July 7, 1942. H. E. MALONE 2,288,636

CONTROL DEVICE

Filed March 8, 1940 2 Sheets-Sheet 1

Fig: 2

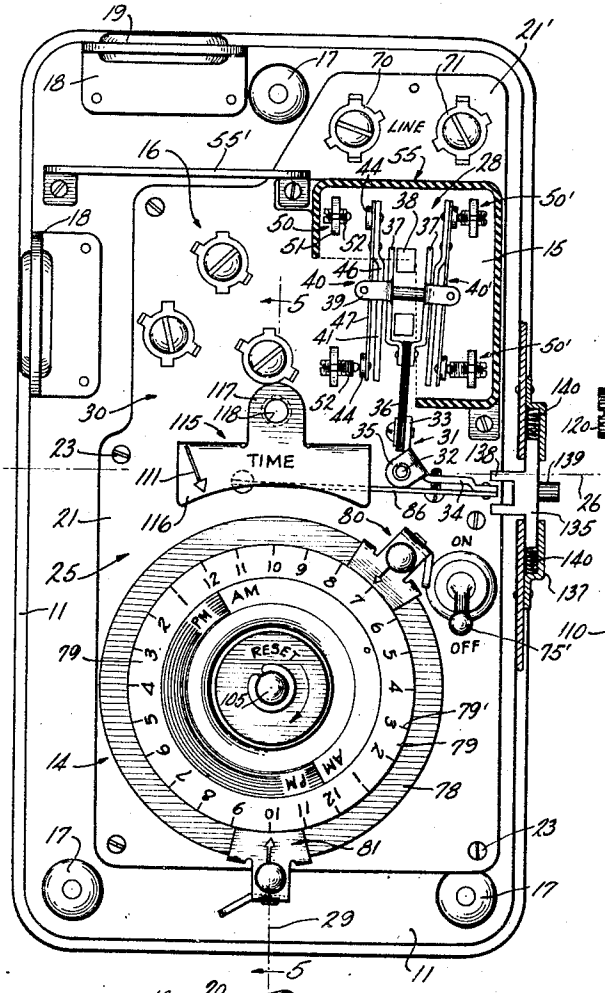


Fig: 3

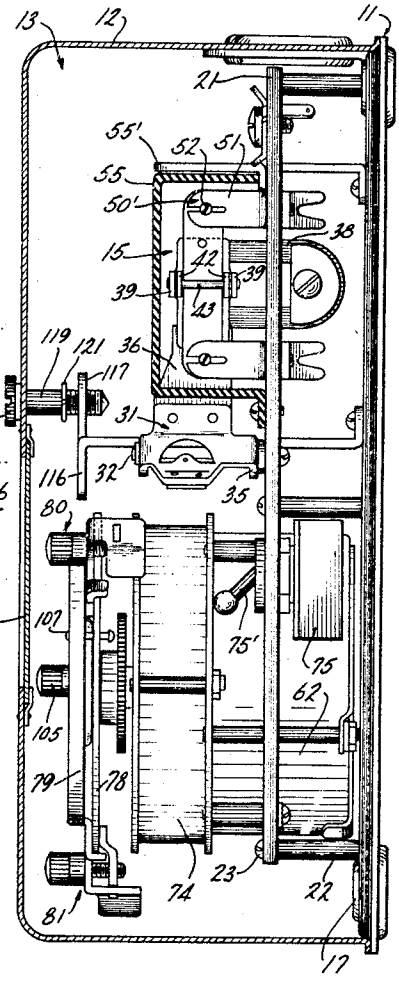


Fig: 1

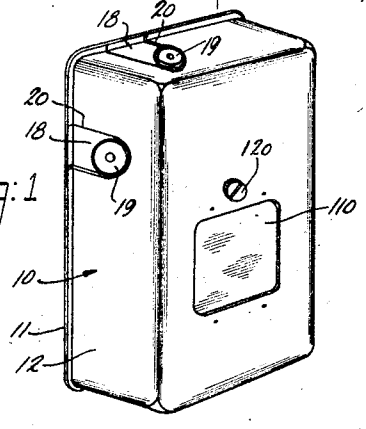
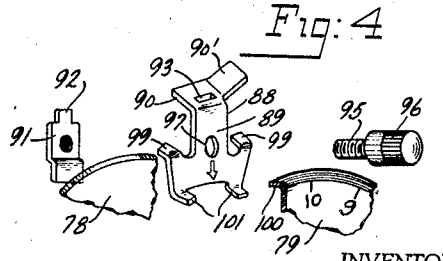


