28 TRANSMITTER DISTRIBUTOR UNIT (LXD)

DESCRIPTION AND PRINCIPLES OF OPERATION

CONTENTS PAGE

1. GENERAL

1.01 This section provides the description and principles of operation for the 5- and 6-level 28 transmitter distributor unit (single contact).

1.02 All references in text to left or right, front or rear, up or down are made from a position in front of, and facing the unit.

1.03 The single contact 28 transmitter distributor unit (Figure 1) is an electromechanical device, which reads code combinations perforated in tape, translates these combinations into electrical impulses, and transmits them in the form of a 5- or 6-level, start-stop permutation code to one or more receiving stations.

1.04 The unit can be used as a component in a self-contained set, in an Automatic Send-Receive Set (ASR), or in a gang-mounted arrangement.

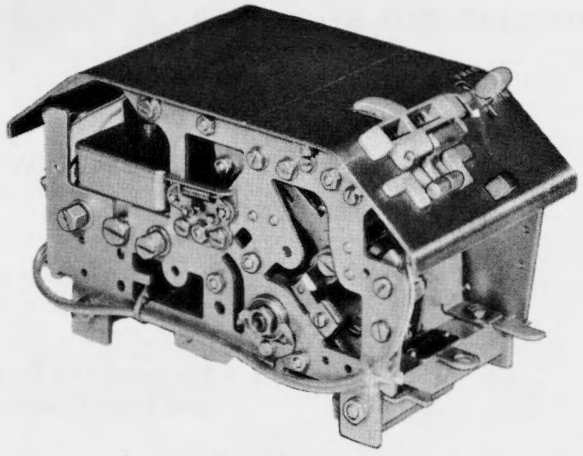


Figure 1 - Typical 5-Level Transmitter Distributor Unit

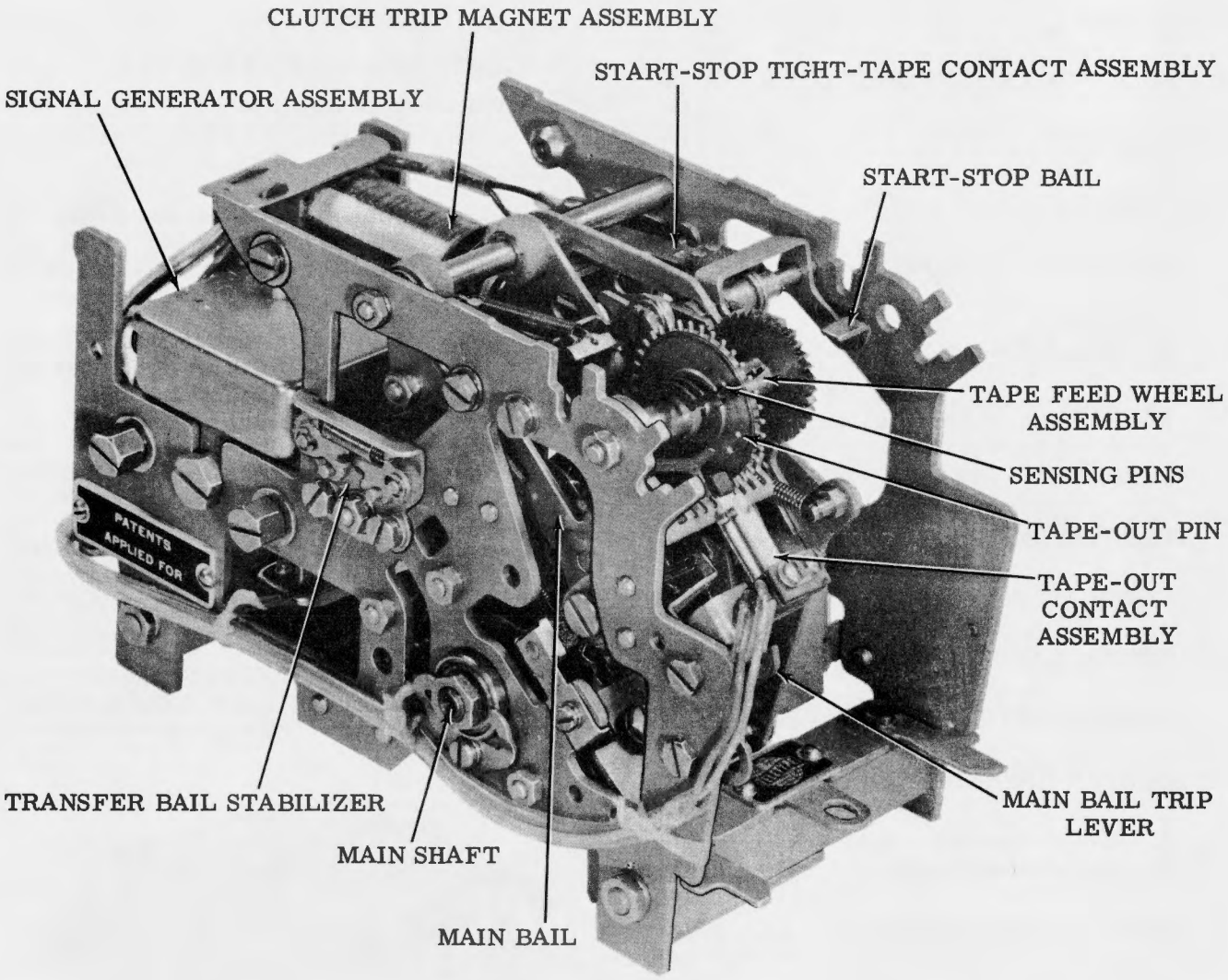


Figure 2 - Transmitter Distributor Unit (Cover Plate, Top Plate and Tape Guideplate Removed)

1.05 The transmitter distributor uses a single camshaft to start, and sequentially perform, the functions of sensing the intelligence stored in a perforated tape. An electrical contact is linked to certain mechanisms to translate the intelligence sensed into pulses of current (marking) and no current (spacing). The unit accepts either chadless or fully perforated tape (Figure 4).

1.06 The signal generator assembly (Figure 12) includes a contact toggle assembly, a drive link, a cover, and an eccentric for adjusting the signal contacts. The signal contacts may be made of either tungsten or gold-plated tungsten.

Note: Gold-plated contacts may be used for both standard applications (including those with data sets) and special low-level applications. However, once used for standard application, they may not be suitable for special low-level application.

2. FUNCTION AND CONFIGURATION

FUNCTION

2.01 The basic operation of the transmitter distributor is to mechanically sense perforated tape and transfer the information to the signal generator, which performs the actual signal transmission (Figure 2).

2.02 The transmitter distributor can be thought of as having two basic functions. The transmitter (tape reader) senses or reads the punched code combinations in the tape and transfers this data mechanically to the distributor. The distributor (signal generator) converts the parallel signal from the transmitter into sequential, start-stop signals for distribution on line.

CONFIGURATION

2.03 The following operating mechanisms of the transmitter distributor are contained between three parallel plates.

(a) The tape sensing mechanism which consists of a bank of sensing pins, (5 or 6 depending on the code level) each with its corresponding transfer lever and latchlever (Figures 2 and 3).

(b) The main shaft assembly, (Figures 2 and 3) which is centrally located in the lower portion of the unit, has the outer race of each ball bearing clamped to the respective front and rear plates. The main shaft assembly consists of multiple cams, eccentrics, and a clutch. Motor power to the shaft is obtained from an external source and is controlled by the clutch and the clutch trip magnet assembly.

(c) A tape feed mechanism that accommodates either chadless or fully perforated tape.

(d) A tape-out pin (Figure 2), located to the right of the sensing pins, stops transmission if there is no tape in the sensing head (Figure 5).

(e) A quick disconnect 36-pin terminal or plug which aligns with its mate on a base, facilitates making electrical connections (Figure 3).

(f) A nylon insulating screw is mounted on the connector bracket and adjusted to align with, and actuate the "Line Shunt Switch" on the associated base (Figure 3).

2.04 The tape lid has the following components:

(a) A three-position control lever for manual control of the unit. The lever positions are FREE, STOP, and RUN.

(b) A pair of adjustable guides (Figure 5) for aligning and locating 11/16- or 7/8-inch wide tape over the feed wheel. An index line is scored in the tape guides 0.600 inch (6 characters) ahead of the sensing pins to aid in aligning the tape.

(c) A tight-tape device on the tape lid stops transmission if the tape becomes taut or tangled.

(d) A spring-loaded tape lid (Figure 5) that snaps open when the red tape lid release plunger is depressed.

ELECTRICAL CIRCUITS

2.05 The transmitter distributor has two electrical circuits, the clutch trip magnet circuit and the signal circuit. The clutch trip magnet circuit consists of the clutch trip magnet coils which are in series with the tape-out, start-stop, and tight-tape contact assemblies. The signal circuit consists of the transmitter signal generator contacts wired to provide neutral operation.

