June 2, 1942. J. M. MELICK 2,284,755

COIN COLLECTOR APPARATUS

Original Filed Jan. 11, 1940 4 Sheets-Sheet 1

FIG. 1

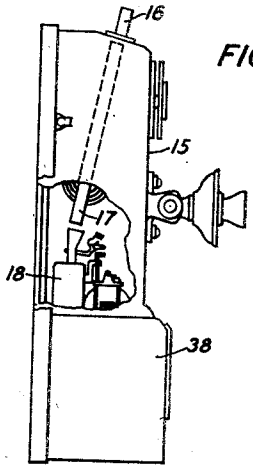

FIG. 2

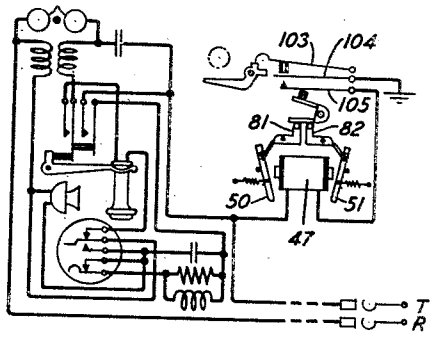

FIG. 3

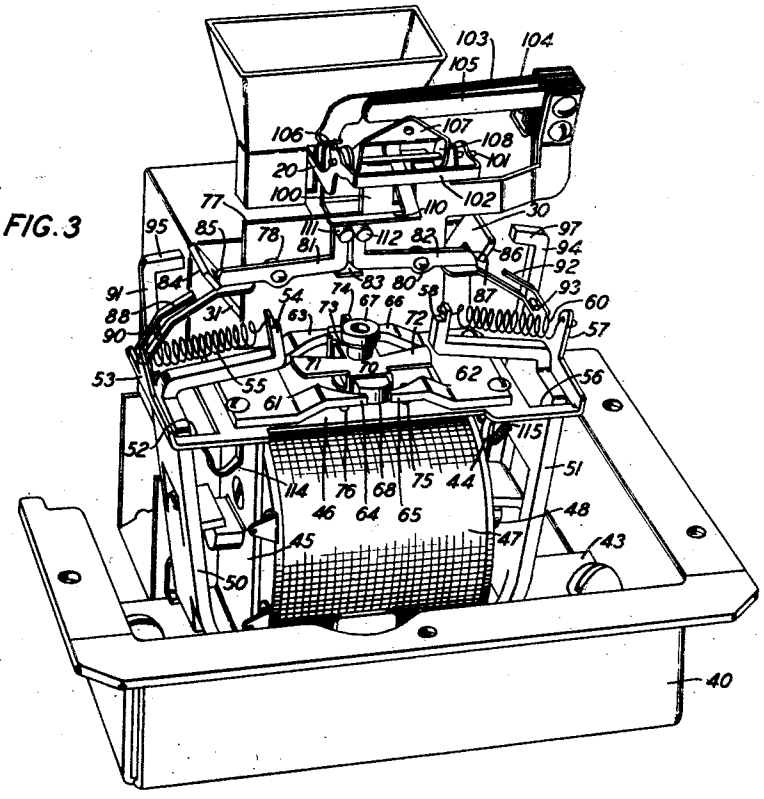

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FIG. 5

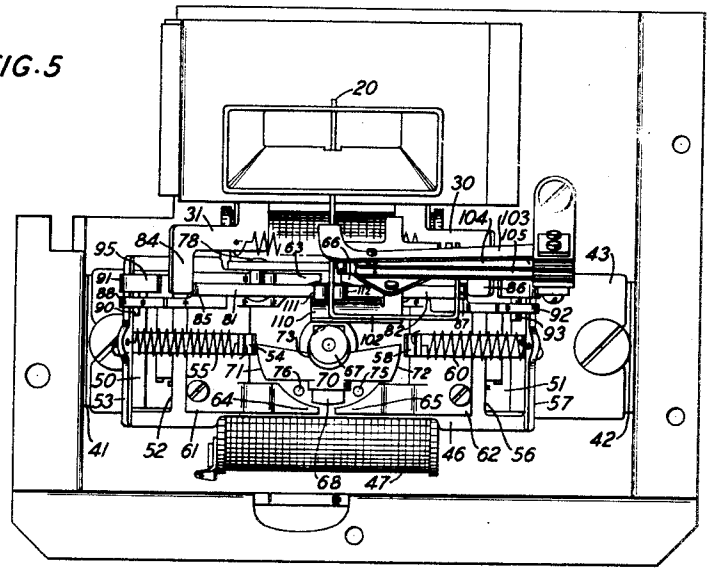
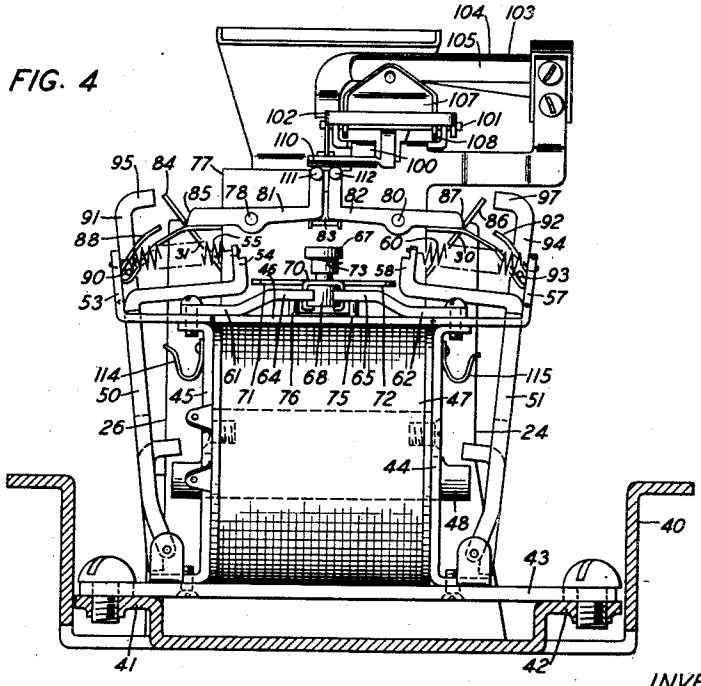


