BULLETIN NO. 201
ISSUE 1
FEBRUARY, 1948

TELETYPE

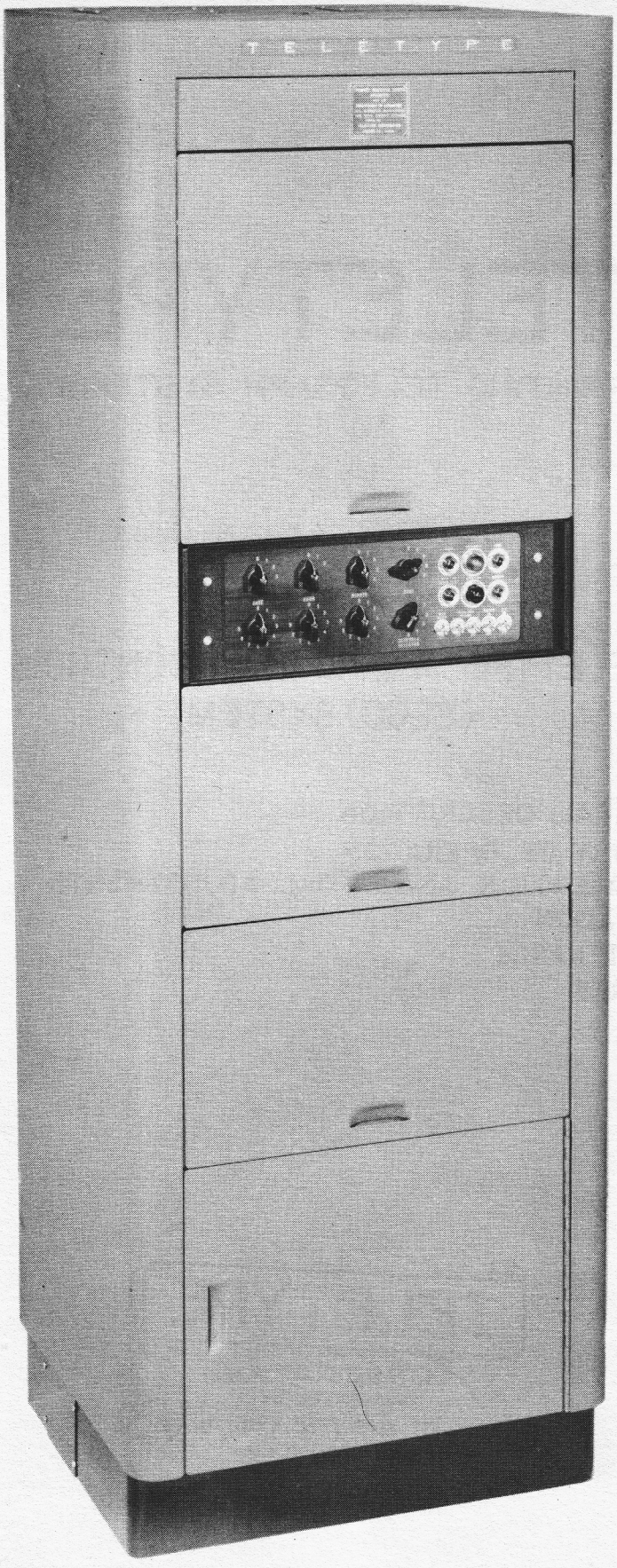
PRINTING TELEGRAPH SYSTEMS

TELETYPE SEQUENTIAL CONTROL (SECO) SYSTEM

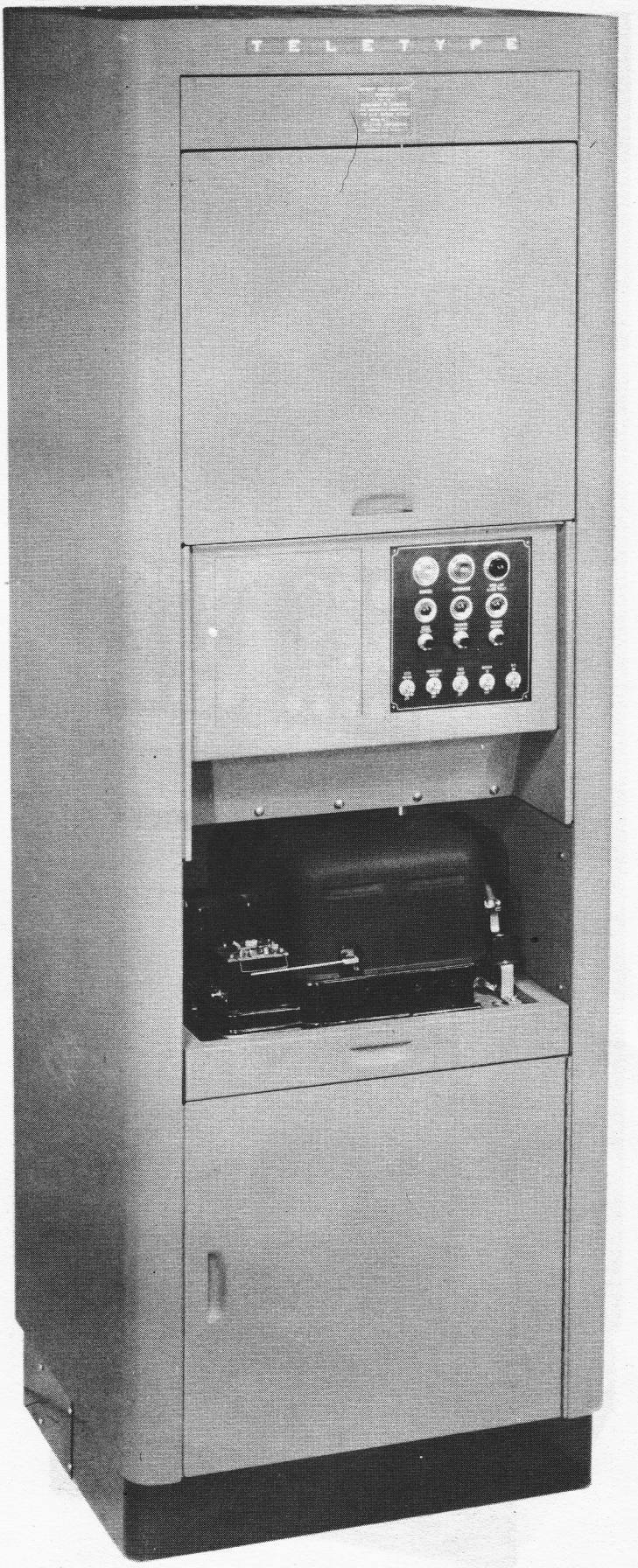
SECTIONS

TELETYPE
REG. U. S. PAT. OFF.
CORPORATION
SUBSIDIARY OF
Western Electric Company
CHICAGO, U. S. A.

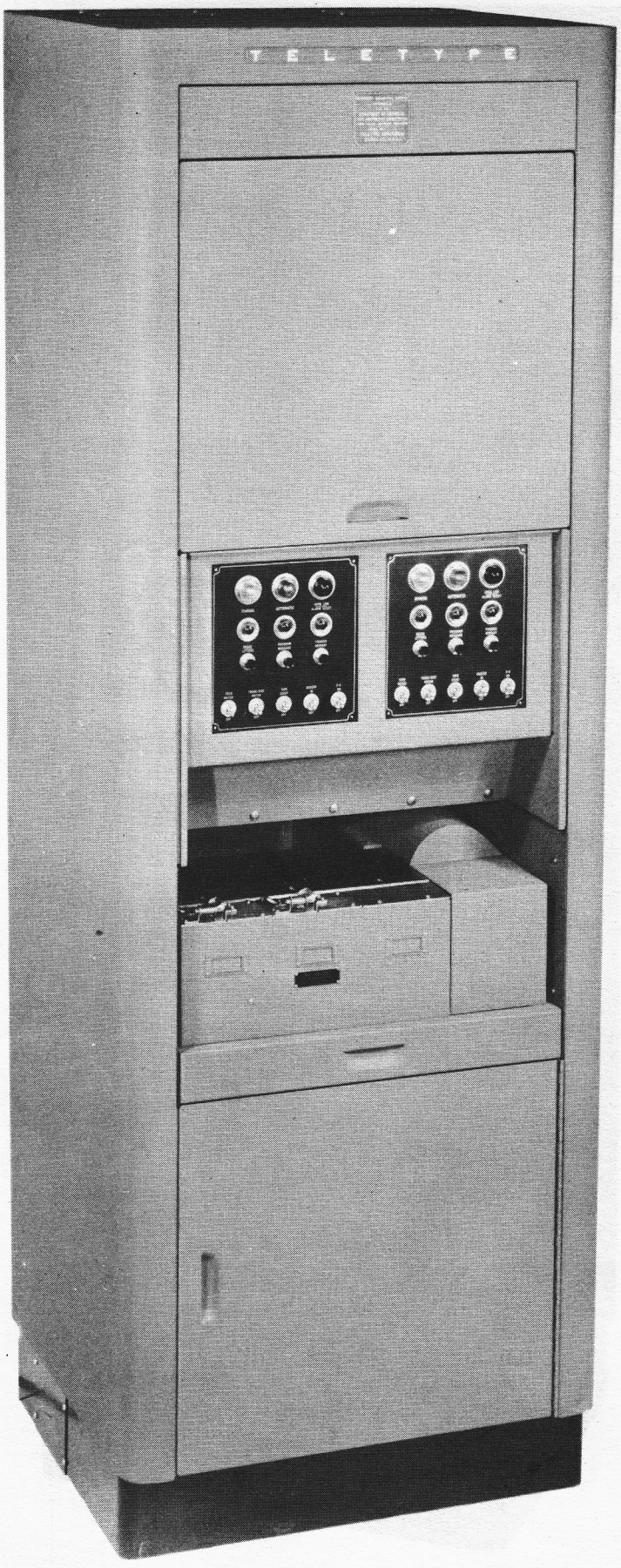
Printed in U. S. A.



PRIMARY STATION



SECONDARY STATION (SINGLE CIRCUIT)



SECONDARY STATION (TWO- CIRCUIT)

TABLE OF CONTENTS

SECTION III INSTALLATION AND INITIAL ADJUSTMENTS

SECTION IV OPERATION

SECTION V MAINTENANCE

TELETYPE BULLETIN 201
TELETYPE SEQUENTIAL CONTROL (SECO) SYSTEM

SECTION I

GENERAL DESCRIPTION

1. GENERAL

a. The SECO system, when applied to a Teletype circuit, provides facilities by means of which a primary station may automatically control the sequential collection of data stored in the form of perforated tape at a series of secondary stations on the circuit, with the minimum of manual attention and without loss of time. The system also exercises control over automatic diversion equipment for relaying collected data on a telegraph network where a reperforator transmitter is involved. Since the primary equipment may be conveniently switched from circuit to circuit it is ordinarily located at a switching center on the network. The equipment is at present geared for a transmitting speed of 368 o.p.m.

b. Standard printer functional code combined with station call letters arranged in the desired order in an endless loop of perforated tape provides the primary station with a flexible medium of automatic control.

c. When manual controls of the primary SECO equipment are set for automatic operation and a start button is operated, message traffic is interrupted by a momentary opening of the signal line, and the primary station proceeds to transmit preliminary data to all stations on the circuit and then calls the first secondary station whose identification letters are perforated in the control tape. At this point transmission from the primary SECO equipment ceases and secondary SECO equipment at the outlying station, having recognized the identification letters of its own station, starts transmission of its message from perforated tape previously placed in its transmitting unit. At the conclusion of this message, unlock-code (end-of-message) signals in the message tape are transmitted to shut down transmission from the secondary station and restart the primary equipment for transmission of the condition-select-lock code of the next secondary station. Reciprocal action continues until the messages at all secondary stations set for automatic control have been collected. The unlock code for the last station in the collecting sequence will start transmission of the system shut-down code from the control tape at the primary station. This code shuts down the system and leaves the primary equipment in readiness for the next sequential collection. Any secondary station that has not been set for automatic control or is interrupted during sequential transmission, may transmit under manual control during the shut-down period.

d. The calling code for a secondary station contains elements which determine whether the subsequent message will be reperforated in a tape for relaying on a program basis under control of message diversion equipment or be recorded as a local message only.

2. MAJOR UNITS AND ACCESSORIES

a. PRIMARY SECO (CAA TYPE NO. 1115) - Primary equipment consists of:

Quantity	Teletype Code	Description
1	AC201AB	Primary SECO Cabinet
1	BS1A	Primary Selector Unit
1	115272	Set of Gears (Selector - 368 o.p.m.)
1	BSP1	Selector Panel
1	MU36	Motor Unit
1	115416	Set of Gears (Motor - 368 o.p.m.)
1	CU1	Primary Control Unit
1	RY30	Relay (Signal Line)
2	MXB13	Base
1	MXD14	Transmitter Distributor
1	MFD1	Transmitting Distributor

5	115427	Plate (Assembly)
1	116179	Tape Guide Assembly
1	115386	Switching Panel
1	115469	Primary Connector Assembly

b. TWO-CIRCUIT SECONDARY SECO (CAA TYPE NO. 1116) - Two-circuit secondary equipment consists of:

1	AC202AB	Secondary SECO Cabinet
2	BS1B	Secondary Selector Unit
2	115272	Set of Gears (Selector - 368 o.p.m.)
1	BSP1	Selector Panel
1	MU36	Motor Unit
1	115416	Set of Gears (Motor - 368 o.p.m.)
2	CU2	Secondary Control Unit - Two-Circuit
2	RY30	Relay (Signal Line)
1	MXB13	Base
2	MXD14	Transmitter Distributor
2	MFD1	Transmitting Distributor
1	115427	Plate (Assembly)
2	115385	Set of ASID Adapter Parts
8	-	Selector Code Levers
1	115437	Set of Parts to Mount MXB in Cabinet
1	91862	Receptacle
1	95003	Receptacle
1	115387	Switching Panel
1	115470	Secondary Connector Assembly

Additional apparatus required but not furnished on the contract:

2	-	ASID Units

c. SINGLE-CIRCUIT SECONDARY SECO (CAA TYPE NO. 1116) - Single-circuit secondary equipment consists of:

1	AC202AB	Secondary SECO Cabinet
1	BS1B	Secondary Selector Unit
1	115272	Set of Gears (Selector - 368 o.p.m.)
1	BSP1	Selector Panel
1	MU36	Motor Unit
1	115416	Set of Gears (Motor - 368 o.p.m.)
1	CU3	Secondary Control Unit - Single Circuit
1	115382AB	Control Unit Blank
1	RY30	Relay (Signal Line)
1	115385	Set of ASID Adapter Parts
4	-	Selector Code Levers
1	115438	Set of Parts to Mount XD in Cabinet
1	115386	Switching Panel
1	115470	Secondary Connector Assembly

Additional apparatus required but not furnished on the contract:

1	-	ASID Unit
1	-	Transmitter Distributor (XD) Modified for SECO Use

3. CABINET ARRANGEMENT

a. PRIMARY STATION

(1) The SECO apparatus at a primary station is contained in a single primary cabinet. The primary cabinet supports apparatus on four levels and in a lower compartment. At each level sliding rails with rollers permit the apparatus to slide outward to facilitate main-

tenance. Shock mounts are included where motor-driven units are involved.

(2) A single primary sequential selector (Figure 1) located on the No. 1 level co-acts with a primary control unit located on the No. 2 level so as to control the operation of a multiple transmitter-distributor set located on the No. 3 or No. 4 level.

(3) The third and fourth levels each can accommodate a multiple transmitter distributor set which includes from one to three multiple transmitter distributors (MXD), one multiple transmitting distributor (MFD), and a driving motor (Figure 14). One to six MXD units are utilized depending on the number of schedules served by the primary station. Connection to line circuits is made by plugging the control unit line cord into a multiple-jack switching panel located below the No. 4 level. A six-position schedule selector switch located on the control unit panel (Figure 10) permits selection of the required MXD unit. The MXD transmits code combinations from the control tape which is threaded between slack-absorbing rollers mounted to the rear of the unit involved. The MFD channels to the signal line code combinations originating on contacts of the date-time-zone switches and the counting-chain relays of the control unit (Figure 9). With levels three and four fully equipped with MXD units, the system can serve six different schedules.

(4) The lower compartment of the cabinet contains an electrical service assembly and accommodates a rectifier.

(5) A full length door opens outward at the rear of the primary cabinet. At the front, three doors move upward and disappear within the cabinet; a door on the lower compartment swings outward.

b. SECONDARY STATION

(1) At a secondary station, SECO apparatus is housed in a single cabinet if one or two line circuits are served. Where a greater number of line circuits are involved additional cabinets are required. A secondary cabinet supports apparatus on three levels and in a lower compartment. See Figures 2 and 3.

(2) The No. 1 level of the secondary cabinet supports a motor-driven secondary sequential selector. For two-circuit stations an additional secondary selector unit surmounts the first.

(3) The No. 2 level supports two secondary control units (when two are required) in a side-by-side arrangement. Each control unit provides space and interconnections for an ASID unit not furnished by Teletype Corporation. A secondary selector and a control unit co-act with the ASID unit which starts and stops transmitting mechanism and inserts station identification as required.

(4) The No. 3 level supports the transmitting mechanism which consists of a transmitter distributor (XD) for single circuit stations, or a multiple transmitter-distributor set (similar to that used at the primary station) which includes two multiple transmitter distributors (MXD) and two multiple transmitting distributors (MFD) on a motor driven base, for multiple-circuit stations. This base provides space for one pair of spare MXD-MFD units. The transmitter distributor originates all transmission at a single circuit station. At a multiple circuit station, the MXD transmits data, stored in a perforated tape, under either automatic or manual control. The MFD comes into use and transmits station identification under ASID control only when transmission is effective on a manual basis. When transmission is effective on an automatic basis all transmission originates in the MXD since transmission of station identification is not required. The third level also supports a tape bin that receives the tape after it passes through the transmitting mechanism.

(5) Connections to line circuits are made by plugging a cord from each control unit into a multiple-jack switching panel located below the No. 3 level.

(6) The lower compartment contains an electrical service assembly and accommodates a rectifier.

(7) Full length doors open outward at the rear of the secondary cabinet. At the front, a door that provides access to the upper level moves upward and disappears within the cabinet. A front door on the lower compartment swings outward.

4. DESCRIPTION OF COMPONENTS

a. SEQUENTIAL SELECTOR (PRIMARY) -

(1) GENERAL

(a) The sequential selector mounts upon a metal panel which is supported by slide rails and rollers within the cabinet. The panel

also supports the motor unit and a vertical counter shaft for driving the main shaft of the sequential selector.

(2) OPERATING PRINCIPLES

(a) The sequential selector (Figure 4) utilizes a holding magnet selector to translate code signals for the activation of interconnected contact operating mechanisms. The required contact is actuated in response to the application of a predetermined combination of translated signals. In order to prevent inadvertent operation of sequential selector contacts, combinations of signals not found in message transmission over the SECO system have been chosen for their operation. Readily detachable code levers provide a rapid means for adapting the selector to any change in the combination sequence assigned to a contact. The operating lever associated with a contact responds only when reached through the interconnecting features of mechanism that follows the combination sequence of the contact involved. Where mixed signals are being applied to the sequential selector, significant elements of a combination may be stored in the mechanism until the complete combination has been received. Each element of a combination causes its particular mechanism to latch. As this mechanism latches it conditions adjacent mechanism preparatory to reception of the next sequential element of the combination. Where it is required that a contact be closed for a prolonged period, it is necessary that the unlatching be controlled by a predetermined combination. Where instantaneous closure only is required, unlatching occurs during the subsequent operating cycle of the sequential selector. The primary mechanism incorporates a general unlatching feature that responds to a special combination (BLANK).

(b) In order to facilitate orientation of the selector to incoming RY signals, a visual indicator that indicates either accuracy or errors in the translation of signals is provided. This mechanism is disabled during message traffic.

b. SEQUENTIAL SELECTOR (SECONDARY)

(1) The secondary sequential selector (Figure 5) is similar to the primary selector, except that it is equipped with a single contact which is used for control purposes at the secondary station. Consequently fewer code levers and associated mechanisms are required.

c. CONTROL UNIT (PRIMARY)

(1) The primary control unit (Figure 9) involves seven circuit conditioning relays (prefix P), two pilot relays (prefix E), fourteen counting-chain relays (prefix A, B, C, or D), mounting facilities for a signal line relay, an open-line alarm buzzer, and a front panel. See Wiring Diagram WD-2474. The front panel (Figure 10) mounts six date-time switches, a zone switch, a schedule switch and five toggle switches. The toggle switches control the sequential selector motor, the multiple transmitter-distributor unit motors individually, the circuit of the open-line alarm buzzer, and the DC power supply. Also on the front panel are two indicating lamps (one red, one amber) and four push buttons identified as START, STOP, RESTART and OPEN LINE ALARM RESET. Fuse receptacles and wire terminal facilities that include a signal-line cord, three multiple-conductor cords for convenient interconnection (one with the sequential selector, one with each transmitting set) and two power cords (AC and DC) are located at the rear of the unit. The seventh relay of the circuit conditioning group mounts in a potentiometer-controlled electronic timing unit. All relays except No. 7 of the circuit control group are protected by metal dust covers.

(2) The six date-time switches may be rotated to any required position from zero to nine so as to apply corresponding code combinations to open contacts of the first six relays of the counting chain. These relays are identified as - A, B, C, B1, C1, and B2. The zone switch rotates to position Z, E, C, M, and P to apply these code combinations to open contacts of relay B3. The schedule switch rotates to positions one to six so that sequential control may be exercised through any one of the six MXD units when available in the cabinet. Relays C2, C3, B4, C4, B5, C5, and D are directly wired for the transmission of LTRS, CR, LF, LF, FIGS, CR, and LTRS, respectively. The transmitting distributor (MFD) controls the counting chain so as to operate each relay in sequence and transmits code in the pattern established by the relay contacts.

(3) The red lamp designated OPEN-LINE and the buzzer are arranged in parallel in their circuits to provide both audible and visual indications when an open signal line occurs. A switch in series with the buzzer permits its disabling by the attendant. The amber lamp designated AUTOMATIC, when illuminated, indicates that the primary apparatus is engaged in the process of sequential collection.

d. CONTROL UNIT (SECONDARY)

(1) The secondary cabinet utilizes a

single control unit (CU3) where transmission is applied to one signal line only or to one signal line at a time. Two control units (CU2) are used where transmission is applied to two signal lines simultaneously.

(2) The control unit CU2 (Figure 11) consists of a metal framework that supports six circuit-control relays, motor control relay, a line-relay base, a front panel, power-line fuse receptacles, and circuit connection facilities that include a signal-line cord, two multiple-conductor cords for convenient interconnection, one with the selector unit and the other with the multiple transmitter-distributor set. A cavity with adjacent slip connections accommodates an ASID unit. The relays are identified as S1, S2, S3, S4, S5, S6, and S7. See Wiring Diagram WD-2460.

(3) The front panel (Figure 12) mounts three push-button type switches - BREAK LETTERS, FIGURES RESTART, and PROGRAM MESSAGE; five toggle switches - DC power, BUZZER control, TAPE START, TRANSMITTER DISTRIBUTOR and SELECTOR MOTORS; and three indicating lamps - white, amber, and red.

(4) The red lamp designated OPEN LINE and the alarm buzzer are arranged in parallel in their circuits to provide both audible and visual indications when an open signal line occurs. A switch in series with the buzzer permits its disabling by the attendant. The amber lamp designated AUTOMATIC, when illuminated, indicates that the secondary apparatus is conditioned for operation on an AUTOMATIC collection basis. The white lamp designated MANUAL indicates that the secondary apparatus is conditioned for operation on a MANUAL collection basis.

(5) Control unit CU3 (Figure 13) differs from the CU2 only in that it omits relay S4 and S5 with associated wiring.

e. MULTIPLE TRANSMITTER-DISTRIBUTOR SET

(1) GENERAL

(a) The multiple transmitter-distributor set includes a base (MXB) which provides mounting space with electrical slip connections for three transmitter distributors (MXD) and three transmitting distributors (MFD) driven by a single motor (Figure 14). The base includes the motor, counter shaft, and circuit elements and is provided with resilient mounts. Three multiple point connectors in the base facilitate interconnection with control unit cables. The MXD units occupy positions forward of the counter shaft. The MFD units are placed to the rear. Metal panels enclose the working parts. Card holds for identifying the transmitters with their respective circuits are provided on the front of the panels.

(b) The primary station utilizes one MFD unit only and it must operate in the No. 1 position (left) on the upper transmitter-distributor base. The primary station utilizes a separate MXD unit for each signal line served by the equipment. Positioning of the MXD is optional. Cover plates are placed over the vacant MXD positions.

(c) The secondary station requires two MXD-MFD pairs for each two-circuit cabinet.

(2) MULTIPLE TRANSMITTER DISTRIBUTOR (MXD)

The MXD includes a bank of transmitting contacts in series with the signal line and is geared to the counter shaft of the base (MXB). At the primary station, the MXD transmits code perforated in the control tape. At the secondary station, transmission is from a message tape. The end of tape or a stop perforation at the edge of the tape will cause automatic interruption of transmission from the MXD. It also incorporates a manual stop.

(3) MULTIPLE TRANSMITTING DISTRIBUTOR (MFD)

The MFD is geared to the counter shaft of the base (MXB) and utilizes transmitting contacts similar to those of the MXD. At the primary station it transmits code originating at the contacts of the counting chain relays of the control unit. At the secondary station (two-circuit cabinet) the MFD transmits station identification code originating in the ASID unit.

f. TRANSMITTER DISTRIBUTOR (XD)

The XD is used at single-circuit secondary stations only and originates all transmission from that point. It is of the standard motor-driven variety modified by the addition of a special tape-control magnet that adapts it to ASID control.

SECTION II

THEORY OF OPERATION

1. THEORY OF COMPONENTS

a. SEQUENTIAL SELECTOR (PRIMARY)

(1) MAIN SHAFT

(a) The main shaft (Figure 18) carries a selector cam sleeve located between the discs of a friction clutch at one end of the shaft for actuating the holding-magnet selector. Toward the other end of the shaft a pawl-and-ratchet clutch controls the revolutions of an operating eccentric assembly. The selector cam sleeve under control of the selector magnet, (Figure 26) through the medium of the range-finder mechanism (Figure 33), makes one revolution in response to each START impulse of the signal code. A shaft with a clutch trip lever (Figure 43) at the end nearest the selector cam sleeve and a clutch blocking lever at the operating end enables the selector cam sleeve to control the operating eccentric assembly so that it makes one revolution subsequent to each revolution of the selector cam sleeve.

(b) Adjacent to the operating eccentric assembly a ratchet wheel (Figure 41) on the main shaft, with a double row of teeth for actuating and controlling the eccentric assembly, rotates continually while the motor runs. A driving pawl and a blocking pawl that pivot on a drive arm at the end of the assembly are in a position that permits them to engage the teeth on the ratchet wheel when released by the clutch blocking lever. With the selector magnet energized and the selector cam sleeve stationary the clutch blocking lever engages one end of the driving pawl and causes the opposite end to swing clear of the ratchet wheel. A stud in the side of the driving pawl likewise holds the blocking pawl clear of the ratchet wheel. Forward motion of the eccentric assembly is thus terminated while a detent drops into a notch in a detent sleeve (Figure 42) to prevent backward slip. As the selector cam sleeve completes a revolution during a selecting cycle, the sixth cam strikes the clutch trip lever and causes the trip shaft to rotate the blocking lever clear of the driving pawl. Both pawls then engage the rotating ratchet wheel. The teeth engaged by the driving pawl face in the direction of rotation and carry the pawl and operating eccentric assembly with them. The teeth engaged by the blocking pawl face in the opposite direction and prevent the assembly from rotating faster than the shaft.

(c) Two eccentrics on the operating eccentric assembly are encircled by drive links; one of which connects with a main-bail operating bar while the other connects with a stripper bail operating bar.

(2) RANGE-FINDER ASSEMBLY

(a) The range-finder assembly (Figure 33) consists essentially of a mounting plate with graduated scale, an index arm, stop lever, trip latch, bell crank and trip-latch plunger.

(b) The angular position of the stop lever is controlled by the index arm so as to stop the selector cam sleeve at the required position. The trip latch, under tension from a compression spring, latches the stop lever and consequently holds the selector cam sleeve in the stop position.

(c) Release of the stop lever and selector cam sleeve occurs when the selector magnet armature, under tension of its spring, impresses the armature trip-off screw, located on the upper extension of the armature, against the trip-latch plunger. Movement of the plunger tilts the bell crank and moves the trip latch clear of the stop lever.

(3) HOLDING-MAGNET SELECTOR

(a) The holding-magnet selector (Figure 25), consists essentially of a two-coil selector magnet, armature, selector arm, locking lever, and five each of selector levers, swords and transfer levers.

(b) The armature pivots on the selector magnet bracket, extends above the selector arm, and, under tension of the armature spring, rides the armature cam on the selector cam sleeve. This cam impresses the armature against the core of the magnet in timed relation to the code impulses. If the magnet is not energized when the armature is presented, the armature is immediately retracted by its spring; if energized, the armature is held by the magnet for the duration of the marking impulse. The armature carries two adjusting screws; the trip-off screw on an upper extension (Figure 35) and a selector arm operating screw (Figure 25) on a lower extension. A selector-

arm spring links the selector arm to the armature and tends to hold the selector arm against the head of the selector-arm operating screw.

(c) The selector arm pivots on a bracket located in front of the magnet bracket. Horizontal extensions of the selector arm are positioned so as to present a blocking surface to the arms of the five swords. A locking wedge (Figure 28) with stud extending inward, is attached to the forward end of the selector arm. A stop detent, into which the stud projects, limits the travel of the selector arm and tends to hold it to either side.

(d) The locking wedge is acted upon by a locking lever, the upper extension of which locks the selector arm to MARKING or SPACING as the locking lever drops into each indent of the locking cam (second from the outer end) on the cam sleeve. The locking lever rides its cams under tension from the locking lever spring.

(e) The five selector levers and the swords, which are coupled to them by floating pivots, lie between separator plates (Figure 20). The swords are under slight pressure from the springs of these plates. The selector levers pivot on a single post and under tension of their springs impress the tips of the swords against the arms of the transfer levers. The transfer levers also lie between the separator plates and pivot on a single post. Five cam teeth on the cam sleeve actuate the selector levers in sequence, causing the swords to be withdrawn from the transfer levers for repositioning by the selector arm.

(f) Translation of a signal is accomplished as follows: From an idling condition, under which the main shaft rotates with the magnet energized and with the selector cam sleeve and function eccentric assembly stationary, the selecting cycle is initiated by the reception of the start impulse (no current - SPACING). The armature spring retracts the armature, and with it the selector arm, to the spacing side. Pressure on the trip-latch plunger by the trip-off screw causes release of the selector cam sleeve by the range finder mechanism.

(g) During rotation of the cam sleeve, the armature is impressed on the core of the magnet each time the armature rises from the indent of the cam. Assuming that code intervals representing CARRIAGE RETURN signal are being applied to the magnet, the first is SPACING (no current). The armature will be impressed on the magnet core in time with the No. 1 code impulse, but since this interval is SPACING (no current), the armature and selector arm will immediately return to SPACING in time for the selector arm to be locked in that position by the locking lever. If the tip of the No. 1 sword is in the SPACING position when responding to the selector action described in the foregoing, it will not require repositioning and will merely perform a simple motion without contacting the selector arm.

(h) Since the second and third code intervals of the CARRIAGE RETURN signal are also SPACING (no current), similar action takes place with No. 2 and No. 3 swords as the cycle progresses.

(i) The fourth code interval of the CARRIAGE RETURN signal is MARKING (current). This impulse holds the armature attracted on the fourth presentation. The selector arm, co-active with the armature, will likewise be in its MARKING position where it will be immediately locked by the locking lever as it drops from the high part of its cam. The No. 4 selector lever, riding to the peak of its cam, shifts the No. 4 sword in the direction of the selector arm. Assuming that the tip of the sword is in the SPACING position (tip toward the upper stop post) its upper arm will be blocked by the selector arm, and cause the sword tip to shift toward MARKING (lower) stop post. As the No. 4 selector lever drops from the peak of the cam, the No. 4 sword will be impressed against the lower arm of the No. 4 transfer lever and will cause it to move the associated vane operating link (Figure 24) toward the rear. Where any sword is impressed against the upper arm of a transfer lever the associated operating link will be moved forward.

(j) The fifth code interval of the CARRIAGE RETURN signal, being SPACING, operates the No. 5 sword in the same manner as that for the first, second, and third interval described above.

(k) During the fifth code interval, the selector cam sleeve will have rotated sufficiently to cause the sixth cam tooth (innermost) to strike the clutch trip lever to initiate the operating cycle.

(l) Immediately following the fifth code interval, the armature will again be presented to the magnet where it will be retained by the stop impulse - MARKING. During this interval, no locking action will be applied to the selector arm, since, at that time, the locking lever will be riding the long high portion of

its cam. During the stop interval, the stop arm of the selector cam sleeve will come to rest against the stop lever on the range finder, thus completing the selecting cycle.

(m) From the above, it is apparent that the code impulses are utilized to direct the tips of the swords relative to the arms of the transfer levers, and that the motivating force applied to the transfer levers derives from the tension of the selector lever springs. The operating links position vanes (Figure 24) for the selection of contact operating mechanism.

(4) CONTACT OPERATING MECHANISM

(a) The major components of the contact operating mechanism (Figures 37 and 44) are arranged in parallel banks of common or similar parts positioned above, below, and to the front of five vanes that respond to signals translated by the holding-magnet selector. The upper horizontal bank includes function levers, code levers, and vane locking levers. The function levers pivot on a shaft at the rear and are tensioned downward by means of springs. The code levers attach themselves to studs on the sides of the function levers and are cut to permit selection of both code and function levers by the vanes in response to assigned signals. The order of arrangement of the various code levers on the bank corresponds to the signal sequence of combinations that prepare the paths for the actuation of the contacts. Each coded lever displays characters on its side and forward end to indicate the signal with which the lever is identified.

(b) A main bail (Figure 37) that is motivated by an eccentric drive link on the operating eccentric assembly raises and lowers the function levers with relation to the vanes to permit selection in co-ordination with the action of the holding-magnet selector. The code lever that occupies the initial position with relation to the operation of a mechanical combination is readily selected when its translated signal is applied to the vanes. However, consecutive pairs of levers that enter into the combination require unblocking of the function lever at its forward end. This act is performed by adjacent mechanism during the preceding operating cycle.

(c) Each function lever acts as the motivating member of a train of vertically positioned mechanism which includes (as shown on Figure 19) a pull bar, operating lever, latching lever and blocking lever. Blocking levers at the initial stages of mechanical sequences are disabled by unblocking keys. See Positions 1, 7, 11, and 16 (Figure 3). An assembly (Figure 7) that includes all blocking and latching levers may be readily removed for accessibility. See Figure 6.

(d) Selection of a function lever permits its lower extension to engage a pull bar which is hooked to a stud in the side of an operating lever. Upward movement of the function lever lifts the operating lever to a position where it latches with a latching lever. In rising, a camming surface on the operating lever acts upon the adjacent (to the right) blocking lever to give freedom of selection to the consecutive function lever. An additional camming surface on the operating lever strikes extension E (Figure 37) when present on the adjacent (to the left) latching lever and restores the operating lever that may have been previously latched during the application of a combination. Where extension E is present on a latching lever, projection P is omitted. Where it is required that the operation of a contact be prolonged, its associated latching lever is formed with extension E when its unlatching mechanism is located immediately to the right of the contact mechanism. The operating lever that performs the unlatching responds to a single signal which acts as a continuation of the combination which performed the latching. Where it is required that the operation of a contact be of an instantaneous nature, the latch associated with the operating lever is provided with projection P. A stripper bail (Figure 37) that is motivated by an eccentric drive link on the operating eccentric assembly (Figure 36) strikes projection P of the latching lever during the subsequent operating cycle and permits the operating lever to be restored. The stripper bail hinges on stripper-bail levers (Figure 38) at each end which apply reciprocating motion. An extension of the stripper bail normally rests on the upper lever of a latch bail and, travelling in this plane, strikes projection P of active latching levers on its forward stroke. On the rearward stroke, the stripper bail detaches any pull bar from its engaged position on the function lever extension. Where it is required that the operation of a contact be prolonged and the mechanism that responds to the final signal in its unlatching combination is not located adjacent to the operating lever associated with the contact, the active latching lever is not provided with either extension E or projection P. In order to trip such a latch the stripper bail must ride on the lower latching surface of the latch bail. This is permitted when extension "U" of an unlatching function lever (Figure 38), that responds to the final ele-

ment of the unlatching combination, strikes the latch bail and causes it to drop the stripper bail to the lower latching surface. The stripper bail is then in a position to trip any latching lever. On its rearward stroke the stripper bail strikes a reset eccentric which returns it to the upper latching position.

(e) Bridging of adjacent operating levers and blocking levers so that bridged pairs respond to one sequential element of a signal combination is accomplished by clamping pairs of levers to an elongated nut (Figure 5) positioned between them. This feature is applied where it has been found advantageous to use optional signals at any point in a combination sequence such as the calling code of secondary station which may be used for transmission on either a program or local basis. Bridging of operating levers only is done where mechanism associated with an uncoded code lever is interposed in the mechanical sequence but not accounted for in the signal combination sequence.

(5) RY TEST MECHANISM

(a) The RY test mechanism, (Figure 4) located at the right front of the selector unit, is provided for the purpose of indicating errors in reception when orienting the selector to incoming signals.

(b) The mechanism consists of two blocking levers, two trip-off levers, two code function levers, an RY latch lever, an RY latch, and a bracket (Figure 40).

(c) The indicator on the RY test mechanism shows red, green, or white. During message traffic, the indicator may be manually positioned to GREEN and there remain inoperative. During orientation of the holding magnet selector, it should be positioned to WHITE where it will remain so long as RY signals are accurately translated by the selector. Any error in translation of R or Y will cause a shifting of the indicator to red after which it may be manually returned to the WHITE position.

(d) Normally the RY latch lever (right one as viewed from front of unit) is in its downward position (green portion of indicator showing) so that its extension is not in contact with the blocking lever. The blocking levers are then in a position to block the function levers when the R or Y combination is received. When orientation range is being determined, the RY latch is placed in its downward position so that the RY latch lever is completely unlatched from the RY latch lever. The RY latch lever turns counterclockwise on its pivot point, by tension of its spring, and moves the blocking levers out of the path of the function levers. The function levers are then permitted to move downward during the operating cycle when their code combinations are applied to the vanes. When the function lever moves downward, its lower extension comes in contact with the latch bail in such a manner that the stripper bail extension (Figure 38) unlatches from the latch bail, thereby permitting the stripper bail to move to a lower position so as to by-pass projection "N" of the trip-off lever (Figure 40) and leave the remaining part of the mechanism undisturbed. If the holding magnet selector fails to translate R or Y correctly, the vanes will not take a setting to receive the code bar, therefore the code bar will be blocked by them. Since the code bar is blocked, the extension on the function lever does not trip the latch bail. The stripper bail, being latched, travels at a higher level than previously described above so as to come in contact with projection "N" (Figure 40) and operate the trip-off lever. The lower end of the trip-off lever moves the RY latch lever clockwise sufficiently to permit the blocking lever to move back into position to block the function lever. The RY latch lever becomes latched in this position by the first notch on the RY latch and the red portion of the indicator registers an error.

b. SEQUENTIAL SELECTOR (SECONDARY)

(1) The secondary sequential selector (Figure 5) is similar to the primary selector except that it is equipped with a single contact which is used for control purposes at the secondary station. Fewer code levers and associated mechanisms are required. The latching lever in each group of mechanism that responds to each element of the condition-select-lock combination is formed with projection P except the lever in that group (space), that is actuated by the lock signal, which has neither projection P or extension E. See Figure 8. Therefore, each operating lever associated with a latching lever having the P projection remains latched for the duration of one operating cycle only, since it is unlatched by action of the stripper bail during the subsequent operating cycle. The operating lever that responds to SPACE translation latches and holds the transfer contact operated for a prolonged period since it is not disturbed by the stripper bail so long as it reciprocates on the upper level of the latch bail. See Figure 38.

(2) In order to open the transfer contact and consequently shut down the secondary station, the calling code is supplemented by the addition of FIGS and CR signals. The combination still in the selector is extended to the mechanism identified with FIGS and CR elements since the function lever in the FIGS group stands unblocked while the SPACE operating lever is latched. Selection of the CR function lever causes its lower extension to rotate the latch bail (Figure 38) sufficiently to permit the stripper bail to ride on its lower level and thereby unlatch the SPACE operating lever in the manner described in Paragraph 2a(4)(d). The FIGS operating lever is unlatched during selection of the CR function lever.

c. CONTROL UNIT (PRIMARY)

(1) CIRCUIT CONDITIONING RELAYS - FUNCTIONING OF CONTACTS

(a) RELAY P1

1-2 (Front) energizes relay P5 and applies holding battery to relays E1, E2, and P2.

2-3 (Front) energizes relay P6 on release of START button.

1-2 (Rear) supplies battery for operation of relay A preparatory to the transmission of the date-time-zone group, and to relay C4 when transmission of emergency end-of-message code is required.

4-5 (Rear) conveys AC to the automatic timer when the signal line is marking in excess of .170 second. This is a slow-release relay which remains energized on impulses of signal frequency.

(b) RELAY P2

1-2 (Front) conveys AC to the MXD clutch magnet for transmission of the second and subsequent station calls.

4-5 (Front) provides a locking circuit for relay P2.

3-4 (Rear) supplies battery for locking relays P3, P5, and P6 and for START and RESTART buttons.

4-5 (Rear) closes the circuit to the OPEN LINE lamp and the alarm buzzer. This is a slow-release relay which remains energized on impulses of signal frequency; becomes de-energized when line relay is on SPACING for period in excess of .170 second.

(c) RELAY P3

1-2 (Front) provides a path for the operation of P4 by the START button.

3-4 (Front) provides locking circuit for relay P3.

1-2 (Rear) conveys AC to the clutch magnet circuit of the MXD for the transmission of the second and subsequent station calls.

3-4 (Rear) conveys AC to the electronic timer for the operation of relay P7 when the signal line becomes marking for a period in excess of .170 second.

(d) RELAY P4

1-2 (Front) provides an operating path for P3 when the start button is released after being pressed.

3-4 (Front) closes circuit for energization of P5 when START button is pressed.

5-6 (Front) applies holding battery to P2 when P4 opens the signal line due to pressure on the START button.

1-2 (Rear) opens the signal line to interrupt message traffic when P4 responds to pressure on the START button.

3-4 Opens the circuit through the magnet of the sequence selector in response to pressure on the START button to apply a BLANK signal for the purpose of releasing any latched operating levers. This is a slow-release relay which becomes de-energized .300 second after the start button is released.

(e) RELAY P5

1-2 (Front) conveys locking battery to P6 during transmission prior to and including transmission of the first station call.

2-3 (Front) provides a path for locking battery to P6 during transmission of an emergency end-of-message code.

4-5 (Front) applies locking battery to P5.

6-7 (Front) provides a path for the operation of P6 when the START button is released after pressure.

1-2 (Rear) provides an AC path to the MFD and MXD clutch magnets for transmission prior to and including the first station call.

2-3 (Rear) provides an AC path to the MFD clutch magnet for transmission of an emergency end-of-message code.

4-5 (Rear) provides a path for the operation of relay A preparatory to transmission of the first date digit.

5-6 (Rear) provides a path for the operation of relay C4 when transmission of an emergency end-of-message code is required.

7-8 (Rear) provides an operating path to P3 when the start button is released after being depressed.

(f) RELAY P6

1-2 (Front) applies battery to the windings of relays E1 and E2 when transmission of an emergency end-of-message code is required.

3-4 (Front) closes the locking circuit of relay P6.

1-2 (Rear) provides a path for AC current to the circuits of the MXD or MFD clutch magnet as required.

(g) RELAY P7

2-3 Applies operating current to relay P6 when an emergency end-of-message code is required.

