April 3, 1934. W. K. KLOSE 1,953,414

SHADED POLE ELECTRIC COIN SELECTOR

Filed March 7, 1932

FIG. 1

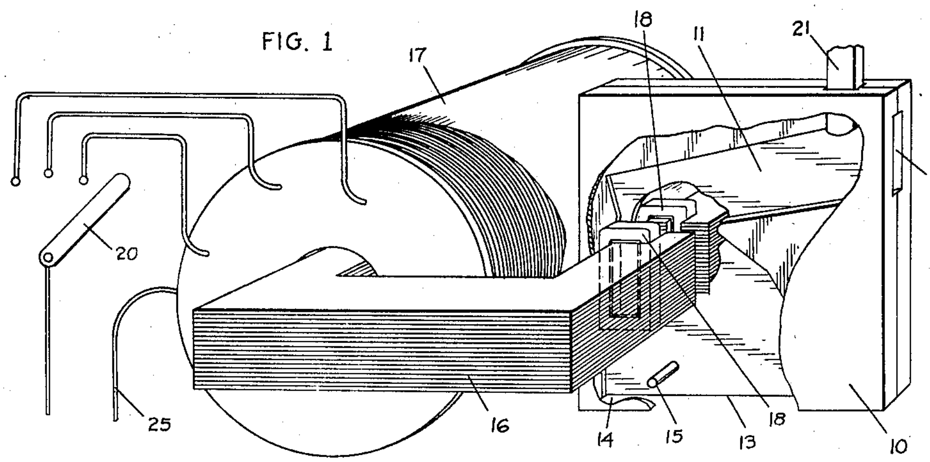


FIG. 6

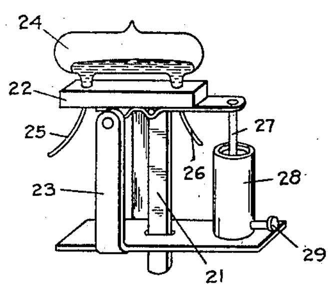


FIG. 3

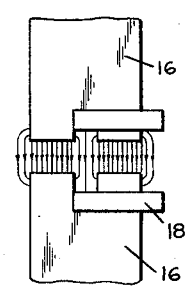


FIG. 4

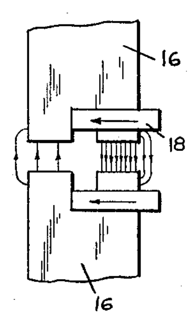


FIG. 5

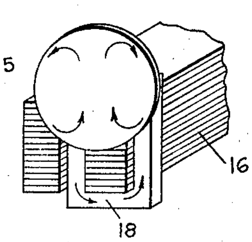
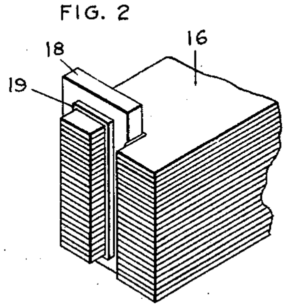


FIG. 2



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Patented Apr. 3, 1934 1,953,414

UNITED STATES PATENT OFFICE

1,953,414

SHADED POLE ELECTRIC COIN SELECTOR

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Application March 7, 1932, Serial No. 597,314

9 Claims. (Cl. 194—101)

My invention relates to electric coin selectors, its primary object being the provision of a device for conducting coins through a magnetic field for the purpose of accepting some coins and rejecting others.

Another of my objects is to provide a rotating magnetic field through which the coins are to be passed so that various directional impulses will be imparted to the coins, depending on the metal of which the coins consist.

Another of my objects is the provision of a coin chute with an abutment below the coin chute so positioned that the coin will fall onto the abutment at one side or the other of its vertical center line so that it must roll off in one direction or the other, the different directional impulses having been imparted to the coins before they reach this abutment.

Another of my objects is the provision of a coin selector having means for adjustment to coins of various metals and alloys in accordance with the resistivity and the weight of the metal or alloy.

Another of my objects is the provision of a time switch which, on the insertion of a coin, turns on the current and which automatically turns off the current after a predetermined time interval, the switch being adjustable to different time intervals.

Another of my objects is to provide a rotating magnetic field between the poles of a single phase alternating current electromagnet by means of shading coils surrounding portions of the pole pieces.

Having in view these objects and others which will be pointed out in the following description, I will now refer to the drawing, in which

Figure 1 is a view in perspective and partly diagrammatic of my coin selector, parts being broken away to disclose parts which would otherwise be concealed.

