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BULLETIN 185B

DESCRIPTION AND ADJUSTMENTS
MULTIPLE TRANSMITTER DISTRIBUTOR
AND BASE

MXD, MFD, MXB

TELETYPE[®]

CORPORATION

SUBSIDIARY OF *Western Electric Company* INC.

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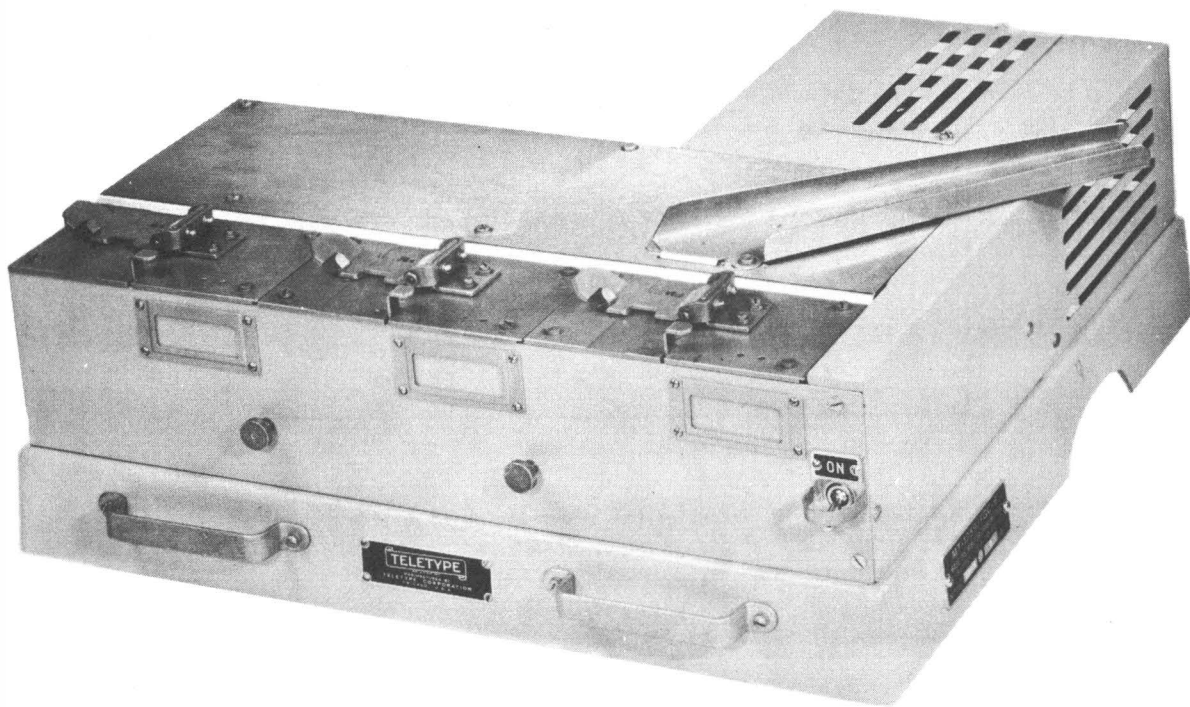
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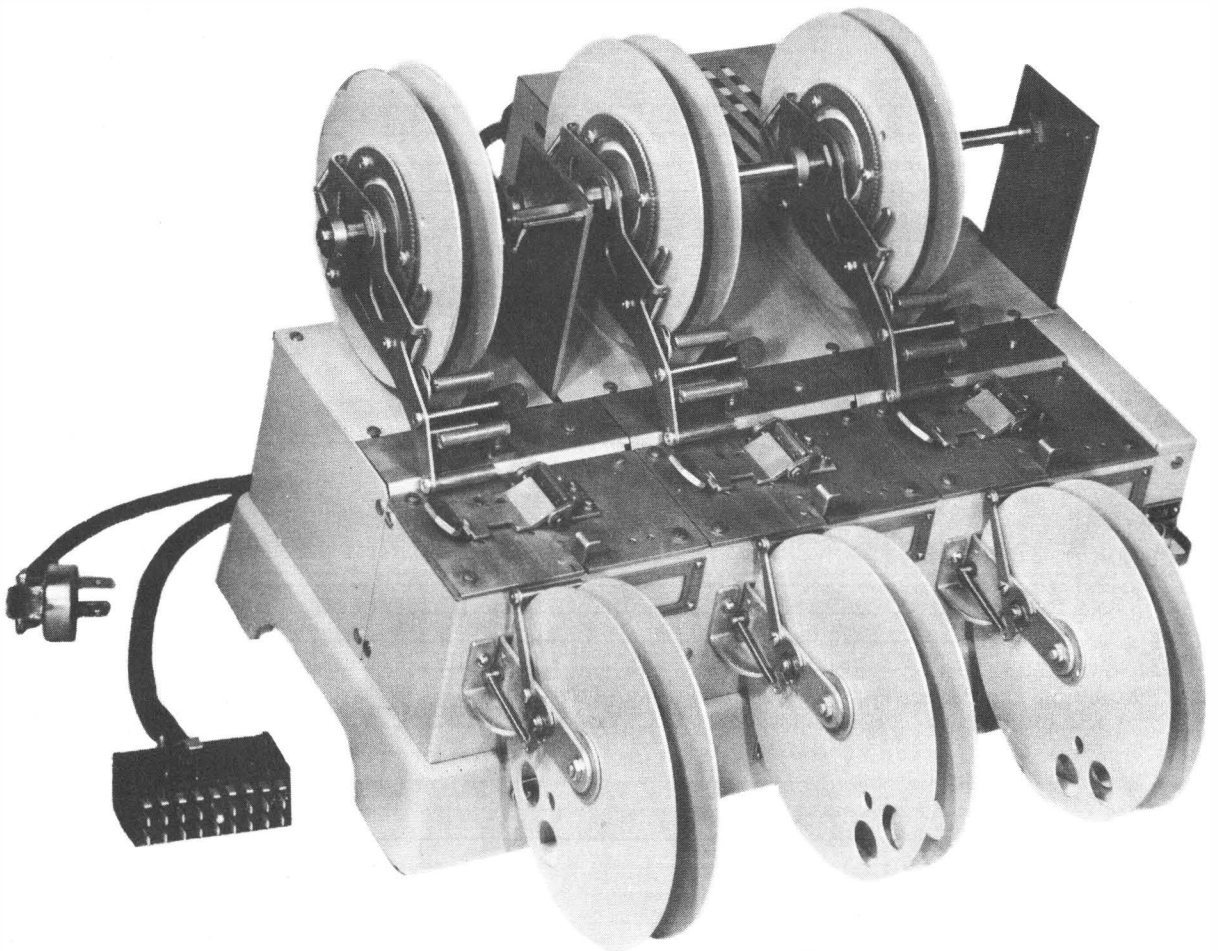
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MULTIPLE MESSAGE TRANSMITTER DISTRIBUTOR



MULTIPLE NUMBERING TRANSMITTER DISTRIBUTOR

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SECTION 1 - GENERAL DESCRIPTION AND THEORY OF OPERATION

1. DESCRIPTION

a. GENERAL

(1) The Teletype Multiple Transmitter Distributor Set described herein provides sending facilities for tape message relaying when used in conjunction with reperforators. A complete set consists of a base unit with motor and cover and three multiple transmitter distributors. There are two types of transmitter distributors which transmit code combinations from a standard 11/16" perforated tape. One is designed to transmit the code combinations of a message tape and is designated message transmitter. Figure 1. The other, designated numbering transmitter, is equipped with a LETTERS sensing mechanism which makes it responsive to LETTERS code combinations in a numbering tape. Figure 2. This mechanism operates a contact connected to external control relays which stop the numbering transmitter and start a message transmitter.

(2) The Multiple Transmitter Distributor Base provides facilities for mounting three message transmitters, three numbering transmitters, or two message and one numbering transmitter. Figure 1 and 2.

(3) The function of the message transmitter is to translate the code combinations of a perforated message tape into electrical impulses and transmit them in sequence to a signal line. The function of the numbering transmitter is to insert automatically into the signal line successive numbers from a numbering tape, which will identify each message before it is transmitted.

(4) The multiple transmitter distributors are arranged to handle either fully perforated or chadless tape from reperforators, or tape prepared on keyboard perforators.

(5) A 60 cycle synchronous motor or a 50-60 cycle governed motor mounted on the base furnishes motive power for driving the transmitter units through the medium of a countershaft and a set of gears.

(6) Wiring is brought out from each transmitter unit by a cable whose leads terminate in spade type terminals, a multi-point plug connector, or a slip connector. The bases are correspondingly equipped with terminal strips, multi-point receptacles, or slip connectors.

(7) A third type of transmitter, designated multiple transmitting distributor, is similar to the transmitter distributor except it is not equipped with tape sensing and feeding mechanisms. It is used to transmit signals originating on external circuits. Included on the unit are individually insulated transmitting contacts, a transmitting cam sleeve, a clutch magnet, and an auxiliary timing contact.

b. PHYSICAL

(1) The Multiple Transmitter Distributor Base consists essentially of a base casting, a motor, a countershaft with gears to transfer the motive power to the individual transmitters, series resistors for the transmitter clutch magnets, filter capacitors for the transmitting contacts, governor circuit components for bases equipped with governed motors, a multi-conductor plug on a cable and a power cord for signal line and power connections, a power switch on most units, covers, and top plates. Additional features include control relays for automatic message numbering (Figure 3), tape supply reels for numbering tapes, rewind reels to take up the numbering tapes, individual front doors for accessibility to individual transmitters, and card holders for circuit identification cards.

(2) The multiple transmitters consist essentially of the following mechanisms: a clutch magnet assembly which engages and disengages the clutch; a clutch coupled between the drive gear and cam sleeve; a cam sleeve with associated contact levers and contacts; a tape sensing mechanism consisting of levers and pins which transform the code combinations in a perforated tape into electrical impulses; a tape feeding mechanism consisting of levers and a ratchet which automatically advances the tape upon the completion of each cycle of operation; a tape stop mechanism which automatically stops the unit when it is out of tape or when the mechanism is operated manually; a driven gear; a base plate; and a top plate with a hinged tape lid. Figures 4, 5 and 6.

2. THEORY OF OPERATION

a. GENERAL

(1) The basic function of the Multiple Message Transmitter Distributor Set is to provide sending facilities for tape message relaying. The three multiple transmitters operate independently of each other in transmitting, in the form of electrical impulses, code combinations previously perforated in paper tape.

(2) The Multiple Numbering Transmitter Distributor provides automatic message identification facilities for three transmitting stations. Associated with each of the three numbering transmitters are the necessary relay controls and accessories to govern the automatic insertion (prior to the transmission of a message proper) of the message number, station identification, or any other essential code information, on all messages transmitted by an associated message transmitter.

b. SIGNALING CODE

(1) Information is transmitted in the form of a five-unit, start-stop signaling code in which each character

or function is represented by a sequential combination of current and no-current intervals. Intervals during which current flows in the signal line are referred to as MARKING, and intervals during which no current flows as SPACING. The transmission pattern for a complete character consists of a start element (always spacing), five code elements - each of which may be either marking or spacing and a stop pulse (always marking). The start and stop elements are used to maintain synchronism between the receiving equipment and the transmitter.

(2) Each combination consists of 7.42 units of time - the start element, the five code elements, and a stop element which is 1.42 times as long as each of the other elements. This is referred to as the 7.42 unit transmission pattern. See Figure 7. Some telegraph systems employ a 7.00 unit transmission pattern in which the stop element is equal to each of the other elements. Inter-operation between 7.00 and 7.42 unit apparatus is satisfactory providing the operating speeds selected yield identical unit pulse lengths. For example, units operating at 390 opm with the 7.00 pattern and units operating at 368 opm with the 7.42 pattern both produce signals with a length of 22 milliseconds (.022).

c. MESSAGE TRANSMITTER DISTRIBUTOR

(1) CLUTCH MAGNET ASSEMBLY (Positive action clutch)

(a) This assembly consists of a two coil magnet and an armature with a clutch throwout lever attached. See Figure 4. Transmission starts immediately after the clutch magnet is energized and stops upon completion of the cycle in which the magnet is de-energized. The action is as follows:

(b) From an idling condition in which the magnet is de-energized, clutch teeth disengaged, start-stop contact closed, and the selector lever pins in their downward position, battery is applied to the clutch magnet. The clutch magnet (Figure 4) attracts the armature which disengages the clutch throwout lever from the driven clutch member and permits the cam sleeve to rotate. As the cam sleeve rotates, its individual cams actuate their respective contact levers which control the opening and closing of the transmitting contacts. Other cams of the cam sleeve actuate the selector levers, and feed wheel. The cam sleeve rotates continually while the clutch magnet is energized.

(c) When the clutch magnet circuit is broken, the clutch throwout lever responds to the tension exerted on it by its spring and moves into engagement with the driven clutch member. A camming surface of the driven clutch member comes in contact with the clutch throwout lever and disengages the clutch teeth. The cam sleeve then comes to a stop and transmission ceases.

(2) CLUTCH MAGNET ASSEMBLY (All metal in-

ternal expansion clutch) Figure 6.

(a) This assembly consists of a two coil magnet assembly mounted to an angle bracket which, in turn, is mounted to a larger bracket. Also mounted to the larger bracket are an armature bail and shaft assembly, and a trip lever-reset-latch lever and shaft assembly. Transmission starts immediately after the clutch magnet is energized and stops upon completion of the cycle in which the magnet is de-energized. The action is as follows:

(b) From an idling condition in which the magnet is de-energized, clutch disengaged, start-stop contact closed, and selector lever pins in their downward position, battery is applied to clutch magnet. The clutch magnet attracts the armature and causes the bail assembly to disengage the latched trip lever. As the freed trip lever is pulled by its spring, it disengages the clutch shoe release lever, thereby permitting the clutch to engage and rotate the cam sleeve assembly. The clutch assembly and the cam sleeve assembly rotate continually as long as the clutch magnets are energized.

(c) When the clutch magnet circuit is broken, the armature and bail assembly are returned to their original position by the armature spring. As the clutch assembly completes its revolution, the reset cam operates the reset lever to return the trip lever to its original position. There, it is latched by the armature bail assembly and acts to block the clutch shoe release lever. As the clutch assembly and the attached cam sleeve assembly come to rest, the latch lever drops into a notch in the clutch disk assembly to hold the clutch disengaged until the clutch magnet is again energized.

(3) CLUTCH ASSEMBLY - (All metal internal expansion clutch) - The clutch has two shoes which bear against the inside surface of the drum. The drum in turn is keyed to the main shaft. It operates as follows:

(a) Figure 8 shows the clutch disengaged. Disengagement is accomplished by bringing together lug A on the clutch cam disk and the lower end of clutch shoe lever β . 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 9 shows the same clutch engaged. This is accomplished by releasing the 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 causes 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 preceding 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 is keyed to the clutch hub which in turn is keyed to the cam sleeve assembly.

(4) TAPE SENSING MECHANISM

(a) The transfer of the code combination from the perforated tape to the contact levers which control the transmitting contacts is accomplished by means of the selector lever bail, its cam, selector lever pins, and selector levers (Figure 10).

(b) As the cam sleeve rotates, the selector lever bail extension roller (Figure 10) rides onto the high part of its cam and permits the selector levers to respond to the tension exerted on them by their springs. The selector levers rotate counter-clockwise and move their pins upward through an opening in the top plate to sense the perforated tape. The selector lever pins which encounter perforated holes in the tape advance through the perforations, whereas the pins which do not encounter perforated holes in the tape are blocked by the tape and are prevented from advancing farther.

(c) The position of a selector lever determines whether or not the contact lever is blocked or permitted to rise into the indent of its cam and thus rotate slightly in a counter-clockwise direction as shown in Figure 10. The opening and closing of the transmitting contacts is controlled by the contact levers. If a selector lever pin passes through a perforated hole in the tape, the selector lever moves out of the path to be taken by the end of the contact lever and thus permits the contact lever to rotate when the indent of its cam reaches the lever. The rotation of the contact lever permits the transmitting contact to close and create a MARKING condition on the signal line. If a selector lever pin is blocked by the tape, the selector lever blocks the contact lever and thus prevents its rotation. Under this condition, the transmitting contact remains open and a SPACING condition is created on the signal line.

(d) In spite of the fact that all the selector levers act simultaneously and take the position predetermined by the perforations in the tape, the MARKING and SPACING conditions are applied to the signal line in sequence due to the arrangement of the cams on the cam sleeve.

(e) The start-stop contact is operated from a cam on the cam sleeve through the medium of a contact lever. The contact opens at the beginning of each revolution of the cam sleeve to produce the start interval (SPACING) and remains open during the transmission of the code. After the code has been transmitted the start-stop contact closes and produces a stop

interval (MARKING) on the signal line.

(f) After the fifth code interval has been applied to the circuit, the selector lever bail extension roller (Figure 10) rolls into the indent of its cam and produces motion which causes the selector lever bail to retract all of the selector levers from their sensing position.

(5) TAPE FEEDING - Immediately after the selector lever bail has retracted all the selector lever pins from the tape, the feed roller rolls into the indent of its cam (Figure 11). This motion is passed on to the ratchet wheel and feed wheel by means of the feed pawl lever and the feed pawl, and rotates the feed wheel. The feed wheel has pins on its periphery (Figure 4) which engage the feed holes in the tape. As the feed wheel rotates, the tape is advanced through its guide. While the feed wheel is rotating, a detent roller (Figure 11) rides over a tooth on the ratchet wheel and brings the feed wheel to rest in a position in which the perforations in the tape are directly over the selector lever pins.

(6) STOP MECHANISM - Within the unit there are two means for interrupting the clutch magnet circuit. The clutch magnet windings are connected in series with an automatically operated tape-out contact (Figures 4 and 12) and a manually operated tape-out contact (Figures 5 and 13). When either contact is opened, operation of the unit will stop.

(7) AUTOMATIC STOP - The automatically operated tape-out contact is located adjacent to the transmitting contacts (Figure 4). It is controlled by a tape-out contact lever which operates from the cam sleeve like the five selector levers. The associated tape-out sensing lever pin is in line with and adjacent to the selector lever pins (see Figure 14). It has a sensing area that senses along the edge of the tape with each revolution of the cam sleeve. When the end of the tape passes through the transmitter the tape-out sensing pin is allowed to move upward through its opening in the top plate so that the tape-out sensing lever turns in a clockwise direction as shown in Figure 15. The lower end of the tape-out sensing lever moves out of the path of the extension on the tape-out operating lever and permits it to ride into the indent of its cam. As the tape-out operating lever rides into the indent of its cam, one end of the tape-out contact lever opens the automatic tape-out contact while the other end of the lever becomes latched by the tape-out contact lever latch (Figures 5 and 15). The opening of the tape-out contact breaks the circuit of the clutch magnet and stops the operation of the unit.

(8) MANUAL STOP - The manually operated contact is located at the front of the unit (Figure 5). It may be opened by depressing the release bar or it may be closed by releasing the release bar. The release bar may be depressed momentarily or it may be latched in the downward position by moving it slightly rearward. When the release bar is depressed, three op-

erations are performed: The manually operated contact opens and stops the transmitter, the tape-out contact lever is unlatched thereby permitting the automatically operated tape-out contact to close, and the feed wheel detent and feed pawl are disengaged from the ratchet feed wheel so that the feed wheel may turn freely in its bearings. This feature facilitates the insertion and removal of tape from the tape guide, without raising the hinged tape lid, if desired. When the release bar is released, the manually operated contact closes and operation of the transmitter is resumed.

d. NUMBERING TRANSMITTER DISTRIBUTOR

(1) GENERAL - The structure and functions of the numbering transmitter distributor are the same as those of the message transmitter distributor with the exception of the letters sensing mechanism which is a feature of the numbering transmitter distributor only. The numbering transmitter (Figures 2 and 5) is used to number messages and identify the station before each message is transmitted. It is also used to switch circuits through control relays which cause the numbering transmitter distributor to stop, and a message transmitter to start.

(2) LETTERS SENSING MECHANISM

(a) The letters sensing mechanism (Figure 16) operates when the letters code combination is sensed in the number tape. Its operation opens a contact which breaks a circuit to the stop magnet of the numbering transmitter, through external control relays, and stops the transmitter. The control relays also close a circuit to the stop magnets of a message transmitter.

(b) During each operating cycle, when the selector lever pins are sensing the tape, a letters operating lever senses the ends of the five selector levers. If any of the selector levers are in the spacing position, they block the path of the letters operating lever and prevent it from operating. If the code combination is letters (all marking impulses), the letters operating lever is not blocked by any of the selector levers and therefore is permitted to operate. The letters operating lever has two extensions (Figure 17), one of which rides a cam on the cam sleeve to permit sensing of the selector levers, the other engages the tape-out contact lever when a letters code combination is sensed in the tape and consequently opens the tape-out contact. The tape-out contact of the numbering transmitter opens momentarily to pulse the external control relays which stop the numbering transmitter and start a message transmitter.

(3) CONTROL RELAY CIRCUIT OPERATION (For units having base equipped with Transmission Control Relays.

When the manual control contact of the numbering transmitter (Figure 18) is closed, to the left (release bar in upward position), relay 2 becomes energized

by a circuit through the manual control contact and contact 1-2 of relay 1. If a numbering tape is in the numbering transmitter, the automatic stop contact will be closed, and relay 1 will be energized by a circuit through the manual control contact and the automatic stop contact upon the closure of contact 7-8 on relay 2. Relay 1 locks through its contact 6-5 and automatic stop contact of the numbering transmitter. Opening of contact 1-2 on relay 1 releases relay 2. Relay 1 remains operated until a numbering cycle is completed. When a message tape is inserted in the message transmitter and its manual start contact is closed, a circuit is established through the manual control contact of the numbering transmitter, contact 3-4 of relay 1, 2-1 of relay 2, automatic stop contact and manual start contact of the message transmitter. This circuit energizes the clutch magnet of the numbering transmitter and starts transmission of the identification group of characters and functions typical of which are - CARRIAGE RETURN, LINE FEED, STATION IDENTIFICATION, FIGS, MESSAGE NUMBER, CARRIAGE RETURN, LINE FEED, LTRS. Transmission of LTRS function causes the automatic stop contact of the numbering transmitter to open momentarily and break the locking circuit of relay 1. Opening of contact 3-4 on relay 1 de-energizes the clutch magnet of the numbering transmitter and stops transmission. Closure of contact 1-2 on relay 1 causes relay 2 to operate and lock through its contact 3-4 and the manual control contact of the numbering transmitter. Closure of contact 5-6 on relay 2 provides a circuit through the manual control contact of the numbering transmitter, automatic stop contact and manual start contact of the message transmitter, that energizes the clutch magnet of the message transmitter and starts message transmission. Closure of contact 7-8 on relay 2 re-energizes relay 1 which again locks through its contact 6-5 and the automatic stop contacts of the numbering transmitter. The numbering transmitter remains idle during message transmission since its clutch-magnet circuit is open at contact 1-2 of relay 2. Opening of the automatic stop contact on the message transmitter, occasioned by the ending of tape, releases relay 2 and leaves the system in readiness for the next numbering cycle to be initiated by the insertion of another tape in the message transmitter.

e. MULTIPLE MESSAGE TRANSMITTER DISTRIBUTOR BASE

(1) A Multiple Message Transmitter Distributor Base (Figure 1) consists of a base casting upon which are mounted the following components, depending upon the features provided: Either a synchronous or a series governed motor, a countershaft (with gears), side covers, front cover, top cover plate, provision for making connections to the associated transmitter distributors (terminal strips, multi-point receptacles or slip connectors with shorting type signal line terminals to prevent opening the signal line when a transmitter distributor unit is removed), series resistors for the distributor clutch magnets, and filter circuits for the distributor transmitting contacts. In addition, governor

circuit components are provided on those bases which are equipped with the series governed motor. A multi-point male connector on a cable and a power cord are used for signal and power connections. Various motor gear and pinion combinations provide for operation of the associated transmitter distributor units at 60, 75, and 100 WPM with either synchronous or governed motors, and at 390 OPM (7.00 unit transmission pattern) with the synchronous motor only. The front cover assembly is either removable, or arranged as a door which may be swung downward for removal and replacement of the distributor units on the base. Card holders are provided on the front for circuit identification cards. The power switch, provided on most units, is located at the right front corner of the base and is used to actuate the AC power and DC control circuits.

