

COIN COLLECTORS

GENERAL INFORMATION AND METHOD OF OPERATION

1.00 GENERAL

A coin collector, in addition to performing basic functions of a telephone set, must be capable of collecting charges for calls and refunding deposits when required.

2.00 TELEPHONE CIRCUIT

2.01 The talking circuit is the same as the one used in conventional telephones, except for the addition of two signal transmitters and an electromagnet in series in the primary circuit, as shown in Fig. 1.

2.02 Coin signal tones are picked up by the two signal transmitters and carried over the

voice path to the local or toll operator, indicating the denomination and number of coins deposited. The two transmitters are in parallel with a 22-ohm resistor. This arrangement controls the volume level and protects the transmitters against excessive current.

2.03 The electromagnet is a part of the coin chute and is used in conjunction with 10-cent operation, as covered in Part 3. A capacitor is connected in parallel with the electromagnet winding to minimize its effect on transmission. Network-type circuits equipped with dial have a resistor in series with the capacitor to protect the off-normal dial contacts from excessive arcing. In areas of low-frequency inductive interference, it may be necessary to substitute a unit of higher capacity in order to keep the noise pickup within

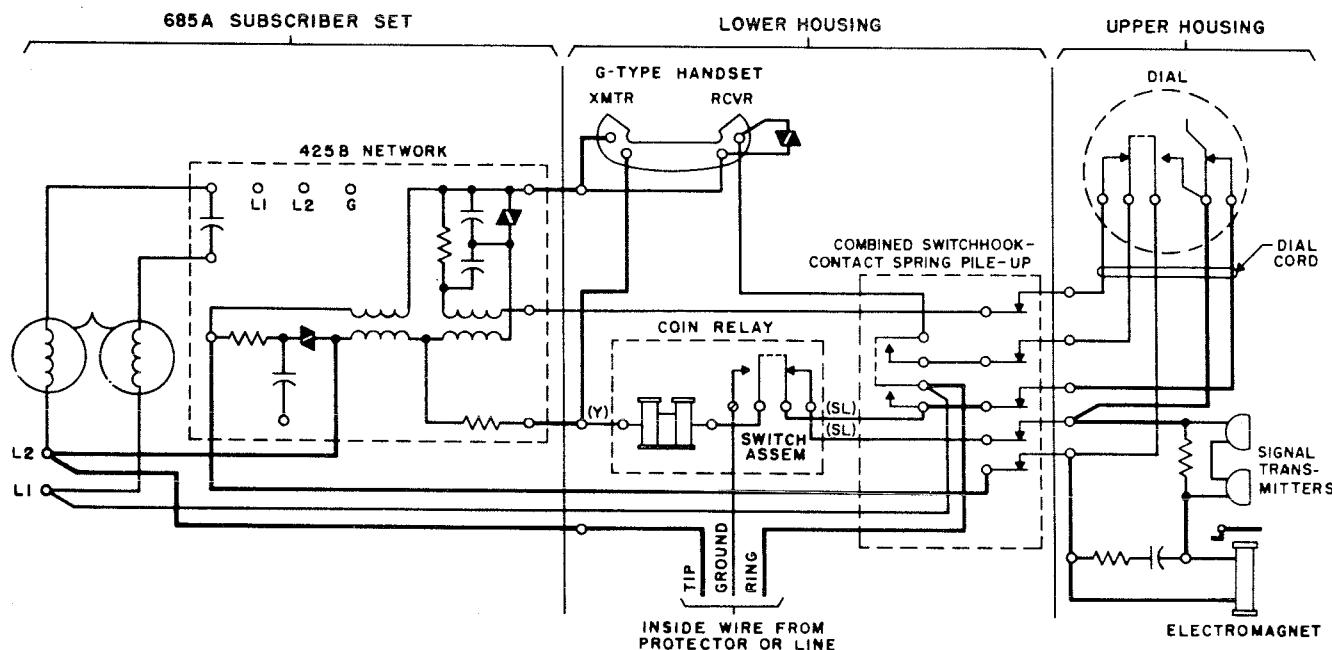


Fig. 1 — Prepay Network-type Coin Collector Circuit

acceptable limits. (See section entitled Inductive Noise.)

2.04 The G-type handset is equipped with a 44A varistor bridged across the receiver to reduce acoustic disturbances. A set equipped with an F-type handset has a 37A varistor bridged across the receiver terminals on the backplate.

3.00 COIN-HANDLING FEATURES, UPPER HOUSING

3.01 Coin-handling features of the upper housing consist of a coin gauge, washer-reject and coin-release push-button mechanism (when provided), and coin-chute assembly (see Fig. 2). These units control the coins and, if accepted, direct them to the coin hopper of the mechanism unit on the lower housing. From the coin hopper, they reach the coin receptacle or return chute. Rejected coins fall directly into the return chute.

Coin Gauge

3.02 The coin gauge is positioned on top of the upper housing and provides nickel, dime, and quarter openings for the deposit of coins. The respective openings are dimensioned to receive United States and Canadian coins and guide them to their proper channel in the coin chute.

