

BULLETIN NO. 2138

ISSUE 1

SEPTEMBER, 1952

TELETYPE

PRINTING TELEGRAPH SYSTEMS

DESCRIPTION
SEQUENTIAL SELECTOR
(BS6)

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

BULLETIN NO. 2138
ISSUE 1
SEPTEMBER, 1952

TELETYPE

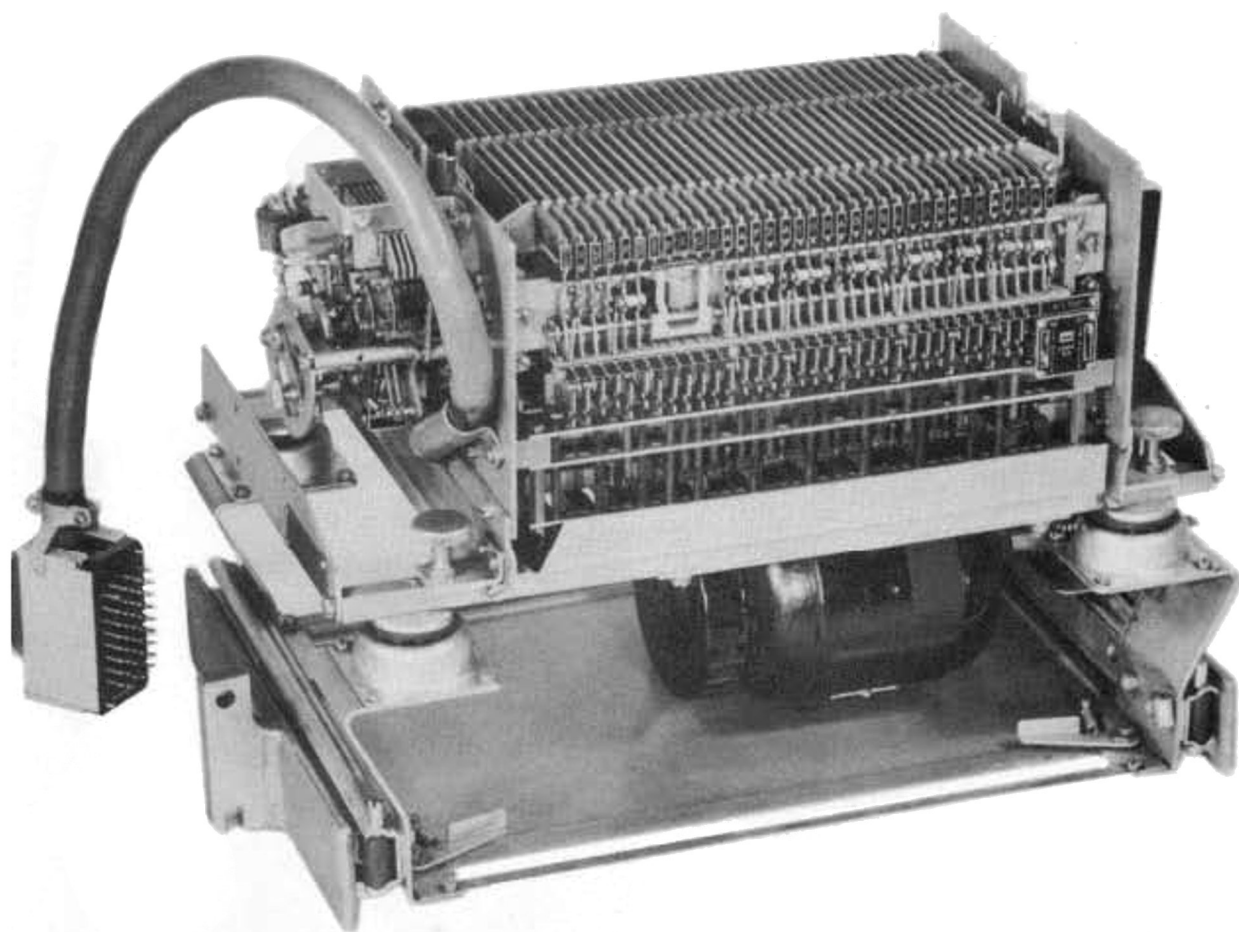
PRINTING TELEGRAPH SYSTEMS

DESCRIPTION

SEQUENTIAL SELECTOR

(BS6)





(213B)

TABLE OF CONTENTS

	<u>Page</u>
1. GENERAL DESCRIPTION	1.
2. THEORY OF OPERATION	1.
a. Main Shaft	1.
b. Range-Finder Assembly	1.
c. Holding-Magnet Selector	2.
d. Contact Operating Mechanism	3.
e. "H" Answer-Back Mechanism	4.
f. RY Test Mechanism	4.
g. Mechanical Timer	5.
(1) General	5.
(2) Operation	5.

TELETYPE BULLETIN 213B

DESCRIPTION AND THEORY OF OPERATION

1. GENERAL DESCRIPTION

a. The Teletype Sequential Selector is a motor-driven electro-mechanical receiving unit which automatically controls telegraph signal circuits in response to predetermined sequences of printing telegraph signals. These sequences may be composed of both character and functional signals which precede and follow regular Teletype messages. Facilities are available for equipping the unit with as many as 33 switching contacts. When changes are necessary a contact can be placed under the control of a required sequence by manually substituting the necessary code levers.

b. The Sequential Selector unit is mounted by resilient fittings to a metal panel which may be secured to a relay rack, a cabinet shelf or a table. The panel also supports the motor and a countershaft which drives the main shaft of the selector unit. The panel incorporates sliding rails and latches which permit forward movement of the panel relative to its mounting brackets, which are positioned for standard relay rack spacing.

c. As an adjunct to the contact operating mechanism a mechanical timer is attached to the left, lower rear, side of the Sequential Selector. The timer is geared to the main shaft through a friction clutch. When it is desirable to introduce a pause in the control sequence, the timer operates in response to a BLANK combination in a transmitter start pattern.

d. The Sequential Selector incorporates an answer back feature which generates an "H" character signal by means of a cam and contact assembly located near the lower, right, rear corner of the unit. When the Sequential Selector at an outlying station receives the transmitter start pattern signal sequence directing it to start an associated transmitter distributor, the "H" answer back mechanism automatically starts. If there is tape in the transmitter distributor, it will also start and the "H" answer back signal will be shunted out of the signal circuit by means of an external relay. If the transmitter distributor is without tape, it will not start. However, the "H" answer back signal will be transmitted over the signal line connected to the transmitter distributor.

e. 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 disarmed during message traffic.

f. In addition to the 33 contacts which may be actuated in response to selecting combinations, a universal contact may be used. This contact is actuated by a bracket attached to the left arm of the stripper ball and responds to each operating cycle of the bail.

2. THEORY OF OPERATION

a. MAIN SHAFT

(1) The main shaft assembly (Figure 5) includes a selector cam sleeve located between the discs of a friction clutch at one end of the shaft for actuating the holding-magnet selector. Near 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 7) through the medium of the range-finder mechanism (Figure 8), makes one revolution in response to each START impulse of the signal code. A shaft with a clutch trip lever (Figure 9) 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.

(2) Adjacent to the operating eccentric assembly on the main shaft is a ratchet wheel (Figure 9) for actuating and controlling the eccentric assembly. The ratchet wheel rotates continually while the motor runs. A driving pawl that pivots on a drive arm at the end of the assembly is in a position that permits it 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. Forward motion of the eccentric assembly is thus terminated while a detent drops into a notch in a detent sleeve (Figure 5) 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. The pawl then engages 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.

(3) Two eccentrics on the operating eccentric assembly are encircled by drive links; one of which connects with a main-bail operating bar, and the other connects with a stripper-bail operating bar. An "H" answer-back cam and a detent sleeve are also a part of the eccentric assembly.

b. RANGE-FINDER ASSEMBLY

(1) The range-finder assembly (Figure 8) consists essentially of a mounting plate with graduated scale, an index arm, stop lever, trip latch, bell crank and trip-latch plunger.

(2) 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.

(3) 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.

c. HOLDING-MAGNET SELECTOR

(1) The holding-magnet selector (Figure 7), consists essentially of a two-coil selector magnet, armature, selector arm, locking lever, and five each of selector levers, swords and transfer levers.

