April 2, 1935. M. H. RHODES 1,996,173

TIME CONTROLLED SWITCH

Filed May 29, 1933 4 Sheets-Sheet 1

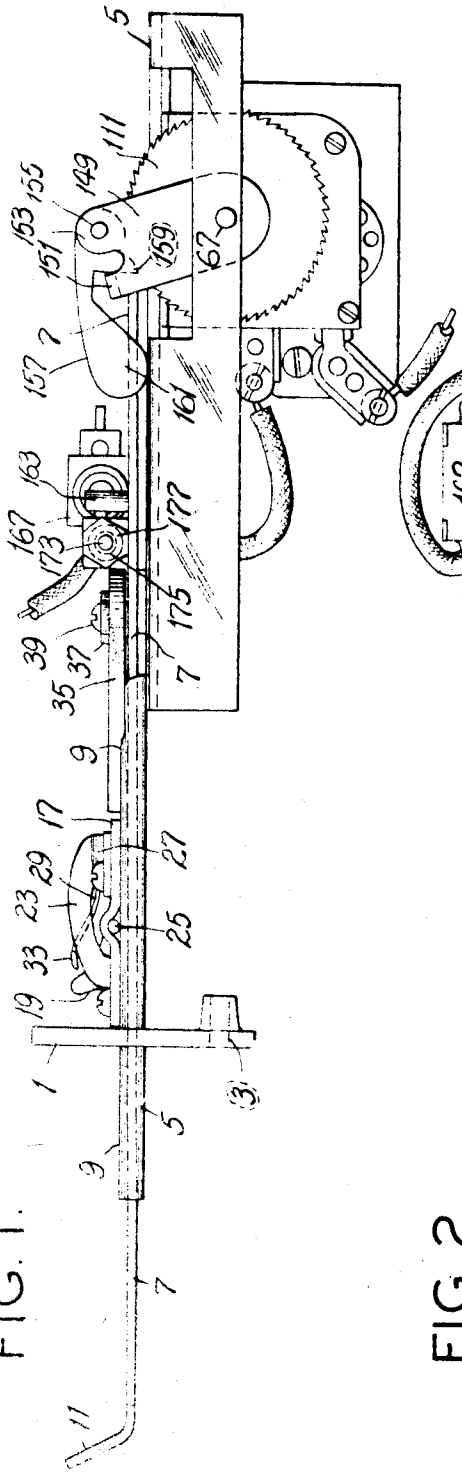


FIG. 1.

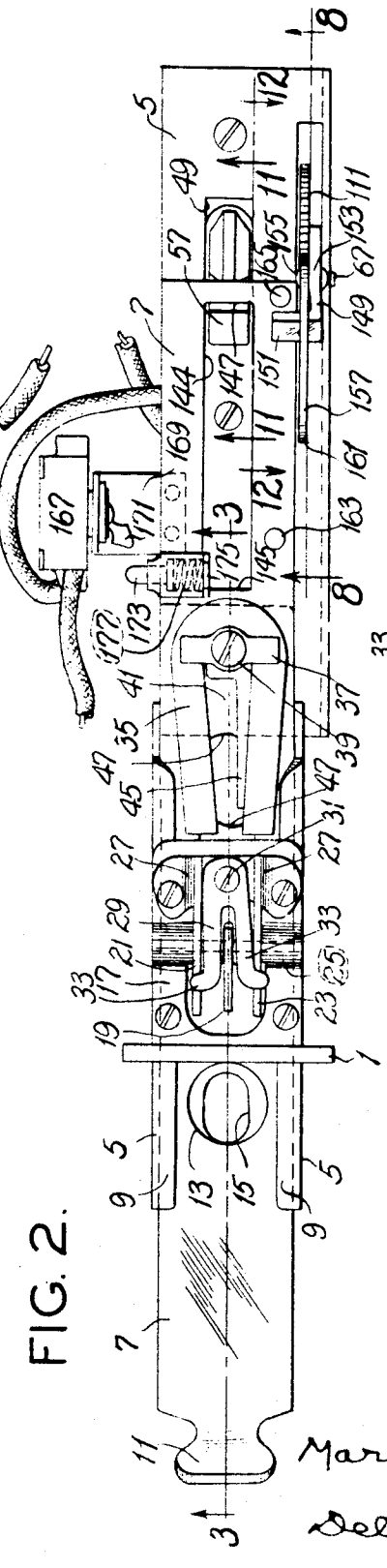


FIG. 2.

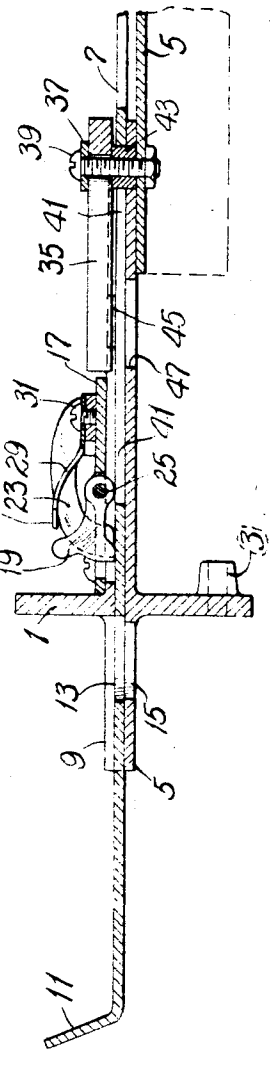


FIG. 3.

