

RESTRICTED

TELETYPE

PRINTING TELEGRAPH SYSTEMS

OFF-LINE AUTOMATIC EQUIPMENT
MANUFACTURED FOR U. S. NAVY

SECTIONS

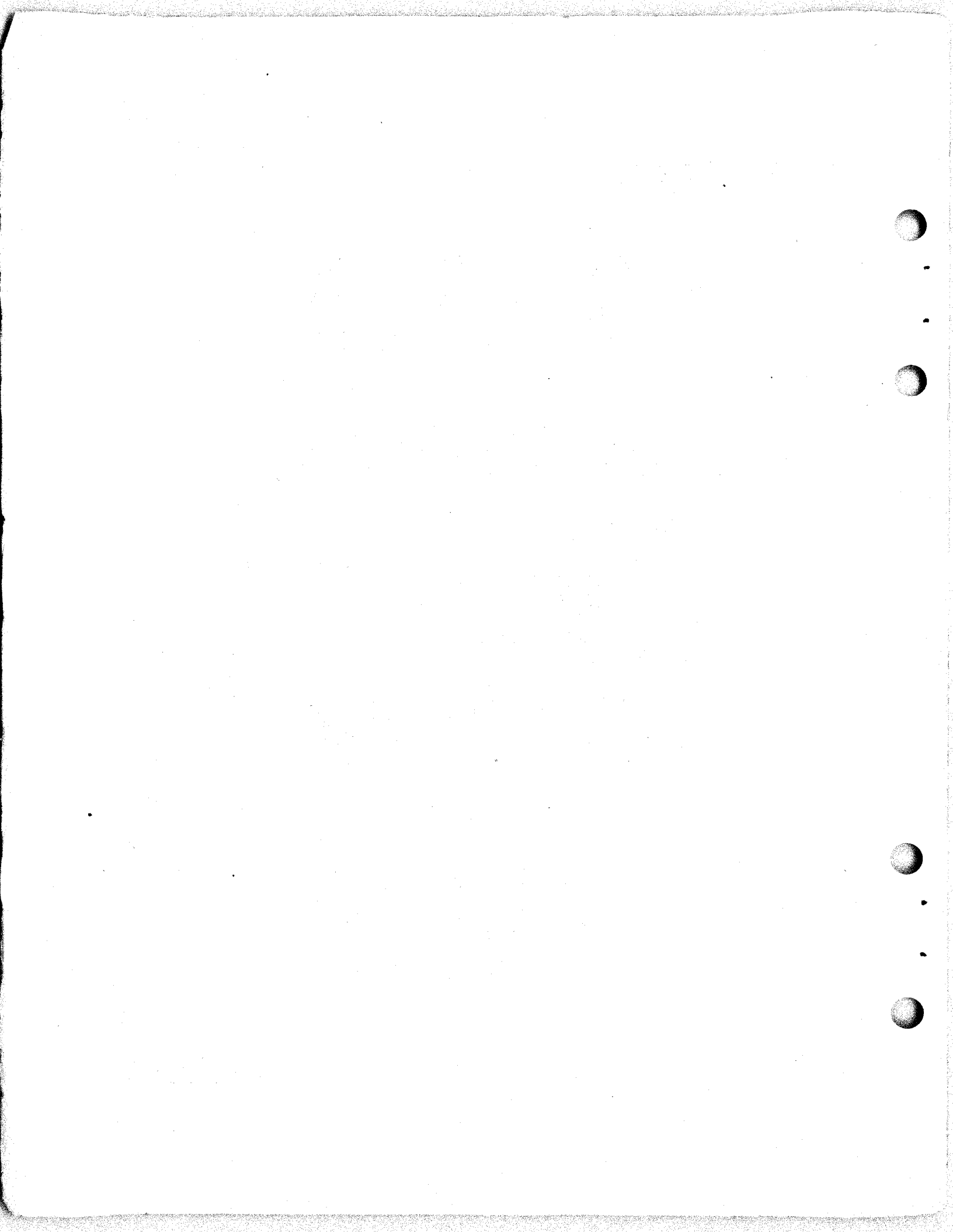
- 1 GENERAL
- 2 INSTALLATION AND INITIAL ADJUSTMENTS
- 3 THEORY OF OPERATION
- 4 CORRECTIVE MAINTENANCE
- 5 LUBRICATION
- 6 SPARE PARTS KITS
- 7 WIRING DIAGRAMS

TAPE READER . . . (ENG 313)
TRANSLATOR . . . (ENG 308)
TABLE (ENG 314)
RECTIFIER (REC 30)

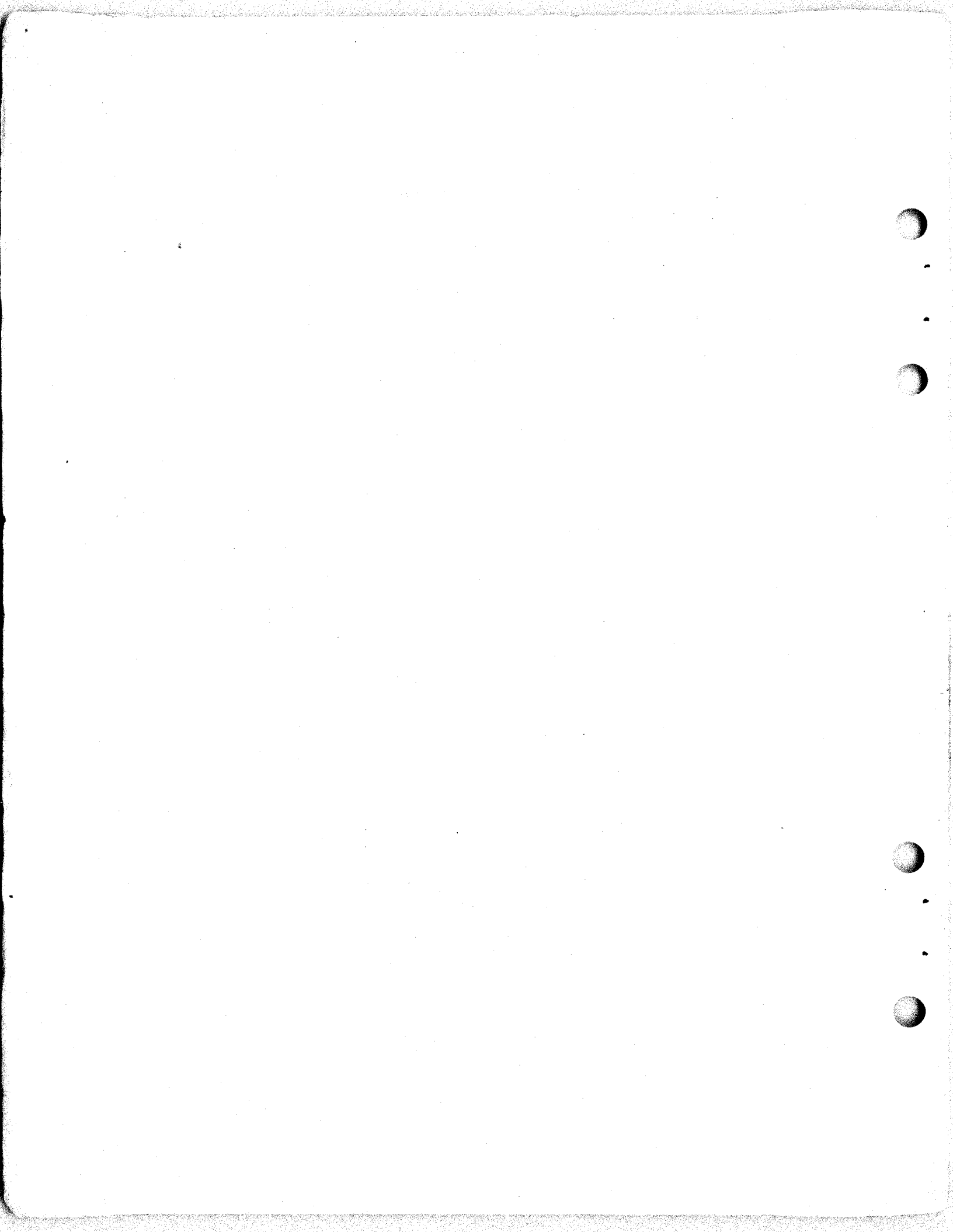


RTTY ELECTRONICS
~~TELETYPE=Sales-Service-Parts~~
PO Box 20101 El Sobrante, Ca.
94820. (510)222-3102
mr_rtty@pacbell.net

RESTRICTED



Section	Page
1 GENERAL - - - - -	1
The figures referred to in the following sections are arranged in numerical sequence on Pages 77 to 95 incl.	
2 INSTALLATION AND INITIAL ADJUSTMENTS	
Power Connections - - - - -	2
Installation of the Typing Reperforator - - - - -	2
Installation of the CSP Unit - - - - -	3
Installation of the Tape Reader - - - - -	3
Installation of the Rectifier - - - - -	4
Rectifier Adjustments - - - - -	4
Final Installation Procedure - - - - -	5
3 THEORY OF OPERATION	
Tape Reader - - - - -	6
Tape Reader Circuits - - - - -	16
Translator - - - - -	21
Translator Circuits - - - - -	22
Table - - - - -	25
Rectifier - - - - -	26
4 CORRECTIVE MAINTENANCE - ADJUSTMENTS	
Tape Reader Adjustments - - - - -	28
Relay Adjustment - - - - -	42
Translator Adjustments - - - - -	45
Probable Troubles and Possible Causes - - - - -	52
5 LUBRICATION	
General - - - - -	56
Tape Reader - - - - -	56
Translator - - - - -	58
6 SPARE PART KITS	
General - - - - -	59
List of Parts for Kit No. 113072 for the Tape Reader - - - - -	60
List of Parts for Kit No. 111175 for the Typing Reperforator - - - - -	61
List of Parts for Kit No. 111173 for the Model 15 Printer - - - - -	65
List of Parts for Kit No. 111196 for the Rectifier and Table - - - - -	70
7 WIRING DIAGRAMS	
WD 2423 Wiring Diagram of Table - - - - -	71
WD 2441 Theoretical Wiring Diagram of Off-Line System - - - - -	72
WD 2417 Wiring Diagram of Translator - - - - -	73
WD 2424 Wiring Diagram of Tape Reader - - - - -	74
WD 2425 Wiring Diagram of Relay Assembly of Tape Reader - - - - -	75
WD 2204 Wiring Diagram of Rectifier - - - - -	76



RESTRICTED

SECTION 1

GENERAL

101 THE OFF LINE AUTOMATIC SYSTEM

The Off-Line Automatic System is used in U. S. Navy communications. It is comprised of the following:

Tape Reader (ENG 313)
CSP (With ENG 308)
Model 14 Typing Reperforator (With Keyboard)
Table (ENG 314)
Rectifier (REC30)

Auxiliary equipment normally used with the Off-Line Automatic System is as follows:

Model 15 Teletype (Receiving Only)
Model 14 Typing Reperforator (With Keyboard)

This bulletin contains detailed descriptions and installation and maintenance instructions for the following units of the Off-Line Automatic Equipment:

Tape Reader (ENG 313)
Translator (ENG 308)
Table (ENG 314)
Rectifier (REC30)

The general theory of operation of the Off-Line Automatic System, certain descriptions and maintenance instructions are presented in U. S. Navy publications prepared for CRF repairmen. Descriptions, maintenance information and parts lists for the standard teletype devices used in the Off-Line Automatic System are to be found in manufacturer's bulletins shipped with the devices.

SECTION 2

201 INSTALLATION AND INITIAL ADJUSTMENTS

(a) Power Connections

- (1) The AC motors with which Teletype Off-Line apparatus is equipped are designed for operation on 110-115 volt, 60 cycle current. When the power supply is of this voltage and frequency, wires A, B, and C in the electrical service assembly on the table should be moved to terminals 1, 7, and 9 respectively for direct connection to power as indicated in Note 5 of Wiring Diagram W.D. 2423. When AC current with voltage and frequency of other values is supplied, wires A, B, and C should remain on terminals 2, 8, and 10 respectively for connection to the adjusted voltage output of the rectifier.
- (2) Throw the electrical service assembly switch (at the front of the table) to the "OFF" position and connect AC power to terminals 4 and 5 of the electrical service assembly on the table. Ground the framework of the equipment by connecting a ground to terminal 3.

(b) Installation of the Typing Reperforator

- (1) Remove the four 105627 studs from typing reperforator keyboard.
- (2) Attach 114182 base plate assembly to the keyboard using the same 105627 studs.
- (3) Remove table drawer stop, located on the bottom of the drawer at the rear, and remove drawer from table.

NOTE: Drawer stop is readily accessible with compartment door open.

- (4) Place the keyboard in the left-hand position on the table so that the 105627 studs are in alignment with the holes in the shock mounts.
- (5) Assemble stove bolt with the lock washer against the head, the large flat washer next and then the spacer.

NOTE: These parts are to be found in a bag tied to the table.

- (6) Insert stove bolt assemblies through the shock mounts into the 105627 studs and tighten.
- (7) Drop the four cords through the large hole in the table top and plug them into the electric service assembly on the table as shown on the diagram pasted to the inside of the table compartment door. See Figures 55 and 56.
- (8) Place typing reperforator on the keyboard and secure it with the thumb screws provided.
- (9) Assemble tape container to the right-hand side of the keyboard, using the two screws to be found in the keyboard.

RESTRICTED

- (10) Place cover over typing reperforator so that the thumb screws in the cover fit into the slots on the base plate brackets and tighten the screws.

(c) Installation of CSP Unit

- (1) Place the CSP in the center position on the table over the four mounting holes provided.
- (2) Secure the CSP to the table by means of four 1/4 - 20 x 9/16 screws and lock washers to be found in the bag tied to the table.
- (3) Drop the power cord through the small hole at rear of table and insert the plug into the electric service assembly receptacle designated "Translator Motor" on the diagram pasted to the compartment door. See Figures 55 and 56.
- (4) Insert the 48 prong plug of the 113070 connecting cord into the 48 point receptacle at the left rear of the CSP base.

(d) Installation of Tape Reader

The bag tied to the tape reader contains the studs, washers, nuts, and lock washers for securing the tape reader to the table.

- (1) Insert the four studs into the shock mounts in the table (at the right side) so that the hexagonal portion rests on top of the mount.
- (2) Drop the three cords through the large hole in the table and place tape reader on the table so that the studs fit into the four holes in the tape reader base plate.
- (3) Assemble the locking plates to the studs so that the formed ends fit into the small holes alongside the stud holes.

NOTE: Rotate studs so that the locking plates will mate properly with the studs.

- (4) Assemble nuts and lock washers to the threaded portions above the base plate.
- (5) Assemble nuts and lock washers to the threaded portions extending below the shock mount.
- (6) Plug the three cords into the electric service assembly receptacles designated "Tape Reader" on the diagram pasted on the compartment door.
- (7) Insert the 33 point receptacle of the 113070 connecting cord into the 33 prong recessed plug at the left rear end of the tape reader.
- (8) Insert the 18 prong plug, on the cord from the translator, into the 18 point receptacle at the right rear end of the tape reader. See Figure 56.

RESTRICTED

- (9) Place the cover over the tape reader so that the slots fit over the thumb screws and tighten screws.

(e) Installation of Rectifier

- (1) Locate the 113150 rectifier mounting base on the floor under the table at the right rear end of the table.
- (2) Remove the cover from the rectifier.
- (3) Remove the shock mounts from the 113150 mounting base.
- (4) Assemble shock mounts to the rectifier utilizing the existing screws and nuts used for securing rectifier components to the rectifier base.
- (5) Replace the rectifier cover.
- (6) Mount rectifier on the 113150 base so that the shock mounts slide into the rails on the base and secure the free end of the shock mounts with the four screws provided.

NOTE: When finally mounted, the side of the rectifier containing the door should face the front of the table and the guide rails on the base should be at the rear.

(f) Rectifier Adjustments

- (1) Throw the rectifier switch to the "OFF" position and open the hinged door of cover.

CAUTION: The secondary voltage of the transformer is 400 volts. Do not make any adjustments or change any tubes while the unit is in operation.

- (2) To adjust for AC input voltage, connect the flexible lead on the left-hand and top side of the control panel to the terminal with the marking which most nearly corresponds to the voltage of the available AC supply. Refer to wiring diagram W.D. 2204.
- (3) To adjust for frequency, connect the flexible lead on the right-hand side of the control panel to the terminal having a marking which most nearly corresponds to the frequency of the available AC supply.
- (4) Insert the three plugs into the electric service assembly receptacles designated "Rectifier" on the diagram pasted to the compartment door and throw the rectifier switch to the "ON" position. See Figures 55 and 56.
- (5) To adjust the DC output voltage, connect a 60 watt, 115 volt Mazda lamp in series with a suitable ammeter across the DC output of the rectifier and adjust the potentiometer with screw driver slot located in the center of the tap panel until the ammeter reads 0.5 ampere.

RESTRICTED

It will be necessary for the rectifier to be connected to the AC supply for approximately twenty seconds before DC output will be available. This time delay is necessary for the protection of the grid controlled rectifier tubes. This adjustment should be checked when the unit is installed and periodically thereafter.

The time delay may be adjusted by means of the adjusting screw and lock nut located on the tie bar between the two bi-metal strips.

The time delay relay is located under a metal cover at the top of the door opening. The cover is removable by loosening one screw and sliding the cover off to the right.

The time delay switch contacts should be adjusted by bending so that the DC output from the tubes is available before the AC output from the auto-transformer.

(g) Final Installation Procedure

- (1) Throw electric service assembly switch (at the front of the table) to the "ON" position.
- (2) Plug a milliammeter into one of the line jacks and adjust line current to .060 amp. by means of the rheostat inside the electric service box which can be reached by inserting a screw driver through the hole in the bottom of the electric service box near the rear.
- (3) Plug line and power cords from external tables into the electric service receptacles designated "External Tables" on the diagram pasted on the table compartment door. See Figures 55 and 56.
- (4) See that the power switches on all pieces of equipment are turned on.
- (5) Mount the large tape basket on the right end of the table in the slots and hangers provided.
- (6) Slide small tape basket onto the rails provided under the table top.

SECTION 3

THEORY OF OPERATION

301 TAPE READER

(a) Arrangement

The motor unit is geared to the distributor shaft. The distributor shaft carries a distributor cam sleeve which is actuated by a pawl-and-ratchet clutch under the control of a distributor magnet. The distributor cam sleeve actuates six transmitting contacts and a counter pulsing contact.

The forward portion of the distributor shaft is geared to the counting shaft. The counting shaft carries two counting cam sleeves which are actuated by a friction clutch. Each sleeve is controlled by a magnet-operated escapement (Figure 14). The left-hand counter, as observed from the front of the tape reader, is known as the unit counter. It includes eight electrical contacts. The group counter with sixteen electrical contacts is on the right. See Figures 2 and 3.

Located forward of the distributor shaft is the sensing shaft. A magnet-controlled, pawl-and-ratchet clutch (Fig. 7) transfers motion from the distributor shaft to the sensing shaft.

Detents associated with the distributor cam sleeve and with the sensing shaft hold each in its stop position when the corresponding clutch is disengaged.

The four relays in the forward row of the relay bank are identified from left to right as follows:

- (1) E Relay - energized when the controller switch is in the E position.
- (2) D Relay - energized when the controller switch is in the D position.
- (3) Relay P1 - energized when the controller switch is in positions P, R, or O.
- (4) Relay P2 - energized when the controller switch is in positions P, R, or O.

The four relays in the rear row of the relay bank are identified from left to right as follows:

- (1) Start Relay - de-energized while tape sensing is in progress.
- (2) Stop Relay - energized while tape sensing is in progress.
- (3) Auto-Stop Relay - de-energized while tape sensing is in progress.
- (4) Advance Relay - energized while tape sensing is in progress.

RESTRICTED

For interconnection with the electrical service assembly on the table (ENG 314), the tape reader is equipped with three cords with plugs - AC, DC, and signal line. Two receptacles are provided in the rear of the tape reader. One accommodates a cable with 18-point male plug and the other a cable with a 33-point female plug. These cables extend from the CSP 889 to the tape reader.

The internal wiring of the tape reader includes a 12-point plug and receptacle which facilitate removal of the alphabet contact assembly and the 33-point receptacle with common cable.

(b) Tape Sensing

The tape sensing mechanism which is assembled on the forward portion of the tape reader includes a tape guide with retaining lid, feed roll, feed lever, feed pawl, sensing contacts, sensing levers, operating bail, transfer levers, code bars, alphabet contact levers, alphabet contacts, reset levers, spreader operating lever, spreader bars, and a sensing shaft. See Figures 3, 4, 17, 19, and 27.

The feed roll advances the tape through the tape guide in uniform steps, commensurate with the feed hole spacing, and positions it so as to present its code perforations to the pins on the ends of the sensing levers. When the sensing shaft is in its stop position, the operating bail rests on the peak of its cam on the shaft and holds the sensing levers downward - pins withdrawn from the tape. The reset lever also rests on the high portion of its cam and holds the code bars to the left. The code bars, in the left position, hold the curved extensions of the transfer levers clear of the lower extensions of the sensing levers. See Figure 27.

Engagement of the sensing shaft clutch and subsequent rotation of the sensing shaft permits the operating bail to ride to the low part of its cam. Sensing lever springs then rotate the sensing levers against the tape. Levers that project their pins through code perforations close sensing contacts and thus prepare paths which are completed through relay P2 to corresponding contacts of the distributor, provided the controller switch is in any one of positions P, R, or O. See paragraph 302 (a).

Code bars (Figure 4) which correspond to sensing levers that project through perforations in the tape assume positions to the right since the curved arms of the associated transfer levers are free to move upward into the notches on the lower extensions of the sensing levers.

Sensing levers that meet the unperforated portions of the tape impress their tongues against the upstops which have no circuit connections. The lower extensions of these sensing levers block the upward movement of the transfer lever arms (Figure 27) and corresponding code bars are held to the left.

Toward the end of the sensing cycle, the spreader operating lever moves into and out of the indent of its cam, permitting the spreader blades (Figures 17 and 19) to collapse momentarily and allow the selection of an alphabet contact lever by the aligned notches in the code bars. The selected contact lever momentarily closes its alphabet contact and transmits a single impulse to the corresponding key circuit on the CSP, provided the controller switch is in the E or D positions. See paragraph 302 (b).

RESTRICTED

(c) Tape Feeding

Action of the feed lever extension (Figure 20) causes the tape feed pawl which is attached to the feed lever to engage a tooth on the feed roll ratchet and advance the tape one position while the sensing lever pins are withdrawn. A detent riding the feed roll ratchet insures accurate stepping of the tape.

(d) End-of-Tape Stop

A sixth pin (Figure 31), located at the forward edge of the channel in the tape guide, is held depressed while the tape is latched under the retaining lid. The pin, in turn, depresses the arm of a contact operating lever and permits a sixth pin contact to stand open. When the end of a severed tape or a notch in the edge of the tape passes over the stop pin, the pin rises in the tape channel and permits the contact operating lever to be fully under the control of its cam on the sensing shaft. As the sensing shaft rotates, closure of the sixth pin contact energizes the auto-stop relay and stops tape sensing.

(e) Distributor

The distributor shaft carries a ratchet with a double row of teeth for actuating the distributor cam sleeve. The cam sleeve is provided with six transmitting contact cams, a counter pulsing contact cam, and a drive arm. A driving pawl and a blocking pawl are mounted on a stud in the side of the drive arm. When the distributor magnet, adjacent to the distributor shaft, is de-energized, its armature extension engages the end of the drive pawl and causes the opposite end to swing clear of the ratchet teeth. A stud in the side of the driving pawl likewise holds the blocking pawl clear of the ratchet. Under these conditions, the distributor cam sleeve is held stationary. See Figure 7.

When the distributor magnet is energized, its armature extension releases the drive pawl and permits both pawls to rest on the ratchet. The ratchet teeth on which the drive pawl rests face in the direction of rotation and carry the pawl and cam sleeve with them. The ratchet teeth on which the blocking pawl rests face in the opposite direction and prevent the cam sleeve from rotating faster than the shaft.

The transmitting contacts of the distributor close in sequential order. When the distributor cam sleeve is in the stop position, the start-stop contact (second from the rear) only is closed. The counter pulsing contact (rearmost) is closed during the greater portion of the transmitting cycle.

(f) Counting (Enciphering)

When the controller switch is in the E position (E relay energized, D relay and relays P1 and P2 de-energized), a circuit is established that permits the distributor to pulse the unit counter magnet once for each transmitting cycle. With each pulse, the unit counter advances one count in response to escapement action. See paragraph 302 (c).

On the fifth count, the unit counter takes over control of transmission and inserts SPACE. It interrupts tape sensing by breaking the

RESTRICTED

pulsing circuit of the sensing clutch magnet at contact 1. See paragraph 304 (b). It also opens contact 4 and closes contacts 3 and 5. Opening of contact 4 disconnects distributor contact 3 from the corresponding Baudot contact on the translator (see paragraph 304 (a)) while closure of contact 5 provides a circuit from marking line battery to the distributor for the transmission of space. Closure of unit counter contact 3 pulses the distributor magnet for one cycle. The distributor, in turn, pulses the counter to a position where contact 1 closes and restores tape sensing. See Paragraphs 302 (d) and 302 (e).

With tape sensing restored, the unit counter advances to the count of ten, and then on the transmission of SPACE reaches its ZERO position. On the tenth, twentieth, thirtieth, fortieth, and fiftieth counts, unit counter contact 2 closes during space transmission and permits the group counter magnet to be pulsed by the pulsing contact on the distributor. At this time both counter magnets are pulsed simultaneously and in parallel. See paragraph 302 (f).

Escapement contacts associated with each counter magnet and in series with their circuits open as the escapement armatures are pulled downward, thereby removing the shunts from 2000 ohm resistors in parallel portions of the counter magnet circuits. These resistors are intended to prolong contact life by reducing the magnitude of the holding current that is broken when de-energization of the magnets occur.

While the group counter is receiving its second and fourth stepping pulses from the distributor, group counter contact No. 1 opens momentarily and splits the pulses with the result that the counter advances two extra steps. This arrangement causes the group counter to step the same distance in response to five revolutions of the unit counter when the controller switch is in the E position as it would to seven revolutions of the unit counter when the control switch is in the D position. In D position, the No. 1 group counter contact is short circuited by front contact 10-11 of the D relay.

After the group counter has counted ten five-character groups and space has been transmitted, it opens its No. 4 contact and breaks the pulsing circuit of the unit counter magnet, thus leaving the unit counter in the ZERO position. Group counter contacts 6 and 9 likewise open. The opening of contact 6 breaks the circuit of the sensing clutch magnet. The opening of contact 9 disconnects contact 4 of the distributor from the corresponding Baudot contact on the translator (see paragraph 304 (a)). Simultaneous with the opening of contacts 4, 6, and 9 on the group counter, contact 5 closes and permits the group counter to be pulsed to the ZERO position by the distributor during transmission of CARRIAGE RETURN, CARRIAGE RETURN and LINE FEED. Contact 7 closes so as to energize the distributor magnet. See paragraphs 302 (g) and 302 (h).

With the unit counter idle and the group counter being pulsed from the distributor, contact 11 closes and establishes a circuit by which line battery is connected to distributor contact 4 for the transmission of CARRIAGE RETURN during two cycles, following which contact 10 closes to provide a corresponding circuit for the transmission of a single LINE FEED from contact 2 of the distributor. See paragraph 302 (i). Prior to the transmission of LINE FEED, contact 8 opens and breaks the circuit leading from distributor contact 2 to the corresponding Baudot contact on the translator. See paragraph 304 (a).

It should be noted that, in the counting sequence described above, ten five-letter groups are counted prior to the transmission of CARRIAGE RETURN, CARRIAGE RETURN and LINE FEED signals. Where the first line of a message has less than fifty characters, the transmission of CARRIAGE RETURN, CARRIAGE RETURN and LINE FEED may be manually controlled from the group eliminator switch so as to follow any five-letter group from one to nine, in accordance with the position of the switch.

RESTRICTED

(g) Group Elimination

With the group eliminator switch in the ZERO position and the controller switch in the E position, the counting mechanism counts ten groups of five characters each before inserting CARRIAGE RETURN, CARRIAGE RETURN and LINE FEED signals.

When the group eliminator switch is rotated to any of positions one to nine, inclusive, and the controller switch then rotated to positions P, R, or O, the counting cam sleeves, either one or both, rotate sufficiently so as to drop from their count five-letter groups corresponding in quantity to the pointer setting of the group eliminator switch.

With the controller switch in positions P, R, or O, relays P1 and P2 are energized while E and D relays are de-energized.

(1) Position One

With the group eliminator switch in position one and the controller switch rotated to positions P, R, or O, the unit counter advances five steps and stores one group prior to transmission. With subsequent transmission, CARRIAGE RETURN, CARRIAGE RETURN and LINE FEED are inserted after the forty-fifth transmitted character. If the last group of the first line consists of less than five characters, the group must be filled in with SPACE combinations when preparing the tape. Rotating the group eliminator switch to Position 1 provides a circuit through contact 6 of the unit counter to its magnet. See paragraph 302 (j) (1). The contact opens and closes alternately until it reaches the count of five where the contact stands open. With the restoration of the control switch to E and the resumption of transmission, the counter magnet is pulsed from the distributor.

(2) Position Two

With the group eliminator switch rotated from zero to Position 2, or to any position having an even number, pulsations introduced by the closing and opening of contact 7 step the unit counter to the count of 10. In Position 2, the switch completes a circuit through contact 15 of the group counter to its magnet and pulses the group counter one step, so as to eliminate two five-character groups. See paragraph 302 (j) (2). After this step, contact 15 stands open.

(3) Position Three

With the switch rotated from zero to Position 3 or any position having an odd number, the unit counter is pulsed by its No. 6 contact to the count of five. In Position 3, group counter is pulsed once through contact 15. Three groups are eliminated as represented by the positions of the counter cam sleeves; i.e., two by the group counter plus one by the unit counter.

(4) Position Four

With the switch in position 4, the unit counter advances to the zero position as described under Position 2. The switch brings

RESTRICTED

contact 14 into the group counter magnet circuit and steps that counter two positions, after which contact 14 stands open. Four five-letter groups are eliminated.

(5) Position Five

With the switch in position 5, the unit counter is pulsed as in Positions 1 and 3. The group counter is pulsed two steps by contact 14 and five groups are eliminated.

(6) Position Six

With the switch in Position 6, the unit counter advances to zero as in positions 2 and 4. The switch brings contact 13 into the group counter magnet circuit. Pulsations from contact 13 steps the counter three positions, after which the contact stands open. Six groups are eliminated.

(7) Position Seven

With the switch in Position 7, the unit counter is pulsed as in Positions 1, 3, and 5. The group counter is advanced three positions by contact 13 and seven groups are eliminated.

(8) Position Eight

With the switch in Position 8, the unit counter is pulsed as in Positions 2, 4, and 6. The switch brings contact 12 into the group counter magnet circuit. Pulsations from contact 12 steps the counter four positions, after which the contact stands open. Eight groups are eliminated.

(9) Position Nine

With the switch in Position 9, the unit counter is pulsed as in Positions 1, 3, 5, and 7. The group counter is pulsed as in Position eight. Nine groups are eliminated. When the control switch is thrown to the E position and transmission started, CARRIAGE RETURN, CARRIAGE RETURN and LINE FEED follows the first group of five characters in the message.

(h) Zeroizing

While transmitting CARRIAGE RETURN, CARRIAGE RETURN and LINE FEED, the group counter closes contact 3 and brings contact 7 of the unit counter into its magnet circuit. See paragraph 302 (k) (1). Opening and closing of contact 7 steps the unit counter to its zero position. If the unit counter is already in the zero position, contact 7 stands open and the closing of contact 3 has no effect. Contact 3 is effective, however, in case the group counter has stepped to the CARRIAGE RETURN position in response to SPACE RECOGNITION, leaving the unit counter in an off-zero position, or in any case where the unit counter is not in its zero position when the group counter opens its No. 4 contact which interrupts the unit counter pulsing by the distributor.

RESTRICTED

If tape sensing stops for any reason after the transmission of less than ten characters in a line (group eliminator switch on ZERO), throwing the controller switch to P, R, or O energizes relay P1 and P2 and permits unit counter contact 7 to pulse the counter to the ZERO position.

If from ten to forty-nine characters have been transmitted, the unit counter is zeroized as in the foregoing paragraph, while the group counter is zeroized by pulsations from contact 16 which becomes effective after the group counter has advanced one position. See paragraph 302 (k) (2).

Should stoppage occur in a line where group elimination has been applied and zeroizing be necessary, the group eliminator switch may be left in its advanced position when rotating the controller switch to P, R, or O. The unit counter will be zeroized by contacts 6 or 7 while the group counter may be zeroized by any contact from 12 to 16, inclusive. The counters will advance beyond zero, if required, and conform to positions indicated by the group elimination switch in accordance with group elimination theory described in paragraph 301 (g).

(i) Counting (Deciphering)

When the controller switch is in the D position (D relay energized, E relay and relays P1 and P2 de-energized), the distributor pulses the unit counter once for each transmitting cycle. See paragraph 302 (c). With each pulse the unit counter advances one step, except on the second and seventh pulses when contact 8 on the unit counter, in series with the distributor contact, opens and closes so as to split the second and seventh into two separate pulses. It should be noted that when deciphering the E relay removes its shunt from unit counter contact 8. These two additional impulses compensate for the two impulses received by the counter when transmitting SPACE following the fifth and tenth character when the controller switch is in E position. In either case, the unit counter takes twelve steps in completing a revolution. On the twelfth step of each revolution, unit counter contact 2 closes and permits the group counter magnet to be pulsed once by the distributor. See paragraph 302 (f).

As the unit counter completes its sixth revolution (sixty transmitting cycles), the group counter will have stepped six positions. On the sixth step the group counter closes its No. 2 contact and provides a path by which it may be pulsed for the seventh step by the SPACE contact on the translator simultaneous with the transmission of space, provided space occurs between the sixtieth and seventieth transmitting cycle. See paragraph 304 (c). This action is known as SPACE RECOGNITION. On the seventh step, the group counter opens contacts 4 and 6 and closes contacts 5 and 7. Subsequent action is as described in paragraph 301 (f). Closure of contact 5 permits the group counter to be pulsed to the ZERO position by the distributor during the transmission of CARRIAGE RETURN, CARRIAGE RETURN and LINE FEED. Closure of contact 7 energizes the distributor magnet for a time interval sufficient for the transmission of CARRIAGE RETURN, CARRIAGE RETURN and LINE FEED which is brought about by the closure of contacts 11 and 10, respectively.

Provided no space occurs between the sixtieth and seventieth transmitting cycle, the unit counter pulses the group counter at the end of its seventh revolution. This seventh step of the group counter causes

RESTRICTED

CARRIAGE RETURN and LINE FEED to follow the seventieth transmitting cycle regardless of word ending.

(j) Tape Sensing Control

The four relays in the rear row on the relay bank are identified, from left to right, as - START relay, STOP relay, AUTO-STOP relay, and ADVANCE relay. Four timing contacts controlled by cams on the sensing shaft enter into the operation of these relays.

(1) Idling Condition

When DC power is applied to the tape reader with the sensing shaft in its stop position and its timing contacts T2 and T3 closed, the advance relay operates and, through its forward contact 11-12, applies a locking circuit to its winding. See paragraphs 302 (m) (1) and 302 (m) (2). Closure of rear contacts 9-10 on the advance relay causes the start relay to operate and, through its rear contact 7-8, apply a locking circuit to its winding. This circuit is effective through rear contact 7-8 of the start relay, through rear contact 4-5 of the advance relay and through the start switch. See paragraphs 302 (m) (3) and 302 (m) (4).

Energization of the start relay causes its front contact 5-6 to break the operating circuit of the advance relay. Forward contact 2-3 breaks the sensing clutch magnet circuit and the circuit of the distributor magnet when the controller switch is on R, P, or O. See paragraph 304 (b).

Closure of front contact 8-7 on the start relay causes the stop relay to operate and, through its rear contact 7-8, apply a locking circuit to its winding provided the tight-tape contact is closed. This circuit is effective through rear contact 7-8 of the stop relay, the stop switch, the tight-tape contact, front contact 6-5 of the auto-stop relay and rear contact 7-8 of the advance relay. See paragraphs 302 (m) (5) and 302 (m) (6). If the tight tape contact is open, the locking circuit is not effective but the stop relay is held energized by the closed condition of forward contact 8-7 on the start relay.

Energization of the stop relay causes its rear contact 3-2 to break the operating circuit of the start relay. Rear contact 6-5 breaks the operating circuit of the advance relay. Front contact 8-7 closes in the sensing clutch magnet circuit (including distributor clutch magnet circuit when the controller switch is on P, R, or O). See paragraph 304 (b).

So long as the start magnet remains energized, no tape sensing is possible. To start tape sensing the tight-tape contact must be closed and pressure must be applied to the start button.

The auto-stop relay remains unoperated provided that tape in the tape channel is holding the sixth pin depressed and that it receives no impulses from either the blank contact on the tape reader or the error-lock contact on the translator.

RESTRICTED

Timing contact T4 (controlled by the sensing shaft) parallels the stop switch, the tight-tape contact and front contact 6-5 of the auto-stop relay, to prevent the stop relay from being released as the sensing shaft clutch reaches the throw-out position.

(2) Start Button

Pressure on the start button breaks the locking circuit of the start relay. In releasing, the start relay closes a contact in the sensing clutch magnet circuit (both sensing and distributor magnet circuits if the control switch is on P, R, and O), but opens the operating circuit of the stop relay at forward contacts 8-7. If the stop relay remains energized due to its circuit being locked through the tight-tape contact, tape sensing and subsequent transmission will ensue. See paragraphs 302 (m) (4), (5), and 304 (b). If the tape reader is operated with the control switch in the E or D positions, the sensing and distributor clutch magnets are pulsed in timed relation by the translator pulsing contacts. If operation proceeds with the control switch in P, R, or O positions, steady battery is applied to both clutch magnets through the contacts of P1 relay. See paragraph 302 (n). Timed relation will be maintained by the clutch coupling between the distributor and sensing shafts. Once started, tape sensing will continue until interrupted by any one of the stop features.

(3) Stop Button

Pressure on the stop button de-energizes the stop relay by opening its locking circuit. See paragraph 302 (m) (6). A timing contact T4 times the effect of the automatic stop features and the manual stop, with relation to the sensing cycle. Release of the stop relay breaks the circuit of the sensing clutch magnet at forward contacts 8-7 (also distributor magnet when control switch is on P, R, or O) and closes the operating circuit of the start relay. When actuated, the start relay closes its locking circuit, energizes the stop relay, and breaks the circuit of the sensing clutch magnet at forward contacts 2-3. With the start relay energized, tape sensing is interrupted.

(k) Automatic Stop Features

(1) Tight Tape Stop

Opening of the tight tape contact breaks the locking circuit of the stop relay and interrupts tape sensing in the same manner as described under "Stop Button" paragraph 301 (j) (3).

(2) Sixth Pin Contact

The locking circuit of the stop relay breaks and tape sensing ceases when the auto-stop relay becomes energized. This occurs when the end of the tape or a notch in the edge of the tape passes over the sixth pin and allows the sixth pin contact to close. See paragraph 301 (d). Closure of the sixth pin contact energizes the auto-stop relay causing it to break the locking circuit of the stop relay. See paragraph 302 (m) (7). The foremost timing contact T5 (associated with the sensing shaft) stands closed and

RESTRICTED

permits the auto-stop relay to apply locking current to its winding while the sensing shaft is in its stop position. See paragraph 302 (m) (8). When energized, the auto-stop relay (at its front contact 8-7) closes the circuit of the auto-stop indicator lamp (clear). See paragraph 302 (m) (9).

(3) BLANK Contact

A BLANK signal in the tape causes the tape reader to close a BLANK contact (associated with the alphabet contacts) which energizes the auto-stop relay and stops tape sensing as described in the preceding paragraph. See paragraph 302 (m) (7) for BLANK contact circuit.

(4) SPACE Contact

When an irregularity in character grouping appears in enciphered tape, the sensed SPACE combination closes a SPACE contact on the tape reader, in series with the ERROR-LOCK contact on the translator, and permits the auto-stop relay to be energized from the translator. See paragraph 304 (d). Energization of the auto-stop relay interrupts tape sensing as previously described in paragraph 301 (k) (2).

After an operating condition has been restored at the point where auto-stop originated, the locking circuit of the auto-stop relay may be broken and tape sensing restored by pressing the start button. Pressure on the single-step or repeat buttons will permit opening of tape advance forward contact 5-6 and also break the locking circuit of the auto-stop relay.

(m) Tape Advance Features

(1) Single Step Tape Advance

Pressure on the single-step advance button breaks the circuit of the advance relay. Opening of advance relay rear contact 4-5 breaks the locking circuit of the start relay. Opening of forward contact 10-9 breaks the circuit of the distributor clutch magnet. Closure of forward contact 2-3 on the start relay energizes the sensing clutch magnet (tight tape contact closed and stop relay energized). Rotation of the sensing shaft opens timing contact T5 which breaks the locking circuit of the stop relay. Opening of forward contact 8-7 of the stop relay breaks the sensing clutch magnet circuit so as to permit one revolution of the sensing shaft. With the distributor clutch magnet circuit open no transmission occurs. The start and stop relays remain de-energized until the single advance button is released. Release of this button energizes the advance relay which closes a circuit to the start relay. Actuation of the start relay holds the sensing clutch magnet circuit open and energizes the stop relay.