FIG. 4



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COIN COLLECTOR APPARATUS

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FIG. 6

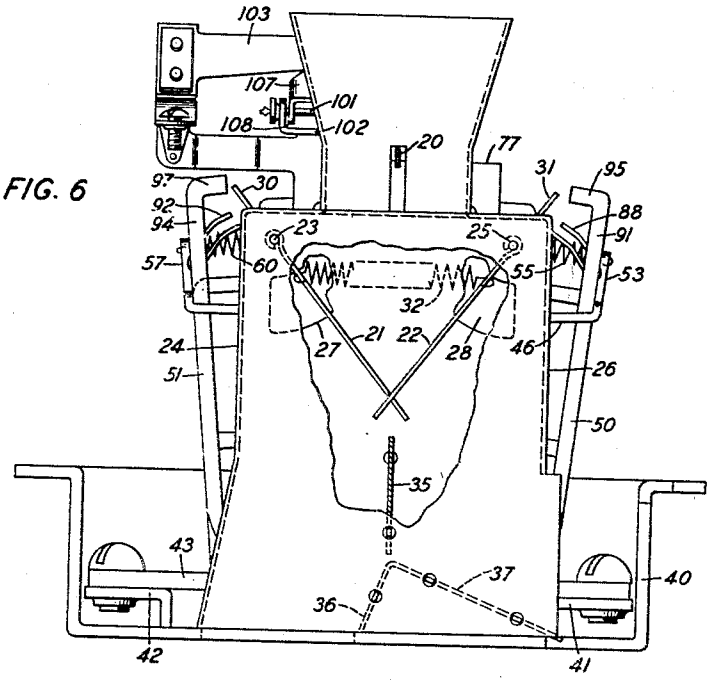


FIG. 7

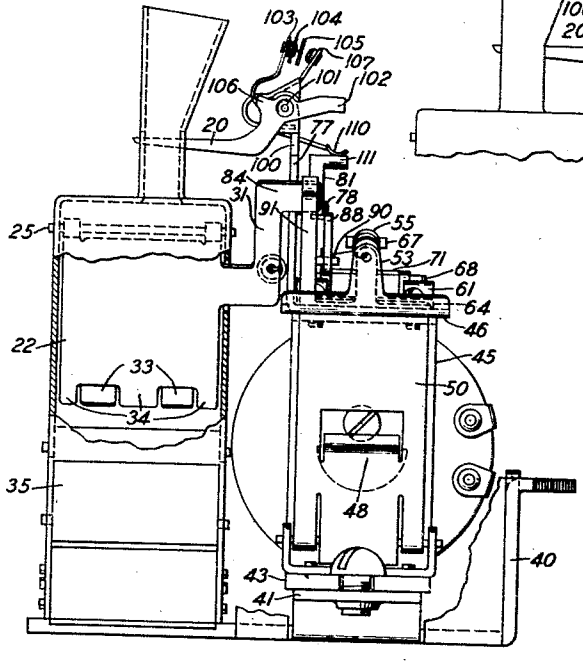


FIG. 11

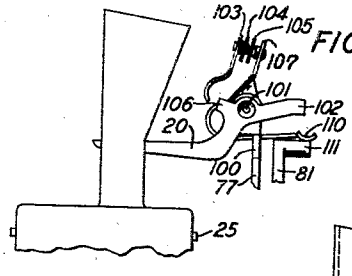
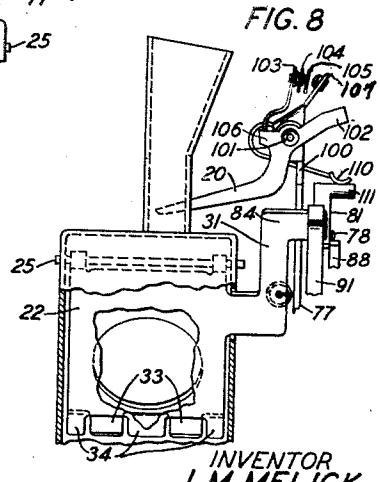


