Jan. 17, 1939. A. W. WELCOME 2,144,172

COIN CONTROLLED TIME SWITCH

Filed Aug. 3, 1934 3 Sheets-Sheet 1

Fig. 1

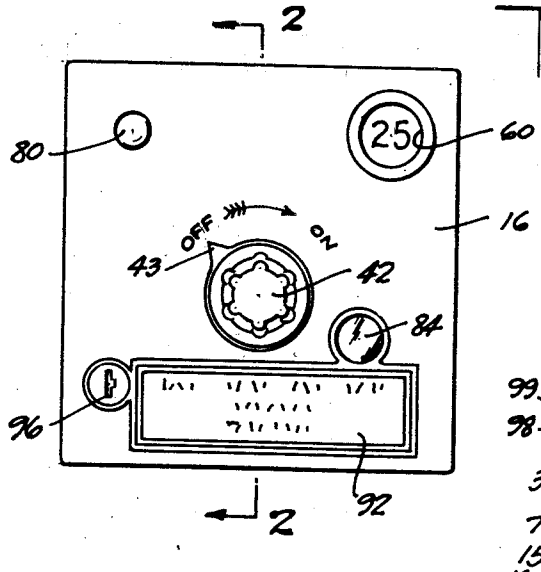


Fig. 2

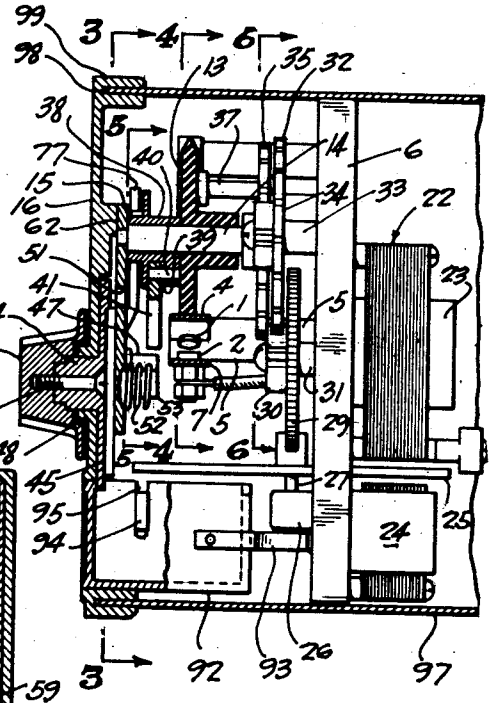
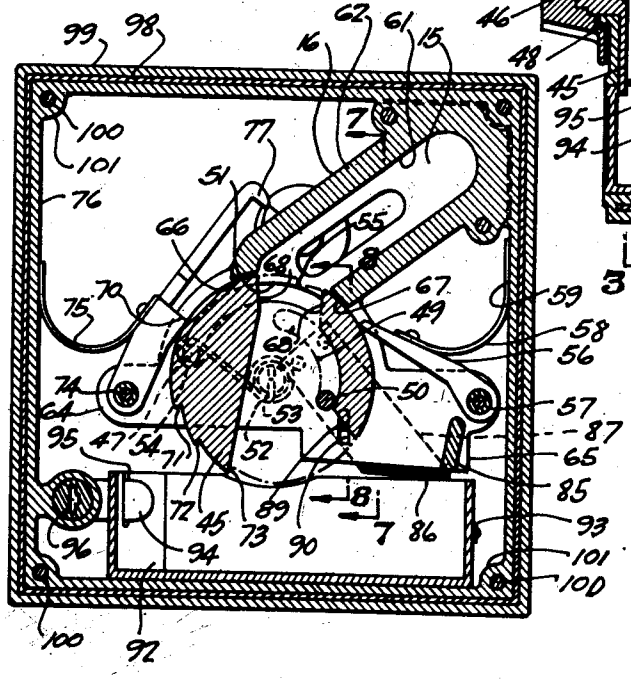


