

35 NONTYPING REPERFORATOR

GENERAL DESCRIPTION AND PRINCIPLES OF OPERATION

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1. GENERAL

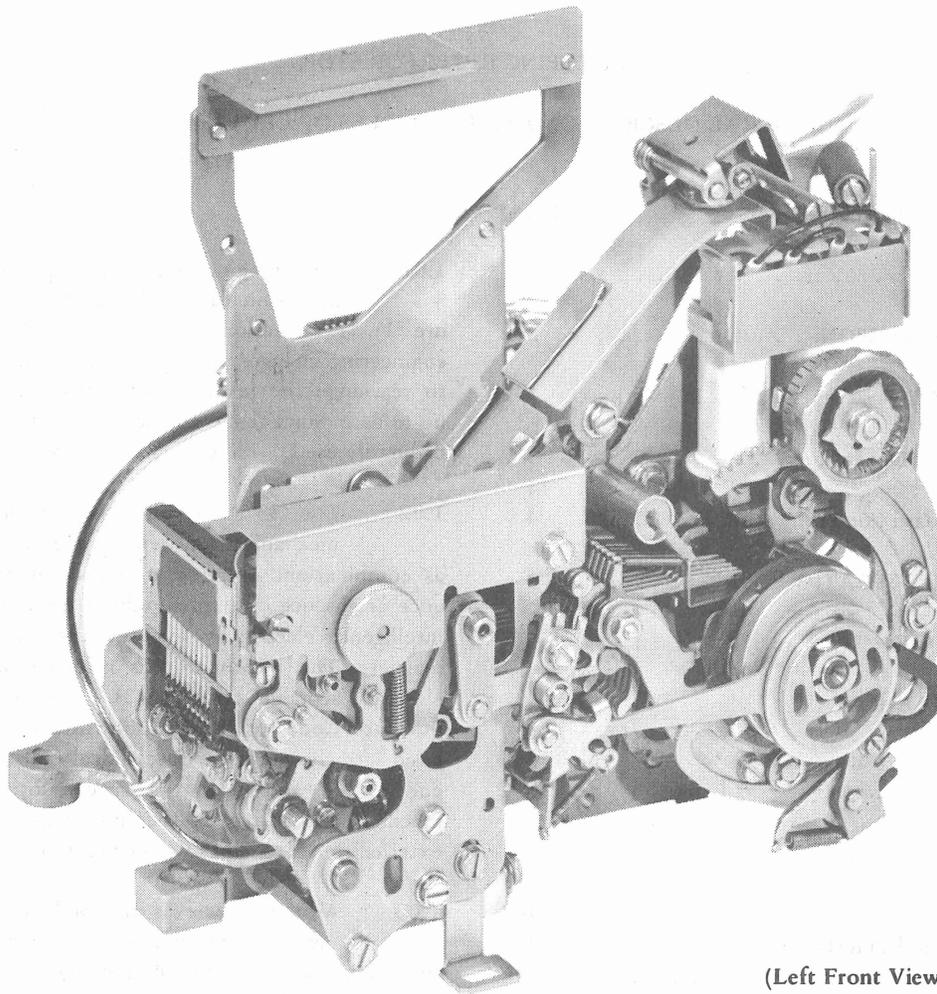
1.01 This section contains description and principles of operation for the 35 nontyping reperforator (Figure 1). The section has been revised to include recent engineering changes, incorporate TCN753 and TCN875, and to rearrange the text, so as to bring the section generally up-to-date. Since this is an extensive revision, marginal arrows ordinarily used to indicate changes have been omitted.

1.02 The 35 Nontyping Reperforator is an electro-mechanical unit which records information in tape as combinations of perforations representative of the presence or absence of a signal pulse in each of the eight levels of intelligence electrically fed into the unit and its selecting magnets. The information is received in the form of an electrical signaling code (ASCII - United States of America Standard Code for Information Interchange) which is translated into the necessary mechanical motions to perforate the code holes and feed the tape. Motive power for the mechanical features of the unit must be provided by an external source, such as a motor unit and drive mechanism.

1.03 Motive power is received through a jack shaft geared at the rear to the main shaft. Rotation of the main shaft is distributed by two all-steel internal expansion clutches, one a selector clutch, the other a function clutch. When engaged, the clutches permit their associated mechanisms to operate at the speed established by rotation of the main shaft. Operating speeds of 60, 75, or 100 words per minute are available through changes in gears.

1.04 The selecting mechanism, in addition to the clutch, includes a two-coil magnet in series with the external signal line. The magnets are operated on an 0.060 ampere or 0.500 ampere circuit from a selector magnet driver in the electrical service unit. A range finder is used to refine the mechanical orientation of the selector mechanism to the signaling code.

1.05 The function clutch is tripped by the selector mechanism to initiate transfer of motion from the main shaft to the perforating mechanism. A feed and die wheel advances the one inch tape to the punch block, where the feed hole and code holes are punched, fully perforated, in a code pattern established by mechanical linkage to the



(Left Front View)

Figure 1 - 35 Nontyping Reperforator

selector mechanism. The tape may be threaded and manually advanced by a hand-wheel. This equipment has no provision for any alpha-numerical imprint corresponding to the code.

1.06 Perforated code holes correspond to the marking, or current, pulses in the signal circuit. Unperforated portions of the tape correspond to the spacing, or no-current, pulses in the signal circuit. Reading from the rear as the tape feeds from the punch block, the code holes represent the 1, 2 and 3 bits of the signal code, the feed hole, and the 4, 5, 6, 7, and 8 bits. Since the eighth bit in the code is always marking, the eighth, or foremost, code hole is always perforated (except for even parity when the eighth bit is either marking or spacing). The equipment is designed to operate on an 11-unit transmission pattern utilizing an eight level start-stop code.

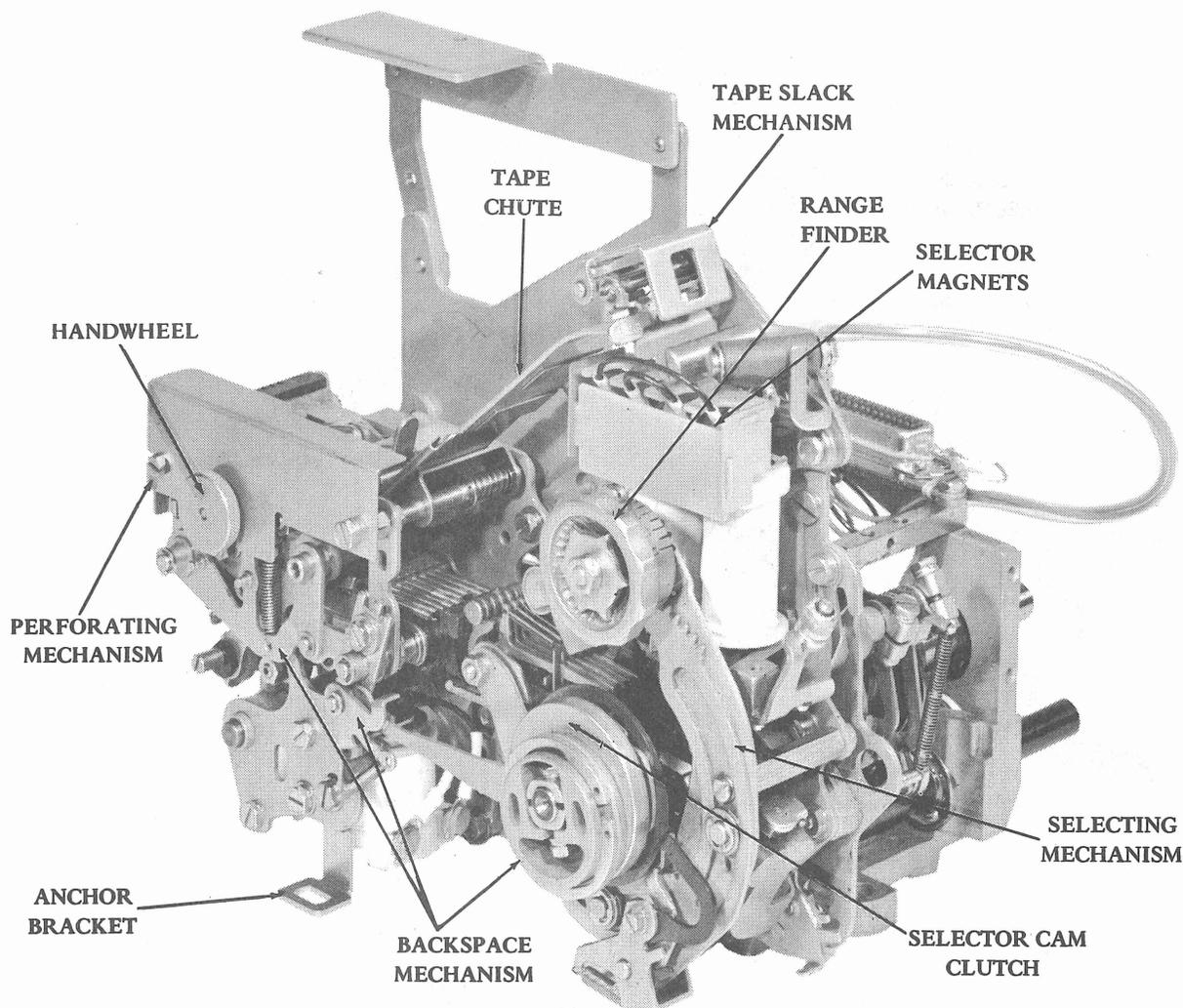
1.07 Unless stated to the contrary, references in the text to left or right indicate the operator's right or left, facing the front of the unit, the selector mechanism at the