Figure 2 is a view in perspective of an end fragment of one of the pole pieces of the electromagnet, showing particularly the position and nature of the shading coil.

Figure 3 is a diagrammatic view of the pole pieces showing the shading coils in position and indicating the lines of force in the magnetic field when the primary circuit is at its highest intensity.

Figure 4 is a view similar to Figure 3 but showing the opposite directions of the lines of force between the shaded portions of the poles and the unshaded portions at the moment when a directional change of the flow in the primary circuit has taken place and when this current is still at its minimum intensity.

Figure 5 is a view in perspective of an end fragment of the electromagnet and of the shading coil and showing a metal disk in the magnetic field and showing also the direction of the induced eddy currents in the shading coil and the disk.

Figure 6 is a view in perspective of the time switch mechanism.

For receiving, conducting and discharging the coins, I provide a member 10 having a downwardly and rearwardly inclined chute 11 with a mouth at 12 and with a forward outlet 13 and a rearward outlet 14. The member 10 is made from a suitable dielectric, this being in the present instance in the form of two plates which are so grooved that the passageway 11 is formed between them when the plates are secured together. A coin introduced into the mouth 12 will naturally roll down the downwardly and rearwardly inclined chute 11 until it strikes the back wall of that chute. At this point it bounces very slightly due to the elasticity of the metal and of the material of the member 10 and it then falls downwardly into the open space in the lower portion of the member 10.

The pin 15 is positioned in the direct path of the falling coin but it is slightly offset from the vertical center line of the falling coin. Its position is such that the preponderance of weight of the coin is to the front of the pin 15. This insures that the coin will fall through the outlet 13. The problem of coin selection thus resolves itself into giving the desired coin a distinct rearward impulse so that when it strikes the pin 15, the preponderance of weight will be on the rear side of the pin 15, coins of other metals or alloys being not responsive to that impulse. A coin which is thus selected must fall through the opening 14.

The invention herein described must, however, not be confused with those coin selectors which depend for their operation on the elasticity of the coin or with those coin selectors which depend on the retarding action of a magnetic field on a coin passing through this field. It is true that the bouncing effect of the coin must be taken into consideration in the design of the machine but this invention makes no use of this property for the selection of the coins.

The walls of the member 10 are provided with apertures for the reception of the poles of an electromagnet 16 which is energized by a coil 17. The magnet is in laminated form and is built up from metallic sheets having high permeability, low remanence, small coercive force and high resistivity. The sheets are insulated from each other as by varnish between the layers.

The two poles of the magnet project through the walls of the body 10 but they are spaced a sufficient distance to permit the passage of coins between them. The coil 17 is adapted to be plugged into the ordinary commercial lighting system having an alternating current.

The electromagnet as so far described is a single phase magnet which produces an oscillating magnetic field between its poles, and though this magnetic field is of considerable intensity, its action on a coin passing between its poles is none other than the original discovery of magnetic induction made by Faraday, namely that any metallic conductor passing through a magnetic field of high intensity has its motion retarded. To make this magnetic field not only oscillating but rotating as well I have, in this invention introduced shading coils consisting of short circuited rings insulated from actual contact with the metal of the pole piece and made of a metal of low resistivity, around portions of the pole pieces of the electromagnet. In principle these shading coils enclose a portion of the total magnetic flux of the magnet. Consequently, when a directional change takes place in the magnetic lines due to the continuous changes of directional flow of alternating current in the energizing coil 17, there are caused to flow, in the shading coils 18, currents which flow in a direction tending to oppose the change of the magnetic flux in the electromagnet 16. These induced currents in the shading coils establish a local magnetic flux and due to this flux they cause that portion of the poles which they enclose to retain their particular polarity for an infinitesimal period of time longer than that portion which is not enclosed by such coils, and they consequently cause a continuous lagging of the polarity changes in the extremities of these shaded portions. This lagging is commercially referred to as the splitting of the phase and causes a single phase electromagnet to act the same as a two-phase magnet, and creates the rotating magnetic field on which this invention depends for imparting a lateral and rotary motion for the selection of coins. The effect of this rotating magnetic field on coins of various metals is very marked, depending on the strength of the field, on the resistivity of the metal and on the weight of the coin.

Referring now to Figure 1, a coin of any metal or alloy passing down the chute 11 rolls downwardly and rearwardly until it strikes the back wall of the chute. It here comes momentarily to rest but almost immediately takes up its motion again in a downward direction. It now, however, cuts through the magnetic lines oscillating between the pole pieces of the magnet 16. Cutting through these lines of force causes eddy currents to flow in the coin as shown in Figure 5. These induced eddy currents in the coin cause magnetic lines to emanate from the coin and cause poles to form on opposite faces and opposite sides of the coin.