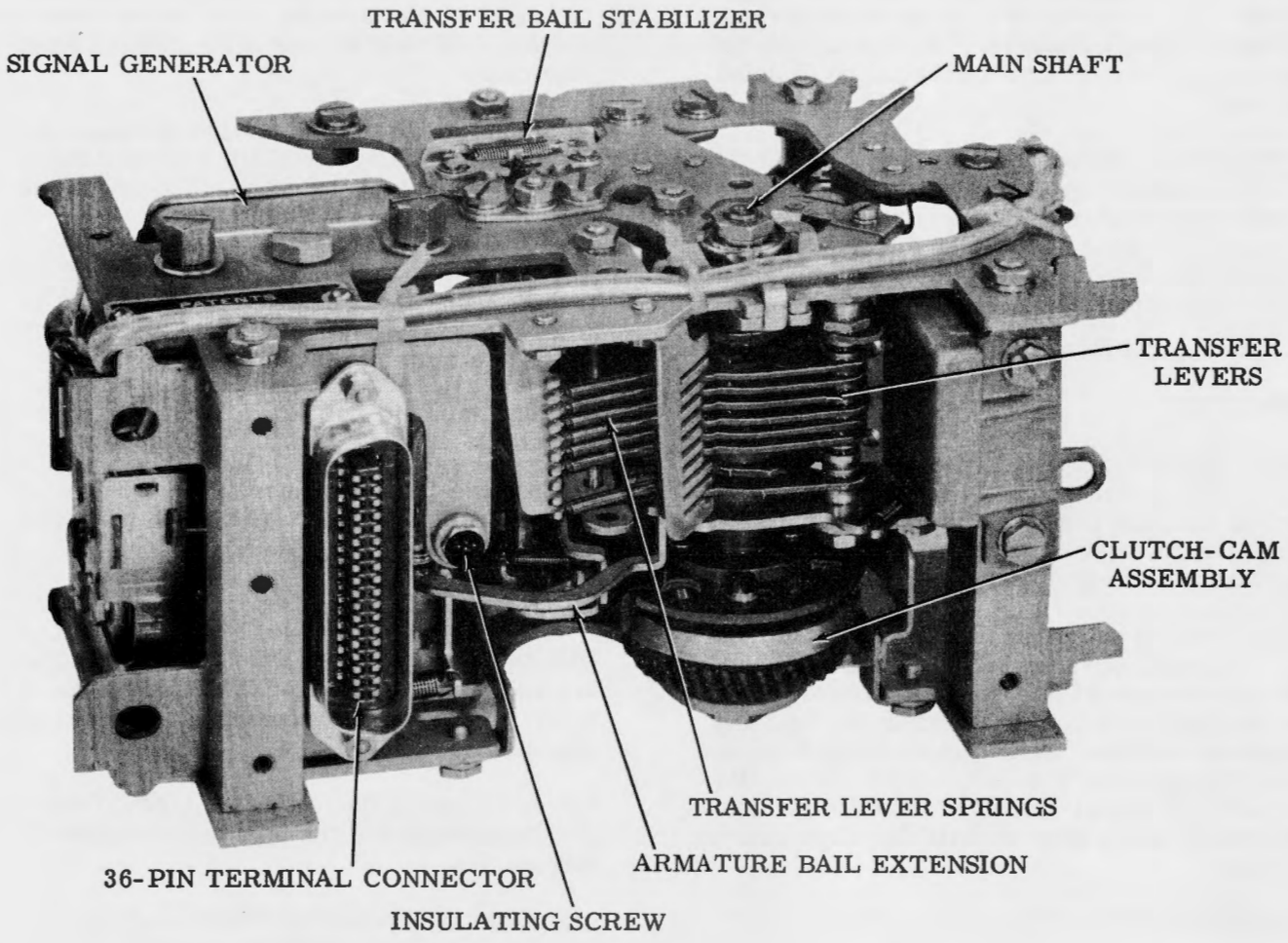


Figure 3 - Transmitter Distributor Unit (Bottom View)

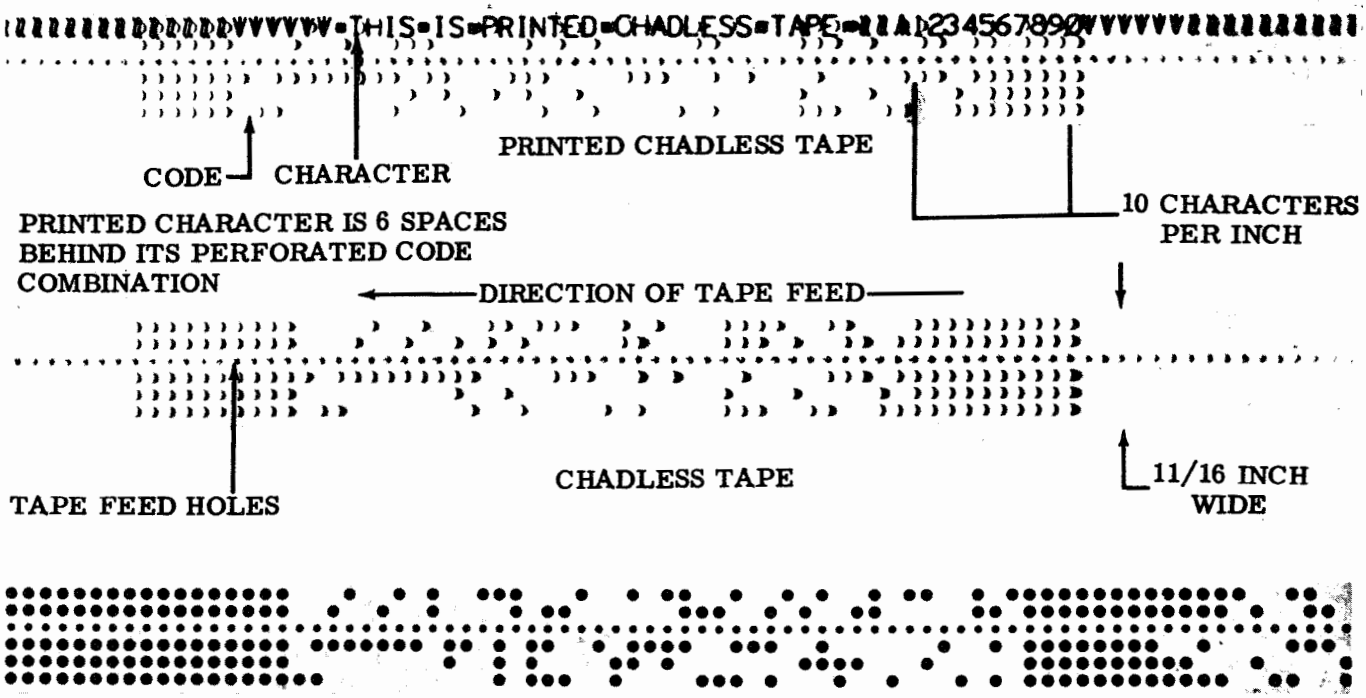


Figure 4 - Standard 5-Level Perforated Tapes

A. Control Circuits

2.06 The control circuit (clutch trip magnet) operates from the following power sources:

(a) 115 v ac ±10% 60 cycles.

(b) 120 v dc ±10% with suitable external resistance.

(c) 50 v dc ±10% with suitable external resistance.

2.07 The tight-tape, tape-out, and manual control mechanisms operate contact assemblies which are in series with the clutch trip magnet assembly. Actuation of any one of these devices opens the clutch trip magnet circuit, causing the clutch to become disengaged, and the transmitter to go into an idle line condition.

Note: Overload protection must be provided externally to the unit.

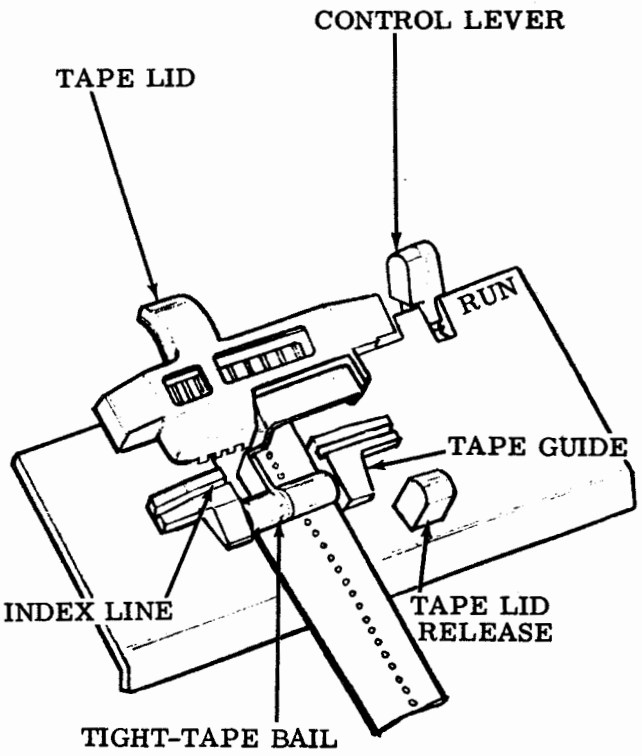
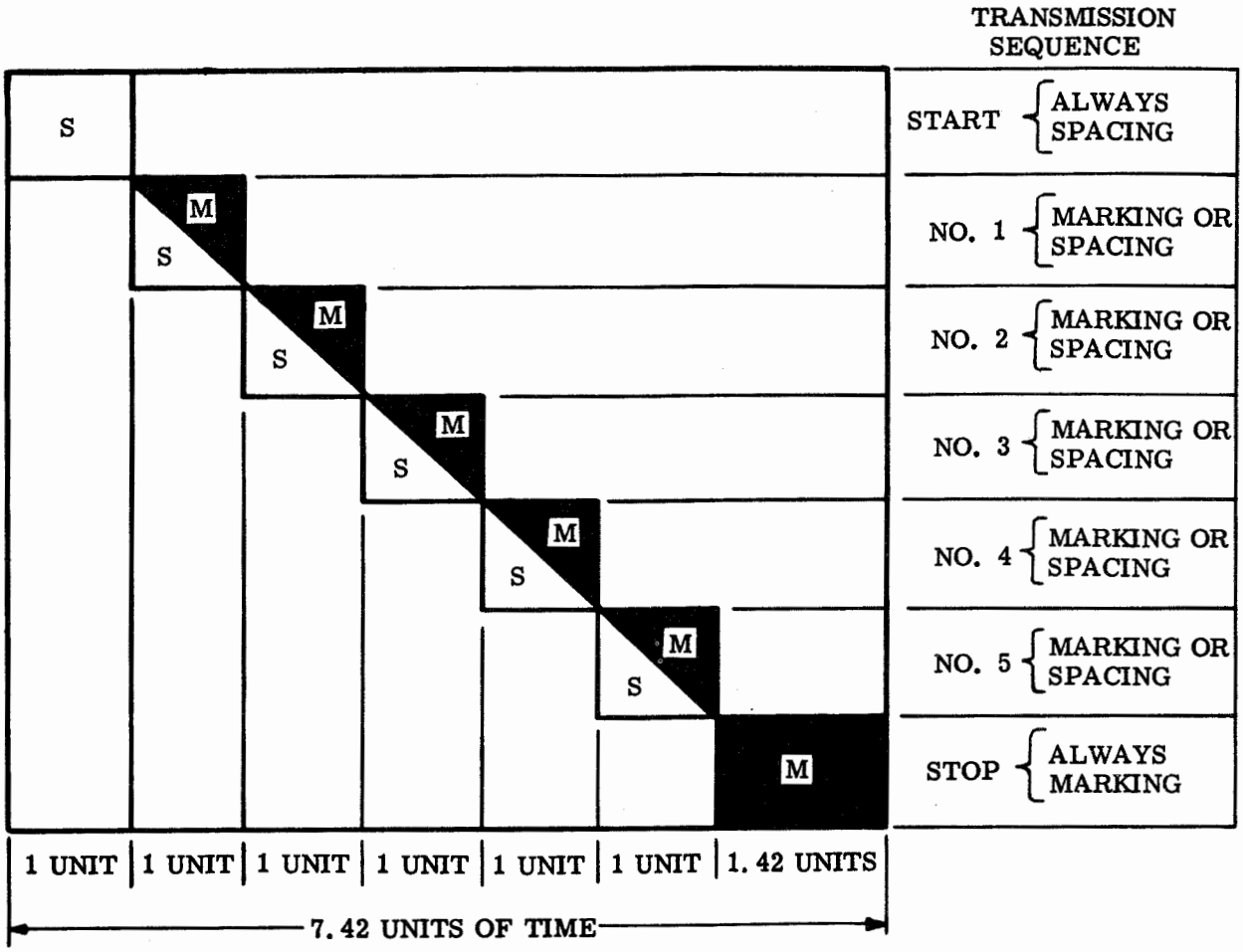
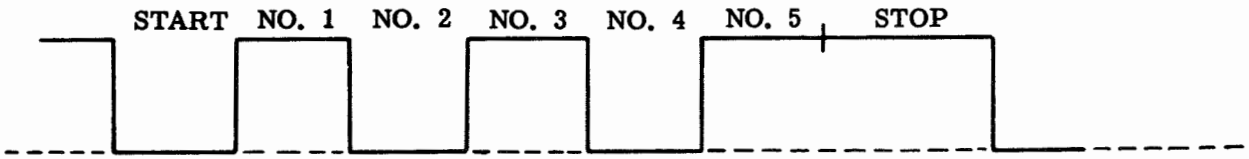


