27. Mechanical Operation of the Transmitter Distributor

27-1. The purpose of the transmitter distributor is to decode the intelligence stored on the perforated tape, convert that intelligence into marking and spacing impulses, and transmit the message through signal channels to the distant station.

27-2. **General Information.** Mounted on its base, the transmitter distributor protrudes from the left side of the ASR cabinet, as shown in figure 81. Figure 154 illustrates a closeup view of the unit with the cover removed. Transmitting from previously prepared tape, the component is exclusively for on-line service: there are no off-line functions. The typing unit monitors the transmitter distributor transmission in line operation. The transmitter distributor is electrically isolated from the basic teletypewriter circuits in the (K) mode of operation. In the (K-T) and (T) modes, it operates only when the SEND key lever on the keyboard has been depressed and the transmitter distributor tape-out, start-stop, and tight tape contacts are all closed. A main shaft and cam-clutch assembly operate a sensing mechanism, transfer mechanism, and a signal generator. After discussing the tape lid, freewheeling feed, and the various tape switch mechanisms, we will return to the main shaft and the sequences of operation.

27-3. **Tape Lid Operation.** When the red tape lid release button, (shown to the right in fig. 154) is depressed, the tape lid release plunger, illustrated in figure 155, forces the plunger bail and extension to pivot downwards. The latching post and the lower portion of the tape lid also rotate under tension of the spring connected to the latching post and the bail. This raises the portion of the tape lid which is above the tape guide plate.

27-4. With the tape lid open, the perforated message tape can be placed in the tape guide so that the feed holes engage the teeth of the feed wheel. Of course, the tape is inserted with the typed side up and the perforations for the first character to be transmitted over the apertures of the sensing pins.