right and the punch mechanism at the left. In illustrations, unless specifically labeled otherwise, it is assumed that the equipment is being viewed from the front. Pivot points are shown in the drawings by circles or ellipses which are solid black to indicate fixed points and crosshatched to indicate floating points.

PHYSICAL DESCRIPTION (Figures 2 and 3)

1.08 A cast frame provides mounting facilities for the various mechanisms which comprise the nontyping reperforator.

1.09 Two shafts, a jack shaft located directly beneath the main shaft, transmit externally supplied power to rotate the two cam-clutch mechanisms. The jack shaft connects to the intermediate gearing of the associated equipment and is geared to the main shaft at the rear of the unit. Changes in the gearing of the jack shaft and main shaft will permit changes from 60 to 75 or 100 words per minute operating speed.



(Right Front View)

Figure 2 - 35 Nontyping Reperforator

1.10 The selecting mechanism is mounted around the front end of the main shaft. It includes a two-coil magnet, a selector cam-clutch and a range finder. By means of the range finder, the selecting mechanism can be adjusted in relation to the signal code.

1.11 The function cam-clutch is tripped by the selecting mechanism. It drives the rocker bail, which transmits power to the perforator through the perforator drive link and the rocker arm.

1.12 The perforator mechanism includes the punch, the tape feed mechanism and the backspace mechanism. The punch accommodates one inch wide tape, perforated ten code characters to the inch with eight level fully perforated code holes. The tape is fed by a feed wheel and die wheel which indents but does not perforate the tape. The feed hole is perforated in the punch block. The backspace mechanism operates in response to an external electrical

signal applied to the backspace magnet. Power for reversing the movement of the tape through the punch, one character at a time, is supplied through an eccentric mechanism on the front end of the main shaft.

1.13 The mechanical linkage of selector push levers and punch slide latches and the perforator punch slides interconnects the selector and perforator mechanisms.

TECHNICAL DATA

A. Approximate Dimensions

Width	7-1/2 inches
Depth	6-1/2 inches
Height	6 inches
Weight5-1/2 pounds

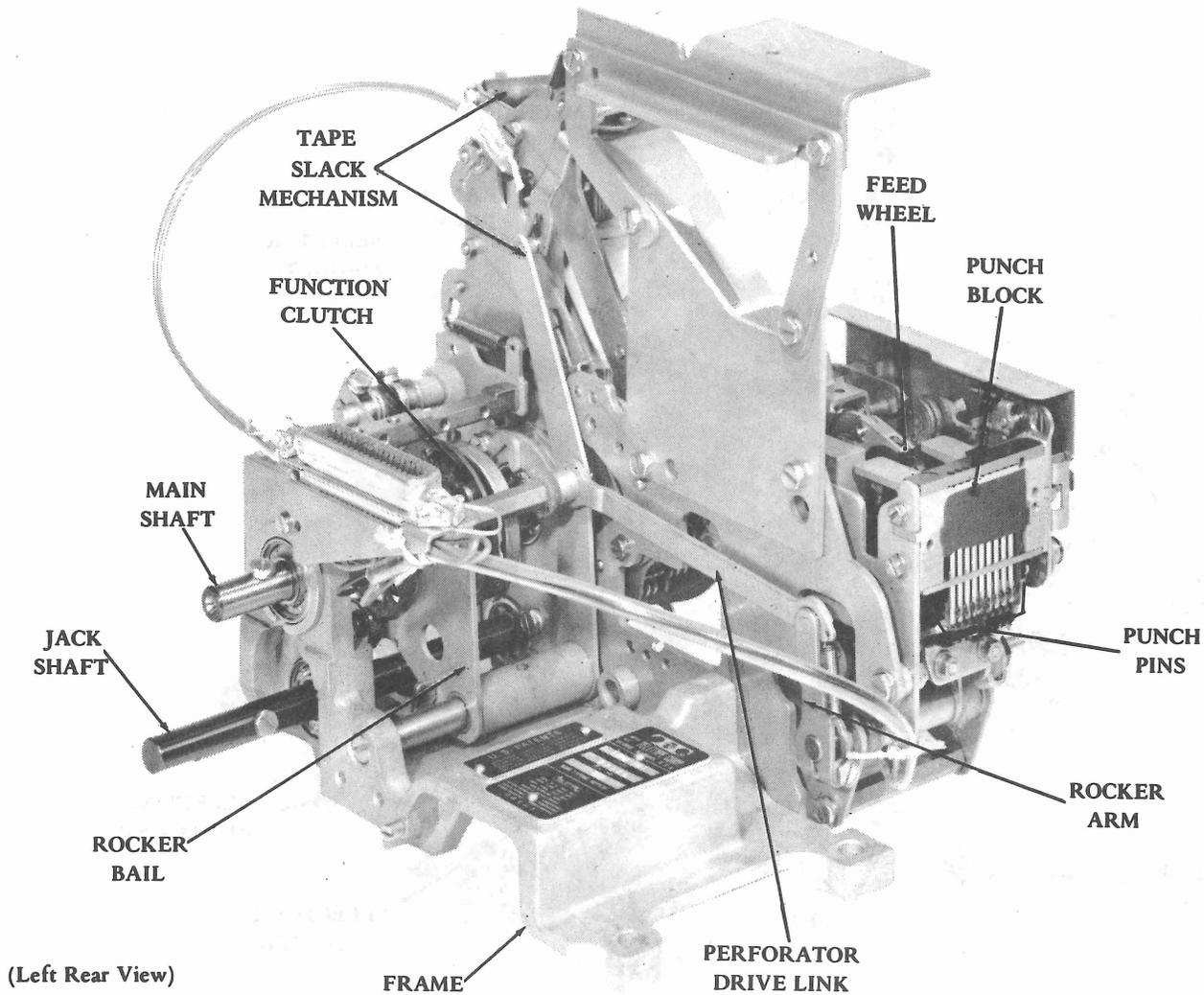


Figure 3 - 35 Nontyping Reperforator

B. Signal

Code Sequential, 11-unit
start-stop
Current 0.500 amperes

C. Tape (Standard Communications)

Width 1 inch
Perforations eight-level, fully
perforated
Holes/inch 10
Feed holes and code holes in line

2. PRINCIPLES OF OPERATION

2.01 The basic function of the 35 Nontyping Reperforator is to record information in paper tape as fully perforated code holes. The information is received from a signal line in the form of signaling code combinations which

represent characters or functions. The reperforator translates these combinations into mechanical motions which advance the tape and perforate corresponding combinations of code holes. A feed hole used to advance the tape through transmitting or reading equipment is perforated simultaneously with the code hole. The feed hole is of smaller diameter than the code holes.

2.02 Character representations, or graphics, are the alphabetic, numeral or symbol intelligence representations. Function representations are the coded equivalent of operations auxiliary to transmission or reception of the graphics, such as carriage return, line feed, or signal bell. Both character and function representations are perforated into the tape, so it can be used in conjunction with typing equipment.

