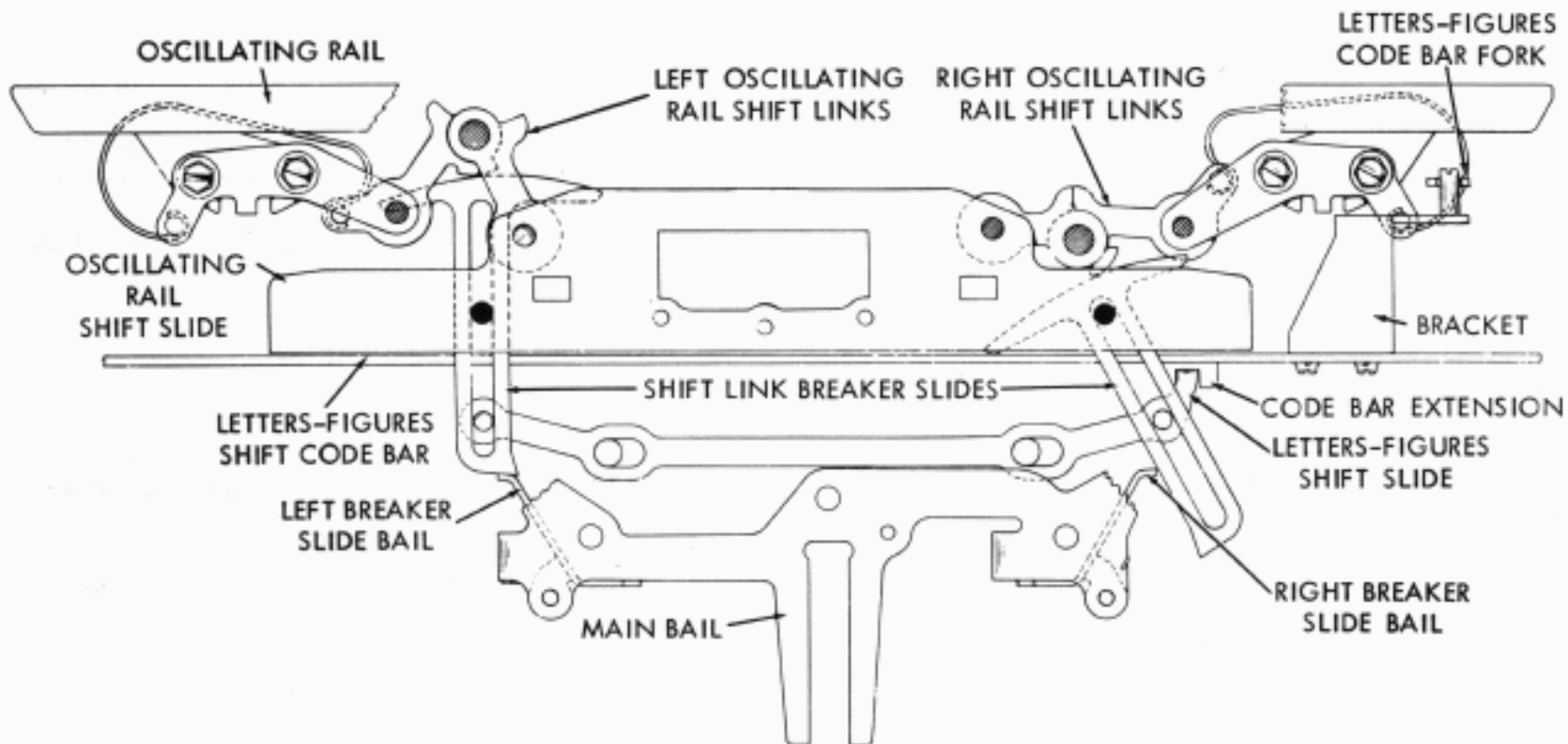


Figure 2-37 Letters-Figures Shift Mechanism, Letters Position

tion slide (figure 2-38). Thus, when a spacing function occurs, letters shift will take place in the manner described in paragraph 3i(2). The projection at the lower end of the spacing function lever is removed in order not to operate the spacing suppression bail which would suppress spacing. When it is undesirable to use the unshift on space feature, the mechanism may be disabled. This is accomplished by turning a screw (located over the front end of the function pawl) downward until the rear end of the pawl is raised to clear the function bar.

**NOTE**

The space function bar must be in its rearmost position when turning the screw down.

(4) **CARRIAGE RETURN FUNCTION** - The carriage return function mechanism is located in the right end of the Typing Unit. Reception of the carriage return code causes the carriage return function bar, pawl, and lever to operate (figure 2-39). The lower end of the function lever engages the carriage return slide arm and pushes it forward (toward the left in the figure). The slide arm, in turn, moves the

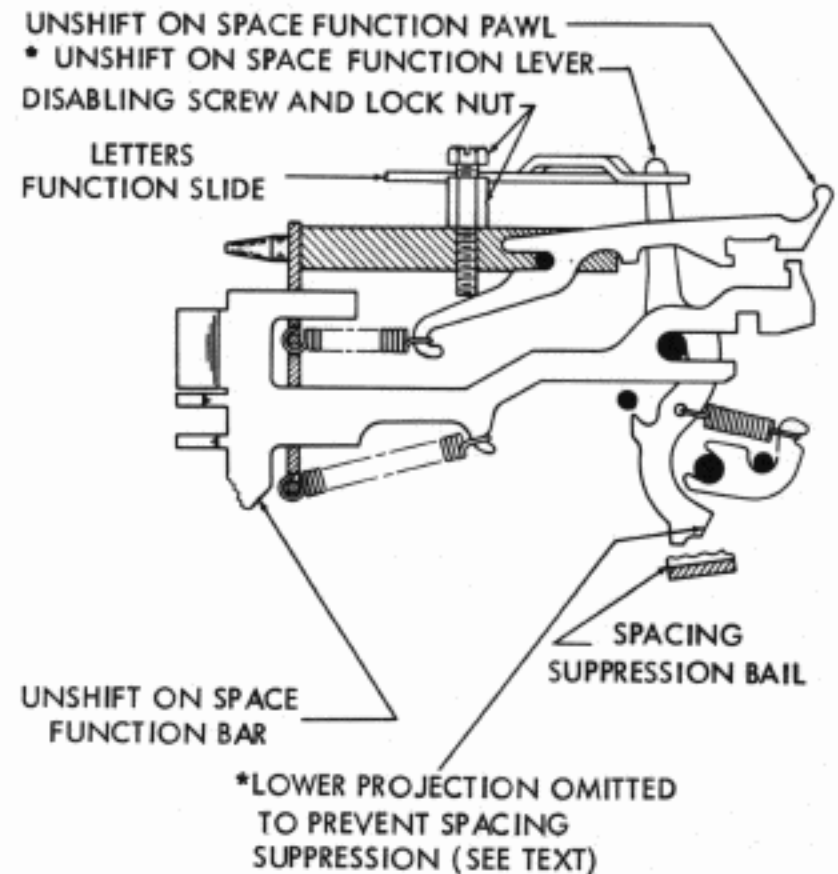


Figure 2-38 Unshift on Space Function Mechanism, Disabled

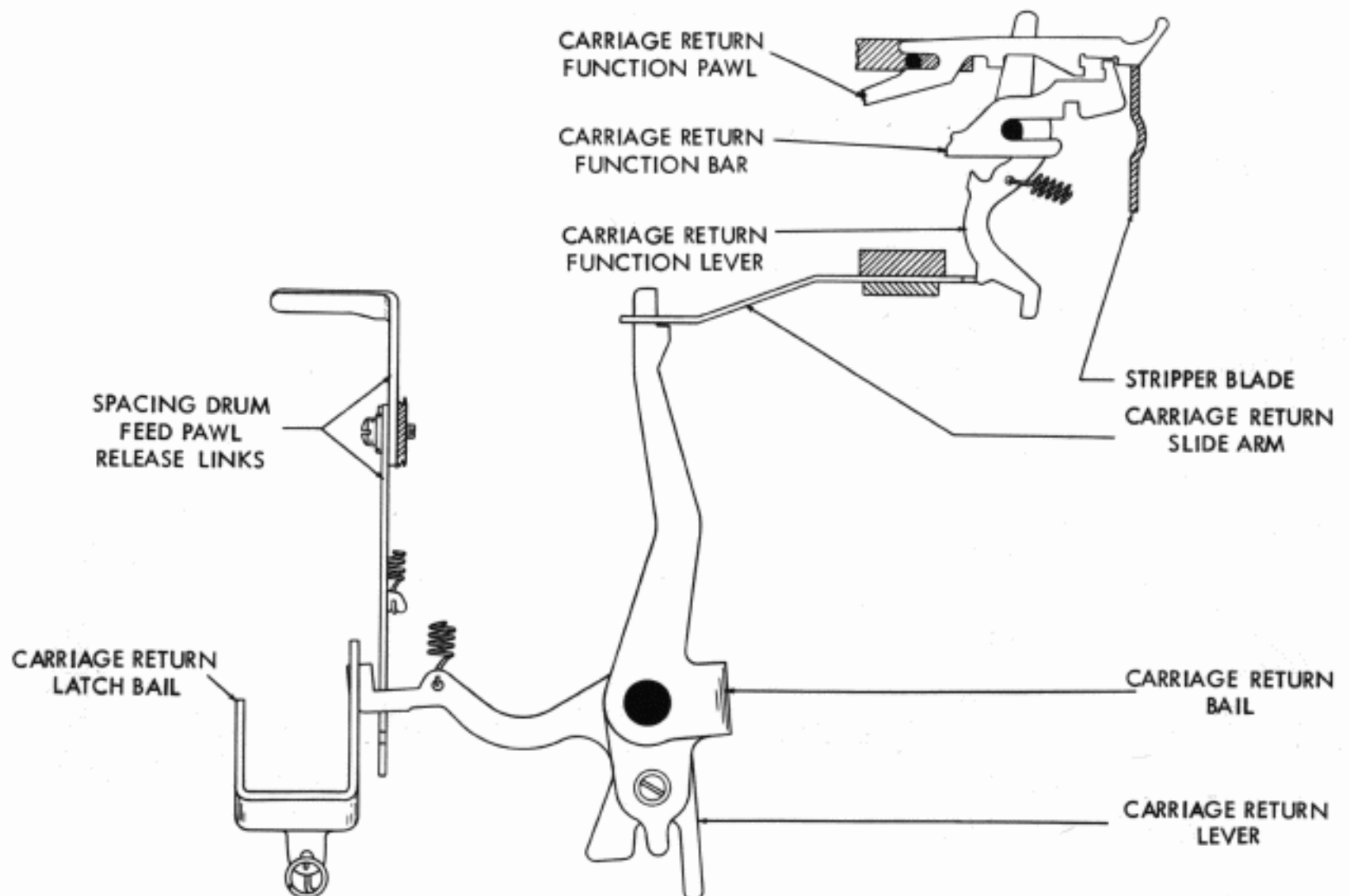


Figure 2-39 Carriage Return Function Mechanism

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 2-40). When the carriage return lever reaches its 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 counter-clockwise rotation, the roller on its 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 lines 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 counter-clockwise 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.

(5) LINE FEED FUNCTION

(a) The line feed function mechanism is located in the left end of the Typing Unit. The reception of the line feed code causes the line feed function bar, pawl, and lever to operate (figure 2-41). The lower end of the line feed function lever engages the line feed slide arm and pushes it forward (to the left in the figure). The slide arm, in turn moves the line feed clutch trip arm and the trip lever about their pivot point 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 web the equivalent of 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 of

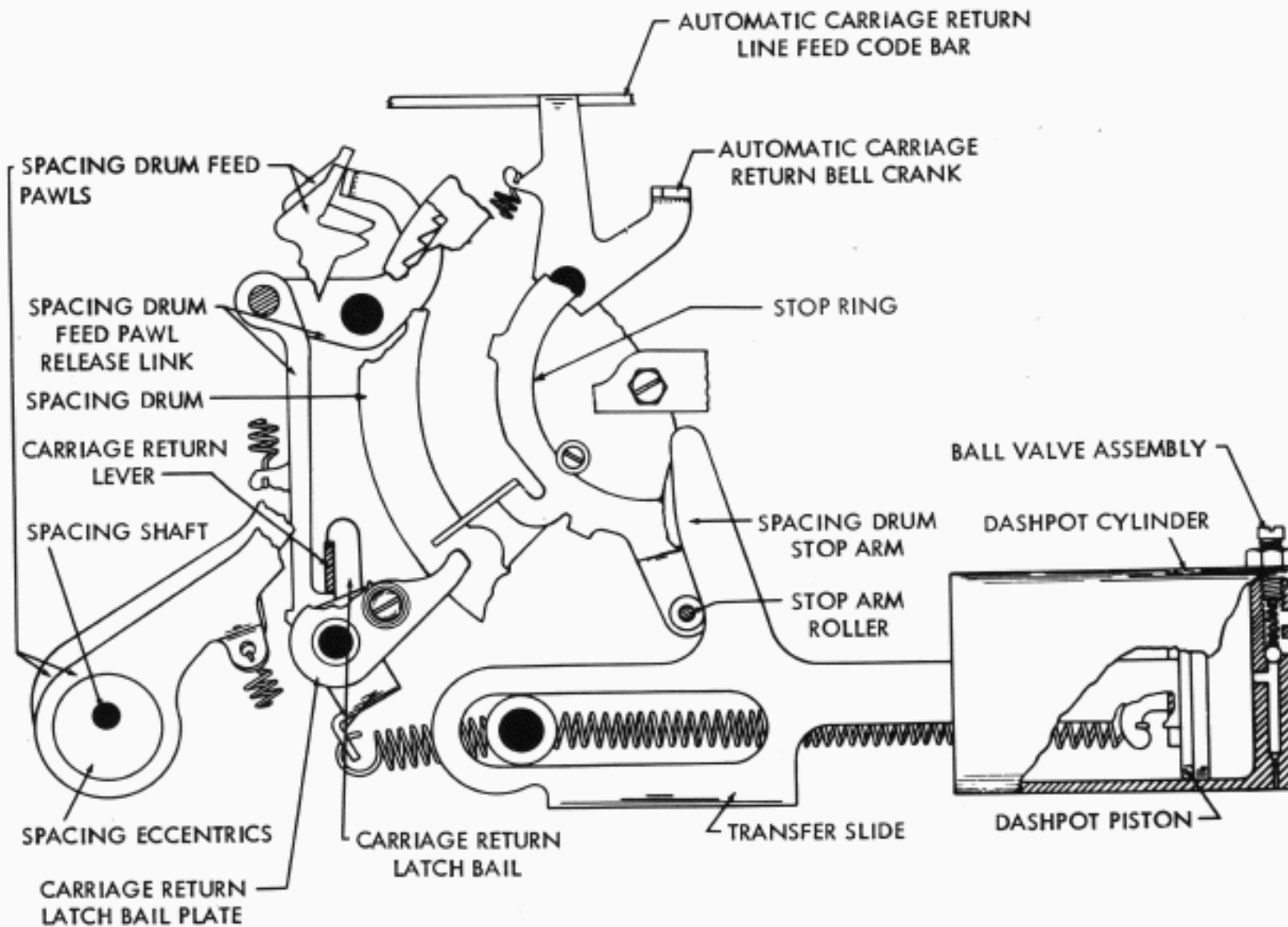


Figure 2-40 Carriage Return Mechanism



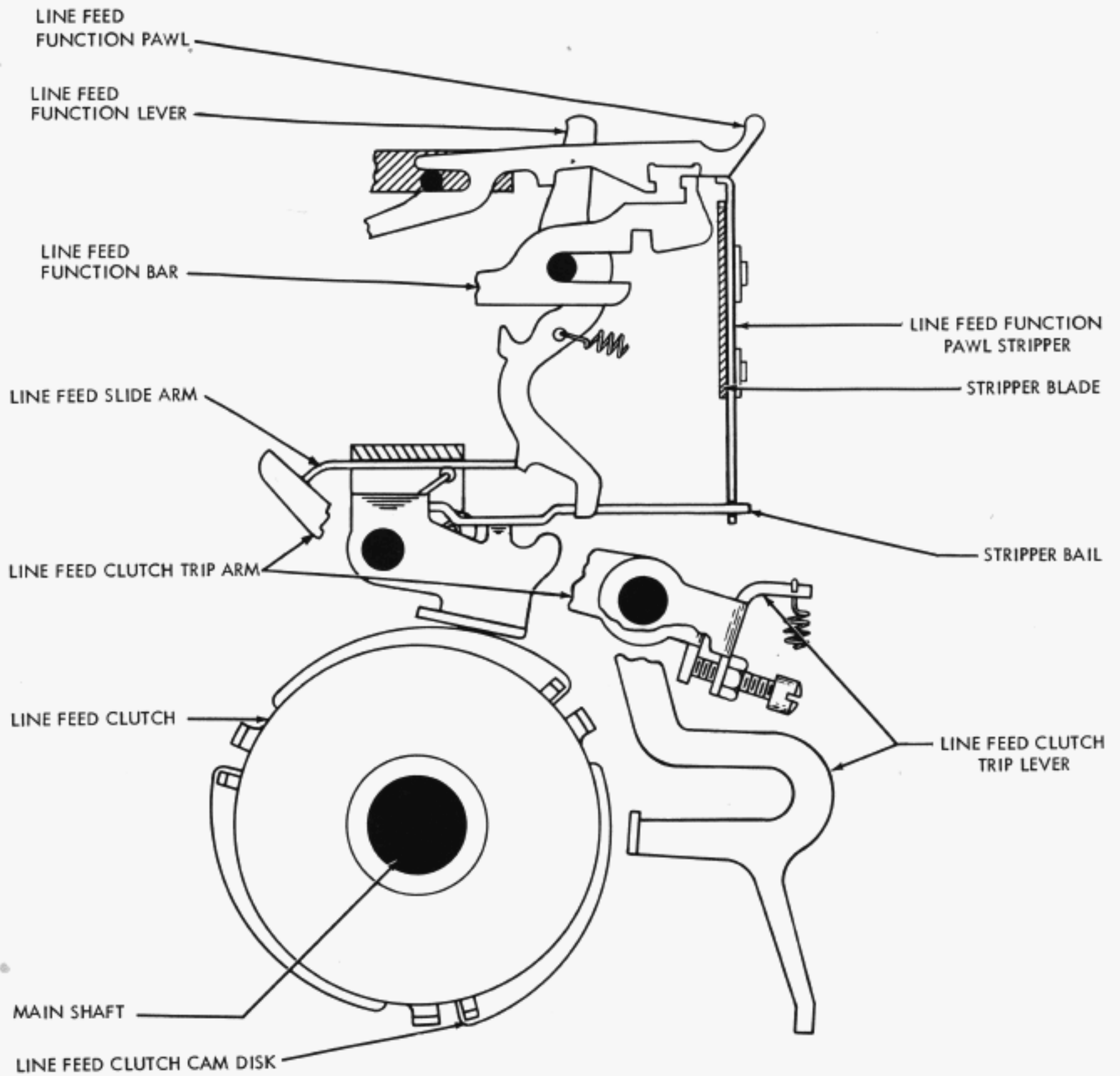


Figure 2-41 Line Feed Function and Clutch Mechanism.

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 use of a line feed function pawl stripper which is mounted on the main stripper blade under the line feed function pawl (figure 2-42) and the automatic line feed function pawl, if present. The line feed function pawl stripper is slotted so that vertical motion on its mounting studs will strip the line feed function pawl from its associated function bar. The lower end of the line feed

function pawl stripper has a horizontal slot which is open at one end and in which the stripper bail arm rides. The cam disk on the three-stop line feed clutch furnishes the motive force to operate the line feed function pawl stripper bail once each one-third revolution of the line feed clutch. The stripper bail arm may be shifted to the right or left out of engagement or into engagement with the horizontal slot in the line feed function pawl stripper by action of the single or double line feed lever (figure 2-42). The upper end of the pivoted single or double line feed lever protrudes from the upper left rear portion of the Typing Unit where it rides in a two position side frame detent. When the lever is in position #1 the stripper bail arm

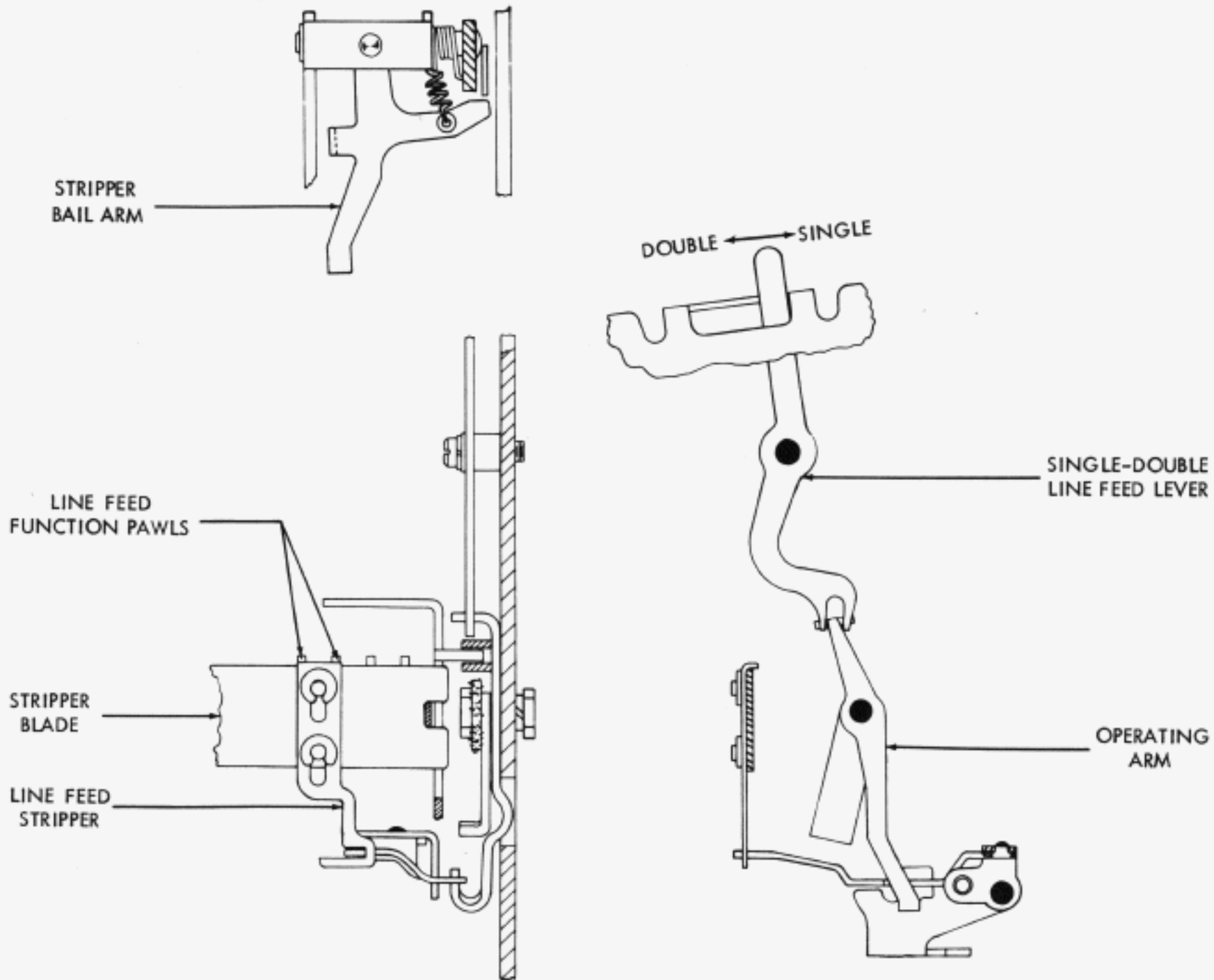


Figure 2-42 Single-Double Line Feed Positioning Mechanism

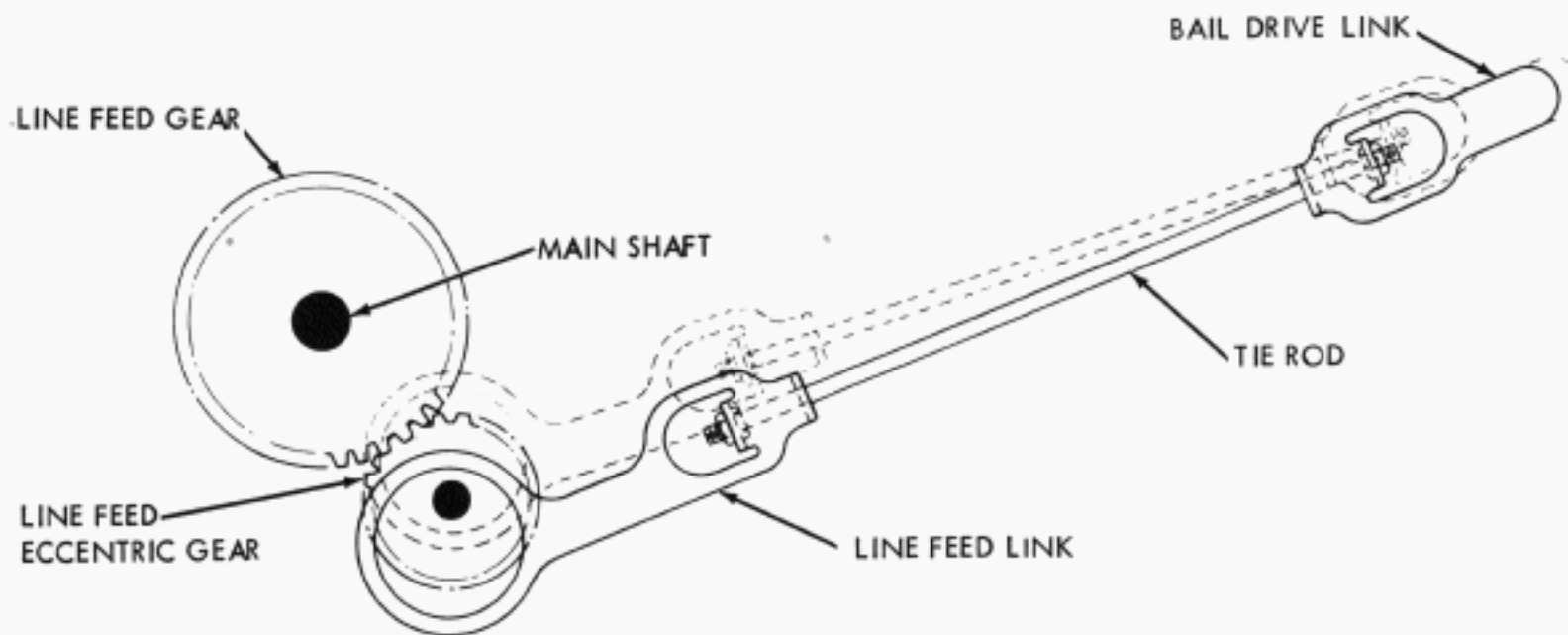


Figure 2-43 Line Feed Mechanism

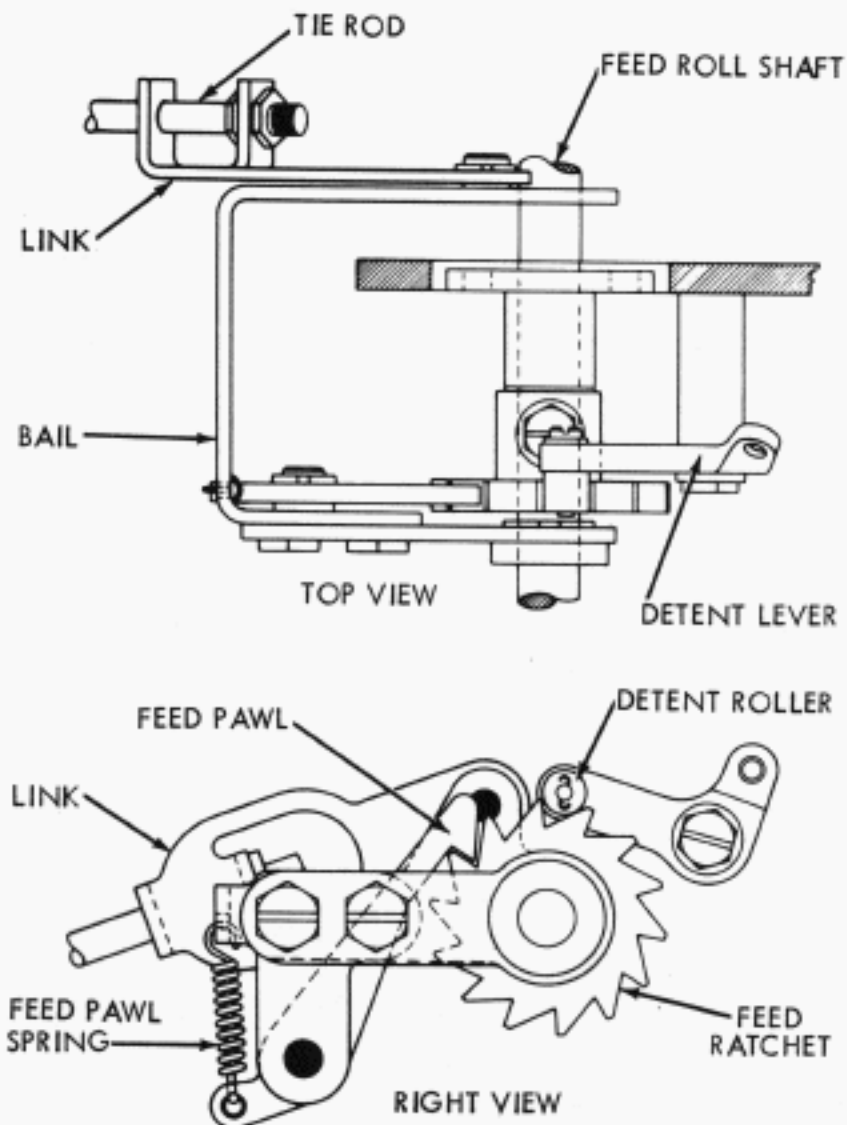


Figure 2-44 Line Feed Mechanism

is moved into the slot at the bottom of the line feed function pawl stripper applying vertical motion to strip off the line feed pawl. When the lever is in position #2 the stripper bail arm is moved to the left, out of the slot in the line feed function pawl stripper, so that the vertical motion is not transferred to the stripper. In the double line feed position, the line feed function pawl will be stripped off by the main stripper blade. All other function pawls are stripped by the main stripper blade regardless of the position of the line feed selector lever. 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 the left end of the stunt box for the sole purpose of suppressing spacing on single line feed function (figure 2-28). This mechanism which always operates on the line feed function code, is released only by the stripper blade, and therefore holds the spacing suppression bail operated until the spacing cycle is completed. After the line feed clutch is stopped by its trip lever, it is disengaged by the trip lever and latch lever in the same manner as the three-stop spacing clutch.

(b) Each one-third revolution of the line feed clutch causes its attached spur gear to rotate the line feed eccentric spur gear, and its attached eccentric, one-half of a revolution (figure 2-43). A line feed link is operated by the line feed eccentric. The line feed link is connected to the transparent web feeding mechanism (figure 2-44) by a tie rod which extends toward the rear of the Typing Unit. The web feeding mechanism consists of a roller, mounted between two brackets, to which a feed ratchet is attached. A feed

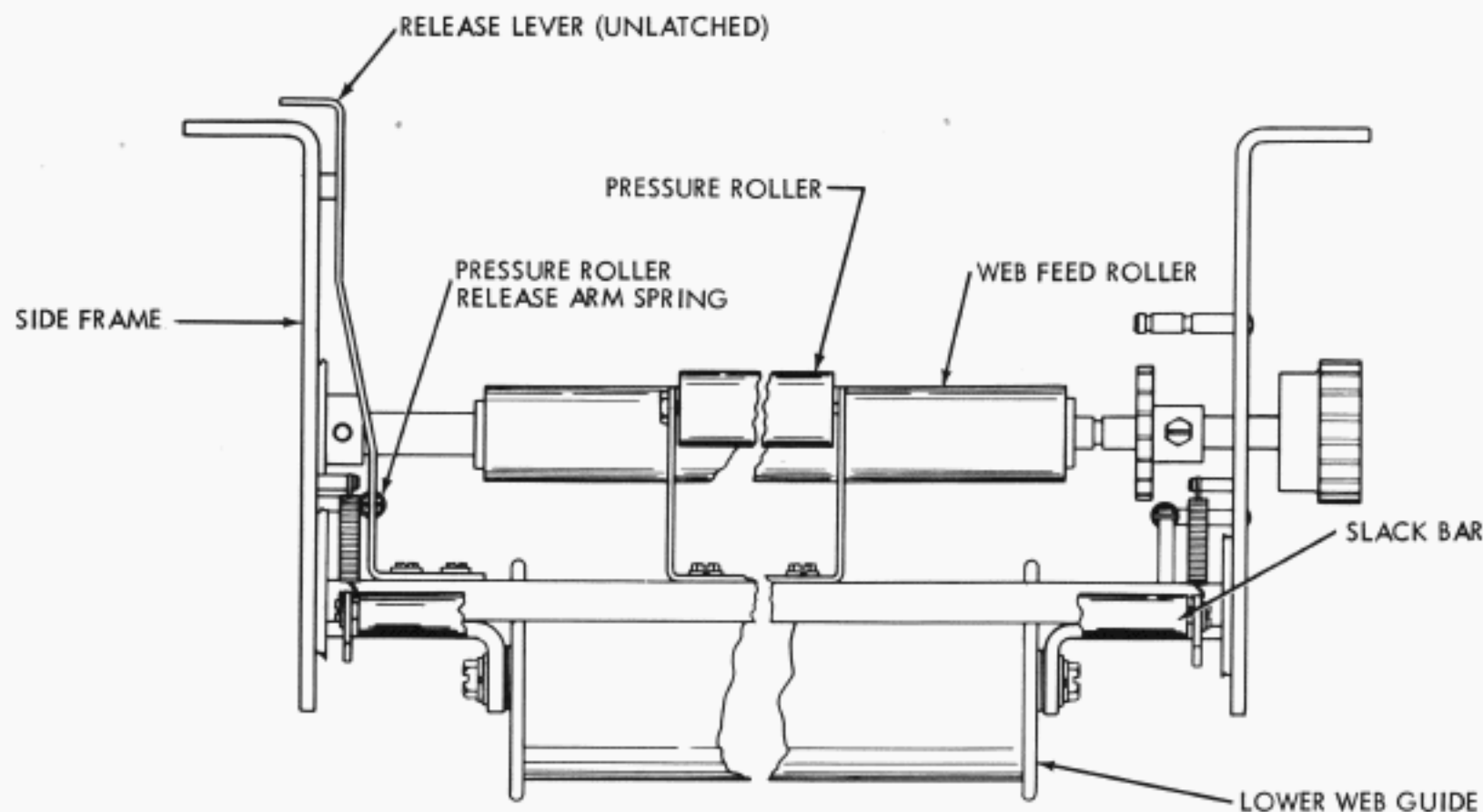


Figure 2-45 Web Feed Mechanism

pawl, connected to the tie rod by means of a bail and a link, engages the feed ratchet. Rotation of the line feed eccentric one-half turn from its highest position causes the feed pawl, which is resting between two teeth on the feed ratchet, to ride up and engage the next tooth on the ratchet and then pull down against this tooth rotating the feed roller and advancing the web the equivalent of one line. Rotation of the line feed eccentric the second half turn pulls the feed pawl against the same ratchet tooth again, rotating the feed roll the equivalent of another line, and, as the eccentric swings upward through the last 90 degrees of its orbit, pushes the feed pawl up one tooth on the ratchet. For each complete revolution of the line feed eccentric the line feed pawl advances the feed ratchet two teeth against its detent, then the pawl rides up on the ratchet over two teeth into position to advance the web again. Thus it can be seen that line feeding occurs, one line in the second quarter, and one line in the third quarter of each revolution when the cycle begins with the eccentric in its highest position. The feed ratchet detent roller positions itself between two teeth on the ratchet to hold the feed roller in the position to which it has been advanced.

(c) A pressure roller mounted to the rear of the feed roller applies pressure against the feed roller to gain positive traction on the transparent web that passes between the two rollers (figure 2-45). In order to facilitate threading the web, pressure of the roller is released by moving the pressure roller release lever to its latched position. Pressure is returned to the web by unlatching the lever. A knob mounted on the left end of the feed roller shaft provides for manual feeding of the transparent web. A series of rollers guide and align the web as it passes forward and up to the rewind assembly.

(6) BLANK FUNCTION - A function bar, coded to operate when the signal code for blank function is received, may be installed in the stunt box, along with its associated pawl and lever, to operate a switch, mounted so that it is actuated by the operated function lever. Leads from the switch contacts may be brought out to the connector on the Typing Unit frame for auxiliary purposes. If the blank function bar has been omitted a clip is used to hold the function pawl away from the stripper blade.



## 4. MOTOR UNITS (Figures 2-46 and 2-46A)

## a. Synchronous Motor

(1) Rotary motion for operating the Projector Typing Unit is provided by a motor mounted on the right rear corner of the Receiving-Only Base. The synchronous motor is for use with single phase, 115 volt (plus or minus 10 per cent) alternating current, at a frequency of 60 cycles per second (plus or minus 0.5 cycle). It is a 1/20 horsepower, 3600 rpm, two pole wound stator, ball bearing motor, with a squirrel cage type rotor. The stator has two windings; a main operating winding and an auxiliary (figure 2-47). The auxiliary winding is in series with a 43 mf a. c. electrolytic capacitor and with a current-operated motor-starting relay. The initial starting current, 9 amperes, causes the relay to pull up and its contacts close the auxiliary winding circuit. As the rotor gains speed, the current flowing through the motor (and also the relay coil) decreases. When a predetermined current value is reached, 1.85 amperes, the relay armature is released, the relay contacts are opened, and the auxiliary winding circuit is disconnected from the line. The rotor continues to accelerate until it reaches synchronous speed (3600 rpm). The motor is wired in such a manner that the rotor rotates counter-clockwise when viewed from the fan end.

(2) The starting relay and capacitor together with a thermal cut-out switch are mounted in a compartment on the underside of the motor. The thermal cut-out switch is in series with both the main and auxiliary motor windings, and if excessive current is drawn by the motor (due, for example, to a blocked rotor) the switch will open the circuit. This is to prevent overheating and possible damage to the motor if it is stalled. The switch may be manually reset, if tripped, by depressing the red button which projects upward through the motor mounting plate. There are two fans located within the motor housing, one at each end of the rotor. These draw cooling air in through the slots of the end bells and exhaust it through the slots in the motor housing. The end bells have rubber vibration mounts on which the motor rests in its mounting bracket. The rubber mounts are held in the bracket by means of mounting straps. The motor shaft has a tapped hole for use in fastening the intermediate driving helical gear. All end play is taken up by means of a conical shaped spring which bears against the outer race of one of the ball bearings. The motor mounting bracket is fastened to the base by means of four screws and lockwashers.

## b. Series or Governed Motor

(1) The series governed motor is for use with a single phase, 115 volt (plus or minus 10 per cent) alternating current, at a frequency of 50 to 60 cycles per second. It is a 1/20 horsepower, 3600 rpm ball bearing motor which depends on an electro-mechanical governor for its speed regulation. The armature is wired in series with two field windings and the governor contacts. A 250 ohm, 40 watt resistor and a 0.5 mfd capacitor are connected in parallel with the governor contacts. When the contacts are closed, the resistor is shorted out. When the contacts are open,

the resistor is in series with the motor to limit its operating current and reduce its speed. The capacitor serves as a spark suppressor for the governor contacts. Normal starting current is 2.0 amperes, running current 1.6 amperes, and rated torque 14.0 ounce inches.

(2) The combination fan and governor is mounted on one end of the motor shaft. The fan draws cooling air through the motor housing and also serves as a mounting plate for the governor slip rings and for the governor contact mechanism (mounted on opposite sides of the fan). Connections to the two slip rings, which are wired to the governor contacts, are made by means of two brushes mounted on the ends of the motor housing. Normally the governor contact spring holds the governor contact against the contact screw (figure 2-47A). When the motor shaft exceeds a predetermined speed, the centrifugal force developed on the governor contact briefly overcomes the pull of the governor spring, and the governor contact leaves the contact screw until the motor slows down. The tension on the contact spring may be adjusted to maintain the motor speed at 3600 rpm.

(3) Means are provided to compare the motor speed with a standard in making the contact spring tension adjustment. An aluminum cover fits against the side of the fan and encloses the governor contact mechanism. The outside of the cover is finished in white, with four black stripes equally spaced about its periphery. This serves as a target which should appear to stand almost still at 3600 rpm, when viewed through the moving shutter of a 120 vibrations per second tuning fork.

## NOTE

The six spot and thirty-five spot rows serve as targets when using an 87.6 cps tuning fork. The six spot target is used to approach an on-speed setting, and the thirty-five spot is used to arrive at an accurate setting.

(4) The two motor brushes are protected by 0.5 mfd capacitors connected between the brushes and the grounded frame of the motor (figure 2-47B). These tend to by-pass any electrical noise created by the brushes as they make and break contact with the various segments of the armature commutator. The motor is wired in such a manner that the armature rotates counterclockwise when viewed from the governor end.

(5) The method of mounting the series motor is similar to the method of mounting the synchronous motor. The housing provided on the underside of the mounting bracket contains both the 250 ohm resistor and 0.5 mfd capacitor in the governor circuit, as well as an electrical noise suppressor. The purpose of the electrical noise suppressor in the motor input circuit is to prevent any radio interference which may be generated by the motor from being radiated by the motor power leads. To prevent this disturbance from being radiated directly from any of the motor components or wiring, the entire ac motor is enclosed by grounded metal housings with screened openings. The screening is to permit the circulation of cooling air through the motor and across the governor resistor, and also

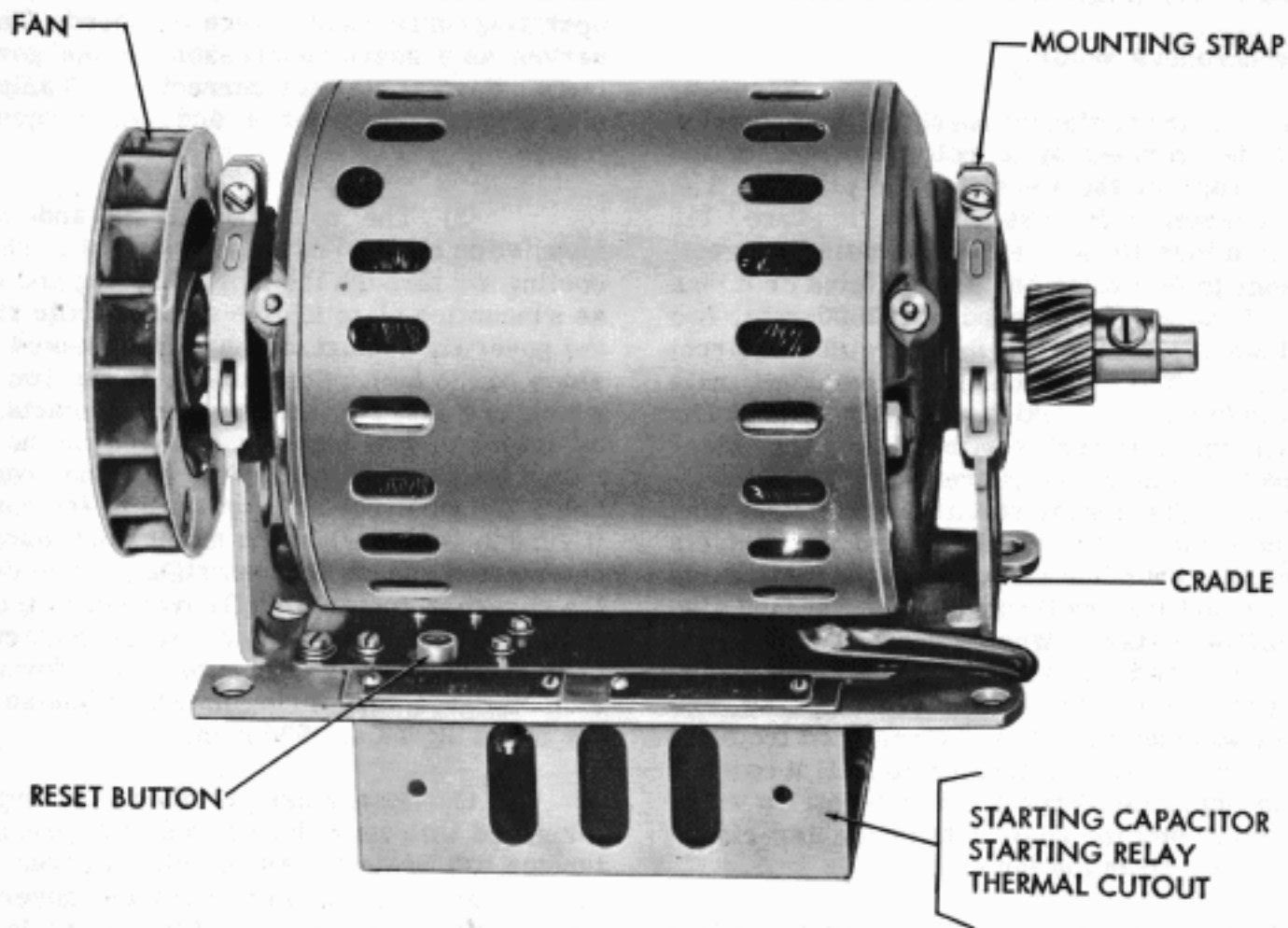


Figure 2-46. Synchronous Motor Unit

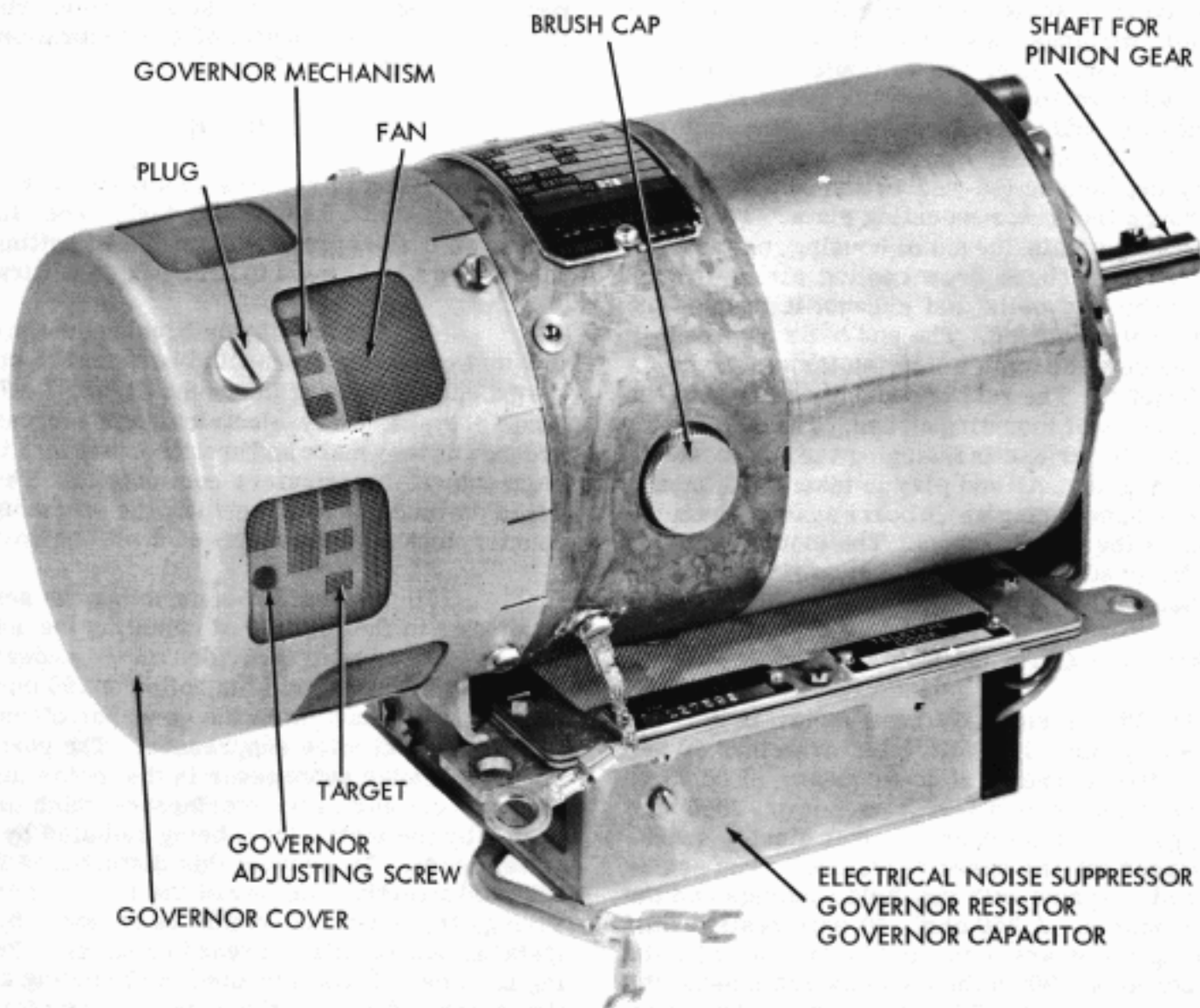


Figure 2-46A. Governed Motor Unit

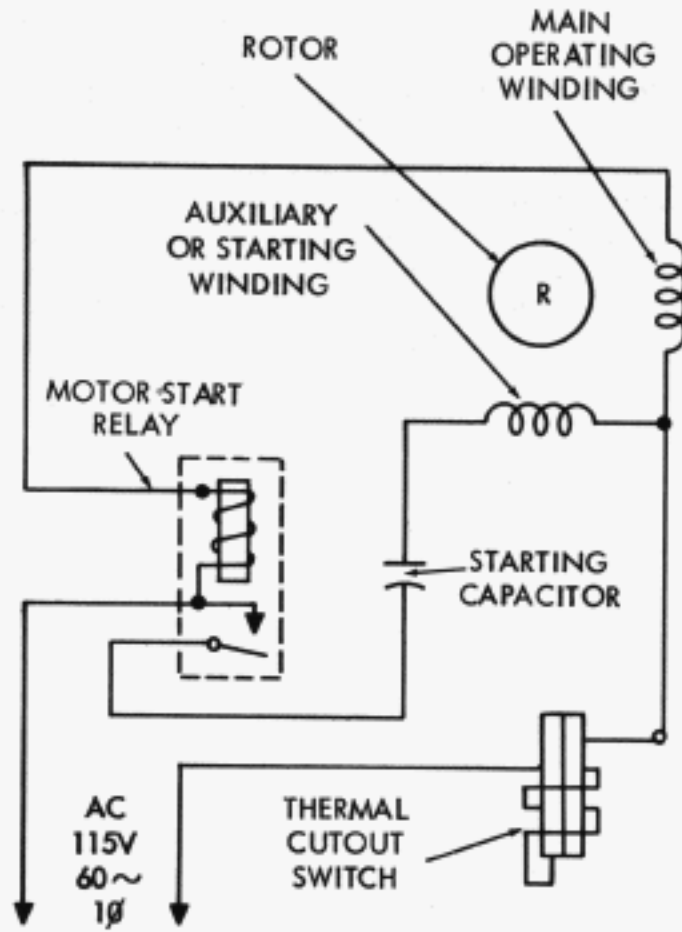


Figure 2-47. Schematic Wiring Diagram of Synchronous Motor

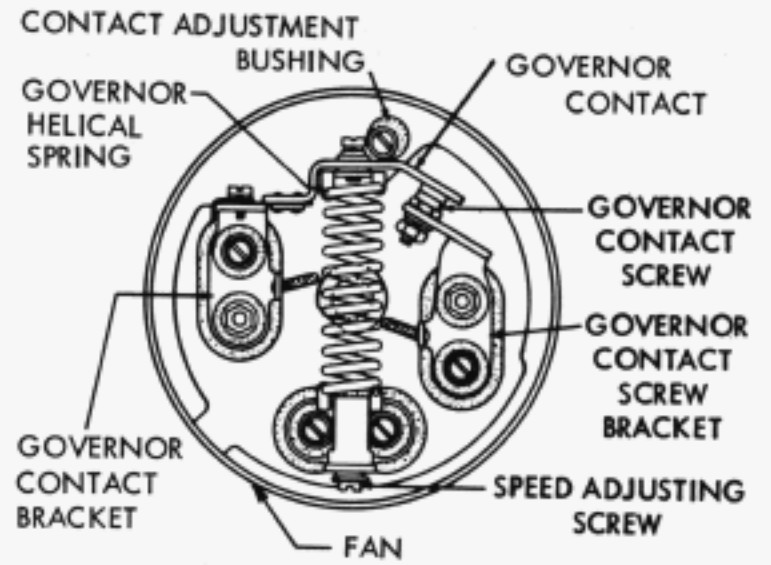


Figure 2-47A. Governor for Governed Motor

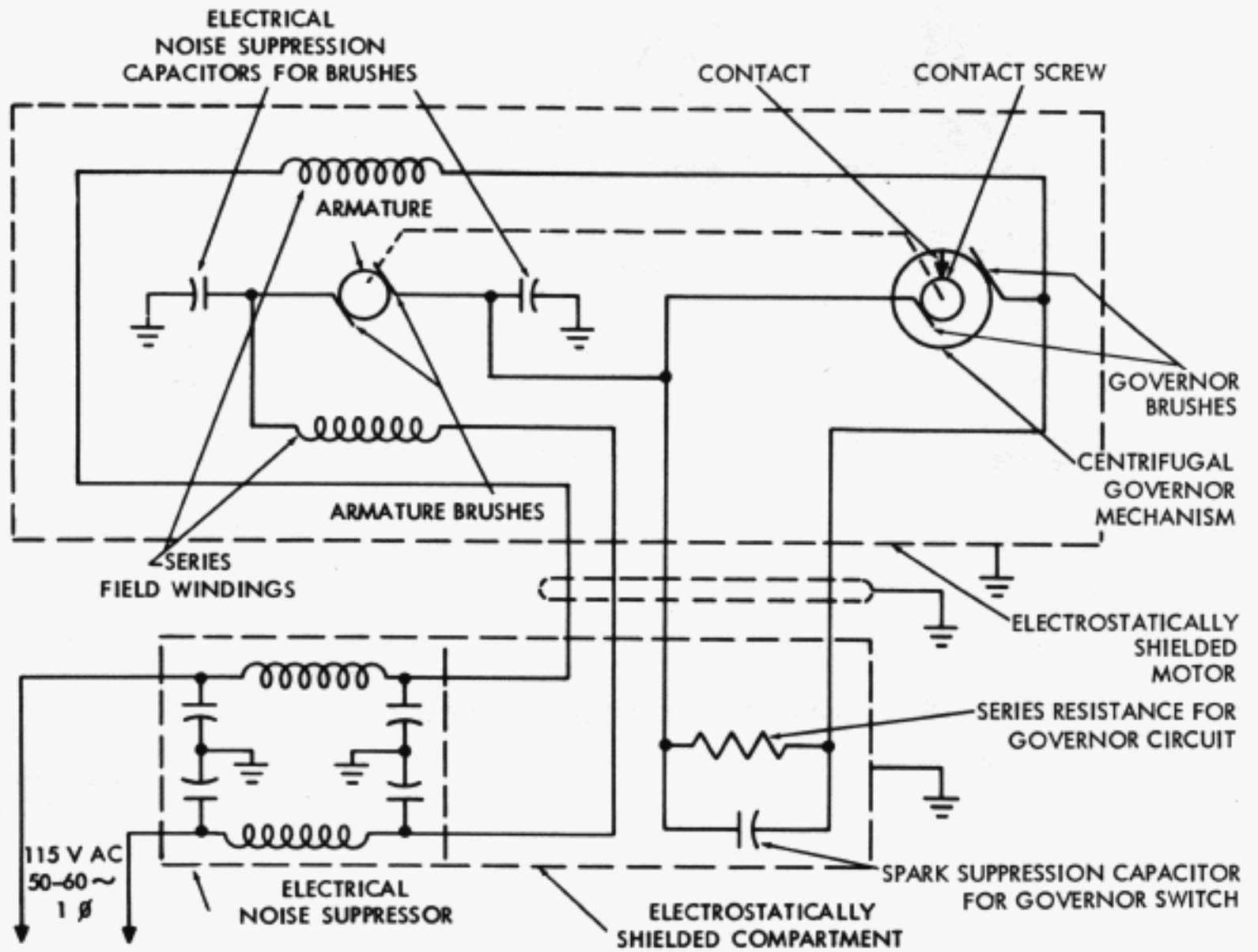


Figure 2-47B. AC Governed Motor Schematic Wiring Diagram



to permit the target to be viewed when checking the motor speed. A threaded plug provided in the governor shield housing may be removed to permit the insertion of a screwdriver when necessary to adjust the motor speed. Access to the compartment on the underside of the motor may be gained by removing a screw and lock washer and sliding the bottom cover plate aside.

5. RECEIVING-ONLY BASE (Figure 2-48)

a. The Receiving-Only Base is a sheet metal structure which supports the intermediate shaft assembly and provides mounting facilities for the typing unit and the Motor Unit. Located on the rear left corner of the base is a bracket in which a 19 point plug connector is mounted. Power for the Typing Unit

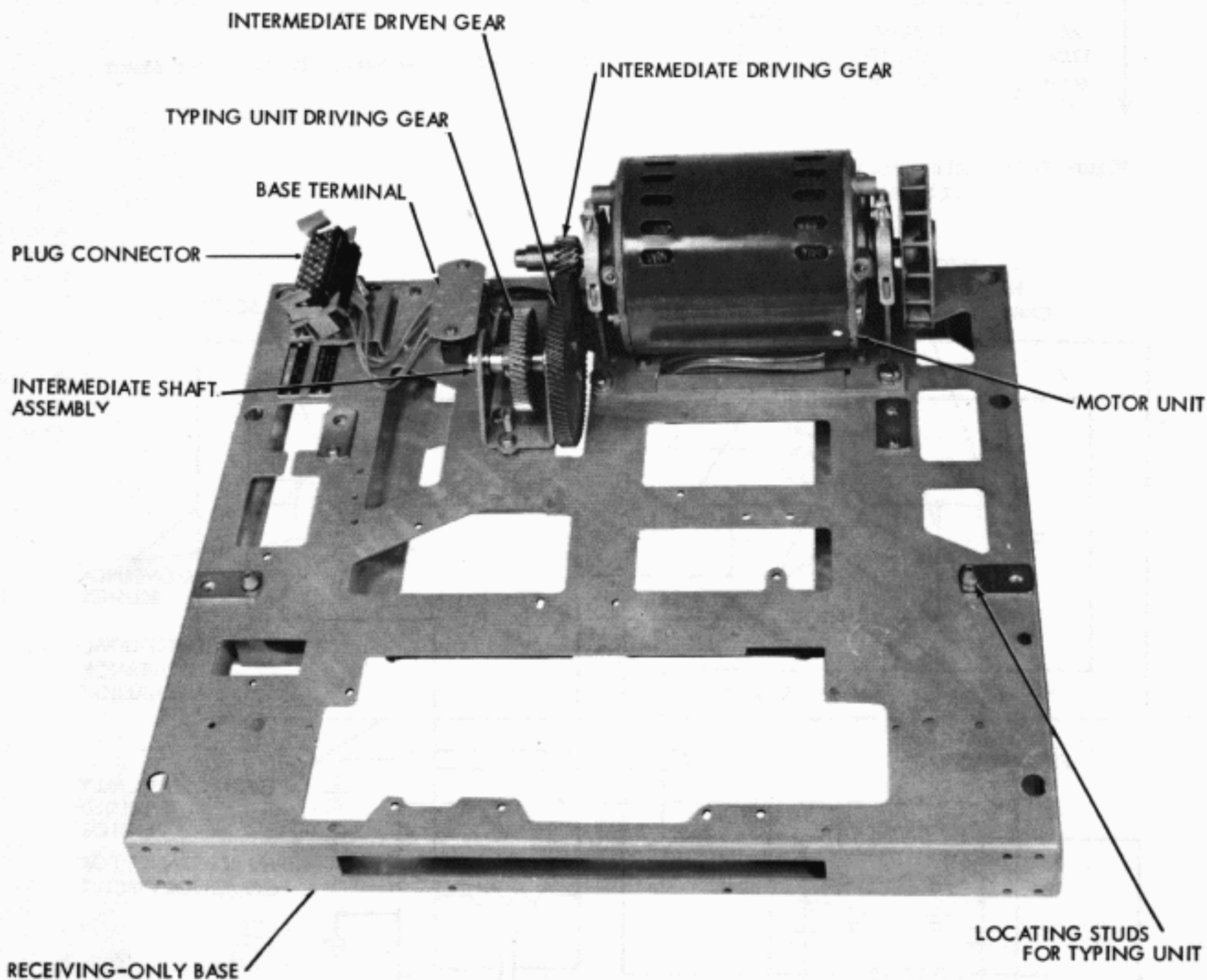


Figure 2-48. Base with Intermediate Gear Assembly and Motor Unit



motor, web rewind motor and the projector lamp is brought in at this connector. A base terminal is located to the right of the connector to which are connected the power leads from the connector. The base terminal has screw type connections for ease of assembly, or disassembly for servicing, of the various components.

b. The intermediate shaft assembly (figure 2-48) is located on the rear central portion of the base. It

consists of a bracket which mounts a shaft supported at both ends by ball bearings. Two helical gears mounted on the shaft serve to transmit rotary motion from the motor to the typing unit. The larger of the two gears is the intermediate driven gear which meshes with the intermediate driving gear on the shaft of the synchronous motor. These two gears are the speed change gears that control the operating speed of the typing unit. The smaller of the gears on the intermediate drive shaft is the typing unit driving gear which meshes with the typing unit driven gear located

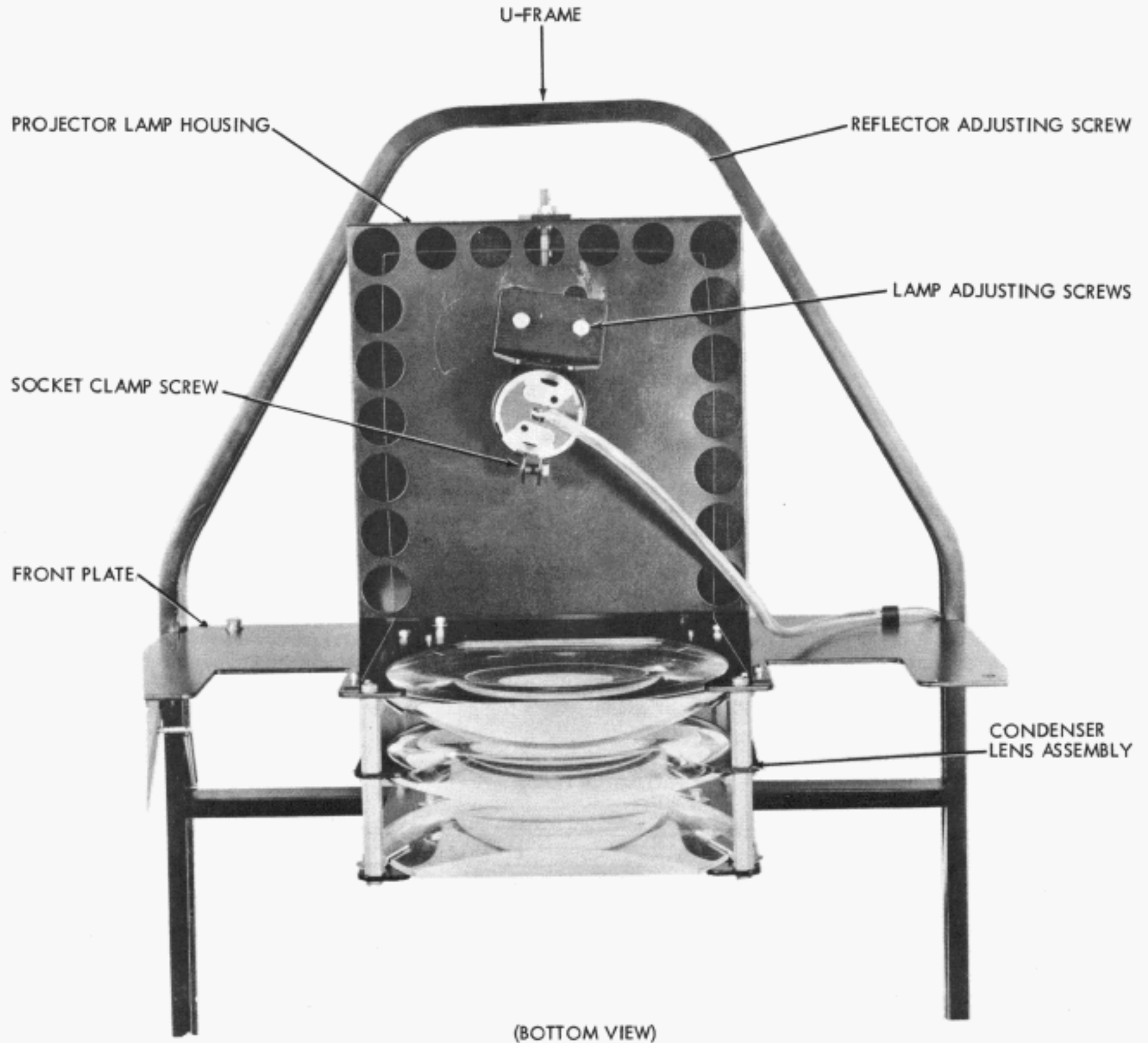


Figure 2-49 Lamp Housing and Condenser Lens Assembly

on the main shaft of the typing unit. The entire intermediate shaft assembly can be adjusted for proper operating characteristics by means of an adjusting screw. The Typing Unit is mounted centrally toward the front of the base with four mounting screws, so that the transparent web mounting bracket and guide rollers extend to the rear over the mounted Motor Unit. The Motor Unit is mounted with four screws at the rear right corner of the Base prior to mounting the Typing Unit. The rear left motor mounting screw also secures a guard that extends over the intermediate gears.

#### 6. PROJECTOR FRAME (Figures 1-2 and 1-3)

a. Most of the features of the Projector Frame have been discussed in Section 1. The various adjustments of the optical system and web rewind mechanism will be covered in a subsequent section devoted to adjustments.

b. The projector lamp housing and condenser lens assembly are mounted on the U-shaped frame, hinged to the top of the main frame (figure 2-49). The source of illumination located in the lamp house is a 500 watt, 120 volt, prefocused clear projector lamp. The rays of light from the lamp are collected and focused onto the condenser lens by the lamp reflector. The condenser lenses concentrate the light evenly over the area of the web whose image is to be projected on the translucent screen. The objective lens, located at the top rear of the frame, has a focal length of 8.5 inches and a diameter of 2-1/2 inches. It is mounted in a metal tube having a spiral slot. A thumb screw protruding through the slot affords simple helical focusing of the image on the screen after which the thumb screw is tightened in place. A small mirror located at an angle below the lens directs the rays of light into the lens.

c. Positioned in front of the objective lens, as viewed from the front of the cabinet, is the transparent web rewinding assembly. The rewind assembly consists of a web rewind spindle assembly, clutch, motor and upper guide rollers (figure 2-50). The upper guide

rollers along with the platen roller, located on the typing unit, hold the transparent web in a vertical plane positioned correctly in front of the platen and guides it onto the rewind spindle cylinder. The rewind spindle cylinder is a slotted metal tube centered over the spindle by a right and left hub and mounted between two brackets. The right end of the spindle mounts a friction clutch whose slotted arm slips over the motor arm stud. A shaded pole, 115 volt A.C., 60 R.P.M. motor is mounted on a bracket to the right of the clutch and imparts motion to the spindle by means of the clutch. The rotation of the motor shaft is counter-clockwise as viewed from the end of the drive shaft. The motor operates continuously from the time the projector lamp is turned on and exerts an even pull on the transparent web, by means of the friction clutch, keeping the web tensioned properly for the typing operation. At the time of line feed tension on the web is reduced, the rewind clutch takes hold, the cylinder revolves and takes up the slack in the web.

d. A cable tied to the frame connects the projector lamp and the winder motor to the base terminal strip. Another cable, tied to the frame, has a connector plug that engages the lower connector \* on the panel located on the left side of the lower section of the projector cabinet for power and signal circuit. There are two connectors on the other end of the cable, one of which goes to the typing unit (signal line) and the other to the base (power lines).

\*The upper connector on the panel is provided for possible use of a monitoring tape printer. When this printer is not used it is necessary to provide a strap from terminal 9 to terminal 10 on the upper connector.

#### 7. PROJECTOR CABINET - The Projector Cabinet is an enclosure designed to offer rigid support and maximum protection to the components of the Receiver Projector Set. Its dimensions are dictated by the optical requirements of the system. Refer to Section 1 for general discussion of the Projector Cabinet.

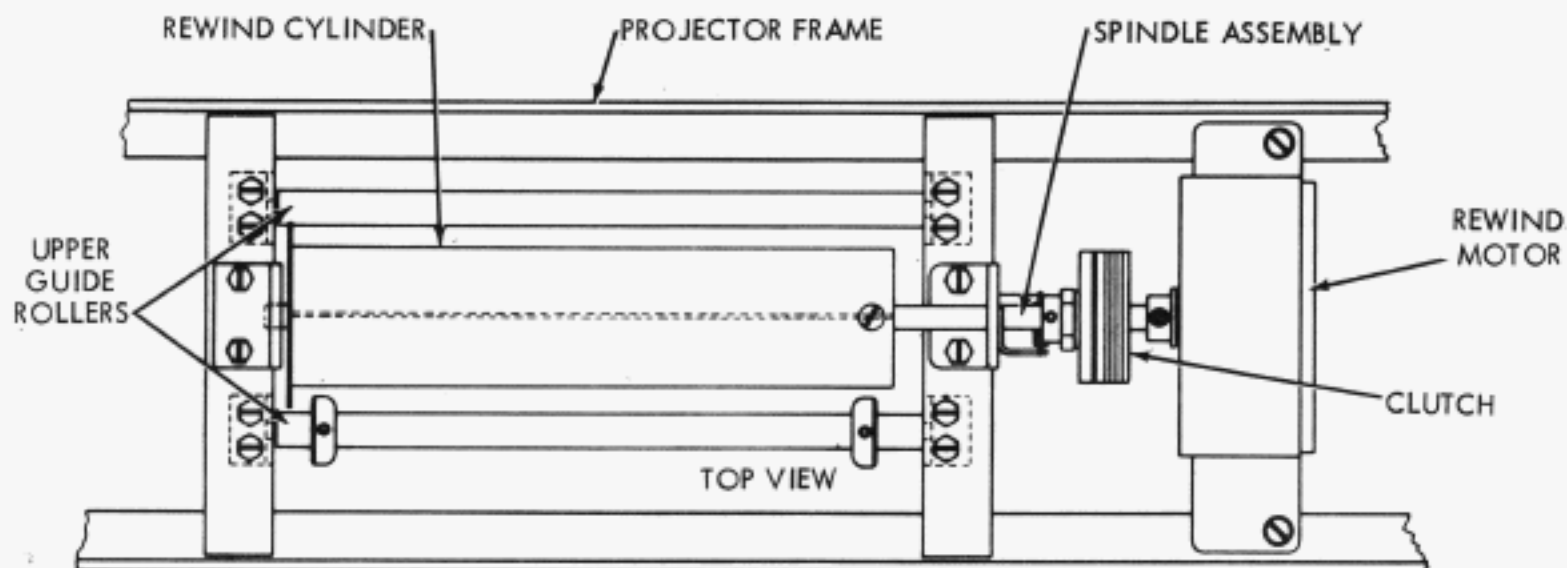


Figure 2-50 Transparent Web Rewind Mechanism

## SECTION 3 - INSTALLATION

## 1. GENERAL

a. The Model 28 Receiver Projector Set is packed in three wooden boxes and four cardboard cartons. The upper section of the Projector Cabinet with the exhaust blower are in one wooden box, the lower section of the cabinet, the switch and control panel and the translucent screen are in another wooden box and the Projector Frame, roll of transparent web, lens assemblies, lamp and reflector and set of gears to control speed of operation are in the third box. In the cartons will be found the Projector Typing Unit, the Motor Unit, the base and the large mirror.

b. Observe all caution labels and instructions appearing on the boxes and cartons. Unpack all components with care and keep loose parts and bags of hardware with their associated components until ready for use in installation.

## 2. INSTALLATION (Figure 3-1)

## a. Projector Cabinet - Lower Section

(1) Remove the lower section of the projector cabinet from its packing box with care to avoid damage to the finish. Remove any loose parts tied inside the cabinet, such as the projector screen which is rolled up and inserted into a cardboard tube tied on the floor of the cabinet.

(2) Move the lower section of the cabinet to the point of installation. For convenience in handling, or, if necessary, in order to pass through doorways, remove the two channels with their resilient mountings along with the angle iron tracks and the floor plate, as a complete assembly. This is accomplished by removing the four bolts from the inner corners of the cabinet. When the floor plate assembly is positioned and the cabinet replaced and bolted the entire lower section may be anchored to the mounting surface by

means of 1/2" bolts (not provided) through the mounting holes in the resilient mountings. See figure 3-2 for space requirements.

(3) The three pairs of incoming lines (signal, control and power) are brought into the cabinet and appropriate connection made to the control panel terminal block (see applicable wiring diagrams furnished with the units).

## b. Projector Cabinet - Upper Section

(1) Unpack the upper section of the projector cabinet having the same serial number as the lower section. Remove the bag of hardware tied to the frame. Position the upper section of the cabinet on top of the lower section with the open side of the upper section to the front. Fasten the two sections together using the cap screws and washers found in the bag.

(2) Run the long two-wire cable, which originates at a connector on the control panel, up along the rear corner of the upper section to the blower and connect it to the two terminals to which the blower motor is connected. A cable clamp is provided on the blower mounting bracket to hold the cable in position.

(3) Remove the mirror from its carton and take the bag of hardware from the mirror frame where it is tied. Mount the mirror in the upper section of the cabinet using the screws and washers contained in the bag. The mirror frame bracket, which has two mounting holes, fastens to a bracket located on the lower rear wall of the upper section. The other two brackets are fastened to the top of the upper section. The screws pass through body holes in the brackets into tapped holes in the cabinet.

(4) Remove the screen frame from the front of the upper section and install the transparent screen (with non-crystalline side of the screen toward the

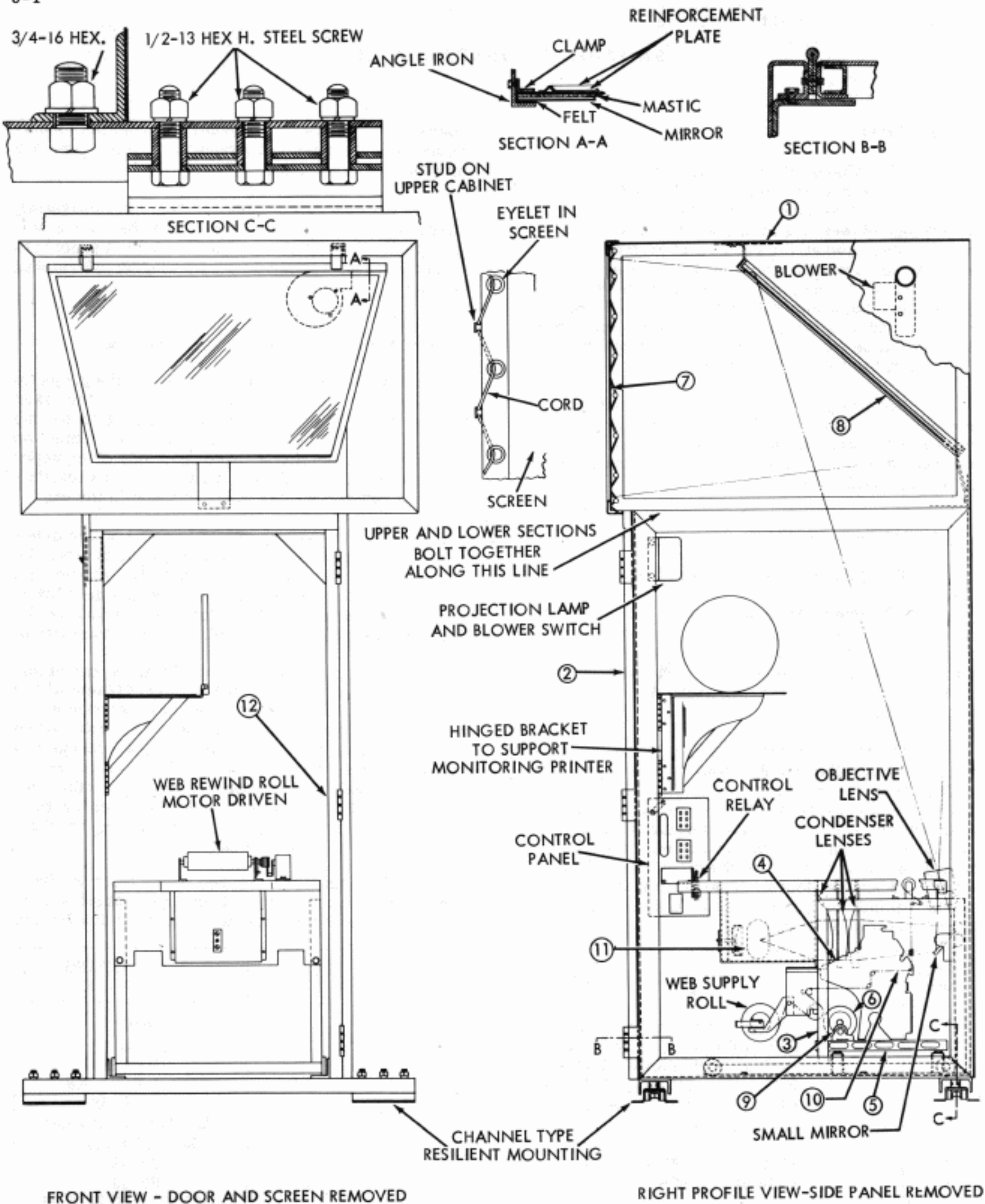
ITEM NO.	NAME OF ITEM	QTY	IDENTIFYING NUMBER
1	PROJECTOR CABINET - UPPER	1	PCU1
2	PROJECTOR CABINET - LOWER	1	PCL1
3	PROJECTOR FRAME WITH LENSES	1	PF3
4	RECEIVER PROJECTOR TYPING UNIT	1	LP67 */AS
5	RECEIVING ONLY BASE	1	LB7/000
6	MOTOR UNIT	1	LMU3 (Synchronous) LMU4 (Series)
7	TRANSLUCENT SCREEN	1	90864
8	LARGE MIRROR	1	98048
9	SET OF GEARS	1	151100 (100 W. P. M.) 151060 ( 60 W. P. M.)
10	TRANSPARENT WEB	1	98145
11	PROJECTION LAMP	1	98318
12	RED FILTER	1	105608

\*TYPEBOX - Specify "YJ" or "RV"

Components of Receiver Projector Set

Figure 3-1

269B



FRONT VIEW - DOOR AND SCREEN REMOVED

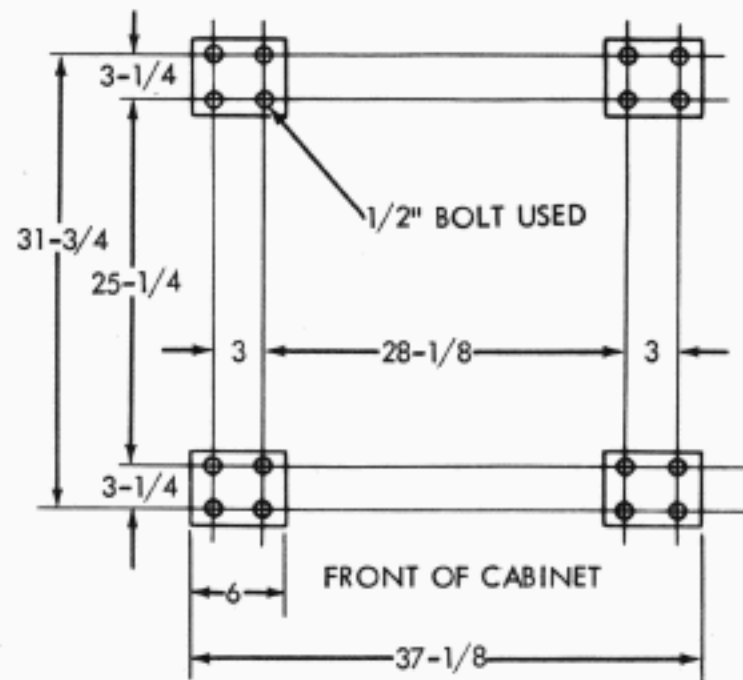
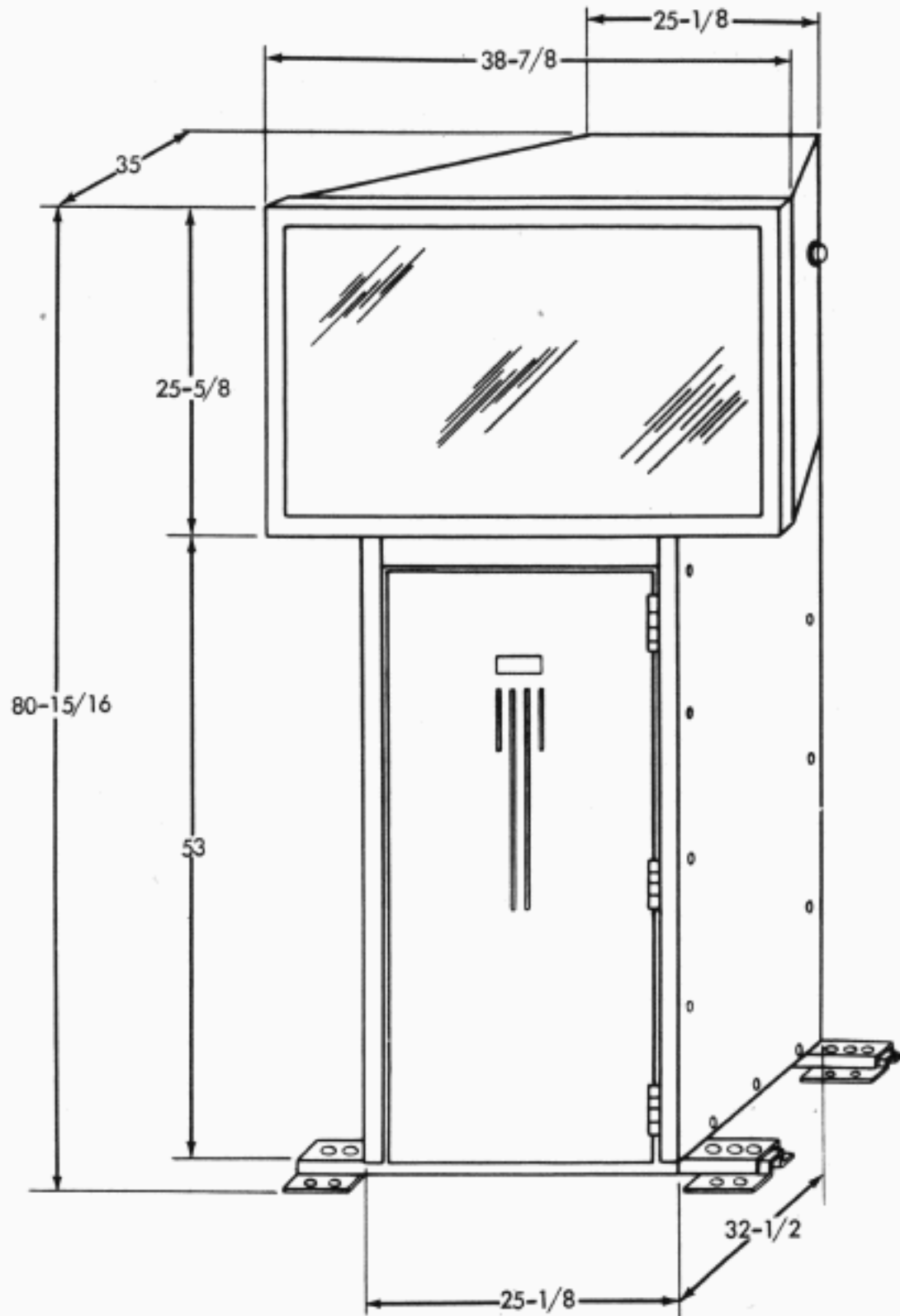
RIGHT PROFILE VIEW - SIDE PANEL REMOVED

NOTE 1  
PROJECTOR CABINET - UPPER, 1-1/8 X 1-1/8 X 1/8 ANGLE IRON FRAME COVERED WITH 16 GAUGE SHEET STEEL SPOT WELDED IN POSITION, ALKYD FINISH.

NOTE 2  
PROJECTOR CABINET - LOWER, 2 X 2 X 3/16 ANGLE IRON FRAME COVERED WITH 16 GAUGE SHEET STEEL. REAR PANEL SPOT WELDED AND SIDE PANELS BOLTED IN POSITION, ALKYD FINISH.

Figure 3-1 Arrangement of Receiver Projector Station Equipment





LAYOUT OF HOLES, RESILIENT MOUNTING

Figure 3-2 Space Requirements for Receiver Projector Station

projector). To do this, unroll the screen (which was protected by the cardboard tube) and place it over the opening in the upper section of the cabinet. Since the cord has already been laced into eyelets of the screen it is necessary only to hold the screen in position and pull the loops of cord between adjacent eyelets around the edge of the cabinet and over the corresponding studs positioned about the edge of the screen opening. Then begin at a corner and work in opposite directions to draw the cord snug and center the screen over the opening. Work toward the free ends of the cord. Repeat this process several times, carefully working out the wrinkles and centering the screen. Tie the ends of the lacing cord securely and replace and secure the frame around the screen.

### c. Projector Frame

(1) Remove the Projector Frame from its wooden box and place it on its rollers in front of the cabinet in position to be rolled onto the cabinet rails when this phase is completed. The side of the frame with the cross members should be facing the cabinet. Remove the loose parts that have been taped or tied to the frame members or packed in the lamp housing. Free and unwrap the connectors from the frame and remove the protective tissue from the condenser and objective lenses. Place the red filter in its holder on the right side of the lower cabinet section. Install the projector lamp reflector in the lamp housing and insert the projector lamp in its socket. Remount the cover on the lamp housing. Set aside the roll of transparent web, the gear set and the hardware until needed.

(2) Remove the two thumb screws from the front plate on the Projector Frame and raise the hinged section of the frame upward to its latched position. Install the rewind spindle in its brackets engaging the stud on the motor drive arm.

(3) Remove the Model 28 Base from its carton and place the base on the two cradle rails of the Projector Frame with the front of the base toward the small mirror in the frame. Fasten the base to the rails using the four screws that were secured in the rails. If there is difficulty in aligning the base mounting holes with the holes in the cradle rails, loosen the four cradle rail mounting screws and shift the rails slightly to align the mounting centers.

(4) Remove the gear guard and bag of hardware tied to the base. Take the Motor Unit from its carton and place it in position on the right rear corner of the base. Using three of the screws, with captive lock washers, from the bag, secure the Motor Unit in position. The left rear mounting screw is omitted at this time.

(5) Remove the insulator cover from the terminal block on the base, just to the left of the motor. Connect the motor leads to terminals 1 and 2 of this terminal block. At this time the power leads to the projector lamp and web rewind motor should be connected to the base terminal according to the wiring diagram. Replace the insulator cover on the terminal block. Install the cable connector onto the base connector.

(6) Remove the set of gears from their carton. Remove the screw and lock washer from the gear end of the motor shaft. Place the small helical gear (intermediate driving gear) on the motor shaft with the gear end toward the motor. Secure the gear with the screw and lock washer just removed. Remove the two screws and lock washers from the hub on the intermediate gear shaft. Mount the intermediate driven gear on the hub with the flat side of the gear outward, meshing it with the intermediate driving gear on the motor shaft. Secure the gear with the two screws and lock washers removed. See figure 2-48.

(7) Install the gear guard in position over the intermediate gear assembly. It should be placed so that its mounting hole aligns with the left rear motor mounting hole and its formed ears positioned over the rear surface of the base. Secure the guard with the fourth motor mounting screw.

(8) Remove the Model 28 Projector Typing Unit from its carton and take off the wood platform. Install the ribbon on the typing unit following the instructions given in Section 5 paragraph 8c. Also install the type box -- see instructions and CAUTION note in Section 5, paragraph 10a(1)(c).

### NOTE

Insert a piece of bond paper between the selector magnet pole faces and the armature to soak up any lubricant which may have accumulated there. When removing the paper, make sure no lint or bits of paper remain.

(9) Place the typing unit on the base, making certain that the front feet on the typing unit are placed over the locating studs provided on the base. Rotate the motor fan wheel by hand to mesh the typing unit driven gear and the typing unit driving gear. Secure the typing unit using the remaining four screws (with captive lock washers) found in the bag that was tied to the gear guard. Insert the signal line cable connector onto the typing unit connector.

(10) Two adjustments must be made at this time. Refer to Section 5 (Adjustments) and check the Motor, Base and Typing Unit Gearing illustrated. It may be necessary to refine the adjustments in order to obtain quietest operation.

(11) Install the roll of transparent web on the spindle at the rear of the Typing Unit and thread it as instructed in paragraph 8b of Section 5.

(12) Lower the hinged section of the projector frame and secure it with the two thumb screws previously removed. Roll the projector frame into the lower cabinet. It should settle into the depressions provided in the projector frame tracks and the four frame mounting holes should line up with the corresponding holes in the tracks. Using the four cap screws, flat washers and lock washers, found in the bag tied to the frame, fasten the projector frame to the cabinet.

### 3. ELECTRICAL

a. Connect the cord connector from the Projector Frame Assembly to the lower of the two receptacles on the control panel on the left side of the lower cabinet. The upper receptacle is provided for operation of a monitoring tape printer. If a monitor is not used, terminal 9 must be strapped to terminal 10 of this receptacle.

b. Connect all cord connectors. Operation of the manual switch on the left side of the cabinet should energize the exhaust blower, the projector lamp and the web rewind motor. See the applicable wiring diagrams furnished with the units for points of connection for the power line, signal line and control line.

c. The signal line connects the typing unit selector magnets in series with the transmitting contacts of the sending station. The control line connects the manual switch of the sending station to the control relay on the control panel on the left side of the cabinet.

### 4. OPTICAL SYSTEM

a. Objective Lens - Focusing is accomplished by loosening slightly the thumb screw in the lens mount and raising or lowering the objective lens, carefully, in its mount, until the sharpest image is obtained on the screen. Tighten the thumb screw.

b. Refer to the adjustment section for detailed information on alignment of the condenser lenses.

## SECTION 4 - OPERATOR'S SECTION

## 1. INTRODUCTION.

a. The Model 28 Receiver Projector Set (figure 4-1) is a part of an information transmitting system which provides means for typing messages received from a Sending Station, and projecting them simultaneously onto a translucent screen approximately 2 x 3 feet in size, for viewing by groups of people.

b. The Typing Unit is a Standard Teletypewriter, modified with an oscillating platen to permit projection of the complete message, and a transparent web mounting and feed system which provides the transparent material on which the message is printed.

c. A 500 watt projector lamp mounted in a housing on the projector frame supplies the source of illumination. A concave reflector mounted in front of the lamp directs the rays of light towards the rear through a system of three condenser lenses onto a small diagonally mounted mirror. The transparent web

with its printed message extends vertically upward between the condenser lenses and the mirror. Located directly above the small mirror is the objective lens which focuses the image of the message on the web onto the rear of the transparent screen by way of a second and larger mirror that is positioned diagonally across the upper part of the projector cabinet to direct the rays of light forward.

## 2. TYPING UNIT.

a. The Teletypewriter (figure 4-2) operates in response to a five unit start-stop code consisting of pulses of current and no current originating at the keyboard or transmitter of the Sending Station. A type box, mounted on a carriage, advances from left to right in front of the platen during the typing process. Non-typing functions, such as the return of the carriage for starting a new line, shifting operations and line feeding are performed as a result of signals that originate at the Sending Station.

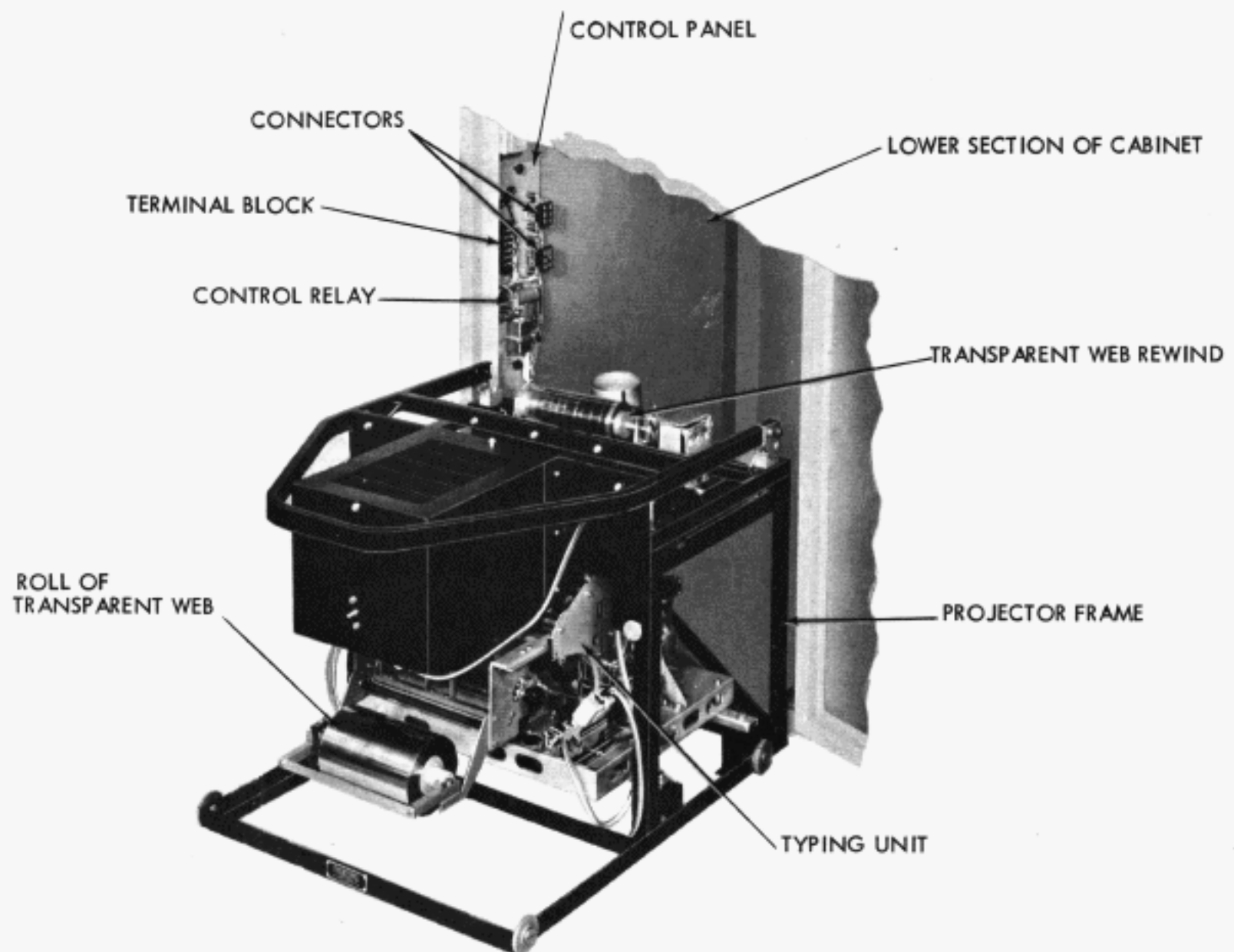


Figure 4-1 Projector Frame Assembly, In Front of Cabinet



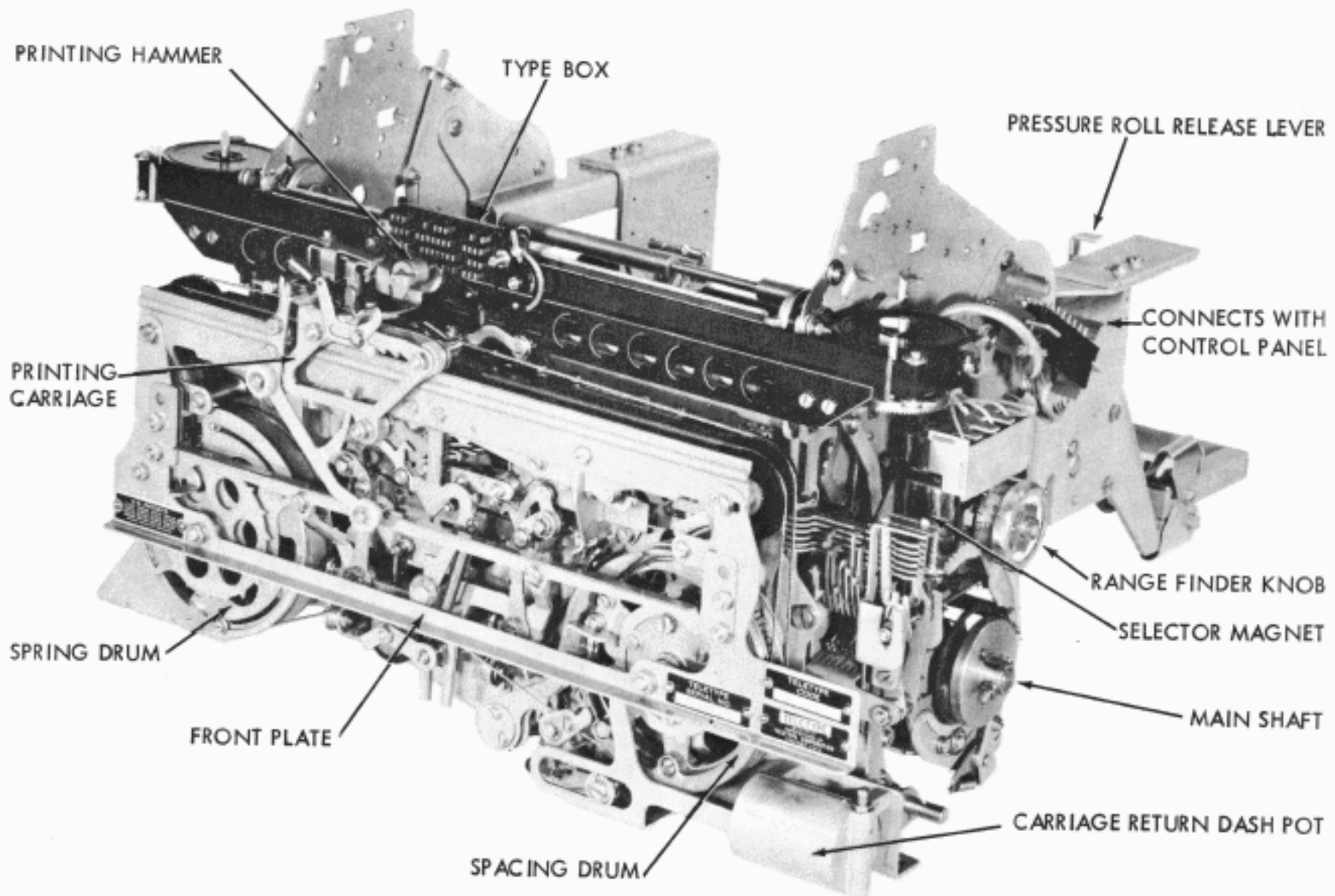


Figure 4-2 Projector Typing Unit, Front View

b. The type box of the unit contains large Gothic type which, when printed on the web, projects clearly on the screen but causes some overlapping of characters when single line feed is employed. With the type box in LETTERS position the unit will print the alphabet in capitals only, and in FIGURES position will print punctuation and special symbols as well as figures. The type box can be easily removed for replacement or for cleaning the type.

c. All the Sets in the system must operate at the same rate of speed as the Sending Station in order to synchronize with the incoming signal. This Receiver Projector Set is shipped with a set of gears for 100 words per minute operation. It uses a two wire signal line in series with the Sending Station. Power is applied to the Typing Unit Motor by way of the contacts on a relay in the Projector cabinet. This relay is energized remotely from the Sending Station over the control lines.

d. The length of text line that the typing unit will print is limited to 46 characters (including spaces) in order to keep the projected image within the 3 foot width of the translucent screen. The left and right margins are adjusted at the factory. If any readjustment is required it should be made, according to instructions given in Section 5, by authorized maintenance personnel.

### 3. MOTOR UNIT

a. The Synchronous Motor (figure 4-3) consists of a 115 volt, 60 cycle synchronous motor operating on single phase alternating current, equipped with a thermal cut-out switch mounted in a compartment under the motor. If, due to excessive load, the motor windings overheat, the thermal switch will operate opening the circuit that supplies power to the motor.

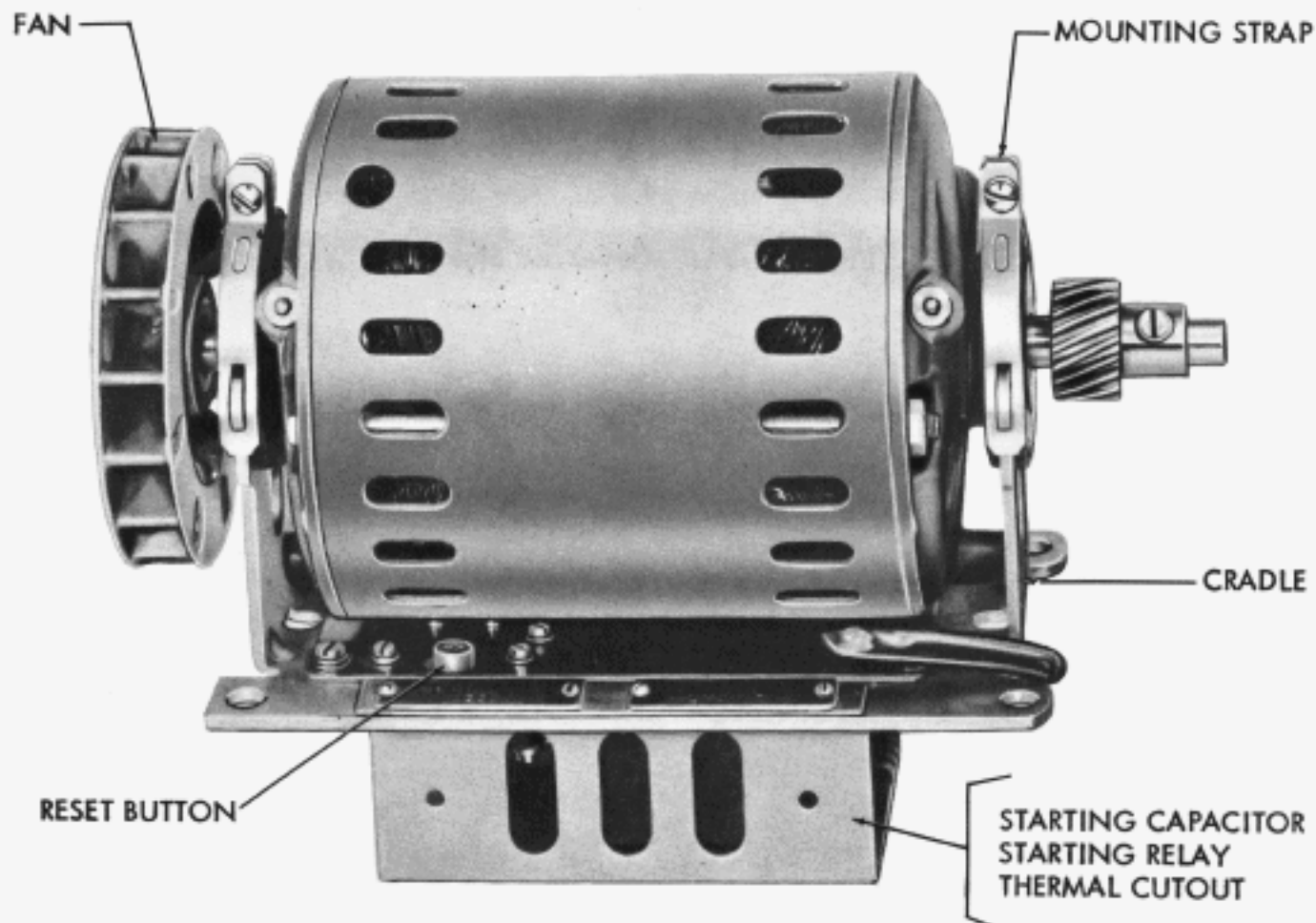
The motor should be allowed to cool for at least five minutes before depressing the red button located on top of the thermal switch compartment to re-start the motor.

b. The Series or Governed Motor (figure 4-3B) is a 115 volt motor operating on single phase alternating current of 50 to 60 cycles. It depends on an electro-mechanical governor for regulation of its speed.

c. Motor Speed requires attention only when a governed motor is used. Notify authorized maintenance personnel if adjustment is required. Procedures for adjustment are described in Section 5.

4. THE PROJECTOR FRAME supports the Base on which is mounted the Typing Unit, Motor Unit and Intermediate Gear Assembly, as well as the optical system. Also, on top of the frame near the rear is mounted the transparent web rewind mechanism which consists of a motor driven rewind spindle and cylinder.

5. THE PROJECTOR CABINET houses a large mirror across the upper section to reflect the message onto the rear of the screen. Located behind the mirror is a ventilating blower to exhaust the heat generated by the 500 watt projection lamp. The projection screen is laced over the front of the top section. The lower part of the Projector cabinet houses the projector frame assembly and the control panel. Located in the upper right corner of the left side of the lower section of the cabinet is a toggle switch. This switch, when operated, starts the ventilating blower, turns on the 500 watt projection lamp and starts the web rewind motor. (The Typing Unit Motor is energized remotely from the Sending Station). Also on the left side of the cabinet, inside, is a bracket or shelf provided to support a Monitoring Tape Printer (optional equipment).



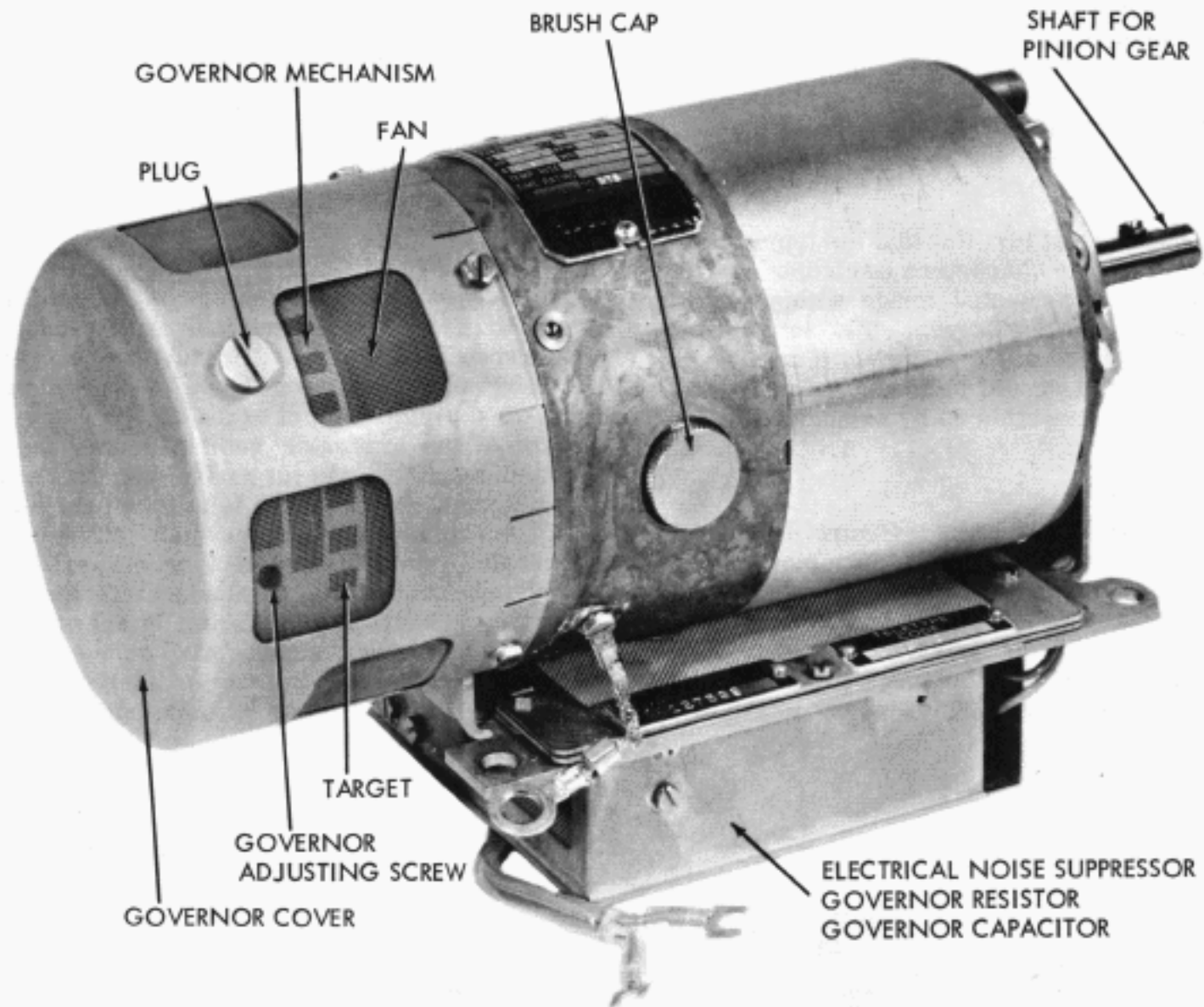


Figure 4-3A. Governed Motor





6. PRELIMINARY STARTING PROCEDURE.

**WARNING**

**DANGEROUS VOLTAGES EXIST IN THIS EQUIPMENT. AVOID WORKING ON IT WHILE THE POWER IS ON.**

**WEAR DARK GLASSES TO PROTECT THE EYES FROM THE INTENSE LIGHT OF THE PROJECTOR LAMP WHEN WORKING WITH THE OPTICAL SYSTEM.**

a. Note that the power, signal and control lines are properly connected.

b. Check the transparent web supply. If only a few turns remain install a fresh roll. (Paragraph 7.)

c. Check the condition of the typing ribbon. If it is frayed, shows signs of wear or if the printed copy, as projected on the screen, lacks the contrast necessary for easy legibility, replace as directed in paragraph 8.

d. Verify that the projection lamp is not burned out. (Paragraph 9.)

7. TRANSPARENT WEB.

a. To remove a roll of used transparent web, with the projector frame in position in the cabinet, cut the web off close to the wooden supply spindle, if it is not already completely expended from the spool, and feed it through the feed roll manually by turning the feed roll handwheel. See figure 4-1. Rotate the rewind cylinder by hand in order to wind up the free end of the web. Hold the latch on the right rewind spindle bracket disengaged and raise the right end of the spindle assembly up out of the spindle bearing notch disengaging the clutch arm from the motor arm stud at the same time. Slide the spindle assembly toward the right out of the bearing hole in the left bracket. Remove the left spindle hub from the end of the spindle cylinder. This permits the cylinder to spring closed slightly so that the roll of used transparent web can be pulled off. Reinsert the hub into the cylinder and return the spindle assembly to its brackets, reversing the disassembly procedure.

b. To replenish the supply of transparent web, remove the 2 thumb screws from the front plate of the projector frame and raise the hinged section of the frame to its latched position to gain access to the web mounting bracket assembly. See figure 4-1. Slide the right web spindle retainer (as viewed from the FRONT of the cabinet) on the web mounting bracket toward the

**OPERATOR'S CONTROLS**

CONTROL	CONTROL POSITION	FUNCTION
Power Switch lever	Up	Operates projection lamp, ventilating blower and web rewind motor.
Feed roll hand wheel		Provides manual rotation of feed roll when replenishing transparent web.
Single-double line feed Lever	#1 #2	Single line feed of web Double line feed of web
Pressure roller release lever	Unlatched (forward) Latched (to rear)	Applies pressure against web for proper line feed. Removes pressure against web for replenishing web supply.
Range finder knob		Compensates typing unit for distortion in incoming line signal.
Printing Spring Adjusting Bracket	Notch 1  Notch 2 & 3	Adjusts printing hammer blow for clear printing on web.  Adjusts printing hammer for heavy blow. For use on multiple copy work. <b>NOT INTENDED FOR USE ON TRANSPARENT WEB.</b>

**OPERATOR'S INDICATORS**

INDICATOR	FUNCTION
LTRS Pointer	When positioned in front of the printing hammer, indicates the next character to be printed will be lower case or letters.
FIGS Pointer	When positioned in front of the printing hammer, indicates the next character to be printed will be upper case or figures and punctuation.

front and remove the web supply spindle from the Unit. Pull the empty cardboard core off of the wooden spindle toward the end opposite from the garter spring. Reinsert the spindle carefully into a fresh roll of transparent web so that the web will unwind from underneath and the garter spring on the spindle is to the LEFT when remounted in its holders. Place the roll of web on end on a flat surface, while inserting the spindle, or push against the cardboard core of the roll of web, not against the rolled web itself. Pressure against the rolled web may result in the web slipping laterally on its core resulting in misalignment and poor tracking when threaded. Push the spindle into the roll of web until the core seats between the garter spring on the left and the retaining spring on the right. Reinstall the spindle with its roll of web between the brackets at the rear of the typing unit and relatch the spindle retainer. Feed the web up over the slack bar, down under the lower web guide, up between the latched pressure roll and the feed

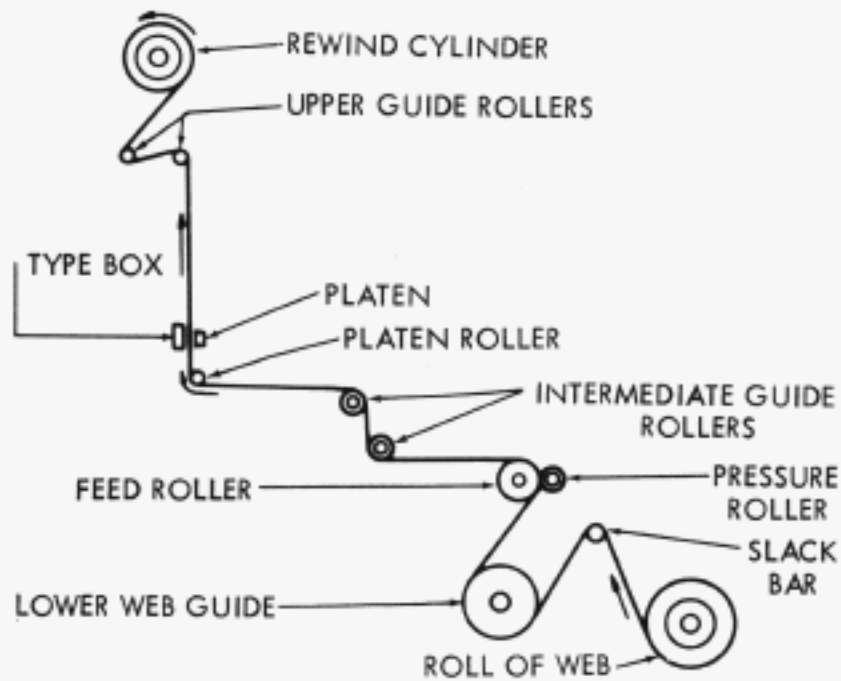


Figure 4-4 Path of Transparent Web

roll, following the route shown in figure 4-4. The pressure roll is latched and its pressure removed from the feed roll by moving the release lever toward the rear of the Typing Unit until it is secured by the release lever latch. When threading is completed the release bar must be unlatched so that the web will line feed properly. Route the web up to the rewind assembly where it should be inserted into the slot in the rewind cylinder, approximately one-half inch from the flange on the spindle hub, and four or five turns taken up, by turning the rewind cylinder by hand in the direction of rotation, drawing the web taut to prevent slippage. The web will seek its own location on the cylinder as the machine is operated. Unlatch the hinged section of the frame, close and secure it with the thumb screws. Return the unit to operation observing that the web is feeding and rewinding properly.