(2) Underneath the base are three sets of capacitors and resistors which function as spark protectors across the manual and automatic contacts on the transmitter distributor unit. A tape guide on the top cover is provided to guide the expended tape from the #3 distributor into its proper tape bin when the base is mounted in its associated sending cabinet.

f. MULTIPLE NUMBERING TRANSMITTER DISTRIBUTOR BASE

(1) The multiple numbering transmitter distributor bases are similar to the multiple message transmitter distributor bases except that they are equipped with additional facilities for automatically winding and for manually rewinding numbering tapes (Figure 2). These bases are equipped with a removable front cover or three front doors, one for each transmitter distributor position. A take-up reel which stores the tape in

preparation for transmission is mounted on the cover or door in front of each transmitter distributor. A crank handle is provided on each of these reels to facilitate loading the numbering tape. A wing nut on the tape reel shaft provides for quick removal of the tape reel from its bracket on the front cover. A shaft mounted across the top of the base unit contains three take-up reels, one for each multiple transmitter distributor position. The shaft is driven from the base countershaft by means of a feed arm and ratchet assembly. The upper end of the feed arm pivots on the tape reel shaft. A slot in the lower end of the arm mounts over an off-center stud on the end collar of the countershaft. Rotation of the end collar applies oscillating motion to the lower end of the feed arm. A feed pawl attached to the feed arm rotates the ratchet wheel and the tape reel shaft. A check pawl on one of the mounting brackets prevents counter rotation of the shaft. The tape reel shaft applies a torque to each tape reel by means of three friction clutches. As tape is fed from the tape feeding mechanism of the transmitter distributor, the take-up reel winds the tape.

(2) A tape snubber assembly is provided at each tape reel position to prevent breakage of the tape and to direct it onto the reel. A ratchet wheel is attached to the left side of each take-up reel. A tight-tape arm with a check pawl attached pivots at the tape reel shaft and extends forward to the tape snubber assembly. Tight tape passing through the snubber maze, lifts the tight-tape arm which presses the check pawl into engagement with its ratchet wheel stopping rotation of tape reel through action of its friction clutch. When more tape is fed from the transmitter distributor, slack in the tape permits the tight-tape arm and pawl to move downward and release the take-up reel for further rotation.



SECTION 2 - ADJUSTMENTS

1. GENERAL

a. The following requirements and adjusting procedures for the maintenance of the Teletype Multiple Transmitter Distributor and Base are arranged in a sequence that would be followed if a complete readjustment of a unit were undertaken. In following such a procedure, parts or assemblies which are removed to facilitate adjustments should not be replaced until all other adjustments are made which would be facilitated by the removal of these parts. If any adjustment is changed, related adjustments should be checked.

b. The spring tension values indicated in this bulletin are scale readings which should be obtained when Teletype scales are used as specified. Springs which do not meet the requirements specified, and for which no adjusting procedure is given, should be replaced by new springs. Ordering information may be obtained from the Teletype Multiple Transmitter Distributor Parts bulletin.

c. Before proceeding with any adjustment, read the applicable portion of the adjusting text carefully. After the adjustment is completed, be sure to tighten any screws or nuts which may have been loosened. If a part that is mounted on shims is to be dismantled, 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.

2. MISCELLANEOUS INSTRUCTIONS

a. When AC or DC governed motor units are used, a tuning fork (speed indicator) is supplied for checking the motor speed. The tuning fork is equipped with shutters attached to the ends of the tines. The governor of the motor is equipped with a speed target of alternate black and white spots.

b. With the motor running and the target well illuminated, tap the tuning fork lightly to start it vibrating. Hold the fork close to the eye and view the spots on the target through the vibrating shutter. If the motor is running at the correct speed, the spots will appear to be stationary. If the motor is running too fast, the spots will appear to be moving in the direction in which the motor is rotating; if too slow, in the opposite direction. The speed may be increased or decreased by momentarily pressing against the speed adjusting lever or the governor adjusting bracket respectively.

NOTE

There is a possibility of setting the speed incorrectly, due to getting a speed multiple; i.e., the speed could be half the desired speed, or two thirds the speed, or some other multiple, even though the spots appear to be stationary when viewed through the tuning

fork shutters. This should be kept in mind if trouble is encountered in the operation of the equipment.

c. No speed setting is required on units equipped with synchronous motors since they are constant speed motors.

MULTIPLE TRANSMITTER DISTRIBUTOR

NOTE

The first five adjustments (3 through 7) apply only to units equipped with a positive-action clutch.

3. TRANSMITTING CAM SLEEVE END PLAY (Figure 19)

The transmitting cam sleeve should have some end play, not over .002". To obtain this requirement, add or remove shims between the transmitting cam sleeve and the side frame bearing. Further refine this adjustment by positioning the clutch driving member on the transmitting shaft.

4. CLUTCH SPRING COMPRESSION (Figure 19)

With the clutch teeth engaged, insert a 32 oz. scale through the hole in the side frame and hook it over the clutch driven member projection and pull directly in line with the shaft. It should require 12 to 15 ozs. to separate the clutch teeth.

5. CLUTCH (Figure 19)

There should be .005" to .015" clearance between the clutch teeth when the clutch is fully disengaged. To obtain this requirement, position the clutch throwout lever by adding or removing shims between the shoulder on the throwout lever post and the side frame.

6. STOP MAGNET BRACKET

With the magnet armature held against the magnet cores, there should be some clearance not more than .004" between the clutch throwout lever and the high part of the cam on the clutch driven member. To adjust, loosen the stop magnet bracket mounting screw and position the bracket. Tighten the mounting screws. See Figure 19 for location of parts.

7. ARMATURE SPRING TENSION

With the clutch throwout lever on the low part of the clutch driven member, unhook the armature spring from the spring post and hook an 8 oz. scale in the spring eye. It should require 2 to 3-1/2 ozs. at 60 wpm. and 3-1/2 to 4-1/2 ozs. at 75 or 100 wpm. to extend the spring to its operating position length. See

Figure 19 for location of parts.

NOTE

It will be necessary to supply .100 amp. D.C. for satisfactory operation of the start magnet.

The next eleven adjustments (8 through 18) apply only to unit equipped with an all metal internal expansion clutch.

8. TRANSMITTING CAM SLEEVE END PLAY ADJUSTMENT (Figure 20)

The transmitting cam sleeve should have some end play, not over .002". To obtain this requirement, add or remove shims between the transmitting cam sleeve and the side frame bearing.

9. CLUTCH MAGNET BRACKET ADJUSTMENT (Figure 21)

With the clutch magnets energized, the armature should make contact with both pole pieces, and there should be .004" to .008" clearance between the high part of the armature bail and the lower extension of the clutch trip lever measured at the closest point. To adjust, position the magnet bracket with its mounting screws loosened.

10. CLUTCH TRIP LEVER AND LATCH LEVER ADJUSTMENT (Figure 22)

When the clutch is disengaged by the clutch trip mechanism, the clutch trip lever should fully engage the clutch shoe lever, and the clutch latch lever should engage the full width of the notch in the clutch disk. To adjust, loosen the trip mechanism bracket mounting screws, disengage the clutch latch lever and position the trip mechanism bracket.

11. CLUTCH TRIP LEVER ADJUSTMENT (Figure 23)

When the clutch magnet is de-energized and the reset roller is on the high part of its cam, there should be .012" to .020" between the latching surface of the clutch magnet armature bail and the lower extension of the clutch trip lever. To adjust, loosen the reset lever clamp screw and position the clutch trip lever.

12. CLUTCH MAGNET ARMATURE SPRING TENSION (Figure 23)

When the clutch magnet is de-energized and the reset roller is on the high part of its cam, place the push end of an 8 oz. spring scale against the clutch magnet armature bail just above the armature spring, and push parallel to the spring. It should require 4-1/4 to 5-1/2 oz. to start the armature bail moving away from the clutch trip lever extension.

NOTE

It will be necessary to supply .100 amp D.C. for satisfactory operation of the clutch magnet.

13. CLUTCH TRIP LEVER SPRING TENSION (Figure 21)

With the clutch latched in the stop position, operate the clutch magnet armature bail to unlatch the clutch trip lever. Hold the armature against the magnet pole pieces. Place the push end of an 8 oz. spring scale against the stop lug of the clutch trip lever and push at a right angle to the lever. It should require 5 to 8 oz. to start the lever moving toward the clutch.

14. CLUTCH LATCH LEVER SPRING TENSION (Figure 21)

With the clutch latch lever resting on the center of the stop lug on the clutch disk, place the hook of an 8 oz. spring scale over the top of the latch lever and pull at a right angle to the lever. It should require 1 to 2 oz. to start the latch lever moving from the stop lug.

15. TRIP LEVER SHAFT COMPRESSION SPRING

The only requirement for this spring is that it hold the latch lever firmly against the bushing in the trip lever without binding the latch lever enough to affect the requirements of the clutch latch lever spring tension in the preceding paragraph.

16. CLUTCH SHOE MECHANISM (Figure 24)

The gap between the clutch shoe release lever and its stop lug on the clutch disk should be .055" to .085" greater when the clutch is engaged than when the clutch is disengaged. To adjust, loosen the two clamp screws in the clutch disk, engage a wrench on the lug of the adjusting disk and rotate the disk.

NOTE

After the above adjustment is made, disengage the clutch, and rotate the drum in its normal direction of rotation to make certain that it does not drag on the shoes. If the drum drags, refine the above adjustment.

17. CLUTCH SHOE LEVER SPRING TENSION (Figure 25)

With the clutch engaged and the cam disk held to prevent its turning, place the hook end of a horizontally held 32 oz. spring scale against the side of the clutch shoe release lever which is opposite the stop lug on the clutch disk. With the spring scale pulled tangent to the clutch, it should require 16 to

20 ozs. to move the shoe lever in contact with the stop lug.

18. CLUTCH SHOE SPRING TENSION (Figure 25)

NOTE

In order to check this spring tension it is necessary to remove the clutch from the shaft. Therefore, it should not be checked unless there is good reason to believe that it does not meet the requirement.

With the clutch drum removed, hook an 8 oz. scale over the primary shoe and pull at a tangent to the friction surface. It should require 3 to 5 ozs. to start the primary shoe moving away from the secondary shoe at point of contact.

19. CONTACT LEVER BRACKET

The contact lever extensions should ride fully on their respective cams. To adjust, position the contact lever bracket with the mounting screws loosened.

20. TRANSMITTING CONTACT GAP (Figure 26)

a. With any contact lever on the high part of its cam, the contact gap should be .017" to .025" (.015" to .025" for start-stop contacts) when using a signal measuring device. If no signal measuring device is available, all contact gaps should be .017" to .023" for 60 and 75 wpm operation and .020" to .025" for 100 wpm operation. To adjust, bend the short contact spring.

b. If unit is equipped with adjustable backstops, apply the push end of an 8 oz. scale to the top end of the short contact springs and push at right angles to the springs. It should require 4 to 8 ozs. to move the contact springs away from their backstops. To adjust, position the backstop adjusting screws with their lock nuts loosened. Figure 27. Recheck contact gap requirement in paragraph a.

21. TRANSMITTING CONTACT SPRING PRESSURE (preliminary)

a. With any contact lever on the high part of its cam, it should require 7 ozs. to just start the contact spring moving away from its contact lever when the push end of an 8 oz. scale is applied to the long contact spring just above the contact point. Figure 28.

NOTE

If the unit is equipped with adjustable backstops, loosen lock nuts and backoff adjusting screws all the way.

b. Rotate the cam sleeve until the contact lever, associated with the contact spring, is on the low part of its cam. Turn the unit so as to face the contacts.

c. To increase the contact spring pressure, insert a 72003 contact spring bender, with its projection downward, from the right-hand side between the contact bracket and the stiffener of the long contact spring. Turn the spring bender in a clockwise direction to bend the long contact spring and its stiffener.

d. To decrease the contact spring pressure, insert the 72003 contact spring bender, with its projection upward, from the right-hand side between the long and short contact springs and turn it clockwise to bend the long contact spring and stiffener.

22. TRANSMITTING CONTACT SPRING PRESSURE (Final) (Figure 29)

With any contact lever on the low part of its cam it should require a pressure of 5 to 5-1/2 ozs. to open the associated contact when the push end of an 8 oz. scale is applied to the longer contact spring just above the contact point. If necessary, refine the contact spring pressure by rebending the longer contact spring as described above to meet the final requirement. Recheck the TRANSMITTING CONTACT GAP adjustment.

23. COMB SHAFT RETAINER (Figure 30)

NOTE

Before making this adjustment make certain that the side of the retainer in which the end of slot is closest to the hole, is at the right.

The comb shaft should be clamped by the retainer so that it rests at the bottom of the shaft slot.

To adjust, loosen the retainer clamps screw on each end of the comb and position each retainer so that eccentric slot in the retainer takes up the clearance between the shaft and the bottom of the shaft slot. Tighten the clamp screws.

24. TAPE-OUT CONTACT LEVER LATCH (Figure 31)

With the tape-out operating lever resting firmly on the approximate center of the low part of its cam, and with the tape-out contact lever resting against its stop, there should be from .008" to .025" clearance between the latching surface of the tape-out contact lever latch and the tape-out contact lever. To adjust, loosen the tape-out contact lever latch mounting screw nut and position the mounting screw in the elongated hole of the bracket. Tighten the nut.

NOTE

On units equipped with a letters sensing mechanism, this adjustment must be made and checked with the letters operating lever resting against one or more selector levers which are in the unselected (blocked) position.

25. TAPE-OUT CONTACT LEVER LATCH SPRING (Figure 31)

With the tape-out operating lever resting on the low part of its cam and an 8 oz. scale hooked over the contact lever latch at the bottom of the notch, it should require 1-1/4 to 2 ozs. to start the latch moving.

NOTE

The following two adjustments (26 and 27) apply only to units not equipped with adjustable backstops.

26. TAPE-OUT CONTACT GAP (Figure 32)

NOTE

On units equipped with the "Letters Sensing Mechanism" move the tape-out contact lever latch lock-out screw upward and tighten the lock nut.

With the transmitting cam cylinder in its stop position (clutch teeth disengaged) and the tape-out contact lever in its latched position, the contact gap should be .020" to .025". To adjust, bend the shorter contact spring.

27. TAPE-OUT CONTACT SPRING PRESSURE (Figure 31)

With the transmitting cam cylinder in its stop position (clutch teeth disengaged) and the tape-out contact lever in its unlatched position, it should require a pressure of 2 to 3 ozs. to open the contact when the push end of an 8 oz. scale is applied to the contact spring just above the contact point. To adjust, bend the longer contact spring; recheck the contact gap adjustment.

NOTE

The following four adjustments (28, 29, 30 and 31) apply only to units equipped with adjustable backstops.

28. TAPE-OUT CONTACT GAP ADJUSTMENT (Preliminary)

NOTE

On units equipped with the "Letters Sensing Mechanism" move the tape-out contact lever latch lock-out screw upward and tighten the nut.

With the transmitting cam cylinder in its "stop" position (clutch teeth disengaged) and with the tape-out contact lever in its latched position, back up the backstop adjusting screw all the way. Adjust the short contact spring by bending so that there is a gap

of .035" to .040" between the contact points.

29. CONTACT SPRING (LONG) TENSION (Preliminary)

With the transmitting cam cylinder in its "stop" position (clutch teeth disengaged) and with the tape-out contact lever in its latched position, apply the push end of an 8 oz. scale to the long contact spring just above the contact and push at right angle to the spring. Adjust the long contact spring by bending so that it requires approximately 4-1/4 ozs. to just move the contact spring away from its contact lever.

30. TAPE-OUT CONTACT GAP ADJUSTMENT (Final)

With the transmitting cam cylinder in its "stop" position and with the tape-out contact lever in its latched position (make sure that the friction between the tape-out contact lever and the tape-out operating lever does not interfere) adjust the backstop screw until there is from .020" to .025" clearance between the contact points.

31. TAPE-OUT CONTACT SPRING TENSION (Final)

With the transmitting cam cylinder in its "stop" position and with the tape-out contact lever latched, adjust the short contact spring by bending so that it requires from 4 to 8 ozs. to just move the short contact spring away from its backstop screw when an 8 oz. scale is applied at right angle to the end of the short contact spring.

With the transmitting cam cylinder in its "stop" position, with the tape-out contact lever unlatched and with clearance between the long contact spring and its contact lever (the contact lever may have to be moved manually to overcome the friction** between it and the tape-out operating lever), apply the push end of an 8 oz. scale to the long contact spring, just above the contact point, and push horizontally. It should require from 2 to 3 ounces to just open the contacts. Adjust by bending the long contact spring.

**NOTE

Make sure that this friction is not sufficient to interfere with the safe closure of the contacts. Recheck the .020" to .025" TAPE-OUT CONTACT GAP adjustment.

32. TAPE-OUT CONTACT LEVER UPSTOP (Figure 33)

With the cam in its stop position and the tape out lever unlatched, there shall be .005" to .015" clearance between the tape-out contact lever and the contact insulator. To adjust, position the upstop by loosening the clamp screw and rotating the upstop on the shoulder screw. Tighten the clamp screw.

33. TAPE-OUT OPERATING LEVER SPRING TENSION (Figure 31)

With the transmitting cam cylinder in its stop position (clutch teeth disengaged) and the tape-out operating lever resting on the high part of its cam, hook the end of a 32 oz. scale over the top of the tape out operating lever. It should require a pull of 10 to 14 ozs. to start the lever moving away from the cam.

34. RELEASE BAR CONTACT ADJUSTMENT

a. With the release bar fully depressed, there should be a gap of .020" to .035" between the contact on the heavy short contact spring and the contact of the long contact spring (Figure 34). Adjust by bending the short heavy contact spring.

b. With the release bar in the unoperated position (up), it should require a tension of 2-1/2 to 3-1/2 ozs. to open the contact when an 8 oz. scale is hooked over the long contact spring just above the contact point and pulled horizontally (Figure 34). To adjust, bend the long contact spring; recheck the contact gap adjustment.

c. With the release bar unoperated, there should be a gap of .010" to .020" between the contact of the short thin contact spring and the contact of the long contact spring (Figure 34). To adjust bend the short thin contact spring stiffener.

d. With an 8 oz. scale hooked over the short thin contact spring at the contact point, it should require 2-1/2 to 5-1/2 ozs. to just start moving the spring away from the spring stiffener (Figure 34). To adjust, bend the short thin contact spring.

CHECKS

1. On units equipped with the 138591 detent lever (with curved horizontal extension) and 125236 detent lever spring (approx. 25 turns-.024" wire), check to see that there is some clearance between the contact of the long contact spring and that of the heavy short spring when the feed wheel detent roller rests in the hollow between two ratchet teeth and when the release bar stud of the partially operated release bar is just touching the detent lever extension.

2. With the release bar in its unoperated (up) position, the release bar stud must clear the top edge of the insulator of the contact swinger.

3. If necessary, refine the FEED WHEEL DETENT adjustment and/or remake the RELEASE BAR CONTACT adjustment.

35. RELEASE BAR SPRING TENSION (Figure 34)

Apply the push end of an 8 oz. scale to the top

of the release bar and push vertically downward. It should require 1-1/2 to 3 ozs. to start the release bar moving.

36. SELECTOR LEVER COMB (Figure 35)

With the transmitting cam sleeve in its stop position, there should be a clearance of .002" to .012" between the lower ends of the selector levers and the horizontal extensions of the contact levers. To adjust, add or remove shims under the selector lever comb on each of the side frames.

37. TAPE-OUT SENSING LEVER (Figures 36, 37 and 38)

NOTE

The multiple transmitter distributor units should operate satisfactorily when adjusted as specified in the adjustment bulletin. However, in installations where it is necessary to run badly worn creased tapes through the transmitter, it is recommended that the 97523 tape-out sensing lever be adjusted as follows in order to provide more margin in the operation of the tape-out mechanism. It is recommended that two 116799 bending tools be used to facilitate this adjustment.

a. Unhook the release bar spring from the release bar. Remove the four screws which hold the top plate and the shims from under each corner of the top plate. Move the release bar out of the way and slide the top plate off the unit. Do not bend the tape sensing levers.

b. With the bending tools placed as shown in Figure 36, bend the horizontal leg of the tape-out sensing lever so that the top of its sensing pin is flush, within .005", with the top of the adjacent selector lever pin. Avoid damaging the pin with the bending tool.

c. With the transmitting cam sleeve in its stop position, place the bending tools on the lever as shown in Figure 37 and bend the vertical leg of the sensing lever to obtain .015" to .030" clearance as shown in Figure 38.

d. Replace the top plate and release bar spring by reversing the procedure outlined in Paragraph (a) above.

e. After the above adjustment has been applied, recheck the following adjustments:

- 1 TAPE-OUT CONTACT LEVER LATCH
- 2 TOP PLATE
- 3 SELECTOR LEVER BAIL
- 4 FEED PAWL LEVER

38. TOP PLATE (Without adjustable posts) (Figure 26)

a. With the selector lever pins just flush with the top surface of the tape guide slot in the top plate, the lower ends of the five selector levers should overlap their contact levers by .050" to .090". To adjust, rotate the transmitting cam cylinder until the selector lever pins are flush with the top surface of the tape guide slot and shim the top plate at its four corners to obtain the proper overlap.

b. Before tightening the mounting screws, position the top plate so that the selector lever pins are aligned approximately on the center line of the slotted hole in the top plate, and so that the clearance is not less than .006" between the pins (Tape-out pin included) and the edges of the slotted hole.

39. TOP PLATE (With adjustable posts) (Figure 26)

a. With the selector lever pins just flush with the top surface of the tape guide slot in the top plate, the lower ends of the five selector levers should overlap their contact levers by .050" to .090". To adjust, rotate the transmitting cam cylinder until the selector lever pins are flush with the top surface of the guide slot. Loosen the four top plate mounting screws and lock nuts on the two front posts. Rotate the upper adjustable sections of the posts clockwise until there is approximately 1/16" clearance between the top plate and the post. Shim the top plate at the two rear corners to meet the requirement above, and tighten the rear mounting screws. Rotate the upper adjustable sections of the two front posts until they just touch the top plate, and lock in place by means of the lock nut. Tighten front mounting screws.

b. When tightening the two rear mounting screws, position the top plate so that the selector lever pins are aligned approximately on the center line of the slotted hole in the top plate, and so that the clearance is not less than .006" between the pins (including tape out pin) and the edges of the slotted hole.