(2) 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 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 8) and a selector-arm operating screw 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.

(3) 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 7) 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.

(4) 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.

(5) The five selector levers and the swords, which are coupled to them by floating pivots, lie between separator plates. 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, and cause the swords to be withdrawn from the transfer levers for repositioning by the selector arm.

(6) 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.

(7) 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 its 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.

(8) 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.

(9) 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, coactive 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 10) toward the rear. Where any sword is impressed against the upper arm of a transfer lever the associated operating link will be moved forward.

(10) The fifth code interval of the CARRIAGE RETURN signal, being SPACING, oper-

ates the No.5 sword in the same manner as that for the first, second, and third interval described above.

(11) 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.

(12) 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.

(13) 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 10) for the selection of contact operating mechanism.

(14) Five vanes respond to signal translation by the holding-magnet selector. A sixth vane (in the most forward position) is positioned to either MARKING or SPACING (activated or deactivated position) in response to predetermined code signals for the purpose of unblocking or the printer selecting code levers in order to control the selections of contacts. The sixth vane is operated by two bell cranks mounted on the blocking lever shaft above the second and third operating lever. Operating lever yokes attached to the second and third operating levers actuate the bell cranks which in turn activate and deactivate the sixth vane. A vane detent (Fig. 11) is provided to hold the vane where placed by each repositioning operation.

d. CONTACT OPERATING MECHANISM

(1) The major components of the contact operating mechanism (Figure 12) 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 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.

(2) A main bail (Figure 12) 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 function lever selection in co-ordination with the action of the holding-magnet selector. With the sixth vane activated, the printer selecting code lever (Figure 2) 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 vane. However, consecutive 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.

(3) Each function lever acts as the motivating member of a train of vertically positioned mechanism which includes (as shown on Figure 6) 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 Position 1, (Figure 2). An assembly (Figure 4) that includes all blocking and latching levers may be readily removed for accessibility.

(4) 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 12) 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. 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 12) that is motivated by an eccentric drive link on the operating eccentric assembly (Figure 5) strikes projection P (Figure 6) 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 13) at each end which apply reciprocating motion. An extension of the stripper bail normally rests on the upper level 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 operation 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 13), that responds to the final element 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 except the one associated with the H character (No. 2 from left). This latching lever has an extension E, and therefore can be stripped only by the adjacent (to the right) operating lever. On its rearward stroke the stripper bail strikes a reset eccentric which returns it to the upper latching position.

(5) Bridging of adjacent blocking levers so that a bridged group responds to one sequential element of a signal combination is accomplished by clamping the levers together with an elongated nut (Figure 2). This feature is applied where it has been found advantageous to use optional signals at any point in a combination sequence. The four transmitter start character function levers are blocked by a common blocking bail instead of blocking levers. This bail is actuated by the space operating lever when the space selection is received by the selector unit.

e. "H" ANSWER-BACK MECHANISM

(1) The "H" answer-back mechanism and its associated parts provide a feature by which the character H is automatically generated in the signal line by means of a cam and contact assembly. The mechanism consists of a contact assembly that is wired into the line, a cam, a cam follower, a latch bail shaft with a trip latch, an auxiliary latch, a transmitter start function lever blocking bail and a blocking blade located at the rear of the unit, (Figures 14 & 15). The four contact operating levers associated with the transmitter start characters (Figure 2) extend to the rear of the unit and operate the blocking bail of the answer-back mechanism. A third bail is attached to the clutch trip shaft directly above the four contact operating levers that are associated with the transmitter start characters. Each of these operating levers have a yoke attached near their midpoint for the purpose of tripping the clutch trip shaft while the transmitter start character is selected. The space operating lever extends to the rear and operates the blocking blade.

(2) When a transmitter start character is selected, the front end of the operating lever is pulled upward and latched, while the rear end of the lever presses downward on the transmitter start function lever blocking bail. The blocking bail is attached to the trip latch by means of a latch bail shaft. Rotation of the latch bail shaft moves the trip latch away from the auxiliary latch and permits the cam follower to rest on the auxiliary latch. Further rotation of the H

Answer-back cam moves the auxiliary latch so as to permit the cam follower to ride the H answer-back cam and actuate the H answer-back contact. The yoke on the selected operating lever of the transmitter start character blocks the clutch trip shaft from returning to its blocking position, and thereby causes the main shaft to make a second revolution. Near the beginning of the second revolution the answer-back cam moves the auxiliary latch from its latching position and permits the cam follower to ride the "H" answer-back cam. An extension on the cam follower opens the contact when it rides the low parts of its cam. When it rides the high parts of the cam the contact closes. During the second revolution of the main shaft, the contact is open for a time interval equivalent to the first three impulses (start, No. 1 and No. 2), closed for the third, open for the fourth, and closed for the fifth and STOP.

(3) The extension on the operating lever of the space position serves a dual purpose. When operated it permits a holding lever to move downward and latch the timer contact bail operated. It also presses downward on an extension of the larger blocking bail which blocks the function levers of all the printer selecting characters. (Figure 15). By holding the timer contact operated, selection of single transmitter start characters may be repeated after sending the full transmitter start pattern. Since the latch lever for the space operating lever has an extension E which extends to the operating lever in letters position, reception of the letters selection will unlatch the space operating lever which restores the common blocking bail at the front of the unit to its normal blocking position under the four transmitter start function levers. It also unlatches the timer contact and restores the larger blocking bail to its normal unoperated position.

f. RY TEST MECHANISM

(1) The RY test mechanism, (Figure 2) 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.

(2) 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 16).

(3) 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.

NOTE

When using the RY test, the sixth vane must be in the unblocking position.

(4) 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. The RY latch lever turns counter-clockwise (Figure 16) 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 13) 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 16) 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 of 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 16) 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.

g. MECHANICAL TIMER

(1) GENERAL

The operating cycle of the mechanical timer is initiated by the selection of an operating lever (with an extension on its rear end) in response to a predetermined signal in a control sequence. Concurrent with a measured pause (marking interval on the signal line) in control transmission, the mechanical timer times the removal of a blocking bar from a function lever (next in the order of selection) whereby the selector accepts a true control sequence but rejects any sequence having inaccurate timing of components.

(2) OPERATION

(a) The timing mechanism (Figures 17 and 18) includes a driving shaft with gear, a cam

sleeve which incorporates six cams, and a group of levers for operating a contact and unblocking a function lever in timed relation to the reception of code elements of a control sequence.