(2) Repeat Tape Advance

Pressure on the repeat advance button releases the advance relay and, in turn, the start relay which closes the sensing clutch

RESTRICTED

magnet circuit as described in paragraph 301 (j) (2). However, the repeat button when depressed applies a shunt to timing contact T5 and maintains holding battery on the stop relay so as not to break the sensing clutch magnet circuit. See paragraph 302 (m). Tape sensing is continuous while this button is depressed but no transmission occurs since the distributor clutch magnet circuit is open at the advance relay contacts.

302 TAPE READER CIRCUITS

Refer to Diagram WD-2441 for the schematic wiring of the tape reader and to Diagrams WD-2424 and WD-2425 for actual wiring.

(a) Sensing Contact Circuits

The common side of the sensing contact circuits pick up negative (marking) line battery at terminal 1 of the power terminal block. Terminals 1, 2, and 3 are connected by the line cord to the line receptacle of the electrical service assembly on the table. The circuits from contact tongues 1 to 5, inclusive, pass through slip connections 58, 55, 53, 51, and 48, respectively, on the relay bank, through rear contacts 6-7 and 1-2, and front contacts 2-1, 4-5, and 7-8, respectively, of relay P2 when energized, through slip connections 59, 56, 54, 50, and 47, respectively, to corresponding distributor contacts. The circuit from the common side of the distributor contacts leads through the DC fuse to positive battery at power terminal 10. Terminals 10 and 11 are connected by the DC power cord to the DC receptacle of the electrical service assembly on the table.

(b) Alphabet Contact Circuits

With the controller switch in positions E or D, the common side of the alphabet contact circuit picks up AC battery through conductor 27 of the large cable that connects the tape reader to the CSP, passes through conductor 4 in the internal cable of the tape reader to slip connection 40 on the relay bank, through forward contact 1-3 of relay P1, through forward contact 7-8 of tape advance relay to slip connection 2, through conductor 7 of the internal cable to the common side of the alphabet contacts. The individual circuits from alphabet contacts 1 to 25 inclusive follow conductors numbered correspondingly in the large cable that connects the tape reader to the CSP and are connected in parallel with corresponding key contacts of that unit. Refer to the maintenance instructions for the CSP.

The circuit from alphabet contact Z follows conductor 3 of the internal cable to slip connection 8 on the relay bank to front contact 5 of E relay. If the controller switch is in the E position - E Relay front contact 5-4 closed, the circuit continues through slip connection 9, through conductor 1 of the internal cable, through conductor 24 of the large external cable to the CSP. If the controller switch is in the D position - E relay front contact 5-6 closed, the circuit continues through slip connection 7, through conductor 2 of the internal cable, through conductor 26 of the large external cable to the CSP. The CSP responds to the impulse received from an alphabet contact as indicated by the control switch position, and causes the translator to close its Baudot contacts in accordance with the code of the appropriate character.

RESTRICTED

(c) Unit Counter Magnet Circuit

The circuit of the unit counter magnet picks up negative battery at power terminal 11 on the tape reader, passes through the unit counter magnet, through slip connection 39 on the relay bank, through rear contact 7-8 on relay P1, through slip connection 37, through the escapement contact at the magnet, through contact 4 on the group counter, through slip connection 17 on the relay bank, through front contact 1 to 2 on the E relay, through slip connection 13, through the pulsing contact on the distributor, through slip connection 38 on the relay bank, through rear contact 3-2 on relay P1, through slip connection 64 to the DC fuse and positive battery at power terminal 10. As the escapement armature is pulled downward, it opens the escapement contact and removes the shunt from a 2000 ohm resistor in a parallel portion of the unit counter magnet circuit extending from rear contact 8 on relay P1, through the resistor, through slip connection 30 on the relay bank to contact 4 on the group counter. This resistor is intended to prolong contact life by reducing the magnitude of the holding current which is broken when de-energization of the magnet occurs.

It should be noted that when enciphering, unit counter contact 8 is shunted by front contact 1-2 of E relay.

(d) Circuit for Transmission of SPACE

The circuit for the transmission of SPACE picks up MARKING line battery (negative) at terminal 1 on the power terminal block, passes through contact 5 on the unit counter, through slip connection 6 on the relay bank, through front contact 7-8 on E relay, through slip connection 5, through slip connection 52 on the relay bank, through front contact 3-1 of relay P2, through slip connection 54 to distributor contact 3. The circuit from the common side of the distributor contacts is covered in paragraph 302 (a).

(e) Distributor Clutch Magnet Circuit (SPACE transmission)

The circuit for pulsing the distributor clutch magnet during transmission of SPACE picks up positive battery at power terminal 10, passes through the DC fuse, through slip connection 64, through rear contact 2-1 of E relay (E relay energized), through slip connection 10, through contact 3 of the unit counter, through slip connection 36, through front contact 10-9 of advance relay, through slip connection 41, through the distributor magnet, through slip connection 32, through front contact 8-9 of relay P1, through slip connection 62 to negative battery at power terminal 11.

(f) Group Counter Magnet Circuit (Group Counting)

The circuit of the group counter magnet when pulsed through unit counter contact 2, picks up negative battery at power terminal 11, passes through the group counter magnet and escapement contact, through contact 1 on the group counter, through contact 2 on the unit counter, through the distributor pulsing contact, through slip connection 38 on the relay bank, through rear contacts 3-2 of relay P1, through slip connection 64, to the DC fuse and positive battery at power terminal 10. As the escapement armature is pulled downward it opens the escapement contact and removes the shunt from a 2000 ohm resistor in a parallel portion of the group counter

RESTRICTED

magnet circuit extending from the magnet through slip connection 33 on the relay bank, through the resistor, through front contacts 6-5 of relay P1, through slip connection 21 to the opposite side of the escapement contact. This resistor circuit is comparable to the similar circuit associated with the unit counter magnet. See paragraph 302 (c).

(g) Group Counter Magnet Circuit (C.R., C.R., and L.F. Transmission)

The circuit for pulsing the group counter magnet during CARRIAGE RETURN, CARRIAGE RETURN, and LINE FEED transmission is identical with that described under "Group Counting Magnet Circuit (SPACE Transmission)" except that group counter contact 5 replaces unit counter contact 2 in the circuit.

(h) Distributor Magnet Circuit (C.R., C.R., and L.F. Transmission)

The circuit for pulsing the distributor magnet during transmission of CARRIAGE RETURN, CARRIAGE RETURN, and LINE FEED picks up positive battery at power terminal 10, passes through the DC fuse, through contact 7 on the group counter, through slip connection 36 on the relay bank, through front contact 10-9 of the advance relay, through slip connection 41, through the distributor magnet, through slip connection 32, through front contact 8-9 of relay P1, through slip connection 62, to negative battery at power terminal 11.

(i) Circuits for Transmission of C.R. and L.F.

The circuit for the transmission of CARRIAGE RETURN and LINE FEED utilizing contacts 11 and 10, respectively, on the group counter picks up marking line battery (negative) at terminal 1 of the power terminal block and leads to contacts 10 and 11 on the group counter. From contact 11 the circuit passes through slip connection 49 on the relay bank, through forward contact 6-5 on relay P2, through slip connection 50 to distributor contact 4. From contact 10 the circuit passes through slip connection 57 on the relay bank, through rear contact 3-2 of relay P2, through slip connection 56 to distributor contact 2. The circuit from the common side of the distributor contacts is covered in paragraph 302 (a).

(j) Group Eliminator Switch Circuits

(1) Unit Counter Control

With the group eliminator switch in Position 1, the circuit of the unit counter magnet picks up positive battery at power terminal 10, passes through the DC fuse, through slip connection 64 on the relay bank, through front contact 11-10 of relay P2, through slip connection 63, to the rotor on the upper bank of the group eliminator switch, through contact 1 of the switch, through contact 6 and the magnet of the unit counter to negative battery at power terminal 11. This circuit is effective when the group eliminator switch is in any of positions 1, 3, 5, 7, or 9, since the contact points under these designations on the upper bank of the switch are wired in parallel. This circuit is also effective when the group eliminator switch is in any one of positions 2, 4, 6, or 8, which have parallel wiring, except that the circuit extends from these contact points through contact 7 of the unit counter to the magnet.

RESTRICTED

(2) Group Counter Control

The group counter magnet is not pulsed during group elimination when the switch is thrown to position 1. For positions 2 and 3, the contacts of which are in parallel, the circuit of the group counter magnet picks up positive battery at power terminal 10, passes through the DC fuse, through slip connection 64 on the relay bank, through rear contact 10-9 of relay P1, through slip connection 31, through the rotor and contact 2 or 3 on the lower bank of the group eliminator switch, through contact 15 of the group counter, through the group counter magnet to negative battery at power terminal 11. This circuit is also effective for positions 4 and 5, 6 and 7, 8 and 9 with the exception that contact 15 of the group counter is replaced in the circuit by contacts 14, 13, and 12, respective to the paired positions.

(k) Zeroizing Circuits

(1) Unit Counter

When the unit counter is being zeroized in the manner described in paragraph 301 (h), its magnet circuit picks up positive battery at power terminal 10, passes through the DC fuse, through group counter contact 3 to the zero terminal on the upper bank of the group eliminator switch, through contact 7 and the magnet winding of the unit counter to negative battery at power terminal 11.

(2) Group Counter

When the group counter is being zeroized in the manner described in paragraph 301 (h), its magnet circuit picks up positive battery at power terminal 10, passes through the DC fuse, through slip connection 64 on the relay bank, through rear contact 10-9 on relay P1, through slip connection 31, through the rotor and the zero terminal on the lower bank of the group eliminator switch, through group counter contact 16 to the magnet and negative battery at power terminal 11.

(m) Tape Sensing Control Circuits

(1) Advance Relay Operating Circuit

The operating circuit of the advance relay picks up positive battery at power terminal 10, passes through the DC fuse, through the repeat advance switch, through the single step switch, through slip connection 43 on the relay bank, through the winding of the advance relay, through slip connection 44, through timing contact T2, through slip connection 18, through stop relay rear contact 6-5, through start relay front contact 6-5, through slip connection 62 to negative battery at power terminal 11.

(2) Advance Relay Locking Circuit

The locking circuit of the advance relay branches off from the operating circuit at the negative terminal of the advance relay winding, passes through front contact 11-12 of the advance relay and follows the operating path to negative battery.

RESTRICTED

(3) Start Relay Operating Circuit

The operating circuit of the start relay picks up positive battery at power terminal 10, passes through the DC fuse through slip connection 64 on the relay bank, through rear contact 9-10 of the advance relay, through rear contact 3-2 on the stop relay, through the start relay winding, through slip connection 62 to negative battery at power terminal 11.

(4) Start Relay Locking Circuit

The start relay locking circuit picks up positive battery at power terminal 10, passes through the DC fuse, through the start switch, through slip connection 42 on the relay bank, through rear contact 4-5 on the advance relay, through rear contact 7-8 on the start relay, through the relay winding, through slip connection 62 to negative battery at power terminal 11.

(5) Stop Relay Operating Circuit

The operating circuit of the stop relay picks up positive battery at power terminal 10, passes through the DC fuse, through slip connection 64 on the relay bank, through the start relay forward contact 8-7, through the stop relay winding, through slip connection 62 to negative battery at power terminal 11.

(6) Stop Relay Locking Circuit

The locking circuit of the stop relay picks up positive battery at power terminal 10, passes through the DC fuse, through slip connection 64 on the relay bank, through rear contact 7-8 of the advance relay through forward contact 6-5 of the auto-stop relay, through slip connection 29, through the tight tape contact, through the stop switch, through slip connection 19 on the relay bank, through rear contact 7-8 of the stop relay, and joins the operating circuit at the positive side of the stop relay winding.

(7) Auto-Stop Relay Operating Circuits

When the auto-stop relay is energized due to sixth pin action, the operating circuit picks up positive battery at power terminal 10, passes through the DC fuse, through the sixth pin contact, through slip connection 25 on the relay bank, through the winding of the auto-stop relay, through slip connection 62 to negative battery at power terminal 11.

When the auto-stop relay is energized due to closure of the blank contact of the alphabet group on the tape reader, the operating circuit of the auto-stop relay picks up positive battery at power terminal 10, passes through the DC fuse, conductor 5 on the 12 point plug of the internal cable, through the blank contact, through conductor 6 on the 12 point plug of the internal cable and joins the path of the operating circuit at slip connection 25 of the relay bank.

RESTRICTED

(8) Auto-Stop Relay Locking Circuit

The locking circuit of the auto-stop relay picks up positive battery at power terminal 10, passes through the DC fuse through the start contact, through slip connection 42 on the relay bank, through front contact 5-6 on the advance relay, through slip connection 45, through timing contact T5, through slip connection 26 on the relay bank, through rear contact 7-8 on the auto-stop relay and joins the operating circuit at the positive side of the relay winding.

(9) Auto-Stop Indicator Lamp Circuit

This lamp circuit picks up positive battery at power terminal 10, passes through the DC fuse, through slip connection 64 on the relay bank, through forward contact 8-7 of the auto-stop relay, through slip connection 27, through the amber lamp to negative battery at power terminal 11.

(10) Plain Lamp Circuit

This lamp circuit picks up positive battery at power terminal 10, passes through the DC fuse, through slip connection 64 on the relay bank, through rear contact 10-9 of relay P2, through slip connection 61, through the plain lamp to negative battery at power terminal 11.

(n) Relays P1 and P2 Operating Circuits

This circuit picks up positive battery at power terminal 10, passes through the DC fuse, through slip connection 64 on the relay bank, through rear contact 2-3 of E relay, through rear contact 3-2 of D relay, through the windings of relays P1 and P2 in parallel, through slip connection 62 to negative battery at power terminal 11.

303 TRANSLATOR

(a) Components

The translator consists essentially of 5 Baudot code contacts, a SPACE contact, an ERROR-LOCK contact, a set of contacts for pulsing the sensing and distributor clutch magnets, and the mechanism required for the selection and actuation of these contacts. See Figure 34.

(b) Arrangement

The typewheel shaft of the CSP carries a pinion which drives a cam assembly for actuating the translator mechanism. See Figure 36. When the typewheel shaft is in its stop position, a reset bail holds the code rings in the SPACING position against the tension of their springs. In the spacing position the code rings hold the code contacts closed to the SPACING side. Operation of a printer magnet allows a stop pin to move forward and present its code projections to the code rings. When the cam assembly revolves, the reset bail releases the code rings and leaves them tensioned toward MARKING by their springs. Code rings move freely to MARKING or are intercepted by the stop pin in accordance with requirements of the five unit code as represented by the coded teeth on the stop pins.

RESTRICTED

When the fifth contact is closed to MARKING, a latch (Figure 47) becomes effective and holds the contact in this position until after the distributor has completed the transmitting cycle.

When code rings 4 and 5 are positioned to SPACING, a latch lever (Figure 41), under control of the cam assembly, holds these code rings in this position until after the distributor has completed the transmitting cycle.

A pulsing contact lever that rides the cam assembly allows its contact to close in the sensing clutch magnet circuit when the typewheel shaft of the CSP is in the stop position. During translation of a character, the pulsing contact lever closes its contact in the distributor clutch magnet circuit for the transmission of the translated character.

The SPACE contact is controlled by a lever that rides the peripheral surface of the code rings. Code notches in the code rings permit selection of this contact lever on SPACE combination.

This contact is in series with No. 2 contact of the group counter on the tape reader. Coaction of these contacts, when deciphering, effects SPACE recognition by pulsing the group counter to its seventh position on the first deciphered SPACE that follows the sixtieth transmitting cycle. From its seventh position the group counter proceeds to transmit CARRIAGE RETURN, CARRIAGE RETURN and LINE FEED as described in Paragraph 301 (i).

The ERROR-LOCK contact (Figure 38) remains closed during the translation of each five-character group received when deciphering. This contact is connected in series with a SPACE contact SP1 located in the alphabet group on the tape reader. See Paragraph 304 (d). A cam mounted on the end of the spacing shaft of the CSP 889 opens the ERROR-LOCK contact following the translation of each five-character group. This opening of the contact normally takes place while the tape reader is closing a SPACE contact in response to the SPACE code combination which appears between five-letter groups in encyphered tape. If irregular grouping should appear in the encyphered tape, closure of the ERROR-LOCK contact and a SPACE contact on the tape reader, in series, will actuate the auto-stop relay and interrupt tape sensing.

304 TRANSLATOR CIRCUITS

(a) Code Contacts

See Wiring Diagram WD-2417 for translator circuits.

The circuit to the MARKING (lower) code contacts picks up negative line battery at No. 1 terminal of the power connection block on the tape reader, connects with point 6 of the smaller external cable receptacle and follows conductor 6 of that cable to the MARKING code contacts of the translator.

The circuit to the SPACING (upper) code contacts picks up negative line battery at No. 3 terminal on the power connection block, connects with point 7 of the smaller external cable receptacle and follows conductor 7 of the smaller cable to the SPACING code contacts of the translator. Negative battery is supplied to terminal 3 on the tape reader from the signal line circuit of the table.

RESTRICTED

The circuits of the code contact tongues, 1 to 5, inclusive, on the translator follow conductors of corresponding numbers in the smaller cable to the tape reader. Circuits 1 and 5 lead directly to slip connections 60 and 46 respectively on the relay bank, through rear contact 8-7 and front contact 9-8 of relay P2, through slip connections 59 and 47, respectively, to distributor contacts 1 and 5.

Circuits 2 and 4 pass through group counter contacts 8 and 9, respectively, through slip connections 57 and 49, respectively, on the relay bank, through rear contact 2-3 and front contact 6-5 of relay P2, through slip connections 56 and 50, respectively, to distributor contacts 2 and 4.

Circuit 3, when the controller switch is in E position, passes through contact 4 of the unit counter, through slip connection 52 on the relay bank through front contact 3-1 of relay P2, through slip connection 54, to distributor contact 3.

When the control switch is in D position, the circuit leads directly through slip connection 4 on the relay bank, through front contact 9-8 of E relay (which by-passes unit counter contact 4), through slip connection 5, through slip connection 52, through front contact 3-1 of relay P2, through slip connection 54, to distributor contact 3.

The common side of the distributor contacts passes through the DC fuse to positive battery at power terminal 10 which is wired to the electrical service assembly of the table.

(b) Clutch Magnet Pulsing Circuits

The tongue of the clutch magnet pulsing contact picks up positive battery at power terminal 10, passes through the DC fuse to point 12 on the smaller external cable receptacle and follows conductor 12 to the contact tongue.

With the tongue closed to the sensing magnet side (upper), the circuit follows conductor 14 of the smaller cable to the receptacle on the tape reader, passes through the sensing clutch magnet when the controller switch is on E or D, through unit counter contact 1, through group counter contact 6, through slip connection 16 on the relay bank, through front contact 2-3 of the start relay, through front contact 8-7 of the stop relay, through slip connection 62 to negative battery at power terminal 11. With the controller switch on P, R, or O, positive battery is applied steadily through front contact 11-10 of relay P1, through slip connection 35 to point 14 on the smaller receptacle. From this point the circuit follows the path just described, to the sensing clutch magnet.

With the tongue closed to the distributor magnet side (lower), and the controller switch on E or D, the circuit follows conductor B of the smaller cable to the receptacle on the tape reader; passes through slip connection 36 on the relay bank, through front contact 10-9 of the tape advance relay, through slip connection 41, through the distributor magnet, through slip connection 32 on the relay bank, through front contact 8-9 of relay P1, through slip connection 62 to negative battery at power terminal 11. With the controller switch on P, R, or O, positive battery is applied steadily through rear contact 5-4 of relay P1, through slip connection 36 to point 13 of the smaller receptacle. From this point the circuit follows the path just described, to the distributor clutch magnet.

RESTRICTED

(c) Controller Switch Auxiliary Contacts

The circuit leading to the tongue of the auxiliary contacts picks up positive battery at power terminal 10, passes through the DC fuse to point 9 on the smaller external receptacle, through conductor 9 of the cable, and when the switch is on E, through the E contact and conductor 11 of the smaller cable to the tape reader, through slip connection 1 on the relay bank, through the E relay winding, through slip connection 62 to negative battery at power terminal 11.

When the switch is on D, the circuit from the relay tongue passes through the D contact and conductor 10 of the smaller cable to tape reader; through slip connection 20 on the relay bank, through the D relay winding to slip connection 62 and negative battery at power terminal 11.

(d) Error-Lock Circuit (SPACE Contact SP1)

The error-lock contact circuit (effective when the controller switch is in position D) picks up positive battery at power terminal 10, passes through the DC fuse to point 9 on the smaller external receptacle, through conductor 9 of the smaller cable through the tongue and auxiliary contact D of the control switch, through the error contact, through conductor 15 of the smaller cable, to point 15 on the tape reader, through the error contact strap on the disabling block, through the receptacle and conductor 11 of the internal cable, through SPACE contact SP1, through the plug and conductor 6 of the internal cable and joins the operating circuit of the auto-stop relay at slip connection 25 on the relay bank. See Paragraph 302 (m) (7).

(e) SPACE Recognition Circuit

Positive battery reaches the tongue of the control switch auxiliary contacts as described in Paragraph 304 (c). With the switch on D, the circuit extends through the D contact, through the SPACE contact of the translator and conductor 8 of the smaller cable to point 8 of the receptacle on the tape reader; through group counter contact 2, through the group counter magnet to negative battery at power terminal 11.

(f) SPACE Contact SP2 Circuit (Enciphering)

With the controller switch in the E position, the circuit of SPACE contact SP2 picks up AC battery through conductor 27 of the large external cable that connects the CSP with the tape reader, passes through conductor 4 on the plug of the internal cable, through slip connection 40 on the relay bank, through front contact 1-3 of relay P1, through front contact 7-8 of the advance relay, through front contact 11-10 of E relay, through slip connection 3, through conductor 10 on the plug of the internal cable, through SPACE contact P2, through conductor 28 on the large external cable to the SPACE key contact on the CSP.

(g) "A" Contact Shunt

As a step toward facilitation of tandem operation of CSP units, a shunt circuit for the "A" contact of the CSP has been provided on the tape reader only.

RESTRICTED

This circuit leads from terminal 29 of the 33 point receptacle on the tape reader through conductor 8 of the plug on the internal cable, through slip connection 12 on the relay bank, through rear contact 6-7 of E relay and rear contact 4-5 of D relay in parallel, through rear contact 54 of the start relay, through slip connection 14, through conductor 9 on the plug of the internal cable to terminal 30 on the larger tape reader receptacle.

(h) Motor Circuit

The tape reader motor circuit picks up AC battery at power terminal 7, passes through the AC fuse, through one pole of the motor switch, through motor connection No. 2, through the motor windings, through motor connection No. 1, through the other pole of the motor switch to AC battery at power terminal 6.

305 TABLE

The electrical service assembly on the table includes both power and signal line facilities. See Diagram WD-2423.

A switch, pilot lamp, fuse receptacle, power panel, 6 two-point AC receptacles, 2 four-point AC receptacles, 3 three-point DC receptacles, and 1 four-point DC plug are associated with the power supply circuits.

A three-point plug, 2 pairs of line jacks, a 1500 ohm rheostat, a 650 ohm fixed resistor, and an impedance element of ~~1500~~³⁰⁰ ohms DC resistance are associated with the signal line circuit.

The six two-point receptacles are wired to AC power supply terminals on the power panel. All of these receptacles with the exception of the second from the front in both upper and lower rows are associated with the indicator lamp, the fuse, and the switch.

Leads that connect the two four-point receptacles with the power panel may be connected in accordance with notes on Diagram WD-2423, so as to operate the tape reader and typing reperforator motors on AC as applied to the table or from the AC output of the rectifier if voltage adjustment is required.

Wiring leading to a ground terminal provides for grounding the table and the framework of associated apparatus.

The signal line cord of the tape reader connects negative battery from terminal 2 on the tape reader to the center point of the signal line plug on the table. The circuit passes through the rheostat, through the fixed resistor, and thence through two parallel paths; one through the four jacks in series to the larger prong of the plug, through the line cord to terminal 1 on the tape reader and to the MARKING (lower) code contacts of the translator; the other through the impedance element, to the smaller prong of the plug, through the line cord to terminal 3 on the tape reader and to the SPACING (upper) code contacts of the translator. See Paragraphs 302 (b) and 304 (a).

The two pairs of line jacks will accommodate signal line cords from one typing reperforator and one Model 15 printer, if required.

RESTRICTED

306 RECTIFIER

(a) General

The Model REC30 rectifier is a power unit designed to provide filtered direct current suitable for the operation of Teletype signal circuits and to provide the proper A.C. voltage for the operation of series governed motors, when connected to A.C. sources of various voltages and frequencies. The input requirements and the output rating are as follows:

Input: 95, 105, 115, 125, 190, 210, 230, or 250 volts
25, 40, 50, or 60 cycles, single phase A.C.

Output: 0.9 amperes at 120 volts D.C. (No load voltage not to exceed 130 volts)

Also

A.C. at suitable voltage for the operation of three series governed motors at frequencies of 25, 40, 50, or 60 cycles.

The power unit consists essentially of an auto-transformer, necessary control and filament windings for the operation of the grid control rectifier network, an insulating type plate transformer, suitable radio interference filters on both A.C. input and D.C. output circuits, D.C. output filter consisting of a choke and two condensers, resistor network, two grid-controlled rectifier tubes, one voltage standard tube, and one amplifier tube. All of these parts are secured to a metal base which has metal feet for shelf mounting.

The power unit is designed for use in tropical climates and is furnished complete with cover, terminal panel and cords and plugs for making A.C. input, A.C. output for series governed motors and D.C. output connections.

The case is finished in black baked wrinkle enamel.

The approximate dimensions of the power unit are 25" long, 8" wide and 11" high. The approximate net weight is 110 pounds. It is arranged for shock mounting to a resilient base which may be secured to the deck.

(b) Double Pole Power Switch

The double pole power switch, when thrown in the "OFF" position, completely isolates the fuses and flexible leads from the A. C. supply.

CAUTION: Throw switch to "OFF" position before opening hinged door of rectifier cover.

Any terminal on the main terminal panel may be 250 volts above ground potential with switch in the "ON" position.

RESTRICTED

(c) Main Terminal Panel

The main terminal panel, which is located directly behind the hinged door in the cover, contains terminals for A.C. output taps, fuses, and potentiometer. The A.C. input taps for the line voltages of 95, 115, 125, 190, 210, 230 and 250 volts are located on the top and left-hand side of the panel. The A.C. output taps to proper adjusted voltage for operating series governed motors on frequencies of 25, 40, 50, or 60 cycles are located on the right-hand side of the panel.

(d) Cord and Condenser Terminal Panel

The A.C. input, A.C. output and D.C. output cords and two filter condensers terminate on a panel at the left-front of the rectifier. The cover must be removed to gain access to this panel. See wiring diagram WD-2204.

SECTION 4

CORRECTIVE MAINTENANCE - ADJUSTMENTS

401 TAPE READER ADJUSTMENTS

(a) General

The following adjustments are arranged in a sequence that would be followed if a complete readjustment of a set were undertaken. In following such a procedure, parts or assemblies which are removed to facilitate adjustment 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.

The spring tension values indicated herein 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.

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-ups can be replaced when the part is remounted.

Remove the base plate.

Remove the control panel.

NOTE: Before starting to make adjustments, turn the spreader operating lever stop screw to its maximum downward position and set the code bar reset and spreader levers adjustments to their maximum reset positions. See Figure 17.

(b) Motor Position Adjustment

There should be a barely perceptible amount of backlash between the motor pinion and the highest point on the distributor shaft gear. The lateral alignment of the motor pinion and the distributor shaft gear should be such that the center line of the gear coincides with a vertical line through the center of the hole in the motor pinion.

To adjust, shift the motor by taking up the play between the drilled motor mounting holes and the motor mounting screws until the two lines previously mentioned coincide. See that the edges of the motor base are parallel to the respective edges of the motor plate, then tighten the four mounting screws.

Loosen the left motor plate mounting screw and lock nut on the motor plate adjusting screw. Slightly loosen the two right motor plate mounting screws to prevent stripping of the threads while making the following adjustment:

RESTRICTED

By means of the motor plate adjusting screw, adjust the vertical position of the motor pinion until there is a barely perceptible amount of backlash between the motor pinion and the highest point on the distributor shaft gear. This high point may be found by turning the distributor shaft for one complete revolution. Start the motor and carefully readjust the vertical position of the motor pinion by means of the adjusting screw until the gear noise is reduced to a minimum. Tighten the three motor plate mounting screws and the adjusting screw lock nut. Recheck the backlash between the gears.

CAUTION: Care should be exercised in adjusting the vertical position of the motor pinion while the motor is running in order to avoid damaging the distributor shaft gear or reducing the speed of the motor as a result of too close a mesh between the gear and the pinion.

(c) Distributor Cam Cylinder End Play (Figure 5)

The cam cylinder should have some end play, not more than .002". To adjust, loosen the mounting screws in the distributor shaft gear hub and the distributor clutch ratchet, and the two gear clamp nuts on the distributor shaft. Position the clutch ratchet to provide the required clearance. Tighten the ratchet mounting screw. Tighten the gear inner clamp nut just enough to eliminate the distributor shaft end play in the rear ball bearing. Tighten the lock nut. Tighten the gear hub mounting screw. Recheck the cam cylinder end play. There should be some clearance between the end of the distributor shaft and the end of the sensing shaft.

(d) Distributor Clutch Magnet Adjustment

- (1) With the armature held against the core face there should be .002" to .006", between the top surface of the armature extension and the retaining shoulder on the clamp plate. Adjust by means of the clamp plate screws. See Figure 6.
- (2) With the clutch in the STOP position there should be some clearance between the sides of the clutch pawl stop extension and the front and rear edges of the rectangular hole in the armature extension when the play in the armature is taken up in a direction to make the clearance a minimum. To adjust, position the magnet assembly on the base casting. See Figure 5.
- (3) With the armature held against the core face, there should be .006" to .015" clearance between the point of the clutch pawl stop extension and the bottom surface of the armature extension, measured at the left end of the rectangular hole in the armature extension. To adjust, position the magnet yoke on the mounting bracket by means of its two mounting screws. See Figures 5 and 6.
- (4) With the clutch in its STOP position, the point of the clutch pawl stop extension should be flush with or not more than ~~.015~~.005" above the top surface of the armature extension. Adjust by means of the armature up-stop screw. See Figure 7.

- (5) Rotate the clutch so that the pawl is away from the armature extension. Hook an 8 oz. scale under the left end of the armature extension. It should require a pull of 3 to 4 ozs. to start the armature extension moving. See Figure 7.

(e) Distributor Clutch Pawl Spring Tension (Figure 8)

Rotate the clutch so that the pawl springs are on the left side of the shaft and in a vertical position. Rotate the cam backward slightly to free the pawls. Hook an 8 oz. scale under the end of each pawl at the spring hole and pull in line with the spring. It should require 3 to 4 ozs. to start the pawl moving. Check each spring. Hold the check pawl off when measuring the driving pawl spring.

(f) Sensing Shaft Clutch Magnet Adjustment

- (1) With the armature held against the core face there should be .002" to .006", between the top surface of the armature extension and the retaining shoulder on the clamp plate. Adjust by means of the clamp plate screws. See Figure 6.
- (2) With the clutch in its STOP position there should be some clearance between the sides of the clutch pawl stop extension and the front and rear edges of the rectangular hole in the armature extension when the play in the armature is taken up in a direction to make the clearance a minimum. To adjust, position the magnet assembly on the base casting. See Figure 5.
- (3) With the armature held against the core face there should be .006" to .015" clearance between the point of the clutch pawl stop extension and the bottom surface of the armature extension, measured at the left end of the rectangular hole in the armature extension. To adjust, position the magnet yoke on the mounting bracket by means of its two mounting screws. See Figures 5 and 6.
- (4) With the clutch in its STOP position, the point of the clutch pawl stop extension should be flush with, or not more than .010" above the top surface of the armature extension. Adjust by means of the armature up-stop screw. See Figure 7.
- (5) Rotate the clutch so that the pawl is away from the armature extension. Hook an 8 oz. scale under the left end of the armature extension. It should require a pull of 3 to 4 ozs. to start the armature extension moving. See Figure 7.

(g) Sensing Shaft Clutch Pawl Spring Tension

Rotate the clutch so that the pawl springs are on the left side of the shaft and in a vertical position. Rotate the cam backward slightly to free the pawls. Hook an 8 oz. scale under the end of each pawl at the spring hole and pull in line with the spring. It should require 2-1/2 to 3-1/2 ozs. to start the pawls moving. Check each spring. Hold the check pawl off when measuring the driving pawl spring. Check in manner shown in Figure 8.

RESTRICTED

THERE SHOULD BE A BARELY PERCEPTIBLE AMOUNT OF BACKLASH BETWEEN THE COUNTING SHAFT GEAR AND THE DISTRIBUTOR SHAFT GEAR AT THE CLOSEST POINT BETWEEN THE GEARS. CHECK THROUGHOUT A COMPLETE REVOLUTION OF THE LARGER GEAR. TO ADJUST, ADD OR REMOVE AN EQUAL NUMBER OF SHIMS UNDER THE COUNTING SHAFT BRACKETS

(h) Detent Adjustment (Figure 9)

With the cam held fully in its STOP position, there should be some clearance, not more than .006", between the left edge of the detent hook and the shoulder of the notch in the cam. To adjust, rotate the detent eccentric. The detent should ride fully on its cam. Check on both the distributor and sensing shaft.

With each detent lever in the indent of its cam and the armature unoperated, the clutch pawl should have some play in a direction away from the stopping surface of the slot in the armature extension. Check both clutch pawl extensions.

(i) Detent Spring Tension (Figure 10)

With each detent resting on the high part of its cam, hook an 8 oz. scale just back of the hook end of the detent lever and pull upward. It should require a pull of 3 to 5 ozs. to move the detent away from the cam. Measure each detent spring.

(j) Distributor Contact Bracket Adjustment

The contact levers should ride approximately in the center of their cams. To adjust, position the contact bracket by means of its mounting screws. See Figure 5.

(k) Distributor Contact Gap Adjustment

With any contact lever on the high part of its cam, the contact gap should be .020" to .025". To adjust, bend the shorter contact spring. See Figure 11.

NOTE: The start-stop contact gap may be .015" to .025".

(l) Distributor Contact Spring Pressure

With any contact lever on the low part of its cam, apply an 8 oz. push scale to the long contact spring just above the contact. It should require a force of 4-1/2 to 5-1/2 ozs. to open the contacts. To adjust, bend the long contact spring and stiffener. Recheck the contact gap adjustment. See Figure 12.

(m) Timing Contact Bracket Adjustment

The contact levers should ride approximately in the center of their cams. To adjust, position the bracket by means of its mounting screws.

(n) Timing Contact Gap Adjustment

With any contact lever on the high part of its cam, the contact gap should be .020" to .025". To adjust, bend the shorter contact spring.

(o) Timing Contact Spring Pressure

With any contact lever on the low part of its cam, apply an 8 oz. scale to the top of the long contact spring and pull at right angle to the

RESTRICTED

spring. It should require a force of 3 to 4 ozs. to open the contacts. To adjust, bend the long contact spring and stiffener. Recheck the contact gap adjustment.

(p) Unit Counter Contact Bracket Adjustment

The contact levers should ride approximately in the center of their cams. To adjust, position the bracket by means of its mounting screws.

(q) Unit Counter Contact Gap Adjustment

With any contact lever on the high part of its cam, the contact gap should be .020" to .025". To adjust, bend the shorter contact spring. See Figure 13 for location of parts.

(r) Unit Counter Contact Spring Pressure (Figure 13)

With any contact lever on the low part of its cam, apply an 8 oz. push scale at the top of the long contact spring. It should require 3 to 4 ozs. to open the contacts. To adjust, bend the long contact spring and stiffener. Recheck the contact gap adjustment.

(s) Group Contact Bracket Adjustment

The contact levers should ride approximately in the center of their cams. To adjust, position each bracket by means of its mounting screws.

(t) Group Counter Contact Gap Adjustment

With any contact lever on the high part of its cam, the contact gap should be .020" to .025". To adjust, bend the shorter contact spring. See Figure 13.

(u) Group Counter Contact Spring Pressure

With any contact lever on the low part of its cam, apply an 8 oz. scale at the top of the long contact spring. It should require 3 to 4 ozs. to open the contacts. To adjust, bend the long contact spring and stiffener. Recheck the contact gap adjustment. See Figure 13.

(v) Unit Counter Escapement Magnet Adjustments

- (1) With the armature held in its downward position, the lower surface of the armature should be approximately parallel to the ends of the magnet yoke and the magnet bracket. See Figure 14.
- (2) The armature should have some side play, not more than .004". To adjust, position the armature shaft by means of its set screw. See Figure 14.
- (3) With the armature held in its operated position and a peak of the No. 8 cam resting in the dwell of its contact lever, the lower end of the escapement pawl should be against the radial face of a tooth in the ratchet and the escapement pawl should align with the ratchet within .020". To adjust, position the magnet assembly by means of its mounting screws. With the armature held

RESTRICTED

in its downward position and the lower end of the escapement pawl against the radial face of a tooth on the ratchet, the points of Nos. 6 and 7^{cams} should rest on the dwells of their contact levers. Make this check for every tooth on the ratchet.

- (4) With the armature held in its operated position, there should be a clearance of .010" to .020" between the bottom of a notch in the ratchet and the upper surface of the lower escapement prong measured at the point of least clearance. To adjust, position the escapement pawl by means of its mounting screws. See Figure 14.
- (5) With the armature against its up-stop screw, there should be a clearance of .004" to .010" between the point of the upper escapement prong and the bottom of a notch in the ratchet. To adjust, rotate the up-stop screw. See Figure 15.
- (6) With the armature fully down, the point of the upper escapement prong should clear the ratchet teeth by at least .002". See Figure 14.

With the armature up, the point of the lower escapement prong should clear the ratchet teeth by at least .002". Check for a complete revolution of the ratchet. If necessary, refine adjustments (4) and (5). See Figure 15. Check for this clearance at each tooth on the ratchet.

(w) Group Counter Escapement Magnet Adjustments

- (1) With the armature held in its downward position, the lower surface of the armature should be approximately parallel to the ends of the magnet yoke. To adjust, add or remove shims between the magnet yoke and the magnet bracket. See Figure 14.
- (2) The armature should have some side play, not more than .004". To adjust, position the armature shaft by means of its set screw. See Figure 14.
- (3) With the armature held in its operated position and a peak of the No. 1 cam resting in the dwell of its contact lever, the lower end of the escapement pawl should be against the radial face of a tooth in the ratchet and the escapement pawl should align with the ratchet within .020". To adjust, position the magnet assembly by means of its mounting screws. With the armature held in its downward position and the lower end of the escapement pawl against the radial face of a tooth on the ratchet the points of Nos. 12, 13, 14, 15, and 16 cams should rest on the dwells of their respective contact levers. Make this check for every tooth on the ratchet.
- (4) With the armature held in its downward position, there should be a clearance of .010" to .020" between the bottom of a notch in the ratchet and the upper surface of the lower escapement prong, measured at the point of least clearance. To adjust, position the escapement pawl by means of its mounting screws. See Figure 14.

RESTRICTED

- (5) With the armature against its up-stop screw, there should be a clearance of .004" to .010" between the point of the upper escapement prong and the bottom of a notch in the ratchet. To adjust, rotate the up-stop screw. See Figure 15.
- (6) With the armature fully down, the point of the upper escapement prong should clear the ratchet teeth by at least .002". See Figure 14.

With the armature up, the point of the lower escapement prong should clear the ratchet teeth by at least .002". Check for a complete revolution of the ratchet. If necessary, refine adjustments (4) and (5). See Figure 15. Check for this clearance at each tooth on the ratchet.

(x) Escapement Magnet Armature Spring Tension (Figure 15)

Apply a 32 oz. push scale at the front end of the armature against the bearing bracket and push downward. It should require 7 to 9 ozs. to move the armature from its up-stop. Check each magnet assembly.

(y) Spreader Eccentrics Adjustment

When the operating cam is rotated slowly, the right and left alphabet contact levers (both upper and lower) should move away from the code bars at approximately the same instant. To adjust, rotate the two spreader eccentrics. See Figure 16 for location of parts.

(z) Spreader Lever Adjustment (Figure 16)

- (1) With the spreader lever roller on the high part of its cam, there should be ~~.010"~~ ^{.013"} to ~~.020"~~ ^{.023"} clearance between the alphabet contact levers and the No. 1 code bar (code bar closest to rear of machine), when the play is taken up in a direction to make this clearance a minimum. Adjust by means of the spreader operating lever clamp screw. Recheck "spreader eccentric adjustment."
- (2) With the spreader lever on the low part of its cam and all code bars in the MARKING position, each unselected alphabet contact lever should be blocked by the full thickness of the contact lever at each code bar. Each selected alphabet contact lever should clear both sides of the notch in the code bar by at least .006". Make this check at each code bar.