Washer-reject and Coin-release Push-button Mechanism

3.03 The washer-reject mechanism functions to prevent washers from entering the coin chute. Washers are detected and ejected by star wheels associated with each channel. The bottom spoke of the star wheel is moved downward by the deposited coin. The second spoke moves against the side of the coin near its center, deflecting it into the coin chute. Washers having open centers will not be deflected and will drop into the return chute.

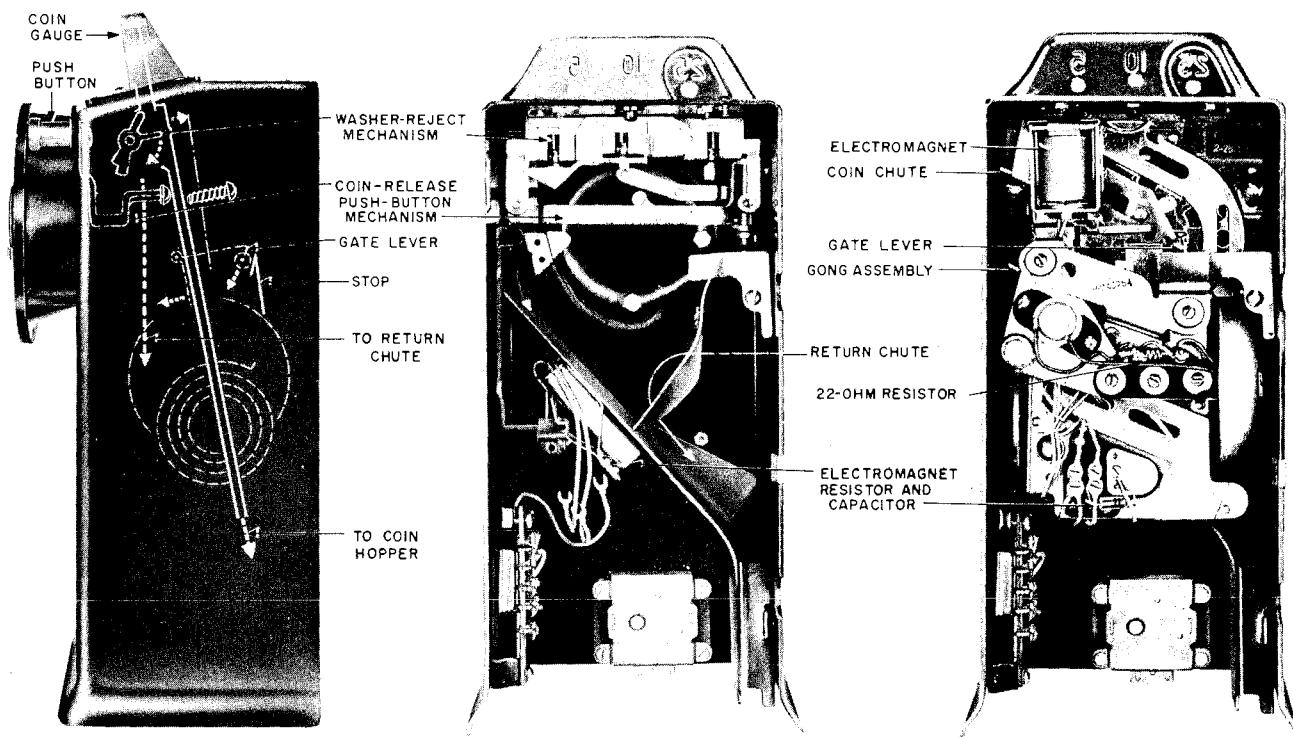


Fig. 2 — Coin-handling Features, Upper Housing

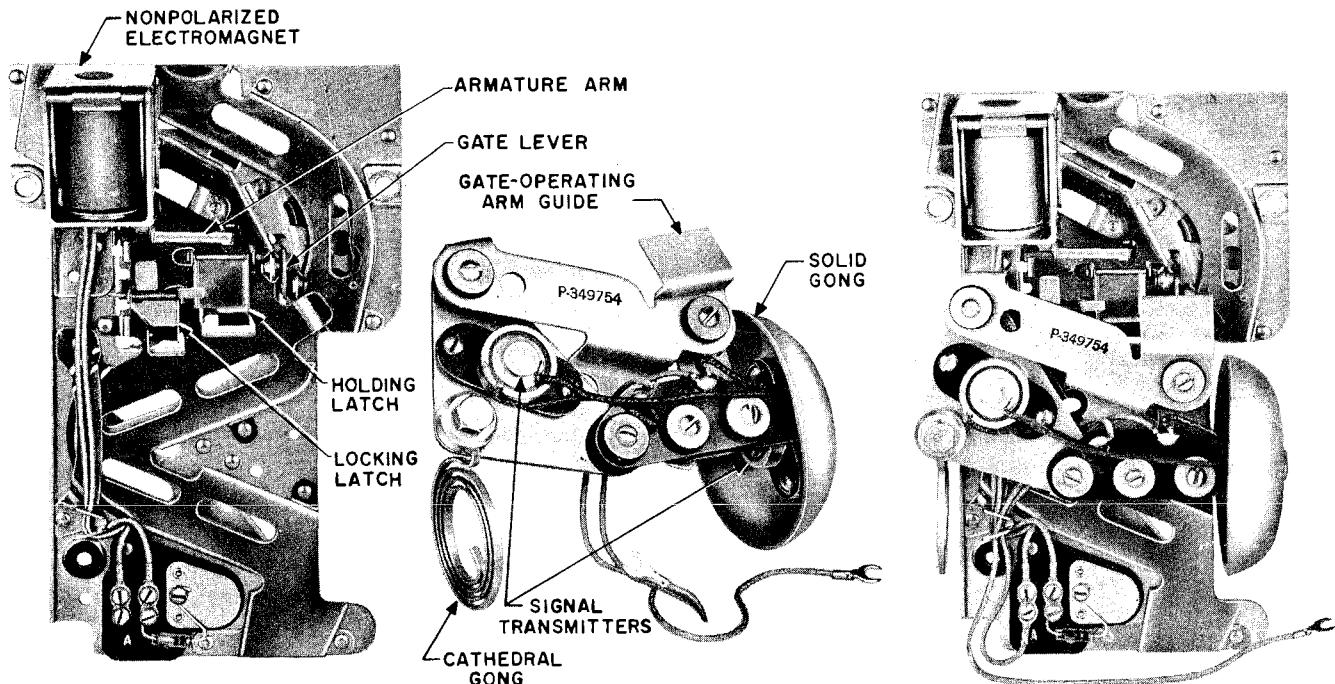


Fig. 3 – Coin Chute and Assembly

3.04 The operation of the coin-release push button moves the upper part of the coin chute away from the washer-reject mechanism. This will release washers or coins wedged at this location and allow them to drop into the return chute. This movement of the coin chute also opens the gate associated with the nickel channel, releasing coins held at that location (see 3.10).

Coin-chute Assembly

3.05 Several different types of coin chutes and coin-chute assemblies are provided. They differ according to service and associated equipment. Three services are provided: manual postpay, 10-cent prepay, and 10-cent dial postpay (CDO). Each service may be arranged for the use of United States coins only or for United States and Canadian coins. The difference here is in the size of the reject openings in the quarter channel. Coin chutes used with washer-reject and push-button mechanisms are not interchangeable with those used without such equipment. Piece-part

numbers for coin chutes and coin-chute assemblies are covered in the section entitled Coin Collectors, Identification and Assembly of Parts.

3.06 Generally, the coin-chute assembly consists of a coin chute, including electromagnet, and a gong assembly with signal transmitters, as shown in Fig. 3.

Coin Chute

