Oct. 28, 1941. H. A. HENNING 2.260.522

COIN COLLECTOR APPARATUS

Filed May 7, 1940 4 Sheets-Sheet 1

FIG. 1

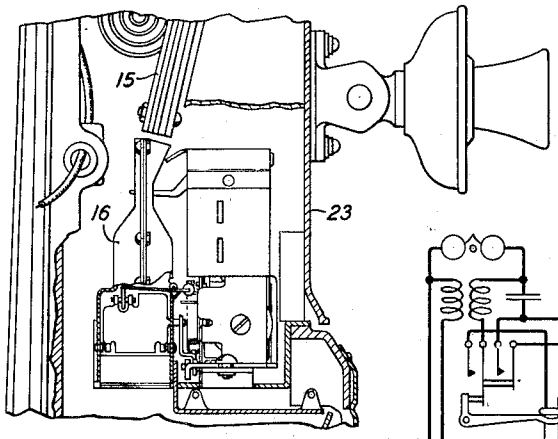


FIG. 2

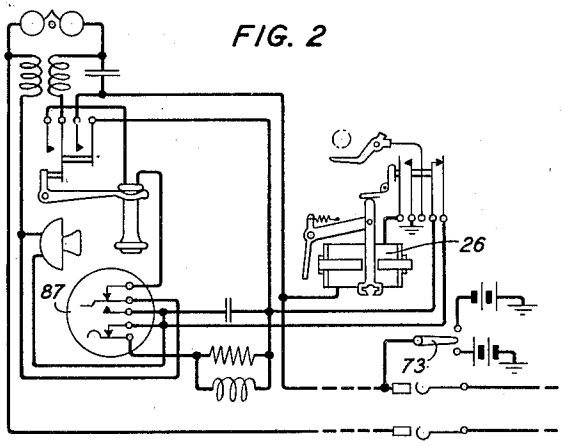
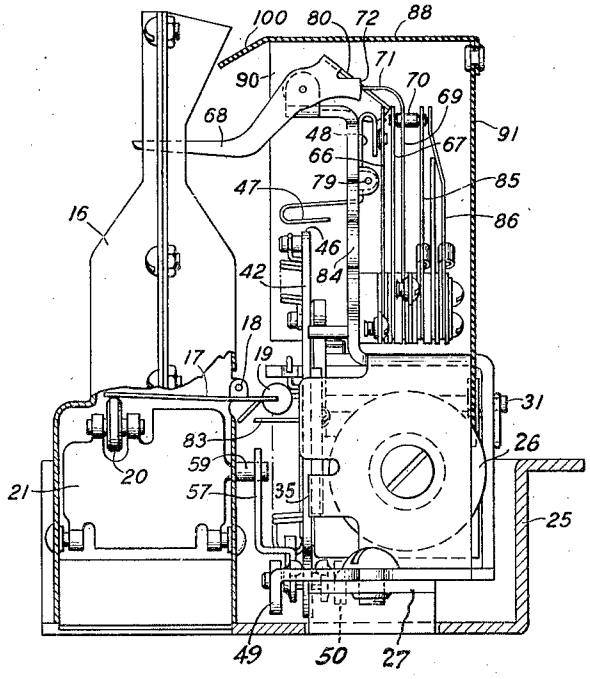