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April 2, 1935. M H. RHODES 1,996,173

TIME CONTROLLED SWITCH

Filed May 29, 1933 4 Sheets-Sheet 2

FIG. 4.

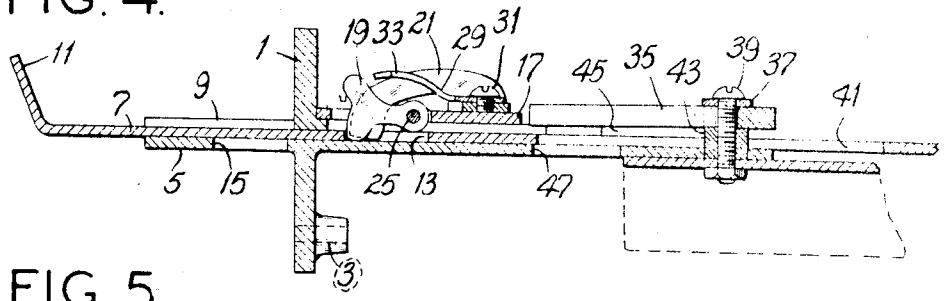


FIG. 5.

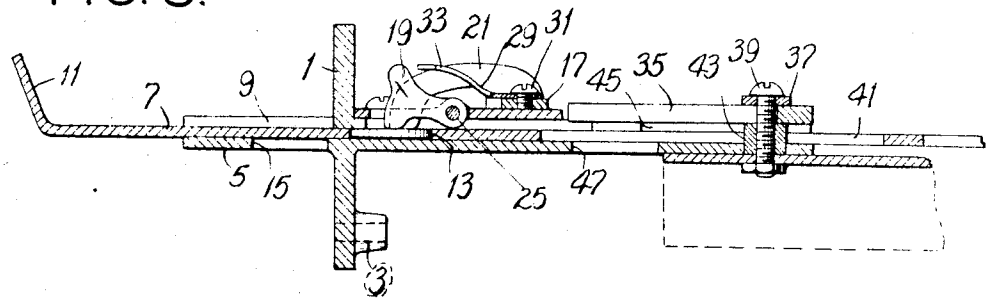


FIG. 6.

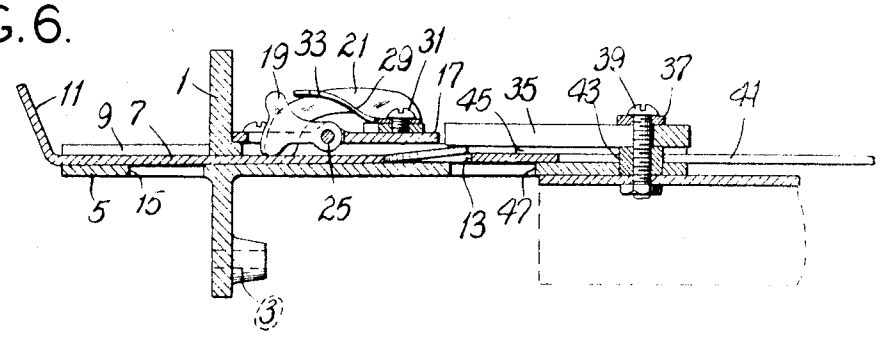
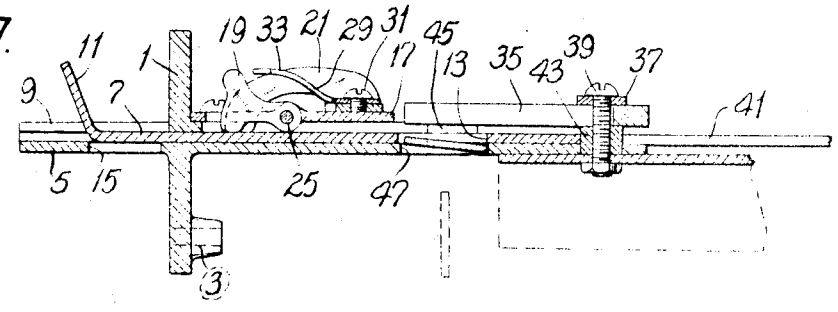


FIG. 7.



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April 2, 1935. M. H. RHODES 1,996,173

TIME CONTROLLED SWITCH

Filed May 29, 1933 4 Sheets-Sheet 3

FIG. 8.

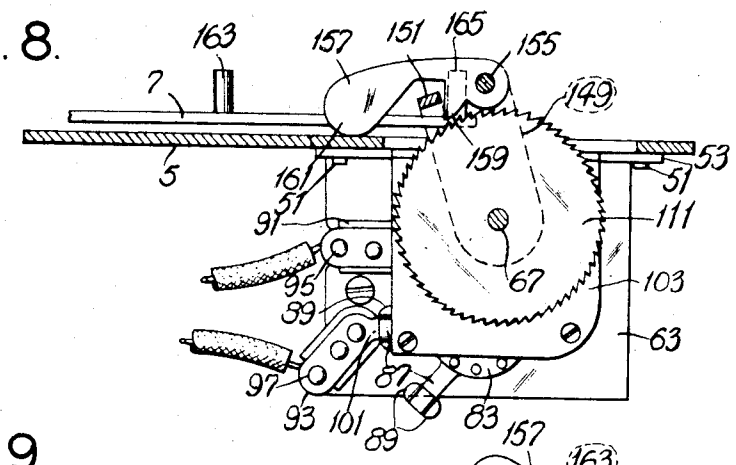


FIG. 9.

