

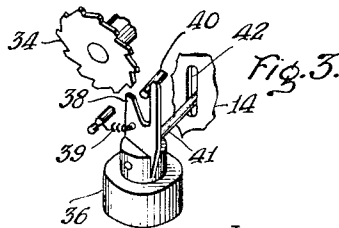
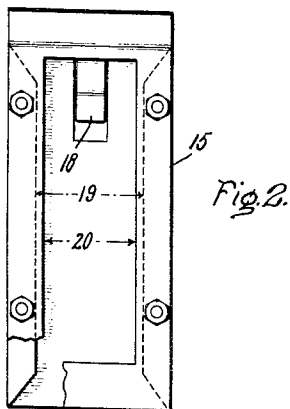
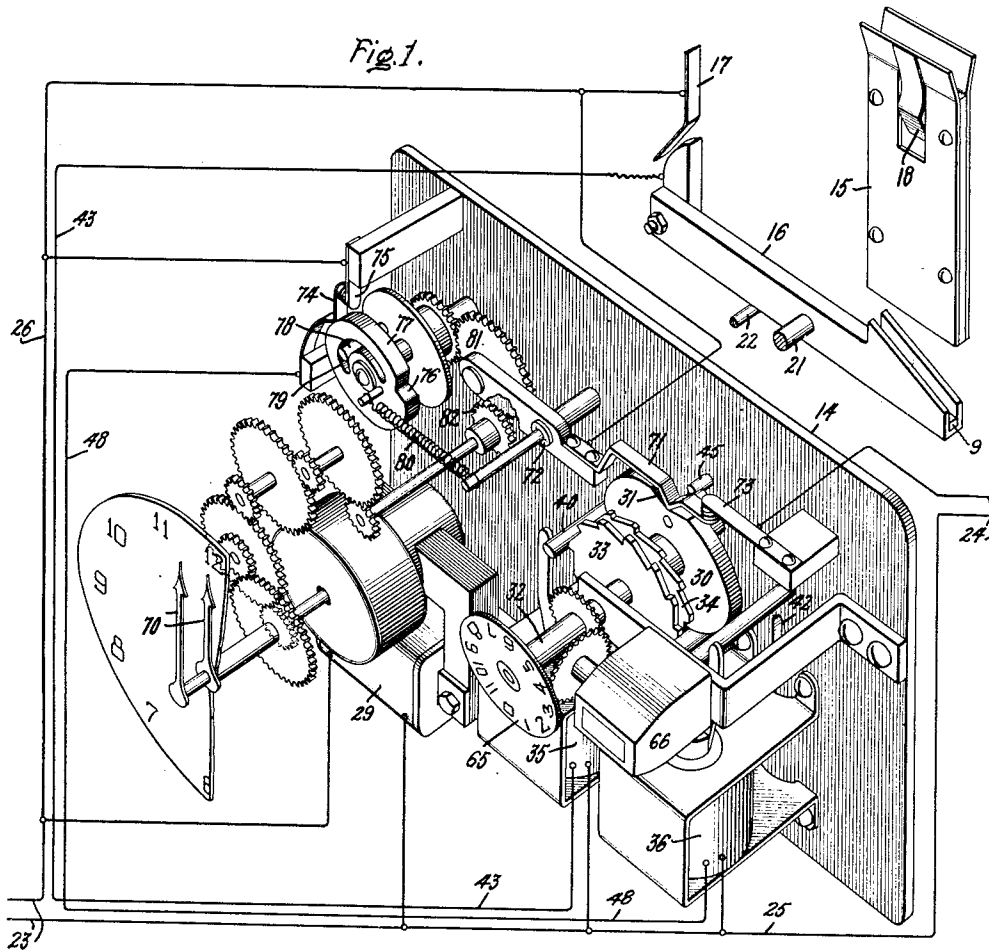
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COIN TIME SWITCH SYSTEM

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COIN TIME SWITCH SYSTEM

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My invention relates to a coin controlled time switch and system for general use whereby by the insertion of one or more coins of the proper value a person may use an electrical appliance controlled by the switch for a time dependent upon the number of coins inserted. This general type of switch is well known and the object of the present invention is to provide various improvements insuring reliability of operation under all conditions.

