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ELECTRICAL SELECTOR FOR COIN CHUTES

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This invention relates to coin detecting and slug ejecting apparatus of electrical type intended for use in combination with coin chutes, and the primary object is to provide positive, efficient and inexpensive apparatus capable of being included as a part of machines, the operation of which depends upon the insertion of genuine coins of predetermined value.

This invention has for a salient object, the provision of an electrical coin selector for coin chutes which tests the coin introduced thereto by analyzing its frequency of vibration and converting sound vibrations of the coin into electrical impulses, the nature of which controls the position of a diverting means, to the end that genuine coins of certain types are directed to a coin receiving box while spurious coins and/or slugs are rejected.

Another important object of this invention is to provide electro-mechanical means for establishing vibrations and utilizing such vibrations to operate diverting means disposed in the path of travel, for the purpose of definitely and accurately detecting the nature of a coin introduced into the means and thereby directing the coin along a normal path of travel or through a branch thereof.

A yet further object of this invention is to provide an electrical selector for coin chutes, having as a component part thereof, means for establishing and detecting vibration frequencies of coins and thereafter employing such vibrations to operate electrically controlled parts for establishing the path of travel of the coin whereby the latter is diverted if of a spurious nature.

This invention has for a more specific object than those above set down, the provision of coin testing apparatus of a nature employing an electrical circuit having appropriate parts for amplifying electrical impulses and for handling such impulses in a way that is directly related to the sound vibrations of the coin whereby selection is positively and accurately made.

Other objects of the invention as well as specific details of construction that are preferably employed in producing commercial forms of selectors embodying the concepts of the present invention, will appear during the course of the following specification, referring to the accompanying drawings wherein:

Figure 1 is a side elevational view of a selector for coin chutes illustrating the same entirely removed from association with any apparatus.

Fig. 2 is an edge elevational view of the selector for coin chutes.

Fig. 3 is a top plan view of the selector illustrated in Fig. 1.

Fig. 4 is a fragmentary sectional view taken on line IV—IV of Fig. 1; and

Fig. 5 is a wiring diagram illustrating an electrical circuit usable with parts of the selector shown in Figs. 1 to 4 inclusive.

The numeral 8 designates a section of a coin chute forming a part of the selector that is carried by a suitable frame 10 upon which is mounted the directional microphone, generally indicated by the numeral 12 and having a conventional reflector for collecting sound waves.

An anvil 16 having an inclined face 18 is rigidly secured to frame 10 through the medium of a clamp or the like, 19, it being important that this anvil 16 be rigid and solid enough to establish vibrations in the coin when the same is dropped from the end of section 8 of the coin chute disposed the proper distance above surface 16.

Hopper 20 has one wall thereof lined with soft substance 22 against which the coin impinges when it rebounds from anvil 14. Substance 22 must be employed to eliminate conflicting vibrations that might be picked up by microphone 12.

Hopper 29 merges into an outlet conduit 24 in vertical alignment with coin box 25. This coin box is usually positioned where unauthorized persons cannot reach the same and where only the operator of the mechanism with which the coin chute is combined, may empty the same from time-to-time.

A branch 26 in communication with conduit 28 terminates in a reject stall 28 through which passes spurious coins, slugs or the like.

Solenoid 32 mounted on a part of frame 10 has a reciprocable core 30 normally disposed in conduit 38 traversing the path of travel for all coins entering chute 6.

Microphone 12 picks up the sound vibrations of the coin and in the preferred manner of constructing the selector, microphone 12 will resonate at the frequency of the coin and creates electrical impulses which enter the circuit, diagrammatically shown in Fig. 5.

