

June 1, 1965

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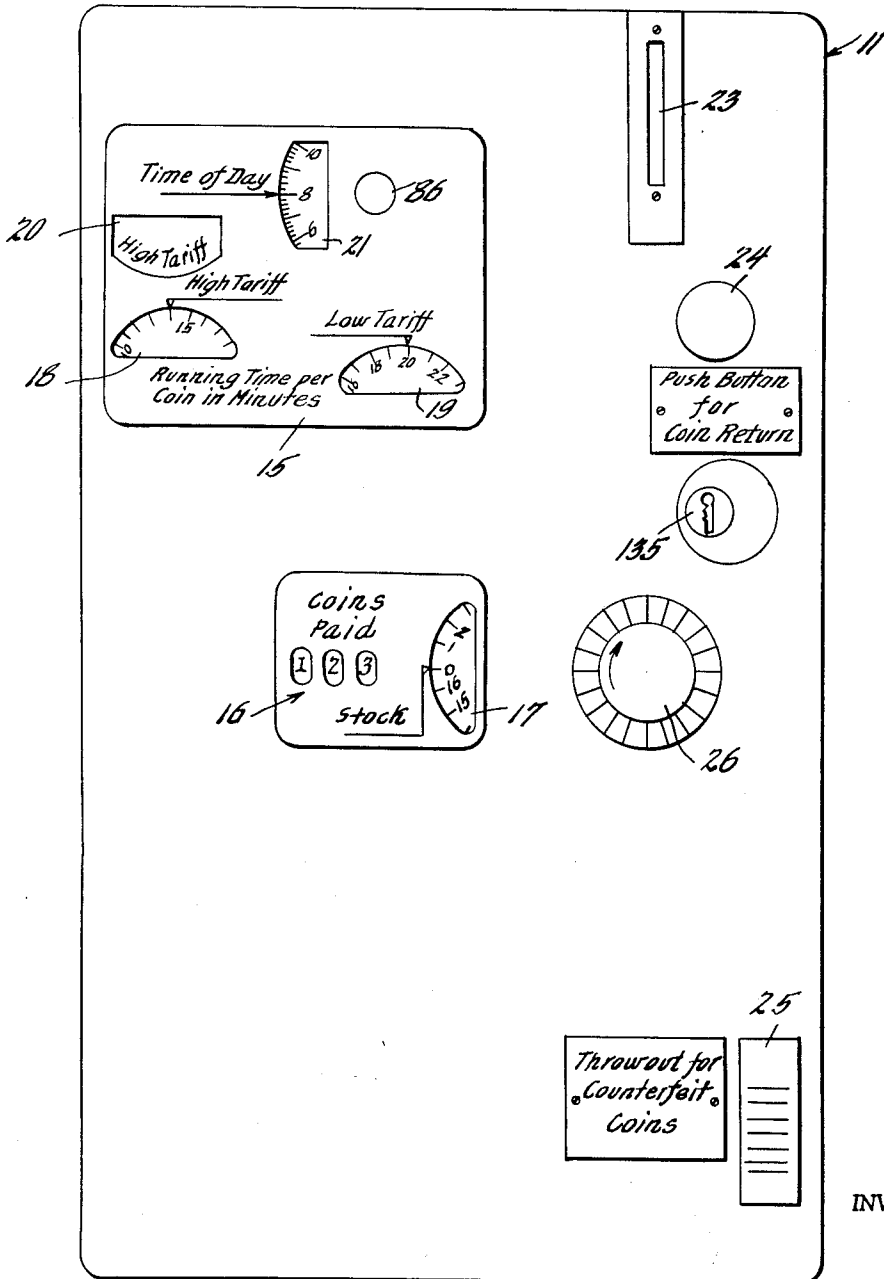
3,187,122

CHECK OPERATED TIME SWITCH

Filed Feb. 21, 1962

7 Sheets-Sheet 1

FIG. 1



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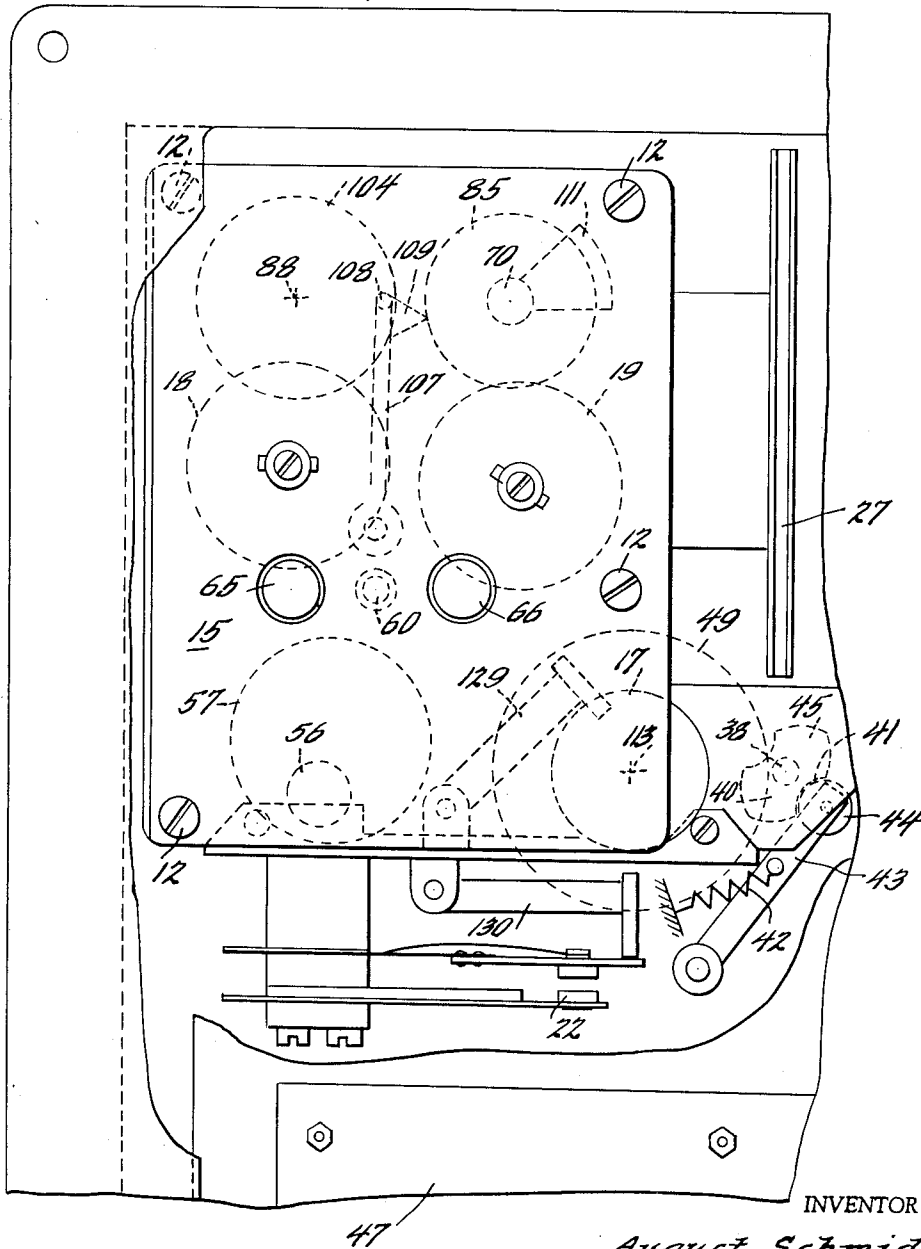
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CHECK OPERATED TIME SWITCH

