28 TYPING REPERFORATOR KEYBOARDS AND BASES

DESCRIPTION AND PRINCIPLES OF OPERATION

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1. GENERAL

1.01 The 28 typing reperforator keyboards provide mounting and transmission facilities for the 28 Keyboard Send-Receive Typing Reperforator Set. The 28 receive-only bases provide mounting facilities for 28 Receive-Only Reperforator Sets.

2. DESCRIPTION

KEYBOARD (Figures 1, 2 and 3)

2.01 The keyboard is a device for converting the mechanical action resulting from the depression of a key into electrical pulses that are transmitted over a signal line. In addition, it provides mounting facilities for a typing reperforator unit and a motor unit, as well as for a variety of accessories.

2.02 Motive force for activating the keyboard is derived from the motor unit by way of an intermediate shaft assembly. Electrical wiring to and from the keyboard is terminated in a 16-point connector and three terminal boards.

2.03 The keyboard is operable on line at the following speeds; 60, 75 and 100 words-per-minute; or 368, 460, and 600 operations-per-minute. Operating speeds are varied by interchanging sets of gears that are supplied as optional components. The signal generator contact box may be adapted to provide either polar or neutral signals. It may also be adapted for synchronous pulsed transmission.

2.04 The major sections of the keyboard are the base assembly, keyboard mechanism, and the signal generator mechanism.

A. Base Assembly

2.05 The base assembly provides mounting facilities for the keyboard and signal generator mechanisms, the intermediate gear shaft assembly, tape container, tape out switch, a base casting for support of the typing reper-

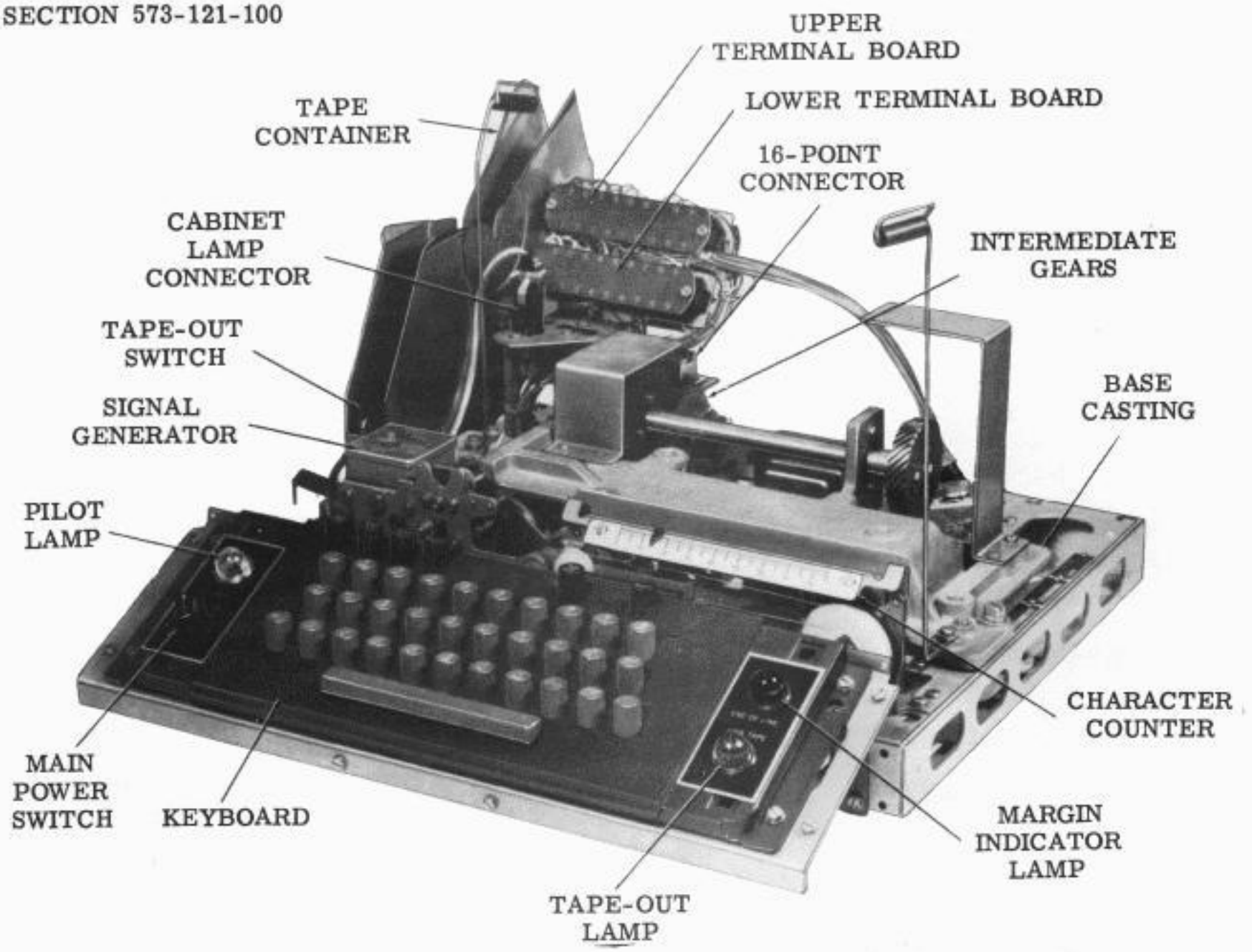


Figure 1 - Send-Receive Typing Reperforator Keyboard

forator unit, a character counter mechanism, and optional accessories.

2.06 The intermediate gear shaft assembly includes three gears and a shaft. The assembly transfers motive power through a gear to the typing reperforator unit. Through a shaft connected to this gear motive power is conveyed to a pair of helical gears which in turn drive the signal generator mechanism.

2.07 The character counter mechanism contains a scale which records in increments of one character the length of the message transmitted, up to the 72-character equivalent of a page-printed teletypewriter line. When 66 to 68 characters have been typed, an end of line indicator lamp lights. Depressing the carriage return (CAR RET) key returns the counter to zero and opens the lamp circuit.

B. Keyboard Mechanism

2.08 The keyboard mechanism contains the keytops, keylevers, code bars and levers and other code selecting parts that transform the intelligence contained in the manual selection of a keytop into a teletypewriter code combination, represented by code bar positions. The code combination for the selected character is transferred from the code bars through transfer levers to the signal generator mechanism. In addition, this mechanism contains a rotary-type main power switch and power, tape out, and margin indicator lamps.

2.09 The keytops are positioned in the conventional three-bank arrangement, with numerals, punctuation marks, and special symbols available in upper case positions. The space bar is located centrally below these keys. Keytops for local operations provided above the

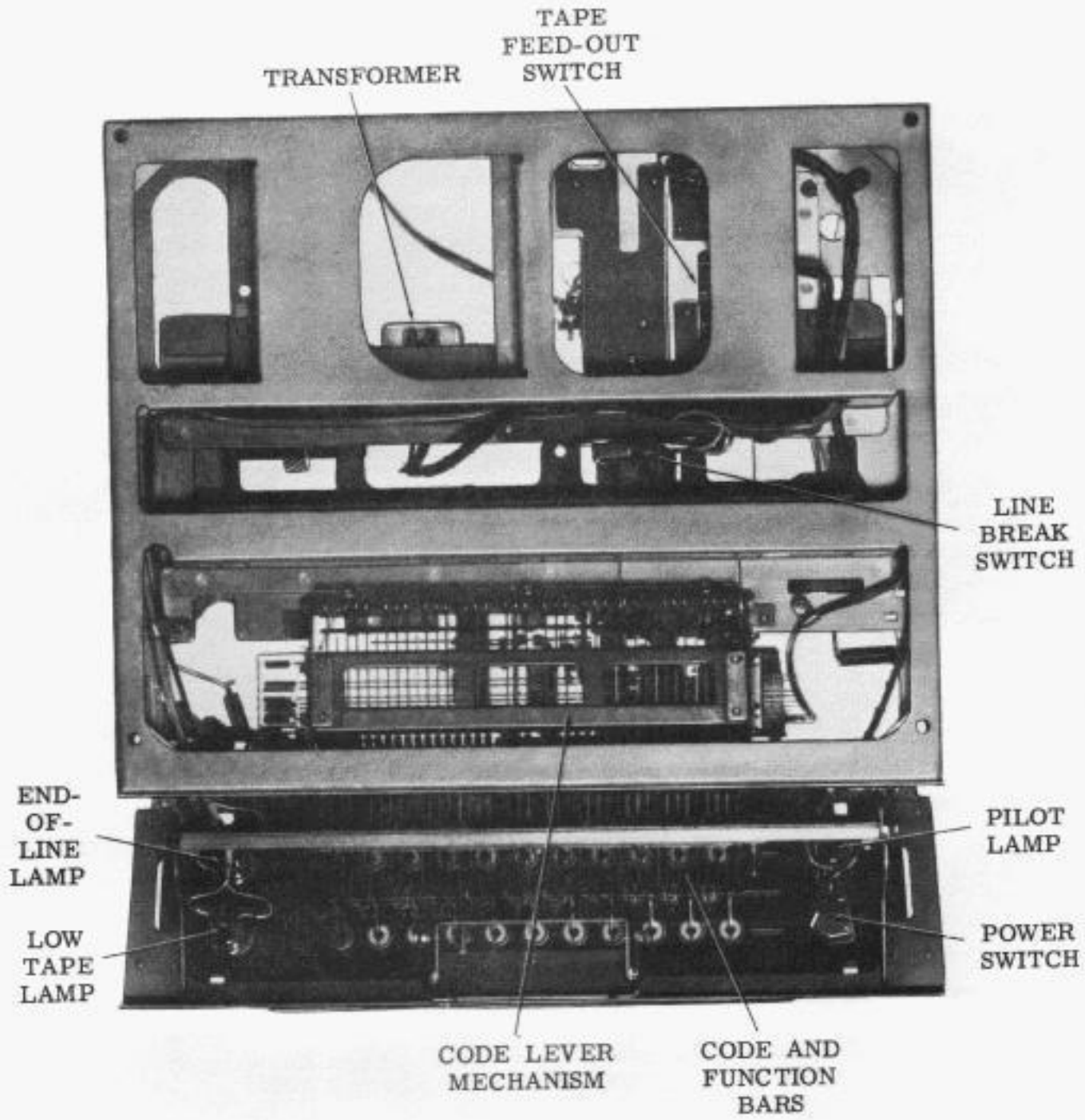


Figure 2 - Send-Receive Typing Reperforator Keyboard (Bottom View)

standard keytops for facility of operation. This row has provisions for 11 keys. A wedge lock assembly prevents the simultaneous depression of more than one keytop.

C. Signal Generator Mechanism

2.10 The signal generator mechanism generates the start-stop teletypewriter signal. It consists of, basically, an enclosed contact box containing a set of fulcrum-type transmitting contacts, a transfer bail that controls the opening and closing of the contacts, selector levers that engage the transfer bail in a sequence determined by the position of the code bars, and a multi-lobe cam which determines the pulse duration of the signal code elements. A shaft, which mounts a gear and clutch, receives motive power to drive the mechanism from a gear on the intermediate gear shaft assembly.

2.11 The contact box may be adapted to generate either neutral or polar signals, and may be equipped with an rf or arc suppression network.