40. FEED WHEEL (Figure 39)

a. The feed pins on the tape feed wheel should extend .035" to .045", above the top surface of the channel in the top plate. To adjust, insert shims between the feed wheel brackets and the bottom surface of the top plate.

b. The mounting screws should engage the top plate with the maximum number of threads without protruding through the surface. Adjust by inserting unused shims between the brackets and the clamp plates.

c. Position the tape feed wheel so that when a piece of perforated tape having perforations properly centered, is engaged by the feed wheel, there will be an equal amount of clearance between the sides of the tape guide slot in the top plate and the edges of the

perforated tape. Adjust the feed wheel by means of the pilot screws. When adjusted, there should be some end play, not more than .002". Recheck adjustment
a. See Figures 40 and 41 for location of parts.

NOTE

If necessary, the accessibility of the right pilot screw may be improved by removing the hexagonal post on which the transmitter filter is mounted, and rotating the post and filter to the right.

41. SELECTOR LEVER BAIL

a. Before making this adjustment on transmitter distributor units having a mechanism for momentarily opening the tape-out contact on LETTERS combination, move the letters operating lever (Figure 42) toward the front of the transmitter by means of its mounting stud and the slotted hole in the bracket. This is done so that the vertical projection of the letters operating lever will not interfere with the free movement of the selector levers.

b. With the selector cam sleeve in its stop position (clutch fully disengaged) and the selector lever bail extension roller resting on the low part of its cam, the highest selector lever pin should not project above the top surface of the tape guide slot in the top plate and should not be below the top surface by more than .010". See Figure 43 for location of parts. To adjust, insert a screw driver through a hole in the side frame, loosen the selector lever bail clamping screw (Figure 19) and position the selector lever bail with relation to its extension. Tighten the clamping screw.

42. SELECTOR LEVER BAIL SPRING (Figure 26)

With the transmitting cam cylinder in its stop position and the selector lever bail extension roller resting on the low part of its cam, place the push end of a 32 oz. scale against the selector lever bail extension directly above the spring and push in line with the spring. It should require at least 10 ozs. to start the bail moving.

43. SELECTOR LEVER SPRING (Figure 26)

With the selector lever pins in their uppermost position, apply the push end of an 8 oz. scale to the top of a selector lever pin and push vertically downward. It should require 3-1/4 to 4-1/4 ozs. to push the selector lever pin downward until the top of the pin is flush with the upper surface of the tape guide slot in the top plate.

44. TAPE-OUT SENSING LEVER SPRING (Figure 31)

With the tape-out sensing pin in its uppermost position, apply the push end of an 8 oz. scale horizontally at the bend of the tape-out sensing lever just below the selector lever bail. It should require 1/2

to 1-1/2 ozs. to start the tape-out sensing lever moving.

45. FEED WHEEL DETENT

Select a piece of tape (regular or chadless tape) with a series of LETTERS perforations checked for 10 holes to the inch. With the detent roller resting in an indent between two teeth of the tape feed ratchet wheel, rotate the cam sleeve until the tape pins are flush with the bottom of the tape. Engage the feed perforations of the tape with the feed wheel so that the LETTERS perforations are directly over the tape pins. When the play of the tape on the feed wheel is taken up in the direction of rotation of the feed wheel, the tape sensing pin with the minimum clearance in its code hole should just clear the trailing edge of its code hole. To adjust, hold the feed pawl away from the ratchet and position the detent eccentric. Keep the high part of eccentric toward the rear of the unit. See Figure 40 for location of parts.

46. SELECTOR LEVER GUIDE (Figure 26)

When a piece of tape, perforated with the LETTERS combination and properly centered (having No. 1 and No. 5 code holes equidistant from edges), is placed in the transmitter and the cam sleeve rotated until the selector lever pins are in their uppermost position, the pins should be approximately in line with the center line through each hole in the perforated tape. To adjust, loosen the mounting screws of the selector lever guide and position the guide. Tighten the mounting screws.

47. FEED WHEEL DETENT SPRING (Figure 40)

With the feed pawl held away from the feed wheel ratchet, hook a 32 oz. scale over the head of the detent roller screw and pull parallel to the top plate. It should require 14 to 20 ozs. to start the detent moving.

48. FEED PAWL LEVER (Figure 44)

With the transmitting cam sleeve in stop position, there should be some clearance not more than .010" between the feed pawl and the face of the ratchet wheel tooth which has the least amount of clearance. Check throughout a complete revolution of the ratchet wheel. To adjust, loosen the clamp screw and position the feed pawl lever with respect to the feed pawl arm. Tighten the clamp screw.

49. FEED PAWL ARM SPRING (Figure 40)

With the transmitting cam sleeve in stop position and the feed roller resting on the low part of its cam, unhook the feed pawl spring from the feed pawl. With a 32 oz. scale hooked over the feed pawl arm in line with the spring hole and pulled at right angles to the feed pawl arm, it should require 24 to 30 ozs. to start the feed pawl arm moving. Replace the feed pawl

spring.

50. FEED PAWL SPRING (Figure 40)

With the transmitting cam sleeve in stop position, hook an 8 oz. scale over the lower part of the feed pawl, near the spring hole, and pull at right angles to the feed pawl. It should require **ozs. to start the feed pawl moving away from the ratchet wheel.

** For units operating at 60 or 75 wpm. the tension should be 1/2 to 2 ozs. (Spring has 60 turns)
For units operating at 100 wpm. the tension should be 3-1/2 to 4-1/2 ozs. (Spring has 40 turns)

51. TAPE LID PIVOT SCREWS (Figure 41)

The tape lid should be located centrally with respect to the tape lid bearing bracket and should be free to pivot without binding, with a minimum amount of end play at the bearings. Adjust by means of the two tape lid pivot screws to meet the above requirements. Tighten the two lock nuts.

52. TAPE LID VERTICAL (Figure 41)

The tape lid should rest flatly along both edges of the tape guide slot in the top plate. To adjust, loosen the two tape lid bearing bracket mounting screws and position the tape lid to meet the above requirement. Tighten the mounting screws.

CAUTION

In making this adjustment, make sure that the lowest section of the tape lid is within the tape guide slot of the top plate.

53. TAPE LID HORIZONTAL (Figure 41)

The horizontal adjustment of the tape lid should meet the following requirements:

a. The feed wheel pins should line up centrally between the fins of the feed wheel pin slot in the tape lid.

b. With the selector lever pins in the upper position, there should be at least .006" clearance between the selector lever pins (tape-out sensing pin included) and any part of the tape lid.

c. The selector lever pins should be inside their slots and .010" to .015" from the end of the tape fins. This tolerance does not apply to units equipped with the 135561 tape lid. To adjust, loosen the tape lid bracket mounting screws (Figure 41) and position the tape lid to meet all three requirements. Tighten the mounting screws.

54. TAPE LID LATCH SPRING POSITION (Figure 45)

The tape lid latch spring should be adjusted verti-

cally so that the tape lid latches firmly. To adjust, loosen the tape lid latch spring mounting screws, position the spring up or down to meet the requirement, and tighten the mounting screws.

55. TAPE LID LATCH SPRING TENSION (Figure 45)

With the tape lid latched, apply a 32 oz. scale at right angles to the uppermost bent section of the latch spring and push downward. It should require 12 to 16 ozs. to just start deflecting the spring. Adjust by gradually bending the spring approximately midway between its upper mounting hole and the top plate.

56. LETTERS OPERATING LEVER (Figure 42)

With the letters operating lever riding on the high part of its cam, rotate the cam sleeve until the bottom edges of the ends of the horizontal members of the selector levers are in line with the bottom edge of the horizontal section of the letters operating lever vertical extension. Under this condition, there should be from .005" to .010" clearance between the ends of the selector lever providing the minimum clearance and the operating lever vertical extension. To adjust, loosen the letters operating lever stud nut and position the bracket; tighten the nut.

57. LETTERS OPERATING LEVER VERTICAL EXTENSION (Figure 46)

Rotate the transmitting cam cylinder until all selector lever pins are in their selected (uppermost) position and the letters operating lever horizontal extension is on the low part of its cam. Under this condition there should be .020" to .040" clearance between the underside of the horizontal members of the selector levers and the top surface of the letters operating lever vertical extension. To adjust, loosen the two vertical extension mounting screws and position the extension vertically to meet the foregoing requirement. Tighten the mounting screws and recheck the letters operating lever adjustment.

NOTE

Old units having tape-out sensing levers which are not cut off at the selector lever guide should be checked to be sure that there is at least .010" clearance between the letters operating lever vertical extension and the tape-out sensing lever when a piece of tape perforated with the letters combination is placed in the unit and the cam cylinder is positioned as in the foregoing paragraph.

58. LETTERS OPERATING LEVER HORIZONTAL EXTENSION (Figure 31)

Move the tape-out contact lever latch lockout screw upward so that it is ineffective. Set up the LETTERS combination and rotate the cam sleeve manually until the letters operating lever (Figure 42) is

resting on the low part of its cam. With the letters operating lever in this position, there should be .010" to .020" clearance between the latching surface of the tape-out contact lever latch and the tape-out contact lever. To adjust, loosen the horizontal extension clamping screw (Figure 42) and position the letters operating lever horizontal extension with respect to the tape-out contact lever. Tighten the extension clamping screw.

NOTE

After completing the "Letters Operating Lever Horizontal Extension Adjustment", make the tape-out contact lever latch ineffective by positioning the lockout screw downward so as to provide a clearance of at least .010" between the end of the tape-out contact lever and the tape-out contact lever latch.

NOTE

On units equipped with a letters sensing mechanism, this adjustment must be made and checked with the tape-out sensing lever in the unselected (blocked) position.

59. LETTERS OPERATING LEVER HORIZONTAL EXTENSION SPRING (Figure 42)

With the letters operating lever resting on the high part of its cam, hook a 32 oz. scale over the vertical arm of the letters operating lever as close as possible to the selector lever and pull at right angles to the letters operating lever. It should require 8 to 13 ozs. to start the letters operating lever moving.

60. RELEASE BAR LATCH (Figure 47)

a. With the release bar fully depressed, there should be some clearance, not more than .010", between the release bar latch and the latching edge of the release bar. Adjust by bending the release bar latch.

b. When the release bar is latched and the release bar slot is fully engaging the release bar latch, there should be some clearance, not more than .010", between the slot in the release bar and the top plate. To adjust, loosen the release bar latch mounting screws and position the latch in its mounting holes.

61. DOOR STOP PLATE

The flat surface of the door stop plates mounted on the front posts should be parallel with the front edge of the base plate. To adjust, loosen post mounting screw and position by eye. Tighten mounting screw.

MULTIPLE TRANSMITTER DISTRIBUTOR BASE

62. MAIN SHAFT (Figure 48)

a. Remove the screw holding the motor gear hub to the main shaft and slide the motor gear and hub to the right along the main shaft until the motor gear and the motor pinion are completely disengaged.

b. The main shaft should turn freely in its bearings. Check throughout one complete revolution of the main shaft. To adjust, loosen the mounting screws on the two main shaft bearings and align the bearings. If necessary, add or remove shims between either bearing and its boss on the base casting. Tighten the mounting screws of both bearings.

c. The main shaft should have some end play, not over .004". To adjust, loosen the two set screws in the collar at the left end of the shaft and position the collar on the main shaft. Tighten the set screws.

63. MOTOR PINION

The motor pinion should line up with the motor gear on the main shaft within $1/32"$. To adjust, loosen the four mounting screws and position the motor on its mounting brackets. Tighten the mounting screws.

64. MOTOR PINION BACKLASH

There should be a barely perceptible amount of backlash between the motor pinion and the motor gear. This backlash should be checked throughout one complete revolution of the motor gear. To adjust, loosen the four mounting screws which clamp the two motor plates to the base casting, and add or remove shims between the motor plates and their bosses on the base casting. Tighten the mounting screws.

65. GEAR GUARD ADJUSTMENT

There should be some clearance between the gear guard and the motor gear at the closest point, throughout one complete revolution of the motor gear. To adjust, loosen the gear guard mounting screws and position the gear guard. Tighten the mounting screws. The amount of clearance will depend on the size of the motor pinion.

66. SLIP CONNECTOR BRACKETS

The slip connector brackets should be parallel to the main shaft. To adjust, loosen the mounting screws, reposition the brackets, then tighten the mounting screws. Check the right hand slip connector bracket for clearance between it and the motor pinion.

67. SLIP CONNECTOR

a. The first pair of contact springs (left hand pair as viewed from front) on each slip connector assembly are required to make contact when the transmitter distributor is removed from the base assembly. The contact springs should be tensioned against each other so that when the pressure of one spring is removed, its mate will follow approximately $3/64$ inches. Gauge

by eye.

b. The contact springs, other than the pair in paragraph a. are not to make contact when the transmitter distributor is removed from the base assembly. There should be .020" to .060" clearance, between the springs in the pairs, gauged at the closest point between the contacting surfaces. The springs should be approximately parallel. The forming of the tips or terminals must not be altered to meet any requirement during adjustment.

c. Adjacent springs, not in the same pair, shall have perceptible clearance when a transmitter distributor is inserted into the slip connectors.

68. DISTRIBUTOR UNIT POSITION

Each unit should be positioned on the base so as to provide a minimum amount of backlash, without binding, between the driven gear on the unit and the driving gear on the main shaft. Check throughout one complete revolution of the gear. To adjust, loosen the three mounting screws and position the unit. Tighten the mounting screws.

NOTE

When the right hand unit is mounted and adjusted there should be at least $1/8"$ clearance between the soldered connection on one of its connection lugs and the gear guard. Bend the connection lug away from the gear guard, if necessary, but do not short across the adjacent connection.

69. COVER

Cover plates should meet with a minimum of clearance. To adjust, start at the front plate on the right side and work counterclockwise around the base. Loosen the mounting screws, position the plate, then tighten the mounting screws.

70. DOOR STOP SCREW

The door should be flush with the front edge of the transmitter distributor top plate. To adjust, loosen the lock nuts on the door stop screws on the transmitter distributors, adjust the stop screws, and tighten the lock nuts. The left cover plate may have to be repositioned for minimum clearance between it and the door.

NOTE

The following seven adjustments (71 through 77) apply only to units equipped with control relays.

CAUTION

Remove power before attempting any of the

relay adjustments.

71. CONTACT SPRINGS

All contact springs should be free from sharp bends or kinks and should be approximately parallel with the heel piece. The contact points should be in alignment.

72. HEEL-PIECE GAP (Figure 49)

With the residual screw in its approximately correct setting and the relay electrically operated, there should be some clearance, not more than .004", at the closest point between the armature and the heel piece. The armature should also be reasonably parallel with the heel piece. To adjust, loosen armature clamping screws and position armature. Tighten the armature clamping screws. Recheck clearance.

73. RESIDUAL SCREW (Figure 49)

With the relay electrically operated, there should be some clearance, not more than .004", at the closest point between the armature and the core. To adjust, loosen residual-screw lock nut and position the screw. Tighten the lock nut.

74. ARMATURE BACKSTOP (Figure 49)

With the armature resting against the backstop, there should be from .004" to .012" between the insulator on the armature arm and the swinger of the first break combination. To adjust, bend the armature backstop.

75. MAXIMUM ARMATURE TRAVEL (Figure 49)

With the proper* gage between the armature residual screw and the magnet core and the armature operated by hand, the first BREAK contact should not break. To adjust, bend the heavy break spring or if necessary bend the armature. Recheck 74 above.

*For 117760 relay (slow operating) use .015" gage.
For 117761 relay use .013" gage. (Figure 3)

76. CONTACTS (Figure 49)

a. There should be a minimum of .010" contact separation between MAKE contacts with the relay unoperated.

b. When the armature is slowly operated by hand, there should be at least a slight movement of the heavy BREAK spring, and the MAKE springs should also move at least .010". Gauge by eye. The BREAK contact should break before any MAKE contact makes.

c. There should be a minimum clearance of .010" between the noncontacting surfaces of adjacent contact springs.

77. ELECTRICAL REQUIREMENTS

	<u>Operate Current</u>	<u>Non-Operate Current</u>
117760 Relay (slow operating)	17 ma.	14.8 ma.

Increase or decrease tension in contact springs to meet this requirement. Recheck 74, 75, and 76, after adjusting. Electrical requirements for the 117761 relay are unnecessary.

NOTE

Unless indicated otherwise, the following thirteen adjustments (78 through 90) apply to both 75 ft. and 250 ft. capacity tape winders.

78. TAPE WINDER SHAFT BEARING ALIGNMENT

The tape winder shaft should spin freely when rotated in a clockwise direction as viewed from the right hand end. To adjust, set the left bearing plate squarely and at the approximate center of its vertical adjustment. Then position the right bearing plate squarely and up or down until the shaft spins freely. Tighten the mounting screws.

79. CHECK PAWL SPRING (Figure 50)

Hook an 8 oz. scale close to the engaging tip of the check pawl and pull at right angle to the pawl. It should require 1/2 to 1-1/2 ozs. to move the pawl completely out of engagement with the ratchet.

80. FEED PAWL SPRING (Figure 50)

Hook an 8 oz. scale in the spring hole of the feed pawl and pull at right angle to the pawl. It should require 3/4 to 2 ozs. to start the pawl moving.

81. RATCHET WHEEL HUB END PLAY (Figure 51)

There should be some end play, not more than .005", between the ratchet wheel hub and bearing hub. To adjust, position the collar at the bearing by means of its set screw.

82. TAKE-UP REEL CLUTCH TORQUE (Figure 52)

With the motor running and the tape reel assembly operating, hook a 32 oz. scale in the hole of the left-hand reel and pull at a right angle to the radius of the reel and horizontally against the rotation of the reel. It should require from 7 to 9 ozs. (75 ft. winder) or 11 to 16 ozs. (250 ft. winder) to hold the reel stationary. To adjust the torque, loosen the friction nut lock nut (Figure 51) and turn the friction nut clockwise (viewed from motor end of base) to increase the torque, and counter-clockwise to decrease it. Hold the friction nut by means of a 76289 wrench and tighten the lock nut. Adjust each take-up reel in the same manner.

83. CHECK PAWL

With the motor running and one tape reel held stationary, the other two reels should rotate with as little backward motion as possible. To adjust, loosen the lock nut on the check-pawl eccentric mounting post and rotate the post to provide the least amount of overtravel between the check pawl and a tooth on the ratchet without the check pawl failing to drop into each notch. Check throughout one complete revolution of the ratchet.

84. TAKE-UP REEL POSITION

The take-up reels should be centered as nearly as possible with the feed wheel of the transmitter-distributor units. To adjust, position the clutch sleeves by means of the enlarged mounting holes.

85. PIVOT ARM

There should be some end play, not more than .005", between the pivot-arm hub and the clutch sleeve. To adjust, loosen the collar set screw and position the collar. Tighten the set screw.

86. PIVOT-ARM LATCH

The pivot arm should latch securely as its rear post drops into the hole of the pivot-arm latch. To adjust, position the tape-snobber assembly by means of its mounting screws. To refine the adjustment it may be necessary to reposition the spring latch by means of its mounting screws.

87. TIGHT-TAPE ARM SPRING (Figure 52) (250 ft. winders only)

With a 32 oz. scale hooked to the tight-tape arm at the spring hole and pulled in line with the spring it should require 8 to 11 ozs. to pull the arm away from its stop.

88. TAPE REEL STOP PAWL SPRING (Figure 52) (250 ft. winders only)

With an 8 oz. scale hooked over the stop pawl between the spring hole and the point at which it touches the tight-tape arm and pulled in line with the spring, it should require 1-1/4 to 1-3/4 ozs. to start the pawl moving away from the tight-tape arm.

89. REWIND-REEL SLACK ARM (Figure 53) (250 ft. winders only)

When operated the slack arm should not touch either the cover or the rewind reel. To adjust, rotate the eccentric.

90. REWIND-REEL SLACK ARM SPRING (Figure 53) (250 ft. winders only)

With an 8 oz. push scale applied to the tape stud

and pushed horizontally, it should require 1 to 2 ozs. to start the arm moving.

SYNCHRONOUS MOTOR

91. STARTING SWITCH

NOTE

These requirements should not be checked unless there is reason to believe the starting switch is out of adjustment.

a. Remove the motor unit from the base and remove the motor fan and pinion.

b. Remove the switch end shield screws and the switch commutator mounting screws, also the switch end shield.

c. Pull out the rotor until the brush holder spring is accessible and remove the spring.

d. Spring tension for 50 and 60 cycle motors should be 1-1/2 to 2-1/2 ozs., and 3 to 3-3/4 ozs. respectively, when extended to a length of 5 inches, using an 8 oz. scale.

e. The brush holders should be mounted by means of the center set of mounting holes and should be free.

f. The brush holder stop pins should be safely within the holes of the fiber disk when all the play in the brush holders has been taken up to make the engagement of the pins with the disk a minimum.

g. Replace the brush holder spring, making certain that the spring eyes are fully engaged with each other.

h. Replace the switch commutator screws and tighten the two screws alternately, a little at a time, until both screws are tight.

i. Replace the switch end shield screws, using the same precaution in tightening as above.

j. Apply the push end of a 12 lb. scale against the fan end of the shaft and push parallel with the shaft. It should require at least 7 lbs. pressure to start the shaft moving. (Applies to A.C., D.C. and synchronous motors.)

k. Replace the motor fan and pinion. Replace the motor unit on the base and check the motor plate adjustment.

GOVERNED MOTOR

NOTE

Remove the governor adjusting bracket, brush

spring plate, target and governor cover.

92. GOVERNOR SHELL (Figure 54)

NOTE

Remove the speed adjusting spring.

a. The governor contact points should meet squarely and there should be at least .010" clearance between the governor spring bracket and the rim of the governor shell. To adjust, position the governor spring bracket by means of its mounting screws.

NOTE

If necessary, reposition the "fixed contact" bracket to facilitate squaring up the contacts.

b. There should be a gap of .015" to .040" between the governor contacts. To adjust, bend the governor contact spring.

NOTE

Replace the speed-adjusting spring.

93. ADJUSTMENTS FOR ALIGNMENT AND SQUARENESS OF GOVERNOR CONTACTS

a. All governor contacts can be adjusted for alignment of edges; only those governor shells which provide elongated mounting holes for the fixed contact bracket permit adjustment of the contact for height by positioning the contact bracket.

b. The governor contacts should be in line and meet squarely so that maximum contact surface is provided. (Check with the retractile spring tension adjusted so that the contacts just make, or to the limit of the adjusting screw.)

(1) Line up edges of contacts by means of the floating contact hinge mounting screw.

(2) Adjust contacts for squareness from right to left by positioning the height of the fixed contact bracket using the elongated mounting holes in the governor shell.

(3) To adjust from front to back, twist the floating contact hinge and apply pressure to the arm near the contact.

NOTE

Check by use of a .002" gauge (smaller if available). Check with gauge between edges of the contacts to see that the gauge enters (or does not enter) equally on all sides.

94. SPEED-ADJUSTING-WHEEL FRICTION-WASHER SPRING PRESSURE (Figure 54)

To measure this requirement, remove the governor adjusting bracket and governor cover and rotate the speed adjusting wheel to a point where the governor contact pressure is 13 to 14 ozs., as indicated by hooking a 32 oz. scale over the contact spring next to the contact point and pulling parallel to the speed adjusting spring. Then insert a bank pin (radially) in the leather rim of the speed adjusting wheel, and hook a 32 oz. scale over the pin and pull at a tangent to the periphery of the adjusting wheel. It should require 16 to 24 ozs. to start the wheel moving. To adjust the friction, remove the friction washer and bend the large projections.

95. GOVERNOR SHIMS

There should be at least .006" clearance between the adjusting-lever wearing strip and the adjusting wheel when the adjusting wheel is opposite the wearing strip and the play of the armature is taken up in a direction to make this clearance a minimum by overcoming the armature end thrust spring. To adjust, install shims on the armature shaft between the governor hub and the end frame casting if necessary. See Figure 55 for location of parts.

