Feb. 19, 1952 F. E. WALLIN 2,586,129

ELECTRIC MULTIPLE COIN EVALUATOR

Filed Feb. 11, 1947

2 SHEETS—SHEET 1

Fig. 1.

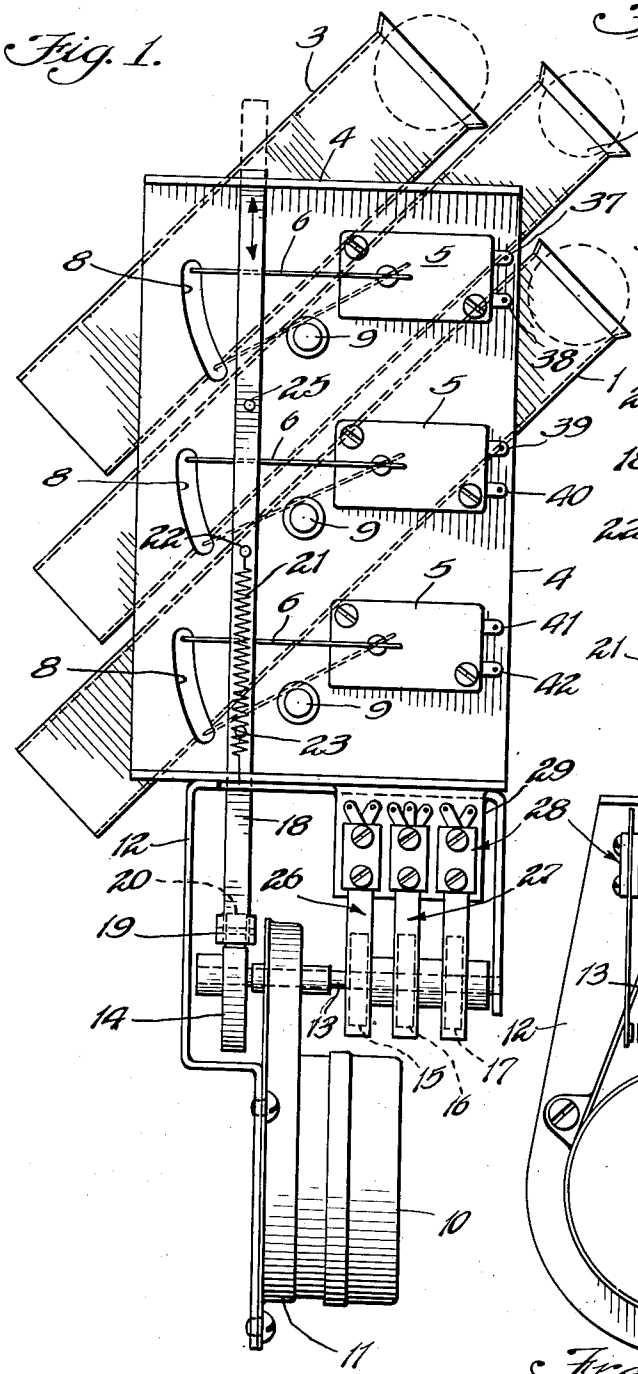
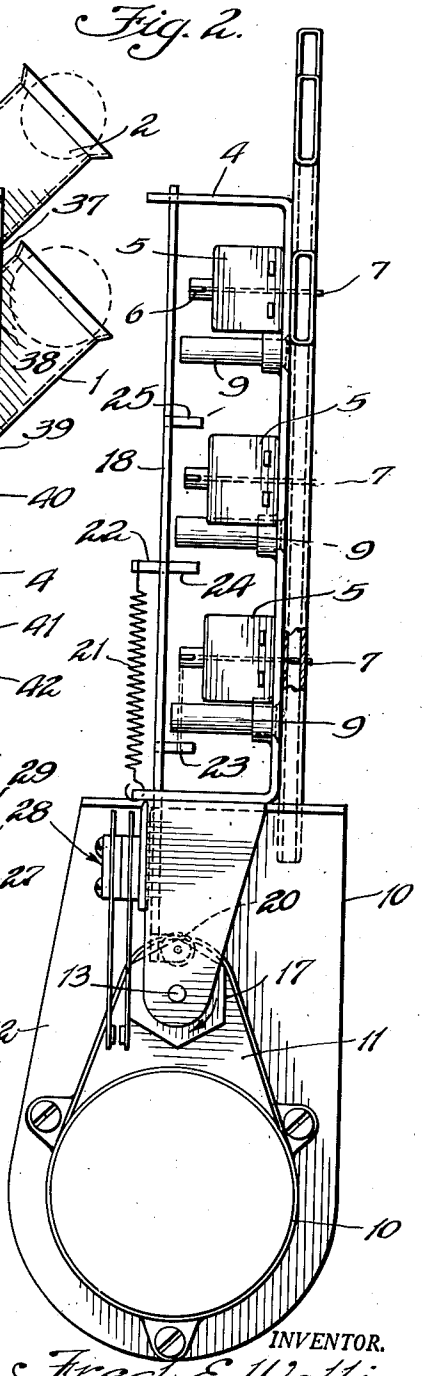