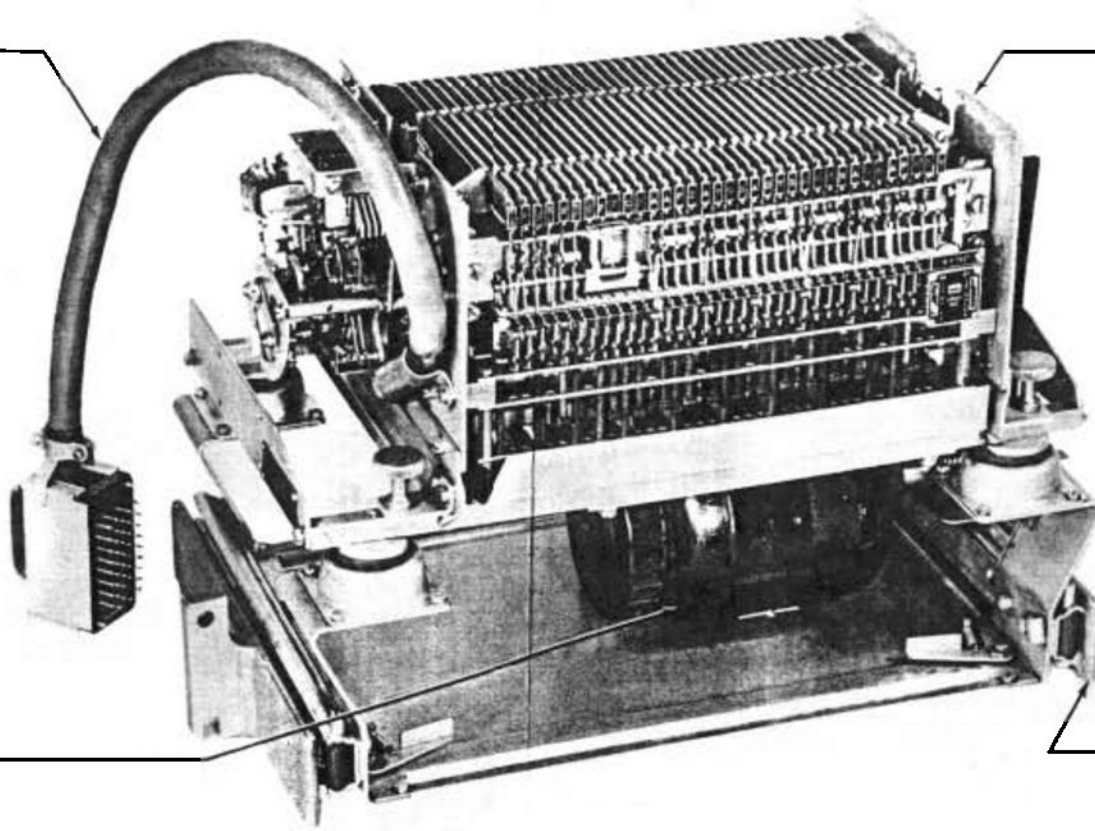
(b) Prior to its release, the cam sleeve is held stationary by a blocking bail which engages No. 1 cam. Release occurs when a trip bar extending upward from the blocking bail is pushed downward by a special operating lever. A friction clutch associated with the sleeve applies the driving torque. Soon after the start of rotation, a contact lever drops from the high part of No. 2 cam and, under normal conditions of operation, actuates a contact bail to operate the timer contact which connects to an external circuit. Prior to contact operation, a contact-bail latch drops from the high part of No. 3 cam in readiness to hold the contact operated as soon as actuated. Following operation of the timer contact, a blocking lever rides to the low part of No. 6 cam and withdraws a blocking bar for a timed interval in order that either space or X function lever may be selected. Upon the selection of the space operating lever, in the transmitter start pattern, a holding lever is permitted to move downward to latch the contact bail operated. The contact bail latch releases its hold on the contact bail just prior to completion of a rotating cycle of the sleeve. The contact bail, however, does not release the contact (because of the holding lever) until the SPACE operating lever is released by reception of the LETTERS combination. The X function lever is selected to operate a contact which stops the transmitter when the transmitter stop pattern is received. Should a false signal release the selector cam sleeve immediately following the signal which initiated timer rotation, a sensing lever drops from No. 4 cam on the selector cam sleeve and provides freedom of action for a latch bail. Under such conditions the latch bail drops from the peak of No. 5 cam on the timer cam sleeve immediately following the start of its rotation. Action of the latch bail actuates a blocking-lever latch to release a blocking lever which engages the contact bail and restrains it from operating the timer contact. Should a true signal of a selecting sequence follow the signal that initiates timer action but be improperly timed with relation to the withdrawal of the function-lever blocking bar, the blocking lever at the forward end of the function lever will be reset so as to render selection ineffective.

