



BULLETIN 253B  
GENERAL DESCRIPTION  
AND  
THEORY OF OPERATION  
MODEL 28  
TRANSMITTER DISTRIBUTOR  
LCXD

**TELETYPE<sup>®</sup>**

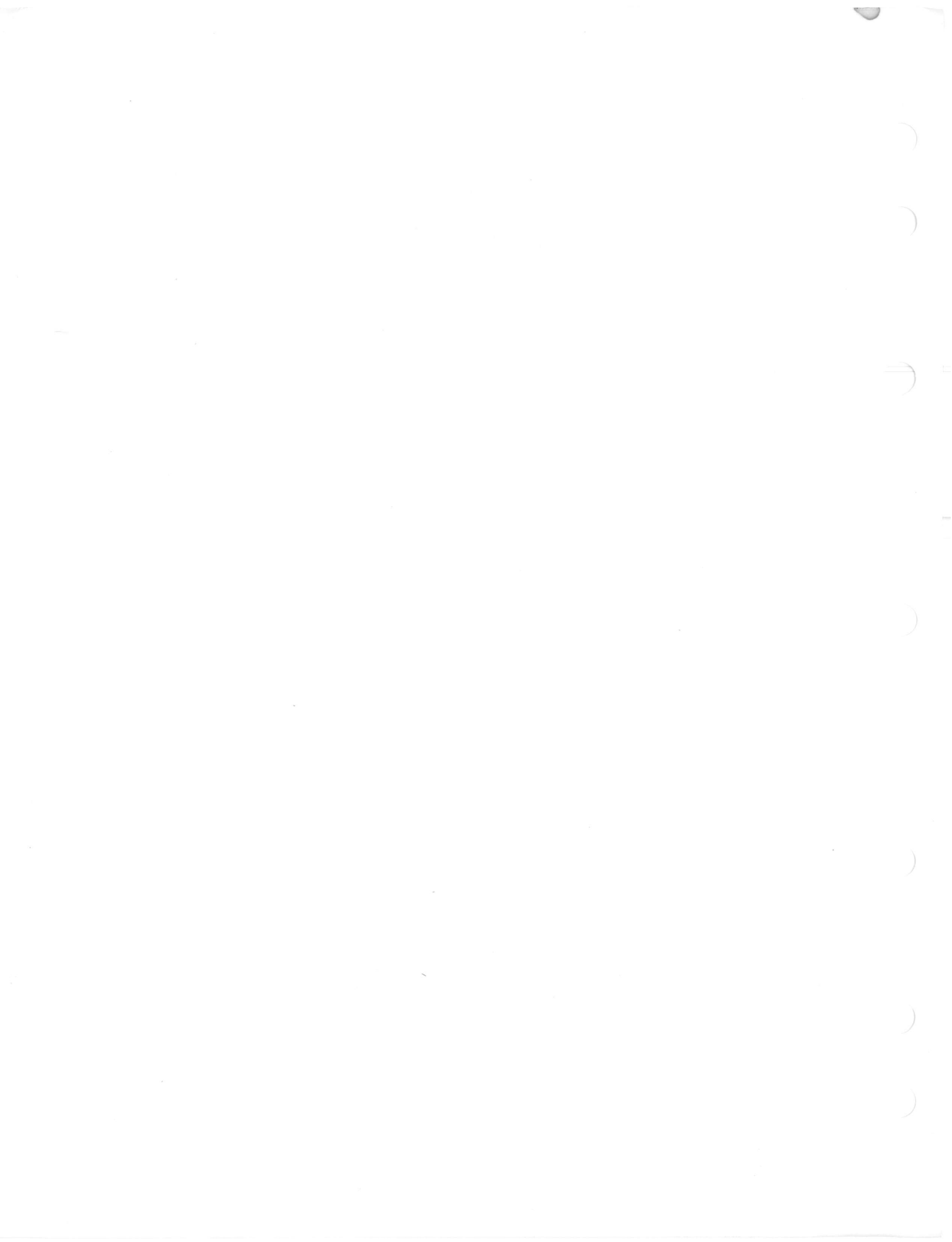
**CORPORATION**

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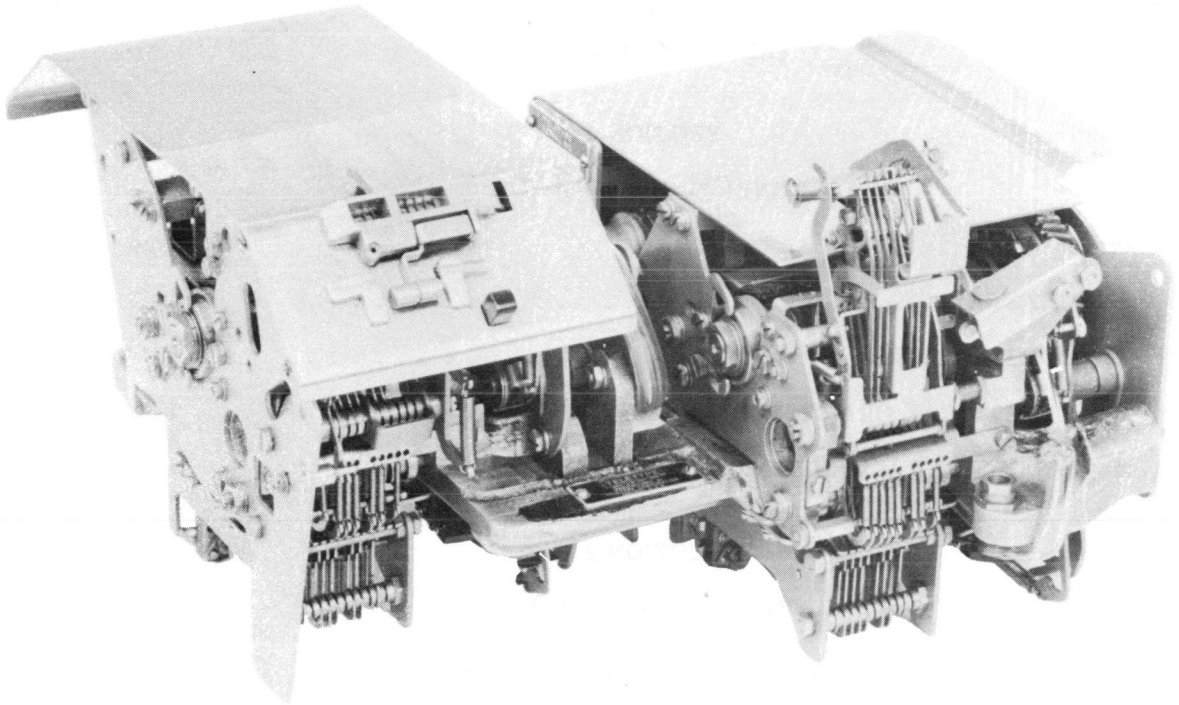
## LIST OF EFFECTIVE PAGES

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TRANSMITTER DISTRIBUTOR - LCXD  
( Pivoted and Fixed Head, Multi-contact )

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## SECTION 1

## GENERAL DESCRIPTION

## 1. GENERAL

a. Function. (Figure 1-1) — The Model 28 two-shaft transmitter-distributor is a combined pivoted tape reader and distributor with an auxiliary fixed tape reader. The unit is designed to sense code combinations in perforated tape or code pulses from external multiple-wire input and to convert these codes into electrical code pulses for distribution over a signal circuit. Provision is made for either single-wire or multiple-wire output. This unit of equipment is a part of the Model 28 series of telegraph switching components.

b. Tape Readers. — The pivoted tape reader senses tape which comes from a perforating mechanism on an automatic send-receive set. The fixed tape reader serves as an auxiliary reader, enabling the operator to transmit messages from short pieces of tape, not prepared on a continuous basis, without having to remove the tape from the pivoted reader. The distributor operates from either the pivoted or the fixed tape reader.

c. Features. (Figures 1-2, 1-3) — The pivoted transmitter-distributor incorporates the following features:

(1) Senses and transmits the last character perforated by its associated perforating unit

(2) Sensing and distributor mechanisms capable of being actuated independently from either a local or remote source

(3) Wiring for both readers, distributors, auxiliary contacts, clutch magnets, tape lid switch, and last-character switch terminates at a 32-point connector

(4) Accommodation of fully perforated and round or square chadless code perforations, and fully perforated, chadless or embossed feed holes

(5) Operating speeds up to 100 words per minute (7.42 unit code, or equivalent 7.00 unit code) with gear changes only

(6) Auxiliary contacts "A" and "B" operated from pivoted reader sensing cam for controlling external circuit and distributor mechanism

(7) Auxiliary contact "C" operated from distributor cam for control of external circuit

(8) Auxiliary contact "D" operated by fixed reader sensing cam for control of distributor mechanism

(9) Oil reservoirs for extending lubrication intervals

(10) Spring biased hinged tape lids for simple, foolproof tape insertion

(11) Five level tape handling facilities with provision for modification to six, seven or eight level tapes

(12) Pivoted reader tape-out pin, retarded one-half character, actuating a normally-closed contact

(13) Fixed reader tape-out pin, either four characters in advance of or in line with tape sensing pins, which operates a normally-closed switch in clutch magnet circuit when end of tape passes through reader

(14) Fixed reader tape lid pin which operates a normally-closed switch in the clutch magnet circuit when the tape lid is opened

(15) Tight tape mechanism to stop operation if tape becomes tight or twisted

(16) Device for directing tape loop into storage bin

(17) Remote control

(18) Pivoted reader which is mounted under the dome of the Automatic Send Receive set cabinet in line with the tape perforating mechanism in order to sense the last character perforated

(19) Fixed reader portion of unit is external to cabinet to provide accessibility for operation

## 2. COMPONENTS

a. Pivoted Reader and Distributor. (Figures 1-2, 1-3) — The casting and two mounting plates provide support for the following pivoted reader mechanisms and units:

(1) Pivoted sensing head or yoke which houses the feed mechanism, sensing pins and tape-out pin

(2) Last character switch which is actuated by the yoke

(3) Tape deflector which is mounted in front of the yoke

(4) Tape depressor which rides above the yoke and is mounted on a cross bar between the mounting plates

(5) Sensing shaft and cam assembly which actuates the pivoted sensing mechanism

(6) Distributor shaft and cam assembly which actuates the distributor contacts through appropriate mechanism (This shaft is common to the fixed sensing cam assembly.)

(7) Oil reservoir for the cams which is mounted on the cross bar

(8) Two clutch trip mechanisms which control the action of the distributor and sensing cams

(9) Storing switch which stores the sensed code combination for sequential transmission

(10) Cover to protect internal operating mechanisms

b. Fixed Reader. — The casting and two mounting plates provide support for the following fixed reader mechanisms and units:

(1) Tape guide plate which includes the tape lid and twisted tape bail

(2) Top plate and cover plate which enclose operating components

(3) Twisted tape switch mechanism and tape-out switch

(4) Sensing shaft and cam assembly which actuates the fixed sensing mechanism (shaft is common to pivoted reader distributor cam assembly)

(5) Oil reservoir for the sensing cam which is mounted on a cross bar

(6) A clutch trip which controls the action of the sensing cam

(7) Storing switch which stores the sensed code combination for sequential transmission

### 3. ELECTRICAL CHARACTERISTICS AND REQUIREMENTS

a. Signalling Code. (Figure 1-4) — The signalling code most generally transmitted is the five-unit, start-stop neutral code 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 flow of current is interrupted through the opening of a contact. The transmission pattern for a complete character consists of a start pulse (always spacing), five code pulses — any one of which may be either marking or spacing, and a stop pulse (always marking). The start and the stop pulses are to keep the receiving telegraph apparatus in synchronism with the transmitter.

b. Control Circuit Requirements. — The clutch trip magnets will operate from 110-120 volts, d-c, or 45-55 volts, d-c. Input current to each clutch trip magnet is approximately 0.100 ampere.