Fig. 2.



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2 SHEETS—SHEET 2

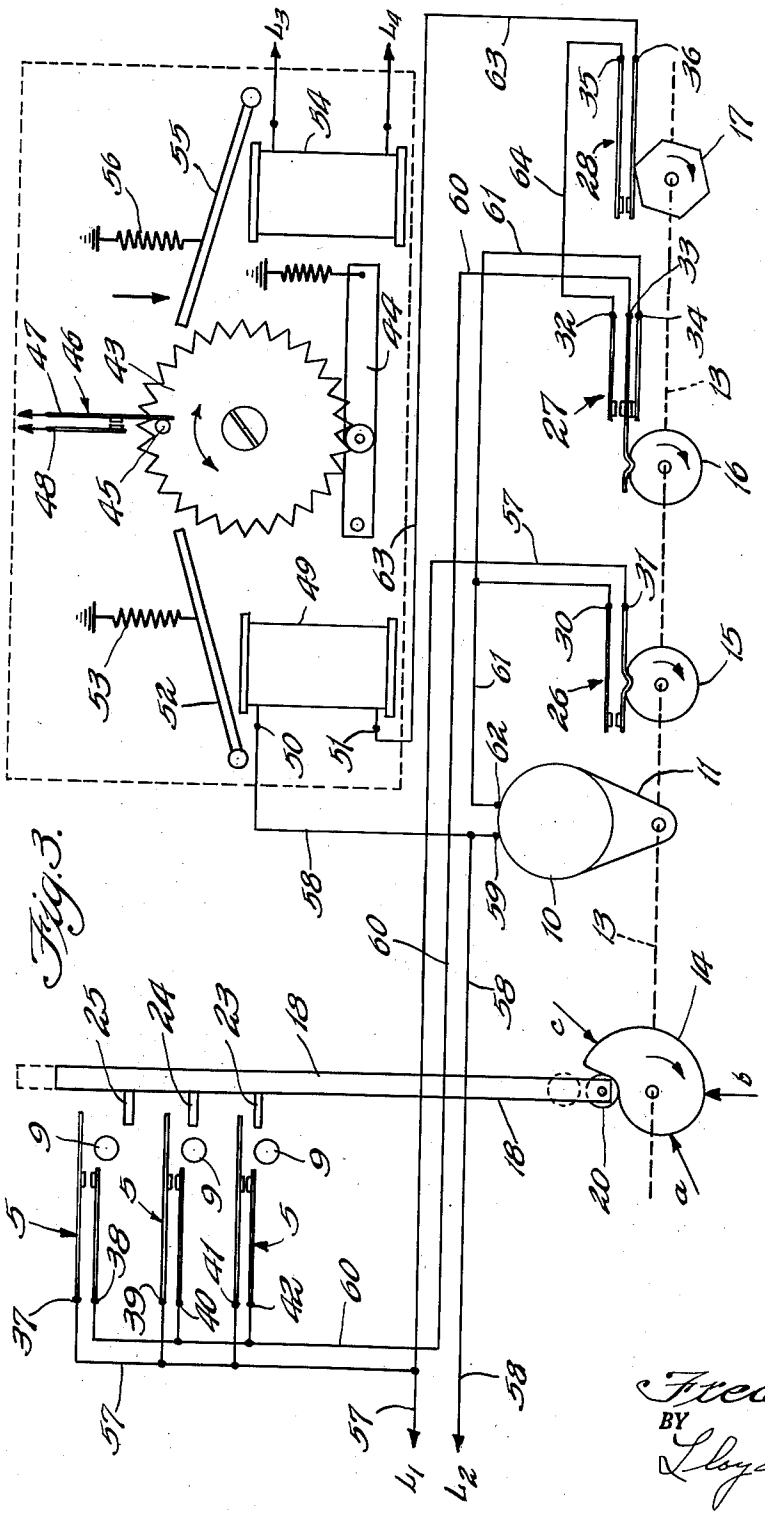

Fig. 3.

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UNITED STATES PATENT OFFICE

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ELECTRIC MULTIPLE COIN EVALUATOR

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Application February 11, 1947, Serial No. 727,897

2 Claims. (Cl. 194—9)

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This invention relates in general to coin controlled apparatus and more particularly to an electric mechanical device for automatically producing a predetermined number of electric impulses corresponding in number to the value of coins of different denominations deposited therein. Devices of this general character are required and used in multiple coin operated vending machines, phonographs and the like.

In previous devices it has long been a problem to provide multiple coin responsive apparatus which would accurately and positively provide a predetermined number of electric impulses, with said impulses of predetermined duration, corresponding with the deposit of a plurality of coins of predetermined different denominations.

The construction of the apparatus in this invention together with its associated electrical circuit provide a comprehensive solution to the problem which is adapted to economical manufacture and dependable operation.

A principal object of the invention is the provision of a plurality of coin actuated switches for initiating the operation of an electric impulsing mechanism for delivering a predetermined number of electric impulses of predetermined duration corresponding in number to coins of predetermined denomination.

A further object of the invention is the provision of a motor-driven switch control mechanism responsive to coin operated switches including means for holding and restoring said coin switches at predetermined time intervals.