Fig: 4



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July 7, 1942. H. E. MALONE 2,288,636

CONTROL DEVICE

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Fig: 5

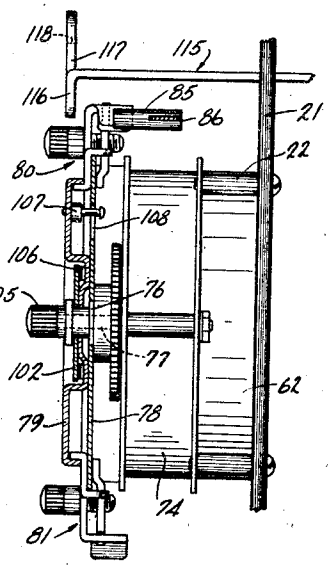


Fig: 6

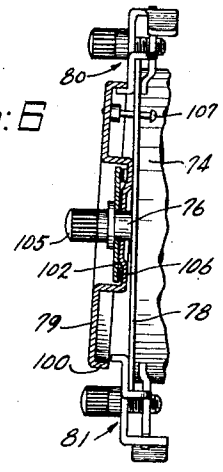


Fig: 7

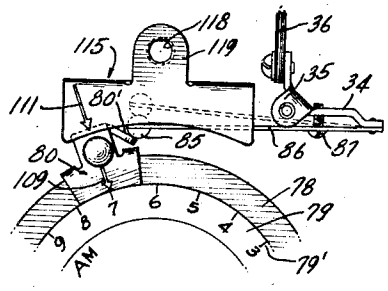


Fig: 8

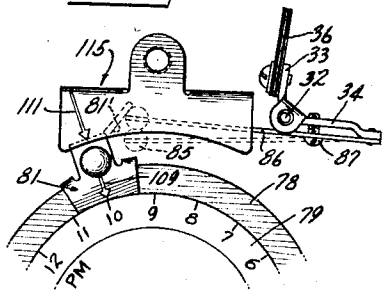
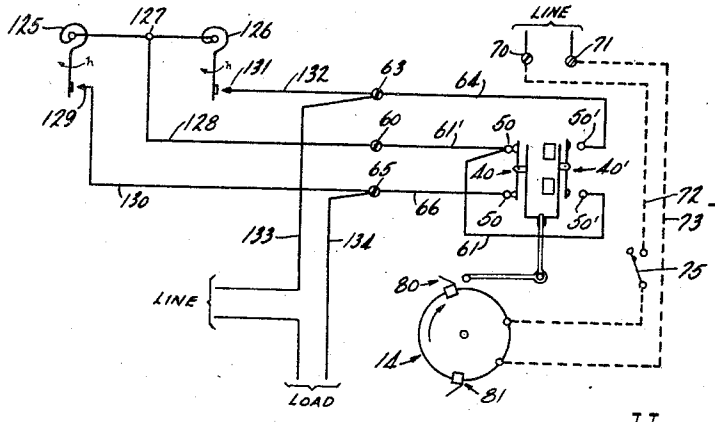


Fig: 9



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Patented July 7, 1942

2,288,636

UNITED STATES PATENT OFFICE

2,288,636

CONTROL DEVICE

Homer E. Malone, Milwaukee, Wis., assignor to Perfex Corporation, Milwaukee, Wis., a corporation of Wisconsin

Application March 8, 1940, Serial No. 322,983

11 Claims. (Cl. 200—38)

The invention relates generally to time switch mechanisms and more particularly it relates to a time switch mechanism of the clock type having adjustable means whereby the time of actuation of the switch mechanism may be readily varied.

The primary object of the present invention is to provide a new and improved time switch device of this character which is adaptable for use with a wide variety of control devices and to satisfy a wide variety of desirable control requirements.

Another object of the present invention is to provide a new and improved time switch mechanism wherein a novel disposal of the various component elements results in an unusually compact and effective unit.

