Nov. 25, 1952 E. W. ANDERSON 2,619,169

AUTOMATIC ELECTRIC TIME SWITCH MECHANISM

Filed Dec. 11, 1951

3 Sheets-Sheet 1

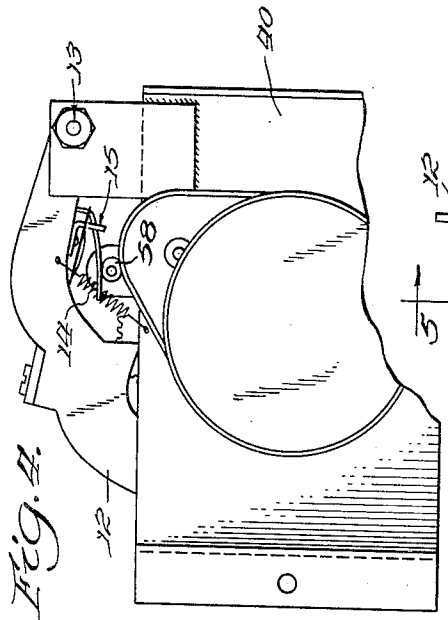


Fig. 4.

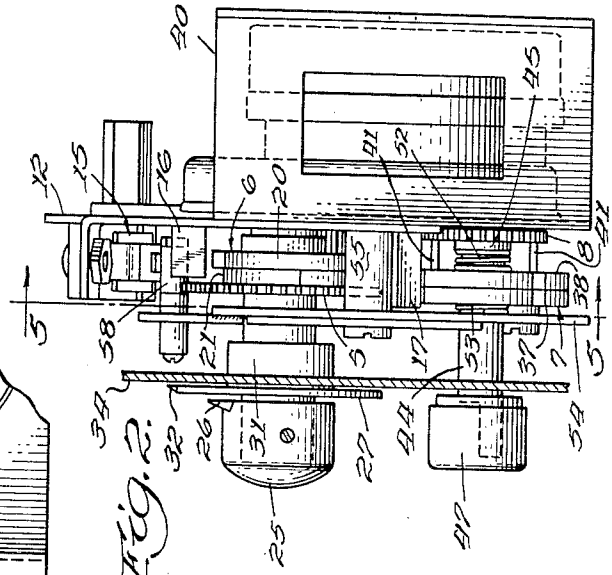


Fig. 2.

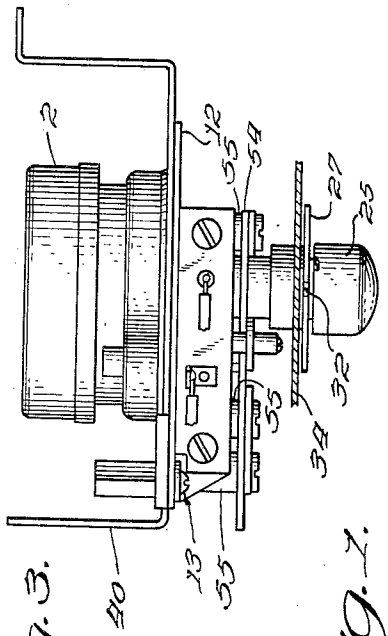


Fig. 3.

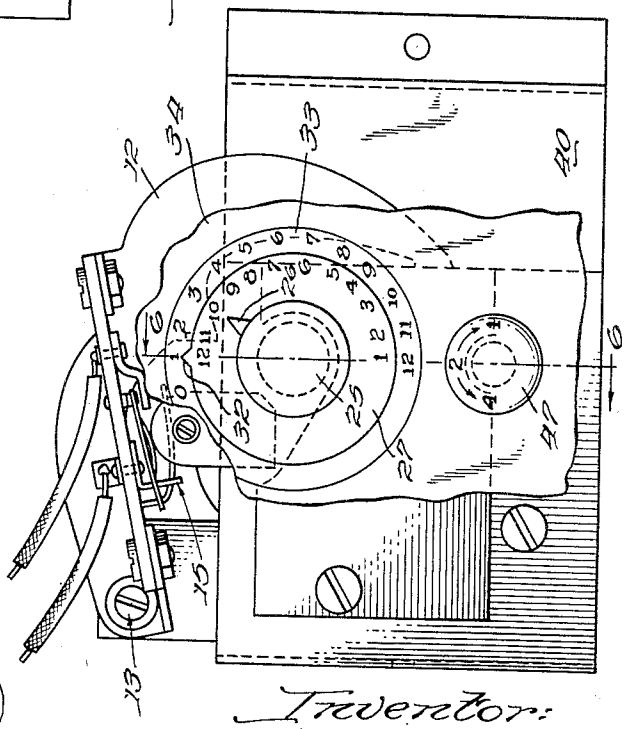


Fig. 1.