### 4. WEIGHT AND DIMENSIONS

a. Weight. — The Transmitter-Distributor weighs 15 lbs.

b. Dimensions. — Width (left to right as viewed from front of unit) 10 inches; length (front to rear) 11 inches; height 6 inches.

## SECTION 2

## THEORY OF OPERATION

## 1. GENERAL

The description text in this section pertains to the sequence of operation of the transmitter-distributor under assumed conditions. These conditions are as follows:

a. Current applied to the distributor and sensing clutch trip magnet circuits

b. Power applied to the motor driving the unit

c. Tape inserted in the tape lids and tape lid closed

d. Pivoted reader sensing clutch trip magnet circuit connected in series with the last character contact and tape-out contact on storing switch

e. Distributor clutch trip magnet and auxiliary distributor clutch trip magnet contacts (pivoted and fixed readers) connected in series

f. Storing switch contacts and distributor contacts connected in series with the signal line

g. Transmitter-distributor in idle line condition with pivoted sensing head against the punch block

## 2. GEARING

The distributor shaft and fixed reader sensing shaft assembly mounts two gears; the rear gear meshes with the intermediate gear train on the base and is driven from a motor. The clutch drum gear, through an idler gear, drives the pivoted reader sensing clutch drum gear to rotate both shafts at the same speed.

## 3. SUMMARY OF OPERATION SEQUENCE — PIVOTED READER

a. Tape feeds from the reperforator, moving the pivoted sensing head away from the punch block. This actuates the last character switch and initiates sensing shaft rotation through the energized sensing clutch trip mechanism.

b. The sensing cam rotates to advance the tape stripping the previous stored character, sense the code perforations in the tape, and store the sensed character in the storing switch.

c. During the sensing cycle, the auxiliary distributor clutch trip contact closed to initiate the distributor cycle through the energized distributor clutch trip mechanism. The distributor shaft rotates to actuate the distributor contacts and distribute a pattern of code pulses over the signal line which correspond to the code combination stored in the storing switch, i.e., the previously sensed character.

d. In continuous transmission, the sensing cam will have started its next cycle while the actions controlled by the distributor cam are taking place. These actions will continue until the sensing clutch trip magnet circuit is interrupted by the stop mechanism(s).

## 4. SUMMARY OF OPERATION SEQUENCE — FIXED READER

a. As the sensing clutch trip is energized, the clutch will trip and the sensing cam will start rotating.

b. Subsequent operation follows the same cycle as the pivoted reader (para. 3.b, c and d).

## 5. PIVOTED SENSING MECHANISM

## a. Sensing Clutch Trip.

(1) Last Character Switch. (Figure 2-2) — As tape feeds from the reperforator, it moves the pivoted sensing head away from the punch block. An extension on the yoke actuates the last character switch contacts, closing the sensing clutch trip magnet circuit.

(2) Clutch Trip Action. (Figure 2-3) — As the sensing clutch trip magnet is energized, its armature and armature extension bail are attracted to the magnet core, thus releasing the latching extension of the lower trip lever. The lower trip lever and the upper trip lever pivot on their shaft and the upper trip lever releases the clutch shoe lever from the stop lug on the clutch cam disk.

b. Clutch Engagement. (Figure 2-4) — Clutch engagement is accomplished by releasing the lower end of the clutch shoe lever, B. The upper end of the clutch shoe lever 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 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 of the preceding steps, 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 sleeve and engagement of the clutch starts the sensing cam sleeve rotating.

c. Clutch Reset. (Figure 2-3)

(1) As the sensing cam sleeve starts its rotation, the reset extension of the lower trip lever rides to the peak of its cam to place the upper trip lever in the path of the clutch shoe lever.

(2) Should the magnet remain energized, the armature will remain attracted to the magnet core and the armature extension bail be prevented from latching the lower trip lever. Then, as the cam continues to rotate, the reset extension of the lower trip lever will ride to the low part of its cam and permit the upper trip lever to pivot out of the path of the clutch shoe lever. The cam will continue to rotate thus, until the trip magnet is no longer energized.

(3) When the clutch trip magnet circuit is interrupted, the armature and armature extension bail will be released. Then, as the reset extension of the lower trip lever rides to the high part of its cam, the latching extension will be latched by the armature extension bail to hold the upper trip lever in the path of the clutch shoe lever. As the clutch shoe lever strikes the upper trip lever, the inertia of the clutch will cause it to rotate a slight additional amount and permit the clutch latch lever to fall into the notch in the cam disk. In this position, the clutch shoe lever is held in proximity to the stop lug on the clutch cam disk.

d. Clutch Disengagement. (Figure 2-5) — Disengagement 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 to stop rotation of the clutch and cam sleeve.

e. Tape Feed. (Figure 2-6) — As the sensing cam sleeve rotates, a roller on the rear feed lever rides to the low part of its cam moving the lower extension of the front feed lever upward. The feed levers actuate a feed pawl which then engages a tooth on the feed wheel to rotate the feed wheel one space. As the feed wheel rotates, the check pawl will rest in the hollow between two teeth and hold the feed wheel in position. With the continued rotation of the sensing cam sleeve, the feed lever roller rides to the low part of its cam and the feed pawl falls to its lower position for the next cycle.

f. Tape Sensing. (Figure 2-8) — At the start of the sensing cam sleeve rotation, the sensing pins are in their downward position, withdrawn from the tape, and the storing switch contacts are arranged in accordance with the code combination of the previous sensed character.

(1) Pusher Bail. (Figure 2-10) — As the pusher bail roller rides to the peak of its cam, the pusher bail moves the push levers to the right, thus stripping any previously selected push levers from the shoulders of their transfer levers. Then, as the pusher bail roller rides to the indent of its cam, the pusher bail is withdrawn from the push levers to permit the levers to rest against their transfer levers.

(2) Sensing Bail. (Figure 2-11) — The sensing bail rollers move into the indent of their cams and the right end of the sensing bail rises to permit the sensing pins to rise and sense the code perforations in the tape. If the code level sensed by a pin is not perforated, travel of the pin is blocked by the tape and the push lever remains to the right of its sensing pin. If the code level is perforated, the pin is free to rise through the perforation sufficiently to permit the top of the push lever to drop under the shoulder of the transfer lever. Further rotation of the sensing cam sleeve will move the sensing bail rollers to the peak of their cams and start the right end of the sensing bail, the sensing pins and the selected push levers moving downward.

(3) Latch Bail. (Figure 2-12) — As the bail rides to the peak of its cam, the lower end of the latch bail will be moved to the left to actuate the latch levers. The lower end of the latch levers are moved to the right to release any previously latched slides and the slides will start to rise under the tension of their springs. If its push lever has not been selected, the slide is free to rise to its unoperated position. If its push lever has been selected, and moved

downward by the transfer lever, the push lever will hold the slide down. Then, as the latch bail roller rides to the indent of its cam, the lower end of the latch bail will move to the right, permitting the latch levers to latch the slides in their operated position.

(4) Storing Switch. (Figure 2-13) — In its unoperated or upward position, the contact lever slide holds the contact lever extension upward and the contact open. In its downward position, the slide permits the contact lever extension to move downward and close the contact. Thus, the code combination of the sensed character is stored in an arrangement of the storing switch contacts, and, on the next cycle of the distributor cam sleeve, will be transmitted sequentially over the signal circuit.

g. Auxiliary Contacts. (Figure 2-14) — The sensing cam actuates the following auxiliary lever and the push levers, contact lever slides, contact lever extensions on the storing switch. The contacts are operated for each cycle of the sensing cam as follows:

(1) Auxiliary "A" contact closes at 40 degrees and opens at 262 degrees (1-cycle operation).

(2) Distributor clutch trip magnet "B" contact closes at 232 degrees and opens at 294 degrees (1-cycle operation).

h. Thus it should be noted that rotation of the sensing shaft initiates rotation of the distributor shaft so that each character sensed is also transmitted during a complete cycle of each of the shafts.

## 6. FIXED SENSING MECHANISM

a. General. — The operation of the fixed sensing mechanisms follows the same pattern as the pivoted sensing mechanism. Differences in the operation of the two sensing mechanisms are discussed in following paragraphs.

b. Clutch Trip and Clutch Action. — The operation of the clutch trip and clutches is the same as the pivoted reader (para. 3.b, c and d).

c. Tape Feed. (Figure 2-7) — The tape feed for the fixed reader is accomplished through the feed pawl and feed lever. The action of the feed lever and feed pawl is opposite to the pivoted reader action. The feed pawl moves downward to pull the feed wheel one space when the feed lever is on the high part of the cam. The detent lever and roller perform the same function as the check pawl on the pivoted reader.

d. Tape Sensing. (Figure 2-9 through 2-12) — Tape sensing through the action of the pusher bail, sensing bail and latch bail is the same as the pivoted reader. The sensing pin movement is in a difference plane and the pivot point is forward.

e. Storing Switch. (Figure 2-13) — Storing switch action is the same as the pivoted reader.

f. Auxiliary Contacts. (Figure 2-14) — Auxiliary contact action is the same as the pivoted reader. The following contacts are incorporated:

(1) Auxiliary "A" contact closes at 312 degrees and opens at 92 degrees.

(2) Auxiliary "B" contact closes at 66 degrees and opens at 236 degrees.

(3) Auxiliary "C" contact is provided to actuate the distributor clutch trip magnet. This contact operates during the time of the number 1 to 5 pulse of the distributor cycle.

## 7. DISTRIBUTOR MECHANISM

a. Clutch Trip. — The distributor clutch trip magnet is energized through the distributor clutch trip magnet contacts actuated by the pivoted or fixed reader sensing cam (para. 5.g.(2)). The action of the clutch trip mechanism and rotation of the distributor shaft is the same as the sensing mechanism (para. 5.a.(2) through 5.d.).

b. Distributor Contacts. (Figure 2-15) — The contacts of the storing switch assembly will have been arranged in conformance with the code combination of the last character sensed by the sensing mechanism. Then, as the distributor cam sleeve continues its rotation, the cam follower levers will be actuated by their cams to open and close the distributor contacts for measured intervals of time. Operation of the distributor contacts (in series with the storing switch contacts) will generate a signal pattern corresponding to the code combination of the previously sensed character.

c. Auxiliary "C" Contacts. (Figure 2-15) — An auxiliary "C" contact is provided which is actuated by the distributor cam through a cam follower lever. This distributor contact closes at 50 degrees and opens at 340 degrees (1-cycle operation).

## 8. STOP MECHANISMS

a. Pivoted Reader Tape-Out Pin. (Figure 2-2)

(1) The tape-out (6th) pin senses that there is no tape in the pivoted reader. Depending upon



specific installation requirements, the tape-out (6th) pin contact may either (1) operate a warning device, or (2) open the sensing clutch trip magnet circuit, or (3) both. In the latter cases (2) and (3), the clutch trip magnet circuit is interrupted and the sequence of paragraph 5.c.(3) occurs.