3.07 The coin chute is made of stainless steel and provides nickel, dime, and quarter channels leading to the coin hopper of the mechanism unit. Nickels are routed to strike a solid gong once. Dimes are routed to strike the same solid gong twice. Quarters are routed to strike a cathedral gong once.

3.08 Control and reject features are provided in the channels. Each channel rejects coins or discs which are below the minimum dimensions allowed for worn coinage. Such coins or discs leave

the coin chute before reaching the gongs and fall into the return chute.

3.09 Ten-cent operation requires a minimum deposit of two nickels or one dime to initiate a prepay call, or to complete a dial postpay non-free call. To provide for this service, the nickel channel is equipped with a holding latch which is controlled by a locking latch (see Fig. 3). The first nickel deposited is stopped and held by the holding latch. A second nickel deposited is deflected by the first nickel into the locking latch. The locking latch is operated by this coin, releasing the first nickel at the holding latch. The two coins pass on down the channel in succession, each striking the solid gong and dropping into the coin hopper.

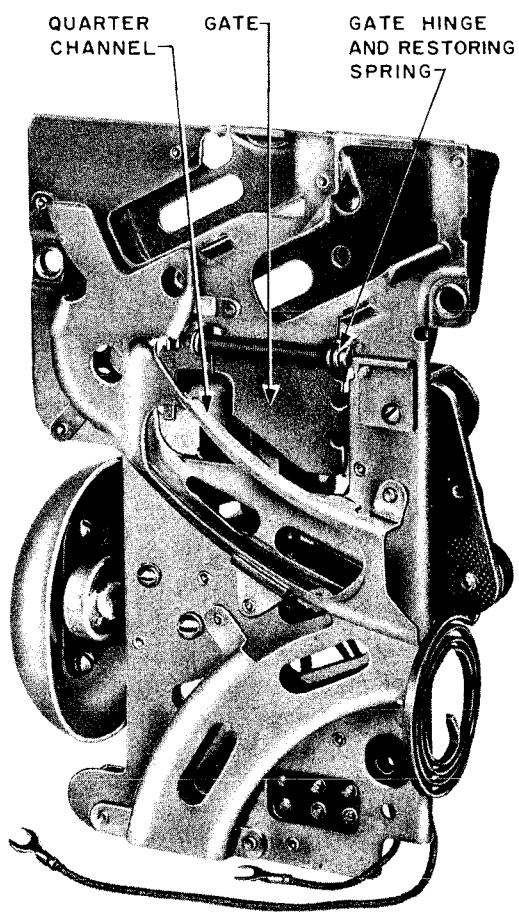


Fig. 4 — P-20A125 Coin-chute Assembly, Rear View

3.10 A hinged gate is provided in the rear wall of the nickel channel opposite the holding and locking latches (see Fig. 4). Pennies which may reach the holding latch will be ejected through an opening in the gate. A single nickel deposited and held by the holding latch will be released by the gate and fall into the return chute when the handset or receiver is hung up. The gate is controlled by an operating arm on the switchhook. The gate is open when switchhook is down and closed when switchhook is up. Nickels deposited when switchhook is down will pass through the open gate and into return chute. The gate is also opened by the coin-release push-button mechanism.