FIG. 3



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COIN COLLECTOR APPARATUS

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FIG. 4

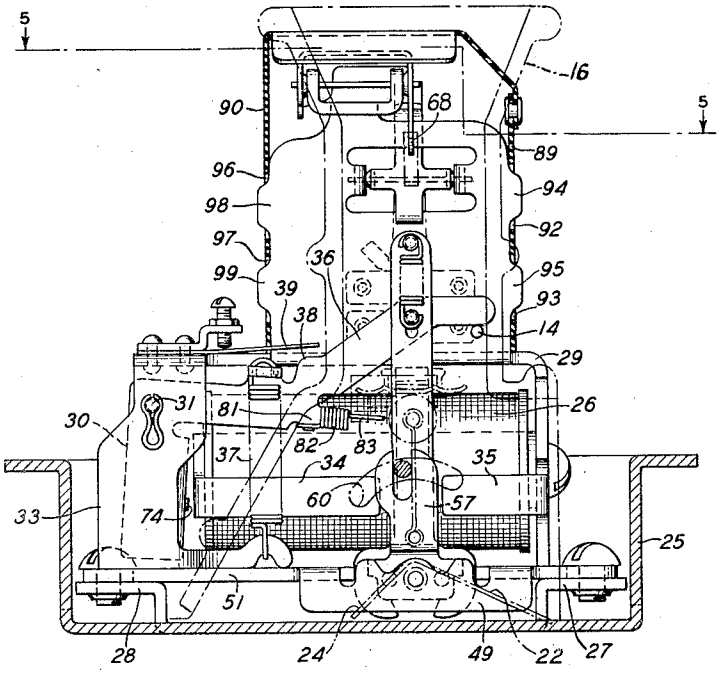
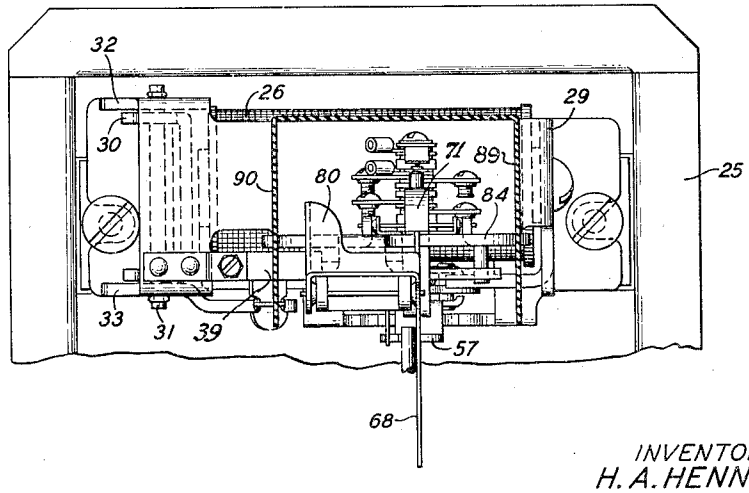


FIG. 5



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Oct. 28, 1941. H. A. HENNING 2,260,522

COIN COLLECTOR APPARATUS

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FIG. 6

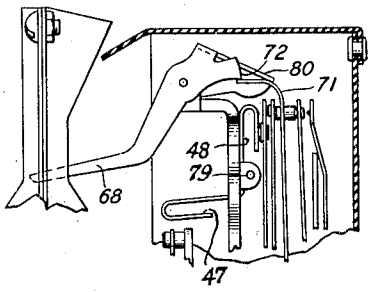


FIG. 8

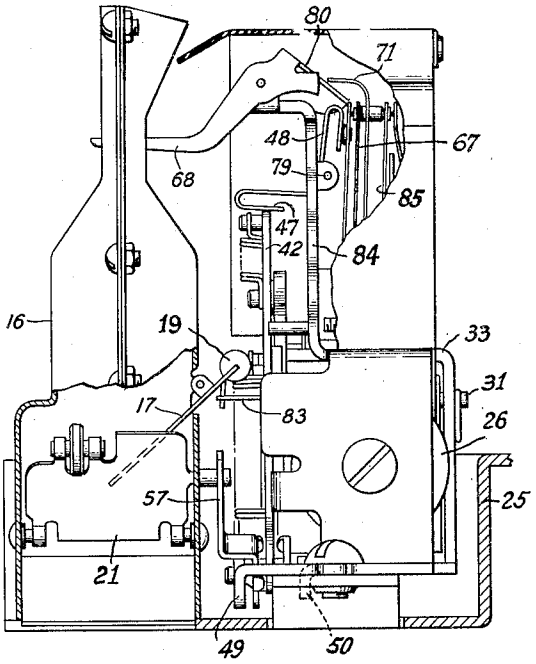
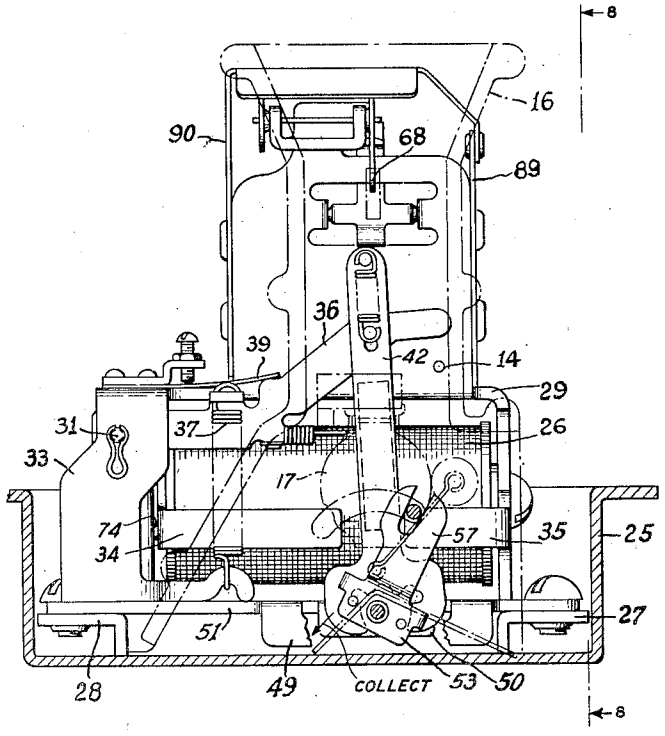