8. **TO REPLACE THE RIBBON**, raise the hinged section of the frame to its latched position as described above. Raise the toggle on each ribbon spool shaft to its vertical position and remove both spools from the shafts. Disengage the ribbon from the ribbon rollers, reverse levers and ribbon guides. Unwind the old ribbon from one of the spools and engage the hook on the end of the new ribbon in the hub of the empty spool. Wind a few turns of the ribbon onto the empty spool in the same direction that it comes off of the full spool. Be sure that the reversing eyelet has been wound up on the empty spool. Place the spools on the ribbon spool shafts in such a manner that the ribbon feeds from the right side of the right spool and from the left side of the left spool without twisting. See figure 4-5. Turn each spool on its shaft until the driving pins on the spool shafts engage the holes in the spools. Thread the ribbon forward around both ribbon rollers, through the slots in the ribbon reverse levers, and through the ribbon guide on the type box carriage. Make certain that the ribbon remains in the guide slots and that both reversing eyelets are between the ribbon spools and the reverse levers. Take up the slack in the ribbon by turning the free spool. Close the hinged section of the projector frame and secure it.

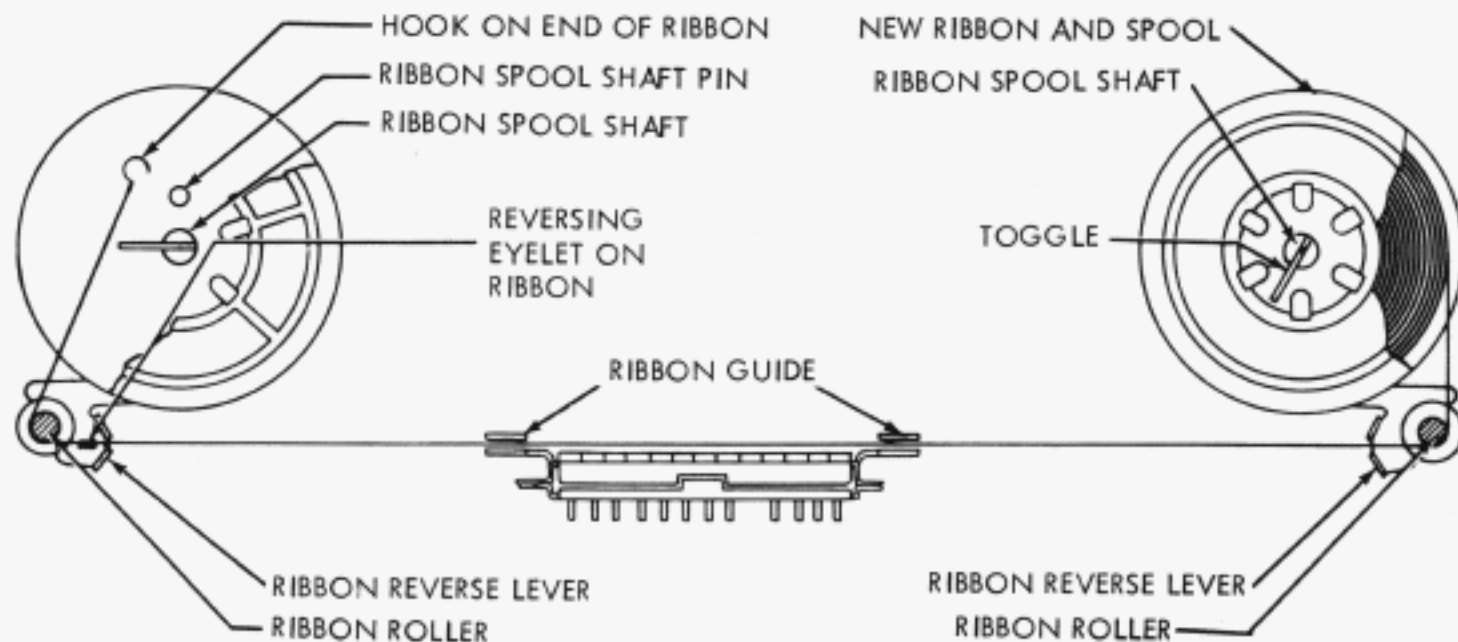


Figure 4-5 Path of Ribbon

9. TO REPLACE THE PROJECTION LAMP turn off the power and remove the front screw from the lamp housing cover, loosen the screw at the rear edge of the housing cover, then slide the cover forward to disengage the slot from the top screw. Lift the cover off of the housing.

#### CAUTION

Wear gloves to protect the hands from possible painful injury of burns or broken glass. If time permits, the projection lamp should be allowed to cool before its replacement is attempted.

With one hand support the lamp socket from underneath the lamp housing, with the other hand grasp the lamp firmly and push downward turning the lamp counterclockwise about 1/4 of a revolution to disengage the flanges on the base of the lamp from the socket. Remove the old lamp and install the new one so that the base flanges correspond with the notches in the socket. Push down against the spring tension of the center contact and turn the lamp clockwise until it is stopped by the positioning pin. When properly seated the filament supporting wires should face directly toward the rear of the lamp housing so that the broadside of the filament is parallel to the front surface of the front condenser lens. If the lamp is out of adjustment it should be re-aligned according to instructions in Section 5. Replace the cover of the lamp house.

10. RANGE FINDER ADJUSTMENT -- Arrange for the Sending Station to send a test signal (alternate R and Y) from a prepared tape fed into the transmitter distributor.

a. Push the range finder knob on the Typing Unit (figure 4-2) inward to engage the gear and rotate it in a clockwise direction until errors appear in the projected copy. Move the knob back slowly in a counterclockwise direction until the errors disappear. Note the number positioned opposite the index mark.

b. Rotate the range finder knob in a counterclockwise direction until errors appear once again. Move the knob back slowly in the clockwise direction until the errors disappear. Note the number positioned opposite the index mark.

c. Determine the average of the two readings obtained in a and b above. Set the range finder knob to this position.

11. OPERATOR'S MAINTENANCE INSTRUCTIONS - Consists of a list of duties normally performed by the operator of the Model 28 Receiver Projector Set, not requiring special tools or test requirement.

a. Replacement of transparent web, ribbon and projector lamp. These items have been covered in paragraphs 7, 8 and 9.

b. Preventive Maintenance

(1) Observe the spacing between letters, line feeding, shifting and unshifting, printing of errors, margin spacing, carriage return, and ribbon reversing.

(2) Note the condition of the typing ribbon once a day.

(3) Check once a week for oxidized (red) metal dust adjacent to any bearing surfaces which may indicate insufficient lubrication. Notify authorized maintenance personnel if this condition exists.

(4) Check the clearness of the typed message on the projector screen once a day. If the printing is blurred or smudged, clean the type faces as outlined below.

(a) Turn the Typing Unit off at the Sending Station.

(b) Remove the type box -- unlock the type box latch by moving it to the right. Grasp the latch extension on the right side of the type box and raise that side up and to the left unhooking the type box from its mounting stud on the left side.

(c) Clean the type box pallets with a dry, stiff brush, such as a short handle typewriter brush. When cleaning the type, be careful not to brush the dirt into the typing unit. DO NOT USE A SOLVENT OR CLEANING COMPOUND ON THE TYPE BOX.

(d) Remount the type box -- Hold the type box with the type facing toward the platen and the large hook on the left. Push this hook under the stud in front of the left type box roller, swing the type box down to the right pivoting on the left stud and push the smaller hook on the right side down into place on the stud of the right type box roller. Be sure the type box is completely seated on the right and left studs. Place the point of the latch toggle in the notch of the type box plate and move the toggle to the left as far as it will go to its latched position.

(e) Check that the typing ribbon has not been disturbed and is still properly threaded in its guides.

(5) Check the condition of the optical system once a week. Use a dry, soft, lintless cloth or lens tissue to clean or remove dust from the condenser lenses, objective lens, small and large mirrors. Remove dust carefully so that lens surfaces are not scratched. Do not use an air hose which would scatter the dust causing it to settle in the Typing Unit.

(6) Clean the translucent screen as needed. The crystalline surface (outside) should be cleaned by a dry process, using a clean brush, not too harsh. The non-crystalline surface (inside) may be cleaned with a brush or a soft cloth. If this method is not sufficient, a clean soft cloth dampened with wood or grain alcohol may be used.

12. OPERATOR'S CHECKLIST of more common equipment faults that may be encountered, probable causes of the trouble and possible remedies follows. If the remedy does not correct the equipment fault, or if, after being corrected, the trouble recurs, notify authorized maintenance personnel.

TROUBLE	PROBABLE CAUSE	POSSIBLE REMEDY
Motor, projector, lamp, blower and rewind inoperative	No power Fuse blown	Check for power at receptacle and see that plug is properly inserted. Replace Fuse
Typing Unit Motor only stopped	Sending Station not transmitting Open control line No power Motor overheated	Check with Sending Station. Check Sending Station switch. See if control relay in projector cabinet is operated. Control relay contacts not closing properly. See that connector plug is properly inserted. Turn off power, allow motor to cool. Depress overload reset button and turn power on again.
Typing Unit motor running but no signal from transmitter	Control line switch on at Sending Station but not Transmitting Typing Unit defective	Check with Sending Station. Notify authorized maintenance personnel.
Typing Unit runs open	Signal lines open Typing Unit or Sending Unit defective	See that all connectors are inserted and check out signal lines. Notify authorized maintenance personnel.
Garbling, piling of letters, over lining, etc.	Oil on selector pole pieces Series motor runs at wrong speed. Range finder improperly adjusted. Sending station transmitting faulty signals.	Run a piece of clean paper between the face of the magnets and the armature. Notify authorized maintenance personnel. Adjust range finder per instructions paragraph 4-10. Notify Sending Station.
Incorrect Web feed	Pressure roll release arm latched Web improperly installed Web slipping on rewind cylinder	Unlatch pressure roll release arm. Reinstall web - observe proper routing and alignment. Remove web and re-thread per instructions.
Projected messages bounce or jump	Platen or ribbon strikes the transparent web	Re-adjust web guide rollers. Notify authorized personnel.
Projected message blurred	Dirty type Objective lens out of focus	Clean the type per instructions of paragraph 4-11b(4). Refocus objective lens and tighten thumb screw.



## SECTION 5 - ADJUSTMENTS AND TROUBLE SHOOTING

## 1. GENERAL

a. Adjustments of the Model 28 Receiver Projector Set Components are arranged in the following order: Projector Typing Unit, Motor Unit, Base, Projector Frame and Cabinet. The adjustments of the Projector Typing Unit are arranged in a sequence that would be followed if a complete readjustment of the unit were undertaken. Other adjustments which do not affect the adjusting sequence may be done at any time during the adjusting procedure. Tools and spring scales required to perform the adjustments are listed in Teletype Bulletin 1124B but are not supplied as part of the equipment. After an adjustment has been completed, be sure to tighten any nuts or screws that may have been loosened. The adjusting illustrations, in addition to indicating the adjusting tolerances, positions of moving parts, and spring tension, also show the angle at which the scale should be applied when measuring spring tensions. If a part that is mounted on shims is to be removed, the number of shims used at each of its mounting screws should be noted so that the same shim pile-up can be replaced when the part is remounted.

b. The spring tensions given in this bulletin are indicated values and should be checked with proper spring scales in the position indicated.

c. References made to LEFT or RIGHT, UP or DOWN, FRONT, or REAR etc. apply to the Set in its normal operating position as viewed from the observers position in front, except in the case of the Typing Unit, Motor Unit and Base which are mounted facing the rear of the cabinet. For purposes of this bulletin the front of the typing unit, motor and base assembly only is that side from which the type box and platen can be viewed.

d. Where instructions call for the removal of parts or subassemblies, refer to the Disassembly and Reassembly procedures at the end of this section.

## e. Projector Typing Unit Adjustments

(1) The Typing Unit may be placed in one of two positions for servicing when removed from the Base: 1. Upright on its four feet and 2. bottom upwards so that it rests on the two upper points of each side frame. If the unit tilts backwards against the transparent web mounting brackets use caution so that the brackets do not become misaligned. If complete readjustment of the unit is made the line feed tie rod should be disconnected and the web mounting brackets taken off at the typing unit side frames in order to provide greater ease in handling the unit. This will also enable the typing unit to be tilted backward so that it rests on its rear feet and the rear points of the side frame as well as the two positions described above.

(2) When the requirement calls for a clutch to be disengaged, the clutch shoe lever must be fully latched between its trip lever and latch lever so that the clutch shoes (figure 5-18) release their tension on the clutch drum. When engaged, the clutch shoe lever

is unlatched and the clutch shoes are wedged firmly against the clutch drum.

## NOTE

When rotating the main shaft of the Typing Unit by hand, the clutches do not fully DISENGAGE upon reaching their stop positions. In order to relieve the drag on the clutches and permit the main shaft to ROTATE freely, apply pressure on the lug of each clutch disk (figure 5-18) with a screwdriver to cause it to ENGAGE its latch lever and thus fully DISENGAGE the internal expansion clutch. This procedure should always be followed prior to placing the Typing Unit on the base and switching on the power.

## (3) Manual Selection of Characters or Functions.

(a) To manually operate the Typing Unit while removed from the Base hold the selector magnet armature (figure 5-1) operated by means of an armature clip and rotate the main shaft in a counterclockwise direction (by means of the handwheel listed in Bulletin 1124B) to bring all clutches to their disengaged position.

## NOTE

The armature clip is attached to the armature by carefully inserting the flat-formed end of the clip over the top of the armature between the pole pieces and hooking the extruded projection under the edge of the armature. The top end of the clip should then be hooked over the top of the bakelite selector coil terminal guard. The spring tension of the clip will hold the armature in the marking (attracted) position.

(b) Fully disengage all clutches as described in the preceding note. Release armature momentarily to permit the selector clutch to engage. Turn the main shaft slowly until the No. 5 selector lever has just moved to the peak of its cam. Strip from the selector levers the push levers which are spacing in the code combination of the character or function that is being selected. It should be noted that selector levers (figure 5-8) move in succession starting with the inner (Number One). Continue to rotate main shaft until all operations initiated by selector action clear through unit.

f. Optical System Adjustments - The adjustments of the optical system are so interrelated that each affects certain of the others. Therefore, in making these adjustments it may be necessary to recheck previous adjustments as succeeding adjustments are made. When making a complete adjustment of the optical system, all optical components should be set at approximately the midpoint of their respective adjusting ranges before proceeding.

## 2. TROUBLE SHOOTING

### a. GENERAL

(1) The information contained in this section is planned so as to provide maintenance personnel with effective means for locating and clearing trouble. It is necessary that the technicians be thoroughly familiar with the theory of operation of the equipment and with the adjusting routine before attempting any maintenance procedures (paragraph 5-1).

(2) The exploded illustrations found in Section 7 are grouped on a functional basis and will assist the technician in locating parts, the relation of parts, the nomenclature of parts and part numbers for ordering information.

(3) Tools required are not supplied as part of the equipment. Refer to Teletype Bulletin 1124B.

(4) Equipment failures can be traced functionally by following the leads listed in the accompanying chart and manifested by the behavior of the equipment. An elimination process of these probabilities should help greatly in clearing the trouble. It is assumed that those more obvious faults listed in Section 4 will have been checked before proceeding with the tabulation of troubles.

### WARNING

DISCONNECT THE POWER BEFORE MAKING ANY CONNECTIONS OR REPLACING PARTS INSIDE THIS EQUIPMENT. WHEN ADJUSTING THE OPTICAL SYSTEM WEAR DARK GLASSES TO PROTECT THE EYES FROM THE INTENSE LIGHT OF THE PROJECTOR LAMP.

### b. TABULATION OF TROUBLES THAT MAY BE ENCOUNTERED

#### (1) TYPING UNIT MOTOR DOES NOT START.

(a) Power failure - Check for 115 volts, 60 cycles applied voltage at the power line terminals on the control panel. If the projection lamp, rewind motor and exhaust blower operate when the local switch on the projector cabinet is turned on then the power source should be satisfactory.

(b) Fuse failure - the Receiver Projector Set is not fused internally. Check the fuse for the circuit in which the set is operating. If open, rotate the typing unit motor by hand and check for excessive load. Also, check the motor for shorted windings and see that the thermal cutout switch and starting relay are not inoperative.

(c) Motor control circuit not functioning properly:

1. Open winding in control relay. Check for voltage at control relay.

2. Control relay contacts not closing properly (figure 5-69).

3. Control circuit switch not making properly at Sending Station.

#### (2) TYPING UNIT MOTOR DOES NOT STOP.

(a) Motor control circuit not functioning properly.

1. Control relay contacts not opening properly (figure 5-69).

2. Control circuit switch not breaking properly at Sending Station.

(3) MOTOR SPEED INCORRECT - Wrong frequency of power supply. Governed motor requires adjustment.

#### (4) PROJECTION LAMP, REWIND MOTOR OR BLOWER MOTOR INOPERATIVE.

(a) If these components are collectively inoperative check for power failure, blown fuse or defective local switch on the side of the projector cabinet.

(b) If any one component is inoperative check to see if it is defective or burned out.

#### (5) NO SIGNALS RECEIVED FROM SENDING STATION.

(a) Open signal line.

1. Check to see that a jumper has been provided between terminals 9 and 10 on the upper connector on the control panel.

2. Binding mechanism - check freeness of moving parts.

3. Check signal line at Sending Station.

(b) Signal line not opening - Binding mechanism - Check at both Receiving and Sending Station.

#### (6) SELECTOR RECEIVING MARGIN SHORT.

(a) Line current - inadequate or excessive.

(b) Shorted selector magnet coils.

(c) Incorrect motor speed - Check line frequency. Check governed motor adjustment.

(d) Armature dirty or oily - drag thin piece of clean paper between armature and magnet core.

(e) Binds in moving parts of code bar linkage - Check for freeness.

(f) Incorrect Adjustment - Check following:

1. Selector Magnet Bracket, figure 5-2.

2. Selector Armature, figure 5-1.

3. Selector Armature Spring, figure 5-3.

4. Selector Clutch Latch Lever Spring, figure 5-5.

5. Start Lever Spring, figure 5-7.

(7) INTERMITTENT ERRORS.

(a) Range finder set beyond range limits.

(b) Line current - inadequate or excessive.

(c) Shorted selector magnet coils.

(d) Incorrect motor speed - see paragraph (3).

(e) Armature dirty - drag clean piece of paper between armature and magnet core.

(f) Binds in moving parts of selector or code bar linkage - check for freeness.

(g) Incorrect adjustment - check following:

1. Selector Magnet Bracket, figure 5-2.

2. Code Bar Shift Lever Link Guide, figure 5-11.

3. Code Bar Detent, figure 5-52.

4. Selector Push Lever Spring, figure 5-4.

5. Transfer Lever Spring, figure 5-8.

(8) GAINING OR LOSING A PULSE.

(a) Binds in moving parts of selector or code bar linkage on particular pulse in trouble - check for freeness.

(b) Incorrect adjustment - check the following adjustments on the particular pulse in trouble.

1. Selector Magnet Bracket, figure 5-2.

2. Code Bar Shift Lever Link Guide, figure 5-11.

3. Code Bar Detent, figure 5-52.

4. Selector Push Lever Spring, figure 5-4.

5. Transfer Lever Spring, figure 5-8.

(9) GARBLING.

(a) Incorrect line current.

(b) Defective selector coils.

(c) Incorrect motor speed - see paragraph (3).

(d) Range finder setting out of limits.

(e) Armature dirty - see paragraph (7)(e).

(f) Binds in moving parts of selector and code bar linkage - check the following:

1. Selector Magnet Bracket, figure 5-2.

2. Code Bar Detent, figure 5-52.

3. Selector Armature Spring, figure 5-3.

4. Selector Clutch Latch Lever Spring, figure 5-5.

(10) SPACING FAILURE OR MULTIPLE SPACING.

(a) Binds in moving parts of spacing chain of linkage, figures 5-19 and 5-25.

(b) Incorrect adjustment - check the following:

1. Spacing Trip Lever Bail Cam Plate, figure 5-25.

2. Spacing Clutch Trip Lever, figure 5-15.

3. Carriage Return Lever, figure 5-33.

4. Spacing Trip Lever Spring, figure 5-25.

5. Spacing Trip Lever Bail Spring, figure 5-25.

6. Spacing Feed Pawl Spring, figure 5-24.

7. Clutch Trip Shaft Set Collar, figure 5-14.

8. Function Stripper Blade Arm, figure 5-47.

9. Function Bar Spring, figure 5-46.

(11) FAILURE ON LETTERS - FIGURES SHIFT.

(a) Binds in moving parts of letters - figures shift linkage -- check for freeness of selector and code bar linkage, and letters and figures function slide (figure 5-26).

(b) Incorrect Adjustment - check the following:

1. Function Stripper Blade Arm, figure 5-47.

2. Shift Code Bar Mechanism, figure 5-26.

3. Function Lever, Function Pawl, and Function Bar Springs, figure 5-46.

(12) FAILURE ON CARRIAGE RETURN.

(a) Binds in moving parts of linkage for carriage return function. Check for freeness of selector and code bar linkage, function bar reset bail and function bar linkage in function box and carriage return bail and slide.



(b) Incorrect Adjustment - check the following:

1. Function Reset Bail Blade, figure 5-27.
2. Function Lever, Function Pawl, and Function Bar Springs, figure 5-46.

(13) FAILURE ON LINE FEED.

(a) Binds in moving parts of linkage for line feed function - check for freeness of selector and code bar linkage, function bar reset bail and function bar linkage in function box, line feed function slide arm and line feed clutch trip lever, figure 5-16, line feed eccentric gear assembly, figure 5-20, and line feed stripper and stripper bail, figure 5-48 - check position of single - double line feed lever. Check upper guide rollers for freeness.

(b) Incorrect Adjustments - check the following:

1. Line Feed Clutch Trip Lever Eccentric Post, figure 5-16.
2. Line Feed Clutch Trip Lever Adjusting Screw, figure 5-16.
3. Line Feed Clutch Trip Lever Spring, figure 5-15.
4. Function Reset Bail Blade, figure 5-27.
5. Function Bar, Function Pawl, Function Lever Springs, figure 5-46.
6. Line Feed Phasing, figure 5-20.
7. Transparent Web Feed Pawl Mechanism, figure 5-53.
8. Feed Pawl Spring, figure 5-54.
9. Pressure Roll Release Arm Spring, figure 5-56.
10. Friction Clutch Adjustment, figure 5-63.

(14) RIBBON FAILS TO FEED OR REVERSE.

(a) Binds in moving parts of ribbon feeding or reversing mechanism - check for freeness of ribbon feed levers, ribbon lever, ribbon reversing lever, and ribbon reverse detent lever.

(b) Detent cam loose - check set screws and ribbon reverse Detent Adjustment, figure 5-43.

(c) Eyelet missing from ribbon.

(d) Incorrect Adjustment - check the following:

1. Ribbon Feed Lever Bracket, figure 5-44.
2. Ribbon Reverse Spur Gear, figure 5-43.
3. Ribbon Reverse Detent, figure 5-43.
4. Ribbon Feed Lever Spring, figure 5-44.
5. Ribbon Ratchet Wheel Friction Spring, figure 5-44.
6. Ribbon Lever Spring, figure 5-45.
7. Ribbon Reverse Detent Lever Spring, figure 5-43.

(15) FAILURE TO POSITION.

(a) Binds in moving parts of linkage for type bar positioning mechanism - check freeness of main rocker shaft; vertical positioning linkage, figure 5-22 and 5-23; SUP., 1, 2, 3 and COM code bars; reversing slide, shift slide drive linkage and oscillator rail linkage, figure 5-29.

(b) Incorrect Adjustment - check the following:

1. Rocker Shaft Left Bracket, figure 5-20.
2. Right and Left Vertical Positioning Lever Eccentric Stud, figures 5-22 and 5-23.
3. Shift Slide Drive Linkage, figure 5-29.
4. Vertical Positioning Lever Spring, figure 5-22.
5. Shift Linkage Spring, figure 5-39.
6. Vertical Positioning Lock Lever Spring, figure 5-23.

(16) FAILURE TO PRINT.

(a) Binds in printing carriage assembly - check for freeness in moving parts, and for missing springs.

(b) Ribbon not properly installed.

(c) Incorrect Adjustments - check the following:

1. Printing Track, figure 5-40.
2. Printing Arm, figure 5-41.
3. Printing Hammer Plunger Springs, figure 5-40.

(17) PROJECTED MESSAGE BLURRED.

(a) Face of type needs cleaning. See paragraphs 5-8g and 5-10a(1).

(b) Out of focus. Adjust objective lens for sharpest image, figure 5-66.

(c) Platen Adjustment, figure 5-55.



**(18) TYPED MESSAGE IMPROPERLY POSITIONED.**

- (a) Left Margin Adjustment, figure 5-34.
- (b) Right Hand Margin Adjustment, figure 5-35.

**(19) PROJECTED MESSAGE IMPROPERLY POSITIONED.**

- (a) Small Mirror Pivot Screws Adjustment, figure 5-66.
- (b) Small Mirror Extension Brackets Adjustment, figure 5-66.
- (c) Left-Hand Margin Adjustment on Screen, figure 5-66.
- (d) Left-Hand Margin Width Adjustment, figure 5-64.

**(20) DARK AREAS ON SCREEN.**

- (a) Projector Lamp Focusing Adjustment, figure 5-65.
- (b) Refinement of Projector Lamp Focusing Adjustment, figure 5-66.

**(21) PROJECTED IMAGE BOUNCES - Oscillating platen or ribbon striking the transparent web. Check the following:**

- (a) Positioning the Typing Unit, figure 5-62.
- (b) Web Roller Adjustment, figure 5-55.

**(22) OVERLAPPING LINES - Where a type box having large gothic type is used it is normal to have some overlapping between adjacent lines when single line feed is employed. See paragraph 2e(13) for other faults.****(23) MOTION OF TYPE BOX ON SCREEN - The Model 28 Receiver Projector is designed so that the last character printed on the transparent web is visible on the screen before the next character is printed. When this feature is not desired it can be eliminated by adjusting the optical system accordingly - check the following:**

- (a) Small Mirror Pivot Screws Adjustment, figure 5-66.
- (b) Objective Lens Mount Adjustment, figure 5-66.

**TROUBLE SHOOTING CHART**

STEP AND INDICATION	TROUBLE	CORRECTION
1. Motor (Typing Unit) Stops and Starts	Does not start Does not stop	paragraph 2e(1) paragraph 2e(2)
2. Motor runs	Speed incorrect	paragraph 2e(3)
3. Projection lamp, rewind motor, blower motor	All inoperative One component inoperative	paragraph 2e(4)(a) paragraph 2e(4)(b)
4. Signal generated at Sending Station	No signal received, runs open No signal received, runs closed	paragraph 2e(5)(a) paragraph 2e(5)(b)
5. Transmission from Sending Station produces typed copy	Short on margin Intermittent errors Gaining or losing a pulse Garbling	paragraph 2e(6) paragraph 2e(7) paragraph 2e(8) paragraph 2e(9)
6. Initiation of functions	Spacing failure Failure on letters-figures shift Failure on carriage return Failure on line feed Ribbon fails to feed or reverse Failure to position Failure to print	paragraph 2e(10) paragraph 2e(11) paragraph 2e(12) paragraph 2e(13) paragraph 2e(14) paragraph 2e(15) paragraph 2e(16)
7. Projected Message	Message blurred Improperly positioned - on web Improperly positioned - on screen Dark areas on screen Image bounces Overlapping lines Motion of type box on screen	paragraph 2e(17) paragraph 2e(18) paragraph 2e(19) paragraph 2e(20) paragraph 2e(21) paragraph 2e(22) paragraph 2e(23)

### 3. PROJECTOR TYPING UNIT ADJUSTMENTS

When making a complete adjustment of Typing Unit, the following conditioning operations should be performed to prevent damage:

a. Loosen the shift lever drive arm clamp screw (figure 5-10).

b. Move the right and left vertical positioning lever eccentric studs (figures 5-22 and 5-23) in rocker shaft brackets to their lowest position.

c. Loosen the two bearing stud mounting screws and the two connecting strip clamp screws in the horizontal positioning drive linkage (figure 5-29).

d. Loosen the clamp screws and move the reversing slide brackets to their uppermost position (figure 5-28).

e. Loosen the function reset bail blade mounting screws (figure 5-27).

f. Loosen the carriage return lever clamp screw (figure 5-33).

g. Loosen the clamp screws in the oscillating rail slide (figure 5-24).

h. Loosen the reversing slide adjusting stud (figure 5-28).

i. Loosen the shift code bar guide plate mounting nuts (figure 5-26).

j. Check the following adjustments during each lubricating period:

(1) Printing carriage position (figure 5-38).

(2) Printing hammer bearing stud (figure 5-38).

(3) Printing hammer stop bracket. Also see note (figure 5-41).

(4) Carriage wire rope (figure 5-31).

(5) Dashpot vent screw (figure 5-36). Also check the transfer slide for binds.

## 3. PROJECTOR TYPING UNIT

## NOTE

TO FACILITATE MAKING THE FOLLOWING ADJUSTMENTS, REMOVE THE RANGE FINDER AND SELECTOR MAGNET ASSEMBLIES. TO INSURE BETTER OPERATION, PULL A PIECE OF KS BOND PAPER BETWEEN THE ARMATURE AND THE POLE PIECES TO REMOVE ANY OIL OR FOREIGN MATTER THAT MAY BE PRESENT. MAKE CERTAIN THAT NO LINT OR PIECES OF PAPER REMAIN BETWEEN THE POLE PIECES AND ARMATURE.

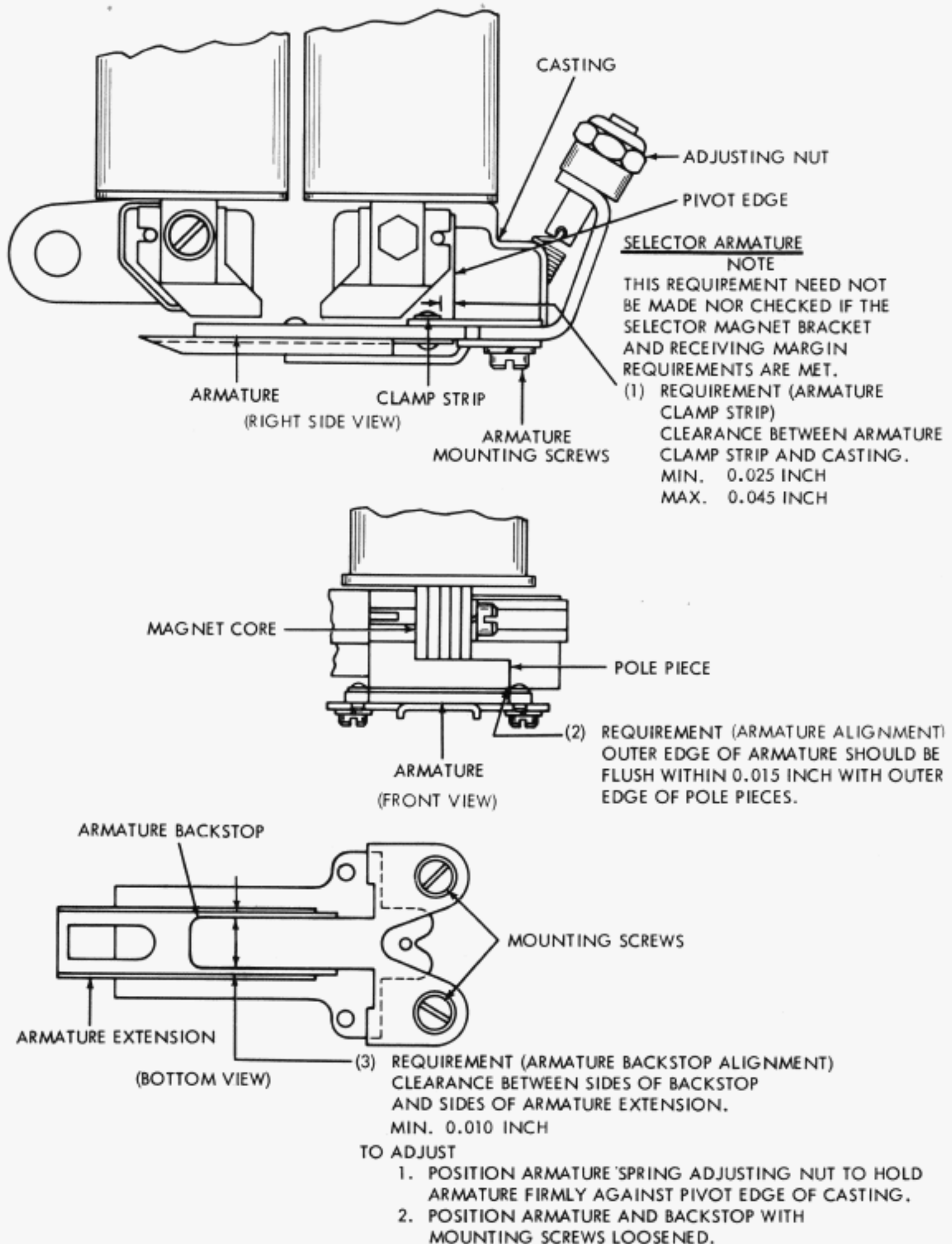
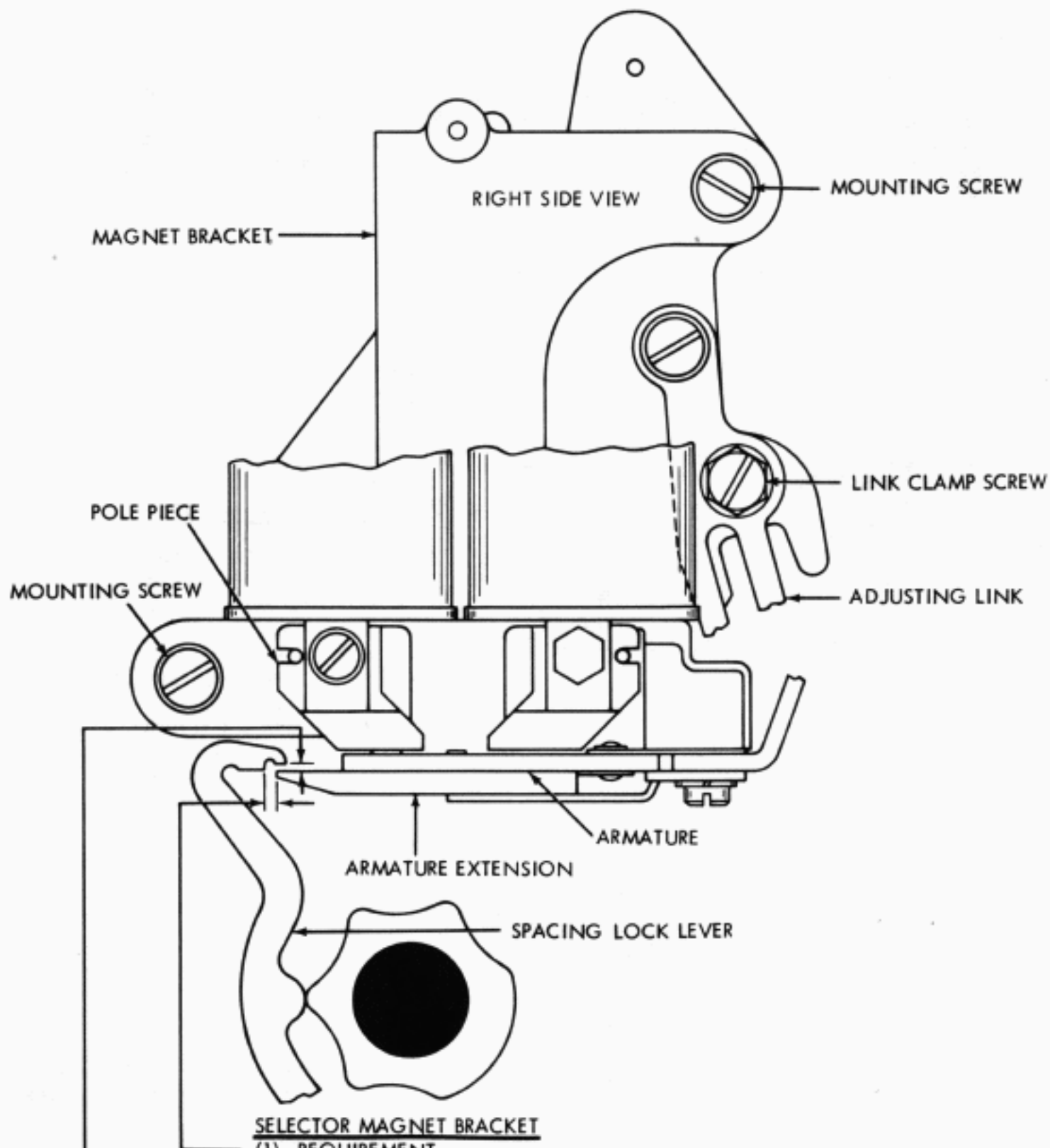


Figure 5-1 Typing Unit, Selector Magnet



SELECTOR MAGNET BRACKET

(1) REQUIREMENT

SPACING LOCK LEVER ON HIGH PART OF CAM. ARMATURE IN CONTACT WITH POLE PIECE. CLEARANCE BETWEEN END OF ARMATURE EXTENSION AND SHOULDER ON SPACING LOCK LEVER.  
MIN. 0.020 INCH  
MAX. 0.035 INCH

TO ADJUST

LOOSEN TWO MAGNET BRACKET MOUNTING SCREWS AND ADJUSTING LINK CLAMP SCREW. POSITION MAGNET BRACKET BY MEANS OF ADJUSTING LINK AND TIGHTEN LINK CLAMP SCREW ONLY.

(2) REQUIREMENT

SPACING LOCK LEVER ON HIGH PART OF CAM. ARMATURE IN CONTACT WITH POLE PIECE. SOME CLEARANCE BETWEEN UPPER SURFACE OF ARMATURE EXTENSION AND LOWER SURFACE OF SPACING LOCK LEVER WHEN LOCK LEVER IS HELD DOWNWARD.  
MAX. 0.003 INCH

TO ADJUST

POSITION UPPER END OF MAGNET BRACKET. TIGHTEN TWO MAGNET BRACKET MOUNTING SCREWS. RECHECK REQUIREMENT (1).

Figure 5-2 Typing Unit, Selector Magnet, Right Side View



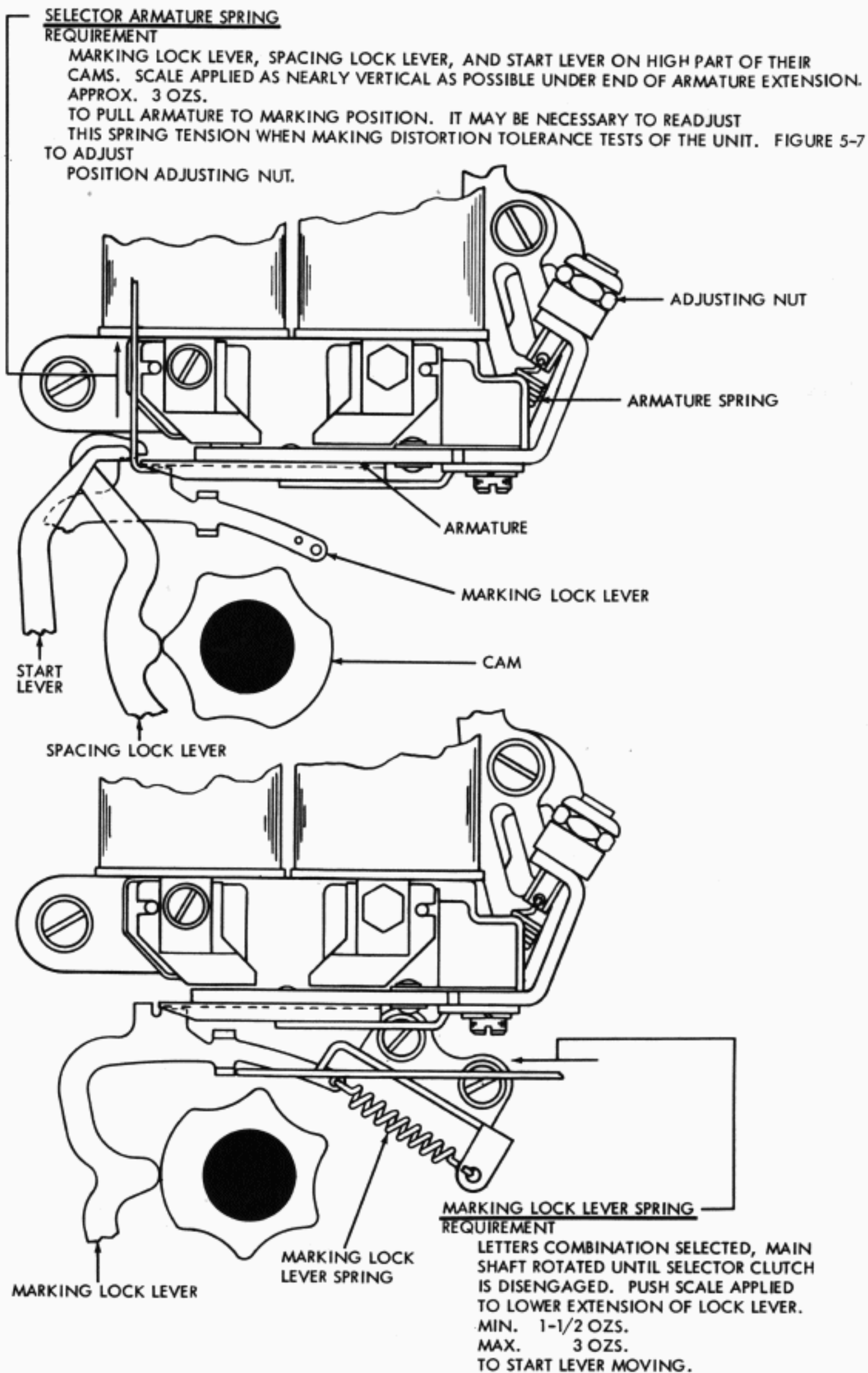


Figure 5-3 Typing Unit, Selector Mechanism, Right Side View

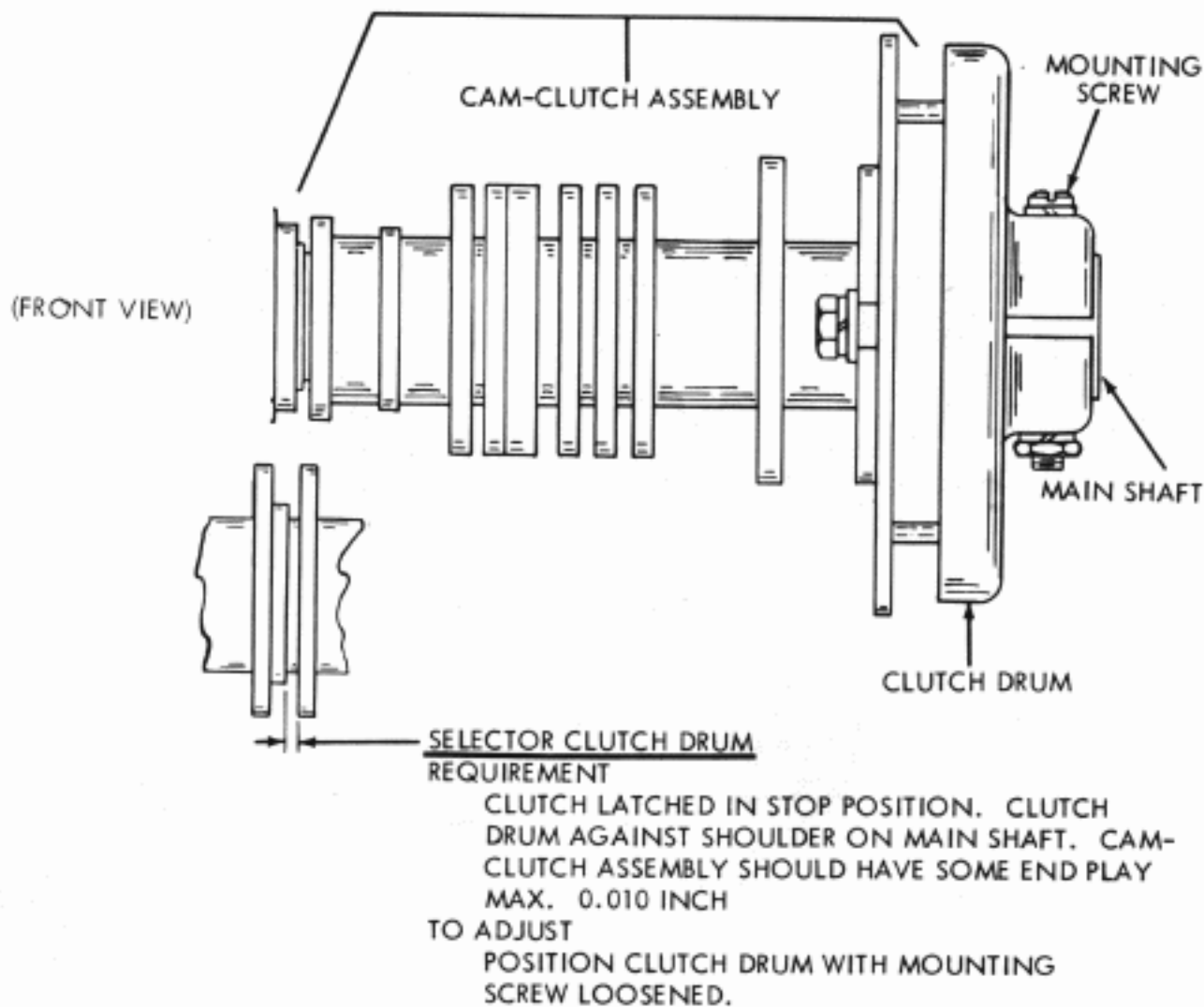
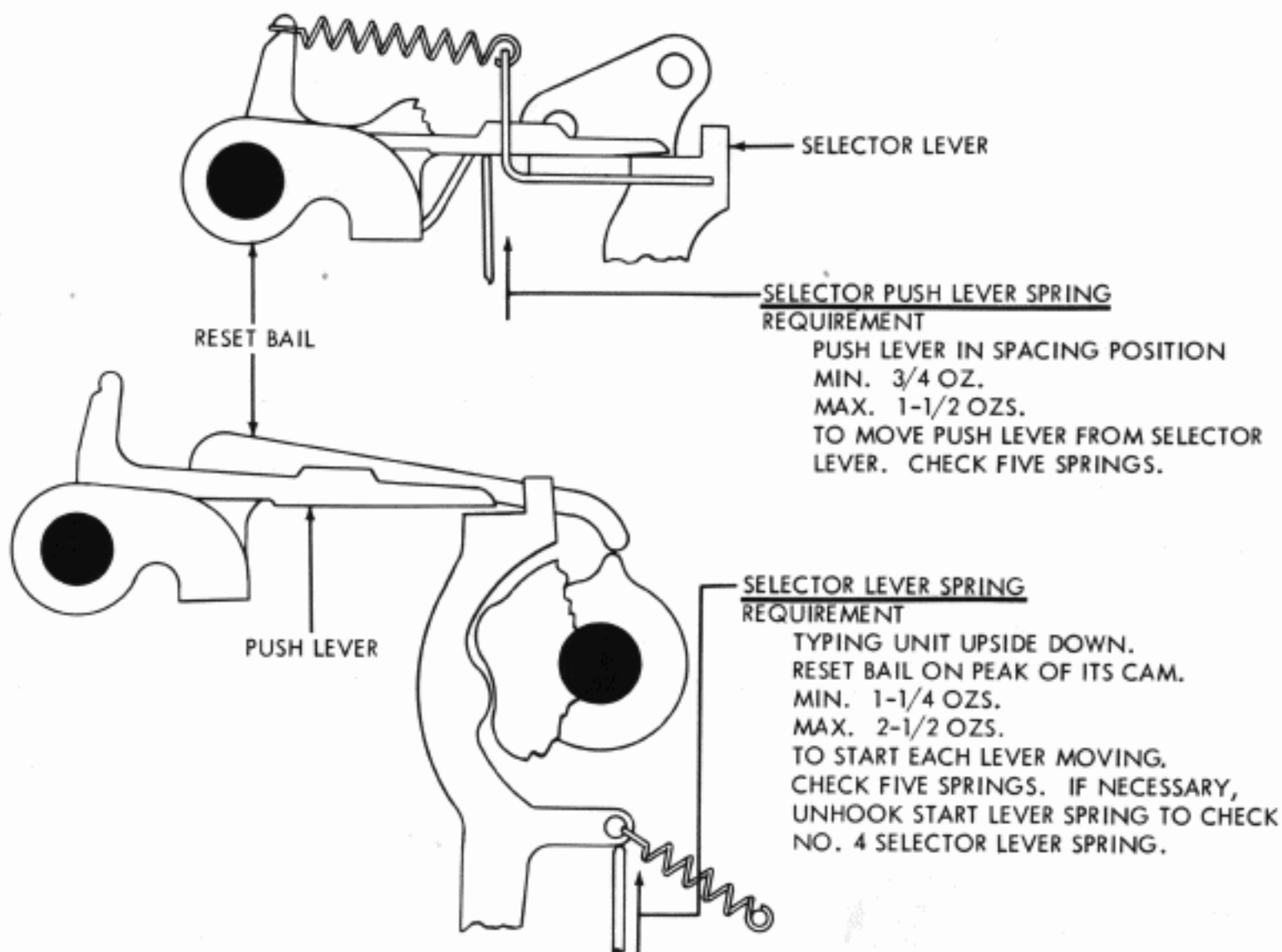


Figure 5-4 Typing Unit, Selector Cam Clutch

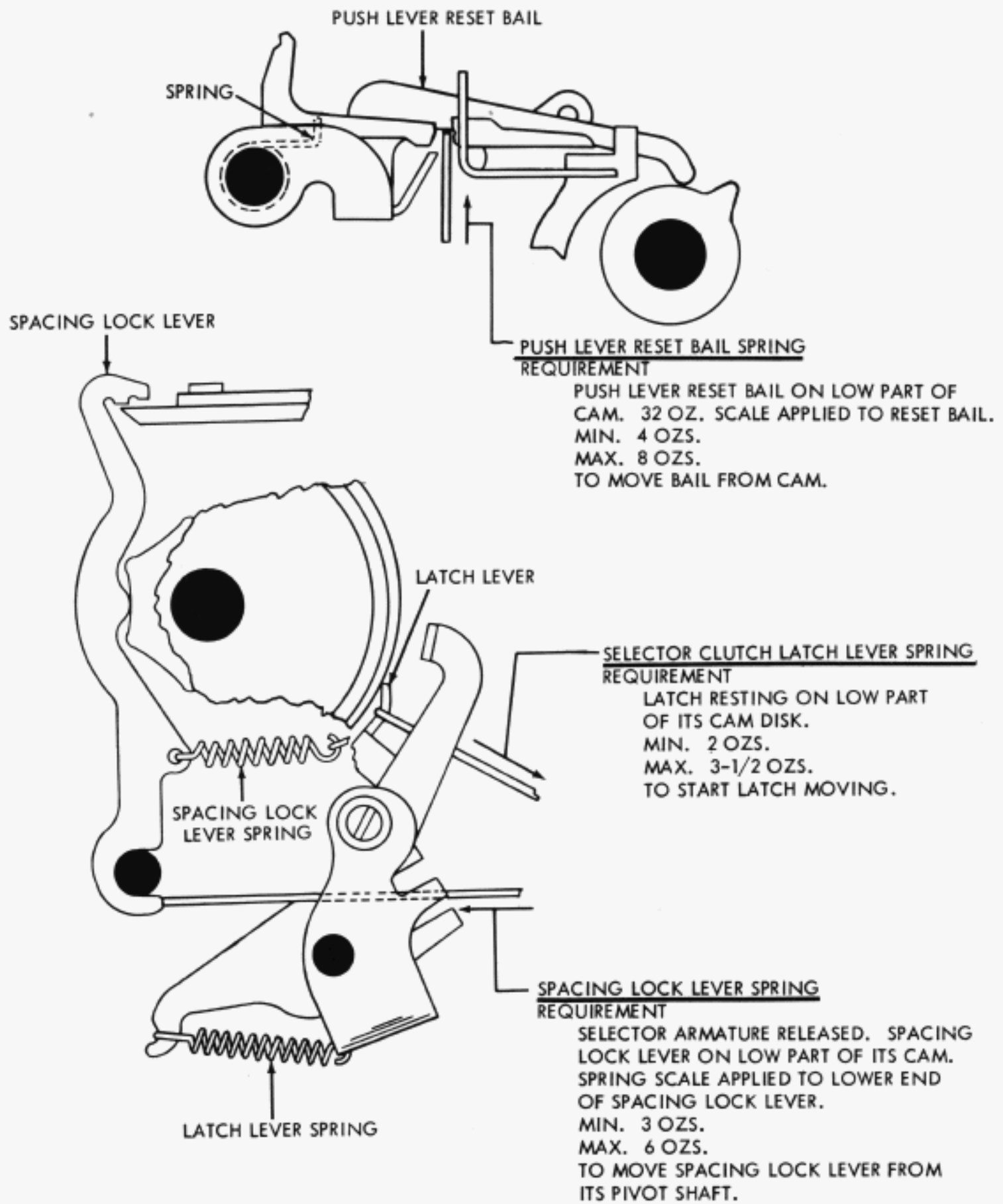


Figure 5-5 Typing Unit, Selector Clutch Mechanism, Right Side View

NOTE: REPLACE RANGE FINDER AND SELECTOR MAGNET ASSEMBLY.

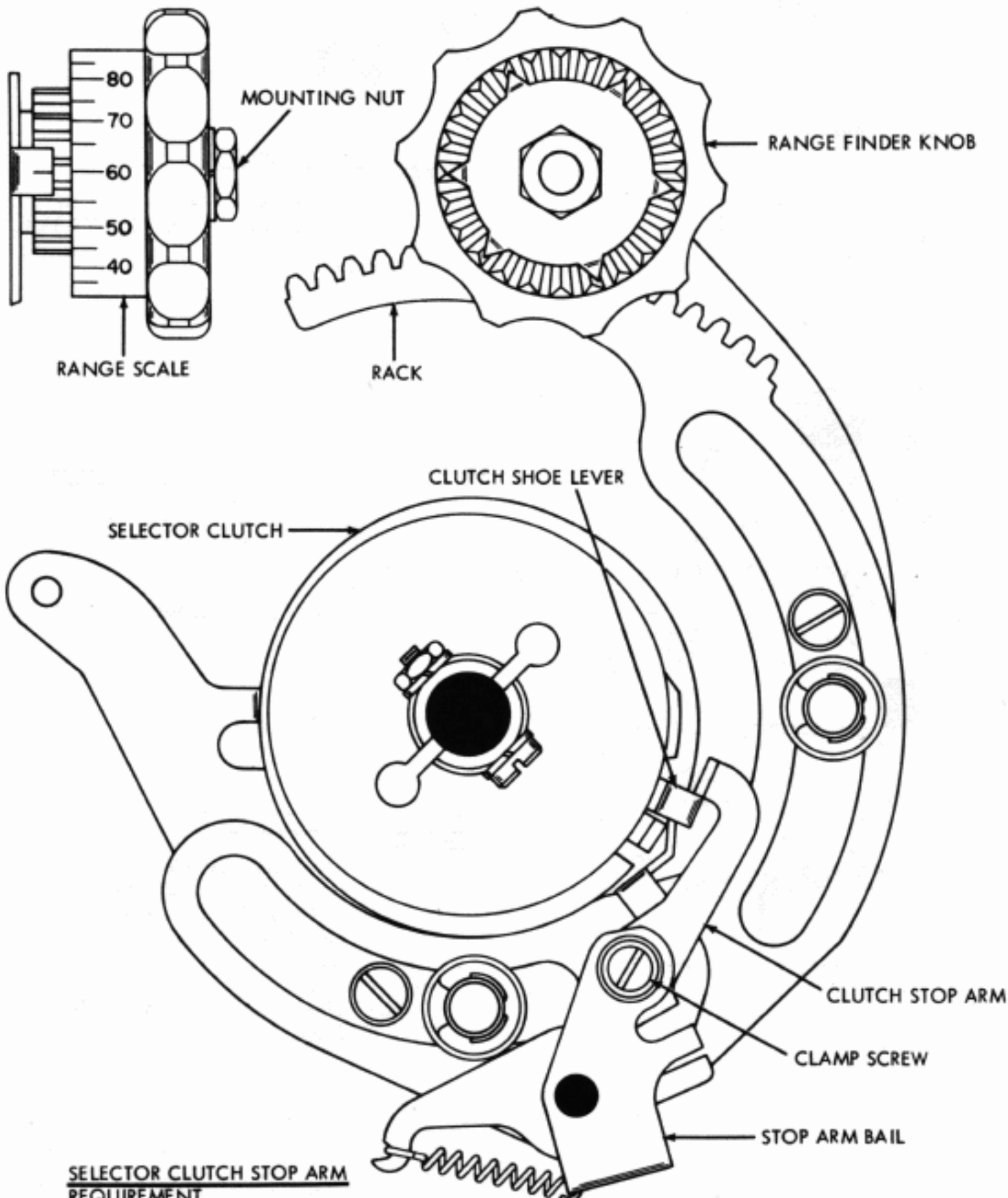
RANGE FINDER KNOB PHASING

REQUIREMENT

WITH RANGE FINDER KNOB TURNED TO EITHER END OF RACK, ZERO MARK ON SCALE SHOULD BE WITHIN 3 POINTS OF SCRIBED LINE ON RANGE FINDER PLATE.

TO ADJUST

REMOVE MOUNTING NUT, DISENGAGE KNOB FROM RACK AND POSITION KNOB. RE-ENGAGE KNOB WITH RACK AND REPLACE MOUNTING NUT.



SELECTOR CLUTCH STOP ARM  
REQUIREMENT

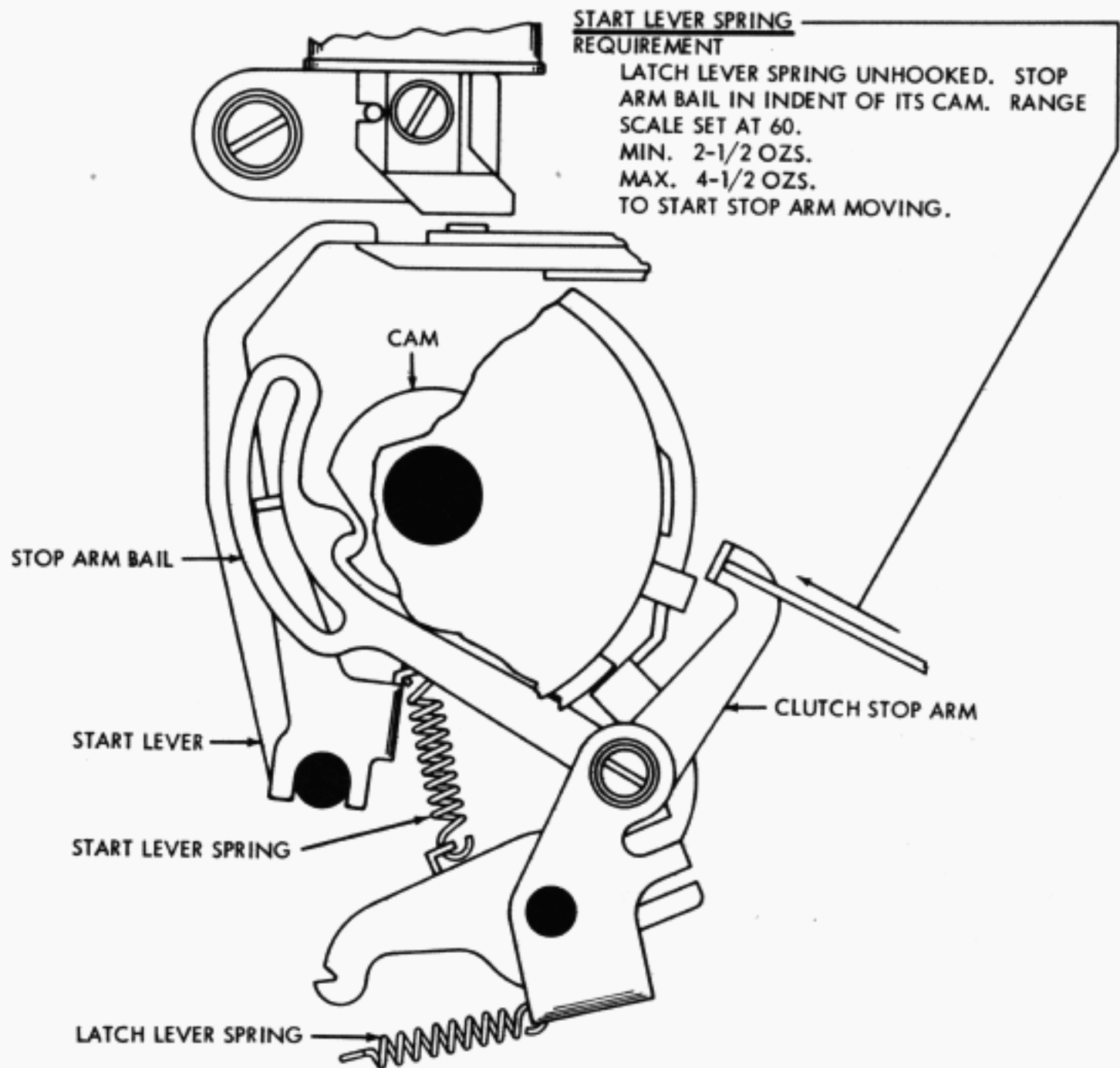
RANGE SCALE SET AT 60. SELECTOR CLUTCH DISENGAGED. ARMATURE IN MARKING POSITION. CLUTCH STOP ARM SHOULD ENGAGE CLUTCH SHOE LEVER BY APPROXIMATELY FULL THICKNESS OF SHOE LEVER.

TO ADJUST

POSITION STOP ARM ON STOP ARM BAIL WITH CLAMP SCREW LOOSENED.

Figure 5-6 Typing Unit, Range Finder Mechanism, Right Side View





**SELECTOR RECEIVING MARGIN**

WHEN A SIGNAL DISTORTION TEST SET IS USED FOR DETERMINING THE RECEIVING MARGINS OF THE SELECTOR, AND WHERE THE CONDITION OF THE COMPONENTS IS EQUIVALENT TO THAT OF NEW EQUIPMENT, THE RANGE AND DISTORTION TOLERANCES BELOW SHOULD BE MET.

**SELECTOR RECEIVING MARGIN MINIMUM REQUIREMENTS**

CURRENT	SPEED IN W.P.M.	POINTS RANGE WITH ZERO DISTORTION	PERCENTAGE OF MARKING AND SPACING BIAS TOLERATED	END DISTORTION TOLERATED WITH SCALE AT BIAS OPTIMUM SETTING
0.060 AMP. (WINDINGS PARALLEL)	60	72	40	35
	75			
	100			
0.020 AMP. (WINDINGS SERIES)	60	72	40	35
	75			

TO ADJUST: REFINE THE SELECTOR ARMATURE SPRING FIGURE 5-3

Figure 5-7 Typing Unit, Selector Clutch Mechanism, Right Side View

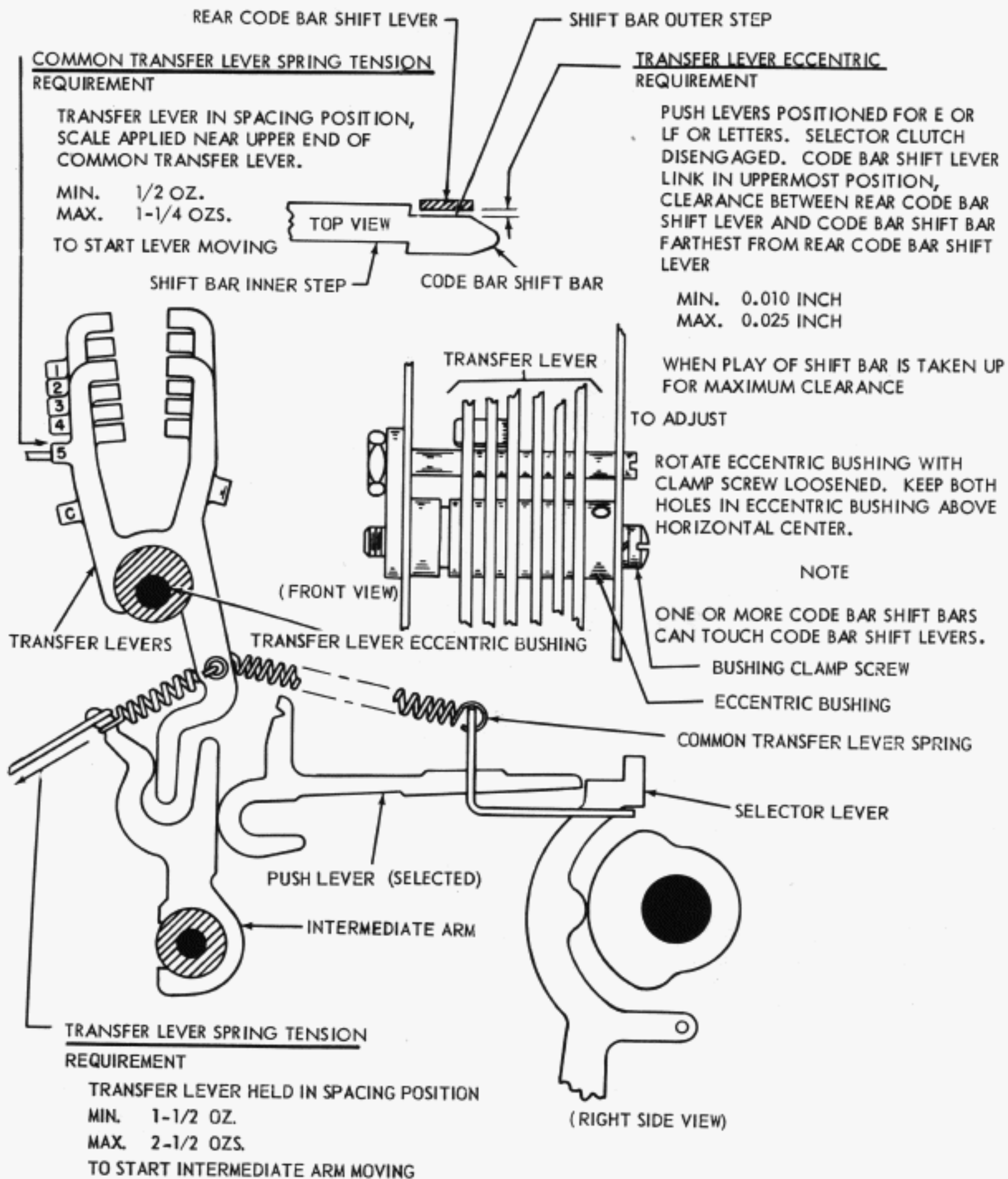
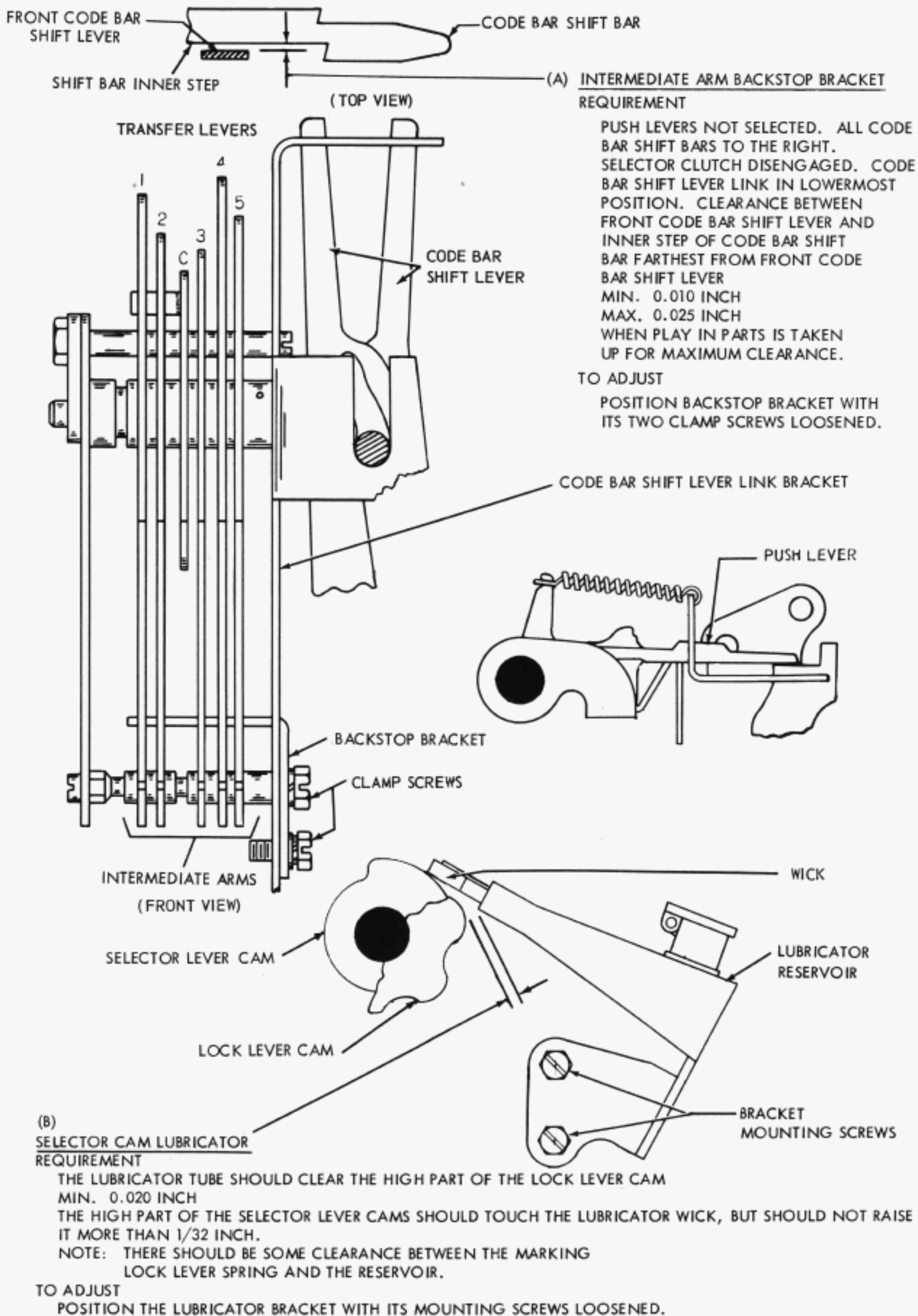


Figure 5-8 Typing Unit, Code Bar Shift Mechanism



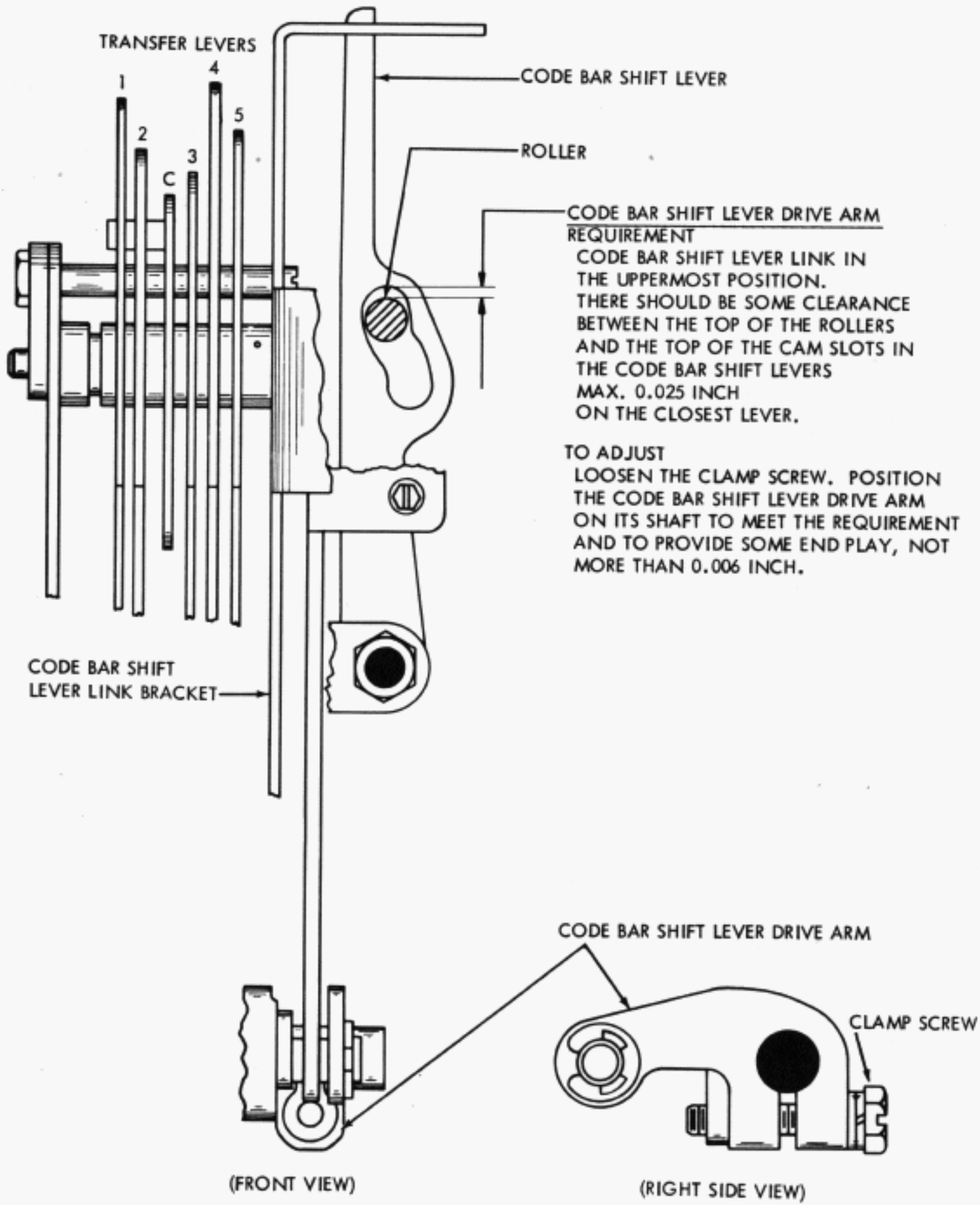


Figure 5-10 Typing Unit, Code Bar Shift Mechanism



**CODE BAR SHIFT LEVER LINK BRACKET****REQUIREMENT**

MOTION OF FRONT AND REAR CODE BAR SHIFT LEVERS SHOULD BE EQUALIZED WITH RESPECT TO CODE BAR TRAVEL.

**TO CHECK (FRONT)**

SELECT BLANK COMBINATION AND ROTATE MAINSHAFT UNTIL CODE BAR SHIFT LEVER LINK REACHES HIGHEST TRAVEL. TAKE UP PLAY FOR MAXIMUM CLEARANCE. CLEARANCE BETWEEN FRONT CODE BAR SHIFT LEVER AND SHOULDER ON NEAREST CODE BAR SHIFT BAR  
MIN. 0.002 INCH  
MAX. 0.025 INCH

**TO CHECK (REAR)**

SELECT LETTERS COMBINATION. CHECK CLEARANCE BETWEEN REAR CODE BAR SHIFT LEVER AND SHOULDER OF CODE BAR SHIFT BAR IN SAME WAY.  
MIN. 0.002 INCH  
MAX. 0.025 INCH

**TO ADJUST**

POSITION ADJUSTING PLATES (FRONT AND REAR) WITH CLAMP SCREWS LOOSENED.

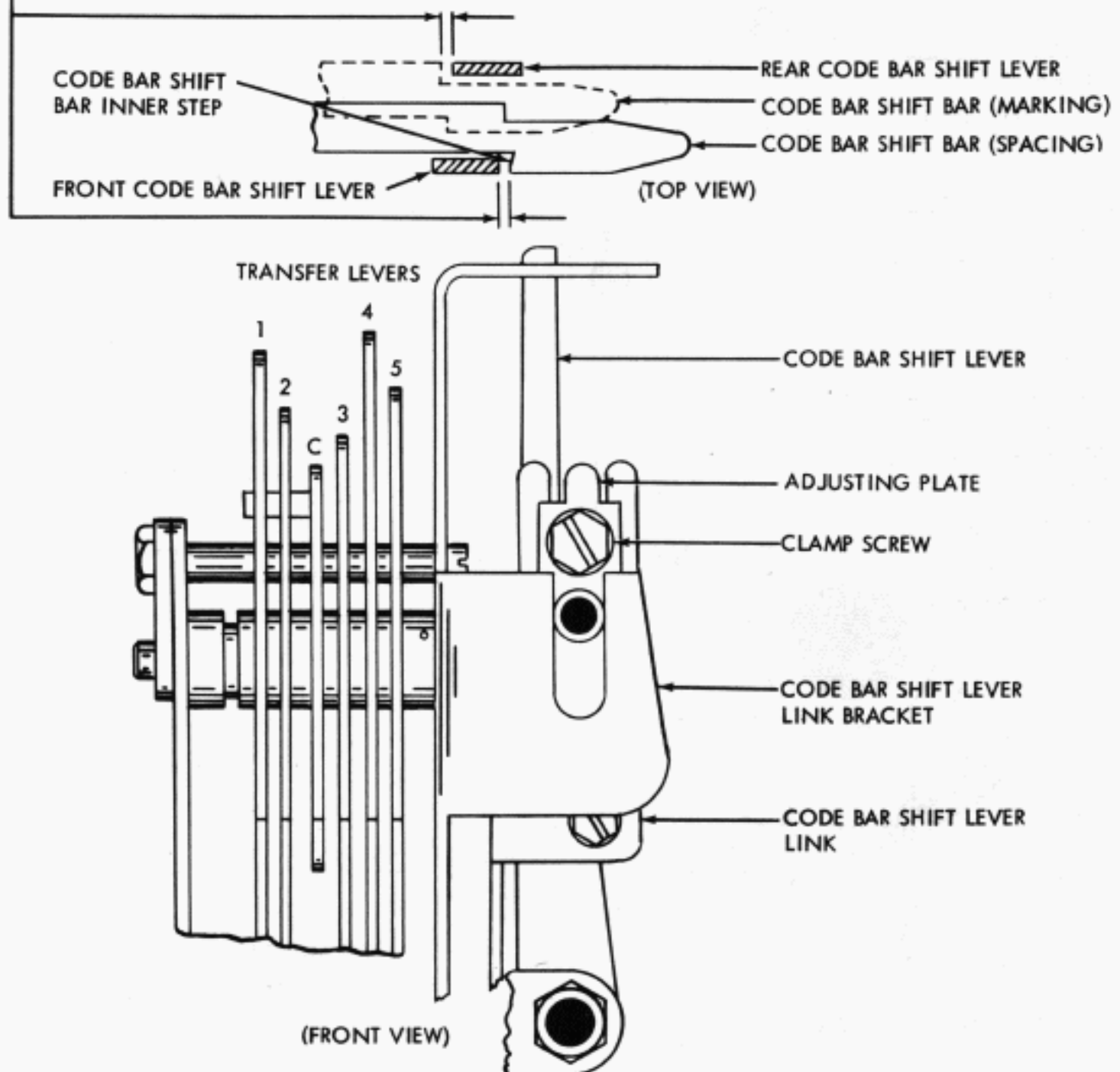


Figure 5-11 Typing Unit, Code Bar Shift Mechanism

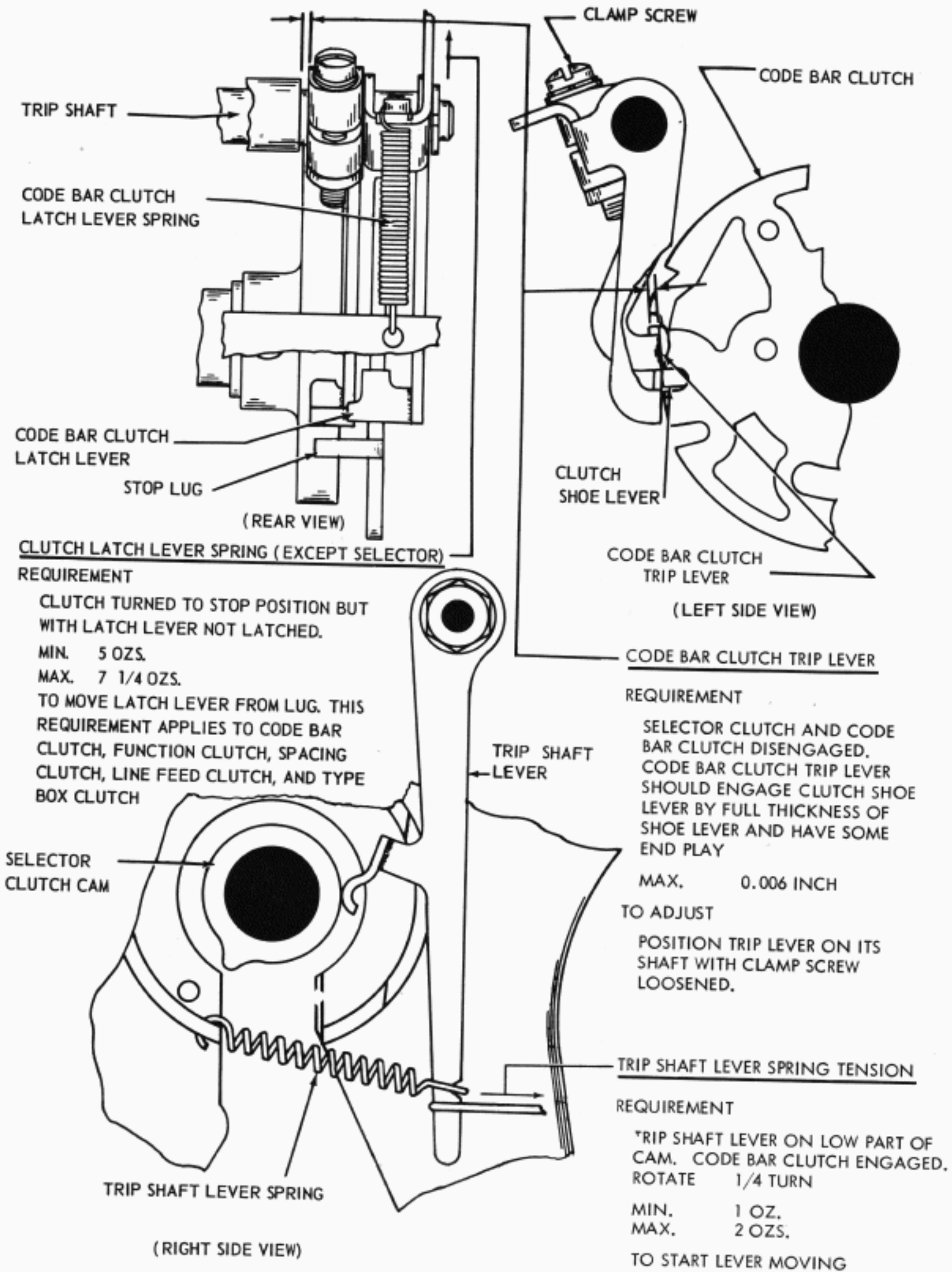
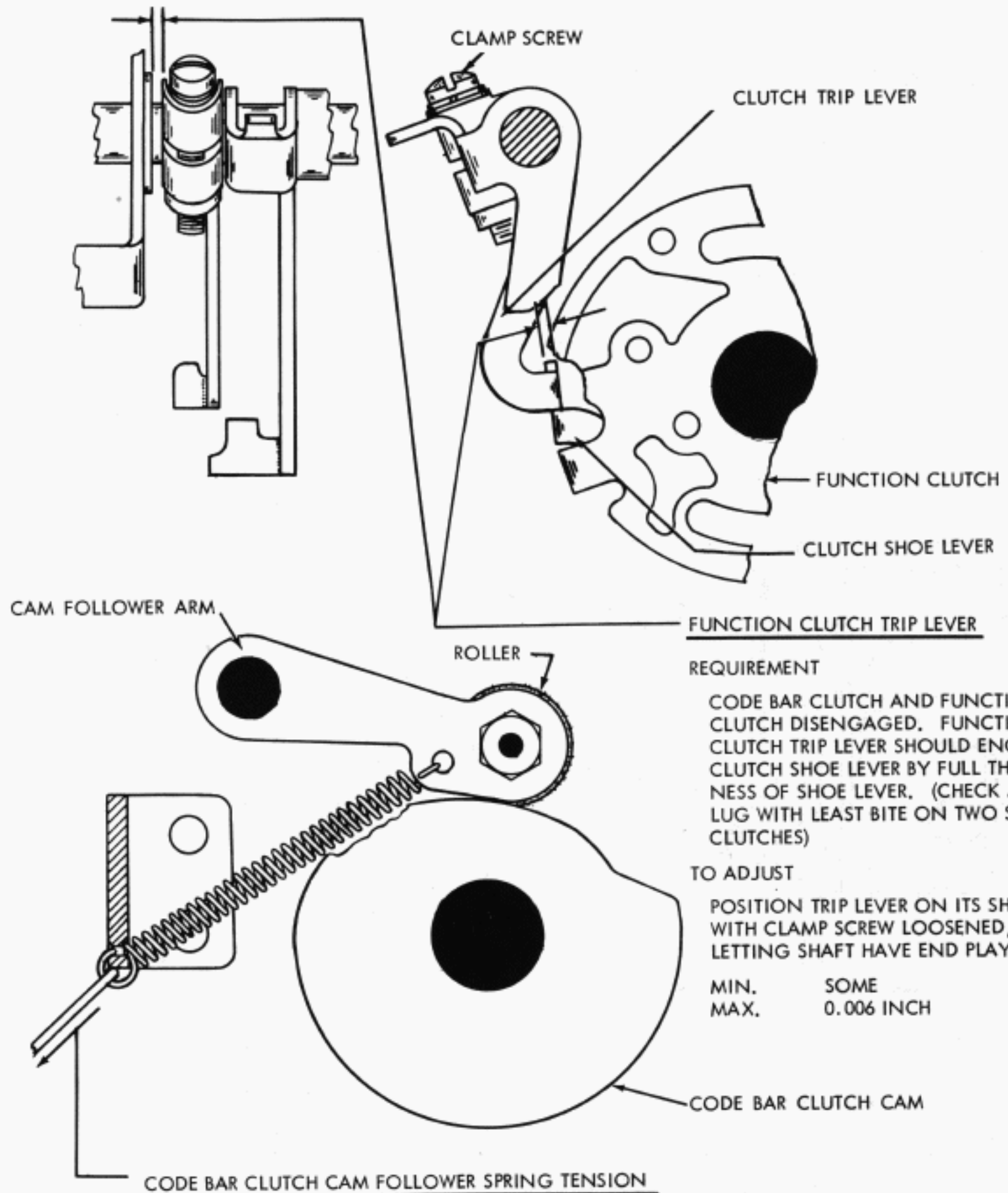


Figure 5-12 Typing Unit, Code Bar Clutch Trip Shaft Mechanism

*att*



**REQUIREMENT**

CODE BAR CLUTCH AND FUNCTION CLUTCH DISENGAGED. FUNCTION CLUTCH TRIP LEVER SHOULD ENGAGE CLUTCH SHOE LEVER BY FULL THICKNESS OF SHOE LEVER. (CHECK AT LUG WITH LEAST BITE ON TWO STOP CLUTCHES)

**TO ADJUST**

POSITION TRIP LEVER ON ITS SHAFT WITH CLAMP SCREW LOOSENED, LETTING SHAFT HAVE END PLAY

MIN.	SOME
MAX.	0.006 INCH

**REQUIREMENT**

CAM FOLLOWER ROLLER ON THE LOW PART OF CAM. THE SPRING UNHOOKED FROM SPRING BRACKET.

MIN.	20 OZS.
MAX.	24 OZS.

TO PULL SPRING TO INSTALLED LENGTH.

Figure 5-13 Typing Unit, Function Clutch Mechanism

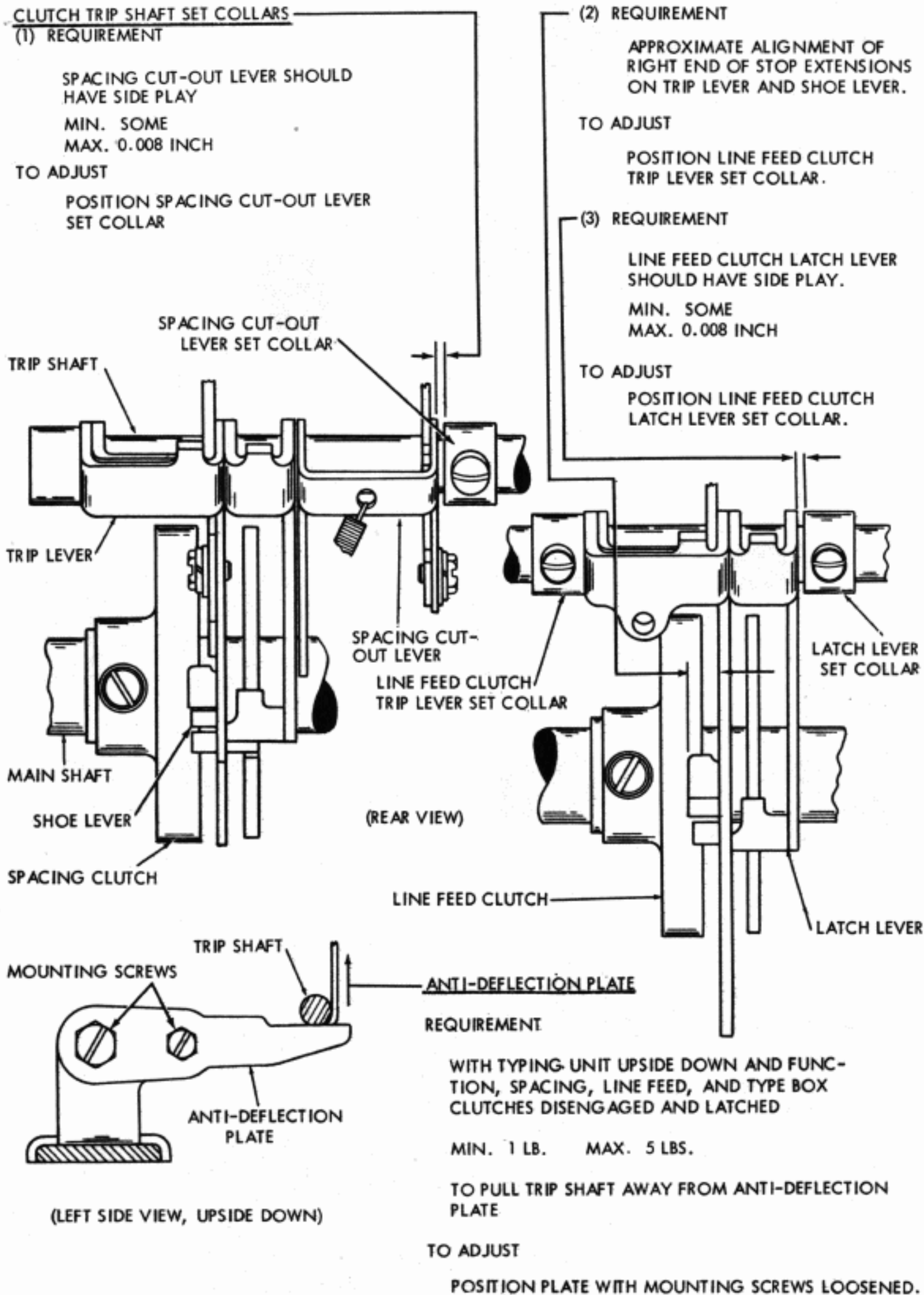
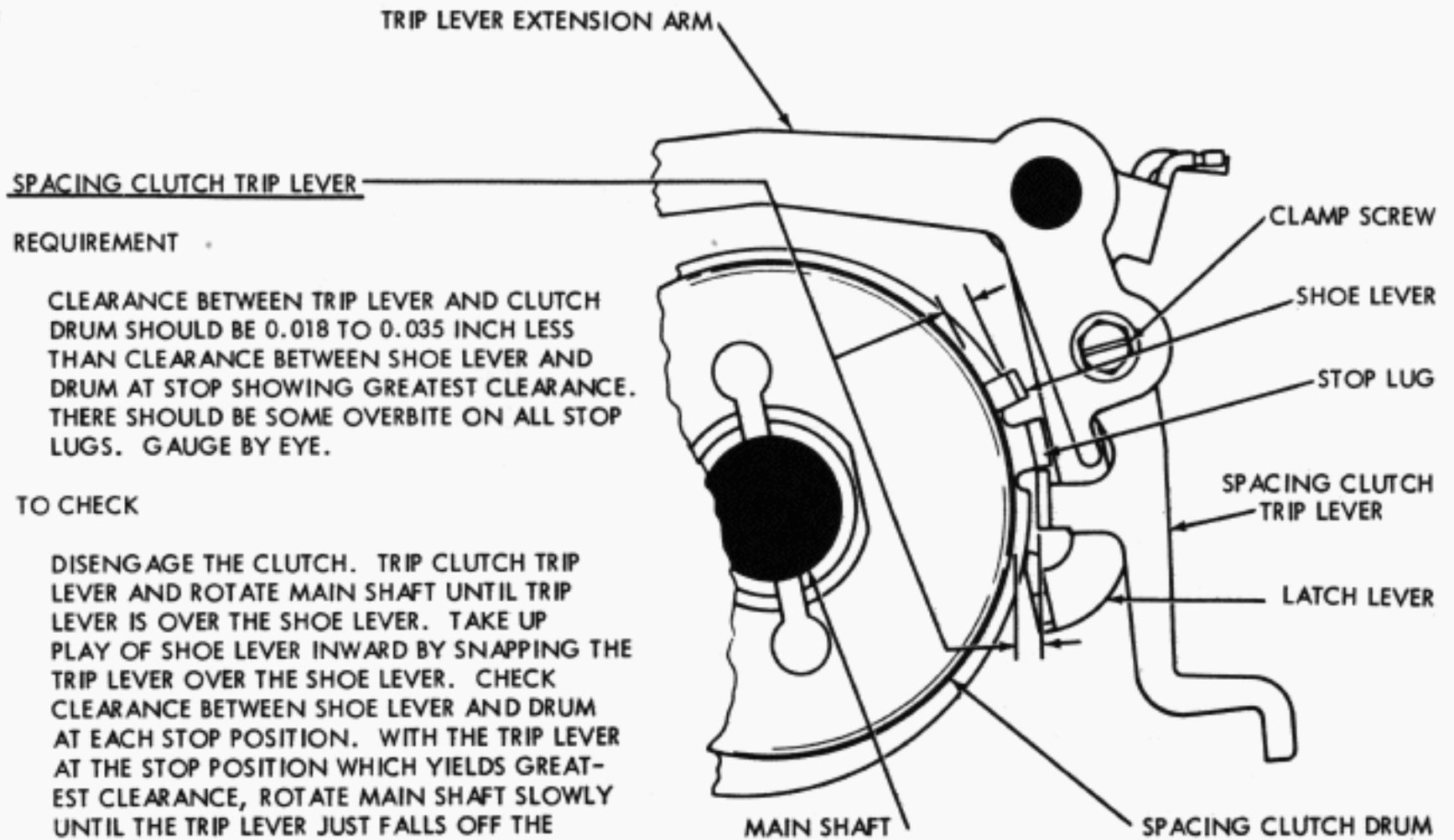


Figure 5-14 Typing Unit, Trip Latch Mechanism





## REQUIREMENT

CLEARANCE BETWEEN TRIP LEVER AND CLUTCH DRUM SHOULD BE 0.018 TO 0.035 INCH LESS THAN CLEARANCE BETWEEN SHOE LEVER AND DRUM AT STOP SHOWING GREATEST CLEARANCE. THERE SHOULD BE SOME OVERBITE ON ALL STOP LUGS. GAUGE BY EYE.

## TO CHECK

DISENGAGE THE CLUTCH. TRIP CLUTCH TRIP LEVER AND ROTATE MAIN SHAFT UNTIL TRIP LEVER IS OVER THE SHOE LEVER. TAKE UP PLAY OF SHOE LEVER INWARD BY SNAPPING THE TRIP LEVER OVER THE SHOE LEVER. CHECK CLEARANCE BETWEEN SHOE LEVER AND DRUM AT EACH STOP POSITION. WITH THE TRIP LEVER AT THE STOP POSITION WHICH YIELDS GREATEST CLEARANCE, ROTATE MAIN SHAFT SLOWLY UNTIL THE TRIP LEVER JUST FALLS OFF THE STOP LUG. CHECK CLEARANCE BETWEEN TRIP LEVER AND DRUM.

## TO ADJUST

POSITION THE TRIP LEVER BY MEANS OF ITS CLAMP SCREW.

(RIGHT SIDE VIEW)

CLUTCH TRIP LEVER SPRING TENSION

## REQUIREMENT

CLUTCH ENGAGED AND ROTATED UNTIL TRIP LEVER RESTS ON STOP LUG

MIN. 11 OZS.

MAX. 16 OZS.

TO MOVE LEVER AWAY FROM STOP LUG.

SPACING CLUTCH TRIP LEVER SPRING

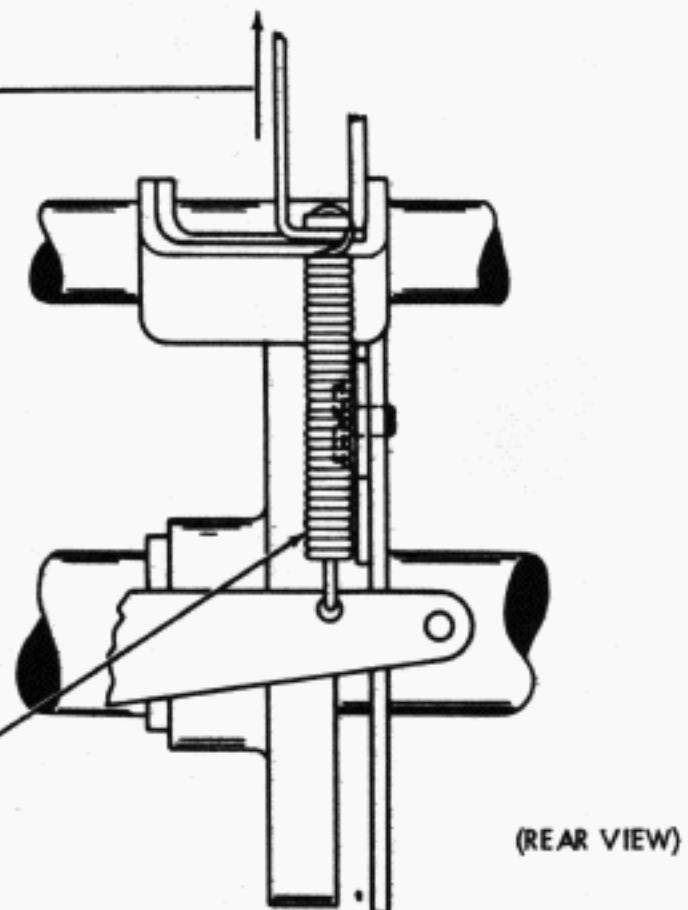


Figure 5-15 Typing Unit, Spacing Clutch Mechanism

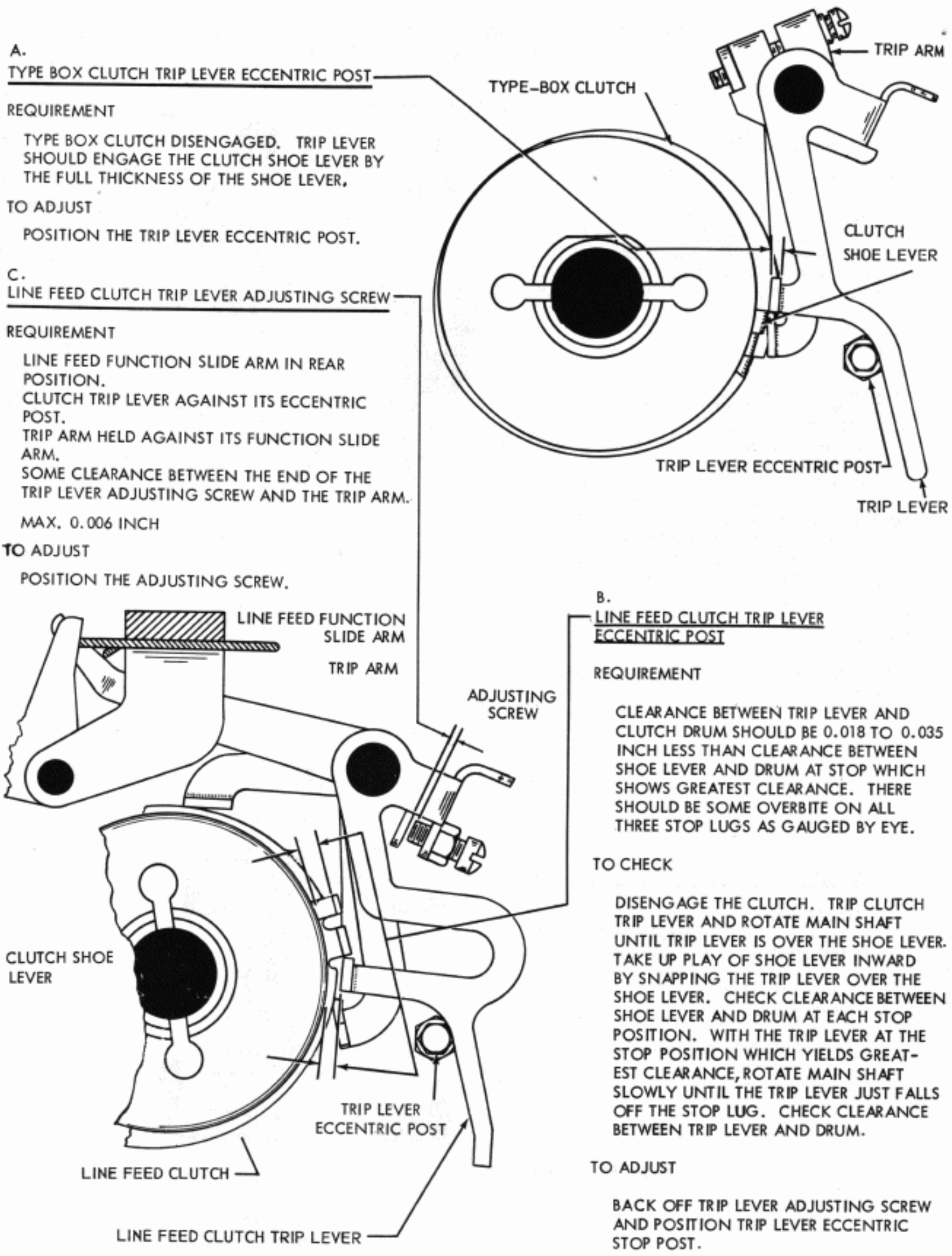


Figure 5-16 Typing Unit, Type Box Clutch and Line Feed Clutch Mechanism

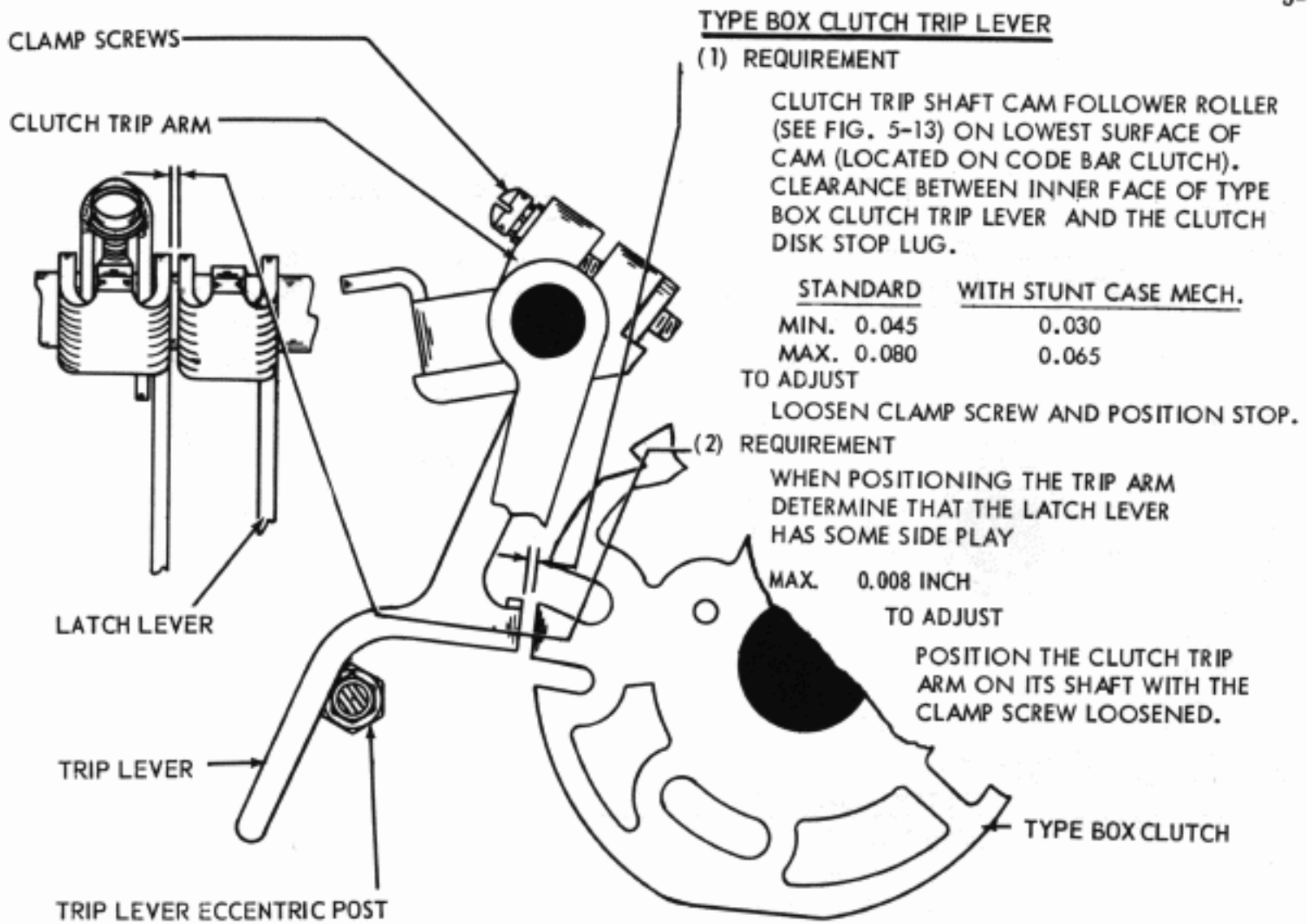
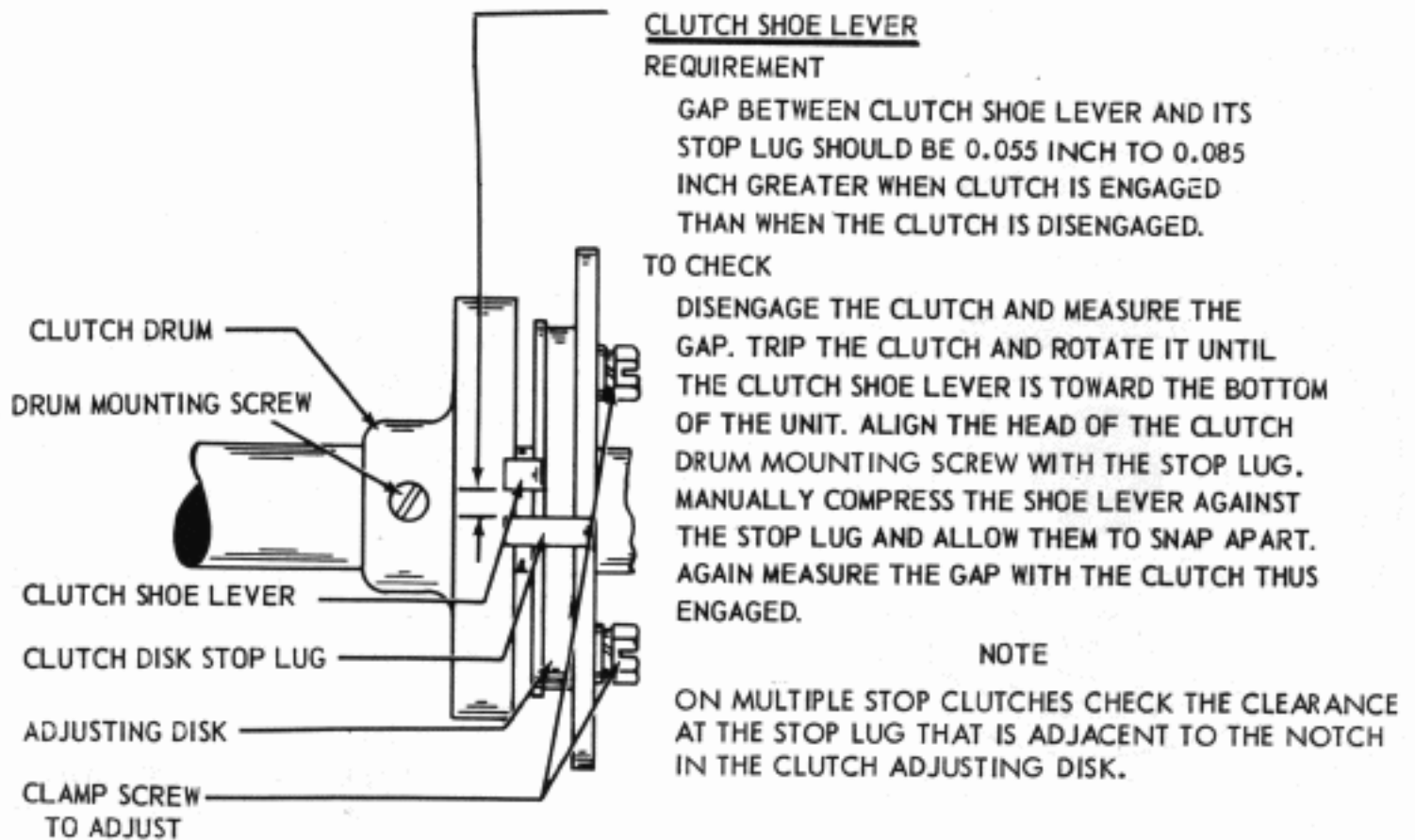


FIGURE 1-33 TYPING UNIT, TYPE BOX CLUTCH MECHANISM

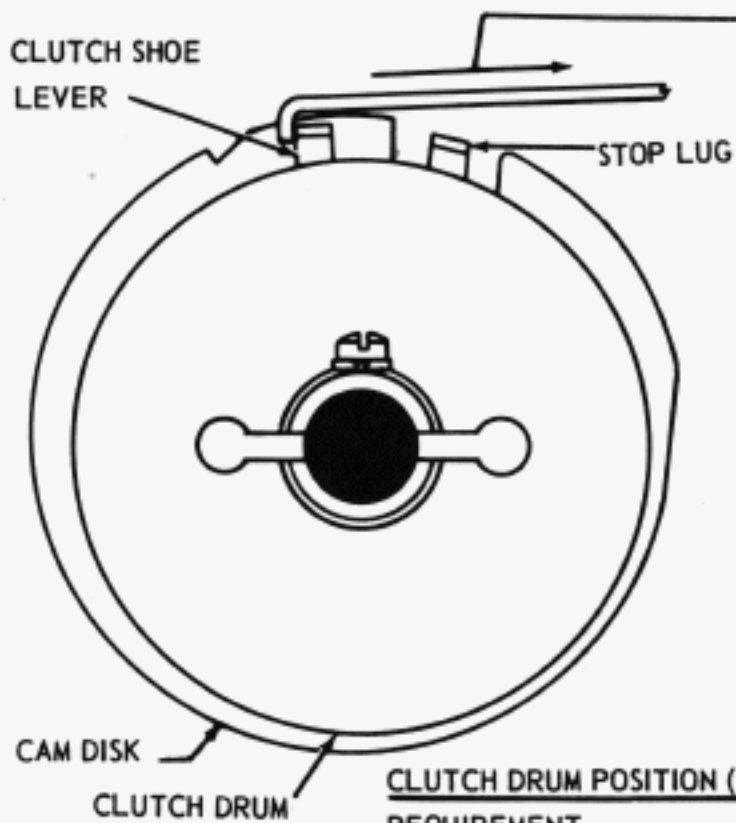


LOOSEN THE TWO CLAMP SCREWS ON THE CLUTCH DISK. ENGAGE A WRENCH OR SCREWDRIVER ON THE LUG OF THE ADJUSTING DISK AND ROTATE THE DISK.

NOTE

AFTER THE ABOVE ADJUSTMENT IS MADE, DISENGAGE THE CLUTCH, REMOVE THE DRUM MOUNTING SCREW AND ROTATE THE DRUM IN ITS NORMAL DIRECTION OF ROTATION TO MAKE CERTAIN THAT IT DOES NOT DRAG ON THE SHOE. IF THE DRUM DRAGS, REFINES THE ABOVE ADJUSTMENT

Figure 5-17 Typing Unit, Clutch Shoe Mechanism (All Clutches)



CLUTCH SHOE LEVER SPRING TENSIONS REQUIREMENT

CLUTCH ENGAGED. HOLD CAM DISK TO PREVENT TURNING. SPRING SCALE PULLED AT TANGENT TO CLUTCH.