3.11 When the gate is open, it protrudes into the quarter channel. A quarter deposited when the switchhook is down will be stopped and held by the open gate until switchhook is raised. When released by the gate's closing, the quarter will continue down its channel, strike the gong, and reach the coin hopper.

3.12 The position of the switchhook has no effect on the dime channel. Dimes will follow their channel into the coin hopper at all times.

Electromagnet

3.13 The purpose of the electromagnet is to arrange for single nickel deposits to meet requirements of toll and overtime charges. This is accomplished by routing nickels around the holding latch after the central office loop is established.

3.14 Nonpolarized electromagnets are used for prepay service and polarized for postpay service. Both types are energized by the central office battery in series with the loop and telephone set primary circuit. An arm on the electromagnet armature is moved into the nickel channel by the operation of the armature. With this armature arm in the channel, nickels bypass the holding latch. This allows single nickel deposits to continue on down the channel, strike the gong, and drop into the coin hopper.

3.15 The nonpolarized electromagnet used in prepay service moves the arm into the nickel channel regardless of which direction current is flowing. The electromagnet operates on **out calls** when dial tone is received or the local operator answers. The electromagnet also operates on **in calls**, as from an operator completing delayed calls.

3.16 The polarized electromagnet used in dial postpay service moves its arm into the nickel channel only when the current flow is in a certain direction. The electromagnet is connected in the circuit so that the current received for dialing moves the arm into the channel. At the time a nonfree call from the coin telephone is answered by the called party, the current flow is reversed to the coin station. This reversed flow of current moves the arm out of the nickel channel, which then requires that two nickels or a dime be deposited to complete the call. On calls to or from an operator, the current flow is not reversed, and the arm is positioned in the nickel channel. This allows single nickel deposits.

Gong Assembly

3.17 The gong assembly is mounted on the coin chute, as shown in Fig. 3. It consists of a supporting bracket on which are mounted the two gongs and their associated signal transmitters. The solid gong for nickel and dime signals and one signal transmitter are mounted on a metal plate. The cathedral gong for quarter signals and the second signal transmitter are mounted on a bracket. The two units are insulated against vibration from each other and from the coin chute by use of rubber grommets at all mounting points. The support bracket also provides a guide to protect the switchhook gate-operating arm from damage when the upper housing is assembled on the backplate.

3.18 The signal transmitters are associated with handset-type coin collectors. In the construction originally employed, the gong assembly

was supported on hinge lugs in the top of the upper housing to allow the assembly to be swung out for maintenance purposes. The first of this type employed only one signal transmitter. A second signal transmitter was added later to improve the coin signals. Transmitter- and receiver-type coin collectors have the gongs mounted on the sides of the upper housing, and the coin signal is picked up by the talking transmitter. When converted to handset types, these collectors are equipped with a signal transmitter inside the solid gong.

4.00 MECHANISM UNIT

The mechanism unit consists of a steel base and coin hopper on which are mounted coin-operated and coin-control equipment as required for the particular service involved. The mechanism base is mounted on top of the lower housing, where the base also serves as a cover for the coin-receptacle compartment.

5.00 MANUAL POSTPAY SERVICE

5.01 In manual postpay service coins are deposited only after the operator has completed the connection to the called party. Refund of deposits is not required. The coin hopper serves simply as a guide to direct coins from the coin chute into the coin receptacle. The later-type coin hopper has clean-out holes to aid in removing stuck coins (see Fig. 5).

5.02 The central office line circuit for manual postpay service furnishes battery on the ring side and ground on the tip side of the line, the same as for flat-rate individual lines. This requires only a completion of the loop through the telephone primary circuit to operate the line circuit and signal the local operator (loop start).

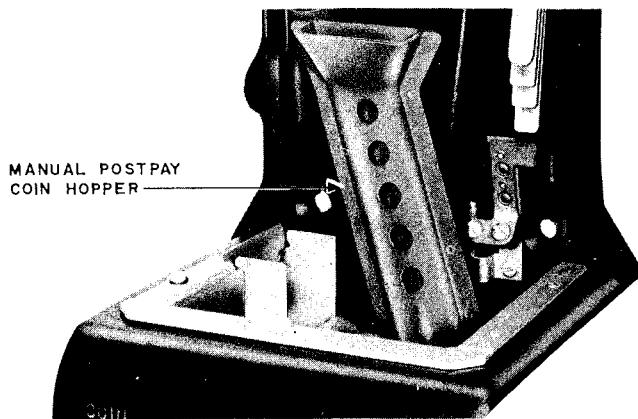


Fig. 5 — Manual Postpay Mechanism Unit

6.00 MANUAL OR DIAL PREPAY SERVICE

6.01 In prepay service a deposit is required before dial tone is received or the local operator answers. Deposits are refunded if the call is not completed. The coin-relay assembly has a coin trigger which extends into the coin hopper above the coin trap (see Fig. 6 and 8). The first coin entering the hopper forces the trigger down to a tripped position. Tripping of the coin trigger operates contacts on the coin-relay switch assembly, preparing the telephone circuit for out calls.