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Fig. 2.



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CHECK OPERATED TIME SWITCH

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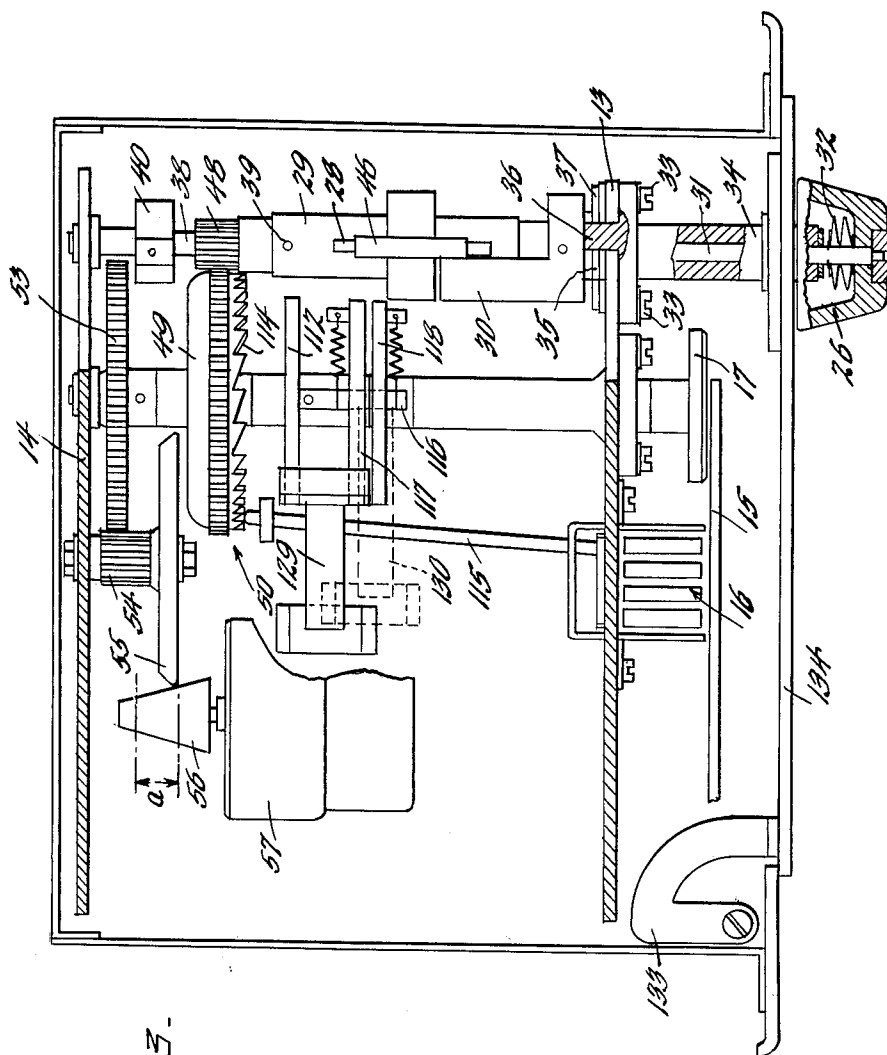


FIG. 3-

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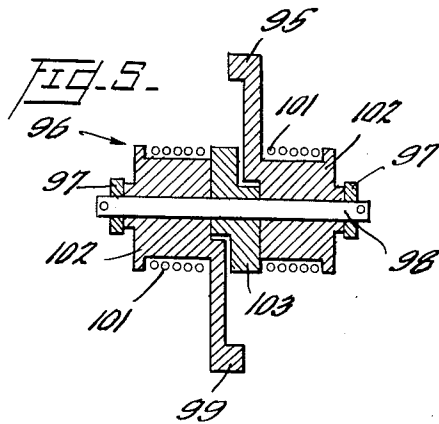
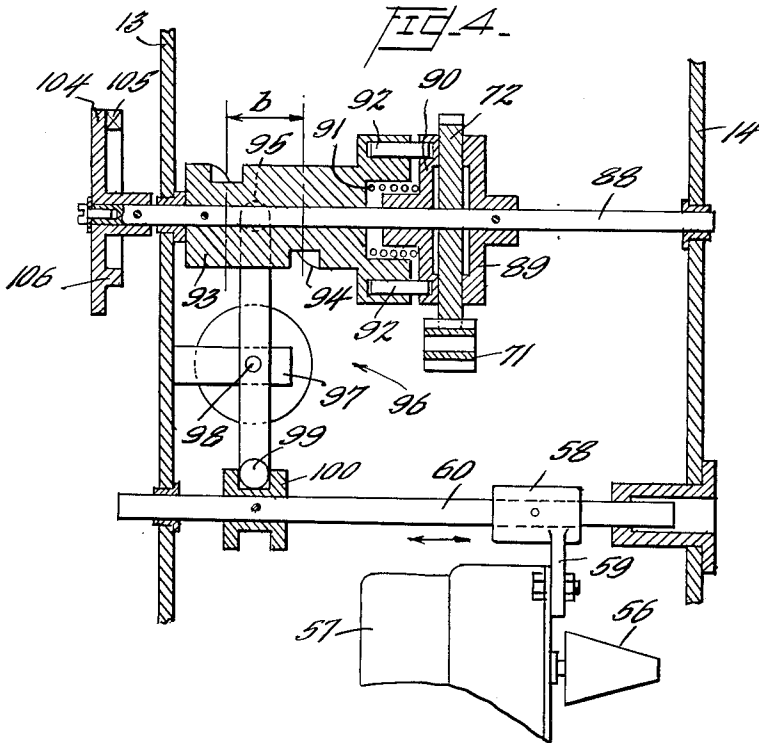
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CHECK OPERATED TIME SWITCH

