

35 NON-TYPING REPERFORATOR
GENERAL DESCRIPTION AND PRINCIPLES OF OPERATION

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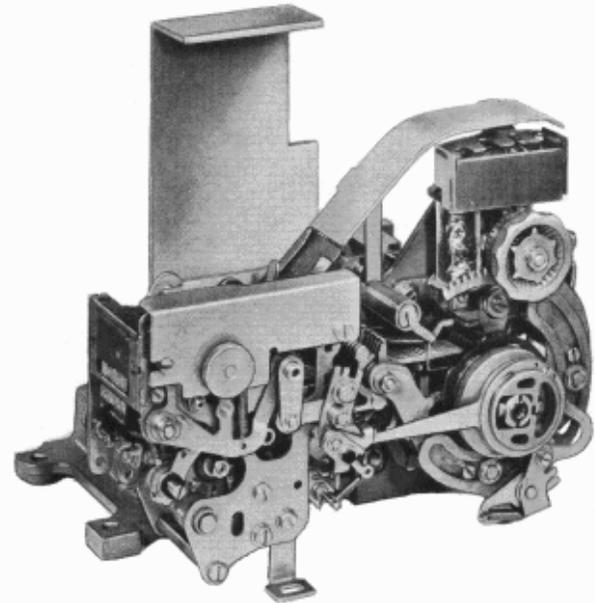


Figure 1 - 35 Non-Typing Reperforator

1. GENERAL DESCRIPTION (Fig. 1)

1.01 This section is reissued to include as a standard a complete general description and basic principles of operation of the 35 Non-Typing Reperforator.

1.02 The 35 Non-Typing 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 which is translated into the necessary mechanical motions to perforate the code holes and feed the tapes. 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

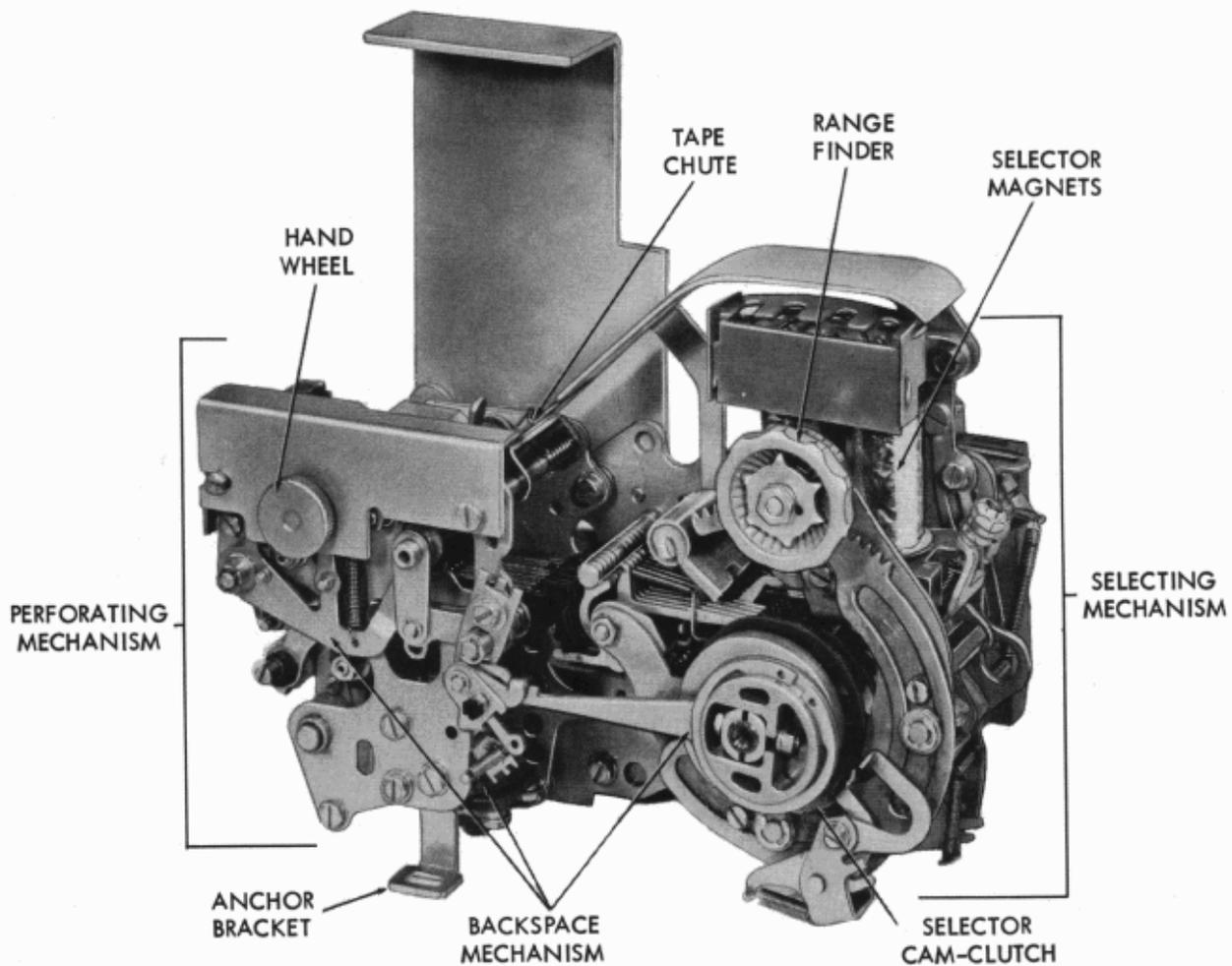


Figure 2 - 35 Non-Typing Reperforator

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 0.500 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 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