FIG. 7



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COIN COLLECTOR APPARATUS

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FIG. 9

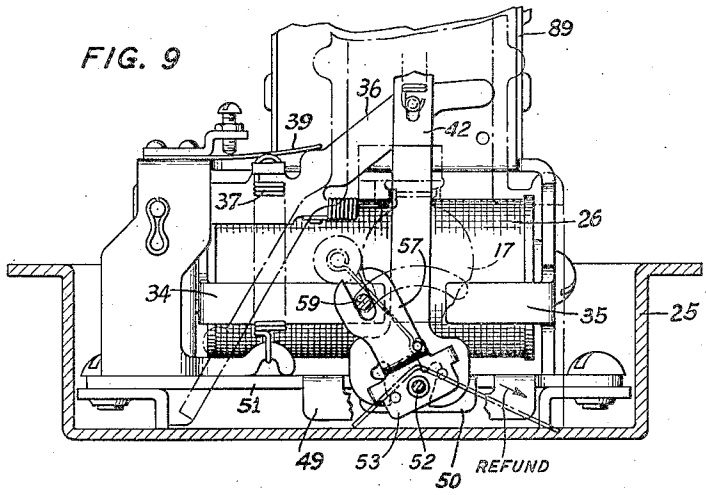


FIG. 10

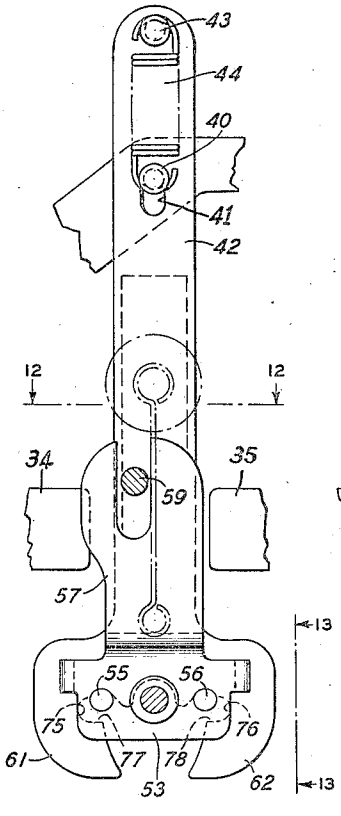


FIG. 11

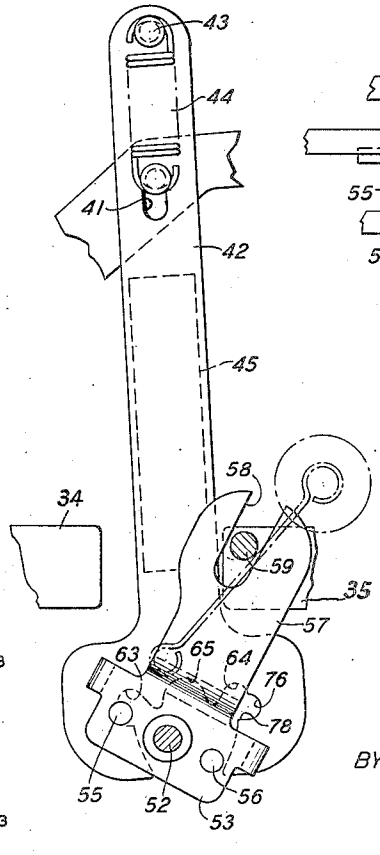


FIG. 12

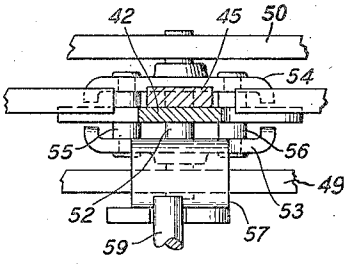
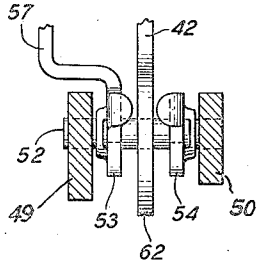


FIG. 13



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Patented Oct. 28, 1941

2,260,522

UNITED STATES PATENT OFFICE

2,260,522

COIN COLLECTOR APPARATUS

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Application May 7, 1940, Serial No. 333,770

2 Claims. (Cl. 175—339)

This invention relates to telephone coin collectors and more particularly to an electromagnetic structure of a type suitable for use in the collection or refunding of deposited coins.

A primary object of the invention is to improve the efficiency of telephone coin collectors, particularly in securing the selective operation of an electromagnet in accordance with the polarity of the voltage applied thereto.

The electromagnetic structure of this invention is of particular value in the operation of telephone coin collectors wherein the subscriber tentatively deposits a coin which is placed under the control of the central office and is subsequently collected or refunded depending upon whether the desired telephone connection is obtained. Thus in the type of coin collector disclosed in the O. F. Forsberg United States Patent 1,043,219, issued November 5, 1912, the coin deposited by the subscriber is temporarily held upon the coin trap which is supported by a pivoted vane under the control of an electromagnet. If the pivoted vane is moved by the electromagnet in one direction the deposited coin is collected, while if it is moved in the opposite direction the coin is refunded and the direction the vane is moved depends upon the polarity of the applied voltage. For producing such a selective actuation to control coin collection or coin refund an electromagnet is required which is capable of efficient operation over a wide variation in energizing current and load.