Fig. 3



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Fig. 4

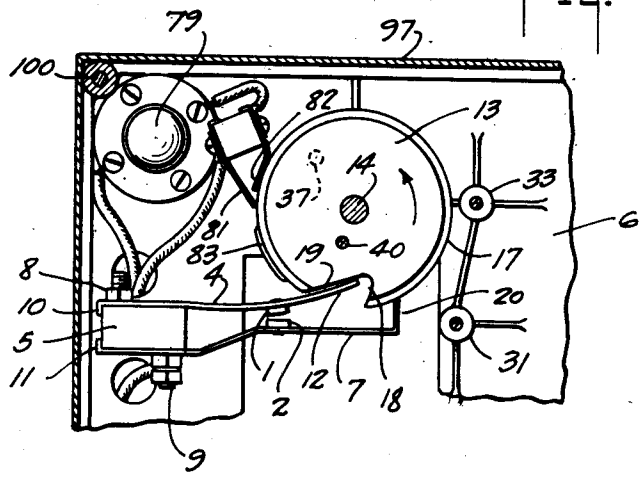


Fig. 5

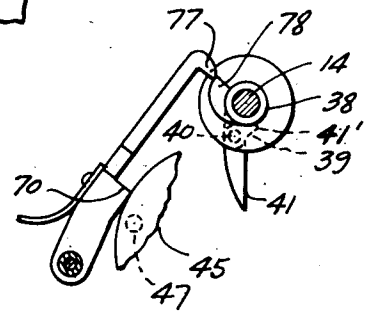


Fig. 6

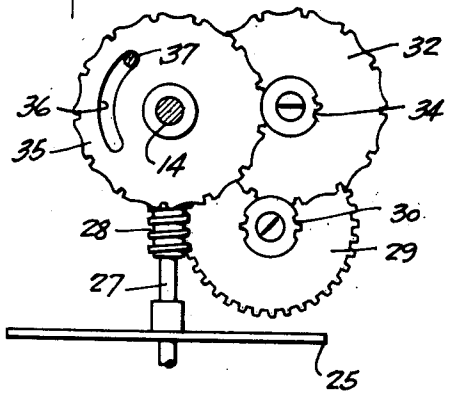


Fig. 7

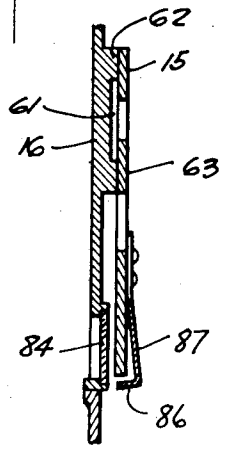
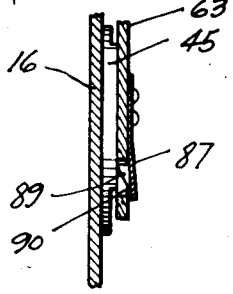