Generally speaking, the circuit comprises an amplifier tube 36, a second amplifier tube 38, and a relay control tube 40. These three tubes as well as band reject filter 42 are contained in housing 44. Two relays 46 and 48 respectively are likewise in the circuit as is a coin operated switch, generally designated by the numeral 50. This latter switch is provided with a resilient contact member 52, the free end of which is immediately below the end of outlet conduit 24 to be struck.
by a coin prior to its dropping into box 26. Microphone 12 is in connection with tube 36 through the medium of wires 54 and 56 and through wires 58 and 60. A grid leak resistor 62 is shunted across the microphone 12. A grid leak voltage from an alternating current source or a battery is supplied to tubes 36, 38 and 40 through wires 62-64, 66-68 and 70-72 respectively. Wires 74 and 76 extend from a source of 24 current to tubes 36, 38 and 40. Band reject filter 44 is shunted across tubes 38 and 36 and comprises an adaptation of the Wien bridge. This bridge is so used that no potential difference will exist across said bridge at points where the same is connected to tubes 36 and 38 respectively, when energy coupled back from tube 38 is of the same frequency as that to which the bridge is balanced. It therefore follows that when the bridge is balanced for a specified frequency, input of electrical currents of the specified frequency to the bridge will not result in the induction of any potential on the part of tube 36. Conversely the bridge will be unbalanced and serve to pass currents of all other frequencies. Condensers 50, 58 and 52 are in filter 42 as are resistors 84, 86 and 88. Coupling condensers 50, 52 and 54 should be used and plate load resistors 56 and 100 are employed in conventional manner. Grid leak resistors 98 and 99 and connected in conventional fashion. Resistors 91 and 99 are conventional cathode biasing resistors. Resistor 95 is a conventional dropping resistor in the screen grid circuit of the tube 36. Condenser 93 by-passes the screen grid of tube 36 to its cathode. Condenser 97 is a conventional cathode by-pass around resistor 93.

Relay 46 has condenser 102 in circuit therewith to by-pass current impulses for the purpose of preventing chatter. This relay 46 has its armature 104 normally attracted to maintain the circuit supplying energy to relay 46 in an open condition. Armature 106 of relay 46 however is normally released until the coil 108 thereof is energized to draw armature 108 against contact point 110.

Solenoid 32 is diagrammatically shown in circuit with relay 46 and the connections thereto are clear and will become more thoroughly understood during the description of the operation of the selector to be hereinafter set down.

Assume that a genuine coin is dropped into chute 8. The distance of fall by gravity should be great enough to set up, in the coin, vibrations sufficient to cause the microphone 12 to create electrical impulses of the same frequency. These impulses are introduced into the control grid circuit of tube 36, and the output of said tube is amplified by the tube 38. The output of tube 38 is fed into relay control tube 40, and also a portion of the output of tube 38 is fed back through filter 42 to the cathode and suppressor grid of cathode biased tube 36. When the frequencies of a genuine coin are generated at the microphone, no voltage exists across the bridge and therefore, no bucking current will pass to the cathode and suppressor grid of tube 36. It is to be noted that the arrangement of the circuit is such that voltages across the bridge, caused by impulses from a spurious coin, are 180° out of phase with the voltage on the cathode and suppressor grid; and that this condition will prevent further amplification by tubes 36 and 38 when the output of the bridge is coupled back to the resistance biased cathode of tube 36.

Amplified electrical impulses generated by the frequencies of a proper coin, that subsequently reach tube 40, control the flow of current to relay 46 to de-energize the same. The current from microphone 12 that is passed to grid of tube 40 when genuine coins are employed, after having been amplified by tubes 36 and 38, result in an amperage drop in the plate circuit supplying current to relay 46. This obtains because tube 40 has no cathode bias resistor or other source of cathode bias voltage, and is therefore zero bias. This manner of operation results in tube 40 drawing its maximum plate current when no input potential is present on its grid. The presence of an alternating input potential on the grid will cause the plate current to drop on the negative portion of the cycle, and remain unchanged on the positive portion of the cycle. The net effect will be a reduction in plate current. The de-energization of relay 46 then occurs because of the drop in plate current, and armature 106 is released to strike contact point 112. The closing of the circuit supplying power relay 46 from lines 114 and 116 will cause relay 48 to close armature 108 and contact points 110.