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Fig. 5.

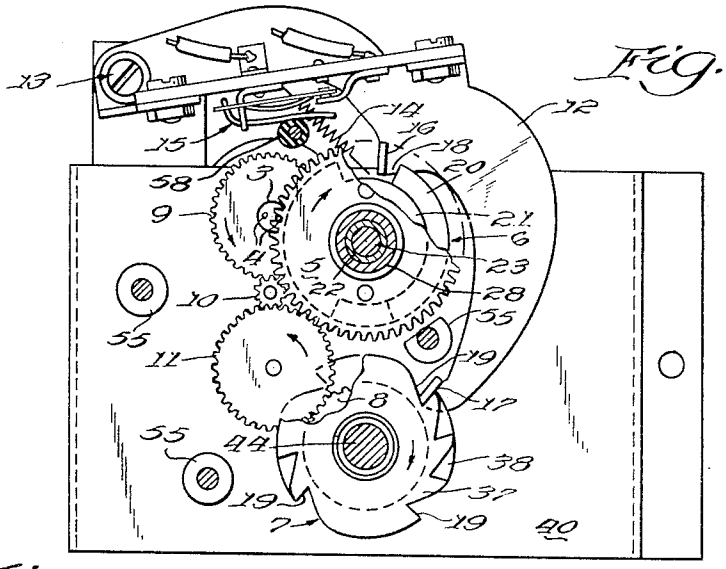


Fig. 6.

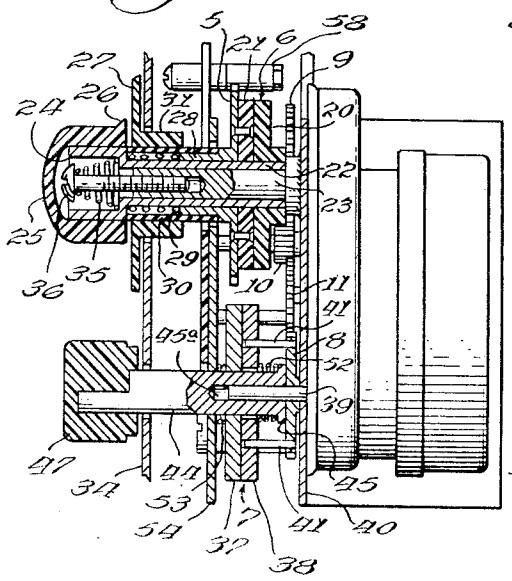


Fig. 7.

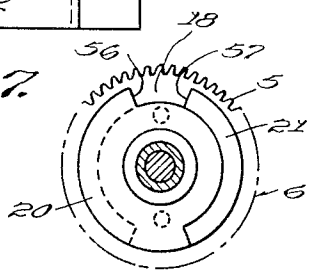


Fig. 8.

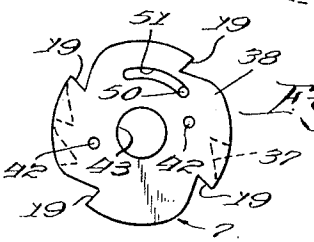


Fig. 9.



Fig. 10.

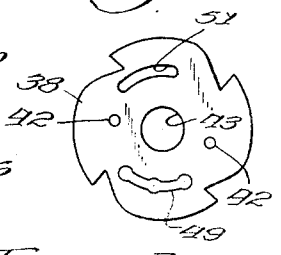


Fig. 11.

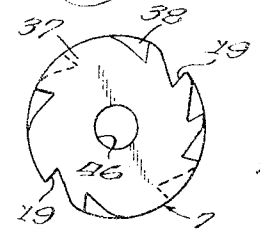
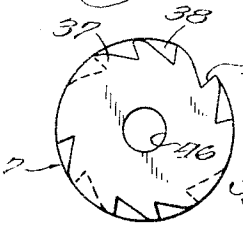


Fig. 12.