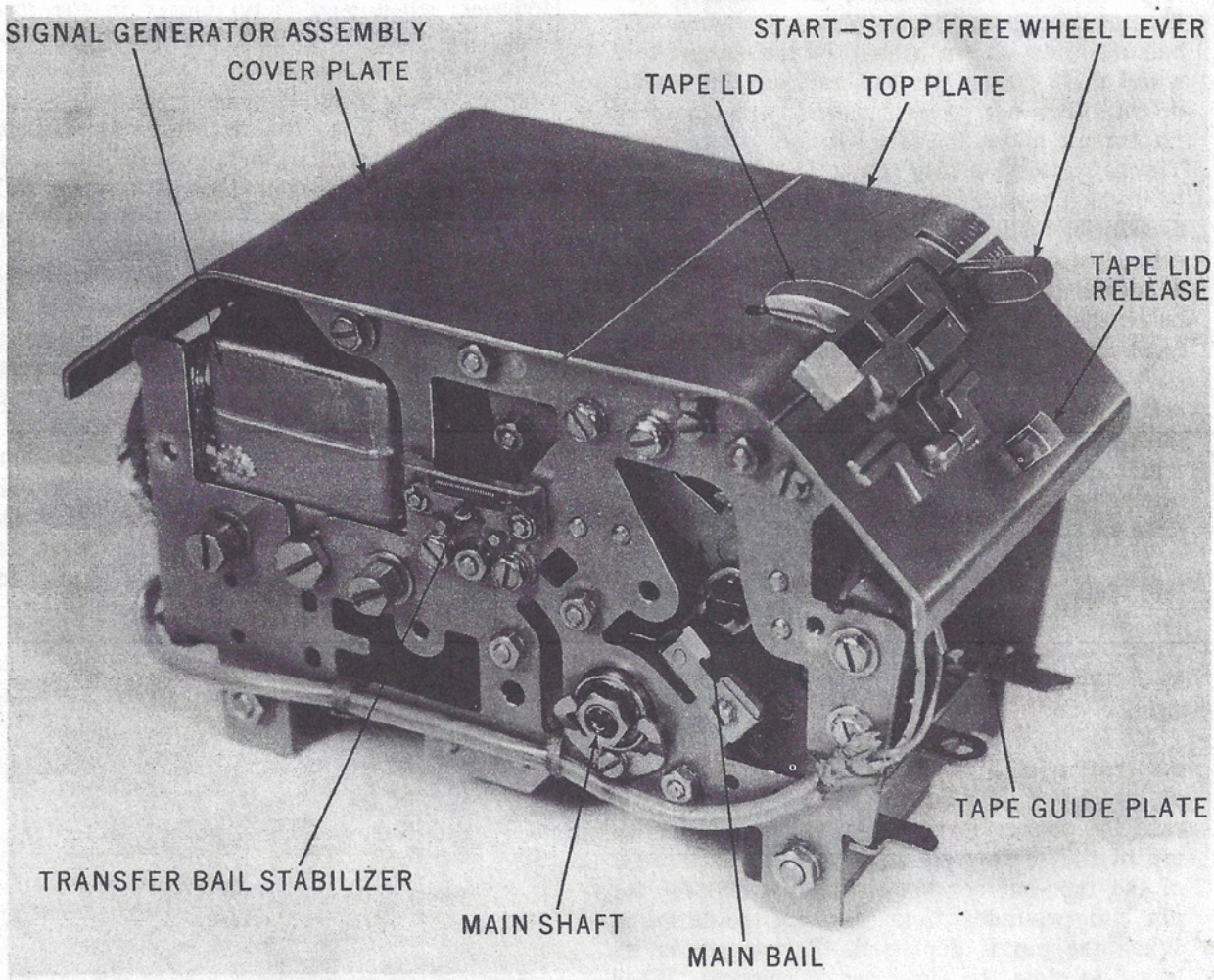

Figure 154. Transmitter distributor, front view with cover removed.

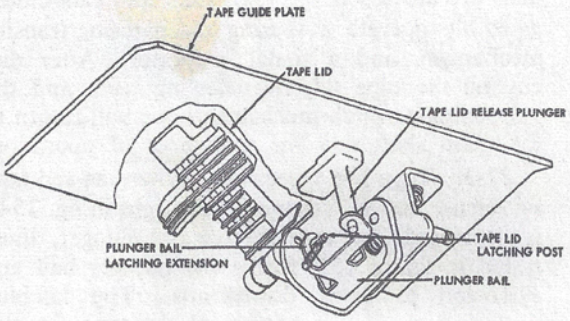

Figure 155. Tape lid mechanism, bottom view.

27-5. The tape lid is closed manually by pressing it down over the positioned tape. When the tape lid is closed, the latching post shown in figure 155 rotates counterclockwise over the end of the plunger bail latching extension. Under spring tension, the latching extension is pulled under the post to latch the tape lid.

27-6. **Freewheeling Feed Wheel.** When the start-stop lever, shown in figure 154, is pushed to the extreme left position, the start-stop bail, illustrated in figure 156, is rotated clockwise. The bail extension, shown behind the ratchet and feed wheel shaft, pushes the feed pawl and the ratchet detent roller out of engagement with the feed ratchet and allows the feed wheel to rotate freely. The bail extension also contacts the intermediate bail which rotates clockwise, permitting the torsion-spring-loaded depressor bail to rotate. This causes the tape-out pin depressor bail extension to depress the tape-out pin so that it is flush with or below the tape guide plate, permitting free movement of the tape under the tape lid. Since the start-stop and tight tape contacts are opened in establishing conditions for freewheeling tape feed, the clutch magnets are deenergized and the transmitter distributor is in the idle condition. Positioning of the tape must be done manually. Release of the start-stop lever to its OFF position returns the tape feed pawl and the detent roller into contact with the ratchet wheel and releases the tape-out sensing pin. This conditions the equipment for operation when the start-stop lever, as shown in figure 154, is again moved to the right.

27-7. **Tape-Out Switch Mechanism.** The tape-out sensing pin, shown in figure 156, is located slightly forward of the five sensing fingers which read the perforated tape. An extension near the top of the sensing pin raises the center swinger of the tape-out contact assembly whenever the pin end protrudes from the tape guide plate. When the pin is depressed, the swinger is released to close the lower set of contacts. When the tape is in the unit and the tape guide lid is closed, the tape holds the sensing pin in the depressed position, closing the contacts and permitting transmission—when related elements of the series wired clutch magnet circuits are closed.