2.03 The unit is referred to as being in the idling condition when the main shaft is turning, the signal circuit is closed, so that no message is being received. The

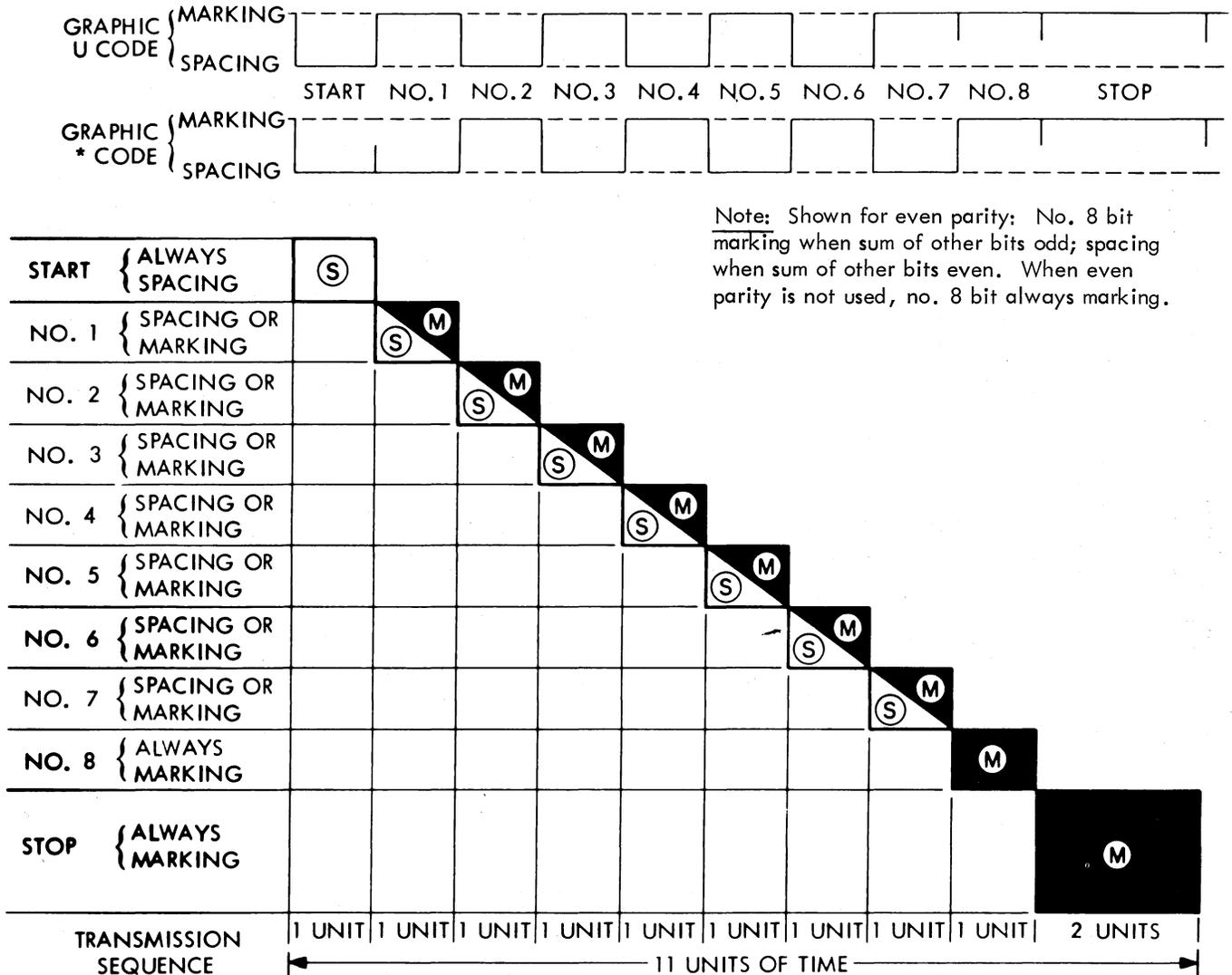


Figure 4 - Signaling Code

unit is running open when the main shaft is turning and no signal is applied to the selector magnets.

2.04 The speed of the equipment is usually given in operations per minute. Each operation includes the receiving of a code combination, the cycling of the two cam-clutches, the perforating of the character and the advancing of the tape. Speed in words per minute is roughly one-sixth of the operations per minute.

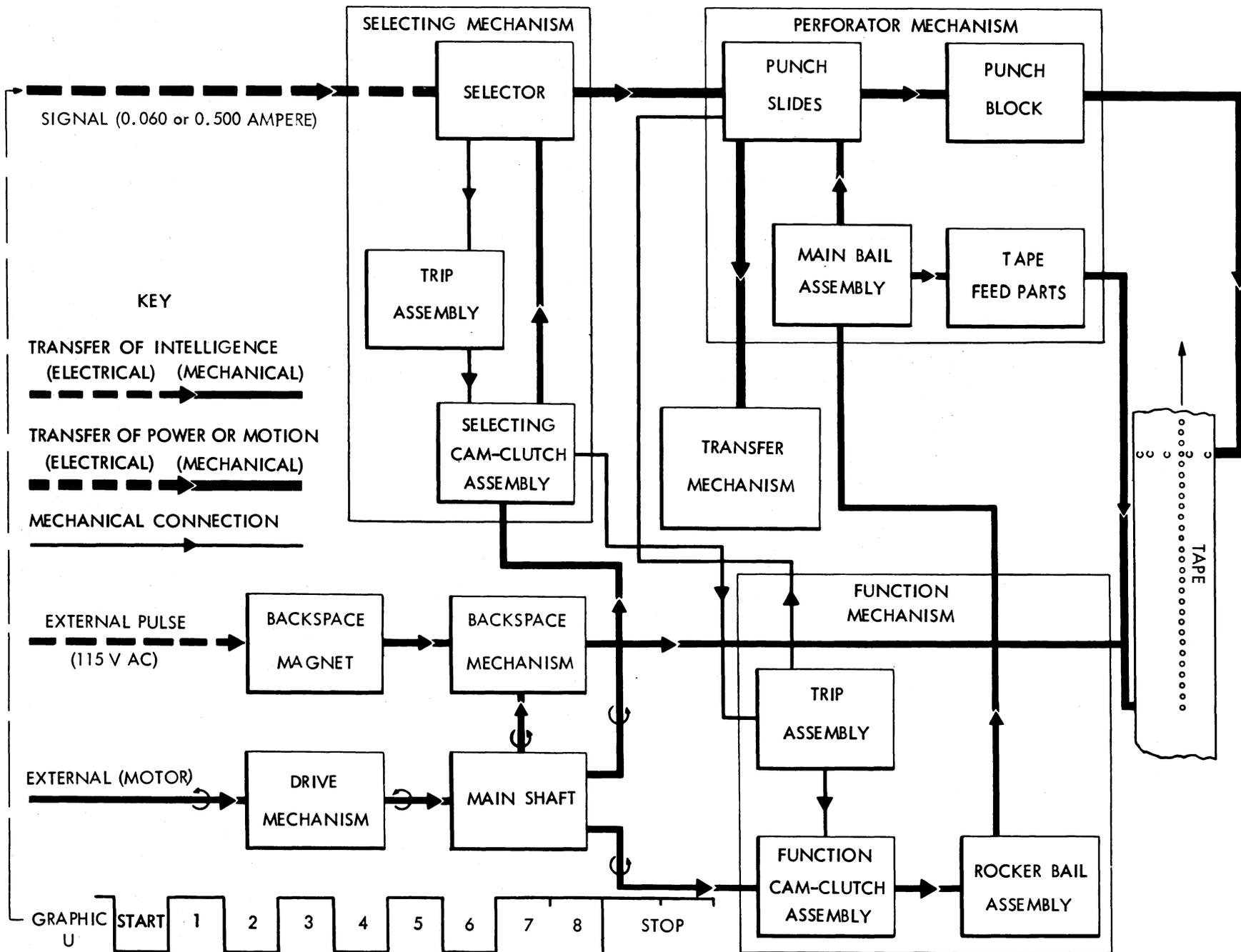
SIGNALING CODE

2.05 Information is received by the reperforator in the form of an eleven bit start-stop signaling code in which each character (graphic) or function is represented by a sequential combination of current and no-current time intervals. Intervals during which current flows in the signal circuit are referred to as marking and during which no current flows as spacing. Every combination includes eight

bits that carry the intelligence, each of which may be either marking or spacing (except that in current applications the eighth bit is always marking), as shown in Figure 4. The intelligence bits are preceded by a start bit (always spacing) and are followed by two stop bits (always marking). Thus each combination consists of 11.0 units of time (referred to as an 11.0 unit transmission pattern). The start and stop bits ensure synchronization between the transmitting and receiving equipment by bringing the receiving equipment to a complete stop at the end of each combination. The marking condition of the eighth bit further enlarges the marking interval at the end of each code combination transmitted.