Another object of the invention is the provision of a plurality of coin actuated switches and a motor-driven impulsing apparatus associated therewith including an electric circuit whereby each said switch when displaced by a coin of a predetermined denomination will be magnetically retained in displaced position and said motor-driven apparatus will deliver a predetermined number of electric impulses to an accumulative means in accordance with the predetermined valve of the coin deposited and whereby said switch will be restored by said motor-driven apparatus after the delivery of a predetermined number of electric impulses to the said accumulative means.

These and other objects in one embodiment of the invention are described and shown in the following specification and drawings in which:

Fig. 1 is a side elevation of the device with wiring removed.

Fig. 2 is an end elevation of the device shown Fig. 1.

Fig. 3 is a schematic and diagrammatic showing of the device shown Fig. 1 connected to a conventional accumulating mechanism.

Referring to Figs. 1 and 2, coin chutes 1, 2 and 3 are secured to plate 4 in parallel spaced relation as shown. Each said chute is adapted to receive a coin of predetermined diameter and denomination and for the purpose of simplification, it is assumed that coin chute 1 is adapted to receive a U. S. nickel, chute 2 adapted to receive a U. S. dime, and chute 3 adapted to receive a U. S. quarter.

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Three spring actuated normally open single pole switches 5 are secured in spaced relation to plate 4, each switch corresponding to each said coin chute. Each said switch 5 is provided with a magnetic operating arm 6 having a right angle projection 7 extending through apertures 8 provided in the backplate 4 and through the coin chutes, thus providing for the free movement of the switch projections 7 in the path of each coin. Permanent magnets 9 are secured by one of their ends to the back plate 4 having their free ends positioned in the path of movement of the switch operating arms 6. It is now apparent that a gravity propelled coin of proper diameter moving through each of the chutes 1, 2 and 3, will strike projection 7 of a corresponding arm 6 during its downward travel and move the switch to its displaced position as shown by dotted lines in Fig. 1, thus closing the contacts in the switch 5. Since the arms 6 are constructed of magnetic material, each magnet 9 will hold its corresponding arm 6 in displaced position by virtue of the magnetic attraction therebetween.

