

35 TAPE READER (PARALLEL OUTPUT)
 DESCRIPTION AND PRINCIPLES OF OPERATION

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1. GENERAL

1.01 This section is concerned with the description and operation of 8-level tape reader units. Refer to related 574-236-series sections for information regarding adjustments, lubrication, and disassembly-reassembly.

1.02 The descriptive and principles of operation information is divided into "basic unit" description, (common to all units) and "variable features" description (which may vary from unit to unit).

1.03 Use of the terms left or right, up or down, front or rear, etc consider the tape reader to be viewed from a position such

that the tape guide plate is to the viewer's right and on top of the tape reader.

2. DESCRIPTION

BASIC UNIT

A. Capability

2.01 The tape reader performs three basic functions:

- (a) Reads code combinations which have been perforated into a paper tape.
- (b) Translates the code combinations, which have been read, into electrical impulses.
- (c) Transmits electrical impulses through individual wires in the form of simultaneous (parallel wire) output to a suitable tape punch.

B. Features

2.02 The equipment is characterized by the following operational and/or physical features:

- (a) Speeds up to and including 200 words-per-minute are obtainable by replacing gears in the associated driving mechanisms.
- (b) Fully perforated or chadless paper tape is accommodated by the unit.
- (c) Two tape guides are provided for locating and aligning paper tape over the feed wheel.
- (d) An index line is scored in each tape guide 0.600 inch (six characters) ahead of the sensing pins to aid in aligning the paper tape when starting.
- (e) A control lever with RUN, STOP, and FREE positions is provided. The last position mentioned permits free wheeling of the tape feed wheel which facilitates insertion or removal of paper tape.

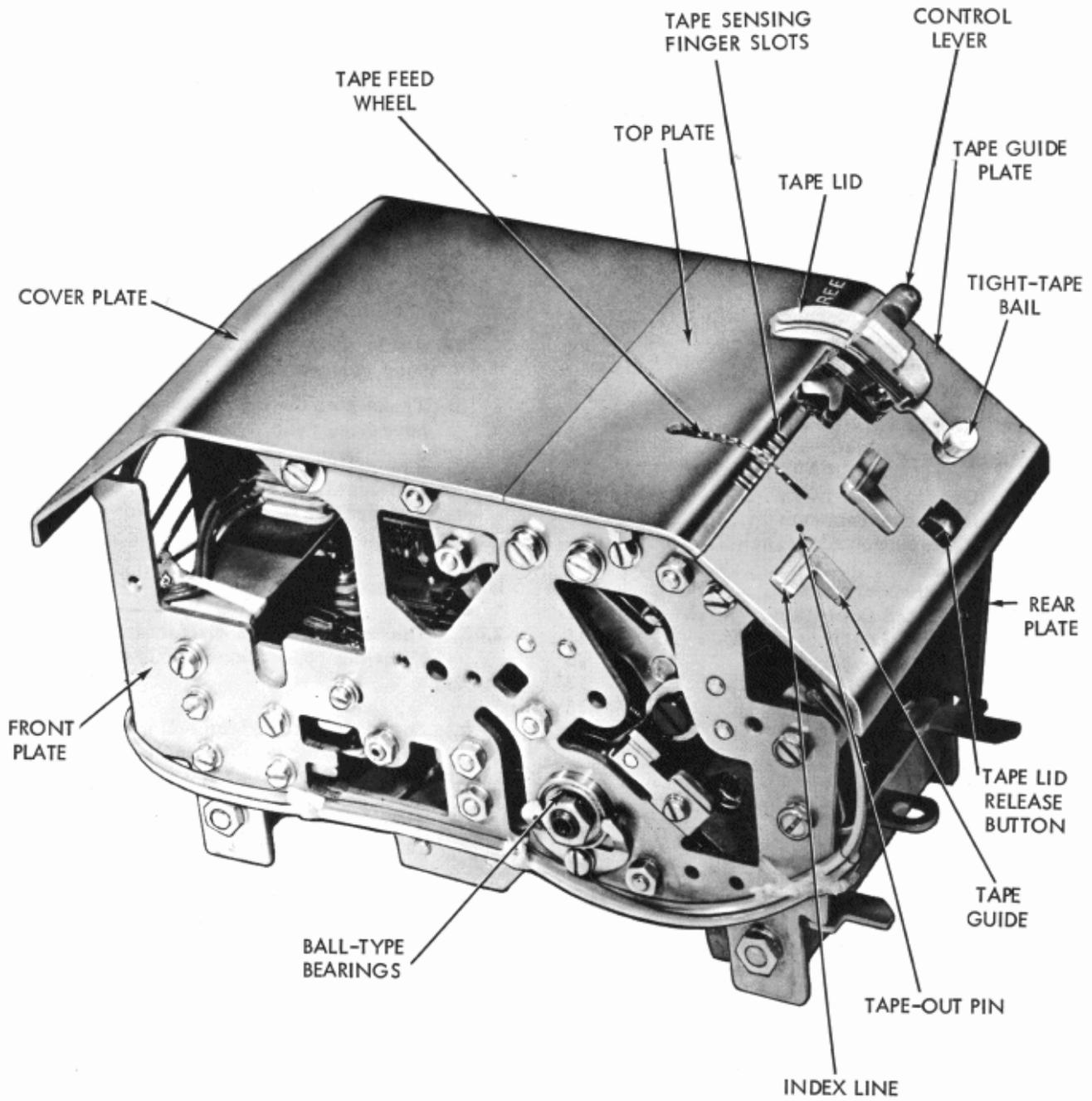


Figure 1 - Tape Reader

(f) A tight-tape device, a part of which is the tight-tape ball, is provided to stop transmission if the paper tape becomes tangled or excessively taut.

(g) A tape-out pin is located to the right and forward of the tape sensing finger slots. The pin stops transmission if there is no paper tape being sensed in the unit. The pin is normally advanced four characters from the sensing fingers, however, the unit may be obtained with the pin in line with the sensing fingers.

(h) The tape lid, as a result of being spring loaded, snaps open when the tape lid release button is depressed.

(i) A connector facilitates the making of electrical connections and handling during servicing.

(j) A nylon insulating screw is mounted on the connector bracket. Its purpose is to activate the line shunt switch located on the base.