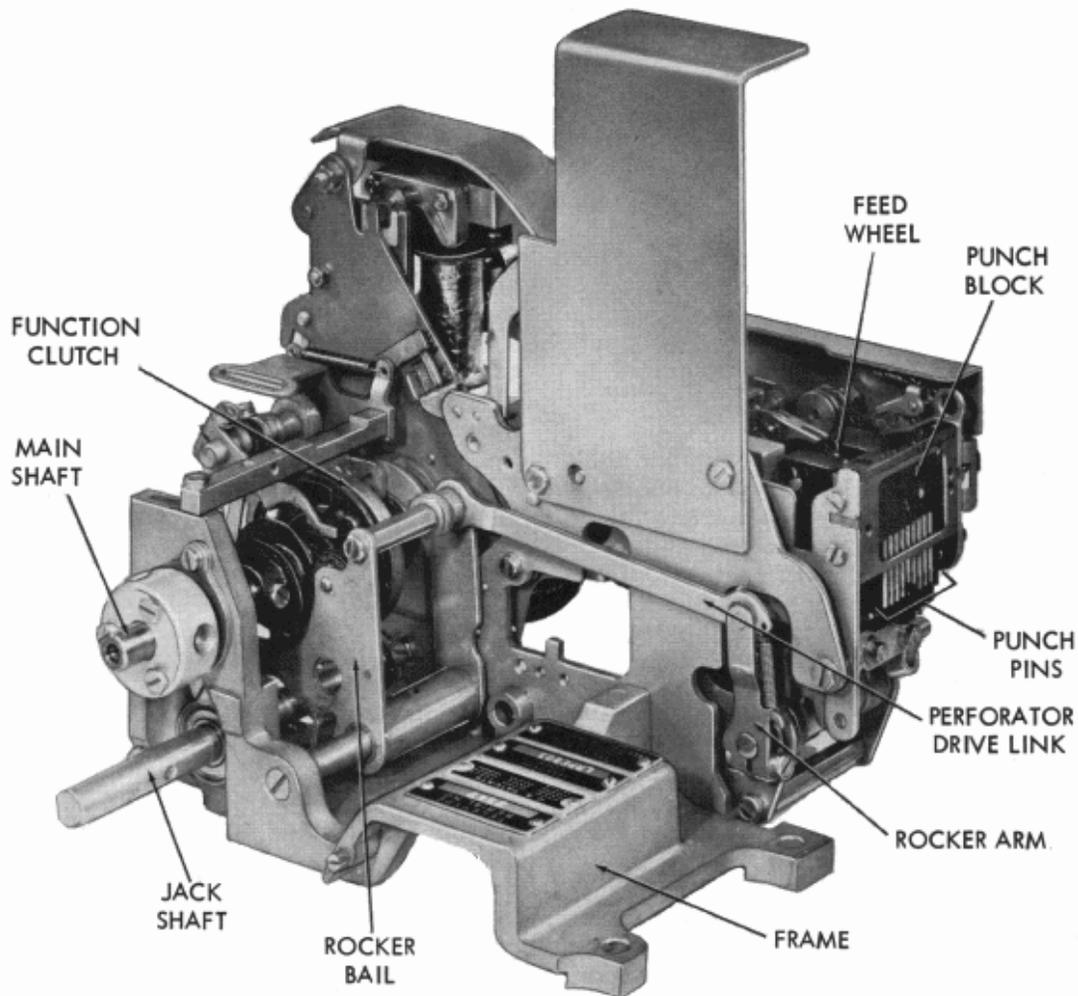


Figure 3 - 35 Non-Typing Reperforator (Left Rear View)

bits. Since the eighth bit in the code is always marking, the eighth, or foremost, code hole is always perforated. 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 (Fig. 2 and 3)

1.08 A cast frame provides mounting facilities for the various mechanisms which comprise the Non-Typing 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.

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 accomodates 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
Weight	5-1/2 pounds

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 Non-Typing 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 that 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 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 (Fig. 4)

2.05 Information is received by the reperforator in the form of an elevenbit 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 spacing), as shown in Fig. 4. The intelligence bits are preceded by a start bit (always spacing) and are followed by two stop bits (always marking). Thus