Another object is to provide a time switch device of this character wherein a single annular time indicating scale serves both as a guide for accurately adjusting the time of switch actuation and as a time indicator whereby the time may be easily ascertained.

A further object of the invention is to provide such a time switch mechanism wherein adjustment of the time switch actuation is rendered more convenient.

A further object of the invention is to provide a time switch of this character having an improved and simplified mounting structure for the settable switch actuating elements.

A more specific object of the invention is to provide such a time switch mechanism wherein the settable switch actuating elements are of an improved and simplified form, and are of such a character that these elements may be adjusted by a simple operation which may be performed with one hand.

Another object is to provide such a time switch in which a relatively large number of switch operations may be attained during the twenty-four hours of the day, and in which the requisite supplemental actuating elements required for such added operations may be incorporated readily and easily by the user.

Another object is to provide such a time switch mechanism having a new, improved and simplified means for securing the enclosing housing in position.

Another object is to provide such a time switch wherein the user may readily shift the switching means from one position to the other, whereby, to simplify the setting of the time switch mechanism.

Other objects and advantages reside in certain novel features of construction, arrangement and combination of various parts which will be hereinafter more fully described and particularly pointed out in the claims.

In the drawings:

Fig. 1 is a relatively small perspective view showing the outer appearance of a timer embodying the features of the invention.

Fig. 2 is an enlarged front elevational view of the timer of Fig. 1, the enclosing cover being removed to show details of operating mechanism

Fig. 3 is a side elevational view taken from the right hand side of Fig. 2.

Fig. 4 is an enlarged perspective view of the adjustable mounting actuating element or dog with the parts shown in separated and extended relation, and with the supporting discs shown in relation thereto.

Fig. 5 is a fragmental sectional view taken along the line 5—5 of Fig. 2, and showing the manner in which the actuating dogs are mounted on the clock mechanism, and the manner in which the actuating dogs are operatively related to the switch mechanism.

Fig. 6 is a fragmental portion of Fig. 5 illustrating the manner in which an actuating dog is placed in position on the clock mechanism.

Fig. 7 is a fragmental front elevational view illustrating the relation of one of the actuating dogs to the switch mechanism.

Fig. 8 is a view similar to Fig. 7 and illustrating the other type or form of actuating dog in its operative relation to the switch mechanism.

Fig. 9 is a schematic wiring diagram illustrating one manner in which the timer of the present invention may be utilized.

While I have illustrated in drawings and will herein describe in detail but a single embodiment of the present invention, it will be understood that various modifications and alternative arrangements may be made by those skilled in the art without departing from the spirit and scope of the invention as defined by the appended claims.

In the form chosen for disclosure herein, the invention is embodied in a 24 hour or day-night timer 10, adapted to be mounted on a wall or other suitable support, and having a mounting base 11 which cooperates with a separably related box-like casing element 12 to form an enclosure or chamber 13 within which the operating elements of the mechanism are housed. Generally considered, the operating mechanism of the present device comprises a clock 14 mounted on the base 11 and adapted to cooperate

with and actuate a switch mechanism 15 which is also mounted on the base 11, the switch mechanism being related to the means which is to be controlled through the medium of terminal means 16 carried on the base 11.

The base 11, as herein shown, is formed from a sheet metal stamping of generally rectangular form having three centrally bored rubber mounting feet 17 adjacent its two lower corners and centrally of its upper edge, these mounting feet being arranged to project from the rear side thereof. The mounting feet 17 extend through suitable holes in the base in a grommet-like relation and are adapted to have mounting screws projected through their central bores to secure the base in the desired relation to a support. The base 11 also carries a pair of upstanding sheet metal brackets 18 adjacent the bordering edge of the base, each of these brackets having a relatively large opening which is normally closed by means such as a rubber knock-out grommet 19 through which the desired connecting wires may be threaded into the chamber 13 The cover 12 has its side wall cut out or slotted as at 20 to clear the openings which may be provided in the rubber grommets 19.

On the forward face of the base 11, and in spaced relation thereto, an insulating mounting plate 21 is supported by spacing sleeves and screws 22 and 23, this mounting plate 21 being of generally rectangular form and slightly smaller than the base 11 and being positioned on the base plate 11 so as to provide clearance opposite the mounting feet 17 thereby to permit convenient insertion of the required fastening screws.