CONNECTING CABLE

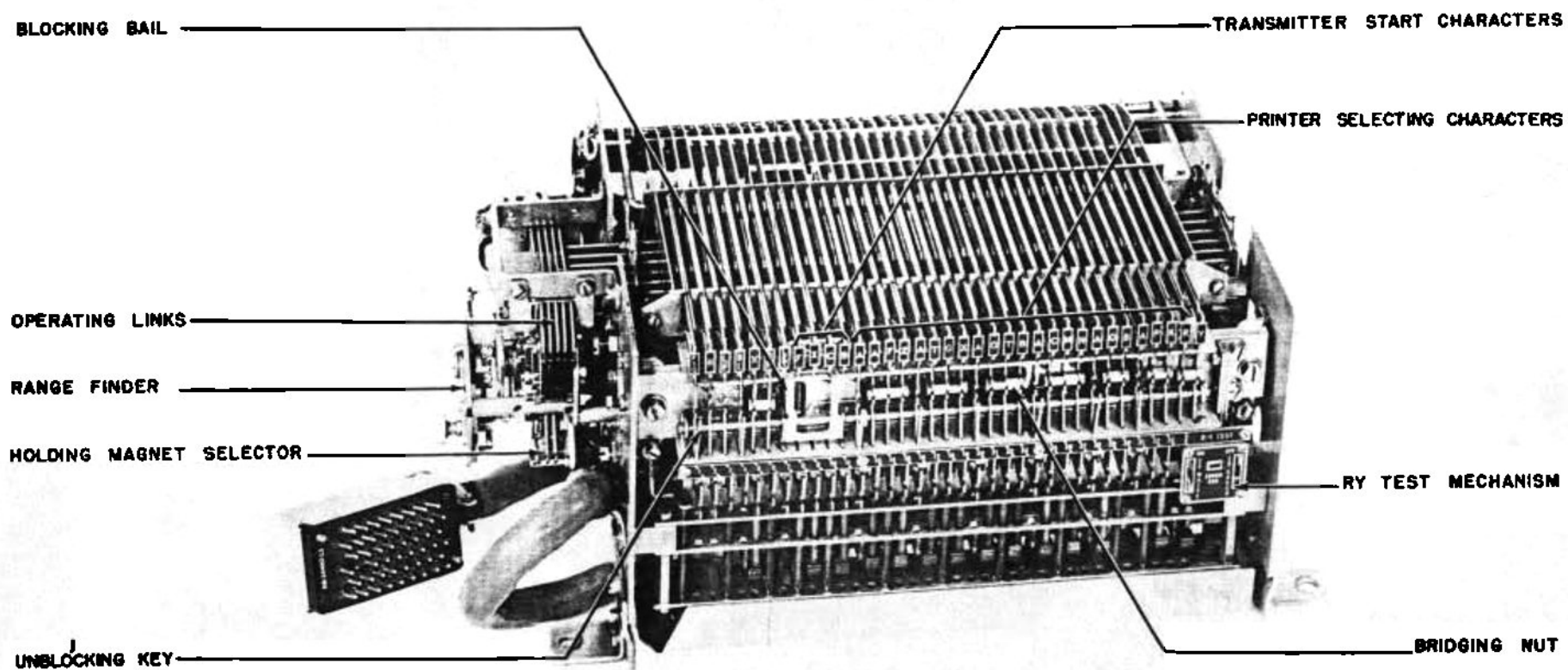
SEQUENTIAL SELECTOR UNIT

MOTOR UNIT

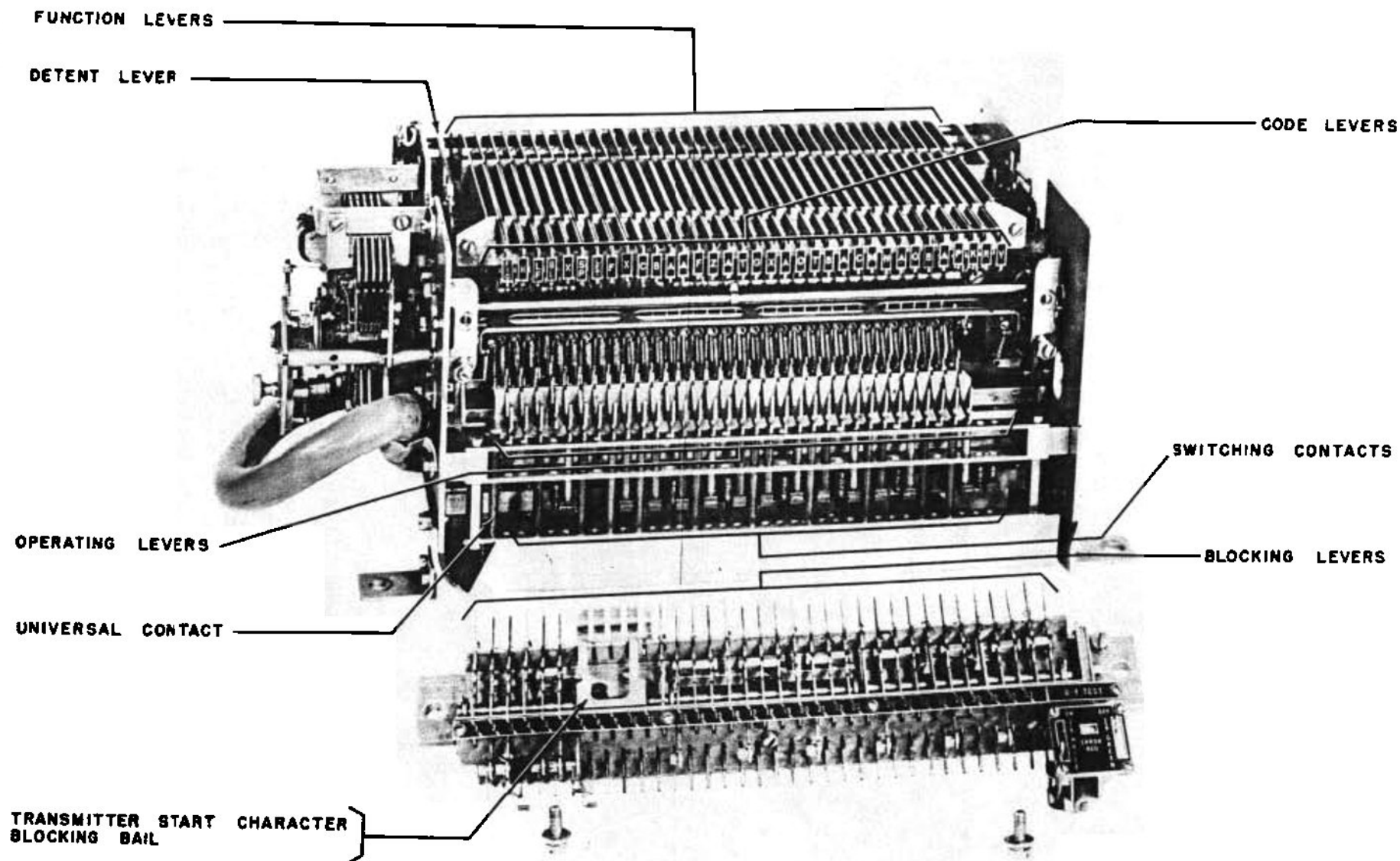
SEQUENTIAL SELECTOR PANEL



SEQUENTIAL SELECTOR AND PANEL
FIGURE 1

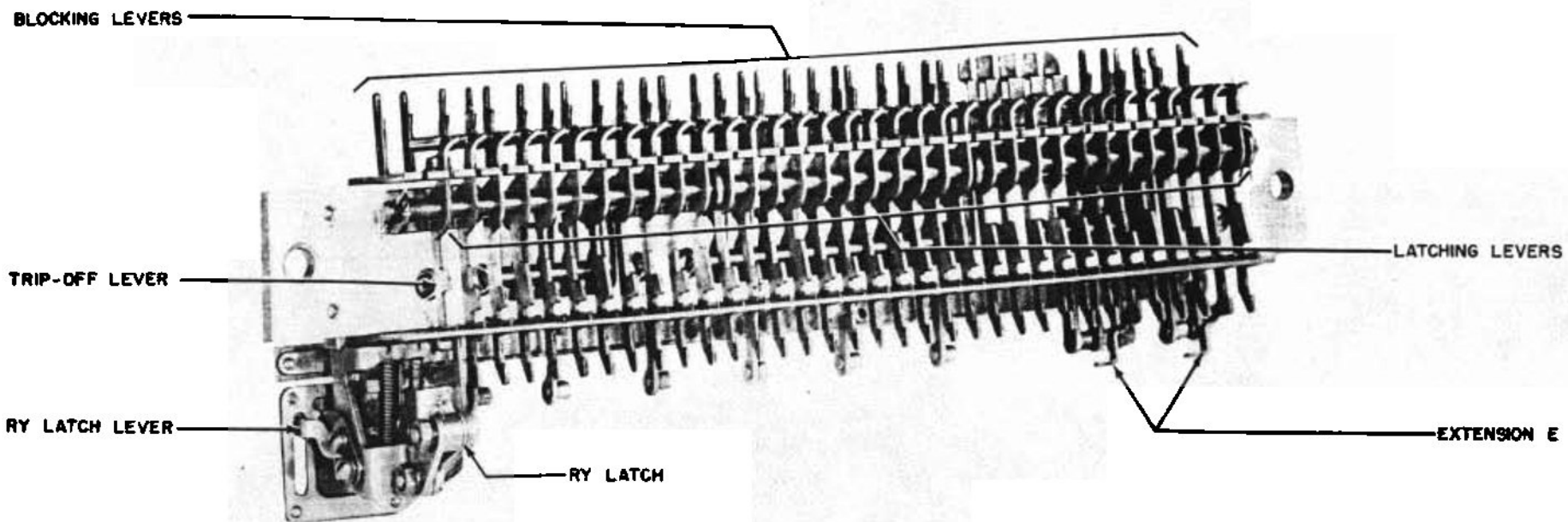