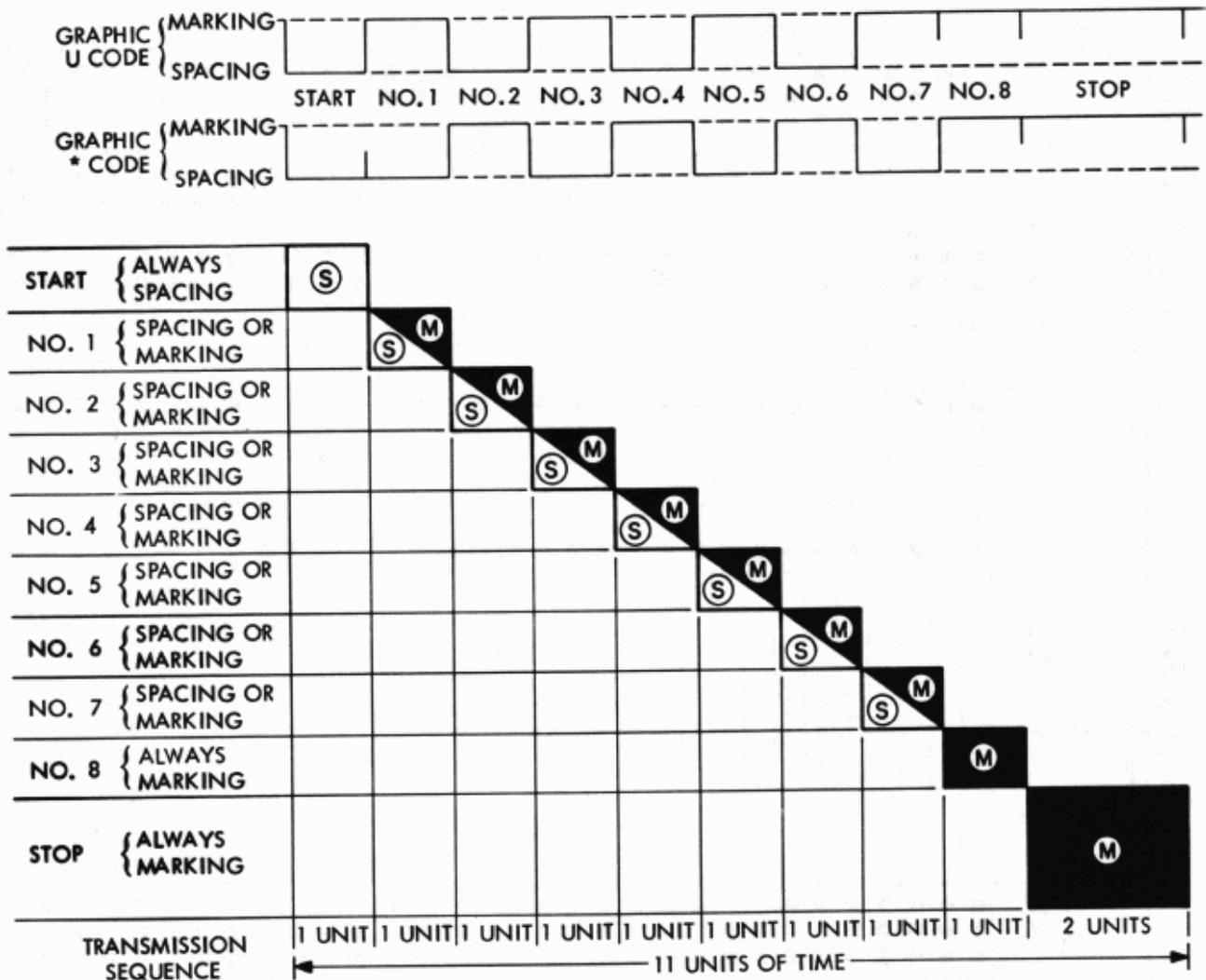


Figure 4 - Signaling Code

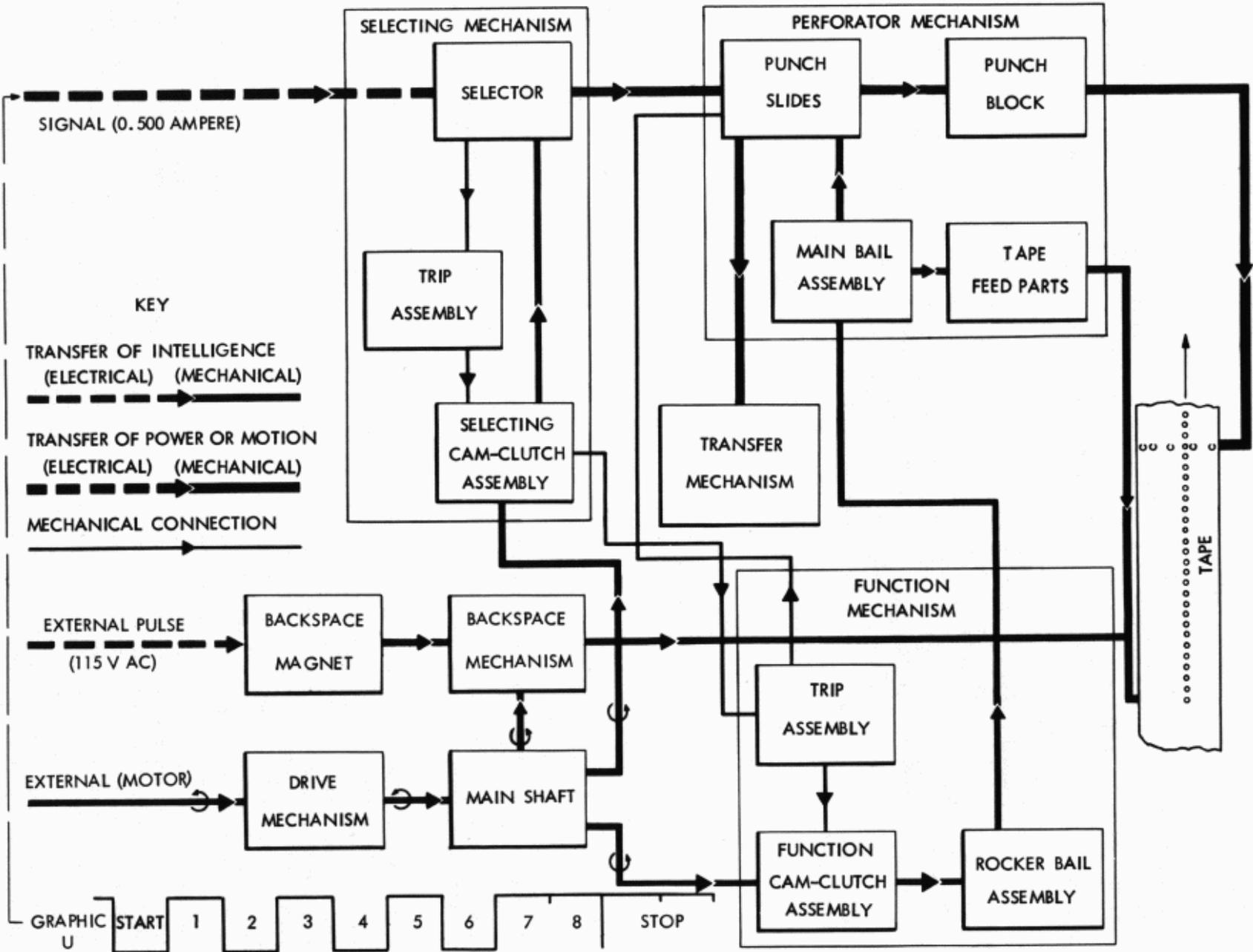
each combination consists of 11.0 units of time (referred to as an 11.0 unit transmission pattern). The start and stop bits ensure synchronization between the transmitting and receiving equipment by bringing the receiving equipment to a complete stop at the end of each combination. The marking condition 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 Fig. 4. In these combinations, alternate marking and spacing condition for the intelligence bits are required.