In accordance with the present invention, the clock mechanism 14, the switch mechanism 15 and the terminal means 16 are so related and disposed upon the mounting plate 21 as to produce an unusually compact relationship of the device as a whole, while preserving adequate space about the terminals to permit convenient connection of the several leads thereto, and at the same time locating the various adjustable elements of the timer in convenient and readily accessible positions. In attaining this desirable relationship the present invention provides for the mounting of the clock mechanism within an area which comprises substantially one half of the generally rectangular base 21, this clock mounting area 25 in the present instance lying between a transverse division line 26 (Fig. 2) and the lower end of the mounting plate 21. With the clock mechanism 14 mounted in the area 25, the switch mechanism 15 is, in all of its principal and bulky elements, mounted in a switch mounting area 28 which comprises substantially one quarter of the area of the mounting plate 21 and is defined between the line 26, the upper end of the mounting plate 21 and a centrally located longitudinal division line indicated at 29. The terminal means 16 is located in a terminal mounting area 30 which is defined by the division lines 26 and 29 and the adjacent side and end edges of the mounting plate 21. Preferably the two grommet brackets 18 are mounted adjacent the terminal mounting area 30 as at the bordering side and end edges thereof. With this convenient and advantageous arrangement or disposal of the several elements, the actuating connection between the clock mechanism and the switch mechanism is provided substantially along the division line 26.

In the present device the switching mechanism 15 is of such a character that it is shifted between two positions by the clock mechanism 14 and, in order that the actuating connection between the clock and the switching mechanism may be relatively simple in character, the switch mechanism 15 is preferably constructed so that after it has been shifted from one position to the other by the clock mechanism it will maintain its shifted position until an opposite shifting movement is imparted thereto by the clock mechanism. While this action may be attained in different ways, the present embodiment is such that the switch mechanism is held in either of its positions by magnetic means. The switch mechanism 15 as herein shown comprises a pair of bridging switch assemblies each constructed along the lines of the switch mechanism illustrated and claimed in my copending application, Serial No. 321,822, filed March 2, 1940. These two bridging switch assemblies are mounted on a common supporting structure 31 pivoted on a stud 32 which projects upwardly from the mounting plate 21. The supporting member 31 comprises a sheet metal stamping in the general form of a bell crank having two arms 33 and 34 disposed generally at right angles to each other and having a pair of spaced integral ears 35 projecting from the juncture of the two arms 33 and 34 and apertured to cooperate with the pivot pin or stud 32. On the arm 33 of the bell crank an insulating block or plate 36 is secured and it is upon this insulating block 36 that the two bridging switch structures are supported. On opposite sides of the insulating block 36 a pair of magnetic armatures 37 are secured as by riveting so as to project in spaced relation beyond the end of the insulating block 36 on opposite sides of a permanent magnet 38 which is mounted in fixed position on the plate 21. The two armatures 37 are so spaced and related to the magnet 38 that the switch supporting structure 31 may be rocked back and forth between two positions. Each armature 37 has a pair of ears 39 formed adjacent its midpoint and on opposite edges thereof so as to project in spaced relation to support a bridging switch structure designated generally by the reference numeral 40. Each bridging switch structure preferably comprises a pressure bar 41 which is relatively rigid and has projecting mounting ears 42 at its midpoint, these mounting ears being positioned between and pivotally related to the mounting ears 39 by means of pivot pin 43. The pressure bar 41 is adapted to carry, at its opposite ends, a pair of movable contacts 44, and in the present form these movable contacts are so supported upon the pressure bar 41 as to provide for a yielding engagement and disengagement of the movable contacts with the opposing stationary contacts. For this purpose the pressure bar is slightly off-set as at 46 and a resilient bar 47 is secured to the outwardly projecting or off-set face of the pressure bar so that the resilient bar 47 is slightly spaced from the pressure bar 41 at its other end. The two movable contacts 44 are supported on the opposite ends of the resilient bar.