MIN. 15 OZS. ONE-STOP CLUTCHES  
MAX. 20 OZS.

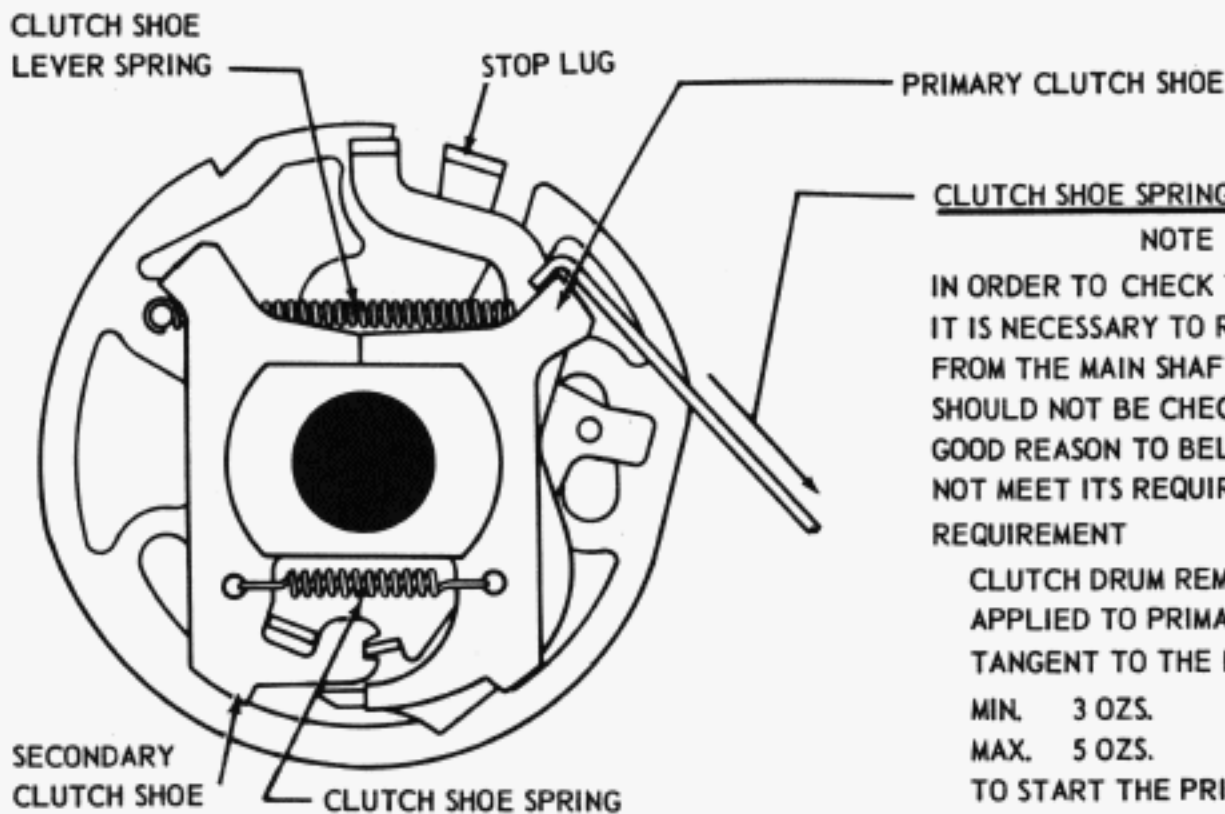
MIN. 16 OZS. MULTIPLE-STOP CLUTCHES  
MAX. 22 OZS.

TO MOVE THE SHOE LEVER IN CONTACT WITH THE STOP LUG.

CLUTCH DRUM POSITION (EXCEPT SELECTOR) REQUIREMENT

CLUTCH SHOE LEVER HELD DISENGAGED. CLUTCH SHOULD HAVE SOME END PLAY  
MAX. 0.015 INCH

TO ADJUST POSITION EACH DRUM AND SPACING CLUTCH SET COLLAR WITH MOUNTING SCREWS LOOSENED.



CLUTCH SHOE SPRING TENSION

NOTE

IN ORDER TO CHECK THIS SPRING TENSION, IT IS NECESSARY TO REMOVE THE CLUTCH FROM THE MAIN SHAFT. THEREFORE, IT SHOULD NOT BE CHECKED UNLESS THERE IS GOOD REASON TO BELIEVE THAT IT DOES NOT MEET ITS REQUIREMENT.

REQUIREMENT

CLUTCH DRUM REMOVED. SPRING SCALE APPLIED TO PRIMARY SHOE AT A TANGENT TO THE FRICTION SURFACE.

MIN. 3 OZS.  
MAX. 5 OZS.

TO START THE PRIMARY SHOE MOVING AWAY FROM SECONDARY SHOE AT POINT OF CONTACT.

Figure 5-18 Typing Unit, Clutch Mechanism, Left Side View



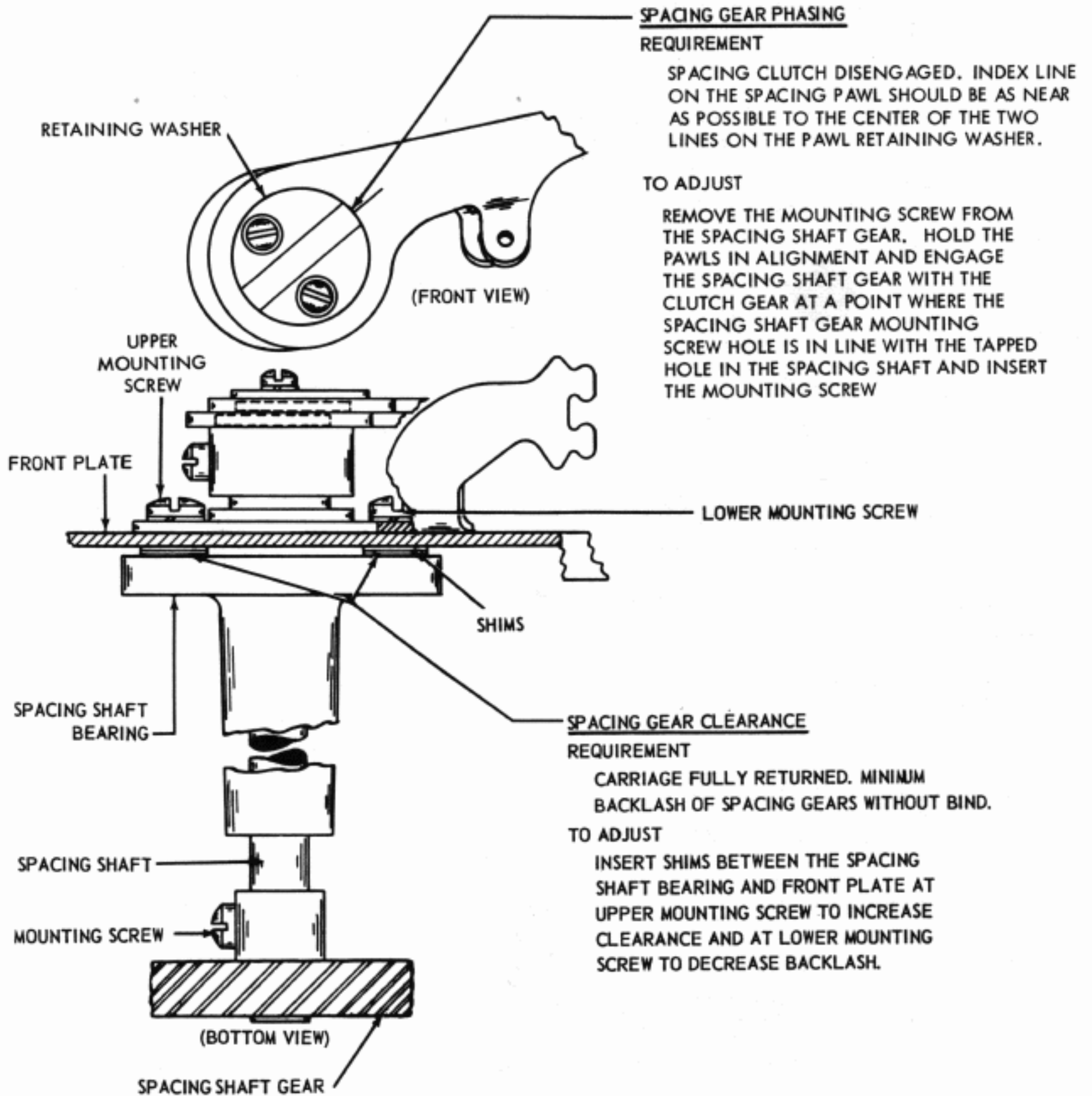


Figure 5-19 Typing Unit, Spacing Mechanism

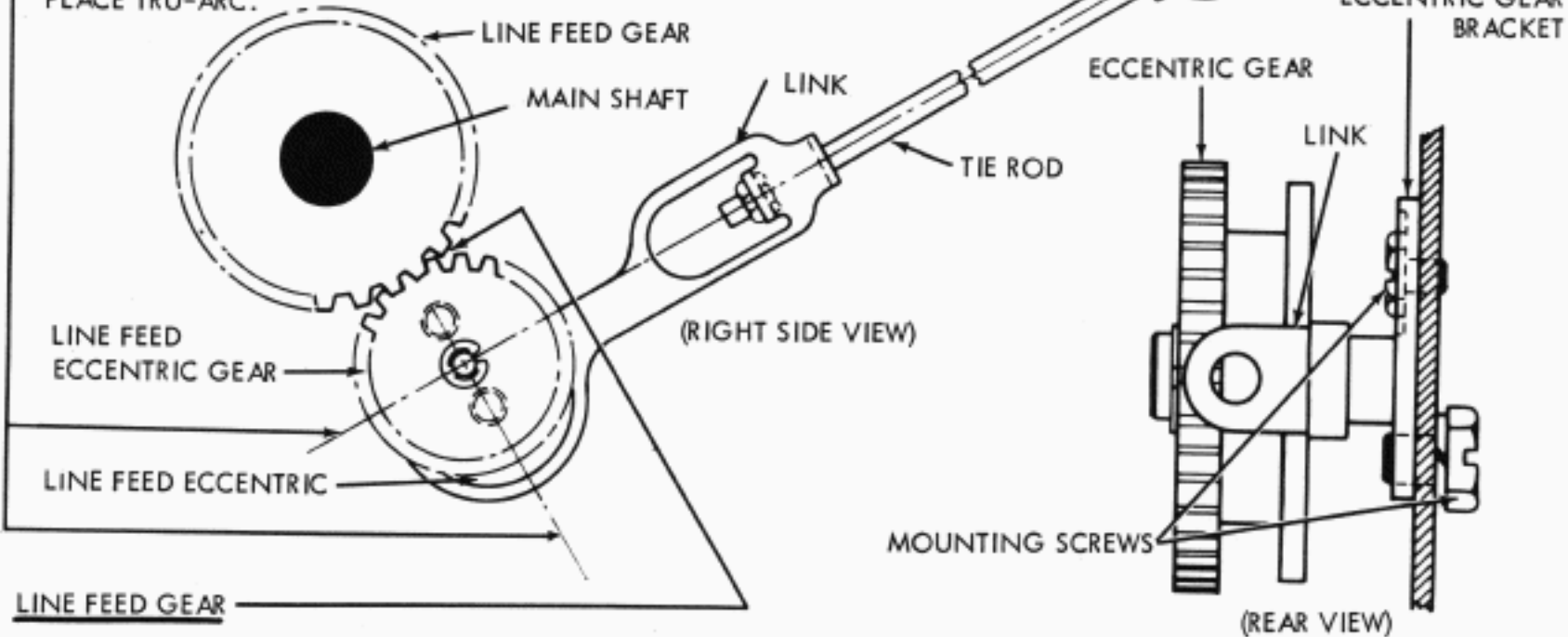
LINE FEED PHASING

REQUIREMENT

TYPING UNIT IN STOP POSITION. A CENTER LINE THRU THE TWO TAPPED HOLES IN THE LINE FEED ECCENTRIC GEAR SHOULD BE PERPENDICULAR TO A CENTER LINE THRU THE TIE ROD.

TO ADJUST

LINE FEED CLUTCH IN STOP POSITION THAT PLACES HIGH PART OF LINE FEED ECCENTRIC AT ITS FURTHEST POINT FROM THE MAIN SHAFT. REMOVE TRU-ARC AND RE-ENGAGE LINE FEED ECCENTRIC GEAR TO MEET REQUIREMENT. REPLACE TRU-ARC.



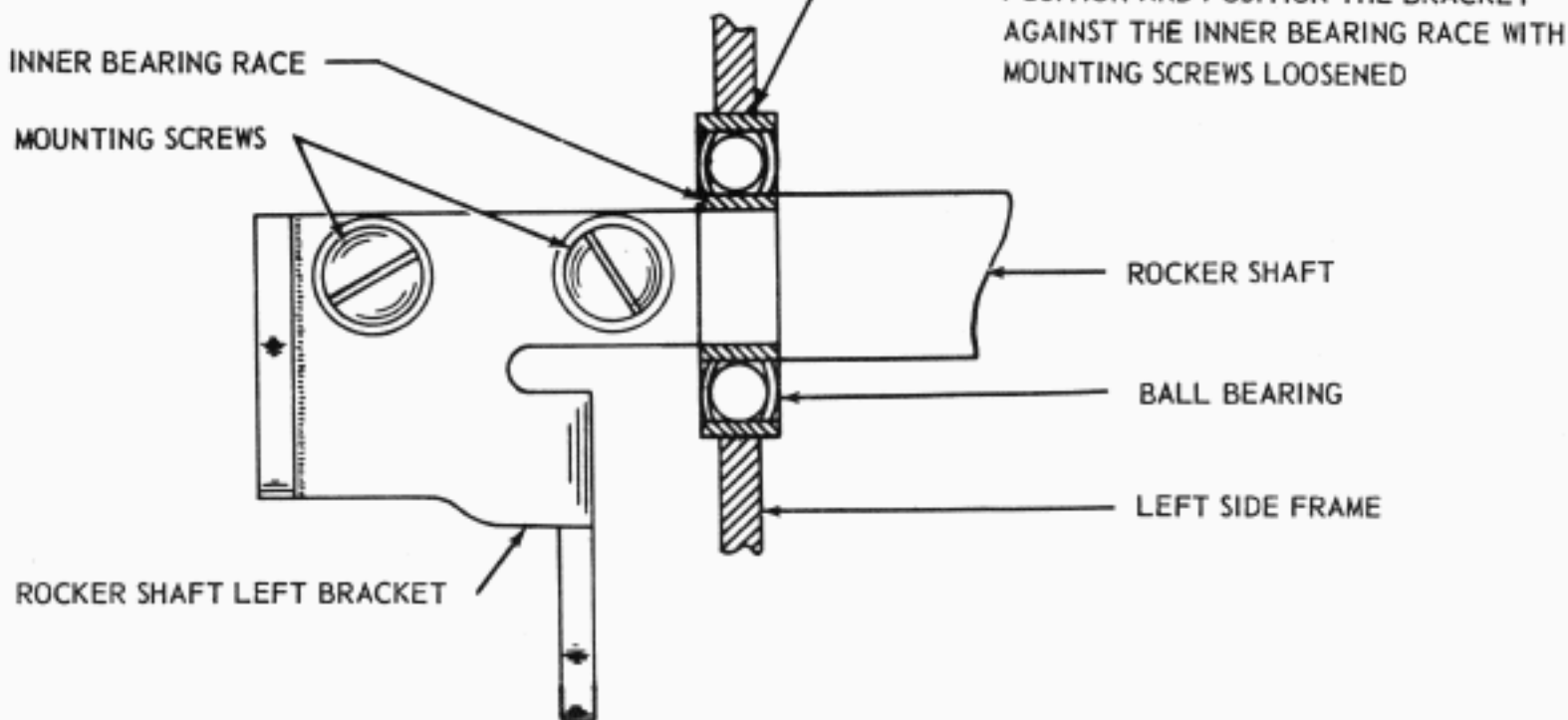
LINE FEED GEAR

REQUIREMENT

MINIMUM BACKLASH WITHOUT BINDING IN LINE FEED GEARS.

TO ADJUST

POSITION LINE FEED ECCENTRIC GEAR BRACKET, WITH ITS MOUNTING SCREWS LOOSENED, TO MEET REQUIREMENT. TIGHTEN SCREWS.



ROCKER SHAFT LEFT BRACKET

REQUIREMENT

ROCKER SHAFT LEFT BRACKET FIRMLY SEATED AGAINST INNER BEARING RACE.

TO ADJUST

HOLD ROCKER SHAFT IN EXTREME LEFT POSITION AND POSITION THE BRACKET AGAINST THE INNER BEARING RACE WITH MOUNTING SCREWS LOOSENED

Figure 5-20 Typing Unit, Line Feed and Rocker Shaft Mechanism

NOTE

ANY CHANGE IN THIS ADJUSTMENT WILL REQUIRE A RECHECKING OF THE FOLLOWING ADJUSTMENTS:  
 HORIZONTAL POSITIONING DRIVE LINK (FIG. 5-29)  
 RIGHT VERTICAL POSITIONING LEVER  
 ECCENTRIC STUD (FIG. 5-22)  
 LEFT VERTICAL POSITIONING LEVER  
 ECCENTRIC STUD (FIG. 5-23)  
 VERTICAL POSITIONING LOCK LEVER (FIG. 5-30)  
 RIBBON FEED LEVER STOP BRACKET (FIG. 5-44)  
 SPACING TRIP LEVER BAIL CAM PLATE (FIG. 5-25)  
 PRINTING TRACK (FIG. 5-40)  
 PRINTING ARM (FIG. 5-41)  
 REVERSING SLIDE BRACKETS (FIG. 5-29)  
 RIBBON REVERSE SPUR GEAR (FIG. 5-43)

ROCKER SHAFT ECCENTRIC STUD

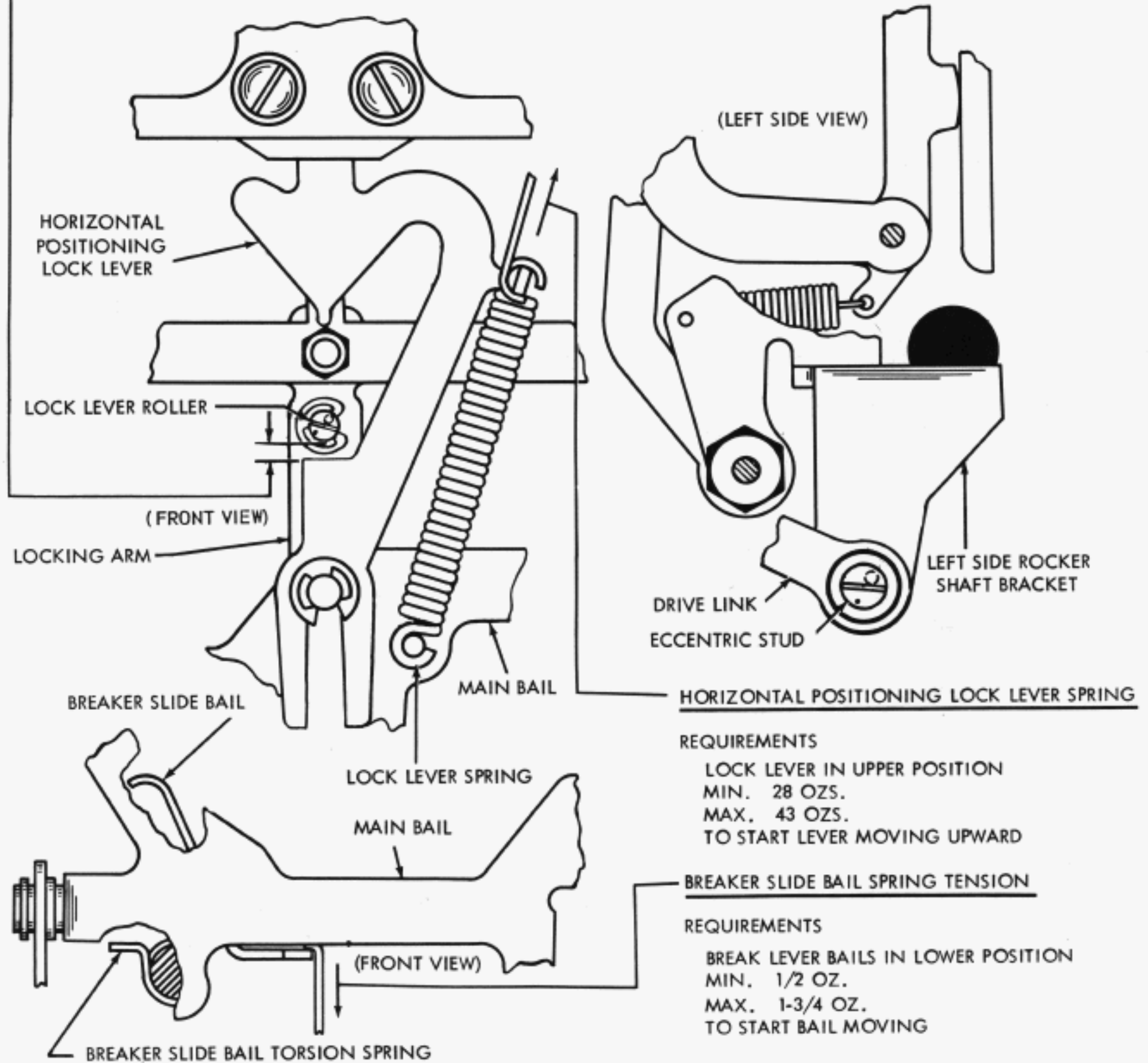
REQUIREMENT

TYPE BOX CLUTCH DISENGAGED. PLAY IN LOCKING ARM TAKEN TOWARDS FRONT. GAP BETWEEN LOWER SIDE OF LOCK LEVER ROLLER AND TOP EDGE OF SHOULDER ON HORIZONTAL POSITIONING LOCK LEVER

MIN. 0.055 INCH  
 MAX. 0.090 INCH

TO ADJUST

POSITION ECCENTRIC STUD IN LOWER END OF ROCKER SHAFT LEFT BRACKET. KEEP HIGH PART OF ECCENTRIC (MARKED WITH DOT) BELOW CENTER LINE OF DRIVE LINK.



HORIZONTAL POSITIONING LOCK LEVER SPRING

REQUIREMENTS

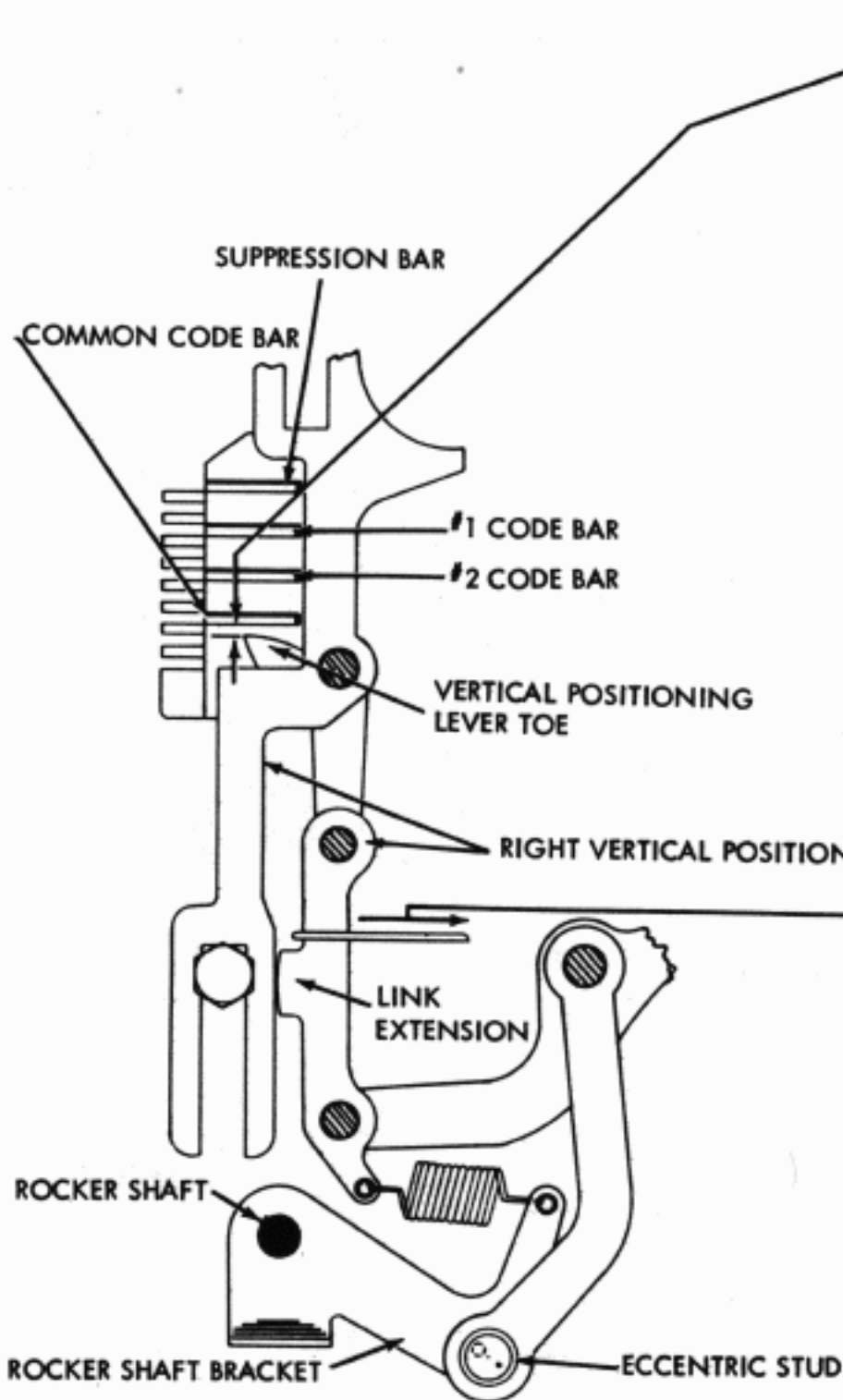
LOCK LEVER IN UPPER POSITION  
 MIN. 28 OZS.  
 MAX. 43 OZS.  
 TO START LEVER MOVING UPWARD

BREAKER SLIDE BAIL SPRING TENSION

REQUIREMENTS

BREAK LEVER BAILES IN LOWER POSITION  
 MIN. 1/2 OZ.  
 MAX. 1-3/4 OZ.  
 TO START BAIL MOVING

Figure 5-21 Typing Unit, Shift and Positioning Mechanism



**A. RIGHT VERTICAL POSITIONING LEVER**

**ECCENTRIC STUD**

**REQUIREMENT**

TYPE BOX CLUTCH DISENGAGED, COMMON CODE BAR IN SPACING POSITION. PLAY TAKEN UP BETWEEN THE COMMON CODE BAR AND THE TYPE BOX TRACK TO MAKE THE CLEARANCE A MINIMUM.

MIN. 0.030 INCH  
MAX. 0.050 INCH

CLEARANCE BETWEEN THE TOE OF VERTICAL POSITIONING LEVER AND THE BOTTOM OF THE COMMON CODE BAR WHEN PLAY IS TAKEN UP TO MAKE CLEARANCE A MINIMUM.

**TO ADJUST**

POSITION THE ECCENTRIC STUD IN THE RIGHT ROCKER SHAFT BRACKET. POSITION HIGH PART OF ECCENTRIC (MARKED WITH DOT) TOWARD THE REAR.

**B. VERTICAL POSITIONING LEVER SPRING TENSION**

**REQUIREMENT**

VERTICAL POSITIONING TOES (RIGHT AND LEFT) IN CONTACT WITH THE SUPPRESSION CODE BAR. LEVERS NOT BUCKLED.

MIN. 5 OZS.  
MAX. 10 OZS.

TO MOVE THE LINK EXTENSION AWAY FROM THE VERTICAL POSITIONING LEVER. CHECK BOTH RIGHT AND LEFT SPRINGS.

Figure 5-22 Typing Unit, Vertical Positioning Mechanism, Right Side



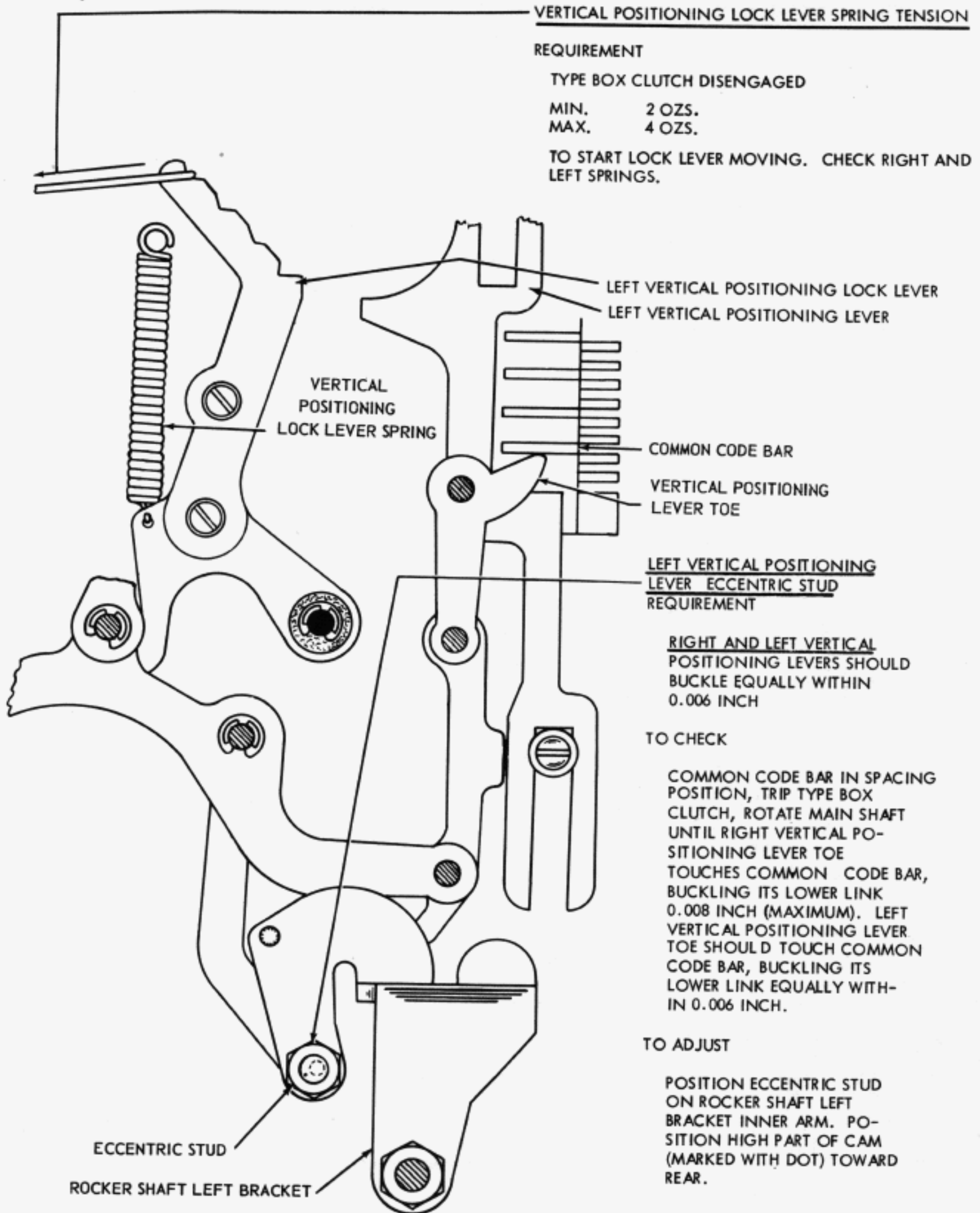


Figure 5-23 Typing Unit, Vertical Positioning Mechanism, Left Side

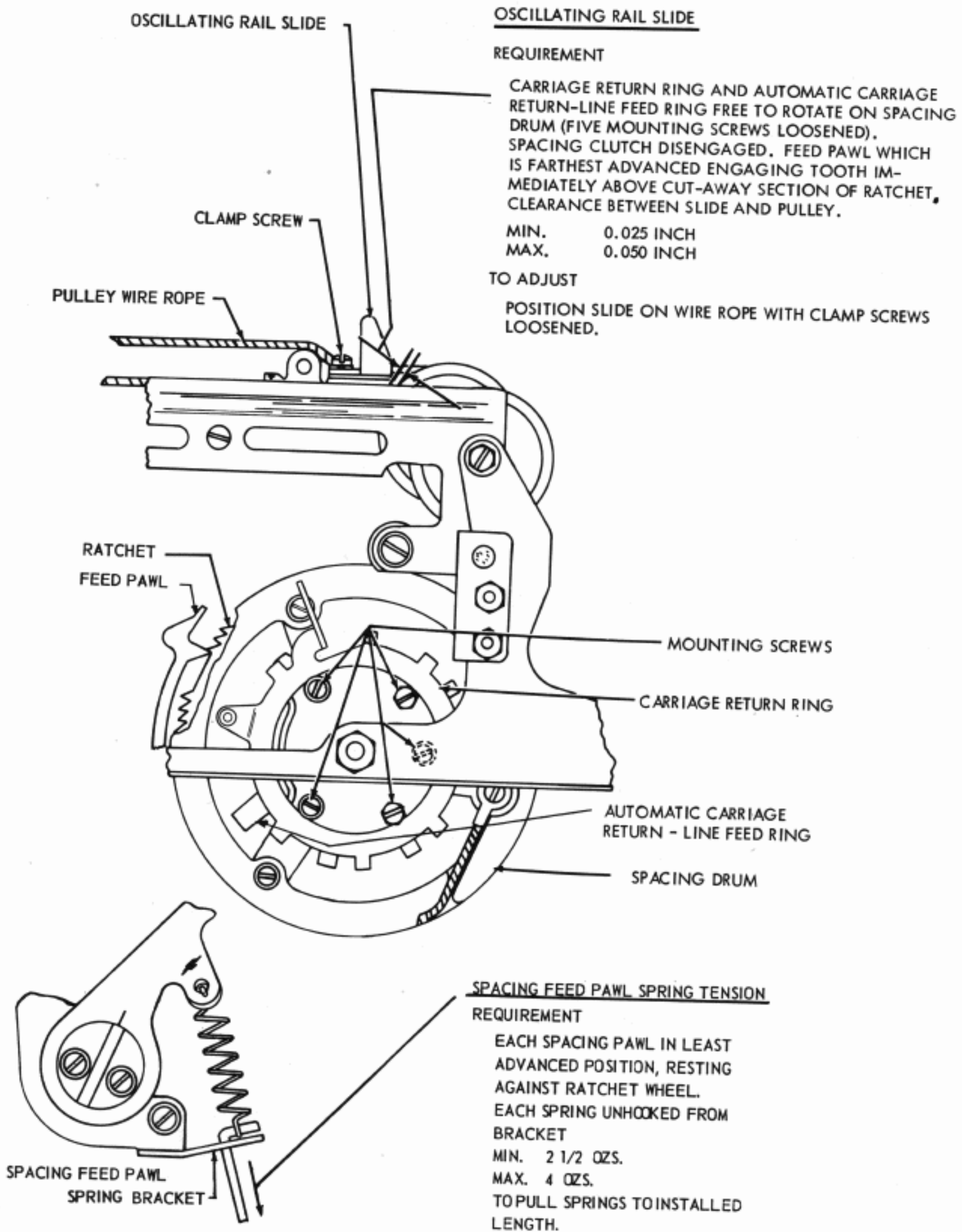


Figure 5-24 Typing Unit, Spacing Mechanism

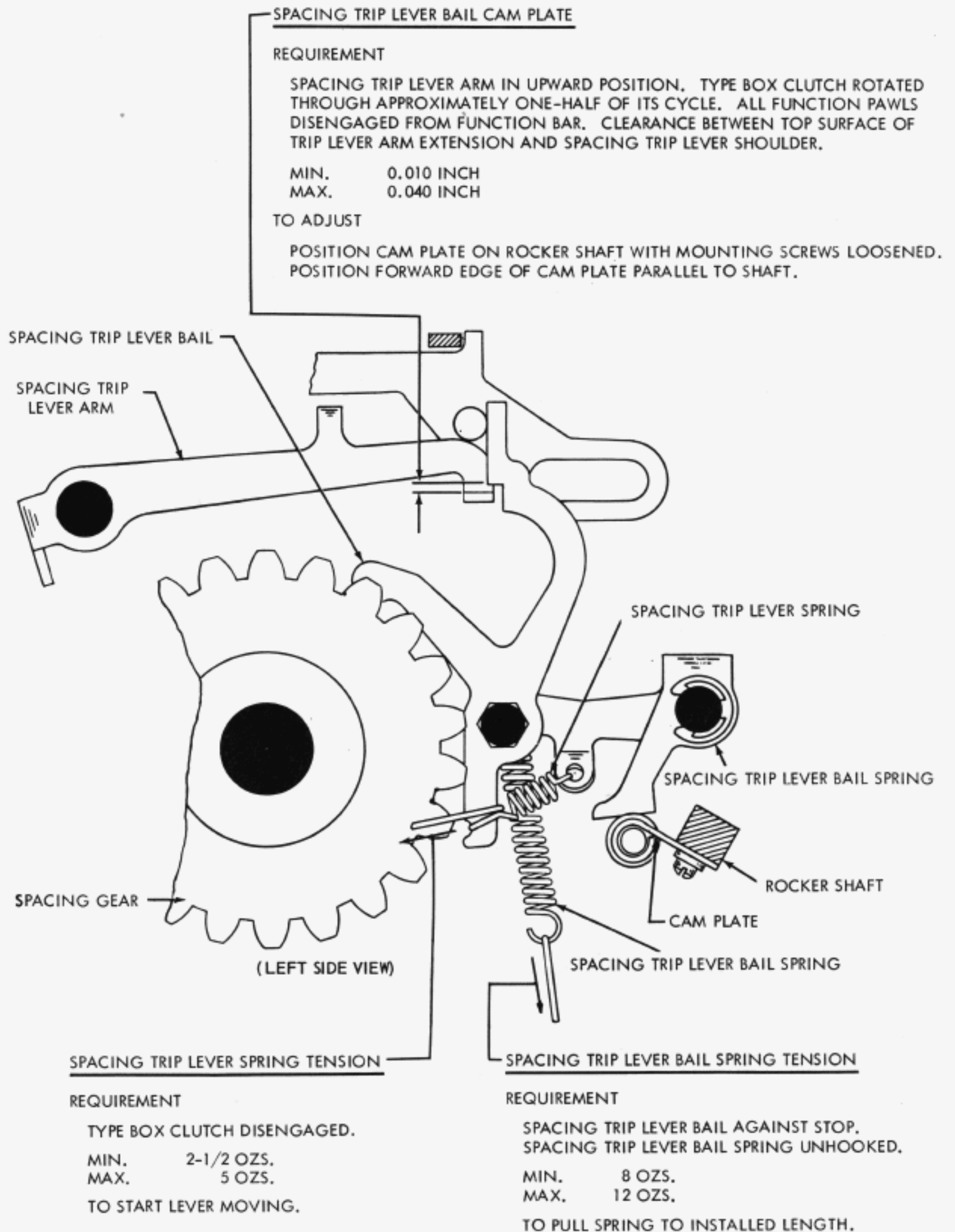


Figure 5-25 Typing Unit, Spacing Mechanism

FIGS-LTRS SHIFT CODE BAR OPERATING MECHANISM

REQUIREMENT

1. WITH FUNCTION CLUTCH ROTATED UNTIL CLUTCH DISK STOP LUG IS TOWARD BOTTOM OF UNIT, HOOK FIGURES FUNCTION PAWL OVER THE END OF THE FUNCTION BAR. CLEARANCE BETWEEN UPPER GUIDE PLATE EXTENSION AND SHIFT SLIDE  
MAX. 0.020 WHEN PLAY IS TAKEN UP FOR MAXIMUM
2. WITH 32 OZ. PULL APPLIED TO FUNCTION PAWL THERE SHOULD BE MIN. 0.002 INCH BETWEEN SHOULDER OF FIGURES FUNCTION PAWL AND FACE OF FUNCTION BAR.
3. REPEAT THE PROCEDURE FOR THE LETTERS FUNCTION PAWL. CHECK CLEARANCE BETWEEN LOWER GUIDE PLATE EXTENSION AND SHIFT SLIDE.

TO ADJUST

POSITION UPPER AND/OR LOWER GUIDE PLATE BY THE ADJUSTING SLOT WITH THE CLAMP NUTS LOOSENED.

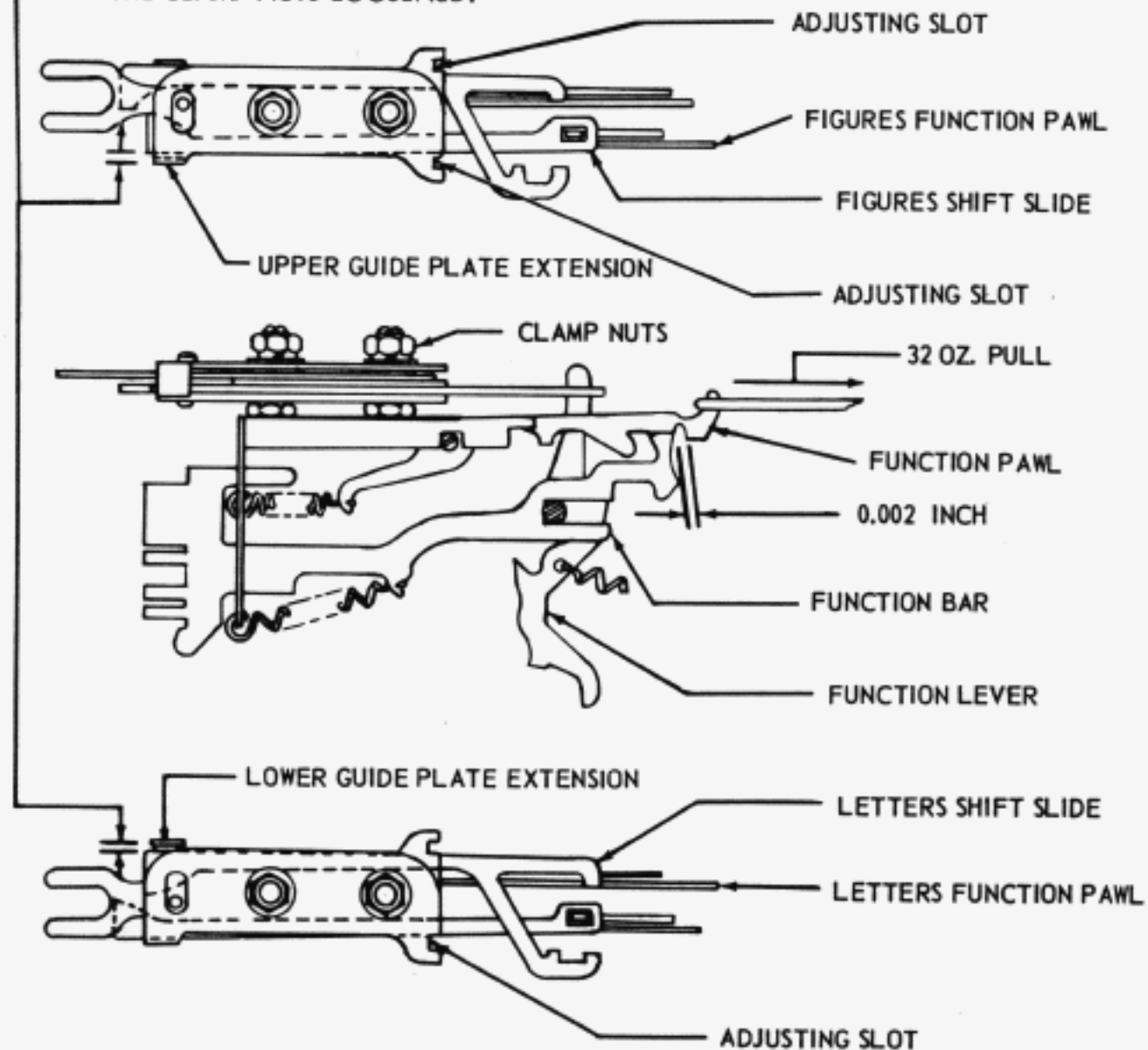
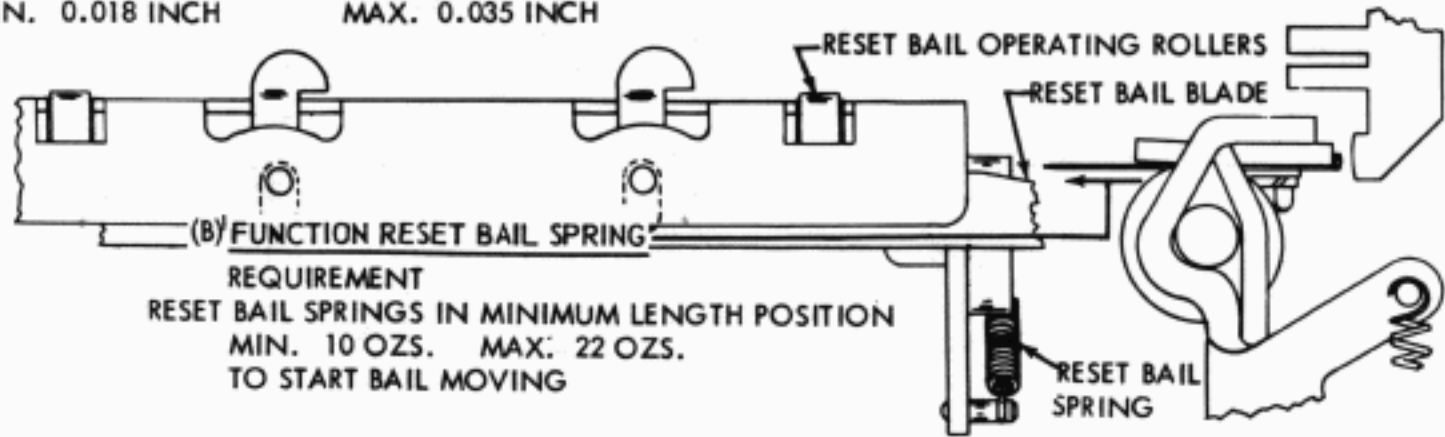


Figure 5-26 Typing Unit, Shift Code Bar Operating Mechanism



**(A) FUNCTION RESET BAIL BLADE****(1) REQUIREMENT**

FUNCTION AND TYPE BOX CLUTCHES DISENGAGED. FUNCTION PAWLS UNLATCHED. FUNCTION BAR HELD IN MAXIMUM REARWARD POSITION. CLEARANCE BETWEEN FUNCTION BAR AND RESET BAIL BLADE:  
MIN. 0.018 INCH      MAX. 0.035 INCH

**(B) FUNCTION RESET BAIL SPRING**

REQUIREMENT  
RESET BAIL SPRINGS IN MINIMUM LENGTH POSITION  
MIN. 10 OZS.      MAX. 22 OZS.  
TO START BAIL MOVING

**TO CHECK**

MEASURE CLEARANCE AT BARS LOCATED IN STUNT BOX SLOTS 1, 4, 11, 18, 23, 33, 38 AND 41. IF THERE IS NO BAR IN A DESIGNATED SLOT, USE NEAREST BAR. IF THERE IS A BAR ON EACH SIDE OF A DESIGNATED VACANT SLOT, USE BAR IN HIGHEST NUMBERED SLOT. (NOTE: FACING REAR OF UNIT, SLOTS ARE NUMBERED FROM LEFT TO RIGHT).

**TO ADJUST**

POSITION BLADE ON RESET BAIL WITH ITS MOUNTING SCREWS FRICTION TIGHT.

**(2) REQUIREMENT**

FUNCTION PAWL SHOULD OVER TRAVEL FUNCTION BAR BY A MIN. OF 0.002 INCH.

**TO CHECK**

IF CARRIAGE RETURN LEVER ADJUSTMENT HAS NOT BEEN MADE, ITS CLAMP SCREW SHOULD BE LOOSENED. POSITION FUNCTION CLUTCH SO THAT LUG ON CLUTCH DISK IS TOWARD BOTTOM OF UNIT. STRIP OFF ANY SELECTED FUNCTION PAWLS. HOLD FUNCTION LEVER IN MAXIMUM REARWARD POSITION (DO NOT PUT OVER 2 LBS. OF TENSION ON LEVER) AND HOLD FUNCTION PAWL TO REAR WITH A TENSION OF 32 OZS. (AS LOAD ON RESET BAIL AFFECTS OVER TRAVEL, DO NOT LATCH MORE THAN ONE PAWL AT A TIME). MEASURE CLEARANCE. REPEAT FOR EACH FUNCTION PAWL ON STUNT BOX.

**TO ADJUST**

IF NECESSARY, REFINE REQUIREMENT (1) WITHIN ITS LIMITS OF .018 INCH TO .035 INCH.

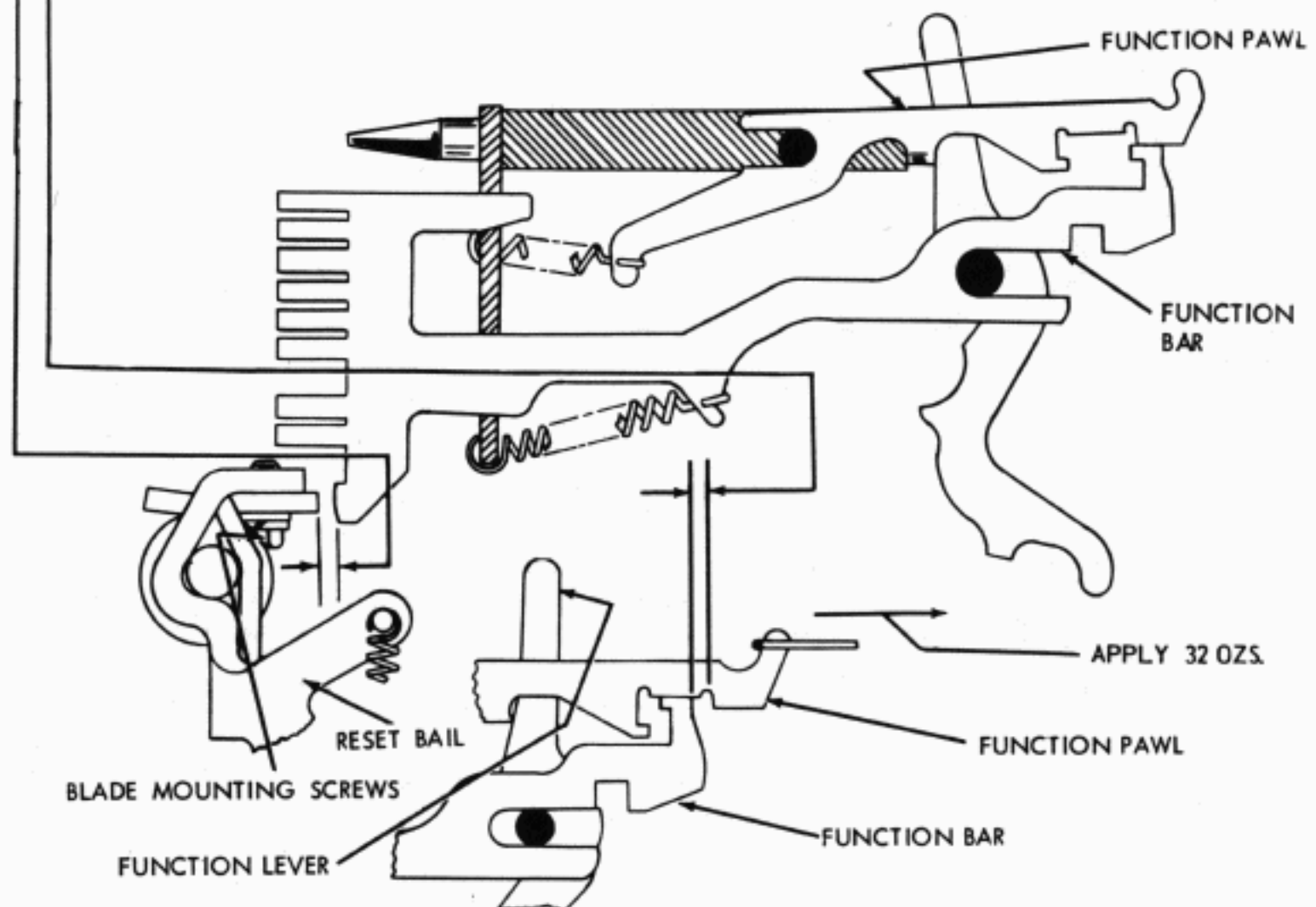
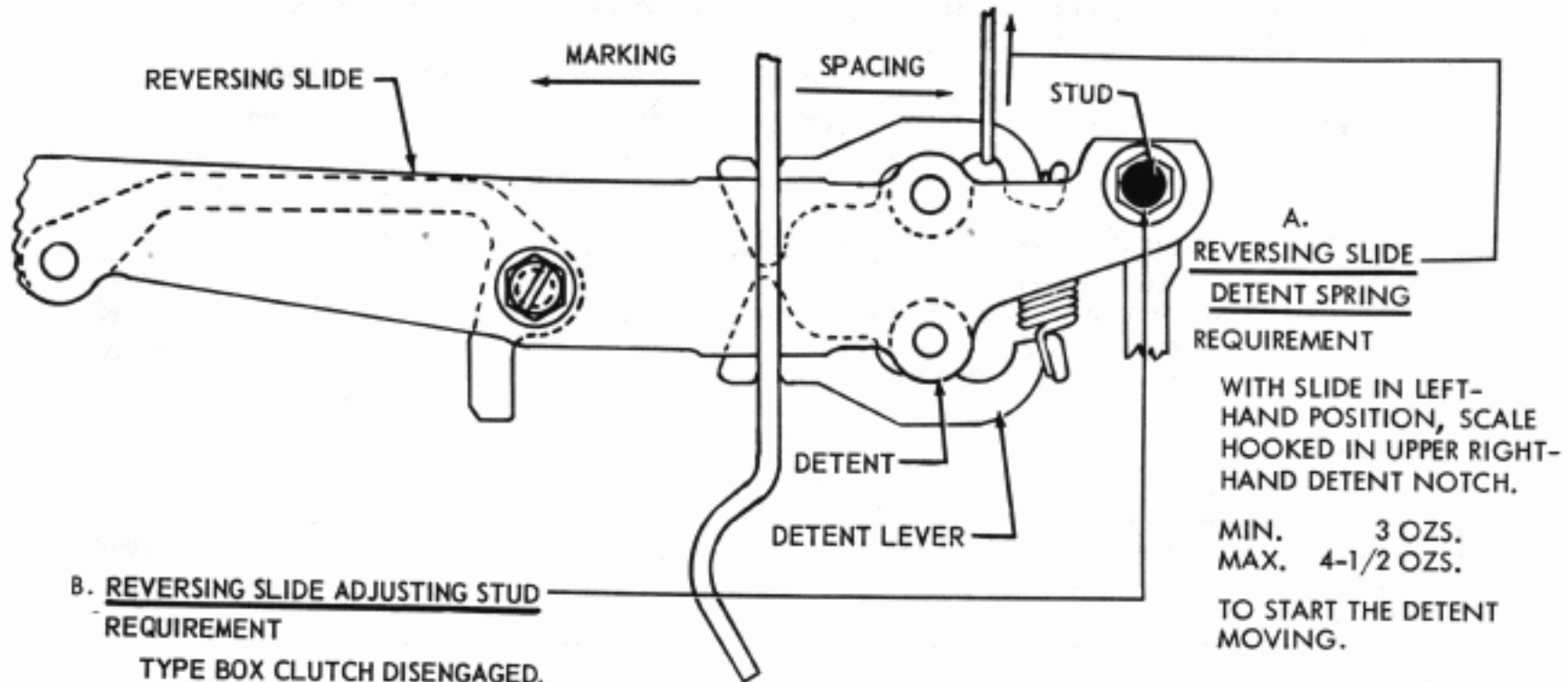


Figure 5-27 Typing Unit, Function Bar, Reset Mechanism



**B. REVERSING SLIDE ADJUSTING STUD REQUIREMENT**

TYPE BOX CLUTCH DISENGAGED.  
WITH NO. 3 CODE BAR IN SPACING POSITION (RIGHT), THE REVERSING SLIDE DETENT ROLLERS SHOULD BE FULLY SEATED IN THE RIGHT-HAND NOTCHES OF THE DETENT LEVER.  
WITH NO. 3 CODE BAR IN MARKING POSITION (LEFT), THE REVERSING SLIDE DETENT ROLLERS SHOULD BE FULLY SEATED IN THE LEFT-HAND NOTCHES OF THE DETENT LEVER.

TO ADJUST POSITION THE REVERSING SLIDE STUD IN ITS ELONGATED HOLE WITH ITS MOUNTING NUT LOOSENED.

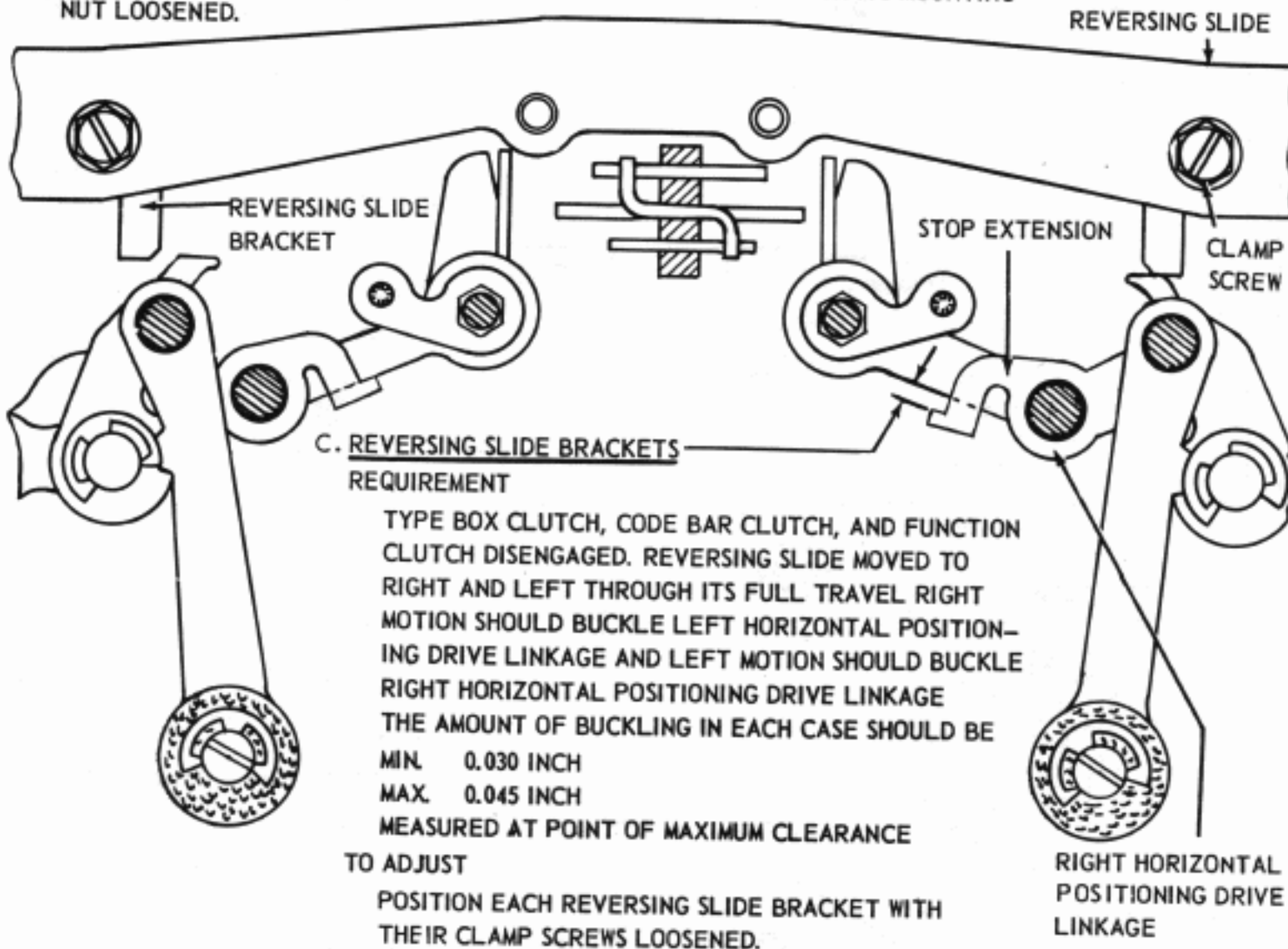


Figure 5-28 Typing Unit, Horizontal Motion Reversing Mechanism, Front View

HORIZONTAL POSITIONING DRIVE LINKAGE

## REQUIREMENT

TYPE BOX CLUTCH DISENGAGED.  
 CODE BARS 4 AND 5 TO SPACING (RIGHT).  
 CLEARANCE BETWEEN EACH SIDE OF CENTER HORIZONTAL STOP SLIDE AND DECELERATING SLIDES,  
 ON SIDE WHERE KNEE LINK IS STRAIGHT SHOULD BE EQUAL (WITHIN 0.008 INCH)

MIN. 0.015 INCH  
 MAX. 0.040 INCH

## TO ADJUST

LOOSEN BEARING STUD MOUNTING SCREWS AND CONNECTING STRIP MOUNTING SCREWS FRICTION TIGHT. POSITION ONE OR BOTH BEARING STUDS ON THE CONNECTING STRIP TO PROVIDE 0.025 INCH TO 0.035 INCH BETWEEN THE CENTER HORIZONTAL SLIDE AND THE DECELERATING SLIDE ON THE SIDE WHERE THE LINKAGE IS NOT BUCKLED. TIGHTEN THE TWO INNER MOUNTING SCREWS. CHANGE POSITION OF REVERSING SLIDE AND CHECK OPPOSITE CLEARANCE. EQUALIZE BY SHIFTING BOTH STUDS AND CONNECTING STRIP AS A UNIT. HOLD THE DRIVE LINKAGE HUB AGAINST THE LOWER VERTICAL LINK OF THE DRIVE LINKAGE. TIGHTEN THE TWO OUTER BEARING STUD MOUNTING SCREWS. CHECK THE LINKAGE FOR FREENESS THROUGHOUT A COMPLETE CYCLE. THE TYPE BOX CLUTCH DISK SHOULD HAVE SOME MOVEMENT IN THE NORMAL DIRECTION OF ROTATION IN THE STOP POSITION.

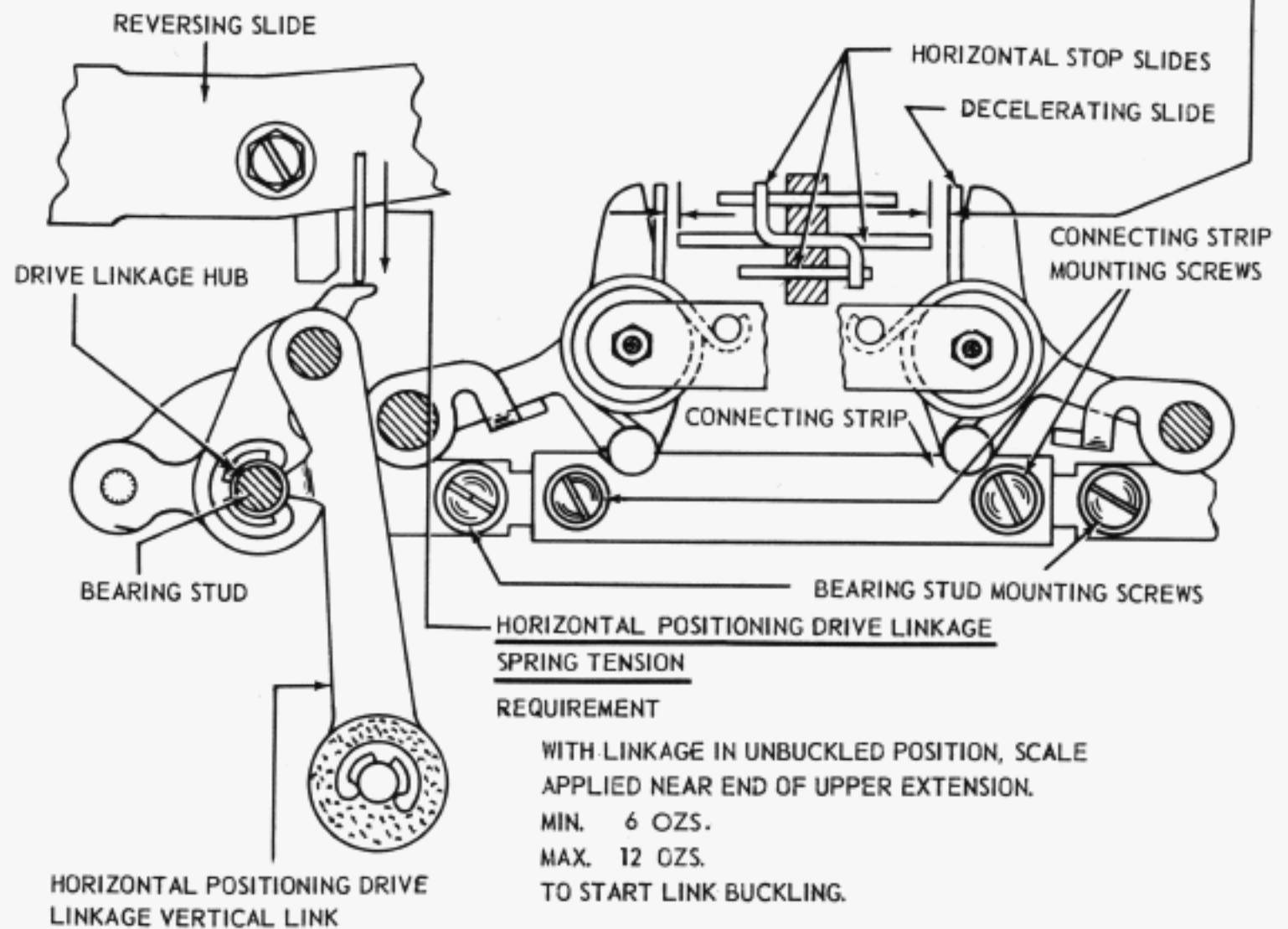


Figure 5-29 Typing Unit, Horizontal Positioning Drive Mechanism, Front View

VERTICAL POSITIONING LOCK LEVER

(1) REQUIREMENT

LETTERS COMBINATION SET UP ON CODE BARS. MAIN SIDE OPERATING LEVERS AT UPPER END OF TRAVEL. UPPER NOTCH OF VERTICAL POSITIONING LOCK LEVER FULLY ENGAGED (MANUALLY IF NECESSARY) WITH VERTICAL SLIDE PROJECTION, UPPER SURFACE OF FOLLOWER ARM REAR EXTENSION SHOULD BE

MIN. IN CONTACT WITH  
MAX. 0.004 INCH AWAY FROM  
INNER EXTENSION OF MAIN SLIDE LEVER.

LEFT VERTICAL POSITIONING LOCK LEVER

LEFT VERTICAL SLIDE PROJECTION

(2) REQUIREMENT

WITH PLAY TAKEN UP BY PULLING UPWARD WITH 8 OZS. TENSION ON TYPE BOX CARRIAGE TRACK, VERTICAL SURFACES

MIN. IN CONTACT WITH OR  
MAX. 0.012 INCH AWAY  
FROM EACH OTHER

TO ADJUST

POSITION RIGHT AND LEFT VERTICAL POSITIONING LOCK LEVERS WITH CLAMP SCREWS LOOSENED.

CLAMP SCREWS

INNER EXTENSION

LEFT MAIN SIDE LEVER

LEFT FOLLOWER ARM REAR EXTENSION

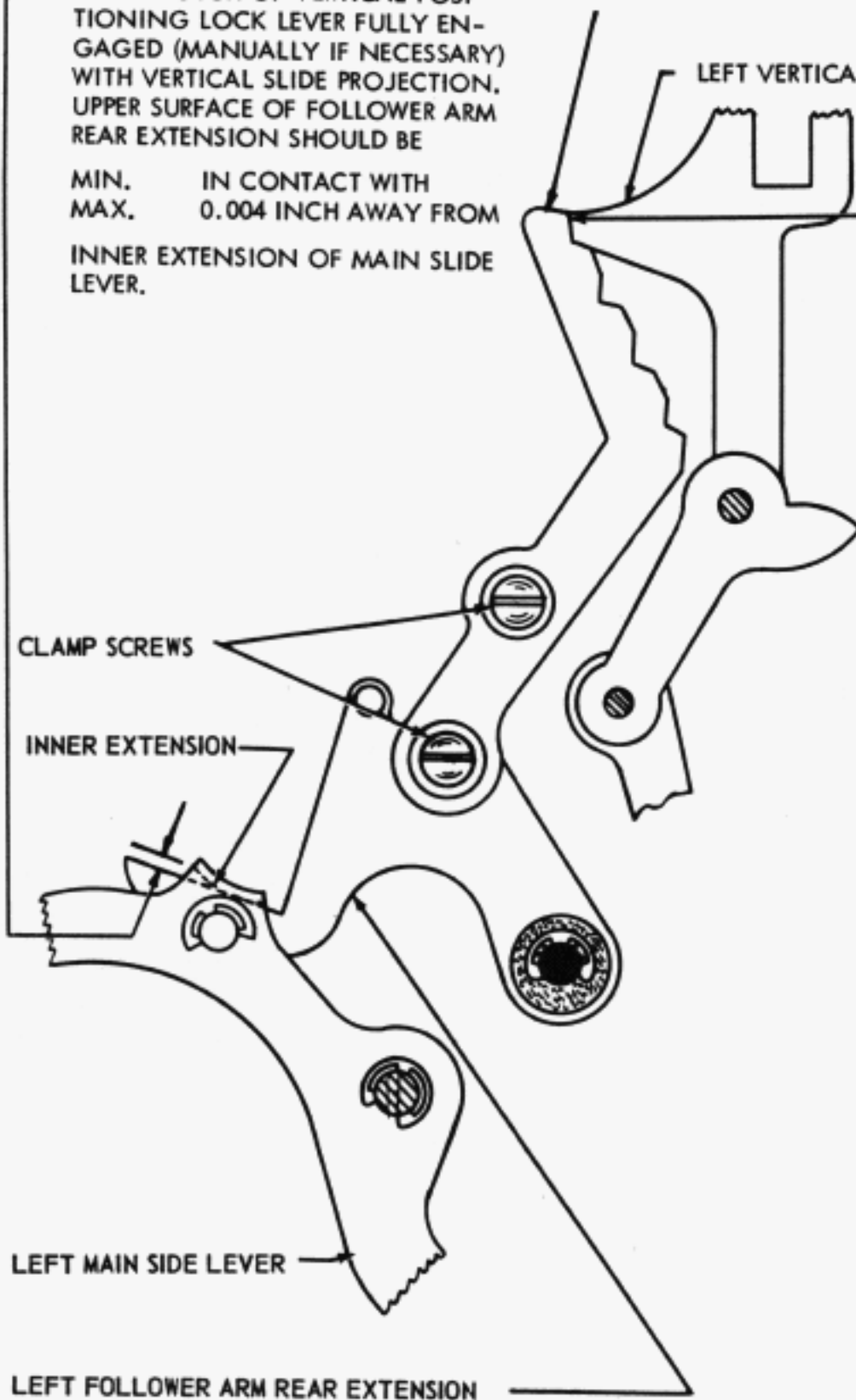
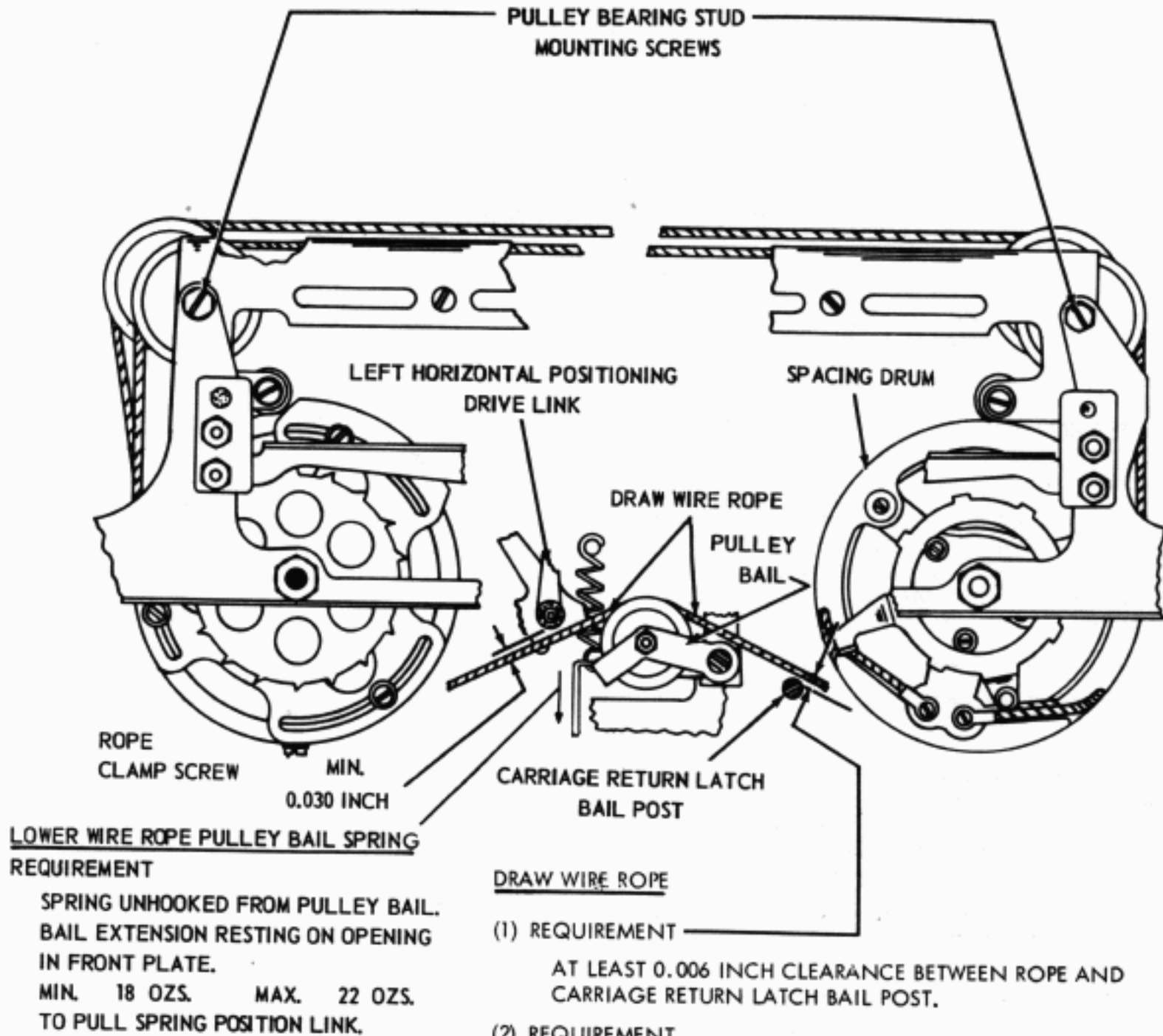


Figure 5-30 Typing Unit, Vertical Positioning Mechanism, Left





## TO ADJUST

ADVANCE PRINTING CARRIAGE TO ITS EXTREME RIGHT HAND POSITION. ROTATE TYPE BOX CLUTCH 1/2 REVOLUTION. LOOSEN THE ROPE CLAMP SCREW ONE TURN ONLY. POSITION THE PULLEY BEARING STUDS, WITH THEIR MOUNTING SCREWS LOOSENED, TO MEET REQUIREMENT. MAKE CERTAIN THAT THE ROPE MOVES AROUND ITS CLAMP SCREW. TIGHTEN BOTH FRONT AND REAR CABLES WITH SLIGHTLY GREATER TENSION ON REAR CABLE. TIGHTEN THE CLAMP SCREW.

Figure 5-31 Typing Unit, Spacing Mechanism, Front View

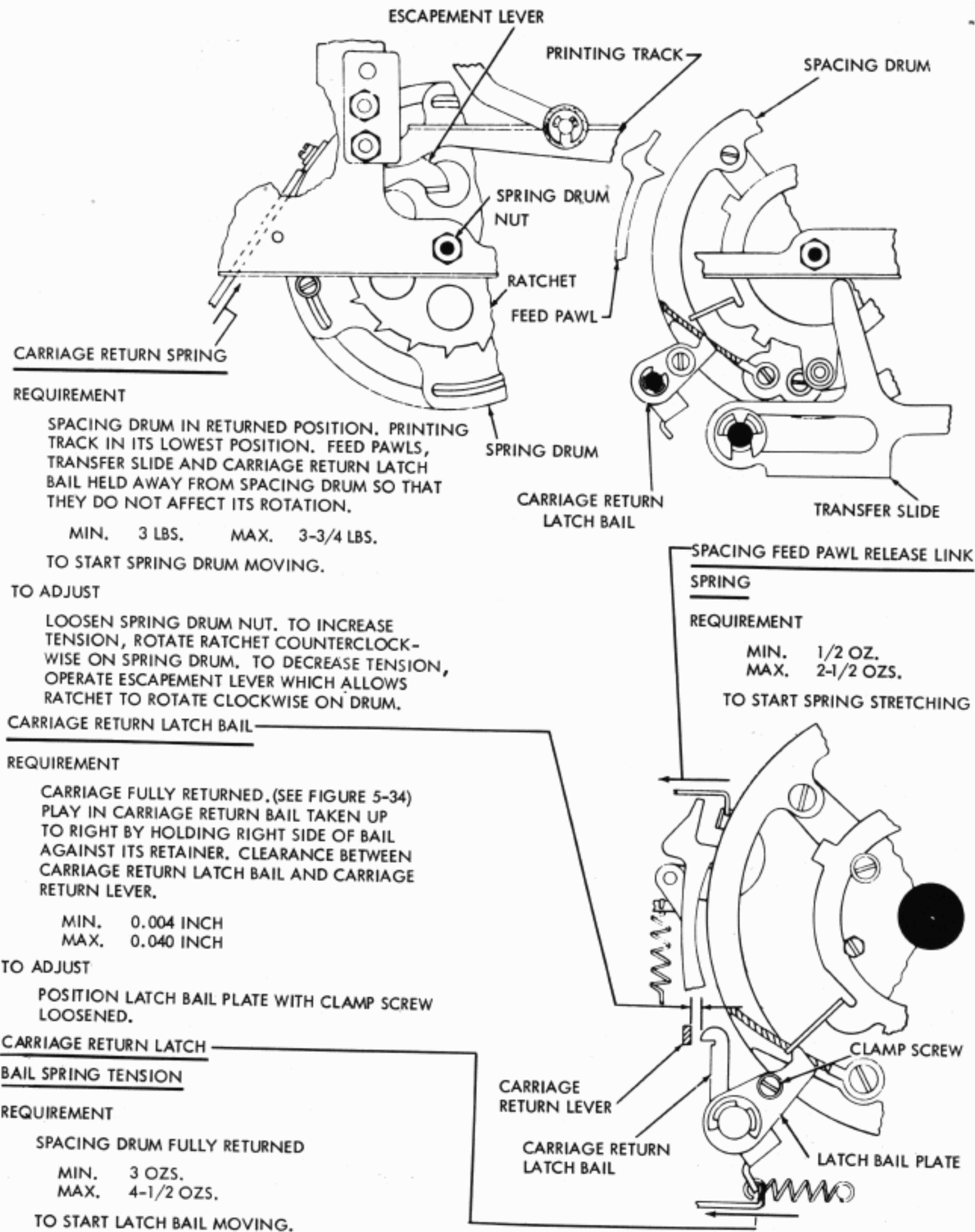


Figure 5-32 Typing Unit, Carriage Return Mechanism, Front View

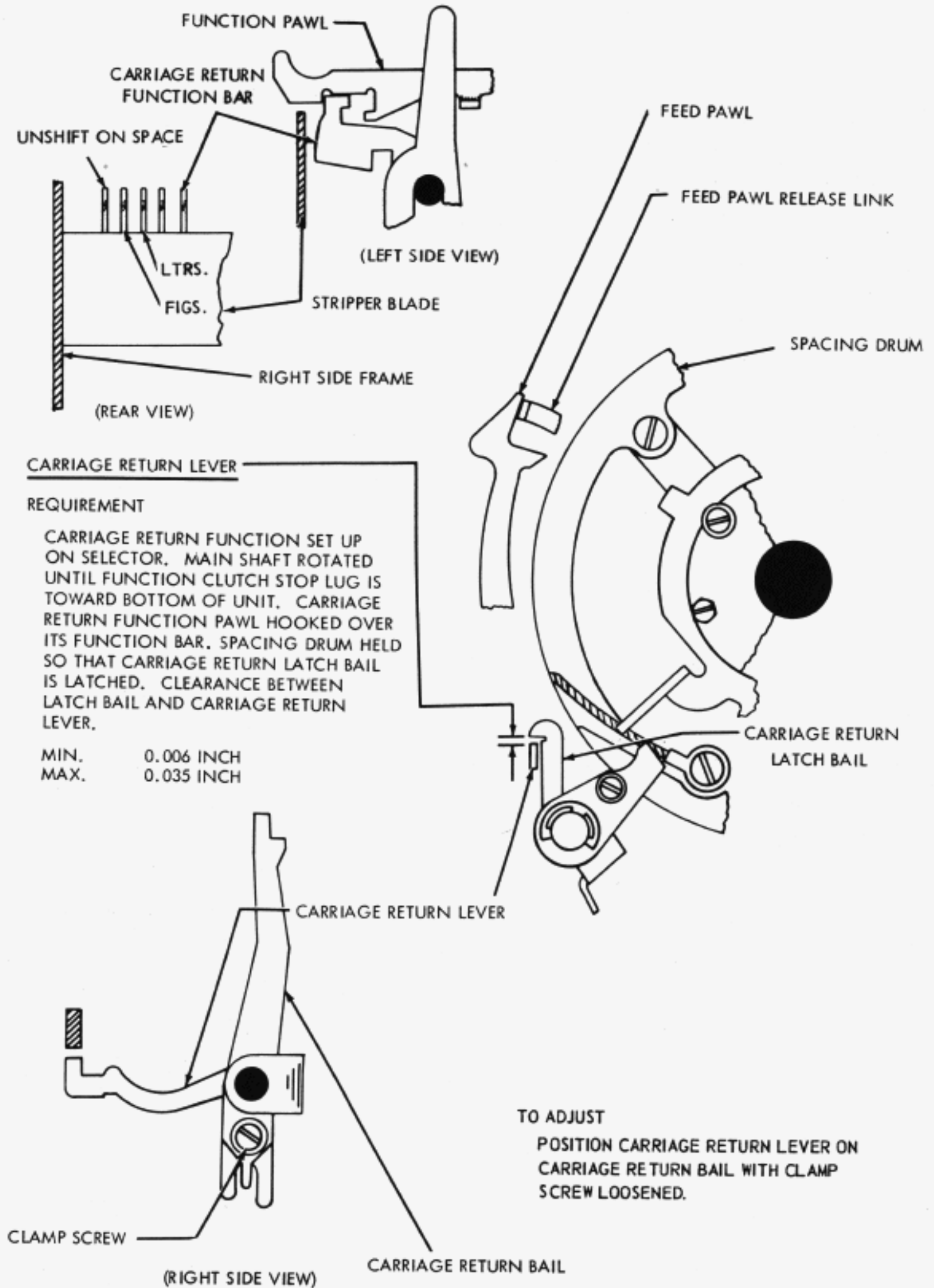
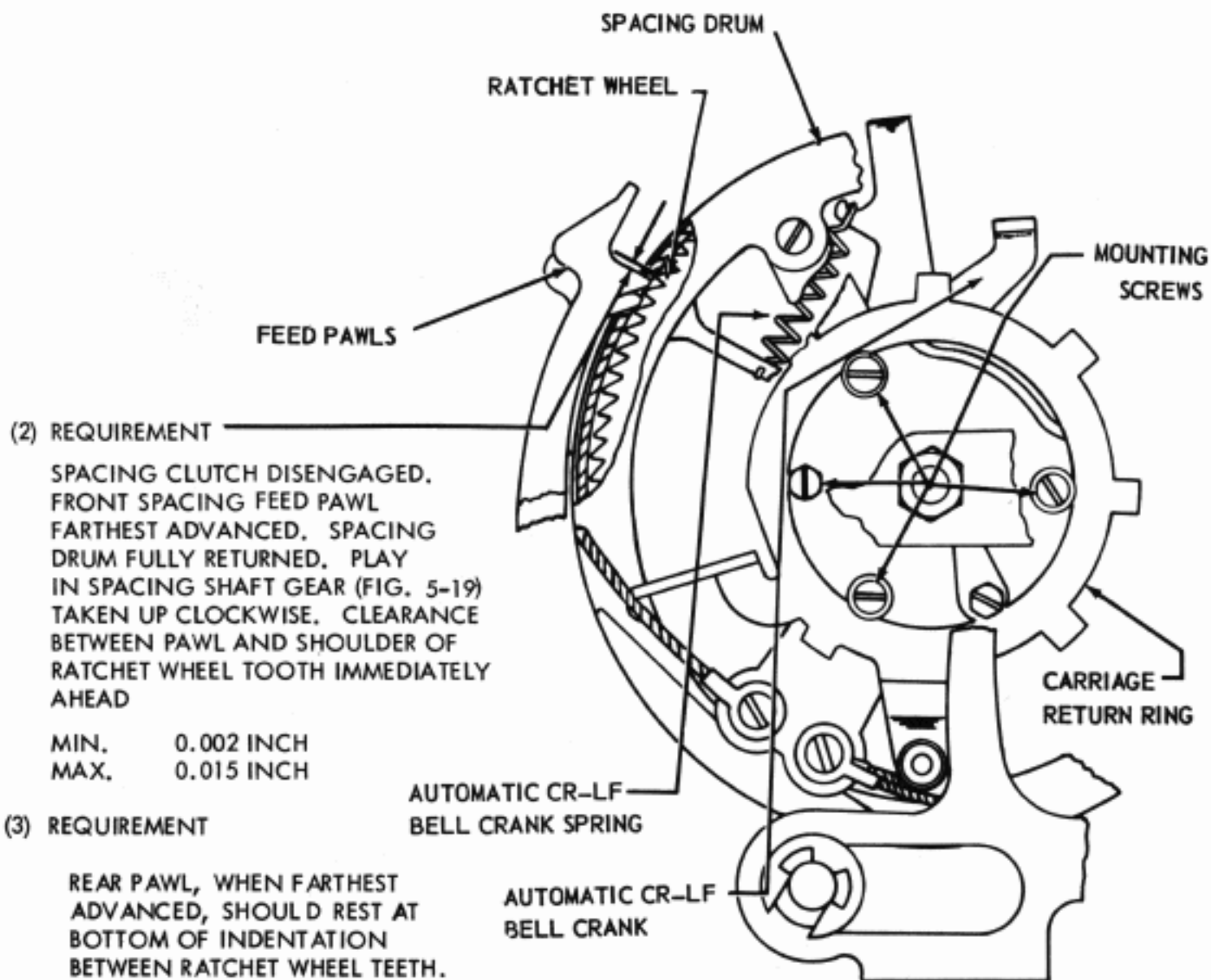
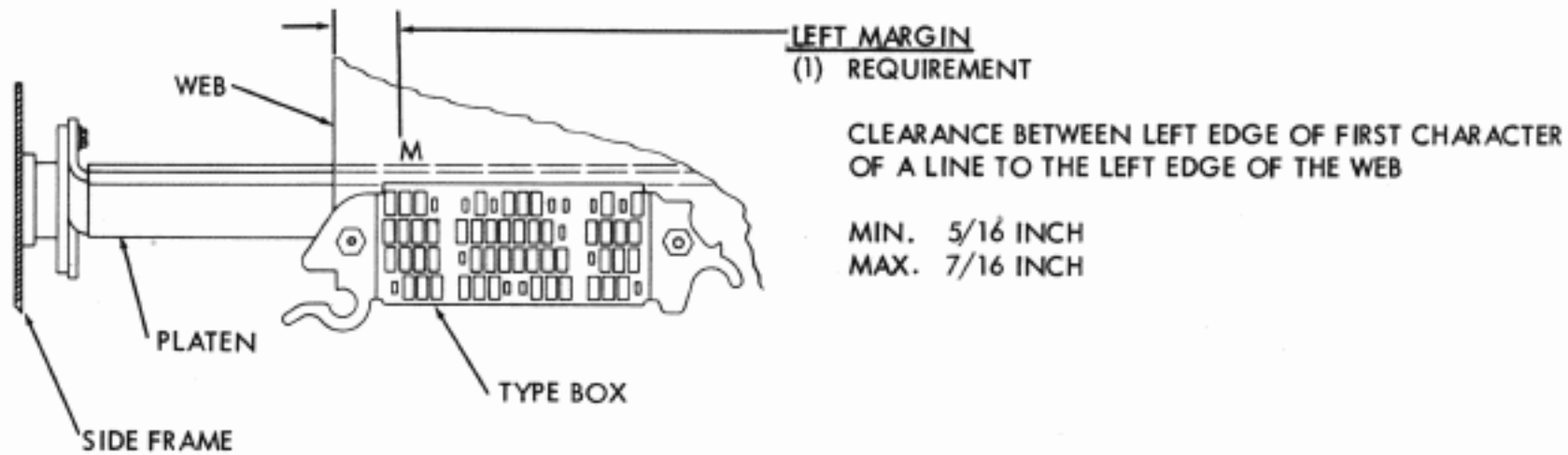


Figure 5-33 Typing Unit, Carriage Return Mechanism

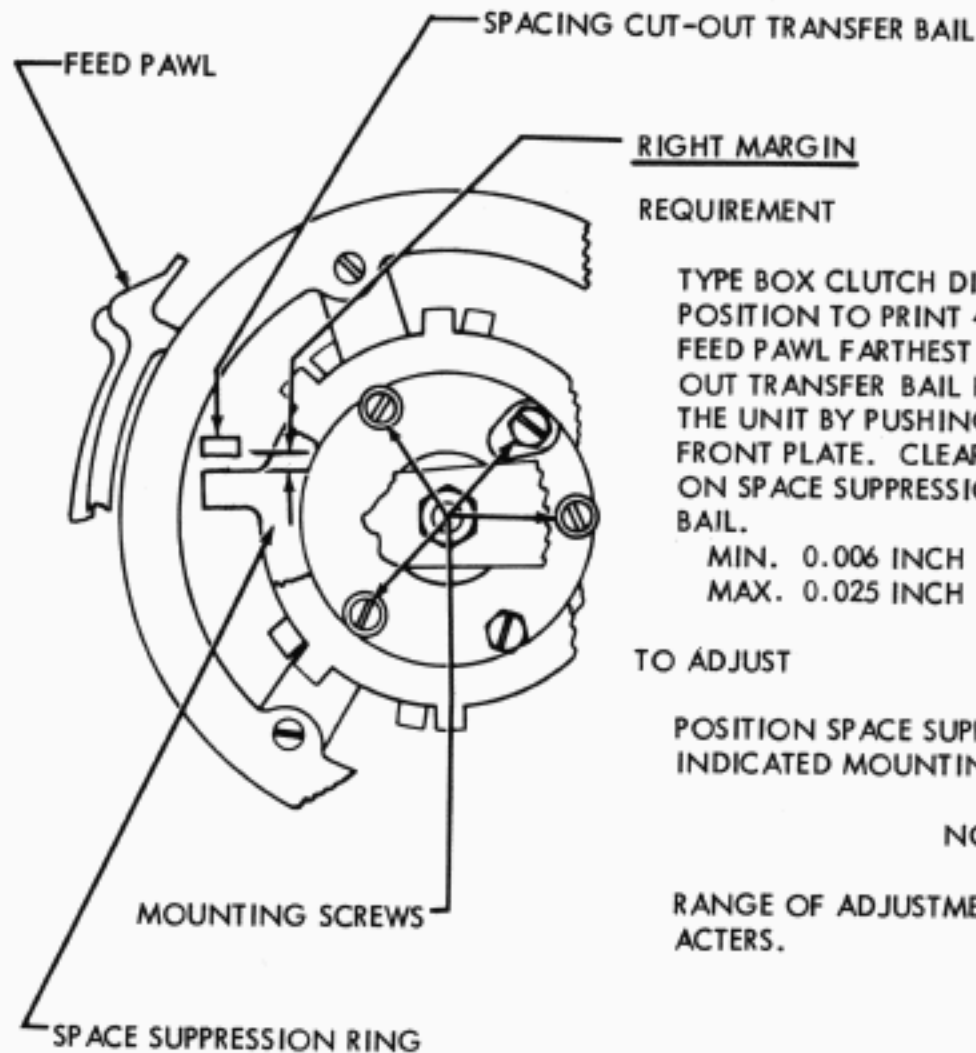


TO ADJUST  
POSITION CARRIAGE RETURN RING WITH  
FOUR MOUNTING SCREWS LOOSENED.

NOTE

FOR LINES OTHER THAN 46 CHARACTERS IN LENGTH,  
THE MARGIN MAY BE VARIED AS REQUIRED. RANGE  
OF ADJUSTMENT IS 0 TO 85 CHARACTERS.

Figure 5-34 Typing Unit, Carriage Return Mechanism



TYPE BOX CLUTCH DISENGAGED. CARRIAGE IN POSITION TO PRINT 46TH CHARACTER. FRONT FEED PAWL FARTHEST ADVANCED. SPACING CUT-OUT TRANSFER BAIL HELD TOWARDS THE REAR OF THE UNIT BY PUSHING THROUGH THE HOLE IN THE FRONT PLATE. CLEARANCE BETWEEN EXTENSION ON SPACE SUPPRESSION RING AND TRANSFER BAIL.

MIN. 0.006 INCH  
MAX. 0.025 INCH

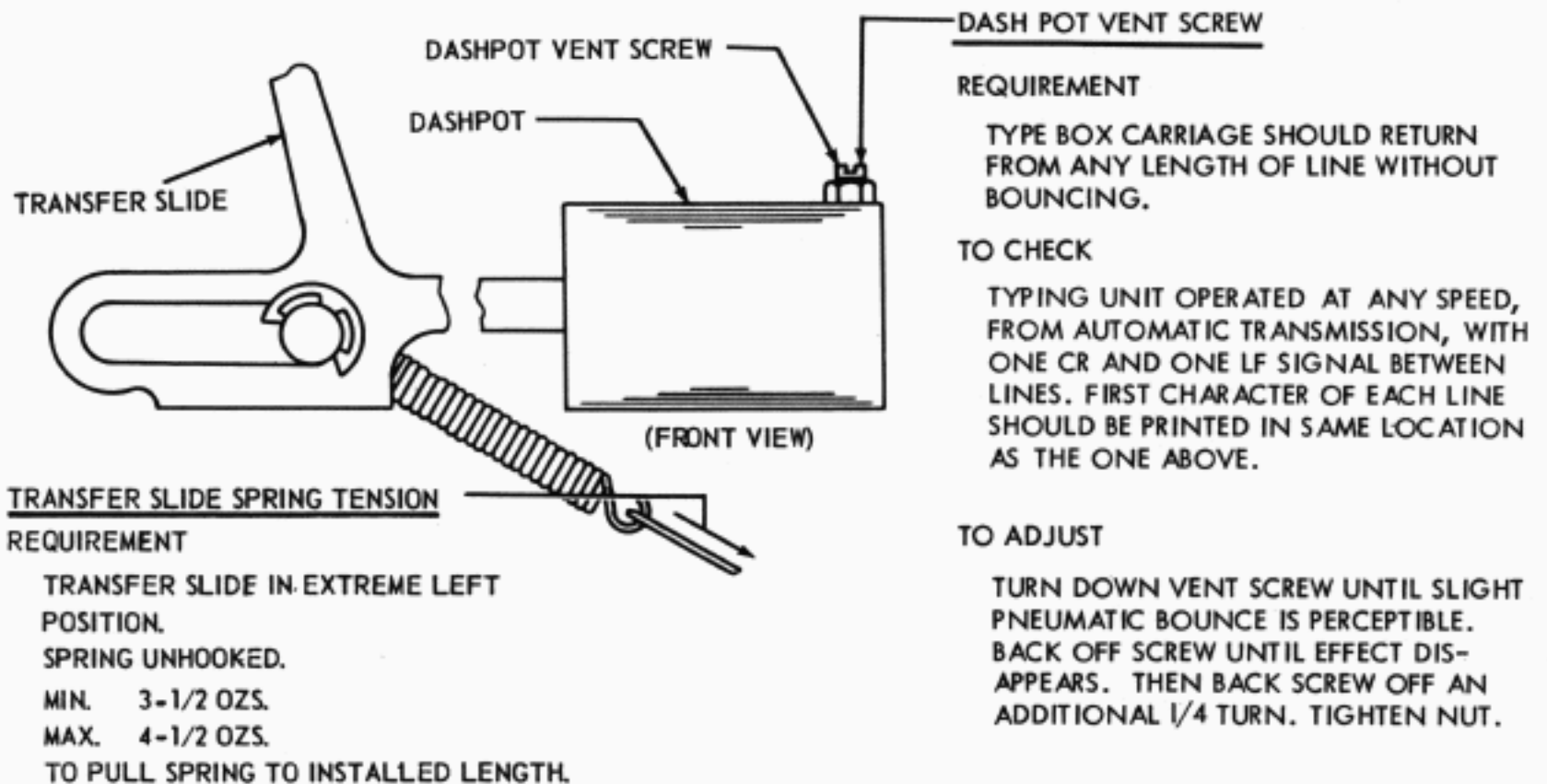
TO ADJUST

POSITION SPACE SUPPRESSION RING WITH FOUR INDICATED MOUNTING SCREWS LOOSENED.

NOTE

RANGE OF ADJUSTMENT IS FROM 0 TO 85 CHARACTERS.

Figure 5-35 Typing Unit, Space Suppression



REQUIREMENT

TYPE BOX CARRIAGE SHOULD RETURN FROM ANY LENGTH OF LINE WITHOUT BOUNCING.

TO CHECK

TYPING UNIT OPERATED AT ANY SPEED, FROM AUTOMATIC TRANSMISSION, WITH ONE CR AND ONE LF SIGNAL BETWEEN LINES. FIRST CHARACTER OF EACH LINE SHOULD BE PRINTED IN SAME LOCATION AS THE ONE ABOVE.

TO ADJUST

TURN DOWN VENT SCREW UNTIL SLIGHT PNEUMATIC BOUNCE IS PERCEPTIBLE. BACK OFF SCREW UNTIL EFFECT DISAPPEARS. THEN BACK SCREW OFF AN ADDITIONAL 1/4 TURN. TIGHTEN NUT.

TRANSFER SLIDE SPRING TENSION  
REQUIREMENT

TRANSFER SLIDE IN EXTREME LEFT POSITION. SPRING UNHOOKED.

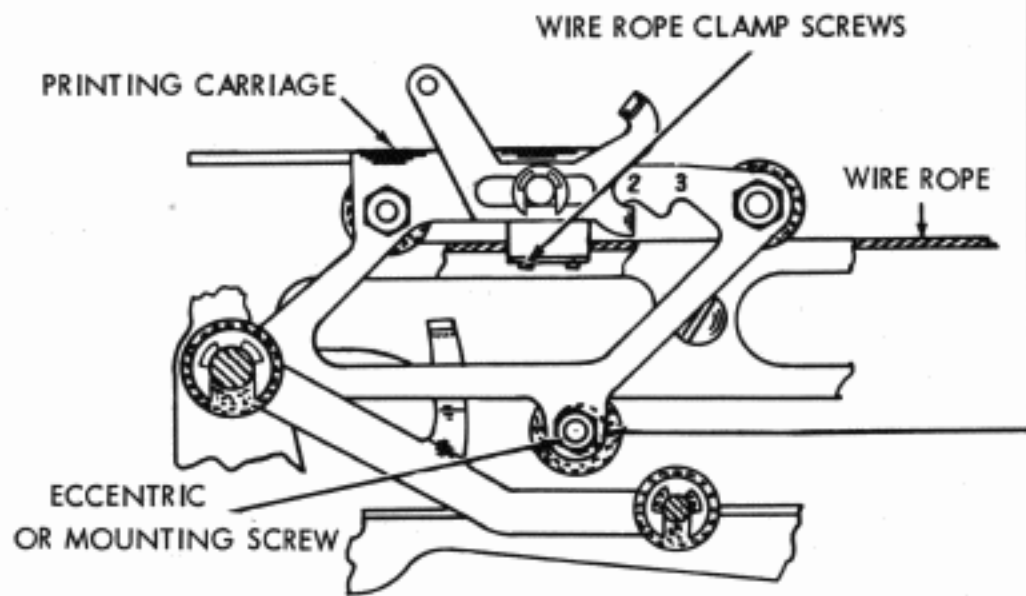
MIN. 3-1/2 OZS.

MAX. 4-1/2 OZS.

TO PULL SPRING TO INSTALLED LENGTH.

Figure 5-36 Typing Unit, Dash Pot Mechanism



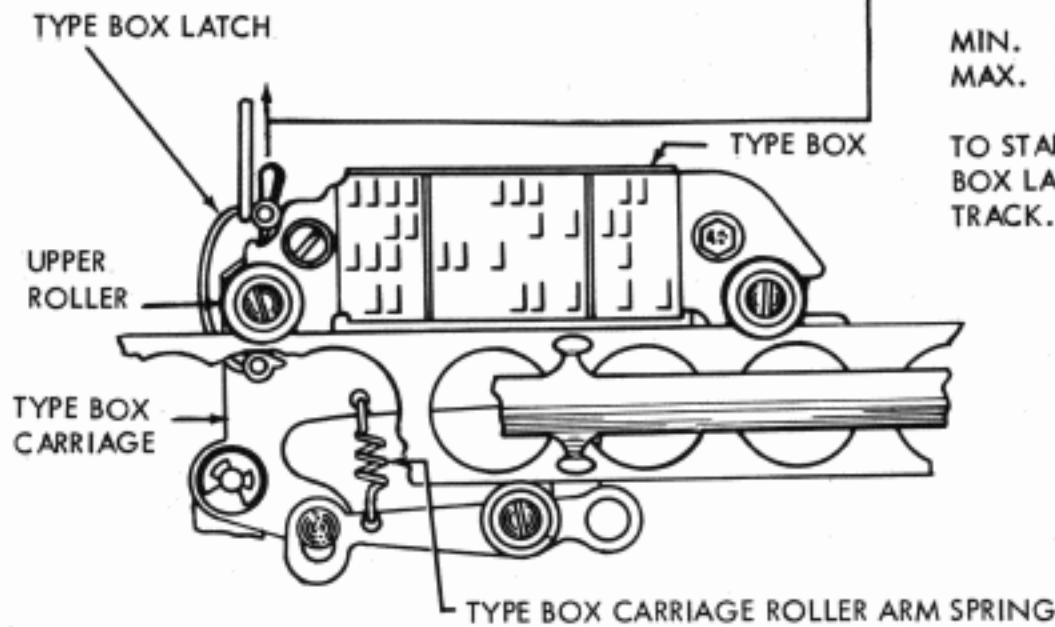


PRINTING CARRIAGE LOWER ROLLER REQUIREMENT

CARRIAGE WIRE ROPE CLAMP SCREWS LOOSENED. PLAY OF CARRIAGE ON TRACK-MIN. WITHOUT BIND, THROUGHOUT TRACK'S FULL LENGTH.

TO ADJUST (ECCENTRIC BUSHING) POSITION LOWER ROLLER WITH SCREW NUT LOOSENED. KEEP HIGH PART OF ECCENTRIC (CHAMFERED CORNER) TOWARD THE RIGHT.

TO ADJUST (SLIDING SCREW) POSITION LOWER ROLLER WITH MOUNTING SCREW LOOSENED.



TYPE BOX CARRIAGE ROLLER ARM SPRING REQUIREMENT

MIN. 28 OZS.  
MAX. 36 OZS.

TO START UPPER ROLLER, NEAREST TYPE BOX LATCH, MOVING AWAY FROM CARRIAGE TRACK.

DECELERATING SLIDE SPRING TENSION

REQUIREMENT

PRINTING BAIL IN DOWNWARD POSITION. PRINTING CARRIAGE AND DECELERATING SLIDE ASSEMBLY IN RIGHT HAND POSITION.

MIN. 1/2 OZ.  
MAX. 1-1/2 OZS.

TO START THE SLIDE MOVING, WITH THE PRINTING CARRIAGE AND DECELERATING SLIDE IN THEIR LEFT HAND POSITION CHECK THE LEFT HAND DECELERATING SLIDE

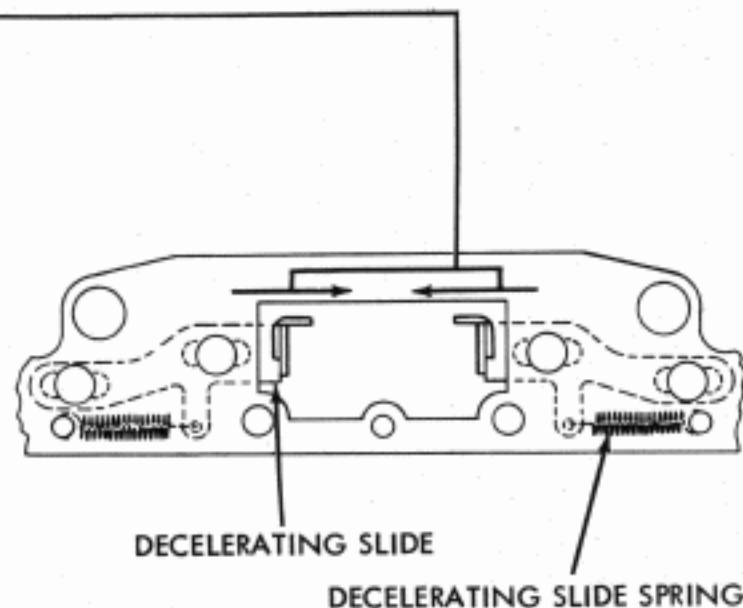
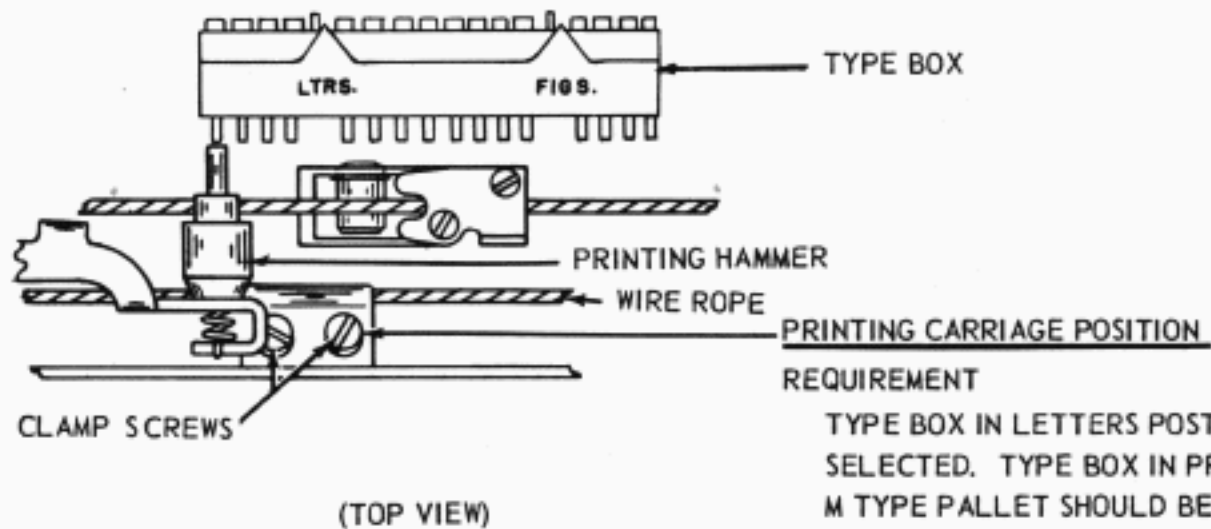


Figure 5-37 Typing Unit, Printing and Type Box Carriage and Decelerating Slide Mechanism

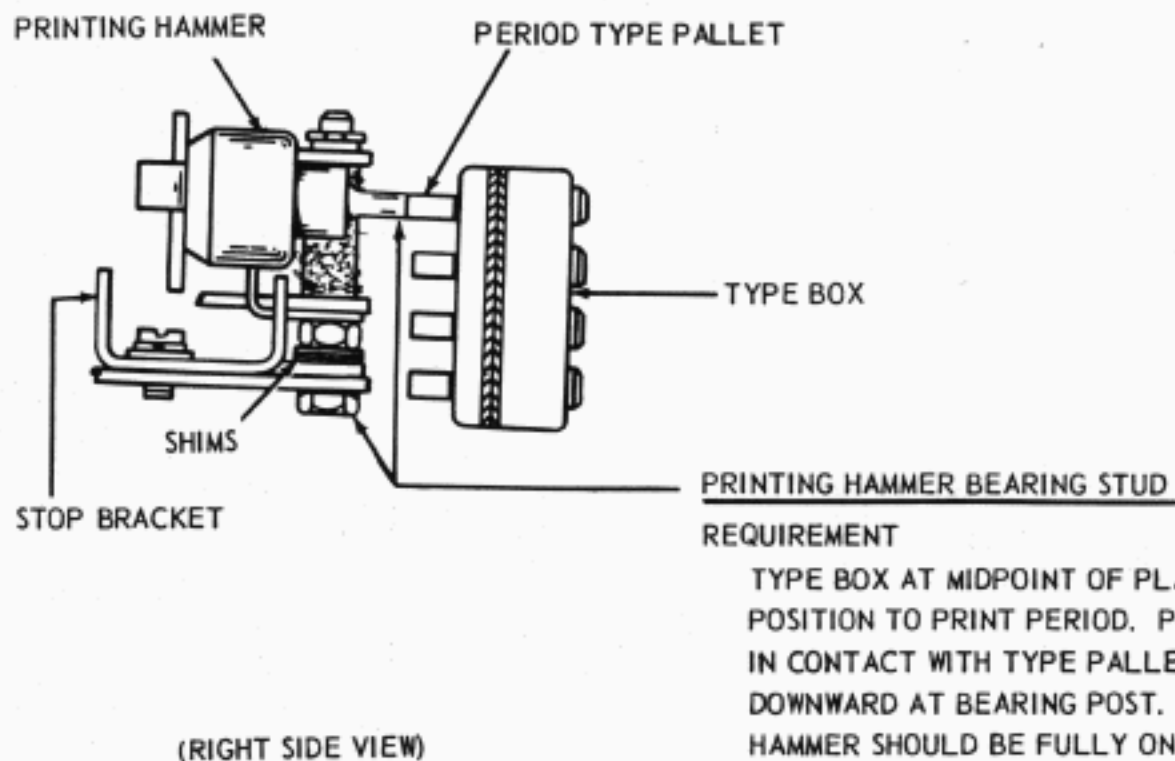
PRINTING CARRIAGE POSITION

## REQUIREMENT

TYPE BOX IN LETTERS POSITION, M TYPE PALLET SELECTED. TYPE BOX IN PRINTING POSITION. M TYPE PALLET SHOULD BE APPROXIMATELY IN CENTER OF PRINTING HAMMER WHEN HAMMER IS JUST TOUCHING M TYPE PALLET.

## TO ADJUST

POSITION PRINTING CARRIAGE ON WIRE ROPE WITH CLAMP SCREWS LOOSENED.

PRINTING HAMMER BEARING STUD

## REQUIREMENT

TYPE BOX AT MIDPOINT OF PLATEN AND IN POSITION TO PRINT PERIOD. PRINTING HAMMER IN CONTACT WITH TYPE PALLET AND PRESSED DOWNWARD AT BEARING POST. FACE OF HAMMER SHOULD BE FULLY ON END OF TYPE PALLET.

## TO ADJUST

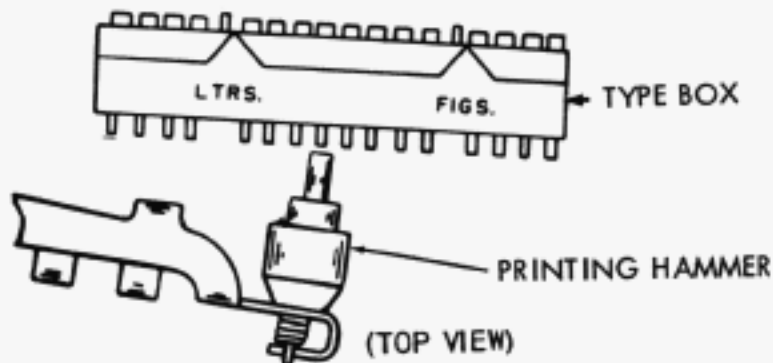
ADD OR REMOVE SHIMS BETWEEN SHOULDER ON BEARING POST AND STOP BRACKET.

Figure 5-38 Typing Unit, Printing Carriage

SHIFT LINKAGE

REQUIREMENT

CARRIAGE NEAR MIDPOINT OF PLATEN. TYPE BOX IN POSITION TO PRINT LETTER "O". MANUALLY BUCKLE RIGHT SHIFT LINKAGE. SHIFT TYPE BOX TO LEFT. FIGURE "9" TYPE PALLET SHOULD BE APPROXIMATELY IN CENTER OF PRINT HAMMER WHEN HAMMER IS JUST TOUCHING "9" TYPE PALLET.

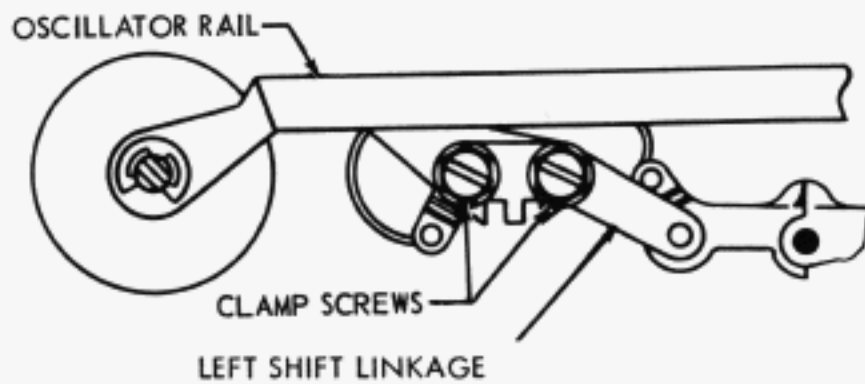


TO ADJUST

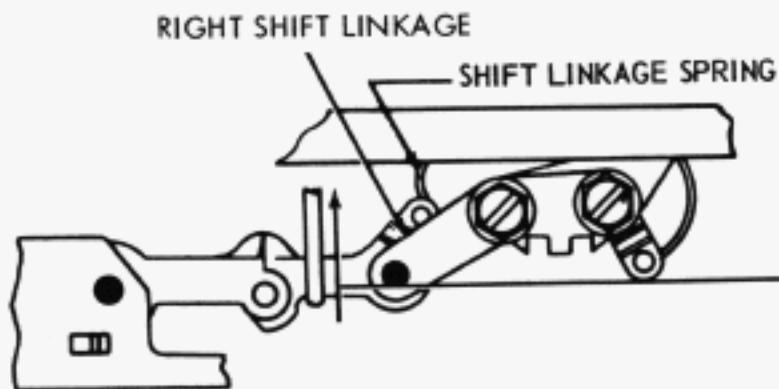
POSITION LEFT SHIFT LINKAGE ON OSCILLATOR RAIL WITH TWO CLAMP SCREWS LOOSENED

TO RECHECK

SHIFT ALTERNATELY FROM "O" TO "9". TAKE UP PLAY IN EACH DIRECTION. REFINE ADJUSTMENT IF NECESSARY.