(k) The approximate dimensions of the tape reader are:

Length	7-1/8 inches
Height	4-1/4 inches
Depth	3-5/8 inches
Weight	4 pounds

C. Physical Description

2.03 The operating mechanisms of the tape reader are supported between three vertical-parallel plates (front, center, and rear) which are separated a fixed distance by spacers and tie bars. The top part of the unit consists of three different plates (cover plate, top plate, and tape guide plate assembly). The tape guide plate assembly consists of a tape lid, a red tape lid release button, a gray-green control lever, and two tape guides. The tape guides are scored with an index line which is located six characters ahead of the sensing fingers when the guides are in their assembled position. The tape sensing fingers extend through slots in the top plate. The riding type tape-out pin extends through a hole in the tape guide plate to the right and forward of the tape sensing finger slots. The tape feed wheel pins extend through slots in the top plate and tape

guide plate. A mainshaft assembly is centrally located in the lower portion of the unit and consists of multiple cams, a clutch, and ball-type bearings. The ball-type bearings located on the mainshaft, one on each end, are mounted onto the front and rear plates. The motive force is obtained from a motor (supplied separately) through a combination of helical gears.

D. Electrical Characteristics

Control Circuit

2.04 The control circuit is a series circuit and includes contact assemblies which are activated by the clutch trip magnet, tape-out, control, and tight-tape mechanisms. The circuit is capable of operating from the following power sources:

- (a) 115 volts AC \pm 10%, 60 cycles.
- (b) 120 volts DC \pm 10% with suitable resistance.
- (c) 50 volts DC \pm 10% with suitable resistance.

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

Signal Circuit

2.05 The signal circuit consists of the code reading contact assembly and auxiliary No. 1 contact assembly. The code reading contacts are not required to make and break current, but merely condition the circuit. The recommended maximum current that flows through the auxiliary contacts at the time normally open contacts close is 750 milliamperes with arc suppression.

Note: Arc suppression circuitry is to be provided by the user where required.

VARIABLE FEATURES

A. Auxiliary No. 2 Contacts

2.06 A No. 2 auxiliary contact assembly is operated by the No. 2 auxiliary cam on the mainshaft. Contacts open or close on each operating cycle.

3. PRINCIPLES OF OPERATION

BASIC UNIT

A. General

3.01 The succeeding paragraphs describe a normal sequence of operations for the tape reader. The following conditions are assumed prior to starting the operating sequence:

- (a) The external portion of the signal and control circuits are complete (Paragraphs 2.04 and 2.05).
- (b) The control lever is in its STOP position.
- (c) The driving motor is running with the tape reader in its idle line condition, i e , clutch disengaged and mainshaft stationary.

- (d) Tape is in position on the tape guide plate with the tape lid closed (Figure 2).

B. Operating Sequence

Clutch Trip Magnet (Figure 3)

3.02 Action is initiated by pushing the control lever to its RUN position. When the control lever is pushed to the right to its RUN position, the cam surface of the lever moves the control lever bail causing it to pivot on its axis (Figure 4). As the bail pivots, its extension moves down allowing the break contact spring to make contact with the stationary contact spring, closing the clutch trip magnet assembly circuit. This action causes the magnet to be energized and to attract its armature. As the armature is attracted, the armature extension bail moves into contact with the main bail latch lever. The armature extension bail continues its motion causing the main bail latch lever to pivot and release the main bail assembly.

