

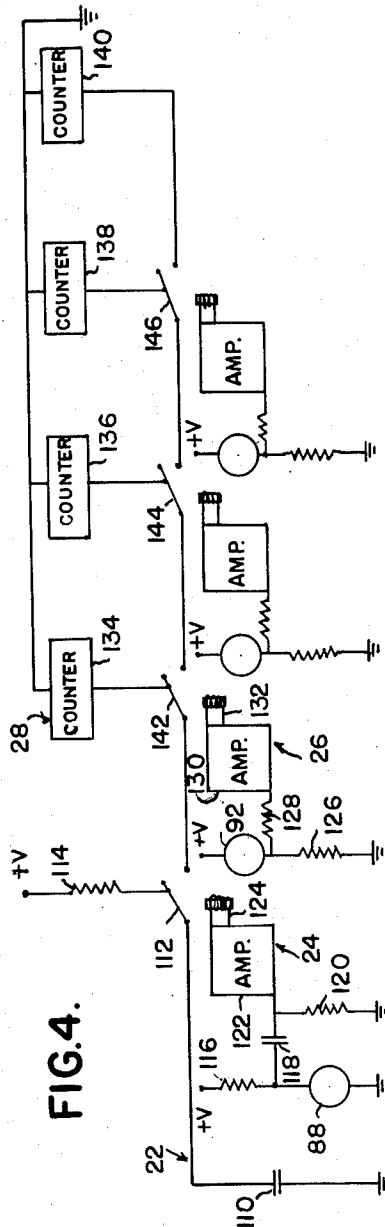
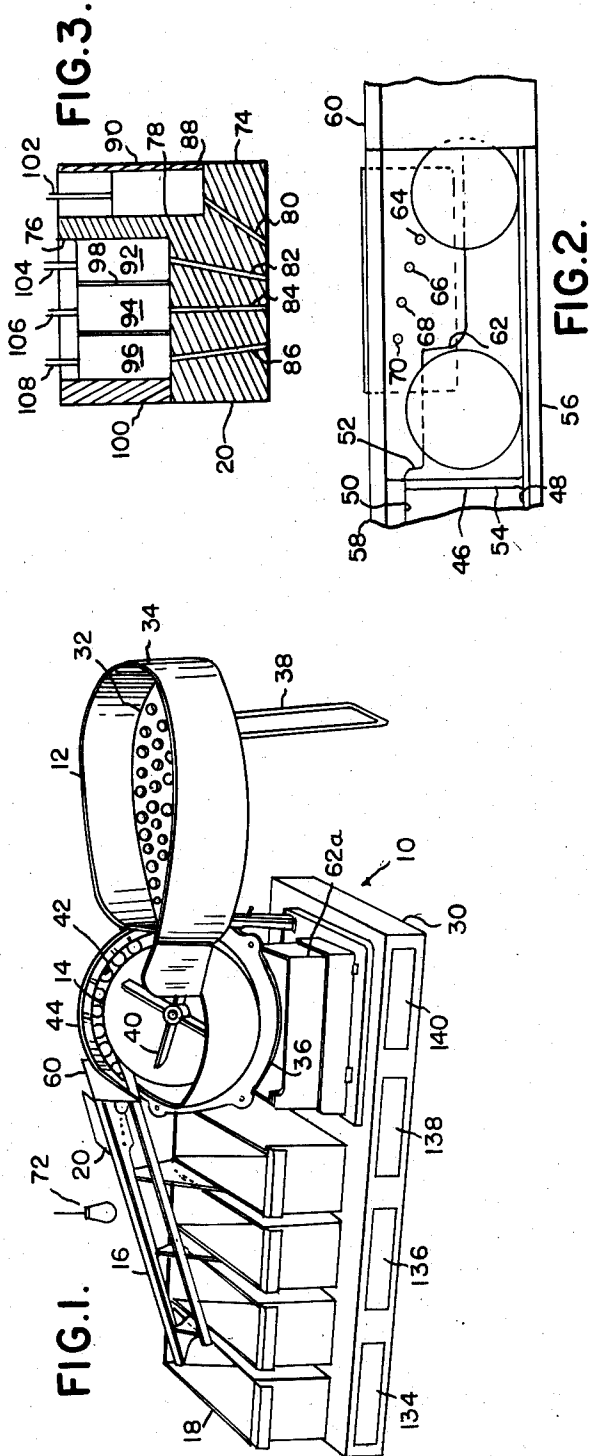
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COIN SORTER-COUNTER

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COIN SORTER-COUNTER

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The present invention relates to coin handling equipment and refers more specifically to a coin sorter-counter including means for electronically counting the number of coins of each denomination sorted.