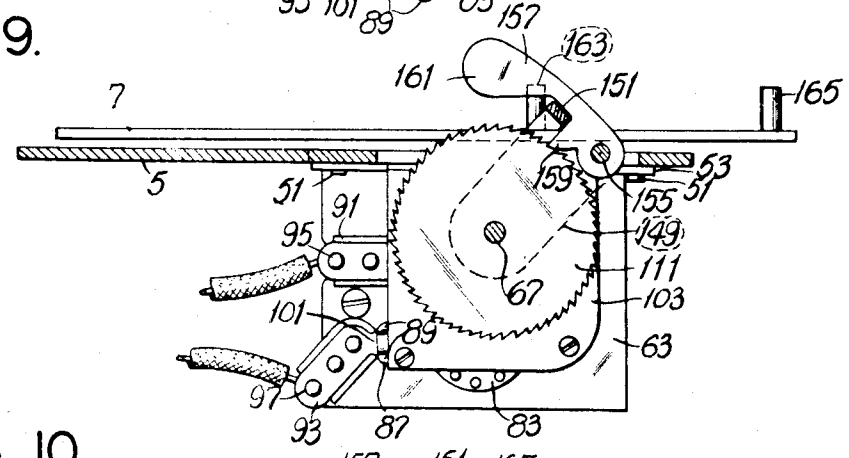


FIG. 10.

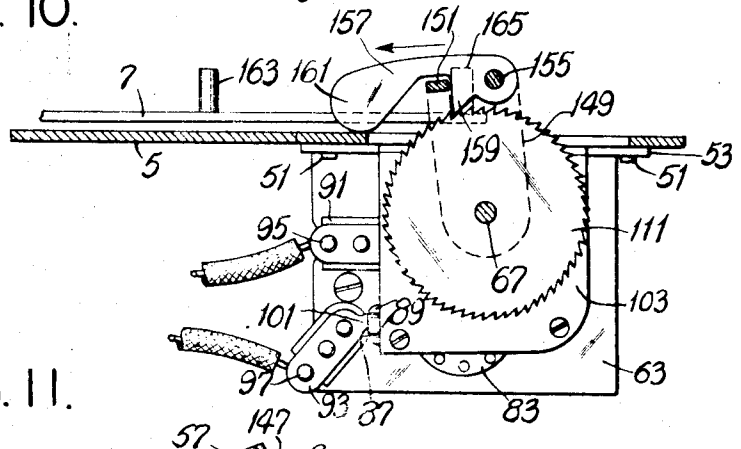
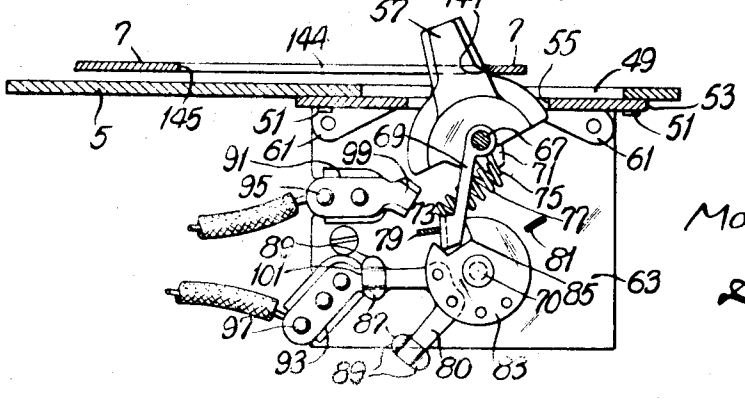


FIG. 11.



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April 2, 1935. M. H. RHODES 1,996,173

TIME CONTROLLED SWITCH

Filed May 29, 1933 4 Sheets-Sheet 4

FIG. 12.

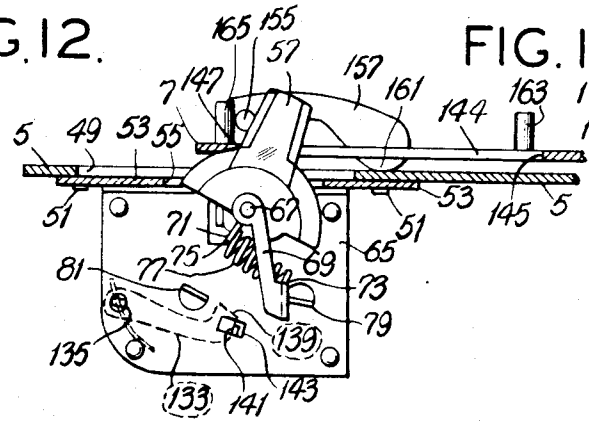


FIG. 15.