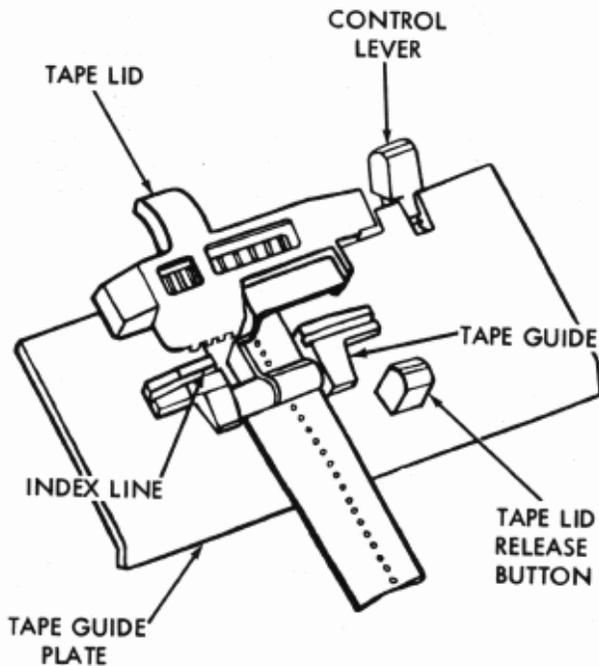


Figure 2 - Tape Guide Plate

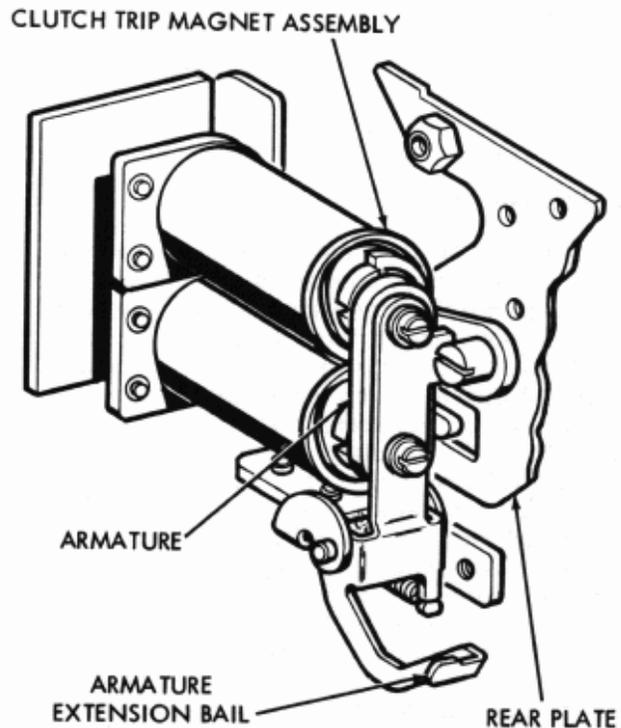


Figure 3 - Clutch Trip Magnet Assembly

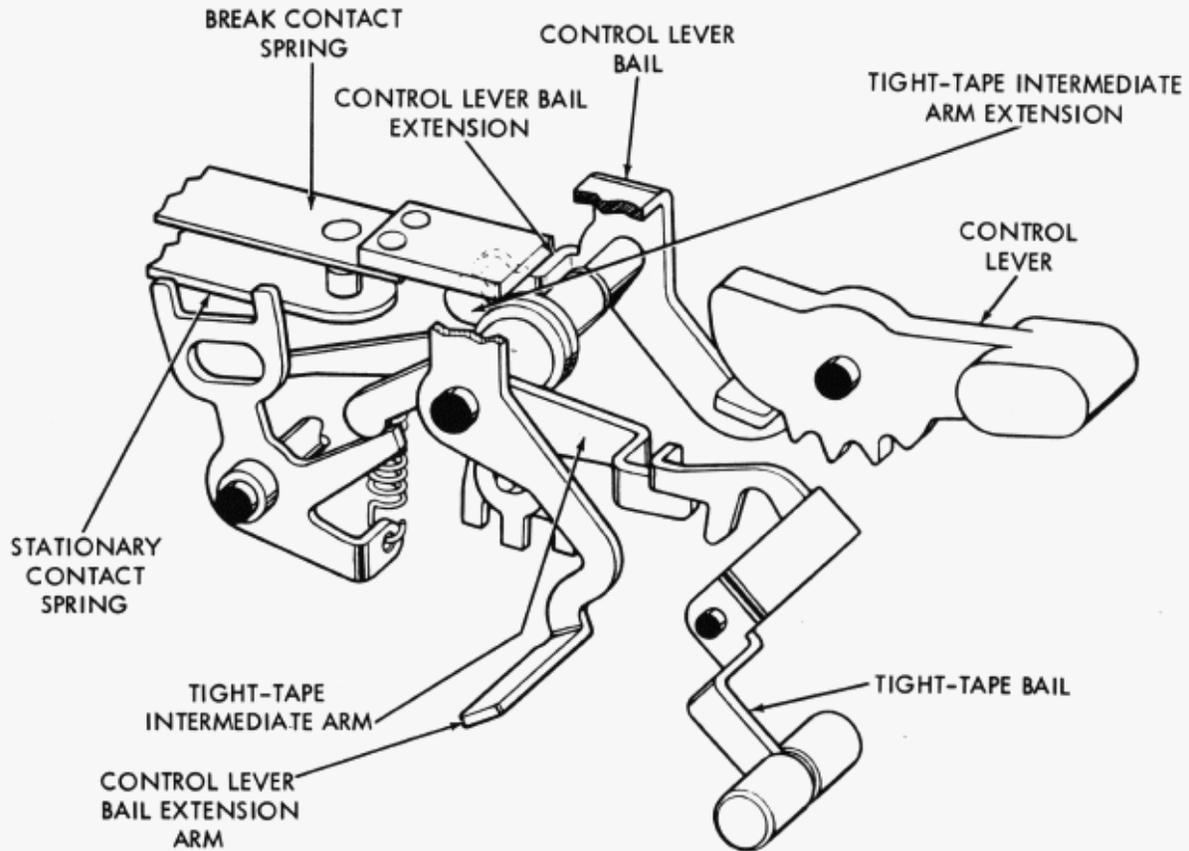


Figure 4 - Control Mechanism

Main Bail - Initial (Figures 5 and 6)

3.03 The main bail assembly swings upward as a result of the tension of the main bail spring. Three additional actions occur simultaneously with the upward movement of the main bail assembly:

- (a) The feed pawl is raised one tooth on the feed wheel ratchet.
- (b) The sensing fingers, under spring tension, move upward to sense perforations in the tape in position on the tape guide plate. If one or more of the sensing fingers encounter perforation(s) in the tape, the finger(s) will extend through the perforation(s) until the extension on each sensing finger is blocked by the main bail spacer post. The sensing fingers that extend through the tape move their associated transfer levers upward so that the transfer lever extensions are brought above the line of action of the blade on the locking bail. If any of the sensing fingers do not sense a perforation in the