Switch 50 being always normally closed, is in this circuit, which may be traced as follows: From line 114 through wires 126 and 126, armature 106, wire 118, armature 106, wire 120, wire 122, wire 122, armature 106, wire 126 and wire 128 to line 116. Obviously the coil of solenoid 32 will be energized through the following circuit:

From line 116 through wires 126 and 126, armature 106, wire 124, wire 120, armature 106, wire 122, armature 106, wire 126 and wire 128 to line 114. Such electrical action in the system will withdraw core 34 from within the passage formed by outlet conduit 24 and permit the genuine coin to drop directly into coin box 26. As the coin drops, it will strike member 52 of switch 50 and momentarily open the circuit just traced to cause armature 106 to return to the position shown in Fig. 5, where core 34 is in the normal position barring the passage of coins through conduit 24.

The momentary passage of current from microphone 12 to relay control tube 40 will have passed and the current that was altered by the flow of energy to the grid of tube 40 will return to its normal condition to energize relay 46 and again withdraw armature 106 from contact point 112.

Microphone 12 is of the crystal type that establishes a current and which has a resonance point. This microphone should resonate at the frequency of the coin selected by the user to be that which is of the proper denomination and which should be allowed to pass into coin box 26.

The description just set down as to the manner in which a coin of predetermined type is allowed to pass into box 26 through conduit 24, indicates to a large degree, what occurs when a slug or spurious coin is introduced into chute 8. As is the case with coin 134 any slug will strike inclined face 16 of anvil 14 to establish a strain within the coin or member 134 and thereby induce vibrations that will be picked up by microphone 12.

Coin 134 is in a plane substantially parallel to the face of microphone 12 and therefore, the mechanical vibrations created immediately adjacent to microphone 12 will create sound waves that will be positively picked up.

An improper coin will have the sound vibrations thereof picked up by microphone 12 for conver-
sion into electrical impulses of the same frequency as the mechanical vibrations produced by the striking of anvil 14. These electrical impulses are amplified by tube 26 and fed to tube 36 from which a part of the impulses is fed back through filter 42 to tube 36 in an opposite fashion to nullify the impulses on the first tube and to prevent an action on tube 40. A certain portion of the current passes however, to tube 40 and hence results in a slight change in the current flow through tube 40 but does not affect the setting thereof. Relay 48 is therefore allowed to remain as shown in the diagram of Fig. 5, and therefore, core 34 of solenoid 32 remains stationary to be struck by the slug or spurious coin for diversion into passage 28 and thence through reject stall 30.

From the above it is to be noted that filter 42 receives and conducts a part of the current to tube 36 when a slug is dropped through chute 3 and because filter 42 is arranged to allow the flow of current of all impulses but those of a frequency of the proper coin the amplifying action of tubes 36 and 38 will be held to a very low gain level.

Tubes 36, 38 and 40 are of commercial type and when the circuit is established as indicated by Fig. 5, the proper relationship with respect to dropping proper predetermined coins and coins or units other than that of selected value will be as mentioned.

It is vital to the successful operation of the selector that the vibrations of the coin or other device dropped through chute 3, be converted into electrical impulses and that no part of the mechanism be allowed to vibrate to effect the action of microphone 12 nor the parts associated therewith.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. In an electrical selector for coin chutes, a conduit providing a path of travel for coins to a point of discharge; means having an element normally in the path for directing spurious types of coins from the path to prevent them from passing to the point of discharge; a rigid anvil disposed to be struck by coins moving in said path; a microphone adjacent to the anvil to pick up sound vibrations of the coin when it strikes the anvil; and means operable by the electrical impulse output of said microphone to withdraw the diverting means element from the path when genuine types of coins are sent along the path.

2. In an electrical selector for coin chutes, a conduit providing a path of travel for coins to a point of discharge; means having an element normally in the path for directing spurious types of coins from the path to prevent them from passing to the point of discharge; a rigid anvil disposed to be struck by coins moving in said path; a microphone adjacent to the anvil to pick up sound vibrations of the coin when it strikes the anvil; means for amplifying the electrical impulse output of said microphone; and means operable by the amplifying means to withdraw the diverting means element from the path when certain genuine types of coins are sent along the path.