1. THEORY OF OPERATION

a. Refer to Wiring Diagram WD-2474. With AC applied to terminals 5 and 6 of the electronic timer and with contact 4-5 rear of relay P1 open, capacitor C1 is charged with the polarity indicated and to the peak of an AC voltage determined by the setting of the potentiometer. This AC voltage is that between terminal 6 and the slider of the potentiometer. During the half cycles that terminal 5 is positive with respect to terminal 6 the positive charge reaches the condenser from terminal 5 through the potentiometer and its slider. The negative charge reaches the condenser from terminal 6 through resistor R2 and the cathode and grid of the tube. The grid and cathode elements of the tube, in this instance, function as a simple rectifier in which the grid acts as an anode.

b. When contact 4-5 rear of relay P1 closes, condenser C1 starts discharging through resistor R1 and, after a time delay, relay P7 is actuated. This is accomplished as follows: Closure of 4-5 rear on P1 effectively switches the cathode from one side of the AC line (6) to the other side of the line (5). A circuit is thus established from the secondary winding of the transformer, through the coil of the relay P7, from anode to cathode of the tube through contact 4-5 rear of P1 and back to the secondary of the transformer. The voltage applied to the grid of the tube consists of the AC voltage from terminal 5 to the slider plus the DC voltage across capacitor C1. Since the DC voltage in the grid circuit is greater than the AC voltage in the grid circuit, the tube does not pass current. When the voltage on the capacitor reaches a low enough value the grid voltage rises high enough to permit sufficient plate current to flow, thereby operating relay P7. The length of the time delay can be adjusted by the potentiometer. The purpose of capacitor C2 is to supply current to the coil of the relay on the half-cycle during which the tube does not pass current. Opening of contact 4-5 rear on relay P1 de-energizes relay P7 and allows capacitor C1 to recharge.

d. CONTROL UNIT (SECONDARY)

(1) CIRCUIT CONDITIONING RELAYS - FUNCTIONING OF CONTACTS

(a) RELAY S1

1-2 Provides positive battery for energizing Relay S7 when S1 is operated.

3-4 Provides a locking circuit for S1 through the MANUAL button.

5-6 Provides negative battery to the MANUAL lamp when S1 is de-energized.

5-7 Provides negative battery to the AUTOMATIC lamp when S1 is energized.

9-10 Provides plus battery for energizing relay S6 when S1 is operated, thereby re-energizing S6 after the .300 second open-line interval at the beginning of the collecting sequence.

11-12 Provides a circuit for energizing relay S3 through 7-8 of S6 when the selector contact is closed.

13-14 Prevents negative battery from reaching relays ST and OL (ASID) through 3-4 of SS (ASID) if the tape-start switch is thrown to the ON position when the AUTOMATIC lamp is lighted. See Wiring Diagrams WD-2460, WD-2462, and WD-2463

for schematics of CU2, CU3, and ASID unit respectively.

16-17 See Paragraph 1.d.(1)(b) Contact 3-4.

(b) RELAY S2

1-2 Provides plus battery for holding S2 energized through 3-4 of S6 in the event that the secondary station, while transmitting on an automatic basis, drops from sequence, due to a temporary opening of the signal line before completing its message, and opens its transfer contact on the selector in response to end-of-message transmission from the consecutive station. With S2 energized, the selector motor will be kept running and the open-line lamp will be lighted through contact 9-10 of S-6 (de-energized) and serve as an indication to the operator that the message had been broken.

3-4 Provides a circuit to the open-line lamp from negative battery at 16-17 of relay S1 through 9-10 of S6 (de-energized), 3-4 of S2 (de-energized) 8-9 of relay CO (ASID) energized, 6-7 of S2, to ground at 1T-2T of BP (ASID). CO is energized only when the signal line breaks during MANUAL transmission.

4-5 Provides positive battery to the open-line lamp through 9-10 of S6 (de-energized) and 16-17 of S1. If the signal line breaks during AUTOMATIC transmission, S2 remains operated and S6 releases.

6-7 Provides a path for locking CO (ASID) through contact 1T-2T of BP when the signal line opens during MANUAL transmission and for momentarily locking CO when a restart key is pressed. This path is broken at 6-7 of S2 to prevent locking by CO after an open-line condition during AUTOMATIC transmission. This permits starting without using a restart button.

9-10 Provides a path that extends through 5-6 S4, 8-9 S3, and 7-8 ST (ASID) for supplying AC to the MFD clutch magnet for transmission of station identification under MANUAL control. Due to the slow release of S2, this circuit does not close at 9-10 of S2 until ST (ASID) has released. Not used on CU3 (single circuit).

(c) RELAY S3

1-2 Provides a locking circuit for S3 through 4-5 of S6 and the contact of the selector.

3-4 Completes a circuit for energizing TT (ASID) to start tape transmission and eliminate station identification by by-passing the counting-chain relays when S3 is operated.

6-7 Completes a circuit through 1-2 of SS (ASID) for energizing CP (ASID) when S3 is operated. In AUTOMATIC transmission battery must be provided to CP in some other way than through 4-5 P (ASID) since P is not operated when the counting chain is by-passed.

8-9 Completes an AC circuit through 7-8 ST (ASID), 5-6 of S4 and 9-10 of S2 for operation of the MFD clutch magnet.

9-10 Completes an AC circuit through 7-8 ST (ASID) for operation of the MXD clutch magnet.

11-12 Provides a cource of battery for the AUTOMATIC lamp when S3 operates and releases S1.

14-15 With the TAPE-START switch in the OFF position and S3 operated, a circuit is completed from 3-4 of LB or 2T-3T of CP (ASID), depending on circuit conditions, through 13-14 S1, the ET and MANUAL contacts on the MXD, 14-15 S3, and 3-4 SS for energizing OL, and 4-5 of OL, 1-2 of CO for energizing ST (ASID).

16-17 With the TAPE-START switch in the OFF position and S3 unoperated, a signal-line circuit is established through the TAPE-START switch, 16-17 S3, 1B-2B CP, 1B-2B BP (ASID), and start-stop contacts of the MFD and MXD, which shunts relay SS from the signal line circuit when the station is not operating. This shunt is broken by the TAPE-START switch during MANUAL operation or by S3 during AUTOMATIC operation.

18-19 Completes a circuit through 5-6 S1 for the MANUAL lamp when controls are set for MANUAL operation. This contact breaks when the AUTOMATIC button is pressed.

20-21 Provides a locking circuit for S1 which becomes effective when S1 operates. This contact breaks the locking circuit and releases S1 when S3 operates.

(d) RELAY S4 (NOT USED WITH CU3)

1-2 Completes a locking circuit for S4 through 1-2 ST (ASID).

5-6 Conveys AC from 7-8 ST (ASID) 9-8 S3 to 9-10 S2, to MFD clutch magnet.

6-7 Conveys AC from 7-8 ST (ASID) 9-8 S3, to 9B-10B TT and MXD clutch magnet.

(e) RELAY S5 (NOT USED WITH CU3)

4-5 Provides an operating circuit for S4 through 1-2 of relays 6 or 7 (ASID) 1T-2T TT, 3-4 S3 and 1-2 of ST under normal conditions.

5-6 Provides an operating circuit for S4 through 1T-2T of relay 8 (ASID) 1T-2T TT, 3-4 S3 and 1-2 of ST when the FIGS RESTART button is used.

(f) RELAY S6

1-2 Provides a locking circuit for S6 through the marking contact of the line relay.

3-4 Provides a locking circuit for S2 as described in Paragraph 1.d(1)(b) contact 1-2.

4-5 Provides a locking circuit for S3 and causes release of S3 in case the signal line opens during AUTOMATIC transmission.

7-8 Supplies negative battery to the winding of S3 when S6 is energized.

9-10 Provides circuit to open-line lamp as described in Paragraph 1.d.(1)(b) contact 3-4.

(g) RELAY S7

1-2 Makes and breaks the AC circuit to the selector motor.

e. MULTIPLE TRANSMITTER-DISTRIBUTOR SET

(1) TRANSMITTER DISTRIBUTOR (MXD)

(a) COMPONENTS

The transmitter distributor (Figures 15 and 16) consists essentially of the following mechanisms: A cam sleeve with associated contact levers and contacts for 7.42 transmission, clutch magnet assembly, tape-sensing and tape-feeding mechanisms (Figures 60 and 61), tape-stop mechanism (Figure 62), driven gear, base plate, top plate with a hinged tape lid, and a transmitting-contact filter.

(b) CLUTCH-MAGNET ASSEMBLY

1. This assembly is made up of a two-coil magnet and an armature with a clutch throwout lever attached. See Figure 16. Transmission starts when the clutch magnet is energized and stops when it is de-energized. The action is as follows:

2. From an idling condition in which the magnet is de-energized, clutch teeth disengage , start-stop contact closed, and the selector-lever pins in their downward position, AC power is applied to the clutch magnet. The magnet (Figure 63) attracts the armature which disengages the clutch throwout lever from the driven clutch member and permits the clutch teeth to engage causing the cam sleeve to rotate. As the cam sleeve rotates, its individual cams actuate their respective contact levers (Figure 65) which control the opening and closing of the transmitting contacts as permitted by the selector levers (Paragraph 1.e.(1)(c)3). Other cams of the cam sleeve actuate the selector-lever bail, and feed pawl. The cam sleeve rotates continually while the clutch magnet is energized.

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

(c) TAPE-SENSING MECHANISM

1. The transfer of the code combination from the perforated tape to the contact levers which control the transmitting contacts is accomplished by means of the selector-lever bail, its cam, selector lever pins, and selector levers (Figure 64).

2. As the cam sleeve rotates, the selector-lever bail extension roller (Figure 65) rides onto the high part of its cam and permits the selector levers to respond to the tension exerted on them by their springs. The selector levers rotate counterclockwise and move their pins upward through an opening in the top plate to sense the perforated tape. The selector-lever pins which encounter perforated holes in the tape advance through the perforations, whereas the pins which do

not encounter perforated holes are blocked by the tape and are prevented from advancing farther.

3. The position of a selector lever determines whether or not the contact lever is blocked or permitted to rise into the indent of its cam and thus rotate slightly in a counterclockwise direction as shown in Figure 65. The opening and closing of the transmitting contacts is controlled by the contact levers. If a selector-lever pin passes through a perforated hole in the tape, the selector lever moves out of the path to be taken by the end of the contact lever and thus permits the contact lever to rotate when the indent of its cam reaches the lever. The rotation of the contact lever permits the transmitting contact to close and create a MARKING condition on the signal line. If a selector-lever pin is blocked by the tape, the selector lever blocks the contact lever and thus prevents its rotation. Under this condition, the transmitting contact remains open and a SPACING condition is created on the signal line.

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

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

6. After the fifth code interval has been applied to the circuit, the selector-lever bail extension roller (Figure 64) rolls into the indent of its cam and produces motion which causes the selector-lever bail to retract all of the selector levers from their sensing position.

(d) TAPE FEEDING

Immediately after the selector-lever bail has retracted all the selector-lever pins from the tape, the feed roller rolls into the indent of its cam (Figure 66). This motion is passed on to the feed-wheel ratchet through the medium of the feed-pawl lever and the feed pawl, and rotates the feed wheel. The feed wheel has pins on its periphery (Figure 67) which engage the feed holes in the tape. As the feed-wheel rotates, the tape is advanced through its guide. While the feed wheel is rotating, a detent roller (Figure 66) rides over a tooth on the feed-wheel ratchet and brings the feed wheel to rest in a position in which the perforations in the tape are directly over the selector-lever pins.

(e) STOP MECHANISM

Within the unit there are two means for interrupting the clutch-magnet circuit. The clutch-magnet windings are connected in series with an automatically-operated contact and a manually-operated contact (Figures 62 and 69). When either contact is opened, operation of the unit will stop.

(f) AUTOMATIC STOP

The automatically-operated tape-out contact is located adjacent to the transmitting contacts (Figure 62). It is controlled by a tape-out contact lever which operates from the cam sleeve like the five selector levers. The associated tape-out sensing-lever pin is in line with and adjacent to the selector-lever pins (see Figure 67). It has a sensing area that senses along the edge of the tape with each revolution of the cam sleeve. When the end of the tape passes through the transmitter, the tape-out contact lever turns in a clockwise direction as shown in Figure 68. The lower end of the tape-out contact lever will have then moved out of the path of the extension on the tape-out operating lever and permitted it to ride into the indent of its cam (Figure 62). As the tape-out operating lever rides into the indent of its cam, one end of the tape-out contact lever opens the automatic tape-out contact, while the other end of the lever becomes latched by the tape-out contact lever latch. The opening of the tape-out contact breaks the circuit of the clutch magnet and stops the operation of the unit.

(g) MANUAL STOP

The manually-operated contact is located at the front of the unit (Figure 69). It may be opened by depressing the release bar or it may be closed by releasing the release bar. The release bar may be depressed momentarily or it may be latched in the downward position by moving it slightly rearward. When the release bar is depressed, three operations are performed: the manual tape-out contact opens and stops the transmitter, the tape-out con-

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

(2) TRANSMITTING DISTRIBUTOR (MFD)

(a) The unit consists of a distributing-shaft assembly, magnet-operated clutch, set of distributing contacts with their associated contact levers, filter, and base plate. Two upright plates mounted to the base plate support the distributing-shaft assembly. See Figure 17.

(b) While in an idling condition the clutch teeth are disengaged and the cam sleeve is held stationary by the clutch throwout lever which is engaged with the driven clutch member. When the clutch magnet is energized it attracts its armature which pulls the throwout lever out of engagement with the driven clutch member and allows the clutch teeth to engage. The cam sleeve then rotates with the shaft. Rotation continues until the magnet is de-energized. The cams on the cam sleeve actuate the contact levers which cause all of the distributor contacts to close and open invariably with each revolution of the cam sleeve. If line battery is applied to a contact as it closes, a MARKING impulse is transmitted to the signal line. If line battery is removed from the contact as it closes, a SPACING condition prevails on the signal line. Rotation of the distributing cam sleeve also actuates an auxiliary contact for the purpose of pulsing associated relays. When the circuit to the clutch magnet is broken the clutch throwout lever spring pulls the throwout lever into engagement with the driven clutch member. This action disengages the clutch teeth and brings the cam sleeve to rest in its stop position.

(c) A detent lever (Figure 66) rides a cam on the cam sleeve. When the cam sleeve reaches its stop position, the detent lever drops into the indent of its cam to prevent the sleeve from rotating backward.

f. TRANSMITTER DISTRIBUTOR (XD)

Single-circuit secondary stations utilize a transmitter distributor (XD) that is standard except that it has added to it an electromagnetic solenoid with plunger for controlling tape feeding in conjunction with the transmission of station identification.

2. THEORY OF SYSTEM

a. PRIMARY STATION

(1) IDLING CONDITION

Primary SECO apparatus as it enters an idling period displays no signal lamp indication and so long as this condition endures may be started on a collecting sequence by use of the START button only. Should the RED lamp be lighted, the OPEN LINE ALARM RESET button must first be used. See Paragraph 2.a.(8). This latter condition is presupposed in the theory that follows:

(2) OPEN LINE ALARM RESET BUTTON

From an idling condition under which all control-unit relays except the signal-line relay are unoperated (red lamp lighted), and sequential selector contacts stand closed with the exception of contacts 4 and 6, local circuits are put in readiness for automatic operation by pressing the OPEN LINE ALARM RESET button. See Wiring Diagram WD-2474. This action energizes relay P2 which locks with battery supplied through the MARKING contact of the signal-line relay and front contact 4-5 of P2. The open-line indicating lamp (red) goes out since its circuit is broken at rear contact 4-5. Closure of rear contact 3-4 prepares a path for the completion of circuits by the RESTART and START buttons. Closure of rear contact 1-2 prepares paths which are utilized subsequent to the actuation of relay P3 and the closure of contact 6 on the sequential selector.

(3) START BUTTON

(a) Pressure on the START button energizes relay P4 which breaks the signal line at its rear contact 1-2 and interrupts message traffic on the circuit. The signal-line relay armature swings to its SPACING contact and completes a circuit that energizes relay P1. Operation of P1 causes its front contact 1-2 to complete circuits for the energization of relay E2 through contact 2-3 of all chain relays in series, through contact 1-3 of E2, through 4-5 of E1 and the auxiliary contact of the MFD, and for the energization of P5 and the locking of P2 through front contacts 3-4 and 5-6 respectively of P4. While relay E2 is operated its front contact 1-2 shunts 2-3 of the counting chains so long as the MFD auxil-

iary contact remains closed.

(b) Release of the START button breaks the operating circuit of relay P4 which releases after .300 second delay to close the signal line at its rear contact 1-2 and energize P3 and illuminate the AMBER lamp by completing a circuit through 1-2 front of P4, 7-8 rear of P5, STOP button and 3-4 rear of P2. P3 locks through its own 3-4 front, S7, STOP button and 3-4 rear of P2. Closure of the signal line causes the release of P1 since its operating circuit is interrupted at the SPACING contact of the line relay for a period in excess of .170 second. P6 becomes energized through 6-7 front on P5 and 2-3 front on P1 and locks through 3-4 rear of P2, the STOP button, S7, 1-2 front of P5, S2, and 3-4 front on P6. Closure of 1-2 front on P6 causes relay A to be energized through 2-3 front on all chain relays except A, through 4-5 rear of P5, and rear 1-2 of P1. Relay A locks through its 8-9 front, 2-3 front of the counting chain and 1-2 front on P6 and awaits the start of transmission from the MFD. The clutch magnet of the MXD is energized by AC through 1-2 rear of P6, 1-2 rear of P5, and S1 to start transmission of the sequence heading from characters stored in a control tape at the primary station. With the start of transmission P1 will operate and remain operated so long as the signal-line relay continues to vibrate but will release whenever a MARKING period in excess of .170 second occurs on the circuit.

(4) PRIMARY TRANSMISSION

(a) That part of the sequence heading leading up to but not including the date-time group is transmitted from a control tape in a primary transmitter distributor (MXD) and is terminated with the transmission of the signals LTRS, SPACE, and FIGS. Selector contact S1 opens on the combination LTRS SPACE. S4 closes when FIGS signal is added to the preceding combination. The opening of S1 stops the primary MXD by interrupting the circuit to its clutch magnet. Closure of S4 starts the primary transmitting distributor (MFD) by closing the AC circuit to its clutch magnet. Due to preceding pressure and release of the START button which caused pilot relay E2 and counting chain relay A to operate and lock, the first cycle of transmission from the MFD will consist of signal elements predetermined by the setting of the first digit switch of the date-time group and applied to the contacts of relay A.

(b) Opening of the MFD auxiliary contact at the start of the transmitting cycle, de-energizes relay E2 which closes its contact 4-5 front and prepares a path for the actuation of E1 which becomes effective when the MFD auxiliary contact closes at the end of the first transmitting cycle. Relay E1 locks through its 1-2 front and actuates relay B through 1-2 rear of E1, 5-4 front of A, 3-2 of the counting chain, and 1-2 front of P6 and 1-2 front of P1 in parallel. Relay B locks through its 8-9 front and unlocks A at 2-3 front. The MFD transmits the signal applied to relay B by the second digit switch of the date-time group and while so doing switches energy from relay E1 to E2. When C is presented to the MFD relay B drops from the chain.

(c) Pulsing of the counting chain by the MFD auxiliary contact continues until the DATE-TIME-ZONE group, consisting of signals representing SIX DIGITS, LTRS, ZONE (single letter of alphabet), CARRIAGE RETURN, and LINE FEED, has been transmitted. This action accounts for the operation of chain relays A, B, C, B1, C1, B2, B3, C3, and B4. On the reception of C.R. signal, selector contact S4 opens to stop MFD transmission. This stoppage becomes effective after a subsequent L.F. signal has been transmitted and leaves relay B4 energized. On the reception of L.F. selector contact S1 closes and starts transmission from the primary MXD. This transmission is for the purpose of conditioning the system and calling in the first secondary station on the circuit. It originates in the control tape and consists of CARRIAGE RETURN followed by either CARRIAGE RETURN or FIGS, LTRS, the secondary station call letters consisting of from two to four letters of the alphabet, and SPACE. Whether the second transmitting cycle of the foregoing series provides C.R. or FIGS signal depends on requirements for relaying the circuit traffic. For secondary stations transmitting on a LOCAL basis, the call letters are preceded by C.R., FIGS, LTRS. For secondary stations transmitting on a PROGRAM basis, the call letters are preceded by C.R. C.R. LTRS. Either code will bring in the required station but on the latter code auxiliary equipment (exclusive of the SECO system) activates the relaying facilities. SPACE completes the call by closing and locking-in a contact on the selector at the secondary station which then proceeds to transmit. SPACE also joins with LTRS, SPACE, and L.F. occurring earlier in the heading (see Paragraph 2.a.(8)(c), to form a combination which momentarily opens selector contact S2 to stop primary MXD transmission. This is accomplished by breaking the locking circuit of relay P6 which interrupts the AC supply through S1 to the primary distributor. LTRS signal follows SPACE from the control tape

and forms an extension of the combination referred to above (LTRS, SP, L.F., SP) for momentarily opening selector contact S3 to de-energize P5 and break the primary starting circuit. Closure of 2-3 rear on P5 places the primary MFD under the control of relay P7 and P6 during a prolonged MARKING interval on the signal line incident to the failure of a secondary station to respond to its call or its failure to send end-of-message code. Closure of 5-6 rear on P5 places relay C4 directly under the control of P1 for a like purpose.

(d) Transmission from the secondary station proceeds from previously prepared tape. The perforations in this tape terminate with an end-of-message code (FIGS, C.R., LTRS). FIGS C.R. when added to the calling combination already stored in the secondary selector unlatches its contact mechanism and shuts-down the equipment. The secondary equipment, in shutting-down reverts to the MANUAL condition.

(e) Reception of FIGS C.R. LTRS combination by the primary station closes selector contact S6 to energize the clutch magnet of the MXD for transmission of the next station call. The call terminates with SPACE and is followed by LTRS signal. Contact S6 opens on the reception of SPACE and stops primary transmission.

(5) EMERGENCY END-OF-MESSAGE TRANSMISSION

(a) In the event that the secondary station does not respond to its call or fails to transmit end-of-message code, the subsequent marking period on the signal line causes relay P1 to release after .170 second. Contact 1-2 rear on P1 energizes relay C4 which locks through 8-9 front. Contact 4-5 rear on P1 closes a circuit to relay P7 which operates after 3. seconds delay and energizes P6. See Section 1, Paragraph 1.c.(1)(g). Contact 1-2 rear on P6 closes the MFD clutch magnet circuit for transmission of an emergency END-OF-MESSAGE code represented by FIGS C.R. LTRS combination but preceded by L.F. signal. Relays C4, B5, C5, and D are permanently wired for these signals respectively and are presented to the MFD in this order as an extension of the counting chain. FIGS C.R. combination momentarily opens contact S5 to break the locking circuit of relay P6 and stop the primary MFD. FIGS C.R. LTRS combination closes contact S6 to start transmission of the next station call by the MXD.

(b) Any secondary station that fails to transmit in normal sequence under automatic control may transmit under manual control after the automatic collection sequence ends.

(6) STOP BUTTON

Transmission from the primary station may be interrupted at any time by pressing the STOP button and be resumed by pressing the RESTART button except when interruption occurs prior to completion of the first station call. Interruption subsequent to the first station call releases relay P3 and relay P6 if operated. Release of these relays will break the AC circuits to both the MXD and MFD units. Restoration is made by pressing the RESTART button. However, should interruption occur prior to completion of the first station call, relay P5 will also release. This necessitates pressing the START button to re-arrange the local circuits as at the start of collection and may involve restarting the control tape.

(7) SYSTEM SHUT-DOWN

The last station on a circuit to normally complete its message transmits LTRS C.R. L.F. followed by FIGS C.R. LTRS.. The secondary station stops its selector motor and reverts to MANUAL as described in Paragraph 2.a.(4)(d). Reception of FIGS C.R. LTRS causes the primary selector to close contact S6 and start transmission from the MXD. This final transmission from the control tape at the end of a collection sequence consists of LTRS C.R. FIGS FIGS LTRS. Reception of FIGS FIGS (shut-down combination) by the primary selector causes a momentary opening of contact S7. LTRS signal introduces the necessary operating cycle for closing this contact. Breaking of contact S7 releases relay P3 to shut-down primary apparatus. Relay P1 releases after a prolonged marking interval on the signal line. Unless the signal-line current is interrupted for a period in excess of .170 second, relay R2 will remain operated and a new collection sequence may be started by pressing the START button. Also selector contact S6 will remain closed until the start of the next sequence collection unless an open interval occurs on the signal line.

(8) OPERATING CYCLE OF PRIMARY APPARATUS

(a) OPEN LINE ALARM RESET BUTTON

P2 operates

RED light goes out

(b) START BUTTON

1. PRESSURE APPLIED

P4 operates (1-2 rear breaks) P2 holds

Signal line opens (circuit traffic interrupted)

P1 operates (1-2 front closes)

P5 operates

E2 operates

2. PRESSURE REMOVED

P4 releases (1-2 front closes) (1-2 rear closes)

P3 operates

AMBER lamp lights

Signal line closes

P1 releases (2-3 front closes)

P6 operates (1-2 front closes) (E2 holds)

Relay A operates

MXD operates

P1 operates

(c) PRIMARY TRANSMISSION

MXD (tape)

LTRS
CG (or corresponding station ident.)
CR
10 L.F. operations
AW
SPACE
FIGS
0000 (circuit number)
LTRS, SPACE → S1 opens (selector) MXD stops
FIGS → S4 closes MFD starts

MFD

DATE-TIME SIGNALS
LTRS
C (Zone)
CR → S4 opens MFD stops

LF → S1 closes MXD starts

MXD

(FIGS) CR
CR
LTRS
ABC → Secondary transmission starts (or corresponding station ident.)

SPACE → S2 opens momentarily P6 releases MXD stops

LTRS → S3 opens momentarily P5 releases starting circuit interrupted

(d) SECONDARY TRANSMISSION

MESSAGE (tape)

LTRS
CR
LF
FIGS
CR → Secondary transmission stops

LTRS → S6 closes Primary MXD starts

(e) FAILURE OF STATION TO ANSWER OR FAILURE TO SEND UNLOCK CODE

3 SECONDS MARKING INTERVAL - P1 releases (1-2 rear closes)
(1-2 front opens)
(4-5 rear closes)
C4 operates
B4 releases
P7 operates
P6 operates (1-2 rear closes)
MFD transmits

MFD TRANSMISSION

LF
FIGS
CR — S5 opens momentarily
P6 releases
MFD stops

LTRS — S6 closes
MXD starts

(f) STOP BUTTON

PRESSURE - P3 releases
P6 releases
MXD stops

(g) RESTART BUTTON

PRESSURE - P3 operates
P6 operates
MXD starts

(h) END OF SEQUENTIAL COLLECTION

PRIMARY TRANSMISSION

MXD (tape)

LTRS
CR
FIGS
FIGS — S7 opens momentarily

LTRS P3 releases (1-2 rear opens)
MXD stops
P1 releases

(i) SIGNAL LINE OPENS - P2 releases

(9) ARRANGEMENT OF CODE LEVERS IN SEQUENTIAL SELECTOR

PRIMARY POSITION		SECONDARY POSITION		
1	LTRS	1	CR	
2	SPACE	2	CR	
3	LF	3	FIGS	
4	SPACE	4	LTRS	
5	LTRS	5		Station Call Letters (also uncoded levers)
6	UNCODED	6		
7	LTRS	7		
8	SPACE	8		
9	FIGS	9	SPACE	
10	CR	10	FIGS	
11	FIGS	11	CR	
12	CR			
13	LTRS	Locking Levers Positions 2-3 Bridged		
14	UNCODED			
15	SPACE			
16	FIGS			
17	FIGS	Operating Levers Positions 2-3 Bridged		
	BLANK			
Operating Levers Positions 5-6 Bridged 13-14 Bridged		Levers in other uncoded positions bridged to preceding levers		

b. SECONDARY STATION (USING CONTROL UNITS CU2)

(1) AUTOMATIC OPERATION

(a) When the calling code of the secondary station is received, the sequential selector closes and latches its contact. See Wiring Diagram WD-2460. Closure of this contact completes a circuit that energizes relay S2 directly, and also S3 by utilizing a path through contacts 11-12 of S1 which is then in the operated position. Energization of relay S3 breaks the locking circuit of S1 and permits it to revert to the unoperated position. Opening of contact 16-17 on relay S3 removes the shunt from the winding of relay SS in the ASID unit so that it may be energized and pulsed by the signal-line current. Operation of SS (ASID) de-energizes LB which energizes OL by utilizing the circuit through contact 13-14 of relay S1 and contact 14-15 of S3. Operation of OL closes a circuit through the winding of relay ST. When ST operates it closes a circuit through contact 9-10 of relay S3 to energize the clutch magnet of the secondary transmitter distributor (MXD) and start transmission of the message stored in the perforated tape. At contact 3-4, relay S3, when operated, closes a circuit to the ASID unit so as to energize its relay TT and disable its counting chain relays. At contact 6-7 relay 3 closes a circuit to energize relay OP (ASID).

(b) As transmission of the message stored in the tape is completed, the end-of-message code (FIGS, CR, LTRS) also perforated in the tape, is transmitted. When FIGS - CR is applied to the secondary sequential selector it unlatches selector mechanism that allows the selector contact to open and release relays S2, S3, and S7, of the control unit. Release of relay S3 breaks the circuit of the MXD clutch magnet to stop transmission. Release of S7 stops the selector unit motor. The AUTOMATIC light is extinguished and the MANUAL lamp is illuminated.

c. STOP DUE TO OPEN LINE (AUTOMATIC CONTROL)

Should an open-line condition occur during automatic transmission which would permit the line relay armature to remain on the spacing side for a period in excess of .170 second, relay S6 will become de-energized and break the locking circuit of relay S3. In releasing, S3 stops transmission by interrupting the circuit to the MXD clutch magnet and changes the light indication from AUTOMATIC to MANUAL. Under this condition, relay S2 remains operated in order to provide circuits for lighting the open-line lamp and keeping the holding relay S7 operated. The control unit motor is thus kept running. After the signal line has been restored to a closed condition, relay S6 may be re-energized by pressing the ALARM RESET push button. This action extinguishes the OPEN LINE lamp. Use of the RESTART button however, must be governed by established operating routine. (See Paragraph 2.a.(8)(g).) After the interruption of automatic transmission from a secondary station due to opening of the signal line and subsequent closure of the line, the contact of the selector unit will remain latched in the closed position and relay S2 will remain operated until FIGS - CR combination of the end-of-message code is transmitted on the circuit.

d. MANUAL OPERATION

If transmission is to be on a PROGRAM basis, the PROGRAM MESSAGE button should be pushed inward. This button is used in its outward position for operation on a LOCAL basis. Pressure on the MANUAL button prepares local circuits for MANUAL operation with the white indicating lamp lighted. The throwing of the TAPE START switch to the ON position removes the shunt from the winding of relay SS (ASID) and applies AC to the clutch magnet of the MFD by operating relays OL and ST (ASID) to start transmission of station identification from the ASID unit. The relay in the ASID unit which sets up the code for the last character of station identification provides a circuit for energizing relay S4 of the control unit. Relay S4 locks up through its contact 1-2 and through relay ST (ASID). As relay S4 operates, it switches AC from the MFD clutch magnet to the MXD clutch magnet to start tape transmission. At the end of MANUAL transmission, the MXD clutch magnet circuit is broken either by the opening of the end-of-tape contact on the MXD or by the influence of the tape-start switch when thrown to the OFF position.

e. INTERRUPTION OF TRANSMISSION (MANUAL CONTROL)

If interruption due to open line or other causes should occur during manually controlled transmission, release of relay SS and associated relays in the ASID unit interrupts the AC circuit to the clutch magnet of the transmitting unit and stops transmission. Before resuming transmission, the operator must observe the printed copy of the message and determine whether printing had been in the FIGURES or LETTERS position when stoppage occurred. If printing had stopped in the

LETTERS position the BREAK-LETTERS key should be depressed. If printing had stopped in the FIGURES position, the FIGURES-RESTART button should be depressed.

f. SECONDARY STATION (USING CONTROL UNIT CU3)

Theory of operation of a single-circuit station relative to a multiple-circuit station differs only with regard to the transmitter-distributor and its control circuits. See Wiring Diagram WD-2462. Since a single transmitter-distributor unit (XD) is used for transmitting both station identification and message code it is necessary that the XD be equipped with a special electro-magnetic solenoid and plunger to prevent feeding of the tape during transmission of station identification. Consequently relay TT (ASID) acts directly on this solenoid to start tape transmission. This modification of transmission permits the elimination of relays S4 and S5, contact 9-10 from relay S2, and 8-9-10 from relay S3.

SECTION III

INSTALLATION AND INITIAL ADJUSTMENTS

1. GENERAL

The SECO equipment covered by this bulletin consists of the following:

a. PRIMARY SECO (CAA TYPE NO. 1115) - Each primary station consists of:

Quantity	Teletype Code	Description
1	AC201AB	Primary SECO Cabinet
1	BS1A	Primary Selector Unit
1	115272	Set of Gears (Selector - 368 OPM)
1	BSP1	Selector Panel
1	MU36	Motor Unit
1	115416	Set of Gears (Motor - 368 OPM)
1	CU1	Primary Control Unit
1	RY30	Relay (Signal Line)
2	MXB13	Base
1	MXD14	Transmitter Distributor
1	MFD1	Transmitting Distributor
5	115427	Plate (Assembly)
1	116179	Tape Guide Assembly
1	115386	Switching Panel
1	115469	Primary Connector Assembly

b. TWO-CIRCUIT SECONDARY SECO (CAA TYPE NO. 1116) - Each two-circuit secondary equipment consists of:

1	AC202AB	Secondary SECO Cabinet
2	BS1B	Secondary Selector Unit
2	115272	Set of Gears (Selector - 368 OPM)
1	BSP1	Selector Panel
1	MU36	Motor Unit
1	115416	Set of Gears (Motor - 368 OPM)
2	CU2	Secondary Control Unit - Two-Circuit
2	RY30	Relay (Signal Line)
1	MXB13	Base
2	MXD14	Transmitter Distributor
2	MFD1	Transmitting Distributor
1	115427	Plate (Assembly)
2	115385	Set of ASID Adapter Parts
8	-	Selector Code Levers
1	115437	Set of Parts to Mount MXB in Cabinet
1	91862	Receptacle
1	95003	Receptacle
1	115387	Switching Panel
1	115470	Secondary Connector Assembly

Additional apparatus required but not furnished on the contract:

2	-	ASID Unit

c. SINGLE-CIRCUIT SECONDARY SECO (CAA TYPE NO. 1116) - Each single-circuit secondary equipment consists of:

1	AC202AB	Secondary SECO Cabinet

1	BS1B	Secondary Selector Unit
1	115272	Set of Gears (Selector - 368 OPM)
1	BSP1	Selector Panel
1	MU36	Motor Unit
1	115416	Set of Gears (Motor - 368 OPM)
1	CU3	Secondary Control Unit - Single Circuit
1	115382AB	Control Unit Blank
1	RY30	Relay (Signal Line)
1	115385	Set of ASID Adapter Parts
4	-	Selector Code Levers
1	115438	Set of Parts to Mount XD in Cabinet
1	115386	Switching Panel
1	115470	Secondary Connector Assembly

Additional apparatus required but not furnished on the contract:

1	-	ASID Unit
1	-	Transmitter Distributor (XD) Modified for SECO Use

2. GENERAL INSTRUCTIONS

a. Unpack all parts and units with care. Muslin bags and small packs should be kept with their associated piece of apparatus until used in the installation.

b. Remove the wires which hold the slide rails and shelves inside the cabinet.

c. Check the lubrication on all slides (grease) and rollers (oil) and relubricate if necessary.

d. Signal line and power circuits may be brought into the cabinet through openings provided in the top of the cabinet or through ducts provided at the sides of the base and openings in the floor of the bottom compartment as desired. (Duct adapters for interconnection purposes are to be provided for each side of the cabinet base as soon as possible.) Remove duct covers accordingly. See Figure 1.

e. Two 1/2-inch holes are provided in the horizontal duct of the cabinet base for the purpose of securing it to the floor. Suitable holes should be provided in the floor where the cabinet is to be located in accordance with dimensions shown on Figure 76.

f. Place the cabinet in position, remove the two duct covers inside the cabinet, and secure the cabinet in position. It is recommended that one-inch (outside diameter) washers be used above the 1/2-inch holes in the base.

g. For installation of the 115385 set of ASID adapter parts for secondary SECO see Specification S-5565.

3. INSTALLATION OF PRIMARY EQUIPMENT IN CABINET

a. Assemble the 115386 switching panel in the top front part of the lower compartment as shown in Figure 1 and as follows: Place the four speed nut clips, from the muslin bag tied to the unit, over the edges of the cabinet at the first and fourth holes below the lower shelf (No. 4 level). Place the switching panel between the two pair of clips in the doorway and secure it in place with the four speed screws. See Figure 1.

b. Remove the front cover from the MXB13. Insert the rear mounting screw, washer, and lock washer for the MXD and MFD in their place in position No. 1 of the MXB base. Place the MXD14 transmitter distributor on the MXB13 base in position No. 1 (left as viewed from front) and in front of the counter shaft. See Figure 1. Place the MFD1 transmitting distributor on the base in position No. 1 behind the counter shaft. Press the units toward the counter shaft so as to position the slip connections and line up the gears. Inser the mounting screws, washers and lock washers from the muslin bag and position the units to provide a barely perceptible amount of backlash between the gears. (Check throughout a complete revolution of the larger gear.) Tighten the mounting screws. Rotate the eccentrics (provided on the base) against the unit plates and tighten their mounting screws.

c. Assemble the 115427 plate assemblies in all other MXD positions on the two MXB bases to be used with the primary cabinet by means of the mounting screws, washers, and lock washers furnished with the plate assembly.

d. Place the MXB covers in position on the base and secure them with their mounting screws.

e. Place the blank MXB set on the lower shelf (No. 4 level) so that the vibration mounts, on bottom of base, rest on the four studs provided on the shelf. Place the other MXB set (containing the MXD and MFD) on the next shelf above (No. 3 level) in the same manner.

f. With the screws, washers, and lock washers furnished, assemble the 116179 tape guide assembly to the shelf (No. 3 level) directly in line with the MXD unit so that the rollers are toward the right (viewed from front).

g. Remove the two brackets (located near the front rollers) from beneath the side rails of the CU1 control unit. Pull out the two slide rails (No. 2 level) from the cabinet and place the CU1 control unit on them so that the front rollers of the CU1 side rails are behind the roller stops provided on the slide rails of the cabinet. Replace the two brackets previously removed from the side rails.

h. Pass the five longest cords of the control unit between the slide rails and the cabinet wall. Place the multiple receptacles onto the multiple plugs of the MXB's. The AC and DC power cords are to be plugged into the electrical service assembly in the left bottom compartment, and the line cord into position No. 1 in the switching panel after all installation is completed. Plug the RY30 line relay into its receptacle along the right side of the control unit.

i. CU1 POSITIONING ADJUSTMENT

(1) The front panel of the CU1 control unit should be flush with the doors above and below it. To adjust, position the latch detent springs (located at the rear of the side rails) horizontally by means of their mounting screws.

(2) The detent latch springs should engage the detents equally. To adjust, position the detents by means of their mounting screws and brackets.

j. Assemble gears to the selector panel counter shaft as follows: Remove the upper and lower gear guards from the shaft end of the BSP selector panel. Remove the nut and washer from the lower end of the counter shaft. Remove the gear hub from the lower end of the shaft. Pull upward on the shaft until the top bearing slips from its retainer. Remove the gear hub from the middle of the shaft and assemble the steel gear of the 115272 set of gears to the hub. Slip the gear and hub back on the shaft (with mounting hole downward) and secure it in position with its mounting screw and lock washer. Insert the shaft back through the bearing. Assemble the fiber gear of the 115416 set of gears to the hub, removed from the lower end of the shaft, and slip the hub and gear onto the lower end of the shaft with mounting hole upward. Replace the hub mounting screw and lock washer but do not tighten. Replace the lock washer and nut on the end of the shaft and tighten. Tighten the hub mounting screw.

k. Assemble the steel motor pinion from the 115416 set of gears to the motor shaft with mounting hole toward the motor. Secure it in position with the mounting screw and lock washer furnished. Replace the gear guards.

m. Remove the four motor-plate mounting screws from the center rails of the selector panel. Place the motor unit through the upper section of the panel onto the center rails of the panel so that the motor hangs underneath its plate and the teeth of the motor pinion mesh with the teeth of the fiber gear on the lower end of the counter shaft.

n. MOTOR POSITION ADJUSTMENT

There should be a barely perceptible amount of backlash between the motor pinion and the highest point on the main shaft gear. Check throughout a complete revolution of the larger gear. To adjust, position the motor, by means of its mounting screws, so that the motor casting is approximately parallel to the edges of the motor mounting plate. Then position the motor plate by means of its mounting screws.

o. By means of the two screws, washers, and lock washers in the muslin bag tied to the 115469 primary connector assembly, mount the assembly to the left side of the bottom section of the selector panel.

p. Place a screw (with washer and lock washer) from the muslin bag tied to the selector panel, in the bottom hole of each of the brackets fastened to the sides of the cabinet just above the control unit (No. 1 level). Place the selector panel in the top compartment so that the slots in the ears of the side castings slide onto the two screws just installed. Insert the remaining two screws (with washers, and lock washers) through the top holes in the ears of the castings and secure the selector panel to the brackets by tightening the four screws.

q. Place the multiple receptacle of the remaining cord from the control unit onto the multiple plug at the rear of the primary connector assembly installed in Paragraph 3.o.

r. Install the fiber gear, from the 115272 set of gears on the BS1A selector shaft. Remove the two thumb screws from the bottom rail of the selector panel and slide the BS1A selector unit into the bottom section of the panel. Secure it in position by means of the two thumb screws just removed. Pass the selector cord behind the left front leg of the panel and plug the multiple plug into its receptacle at the front side of the primary connector.

s. Solder the signal line wires to terminals No. 5 and No. 6 on the switching panel to correspond to receptacle No. 1 on the front side of the panel. See WD-2473. If more than one signal line enters the cabinet, wire to appropriate jack terminals.

t. Remove the cover plate from the electrical service assembly, located at lower left side of cabinet, and make the necessary wiring to power. See WD-2464.

u. Place the rectifier shelf in the bottom of the cabinet.

v. Place the rectifier partially inside the cabinet on its shelf. Plug the rectifier cords from the control unit into their receptacles of the electrical service assembly. Then position the rectifier on its shelf.

w. Make certain that all power switches are in the OFF position and then plug the power cords from the control unit into their receptacles in the electrical service assembly. Insert the line cord.

4. INSTALLATION OF TWO-CIRCUIT EQUIPMENT IN SECONDARY CABINET (See General Instructions Paragraph 2.)

a. Assemble the 115387 two-circuit switching panel in the two circuit AC202AB secondary cabinet as outlined in Paragraph 3.a.

b. Assemble the four 115437 stud feet, from the muslin bag, to the bottom shelf (No. 3 level) in the holes positioned to correspond to the vibration mounts on the bottom of the MXB base.

c. Remove the covers from the MXB base which is to be used in the two-circuit secondary cabinet. Assemble the two MXD14 and MFD1's to the base in positions No. 2 and No. 3 and adjust as outlined in Paragraphs 3.b., 3.c., and 3.d.

d. Place the assembled MXB set on the bottom shelf (No. 3 level) so that the vibration mounts rest on the stud feet. See Figure 3.

e. Remove the 8 screws, washers, and lock washers from the bag tied to the middle shelf (No. 2 level), and the 4 nuts, washers and lock washers from the studs in back of the front panels.

f. Place the two CU2 control units in position on the middle shelf (No. 2 level). Place the 8 screws, removed in Paragraph e. through the elongated holes from the bottom side of the shelf and screw them into the threaded holes in the bottom of the control unit frames. Do not tighten. Place the slots of the instrument plates over the 4 studs located on the inside front part of the shelf. Replace the 4 nuts, washers, and lock washers previously removed from the studs. Do not tighten.

g. Center the control-unit instrument plates in the front openings of the shelf and tighten the 8 screws and 4 nuts.

h. Pass the line and power cords (rubber insulated) downward between the slide rails and the cabinet wall. The power cords are to be plugged into their respective receptacles in the electrical service assembly, and the line cord into the switching panel after all installation is completed. Place the multiple receptacles onto the multiple plugs of the distributor so that the control unit in the left position connects to the distributor unit in the left position (viewed from front).

i. Remove the covers from the top of the control units and install the ASID units in position at the rear of the control units. See Paragraph 2.g. Plug an RY30 line relay into its receptacle along the right side of each control unit. Replace the covers.