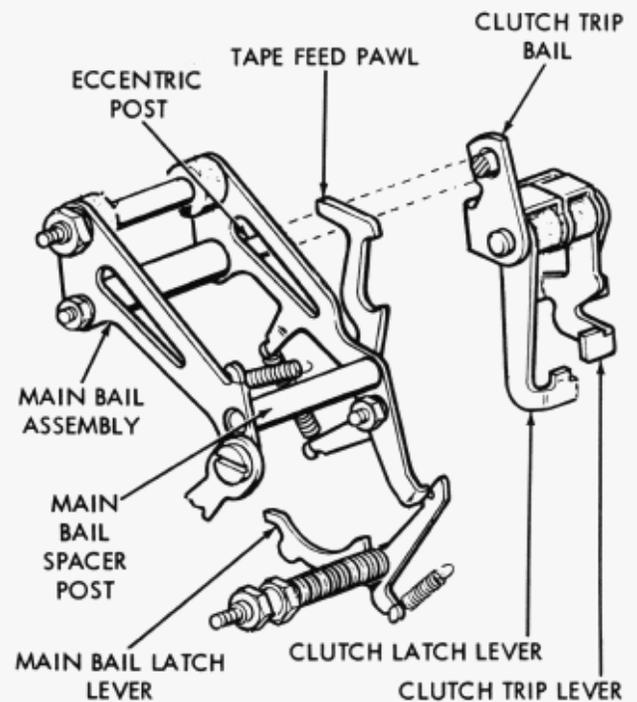


Figure 5 - Main Bail Assembly

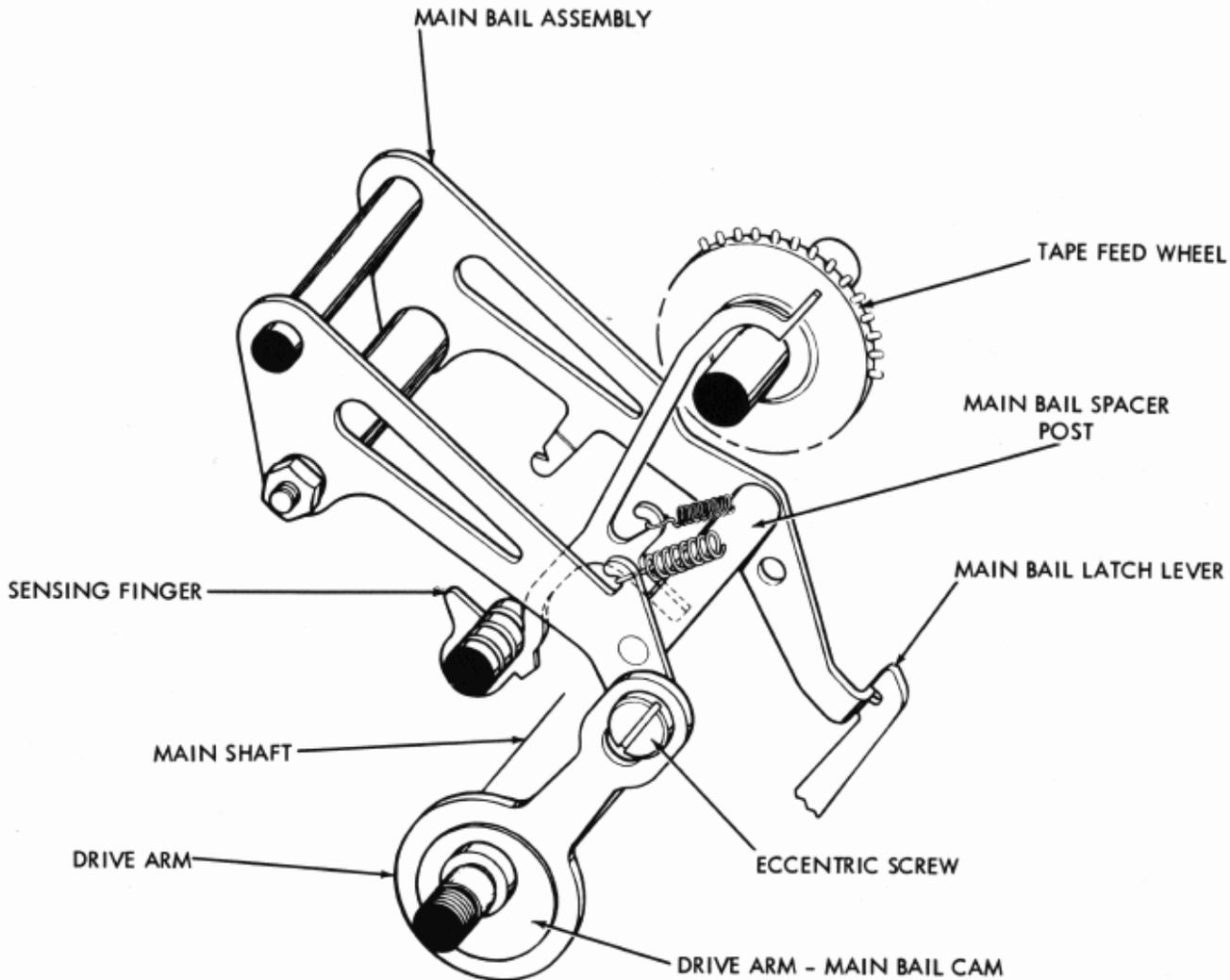


Figure 6 - Main Bail and Drive Arm Mechanism

tape, the associated transfer levers remain stationary and their extensions remain below the line of action of the blade on the locking bail.

(c) The main bail eccentric post cams the clutch trip bail which pivots on its axis and moves the clutch trip lever away from the clutch shoe lever.

Clutch Trip Lever (Figure 5)

3.04 The transmitting cycle starts when the clutch trip lever is moved away from the clutch shoe lever. The clutch shoes engage the clutch, and the clutch mainshaft assembly starts rotating (Figures 7 and 8).

Locking Bail (Figure 9)

3.05 While the clutch mainshaft is rotating, the high part of the locking bail cam moves away from contact with the locking bail. Simultaneously the locking bail, under spring tension, moves to the left. The blade of the locking bail locks all transfer levers in their selected position by blocking the transfer lever extensions and preventing the transfer levers from changing positions.

Sensing Arms (Figure 10)

3.06 The transmitting cycle progresses by further rotation of the clutch mainshaft assembly. The sensing bail cam follower rides