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Fig. 13.

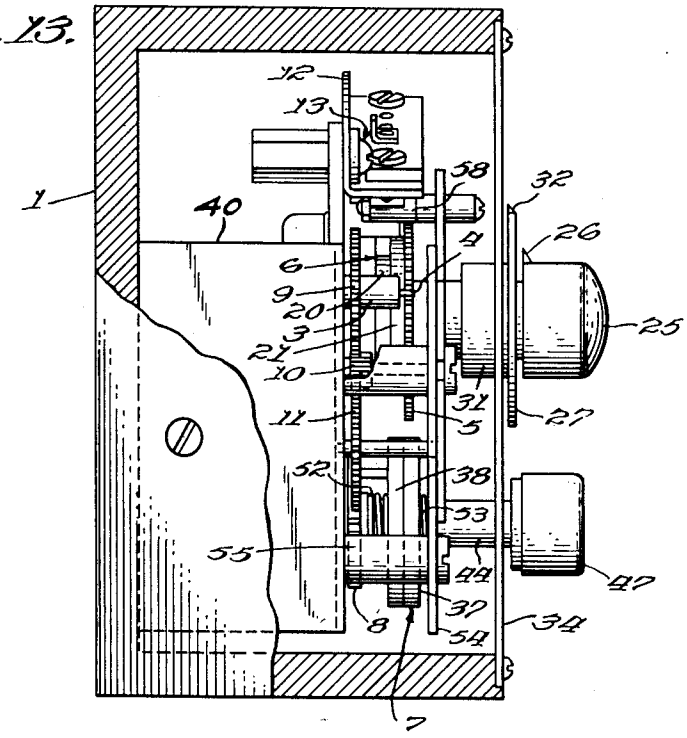


Fig. 14.

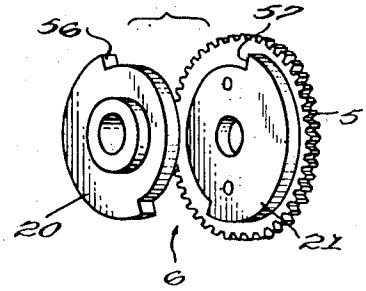
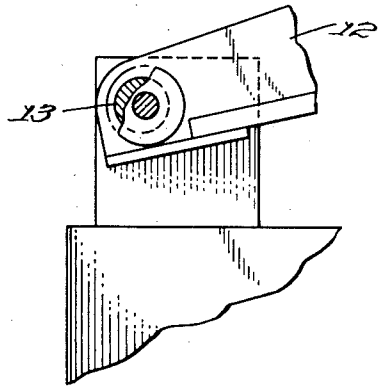


Fig. 15.



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UNITED STATES PATENT OFFICE

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AUTOMATIC ELECTRIC TIME SWITCH MECHANISM

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Application December 11, 1951, Serial No. 261,039

15 Claims. (Cl. 161—1)

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This invention relates to improvements in clock operated switch mechanisms.

Speaking more specifically, the present invention relates to a time switch mechanism actuated by the works of a clock in which one can pre-set the starting hour of any group of hours in the twenty-four daily cycle, pre-set the number of hours in the group of which the starting hour is the beginning, and also pre-set the number of times each hour each day that an appliance can be activated after it has been placed in the electric circuit energizing the appliance.

The need for such a device exists in the use thereof with other devices in the field of mechanized sleep suggestion. Constructive suggestion given during normal sleep by various sound producing apparatus is fast becoming recognized as a most effective therapy for the elimination of unwanted habits, the creation of desired habits and the correction of psychosomatic ills. It is also possible by repeating during normal sleep any data that it is desired to memorize, such as foreign languages, formulae, lectures and the like, to record such material in memory in such a way that it may be easily recalled to consciousness at will.

Accordingly, an important object of the invention is to provide improved clock operated time switch mechanism which may be pre-set so that it will mechanically determine the number of hours time which will elapse between the time when the switch mechanism is placed in the circuit of the appliance it is to control and the time when the appliance is to be activated; which is additionally pre-settable to mechanically determine the number of hours that the time switch will energize the appliance; and which is also pre-settable to mechanically determine the number of times each hour that the appliance will be activated.