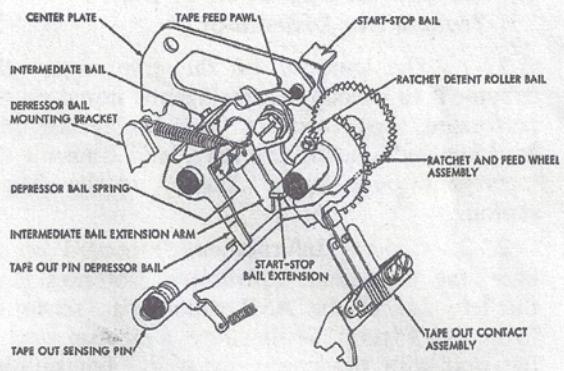

Figure 156. Freewheeling and tape-out mechanism.

27-8. During transmission the code sensing fingers cannot differentiate between a no-tape condition and a letters code combination and would tend to continue transmitting letters combinations after the tape has run out of the machine. However, when tape is no longer in the tape guide, the tape-out sensing pin moves outward under spring tension and the clutch magnet circuit is opened to end transmission.

27-9. **Tight Tape Switch Mechanism.** Tight or tangled tape passing under the rollers of the tight or tangled tape bail, shown in figure 157, causes the bail to be raised. The bail arm pivots the intermediate arm clockwise, raising the contact arm. This lifts the swinger of the start-stop tight tape contacts to open the clutch magnet circuit. Transmission ceases, preventing damage to the message tape. Transmission will be resumed automatically when the condition is remedied and the contacts are allowed to close.

27-10. **Sequence of Operation.** If we assume that the Model 28 ASR set is operating normally with the keyboard selector switch in either the K-T or T position and the SEND key lever depressed, we know that the set is conditioned for

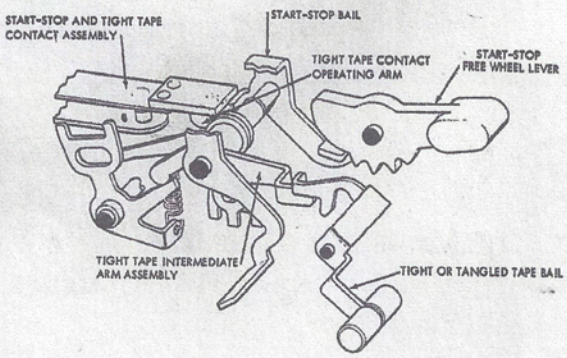

Figure 157. Tight tape switch mechanism.

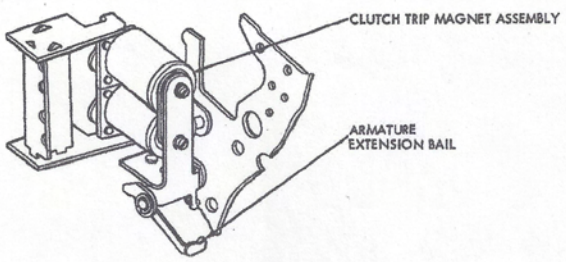

Figure 158. Transmitter distributor clutch trip magnets.

automatic transmission through the transmitter distributor. Of course, the main power switch must be on and the keyboard motor must be supplying power to the main shaft of the transmitter distributor. The start-stop freewheel lever, shown in figures 154 and 157, is in the OFF (center) position, and the first character of a message tape has been placed over the sensing fingers and the tape lid closed.

27-11. The equipment remains in an idling condition, the clutch drum rotating with the attached driven gear of the main shaft, until the green start-stop freewheel lever is operated manually. Then its RUN position completes the magnet circuit and energizes the magnets shown in figure 158. The armature then operates to trip the spring-loaded main bail, illustrated in figure 159. The main bail, in turn, trips the clutch trip lever bail, releasing the clutch to drive the main shaft and cam-clutch to furnish power for the sensing, transfer, and signal generating functions of the transmitter distributor. The machine then responds to the perforated tape until the start-stop switch is returned to the center or OFF position, or the end-of-tape or tight tape contacts open.