This invention as applied to a telephone coin collector of the above type preferably comprises a single-coil electromagnet. The armature for the electromagnet has a lateral extension to which is rotatably coupled a depending member comprising a permanent magnet located in the field of the electromagnet so that the depending member is deflected laterally in a direction dependent upon the polarity of the voltage applied to the winding. The depending member will, therefore, be moved longitudinally whenever the armature is attracted and at the same time will be deflected laterally in a direction defining the polarity of the applied voltage. The lower end of the depending member may comprise a cam type latch for engaging suitable means for rotating the coin vane clockwise or counter-clockwise depending upon the direction the depending member is deflected.

In accordance with this invention the previously described depending member has a loose link connection with the armature extension whereby the usual armature restoring spring may restore the armature to normal while the subsequent restoring of the depending member to normal is secured by a retractile spring coupling the armature extension to the depending member and effective only when the coin load has been discharged from the coin trap.

A further feature of the invention is concerned with the control of the spring contacts which are closed by initial coin deposit to place the electromagnet under control of the remote central office. In accordance with this invention the mechanism which serves to enable these contacts to assume their normal operated condition comprises an extension of the depending member previously mentioned. While this depending member when actuated serves to move the coin vane to a position to enable the coin trap to drop under the influence of gravity, the discharge of coins from the coin trap may be accelerated by having the armature of the electromagnet carry a spring extension for positively engaging the external portion of the coin trap to positively dump the trap after the trap has been freed from the coin vane. Still further features of the invention will be apparent from the following detailed description.