NOTE

If difficulty is encountered in mating the slip connections, loosen the mounting screws of the slip-connection blocks and shift the blocks to a more favorable position. Tighten the screws.

j. Install the sets of gears, motor unit, 115470 secondary connector assembly, and selector panel as outlined in Paragraphs 3.j.,

3.k., 3.m., 3.n., 3.o., and 3.p. Also install the remaining steel gear to the top of the selector-panel counter-shaft.

k. Place the multiple receptacles of the shortest cords from the control units onto the multiple plugs at the rear of the secondary connector.

m. Install the fiber gears from the 115272 sets of gears on both BS1B selector shafts. Install the two BS1B selector units, one in the bottom section of the panel and one in the top section of the panel in a manner similar to that outlined in Paragraph 3.r.

n. Pass the cords from the selector units downward behind the left front leg of the selector panel and plug them into the receptacles so that the bottom selector corresponds to the right control unit as determined by the cord at the rear of the connector.

o. Remove the four code levers representing the station's call letters (uncoded levers included) from the small paper bags, and attach them to the four function levers (Figure 5) in positions 5, 6, 7, and 8, using one of the patterns shown on Figure 77 and according to the assigned call letters of the station.

p. Where uncoded code levers appear, bridge the operating lever of the corresponding slot to the preceding operating lever by means of the bridging nuts and screws furnished, as shown on Figure 77. See Figure 5.

q. Solder the wires for one signal line to terminals 5-6 and the wires for the other signal line to terminals 11-12 on the terminal block of the switching panel to correspond to plug receptacles No. 1 and No. 2 respectively on the front of the switching panel. See WD-2473.

r. Remove the cover plate from the electrical service assembly, located at lower left side of cabinet, and install the 91862 and 95003 receptacles in the top holes of the cover plate with screws and nuts furnished.

s. Make the necessary wiring to power. See WD-2464. Replace the cover plate.

t. Place the rectifier shelf in the bottom of the cabinet, and install the rectifier as outlined in Paragraph 3.v.

u. Make certain that all power switches are in their OFF position, then plug the power cords into their receptacles in the electrical service assembly. Insert the line cord.

5. INSTALLATION OF SINGLE-CIRCUIT EQUIPMENT IN SECONDARY CABINET (See General Instructions Paragraph 2.)

a. Install the 115386 switching panel in the bottom compartment as outlined in Paragraph 3.a.

b. Pull the bottom shelf (No. 3 level) out and install the model 14 transmitter distributor base on the shelf so that the vibration mounts are over the mounting holes provided in the shelf. Secure the base in place with the 4 screws, washers, and lock washers furnished with the base. See Figure 2.

c. Slip the model 14 transmitter distributor onto its base. Slip tape platform furnished with the 115438 set of parts, onto the front side of the tape bin directly under the path of the tape from the transmitter distributor.

d. Install the CU3 control unit on the middle shelf (No. 2 level) in a similar manner as outlined for CU2 in Paragraphs 4.e., 4.f., 4.g., and 4.h.

e. Install the 115382AB control-unit blank in the unused opening in the shelf.

f. Remove the cover from the control unit and install the ASID unit in position at the rear of the control unit. See Paragraph 2.g. Plug the RY30 line relay into its receptacle along the right side of the control unit. Replace the cover.

g. Install the sets of gears, motor unit, 115470 secondary connector assembly, and selector panel as outlined in Paragraphs 3.j. through 3.p.

h. Place the multiple receptacle of the remaining cord from the control unit onto the multiple plug at the rear of the secondary connector just installed on the selector panel.

i. Install the BS1B secondary selector unit in its panel as outlined for the primary selector in Paragraph 3.r.

j. Remove the four code levers representing the station's call letters (uncoded levers included) from the small paper bags, and attach them to the four function levers (Figure 5) in positions 5, 6, 7, and 8, using one of the patterns shown on Figure 77 and according to the assigned call letters of the station.

k. Where uncoded code levers appear, bridge the operating lever of the corresponding slot to the preceding operating lever, by means of the bridging nuts and screws furnished, as shown on Figure 77.

m. Solder the signal line wires to terminals No. 5 and No. 6 on the switching panel to correspond to receptacle No. 1 on the front side of the panel. See WD-2473.

n. Remove the cover plate from the electrical service assembly, located at lower left side of cabinet, and make the necessary wiring to power. See WD-2464.

o. Install the rectifier as outlined in Paragraphs 3.u. and 3.v.

p. Make certain that all power switches are in their OFF position, then plug the power cords into their receptacles in the electrical service assembly. Insert the line cord.

SECTION IV

OPERATION

1. PRIMARY STATION

a. PRELIMINARY OPERATIONS

Before starting sequential collection by means of the SECO system the following preliminary operations should be performed at the primary station:

(1) Prepare a loop of control tape representing a sequence heading and the condition-select-lock codes of the stations arranged in the order in which they should transmit under sequential control of the primary station involved. The final perforations in this tape should consist of LTRS, CR, FIGS, FIGS, LTRS which include the shut-down code. Refer to Section II, Paragraph 2a(8)(c).

(2) Position the control tape at its starting point in the appropriate MXD transmitter and thread it between the rollers at the rear. These rollers are adjustable and will accommodate a loop of tape from two to seven feet in length. After the tape is positioned make certain that the release bar on the MXD is in its released position.

(3) Plug the line cord from the control unit into the appropriate signal line jack in the switching panel.

(4) Position the toggle switches as follows:

(a) DC - ON

(b) TRANS-DIST MOTOR (either No. 1 or No. 2) ON

(c) SECO MOTOR - ON

(d) BUZZER - IN

(5) Press the OPEN LINE ALARM RESET button to suppress the open-line signal.

(6) At the time for starting an hourly weather sequence collection, position the dials to indicate the day of the month, the hour, the minute, the time zone, and the number of the MXD transmitter.

(7) Press the START button to start the sequence collection. This action will open the signal line for 300 milli-seconds and start sequential control by transmitting the sequence heading (including date-time-zone group) and the condition-select-lock code of the first station to be called. Once started, automatic collection continues uninterrupted, under normal conditions, until the sequence is completed whereupon the apparatus reverts to a normal idling condition.

b. SUMMARY OF OPERATION

(1) Following the completion of an hourly sequence collection and provided that no open-line condition develops, the apparatus may be started on the next hourly collection by a mere pressure of the START button subsequent to the setting of the variable dials. Should an open-line condition occur to shut down the primary equipment, it will be necessary for the attendant to operate the OPEN LINE ALARM RESET button after the open-line condition has been corrected. After correction of the open line or any other faulty condition, the attendant should shift the control tape in the MXD unit to a position in conformance with the time schedule and then press the RESTART button to reactivate the sequence collection. If mal-operation occurs or the necessity of stopping the sequence collection arises, primary transmission may be stopped by pressing the STOP button. If a secondary station is transmitting when the STOP button at the primary station is operated, secondary transmission will continue until the message is completed. Transmission from the primary station may be interrupted at any time by pressing the STOP button and be resumed by pressing the RESTART button except when interruption occurs prior to completion of the first station call. Stoppage prior to completion of the first station call necessitates pressing the START button to re-arrange the local circuits as at the start of collection and may involve restarting the control tape. Exact procedure will be governed by established operating routine.

2. SECONDARY STATION

a. PRELIMINARY OPERATIONS (AUTOMATIC COLLECTION)

Before the start of AUTOMATIC collection from a secondary station, the following preliminary operations should be performed:

(1) Plug the line cord from the secondary control unit into the required signal-line jack on the switching panel.

(2) Position the toggle switches as follows:

(a) DC - ON

(b) SECO MOTOR - OFF

(c) TRANS-DIST MOTOR - ON

(d) TAPE START - OFF

(e) BUZZER - IN

(3) Push the OPEN LINE ALARM RESET button if an open-line condition is evident.

(4) At a suitable time before the secondary station is due to transmit under SECO control, place the prepared tape in the transmitting unit and make certain that the release bar (MXD only Figure 15) is in the released position.

(5) Press the AUTOMATIC push button to render the equipment subject to automatic control which will be evidenced by the illumination of the AMBER lamp. The attendant will then be relieved of any additional duties relative to the transmission of the message because the primary station will transmit the condition-select-lock code (including the secondary station call letters) to automatically start transmission of the message in the transmitting unit and identify the sending station.

b. SUMMARY OF OPERATION

(1) Should the signal line open, transmission will stop and the equipment will revert to MANUAL. After the signal line has been closed, the attendant may press the OPEN LINE ALARM RESET button to restore the equipment to the normal condition and suppress the open-line signal. Following a break in secondary transmission, the secondary equipment should be left in MANUAL for transmission on a MANUAL basis at the time prescribed for this type of operation.

c. PRELIMINARY OPERATIONS (MANUAL CONTROL)

Before the start of transmission on the MANUAL basis, the following preliminary operations should be performed:

(1) Plug the line cord from the secondary control unit into the required signal-line jack on the switching panel.

(2) Position the toggle switches as follows:

(a) DC - ON

(b) SECO MOTOR - ON

(c) TRANS-DIST MOTOR - ON

(d) BUZZER - IN

(3) Press the OPEN LINE ALARM RESET button if an open-line condition is evident.

(4) Place the prepared tape in the transmitting unit and make certain that the release bar (MXD only Figure 5) is in the released position.

(5) Push the PROGRAM MESSAGE key inward for transmission of a PROGRAM message; pull it outward for transmission of a LOCAL message.

(6) Press the MANUAL push button, if necessary, to render the equipment subject to MANUAL control which will be evidenced by the illumination of the WHITE lamp.

(7) At a time when the circuit is available, throw the TAPE-START switch to the ON position to start transmission.

d. SUMMARY OF OPERATION

(1) Tape transmission on a MANUAL basis is preceded by the transmission of station identification under the control of the ASID unit. Once started, secondary transmission continues, under normal conditions, until the end-of-tape is reached. The attendant may stop transmission by throwing the TAPE START switch to the OFF position also by disengaging the release bar on the MXD (two-circuit station) or raising the tape-lever on the XD (single circuit station).

(2) Should transmission be interrupted by the opening of the signal line it may be restarted by pressing either the BREAK-LETTERS or the FIGURES-RESTART button. When an inspection of the printed copy indicates that stoppage occurred while printing upper-case characters, use the FIGURES-RESTART button; otherwise use the BREAK-LETTERS button. In either case station identification will precede tape transmission. The BREAK-LETTERS button is also available for breaking the signal line in order to stop transmission by another station when this action is expedient.

3. FUNCTIONING OF CONTROLS

a. CONTROL UNIT (PRIMARY)

(1) PUSH BUTTONS

(a) OPEN-LINE ALARM RESET

Pressure on this button energizes relay P2 which then opens the circuit to the red lamp. See schematic wiring diagram WD-2474. The red lamp illuminates when the signal line opens for a prolonged period and continues to glow after the signal line current has been restored. This is an indication that relay P2 stands de-energized and must be actuated by pressing the OPEN-LINE ALARM RESET button before an attempt is made to start or restart the apparatus. During idling periods between scheduled sequential collections relay P2 normally stands energized unless the equipment is switched to another circuit or an OPEN period occurs on the signal line.

(b) START

The START button when pressed causes the signal line to open and, subsequent to its release, starts the process of automatic operation that continues until the last station in the collecting sequence has transmitted its data whereupon the primary apparatus reverts to the idling condition in readiness to again respond to the START button.

(c) STOP

The STOP button when pressed de-energizes relay P3 for the purpose of temporarily interrupting sequential collection. A secondary station, if transmitting, will continue and complete its message after the primary has responded to the STOP button.

(d) RESTART

The RESTART button is used to re-energize relay P3 for the resumption of normal sequential control following interruption by the STOP button or opening of the signal line.

b. CONTROL UNIT (SECONDARY)

(1) MANUAL PUSH BUTTON

The push button designated MANUAL, when pressed, prepares the circuits for transmission on a manual basis. An indicating lamp (white) located above the push button glows while the manual condition endures.

(2) AUTOMATIC PUSH BUTTON

The push button designated AUTOMATIC, when pressed, prepares circuits for transmission on an automatic basis. An indicating lamp (amber) located above the push button glows while the automatic condition endures. Under this condition the secondary station will respond automatically when called in by the primary control apparatus.

(3) OPEN-LINE ALARM-RESET PUSH BUTTON

The push button designated ALARM RESET when pressed restores local circuits on a MANUAL basis after an opening of the signal line has caused the apparatus to shut down. An indicating lamp (red) located above this button illuminates when an opening of the signal line occurs during transmission.

(4) BREAK-LETTERS PUSH BUTTON

In a case of interrupted transmission at the secondary station where an inspection of the printed copy indicates that the printer was operating in lower case when interrupted, RESTARTING of transmission should be accomplished by the use of this button. It may also be used for interrupting traffic from other stations by opening the signal line.

(5) PROGRAM-MESSAGE BUTTON

The button designated PROGRAM MESSAGE is a two-position button which, in its INWARD POSITION, influences the ASID unit in that, when transmitting on a MANUAL basis, the PROGRAM ADDRESS will be transmitted from elements within the ASID unit prior to transmission of the message. In a like manner, the SHORT ADDRESS will be transmitted when the button is in its OUTWARD POSITION.

(6) FIGURES-RESTART PUSH BUTTON

This push button is used in the same manner as the BREAK-LETTERS push button referred to in Paragraph (4) for restarting purposes when an inspection of the printed copy indicates that the printer was operating in upper case at the time of interruption of transmission.

(7) SECO MOTOR SWITCH

The switch designated SECO MOTOR turns on and off the motor that drives the sequential-selector unit. When the equipment is conditioned for AUTOMATIC operation the sequential-selector motor starts automatically and stops

when the equipment reverts to the MANUAL basis.

(8) TRANSMITTER-DISTRIBUTOR MOTOR SWITCH

The switch designated TRANS-DIST MOTOR controls the starting and stopping of the driving motor for the transmitting unit and the turning ON and OFF of the rectifier.

(9) TAPE START SWITCH

The switch designated TAPE START serves the purpose of starting transmission of a message in the transmitting unit on a MANUAL basis.

(10) BUZZER SWITCH

The switch designated BUZZER serves the purpose of switching the alarm buzzer IN or OUT relative to the opening of the signal line.

(11) DC SWITCH

The switch designated DC serves the purpose of turning the DC power supply of the control unit ON or OFF.

SECTION V

MAINTENANCE

1. ADJUSTMENTS

a. GENERAL

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

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

(3) Before proceeding with any adjustment, read the applicable portion of the adjusting test 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.

NOTE

The 81093 set of tools plus the following special tools is sufficient for adjusting the SECO apparatus:

2	116779	Bending Tool
1	118530	.157" and .281" Gauge
1	118531	Spring Bender (W.E. 505A)
1	118532	Spring Bender (W.E. 507A)

b. SEQUENTIAL SELECTOR

(1) SELECTING A CODE BAR

When the instructions for making an adjustment specify the selection of a certain code bar, the following method should be followed: (Refer to Teletype code chart shown on Figure 81). Hold the armature against the magnet pole faces and rotate the main shaft counterclockwise, as viewed from the drive gear end, until the operating cam sleeve and the selector cam sleeve are in their stop position. Then release the armature and continue to rotate the main shaft until the locking lever (see Figure 25) is about to drop off the long high part of the locking cam. Hold or release the selector armature to move the selector arm extension to the operated (MARKING) or unoperated (SPACING) side in accordance with the first selecting impulse of the code combination to be set up. Refer to the code chart (Figure 81). Hold the selector arm extension in this position and again rotate the main shaft until the outer (No. 1) selector sword has been positioned and the locking lever is on the peak of the locking cam. Position the selector arm extension in accordance with the second impulse of the code combination to be set up and repeat the procedure followed in positioning the outer (No. 1) selector sword. Position all of the selector swords by following the foregoing procedure. When all swords have been positioned and the pawl-and-ratchet clutch has been engaged, further rotation of the main shaft will cause the unit to select the code bar which corresponds to the code combination set up on the holding magnet selector.

(2) TO MEASURE RECEIVING RANGE

(a) Mounted on the holding-magnet selector mounting plate at the left end of the main shaft of the unit is the range finder assembly which is used for the purpose of orienting the selector to the incoming signals. Transmit RY (the letters RY alternately) to the unit continually while the receiving range is being determined. The range may be determined as follows:

(b) Set the RY-test indicator so that its green portion appears. While RY is being received, loosen the index arm thumb screw (Figure 33) and shift the index arm of the

range finder toward 0 until an error (red) appears on the RY test indicator. Reset the indicator. Then move the arm back slowly until errors no longer appear. This position indicates one limit of the orientation range. Note the position of the index arm on the scale. Determine the opposite end of the receiving range by repeating the foregoing procedure with the index arm near the opposite end of the scale. After the two limits of the receiving range have been found, set the index arm of the range scale midway between these two points.

NOTE

If facilities for transmitting biased test signals to the receiving unit are available, the index arm should be set at the optimum setting for the reception of biased signals.

(3) SELECTOR SEPARATOR PLATE ADJUSTMENTS (Figure 20)

NOTE

The separator-plate leaf springs are adjusted during the initial assembly of the unit and should require attention only if the selector has been damaged or dismantled. If it is found necessary to check the adjustment, extreme care should be exercised in the removal and replacement of the selector lever springs to guard against distorting them. The subsequent selector adjustments will be facilitated if the swords and selector levers are replaced in the identical positions they formerly occupied.

The leaf springs should exert a light pressure against the swords. To adjust, bend the leaf springs at the narrow portions so that the ends of the springs are .050" to .060" below the under surface of the straight portions.

(4) MAIN SHAFT ADJUSTMENT

The selector cams on the selector cam sleeve should line up with their respective selector levers. Check by rotating the main shaft. To adjust, loosen the screw in the gear hub and the screw in the ratchet hub assembly and position the main shaft. Tighten the screws. See Figure 36.

(5) SELECTOR VANES ADJUSTMENT

(a) The selector vanes should have some end play, not more than .010". To adjust, position the vane guide brackets to provide the proper clearance. See Figure 21.

(b) With the main shaft in the stop position there should be a clearance of .055" to .065" between the No. 5 vane and the associated projection of the right and left vane lock levers at their closest points. See Figure 22. To adjust, add or remove shims between the main-bail operating bar and the operating-bar link brackets. See Figure 36.

(c) With the vanes in the SPACING position they should be approximately in the center of the blocking extensions on the letters code lever. See Figure 23. To adjust, position the left vane stop by means of its mounting screws. Make certain that the right vane stop and the operating-link bracket do not interfere with the adjustment. With the vanes in the spacing position and resting against the extensions on the left vane stop, position the right vane stop by means of its mounting screws so that its extensions just touch at least one of the vanes.

(6) SELECTOR-VANE OPERATING-LINKS TRAVEL ADJUSTMENT (Figure 24)

The selector vanes should have full travel between their stops. To adjust, position the selector-vane operating-link bracket by means of its mounting screws. Also provide some clearance between the top of the vanes and the top of the slot in the vane operating links.

(7) SELECTOR-VANE OPERATING LINK ADJUSTMENT (Figure 24)

The selector-vane operating links should be aligned with the selector transfer levers and should operate without binding. To adjust, loosen the front and rear selector-vane operating-link comb. Locate the front comb, so that the links are in line with the transfer levers and the comb teeth are parallel to the selector-vane operating links. Tighten the screws in the front comb. Locate the rear comb so as to eliminate any bind between the links and the combs. Tighten the screws in the rear comb.

NOTE

There should be some clearance, not more than .010", between the bottom of the bracket and the top surface

of the selector-vane operating links. (Check both front and rear.)

(8) THE HOLDING-MAGNET SELECTOR SHOULD MEET THE FOLLOWING REQUIREMENTS:

NOTE

Arrange the unit in a vertical position so that the selector mechanism is upward.

REMOVE THE RANGE-FINDER ASSEMBLY.

(9) ARMATURE PIVOT SCREW ADJUSTMENT (Figures 25 and 27)

With the armature spring and the selector arm spring unhocked, the armature should be free on its pivots with barely perceptible end play. Adjust by means of the upper pivot screw.

(10) SELECTOR MAGNET ADJUSTMENT (Figure 26)

When the armature is in its operated position, it should touch both magnet cores at approximately the centers of their pole faces. The cores should be centrally located with respect to the armature as gauged by eye when holding a light background behind the magnet and the armature assembly. To adjust, remove the selector-magnet bracket from the unit and reposition the magnet core assembly by means of its mounting screws while holding the assembly so that the cores are vertical. The armature should rest against the pole faces by its own weight. Replace the selector-magnet bracket.

(11) SELECTOR-ARM PIVOT SCREW ADJUSTMENT (Figures 27 and 28)

With the armature spring, the selector-arm spring, and selector-arm stop-detent spring unhooked, the selector arm should be free on its pivots with barely perceptible end play, and the locking lever should overtravel the top and bottom edges of the locking wedge. There should be a minimum clearance of .008" between the selector arm and the armature extension. There should also be a minimum clearance of .010" between the selector arm and the selector-arm stop detent when the play in the detent is taken up in a direction to make this clearance a minimum. The end play may be adjusted by means of the upper pivot screw. If the minimum clearance requirements are not met, it will be necessary to remove the selector-magnet bracket and the selector-arm bracket and adjust both pivot screws of the selector arm.

(12) SELECTOR-ARM BRACKET ADJUSTMENT (Figure 25)

(a) The selector-arm bracket should be positioned so as to provide some clearance, not more than .040", between each sword and either stop post, under the following conditions:

(b) Remove the locking-lever spring, the armature spring, and the selector-arm spring. Rotate the main shaft until the No. 1 selector lever is resting on the peak of its cam. With the selector arm in its SPACING position, move the spacing arm of the No. 1 sword against the selector-arm extension. Then rotate the selector arm slowly toward the MARKING position until it just leaves the spacing arm of the No. 1 sword. There should be some clearance, not more than .040", between the No. 1 sword and the spacing stop post.

(c) With the selector arm in its MARKING position, move the marking arm of the No. 1 sword against the selector-arm extension. Then rotate the selector arm slowly toward the spacing position until it just leaves the marking arm of the No. 1 sword. There should be some clearance, not more than .040", between the No. 1 sword and the marking stop post.

(d) With each selector lever on the peak of its cam, each associated sword should be tried for the foregoing requirement of some clearance, not more than .040". To adjust, loosen the selector-arm-bracket mounting screws just enough to make the bracket friction tight. Then, to equalize the clearance between the swords and the stop posts, loosen the centralizing eccentric-screw lock nut and turn the eccentric screw clockwise to provide more clearance on the SPACING side, or counterclockwise to provide more clearance on the MARKING side.

NOTE

Be sure that the selector-arm stop detent does not interfere with the adjustment.

(e) The centralizing eccentric screw should always be located so that its indicating line is adjacent to the marked scale which has been provided on the bracket to aid in gauging the amount the screw must be turned. Tighten the lock nut when the selector arm has been centralized. To obtain the "some clearance, not more than .040", requirement between the swords and the stop posts, insert the 90783 adjusting wrench in one of the two holes pro-

vided and turn the wrench to move the bracket closer to or farther from the swords as required. Then tighten the selector-arm bracket mounting screws. Replace the locking-lever spring and armature spring.

(13) LOCKING WEDGE ADJUSTMENT (Figure 29)

With the locking lever on any peak of its cam, the end of the locking wedge should clear the locking lever by .006" to .010" when the end of the wedge is held in line with the locking lever. To adjust, loosen the locking-wedge mounting screw and position the locking wedge in its guide; then tighten the mounting screw.

(14) LOCKING-LEVER SPRING TENSION (Figure 29)

With the locking lever on the high part of its cam, hook an 8 oz. scale on the end of the locking lever at the spring hole and pull in line with the spring. It should require from 4 to 5-1/2 ozs. to start the lever moving away from the cam.

(15) SELECTOR-ARM STOP DETENT ADJUSTMENT (Figure 28)

(a) With the selector-arm spring removed and the locking lever on the low part of its cam, there should be an equal amount of clearance, within .003", between the sides of the locking wedge and the locking lever when the selector arm is in the MARKING or SPACING position.

NOTE

When checking the MARKING position, be sure that the selector-arm operating screw does not interfere with the movement of the selector arm.

(b) To adjust, loosen the screw that mounts the selector-arm stop-detent eccentric post just enough to make the post friction tight. Position the stop detent by turning the post; then tighten the post mounting screw.

REPLACE THE SELECTOR-ARM SPRING

(16) SELECTOR-ARM STOP-DETENT SPRING TENSION (Figure 28)

Unhook the stop-detent spring from the locking lever guide and hook an 8 oz. scale in the spring eye. It should require 4 to 5 ozs. to pull the spring to its position length. Rehook the spring.

(17) SELECTOR-LEVER SPRING TENSION (Figure 29)

With the transfer levers in the MARKING position and the main bail in its highest position, move the swords manually to the SPACING position. Hook a 32 oz. scale to the end of each selector lever at the selector cam sleeve and pull radially to the selecting shaft. It should require 6 to 10 ozs. to start each selector lever moving.

NOTE

Before checking the tension of the selector-lever springs, make sure the selector levers are free and without bind.

(18) SELECTOR-MAGNET-BRACKET POSITION ADJUSTMENT (Figure 30)

From the normal STOP position of the selector cam sleeve, rotate the sleeve until the locking lever just drops off the high part of its cam; then rotate the sleeve backward until the rotation is stopped by the locking lever. There should be a clearance of .060" to .065" between the armature extension and the face of a tooth on the armature cam. To adjust, loosen the selector-magnet-bracket mounting screws and the selector-magnet-bracket adjusting-arm mounting screws just enough to make the bracket and adjusting arm friction tight. Then position the selector-magnet bracket by means of the adjusting arm. Use the 90783 adjusting wrench. To do this, insert the adjusting wrench in the hole above the end of the adjusting arm and rotate the wrench. Tighten the bracket and adjusting-arm mounting screws.

NOTE

When checking this requirement, the armature lever should be held approximately .045" from the bottom of the notch of its cam.

(19) SELECTOR-MAGNET BRACKET ADJUSTMENT (Figure 26)

NOTE

When making this adjustment, the selector arm should be kept in the MARKING position.

(a) With the selector magnet energized, the clearance between the selector-arm operating screw and the selector arm should be .004" to .006" greater when the armature extension

is on a peak of its cam than when the armature extension is opposite an indent on the cam.

1. To adjust, de-energize the magnet and rotate the selector cam sleeve until the armature extension is resting on a peak of the armature cam. While holding the cam sleeve in this position, turn the main shaft to a point where it moves the armature lever the greatest distance.

2. With the selector magnet still de-energized, loosen the selector-magnet-bracket mounting screws, the adjusting-screw lock nut, and, by means of its adjusting screw, rotate the selector-magnet bracket so that the armature just touches the pole-faces; then turn the adjusting screw an additional one-tenth of a turn counterclockwise. This will press the armature firmly against the magnet cores. (While making the one-tenth of a turn adjustment, be careful to avoid lost motion by taking up the slack in the adjusting screw).

3. With the selector magnet energized, measure the clearance between the selector-arm operating screw and the selector arm, and, if there is no clearance, back off the selector-arm operating screw to provide at least .006" clearance. Then rotate the selector cam sleeve so that the armature lever is opposite an indent of its cam and again measure the clearance between the selector-arm operating screw and the selector arm. If the difference in the two clearances exceeds .006", the selector-magnet-bracket adjusting screw should be turned clockwise. If the difference in the clearance is less than .004", turn the screw counterclockwise. Tighten the selector-magnet-bracket mounting screws and adjusting-screw lock nut.

(20) ARMATURE SPRING TENSION ADJUSTMENT (Figure 26)

(a) Unhook the armature spring from its spring arm and rotate the main shaft until the armature extension is on the high part of the armature cam. With a 32 oz. scale hooked in its spring eye, pull the spring to its position length. It should require the following spring tensions:

1. If a distortion test set is available, the spring tension should be set at the optimum value within the limits of 13 to 24 ozs. when range is being checked.

2. If no distortion test set is available, the spring tension should be 17 to 19 ozs., except when the coils are connected in parallel without a 1000 ohm shunt. Under this latter condition the tension should be 13 to 15 ozs.

To adjust, loosen the spring-arm mounting nut and position the spring arm. Then tighten the mounting nut. Recheck the armature spring tension.

(21) SELECTOR-ARM OPERATING SCREW ADJUSTMENT (Figure 31)

With the selector magnet energized and the selector cam sleeve rotated so that the selector arm is in the MARKING position and the armature extension is opposite an indent of its cam, there should be a clearance of .003" to .006" between the selector-arm operating screw and the selector arm. To adjust, loosen the selector-arm operating-screw lock nut and position the screw; then tighten the lock nut.

NOTE

The 1000 ohm resistor may be connected across the selector-magnet coils when it is desirable to reduce the negative internal bias.

(22) SELECTOR-ARM SPRING TENSION (Figure 32)

Unhook the selector-arm stop-detent spring. With the armature extension on a high part of its cam and the locking lever held away from the locking wedge, hook an 8 oz. scale over the end of the locking wedge and pull parallel to the selector-arm spring. It should require 1-1/4 to 1-3/4 ozs. to start the selector arm moving. Replace the detent spring.

(23) STOP-LEVER ECCENTRIC SCREW ADJUSTMENT (Figure 33)

The stop lever on the range-finder assembly should overtravel the latching face of the trip latch by not more than .006". To adjust, loosen the nut on the stop-lever eccentric screw and position the screw. Tighten the nut and make certain that the tightening of the nut does not disturb the adjustment.

(24) TRIP-LATCH SPRING COMPRESSION (Figure 33)

NOTE

When measuring this requirement, the range-finder assembly should be held in a horizontal position. Apply the push end of an 8 oz. scale, held in a vertical posi-

tion, to the trip latch as near the stop lever as possible. It should require 1 to 1-1/2 ozs., when pushing upward, to start the trip latch moving.

(25) STOP-LEVER SPRING TENSION (Figure 33)

NOTE

Be sure that the stop-lever eccentric has been adjusted before checking this requirement.

With the trip-latch plunger held operated, hook an 8 oz. scale on the end of the stop lever of the range-finder assembly and pull horizontally at a right angle to the stop lever. It should require 3/4 to 1-1/4 ozs. to start the lever moving. REPLACE THE RANGE-FINDER ASSEMBLY. IN REPLACING THE RANGE FINDER, AVOID JAMMING THE TRIP-LATCH PLUNGER AGAINST THE ARMATURE SCREW.

(26) TRIP-OFF SCREW ADJUSTMENT (Figure 35)

(a) There should be some clearance, not more than .002", between the stop lever and the trip latch when the armature is in the unoperated position and the selector cam sleeve is rotated until the stopping edge of the stop lever is directly below the latching surface of the trip latch.

(b) The trip-latch plunger should have at least .002" end play when the armature is held in the attracted position and the stop lever is against its eccentric stud. See Figure 33. To adjust, loosen the trip-off-screw lock nut and position the screw to meet the first requirement. The latter requirement serves as a check on the trip-off screw adjustment and also on the adjustment of the selector-magnet bracket.

END OF HOLDING MAGNET SELECTOR ADJUSTMENTS

PLACE THE UNIT BACK IN ITS NORMAL POSITION.

(27) OPERATING ECCENTRIC ASSEMBLY ADJUSTMENT (Figure 36)

The function eccentric assembly on the main shaft should have some end play, not more than .006". To adjust, position the ratchet hub assembly by means of its mounting screw. Tighten the ratchet-hub assembly mounting screw. Remove the blocking and latching lever assembly.

(28) MAIN-BAIL OPERATING BAR ADJUSTMENT (Figure 36)

There should be some end play, not more than .006", on the main-bail operating bar. Adjust by means of the pilot screws.

(29) STRIPPER-BAIL OPERATING BAR ADJUSTMENT

There should be some end play, not more than .006", on the stripper-bail operating bar. Adjust by means of the pilot screws.

(30) STRIPPER BAIL ADJUSTMENTS

(a) The stripper bail assembly should be centered on its pilot screws with some end play, not more than .010". Adjust by means of the pilot screws.

(b) Rotate the high part of each reset eccentric (Figure 38) to a position where they will not interfere with adjustments. Rotate the eccentric shoulder screws so that the high part of the eccentric is downward. Remove the stripper-bail spring. With the LETTERS combination selected and the stripper bail latched in the upper notch of the latch bail (Figure 38), rotate the main shaft until the extension "U" of the right-hand function lever is at its closest point to the latch bail. There should be from .050" to .055") clearance between the extension and the latch bail. To adjust, loosen the right-hand nut on the latch-bail shaft and position the shaft. Loosen the left-hand nut and position the shaft so that the upper notches of both latches are resting against the bottom of the stripper-bail extensions. Tighten the nuts and replace the stripper-bail spring.

(31) BLOCKING-LEVER SPRING TENSION (Figure 37)

It should require 1 to 2-1/2 ozs. to start the blocking lever moving when an 8 oz. scale is hooked to it just above the comb and pulled parallel to the spring.

NOTE

Where bridge nuts are used, remove the nuts before taking the spring tension.

(32) LATCH-BAIL SPRING TENSION

With the stripper bail in its forward position latched, and held away from the latch bail, hook an 8 oz. scale over the right latch-bail spring post and pull in line with the spring. It should require 3/4 to 1-1/4 ozs. to start the latch bail moving. Check the left latch-bail spring in the same manner. See Figure 38 for location of parts.

(33) STRIPPER-BAIL SPRING TENSION

With the stripper bail in its forward position and the latch bail held away, hook a 32 oz. scale over the right stripper-bail spring post and pull in line with the spring. It should require 11 to 13 ozs. to start the stripper bail moving. Check the left stripper-bail spring in the same manner. See Figure 38 for location of parts.

(34) BLOCKING AND LATCHING LEVER SHAFTS ADJUSTMENT (Figure 39)

With both combs mounted to the blocking and latching lever mounting plate, the shafts should be parallel to each other within .010". To adjust, loosen the mounting screws which mount the latching-lever shaft brackets. Place a .157" gauge at the right end between the shaft and the upper comb and tighten the right end mounting screw. Adjust the left end in the same manner. Position the middle brackets until the shaft is free and tighten the mounting screws. To adjust the blocking-lever shaft, proceed in the same manner using a .281" gauge between the shaft and the bottom comb.

INSTALL THE BLOCKING AND LATCHING LEVER ASSEMBLY

(35) BLOCKING AND LATCHING LEVER ASSEMBLY ADJUSTMENTS

(a) Position the two eccentrics on the mounting plate so that the high part of each eccentric is toward the left of the unit.

(b) Position the stripper-bail eccentric screws, to meet the following requirements:

1. With the stripper bail latched and in its forward position, the RY latch lever should overtravel the first notch of the RY latch some, not more than .010", at the closest point. See Figure 40.

2. There should be .010" to .020" clearance between the forwardmost latch lever and the bottom of its slot in the lower comb. See Figure 39.

Remove the blocking and latching lever assembly.

3. Recheck the .050" to .055" clearance under "STRIPPER BAIL ADJUSTMENT."

(36) RESET ECCENTRIC ADJUSTMENT (Figure 38)

With the stripper bail in its rearmost position, the stripper-bail extension should overtravel the notch on the latch bail some, not more than .010". To adjust, position the left reset eccentric to meet this requirement; then position the right reset eccentric so that it just touches the bail.

REPLACE THE BLOCKING AND LATCHING LEVER ASSEMBLY

(37) BLOCKING-LEVER ASSEMBLY ADJUSTMENT (Figure 37)

(a) With the BLANK combination set up, there should be some clearance, not more than .015" between the bottom front end of a function lever and the top of its blocking lever when the code levers are resting on the vanes. To adjust, move the blocking-lever-assembly mounting plate up or down by means of the eccentrics on which they are supported.

(b) The sides of the blocking levers should be as close as possible to their associated code levers without exerting any pressure on them. To adjust, place the code levers in the stop position. Loosen the two screws which mount the blocking and latching lever mounting plate. Position the plate so that the latching levers are riding on the latching extensions of the operating levers, and so that the blocking levers and function levers are approximately in line with each other. Tighten the plate mounting screws friction tight. If necessary, back off the positioning screw, located in the left side frame at the end of the mounting plate. Move the plate laterally until there is some clearance between each blocking lever and its associated code lever, but not more than .004" between the closest pair of levers. Screw the positioning screw in until it just touches the plate and tighten the lock nut. While holding the mounting plate against the positioning screw, tighten the two plate mounting screws.

(38) FRONT CODE-LEVER COMB ADJUSTMENT (See Figure 37)

The code-lever comb should be positioned so as to prevent any bind on the code or function levers when they are lifted from their slots.

To adjust, position the comb by means of its mounting screws.

(39) PULL-LEVER SPRING TENSION (Figure 37)

With the function levers in their extreme upper position and the pull bars against the function-lever extension (not latched), it should require from 1/2 to 1-1/2 ozs. to start each pull lever moving when the push end of an 8 oz. scale is applied horizontally to the lever at the spring lug.

(40) CONTACT OPERATING-LEVER SPRING TENSION (Figure 37)

With the unit resting on its rear side, apply a 32 oz. pull scale to the end of each operating lever and pull horizontally to the left (viewed from the range finder end). It should require from 6 to 8-1/2 ozs. to start each operating lever moving. If a contact is associated with the operating lever, hold the contact spring off while checking this spring tension.

(41) FUNCTION-LEVER SPRING TENSION (Figure 37)

With the stripper bail in its rearmost position and the main bail in its uppermost position, it should require from 1 to 2 ozs. to start each code lever moving when an 8 oz. scale is hooked under each code lever in front of the code-lever comb and pulled vertically upward.

(42) FUNCTION-LEVER (WITH EXTENSION "U") SPRING TENSION (Figure 37) See Figure 38.

With the stripper bail in its rearmost position and the main bail in its uppermost position, it should require from 9 to 12 ozs. to start each function lever moving when a 32 oz. scale is hooked under the function lever in front of the front function-lever comb and pulled vertically upward.

(43) VANE LOCKING-LEVER SPRING TENSION (Figure 22)

With the main bail in its uppermost position, it should require from 1 to 2 ozs. to start each locking lever moving.

(44) DRIVE-PAWL SPRING TENSION (Figure 41)

With the unit resting on its front side, rotate the main shaft until the drive pawl and check pawl are in a vertical position. Rotate the shaft backward slightly to disengage the pawls from the ratchet teeth. With an 8 oz. scale hooked to the drive pawl at the spring hole and pulled in line with the spring, it should require from 1-1/2 to 2-1/2 ozs. to start the pawl moving. The check pawl should be held away from the pin in the drive pawl when checking this spring tension.

(45) BLOCKING-PAWL SPRING TENSION (Figure 41)

With conditions set up as outlined under DRIVE-PAWL SPRING TENSION above, it should require 1-1/2 to 2-1/2 ozs. to start the check pawl moving when an 8 oz. scale is hooked to the check pawl at the spring hole and pulled in line with the spring.

(46) BLOCKING-PAWL BACKSTOP ADJUSTMENT (Figure 41)

With the blocking pawl resting on the point of a ratchet tooth, there should be some clearance, not more than .030", between the back of the pawl and the backstop. To adjust, loosen the pawl mounting screw nut and position the backstop. Tighten the nut.

(47) DETENT-LEVER ECCENTRIC ADJUSTMENT (Figure 42)

With the operating cam sleeve held fully in its stop position, there should be some clearance, not more than .006", between the end of the detent lever and the shoulder in the notch of the sleeve (Figure 42). There should also be some end play between the end of the clutch drive pawl and the bottom of the guide slot on the drive arm (Figure 41). To adjust, rotate the detent-lever eccentric (Figure 42).

(48) DETENT-LEVER SPRING TENSION (Figure 42)

With the detent lever on the high part of the sleeve it should require from 1-1/2 to 2-1/2 ozs. to start the detent lever moving when an 8 oz. scale is applied to the lever at the cam end and pulled at right angle to the lever.

(49) MAIN-SHAFT CLUTCH BLOCKING LEVER ADJUSTMENT (Figure 41)

(a) The clutch trip lever (Figure 43) should be centered on its cam. There should be some end play, not more than .006", in the blocking-lever shaft. Adjust by means of the pilot screws.

(b) There should be some clearance,

not more than .010" between the clutch blocking lever and the tip of the clutch drive pawl when the clutch trip lever is on the peak of its cam. To check this clearance, it will be necessary to hold the selector cam sleeve stationary and rotate the main shaft. To adjust, position the clutch blocking lever by means of its enlarged mounting holes. Make certain that the clutch drive pawl is fully in line with the blocking surface of the blocking lever.

(c) There should be some clearance, not more than .010", between the clutch blocking lever and the closest point on any part of the clutch assembly. Check through one complete revolution of the cam sleeve assembly. To adjust, reposition the eccentric backstop. Recheck CHECK-PAWL BACKSTOP ADJUSTMENT.

NOTE

When the magnet armature is held operated and the main shaft rotated to the stop position, the clutch blocking lever should engage the clutch drive pawl by at least .020". If necessary, refine the adjustments obtained by rotating the eccentric backstop screw.

(50) CLUTCH TRIP-LEVER SPRING TENSION (Figure 43)

With an 8 oz. scale inserted between No. 3 and No. 4 vanes and hooked to the clutch trip lever at the spring hole, pull at right angle to the lever. It should require from 3 to 4-1/2 ozs. to start the lever moving.

(51) SELECTOR CLUTCH TORQUE (Figure 45)

The clutch torque should be measured after the motor has been running at least ten minutes with the cam sleeve stationary. Hook a 32 oz. scale to the selector cam-sleeve stop arm and pull at right angle to the stop arm. It should require 14 to 18 ozs. to hold the selector cam sleeve stationary while the shaft is turning.

(52) SELECTOR CONTACT CHECK (See Figure 44)

NOTE

The parts of the contact assemblies used on the sequential selector are designed so as to require no adjustment after they are assembled. If, however, the springs should become distorted they may be restored to their normal condition by bending them to meet the following requirements:

(a) Each portion of the bifurcated short springs should have a tension of 1 to 2-1/4 ozs. against its associated backstop. Check with an 8 oz. scale hooked as close as possible to the contact point of the short contact spring and pull horizontally at right angle to the backstop. The contact swinger (middle spring) should be held clear when checking the upper spring.

(b) It should require from 2 to 3-1/2 ozs. to just separate the contacts of the swinger from the contacts of the upper spring. Check by hooking an 8 oz. scale to the swinger at the contact point and pulling horizontally with the unit resting on its back.

(c) There should be a minimum clearance of .015" between the contacts of the swinger and the contacts of the lower springs.

(53) CONTACT BAR ADJUSTMENT (Figure 44)

(a) With the contact operating lever in its unlatched position there should be some clearance, not more than .010", between the lower bifurcated contact springs and their associated backstops measured at the end of the backstop. To adjust, loosen the screws which mount the mounting-bar brackets to the side frame and rotate the contact mounting bar to obtain the clearance. Tighten the screws.

(b) The bakelite insulator of each contact spring should be centered under its respective plunger. To adjust, loosen the screws which mount the contact mounting bar to its brackets, position the bar assembly, and tighten the mounting screws.

(54) SELECTOR PANEL ADJUSTMENTS

(a) MOTOR POSITION ADJUSTMENT

There should be a barely perceptible amount of backlash between the motor pinion and the highest point on the counter-shaft gear. Check the backlash throughout a complete revolution of the larger gear. To adjust, tighten the motor mounting screws with the motor base approximately parallel to the edges of the motor mounting plate. Position the motor pinion by means of the motor mounting plate.

(b) DISTRIBUTOR-UNIT POSITION ADJUSTMENT

There should be a barely perceptible amount

of backlash between the distributor-shaft gear and the highest point on the counter-shaft gear. Check the backlash throughout a complete revolution of the larger gear. To adjust, position the unit by means of its eccentrics.

(c) SELECTOR-PANEL SLIDE LATCH ADJUSTMENT (Figure 46)

The rail latch should be adjusted, by means of its eccentric bushing, so that, when the rail is latched in position, there is no end play between the rail support and the rail stop.

c. PRIMARY CONTROL-UNIT RELAY ADJUSTMENTS (For operating current value of control unit relays see page 5-14)

(1) CONTACT SPRINGS AND ARMATURE HINGE POSITIONS

(a) The contact springs and hinge brackets should be positioned to meet the following requirements:

1. The contacts on all relays shall line up within the limits illustrated in Figure 47.

2. The spring tangs should rest on the spool head so that the free end of the tang extends back of the front face of the spool head (Figure 48).

3. The width of each spring tang should line entirely within the projection of the top and bottom edges of the slot in the spool head but the tang should not rub on the spool head when moved from its normal position of rest on the spool head in the direction of travel of the spring (Figure 48).

4. The hinge pins should not bind in the holes of the hinge brackets (Figure 49).

5. Springs which do not rest against the spool head should have a clearance of at least .010" between the edge of the spring and the spool head.

6. The spring studs should not rub or touch the sides of the holes in the springs through which they pass during operation of the relays.

(b) To adjust, slightly loosen the contact spring mounting screws and position the springs and hinge brackets. Tighten the mounting screws.

(2) ADJUSTING STUD CLEARANCE (Figure 49)

There should be some clearance between the armature and adjusting stud over the entire armature travel. If necessary to adjust, bend the stud with a pair of long nose pliers.