The form of switch described is one in which the timing motor is continuously operated and drives the hands of a clock. I prefer to employ a synchronous motor as the timing motor and it is preferable that the synchronous motor be of the self-starting type. The switch which closes and opens the circuit is preferably actuated by a cam controlled by two relays. One of these relays is actuated in response to the insertion of coins and the other relay is actuated in response to the timing motor. The first relay serves to close the service switch and move the cam from a switch opening position in accordance with the number of coins inserted and the other relay periodically moves the cam in the opposite direction to eventually open the switch. Means are provided for preventing the operation of the switch by other than proper coins, for showing the total number of coins deposited and the number of coins deposited for which service has as yet not been rendered. The switch may be used for controlling the circuit of such devices as radio sets, player pianos, washing machines, refrigerators or any electrical appliance of circuit desired where a person wishes to use the device or circuit and pay for the use or service in this manner.

One great advantage in the use of a synchronous motor in a device of this character is that it may be connected to the source of supply controlled by the switch so as to automatically suspend the timing function upon the failure of the source of supply. When power comes on again the timing function may be resumed and if the motor is of the self-starting type it will be resumed automatically. Thus the full time value of the service paid for is obtained which is not the case where a spring clock timing device is used under similar circumstances.

The features of my invention which are believed to be novel and patentable will be pointed out in the claims appended hereto. For a better understanding of my invention reference is made in the following description to the accompanying drawing which shows in Fig. 1 a perspective view of the coin switch mechanism removed from its casing and combined with a clock, Fig. 2 is a detailed side view of the coin chute shown in Fig. 1, and Fig. 3 shows some of the details of relay 36 which are hidden from view in Fig. 1.

It will be understood that the mechanism shown will be enclosed in a suitable casing provided with a lock or sealed whereby only authorized access may be had to the coin box and other parts of the device.

Referring now to Fig. 1, the coin switch mechanism is represented as being supported on a plate 14 which is removable as a unit from the casing by removing holding bolts. The coin chute 15 and the switch mechanism 16, 17 adjacent thereto are not shown as supported by plate 14 but ordinarily they will be, the present illustration being used to better expose the working parts to view. The coin chute and the switch parts adjacent thereto are provided to initiate the service by the insertion of a coin of the proper value in the top of the chute 15. It will be assumed that the chute represented is designed to take 25 cent pieces. As best shown in Fig. 2 the chute has an opening on one side, and near its top on the opposite side is a spring 18 with its free end extending into the chute space. The dimension 19 of the chute is slightly larger than the diameter of a 25 cent piece whereas the dimension 20 of the side opening is less than the diameter of a penny, nickel or dime. As a result, if one of the latter coins is inserted in the top it will be ejected through the side opening by the spring 18 and will not operate the switch bar 16 as now to be described.

If a 25 cent piece is inserted it will slide down the chute and drop out at the bottom, falling upon the right hand end of switch bar 16. Before proceeding further it may be noted that the spring 18 will prevent a coin being shaken out of the coin chute once it has been inserted; that is to say, if the box is inverted with the intent of having coins fall out of the entrance end of the chute, the spring 18 prevents coins from being removed in this way.

Switch bar 16 is pivoted at 21 and normally rests against a stop 22 with the switch contacts at 17 open. When a coin of the proper weight drops upon the grooved end of this bar 16 it is turned about pivot 21, closing the contacts on 16 and 17, and the coin then rolls off the right hand end into a suitable coin receptacle or to the bottom of the casing whereupon the switch contacts immediately open again.