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7 Sheets-Sheet 4



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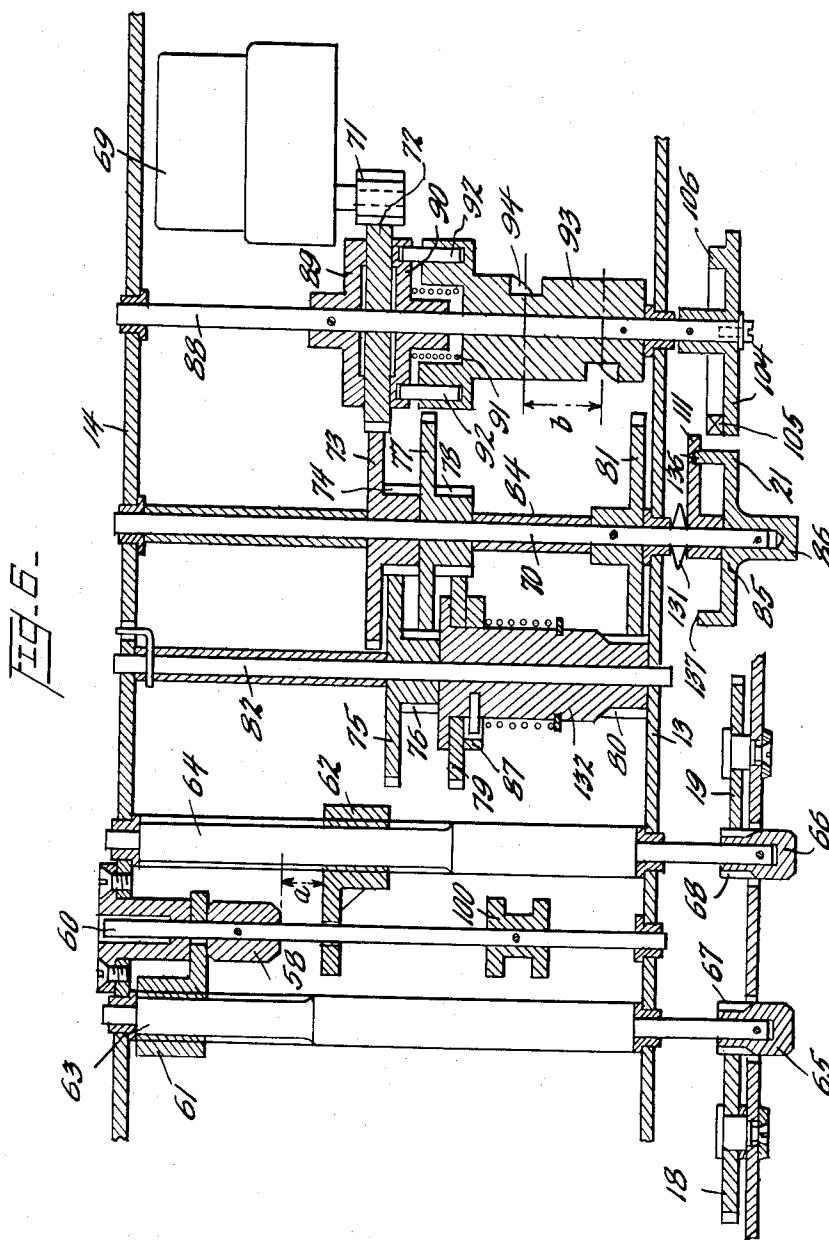
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CHECK OPERATED TIME SWITCH