(aa) Spreader Lever Stop Screw Adjustment (Figure 17)

With the spreader lever roller on the highest part of its cam, there should be some clearance, not more than .006", between the head of the stop screw and the spreader lever. To adjust, rotate the stop screw.

(bb) Spreader Bar Spring Tension (Figure 17)

With the spreader lever roller on the high part of its cam, unhook the spring from the spring post and hook an 8 oz. scale in the spring loop. It should require ~~5~~ ²² to ~~7~~ ¹⁶ ozs. to pull the spring to position length. Replace the spring.

RESTRICTED

Remove the alphabet contact assembly from the base casting.

(cc) Alphabet Contact Lever Spring Tension (Figure 19)

With the sensing cam sleeve in its STOP position, hook an 8 oz. scale over the front end of each lower contact lever just below the lobe and pull at a right angle to the lever. It should require 3 to 4 ozs. to start the lever moving. Check each upper lever for freeness.

(dd) Alphabet Contact Adjustments (Figure 18)

- (1) Each contact assembly should be positioned so that the contact lever is approximately in the center of the contact insulator. The contact springs should clear the steel spacers by at least .010".
- (2) Apply an 8 oz. push scale to the short contact spring at the contact point and push at right angle to the spring. It should require some tension not more than 1-1/2 ozs. to move the spring away from the bakelite stop. To adjust, bend the short contact spring. Check each contact.
- (3) Apply an 8 oz. push scale to the long contact spring in line with the contacts. It should require 1/4 to 1-1/2 ozs. to move the long contact spring away from the bakelite stop. To adjust, bend the long contact spring. Check each spring.
- (4) The contact gaps should be .010" to .025". The two contacts in any pile-up should close at approximately the same time. To adjust, bend the ends of the short contact springs. Recheck adjustment (1).

Replace the alphabet contact assembly.

- (5) The lobe on the contact lever should operate approximately at the center of the contact lever insulator. With the alphabet contact levers resting against the code bars but not selected, there should be a clearance of .010" to .040" between the insulator of the long contact spring and the contact lever. To adjust, bend the long contact spring between the insulator and the contacts. Check each contact. In each group of contacts the clearance should be equal within .020". Recheck adjustments (2) and (3). See Figure 19.

(ee) Tape Sensing Adjustments

Remove the top plate. Care should be exercised to avoid the loss of the sixth pin and spring.

(ff) Tape Feed Pawl Spring Tension Adjustment (Figure 20)

Rotate the tape sensing cam until the feed pawl is in its uppermost position. Apply the push end of an 8 oz. scale to the feeding tip of the tape feed pawl and push horizontally toward the left. It should require 1 to 2 ozs. to hold the pawl in a vertical position. To adjust, loosen the feed pawl mounting screw and position the spring. Tighten the mounting screw.

RESTRICTED

(gg) Feed Lever Spring Tension Adjustment (Figure 20)

With the tape feed lever roller on the low part of its cam, hook a 32 oz. scale under the end of the feed lever (just below the spring hole) and pull upward in line with the spring. It should require 17 to 19 ozs. to start the feed lever moving. To adjust, loosen the terminal screw and position the spring anchor. Tighten the terminal screw.

(hh) Tape Feed Wheel Shaft Bearing Adjustment

The feed wheel shaft should be free in its bearings and should have some end play, not more than .002". To adjust, loosen the feed wheel shaft bearing mounting screws and position the bearings. Tighten the screws. See Figure 24 for location of parts.

(ii) Detent Lever Spring Tension (Figure 22)

Hold the transmitter top plate upside down and in a horizontal plane. Make sure that the detent roller is resting in the hollow between two teeth on the feed wheel ratchet. Hook a 32 oz. scale to the lobe of the detent lever in line with the spring and pull horizontally against the tension of the spring. It should require 12 to 15 ozs. to start the detent lever moving.

(jj) Tape Retaining Lid Latch Wearing Strip Shims Adjustment

With a .003" thickness gauge placed between the retaining lid and the front guide rail on the tape guide, the latch should not close freely. With the gauge removed and the retaining lid held against the front guide rail, the latch should operate freely under its own spring tension. To adjust, increase or decrease the number of shims installed between the latch wearing strip and the top plate. See Figure 25.

(kk) Sixth Pin Spring Tension (Figure 22)

With the transmitter top plate held upside down and in a horizontal position, it should require 1 to 2 ozs. to push the sixth pin downward until the shoulder touches the pin guide.

(ll) Sixth Pin Guide Adjustment

When a piece of tape which has been notched by means of the tape notcher is inserted in the tape guide so that the notch is over the sixth pin hole, the sixth pin should just clear the bottom of the notch in the tape. To adjust, position the sixth pin guide by means of its mounting screws. See Figure 22.

Replace the transmitter top plate. When doing this, hold the feed pawl up so that it engages the feed wheel ratchet. Hold the sixth pin to prevent it from falling out of its guide.

NOTE: There should be at least .020" clearance between the side of the feed pawl spring and the sensing lever guide. There should also be at least .025" clearance between the feed pawl spring and the feed wheel ratchet when the feed pawl is in its uppermost position. If these clearances do not exist, modify the Tape Feed Pawl Spring

RESTRICTED

Tension Adjustment within its specified limits to obtain the required clearance. See Figure 24.

(mm) Tape Space Adjustment (Figure 23)

The clearance between the tape guide and the retaining plate should be .011" to .014" throughout the area of the retaining plate when the retaining lid is latched closed, and the play taken up in a direction to make this clearance a minimum. To adjust, increase or decrease the number of shims installed between the retaining lid and the retaining plate.

(nn) Tape Guide Adjustment (Figure 24)

When a piece of perforated tape is engaged with the pins of the feed wheel, there should be equal clearance between the edges of the tape and the tape guide. To adjust, loosen the tape guide mounting screws and position the guide. Tighten the screws.

(oo) Tape Retaining Plate Adjustment

The retaining plate should be positioned so that its edges are approximately parallel to the tape guide and so that the ribs are equally spaced between the tape pins. To adjust, loosen the mounting screws and position the plate. Tighten the screws. See Figures 23 and 25.

(pp) Retaining Lid Latch Spring Adjustment (Figure 25)

With the slope on the latch resting against the top plate (not latched), hook an 8 oz. scale to the upper end of the latch and pull at right angles to the formed upper end of the latch. It should require 1-1/2 to 7 ozs. to start the latch moving on its pivot.

(qq) Detent Bracket Adjustment

Obtain a piece of tape perforated with a series of LETTERS combinations. Check the tape to determine if the spacing of the perforations meets the requirement of 10 holes to the inch. (Fold the lids of one set of five perforations backward so that the lids do not obstruct the holes.) Engage the feed perforations with the feed wheel so that the unobstructed perforations are over the tape pins. With the detent roller resting in an indent between two teeth of the feed wheel ratchet and with the tape pins flush, take up the play of the tape on the feed wheel toward the left. The tape pin farthest to the right should just clear the right edge of its associated code hole. To adjust, loosen the detent bracket mounting screws (Figure 24) and position the bracket. Tighten the mounting screws.

(rr) Tape Feed Lever Adjustment (Figure 26)

With the sensing shaft in its STOP position and the detent roller resting between two teeth on the feed wheel ratchet, there should be some clearance, not more than .010", between the face of the first tooth below the horizontal center line on the ratchet wheel and the face of the feed pawl. To adjust, loosen the feed lever extension clamp screw (Figure 20) and position the extension. Tighten the screw and recheck the clearance.

RESTRICTED

(ss) Contact Tongue Adjustment

- (1) Burnish all contacts with a worn contact file or burnisher.
- (2) Straighten the contact tongues by bending* so that they are parallel (both crosswise and lengthwise) to the upper contact screw bridge.
- (3) Staggered contacts; i.e., contact tongues not in the same plane, are permissible provided this staggering does not exceed .030". See Figure 28.

* Use tool No. 88882. (Spring bender)

(tt) Operating Bail Adjustment

Back off the sensing contact screws. With the operating cam in its STOP position, the operating bail should be adjusted, by means of its clamp screw, (Figure 27) so that the top of the longest tape pin is just flush with or not more than .005" below the surface of the tape guide.

(uu) Sensing Contact Screw Adjustment (Figure 21)

With the operating bail on the low part of its cam and a straight edge held across the top of the tape guide directly over the tape pins, the pins should just touch the straight edge or be not more than .005" below it. To adjust, loosen the lower sensing contact set screw and rotate the lower sensing contact screw. Tighten the set screw.

NOTE: When making this adjustment make sure that the transfer levers do not interfere with the movement of the sensing levers.

(vv) Sensing Contact Upstop Screws Adjustment (Figure 21)

With the operating bail roller on the low part of its cam, there should be .006" to .010" clearance between each upstop screw and its corresponding contact. To adjust, rotate the upstop screw.

(ww) Transfer Lever Bracket Shims Adjustment

With the operating cam in its STOP position, the clearance between the lower ends of the Nos. 1 and 5 sensing levers and their corresponding transfer levers should be equal within .005". To adjust, add or remove shims under the transfer lever bracket at the end having the greater clearance. There should be no shims under the end having the lesser clearance. Insert unused shims under the heads of the mounting screws. See Figure 29 for location of parts.

(xx) Operating Bail Spring Tension (Figure 21)

Rotate the sensing shaft to its STOP position. Insert a piece of blank tape in the transmitter tape guide and close the tape retaining lid. Rotate the sensing shaft until the operating bail roller is on the low part of its cam. Hook an 8 oz. scale under the operating bail clamp screw and pull upward. It should require from 3-1/2 to 4-1/2 ozs. to start the bail moving.

RESTRICTED

(yy) Tape Sensing Lever Spring Tension Adjustment (Figure 21)

Set the operating bail roller on the low part of its cam. Hook an 8 oz. scale under the horizontal portion of a sensing lever and, with the scale rod just clearing the contact tongue pivotal mounting, pull vertically upward. It should require 6 to 6-1/2 ozs. to separate the contacts. Use a test lamp to determine when the contacts break. Measure all sensing lever springs in the same manner. To adjust, loosen the contact lever spring anchor terminal screws and position the anchors. Tighten the terminal screws.

(zz) Transfer Lever Bracket Adjustment (Figure 29)

With the tape pins up and the code bar reset bail lever on the low part of its cam, there should be some clearance, not more than .010" between the right edge of each transfer lever and its corresponding sensing lever. To adjust, position the transfer lever bracket. Make sure the transfer levers are free in their guide plates.

(aaa) Code Bar Reset Lever Adjustment (Figure 27)

With the sensing shaft in its STOP position, there should be a clearance of .015" to .025" between the lower end of each sensing lever and its corresponding transfer lever. Adjust by means of the code bar reset lever clamp screw.

* (bbb)(1) Code Bar Reset Bail Backstop Screws Adjustment (Figure 29)

With the code bar reset bail roller resting on the low part of its cam, turn in the backstop screws until they just touch the code bar reset bail. After making this adjustment there should not be more than .002" clearance between the roller and the low part of its cam if the bail is resting against the backstop screw or not more than .002" between the bail and the backstop screws if the bail is resting against the cam.

(ccc) Code Bar Spring Tension (Figure 29)

With the code bar reset bail against its backstop screws and the spreader lever roller (Figure 17) on the high part of its cam, apply the push end of an 8 oz. scale against the right end of the code bar and push in line with the code bar. It should require from 5 to 7 ozs. to start the code bar moving. Check each code bar.

(ddd) Sixth Pin Contact Adjustment

- (1) With the sixth pin contact lever on the high part of its cam, there should be some clearance, not more than .010", between the bottom of the contact lever when the pin is pushed up against a straightedge held in the bottom of the tape guide over the sixth pin hole. To adjust, position the sixth pin contact lever bracket by means of its mounting screws. See Figure 30.
- (2) With a piece of tape in the tape guide, the retaining lid latched, and the transmitter cam sleeve rotated so that the sixth pin contact lever is off the high part of its cam, there

should be .008" to .012" gap between the contacts. To adjust, bend the short contact spring stiffener. See Figure 31.

- (3) With the sixth pin operating lever on the high part of its cam, hook an 8 oz. scale over the top of the short contact spring. It should require at least 4 ozs. to start the spring moving away from its stiffener. To adjust, bend the short contact spring. Recheck adjustment (2). See Figure 30.
- (4) With the sixth pin contact lever held away from the long contact spring insulator, apply an 8 oz. push scale to the insulator. It should require 2 to 3 ozs. to open the contacts. To adjust, bend the long contact spring. See Figure 31.

(eee) Sixth Pin Contact Lever Spring Tension (Figure 31)

With the sixth pin contact lever on the low part of its cam, hook an 8 oz. scale to the lever at the spring. Hold the long contact spring and the sixth pin off, and pull in line with the spring. It should require 3/4 to 1-1/2 ozs. to start the lever moving.

(fff) Tight-Tape-Stop Mechanism Adjustments (Figure 32)

- (1) The tape lever should be approximately parallel to the right edge of the transmitter top plate. To adjust, position the bracket by means of its mounting screws.
- (2) The end of the tape lever should be approximately flush with the face of the collar and, when the lever is held up at an angle of approximately 45 degrees, the tension spring should extend across the center of the set collar. To adjust, position the set collar.
- (3) The contacts should be closed when the tape lever is in a horizontal position. To adjust, position the contact operating post. The tape lever should operate freely in the bearings.
- (4) With the tape lever in its upward position, there should be .015" to .025" clearance between the rear contact insulator and the mounting bracket, and .015" to .025" gap between the contacts. To adjust, bend the contact springs.

(ggg) Escapement Magnet Assembly Contact Adjustments

- (1) With the armature held in its downward position, the contact gap should be .008" to .015". To adjust, bend the short contact spring stiffener. See Figure 14.
- (2) Apply an 8 oz. push scale to the short contact spring just above the stiffener. It should require at least 4 ozs. to start the spring moving away from the stiffener. To adjust, bend the short contact spring. Recheck adjustment (1). See Figure 14.

RESTRICTED

- (3) With the armature up, hook an 8 oz. scale to the long contact spring at the contact and pull at a right angle to the spring. It should require 3 to 4 ozs. to open the contacts. To adjust, bend the long contact spring. There should be some clearance between the end of the operating extension and the long contact spring insulator. See Figure 15.

(hhh) Unit and Group Counter Friction Clutch Torque (Figure 33)

Allow the motor to run at least 10 minutes before measuring the torque. Hook a 64 oz. scale to the point of a tooth in the ratchet, and pull in a line tangent to the ratchet. It should require 32 to 40 ozs. to start the ratchet moving away from the escapement prong.

(iii) Synchronous Motor Requirements

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

- (1) Remove the motor unit from the base and remove the motor fan and pinion.
- (2) Remove the switch end shield screws and the switch commutator mounting screws. Remove the switch end shield.
- (3) Pull out the rotor until the brush holder spring is accessible and remove the spring.
- (4) The tension of the spring for 60 cycle motors should measure 3 to 3-3/4 ozs. when extended to a length of 5 inches, using an 8 oz. scale. The tension of the spring for 50 cycle motors should measure 1-1/2 to 2-1/2 ozs. when extended to a length of 5 inches, using an 8 oz. scale.
- (5) The brush holders should be mounted by means of the center set of mounting holes and should be free.
- (6) The brush holder stop pins should be safely within the holes of the fiber disc when all the play in the brush holders has been taken up so as to make the engagement of the pins with the disc a minimum.
- (7) Replace the brush holder spring, making certain that the spring eyes are fully engaged with each other.
- (8) Replace the switch commutator screws and tighten the two screws alternately, a little at a time, until both screws are tight.
- (9) Replace the switch end shield screws using the same precaution in tightening as in the foregoing.
- (10) Apply the push end of a 12 lb. scale against the fan end of the shaft and push in line with the shaft. It should require at least 7 lbs. pressure to start the shaft moving.

RESTRICTED

- (11) Replace the motor fan and pinion. Replace the motor unit on the base and adjust its position.

402 RELAY ADJUSTMENT

(a) Assembly Requirements

These requirements are attained in the assembly of the relay and need be checked only if the relay has been dismantled to replace worn or damaged parts. The relays may be adjusted to meet these requirements by loosening the screws and positioning the various components or bending associated parts when necessary.

- (1) There should be at least .008" clearance between the armature and the adjusting stud in all positions of the armature travel. Gauge by eye. In questionable cases use an .008" feeler gauge.
- (2) The outer edges of the contact springs should be aligned within 1/32". Gauge by eye.
- (3) The contact forms should be aligned so that the width of the contacting surface of one contact bar falls wholly within the length of its mating contact bar. Gauge by eye.
- (4) The edges of all contact springs should clear the edges of the spool head by at least .010". Gauge by eye or use .010" feeler gauge.
- (5) The spring studs should not rub or touch the sides of the holes through which they pass during operation of the relay.
- (6) Spring tangs should rest on the spool head as shown in Figure 58. Gauge by eye.
- (7) The armature should be centered with the relay core and the legs of the armature must clear the spool head (Figure 59) at all times. Gauge by eye.
- (8) Both legs of the armature should bear against the hinge bracket with the relay energized and continue to bear against it when released. Gauge by eye. Operate relay electrically.

NOTE: These relays are designed to operate on full 120 volts DC. However, to avoid the blowing of fuses due to short circuiting the leads while attaching them to the relay, a 60 watt lamp should be placed in series with the relay coil when energizing the relay for adjusting purposes.

(b) Adjustment Requirements

These requirements will need to be checked periodically as well as after any repairs or replacements have been made on the relay.

- (1) Adjust the backstop nut so that, with the relay unoperated, a .050" gauge will go between the armature and core and a .056" gauge will not go.

RESTRICTED

Use gauges from the No. 114197 nest of gauges inserted as shown in Figure 59.

- (2) All springs should be free from sharp kinks or bends. A gradual bow is permissible. Gauge by eye.
- (3) There should be at least .008" clearance between adjacent springs in both operated and unoperated positions. Gauge by eye or use .008" feeler gauge.
- (4) Contact Spring Tensions

- (4.1) All springs should be tensioned toward the armature. The springs indicated "arm. oper." (Figures 60, 61, and 62) should be measured with the armature operated.

All other springs should be measured with the armature unoperated.

All springs should be measured with the scale applied to a point between the contacts and the end of the spring.

The tension of a bifurcated spring (Figure 58) should be measured by engaging both legs of the spring at the same time.

The tension of any spring should be measured by lifting it slightly off its resting place so that there is a perceptible space between the spring and its resting place.

The tensions should be adjusted by bending the contact springs with spring adjustors 114199, 114200, 114202, or 102438.

- (4.2) Springs designated "A" (Figures 60, 61, and 62) need have no definite tension but should be tensioned toward the armature. When the "A" springs are tensioned against the armature, either directly or indirectly through studs, the tensions of all such "A" springs together with the No. 6 and No 8 "D" springs on No. 112925 relay, should hold the armature against the adjusting nut with a pressure of at least 18 grams. Measure by applying the end of a No. 114198 gram scale to the back of the armature just below the adjusting nut, in line with the tops of the contact springs.

NOTE: The loads of the two banks of contacts on each relay should be distributed so that the difference in load between the two is not greater than 2-1/2 times. To measure this, apply the gram scale to the "A" spring nearest the armature, at the stud, in a direction to move the spring away from the armature.

- (4.3) Each spring designated "B" should have a tension of at least 18 grams against its associated "C" spring.

NOTE: When checking "B" spring No. 7 on relay No. 112923, the combined tension of "D" spring No. 5 and "B" spring No. 7 is taken with the scale applied to the "B" spring.

When checking "B" spring No. 5 on relay No. 112923, the combined tension of "D" spring No. 2 and "B" spring No. 5 is taken with the scale applied to the "B" spring.

- (4.4) Each spring designated "C" should have a tension of at least 25 grams against the spool head notches.
- (4.5) Each spring designated "D" should have a tension of at least 5 grams.
- (4.6) Spring designated "E" should have a tension of at least 28 grams.
- (5) Armature Alignment
 - (5.1) Relays 112924 and 112925

With the relay energized as indicated in Paragraph (a) (8), at least one stop button on the armature should rest against the core. The other button should not clear the core by more than .005". Gauge visually and with a .005" feeler gauge.
 - (5.2) No. 112923 Relay

With the relay energized, only the embossed surface of the armature should rest against the core.
 - (5.3) To make the above adjustment, bend the leg of the armature hinge bracket associated with the side that does not touch the core.
- (6) Stud Gap
 - (6.1) With the armature unoperated, the clearance at points "S" shown in Figure 60, 61, and 62 should be from .002" to .004".
 - (6.2) With the armature unoperated, the clearance at points "T" should be at least .006".
 - (6.3) To meet these requirements, bend the tangs of the "C" springs involved.

NOTE: It may be necessary to readjust the tensions of the "C" springs and their associated "A", "B", or "D" springs to meet these requirements.

RESTRICTED

(7) Contact Gap and Make Requirements

- (7.1) There should be at least .005" clearance between each pair of contacts normally open with the relay unoperated. The contact separation between the contacts designated "U" in Figure 60 should be at least .010".
- (7.2) Insert an .018" gauge from the 114197 nest of gauges as shown in Figure 60 and energize the relay as described in Paragraph (a) (8). Contacts which are normally open with the relay unoperated should remain open. Contacts designated "U" in Figure 60 need not adhere to this requirement.
- (7.3) With an .008" gauge inserted as above, at least one pair of normally open contacts on each spring should close.
- (7.4) With the relay energized without a gauge between the armature and core, all normally closed contacts should have a gap of at least .005".
- (7.5) With the relay energized as in item (7.4) above, both contacts on each pair of normally open contacts should make.
- (7.6) To meet these requirements it will be necessary to bend the tangs of the "C" springs. The stud gaps and spring tensions associated with any "C" spring readjusted must be rechecked and readjusted if disturbed from the requirements previously given.

(c) Operating Requirements

- (1) Energize the relay as described in Paragraph (a) (8) and see if the armature pulls up firmly against the core without apparent lag or hesitation.

NOTE: If the relay does not meet this requirement, lighten the tensions on the "A," "B," and "D" springs within their specified limits.

- (2) With the relay energized, see that good contact is established with the heavy springs. To make this test apply the end of the 94646 orange stick to the heavy spring and move it away from the light spring. The light spring should follow the heavy spring for a short distance before the contacts open.
- (3) With the relay unoperated, repeat this test with the contacts that are normally closed.

403 TRANSLATOR ADJUSTMENTS (Including Certain Adjustments on the CSP)

(a) Before adjusting the translator, remove the following:

- (1) The ENG-308 from the CSP
- (2) The front cover from the translator
- (3) The stop pin guide

RESTRICTED

NOTE: To set the translator cam assembly in its STOP position, rotate the shaft until the scribed line on the pulsing contact lever is approximately in line with the scribed line on its cam. See Figure 46.

(b) Code Ring Guide Post Adjustment (Figure 35)

The code ring guide posts should permit each code ring to have a barely perceptible amount of play as measured between the ring and any one post. To adjust, position the right-hand guide post bracket by means of its mounting screws.

Loosen the gear and cam assembly mounting bracket.

(c) Translator Mounting Plate Adjustment (Figure 35)

With the code ring reset bail on the high part of its cam, turn the reset bail eccentric to provide some clearance between the blocking edges of the teeth on the No. 4 code ring and the "A", "L", and "Z" stop pins. This clearance at the "A", "L", and "Z" stop pins should be equal within .006". To adjust, position the mounting plate by means of its mounting screws.

(d) Gear and Cam Assembly Mounting Bracket Adjustment (Figure 35)

The gears should have a perceptible amount of backlash throughout a complete revolution of the larger gear. To adjust, position the cam assembly mounting bracket by means of its mounting screws. The cam assembly should have a perceptible end play on its bearing post.

Replace the stop pin guide.

(e) Stop Pin Guide Adjustment (Figure 36)

There should be some clearance between the inner edge of each stop pin and the end of its guide notch.

The pins should not rest constantly against either side of the guide notches and should operate freely. To adjust, position the guide on the code ring posts.

(f) Code Ring Reset Bail Eccentric Adjustment (Figures 35 and 36)

With the operating cam assembly in the STOP position, there should be .030" to .040" clearance between the blocking edge of a tooth on the No. 4 code ring and the "A", "L", and "Z" stop pins when these stop pins are selected. To adjust, rotate the reset bail eccentric.

(g) Space Recognition Contact Lever Extension Adjustment (Figure 36)

With the Nos. 1, 2, 4, and 5 code rings blocked by the space stop pin, there should be a clearance of .015" to .035" between the upper surface of the extension blade and the lower edge of the code ring extensions. Check each ring when the play is taken up in a direction to make this clearance a minimum. To adjust, position the extension blade by means of its mounting screws.

RESTRICTED

(h) Pulsing Contact Lever Eccentric Adjustment (Figure 37)

With the code rings in the MARKING position, the reset bail on the low part of its cam and the pulsing contact lever on the high part of its cam, there should be .020" to .030" clearance between the edge of the extension blade and the ends of the code ring extensions. To adjust, rotate the eccentric.

(i) Error Contact Adjustment (Figures 38 and 39)

- (1) With the push end of an 8 oz. scale applied to the long contact spring between the contact point and the insulator, it should require a pressure of 1 to 2 ozs. to open the contacts. To adjust, bend the long contact spring. The two contacts should close at approximately the same time. To adjust, bend the shorter contact spring. See Figure 38.
- (2) With the longer contact spring insulator on the high part of its cam, the contact gap should be .015" to .025". To adjust, position the contact bracket by means of its mounting screws. See Figure 39.

(j) Nos. 4 and 5 Code Ring Latch Blade Adjustment (Figures 40 and 41)

- (1) Select E, N, T, or Z stop pin (Figure 35) and rotate the cam assembly slowly until the latch lever is on the low part of its cam. There should be a clearance of .010" to .035" between the upper surface of the latch blade and the code ring extensions. See Figure 40. Check this adjustment with each of the above stop pins selected.
- (2) Rotate the cam assembly slowly until the points of Nos. 4 and 5 code ring extensions are in line with the edge of the latch blade. Determine whether the latch blade or the space contact lever extension blade clears the code ring extensions by the least amount. At the point of least clearance there should be .020" to .030". To adjust (1) and (2), position the latch blade on the latch lever. See Figure 41.

(k) Pulsing and Space Contacts Adjustment (Figure 42)

Remove the contact bracket from the mounting plate.

- (1) With the push end of an 8 oz. scale applied to the long pulsing contact spring between the contact point and the insulator, it should require 1 to 2 ozs. to open the lower contacts. To adjust, bend the longer contact spring.

The two contacts should close at approximately the same time. To adjust, bend the lower contact springs.

- (2) The upper bifurcated contact gaps should be approximately equal and should be from .015" to .025". To equalize the contact gaps bend a prong of the upper contact spring. To obtain the .015" to .025" gap, bend the upper contact spring stiffener.

RESTRICTED

- (3) With the pull end of an 8 oz. scale applied to the upper contact spring at a contact point, it should require 1-1/2 to 3 ozs. to move the spring away from its stiffener. To adjust, bend the upper contact spring. Check each contact. Recheck adjustment (2).
- (4) With the push end of an 8 oz. scale applied to the long space contact spring between the contact point and the insulator, it should require 1 to 2 ozs. to open the contacts. To adjust, bend the longer contact spring.

Replace the contact bracket on the mounting plate.

- (5) With the cam assembly in the STOP position, the lower contact gap should be .015" to .025". See Figure 41.
- (6) With the contact levers on the low part of their cams, there should be some clearance between the lower surface of the contact insulators and their contact levers. To make adjustment (5) and (6), position the contact bracket by means of its mounting screws. See Figure 43.

NOTE: Before tightening the contact bracket mounting screws, position the contact guard so that it does not interfere with the operation of the contacts.

- (7) With the space contact lever extension blade resting against the end of the code ring extensions, the space contact gap should be .015" to .025". To adjust, bend the lower contact spring. See Figure 44.

NOTE: With the space stop pin selected and the code ring reset bail on the low part of its cam, there should be some clearance between the lower surface of the space contact insulator and its operating lever. See Figure 43.

(m) Code Contacts Adjustment

The following adjustments apply to Nos. 1, 2, 3, 4, and 5 code contact assemblies:

Remove the contact bracket from the mounting plate.

- (1) Apply an 8 oz. pull scale to the end of the lower contact spring and pull at a right angle to the spring. It should require some tension, not more than 1-1/2 ozs. to move the spring away from its stiffener. To adjust, bend the lower contact spring. See Figure 45.
- (2) With an 8 oz. scale applied to the long contact spring midway between the contact point and the insulator, it should require 1 to 2 ozs. to close the lower contacts. To adjust, bend the long contact spring. See Figure 45.

RESTRICTED

- (3) The contact gap should be .015" to .025". To adjust, bend the upper short contact spring.

Replace the contact bracket.

- (4) With the cam assembly in its STOP position, there should be .110" to .125" clearance between the lower edge of the code ring extension and the insulator on the longer contact spring, when measured at the closest point. To adjust, position the contact bracket by means of its mounting screws. See Figure 46. Adjust Nos. 1, 2, 3, and 4 contact assemblies in the same manner.

NOTE: On No. 5 contact, the clearance should be .070" to .090" and should be checked between the contact lever and the insulator on the contact spring when the lever is held lightly against the code ring extension. See Figure 47.

(n) No. 5 Contact Lever Latch Plate Adjustment (Figure 48)

Rotate the cam assembly until the code ring reset bail cam follower is on the low part of its cam and the No. 5 code ring is fully operated. There should be some clearance, not more than .010", between the right-hand surface of the contact lever latching extension and the shoulder of the notch in the contact lever latch. To adjust, position the latch plate by means of its mounting screws.

(o) Trip Lever Plate Adjustment (Figure 47)

With the cam assembly in the STOP position there should be .006" to .015" clearance between the top surface of the contact lever latch and the contact lever extension when the contact lever is held so as to give the closest approach to the latch. To adjust, position the trip lever plate by means of its mounting screws.

(p) Spacing Shaft End Play Adjustment

The spacing shaft should have some end play, not more than .006". To adjust, position the friction clutch sleeve and the error contact cam (Figure 38) on the shaft.

(q) Code Ring Reset Bail Spring Tension (Figure 48)

With the reset cam follower on the low part of its cam, hook an 8 oz. scale over the front side of the bail at the bend and pull horizontally to the right. It should require 1-1/2 to 2-1/2 ozs. to start the bail moving.

(r) Code Ring Reset Bail Yield Spring Tension

With the A and M stop pins manually selected, the reset cam follower on the low part of its cam, and the reset bail spring unhooked from its stationary post, hook a 12 lb. scale to the bend of the reset bail and pull the scale to the left. It should require from 3-3/4 to 6 lbs. to move the reset bail away from its eccentric. See Figure 48 for location of parts.

(s) Code Ring Spring Tension (Figure 35)

With the cam assembly in its STOP position, hook a 32 oz. scale to the end of the contact operating extension and pull at a right angle to the extension as nearly in line with the ring as possible. It should require 8 to 12 ozs. to start the ring moving.

NOTE: When measuring the No. 5 ring spring hold the contact latch trip lever off.

(t) No. 5 Contact Latch Spring Tension (Figure 47)

With the cam assembly in its STOP position, place the pull end of an 8 oz. scale through the opening in the channel just above the cable receptacle. Hook the scale to the lower arm of the trip lever and pull horizontally to the right. It should require a pull of 1 to 2 ozs. to move the trip lever away from the code ring extension.

(u) Space Contact Lever Spring Tension (Figure 41)

With the cam assembly in its STOP position, hook an 8 oz. scale to the bend of the space contact lever extension blade. Hold the contact spring off and pull the scale horizontally to the left. It should require $3/4$ to $1-1/2$ ozs. to start the lever moving.

(v) Pulsing Contact Lever Spring Tension (Figure 43)

With the pulsing contact lever on the low part of its cam, hook an 8 oz. scale over the head of the eccentric mounting screw. Hold the contact spring and the space lever off and pull horizontally to the left. It should require $2-1/2$ to $3-1/2$ ozs. to move the lever from its cam.

(w) Nos. 4 and 5 Code Ring Latch Lever Spring Tension (Figure 41)

With the cam assembly in its STOP position, hook an 8 oz. scale over the head of the upper clamp screw. Hold the space contact lever off and pull the scale horizontally to the left. It should require $1-3/4$ to $2-3/4$ ozs. to start the lever moving.

(x) Motor Power Switch Bracket Adjustment (Figure 49)

With the control switch in P position and the power switch in its ON position, there should be some clearance, not more than $.030$ ", between the bail end of the switch toggle lever and the switch operating lever. To adjust, loosen the switch bracket mounting screws, and position the bracket. Tighten the mounting screws.

NOTE: Before tightening the screws, position E-D contact bracket so that it is approximately parallel to the rear edge of the switch control top plate.

(y) Control Switch Cam Position Adjustment (Figure 50)

With the control switch in the E position, the E-D contact lever should be on the high part of its cam and the cam should be in vertical alignment with the lever. To adjust, position the cam by means of its set screw.

RESTRICTED

(z) E-D Contacts Adjustment

- (1) With the control switch in E position, there should be some clearance, not more than .020", between the end of the E-D contact lever and the contact spring insulator (Figure 50). To adjust, bend the front contact spring. The two front contacts should close at approximately the same time.
- (2) With an 8 oz. scale applied at the top of the longer contact spring and pulled at a right angle to the spring, it should require 1 to 2 ozs. to open the front contacts. To adjust, bend the longer contact spring. Recheck adjustment (1). See Figure 52.
- (3) With an 8 oz. scale applied to the end of the rear contact spring and pulled at a right angle to the spring, it should require 2 to 3 ozs. to move the spring away from its stiffener. Check each contact. To adjust, bend the rear contact spring. See Figure 51.
- (4) With the control switch in the O-P-R positions, the rear contact gap should be .015" to .025". To adjust, bend the rear contact spring stiffener. The two rear contacts should close at approximately the same time. To adjust, bend a prong on the bifurcated contact spring. See Figure 52.
- (5) With the control switch in the O-P-R position, the front contact gap should be at least .010". If necessary, refine adjustment (1) within its specified limits. See Figure 52.

(aa) Mounting the ENG-308

The ENG-308 should be mounted on the CSP as follows:

- (1) Rotate the main shaft of the CSP to its STOP position (clutch fully disengaged).
- (2) Place the control switch in O position.
- (3) Rotate the translator cam assembly to its STOP position.
- (4) Place the ENG-308 on the CSP. Before tightening the mounting screws, take up the play in the mounting screw holes by holding the ENG-308 toward the rear and to the right. With the mounting screws tight, there should be a perceptible amount of backlash in the gears. Check through a complete revolution of the larger gear. To adjust, add or remove thin shims under the feet of the ENG-308.

(bb) E-D Contact Lever Spring Tension (Figure 50)

With the control switch in E position, hook a 32 oz. scale over the spring post and pull in line with the spring. It should require 12 to 16 ozs. to move the lever away from the cam.

(cc) Space Cam Follower Fulcrum Adjustment (Figure 53)

RESTRICTED

With the control switch in P position, rotate the typewheel shaft until the space cam follower drops into the indent in the cam. The space pawl should clear the point of the highest tooth on the rear ratchet by .015" to .025" (Figure 53A). With the switch in the E position, the pawl should clear the highest tooth on the front ratchet by at least .010". To adjust, loosen the outer clamping screw and position the space cam follower fulcrum. Tighten the clamping screw.

(dd) Spacing Ratchet Adjustment

Place the control switch in R position.

With the error contact spring insulator (Figure 39) on the high part of its cam, a tooth on the center ratchet should align with the latching surface of the spacing pawl (Figure 53B). With the control switch in E or P position, the side of the spacing pawl should clear the side of the teeth of the center spacing ratchet by at least .010" (Figure 53C). To adjust, back off the ratchet clamp nuts and rotate the ratchet on the shaft. Tighten the clamp nuts and recheck the adjustment.

(ee) Spacing Shaft Bracket Adjustment

There should be a perceptible amount of backlash between the spacing shaft gear and its drive gear. Check through a complete revolution of the larger gear. To adjust, position the spacing shaft bracket by means of its mounting screws.

(ff) Spacing Shaft Friction Clutch Torque (Figure 54)

Place the control switch in the R position. With the motor running, hook an 8 oz. scale in a notch on the clutch adjusting nut, hold the error contact off, and pull the scale in a line tangent to the nut. It should require 5 to 8 ozs. to start the shaft rotating backwards. To adjust, rotate the clutch adjusting nuts.

404 PROBABLE TROUBLES AND POSSIBLE CAUSES

(a) General

- (1) Trouble - Failure to stop at notch in edge of tape or at end of tape.

Cause - Sixth pin missing.

- (2) Trouble - Feed hole tearing.

Cause - Incorrect adjustment of sensing lever operating bail.

Note: See note under Item 3.

- (3) Trouble - Dropping of impulses in "P" position, but not in "E" or "D" positions.

Causes - 1. Incorrect adjustment of sensing contact screws.
2. Dirty sensing contacts.
3. Dirty distributor contacts.

RESTRICTED

NOTE; The sensing screw adjustment and the operating bail adjustment are interrelated and if one is readjusted the other must be rechecked.

- (4) Trouble - Dropping of complete characters in "E" or "D" positions.

Causes - 1. Binding alphabet contact lever, dirty alphabet contact, broken or damaged alphabet contact spring.
2. CSP out of step with tape reader caused by incorrect adjustment of spreader lever or spreader bar eccentrics.

- (5) Trouble - Incorrect printing of characters not traceable to uniform gain or loss of an impulse.

Cause - The code bars bounce out of position after selection has been made, permitting two alphabet contact levers to be selected simultaneously.

Remedy - Readjust transfer lever bracket and code bar reset lever.

- (6) Trouble - Errors in printing where the code combination of the printed character represents a shift in the code combination of the transmitted character.

Examples:

<u>CHARACTER TRANSMITTED</u>		<u>CHARACTER PRINTED</u>	
<u>CHARACTER</u>	<u>CODE</u>	<u>CHARACTER</u>	<u>CODE</u>
A	1-2	I	2-3
R	2-4	H	3-5
D	1-4	L	2-5
S	1-3	R	2-4

Causes - 1. Weak springs on the distributor clutch pawls.
2. Distributor clutch pawls binding.

- (7) Trouble - Errors in printing traceable to a uniform gain or loss of any impulse.

Causes - 1. Failure of Baudot code contacts on translator to close or open.
2. Dirty contacts on distributor.
3. Binding contact levers on distributor.

- (8) Trouble - Errors in printing traceable to the uniform loss of any impulse but No. 3.

Cause - Incorrect adjustment of space latch on translator.

- (9) Trouble - Faulty zeroizing and group elimination.

Causes - 1. Weak, dirty, or broken contact on rotary switch.

2. Dirty contact on unit or group counter zeroizing contacts.
3. Worn, broken or damaged points on unit or group counter zeroizing cams.

(10) Trouble - Translator out of step with tape reader.

Cause - Cam sleeve assembly on translator not positioned correctly.

NOTE: This trouble most likely to occur when replacing ENG-308.

(11) Trouble - Failure to transmit end of line signals on the first space following 60 characters in "D."

Causes - 1. Incorrect adjustment of space latch on translator.
2. Failure of No. 2 contact on group counter.

(12) Trouble - CSP does not run continuously during encipherment of characters.

Cause - Incorrect adjustment of sensing and distributor pulsing contact assembly on translator.

It should be noted that most of the troubles listed above could also be caused by faulty operation of any of the eight controlling relays. Therefore, if correction of the causes listed above does not clear the trouble a complete check of the related relays will be necessary.

(b) Rectifier

Refer to Pages 4, 26, and 76 for installation, adjusting, and wiring information covering the REC30 rectifier.

If the D.C. output fails to become available within approximately one minute after the power switch is turned on, make sure that:

- (1) The input fuse (lower one on the main terminal panel) is not burned out.
- (2) The plate transformer fuse (upper one on the terminal panel) is not burned out.
- (3) The front "make" contact of the relay (contact nearest the door of the cabinet) is in contact with its associated contact.
- (4) The filaments on both grid controlled rectifier tubes are lit.
- (5) The bi-metal pulls the relay armature down.

If the bi-metal does not pull the relay armature down, check the back contacts (normally closed) of the relay. These contacts in multiple are in series with the primary winding of the heater transformer. If the bi-metal is inoperative and these contacts are making, the heater transformer is probably at fault. The

RESTRICTED

unit may be manually started by depressing the relay armature with a stick or other piece of nonconducting material. Once closed the relay coil will hold in.

If the D.C. output rises considerably or if the rectifier output does not regulate properly, either the neon lamp and/or the amplifier tube may be defective.

If a high enough output voltage cannot be obtained, one or both of the rectifier tubes may need replacement. If the line voltage drops considerably below the A.C. input line voltage setting, the D.C. output voltage will drop. In this case, the lower A.C. input line tap should be used to match the actual line voltage.

In the event that the time delay relay fails to hold down magnetically and the bi-metal remains hot, check relay coil and/or resistor in series with same. This could affect both the A.C. and D.C. outputs.