Figure 5 - Tape Guideplate



SIGNALING CODE



GRAPHIC REPRESENTATION OF LETTER "Y"

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CODE HOLE COMBINATIONS OF TYPICAL CHARACTER ARRANGEMENT

Figure 6 - Start-Stop Signaling Code

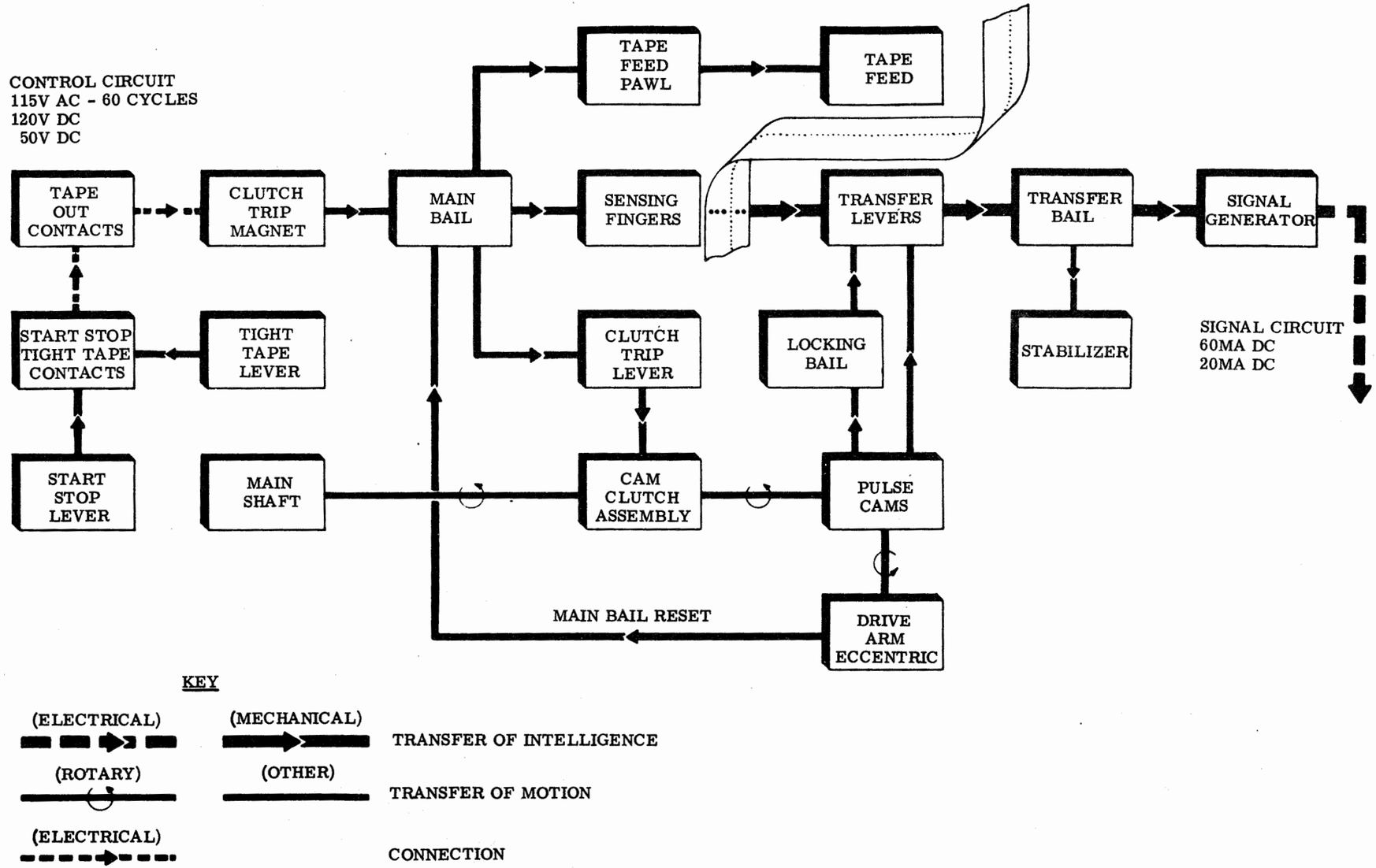

Figure 7 - Functional Block Diagram of Transmitter Distributor Unit

B. Signal Circuit

2.08 The signal contacts in the signal generator operate efficiently at a signal line current of:

60 milliamperes ±10% dc
20 milliamperes ±10% dc

2.09 The signal code transmitted is a 5- or 6-level start-stop neutral code (Figure 6) consisting of current and no-current intervals or pulses. A marking pulse is a measured interval of time during which current flow is permitted through the closure of a contact. A spacing pulse is a measured interval of time during which the current flow is interrupted through the opening of a contact. The start and stop pulses are necessary to keep the receiving apparatus synchronized with the transmitter.

3. TECHNICAL DATA

OPERATING

3.01 Operating data for the unit includes:

Code . . . . . 5- or 6-level.

Operating speeds . . . various speeds up to 100 wpm. Speed is varied by making external gear changes.

Tape . . . . . chadless or fully perforated.

Motor power . . . from external motor unit.

ELECTRICAL

3.02 Electrical requirements for the clutch trip magnets can be summarized as follows with the control circuit operating from the following external sources:

(a) 115 v dc ±10% 60 cycles.

(b) 120 v dc ±10% with suitable external resistance.

(c) 50 v dc ±10% with suitable external resistance.

PHYSICAL

3.03 The approximate physical dimensions for the unit are:

Width	7-1/2 inches
Depth	3-5/8 inches
Height	5 inches
Weight	7 pounds

4. GENERAL OPERATION

4.01 The following paragraphs describe the general operation of the 28 transmitter distributor unit. In conjunction with these paragraphs see Figure 6, Functional Block Diagram of Transmitter Distributor Unit for pertinent information about unit operation.

4.02 The operating cycle starts with the transmitter distributor in the idle signal line condition, the drive motor running, tape in the unit, and the external portions of the transmitter distributor circuits complete. Move the control lever (Figures 5 and 8) to the RUN position. This positioning energizes the clutch trip magnet by completing the circuit through the start-stop and tight-tape contact assembly. Thus, the contact closes to complete the clutch trip magnet circuit, energizes the magnet, and pulls the armature up. The armature bail extension (Figure 9) cams the main bail latchlever about its pivot post to release the main bail.

4.03 The clutch tripbail is reset by an eccentric on the main bail. The eccentric rides in the slot of the clutch tripbail. When the eccentric on the spring biased main bail cams the clutch tripbail, the tripbail, in turn, moves the clutch trip lever (Figure 9) away from its latch. When the main bail is released, the clutch tripbail is also released by the interconnection. The main bail swings up drawn by the main bail spring and causes two actions to occur.

4.04 First, the main bail raises the feed pawl (Figure 10) one tooth on the feed wheel ratchet. Secondly, the main bail permits the sensing pins to rise to read the perforations in the tape. If any of the sensing pins sense a perforation in the tape they extend upward through the perforations until stopped by the spacer on the main bail, and in extending upward rotate their associated transfer levers up.