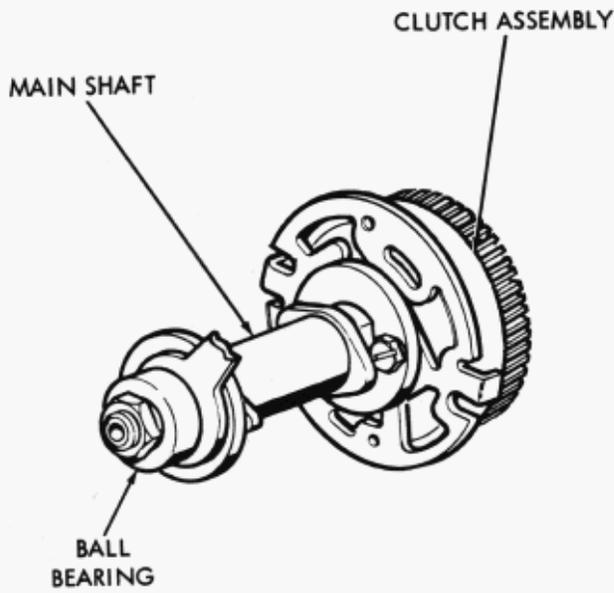


Figure 7 - Clutch Mainshaft Assembly

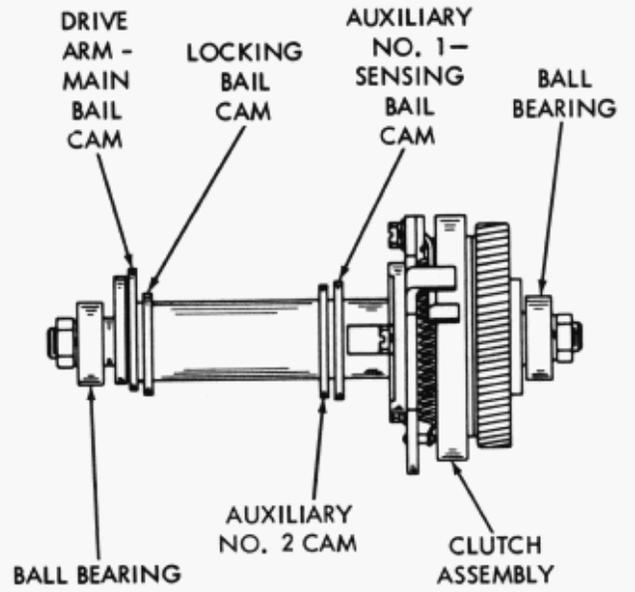


Figure 8 - Clutch Mainshaft Assembly, Right Side View

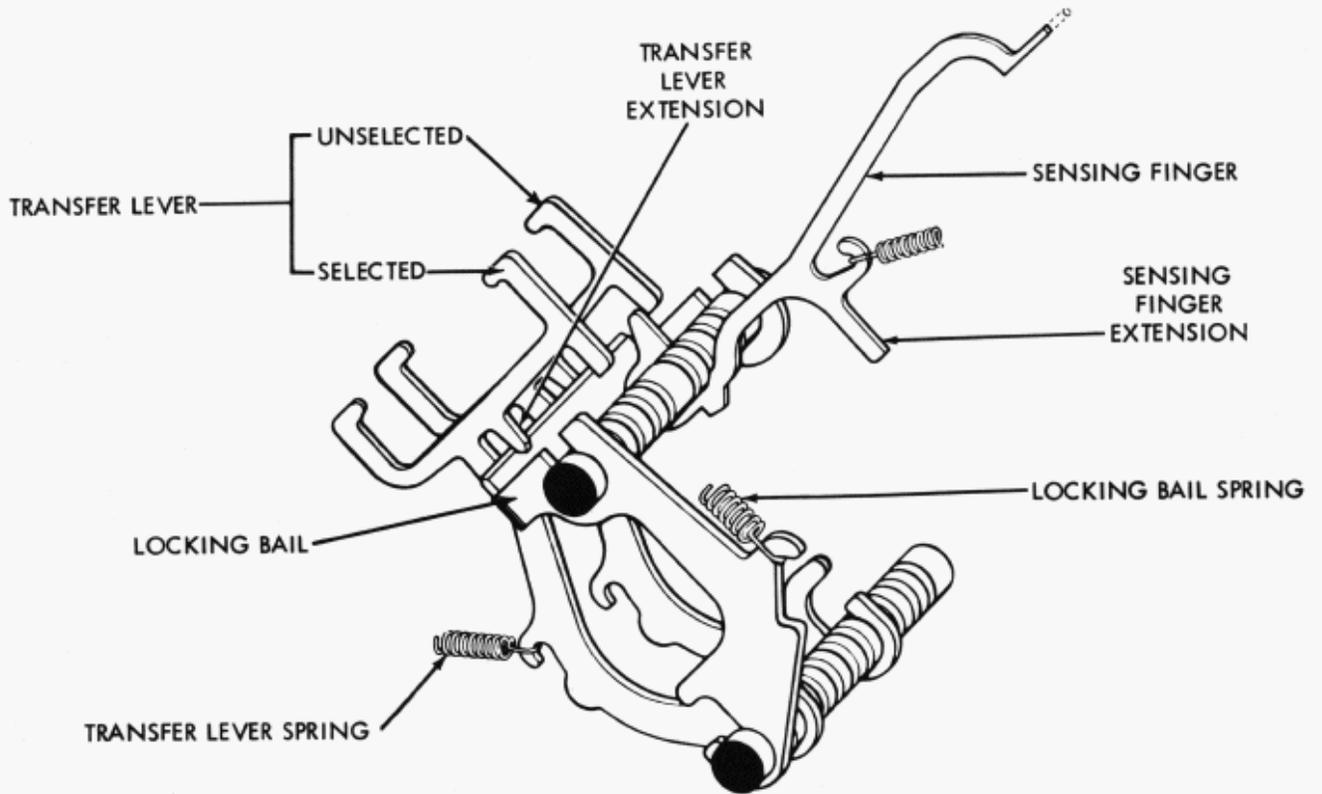


Figure 9 - Locking Bail Mechanism, Front View

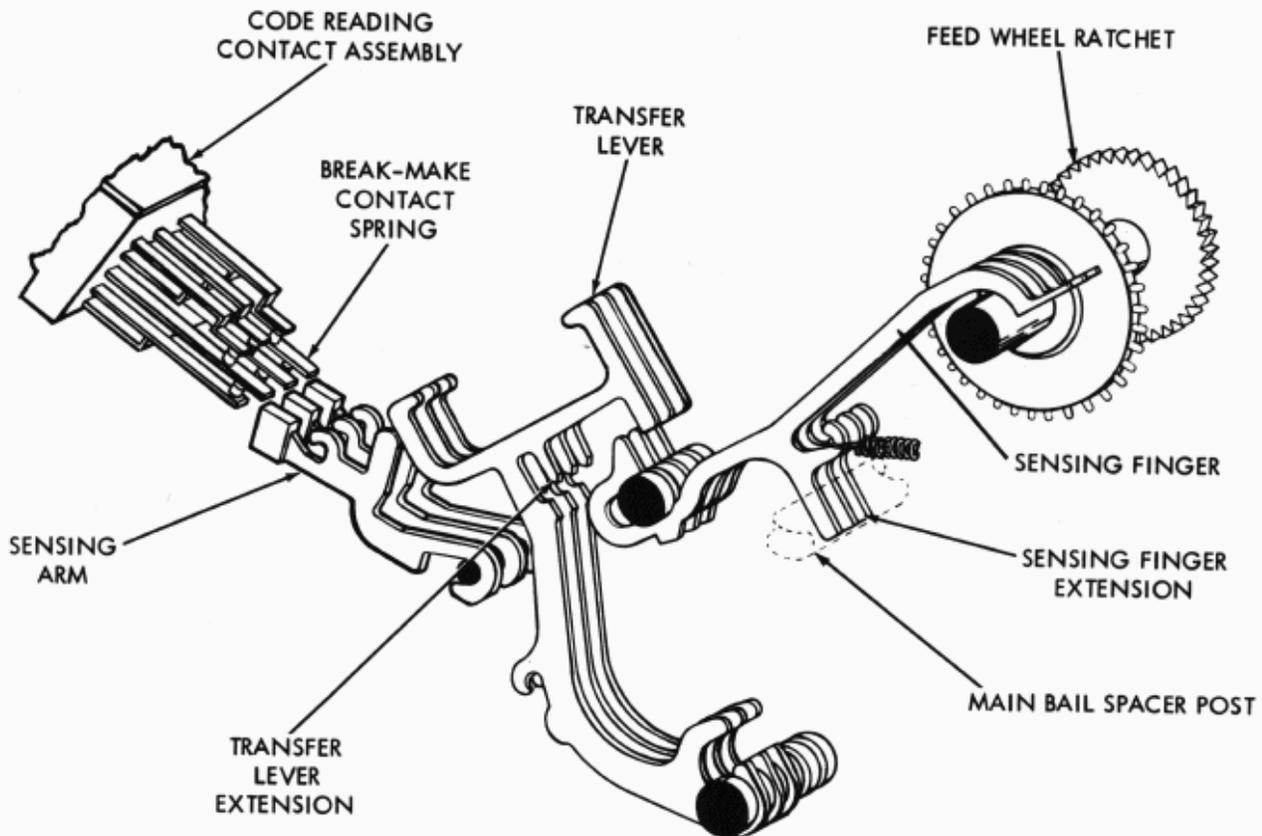


Figure 10 - Transfer Lever Mechanism, Front View

the auxiliary no. 1 - sensing bail cam, and moves down as the high part of the cam contacts the follower. As the sensing bail cam follower moves down, the sensing bail moves up. This causes the sensing arms to move up from the position they occupy when the clutch is in its stop position and its clutch shoes disengaged from the clutch drum. In this latter position the sensing arms do not contact their break-make contact springs on the code reading contact assembly.

Note: The stop position refers to that position where the shoe lever contacts the trip lever with the main bail assembly latched.

3.07 The amount of movement of the sensing arms depends upon the position of the transfer levers. The sensing arms move up only so far as they are not blocked by their associated transfer levers. In the spacing position the transfer levers block the upward movement of their associated sensing arms so that each of their mating break-make contact springs are not operated. In this way normally closed

contacts remain closed as the sensing bail continues its upward movement. In the marking position, the transfer levers permit their associated sensing arms to move upward until each of their mating break-make contacts are operated. The normally closed contacts open, and the normally open contacts close.