A further object of the invention is to provide an improved pivot means for a swingable switch arm positionable by the manufacturer whereby the precision otherwise necessary in making the parts may be reduced.

A still further object of the invention is to provide an improved adjustable cam pin in combination with the electric closing switch which may be turnably adjusted to vary the length of time between the closing and opening of the switch.

Yet a further object pertains to mechanism having a new and improved mode of assembling whereby manufacture and assembling of parts are cheapened and facilitated and wherein such combined parts involve a new and improved mode of operation.

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A more specific object of the invention is to provide in a timing switch of the above character a novel and improved assembly of cooperating cam members which are adjustable in relation to each other in providing a registered pair of notches in their periphery or a plurality of pairs of registered notches in their periphery in which to selectively seat the projection of a switch carrying arm.

Other objects, advantages and features of invention will hereinafter appear.

Referring to the accompanying drawings, wherein is shown a preferred embodiment of the invention as now being actively demonstrated,

Fig. 1 is a fragmentary front elevational view of the device.

Fig. 2 is a right hand elevation of the structure shown in Fig. 1.

Fig. 3 is a top plan view in projection with the structure shown in Fig. 1 on a smaller scale.

Fig. 4 is a fragmentary rear elevation of the structure shown in Fig. 3.

Fig. 5 is a section on line 5—5 of Fig. 2.

Fig. 6 is a section on line 6—6 of Fig. 1.

Fig. 7 is a rear view of the top cam assembly.

Fig. 8 is a rear view of the lower cam assembly with parts set for actuating an appliance four times an hour.

Fig. 9 is an inner face view of the outer, lower cam member.

Fig. 10 is an inner face view of the inner, lower cam member.

Fig. 11 is a front face view of the lower cam assembly with parts set to actuate an appliance twice an hour.

Fig. 12 is a front face view of the lower cam assembly with parts set to actuate an appliance once an hour.

Fig. 13 is a cased-in, left hand, elevational view of the device, a part of the near wall being broken away to disclose interior construction.

Fig. 14 is an exploded perspective view of the upper cam assembly per se.

Fig. 15 is an enlarged, fragmentary elevational view of the pivoted, eccentric mounting of the switch arm of the device.

Referring in detail to the several figures and with particular reference to the parts in the assembled views, therein will be found a casing 1 containing a housing 2 enclosing a motor of the type used in clocks and operating an hour shaft 3 which carries a two toothed gear comprising two diametrically spaced apart pins 4 adapted to mesh with the teeth of and drive a gear 5 of the upper cam assembly 6 once every twenty-four hours.

With the upper cam assembly co-operates a lower cam assembly 7, the gear 8 which drives the latter assembly being driven by gear 9 mounted on motor shaft 3 through the medium of idler gears 10 and 11 operating therebetween.

Cam assembly 6 is geared to rotate once every twenty-four hours, while cam assembly 7 is geared to rotate once each hour.

A switch arm 12, eccentrically pivoted at 13 is normally under the tension of spring 14 tending to close a conventional (micro) switch 15. Said switch together with its mounting mechanism is attached to arm 12. Arm 12 carries two lateral projections 16 and 17 which are permitted at times to engage simultaneously within a gap 18 and notches 19 in the respective cam assemblies 6 and 7. Only when projection 16 on arm 12 is over the gap 18 of cam assembly 6 is projection 17 on arm 12 permitted to drop into a notch 19 in cam assembly 7. The number of times projection 17 on arm 12 is permitted to drop into a notch 19 in cam assembly 7 determines the number of times each hour that switch 15 will be closed.

Upper cam assembly 6 comprises two co-operating cam elements 20 and 21 adjustable in turnable relation to each other, element 20 being secured to sleeve 22 adjustably mounted on stud shaft 23 and element 21 being riveted to gear 5. Cam element 20 is adjustable in relation to composite cam element 21 and gear 5 as will be hereinafter more fully pointed out.