SEQUENTIAL SELECTOR
FIGURE 2



SEQUENTIAL SELECTOR
BLOCKING AND LATCHING LEVER REMOVED

FIGURE 3



BLOCKING AND LATCHING LEVER ASSEMBLY
(REAR VIEW)
FIGURE 4

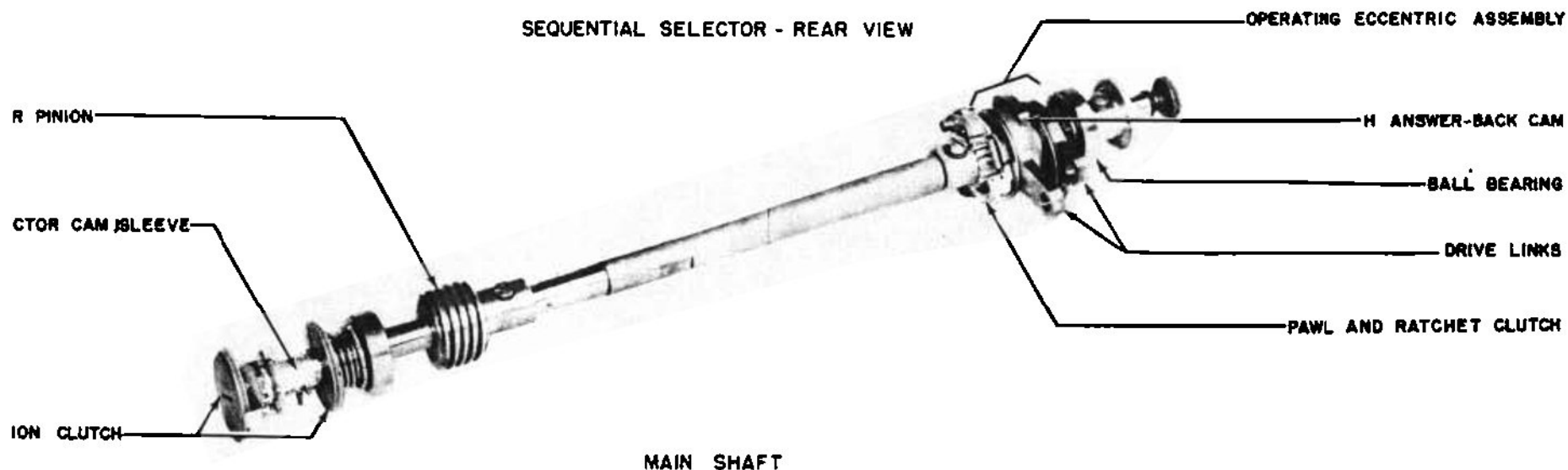
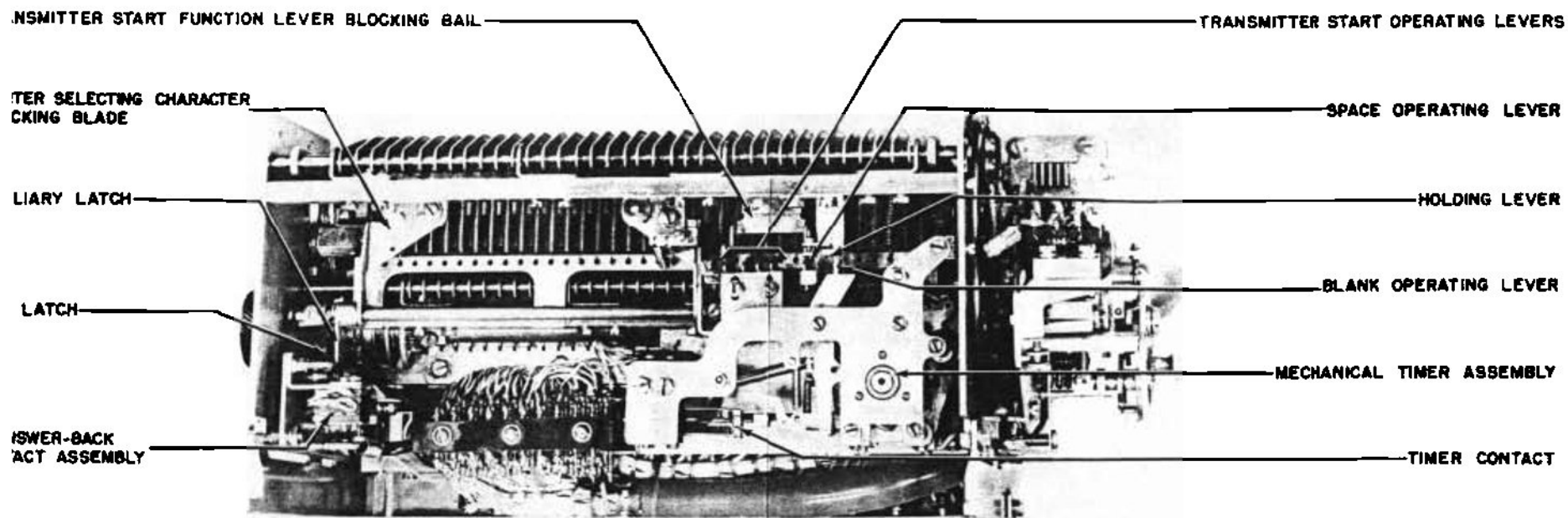