Referring to the drawings,

Fig. 1 is a sectional view of a central portion of a telephone coin collector employing the coin relay of this invention;

Fig. 2 is a circuit diagram of a coin collector substation;

Fig. 3 is an end view partly in section of the coin relay and associated coin hopper;

Fig. 4 is a side view partly in section of the apparatus of Fig. 3;

Fig. 5 is a top view taken along the line 5—5 of Fig. 4;

Fig. 6 is a view of the contact springs and associated parts in their operated condition due to coin deposit;

Fig. 7 is similar to Fig. 4 except that certain movable parts are shown in operated condition due to the application of collect current to the relay;

Fig. 8 is similar to Fig. 3 except that the movable parts are shown in their operated position as in Fig. 7;

Fig. 9 corresponds to Fig. 7 except that in Fig. 9 the movable parts are shown in their operated positions due to the application of refund current;

Fig. 10 is an enlarged view of the cam type latch carried by the extension of the electromag-

net with the various parts shown in their normal condition;

Fig. 11 is similar to Fig. 10 except that the movable parts are shown in their operated condition due to the application of collect current;

Fig. 12 is a top view taken along the line 12—12 of Fig. 10; and

Fig. 13 is a side view partly in section of the lower end of the cam latch of Fig. 10.

The above drawings do not disclose a complete telephone coin collector but the general construction of one form of such a collector with which this invention may be employed may be ascertained by reference to the O. F. Forsberg United States Patent 1,043,219.

As disclosed in the Forsberg patent a person wishing to use a telephone coin collector inserts a coin in a coin gauge and the deposited coin after traversing a coin chute 15 for testing its genuineness and after striking a suitable coin signal drops into a coin hopper 16 and comes to rest upon a coin trap 17 which extends across the passageway. This trap 17 which is shown pivoted along the axis 18 has a counterweight 19 and when it carries a coin load is supported by a roller 20 on a vertical coin vane 21 pivoted at its lower end. The coin passage below trap 17 (Fig. 4) is divided into two coin channels, a refund chute 22 leading to an opening whereby coins are accessible from outside the coin collector housing 23, and a collect chute 24 leading to a cash compartment within the housing. As explained in the Forsberg patent, if the vane 21 is moved to close the collect passageway 24 the dropping of trap 17 will allow the deposited coin to fall into refund chute 22 while if the vane is moved to close the refund passageway 22 the dropping of trap 17 will allow the deposited coin to fall into collect chute 24. The apparatus so far described is similar to that disclosed in the Forsberg patent.

The invention in the embodiment shown in the drawings is primarily concerned with the provision of improved means whereby the operation of vane 21 may be remotely controlled to collect or refund a deposited coin depending upon whether or not the desired telephone connection is secured.

Suitably mounted on lugs 27, 28 of tray 25 and adjacent the coin hopper 16 is an electromagnet comprising a single coil 26 surrounding a core of soft iron or other suitable magnetic material. A U-shaped strip 29 of magnetic material surrounding the top and ends of the coil completes the main magnetic circuit except for the armature 30 which is pivoted about a horizontal axis 31. Armature 30 in a horizontal cross-section is U-shaped with a flat face adjacent the core and a flat portion parallel to and closely adjacent each of the plates 32, 33 of the return path 29. An auxiliary return path for the magnetic flux is provided by arm 34 fastened to the core at the armature end thereof and arm 35 extending from the U-shaped member 29 at the opposite end of the core. The adjacent ends of these two arms 34, 35 are separated by an air-gap for a purpose to be described later.

Integral with armature 30 is a lateral and upwardly extending arm 36 to an intermediate portion of which is fastened the armature restoring spring 37. Armature 30 is biased to its normal position by spring 37 which holds arm 36 against a stud 14 projecting from the vertical mounting plate 84. Arm 36 also carries a shoulder 38 which on its upward travel due to armature attraction picks up an additional armature restoring spring 39.