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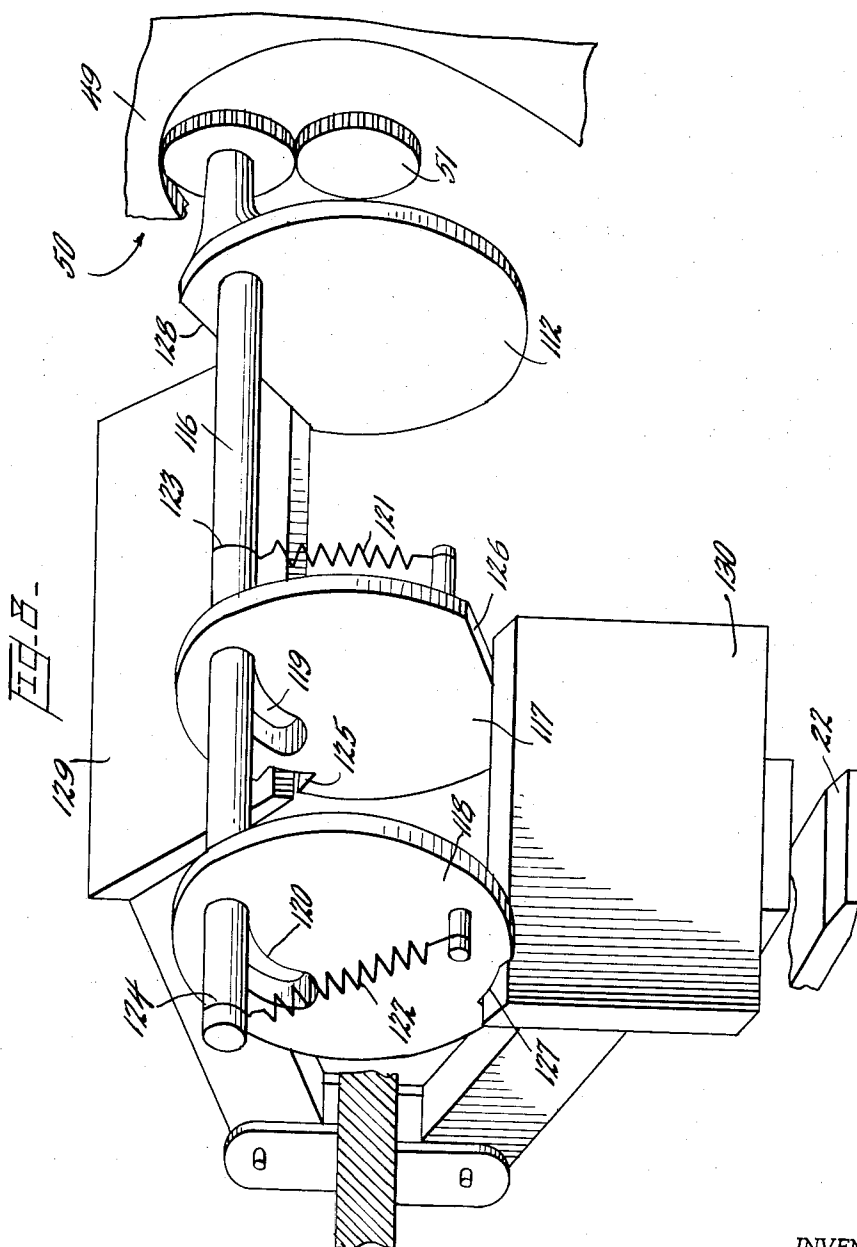
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CHECK OPERATED TIME SWITCH

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7 Sheets-Sheet 7



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CHECK OPERATED TIME SWITCH

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Claims priority, application Switzerland, Feb. 21, 1961, 2,197/61

6 Claims. (Cl. 200—38)

This invention relates to a prepayment time switch, whose running time is started by the insertion of a coin for an installation, particularly an automatic bowling-pin setting-up device, with a variable time availability.

The prepayment time switch is designed to keep in operation for a certain time interval per coin any installation, particularly one intended for public use, such as an electrically-operated bowling-pin setting-up device. The time interval per coin shall thereby be adjustable in order to cater for varying electricity costs. Furthermore, the prepayment time switch shall indicate externally visible details of the time interval per coin inserted and also the total time still available for operation of the installation.

The prepayment time switch is principally characterized in that, by means of devices controlled by a clock, several equal and adjustable time availabilities of the installation are allotted to several time periods of the day which are adjustable with respect to both length and time of day.

Further features of the invention will appear from the following description and claims, taken in conjunction with the accompanying drawings, wherein there is shown, purely by way of example, one preferred form incorporating the invention.

In said annexed drawings:

FIG. 1 shows a front view of the prepayment time switch;

FIG. 2 shows a front view according to FIG. 1 illustrating the positions of the component parts;

FIG. 3 is a top plan view partly in section showing the prepayment time switch;

FIG. 4 is a sectional view showing a control shaft with sliding axle for an electric motor of the prepayment time switch;

FIG. 5 is a sectional view showing a detail according to FIG. 4;

FIG. 6 is a cross section of the prepayment time switch, as developed;

FIG. 7 is a sectional view of a control shaft;

FIG. 8 is a perspective view showing the control cams of the control shaft;

FIG. 9 is a side view showing a tariff control mechanism.

Referring to FIGS. 1 and 2, the prepayment time switch is accommodated within a substantially rectangular case 11. The auxiliary means described hereinafter, providing automatic operation, are mainly arranged on axes or shafts that are fixed to or journaled in two case walls on plates 13 and 14 which are spaced apart by three distancing bolts 12 (FIG. 2). The front case wall 13 carries a control panel 15 having arranged thereon the means necessary for operating, adjusting, checking, etc. the prepayment time switch.

The prepayment time switch in the form shown shall record each coin inserted to operate the unit. For this purpose a conventional register 16 is provided (FIGS. 1 and 3). The prepayment time switch shall, furthermore, permit the storage of several coins and thus a multiple of the time interval per coin available for operation of the unit without the same being switched off at the end of each time interval for each coin. The number of coins stored in the prepayment time switch can be read

externally on a scale disc 17 (FIGS. 1 and 3). In the form shown a maximum storage of sixteen coins is possible, as may be seen from the graduations on the periphery of scale disk 17. Moreover, various time intervals available per coin for operation of the unit, depending on the electricity tariff, can be read on the control panel 15 of the prepayment time switch. The time interval available for operation of the unit is read in minutes per coin on scale 18 for high tariff and on scale 19 for low tariff. The time interval applying at any given moment is indicated on the index visible through window 20 and is controlled by an ordinary clock 21 in accordance with the time of day (FIG. 1). The scales 17 to 21 visible in windows of control panel 15 are sections of dials which, on rotation, can only show part of the scale through the windows.

The control panel 15 has furthermore arranged thereon a slot 23 for the insertion of the coin, and button 24 for coin return with collector 25 for the rejected false coin (FIG. 1). By means of the lock 135 the door 134 which swivels on hinges 133 is locked, so that only certain knobs and scales are accessible or visible to the user of the prepayment time switch (FIG. 3). The operation of the prepayment time switch, i.e. the co-operation of the "time purchased" by insertion of the coin with the normal elapse of the time of day is switched on by a rotary knob 26 (FIGS. 1 and 3). Operation of the prepayment time switch controls an electric contact 22 through the position of which the unit, say, an automatic bowling-pin setting-up device, is switched either on or off.