(FRONT VIEW)



SHIFT LINKAGE SPRING TENSION

REQUIREMENT

LINK IN STRAIGHT POSITION

MIN. 7 OZS.

MAX. 14 OZS.

TO START EACH LINK MOVING.

Figure 5-39 Typing Unit, Shift Mechanism

**A. PRINTING TRACK**

**REQUIREMENT**

PRINTING TRACK IN ITS EXTREME DOWNWARD POSITION. BLANK SELECTION IN FIGURES. PRINTING HAMMER OPERATING BAIL LATCHING EXTENSION HELD WITH LEFT FACE IN LINE WITH THE LATCH SHOULDER. PRINTING ARM SLIDE POSITIONED ALTERNATELY OVER EACH TRACK MOUNTING SCREW. PRINTING BAIL RESET EACH TIME. CLEARANCE BETWEEN LATCHING EXTENSION AND OPERATING BAIL LATCH SHOULD BE

MIN. 0.015 INCH MAX. 0.040 INCH

**TO ADJUST**

POSITION THE PRINTING TRACK UP OR DOWN WITH ITS MOUNTING SCREWS LOOSENED.

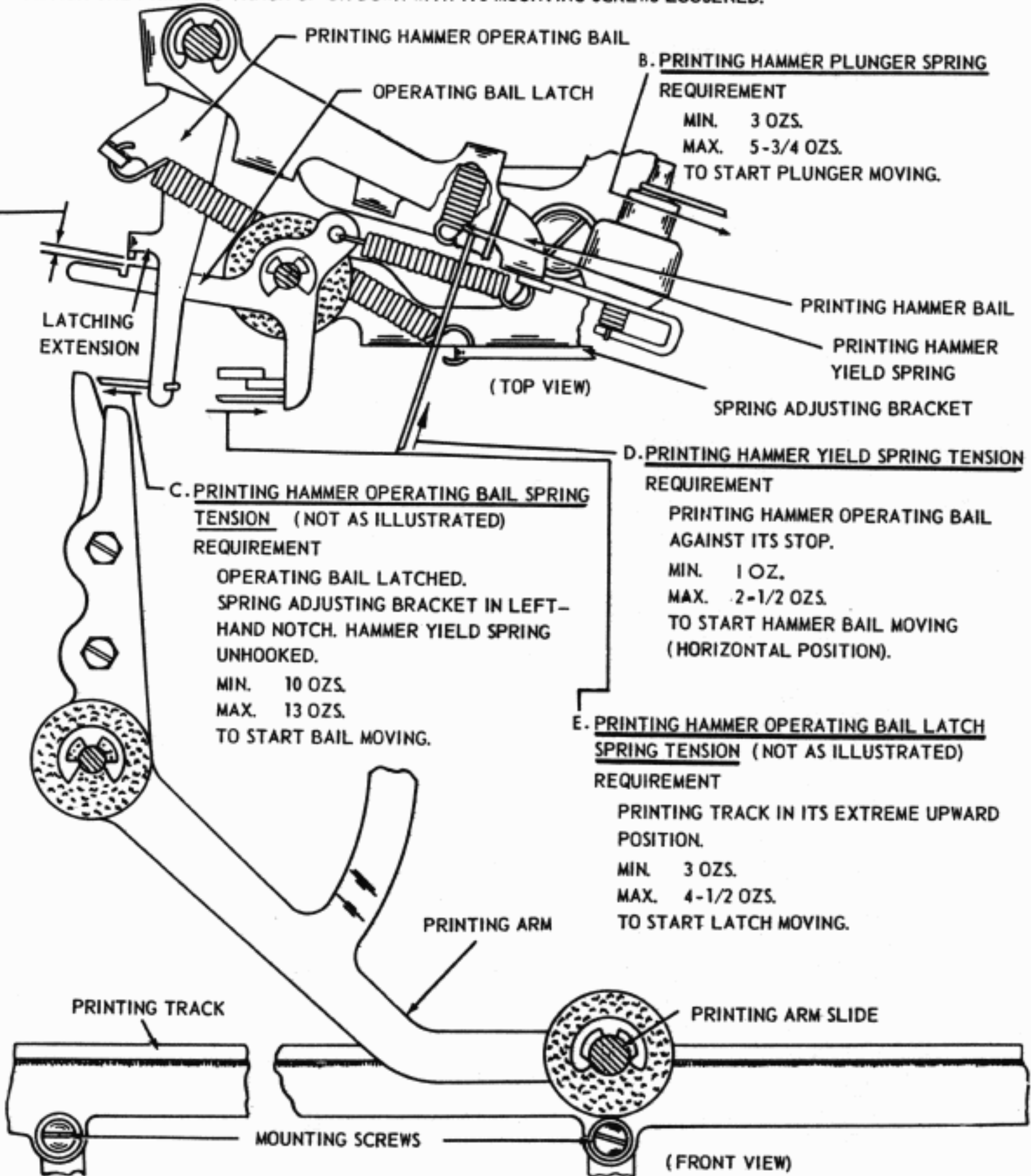


Figure 5-40 Typing Unit, Printing Mechanism

**PRINTING HAMMER STOP BRACKET**  
REQUIREMENT

TYPE BOX IN POSITION TO PRINT M, PRINTING TRACK IN ITS MAXIMUM DOWNWARD POSITION. PRINTING HAMMER STOP BRACKET HELD TOWARD THE PLATEN WITH 8 OZS. OF PRESSURE. CLEARANCE BETWEEN PRINTING HAMMER AND M TYPE PALLET

MIN. 0.005 INCH  
MAX. 0.035 INCH

CHECK AT BOTH ENDS OF PLATEN.

TO ADJUST

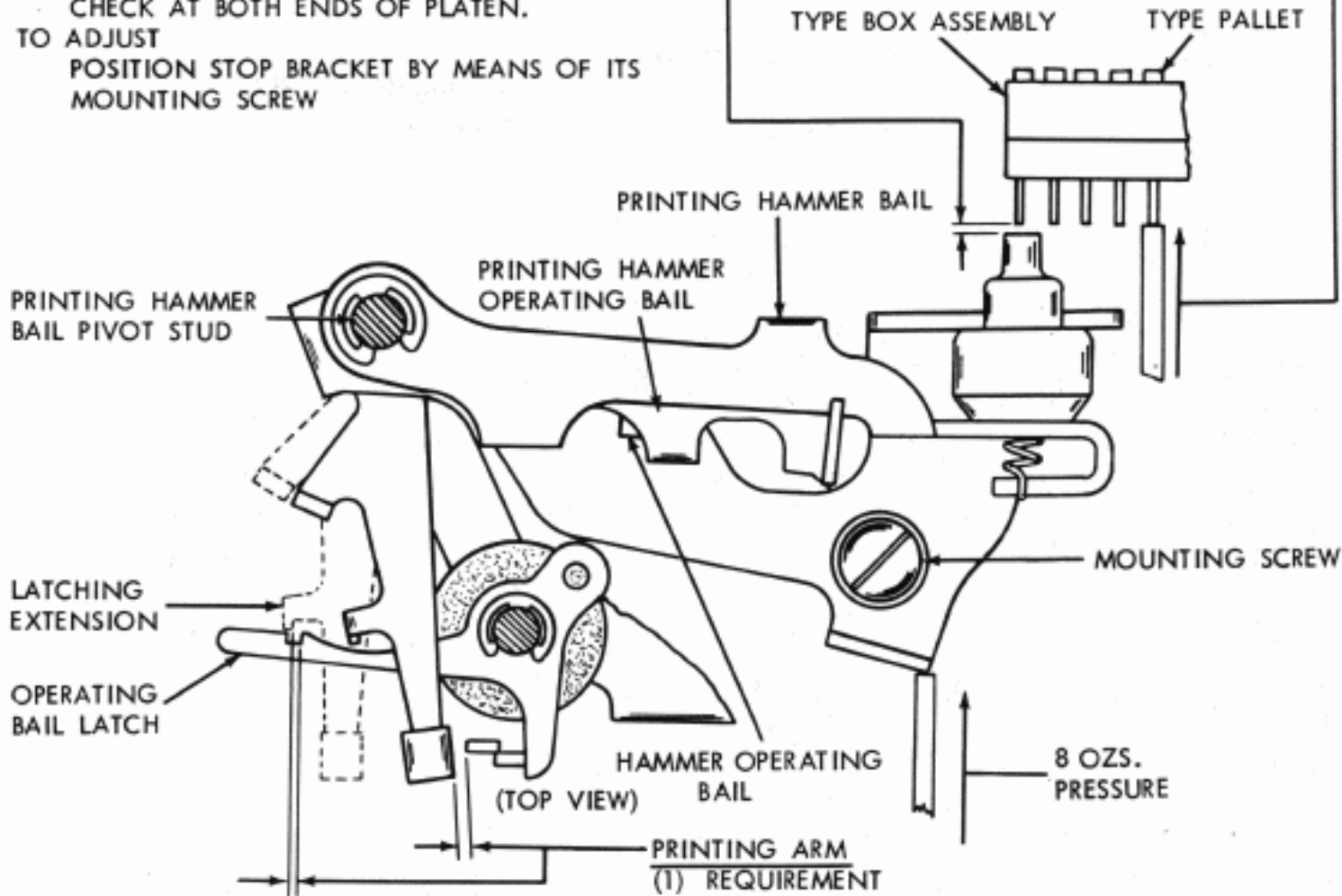
POSITION STOP BRACKET BY MEANS OF ITS MOUNTING SCREW

**TYPE PALLET SPRING TENSION**  
REQUIREMENT

TYPE BOX REMOVED FROM THE UNIT. 8 OZS. SCALE APPLIED VERTICALLY TO THE END OF THE PALLET SHANK.

MIN. 1/4 OZS.  
MAX. 3/4 OZS.

TO START PALLET MOVING.



(1) REQUIREMENT

PRINTING TRACK IN MAXIMUM DOWNWARD POSITION.

PRINTING HAMMER OPERATING BAIL AGAINST ITS STOP.

SOME CLEARANCE BETWEEN SECONDARY PRINTING ARM AND FORWARD EXTENSION OF HAMMER OPERATING BAIL.

MAX. 0.015 INCH

WHEN PRINTING ARM SLIDE IS HELD DOWNWARD OVER EACH PRINTING TRACK MOUNTING SCREW FOR MAXIMUM CLEARANCE.

(2) REQUIREMENT

PRINTING TRACK IN UPPERMOST POSITION.

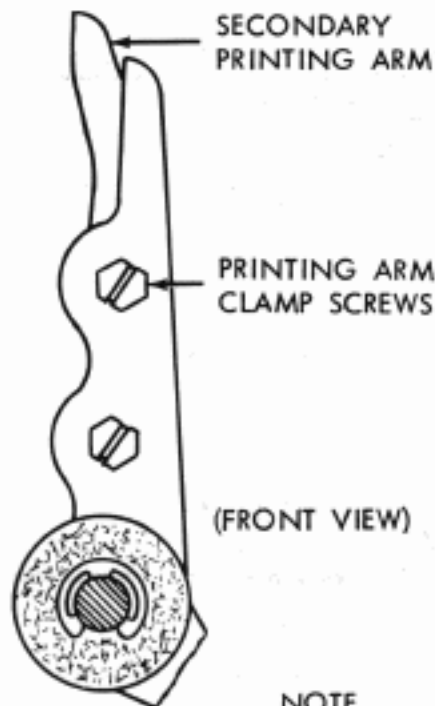
LATCHING EXTENSION OF PRINTING HAMMER OPERATING BAIL SHOULD OVERTRAVEL LATCHING SURFACE OF OPERATING BAIL LATCH BY

MIN. 0.006 INCH

CHECK RIGHT AND LEFT POSITIONS

TO ADJUST

POSITION SECONDARY PRINTING ARM WITH CLAMP SCREWS LOOSENED.



NOTE

THE PRINTING ARM ADJUSTMENT SHOULD ALWAYS BE MADE WITH THE PRINTING HAMMER OPERATING BAIL SPRING BRACKET IN THE NO. 1 POSITION. POSITIONS NO. 2 AND 3 ARE TO BE USED ONLY FOR MAKING MULTIPLE COPIES.

Figure 5-41 Typing Unit, Printing Mechanism



NOTE: THIS ADJUSTMENT SHOULD BE MADE WITH THE TYPEBOX IN ITS UPPER POSITION.

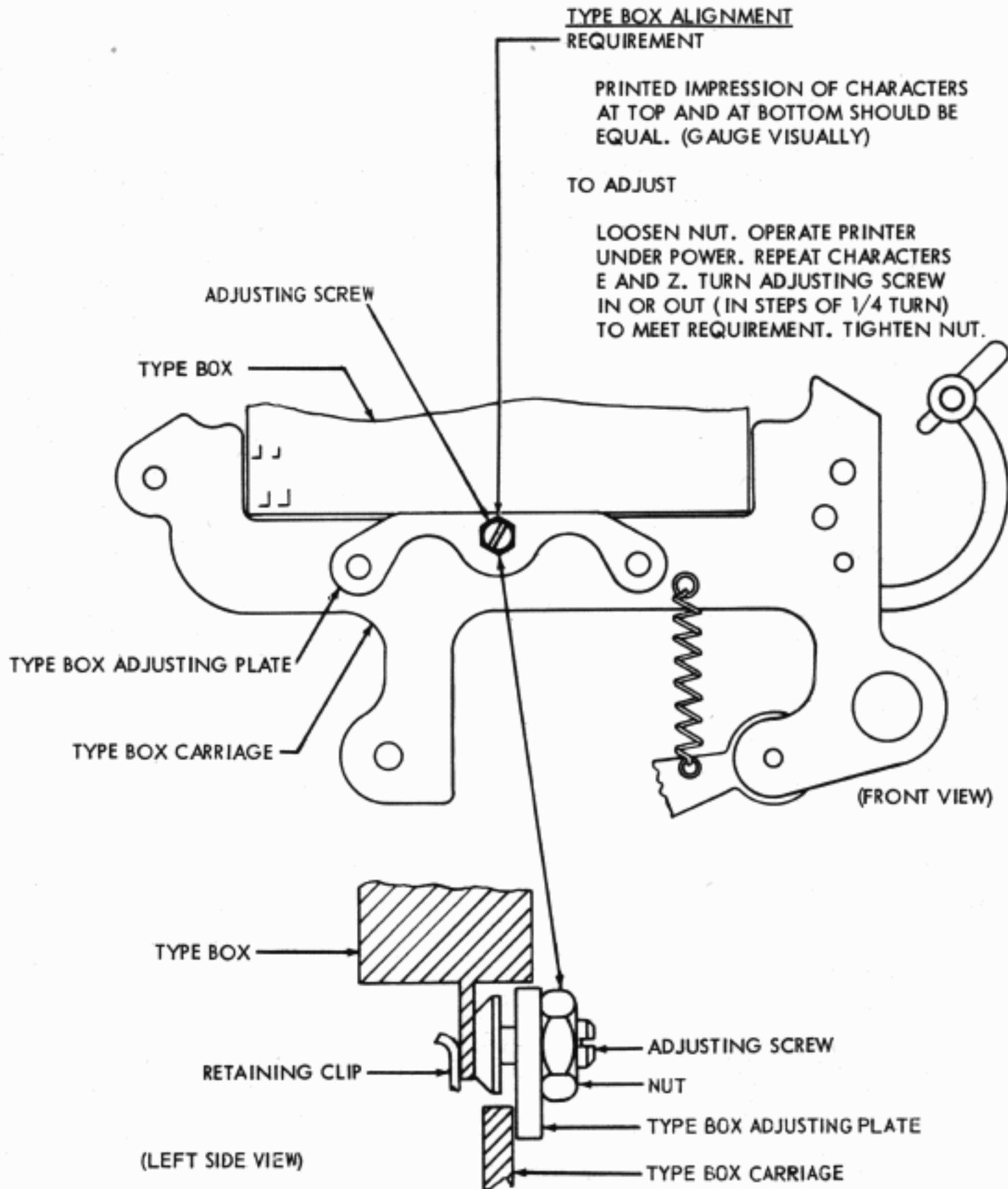
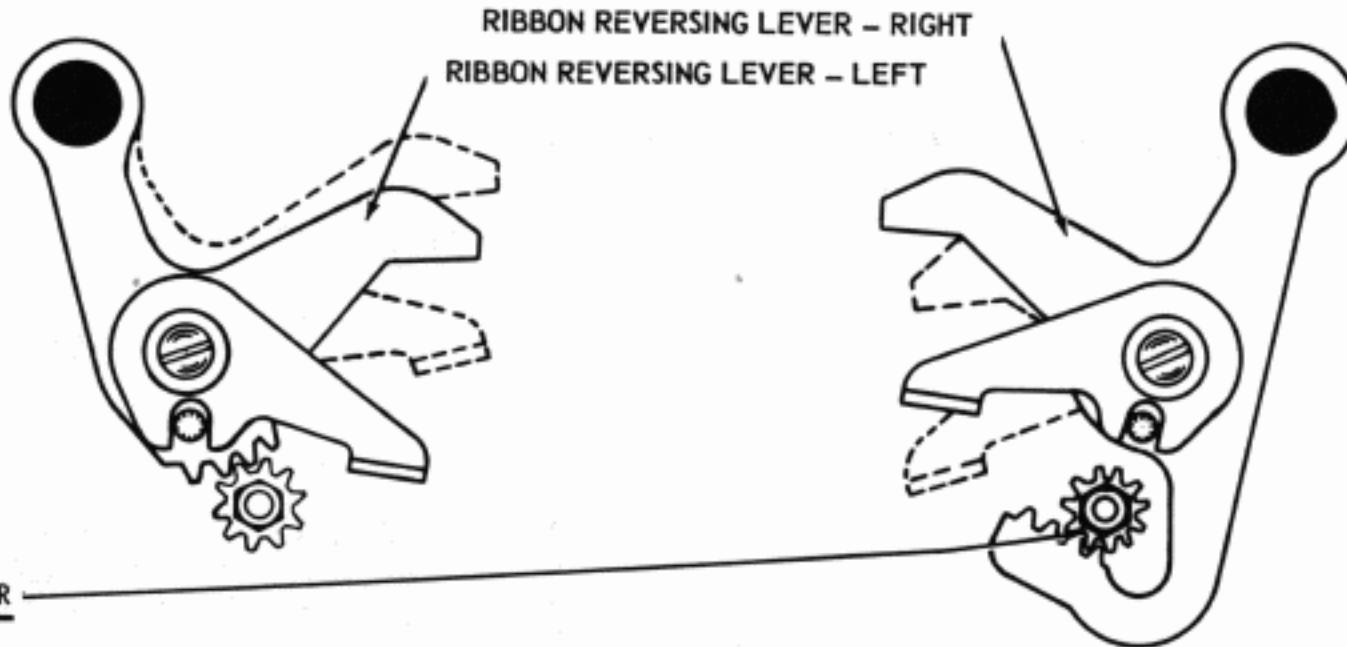


Figure 5-42 Typing Unit, Type Box



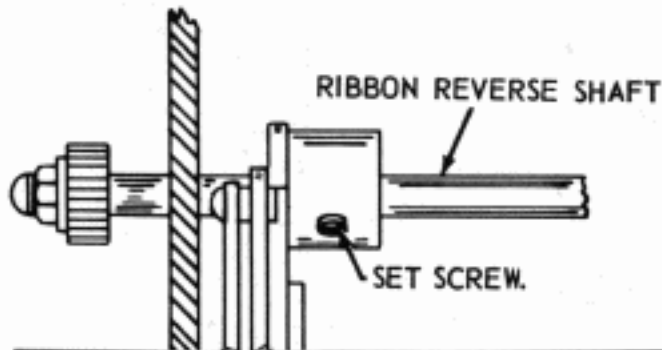
**A.**  
**RIBBON REVERSE SPUR GEAR**

**REQUIREMENT**

WHEN RIGHT REVERSING LEVER IS IN ITS MAXIMUM DOWNWARD POSITION, THE LEFT REVERSING LEVER SHOULD BE IN ITS MAXIMUM UPWARD POSITION.

**TO ADJUST**

LOOSEN THE SET SCREWS IN THE DETENT CAM. LOOSEN THE LEFT SPUR GEAR NUT. SECURELY TIGHTEN THE RIGHT SPUR GEAR NUT. MOVE THE RIGHT REVERSING LEVER TO ITS MAXIMUM DOWNWARD POSITION AND HOLD LEFT REVERSING LEVER IN ITS MAXIMUM UPWARD POSITION, THEN TIGHTEN THE LEFT SPUR GEAR NUT.



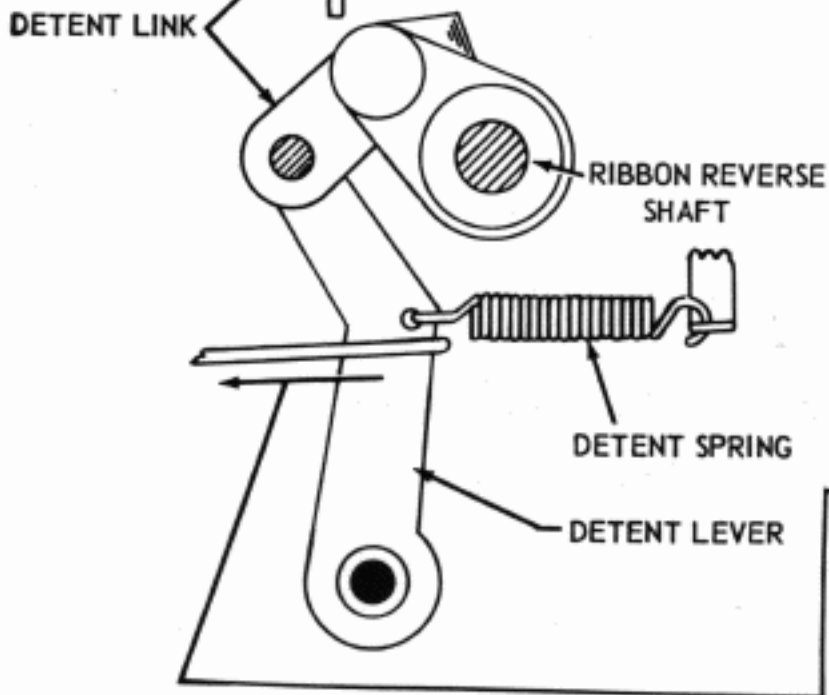
**B. RIBBON REVERSE DETENT**

**REQUIREMENT**

RIBBON REVERSE DETENT LINK BUCKLED IN ITS DOWNWARD POSITION, CLEARANCE BETWEEN DETENT LINK AND DETENT LEVER.  
MIN. SOME - MAX. 0.055 INCH  
WHEN PLAY IN THE LEVER IS TAKEN UP LIGHTLY TOWARD THE RIGHT SIDE OF THE PRINTER.

**TO ADJUST**

HOLD LEFT RIBBON REVERSING LEVER IN ITS DOWNWARD POSITION, POSITION DETENT LINK, AND TIGHTEN THE UPPER SET SCREW IN THE HUB OF THE DETENT LINK. BUCKLE THE DETENT LINK UPWARD AND TIGHTEN LOWER SET SCREW.



**C. RIBBON REVERSE DETENT LEVER SPRING TENSION**

**REQUIREMENT**

DETENT LINK BUCKLED IN UPWARD POSITION  
MIN. 10 OZS. MAX. 18 OZS.  
TO START DETENT LEVER MOVING TOWARD REAR.

Figure 5-43 Typing Unit, Ribbon Reverse Mechanism

RIBBON FEED LEVER BRACKET(1) REQUIREMENT (LEFT-HAND MECHANISM)

LEFT REVERSING LEVER IN UPWARD POSITION.  
RIBBON MECHANISM IN UPPER POSITION.  
RATCHET WHEEL HELD AGAINST THE DETENT LEVER.  
CLEARANCE BETWEEN THE FRONT FACE OF THE  
FEED LEVER AND THE SHOULDER OF A TOOTH  
ON THE RATCHET WHEEL

MIN. 0.015 INCH  
MAX. 0.035 INCH

## TO ADJUST

POSITION THE FEED LEVER BRACKET WITH ITS  
MOUNTING SCREWS LOOSENED.

RIBBON REVERSING LEVER-LEFT

FEED LEVER BRACKET

LONG FEED  
LEVER SPRING

DETENT LEVER

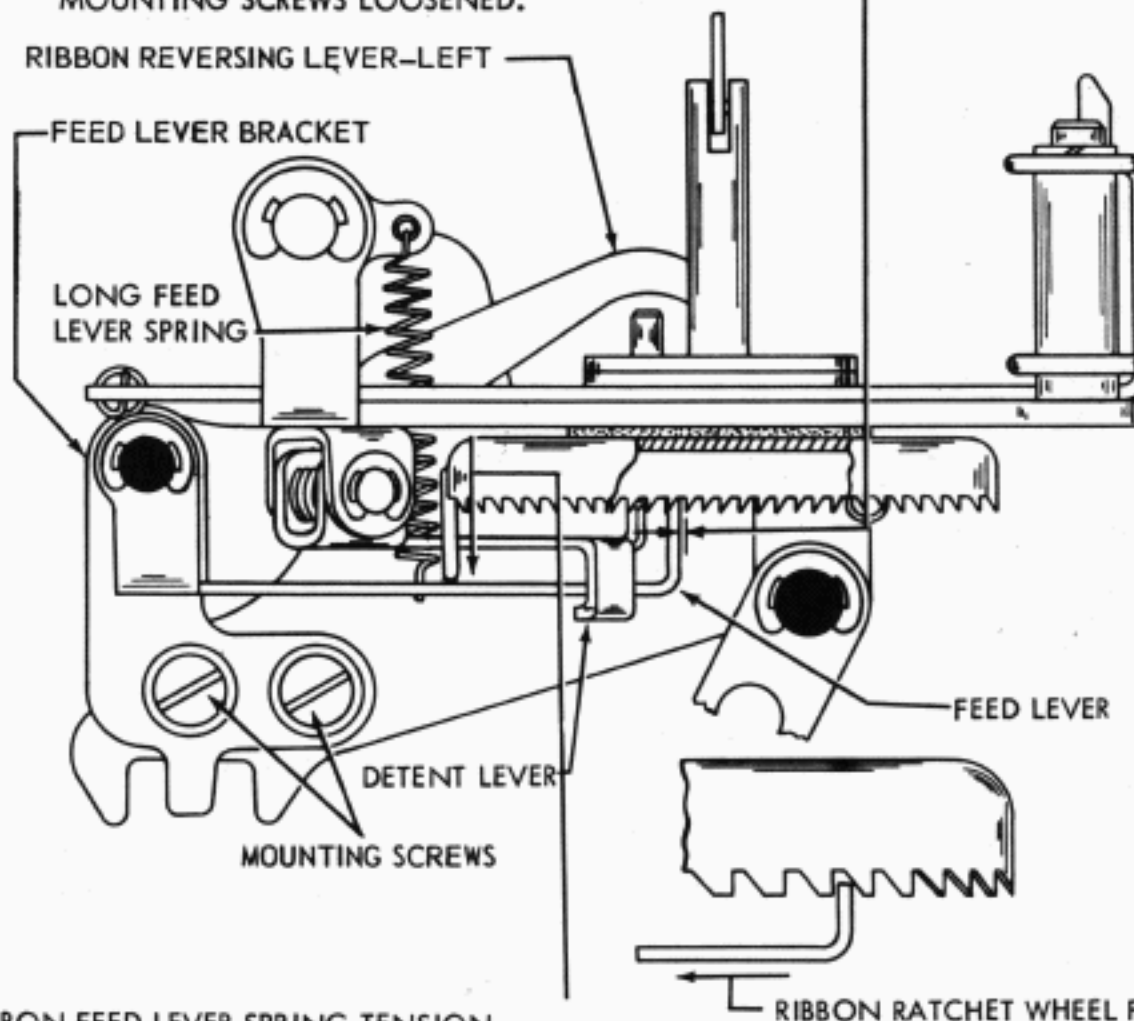
MOUNTING SCREWS

(2) REQUIREMENT (RIGHT-HAND MECHANISM)

RIGHT REVERSING LEVER AND RIBBON  
MECHANISM IN UPWARD POSITION, AD-  
JUST FEED LEVER BRACKET IN THE  
SAME MANNER.

## NOTE

ROTATE THE MAIN SHAFT. THE  
RATCHET WHEEL SHOULD STEP ONE  
TOOTH ONLY WITH EACH OPERATION

RIBBON FEED LEVER SPRING TENSION  
REQUIREMENT

RIBBON FEED LEVERS IN UPPERMOST POSITION.  
FOR LONG LEVER: PUSH DOWNWARD NEAR ITS  
SPRING.  
FOR SHORT LEVER: PUSH DOWNWARD AT POINT  
NEAR LONG LEVER SPRING.

MIN. 3/4 OZ.  
MAX. 2 OZS.

TO START FEED LEVERS MOVING. MEASURE  
ALL FOUR PAWLS.

## REQUIREMENT

FEED LEVERS DISENGAGED.

MIN. 3 OZS.  
MAX. 7-1/2 OZS.

TO START THE RATCHET WHEEL MOVING.

NOTE: IF MINIMUM REQUIREMENT OF SHORT  
LEVER IS NOT MET, PULL LOWER END  
OF TORSION SPRING TO REAR.

Figure 5-44 Typing Unit, Ribbon Feed Mechanism, Left Side View

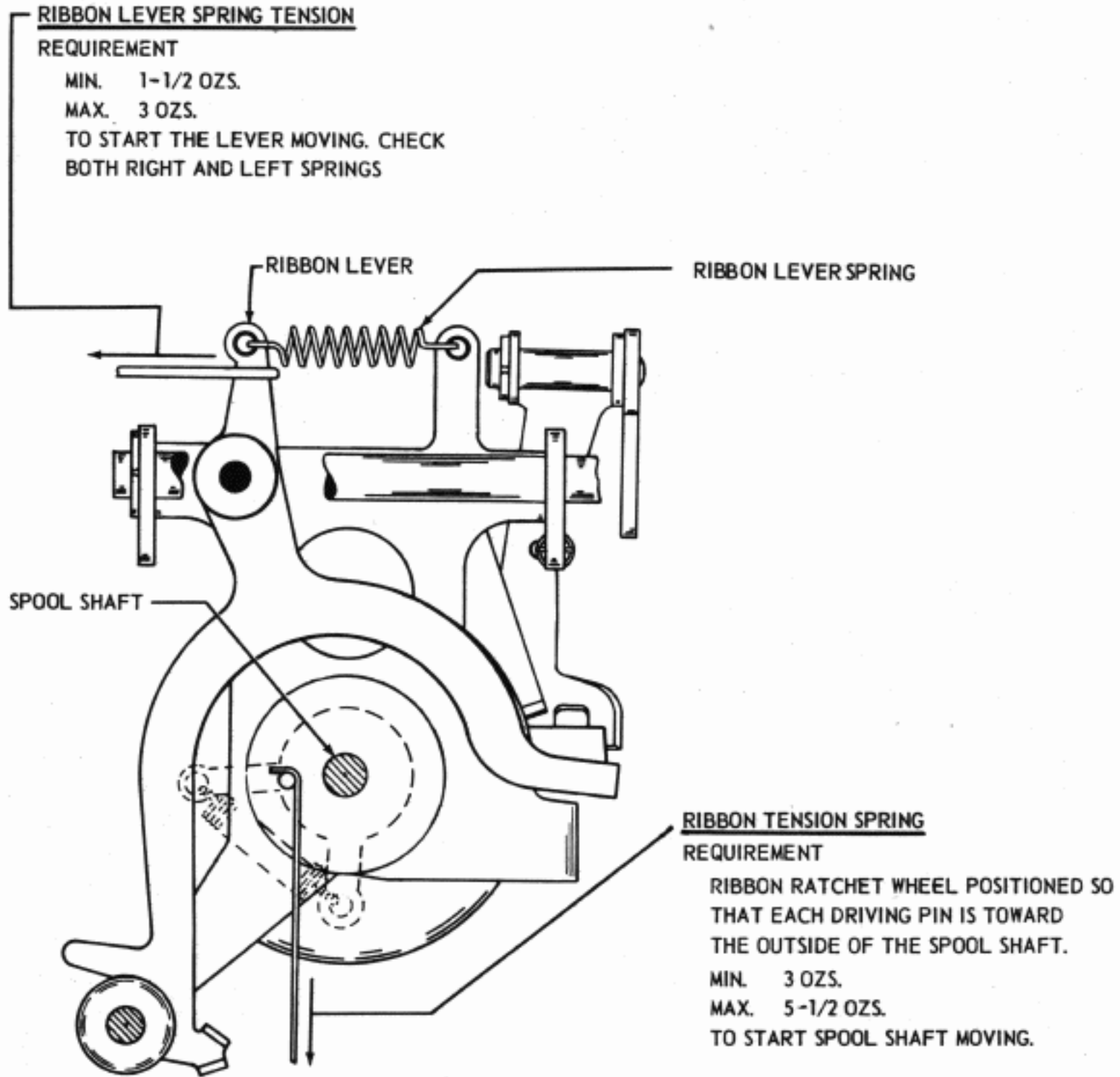
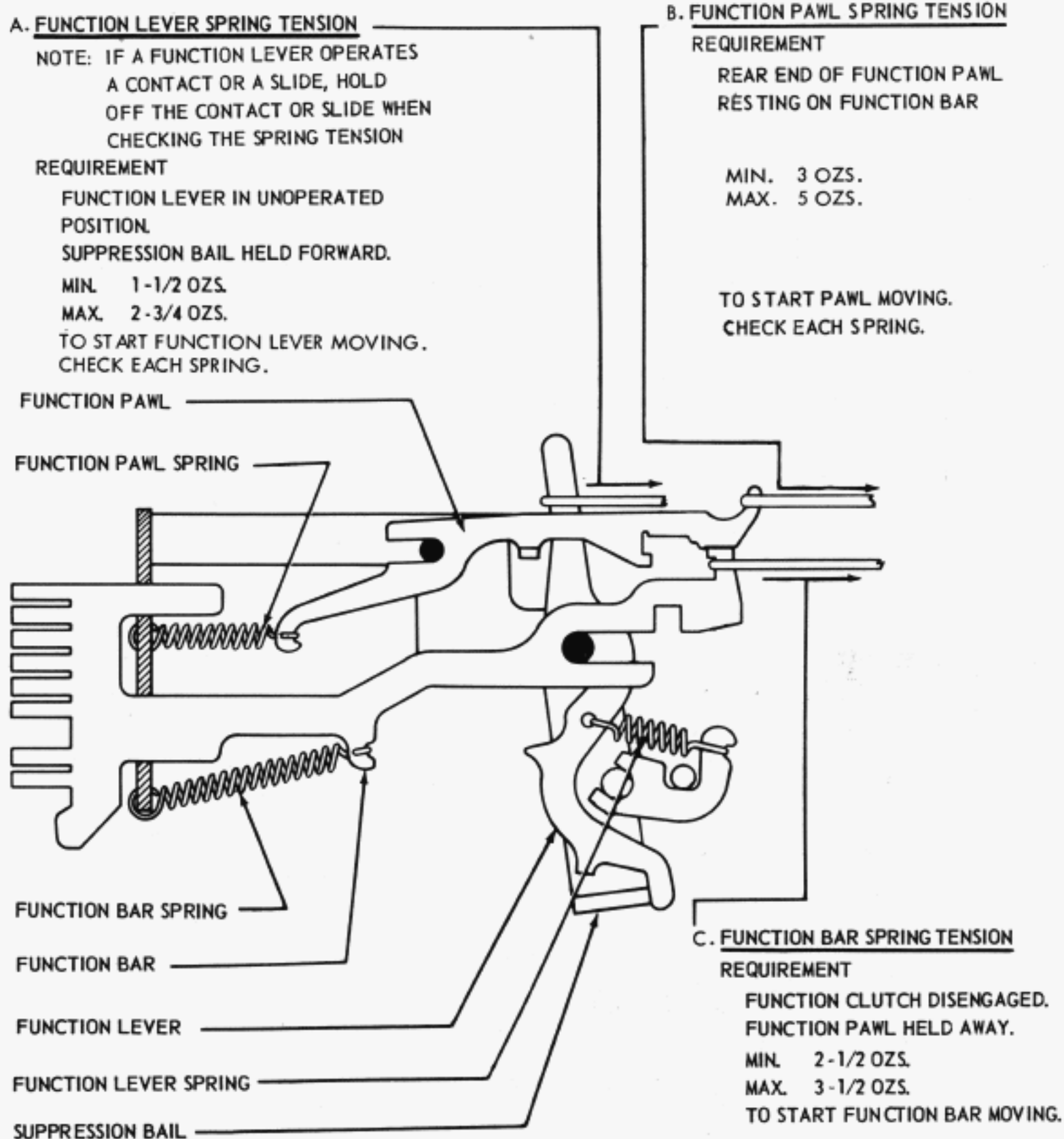


Figure 5-45 Typing Unit, Ribbon Reverse Mechanism, Top View



## CAUTION:

SEVERE WEAR TO THE POINT OF OPERATIONAL FAILURE WILL RESULT IF THE TYPING UNIT IS OPERATED WITHOUT EACH FUNCTION PAWL HAVING EITHER A RELATED FUNCTION BAR OR, WHERE A FUNCTION BAR IS MISSING, A RELATED FUNCTION PAWL CLIP TO HOLD THE FUNCTION PAWL AWAY FROM THE STRIPPER BLADE.

Figure 5-46 Typing Unit, Stunt Box Mechanism



STRIPPER BLADE DRIVE CAM POSITION

REQUIREMENT

STRIPPER BLADE DRIVE CAM SHOULD MOVE EACH STRIPPER BLADE CAM ARM AN EQUAL DISTANCE ABOVE AND BELOW CENTER LINE OF ITS PIVOT (GAUGE BY EYE)

- A. UPWARD DIRECTION
- B. DOWNWARD DIRECTION

TO CHECK

WITH FUNCTION CLUTCH DISENGAGED OBSERVE ENGAGEMENT OF STRIPPER BLADE DRIVE CAM (UPPER PEAK) WITH STRIPPER BLADE CAM ARM. THEN ROTATE CLUTCH TO TURN CAM TO ITS EXTREME DOWNWARD POSITION AND OBSERVE ENGAGEMENT OF LOWER CAM PEAK.

TO ADJUST

WITH STRIPPER BLADE DRIVE ARM MOUNTING SCREWS LOOSENED, EQUALIZE THE OVERTRAVEL OF EACH CAM PEAK.

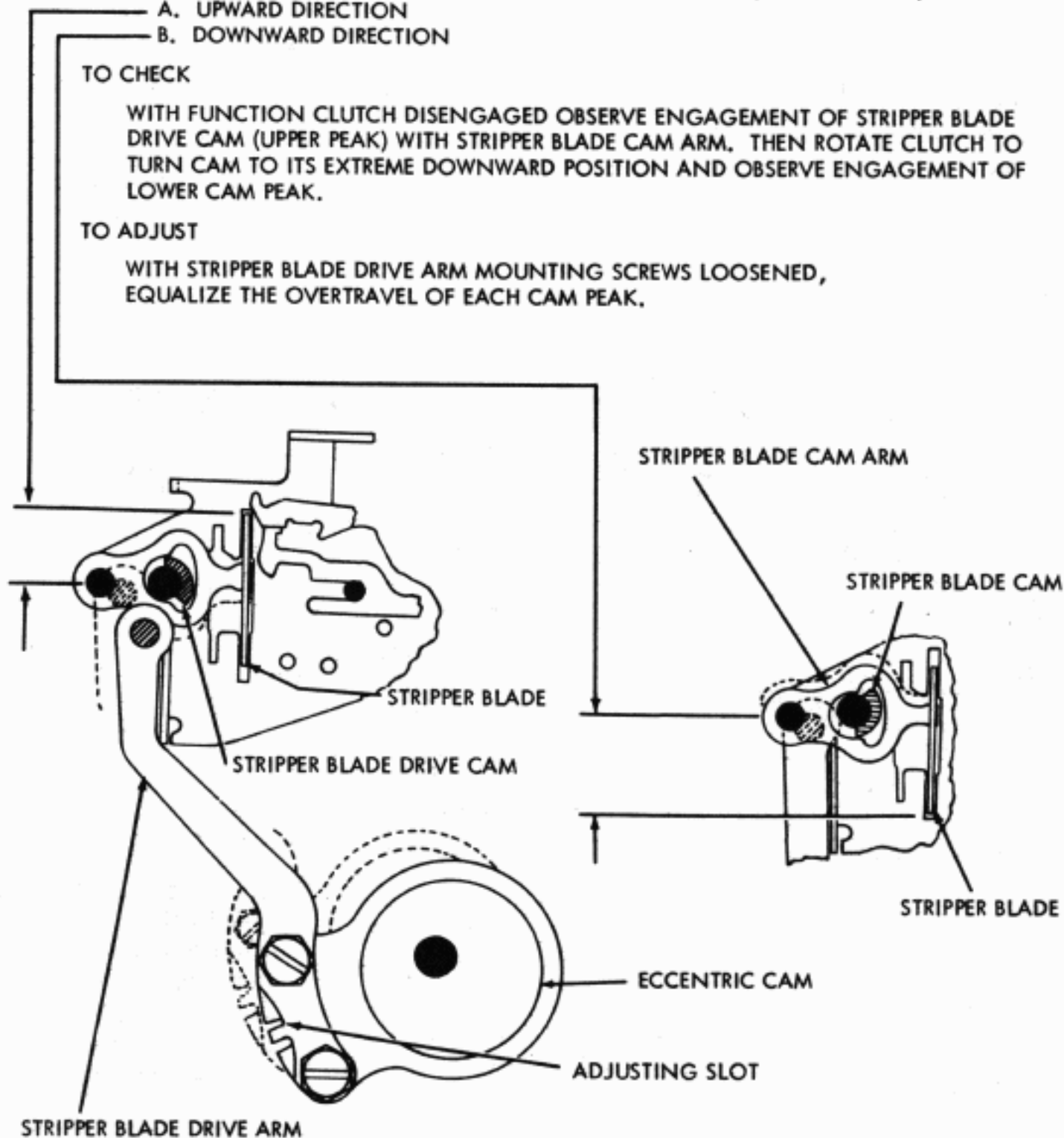


Figure 5-47 Typing Unit, Function Pawl Stripper Mechanism

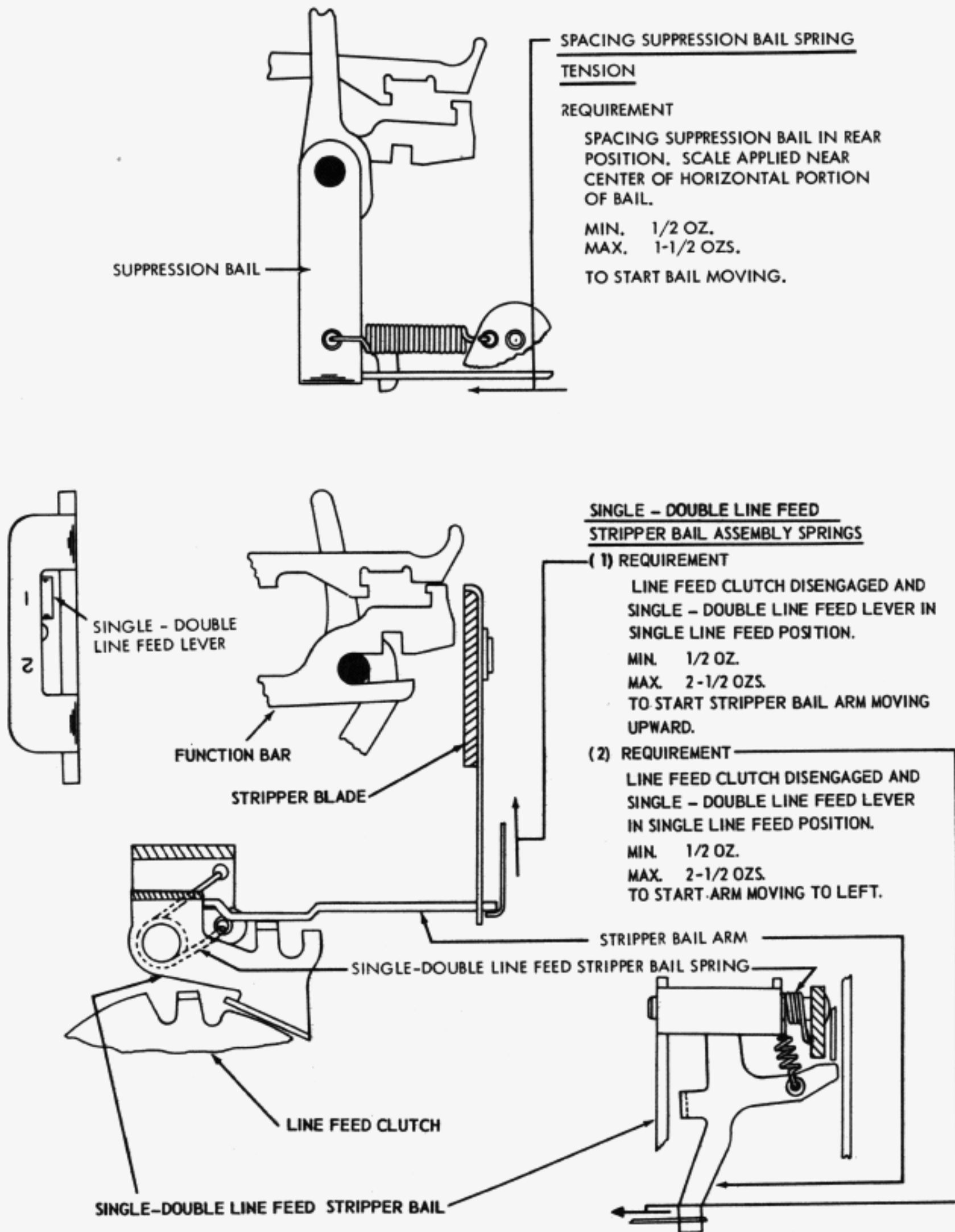
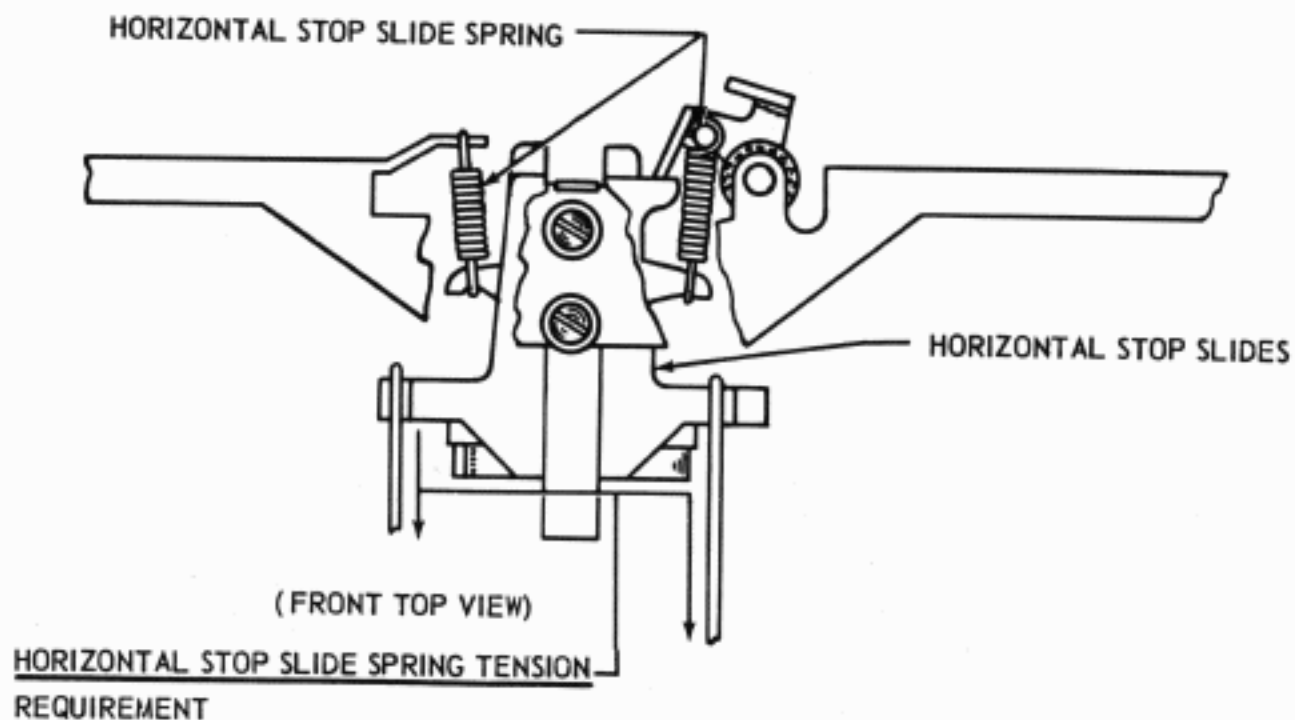


Figure 5-48 Typing Unit, Single-Double Line Feed Mechanism



HORIZONTAL STOP SLIDE SPRING TENSION  
REQUIREMENT

CODE BARS IN MARKING POSITION (LEFT).  
TYPE BOX CLUTCH ROTATED 1/4 TURN FROM ITS STOP POSITION.  
HORIZONTAL MOTION DECELERATING SLIDES (FIG. 5-37 ) HELD AWAY  
FROM HORIZONTAL STOP SLIDES.  
MIN. 1/2 OZ. MAX. 1-1/2 OZS. FOR UPPER AND LOWER SLIDES  
MIN. 1-3/4 OZS. MAX. 3 OZS. FOR MIDDLE SLIDE  
TO START SLIDE MOVING.  
NOTE: WHEN CHECKING UPPER AND LOWER SLIDES, HOLD MIDDLE  
SLIDE 1/32 INCH FORWARD.

Figure 5-49 Typing Unit, Horizontal Motion Stop

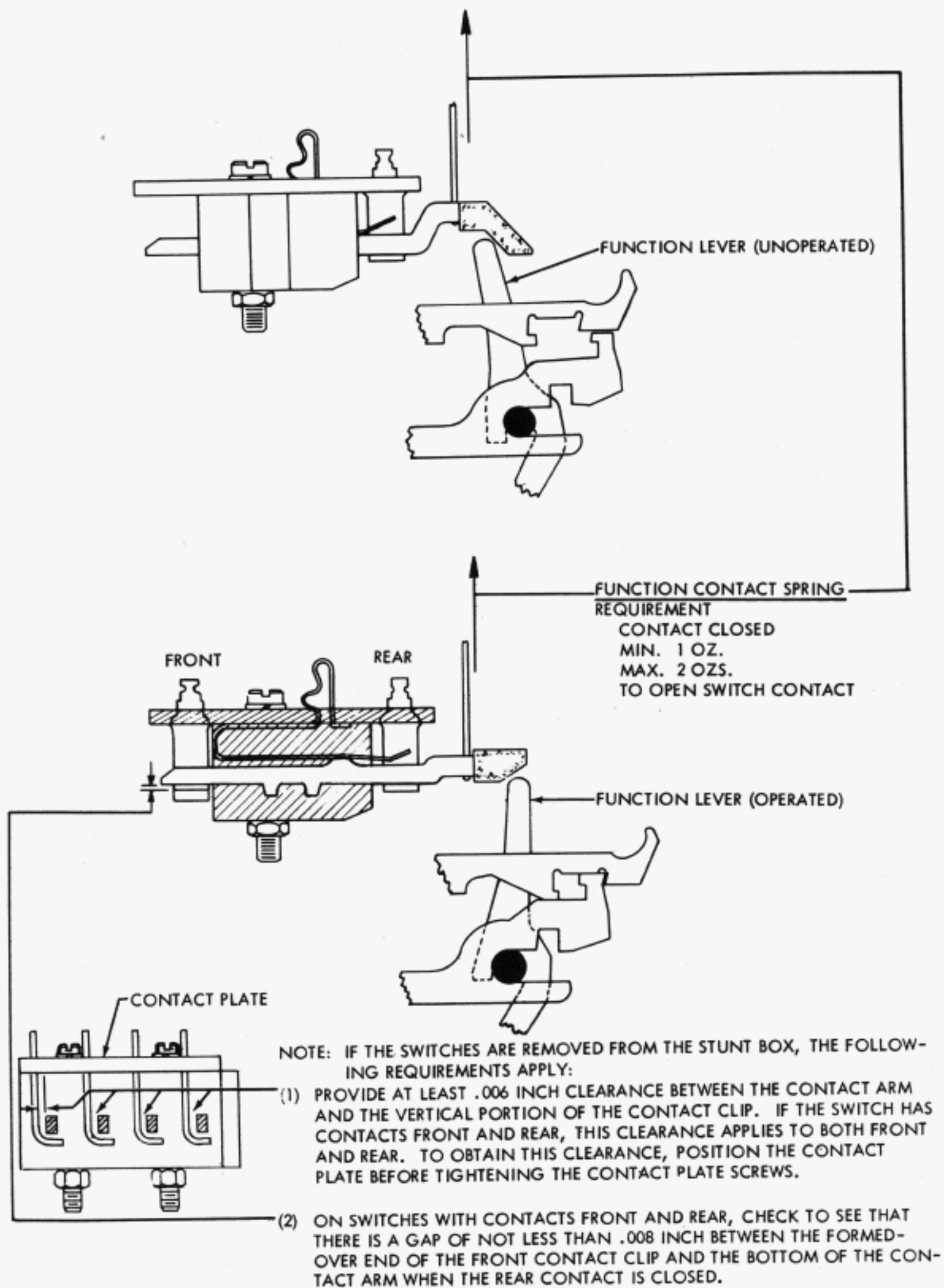


Figure 5-50 Typing Unit, Function Contacts

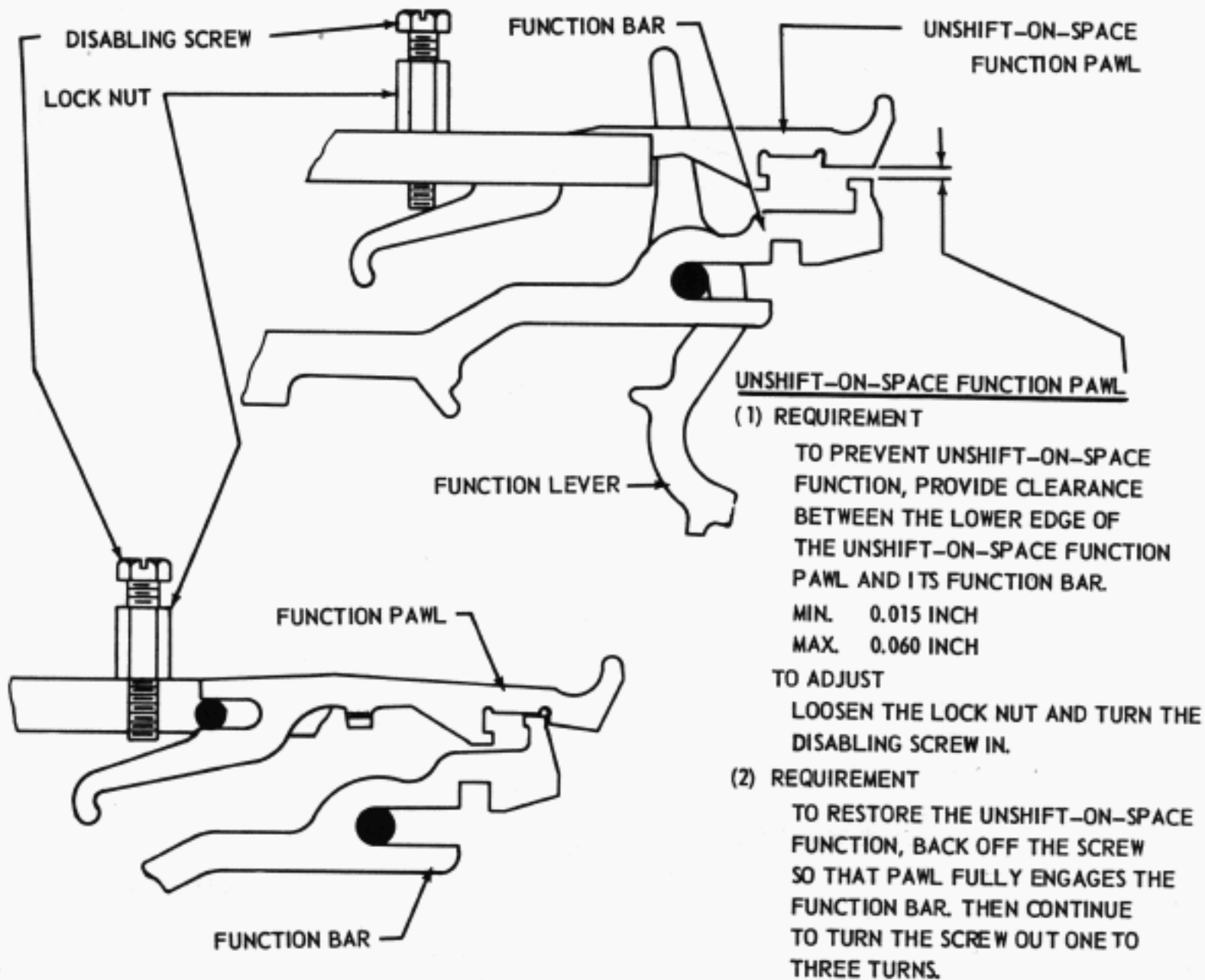


Figure 5-51 Typing Unit, Unshift-on-Space Mechanism, Left Side View



**CODE BAR DETENT REQUIREMENT**

FRONT PLATE REMOVED. ALL CLUTCHES DISENGAGED. SUPPRESSION AND SHIFT CODE BARS SHOULD DETENT EQUALLY (GAUGED BY EYE)

**TO ADJUST**

EQUALIZE THE DETENTING OF THE CODE BARS BY ADDING OR REMOVING SHIMS BETWEEN THE CASTING AND THE CODE BAR BRACKET.

**CODE BAR DETENT SPRING TENSION**

**NOTE**

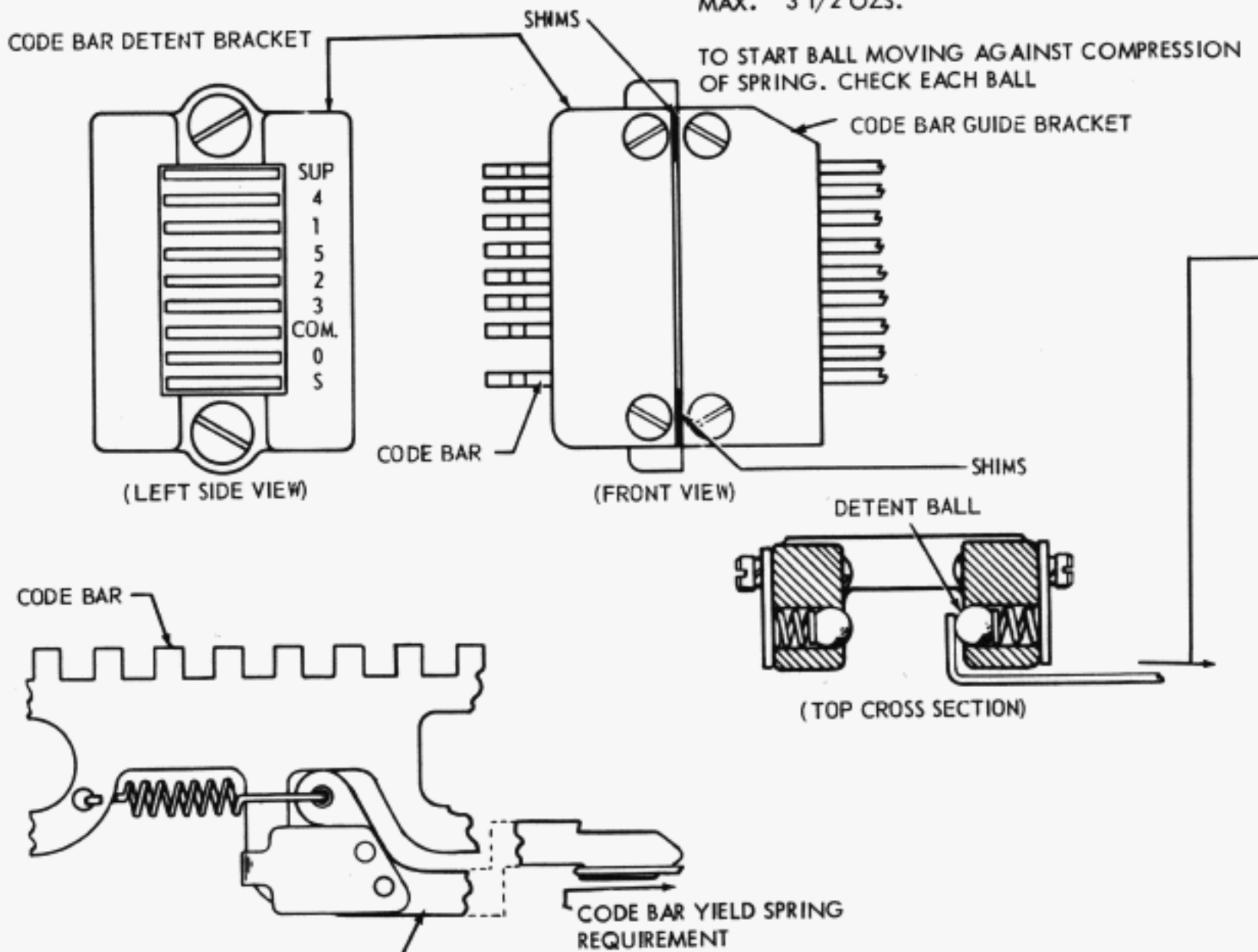
UNLESS THERE IS REASON TO BELIEVE THAT THESE SPRINGS ARE CAUSING OPERATING FAILURE DO NOT CHECK THIS REQUIREMENT.

**REQUIREMENT**

CODE BAR DETENT BRACKET CAREFULLY REMOVED AND CODE BARS REMOVED FROM DETENT BRACKET. SCALE APPLIED TO DETENT BALL AND PULLED IN DIRECTION OF BALL TRAVEL

MIN. 1 1/2 OZS.  
MAX. 3 1/2 OZS.

TO START BALL MOVING AGAINST COMPRESSION OF SPRING. CHECK EACH BALL



SELECTOR CLUTCH AND CODE BAR CLUTCH DISENGAGED. NO. 1 CODE BAR IN SPACING POSITION.

MIN. 17 OZS.  
MAX. 23 OZS.

TO START CODE BAR SHIFT BAR PIVOT MOVING AWAY FROM CODE BAR. CHECK NO. 2 AND COMMON CODE BAR SHIFT BAR IN THE SAME MANNER.

Figure 5-52 Typing Unit, Code Bar Detent Mechanism

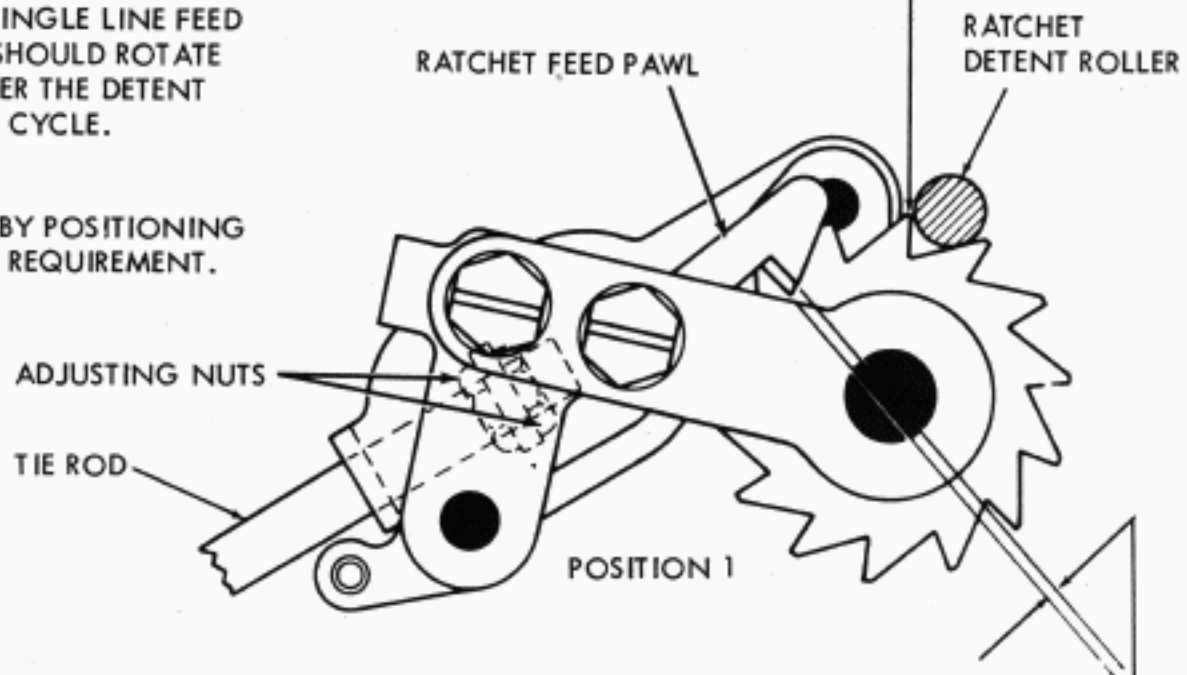
**A. FEED PAWL (PRELIMINARY)**

**REQUIREMENT**

WITH LINE FEED LEVER IN SINGLE LINE FEED POSITION THE FEED PAWL SHOULD ROTATE ONE RATCHET TOOTH UNDER THE DETENT ROLLER IN EACH LINE FEED CYCLE.

**TO ADJUST**

VARY LENGTH OF TIE ROD BY POSITIONING ADJUSTING NUTS TO MEET REQUIREMENT.



**B. FEED PAWL (FINAL)**

**REQUIREMENT**

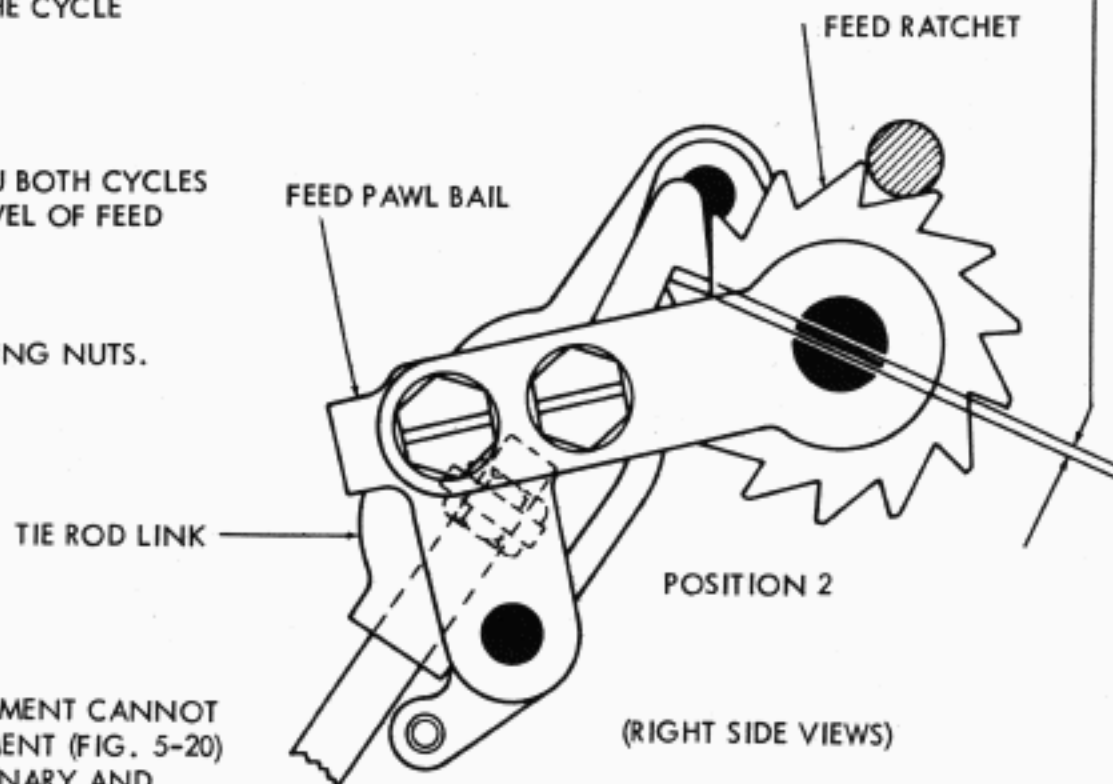
UPON COMPLETION OF A LINE FEED CYCLE CLEARANCE BETWEEN FEED PAWL AND RATCHET TOOTH ENGAGED IN THE CYCLE

MIN. 0.002 INCH  
MAX. 0.005 INCH

TURN LINE FEED CLUTCH THRU BOTH CYCLES TO DETERMINE FURTHEST TRAVEL OF FEED PAWL.

**TO ADJUST**

REFINE POSITION OF ADJUSTING NUTS.



**NOTE**

IF PRELIMINARY AND FINAL ADJUSTMENT CANNOT BE MET, REMAKE PHASING ADJUSTMENT (FIG. 5-20) AND REPEAT THE FEED PAWL PRELIMINARY AND FINAL ADJUSTMENTS.

Figure 5-53 Typing Unit, Transparent Web Feed Pawl Mechanism

FEED ROLL SHAFT

## 1. REQUIREMENT

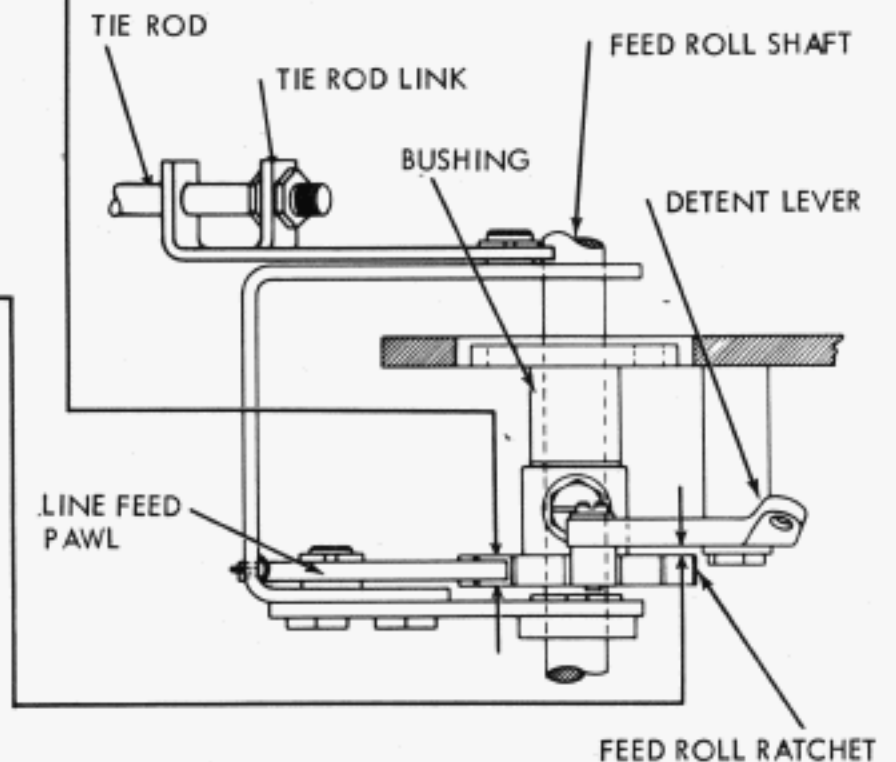
PRESSURE ROLL RELEASE ARM IN LATCHED POSITION. FEED ROLL WITH BARELY PERCEPTIBLE END PLAY. LINE FEED PAWL SHOULD RIDE FULLY ON FEED ROLL RATCHET.

## 2. REQUIREMENT

CLEARANCE BETWEEN SIDE OF FEED ROLL RATCHET AND DETENT LEVER  
MIN. 0.010 INCH  
WHEN END PLAY OF FEED ROLL IS TAKEN UP TO MAKE CLEARANCE A MINIMUM.

## TO ADJUST

POSITION SET COLLAR ON LEFT END OF FEED ROLL SHAFT (AS SEEN FROM REAR OF TYPING UNIT) AND ADD OR REMOVE SHIMS BETWEEN HUB OF FEED ROLL RATCHET AND BUSHING AT RIGHT END OF SHAFT.



(TOP VIEW)

FEED ROLL DETENT LEVER SPRING

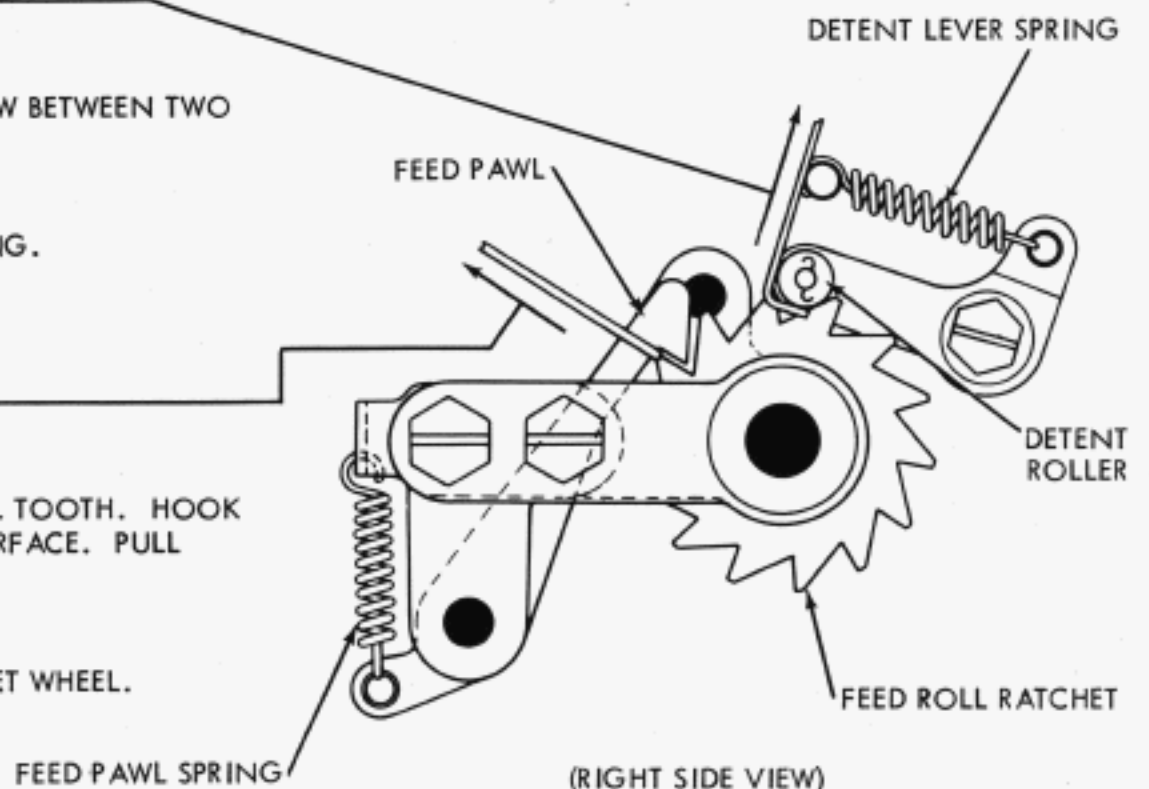
## REQUIREMENT

DETENT ROLLER RESTING IN HOLLOW BETWEEN TWO TEETH ON FEED ROLL RATCHET  
MIN. 44 OZS.  
MAX. 56 OZS.  
TO START THE DETENT LEVER MOVING.

FEED PAWL SPRING

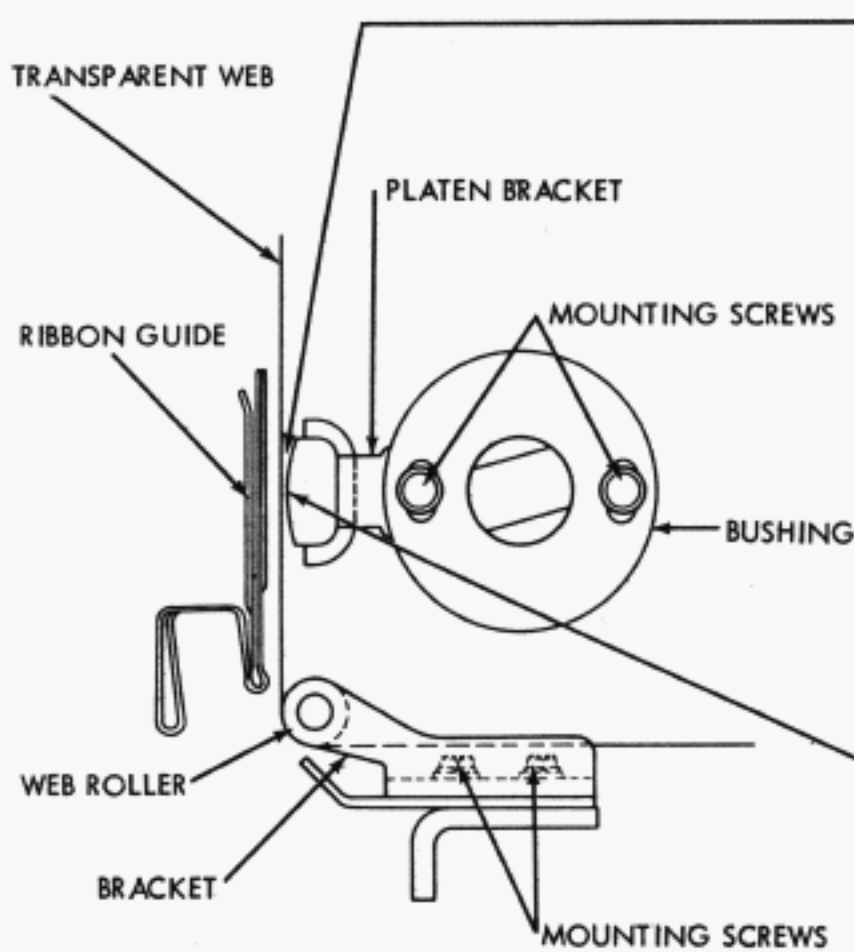
## REQUIREMENT

FEED PAWL FREE OF RATCHET WHEEL TOOTH. HOOK SCALE JUST BELOW ENGAGING SURFACE. PULL PERPENDICULAR TO FEED PAWL.  
MIN. 6 OZS.  
MAX. 9 OZS.  
TO MOVE FEED PAWL FROM RATCHET WHEEL.



(RIGHT SIDE VIEW)

Figure 5-54 Typing Unit, Feed Roll Pawl and Detent Assembly



(RIGHT SIDE VIEW)

WEB ROLLER

NOTE: PERFORM THIS ADJUSTMENT AFTER "POSITIONING THE TYPING UNIT" (FIG. 5-62).

REQUIREMENT

TRANSPARENT WEB THREADED AND UNDER TENSION. PLATEN IN UPPERMOST POSITION. THE WEB SHOULD JUST CLEAR TYPING SURFACE OF PLATEN. GAUGE BY EYE. CHECK THIS REQUIREMENT EACH TIME TYPING UNIT IS INSTALLED IN PROJECTOR FRAME.

TO ADJUST

POSITION THE TWO WEB ROLLER BRACKETS WITH THEIR MOUNTING SCREWS LOOSENED. TIGHTEN THE SCREWS.

PLATEN

REQUIREMENT

TYPE PALLETS SHOULD STRIKE CENTER OF PLATEN AS GAUGED BY EYE.

TO ADJUST

POSITION THE PLATEN BRACKETS ON THEIR BUSHINGS WITH THE MOUNTING SCREWS LOOSENED. TIGHTEN SCREWS.

NOTE: SELECT LETTER M. TURN MAIN SHAFT BY HAND UNTIL PRINTING HAMMER JUST STRIKES PALLET TO CHECK ADJUSTMENT.

Figure 5-55 Typing Unit, Platen and Web Roller

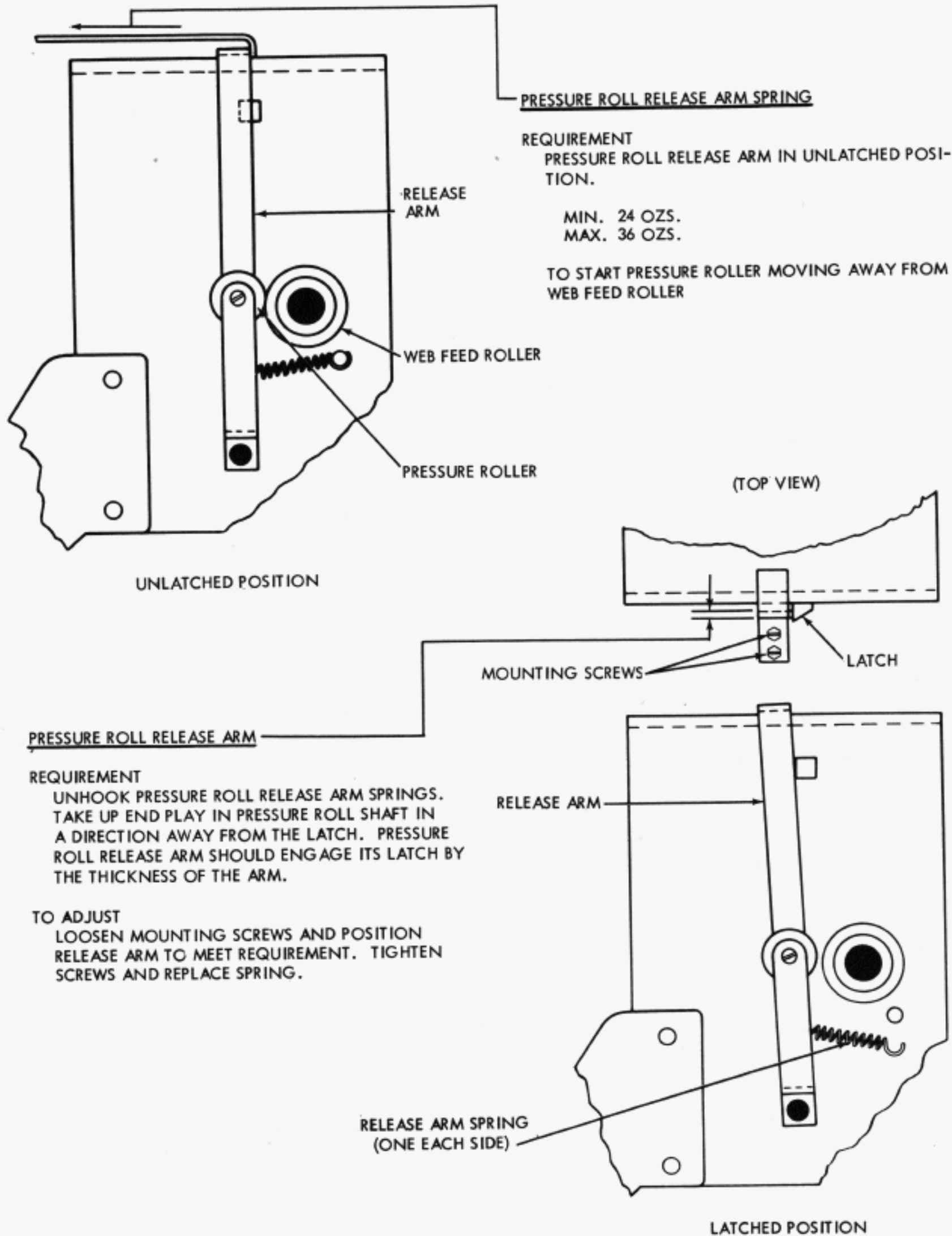
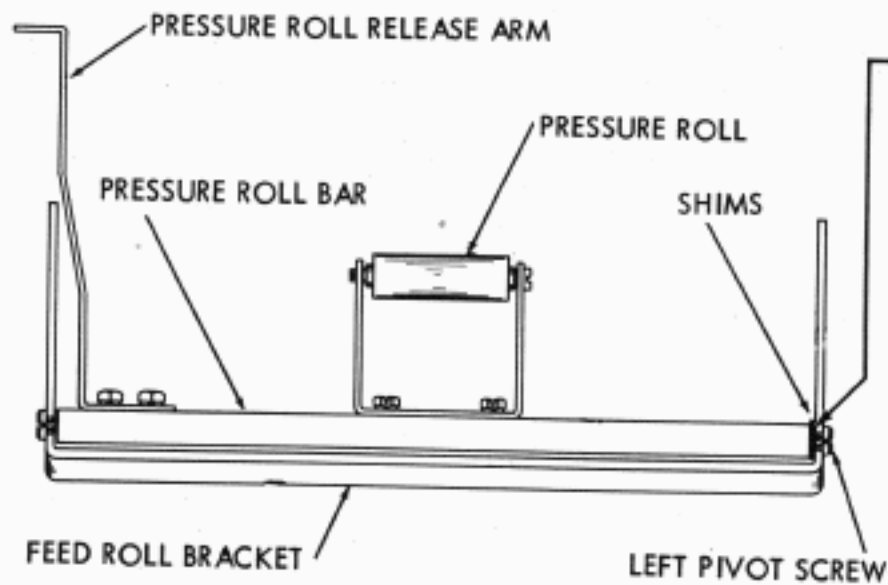


Figure 5-56 Typing Unit, Pressure Roll Assembly



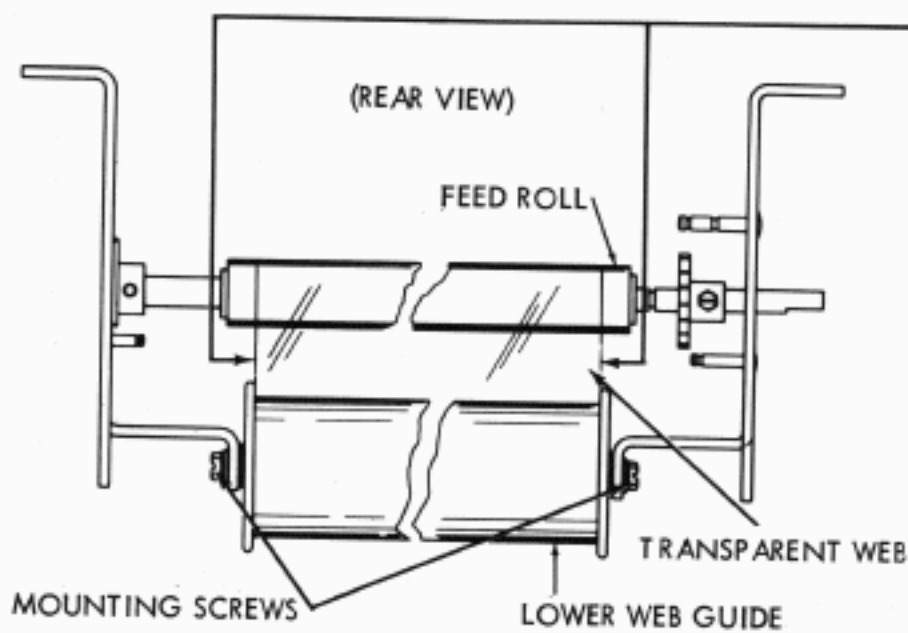


PRESSURE ROLL BAR

REQUIREMENT  
PRESSURE ROLL BAR SHOULD HAVE BARELY PERCEPTIBLE END PLAY.

TO ADJUST  
REMOVE LEFT PILOT SCREW FROM FEED ROLL BRACKET. ADD OR REMOVE SHIMS BETWEEN LEFT END OF PRESSURE ROLL BAR AND FEED ROLL BRACKET.

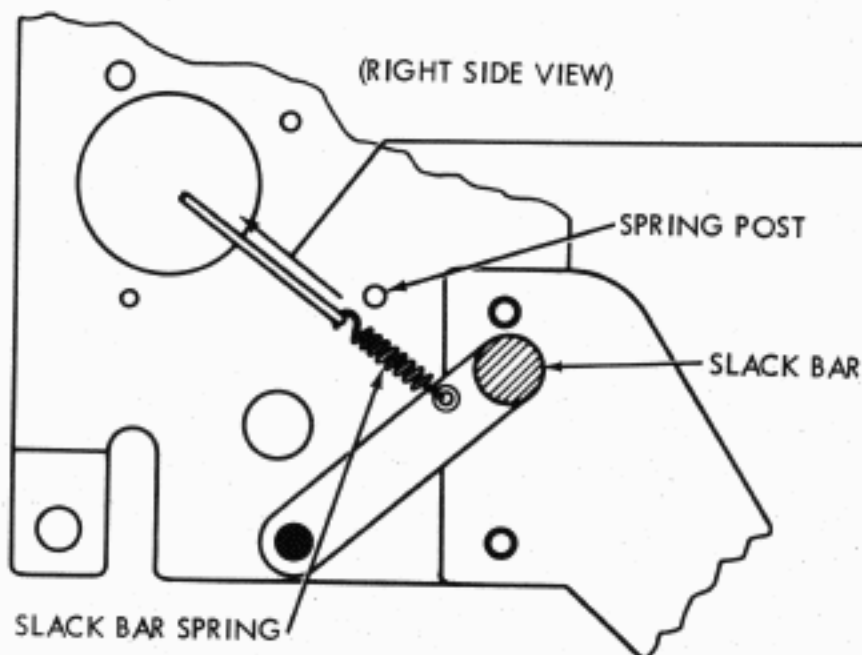
Figure 5-57 Typing Unit, Pressure Roll Bar Assembly



LOWER WEB GUIDE

REQUIREMENT  
WITH TYPING UNIT IN POSITION IN PROJECTOR FRAME THE LOWER WEB GUIDE SHOULD BE HORIZONTAL AND POSITIONED SO THAT TRANSPARENT WEB PULLED BETWEEN FEED ROLL AND WEB GUIDE IS EQUALLY TAUT ALONG BOTH RIGHT AND LEFT EDGES. (SEE FIG. 5-70).

TO ADJUST  
WITH ITS MOUNTING SCREWS LOOSENED, POSITION THE WEB GUIDE TO MEET REQUIREMENT. TIGHTEN MOUNTING SCREWS AND RECHECK WEB.

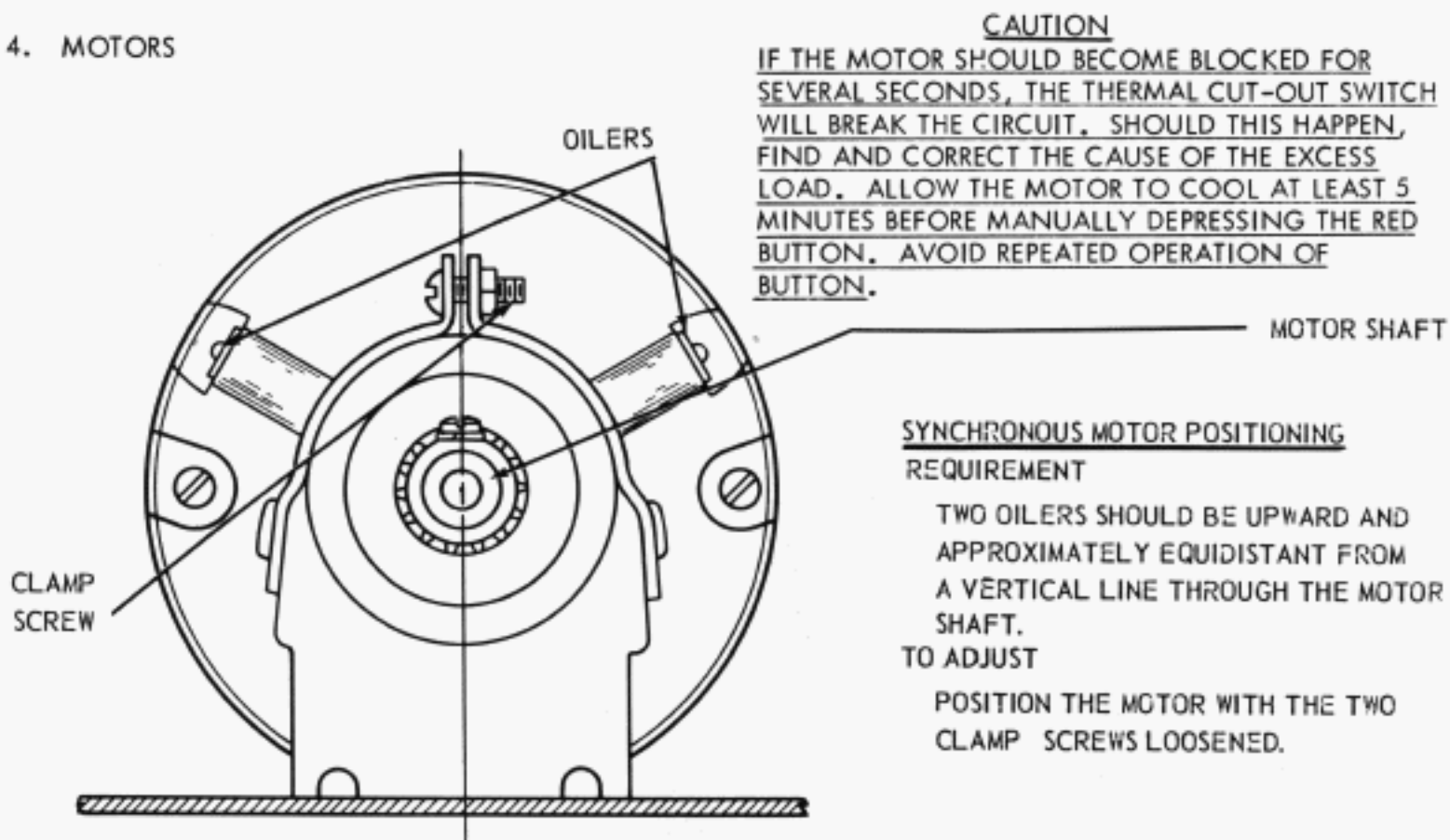


SLACK BAR SPRING

REQUIREMENT  
WITH SLACK BAR HELD UPWARD AGAINST ITS STOP UNHOOK LEFT SLACK BAR SPRING FROM ITS POST. HOOK SCALE IN END OF SPRING.  
MIN. 3/4 OZ.  
MAX. 1-3/4 OZS.  
TO PULL SPRING TO POSITION LENGTH. REHOOK SPRING AND REPEAT PROCEDURE ON RIGHT SLACK BAR SPRING.

Figure 5-58 Typing Unit, Lower Web Guide

## 4. MOTORS

**CAUTION**

IF THE MOTOR SHOULD BECOME BLOCKED FOR SEVERAL SECONDS, THE THERMAL CUT-OUT SWITCH WILL BREAK THE CIRCUIT. SHOULD THIS HAPPEN, FIND AND CORRECT THE CAUSE OF THE EXCESS LOAD. ALLOW THE MOTOR TO COOL AT LEAST 5 MINUTES BEFORE MANUALLY DEPRESSING THE RED BUTTON. AVOID REPEATED OPERATION OF BUTTON.

**SYNCHRONOUS MOTOR POSITIONING REQUIREMENT**

TWO OILERS SHOULD BE UPWARD AND APPROXIMATELY EQUIDISTANT FROM A VERTICAL LINE THROUGH THE MOTOR SHAFT.

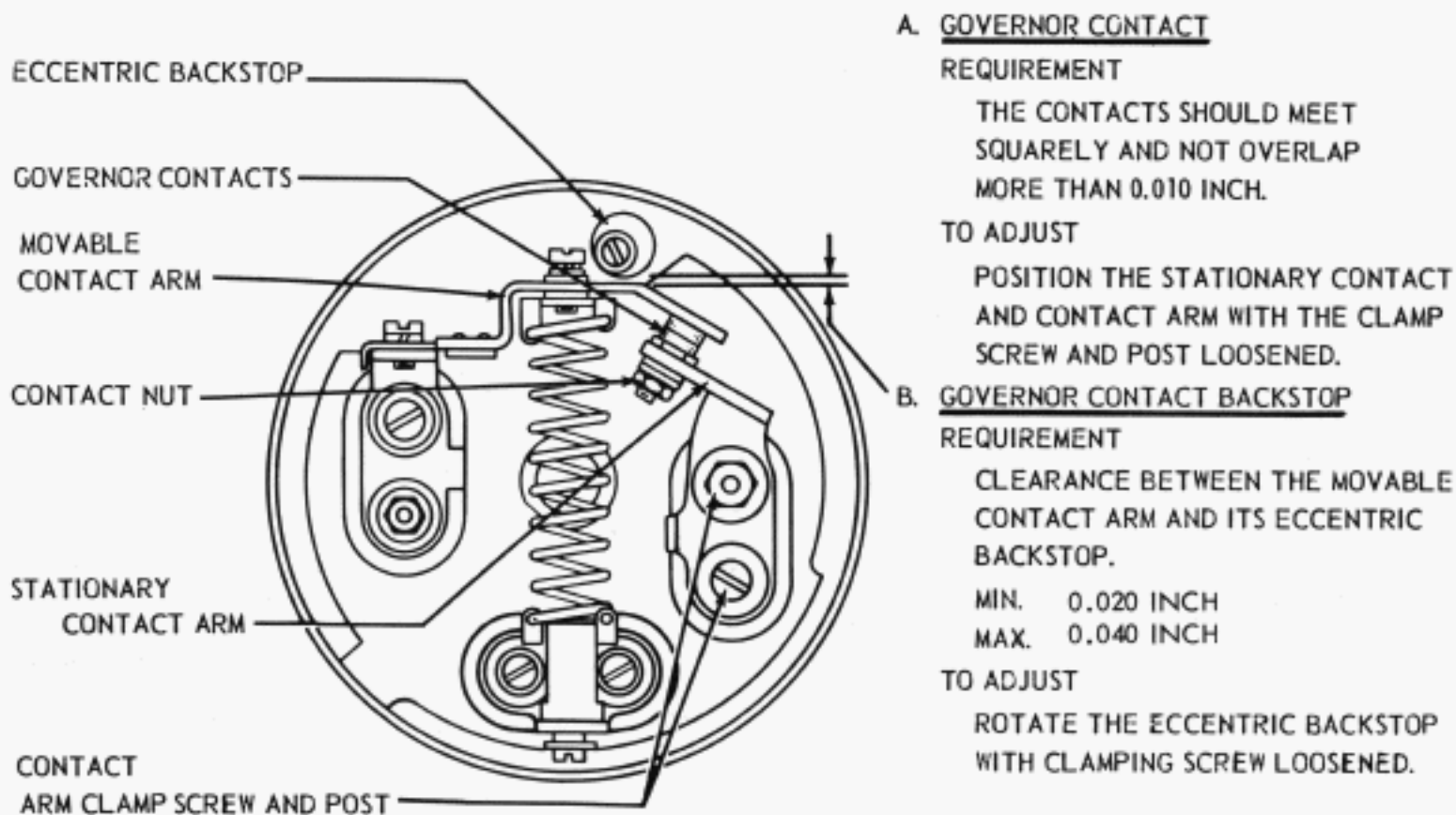
**TO ADJUST**

POSITION THE MOTOR WITH THE TWO CLAMP SCREWS LOOSENED.

Figure 5-59. Synchronous Motor

**GOVERNED MOTOR POSITIONING****REQUIREMENT**

MOTOR SHOULD BE CENTRALLY POSITIONED IN ITS RUBBERMOUNTS SO AS TO PROVIDE AT LEAST 0.020 CLEARANCE BETWEEN THE MOTOR HOUSING AND THE CRADLE AT THE GOVERNOR END. THE CABLE SHOULD ALSO CLEAR THE GROMMET IN THE SCREEN BY AT LEAST 0.030 INCH.

**A. GOVERNOR CONTACT****REQUIREMENT**

THE CONTACTS SHOULD MEET SQUARELY AND NOT OVERLAP MORE THAN 0.010 INCH.

**TO ADJUST**

POSITION THE STATIONARY CONTACT AND CONTACT ARM WITH THE CLAMP SCREW AND POST LOOSENED.

**B. GOVERNOR CONTACT BACKSTOP****REQUIREMENT**

CLEARANCE BETWEEN THE MOVABLE CONTACT ARM AND ITS ECCENTRIC BACKSTOP.

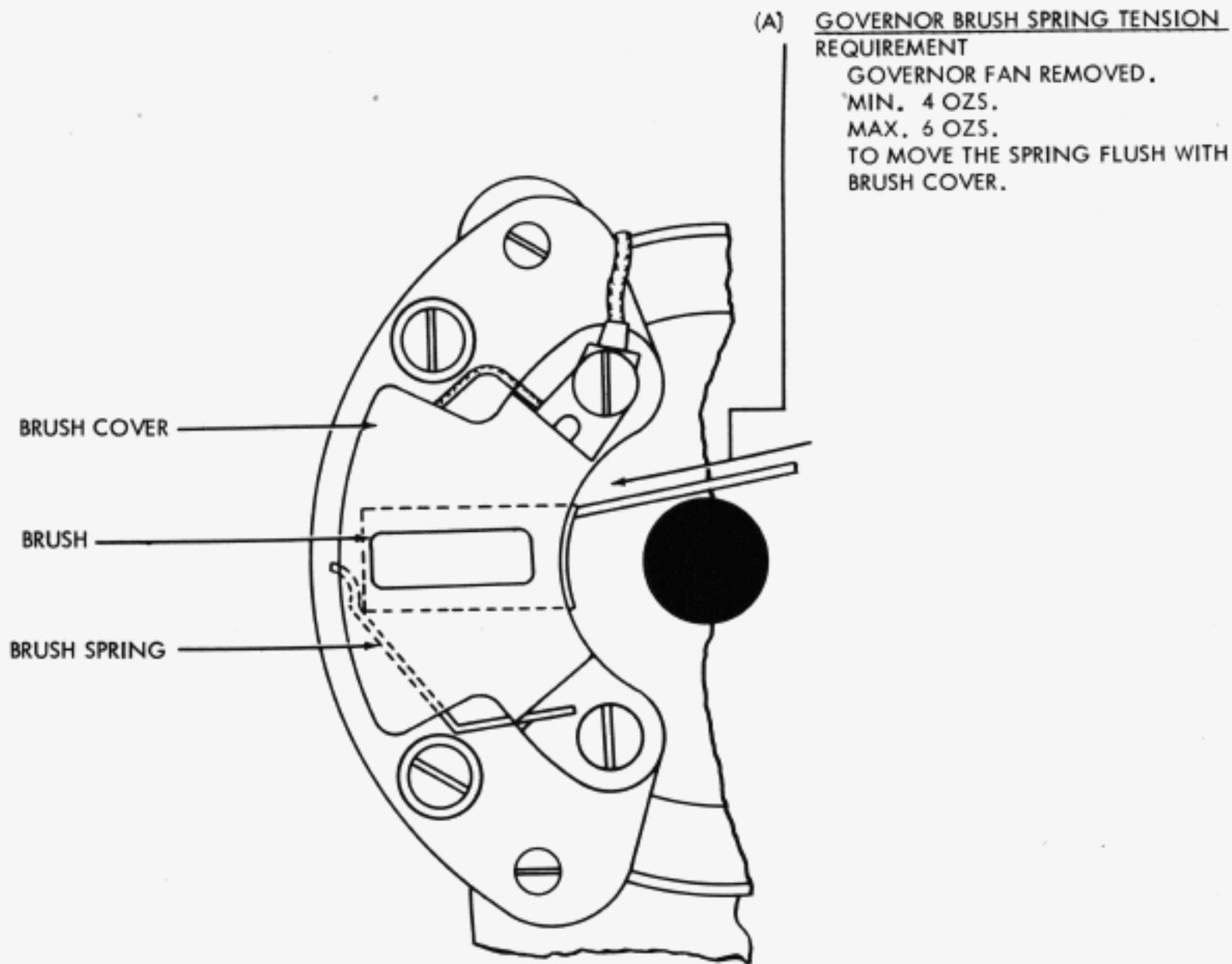
MIN. 0.020 INCH

MAX. 0.040 INCH

**TO ADJUST**

ROTATE THE ECCENTRIC BACKSTOP WITH CLAMPING SCREW LOOSENED.

Figure 5-59A. Governed Motor



(B) GOVERNED MOTOR SPEED ADJUSTMENT REQUIREMENT

WITH THE 4 SPOT TARGET ILLUMINATED AND VIEWED THROUGH THE VIBRATING SHUTTERS OF A 120VPS TUNING FORK, THE SPOTS SHOULD APPEAR STATIONARY WHILE THE MOTOR IS RUNNING.

TO ADJUST

STOP THE MOTOR AND TURN THE ADJUSTING SCREW AS INDICATED ON THE GOVERNOR COVER.

NOTE

IT IS POSSIBLE TO ADJUST THE MOTOR TO SOME MULTIPLE OF THE CORRECT SPEED. TO CHECK FOR CORRECT SPEED, RETURN THE TYPE BOX CARRIAGE TO THE LEFT MARGIN, SET UP ANY CHARACTER ON THE SELECTOR AND MANUALLY TRIP THE TYPE BOX CLUTCH TRIP LEVER. IF THE UNIT IS EQUIPPED WITH GEARS FOR 60 WPM OPERATION, IT SHOULD PRINT 35 CHARACTERS IN 5 SECONDS; WITH 75 WPM OPERATION - 44 CHARACTERS IN 5 SECONDS; WITH 100 WPM OPERATION - 57 CHARACTERS IN 5 SECONDS OR A FULL LINE OF 46 CHARACTERS IN ABOUT 4-1/4 SECONDS.

Figure 5-59B. Governed Motor Speed and Brush Spring Tension

## 4. MOTORS

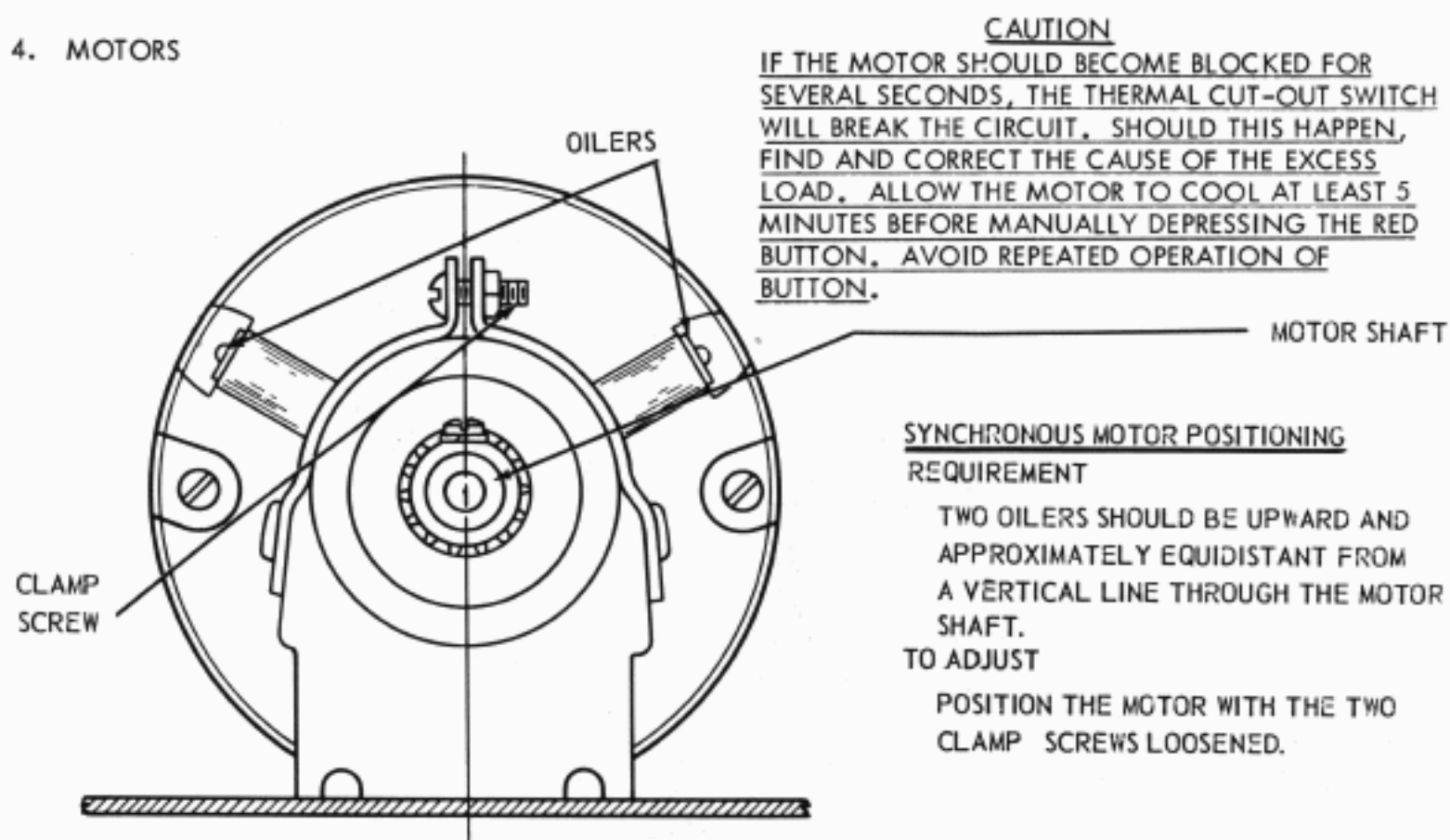


Figure 5-59. Synchronous Motor

GOVERNED MOTOR POSITIONING

## REQUIREMENT

MOTOR SHOULD BE CENTRALLY POSITIONED IN ITS RUBBERMOUNTS SO AS TO PROVIDE AT LEAST 0.020 CLEARANCE BETWEEN THE MOTOR HOUSING AND THE CRADLE AT THE GOVERNOR END. THE CABLE SHOULD ALSO CLEAR THE GROMMET IN THE SCREEN BY AT LEAST 0.030 INCH.

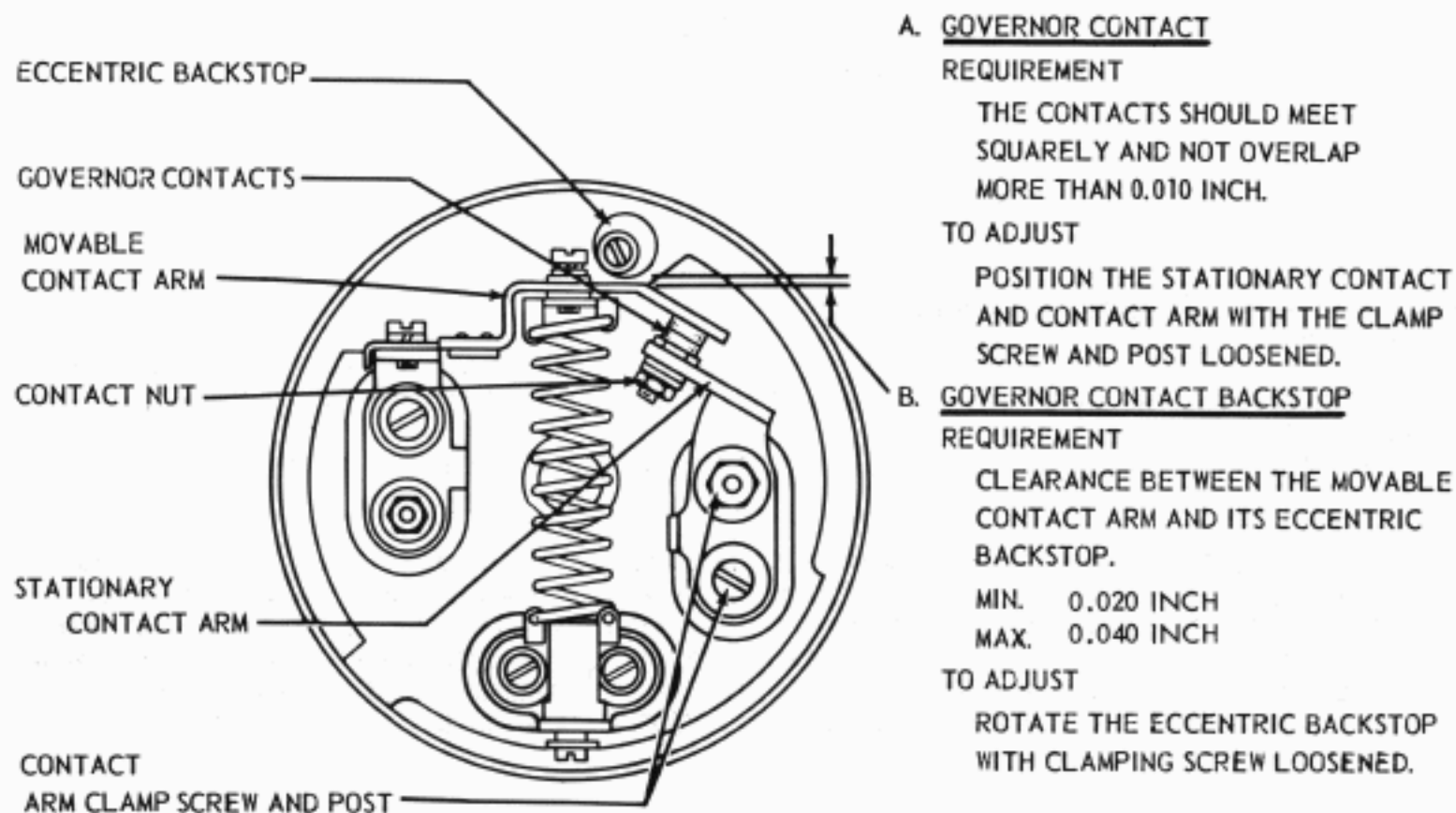
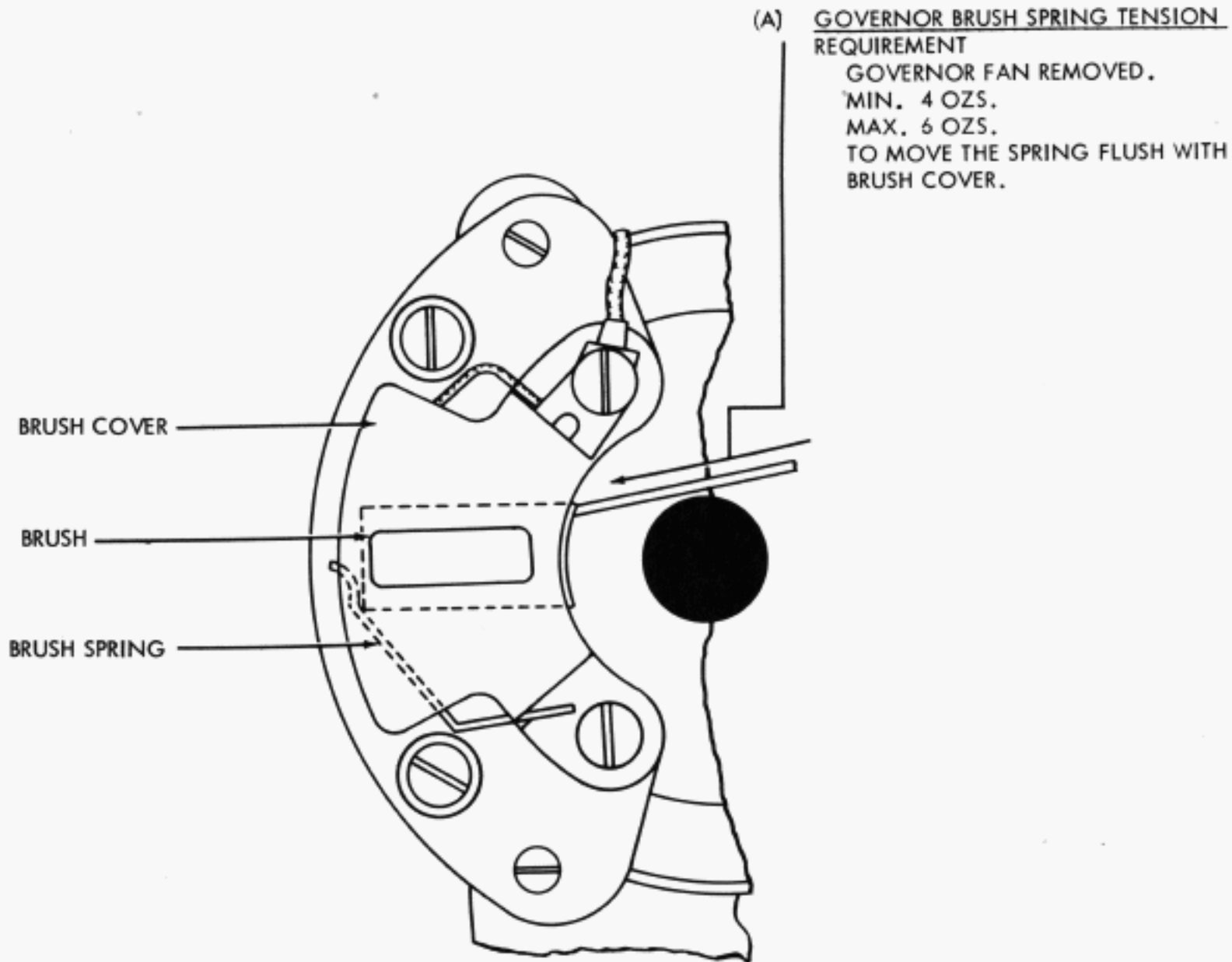


Figure 5-59A. Governed Motor



(B) GOVERNED MOTOR SPEED ADJUSTMENT REQUIREMENT

WITH THE 4 SPOT TARGET ILLUMINATED AND VIEWED THROUGH THE VIBRATING SHUTTERS OF A 120VPS TUNING FORK, THE SPOTS SHOULD APPEAR STATIONARY WHILE THE MOTOR IS RUNNING.