3.08 As the transmitting cycle nears its end, the sensing bail cam follower rides the auxiliary no. 1 - sensing bail cam to its low part and moves up. When this happens, the sensing bail moves down, and the sensing arms return to their rest positions with the normally closed contacts closed.

Auxiliary No. 1 Contact Assembly

3.09 The auxiliary no. 1 contact assembly is not affected by the position of the transfer levers. The break-make contact spring of the auxiliary contact assembly operates every operating cycle from normally closed to open and from open to normally closed. The contact is operated by the operating bail riding on the auxiliary no. 1 sensing bail cam (Figure 8).

Drive or Cam Follower Arm (Figure 6)

3.10 Simultaneously with the beginning of the transmitting cycle (Paragraph 3.04), the drive arm - main bail cam moves the main bail assembly down by interaction of the drive or cam follower arm which is attached to the main bail assembly with an eccentric screw.

Main Bail - Final (Figure 6)

3.11 As the main bail assembly moves down, the main bail spacer post causes the sensing fingers, that are extended, to be withdrawn from the perforations in the tape. The main bail assembly also pulls down on the feed pawl and continues down to its latching position. The main bail latch lever does not latch, however, until the armature is released. When the armature is released, the armature extension bail allows the main bail latch lever to assume its latching position.

Tape Feed (Figure 11)

3.12 When the feed pawl moves down (Paragraph 3.11), it advances the feed wheel ratchet one tooth against the action of the feed

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

Repetition

3.13 The drive or cam follower arm moves again to its upper position. Since the clutch trip bail does not latch, the main bail assembly swings upward, and the clutch main-shaft assembly continues to rotate.

Note: The transmitting cycle ends at that point where the clutch shoe lever either passes or is latched against the clutch trip lever.

The complete operating sequence to this point is repeated until the tape reader runs out of tape.

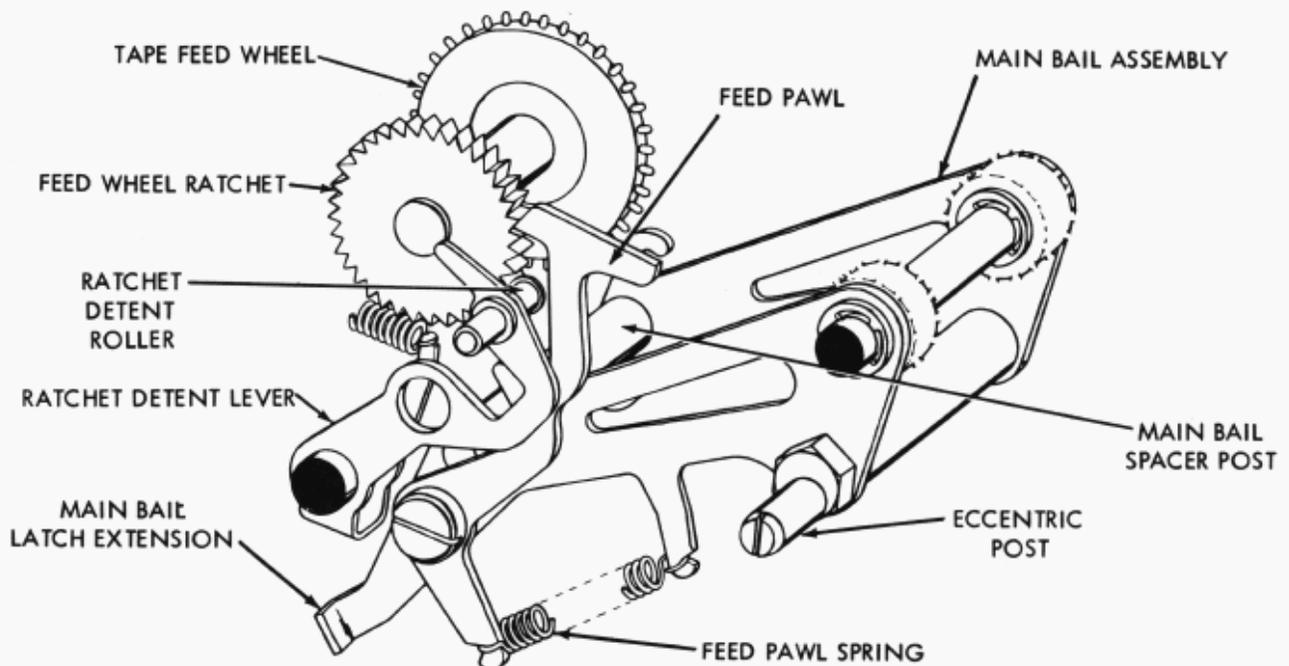


Figure 11 - Tape Feed Mechanism, Rear View

C. Termination of Transmitting Action

Tape-Out Pin (Figure 12)

3.14 The code sensing fingers cannot differentiate between a no tape condition and perforations; therefore, the unit operates as if all perforations were sensed and goes through the actions previously described. However, the tape-out pin feature senses that there is no tape in the tape guide plate. The tape-out pin moves upward to lift the break-make contact spring of the tape-out contact assembly and open the clutch trip magnet circuit.

Armature (Figure 3)

3.15 Since the tape-out contact assembly is in series with the control contact assembly, the clutch trip magnet becomes de-energized and releases its armature. This

permits the armature extension bail to pivot out of its blocking position and allow the main bail latch lever to be moved by its spring.

Clutch Latch Lever (Figure 5)

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

D. Clutch Operation

Clutch Engaged (Figure 13)