BASES

2.12 The typing reperforator bases are available in several variations. They provide a foundation for a motor unit and either one or three typing reperforator units, and also for

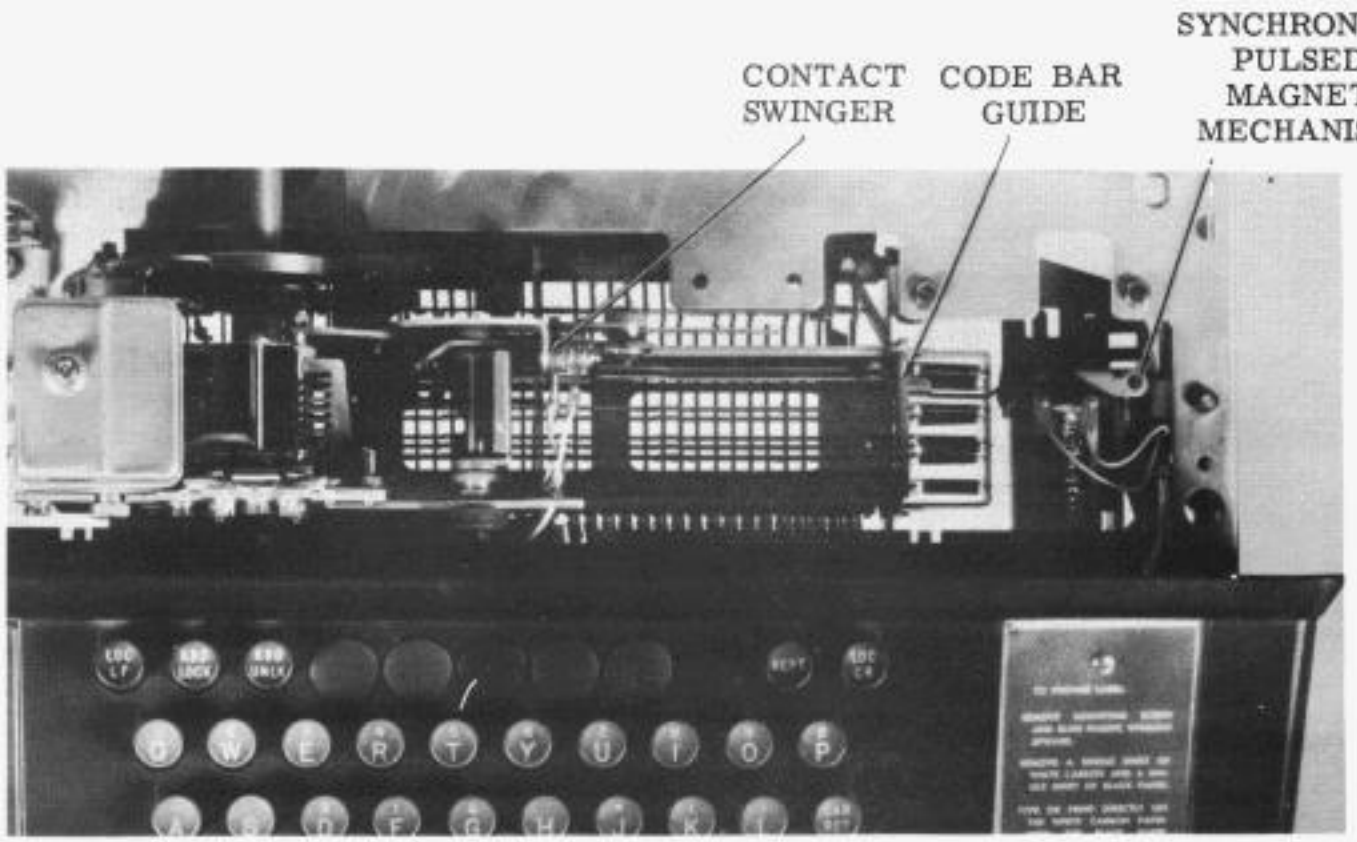


Figure 3 - Send-Receive Typing Reperforator Keyboard (Top View)

electrical and mechanical operational devices and accessories. Four typical bases are described below.

A. Single-Plate Base

2.13 This base contains a plate that rests on four metal feet and serves as a foundation for the other elements. Wiring, a power switch, a four-point terminal board, and a three-point power connector are part of the power circuitry. All other wiring terminates in a 32-point connector mounted by a bracket at the rear of the plate. Three nine-point terminal boards provide intermediate connecting points for this wiring which includes two selector magnet leads. The typing reperforator unit is mounted by four tapped holes at the left front of the plate. The motor unit is supported by three posts and an adjusting plate. Motion is transferred from the motor unit to the typing reperforator unit by a single-speed drive mechanism (Fig. 7). Gear sets may be interchanged to obtain different operating speeds. A tape container with a roller, a wire guide and a wooden filler for a tape roll is attached to the extreme right of the plate. A low tape mechanism incorporating two switches which may be connected to visual or audible alarms is located in the rear of the container. The base may be carried by a front handle and the connector mounting bracket which serves as a rear handle.

B. Double-Plate Base (Fig. 4)

2.14 In this base, an upper plate is separated from a somewhat larger lower plate by rubber vibration mounts. The lower plate rests on four leather feet and has two handles and four slots for mounting a cover. Wiring, a power switch and a three-point connector are part of the power circuitry. All other wiring terminates in a 16-point connector. Two nine-point terminal boards provide intermediate connecting points for all wiring except two selector magnet leads. A clamp with keeper secures cables where they leave the base. The tape container and the mounting facilities for the motor unit and the typing reperforator unit are identical to those of the single-plate base (see above). A low tape lamp is mounted by a bracket on the tape container. Motion can be transferred from the motor unit to the typing reperforator unit through a single-speed drive mechanism (Fig. 7). Gear sets may be interchanged to obtain different speeds, available as an optional feature, a variable-speed drive mechanism, which permits manual selection of operating speeds (60, 75, or 100 wpm) by movement of a lever, may be used with this base (Fig. 20).

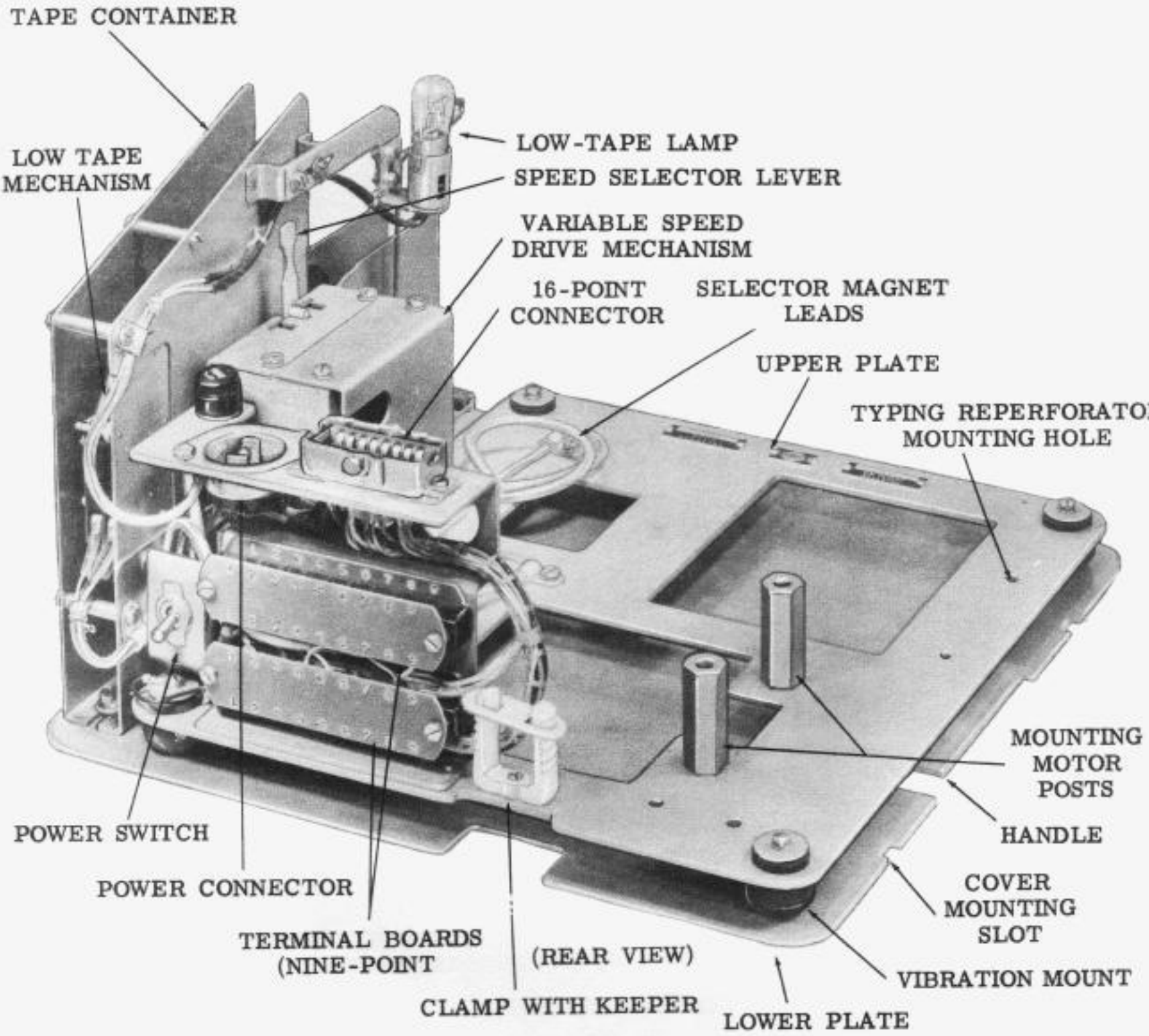


Figure 4 - Double-Plate Receive-Only Base

C. Miniaturized Base (Fig. 5)

2.15 This base is similar to the base described in 2.14 in that it is of double-plate construction and contains essentially the same features. It is, however, lighter in weight and smaller in size, and the mechanisms are arranged differently to conserve space.

2.16 The base contains two rectangularly shaped plates, separated by vibration isolators, and equipped with four feet. A casting provides mounting facilities for a motor unit. A tape container, equipped with a tape out switch, is supported by brackets above the motor unit mounting. A control panel contains a main power switch, a tape out lamp, and provisions for a tape feed out switch. Its mounting bracket also contains a fuse holder. Terminal boards, cable clamps, a reperforator connector, and the necessary electrical wiring are included. The base is normally equipped with a variable speed drive mechanism, which permits manual selection of operating speeds (60, 75, or 100 wpm) by movement of a lever. A single-speed drive mechanism with which speed changes are made by changing gears may be used with this base.

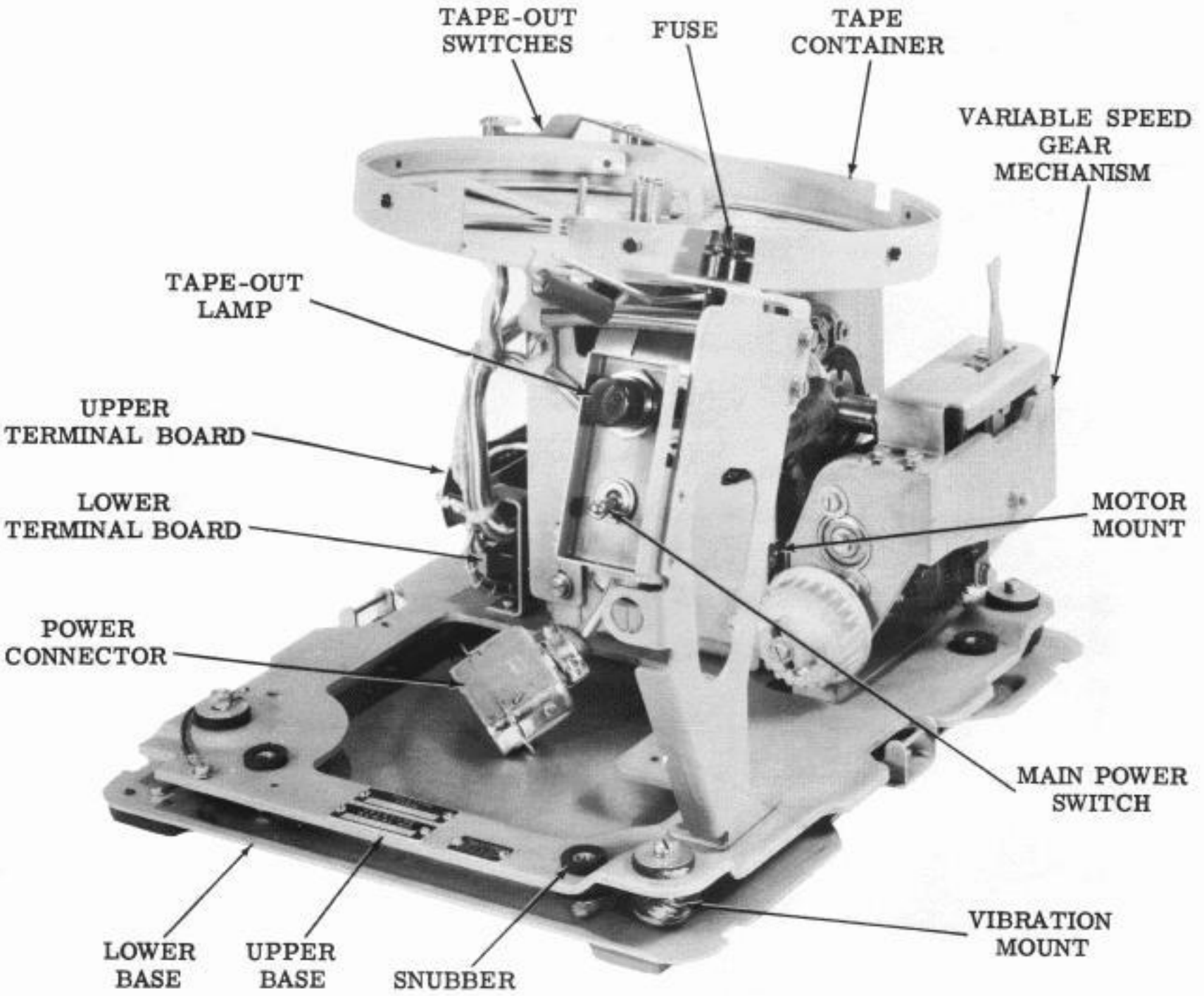


Figure 5 - Miniaturized Base

D. Multiple Reperforator Base (Fig. 6)

2.17 This base provides mounting facilities for three typing reperforator units and one motor unit, and for the necessary auxiliary equipment. A plate upon which the components are installed is separated from an oil pan by resilient mountings. Side rails are provided for installation of the base in a cabinet. Posts on an adjustment plate are provided for mounting a motor unit. Three tape containers equipped with tape out switches, a 14-point connector, terminal blocks, a main power switch, are also included. Three chad containers are provided on bases accommodating fully-perforated tape output typing reperforator units. The typing reperforator units, which are mounted near the front of the base, receive rotary motion from the motor unit through a cross-shaft assembly and timing belts. On some bases, intermediate gear assemblies transfer the motion from the cross shaft to the typing reperforator units via timing belts. The units may operate at a common speed or at independently varied speeds. Speed changes are made by interchanging gears at the motor unit and cross-shaft assembly; by changing the sprocket and timing belt at the reperforator units; or on bases so equipped, by changing gears in the intermediate gear assemblies.