TO ADJUST

STOP THE MOTOR AND TURN THE ADJUSTING SCREW AS INDICATED ON THE GOVERNOR COVER.

NOTE

IT IS POSSIBLE TO ADJUST THE MOTOR TO SOME MULTIPLE OF THE CORRECT SPEED. TO CHECK FOR CORRECT SPEED, RETURN THE TYPE BOX CARRIAGE TO THE LEFT MARGIN, SET UP ANY CHARACTER ON THE SELECTOR AND MANUALLY TRIP THE TYPE BOX CLUTCH TRIP LEVER. IF THE UNIT IS EQUIPPED WITH GEARS FOR 60 WPM OPERATION, IT SHOULD PRINT 35 CHARACTERS IN 5 SECONDS; WITH 75 WPM OPERATION - 44 CHARACTERS IN 5 SECONDS; WITH 100 WPM OPERATION - 57 CHARACTERS IN 5 SECONDS OR A FULL LINE OF 46 CHARACTERS IN ABOUT 4-1/4 SECONDS.

Figure 5-59B. Governed Motor Speed and Brush Spring Tension





5. RECEIVING ONLY BASE

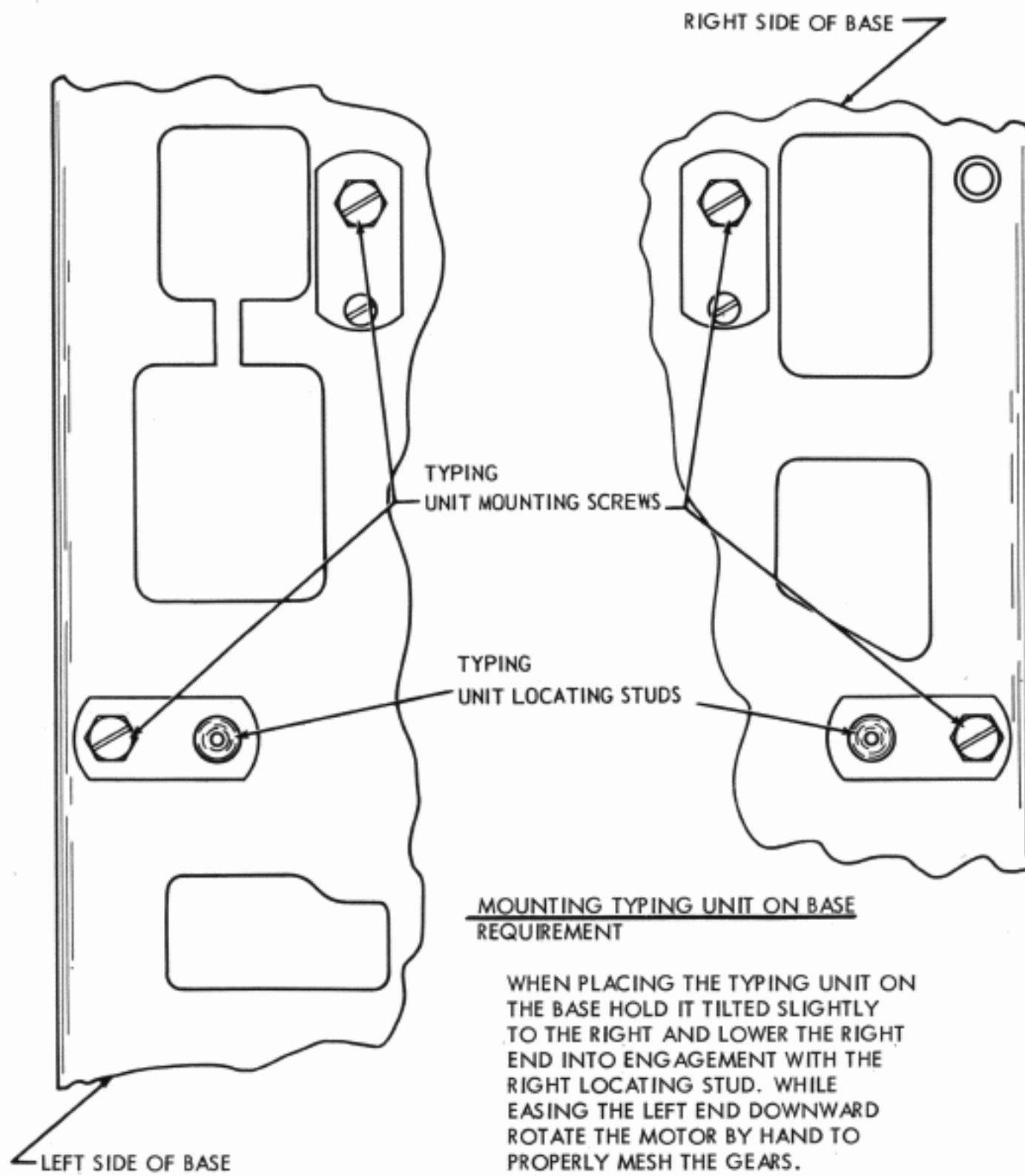


Figure 5-60 Base - Mounting Typing Unit

## (2) REQUIREMENT

THERE SHOULD BE A BARELY PERCEPTIBLE AMOUNT OF BACKLASH BETWEEN THE INTERMEDIATE DRIVING GEAR AND THE INTERMEDIATE DRIVEN GEAR AT THE POINT WHERE THE BACKLASH IS THE LEAST.

## TO ADJUST

RAISE OR LOWER THE FRONT END OF THE INTERMEDIATE GEAR BRACKET BY MEANS OF THE FILISTER HEAD ADJUSTING AND CLAMPING SCREWS LOCATED AT THE FRONT END OF THE BRACKET. REFINE REQUIREMENT (1) IF NECESSARY.

INTERMEDIATE GEAR BRACKET

## (1) REQUIREMENT

THERE SHOULD BE A BARELY PERCEPTIBLE AMOUNT OF BACKLASH BETWEEN THE TYPING UNIT DRIVEN GEAR AND THE TYPING UNIT DRIVING GEAR AT THE POINT WHERE BACKLASH IS THE LEAST.

## TO ADJUST

POSITION THE COMPLETE INTERMEDIATE GEAR MECHANISM BRACKET BY UTILIZING THE ADJUSTING SLOTS WITH THE THREE HEXAGON HEAD SCREWS LOOSENED. ALIGN THE GEARS AT THIS TIME.

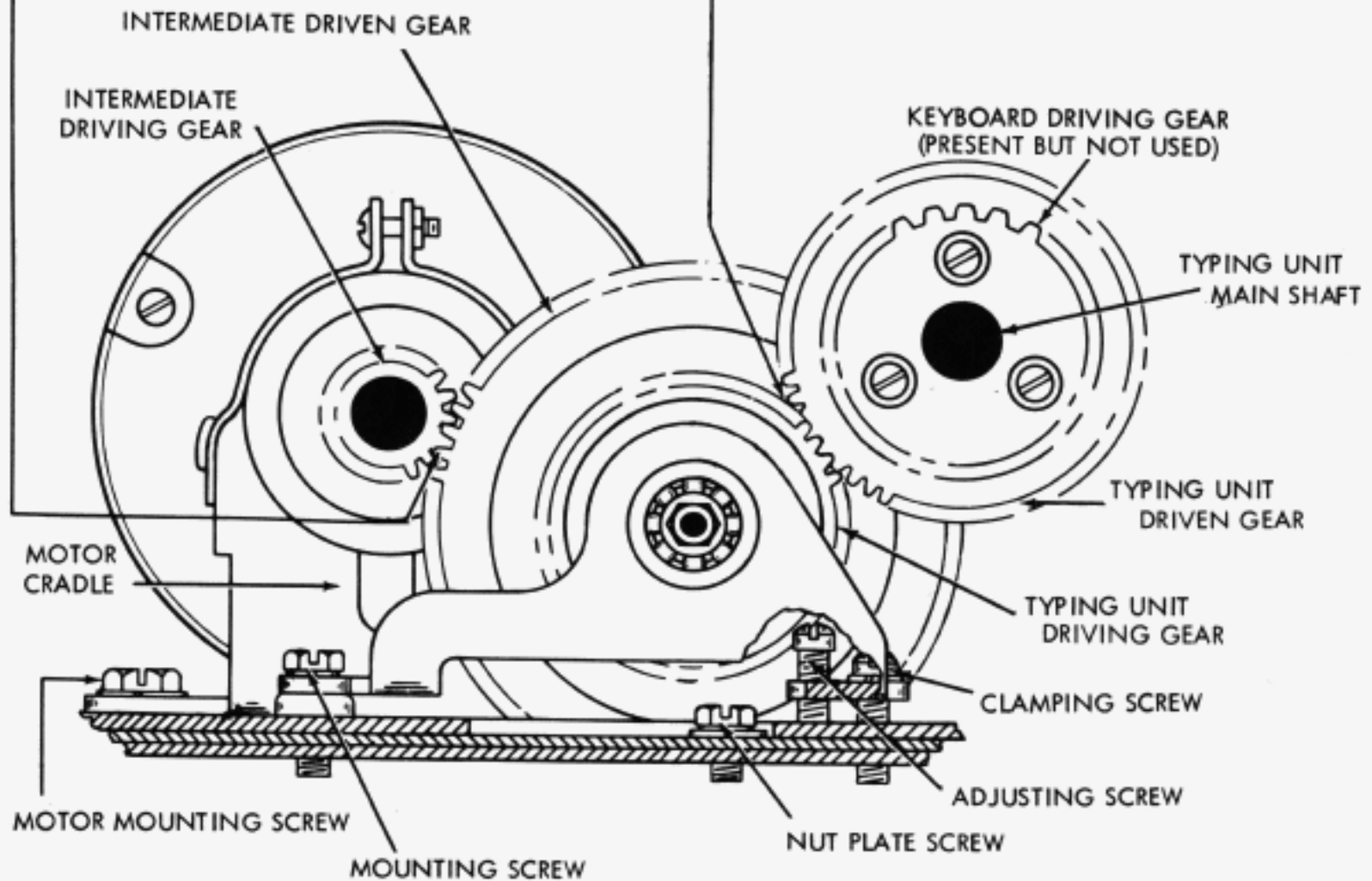
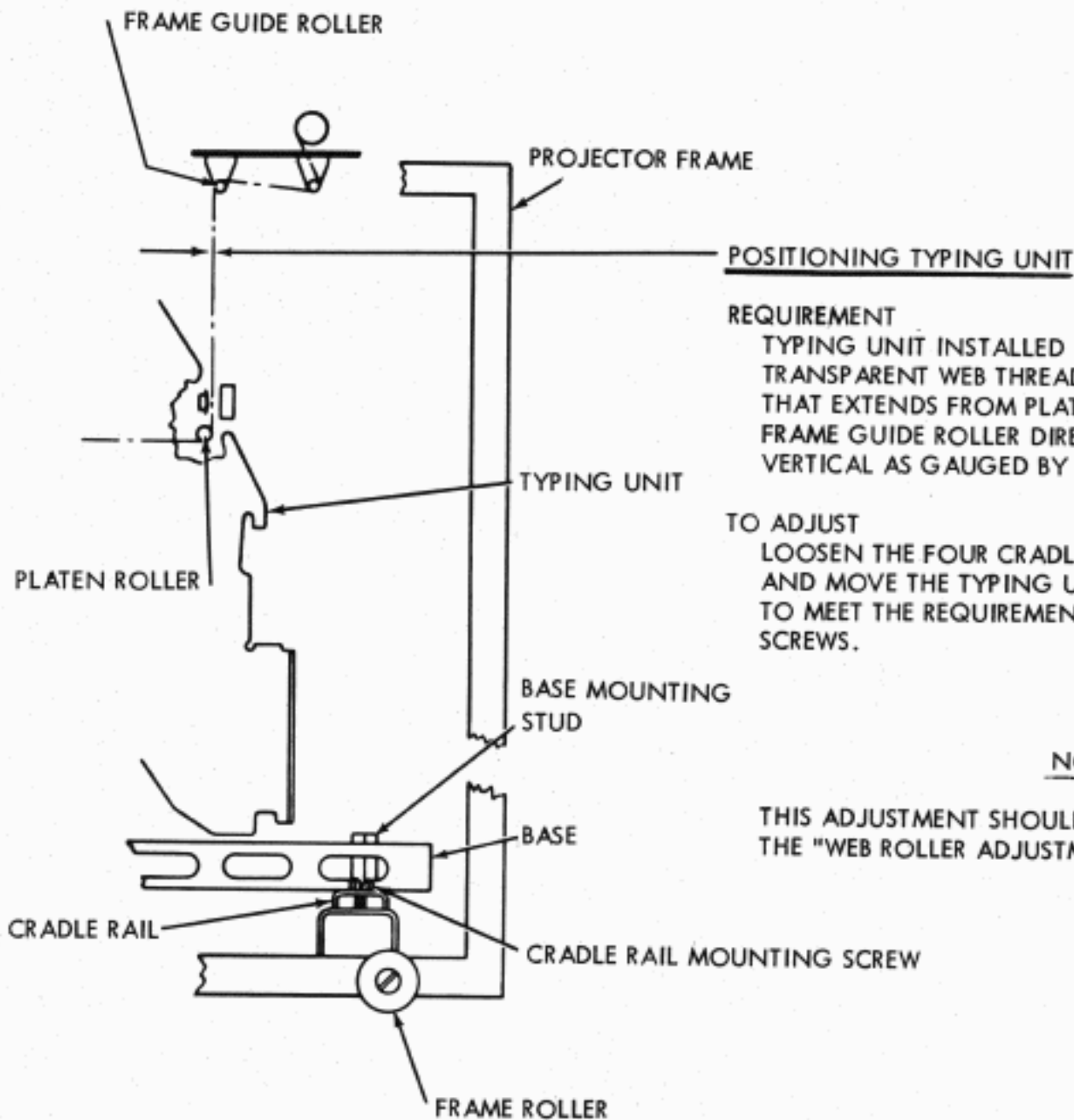


Figure 5-61 Base, Motor and Typing Unit Gearing

6. PROJECTOR FRAME



**REQUIREMENT**

TYPING UNIT INSTALLED IN PROJECTOR FRAME AND TRANSPARENT WEB THREADED. THAT PART OF WEB THAT EXTENDS FROM PLATEN ROLLER TO PROJECTOR FRAME GUIDE ROLLER DIRECTLY ABOVE SHOULD BE VERTICAL AS GAUGED BY EYE.

**TO ADJUST**

LOOSEN THE FOUR CRADLE RAIL MOUNTING SCREWS AND MOVE THE TYPING UNIT AND BASE ASSEMBLY TO MEET THE REQUIREMENT. TIGHTEN THE FOUR SCREWS.

**NOTE**

THIS ADJUSTMENT SHOULD BE PERFORMED BEFORE THE "WEB ROLLER ADJUSTMENT" (FIG. 5-55).

Figure 5-62 Projector Frame, Positioning Typing Unit

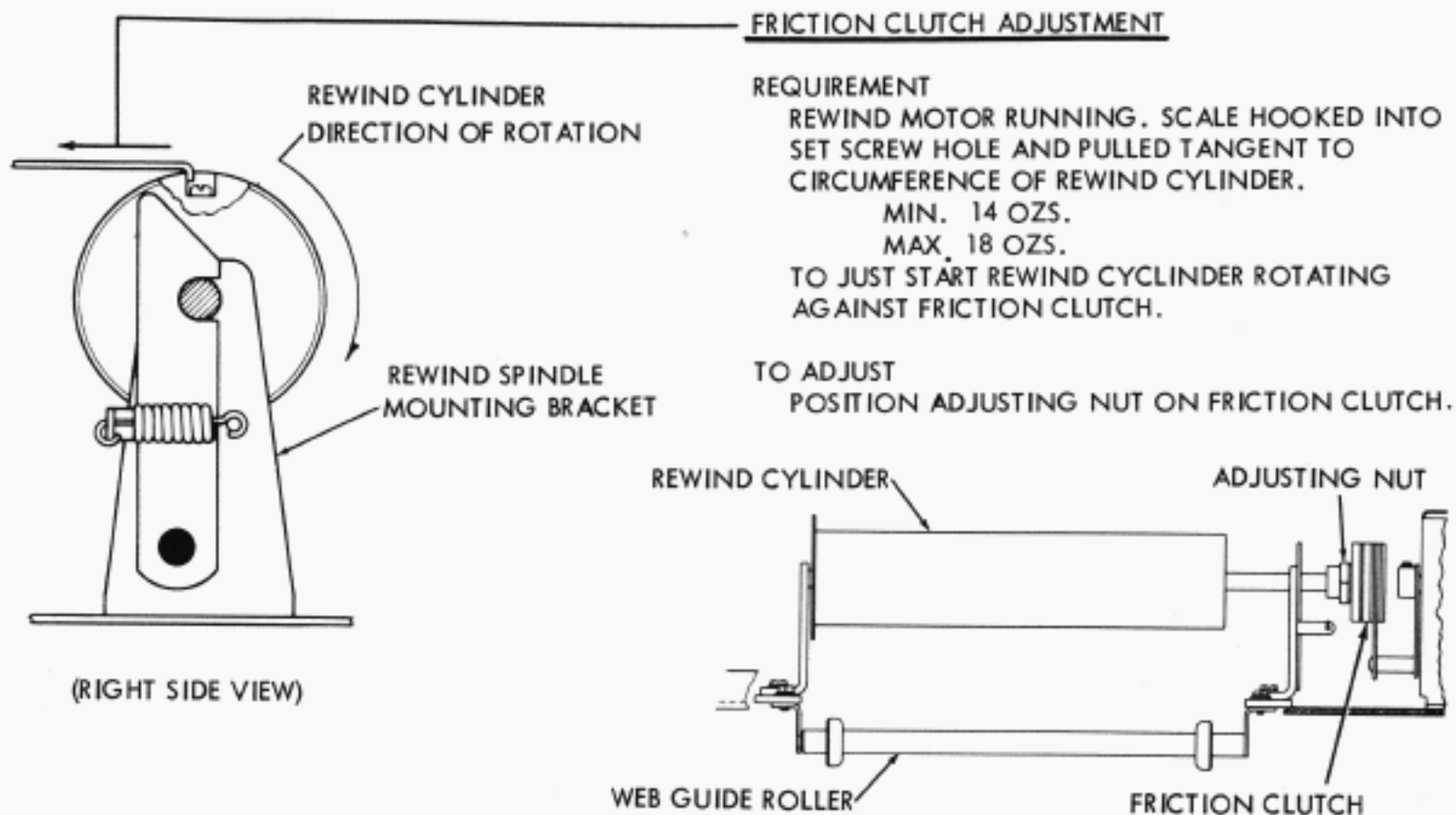


Figure 5-63 Projector Frame, Rewind Friction Clutch Mechanism

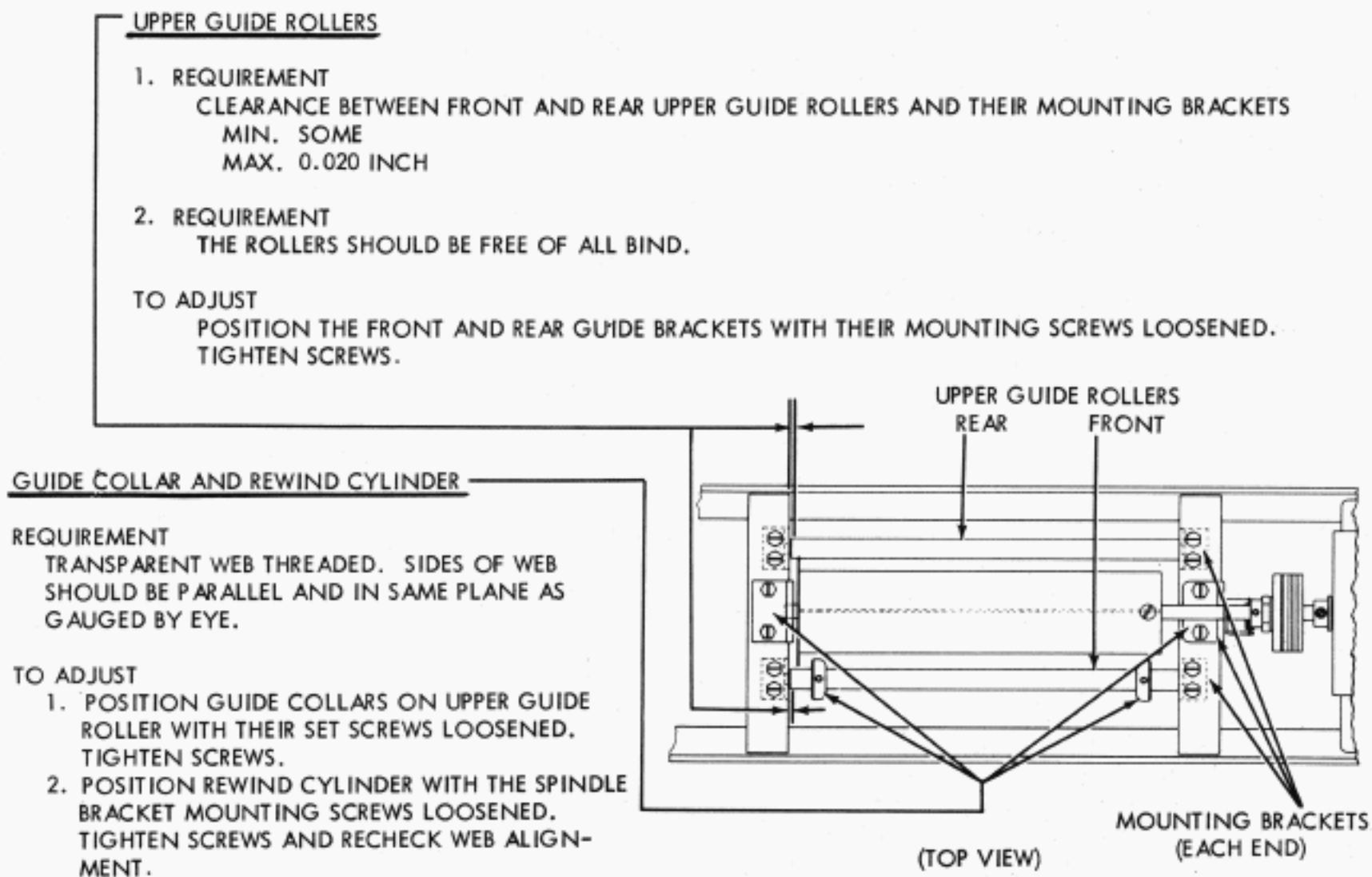


Figure 5-64 Projector Frame, Upper Guide Roller Assembly



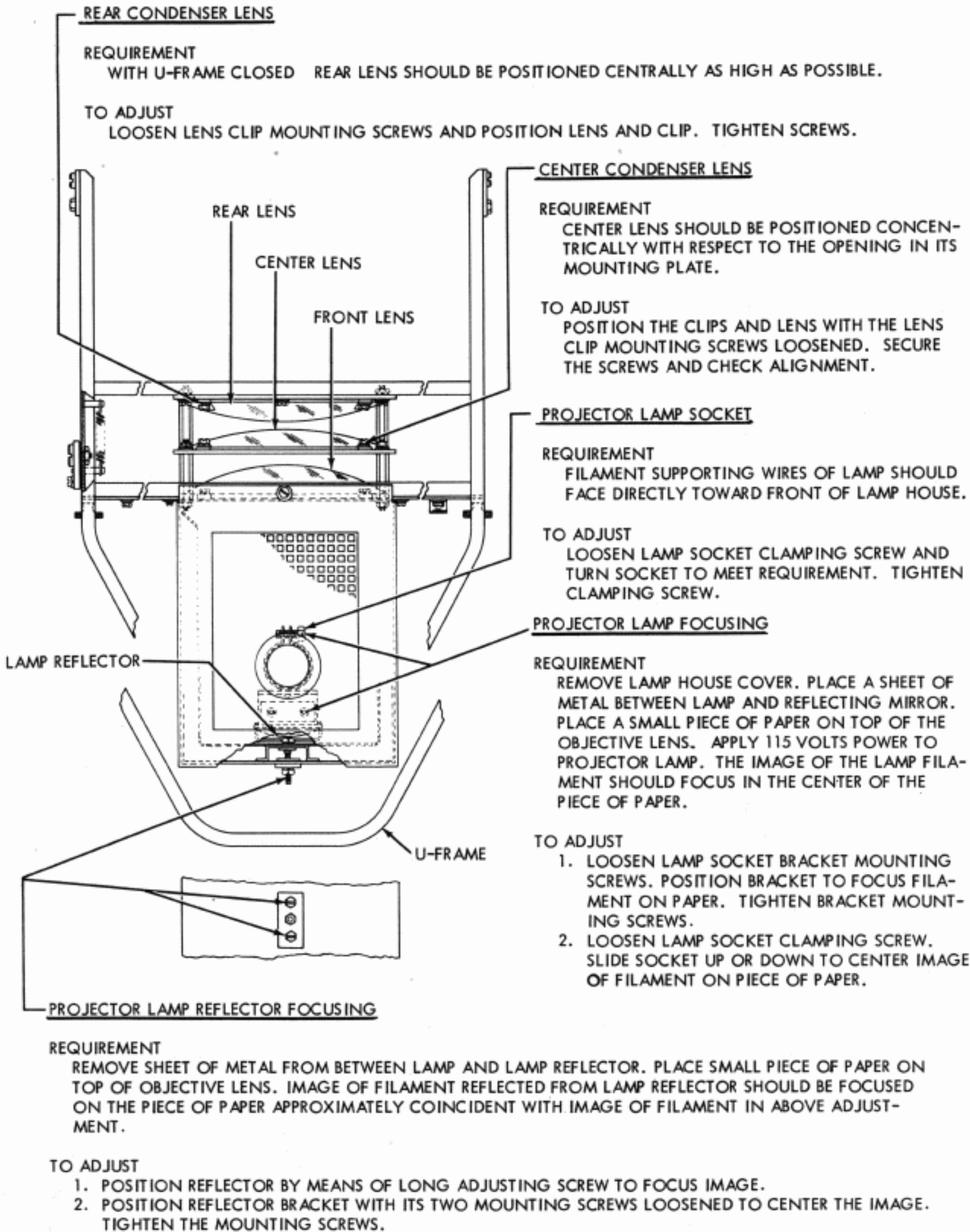
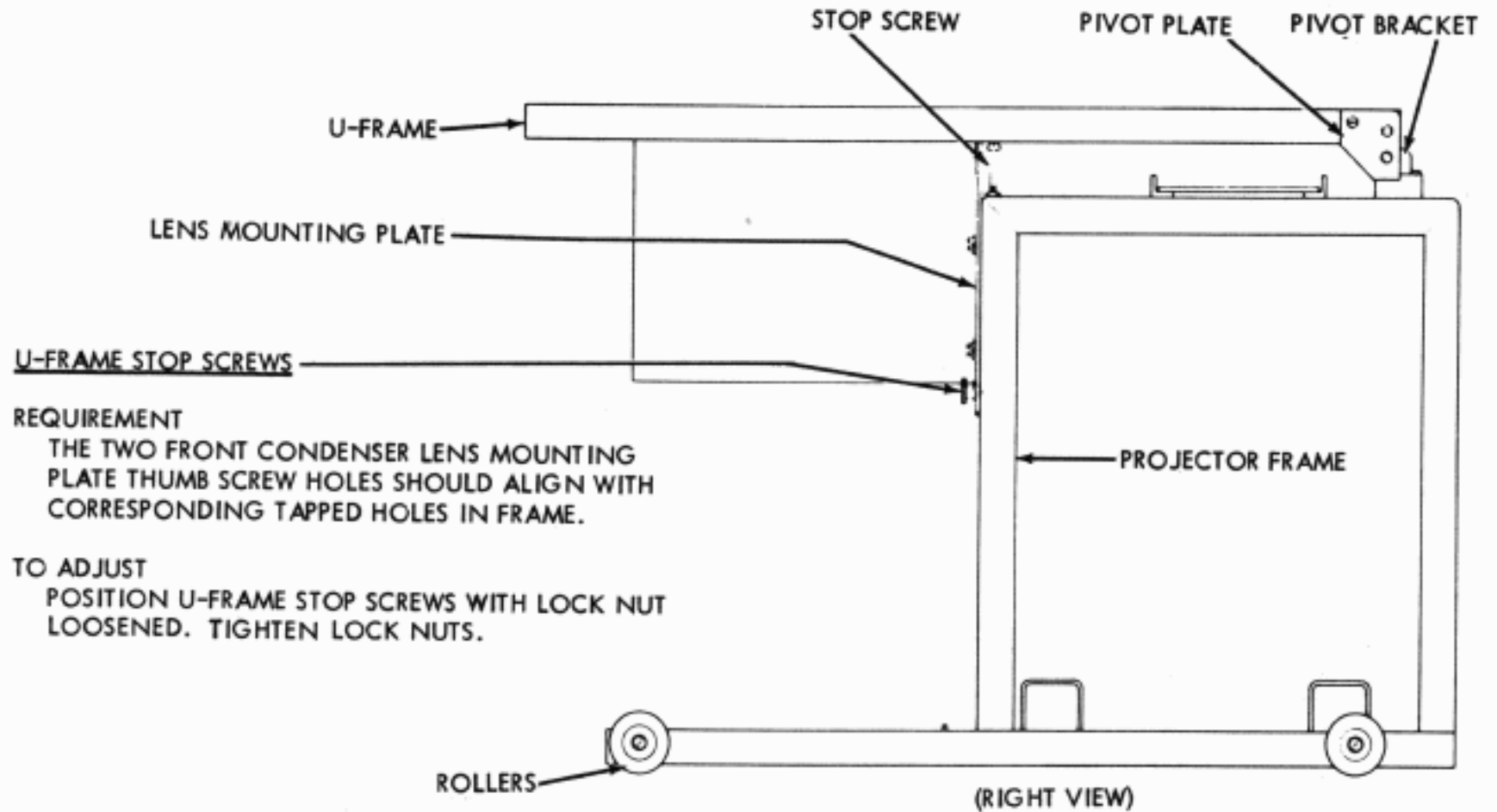


Figure 5-65 Projector Frame, Condenser Lens and Lamp House Assembly



**NOTE**  
THE U-FRAME ASSEMBLY SHOULD BE POSITIONED TO ALLOW CLEARANCE BETWEEN LENS MOUNTING PLATE AND STOP SCREWS WHEN CLOSING U-FRAME BY MEANS OF ENLARGED MOUNTING HOLES IN RIGHT AND LEFT PIVOT PLATES AND PIVOT BRACKETS AT HINGING POINT OF U-FRAME.

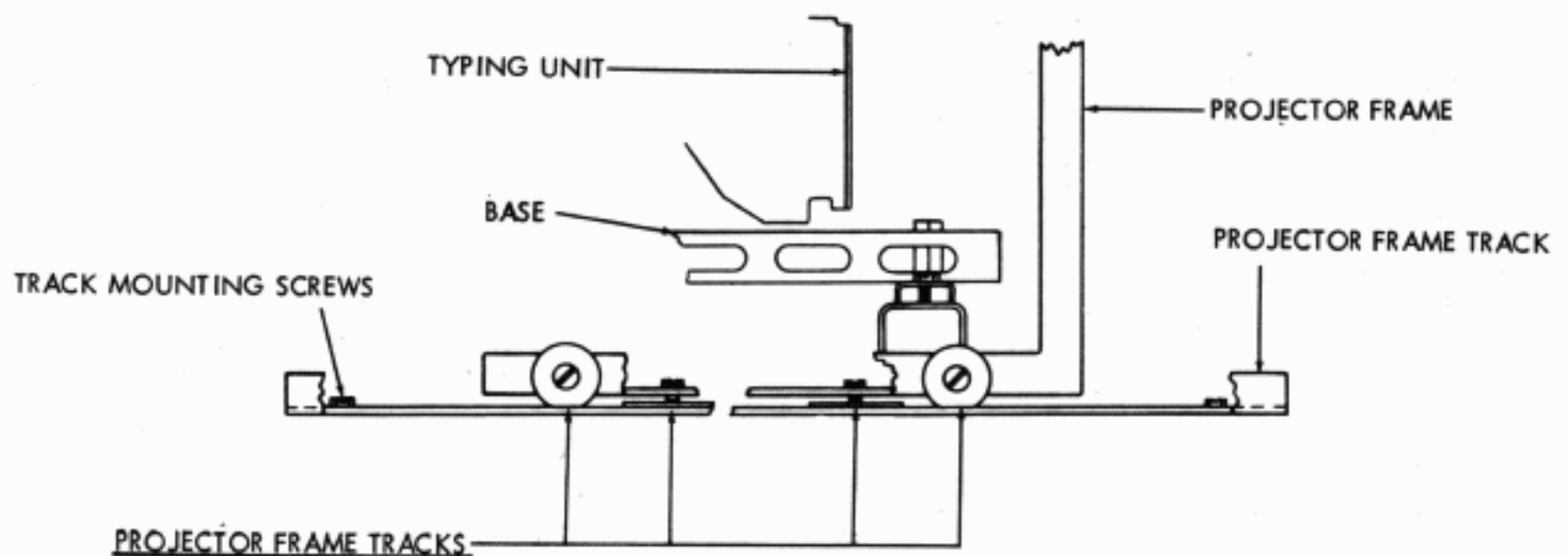


Figure 5-66' Projector Frame Adjustment and Mounting

A. OBJECTIVE LENS MOUNT

**REQUIREMENT**

THE LENS MOUNT SHOULD BE POSITIONED SO THAT THE OBJECTIVE LENS WILL COVER EVENLY THE AREA OF TRANSPARENT WEB TO BE PROJECTED.

**TO ADJUST**

LOOSEN THE TWO MOUNTING SCREWS AND POSITION LENS MOUNT TO MEET REQUIREMENT WHILE OBSERVING PROJECTED MESSAGE ON SCREEN. TIGHTEN THE THUMB SCREWS.

C. OBJECTIVE LENS FOCUSING

**REQUIREMENT**

THE LINE OF COPY PROJECTED ON THE LOWER EDGE OF THE SCREEN SHOULD BE IN SHARP FOCUS.

**TO ADJUST**

LOOSEN KNURLED THUMB SCREW AND ROTATE LENS IN ITS HELICAL MOUNT. TIGHTEN THUMB SCREW.

**NOTE**

RE-FOCUS THE OBJECTIVE LENS EACH TIME THE POSITION OF THE SMALL MIRROR IS CHANGED.

B. SMALL MIRROR PIVOT SCREWS

**REQUIREMENT**

WITH PROJECTOR LAMP TURNED ON, PRINT ONE FULL LINE OF COPY. THE LINE OF COPY SHOULD APPEAR FAIRLY CLOSE TO LOWER EDGE OF SCREEN.

**TO ADJUST**

LOOSEN SMALL MIRROR PIVOT THUMB SCREWS TO FRICTION TIGHT.

1. SLIDE MIRROR TO CENTER OF ITS ADJUSTABLE LIMITS.
  2. ROTATE MIRROR ABOUT ITS PIVOTS TO POSITION THE LINE OF COPY.
- TIGHTEN PIVOT THUMB SCREWS.

**NOTE**

1. IF THIS ADJUSTMENT DOES NOT MEET REQUIREMENT OR IF IT IS DESIRED TO REDUCE THE APPEARANCE OF THE OSCILLATING PLATEN AND TYPE BOX ON THE SCREEN, REMAKE ADJUSTMENT 1. MOVING SMALL MIRROR TO FRONT OR REAR OF CENTER POSITION, AS NECESSARY, AND RESET ADJUSTMENT 2.
2. ADJUSTMENTS A AND B SHOULD BE PERFORMED AT SAME TIME TO OBTAIN PROPER ALIGNMENT AND EVEN COVERAGE OF THE TEXT.

D. LEFT-HAND MARGIN ON SCREEN

**REQUIREMENT**

A CHARACTER PRINTED AT LOWER LEFT OF SCREEN SHOULD HAVE SAME LEFT-HAND MARGIN WHEN ADVANCED TO THE TOP OF SCREEN AS IT HAD AT BOTTOM OF SCREEN.

**TO ADJUST**

LOOSEN TWO THUMB SCREWS IN MIRROR BRACKETS MOUNTING STRIP TO FRICTION TIGHT. SWING MOUNTING STRIP, FORWARD OR BACKWARD AS REQUIRED, AT THE RIGHT SIDE PIVOTING ON LEFT THUMB SCREW UNTIL LEFT MARGIN IS EQUAL AT TOP AND BOTTOM OF SCREEN. TIGHTEN THUMB SCREWS. RECHECK ADJUSTMENTS A, B AND C AND REPEAT D IF NECESSARY.

E. SMALL MIRROR EXTENSION BRACKETS

**REQUIREMENT**

A LINE OF COPY PROJECTED ON LOWER EDGE OF SCREEN SHOULD BE PARALLEL TO LOWER HORIZONTAL PORTION OF SCREEN FRAME.

**TO ADJUST**

LOOSEN SMALL MIRROR PIVOT THUMB SCREWS TO FRICTION TIGHT. ROTATE ONE SIDE OF MIRROR IN ITS SLOT USING OPPOSITE THUMB SCREW AS A PIVOT UNTIL THE LINE OF COPY IS PARALLEL WITH BOTTOM EDGE OF SCREEN. TIGHTEN THUMB SCREWS.

**NOTE**

PERFORM THIS ADJUSTMENT ONLY IF PREVIOUS ADJUSTMENTS HAVE FAILED TO MEET THE REQUIREMENT.

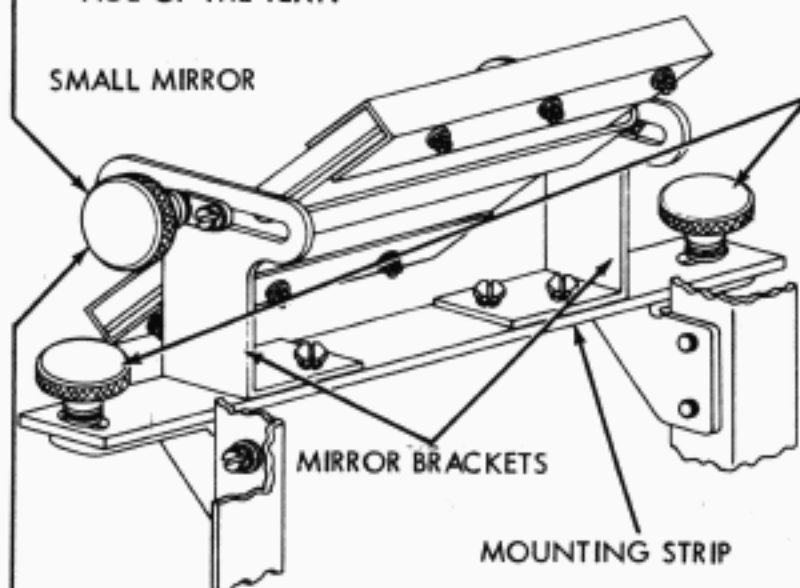
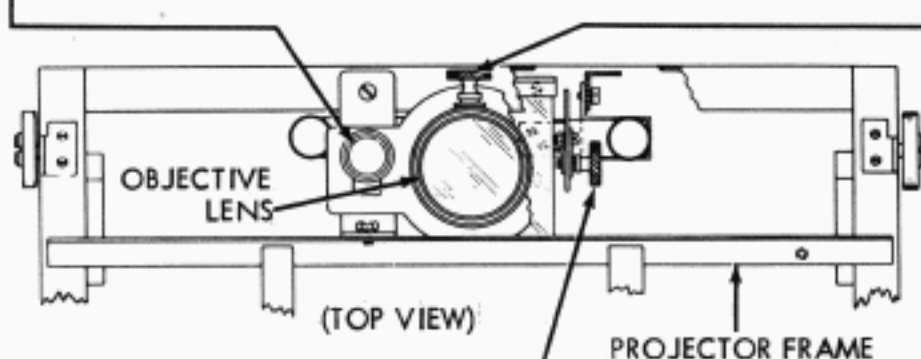
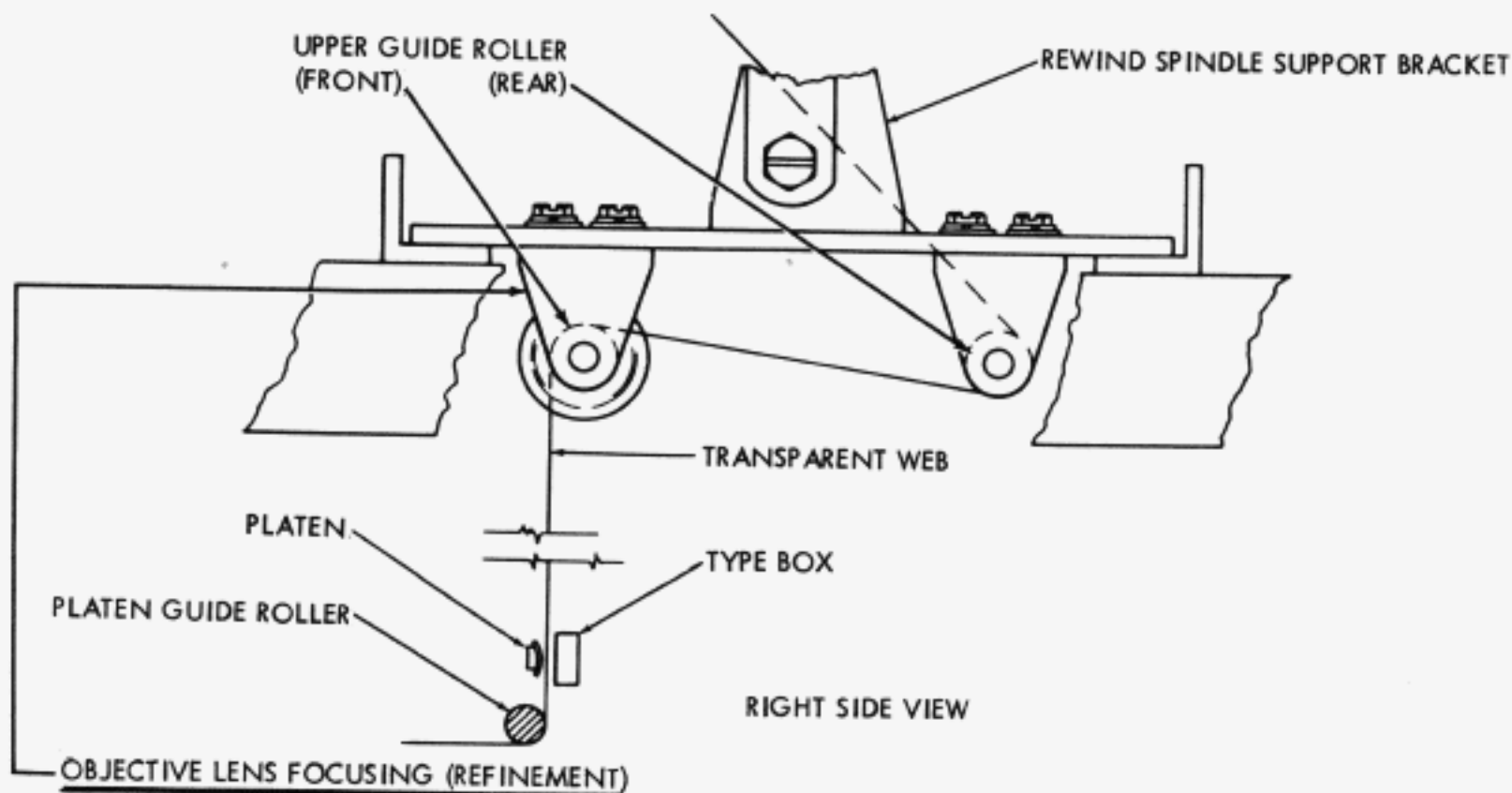


Figure 5-67 Projector Frame, Optical Assembly

**REQUIREMENT**

FEED A PRINTED LINE TO TOP OF SCREEN. PRINT ANOTHER FULL LINE AT BOTTOM OF SCREEN. BOTH TOP AND BOTTOM LINE SHOULD BE IN SHARP FOCUS.

**TO ADJUST**

OBTAIN BEST POSSIBLE FOCUS OF BOTTOM LINE BY POSITIONING OBJECTIVE LENS IN ITS MOUNT. IF UPPER LINE IS SLIGHTLY OUT OF FOCUS LOOSEN UPPER FRONT WEB ROLLER SUPPORT BRACKETS AND SLIDE ROLLER BACKWARD OR FORWARD AS NECESSARY TO FOCUS TOP LINE. KEEP UPPER ROLLER PARALLEL TO PLATEN GUIDE ROLLER. TIGHTEN SUPPORT BRACKET SCREWS.

**PROJECTOR LAMP FOCUSING (REFINEMENT)****REQUIREMENT**

AFTER ALL OPTICAL ADJUSTMENTS HAVE BEEN COMPLETED, THERE SHOULD BE EVEN ILLUMINATION OF THE SCREEN.

**TO ADJUST**

SLIGHT SHADING IN ONE OR MORE CORNERS CAN BE REMOVED BY MOVING PROJECTOR LAMP TOWARD CONDENSER LENSES. USE CARE TO KEEP IMAGE OF FILAMENT CENTRALLY LOCATED ON OBJECTIVE LENS. SEE "PROJECTOR LAMP FOCUSING", FIG. 5-65.

**NOTE**

THE ABOVE ADJUSTMENT WILL THROW THE IMAGE OF THE FILAMENT ON THE OBJECTIVE LENS SLIGHTLY OUT OF FOCUS. THIS IS NOT OBJECTIONABLE IF SCREEN ILLUMINATION IS UNIFORM.

**LEFT HAND MARGIN WIDTH (REFINEMENT)****1. REQUIREMENT**

AFTER ALL OPTICAL ADJUSTMENTS ARE COMPLETED, LEFT HAND MARGIN ON SCREEN SHOULD BE  
MIN. 3/8 INCH  
MAX. 1 1/4 INCH

**2. REQUIREMENT**

IT SHOULD BE POSSIBLE TO PROJECT  
MIN. 45  
PROPERLY SPACED CHARACTERS PER LINE.

**TO ADJUST**

REFINE TYPING UNIT "LEFT MARGIN". SEE FIGURE 5-34.

Figure 5-68 Projector Frame, Optical Assembly

7. PROJECTOR CABINET

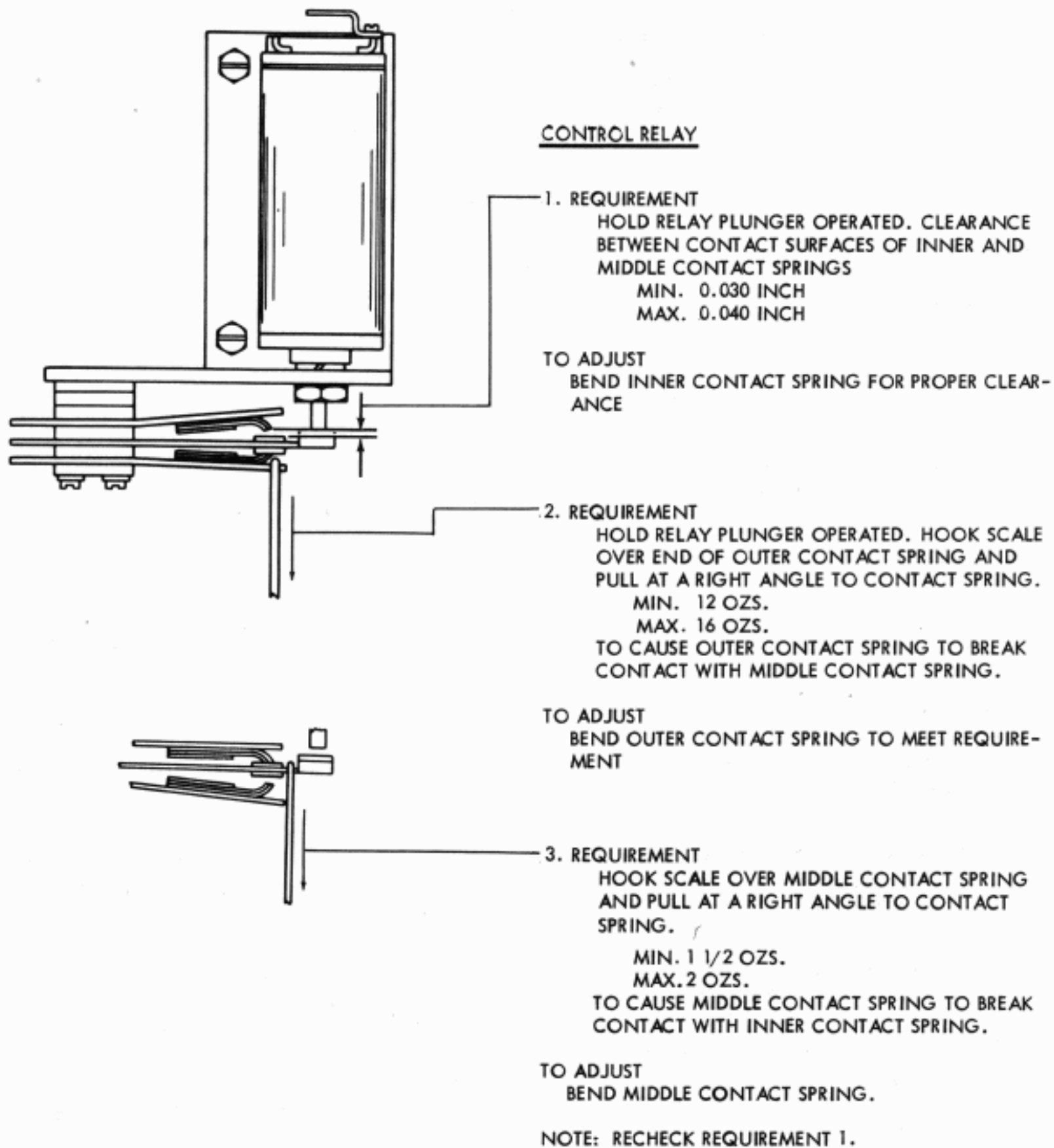


Figure 5-69 Projector Cabinet, Control Relay



## 8. MISCELLANEOUS INSTRUCTIONS

a. TO REMOVE A ROLL OF USED TRANSPARENT WEB, with the projector frame in position in the cabinet, cut the web off close to the wooden supply spindle, if it is not already completely expended from the spool, and feed it through the feed roll manually by turning the feed roll handwheel. See figure 1-2. Rotate the rewind cylinder by hand in order to wind up the free end of the web. Hold the latch on the right rewind spindle bracket disengaged and raise the right end of the spindle assembly up out of the spindle bearing notch disengaging the clutch arm from the motor arm stud at the same time. Slide the spindle assembly toward the right, out of the bearing hole in the left bracket. Remove the left spindle hub from the end of the spindle cylinder. This permits the cylinder to spring closed slightly so that the roll of used transparent web can be pulled off. Reinsert the hub into the cylinder and return the spindle assembly to its brackets, reversing the disassembly procedure.

b. TO REPLENISH THE SUPPLY OF TRANSPARENT WEB, remove the 2 thumb screws from the front plate of the projector frame and raise the hinged section of the frame to its latched position to gain access to the web mounting bracket assembly. Slide the right web spindle retainer (as viewed from the FRONT of the cabinet) on the web mounting bracket toward the front and remove the web supply spindle from the Unit. Pull the empty cardboard core off of the wooden spindle toward the end opposite from the garter spring. Reinsert the spindle carefully into a fresh roll of transparent web so that the web will unwind from underneath and the garter spring on the spindle is to the LEFT when remounted in its holders. Place the roll of web on end on a flat surface while inserting the spindle, or push against the cardboard core of the roll of web, not against the rolled web itself. Pressure against the rolled web may result in the web slipping laterally on its core resulting in misalignment and poor tracking when threaded. Push the spindle into the roll of web until the core seats between the garter spring on the left and the retaining spring on the right. Reinstall the spindle with its roll of web between the brackets at the rear of the Typing Unit and relatch the spindle retainer. Feed the web up over the slack bar, down under the lower web guide, up between the latched pressure roll and the feed roll, following the route shown in figure 5-70. The pressure roll is latched and its pressure removed from the feed roll by moving the release lever toward the rear of the Typing Unit until it is secured by the release lever latch. When threading is completed the release bar must be unlatched so that the web will line feed properly. Route the web up to the rewind assembly where it should be inserted into the slot in the rewind cylinder, approximately one-half inch from the flange on the spindle hub, and four or five turns taken up, by turning the rewind cylinder by hand in the direction of rotation, drawing the web taut to prevent slippage. The web will seek its own location on the cylinder as the machine is operated. Check the WEB ROLLER ADJUSTMENT before placing the unit in operation (figure 5-55). Unlatch the hinged section of the frame, close and secure it with the thumb screws. Return the unit to operation observing that the web is feeding and rewinding properly.

c. TO REPLACE THE RIBBON, raise the hinged section of the frame to its latched position as described above. Raise the toggle on each ribbon spool shaft to its vertical position and remove both spools from the shafts. Disengage the ribbon from the ribbon rollers, reverse levers and ribbon guides. Unwind the old ribbon from one of the spools and engage the hook on the end of the new ribbon in the hub of the empty spool. Wind a few turns of the ribbon onto the empty spool in the same direction that it comes off of the full spool. Be sure that the reversing eyelet has been wound up on the empty spool. Place the spools on the ribbon spool shafts in such a manner that the ribbon feeds from the right side of the right spool and from the left side of the left spool without twisting. See figure 5-71. Turn each spool on its shaft until the driving pins on the spool shafts engage the holes in the spools. Thread the ribbon forward around both ribbon rollers, through the slots in the ribbon reverse levers, and through the ribbon guide on the type box carriage. Make certain that the ribbon remains in the guide slots and that both reversing eyelets are between the ribbon spools and the reverse levers. Take up the slack in the ribbon by turning the free spool. Close the hinged section of the projector frame and secure it.

d. TO REPLACE THE PROJECTION LAMP, turn off the power and remove the front screw from the lamp housing cover, loosen the screw at the rear edge of the housing cover, then slide the cover forward to disengage the slot from the top screw. Lift the cover off of the housing.

## CAUTION

Wear gloves to protect hands from possible painful injury of burns or broken glass. If time permits, the projection lamp should be allowed to cool before its replacement is attempted.

With one hand support the lamp socket from underneath the lamp housing, with the other hand grasp the lamp firmly and push downward turning the lamp counter-clockwise about 1/4 of a revolution to disengage the flanges on the base of the lamp from the socket. Remove the old lamp and install the new one so that the base flanges correspond with the notches in the socket. Push down against the spring tension of the center contact and turn the lamp clockwise until it is stopped by the positioning pin. When properly seated the filament supporting wires should face directly toward the rear of the lamp housing so that the broadside of the filament is parallel to the front surface of the front condenser lens. If the lamp is out of adjustment it should be re-aligned according to instructions in figures 5-65 and 5-66. Replace the cover of the lamp house.

e. TO INSTALL A TRANSLUCENT SCREEN that has become shrunken or wrinkled in storage requires special care. The lacing should be tightened gradually over a period of several days in order to restore the screen to its original shape and size without damaging it. A screen should never be folded, creased or handled carelessly.

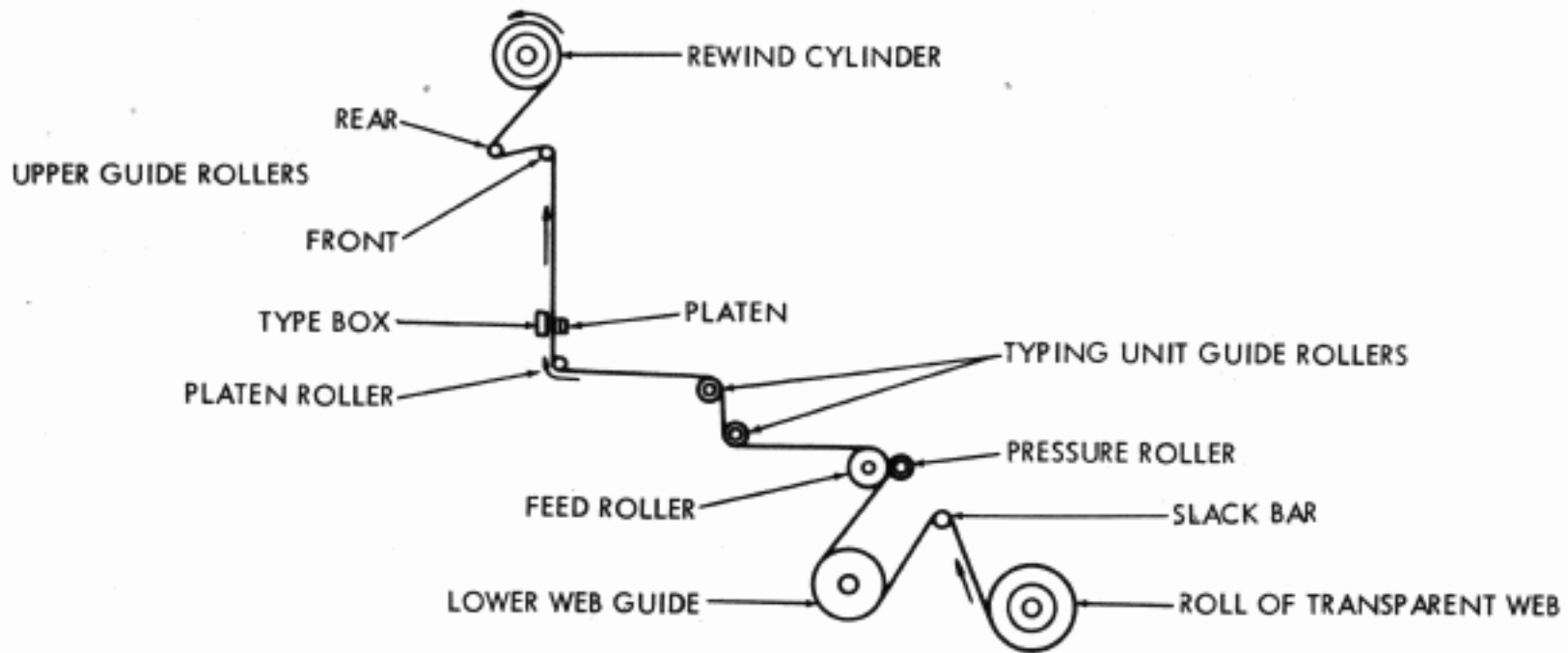


Figure 5-70 Path of Transparent Web

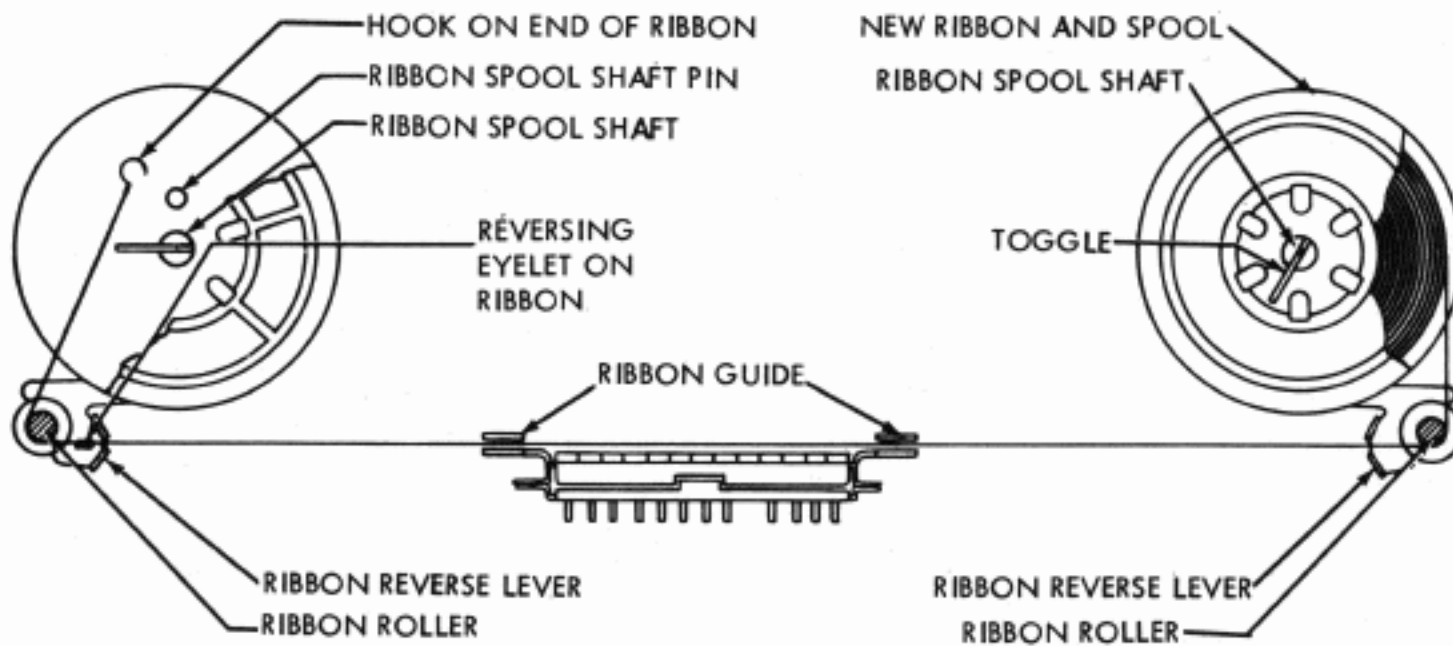


Figure 5-71 Path of Ribbon

f. TO CLEAN THE TRANSLUCENT SCREEN, the crystalline surface should be cleaned by a dry process, using a clean brush, not too harsh. The non-crystalline side, which should always face in toward the projector, may be cleaned with a brush or a soft cloth. If this method is not sufficient, a clean soft cloth dampened with wood or grain alcohol may be used.

g. TO CLEAN THE TYPE, remove the type box and clean the type box pallets with a dry, stiff brush, such as a short handle typewriter brush. When cleaning the type, be careful not to brush the dirt into the typing unit. DO NOT USE A SOLVENT OR CLEANING COMPOUND ON THE TYPE BOX.

h. TO ADJUST THE RANGE FINDER - (if a signal distortion test set is not available) - Arrange for the Sending Station to send a test signal (alternate R and Y) from a prepared tape fed into the transmitter distributor.

(1) Push the range finder knob on the Typing Unit inward to engage the gear and rotate it in a clockwise direction until errors appear in the projected copy. Move the knob back slowly in a counter-clockwise direction until the errors disappear. Note the number positioned opposite the index mark.

(2) Rotate the range finder knob in a counter-clockwise direction until errors appear once again. Move the knob back slowly in the clockwise direction until the errors disappear. Note the number positioned opposite the index mark.

(3) Determine the average of the two readings obtained in a. and b. above. Set the range finder knob to this position.

## 9. TOOLS

For a listing of tools required to maintain the Model 28 Receiver Projector Set, refer to Teletype Bulletin 1124B.

10. DISASSEMBLY AND REASSEMBLY. (For illustration of parts referred to herein see Section 7 of this Bulletin.)

### NOTE

If a part that is mounted on shims is to be removed, the number of shims used at each of its mounting screws should be noted so that the same shim pile-up can be replaced when the part is remounted. Retaining rings (Tru-Arc) are of spring steel and have a tendency to release suddenly. Loss of these can be minimized as follows: Hold the tru-arc with your left hand to prevent it from rotating. Place the blade of a suitable screwdriver in one of the slots of the tru-arc. Rotate the screwdriver in a direction to increase diameter of tru-arc. Tru-arc will come off easily without flying.

a. TYPING UNIT. To remove the Typing Unit from the Base proceed as follows: Remove the four 151678 screws that secure the Typing Unit to the Base. Remove the 152466 cable plug from the right side frame. Lift the typing unit from the Base.

## (1) TYPE BOX

(a) To remove the type box, proceed as follows:

1. Trip the 150075 type box latch toggle to the right.

2. Lift the right end of the type box upward to an angle of approximately 45 degrees and pull the type box toward the right to disengage it from the left hand bearing stud.

(b) To disassemble type box and replace a type pallet, proceed as follows:

1. Remove both screws and nuts that secure the front plate to the rear plate assembly. Separate the two plates.

2. Remove the spring from the pallet by compressing the spring slightly and pulling the formed end out of the slot in the pallet.

### NOTE

This spring should be discarded once it has been removed from its assembly.

3. Replace pallet (omit this step if replacing spring only).

4. Install new pallet spring making sure that the formed end of the spring extends through the slot in the pallet.

5. Line up the front plate with the rear plate assembly and draw the two plates together until the head of the pallet leaves the rear plate by approximately 1/16". This may be accomplished by using two 6-40 screws (at least 11/32" long) and nuts in place of the screws and nuts removed in step 2 and tightening them only enough to hold the pallets as specified above. (Do not clamp the plates together until all pallets have been moved into their correct position.)

6. Manipulate the pallets until they fall into their respective openings in the front plate and press plate together.

7. Replace screws and nuts used in step 5. with screws and nut removed in step 1.

(c) To reinstall type box, reverse the procedure used in removing it.

### CAUTION

The type box should be firmly seated on the bearing studs and the point of the latch toggle should be placed in the notch of the type box plate, before moving the toggle to its latched position, to avoid springing the latch.

## (2) PRINTING CARRIAGE

(a) To remove the printing carriage, proceed as follows:

1. Loosen the two 151152 Screws which clamp the 150230 Plate to the wire rope and disengage the carriage from the wire rope.

2. Move the carriage to the left of its track and tilt the lower part forward to disengage the rollers from the track.

3. The disassembly of the printing carriage is shown in Section 7.

(b) To reinstall the carriage, reverse the procedure used in removing it.

1. Make certain that the 150068 printing arm is correctly re-engaged with the 150598 Printing Track.

2. Position the carriage clamp on the wire rope for correct printing position as specified in figure 5-38.

## (3) TYPE BOX CARRIAGE

(a) To remove the type box carriage, proceed as follows:

1. Move the type box carriage to its extreme right hand position.

2. Hold the 152548 and 152255 code bar shift bar levers in the marking position and rotate the main shaft so that the type box is in its uppermost position.

3. Remove the 119652 retainer ring from the stud in the right hand end of the 152503 type box carriage link and disengage the link from the carriage.

4. Hold the 153810 ribbon guide forward and the 150311 ribbon reverse lever back and pull the carriage toward the right to disengage it from the carriage track. For disassembly see Section 7.

(b) To reinstall the carriage, reverse the procedure used in removing it. (See figure 5-37.)

## (4) FRONT PLATE

(a) To remove the front plate, proceed as follows:

1. Remove the Typing Unit from the Base.

2. Remove the 119652 retainer ring from the 152503 type box carriage link right hand stud and disengage the link from the carriage. (See instructions for removing the link retainer in paragraph 10a(3).)

3. Remove the two 152893 and 153841 screws, which secure the 150245 main bail drive bracket to the 150365 rocker shaft.

4. Remove the 150202 spacing shaft gear.

5. Remove the four 151606 screws which secure the front plate assembly to the typing unit side frame.

6. Pull the front plate assembly forward to disengage it from its connecting parts in Typing Unit.

7. The disassembly of the front plate is shown in Section 7.

(b) To reinstall the front plate assembly, reverse the procedure used in removing it.

1. Make certain that the 150770 and 150771 code bar bell cranks, the 152596 letters-figures shift slide, the 152522 reversing slide shift lever, and the 152545 carriage return lever extension are properly engaged with their mating parts before tightening the front plate mounting screws.

2. Replace the 150202 spacing shaft gear. See figure 5-19 for adjustment on phasing the spacing gears.

## (5) STUNT BOX

(a) To remove the stunt box, proceed as follows:

1. Remove the Typing Unit from the Base.

2. Remove the 151627 rear tie bar from the typing unit side frames.

3. Remove the 151692 screw from the right and left stunt box bracket which secure the stunt box assembly in the Typing Unit.

4. Remove the 151637 screw from the 153291 cam shaft drive arm, remove the tru-arc retainer and slide the drive arm to the left out of engagement with the 153000 stripper blade drive arm.

5. Lift the stunt box assembly upward to disengage it from its locating brackets and pull toward the rear to disengage all code bar forks from the code bars. Remove the contact assembly and cable clamp, if present, from the stunt box. Remove the stunt box, using care not to damage the 155060 line feed function pawl stripper.

6. Disassembly of the stunt box is shown in Section 7.

7. If it is necessary to replace a switch contact spring, proceed as follows:

a. Remove the two screws which hold the contact plate to the block.

b. Carefully unsolder the cable from the terminal lug so as to avoid damage to the cable.

c. Remove the contact plate with spring.



d. Remove the contact arm from the block.

e. Slip spring from plate.

f. Place the new spring in position.

g. Before mounting the contact plate on the block, make sure the end of the spring rests on top of the formed-over portion of the contact clip. There should be some clearance between the low end of the spring (front) and the upper edge of the contact arm to avoid interference with the normal movement of the contact arm.

h. Mount the contact plate with springs and the contact block in the required location with the two screws friction tight.

i. Carefully resolder the cables to the terminal lugs so as to avoid overheating.

j. Insert the pointed end of the contact arm, notch downward, between the bent up end of spring and the formed-over portion of the contact clip. Push the arm into its operating position in the contact block.

k. Before tightening the contact plate screws, see figure 5-50.

(b) To reinstall the stunt box assembly:

1. Push it forward in its guide rails to within 1/8 inch of its final position. Avoid damaging the 155060 line feed function pawl stripper against the left stunt box bracket.

2. Manually disengage the function pawls from their function bars and push the stunt box assembly forward and downward until it is latched in place on its locating brackets.

3. Replace the stunt box mounting screws, receptacle and selector magnet wires.

#### (6) FUNCTION BAR, PAWL, AND LEVER

(a) To remove a function bar, proceed as follows:

1. Remove the stunt box from the Typing Unit - see paragraph 10a(5).

2. Unhook the 4703 function bar spring.

3. Hold the function bar toward the rear of the stunt box and disengage its function pawl from the function bar.

4. Pull the function bar toward the front to remove it from the stunt box.

(b) To remove a function pawl after the function bar has been removed:

1. Remove the pawl spring.

2. Hold associated function lever back.

3. Remove the pawl from top of stunt box.

(c) To remove a function lever after the function bar and function pawl have been removed:

1. Remove the 152889 shaft retainer plate.

2. Remove the 150547 shaft nearest the front of the stunt box.

3. Unhook spring from function lever and remove the lever through top of stunt box.

(d) To replace the function bar, reverse the procedure used in removing it.

#### (7) CODE BARS

(a) To remove the code bar assembly, proceed as follows:

1. Remove the Typing Unit from the Base.

2. Remove the stunt box assembly. See paragraph 10a(5).

3. Remove the front plate assembly. See paragraph 10a(4).

4. Remove the 151657 screws and 2191 lock washers which secure the code bar assembly to the side frame.

5. Remove the 150301 code bar shift bar retainer plate from 152576 right hand code bar casting.

6. Remove the 152548 and 152255 code bar shift bars and 152257 springs from the code bars and pull the code bar assembly forward and to the left.

7. Disassembly of the code bars is shown in 1149B.

(b) To reinstall the code bar assembly, reverse the procedure used in removing it, except do not tighten the mounting screws.

1. Hook the short extension of the 152257 spring in the spring hole of the 152256 code bar. The short extension of the spring should be hooked from the bottom of the code bar and the long extension should be hooked over the top of the code bar shift bar.

2. Loosen the 151630 code bar assembly tie bar screws and hold the code bar castings back and downward firmly against their locating surfaces on the side frame and tighten the four mounting screws.

3. Tighten the two tie bar screws.



(8) MAIN SHAFT

(a) To remove the main shaft, proceed as follows:

1. Remove the Typing Unit from the Base.
2. Remove the selector cam-clutch assembly. See paragraph 10a(13).
3. Set the Typing Unit upside down.
4. Return the carriage to its left-hand position.
5. Remove the 151686 screw which secures the 150673 spacing shaft in the 150668 spacing pawl hub.
6. Remove the spacing shaft with gear.
7. Remove the 119653 retainer which secures the line feed eccentric gear assembly on the 163548 stud.
8. Remove the eccentric gear assembly from the stud.
9. Remove the 151686 screw which secures the 153823 collar and the 153824 clamp from right end of main shaft. Remove the 152573 main shaft right hand bearing retainer plate.
10. Remove the 150010 retainer plate at the 150046 clutch bearing and remove the 150244 link.
11. Remove the two 151630 screws from the 152537 main shaft left hand bearing clamp.
12. Unhook the 74701, 153806 and 70388 spring from the triplevers and latch levers associated with all clutches. Position the code bar clutch so that the low part of the clutch cam clears the spring cam on the cam follower. Unhook the 153806 code bar clutch cam follower spring.
13. Remove the 153300 function clutch arm by removing the two 151630 screws and 119652 Retainer Ring.
14. Unhook the 154688 springs from the 153573 function bar reset bail.
15. Move the main shaft assembly toward the left to disengage the code bar clutch and function clutch links from their connecting pins.
16. Lift the left end of the shaft assembly out of the side frame and position the shaft so that the function clutch link passes the suppression assembly bracket and remove the shaft assembly from the typing unit.
17. When assembling the clutches which have cams and disks marked "O" for identification, the marked side of the parts should face away from the

clutch side of the assembly. The function and code bar clutches should have their driving links assembled so that the longer end of the hub faces away from the clutch side of the assembly.

18. Disassembly of the main shaft and clutches is shown in Section 7.

(b) To re-install the shaft assembly, reverse the procedure used in removing it.

(c) To phase the spacing gears and line feed gears, see figures 5-19 and 5-20 respectively.

(d) Remake the stripper blade drive cam position adjustment (figure 5-47).

(9) UPPER DRAW WIRE ROPE

(a) To remove the upper draw wire rope, proceed as follows:

1. Return the carriage to the left hand position.
2. Loosen the 112626 nut on the front end of the 150197 spring drum bearing post. Operate the 150237 ratchet escapement lever to unwind the 74272 carriage return spring.
3. Remove the 150712 wire rope from the 150230 clamp plate on the printing carriage, and the 152521 clamp on the 150728 oscillating rail slide.
4. Loosen the 151618 clamp screw which secures the wire rope to the 150827 spring drum, and remove the wire rope from the drum.
5. Remove the 151618 screw in the 154627 spacing drum which secures the ends of the wire rope, and remove the rope from the drum.
6. Disassembly of the wire rope, spring drum and spacing drum is shown in Section 7.

(b) To replace the upper draw wire rope, reverse the procedure used in removing it.

(10) LOWER DRAW WIRE ROPE

(a) To remove the lower draw wire rope, proceed as follows:

1. Remove the 151658 screw which secures the 150225 lower draw wire rope to the 154627 spacing drum, and remove the end of the rope from the drum.
2. Loosen the 151637 screws which secure the 150796 margin indicator cam disk on the spring drum and position the disk to expose the wire rope mounting screw.
3. Remove the 151346 lower draw wire rope screw and move the rope from the spring drum.

4. Loosen the 151632 screws in the 150800 bearing studs which mount 150224 printing carriage pulleys and move the studs toward the center of the Typing Unit.

5. Disassembly of the lower draw wire rope is shown in Section 7.

(b) To replace the wire rope, reverse the procedure used in removing it.

1. Make certain that the lower draw wire rope is in front of the printing carriage wire rope in the track around the drums.

2. Adjust the position of the type box, the printing carriage, and the wire rope tension as specified in figures 5-32, 5-34 and 5-37.

#### (11) PLATEN

(a) To remove the platen assembly, proceed as follows:

1. Remove the 119652 tru-arc retainers from the 163549 right and the 164997 left platen drive link studs and carefully pull the 163557 right and 163556 left intermediate platen drive links from the studs.

2. Remove the two screws from the 150720 right and the 150719 left platen retainers and take the retainers off.

3. Slide the right and left 150714 bronze sleeve bearings, with the platen assembly still in position, out of their slots in the right and left typing unit side frames.

(b) To disassemble the platen assembly see Section 7.

(c) To reinstall the platen assembly reverse the procedure used in removing it.

#### (12) SELECTOR CAM-CLUTCH

(a) To remove the selector cam-clutch, proceed as follows:

1. Lift the 152410 push lever reset bail cam follower from its cam and latch it in its raised position on the push lever guide. Lift the selector levers and the marking lock lever by moving the marking lock lever forward until the armature drops behind it.

2. Remove the 151642 screws which mounts the 150001 selector clutch drum and position the cam clutch so that the stop lug on the 154694 disk is in the uppermost position.

3. Place 152410 reset ball in raised position. Hold 152432 stop arm and 152405 marking lock lever to left, grasp cam-clutch by cam-disk (not by drum) and pull forward while rotating the cam-clutch slowly. The cam-clutch should come off easily. Do not force it.

4. Disassembly of the selector cam clutch is shown in Section 7.

(b) To replace the cam-clutch assembly, reverse the procedure used in removing it except:

1. As the cam-clutch approaches its fully installed position, move the trip shaft lever and the cam-clutch latch lever so that they ride on their respective cams.

2. Restore the push lever reset bail and the armature to their operating position.

#### (13) SELECTOR MECHANISM

(a) To remove the selector mechanism, proceed as follows:

1. In order to remove the selector mechanism from the Typing Unit the cam-clutch assembly must be removed. See paragraph 10a(12).

2. Remove the 152457 felt wick. Remove the 151658 screw which secures the selector mechanism to the 152546 bracket on the code bar positioning mechanism.

3. Remove from the selector mechanism the 150563 spring which connects with the 152640 common transfer lever on the code bar positioning mechanism.

4. Remove the remaining three 151630 selector mounting screws and lift the selector from the main shaft bearing housing.

5. Disassembly of the selector mechanism is shown in Section 7.

(b) To replace the selector mechanism, reverse the procedure used in removing it.

(c) For readjustment of selector mechanism see the adjusting figures 5-1 to 5-3 and 5-5 to 5-7.

#### (14) CODE BAR POSITIONING MECHANISM

(a) To remove the code bar positioning mechanism, proceed as follows:

1. Remove from the selector the 150563 spring attached to the common transfer lever and restore any operating push levers to the spacing position by raising the 152410 reset bail.

2. Loosen the 151721 clamp screw on the 150447 shift lever drive arm, and remove the two screws which mount the mechanism - the 151630 to the side frame, and the 151658 to the 152400 selector plate.

3. Manipulate the 152635 to 152640 transfer levers and 152255 code bar shift bars while gently twisting the mechanism so as to slide the mechanism off the code bar shift bars.

4. Disassembly of the code bar positioning mechanism is shown in Section 7.

(b) To replace the mechanism on the Typing Unit, reverse the procedure used in removing it.

1. With the main shaft in the stop position, push the code bar shaft bars to the marking position (left front view). Manipulate the code bar shift bars and transfer levers so that the shift bars line up with their respective slots in the 155586 bracket, and slide the shift bars through the slots, one at a time (leave the bottom slot vacant).

#### (15) SELECTOR MAGNET ASSEMBLY

(a) To remove the selector magnet assembly, proceed as follows:

1. Remove the two 151657 screws and 3598 nut which mount the range finder to the selector.

2. Remove the 152468 cable from the 81778 coil terminal screws.

3. Remove the two 151631 magnet assembly mounting screws and lift the assembly out.

4. Disassembly of the selector magnet assembly is shown in Section 7.

#### (16) TRANSPARENT WEB BRACKET ASSEMBLY

(a) To remove the transparent web bracket assembly from the Typing Unit:

1. Remove the 119653 tru-arc retainer from the 163548 line feed eccentric gear bracket stud. Slide the line feed eccentric gear assembly off of the

stud. It will be necessary to trip the line feed clutch and rotate the main shaft until the line feed clutch shoe lever and stop lug have moved far enough to permit the line feed eccentric gear to be removed from its shaft.

2. Remove the three screws that fasten the 163566 right and 163565 left web mounting brackets to the right and left typing unit side frames.

3. Disassembly of the web bracket assembly is shown in Section 7.

(b) To replace the web bracket assembly, reverse the procedure used in removing it.

#### NOTE

Before reinstalling the 119653 retainer on the gear bracket stud refer to Line Feed Phasing Adjustment, figure 5-20. Also check the Feed Pawl Preliminary and Final Adjustments, figure 5-53.

#### b. MOTOR

(1) Remove the four screws that secure the motor base plate to the base. Remove the screws that secure the cover on the base terminal board and disconnect the motor leads from terminals 1 and 2 on the terminal board.

(2) Disassembly of the Motor is shown in Section 7.

c. Disassembly of the Base, Projector Frame and Cabinet require no special instructions. Necessary disassembly information for these components is shown in Section 7.

## SECTION 6 - LUBRICATION AND PREVENTIVE MAINTENANCE :

## 1. GENERAL

1.01 The Model 28 Receiver Projector Set should be lubricated as directed in this section. The figures indicate points to be lubricated and the kind and quantity of lubricant to be used. Lubricate the set just prior to placing it in service. After a few weeks in service, re-lubricate to make certain that all points receive lubrication. The following lubrication schedule should be followed thereafter.

<u>OPERATING SPEED</u>	<u>LUBRICATING INTERVAL</u>
(Words per Minute)	(Whichever occurs first)
60-----	3000 hrs. or 1 yr.
75-----	2400 hrs. or 9 mo.
100-----	1500 hrs. or 6 mo.

1.02 Use Teletype KS-7470 oil at all locations where the use of oil is indicated. Use KS-7471 grease on all surfaces where grease is indicated except the motor bearings. Apply two drops of KS-7470 oil to motor bearings every four months (depress oiler with metal object). If the Typing Unit motor is disassembled at any time, repack the bearings with KS-7471 grease.

1.03 The photographs show the paragraph numbers referring to particular line drawings of mechanisms and where these mechanisms are located on the unit. Parts in the line drawings are shown in an upright position unless otherwise specified.

1.04 The illustration symbols indicate the following lubrication directions:

0	Apply 1 drop of oil.
02	Apply 2 drops of oil.
03	Apply 3 drops of oil, etc.
G	Apply thin film of grease.
SAT	Saturate (Felt oilers, washer, wicks) with oil.

1.05 All spring wicks and felt oilers should be saturated. The friction surfaces of all moving parts should be thoroughly lubricated. Over lubrication should be avoided. Special care must be taken to prevent any oil or grease from getting between the selector armature and its magnet pole faces or between electrical contacts on the Typing Unit.

1.06 Apply a thick film of grease to all gears and the spacing clutch reset cam plate.

1.07 Apply oil to all cams, including the camming surfaces of each clutch disk.

2. PREVENTIVE MAINTENANCE - A thorough visual examination of the equipment should be made during these periodic lubrication checks for conditions that could possibly cause trouble later. Watch for evidence of insufficient lubrication. The appearance of oxidized (red) metal dust adjacent to any bearing surface may indicate insufficient lubrication. Also, observe the adjustable clearances of working parts and check for loose screws or nuts. Use care to prevent the introduction of trouble when working on the equipment; avoid damage or distortion to delicate springs and do not disturb adjustments unnecessarily.

## NOTE

During each lubrication period, check the following adjustments:

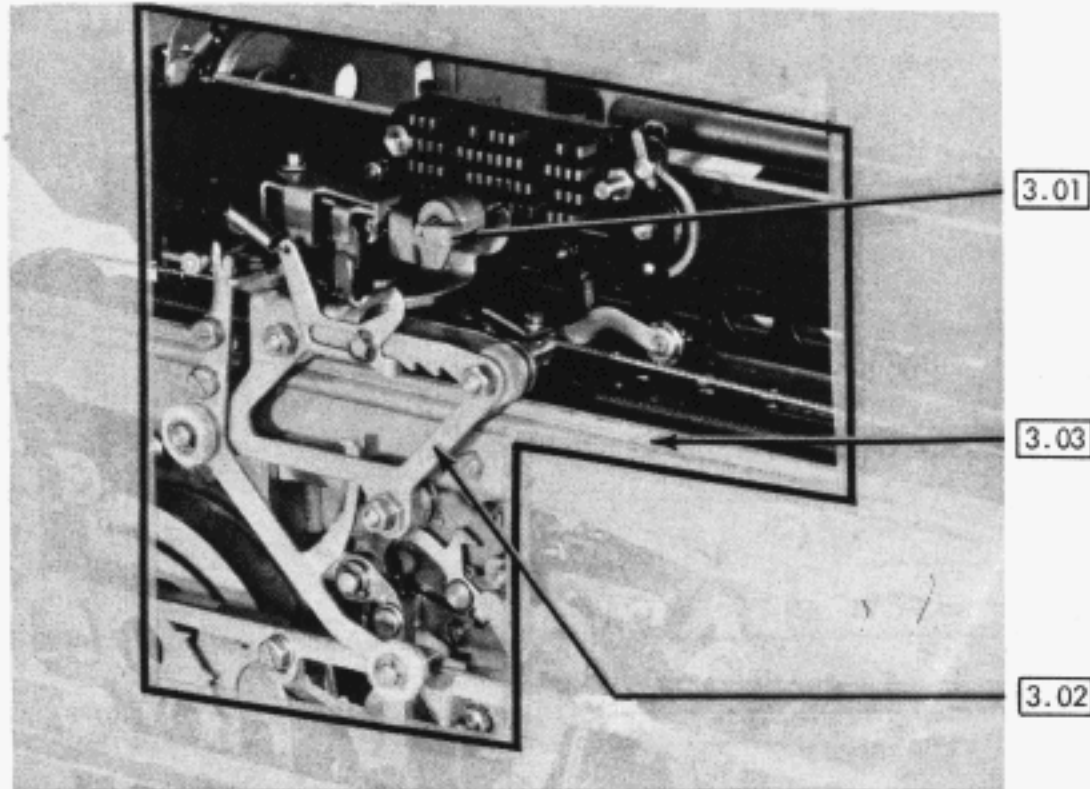
1. PRINTING CARRIAGE POSITION
2. PRINTING HAMMER BEARING STUD
3. PRINTING HAMMER STOP BRACKET (Also see note after "Printing Arm" adjustment)
4. CARRIAGE WIRE ROPE

2.01 ROUTINE MAINTENANCE CHECK CHART

WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS
1. Accumulation of dust and dirt.	Check for dust and dirt on all parts of the Set. Clean by wiping with a soft lint-free cloth. Avoid use of an air hose. Use a separate oil-free cloth for the optical system, mirrors and screen.	Be sure that springs are not disengaged or other parts disturbed. Avoid getting dust and dirt into bearings and moving parts. Avoid getting an oil film on the lenses and mirrors.
2. Selector response.	<p>If the selector responds to distorted signals as specified in figure 5-7, no maintenance is required. If the requirements are not met, the following routine should be followed:</p> <ol style="list-style-type: none"> <li>1. Clean the magnet pole faces by running a clean piece of paper between them and the armature.</li> <li>2. Examine selector parts for wear and replace if worn.</li> <li>3. Check adjustments of selector mechanism. See figures 5-1, 5-2, and 5-3.</li> <li>4. Check selector mechanism springs and replace if necessary.</li> </ol>	Use extreme care to guard against overtightening screws, which might result in stripping.
3. Adjustments	<p>Most adjustments will remain within specification limits for the life of the equipment and do not require checking unless trouble occurs. Check and remake, if necessary, the following adjustments:</p> <ol style="list-style-type: none"> <li>1. Dashpot, figure 5-36.</li> <li>2. Carriage wire rope, figure 5-31.</li> <li>3. All clutches, figures 5-17 and 5-18.</li> </ol>	
4. Lubrication	Remove the Typing Unit from the projector frame. Examine all of its mechanisms for signs of lubrication failure, usually evidenced by the presence of red powdery substance at point of failure. If failure is observed, the parts should be examined and replaced if damaged. Lubricate the equipment in accordance with the following figures and wipe off excessive lubricant with a clean cloth.	Be sure that springs are not disengaged and that other parts are not disturbed during examination and lubrication.



3. PROJECTOR TYPING UNIT



TYPING UNIT IN UPRIGHT POSITION

3.01 PRINTING MECHANISM

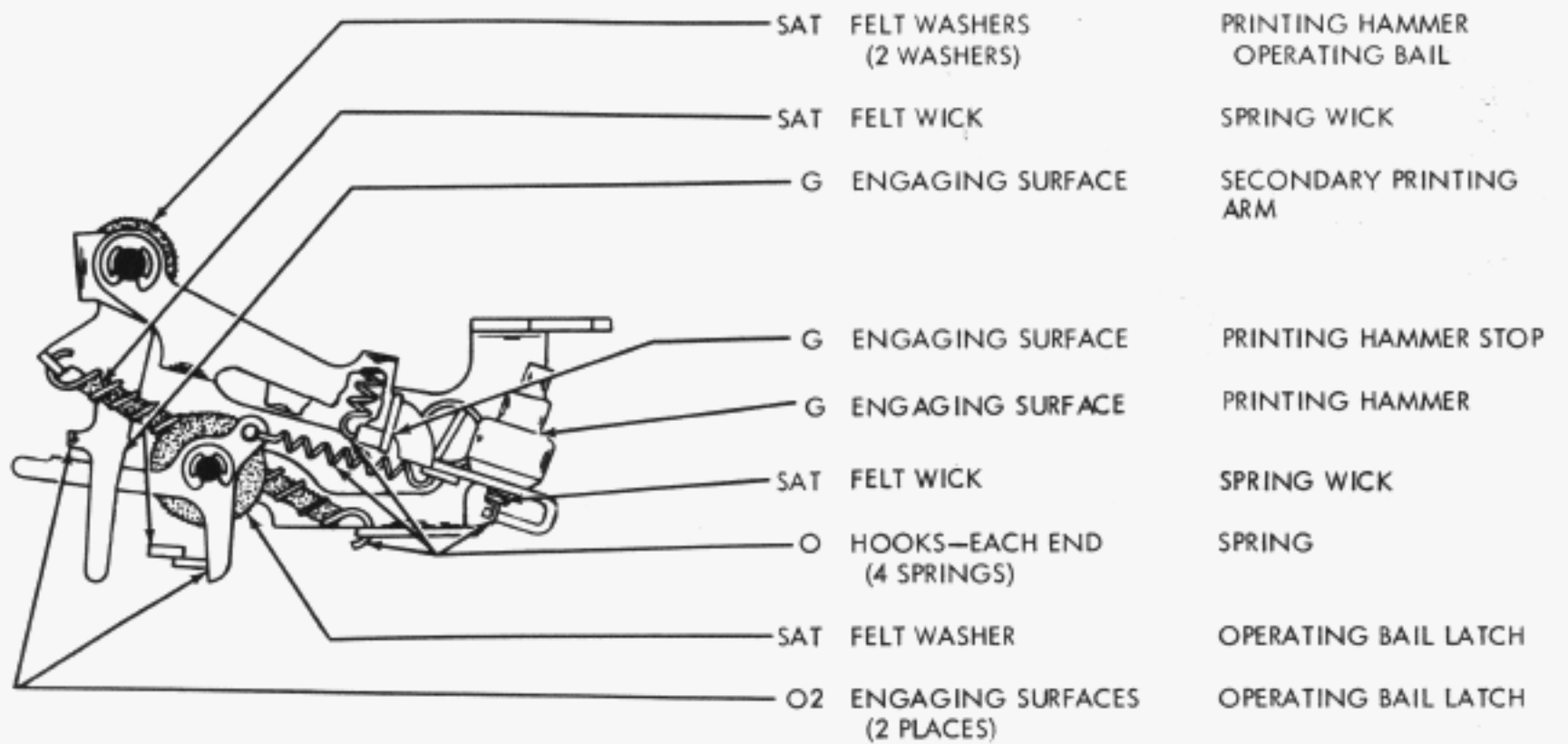
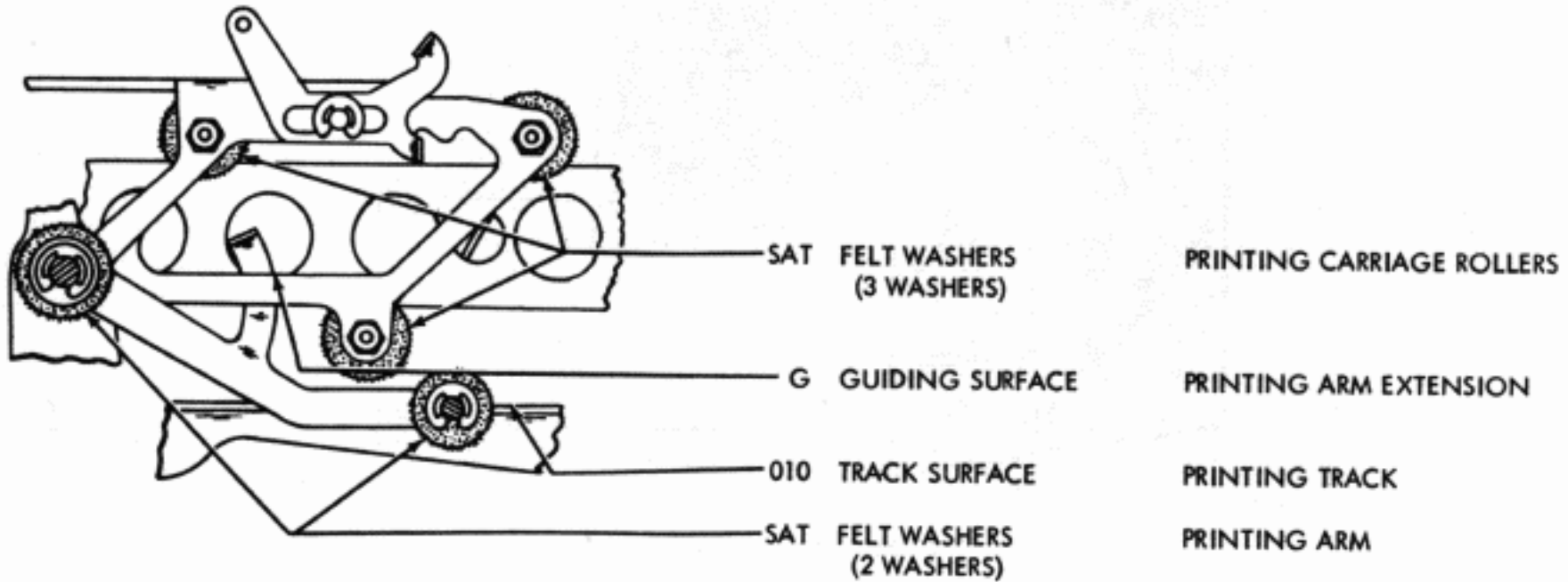


Figure 6-1 Typing Unit Lubrication - Printing Mechanism

3.02 PRINTING MECHANISM (Continued)



3.03 TYPE BOX CARRIAGE MECHANISM

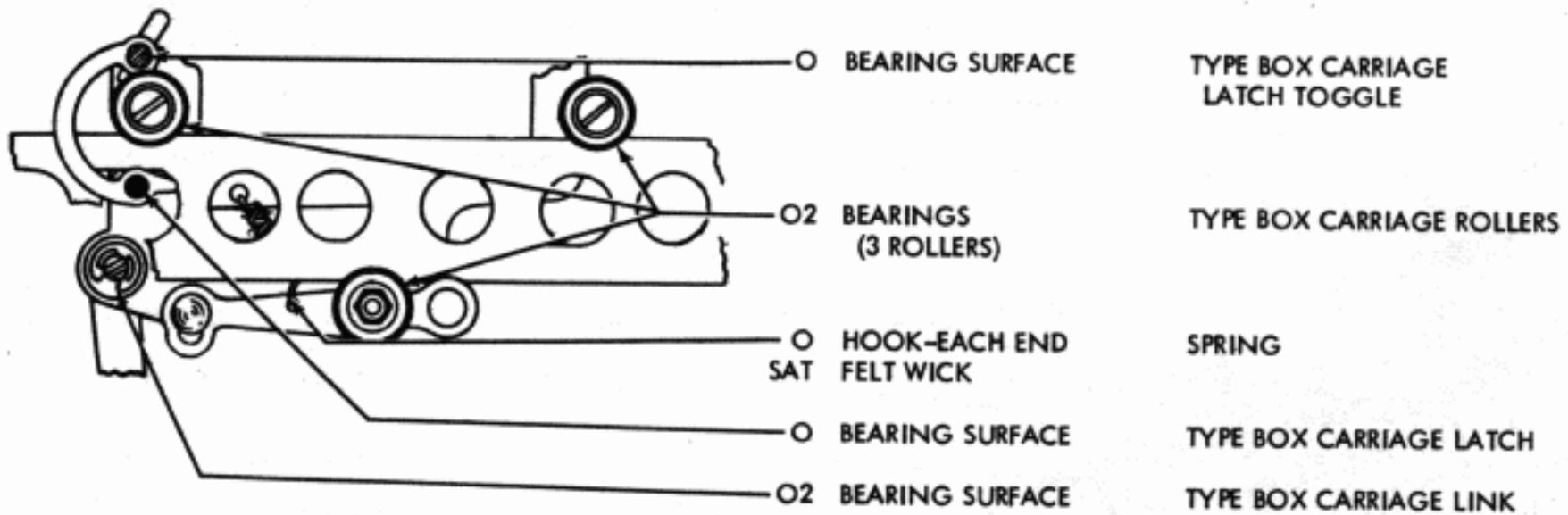
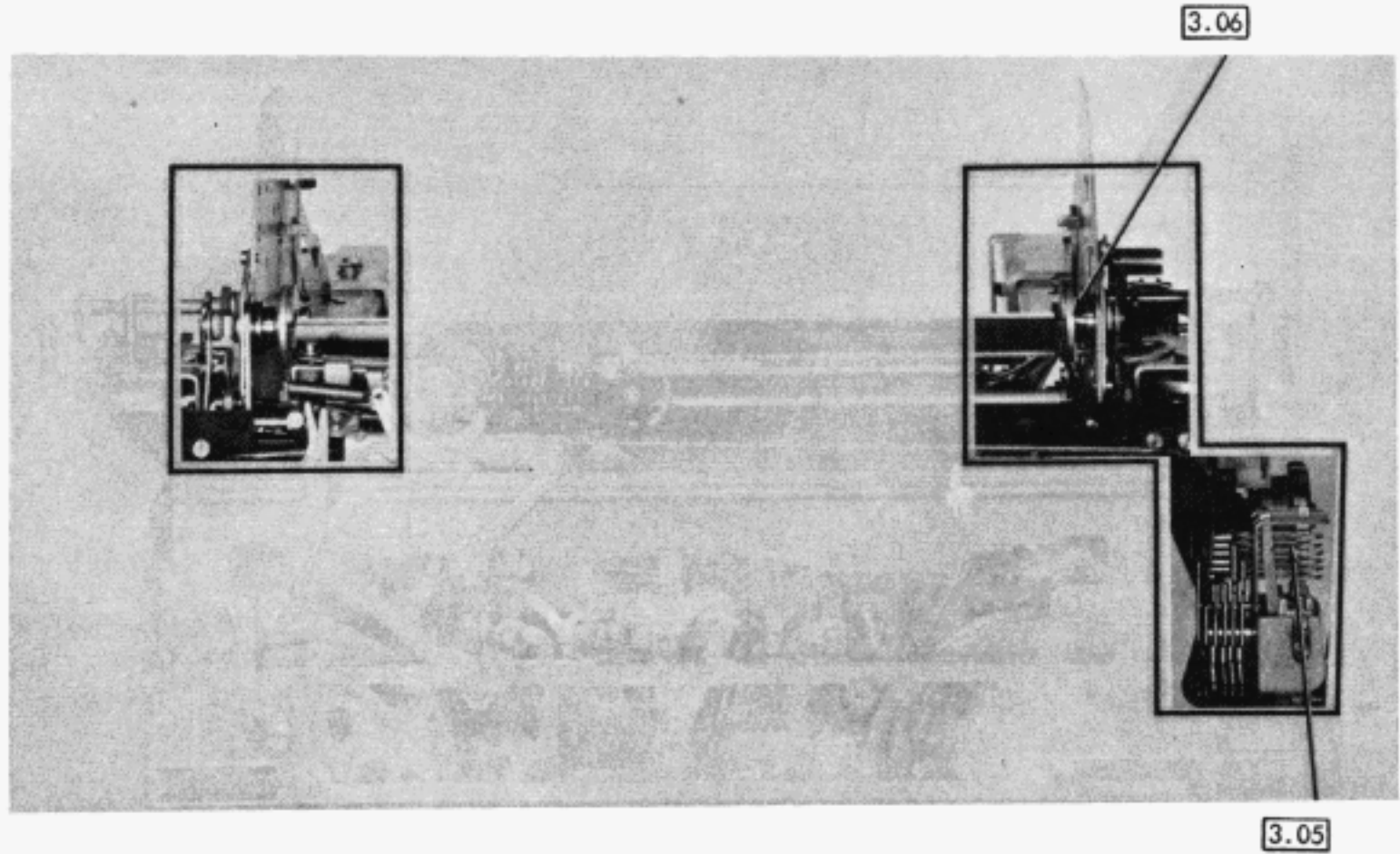


Figure 6-2 Typing Unit Lubrication - Printing Mechanism and Type Box Carriage

3.04 CODE BAR MECHANISM  
PLATEN MECHANISM



TYPING UNIT IN UPRIGHT POSITION

3.05 CODE BAR MECHANISM

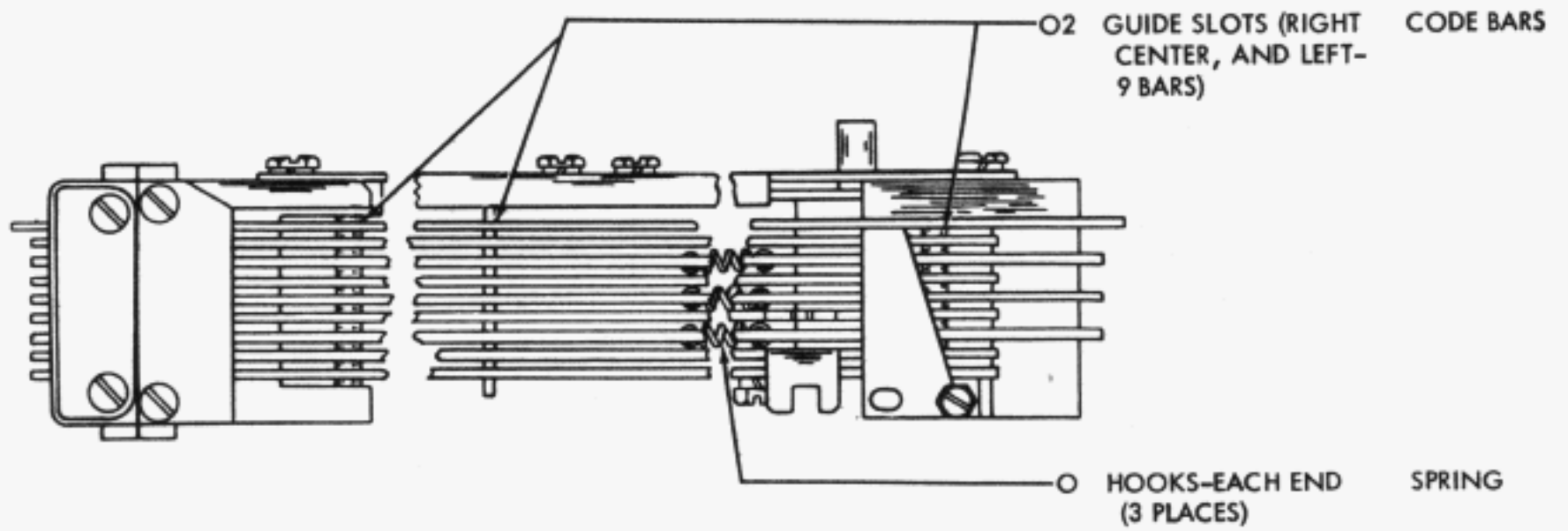
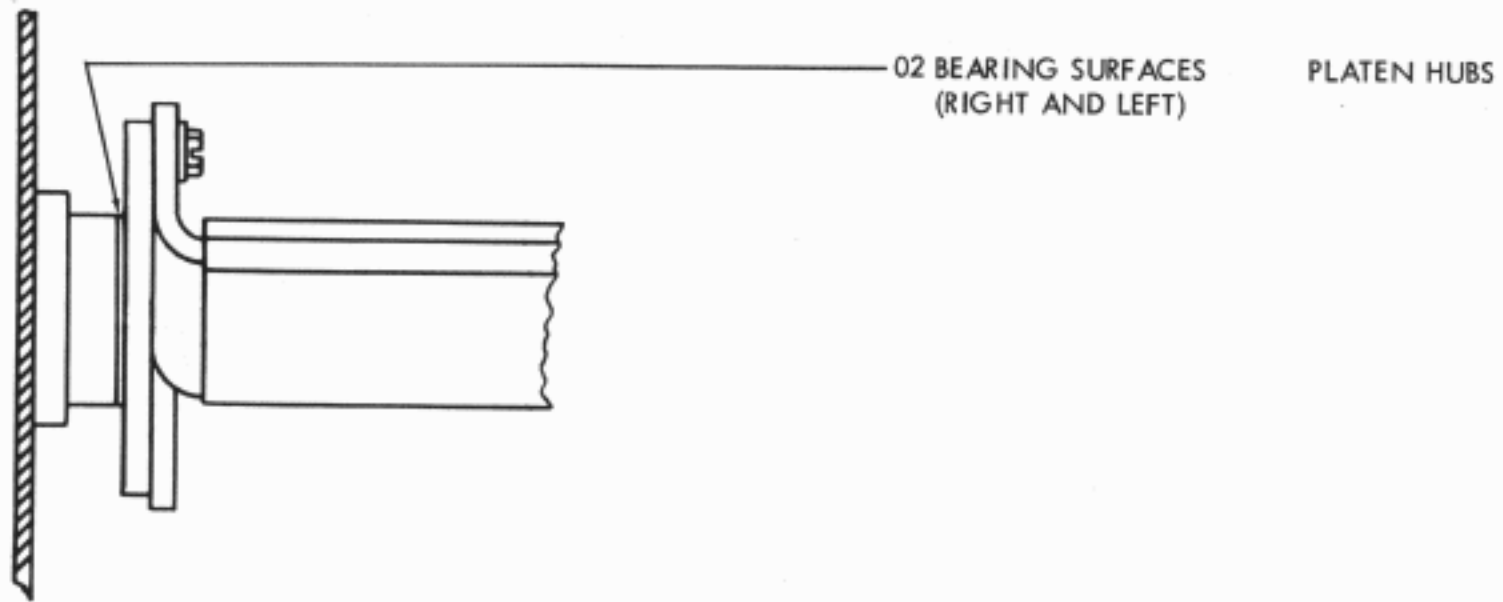
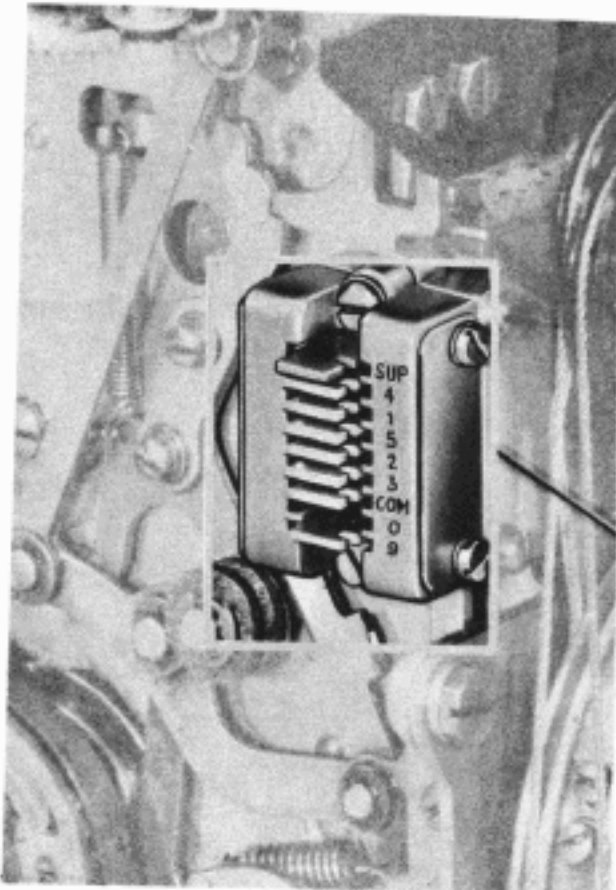