2.06 The code representations for the graphics U and * are illustrated in Figure 4. In these combinations alternate marking and spacing condition for the intelligence bits are required.

Figure 6 - Block Diagram of 35 Nonotyping Rep perforator



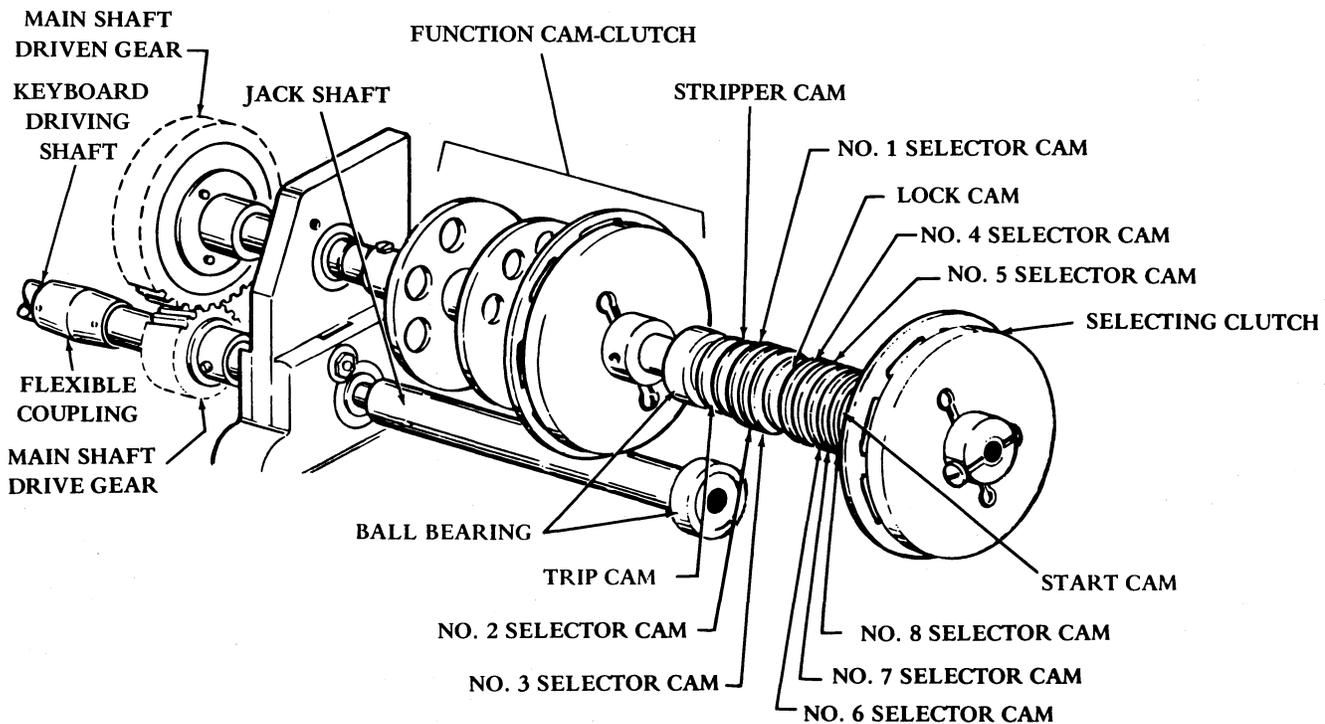


Figure 7 - Main Shaft and Jack Shaft

2.10 The signaling code combinations, such as the combination representing the graphic U, plotted at the left of Figure 6, are applied to the selecting mechanism. The start pulse of each code combination causes the selector, through a trip assembly, to trip the selecting cam-clutch. The main shaft then imparts motion to the cam-clutch throughout the selecting cycle. The cam-clutch mechanism, in turn, transfers timed motion to the selector, which converts the intelligence bits of the code combination into a corresponding mechanical arrangement. Near the end of the selecting cycle, the cam-clutch actuates the function trip assembly. The latter trips the function cam-clutch and releases the punch slides of the perforating mechanism so that they can receive the code arrangement from the selector. The selecting cam-clutch is then disengaged and remains inoperative until the next code combination is received.

2.11 The function cam-clutch, driven by the main shaft, imparts motion to the rocker bail throughout the function cycle. The rocker bail transfers the motion to the perforator main bail which, in turn, distributes it to the punch slides and the tape feed parts. The punch slides, having received the arrangements from the selector, cause the punch pins to perforate code holes in the tape corresponding to the code pulses received by the selecting mechanism. Late in the function cycle, the tape feed parts advance the tape one character space. The function cam-clutch is then disengaged and remains stationary until again tripped by the selecting

cam-clutch. The operations of the reperforator may overlap if the code combinations are being received fast enough. For example, while the perforating mechanism is punching the code combination and advancing the tape, the selecting mechanism may be processing the next code combination.

MOTION

2.12 Rotary motion from an external source is received by the main shaft, through the jack shaft (Figure 7) which rotates continuously as long as the unit is under power. Selecting and function cam-clutches distribute this motion to the selecting and function mechanisms as described below.

SELECTION

A. General

2.13 The selecting mechanism, made up of a selector (2.20), a clutch trip assembly (Figure 8), and a cam-clutch (Figure 7), translates the signaling code combinations into mechanical arrangements which govern the perforation of the tape. The electrical pulses comprising each code combination are applied to a magnet of the selector. The magnet, through an armature, controls the clutch trip assembly and the parts associated with translation. The cam-clutch transfers timed motion to the selector and also