Near its outer end arm 36 also carries a stud or pin 40 which projects through a slot 41 in a vertically arranged member 42 where the length of the slot in the direction of movement of arm 36 due to armature attraction is substantially greater than the diameter of pin 40. Extending between stud 40 on arm 36 and a stud 43 on member 42 is a coiled spring 44 for normally maintaining stud 40 in substantial engagement with the upper end of slot 41 whereby arm 36 and member 42 may be moved upwardly simultaneously but enabling the restoring of member 42 to its normal position to be delayed for a short time after armature 30 has been restored to normal. It will also be obvious that member 42 is free to pivot about pin 40 as an axis. This substantial engagement of pin 40 against the upper end of slot 41 is obtained by adjustment of the position of stud 14 against which arm 36 is biased by restoring spring 37.

Vertical member 42 also carries a small permanent bar magnet 45 the lower end of which lies centrally in the air-gap between the adjacent ends of arms 34, 35. When member 42 is raised vertically by armature attraction its upper end 46 is adapted to engage the lower arm 47 of an angular lever 48 to operate the spring pile-up as will be described later.

Suitably supported between spaced portions 49 and 50 of the bottom plate 51 of the coil supporting structure is a stationary rod 52 about which is rotatably mounted a framework (Fig. 12) comprising two cross-pieces 53, 54 which are centrally apertured to receive rod 52. These two cross-pieces are rigidly united by two spaced pins 55, 56 which lie on opposite sides of rod 52 with the two pins and the rod normally lying in a substantially horizontal plane as shown in Fig 10. The cross-bar 53 has an upwardly extending arm 57 terminating at its upper end in a fork 58 for receiving the coin vane pin 59 which projects through the arcuate slot 60 in the adjacent coin hopper side wall.

Depending arm 42 terminates in a cam type latch comprising a pair of spaced jaws 61, 62 which embrace the pins 55, 56 with pin 55 normally lying in a recess 63 and pin 56 normally lying in a recess 64 as shown in Fig. 10. Intermediate recesses 63, 64 the arm 42 has a hollowed-out portion 65 to avoid contact with stationary rod 52. These pins 55, 56 serve to hold arm 57 centered in its non-operative position, since the downward pull on stud 43 produced by spring 44 causes a downward thrust on arm 42 to normally maintain cam surfaces 63, 64 against pins 55, 56. These recesses 63, 64 are so positioned that when the pins 55, 56 are resting therein the arm 42 and its permanent magnet 45 are centrally located in the air-gap between arms 34, 35.

As shown in Figs. 2 and 3, the winding 26 of the electromagnet cannot be energized until spring contacts 66, 67 have been closed to connect one terminal of the winding 26 to ground. However, these contacts may be closed by the deposit of a coin in the collector. Any deposited coin before coming to rest on coin trap 17 strikes a coin trigger 68 and causes the coin trigger to move downwardly from its normal position of Fig. 3 to permit the passage of the coin after which the trigger assumes its coin actuated position of Fig. 6. A biasing spring 69 carrying a

stud 70 is normally prevented from closing contacts 66, 67 because its upper end 71 lies against coin trigger shoulder 72 as shown in Fig. 3. However, the coin actuation of trigger 68 lifts shoulder 72 out of the path of spring end 71 thereby allowing the biasing spring 69 to move freely to the left as seen in Fig. 6 to close the contacts. Thereafter and at the proper time a suitable switching means 73 at the central office (Fig. 2) may be actuated to connect either positive or negative battery to winding 26 depending upon whether coin collection or coin refund is desired.

Subsequent to coin deposit but prior to the energization of electromagnet 26 the various movable parts occupy their normal positions as shown in Fig. 4. But as soon as battery is applied to winding 26, armature 30 is attracted from its position of Fig. 4 to its position of Fig. 7 where its stud 74 lies against the adjacent framework of the relay. This armature movement lifts the depending arm 42 upwardly to free pins 55, 56 of the confining action of recesses 63, 64. As the upward movement of member 42 is initiated, permanent magnet 45 which lies in the stray magnetic field between pole extensions 34, 35 will be attracted towards arm 34 or arm 35 depending upon the polarity of the applied voltage. If the applied voltage is of one polarity arm 42 in moving upwardly is also moved counter-clockwise about its pivoting axis 40 as seen in Fig. 11 to bring the lateral recess 75 of jaw 61 into engagement with pin 55. With pin 55 in recess 75 the continuation of the upward movement of arm 42 due to armature attraction causes arm 42 to lift pin 55 upwardly and thrust pin 56 downwardly since with pin 55 embraced by recess 75 of jaw 61 the inner configuration of the opposing jaw 62 lies outside the downward path of pin 56. The completed relative movement of the framework comprising pins 55, 56 is shown in Fig. 11 for an applied voltage of one polarity and shows that the framework 53, 54 has been rotated clockwise through an angle of about 25 degrees.