96. INNER AND OUTER DISK CONTACT SPRING (Figure 56)

a. The inner and outer disk contact spring should conform to the following requirements, which may be checked by removing the governor cover, target, and brush spring plate.

(1) The distance from the inside surface of the governor cover to the highest point on the contact springs should be $25/32"$ to $27/32"$.

(2) Place a "D" (89955) socket wrench over the nut located in the center of the governor cover that is used to hold the contact springs in place. With a 6" scale, measure the radial distance from the vertical surface of the wrench to the point where the scale touches the curved surface of the inner disk contact spring. This distance should be $17/32"$ to $19/32"$.

(3) In a similar manner, measure the distance from the wrench to the point of contact on the outer disk contact spring. This distance should be $7/16"$ to $1/2"$.

b. These requirements may be obtained by bending the contact springs. Replace the governor cover, target, and brush spring plate.

97. GOVERNOR BRUSH-SPRING-PLATE BRACKET

a. The governor brush-spring-plate bracket should be positioned to meet the following requirements.

(1) A line established by the center of the outer disk and the center of one of the brushes should

pass through some portion of the other brush (Figure 57).

(2) The surface of the brush-spring-plate bracket on which the brush spring plate is mounted, should be in alignment with the outer surface of that part of the governor cover to which the target is mounted (Figure 55).

(3) The bracket should be parallel to the edge of the motor base plate.

(4) Adjust the brush spring plate bracket by utilizing its mounting slots.

98. GOVERNOR BRUSH SPRING PRESSURE (Figure 55)

a. INNER DISK BRUSH SPRING: Hook an 8 oz. scale over the inner spring just in front of the carbon contact brush. Pulling horizontally away from the motor, it should require 4-1/2 to 5-1/2 ozs. to start the brush moving away from the disk.

b. OUTER DISK BRUSH SPRING: Apply an 8 oz. push scale against the outer brush spring just in front of the carbon contact brush. Pushing hori-

zontally toward the motor, it should require 4-1/2 to 5-1/2 ozs. to start the brush moving away from the disk.

c. To obtain the correct brush spring pressure remove and bend the brush springs. When the springs are replaced and the pressure obtained, make certain that the contact brushes lie flat against their respective disks, and that the outer edges of the brushes are either flush with, or not more than 3/64" inside the outer edges of the disks. Replace the governor adjusting bracket.

NOTE

If necessary, level off brushes by passing a piece of No. 00 sandpaper between the brush and disk.

99. GOVERNOR ADJUSTING BRACKET (Figure 55)

The adjusting surface of the governor adjusting bracket should clear the speed adjusting wheel by .020" to .060". Bend the governor adjusting bracket if necessary to secure this clearance.



SECTION 3 - LUBRICATION

1. GENERAL

a. The oil and grease specified in the supplement furnished with this bulletin should be used to lubricate the transmitter distributors.

b. Unless otherwise specified, one or two drops of oil at each of the places indicated will be sufficient. Use oil for lubrication at all of the places listed in the following, except where the use of grease is specified.

2. INDIVIDUAL MULTIPLE TRANSMITTER DISTRIBUTOR UNITS

a. Units With Positive Action Clutch

(1) Selector cam assembly shaft - two oil cups.

(2) Clutch - sliding member.

(3) Cam felt oiler - saturate felt with oil.

(4) Clutch throwout lever - bearings.

(5) Contact lever pivoting clutch.

b. Units With All Metal Internal Expansion Clutch

(1) Selector cam - sleeve and clutch assembly shaft - two oil cups - fill with oil.

(2) Clutch internal mechanism - 4 drops of oil.

(3) Clutch disk - camming surface - thin film of grease.

(4) Clutch trip reset cam - camming surface - thin film of grease.

(5) Cam sleeve assembly - saturate felt lubricators with oil.

(6) Clutch trip lever - stop surface - thin film of grease.

(7) Clutch magnet armature bail - latch surface.

(8) Armature bail shaft - felt lubricators - saturate with oil.

(9) Clutch trip shaft - felt lubricators - saturate with oil.

(10) Clutch trip reset lever roller - felt lubricator - saturate with oil.

(11) Contact lever pivoting shaft.

c. Gear - (grease).

d. Selector lever pivoting shaft and guiding comb - oil sparingly.

e. Feed pawl lever roller - bearings.

f. Feed pawl - bearing.

g. Feed pawl - ratchet.

h. Feed roll - bearings - two.

i. Feed wheel detent - bearing.

j. Feed wheel detent roller - bearing and points of contact with feed pawl and release bar.

k. Tape-out contact lever - guide slot in spring bar.

l. Tape-out lever latch - bearing and point of contact with tape-out contact lever.

m. Release bar - bearing guide.

n. Letters operating lever - bearing.

o. Feed pawl lever roller - felt lubricator - saturate with oil.

p. Selector lever bail extension roller - bearing.

q. Selector lever bail extension - felt lubricators - saturate with oil.

r. Letters operating lever extension - cam following surface.

3. PARTS ON BASE

a. Gears - apply light film of grease.

b. Main shaft - bearings - 3 holes in bearing mounting blocks.

c. Main shaft driving gear - bearing oil hole.

4. MOTOR

a. Motor pinion - light film of grease.

b. Motor bearing oiler - grease, use grease gun.

5. TAPE WINDER LUBRICATION

- a. Sleeve bearings.
- b. Pivot arm hub.
- c. Tight-tape arm pivot.
- d. Tape reel stop pawl pivot and engagement with tight-tape arm.
- e. Ratchet wheel hub and drive arm.
- f. Detent Pawl.
- g. Drive pawl.
- h. Ratchet wheel teeth 4 places - thin film of grease.

i. Eccentric hub and drive arm - film of grease on hub, drive pin, and fork.

j. Take-up reels at sleeves (2 places).

NOTE

In order to prevent oil from running onto the numbering tape and shortening its life, do not oil the felt washers of the clutches on the take-up reels.

k. Rewind reels at shafts (2 places).

l. Rewind-reel slack arm pivot.

m. Oil both loops of all helical springs.