(2) The action of the tape-out pin is such that when there is tape in the pivoted sensing head, the tape-out pin is held in its downward position and the tape-out contact on the storing switch remains closed. When there is no tape in the sensing head, the tape-out pin moves to its upward position through spring action and opens the contact.

b. Last Character Contact. (Figure 2-2) — Stopping the pivoted reader can also be accomplished through the last character contact. When tape stops feeding from the punch, the pivoted head climbs up the tape and after reading the last character, an extension on the yoke actuates the last character switch, opening the sensing clutch trip magnet circuit if it is wired in series.

c. Fixed Reader Tape-Out Pin. (Figure 2-16) — The tape-out pin is of the riding type and extends through a hole in the tape guide plate. With tape in the reader, the tape-out pin is depressed and one contact on the tape-out switch is closed through a contact arm. The contact energizes the sensing clutch trip magnet circuit. As the end of the tape passes over the

tape-out pin, the pin rises to open the clutch trip magnet circuit and stop transmission.

d. Fixed Reader Tape Lid Pin. (Figure 2-16) — The tape lid pin rides in a slot in the top plate. When the tape lid is closed (Figure 2-17), the tape lid pin is depressed and energizes the sensing clutch trip magnet circuit through a tape-out switch contact. The circuit is opened whenever the tape lid is open, thus preventing operation.

e. Fixed Reader Tape Lid. (Figure 2-17) — When the red plastic tape lid release plunger is depressed, it operates the plunger bail. The latching extension of the plunger bail releases the tape lid latching post permitting the post spring to move the post downward and the tape lid upward. Manually depressing the tape lid causes the latching post to move upward, past the latching extension of the plunger bail. The latching extension of the bail then moves under the post to hold the post up and the tape lid closed.

f. Fixed Reader Tight Tape Mechanism. (Figure 2-18) — If the tape should become tight during transmission, the tight tape bail will pivot upward and actuate the tight tape bail switch through the tight tape slide arm assembly. The switch is a normally-closed type connected in series with the sensing clutch trip magnet circuit. Operation will, therefore, stop whenever the tape becomes tight.