27-12. *Cam-clutch main shaft.* The cam-clutch shown in figure 159 is a part of the main shaft, attached by a hub at the rear of the shaft, to the disk portion of the clutch. The drum rotates freely about the shaft with the helical driven gear to which it is attached. Figure 160 shows the cam-clutch main shaft.

27-13. As you can see by the illustration, the cam-clutch has five sensing finger transfer lever cams, a start cam, a stop cam, a locking cam, and a main bail drive arm eccentric cam. The cams are positioned to trip their associated mechanisms in the order required for the sequential electrical transmission of the marking and spacing code elements. The shaft also has an eccentric cam to operate the main bail drive arm during the function cycle.

27-14. When the start-stop freewheel lever, shown in figure 157, is moved to the right, the camming surface lever allows the start-stop bail to move upward. As the bail pivots on its mounting, the left extension of the bail moves away from the swinger of the start-stop, tight tape contact assembly and closes the contacts to complete the clutch magnet circuit. As the clutch trip magnet armature (shown at the top of fig. 159) is pulled up, it rotates the main bail latch lever, freeing the spring-loaded main bail and allowing

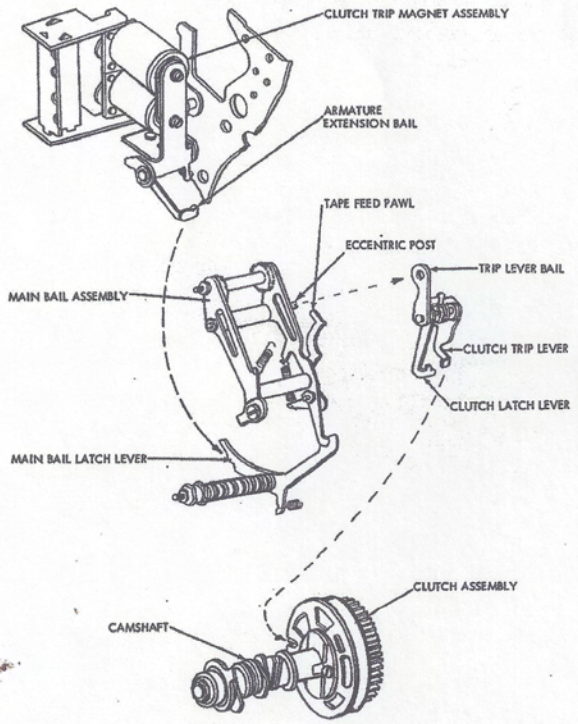

Figure 159. Cam-clutch main shaft.

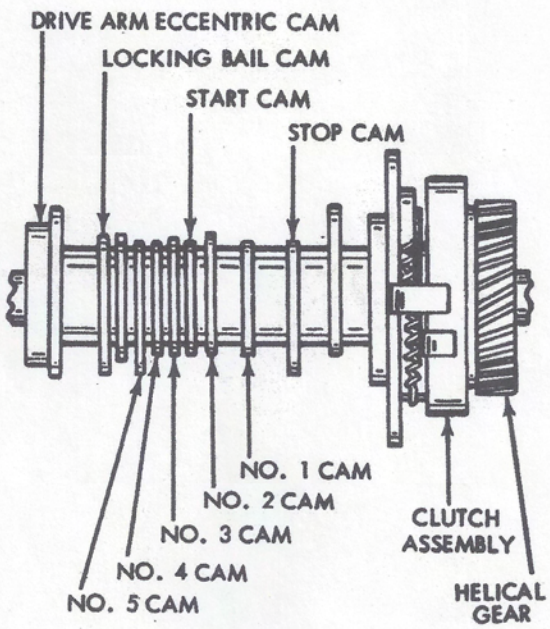

Figure 160. Transmitter distributor control mechanism.

the bail to rotate counterclockwise. This movement is transmitted through an eccentric post to the clutch trip lever bail. The clutch trip lever bail moves the clutch trip lever out of engagement with the clutch shoe, releasing the clutch to start the main shaft rotating.