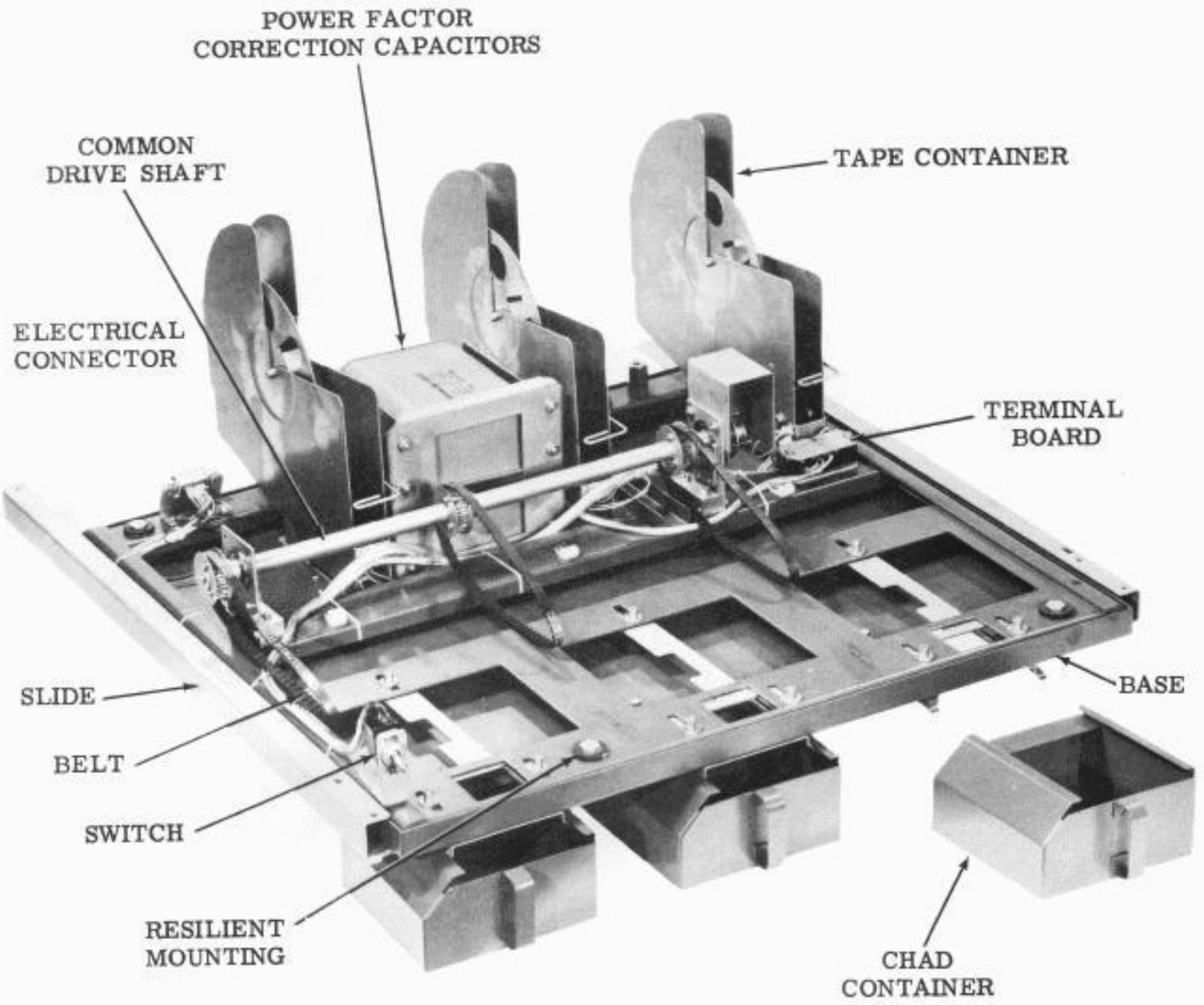


Figure 6 - Multiple Reperforator Base

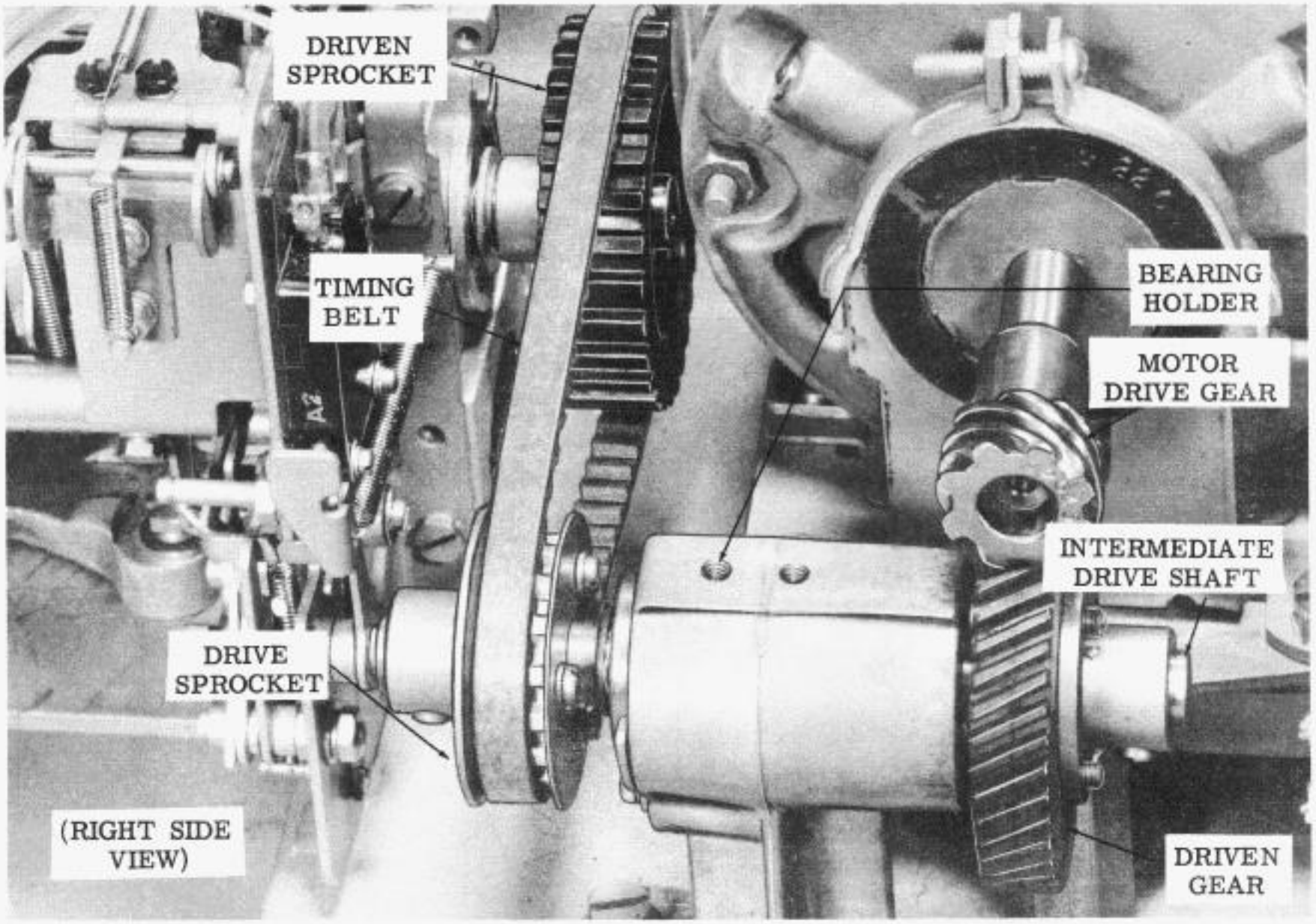


Figure 7 - Single-Speed Drive Mechanism

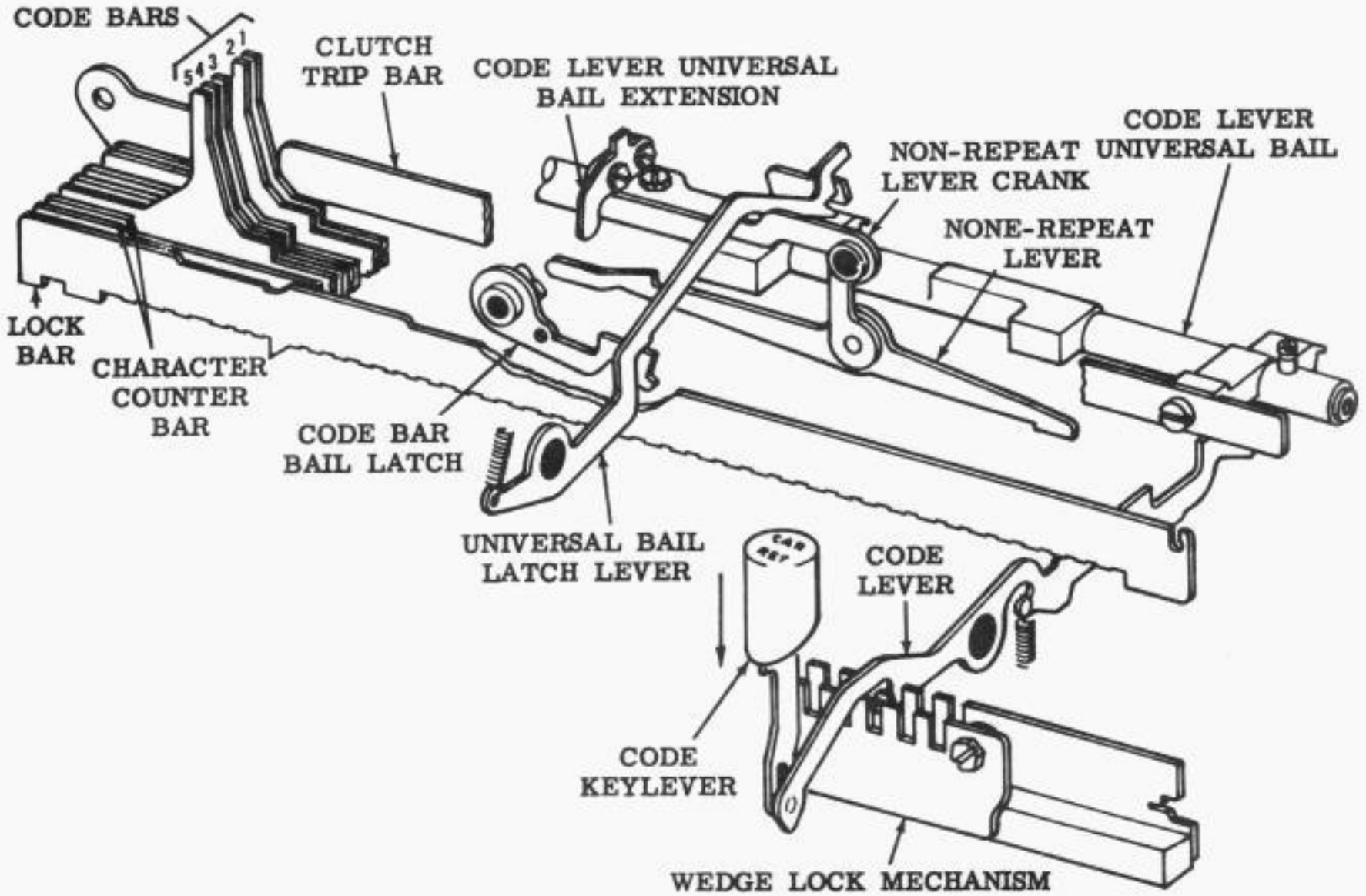


Figure 8 - Code Bar and Code Lever Universal Bail Mechanism

3. SEND-RECEIVE KEYBOARD

SEQUENCE OF OPERATION

A. Depression of Keys (Figs. 8, 10, 11 and 12)

3.01 As a code selecting keytop is depressed, the corresponding code lever rotates about its pivot point. The rear end of the code lever comes up and rotates the universal bail. The extension arm on the top of the universal bail moves out of engagement with the step at the rear end of the universal bail latch. This occurs when the key and corresponding code lever are about two-thirds of the way toward full stroke. The universal bail latch then moves downward under spring force developed by the universal bail latch spring. As this latch comes down, it strikes the code bar reset bail latch lever and carries it downward. When the corner of the reset bail latch descends beyond the center line of the needle bearing (mounted on the reset bail), the various spring forces acting on the reset bail cause it to swing to the right. This in turn allows the various code bars to move to the right (in the direction of the spring forces acting on each code bar). During this time, the code lever is moved up to its full position. Therefore, the code lever may stop some of the code bars from moving to their extreme right hand position. The code bars have vertical extensions that engage a curved part of the signal generator transfer levers. Those code bars that are permitted to move to the extreme right also move the corresponding transfer lever to the right. However, those code bars that are stopped, because their teeth engage the actuated code lever, do not quite touch or move their corresponding transfer levers. Therefore, these transfer levers remain in their normal left hand position (Figure 12).

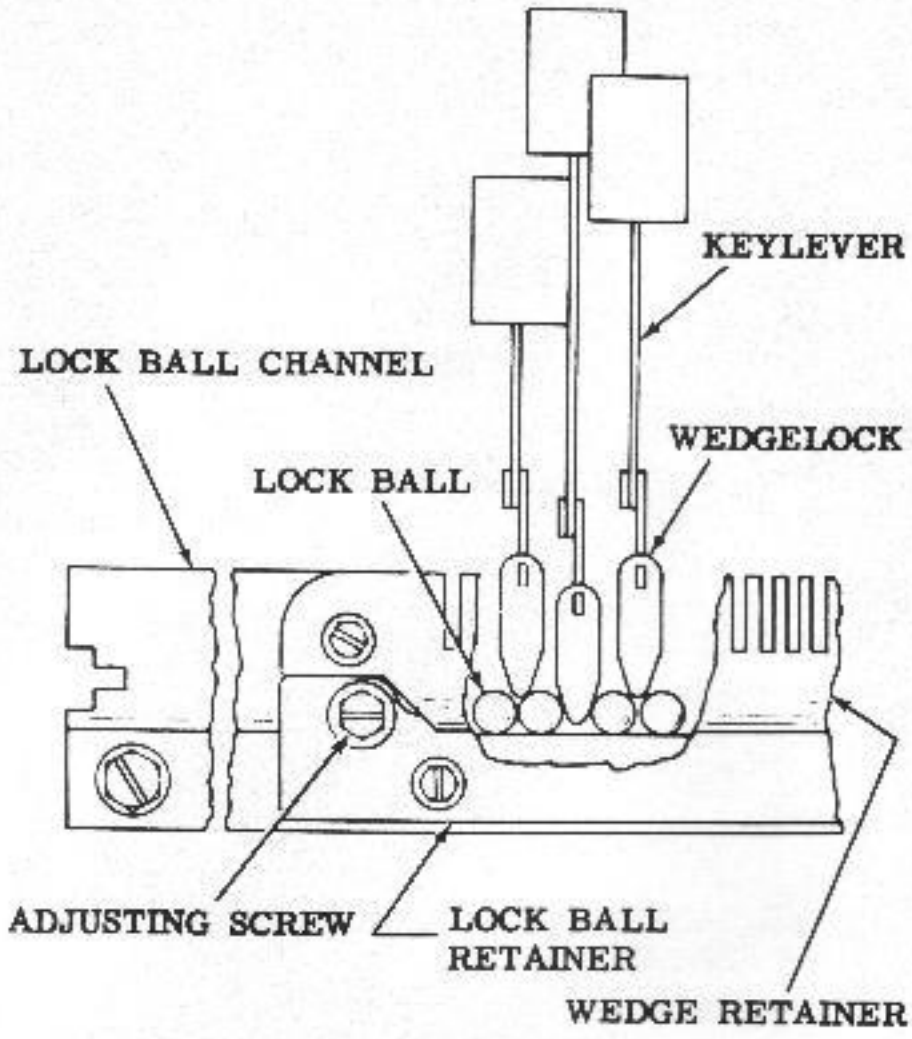


Figure 9 - Wedge Lock Mechanism

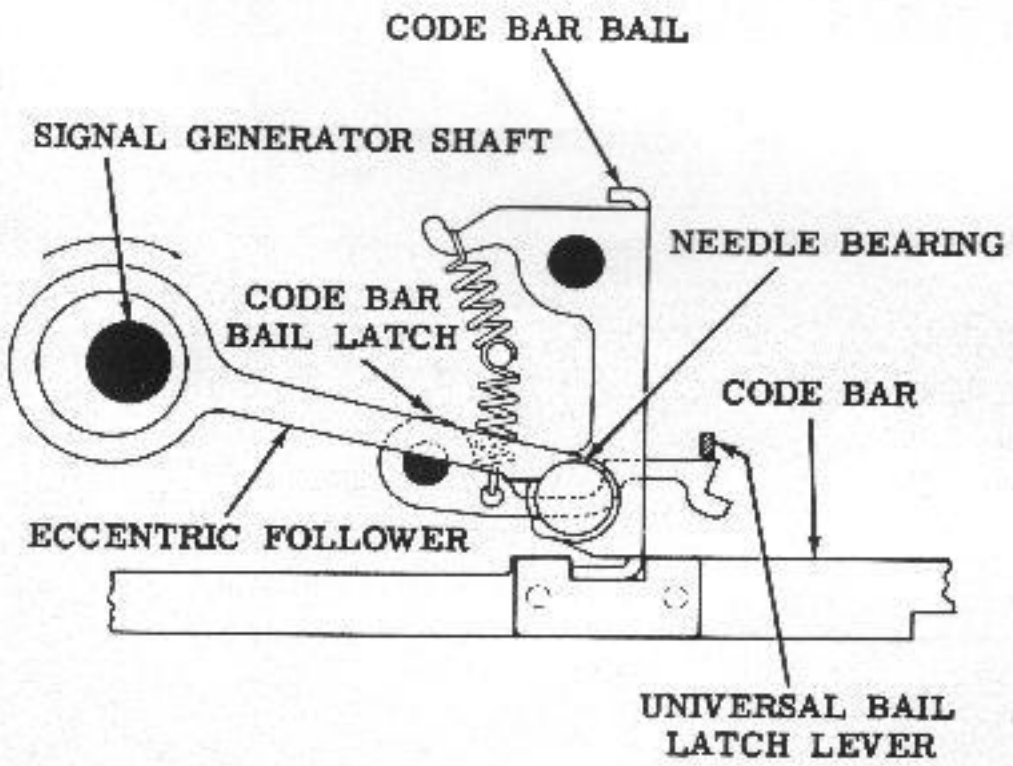


Figure 10 - Code Bar Bail Mechanism