On the other hand, if the applied voltage is such that the permanent magnet 45 is attracted towards pole extension 34 to bring pin 56 out of recess 64 and into the lateral recess 76 of jaw 62 the completion of the upward movement of arm 42 by armature attraction will cause recess 76 to lift pin 56 upwardly since the other pin 55 under the assumed conditions will be free of recess 75; and upon the completion of the combined clockwise and upward movement of arm 42 the pins 55, 56 will lie in an angular position just the reverse of that shown in Fig. 11, namely, the position occupied by these pins in Fig. 9. As previously stated, restoring spring 37 for the unoperated position of armature 30 holds the pins 55, 56 of framework 53, 54 in the recesses 63, 64 as shown in Fig. 10 so that coin vane 21 which is coupled to arm 57 of this framework by means of pin 59 cannot be moved in either direction to release trap 17 until the armature 30 has been operated.

It, therefore, follows that the structure which comprises cross-bars 53, 54 with the interconnecting pins 55, 56 will be moved clockwise or counter-clockwise about its axis 52 depending upon the polarity of the applied voltage; and since arm 57 is a part of this rotatable structure it follows that for an applied voltage of one polarity coin vane 21 will be moved counter-clockwise to its coin refunding position of Fig. 9 and for an applied voltage of the opposite polarity coin vane 21 will be moved clockwise to its coin collect position of Fig. 7.

It will be apparent from the showing of Fig. 10 that if arm 42 should be moved upwardly by armature attraction without any lateral movement the horizontal shoulders 77, 78 would strike pins 55, 56 simultaneously whereupon the upward movement would cease without producing any rotative movement of the vane controlling arm 57. But the arrangement of the parts is such, assuming a small initial upward movement of arm 42, that only a slight lateral movement of arm 42 in one direction or the other is needed to have only one of these cam surfaces 77, 78 contact with its associated pin thereby producing the desired rotative movement.

Regardless of the polarity of the applied voltage the resulting upward movement of arm 42 brings its upper end 46 into engagement with the horizontal arm 47 of an angular lever 48 which is pivoted about axis 79 thereby rotating lever 48 clockwise from its normal position of Fig. 6 to its advance position of Fig. 8. After coin deposit and before the electromagnet is energized, the counterweight 80 is restrained from restoring the coin trigger 68 to normal by reason of the fact that as shown in Fig. 6 the under-surface of shoulder 72 is resting on the horizontal tip 71 of the biasing spring 69. But the clockwise movement of angular lever 48 in changing from its position of Fig. 6 to its advanced position of Fig. 8 serves to cause a lateral movement to the right of the contact spring assembly a distance sufficient to free trigger shoulder 72 from the restraining action of spring end 71, whereupon trigger 68 is free to restore to normal although the closed condition of contacts 66, 67 is not disturbed by this lateral movement produced by the actuation of lever 48. In Fig. 8 it is assumed that the electromagnet is still energized with arm 42 maintained in its fully actuated poistion. As soon as the electromagnet has been deenergized, the downward movement of arm 42 allows the spring pile-up to move to the left until projection 71 again engages the vertical edge of shoulder 72 whereupon the electrical contacts 66, 67 may again assume their normal open position.

The pin and slot connection between arm 42 and armature extension 36 is primarily for improving operating conditions when the energizing voltage is applied to the relay for an abnormally short interval and is removed before the entire coin load has been discharged from the coin trap 17. If at the moment relay 26 is deenergized it is assumed that a coin is being discharged from the coin trap 17 it is obvious that coin vane 21 cannot be restored to its vertical position until such a coin has been fully discharged. Under the assumed conditions spring 37 is free to restore armature 30 to normal while arm 42 will remain in an elevated position with pin 40 sliding down to the bottom of slot 41 causing an elongation of the coiled spring 44. After the interfering coin has been discharged, spring 44 which, of course, is weaker than spring 37, will be free to complete the downward movement of member 42 to its position of Fig. 10 and in completing its downward movement jaws 61, 62 will force pins 55, 56 to assume their normal position in a horizontal plane, thereby causing vane 21 to again assume its normal vertical position underneath coin trap 17. The length of slot 41 is preferably such that arm 42 may remain in its elevated position with armature 30 restored to its normal unoperated position.