6.02 The central office line circuit used with dial prepay service supplies battery on the ring side of the line and has the tip side of the line open. A coin or coins must be deposited to place a ground at the station to operate the line-circuit equipment (ground start). The ground is placed on the tip side and is connected to the battery on the ring side through the primary circuit when the switchhook is up. The line circuit operates and prepares the line for dialing over the tip and ring conductors as indicated by dial tone.

6.03 Manual offices supply battery on the tip side of the line with the ring side open. With the trigger tripped, the ground on the tip side will signal the operator even though the handset or receiver is not off switchhook. The central office cord circuit supplies talking battery over the tip and ring conductors.

Coin-relay Switch Assembly

6.04 The coin-relay switch assembly consists of two pairs of spring contacts (see Fig. 1). One pair, which is normally open, closes when the trigger is tripped by a deposited coin and connects ground through the coin-relay winding to the tip side of the line. The connection to the tip side of the line is made through the center tap connection of the network or induction coil. This balances the talking circuit to ground and prevents excessive inductive noise interference.

6.05 The second pair of spring contacts is normally closed and is opened when the trigger is tripped. The contacts are wired in parallel with the pulsing contacts of the dial. With the coin-relay contacts closed, the dial-pulsing contacts are shorted. The coin trigger must be tripped and the shorting contacts opened before dialing can be accomplished.

6.06 Earlier-type coin relays were equipped with ground contact springs only (2-spring relay). Dial shorting was first accomplished by adding one normally made contact to the assembly (3-spring relay).

6.07 The single-coil, slow-release, coin-relay switch assembly, in addition to ground and dial-shorting contacts, has a 3-spring break-make combination which functions to short-circuit either a resistor or the relay coil as shown in Fig. 10 and as covered in 6.16.

Coin Hopper

6.08 For prepay service, the hopper is equipped with a coin trap which stops and holds all coins that enter the coin hopper. The coin trap is

held in its horizontal position or released in relation to the position of a coin vane. The coin vane is under the control of the coin relay which is mounted on the mechanism base, Fig. 6 and 7, or on the coin hopper, Fig. 8 and 9.