An electric motor 10 preferably of the constant speed variety, having an integral speed reducer 11 driven thereby, is mounted to a frame 12 which frame is secured to the lower flange of plate 4. Shaft 13 driven by speed reducer 11 is provided at one end with a restoring cam 14 and three switch operating cams 15, 16 and 17, on its opposite end. A desirable rotational speed of shaft 13 has been found to be approximately 4 revolutions per minute.

A restoring bar 18 is slidably retained for reciprocation in plate 4 and frame 12 as shown. The lower end of bar 18 is provided with a clevis 19 which retains a pivotally mounted roller 20, which roller engages the working edge of cam 14. A spring 21, secured at its upper end by pin 22 integral with bar 18 and secured at its opposite end to the lower flange of plate 4, normally urges the bar downward. Restoring pins 23, 24 and 25, integral with bar 18, are in different spaced relation with respect to the displaced positions of their corresponding switch arms 6. Motor cycling switch 26, coin transfer switch 27 and pulsing or commutator switch 28 are positioned in operating relation with cams 15, 16 and 17 respectively by platform 29 integral with frame 12.

The principal feature of the device resides in the one revolution movement of shaft 13 subsequent to the deposit of each coin regardless of denomination, the detailed operation of which will be hereinafter described.

Referring to Fig. 3, the cams 14, 15, 16 and 17

are shown in their proper operating relation with the restoring bar 18 and its roller 20 in normal rest position. Motor cycling switch 26 is normally open and comprises two blades 30 and 31. Coin transfer switch 27 is a single pole double throw switch having blades 32, 33 and 34, and is normally positioned as shown. Pulsing switch 28 is normally open and comprises two blades 35 and 36. The coin switches 5 are normally open and are provided with two blades 37—38, 39—40, and 41—42. A well-known add-subtract accumulating apparatus shown in dotted enclosure, consists of a toothed wheel 43 and a detent assembly 44, a switch pin 45 secured in said wheel, and a normally closed master switch 46 having two blades 47 and 48, operated by pin 45.

An additive-electro-magnet 49, having two terminals 50 and 51, is positioned to attract an armature pawl 52 against the restraining action of a spring 53 positioned as shown. A subtractive electro-magnet 54, having external leads L3 and L4, is positioned to operate armature pawl 55 against the restraining action of a spring 56 as shown.

A conductor 57 is connected to one side of source of electric power L1 and runs to coin switch blades 37, 39 and 41, and to blade 31 of the motor cycling switch 26. Conductor 58 is connected to the remaining side of source of electric power L2 and connects to one terminal 59 of the electric motor 10 and to one terminal 50 of additive magnet 49. A conductor 60 connects coin switch blades 38, 40 and 42, with the center blade 33 of the coin transfer switch 27. A conductor 61 connects the remaining terminal 62 of the electric motor 10 with the remaining blade 30 of switch 26 and the blade 34 of switch 27. A conductor 63 connects the remaining terminal 51 of the electro-magnet 49 with blade 36 of the pulsing switch 28. A conductor 64 connects the remaining blade 32 of switch 27 to the remaining blade 35 of switch 28.

The blades 47 and 48 of the master switch 46, are connected to the device to be operated not shown. Likewise the leads L3 and L4 of subtractive magnet 54 run to a control circuit in the device to be operated not shown.