FIG. 8



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COIN COLLECTOR APPARATUS

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FIG. 10

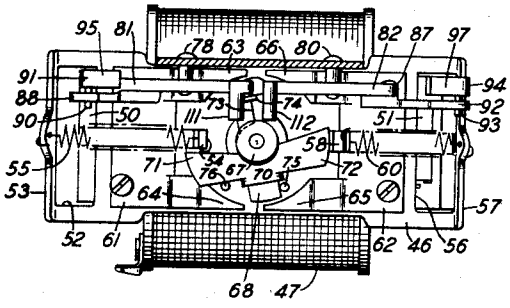


FIG. 13

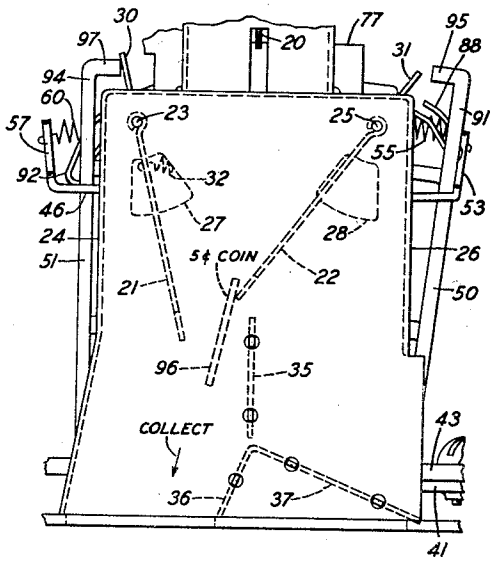


FIG. 9

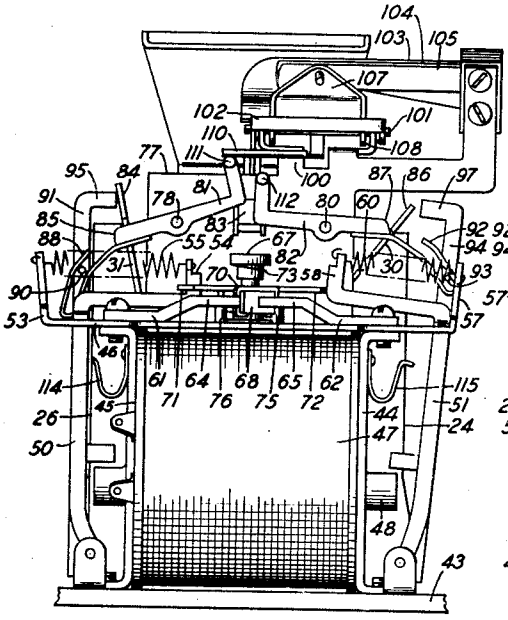
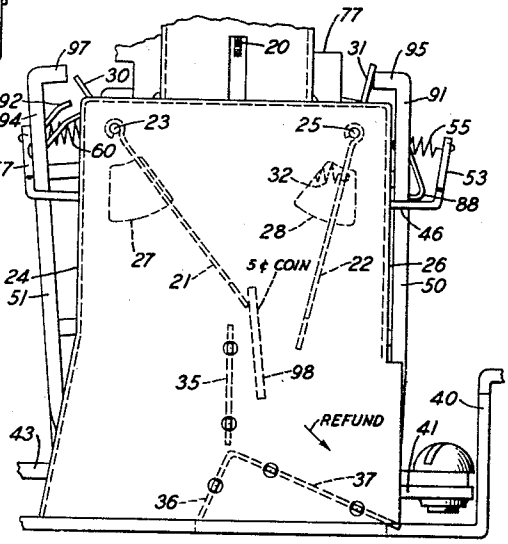


FIG. 12



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Patented June 2, 1942 2,284,755

UNITED STATES PATENT OFFICE

2,284,755

COIN COLLECTOR APPARATUS

John M. Melick, Cresskill, N. J., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York

Original application January 11, 1940, Serial No. 313,329. Divided and this application September 24, 1940, Serial No. 358,063

6 Claims. (Cl. 175—339)

This invention relates to coin collection apparatus in which a coin or token is deposited for the use of an instrument; and this application constitutes a division of my application Serial No. 313,329, filed January 11, 1940, on Coin collector apparatus which issued on August 26, 1941 as Patent 2,253,863.