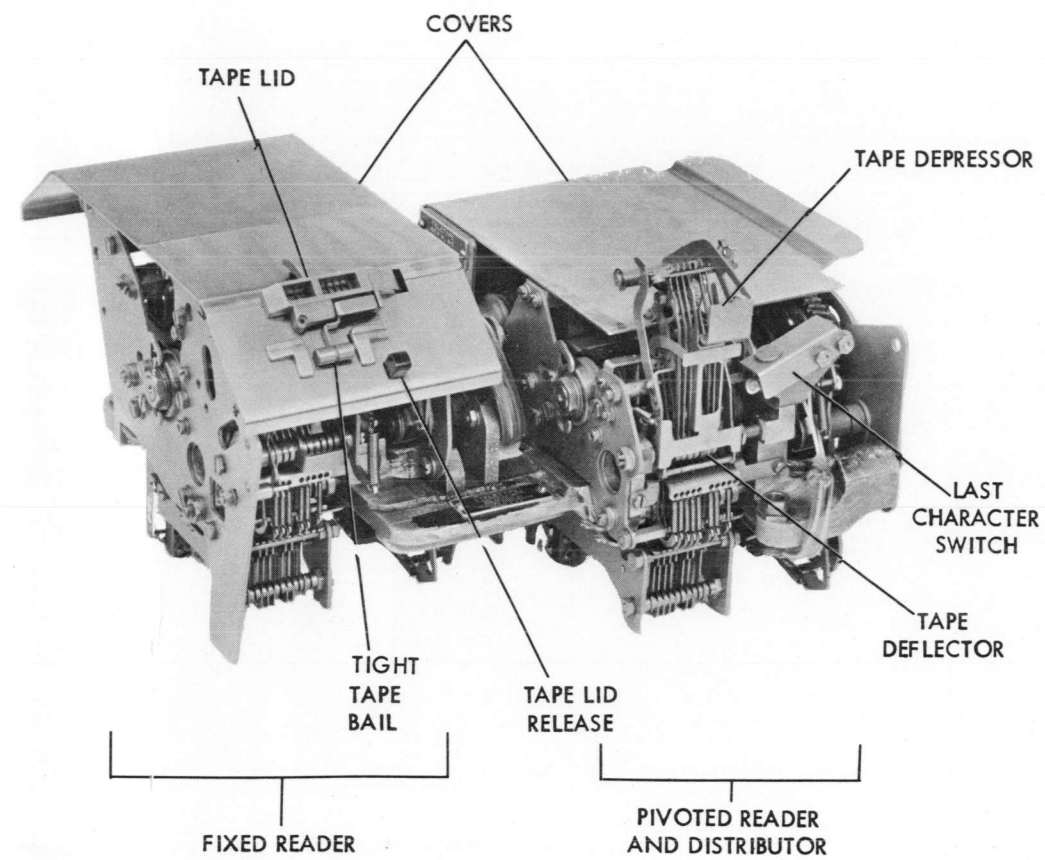


Figure 1-1. LCXD Pivoted Transmitter Distributor

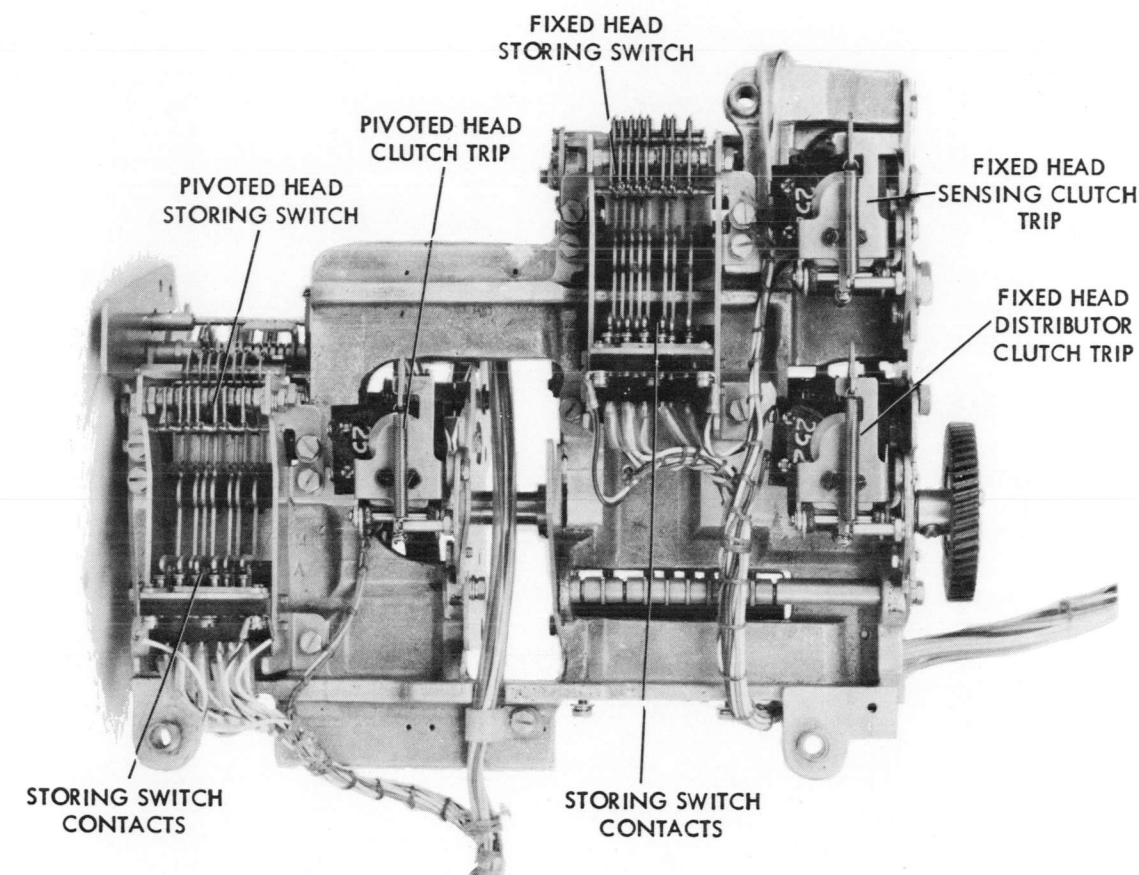


Figure 1-2. LCXD Pivoted Transmitter Distributor, Bottom View

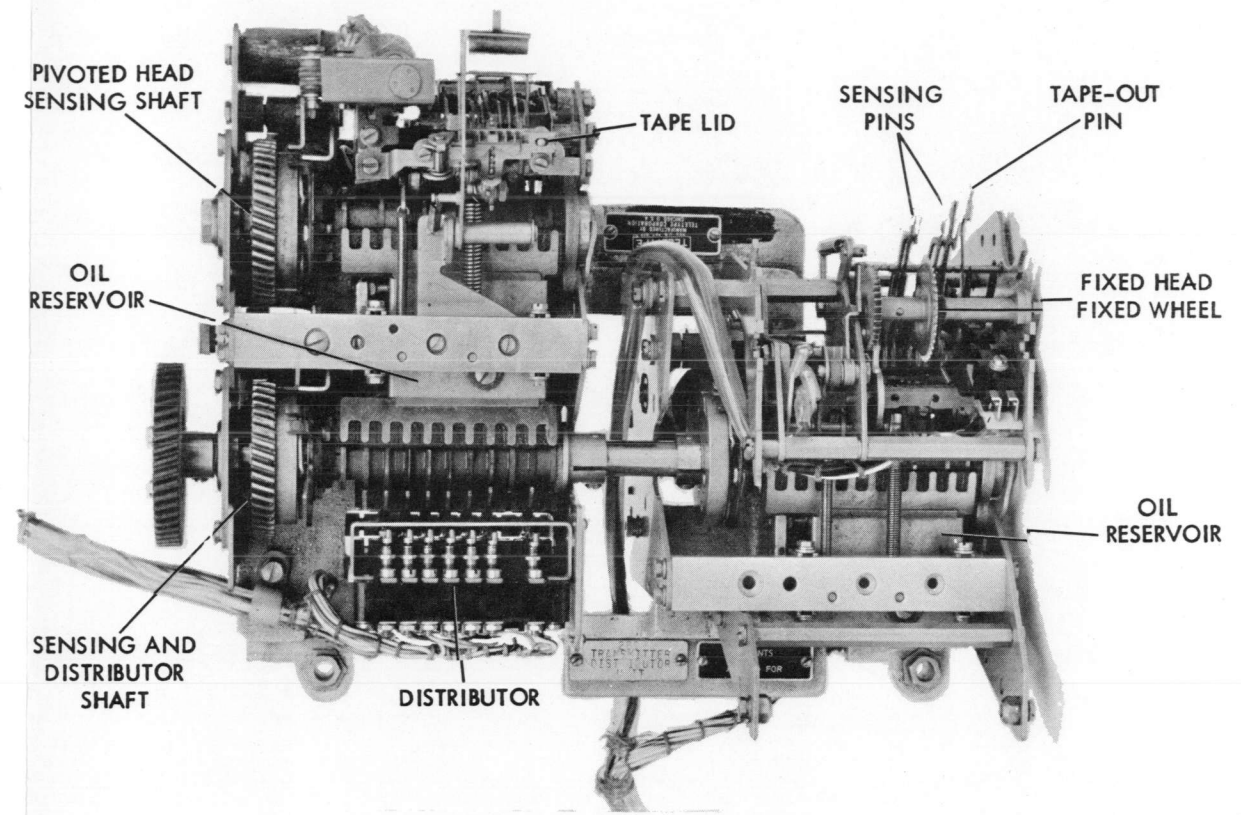


Figure 1-3. LCXD Pivoted Transmitter Distributor, Top View

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Figure 1-4. Code Chart

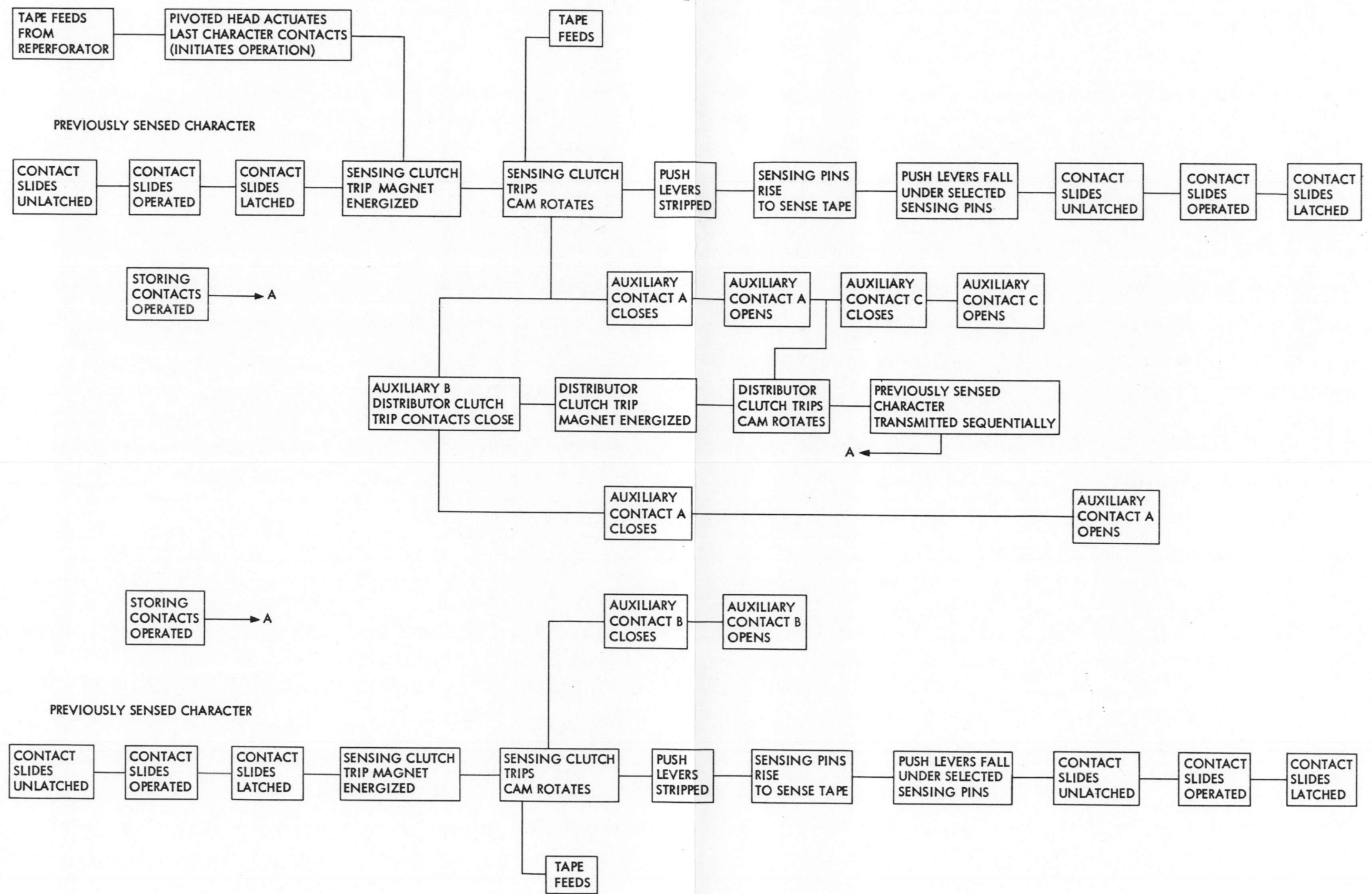


Figure 2-1. Functional Block Diagram