When a coin is inserted in the slot 23, it falls through a coin tester 27 (FIG. 2). There the coin is graded either as "false" and falls through the apparatus into the collector 25, or is graded "genuine" and falls into a slot 28 in a capable of being coupled hollow shaft 29 (FIG. 3). The coin thus establishes a coupling between the driven jaw on shaft 29 and the driving jaw 30 (FIG. 3). Said driving jaw is fixed to a shaft 31 which is connected to the rotary knob 26 over a spring-biased friction coupling 32. The shaft 31 is rotatably supported in a bearing bracket 34 which is fixed by screws 33 to the front case wall 13. The shaft 31 together with the driving jaw 30 attached thereto can only be rotated through a little more than 90°, whereupon the nose 35 on the driving jaw 30 rests against the stop 36 on the case (FIG. 3). Shaft 31, driving jaw 30 and rotary knob 26 are continuously urged against the stop 36 by an initially tensioned torsion spring 37 and can only be rotated clockwise against the action of the spring 37. Due to the friction coupling 32, only the rotary knob can be turned in either direction and through any angle exceeding the predetermined angle of rotation of slightly more than 90°, thus preventing damage to the apparatus as a result of incorrect handling from outside. The shaft 29 is coupled by means of a pin 39 to a shaft 38 which is journaled in the rear case wall 14. The shaft 29 is thus rotatably supported at one end in the rear case wall 14 over shaft 38 and, at the other end, on the butt end of shaft 31 (FIG. 3). Said shaft 38 has fixed thereto a notched disk 40 with two notches 41 displaced by 180° (FIG. 2). A roller 44 at the end of an arm 43 which is biased by a spring 42 rests on said notched disk 40. Said disk 40 has two cams 45 distributed on its periphery between the notches 41 so that, upon insertion of a coin 46, the shaft 29 has to be turned by means of rotary knob 26 through approximately 90° only as a result of which the roller 44 rests on the notched disk just over the highest point of a cam 45, whereupon the further rotation of shaft 29 up to the engagement of roller 44 in the next notch 41 is automatically effected by the spring-biased arm 43. The shaft 29 is therefore rotated through

180° for every 90° rotation of rotary knob 26. Through this 180° rotation the inserted coin drops into a coin till 47 (FIG. 2) and the slot 28 in shaft 29 lies, rotated through 180°, under the coin tester 27 ready to take the next coin. A pinion 43, which is fixed to the shaft 38 (FIG. 3) and preferably integral with shaft 29, is thus rotated through 180° for every passage of a coin from the coin tester 27 to the coin till 47 and drives the hollow wheel of a sun-and-planet gear 50 through a certain angle allotted to the coin inserted (FIG. 3).

The sun wheel 51 of the sun-and-planet gear 50 is mounted on shaft 52 (FIG. 7) and is driven by a friction disk 55 over a gear train comprising the wheel pair 53 and 54 (FIGS. 3 and 7). The friction disk, in turn, is driven by the conical driving wheel 56 of an electric motor 57. Due to the conical shape of driving wheel 56 and the possibility of its axial displacement, as described below, the friction disk 55 is driven with a variable transmission ratio for a constant speed of the electric motor 57; the speed of the sun wheel 51 of the sun-and-planet gear 50 may, therefore, be varied for constant speed of the electric motor 57 by axially displacing the electric motor 57 and, therewith, the driving wheel 56. The momentary diameter of the driving wheel 56, on which the friction disk 55 runs, is, as described hereinafter, a criterion for the various time intervals indicated on scales 18 and 19 mounted on the control panel 15 (FIGS. 1 and 2). A different time interval for operation of the installation, say, an automatic bowling-pin setting-up device, is allotted to every effective diameter of the driving wheel 56. How and to what extent the effective diameter of the driving wheel 56 is varied dependent on the actual time of day, is described hereafter.

The electric motor 57 is mounted on an axle 60 which is journaled in the case walls 13 and 14 by means of a bracket 59 with bearing boss 58 (FIGS. 4 and 6). Said axle 60 is displaceable endwise and rotatable for the purpose of shifting the electric motor 57 with respect to the friction disk 55. The amount of rotation is given by the various diameters of the driving wheel 56. The endwise displacement of axle 60 represents the axial displacement of wheel 56 and is limited by two manually and selectively adjustable stops 61 and 62 (FIG. 6). Said stops are carried respectively on rotatable right-hand threaded spindles 63 and 64, and on axle 60 to secure them against rotation. Said spindles are journaled in the case walls 13 and 14 and are adjustable by means of rotary knobs 65 and 66 (FIGS. 2 and 6). With these rotary knobs 65 and 66, therefore, the amount of displacement of the driving wheel 56 relative to the friction disk 55 and also the position of the range of displacement along the length of the driving wheel 56 is determined thereby. The amount of play *a* of the bearing boss 58 (FIG. 6) between the stops 61 and 62 represents the momentary possible range of displacement of the driving wheel 56, and the position of the stops 61 and 62 on their spindles 63 and 64 respectively determines the position of the range of displacement *a* along the length of the driving wheel 56 (FIGS. 3 and 6).

The knobs 65 and 66 are provided with teeth 67 and 68 respectively to drive the scale disks 18 and 19 which are similarly provided with teeth (FIGS. 2 and 6). By means of the knobs 65 and 66, therefore, the scale disks 18 and 19 are set to the running time of the prepayment time switch as desired by the proprietor, i.e. the position of the stops 61 and 62 on their spindles 63 and 64, and the spacing of the stops 61 and 62 are set (FIG. 6).

Thereby the indicator marks on the scale disks 18, 19 (FIG. 1) are so arranged that, for example, with no play *a* of the electric motor 57 between the two stops 61, 62, i.e. when both stops rest against the bearing boss 58, the scales 18 and 19 indicate the same running time. When, however, the two stops 61, 62 rest against the bearing boss 58 the driving wheel 56 of the electric motor cannot drive with various diameters, but drives the friction disk 55 with a certain diameter which corresponds

to a certain running time of the prepayment time switch in a manner disclosed later as description proceeds.