The invention is particularly suitable for use in a telephone pay station of the general type illustrated in the O. F. Forsberg U. S. Patent 1,043,219, issued November 5, 1912, wherein a deposited coin is temporarily held upon a coin trap after the coin has actuated a trigger to close electrical contacts for the purpose of signaling the central office and for the additional purpose of establishing an energizing circuit for a coin relay. Thereafter, battery at the central office may be applied to the line to energize the relay whose armature serves to release the coin trap to direct the coin into a collect chute if the applied voltage is of one polarity, and to direct the coin into a refund chute if the applied voltage is of the opposite polarity. The operation of the relay also serves to restore the coin trigger to normal to reopen the electrical contacts controlled thereby.

An object of this invention is to provide an improved coin handling mechanism of efficient and positive operation. A further object is an improved electromagnet capable of being selectively operated in accordance with the polarity of the voltage applied thereto.

In accordance with the preferred embodiment of the invention as applied to coin collectors, the deposited coins are held in suspense on a coin trap comprising two downwardly inclined vanes pivoted at their upper ends, with the lower ends engaged to form a V-shaped coin supporting surface, with the junction of the two vanes lying immediately above a partition which separates a collect chute from a refund chute. Improved relay means are provided effective upon the application of collect current to move only that vane lying above the collect chute to a substantially vertical position whereby the deposite coins are directed into the collect chute; while upon the application of refund current the relay moves the vane above the refund chute to a substantially vertical position to permit the deposited coin to drop into the refund chute.

The preferred coin relay construction comprises a solenoidal winding having a pivoted armature at each end of the core. Mounted adjacent the winding is a rotatable member carrying a permanent magnet located between polar extensions of the core whereby the application of energizing current to the winding causes a rotation of said member in a direction dependent upon the polarity of the applied voltage. The said member is biased to a normal position where projections such as lugs on said member prevent the movement of both armatures to their attracted positions, but the rotation of said member in a given direction releases one of said armatures and prevents the operation of the other armature so that one armature is operated for applied voltage of one polarity and the other armature is operated for applied voltage of the opposite polarity. Each of the two above-mentioned vanes in the coin hopper is individually controlled by one of these armatures for permitting the collection of deposited coins when one armature is operated and for refunding the deposited coins when the other armature is operated.

The energizing circuit for the coin relay just described is preferably established by electrical contacts which are closed by the operation of a coin trigger located in the coin hopper above the coin trap. If energizing current has been applied to the relay the operated armature also serves to restore the coin trigger to normal to insure the reopening of these contacts at the proper time.

Other features of the invention will be apparent from the following detailed description taken in connection with the accompanying drawings in which:

Fig. 1 is a side view of a telephone coin collector embodying the present invention;

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

Fig. 3 is a view in perspective of the coin handling mechanism of this invention;

Fig. 4 is a front view of the coin relay and associated coin hopper of Fig. 3;

Fig. 5 is a top view of the apparatus of Fig. 4;

Fig. 6 is a rear view of the apparatus of Fig. 4;

Fig. 7 is a side view partly in section of the apparatus of Fig. 4;

Fig. 8 is a side view of a portion of the apparatus of Fig. 7 with the coin trigger in coin operated position;

Fig. 9 is a view of the apparatus corresponding to that of Fig. 4 except that one of the armatures of the relay is shown in attracted position;

Fig. 10 is a top view of the apparatus of Fig. 9 except for the omission of the electrical spring pile-up;

Fig. 11 is a side view of the coin trigger mechanism for the operated condition of Fig. 9;

Fig. 12 illustrates the position of the coin trap when one of the relay armatures is operated; and

Fig. 13 illustrates the position of the coin trap when the other relay armature is operated.

Mounted upon the upper housing 15 of the coin collector of Fig. 1 is a coin gauge 16 for receiving coins of various denominations and for directing them into individual channels of a multi-coin chute 17 where they selectively actuate suitable sound signals before dropping into the mouth of a coin hopper 18. The first deposited coin upon reaching the coin hopper actuates a coin trigger 20 and then is temporarily held in suspense within the hopper for subsequent collection or refund depending upon whether or not the desired telephone connection is established.

As shown particularly in Fig. 6, the coin hopper mechanism of this invention contains two vanes 21, 22 which together constitute a coin supporting means for all coins deposited in the hopper. Vane 21 is pivotally supported from a pin 23 extending between the front and rear walls of the hopper adjacent hopper side wall 24, while vane 22 is pivotally supported from a pin 25 extending between the front and rear walls of the hopper adjacent the opposite side wall 26. The front wall of the hopper has two spaced apertures 27 and 28 through which project formed extensions or arms 30, 31 of vanes 21, 22. Arms 30, 31 externally of the hopper are joined by a coiled spring 32 to maintain the two vanes in a normal position with their lower ends engaging each other. Preferably, and as shown in Fig. 7, the lower end of vane 21 has spaced projections 33 which are adapted to fit into slots between the spaced projections 34 on the lower end of vane 22 so that normally the lower ends of the two vanes overlap each other as shown in Fig. 6.