Sleeve 22 has a diametrically enlarged free end portion 24 whereto is secured knob 25, said knob being provided with a pointer 26 manually settable in relation to the graduations on dial 27. End portion 24 forms an inner, annular shoulder at its juncture with the sleeve 22. Gear 5 is provided with a hub 28 and between said shoulder and the end of said hub is mounted a spiral compression spring 29. This spring is adapted to hold cams 20 and 21 together under friction, but at the same time permit them to be manually moved in relation to each other. The adjustment of the relationship of cams 20 and 21 is achieved by turning knob 25 while the composite cam 21 and gear 5 is held against movement by virtue of the engagement of the pins 4 of the toothed sprocket with the teeth of gear 5.

Hub 28 has a portion of its free end diametrically reduced and telescoped part way into a secured relation with a cylindrical sleeve 30, preferably constructed of fiber, that portion of the sleeve 30 which projects beyond the telescoped end of the hub surrounding the spring 29.

Dial 27 carries a hub 31 which surrounds and is secured to the free end portion of the sleeve 30. Dial 27 carries a pointer 32 to register selectively with the graduations of a stationary dial 33 mounted on the face of the cover 34.

End portion 24 also forms with sleeve 22 an outer annular shoulder against which abuts a conically shaped compression spring 35 held thereagainst by a screw 36 tapped into the end of the aforementioned stub shaft 23.

As previously stated gear 11 is in mesh with gear 8 which is responsible for rotating the lower cam assembly once each hour. Lower cam assembly 7 comprises two abuttable, turnably adjustable cam members 37 and 38, cam member 37 being located forwardly of cam memer 38 as seen in Fig. 6. These two cam members are also separately shown in Figs. 9 and 10 with their abuttable faces facing forwardly.

Gear 8 is rotatably mounted upon a stub shaft 39 secured in the face portion of the mounting plate 40 which supports the apparatus in the casing 1. Said gear 8 carries two diametrically opposite pins 41 which occupy with a working fit openings 42 in the cam member 38. Member 38 has an axial bore 43 through which extends a turnable shaft 44, said shaft having an inner, shouldered end 45 perpendicularly abutted against gear 8 and extending through said hole 43 with a clearance fit. Shaft 44 is provided with an axial bore 45a into which extends the aforementioned stub shaft 39 with a rotatable fit.

Cam member 37 is also provided with an axial hole 46 through which the turnable shaft 44 extends with a force fit so as to render the member 37 turnable with the shaft and at the same time adjustable in relation to the member 38.

Shaft 44 extends outwardly beyond the dial face plate 34 where its outer end is provided with a knob 47 whereby the shaft 44 can be partially turned as need be to provide for the adjustability of the member 37 in relation to the member 38.

The predetermined adjustability of member 37 in relation to member 38 is provided for by utilizing a bearing ball 48 selectively settable in three positions in a ball race 49 formed in the face of the member 38 with which the bearing ball cooperates, and a pin 50 carried by the member 37 and occupying an arcuate slot 51 formed in the member 38.

Between the inner or rear face of the member 38, as seen in Fig. 6, and the shouldered end portion 45 of the shaft 44 is interposed a coiled spring 52 surrounding the shaft, which is sufficiently tensioned to cause members 37 and 38 at all times to abut, but when the knob 47 is manually turned so as to provide a new relationship of the abutted cam members, the ball 48 will cause the member 38 to yield to the travel of the ball and move away therefrom under the opposition of the spring 52 until the ball reaches another seat in the race 49. This movement of relation between the adjustable member 37 and fixed member 38 causes the peripheral cam teeth 19 of the respective cam members 37 and 38 to in turn assume different relationships as shown in Figs. 8, 11 and 12, the need for which will be explained later.

A spacer spring 53 coiled around the shaft 44 fills in the space between the intermediate mounting plate 54 and the cam member 37 to minimize friction otherwise set up between the adjacent faces of the two latter mentioned parts.

Spacers 55 are utilized to maintain the spaced apart relation of the intermediate mounting plate 54 and the mounting plate 40.

Pin 56 is preferably constructed as a cam so that the time the (micro) switch 15 remains closed can be made a variable within certain limits. This operation is accomplished by rotationally adjusting the cam pin 56 about its axis in relation to the switch 15. For example, when the microswitch arm has to travel farther to close the switch, it will remain closed for a shorter period than when the opposite condition occurs.