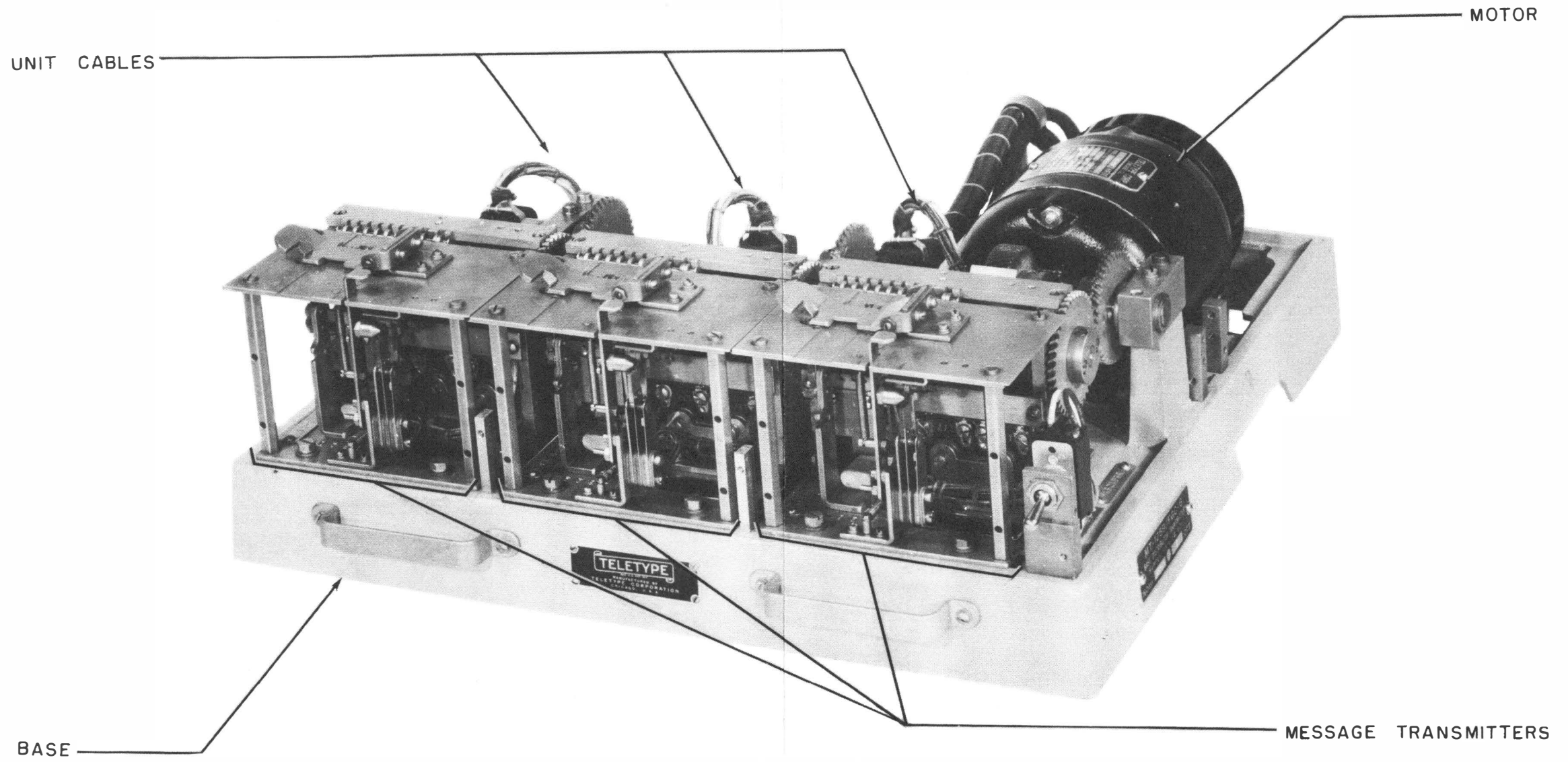


FIGURE 1

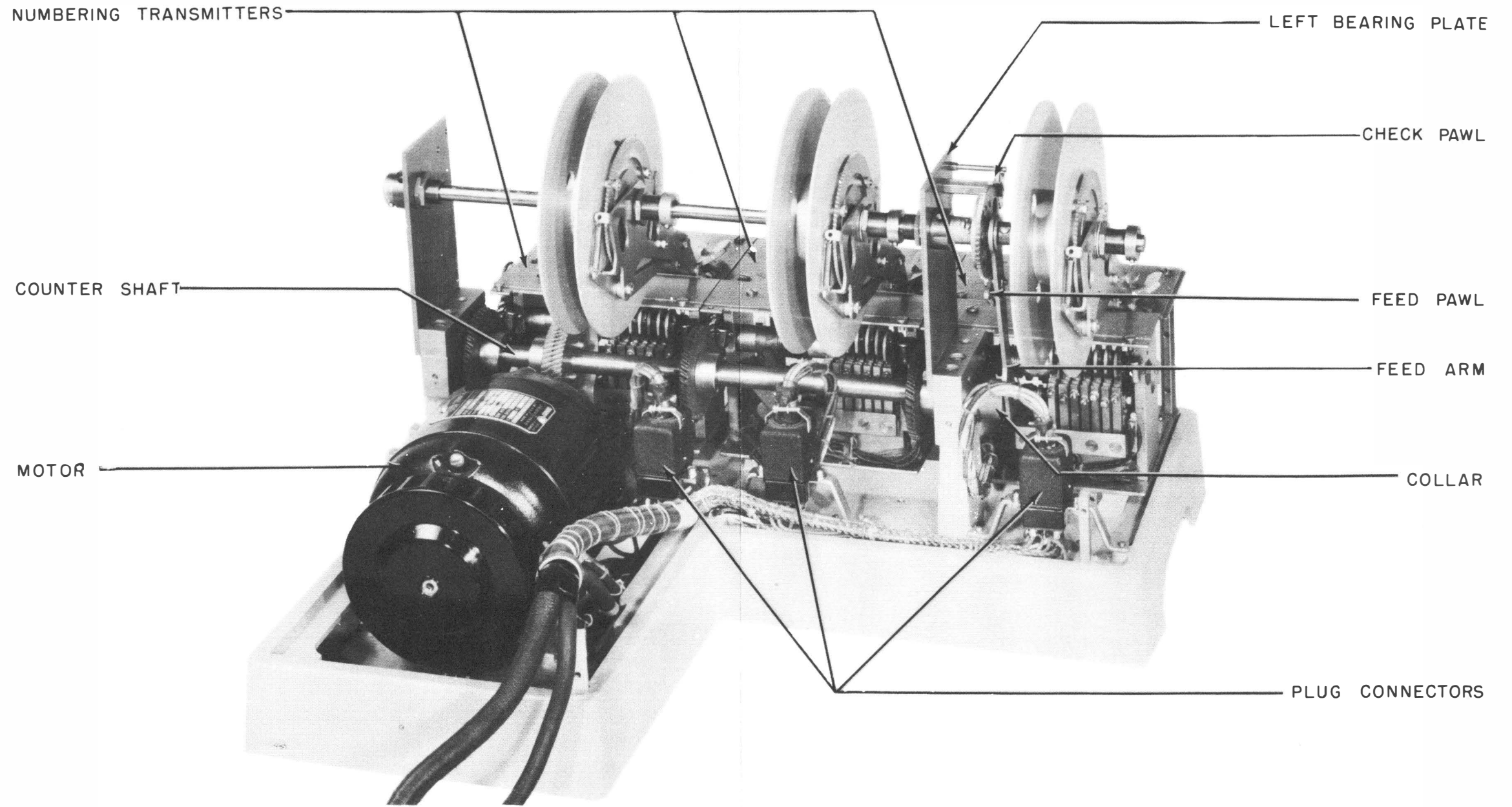


FIGURE 2

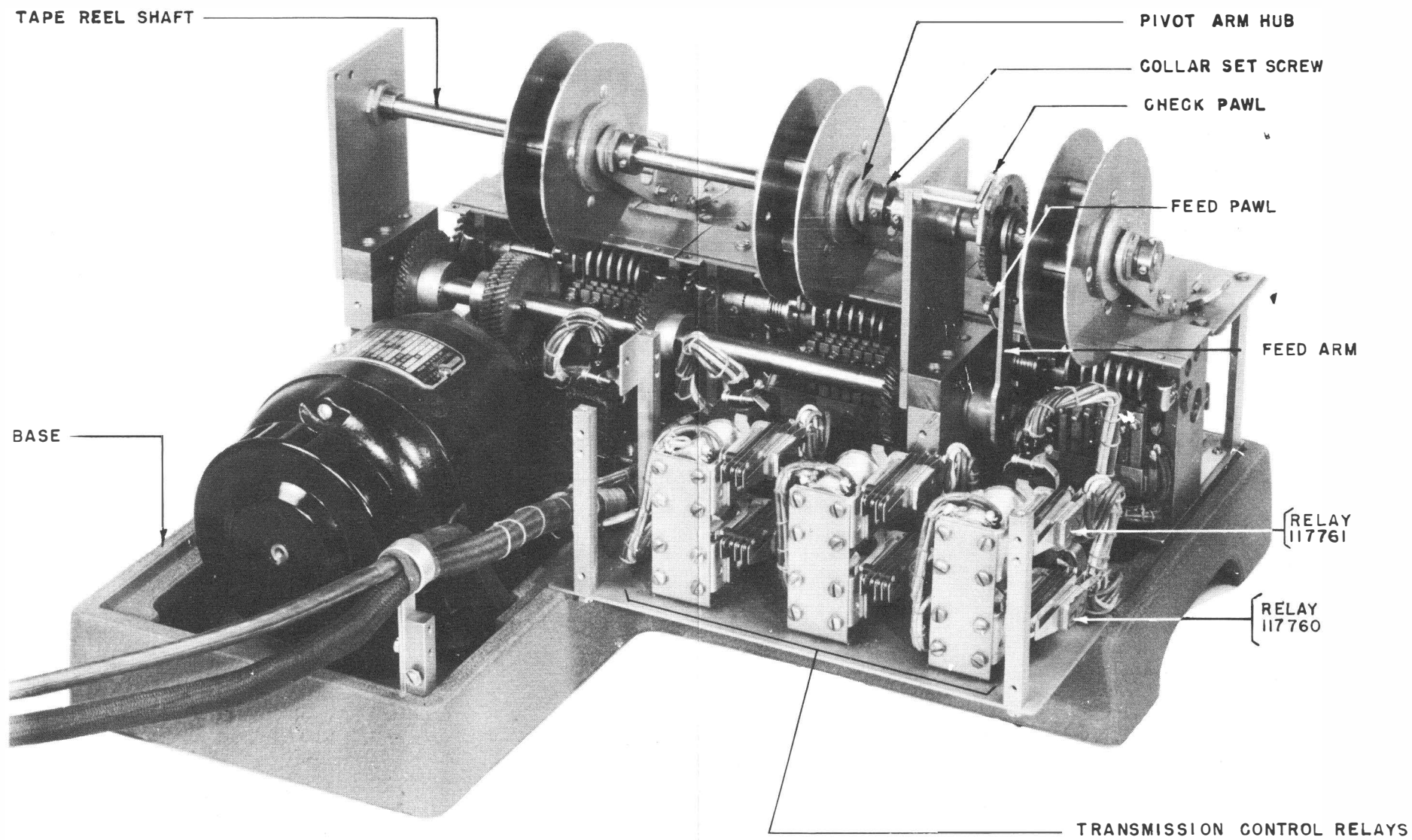


FIGURE 3

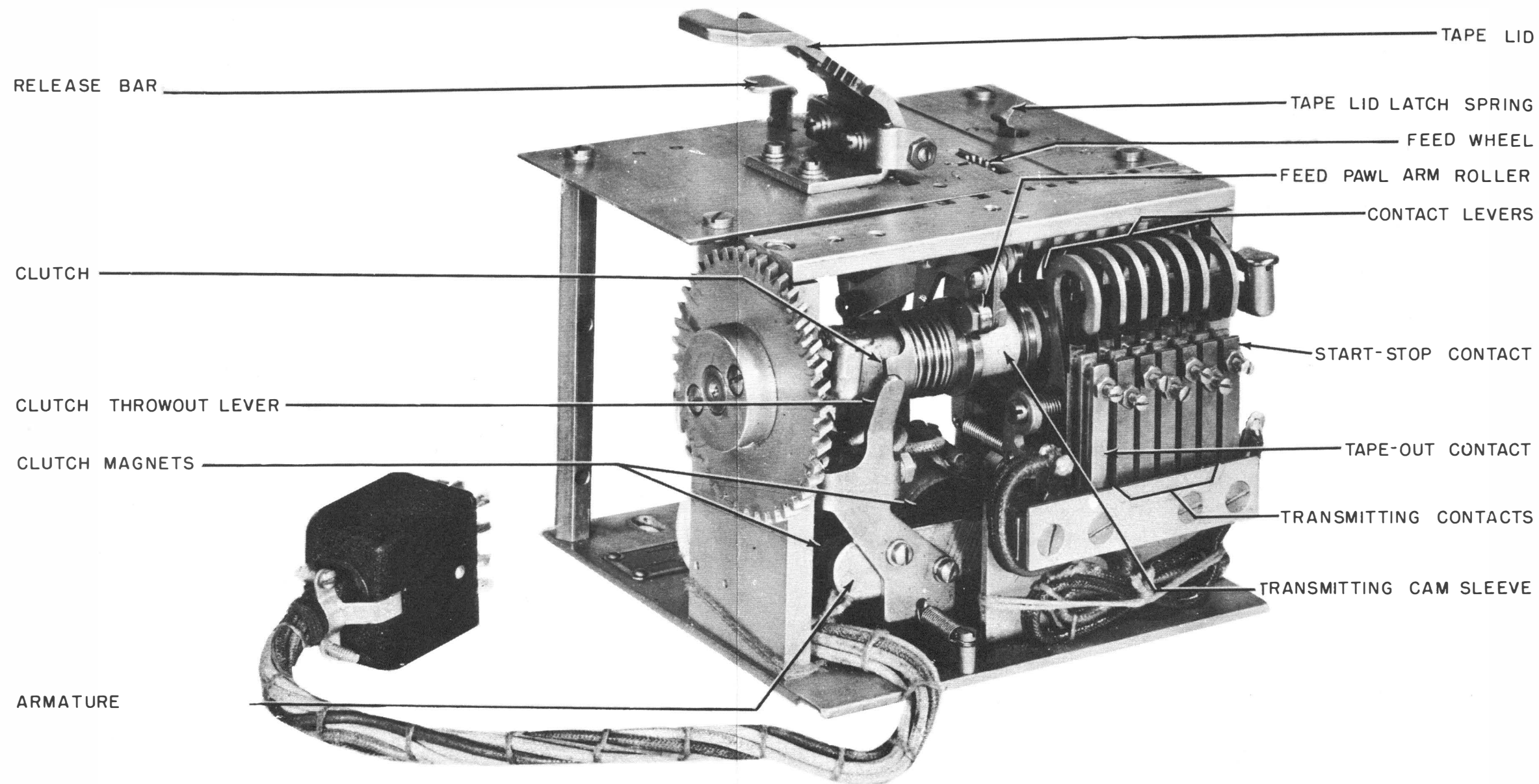


FIGURE 4

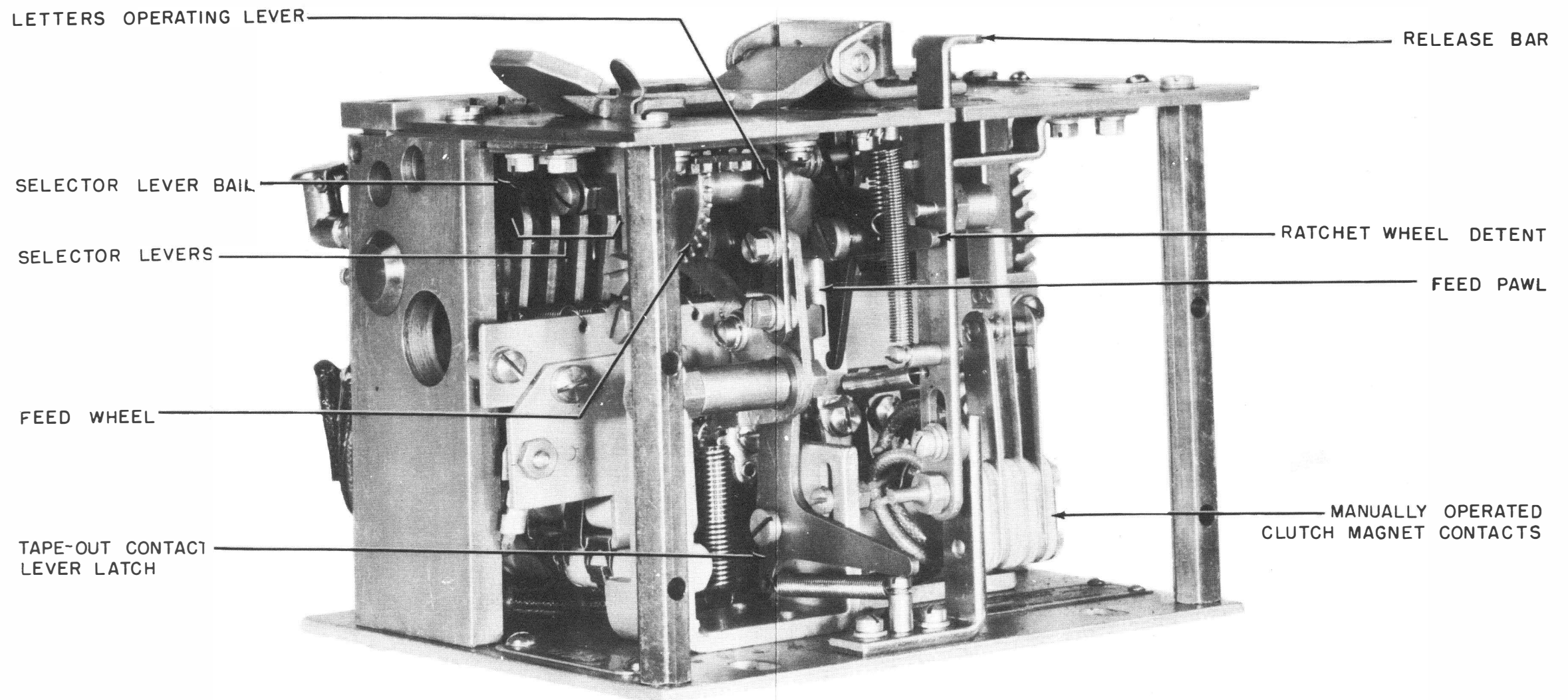


FIGURE 5

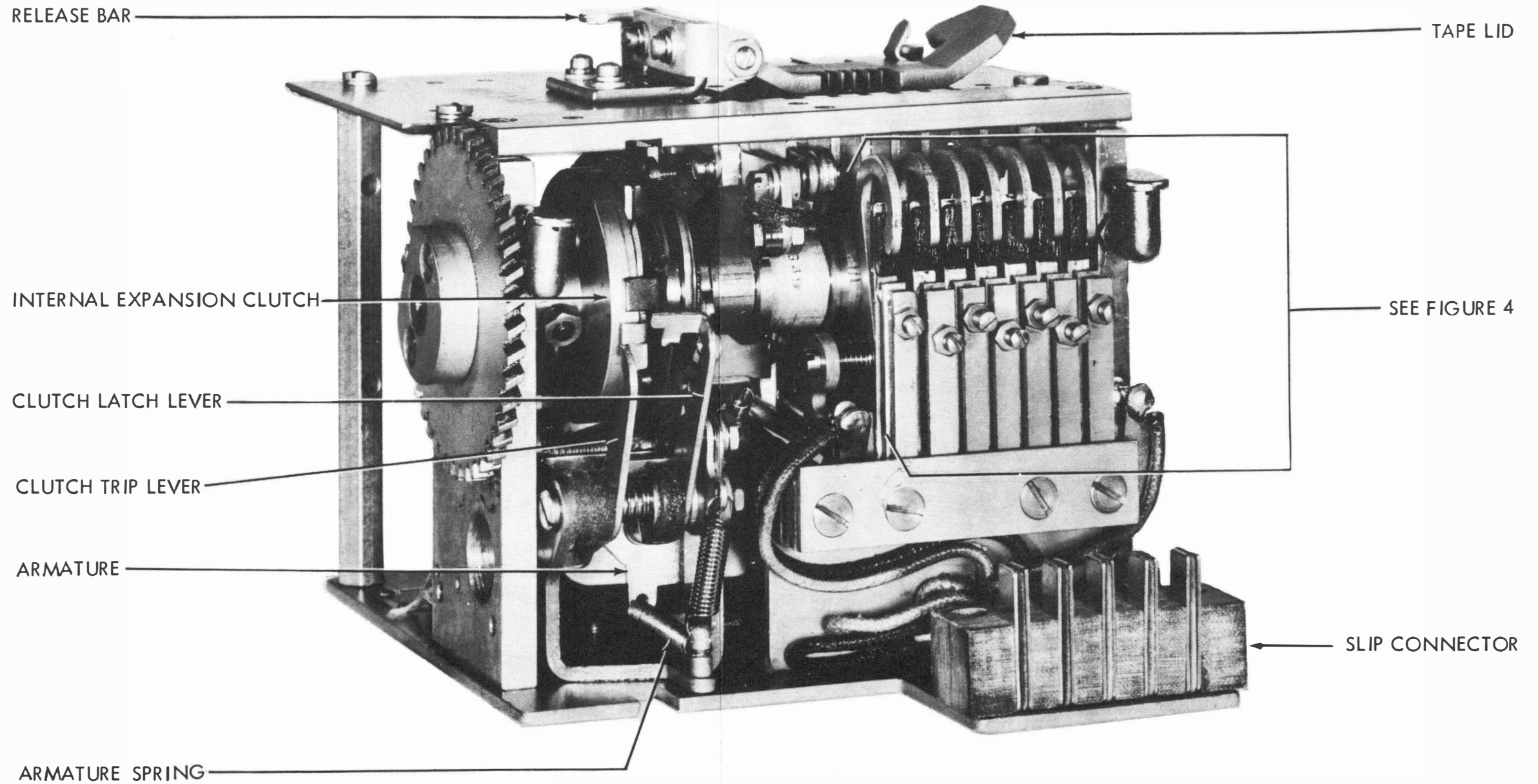


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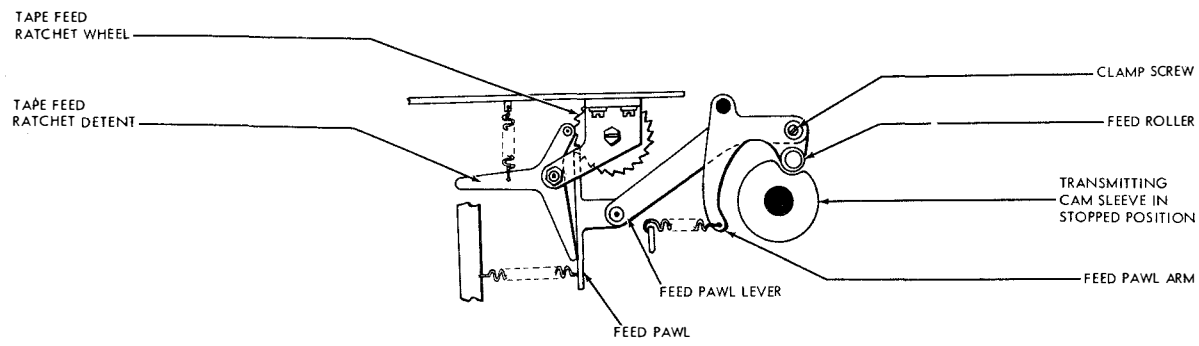


FIGURE 11

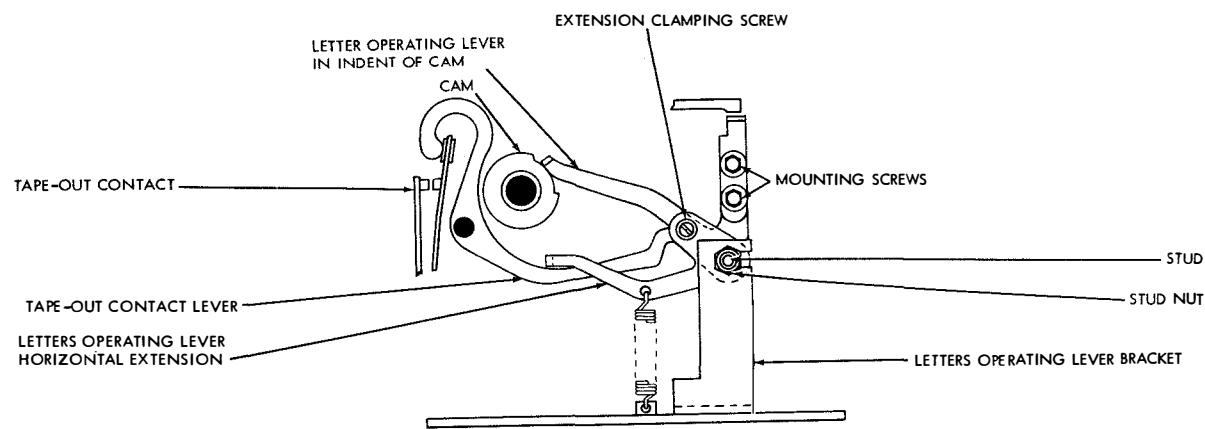


FIGURE 12

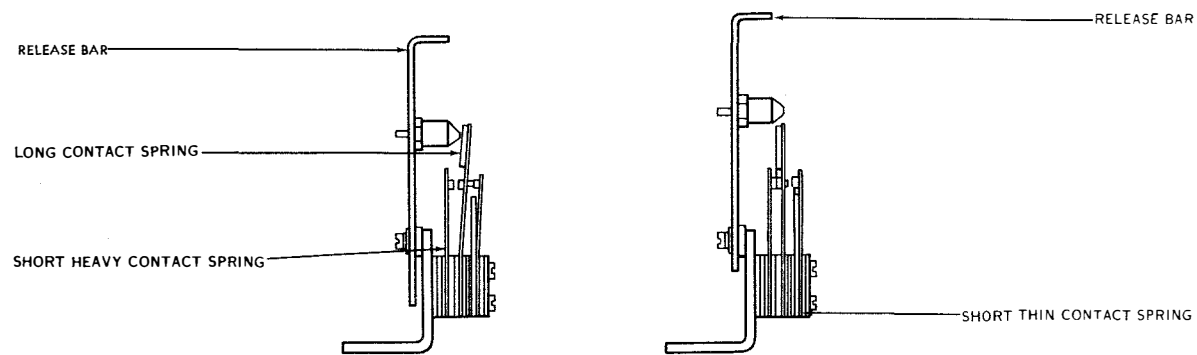