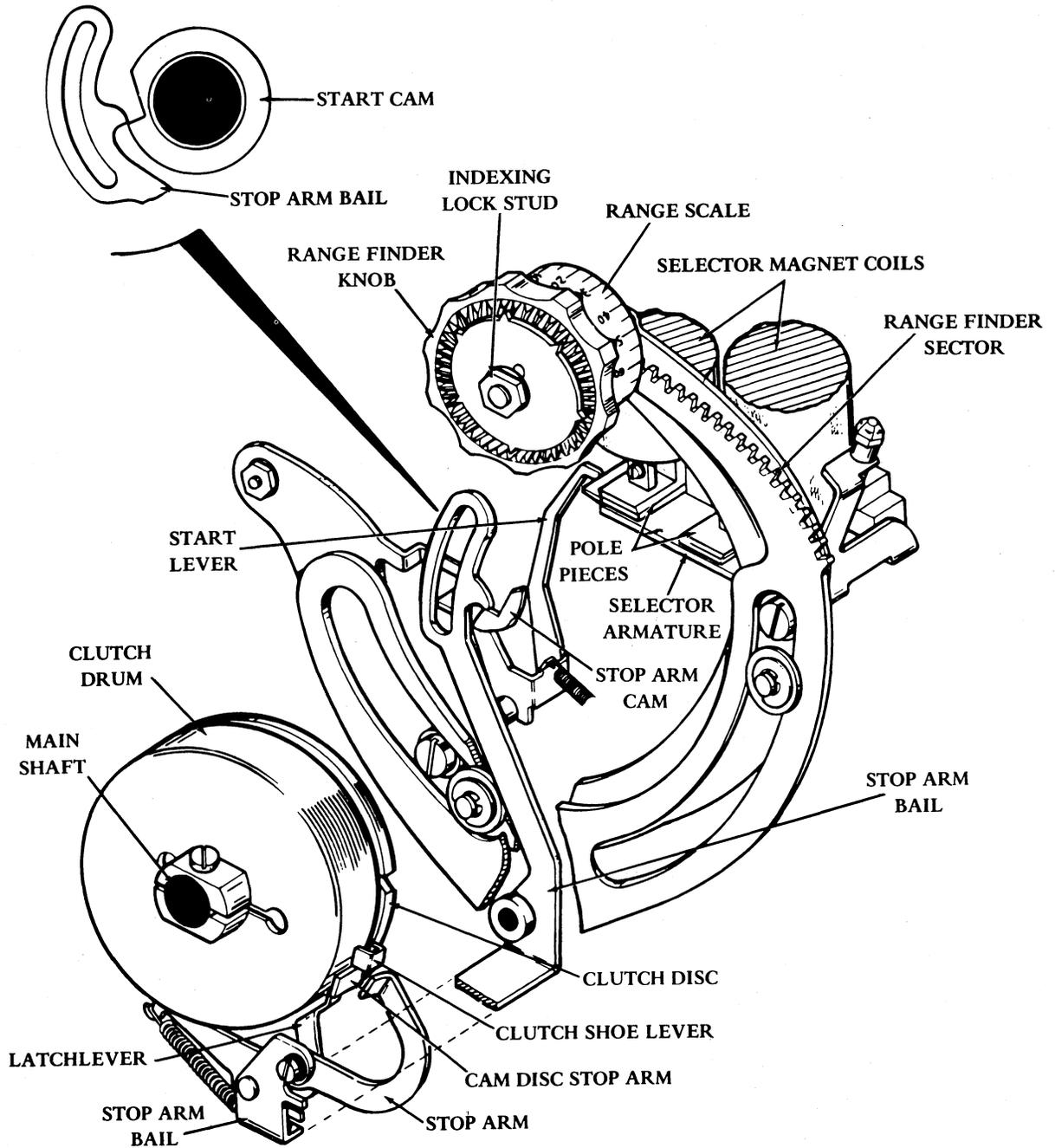


Figure 8 - Range Finder and Selecting Cam-Clutch Trip Assembly

trips the function cam-clutch. By means of a range finder assembly (Figure 8), the selecting mechanism can be adjusted to sample the code bits at the most favorable time for optimum operation. The mechanical arrangements produced by the selecting mechanism are passed on to the punch slides which control the perforating mechanism (2.22).

B. Reception and Translation

Selecting Cam-Clutch and Trip Assembly

2.14 The selecting cam-clutch includes (from right to left in Figure 7) the clutch, the start cam, the eighth, seventh, sixth, fifth, and fourth pulse cams, the lock cam, the third, second, and first pulse cams, the stripper cam, and the trip cam. During the time in which the signal line current is closed (marking), the selector magnet coils are energized and hold the selector armature up against the magnet pole pieces (Figure 8). In this position, the armature blocks the start lever, and the cam-clutch is held stationary between the stop arm and latchlever.

2.15 The selector armature assembly with two antifreeze buttons (Figure 11) has been designed to overcome delay of the armature release. The addition of the rear antifreeze button increases the leverage ratio of the armature retractile spring. Attraction of the armature from the spacing to the marking position causes the rear antifreeze button to contact the magnet core first. This action compels the armature to pivot on the rear button and continue its upward motion, until the front antifreeze button also

contacts its magnet core. This shift in the fulcrum point changes the leverage ratio of the retractile spring from 1 to 6 in the spacing position to approximately 1 to 1 in the marking position. This occurs when the armature is a few thousandths of an inch from the magnet core. This shift in fulcrum points and the associated change in the armature spring ratio enables the use of a low initial spring tension in the armature spacing position (low impedance to armature attraction); yet provides a high initial armature release tension (4 to 5-1/2 ounces in armature attract position) to overcome oil film or residual magnetism.

2.16 When a code combination is received, the start bit (spacing) de-energizes the magnet, and the selector armature under tension of its spring moves down out of the way of the start lever. The start lever turns clockwise under spring pressure and moves the stop arm bail into the indent of the start cam (Figure 8). As the stop arm bail rotates about its pivot point, the attached stop arm is moved out of engagement with the clutch shoe lever. The selecting cam-clutch engages and begins to rotate counterclockwise. The stop arm bail immediately rides to the high part of its cam, where it remains to hold the start lever away from the armature while the intelligence bits of the code are received and processed by the selector (2.20 to 2.22).

2.17 When the stop bit at the end of the code combination is received, the armature is pulled up and blocks the start lever. Thus the stop arm bail is prevented from dropping into the low part of its cam, and the attached stop arm is held in position to stop the clutch shoe lever.