The maximum period of time that the switch will remain closed is governed by the size of the cam notches 19. The eccentric cam pin 56 in effect shortens the distance the projection 17 on arm 12 has to travel in the notch to open the switch.

Arm 12 is preferably constructed to pivot on the eccentric pin 13. This peculiar pivoting can render less need for precision in the manufacture of the parts as the adjustment can be made

at the factory without further adjustment being necessary. Also the eccentric pin 13 can be set in such a manner that the projection 17 on the switch arm 12 will only graze or ride upon the periphery of the lower cam assembly at the time the upper projection 16 on the switch arm occupies a position in the cam gap 18. This peculiar setting of the switch arm reduces wear on the periphery on the lower cam assembly.

Adjustments

The width of the notch or gap between shouldered faces 56 and 57 of the cams 20 and 21 determines the number of hours that the projection 16 of arm 12 remains positioned adjacent the gap 18 created by the relationship of the two cam elements 20 and 21 as seen in Figs. 5 and 7. The latter two elements can be set either to narrow or widen said gap by means of knob 25. The width of the gap is denoted by the numerical setting of pointer 26 on dial 27 which will indicate the maximum number of hours the switched in appliance can be intermittently activated.

Gear 5 attached to cam element 21 can be rotated by knob 25 so as to change the position of the gap created by the relationship of the cams 20 and 21 to any position desired simply by manually pulling out knob 25. This operation disengages gear 5 from the pins 4 of the two toothed sprocket on motor shaft 3 so that gear 5 can be rotated. The position of the gap in upper cam assembly is denoted by a stationary graduation on dial 33 on cover 34, which shows the number of hours between the time when the time switch mechanism is connected to the electric current and the hour at which the appliance will be activated.

The two cam elements 37 and 38 of the lower cam assembly may be adjusted in relation to each other so that either one, two or four notches 19, Figs. 12, 11 and 8, will appear on the adjusted cam's circumferences. Each time the projection 17 is permitted to drop into a registered pair of cam notches 19 the arm 12 moves so that eccentric pin 58 closes the contacts of (micro) switch 15. Relationship of the two cam elements comprising the lower cam assembly are settable to either one, two or four notches in accordance with the numbers indicated on the face of knob 47 (Fig. 1).

Pre-set controls of time switch mechanism

Stationary graduated dial 33 on cover face 34 provides a guide for setting the pointer 32 to indicate on the dial the number of elapsed hours between the time of setting the pointer and the time the switch mechanism can close the circuit to the appliance. Dial 27 provides a guide for setting the pointer 26 to indicate the duration of the time or number of hours the switch mechanism can operate. Knob 47 enables one to adjust the number of times each hour the appliance will operate for the number of hours indicated by pointer 26 on dial 27.

Motor 2, as stated, rotates hour shaft once every hour. Gear 5 and upper cam assembly 6, as already stated, make one revolution every twenty four hours. Pulling out knob 25 disengages gear 5 and upper cam assembly 6 from motor shaft 3 and permits rotation of the latter gear and cam assembly so that the number of hours can be pre-set on dial 33 by pointer 32 that it will take the gap 18 in cam assembly 6 to reach projection 16 on switch arm 12 and allow the latter projection to drop into the gap

18 provided for it when a registered pair of notches 19 in cam assembly 7 is positioned for having projection 17 to drop into said notch 19.

Synchronization of the gaps 18 and notch 19 permit both of the projections 16 and 17 on switch arm 12 to simultaneously drop respectively therein, and the swinging movement of the switch arm thus permitted will in turn cause micro switch 15 to be closed by its contact with the cam pin 58.

Setting operations

1st preset: To pre-set the number of hours of elapsed time between the time when this mechanism is placed in the circuit of the appliance it is to control and the time when the appliance is to be activated, pull out knob 25 (dial 27 will accompany it and rotate with knob 25) and rotate clockwise until the pointer 32 is adjacent to a figure on dial 33 equal to the number of hours that will elapse from setting time until the hour the appliance is to be energized. Then release knob. To illustrate further: If this mechanism is placed in the electric circuit of the appliance at 5 p. m. and it is desired to start the operation of the appliance at 11 p. m. the number of hours between 5 p. m. and 11 p. m. is six. Therefore the pointer on dial 27 should be set adjacent to the figure six on dial 33. Thereafter this time switch would energize the appliance at 11 p. m. every night without further ado.