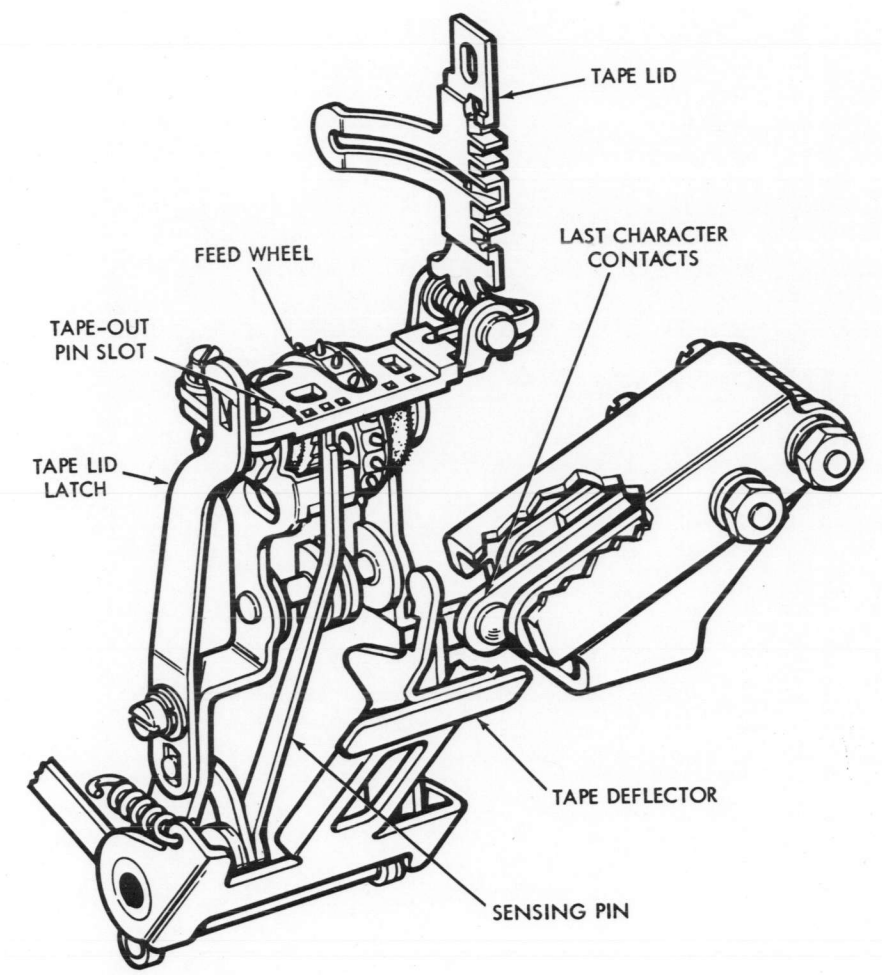


Figure 2-2. Pivoted Sensing Head

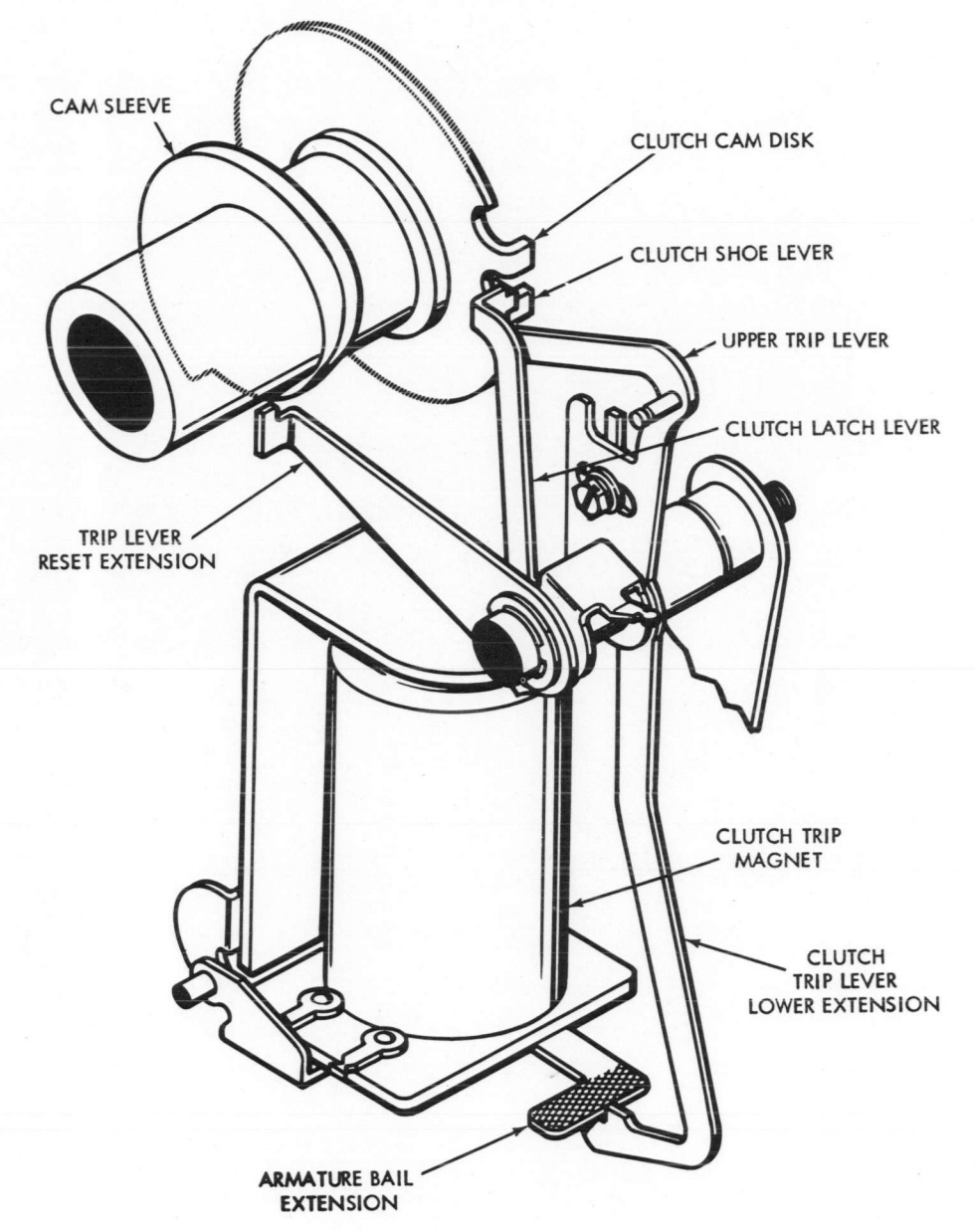


Figure 2-3. Clutch Trip Mechanism



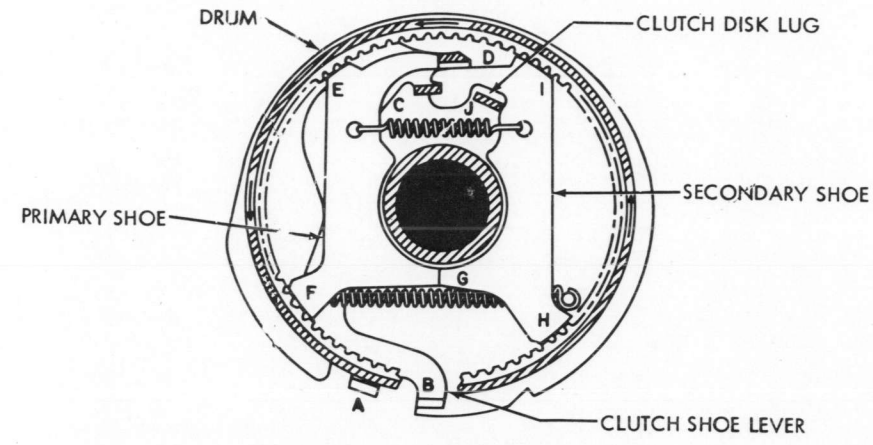


Figure 2-4. Clutch Engaged

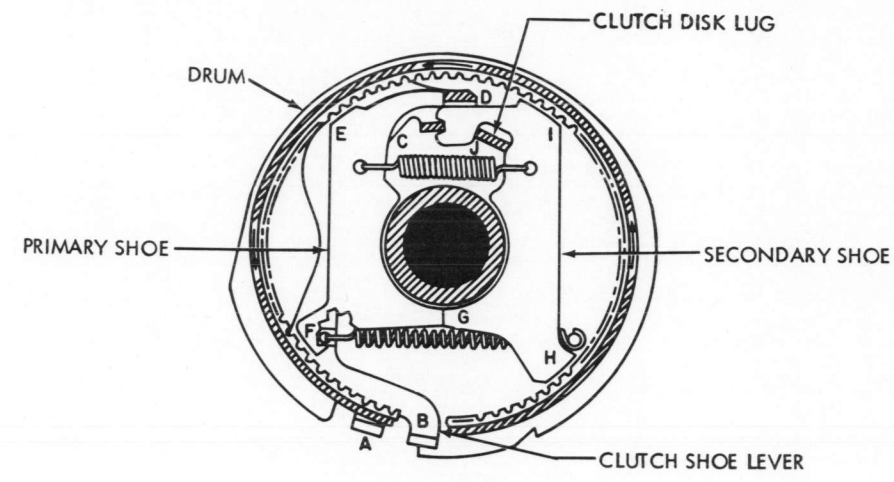


Figure 2-5. Clutch Disengaged

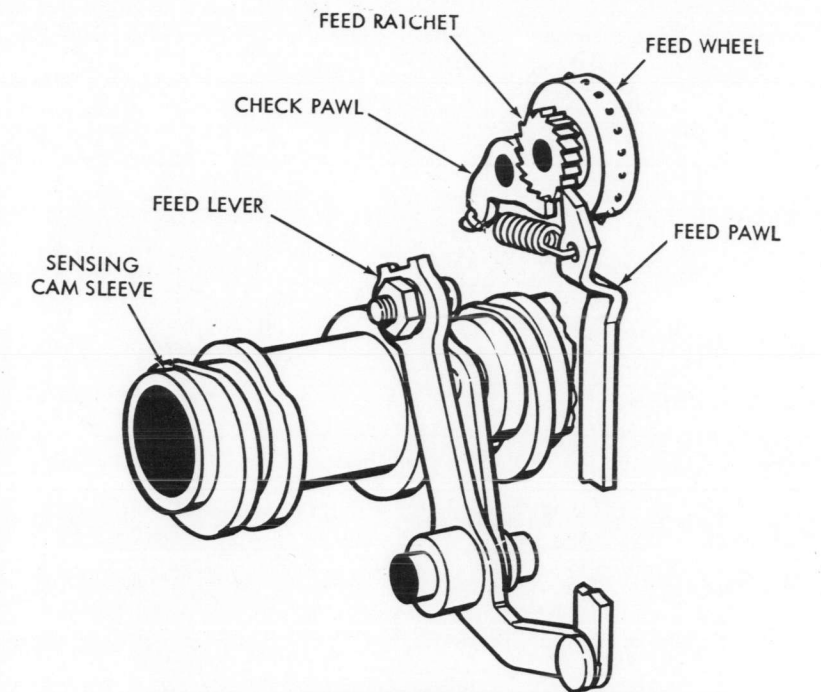


Figure 2-6. Tape Feed Mechanism - Pivoted Reader

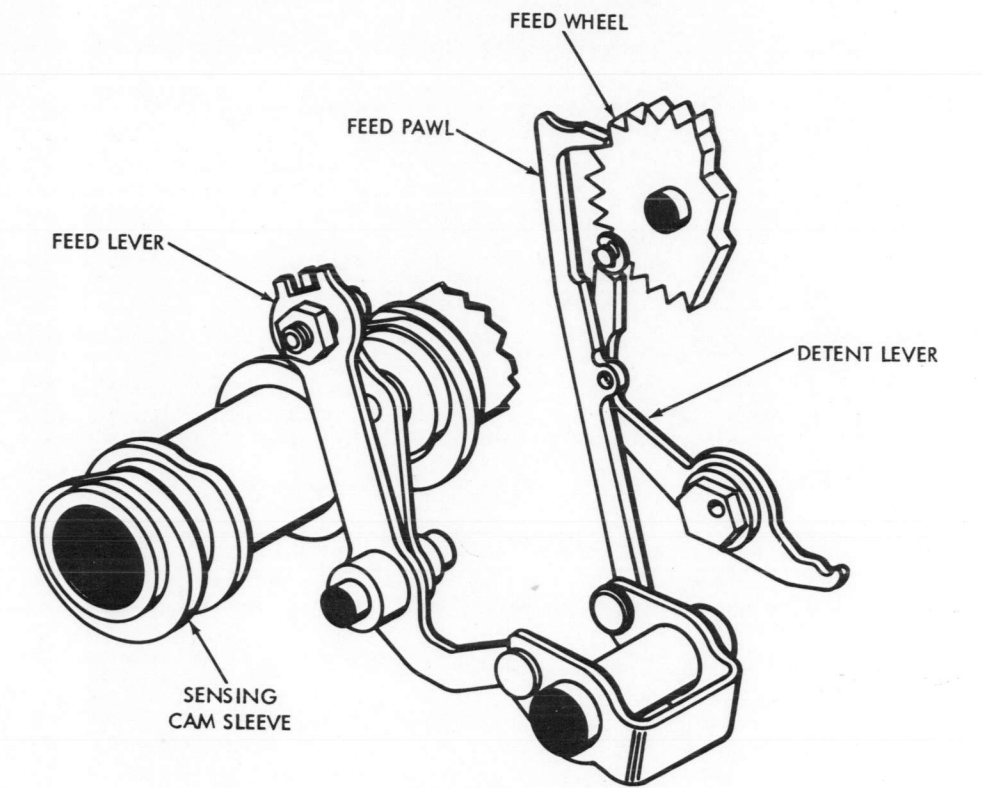