(3) ADJUSTING NUT TIGHTNESS (Figure 49)

The adjusting nut should be sufficiently tight on the stud to prevent its being readily turned with the thumb and forefinger. To adjust, back off the adjusting nut from the adjusting stud until its slotted portion is free of the stud, then press slotted parts of the nut closer together, using a pair of long nose pliers.

NOTE

For the following relay adjustments refer to Paragraph 1c(6) below and Figures 47 to 56. Apply the spring tension requirement and armature travel as indicated in these figures. The contact springs are designated by letters, each spring having the same letter is adjusted to meet the requirement specified for that spring regardless of the contact arrangement.

(4) ARMATURE TRAVEL ADJUSTMENT

(a) On "U" type relays there should be a clearance between the armature anti-freeze buttons and the core equal to the value of armature travel given in the chart below. To adjust, turn the adjusting nut.

(b) On "Y" type relays there should be a clearance between the armature and the core equal to the value of armature travel given in the chart below. To adjust, turn the adjusting nut.

(5) CONTACT SPRING TENSION (Figures 50 to 56)

The springs should be tensioned toward the armature. All spring tensions are measured with the armature in the unoperated position except where the abbreviation "Arm. Opr." is shown associated with an arrow mark leading to a spring. On these springs the tension is measured with the armature held operated.

(a) "A" CONTACT SPRING TENSION

There is no definite tension requirement for individual "A" springs; however, together with any "D" springs that may also be tensioned

against the armature, it should require a pressure of 20 to 45 grams (applied to the center of the armature approximately 1/8 inch below the adjusting nut) to start the armature moving away from the adjusting nut.

(b) "B" CONTACT SPRING TENSION

Each "B" contact spring should be tensioned toward the armature and together with any "D" springs which may in turn be tensioned against it, shall require a pressure of 20 to 40 grams (applied to both prongs at the tip of the spring) to start its contacts moving away from its associated "C", break, contacts. To adjust, bend the "B" contact spring.

(c) "C" CONTACT SPRING TENSION

The "C" contact springs should be tensioned toward the armature so that it requires a pressure of at least 30 grams (applied to the end of the spring above the contacts) to start the tang of each spring moving away from the side of the slot in the spool head next to the armature. To adjust, bend "C" contact spring.

NOTE

Some of these springs are measured with the armature in the operated position.

(d) "D" CONTACT SPRING TENSION

The "D" contact spring should be tensioned toward the armature so that it requires a pressure of 5 to 15 grams (applied to both prongs at the tip of the spring) to start the spring moving away from its resting place. To adjust, bend the "D" contact spring.

(e) "E" CONTACT SPRING TENSION

The "E" contact spring should be tensioned towards the armature so that it requires a pressure of 30 to 50 grams (applied to both prongs at the tip of the spring) to start its contacts moving away from its associated "C", break, contact. To adjust, bend the "C" contact spring.

(f) "F" BUFFER SPRING TENSION

The "F" buffer spring should be tensioned toward the armature so that it requires a pressure of 25 to 100 grams (applied at the tip of the spring) to start the spring tang moving away from its stop. To adjust, bend "F" buffer spring.

(6) STUD GAP ADJUSTMENT (Figures 50 to 56)

(a) "S" STUD GAP ADJUSTMENT

With the armature unoperated, there should be some clearance between the end of the armature operated stud and the "B" or "D" spring. To adjust, bend the associated "C", break contact spring tang and recheck its spring pressure. Recheck the "B" or "E" contact spring pressure.

(b) "T" STUD GAP ADJUSTMENT

With the armature unoperated, there should be at least .006" clearance between the end of the armature operated stud and the "B" spring. To adjust, bend the associated "C", break, contact spring tang and recheck its spring pressure. Recheck the "B" contact spring pressure.

(7) CONTACT SEQUENCE

On break-make contacts of the spring combinations, the normally-closed contacts shall break before the normally-open contacts make. Gauge by eye. To adjust, modify the spring tensions and stud gaps adjustments within their limits.

(8) CONTACT MAKE ADJUSTMENTS

(a) "B" CONTACT MAKE ADJUSTMENT

(9) ARMATURE TRAVEL AND MARKINGS CHART

Part No.	Type	Marking	Armature Travel	Figure
115326	U	A, B, B1, B2, B3, B4, B5, C, C1, C2, C3, C4, C5, D	.044 to .050	50
115335	U	E1, E2	.050 to .056	51
115328	U	P3	.032 to .038	52
115329	U	P5	.053 to .059	53
115354	U	P6	.044 to .050	54
115331	Y	P1, P2	.044 to .050	55
115332	Y	P4	.056 to .062	56

Both contacts of the "B" bifurcated springs should make with their associated "C" break, contact springs when the armature is in the unoperated position; they should also make contact with their associated "C", make, contact springs when the armature is operated. To adjust, bend the ends of the springs, (obtain by bending only the ends of the "B" springs if possible). Recheck the spring tensions and stud gaps.

(b) "A" AND "D" CONTACT MAKE ADJUSTMENT

Both contacts of the "A" and "D" contact springs should make with their associated "C" contact springs when the armature is in the operated position. To adjust, bend the bifurcated spring ends and recheck the spring pressure.

(c) "E" CONTACT MAKE ADJUSTMENT

Both contacts of the "E" spring should make with the "C" spring when the armature is in the unoperated position and both contacts of the "D" spring should make with the "E" spring when the armature is in the operated position. To adjust, bend the ends of the springs (obtain by bending only the ends of the "E" springs if possible). Recheck the spring pressures.

(10) CONTACT TIMING ADJUSTMENT

(a) "A", "B" AND "D" CONTACT TIMING ADJUSTMENT

Each of these relays shall meet the following requirements:

1. With the relay electrically energized against a .016" thickness gauge none of the contacts shall make with a mating contact on the associated "C", make, contact spring.

2. With the relay electrically energized against a .009" thickness gauge at least one of the contacts on each spring shall make with its mating contact on the associated "C", make, contact spring.

3. To adjust, bend the tang on the associated "C" contact springs and recheck their pressure.

(b) "E" CONTACT TIMING ADJUSTMENT

When the relay is electrically energized against a .005" thickness gauge both break contacts shall be separated from their mating contacts on the "C" springs. To adjust, bend the tang on the associated "C", bre k, contact spring and recheck spring pressure.

(11) ELECTRONIC TIMER (RELAY P7) ADJUSTMENTS

(a) ARMATURE YOKE ADJUSTMENTS (Figure 80A)

There should be from .002" to .004" clearance between the inner surface of the armature and the heel piece when the armature is against the magnet core. To check, back off the residual screw so that it does not touch the magnet core. To adjust, loosen the armature-yoke mounting screw and position the yoke. Tighten the mounting screw.

(b) RESIDUAL SCREW ADJUSTMENT (Figure 80B)

There should be from .002" to .003" clearance between the armature and the magnet core when the armature is held operated. To adjust, position the residual screw. Tighten the lock nut.

(c) RELAY CONTACT ADJUSTMENTS (Figure 80C)

1. The inner contact spring should be parallel to the heel piece, and the contact points should be evenly aligned. To adjust, loosen the contact pile-up mounting screws and position the contact springs. Tighten the contact mounting screws.

2. When an 8 oz. scale is hooked over the upper end of the middle contact spring and pulled horizontally at right angle to the spring, it should require 1/2 to 3/4 ozs. to start the middle contact spring moving. To adjust, bend the middle contact spring. When making the check, hold the armature arm so that it does not rest against the contact spring.

3. There should be .015" to .020" clearance between the outer and middle contact points. To adjust, bend the outer contact spring.

(d) ARMATURE-ARM BACKSTOP ADJUSTMENT (Figure 80C)

The armature arm should have a slight amount of play, not more than .010", between the backstop and the inner contact spring. To adjust, bend the armature-arm backstop.

d. SECONDARY CONTROL UNIT RELAY ADJUSTMENTS

(1) CONTACT SPRINGS AND ARMATURE HINGE POSITIONS
(For operating current value of control unit relays see page 5-14.)

(a) The contact springs and hinge brackets should be positioned to meet the following requirements:

1. The contacts on all relays shall line up within the limits illustrated in Figure 47.

2. The spring tangs should rest on the spool head so that the free end of the tang extends back of the front face of the spool head (Figure 48).

3. The width of each spring tang should lie entirely within the projection of the top and bottom edges of the slot in the spool head but the tang should not rub on the spool head when moved from its normal position of rest on the spool head in the direction of travel of the spring. (Figure 48).

4. The hinge pins should not bind in the holes of the hinge brackets (Figure 49).

5. Springs which do not rest against the spool head should have a clearance of at least .010" between the edge of the spring and the spool head.

6. The spring studs should not rub or touch the sides of the holes in the springs through which they pass during operation of the relays.

(b) To adjust, slightly loosen the contact spring mounting screws and position the springs and hinge brackets. Tighten the mounting screws.

(2) ADJUSTING STUD CLEARANCE (Figure 49)

There should be some clearance between the armature and adjusting stud over the entire armature travel. If necessary to adjust, bend the stud with a pair of long nose pliers.

(3) ADJUSTING NUT TIGHTNESS (Figure 49)

(a) The adjusting nut should be sufficiently tight on the stud to prevent its being readily turned with the thumb and forefinger. To adjust, back off the adjusting nut from the adjusting stud until its slotted portion is free of the stud, then press slotted parts of the nut closer together, using a pair of long nose pliers.

NOTE

For the following relay adjustments refer to Paragraph 1d(6) below and Figures 54, 55, 57 and 58. Apply the spring tension requirement and armature travel as indicated in these figures. The contact springs are designated by letters, each spring having the same letter is adjusted to meet the requirement specified for that spring regardless of the contact arrangement.

(4) ARMATURE TRAVEL ADJUSTMENT

(a) On "U" type relays there should be a clearance between the armature anti-freeze buttons and the core equal to the value of armature travel given in the chart below. To adjust, turn the adjusting nut.

(b) On "Y" type relays there should be a clearance between the armature and the core equal to the value of armature travel given in the chart below. To adjust, turn the adjusting nut.

(5) CONTACT SPRING TENSION (Figures 54, 55, 57 and 58)

(a) The springs should be tensioned toward the armature. All spring tensions are measured with the armature in the unoperated position except where the abbreviation "Arm Opr." is shown associated with an arrow mark leading to a spring, on these springs the tension is measured with the armature held operated.

1. "A" CONTACT SPRING TENSION

There is no definite tension requirement for

(6) ARMATURE TRAVEL AND MARKING CHART

Part No.	Type	Marking	Armature Travel	Figure
115352	U	S-5	.044 to .050	57
115353	U	S-1, S-3	.047 to .053	58
115354	U	S-4	.044 to .050	54
115331	Y	S-2, S-6	.044 to .050	55

individual "A" springs; however, together with any "D" springs that may also be tensioned against the armature, it should require a pressure of 20 to 45 grams (applied to the center of the armature approximately 1/8 inch below the adjusting nut) to start the armature moving away from the adjusting nut.

2. "B" CONTACT SPRING TENSION

Each "B" contact spring should be tensioned toward the armature and together with any "D" springs which may in turn be tensioned against it, shall require a pressure of 20 to 40 grams (applied to both prongs at the tip of the spring) to start its contacts moving away from its associated "C", break, contacts. To adjust, bend the "B" contact spring.

3. "C" CONTACT SPRING TENSION

The "C" contact springs should be tensioned toward the armature so that it requires a pressure of at least 30 grams (applied to the end of the spring above the contacts) to start the tang of each spring moving away from the side of the slot in the spool head next to the armature. To adjust, bend "C" contact spring.

NOTE

Some of these springs are measured with the armature in the operated position.

4. "D" CONTACT SPRING TENSION

The "D" contact spring should be tensioned toward the armature so that it requires a pressure of 5 to 15 grams (applied to both prongs at the tip of the spring) to start the spring moving away from its resting place. To adjust, bend the "D" contact spring.

5. "F" BUFFER SPRING TENSION

The "F" buffer spring should be tensioned toward the armature so that it requires a pressure of 25 to 100 grams (applied at the tip of the spring) to start the spring tang moving away from its stop. To adjust, bend "F" buffer spring.

(7) STUD GAP ADJUSTMENT (Figures 54, 55, 57 AND 58)

(a) "S" STUD GAP ADJUSTMENT

With the armature unoperated, there should be some clearance between the end of the armature operated stud and the "B" or "D" spring. To adjust, bend the associated "C", spring pressure. Recheck the "B" or "E" contact spring pressure.

(b) "T" STUD GAP ADJUSTMENT

With the armature unoperated, there should be at least .006" clearance between the end of the armature operated stud and the "B" spring. To adjust, bend the associated "C", break, contact spring tang and recheck its spring pressure. Recheck the "B" contact spring pressure.

(8) CONTACT SEQUENCE

On break-make contacts of the spring combinations, the normally-closed contacts shall break before the normally-open contacts make. Gauge by eye. To adjust, modify the spring tensions and stud gap adjustments within their limits.

(9) CONTACT MAKE ADJUSTMENTS

(a) "B" CONTACT MAKE ADJUSTMENT

Both contacts of the "B" bifurcated springs should make with their associated "C", break, contact springs when the armature is in the unoperated position; they should also make contact with their associated "C", make, contact springs when the armature is operated. To adjust, bend the ends of the spring, (obtain by bending only the ends of the "B" springs if possible). Recheck the spring tensions and stud gaps.

(b) "A" AND "D" CONTACT MAKE ADJUSTMENT

Both contacts of the "A" and "D" contact springs should make with their associated "C" contact springs when the armature is in the operated position. To adjust, bend the bifurcated spring ends and recheck the spring pressure.

(10) CONTACT TIMING ADJUSTMENT

(a) "A", "B" AND "D" CONTACT TIMING ADJUSTMENT

Each of these relays shall meet the following requirements:

1. With the relay electrically energized against a .016" thickness gauge none of the contacts shall make with a mating contact on the associated "C", make contact spring.

2. With the relay electrically ener-

OPERATING CURRENT VALUES FOR CONTROL UNIT RELAYS

Teletype Part No.	Western Electric D Spec. No.	Type	Rated D.C. Operating Voltage	Coil D.C. Rated Resistance	Rated Operating Current	Measured D.C. Operating Voltage	Measured D.C. Coil Resistance	Minimum Operating Current	Maximum Release Current
115326	D55228	U	115	2500 ohms	.046 amp.	122	2580 ohms	.007 amp.	.004 amp.
115328	D142436	U	115	2500 ohms	.046 amp.	122	2563 ohms	.006 amp.	.002 amp.
115329	D142437	U	115	2500 ohms	.046 amp.	122	2600 ohms	.010 amp.	.003 amp.
115331	D55226	Y	115	*2000 ohms	*.058 amp.	122	2063 ohms	.009 amp.	.002 amp.
115332	D142438	Y	115	2000 ohms	.058 amp.	122	2033 ohms	.020 amp.	.002 amp.
115335	D142462	U	115	2500 ohms	.046 amp.	122	2540 ohms	.007 amp.	.002 amp.
115352	D55225	U	115	2500 ohms	.046 amp.	120	2516 ohms	.007 amp.	.002 amp.
115353	D55223	U	115	2500 ohms	.046 amp.	120	2578 ohms	.010 amp.	.003 amp.
115354	D55224	U	115	2500 ohms	.046 amp.	120	2509 ohms	.007 amp.	.004 amp.

* This relay may be operated with 400 ohms in series with the coil. Rated current is then .048 amp.

ELECTRONIC TIMER INCLUDING RELAY P7

Teletype Part No.	General Electric Spec.No.	Type	Rated A.C. Operating Voltage	Measured D.C. Operating *Voltage	Measured D.C. Coil *Resistance	Minimum Operating *Current	Maximum Release *Current
115333	GEH 1033B	CR 7504-A1	115	120	6200 ohms	.003 amp.	.002 amp.

* Measured through the relay coil only, eliminating the circuit.

gized against a .009" thickness gauge at least one of the contacts on each spring shall make with its mating contact on the associated "C", make, contact spring.

(b) To adjust, bend the tang on the associated "C" contact springs and recheck their pressure.

(12) PUSH BUTTON ADJUSTMENT

(a) On the Break-Letters and Figures-Restart push buttons the normally-open contact of the right-hand pileup A (Figure 59) should make before the normally-open contact of the left-hand pileup B. To insure this condition, the contact pileup should meet the following requirements:

1. Contact springs 1 and 2 (Figure 59) should rest against the button plunger with a tension of from 1 to 10 ozs. Check with an 8 oz. scale applied at right angle to the contact spring. To adjust, bend contact springs 1 and 2.

2. Contact gap A (Figure 59) should be .025" to .040". Contact gap B should be .050" to .065". To adjust, bend contact springs 6 and 3 respectively.

3. Contact spring 3 should press against contact spring 4 at the contact point with a pressure of 3 to 8 ozs. Contact spring 6 should press against contact spring 5 at the contact point, with a pressure of 3 to 8 ozs. To check, apply an 8 oz. scale to the top of contact springs 3 and 6 respectively and pull at right angle to the spring in a direction away from the opposing spring. To adjust, bend contact springs 3 and 6.

4. With the button fully depressed, there should be a gap of at least .020" between the contact points at C and D (Figure 59).

e. MULTIPLE TRANSMITTER DISTRIBUTOR SET

In the absence of a note to the contrary, these adjustments apply to the MXD only.

NOTE

The following eight adjustments apply to both MXD14 and MFD1.

(1) TRANSMITTING CAM-SLEEVE END PLAY ADJUSTMENT (Figure 63)

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

(2) CLUTCH SPRING COMPRESSION (Figure 63)

With the clutch teeth engaged, insert a 32 oz. scale through the hole in the side frame and hook it over the clutch driven member projection. Pull directly in line with the shaft. It should require 9 to 12 ozs. to separate the clutch teeth.

(3) CLUTCH ADJUSTMENT (Figure 63)

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

(4) CLUTCH-MAGNET BRACKET ADJUSTMENT

With the magnet armature held against the magnet cores, there should be some clearance, not more than .004", between the clutch throwout lever and the high part of the cam on the driven clutch member. To adjust, loosen the clutch-magnet bracket mounting screws and position the bracket. Tighten the mounting screws. See Figure 63 for location of parts.

(5) ARMATURE SPRING TENSION

With the clutch throwout lever on the low part of the driven clutch member, unhook the armature spring from the spring post and hook an 8 oz. scale in the spring eye. It should require 3-1/2 to 4-1/2 ozs. to extend the spring to its operating position length. See Figure 63 for location of parts.

(6) TRANSMITTING-CONTACT SPRING PRESSURE (PRELIMINARY)

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

(b) Adjust as follows:

NOTE

If the unit has contact stop screws, back them off all the way.

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

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

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

(7) TRANSMITTER-CONTACT GAP ADJUSTMENT (Figure 64)

(a) With any contact lever on the high part of its cam, the contact gap should be *.020" to .025". To obtain this requirement, rotate the backstop screw.

NOTE

*For start-stop contacts, the gap should be .015" to .025".

(b) The short contact springs should rest against their backstops with a pressure of 4 to 8 ozs., measured by applying the push end of an 8 oz. scale to the end of the short contact springs.

(c) To adjust, bend the short contact springs and position the backstop adjusting screws to meet the requirements of (a) and (b) above.

(8) TRANSMITTING-CONTACT SPRING PRESSURE (FINAL) (Figure 65)

With any contact lever on the low part of its cam, it should require a pressure of 4-1/2 to 5-1/2 ozs. to open the associated contact when the push end of an 8 oz. scale is applied to the longer contact spring just above the contact point. If necessary, refine the contact spring pressure by rebending the longer contact spring as described above to meet this final requirement. Recheck the transmitting contact gap adjustment.

(9) CAM-SLEEVE DETENT-LEVER SPRING TENSION (MFD) (Figure 66)

With the transmitting cam sleeve in the stop position and the detent-lever roller resting on the low part of its cam, apply the push end of an 8 oz. scale to the detent lever just above the spring hole and push at right angle to the detent lever in line with the spring. It should require 6 to 8 ozs. to start the detent lever moving.

(10) COMB SHAFT RETAINER ADJUSTMENT

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

NOTE

Before making this adjustment, make certain that the side of the retainer, in which the end of the slot is closest to the hole, is at the right. (Viewed from top front).

To adjust, loosen the retainer clamp screw on each end of the comb and position each retainer in such direction that the eccentric slot in the retainer takes up the clearance between the shaft and the bottom of the shaft slot. Tighten the clamp screws. See Figure 67B for location of parts.

(11) TAPE-OUT CONTACT-LEVER LATCH ADJUSTMENT (Figure 68A)

With the tape-out operating lever resting on the low part of its cam, there should be .010" to .020" clearance between the latching surface of the tape-out contact-lever latch and the tape-out contact lever. To adjust, loosen the tape-out contact-lever latch mounting screw nut and position the mounting screw in the elongated hole of the bracket. Tighten the nut.

(12) TAPE-OUT CONTACT-LEVER LATCH SPRING TENSION (Figure 68A)

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

(13) TAPE-OUT CONTACT GAP ADJUSTMENT

With the transmitting cam sleeve in its stop position (clutch teeth disengaged) and the tape-out contact lever in its latch position, the contact gap should be .020" to .025". Adjust by means of the contact adjusting screw. See Figure 68 for location of parts.

(14) TAPE-OUT CONTACT SPRING PRESSURE (Figure 68B)

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

(15) TAPE-OUT OPERATING-LEVER SPRING TENSION (Figure 68B)

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

(16) RELEASE-BAR CONTACT ADJUSTMENT (Figure 69)

(a) With the release bar fully depressed, there should be a gap of .020" to .025" between the contact on the heavy short contact spring and the contact of the long contact spring (Figure 69A). Adjust by bending the short heavy contact spring.

(b) With the release bar in the unoperated position (up), it should require a tension of 2-1/2 to 3-1/2 ozs. to open the contacts when an 8 oz. scale is hooked to the long contact spring just above the contact point and pulled horizontally (Figure 69B). To adjust, bend the long contact spring; recheck the contact gap adjustment.

(c) With the release bar unoperated, there should be a gap of .010" to .015" between the contact of the short thin contact spring and the contact of the long contact spring (Figure 69B). To adjust, bend the short thin contact spring stiffener.

(d) With an 8 oz. scale hooked to the short thin contact spring at the contact point, it should require 2-1/2 to 3-1/2 ozs. to just start the spring moving away from the spring stiffener (Figure 69B). To adjust, bend the short thin contact spring.

(17) RELEASE-BAR SPRING TENSION (Figure 69B)

Apply the push end of an 8 oz. scale to the top of the release bar and push vertically downward. It should require 1-1/2 to 3 ozs. to start the release bar moving.

(18) SELECTOR-LEVER COMB ADJUSTMENT (Figure 64)

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

(19) TAPE-OUT SENSING LEVER ADJUSTMENT

NOTE

It is recommended that two 116799, bending tools be used to facilitate this adjustment.

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

(b) With the bending tools placed as shown in Figure 73, bend the horizontal leg of the tape-out sensing lever so that the top of its sensing pin is flush, within .005", with the top of the adjacent selector lever pin. Avoid damaging the pin with the bending tool.

(c) With the transmitting cam sleeve in its stop position, place the bending tools on the lever as shown in Figure 74 and bend the vertical leg of the sensing lever to obtain .015" to .030" clearance as shown in Figure 75.

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

(e) After the above adjustment has been applied, recheck the TAPE-OUT CONTACT-LEVER LATCH ADJUSTMENT.

(20) TOP PLATE ADJUSTMENT (Figure 64)

(a) With the selector-lever pins just flush with the top surface of the tape guide slot in the top plate, the lower ends of the five selector levers should overlap their contact levers by .050" to .090". To adjust,

rotate the transmitting cam sleeve until the selector-lever pins are flush with the top surface of the tape guide slot and shim the top plate at its four corners to obtain the proper overlap.

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

(21) FEED WHEEL ADJUSTMENT

(a) The feed pins on the tape feed wheel (Figure 15) should extend .035" to .045" above the top surface of the channel in the top plate. To adjust, insert shims between the feed-wheel brackets and the bottom surface of the top plate. The mounting screws should engage the top plate with the maximum number of threads without protruding through the surface. Adjust by inserting unused shims between the brackets and the clamp plates.

(b) Position the tape feed wheel so that when a piece of perforated tape having perforations properly centered is engaged by the feed wheel, there will be an equal amount of clearance between the sides of the tape guide slot in the top plate and the edges of the perforated tape. Adjust the feed wheel by means of the pilot screws. When adjusted, there should be some end play, not more than .002". Recheck adjustment (a). See Figures 67 and 70 for location of parts.

NOTE

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

(22) SELECTOR-LEVER BAIL ADJUSTMENT

With the selector cam sleeve in its stop position (clutch fully disengaged) and the selector-lever-bail extension roller resting on the low part of its cam, the highest selector-lever pin should not project above the top surface of the tape guide slot in the top plate and should not be below the top surface by more than .010". See Figure 64 for location of parts. To adjust, insert a screw driver through a hole in the side frame, loosen the selector-lever-bail clamping screw (Figure 63) and position the selector-lever bail with relation to its extension. Tighten the clamping screw.

(23) SELECTOR-LEVER-BAIL SPRING TENSION (Figure 64)

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

(24) SELECTOR-LEVER SPRING TENSION (Figure 64)

With the selector-lever pins in their uppermost position, apply the push end of an 8 oz. scale to the top of a selector-lever pin and push vertically downward. It should require 3/4 to 1-1/4 ozs. to start the pin moving.

(25) TAPE-OUT SENSING-LEVER SPRING TENSION (Figure 68A)

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

(26) FEED-WHEEL DETENT ADJUSTMENT

With a piece of tape perforated with the LETTERS combination (checked for ten holes to the inch) in the transmitter, and the cam sleeve rotated until the selector-lever pins are in the uppermost position, the pins should be approximately midway between the hinged edge and the trailing edge of the holes in the chadless tape.* To adjust, hold the feed pawl away from the ratchet and position the detent eccentric, keeping the high part of the eccentric toward the rear of the unit. See Figure 70 for location of parts.

*For fully perforated tape the pins should be centered in the perforations.

(27) SELECTOR-LEVER GUIDE ADJUSTMENT

When a piece of tape, perforated with the LETTERS combination and properly centered (having No. 1 and No. 5 code holes equidistant

from the edges), is placed in the transmitter and the cam sleeve rotated until the selector-lever pins are in their uppermost position, the pins should be approximately in line with the center line through each hole in the perforated tape. To adjust, loosen the mounting screws of the selector-lever guide and position the guide. Tighten the mounting screws. See Figure 64 for location of parts.

(28) FEED-WHEEL DETENT SPRING TENSION (Figure 70)

With the detent resting between the two teeth on the feed-wheel ratchet, hook a 32 oz. scale over the roller of the detent and pull parallel to the top plate. It should require 16 to 20 ozs. to start the detent moving.

(29) FEED-PAWL LEVER ADJUSTMENT

With the transmitting cam sleeve in the stop position, there should be a clearance of .010" to .020" between the feed pawl and the face of the second tooth below the horizontal center of the feed-wheel ratchet. To adjust, loosen the clamp screw and position the feed-pawl lever with respect to the feed-pawl arm. Tighten the clamp screw. See Figure 70 for location of parts.

(30) FEED-PAWL-ARM SPRING TENSION (Figure 70)

With the transmitting cam sleeve in the stop position and the feed roller resting on the low part of its cam, unhook the feed-pawl spring from the feed pawl. With a 32 oz. scale hooked over the feed-pawl arm in line with the spring hole and pulled at right angle to the feed-pawl arm, it should require 24 to 28 ozs. to start the feed-pawl arm moving. Replace the feed-pawl spring.

(31) FEED-PAWL SPRING TENSION (Figure 70)

With the transmitting cam sleeve in the stop position, hook an 8 oz. scale over the lower part of the feed pawl near the spring hole and pull at right angle to the feed pawl. It should require 3-1/2 to 4-1/2 ozs. to start the feed pawl moving away from the ratchet wheel.

(32) TAPE-LID PIVOT SCREWS ADJUSTMENT (Figure 67B)

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

(33) TAPE-LID VERTICAL ADJUSTMENT (Figure 67B)

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

CAUTION

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

(34) TAPE-LID HORIZONTAL ADJUSTMENT (Figure 67A)

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

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

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

3. The selector-lever pins should be inside their slots and .010" to .015" from the end of the tape fins.

(b) To adjust, loosen the tape-lid bracket mounting screws (Figure 68B) and position the tape lid to meet all three requirements. Tighten the mounting screws.

(35) TAPE-LID LATCH SPRING ADJUSTMENT (Figure 71)

The tape-lid latch spring should be adjusted vertically so that the tape lid latches firmly. To adjust, loosen the tape-lid latch spring mounting screws, position the spring up or down to meet the requirement, and tighten the mounting screws.

(36) TAPE-LID LATCH SPRING TENSION ADJUSTMENT (Figure 71)

With the tape lid latched, apply a 32 oz.

scale at right angle to the uppermost bent section of the latch spring and push downward. It should require 12 to 16 ozs. to just start deflecting the spring. Adjust by gradually bending the spring approximately midway between its upper mounting hole and the top plate.

(37) RELEASE-BAR LATCH ADJUSTMENT (Figure 72)

(a) With the release bar fully depressed there should be some clearance, not more than .010", between the release-bar latch and the latching edge of the release bar (Figure 72A). Adjust by bending the release-bar latch.

(b) When the release bar is latched and the release bar is fully engaging the release-bar latch, there should be some clearance, not more than .010" between the release bar and the top plate (Figure 72B). To adjust, loosen the release-bar-latch mounting screws and position the latch in its mounting holes.

f. MULTIPLE TRANSMITTER DISTRIBUTOR BASE (MXB13)

(1) MOTOR POSITION AND DRIVE GEAR ADJUSTMENT

(a) The lateral alignment of the motor pinion and the counter-shaft drive 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, loosen the four mounting screws and position the motor on its mounting plate.

(b) There should be a minimum amount of backlash between the motor pinion and the drive gear. This backlash should be checked throughout one complete revolution of the drive gear. To adjust, loosen the four mounting screws which clamp the motor plate to the base casting and add or remove shims between the motor plate and its bosses on the base casting. Tighten the mounting screws.

(2) DISTRIBUTOR UNIT POSITION ADJUSTMENT

Each unit should be positioned on the base so as to provide a minimum amount of backlash, without binding, between the driven gear on the unit and the driving gear on the counter shaft. This backlash should be checked throughout one complete revolution of the gear. To adjust, loosen the mounting screws, the eccentric stop screws, and position the unit. Tighten the mounting screws. Turn the eccentrics against the distributor base plate and tighten their screws.

g. 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 from the base and remove the motor fan and pinion.

(2) Remove the switch and shield screws and the switch commutator mounting screws. Remove the switch and shield.

(3) Pull the rotor out 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 and 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.

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

h. CABINET ADJUSTMENTS

(1) WIRE DUCT ADJUSTMENT

The wire duct in the base of the cabinet should be adjusted in line with the front and rear base frames so that the three base parts are flush on each side and on the bottom. Adjust by means of the 8 mounting screws.

(2) The left rail (116022) and right rail (116024) should be adjusted to the 19.438" dimension as shown on Figure 78. To adjust, add or remove an equal number of shims (116020) between the rails and the cabinet at the mounting screws (front and rear).

(3) DOOR AND LEADER ADJUSTMENTS

The door and leader should be centered in relation to the opening in the cabinet. With the door in this position the 116033 guides should be adjusted as shown on Figure 78 so as to provide a perceptible clearance between the guide and rail throughout the full travel of the door (front to rear). Lock the slides in position by means of the eccentrics (89963).

(4) GUIDE AND RAIL VERTICAL ADJUSTMENTS

There should be a perceptible clearance between the extrusions on the 116033 guides and 116022 and 116024 guide rails throughout the entire travel. See Figure 78 for location of parts. To adjust, bend the guides.

(5) DOOR ROLLER ADJUSTMENT

With the door in position as shown by dotted line on Figure 78 there should be approximately 1/16 inch between the roller and the door. To adjust, rotate the eccentric.

(6) DOOR STOP ADJUSTMENT

With the door in its closed position, there should be at least 1/16 inch clearance between the lug on the rail and the door stop 72019. Refer to Figure 78. To adjust, position the door stop.

(7) SIDE-PANEL STRIP FOR MOUNTING SLIDES ADJUSTMENT

The 116118 and 116119 slides which are mounted to the 116015 panel strips should be adjusted to the 19-9/32" dimension shown on Figure 79. To adjust, add or remove an equal number of 116017 shims between the special nuts on the side panels and the 116015 side-panel strips on both sides of the cabinet (front and rear).

(8) METHOD OF ASSEMBLING PARTS TO MAKE WIRE DUCT See Figure 79.

(9) STOP STRIP ADJUSTMENT

All stop strips or similar parts used as stop strips should be mounted 7/32 of an inch from either the front or rear face of the cabinet shelf. To adjust, position by means of their mounting holes. When the doors are closed make certain they are recessed 5/32 of an inch from the face of the shelf.

(10) DOOR LATCHING ADJUSTMENT

When the door is closed, it should be held firmly against the stop strips. To adjust, bend the latches at the top and bottom of the cabinet as shown in Figure 78.

(11) DOOR STUD ADJUSTMENT

The detenting studs on all front doors of the cabinet should be positioned so that the doors may be opened by a pull of 9 to 12 lbs. when a 12 lb. spring scale is hooked in the hand grip and pulled outward. To adjust, rotate the detent stud.

(12) DRAWER DETENT ADJUSTMENT

When the drawer slides are fully against their stops, the detent bracket should be positioned so that full engagement is made between the detent and the latch detent spring (rear of cabinet). To adjust, position the latch detent springs horizontally by means of their mounting screws. Maintain some clearance between the end of the latch detent springs and the detent mounting screws.

(13) DETENT MOUNTING-BRACKET VERTICAL ADJUSTMENT

The detent latch springs should engage the detents equally. To adjust, position the detents by means of their mounting screws and brackets.

i. TROUBLE SHOOTING

(1) PRIMARY STATION

TROUBLE	POSSIBLE CAUSE
(a) The open-line lamp fails to light when the DC switch is thrown on.	a. Open-line button sticks. b. Contact 4-5, relay P2 is not making. c. Blown fuse. d. Bulb burned out.
(b) Line remains open when start button is pushed.	a. Start button sticks.
(c) Failure of chain relays to step.	a. Dirty relay contacts. b. Auxiliary contact on MFD fails to close (or open).
(d) Wrong character in date-time group.	a. Faulty contact on tap switches.
(e) P1 relay energizes when DC switch is turned on.	a. Reversed line polarity.
(f) P2 energized when line is open.	a. DC polarity reversed.
(g) Failure to start when start button is operated.	a. Stop button stuck. b. Contact 1-2, relay P3 not closed. c. Selector contact No. 1 is open.
(h) Transmission at a very slow rate.	a. Selector contact No. 2 is open.
(i) Circuit number is sent in LTRS instead of FIGS.	a. Selector contact No. 3 is open.
(j) Transmission stops after the circuit number is sent.	a. Selector contact No. 4 does not close.
(k) Continuous line feeds follow transmission of the first station identification.	a. Selector contact No. 5 is open. b. Selector contact No. 6 fails to close.
(m) Transmission shuts down after the first station identification is sent.	a. Selector contact No. 7 is open. b. Loose multiple connection plugs. c. Blown fuses. d. Loose terminal-block screws.

(2) SECONDARY STATION

(a) Transmitter-distributor motor fails to start when its switch is turned on.	a. Blown AC fuse. b. Poor connection at multiple-conductor plug. c. XD loose in base.
(b) Manual lamp fails to go on when DC switch is turned on.	a. Blown DC fuse. b. Contact 18-19, relay S3 fail to make. c. Contact 5-6, relay S1 fail to make. d. Bulb burned out.
(c) Relay LB fails to operate when DC switch is turned on.	a. ASID not in slip connections properly. b. Faulty tape-start toggle switch. c. Contact 16-17 on relay S3 not making.

(d) Relay S6 fails to operate when open-line reset button is pushed.	a. Open-line push button sticks. b. Contact 1-2 relay S6 not making. c. DC reversed. d. Line reversed.
(e) Relay SS fails to operate when tape-start toggle switch is turned on.	a. ASID not in slip connections properly. b. Poor connection at multiple-conductor plug.
(f) Relay D fails to operate when Program Message key is pushed.	a. Open contact in any one of the three push keys. b. ASID not in slip connection properly.
(g) Manual lamp fails to go out when automatic push button is pushed.	a. Automatic or manual push button sticks. b. Contact 3-4 relay S1 fails to make. c. Contact 20-21 relay S3 not making.
(h) Selector motor fails to start when automatic push button is pushed.	a. Contact 1-2 on relay S1 fails to make. b. Contact 1-2 relay S7 fails to make. c. Blown AC fuse.
(i) Open-line lamp goes on when DC switch is turned on.	a. Selector contact is closed.
(j) Selector motor stops when line breaks during automatic transmission.	a. Contact 4-5 relay S6 fails to make.
(k) Selector motor starts when DC switch is turned on.	a. Contacts 2 and 3 relay S1 are shorted. b. Contact 1-2 relay S1 not open. c. Contact 1-2 relay S2 not open. d. Selector contact is closed. e. Contact 2 and 3, relay S6 are shorted.
(m) Fuse blows when automatic button is pushed.	a. Contacts 4 and 5 relay S1 are touching.
(n) Automatic transmission starts when DC switch is turned on.	a. Contacts 12 and 13, relay S1 are shorted.
(o) Relay CO energizes when DC switch is thrown on.	a. Contacts 2 and 3, relay S2 are shorted. b. Contact 6-7, relay S3 is making.
(p) Relay S3 energizes when the automatic button is pushed.	a. Contacts 2 and 3, relay S3 are shorted. b. Selector contact is closed.

NOTE

The transmitter tape-start switch must be in the "ON" position. The tight-tape switch must be closed.

2. LUBRICATION

a. GENERAL

(1) The oil and grease specified in Specification S-5288 should be used to lubricate the SECO equipment.

(2) Unless otherwise specified, one or two drops of oil at each of the places indicated will be sufficient. Use oil for lubrication at all of the places listed in the following, except where the use of grease or oil-grease-oil is specified. Avoid excessive lubrication. Do not allow lubricant to get on magnet pole faces, armature, or contacts.

(3) Oil both loops of all helical springs.

b. SEQUENTIAL SELECTOR

(1) SELECTOR MECHANISM

(a) Armature bearings (2) very spar-

ingly.

(b) Trip-latch plunger, trip latch, bell crank, and stop lever or range-finder assembly.

(c) Swords and selector levers - drop oil between separator plates

(d) Selector transfer levers - all points of contact

(e) Armature locking lever - at pivot

(f) Selector cam sleeve - each cam peak

(g) Locking wedge - at point of contact

(h) Selector arm at pivots and extensions

(i) Selector-arm detent pivots and slot

(2) MAIN SHAFT

Remove range-scale rear mounting screw and swing scale out of the way. Remove friction disc from end of shaft and fill shaft with oil. Replace disc and range scale.