In the past coin sorter-counter machines operable to sort a plurality of mixed coins having different denominations have been known. Such coin sorter-counter apparatus is commercially available electrically operated. In addition mechanical means have been provided previously for counting the number of coins of each denomination sorted by such machines. The mechanical coin counting mechanisms used with the sorter-counter apparatus have often been complicated, bulky and expensive. In addition such mechanical counters are relatively slower and are more inaccurate than electronic counters.

Therefore it is one of the objects of the present invention to provide a coin sorting and counting machine including electronic means for counting the number of coins of each denomination sorted.

More specifically it is an object to provide a coin sorter-counter machine including improved means for counting the number of coins of a predetermined size mixed at random with coins of other sizes which pass a predetermined point.

Still more specifically it is an object to provide a coin sorter-counter machine wherein coins are sorted through sized slots including improved electronic means for counting the number of coins of each denomination passing to the slots to be sorted.

Another object is to provide an improved coin sorter-counter machine as set forth above wherein said electronic means comprises a plurality of photo-electric cells positioned adjacent the path of the coins as they pass to the sized slots to be sorted so that the coins passing thereby interrupt light from a light source directed at the photo-electric cells in accordance with the size of the coins and including means for registering the interruption of the light to the photo-electric cells in accordance with the combination of photo-electric cells to which light is interrupted.

Another object is to provide an improved coin sorter-counter machine as set forth above wherein said means for recording the interruptions of light to the photo-electric cells includes an actuating circuit, counters adapted to be connected to the actuating circuit and control circuits connected to each of the photo-electric cells whereby on passage of a coin of a particular denomination past the photo-electric cells the actuator is operable to cause a count to be registered on a particular counter associated with the denomination of coin passing the photo-electric cells.

It is another object to provide an improved coin sorter-counter machine which is simple in construction, economical to manufacture and efficient in use.

Other objects and features of the invention will become apparent as the description proceeds, especially when taken in conjunction with the accompanying drawings, illustrating a preferred embodiment of the invention, wherein:

FIGURE 1 illustrates an electrically operated rail type coin sorter-counter having electronic coin counting apparatus incorporated therein according to the invention.

FIGURE 2 is an enlarged diagrammatic illustration

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of the beginning portion of the rail of the coin sorter-counter illustrated in FIGURE 1.

FIGURE 3 is a sectional view of the photo-electric cell unit of the electronic coin counting portion of the coin sorter-counter illustrated in FIGURE 1.

FIGURE 4 is a partly block and partly schematic diagram of the electronic coin counting portion of the coin sorter-counter illustrated in FIGURE 1.

With reference to the figures a specific embodiment of the coin sorting and counting device of the invention will now be disclosed.

The coin sorting and counting device generally indicated 10 in FIGURE 1 comprises bin 12, rotating disc 14, rail 16 and trays 18. Coins fed to disc 14 from bin 12 are fed by disc 14 to rail 16 on which they pass to drop into trays 18 according to the denomination thereof in the well known manner of rail type coin sorting machines.

According to the invention electronic apparatus comprising photo-cell unit 20 best shown in FIGURE 3 which is secured to rail 16, and actuating circuit 22, control circuits 24 and 26 and counters 28 shown best in FIGURE 4, which are enclosed in base 30 illustrated in FIGURE 1, is provided to count the number of coins of each denomination passing along rail 16.

More specifically the coin sorting portion of the coin sorting and counting device 10 includes the bin 12 having a perforated bottom 32 to which sides 34 are secured. Bin 12 is supported adjacent hopper 36 by means of a supporting bracket 38. Hopper 36 as shown is adapted to receive coins from bin 12 and includes therein the rotating disc 14 having vanes 40 thereon and forming groove 42 with back plate 44 in which coins of varying denomination arrange themselves on rotation of disc 14 to be fed to rail 16.

Rail 16 as shown includes a back generally indicated 46 including a bottom member 48 having a straight inner edge, an upper member 50 having offsets 52 in the inner edge thereof at intervals therealong corresponding to the spacing of trays 18 and connecting members 54 between the upper and lower members. The offsets in the upper member are positioned to allow coins of varying diameters to fall into different trays 18 positioned beneath the slightly inclined rail 16. Straight bottom members 56 and top member 58 are secured to back member 46 by convenient means to provide guiding surfaces for the coins as they slide along the back member 46 of rail 16. Similarly a plate 60 is positioned over the feed end of the rail 16 as shown best in FIGURE 1 to assure that the coins fed to the rail 16 from hopper 36 are positioned flat on the rail.