2.07 The total number of permutations of an eight level, 11 unit code (with the eighth level always marking) is two to the seventh power, or 128. Specific character and function representations may vary with equipment. The characters (graphics) and functions commonly represented on associated keyboards and typing units are illustrated in Fig. 5. Function representations which are blank are unassigned. For a more complete discussion of the signaling code, refer to the applicable section.

2.08 Marking bits in the intelligence code are represented by holes and spacing bits by the absence of holes. The eighth code level is always marking (perforated). The row of smaller

Figure 6 - Block Diagram of 35 Non-Typing Reperforator



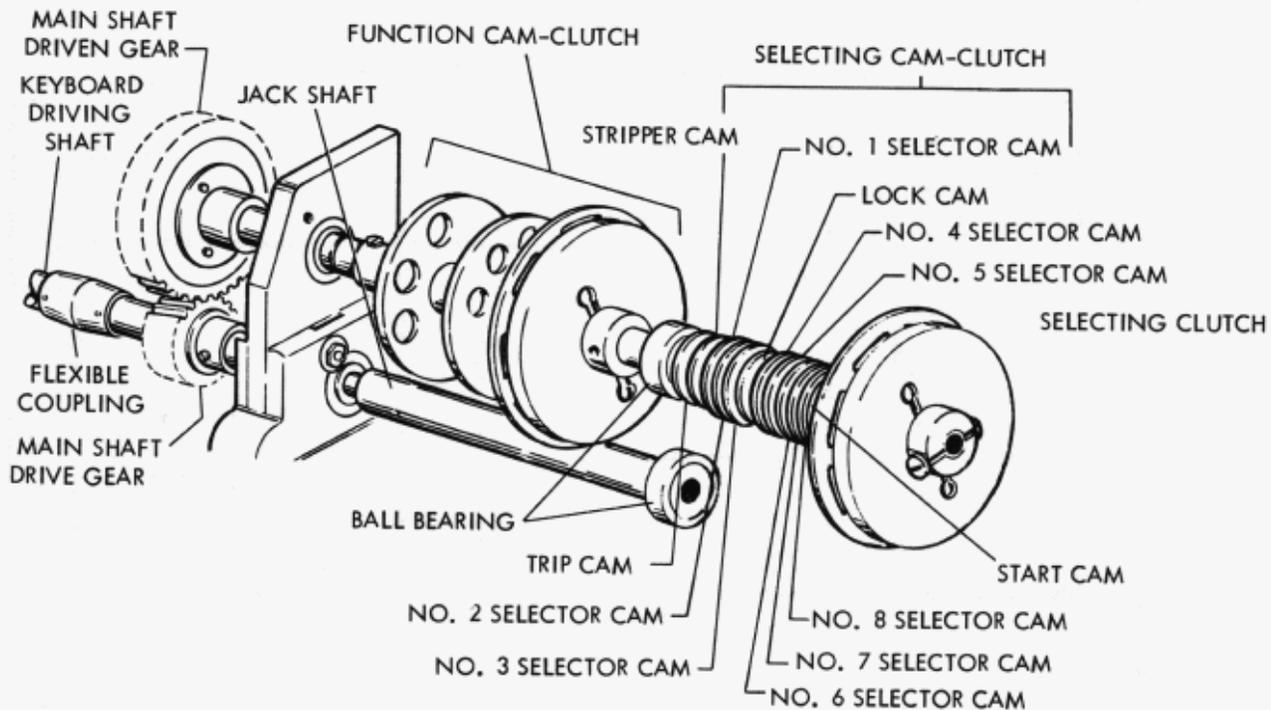


Figure 7 - Main Shaft and Jack Shaft

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 arrangement 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 (Fig. 7)

2.12 Rotary motion from an external source is received by the main shaft, through the jack shaft (see Fig. 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 (Par. 2.19), a clutch trip assembly (Fig. 8) and a cam-clutch (Fig. 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 trips the function cam-clutch. By