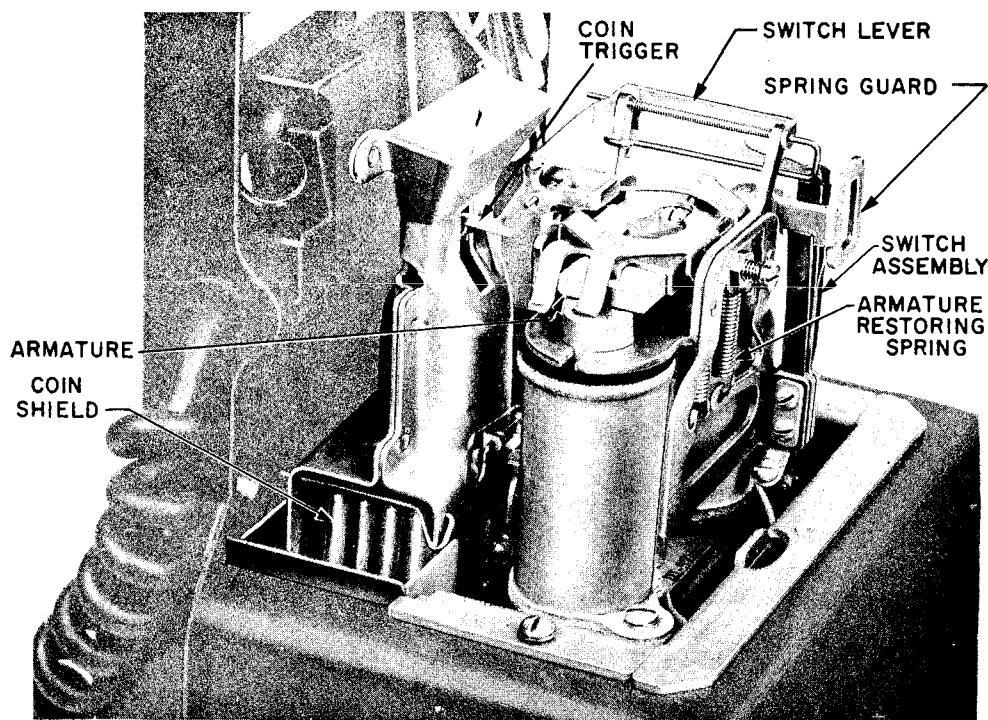


Fig. 6 – Prepay Mechanism Unit, 2-coil Coin Relay

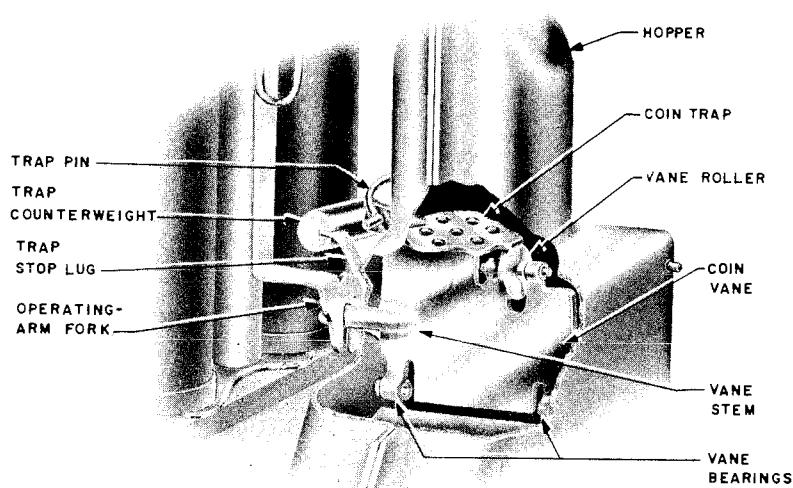


Fig. 7 – Coin Hopper and Rear View of 2-coil Coin Relay

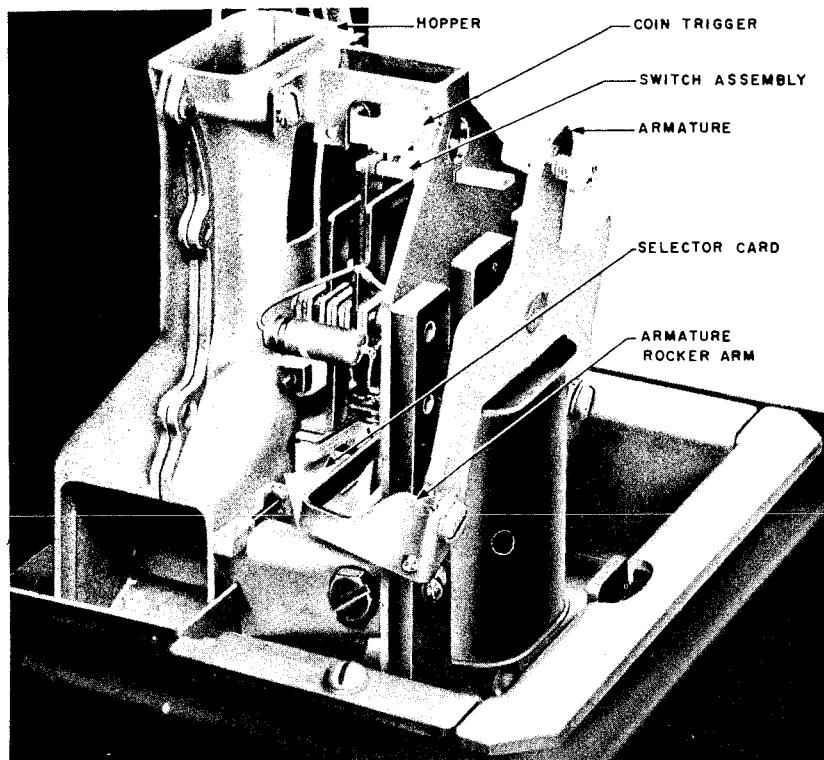


Fig. 8 – Prepay Mechanism Unit, Single-coil, Slow-release Coin Relay

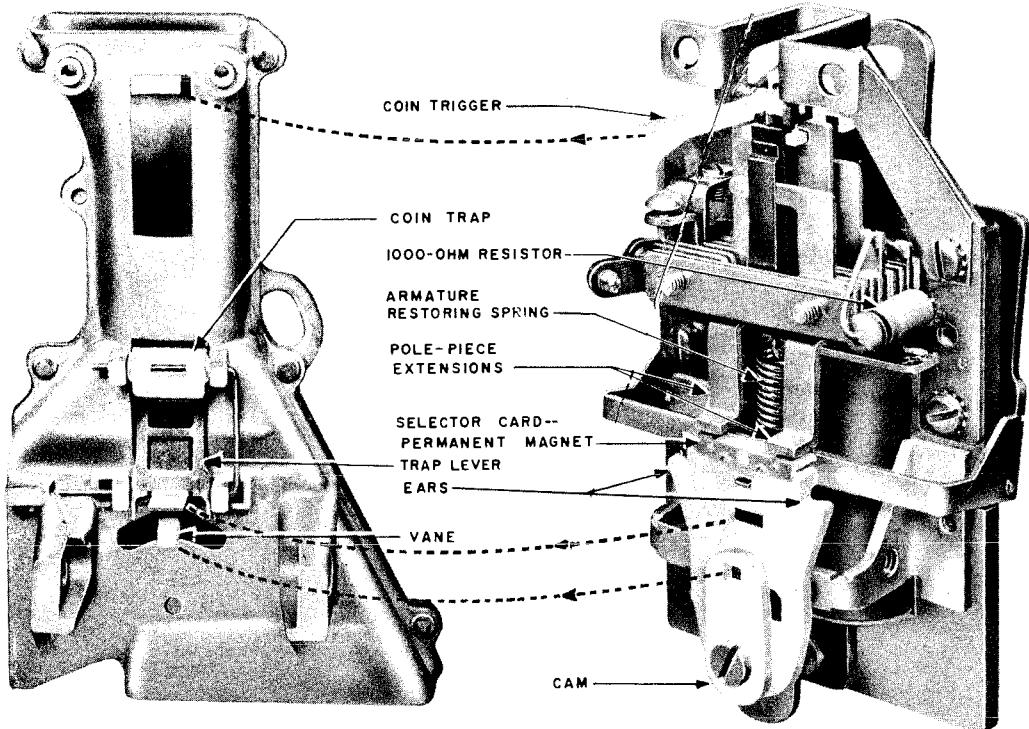


Fig. 9 – Coin Hopper and Rear View of P-10E786 Single-coil,
Slow-release Coin Relay

Coin Relay

6.09 The coin relay is operated to its collect or refund position through the tip ground. Positive coin-collect battery or negative coin-return battery (nominally 116 or 125 volts) is applied to the line, as required, under the control of central office equipment or the operator. To clear coins from the hopper, the relay must remain operated for approximately 1/2 second, otherwise the coins may become wedged in the hopper. The tip ground also provides a signal to other central office equipment, showing that coins have been deposited. Coins may be disposed of while the customer is on the line.

6.10 The operation and subsequent release of the coin relay restores the coin trigger and switch-assembly contacts to their normal position.

Two-coil Coin Relay

6.11 The 2-coil coin relay is a polarized relay. Its direction of operation depends on the direction of the current flow through its windings. Positive current pulls the armature down on the right side and operates the coin vane to the left or collect position. Negative current pulls the armature down on the left side and operates the coin vane to the right or refund position. Moving the coin vane from under the coin trap allows the weight of the held coin or coins to swing the coin trap downward. The coins drop into the coin receptacle or the return chute according to the position of the coin vane.

Single-coil, Slow-release Coin Relay

6.12 The single-coil coin relay shown in Fig. 8 consists of a nonpolarized armature and relay coil designed for fast operation and slow re-

lease. Collect and refund operation of the coin vane is controlled by a polarized selector card located at the back of the relay assembly as shown in Fig. 9. The selector card is made of nylon and has a small permanent magnet embedded along its upper edge.