Fig. 8



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Fig. 9

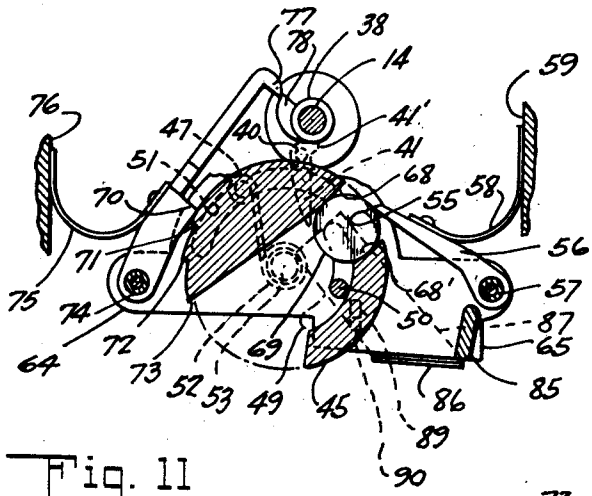


Fig. 10

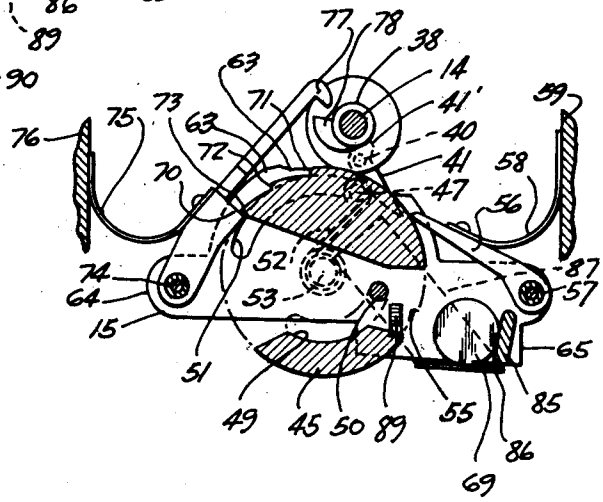


Fig. 11

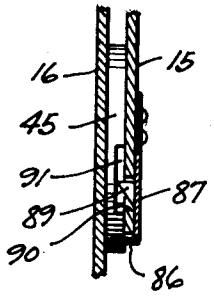
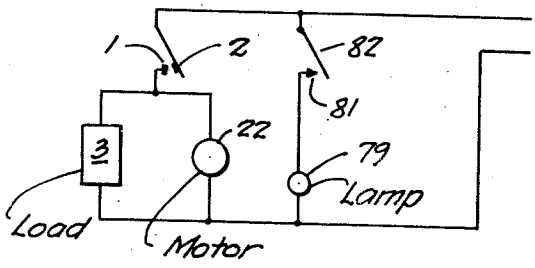


Fig. 12



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UNITED STATES PATENT OFFICE

2,144,172

COIN CONTROLLED TIME SWITCH

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Application August 3, 1934, Serial No. 738,247

1 Claim. (Cl. 200—33)

This invention relates to a device for controlling an electric circuit, and particularly by the aid of a coin control mechanism.

Mechanisms for timing the period of utilizing electric power are now well-known. It is also known to provide a coin-in-the-slot device whereby a coin must be deposited as a prepayment for the period of use of the service.

It is one of the objects of this invention to improve in general this type of mechanism.

The mechanisms of this character usually incorporate a constant speed device, such as a clock mechanism, a synchronous motor, or a disc induction motor. The constant speed device is usually connected to a motion transmission mechanism, such as reduction gearing, so that after a definite number of revolutions the contacts controlling the load circuit are operated. It is another object of this invention to improve in general the mode in which the contacts are arranged, whereby a quick make and break is obtained.

It is still another object of the invention to make it possible to start a new cycle or period of energization some time before the load is disconnected, so that there is no substantial period of interruption. Thus for example, when the timer is used to energize lamps for illuminating a tennis court for a definite interval such as an hour, the device can be operated just before the hour has elapsed, to secure an additional hour of play. This is accomplished without in any way altering the accuracy of the determination of the period of activity paid for.

It is still another object of this invention to provide a signaling device for warning the user prior to the time when the period of energization is to elapse, so that an additional prepayment can be made.

It is still another object of this invention to provide a coin mechanism such that slugs can be detected, and that the coin must be of the proper size for operating the mechanism.

This invention possesses many other advantages, and has other objects which may be made more easily apparent from a consideration of one embodiment of the invention. For this purpose there is shown a form in the drawings accompanying and forming part of the present specification. This form shall now be described in detail, illustrating the general principles of the invention; but it is to be understood that this detailed description is not to be taken in a limiting sense, since the scope of the invention is best defined by the appended claim.

Referring to the drawings:

Figure 1 is a front elevation of a device incorporating the invention;

Fig. 2 is a fragmentary sectional view taken along the plane 2—2 of Fig. 1;

Fig. 3 is a sectional view taken along the plane 3—3 of Fig. 2;

Fig. 4 is a fragmentary sectional view taken along the plane 4—4 of Fig. 2;

Fig. 5 is a detail sectional view taken along the plane 5—5 of Fig. 2;

Fig. 6 is a fragmentary detail view taken along the plane 6—6 of Fig. 2;

Fig. 7 is a detail sectional view taken along plane 7—7 of Fig. 3;

Fig. 8 is a detail sectional view taken along plane 8—8 of Fig. 3;

Fig. 9 is a fragmentary view similar to Fig. 3, showing one stage in the operation of the coin control mechanism;

Fig. 10 is a view similar to Fig. 9, but showing a later stage of operation of the coin control mechanism;

Fig. 11 is a detail sectional view similar to Fig. 8 but illustrating the coin rest in a position to hold the coin from dropping into the coin box; and

Fig. 12 is a schematic wiring diagram of the apparatus.