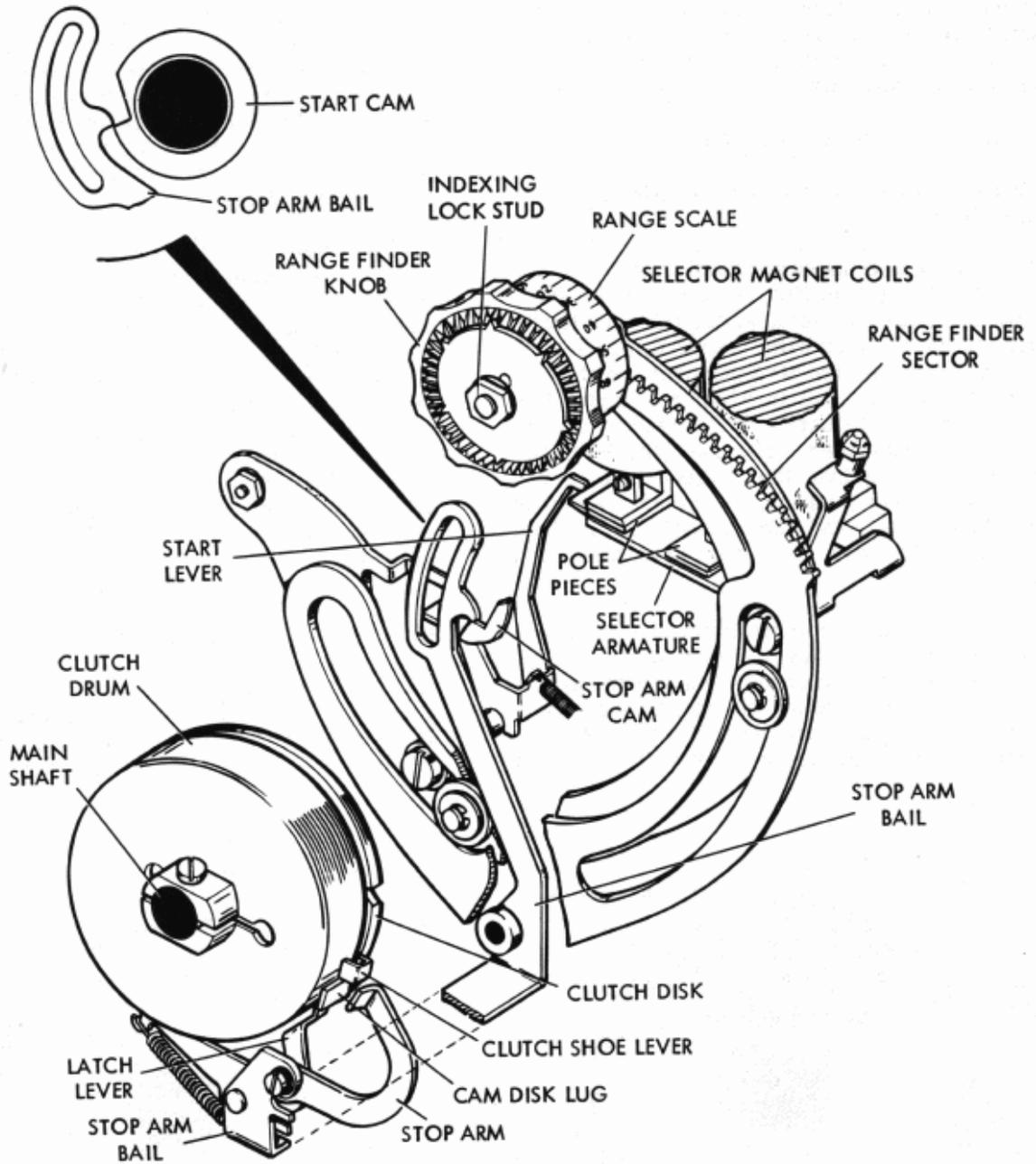


Figure 8 - Range Finder and Selecting Cam-Clutch Trip Assembly

means of a range finder assembly (Fig. 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 (Par. 2.21).

B. Reception and Translation

Selecting Cam-Clutch and Trip Assembly (Fig. 7 and 8)

2.14 The selecting cam-clutch includes (from right to left in Fig. 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 (Fig. 8). In this position, the armature blocks the start lever, and the cam-clutch is held stationary between the stop arm and latch lever.

2.15 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 (Fig. 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 (Par. 2.19 to 2.21).

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

Clutch operation (Fig. 9 and 10)

2.17 The clutch drum is attached to and rotates in unison with the main shaft (Fig. 7). In the disengaged position, as shown in Fig. 10, the clutch shoes do not contact the drum,