Figure 6-3 Typing Unit Lubrication - Code Bar Mechanism

3.06 PLATEN MECHANISM



3.07 CODE BAR MECHANISM (Continued)



3.08 CODE BAR MECHANISM

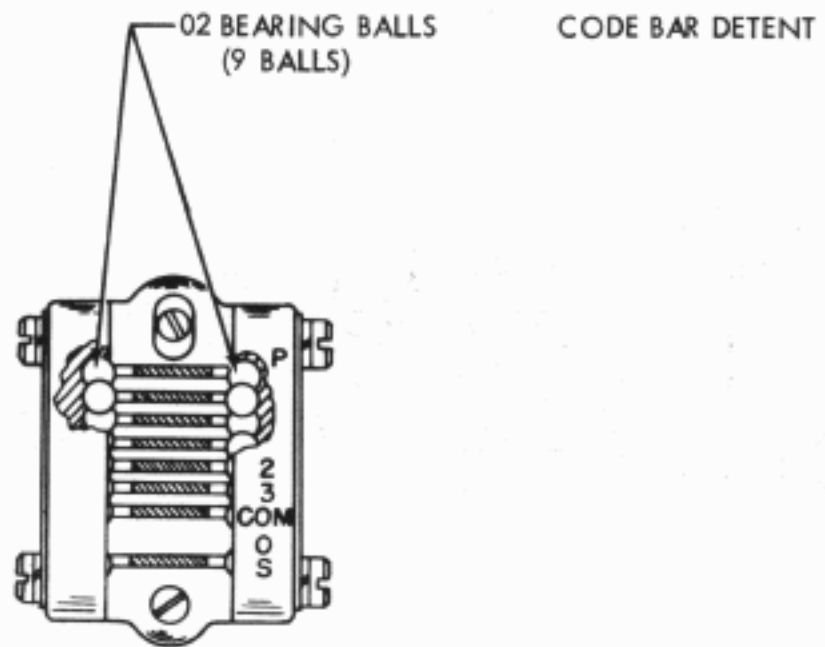
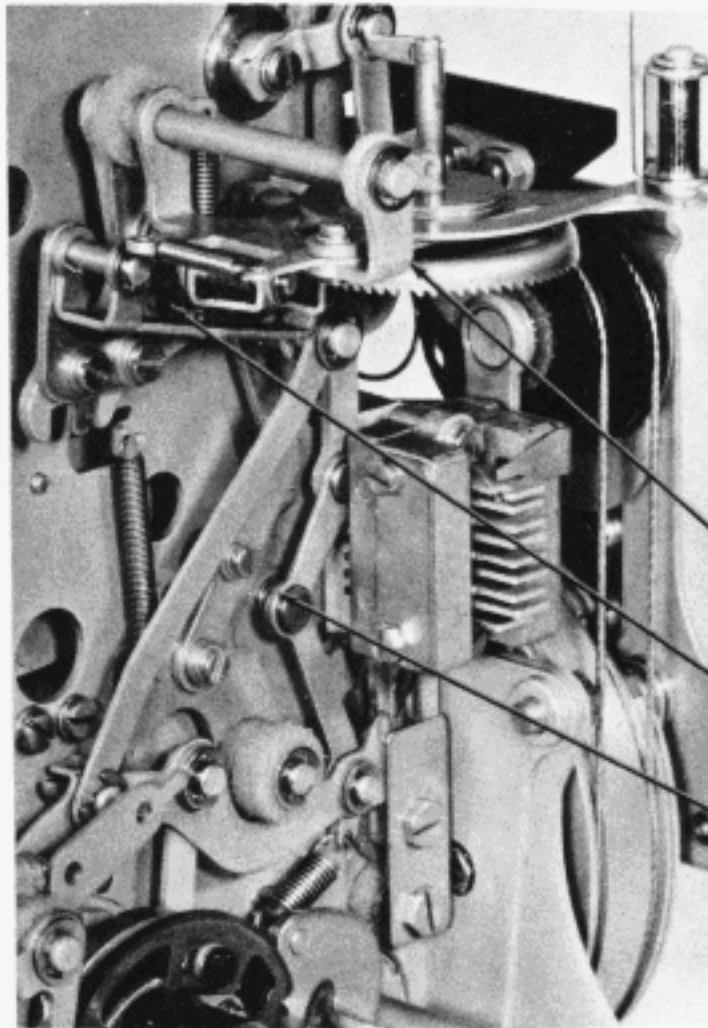
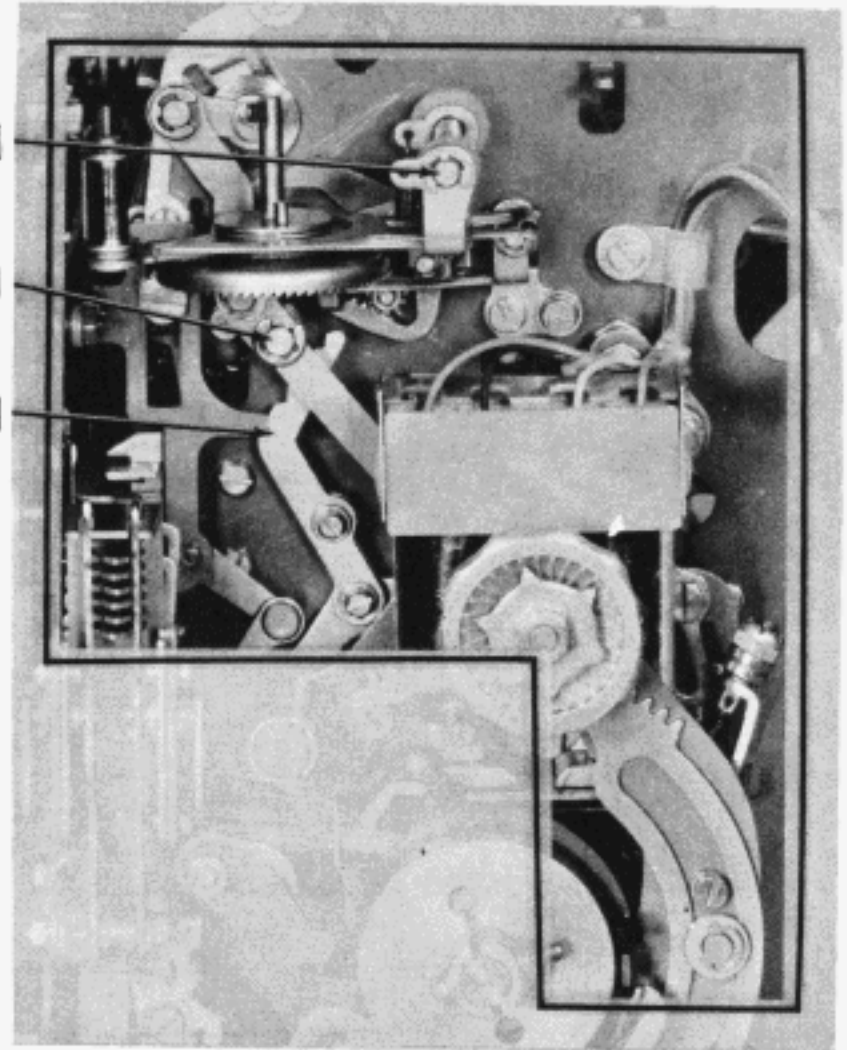


Figure 6-4 Typing Unit Lubrication - Code Bar and Platen Mechanism

3.09 RIBBON FEED MECHANISM



LEFT SIDE VIEW



RIGHT SIDE VIEW

3.10 RIBBON FEED MECHANISM (Right Side)

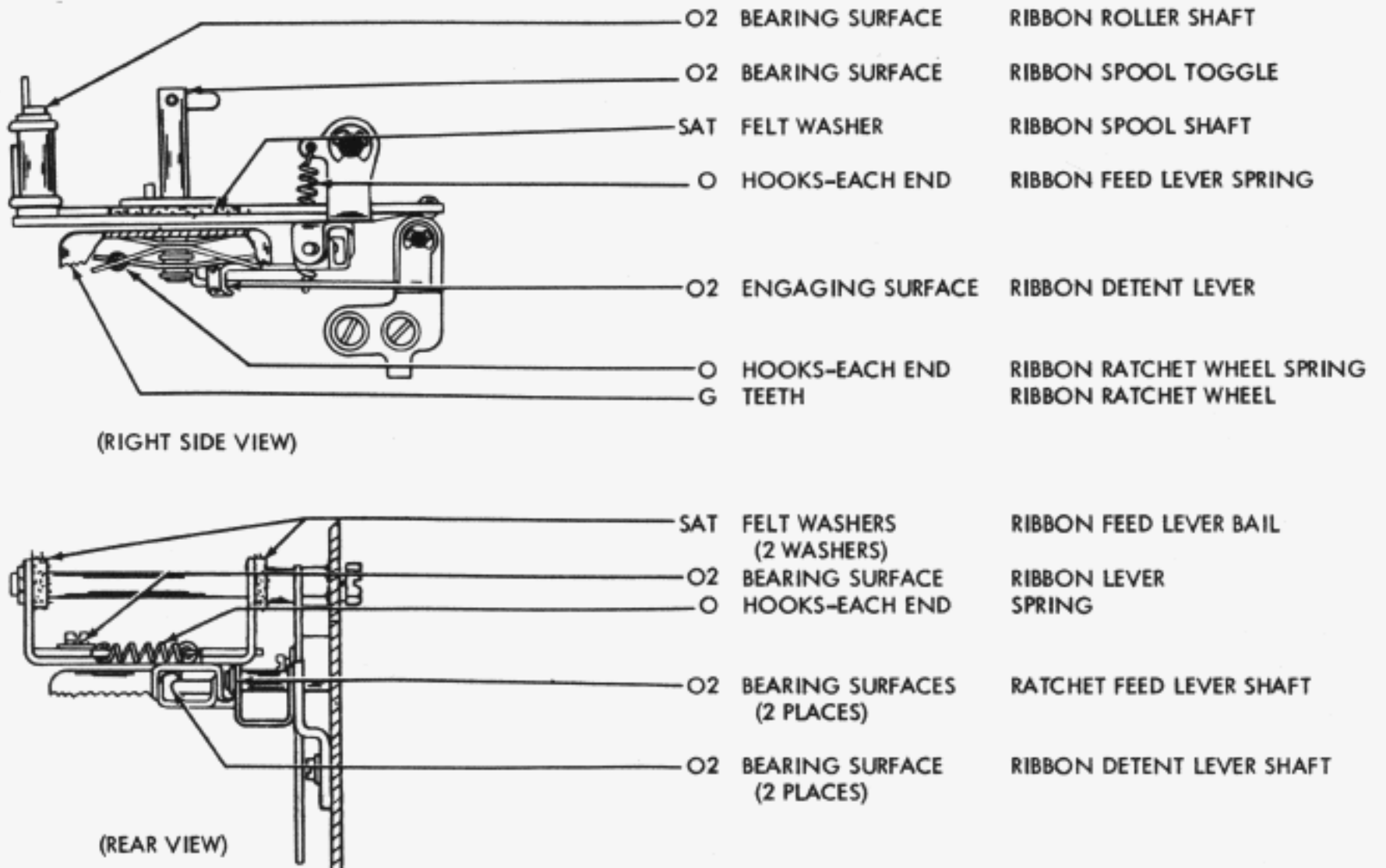
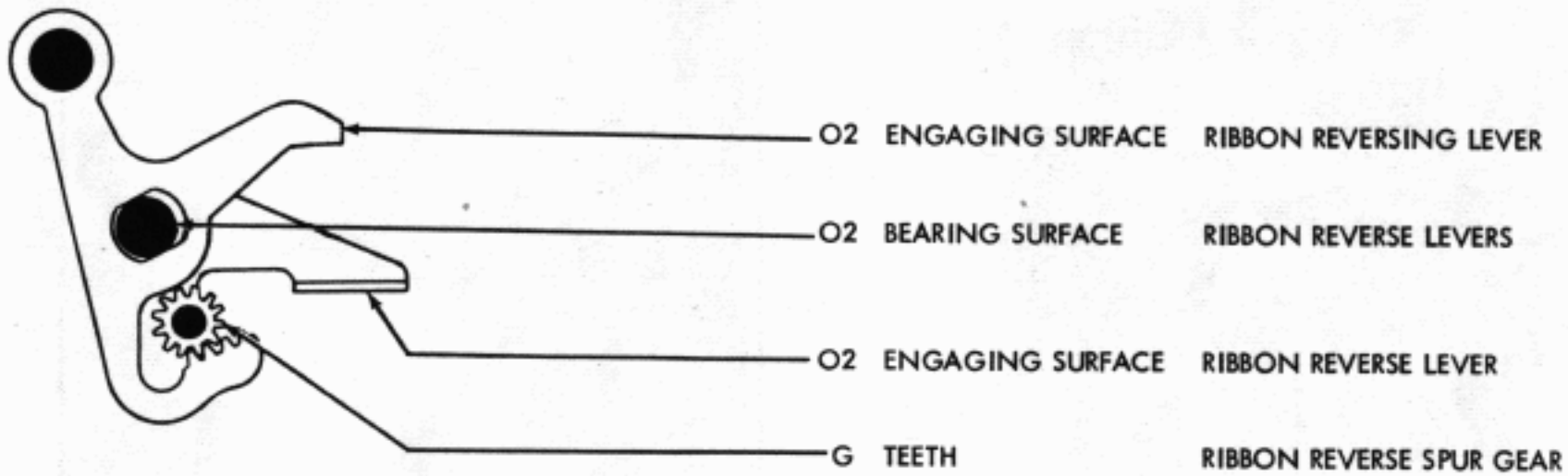


Figure 6-5 Typing Unit Lubrication - Ribbon Feed Mechanism, Right Side



3.11 RIBBON REVERSE MECHANISM



3.12 VERTICAL POSITIONING MECHANISM (Right Side)

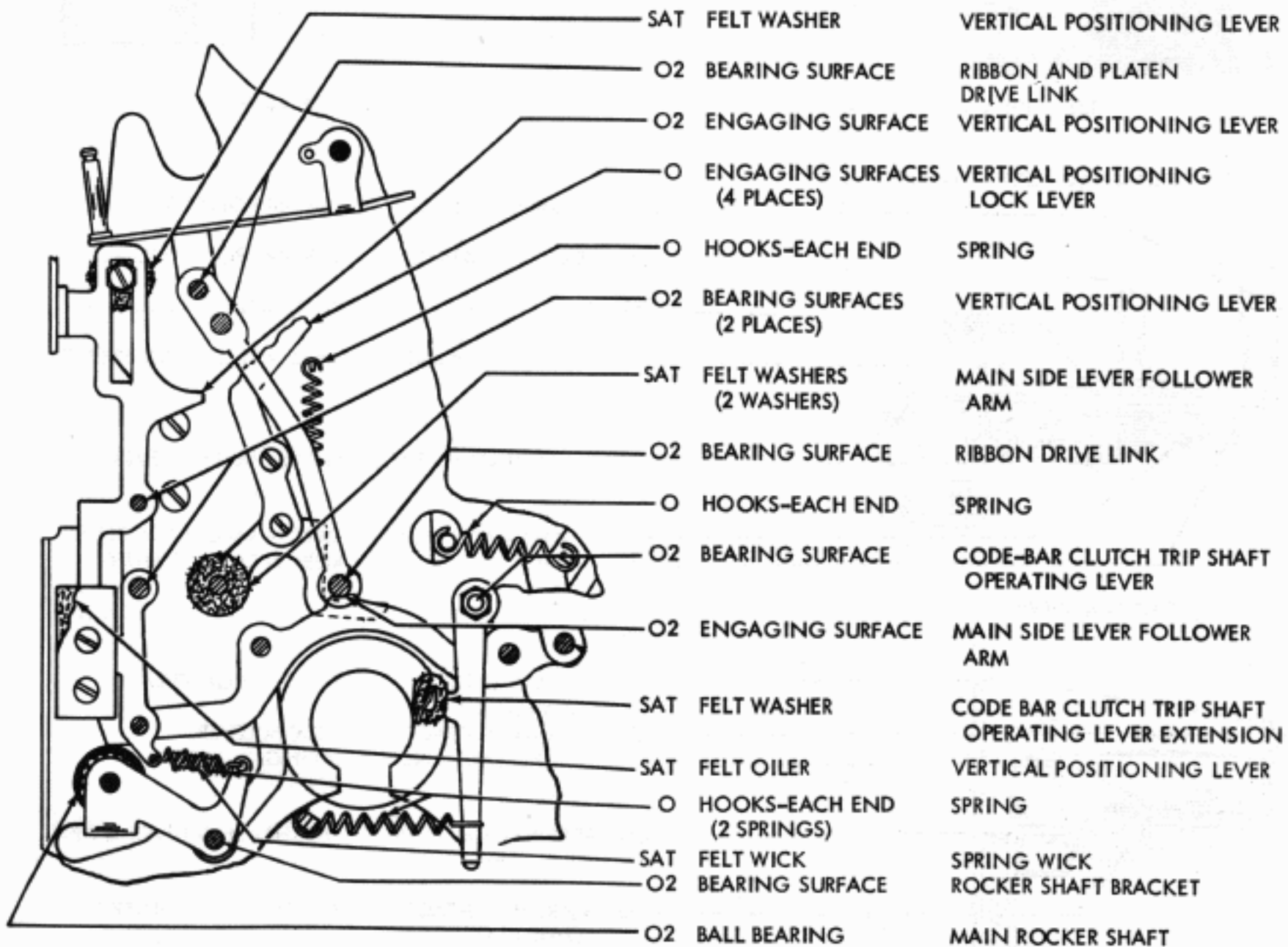
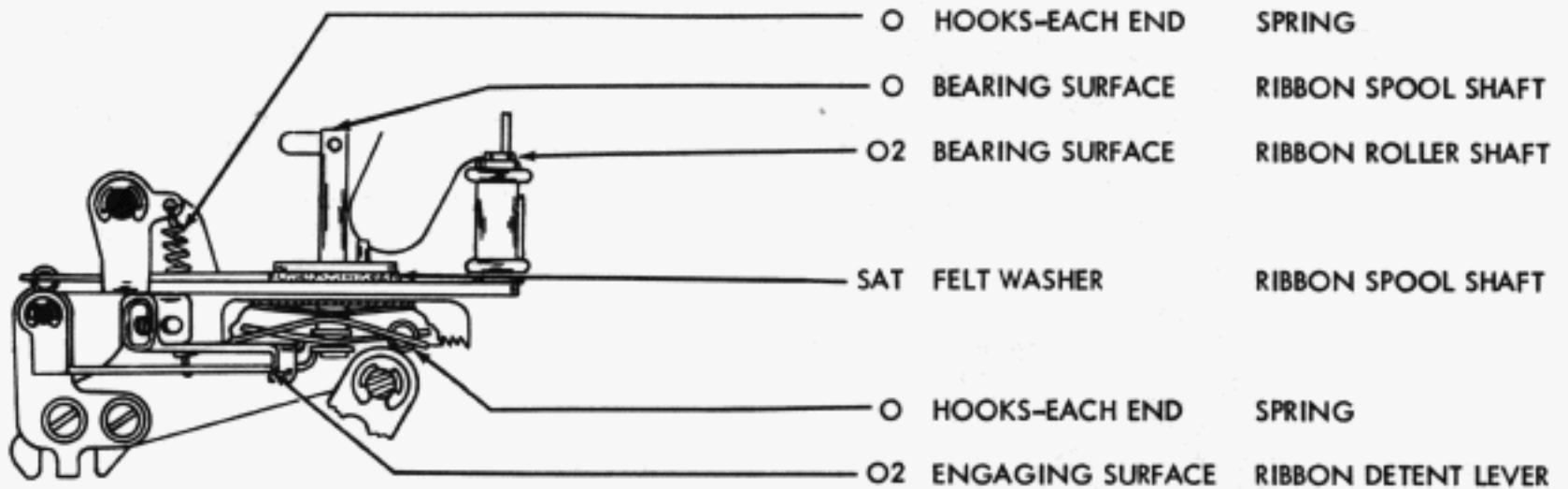
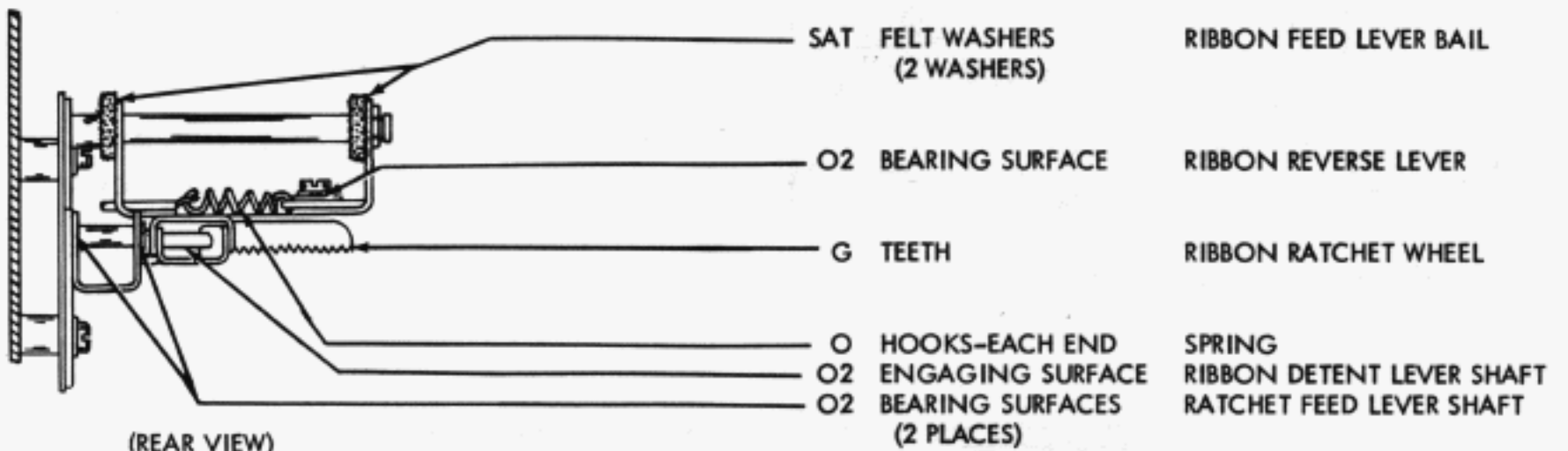


Figure 6-6 Typing Unit Lubrication - Ribbon Reverse and Vertical Positioning Mechanisms, Right Side

3.13 RIBBON FEED MECHANISM (Left Side)



(LEFT SIDE VIEW)



(REAR VIEW)

3.14 RIBBON FEED MECHANISM (Continued)

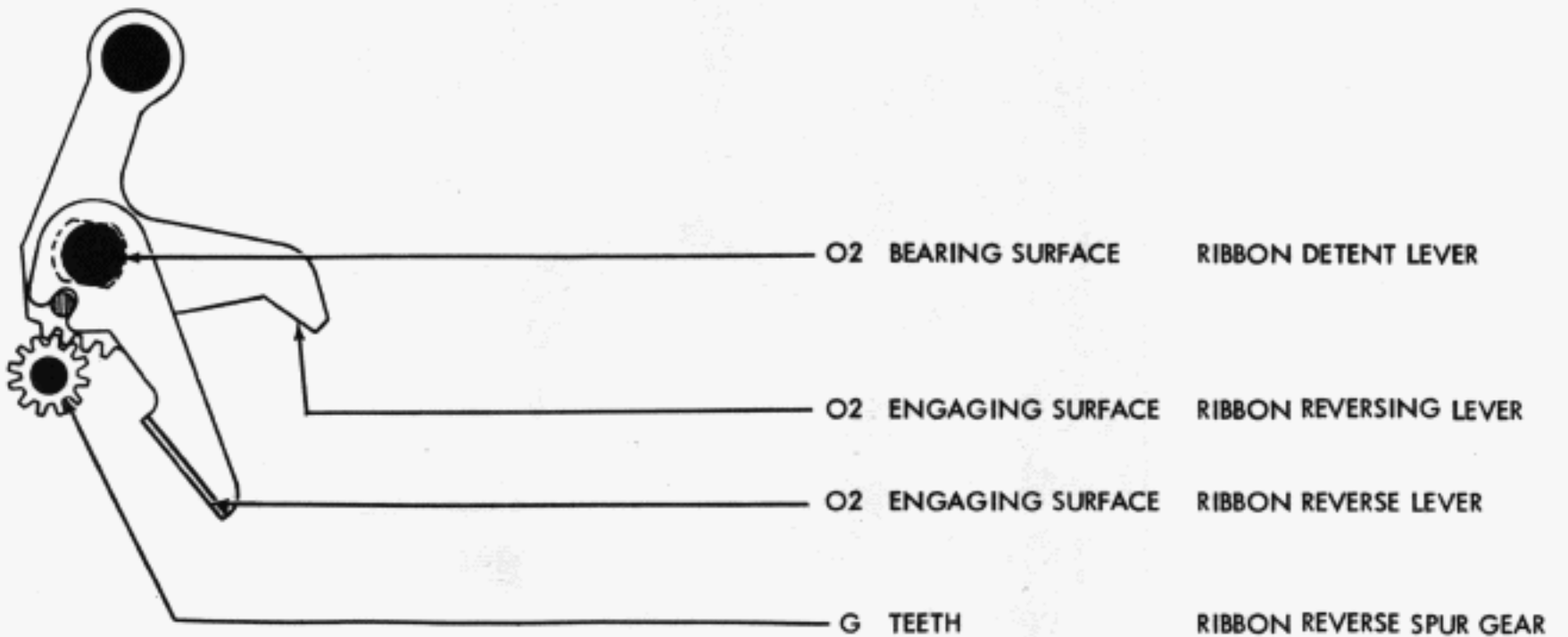
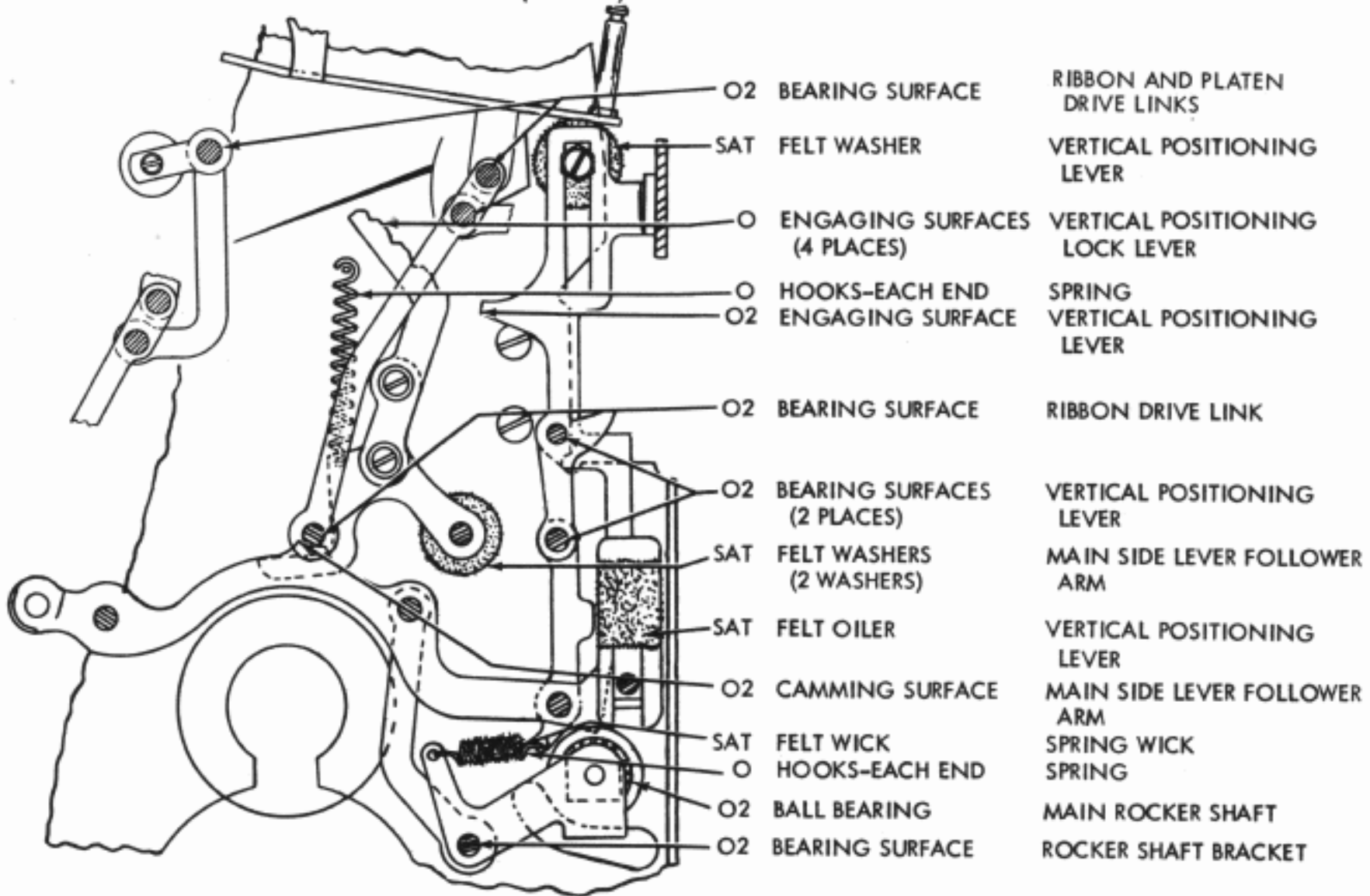


Figure 6-7 Typing Unit Lubrication - Ribbon Feed Mechanism, Left Side

3.15 VERTICAL POSITIONING MECHANISM (Left Side)



3.16 SELECTOR MECHANISMS (RIGHT SIDE VIEW)

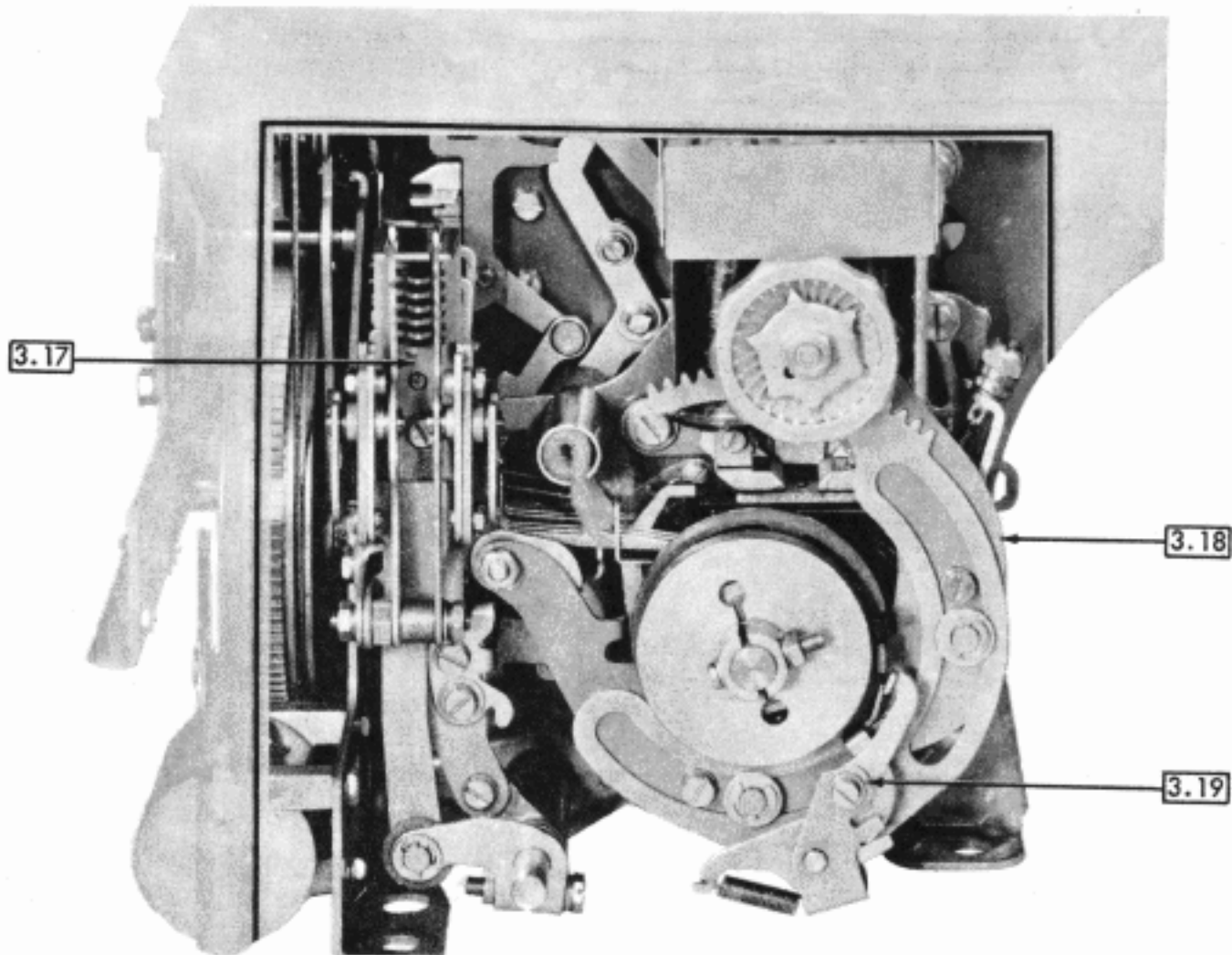
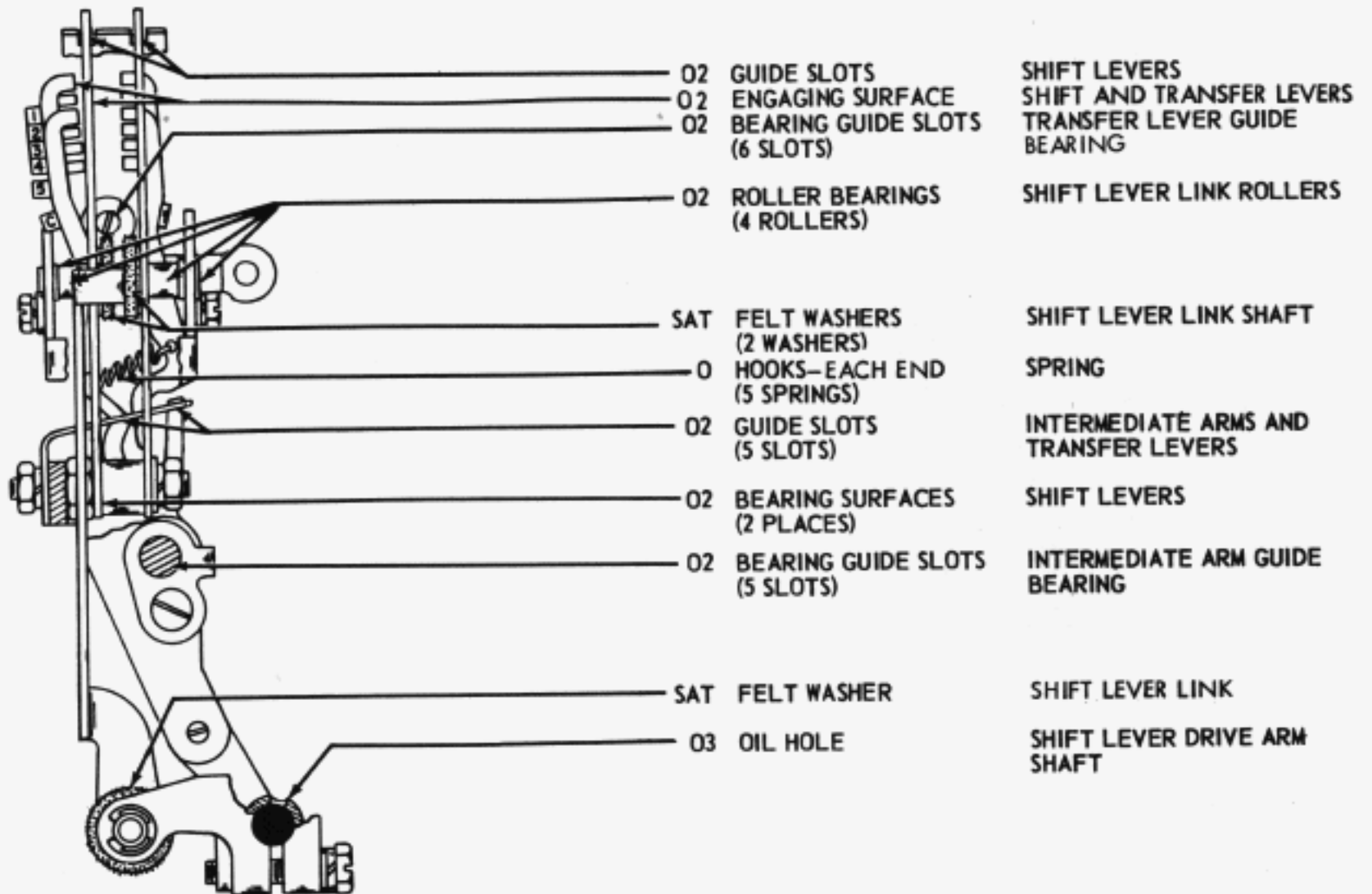


Figure 6-8 Typing Unit Lubrication - Vertical Positioning, Left Side, and Selector Mechanisms

3.17 CODE BAR MECHANISM



3.18 SELECTOR MECHANISM

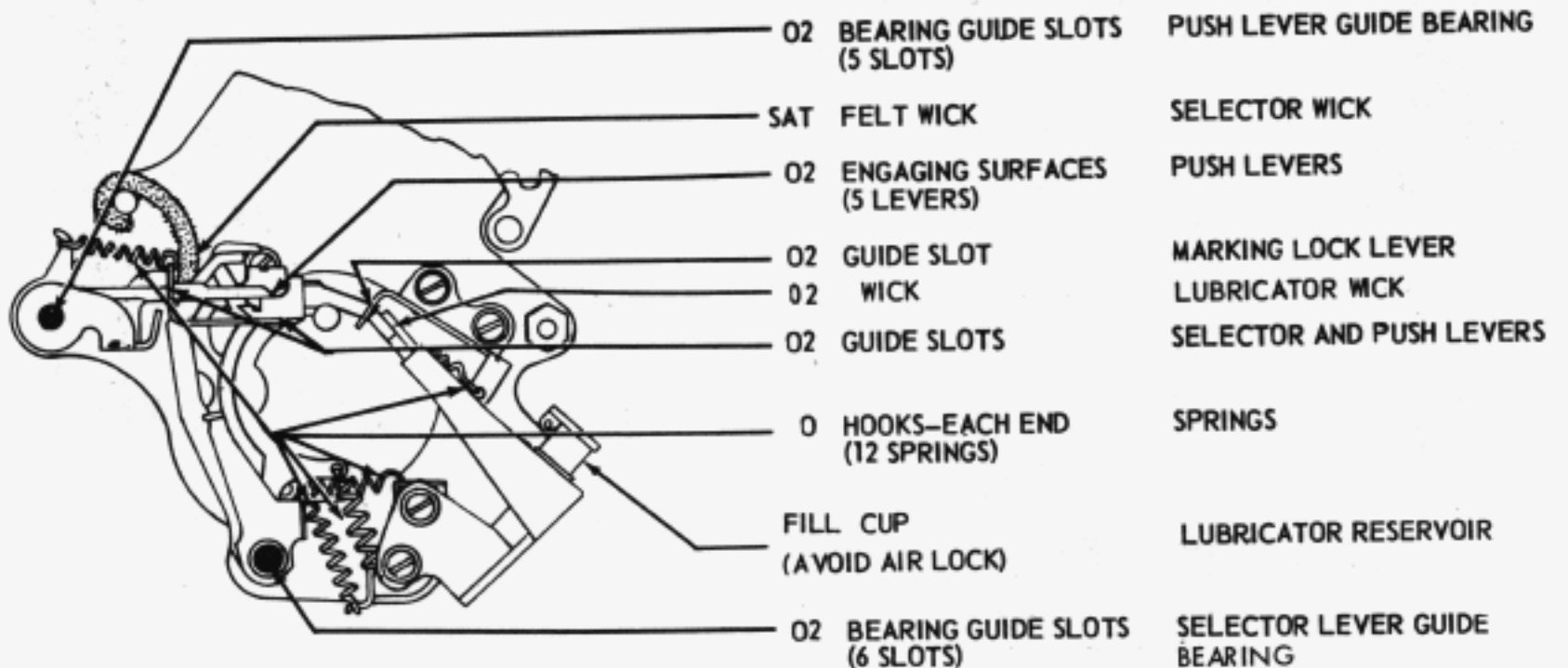
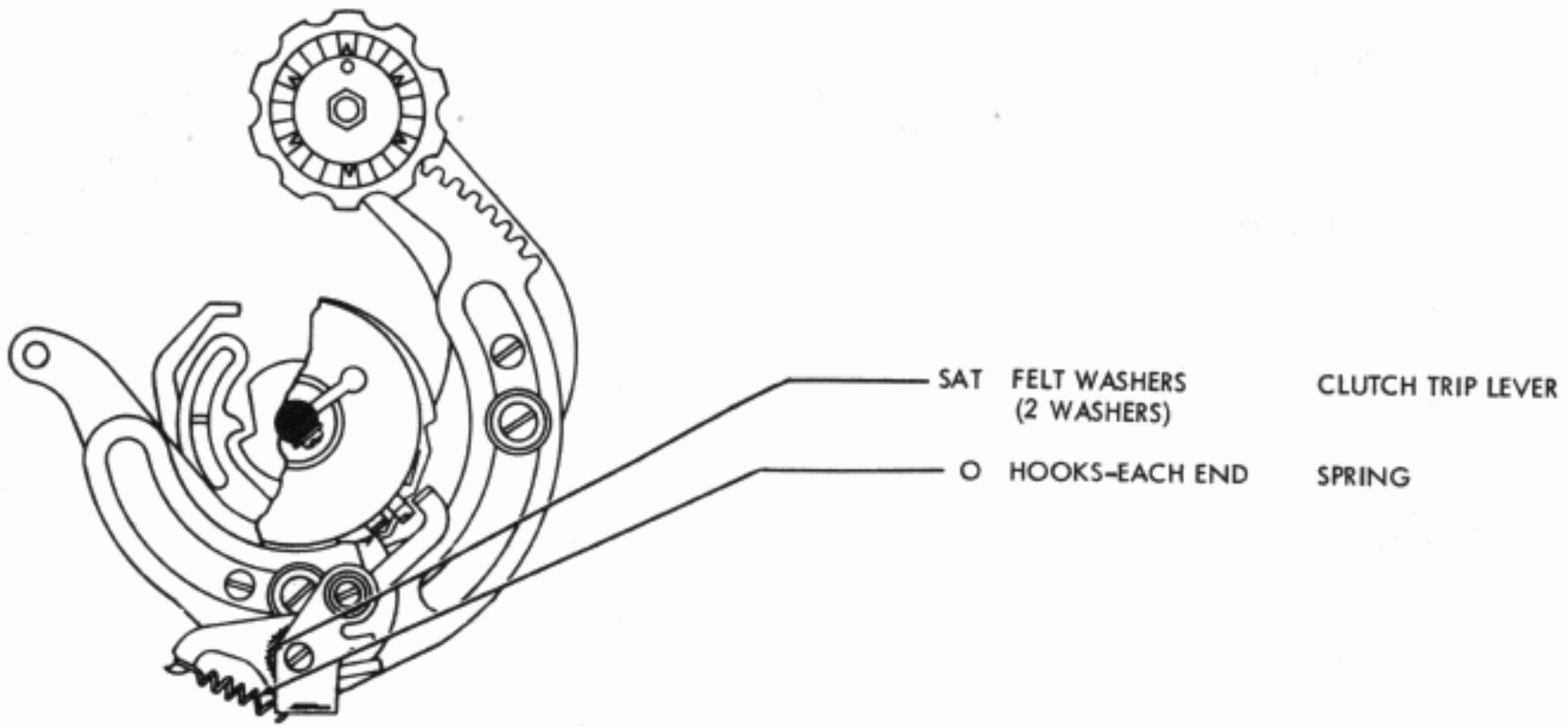


Figure 6-9 Typing Unit Lubrication - Code Bar and Selector Mechanisms

3.19 SELECTOR MECHANISM (Continued)



3.20 STUNT BOX MECHANISM

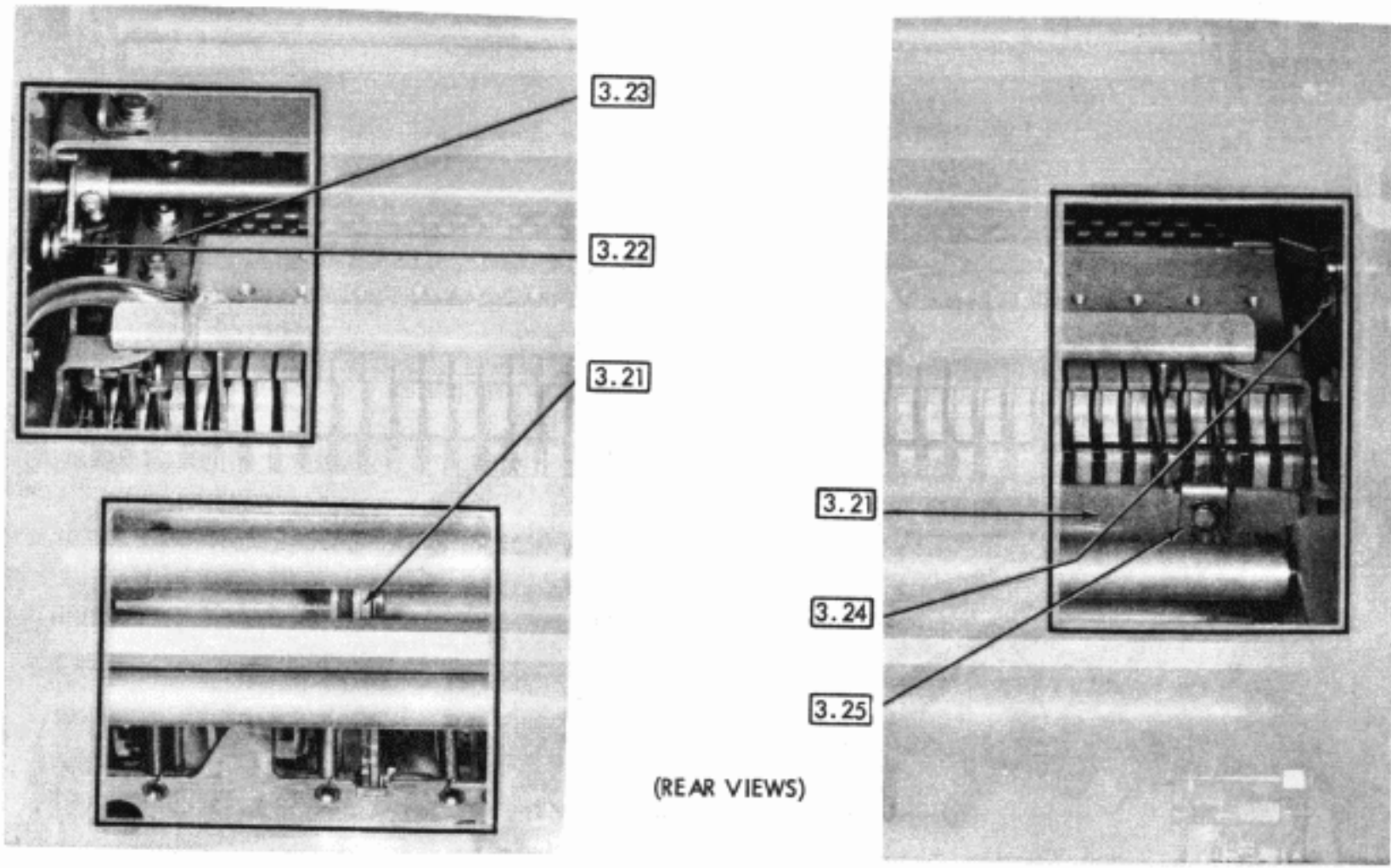
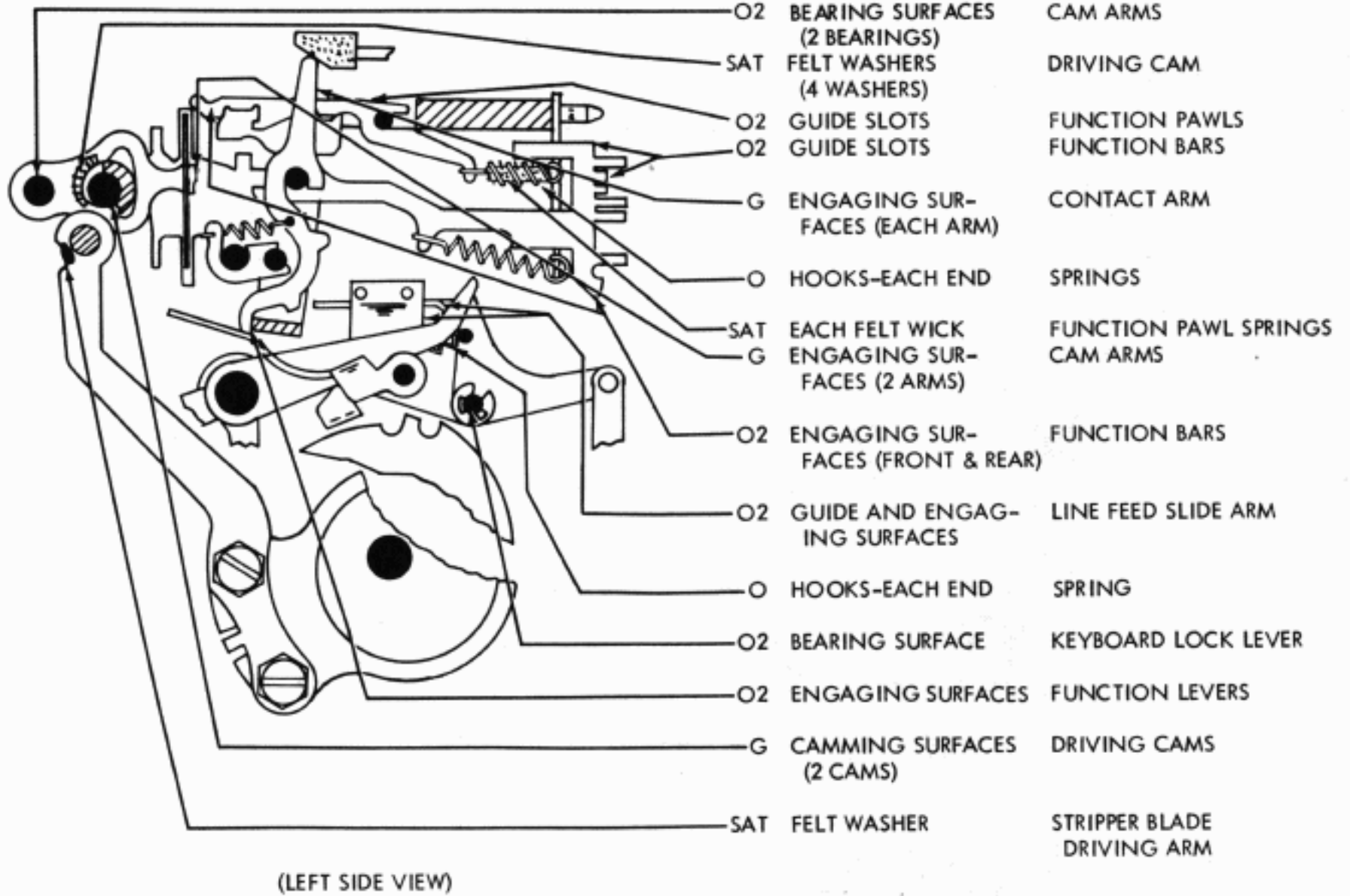


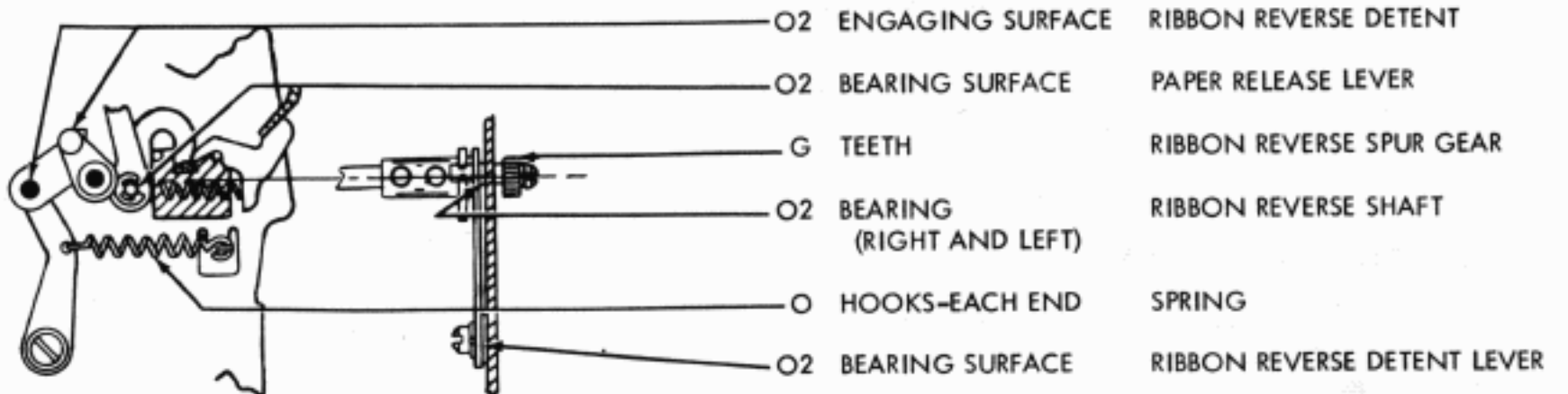
Figure 6-10 Typing Unit Lubrication - Selector and Stunt Box Mechanisms



3.21 STUNT BOX MECHANISM



3.22 RIBBON REVERSE MECHANISM



3.23 SHIFT MECHANISM

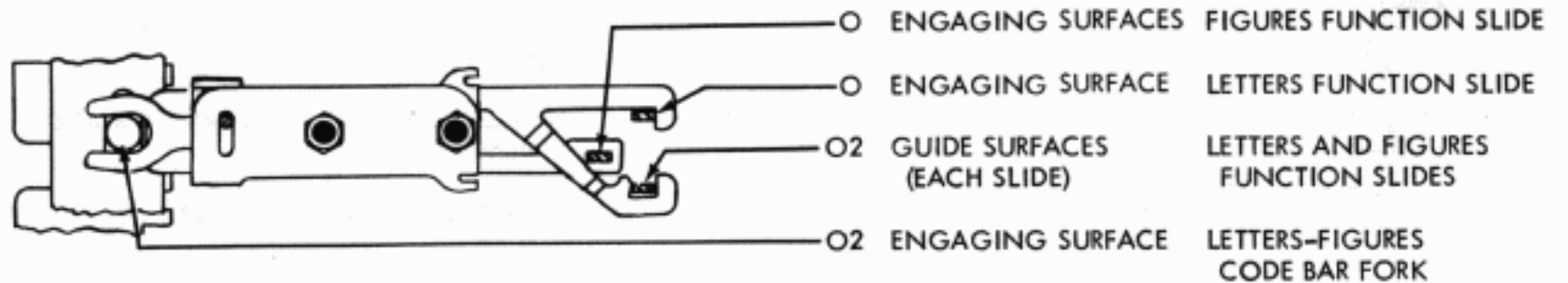
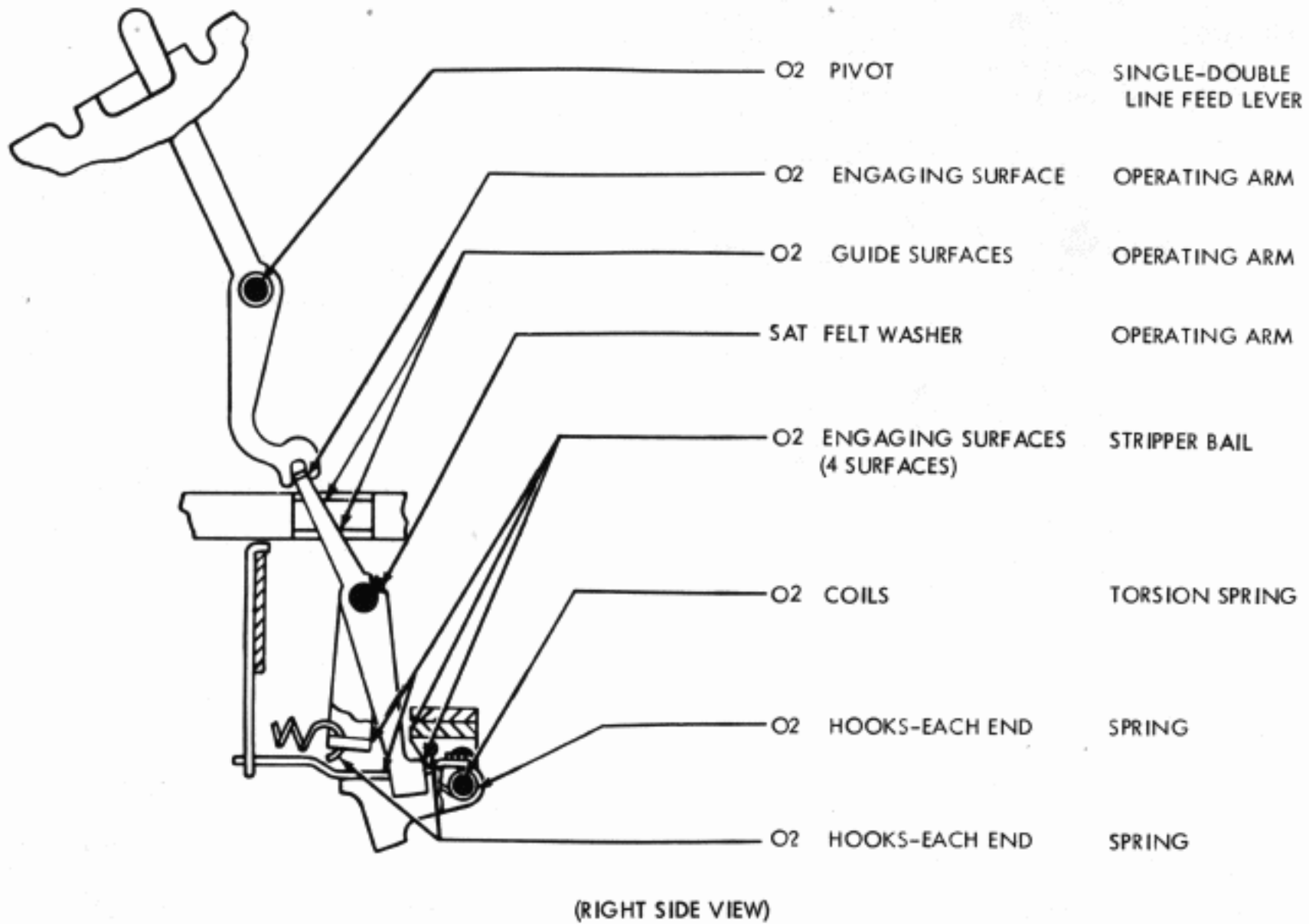


Figure 6-11 Typing Unit Lubrication - Stunt Box, Ribbon Reverse and Shift Mechanism

3.24 SINGLE-DOUBLE LINE FEED MECHANISM



3.25 STRIPPER BLADE MECHANISM

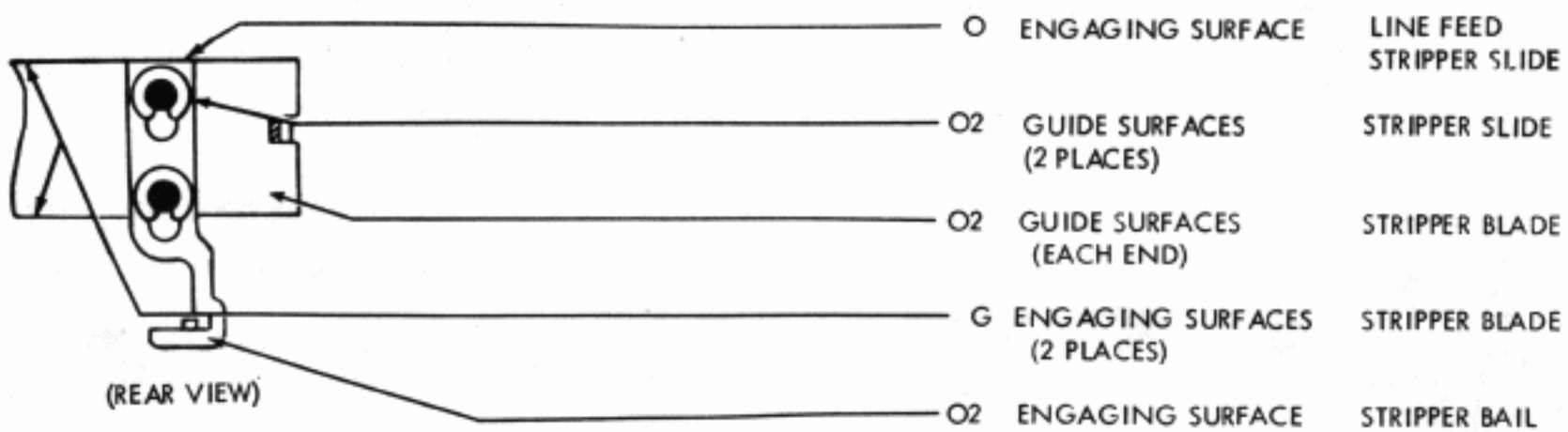
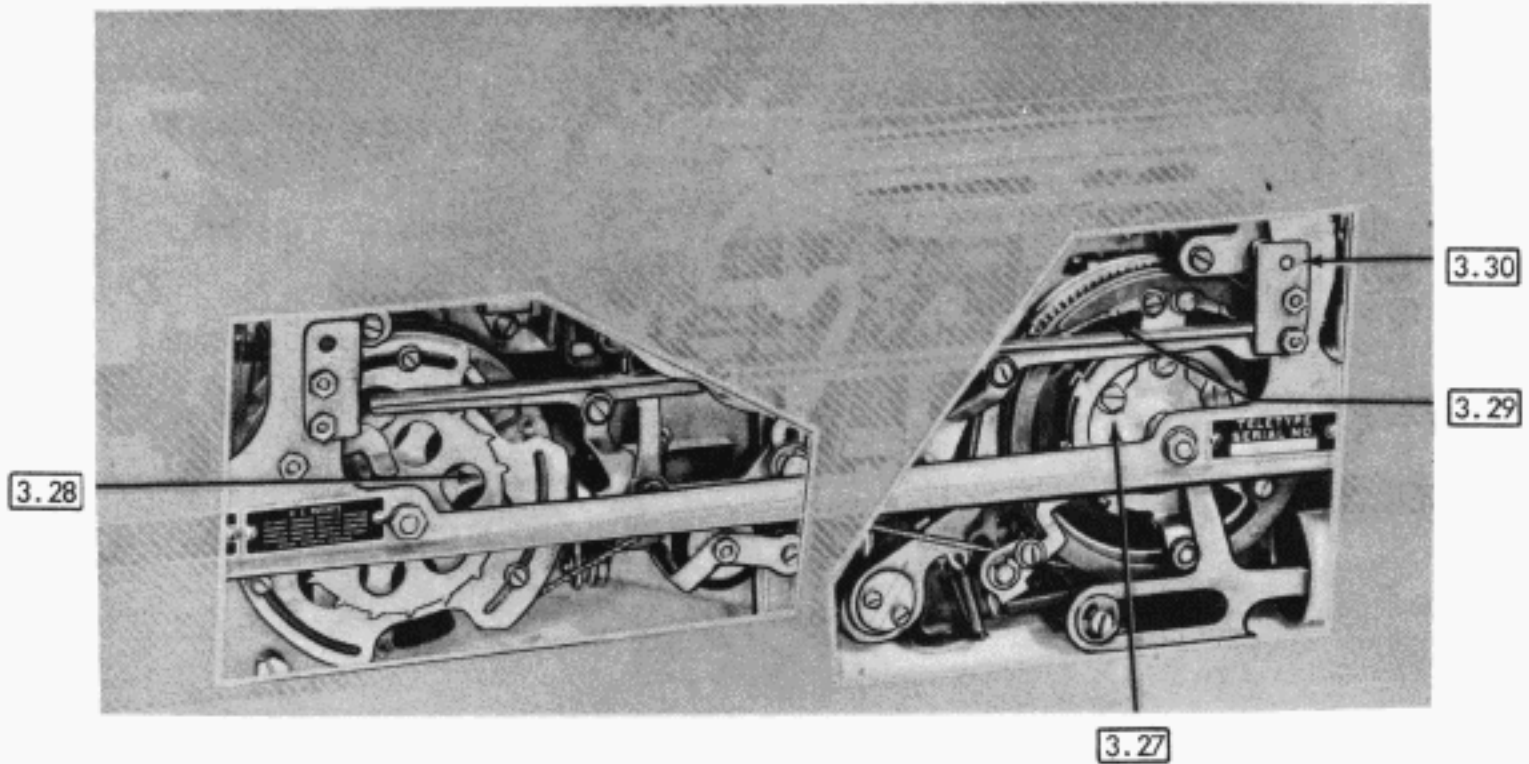


Figure 6-12 Typing Unit Lubrication - Single-Double Line Feed and Stripper Blade Mechanisms

3.26 SPACING DRUM DRIVE MECHANISM



3.27 SPACING DRUM DRIVE MECHANISM

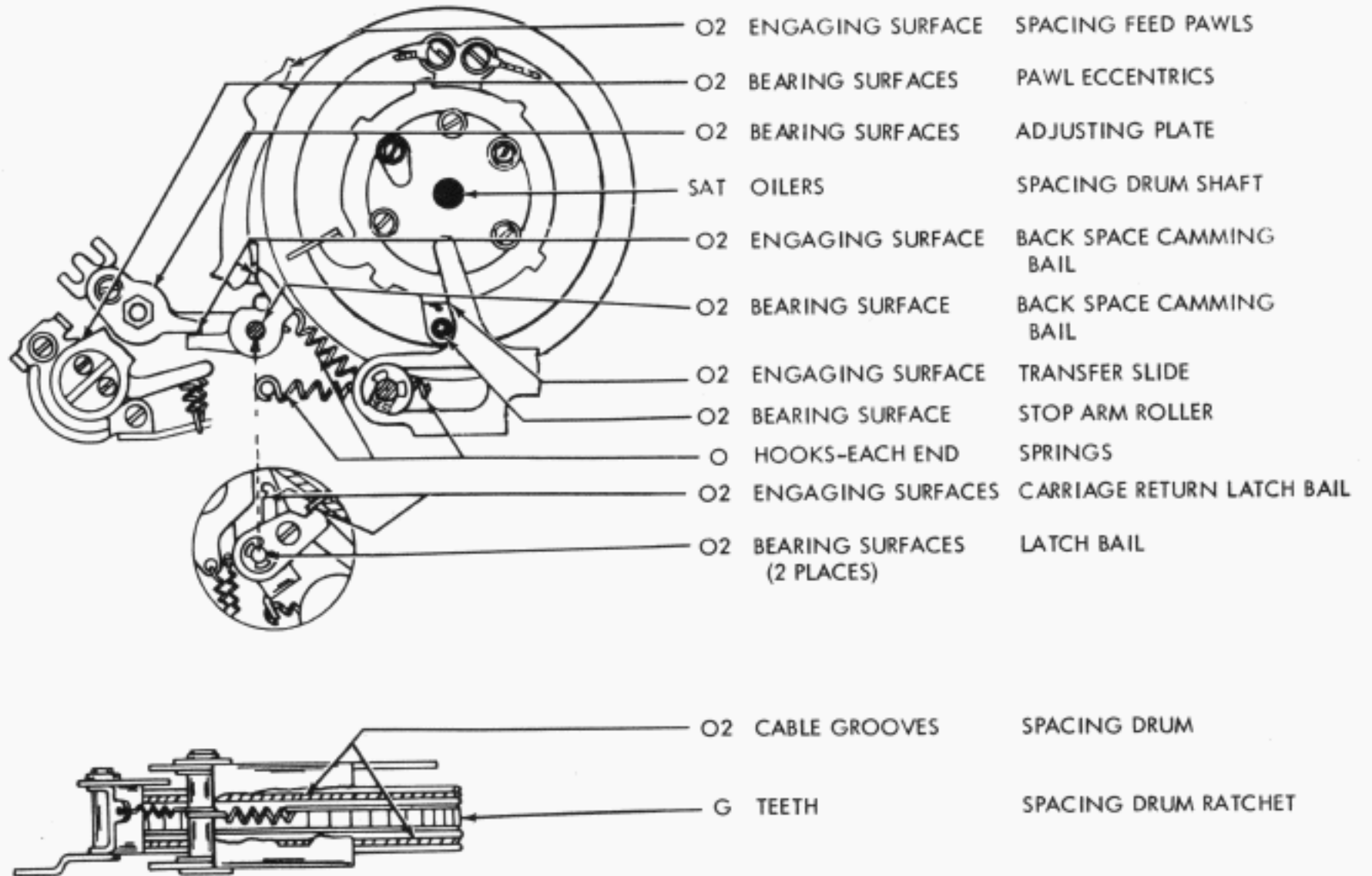
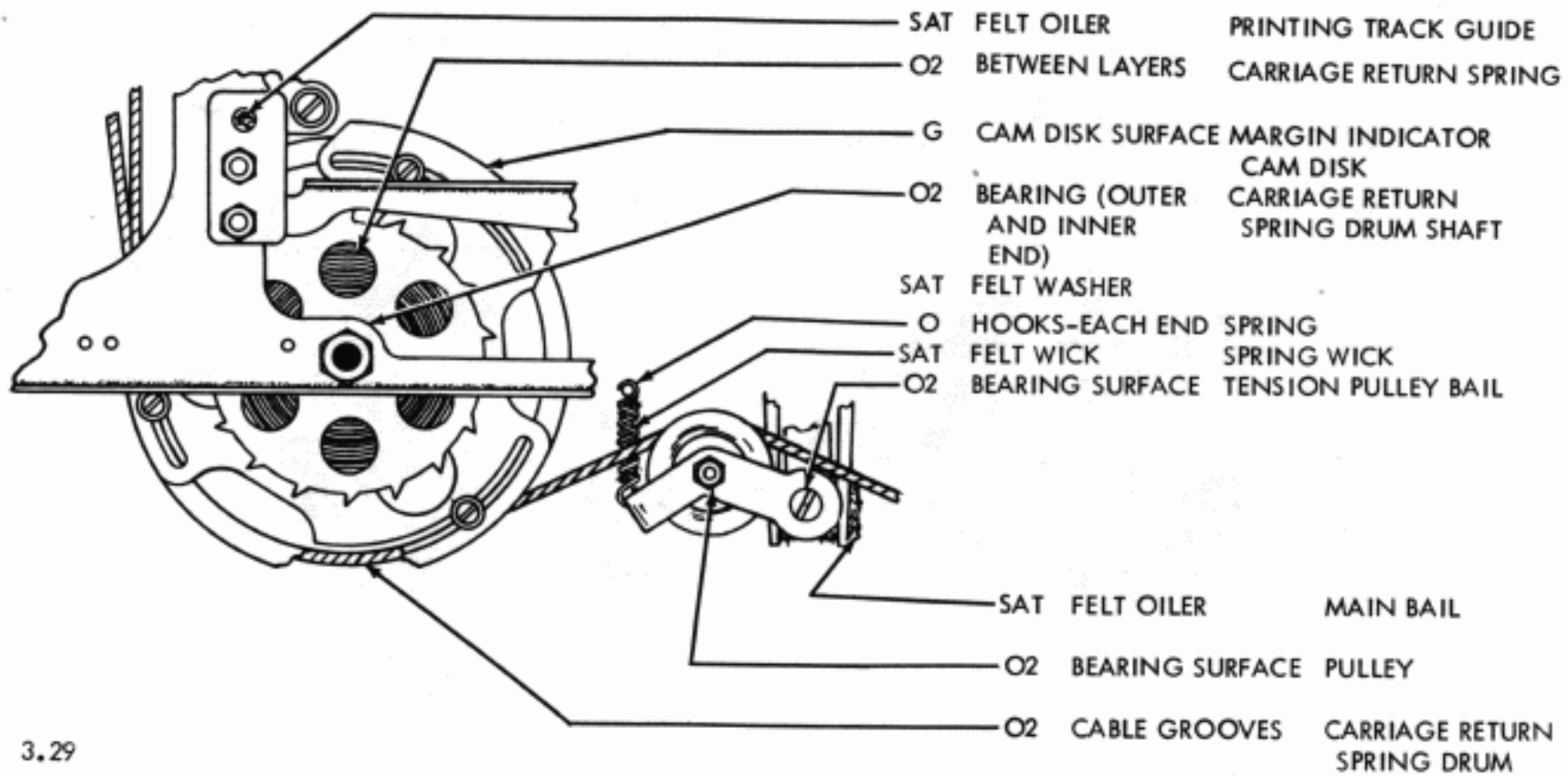
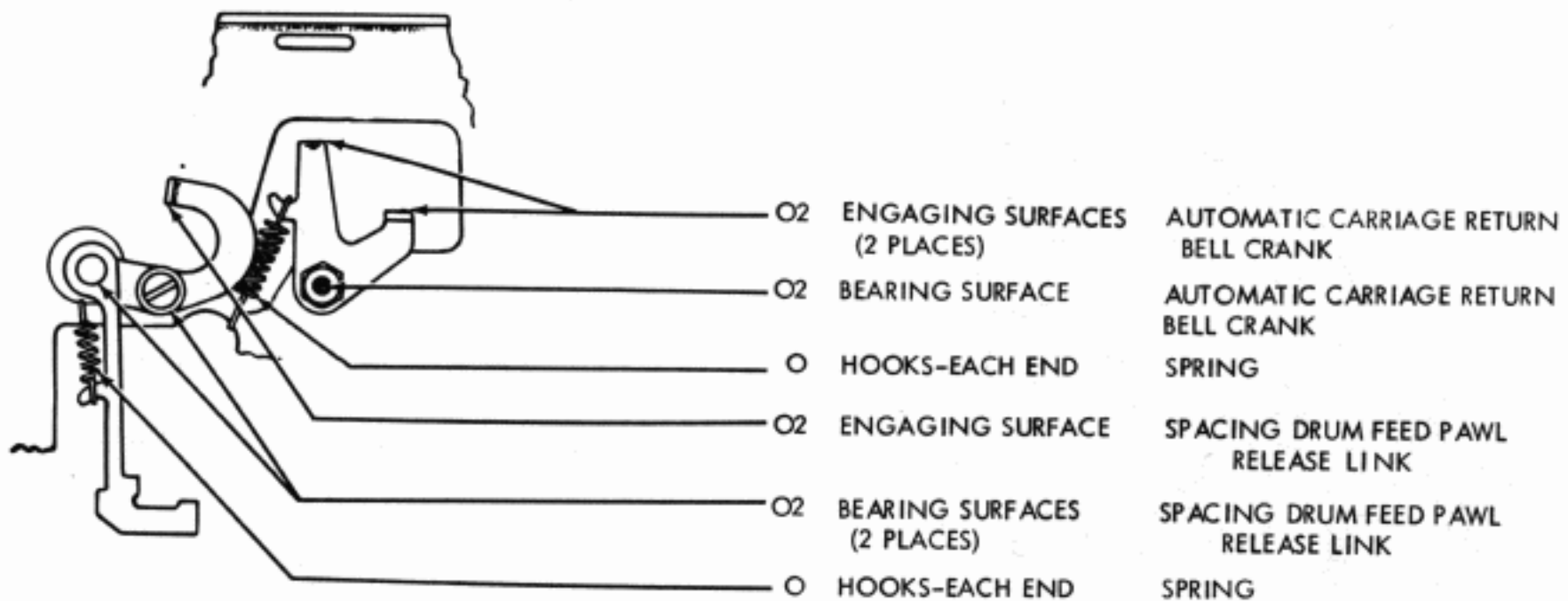


Figure 6-13 Typing Unit Lubrication - Spacing Drum Drive Mechanism

3.28 CARRIAGE RETURN MECHANISM



3.29



3.30

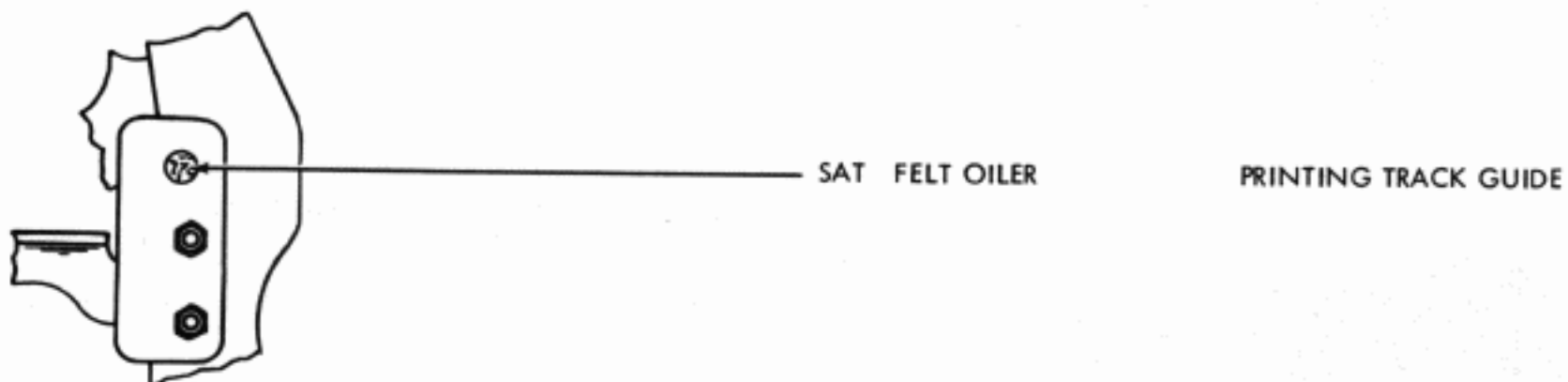
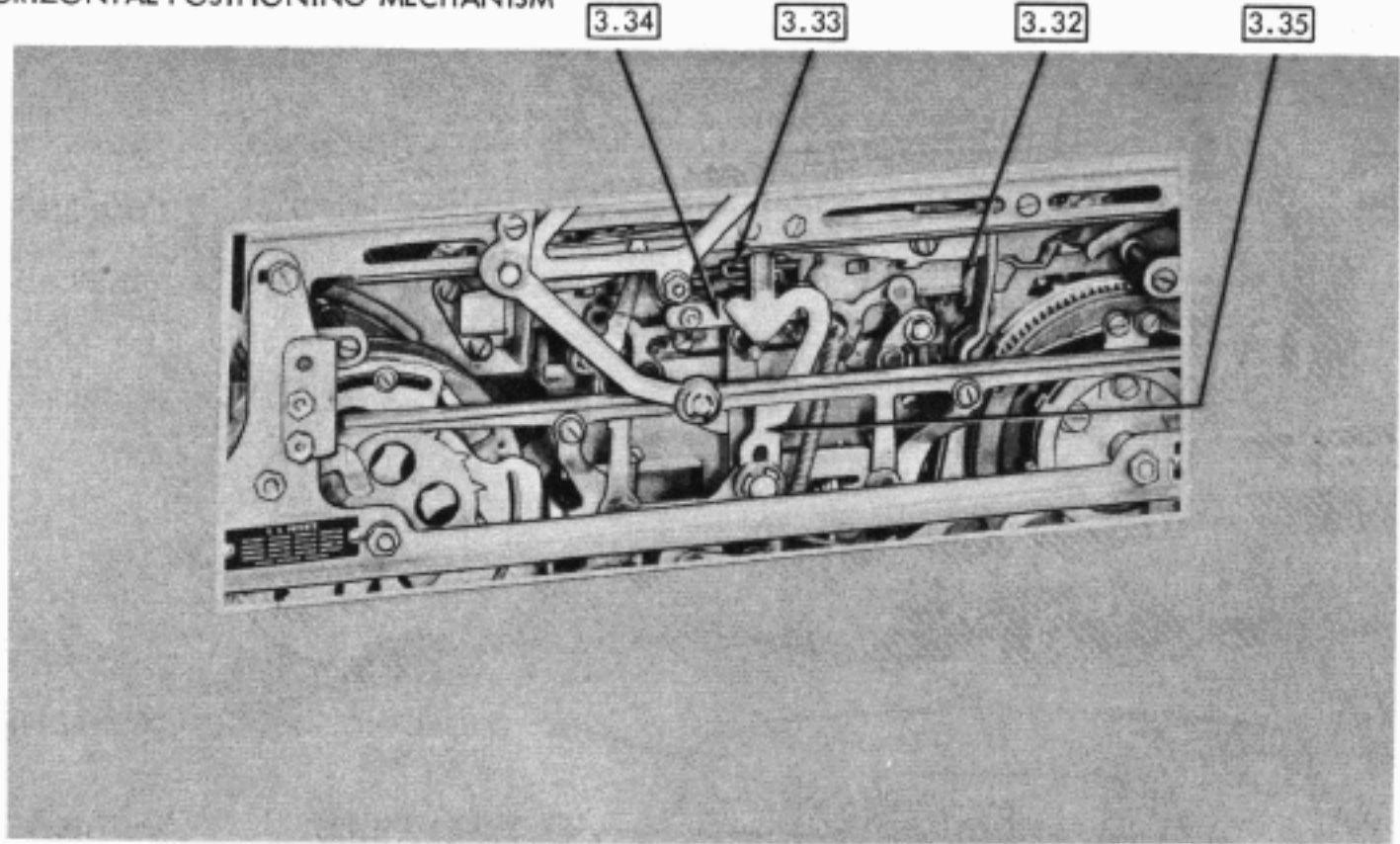


Figure 6-14 Typing Unit Lubrication - Carriage Return Mechanism

3.31 HORIZONTAL POSITIONING MECHANISM



3.32 HORIZONTAL POSITIONING MECHANISM (FRONT VIEW)

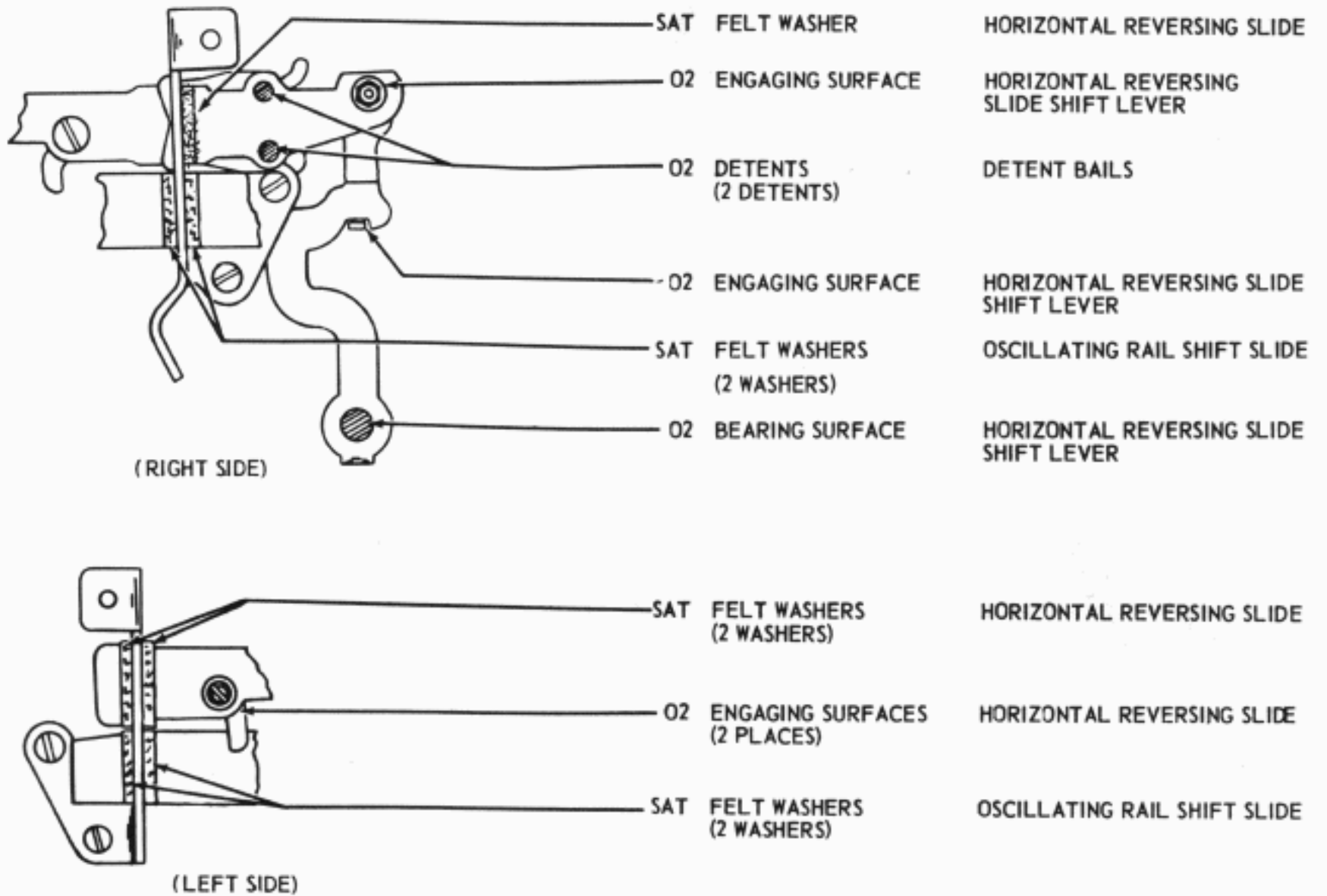
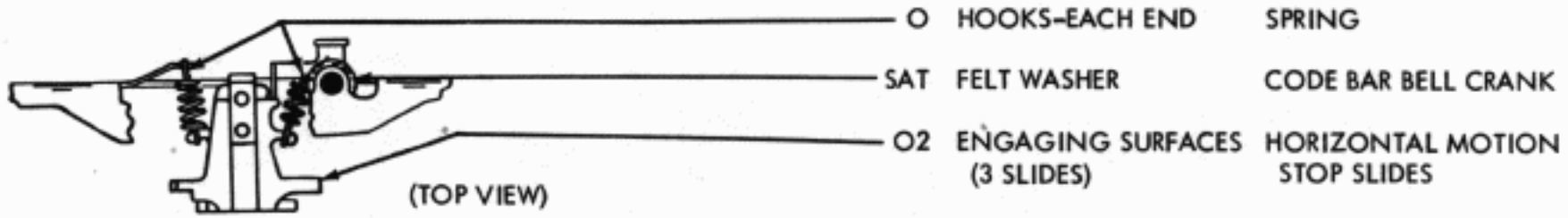


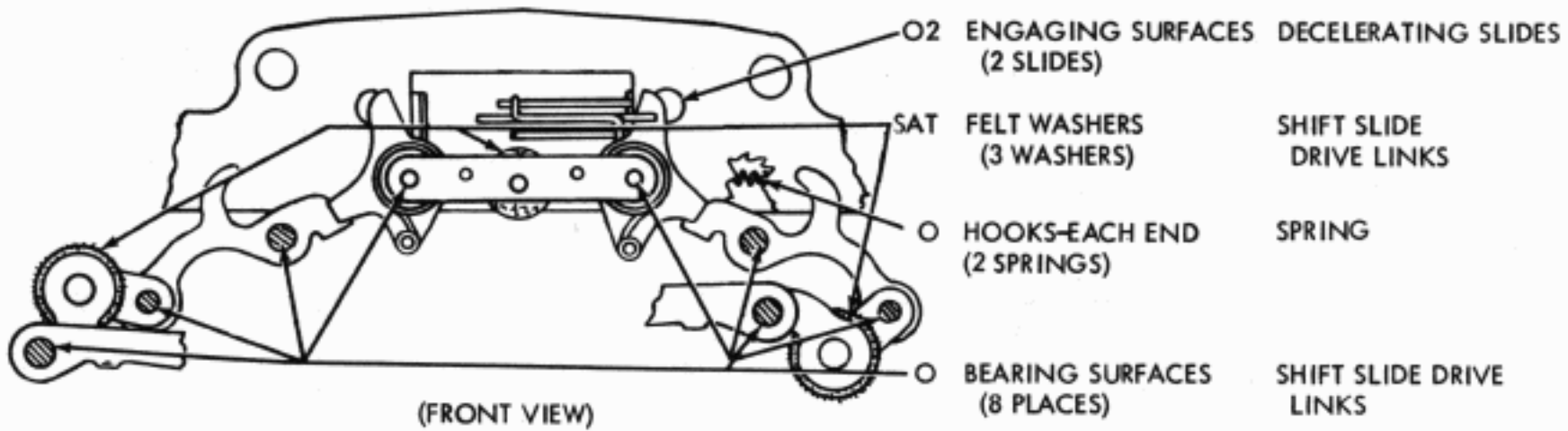
Figure 6-15 Typing Unit Lubrication - Horizontal Positioning Mechanism, Front View



3.33 HORIZONTAL POSITIONING MECHANISM (Continued)



3.34



3.35 HORIZONTAL POSITIONING MECHANISM (Continued)

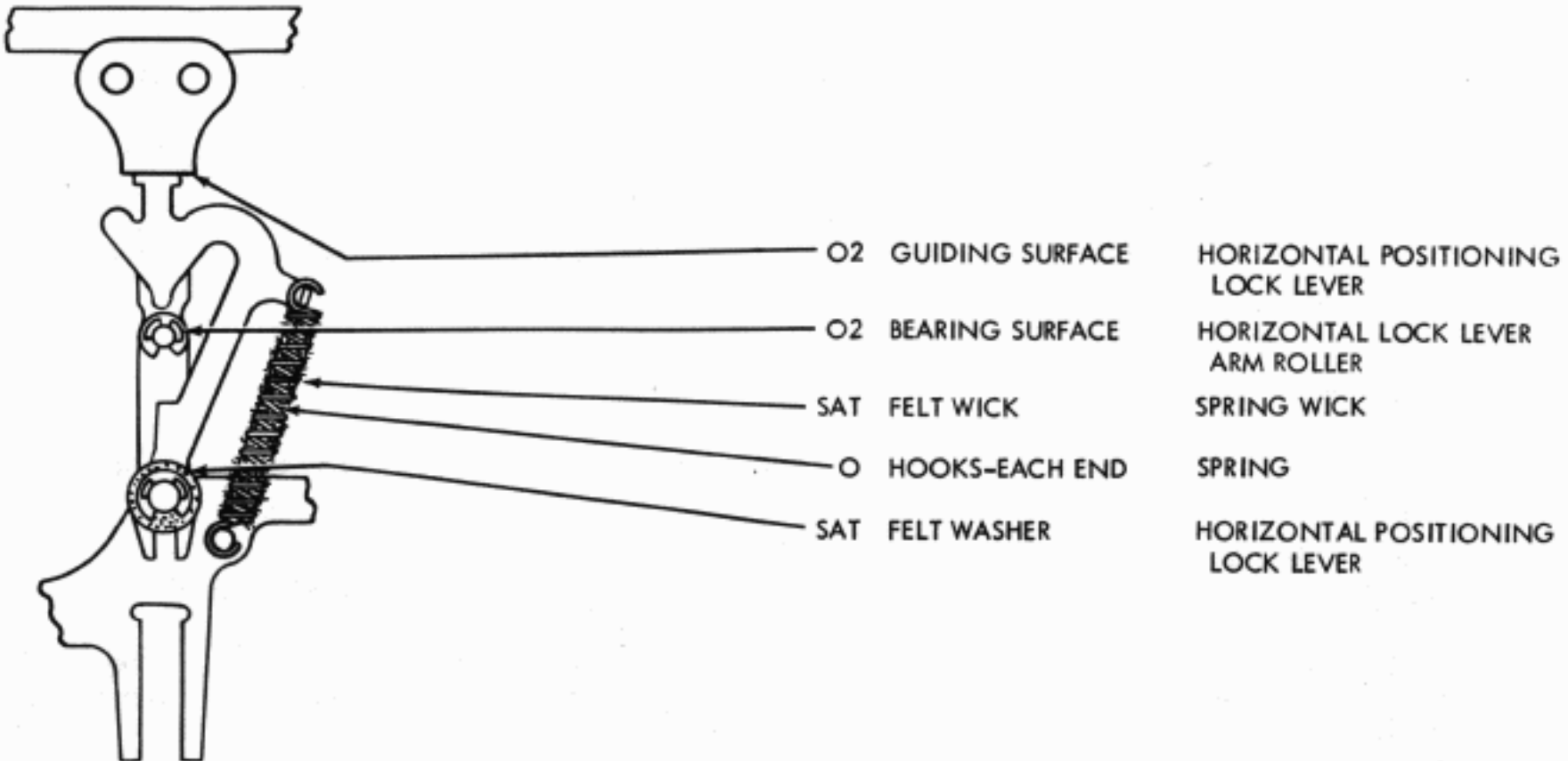
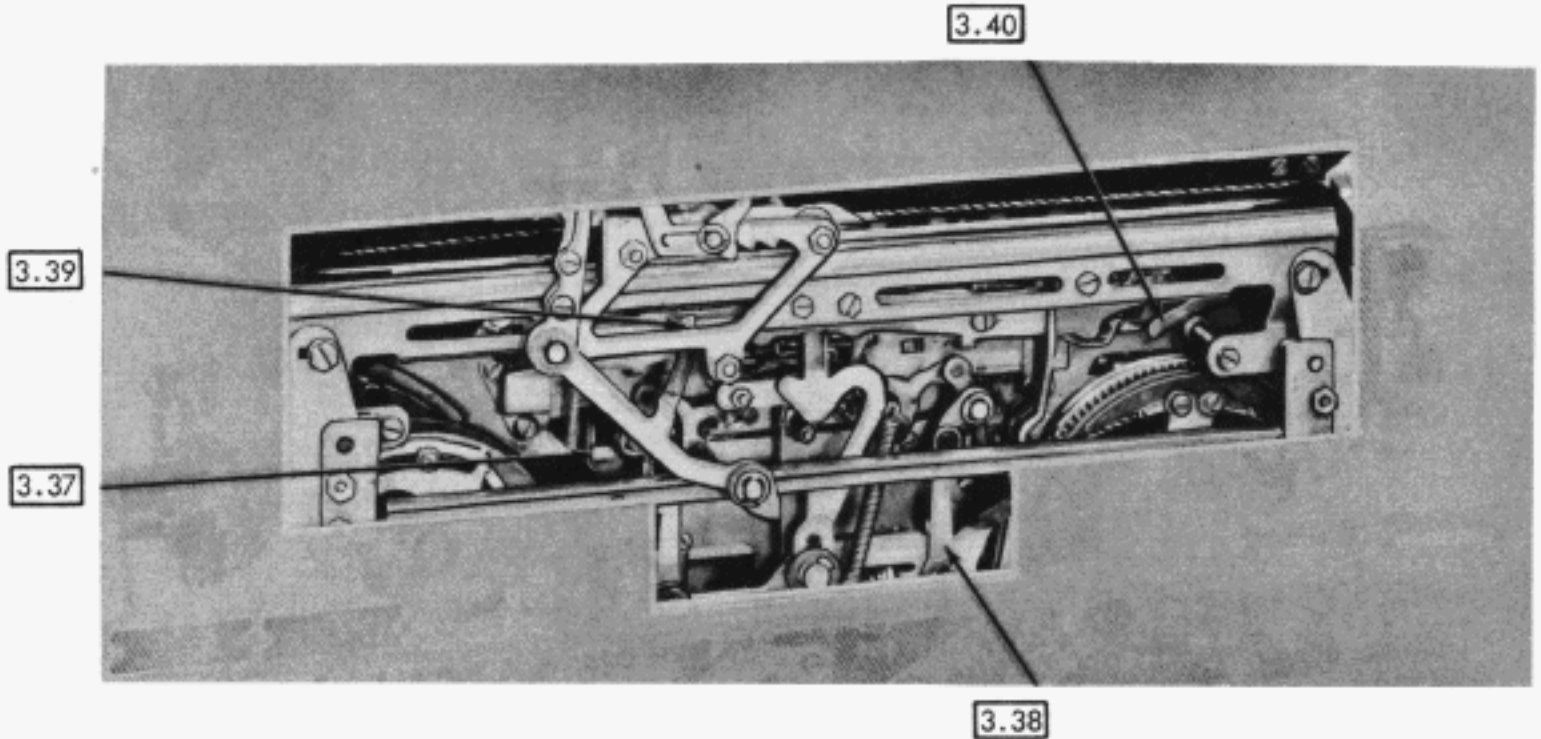


Figure 6-16 Typing Unit Lubrication - Horizontal Positioning Mechanism

3.36 LETTERS-FIGURES SHIFT MECHANISM



(Front View)

(TYPING UNIT IN UPRIGHT POSITION)

3.37 LETTERS-FIGURES SHIFT MECHANISM

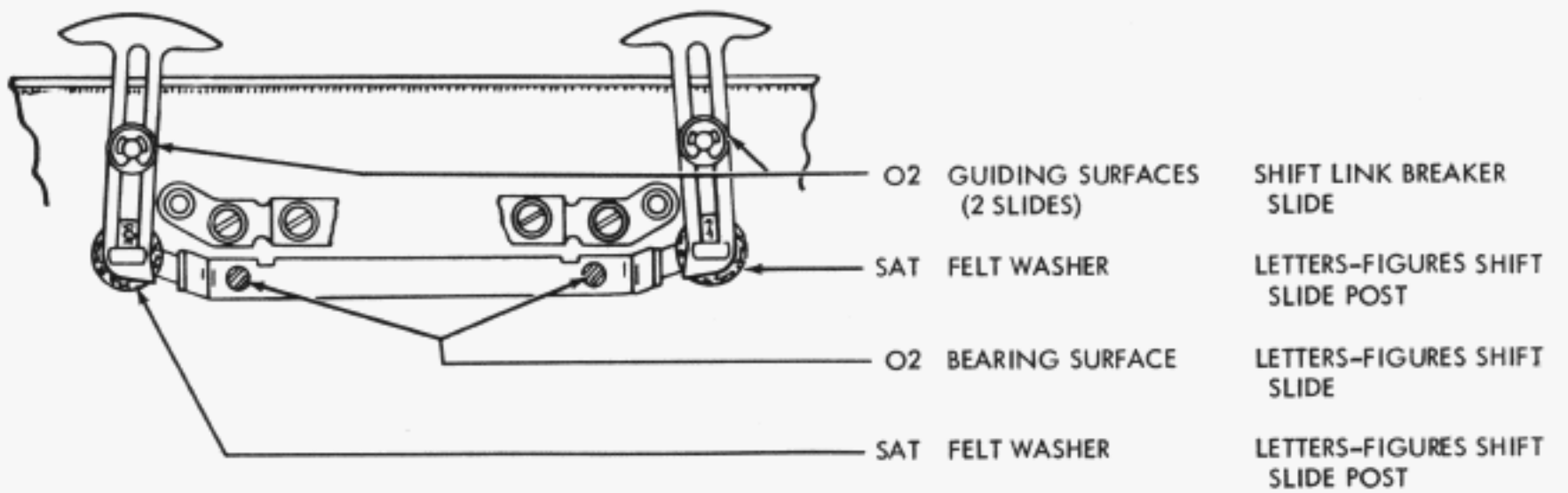
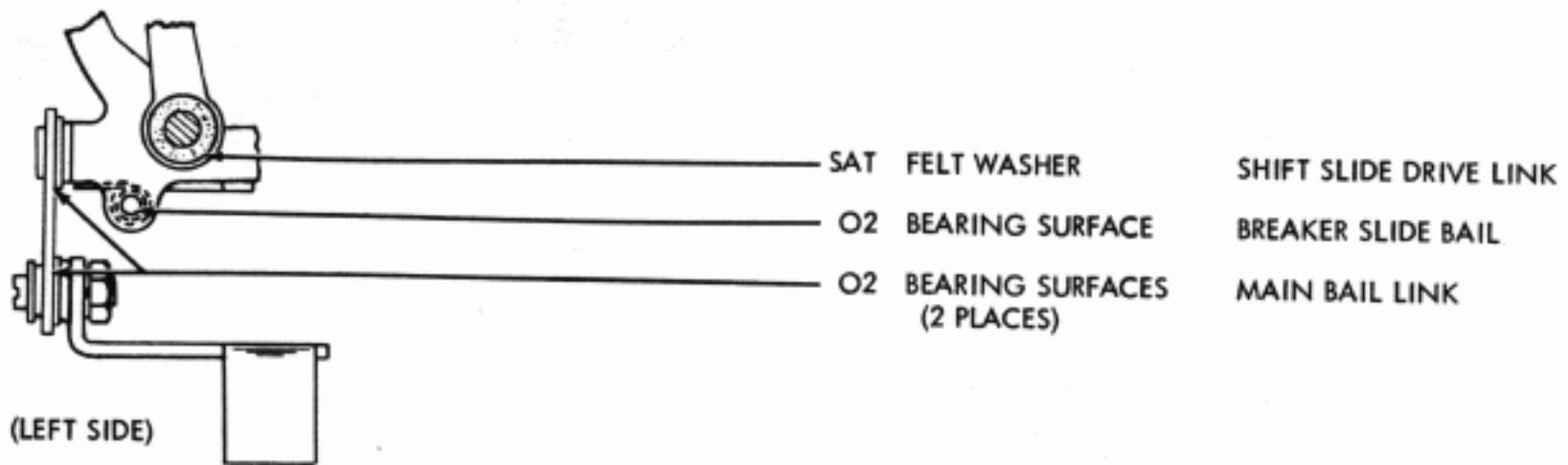
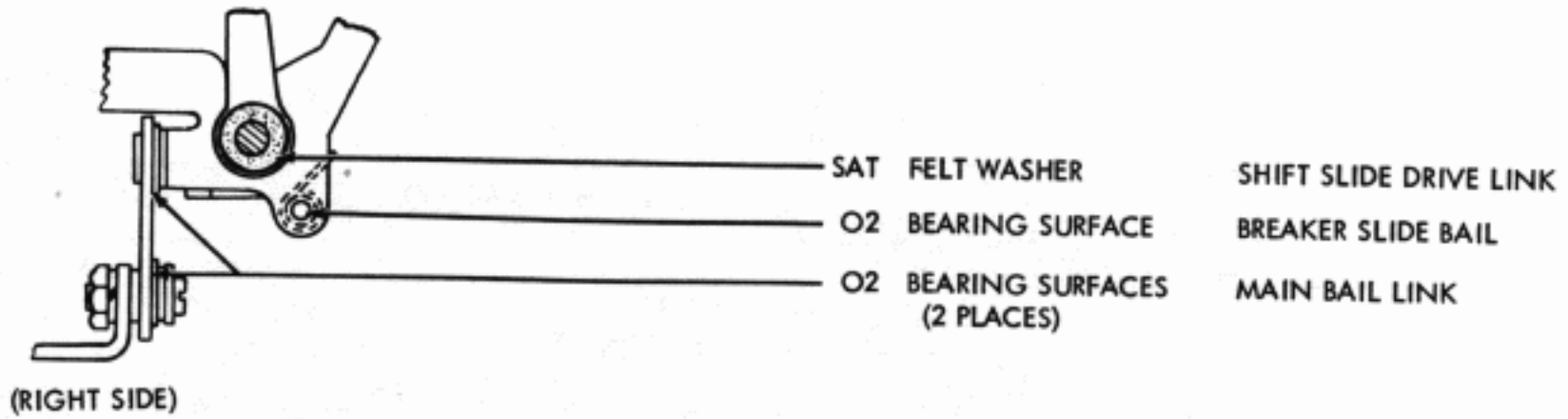


Figure 6-17 Typing Unit Lubrication - Letters-Figures Shift Mechanism

3.38 LETTERS-FIGURES SHIFT MECHANISM (Continued)



3.39 OSCILLATING MECHANISM

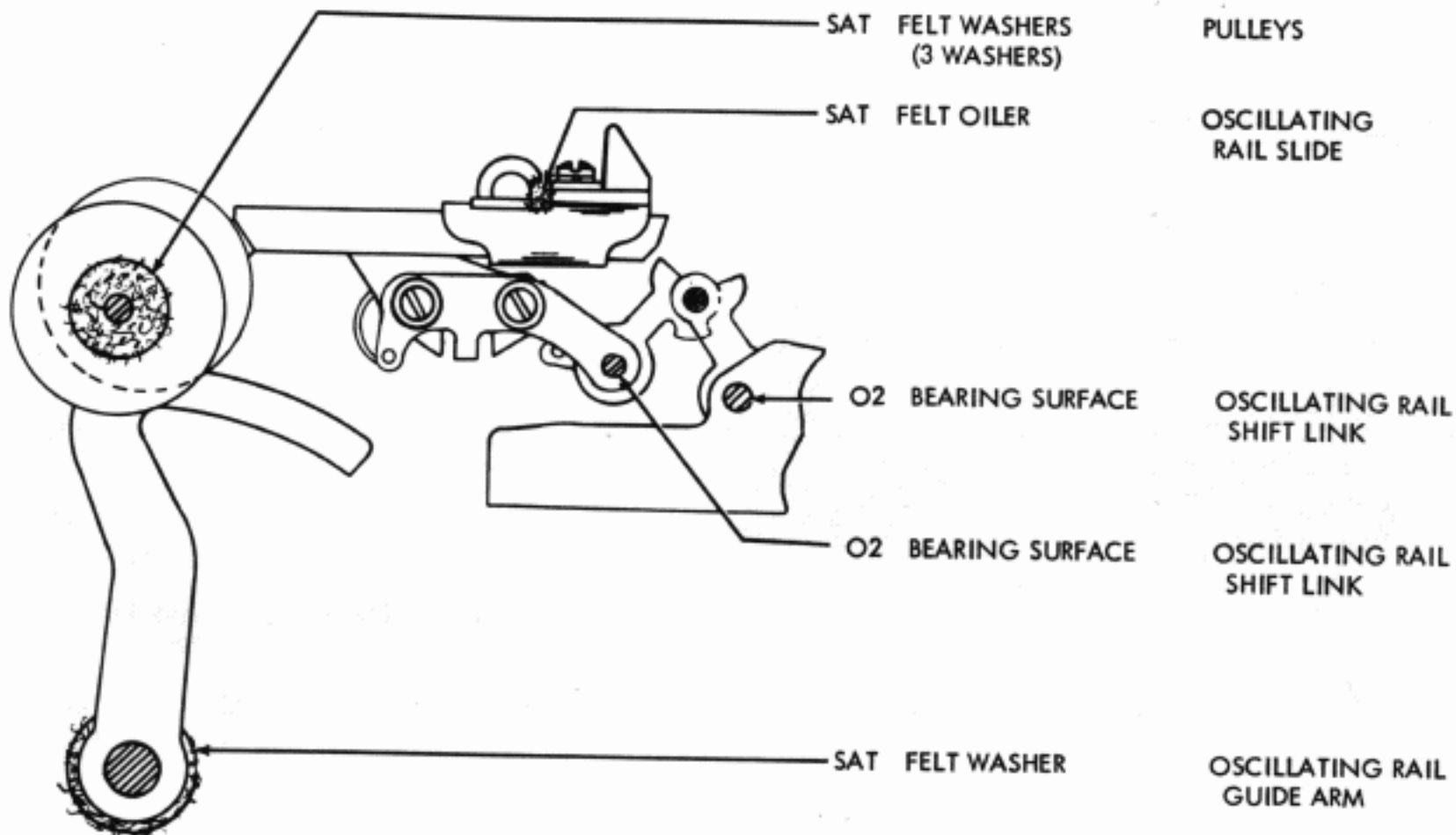
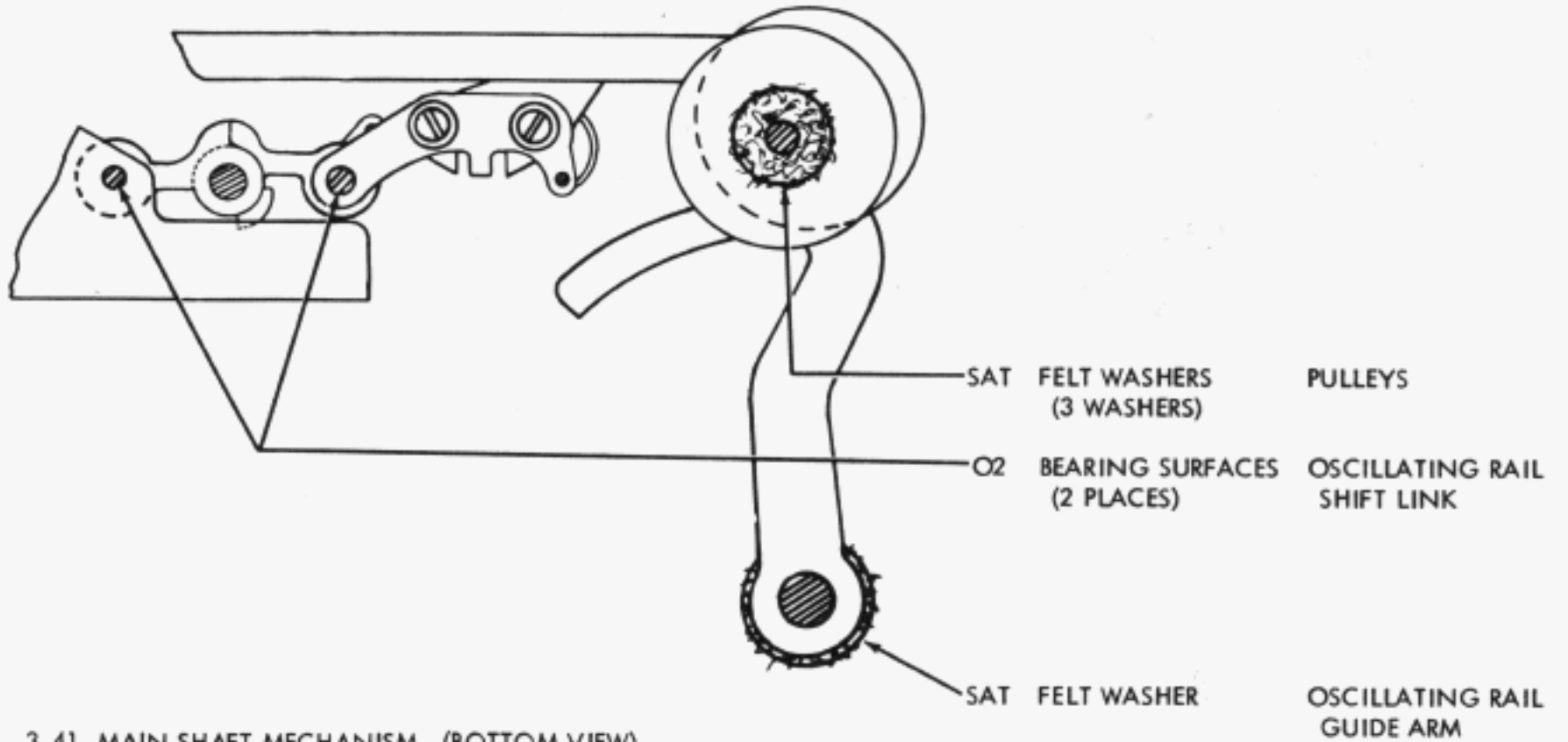


Figure 6-18 Typing Unit Lubrication - Letters-Figures Shift and Oscillating Mechanisms

3.40 OSCILLATING MECHANISM (Continued)



3.41 MAIN SHAFT MECHANISM (BOTTOM VIEW)

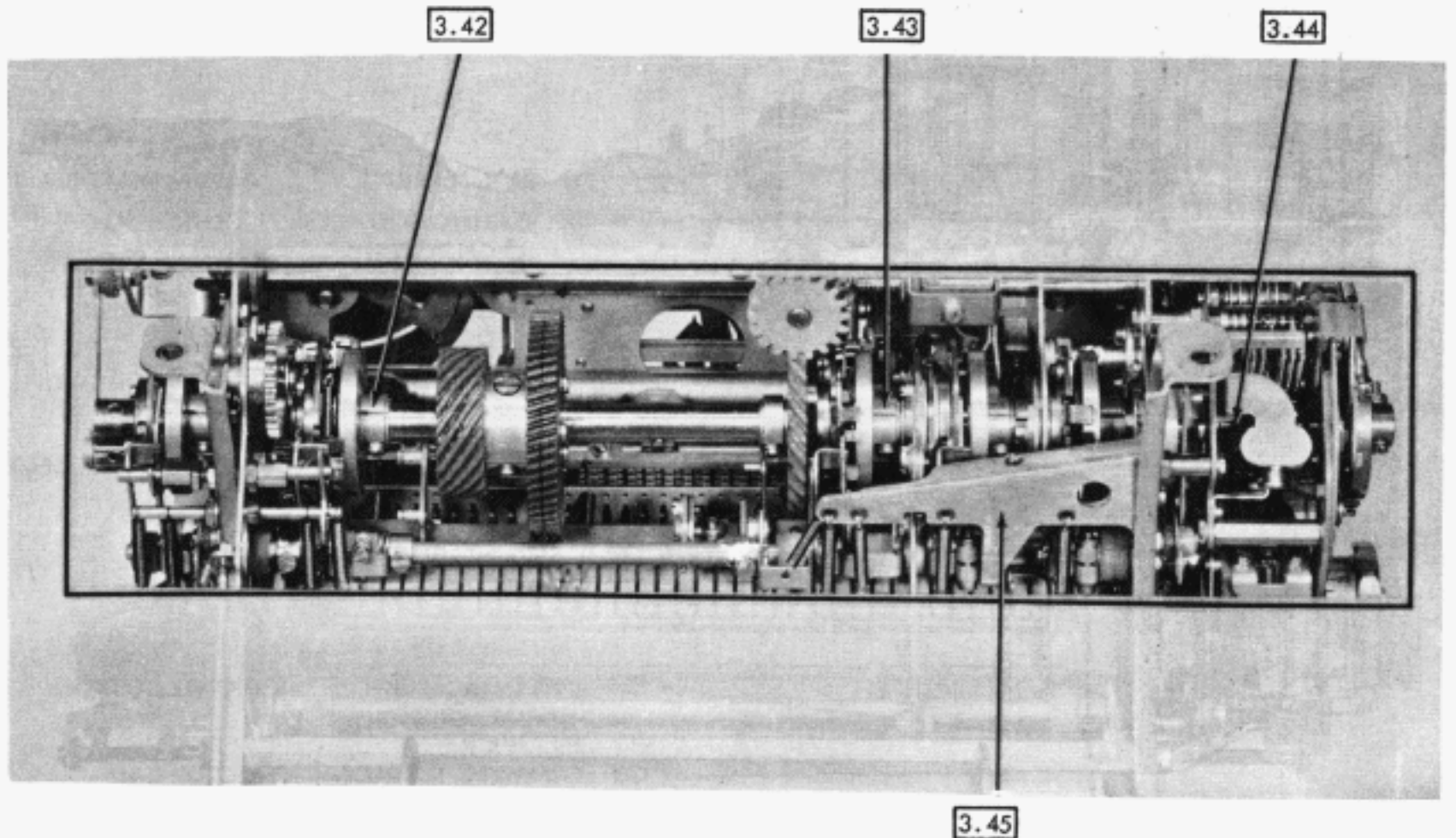
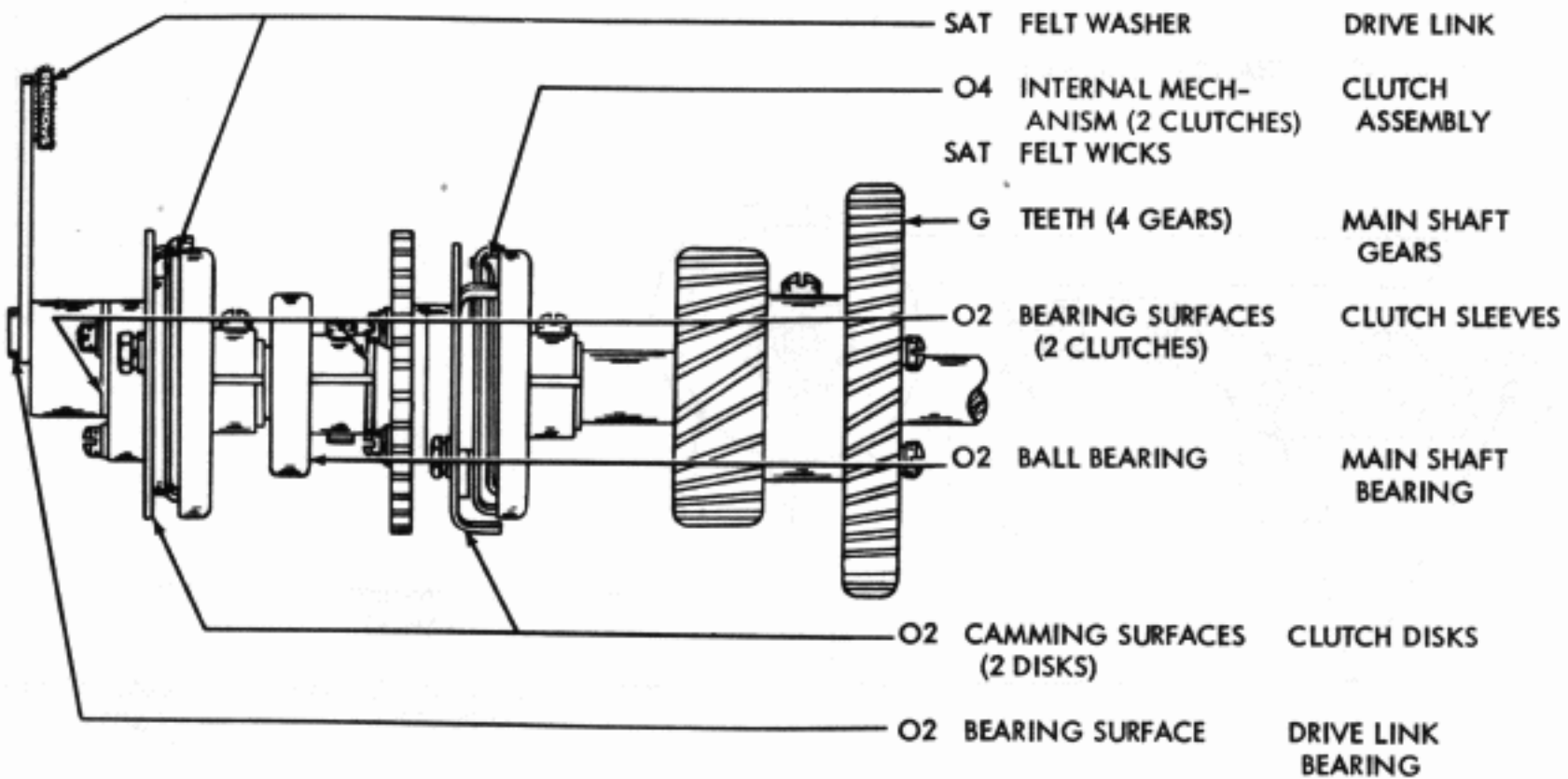
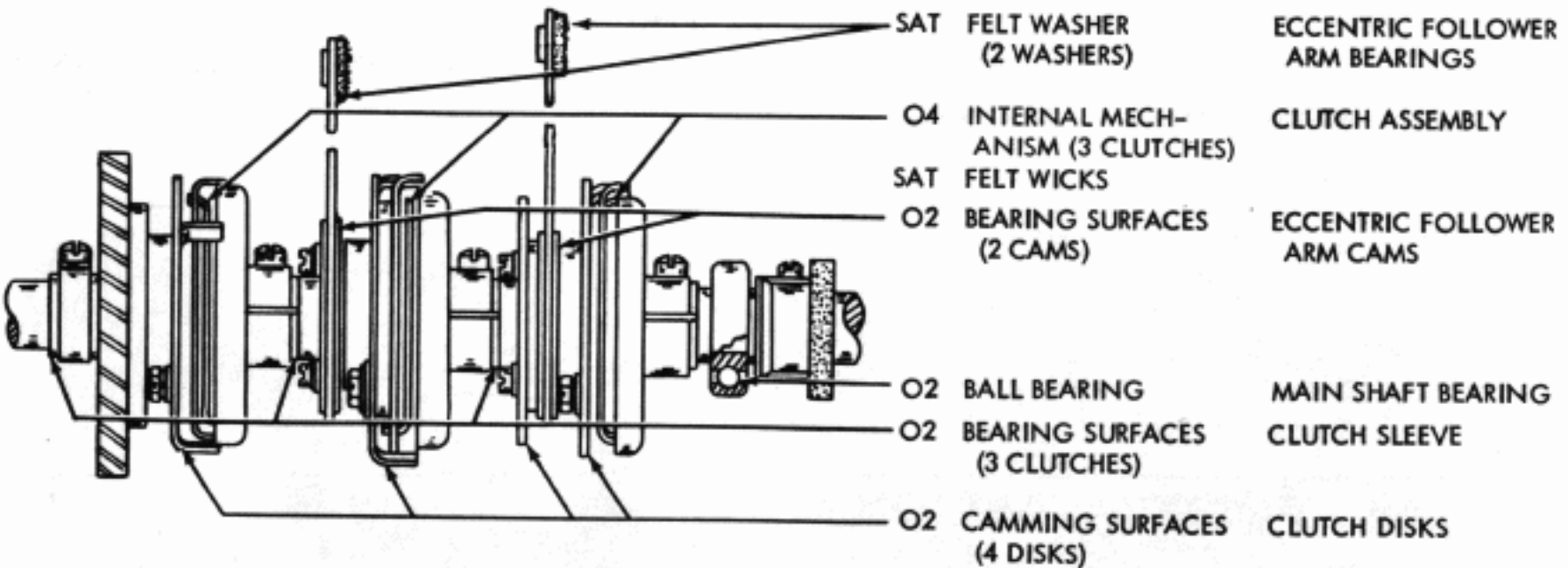