The main function of the device is to control a load circuit by the aid of a pair of contacts. These contacts are shown at 1 and 2 (Figs. 2, 4 and 12) As indicated in Fig. 12, when the contacts 1 and 2 are in engagement the load 3 is energized. The period of engagement of contacts 1 and 2 therefore determines the period of energization of the load. This load may be any translating device, such as lamps for illuminating a tennis court, or the like; an electric refrigerator; an electric washing machine; or any other electrical device.

The contact point 1 is conveniently supported on a resilient arm 4 fastened to a block 5 of insulation material. This block 5 is in turn fastened to a wall of a supporting frame 6 (Figs. 2 and 4). This frame 6 can be appropriately made as by die casting, and as will be described later on, it serves as a main support for many of the parts utilized in the apparatus.

The cooperating contact 2 is similarly supported on a resilient contact arm 7, fastened to the other side of the insulation block 5. Appropriate terminal posts 8 and 9 connect respectively with the arms 4 and 7. These arms are furthermore provided with right-angled extensions 10 and 11, for

appropriately maintaining their position with respect to the supporting block 5.

In the free position, such as indicated in Fig. 4, the resilience of arm 4 is such as to lift the contact point 1 out of engagement with contact point 2; and accordingly the load 3 is deenergized. However, it is possible by the aid of a cam mechanism to depress the free end 12 of arm 4, and to urge contact 1 against contact 2. Since contact 2 is also resiliently supported, this pressure on end 12 acts to maintain the contacts 1 and 2 in resilient engagement.

In the present instance the engagement of contacts 1 and 2 is effected by the aid of a rotatable member 13 (Figs. 2 and 4). This rotatable member is made from insulation material, such as Bakelite an is mounted for rotation on a stationary stub shaft 14 (Figs. 2, 3, 4, 5, 6, 9 and 10). This stub shaft can be appropriately fastened at one end in a boss projecting from the main frame 6. Its other end can be similarly supported in a stationary member or plate 15 carried by a cover member 16.

The rotatable member 13 has a circular portion or periphery 17. When the extremity 12 of resilient arm 4 rests upon the circular portion 17, the arm 4 is depressed and held in its contact making position. However, as member 13 rotates in a counterclockwise direction as viewed in Fig. 4, the extremity 12 is permitted, after a definite angular movement, to drop off portion 14. This is permitted by the provision of a shoulder 18 which terminates the circular portion 17. This shoulder, it will be noted, is undercut. The releasing position is shown in Fig. 4. To reengage the contacts 1 and 2, it is therefore necessary to advance the rotatable member 13 in a counterclockwise direction. This motion causes the surface 19 of member 13 gradually to depress the extremity 12 of arm 4, bringing contact 1 close to contact 2. As member 13 continues to rotate, shoulder 18 passes extension 20 of member 7. Extension 20 snaps off of this shoulder abruptly hinging contact 2 into engagement with contact 1. In other words, rotation of member 13 first depresses spring 4 bringing the contacts close together and then allows member 7 to snap upwardly due to its extension 20 riding off of periphery 17 over shoulder 18. This causes a quick, positive contact which minimizes arcing and sparking. Further rotation of member 13 causes surface 19 to bend members 4 and 7 downward with contacts 1 and 2 in engagement and as the points of flexure are at the corners of insulation block 5 and separated by the thickness thereof a sliding or wiping action between the contacts will occur. This serves to clean the points and makes for more positive contact. As the rotation continues, extremity 12 again rides upon the circular portion 17. The surface 19 is made at an appropriate angle to make it possible to effect this engagement of the contacts by advancing member 13 through a relatively small angle.

Due to the abrupt drop at shoulder 18, the contacts 1 and 2 are rapidly separated when rotatable member 13 reaches the definite angular position of Fig. 4. The undercutting of shoulder 18 eliminates any possibility of extremity 12 being impeded as it springs upward, ensuring an abrupt break. In this way, arcing or sparking between the contacts is substantially eliminated.

As shown in Fig. 4, the contact arm 7 can be provided with an extension 20, which may engage with circular portion 17 when contact 1 separates from contact 2. In this way contact 2 is prevented from following contact 1 as contact 1 raises; and there is accordingly a certainty of deenergization of the load 3, when rotatable member 13 reaches the angular position of Fig. 4.