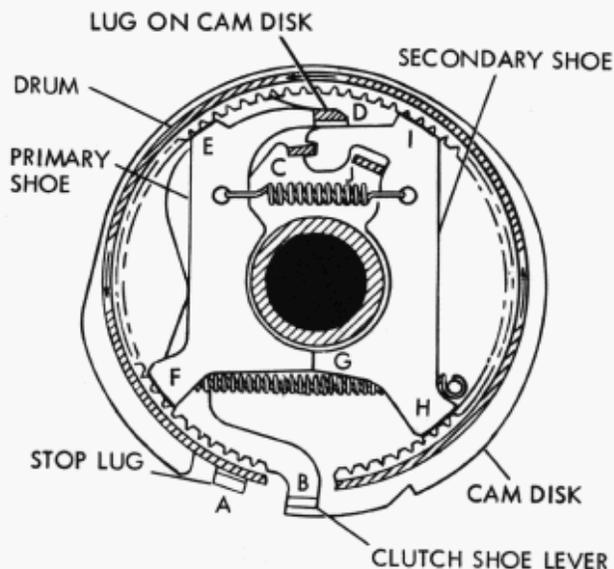


Figure 9 - Clutch, Engaged

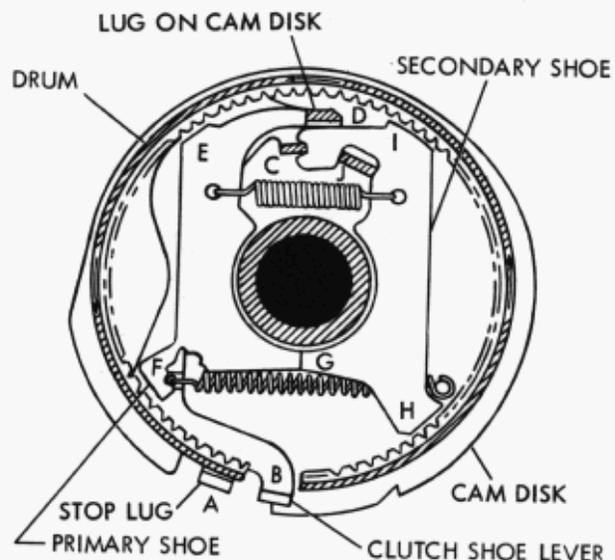


Figure 10 - Clutch, Disengaged

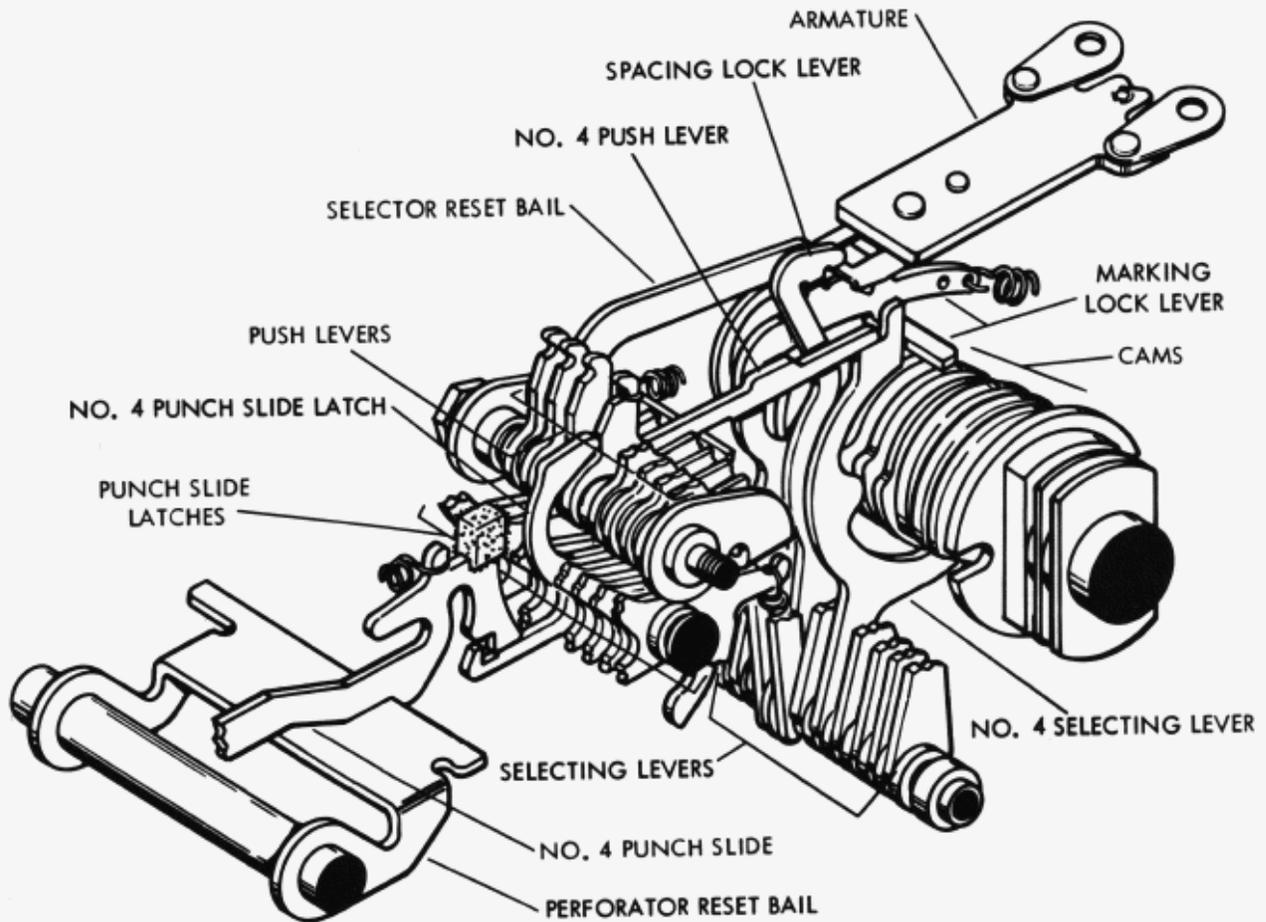


Figure 11 - Selector

and the shoes and cam disk are held stationary. Engagement is accomplished by moving the stop arm (Fig. 8) away from the clutch and thus releasing stop lug A and the lower end of shoe lever B (Fig. 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 disk, and the disk and attached cam turn in unison with the drum.