27-15. As the shaft rotates, the drive arm eccentric (shown in fig. 161) revolves to pull the drive arm downward near the end of the cycle. This causes the main bail to pivot back to its home position and retensions the main bail spring. So long as the magnet circuit is energized, the armature continues to hold the main bail latch lever away from the main bail. As the shaft continues to rotate, the drive arm is moved upward by its eccentric and the spring-loaded bail again rotates counterclockwise to begin another cycle. The clutch trip lever is held away from the clutch shoe and the cam-clutch cycling continues.

27-16. When the start-stop lever is pushed to the OFF position, or a tight tape condition occurs, the start-stop bail is rotated clockwise and its left extension raises the swinger of the start-stop tape contact, opening the magnet circuit. The magnet armature moves away from the magnet under spring tension and the main bail lever is latched when the drive arm next lowers the main bail.

27-17. 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 shown in figure 159, stopping rotation of the main shaft and cams. The disengaged clutch drum continues to rotate with the driven gear.

27-18. *Sensing mechanism.* Five sensing pins which alternately protrude from and retract beneath the tape guide plate are the upper ends of five sensing fingers, one of which is shown in

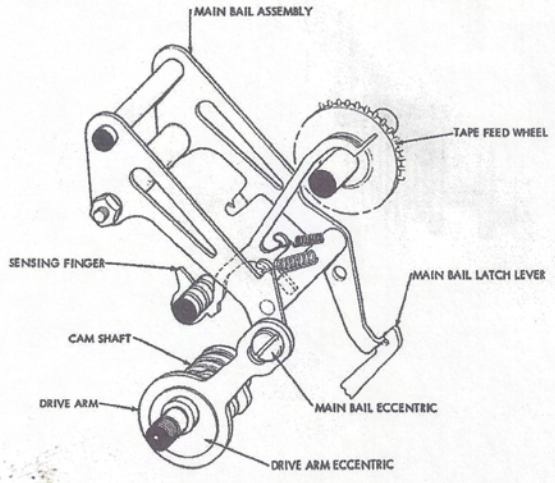

Figure 161. Main bail and drive arm mechanism.

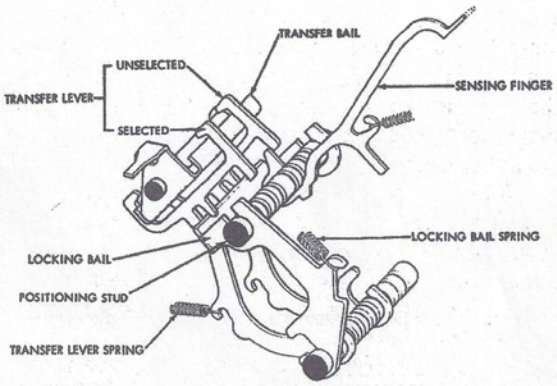

Figure 162. Sensing, locking, and transfer lever mechanism.

figure 162. The lower end of the fingers slide freely on a positioning stud. The lower extension of each sensing finger is under the arm of their associated transfer lever. A sensing finger spring is attached to the hook about midway up the finger. Associated with the hook is an extension which rests against the main bail, as shown in figure 161. When the main bail is down, in its home position, the sensing pins are below the guide plate. When the clutch trip magnet is energized and the bail is released to move upward, the sensing fingers also move upward through the guide plate. If one or more of the sensing pins encounter a perforation in the tape, that finger extends through the perforation. The sensing fingers that extend through the tape move their associated transfer levers, shown in figure 163, upward so that the locking extensions on the transfer levers are above the locking bail (when it moves upward), as shown in figure 162. If any of the sensing fingers do not sense a perforation in the tape, the associated transfer lever does not move upward and their locking extension remains below the locking blade of the locking bail. This condition is also illustrated in figure

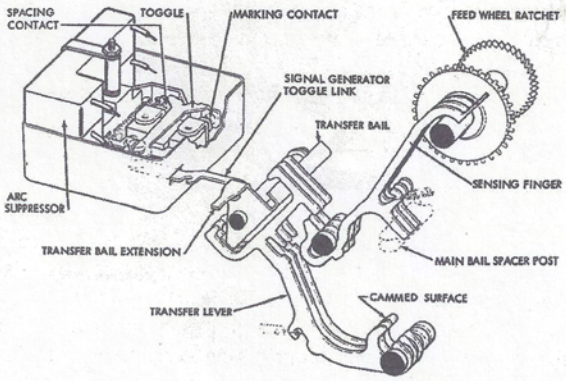

Figure 163. Transfer lever and signal generator mechanism.