The amount of play *a* of the bearing boss 58 as determined by the position of the stops 61, 62 is thus a measure of the difference in time indicated by scales 18 and 19.

As already mentioned at the beginning of the specification, a possible difference in the running times of the prepayment time switch per coin, dependent on the time of day due to varying electricity costs, shall be indicated by scales 18 and 19 (FIG. 1).

For this purpose it must be possible for the momentary time of day to influence the displacement of axle 60 (FIGS. 4 and 6) and therewith the driving wheel 56 through a set range *a* in such a way that the bearing boss 58 rests against one stop, say, stop 61, during certain times of the day and against the other stop 62 during certain other times of day, and that the driving wheel 56 in one case drives the friction wheel 55 with a small diameter and in the other case with a large diameter, so that the running time of the prepayment time switch is of different length at high tariff and low tariff energy costs in a manner to be explained later. The control of the possible displacement of the electric motor 57 (FIG. 4), dependent on the time of day, is effected in the following way.

A second electric motor 69 (FIG. 6) within the case 11 runs at constant speed and drives through interposed gearing a timing shaft 70 which is journaled in the case walls 13 and 14 so that said timing shaft performs one revolution every 24 hours. The pinion 71 of the electric motor 69 drives said shaft 70 over the gear steps of toothed rims 72 to 81. The toothed rims 75 and 76 form a freely rotating gearwheel on an intermediate axle 82. The pairs of toothed rims 73/74 and 77/78 each form a gearwheel also, each of which is freely rotatable on timing shaft 70 and secured against displacement by bearing spacers 83 and 84 (FIG. 6). Thereby the toothed rim 79 is coupled frictionally to toothed rim 80. By means of an axially displaceable spring-loaded thrust disk 87 which is secured against rotation, the toothed rim 79 is pressed against the gearwheel body 132 and thus establishes a friction-tight drive to the toothed rim 80.

The scale disk 21 with indication of the time of day in hours, is arranged on a disk 85 fixed to the timing shaft 70 (FIGS. 1 and 6). A sector 111, freely rotatable on timing shaft 70, is pressed under the action of plate springs 131, so that its teeth 136 engage the spur teeth 137 of disk 85, and is thus driven by the timing shaft 70. The sector 111 can, however, be rotated and adjusted to any position with respect to disk 85 against the action of plate springs 131. The disk 85 has a rotary knob 86 by means of which the disk 85 with its dial can be set to the correct time of day, i.e., the gearwheel 81 and 80 is rotated against the positively and continuously driven toothed rim 79. Due to the friction-tight coupling between the toothed rim 79 and the gearwheel body 132, the correct time of day can be set with the electric motor 69 running. The described timing shaft 70, and the intermediate axle 82 with its gearing 73-81, and the gear train 71 and 72 with the electric motor 69 thus form an electric clock.

The method of displacing the electric motor 57 and therewith the axle 60 dependent on the time of day is disclosed in the following. The gearwheel 72 (FIG. 6) driven by the pinion 71 of the electric motor 69 drives frictionally the shaft 88 which is supported between the case walls 13 and 14. This is accomplished by arranging the gearwheel 72 friction-tight between two disks 89 and 90 which are fixed to the shaft 88, said disk 90 being urged against the gearwheel 72 by the action of a coil spring 91 which is supported on the case. Said disk 90 is coupled by means of pins 92 to a control shaft 93 which is fixed to shaft 88. In the periphery of the con-

control shaft 93 there is an annual groove 94 which is pitched and closes on itself. In said annular groove lies the arm 95 of a two-armed elastic lever 96 (FIG. 5 and 4). The lever 96 is pivoted on a spindle 98 in bearing bracket 97 which is fixed to the case wall 13. The other arm 99 of lever 96 engages a shifting sleeve 100 which is fixed to the axle 60 (FIGS. 4 and 6).

As the control shaft 93 rotates due to the continuous drive of the electric motor 69 for the electric clock, the arm 95 slides in the annular groove 94 and swings to and fro over a distance b (FIGS. 4 and 6). The arms 95 and 99 of lever 96 are maintained in the extended position through torsion springs 101 (FIG. 5). Said springs 101 are supported at one end on a collar 102 of the arms 95 and 99 respectively and at the other end on a common support member 103. Due to this elastic support the arms 95 and 99 of the two-armed lever 96 can be rotated in opposition to each other against the action of said torsion springs 101, i.e. since the arm 95 engages the annular groove 94 in control shaft 93, and the arm 99 engages the shifting sleeve 100 on axle 60 (FIG. 4), on rotation of the control shaft 93 and therewith on swinging of the arm 95 through the distance b , the shifting sleeve 100 and therewith the axle 60 are displaced up to the abutment on a stop 61 or 62 (FIGS. 4 and 6). The swinging distance b of the arm 95 is so selected that it is greater than the largest possible range of displacement a of axle 60 which may be adjusted by the stops 61 and 62. The swinging distance b of arm 95 is therefore always greater than the amount by which the driving wheel 56 of electric motor 57 can be displaced. As the arm 95 is swung through distance b , the arm 99 swings through the amount of possible displacement of axle 60 until the bearing boss 58 abuts on stop 61 or 62 (FIG. 6), the difference in these swinging distances being taken up by the torsion springs 101 on the two-armed lever 96.

The swinging of arm 99 and therewith the displacement of driving wheel 56 is, as mentioned hereinbefore, to take place as a function of the time of day, the running time of the prepayment time switch being automatically changed for high low electricity tariffs.