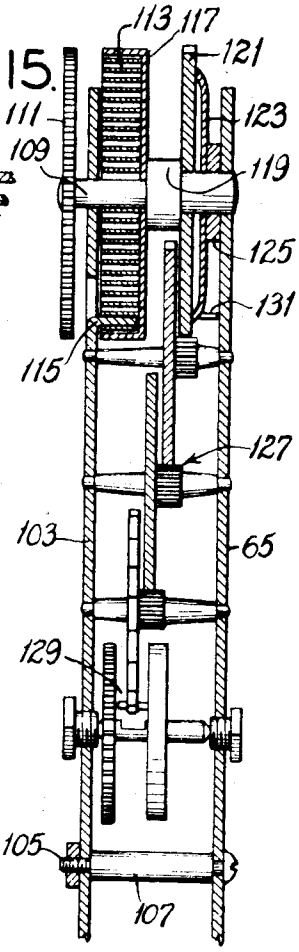


FIG. 13.

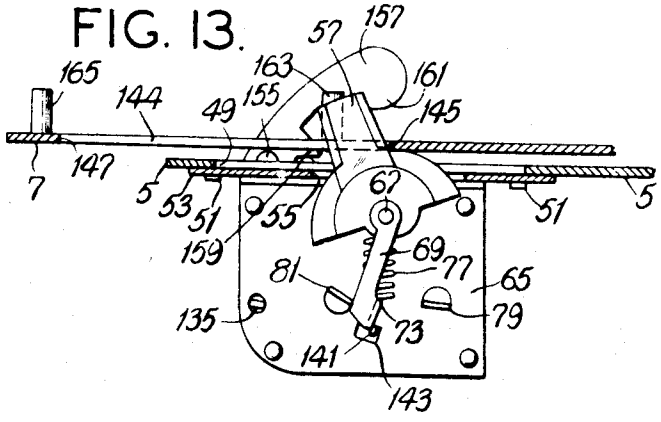
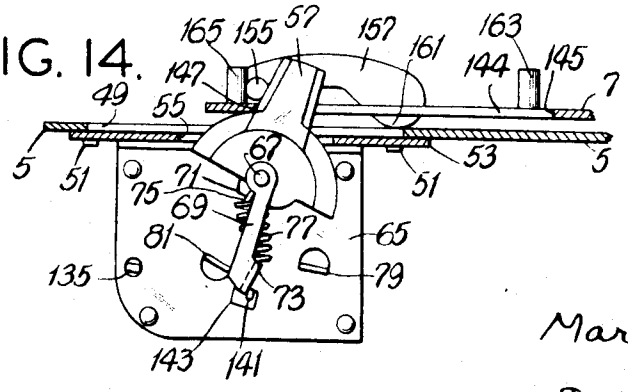


FIG. 14.



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Patented Apr. 2, 1935

1,996,173

UNITED STATES PATENT OFFICE

1,996,173

TIME CONTROLLED SWITCH

Marcus H. Rhodes, Hartford, Conn., assignor to M. H. Rhodes, Inc., Hartford, Conn., a corporation of Delaware

Application May 29, 1933, Serial No. 673,422

6 Claims. (Cl. 200—39)

This invention relates to time-controlled electrical switches, and with regard to certain more specific features, to time-controlled electrical switches adapted for coin-controlled operation.

Among the several objects of the invention may be noted the provision of means for operating a time-controlled switch of the type shown in my copending application, Serial No. 578,596, now Patent No. 1,951,490, dated March 20, 1934, and the like, with a coin receiving and selecting mechanism, so that, for a coin of a predetermined denomination, the flow of electric current may be had for a predetermined time interval; the provision of a switch of the class described which is operable both to initiate the flow of current and to predetermine the time interval during which current will flow by a simple longitudinal movement of a single manually operable means; a switch of the class described which does not function to initiate current flow until after the inserted coin has been delivered into a coin-receiving receptacle, so that momentary insertion of the coin and manipulation of the device throughout less than its full range, to avoid discharging the coin, is unaccompanied by the initiation of current flow; and the provision of a switch of the class described which is relatively simple in construction and operation. Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly comprises the elements and combinations of elements, features of construction, and arrangements of parts which will be exemplified in the structures hereinafter described, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings, in which is illustrated one of various possible embodiments of the invention,

Fig. 1 is a side elevation of a switch embodying the present invention;

Fig. 2 is a top plan view of the switch of Fig. 1;

Fig. 3 is a longitudinal section taken along line 3—3 of Fig. 2, and illustrating a normal position of certain coin selecting elements;

Fig. 4 is a section similar to Fig. 3, illustrating the manner in which motion is intercepted when no coin has been inserted in the device;

Fig. 5 is a section similar to Fig. 3, illustrating the manner in which motion is permitted if a coin of proper denomination has been inserted;

Fig. 6 is a section similar to Fig. 3, illustrating the operation of a certain slug-detecting device;

Fig. 7 is a section similar to Fig. 3, illustrating the discharge of a coin of the proper denomination from the device;

Fig. 8 is a longitudinal section taken along line 8—8 of Fig. 2, and illustrating the time switch operating means of the present invention in their normal position;