The rotatable member 13 is arranged to be advanced in a counterclockwise direction by the aid of a constant speed mechanism. Accordingly the contacts 1 and 2 stay in engagement for one complete revolution of member 13. The mechanism for driving member 13 at a constant speed in this case includes a constant speed motor of the induction disc type. This motor is illustrated diagrammatically at 22 (Figs. 2 and 12). The coils for the motor are shown at 23, 24. The motor is shown as supported on the back of the main frame 6, except for the induction disc 25 (Figs. 2 and 6). This induction disc is provided with an appropriate step bearing located in the boss 26 on the front of the frame 6 as well as an appropriate upper bearing for the upper end of the shaft 27 upon which disc 25 is fastened. This induction disc 25 accordingly drives the perpendicular shaft 27, which is located in front of the frame 6.

The details of the drive by the shaft 27 and the rotatable member 13 will be described hereinafter. It is sufficient at the present time to note that motor 22 is located in a circuit parallel to the load 3 as indicated in Fig. 12. In this way, the opening of contacts 1 and 2 also serves to deenergize the motor 22, and the apparatus comes to rest in the position shown in Fig. 4. It is necessary therefore when it is desired to start the cycle of operations, to advance member 13 to cause contacts 1 and 2 to engage, even while motor 22 is deenergized. For this reason, the mechanical drive between motor 22 and member 13 includes a lost motion connection. This renders it possible to advance member 13 independently of the motor 22 to start the cycle of operations.

This drive mechanism can now be described. Shaft 27, which is driven by the induction disc 25, carries a worm 28. This worm is in engagement with a worm wheel 29 (Figs. 2 and 6). This worm wheel is rigidly fastened to a toothed member 30 which may be of the Geneva type. The elements 29 and 30 can be approximately journalled on a stationary shaft supported on a boss 31 in frame 6. The toothed member 30 serves to drive the toothed member 32 in an intermittent manner, as is well understood. This toothed member 32 is appropriately supported on a stationary stub shaft fastened in boss 33 on frame 6. To this toothed member 32 is fastened a smaller toothed member 34 which engages the toothed member 35 for intermittently advancing it. This tooth member 35 is rotatable upon shaft 14. By appropriate choice of the number of teeth in the various toothed elements, the reduction of speed from the disc 25 to the toothed wheel 35 can be made of any desired value, so that one revolution of wheel 35 can take place in any desired interval such as a quarter or a half hour, or as long as desired.

The drive between wheel 35 and a member 13 includes a slot and pin connection. For example, the wheel 35 can be provided with an arcuate slot 36. In this slot is engaged the pin 37 fastened to the member 13 and having axis parallel to the shaft 14, as shown most clearly in Fig. 6. It is apparent that, as defined by the angular spread of the arcuate slot 36, member 13 can be advanced in a direction to cause energization of the load 3 from the position shown in Fig. 4. In this advanced position, the pin 37 leaves the upper

end of the slot 36. Motor 22 and load 3 are energized; but member 13 is not driven by motor 22 until the upper end of slot 36 reengages the pin 37. Accordingly, the period of energization of the motor 22 and load 3 is again accurately determined by one complete revolution of wheel 35, irrespective of the fact that the member 13 has been advanced by independent means from the open circuiting position of Fig. 4.

In other words, the lost motion connection such as the slot and pin connection 36—37 makes it possible to restart the cycle of operations without disturbing the timing of the mechanism.

The manner in which the independent advancing of member 13 can be accomplished will now be described. Shaft 14 carries a bushing or sleeve 38 immediately adjacent the front face of member 13. This member 38 carries an ear 39 (Figs. 2 and 5). Through this ear passes a pin 40 carried by the member 13 (Figs. 2, 4 and 5). Accordingly the sleeve member 38 is in driving connection with member 13, and if member 38 is advanced in counterclockwise direction as viewed in Fig. 4, then the member 13 will be correspondingly advanced. This advance is accomplished by the aid of a swinging pawl 41 (Figs. 2, 5, 9 and 10). This pawl is pivoted upon the pin 40 and has a short extension 41' adapted to engage against the outer surface of the sleeve 38. Accordingly when the pawl 41 is urged in a counterclockwise direction as viewed in Figs. 5, 9 and 10, the pawl acts as a rigid radial extension, and a corresponding counterclockwise drive is imparted to the member 38. It is sufficient to start the cycle of operations merely to advance pawl 41 to a position such that member 13 will press arm 4 downwardly to cause engagement of contacts 1 and 2. In order to turn this pawl 41 to accomplish this result, use is made of a knob 42 (Figs. 1 and 2). This knob is located on the outside of the cover 16 and carries a pointer 43 cooperating with the legends "Off" and "On". In order to begin a cycle of operation the knob 42 is turned from the "off" position to the "on" position. As described hereinafter, at the end of the cycle of operations the knob 42 is automatically turned to the "off" position.