A rather important detail of construction of the lever 16 is in the provision of a layer of special material in the slotted end thereof for the coin to fall upon. Some material or means is desirable here to cushion the fall of the coin so that it will not bounce and cause a double contact to be made at 17 upon the insertion of a single coin. Experiments with rubber indicate that it deteriorates rapidly and that its resilient properties are not entirely satisfactory for this

purpose. While any material of suitable resiliency may be used I have found that a flexible alkyd resin comprising the product of reaction of a polybasic acid, a polyhydric alcohol having three or more hydroxyl groups in the molecule, a dihydric alcohol and a dibasic aliphatic acid to be satisfactory. A more detailed description of such material may be found in the copending application Serial No. 393,119, Kienle et al. filed Sept. 16, 1929. This material in which the ratio of dihydric alcohol—dibasic aliphatic acid ester to the polybasic acid—polyhydric alcohol ester is 6:1 is particularly suitable. In carrying out the production of a resin of this character, suitable reacting quantities of, for example, phthalic anhydrid, glycerine, glycol, and succinic acid are reacted under proper conditions to produce a resin. This material does not deteriorate as quickly as rubber and when compressed will return to its normal state more slowly than rubber and has been found to have the proper resilient qualities for this application. A strip or layer of such material or its equivalent is therefore preferably used in the coin groove in lever 16 as indicated at 9 to obtain a proper single contact making action of this lever when a coin is dropped thereon.

The source of supply for all parts of the switch mechanism and for the circuit controlled thereby is represented as entering on the lines 23. When a synchronous motor is used the supply will be alternating current. The service circuit controlled by the coin switch is represented at 24. It will be seen that one side of circuit 24 is permanently connected to one supply line through wire 25 and that the other connection is through wire 26 and a pair of switch contact members 71 and 73.

Switch member 71 is resilient and its free end is provided with a bend which rides on a cam 30 containing a depression 31. When the cam is in the initial position represented with the end of 71 resting in the depression 31 the switch contact on 71 is separated from that on 73. When the cam is rotated from this position contact member 71 is raised and the contacts on 71 and 73 are closed.

Cam member 30 is mounted on a rotatable shaft 32 with a pair of ratchet wheels 33 and 34. A ratchet relay 35 is provided with its pawl 37 cooperating with ratchet wheel 33 to rotate the cam shaft in a clockwise direction and a similar relay 36 is provided with its armature pawl 38 cooperating with ratchet wheel 34 to rotate the cam shaft in a counter clockwise direction. The pawls are pivoted to the relay armatures, are biased toward the ratchet wheels by spring 39 (see Fig. 3) and suitably guided in their operation by rods 40 in the forked ends of the pawls. Guide rods 41 are also secured to the relay armatures and slide in slots 42 when the relays are actuated. These details of the relays are to assure their reliable operation and exact movement of the ratchet wheels and may be varied as conditions warrant.

Relay 35 which may be termed the credit relay is momentarily energized through lines 26, contact 17 and line 43 whenever a coin of the proper value is inserted in the coin chute 15 and the lever 16 is operated as previously described. Each of the ratchet wheels illustrated is provided with twelve evenly spaced teeth and in this case the relays are designed to rotate their respective wheels $\frac{1}{2}$ of a revolution for each energization. Thus each time a 25 cent piece is in-

serted in coin slot 15, cam wheel 30 will be rotated $\frac{1}{2}$ of a revolution in a clockwise direction, through relay 35, until it has made $\frac{1}{2}$ of a complete revolution and a pin in the cam wheel 30 comes against a stop pin 45. When this happens the cam stops in such a position that the switch contacts controlled thereby are still closed and will remain closed until the cam has been turned in the opposite direction $\frac{1}{2}$ of a complete revolution to its initial position. Thus it will be observed that with the cam in the initial position shown, any number of coins up to and including eleven coins may be inserted one after the other at a given time to close the switch to the circuit 24 and rotate the cam 30 an amount corresponding to the number of coins inserted.

Relay 36, which may be termed the time service consumption relay or simply the time relay, rotates the cam 30 in the opposite direction and is energized through line 26, contacts 74 and 75 and line 48.