RESTRICTED

SECTION 5

LUBRICATION

TAPE READER AND TRANSLATOR

501 GENERAL

- (a) The oil and grease referred to in Specification S-5288, herewith, should be used for lubricating the off-line apparatus. Unless otherwise specified one or two drops of oil at each of the locations indicated will be sufficient. Use oil for lubrication at all of the locations listed below except where the use of grease is specified.
- (b) Oil both loops of all helical springs.

502 TAPE READER

NOTE: Be careful not to get oil between the pole faces and the armatures of the clutch magnets and escapement magnets.

- (a) Distributor, Counting, and Sensing Shafts
 - (1) Remove oil plugs and fill shafts. Replace plugs. 3 plugs.
 - (2) Distributor shaft ball bearings (6) - oil both sides of each bearing.
 - (3) Contact lever bearings and guides - oil sparingly, light film of grease on points of levers at contact insulators.
 - (4) Cam felt oilers - saturate.
 - (5) Light film of grease on all cams.
 - (6) Detent lever bearing.
 - (7) Light film of grease on detent cam.
 - (8) Clutch pawls bearing and guide.
 - (9) Light film of grease on stopping surface of stop pawls.
 - (10) Clutch magnets armature pivot.
 - (11) Saturate friction clutch felts (4).
 - (12) Light film of grease on ratchet teeth.
 - (13) Escapement magnets armature pivots.
 - (14) Light film of grease on gears.
- (b) Tape Sensing Mechanism
 - (1) Spreader lever bearings - saturate felts.

RESTRICTED

- (2) Spreader bearings - saturate felts.
 - (3) Spreader links and guides.
 - (4) Spreader bail roller.
 - (5) Code bar reset bail bearings - saturate felts.
 - (6) Code bar reset bail roller.
 - (7) Sixth pin operating lever pivot.
 - (8) Light film of grease on insulator of sixth pin contact.
(Between insulator and operating lever.)
 - (9) Sixth pin guide and spring.
 - (10) Tape sensing lever bail bearings.
 - (11) Tape sensing lever bearings.
 - (12) Tape sensing lever contact assembly pivots - oil sparingly.
 - (13) Feed pawl bearing.
 - (14) Feed lever bearing.
 - (15) Feed wheel bearings (2).
 - (16) Detent lever bearings.
 - (17) Detent roller bearings.
 - (18) Retaining lid bearings.
 - (19) Retaining lid latch bearings.
 - (20) Tape sensing levers upper guide.
 - (21) Tape sensing levers lower guide.
 - (22) Transfer lever bearings.
 - (23) Transfer levers guide.
 - (24) Tight-tape-stop lever shaft bearing (2) - oil sparingly.
 - (25) Operating bail roller and pivots.
- (c) Underside of Unit
- (1) Right code bar guide - saturate felt.
 - (2) Left code bar guide - saturate felt.
 - (3) Code bar reset bail notch.

RESTRICTED

- (4) Alphabet contact operating levers, guides and pivots.
 - (5) Light film of grease on insulators of all alphabet contacts. Grease only the side contacted by the operating levers.
- (d) Motor Unit
- (1) Light film of grease on motor pinion and transmitter shaft gear.
 - (2) Motor bearing lubricating holes (2) - grease - use grease gun.
- e) Tape Notcher
- (1) Operating button guide.
 - (2) Notcher guide.

503 TRANSLATOR

Apply a light film of grease to the following places:

- (1) Gears
- (2) Cams
- (3) Spacing ratchet
- (4) Contact operating levers, at point of contact with long contact spring insulator

Apply oil to the following places: One or two drops are sufficient unless otherwise specified.

- (5) Code ring guides
- (6) Stop pin guides
- (7) Code ring reset bail - blade and pivots - saturate felt
- (8) Operating cam assembly - saturate felt
- (9) Contact operating levers and latches - pivots and latching surfaces
- (10) Code ring latch - pivot, guide, latch blade, and cam follower.
- (11) Spacing clutch - saturate felts
- (12) Spacing shaft - bearings
- (13) Tension springs - one drop at each end of each spring

SECTION 6

SPARE PARTS KITS

601 GENERAL

Lists of the following spare parts kits are shown on Pages 60 to 70 inclusive in the form of Teletype check lists:

Kit No. 113072 - Tape Reader

Kit No. 111175 - Model 14 Typing Reperforator Set

Kit No. 111173 - Model 15 Printer Set

Kit No. 111196 - Table and Rectifier

RESTRICTED

Teletype Corporation
Chicago, Illinois, U. S. A.

Check List No. 113072
Issue 2
November, 1946

CHECK LIST FOR THE
113072 SET OF SPARE PARTS
KIT FOR TAPE READER (ZAOU), TO BE
SUPPLIED WITH EACH 58 TYPE SET -
EQUIPMENT SETS

<u>Qty.</u>	<u>Part Number</u>	<u>Description</u>
1	138-33	Open End Wrench 3/16"
2	M241	Magnet Coil 2950 ohms
2	M242	Magnet Coil (Assem.) 530 ohms
2	2415	Spring
2	3640	Lock Washer
2	9558	Contact Spring (Assem.) Upper
2	9559	Contact Spring (Assem.) Lower
2	9649	Contact Spring (Assem.) Lower
2	9655	Contact Spring (Assem.) Upper
2	41830	Contact Spring (Assem.)
2	77030	Contact Spring (Assem.)
2	84705	Contact Spring (Assem.)
6	85318	Washer - Leather
2	100423	Clamping Plate
2	108343	Contact Spring (Assem.)
1	109287	Drive Pawl (Assem.)
1	109290	Blocking Pawl
1	109899	Drive Pawl (Assem.)
1	109900	Blocking Pawl
5	112321	Fuse - 3 amp.
2	112366	Contact Spring (Assem.)
2	112736	Contact Spring (Assem.)
10	112748	Washer - Felt
2	112800	Contact Pin (Assem.)
1	112814	Distributor Ratchet (Assem.)
1	112922	Oper. Shaft Ratchet Hub (Assem.)
1	112929	Lamp - Neon
1	112939	Switch - Double Throw
5	113431	Fuse - 1 amp.
2	113986	Contact Spring (Assem.)
2	114128	Contact Spring (Assem.)

Printed in U.S.A.

RESTRICTED

Teletype Corporation
Chicago, Illinois, U.S.A.

Check List 111175
Issue 1, Page 1
November, 1946

CHECK LIST FOR THE 111175
SET OF EQUIPMENT SPARE PARTS
FOR MODEL 14 TYPING REPERFORATOR SET
FOR NAVY OFF-LINE

<u>Quantity</u>	<u>Part No.</u>	<u>Description</u>
4	33-15	Screw 2-56 x 1/8 Fil.
2	33-43	Screw 2-56 x 3/4 Fil.
4	33-86	Screw 4-40 x 1/8 Fil.
2	33-110	Screw 4-40 x 3/16 Fil.
2	34-1	Nut 1/4-32 Hex.
2	34-4	Nut 10-32 Hex.
6	34-56	Nut 4-40 Hex.
4	34-66	Nut 4-36 Hex.
2	35-27	Spring
4	35-68	Spring
2	35-133	Spring
10	103-27	Washer
2	122-102	Eye - Spring
4	123-244	Washer
1	M169	Magnet Coil (Assem.) 355 Ohms
2	M207	Magnet Coil (Assem.) 92 Ohms
8	1026	Screw 6-40 x 3/8 Fil.
8	1028	Screw 4-40 x 1/4 Fil.
2	1030	Screw 6-40 Shoulder
2	1073	Screw 6-40 Thumb
4	1096	Screw 4-36 x 1/8 Rd.
2	1100	Screw 1/4-32 Pilot
2	1160	Screw 6-40 x 5/16 Fil.
2	1161	Screw 6-40 x 1/4 Fil.
2	1162	Screw 4-40 x 1/4 Fil.
2	1163	Screw 4-40 x 3/16 Fil.
4	1168	Screw 4-40 x 5/16 Fil.
2	1169	Screw 6-40 x 7/16 Fil.
4	1172	Screw 2-56 x 5/16 Fil.
2	1176	Screw 6-40 x 3/16 Fil.
2	1179	Screw 6-40 x 5/8 Fil.
2	1187	Screw 10-32 x 1/4 Fil.
4	1253	Screw 8-32 x 3/8 Rd.
4	1257	Screw 10-32 x 1-1/8 Fil.
4	1264	Screw 10-32 x 1/2 Flat
4	1265	Nut 1/4-20 Hex.
4	1268	Screw 6-40 x 5/16 Flat
2	1269	Screw 6-40 x 1/2 Fil.
4	1297	Screw 6-40 x 2-7/16 Fil.
4	2034	Washer
35	2191	Lock Washer
2	2199	Nut 7/16-32 Hex.
2	2201	Nut 5/16-32 Hex.
4	2322	Lock Washer
2	2407	Lock Washer
4	2422	Lock Washer
15	2449	Lock Washer

RESTRICTED

Teletype Corporation
Chicago, Illinois, U.S.A.

Check List 111175
Issue 1, Page 2
November, 1946

<u>Quantity</u>	<u>Part No.</u>	<u>Description</u>
4	2565	Key Lever Spring
2	2566	Spring - Space Bar
2	2623	Spring
4	2658	Nut 6-32 Hex.
25	2669	Lock Washer
4	2846	Washer
10	3438	Washer
2	3595	Nut 1/4-32 Hex.
12	3598	Nut 6-40 Hex.
8	3599	Nut 4-40 Hex.
6	3606	Nut 6-40 Hex.
2	3608	Spring
2	3610	Spring
4	3618	Insulator
15	3640	Lock Washer
4	3646	Lock Washer
4	3647	Insulator
8	3650	Washer - Brass
2	4705	Spring
2	4810	Wick 5/8" long
4	4813	Wick 1/4" long
2	5446	Screw 6-40 x 9/16 Fil.
4	5740	Screw 2-56 x 1/4 Fil.
1	6685	Sword
1	6686	"T" Lever
8	6745	Screw 10-32 x 1/2 Hex.
15	6746	Screw 6-40 x 5/16 Hex.
6	6796	Screw 10-32 x 1/4 Fil.
2	6800	Screw 6-40 Shoulder
4	6801	Screw 4-40 Pilot
4	6805	Screw 6-40 Shoulder
4	6807	Screw 6-40 Set
6	6810	Screw 10-32 x 3/8 Hex.
15	6811	Screw 6-40 x 5/8 Hex.
4	6814	Screw 6-40 Pilot
1	6827	Connecting Block (Assem.)
2	6909	Pawl - Stop
4	6942	Screw 4-40 Eccentric
2	6990	Screw 1/4-32 Pilot
2	7001	Washer
15	7002	Washer
2	7099	Screw 10-32 Thumb
2	7337	Washer - Felt
2	7394	Space Bar
2	7602	Spring
2	7603	Spring
2	7614	Spring
2	7634	Spring
2	7825	Spring
1	8157	Lever - Right Selector
1	8158	Lever - Left Selector
4	8330	Washer
8	8539	Screw 6-40 x 1/2 Hex.

RESTRICTED

Teletype Corporation
Chicago, Illinois, U.S.A.

Check List 111175
Issue 1, Page 3
November, 1946

<u>Quantity</u>	<u>Part No.</u>	<u>Description</u>
2	8543	Screw 6-40 x 1/4 Fil.
2	8669	Screw 6-40 Shoulder
2	8671	Screw 6-40 Shoulder
10	8896	Shim
2	33038	Spring
15	34432	Washer
4	36273	Washer
4	41663	Washer
1	41732	Plate
4	41733	Insulator
2	41974	Spring
4	55318	Screw 6-32 x 1/4 Rd.
4	55344	Screw 10-32 x 1-5/8 Fil.
2	70177	Screw 6-40 Pilot
15	71047	Shim
4	71266	Washer
6	72508	Screw 6-40 x 3/4 Hex.
5	72521	Wick 1/4" long
5	72522	Wick
2	72563	Washer - Felt
1	72983	Key Lever - Lower
1	72984	Key Lever - Center
1	72985	Key Lever - Upper
4	73419	Shim
1	73588	Contact Spring (Assem.)
1	73593	Contact Spring (Assem.)
2	73894	Screw 6-40 Set
2	74059	Screw 6-40 x 7/32 Hex.
2	74536	Screw 6-40 x 5/32 Fil.
2	74722	Washer
5	74728	Terminal
2	74952	Screw 4-40 x 5/8 Fil.
2	74964	Contact Spring
4	74986	Screw 6-40 x 13/32 Hex.
4	75231	Bushing
2	75436	Resistor 3000 Ohms 2000 - 1000
1	75606	Spring
4	75607	Washer
10	75750	Washer - Bakelite
4	78419	Screw 4-36 x 3/16 Flat
2	80153	Resistor 1410 Ohms 810-600
2	80342	Screw 6-40 x 23/64 Hex.
4	80402	Screw 4-40 x 15/32 Special
2	80471	Spring
2	80581	Spring
2	80592	Contact Spring (Assem.)
2	80755	Bushing - Bakelite
2	80827	Lamp - 120 V.
4	80845	Screw 10-32 x 1-13/16 Fil.
3	81825	Condenser 1/100 M.F.
4	82392	Shim

RESTRICTEDTeletype Corporation
Chicago, Illinois, U.S.A.Check List 111175
Issue 1, Page 4
November, 1946

<u>Quantity</u>	<u>Part No.</u>	<u>Description</u>
4	82440	Screw 6-40 x 7/16 Hex.
4	82474	Terminal
1	82487	Connection Spring
4	82843	Spring
2	82848	Brush Holder
2	87648	Worm Follower
10	87901	Screw 2-56 x 1/8 Flat
4	89305	Screw 1/4-20 x 3/4 Hex.
2	89407	Cotter Pin
2	89917	Screw 4-40 x 9/32 Eccentric
2	90260	Spring
4	90438	Button - Felt
1	90505	Lever - Locking
1	90509	Detent
2	90513	Screw 6-40 Eccentric
2	90514	Screw 3/16-40 Hex. Pivot
2	90515	Screw 3/16-40 Set Pivot
2	90517	Spring
2	90518	Wedge
2	90519	Screw 2-56 x 5/32 Hex.
1	90520	Lever - Armature
2	90524	Screw 4-40 Hex. Special
4	90752	Washer - Felt
2	91120	Spring
2	92291	Condenser 1/10 M.F.
4	92309	Resistor 400 Ohms
2	92511	Roller
4	93160	Washer
4	93971	Nut 10-24 Hex.
2	95005	Resistor 2500 Ohms
4	95281	Screw 10-24 x 3/8 Fil.
2	95426	Spacer
4	95487	Screw 1/4-32 Pilot
8	95841	Screw 10-32 x 3/8 Flat
1	95936	Choke Coil 1-1/10 Ohms
4	96874	Shim
1	97317	Plate - Clamping
4	97492	Nut 10-24 Hex.
4	101063	Fusetron 3.2 Amp.
6	101833	Screw 8-32 x 5/16 Fil.
3	101945	Resistor 2000 Ohms
2	102200	Selector Arm (Assem.)
4	102701	Fusetron 0.3 Amp.
4	103081	Screw 1/4-20 x 1/2 Fil.
2	103615	Condenser 4 M.F.
4	105109	Nut 10-24 Special
2	105305	Condenser 170 M.F.
2	107362	Screw 6-32 x 2-1/2 Fil.
2	107364	Screw 6-32 x 3/8 Flat
2	107367	Screw 10-24 x 2-1/2 Fil.
2	107485	Screw 6-40 Eccentric
2	111602	Insert - Metal
6	111603	Platen - Plastic
4	111711	Backstop - Plastic

RESTRICTED

Teletype Corporation
Chicago, Illinois, U.S.A.

Check List No. 111173
Issue 2, Page 1
November, 1946

CHECK LIST FOR THE NO. 111173
SET OF EQUIPMENT SPARE PARTS
FOR MODEL 15 PRINTER SET FOR
NAVY OFF-LINE

<u>Quantity</u>	<u>Part Number</u>	<u>Description</u>
10	33-15	Screw 2-56 x 1/8 Fil.
4	33-43	Screw 2-56 x 3/4 Fil.
10	33-86	Screw 4-40 x 1/8 Fil.
2	33-179	Screw 8-32 x 3/8 Flat
3	34-4	Nut 10-32 Hex.
3	34-10	Nut 8-40 Hex.
4	34-51	Nut 6-40 Hex.
2	34-56	Nut 4-40 Hex.
2	35-70	Spring
8	103-27	Washer
4	123-244	Washer
1	M169	Magnet Coil (assem.) 355 Ohms
2	M207	Magnet Coil (assem.) 92 Ohms
8	1026	Screw 6-40 x 3/8 Fil.
8	1028	Screw 4-40 x 1/4 Fil.
6	1160	Screw 6-40 x 5/16 Fil.
4	1161	Screw 6-40 x 1/4 Fil.
4	1162	Screw 4-40 x 1/4 Fil.
5	1166	Screw 4-36 x 1/4 Flat
8	1168	Screw 4-40 x 5/16 Fil.
4	1176	Screw 6-40 x 3/16 Fil.
5	1193	Screw 10-32 x 7/8 Fil.
4	1206	Screw 4-40 x 9/16 Fil.
5	1245	Screw 10-32 x 1 Fil.
2	1257	Screw 10-32 x 1-1/8 Fil.
2	1265	Nut 1/4-20 Hex.
2	1297	Screw 6-40 x 2-7/16 Fil.
15	2191	Lock Washer
4	2322	Lock Washer
5	2438	Washer - Brass.
15	2449	Lock Washer
10	2451	Ball
12	2669	Lock Washer
4	2846	Washer
7	3438	Washer
3	3595	Nut 1/4-32 Hex.
7	3598	Nut 6-40 Hex.
3	3599	Nut 4-40 Hex.
4	3606	Nut 6-40 Hex.
4	3618	Insulator
5	3640	Lock Washer
5	3646	Lock Washer
2	3647	Insulator
5	3650	Washer - Brass
2	4703	Spring

RESTRICTED

Teletype Corporation
Chicago, Illinois, U.S.A.

Check List 111173
Issue 2, Page 2
November, 1946

<u>Quantity</u>	<u>Part Number</u>	<u>Description</u>
1	4708	Spring
5	4812	Wick 3/8" Long
8	6745	Screw 10-32 x 1/2 Hex.
9	6746	Screw 6-40 x 5/16 Hex.
5	6760	Shim
2	6796	Screw 10-32 x 1/4 Fil.
2	6800	Screw 6-40 Shoulder
4	6810	Screw 10-32 x 3/8 Hex.
6	6811	Screw 6-40 x 5/8 Hex.
1	6827	Connecting Block (assem.)
1	6830	Latch - Trip
2	6859	Spacer
4	6861	Washer - Felt
1	6909	Pawl - Stop
1	6966	Stop - Eccentric
1	6971	Clutch Throw-out lever
5	7001	Washer
12	7002	Washer
2	7094	Spring - Slip Connection
2	7614	Spring
2	7615	Spring
2	7634	Spring
2	7678	Screw 4-40 Pilot
2	7679	Roller
2	8184	Washer
5	8330	Washer
4	8539	Screw 6-40 x 1/2 Hex.
2	8543	Screw 6-40 x 1/4 Fil.
1	8884	Terminal Block
5	8896	Shim
10	34432	Washer
1	41341	Handle
2	45104	Spring
2	55063	Spring
2	55088	Spring
4	70887	Nut 3/16-24 Hex.
4	71047	Shim
4	72508	Screw 6-40 x 3/4 Hex.
5	72521	Wick 1/4" Long
5	72563	Washer - Felt
1	73588	Contact Spring (assem.)
1	73593	Contact Spring (assem.)
4	74014	Screw 10-32 x 3/4 Hex.
5	74015	Spring
1	74020	Screw 6-40 Eccentric
5	74033	Washer - Leather
4	74059	Screw 6-40 x 7/32 Hex.
4	74085	Washer - Felt
1	74133	Lever No. 1 "T"

RESTRICTED

Teletype Corporation
Chicago, Illinois, U.S.A.

Check List 111173
Issue 2, Page 3
November, 1946

<u>Quantity</u>	<u>Part Number</u>	<u>Description</u>
1	74134	Lever No. 2 "T"
1	74135	Lever No. 3 "T"
1	74136	Lever No. 4 "T"
1	74137	Lever No. 5 "T"
1	74158	Function Bail Blade
1	74161	Latch
2	74170	Screw 10-32 Pivot
1	74171	Screw 6-40 Eccentric
1	74172	Screw 10-32 Eccentric
1	74199	Eccentric
1	74272	Spring
4	74283	Washer - Spring
2	74330	Spring
4	74359	Draw Strap (assem.)
1	74371	Ribbon Carrier (assem.)
2	74514	Screw 4-40 x 55/64 Fil.
4	74536	Screw 6-40 x 5/32 Fil.
2	74567	Screw 1/4-20 x 9/16 Hex.
2	74614	Resistor 2600 Ohms 2000-600
1	74620	Control Switch
1	74684	Spring - Contact
1	74685	Spring - Contact
4	74687	Screw 6-40 x 5/8 Fil.
1	74710	Spring
1	74712	Spring
1	74720	Screw 1/4-20 Thumb
4	74755	Wick
4	74756	Wick
1	74760	Spring
4	74800	Washer - Felt
1	74821	Resistor 2810 Ohms 2000-810
1	74882	Spring
2	74952	Screw 4-40 x 5/8 Fil.
1	74961	Spring
1	74962	Spring
1	74964	Contact Spring (assem.)
4	74986	Screw 6-40 x 13/32 Hex.
2	75229	Spring
1	75231	Bushing
4	75400	Screw 6-40 x 1 Hex.
1	75436	Resistor 3000 Ohms 2000-1000
7	75750	Washer - Bakelite
4	76084	Washer - Felt
1	78011	Condenser 1 M.F.
4	78103	Screw 6-40 x 1-3/16 Hex.
1	78205	Resistor 300 Ohms
1	78301	Screw 10-32 x 5/8 Hex.
2	79523	Screw 2-56 x 25/32 Fil.
4	80255	Screw 4-40 x 21/64 Fil.

RESTRICTED

Teletype Corporation
Chicago, Illinois, U.S.A.

Check List No. 111173
Issue 2, Page 4
November, 1946

<u>Quantity</u>	<u>Part Number</u>	<u>Description</u>
5	80516	Cotter Pin
2	80926	Spring
2	81825	Condenser 1/100 M.F.
1	81841	Condenser 1/4 M.F.
2	82440	Screw 6-40 x 7/16 Hex.
1	82442	Spring
2	82843	Spring
1	82848	Brush Holder
1	82927	Contact Spring (assem.)
1	82930	Contact Spring (assem.)
1	82986	Screw 1/4-32 Pilot
1	82999	Spring
1	83977	Spring Clip
1	84351	Type Bar Backstop
1	84575	Spring
5	87901	Screw 2-56 x 1/8 Flat
2	89305	Screw 1/4-20 x 3/4 Hex.
1	89407	Cotter Pin
5	89881	Wick 3/16" Long
1	90505	Lever - Locking
1	90509	Detent
1	90513	Screw 6-40 Eccentric
2	90514	Screw 3/16-40 Hex. pivot
2	90515	Screw 3/16-40 Set pivot
1	90516	Selector Arm
2	90517	Spring
1	90518	Wedge
1	90519	Screw 2-56 x 5/32 Hex.
1	90520	Lever - Armature
2	90524	Screw 4-40 Hex. Special
1	91120	Spring
1	91175	Roller (assem.)
2	91600	Screw 6-40 x 31/32 Hex.
1	92291	Condenser 1/10 M.F.
2	92309	Resistor 400 Ohms
4	92748	Screw 6-40 x 1-7/16 Fil.
2	93971	Nut 10-24 Hex.
5	94693	Wick 5/16" Long
5	94694	Button - Felt
1	95005	Resistor 2500 Ohms
2	95281	Screw 10-24 x 3/8 Fil.
4	95841	Screw 10-32 x 3/8 Flat
1	97317	Plate - Clamping
2	97492	Nut, 10-24 Hex.
2	101063	Fusetron 3.2 Amp.
3	101833	Screw 8-32 x 5/16 Fil.
2	101945	Resistor 2000 Ohms
2	102701	Fusetron 0.3 Amp.
2	103081	Screw 1/4-20 x 1/2 Fil.

RESTRICTED

Teletype Corporation
Chicago, Illinois, U.S.A.

Check List No. 111173
Issue 2, Page 5
November, 1946

<u>Quantity</u>	<u>Part Number</u>	<u>Description</u>
2	103284	Fusetron 3.2 Amps
1	103615	Condenser 4 M.F.
2	104824	Spring
2	105109	Nut 10-24 Special
1	105221	Contact Spring (assem.)
1	105222	Contact Spring (assem.)
1	105223	Contact Spring (assem.)
1	105305	Condenser 170 M.F.
1	107362	Screw 6-32 x 2-1/2 Fil.
1	107364	Screw 6-32 x 3/8 Flat
1	107367	Screw 10-24 x 2-1/2 Fil.
2	111710	Backstop - Plastic

RESTRICTED

Teletype Corporation
Chicago, Illinois, U.S.A.

Check List No. 111119
Issue 1, Page 1
September, 1945

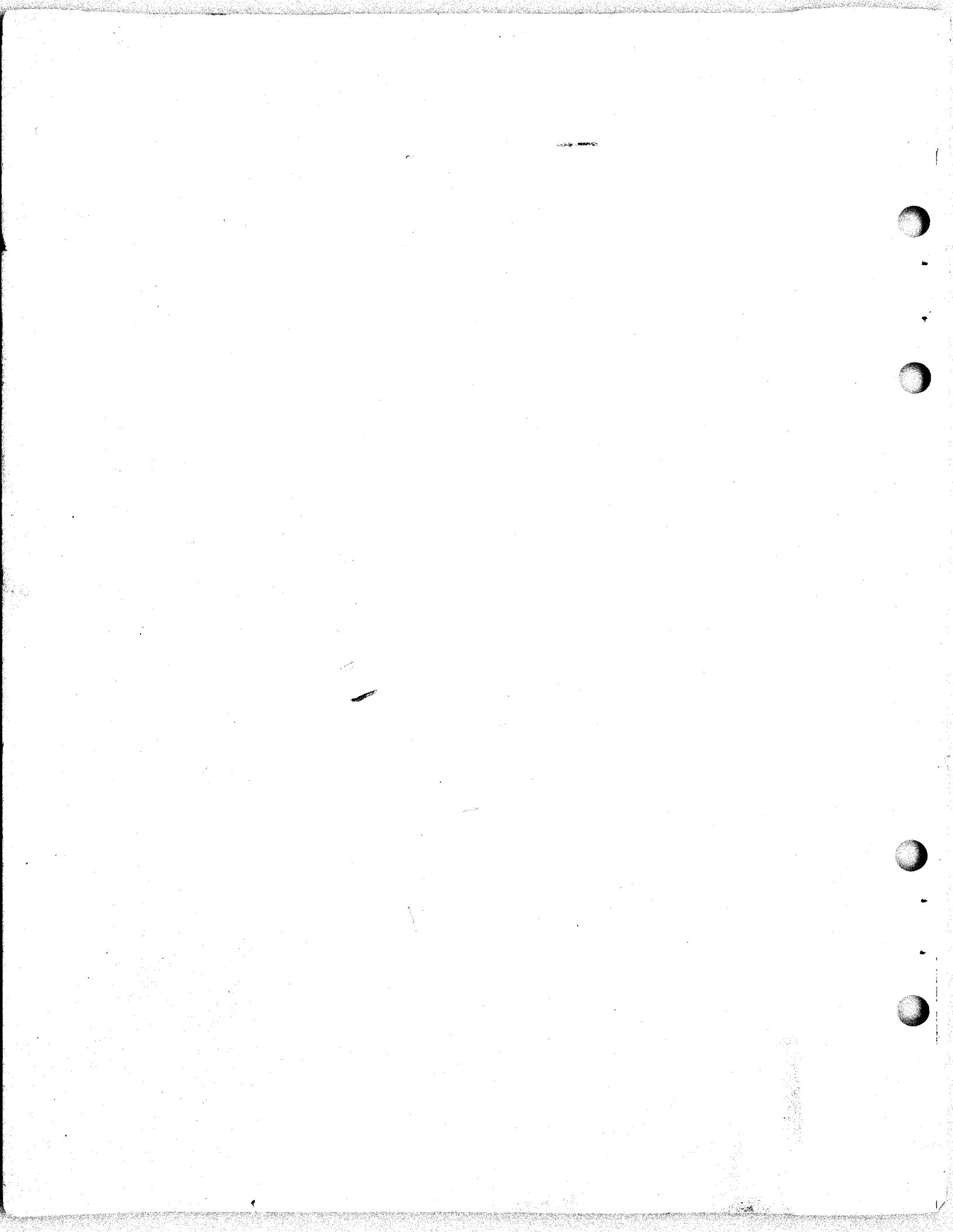
CHECK LIST FOR THE
NO. 111119 SET OF PARTS TO CONVERT
ONE MXB11 EQUIPPED WITH THREE MXD13
FROM 368.1 O.P.M. TO 600 O.P.M.

<u>Quantity</u>	<u>Part No.</u>	<u>Description</u>
3	112658	Cam Sleeve (Assem.)
1	112686	Gear - 39T
1	112687	Pinion - 14T

Printed in U.S.A.

SECTION 7

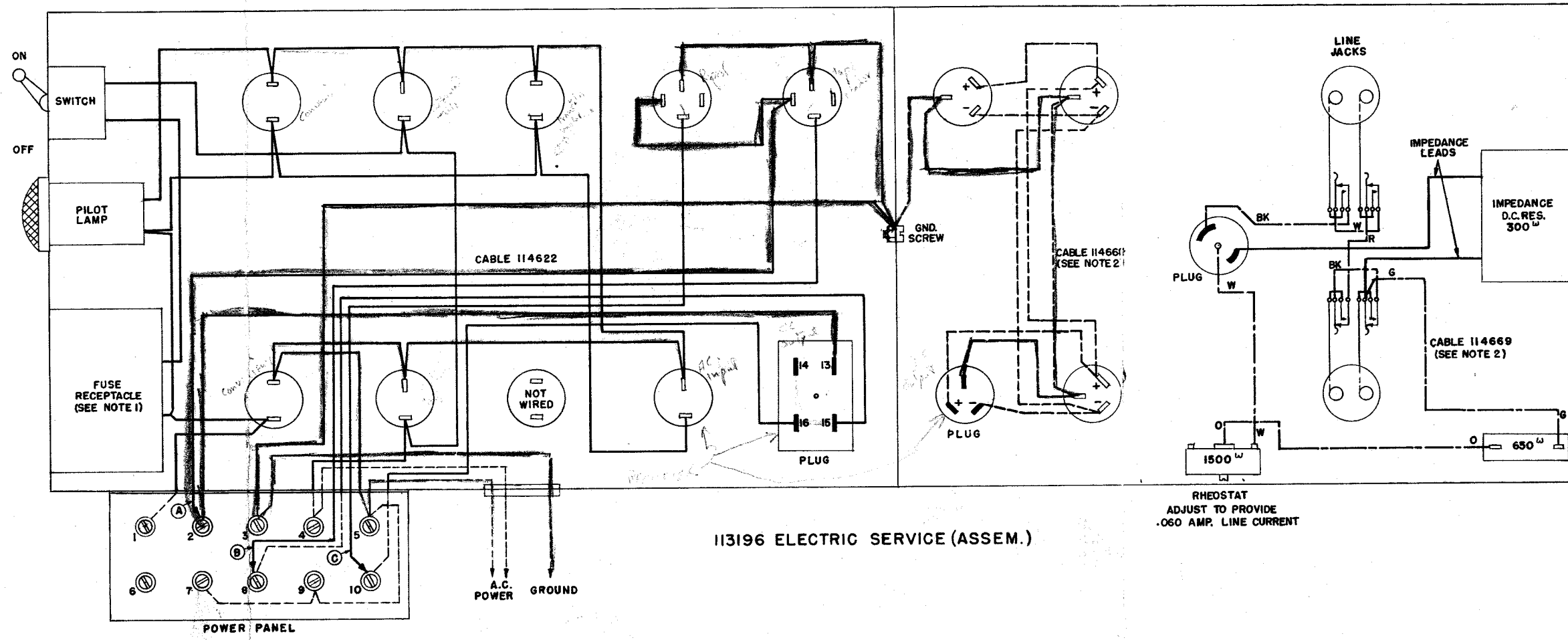
WIRING DIAGRAMS



NO.	NOTES
1.	UNIT EQUIPPED WITH 15 AMP. FUSE AT FACTORY
2.	ASSOCIATED CABLES _____ 114622 CABLE (A.C. POWER) - - - - - 114668 CABLE (D.C. POWER) _____ 114669 CABLE (LINE JACKS)
3.	WIRE COLOR CODE AND SYMBOLS W WHITE G GREEN R RED BK BLACK O ORANGE — DENOTES: SPADE TERMINAL □ DENOTES: OPEN SLOT OF RECEPTACLES ▮ DENOTES: PRONG OF PLUG
4.	RECEPTACLES AND PLUGS SHOWN FROM SLOT AND PRONG SIDES
5.	WHEN MOTOR POWER FOR TAPE READER AND TYPING REPERFORATOR IS SUPPLIED FROM RECTIFIER CONNECT WIRE (A) TO TERMINAL #2 CONNECT WIRE (B) TO TERMINAL #6 CONNECT WIRE (C) TO TERMINAL #10 WHEN MOTOR POWER IS SUPPLIED DIRECT FROM LINE CONNECT WIRE (A) TO TERMINAL #1 CONNECT WIRE (B) TO TERMINAL #7 CONNECT WIRE (C) TO TERMINAL #9

REVISIONS	
B	8-14-46 158-505
C	8-19-46 158-510

SHOWN AS VIEWED FROM THE FRONT



113196 ELECTRIC SERVICE (ASSEM.)

RHEOSTAT
 ADJUST TO PROVIDE
 .060 AMP. LINE CURRENT

RESTRICTED
 WD-2423-C
 2-28-46
 WIRING DIAGRAM
 SAT-4
 TABLE
 (ENG-314)
 DRAWN - L.J.B. APPROVED:
 ENG'R'D. *[Signature]*
 FILE NO. 5804
 TELETYPE
 CORPORATION

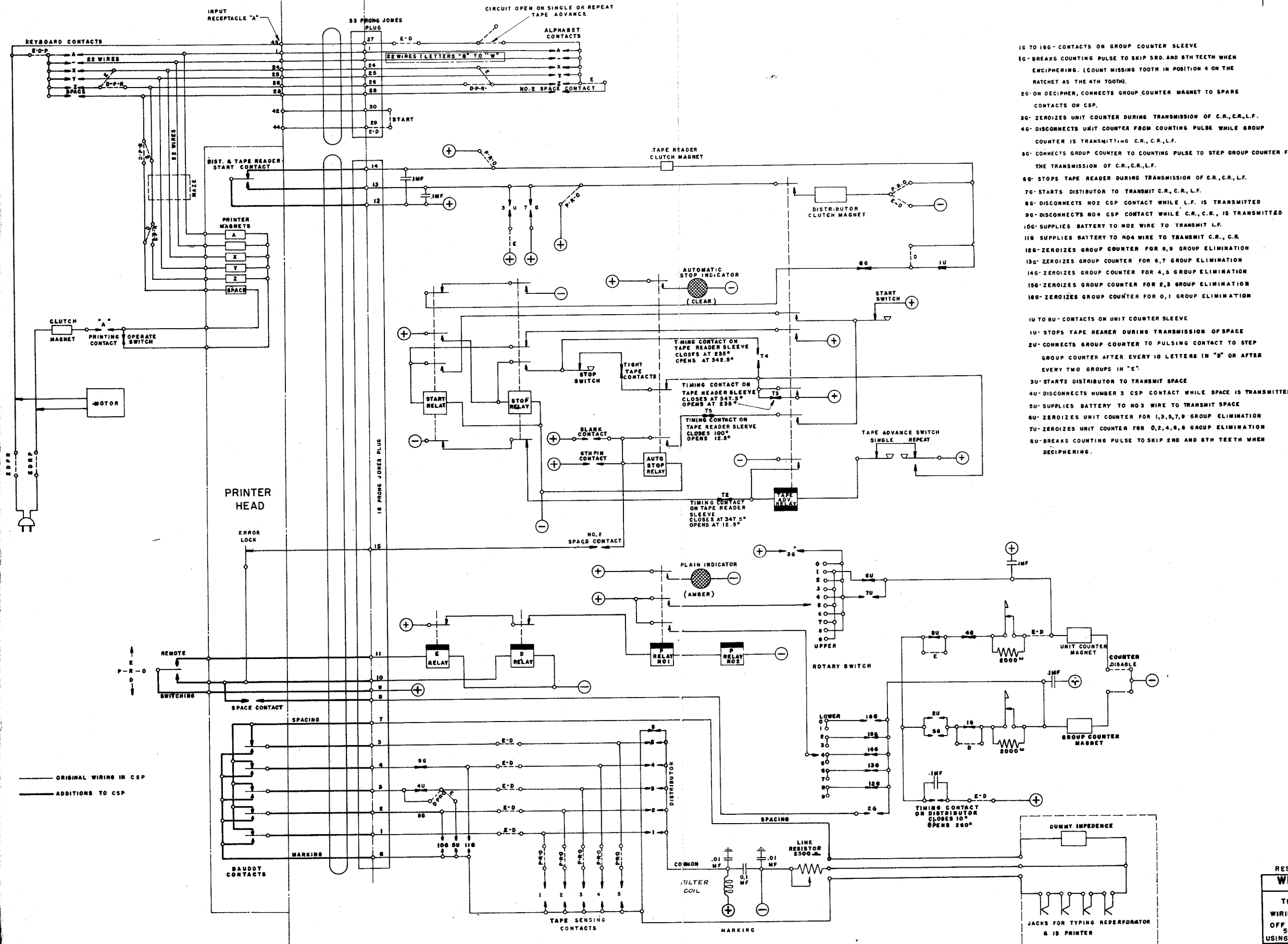
RESTRICTED

REVISIONS
8-14-46 (58-505)

CSP

CABLES

TAPE READER UNIT



- 16 TO 16G- CONTACTS ON GROUP COUNTER SLEEVE
- 16G- BREAKS COUNTING PULSE TO SKIP 3RD AND 6TH TEETH WHEN ENCIPHERING. (COUNT MISSING TOOTH IN POSITION 4 ON THE RATCHET AS THE 4TH TOOTH).
- 26- ON DECIPHER, CONNECTS GROUP COUNTER MAGNET TO SPARE CONTACTS ON CSP.
- 36- ZEROIZES UNIT COUNTER DURING TRANSMISSION OF C.R., C.R., L.F.
- 46- DISCONNECTS UNIT COUNTER FROM COUNTING PULSE WHILE GROUP COUNTER IS TRANSMITTING C.R., C.R., L.F.
- 56- CONNECTS GROUP COUNTER TO COUNTING PULSE TO STEP GROUP COUNTER FOR THE TRANSMISSION OF C.R., C.R., L.F.
- 66- STOPS TAPE READER DURING TRANSMISSION OF C.R., C.R., L.F.
- 76- STARTS DISTRIBUTOR TO TRANSMIT C.R., C.R., L.F.
- 86- DISCONNECTS NO2 CSP CONTACT WHILE L.F. IS TRANSMITTED
- 96- DISCONNECTS NO4 CSP CONTACT WHILE C.R., C.R., IS TRANSMITTED
- 106- SUPPLIES BATTERY TO NO2 WIRE TO TRANSMIT L.F.
- 116- SUPPLIES BATTERY TO NO4 WIRE TO TRANSMIT C.R., C.R.
- 126- ZEROIZES GROUP COUNTER FOR 8,9 GROUP ELIMINATION
- 136- ZEROIZES GROUP COUNTER FOR 6,7 GROUP ELIMINATION
- 146- ZEROIZES GROUP COUNTER FOR 4,5 GROUP ELIMINATION
- 156- ZEROIZES GROUP COUNTER FOR 2,3 GROUP ELIMINATION
- 166- ZEROIZES GROUP COUNTER FOR 0,1 GROUP ELIMINATION

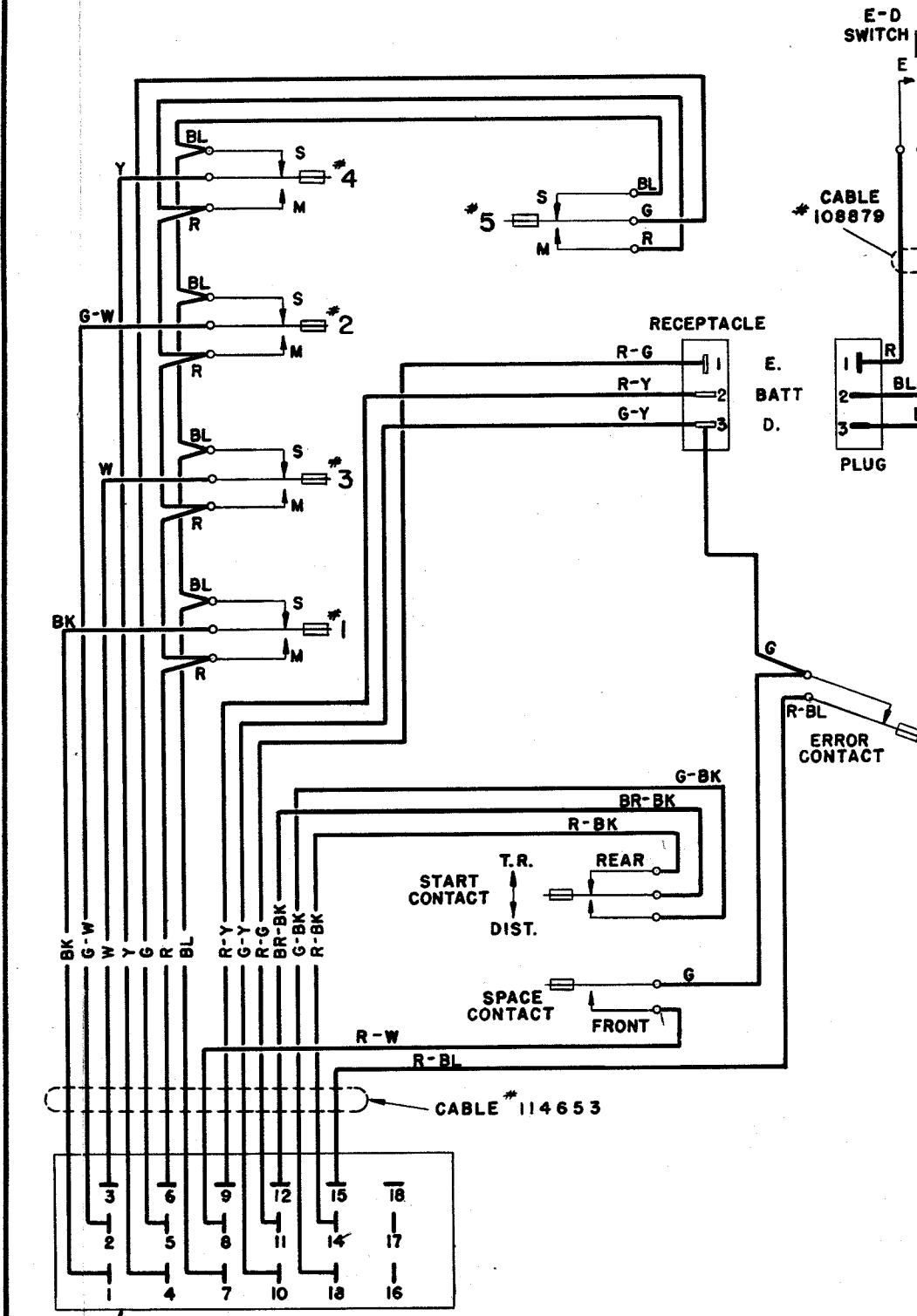
- 1U TO 8U- CONTACTS ON UNIT COUNTER SLEEVE
- 1U- STOPS TAPE READER DURING TRANSMISSION OF SPACE
- 2U- CONNECTS GROUP COUNTER TO PULSING CONTACT TO STEP GROUP COUNTER AFTER EVERY 10 LETTERS IN "D" OR AFTER EVERY TWO GROUPS IN "E".
- 3U- STARTS DISTRIBUTOR TO TRANSMIT SPACE
- 4U- DISCONNECTS NUMBER 3 CSP CONTACT WHILE SPACE IS TRANSMITTED
- 5U- SUPPLIES BATTERY TO NO3 WIRE TO TRANSMIT SPACE
- 6U- ZEROIZES UNIT COUNTER FOR 1,3,5,7,9 GROUP ELIMINATION
- 7U- ZEROIZES UNIT COUNTER FOR 0,2,4,6,8 GROUP ELIMINATION
- 8U- BREAKS COUNTING PULSE TO SKIP 2ND AND 6TH TEETH WHEN DECIPHERING.