FIGURE 5

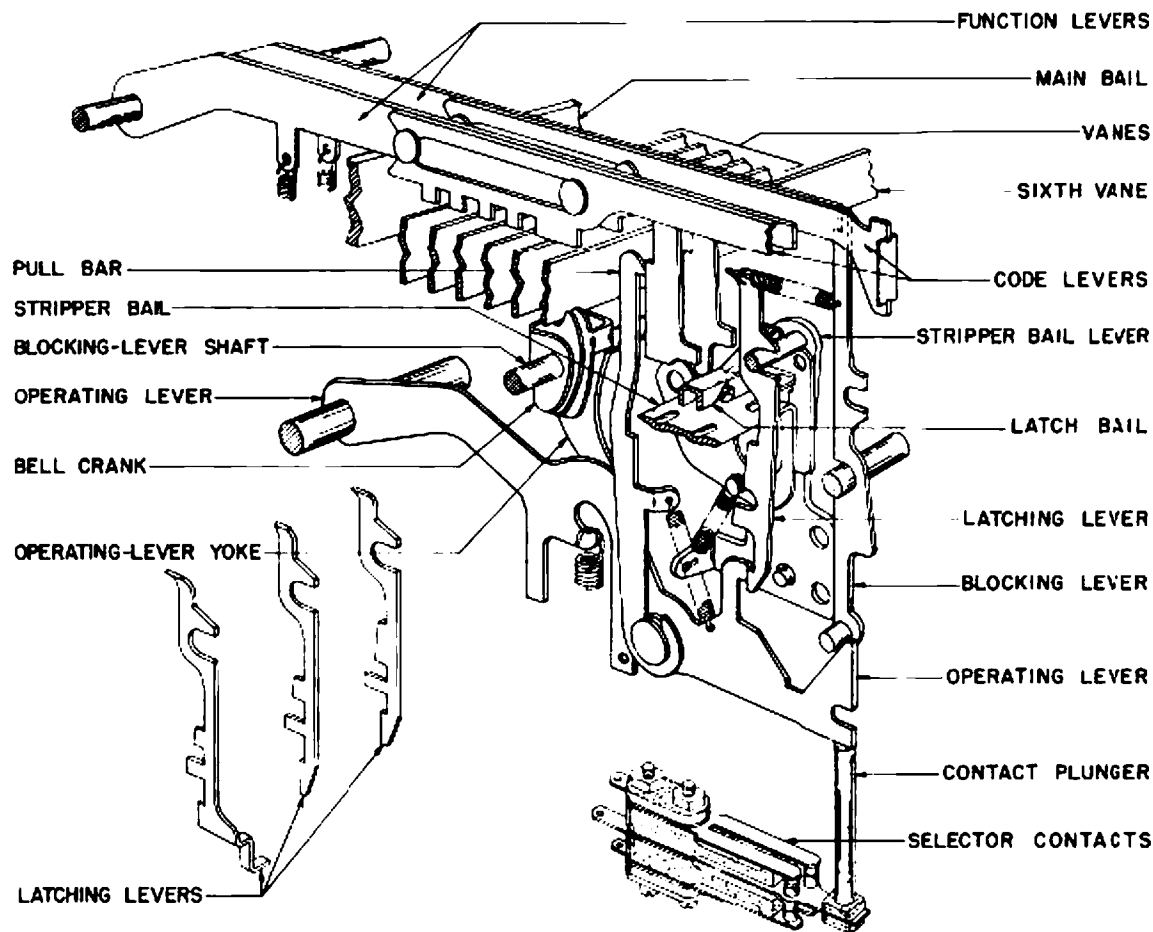


FIGURE 6

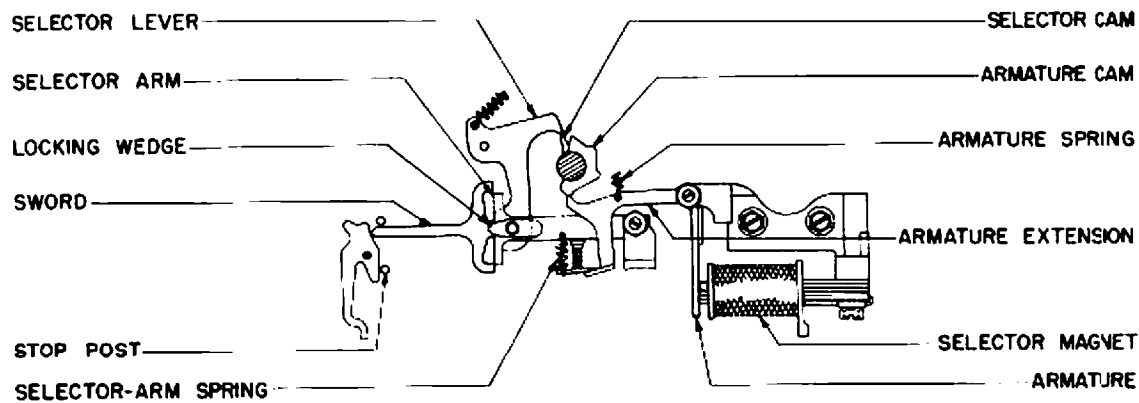


FIGURE 7

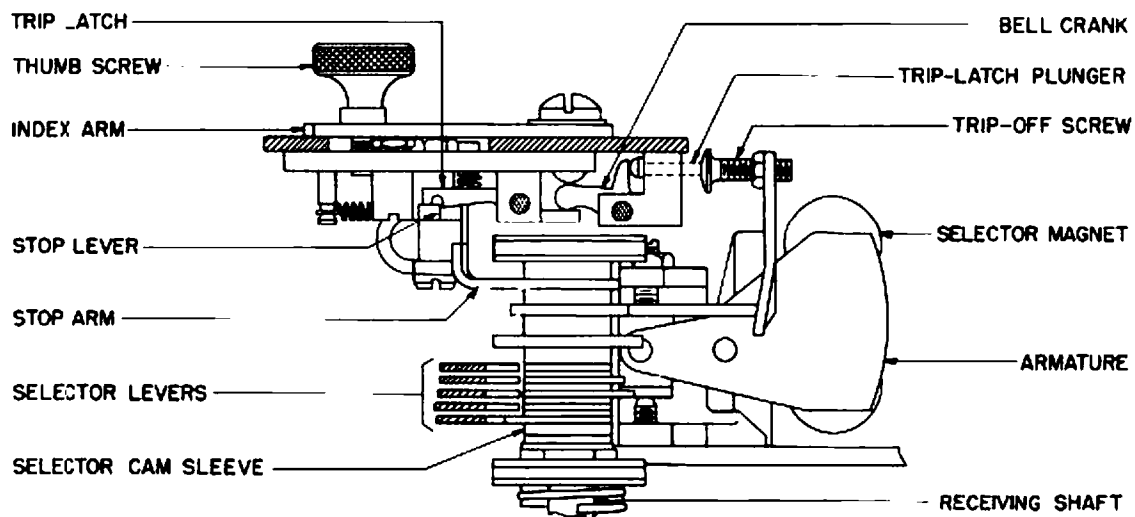


FIGURE 8

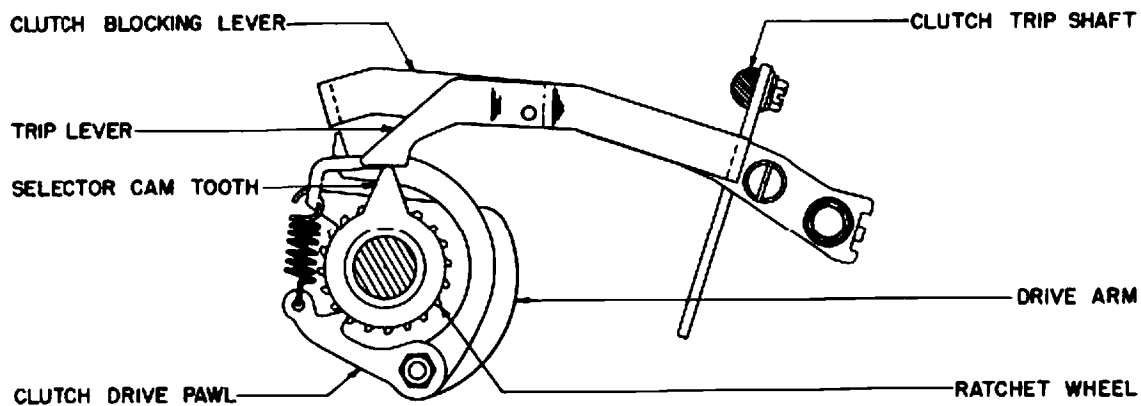


FIGURE 9

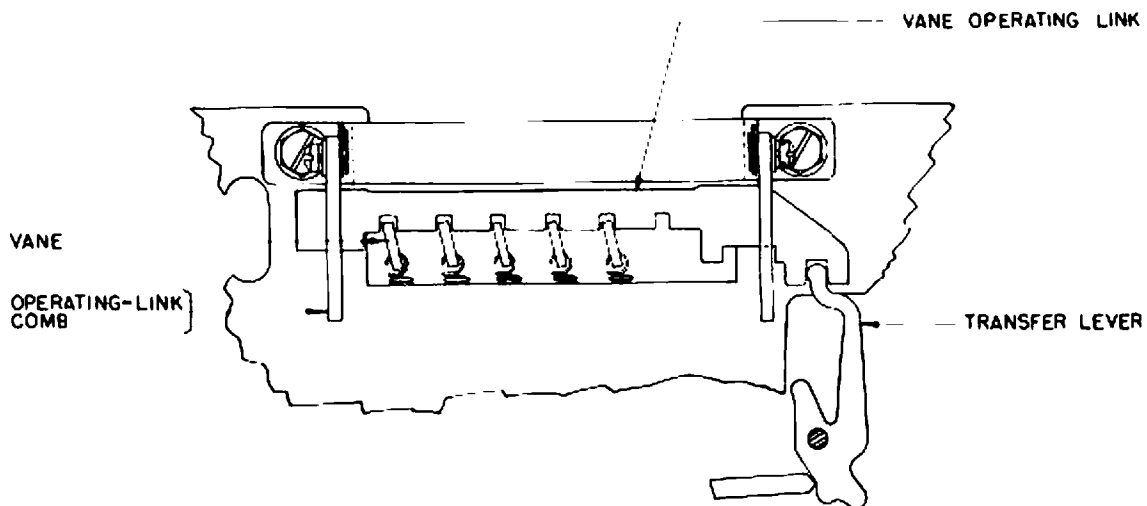