Before proceeding further with the description it will be well to briefly review the complete operation of the parts thus far described. Let us assume the parts are in the position shown which is substantially the position which will exist initially with all circuits open. A coin of the proper value is dropped in chute 15, contact is made at 17 by the raising of the adjacent end of lever 16. The coin rolls off and lever 16 returns to its illustrated position. In the meantime relay 35 has been energized momentarily and has actuated cam shaft 32 $\frac{1}{2}$ of a revolution clockwise, raising contact member 71 and closing the circuit to lines 24. Service on lines 24 is now available for a half hour or such other period for which the apparatus is designed, determined by the gear selection between the motor and the contact mechanism operated thereby. At the end of this period contacts 74, 75 are closed momentarily, relay 36 is energized and returns cam 30 to its initial position, thereby opening the circuit to the service lines 24. If a greater length of uninterrupted service is desired, say two hours for example, four coins are inserted one after the other. This causes four actuations of relay 35 and the rotation of cam 30 $\frac{4}{12}$ of a revolution, requiring four actuations of relay 36 and two hours operation of the timing motor to again open the circuit. Additional coins may be inserted at any time to prolong the service up to five and one half hours with the particular arrangement described.

Now let us assume that with the service switch closed and with the mechanism in condition to render one hour's service, the power supply fails for that length of time. Naturally the motor 29 stops and no service can be rendered until the power supply is reestablished. However, the service paid for is still available when the power comes on again because during the failure the timing function of the mechanism is suspended.

If the timing motor had been an ordinary spring driven clock or even an electric motor connected to some other source of supply than that to the service lines controlled by the coin switch, its timing function would have continued during the failure but no service would have been rendered. Consequently the customer would have paid for service without getting it. It is also generally quite desirable that the motor be of the self-starting variety. Small non-self-starting synchronous motors are generally started by giving them a spin by hand and if provision is made for this to be accomplished, for example, by allowing the

motor shaft to extend a short distance outside the casing, the same provision may be used for stopping the motor and suspending the timing action when service is available and the motor energized.

Thus with such an arrangement a person could insert a coin, start the motor and close the service switch and then stop the motor and its timing function and use the service indefinitely. With the self-starting synchronous motor completely closed by the casing such unauthorized conduct is impossible and yet the exact service paid for is available whenever the supply is available regardless of interruptions. A self-starting synchronous motor suitable for this purpose is described in United States Warren Patent No. 1,495,936, May 27, 1924.

I prefer to provide a register wheel 65 secured to cam shaft 32 to indicate at all times the position of depression 31 with respect to switch member 71 so as to notify anyone using the service how many coins may be inserted or how long the service will be available without inserting any more coins. This register is preferably calibrated in coin numbers and indicates through the window in the casing the number of coins deposited for which service has not yet been rendered. A total coin register 66 is also provided for counting the total number of coins deposited. This register is of a well known construction and operates through a crank 67 and arm 68 from the armature of relay 35. The synchronous motor 29, which serves as the timing device for the coin switch, operates continuously when power is available and drives the hands 70 of a clock. Thus in addition to the coin switch which renders service when coins are deposited we have an electric clock giving time service at all times. A switch member 71 pivoted at 72 and cooperating with a stationary contact 73 is operated by the cam wheel 30 to control the circuit to the service lines 24. However, this switch does not control the circuit of the synchronous motor 29 but the latter is permanently connected across the supply lines 23.

The time relay 36 is energized through switch contacts 74 and 75, the former of which is on a resilient cam follower and is movable and is allowed to move into contact with the stationary contact 75 when the depression 76 in cam 77 comes opposite the cam follower. Cam 77 is driven in a clockwise direction through a lost motion driving connection from a gear train operated from the synchronous motor 29 and this gear train is selected to obtain the desired time interval of the periodic closing operation of contacts 74 and 75 and the corresponding operation of the time relay 36.