— ORIGINAL WIRING IN CSP
 - - - ADDITIONS TO CSP

RESTRICTED
 WD-2441-B
 7-5-46
 THEORETICAL
 WIRING DIAGRAM
 OFF LINE SYSTEM
 58-TYPE
 USING - ZAOU-2
 FILE NO. 2617-1
 DRAWN BY APPROVED
 ENGR. R.D.
 TELETYPE
 CORPORATION

RESTRICTED

REVISIONS	
B	8-14-46 158-505

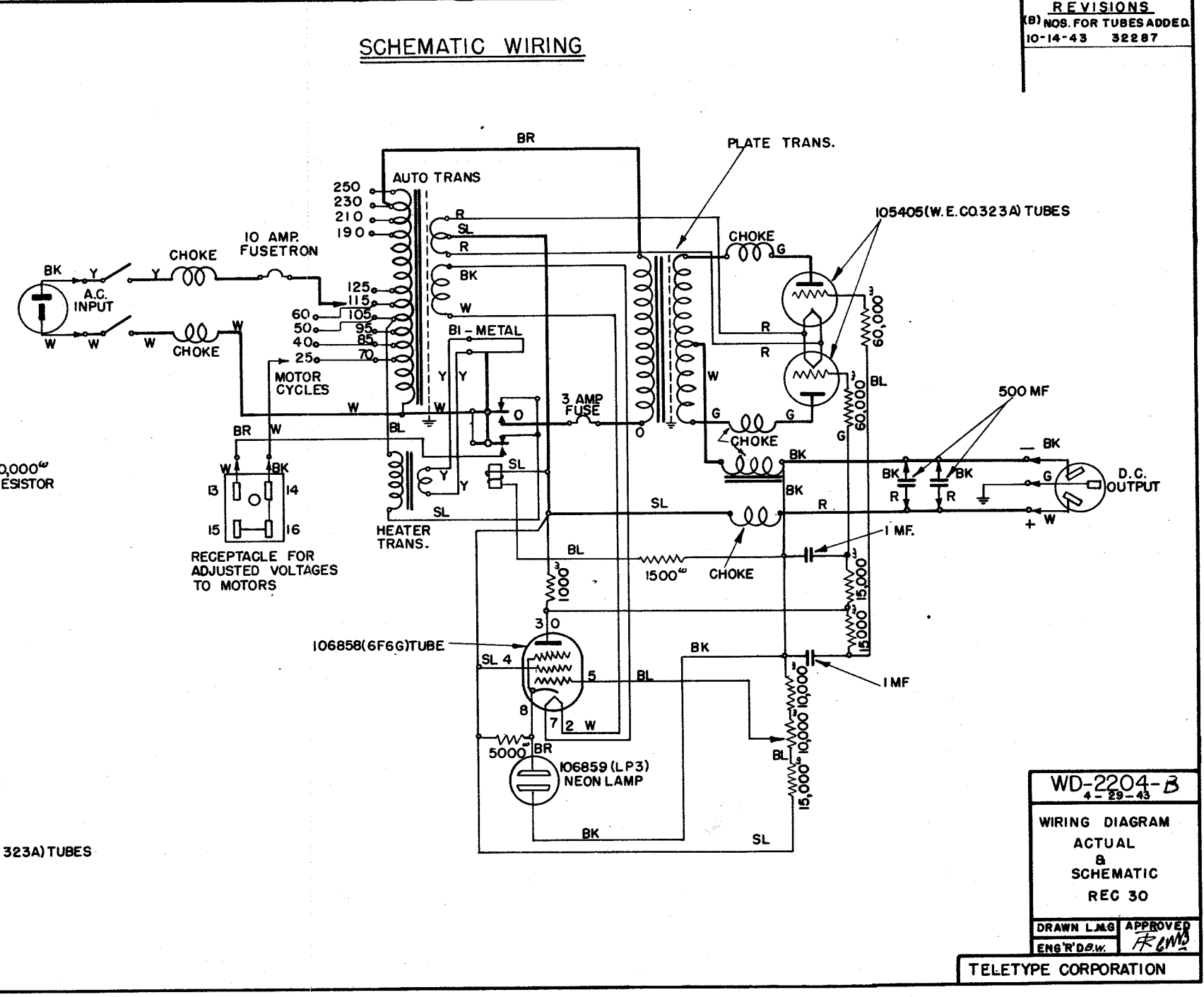
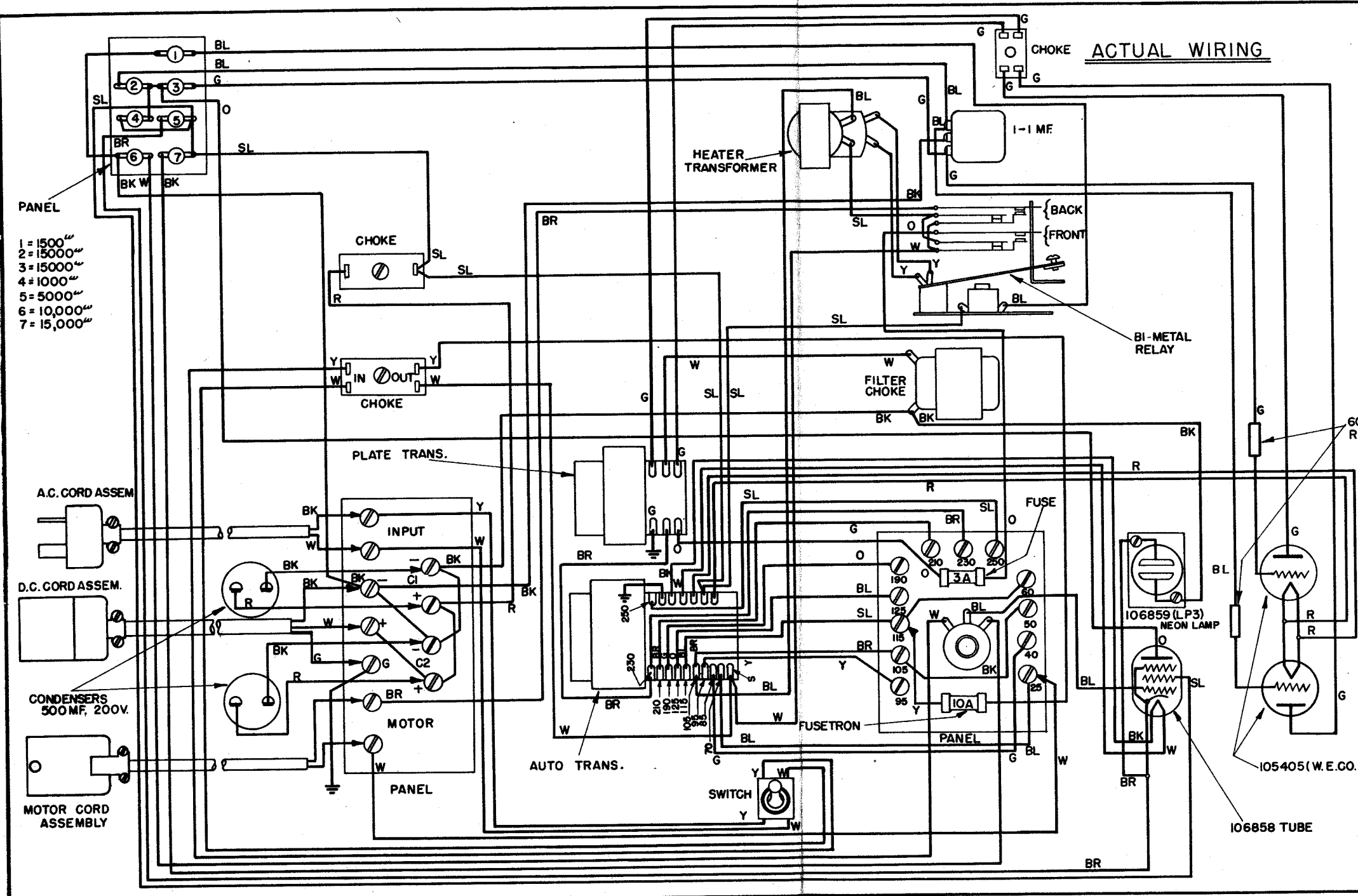


RESTRICTED
TELETYPE CORPORATION
WD-2417-B
11-1-45

WIRING DIAGRAM
 TRANSLATOR
 ASSEM. 113001
 PART OF
 MODIFICATION
 KIT 113000
 (ENG-308)

DRAWN S RN
 TRACED
 CHECKED H.I.R.
 ENG'D. H.I.R.
 APPROVED *[Signature]*

REVISIONS
 (B) NOS. FOR TUBES ADDED
 10-14-43 32287

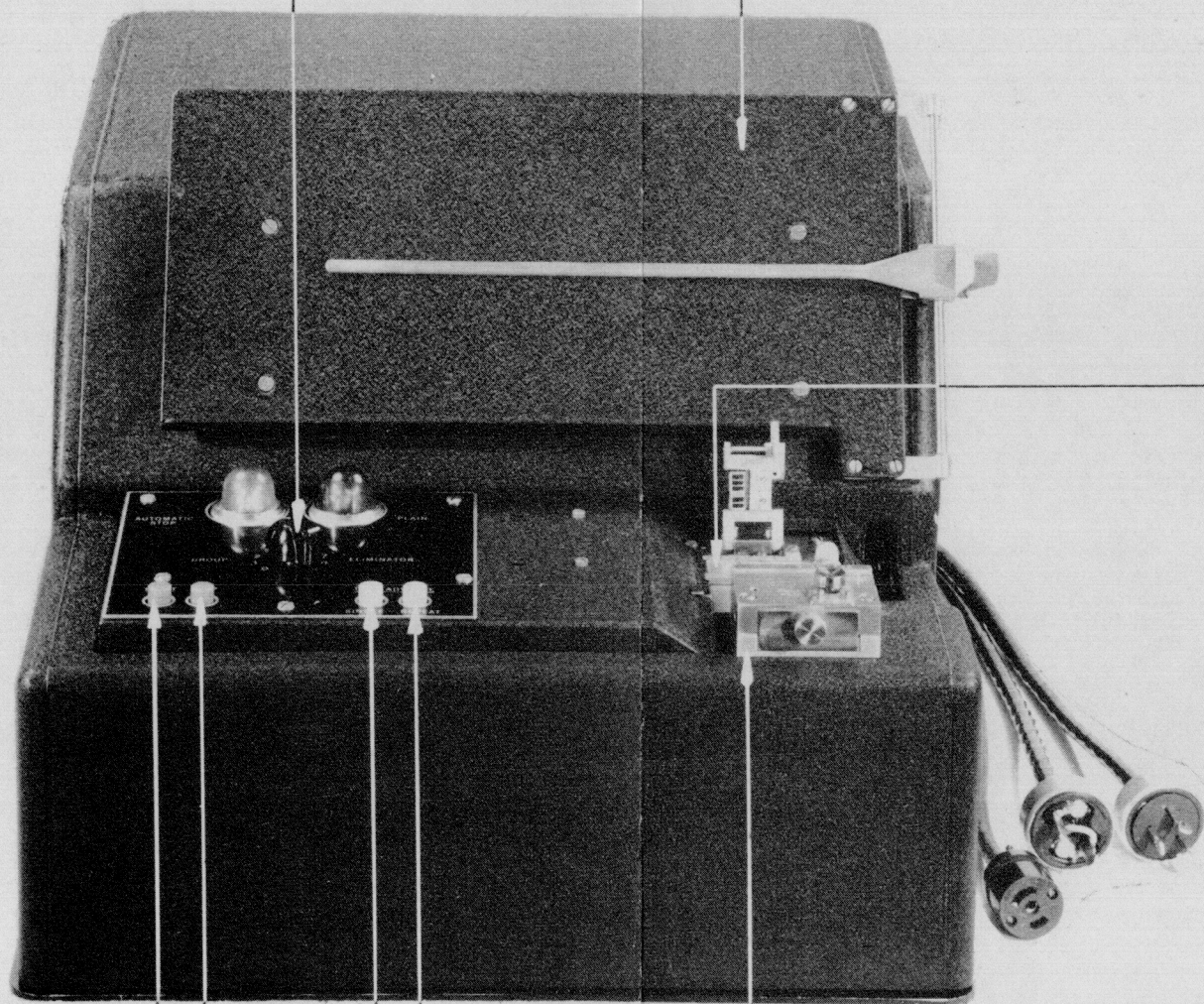


WD-2204-B
 4-29-43
 WIRING DIAGRAM
 ACTUAL
 &
 SCHEMATIC
 REC 30
 DRAWN L.M.G. APPROVED
 ENG'R D.B.W. *R.L.M.B.*
 TELETYPE CORPORATION