Figure 2-7. Tape Feed Mechanism - Fixed Reader

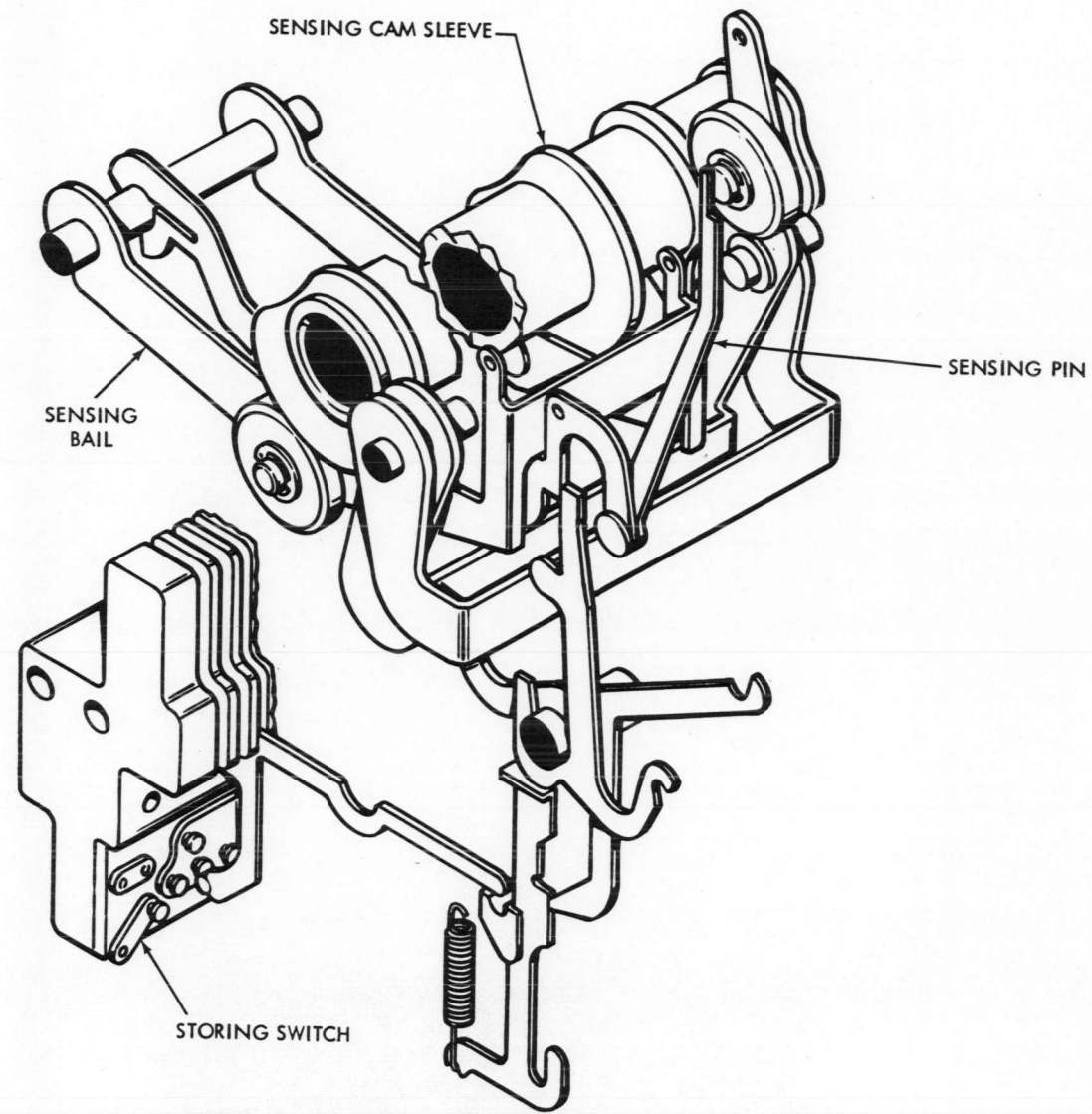


Figure 2-8. Tape Sensing - Pivoted Reader

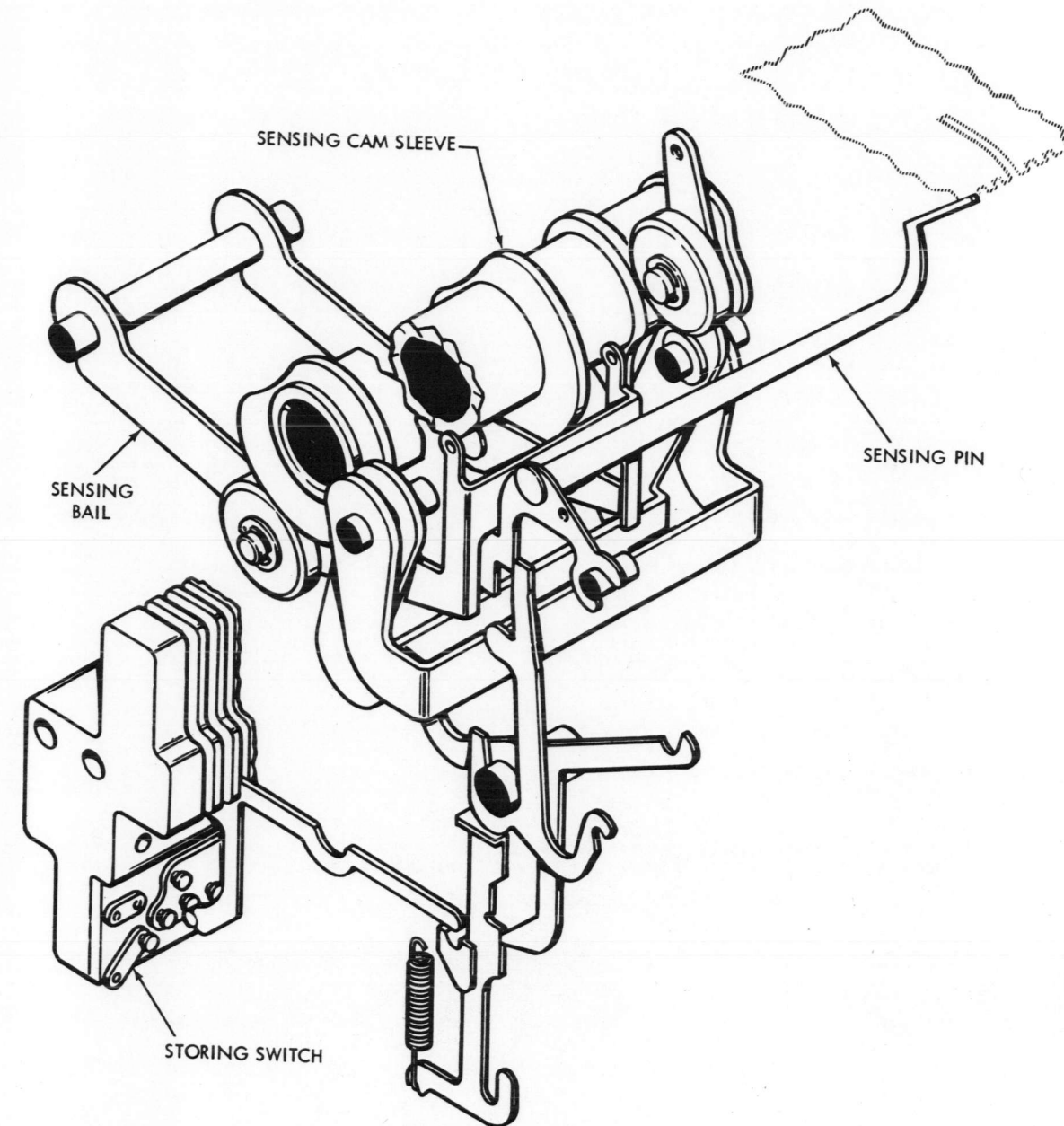


Figure 2-9. Tape Sensing - Fixed Reader

ORIGINAL

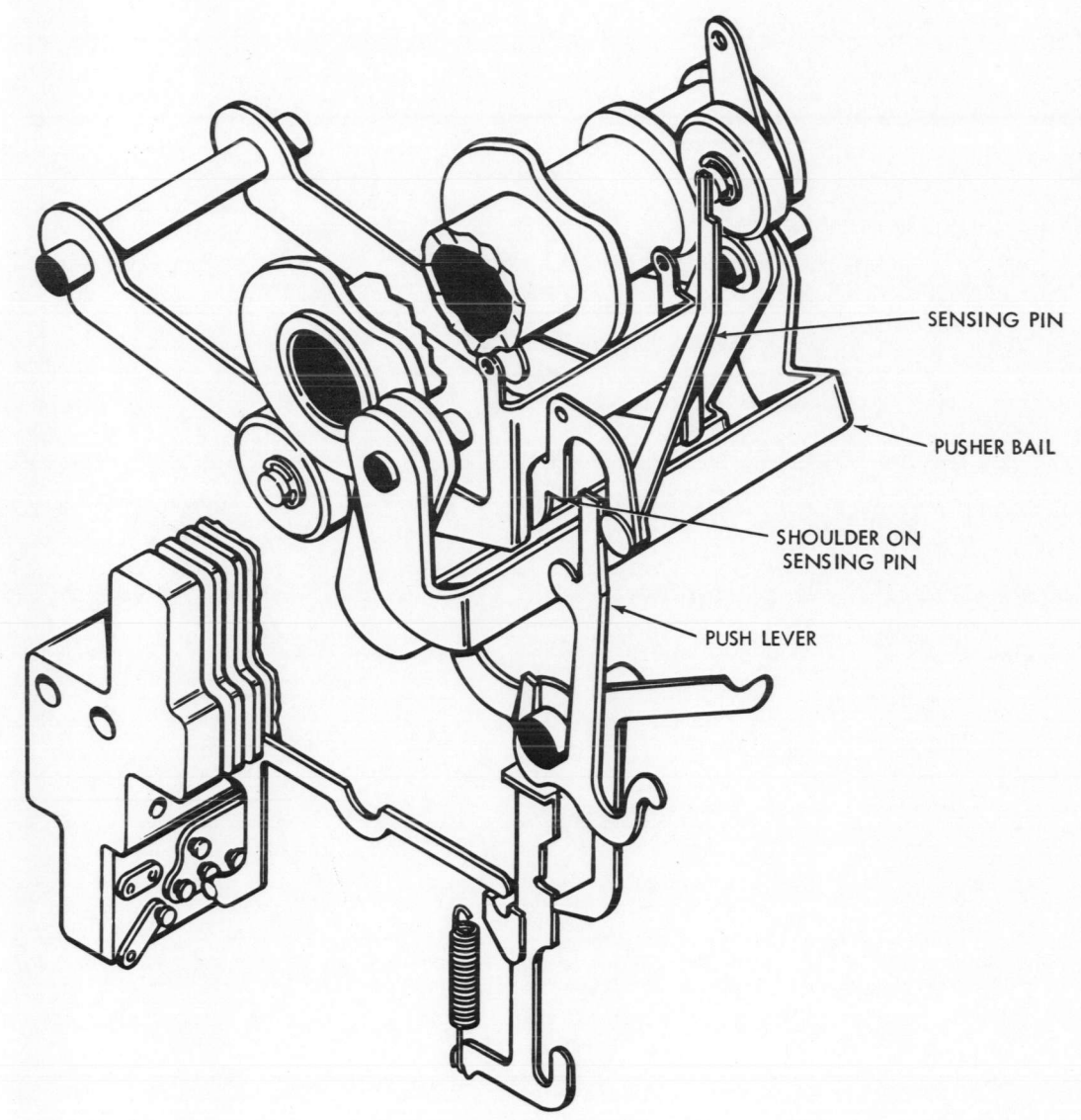


Figure 2-10. Pusher Bail — Pivoted Reader

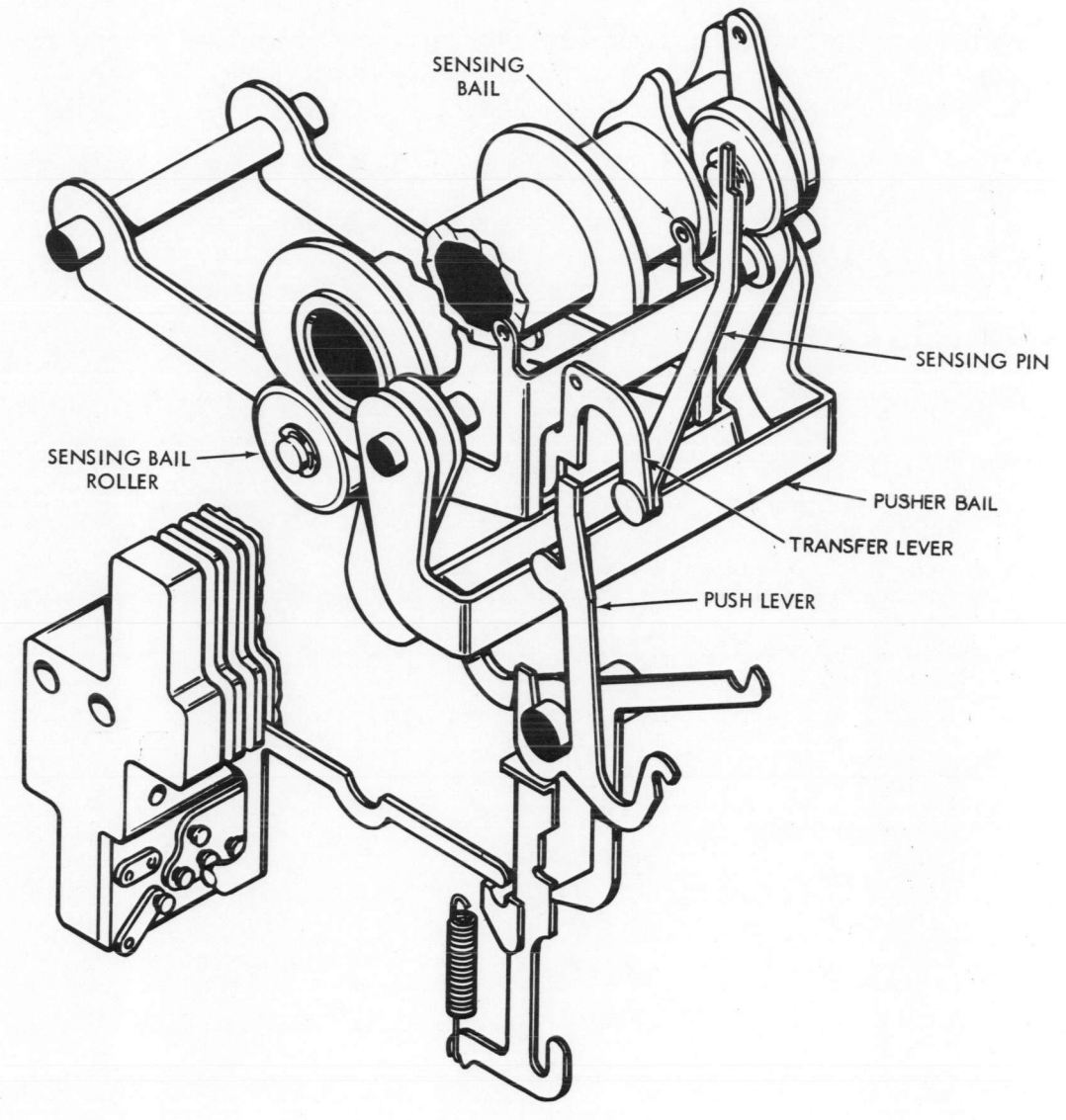


Figure 2-11. Sensing Bail — Pivoted Reader



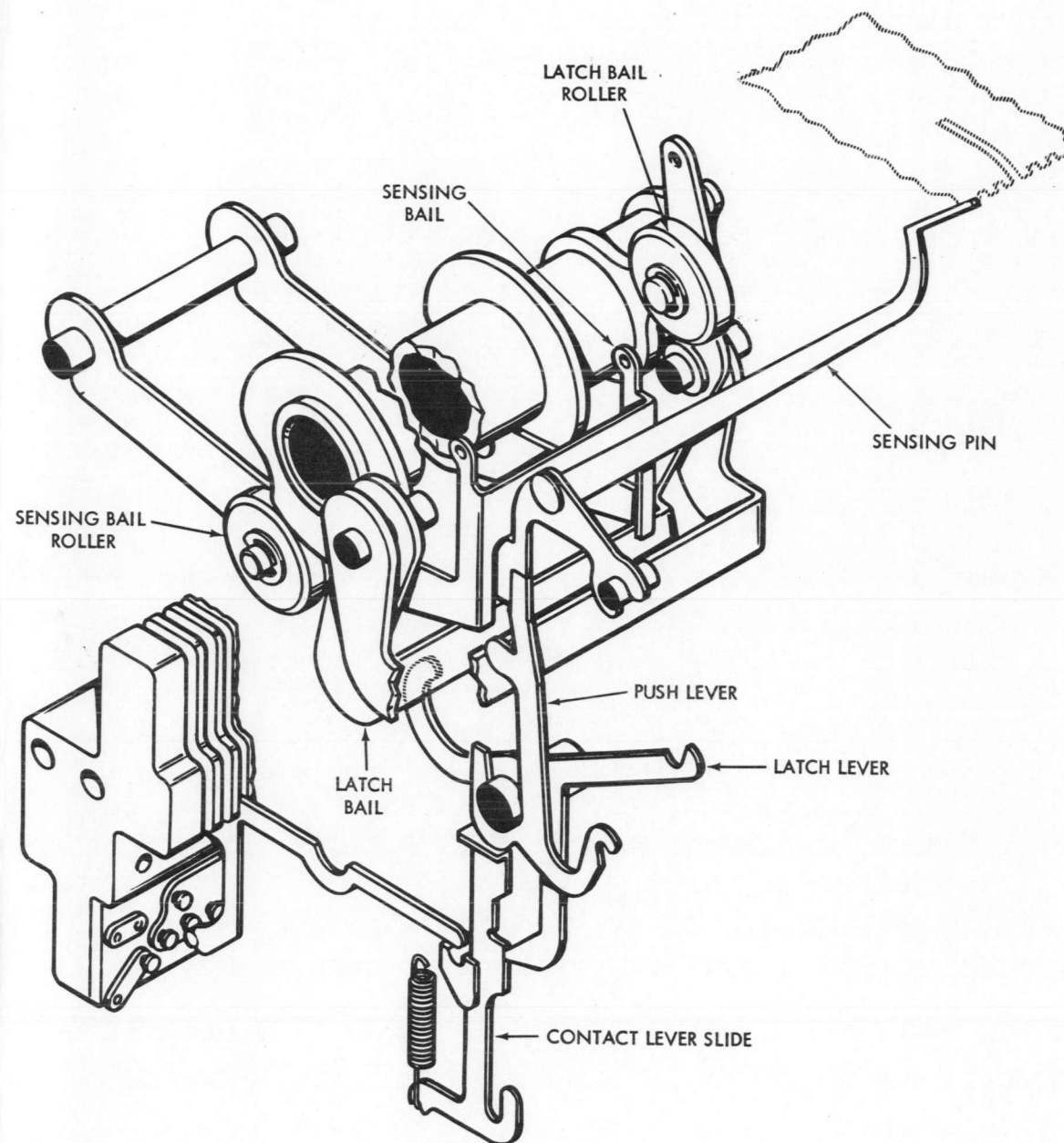