2.18 Disengagement is effected when the lower end of shoe lever B strikes the stop arm (Fig. 10). Lug A and the lower end of the shoe lever are brought together (Fig. 2-7), 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 latch lever seats in the indent in the cam disk (Par. 2.16) and the cam is held in its stop position until the clutch is again engaged.

Selector Operation (Fig. 7, 8 and 11)

2.19 The selector assembly consists primarily of two magnet coils (Fig. 8), an armature and associated bails, levers and latches (Fig. 11). Eight linkages, each of which consists of a selecting lever, a push lever 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 Fig. 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 lock lever is blocked by the end of the armature, and a spacing lock lever swings to the right above the armature and locks it in the spacing position until the next signal transition occurs. Extensions on the marking lock lever prevent the selecting levers from following their cams. When a marking bit is received, the spacing lock lever is blocked by the end of the armature, and the marking lock lever 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 lock lever 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 push lever falls off a step on the selecting lever.

2.20 As the cam rotates, the selecting levers, together with any selected push levers, 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 push levers remain to the right. When the next code combination is received, a selector reset bail, lifted by its cam (Fig. 11), strips the selected push levers from the selecting levers, and the push levers are returned to the right by their springs.

2.21 The selected push levers, in moving to the left, rotate associated punch slide latches counterclockwise (Fig. 11). Just before the eighth push lever is selected, the selecting cam through the function trip assembly causes the perforator reset bail to release the punch slides (Par. 2.25). 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 (Par. 2.30). The latches under spring

tension return to their unselected position when the push levers are repositioned at the beginning of the next selecting cycle.

C. Orientation (Fig. 8)

2.22 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.

2.23 When the range finder knob (Fig. 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 latch lever) 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 lock levers. 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

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

B. Function Cam-Clutch and Clutch Trip Assembly (Fig. 12)

2.25 The trip assembly is shown in its unoperated condition in Fig. 12. A follower lever rides on a function trip cam which is part of the selecting cam-clutch (Fig. 7). Near the end of the selecting cycle, as the main shaft rotates counterclockwise, the high part of the cam pivots the follower lever (Fig. 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 (Par. 2.29); and an upper arm of the main trip lever moves out of the way of a clutch release, which falls against a down-stop and rotates a trip shaft counterclockwise. Immediately, the low part of the trip cam

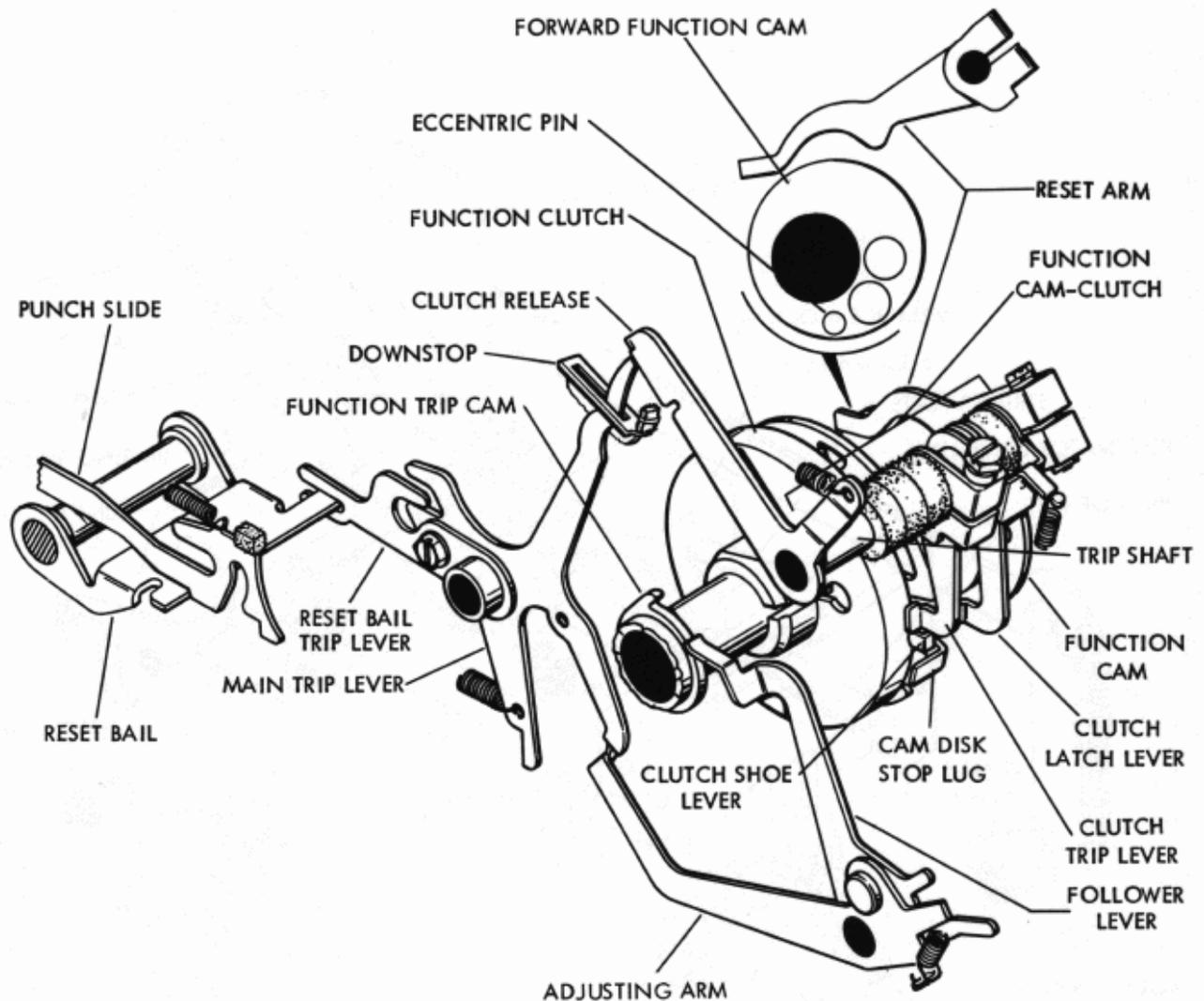


Figure 12 - Function Cam-Clutch and Clutch Trip Assembly

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 Par. 2.17 and 2.18 of this section.