FIGURES
FOR
SECTIONS 2, 3, AND 4

GROUP ELIMINATOR SWITCH

COPY HOLDER



TAPE GUIDE

START

STOP

SINGLE STEP

REPEAT ADVANCE

TAPE CONTROL BUTTONS

TAPE NOTCHER

TAPE READER COMPLETE

FIGURE 1

UNIT COUNTER

GROUP COUNTER

COUNTING SHAFT

RELAY BANK

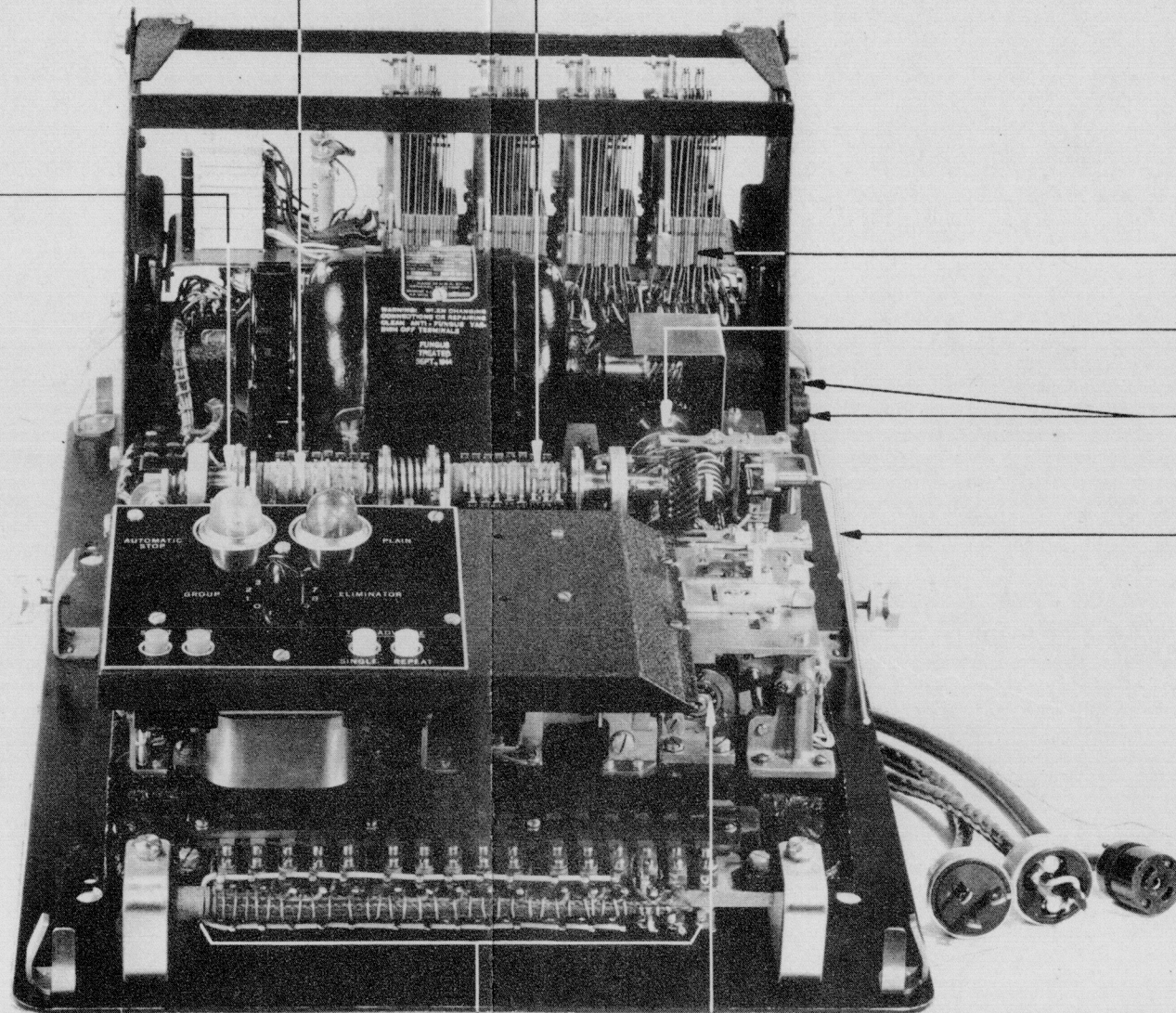
DISTRIBUTOR SHAFT

FUSES

TIGHT TAPE LEVER

ALPHABET CONTACT ASSEMBLY

SENSING SHAFT



TAPE READER—LESS COVER
FRONT VIEW

FIGURE 2

COUNTER MAGNETS

FRICTION CLUTCHES

DISTRIBUTOR

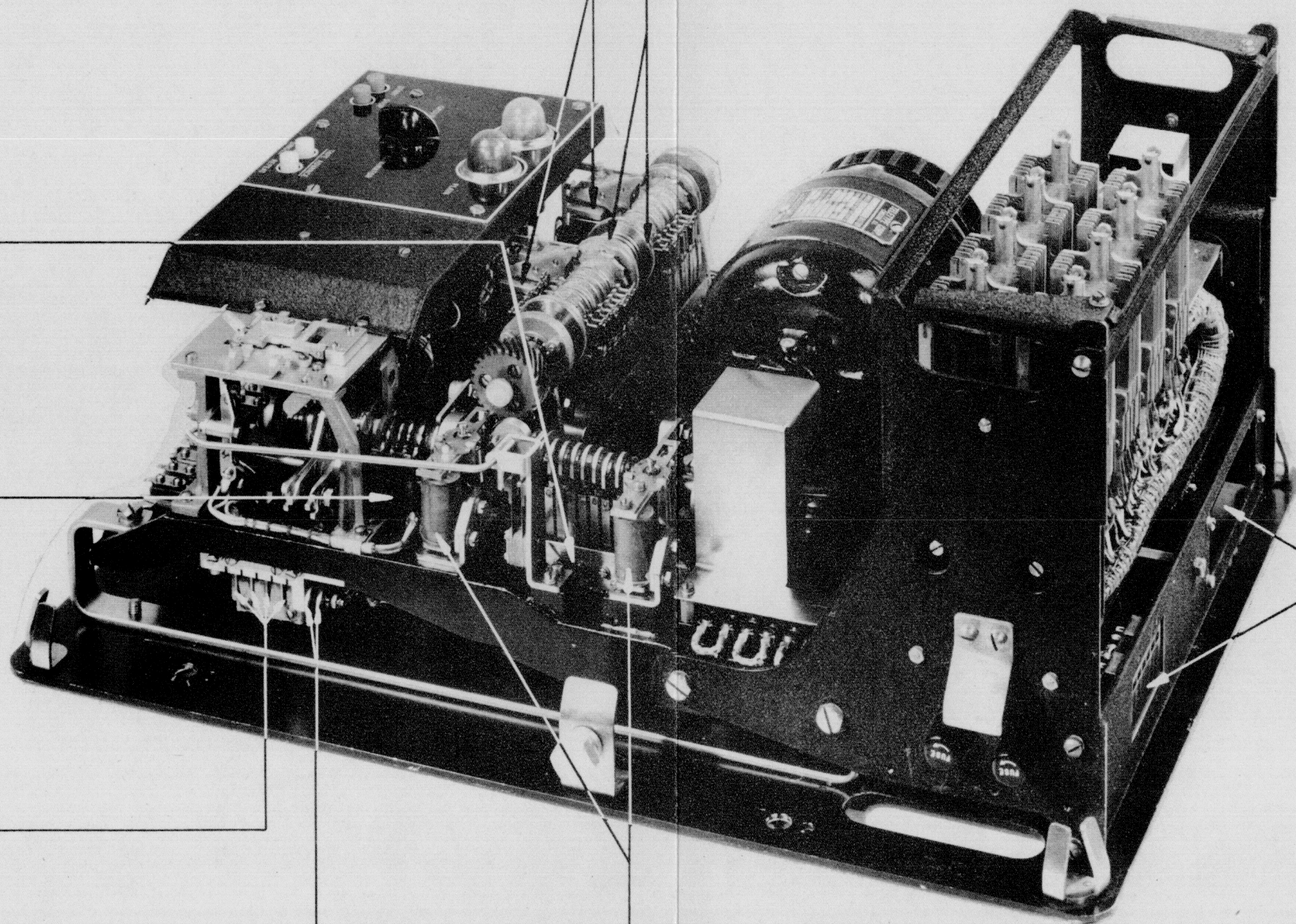
TIMING CONTACTS

INTERCONNECTION
RECEPTACLES

CODE BARS

SPREADER BARS

CLUTCH MAGNETS



TAPE READER - RIGHT SIDE

FIGURE 3

ALPHABET CONTACTS

CODE BARS

CONTACT LEVERS

SPREADER BARS

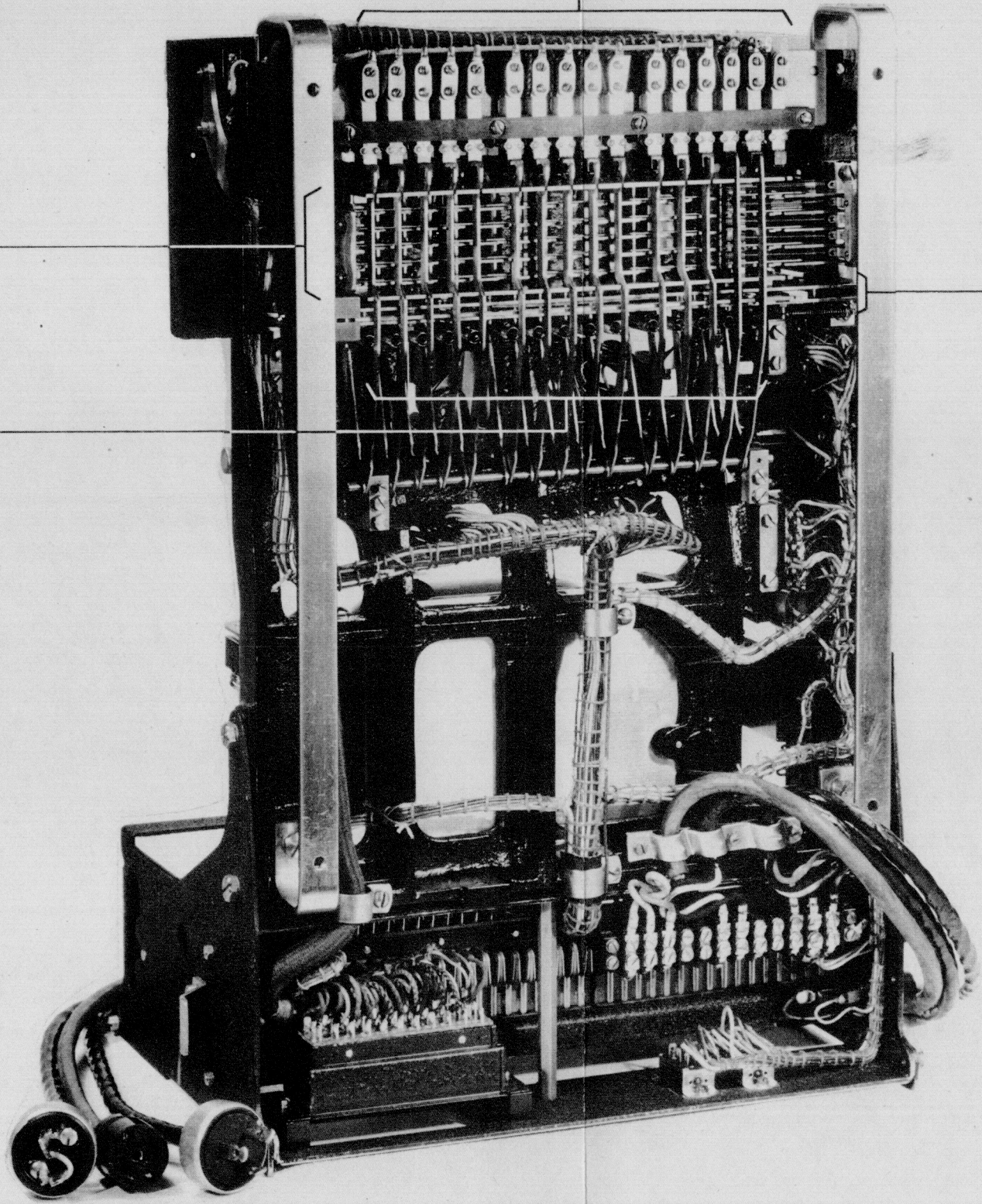


FIGURE 4

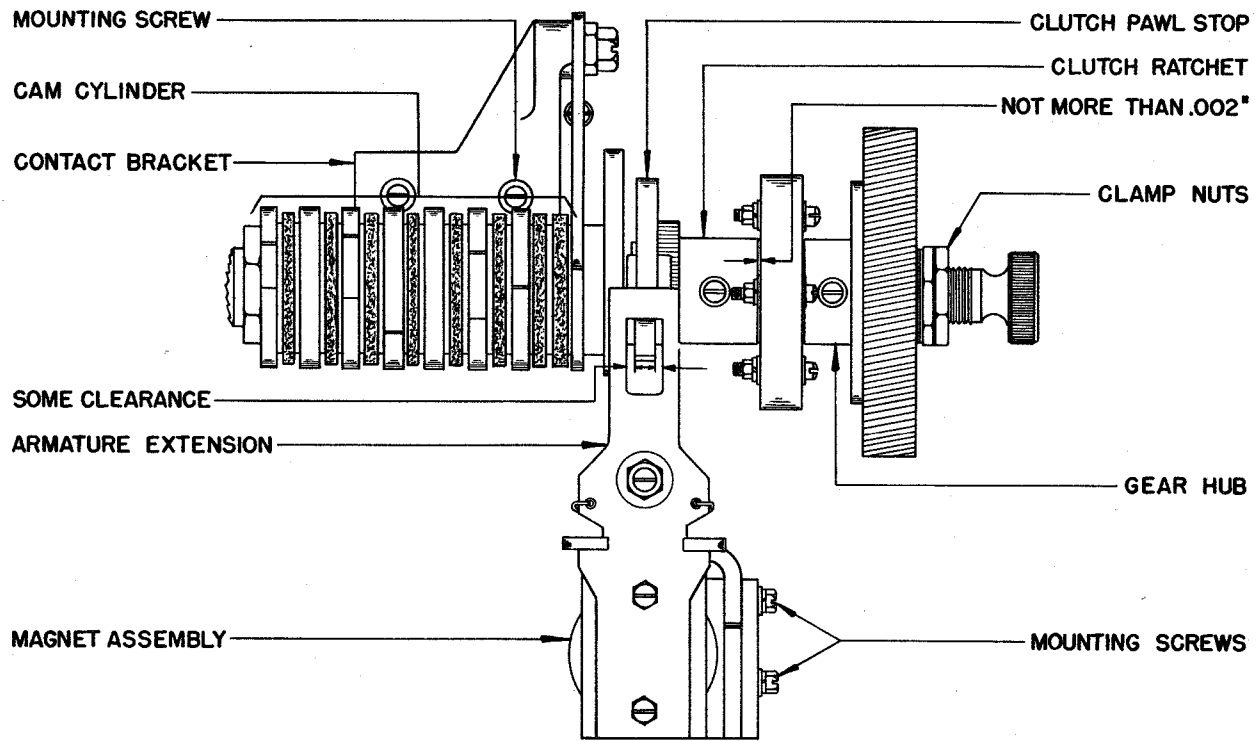


FIGURE 5

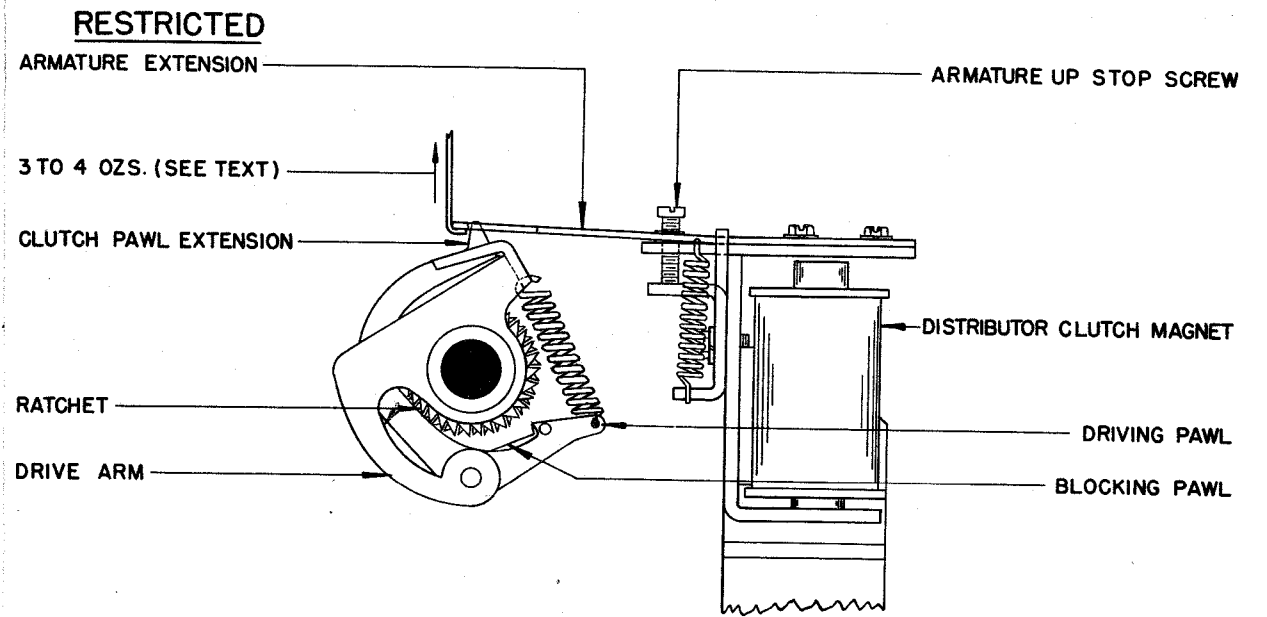


FIGURE 7

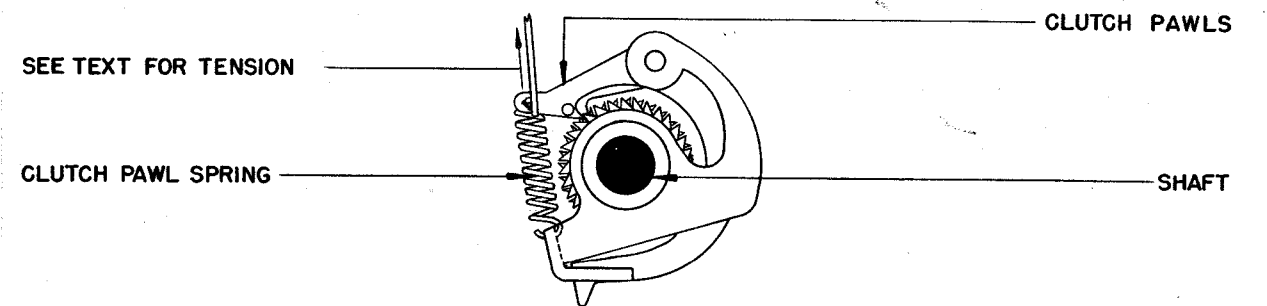


FIGURE 8

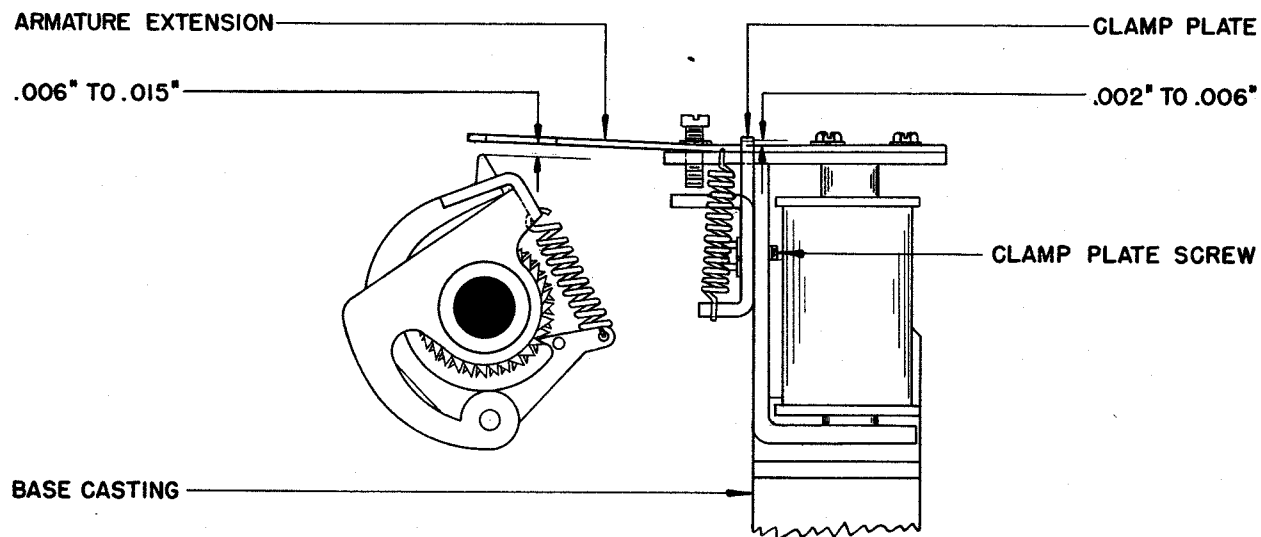


FIGURE 6

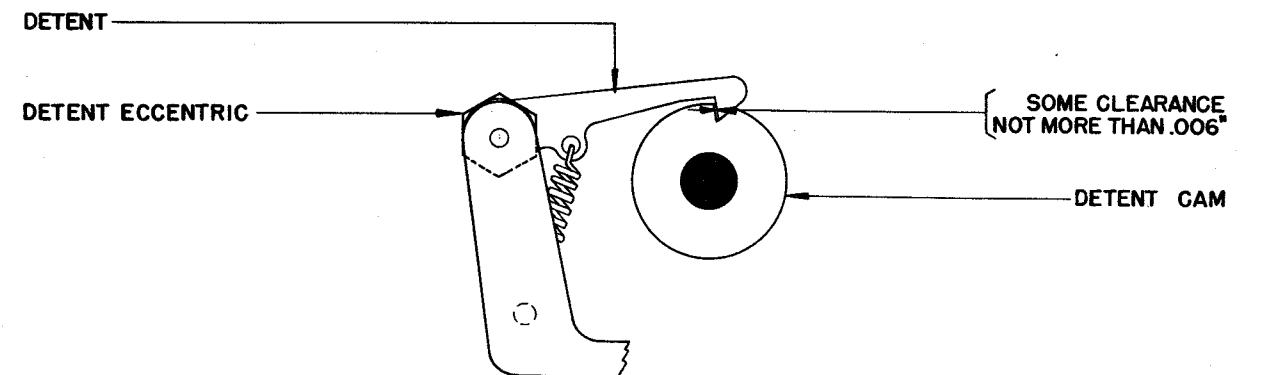


FIGURE 9

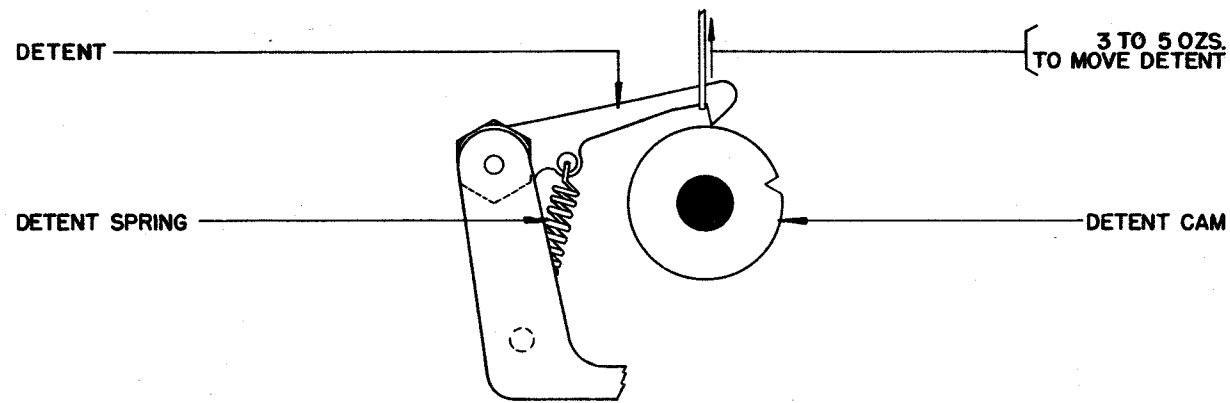


FIGURE 10

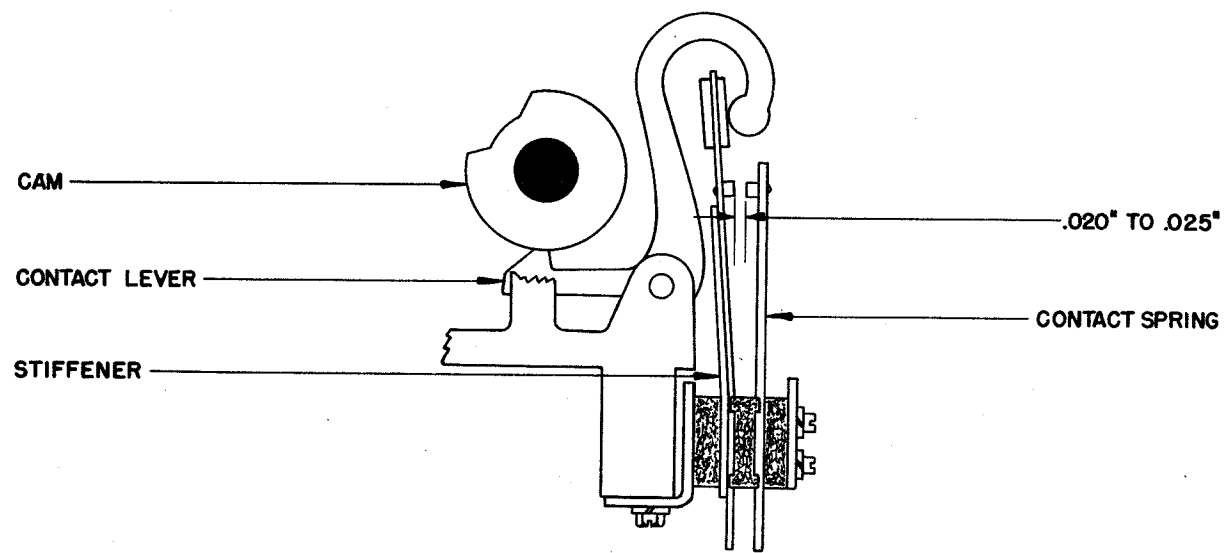


FIGURE 11

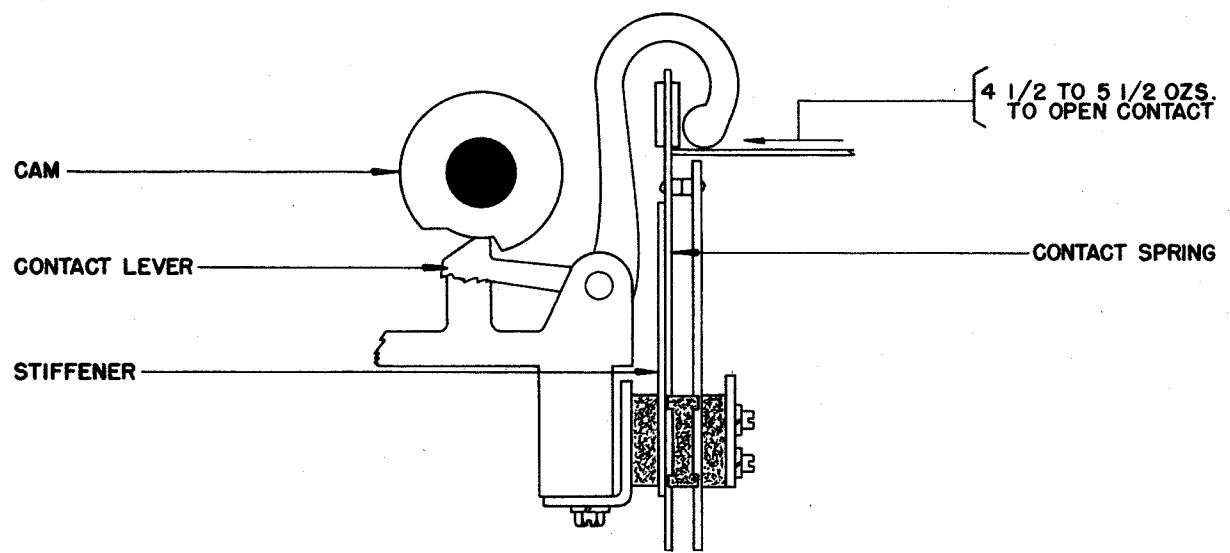


FIGURE 12

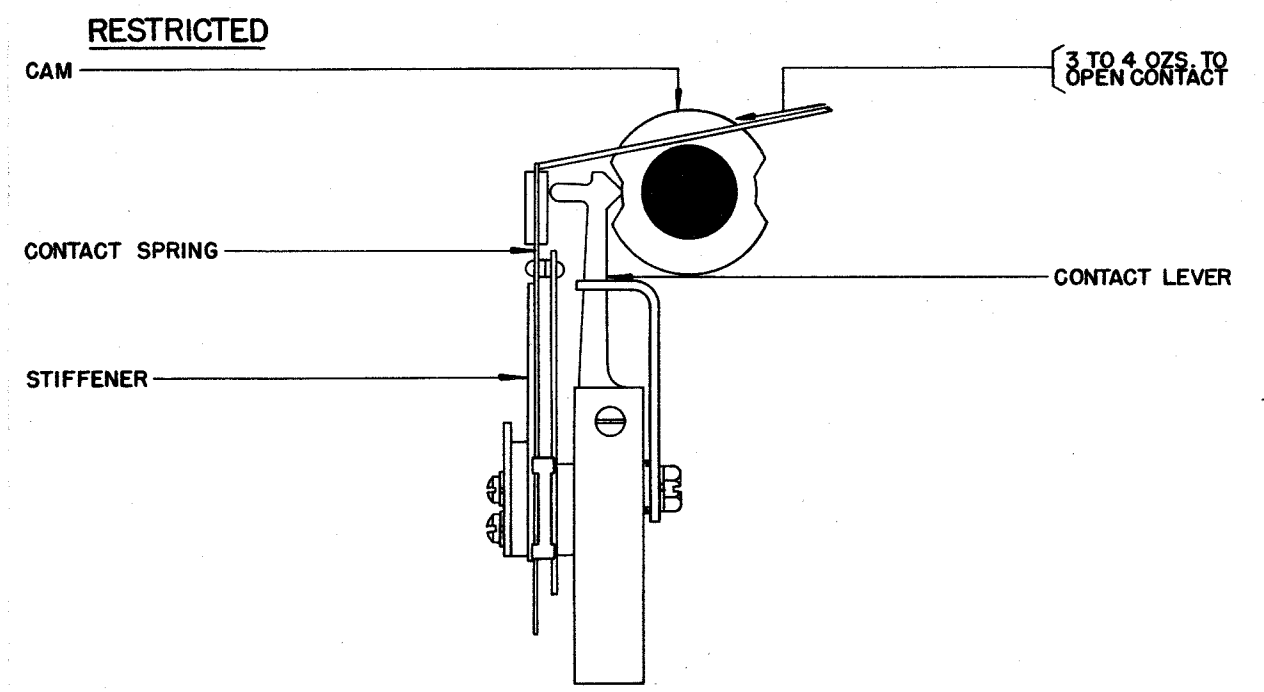


FIGURE 13

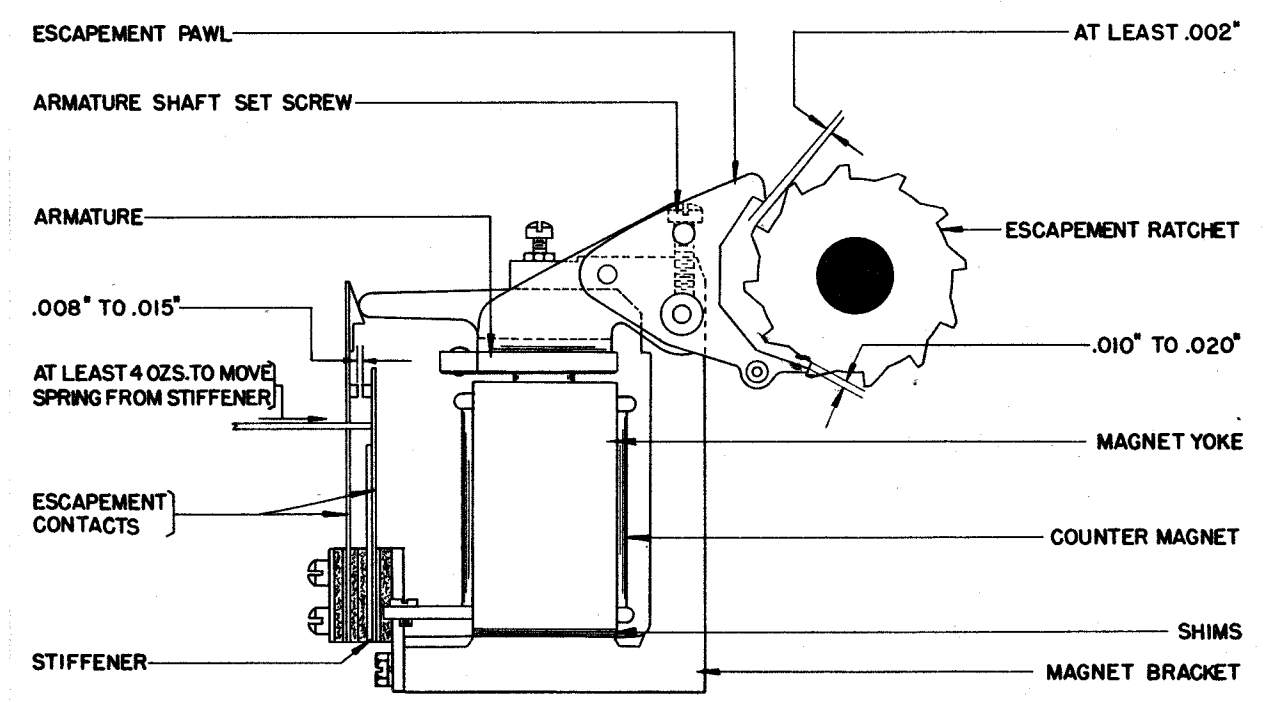


FIGURE 14

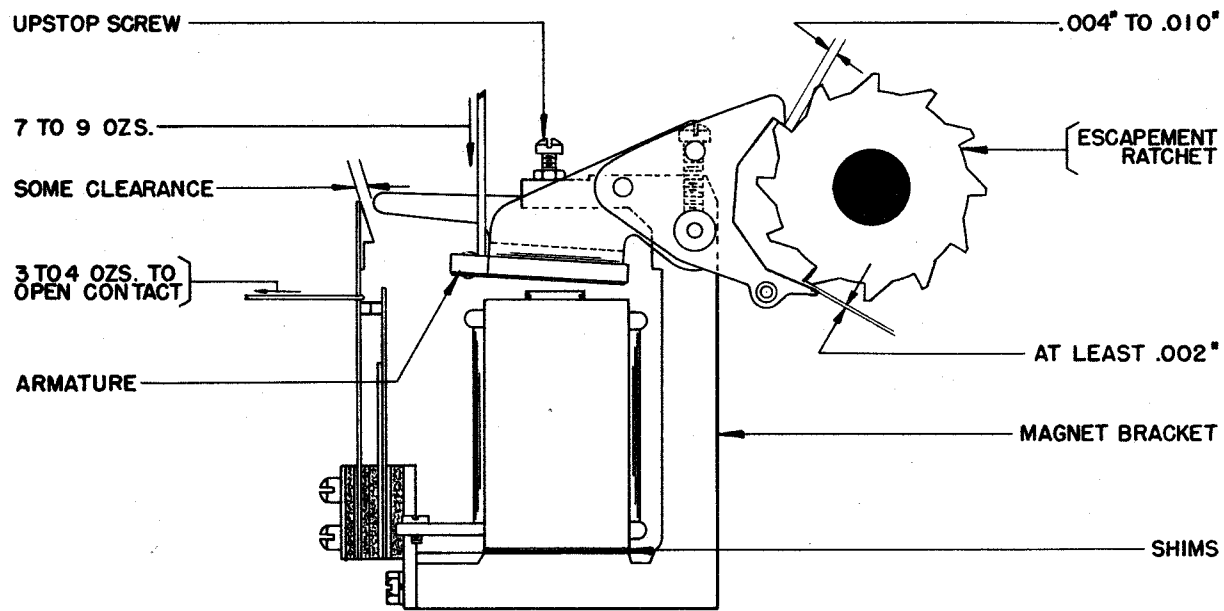