3. In an electrical selector for coin chutes, a conduit providing a path of travel for coins to a point of discharge; means having an element normally in the path for directing spurious types of coins from the path to prevent them from passing to the point of discharge; a rigid anvil disposed to be struck by coins moving in said path; a microphone adjacent to the anvil to pick up sound vibrations of the coin when it strikes the anvil; and means operable by the electrical impulse output of said microphone to withdraw the diverting means element from the path when genuine types of coins are sent along the path, said anvil having a face inclined with respect to the path of travel of the coin to cause the latter to strike at a point on the meeting edge between one face and the annular side thereof.

4. In an electrical selector of the character described for eliminating slugs, structure providing a path of travel for coins to a point of discharge; an element causing all coins to vibrate while in said path; parts responsive to the vibrations of genuine coins; an element for diverting slugs from the path to prevent them from passing to the point of discharge; and means controlled by the responsive parts to operate the diverting means.

5. In an electrical selector of the character described for eliminating slugs, structure providing a path of travel for coins; an element causing all the coins to vibrate while in said path; a resonant microphone responsive to the frequencies of vibration of the genuine coins; an element for diverting slugs from the path to prevent them from passing to the point of discharge; and means controlled by the resonant microphone to operate the diverting means.

6. In an electrical selector of the character described for eliminating slugs, structure providing a path of travel for coins; an element causing all the coins to vibrate while in said path; a resonant microphone responsive to the frequencies of vibration of the genuine coins; an amplifier for increasing the output of the resonant microphone; an element for diverting slugs from the path to prevent them from passing to the point of discharge; and means controlled by the resonant microphone and amplifier to operate the diverting means.

7. In an electrical selector of the character described for eliminating slugs, structure providing a path of travel for coins; an element causing all the coins to vibrate while in said path; a microphone; a selective amplifier for increasing the output of the microphone that is responsive to the frequencies of vibration of the genuine coin; an element for diverting slugs from the path to prevent them from passing to the point of discharge; and means controlled by the microphone and amplifier to operate the diverting means.

8. In an electrical selector of the character described for eliminating slugs, structure providing a path of travel for coins; an element causing all the coins to vibrate while in said path; a resonant microphone responsive to the frequencies of vibration of the genuine coins; a selective amplifier for increasing the output of the microphone that is responsive to the frequencies of the genuine coins; an element for diverting slugs from the path to prevent them from passing to the point of discharge; and means controlled by the resonant microphone and amplifier to operate the diverting means.

9. In an electrical selector for coin chutes, a conduit providing a path of travel for coins to a point of discharge; means having an element normally in the path for directing spurious types of coins from the path to prevent them from passing to the point of discharge; a rigid anvil disposed to be struck by coins moving in said path; a microphone adjacent to the anvil to pick up sound vibrations of the coin when it strikes the anvil; and means operable by the electrical impulse output of said microphone to withdraw the diverting means element from the path when genuine types of coins are sent along the path.

10. In an electrical selector for coin chutes, a conduit providing a path of travel for coins to a point of discharge; means having an element normally in the path for directing spurious types of coins from the path to prevent them from passing to the point of discharge; a rigid anvil disposed to be struck by coins moving in said path; a microphone adjacent to the anvil to pick up sound vibrations of the coin when it strikes the anvil; and means operable by the electrical impulse output of said microphone to withdraw the diverting means element from the path when genuine types of coins are sent along the path.
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disposed to be struck by coins moving in said path; a resonant microphone adjacent to the anvil to pick up sound vibrations of the coin when it strikes the anvil; and means operable by the electrical impulse output of said microphone to withdraw the diverting means element from the path when genuine coins are sent along the path.

10. In an electrical selector for coin chutes, a conduit providing a path of travel for coins to a point of discharge; means having an element normally in the path for diverting spurious types of coins from the path to prevent them from passing to the point of discharge; a rigid anvil disposed to be struck by coins moving in said path; a microphone adjacent to the anvil to pick up sound vibrations of the coin when it strikes the anvil; a selective amplifier for amplifying the output of the microphone that is responsive to the frequencies of the genuine coins; and means operable by the amplifier to withdraw the diverting means element from the path when genuine coins are sent along the path.

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