In operation, the elements described are in their rest positions as shown, and when a coin of lowest denomination, a U. S. nickel, is deposited in chute 1 shown Fig. 1, it will descend by gravity and impinge upon projection 7 and move switch arm 6 to its lowermost position as shown in dotted lines, thus closing the switch which closure will be maintained by virtue of the attraction of the magnet 9 with arm 6. Referring to Fig. 3, and under the assumption that the lowermost switch 5 is held in a closed position, a circuit will be established from L1 through conductors 57, 60, and switch blades 33 and 34, switch 27, through conductor 61 to terminal 62 of the motor 10. The circuit is completed through the remaining terminal 59 of the motor 10 through conductor 58 to the other side of the source of power L2, which will start the rotation of the motor and shaft 13 in the direction shown by arrows. The first few degrees of rotation of shaft 13 and the cams 14, 15, 16 and 17, will first simultaneously close cycling switch 26 and shift the position of blade 33 of switch 27 from blade 34 to blade 32. Thus the circuit to the motor is maintained through conductor 57 instead of conductor 60. Since blade 33 of switch 27 is now in contact with blade 32, a partial circuit through the transfer switch 27 is now established through blade 35 of switch 28 through conductor 64. It is apparent that the further rotation of shaft 13 will momentarily close the pulsing switch 28 to energize magnet 49 through conductors 63 and 58, which action will move wheel 43 in an amount equivalent to the displacement of one tooth and close switch 46, thus establishing one cycle of operation in the device to be operated not shown. By this time cam 14 will have rotated to a position where a portion of its periphery is adjacent to the roller 20 which will have moved bar 18 upward to a position where pin 23 will engage arm 6 of switch 5 better shown Fig. 1. Slightly further movement of bar 18 will break the magnetic attraction between the magnet 9 and the switch arm 6 and restore switch 5 to its normal open position and simultaneously open the circuit through electro-magnet 49. Thus it is apparent that the momentary electric pulse received by magnet 49 will attract the armature 52 against the restraining action of detent assembly 44 which will advance the toothed wheel 43 a distance equivalent to the pitch of one tooth and simultaneously this first movement of wheel 43 will close switch 46 and energize a circuit to the device to be operated now shown, through blades 47 and 48. The shaft 13 will continue its rotation for one revolution when it will be automatically stopped by the action of cam 15 opening the switch 26. Hence it is apparent that a predetermined value of one impulse for the coin of lowest denomination has been applied to the accumulating device through the action of electro-magnet 49. It is also apparent that the deposit of subsequent coins of the lowest denomination value will repeat the above described operation and continue the rotation of wheel 43 one tooth for every coin deposited.

When a coin of medium denomination, a U. S. dime, is deposited, its descent through coin chute 2 will operate a corresponding switch 5 the same as previously described. The motor will again be started by virtue of a temporary circuit established through blades 33 and 34 of switch 27, which rotation will be continued as a result of the closing of switch 26. However, because of the different placement of pin 24 as compared to the pin 23, in bar 18, the rotation of cam 14 will not open the circuit established through blades 39 and 40 until the portion *b* of the cam has reached roller 20, during which time pulsing switch 28 has closed and opened two times. Thus the magnet 49 will receive two pulses before pin 24 dislodges arm 6 of the switch 39 from the magnet 9, which opens the circuit through the switch 28 and the electro-magnet 49. When a coin of largest denomination, such as a U. S. quarter, is deposited in chute 3, the operation is the same as previously described except that a circuit through coin switch blades 37 and 38 remains for a period sufficiently long to permit pulsing switch 28 to close and open five times. Immediately following the fifth opening of the switch 28, portion *c* of cam 14 will have rotated to coincide with the roller 20 thus raising the bar 18 and its furthermost positioned pin 25 to dislodge arm 6 from magnet 9 to open the circuit through blades 37 and 38. Thus the wheel 43 will advance five teeth after the deposit of a coin of largest denomination.

It is now apparent that the deposit of coins of different denomination will advance the wheel 43 in exact proportion to the predetermined value of the coins as determined by the relative posi-

tion of pins 23, 24 and 25 in bar 18 and the predetermined number of projections applied to cam 17 for operating the pulsing switch 28.

When a device of this character is used in connection with a vending or like machine, the circuit controlled by switch 46 is used to cycle the operation of the machine, and upon the completion of each said cyclings, the subtractive magnet 54 is momentarily energized which subtracts one unit of value during or after delivery by the machine.