3.02 A locking wedge is mounted on the projection of the lower position of all code levers and function levers (Fig. 9). When the lever is operated, its locking wedge moves downward between the lock balls in the lock ball channel preventing the simultaneous operation of more than one keylever.

3.03 Simultaneously with the trip-off of the reset bail and the movement of the code bars to the right, the clutch trip bar (located in the rear slots of the code bar guides) moves to the right (Fig. 10). This clutch trip bar engages the clutch stop lever and moves it out of latch with the clutch stop lug. Up to this point, all of the action has been caused by manual operation of the keytop and its associated code lever (Figure 8).

3.04 The motor unit supplies the mechanical power to drive the associated typing reperforator unit and the signal generator shaft. Refer to the appropriate section for description and principles of operation for the motor unit.

B. Positioning of Code Bars (Figs. 11 and 12)

3.05 Once the clutch is tripped, it rotates continuously as long as the keyboard is turned on. Since the clutch shoes are mounted on a plate that is part of the cam assembly, the cam begins to rotate (clockwise when viewed from the front of the keyboard).

3.06 The arrangement of the cam assembly is such that the third cam from the rear begins to push downward on its corresponding transfer lever. At almost the same time, the eighth cam from the rear begins to move the transfer lever locking bail upward. The blade portion of this locking bail goes up beside a downward projection on each transfer lever. The locking projection is left or right of the locking bail, depending upon the position of the transfer lever (as set up by the permutation action of the code bars). Thus, in the first few degrees of cam rotation, the permutated position of the transfer levers is located into position and the code bars are free to be reset in their normal latched position.

3.07 The cams and their corresponding transfer levers are numbered from rear to front. The number 3 cam engages its transfer lever first; and moves it down. Since the start pulse is always spacing, no code bar is required to engage this lever and it is always held to the left by its spring. Therefore, as the third cam moves the lever down, the hook at the upper right side of the transfer lever engages the right