4.05 In rotating upward, the transfer lever extensions are brought above the line of action of the blade on the locking bail. If any of the sensing pins do not sense a perforation in the tape, the associated transfer levers remain stationary. The extensions on these transfer levers remain below the line of action of the locking blade on the locking bail (Figure 11).

4.06 During the movement of the main bail, the clutch tripbail pivots on its axis and pushes the clutch trip lever away from the shoe release lever to engage the clutch and start the camshaft rotating (Figure 9).

4.07 As the camshaft continues its rotation, the high part of the locking bail cam moves away from the locking bail and permits the locking bail to be pulled up by its spring. In its upward travel, the locking blade of the bail is positioned between the lower extension of the selected transfer levers and locks them into position (Figure 11).

4.08 Further rotation of the main shaft moves the lobe of the start cam into position so it cams its respective transfer lever. Since the start transfer lever has no sensing pin, the lever is always in the spacing position. The start transfer lever upper finger hooks the upper side of the transfer bail and causes it to pivot clockwise. The transfer bail extension (Figure 12) moves the signal generator drive link causing the toggle to open the marking contact and close the spacing contact in the signal generator contact assembly. The extension, in moving to the spacing position, forces the marking latch on the stabilizer (Figure 13) out of its way and continues its travel far enough to let the spacing latch fall into the latching position simulating a detent action.

4.09 The shaft continues its rotation until the cam for the first pulse (Figure 14) cams its transfer lever. Depending on the position of the transfer lever finger, upper or lower, the transfer bail (Figure 15) is rotated if the pulse to be transmitted is not the same as the preceding pulse. If the preceding pulse is the same, no action occurs because the bail has previously been rotated. However, if the preceding is different, the extension on the transfer bail moves the drive link and causes the toggle to open the closed contact and close the open contact. The extension also forces its way past the latch and continues its way until the opposite latch on the stabilizer can fall into position.

4.10 The action of the cams for the second, third, fourth, and fifth pulses follow the action of the first pulse in order and repeat the same action as described for the first pulse (Figure 14).

4.11 The cam for the stop pulse follows that of the fifth pulse and the train of action is the same as that of the first pulse except that the stop pulse has no sensing pin, and its transfer lever is blocked. Thus, its lower finger always hooks the transfer bail causing a marking pulse on the completion of each character.

4.12 The tape feed pawl (Figure 17) advances the tape feed ratchet one tooth against the action of the ratchet detent roller. The tape