Figure 2-12. Latch Bail — Pivoted Reader

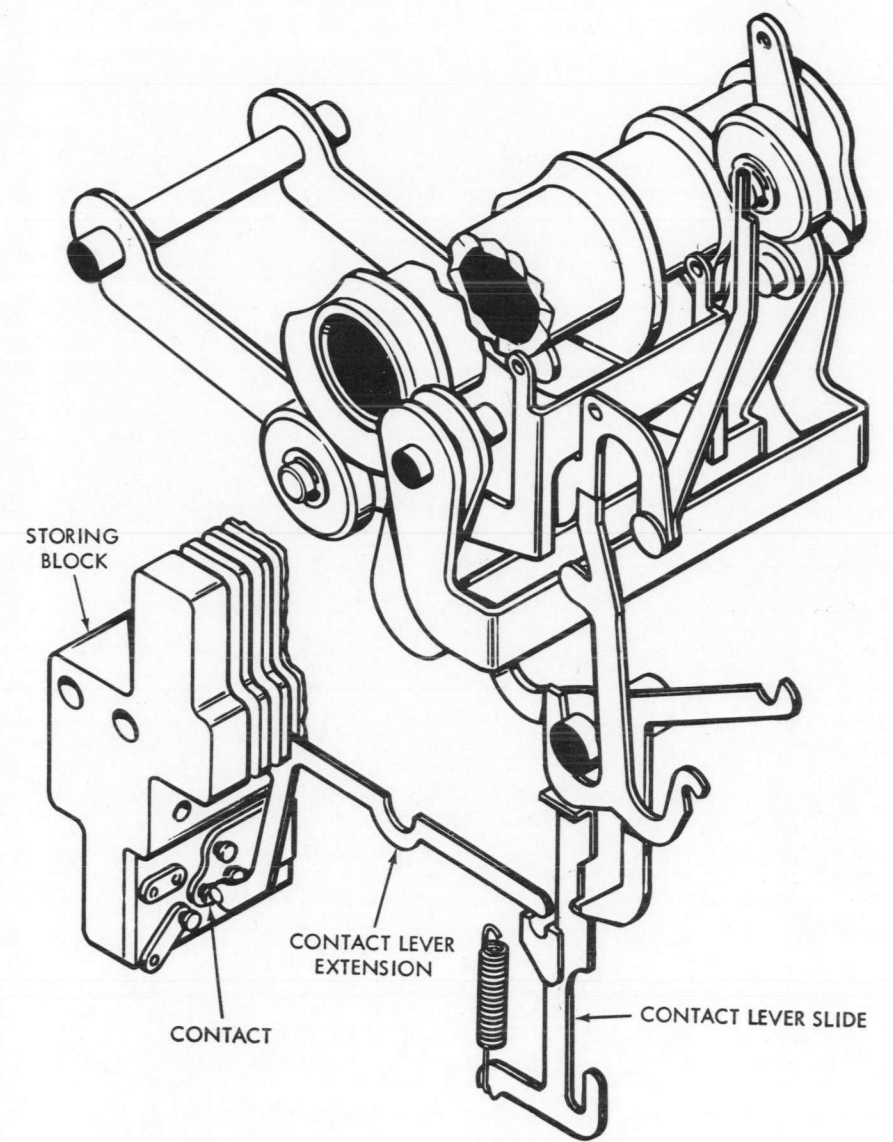


Figure 2-13. Storing Switch — Pivoted Reader



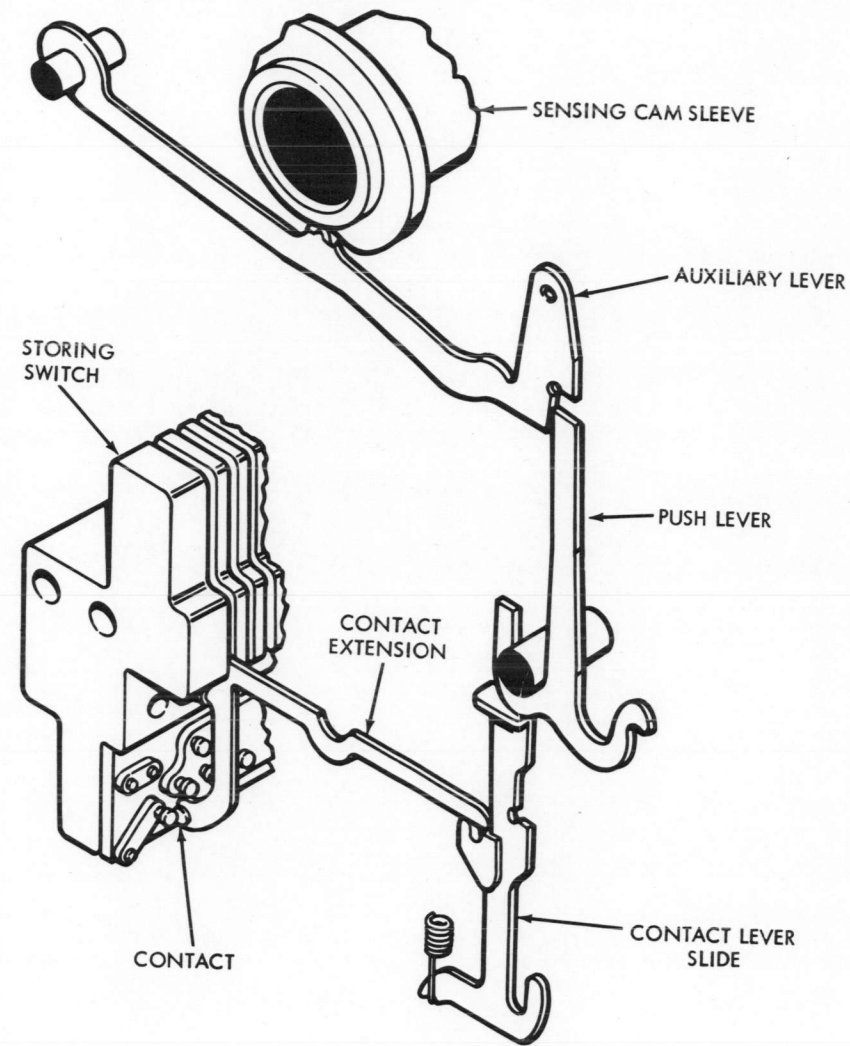


Figure 2-14. Auxiliary Contacts

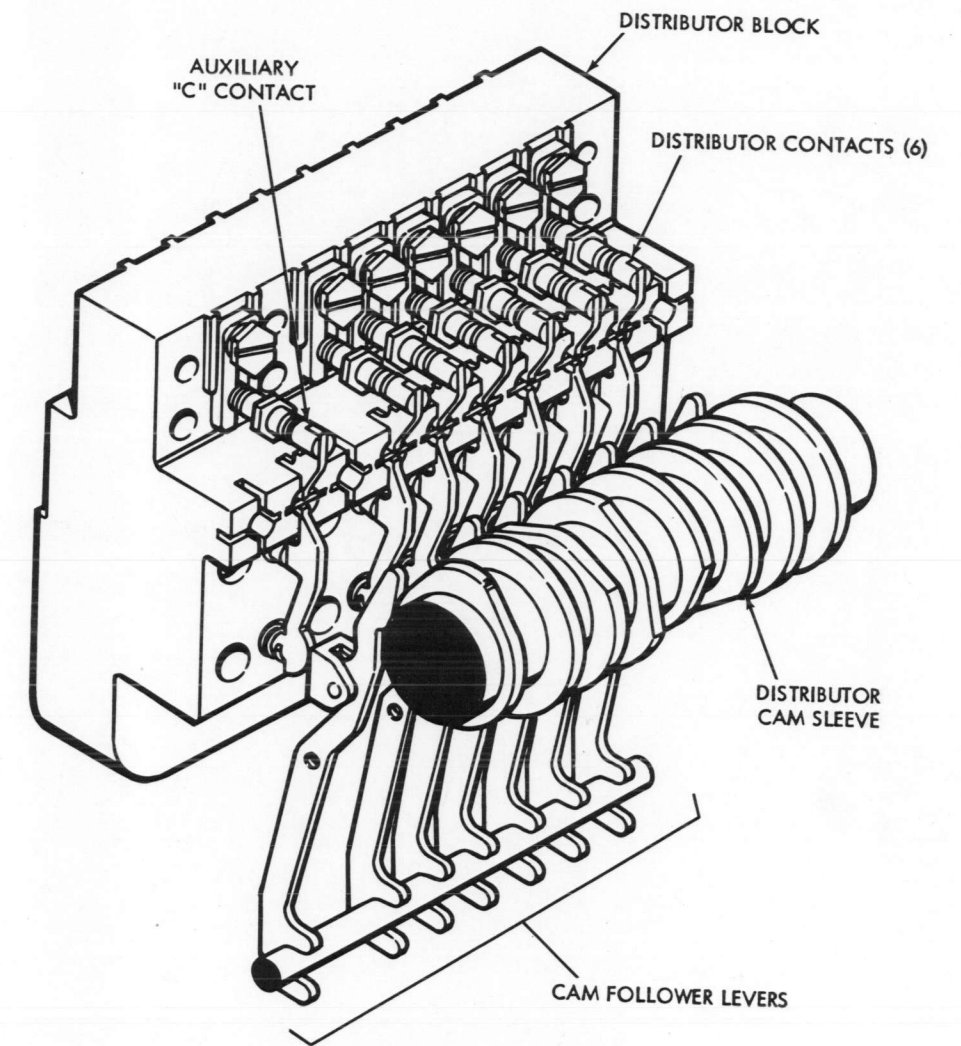


Figure 2-15. Distributor Mechanism

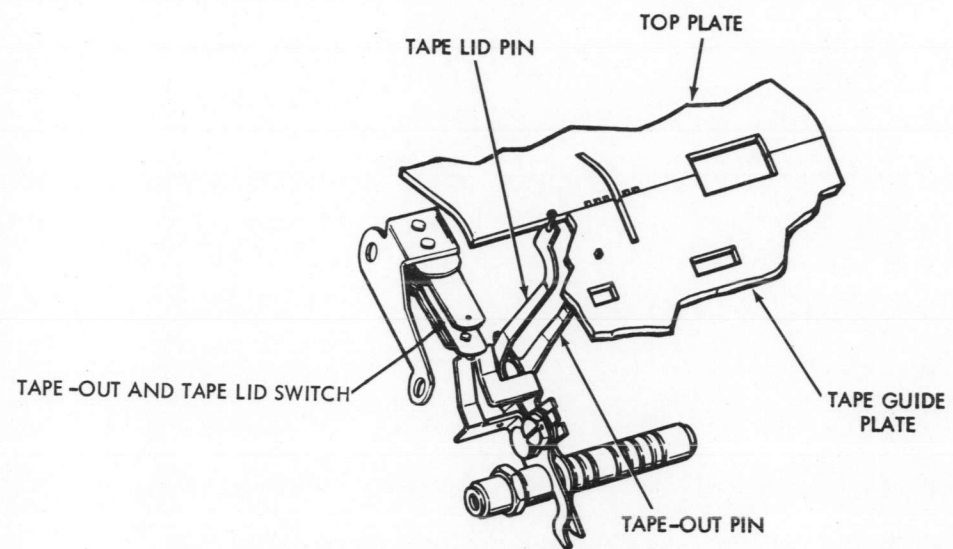


Figure 2-16. Tape-Out Pin and Tape Lid Pin

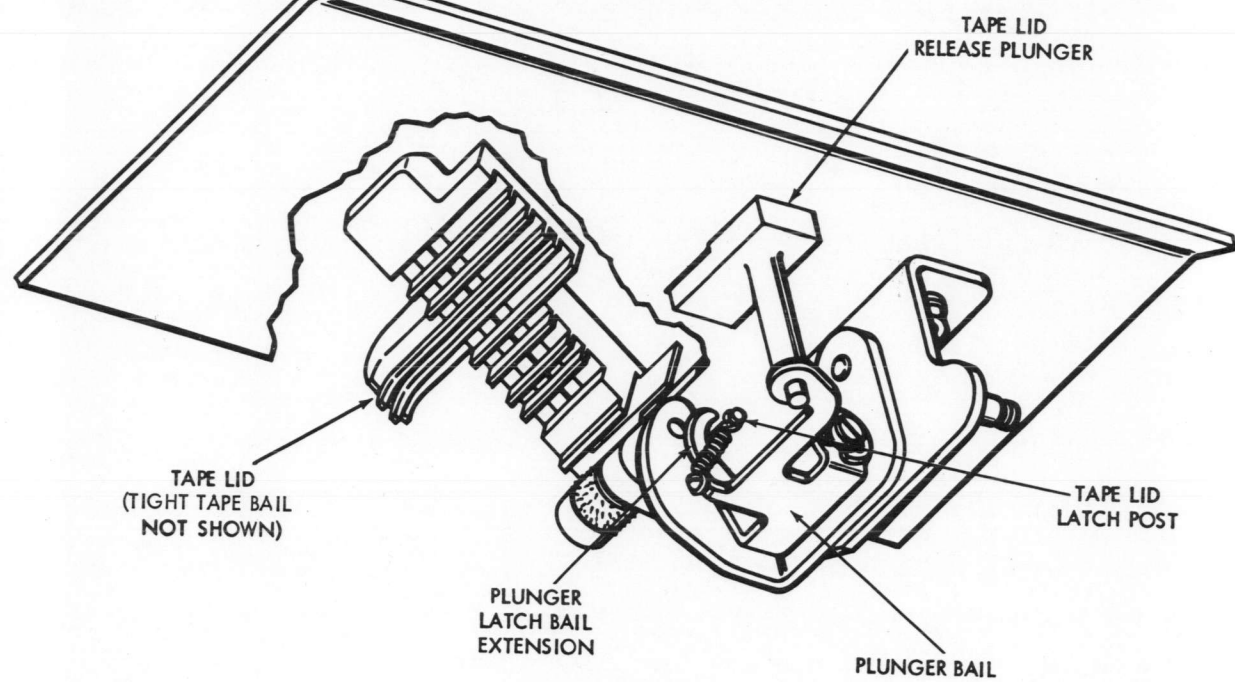