6.13 The selector card is tilted slightly to one side or the other according to the polarity of the current applied to the relay. This is accomplished by two pole-piece extensions, one extension being positioned above each end of the permanent magnet. While in the tilted position, the selector card is moved downward by the operation of the relay armature. This movement guides a cam coupled to the coin vane to the right or to the left according to the direction in which the selector card is tilted.

6.14 With the selector card tilted down on the **right** side, the coin vane is moved to the right or refund position. With the selector card tilted down the **left** side, the coin vane is moved to the left or collect position.

6.15 The coin trap is also mechanically opened by the downward stroke of the selector card and restored on the release stroke. This expedites coin disposal and avoids coins' lodging on the trap. With the coin vane and the coin trap both under the control of the selector card, their movements are synchronized and friction and scoring between these two moving parts are eliminated. The slow-release feature of the relay ensures time for complete disposal of coin deposits even on short coin-battery pulses.

6.16 The slow-release feature is obtained by short-circuiting the coin-relay winding near the end of the operate stroke (see Fig. 10). During the holding period the 1000-ohm resistor is substituted for the short-circuited relay coil. This

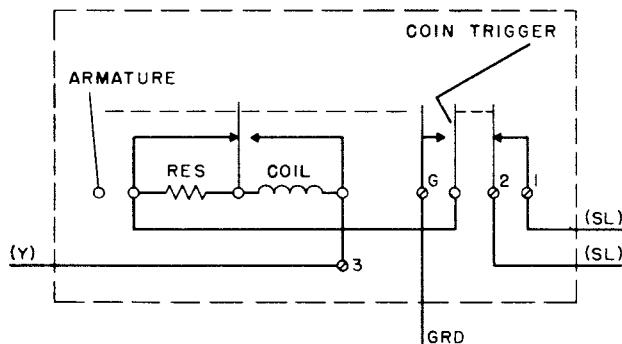


Fig. 10 — P-10E786 Single-coil, Slow-release Coin Relay

protects the coin battery resistance lamps in the central office from a current surge and protects the coin-relay ground contacts from excessive arcing when they open while coin battery is still applied to the line. To prevent reoperation of the relay the ground contacts are opened on the release stroke before the short circuit is removed from the relay coil.

6.17 With either-type relay, the ground circuit remains closed at the station until the release stroke to ensure proper operation of coin pilot lamps at manual or toll switchboards. On the 2-coil relay the station ground circuit remains closed, and the coin pilot lamp is lighted as long as the collect or refund key is held operated. Due to the self-restoring feature of the single-coil relay, however, the station ground remains closed only during the operate and slow-release holding period. This limits the maximum time the coin pilot lamp will remain lighted but ensures at least 1/4-second appearance, which is considered adequate.