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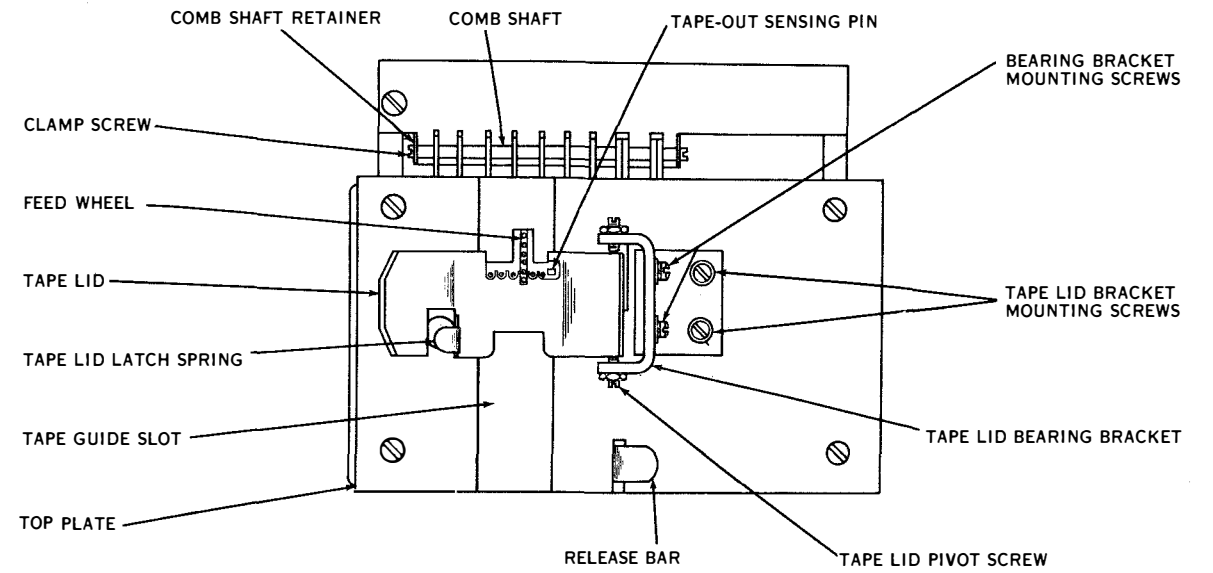


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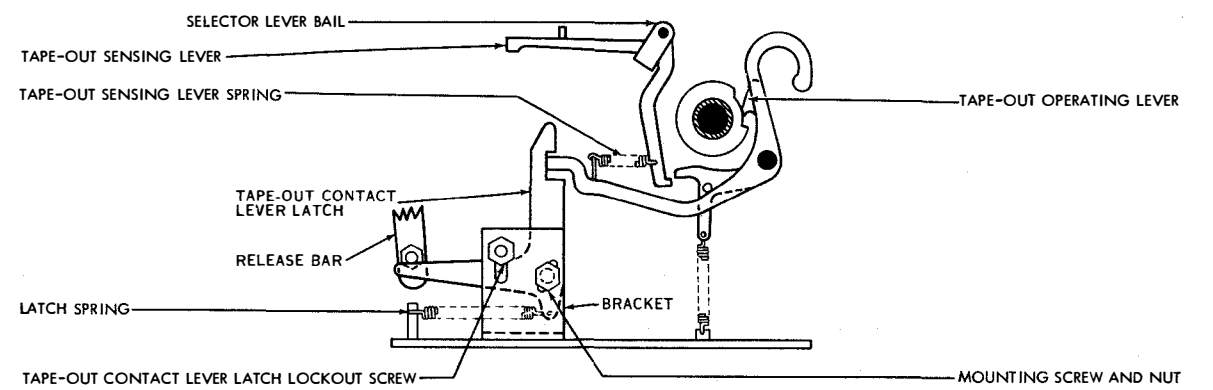


FIGURE 15

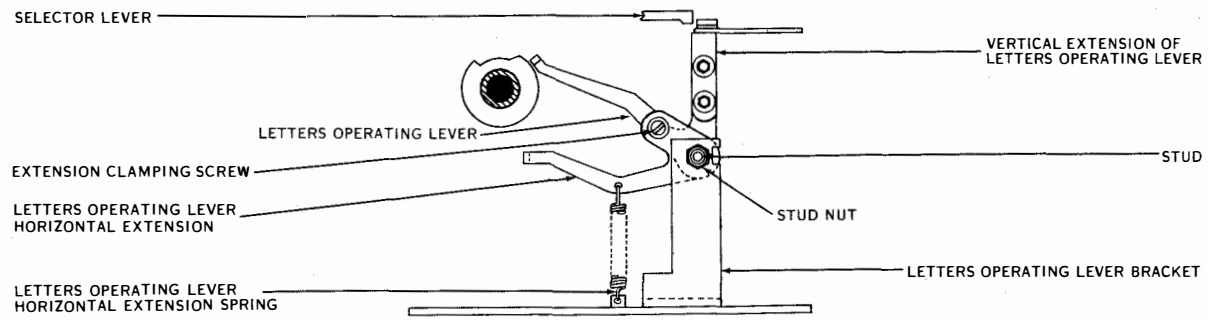


FIGURE 16

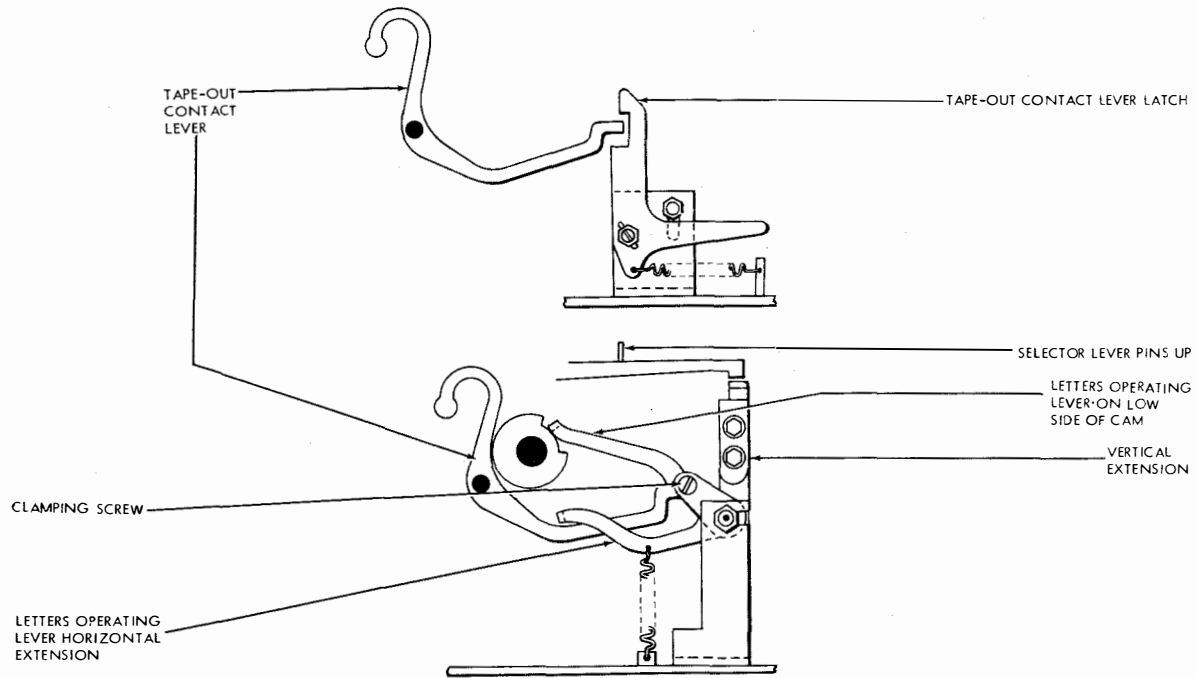


FIGURE 17

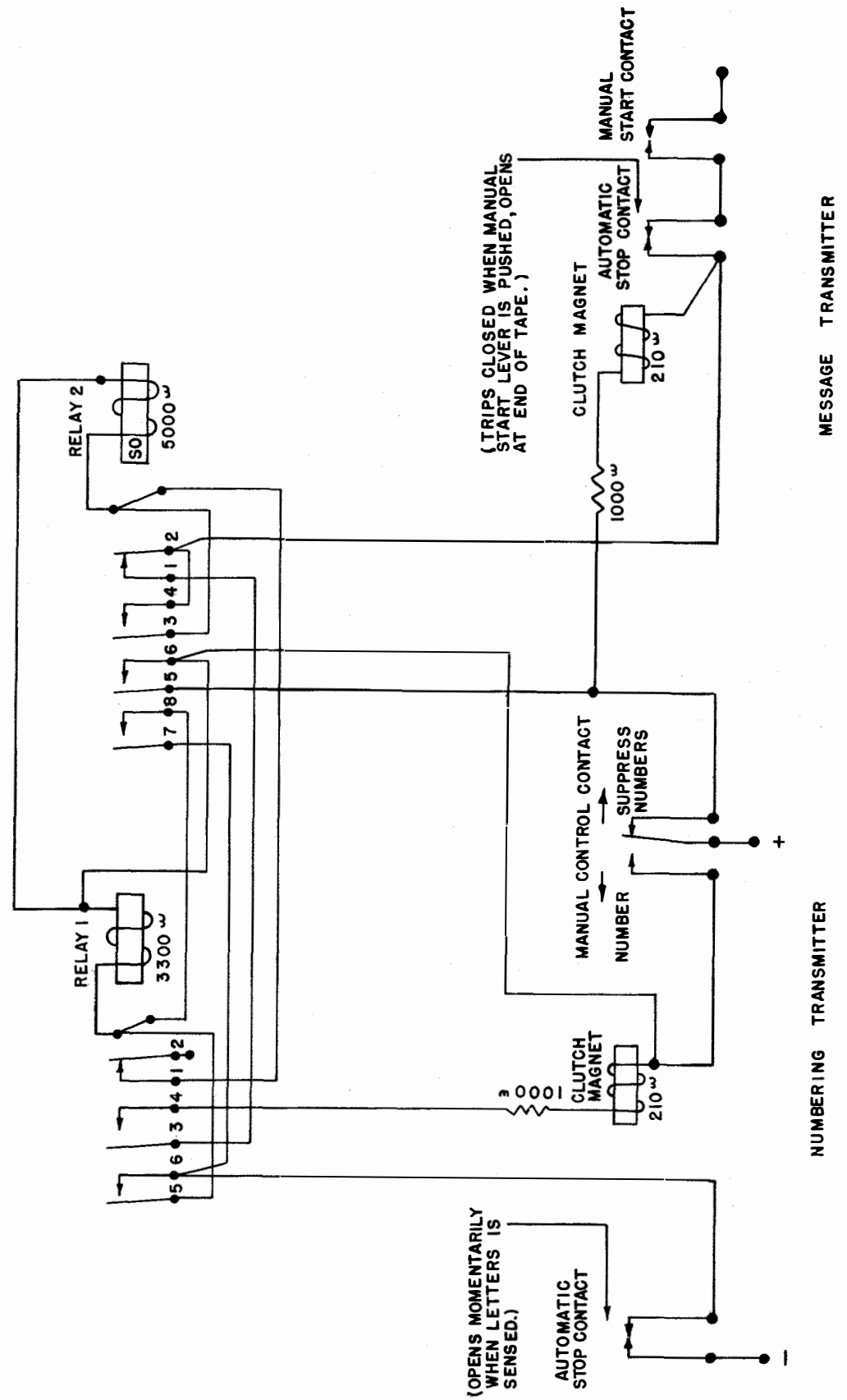


FIGURE 18

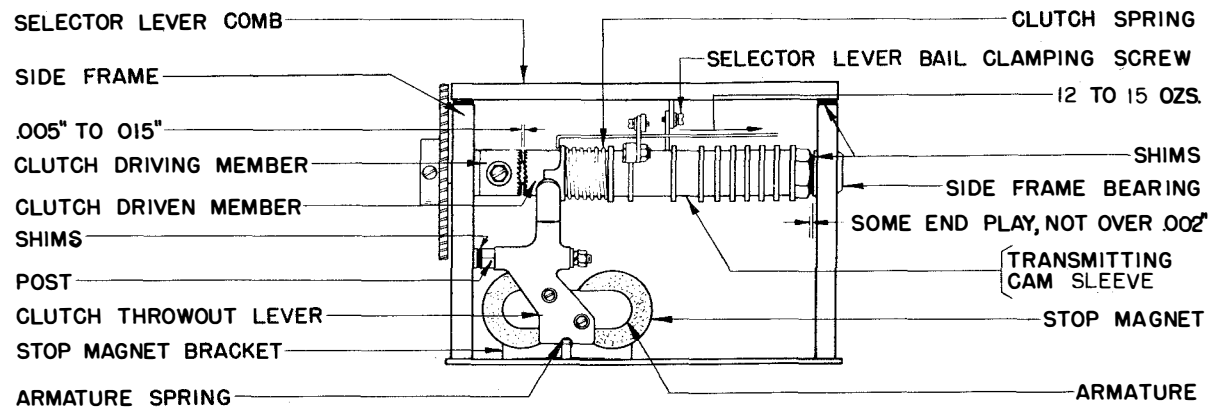


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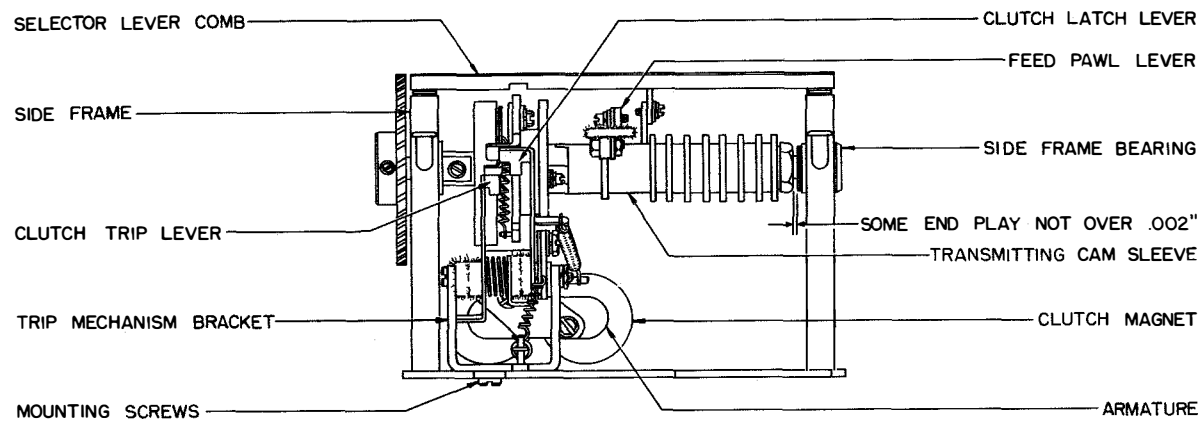