2nd pre-set: To pre-set the number of hours that the time switch will energize an appliance, turn knob 25 so that the pointer 26 is adjacent the figure on dial 27 equal to the number of hours desired. To illustrate further: Circuit will be energized at 11 p. m. by first pre-set. It is desired that it remain energizable for four hours or from 11 p. m. until 3 a. m. Therefore pointer 26 should be set at figure 4 on dial 27.

3rd pre-set: To pre-set the number of times per hour (one, two or four) that the appliance will be activated, knob 47 can be set in any one of three positions simply by turning it clockwise or anticlockwise. When turned to the left hand position the appliance will be activated once each hour of the hours determined by first and second pre-set. When in the center position appliance will be activated two times each hour and when set in the right hand position appliance will be activated four times each hour. This pre-set time of activation, number of hours of activation and number of times per hour the appliance would be activated would continue ad infinitum, or so long as this time switch mechanism was in the electric circuit energizing the appliance.

I claim:

1. In a time switch mechanism of the kind described, a casing housing a clock mechanism driving an hour shaft, two cam assemblies, speed reduction means connecting one of said cam assemblies to said hour shaft to be rotated thereby once every twenty-four hours, speed reduction means connecting the other of said cam assemblies to said hour shaft to be rotated thereby once every hour, the cam assembly which is rotated once every twenty-four hours comprising two cam elements which are so constructed and arranged that when they are manually turned relative to each other either a continuous periphery is provided or a gap in their peripheries is provided, the cam assembly which is rotated once every hour also comprising two relatively movable cam members provided with a plurality of cam notches in their peripheries

adapted to be selectively brought into registry to provide either a single registry of peripheral notches or a plurality of registered peripheral notches, a switch arm, a support secured to said casing, means pivotally connecting said switch arm to said support, said switch arm carrying two lateral projections, one of said projections being associated with the cam assembly that rotates once every twenty four hours and the other projection being associated with the cam assembly that rotates once every hour, yieldable means acting between said casing and switch arm and normally holding said other projection in a grazing relation to the periphery of its associated cam assembly whereby to effect the seating of such projection in a pair of registered notches of the latter cam assembly simultaneously with the seating of said one projection in the gap of the cam assembly which rotates once every twenty-four hours, a switch carried by said switch arm, and means carried by the casing and associated with said switch to close an electric circuit in which said switch is included when said projection which is associated with the cam assembly which rotates once every hour is forced to drop into a pair of registered notches in the latter cam assembly under the urge of said yieldable means.

2. The subject matter of claim 1 and said means which is carried by said casing and associated with said switch comprising a cam pin.

3. The structure set forth in claim 1 and means operatively connected to one of the cam elements of the cam assembly which rotates once every twenty-four hours to turnably adjust it relatively to its companion cam element to widen or narrow said gap in accordance with the number of hours it is desired for the projection associated with the cam assembly which rotates once each hour to drop into a pair of registered notches in the periphery of the latter cam assembly.

4. The subject matter of claim 3 and means associated with one of the cam members of the cam assembly which rotates once every hour to turnably adjust it relative to its companion cam member to pre-set the number of registered notches in their peripheries in accordance with the number of times each hour it is desired for the projection associated with the latter cam assembly to drop into the registered notches thereof.

5. In a time switch mechanism of the kind described, a casing, a clock mechanism housed within said casing and driving an hour shaft, two cam assemblies carried by said casing, speed reduction means connecting one of said cam assemblies to said hour shaft to be rotated thereby once every twenty-four hours, additional means connecting the other of said cam assemblies to said hour shaft to be rotated thereby once every hour, the cam assembly which is rotated once every twenty-four hours comprising two contiguous, turnably adjustable, circular cam elements each having radius struck depressions in their peripheral portions extending throughout at least half of their circumferences with radially extending shoulders at the ends of said depressions and providing a variable gap between the shoulders of adjacent cam elements when adjusted relative to each other, the cam assembly which is rotated once every hour comprising two contiguous, turnably adjustable in relation to each other circular cam members having a plurality of cam notches in their peripheries adapted to be selectively brought into registry when relatively turned, and a switch arm provided with two projections, one of said projections seating in a registered pair of notches in the latter cam assembly when the cam elements of the twenty-four hour cam assembly have been adjusted to form a gap in which to seat simultaneously the other projection of the switch arm.