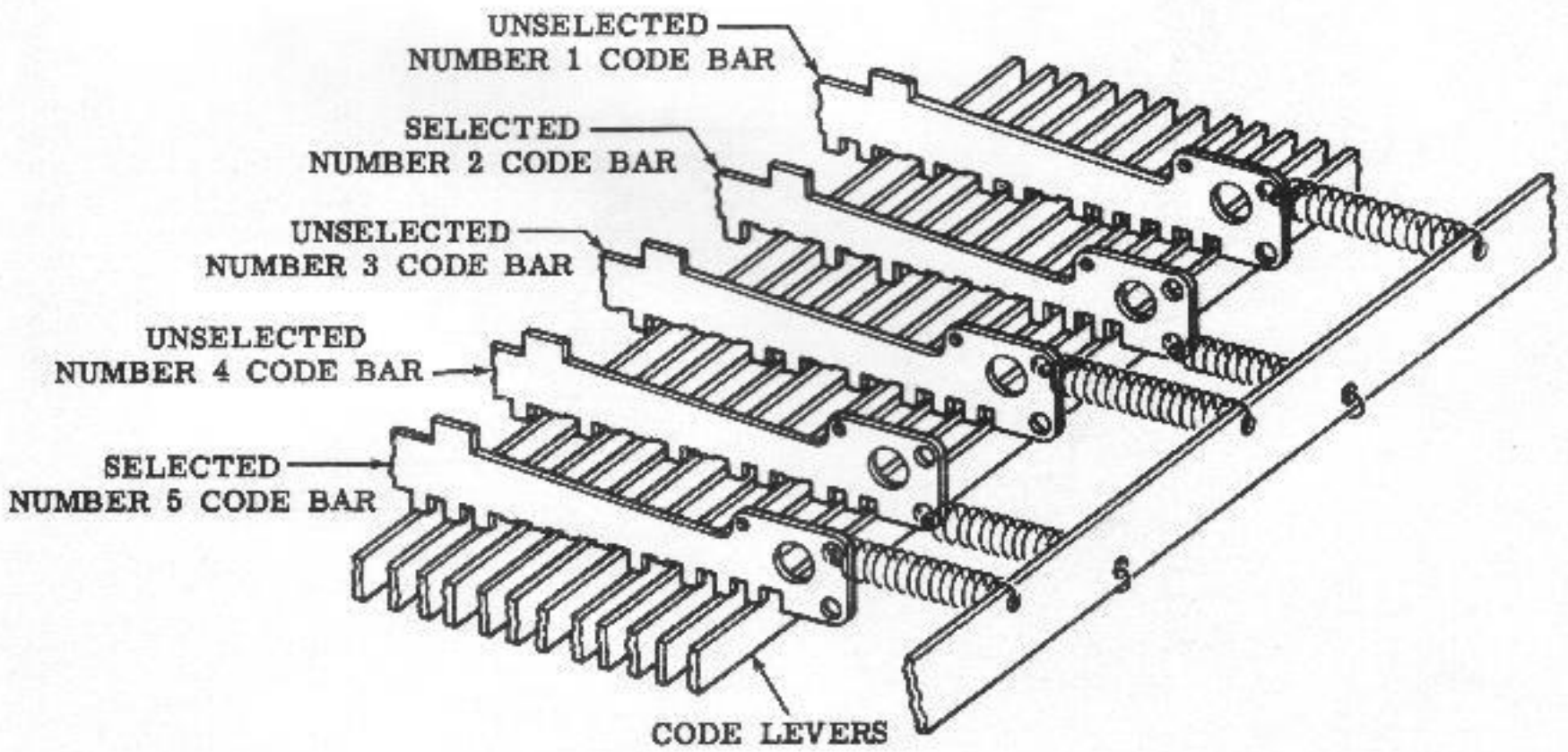


Figure 11 - Code Bar Selection

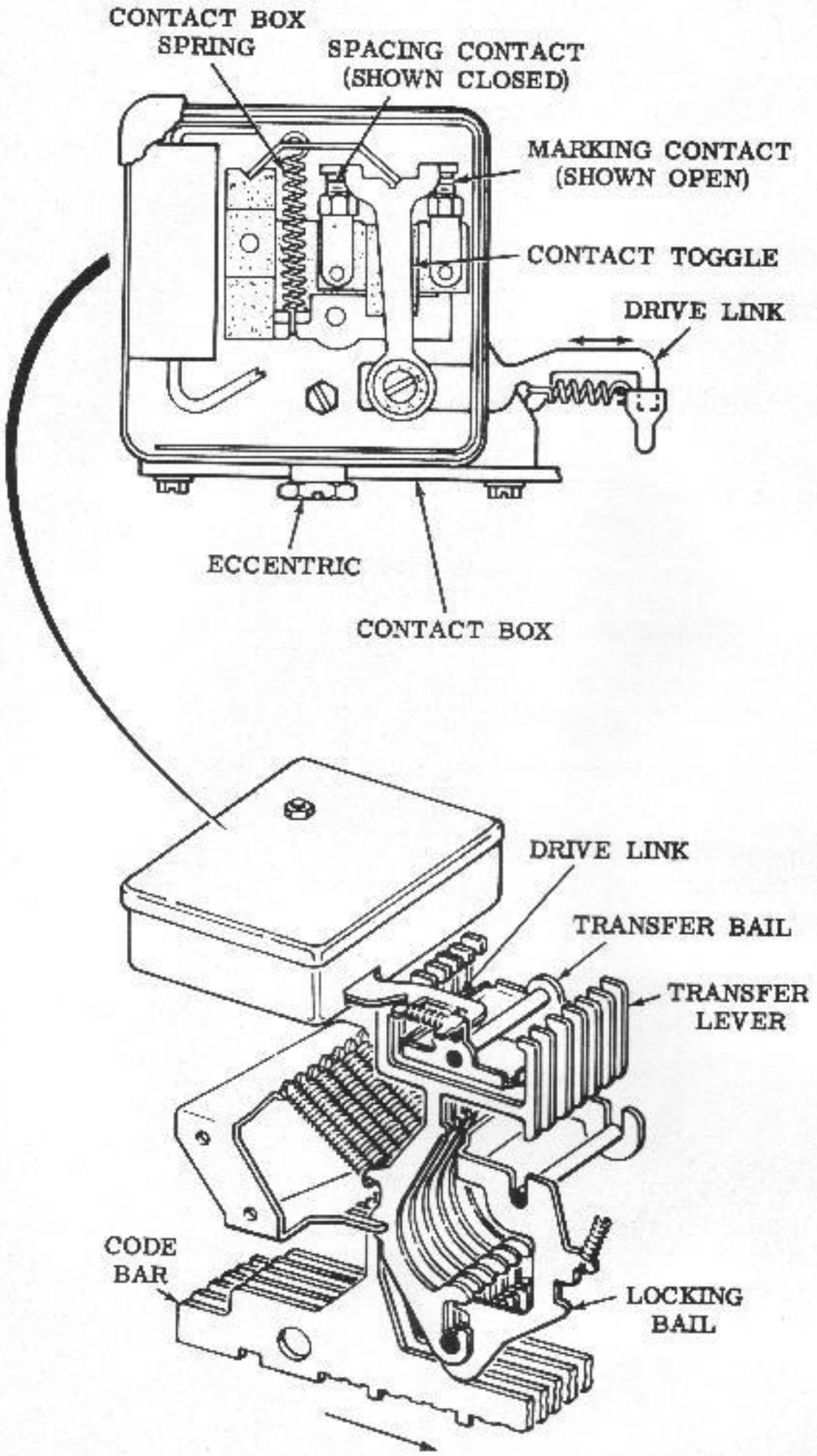


Figure 12 - Transfer Lever Mechanism and Contact Box Mechanism

side of the transfer (rocker) bail. This tips the transfer bail to the right and pulls the contact drive link to the right. The resulting action of the contact toggle is such that the left set of contacts acts as a pivot and the right hand contacts begin to open. The right hand contacts control the signal current in single contact type operation. When these contacts are open, the result is no current in the signal circuit. Therefore, the first pulse, the start pulse of any character code is a spacing (no current) pulse.

3.08 The number 1 cam and the transfer lever move downward next. In turn, the upper left hook of the associated transfer lever pulls down on the rocker bail (holding it to the right or tilting it back to the left). This pushes the drive link to the left (or right) resulting in closing the right (or left) contacts and allowing a marking (or spacing) pulse to be transmitted.

3.09 Similarly, the remaining transfer levers 2, 4, 5 and 6 are pulled downward by their respective cams. The resulting pulse is marking if the transfer lever is to the right or spacing if it is to the left. The number 7 transfer lever is held to the right by a stop pin. Therefore, the last pulse (the stop pulse) is always marking (current on).

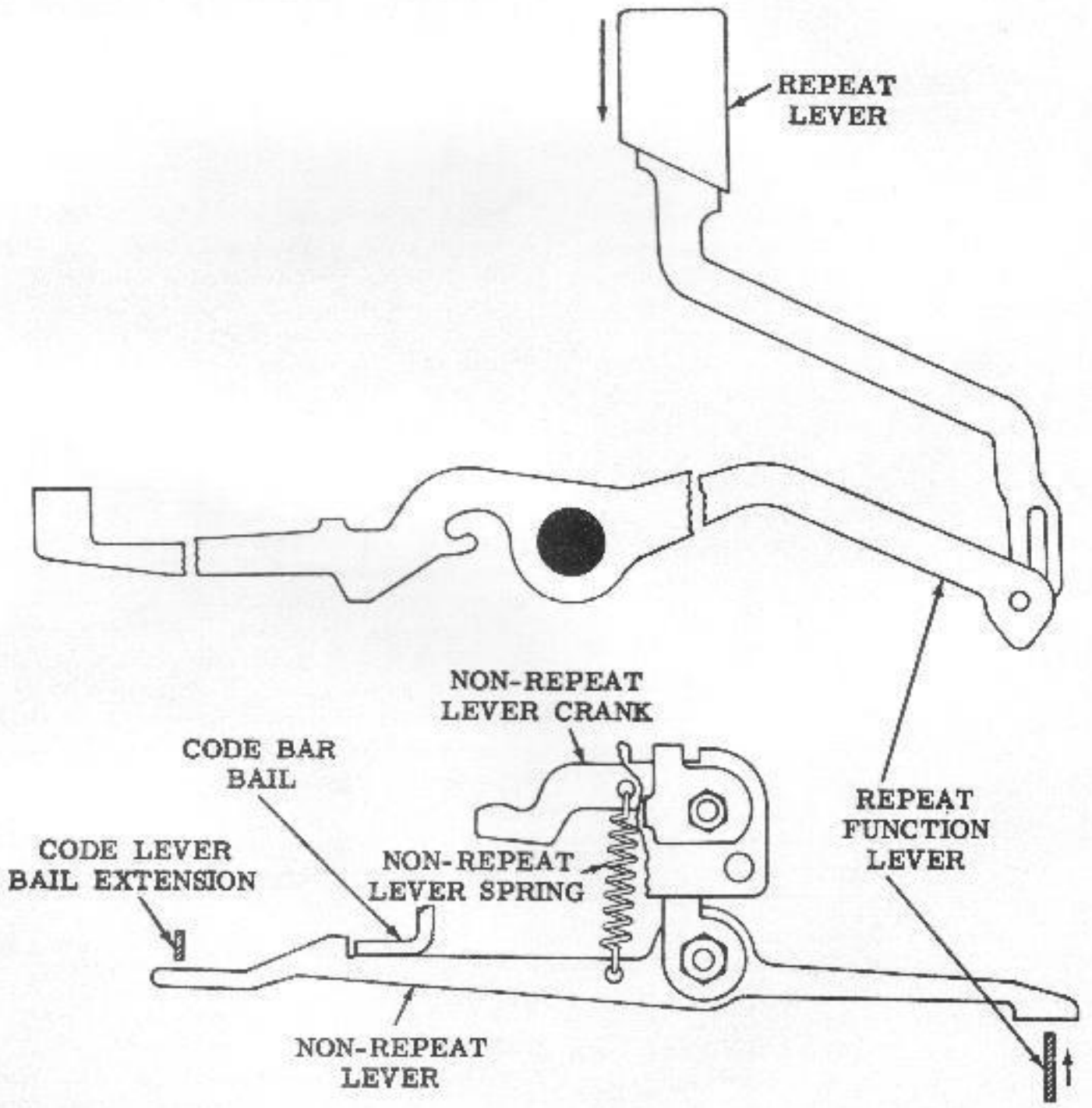


Figure 13 - Repeat Mechanism

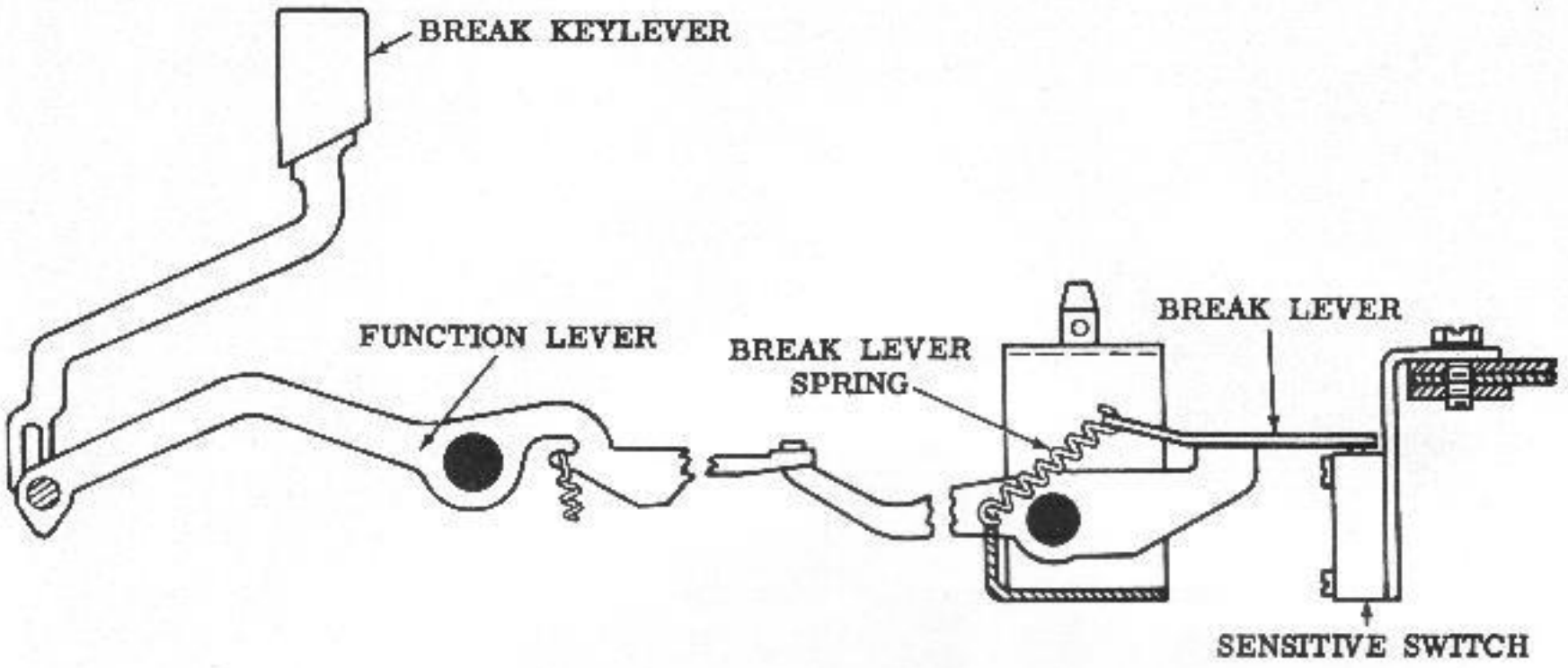


Figure 14 - Electrical Line Break Mechanism

3.10 The locking bail is actuated by the number 8 cam lobe. This cam begins to move the locking bail up into its locking position almost as soon as the cam starts to rotate (Figure 12). Full lock position occurs approximately at the half-way point of the start pulse (48-1/2 degrees of rotation). The dwell on the eighth cam from the front holds the lock bail in its lock position until after the beginning of the number 5 pulse. Then the cam pulls the bail down out of lock, and all transfer levers are free to return to their initial positions at a point about halfway through the stop pulse.