FIGURE 20

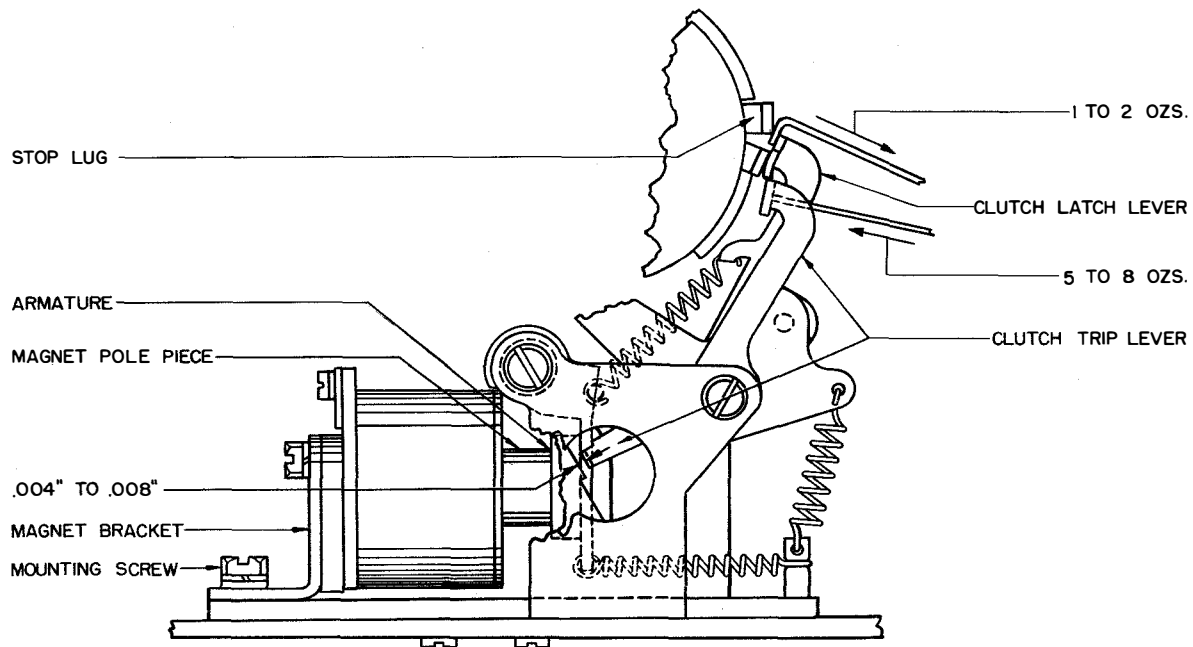


FIGURE 21

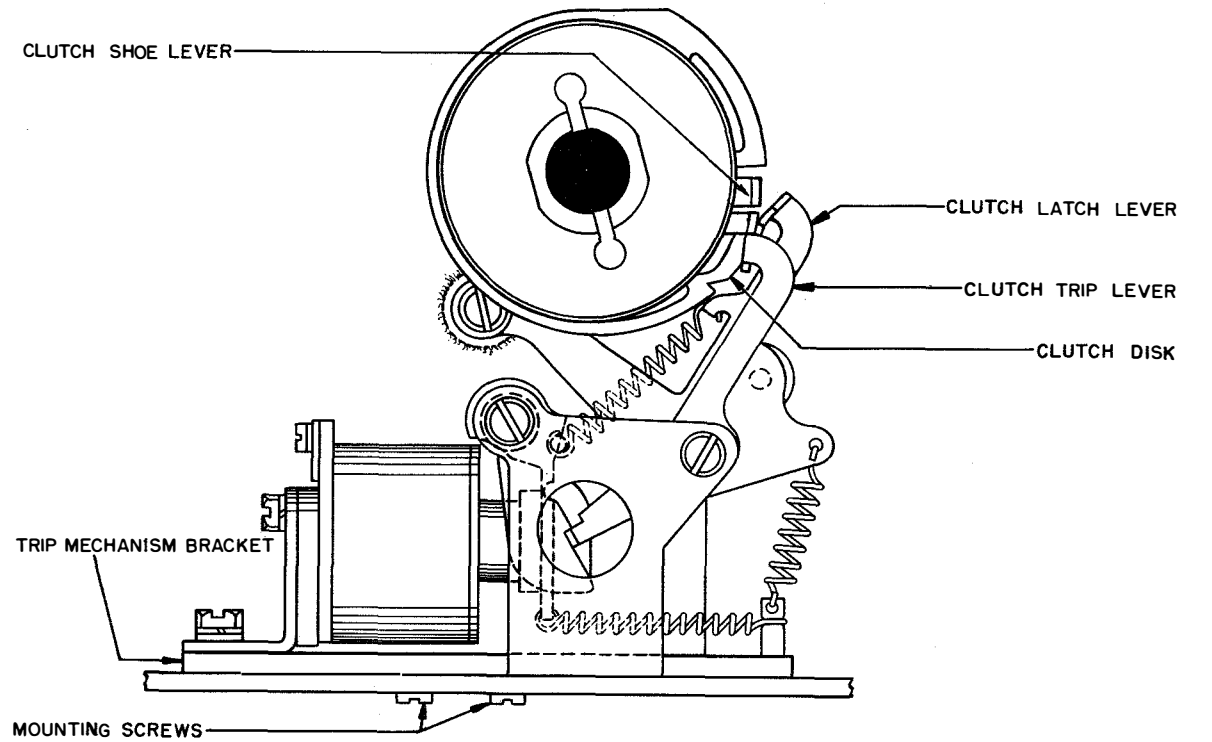


FIGURE 22

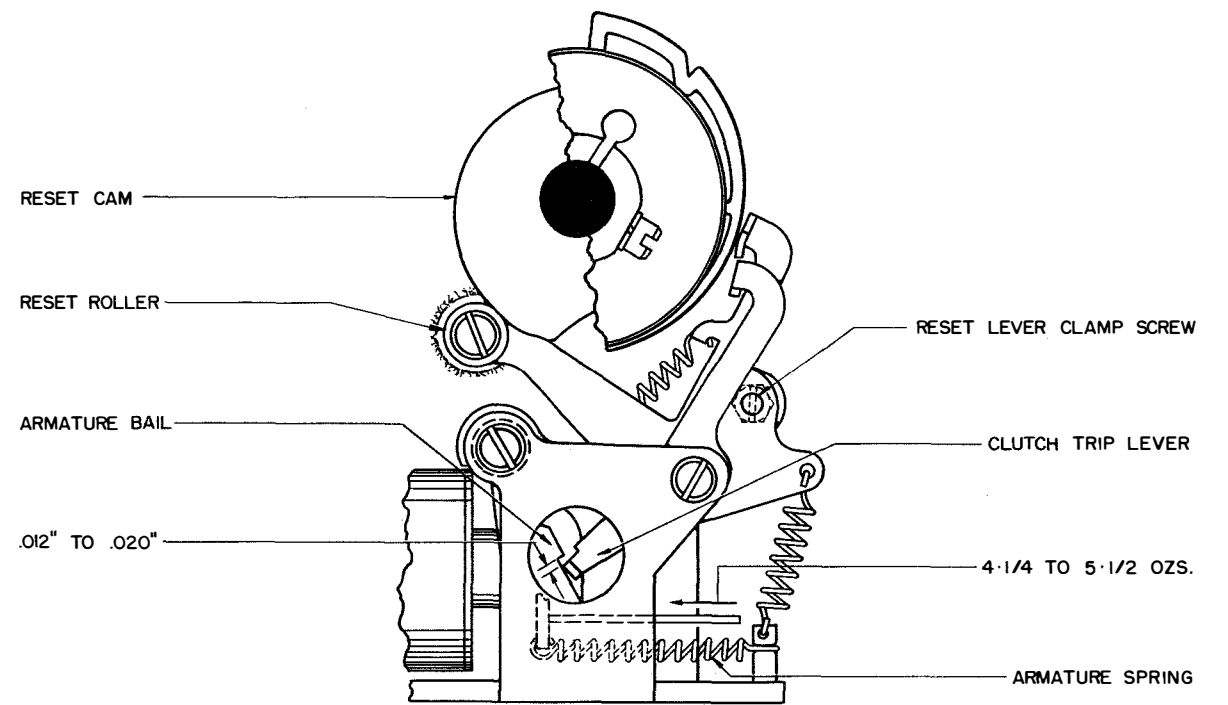


FIGURE 23

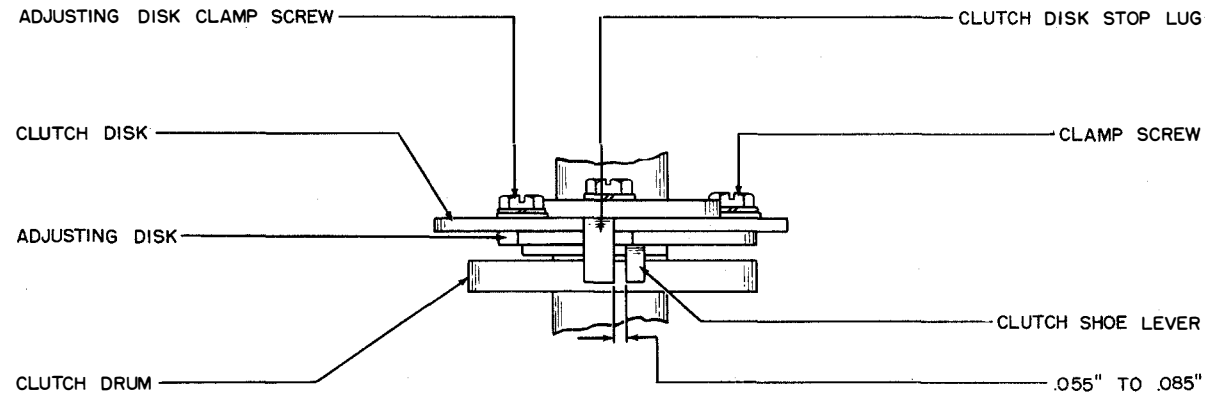


FIGURE 24

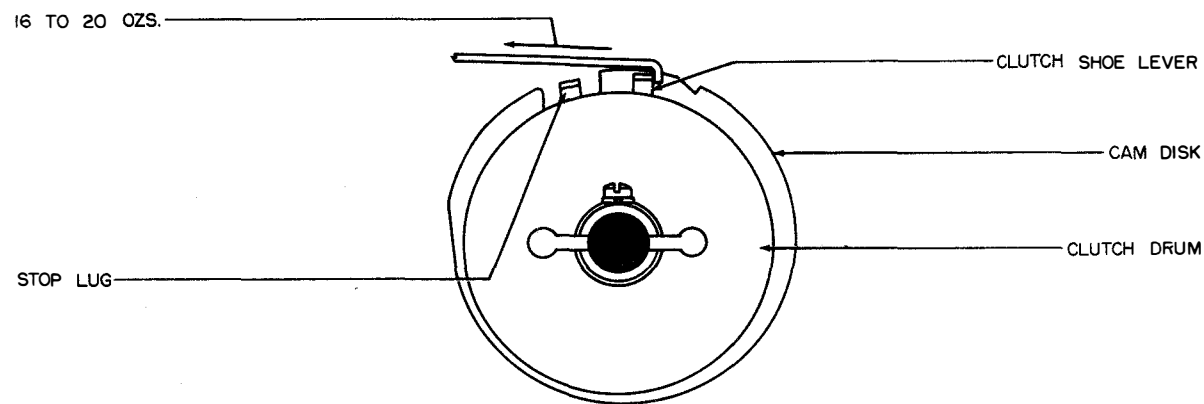


FIGURE 25

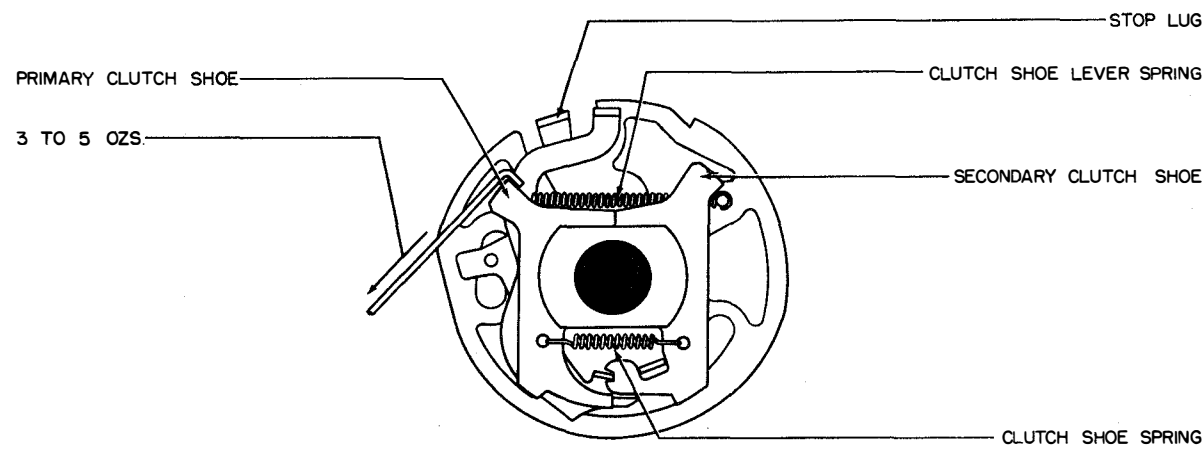


FIGURE 25

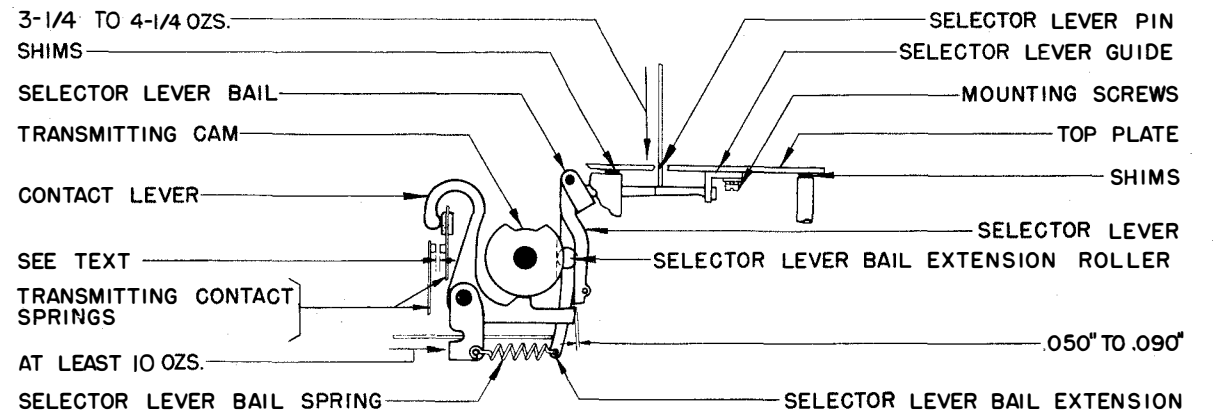


FIGURE 26

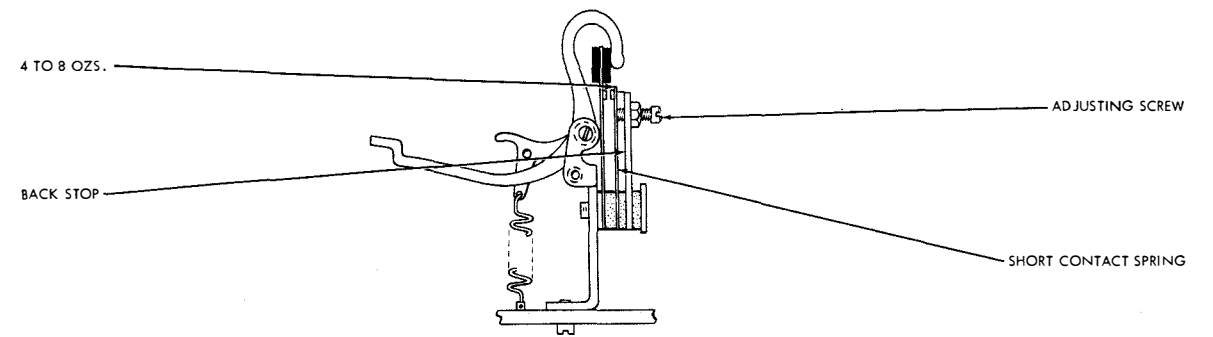


FIGURE 27

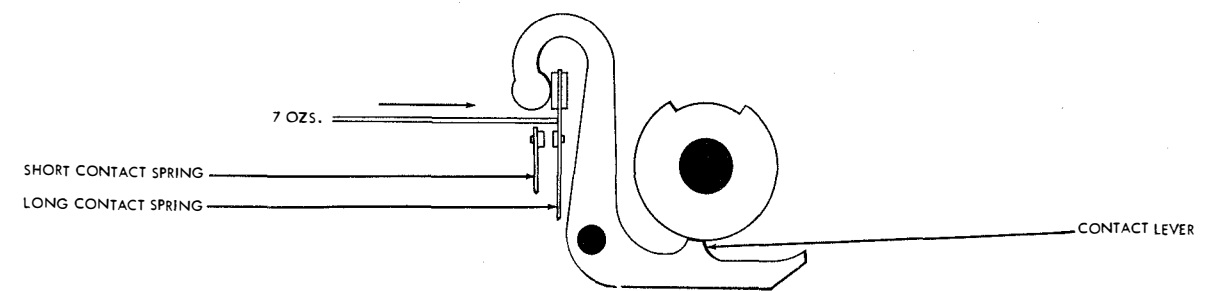


FIGURE 28

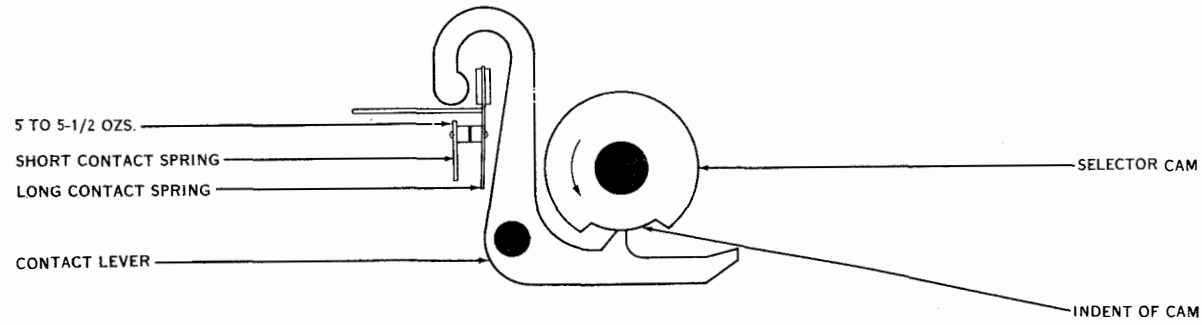


FIGURE 29

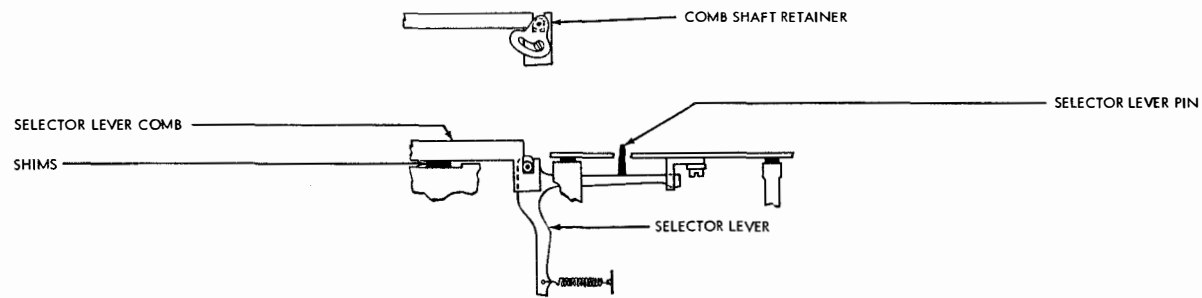


FIGURE 30

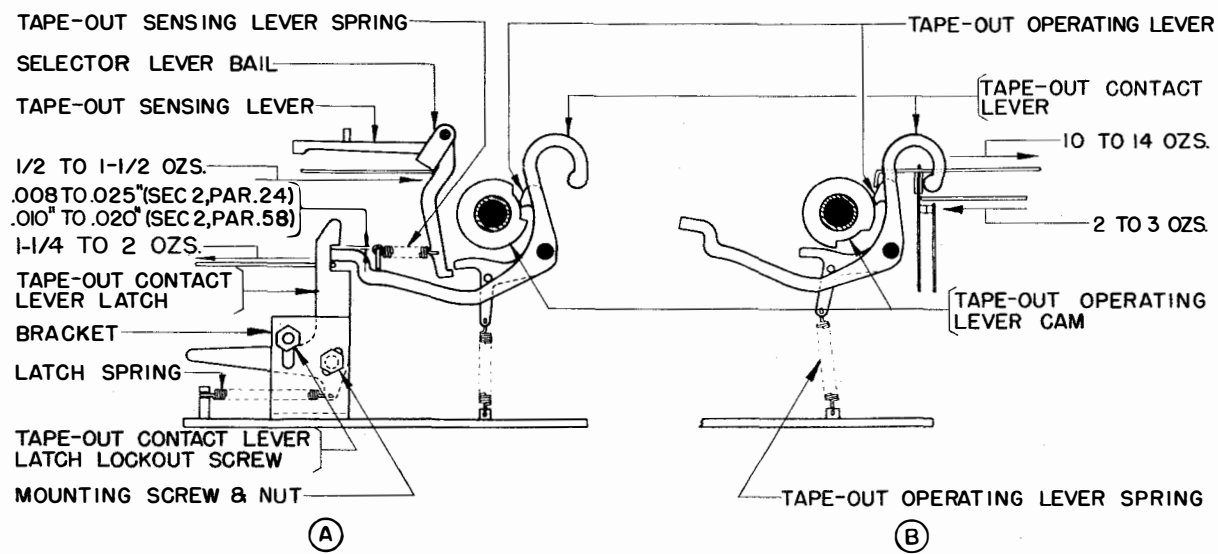


FIGURE 31

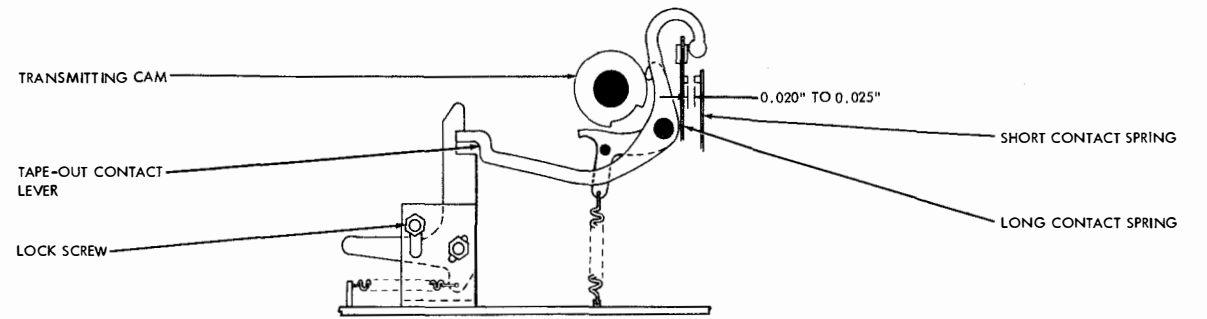


FIGURE 32

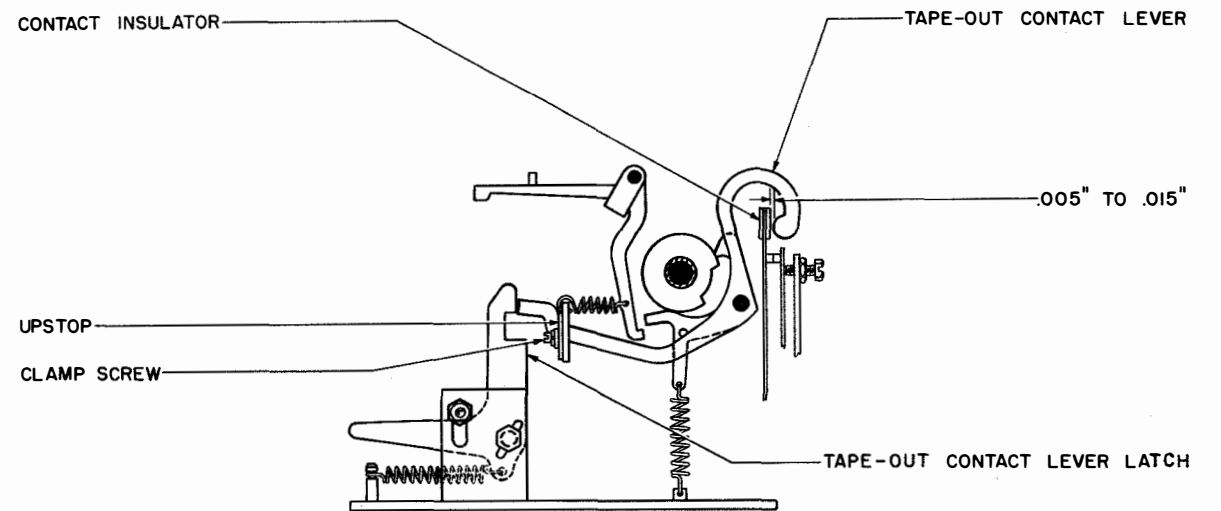


FIGURE 33

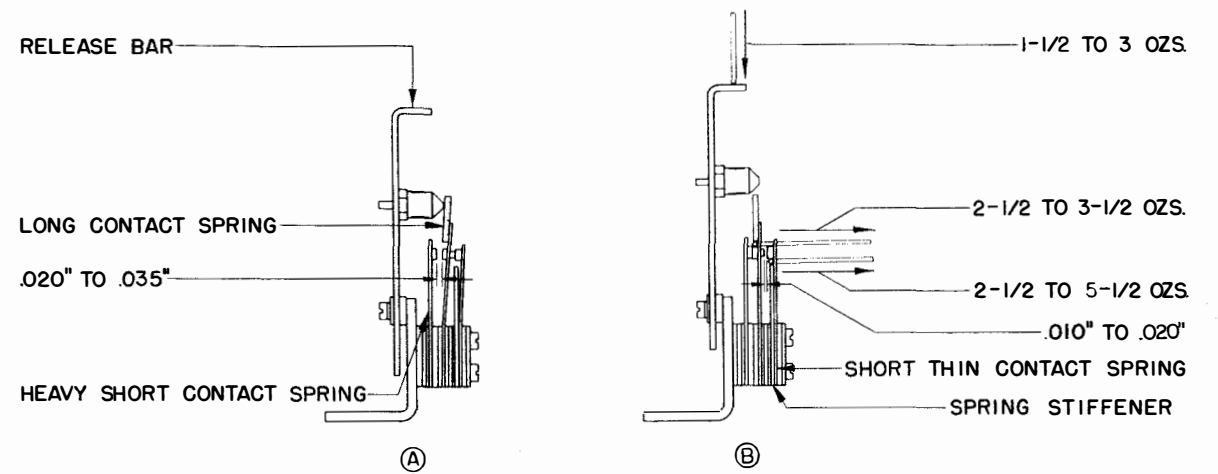


FIGURE 34

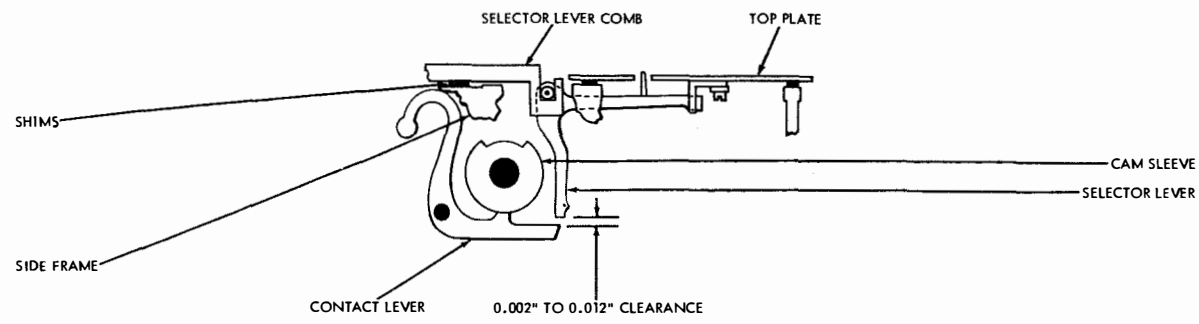


FIGURE 35

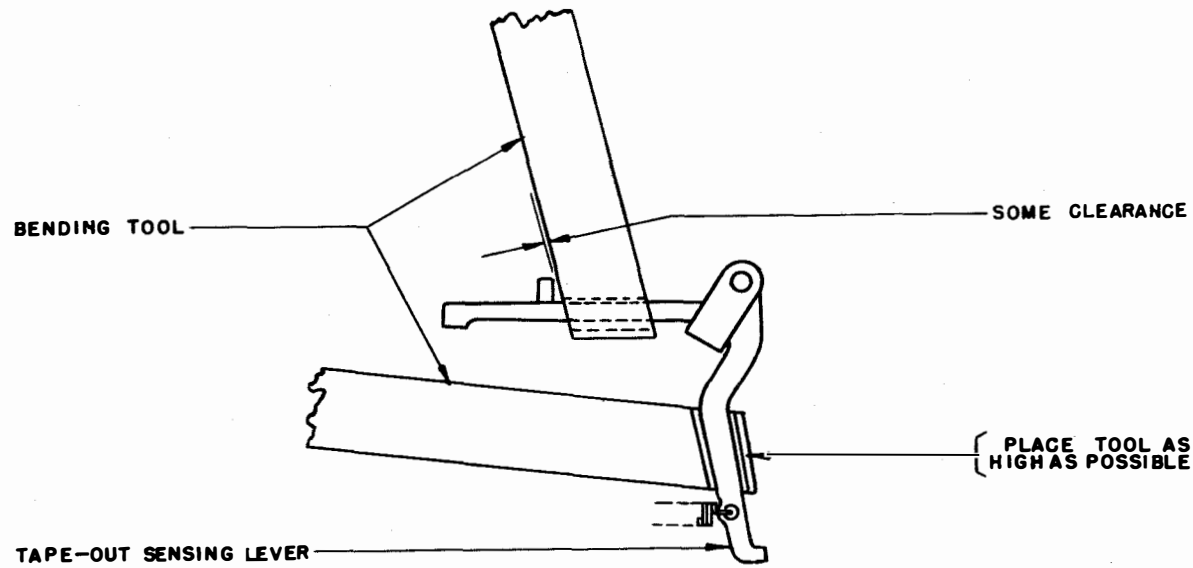


FIGURE 36

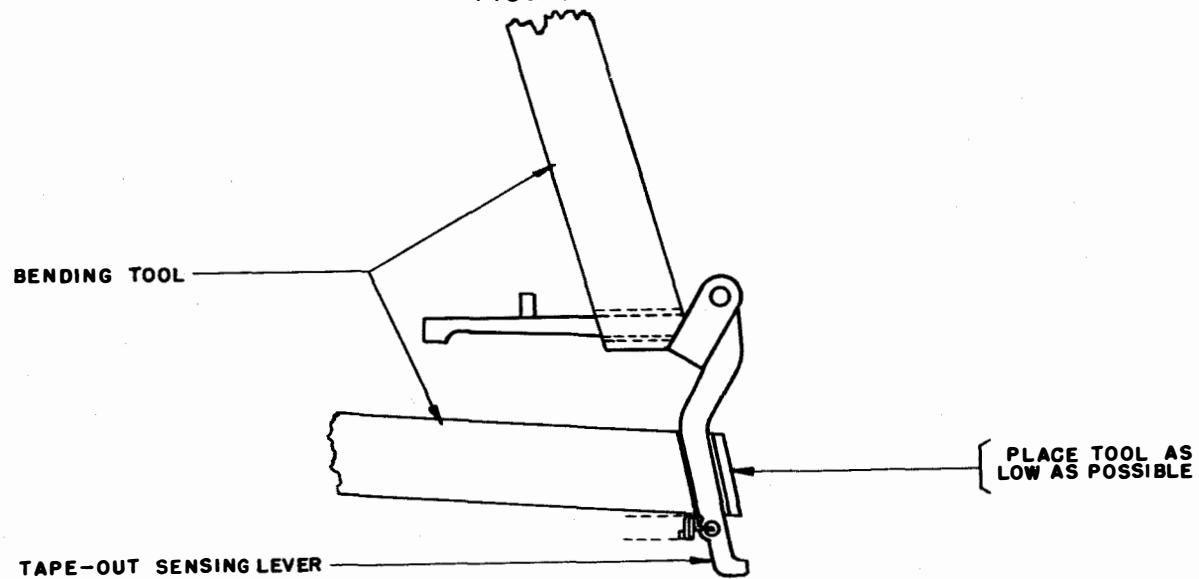


FIGURE 37

185B

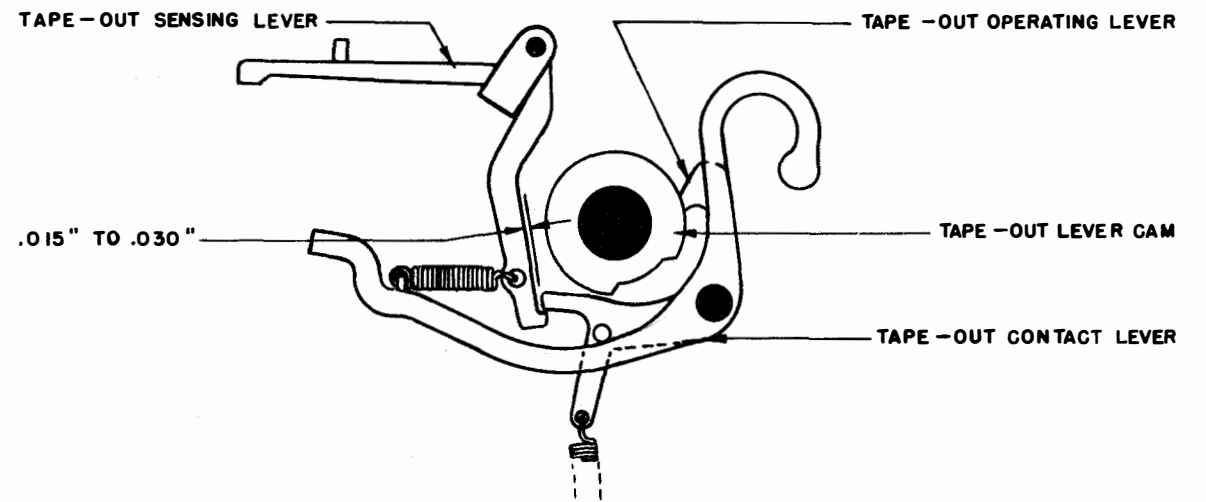


FIGURE 38

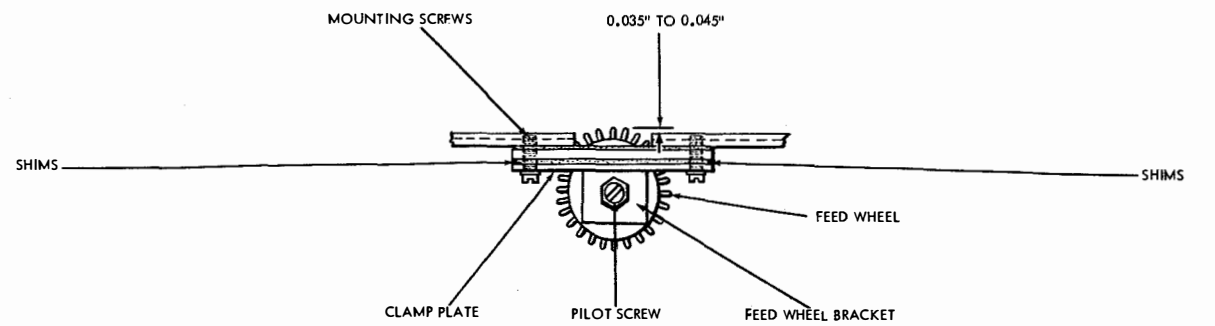


FIGURE 39

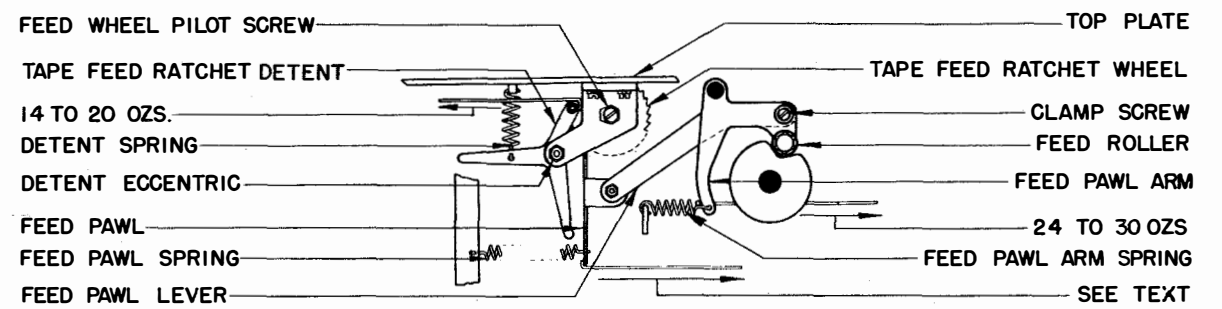
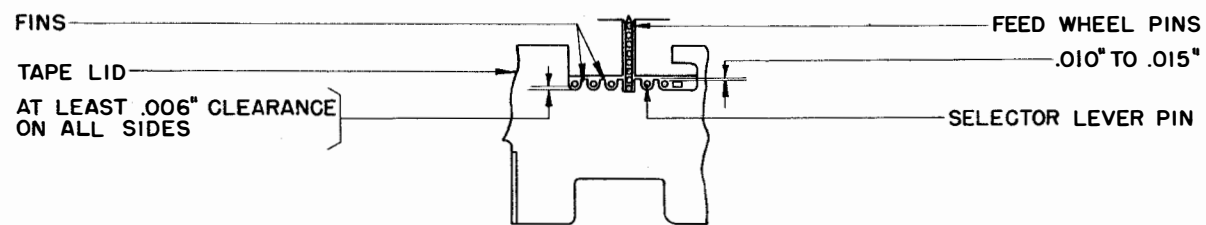
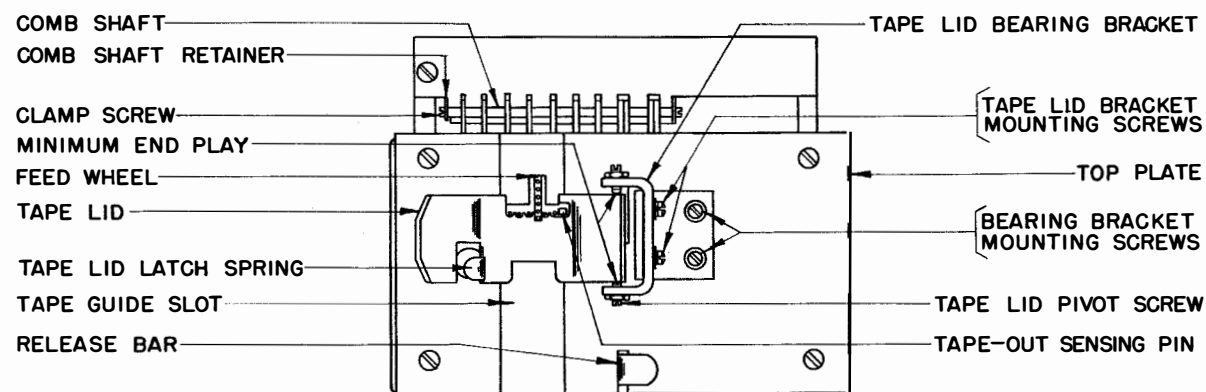


FIGURE 40



(A)



(B)