162. After the intelligence is transmitted, the main bail drive arm pulls the bail downward and the bail, in turn, draws the sensing fingers out of the tape and below the level of the tape guide plate so that the tape can be advanced to the next character.

27-19. *Lock bail and transfer mechanism.* All transfer levers, with the exception of the stop and start transfer levers, are free to remain down or move upward in response to the positioning of the sensing fingers. They move upward for a mark or remain down in the unselected position for a space. Of course, the arrangement of the sensing fingers and their associated transfer levers depends upon the code combination being sensed. The upper ends of all the transfer levers are positioned simultaneously when the main bail is released and the sensing fingers move upward through the tape for marking—or remain unmoved for spacing when blocked by the tape.

27-20. When the main bail is released, the main shaft clutch engages, revolving the cams on the shaft. As the cam-clutch revolves, the locking bail cam positions the locking bail upward between the locking extensions of the transfer levers, locking them in position. Further rotation of the main shaft moves the lobe of the start cam into position and shifts the start transfer lever downward to the right. Since the start transfer lever has no associated sensing finger, the lever always remains in the unselected, or spacing, position. The start transfer lever upper finger always hooks the right side of the transfer bail, shown in figure 163, causing the bail to rotate in a clockwise direction for a space.

27-21. As the main shaft continues to rotate further, the cam for the first pulse moves its transfer lever downward and to the right. Depending on the position of the upper end, the transfer bail is rotated clockwise for space—counterclockwise for mark. The transfer bail is rotated if the pulse to be transmitted is not the same as the preceding pulse. If the preceding pulse is the same, no rotation occurs because the bail has been previously rotated. If the preceding pulse was different, the extension on the transfer bail, shown in figure 163, moves to the right for a spacing pulse or to the left for a marking pulse. The second, third, fourth, and fifth code pulses are generated in the same manner as described for the first code pulse.

27-22. The stop cam pulse follows the fifth cam pulse as the main shaft continues to revolve. Again, the action is the same as that for any other pulse. Since the stop pulse transfer lever does not have a sensing finger, the stop transfer lever is held in position to produce a marking pulse each time it is activated by the stop cam on the main shaft.

27-23. *Signal generator mechanism.* As we said, the transfer bail extension moves to the right for spacing and to the left for marking. As the bail rotates under the impulse of the transfer levers, the end of the transfer bail extension, which protrudes through a slot in the front plate, is held positioned by the transfer bail stabilizer shown in figure 164.

27-24. When the transfer bail extension moves to the left or right, it moves into the U-shaped cutout of either the spacing or marking latch of the stabilizer. The other latch drops down to a blocking position, as illustrated by the spacing latch in figure 164. This prevents any vibration or movement of the transfer bail which might result in a poor contact in the signal generator. If the next impulse is different, the dropped latch will be raised so that the transfer bail can rotate in the opposite direction, at which time the other stabilizer latch does the blocking.

27-25. As you can see in figure 163, the transfer bail is linked to the signal generator toggle through the signal generator toggle link. Movement of this link to the right opens the marking contact and closes the spacing contact, applying spacing pulse to the line. When the link moves to the left, the opposite happens and a marking pulse is applied to the line. In this manner each of the code impulses for the character over the pins will be transmitted over the signal line in sequential order. After the character is transmitted, the mechanism must be reset and the tape stepped to the next character.