(a) Locking-lever-cam felt oil ring - saturate

(b) Selector-cam friction washers (2) - saturate

(c) Ball Bearings (2) - oil-grease-oil

(d) Clutch - oil freely

(e) Compression spring

(f) Gear - grease

(g) Main-bail cam

(h) Stripper-bail cam

(i) Drive-pawl and check-pawl pivot bearings (2)

(j) Detent eccentric (1)

(k) Detent sleeve - grease

(l) Detent spring

(m) Clutch teeth - oil teeth (2)

(n) Drive-pawl guide

(o) Remove oil-plug thumb screw - fill hole with oil several times

(3) BLOCKING-LEVER ASSEMBLY

(a) Blocking-lever pivot bearings

(b) Upper and lower comb guide

(c) Latching-lever pivot bearings

(d) Upper and lower comb guide

(e) Operating-lever camming surfaces - grease lightly

(f) RY-test latching-lever pivot bearing

(g) RY-test operating-lever pivot bearing and latching surfaces

(4) MAIN BAIL

(a) Drive link (1)

(b) Pivot bearings (2) - saturate oil wicks

(c) Connecting-link pivot bearings (4) - saturate oil wicks

(d) Main-bail pivot bearings (2)

(5) STRIPPER BAIL

(a) Drive link (1)

(b) Pivot bearings (2) saturate oil wicks

(c) Connecting-link pivot bearings (4) saturate oil wicks

(d) Stripper-bail-lever pivot points (2) saturate oil wicks

(e) Stripper-bail pivot bearings (2)

(f) Latch-bail pivot bearings (2)

(6) FUNCTION LEVERS

(a) Pivot bearings

(b) Front comb (2)

(c) Rear comb (1)

(7) CONTACT OPERATING LEVERS

(a) Pivot points

(b) Front comb (1)

(c) Rear comb (1)

(d) Pull-bar pivot bearing and latch

(8) VANE ASSEMBLY

(a) Vanes - all points of contact

(b) Vane extension points of contact

(c) Operating-link front and rear combs (2)

c. MXD

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

(2) Clutch - sliding member

(3) Cam felt oilers - saturate felt with oil

(4) Clutch throwout lever - bearings

(5) Contact-lever pivoting shaft

(6) Gear - grease

(7) Selector-lever pivoting shaft and guiding comb - oil sparingly

(8) Feed-pawl-lever roller - bearing

(9) Feed pawl - bearing

(10) Feed-pawl ratchet

(11) Feed roll - bearings - two

(12) Feed-wheel detent - bearing

(13) Feed-wheel detent roller - bearing and points of contact with feed pawl and release bar

(14) Tape-out contact lever - guide slot in spring bar

(15) Tape-out-lever latch - bearing and point of contact with tape-out contact lever

(16) Release bar - bearing and guide

d. MFD

(1) Cam sleeve shaft - two oil cups

(2) Clutch - sliding member

(3) Cam felt oiler rings - saturate with oil

(4) Clutch throwout lever - bearings

(5) Contact-lever pivoting shaft

(6) Gear - apply light film of grease

(7) Cam-sleeve detent lever - bearing

(8) Cam-sleeve detent-lever roller - bearing

e. MXB

(1) Gears - apply light film of grease

(2) Counter-shaft - bearings - oil-grease-oil

f. MOTOR

(1) Motor pinion - light film of grease

(2) Motor bearing lubrication holes - two - grease - use grease gun

g. CABINET

(1) Slides - grease

(2) Latches - grease

(3) Rollers - oil

SECTION VI

Figures referred to in

text of Sections I, II, III, IV, and V

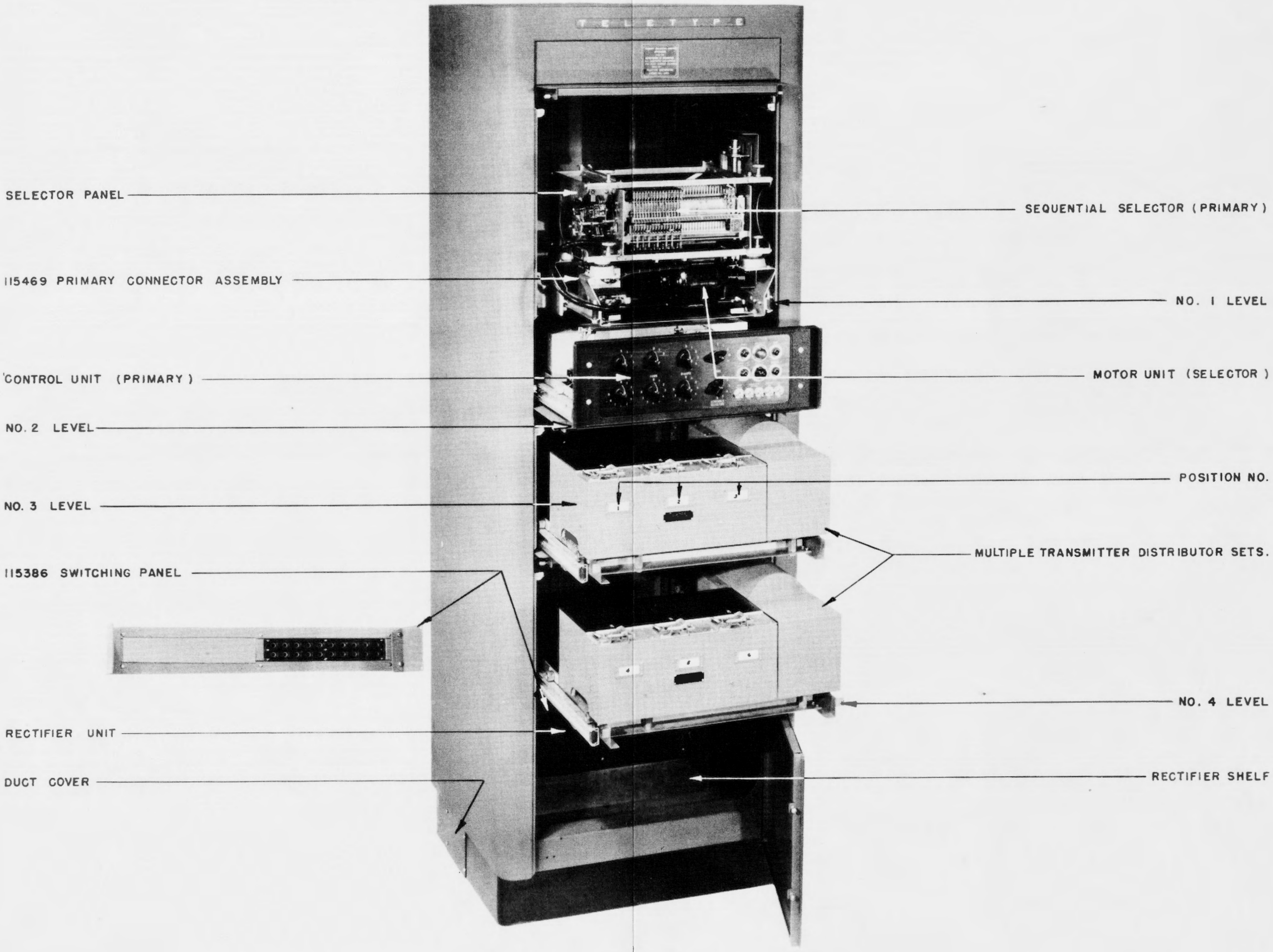


FIGURE 1
PRIMARY EQUIPMENT

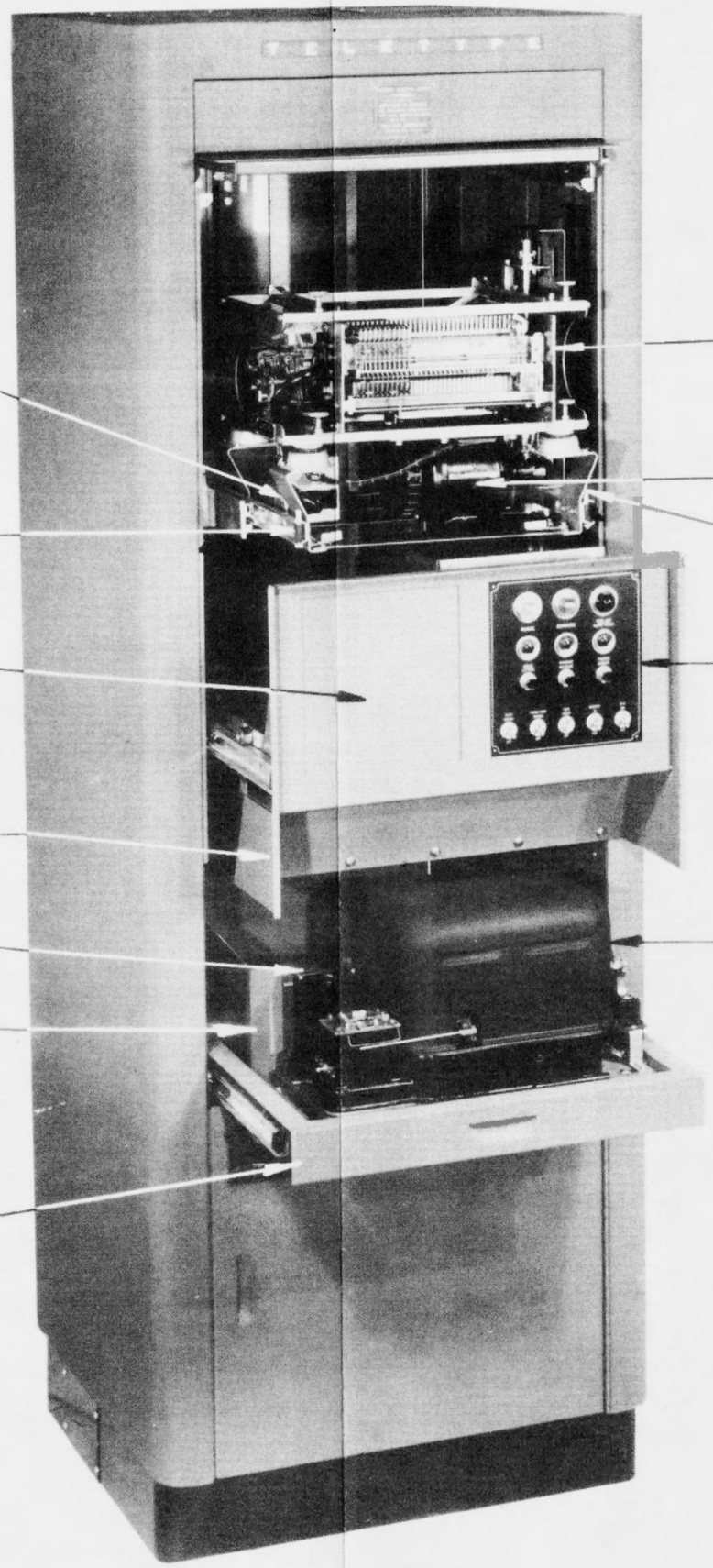


FIGURE 2
SECONDARY EQUIPMENT (SINGLE CIRCUIT)

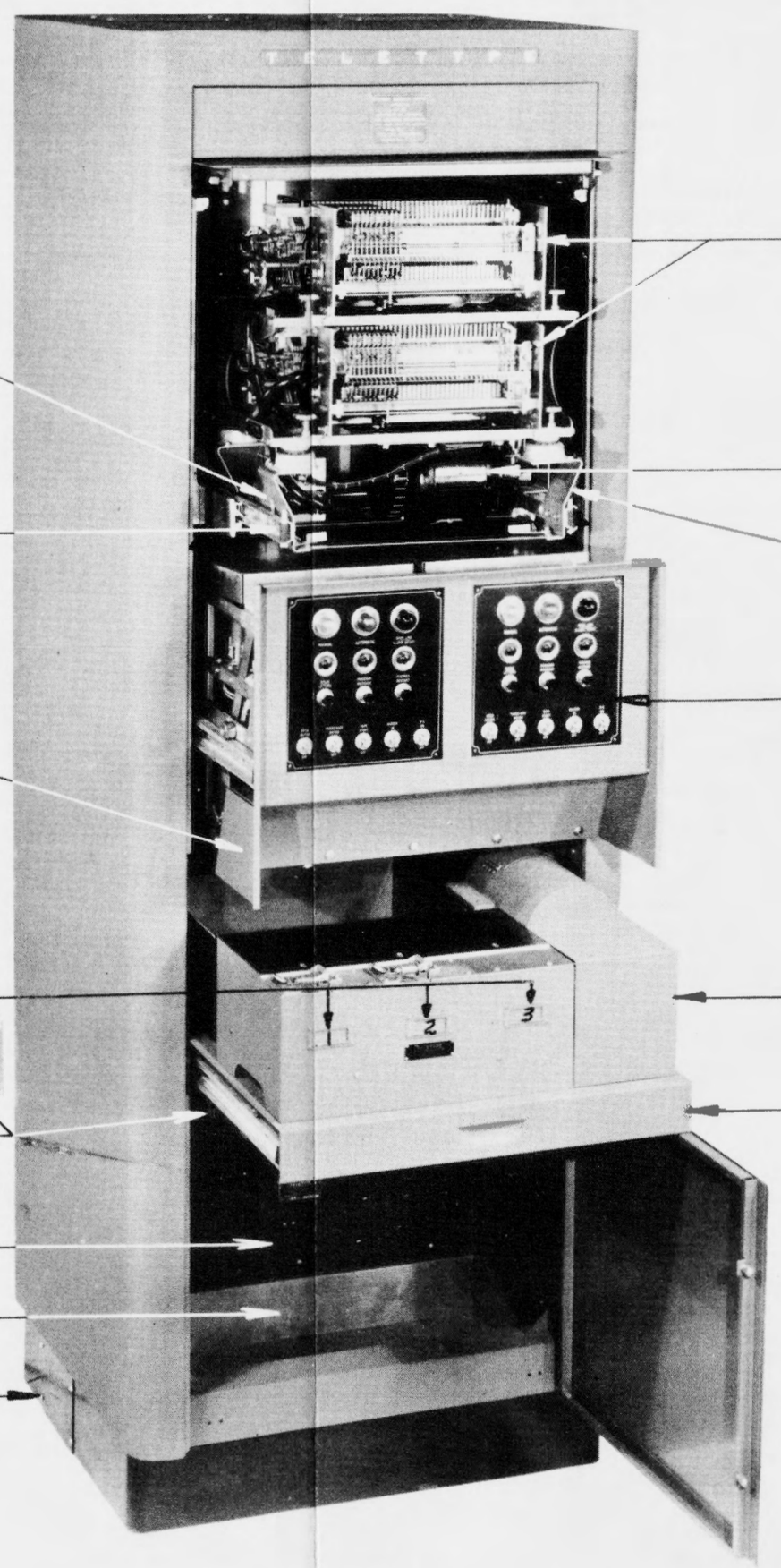


FIGURE 3
SECONDARY EQUIPMENT (TWO-CIRCUIT)

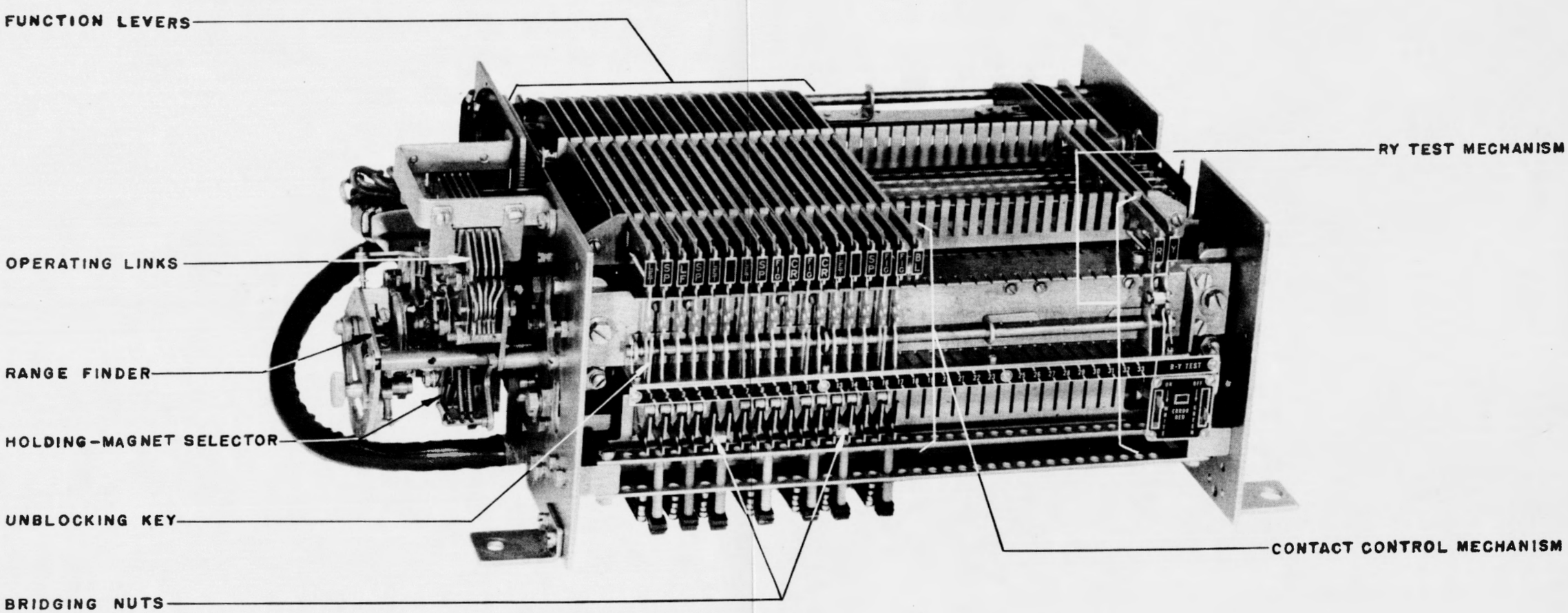


FIGURE 4
SEQUENTIAL SELECTOR (PRIMARY)

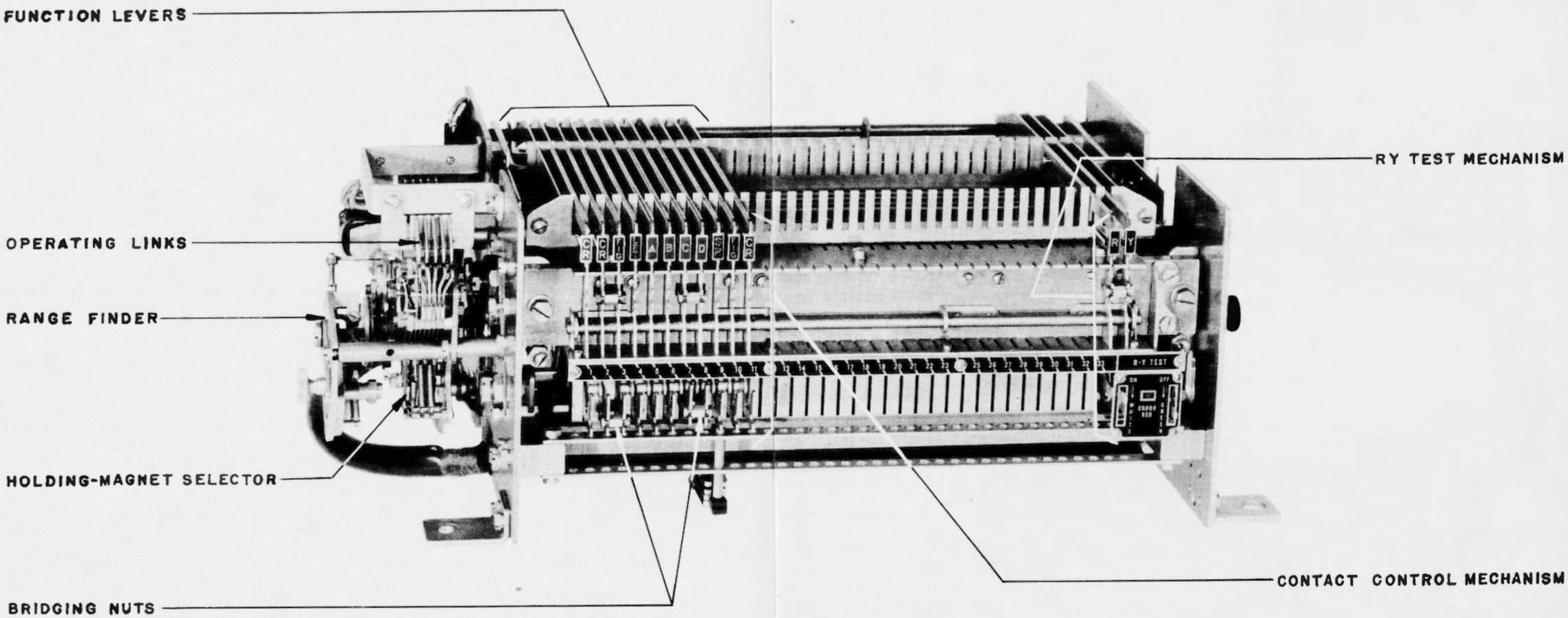


FIGURE 5
SEQUENTIAL SELECTOR (SECONDARY)

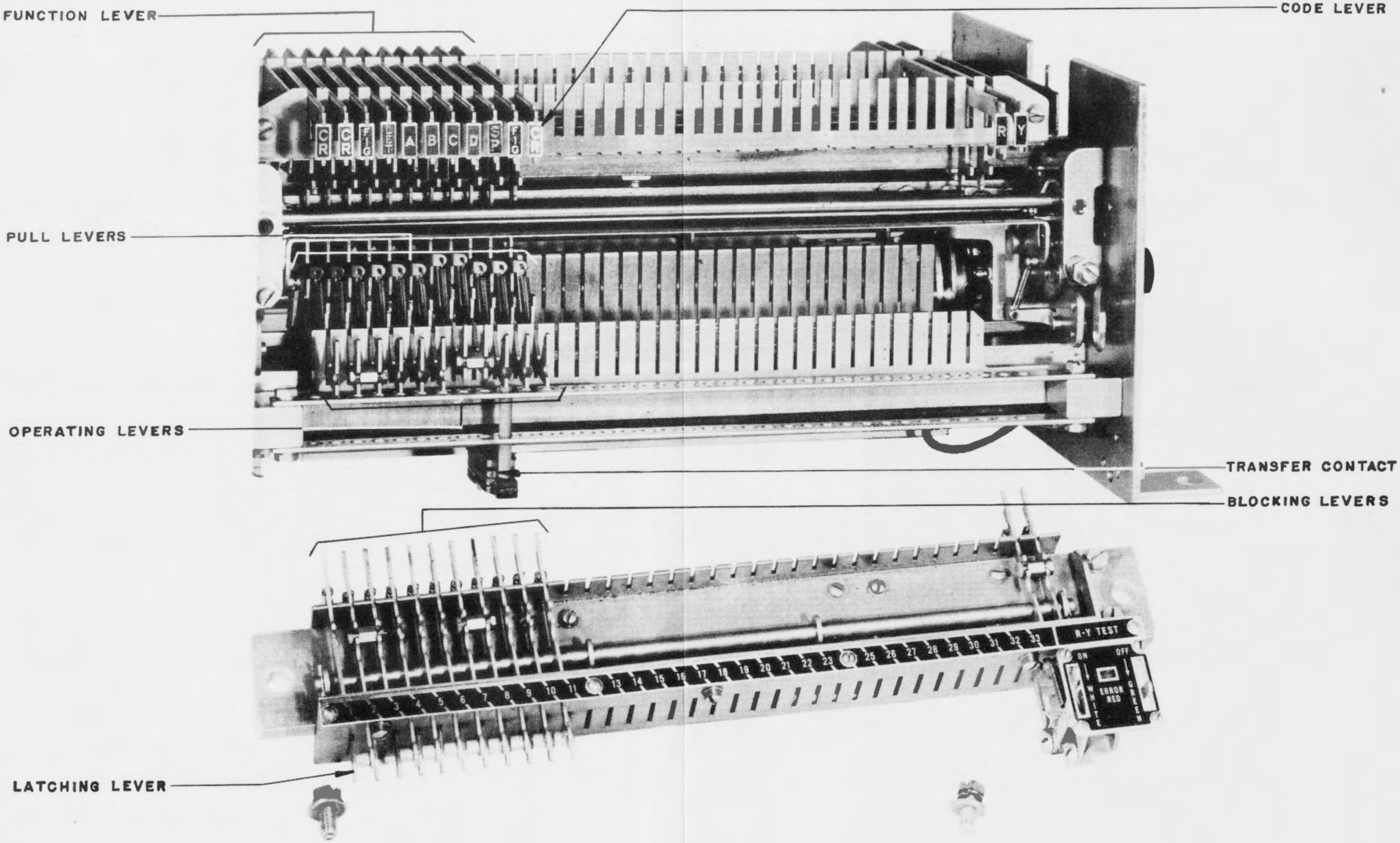


FIGURE 6
SEQUENTIAL SELECTOR (SECONDARY)
BLOCKING AND LATCHING LEVER ASSEMBLY REMOVED

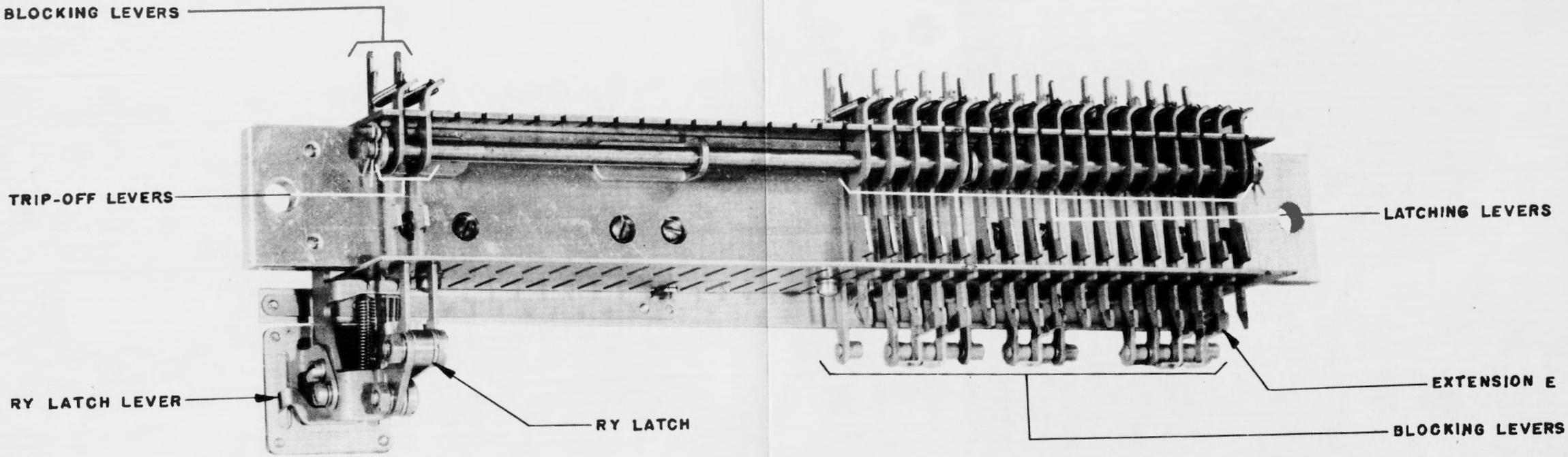


FIGURE 7
BLOCKING AND LATCHING LEVER ASSEMBLY (PRIMARY)
REAR VIEW

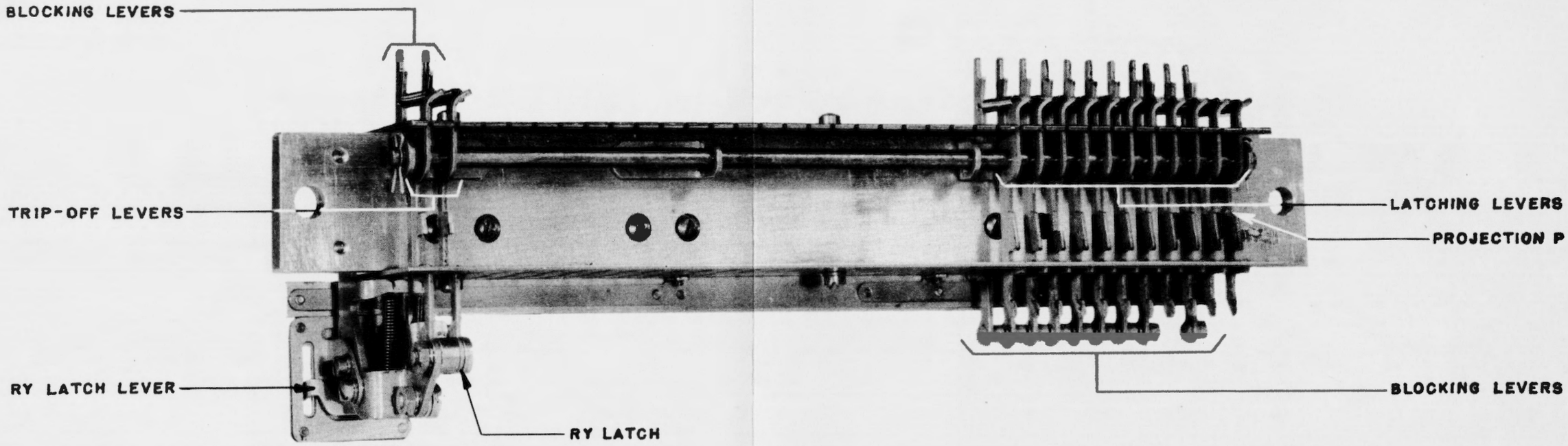


FIGURE 8
BLOCKING AND LATCHING LEVER ASSEMBLY (SECONDARY)
REAR VIEW

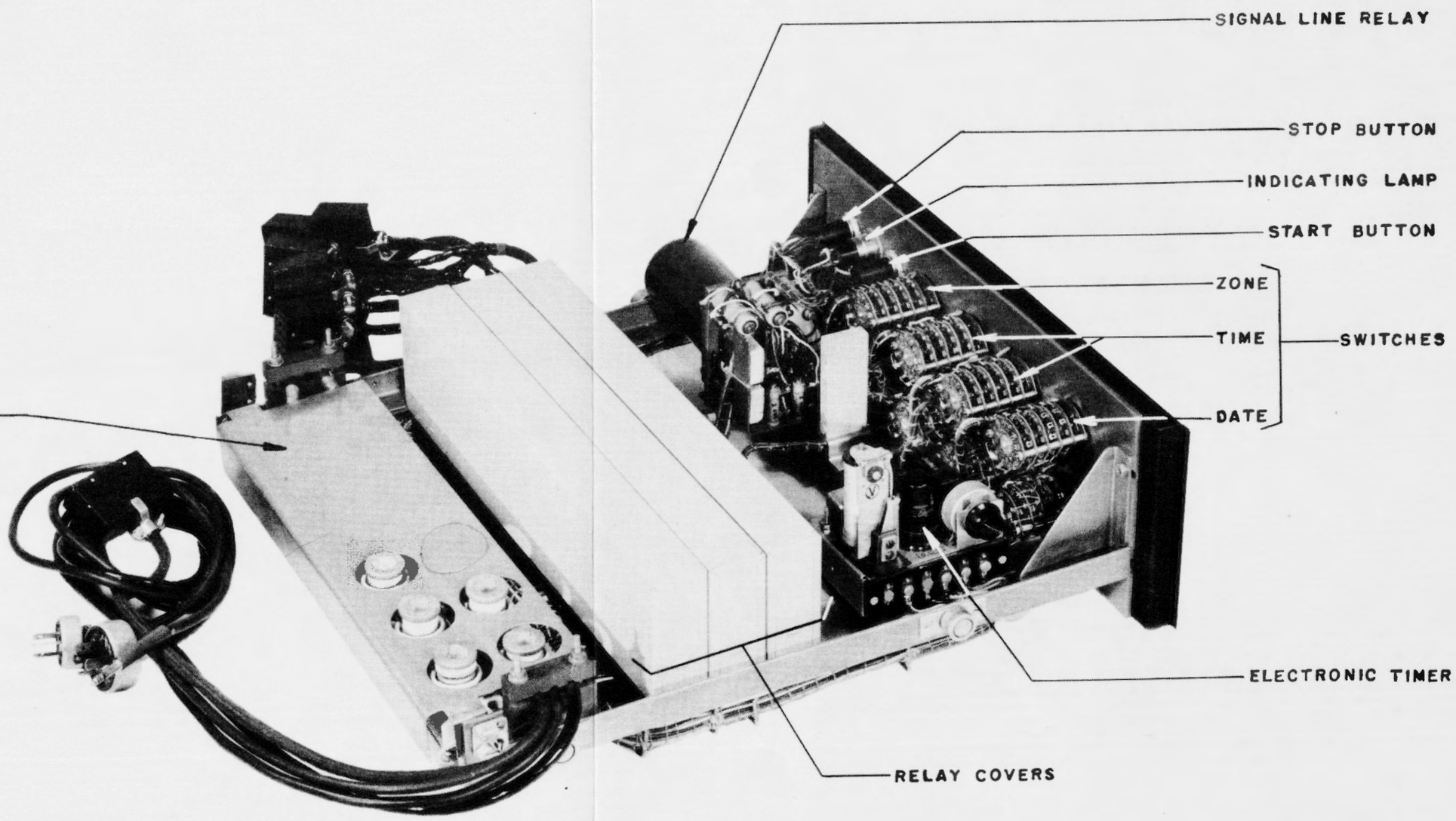


FIGURE 9
CONTROL UNIT (PRIMARY)

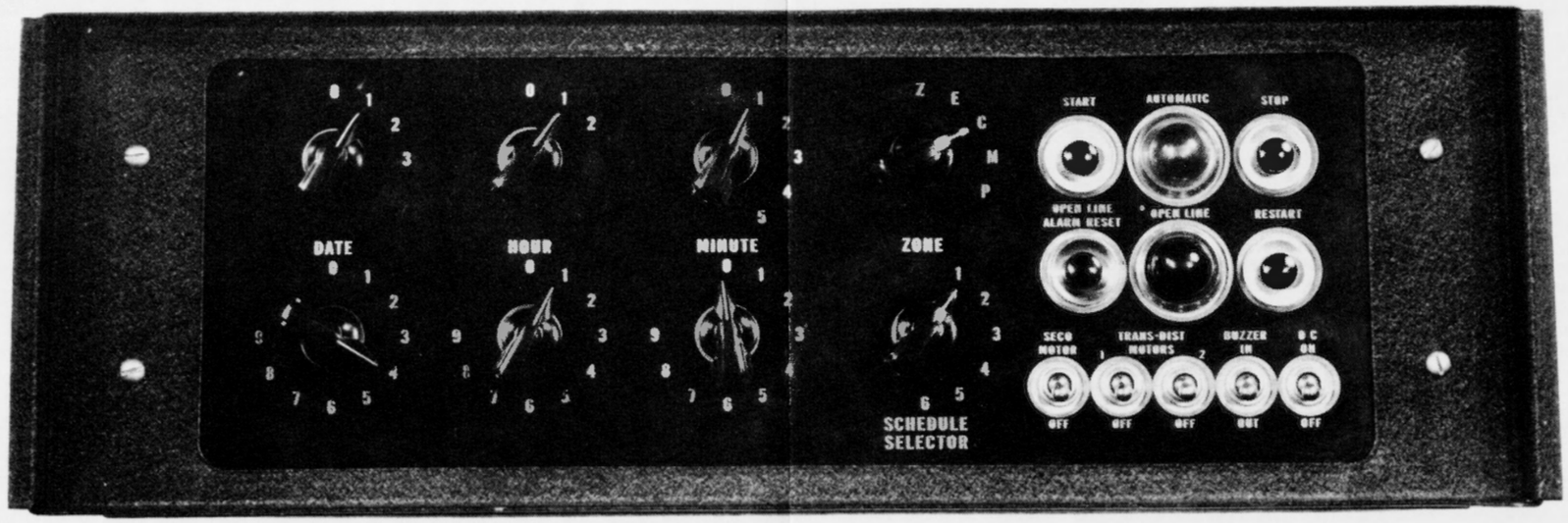


FIGURE 10
CONTROL UNIT PANEL (PRIMARY)
SHOWING MANUAL CONTROLS

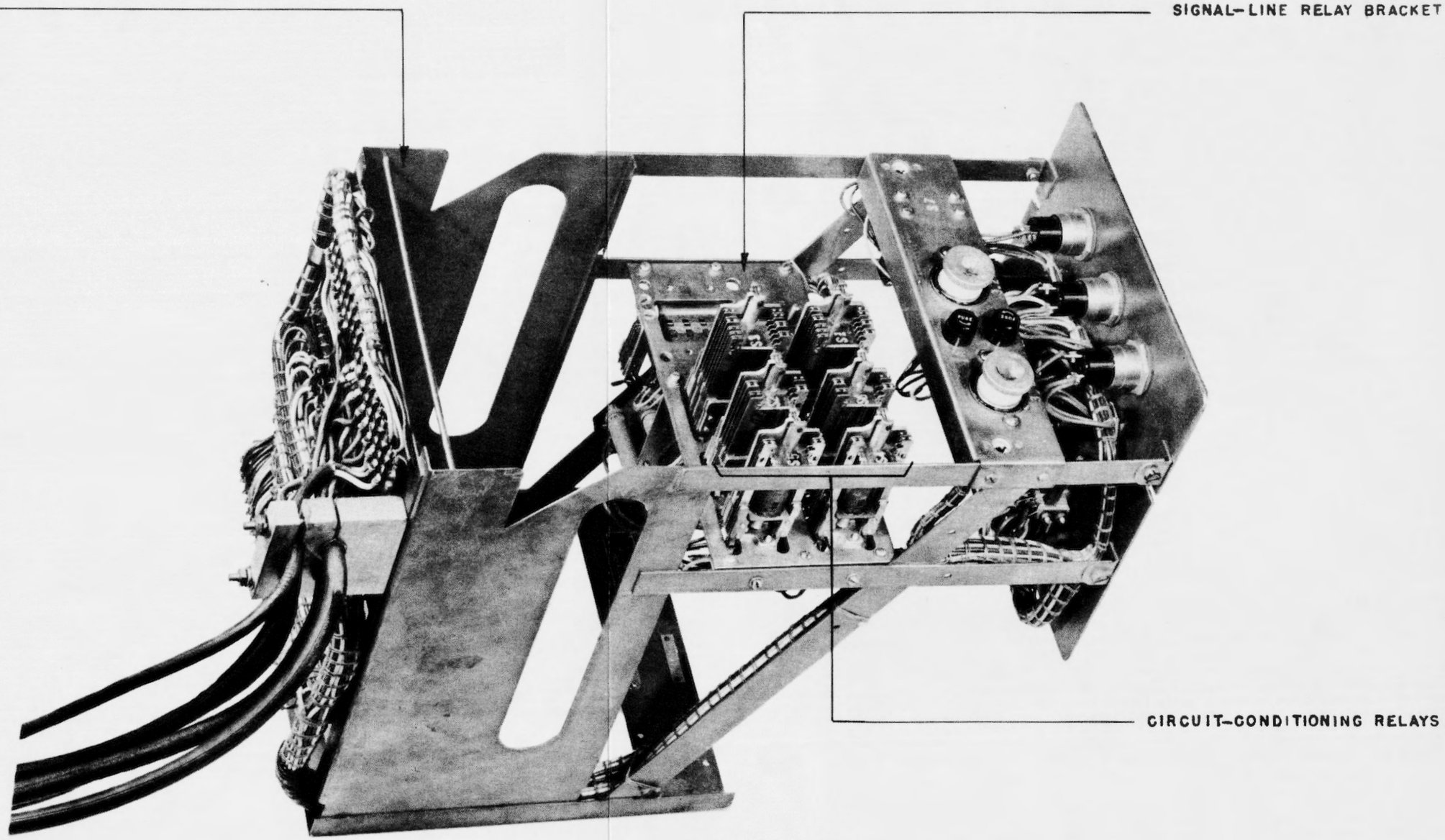


FIGURE 11
CONTROL UNIT (SECONDARY) CU2
COVER PLATE REMOVED

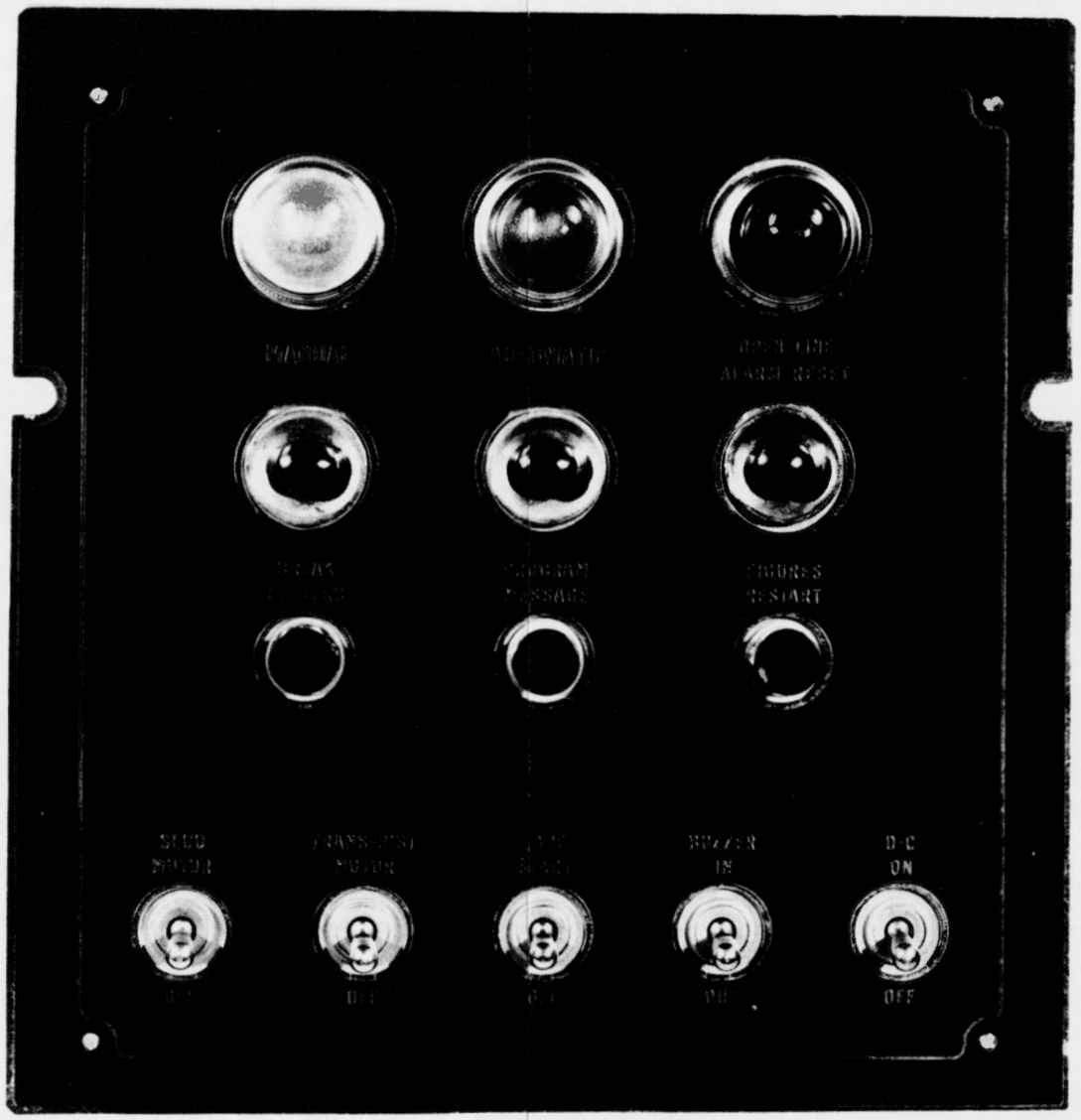


FIGURE 12
CONTROL UNIT PANEL (SECONDARY)
SHOWING MANUAL CONTROLS

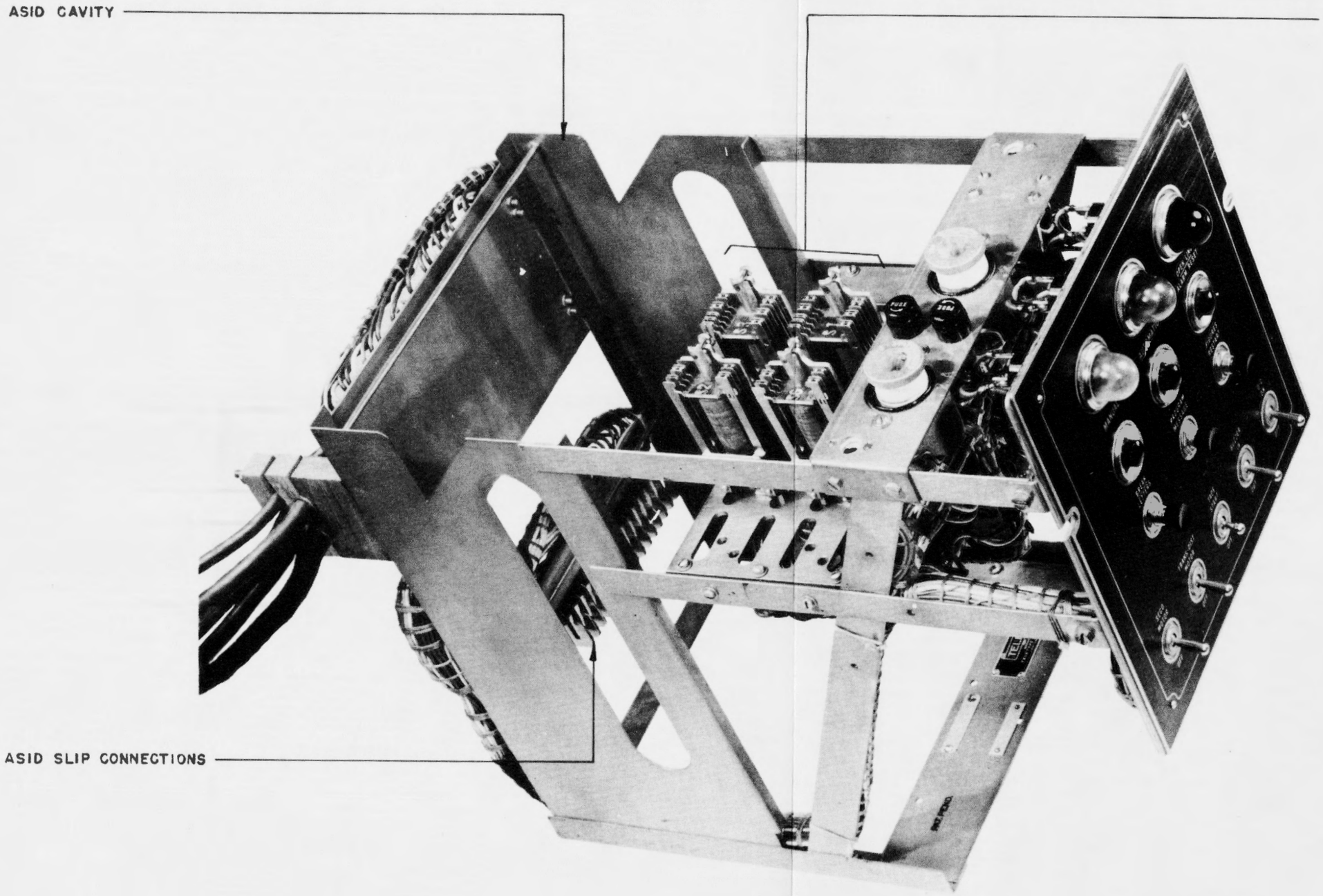


FIGURE 13

CONTROL UNIT (SECONDARY) CU3
COVER PLATE REMOVED

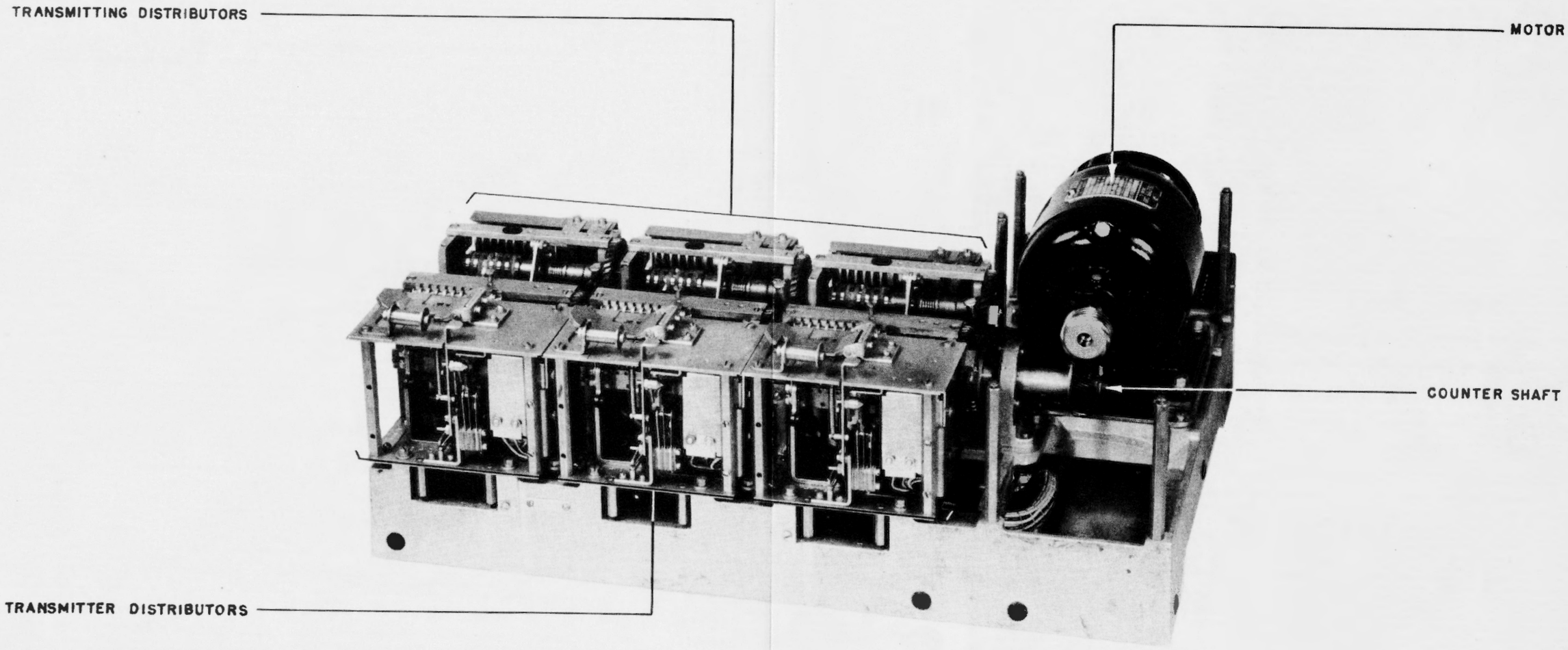


FIGURE 14
MULTIPLE TRANSMITTER DISTRIBUTOR SET
(COVERS REMOVED)