6.18 The selector card and vane cam are designed so that they center mutually at the end of the release stroke. When the relay is operated **manually**, the selector card must first be tilted by pressing downward on one of the ears located on either side of the selector card before the armature is closed. This avoids jamming the engaging surfaces of the selector card and the cam. Force applied downward to the ear on the right

side of the selector card will operate the relay mechanism in the return direction. Force applied downward on the left side will operate it in the collect direction.

Coin Shield

6.19 The coin shield shown in Fig. 6 functions to prevent unauthorized access to the coin hopper. The coin shield is required on all prepay coin collectors which do not have pull-bucket return chutes.

7.00 DIAL POSTPAY SERVICE (CDO)

7.01 In dial postpay service, dial tone is received, the called number is dialed, and the called party answers before a deposit is required. Refund of deposits is not necessary. Dial postpay service has central office equipment which, when the called party answers on nonfree calls, automatically splits the connection and sends a deposit-coin tone to the calling party. Deposit-coin tone is a low tone to inform the calling party that the called party has answered and that the required coins should be deposited. During the time the connection is split, the battery supply to the coin station is reversed in direction. This current reversal prepares the coin collector for the 10-cent initial coin deposit. The first coin, passing through the coin hopper, opens a pair of contacts on the spring assembly, which places a 4450-ohm resistor momentarily in the circuit. The increased loop resistance will cause the central office equipment to remove the split connection and prepare the circuit for conversation.

7.02 The central office line circuit for dial postpay service furnishes battery on the ring side and ground on the tip side of the line. This requires only a completion of the loop through the primary circuit to operate the line circuit and prepare the line for dialing as indicated by dial tone (loop start).

7.03 For dial postpay service, the coin hopper is equipped with a coin trap and a coin vane. The coin vane is positioned permanently to the

left, allowing all coins to drop into the coin receptacle. With the coin vane locked in the collect position, a coin shield is not required. A coin-trap counterweight holds the coin trap in a horizontal position unless it is forced downward by a passing coin. (See Fig. 11.)

7.04 A contact-spring assembly is mounted on the coin hopper. The assembly consists of a pair of normally closed contacts which are opened by linkage to the movement of the coin trap. This results in the contacts' being opened momentarily as each coin drops through the coin hopper and forces the coin trap downward. The contacts are wired in series with the telephone's primary circuit.

7.05 A 63CH (4450-ohm) resistor mounted on the mechanism base is wired in multiple with the contact springs in the primary circuit. The resistor is shunted out of the circuit when the contacts are closed and is effective in the circuit when the contacts are opened.

7.06 A 31A varistor which is mounted on the contact-spring assembly bracket is also bridged across the resistor and the contacts. The varistor is poled so as to be in opposition (open) to the reverse current flow on the line. Under this reverse current condition, the varistor will not shunt out the resistor when the contacts are opened. Normal direction current will flow through the varistor, shunting the resistor, as when coins are deposited with an operator on the line. This reduces objectionable clicks.

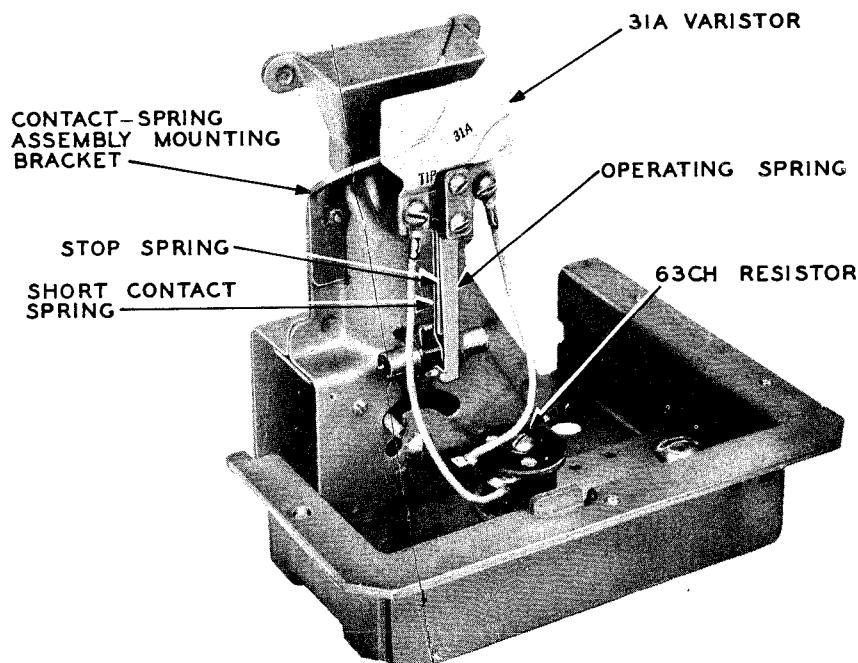


Fig. 11 — Dial Postpay