Fig. 9 is a section similar to Fig. 8, but showing the operating means in an extended position;

Fig. 10 is a section similar to Fig. 8, but showing the operating means in the course of their return from the extended position of Fig. 9 to the normal position of Fig. 8;

Fig. 11 is a section taken along line 11—11 of Fig. 2, illustrating certain mechanical switching means in their normal position;

Fig. 12 is a longitudinal section taken along line 12—12 of Fig. 2, and illustrating the position of certain switch operating means at the stage of operation corresponding to Fig. 8;

Fig. 13 is a section similar to Fig. 12, but showing the means at the stage of operation corresponding to Fig. 9;

Fig. 14 is a section similar to Fig. 12, but showing the means at a stage of operation generally corresponding to Fig. 10; and,

Fig. 15 is an ideal section of a timing train used in the switch of the present invention.

Similar reference characters indicate corresponding parts throughout the several views of the drawings.

The present invention comprises, generally speaking, a combination of a coin selecting and operating mechanism, and a time-controlled switch per se, with elements whereby the normal movement of the coin operating mechanism are effective to operate the time-controlled switch in the desired manner. No claim is made herein to the coin operating mechanism per se, as this comprises a type which may be procured on the open market, nor is any claim made in this application to the construction of the time-controlled switch per se, such being claimed in my copending application, Serial No. 578,596, filed December 2, 1931, now Patent No. 1,951,490, dated March 20, 1934. However, in order to make clear the operating characteristics of the combination as a combination, the coin operating mechanism and the time-controlled switch will be described separately in as brief a manner as is compatible with the objects of the present invention.

Referring now more particularly to Figs. 1 and 2, numeral 1 indicates a face plate which is provided with screw receiving holes 3 for receiving screws to mount the device, as is customary, upon a panel or the like. Extending through the plate 1 is a track 5, in which slides a slide member 7. The slide member 7 is secured in position in the

track 5 by overturned edges 9. The front end of the slide 7 is provided with a manipulating projection 11. A hole 13 is provided in the slide 7 in such position that when said slide is pulled out of said track to its maximum extent, as shown in Figs. 1 and 2, the said hole is directly in front of the plate 1. The hole 13 is just large enough to receive the coin designated for operating the apparatus. A smaller hole 15 is located in the track immediately beneath the hole 13, for convenience in inserting the coin.

Mounted on the upper edges of track 5 immediately behind the plate 1 is a plate 17, upon which are mounted three detent members 19, 21, and 23. Detent 19 rotates in a vertical plane in line with the center of the slide 7 upon a pin 25. Detents 21 and 23 are alike, but located on opposite sides of detent 19, and are suitably pivoted (to rotate in a vertical plane as well) upon projections 27 struck from the plate 17. A leaf spring 29, mounted on the plate 17 by a screw 31, has two fingers 33 which bear one upon the upper edge of each of the detents 21 and 23, urging them always downwardly. The under side of the track 5 is solid beneath the detents.

Progressing rearwardly from the detents, the next means mounted upon the track 5 comprises an ordinary horseshoe magnet 35, the magnetic poles of which are centrally placed above the midline of the slide 7. The mounting for the magnet 35 comprises a clamping bar 37 and a screw 39, the screw 39 passing through a long slot 41 in the center of the slide 7. A collar 43 on the screw 39 spaces the magnet from the track 5. Also mounted by the screw 39 is a bar 45, which is above the level of the slide 7 but under the magnet 35.

The slide 7 continues rearwardly, for switch operating purposes to be described.

Beneath the poles of magnet 35, a hole 47 is provided in the under side of track 5, said hole being of large enough diameter to pass the designated coin. The bar 45 extends to a point somewhat ahead of the center of the hole 47.

The operation of this coin operating mechanism is as follows:

When a suitable coin is inserted in the hole 13 of slide 7, and said slide is pushed into the track 5 (to the left in the drawings), said slide is permitted to move all of the way back until the hole 13 is positioned above the hole 47 in the track 5, whereupon said coin falls out through the hole 47 into the receptacle provided (see Figs. 5 and 7). This is called the "retracted" position of the slide. The original position of the slide, in distinction, may be termed the "extended" position of said slide.

If no coin is placed in the hole 13, the slide 7 cannot be pushed back all of the way, but only until the hole 13 comes beneath the detents 19, 21 and 23, for, as illustrated in Fig. 4, if there is no coin in hole 13, the detents 19, 21 and 23 all fall into said hole and act as positive bars against further movement of the slide.

If a magnetic metal slug (slugs are usually made of iron) is inserted in the hole 13 in place of a legitimate coin, such slug passes the detents 19, 21 and 23, but when it comes beneath the magnet 35, it is lifted as shown in Fig. 6, and its edge is brought to bear against the bar 45, and further progress of the slide 7 is impeded.

From the above, it will be seen that the coin operating mechanism, from a functional standpoint, comprises means for permitting the slide 7 to move through a certain maximum longitudinal travel if the proper coin is inserted therein, but for positively preventing such maximum movement if the proper coin is not inserted. Thus, for the operation of the time-controlled switch of the invention, there is provided a longitudinally movable slide, the motion of which is already regulated by the presence or absence of the designated coin.