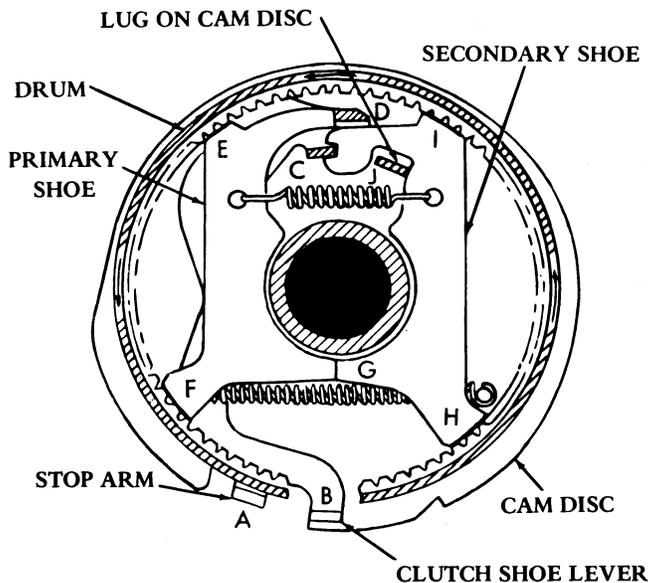


Figure 9 - Clutch, Engaged

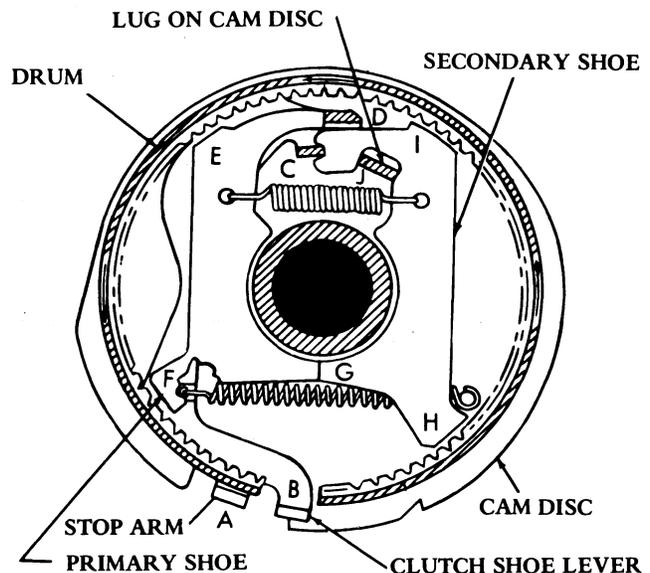


Figure 10 - Clutch, Disengaged

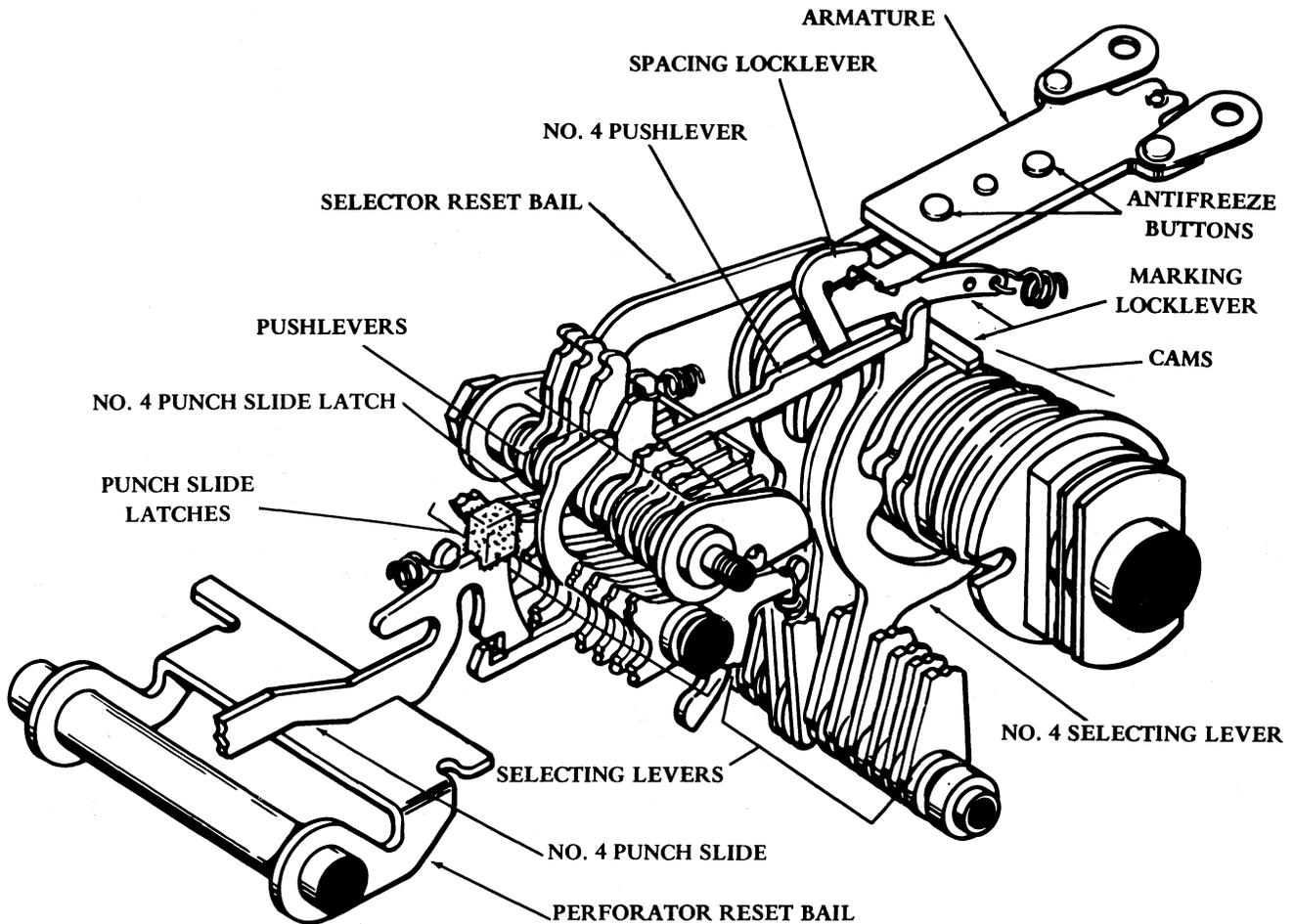


Figure 11 - Selector

When the clutch shoe lever strikes the stop arm, the inertia of a cam disc causes it to continue to turn until its stop arm makes contact with the clutch shoe lever. At this point, a latchlever drops into an indent in the cam disc, and the clutch is held disengaged until the next code combination is received.

Clutch Operation

2.18 The clutch drum is attached to and rotates in unison with the main shaft (Figure 7). In the disengaged position, as shown in Figure 10, the clutch shoes do not contact the drum, and the shoes and cam disc are held stationary. Engagement is accomplished by moving the stop arm (Figure 8) away from the clutch and thus releasing stop arm A and the lower end of shoe lever B (Figure 9). The upper end of lever B pivots about its ear C, which bears against the upper end of the secondary shoe, and moves its ear D and the upper end of the primary shoe toward the left until the shoe makes contact with the notched inner surface of the rotating drum at point E. As the drum turns

counterclockwise, it drives the primary shoe downward so that it again makes contact with the drum at point F. There, the combined forces acting on the primary shoe cause it to push against the secondary shoe at point G. The lower end of the secondary shoe then bears against the drum at point H. The drum drives this shoe upward so that it again makes contact with the drum at point I. The forces involved are multiplied at each of the preceding steps. The aggregate force is applied through the shoes to the lug J on the clutch cam disc, and the disc and attached cam turn in unison with the drum.

2.19 Disengagement is effected when the lower end of shoe lever B strikes the stop arm (Figure 10). Stop arm A and the lower end of the shoe lever are brought together (Figures 2 and 8), and the upper end of lever B pivots about its ear C and allows its other ear D to move toward the right. The upper spring then pulls the two shoes together and away from the drum. The latchlever seats in the indent in the cam disc (2.17) and the cam is held in its stop position until the clutch is again engaged.

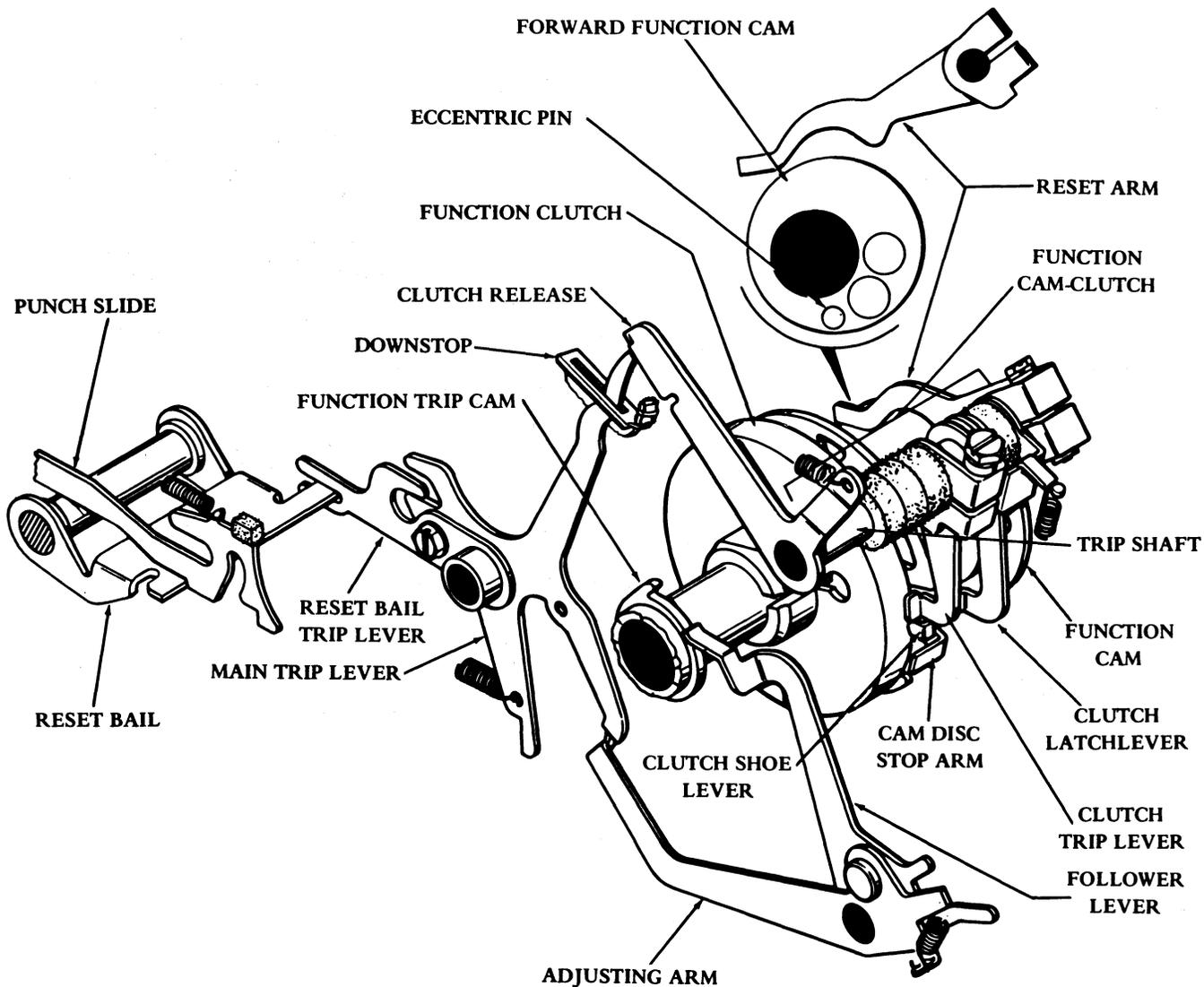


Figure 12 - Function Cam-Clutch and Clutch Trip Assembly

Selector Operation

2.20 The selector assembly consists primarily of two magnet coils (Figure 8), an armature and associated bails, levers and latches (Figure 11). Eight linkages, each of which consists of a selecting lever, a pushlever and a punch slide latch, link the selector cam with the punch slides. Since the linkages are identical, only the no. 4 is shown in its entirety in Figure 11. As the selecting bits of the code combination are applied to the magnet, the cam actuates the selecting levers. When a spacing bit is received, a marking locklever is blocked by the end of the armature, and a spacing locklever swings to the right above the armature and locks it in the spacing position until the next signal transition occurs. Extensions on the marking locklever prevent the selecting levers from following their cams. When a marking

bit is received, the spacing locklever is blocked by the end of the armature, and the marking locklever swings to the right below the armature and locks it in the marking position until the next signal transition occurs. During this marking condition, the selecting levers are not blocked by the marking locklever extensions, but are permitted to move against their respective cams. The selecting lever that is opposite the indent in its cam, while the armature maintains a marking condition, swings to the right, or selected, position, and the end of an associated pushlever falls off a step on the selecting lever.