C. Resetting of the Code Bars (Figs. 10 and 13)

3.11 Reset of the code bars is accomplished by means of an eccentric on the front of the cam assembly, which drives an eccentric follower arm (Figure 10). This arm engages a stud on the side of the reset bail and pulls the reset bail to the left as the cam rotates. At the peak position of the reset eccentric, the code bar reset bail latch is clear of the needle bearing stud. This permits the latch spring to pull the latch up into locking position and the code bar reset bail is latched as the eccentric drives the follower arm back to its initial position. As the code bar reset bail is moved to the left (into reset), it engages projections on the permutation code bars, clutch trip bar, and a step on the non-repeat lever. Thus, all of these elements are moved to the left into latched reset position.

3.12 The reset eccentric is positioned in angular relationship to the remainder of the cam so that pick-up of the code bars and non-repeat lever begins. Just after the number 2 pulse begins, near the end of the start pulse, the code bars have been moved to the left a sufficient distance to permit the code lever (that determined the permutation) to drop down out of the universal bail. This permits the universal bail to rotate forward and move the non-repeat lever down and off the reset bail. At the same time, the extension of the universal bail moves in under its latch lever and holds this latch lever up almost in the same position that the pawl on the non-repeat lever had held it in the early reset movement. With the universal bail latch held up, the reset bail continues to move to the left. Full rest occurs at approximately 180 degrees of cam rotation (1/4 through the number 3 pulse). As soon as the universal bail is permitted to move forward, a second keytop can be depressed. However, from that point on, full time of cam rotation must expire before a third and successive keytops can be operated.

FUNCTION KEYS

A. Repeat Mechanism (Fig. 13)

3.13 Operation of the REPT keylever simultaneously with one of the keylevers in the three lower rows or the space bar disables the non-repeat mechanism and causes the character or function selected to be repeated as long as the

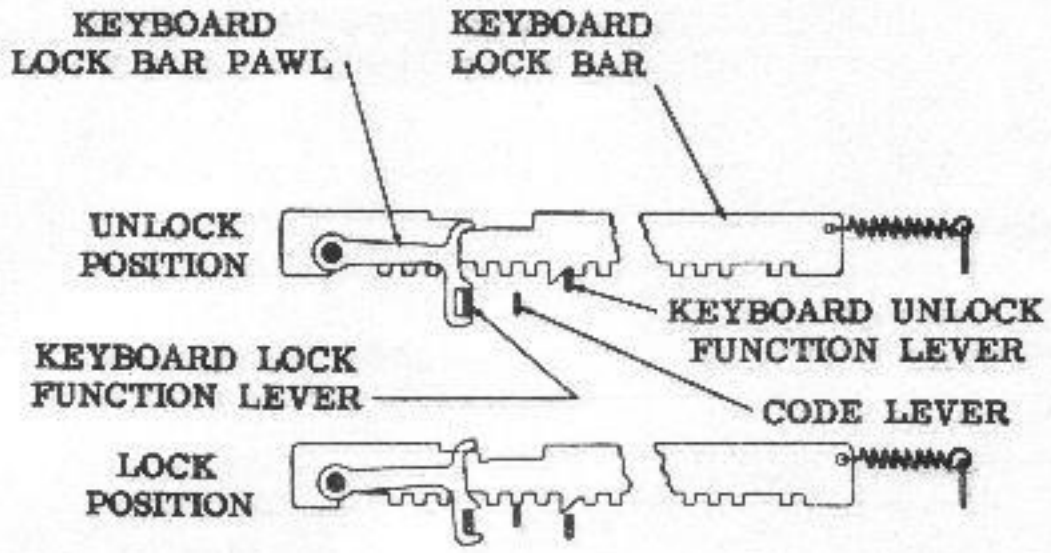


Figure 15 - Keyboard Lock Mechanism

REPT keylever is held operated. The operated REPT keylever causes its function lever to raise the right end of the non-repeat lever (Fig. 13) and rotates it about its pivot point. In this position, the non-repeat lever cannot be engaged and operated by the code bar bail; therefore, the non-repeat lever crank will not reset the operated code bar bail latch. The code bar bail and universal bail latch lever are thus maintained in their operated positions, and the code bar bail follows the eccentric movement back and forth until the REPT keylever is released.

B. Electrical Line Break Mechanism (Fig. 14)

3.14 The electrical line break mechanism provides a means of interrupting signal circuit as an alerting signal for automatic equipment sometimes used in the teletypewriter system. Interruption of the line current is accomplished by depressing the BREAK keylever.

3.15 When the BREAK keylever is depressed, its function lever pivots and raises the front end of the break lever. The rear portion of the break lever depresses the actuator pin of the sensitive switch, which opens the normally closed contacts. This action breaks the continuity of the signal line, causing transmission of a break (no current) signal.

3.16 When the BREAK keylever is released, the tension of the switch spring and the break lever spring cause the function lever to return the keylever to its normal position, and the switch contacts to their normal closed condition.

C. Keyboard Lock-Unlock Mechanisms (Figs. 15 and 16)

3.17 Operation of the (red) KYBD LOCK keylever causes its function lever to raise the keyboard lock bar pawl. In its upper position, the pawl releases the keyboard lock bar, and a spring pulls the bar to the right. In this position, projections on the lower side of the bar block the upward movement of any code lever and the repeat function lever.

3.18 Operation of the (red) KYBD UNLK keylever causes its function lever to rise against a camming surface on the keyboard lock bar and drive the bar toward the left until the lock bar pawl drops into a notch in the lock bar. In this position, the projections on the lock bar lie between the code levers and offer no interference with their operation.

D. Tape Back Space (Fig. 1)

3.19 Depressing the TAPE B.SP. keylever directly activates a switch which controls the back space function on the typing reperforator. The keylever is spring loaded to return to its unoperated position after each operation. There is no associated function lever for this keylever, and the code bar mechanism is not affected by its operation. The operation is isolated from the signal generator mechanism and does not affect other units in the line circuit. The purpose of the back space function is to permit eradication of an erroneous character code, or codes, by reperforating such codes, using the five-hole perforated letters code.

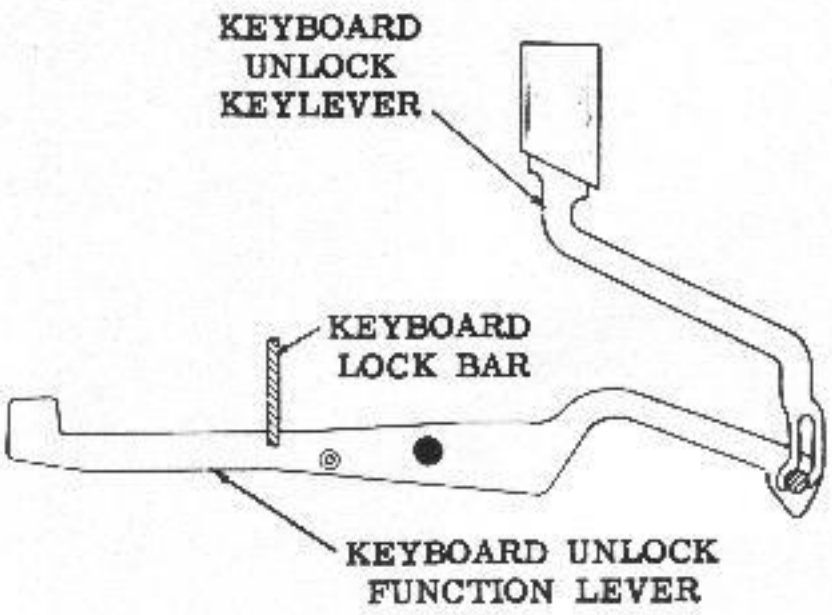


Figure 16 - Keyboard Unlock Mechanism

E. Tape Feed Out (Fig. 1)

3.20 The TAPE F.O. keylever operates a sensitive switch located at the rear of the base. Although the switch is actuated through a function lever, the use of this key is an off-line operation and has no effect on the code bars.

CHARACTER COUNTER MECHANISM
(Figs. 17, 18 and 19)

3.21 The character counter is driven mechanically from the code bar mechanisms through the counter and counter reset code bars located in the second and third (from front) slots of the code bar basket. These code bars have drive projections which engage the forks of the feed and reset bails of the counter. As the code bars fall to the right when a key on the keyboard is struck, the counter mechanism is tripped. These functions may be divided into three distinct phases of operation of the counter mechanism, stepping, counter reset and restart.

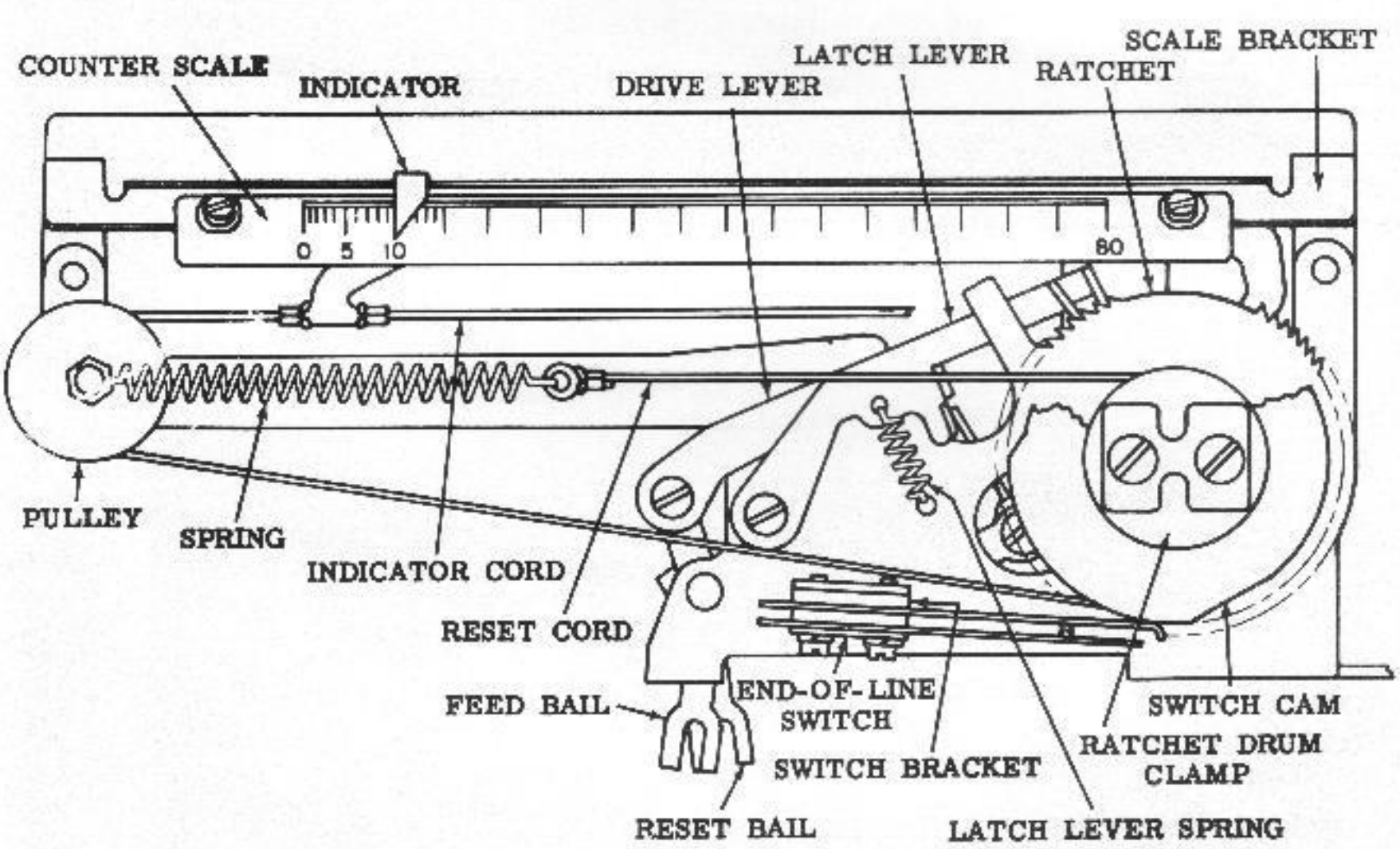


Figure 17 - Character Counter Mechanism (Front View)