Figure 6-19 Typing Unit Lubrication - Oscillating Mechanism and Main Shaft

3.42 MAIN SHAFT, CLUTCHES AND GEARS



3.43



3.44 SELECTOR CAM CLUTCH ASSEMBLY

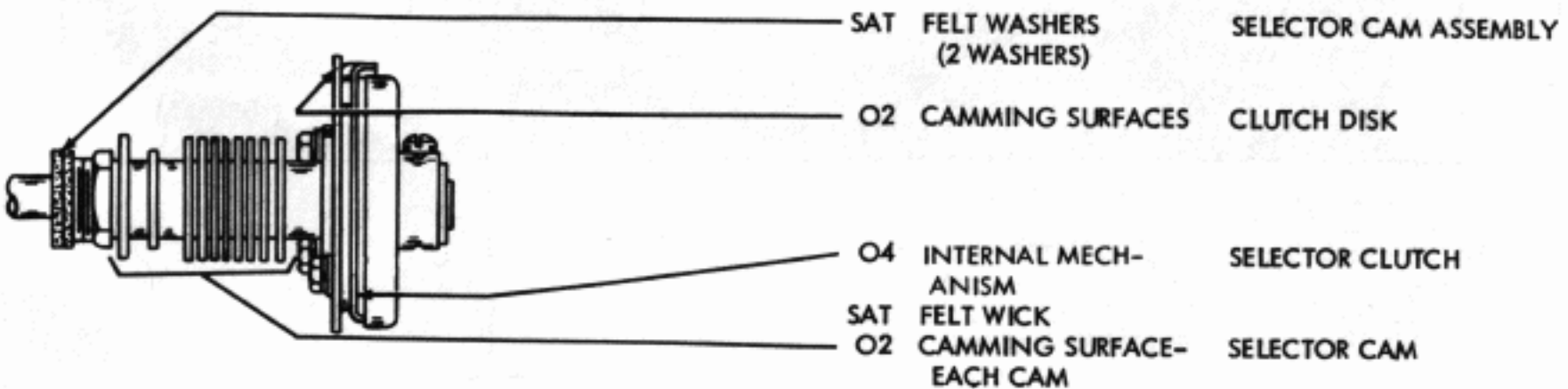
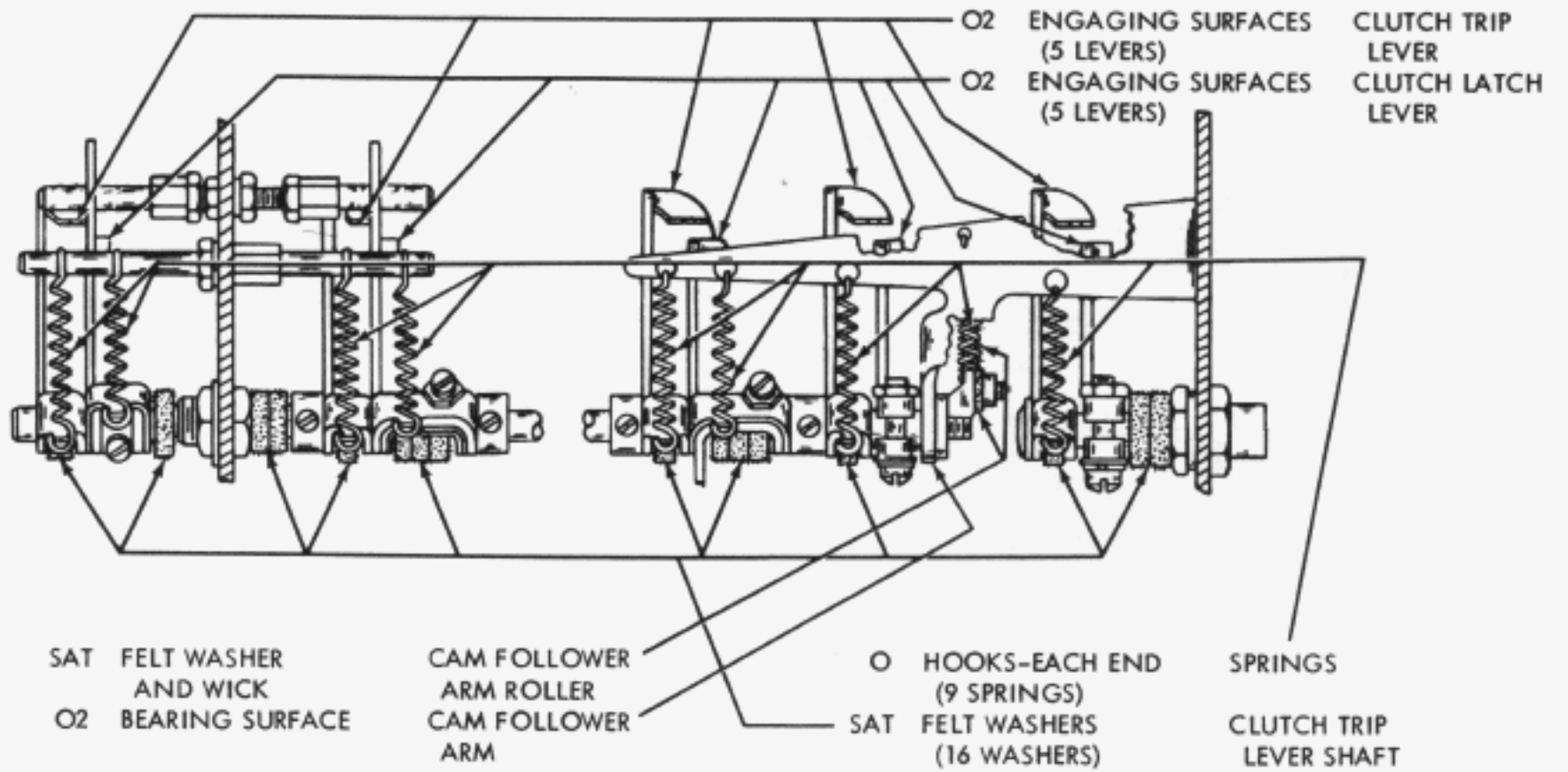


Figure 6-20 Typing Unit Lubrication - Main Shaft, Clutches and Gears



3.45 MAIN SHAFT, CLUTCHES AND GEARS (Continued)



3.46 SPACING MECHANISM (BOTTOM VIEW)

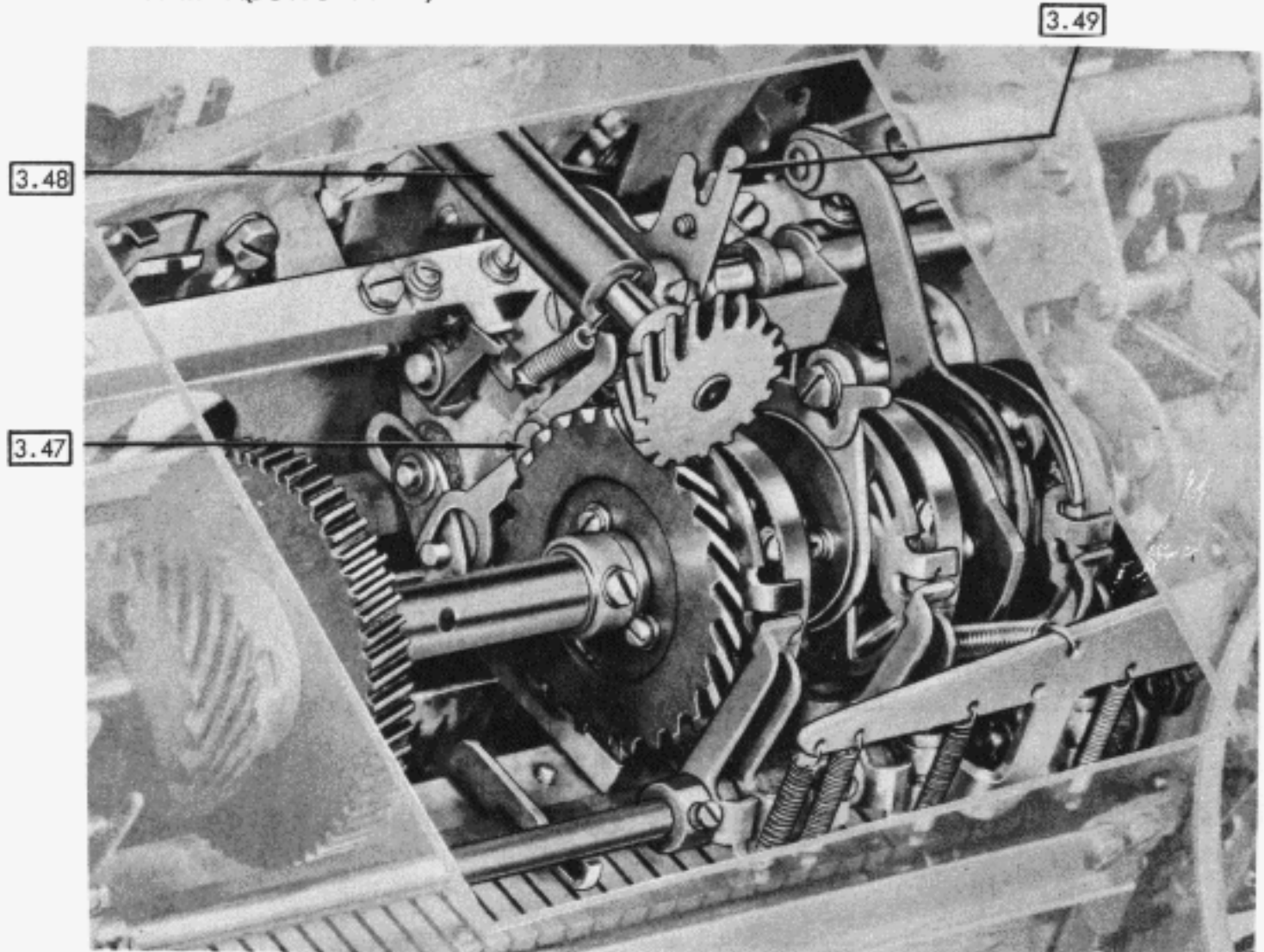
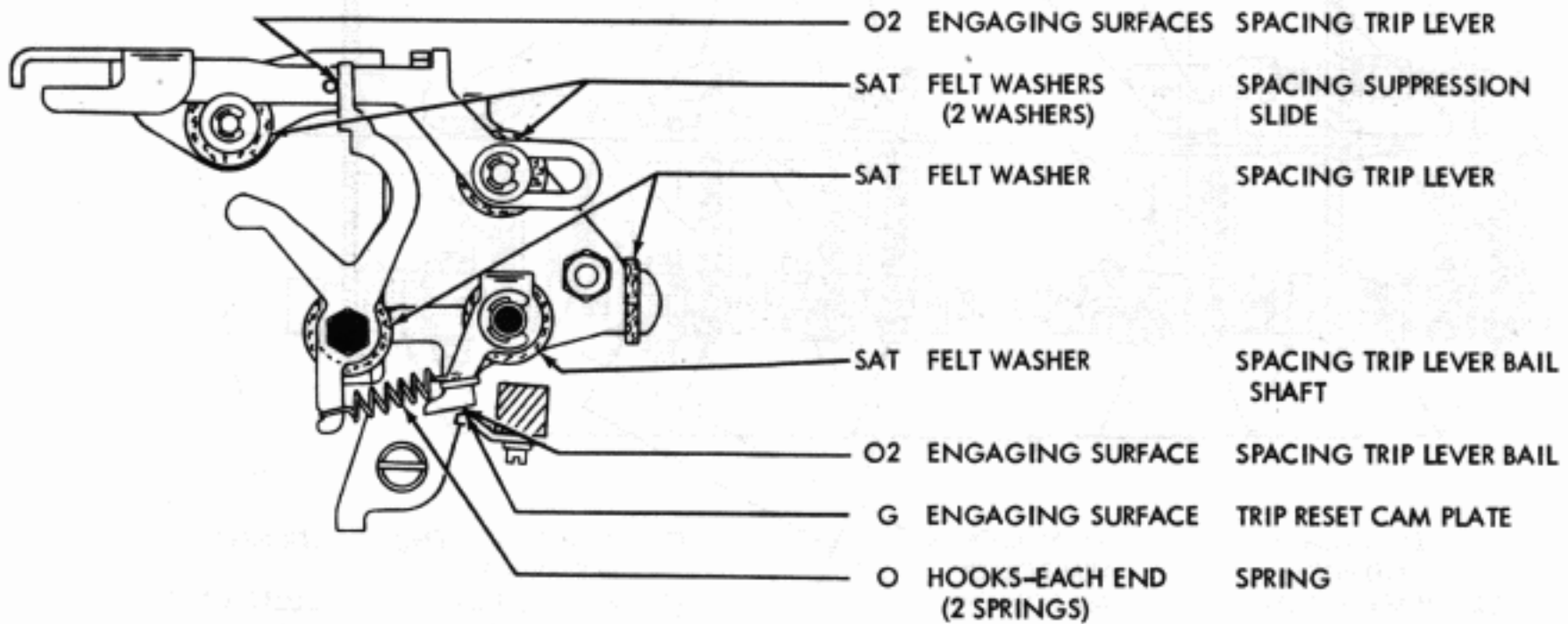
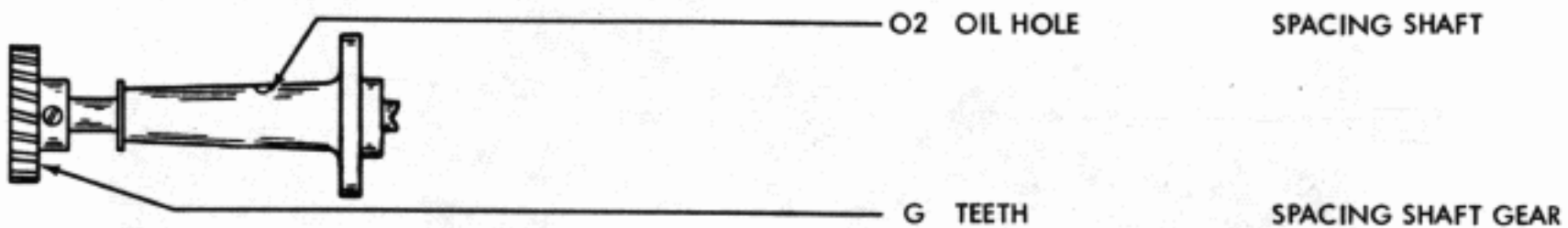


Figure 6-21 Typing Unit Lubrication - Main Shaft, Clutches and Gears

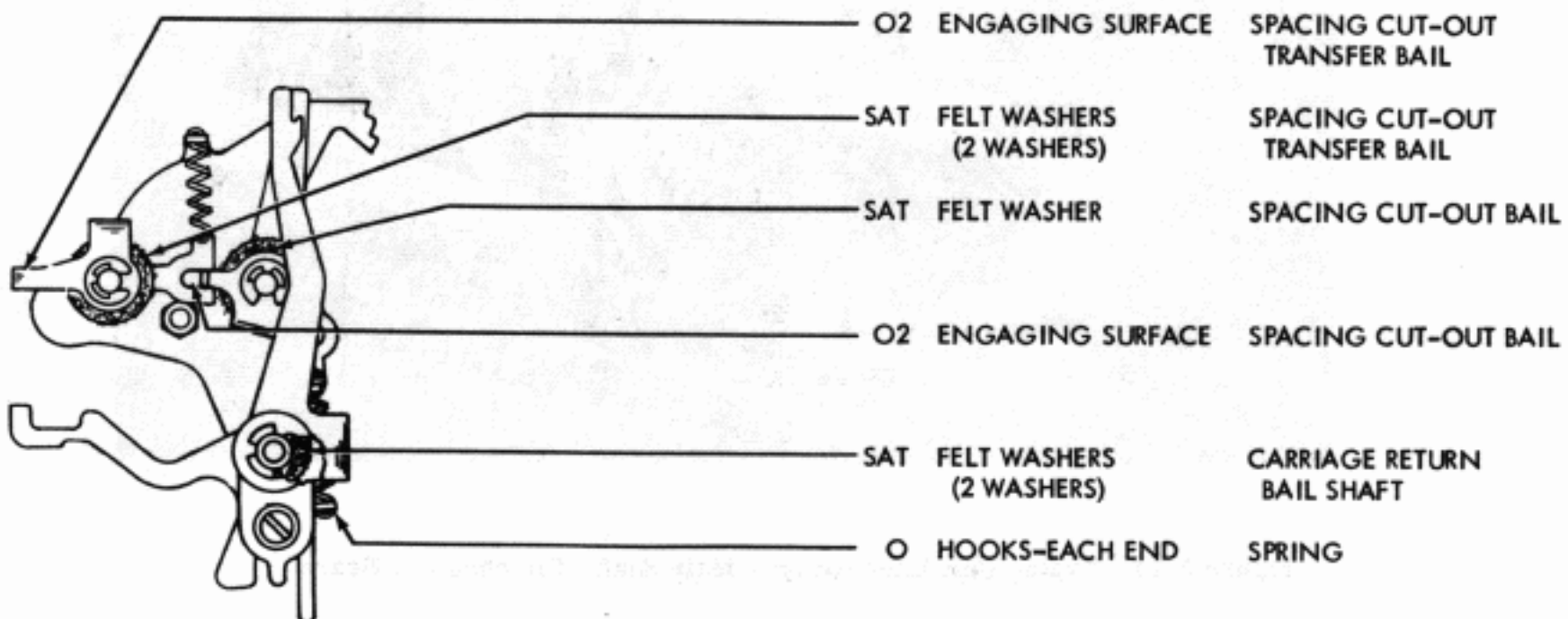
3.47 SPACING MECHANISM (Continued)



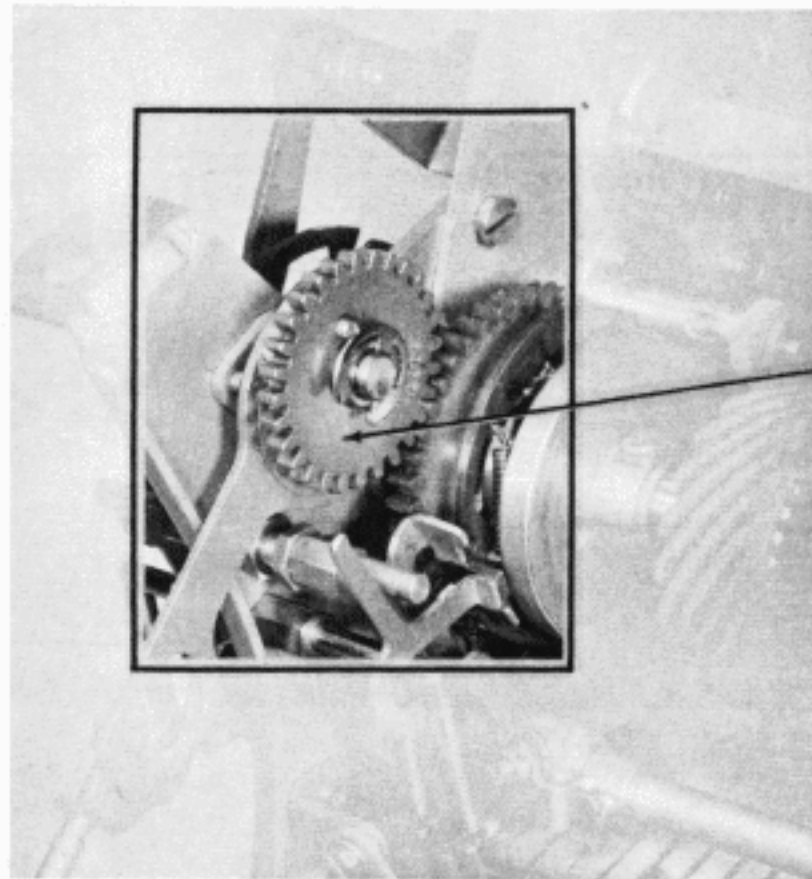
3.48



3.49 SPACING MECHANISM (Continued)



3.50 LINE FEED GEARS



3.51

(BOTTOM VIEW)

3.51 LINE FEED MECHANISM

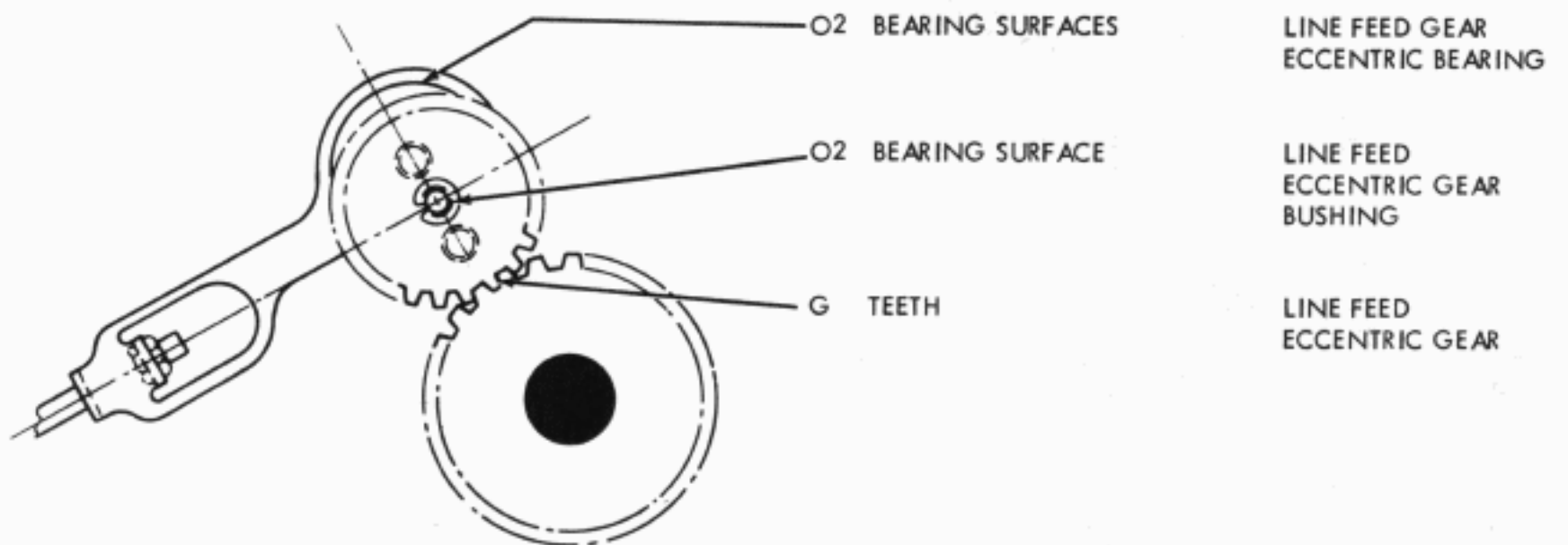
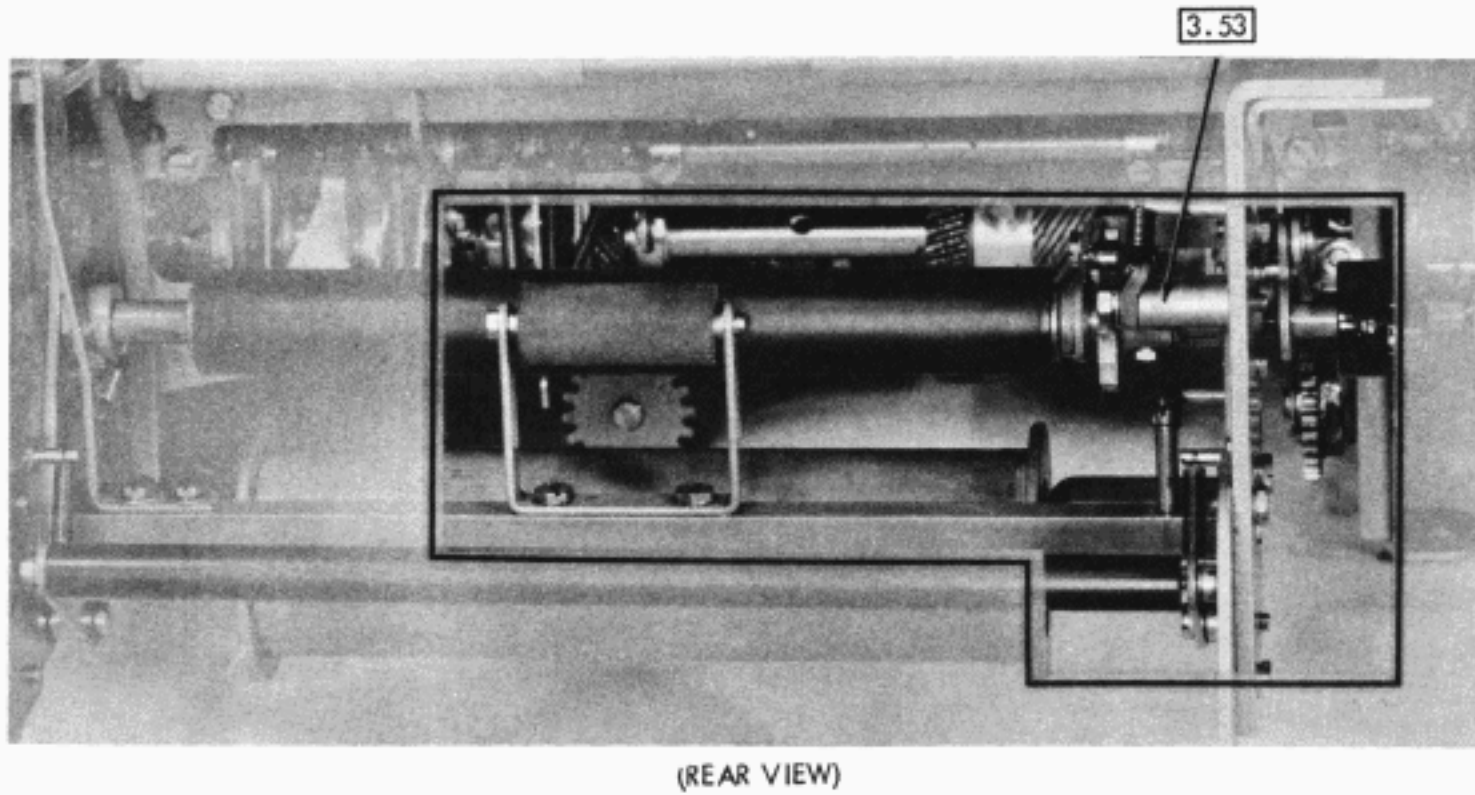


Figure 6-23 Typing Unit Lubrication - Line Feed Gears and Link

3.52 WEB FEED MECHANISM



3.53 FEED ROLL MECHANISM

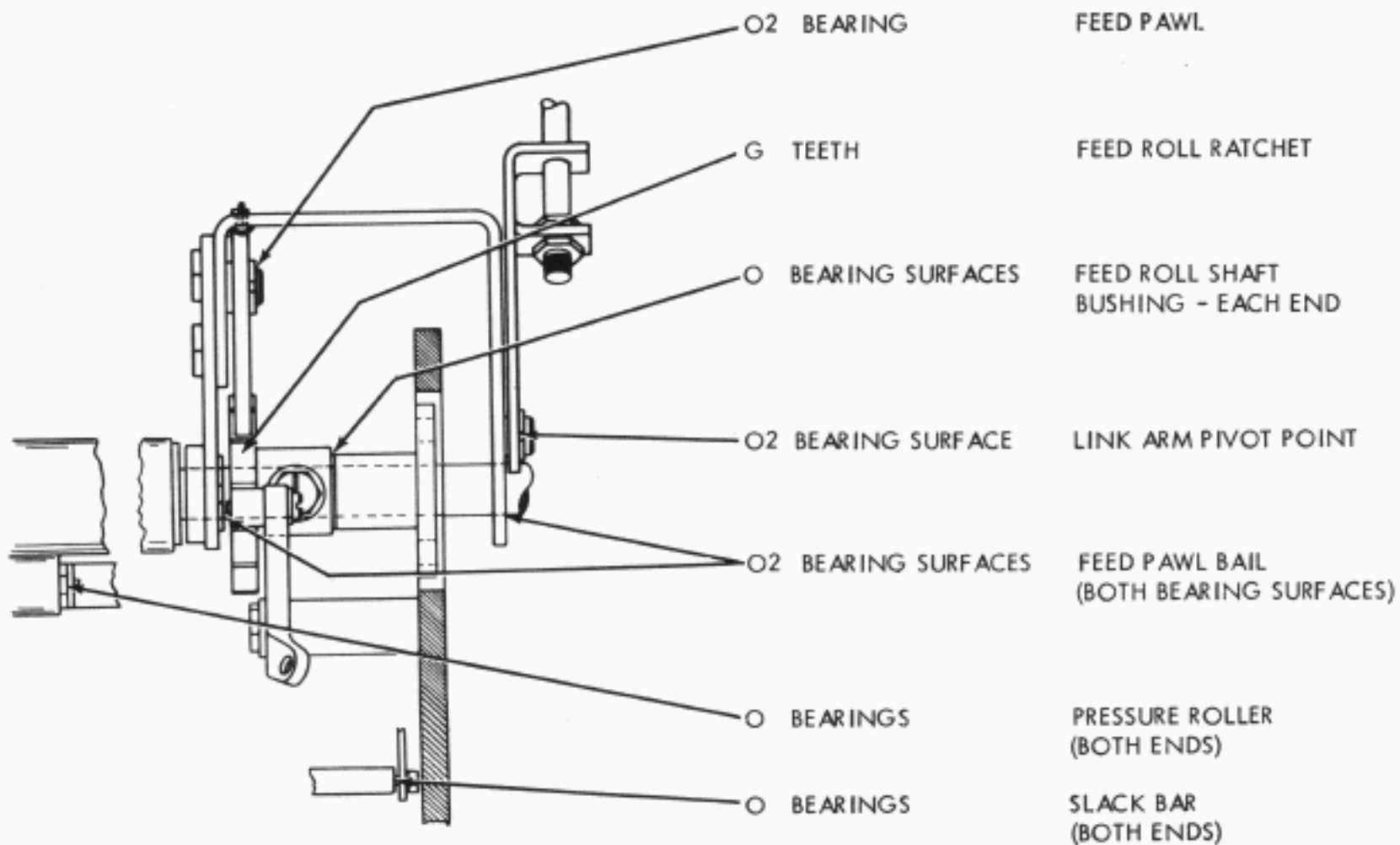
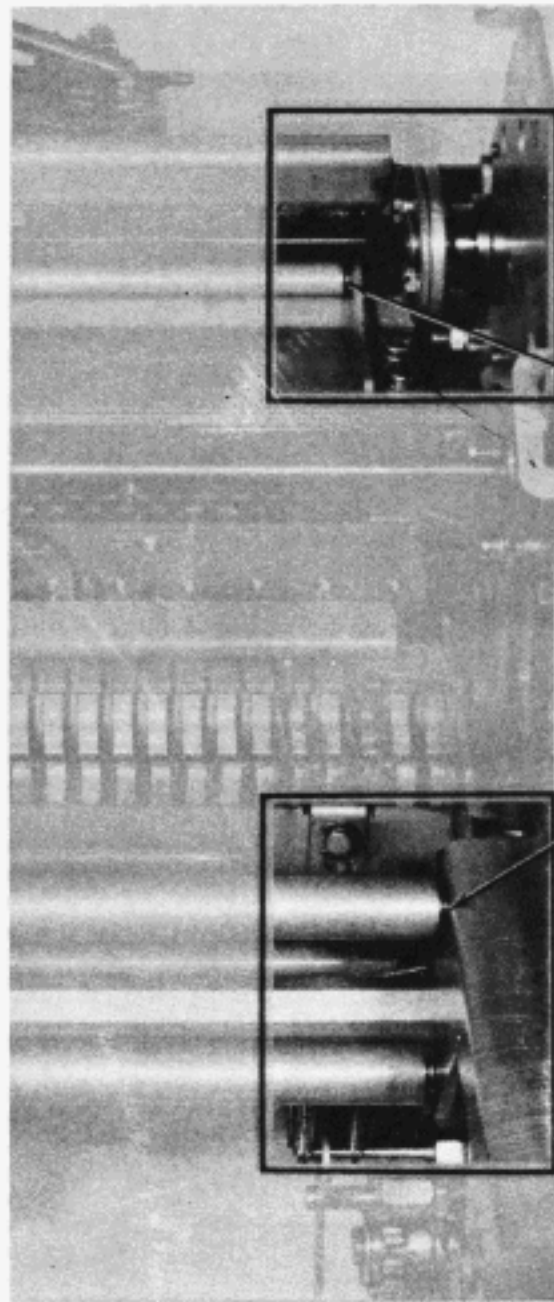


Figure 6-24 Typing Unit Lubrication - Feed Roll, Pressure Roll and Slack Bar Mechanisms

3.54 WEB GUIDE ROLLERS

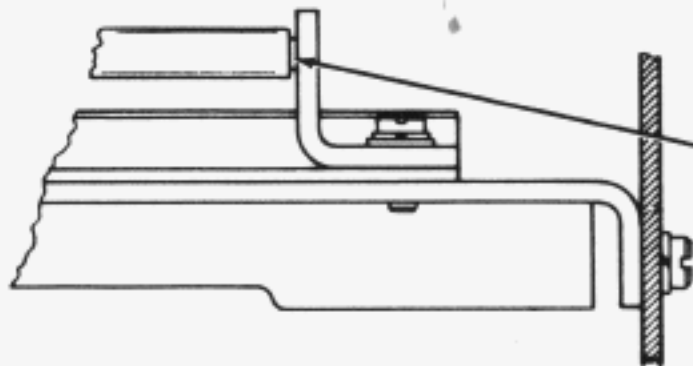
(REAR VIEW)



3.55

3.56

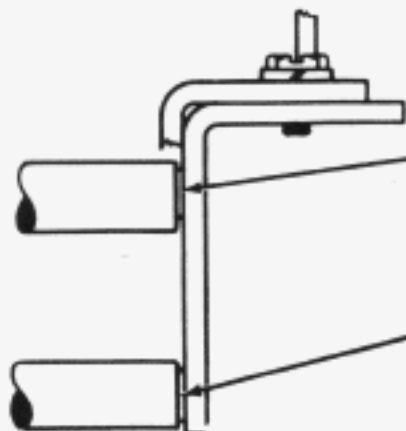
3.55 PLATEN WEB ROLLER



O2 BEARING SURFACES

PLATEN WEB ROLLER (BOTH ENDS)

3.56 UPPER AND LOWER GUIDE ROLLERS



O2 BEARING SURFACES

UPPER GUIDE ROLLER (BOTH ENDS)

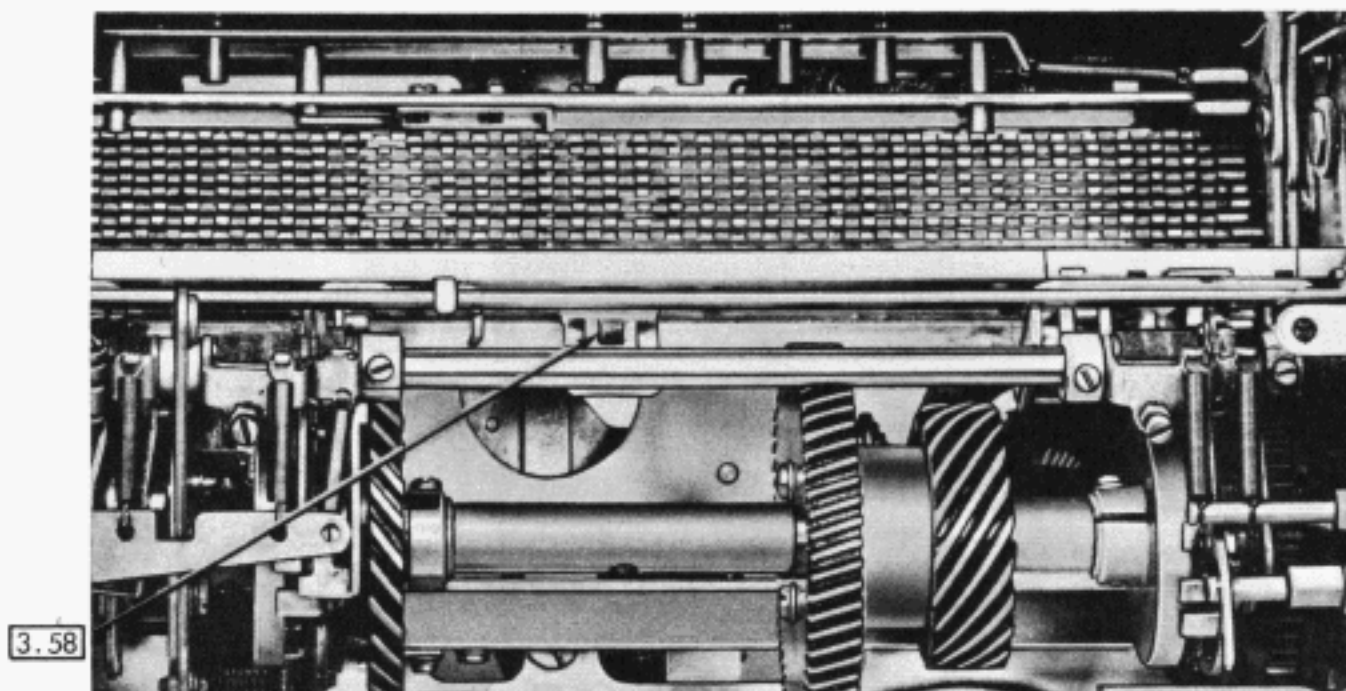
O2 BEARING SURFACES

LOWER GUIDE ROLLER (BOTH ENDS)

Figure 6-25 Typing Unit Lubrication - Web Guide Rollers



3.57 FUNCTION RESET BAIL



(REAR VIEW)

3.58 FUNCTION RESET BAIL MECHANISM

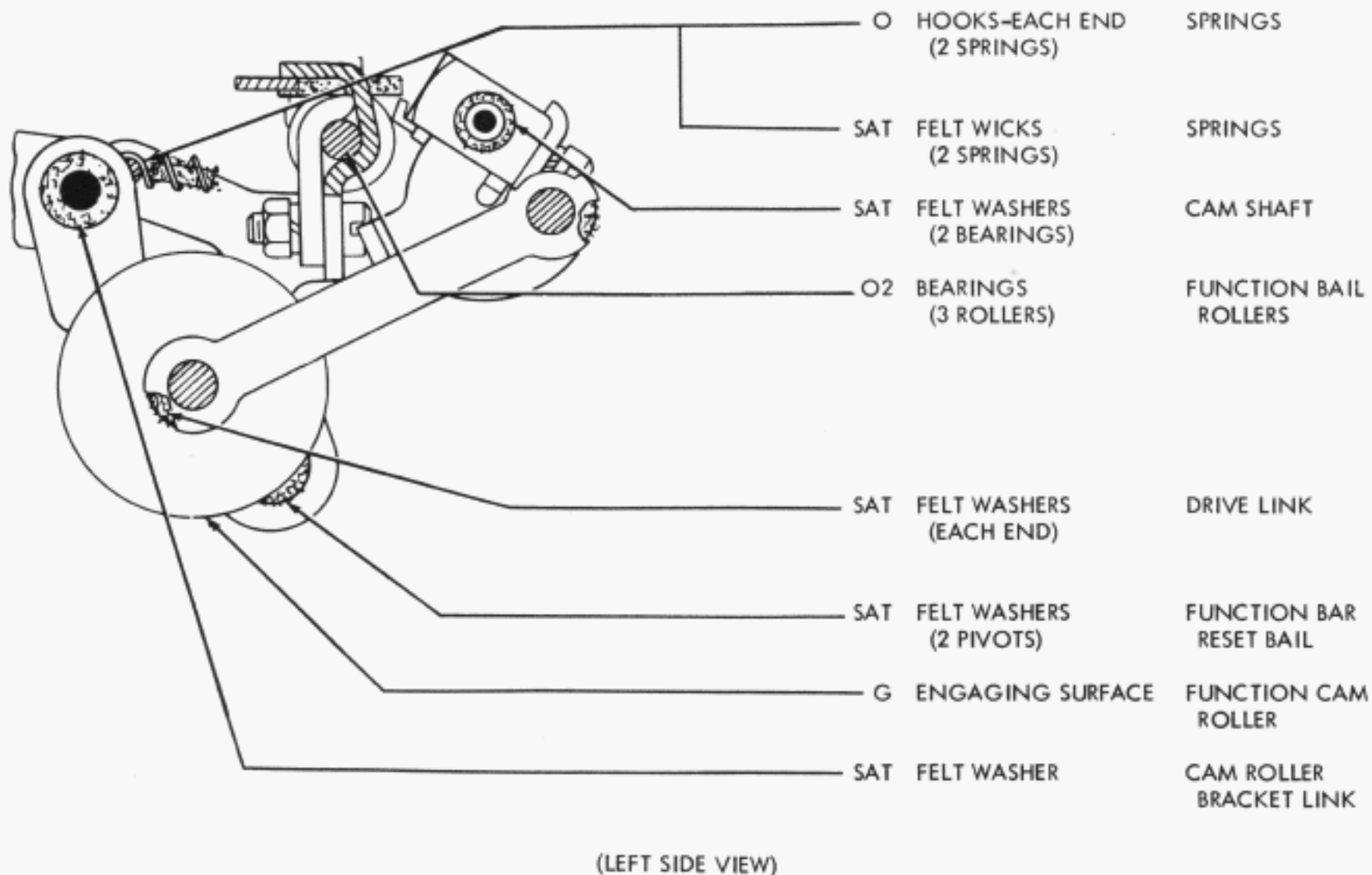
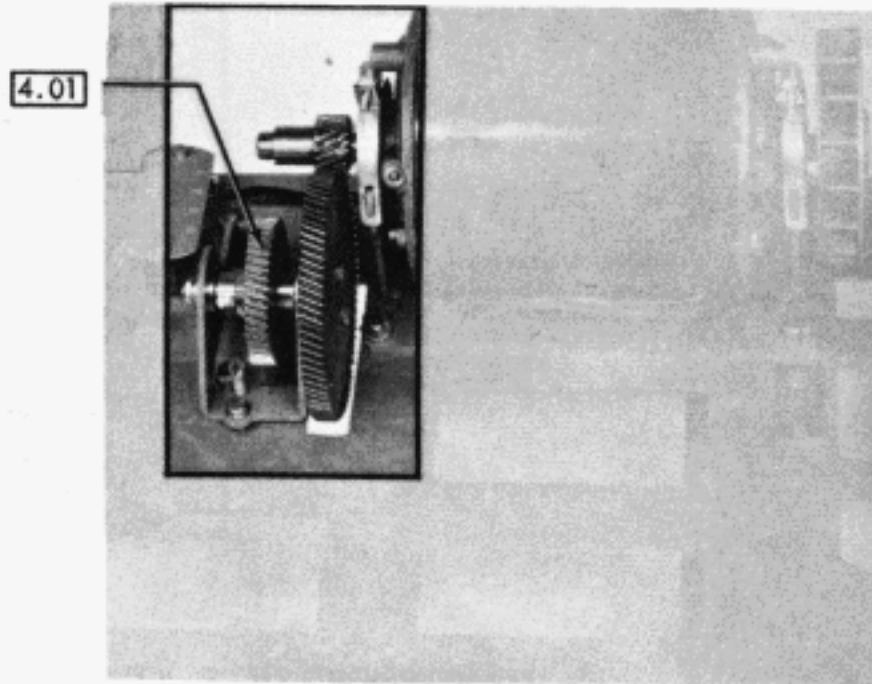


Figure 6-26 Typing Unit Lubrication - Function Reset Bail Mechanism

4. RECEIVING ONLY BASE



BASE IN UPRIGHT POSITION

4.01 MOTOR UNIT AND INTERMEDIATE GEARS

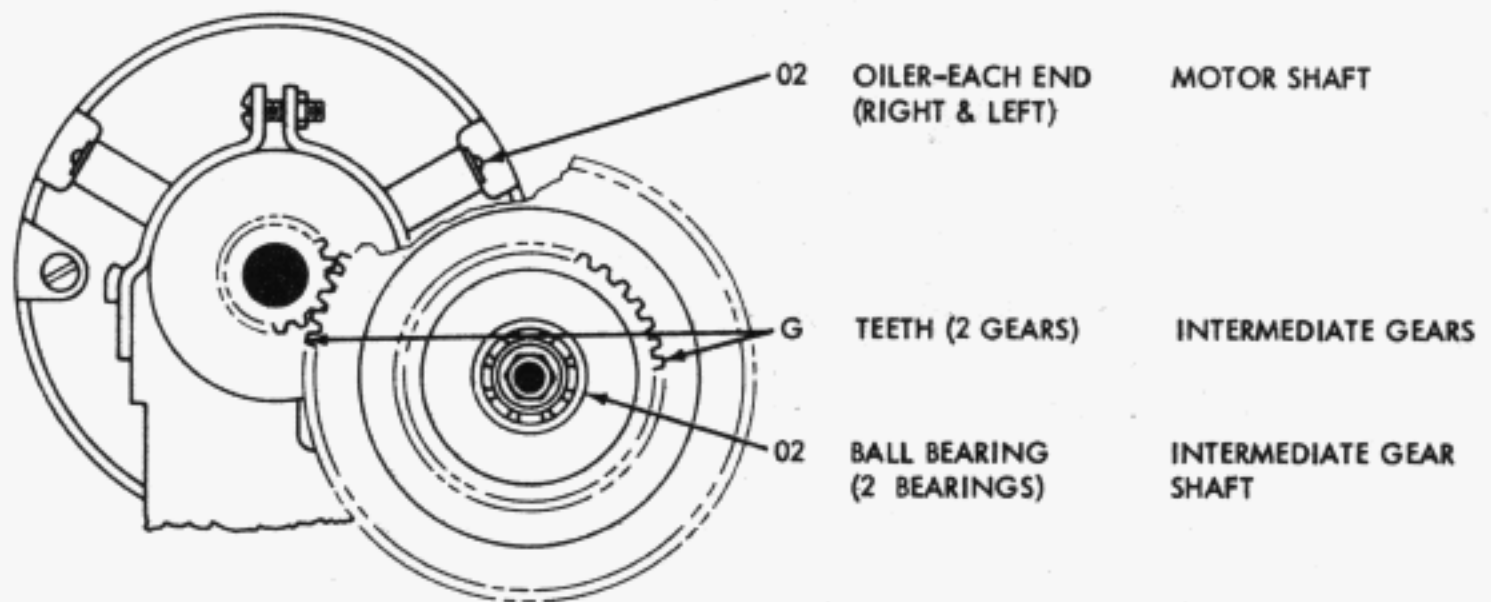
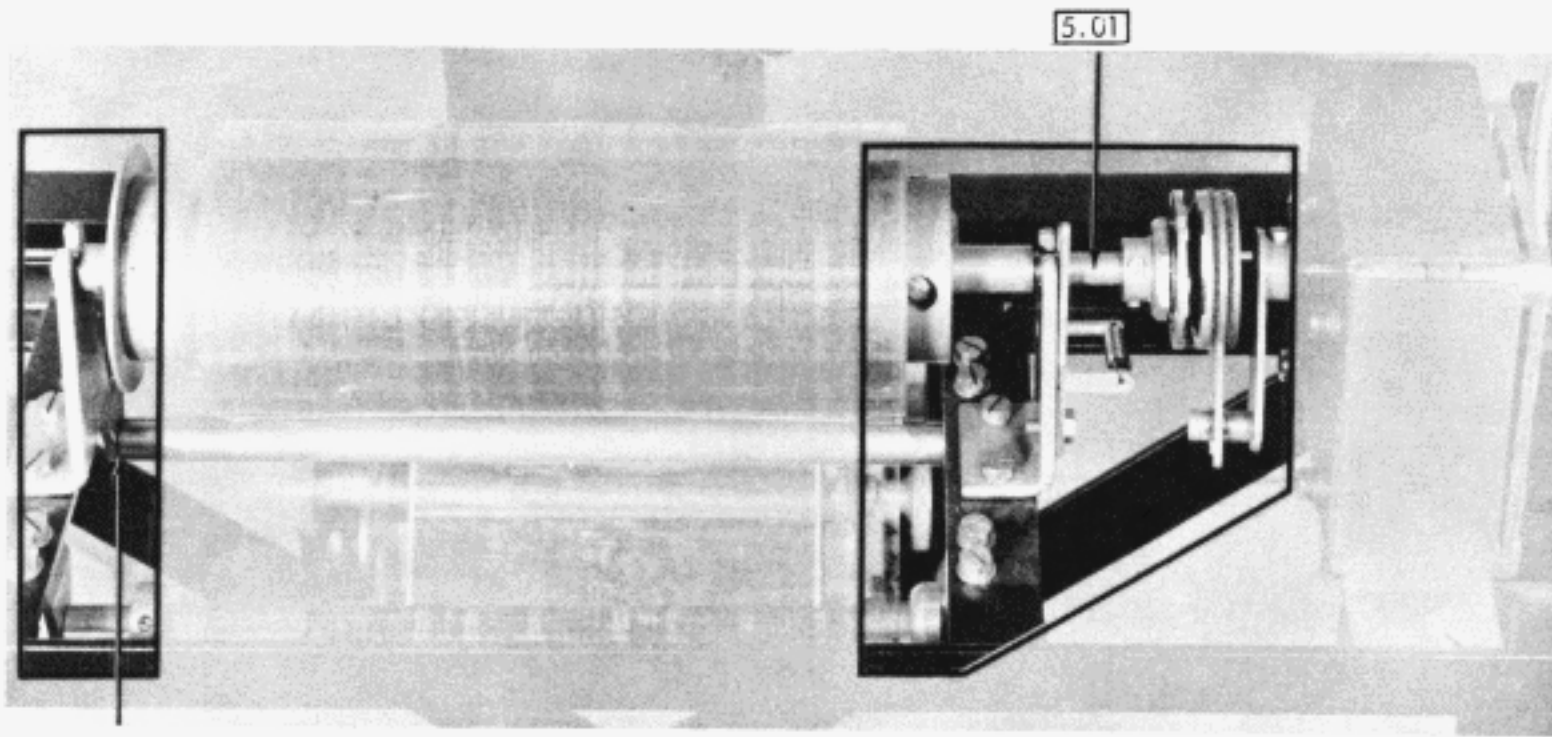


Figure 6-27 Base Lubrication - Motor and Intermediate Gears, Front View

5. PROJECTOR FRAME ASSEMBLY



FRAME UPRIGHT, FRONT VIEW

5.01 WEB GUIDE AND REWIND ASSEMBLY

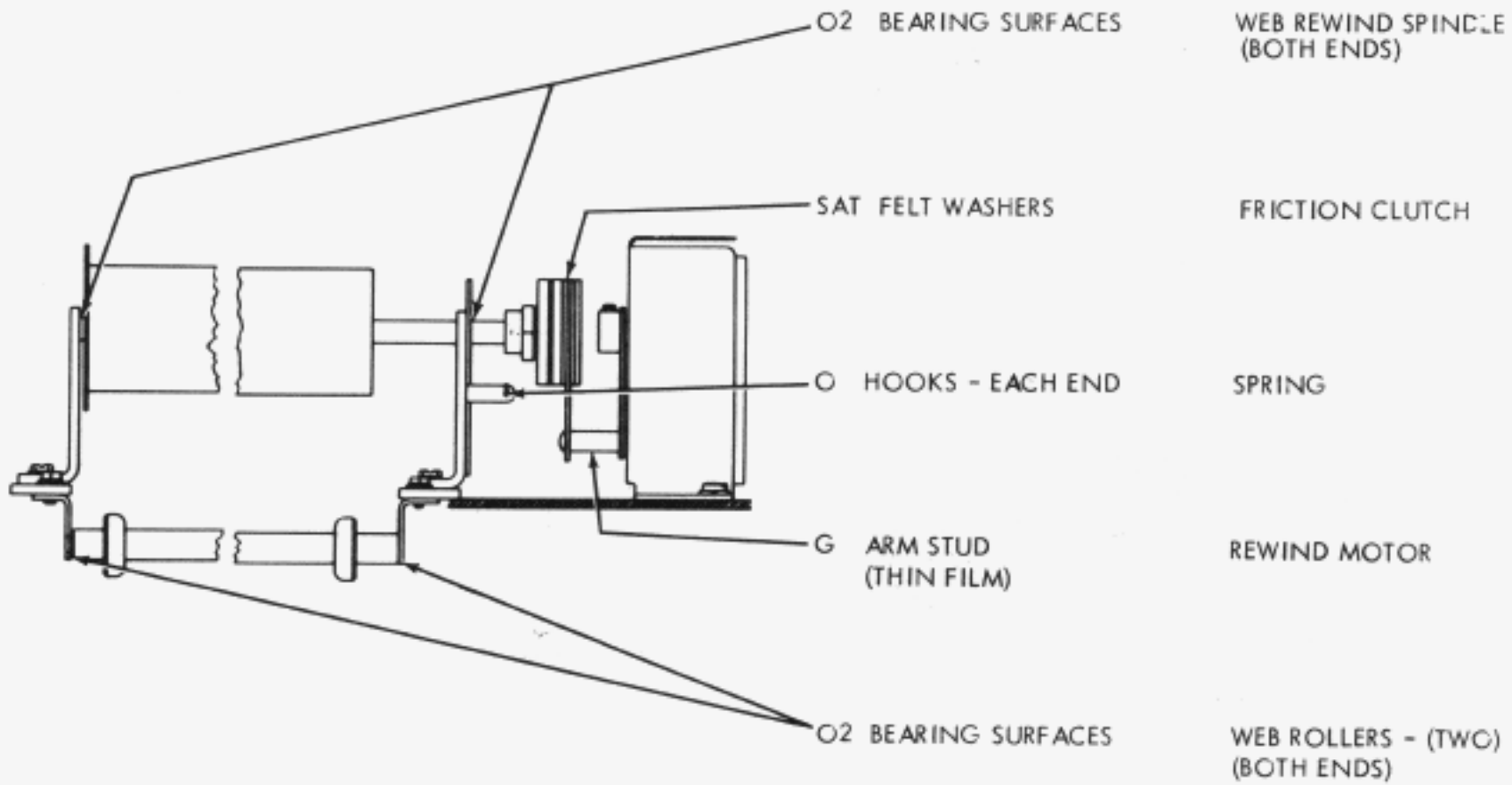
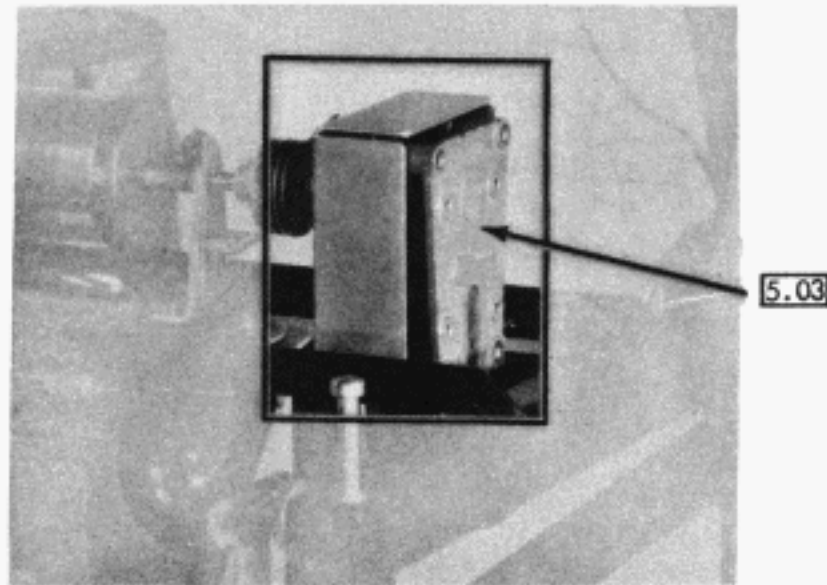
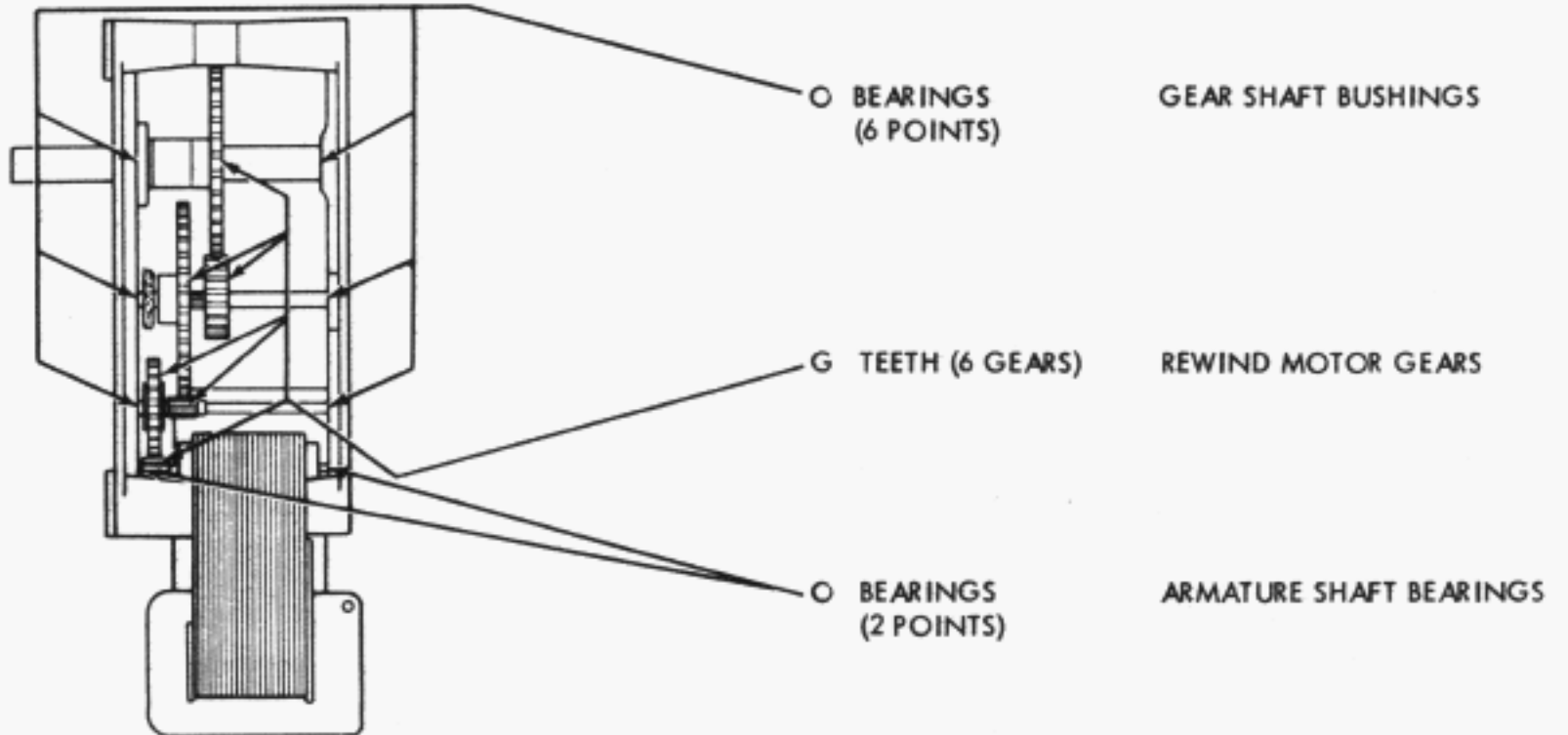


Figure 6-28 Projector Frame Lubrication

5.02 WEB REWIND MOTOR



5.03 REWIND MOTOR MECHANISM



5.04 PROJECTOR FRAME ROLLERS

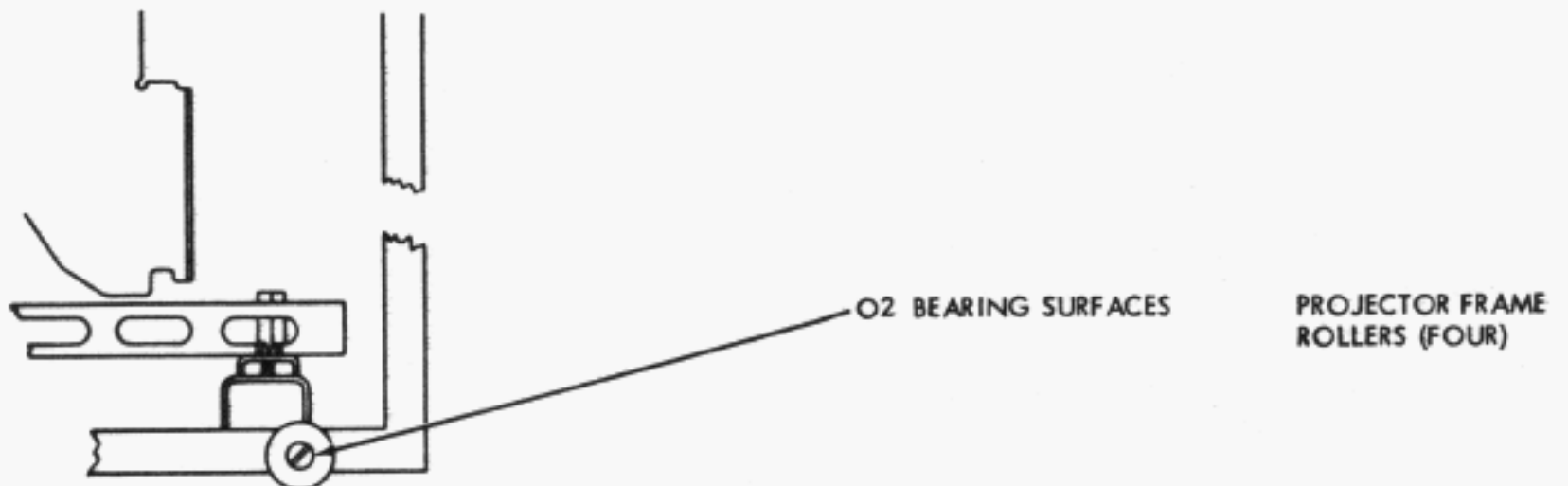
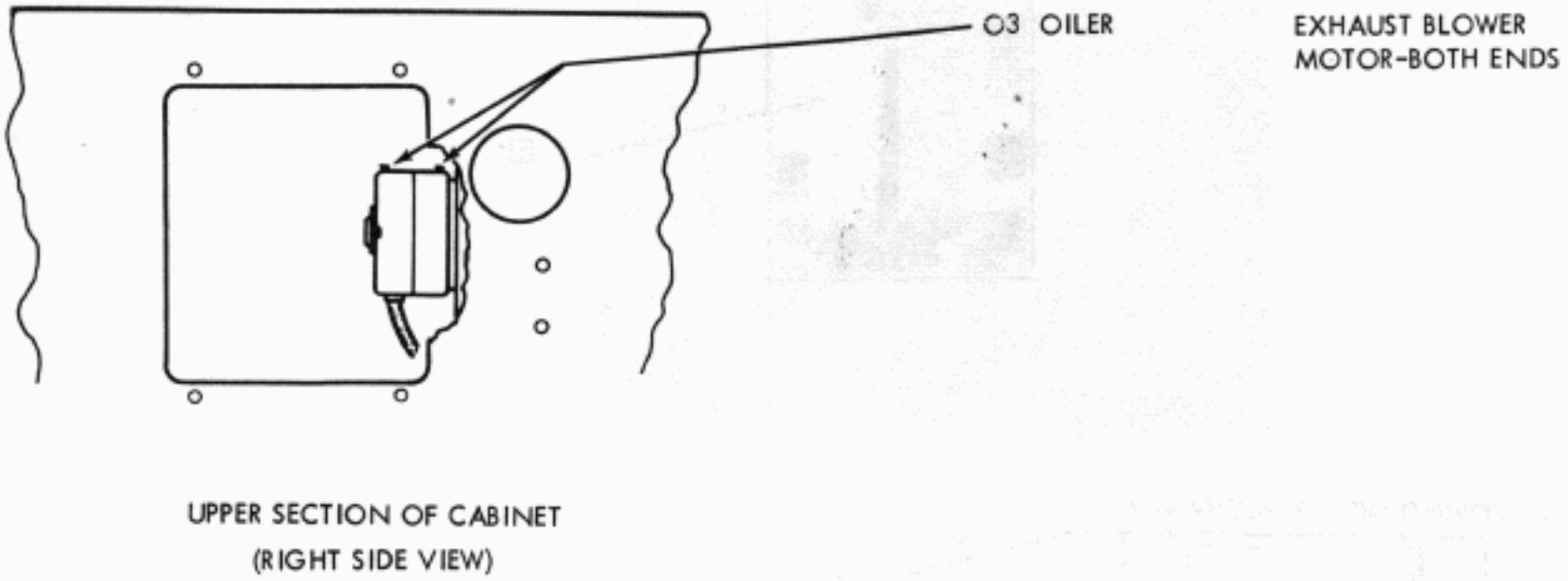


Figure 6-29 Projector Frame Lubrication - Web Rewind Motor and Frame Rollers

6. PROJECTOR CABINET MECHANISM

6.01 EXHAUST BLOWER MOTOR



UPPER SECTION OF CABINET  
(RIGHT SIDE VIEW)

EXHAUST BLOWER  
MOTOR-BOTH ENDS

O3 OILER

Figure 6-30 Projector Cabinet Lubrication - Exhaust Blower Motor



## SECTION 7 - PARTS

## 1. GENERAL

The Parts Section consists of exploded three dimensional line drawing views of the various assemblies and sub-assemblies that make up the components of which the Model 28 Receiver Projector Set is comprised. Individual parts are clearly shown and identified by their appropriate part numbers. The section is arranged in the same general sequence as that used in foregoing sections, with the Projector Typing Unit appearing first. Following each drawing or group of drawings covering a particular component is a numerical index listing the part numbers, correct descriptions and page numbers on which the parts appear.

## 2. MAINTENANCE APPLICATION

The part numbers appearing in the individual index for each component are arranged in numerical order

and lists the correct nomenclature for the part. Reference should be made to the page number indicated in order to positively identify a part by locating it on the appropriate exploded drawing. Or, where the part number is not known, locate the appropriate drawing in the group of drawings covering the component in question. Find the part and its number in the exploded view and refer to the associated index for the correct description of the part.

## 3. DISASSEMBLY AND REASSEMBLY APPLICATION

The exploded views shown should be of great assistance in the disassembly and reassembly of the various components in the Set. Frequent reference to the drawings should be made while following the instructions given in Section 5 on Disassembly and Reassembly.

4. TYPING UNIT

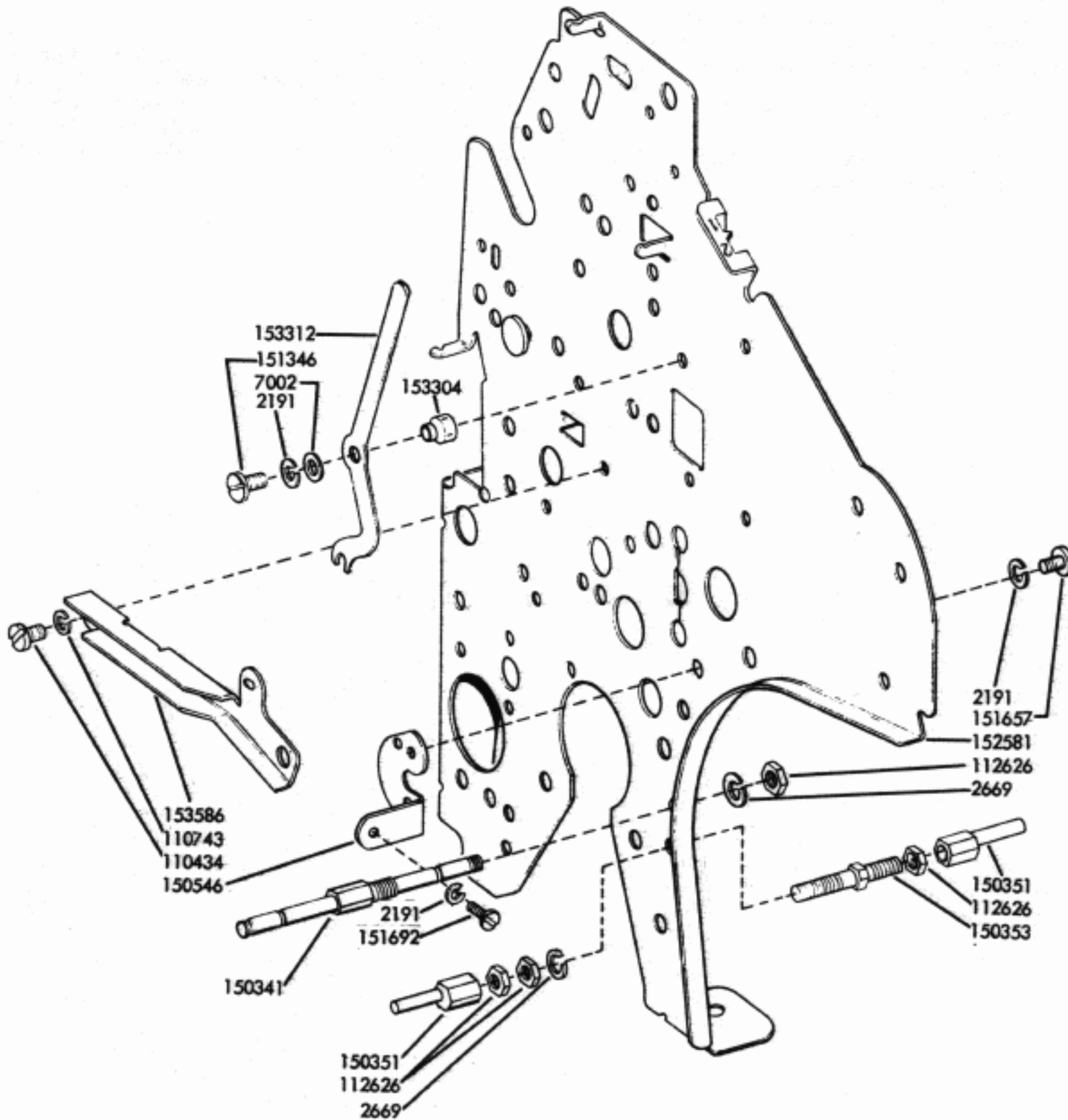


Figure 7-1 Typing Unit, Left Side Frame Mechanism

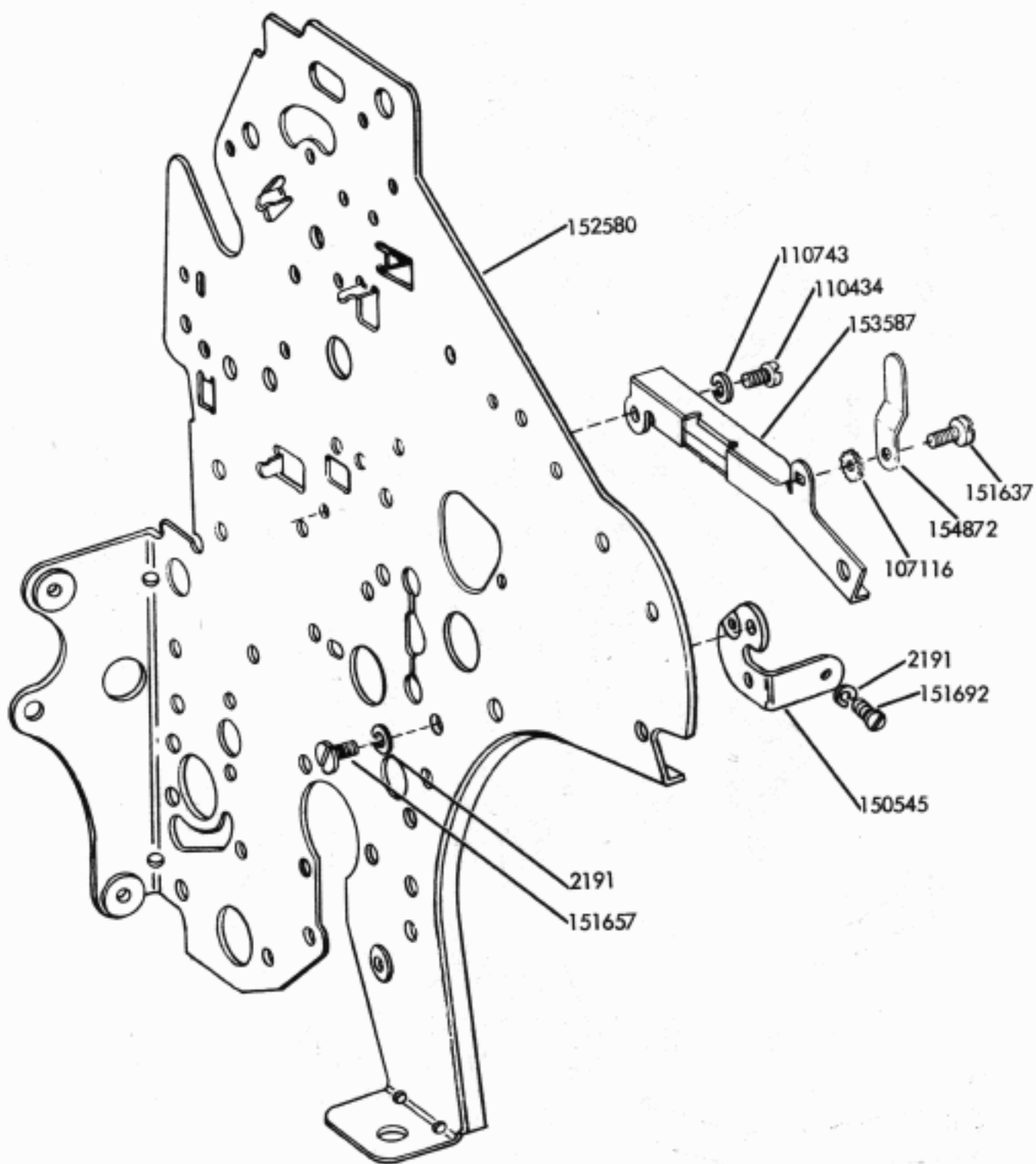


Figure 7-2 Typing Unit, Right Side Frame Mechanism



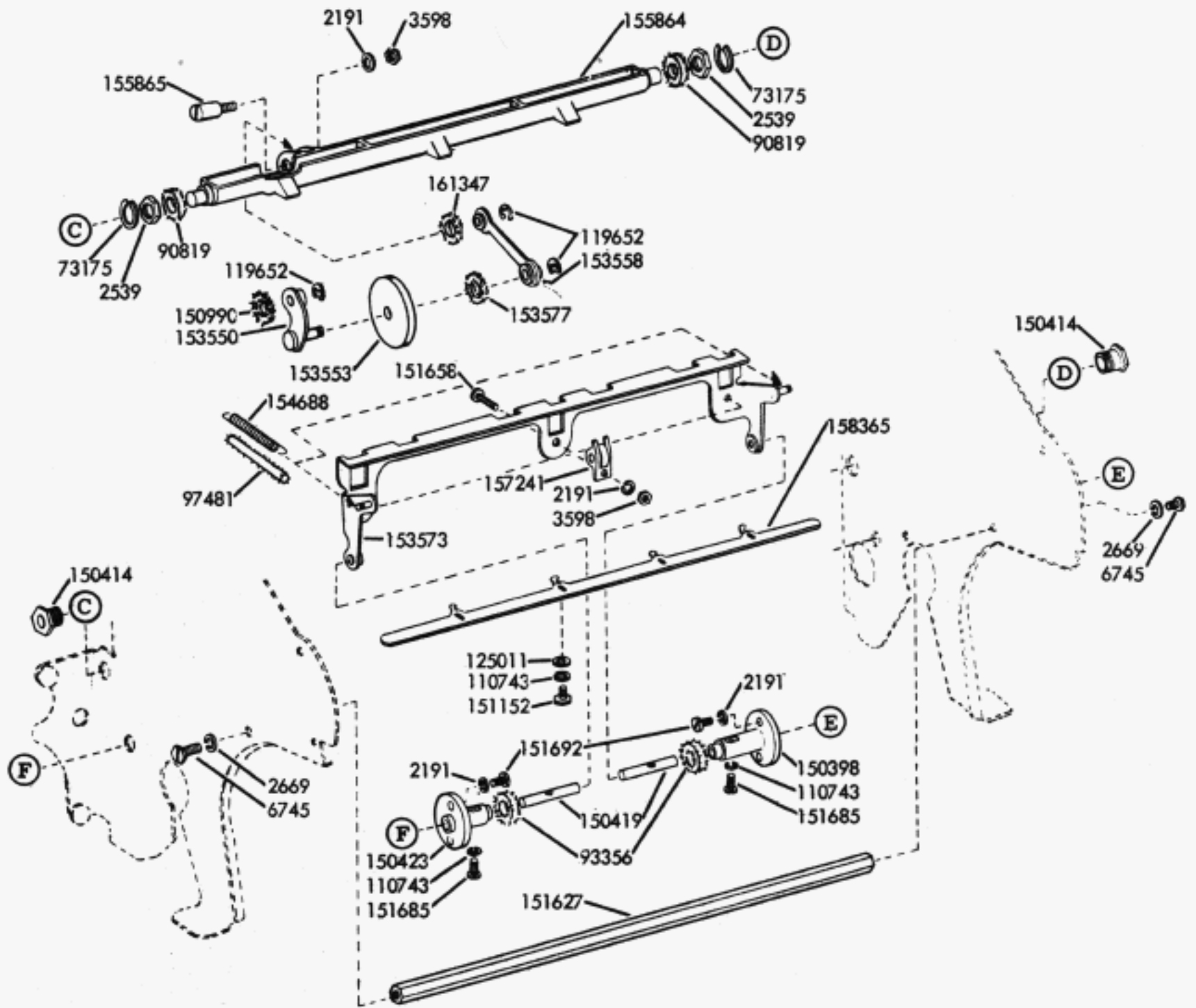


Figure 7-4 Typing Unit, Reset Bail Mechanism





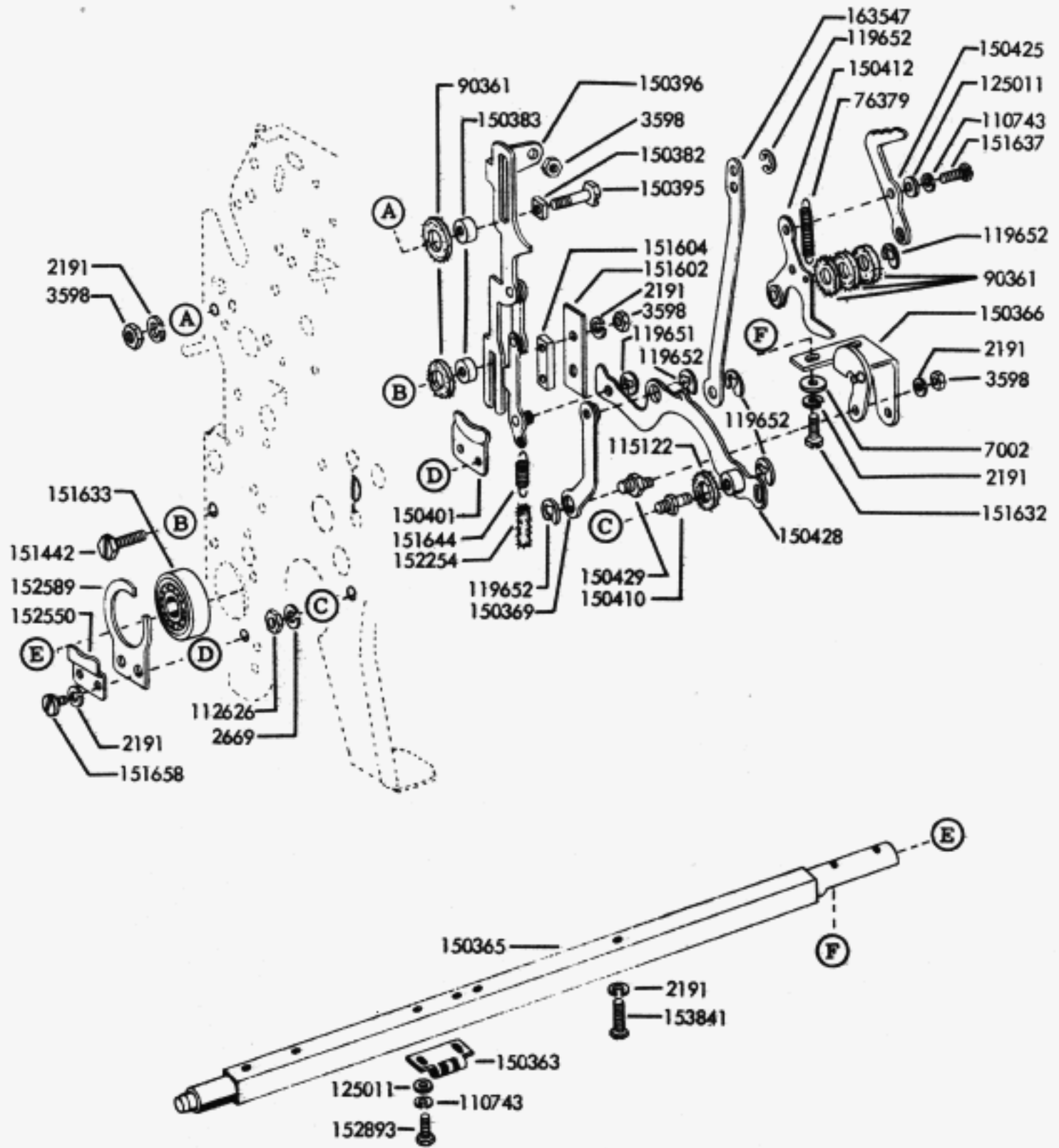


Figure 7-6 Typing Unit, Left Side Linkage and Stripper Blade Mechanism





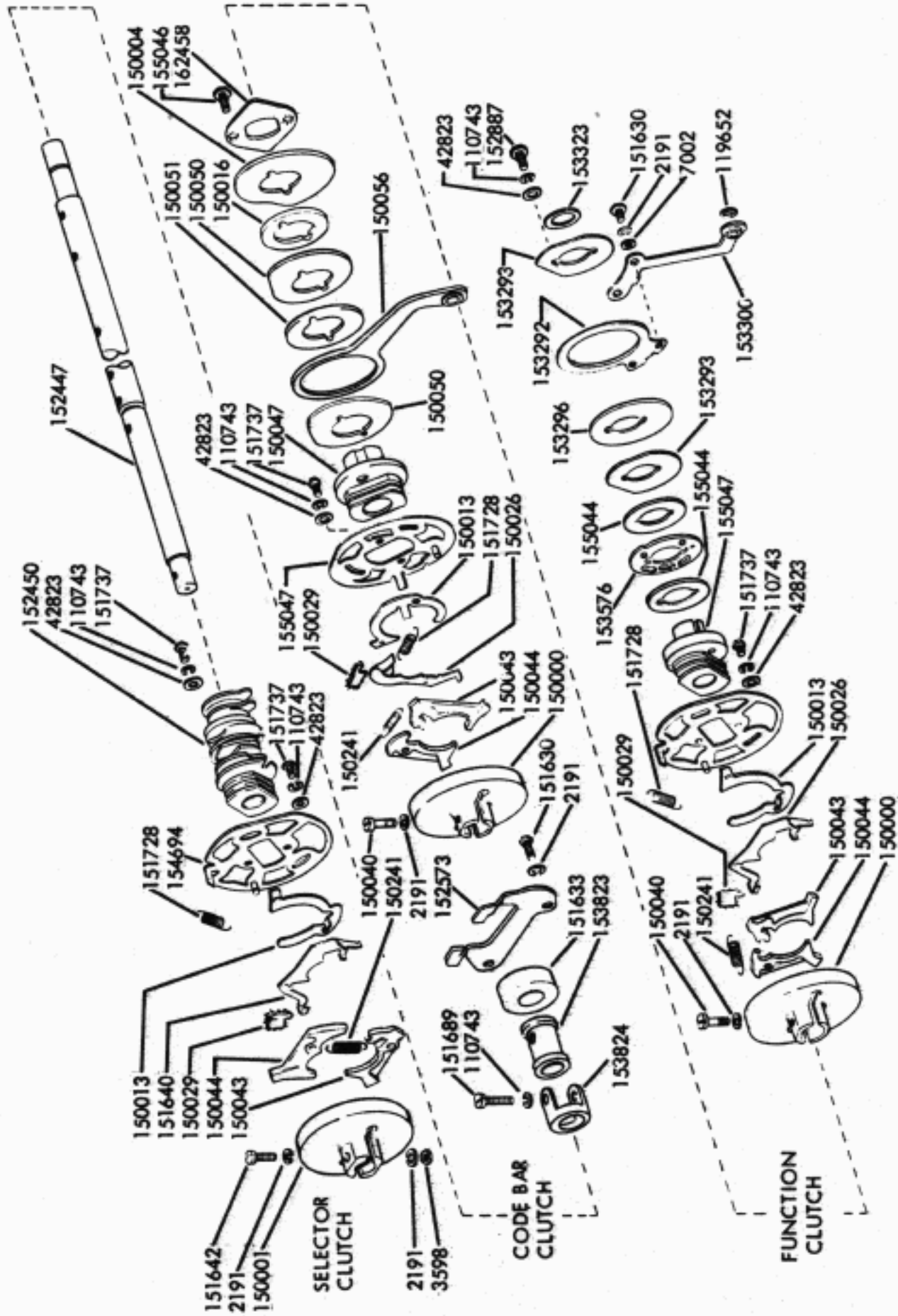


Figure 7-9 Typing Unit, Main Shaft Mechanism



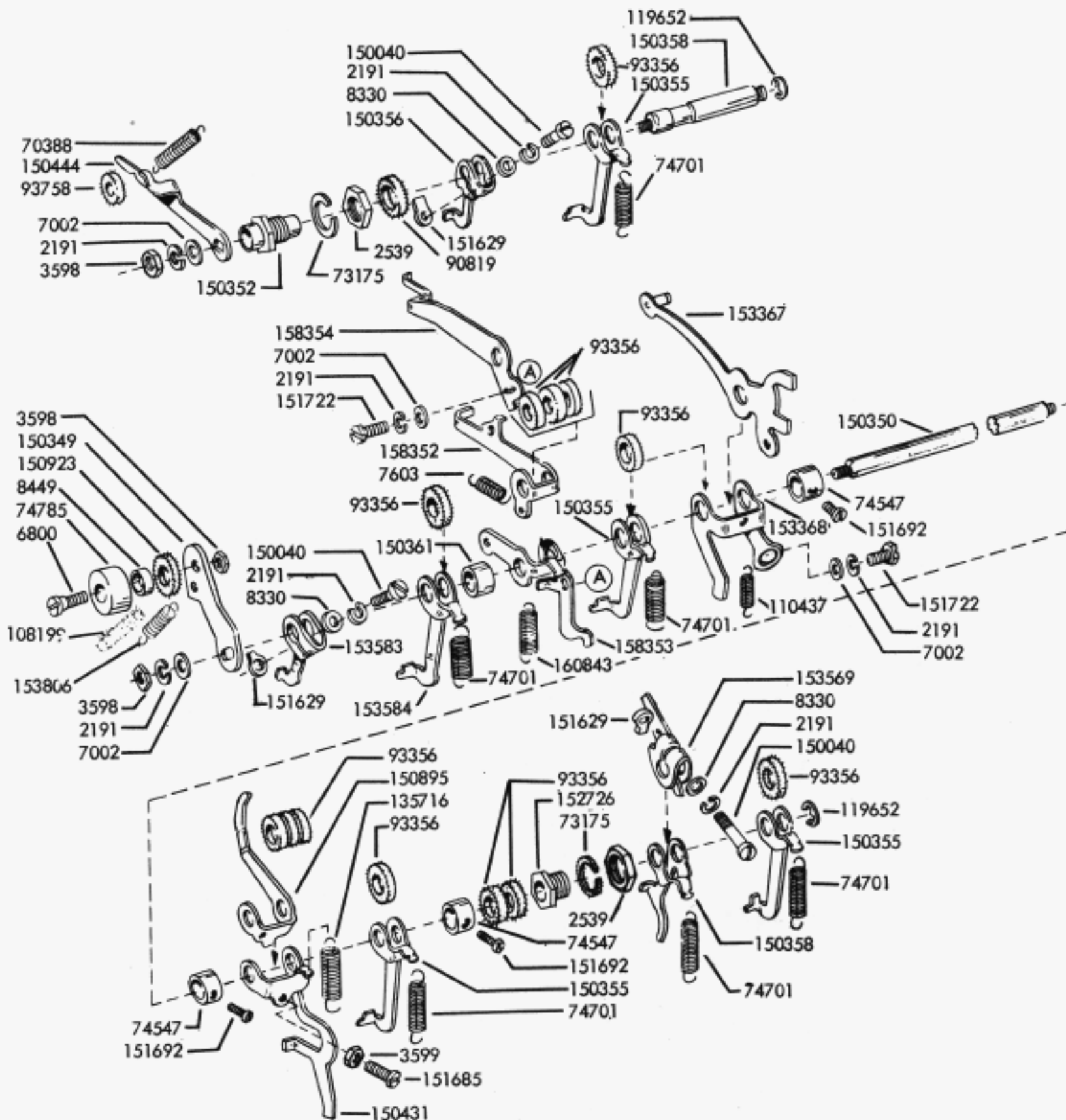


Figure 7-10 Typing Unit, Trip Shaft Mechanism

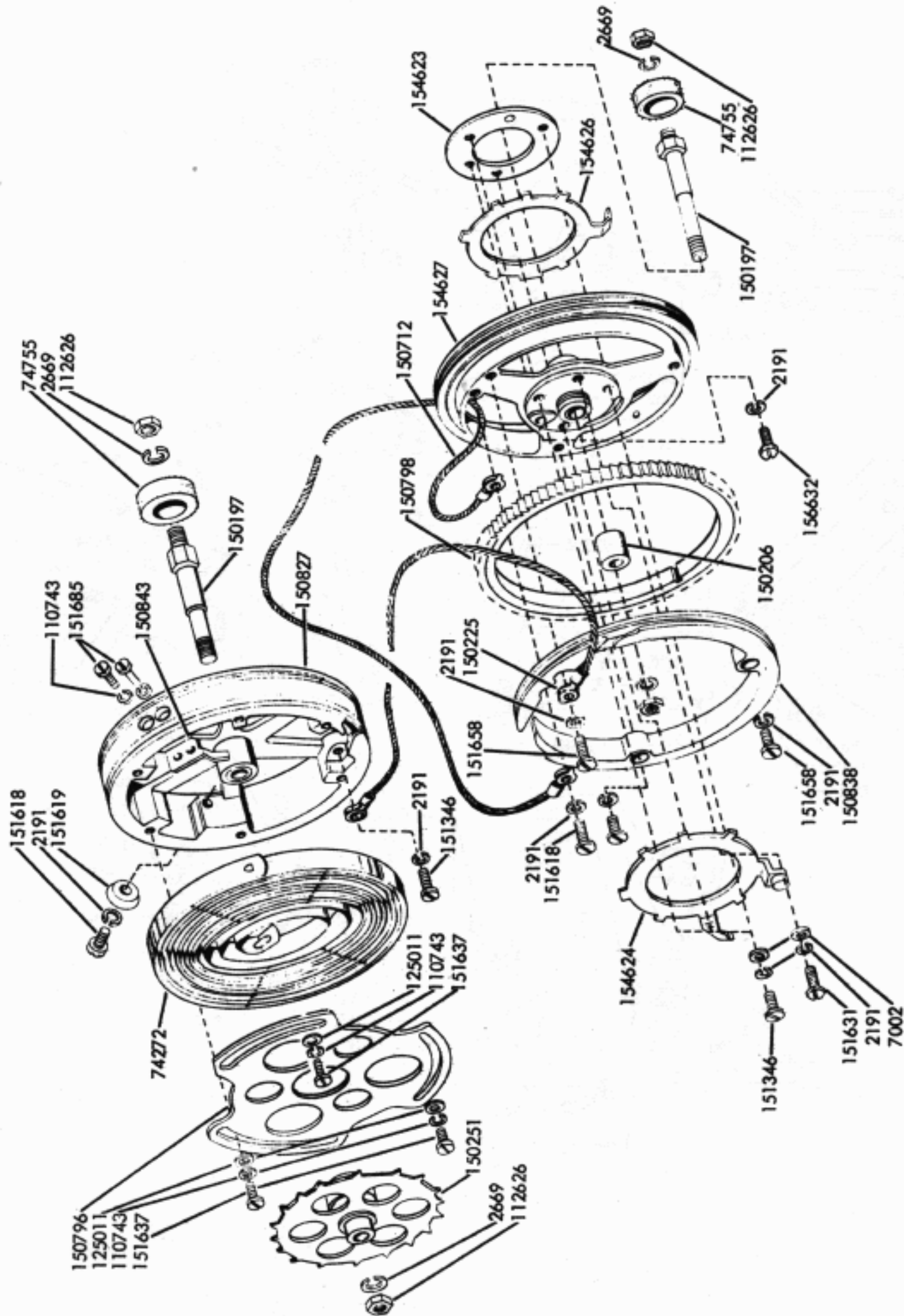


Figure 7-11 Typing Unit, Spring Drum and Spacing Drum





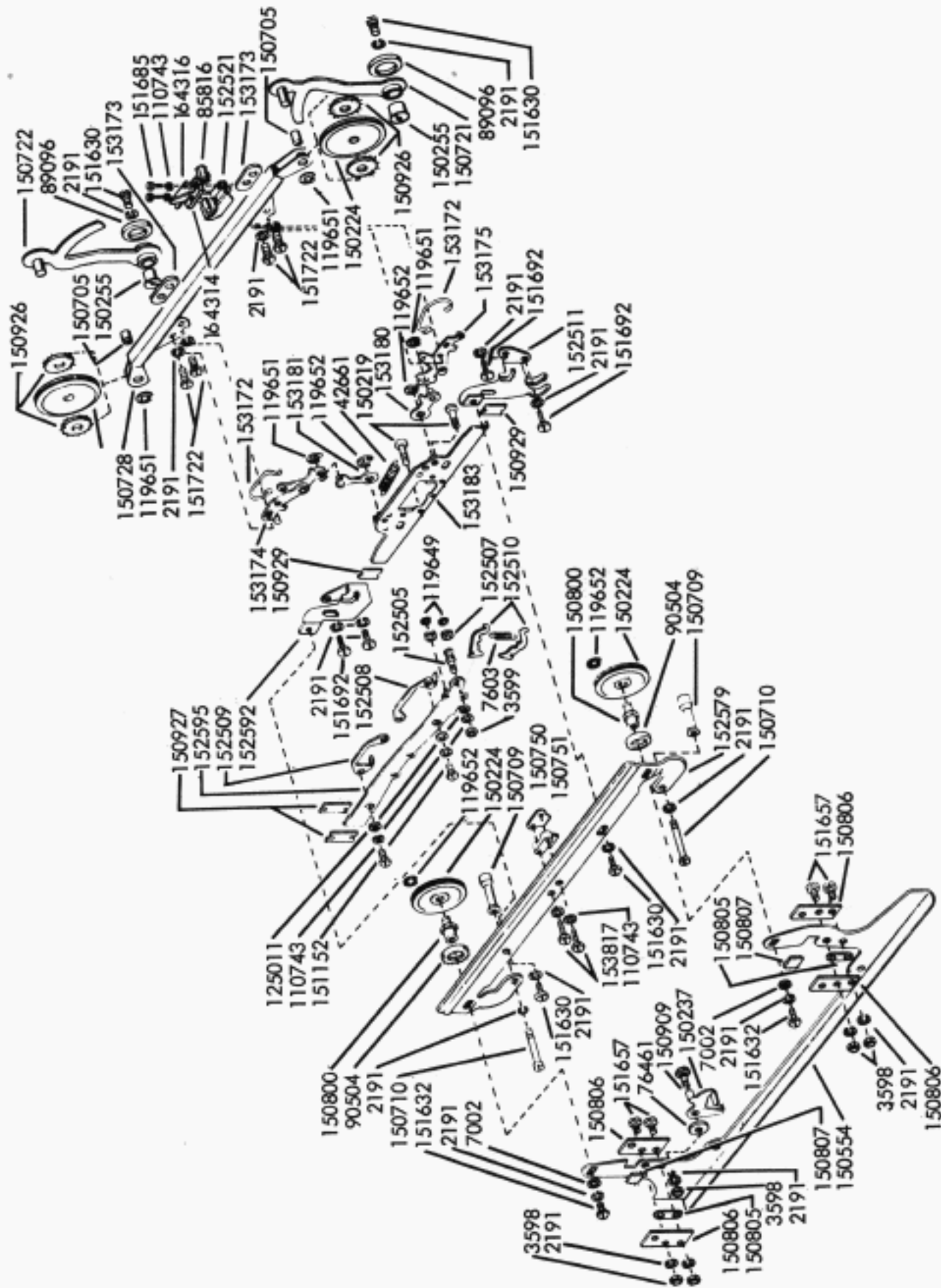


Figure 7-14 Typing Unit, Front Plate Mechanism



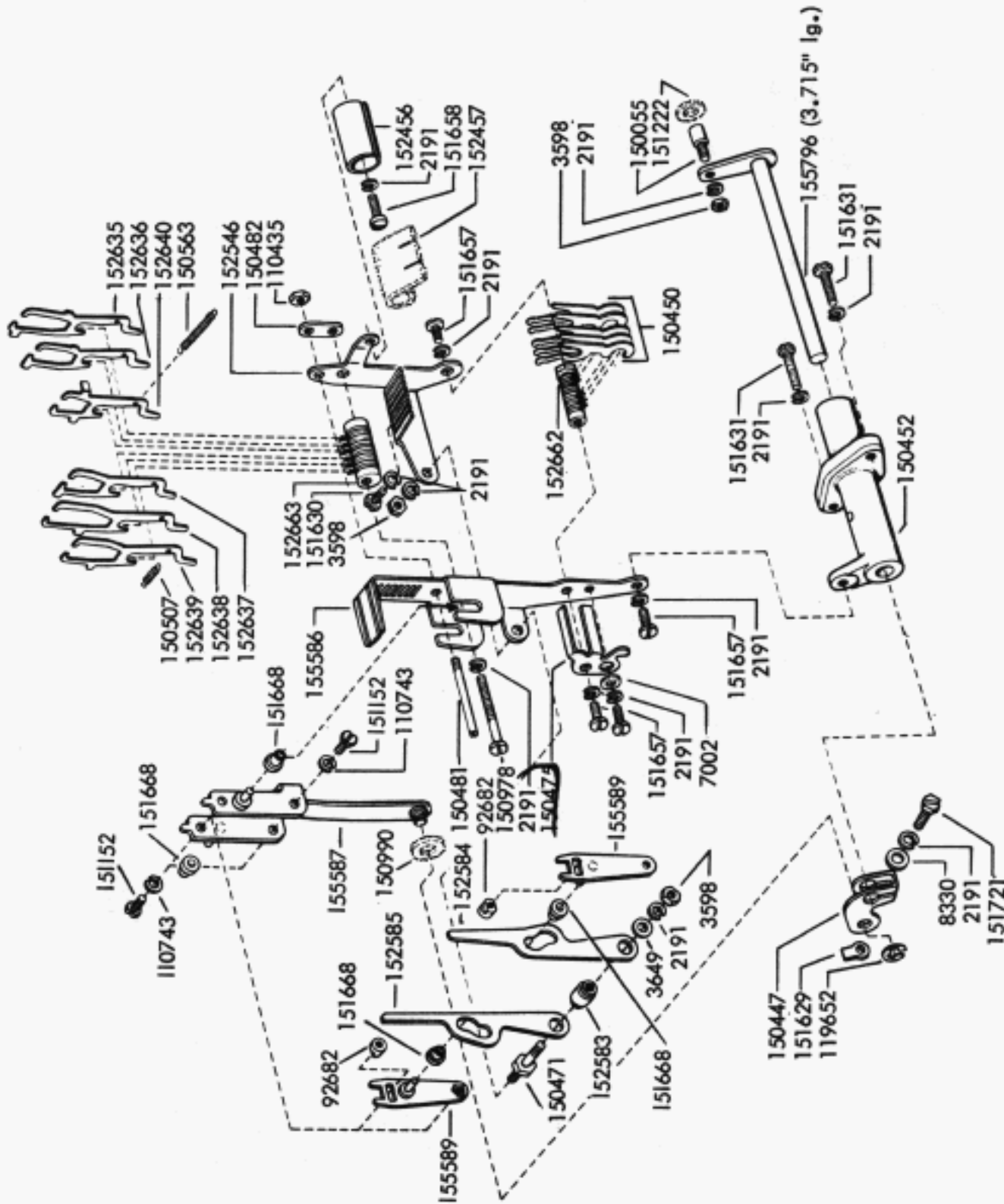


Figure 7-15 Typing Unit, Code Bar Positioning Mechanism



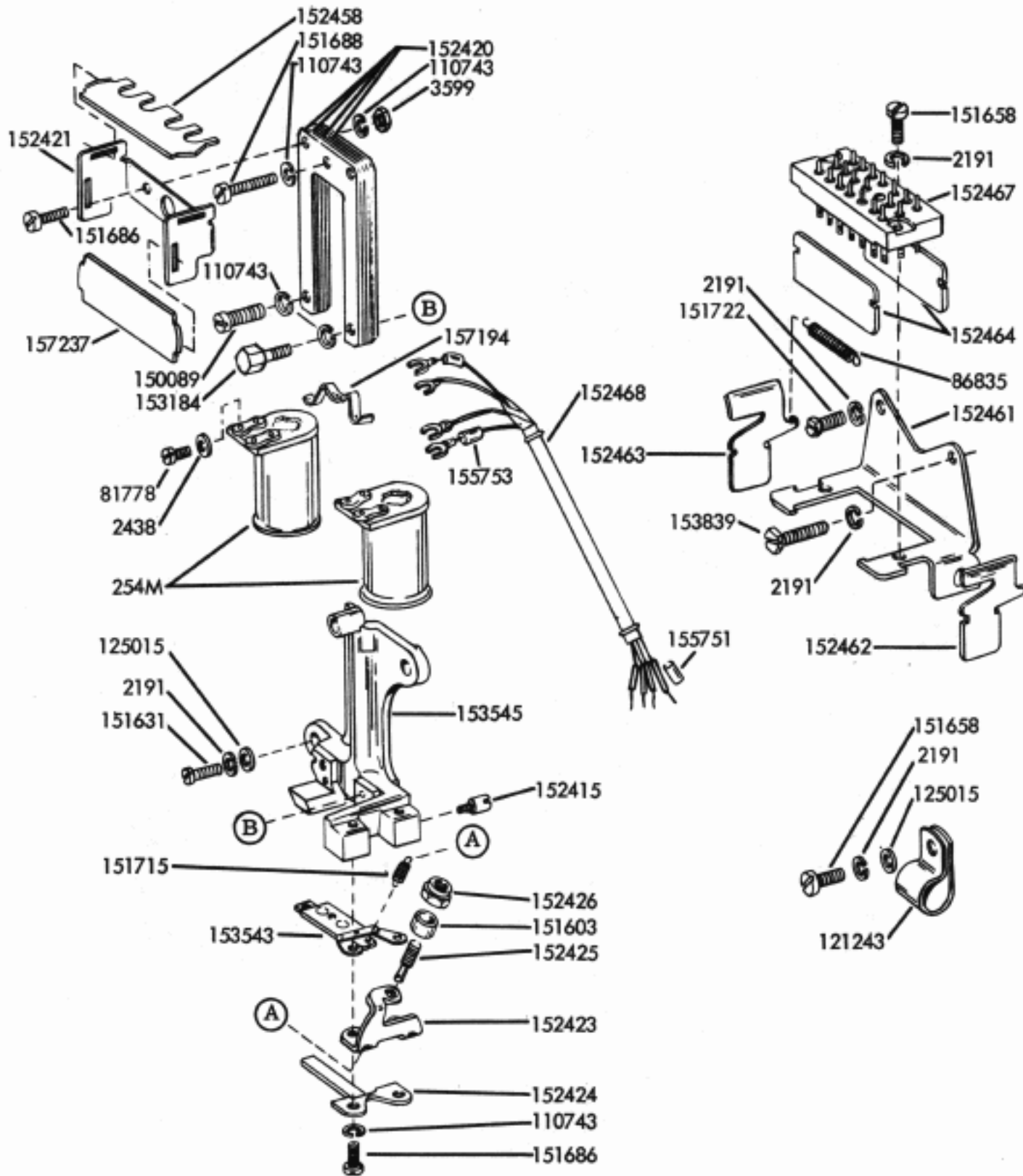


Figure 7-17 Typing Unit, Selector Magnet Mechanism

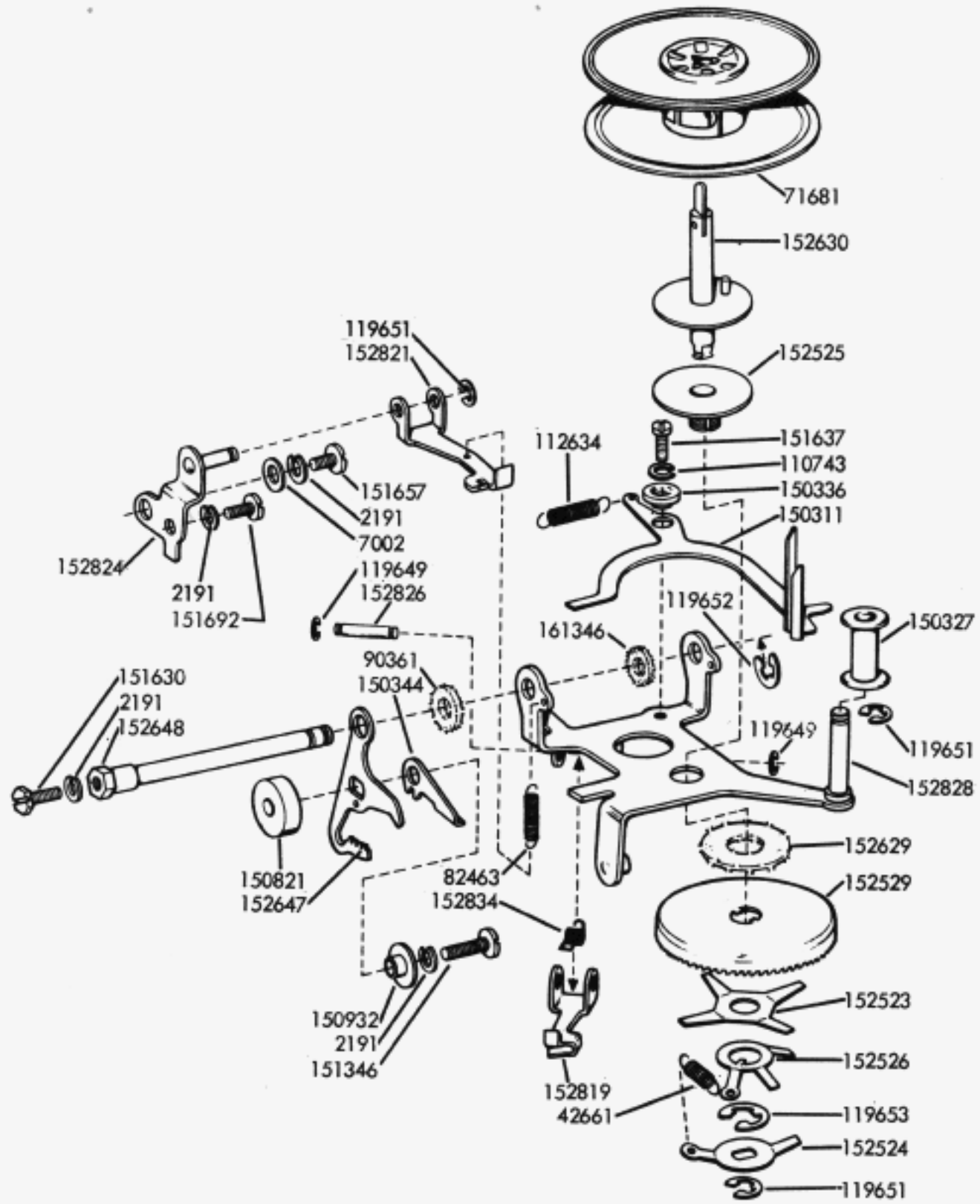


Figure 7-18 Typing Unit, Right Ribbon Feed Mechanism

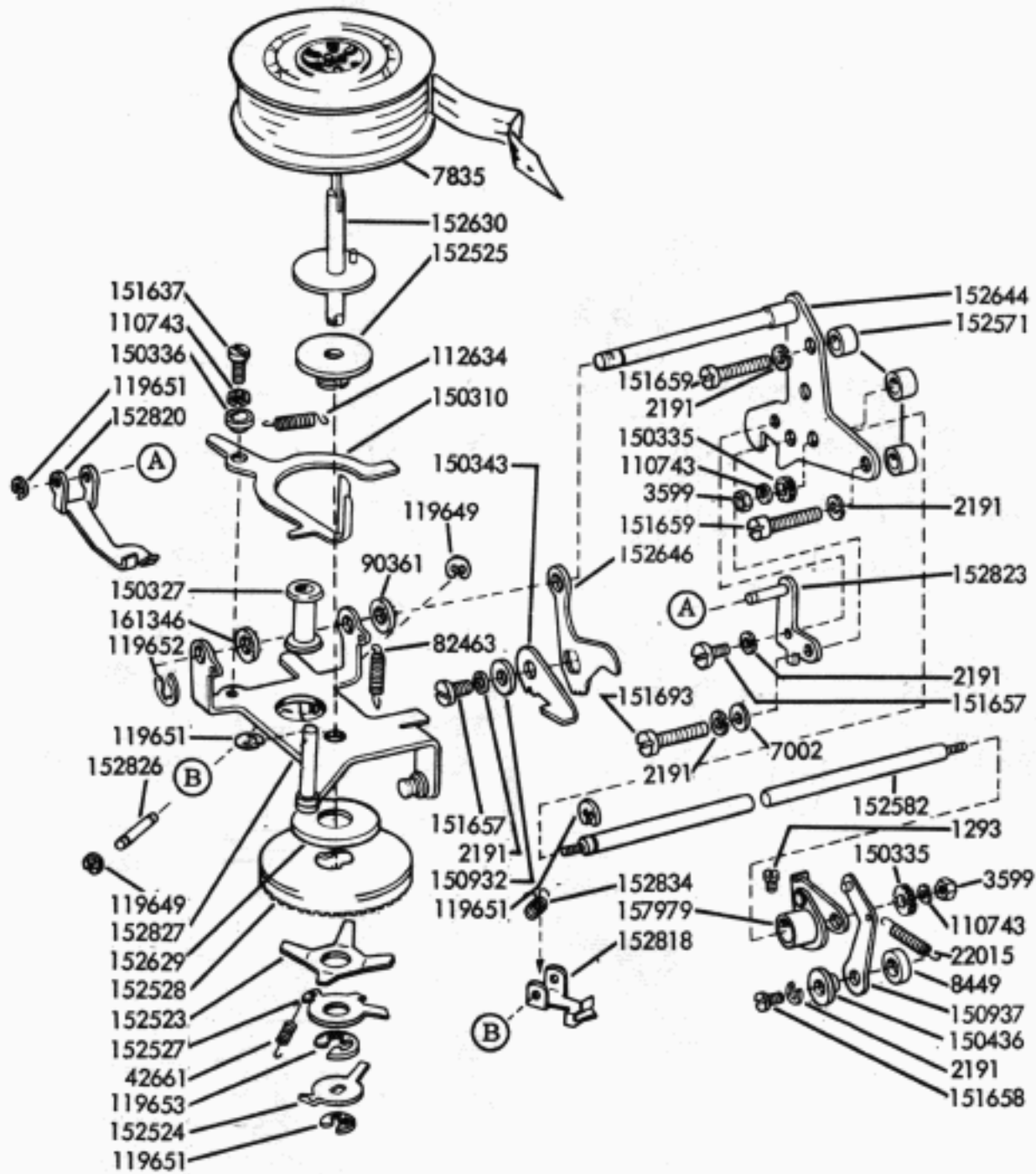


Figure 7-19 Typing Unit, Left Ribbon Feed Mechanism



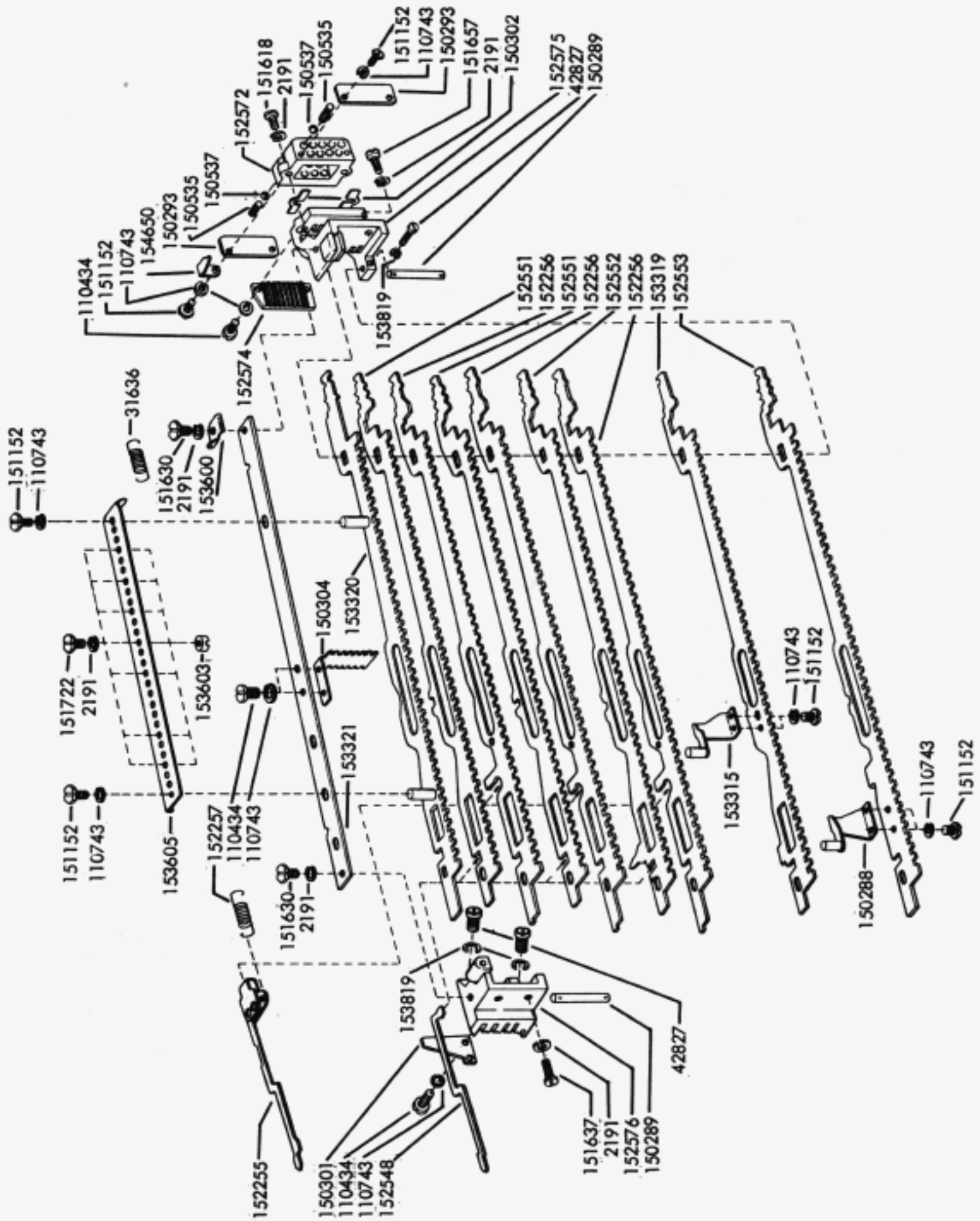


Figure 7-20 Typing Unit, Code Bar Mechanism

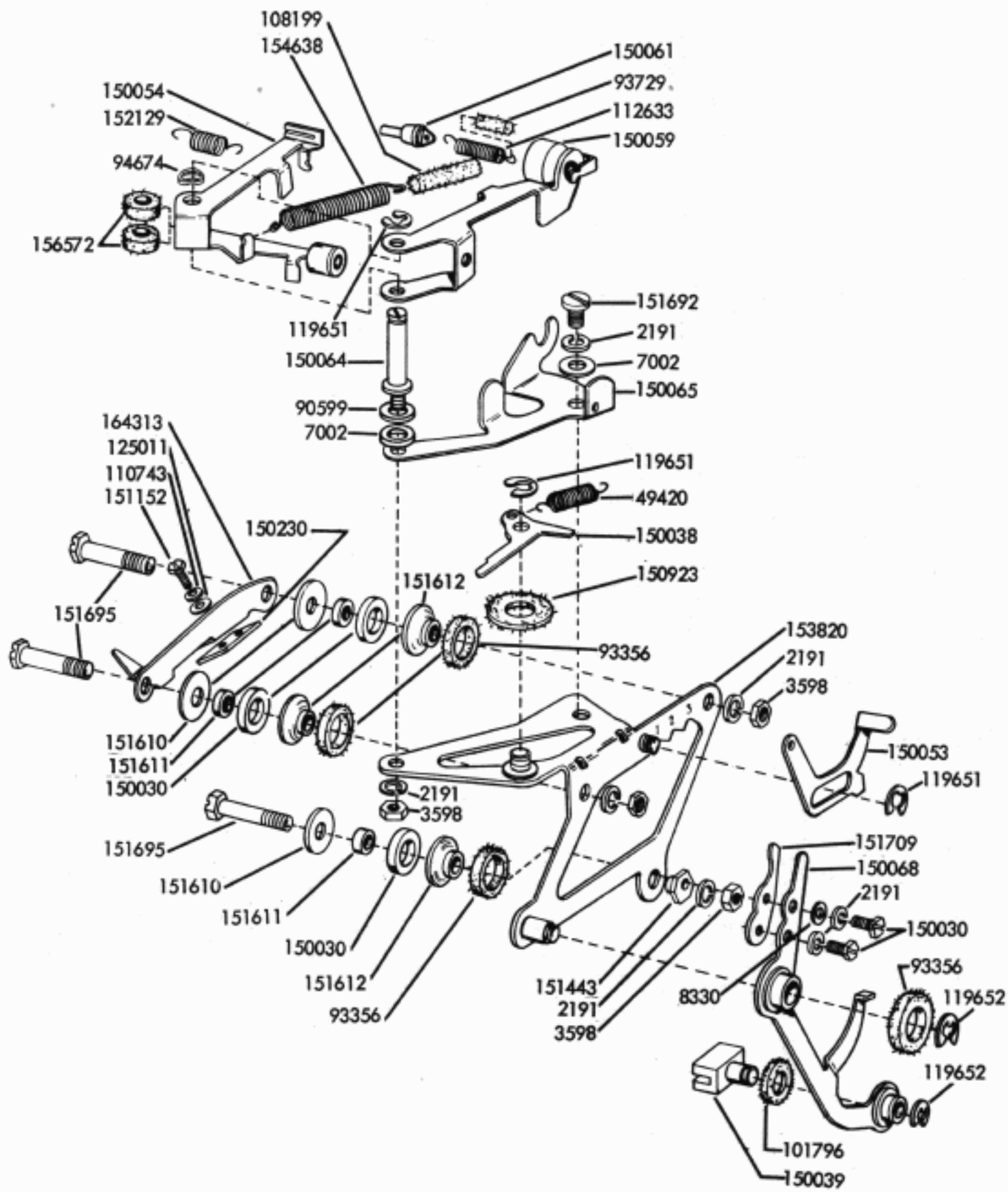
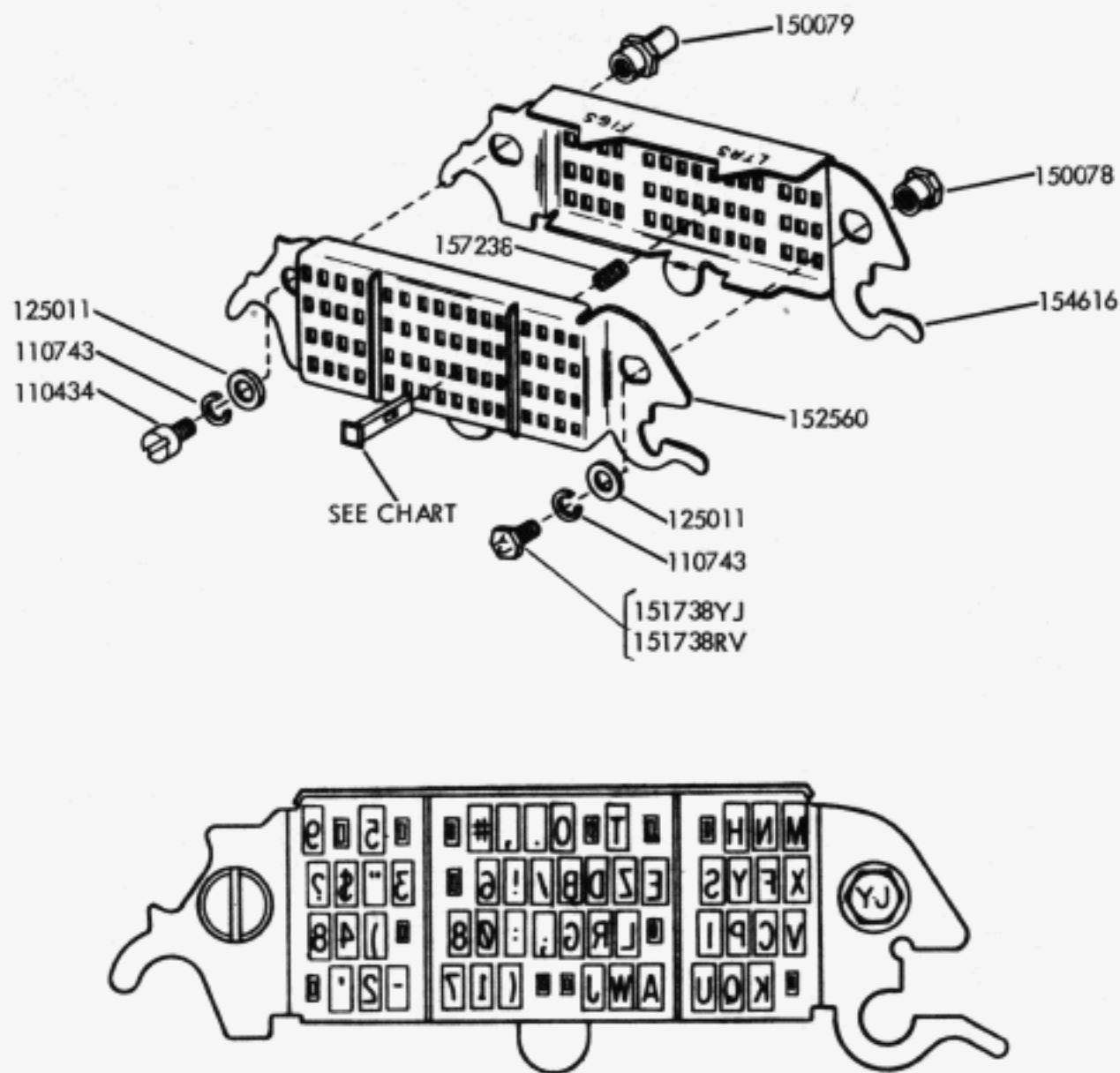