Extending between the front and rear walls of the hopper in the lower portion thereof is a vertical partition 35 for providing two separate coin channels, channel 36 leading to the cash box in the lower housing 38 of the collector of Fig 1, and channel 37 leading to a refund opening in the front wall of the lower housing 38. Preferably, partition 35 lies in a vertical plane which also contains the contacting edges of the two vanes 21, 22 as will be seen from Fig. 6. In order that a coin held by these vanes may be collected, vane 22 should be held stationary and vane 21 moved downwardly substantially to the position of Fig. 13 to enable the coin to drop into collect channel 36; while in order that the coins may be refunded, vane 21 should be held stationary and vane 22 moved downwardly substantially to the position shown in Fig. 12, to enable the coin to drop into the refund channel 37.

The relay construction by means of which the two vanes 21, 22 may be selectively actuated will now be described particularly with reference to Figs. 3, 4 and 5. The mechanism tray 40 forming the top for the lower housing 38 supports not only the coin hopper 18 but in front of the coin hopper supports the coin relay and associated mechanism. The bent-up lugs 41, 42 from the bottom of the tray support a plate 43 upon which is mounted a non-magnetic frame structure comprising two vertical members 44, 45 joined at their upper ends by a horizontal plate 46. Suitably fastened within this framework is a solenoidal winding 47 surrounding a magnetic core 48 the ends of which project beyond the frame members 44, 45. Pivotally mounted from base plate 43 near the ends of core 48 are two armatures, a refund armature 50 and a collect armature 51. Plate 46 of the framework extends beyond both ends of coil 47 and armature 50 works in a slot 52 of one of these extensions, the walls of said slots serving as stops to determine the attracted and non-attracted positions of armature 50. Similarly, armature 51 works in a slot 56 in the other of these plate extensions and the walls of slot 56 serve as stops to determine the attracted and non-attracted positions of armature 51. The upturned tab 53 of plate 46 and the armature extension 54 are connected by the armature restoring spring 55 to bias armature 50 against the outer edge of slot 52 in the non-operated condition. Also, the upturned tab 57 of plate 46 and the armature extension 58 are connected by an armature restoring spring 60 to bias armature 51 against the outer edge of slot 56 in its non-operated condition.

Frame member 46 also supports two members 61, 62 of magnetic material having spaced prongs 63, 64 and 65, 66 which form pole-pieces for the armature lock. Since these members 61, 62 are in the magnetic field of winding 47 it follows that for a current applied to winding 47 these two members 61, 62 will be magnetized with prongs 63, 64 of one polarity and prongs 65, 66 of the opposite polarity, their particular polarity depending upon the direction of current flow through winding 47. Plate 46 also acts as a support for a stationary vertical pin having a cap 67 and rotatably mounted on this pin is a permanent bar magnet 68 one end of which is adjacent pole-pieces 63, 66 and the other end of which is adjacent pole-pieces 64, 65. Rigidly mounted on permanent magnet 68 for rotation therewith is a plate 70 of non-magnetic material having two laterally disposed arms or lugs 71, 72 which normally form an armature lock. Magnet 68 is biased to a normal position (Fig. 3) by means of a spring 73 extending between the stationary cap 67 and upturned lug 74 on one end of plate 70.

As long as magnet 68 remains in its neutral position of Figs. 3 and 4 neither armature can be moved to its attracted position since armature 50 after only a small movement is stopped when its arm 54 engages lug 71, and since armature 51 after only a small movement is stopped when its arm 58 engages lug 72. However, when a current traverses winding 47 prongs 63, 64 become of one polarity and prongs 65, 66 become of the opposite polarity, thereby creating a magnetic field reacting upon the permanent magnet to cause its rotation in a clockwise or counter-clockwise direction depending upon the direction of current flow through winding 47. For example, in Fig. 10, this magnetic reaction has caused a counter-clockwise rotation of magnet 68 to an advanced position determined by the bar magnet engaging a stop 75 in which position lug 71 has been moved out of the path of armature extension 54 although the other lug 72 still is effective to prevent the movement of armature 51 to attracted position. Hence, with bar magnet 68 in the position of Fig. 10 only armature 50 can be moved to its fully attracted position. It is also obvious from Fig. 10 that with current flowing through winding 47 in the opposite direction magnet 68 would be rotated in a clockwise direction to an advanced position determined by the stop 76 in which position lug

72 would lie out of the path of armature extension 58 to permit the fully attracted movement of armature 51 while lug 71 would still be effective to hold armature 50 in its non-attracted position.

There has just been described the selective manner in which armature 50 will be fully actuated when voltage of one polarity is supplied to winding 47, while armature 51 will be fully actuated for an applied voltage of the opposite polarity. It will now be explained how this selective actuation of the two armatures is utilized to collect or refund any coin supported by the two vanes 21, 22 within coin hopper 18.