The two movable contacts 44 of the left hand bridging structure 40 of Fig. 2 are adapted when shifted to the left to engage a pair of stationary contacts 50, each contact 50 comprising an upstanding sheet metal bracket 51 fixed as by screws to the mounting plate 21 and through which a contact screw 52 projects for engagement by its contact 44. By adjustment of the screw threaded contact elements 52 the relation-

ship of the elements may be so adjusted as to define each of the two positions of the switch structure. Each of these positions is preferably such that one of the armatures 37 is relatively close to but still out of contact with the permanent magnet 38, whereby to attain the desired snap action, and in defining this relationship the pressure bar 41 functions as a rigid bridging member. The other or right hand switching structure 40' cooperates and bridges a pair of similar stationary contacts 50'.

Preferably the switching structure 15 is protected by an L-shaped insulating cover structure 55 which is secured to the mounting plate 21 and partially overlies the switching structure as indicated by the dotted outline in Fig. 2. Two of the contacts 50 and 50' are connected in series to one terminal 60 of the terminal means 16 by means of wires 61 and 61' which extend through a wiring space 62 (Fig. 3) formed between the base plate 11 and the mounting plate 21; while another terminal 63 is similarly connected by wire 64 to the other fixed contact 50', and a third terminal 65 is similarly connected by wire 66 to the other fixed contact 50. Thus when the switch mechanism is in its left hand position the two terminals 60 and 65 are bridged, while positioning of the switching structure in its right hand position causes bridging of the two terminals 60 and 63.

It will be noted that in the present embodiment the terminal mounting area 30 contains but three terminals, but it will be apparent that additional terminals could be provided in this area if desired. Line voltage terminals 70 and 71 are herein provided, since the clock mechanism 14 is in the present instance electrically actuated, and in order to segregate the two line voltage terminals 70 and 71 from the terminals 60, 63 and 65, which are often included in a low voltage control circuit, the present invention makes use of the insulating guard 55 which is positioned about the switch mechanism 15 in such a manner that this guard 55 functions in effect as an insulating barrier. To accomplish this result the mounting plate 21 has a projecting portion 21' at its upper right hand corner as viewed in Fig. 2, this portion 21' extending beyond the protecting housing or guard 55 and having the terminals 70 and 71 mounted thereon. An additional barrier between the high and low voltage terminals is provided by an outwardly projecting barrier plate 55' secured to the base 11 and projecting outwardly to the same extent as the guard 55 and adjacent the upper edge thereof.

The terminals 70 and 71 are connected by wires 72 and 73 extending through the wiring space 62 to a selfstarting synchronous electric motor 74 (Fig. 3) which forms a part of the clock mechanism of the present embodiment. If desired, one of the wires, as the wire 72, may include a manual switch mechanism 75 having an actuating element 75' projecting forwardly of the mounting plate 21 so that the clock may be stopped during selected periods or seasons.

The clock mechanism 14 includes the usual gear train (not shown) terminating in a driven sleeve 76 which surrounds a re-set shaft 77, and the clock mechanism of the present embodiment is such that the sleeve 76 makes one revolution in each twenty-four hours.

On the sleeve 76 the present invention provides a combined time-indicating and switch actuating mechanism which comprises a mounting disc 78 rigidly secured to the sleeve and a cooperating disc 79 which is mounted for rotation with disc 78. The disc 79 carries on its outer or forward face suitable indicia such as a scale 79' divided in twenty-four equal parts which are numbered so as to be indicative of the twenty-four hours of the day. Suitable indicia is provided in association with the scale 79' to identify one half of the scale as pertaining to the hours between noon and midnight, and upon the other half to identify it as pertaining to the hours between midnight and noon. On the edge of the mounting disc 78 suitable actuating dogs 80 and 81 are mounted for effecting timed shifting of the switch mechanism 15 back and forth between its two positions. It will be noted in Fig. 7 that the mounting disc 78 rotates in a clockwise direction and that the dog 80 has a cam surface 80' which in such rotation of the mounting disc 78 engages and actuates a follower member 85, which is operatively associated with the switch mounting member 31, so as to shift the follower 85 from the full line position of Fig. 7 to the dotted line position thereby to shift the switch structure to the right. The actuating dog 81 has a similar but oppositely disposed cam surface 81' which is operable upon the follower 85 from the upper position of Fig. 8 to the lower position, thereby to shift the switch structure to its left hand position. The operative connection between the follower 85 and the switch mounting member 31 comprises in the present instance a resilient arm 86 which carries the follower 85 on one of its ends and is secured at its other end to the remote end of the arm 34 of the mounting structure 31. Throughout a portion of its length the resilient arm 86 extends in generally parallel but spaced relation to the arm 34, and for purposes of calibration, a screw 87 extends through a hole in the arm 86 across the space between the arm 86 and the arm 34 and is threaded into the arm 34. With this mounting of the follower 85 the actuating cam surface of either the dogs 80 or 81 act through the resilient connection formed by the arm 86 to build up a resilient switch actuating force in opposition to the restraining force of the magnet 38, so that the switch movements are accomplished with a snap action as pointed out in my aforementioned copending application.