Figure 7-21 Typing Unit, Printing Carriage Mechanism





PALLET	NUMBER	PALLET	NUMBER	PALLET	NUMBER	PALLET	NUMBER
A	157729	N	157742	1	157755	"	157767
B	157730	O	157743	2	157756	'	157768
C	157731	P	157744	3	157757	;	157769
D	157732	Q	157745	4	157758	:	157770
E	157733	R	157746	5	157759	-	157771
F	157734	S	157747	6	157760	/	157772
G	157735	T	157748	7	157761	?	157773
H	157736	U	157749	8	157762	)	157774
I	157737	V	157750	9	157763	(	157775
J	157738	W	157751	0	157743	!	157776
K	157739	X	157752	ø	157764	\$	157777
L	157740	Y	157753	·	157765	&	157778
M	157741	Z	157754	'	157766	* #	157779

\*Not in 154643

YJ Assembly Number 164218  
RV Assembly Number 154643

Figure 7-23. Typing Unit, Type Box Arrangement "YJ" and "RV"

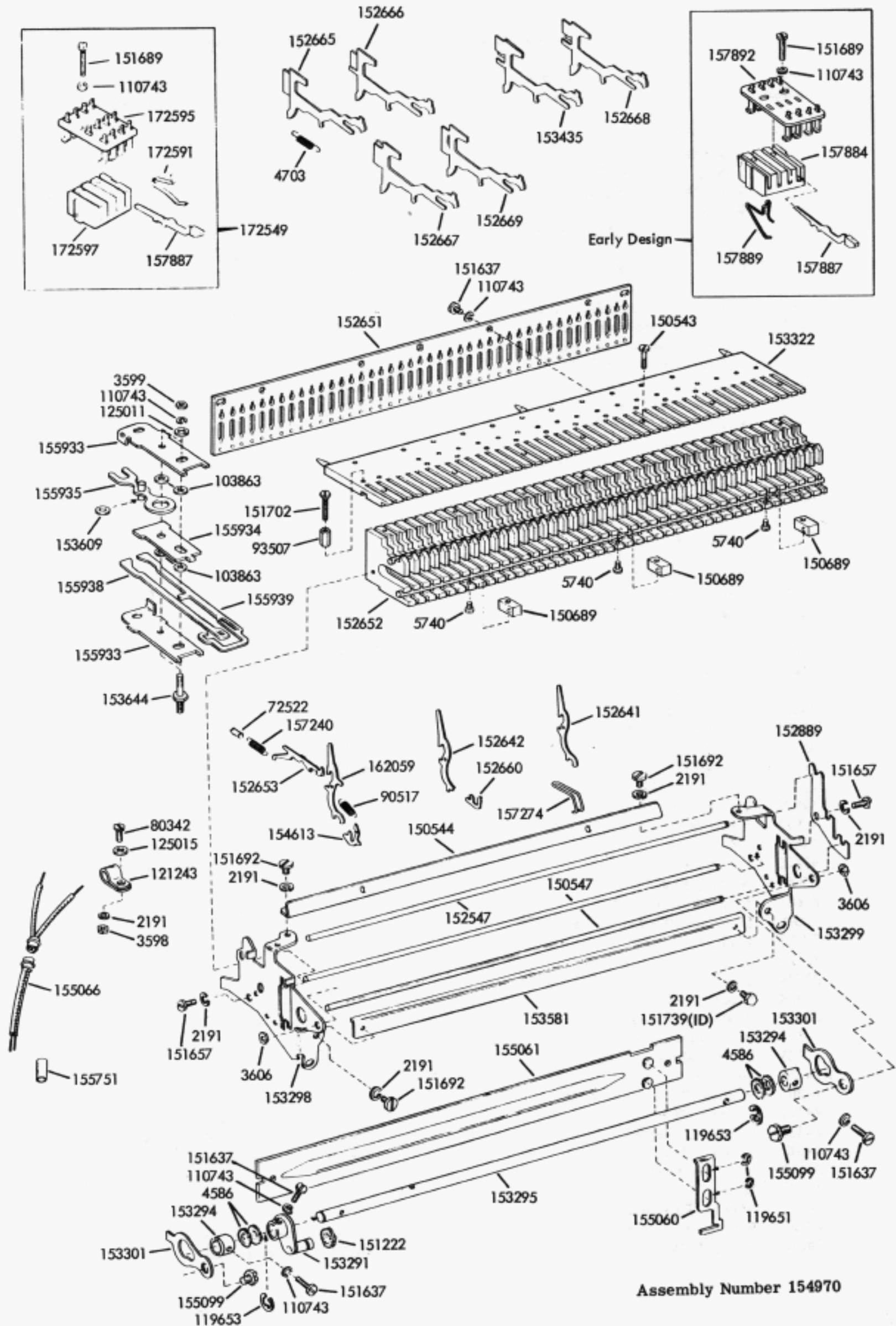


Figure 7-24 Typing Unit, Stunt Box Arrangement "AS"



## NUMERICAL INDEX - PROJECTOR TYPING UNIT

Part Number	Description and Page Number	Part Number	Description and Page Number
254M	Coil 7-18	74878	Spring, Drag 7-23
1038	Screw (6-40 x 9/32 Fil.) 7-23	74882	Spring 7-8,7-23
1214	Screw, Set (10-32) 7-14	75229	Spring 7-14
1293	Screw (4-40 x 1/8 Fil.) 7-20	76379	Spring 7-7,7-8
2034	Washer, Flat 7-17	76461	Washer, Flat 7-15
2191	Washer, Lock Used Extensively	76632	Roller 7-23
2248	Pin 7-23	78044	Post, Spring 7-23
2438	Washer, Flat 7-18	78553	Guide 7-17
2539	Nut (3/8-32 Hex) 7-5,11,23	80342	Screw (6-40 x 23/64 Hex) 7-23,7-25
2669	Washer, Lock Used Extensively	80382	Keytop, Paper 7-23
3598	Nut (6-40 Hex) Used Extensively	80581	Spring 7-4
3599	Nut (4-40 Hex) Used Extensively	81778	Screw (4-40 x 3/16 Fil.) 7-18
3606	Nut (6-40 Hex) 7-6,7-23	82442	Spring 7-4
3640	Washer, Lock 7-4,7-23	82463	Spring 7-4, 7-19,7-20
3649	Washer, Flat 7-16	82726	Spring 7-23
4586	Washer, Felt 7-4,7-24	84575	Spring 7-15
4703	Spring 7-24	84592	Shim 7-23
5740	Screw (2-56 x 1/4 Fil.) 7-24	85816	Wick, Oiler 7-15
6745	Screw (10-32 x 1/2 Hex) 7-5	86304	Spring 7-4
6800	Screw, Shoulder (6-40) 7-11,7-23	86341	Screw, Headless (10-32 x 3/16) 7-23
7002	Washer, Flat Used Extensively	86506	Post, Spring 7-23
7036	Collar 7-4	86835	Spring 7-13,7-18
7059	Lever, Detent 7-23	89096	Washer, Felt 7-15
7603	Spring 7-11,7-15	89897	Nut (10-32 Hex) 7-14
7678	Screw, Special (4-40) 7-23	90361	Washer, Felt 7-4,8,19,20
8330	Washer, Flat 7-11,16,17,22	90490	Shim 7-4
8449	Collar 7-11,7-20	90504	Washer, Felt 7-15
22015	Spring 7-20	90517	Spring 7-25
31636	Spring 7-21	90599	Shim 7-22
33038	Spring 7-4	90679	Washer, Felt 7-4
33828	Spring 7-13	90781	Latch 7-23
34432	Washer, Flat 7-23	90785	Collar 7-23
36273	Washer, Flat 7-13	90791	Washer, Lock 7-8
41382	Spring 7-17	90819	Washer, Felt 7-4,5,11
42661	Spring 7-15,19,20	92413	Knob 7-23
42823	Washer, Flat 7-9,7-10	93356	Washer, Felt Used Extensively
42827	Screw (3-48 x 1/4 Fil.) 7-21	93507	Screw (4-40 x 3/4 Hex) 7-25
45027	Spring 7-14	93729	Wick, Felt 7-22
49420	Spring 7-22	93758	Washer, Felt 7-4,7-11
55064A	Washer, Flat 7-23	93879	Oiler, Felt 7-4
71681	Spool, Ribbon 7-19	94674	Washer, Cup 7-22
72088	Screw (6-40 x 1-1/16 Hex) 7-23	95827	Bushing 7-14
72522	Wick, Felt 7-24	96717	Screw, Shoulder (4-40) 7-17
73175	Washer, Lock 7-5,7-11	97481	Wick, Felt 7-5
73276	Screw, Shoulder (6-40) 7-23	97680	Bracket 7-23
73374	Spacer 7-23	97681	Bushing 7-23
73419	Washer, Flat 7-23	97683	Ratchet 7-23
73520	Wick, Felt 7-14	97684	Bushing 7-23
74056	Plate, Retaining 7-23	97685	Bar 7-23
74272	Spring 7-12	97686	Arm 7-23
74283	Washer, Spring 7-17 7-23	97687	Bracket 7-23
74491	Roller 7-23	97688	Shaft 7-23
74536	Clamp, Cable 7-4	97689	Bracket W/Spring Post 7-23
74547	Collar 7-11	97692	Guide Assembly, Paper 7-23
74553	Wick, Felt 7-8	97695	Roll 7-23
74701	Spring 7-11	97696	Arm 7-23
74755	Washer, Felt 7-12	97697	Post 7-23
74785	Roller 7-11	97698	Bracket 7-23
74877	Spring 7-23	97699	Bearing 7-23

## Numerical Index - Projector Typing Unit

Part Number	Description and Page Number	Part Number	Description and Page Number
97700	Bracket 7-23	150055	Stud 7-16
97701	Bearing 7-23	150056	Arm 7-10
98140	Spindle 7-23	150059	Bail 7-22
98141	Spring, Retaining 7-23	150061	Head, Print Hammer 7-22
101796	Washer, Felt 7-4, 8, 14, 22	150064	Stud 7-22
103863	Spacer 7-25	150065	Bracket 7-22
105028	Wick, Felt 7-13	150068	Arm 7-22
105442	Rod, Tie 7-23	150078	Nut, Should (4-40) 7-24
107116	Washer, Lock 7-2	150079	Stud 7-24
108199	Wick, Felt 7-4, 11, 13, 22	150089	Screw (4-40 x 1/2 Fil.) 7-14, 18
110434	Screw (4-40 x 3/16 Fil.) Used Extensively	150091	Gear 7-9
110435	Nut (4-40) 7-16, 7-23	150116	Pallet, Type 7-10
110436	Spring 7-14	150175	Stud 7-13
110437	Spring 7-11	150184	Link 7-14
110743	Washer, Lock Used Extensively	150193	Hub 7-14
110872	Spring 7-14	150194	Plate 7-14
111355	Spring 7-4	150196	Bail 7-14
112626	Nut (10-32) Used Extensively	150197	Stud 7-12
112633	Spring 7-22	150202	Gear 7-14
112634	Spring 7-19, 20	150203	Washer, Retaining 7-14
115122	Washer, Felt 7-7, 8	150204	Cam, Eccentric 7-14
119648	Ring, Retaining 7-17	150206	Sleeve 7-12
119649	Ring, Retaining	150208	Bail 7-13
119651	Ring, Retaining	150215	Block, Guide 7-13
119652	Ring, Retaining	150218	Bushing 7-13
119653	Ring, Retaining	150219	Screw (4-40 x 1/2 Sq.) 7-15
121243	Clamp, Cable 7-18, 7-25	150224	Pulley 7-15
125011	Washer, Flat	150228	Spacer 7-14
125015	Washer, Flat 7-4, 8, 18, 25	150229	Retainer 7-14
125159	Screw, Pilot (6-40) 7-23	150230	Plate 7-22
125238	Spring 7-14	150232	Retainer, Oil 7-13
125241	Spring 7-23	150233	Roller 7-14
125802	Washer, Flat 7-14	150234	Roller 7-14
128002	Screw (2-5) 7-8	150235	Slide 7-14
130683	Washer, Lock 7-6	150237	Lever 7-15
135716	Spring 7-11	150241	Spring 7-9, 7-10
139555	Spring 7-14	150244	Link 7-9
150000	Drum, Clutch 7-9, 7-10	150245	Bracket 7-13
150001	Drum, Clutch 7-10	150247	Link 7-13
150004	Cam 7-10	150251	Wheel, Ratchet 7-12
150010	Plate, Retaining 7-9	150255	Bushing 7-15
150013	Disk, Adjusting 7-9, 7-10	150263	Bail 7-13
150026	Lever, Shoe 7-9, 7-10	150288	Bracket 7-21
150027	Lever, Shoe 7-9	150289	Stud 7-21
150029	Wick, Felt 7-9, 7-10	150293	Plate 7-20
150030	Roller, Bearing 7-22	150301	Plate 7-21
150033	Disk 7-9	150302	Shim 7-21
150038	Latch 7-22	150304	Bracket 7-21
150039	Slide 7-22	150310	Lever 7-20
150040	Screw (6-40 x 5/8 Fil.) 7-9, 10, 11	150311	Lever 7-19
150043	Shoe 7-9, 7-10	150327	Roller 7-20
150044	Shoe 7-9, 7-10	150335	Gear 7-20
150046	Bearing 7-9	150336	Bushing 7-19
150047	Bearing 7-10	150341	Post, Spring 7-2
150048	Spring 7-17	150343	Lever 7-20
150050	Spacer 7-10	150344	Lever 7-19
150051	Cam, Eccentric 7-10	150349	Arm, Follower 7-11
150053	Bracket 7-22	150350	Shaft 7-11
150054	Bail 7-22	150351	Stud, Eccentric 7-2

## Numerical Index - Projector Typing Unit

Part Number	Description and Page Number	Part Number	Description and Page Number
150352	Bushing 7-11	150547	Shaft 7-24
150353	Stud 7-2	150549	Collar 7-9
150355	Lever, Latch 7-11	150554	Plate 7-15
150358	Lever, Trip 7-11	150558	Spring 7-13
150361	Spacer 7-11	150559	Spring 7-13
150363	Plate 7-7	150563	Spring 7-16
150364	Stud, Eccentric 7-9	150598	Track, Printing 7-13
150365	Shaft, Rocker 7-7	150651	Gear 7-6
150366	Bracket 7-7	150668	Collar, Spacing 7-14
150367	Bracket 7-8	150669	Shim 7-14
150369	Link 7-7	150670	Shim 7-14
150370	Link 7-8	150672	Bearing 7-14
150377	Arm 7-4	150673	Shaft 7-14
150380	Stud 7-8	150677	Pawl, Feed 7-14
150382	Block, Guide 7-7	150678	Pawl, Feed 7-14
150383	Spacer 7-7	150687	Stud 7-17
150384	Spacer 7-8	150689	Block, Guide 7-25
150387	Link 7-8	150694	Slide 7-14
150392	Bail 7-4	150705	Bushing 7-15
150395	Screw, Shoulder (6-40) 7-7,7-8	150709	Spacer 7-15
150396	Lever 7-7	150710	Screw (6-40 x 1-1/4 Fil.) 7-15
150397	Lever 7-8	150712	Rope, Draw Wire 7-12
150398	Stud, Pivot 7-5	150714	Bearing 7-6
150399	Shaft 7-4	150719	Retainer 7-6
150401	Clamp 7-7	150720	Retainer 7-6
150410	Stud 7-7	150721	Arm 7-15
150411	Washer, Flat 7-8	150722	Arm 7-15
150412	Arm, Follower 7-7	150728	Rail 7-15
150413	Arm, Follower 7-8	150731	Slide 7-14
150414	Bushing 7-5	150732	Slide 7-14
150419	Shaft 7-5	150733	Slide 7-14
150420	Lever 7-8	150738	Guide 7-14
150423	Stud, Pivot 7-5	150746	Bushing 7-14
150425	Lever, Lock 7-7,7-8	150748	Stud 7-13
150428	Lever 7-7	150750	Plate 7-15
150429	Stud, Eccentric 7-7,7-8	150751	Block, Guide 7-15
150431	Lever, Trip 7-11	150752	Stud 7-13
150436	Bushing 7-14,7-20	150753	Roller 7-13
150439	Gear 7-9	150754	Roller 7-13
150440	Hub 7-9	150755	Stud 7-13
150441	Gear 7-9	150757	Arm 7-13
150444	Lever 7-11	150758	Pulley 7-13
150447	Arm 7-16	150770	Bellcrank 7-14
150450	Arm 7-16	150771	Bellcrank 7-14
150452	Bearing 7-16	150776	Lever, Lock 7-13
150471	Stud 7-16	150777	Bail 7-13
150475	Bracket 7-16	150781	Stud 7-4
150479	Stud 7-17	150796	Disk 7-12
150481	Shaft 7-16	150798	Wheel, Ratchet 7-12
150482	Plate 7-16	150800	Stud 7-15
150507	Spring 7-16	150805	Shim 7-15
150535	Spring 7-21	150806	Plate 7-15
150536	Spring 7-11, 13, 14	150807	Oiler, Felt 7-15
150537	Ball, Bearing 7-14,7-21	150811	Stud 7-8
150538	Cylinder, Dashpot 7-14	150821	Spacer 7-19
150543	Screw (3-48 x 13/32 Fil.) 7-25	150824	Track 7-8
150544	Handle 7-25	150830	Bushing, Shoulder 7-9
150545	Bracket 7-3	150831	Ring, Retaining 7-9
150546	Bracket 7-2	150838	Ring, Retaining 7-12

## Numerical Index - Projector Typing Unit

Part Number	Description and Page Number	Part Number	Description and Page Number
150843	Plate 7-12	151701	Spring 7-14
150891	Block 7-8	151702	Nut (4-40 Hex) 7-4
150894	Bar 7-4	150709	Arm 7-22
150895	Arm, Trip 7-11	151714	Spring 7-17
150909	Screw, Shoulder (6-40) 7-15	151715	Spring 7-18
150919	Arm 7-4	151721	Screw (6-40 x 3/4 Hex) 7-16
150923	Washer, Felt 7-11,7-13,7-22	151722	Screw (6-40 x 3/16 Hex) Used Extensively
150926	Washer, Felt 7-15	151723	Screw (10-32 x 3/8 Hex) 7-14
150927	Oiler, Felt 7-15	151724	Screw (10-32 x 5/8 Hex) 7-23
150929	Oiler, Felt 7-15	151728	Spring 7-10
150930	Washer, Felt 7-4	151734	Screw (4-40 x 3/8 Fil.) 7-8
150932	Bushing, Shoulder 7-19,7-20	151736	Spring 7-9
150937	Lever 7-20	151737	Screw (4-40 x 11/64 Hex) 7-9,7-10
150970	Bearing 7-9	151738**	Screw, Identification (4-40)7-24
150978	Screw (6-40 x 1-1/8 Fil.) 7-16	151739**	Screw, Identification (6-40) 7-25
150987	Spacer 7-14	151880	Nut (4-40 Hex) 7-8,7-14
150990	Washer, Felt 7-5,7-16	152129	Spring 7-22
151073	Screw (4-40 x 5/32 Fil.) 7-6	152140	Bail 7-22
151103	Spring 7-17	152147	Bearing, Ball 7-4
151152	Screw (4-40 x 3/16 Hex) Used Extensively	152254	Wick, Felt 7-7,7-8
151222	Washer, Felt 7-16,7-24	152255	Bar 7-21
151336	Oiler 7-17	152256	Bar, Code 7-21
151346	Screw (6-40 x 3/8 Fil.) Used Extensively	152257	Spring 7-21
151442	Screw (6-40 x 1/2 Hex) 7-7,7-23	152400	Bracket, Spring 7-17
151443	Eccentric 7-22	152401	Guide 7-17
151602	Plate 7-7,7-8	152402	Guide 7-17
151603	Spacer 7-8,7-18	152403	Bracket 7-17
151604	Block, Guide 7-7,7-8	152404	Bracket 7-17
151606	Screw (10-32 x 1/4 Hex) 7-14	152405	Lever 7-17
151610	Washer, Flat 7-22	152406	Bracket 7-17
151611	Bushing 7-22	152407	Lever 7-17
151612	Spacer 7-22	152409	Lever 7-17
151618	Screw (6-40 x 7/16 Fil.) 7-12, 7-21	152410	Bail, Reset 7-17
151625	Strip 7-13	152411	Lever, Push 7-17
151627	Rod 7-5	152412	Link 7-17
151629	Nut (6-40 Lug) 7-11,7-16	152415	Stud 7-18
151630	Screw (6-40 x 1/4 Hex) Used Extensively	152420	Lamination 7-18
151631	Screw (6-40 x 5/16 Hex) Used Extensively	152421	Bracket 7-18
151632	Screw (6-40 x 3/8 Hex) Used Extensively	152423	Bracket 7-18
151633	Bearing, Ball 7-7	152424	Plate, Stop 7-18
151637	Screw (4-40 x 1/4 Fil.) Used Extensively	152425	Post, Spring 7-18
151640	Lever, Shoe 7-10	152426	Nut, Self Locking (6-40) 7-18
151642	Screw (6-40 x 3/4 Fil.) 7-9,7-10	152427	Latch 7-18
151644	Spring 7-7,7-8	152429	Rock, Sector 7-17
151657	Screw (6-40 x 1/4 Fil.) Used Extensively	152432	Arm, Stop 7-17
151658	Screw (6-40 x 5/16 Fil.) Used Extensively	152436	Knob 7-17
151659	Screw (6-40 x 1/2 Fil.) 7-20	152438	Bail 7-17
151661	Screw (6-40 x 1" Fil.) 7-14	152441	Washer, Flat 7-17
151668	Roller 7-16	152445	Spring 7-17
151685	Screw (4-40 x 5/16 Fil.) 7-5,8,11,12,14,15	152447	Shaft 7-17
151686	Screw (4-40 x 3/8 Fil.) 7-14,7-18	152450	Cam, Selector 7-10
151687	Screw (4-40 x 7/16 Fil.) 7-6	152456	Holder, Wick 7-16
151688	Screw (4-40 x 5/8 Fil.) 7-9,7-18	152457	Wick, Felt 7-16
151689	Screw (4-40 x 3/4 Fil.) 7-10,7-25	152458	Shield 7-18
151690	Screw (10-32 x 5/16 Fil.) 7-9	152461	Bracket 7-18
151692	Screw (6-40 x 3/16 Fil.) Used Extensively	152463	Latch 7-18
151693	Screw (6-40 x 9/16 Fil.) 7-9,7-20	152464	Insulator 7-18
151695	Screw (6-40 x 5/8 Hex) 7-22	152467	Connector 7-18
151700	Screw, Shoulder (6-40) 7-13	152468	Cable 7-19

## Numerical Index - Projector Typing Unit

Part Number	Description and Page Number	Part Number	Description and Page Number
152503	Link 7-8	152638	Lever, Transfer 7-16
152505	Stud 7-15	152639	Lever, Transfer 7-16
152507	Roller, Detent 7-15	152640	Lever, Transfer 7-16
152508	Bracket 7-15	152641	Lever 7-25
152509	Bracket 7-15	152642	Lever 7-25
152510	Lever, Detent 7-15	152644	Bracket 7-20
152511	Guide 7-15	152646	Lever, Reversing 7-20
152514	Bail 7-4	152647	Lever, Reversing 7-19
152515	Lever, Trip 7-4	152651	Plate, Guide 7-24
152516	Slide 7-4	152652	Bar, Guide 7-24
152518	Bail 7-4	152660	Plate, Spring 7-24
152521	Slide 7-15	152662	Shaft 7-16
152522	Lever 7-14	152663	Guide 7-16
152523	Spring 7-19,7-20	152665	Bar, Function 7-25
152524	Bracket 7-19,7-20	152666	Bar, Function 7-25
152525	Hub 7-19,7-20	152667	Bar, Function 7-25
152526	Plate 7-19	152668	Bar, Function 7-25
152527	Plate 7-20	152669	Bar, Function 7-25
152528	Ratchet, Ribbon 7-20	152726	Bushing 7-11
152529	Ratchet, Ribbon 7-19	152818	Lever, Detent 7-20
152537	Clamp 7-9	152819	Lever, Detent 7-19
152538	Plate, Front 7-14	152820	Lever, Feed 7-20
152545	Lever 7-4	152821	Lever, Feed 7-19
152546	Bracket 7-16	152823	Bracket 7-20
152547	Shaft 7-25	152824	Bracket 7-19
152548	Bar 7-21	152826	Pin, Detent 7-19,7-20
152550	Clamp 7-7	152827	Bracket 7-20
152551	Bar, Code 7-21	152828	Bracket 7-19
152552	Bar, Code 7-21	152834	Spring 7-19,7-20
152553	Bar, Code 7-21	152887	Screw (4-40 x 1/2 Hex) 7-9,7-10
152560	Plate, Pallet Box 7-24	152889	Plate, Retainer 7-25
152563	Bracket 7-4	152890	Washer, Flat 7-14
152571	Spacer 7-20	152891	Spring 7-17
152572	Bracket 7-21	152893	Screw (4-40 x 1/4 Hex) 7-4,7-7
152574	Plate 7-21	153172	Spring 7-15
152575	Bracket 7-21	153173	Clamp 7-15
152576	Bracket 7-21	153174	Link 7-15
152579	Track 7-15	153175	Link 7-15
152580	Frame, Right Side 7-3	153180	Link 7-15
152581	Frame, Left Side 7-2	153181	Link 7-15
152582	Shaft 7-20	153183	Slide 7-15
152583	Bearing 7-16	153184	Post 7-18
152584	Lever 7-16	153235	Plate 7-9
152585	Lever 7-16	153236	Gear 7-9
152586	Bracket 7-14	153255	Bail 7-4
152589	Clamp 7-7	153256	Bracket 7-4
152592	Guide 7-15	153291	Arm 7-25
152593	Housing, Bearing 7-8	153292	Plate 7-10
152595	Slide 7-15	153293	Spacer 7-10
152596	Slide, Shift 7-14	153294	Cam 7-25
152597	Bail 7-14	153295	Shaft 7-25
152598	Stud 7-13	153296	Eccentric 7-10
152599	Stud 7-13	153298	Bracket 7-25
152629	Washer, Friction 7-19,7-20	153299	Bracket 7-25
152630	Shaft 7-19,7-20	153300	Arm 7-10
156634	Washer, Flat 7-14	153301	Arm 7-25
152635	Lever, Transfer 7-16	153304	Bushing, Shoulder 7-2
152636	Lever, Transfer 7-16	153305	Spring 7-4
152637	Lever, Transfer 7-16	153311	Arm 7-4



## Numerical Index - Projector Typing Unit

Part Number	Description and Page Number	Part Number	Description and Page Number
153312	Lever 7-2	154624	Ring 7-12
153314	Bracket 7-4	154626	Ring 7-12
153315	Bracket 7-21	154267	Drum, Spacing 7-12
153319	Bar, Code 7-21	154638	Spring 7-21
153320	Bar, Code 7-21	154650	Clip 7-21
153321	Bracket, Tie 7-21	154688	Spring 7-5
153322	Guide 7-25	154694	Disk 7-9, 7-10
153323	Ring 7-10	154872	Bracket 7-3
153331	Linkage 7-13	155042	Bracket 7-4
153332	Linkage 7-13	155046	Screw (4-40 x 5/32 Hex) 7-10
153337	Bushing 7-13	155047	Disk 7-10
153340	Spring 7-13	155060	Slide, Stripper 7-25
153355	Bracket 7-13	155061	Blade 7-25
153367	Arm 7-11	155066	Cable 7-24
153368	Bail, Follower 7-11	155081	Post, Spring 7-14
153382	Bail, Transfer 7-4	155090	Lubricator Assembly 7-17
153383	Arm 3-4	155096	Plate 7-17
153435	Bar, Function 7-25	155099	Screw, Shoulder (6-40) 7-25
153489	Detent 7-17	155586	Bracket 7-16
153530	Plate 7-8	155587	Link 7-16
153531	Plate, Adjusting 7-8	155751	Sleeve, Insulating 7-18, 25
153532	Screw, Adjusting 7-8	155753	Sleeve, Insulating 7-18
153543	Armature 7-18	155796	Shaft 7-16
153545	Bracket 7-18	155864	Shaft 7-5
153550	Link 7-5	155865	Stud 7-5
153553	Roller 7-5	155889	Pallet, Type 7-16
153558	Link 7-5	155933	Plate, Guide 7-25
153569	Arm 7-11	155934	Plate 7-25
153573	Bail 7-5, 7-10	155935	Fork W/Post 7-25
153576	Cam, Function 7-10	155938	Slide 7-25
153577	Washer, Felt 7-5	155939	Slide 7-25
153581	Handle 7-24	156536	Screw (4-40 x 1/8 Fil.) 7-17
153582	Screw, Shoulder (6-40) 7-4	156572	Washer, Felt 7-22
153583	Lever, Trip 7-11	156632	Screw (6-40 x 13/32 Hex) 7-12
153586	Guide 7-2	156740	Screw (6-40 x 7/32 Hex) 7-23
153587	Guide 7-3	157194	Retainer, Spring 7-18
153600	Bracket, Spring 7-21	157237	Shield 7-18
153603	Nut (6-40) 7-21	157238	Spring 7-23
153605	Bracket 7-21	157240	Spring 7-25
153609	Roller 7-25	157241	Clamp 7-5
153644	Stud 7-25	157261	Shaft 7-17
153806	Spring 7-4, 7-11	157274	Clip 7-25
153810	Guide, Ribbon 7-8	157729 to 157779	Pallet, Type 7-24
153817	Screw (4-40 x 3/8 Hex) 7-14, 7-15	157884	Block, Contact 7-25
153819	Washer, Lock 7-21	157887	Arm, Contact 7-25
153820	Frame 7-22	157889	Spring 7-25
153823	Collar 7-10	157892	Plate, Contact 7-25
153824	Clamp 7-10	157972	Arm, Transfer 7-14
153839	Screw (6-40 x 5/8 Hex) 7-8	157979	Link, Toggle 7-20
153841	Screw (6-40 x 9/16 Hex) 7-7	157990	Bracket 7-4
153889	Washer, Flat 7-18	157991	Stud 7-4
154253	Stud 7-14	158335	Stud 7-14
154462	Bracket 7-18	158352	Bail 7-11
154613	Latch 7-25	158353	Bail 7-11
154616	Plate, Pallet Box 7-24	158354	Arm 7-11
154620	Wick, Felt 7-17	158365	Blade, Reset 7-5
154621	Retainer 7-17	160210	Switch Assembly, Contact 7-25
154622	Lubricator 7-17	160843	Spring 7-11
154623	Ring, Retaining 7-12	161342	Lever 7-17

## Numerical Index - Projector Typing Unit

Part Number	Description and Page Number	Part Number	Description and Page Number
161346	Washer, Felt 7-19, 20	163556	Link W/Stud 7-6
161347	Washer, Felt 7-5, 7-13, 7-14	163557	Link W/Stud 7-6
162059	Lever 7-24	163558	Shaft 7-6
162458	Plate, Clamp 7-10	163559	Roller 7-23
162573	Retainer 7-9	163560	Bracket 7-6
163539	Bail W/Studs 7-23	163561	Hub 7-6
163540	Bushing 7-6	163563	Bracket, Platen 7-6
163541	Eccentric 7-6	163565	Bracket 7-23
163542	Pawl, Feed 7-23	163566	Bracket 7-23
163543	Link 7-6	163567	Guide 7-6
163544	Link 7-23	163580	Bracket 7-6
163545	Retainer 7-6	163970	Bracket W/Posts 7-23
163546	Link 7-6	164136	Extension W/Bushing 7-23
163547	Link 7-7	164231	Roll Assembly, Feed 7-23
163548	Plate W/Stud 7-6	164313	Bracket 7-22
163549	Link W/Stud 7-6	164314	Plate 7-15
163553	Rod, Tie 7-23	164316	Plate, Clamp 7-15
163555	Hub 7-6	164997	Link W/Stud 7-6
		172549	Switch Assembly 7-25
		172591	Spring 7-25
		172595	Plate, Contact 7-25
		172597	Block, Contact 7-25

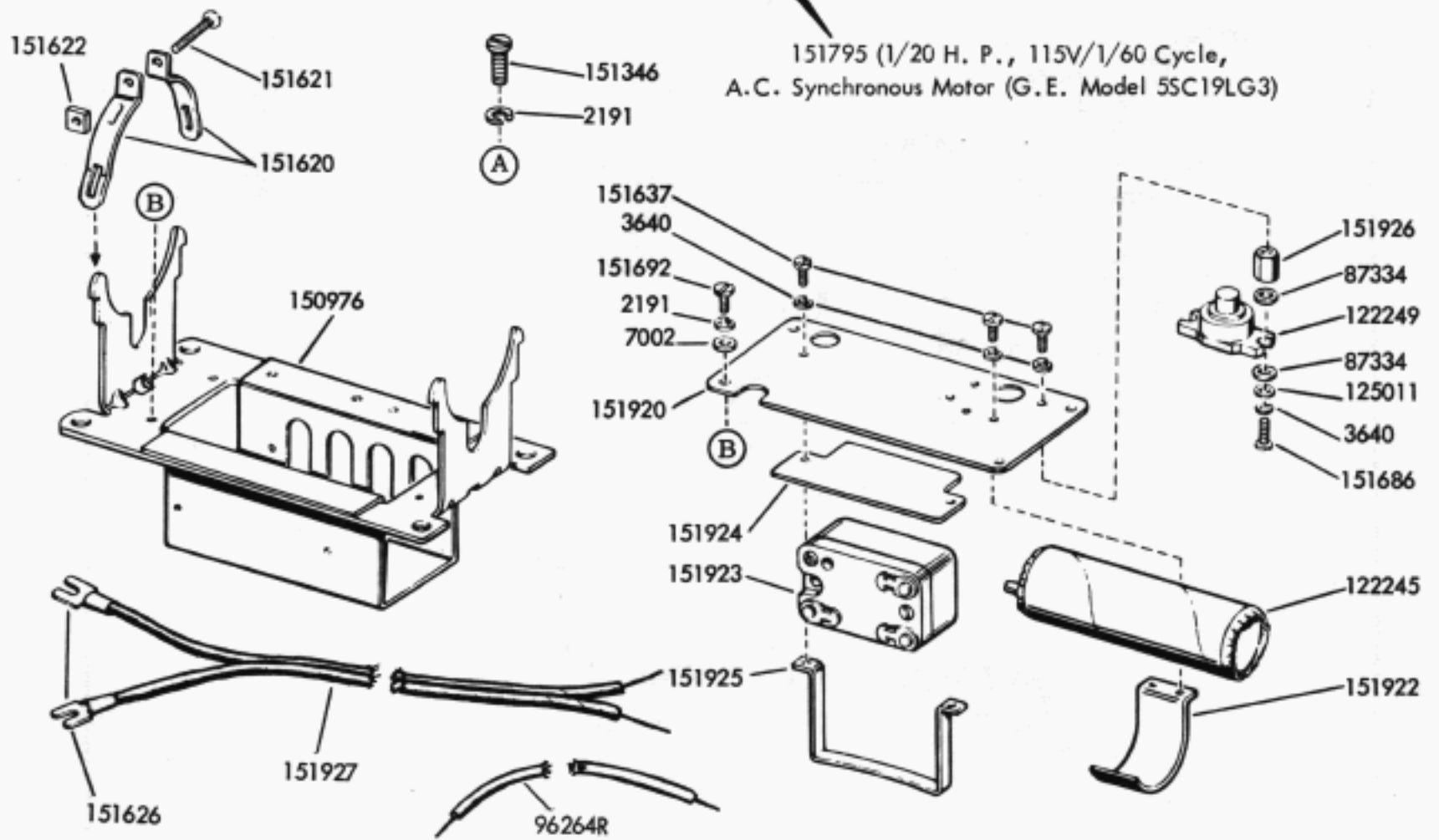
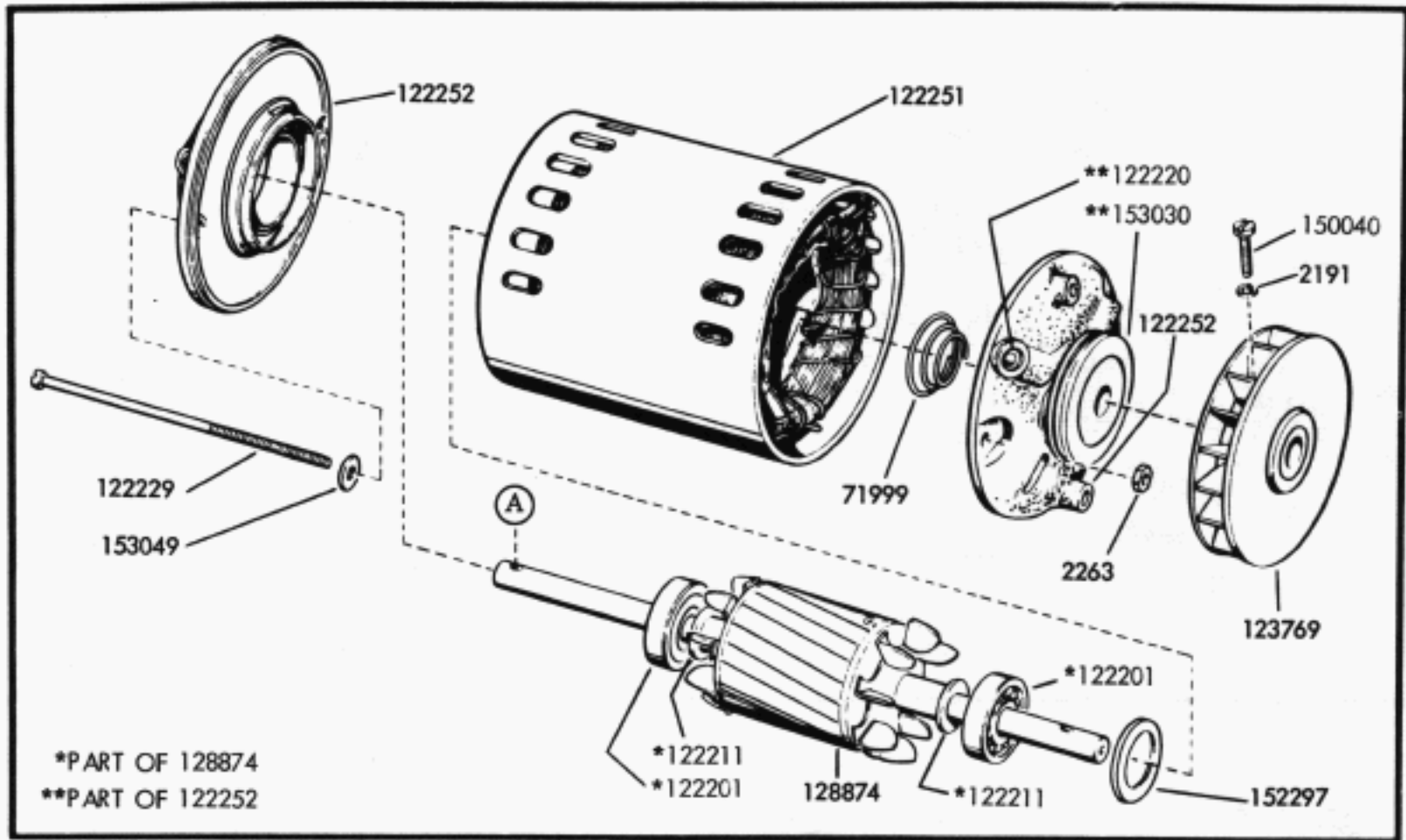


FIGURE 7-25. SYNCHRONOUS MOTOR UNIT

150701 Motor, Series (1/20 H.P., 115V/1/60 Cycle A.C. General Electric Model 5PA664Y2)

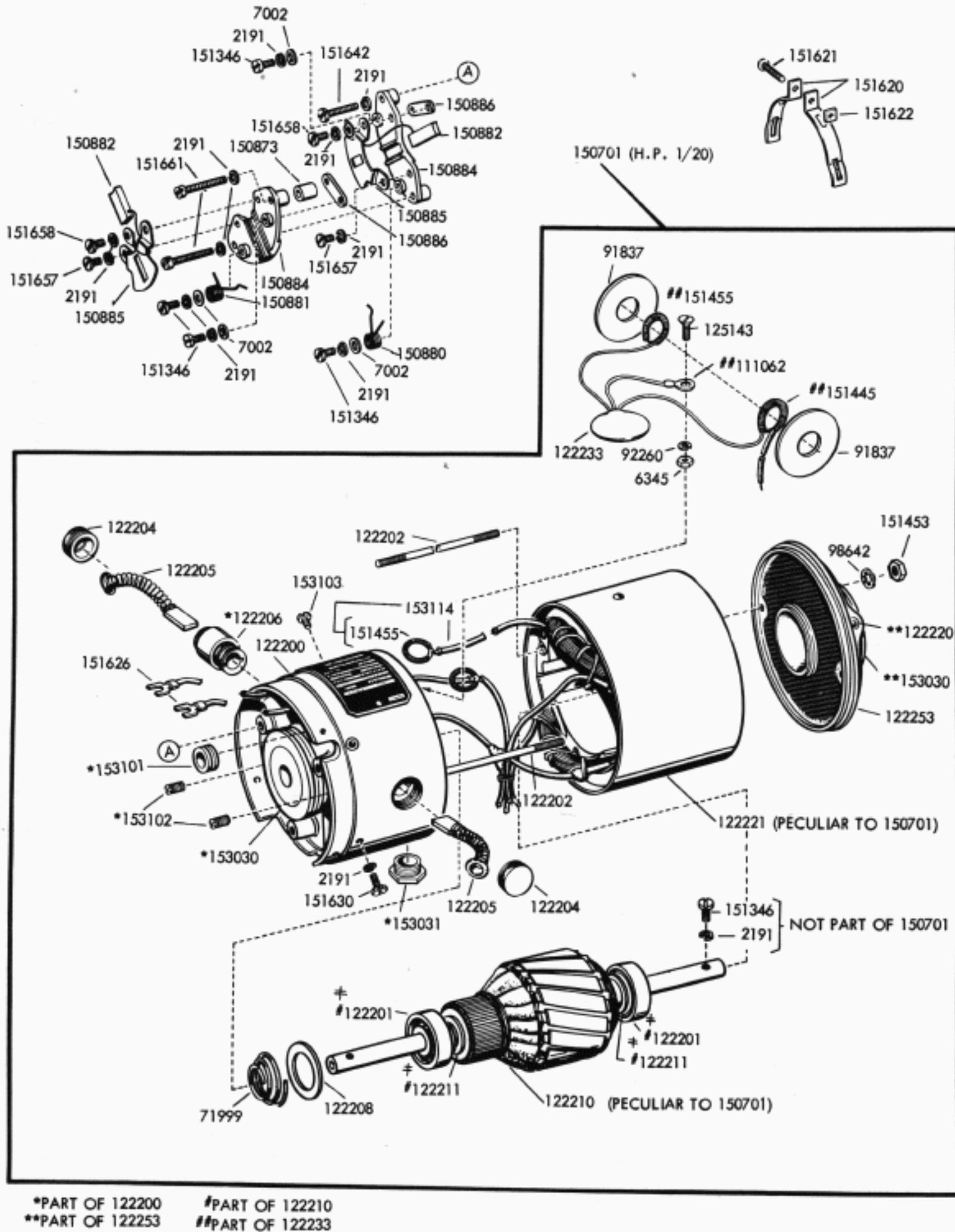


Figure 7-25A. Series Motor Unit

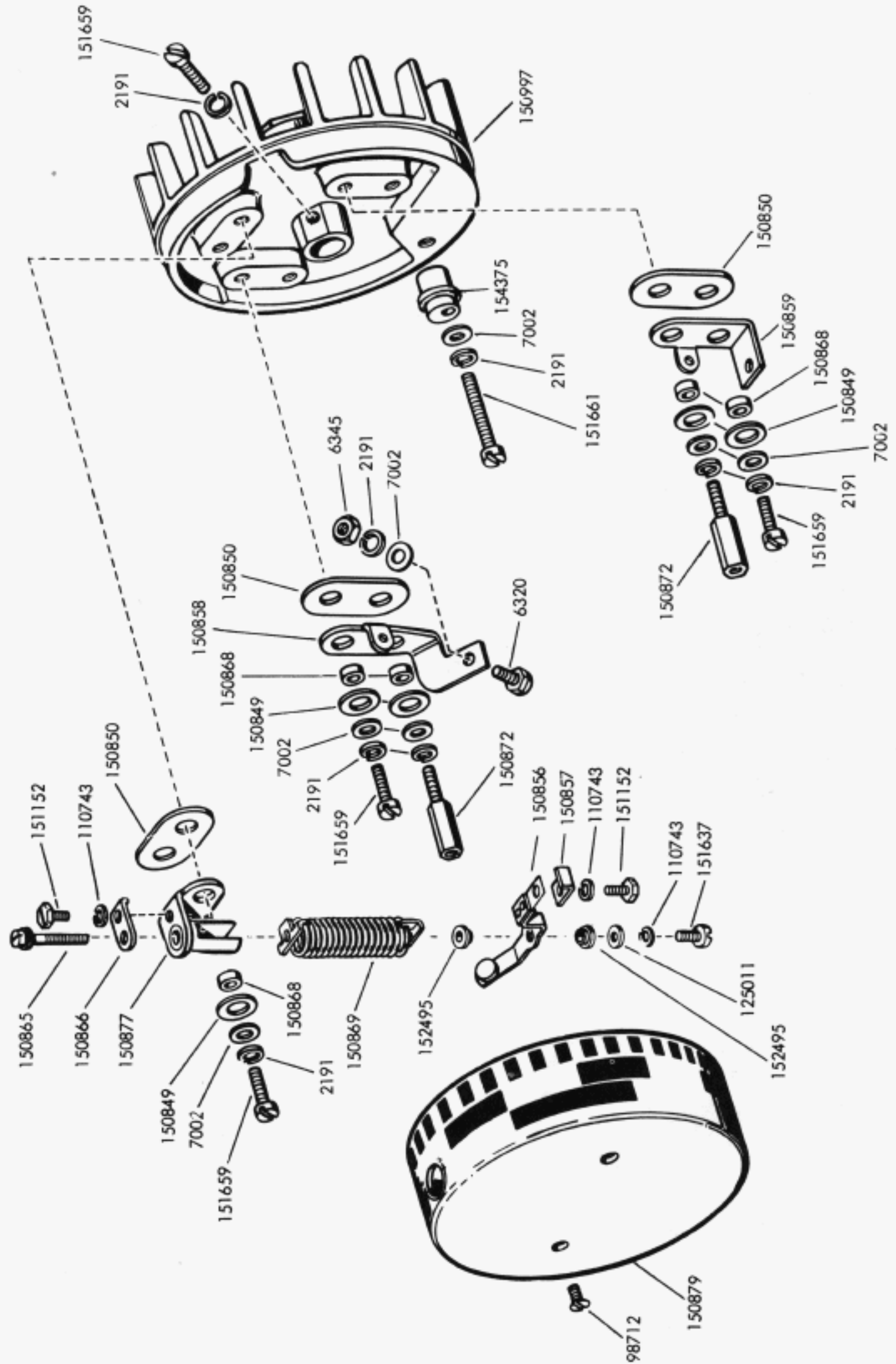


Figure 7-25B. 150845 Governor Assembly



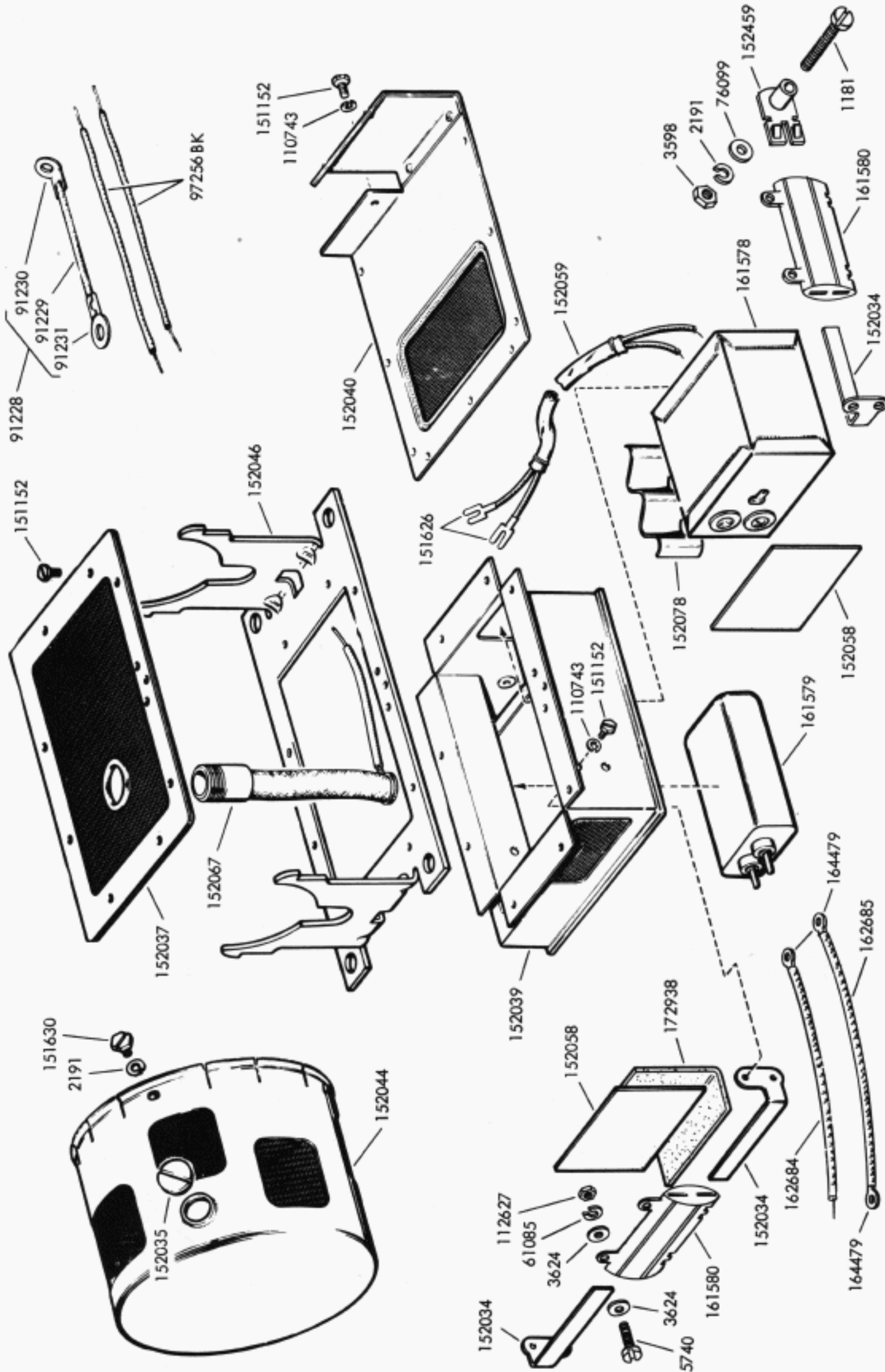


Figure 7-25C. Series Motor Mounting Parts with RF Suppression

6. BASE

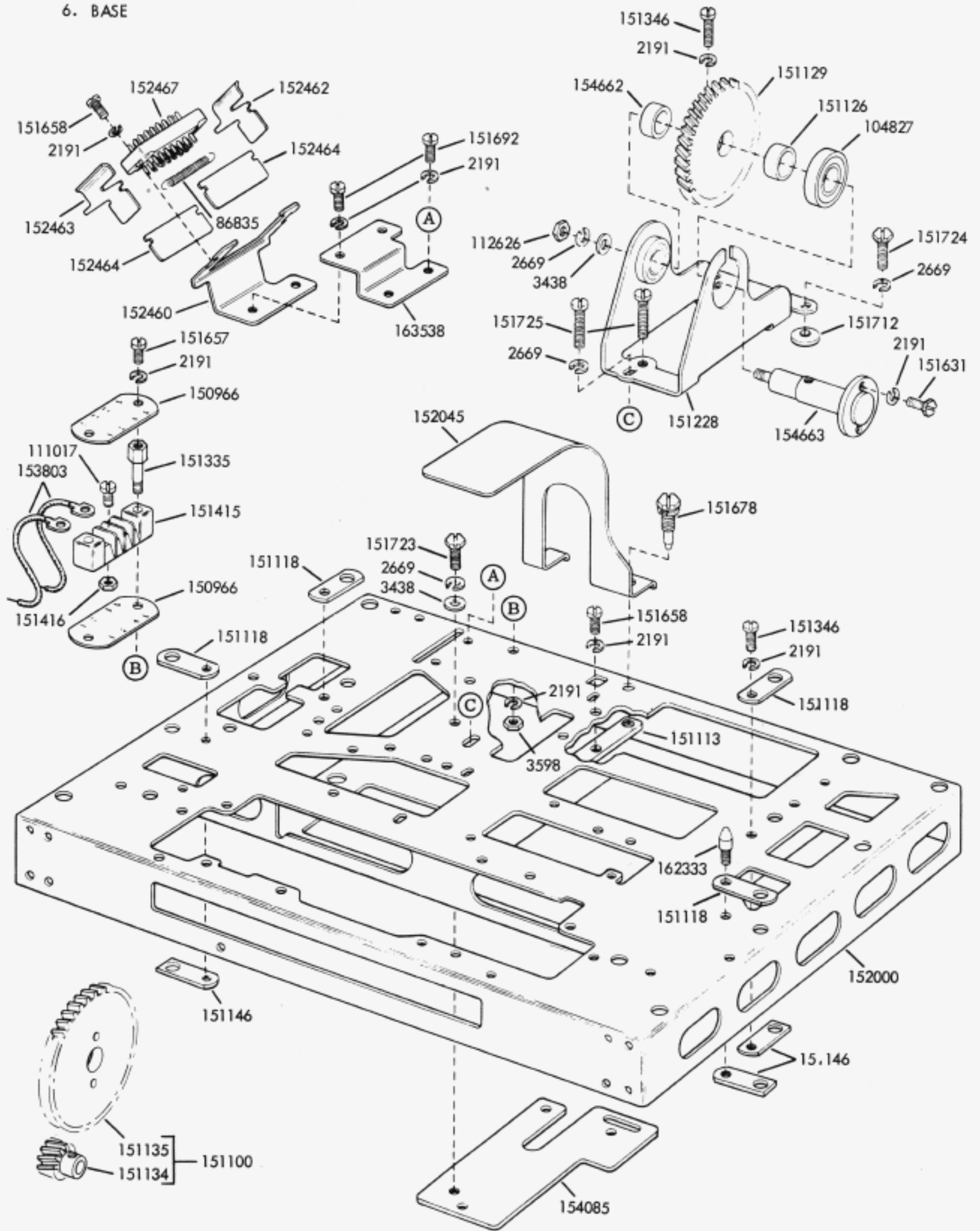


Figure 7-26 Base

## NUMERICAL INDEX - MOTOR AND BASE

Part Number	Description and Page Number	Part Number	Description and Page Number
1181	Screw (6-40 x 11/16 Fil) 7-33C	150849	Washer, Insulator 7-33B
2191	Washer, Lock 7-33,7-33A,7-33B,7-33C,7-33D	150850	Plate, Insulating 7-33B
2263	Nut (8-32 Hex) 7-33D	150856	Arm, Movable Contact 7-33B
2669	Washer, Lock 7-33D	150857	Clamp, Contact Arm 7-33B
3438	Washer, Flat 7-33D	150858	Bracket, Contact 7-33B
3598	Nut (6-40 Hex) 7-33C, 7-33D	150859	Bracket, Contact Arm Mounting 7-33B
3624	Washer, Flat 7-33C	150865	Screw, Clamping (4-40) 7-33B
3640	Washer, Lock 7-33	150866	Clamp, Adjusting Screw Locking 7-33B
5740	Screw (2-56 x 1/4 Fil) 7-33C	150868	Bushing, Insulating 7-33B
6320	Screw, Contact 7-33D	150869	Spring, Governor 7-33B
6345	Nut (6-32 Hex) 7-33B, 7-33C	150872	Stud, Cover Mounting 7-33B
7002	Washer, Flat 7-33, 7-33A,7-33B	150873	Collar, Spacing 7-33A
61085	Washer, Lock 7-33C	150877	Bracket, Governor Spring Guide 7-33B
71999	Spring 7-33, 7-33A	150879	Cover, Governor 7-33B
76099	Washer, Flat 7-33C	150880	Spring, Governor Brush 7-33A
86835	Spring 7-33D	150881	Spring, Governor Brush 7-33A
87334	Washer, Insulating 7-33	150882	Brush, Electrical Contact 7-33A
91228	Strip, Ground 7-33C	150884	Mounting, Brush 7-33A
91229	Connector (2" Connector Briad) 7-33C	150885	Plate, Brush 7-33A
91230	Terminal 7-33C	150886	Plate, Clamp 7-33A
91231	Terminal 7-33C	150966	Insulator 7-33D
91837	Washer, Fiber 7-33A	150976	Bracket 7-33
91837	Washer, Fiber 7-33A	150997	Fan, Governor 7-33B
96264R	Strap (5" Red) 7-33A	151100	Gear Set (100 W.P.M.) 7-33D
97256BK	Strap 7-33C	151113	Strip 7-33D
98642	Washer, Lock (Shakeproof) 7-33A	151118	Plate, Spacing 7-33D
98712	Screw (4-40 x 7/32 Flat) 7-33B	151126	Spacer 7-33D
104827	Bearing, Ball 7-33D	151129	Gear, Helical (48T) 7-33D
110743	Washer, Lock 7-33B	151134	Gear, Helical (20T) 7-33D
111017	Screw (6-40 x 5/16 Fil) 7-33D	151135	Gear, Helical (84T) 7-33D
111062	Terminal 7-33A, 7-33C	151152	Screw (4-40 x 3/16 Hex) 7-33B, 7-33C
112626	Nut (10-32 Hex) 7-33D	151228	Bracket 7-33D
112627	Nut (2-56 Hex) 7-33C	151335	Stud 7-33D
122200	Shield Assembly 7-33A	151346	Screw (6-40 x 3/8 Fil) 7-33,7-33A
122201	Bearing, Ball 7-33,7-33A	151415	Block, Terminal 7-33D
122202	Bolt, Clamping 7-33A	151416	Nut (6-40 Hex) 7-33D
122204	Cap, Brush 7-33A	151453	Nut (10-32 Hex) 7-33A
122205	Brush w/Spring 7-33A	151455	Spring, Helical Clip 7-33A
122206	Holder, Brush 7-33A	151620	Strap 7-33, 7-33A
122208	Washer, Flat 7-33A	151621	Screw (6-32 x 3/4 Rd) 7-33,7-33A
122210	Armature, Motor 7-33A	151622	Nut (6-32 Hex) 7-33,7-33A
122211	Washer, Pull 7-33, 7-33A	151627	Terminal 7-33,7-33A,7-33C
122220	Oiler, Ball 7-33, 7-33A	151630	Screw (6-40 x 1/4 Hex) 7-33A, 7-33C
122229	Bolt (8-32) 7-33,7-33A	151631	Screw (6-40 x 5/16 Hex) 7-33D
122223	Capacitor Assembly 7-33A	151637	Screw (4-40 x 1/4 Fil) 7-33, 7-33B
122245	Capacitor 43 to 48 MFD 7-33	151642	Screw (6-40 x 3/4 Fil) 7-33A
122249	Switch, Thermostatic 7-33	151657	Screw (6-40 x 1/4 Fil) 7-33,7-33B
122251	Stator, Motor 7-33	151658	Screw (6-40 x 5/16 Fil) 7-33,7-33A,7-33D
122252	Shield, End 7-33	151659	Screw (6-40 x 1/2 Fil) 7-33B
122253	Shield Assembly 7-33A	151661	Screw (6-40 x 1 Fil) 7-33A, 7-33B
123769	Fan, Motor 7-33	151678	Screw, Pilot (1/4-32) 7-33D
125011	Washer, Flat 7-33,7-33B	151686	Screw (4-40 x 3/8 Fil) 7-33A
125143	Screw (6-32 x 5/16 Flat) 7-33A	151692	Screw (6-40 x 3/16 Fil) 7-33D
128874	Rotor, Motor 7-33	151712	Button, Pivot 7-33D
150040	Screw (6-40 x 5/8 Fil) 7-33	151723	Screw (10-32 x 3/8 Hex) 7-33D
150349	Washer, Flat 7-33	151724	Screw (10-32 x 5/8 Hex) 7-33D
150701	Motor, Series (1/20 H.P. 115V/1/60 cycle A.C., G.E. 5PA664Y2) 7-33A	151725	Screw (10-32 x 3/4 Hex) 7-33D
		151795	Motor, A.C. Synchronous - 115V/ 1/20 H.P. G.E. 5SC19LG3B 7-33

## NUMERICAL INDEX - MOTOR AND BASE (Continued)

Part Number	Description and Page Number	Part Number	Description and Page Number
151920	Plate, Mounting 7-33	152464	Insulator, Connector 7-33D
151922	Clamp, Capacitor 7-33	152467	Connector 7-33D
151923	Relay 7-33	152495	Bushing 7-33B
151924	Insulator, Relay 7-33	153030	Mount, Vibration 7-33,7-33A
151925	Clamp, Relay 7-33	153031	Bushing, Lead 7-33A
151926	Nut (4-40 Hex) 7-33	153049	Washer, Fiber 7-33A
151927	Cable, Motor 7-33	153101	Grommet 7-33A
152000	Base 7-33D	153102	Screw, Set (8-32) 7-33A
152034	Bracket, Resistor 7-33C	153103	Screw, Self Tapping 7-33A
152035	Plug, Governor Cover 7-33C	153114	Wire Assembly 7-33A
152037	Cover, Container 7-33C	153803	Cable Assembly 7-33D
152039	Container 7-33C	154085	Plate, Nut 7-33D
152040	Lid, Container 7-33C	154375	Bushing, Eccentric 7-33B
152044	Cover, Governor 7-33C	154662	Spacer 7-33D
152045	Guard, Gear 7-33D	154663	Shaft 7-33D
152046	Bracket, Motor Mounting 7-33C	155753	Sleeve, Insulating 7-33
152058	Separator 7-33C	161578	Suppressor, Electrical Noise 7-33C
152059	Cable Assembly 7-33C	161579	Capacitor (1/2 MFD) 7-33C
152067	Nipple 7-33C	161580	Resistor (500 ohm) 7-33C
152078	Spring, Separator 7-33C	162333	Stud, Locating 7-33D
152297	Washer, Flat 7-33	162684	Wire Assembly (2-3/4" LG) 7-33C
152459	Bracket, Resistor Mounting 7-33C	162685	Wire Assembly (4" LG) 7-33C
152460	Bracket 7-33D	163538	Bracket 7-33D
152462	Latch, Right 7-33D	164479	Terminal 7-33C
152463	Latch, Left 7-33D	172938	Insulator 7-33C

7. PROJECTOR FRAME ASSEMBLY

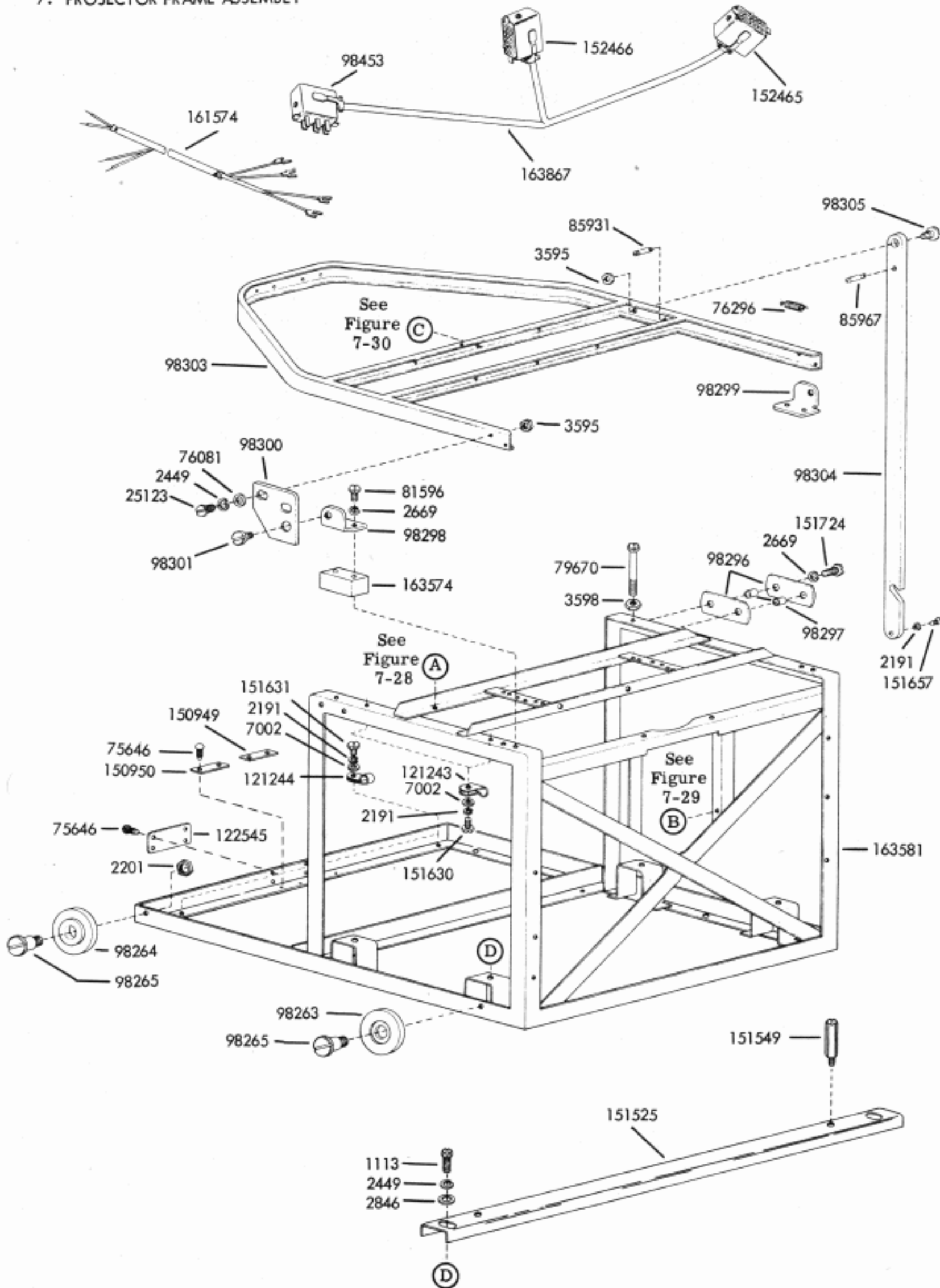


Figure 7-27 Projector Frame Assembly



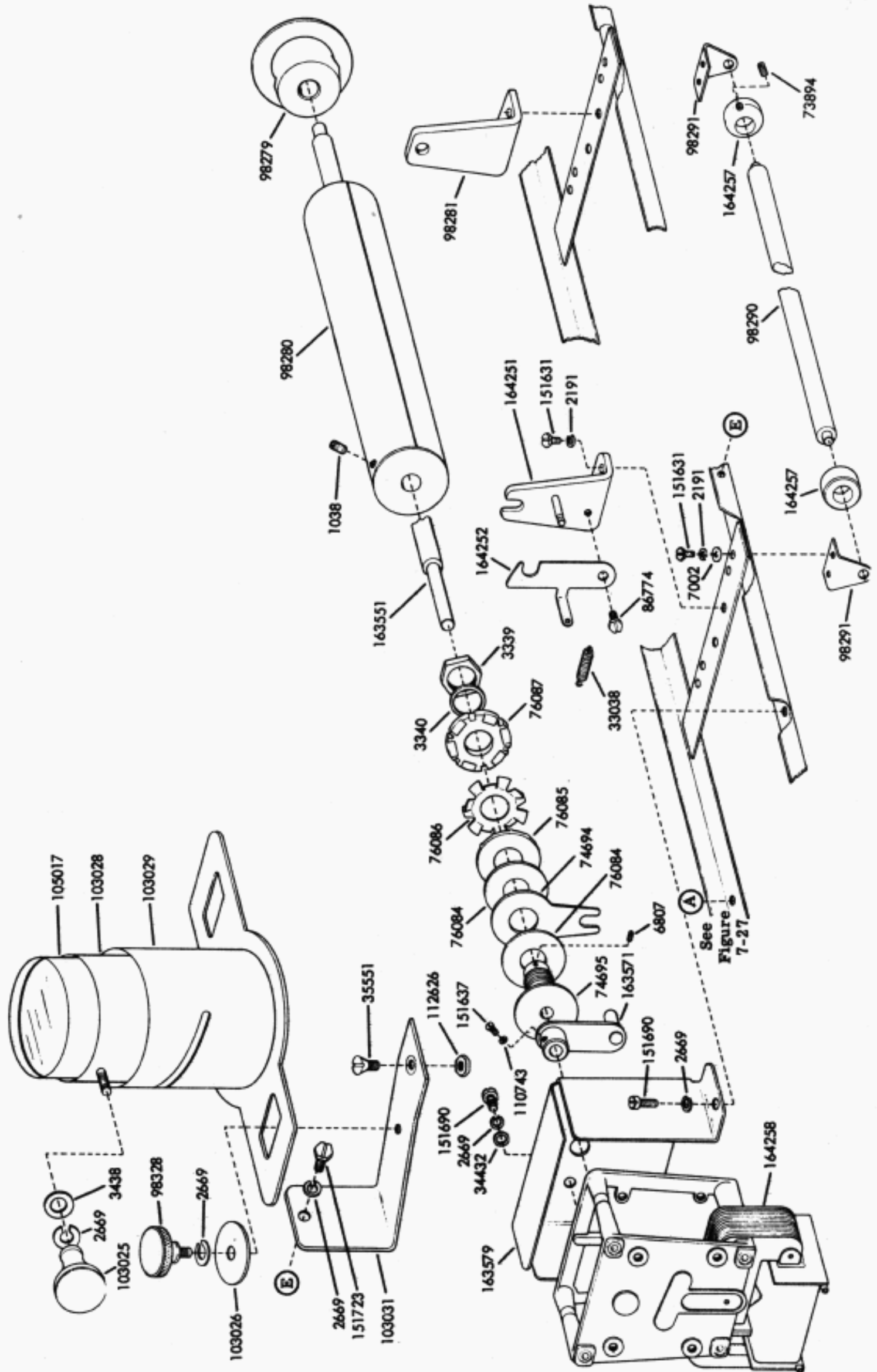


Figure 7-28 Projector Frame, Rewind Mechanism and Objective Lens Assembly

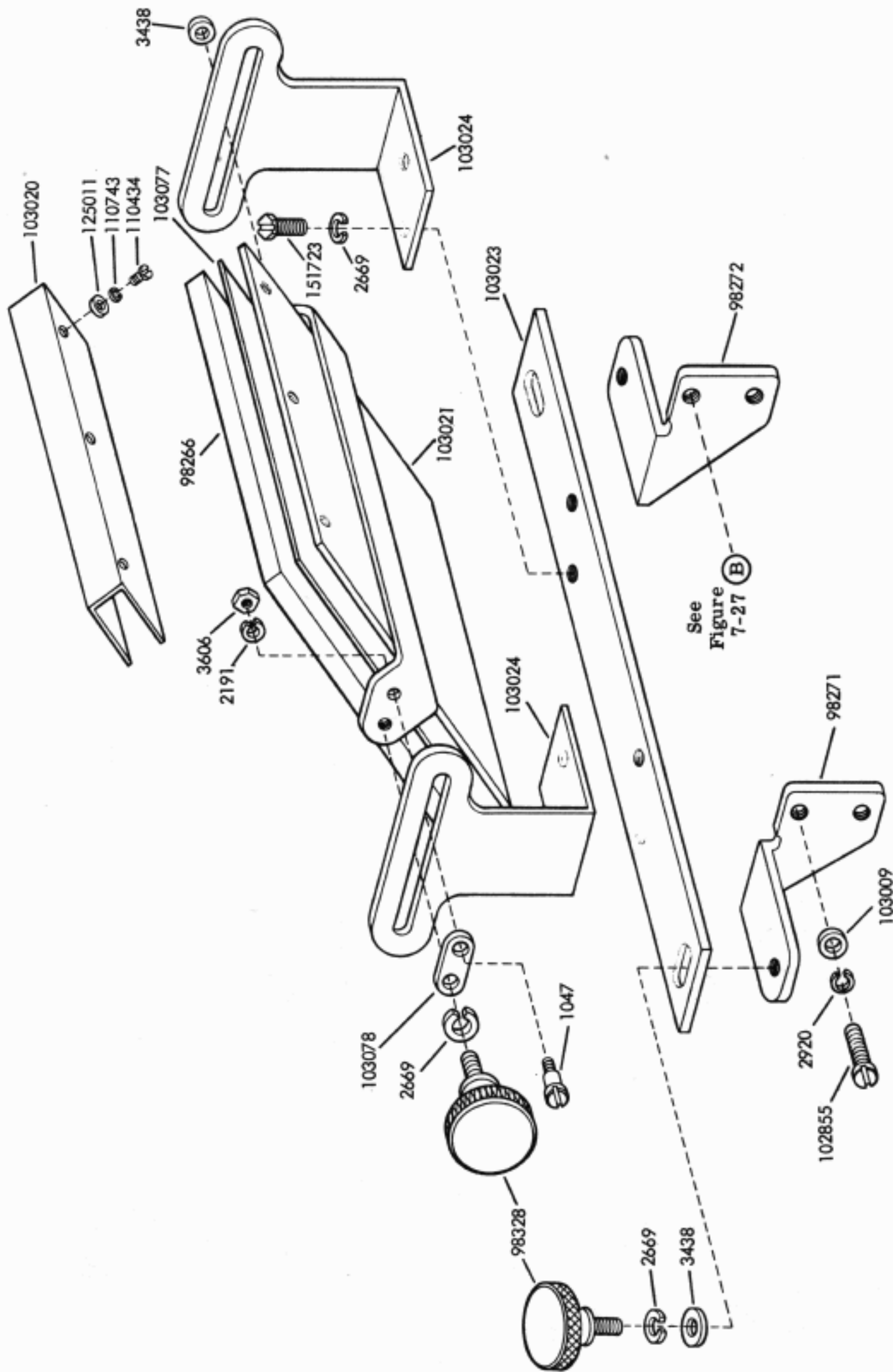


Figure 7-29 Projector Frame, Small Mirror Assembly

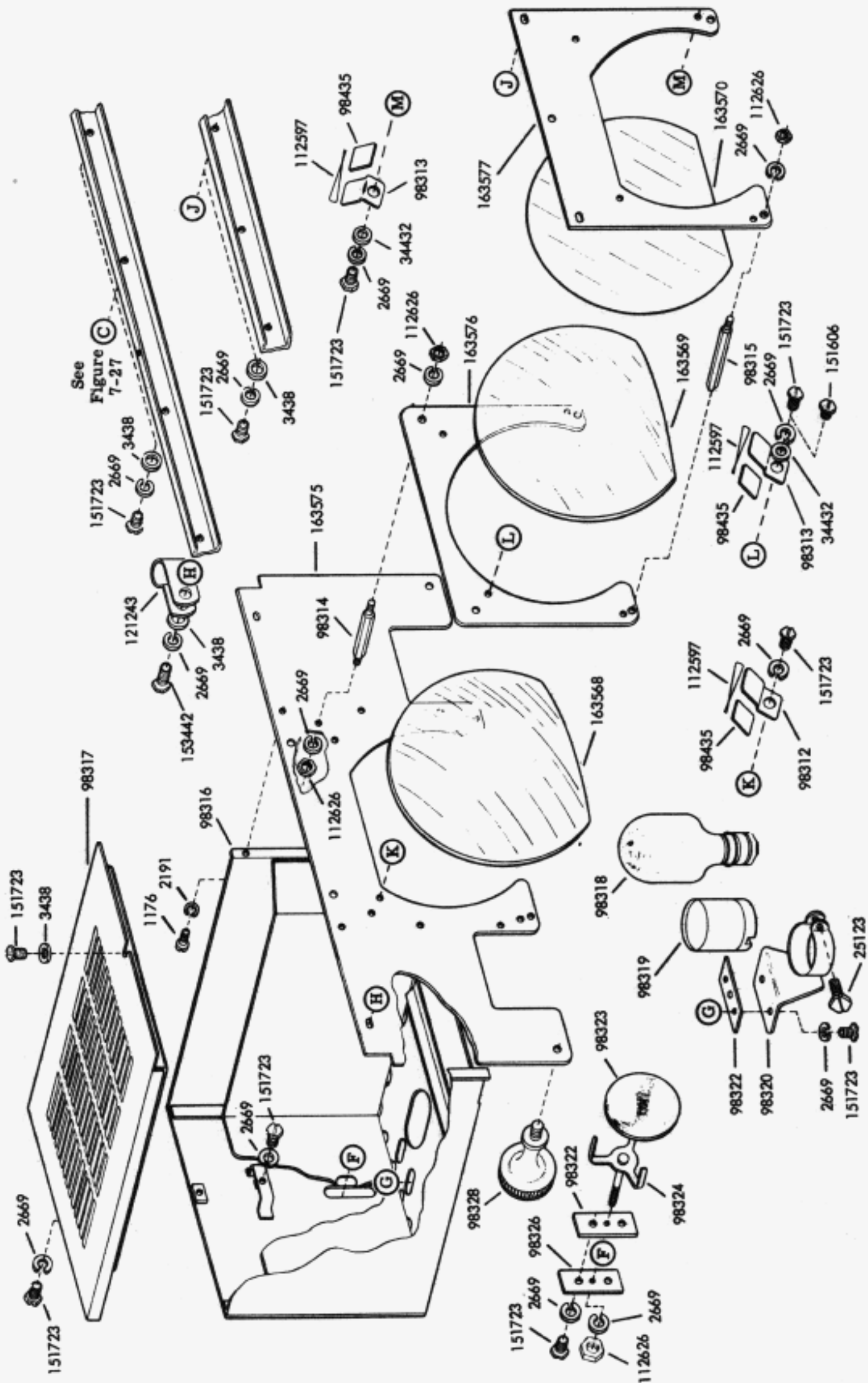


Figure 7-30 Projector Frame, Lamp Housing and Condenser Lens Assembly

ORIGINAL

## NUMERICAL INDEX - PROJECTOR FRAME

Part Number	Description and Page Number	Part Number	Description and Page Number
1038	Screw (6-40 x 9/32 Fil.) 7-37	98314	Post 7-39
1047	Screw, Shoulder (6-40) 7-38	98315	Post 7-39
1113	Screw (1/4-20 x 3/8 Hex) 7-36	98316	Housing, Lamp 7-39
1176	Screw (6-40 x 3/16 Fil.) 7-39	98317	Cover 7-39
2191	Washer, Lock 7-36,7-37,7-38,7-39	98318	Lamp, Projection 7-39
2201	Nut (5/16-32 Hex) 7-36	98319	Socket 7-39
2449	Washer, Lock 7-36	98320	Bracket Assembly 7-39
2669	Washer, Lock 7-36,7-37,7-38,7-39	98322	Plate 7-39
2846	Washer, Flat 7-36	98323	Mirror 7-39
2920	Washer, Lock 7-38	98324	Bracket Assembly 7-39
3339	Nut (9/16-32 Hex) 7-37	98326	Plate 7-39
3340	Washer, Lock 7-37	98328	Screw, Thumb (10-32) 7-37,7-38,7-39
3438	Washer, Flat 7-37,7-38,7-39	98435	Strip, Felt 7-39
3595	Nut (1/4-32) 7-36	98453	Connector 7-36
3598	Nut (6-40) 7-36	102855	Screw (3/8-16 x 11/16 Hex) 7-38
3606	Nut (6-40) 7-38	103009	Washer, Flat 7-38
6807	Screw (6-40 x 3/16 Headless) 7-37	103020	Clamp 7-38
7002	Washer, Flat 7-36	103021	Plate w/Support 7-38
25123	Screw (1/4-32 x 7/16 Hex) 7-36,7-39	103023	Strip, Mounting 7-38
33038	Spring, Tension 7-37	103024	Bracket 7-38
34432	Washer, Flat 7-39	103025	Nut, Thumb (10-32) 7-37
35551	Screw (10-32 x 3/8 Flat) 7-37	103026	Washer, Flat 7-37
73894	Screw (6-40 x 1/8 Headless) 7-37	103028	Holder, Lens 7-37
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74695	Sleeve, Friction 7-37	103077	Pad, Felt 7-38
75646	Screw, Drive (0-3/16) 7-36	103078	Plate 7-38
76081	Washer, Flat 7-36	105017	Lens 7-37
76084	Washer, Felt 7-37	110434	Screw (4-40 x 3/16 Fil.) 7-38
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81596	Screw (10-32 x 1 3/8 Hex) 7-36	125011	Washer, Flat 7-38
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85967	Post, Spring 7-36	150949	Plate, Identification 7-36
86774	Screw, Shoulder (6-40) 7-37	150950	Plate, Serial Number 7-36
98263	Roller 7-36	151525	Rail 7-36
98264	Roller 7-36	151549	Screw, Special (1/4-32) 7-36
98265	Screw, Shoulder (5/16-32) 7-36	151606	Screw (10-32 x 1/4 Hex) 7-39
98266	Mirror 7-38	151630	Screw (6-40 x 1/4 Hex) 7-36
98271	Bracket 7-38	151631	Screw (6-40 x 5/16 Hex) 7-36 7-37
98272	Bracket 7-38	151637	Screw (4-40 x 1/4 Fil.) 7-37
98279	Hub 7-37	151657	Screw (6-40 x 1/4 Fil.) 7-36
98280	Cylinder Assembly 7-37	151690	Screw (10-32 x 29/64 Fil.) 7-37
98281	Bracket 7-37	151723	Screw (10-32 x 3/8 Hex) 7-37,7-38,7-39
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98291	Bracket 7-37	152465	Connector 7-36
98296	Guide 7-36	152466	Connector 7-36
98297	Spacer 7-36	153442	Screw (10-32 x 1/2 Hex) 7-39
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98299	Bracket 7-36	163551	Shaft 7-37
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98301	Screw, Shoulder (1/4-32) 7-36	163569	Lens 7-39
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98304	Bar 7-36	163571	Arm w/Hub and Stud 7-37
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8. PROJECTOR CABINET ASSEMBLY

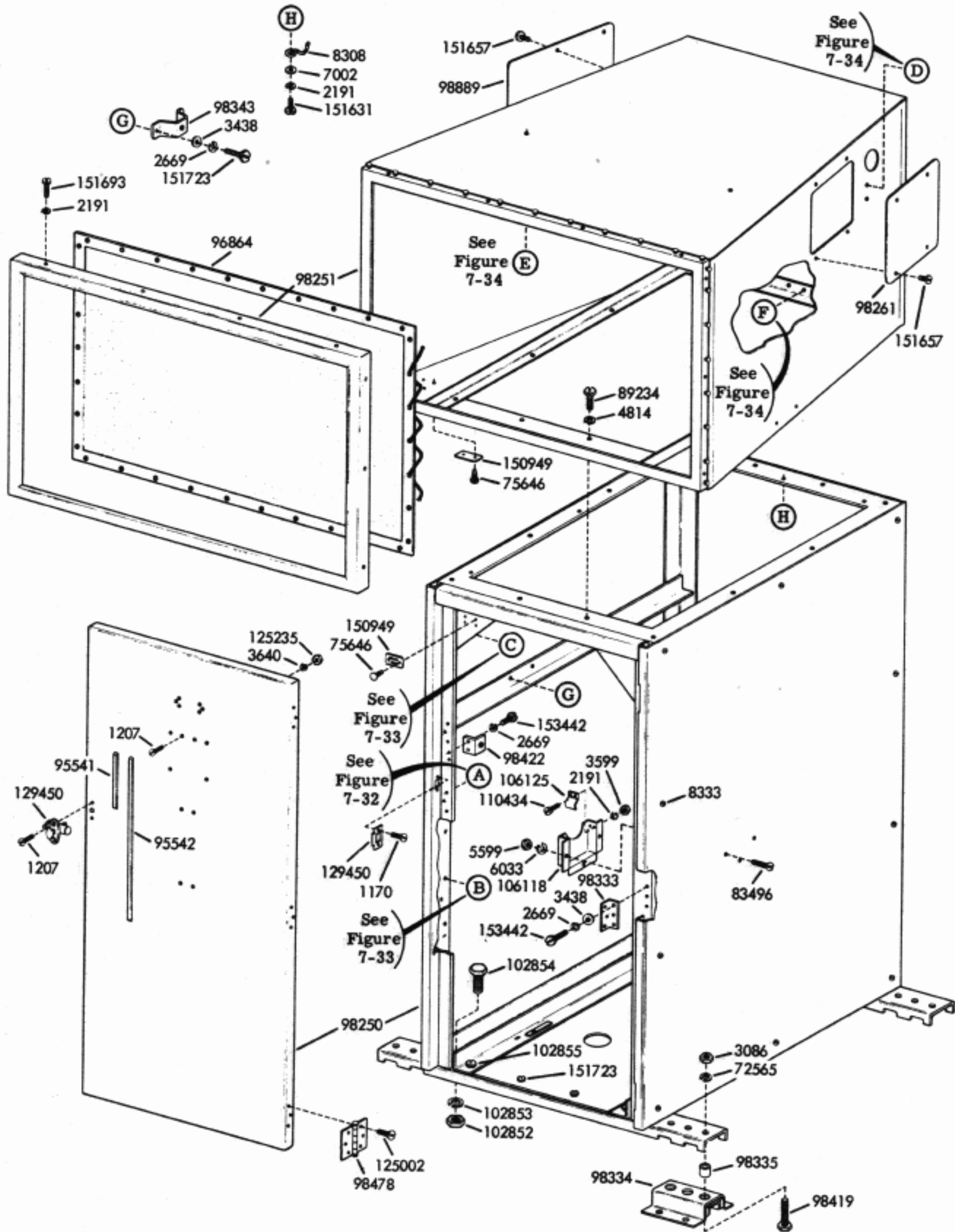


Figure 7-31 Projector Cabinet Assembly

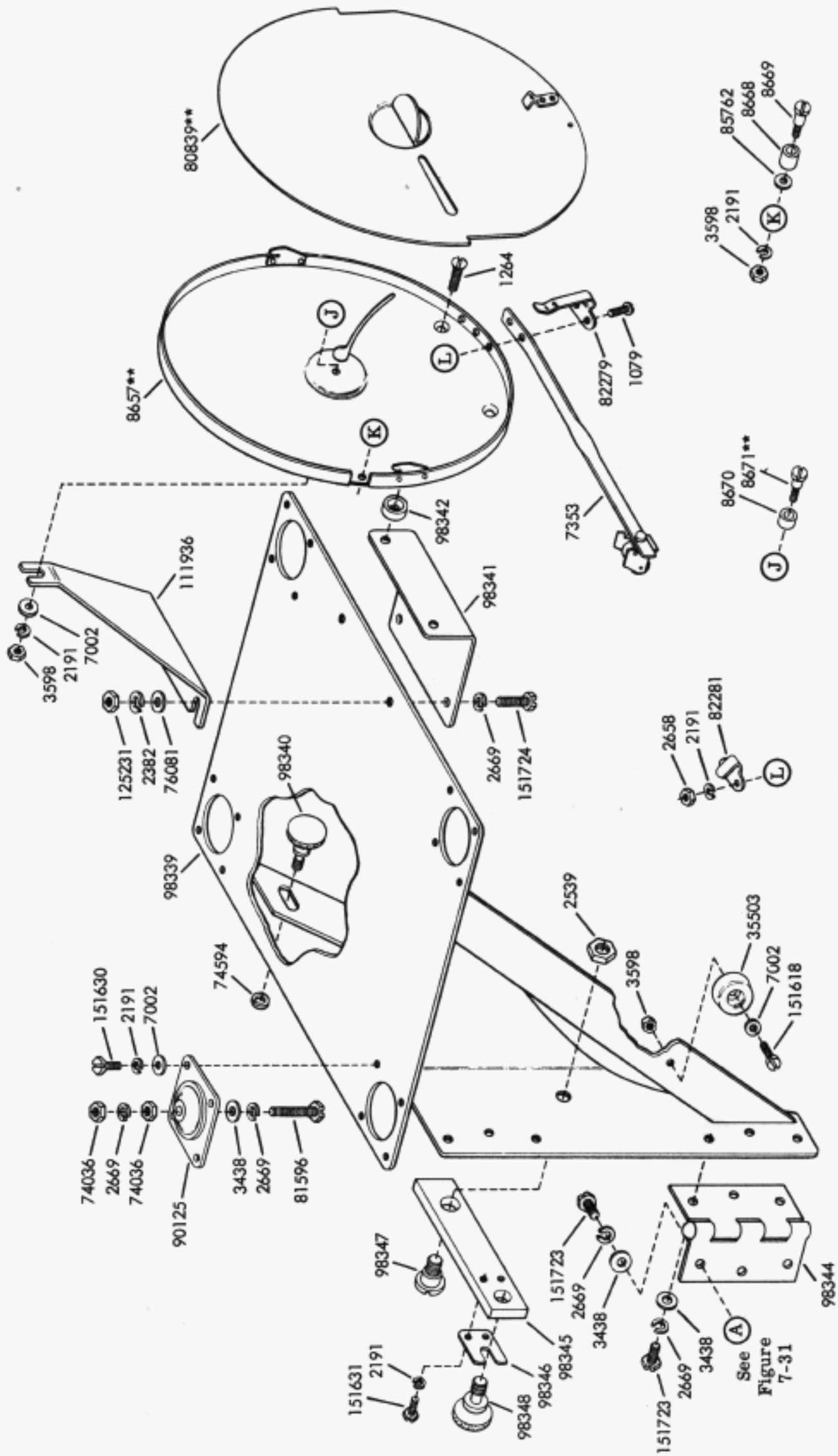


Figure 7-32 Projector Cabinet, Shelf for Monitor

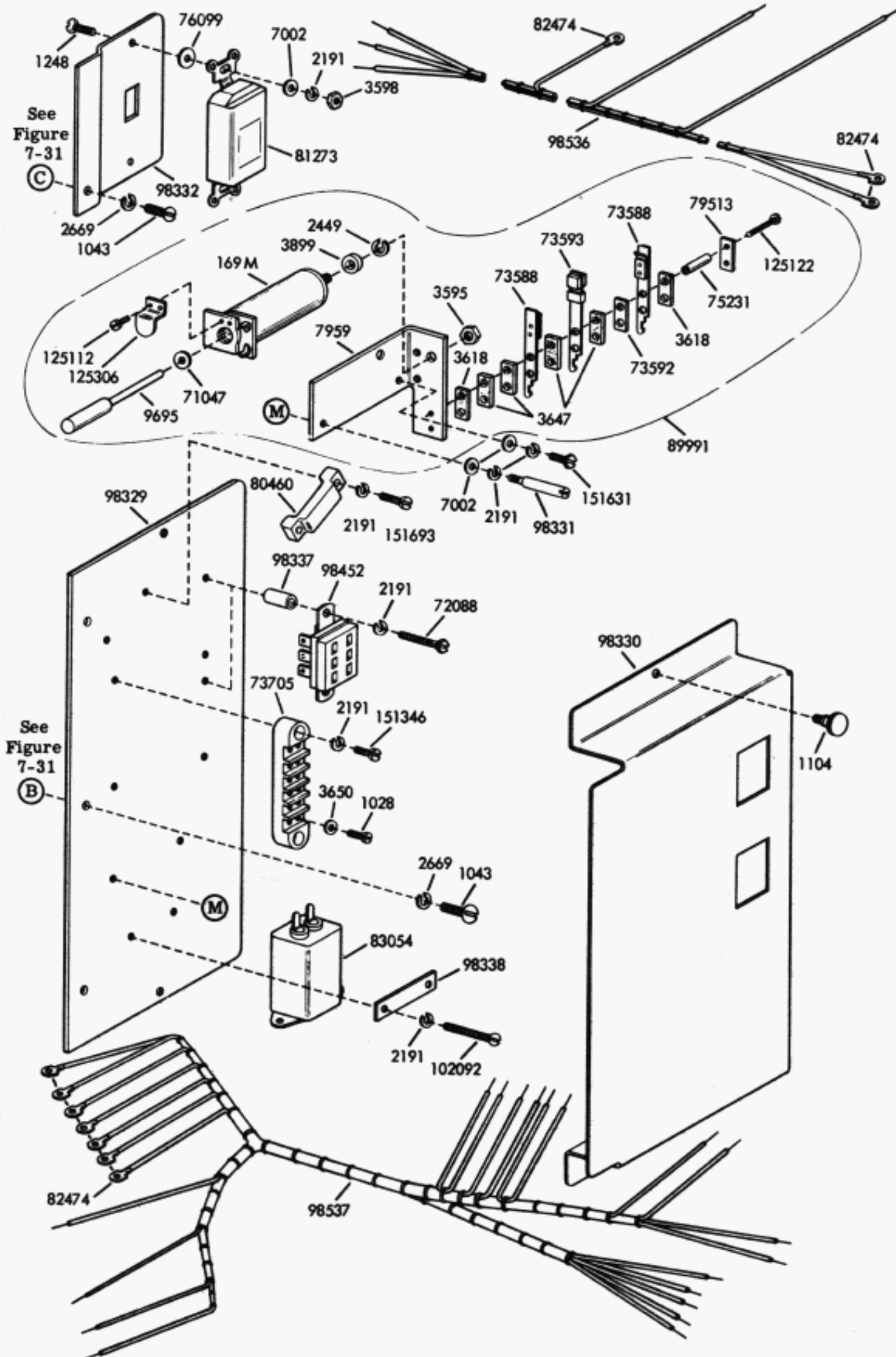


Figure 7-33 Projector Cabinet, Control Panel

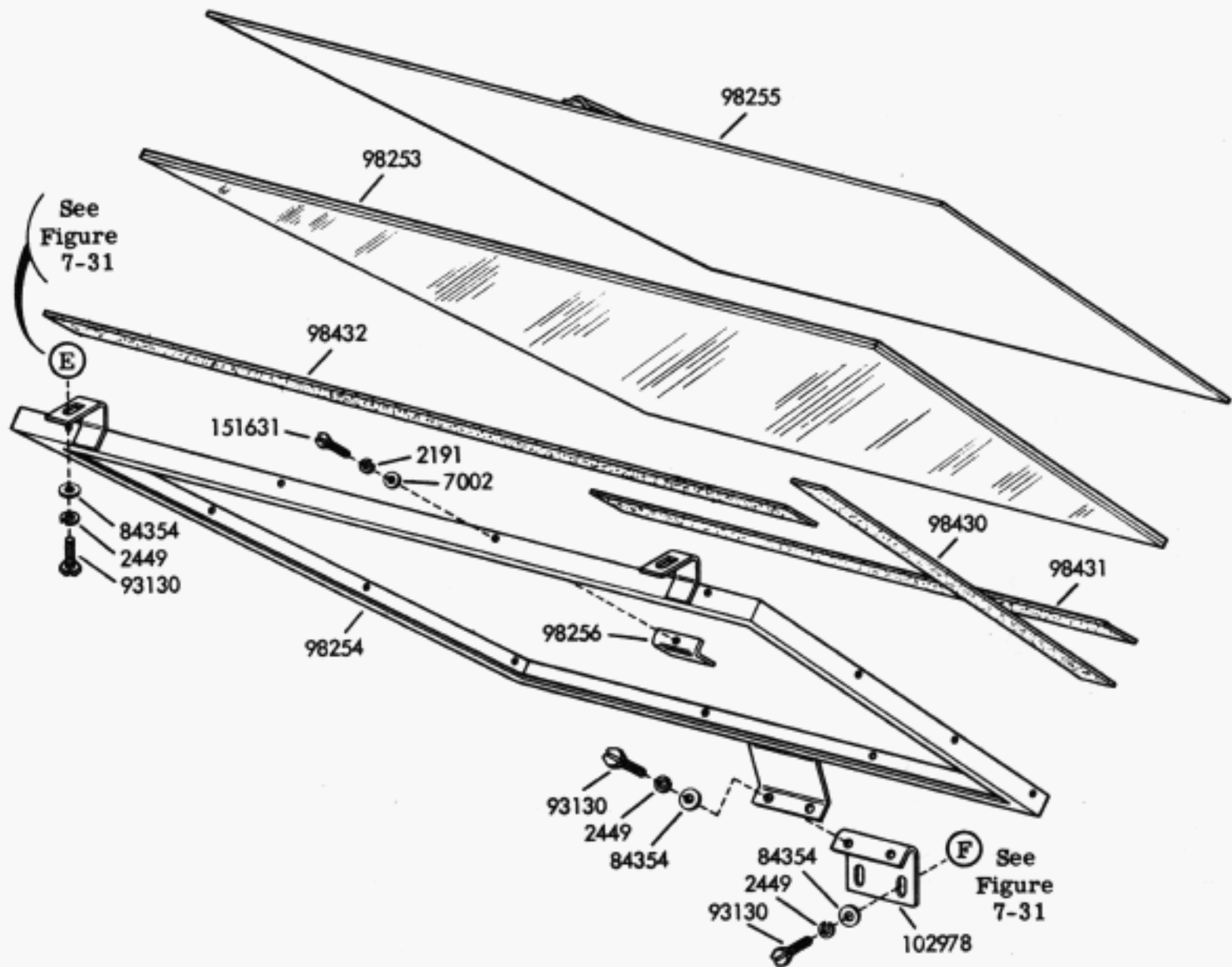
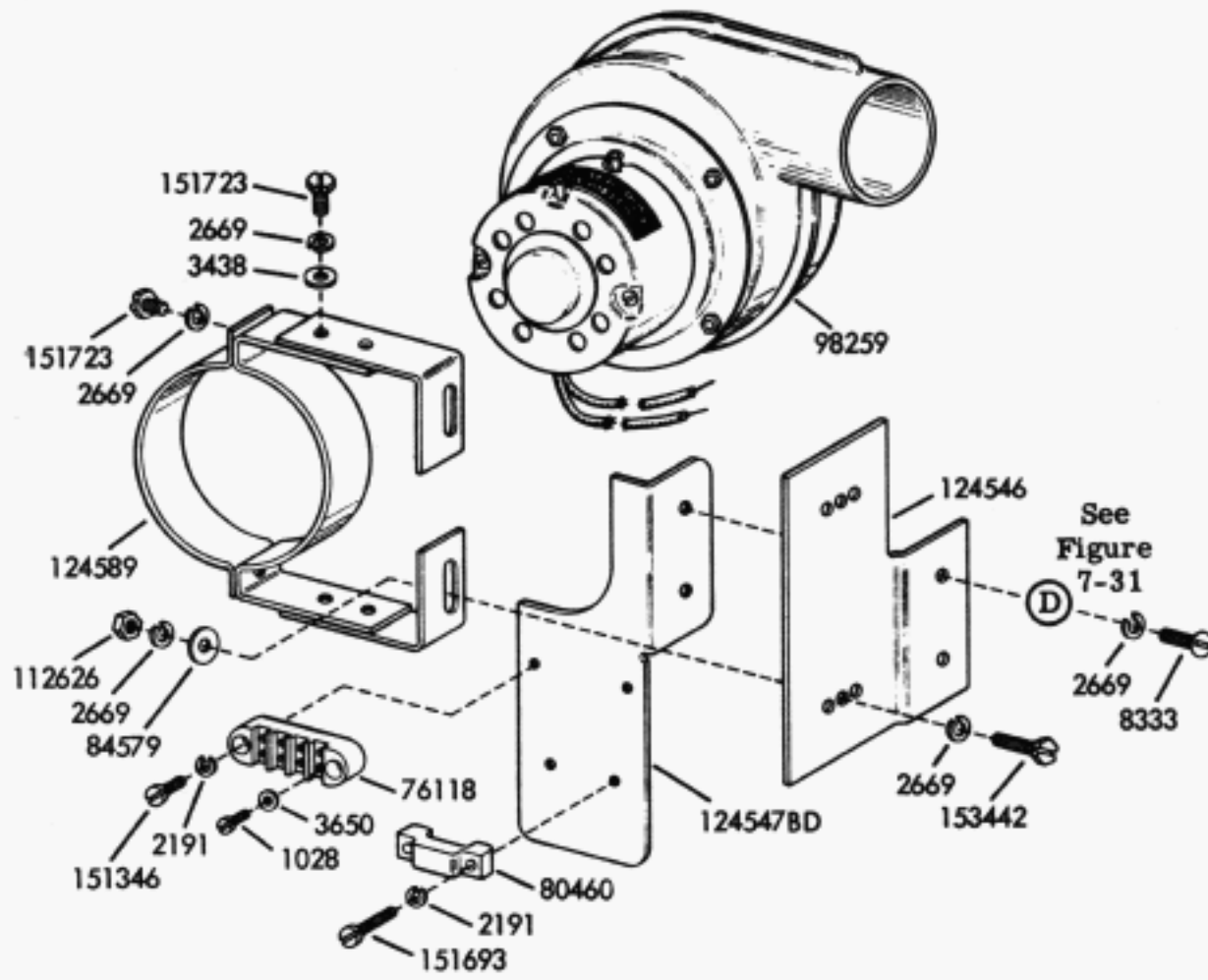


Figure 7-34 Projector Cabinet, Blower and Large Mirror Assembly

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1248	Screw (6-40 x 1/2 Flat) 7-44	85762	Washer, Flat 7-43
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2539	Nut (3/8-32) 7-43	93130	Screw (1/4-20 x 1/2 Hex) 7-45
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2669	Washer, Lock 7-42, 7-43, 7-44, 7-45	95542	Strip 7-42
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3595	Nut (1/4-32) 7-44	98251	Cabinet w/Stud, Upper 7-42
3598	Nut (6-40) 7-43, 7-44	98253	Mirror 7-45
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