FIGURE 10

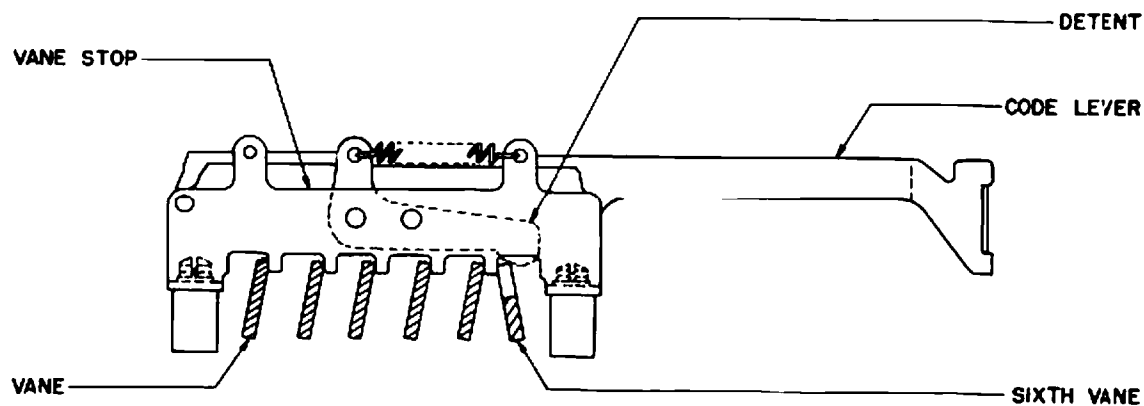


FIGURE 11

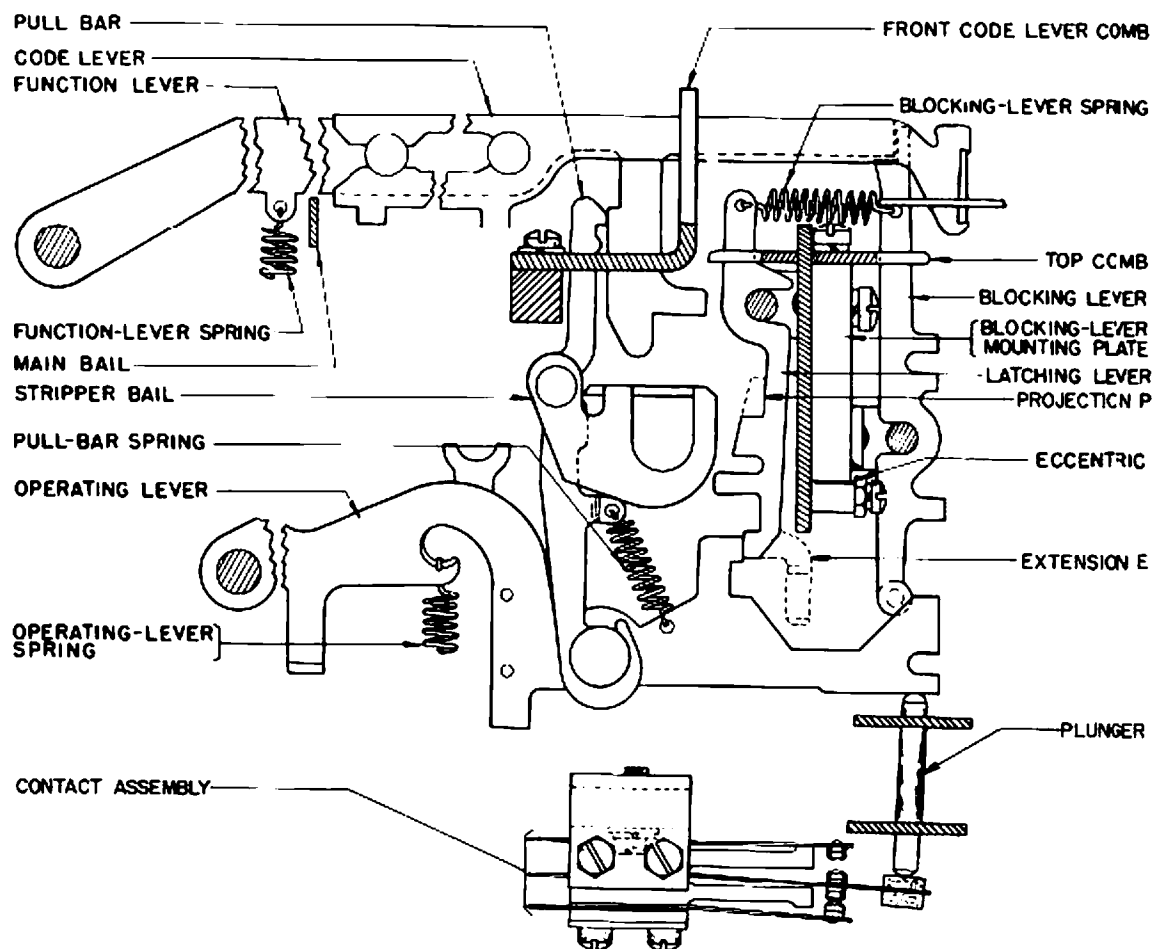


FIGURE 12

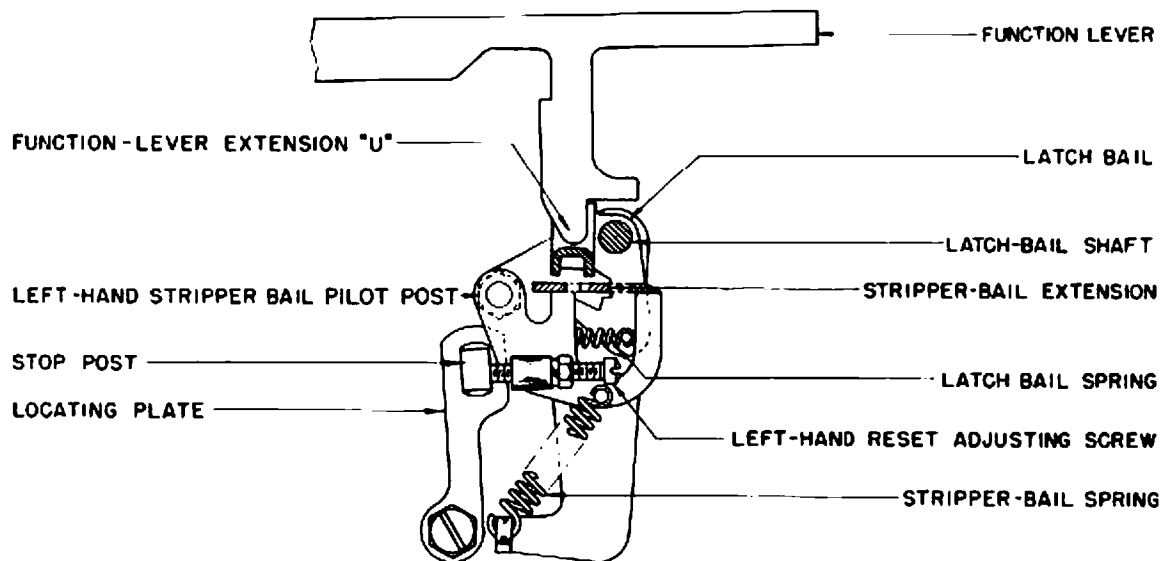


FIGURE 13
STRIPPER BAIL CONTROL MECHANISM

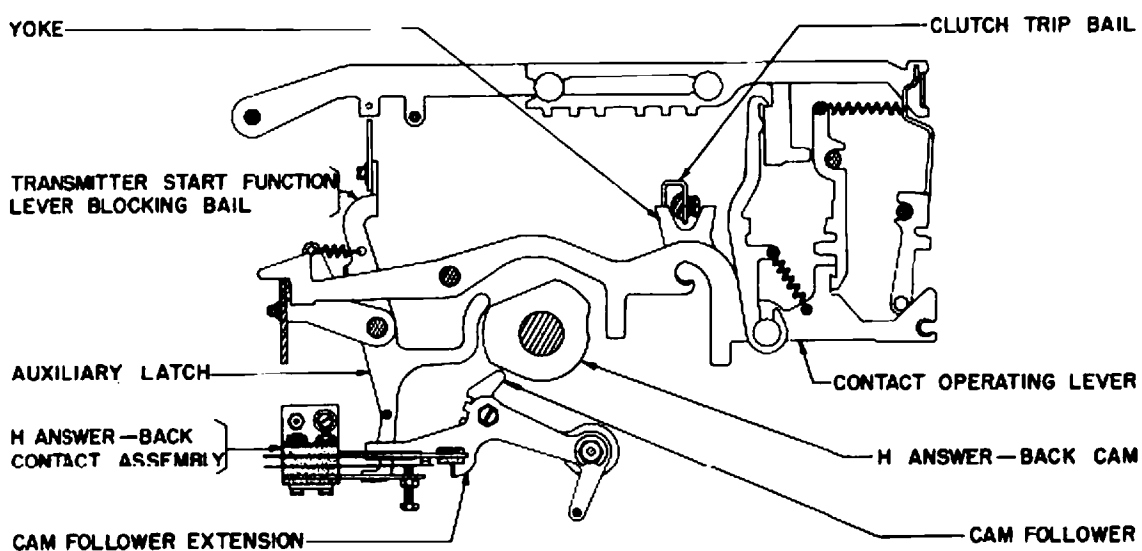