Taking, for example, the particular case shown in Figure 5, the direction shown for the eddy current in the shading coil 18 establishes the fact that in this particular case the main pole piece of the magnet 16 was a north pole but has just changed to a south pole, leaving, however, the shaded portion to remain as a north pole for an infinitesimal time interval. The direction of the arrows on the surface of the coin establishes, on the face of the coin nearest the pole piece, a south pole emanating from the left half of the coin and a north pole emanating from the right half of the coin. Due to the known fact that opposite magnetic poles attract and like magnetic poles repel, it follows that the left half of the coin in Figure 5 is repelled from the left portion of the pole piece and is attracted by the right hand portion of the pole piece, and the right half of the coin is repelled by the right hand portion of the pole piece. This combination of repulsion and attraction of forces causes the coin to move laterally toward the right, or if restrained from going in this direction and the field intensity is high enough and the resistivity of the coin is low enough to cause induced poles in the coin of a strength sufficient to retain the weight of the metal, it will be set in rotation in its counterclockwise direction when viewed as in Figure 5 and in clockwise direction when viewed as in Figure 1.

If now, for example, the coil 17 is adjusted to produce a field between the poles of the magnet 16 of suitable strength for the selection of silver coins of United States mintage, this strength of the magnetic field would be made such as to be a trifle less than that required to induce poles in the silver of sufficient intensity to retain the weight of the coin. Consequently the coin gradually slips downward through the magnetic field. In so doing, however, the magnetic poles induced in the silver, as previously described, cause the coin to be pushed toward the rear of the pin 15 so that it is discharged through the outlet 14. United States silver coins contain a certain percentage of copper and it is a known fact that alloys have greater resistivity than any of the metals of which they are composed.

In general, when coins of metal having greater resistivity than that of silver coins are introduced through the chute 11 when the strength of the field is adjusted for silver coins, the magnetic field will have no appreciable effect on such coins which will be then dropped by gravity to fall through the discard outlet 13. Disks of those metals more closely approaching the resistivity of silver coins, such as brass, are given a decided twist in a clockwise direction when viewed as in Figure 1, the momentum given by this rotative action more positively insuring that the coin on striking the pin 15 will pass through the discard outlet 13. On the other hand, coins of less resistivity than that of coin silver, such as pure copper, will be suspended in the magnetic field and since its rearward motion would be stopped by the back wall of the chute 11, the coin, due to the poles emanating from it, will be set in rapid rotation.

It will thus be seen that three effects on the coin are possible. If the selector is adjusted for coins of any one metal or alloy, such as United States silver coins, then that coin and no other will reach the outlet 14. All other coils will be either retained suspended within the magnetic field or they will be discharged through the discard outlet 13. If the strength of the field remains constant, the disposition of the coins will depend largely on their resistivity and their weight. Copper coins will be suspended because of their low resistivity. Aluminum coins are also suspended in spite of their higher resistivity, the reason for this being the extremely light weight of such coins.

For adjusting the selector to coins of various metals and alloys, I provide means for cutting out some of the coils of the primary circuit 17. This may be done in any one of the conventional ways, the showing in Figure 1 being merely illustrative of a tap switch 20 for closing the circuit through any desired number of coils. In this manner the strength of the magnetic field may be adjusted to coins of any desired metal or alloy.

Coins which remain suspended in the magnetic field would remain so suspended indefinitely until the primary current is cut off. The shutting off of the primary circuit would result in the natural fall of the coin which would thus strike the pin 15 in such a manner as to cause it to fall through the discard outlet 13. A switch is therefore introduced into the system so that the circuit will automatically be broken after a predetermined time interval. Referring to Figures 1 and 6, it will be seen that a plunger 21 passes into the chute 11. This plunger 21 is pivotally connected to a support 22 which in turn is pivotally secured to a fixed member 23. The mercury switch 24 is secured to the support 22, its conductors 25 and 26 passing through the support 22. A coin introduced through the mouth 12 of the chute will raise the plunger 21 to the position shown in Figure 6. In this position the switch 24 is level so that the mercury will turn on the current. In other words the current is turned on automatically by the insertion of the coin in the mouth 12. The support 22 is, however, connected with a piston 27 which is movable in a cylinder 28 having a needle valve 29. The weights of the various parts will naturally tend to restore the mercury switch 24 to a position of such inclination as to break the circuit. The rate of descent of the plunger is, of course, governed by the rate of escape of the air in cylinder 28. By simple adjustment of the needle valve 29 the time interval may be adjusted. The breaking of the circuit through the automatic switch will instantly release any coins which are held suspended in the magnetic field so that these coins will fall through the discard outlet 13.