It will be noted that the actuating arm 86 extends transversely across the mounting plate substantially along the division line 26 so as to be located in a protected relation and contribute to the compact and effective disposal of parts which produces the convenient and compact relation in the present timer. Since the cam portion 81' of the dog 81 must, after actuation of the follower 85, pass the arm 86, the follower 85 projects forwardly from the arm 86 into the path of the cam 81', the arm 86 being located rearwardly of the cam path as shown in Fig. 5.

In accordance with the present invention actuating dogs 80 and 81 are supported on the mounting disc 78 solely in the area adjacent the periphery so that a relatively large number of actuating dogs may be associated with the clock mechanism. The switch mechanism may therefore be actuated back and forth between its two positions a relatively large number of times in the twenty-four hour timing cycle of the clock. Moreover the present invention provides for convenient application of the actuating dogs

80 and 81 to the mounting disc 78 so that a householder may easily mount additional actuating dogs on the clock structure. The actuating dogs of the present device are also advantageous in that they are constructed so that they may be readily adjusted about the periphery of the mounting disc 78 in a simple operation which may be performed with one hand.

In attaining these desirable characteristics the present invention provides an actuating dog which in its preferred form is constructed as shown in detail in Fig. 4 of the drawings. As therein shown each actuating dog comprises an angle member 88 formed from sheet metal to provide an outer or front leg 89, adapted to extend along and against the front face of the mounting disc 78, and a rearwardly projecting leg 90 adapted to extend rearwardly past the periphery of the mounting disc 78. The rearwardly projecting leg 90 has an integral portion 90' which in accordance with the angle at which it is formed, provides the cam surface 80' or 81'. For clamping the front leg 89 against the front face of the mounting disc 78 an inner or rear clamping arm 91 is provided in generally parallel but rearwardly spaced relation to the forward leg 89. This clamping arm 91 has an upwardly projecting lug or ear 92 at its upper end which extends into a slot 93 formed in the upper or rearwardly projecting arm 90, thereby providing a pivotal connection between the clamping arm 91 and the forward leg 89. The two members 89 and 91 thus constitute opposed clamping jaws, and clamping force is applied therebetween by means of a clamping screw 95, the enlarged and knurled head 96 of which is positioned on the outer face of the leg 89 with the screw thereof projecting freely through a hole 97 in the leg 89 and into screw threaded engagement with the clamping arm 91. Thus by actuation of the knurled head 96 the actuating dog may be clamped upon the edge of the mounting disc 78.

It will be noted that the screw 95 extends past the outer edge of the mounting disc 78 and this screw might be utilized to limit the inward movement or positioning of the dog on the mounting disc. However, I prefer to provide a pair of rearwardly projecting lugs 99 formed adjacent opposite edges of and integrally with the leg 89, thereby to provide spaced points of engagement with the periphery of the disc 78. With this construction, the actuating dog resists rocking movement when it engages the follower 85, even though but a slight clamping force has been applied to the clamping screw 95. It is sufficient with the present construction merely to apply enough friction between the actuating dog and the disc 78 to resist relative sliding movement when the associated cam surface engages and actuates the follower 85.