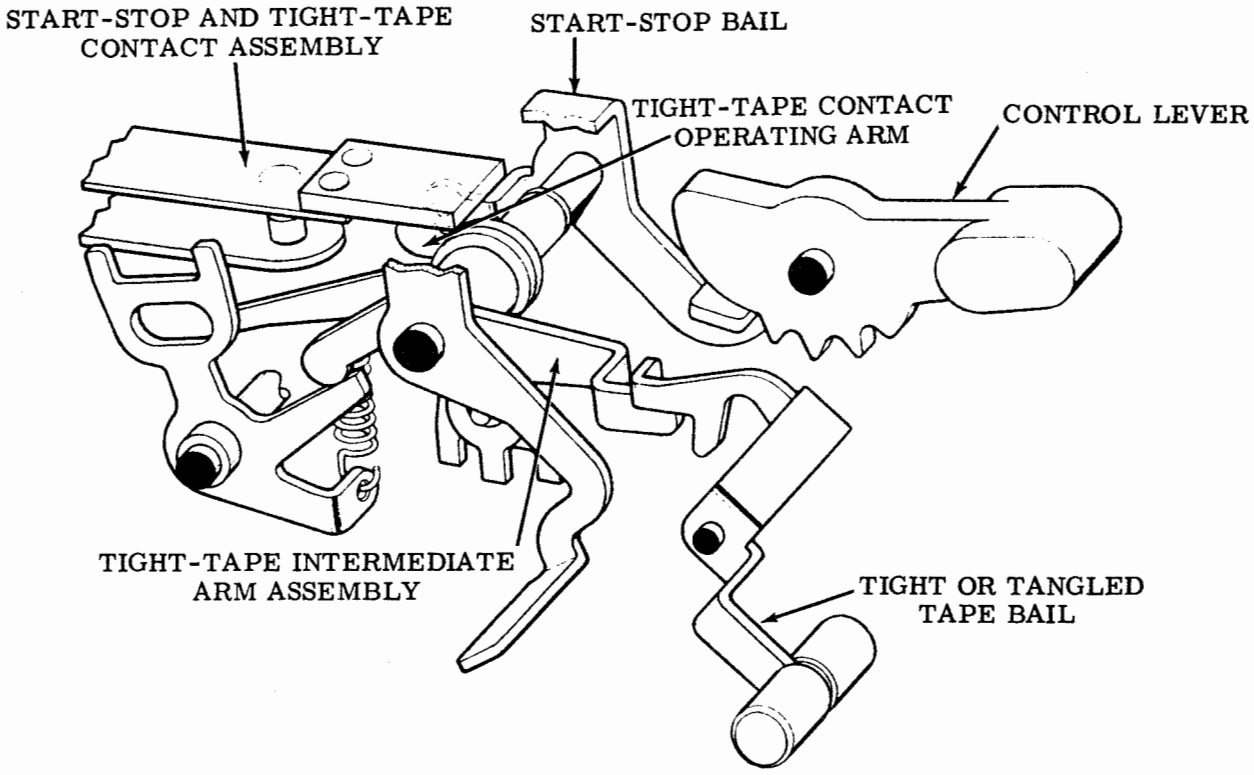

Figure 8 - Start-Stop and Tight-Tape Switch Mechanisms

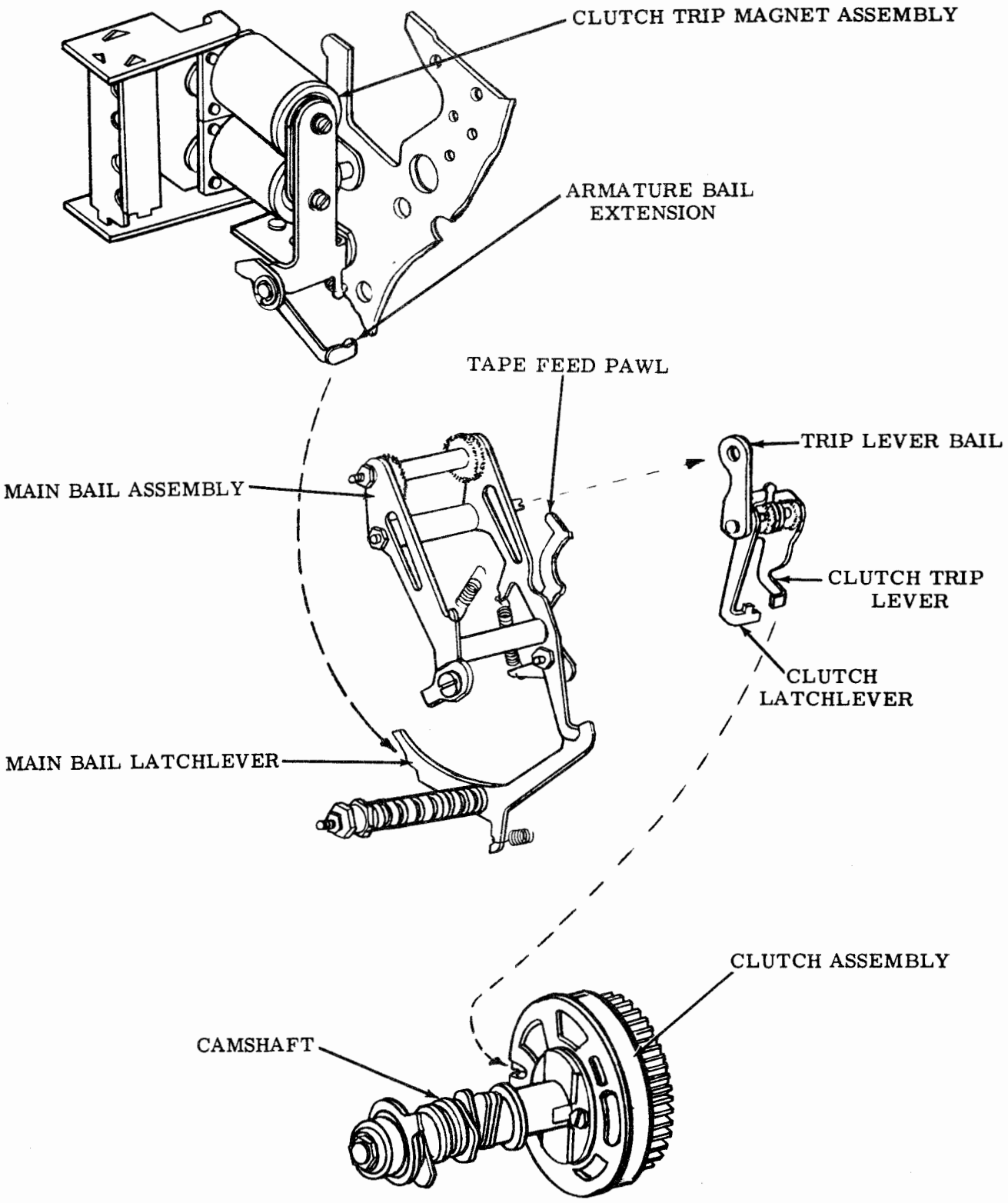

Figure 9 - Function Control Mechanism

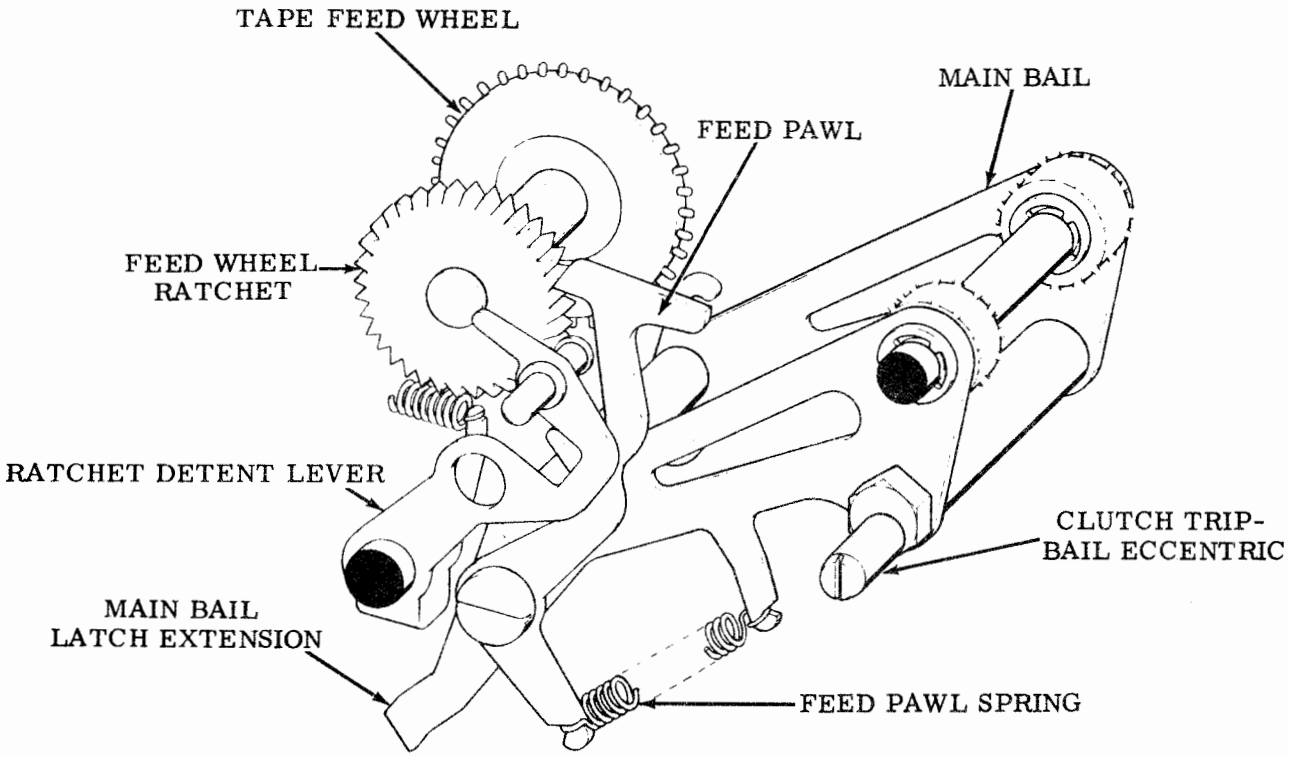

Figure 10 - Tape Feed Mechanism (Rear View)

feed ratchet is part of the tape feed wheel. The tape feed wheel advances the tape one character. The ratchet detent roller bears between two teeth on the ratchet and serves to hold the feed wheel and tape in position during the sensing portion of the operating cycle.

4. 13 Since the clutch tripbail does not latch, the drive arm moves again to its upper position. In so doing, repetition occurs when the main bail swings up, and the main shaft starts to rotate until the unit runs out of tape.

STOPPING THE ACTION

4. 14 The code sensing pins cannot differentiate between a no tape condition and perforations; therefore, the unit operates as if five perforations were sensed and goes through the actions previously described. However, if the tape-out sensing pin senses that there is no tape in the unit, the tape-out pin moves upward, lifting the swinger pad of the tape-out contact assembly and opens the clutch trip magnet circuit.

4. 15 Since the tape out contacts are in series with the start-stop and tight-tape contacts, the clutch trip magnet becomes de-energized and releases its armature. This action permits the armature extension to pivot out of its blocking position and allows the main bail latchlever to be moved by its spring (Figure 9).

4. 16 As the main bail is latched, the clutch trip lever blocks the clutch shoe lever. When the clutch shoe lever is blocked the inertia of the mechanism causes the clutch to rotate far enough to permit the clutch latch to fall into the notch on the clutch cam disc.

5. CLUTCH OPERATION

A. Clutch Engaged

5. 01 The clutch is engaged (Figure 18) by releasing the lower end of lever B. 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 drum at point E. As the drum turns counterclockwise, it drives the primary shoe downward, so that it again makes contact with the drum, this time 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