The lost motion driving connection of cam 77 is to obtain a short momentary closure of the contacts for each revolution thereof and comprises a pin 78 driven from the gear train operating in a circular slot 79 in the cam in conjunction with a spring 80 which normally biases the cam to the rotative position shown. In this position of the cam the contacts are open. Pin 78 makes one revolution in a clockwise direction at a uniform speed during the desired time interval. Upon engaging with the driving end of slot 79 it drives the cam, placing tension on spring 80. After the cam has thus turned about half of a revolution from the position shown the spring passes through the dead center position and thereafter rotates the cam quickly to approximately the position shown. During the fast rotation of the cam the depression therein passes the cam fol-

lower and the switch contacts are allowed to close momentarily.

When cam 30 has been returned to a zero or initial position which is the position illustrated with the service line switch open it is unnecessary to continue the operation of the switch mechanism which energizes the time relay 36 although so far as the mechanism itself is concerned it would do no particular harm to do so, since in this position of cam 30 it is stopped from further counter-clockwise rotation by the stop pin 45.

However, if this switch mechanism is allowed to continue operating after the service switch has been opened the chances are that the cam pin 78 will not be in its proper zero time position when the next coin is inserted and consequently the time service paid for will not be fully rendered but will be somewhat shorter than the full time interval established by complete rotation of cam pin 78. In order that the timing function of this cam will always be correct it is therefore desirable to start it from a definite initial position upon the insertion of a coin and primarily for this reason I provide for disconnecting the driving gear train to cam pin 78 as soon as the service switch is opened at contact 73, at which time pin 78 is in such a position that a full revolution thereof is necessary before the circuit of relay 36 will be closed again. The time interval is thus always correct and is independent of the time indicated by the clock and there is no interference with the time keeping function of the clock. Also, I prefer to discontinue the operation of the switch mechanism for the time relay 36 after it has performed its function so as to reduce the wear on these parts and the slight noise incident to their operation when the device is in use only as a clock. To this end one of the gears 81 in the gear train between motor 29 and the switch operating mechanism is mounted on the rear end of the pivoted switch member 71 so that when this switch member is in the position shown with cam 30 in its initial position and the service switch open gear 81 is raised from engagement with its driving gear 82 and the gear train to the switch mechanism is thus broken. However, as soon as a coin is deposited and cam 30 is turned from the position shown, the switch lever 71 is rotated slightly on its pivot 72 to lower gear 81 into driving engagement with gear 82. Gear 82 is operated continuously from the synchronous motor which drives the clock but the remaining portion of the gear train to the switch mechanism may thus be disconnected and is in operation only when its timing function is required for the coin switch mechanism. The total coin counter 66 is geared directly to the shaft 32 of cam 30. The usual construction of such a counter permits registration for only one direction of rotation of its terminal shaft and since this feature constitutes no part of this invention an explanation of the interior construction of the counter is believed unnecessary.

I will now review briefly the operation of the apparatus shown. Normally the coin switch parts are in the position shown when the service switch controlled thereby is open. The synchronous motor driven clock is in normal operation and keeping time. To close the service switch one or more coins of the proper value are deposited in the coin chute, causing one or more operations of the switch lever 16 and one or more operations of the credit relay 35 and cam 30 is turned in a clockwise direction by an amount to credit the

number of coins deposited. The service switch is closed and gear 81 is lowered into engagement with gear 82 whereupon the mechanism for eventually closing switch contacts 74, 75 for the time relay 36 is set into motion. After the desired time interval, such as an hour or a day, relay 36 is energized to move cam 30 towards a position to open the service switch, the amount of such movement being the same as that produced by the deposit of one coin but in the opposite direction. Depending upon the number of coins inserted this operation is repeated until the time service paid for has been consumed and cam 30 is returned to its initial position whereupon gear 81 is raised from driving connection with gear 82. Coins may be deposited at any time up to the limit of the mechanical credit system of the switch which in this case is a maximum of 11 coins.