As herein pointed out the present invention provides for a simple one hand adjustment of the actuating dogs 80 and 81 and to prevent accidental outward displacement of the actuating dogs during such an adjusting movement, means is provided to restrain the dogs against such outward displacement when the clamping means is released, and this means is such that the dogs 80 and 81 may be readily engaged with or released from the restraining means in the mounting and dismounting of the dogs. In the form herein shown this restraining means is formed in part on the indicating disc 79 and comprises a continuous annular surface 100 which faces radially inwardly with respect to the shaft 77 and is formed by an annular rearward flange at the edge of the disc 79. This annular surface 100 engages a pair of peripherally spaced lugs 101 formed at the inner end of the forward leg 89 so as to project forwardly therefrom. The engagement of the lugs 101 with the surface 100 also acts to resist rocking movement of the dog during its switch-actuating operation.

In order that the lugs 101 may be readily and easily engaged with the annular restraining surface 100, the indicating disc 79 is mounted on the shaft 77 so that it may be separated from the disc 78, as by being rocked to the position shown in Fig. 6. In the present embodiment this shifting movement is readily effected, the indicating disc 79 being secured in place on the shaft by resilient or yielding means. Thus a small disc 102 is held in place on the shaft 77 by a knurled re-set knob 105, and spring means such as a spring washer 106 (Figs. 5 and 6) is interposed between the disc 102 and the disc 79. A headed pin 107 fixed on the disc 79 projects rearwardly therefrom through a keyhole slot 108 (Fig. 5) in the disc 78 to assure rotation of the indicating disc in unison with the mounting disc 78 to which the actuating power is applied. Thus it will be apparent that the user may grasp the edge of the indicating disc 79 to tilt the same to the separated position shown in Fig. 6, thereby to permit convenient mounting or removal of the actuating dogs.

In both the actuating dogs 80 and 81, the cam portions 90' are located on the leading edge of the dog, and are disposed within the angular segment defined by two radii passing from the center of the shaft 77 through the remote side edges of the lugs 99. Each dog 80 or 81 in the present instance takes up a peripheral portion of the mounting disc 78 equal to two hours on the time scale of disc 79, and the side edges of each dog are disposed radially with respect to the segment to be occupied by the dog.

Each actuating dog, on the forward face of the leg 89, has an arrow 109 which cooperates with the time scale 79' on the disc 79 in setting the dogs for actuation of the switch at any desired time. The scale 79' also functions as indicating time visually, as for checking the setting of the clock, and this end is attained by exposing a segmental portion of the scale 79' though a window 110 adjacent the center of tne forward face of the cover 12, and by the provision of a stationary time indicating marking such as an arrow 111 adjacent to the scale 79'. The arrow 111 is so located that it is in radial alignment with the arrow 109 of an actuating dog at the time when such a dog causes shifting of the switch mechanism.

While the time indicating arrow 111 may be placed on any stationary part of the device, I prefer to place it upon a stationary bracket 115 which functions additionally in providing a simple and easily operated means for securing the cover 12 in place on the base 11. The bracket 115 is suitably secured to the base 11 and protects forwardly through openings in the mounting plate 21. At its forward end the bracket 115 is bent downwardly to form a flange 116 (Fig. 5) substantially in the plane of the disc 79, and the arrow 111 is placed upon the forward face of this flange. It will be noted that the lower edge of the flange 116 is formed arcuately to provide clearance for the heads 96 of the clamping screws 95 which project beyond the

flange 116 (Fig. 5) so as to be readily grasped and moved past the flange 116 in an adjusting operation.

To provide for fastening the cover 12 in position, the bracket 115 has a flange or ear 117 struck from the horizontal body of the bracket in the plane of the flange 116. The ear 117 has a screw threaded opening 118 therein for operative engagement by the threaded end of a fastening screw 119 which projects through the forward wall of the cover 12. The screw 119 has its enlarged knurled head 120 positioned on the outside of the cover 12 and has a collar 121 thereon within the cover so as to hold the screw 119 loosely in place on the cover when the cover is removed from the timer. To facilitate fastening of the cover, the screw 119 has its end pointed, thereby to simplify engagement of the screw 119 with the threaded opening 118.

With the switch mechanism illustrated herein, the present timer is particularly adapted for use in transferring dominating control back and forth at selected hours between two differently adjusted control devices, such, for example, as a pair of room thermostats 125 and 126 illustrated in the wiring diagram of Fig. 9. The present control may, of course, be used as a simple "off-on" control in a governing circuit for a device such as an attic exhaust fan, in which case the switch mechanism 15 is preferably simplified so as to eliminate one of the bridging switch assemblies 40.