Having thus described my invention in such full, clear, and exact terms that its construction and operation will be readily understood by others skilled in the art to which it pertains, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a coin selector, a chute for a coin, said chute having an edgewise enlarged vertical delivery opening through which the coin is adapted to freely fall, a transverse abutment disposed across the lower end of the delivery opening of the chute intermediate the edges thereof to arrest falling coins and direct the same edgewise in one direction, and means operating in the enlarged end of the chute for axially turning coins, depending upon their alloy content, falling therethrough whereby the coins when striking the transverse abutment are directed in an opposite direction.

2. In a coin selector, a coin receiving member having a vertical passage therein through which a coin may freely fall, an abutment carried by the member near the lower end of the passage in the path of the coin to receive the lower edge of the falling coin thereagainst, said abutment being offset toward one edge portion of the vertical passage to overbalance the coin for discharge from the opposite edge portion of the passage, and coin turning means operable in said passage above the abutment to axially turn the coin, depending upon its alloy content, while falling and in a direction to overbalance the coin on the abutment in an opposite direction for discharge through the said first edge portion of the passage.

3. In a coin selector, a coin receiving member having a vertical passage therein through which a coin may freely fall, a transverse abutment in the lower end of the passage toward one edge portion thereof to receive the lower edge of a falling coin and deflect the same downwardly through the opposite edge portion of the passage, and a bi-pole magnet having a rotating field between the poles disposed with the poles at opposite sides of the passage for receiving the falling coin therebetween, whereby the coin depending upon its alloy content may be axially rotated to deflect the coin from the abutment downwardly through the said first edge portion of the passage.

4. In a coin selector for the selection of coins of a predetermined resistivity, a coin receiving member having a passage therethrough for a freely falling coin, an alternating current split phase electromagnet disposed with its field intermediate the ends of the passageway to act on the falling coin and impart a rotary movement thereto dependent upon the alloy content of the coin, and a deflector in the path of the falling coin for deflecting coins of a higher or lower resistivity from the path taken by coins of the predetermined resistivity.

5. A coin selector for the selection of coins of a predetermined resistivity, said coin selector including an alternating current split-phase electromagnet, a passageway between the poles of said electromagnet for a falling metallic disc, means for causing the metallic disc to enter said passageway edge-wise and in the projected plane of its gravitational movement, and a deflector in the path of the falling coin for deflecting coins of a higher or lower resistivity from the path taken by coins of the predetermined resistivity.

6. A coin selector for the selection of coins of predetermined resistivity, said coin selector including an alternating current split-phase electromagnet, a passageway between the poles of said electromagnet for a falling metallic disc, means for causing the metallic disc to enter said passageway edgewise and in the projected plane of its gravitational movement, said passageway confining the movement of displacement of the metallic disc to the downwardly projected plane of the disc, and a deflector in the path of the falling coin for deflecting coins of a higher or lower resistivity from the path taken by coins of the predetermined resistivity.

7. A coin selector including an alternating current split-phase electromagnet, a passageway between the poles of said electromagnet for a falling metallic disc, and means for causing the metallic disc to enter said passageway edgewise and in the projected plane of its gravitational movement, said passageway confining the movement of displacement of the metallic disc to the downwardly projected plane of the disc, and means for diverting certain of the metallic discs out of their gravitational path in response to the combined rotating and oscillating field of said electromagnet.

8. A coin selector for the selection of coins of a predetermined resistivity, said coin selector including an alternating current electromagnet, shading coils on portions of the pole pieces of said magnet for setting up a combined oscillating and rotating magnetic field between the poles of said magnet, a passageway between the poles of said magnet for confining the movement of a metallic disc to a gravitational path in the downwardly projected plane of the disc, and a deflector in the path of the falling coin for deflecting coins of a higher or lower resistivity from the path taken by coins of the predetermined resistivity.

9. A coin selector including an alternating cur-

rent split-phase electromagnet, a passageway between the poles of said magnet for confining the movements of displacement of metallic discs to a gravitational path in the downwardly projected plane of the discs, and a displaced abutment in the path of the falling disc for causing the disc to fall on one side or the other of said abutment depending on whether it is acted upon by the oscillating and rotating split-phase magnetic field combined with the force of gravity or by the force of gravity alone.

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