Plate 46 adjacent coin hopper 18 has an upturned portion 77 which supports two spaced pivots 78, 80 for two angular levers or vane latches 81, 82. The normal position of these levers is shown in Figs. 3 and 4 with both levers resting on a stop 83 formed out of plate portion 77. The lateral extension 84 of vane arm 31 normally engages a shoulder 85 on lever 81 to hold vane 21 in coin supporting engagement with vane 22 while the lateral extension 86 of vane arm 30 normally engages a shoulder 87 on lever 82 to hold vane 22 in coin supporting engagement wtih vane 21. Therefore, as long as levers 81, 82 are in their normal positions the two vanes 21, 22 are independently locked in coin supporting position, with each vane completely closing one of the lower coin channels 36, 37.

In order that each lever 81 or 82 may be independently actuated by one of the armatures, it will be noted that lever 81 has a downwardly inclined U-shaped portion 88 embracing a pin 90 on armature extension 91 and similarly lever 82 has a downwardly inclined U-shaped portion 92 embracing a pin 93 on armature extension 94. If we assume an applied voltage to winding 47 of such a polarity as to move bar magnet 68 to a position releasing armature 50, but not armature 51, the resulting attraction of armature 50 will cause pin 90 to engage the inner arm of the U-shaped extension 88 to move lever 81 counter-clockwise as viewed in Fig. 3 to an advanced position shown in Fig. 9 whereby lever shoulder 85 is dropped below vane arm extension 84 to unlock vane 22 while the positive movement of vane 22 to its coin discharging position of Fig. 12 is insured by reason of the fact that armature 50 in moving to its fully attracted position causes the horizontal arm 95 of armature 50 to positively engage vane arm 84 and force vane 22 from its normal position of Fig. 6 to its coin discharging position of Fig. 12. That is, the full actuation of armature 50 not only unlocks vane 22 but after unlocking supplies positive means for forcing vane 22 to a substantially vertical position where vane 22 remains as long as energizing current traverses the relay winding 47. However the weight of the deposited coin or coins on vanes 21, 22, will generally be sufficient to move the released vane 22 to coin discharging position, so that the coin discharging operation generally begins before arm 95 of armature 50 has engaged vane arm 84. It is, therefore, obvious from Figs. 9 and 12 that any coin or coins held in suspense in the coin hopper 18 will be refunded whenever armature 50 is actuated since the consequent release of vane 22 allows the coins to drop in the refund channel 37 while the fact that vane 21 remains in its normal position insures that the entrance to collect channel 36 will remain closed under the assumed conditions illustrated in Fig. 12, where the position of vane 21 is the same as in Fig. 6. The path taken by a coin when vane 22 is unlocked is shown by the five-cent coin 98 of Fig. 12.

If, on the other hand, it is assumed that the voltage applied to winding 47 is of the opposite polarity whereby armature 51 but not armature 50 is released for movement to attracted position, armature pin 93 will engage the inner arm of the U-shaped member 92 to move lever 82 clockwise as viewed in Fig. 3, to an advanced position corresponding to that shown for lever 81 in Fig. 9 whereby shoulder 87 is dropped below vane arm extension 86 to unlock vane 21, after which armature extension 97 positively engages vane arm 86 to force vane 21 from its normal position of Fig. 6 to its coin discharging position of Fig. 13, thereby permitting the suspended coin 96 to fall into the collect channel 36, since it will be apparent under the assumed conditions that the other vane 22 will remain locked in its normal position completely closing the entrance to the refund channel 37.

In telephone collectors of the prepay type it is preferable to have the relay winding or windings in circuit with a pair of normally open electrical contacts which are closed upon coin deposit and reopened when the relay is operated due to either collect or refund current. The manner in which these operations are performed by the mechanism of this invention will now be described.

Vertical plate portion 77 has an extension 100 supporting a pivoting pin 101 for the coin trigger 20 whose counterweight 102 normally maintains the trigger in a substantially horizontal position across the throat of the coin hopper 18 as shown in Fig. 7. Another extension of plate portion 77 supports an electrical spring pile-up comprising a biasing spring 103 and two electrical spring contacts 104, 105. Electrical contacts 104, 105 are normally biased to open position as shown in Fig. 2 but are adapted to be closed upon coin deposit. As shown in Fig. 7 the free end of biasing spring 103 normally engages the side edge of the trigger shoulder 106 to prevent spring 103 from closing the contacts. However, when a coin is deposited the coin operates the trigger from its normal position of Fig. 7 to its operated position of Fig. 8, thereby dropping shoulder 106 below the end of spring 103 to permit spring 103 to force spring contacts 104, 105 together and against the vertical arm 107 of a trigger restoring lever 108 which is pivoted on the same pin 101 as the coin trigger. It also may be noted that with the parts in the position of Fig. 8 and before the relay is energized the free end of spring 103 rests on the upper edge of trigger shoulder 106 to temporarily prevent the restoration of trigger 20 by its counterweight 102. Trigger restoring lever 108 has a downwardly extending arm 110 which normally rests on top of two studs 111, 112 carried, respectively, by the two armature controlled levers 81, 82. Whenever relay winding 47 is energized to rotate either one of the levers 81, 82 the consequent upward movement of either stud 111 or 112 will cause an counter-clockwise rotation (as viewed in Fig. 8) of the trigger restoring lever 108 to cause vertical piece 107 to engage the spring contact 105 and move the spring pile-up towards the coin hopper a distance sufficient to free trigger shoulder 106 from the end of spring 103, in which position the spring pile-up will be maintained as long as relay winding 47 is ener-

gized. This advanced position of the spring pile-up as shown in Fig. 11, therefore, enables the coin trigger 20 to be restored to its normal position of Fig. 7 due to its counterweight 102, so that the subsequent deenergization of relay winding 47 in lowering the advanced stud 111 or 112 will permit the spring pile-up to assume its normal position of Fig. 3 with the end of spring 103 held by trigger shoulder 106 to allow contacts 104, 105 to reopen.