Trays 18 as shown are positioned beneath inclined rail 16 to receive coins of different denomination which fall through rail 16 due to the varying diameters thereof. Additionally means 62a are provided for emptying hopper 36 as desired.

The structure disclosed to this point is entirely conventional and a more complete disclosure thereof may be found in the literature of the trade if desired.

In accordance with the invention electronic means are provided for counting the coins of mixed denomination as they proceed along rail 16. With particular reference to FIGURES 1-3 it will be noted that an extra offset 62 has been provided in the back member of rail 16 and that openings 64, 66, 68 and 70 are provided in the back member 46. Additionally a light 72 is placed adjacent openings 64, 66, 68 and 70 and the photo-electric unit 20 is placed behind rail 16 to receive light from light 72 through openings 64, 66, 68 and 70.

Openings 64, 66, 68 and 70 are positioned with respect to rail 16 so that coins of different denominations will pass between the light source 72 and particular openings

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whereby light through the particular openings is prevented from reaching the photo-electric unit 20. Thus with the particular apparatus shown adapted to count dimes, pennies, nickels and quarters, the opening 64 is positioned so that it is closed on the passage of any of the above mentioned coins down rail 16. Opening 66 is so positioned that it is closed by any of the above mentioned coins, except a dime which is of a diameter too small to close the opening 66. Opening 68 is likewise closed by all coins mentioned above except a dime and penny for the same reason. Opening 70 is of course closed only by the larger diameter quarter. Thus as coins pass down rail 16 it will be seen that they will close different ones of openings 64, 66, 68 and 70 depending upon the denomination of the coin.

The photo-electric unit secured to and positioned behind rail 16 with respect to light source 72, as shown in section in FIGURE 3, includes a body member 74 which may be machined metal. Body member 74 has recesses 76 and 78 therein and light passages 80, 82, 84 and 86 positioned as shown best in FIGURES 2 and 3. A photo-electric cell 88 is positioned in recess 78 in body member 74 and is held in place by member 90 secured to body member 74 as shown. Similarly photo-electric cells 92, 94 and 96 are positioned in recess 76 and are spaced apart by insulating material 98 and are held in position by member 100 also secured to body member 74 by convenient means (not shown).

It will be noted that the light passages 80, 82, 84 and 86 are positioned to pass light from light source 72 received through openings 64, 66, 68 and 70 respectively to photo-electric cells 88, 92, 94 and 96 respectively. Thus as the coins of different denominations pass the openings 64, 66, 68 and 70 a particular set of electrical impulses generated by the photo-electric cells 88, 92, 94 and 96 will be delivered over conductors 102, 104, 106 and 108 to the electrical circuit shown in FIGURE 4 which electrical impulses are operable to cause the counter 28 associated with the denomination of coin causing the particular set of impulses to count one count.

Referring now to FIGURE 4 the actuating circuit 22 comprises capacitor 110, solenoid operated switch 112 and resistor 114 connected in series between ground and a positive voltage source (not shown). Between passage of coins past the openings 64, 66, 68 and 70 the switch 112 is in the normal position as shown and capacitor 110 is allowed to charge through resistor 114. Capacitor 110 is discharged through one of the counters on closing of switch 112 when the trailing edge of a coin passes opening 64 as will later be more fully discussed.

Control circuit 24 as indicated in FIGURE 4 includes photo-electric cell 88, resistor 116, capacitor 118, resistor 120, amplifier 122 which may be of the transistor type and amplifier load solenoid 124 operable to open switch 112 on actuation. The function of the control circuit 24 is to provide a negative pulse for amplification by amplifier 122 which will energize solenoid 124 each time the trailing edge of any coin passes over opening 64.

Such operation is accomplished due to the fact that with light shining on photo-electric cell 88 with no coin in front of opening 64 the resistance of the photo-electric cell 88 is small relative to the resistance of resistor 116 so that a relatively low voltage is present on capacitor 118. When the light to photo-electric cell 88 is cut off by passage of a coin in front of opening 64 the resistance of the photo-electric cell 88 increases sharply whereby a large relatively positive charge is built up on capacitor 118 due to the division of voltage between photo-electric cell 88 and resistor 116. The charge built up on capacitor 118 is caused to dissipate therefrom as the trailing edge of the coin passes the opening 64 creating a sharp negative pulse which is fed to amplifier 122 to actuate solenoid 124. In other words the negative pulse for actuation of amplifier 122 is developed by means of integrating a positive voltage by means of capacitor 118 and resistor 120.