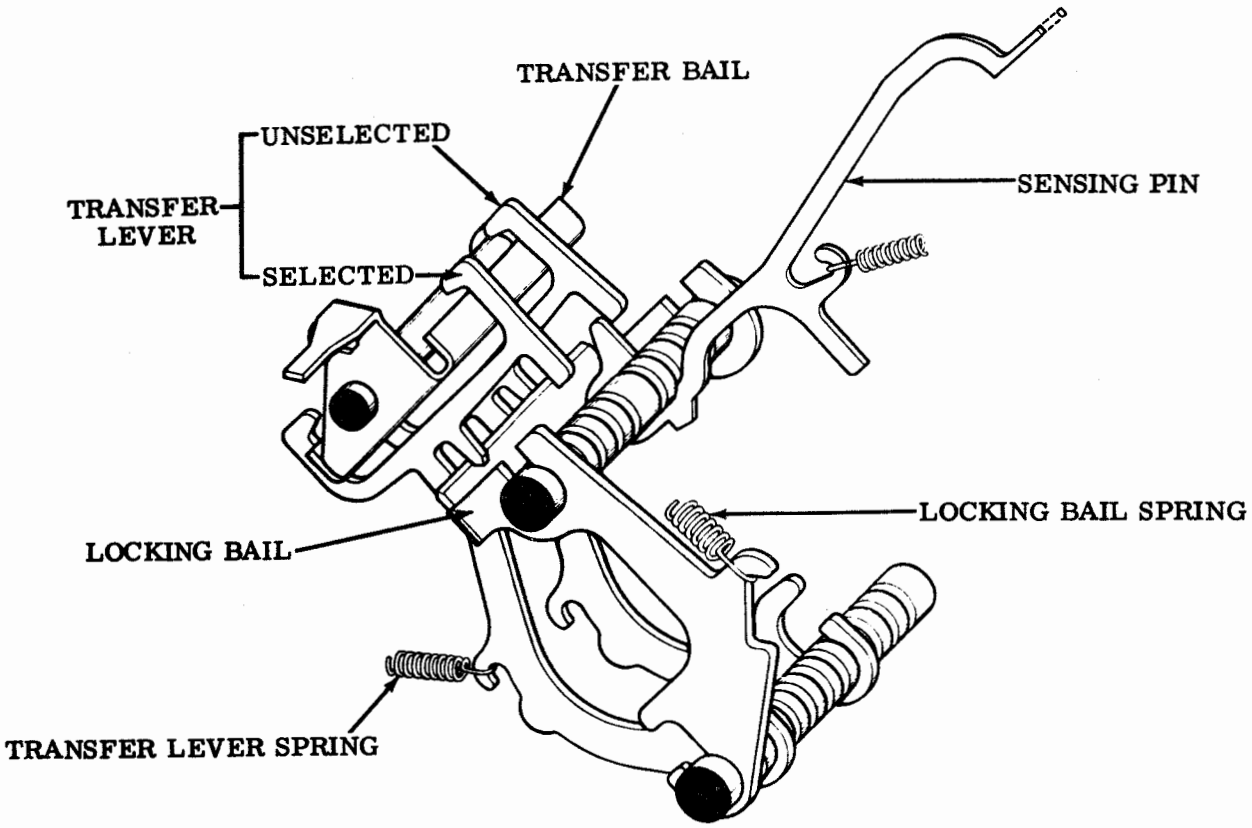

Figure 11 - Locking Bail and Transfer Lever Mechanisms

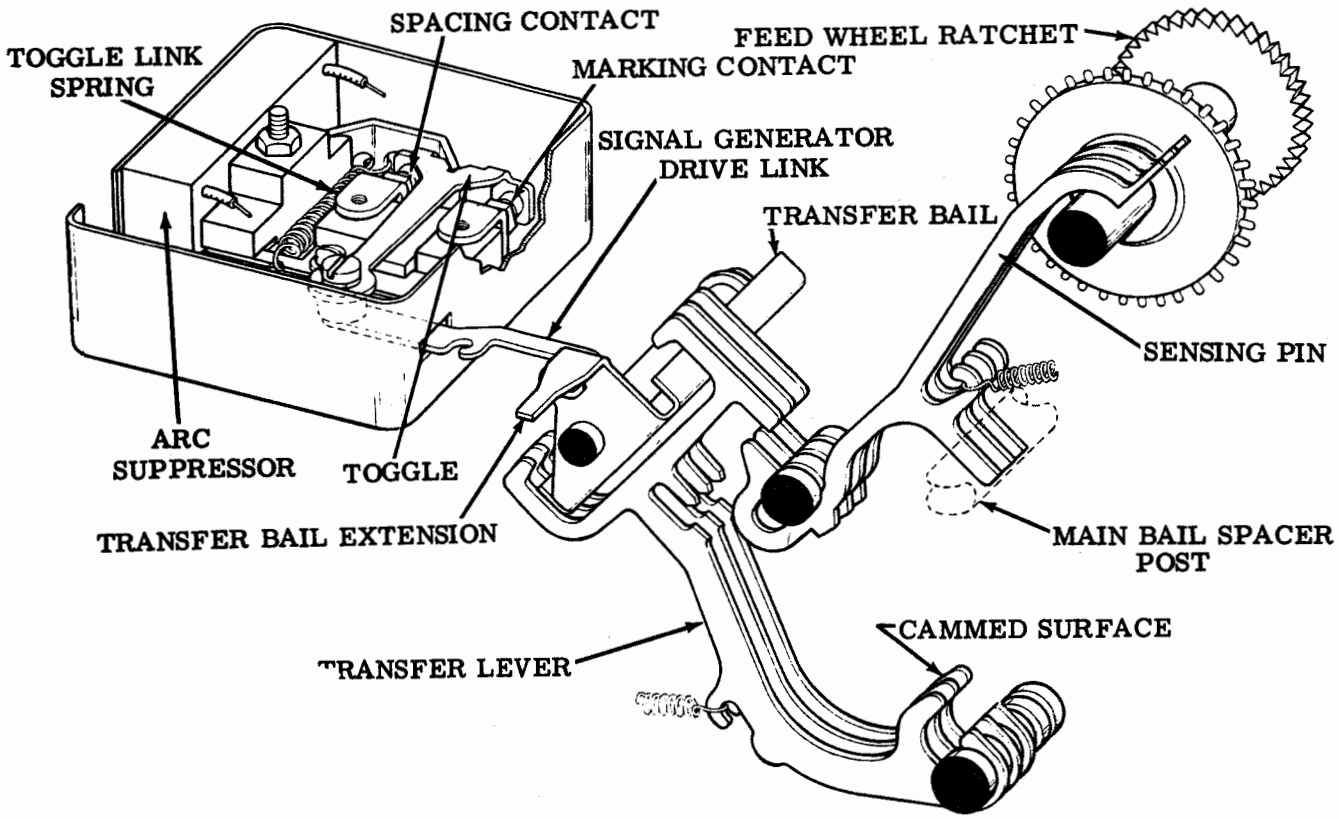

Figure 12 - Transfer Lever and Signal Generator Mechanisms

revolving drum acts to drive this shoe upward so that it again makes contact with the drum at point I. Since the forces involved are multiplied at each succeeding step, the final force developed at point I is very great. This force is applied to the lug J on the clutch cam disc causing it to turn in step with the drum. The cam disc on the clutch, connected to the camshaft, imparts a rotary motion to the cam assembly.

B. Clutch Disengaged

5.02 The clutch is disengaged (Figure 19) by bringing together lug A on the clutch cam disc and the lower end of the clutch shoe lever B. 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.

6. TAPE LID OPERATION

A. Opening

6.01 When the tape lid release plunger (Figure 20) is pressed, the shaft portion of the plunger presses against the tape lid plunger

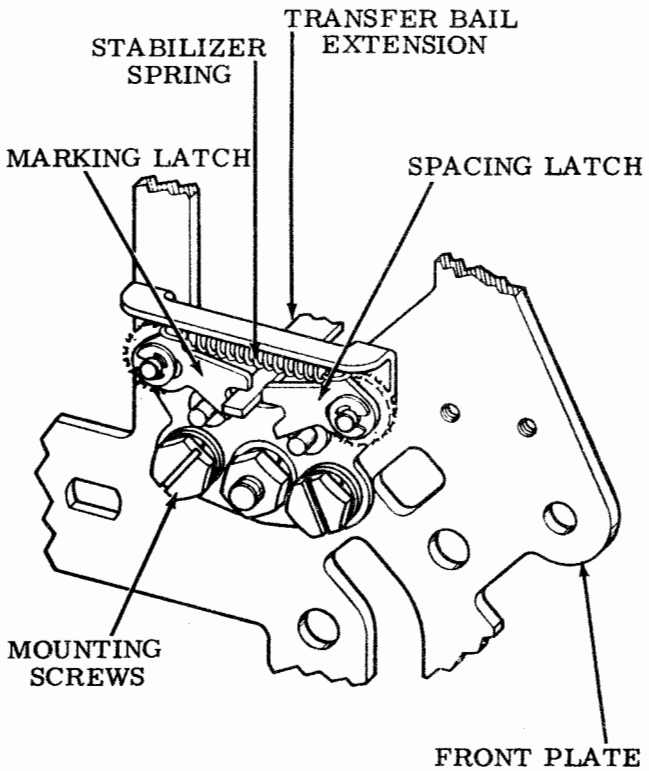

Figure 13 - Transfer Bail Stabilizer

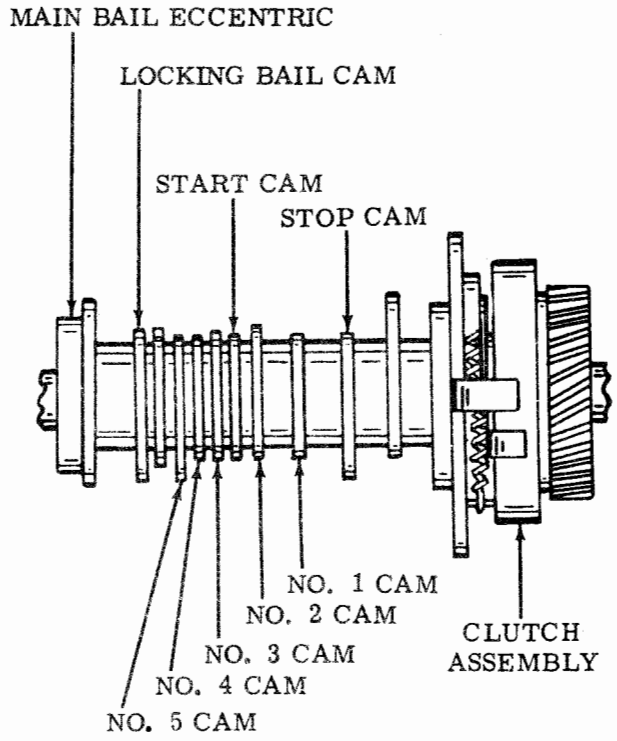

Figure 14 - Clutch Camshaft Assembly

bail extension causing the bail to pivot. The bail, in pivoting, moves its latching extension from under the tape lid latching post to swing down under action of its spring. Since the latching post is mounted on the tape lid behind the pivot point and below the tape guideplate, it causes the main part of the tape lid to swing upward (open) when the post swings downward.

B. Closing

6.02 The tape lid is manually closed by pressing it down against the tape guideplate. As the tape lid is closed, the latching post swings up and cams the latching extension out of its way until it passes the end of the extension which then is pulled under the post, by spring action, latching the post and tape lid.

7. CONTROL LEVER

RUN POSITION

7.01 To start transmission, the transmitter distributor unit must be in an idle signal line condition, the drive motor running, tape in the unit, and the external portions of the transmitter distributor circuits complete. Move the

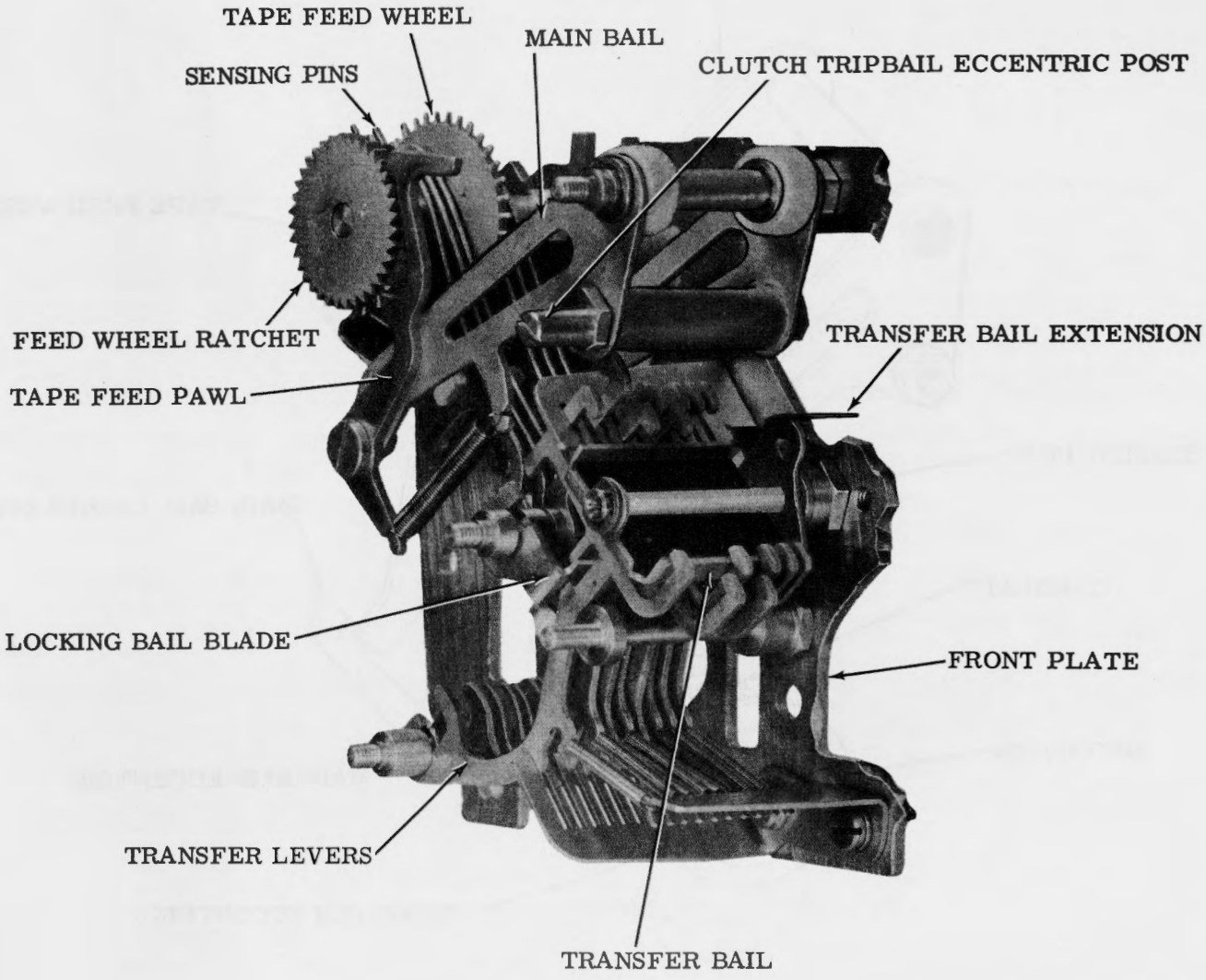

Figure 15 - Front Plate Assembly (Rear View)