27-26. *Tape feed mechanism.* When the clutch magnet is energized and the main bail

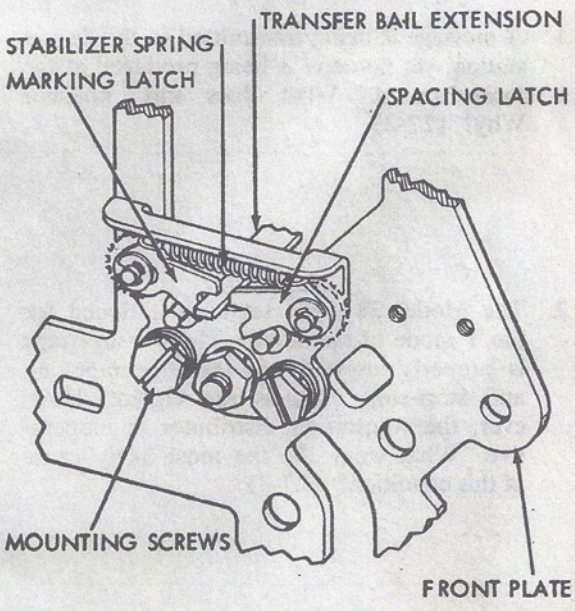

Figure 164. Transfer bail stabilizer.

latch lever released, the main bail assembly, shown in figure 159, rotates and the lower end of the assembly (including the tape feed pawl) moves upward under spring tension. You can see, in figure 165, that this would cause the feed pawl to raise up one tooth on the feed wheel ratchet. When the drive arm, through the drive arm eccentric on figure 161, brings the main bail downward for reset, the tape feed advances the tape feed ratchet one tooth against the holding action of the spring-loaded ratchet detent roller. The tape feed wheel advances the tape one character. The ratchet detent roller bears between two teeth on the ratchet and holds the feed wheel and tape in position during the sensing portion of the operating cycle. As the drive arm moves the bail up for the next reading, the feed pawl hops upward over the next tooth to continue the tape feed cycle.

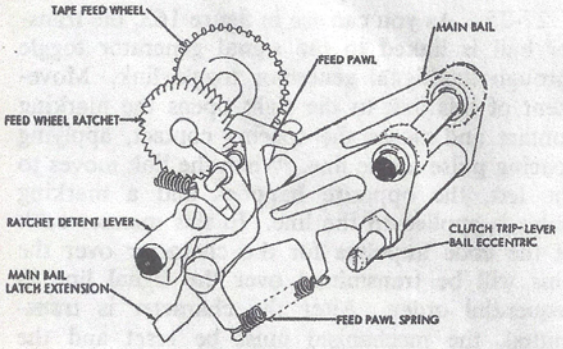

Figure 165. Tape feed mechanism.

Review Exercises

1. A message is being transmitted to the distant station, yet no copy is being produced at the local station. What does this indicate? Why? (27-2)

2. The Model 28 ASR set is conditioned for the T mode of operation. The message tape is properly inserted and the tight tape-out, and start-stop contacts are closed. However, the transmitter distributor is inoperative. What would be the most likely cause of this condition? (27-2)

3. The tape feed wheel ratchet detent roller is not in contact with the ratchet wheel. What does this indicate? How is it accomplished? (27-6)

4. The message tape has run out of the transmitter distributor, yet the machine continues to transmit to the signal line. What code combination is being transmitted? What is the most likely cause of this condition? (27-8)

5. The transmitter distributor has been transmitting a message. In the middle of the message, transmission ceases and a closed line condition exists. What would be the most likely cause of this condition? (27-9)

6. The first cam behind the drive arm eccentric is allowing the associated mechanism to move upward. What operation is taking place at this time? (27-13)

7. The main bail is moving upward. When does this occur? What supplies the power? (27-14)

8. The message being transmitted from the transmitter distributor is being received in a garbled condition. An investigation reveals the fact that the fourth code pulse is always spacing. What is the most likely cause of this condition? (27-18)

9. The transfer bail rotates clockwise for one pulse, then counterclockwise for the remainder of the revolution. What character is being transmitted to the distant station? (27-20–24)

10. The main bail is moving downward under the influence of the drive arm. What must occur before tape feed can take place? Why? (27-26)