3.17 The condition shown in Figure 13 is accomplished 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

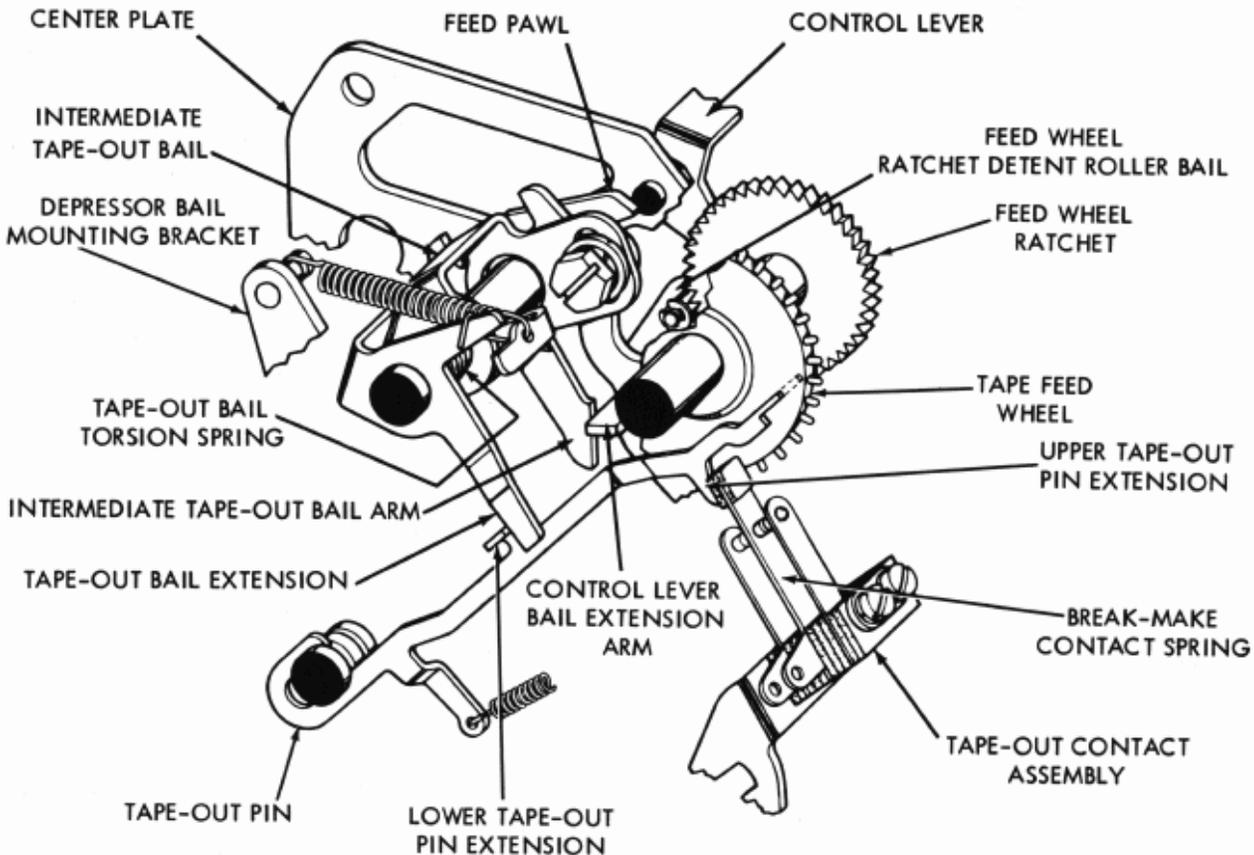


Figure 12 - Free Wheeling and Tape Out Mechanisms

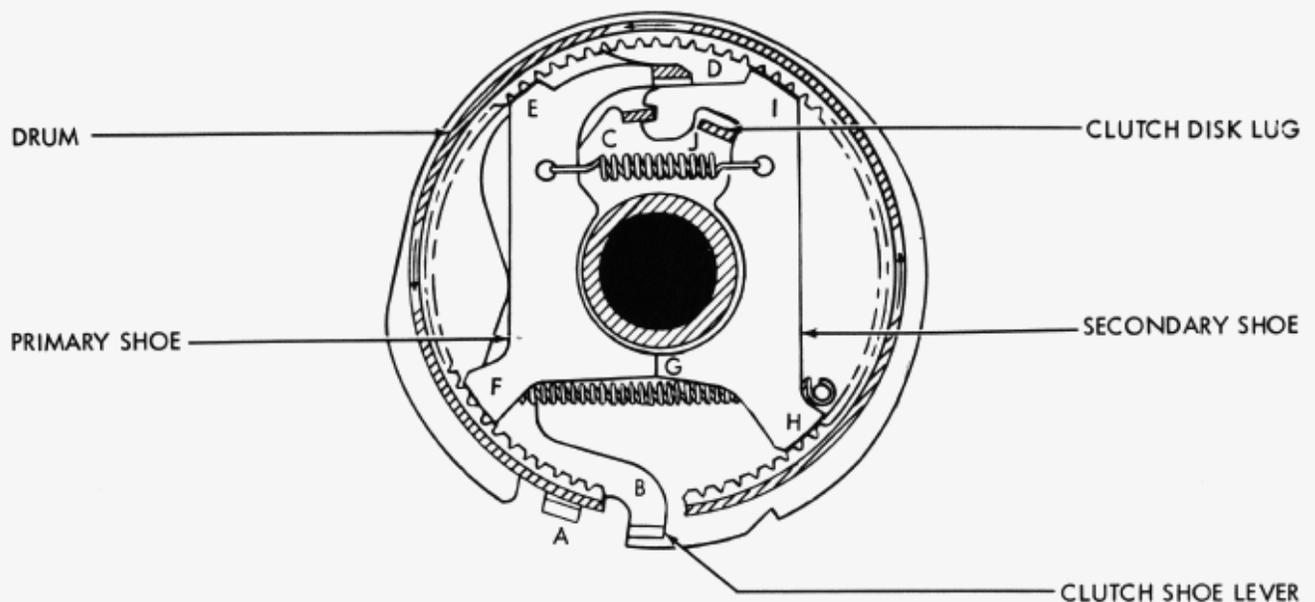


Figure 13 - Clutch - Engaged

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 counter-clockwise, 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 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 disk to cause it to turn in step with the drum. The cam disk on the clutch is connected to the cam shaft imparting rotary motion to the cam assembly.

Clutch Disengaged (Figure 14)

3.18 The condition shown in Figure 14 is accomplished by bringing together lug A on the clutch cam disk 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.

E. Tape Lid Operation (Figure 15)

Opening

3.19 When the tape lid release button is pressed, the shaft portion of the button presses against the latch ball causing the ball to pivot. The ball, in pivoting, moves its latch (Section 570-106-700, Tape Lid Adjustment) from under the post permitting the post to swing downward under action of its spring. Since the post is mounted on the tape lid behind the pivot point and below the tape guide plate, it causes the main part of the tape lid to swing upward (open) when the post swings downward.

Closing

3.20 The tape lid is closed manually by pressing it against the tape position. When the tape lid is closed, its post swings up and cams the latch ball 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.