2.21 As the cam rotates, the selecting levers, together with any selected pushlevers, are moved to the left by the high part of their respective cams, where they remain until the next code combination is received. The unselected

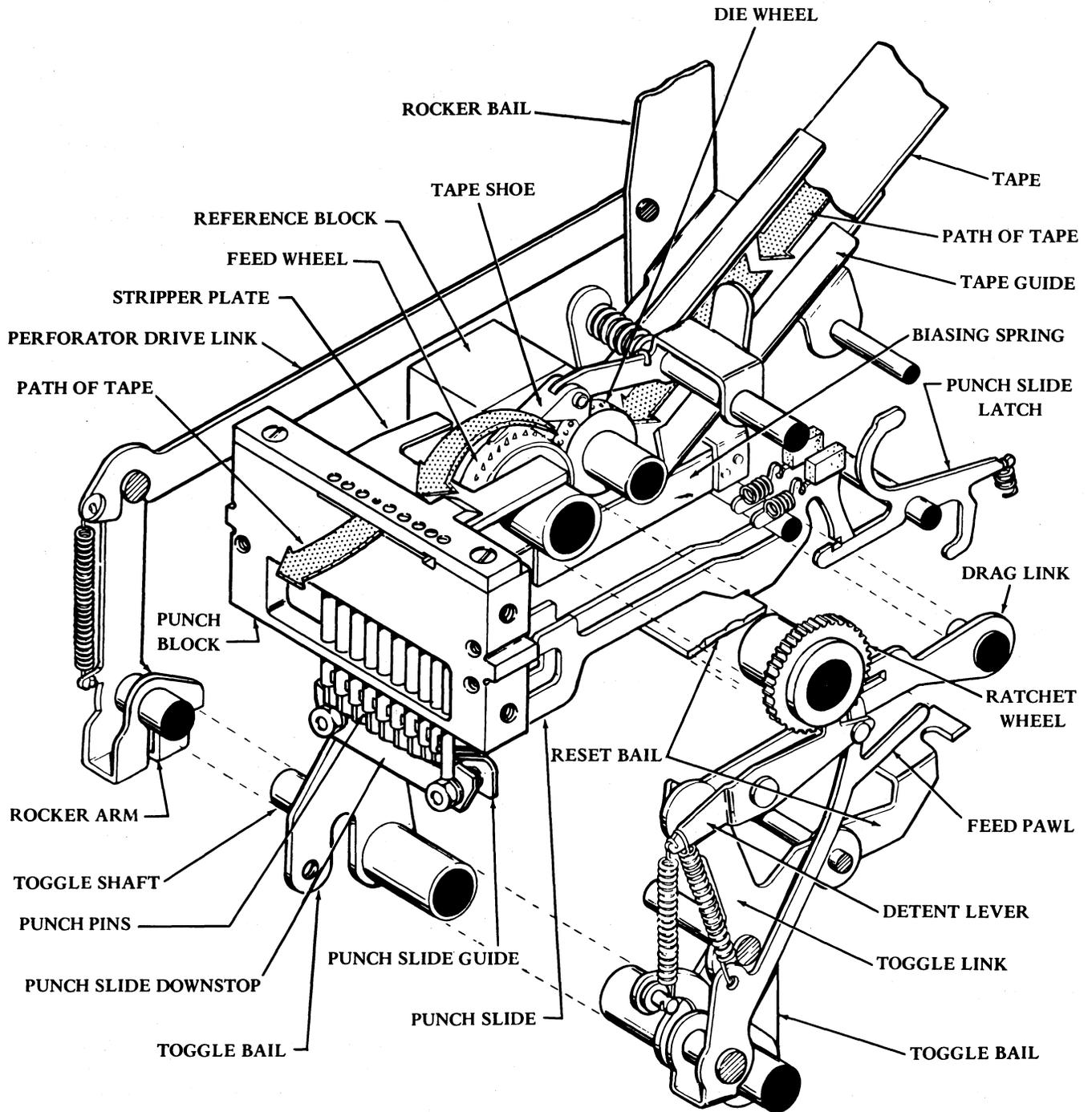


Figure 13 - Perforating Mechanism

pushlevers remain to the right. When the next code combination is received, a selector reset bail, lifted by its cam (Figure 11), strips the selected pushlevers from the selecting levers, and the pushlevers are returned to the right by their springs.

2.22 The selected pushlevers, in moving to the left, rotate associated punch slide latches counterclockwise (Figure 11). Just before the eighth pushlever is selected, the selecting cam through the function trip assembly causes the perforator reset bail to release the punch slides (2.26). The unselected latches retain their associated slides to the right, while the selected latches permit their slides to move to the left under spring tension. During the latter part of the function cycle, the reset bail returns the punch slides to their unselected position (2.31). The latches under spring tension return to their unselected position when the pushlevers are repositioned at the beginning of the next selecting cycle.

C. Orientation

2.23 For optimum performance, the selecting mechanism should be adjusted to sample the signaling code bits at the most favorable time. To make this adjustment, the operating margins are established through the range finder, which provides a means of varying the time of sampling. The obtaining of this optimum setting is referred to as orientation.

2.24 When the range finder knob (Figure 8) is pushed inward and rotated, its attached range finder gear moves the range finder sector (which supports the stop arm bail, stop arm and latchlever) either clockwise or counterclockwise about the selector cam-clutch. This changes the angular position at which the selector cam-clutch stops with respect to the marking and spacing locklevers. When an optimum setting is obtained, the range finder knob is released. Its inner teeth engage the teeth of the indexing lock stud and hold the range finder mechanism in position. The setting may be read on the range scale opposite a fixed index mark.

MOTION FOR PERFORATING AND FEEDING

A. General

2.25 The motion of the main shaft is conveyed to the perforating mechanism by the function mechanism, which is comprised of a cam-clutch (Figure 7), a rocker bail (Figure 13) and a clutch trip assembly (Figure 12).

B. Function Cam-Clutch and Clutch Trip Assembly

2.26 The trip assembly is shown in its unoperated condition in Figure 12. A follower lever rides on a function trip cam which is part of the selecting cam-clutch

(Figure 7). Near the end of the selecting cycle, as the main shaft rotates counterclockwise, the high part of the cam pivots the follower lever (Figure 12) which, through an attached adjusting arm, rotates a main trip lever counterclockwise. A reset bail trip lever attached to the main trip lever lowers the perforator reset bail and releases the punch slides (2.30); and an upper arm of the main trip lever moves out of the way of a clutch release, which falls against a downstop and rotates a trip shaft counterclockwise. Immediately, the low part of the trip cam allows the follower lever to return to its unoperated position, and the upper arm of the main trip lever moves down against the release. When the trip shaft is rotated by the release, it moves an attached clutch trip lever out of engagement with the clutch shoe lever. The clutch engages, and the cam-clutch begins its cycle. The internal operation of the clutch is the same as that of the selector clutch described in 2.18 and 2.19 of this section.

2.27 About midway through the function cycle, an eccentric pin on the function cam lifts a reset arm, which rotates the trip shaft clockwise. The release is moved up and allows the main trip lever to fall against the adjusting arm and raise the reset bail. The eccentric pin then moves out from under the reset arm, and the release is permitted to return to its unoperated position against the main trip lever. When the cam-clutch assembly completes its cycle, the clutch shoe lever strikes the trip lever, and the clutch is disengaged.