The operation of applicant's mechanism has been described in connection with each component part but it seems advisable to briefly describe the operation in a more chronological manner. A deposited coin upon entering coin hopper 18 operates coin trigger 20 to release spring 103 to close contacts 104, 105 (Fig. 8) to signal the central office by closing a circuit to ground through the winding of relay 47. After actuating coin trigger 20 the coin is held suspended on the two-part coin trap 21, 22 of Fig. 6. Assuming the desired telephone connection is obtained, thereby requiring the collection of the deposited coin, equipment at the central office supplies collect current to relay winding 47 to rotate permanent magnet 68 clockwise as viewed in Fig. 3 to permit armature 51 to be fully attracted. Armature 51 in pulling up will rotate lever 82 clockwise to unlock vane 21 from lever shoulder 87 to permit vane 21 under the coin load to move from its position of Fig. 6 to its position of Fig. 13 to discharge the coin into collect channel 36. The attraction of armature 51 in moving upwardly stud 112 on lever 82, rotates the trigger restoring lever 108 to cause the spring pile-up to be moved as a unit towards the coin hopper from its position of Fig. 8 to its position of Fig. 11, thereby freeing coin trigger 20 from the retraining action of spring 103 to permit the trigger to be restored to normal. Hence, when relay 47 is deenergized all parts are restored to normal as in Fig. 3 with the contacts 104, 105 in open condition.

In the event that it is desired to refund the deposited coin, refund current is applied to relay winding 47 with the applied voltage of such polarity that permanent magnet 68 is rotated counter-clockwise to permit armature 50 to be moved to its fully attracted position. Armature 50 in pulling up will rotate lever 81 counter-clockwise to unlock vane 22 from lever shoulder 85 to permit vane 22 to move from its position of Fig. 6 to its position of Fig. 12 to enable the coin to be discharged into the refund channel 37. The attraction of armature 50 in moving upwardly stud 111 on lever 81 rotates the trigger restoring lever 108 in the same manner as described above to restore the coin trigger to normal and reopen contacts 104, 105.

The above-described mechanism presents several advantages, particularly in giving protection against attempted fraudulent operation of the collector. Normally, the armature lock 71, 72 prevents both armatures 50, 51 from moving to their fully attracted positions and the vanes 21, 22 in the coin hopper are likewise held locked by the vane latches 85, 87. It is a customary condition for telephone coin collector relays of the type disclosed in the above-mentioned Forsberg patent that they should not operate for an applied voltage of 40 volts or less, and in the mechanism of the present invention the armature restoring springs 55 and 60 are designed to prevent the armatures from starting to operate for an applied voltage of 40 volts although permitting operation on a somewhat higher voltage. For example, in one embodiment of this invention where the restoring springs 55 and 60 were tensioned so that the relay would not operate on 41 milliamperes the relay would operate at 44 milliamperes with any load on the coin vanes 21, 22 from zero to eleven nickels, would release on 33 milliamaperes in the collect direction and 36 milliamaperes in the refund direction. In applicant's invention the spread between the operate and release values is kept small because only one armature operates at a time and there always remains the air-gap between the armature and the pole-piece on the other side. This results in less difference in the total reluctance of the magnetic circuit in the normal and operated positions so that there is not as much counteraction to the effect of any change in ampere turns with changes in amplitude of operating current applied to the relay. The difference between the operate and release values is also made less by the use of the two springs 114, 115 (Fig. 4) which are compressed near the end of armature travel, adding to the tension of springs 55, 60 at the very end of the armature stroke when the air-gap is a minimum. It should be noted that preferably small clearances are provided between the armature parts 54, 58 and the armature locking lugs 71, 72 so that upon the application of collect or refund current these locking lugs 71, 72 which are of non-magnetic material are free to swing to their fully operated position before the flux in either armature is built up sufficiently to overcome the tension of the armature restoring springs.

The biasing spring 73 serves to center the bar magnet 68 when no current is flowing through the coil 47 and also tends to resist rotation of magnet 68 so that the locking lugs 71, 72 do not get completely out of the way of either armature until the current through coil 47 is greater than the usual talking and signaling current encountered in the field, which is normally less than 15 milliamperes.