Knob 42, as shown most clearly in Fig. 2, has a hollow portion accommodating the boss 44 of a disc 45. This boss 44 serves as a journal for the knob assembly in a boss 48 on cover 16. This disc is rigidly fastened to the knob 42, as by the aid of a flat-headed screw 46. The disc 45 has a face substantially in contact with the inner surface of the cover 16. It carries a pin 47 parallel to the axis of rotation of knob 42. This pin, upon clockwise rotation of knob 42, engages the pawl 41. In Fig. 9 the pin 47 has not yet contacted with pawl 41. In Fig. 10 pin 47 has reached the end of its movement, and has moved the sleeve 38 in a counterclockwise direction sufficient to cause reengagement of contacts 1 and 2. The limit imposed upon the rotation of knob 42 includes an arcuate slot 51 in the stationary wall 15 which is spaced from the disc 45; a pin 47 secured to disc 45 is located in this slot. A similar arcuate slot 49 is formed in disc 45 and embraces a stationary pin 50 fastened to the inside of cover member 16. This is clearly shown in Fig. 2.

Furthermore, clockwise rotation of the knob assembly is resiliently opposed by a helical spring 52. This spring is wound around a stationary anchor piece 53 fastened to the inner surface of the plate 15. One end of the helical spring is connected to this anchor piece 53. The other end of spring 52 is formed into a hook extension 54 engaging the pin 47. Accordingly, as knob 42 is turned in a clockwise direction, the spring 52 is wound up. When rotatable member 13 approaches near the definite angular position of Fig. 4, the spring is released and the knob 42 returns to the "off" position, shown in Fig. 2. Furthermore, the knob 42 is prevented from turning unless a coin is deposited in a manner now to be described.

The disc 45 has a notch 55 in its periphery. This notch is adapted to cooperate with a pawl 56 to prevent rotation of disc 45 unless the pawl 56 is lifted out of the way. This pawl 56 is journaled on a stub shaft 57 fastened in the rear of the cover member 16. It is urged toward engaging position as by a leaf spring 58. This leaf spring is fastened at one end to the pawl 56 and at the other end is confined against a vertical wall 59 formed on the cover 16.

A coin must be utilized to urge pawl 56 free of the notch 55. For this purpose the coin must be deposited in an opening 60 in the cover 16. This opening 60 leads to a coin chute 61 (Fig. 3). This coin chute 61 is formed between an integral boss 62 formed on the inside wall of cover 16, and the plate 15. This plate 15 is also provided with side extensions 64 and 65 as well as an arcuate intermediate portion 63 in which the slot 51 is provided. The disc 45 rotates beneath the overhanging shoulders 66 and 67 of the integral boss 62. The disc is furthermore provided with converging surfaces 68 and 68' which are perpendicular to the plane of the disc. They are spaced apart a sufficient distance to provide a pocket for the coin 69, as illustrated in Fig. 9. The chute 61 is just large enough to accommodate this coin. A smaller coin than the desired denomination will roll out between the surfaces 68 and 68', without being lodged therein.

In the "off" position, the surfaces 68 and 68' form virtually a continuation of chute 61, as illustrated in Fig. 3. Conveniently the size of the coin can be marked on the surface of the plate 15 opposite the opening 60, so as to be exposed through the opening. In the present instance the numeral "25" appears through the opening 60, indicating that a twenty-five cent piece is the proper coin to use in connection with the mechanism. The seating of the coin 69 by the surfaces 68 and 68' is such that the edge of the coin extends slightly above the periphery of the disc 45. Furthermore, the coin pocket so formed falls opposite to the notch 55; so that as the disc 45 is rotated in a clockwise direction, the pawl 56 is urged upwardly by the exposed edge of the coin 69 and accordingly the knob 42 can be turned beyond the position shown in Fig. 9. The lifting of pawl 56 is illustrated in this figure and it is shown to be prior to the time of engagement of pin 47 with the arm 41. In this way it is ensured that a coin must be deposited before it is possible to begin the cycle of operations.