6. The structure set forth in claim 5 and a switch carried by said switch arm, pivotal means carried by said casing whereto mount said switch arm, yieldable means acting between said casing and switch arm tending to close said switch, and means carried by said casing and effective to close said switch when the projection associated with said registered pair of notches seats therein under the urge of said yieldable means.

7. The subject matter of claim 6 and said pivotal means for mounting said switch arm comprising an eccentric member upon which said switch arm has an oscillatory movement thereabout.

8. The structure recited in claim 5 and a gear connected to one of the cam elements which rotates once every twenty-four hours, means associated with the companion cam element of said gear connected cam to adjust said cam element in relation to said gear connected cam element to pre-set the number of hours the projection associated with the one hour rotated cam assembly will seat into a registered pair of notches or a plurality of pairs of registered notches thereof, and dial pre-setting means carried by said casing to pre-set the number of hours before the seating of said projection in said registered notches becomes effective.

9. The structure recited in claim 5 and the first recited speed reduction means comprising a gear connected to one of the cam elements of the cam assembly which rotates once every twenty-four hours, and manually operated means associated with the other cam element of the latter cam assembly to adjust said other cam element in relation to said gear connected cam to circumferentially widen or narrow the depression between the shoulders of the respective cam elements.

10. The subject matter of claim 9 and a stationary dial mounted on the face of said casing, a dial operatively connected to and rotatable with said gear and connected cam element, the latter dial having a pointer associated with the first recited dial, a knob carried by said manually operated means and having a pointer to co-operate with said latter dial to register the number of hours in correspondence with the length of said depression between shoulders of adjusted cam elements, and supporting means carried by said casing whereon to longitudinally adjust said cam assembly which rotates once every twenty-four hours and its associated gear together with said manually operated means on said supporting means to detach the teeth of said gear from their operative connection with said hour shaft whereby to rotate the rotatable dial in relation to said stationary dial to pre-set the number of hours of elapsed time before the seating of the projection in said registered notches.

11. In a time switch mechanism of the kind described, a first cam assembly including a cam driving gear, clock mechanism, an hour shaft rotated by said clock mechanism, means rotated by said hour shaft and operatively con-

nected to said cam driving gear to rotate said first cam assembly once every twenty-four hours, a second cam assembly, said second cam assembly comprising two cam members turnably adjustable in relation to each other, a second gear, means operatively connecting said second gear with said second cam assembly, a gear carried by said hour shaft and rotated thereby, gearing operatively connecting said hour shaft gear to said second gear to rotate said second cam assembly once every hour, said two cam members of the second cam assembly having cam notches in their peripheries, manually operable means connected to one of said two cam members to turnably adjust it relative to the other cam member whereby to register one cam notch of one cam member with a cam notch of the other cam member, a spring tensioned pivoted switch arm having a projection grazing the peripheries of the members comprising said second cam assembly and adapted to seat intermittently in a pair of registered cam notches when the latter notches are rotated by said clock mechanism into a position for the associated projection to drop thereinto as a result of the spring tensioning of said arm, an electric switch carried by said switch arm, and means associated therewith effective to close said switch by the dropping of said associated projection into said registered notches.

12. The subject matter of claim 11 and said means which operatively connects said second gear with said second cam assembly comprising pins carried by said second gear and projecting into apertures in the adjacent cam member with a working fit.

13. The structure recited in claim 11 and yieldable means acting between said second gear and the adjacent cam member to maintain the contiguity of said two cam members.

14. The structure recited in claim 11 and a ball race in the face of one of said cam members of said second cam assembly and provided with a plurality of ball seats, and a ball in a seat in the adjacent face of the other cam member selectively seatable in the seats of said ball race.

15. The structure recited in claim 14 and means carried by one of said cam members and projectable into a slot in the other of said cam members to limit the relative rotation thereof to the extent of said ball race.

EARL W. ANDERSON.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,596,330	Everard	May 13, 1952