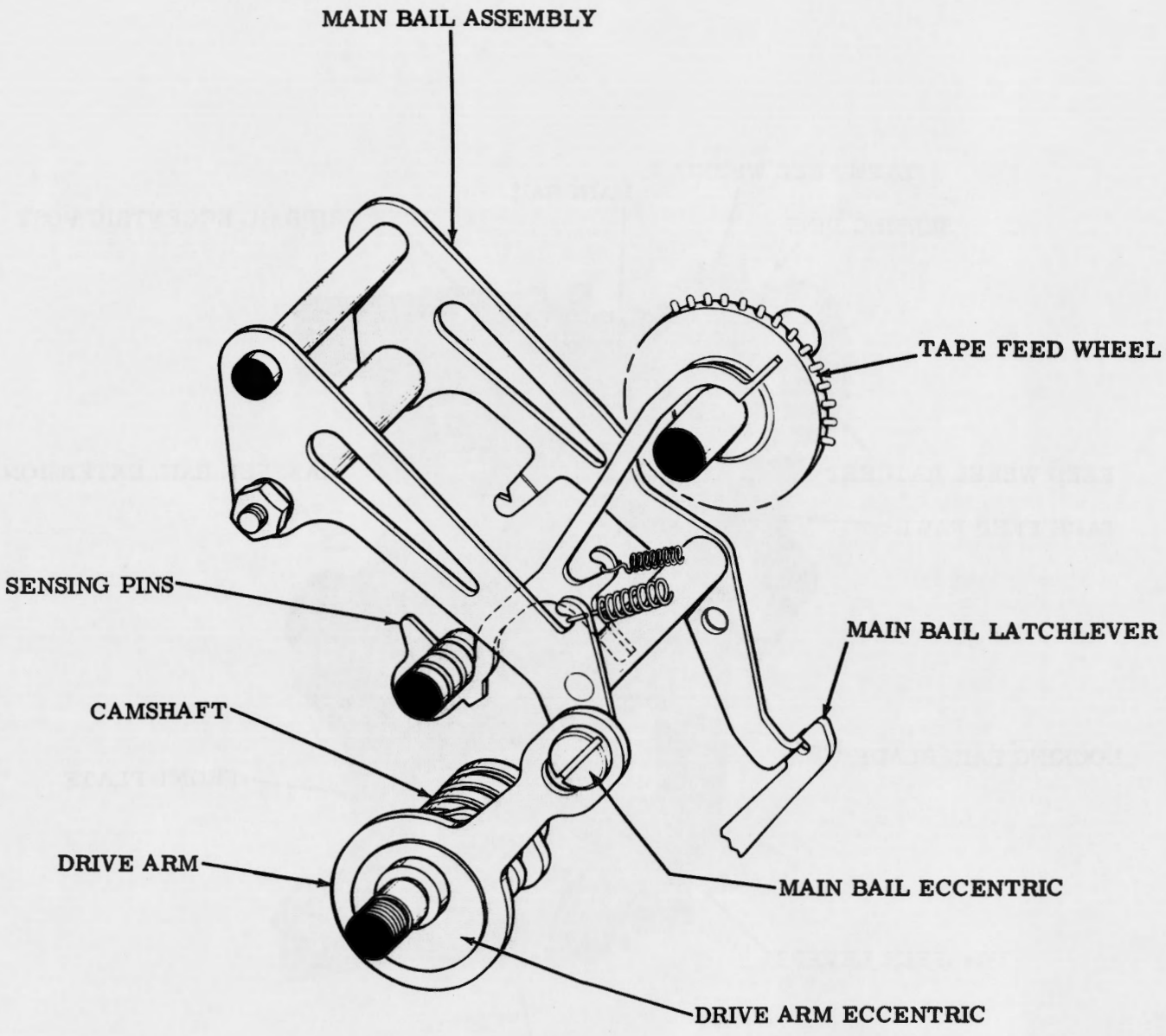

Figure 16 - Main Bail and Drive Arm Mechanism

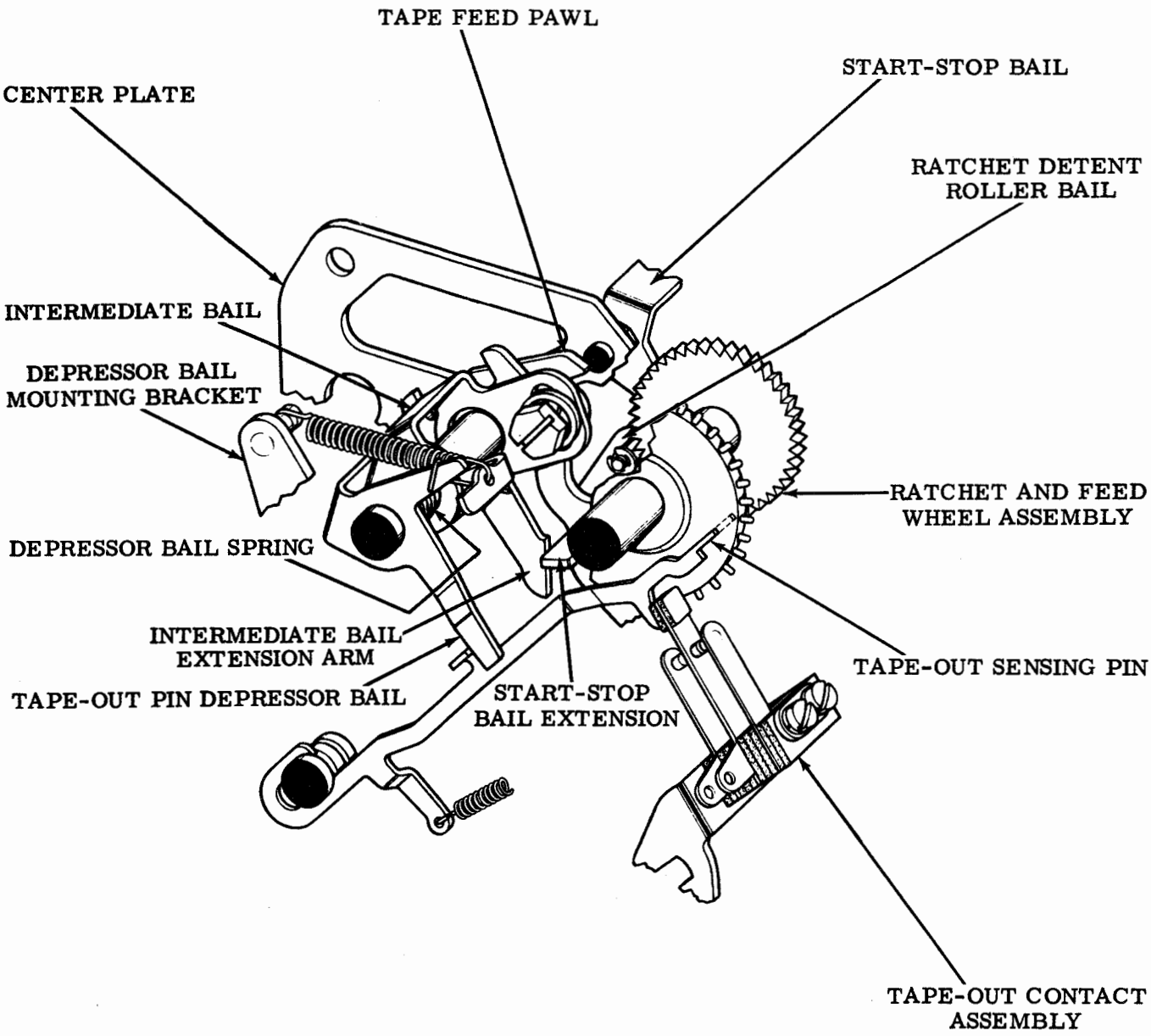

Figure 17 - Freewheeling and Tape-Out Mechanisms

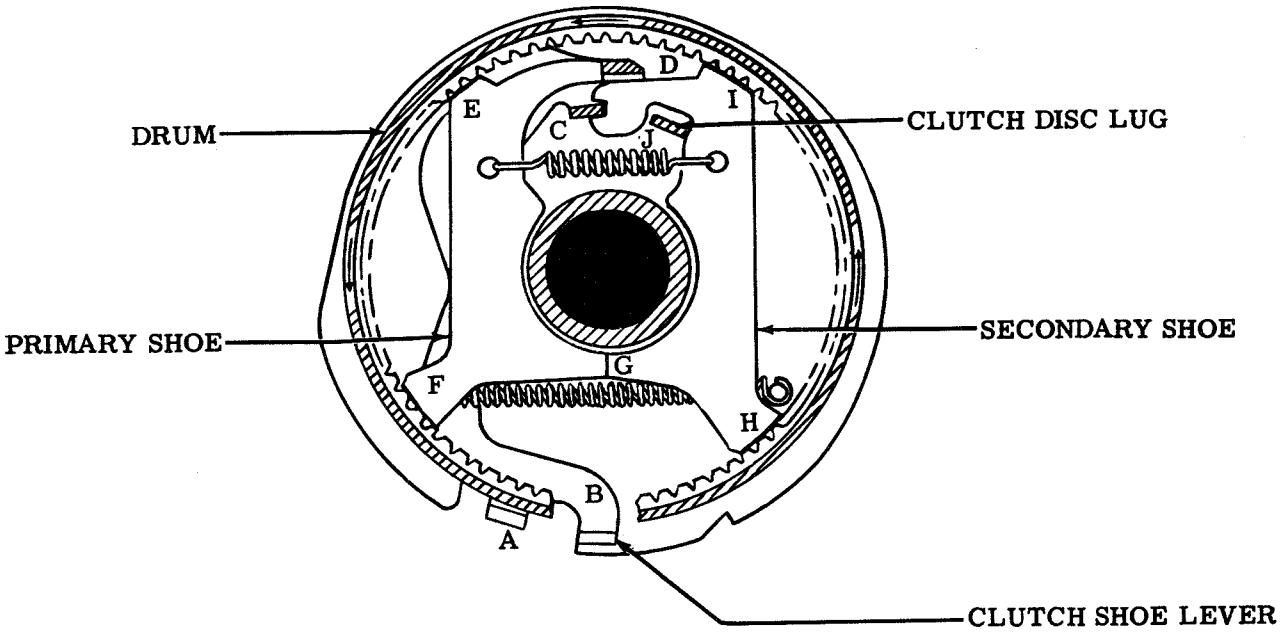

Figure 18 - Clutch — Engaged

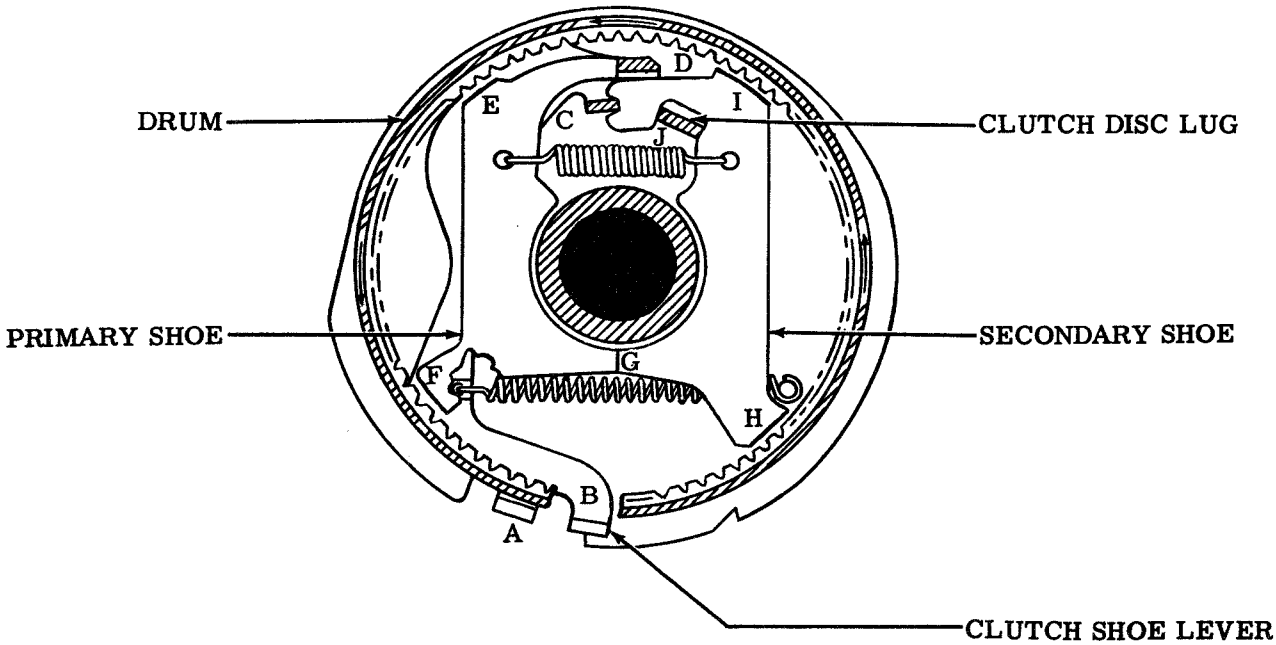

Figure 19 - Clutch — Disengaged

control lever to the RUN position. This positioning energizes the clutch trip magnet by completing the circuit through the start-stop and tight-tape contact assembly. Thus, the contact closes to complete the clutch trip magnet circuit, energizes the magnet, and pulls the armature up. The armature bail extension then cams the main bail latchlever about its pivot post to release the main bail.

STOP POSITION

7.02 When the control lever is pushed to its center or STOP position, the cam surface of the lever cams the start-stop lever bail causing the bail to pivot. As the bail pivots, its extension cams the swinger pad upward on the start-stop contact assembly opening the contacts. This action breaks the circuit to the clutch magnet assembly causing the armature to drop to its unattracted (unenergized) position.

FREE POSITION

7.03 When the CONTROL lever is placed in the FREE position, ie, freewheeling position, the cam surface of the lever cams the start-stop lever bail causing the bail to pivot. As the bail pivots, its extension cams the swinger pad on the start-stop assembly upward opening the contacts, and breaking the circuit to the clutch magnet assembly. The start-stop lever pushes the feed pawl and the ratchet detent roller away from the feed ratchet allowing the feed wheel to rotate freely.