The coin 69 is confined in the pocket formed by surfaces 68 and 68' as well as by the corresponding parallel surfaces of the disc 45 and portion 63 of the plate 15.

As soon as actuating pin 47 approaches close to the arm 41, another pawl 70 engages the first notch 71 of a series of notches on disc 45, preventing backward rotation of disc 45. This ensures that the disc 45 must be turned only toward a coin discharging position. A succeeding notch 72 is provided for preventing the disc 45 from

being reversed after pin 47 is in engagement with arm 41. The last notch 73 is shown as in engagement with pawl 70 in Fig. 10, to hold the disc 45 against the action of spring 52, and to hold it in coin discharging position.

The pin 50 serves the purpose of positively ejecting the coin from its seat in the disc 45 when this is turned to "on" position. By referring to Figs. 9 and 10, it will be plain that as disc 45 is rotated in a clockwise direction, pin 50 will engage the lower edge of the coin 69 and force it outwardly. As the disc approaches the limit of its movement, tooth 89 will similarly engage the coin and finish expelling it from its seat. This serves to prevent the use of some sticky substance, such as chewing gum on the coin to hold it in its seat and permit repeat operation on the same coin.

Pawl 70 is shown as rotatably mounted on a stub shaft 74 fastened to the inner side of the cover member 16. A leaf spring 75 is fastened at one end to the pawl 70 and abuts against the vertical wall 76 provided on the inside of cover 16.

The stub shafts 57 and 74 can be hollow for the accommodation of screws to hold the plate 15 in closely spaced relation to the disc 45, and to form the coin chute.

The disc 45 is held in the position of Fig. 10 until near the time when the period of energization of the load circuit expires. To release the disc 45, it is necessary to lift pawl 70 out of engagement with the notch 73. For this purpose pawl 70 has an extension 77. This extension 77 is in the path of a rising cam 78 fastened to the bushing member 38. Accordingly, as rotatable member 13 carries bushing 38 in a counterclockwise direction, the cam 78 engages under the extension 77 and raises pawl 70 to release the disc 45 (Fig. 9). When this occurs the disc 45 is returned to the "off" position of Fig. 3.

Preferably the lifting of pawl 70 to permit the return of disc 45 is accomplished a short period prior to the disconnection of contacts 1 and 2. Therefore, it is possible to restart the cycle immediately, by inserting an additional coin, without waiting for the circuits to be deenergized. The additional coin can be deposited through the opening 60 and the knob 42 turned. This results in advancing of member 13 through the definite angular position of Fig. 4, but yet within the limits of the angular extent of slot 32.

In order to give a visible signal indication that the period of energization is nearing its end, use is made of a lamp 79, supported on the frame 6, and adapted to be viewed through a red window 80 located in the wall of cover 16. When the red light shows, the operator knows that in order to continue the period of energization, a further prepayment must be made.

The circuit for lamp 79 is controlled by a pair of spring contact arms 81 and 82 (Fig. 4). These contact on the periphery of rotatable member 13. However, since member 13 is made from insulating material, the energization of the lamp 79 is not completed until a conducting segment 83 fastened to the periphery of member 13, bridges the two arms 81 and 82. As is clearly indicated in Fig. 4, this bridging action takes place somewhat prior to the disconnection of contacts 1 and 2.