2.26 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 (Fig. 13)

2.27 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 (Fig. 13).

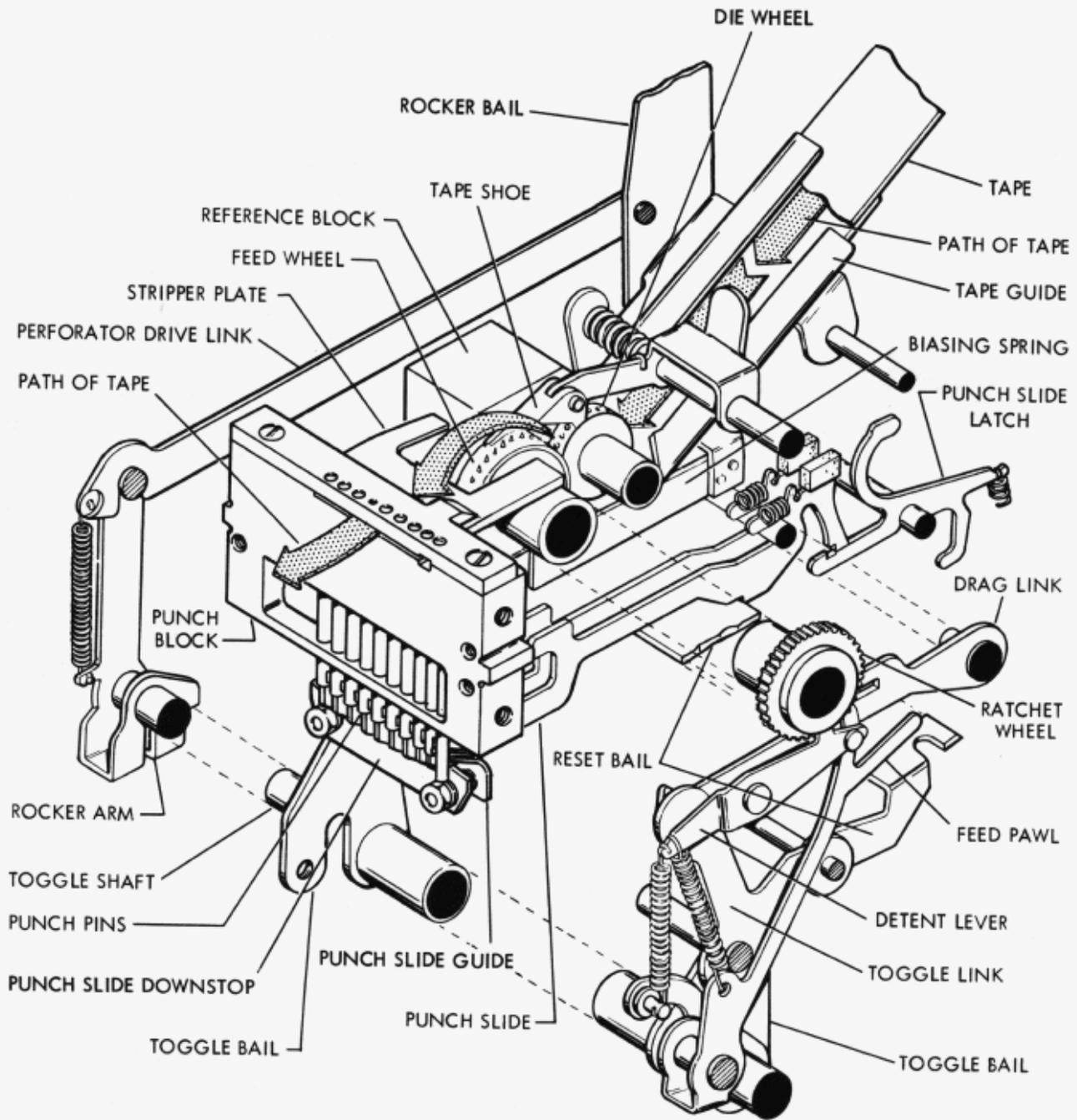


Figure 13 - Perforating Mechanism

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 (Fig. 13)

A. General

2.28 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 (Fig. 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.

B. Perforating

2.29 As described in Par. 2.25, near the end of the selecting cycle, the reset bail is lowered and releases the eight punch slides (Fig. 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 counterclockwise. 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.

2.30 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

2.31 Tape feeding is accomplished after perforation during the last half of each function cycle. The tape is threaded down through a tape guide and then up between a feed wheel and die wheel (Fig. 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. Power Drive Backspace Mechanism

2.32 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 (Fig. 2) consists of a magnet, an eccentric drive on the front end of the main shaft, and a feed assembly at the punch block.

2.33 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 bell crank 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.