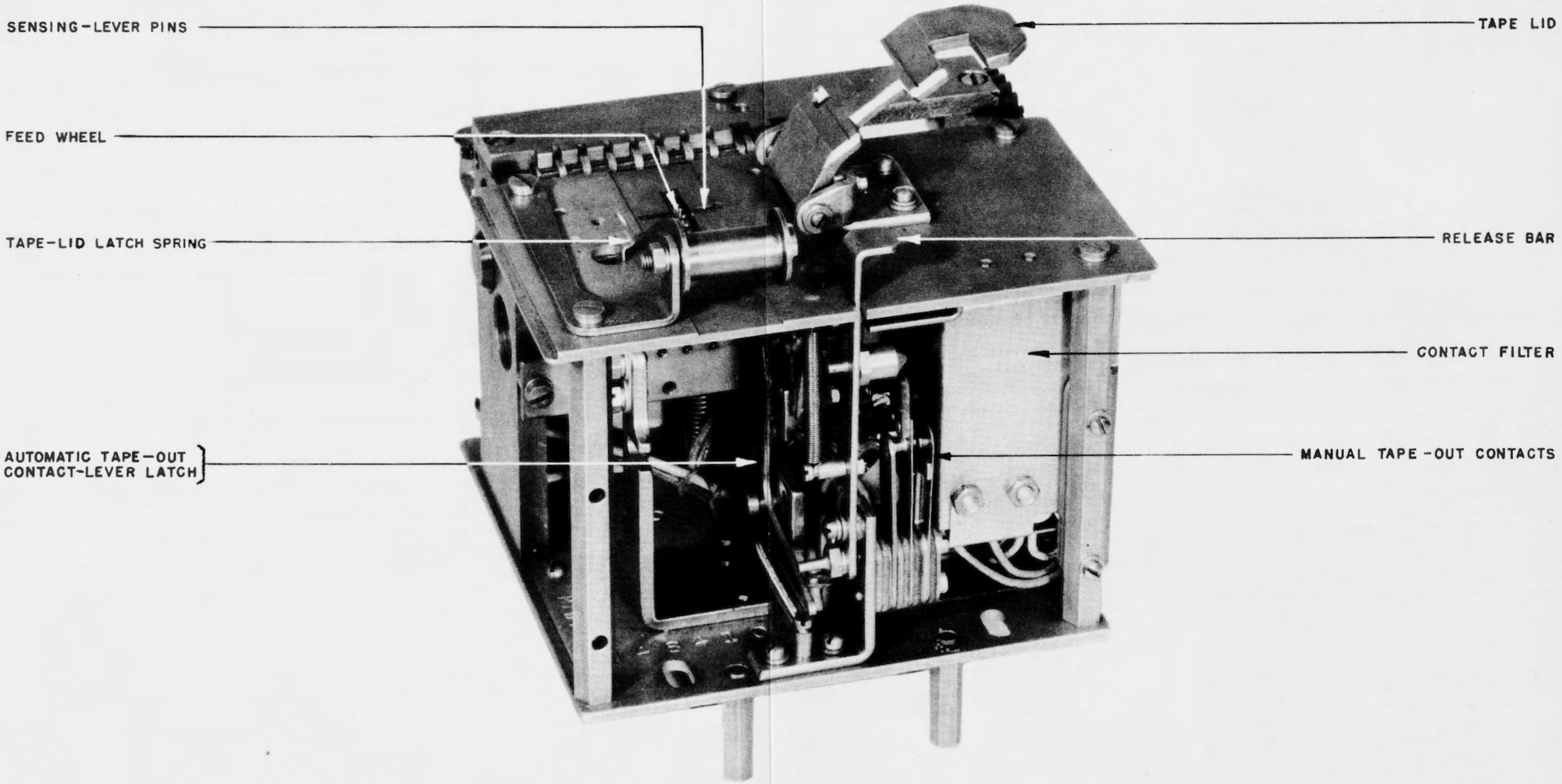


FIGURE 15
MULTIPLE TRANSMITTER DISTRIBUTOR (MXD)
FRONT VIEW

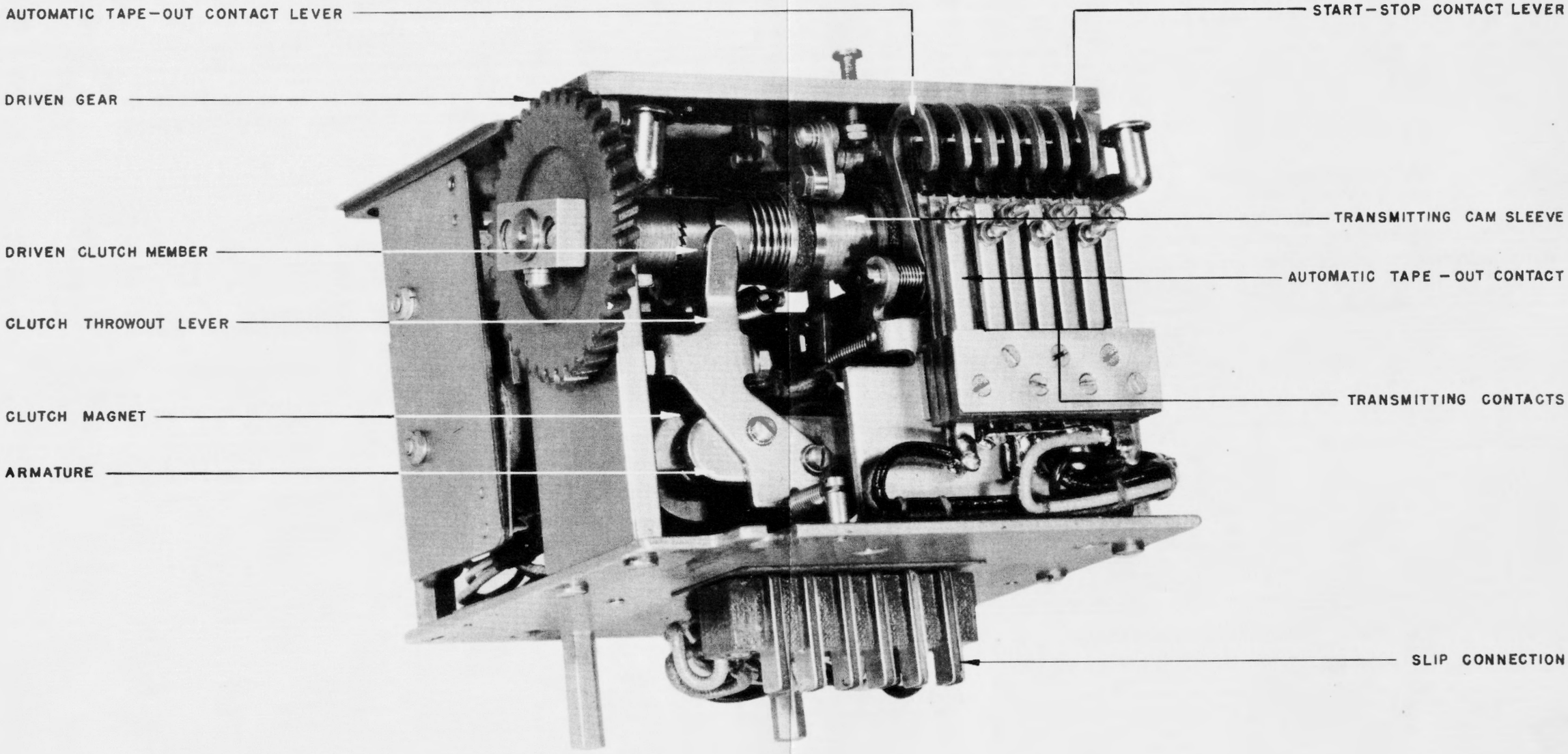


FIGURE 16
MULTIPLE TRANSMITTER DISTRIBUTOR (MXD)
REAR VIEW

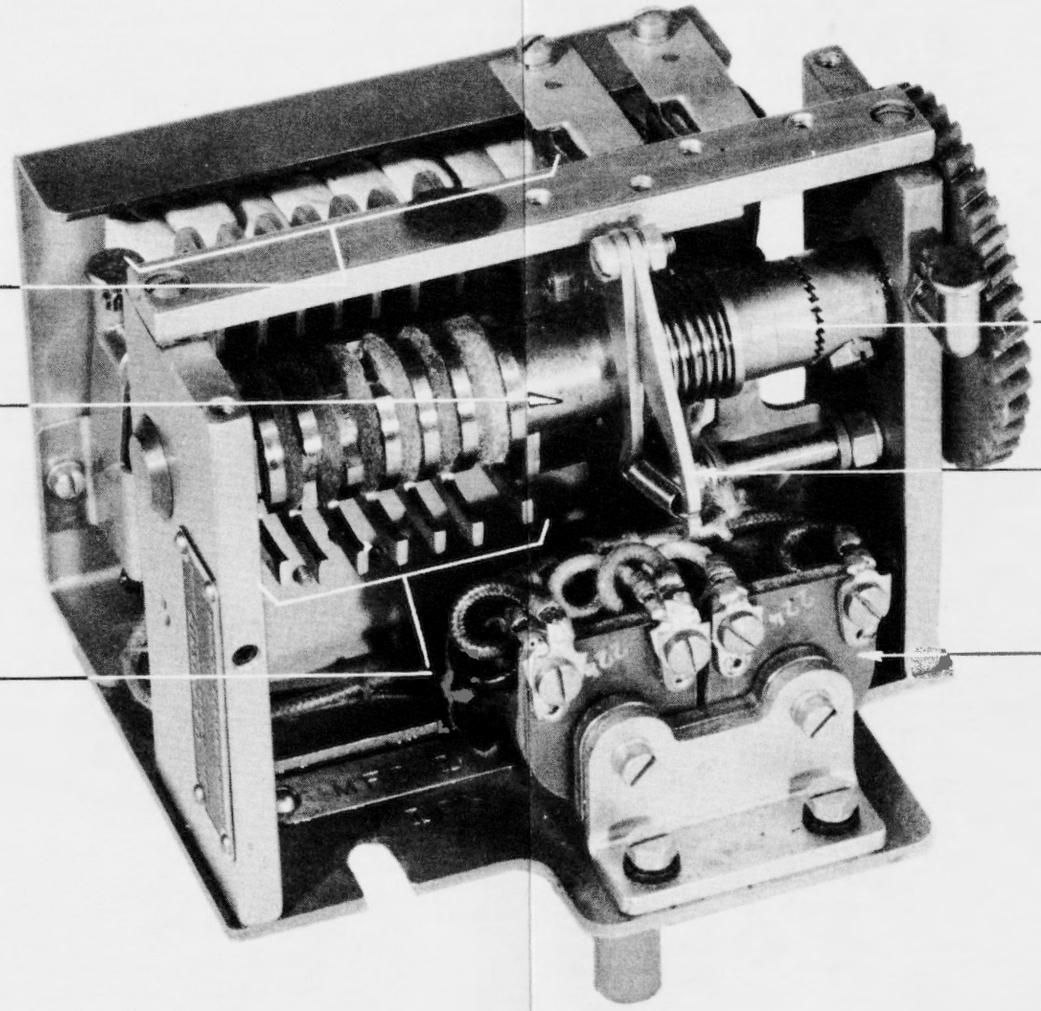


FIGURE 17

MULTIPLE TRANSMITTING DISTRIBUTOR (MFD)

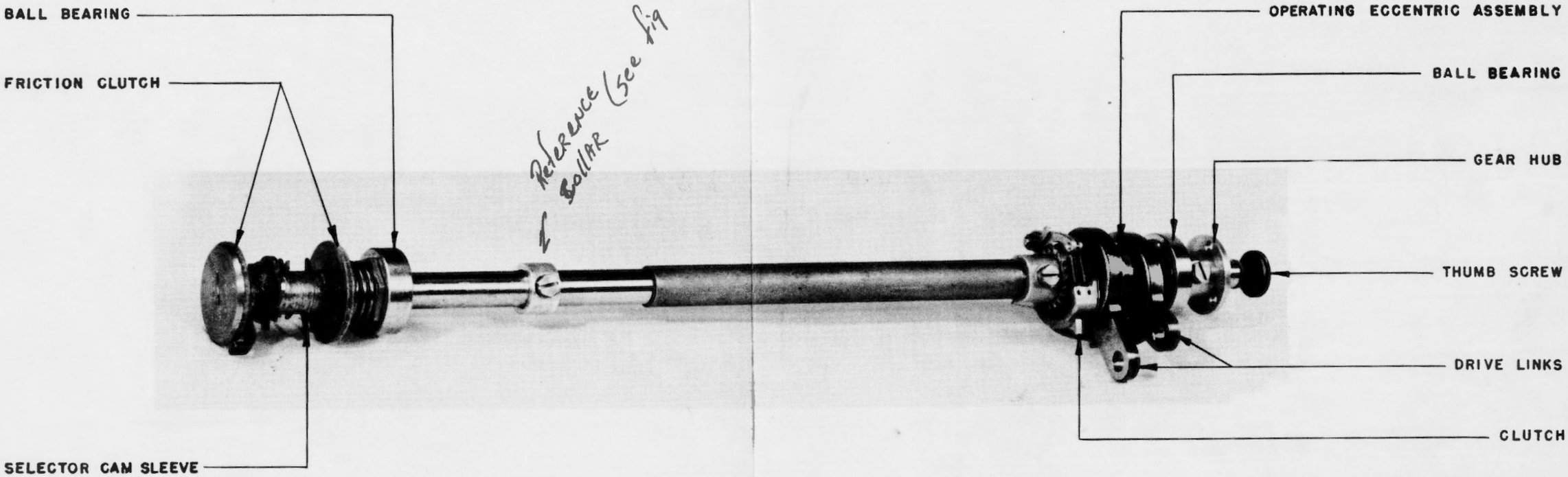


FIGURE 18
MAIN SHAFT (SEQUENTIAL SELECTOR)