Figure 2-17. Tape Lid

ORIGINAL

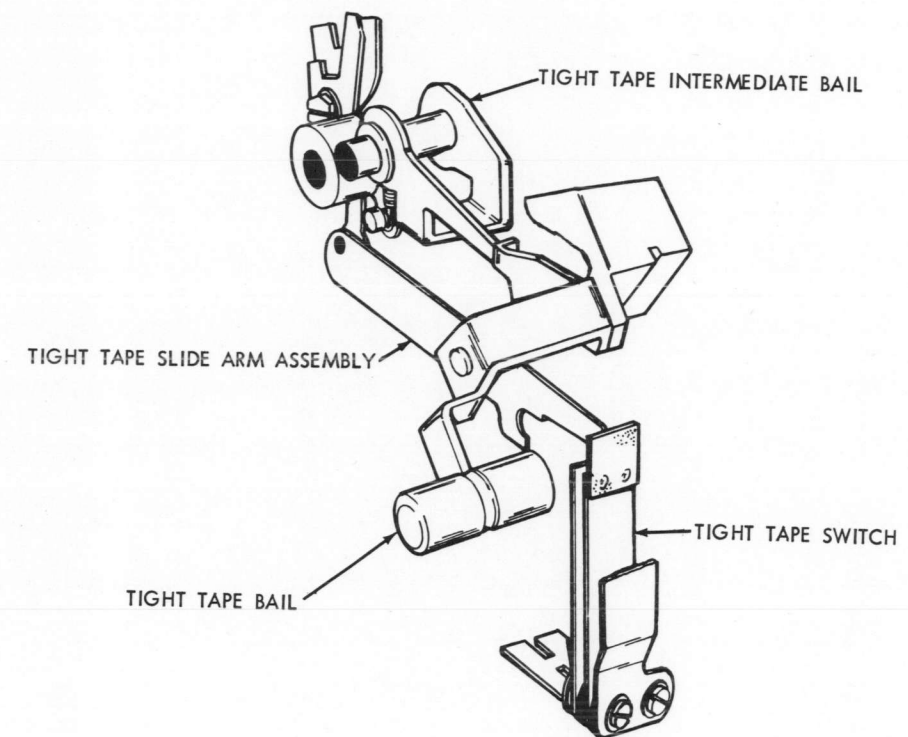
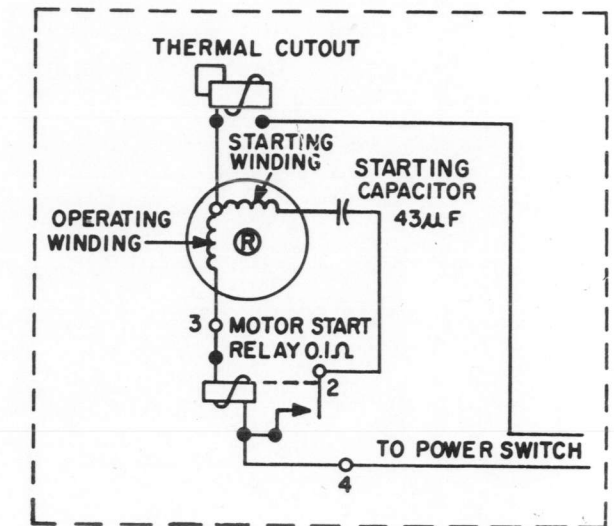
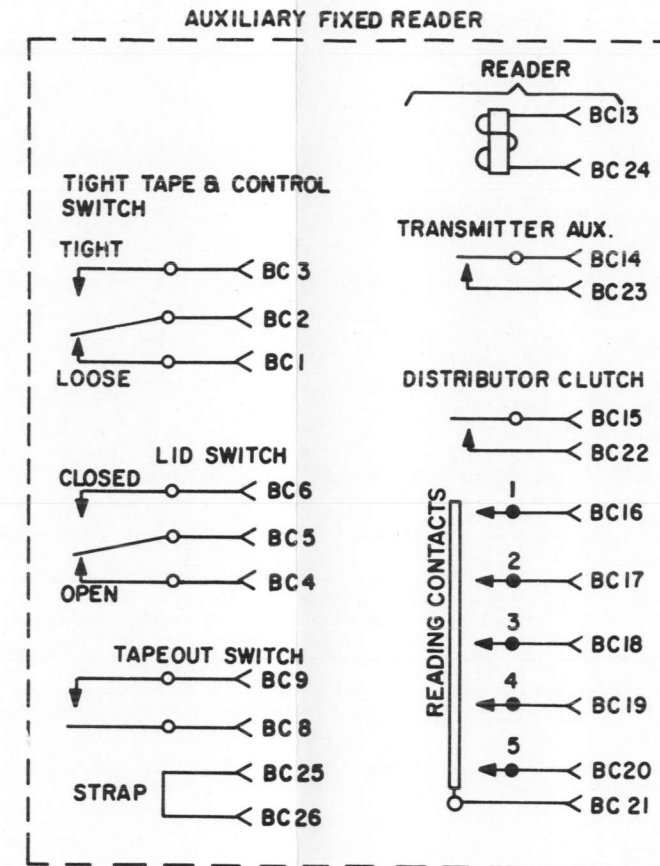
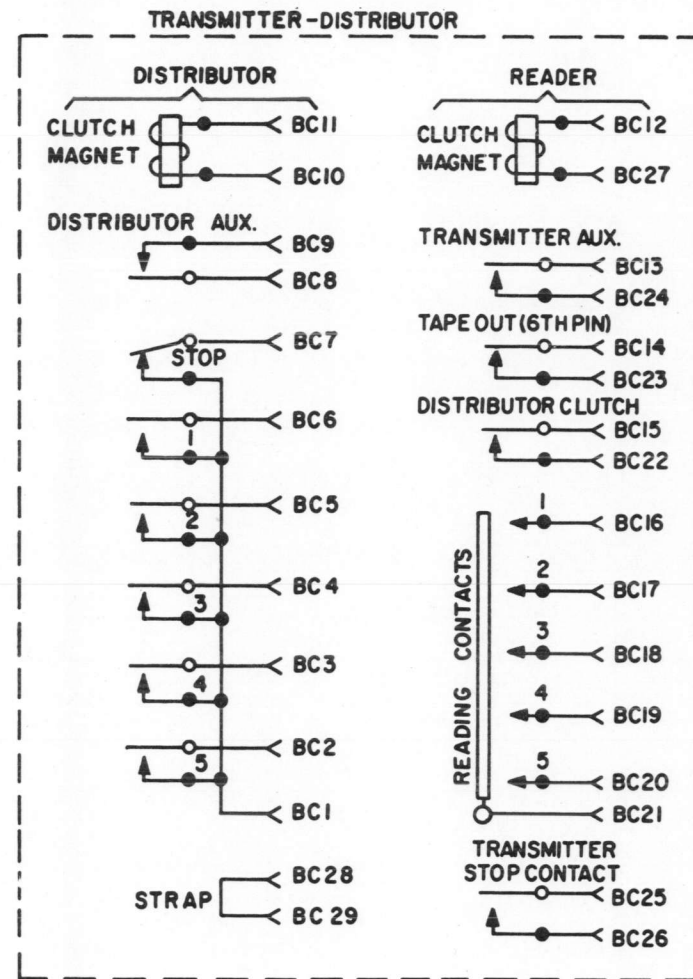


Figure 2-18. Tight Tape Mechanism



NOTE: Transmitter Distributor is driven through shafting by power from an associated unit, but could be driven independently by a motor, as shown on the above schematic.

Figure 2-19. A Typical Wiring Diagram