FIGURE 14

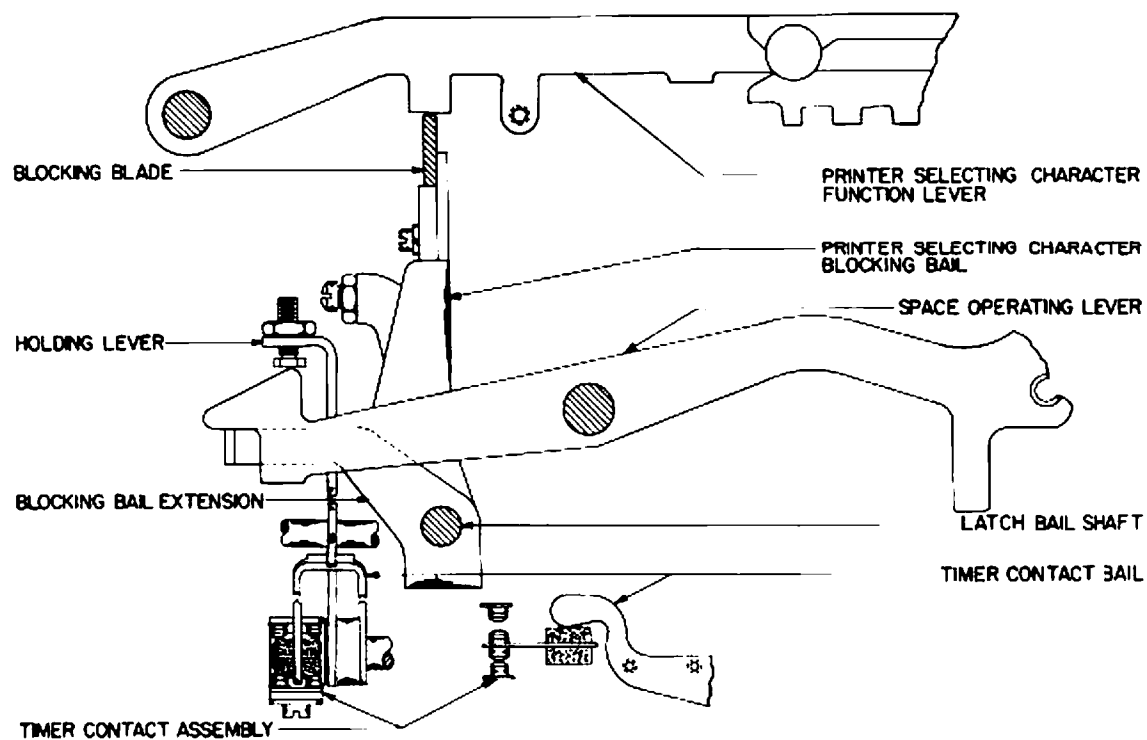


FIG. 15

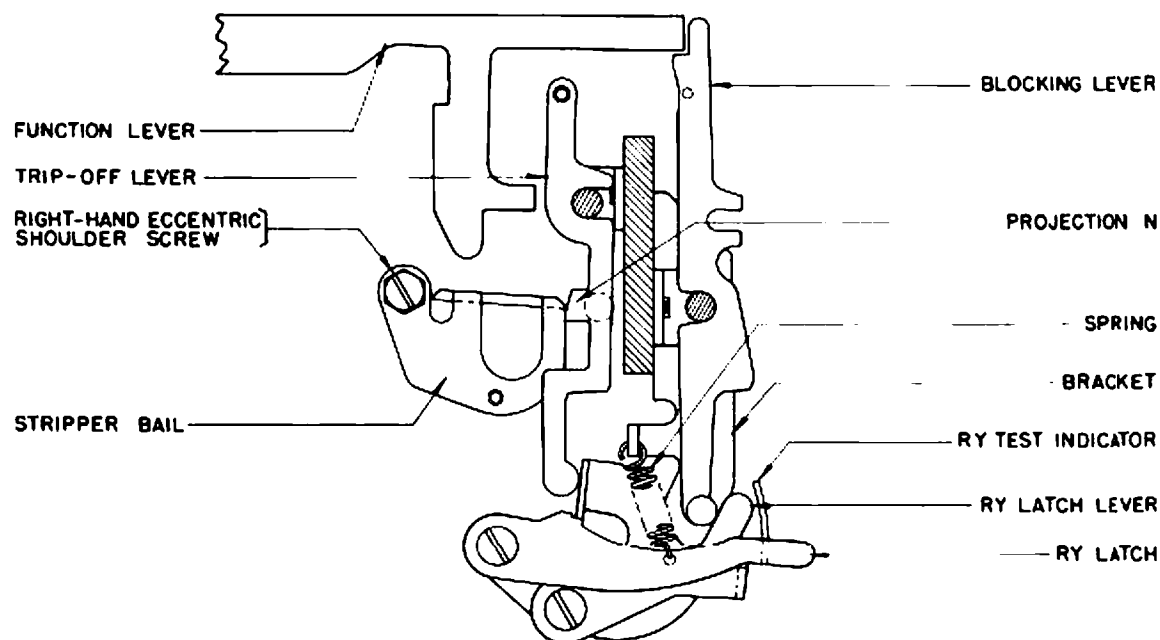


FIGURE 16
RY TEST MECHANISM

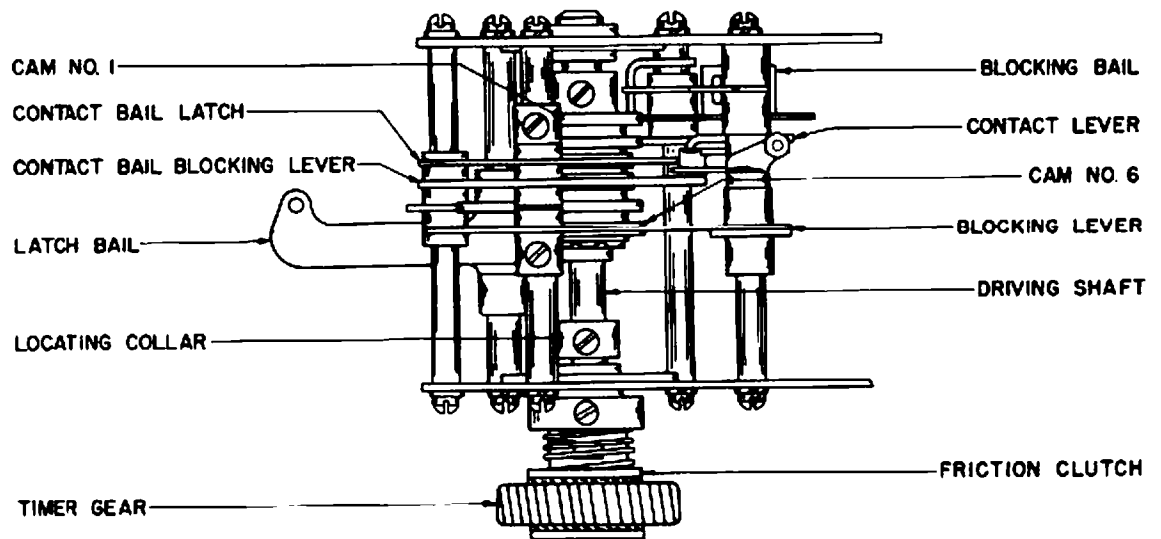


FIGURE 17

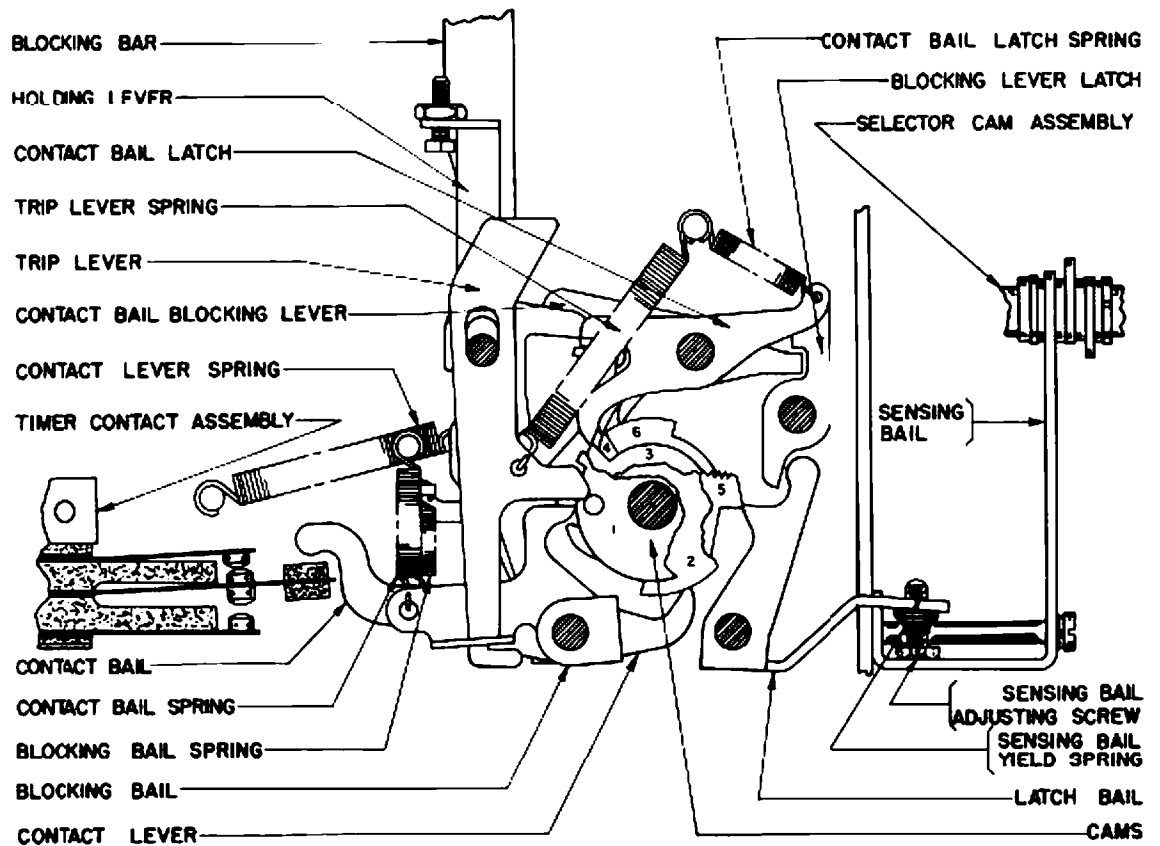


FIGURE 18
MECHANICAL TIMER