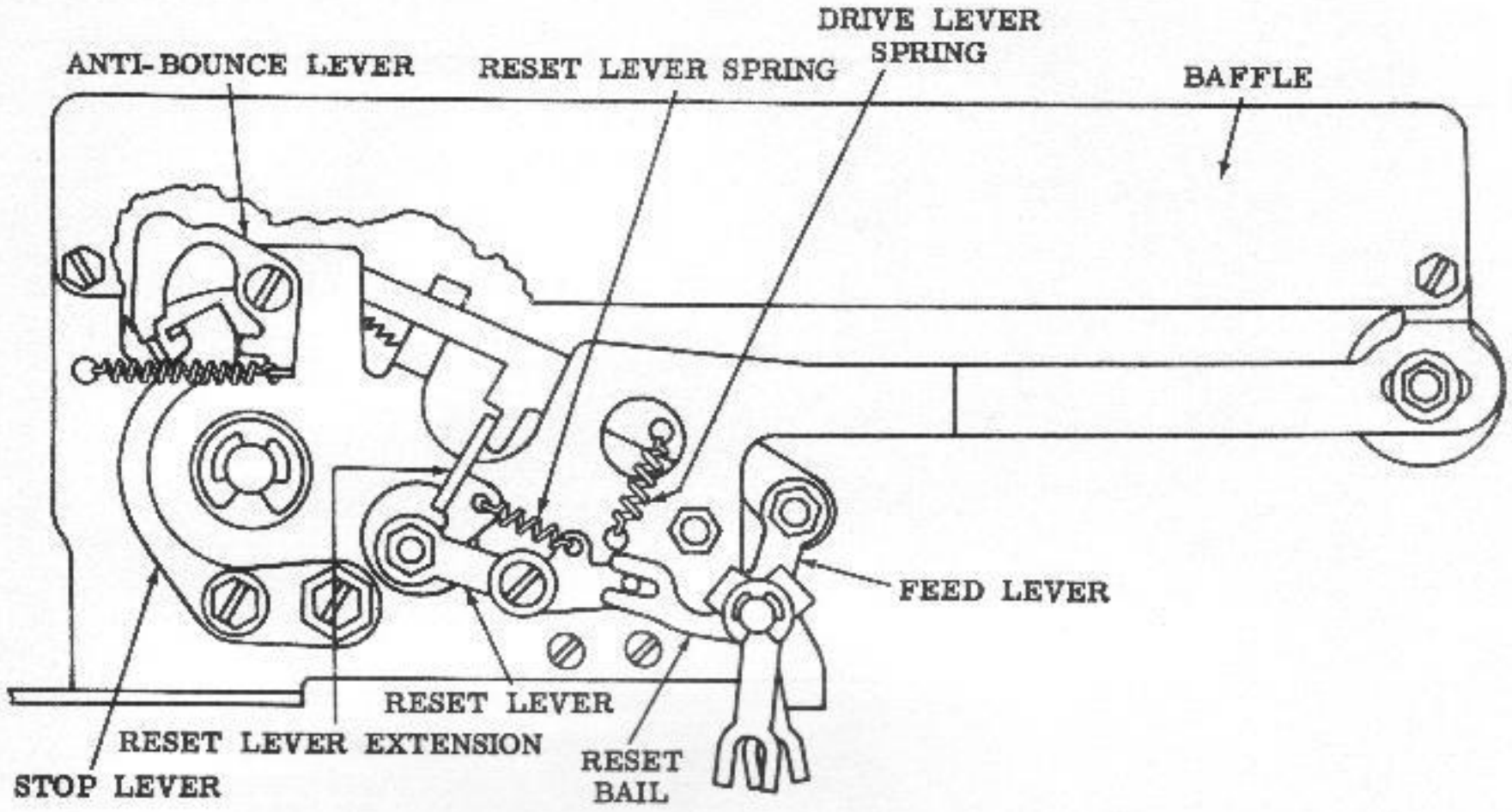


Figure 18 - Character Counter Mechanism (Rear View)

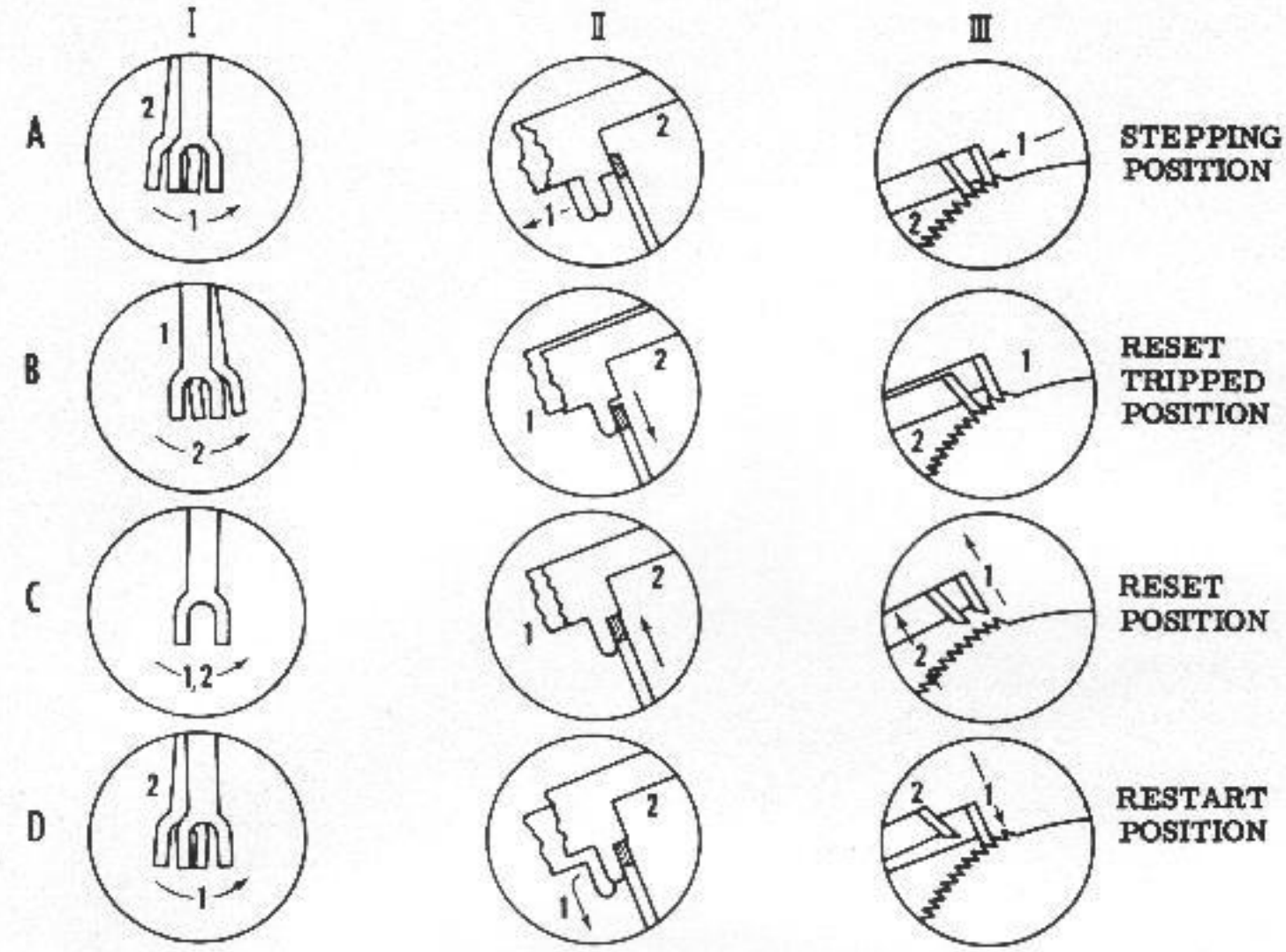
A. Stepping

3.22 Referring to sequence A (Fig. 19), as a key is struck, the code bars fall to the right, carrying with them feed bail (1). The drive bail, which is linked to the feed bail, moves to the left slightly more than one tooth. As the code bars are reset under power, stepping bail (1) moves clockwise, causing the drive lever to advance the ratchet drum one tooth. The drive pawl prevents the ratchet drum from rotating counterclockwise until it is again tripped for the following character. When this occurs, the ratchet drum rotates slightly counterclockwise, coming to rest against the latch lever.

B. Counter Reset

3.23 Sequence B (Fig. 19) illustrates the tripped position of the counter mechanism for a reset function. Reset bail (2) moves counterclockwise as its code bar falls to the right, causing the reset lever in turn to rotate clockwise. As the reset lever rotates clockwise, the reset lever extension moves downward until it falls under the shoulder of the projection on the drive and latch levers under the action of its spring. When the counter bars are reset, as in C (Fig. 19), the reset bail is rotated clockwise to its original position, causing the reset lever to rotate counterclockwise, carrying both the drive and latch levers out of engagement with the ratchet teeth. The mechanism remains in this condition, and the ratchet drum assembly rotates rapidly counterclockwise (under the action of its return spring) until it reaches its zero position.

3.24 As the ratchet drum reaches its zero position, a stop on the ratchet strikes a stop lever fastened to the frame. The elastic impact is transmitted through the stop lever to the anti-bounce lever, whose lower end is normally in contact with the stop lever. The anti-bounce lever rotates counterclockwise, dropping in behind the ratchet stop. As the ratchet drum rebounds from the stop lever, its stop strikes the anti-bounce lever, preventing further motion and maintaining the anti-bounce lever in its actuated position. The ratchet continues to operate between the stop lever and anti-bounce lever until the energy in the system has been largely dissipated. The ratchet stop then remains in contact with the stop lever, permitting the anti-bounce lever to return to its normal position.