A failure of the source of supply automatically suspends the timing function of the device so that when power is again available the time service actually paid for is obtained.

It will be observed that the mechanical relay credit and time service accounting system is applicable to coin switch devices generally regardless of the type of timing motor used and therefore I do not wish to limit my invention to any particular kind of timing motor. Such other embodiments of the invention as fall fairly within the true spirit and scope of the disclosure are intended to be included in the scope of the claims appended hereto.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. A coin controlled time switch comprising a coin chute, a service switch, means operative upon the deposit of a coin in said chute for closing said switch, a continuously operated timing device, a clock driven thereby, timing interval means driven by said timing device for causing the opening of said service switch a predetermined interval of time after it is closed, and means responsive to the closing and opening of said switch for respectively connecting and disconnecting the driving connection between said timing device and timing interval means.

2. A coin controlled time switch comprising a coin chute, a service switch, rotatable operating means therefor, relay actuated means operative upon the deposit of one or more coins in said chute for closing said switch and rotating its operating means away from a switch opening position a distance depending upon the number of coins deposited after the switch is closed, a continuously operated clock, timing interval means driven by said clock, a time relay energized by the operation of the timing interval means for rotating the switch operating means towards a switch opening position whereby the switch will be opened again after a predetermined interval of time dependent upon the extent of rotation necessary and means responsive to the opening and closing of said switch for respectively connecting and disconnecting the timing interval means to and from said clock.

3. A coin controlled time switch comprising a coin chute, a service switch, credit means operative upon the deposit of a coin in said chute for closing said switch, a self-starting synchronous motor, a clock driven thereby, time interval means controlled by said motor for normally opening said switch again a predetermined interval of

time after it is closed, means whereby such time interval may be extended upon the deposit of additional coins in said chute, a common source of alternating current connected to said service switch and motor the connection to the motor being independent of said service switch, and means whereby the time interval means is rendered ineffective when said switch is open.

4. A coin control time switch comprising a coin chute, a service switch, a rotary member for operating said switch said switch being open in an initial rotary position of said member and closed for all other rotary positions of said member, a credit relay energized in response to the deposit of coins in said chute for stepping said member away from its initial position a distance dependent upon the number of coins deposited at a given time, a time relay for stepping said rotary member towards its initial position, the extent of movement of said member being the same by both relays for each energization thereof, a timing motor, the operation of which is continuous and independent of the condition of the service switch and a time interval circuit controller operated by said motor for momentarily energizing said time relay at predetermined spaced intervals of time only when the service switch is closed.

5. A coin controlled time switch, comprising a coin chute, a service switch, a pivoted member for opening and closing said switch, means for closing said switch when a coin is deposited in said chute, a timing motor, means driven by said timing motor for causing the opening of said switch a predetermined interval of time after it is closed, said means being driven from said motor through a gear train one gear of which is mounted on said pivoted member, said gear train being disconnected by said pivoted member when the switch is open and connected by said pivoted member when the switch is closed.

6. In a coin controlled time switch, a coin chute, a horizontally disposed lever freely pivoted on a horizontal axis and having one end located beneath said coin chute in a position to receive a coin dropped through said chute, said lever being so balanced that the added weight of a coin thereon will cause it to tilt thereby permitting such coin to roll off, a switch operated directly by the tilting action of said lever, and a coin receiving surface for said lever, said surface comprising a layer of shock-absorbing resilient material of such character as will prevent the coin from bouncing and thereby causing a double operation of the switch when a coin is dropped thereon.

7. A coin controlled time switch comprising a coin chute, a service switch, credit means operative upon the deposit of a coin in said chute for closing said switch, a motor, a clock driven thereby, time interval means controlled by said motor for normally opening said switch again a predetermined interval of time after it is closed, means whereby such time interval may be extended upon the deposit of additional coins in said chute, a common source of current connected to said service switch and motor, the connection to the motor being independent of said service switch, and means whereby the time interval means is rendered ineffective when said switch is open.

JULIAN H. STARK.