FIGURE 15

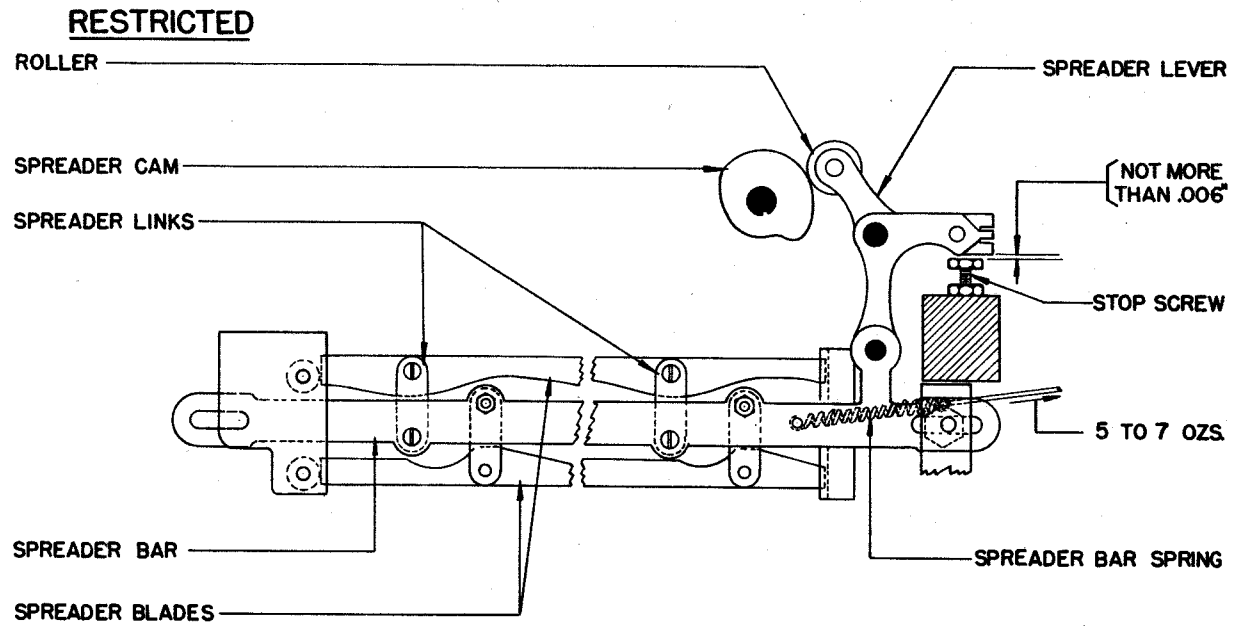


FIGURE 17

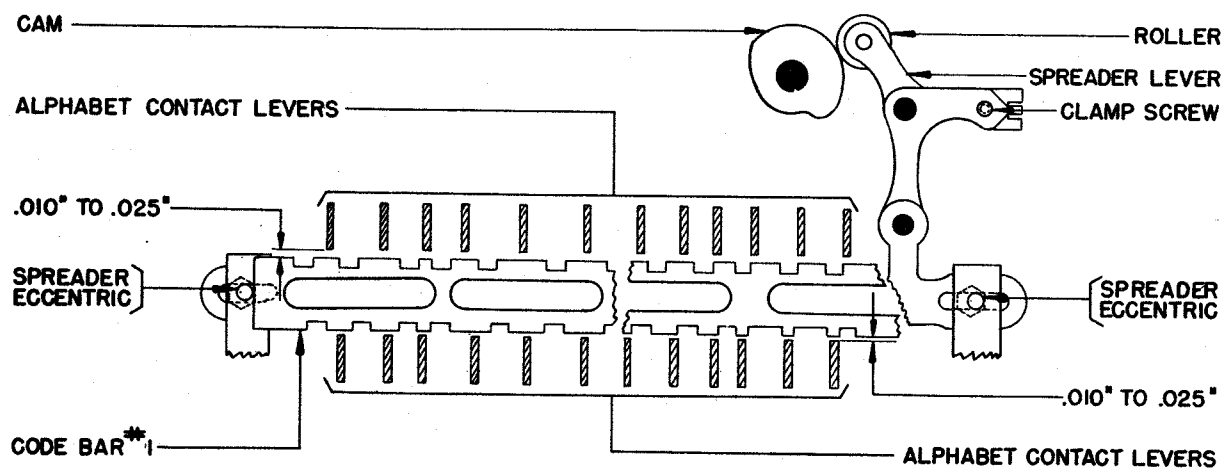


FIGURE 16

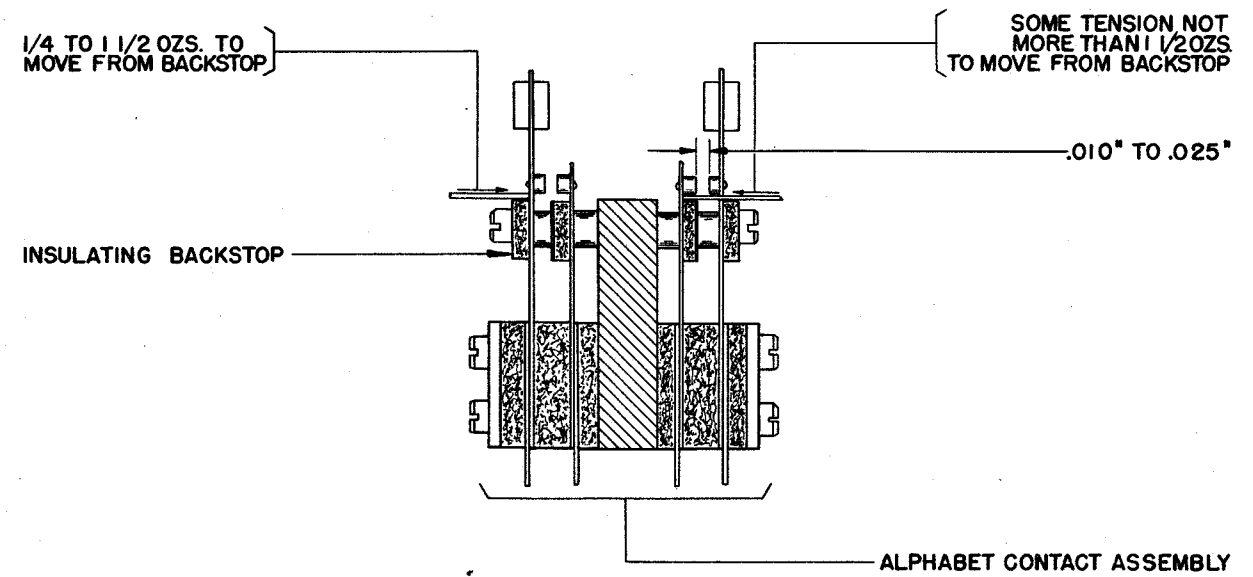


FIGURE 18

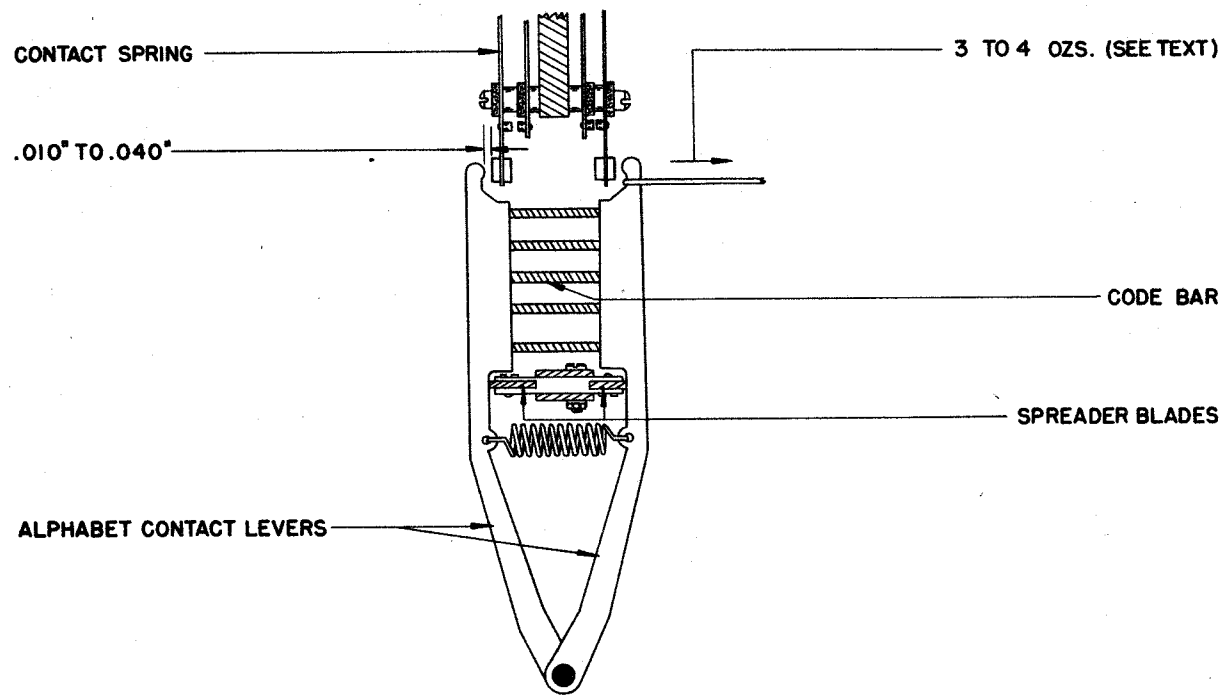


FIGURE 19

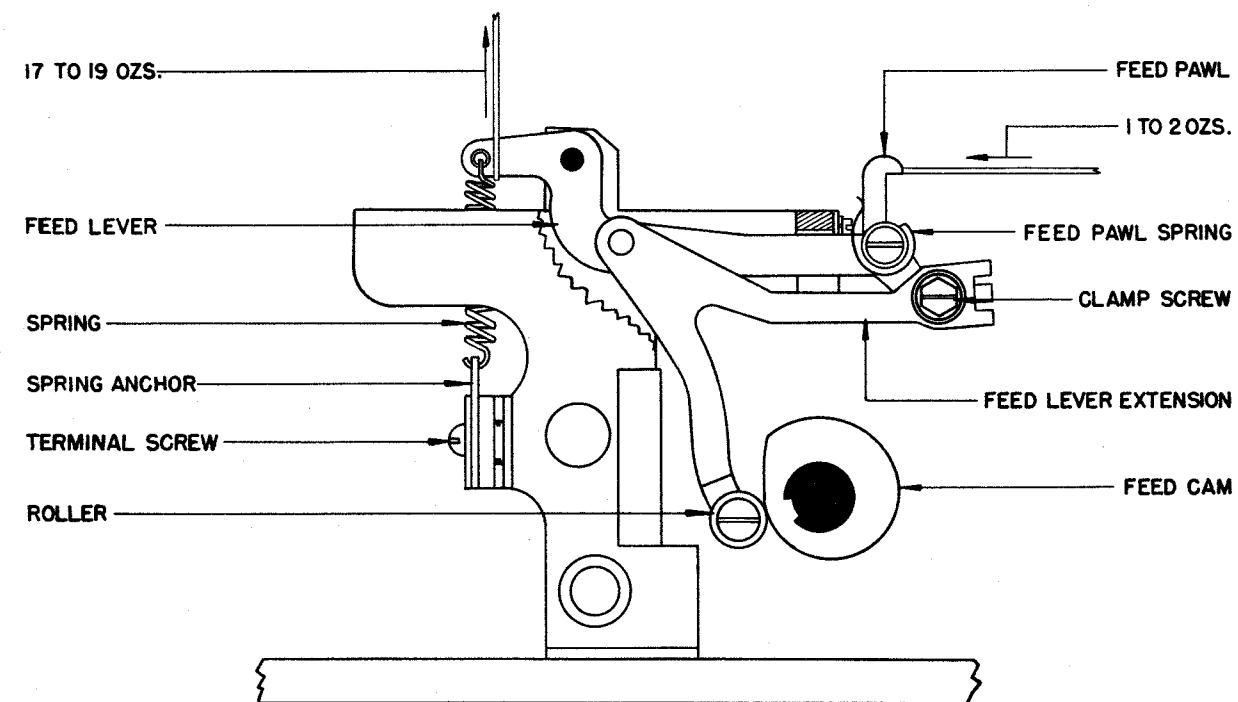


FIGURE 20

RESTRICTED

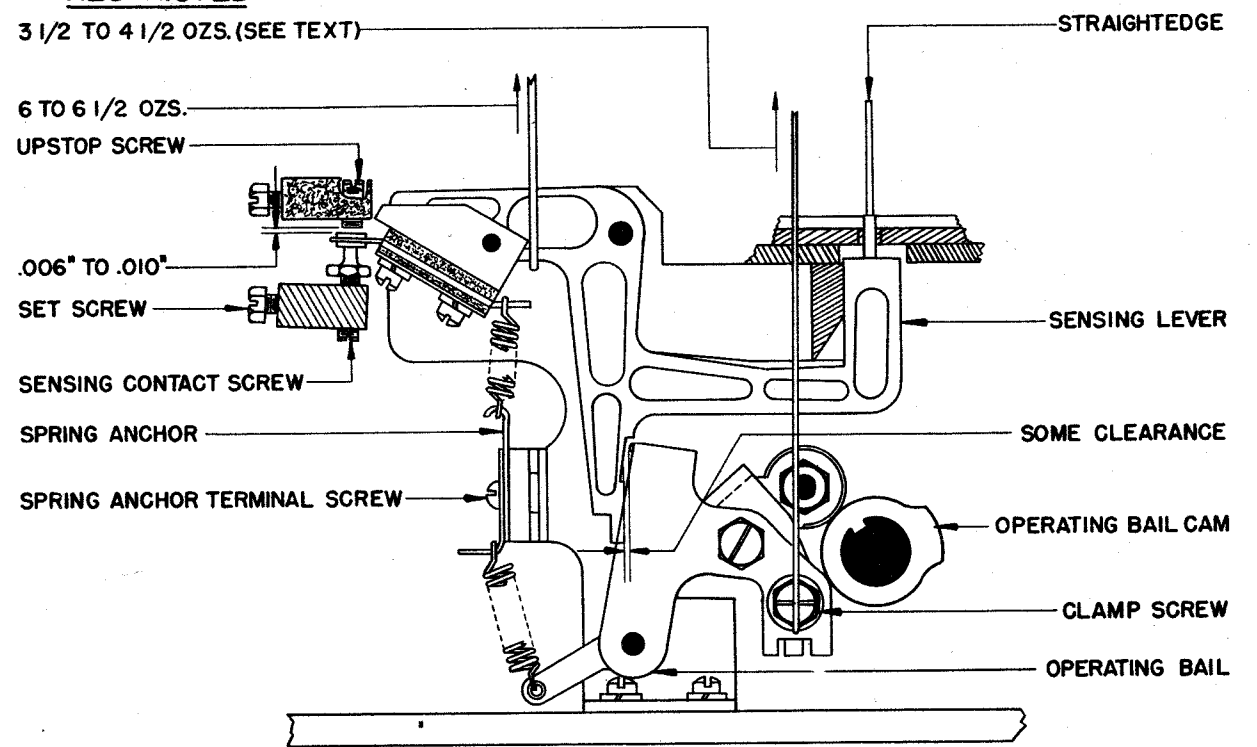


FIGURE 21

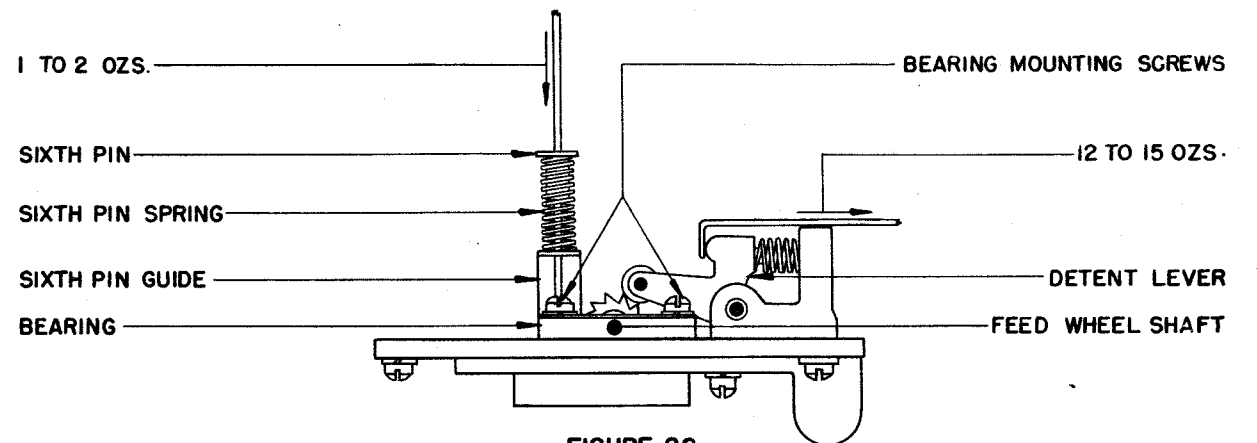


FIGURE 22

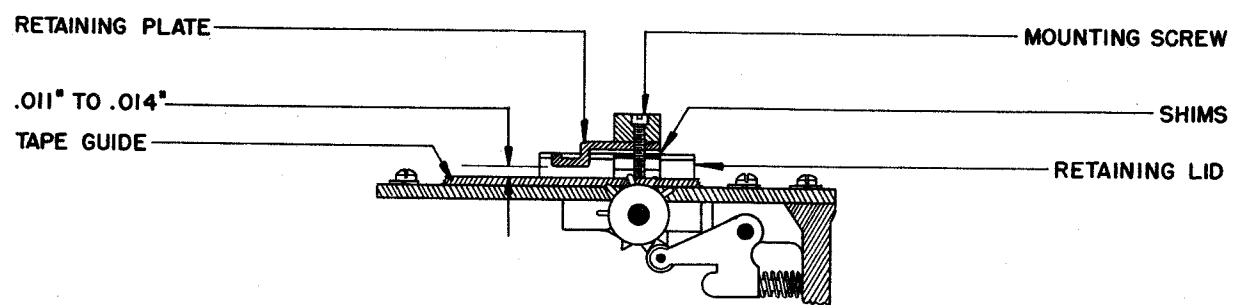


FIGURE 23

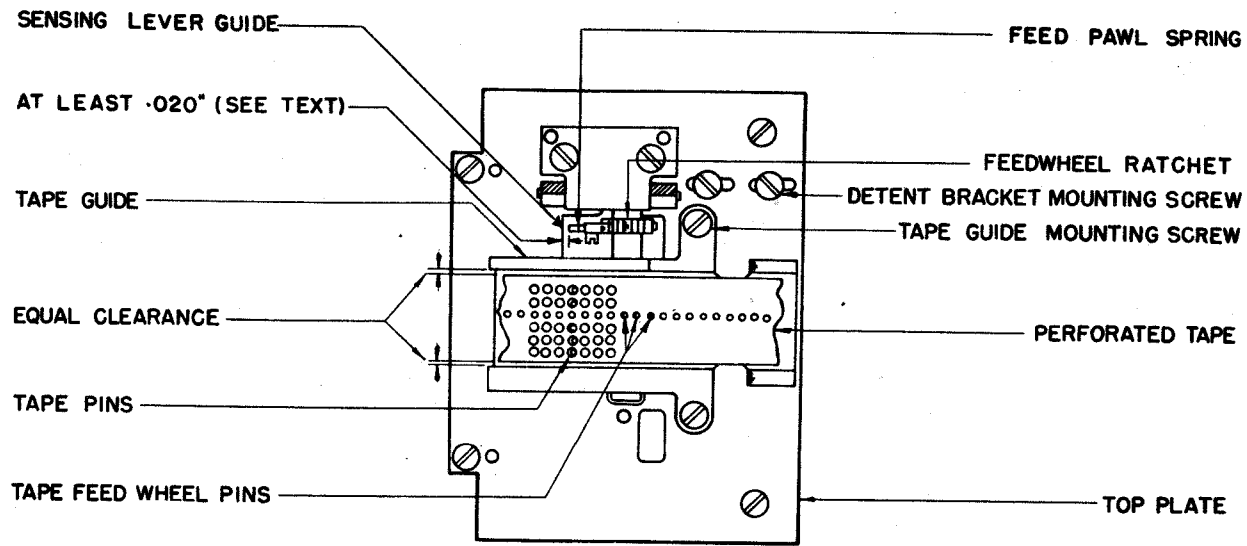


FIGURE 24

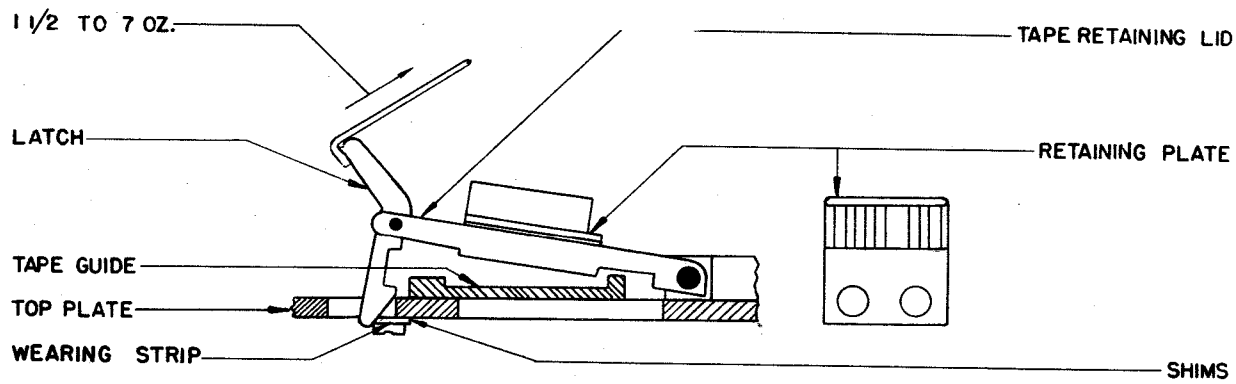


FIGURE 25

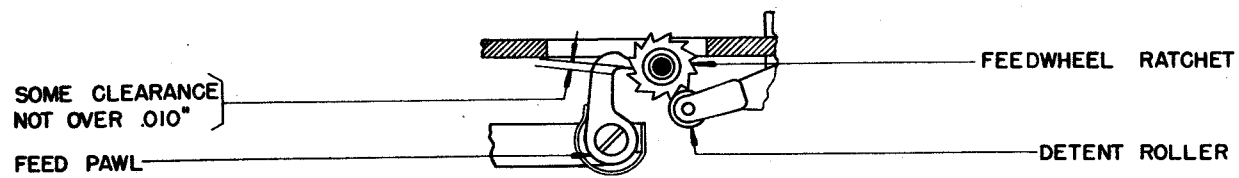


FIGURE 26

RESTRICTED

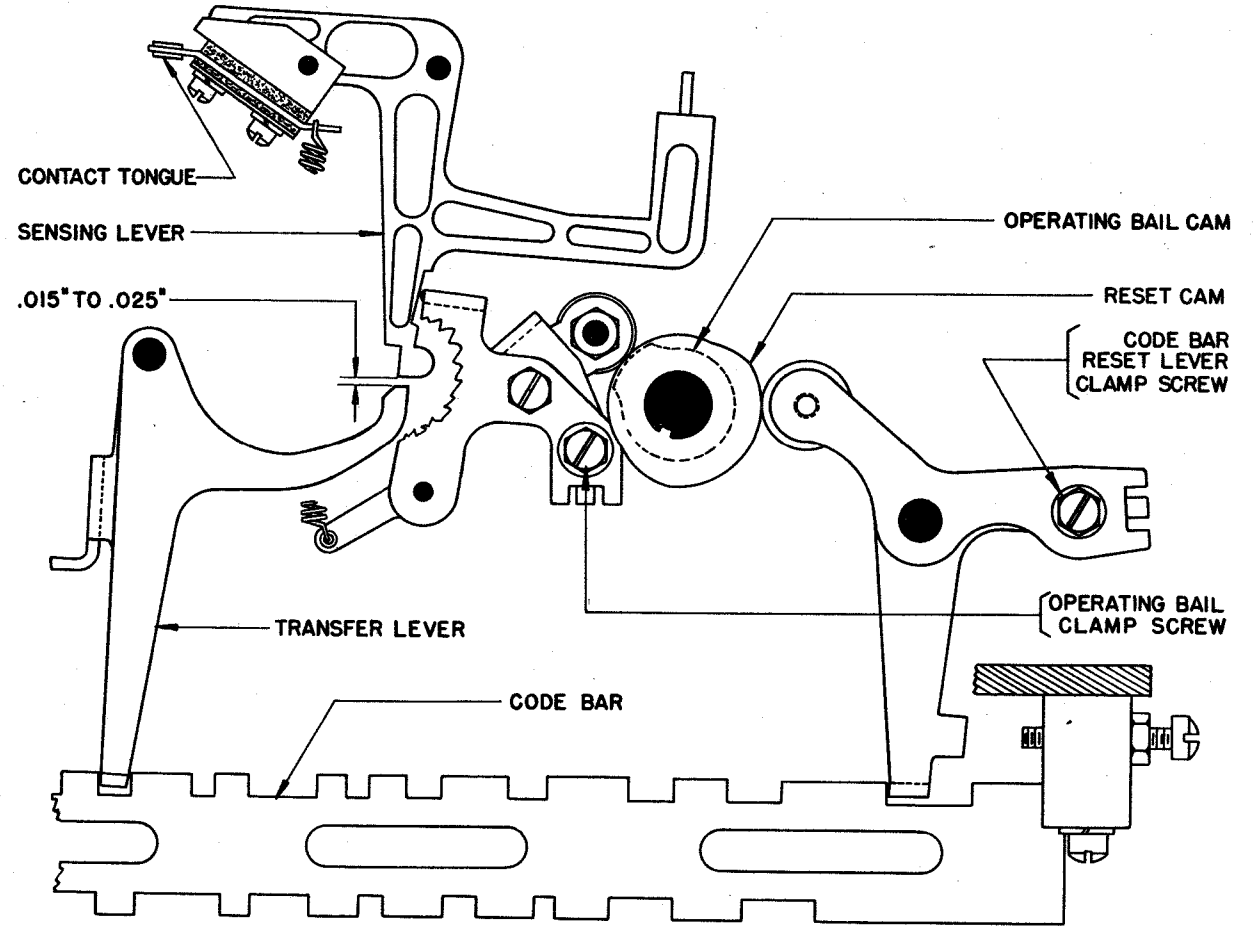


FIGURE 27

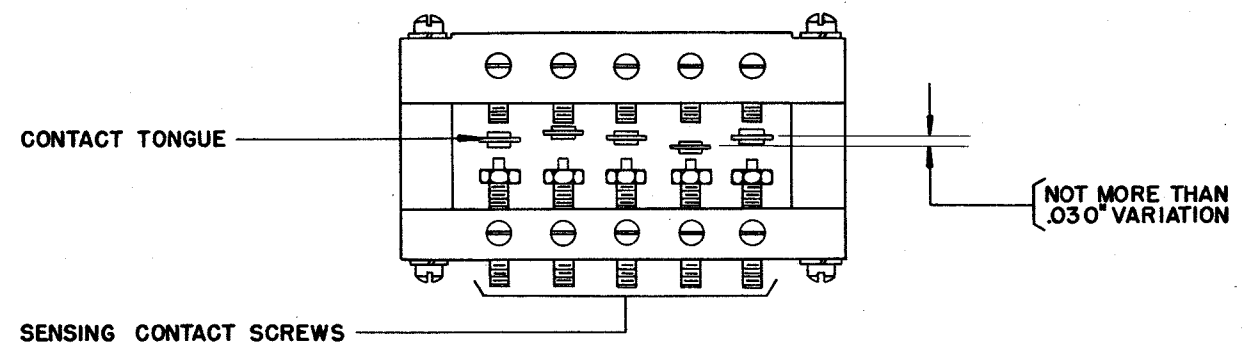


FIGURE 28

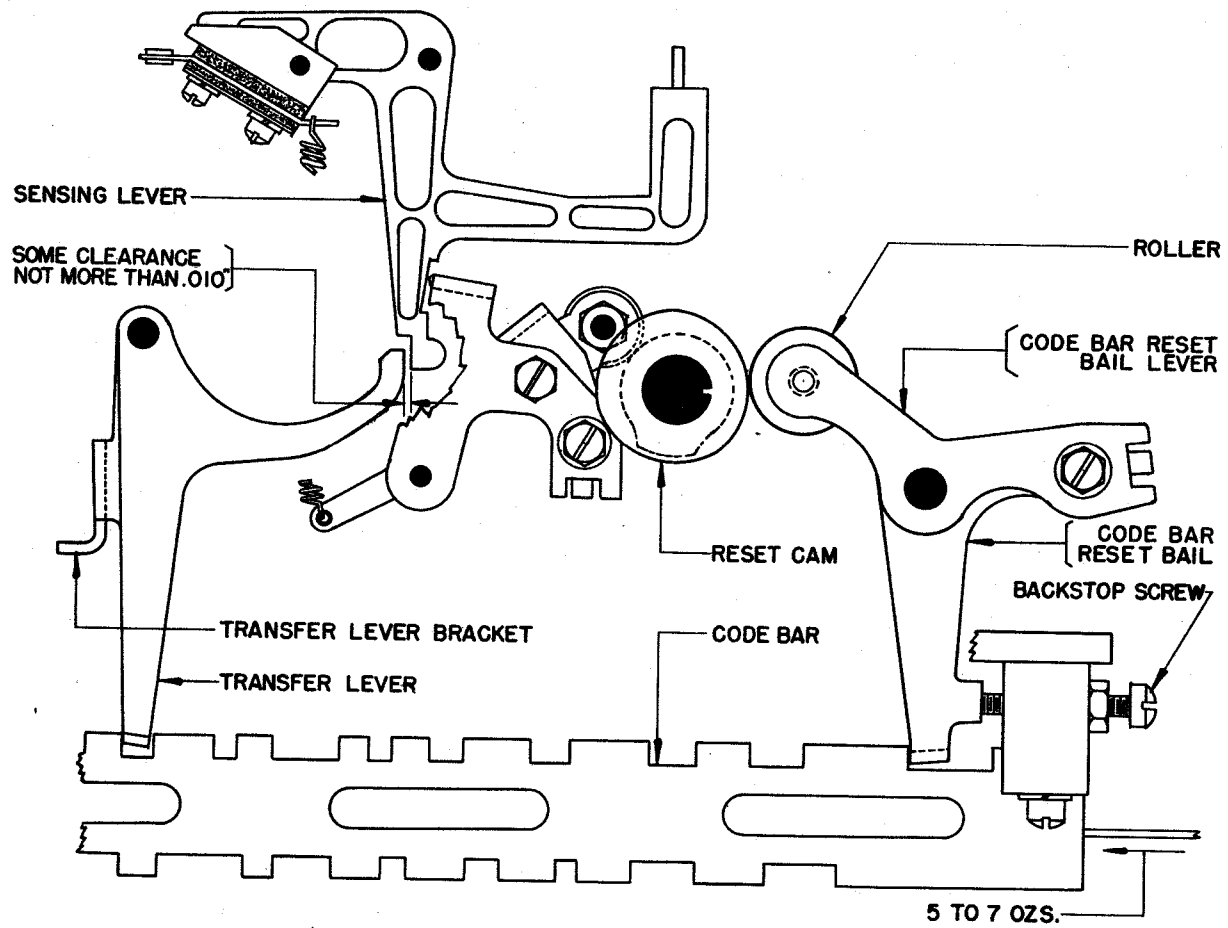


FIGURE 29

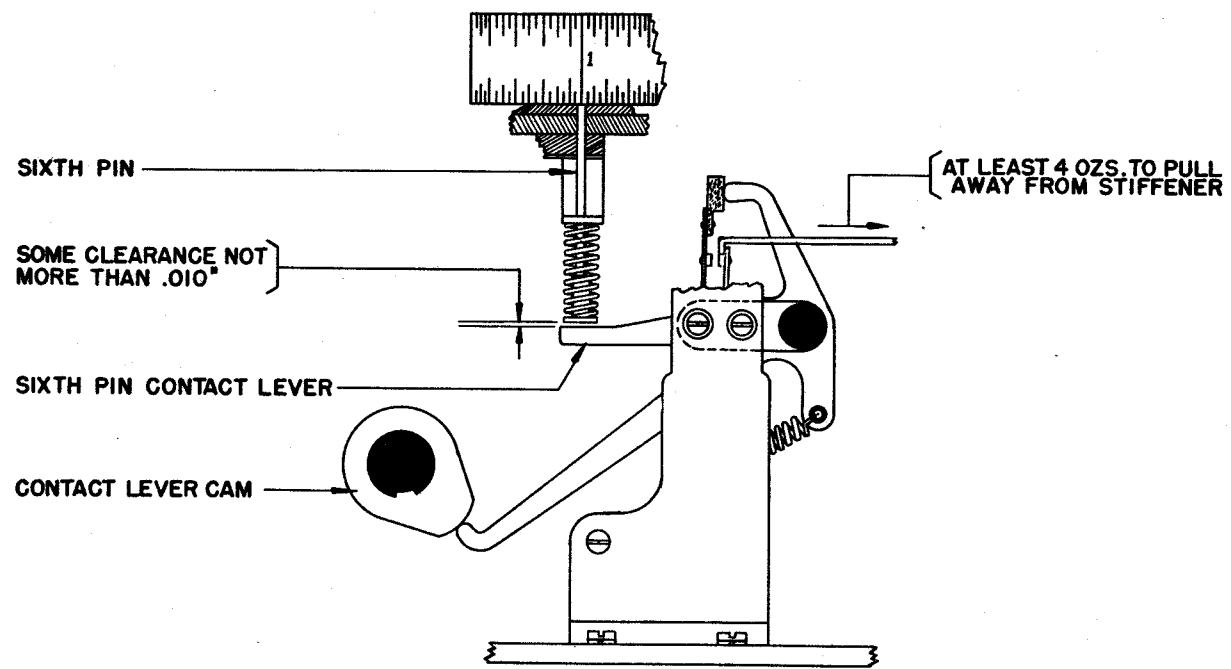


FIGURE 30

RESTRICTED

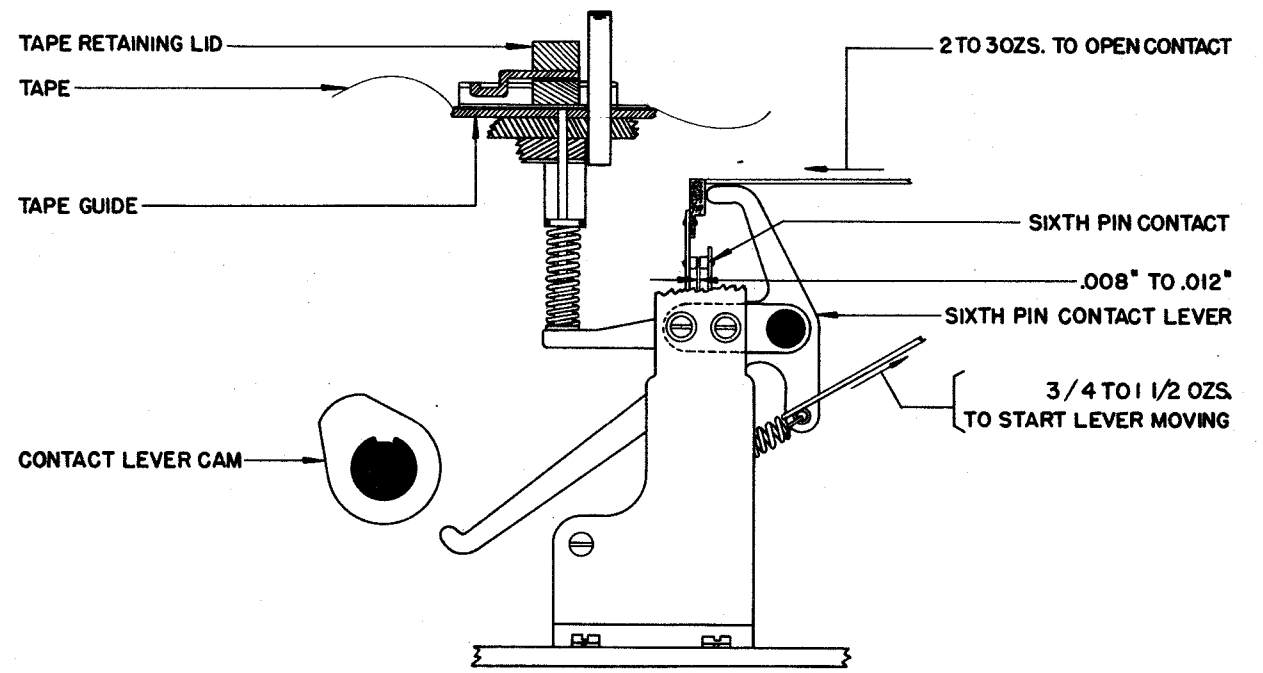


FIGURE 31

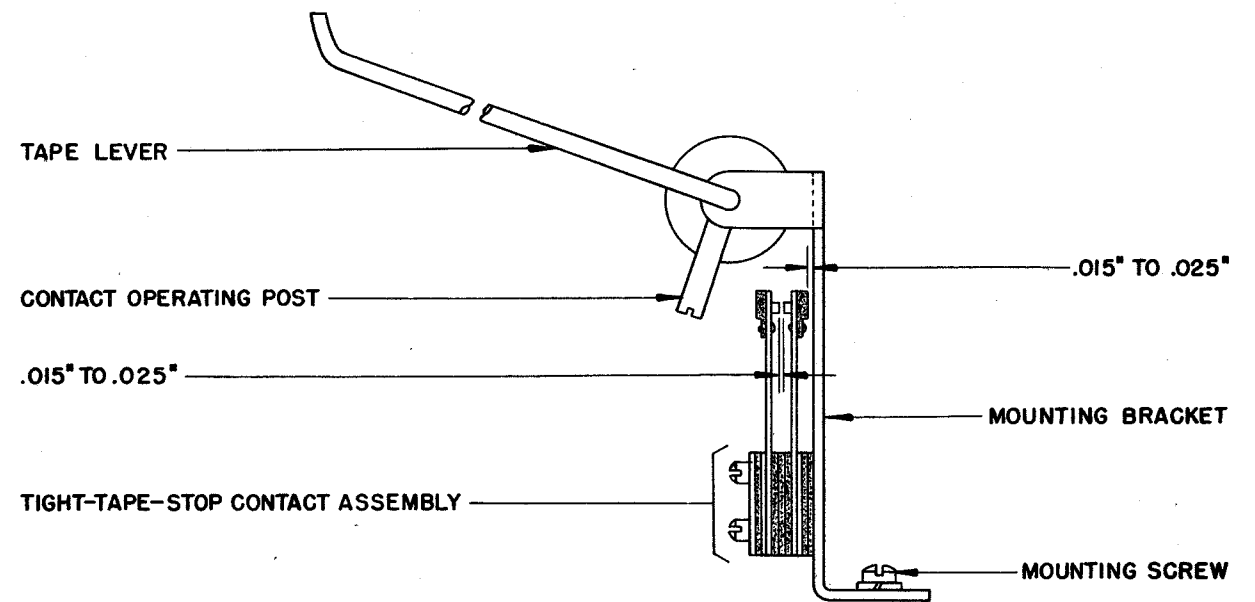


FIGURE 32

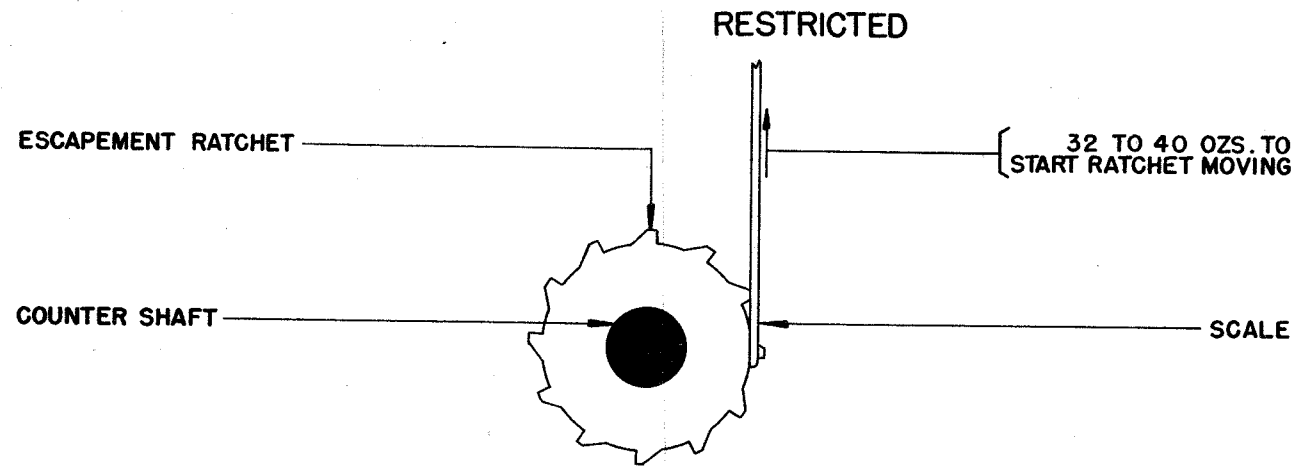


FIGURE 33

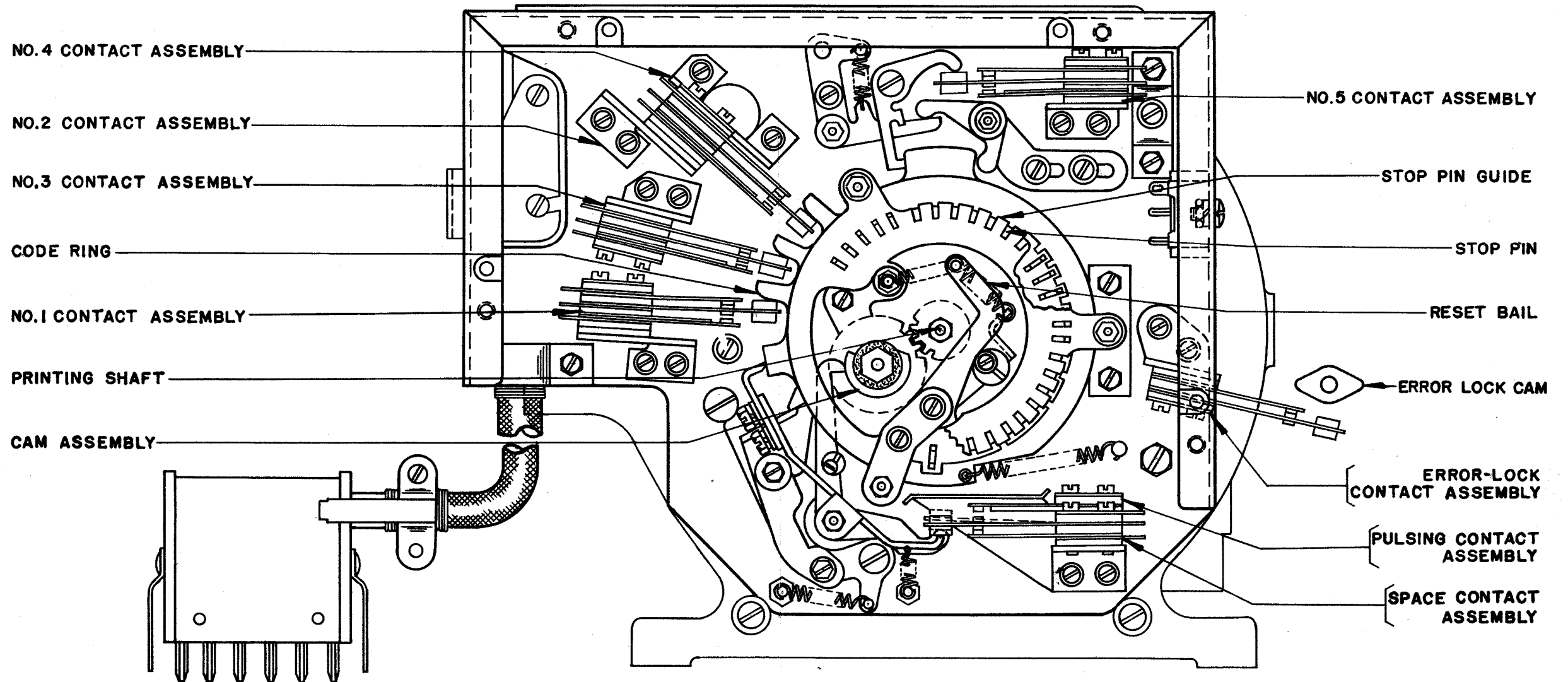


FIGURE 34

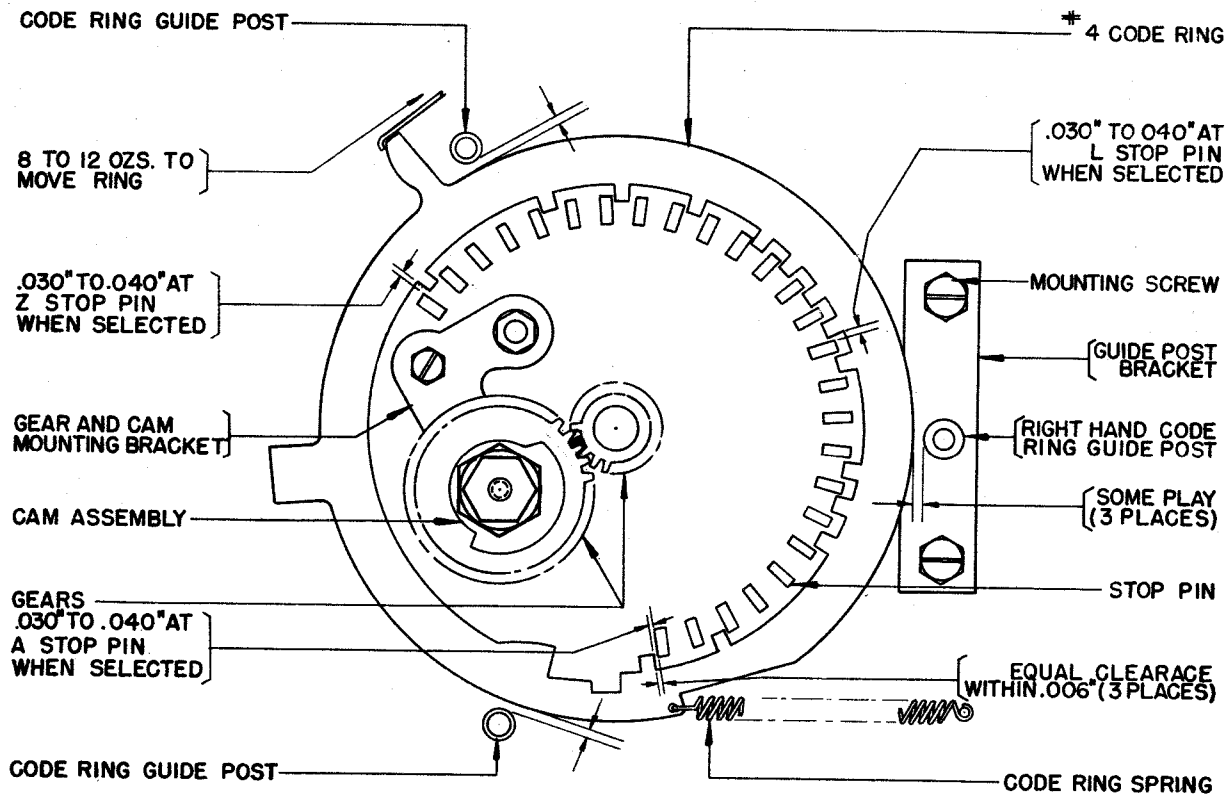


FIGURE 35

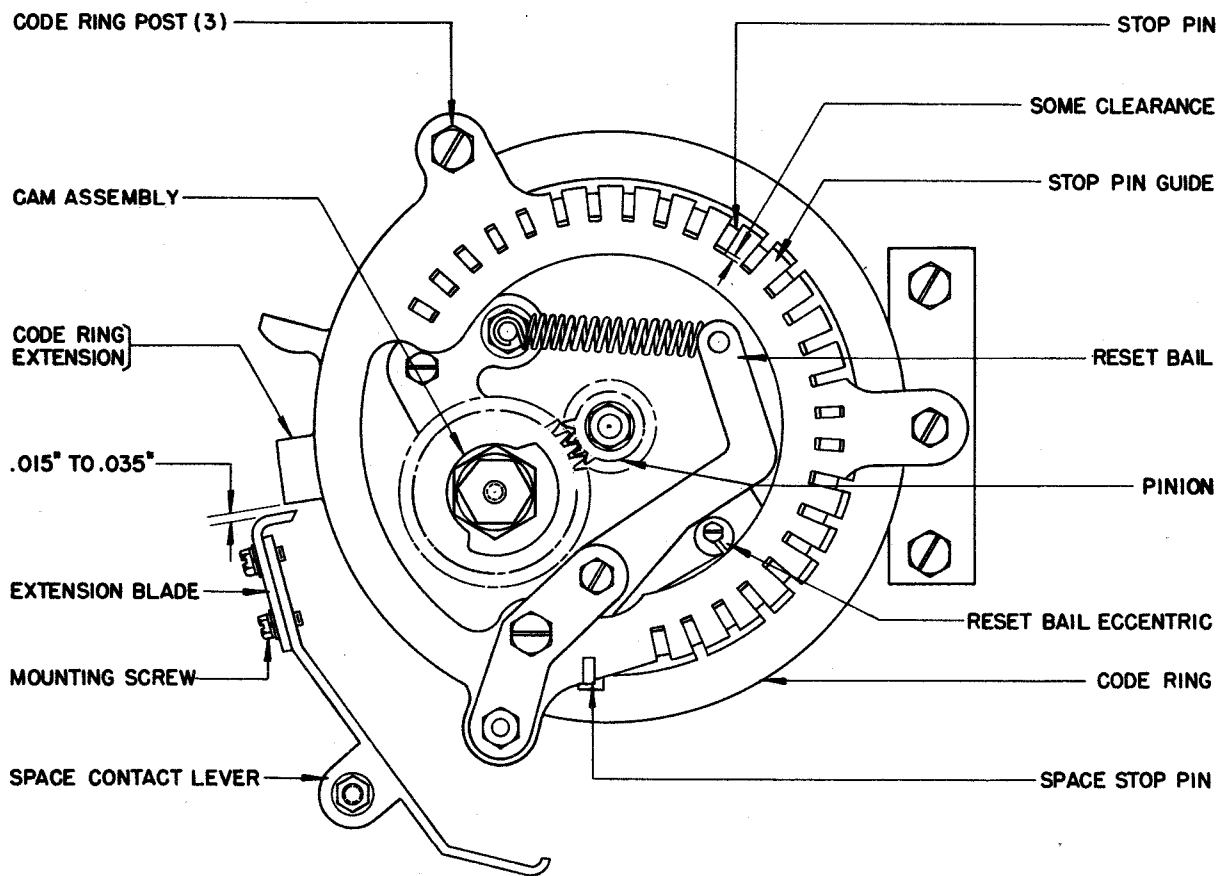


FIGURE 36

RESTRICTED

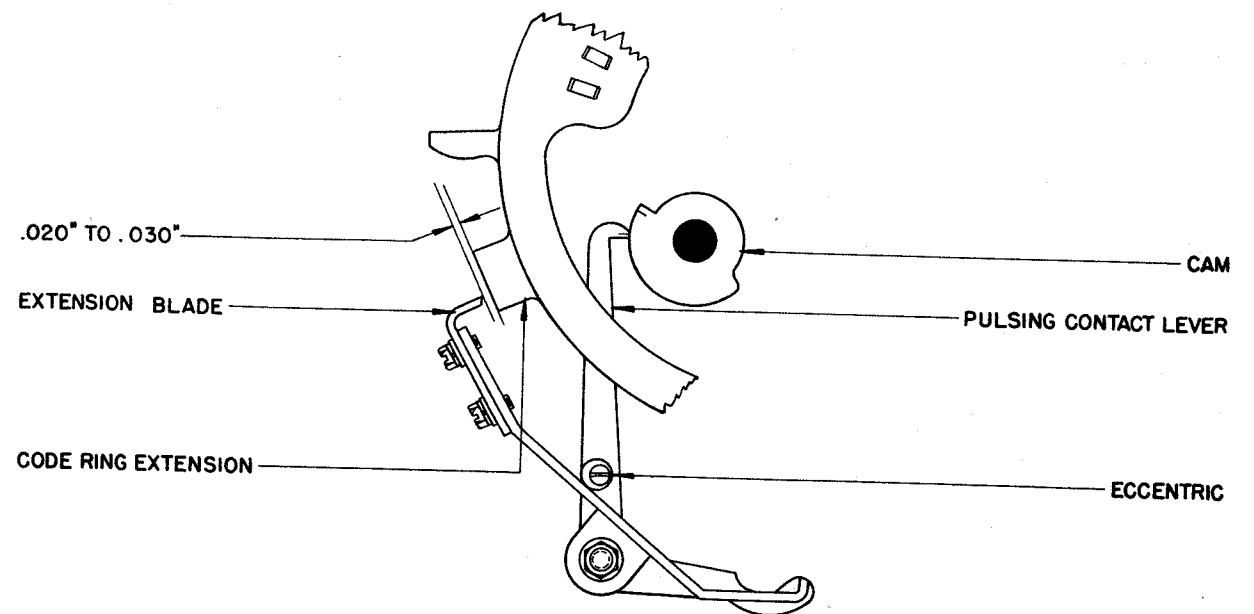


FIGURE 37

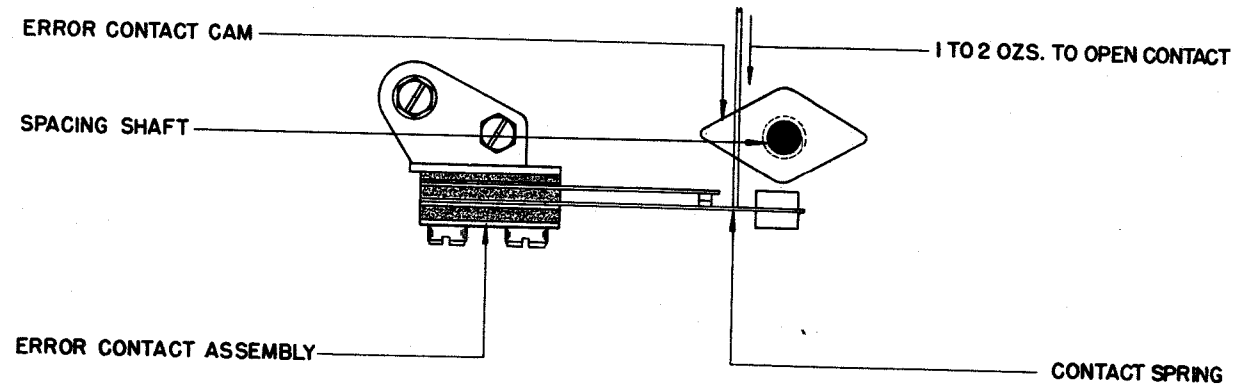


FIGURE 38