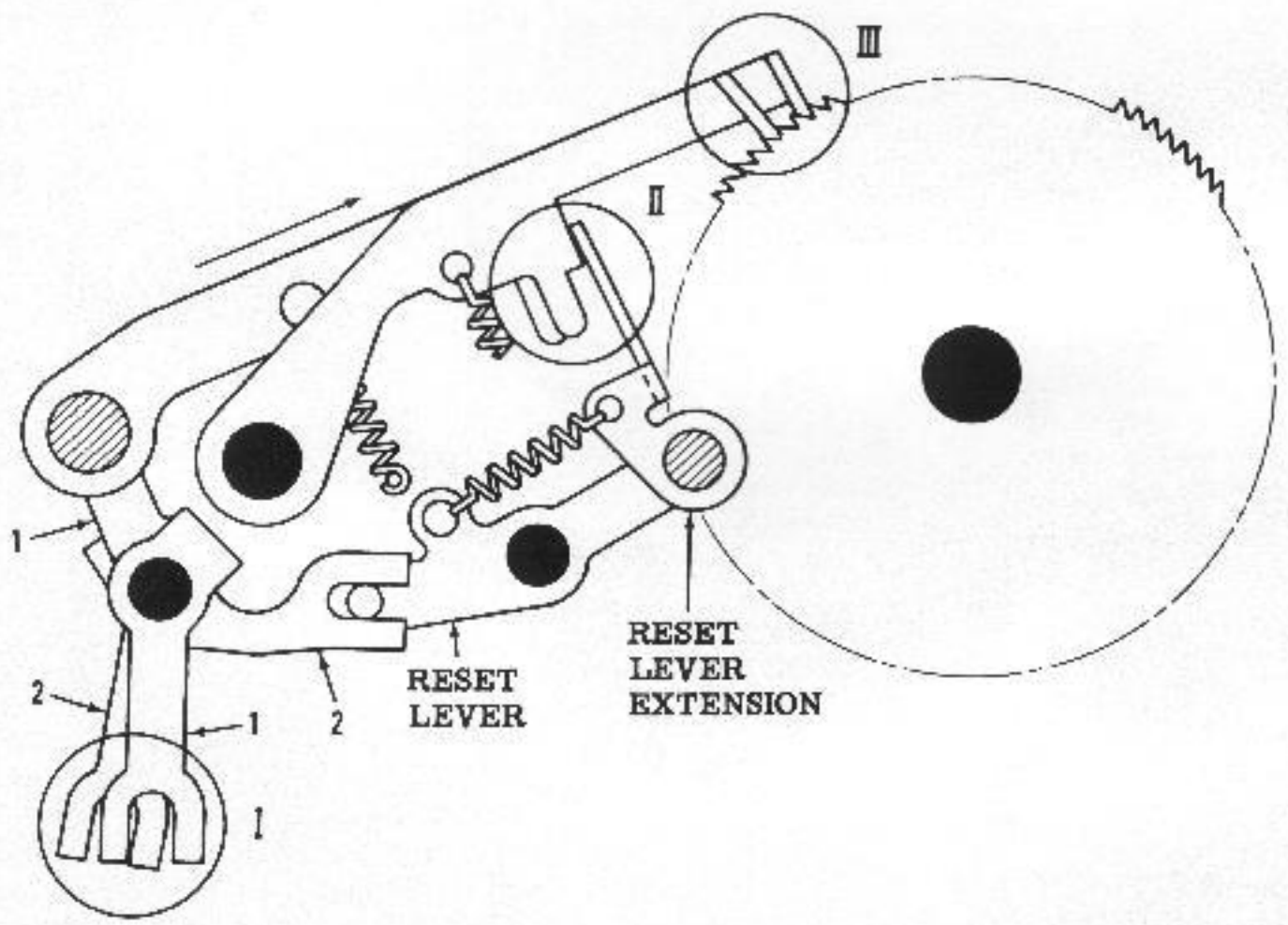


Figure 19 - Operation of Character Counter Mechanism

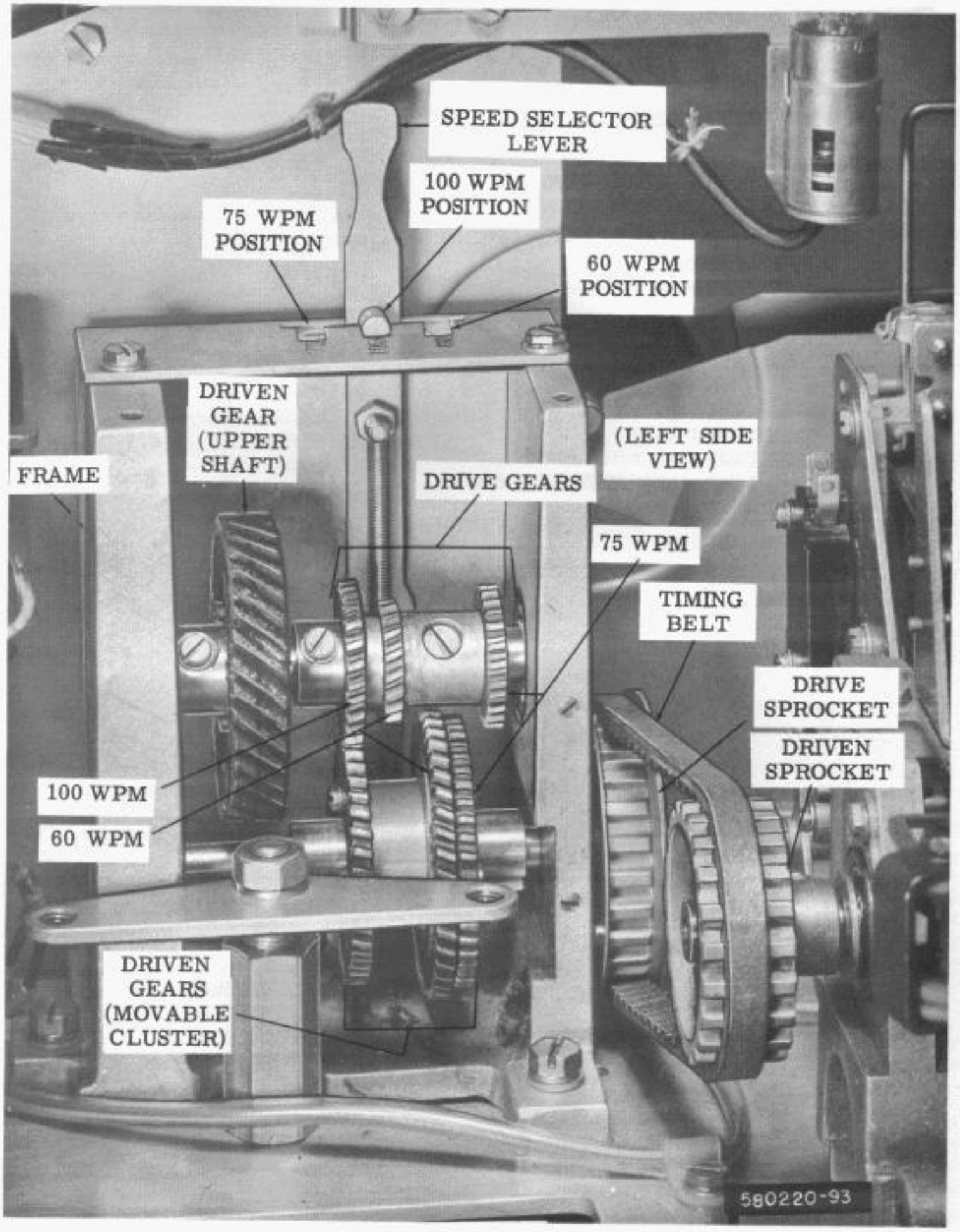


Figure 20 - Variable Speed Drive Mechanism

C. Restart

3.25 Sequence D (Fig. 19) illustrates the restarting action of the counter mechanism for the character following a carriage return. As a key on the keyboard is depressed, the counter code bar falls to the right, the feed bail moves counterclockwise and the drive lever moves to the left. As the drive lever moves to the left, it is disengaged from the reset lever extension and falls into engagement with the ratchet tooth. As the code bars are reset under power, the feed bail rotates clockwise, and the feed lever begins to move to the right. As it does, its projection pushes the reset lever extension to the right and out of engagement with the latch lever, which falls into engagement with the ratchet drum. As the drive lever completes its stroke, it steps the ratchet one tooth, as in the normal stepping operation.

D. End-of-Line Switch (Fig. 17)

3.26 Operation of the end-of-line switch is controlled by a switch cam. The switch cam rotates with the ratchet drum and can be adjusted to close the switch at any typed line length from 10 to 80 characters.

4. BASES

4.01 The receiving-only typing reperforator bases are composed basically of passive mechanisms. The variable-speed drive mechanism, used with certain bases, and available as an optional feature is described below.

5. VARIABLE FEATURES

VARIABLE SPEED DRIVE MECHANISM (Fig. 20)

5.01 This mechanism is used on certain receiving-only bases and permits the manual selection of the typing reperforator operating speed to permit synchronization with the transmission speed of the incoming signal. Speed selections must be made with the motor unit inoperative.

5.02 A motor pinion gear attached to the motor shaft drives the main driving gear on a hub at the front end of the lower of two of the variable speed intermediate gear mechanism shafts. Three gears fastened to hubs which rotate with the lower shaft are driving gears. From the front, the first gear drives at 75 wpm speed; the second, smallest gear at 60 wpm; and the largest gear, at the right, at 100 wpm.

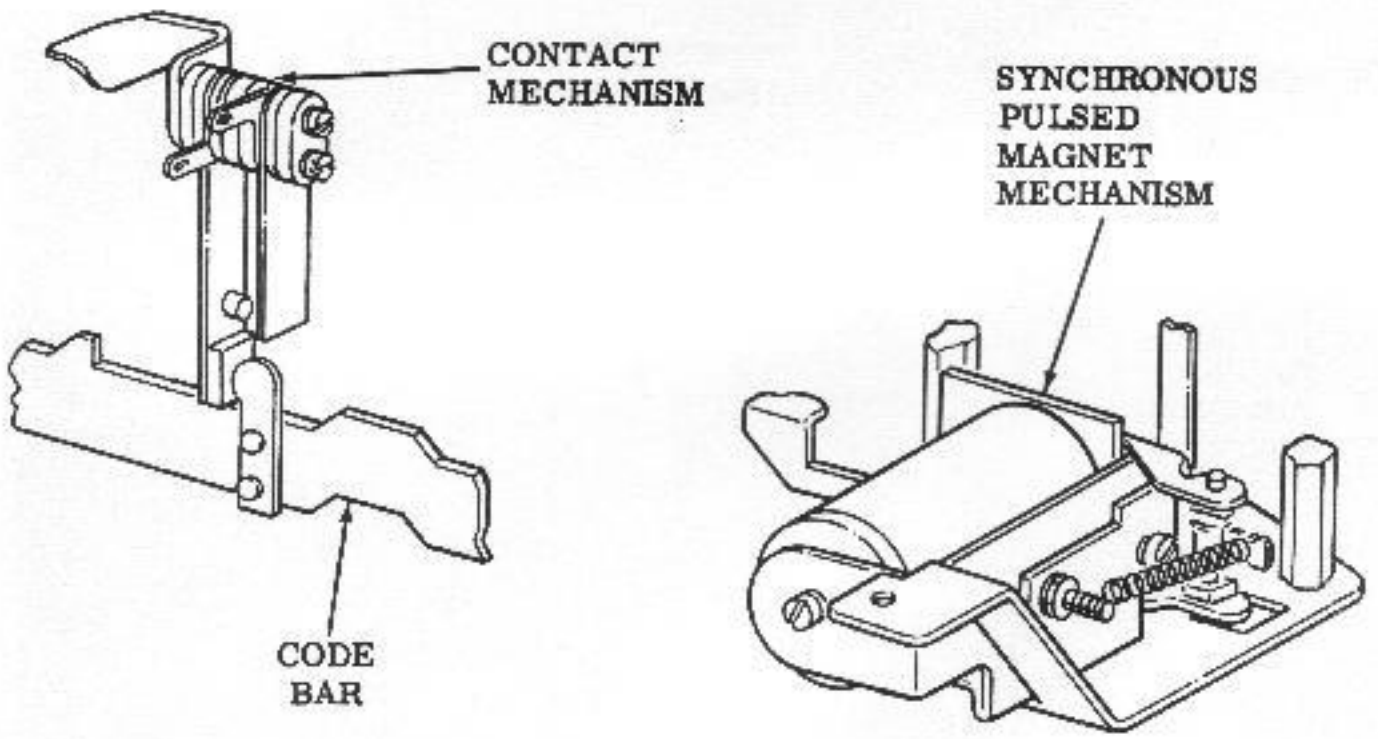


Figure 21 - Synchronous Pulsed Transmission Mechanism

5.03 On the upper shaft, spaced so the gears will clear the non-mating driving gears in the shifting operation but will mate for the selected gear ratio, are three driven gears. The driven gears slide freely horizontally on a hub fastened to the shaft but are keyed to rotate the shaft, regardless of which gear combination has been selected. From the front, the gears on the top shaft are first, the driven gear for 75 wpm operation; second, the largest gear, for 60 wpm; and third, the smallest gear, for 100 wpm.

5.04 Between the second and third gear and separated from the gears by spacers is a gear block on which the shift lever slides. Manually positioning the gear shift handle releases the three position detent in the bottom of the housing and permits the movement of the handle to the right or left, as required to select a gear ratio. The selected ratio is indicated by indexed detents in the grease retainer covering the mechanism. At the rear, the mechanism is in position for 75 wpm operation. The center position is for 100 wpm, and the front index is for 60 wpm.

5.05 The gear ratio selected must be the same as that on the distant station transmitting equipment. The upper shaft drives a hub and driving sprocket at its front end. The sprocket is connected through a timing belt to operate the typing reperforator at the selected speed.

SYNCHRONOUS PULSED TRANSMISSION (Fig. 21)

5.06 The synchronous pulsed transmission mechanism provides a means of initiating signal transmission from the keyboard, at a predetermined rate, upon reception of an 0.050 ampere external clocking pulse of 20 millisecond duration.

5.07 When any green key on the keyboard is depressed, the reset bail moves right and releases all selected code bars. Also released is the universal code bar which moves right and closes the clutch magnet conditioning contacts setting up the clutch trip magnet to receive the external clocking pulse.

5.08 Upon reception of the external clocking pulse, the clutch trip magnet energizes and unlocks the clutch trip bar. As the clutch trip bar moves to the right it engages the clutch trip bail extension and trips the signal generator clutch, allowing the signal generator cam shaft to rotate and transmit the proper sequential signal. After one complete revolution of the signal generator cam shaft, the reset bail returns to the starting position, resetting all code bars and the clutch trip bar.