The switch for which the present invention is adapted comprises, as has been stated, the time-controlled switch of my copending application Serial No. 578,596. However, as shown in said copending application, the switch is not adapted to be directly operated by a simple longitudinal motion alone. Accordingly, certain adaptations are made in the present invention, the significance of which will appear hereinafter.

Broadly considered, the switch comprises mechanical switching means operated by a toggle handle, and a time-delay mechanism which interposes itself, when desired, to prevent functioning of the switch until the expiration of predetermined time intervals, the time intervals being adjustably predetermined by a rotatable adjusting disc.

The construction of the mechanical switching means will be apparent from Fig. 11. Numeral 5, as heretofore, indicates an extension of the track, although the turned-over portions 9 are now disposed of. Beneath a slot 49 in the extension 5 is supported, by rivets or the like 51, a plate 53, upon which the switch as a whole is mounted. The plate 53 has a slot 55 therein, through which a control handle 57 projects. The under side of plate 53 is provided with perpendicular edge extensions 61. To the far extension 61 is secured a contact board or panel 63, which is thus positioned at right angles to the track extension 5. To a similar extension 61 on the other side of strip 59 is secured a plate 65 (see Fig. 15), which is thus maintained parallel to the panel 63. A pin 67 is mounted between the extensions 61, and serves as the axis upon which the handle 57 rotates. Also mounted on the pin 67 is a swingable hammer saddle member 69 and a member 71, the saddle being rotatable with respect to the handle 57 while the member 71 is fixed with respect to said handle. The saddle 69 and the member 71 are provided with noses 73 and 75, respectively, between which is supported a compression spring 77. The arrangement between the handle 57, hammer saddle 69, member 71, and spring 77 is such that an overcentering motion is had when the handle 57 is manipulated. That is, when the handle 57, as it appears in Fig. 11, is rotated to the right, no motion of the hammer saddle 69 takes place until the noses 73 and 75 are in line radially to the pin 67, but as soon as such line is passed, the accumulated force in the compression spring 77 throws the hammer saddle 69 sharply to the right, to the full extent of its movement as limited by a stop 79 struck from the plate 65. A second stop 81 likewise struck from the plate 65 limits movement of the saddle 69 in the opposite direction. It will be apparent that the same overcentering action takes place, but in the reverse direction, when the handle 57 is rotated back to its original position.

The panel 63 is preferably formed of insulating material, such as fiber. On it is mounted a pin 76, which is located substantially directly beneath the pin 67. On the pin 80 rotates a contactor bar assembly, which comprises a spring contactor piece 80 which is secured to a circular anvil piece 83 having a notch 85 cut therein. The notch 85

receives the lower end of the hammer saddle 69. The contactor piece 80 comprises two double-bladed arms 87, each of which extends substantially radially from the pin 70. At their ends, the arms 87 are provided with upturned ears 89, which aid in the ready making of contacts.

Mounted in position on the panel 63 to be engageable by the contactor arms 87 are a pair of terminal pieces 91 and 93, which include binding posts 95 and 97, respectively, and knife-edge extensions 99 and 101, respectively. The binding posts 95 and 97 constitute the means for making exterior connections to the switch. The knife-edge extensions 99 and 101 are in position to be engaged and disengaged by the contactor arm 87 when the contactor assembly is rotated.

By reason of the engagement of the lower end of hammer saddle 69 with the notch 85 in anvil piece 83, rotation of the contactor assembly is had in a quick, forcible manner when the handle 57 is oscillated. Thus, contacts are made and broken in a snapping manner, which avoids the formation of arcs and sparks which deteriorate the terminals and contacting elements.

The time-delay mechanism is mounted between plate 65 and a similar plate 103 which is supported on plate 65 by means of screws 105, as spaced by collars 107 (see Fig. 15). It comprises, primarily, a main shaft 109, to which is affixed, on the outside of the plate 103, an adjusting dial or ratchet wheel 111. Between the plates 65 and 103 are mounted on the main shaft 109 a main spring 113 (the other end of which is anchored to the plate 103 as indicated at numeral 115), a main spring cover plate 117, a spacing collar 119, a main gear 121 (which is rotatable on the shaft 109), a clutch disc 123 (which is fixed on the shaft 109) and a spacing washer 125. Engaging the main gear 121 is a gear train 127 terminated by an escapement mechanism 129. The construction of this train and escapement is of no consequence to the present invention, and may be had by reference to my said copending application. The clutch disc 123 comprises a spider made of spring metal, which has a plurality of radial fingers arranged to bear upon the surface of main gear 121. One of the fingers is provided with an upturned projection 131, which serves purposes to be described hereinafter. The clutch arrangement is such that when the wheel 111 is manually rotated (thus rotating the main shaft 109 to wind the main spring 113), the gear 121 is permitted to remain unmoved, but when the device is running down under the power of the main spring, the gear 121 is held non-rotatable with respect to the shaft 109, and thus, to run down, the main spring must drive the gear train 127 and escapement mechanism 129, whereby the running down may take place only in a slow, timed manner. It will be obvious that the length of time required for the device to run down after its initial winding is proportional to the angle through which the wheel 111 has been rotated in winding. This angle is expressed by the angular rotation of the projection 131 on the clutch disc 123.