F. Control Lever (Figures 1 and 2)

RUN Position

3.21 The RUN position is the position from which action to start transmission is initiated (Paragraph 3.02).

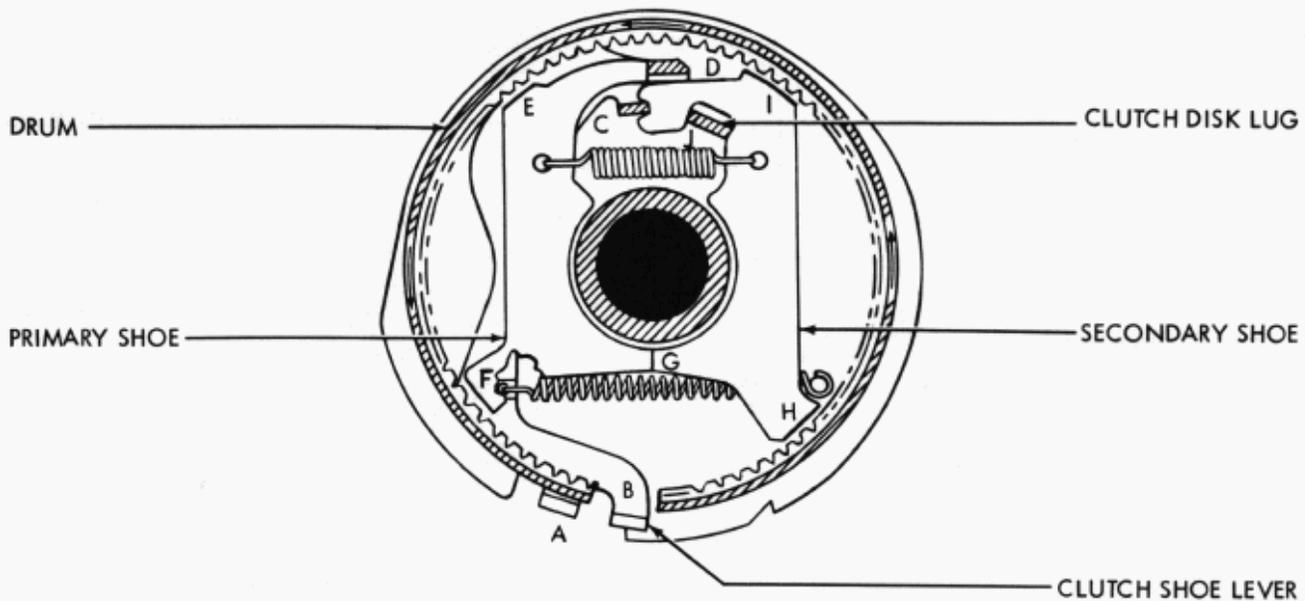


Figure 14 - Clutch - Disengaged

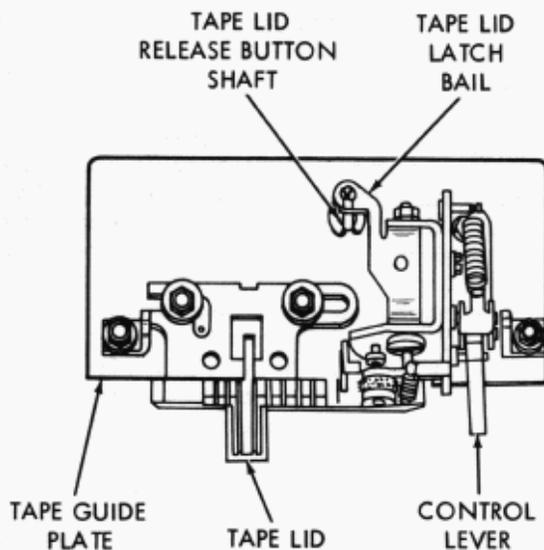


Figure 15 - Tape Lid Mechanism, Bottom View

STOP Position

3.22 The STOP position is the position used to manually stop transmission. When the control lever is pushed to its center or STOP position from its RUN position, the cam surface of the lever moves the control lever bail causing it to pivot on its axis. As the bail pivots, its extension moves up causing the break contact spring to break contact with the

stationary contact spring, opening the clutch trip magnet assembly circuit. The armature is then released to its unattracted position (Paragraph 3.15).

3.23 Simultaneously with the action outlined above, the control lever ball extension arm cams the intermediate tape-out bail arm which rotates the intermediate tape-out bail. The intermediate tape-out bail, in rotating, permits the spring loaded tape-out bail extension to rotate down. As this action occurs, the tape-out bail extension depresses the tape-out pin by contact with the lower tape-out pin extension. The tape-out pin moves down to a flush or below flush position in relation with the tape guide plate and permits manual passage of tape under the tape lid until it contacts the tape feed wheel where the tape is stopped (Figure 12).

FREE Position

3.24 The FREE position is the position used to permit the free passage of tape completely under the tape lid. To accomplish this the control lever is pushed to its extreme left position from its STOP position. The cam surface of the control lever moves the control lever bail causing it to pivot on its axis. As the bail pivots, its extension arm moves down and pushes the feed pawl and the feed wheel ratchet detent roller ball away from the feed

wheel ratchet allowing the tape feed wheel to rotate freely. With the tape-out pin flush or below flush with relation to the tape guide plate (Paragraph 3.23), the above described operation permits free passage of tape under the tape lid (Figure 12).

G. Tight Tape (Figure 4)

3.25 Tight or tangled tape raises the tight-tape bail. The bail pivots, and its extension cams the tight-tape intermediate arm. When the tight-tape intermediate arm pivots, its extension arm moves up contacting the break contact spring and opening the clutch trip magnet circuit. When the clutch trip magnet circuit is opened, transmission stops.

H. Tape-Out Pin (Figure 12)

3.26 The tape-out pin is located on the tape guide plate to the right and forward of the tape sensing fingers. With external portions of the electrical circuits complete, tape-out pin depressed, and the contacts of the control contact assembly closed, the tape reader will transmit if perforated tape is in the unit with the tape lid closed. The tape holds the tape-out pin depressed and allows the tape reader to continue to transmit as long as there is tape in the unit. When no tape is sensed, the spring loaded tape-out pin travels upward

into the hole provided in the tape lid. The upper tape-out pin extension engages the break-make contact spring on the tape-out contact assembly opening contacts. This interrupts the clutch magnet circuit so that transmission ceases.

I. Electrical Circuits

3.28 The electrical circuits of the tape reader consist of the control and signal circuits. The control circuit includes contact assemblies which are activated by the clutch trip magnet, tape-out, control, and tight-tape mechanisms. The signal circuit includes the code reading contact assembly and auxiliary contact assemblies. For additional information, see Paragraphs 2.04 and 2.05.

VARIABLE FEATURES

A. Auxiliary No. 2 Contact Assembly

3.29 Like the auxiliary no. 1 contact assembly, the no. 2 contacts are not affected by the position of the transfer levers. The break-make contact spring of the no. 2 auxiliary contact operate every operating cycle from normally closed to open and from open to normally closed. The contact is operated by a cam follower riding on the auxiliary no. 2 cam (Figure 8). (Also see related adjustments section.)