FIGURE 41

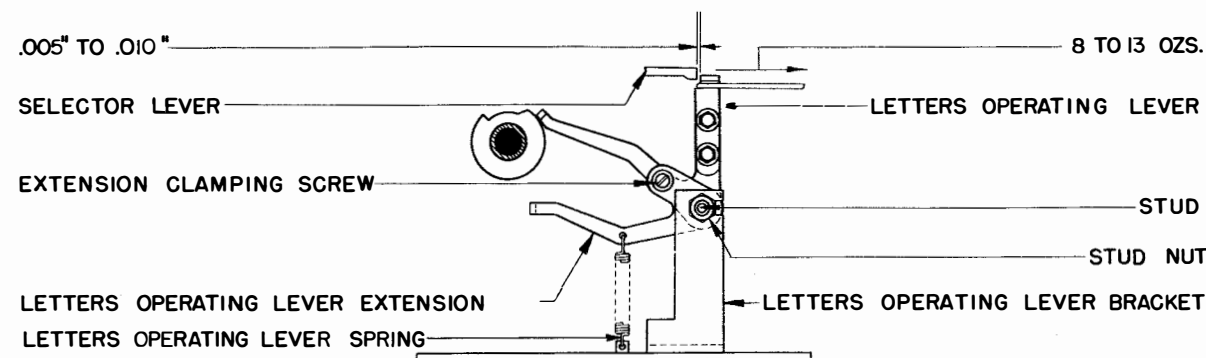


FIGURE 42

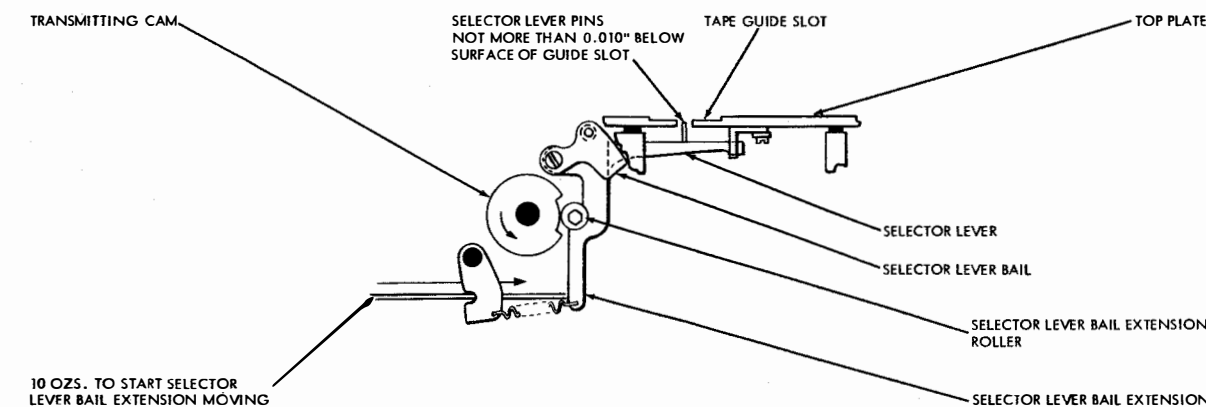


FIGURE 43

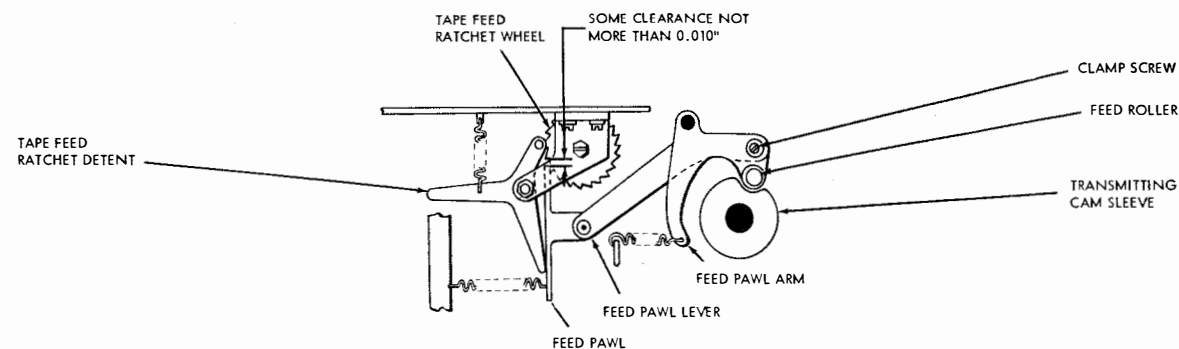


FIGURE 44

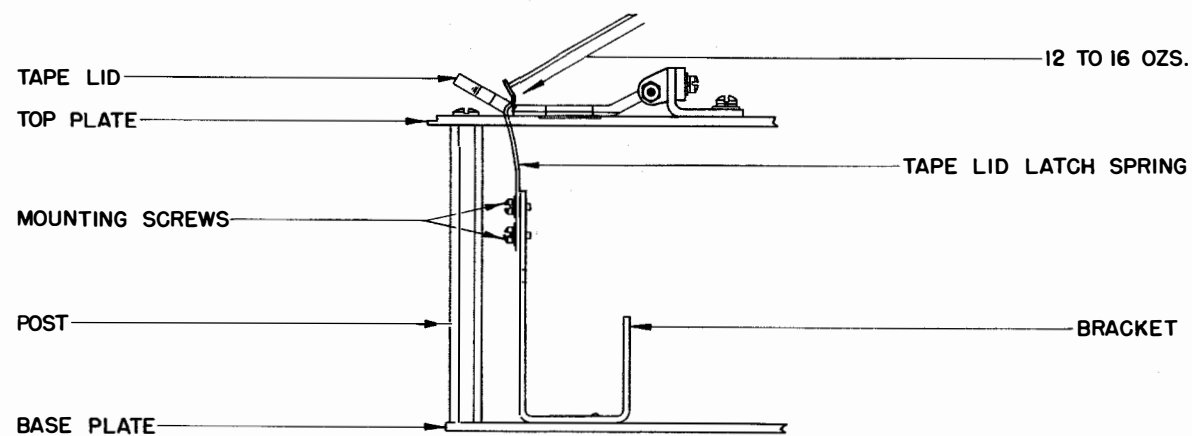


FIGURE 45

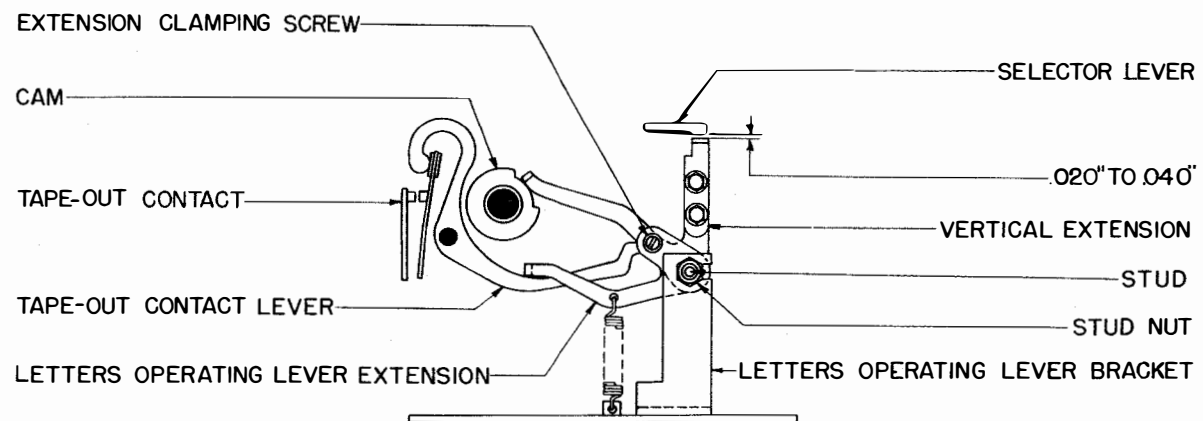


FIGURE 46

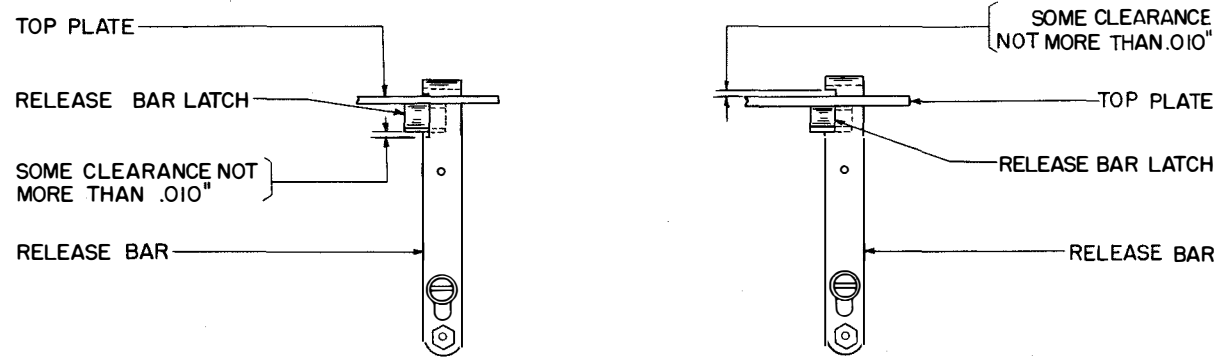


FIGURE 47

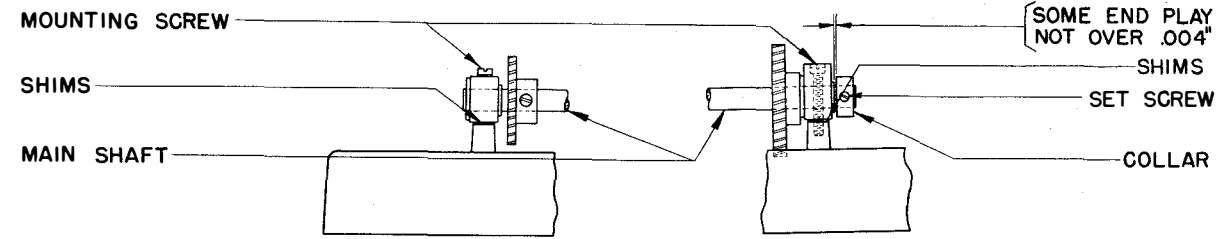


FIGURE 48

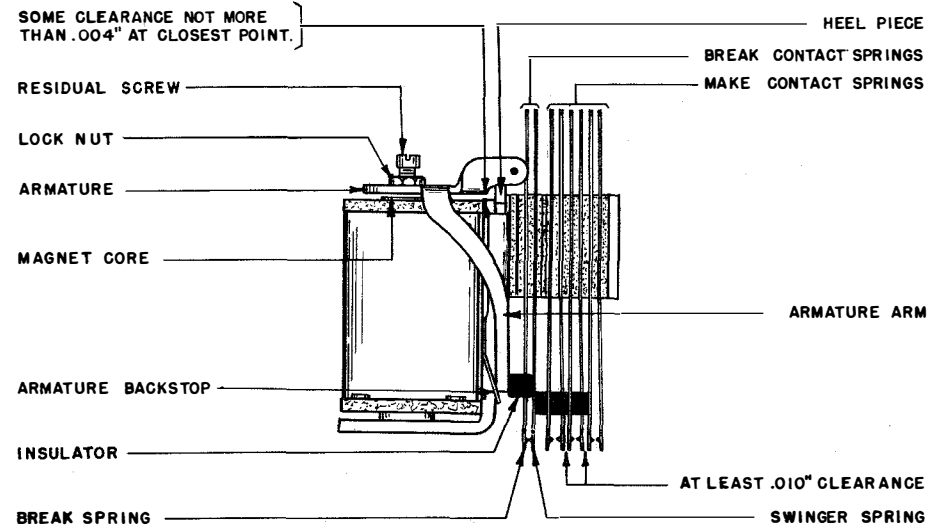


FIGURE 49

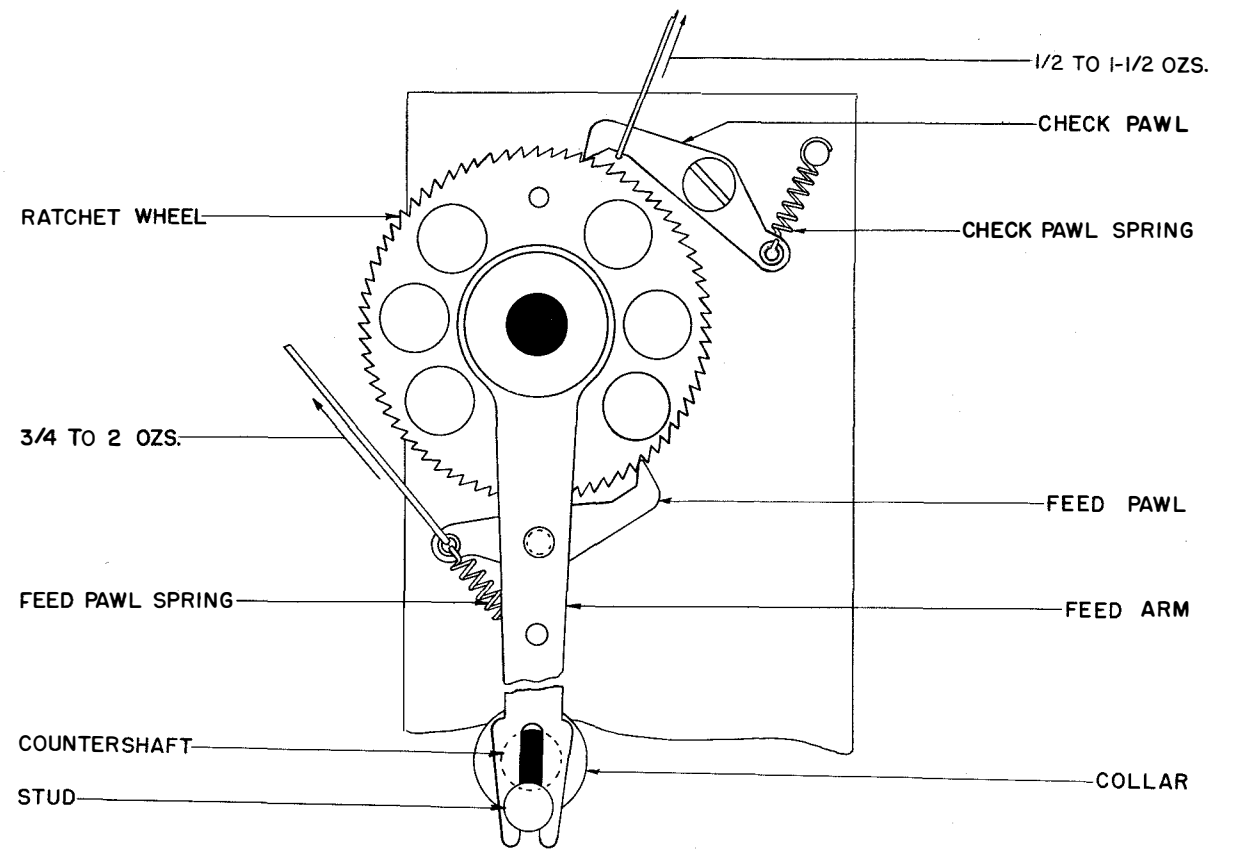


FIGURE 50

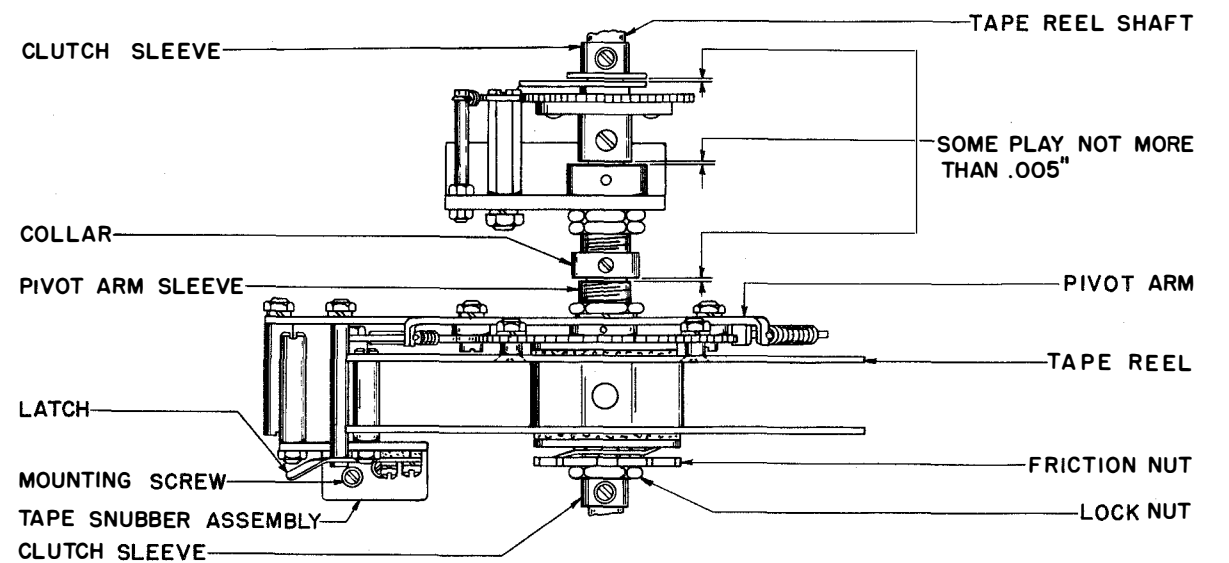


FIGURE 51

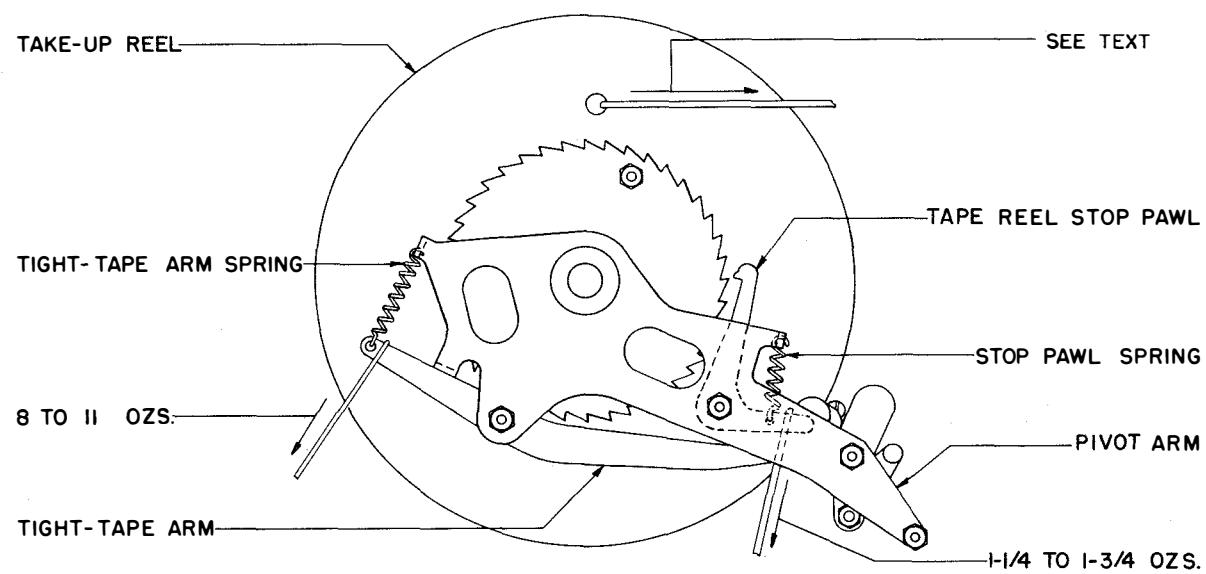


FIGURE 52

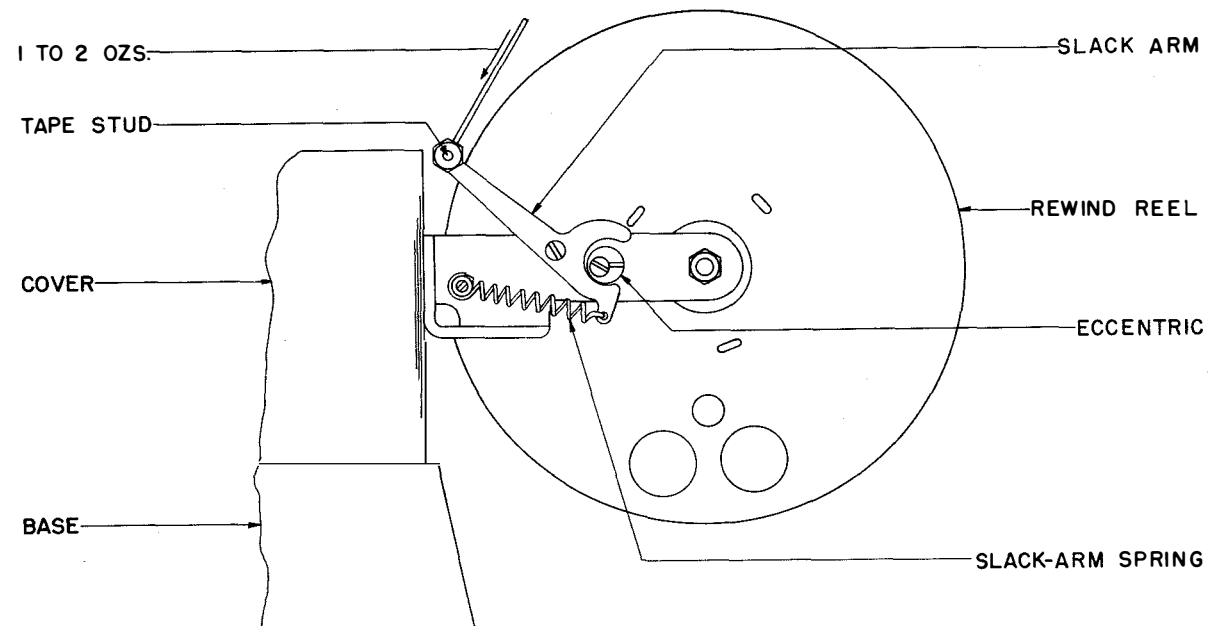


FIGURE 53

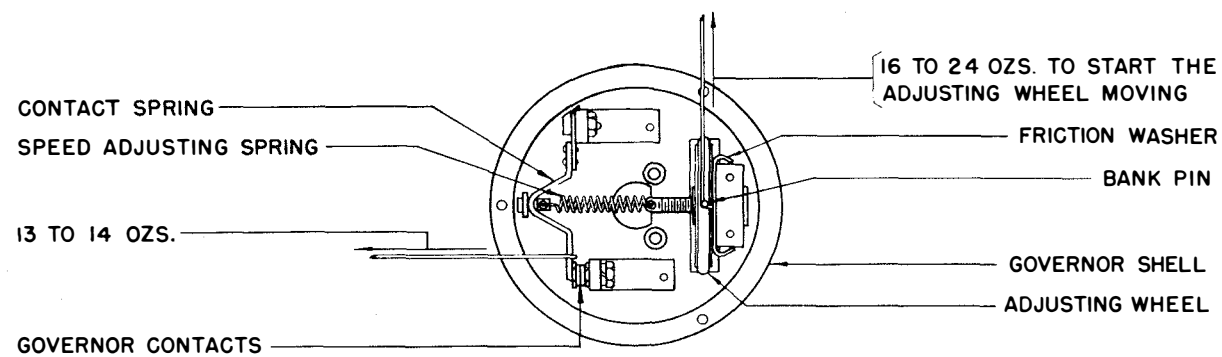


FIGURE 54

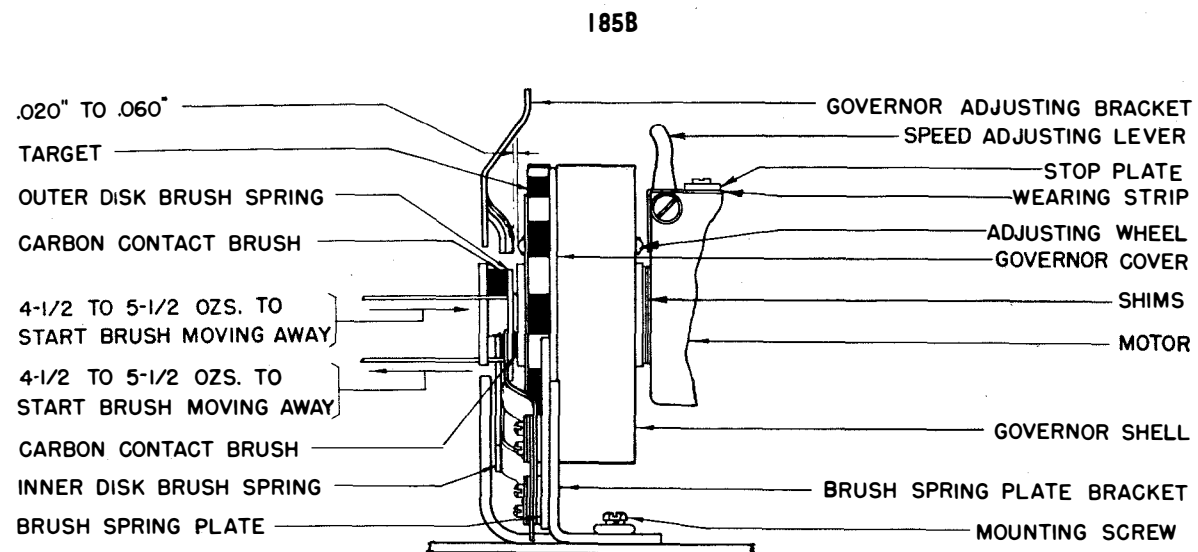


FIGURE 55

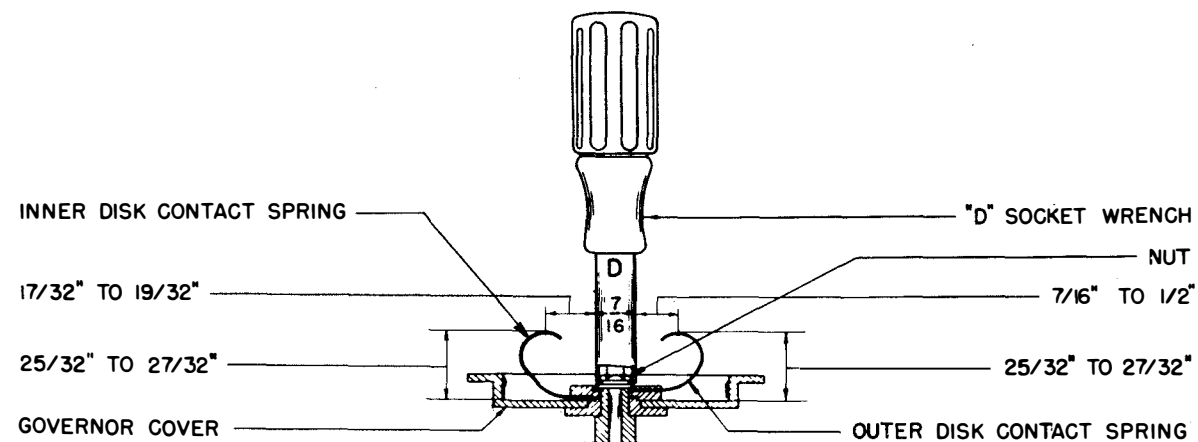


FIGURE 56

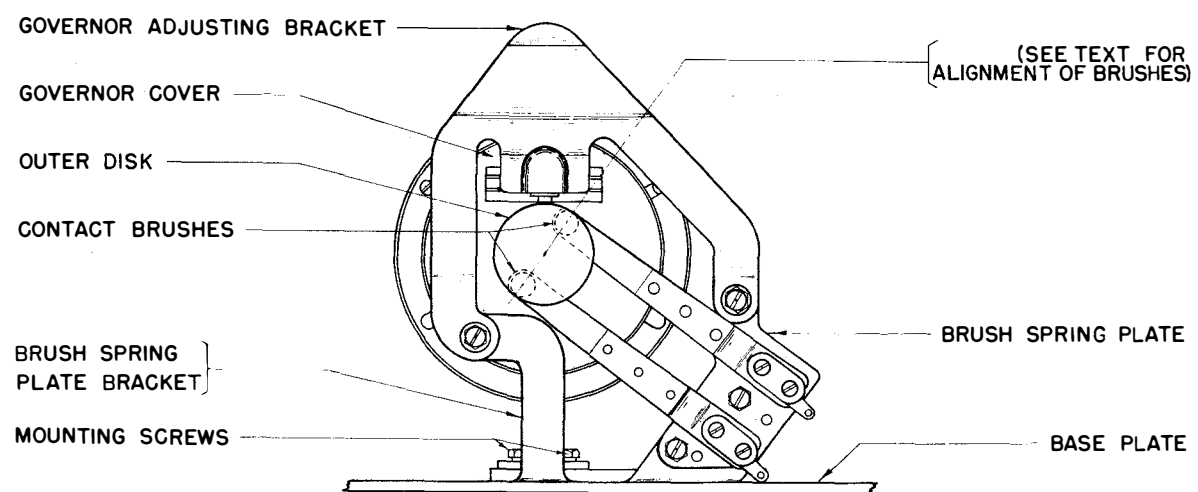


FIGURE 57