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A control circuit 26 is used in conjunction with each of the photo-electric cells 92, 94 and 96. The control circuit 26 includes resistances 126 and 128, amplifier 130 and switch operating solenoid 132. The control circuit 26 is operable to energize the solenoid 132 on reception of a negative pulse.

The negative pulse required to energize solenoid 132 is developed as a coin closes the opening 66, 68 or 70 associated with the photo-electric cell 92, 94 or 96 in the control circuit 26 in which the solenoid is included since the resistance of the photo-electric cell is increased thereby and the division of voltage between the photo-electric cell and the resistance 126 is thus made such that the signal coupled directly to amplifier 130 through resistance 128 becomes much more negative at this time.

The counting circuit 28 includes dime counter 134, penny counter 136, nickel counter 138, quarter counter 140 and relay actuated switches 142, 144 and 146. The counters are such that if an electrical impulse such as that stored on capacitor 110 during the periods between which a coin passes openings 64, 66, 68 and 70 is fed thereto they will register a single count or if so desired may be of the type which register the amount in dollars and cents of the coins of a particular denomination counted thereby. Thus with switches 142, 144 and 146 in the normal position as indicated in FIGURE 4 when switch 112 is closed by solenoid 124 the counter will count indicating one dime has passed down rail 16. Similarly if switch 142 is closed by solenoid 132 and switch 112 is subsequently closed by solenoid 124 counter 136 will register once indicating one penny has passed down rail 16. In like manner the counters 138 and 140 register when a nickel and quarter pass down the rail 16.

In over-all operation a plurality of coins of mixed denomination from bin 12 is dumped into hopper 36 and is caused to be fed down rail 16 by rotation of disc 14. As a coin, for example a nickel, passes the openings 64, 66, 68 and 70 particular ones of the opening will be closed. For example with the nickel the opening 64, 66 and 68 will be closed momentarily which will shut off the light to the photo-electric cells 88, 92 and 94 which will cause the switches 142 and 144 to be closed by means of the associated solenoid 132 in the manner previously described.

Subsequently then as the trailing edge of the nickel passes opening 64 the solenoid 124 will be actuated to close switch 112 as previously indicated whereby the charge stored on capacitor 110 will be allowed to dissipate itself through counter 138 causing counter 138 to register one nickel. Similarly as subsequent coins pass opening 64 the counters will be caused to register in accordance with the denomination of the coins.

Thus according to the invention there is provided electronic means for counting coins as they are sorted. Further the counting means provided may be attached to existing coin sorting devices and is simple in construction, economical to produce and is substantially error free.

While a specific embodiment of the invention has been disclosed it will be understood that many modifications thereof are possible. The disclosure of the invention will no doubt suggest such modifications to those skilled in the art. For example the counting apparatus disclosed may be combined with many different sorting machines. Also the counting apparatus disclosed may be modified to count any number of variably sized discs so as to include half-dollar and dollar coins as well as coins of foreign mint and tokens. It will therefore be understood that it is the intention to include all such suggested modifications of the disclosed apparatus within the scope of the invention.

What I claim as my invention is:

1. Apparatus for individually counting the number of discs each having the same diameter from a plurality of discs having a plurality of diameters, comprising a capaci-

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tor, means for charging the capacitor between counting of the individual discs, a plurality of separate circuits each including a relay solenoid and a variable resistance, a separate counter operably associated with each separate circuit, said separate circuits being operable to sequentially close a plurality of switches in series circuit to connect a different one of said counters in said series circuit depending on the diameter of an individual disc to be counted, another circuit also including a variable resistance and a relay solenoid operable to connect said capacitor in said series circuit for discharging the capacitor through said one of said counters in response to movement of the individual disc.

2. Rail type coin sorting means operable to sort a plurality of coins of different diameter according to the diameter thereof, comprising a longitudinally and transversely inclined rail down which said coins pass during sorting thereof including a bottom reference member for guiding the lower edge of the coins as the coins traverse the rail longitudinally and a member having a flat inclined surface against which the coins rest during their traverse of the rail which flat surface has the lower edge thereof spaced at a variable distance from the bottom reference member equal to the different diameters of the coins to be counted at different predetermined positions longitudinally of the rail, and electronic apparatus operably associated with said coin sorting means for individually counting the number of coins having each different diameter as the coins pass down said rail, comprising a capacitor, means for charging the capacitor between counting of the individual coins, a plurality of separate circuits each including a relay solenoid and a variable resistance, a separate counter operably associated with each separate circuit, said separate circuits being operable to sequentially close a plurality of switches in series circuit to connect a different one of said counters in said series circuit depending on the diameter of an individual coin being counted, another circuit also including a variable resistance and a relay solenoid operable to connect said capacitor in said series circuit for discharging the capacitor through said one of said counters in response to movement of the individual coin.