A camdisk 104 is mounted on shaft 88 (FIGS. 4, 6 and 9). Said camdisk 104 includes two cams 105 and 106 on its front face, which are displaced radially and diametrically to each other and extend over approximately half the circumference (FIG. 9). Said cams 105, 106 operate in conjunction with a ratchet 107 which is pivotally mounted on the case. The ratchet 107 carries a stop 108 and a nose 109 which is urged against the periphery of disk 85 by the action of spring 110 (FIG. 9). Since the camdisk 104 is driven friction-tight clockwise by the electric motor 69 (FIG. 6), the stop 108 of ratchet 107 lies on cam 105 so that the camdisk 104 and also the control shaft 93 are held against rotation. The continuously driven gearwheel 72 rotates frictionally between the two stationary disks 89 and 90 (FIGS. 6 and 4). The control shaft 93 is thus rotated and the driving wheel 56 of electric motor 57 is not displaced relative to friction disk 55. The cams 105 and 106 of cam disk 104 are so disposed as to permit the ratchet 107 with its stop 108 to pivot radially inwards against the action of spring 110, to then rest against cam 106 when a sector 111 strikes against the nose 109. The camdisk 104 and thus the control shaft 93 can now rotate through 180° until the stop 108 abuts on cam 106. As the ratchet 107 is again pivoted radially outwards by the nose 109 sliding on the periphery of disk 85, the stop 108 lies on cam 105, and the camdisk 104 and therewith the control shaft 93 can again rotate through 180° (FIG. 9). The possible rotation of the control disk 93 is thus always 180° , i.e. the arm 95 of the two-armed lever 96 is thereby always swung through distance b (FIGS. 6 and 4). With continuous running of the clock and therewith rotation of disk 85, rotation of the control shaft 93 through 180° is initiated once per day by the pivoting of ratchet 107, and the electric motor 57

with driving wheel 56 is displaced through the set distance a (FIG. 3).

The peripheral angle of the sector 111 is preferably variable. This may be effected, say, by interchanging various sector pieces. Since the rotation of disk 85 is a measure of the elapsed time, a certain peripheral angle of the sector 111 secured on disk 85 corresponds to a certain number of hours.

The size of the peripheral angle 111 thereby represents the period of time during which the ratchet 107 is positioned on cam 105 or 104 respectively and is thus proportional to the running time of the electric motor 57 with a certain diameter of driving wheel 56 to friction disk 55. As the nose 109 drops off sector 111 on to the periphery of disk 85, the driving wheel 56 is displaced through the set distance a . The angular position of sector 111 on disk 85 determines the time of day at which the driving wheel 56 is to be displaced. As the disk 85 rotates in the direction indicated by the arrow (FIG. 9), the ratchet 107 is pivoted anticlockwise by the sector 111 and comes to rest on cam 106 (FIG. 9). The control shaft 93 is rotated through 180° , and the driving wheel 56 is displaced through distance a . The driving wheel 56 now runs with a certain diameter for as long as the nose 109 slides on the periphery of sector 111. At the end of this period the nose drops onto the periphery of disk 85 and the control shaft 93 can again rotate through 180° , whereupon the driving wheel 56 is pushed back through distance a and again drives the friction disk 55 with the same diameter as in the start position.

The low electricity tariff in force when the installation is completed applies for the period of time during which the nose 109 slides on the periphery of sector 111. The sector 111 is thereby fixed to the disk 85 in such a position that this low tariff period applies to the hours of night operation for the example shown. For the remaining time the installation operates at the high electricity tariff, and the driving wheel 56 runs with a diameter which produces a shorter running time of the prepayment time switch in a way to be described later. In order to render visible from outside at what tariff the installation is operating, the front face of the camdisk 104 is inscribed with the words "High tariff" and "Low tariff," one of these designations being always visible through the window 20 in the control panel of the prepayment time switch.

The control mechanism illustrated in FIG. 9 varies the speed of the friction disk 55 and therewith the speed of sunwheel 51 of the sun-and-planet gear 50 in accordance with the time of day. The sun-and-planet gear 50 comprises two driving systems. On the one hand, as described hereinbefore, the hollow wheel 49 of said gear 50 is rotated by pinion 48 through a certain angle per coin deposited (FIG. 3) and, on the other hand, the sunwheel 51 is continuously driven by electric motor 57, whereby the speed of the sun wheel 51 is variable by altering the diameter of the driving wheel 56. The direction of rotation of hollow wheel 49 is opposite to that of the sunwheel 51. Since the speed of the sunwheel is variable, the speed of the planet-wheel carrier 112 (FIG. 7) is correspondingly variable. Said carrier 112 is mounted on shaft 113 carrying the dial 17 (FIG. 1). Said dial indicates, as already mentioned, the number of coins deposited in the prepayment time switch, which have not yet been compensated by a corresponding time availability for operation of the installation, and thus remain to the credit of the player or consumer. By rotation of the hollow wheel 49 according to the number of coins deposited, the number of coins unused as indicated on scale 17 is increased; through the continuous running of the prepayment time switch, i.e. rotation of sunwheel 51, the number of coins unused is gradually reduced. The hollow wheel 49 carries on its front face a ring of serrations 114 (FIG. 7) on which rests a push rod 115 which operates on the register 16 (FIG. 3). Every rota-

tion of the hollow wheel 49 through a certain amount, i.e. every coin accepted by the prepayment time switch, is thus recorded on register 16.

The rotation of the planet-wheel carrier 112 determines the running time of the prepayment time switch and thus the time availability of the automatic bowling-pin setting-up device. One complete revolution of the planet-wheel carrier 112 corresponds to the maximum running time of the time switch and, in the example shown, is obtained with sixteen coins inserted in succession. In order that the prepayment time switch is switched on when the coin is inserted, and switched off at the end of the "time purchased," in both cases with snap-action contact movement, the planet-wheel carrier 112 is coupled by means of a pin 116 to two control cams 117 and 118 (FIGS. 7 and 8). Said control cams are freely rotatable on shaft 113 and have slots 119 and 120 through which the pin 116 extends. The pin 116 is provided with grooves 123 and 124 in which are clipped respectively coil springs 121 and 122, the other ends thereof engage the control cams 117 and 118. Each control cam can thus rotate with respect to the pin 116 through the length of the slot 119 or 120 respectively against the action of the coil spring 121 or 122 respectively. The control cam 117 is provided on its periphery with a notch 125 and a thrust face 126. The control cam 118 has only one notch 127, and the planet-wheel carrier 112 has only one thrust face 128 (FIG. 8). The control cams 117 and 118 and the planet-wheel carrier 112 cooperate with the spring-biased ratchets 129 and 130 so as to cause the latter to slide on the periphery of control cams 117, 118 and planet-wheel carrier 112 (FIGS. 8, 7). The ratchet 129 thereby rests only on the planet-wheel carrier 112 and control cam 117, while the ratchet 130 rests only on the control cams 117 and 118 (FIGS. 7 and 8).