The time required for the complete discharge of a coin load from coin trap 17 is reduced by reason of the fact that in the embodiment shown it is not necessary to rely solely on the coin load to tilt the coin trap downwardly after the coin vane has been removed. Armature extension 36 has a lug 81 surrounded by a coiled wire 82, the free end 83 of the wire being bent outwardly towards the coin hopper to normally lie just below counterweight 19 of the coin trap as shown in Figs. 3 and 4. When the armature is attracted, spring finger 83 in being raised positively engages counterweight 19 to initiate the downward movement of the coin trap although as shown in Fig. 8 the counterweight 19 in its final operated position is out of engagement with projection 83.

If desired, the spring pile-up may comprise two normally closed spring contacts 85, 86 for short-circuiting the pulsing contacts of the calling dial 87 until a coin has been deposited. These contacts 85, 86 are biased to open position but are maintained closed as long as biasing spring 69 is restrained by coin trigger shoulder 72, since in this normal position stud 70 keeps spring 85 pressed against spring 86. Upon the actuation of the coin trigger 68 by coin deposit whereby the trigger is moved from its normal position of Fig. 3 to its operated position of Fig. 6, biasing spring 69 is free to move to the left thereby enabling spring 85 to move to the left due to its bias, and thereby remove the short circuit from the dial pulsing contacts. When the relay 26 is energized it is obvious from Fig. 8 that contacts 85, 86 are again closed and they remain closed upon the subsequent deenergization of the relay.

Spring contacts 66, 67 and 85, 86 are preferably mounted in a vertical position on a plate 84 which extends upwardly from the relay framework. If desired, a dust cover for the spring pile-up may be provided by a housing of which plate 84 forms a part. The cover shown in the drawings comprises a metal or fiber box-like structure comprising a top 88, parallel side walls 89 and 90, and end wall 91. Side wall 89 of the cover contains slots 92, 93 for receiving projections 94, 95 which project laterally from the vertical plate 84 while side wall 90 contains slots 96, 97 for receiving corresponding projections 98, 99 from plate 84. When it is desired to remove this cover the side walls 89, 90 may be sprung apart far enough to free their slots from the above-mentioned lugs after which the cover may be readily lifted to expose the spring pile-up for inspection or repair. If desired, side walls 89, 90 may extend laterally a substantial distance beyond the mounting plate 84 towards the coin hopper while the top wall 88 of the cover may have a similar extension 100.

What is claimed is:

1. In combination, an electromagnet having a core, an energizing winding for said core, a non-permanently magnetized armature mounted for movement about a substantially horizontal axis and having a laterally extending arm, a substantially vertically arranged arm, one of said arms having a slot, a pin on the other of said arms disposed within said slot, spring means for biasing said pin to one end of said slot to cause said arms to move substantially as a unit when said armature is moving from normal to attracted position while permitting said second arm to remain in its attracted position during the return of said armature to its normal position, a permanent magnet mounted on said vertically arranged arm, a rotatable member, and means actuated by said vertically arranged arm for rotating said member in a direction dependent upon the polarity of the voltage applied to said winding.

2. In combination, an electromagnet having a core, a winding for said core, a non-permanently magnetized armature mounted for movement about one axis adjacent said core, said armature having a lateral extension adapted to be elevated when said armature is moved to attracted position, a restoring spring for said armature, a substantially vertically arranged arm carrying a permanent magnet located in the field of said electromagnet, said arm at a point intermediate its length having an elongated slot, a pin on said extension projecting into said slot and spring means connected between said pin and a point on said arm above said pin for biasing said pin against the upper end of said slot, said spring means being weaker than the restoring spring for said armature, said slot being of sufficient length to permit said arm to remain in its elevated position when said armature is in its normal position.

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