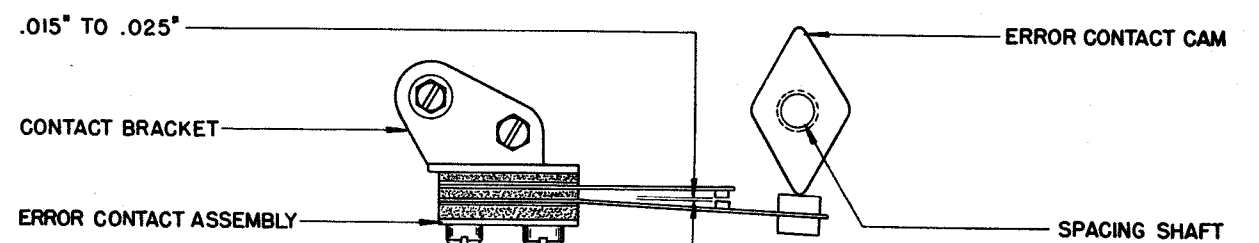


FIGURE 39

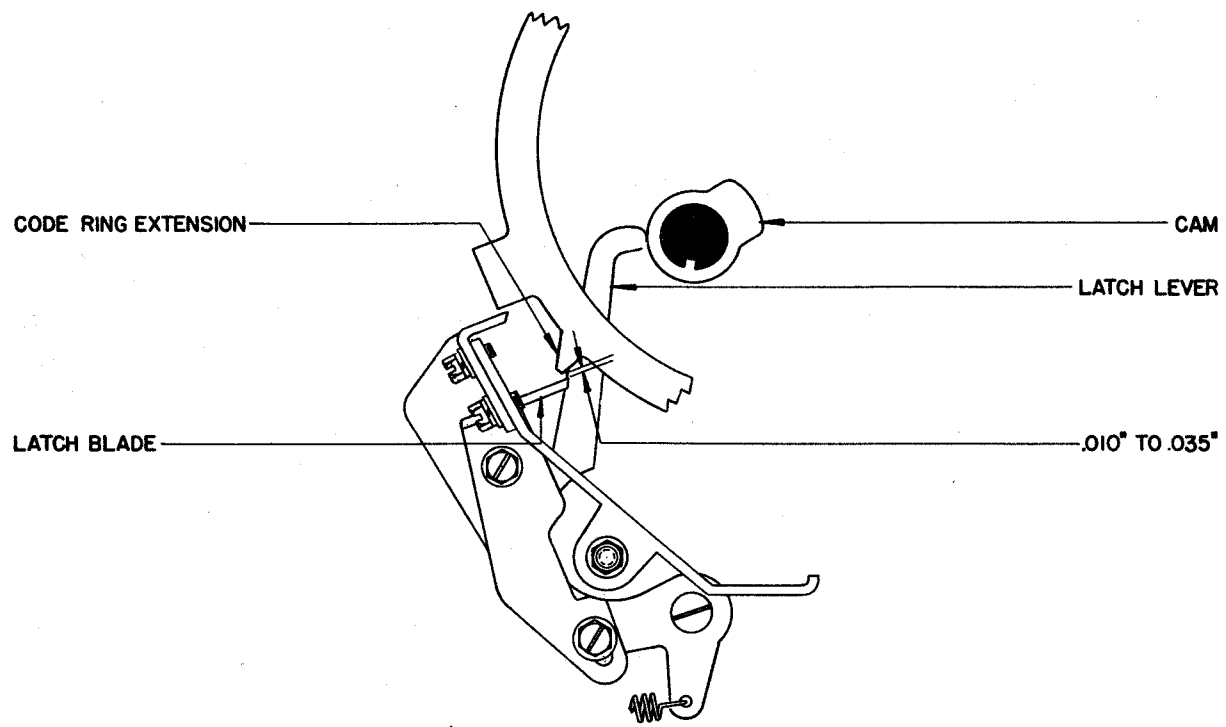


FIGURE 40

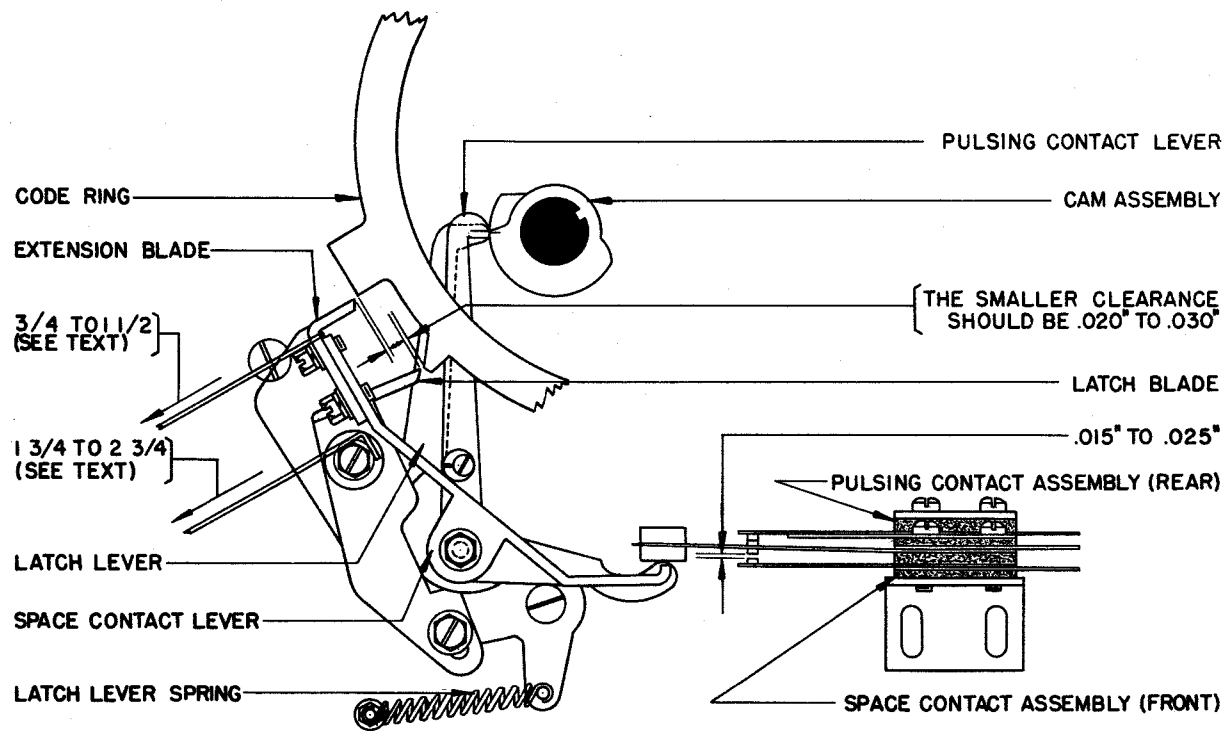


FIGURE 41

RESTRICTED

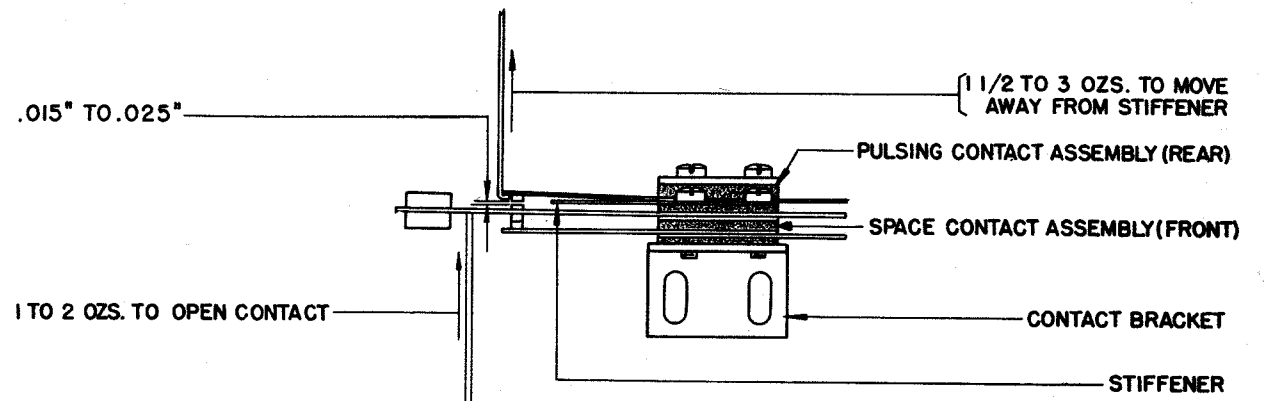


FIGURE 42

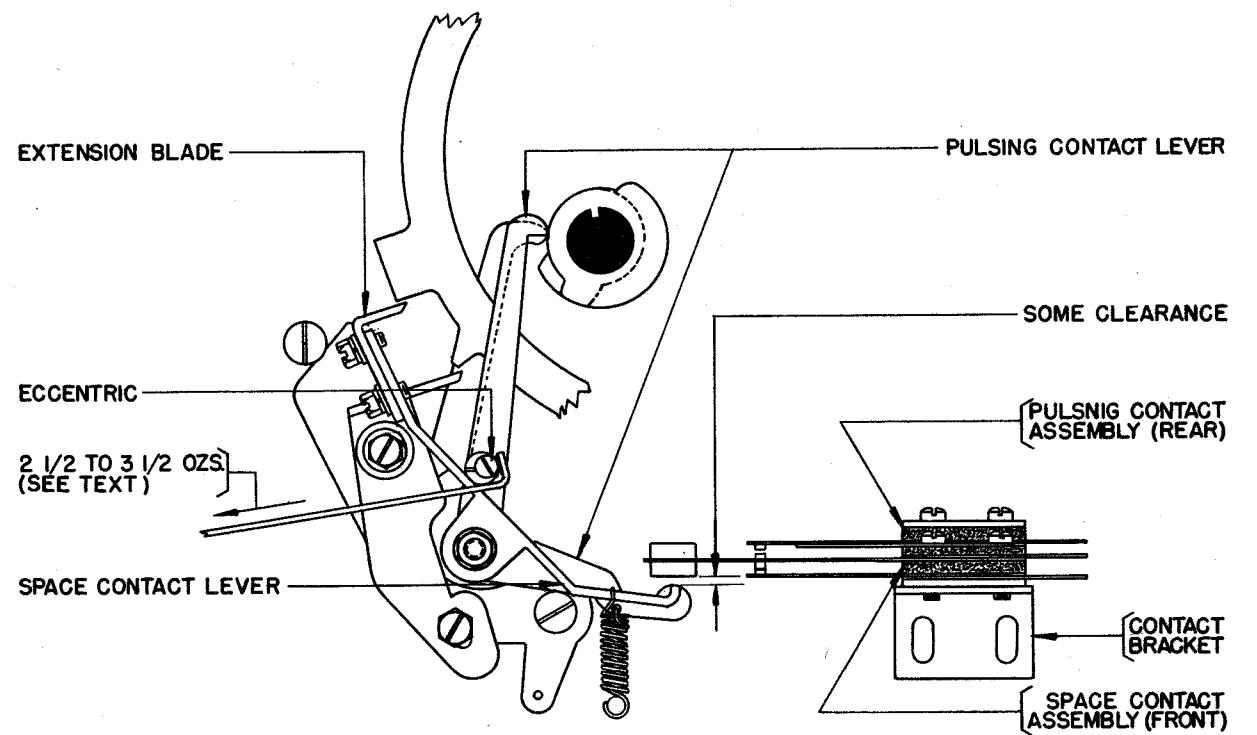


FIGURE 43

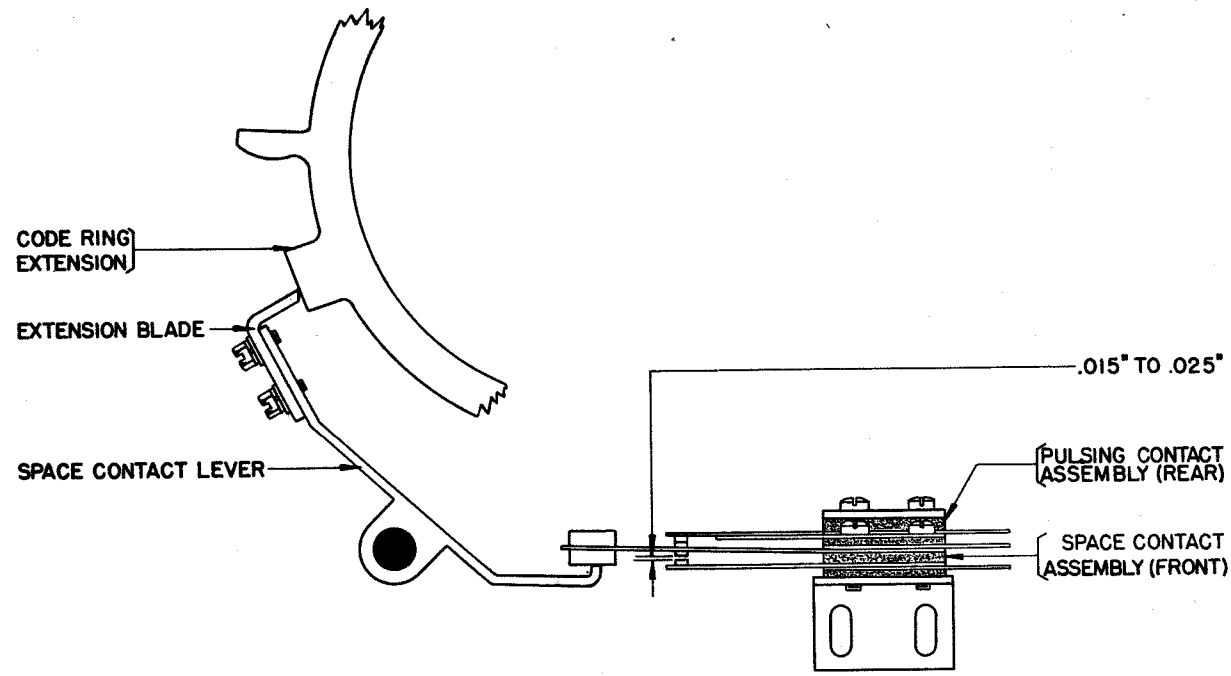


FIGURE 44

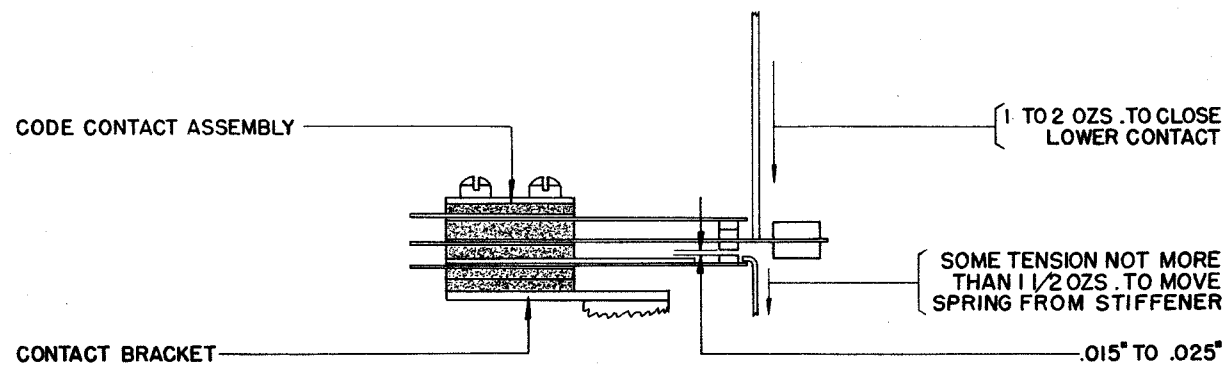


FIGURE 45

RESTRICTED

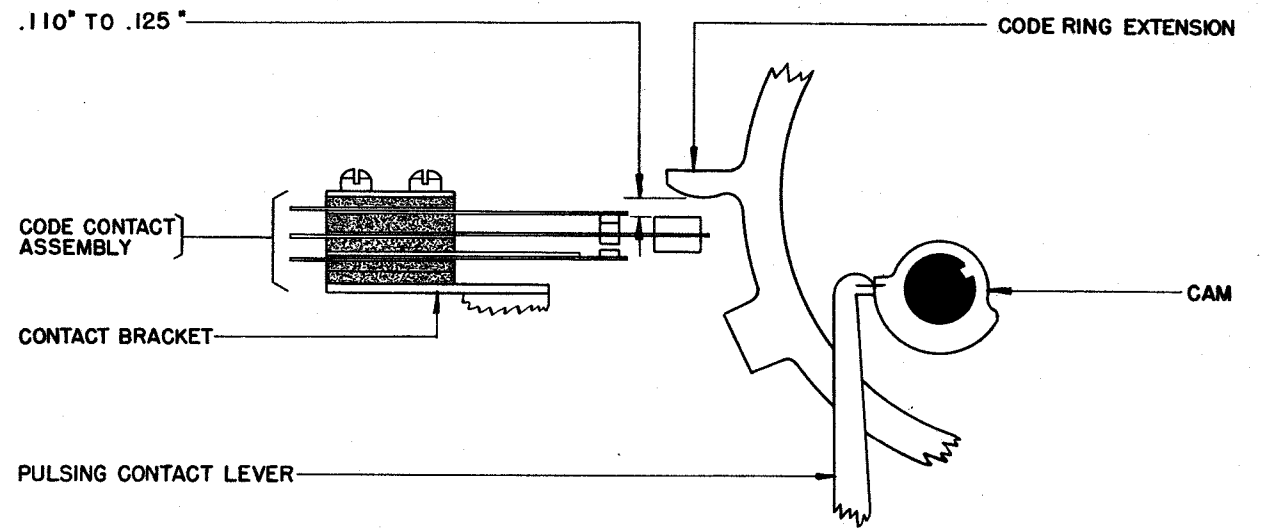


FIGURE 46

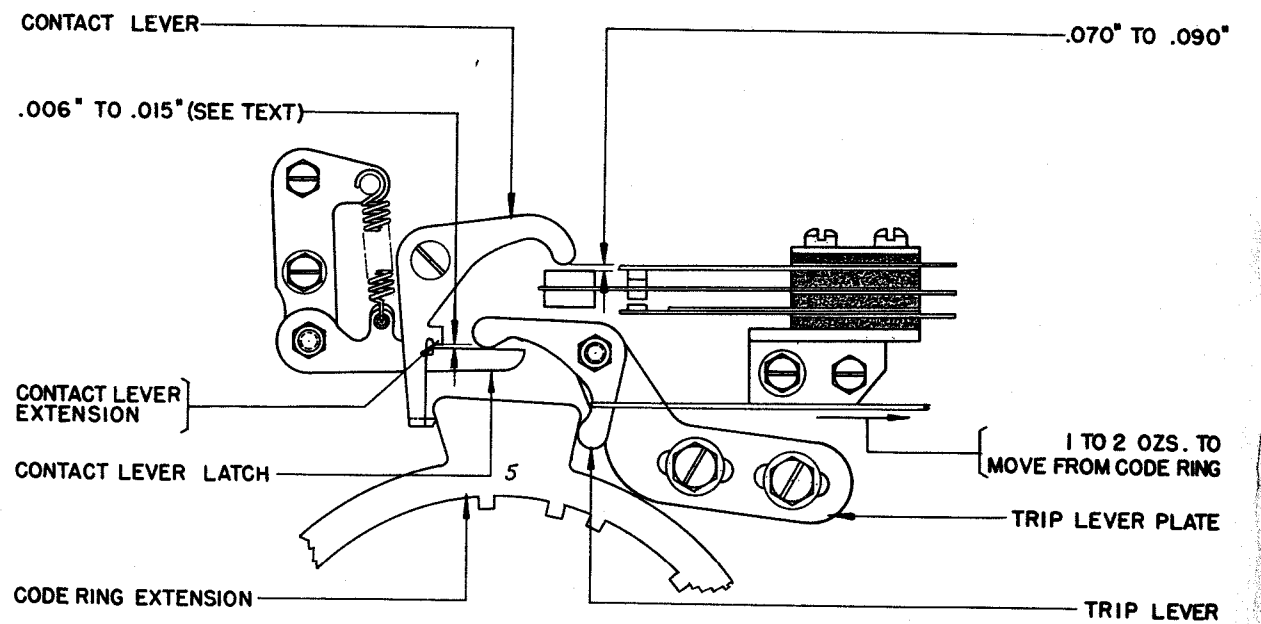


FIGURE 47

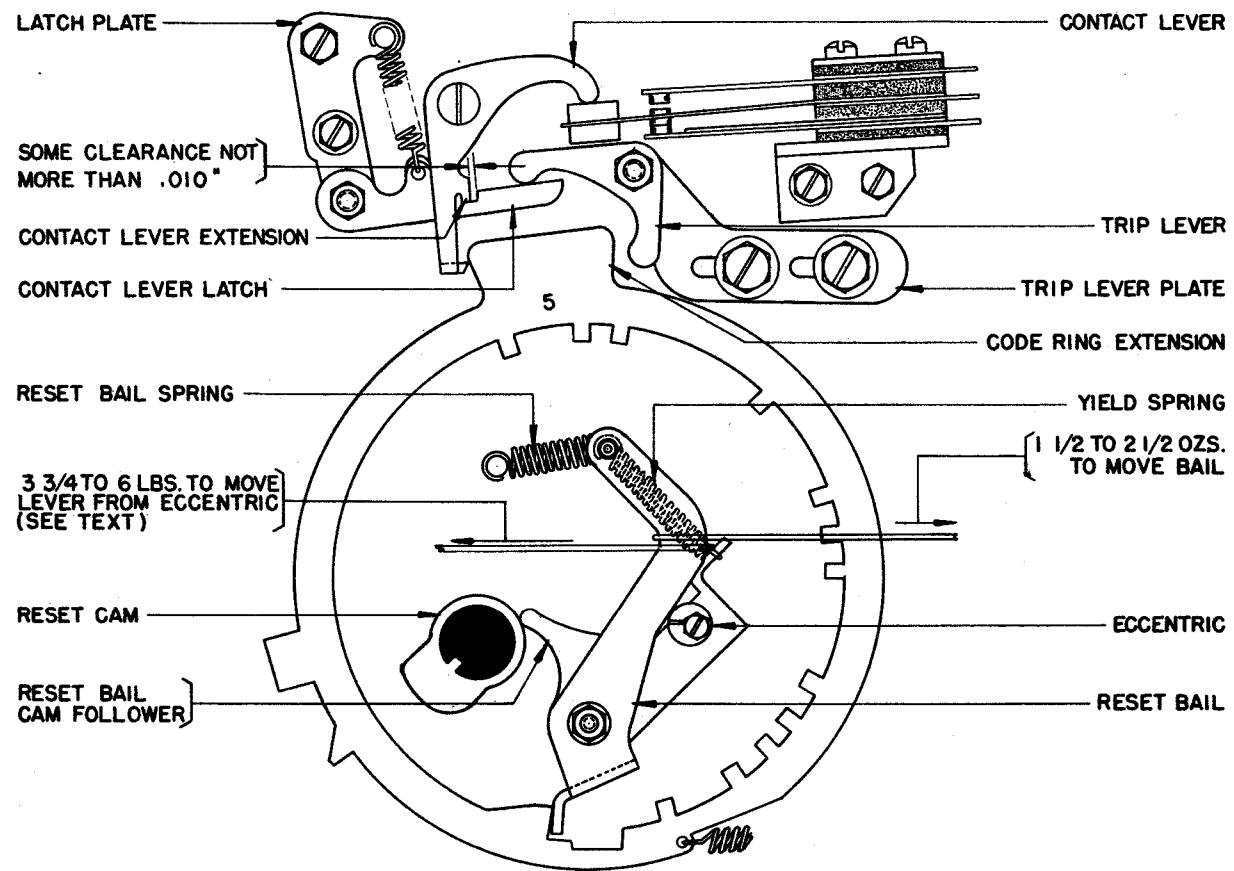


FIGURE 48

RESTRICTED

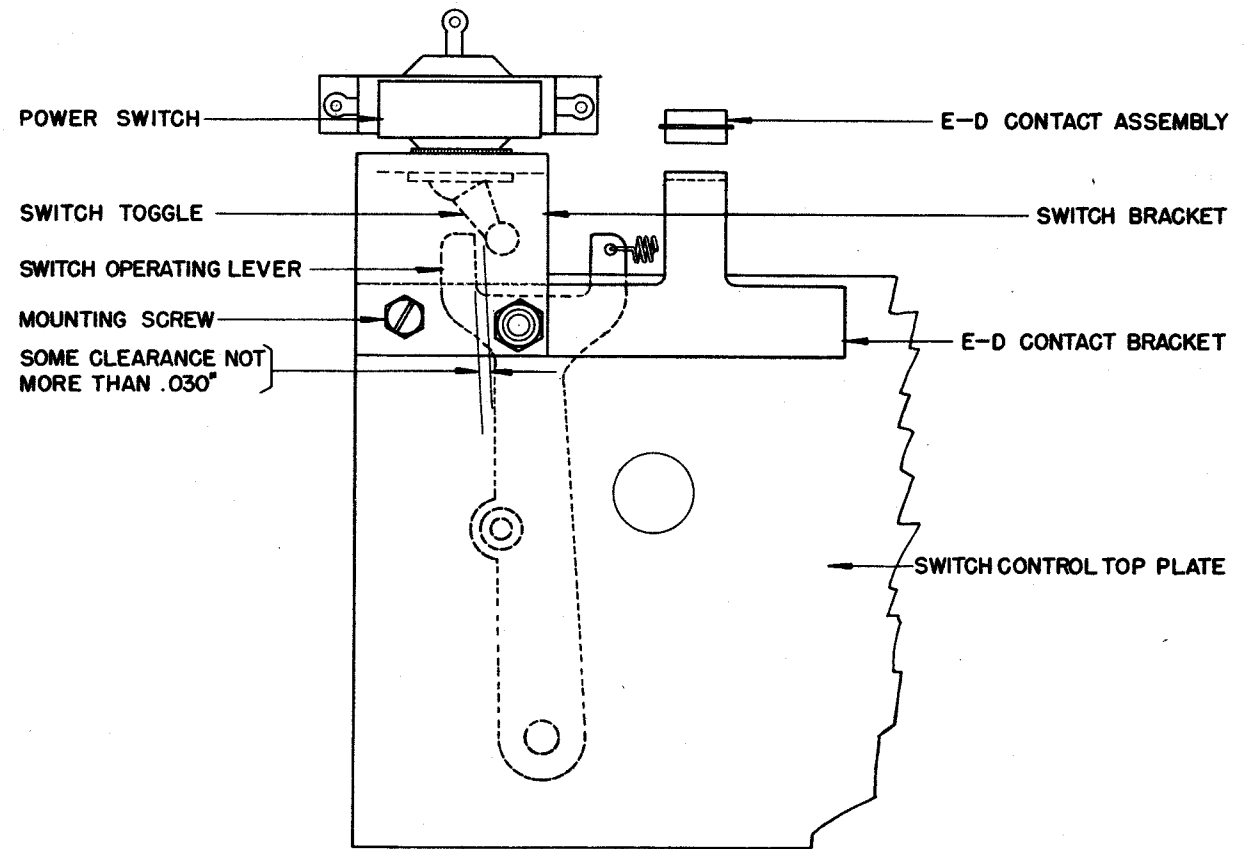


FIGURE 49

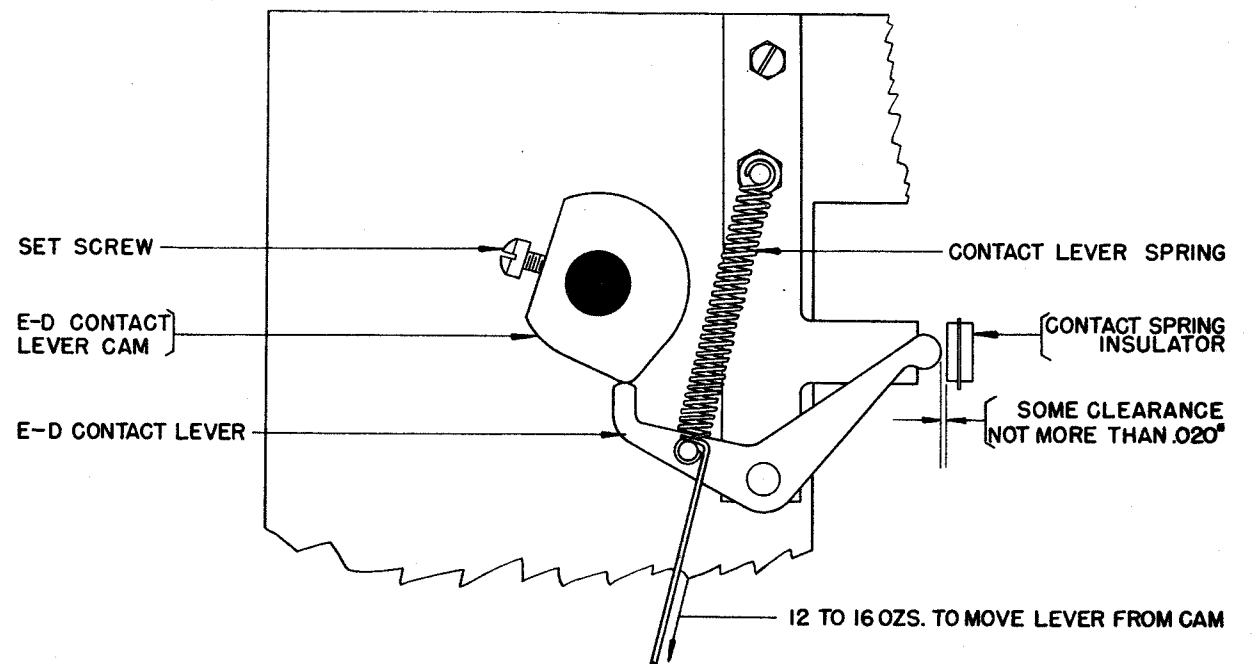


FIGURE 50

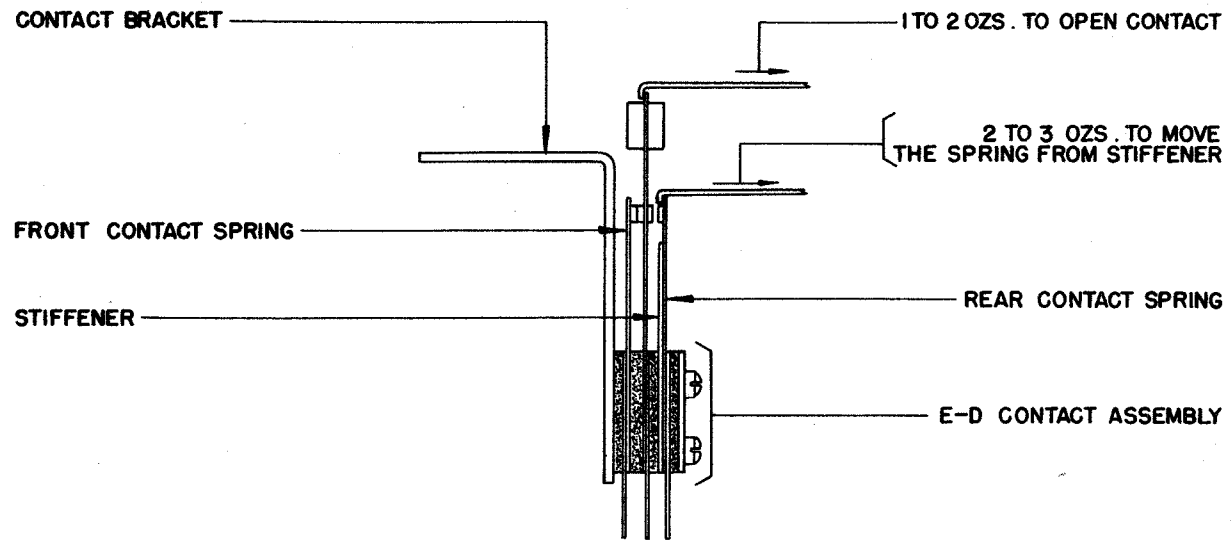


FIGURE 51

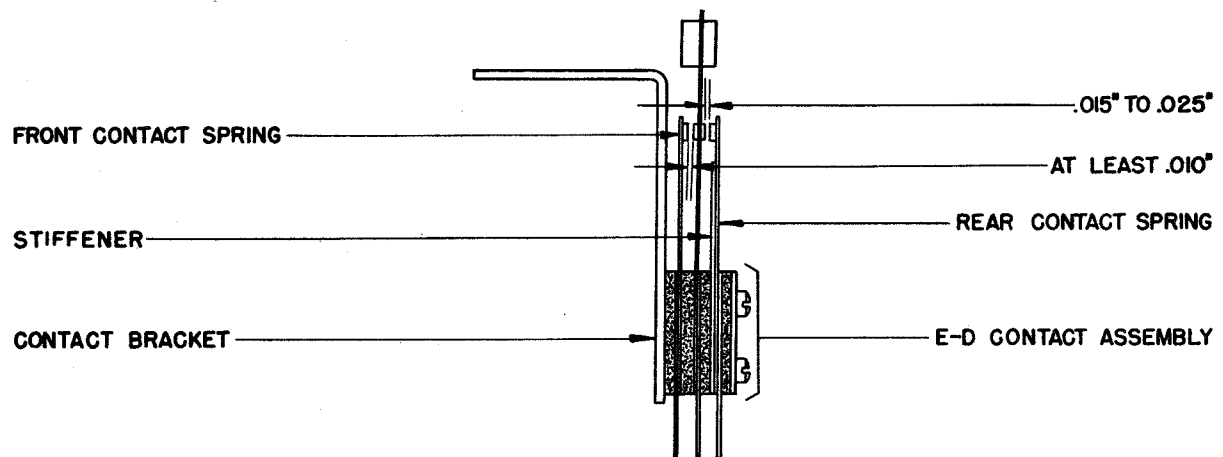


FIGURE 52

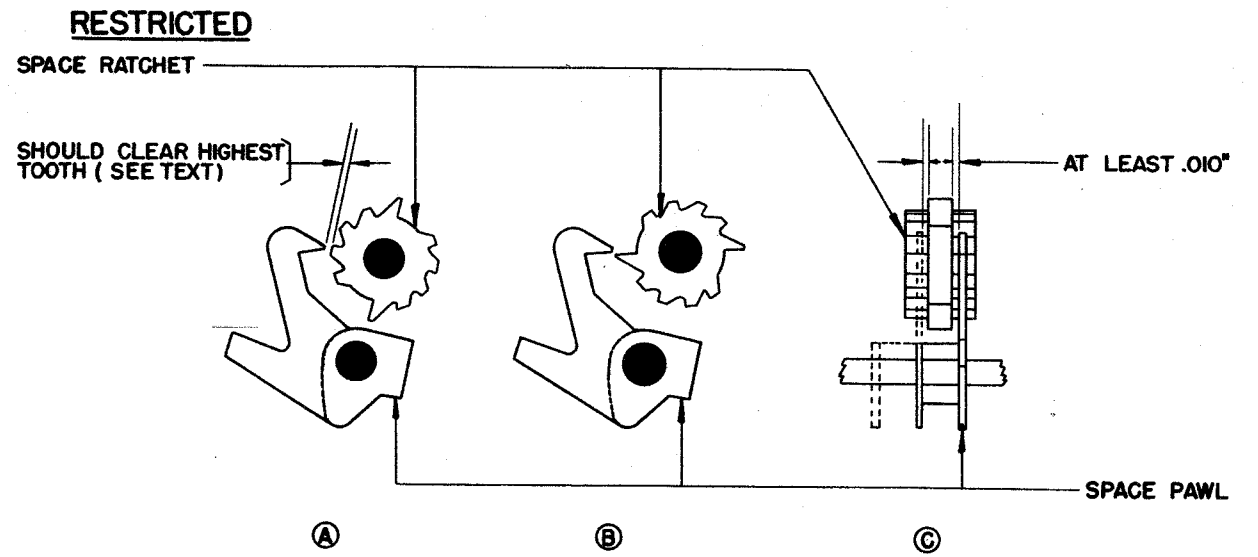


FIGURE 53

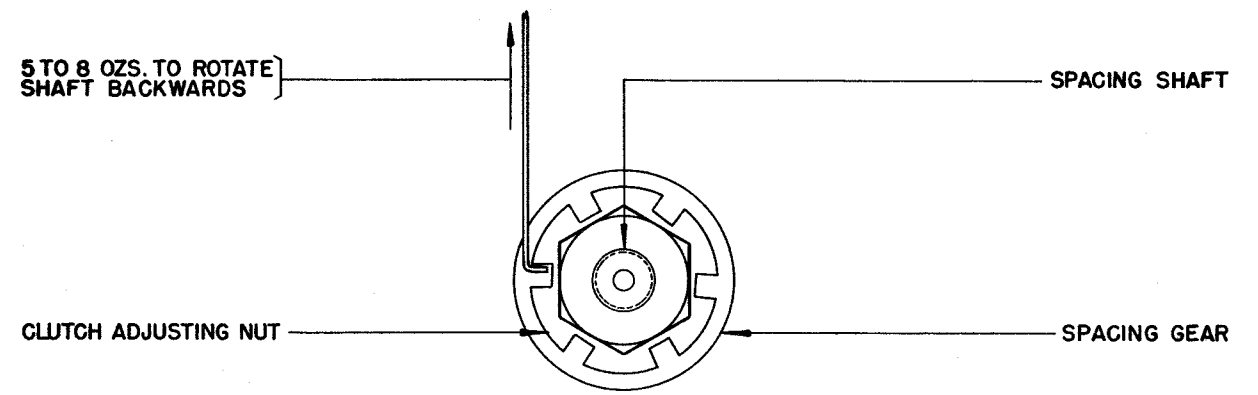
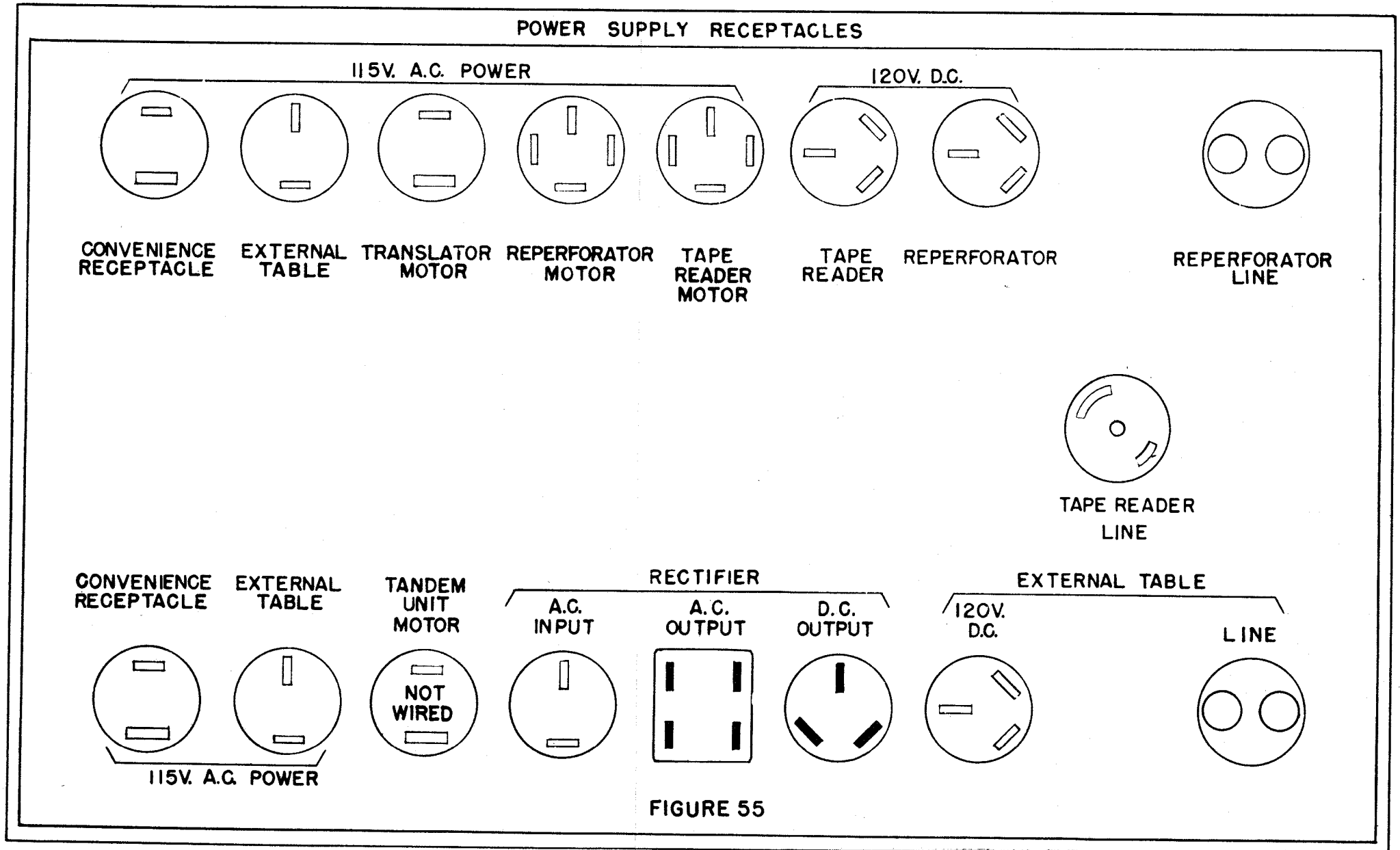


FIGURE 54



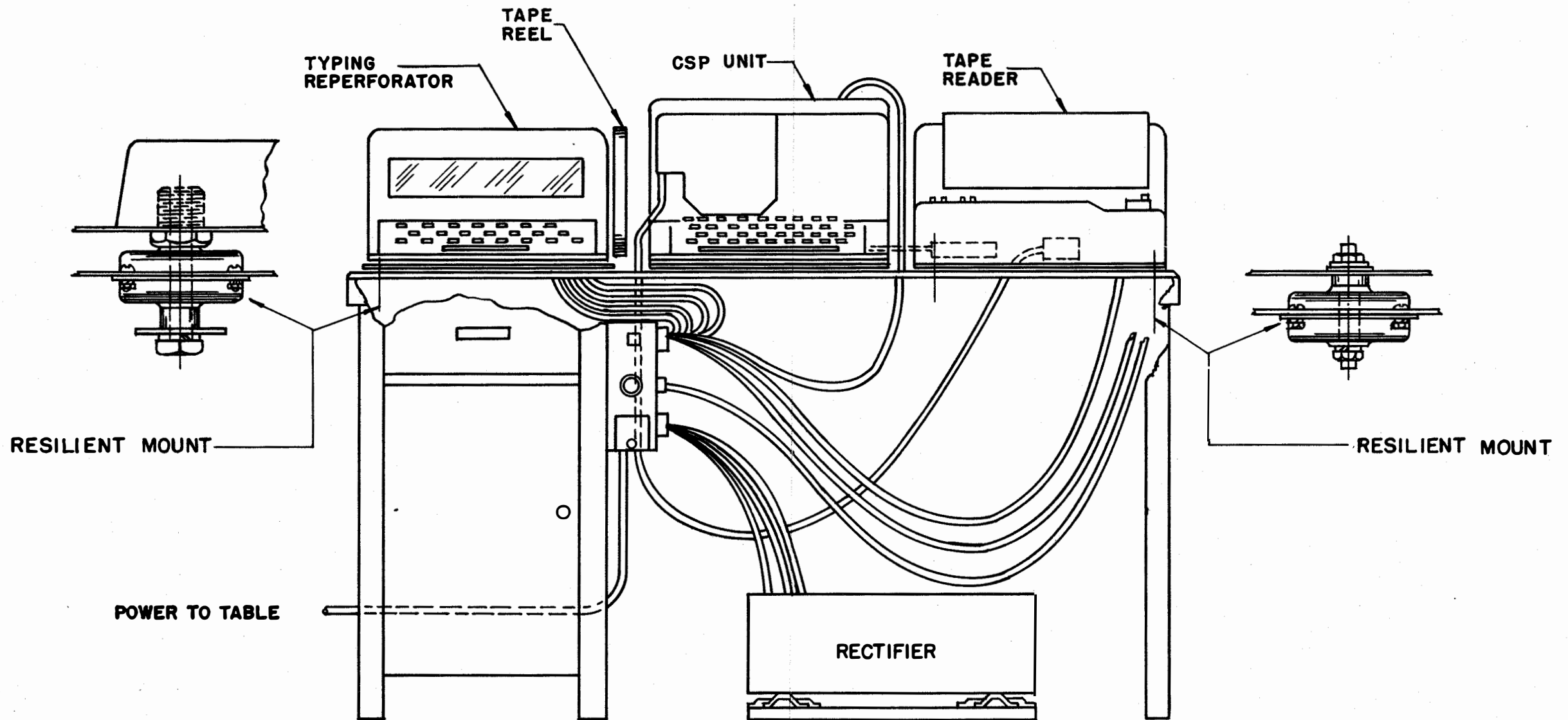


FIGURE 56

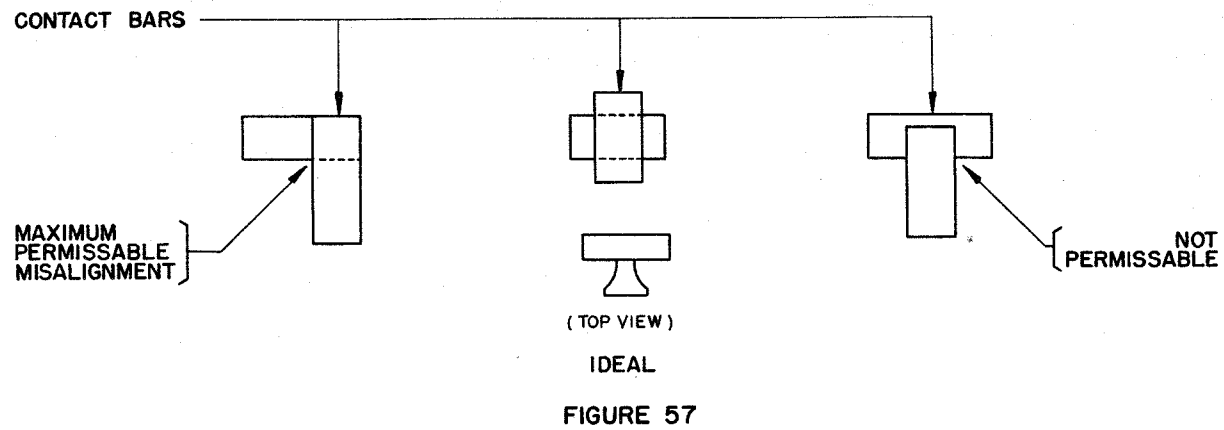


FIGURE 57

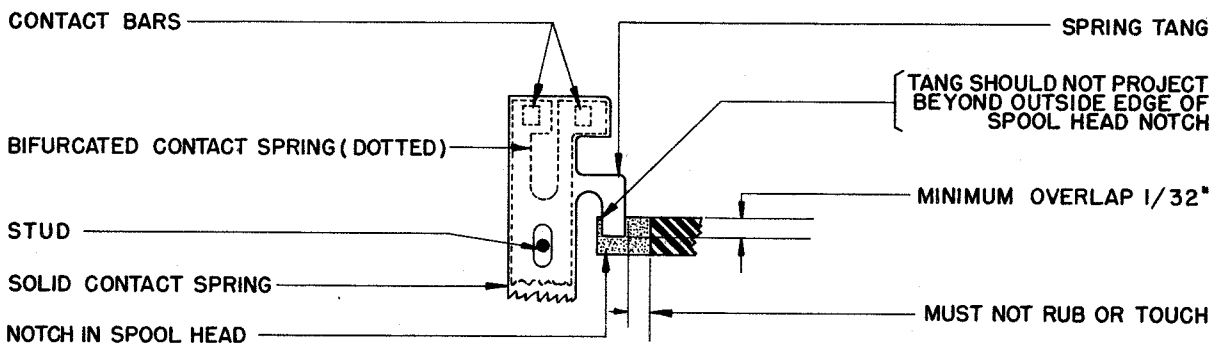


FIGURE 58

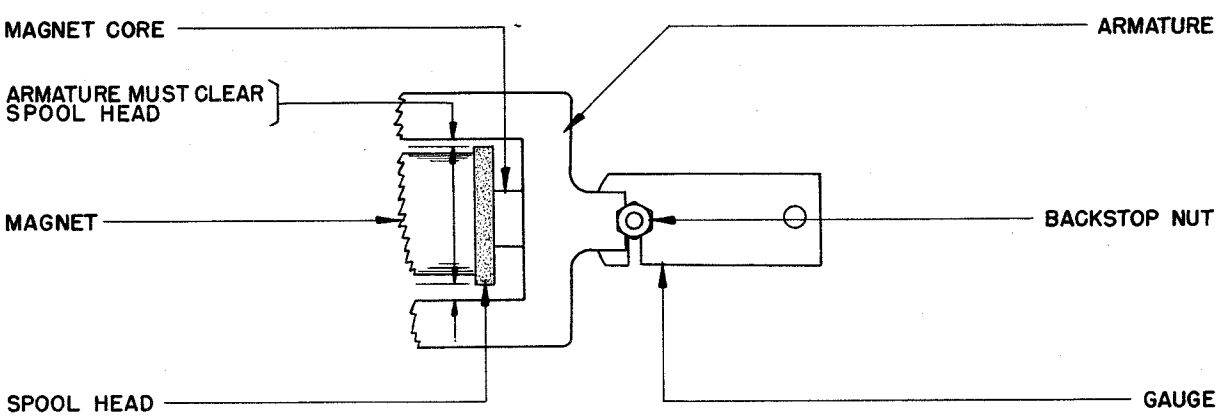


FIGURE 59

RESTRICTED

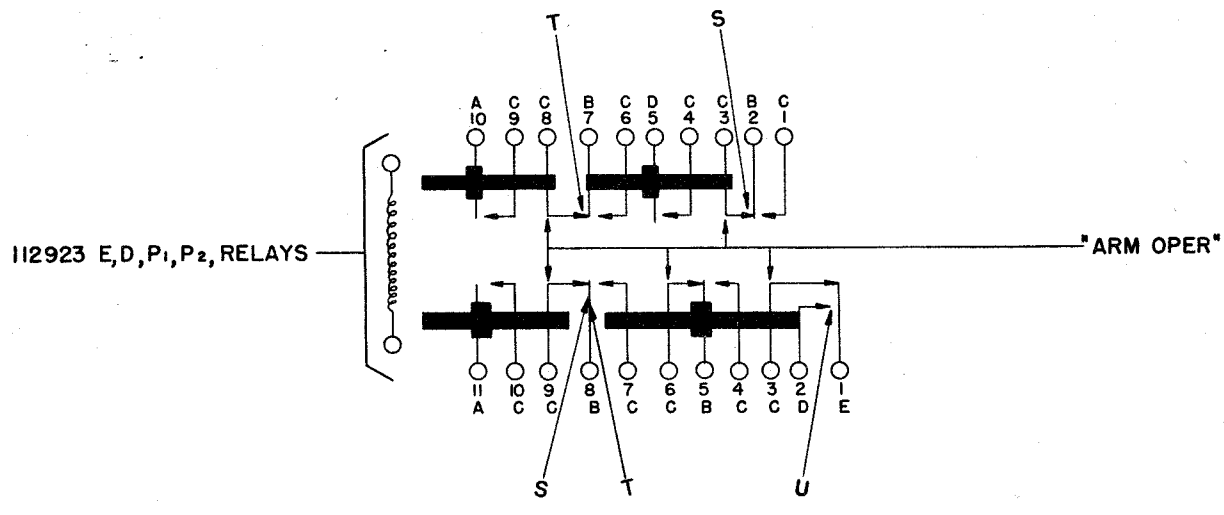


FIGURE 60

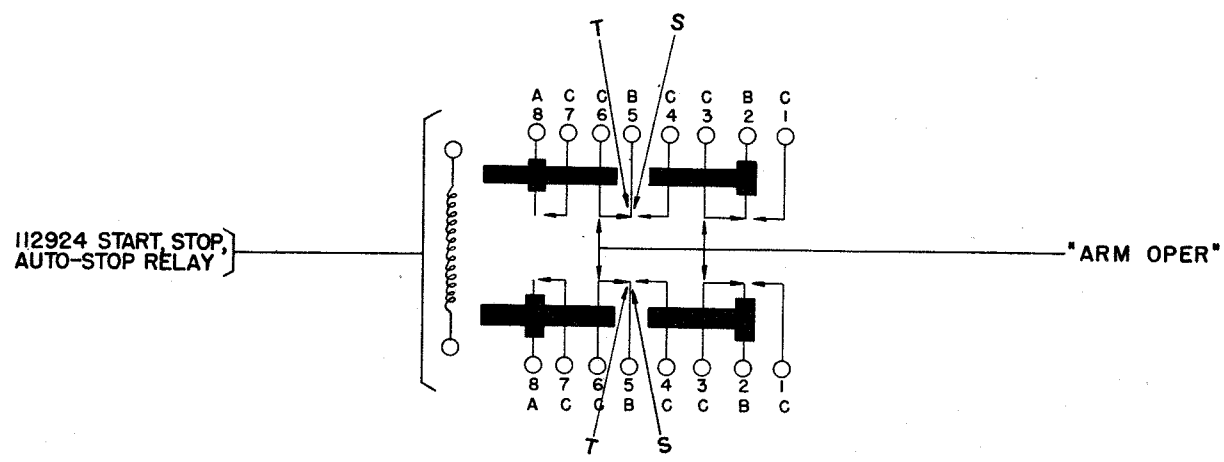


FIGURE 61

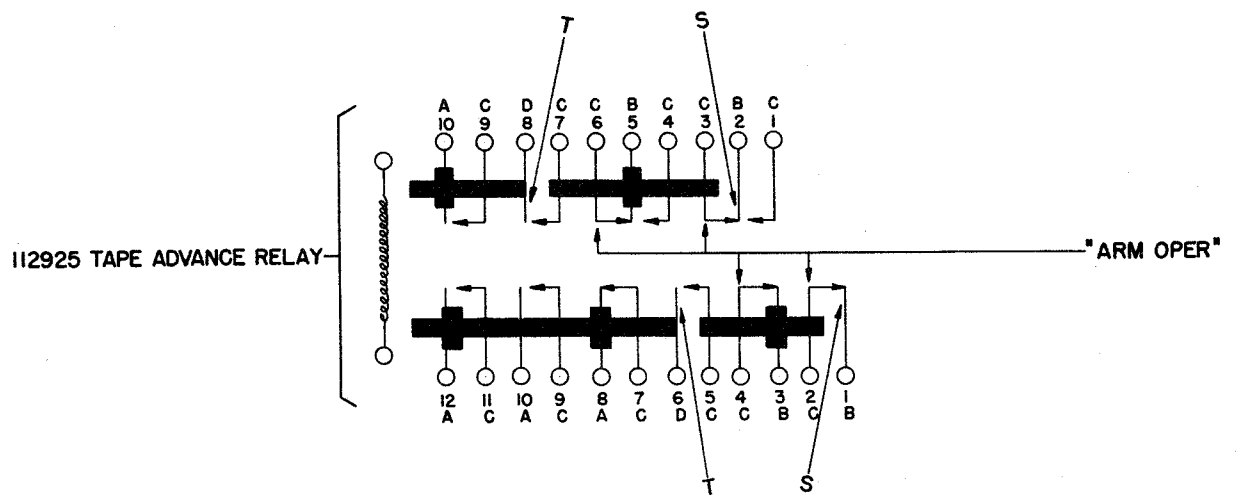


FIGURE 62