Numeral 133 (Fig. 12) indicates a latch lever that is rotatably mounted on a pin 135 that is in turn supported between plates 65 and 103. A spring 137 always urges the lever 133 into its uppermost position. The lever 133 is provided with an upper cam edge 139, and a projection 141 which extends at right angles from the plane of the lever through a slot 143 in the plate 65. The lever 133 is so positioned that the projection 131 on the clutch disc 123 engages the cam edge 139 when said timing mechanism is in its run down position, and thus depresses the lever 133 against the action of the spring 137. When the lever 133 is in its upper position, the projection 141 is in position to intercept the motion of the hammer saddle 69, but when said lever is in its lower position, as when the timing mechanism is run down, said projection 141 clears the hammer saddle 69 and allows it to swing freely. It is through the projection 141 that the time control of the switching means is secured.

The operation of the time-controlled switch is as follows: Assume, initially, that the elements are in the positions indicated in Figs. 11 and 12, this being the normal position of the switch. The timing mechanism is "run down", and hence the lever 133 is depressed and the projection 141 is not in the way of the hammer saddle 69. The control handle 57 is now manipulated to its other position. This action, as has been described, causes the hammer saddle 69 to swing sharply to its other position and move the electrical elements into connected or on position, as indicated in Fig. 13. The time-delay feature is now brought into play by rotating the wheel 111. With a few degrees rotation, the latch lever is permitted to move upwardly and the projection 141 moves into position to intercept the movement of the hammer saddle 69. Subsequent rotation of the wheel 111 merely increases the time interval before the latch will be returned to non-interfering position. After the wheel 111 has been set at the desired interval, the handle 57 is again manipulated as if to turn off the switch. The handle 57 itself moves to its off position, but because of the projection 141, the hammer saddle 69 cannot follow the handle 57, but instead remains in on position, as shown in Fig. 14; the compression spring 77, however, is cocked to return the hammer saddle 69 to off position as soon as the projection 141 is removed. Thus, the switch remains on although the control handle has been thrown to off position.

At the expiration of the set time interval, the projection 131 engages the cam edge 139 to force the lever 133, and hence the projection 141, into its lower position, and thus to permit the hammer saddle 69, under the power of the compression spring 77, to snap sharply to off position and rotate the contactor assembly into disconnecting position. Thus, after the predetermined time interval, the switch automatically turns off, and is ready for another cycle of operations.

Analyzing the manual movements incidental to the above cycle of operations with respect to the coin control mechanism, it will be seen that the following is the sequence: First, the control handle is pushed back from its frontward to its rearward position. Then, the wheel 111 is rotated forwardly to set the desired time interval. Finally, the control handle is returned from its backward to its frontward position.

The elements for accomplishing this sequence of operations merely through the longitudinal motion of the slide member 7 are as follows:

First, with respect to the movement of the handle 57: This is accomplished by extending the slide back the full length of the track 5, and providing a slot 144 in said slide, through which the handle 57 projects. Now, when the slide is pushed backward, the front edge 145 of the slot 144 engages and pushes the handle backwardly (see Fig. 13). When the slide 7 is again pulled

forward, the rear edge 147 of the slot 143 engages and returns the handle 57 to its original position (see Fig. 14).

The mechanism for controlling and moving the ratchet wheel 111 is slightly more complicated. Mounted on the pin 67 exteriorly of the wheel 111, and in a freely rotating manner, is a lever 149 (Fig. 1). At its upper end, the lever 149 is provided with an inwardly turned projection 151 and an upstanding projection 153. To the projection 153 is pivoted, on a pin 155, a pawl member 157, which comprises a tooth 159 and a cam extension 161. The pawl is in the plane of the wheel 111, and the tooth 159 is disposed to engage the teeth of said wheel. The pawl is limited in its rotation by engagement with the projection 151 from lever 149. On the slide 7 are provided two spaced upstanding pins 163 and 165 (see also Fig. 2), which are positioned to engage the projection 151 from lever 149. The operation of this mechanism is as follows: The normal position of the elements is that illustrated in Fig. 8, corresponding to Fig. 1. The cam extension 161 rests upon the track extension 5, thus lifting the tooth 159 from engagement with the wheel 111 so that said wheel is permitted freely to move, as in running down of the time-delay mechanism. Now, when the slide 7 is pushed back to its retracted position the forward pin 163 on the slide 7 engages the projection 151 and thus rotates the lever 149, and hence the pawl 157, to the right, and into the Fig. 9 position. The wheel 111 is not moved during this operation, as the tooth 159 engages the teeth of wheel 111 only on forward rotation. At the end of the backward motion of the slide 7, however, the weight of the cam extension 161 rotates the pawl 157 so that the tooth 159 is engaged with one of the teeth of the wheel 111, as shown. If the slide 7 now be pulled forwardly, the rearward pin 165 engages the projection 151 to rotate the lever 149, and since the tooth 159 remains in engagement with the wheel 111, said wheel 111 is rotated in a winding direction, thus empowering the time-delay mechanism. The winding continues until the cam extension 161 again comes into contact with the track extension 5 to lift the pawl 157 from engagement with the wheel 111. The position of the elements at the moment that the pawl is being lifted out of engagement with the wheel 111 is shown in Fig. 10. When the slide has been pulled forward to its fully extended position, the position of the element is again that shown in Fig. 8, in which position the wheel 111 is free of any engagement with the pawl 157 and is thus permitted freely to return to its run down position, with the action of the time-delay mechanism.