7.04 The start-stop lever extension also cams the intermediate bail extension arm which rotates the intermediate bail. The intermediate bail, in rotating, allows the spring-loaded tape-out pin depressor bail to follow. The depressor bail with its mechanism is mounted on a bracket attached to the front plate. The result of this camming action is the depressing of the tape-out sensing pin to a flush or below flush position relative to the tape guideplate. The position of the tape-out sensing pin allows free passage of the tape under the tape lid (Figure 5).

8. TAPE CONDITIONS

TIGHT OR TANGLED TAPE

8.01 A tight or tangled tape raises the tight tape bail arm (Figure 5). The bail pivots and its extension cams the tight-tape intermediate arm assembly to which the tight tape arm is attached. When the arm assembly is cammed, the associated tight tape arm lifts the swinger on the start-stop, tight-tape contact assembly

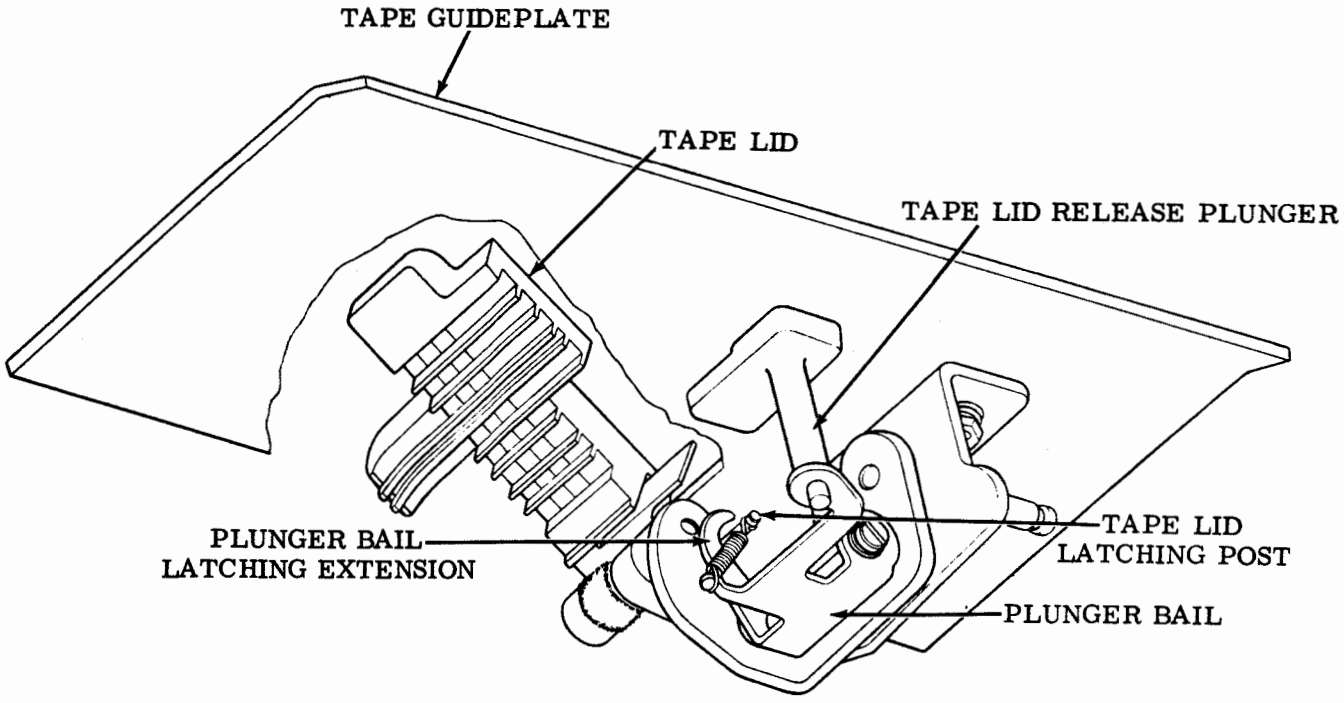

Figure 20 - Tape Lid Mechanism (Bottom View)

up, opening the clutch trip magnet circuit, causing transmission to stop.

TAPE-OUT SENSING PIN

8.02 The tape-out sensing pin (Figure 17) is to the right and slightly forward of the five aligned tape sensing pins. When the tape-out sensing pin is in a depressed position, the circuit is closed, and the unit transmits. Thus, with tape in the unit and the tape lid down, the tape holds the tape-out pin in a depressed position and the circuit is complete.

8.03 When no tape is present, the tape-out sensing pin thrusts up into a hole provided in the tape lid. The rising of the pin opens the tape-out assembly contacts, which opens the clutch magnet circuit, and transmission stops.