3. Rail type coin sorting means operable to sort a plurality of coins of different diameter according to the diameter thereof, comprising a longitudinally and transversely inclined rail down which said coins pass during sorting thereof including a bottom reference member for guiding the lower edge of the coins as the coins traverse the rail longitudinally and a guide member having a flat inclined surface against which the coins rest during their traverse of the rail which flat surface has the lower edge thereof spaced at a variable distance from the bottom reference member equal to the different diameters of the coins to be counted at different predetermined positions longitudinally of the rail, sensing means positioned at the upper end of the rail including a plurality of openings through the guide member of the rail extending transversely thereof and spaced longitudinally of the rail, said openings further being positioned with respect to the bottom reference member of the rail different distances representative of the different diameters of the coins passed down the rail, a plurality of photo-cells positioned at one side of the rail adjacent each of the openings therethrough and a light source positioned on the other side of the rail for energizing the photo-cells when the openings are not blocked by coins traversing the rail, and electronic apparatus responsive to the sensing means for individually counting the number of coins having each different diameter as the coins pass down said rail comprising a capacitor, means for charging the capacitor between counting of the individual coins, a plurality of separate circuits each including a relay solenoid and one of said photo-cells, a separate counter operably associated with each separate circuit, said separate circuits being operable to sequentially close a plurality

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of switches in series circuit to connect a different one of said counters in said series circuit depending on the diameter of an individual coin being counted, another circuit including another one of said photo-cells and a relay solenoid operable to connect said capacitor in said series circuit for discharging the capacitor through said one of said counters in response to movement of the individual coin past said another one of said photo-cells.

4. In combination rail sorting means for discs of different diameter, means for feeding a plurality of discs of different diameter to the sorting means in random order, sensing means operably associated with the sorting means for developing a separate group of electric signals in response to each disc traversing an initial portion of the sorting means representative of the diameter of the particular disc and apparatus connected to the sensing means for receiving each separate group of electric signals and recording the total number of discs of each different diameter for which a separate group of electric signals have been developed by the sensing means, comprising means connected to the sensing means for developing a counting signal after passage of each disc over the initial portion of the sorting means, separate electrical counting means for registering the number of discs having each different diameter, actuating means connected to the counting means for causing one of the counting means to register for each counting signal developed and control means also connected to the sensing means for determining which of the counting means is actuated by the actuating means in accordance with the separate group of electric signals with which a particular counting signal is associated.

5. Structure as set forth in claim 4 wherein the means for developing a counting signal comprises a source of electrical energy, a resistor and a capacitor in series and a switch operable between the resistor and capacitor for alternately connecting the capacitor to the source of electrical energy and one of said counters.

6. Structure as set forth in claim 5 wherein the actuating means comprises an electric circuit for opening and closing said switch as each separate coin passes said initial portion of said rail sorting means.

7. Structure as set forth in claim 6 wherein the control means comprises a plurality of other switches in series with said first switch and one of said counters, each of which switches is separately movable to be connected directly to ground through another of said counters and means for selectively positioning said other switches in series with said first switch and one counter or in series with said other counters in response to the particular group of electric signals developed by a disc traversing the initial portion of the sorting means.

8. In combination rail sorting means for discs of different diameter, including a reference member, said rail sorting means having separate openings provided therein each positioned from the reference member a distance slightly less than a diameter of a different disc and slightly more than the diameter of the next smaller disc, said rail sorting means also having one additional opening provided adjacent the separate openings and closer to said reference member than any of the other openings, all of said openings being closely spaced along the rail sorting means whereby a different number of openings in the rail including said additional opening are simultaneously blocked by discs of each different diameter passing down the rail sorting means, sensing means comprising separate photo-cells positioned adjacent each of said openings for providing different groups of electric signals determined by the diameter of the discs passing the openings simultaneously blocked in response to each disc traversing an initial portion of the sorting means and apparatus connected to the sensing means for receiving each separate group of electric signals and recording the total number of discs of each different diameter for

which a separate group of electric signals have been developed by the sensing means.

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