In some applications, the subtractive cycle is applied to the wheel 43 by a direct mechanical movement applied to the pawl 55 as illustrated by arrow, thus dispensing with magnet 54.

Since it is well known that coin operated machines previous to this invention are often fraudulently operated by linear shock and vibration, it is to be noted that fraudulent operation is substantially impossible with the construction previously described, for the reason that all movable electrical components are low mass switch blades not subject to movement by vibration, and that fraudulent operation is only possible by the rotation of shaft 13, which rotation obviously cannot be affected by linear shock. The opposing armatures 52 and 55 in the add-subtract unit will not impart motion to wheel 43 even though moved through shock, particularly because of the restraining action of the detent assembly 44.

Having described my invention, I claim:

1. In a multiple coin evaluator a frame, means in said frame forming a plurality of independent coin passageways, each of said passageways adapted to conduct coins of predetermined different denominations in separate paths respectively, a like plurality of self-restoring electric coin switches positioned on said frame, each of said switches having its operating arm positioned in its corresponding passageway and adapted to be displaced by each coin descending therein, a like plurality of holding means in said frame, each of said holding means positioned in the path of movement of each said arm respectively for temporarily holding each said arm in displaced position and holding each said switch in its operated position, a shaft journalled for rotation in said frame, electric motor means in said frame for rotating said shaft when said motor is energized, coin switch restoring means movably positioned in said frame, a plurality of spaced abutments in fixed relation on one portion of said restoring means, another portion of said restoring means positioned and arranged for one movement by one revolution of said shaft, means actuated by the shaft for operating said restoring means in predetermined timed relation therewith, each of said abutments corresponding to and positioned to sequentially release in predetermined sequence each said coin switch arm from its corresponding holding means when said restoring means is operated, a normally open motor holding switch means on said frame operatively related to said shaft and adapted to close through a predetermined angle of each revolution of said shaft, an electric commutator means positioned on said frame, means actuated by said shaft for operating said commutator means to produce a predetermined number of make-and-break operations when said shaft is rotated one revolution, an electric pulsing circuit connected to and for operating an electric pulse responsive means, said commutator means connected in said pulsing circuit, a circuit transfer switch means on said frame adapted for operation by said shaft through a predetermined angle of each revolution thereof for initially energizing said motor means and subsequently energizing said pulsing circuit, a source of electric energy, circuit means connecting said source of energy with said coin switches, said motor means, said pulsing circuit, said holding switch means, said pulse responsive means and said transfer switch, whereby the descent of each of said coins of predetermined different denominations in their respective passageways will operate a said corresponding coin switch and energize said circuit means and operate said evaluator to transmit a predetermined different number of electric pulses corresponding with each said coin of different denomination through said pulse responsive means dependent upon the relative movement of each said abutment with respect to its corresponding said switch arm.

2. In a coin evaluator of the character described means forming a frame, a shaft journalled for rotation in said frame, a plurality of normally open coin switches in said frame, a like plurality of coin switch holding means in said frame for independently holding each said switch in closed position when coin operated, each of said coin switches responsive to a coin of different denomination, an electric commutator means positioned on said frame, means actuated by said shaft for operating said commutator means to produce a predetermined number of make-and-break operations by said shaft when said shaft is rotated one revolution, a circuit switch means on said frame adapted to be operated by said shaft through a predetermined angle of each revolution of said shaft for energizing and deenergizing said commutator means, coin switch restoring means movably positioned in said frame, means actuated by said shaft during one revolution thereof for operating said restoring means, a portion of said restoring means arranged and adapted to sequentially release each of said coin switches from its respective holding means in predetermined timed relation when said shaft is rotated one revolution, electric circuit means connecting said coin switches, said commutator means, said circuit switch means whereby the operation of each of said coin switches by coin of corresponding denomination and the rotation of said shaft one revolution will make and break the portion of said circuit means connected to said commutator a predetermined number of times corresponding with each of said coins of different denomination.

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