As the prepayment time switch is switched on, the ratchet 129 gives the control cam 117 a snap-action movement which is disclosed as description proceeds. With this rotary movement the contact 22 is operated with a snap-action movement by ratchet 130 (FIGS. 2 and 8).

The position of the control cams 117 and 118, the planet-wheel carrier 112 and the ratchets 129, 130 as shown in FIG. 8 is that in which the prepayment time switch is switched off, since the contact 22 is open, so that the electric motor 57 is switched off and the automatic bowling-pin setting-up device is not in operation. If the prepayment time switch is to be switched on, a coin is deposited, whereupon the hollow wheel 49 of the sun-and-planet gear 50 rotates (FIG. 8). The planet-wheel carrier 112 is thereby caused to rotate at half the peripheral speed in the same direction, i.e. anticlockwise. The control cams 117, 118, however, cannot rotate, since the spring-loaded ratchets 129 and 130 are engaged respectively in the notches 125 and 129. Simultaneously, the ratchet 129 lies on the thrust face 128 (FIG. 8). Rotation of the planet-wheel carrier 112 causes tensioning of the coil springs 121 and 122 of the control cams 117 and 118, and the ratchet 129 slides on the thrust face 128 and thus out of the notch 125. When the ratchet 129 has moved clear of the notch 125, the control cam 117, by action of the tensioned coil spring 121, instantaneously rotates in the direction of rotation of the planet-wheel carrier 112 until it is stopped by the pin 116 striking against the other end of the slot 119. This snap-action rotary movement of control cam 117 causes the thrust face 126 to press down the ratchet 130 instantaneously, thus closing the contact 22. Incidentally the ratchet 130 also becomes disengaged from the notch 127 in control cam 118 and the latter rotates with a snap-action movement in the direction of rotation of the planet-wheel carrier 112 and thus also that of pin 116 until the other end of the slot 120 strikes against the pin 116.

Closure of the contact 22 switches on the electric motor 57, whereupon the "time purchased" commences to elapse, and the installation, say, an automatic bowling-pin setting up device, is available for use.

Through the insertion of further coins the planet-wheel carrier 112 and the two control cams 117, 118 are caused to rotate further in an anticlockwise direction, and the ratchet 129 slides on the periphery of planet-wheel carrier 112 and on that of control cam 117. Ratchet 130 slides thereby on the periphery of control cam 117 and on that of control cam 118 (FIG. 8).

During the elapse of the "time purchased" the planet-wheel carrier 112, driven by sunwheel 51, rotates in a clockwise direction. Being coupled to the planet-wheel carrier 112 through pin 116 extending through the slots 119 and 120, the cams 117 and 118 are also rotated until the ratchet 130 engages the notch 127. Shortly before this, the ratchet 129 engages the notch 125 so that, on the contact 22 opening and therewith on the automatic bowling-pin setting-up device being switched off, the ratchet 129 already lies in the notch 125, and the start position shown in FIG. 8 is again reached.

In the prepayment time switch according to the invention many components, such as gearwheels, ratchets, hollow shafts, bearing bushes, etc. may be made of plastic material, so that cheap manufacture of the prepayment time switch with absolutely no maintenance is possible.

It is understood that the frequency of automatic displacement of the driving wheel 56 (FIGS. 3 and 6) may be increased in a simple manner by fixing several sectors 111 on the disk 85. The general basic concept of the invention also includes the provision of the camdisk 104 with a plurality of cams of a type similar to those 105 and 106 and displaced to each other whereby the peripheral angles of the cams may be different and as small as required (FIG. 9). The only point of importance is that the stop 103 of ratchet 107, upon pivotal movement of the latter, can traverse radially across the runs of the individual cams on the driven camdisk 104 and can pass, from cam to cam, and that incidentally the whole camdisk, corresponding to the maximum range of displacement of the driving wheel 56 to either side, can turn.

What I claim is:

1. Check operated time switch with a time control particularly for an automatic bowling pin setting device with variable time changes comprising a motor mounted for adjustment axially thereof on an axle, a driving cone on the motor and operable thereby, a friction disk connected to contact the driving cone, adjustable means to shift the motor and cone on its axle through a distance depending upon the time of use as controlled by the number of checks used, and check control mechanism connected to the disk by gear elements to regulate the operation of the time interval available in dependence of the number of checks employed.

2. Check operated time switch according to claim 1, in which a pair of stops are provided which are manually selectively adjustable and connected to control the amount of shift of the motor and its cone relative to the friction disk, and in which means are provided connected to control the driving means in dependence as to the time of day.

3. Check operated time switch according to claim 1, in which the adjustable means for the motor and cone includes a shaft to adjust the driving cone relative to the disk with the shaft being slidably mounted, and in which a cam and swing lever are provided connected to the shaft with means to rotate the cam.

4. Check operated time switch according to claim 1, in which a control shaft with an annular groove and two-armed lever are provided, and in which the adjustable means includes a bearing boss connected to the motor fixed to an axle between two stops whereby the control shaft has on its periphery an annular groove which is

pitched so that one arm of the two-armed lever engages a shifting sleeve mounted on the axle, the bearing boss of the electric motor being fixed to the axle between two stops fixed with the distance between the stops adjustable by means of threaded spindles.

5. Check operated time switch according to claim 1, in which a pair of spaced casing plates are provided for mounting the axle and adjustable means, and in which a plurality of shafts are rotatably mounted in the plates with a cam on one of the shafts to mount the check control mechanism.

6. Check operated time switch according to claim 1,

in which a ratchet and a cam disk are provided to operate the check control mechanism.

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BERNARD A. GILHEANY, *Primary Examiner*.

WALTER STOLWEIN, *Examiner*.