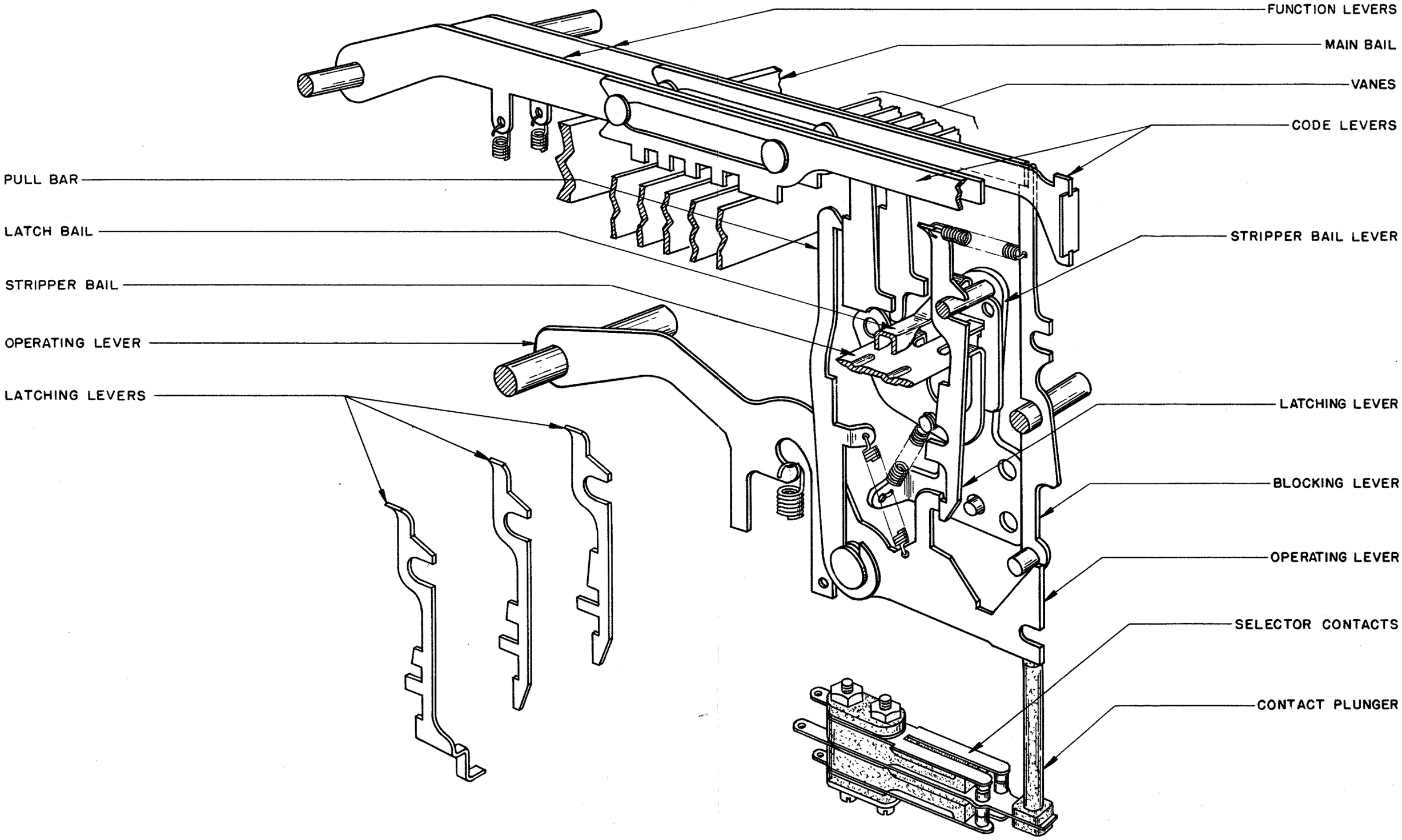


FIGURE 19
CONTACT OPERATING MECHANISM

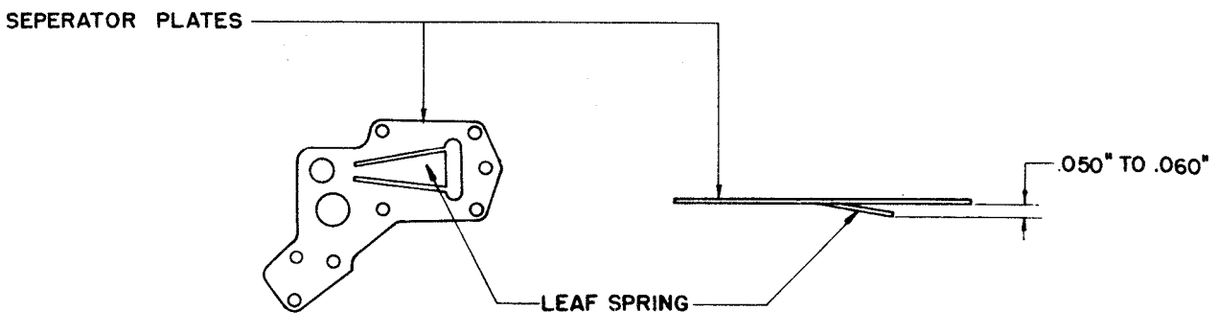


FIGURE 20
SELECTOR SEPARATOR PLATE

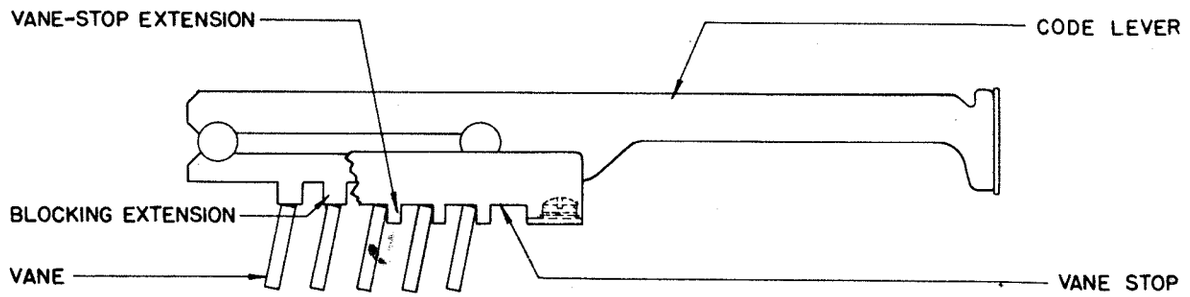


FIGURE 23
VANE STOP

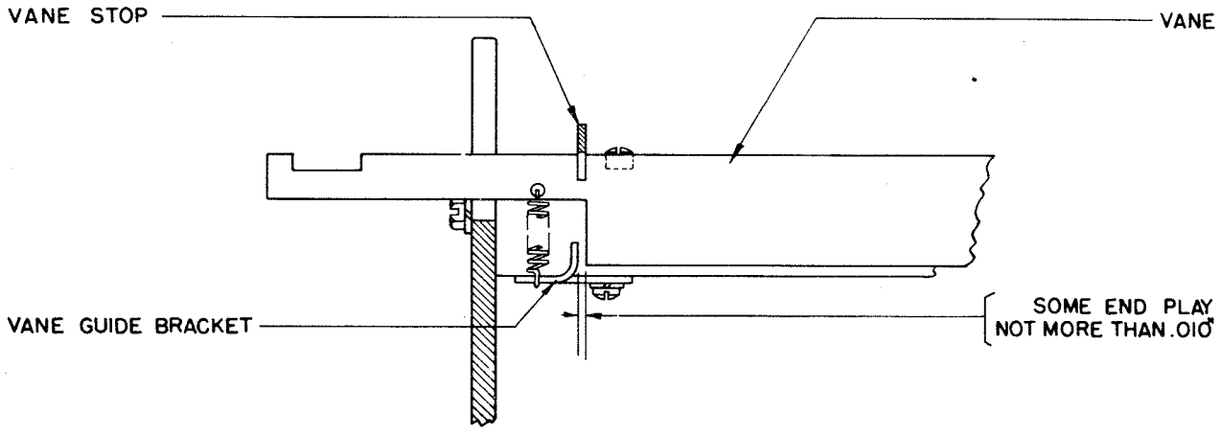


FIGURE 21
SELECTOR VANE

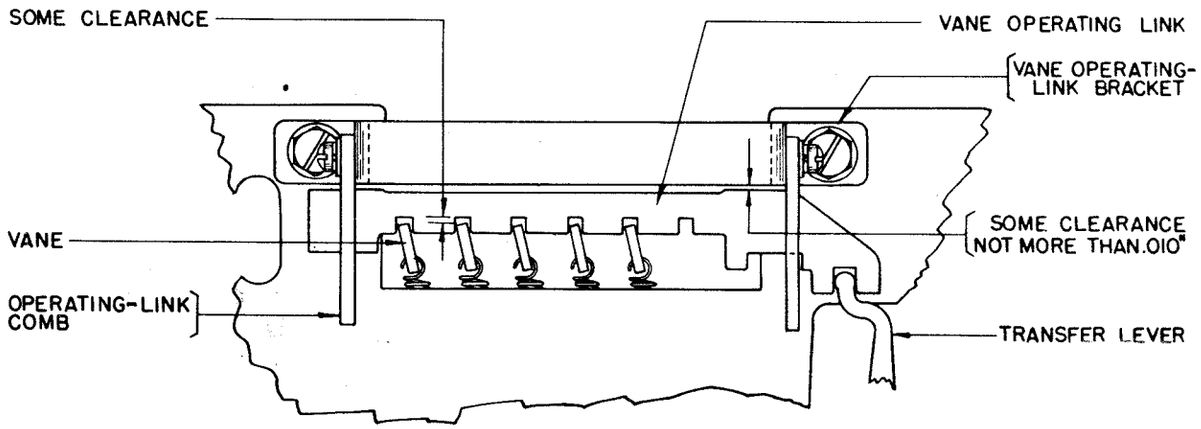


FIGURE 24
VANE OPERATING LINK ASSEMBLY

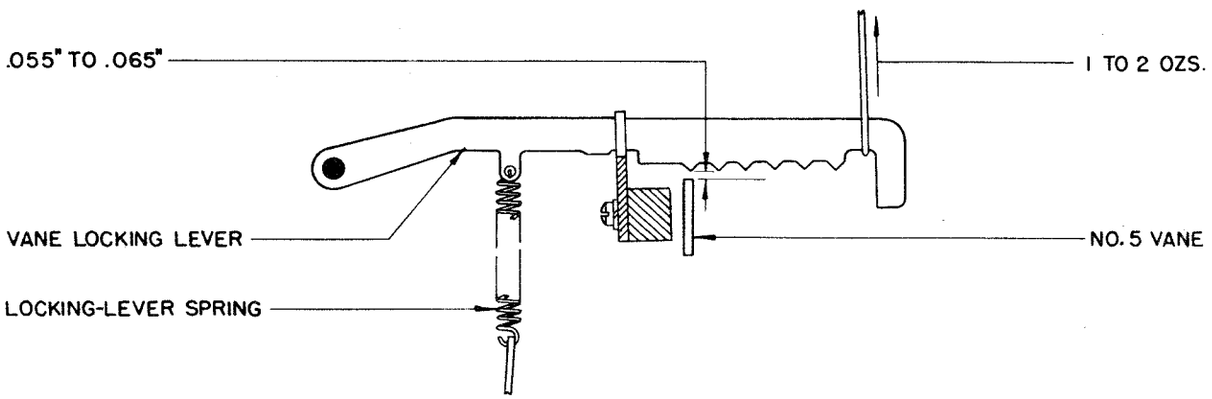


FIGURE 22
VANE LOCKING LEVER

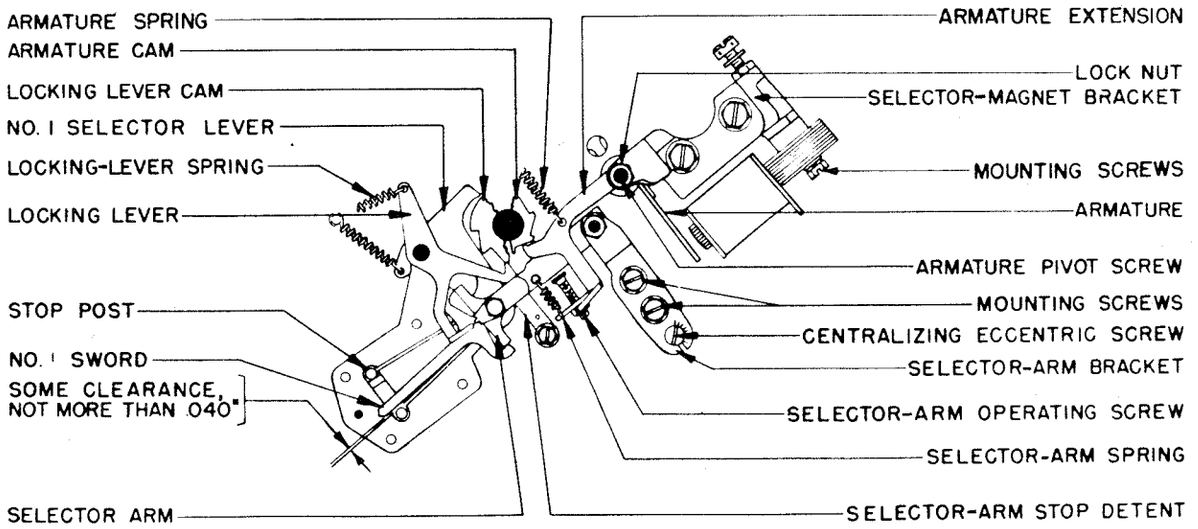


FIGURE 25
HOLDING MAGNET SELECTOR

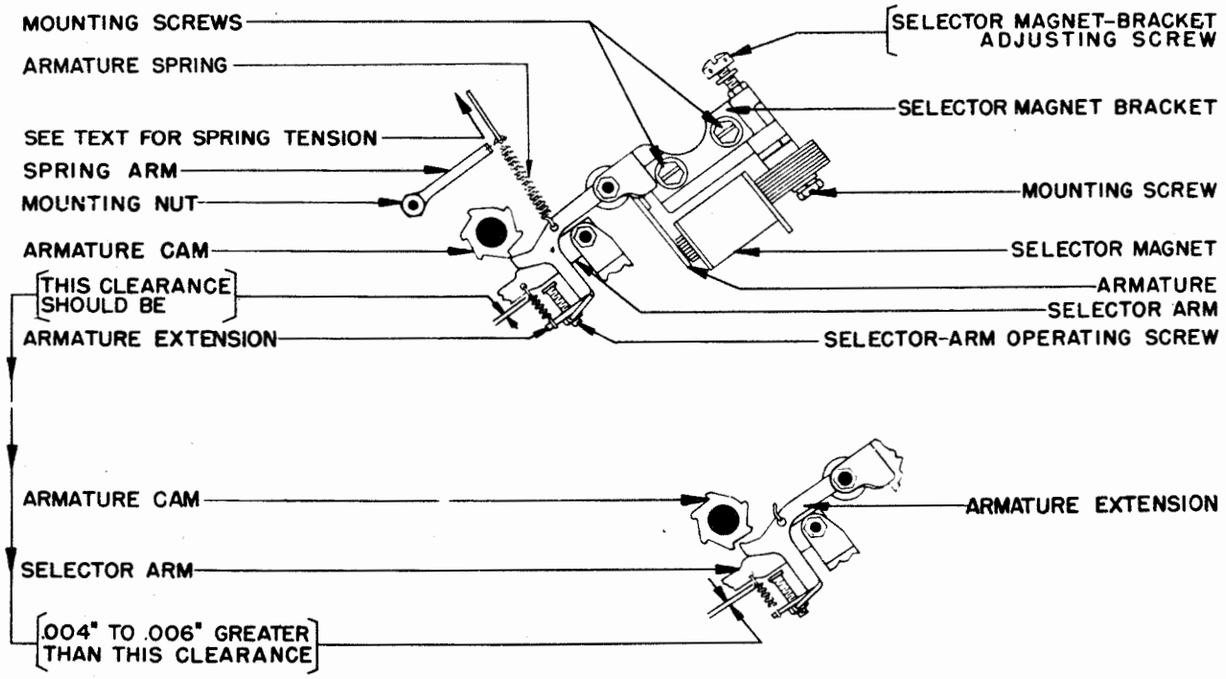


FIGURE 26
HOLDING MAGNET SELECTOR

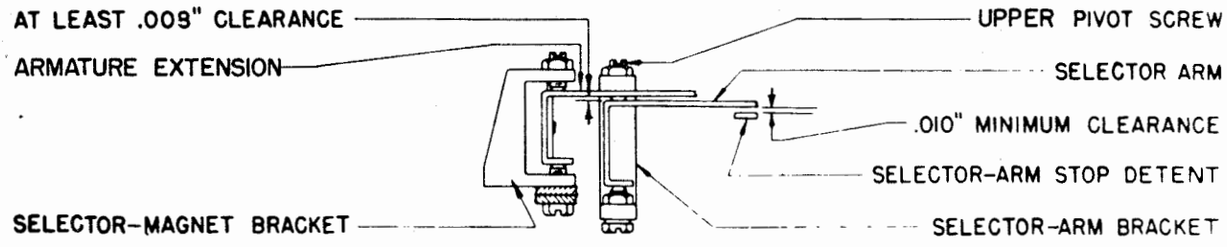


FIGURE 27
ARMATURE BRACKET

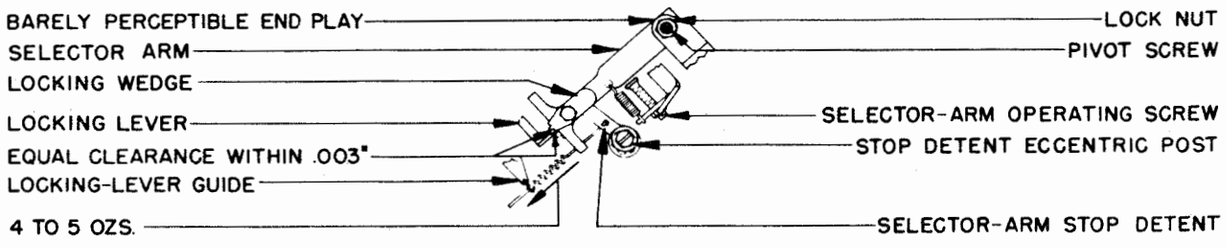


FIGURE 28
SELECTOR ARM LOCKING MECHANISM

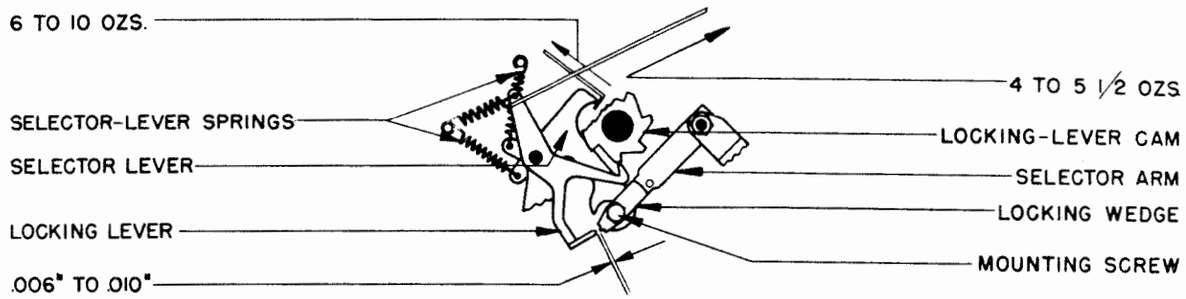


FIGURE 29
SELECTOR ARM LOCKING MECHANISM

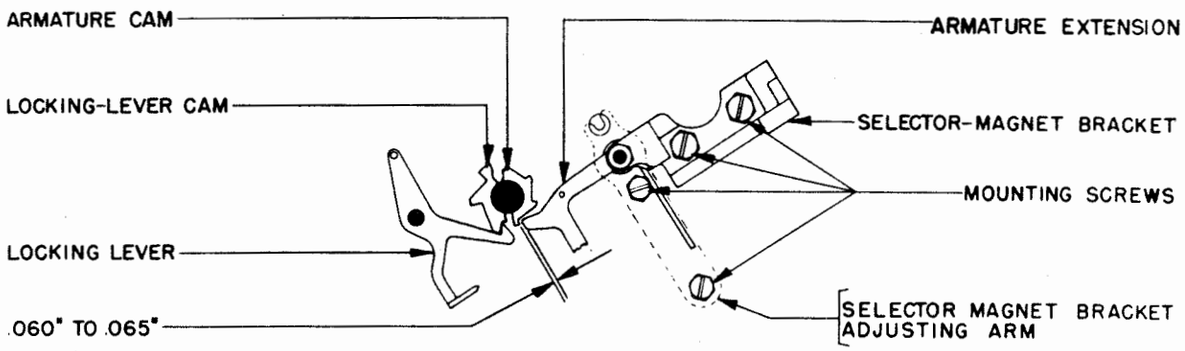


FIGURE 30
SELECTOR MAGNET BRACKET

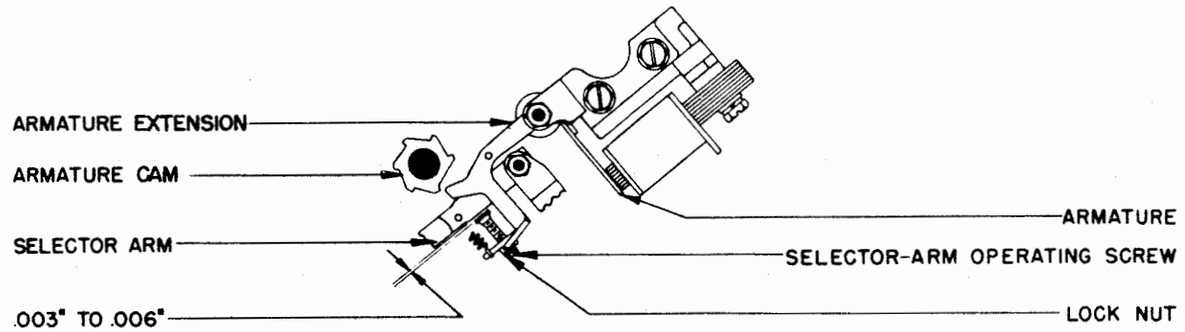


FIGURE 31
SELECTOR ARM OPERATING SCREW

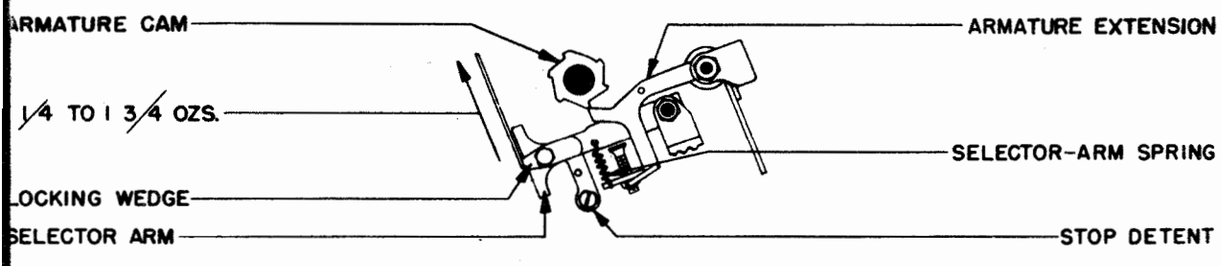


FIGURE 32
SELECTOR ARM SPRING

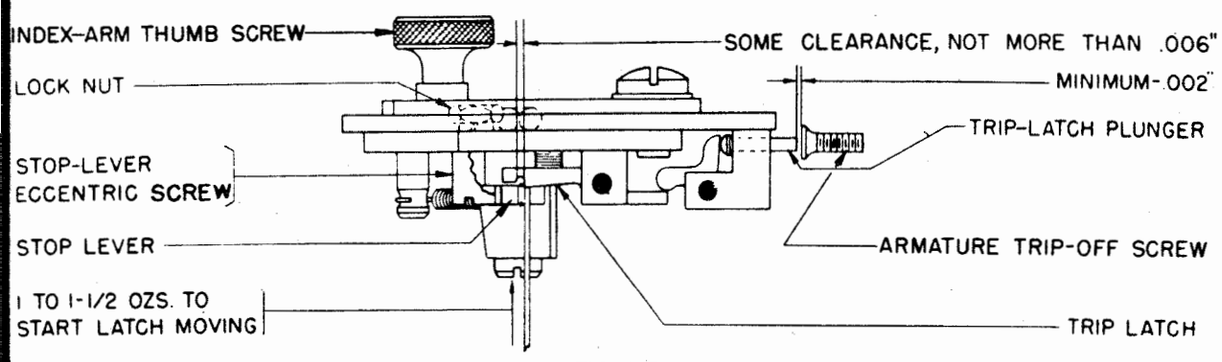


FIGURE 33
RANGE FINDER

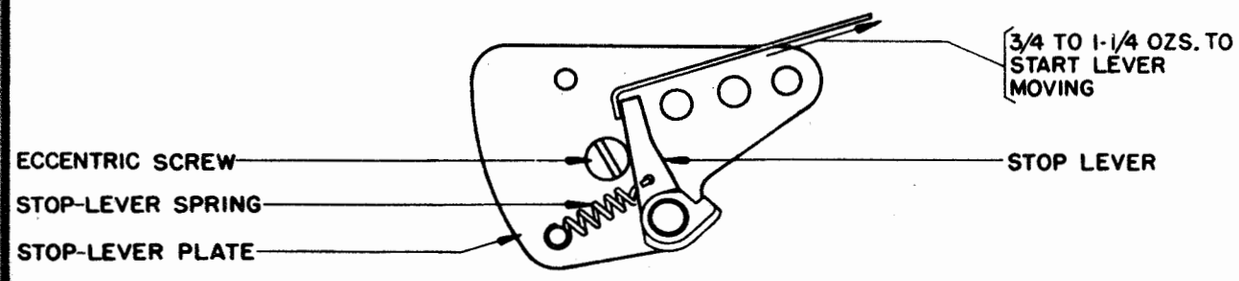


FIGURE 34
STOP LEVER

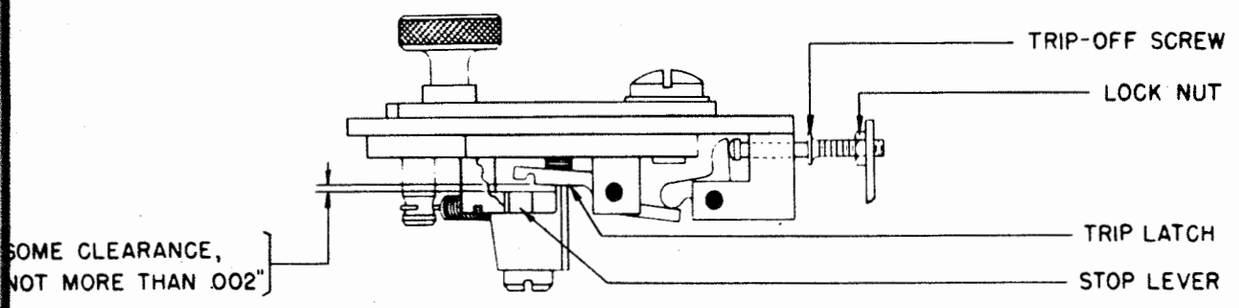


FIGURE 35
RANGE FINDER

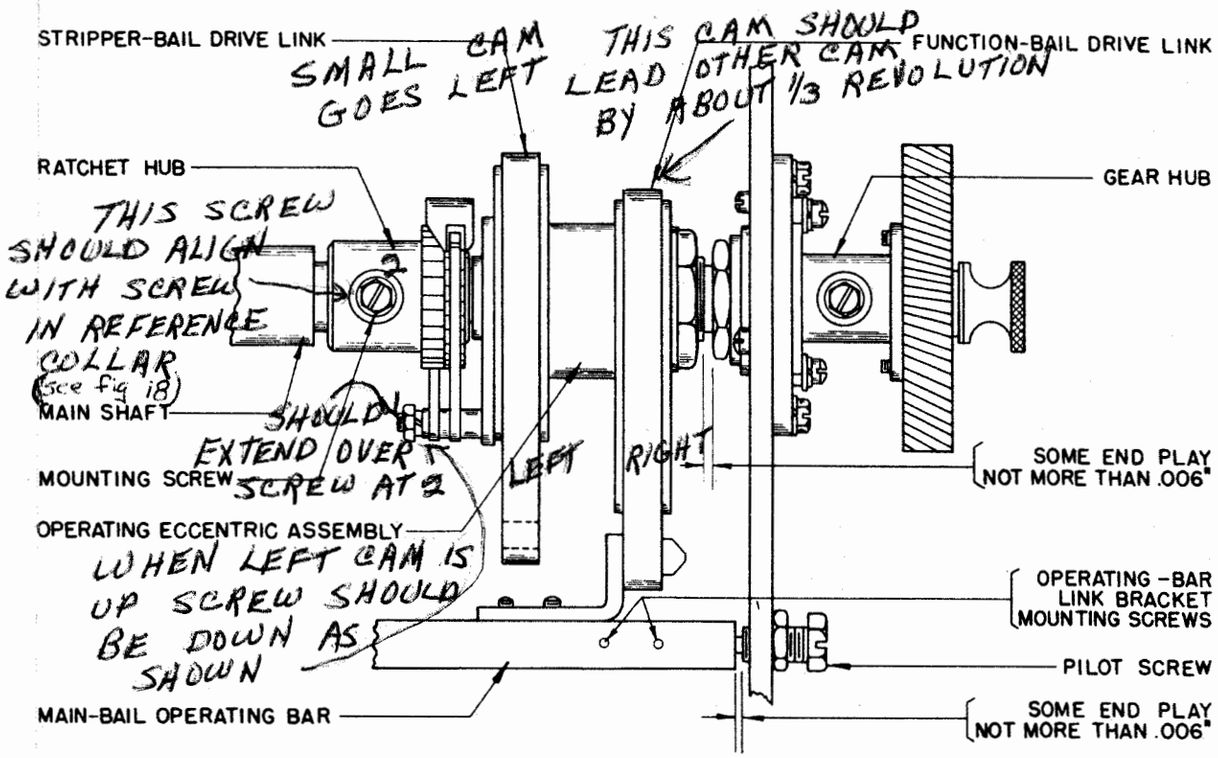


FIGURE 36
MAIN SHAFT ASSEMBLY

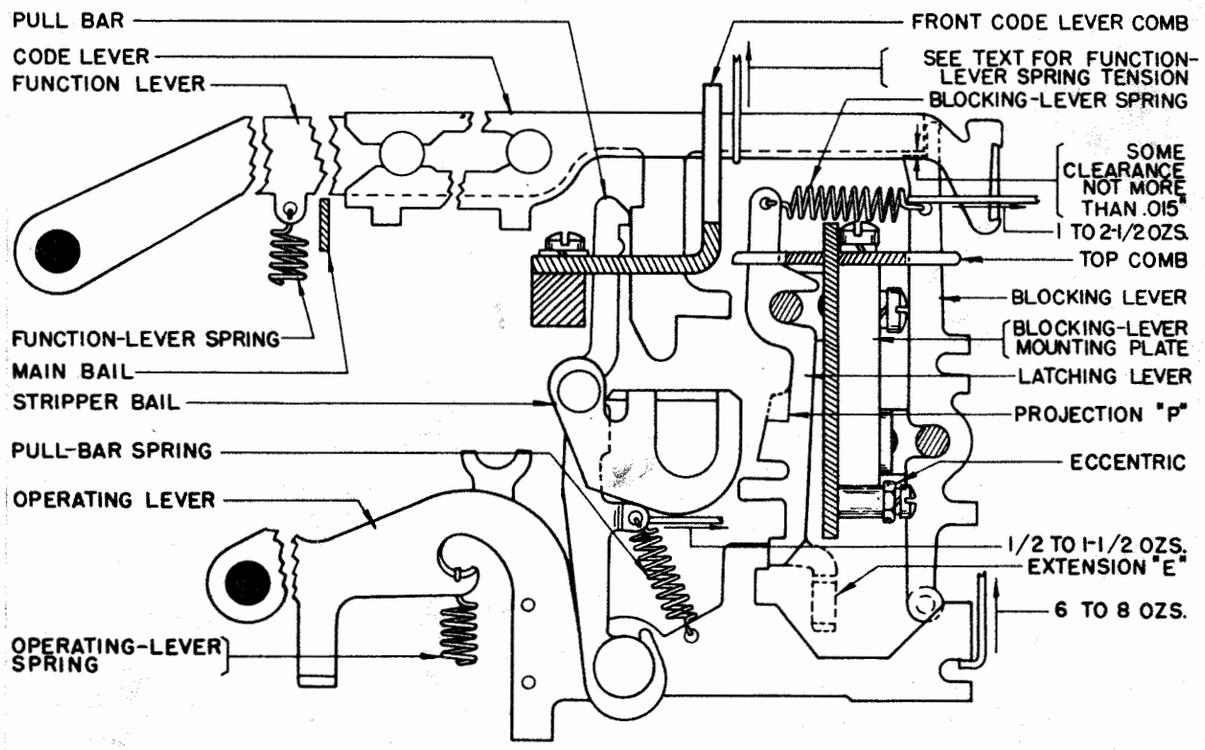


FIGURE 37
CONTACT CONTROL MECHANISM

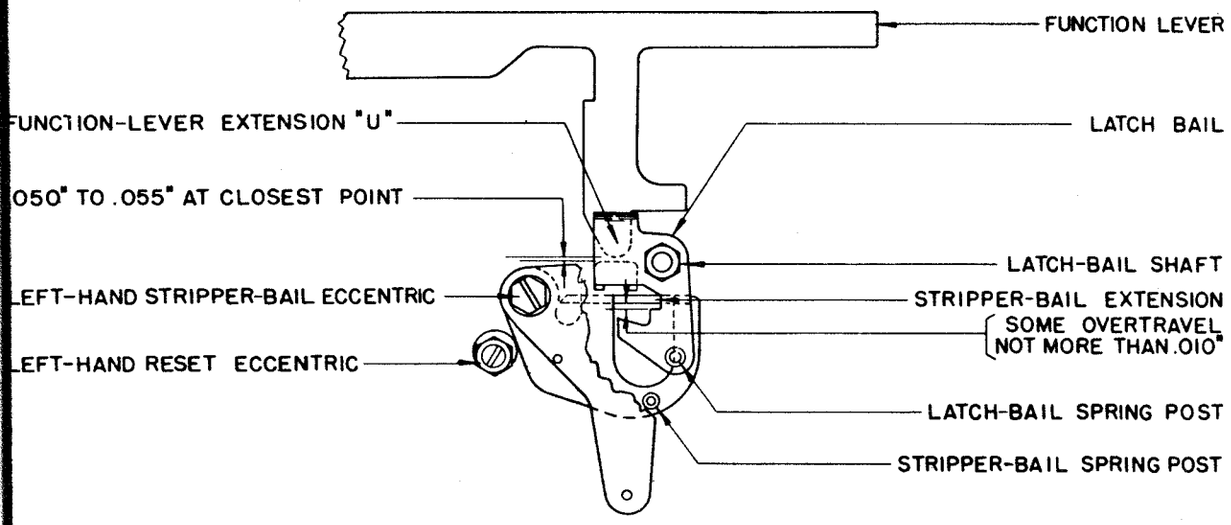


FIGURE 38
STRIPPER BAIL CONTROL MECHANISM

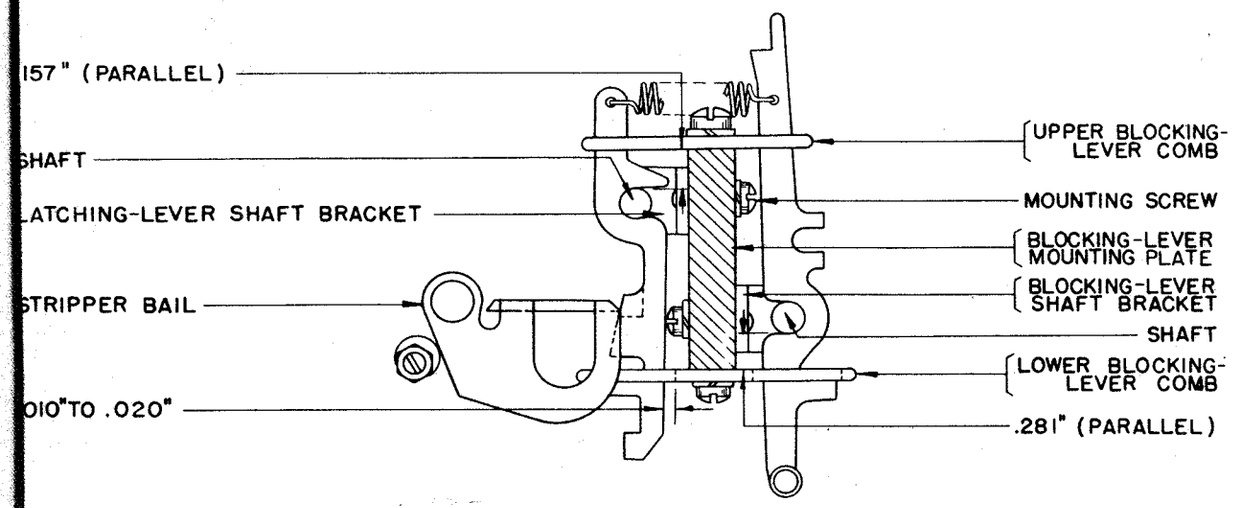


FIGURE 39
BLOCKING AND LATCHING LEVER ASSEMBLY

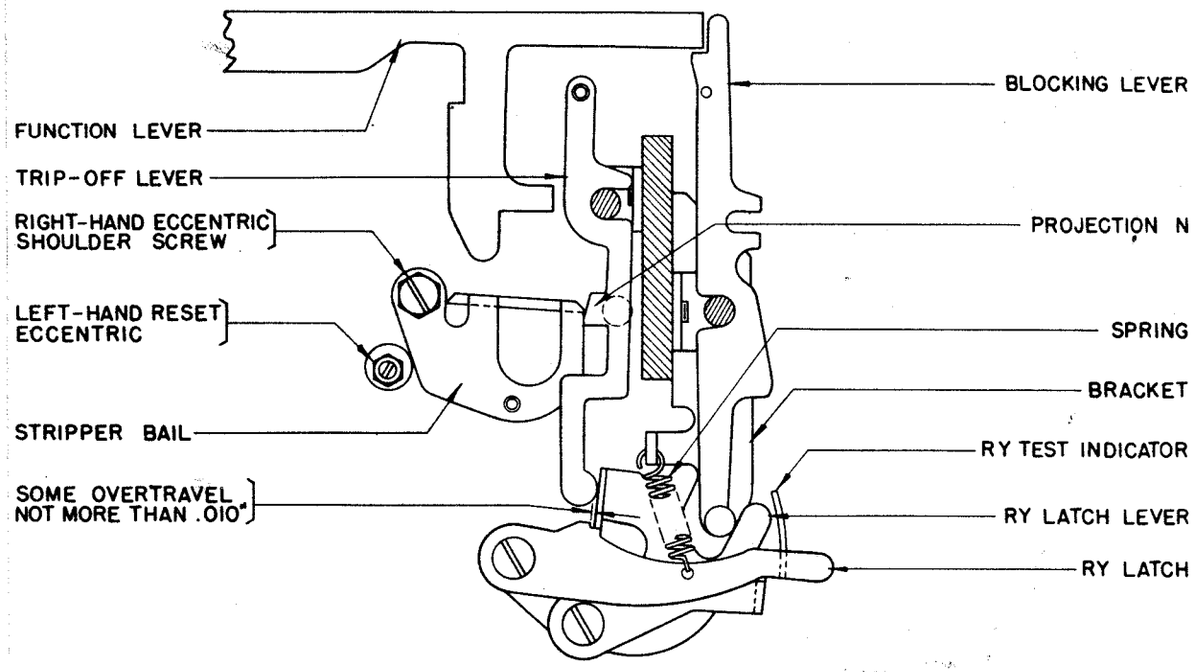


FIGURE 40
RY TEST MECHANISM

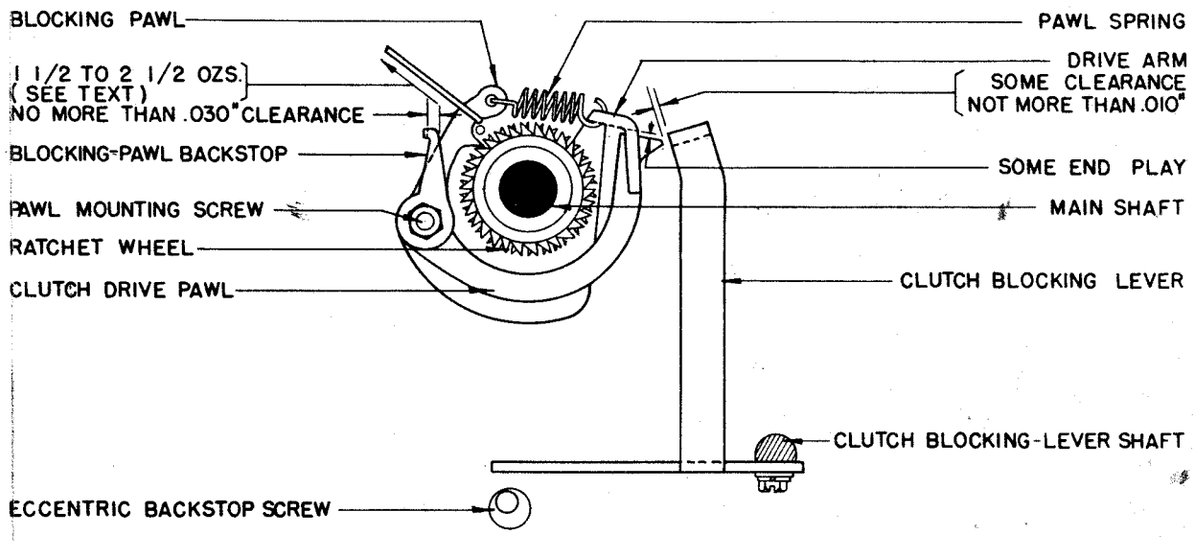


FIGURE 41
OPERATING CLUTCH MECHANISM

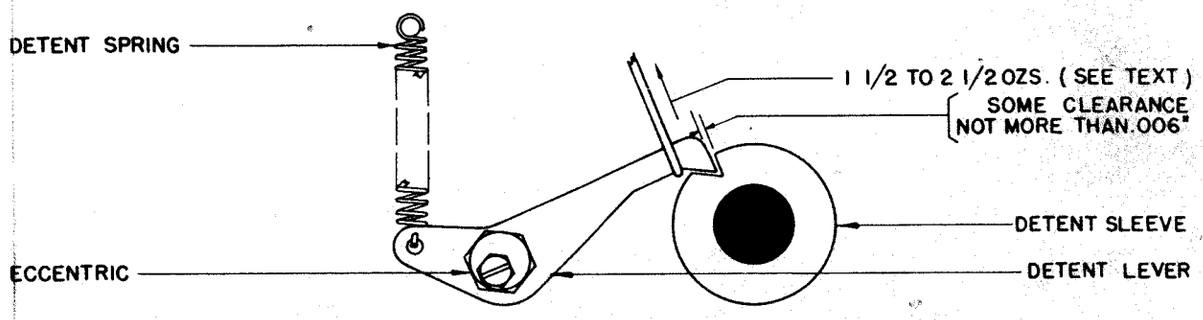


FIGURE 42
OPERATING ECCENTRIC DETENT

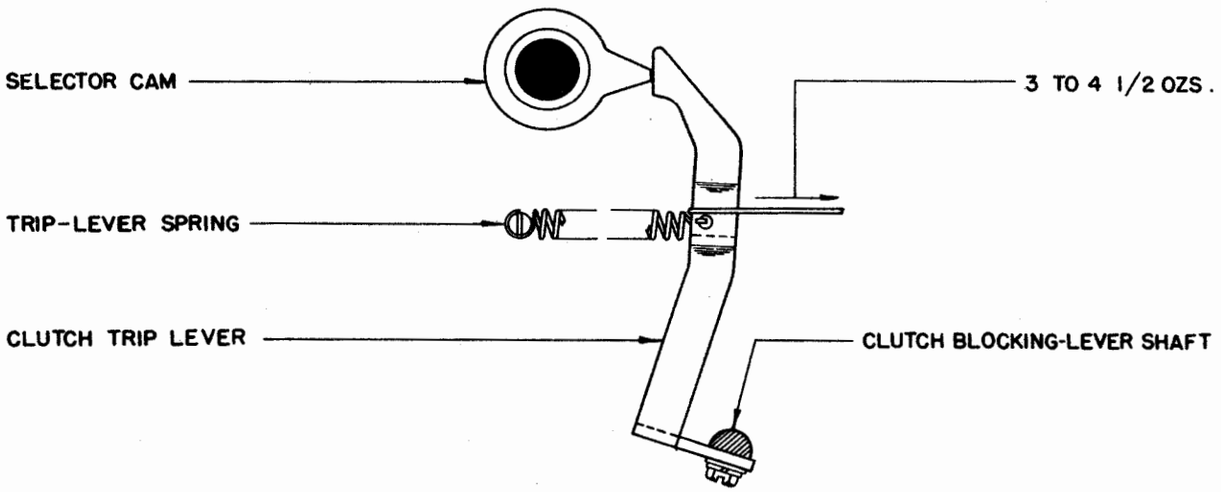


FIGURE 43
CLUTCH TRIP LEVER

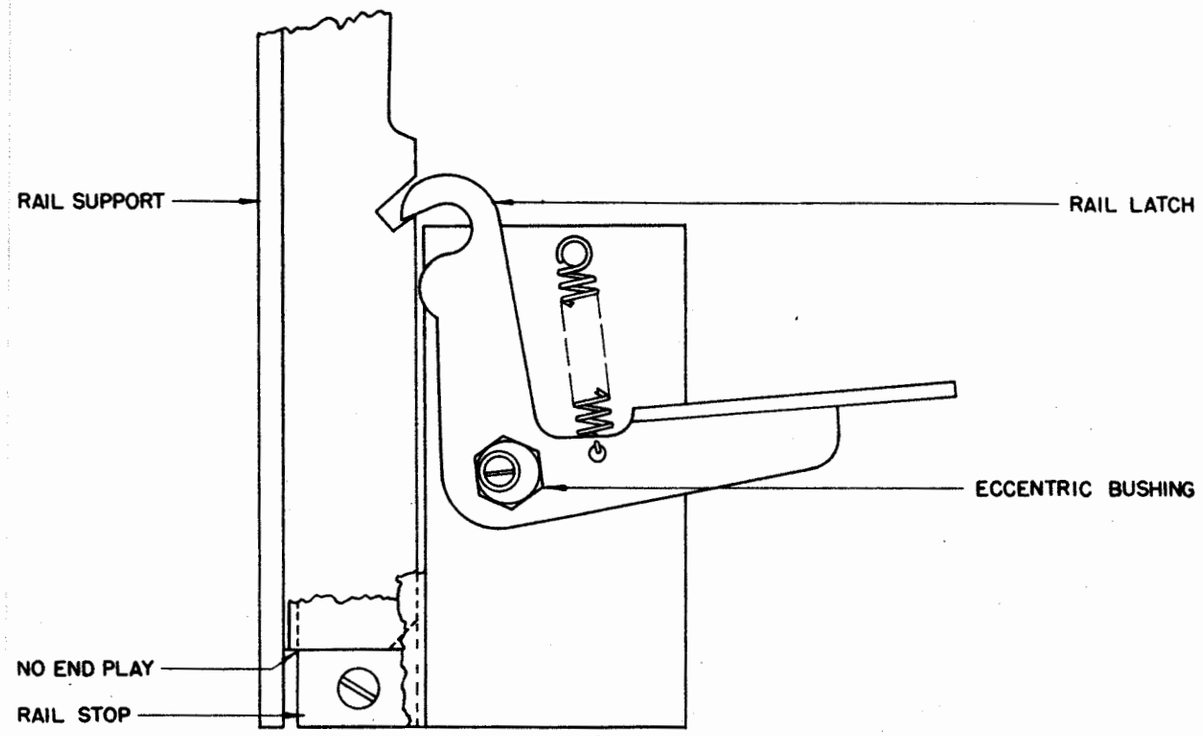


FIGURE 46
SELECTOR PANEL LATCH

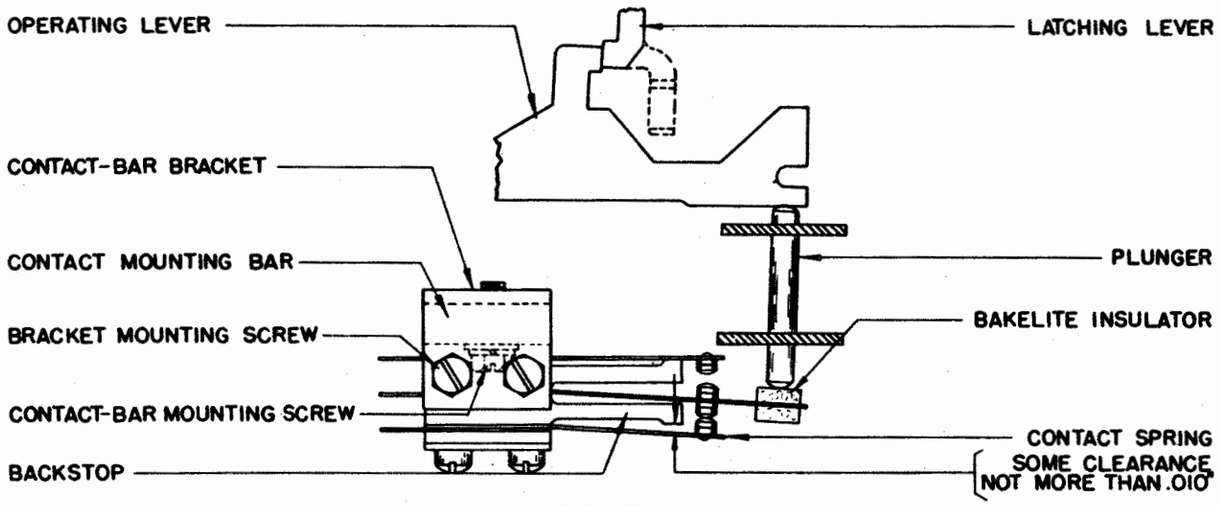


FIGURE 44
CONTACT MECHANISM

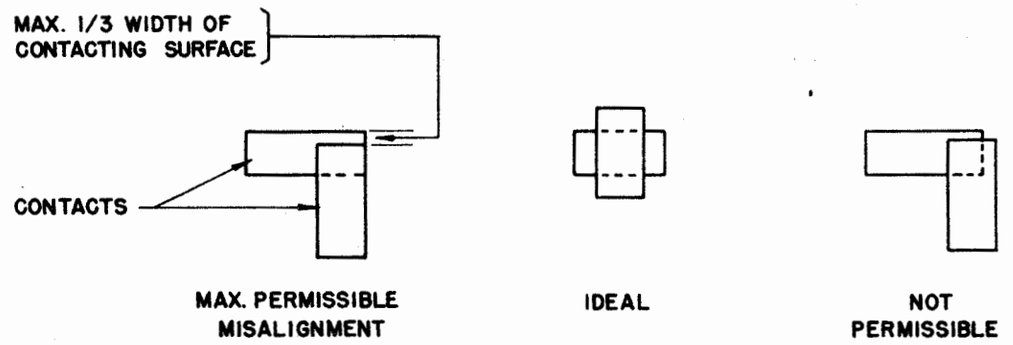


FIGURE 47
CONTACT ALIGNMENT

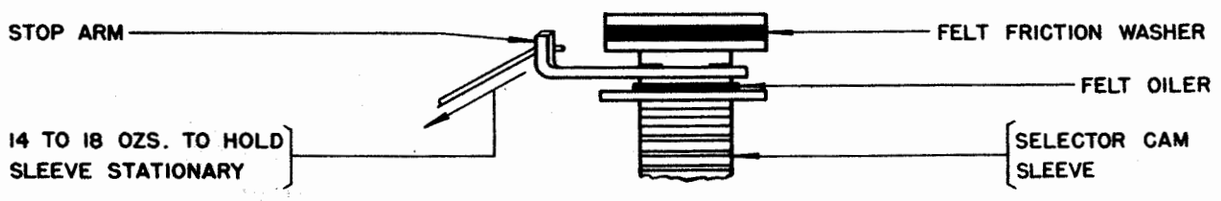


FIGURE 45
SELECTOR CAM SLEEVE

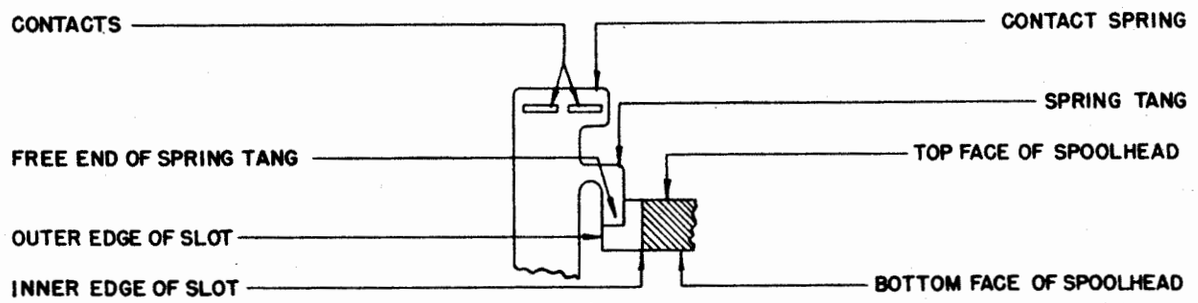


FIGURE 48
RELAY CONTACT SPRING

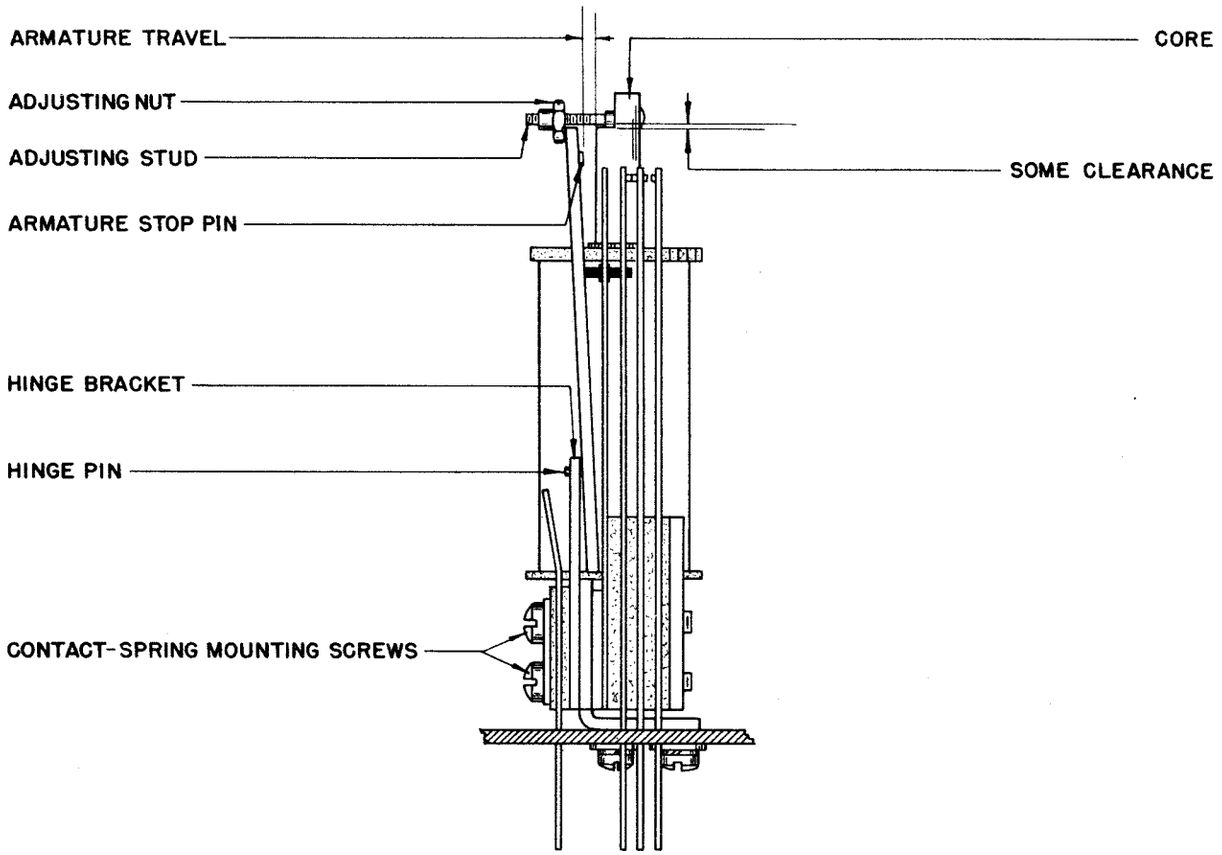


FIGURE 49
RELAY

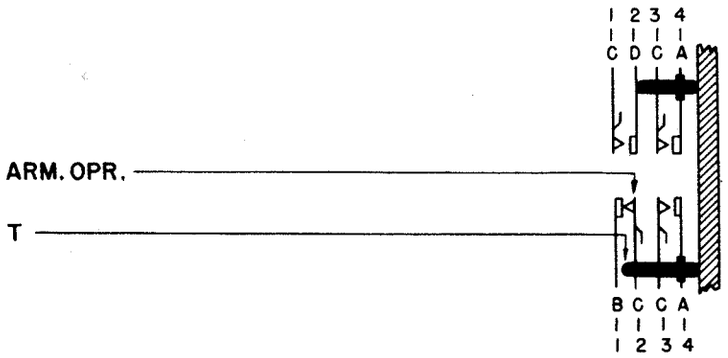


FIGURE 52
RELAY CONTACT SPRINGS

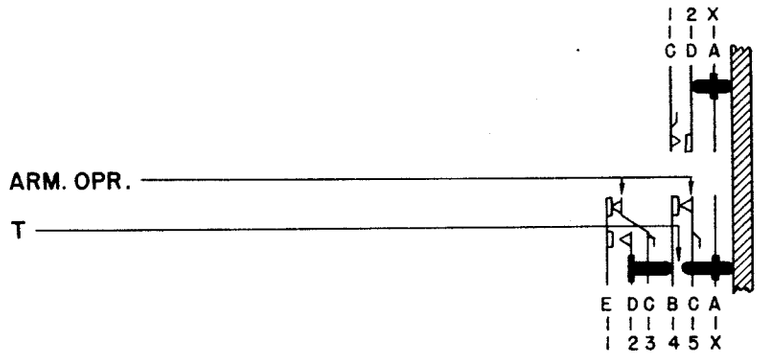


FIGURE 51
RELAY CONTACT SPRINGS

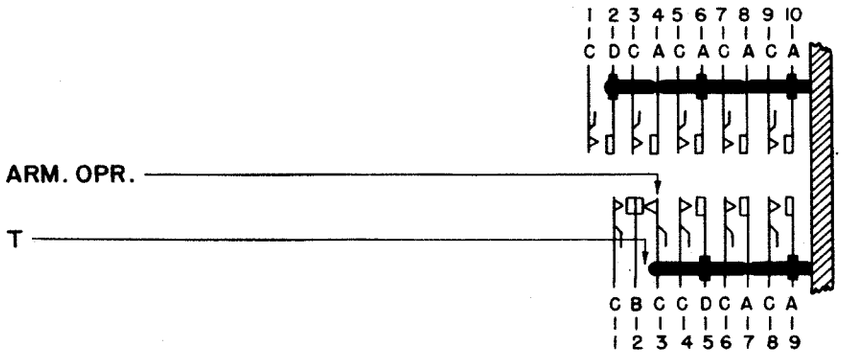


FIGURE 50
RELAY CONTACT SPRINGS

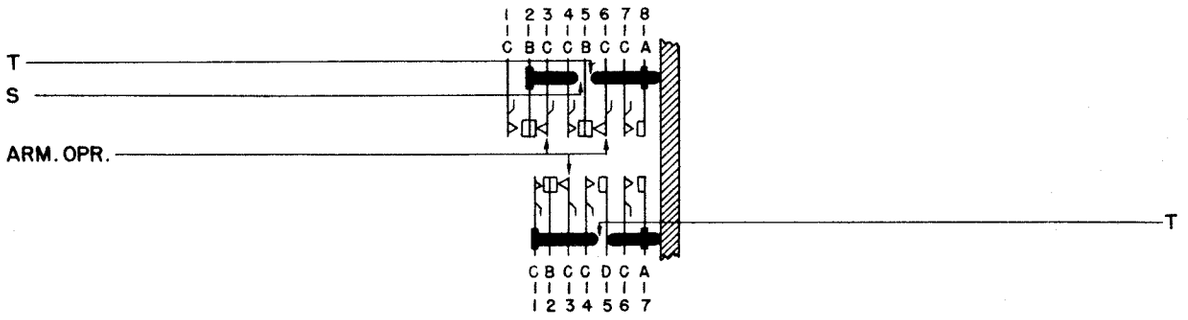


FIGURE 53
RELAY CONTACT SPRINGS

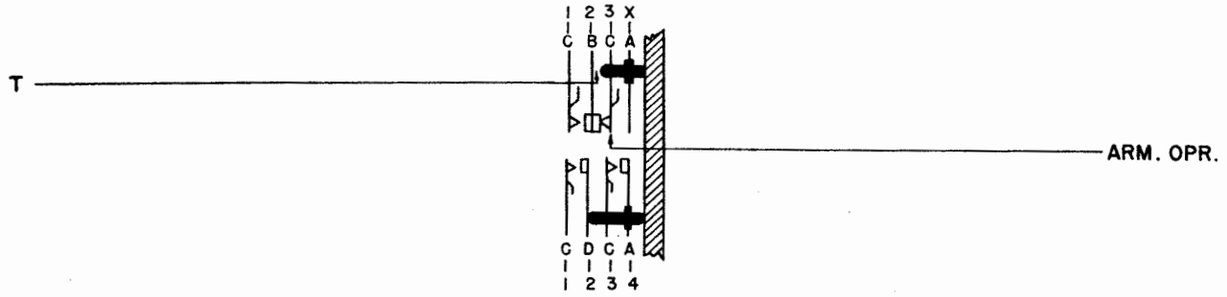


FIGURE 54
RELAY CONTACT SPRINGS

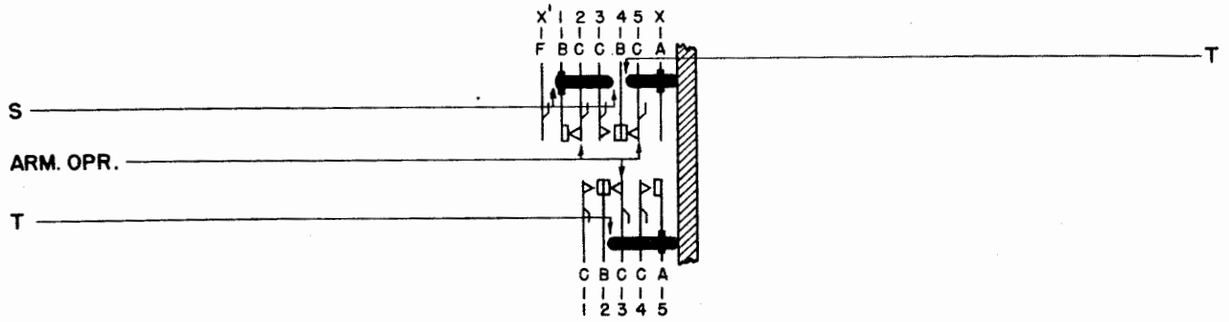


FIGURE 55
RELAY CONTACT SPRINGS

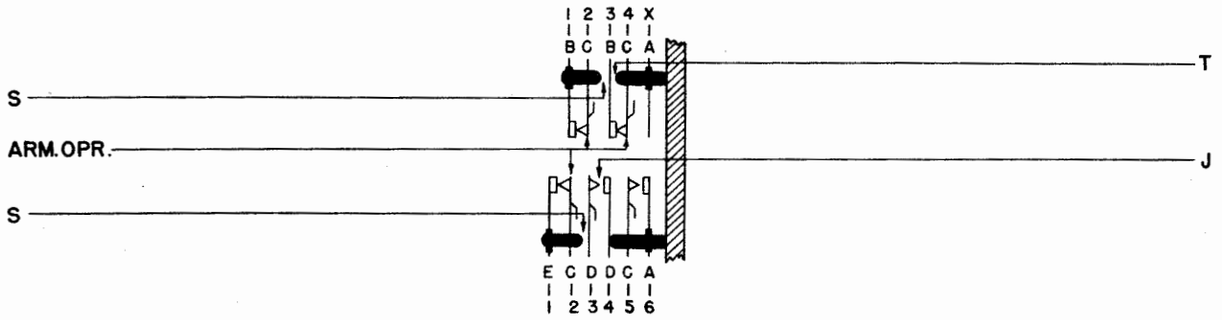


FIGURE 56