C. Rocker Bail

2.28 The function cam and the rocker bail translate the rotation of the shaft into simple harmonic motion which the bail transfers to the perforating mechanism (Figure 13). Each function cycle, the function cams bear against the rollers and cause the bail to rock to the left during the first part of the cycle and then back to its home position during the latter part of the cycle.

TAPE PERFORATING AND FEEDING

A. General

2.29 The perforating mechanism rolls the tape between a feed wheel and a die wheel, which does not perforate the feed hole but merely regulates the amount of tape feed. The punch perforates round holes corresponding to the code combinations received from the signal line and perforates a smaller feed hole positioned between the third and fourth intelligence levels. Intelligence is received from the selecting mechanism by the punch slides, which select the proper punch pins in a punch block assembly (Figure 13). Motion from the rocker bail is distributed to the pins and the tape feed parts by a main bail assembly, which includes a toggle bail, a toggle shaft, a slide post, toggle links, drag links and the punch slide reset bail.

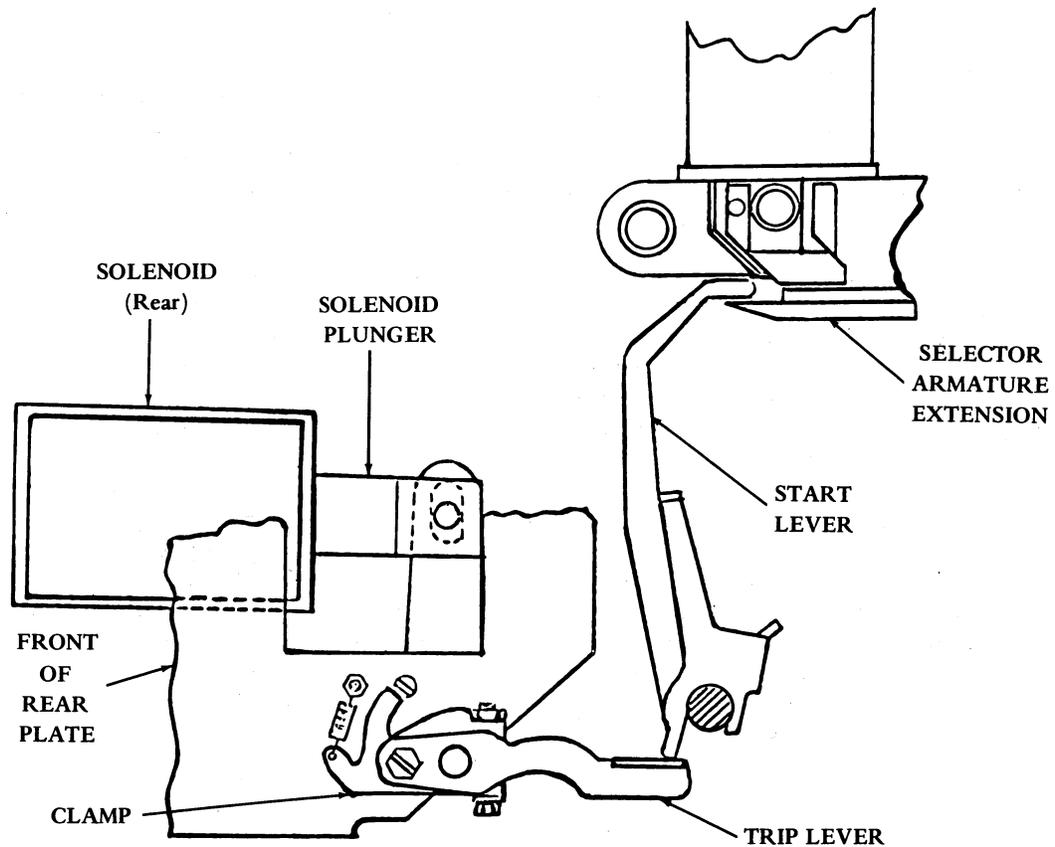


Figure 14 - Rubout Tape Feed-Out Mechanism (Solenoid Operated)

B. Perforating

2.30 As described in 2.26, near the end of the selecting cycle, the reset bail is lowered and releases the eight punch slides (Figure 13). The selected slides move to the left, and the unselected slides are retained to the right by their latches. In the selected position, a projection of each slide extends over the slide post. Since a feed hole is perforated every operation, the punch slide associated with the feed hole punch pin is designed so that it is always in a selected position. During the first part of the function cycle, the rocker bail moves to the left and, by means of a drive link and rocker arm, rotates the toggle shaft and bail counter-clockwise. Toggle links attached to the front and rear of the bail lift the slide post and move the reset bail to the left. The selected slides are carried upward by the post and force the associated pins through the tape. The slides thus become an integral part of the main bail assembly during the perforating stroke. Approximately midway through the function cycle, the function trip assembly lifts the reset bail.

2.31 During the last half of the cycle, the toggle bail is rotated clockwise, pulling the slide post down and lowering the selected punch slides. The punch slides, which engage notches in their respective punch pins, pull the punch pins down below the tape. The main bail assembly and the

selected punch slides and their associated punch pins move as a unit during the perforating stroke, both up and down. The punch pins are positively driven and retracted to produce the fully perforated tape.

C. Feeding

2.32 Tape feeding is accomplished after perforation during the last half of each function cycle. The tape is threaded down through a tape slack mechanism, tape guide and then up between a feed wheel and die wheel (Figure 13). A feed pawl, driven by the toggle bail, acts upon a ratchet and rotates the feed wheel which, by means of sharp pins and a slot in the die wheel, advances the tape one character at a time. A detent with a roller that rides on the ratchet holds the feed wheel and tape in position during perforation. The detent and feed pawl springs are so positioned that the pressure of the detent on the ratchet is high during the first half of the perforation, but is low during idling and the last half of the cycle to facilitate tape threading and feeding. A tape shoe retains the tape on the feed wheel, and a biasing spring holds it back against a reference block so that the feed holes are punched a constant distance from the edge. The tape is stripped from the feed wheel by a stripper plate, passes into the punch block where it is perforated and finally emerges at the left.

D. Slack Tape Mechanism

2.33 The slack tape mechanism (Figures 2 and 3) is driven by the rocker bail of the reperforator. As the rocker bail moves toward the left, it rotates the tape depressor in a clockwise direction. When the tape depressor rotates, it pushes the tape down between the end of the tape platform and a post, causing a loop of tape to be formed. Since the tape is prevented from moving in a direction opposite to that of the tape feeding by the wedging action of a clamp plate, mounted on a post located between the loop and feed wheel, the loop of slack tape is formed only from tape pulled from the roll of tape. When the rocker bail moves back toward the right, the tape depressor is rotated in a counterclockwise direction, leaving a loop of load-free tape for the punch to feed.

E. Power Drive Backspace Mechanism

2.34 The power drive backspace mechanism is used to reverse the tape feed to delete errors in perforated information. The application of an external pulse (115 v ac) initiated by a backspace key on an associated keyboard unit moves the perforated tape one code space to the right with each pulse. The mechanism (Figure 2) consists of a magnet,

an eccentric drive on the front end of the main shaft, and a feed assembly at the punch block.

2.35 When the magnet is energized, the armature bail is pulled downward. An extension on the bail disengages a drive link latch, which drops, engaging a notch on the eccentric arm. As the main shaft moves the eccentric arm to the left, a bellcrank is depressed, contacting the perforator feed pawl and disengaging it. The backspace feed pawl engages the feed wheel ratchet and rotates the feed mechanism counterclockwise. When the magnet is de-energized, the drive link is disengaged from the eccentric arm, which slides freely along the pivot post of the drive link.

F. Rubout Tape Feed-Out Mechanism (Solenoid Operated)

2.36 Tape feed-out (Figure 14) is accomplished by depressing the tape feed-out switch located on the associated base, energizing the solenoid which, in turn, rotates the trip lever. The trip lever engages and trips the selector start lever releasing the selector clutch stop arm causing the selector clutch to be engaged. The clutch will continue to rotate permitting a rubout feed-out, providing the switch is held closed.