Thus is the control of the two parts of the time-controlled switch achieved by a single backward and forward motion of the slide 7, when such motion is permitted by the insertion of a coin of proper denomination, as hereinbefore indicated. It will be noted that, under ordinary circumstances, therefore, the circuit is completed when the coin has been inserted and the slide 7 pushed all of the way in. Now, if the elements were only those thus far described, it would be possible to "cheat" the device by leaving the slide 7 in its pushed in position, and thus never starting the time-delayed turning off into operation. To prevent this, the following procedure is adopted:

Referring again to Figs. 1 and 2, numeral 167 indicates an auxiliary toggle switch of customary design, which is supported on a bracket 169 mounted on the track extension 5. The switch 167 has a handle 171 which moves in the plane of the slide 7. The switch 167 is connected in series with the main time-controlled switch, so that the effective terminals of the device as a whole constitute one terminal of the main switch and one terminal of the auxiliary switch. Mounted on the slide 7 is a retractable detent 173, which is normally pressed outwardly from its casing 175 by a compression spring 177. The detent 173 is positioned to engage the handle 171 of switch 167.

When the slide 7 is pushed backwardly from its Fig. 2 position, the detent 173 engages the switch handle 171 to throw said switch off. Subsequently, the operations are performed which turn on the main time-controlled switch, but the circuit as a whole remains off because the main switch and auxiliary switch are in series. The only way the circuit as a whole can be turned on is to pull the slide 7 back out until the detent 173 again engages the switch handle 171 to return the auxiliary switch to on position. In so pulling the slide forward, the time-delay off feature of the time-controlled switch is set into operation, and thus the difficulty above noted is obviated.

The directions to the user of the switch should instruct that a suitable coin be placed in the slide 7, the slide 7 pushed in as far as it will go, and then pulled back out as far as it will come; these instructions, if followed, will result in the flow of current for a length of time predetermined according to the circumstances.

If it is desired to have the switch on for periods longer than that originally provided for, this may be done by repeating the operations with a second coin at once; this will operate to rotate the wheel 111 a further increment away from "normal" position, and increase the time purchased accordingly. This use of additional coins may be followed until the limit of rotation of the wheel 111 is achieved, and thereafter the current will flow constantly until all of the purchased intervals have elapsed. Thus, if a nickel purchases two minutes of current flow, two nickels will purchase four minutes, three nickels will purchase six minutes, and so on.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As many changes could be made in carrying out the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. In combination, a time-controlled switch comprising mechanical switching elements having a handle for operating the same, and a time-delay mechanism cooperating with said switching elements to effect delayed operation thereof subsequent to the manipulation of said handle, and a rotatable means for adjustably predetermining the extent of said delay, and means for operating both said handle and said rotatable means, said operating means moving back and forth in one direction only.

2. In combination, a time-controlled switch comprising mechanical switching elements having a handle for operating the same, and a time-delay mechanism cooperating with said switching elements to effect delayed operation thereof

subsequent to the manipulation of said handle, and a rotatable means for adjustably predetermining the extent of said delay, and longitudinally movable means for operating both said handle and said rotatable means, movement of said longitudinal movable means being restricted to said longitudinal movement alone.

3. In combination, a time-controlled switch comprising mechanical switching elements having a handle for operating the same, and a time-delay mechanism cooperating with said switching elements to effect delayed operation thereof subsequent to the manipulation of said handle, and a rotatable means for adjustably predetermining the extent of said delay, and longitudinally movable means operative when moved to a retracted position to manipulate said handle to throw said switching means to on position, and when moved back to an extended position, to manipulate said handle to throw said switching means to off position, and means associated with said longitudinally movable means adapted, simultaneously with its handle-manipulating movement, to manipulate said rotatable means to condition said time-delay mechanism to defer return of said switching means to off position for a predetermined time interval.

4. The combination as set forth in claim 3, in which the last-named means includes a pawl engageable with said rotatable means, and means on said longitudinally moving means for actuating said pawl to rotate said rotatable means upon movement of said longitudinally movable means from its retracted to its extended position.

5. The combination as set forth in claim 3, in which the last-named means includes a pawl engageable with said rotatable means, and means on said longitudinally moving means for actuating said pawl to rotate said rotatable means upon movement of said longitudinally movable means from its retracted to its extended position, and camming means associated with said longitudinally movable means for removing said pawl from operative engagement with said rotatable means when said longitudinally movable means is in its fully extended position.

6. In combination, a time-controlled switch having a handle reciprocable in a given plane, and rotatable means for setting the time delay mounted in a plane parallel to that of the movement of the handle, a longitudinally movable plate, means mounting said plate for movement in a plane perpendicular to the planes of said handle and said rotatable means, said plate having means thereon engaging said handle and said rotatable means whereby, upon reciprocation of said plate in its own plane, said handle is reciprocated and said rotatable means is simultaneously actuated to a time-delay setting.

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