RELAY CONTACT SPRINGS

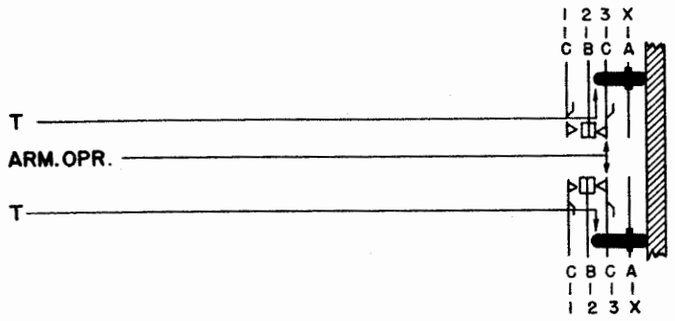


FIGURE 57
RELAY CONTACT SPRINGS

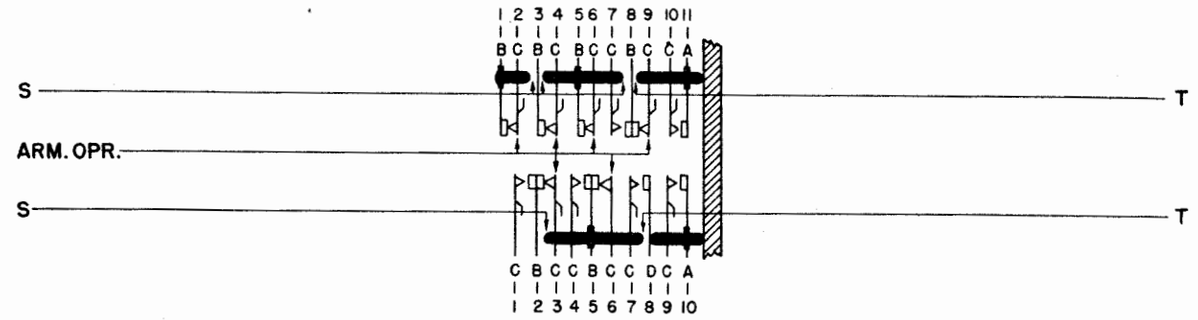


FIGURE 58
RELAY CONTACT SPRINGS

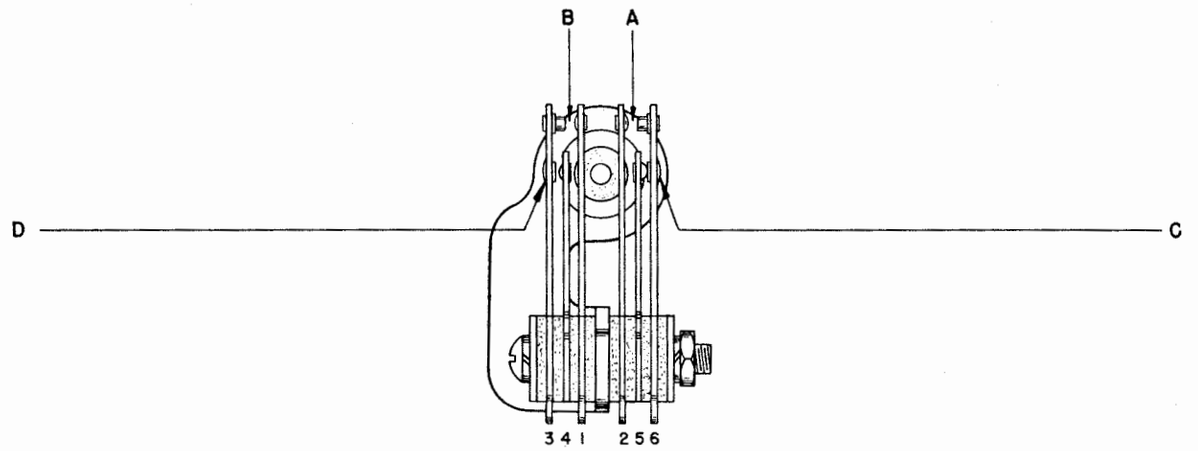


FIGURE 59
PUSH BUTTON CONTACTS

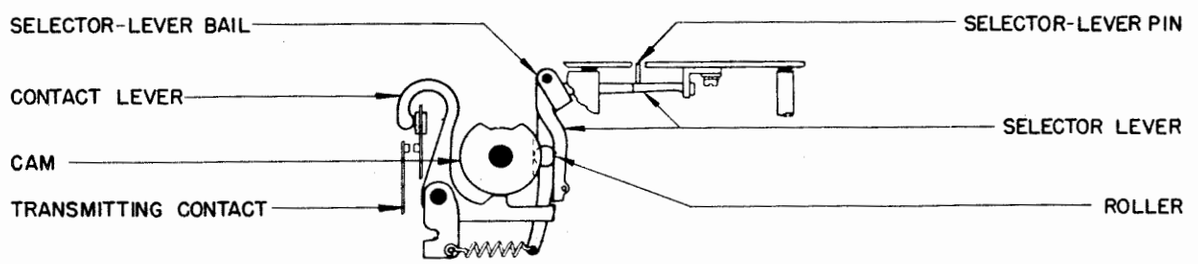


FIGURE 60
TRANSMITTING MECHANISM

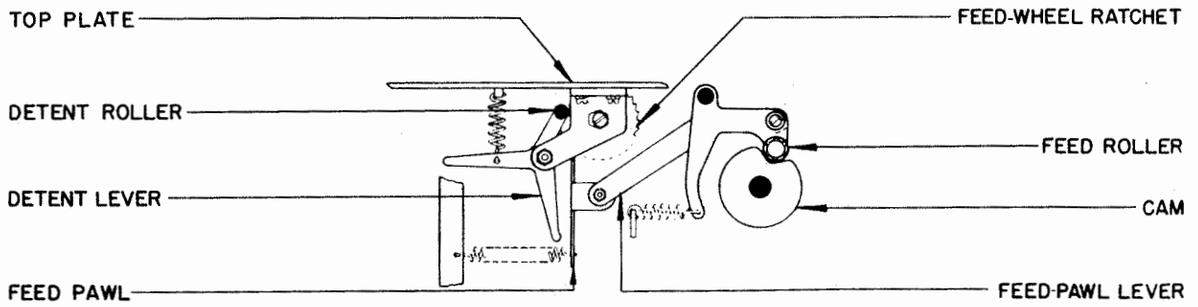


FIGURE 61
DETENTING MECHANISM

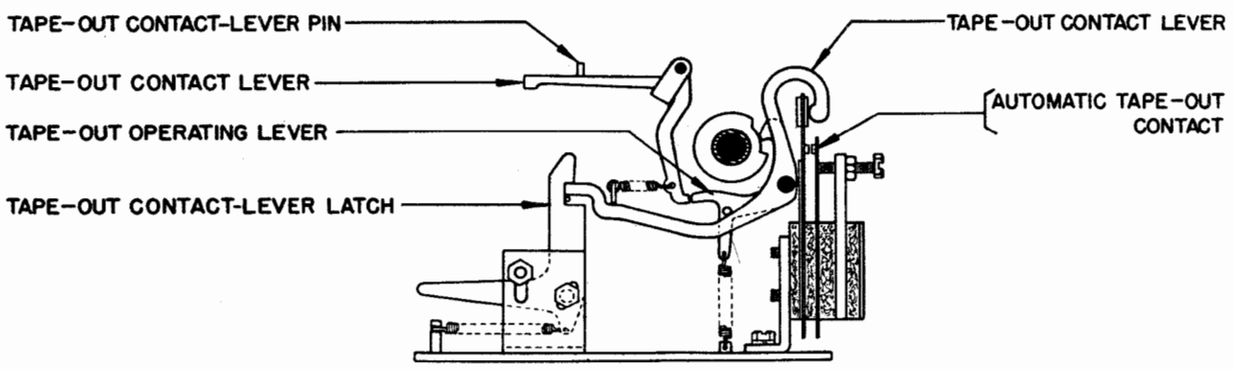


FIGURE 62
TAPE - OUT MECHANISM

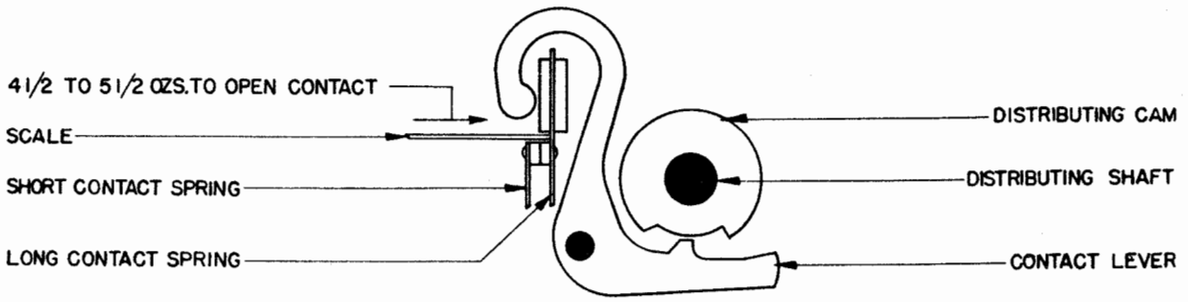


FIGURE 65
CONTACT MECHANISM

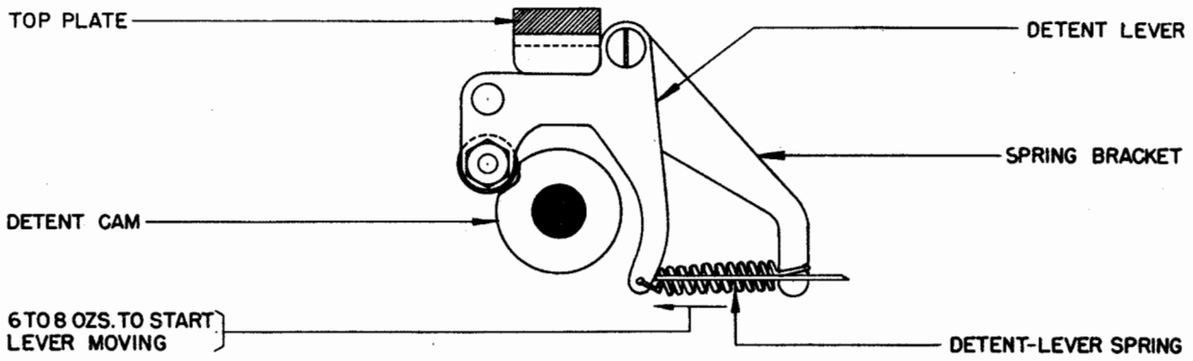


FIGURE 66
CAM SLEEVE DETENT ASSEMBLY

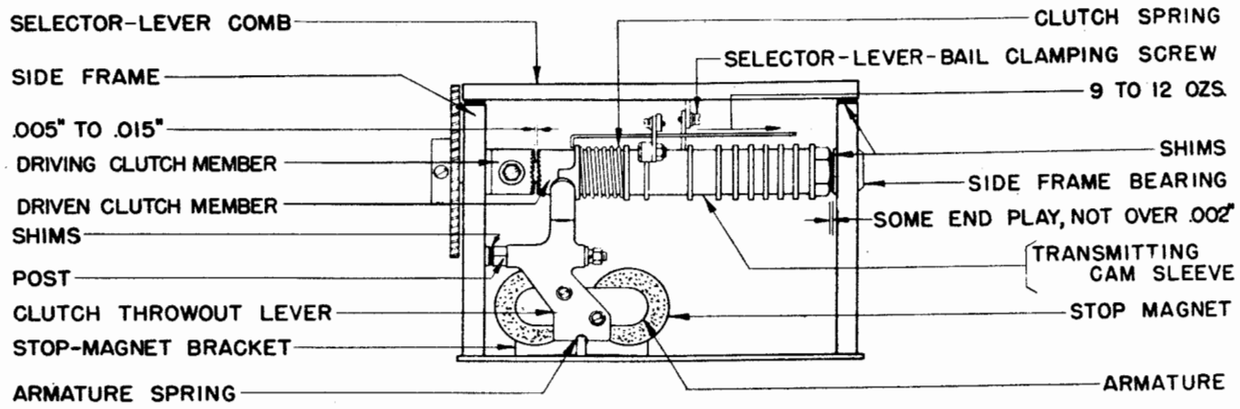


FIGURE 63
TRANSMITTING CAM ASSEMBLY

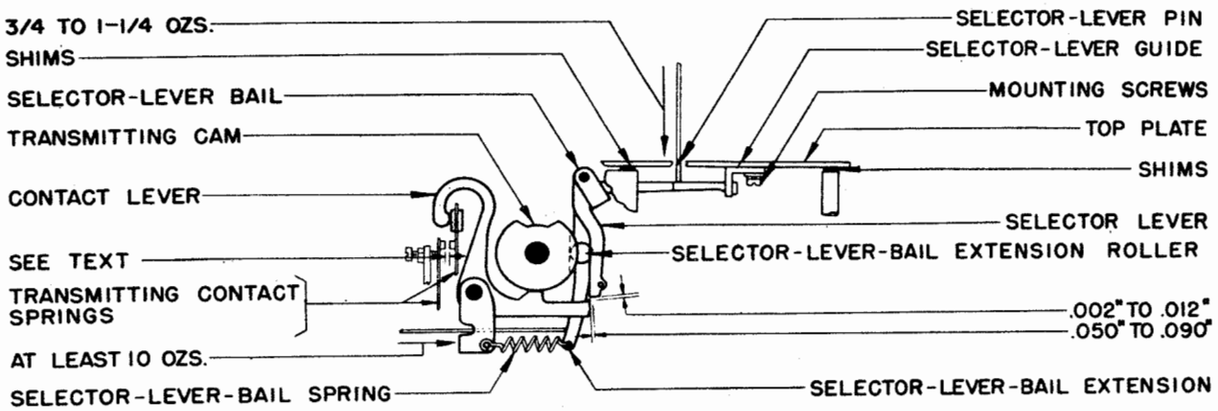


FIGURE 64
TRANSMITTING MECHANISM

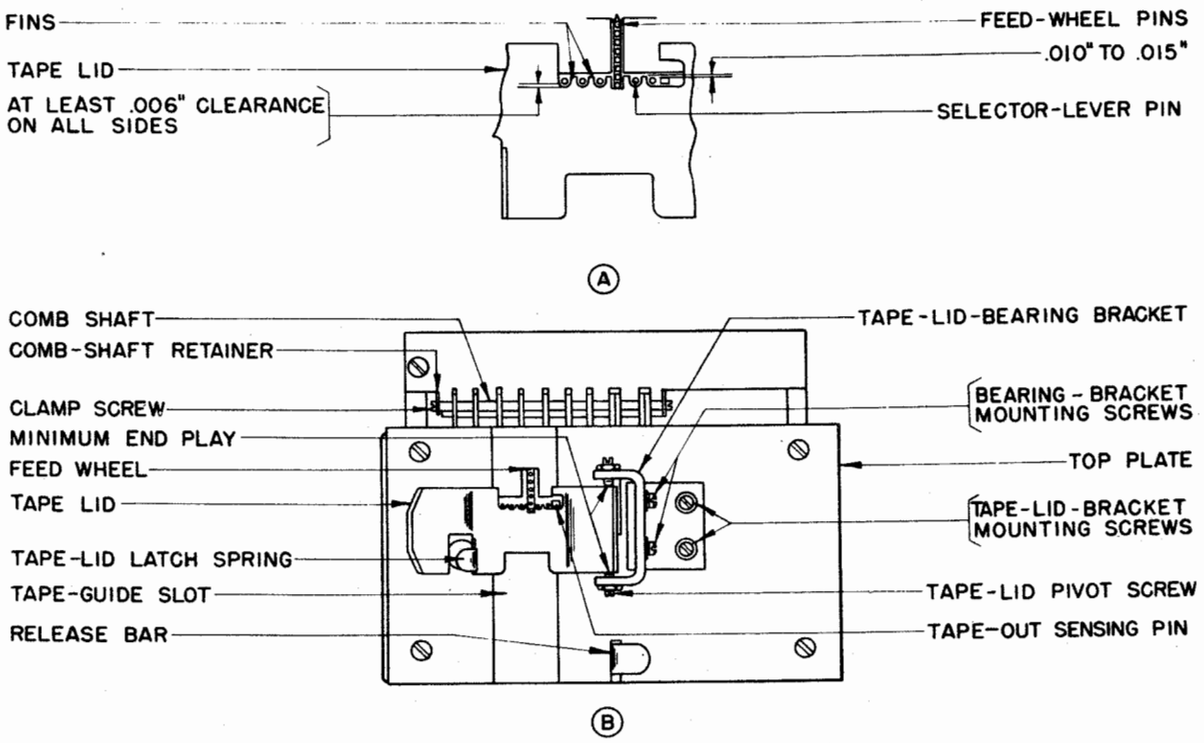


FIGURE 67
TOP PLATE ASSEMBLY

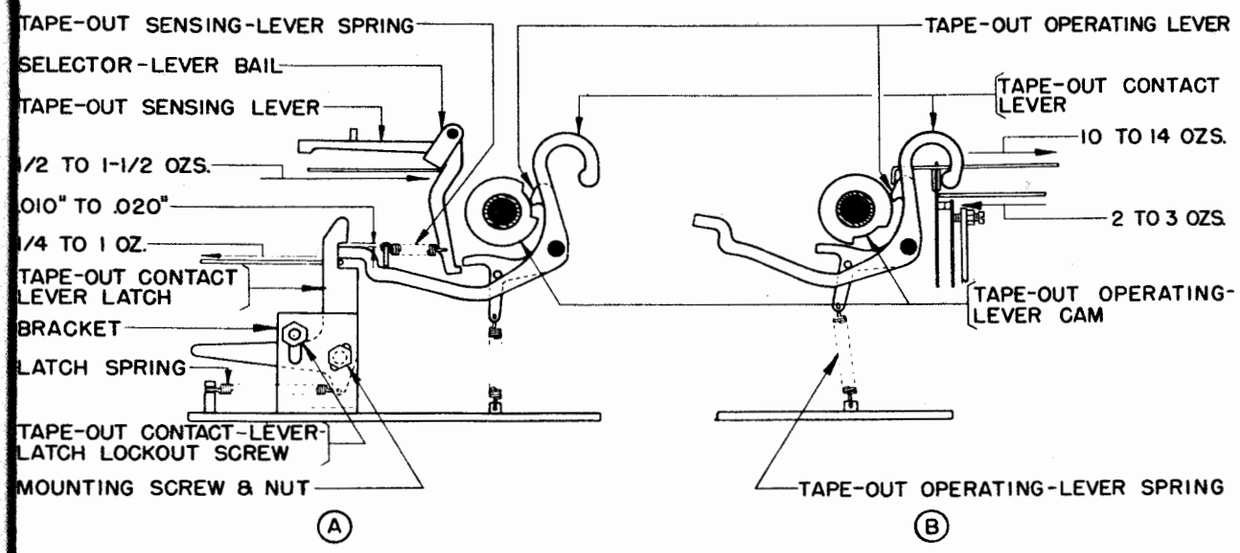


FIGURE 68
AUTOMATIC TAPE-OUT MECHANISM

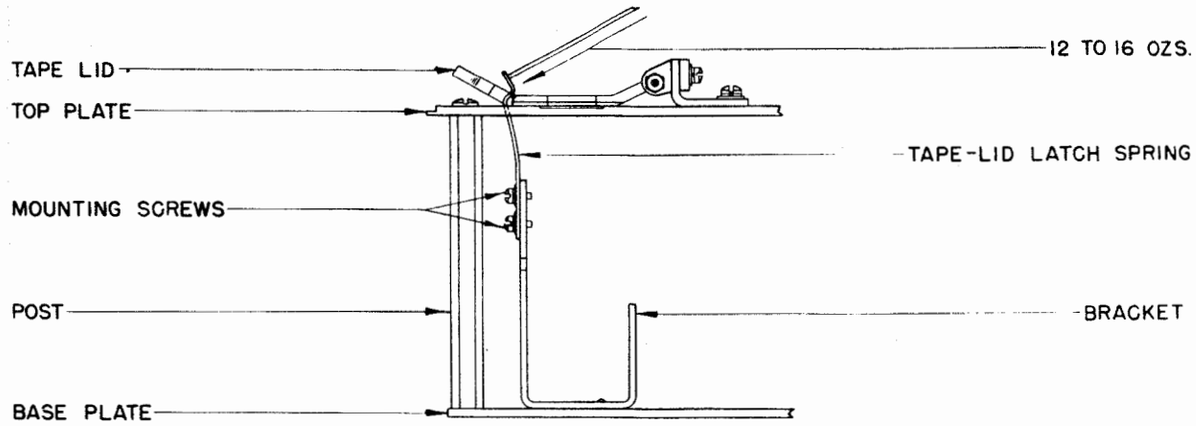


FIGURE 71
TAPE LID ASSEMBLY

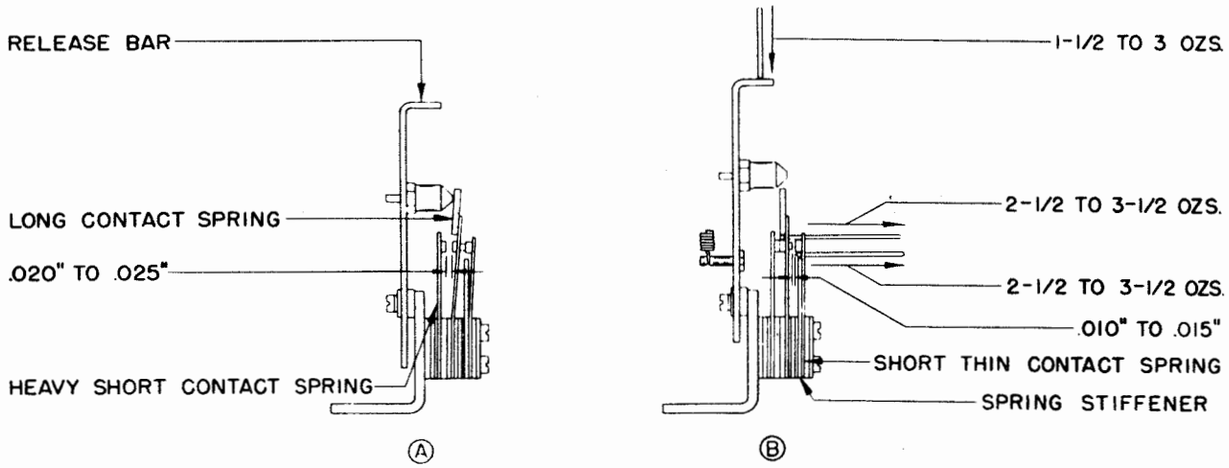


FIGURE 69
MANUAL TAPE-OUT CONTACT

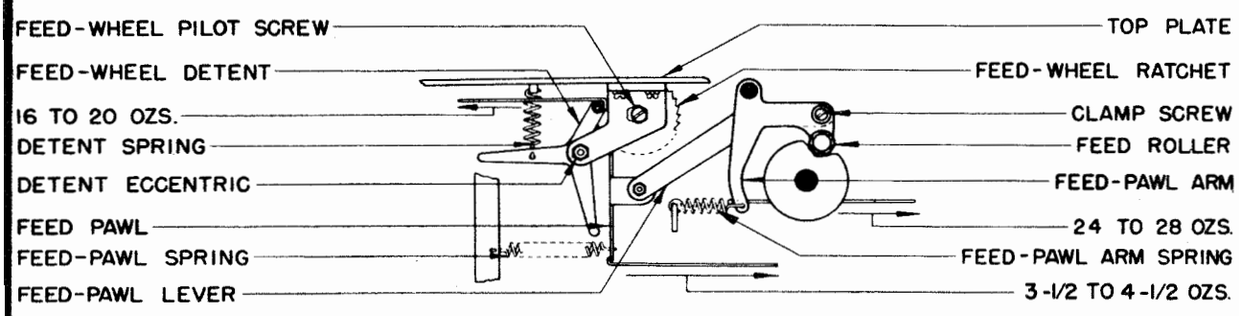


FIGURE 70
TAPE FEED MECHANISM

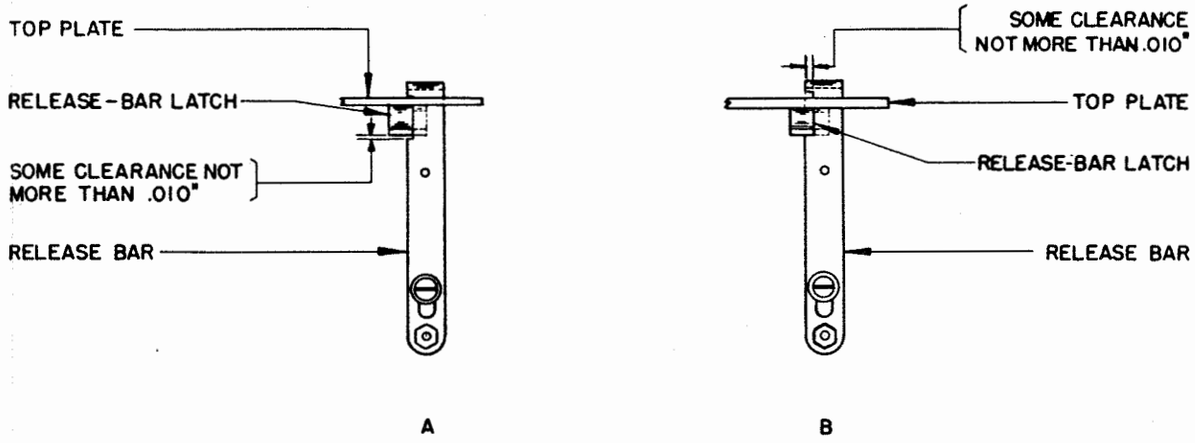


FIGURE 72
RELEASE BAR LATCH

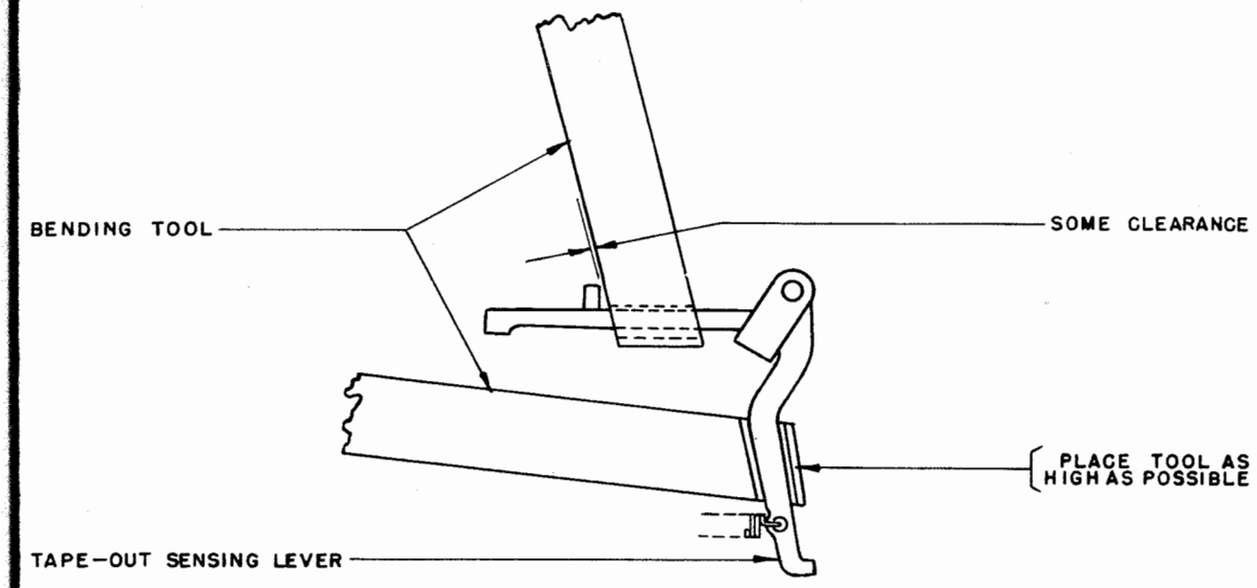


FIGURE 73
TAPE -OUT SENSING LEVER

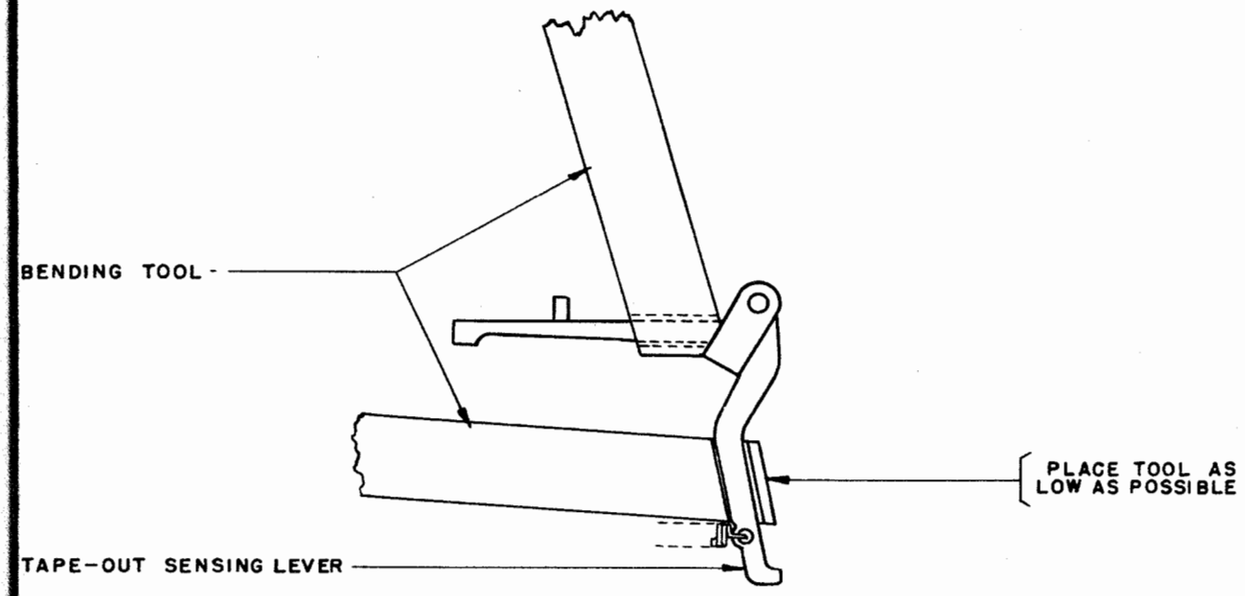


FIGURE 74
TAPE-OUT SENSING LEVER

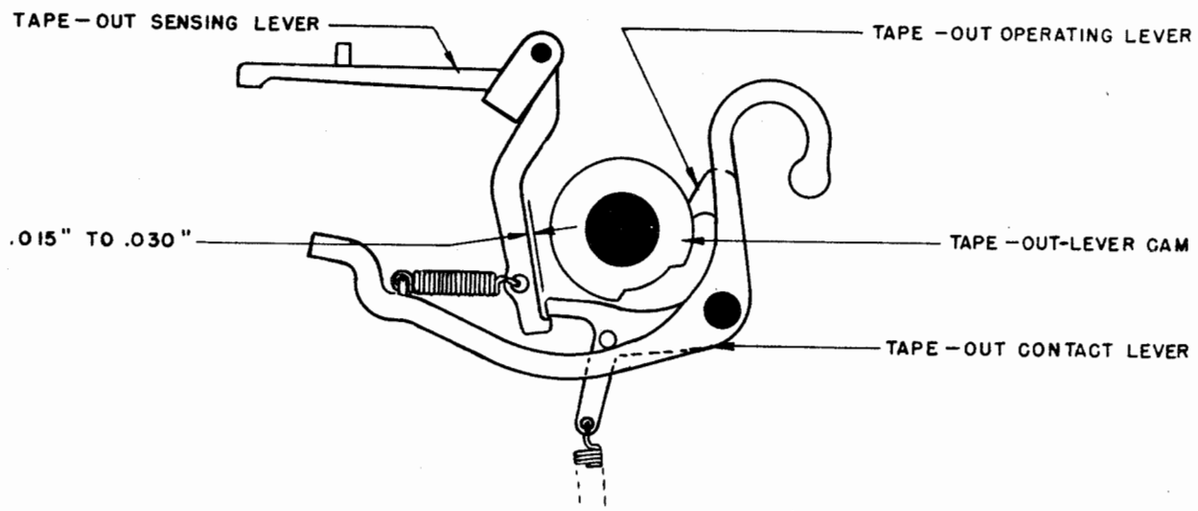


FIGURE 75
TAPE-OUT CONTACT LEVER

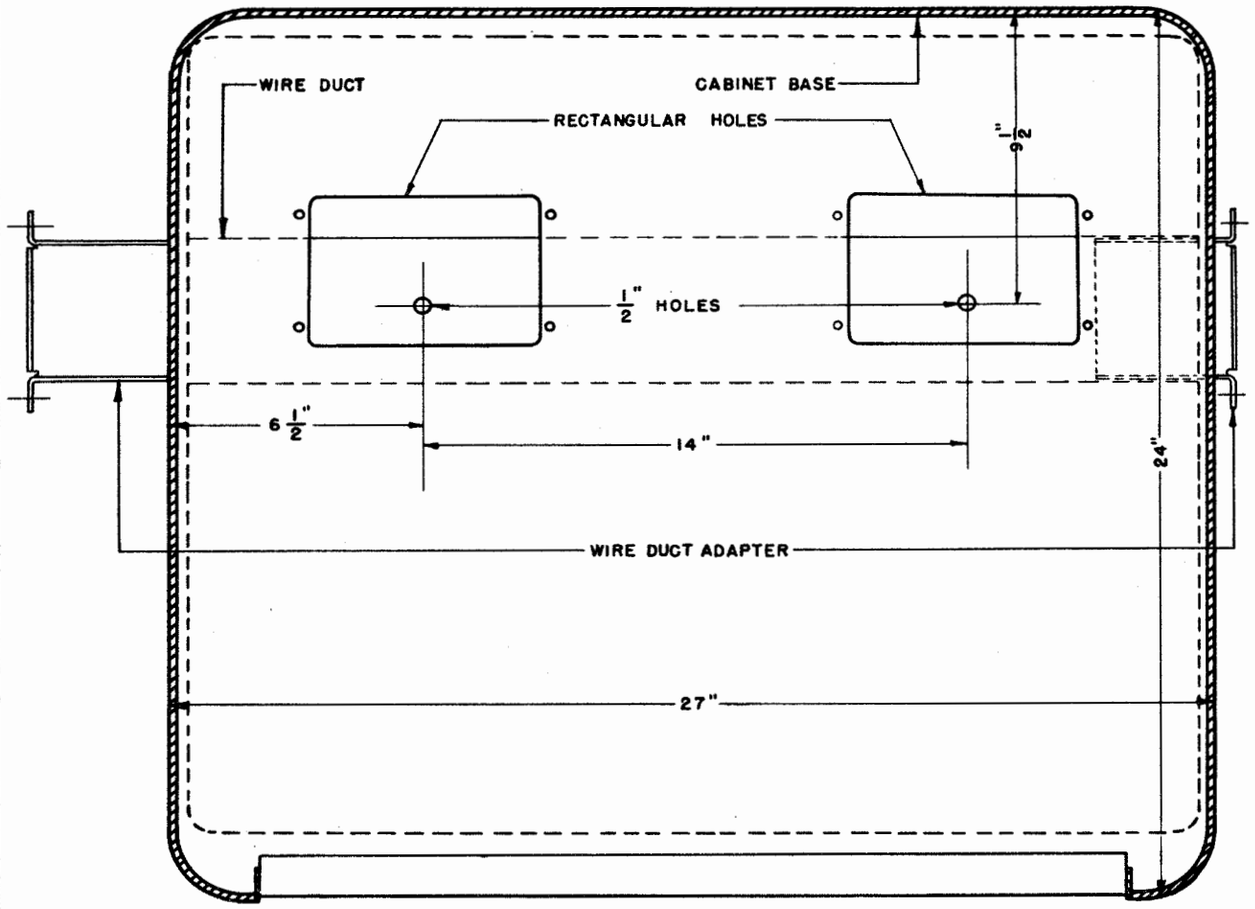
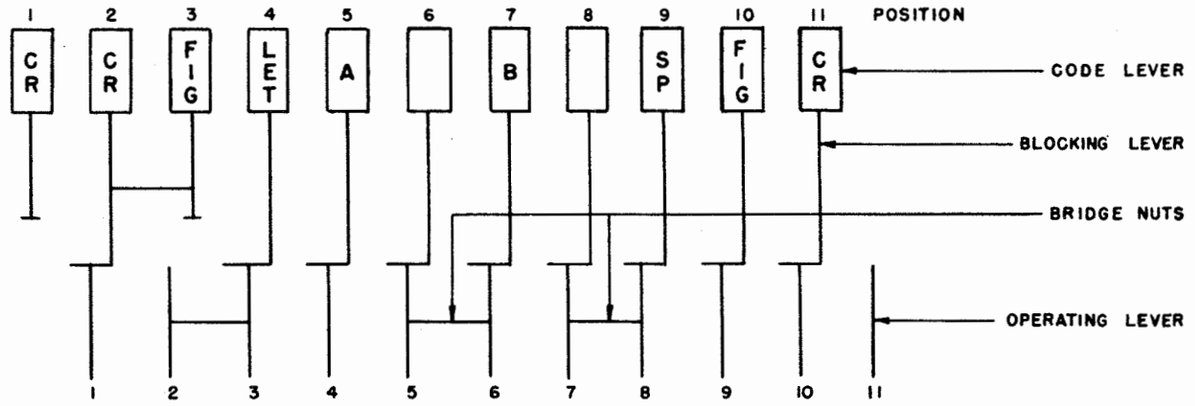
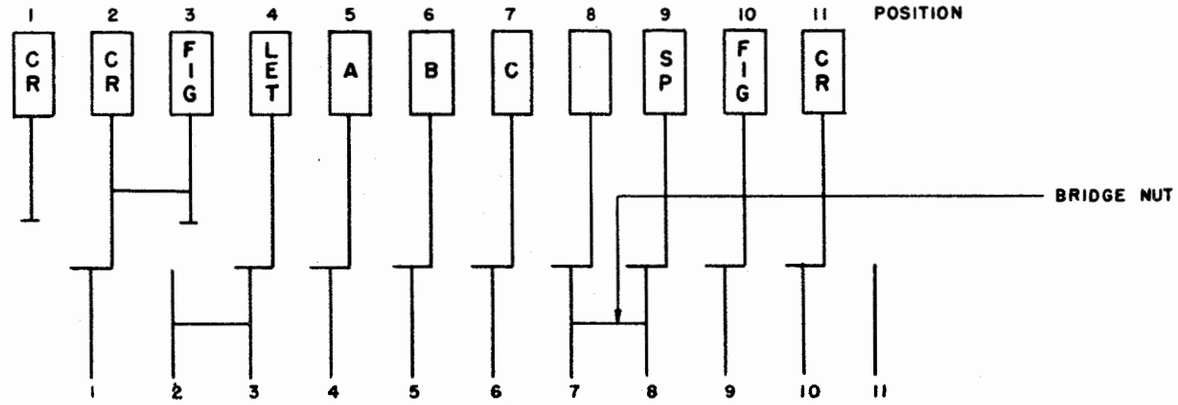


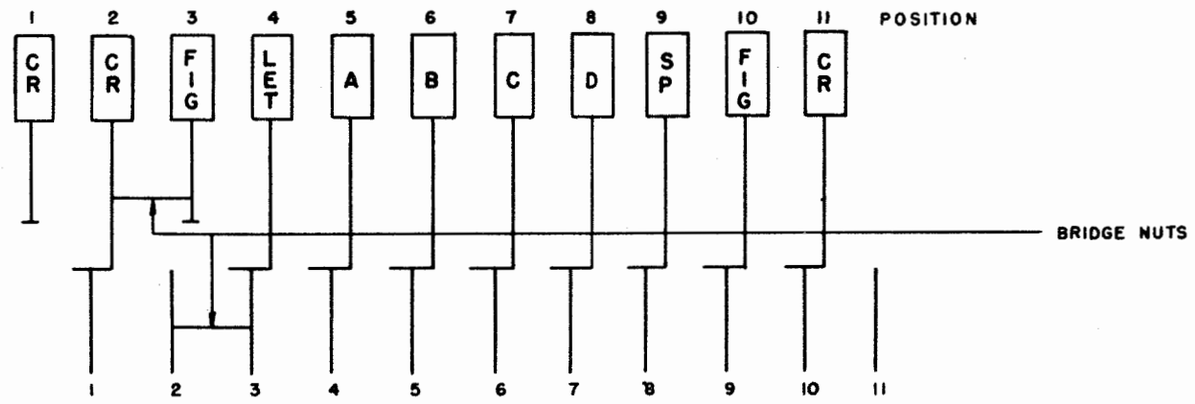
FIGURE 76
APPARATUS CABINET BASE



TWO—LETTER SECONDARY SELECTOR

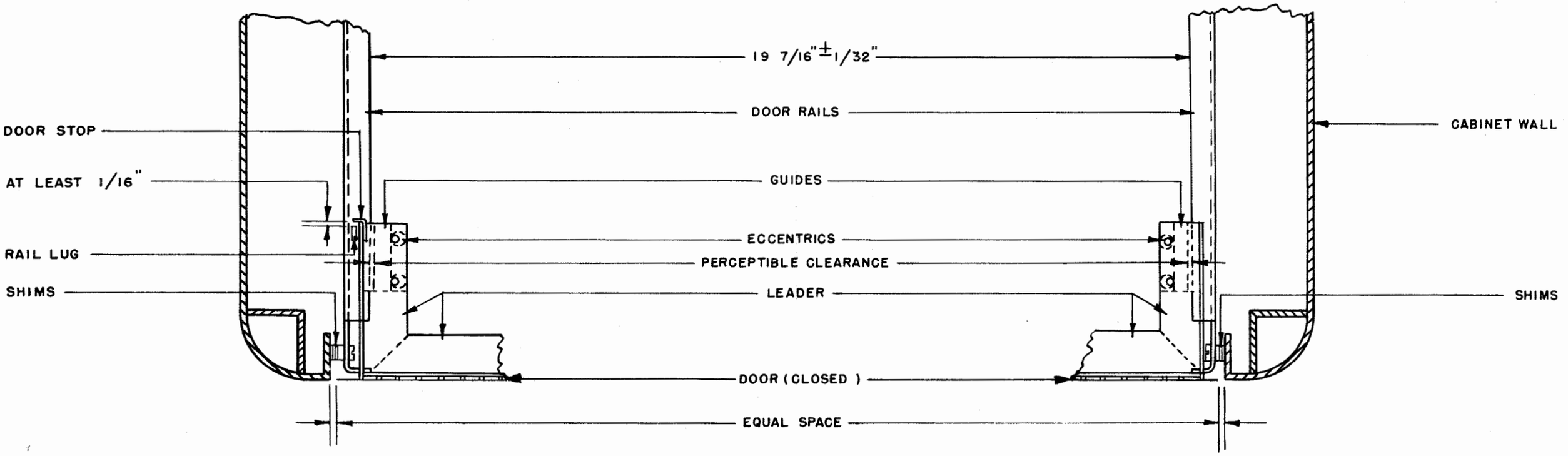


THREE—LETTER SECONDARY SELECTOR



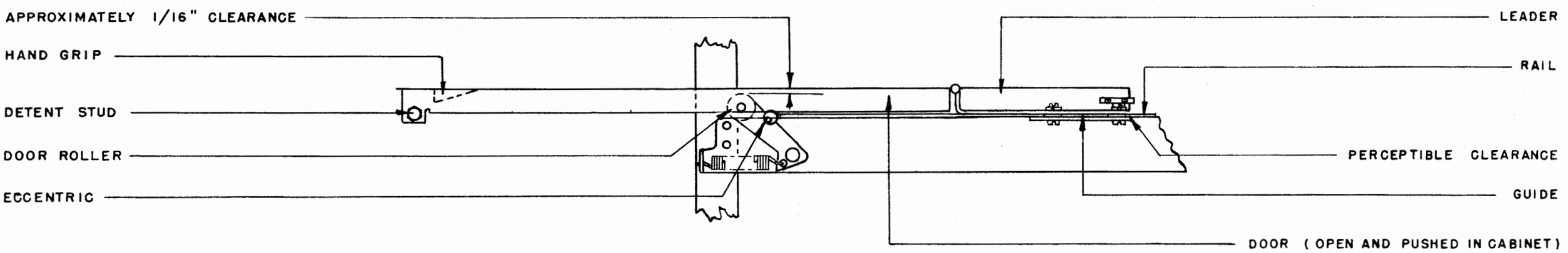
FOUR—LETTER SECONDARY SELECTOR

FIGURE 77
LEVER ARRANGEMENT



CROSS SECTION-TOP VIEW OF CABINET

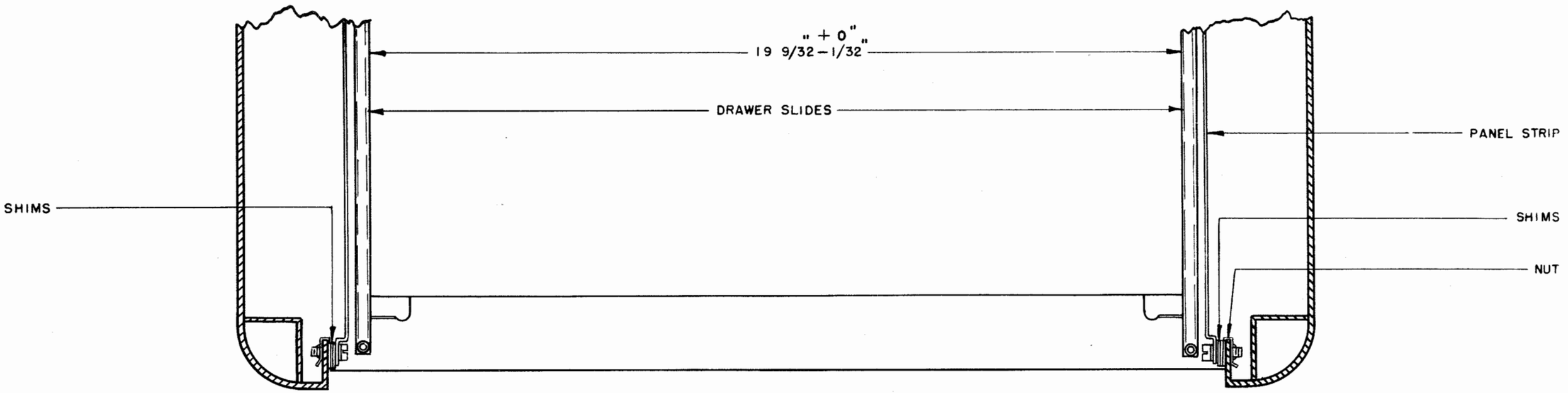
(A)



CROSS SECTION— SIDE VIEW

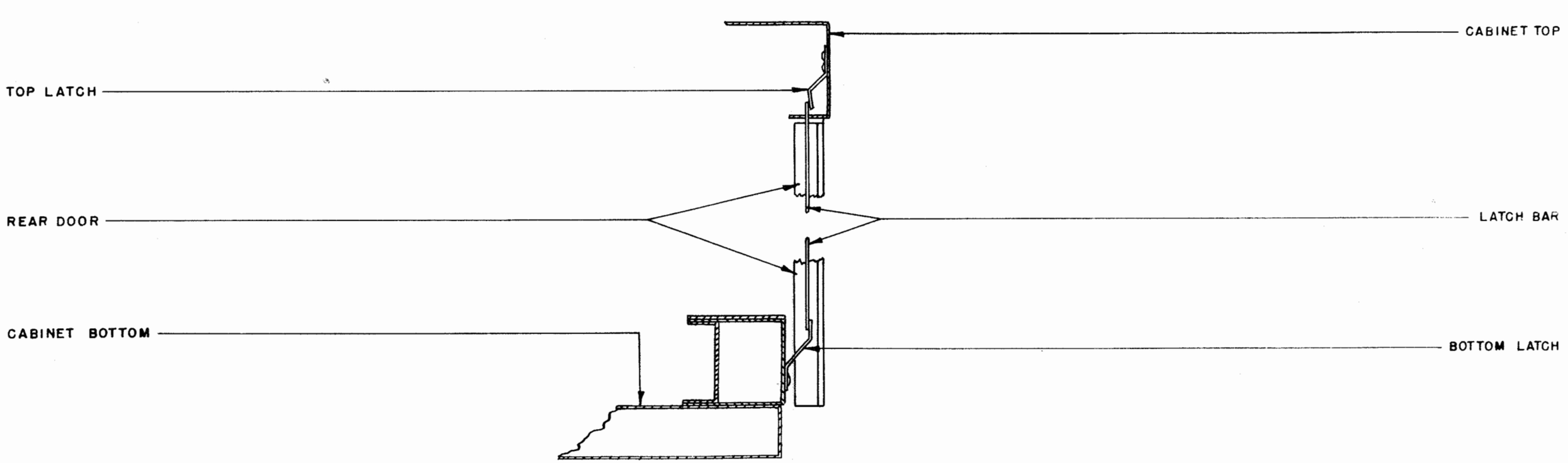
(B)

FIGURE 78
APPARATUS CABINET



CROSS SECTION – TOP VIEW OF CABINET

Ⓐ



CROSS SECTION – SIDE VIEW OF REAR DOOR

Ⓑ

FIGURE 79
APPARATUS CABINET

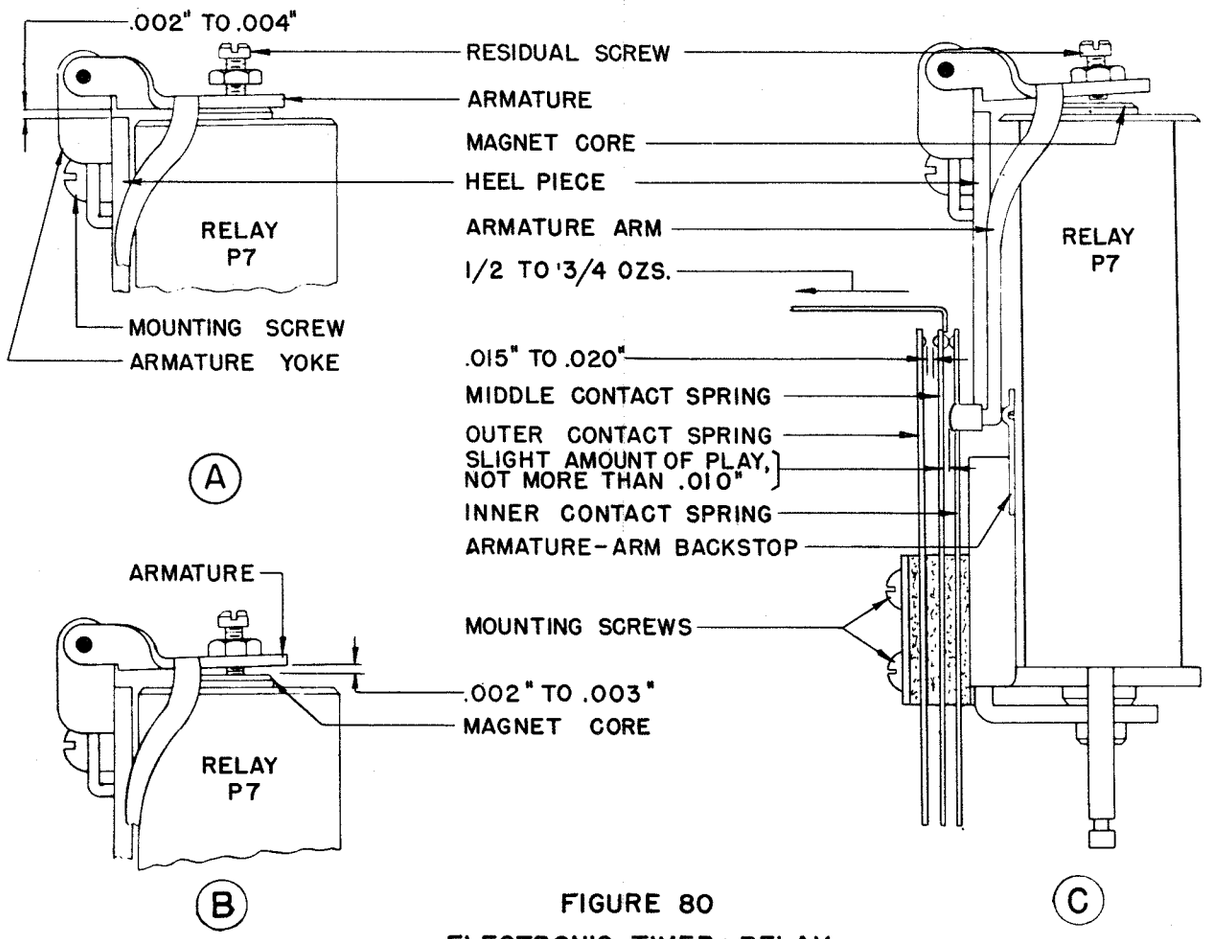


FIGURE 80
ELECTRONIC TIMER RELAY

UPPER CASE	WEATHER SYMBOLS	↑	⊕	○	↗	3	→	↘	↓	8	↙	←	↖	.	◐	9	0	1	4	'	5	7	⊖	2	/	6	+	−					
	COMMUNICATIONS	−	?	:	$	3	!	&	#	8	'	(	)	.	,	9	0	1	4	'	5	7	;	2	/	6	"						
LOWER CASE		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	BLANK	C.R.	L.F.	SPACE	LTR. SHIFT	FIG. SHIFT
	1	●	●		●	●	●				●	●						●		●		●		●	●	●	●					●	●
	2	●		●				●		●	●	●	●				●	●	●			●	●	●						●		●	●
	FEED HOLES	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	3			●			●		●	●		●		●	●		●	●		●		●	●		●	●					●	●	
	4		●	●	●		●	●			●	●		●	●	●			●			●		●		●			●			●	●
	5		●					●	●				●	●		●	●	●			●		●	●	●	●	●					●	●

FIGURE 81
CODE CHART