It should be noted that with the armatures in their non-operated positions each vane latch 88, 92 curves around the armature pins 90, 93 so that each vane latch 88 or 92 cannot move downwardly until its armature has been moved inwardly towards the relay winding. This prevents the coin vanes 21, 22 from operating due to the weight of the coins and also prevents either vane latch from being jarred open by any blows on the collector housing. Since each armature is normaly prevented from moving by the armature lock 71, 72 it is obvious that the vanes 21, 22 in the hopper, the vane latches 88, 92 and the armatures 50, 51 are all locked up and cannot be moved until operating current is applied to the relay winding 47 to release the lock for one of the armatures.

Another desirable feature of applicant's invention relates to the prevention of fraudulent operation of the electrical spring contacts. As shown in Fig. 8 it is evident that the cam surface of trigger shoulder 106 facing the coin hopper has a rising contour to prevent the trigger 20 from being accidentally jarred down. In the above mechanism there is also little chance that the operating voltage supplied from the central office to relay winding 47 could be for such a duration as to permit the trigger 22 to be restored to normal without disposing of the coins in the coin hopper, this being due to the fact that each coin vane is released at the beginning of arma-

ture travel, the coin trigger is restored at the end of armature travel and the coin vanes present a steeply inclined supporting surface from which the coins will be discharged quickly.

While the preferred embodiment of applicant's invention has been described above, it is to be understood that alternative arrangements are contemplated commensurate with the scope of the appended claims.

What is claimed is:

1. An electromagnet comprising a winding, a core for said winding, a rotatable member comprising a permanent magnet lying in the field of said electromagnet and adapted to rotate to an advanced position in a clockwise or counter-clockwise direction determined by the polarity of the voltage applied to said winding, means for biasing said member to a neutral position in the absence of applied voltage, a pair of independently movable armatures for said electromagnet, and means carried by said member normally acting as a mechanical barrier to the movement of each armature from its non-operated position to its attracted position, said means when said rotatable member is in one of its advanced positions releasing one of said armatures while maintaining the other armature locked in its non-operated position, said means when said rotatable member is in the other of its advanced positions releasing the second armature while maintaining the first armature locked in its non-operated position.

2. An electromagnet comprising a winding, a core for said winding, a rotatable member comprising a permanent magnet lying in the field of said electromagnet and adapted to rotate to an advanced position in a clockwise or counter-clockwise direction determined by the polarity of the voltage applied to said winding, means for biasing said member to a neutral position in the absence of applied voltage, a pair of independently movable armatures for said electromagnet, and means carried by said member and comprising a mechanical barrier normally lying in the path of movement of each armature for locking both armatures in their non-operated position when said member is in its neutral position and for selectively releasing one of said armatures in accordance with the polarity of the applied voltage when said member has assumed an advanced position.

3. An electromagnet comprising a winding, a core for said winding, a rotatable member comprising a permanent magnet lying in the field of said electromagnet and adapted to rotate in a direction determined by the polarity of the voltage applied to said winding, stops for determining the extent of clockwise or counter-clockwise rotation of said member, a pair of independently movable armatures for said electromagnet, means carried by said member effective when said member is in neutral position to interpose a mechanical barrier in the path of movement of each armature for locking both armatures in their non-operated positions, effective when said member is in its maximum clockwise position to release one of said armatures and to hold the second of said armatures, and effective when said member is in its maximum counter-clockwise position to release said second armature and to hold said first armature.

4. An electromagnet comprising a winding, a core for said winding, a pair of independently movable armatures for said winding, and means comprising a permanent magnet rotatably mounted in the field of said electromagnet for interposing a mechanical barrier in the path of movement of each armature for normally locking both of said armatures in their non-operated positions for zero current in said winding, for unlocking one of said armatures for a voltage of one polarity applied to said winding, and for unlocking the second of said armatures for a voltage of the opposite polarity applied to said winding.

5. An electromagnet comprising a solenoidal winding, a core within said winding, an armature pivoted adjacent one end of said winding, a second armature pivoted adjacent the opposite end of said winding, and means comprising a permanent magnet rotatably mounted in the field of said electromagnet for interposing a mechanical barrier in the path of movement of each armature for normally locking both of said armatures in their non-operated positions for zero current in said winding, for unlocking one of said armatures for a voltage of one polarity applied to said winding, and for unlocking the second of said armatures for a voltage of the opposite polarity applied to said winding.

6. An electromagnet comprising a winding, a core for said winding, a pair of independently movable armatures pivoted adjacent the opposite ends of said winding for movement towards said winding when a voltage is applied to said winding, a rotatable member biased to a normal position and having a lug normally occupying a position to be engaged by said first armature to prevent movement of said armature to its fully attracted position, said member having a second lug normally occupying a position to be engaged by said second armature to prevent movement of said second armature to its fully attracted position, said member in one advanced position freeing said first armature of said first lug while maintaining said second lug in armature restraining position, said member in a second advanced position freeing said second armature of said second lug while maintaining said first lug in armature restraining position, and means selectively controlled by the polarity of the voltage applied to said winding for moving said member to one of said advanced positions.

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