In order to guard against the use of slugs or counterfeit coins, provision is made whereby the coin discharged from the coin pocket can be viewed from outside the casing. Thus cover 16 has a glass window 84 (Figs. 1 and 7) through which the coin 69 can be viewed when the coin is in the position of Fig. 10. This coin is held in this position by the aid of a rib 85 formed on the extension 65 of plate 15. The lower edge of the disc is supported on a shallow extension or shelf 86 formed on a flat spring member 87, fastened to the inner side of plate 15. This extension 86 is arranged to be active to hold the coin 69 in the position of Fig. 10. This active position however endures only while the disc 45 is in the discharging position. This position is shown in Figs. 10 and 11. It is there seen that the spring member 87 has a tooth 88 extending through an appropriate aperture 90 in plate 15. This tooth is in the path of travel of the raised portions or bosses, of disc 45 which form the surfaces 68 and 68'. In the discharging position shown in Fig. 10, the tooth 89 is located in the hollow space 91 (Fig. 11) in which the coin 69 was located. Therefore the extension 86 extending below the lower edge of plate 15 serves as a rest for the coin 69. However, as soon as disc 45 rotates in a counterclockwise direction as viewed in Fig. 10, the tooth 89 is pressed outwardly and projection 86 is moved out of the path of the coin 69. This position is shown in Figs. 7 and 8.

When the coin drops past the projection 86, it is held in a coin box 92 (Figs. 1, 2 and 3). This coin box has a flat spring 93 having one end fixed to the coin box and its free end engaging against the frame 6, as shown in Fig. 2. This leaf spring serves to urge the coin box 92 outwardly through the appropriate opening formed in the cover 16 unless the coin box is locked in place. For locking the coin box in place, use is made of a rotatable bar 94 (Figs. 2 and 3) engaging in a slot 95 in one side of the box 92. This bar can be rotated only by inserting a key in the lock 96, and by rotating the key after it is inserted.

A sheet metal casing 97 can be provided for housing the whole structure. The open end of the casing can be closed by cover member 16. The edge of casing 97 can be accommodated in the appropriate groove 98 disposed in the flange 99 of cover 16.

Main frame 6 is attached to cover member 16 by screws 100 disposed in suitable bosses 101 located at the corners thereof. Casing 97 may be held in place by a couple of screws secured to the inside of its back and projecting through the main frame 6 where they are engaged by hollow nuts, accessible through the opening formed by the removal of coin box 92. This makes it impossible to tamper with the mechanism or connections unless the lock 96 is manipulated to release the coin box.

The mode of operation of the device can now be set forth. In the position shown in Fig. 4, the load 3 as well as the motor 22 are deenergized. To start the apparatus, a twenty-five cent piece is dropped through the window 60. This piece is accommodated between the surfaces 68 and 68' of the disc 45. The knob 42 is now turned in a clockwise direction. The coin 69 raises the pawl 56 so that it clears the notch 55. Pin 47, fastened to the disc 45, then engages arm 41 and advances member 13 to permit contacts 1 and 2 to close. At the same time pawl 70 successively engages the notches 71, 72 and 73, holding the disc 45 in the position shown in Fig. 10. Coin 69 is now in view through the window 84, so that it is possible to detect the use of slugs or the like.

The completion of the circuit through contacts 1 and 2 energizes both motor 22 and load 3.

The requisite amount of advancing of member 13 by the aid of the disc 45 is well within the limits of arcuate slot 36. As soon as the motor is in operation, the wheel 35 is rotated, and after a while the upper end of slot 36 engages pin 37, and from that point on member 13 is advanced by the motor 22.

Just prior to the arrival of the member 13 to the position shown in Fig. 4, segment 83 connects fingers 81 and 82 and lamp 79 is illuminated. This warns the user that the period of energization is nearing its end. At about the same time rising cam 78 lifts pawl 70 as shown in Fig. 5. This releases disc 45, which rotates back under the action of spring 52 to the position of Fig. 3. It is then possible to insert a new coin through the opening 60 and to advance member 13 past the open circuited position of Fig. 4 so that the cycle can continue for another complete revolution of member 13. Upon reverse rotation of disc 45 from the position of Fig. 10, coin 69 is released and is permitted to drop into the box 92.

I claim:

In a timing device, a switch including a pair of resilient arms each carrying a contact point, a rotatable operating member for said switch having a cam surface adapted to be engaged by the extremities of said arms and including a circular portion terminating in an abrupt shoulder, rotation of said rotatable member to a definite point causing one of said arms to slip off the shoulder and separate the contacts, rotation of said rotatable member beyond the definite point causing the other of said arms to slip off the shoulder and engage the contacts, a motor for advancing said rotatable member and energized by closure of said contact mechanism, a lost motion connection between said rotatable member and the motor, and means independent of the motor for advancing the rotatable member beyond the definite point to close the contact mechanism.

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