When the timer of the present invention is used in connection with two control devices such as the thermostats 125 and 126 the common terminals 127 of the two thermostats is connected by a wire 128 to the terminal 60 of the timer. The other terminal 129 of the thermostat 125 is connected by a wire 130 to the terminal 65 of the timer, while the other terminal 131 of the other thermostat 126 is connected by a wire 132 to the terminal 63 of the timer. From the terminals 63 and 65, leads 133 and 134 extend in series with a source of line current and to the load such as a burner control means, so that as the switch mechanism 15 is shifted back and forth, the burner is placed alternately under the control of the two thermostats 125 and 126.

In the ordinary use of the circuit of Fig. 9, one of the thermostats, as 125, is set to close its contacts at a selected temperature which is to be maintained during the day, while the other thermostat 126 is adjusted for closure at a lower temperature desired during the night, and these differently adjusted controls are placed alternately in dominating relation to the circuit 133—134 at different hours as determined by the adjustment of the dogs 80 and 81 of the timer. When the switch contacts 50 of the timer 10 are bridged, as shown in Fig. 9, the desired night temperature will be maintained by the dominating action of thermostat 126, the circuit being established from the lead 133 to terminal 63, wire 132, terminal 131, thermostat 126, terminal 127, wire 128, terminal 60, wire 61', across the bridged contacts 50, wire 66 to terminal 65 and to lead 134. Reversal of the switch positioning by the timer 10, so as to bridge contacts 50', places the day thermostat 125 in control, through a circuit from lead 133 to wire 64, the bridged terminals 50', wires 61, 61', terminal 60, wire 128, the thermostat 125, and wire 130 to terminal 65 and the lead 134.

To simplify the setting of the time switch, and permit the user to readily verify the setting of the switch mechanism, I provide a manual switch actuator 135 (Fig. 2) which is engageable manually on the exterior of the cover 12. In the form herein shown the actuator 135 comprises a slide member supported and guided on the exterior of the side wall of the cover 12 by a dished guide plate 137, the slide member 136 having spaced lugs 138 projecting inwardly through a slot in the cover so as to be positioned on opposite sides of the arm 34 of the switch supporting member 31. Thus, by engagement of an outwardly projecting finger-piece 139 on the member 135, the lugs 138 may be engaged selectively with the switch supporting member 31 to shift the switch mechanism to the desired relation. Preferably a pair of expansive coil springs 140 are located within the guide plate 137 so as to engage opposite ends of the slide member 136, and these springs 140 act to center the lugs 138 so as to avoid interference with the normal free operation of the switching mechanism by the actuating dogs 80 and 81.

In satisfying the wide variety of conditions or desires on the part of the users, the present timer is of particular advantage since the actuating dogs 80 and 81 are each capable of adjustment to any position throughout the twenty-four hours of the day. Hence the controlling action of the thermostats 125 and 126, or other control devices may, in effect, be reversed merely by re-setting of the dogs 80 and 81. Moreover, the user may readily mount additional actuating dogs 80 and 81 on the mounting disc 76 so as to attain several alternate periods of control by each of the control devices 125 and 126. The maximum number of such alternate periods, and the minimum length of such periods, is limited in the present device only by the angular or segmental width of the dogs 80 and 81, but it will be apparent that the number of lugs mountable on the disc 76 could be increased materially by increasing the size of the disc, or by narrowing the lugs 80 and 81. The relation herein shown, has, however, been found to be satisfactory in most instances, since it requires but a two-hour minimum period between shifting movements of the switch mechanism.

From the foregoing description it will be apparent that the present invention provides a new and improved time switch device which is so constructed and arranged as to be adaptable for use with a wide variety of control devices and to satisfy a wide variety of control requirements or desires. The timer of the present invention is also such that unusual compactness and simplicity of structure are attained, as for example, in the functioning of but a single time scale as a guide for adjusting the time of switch actuation and as a time indicator whereby the time may be readily ascertained.

For the normal user, the timer of the present invention is of particular advantage, since a large number of switch operations may be obtained during each day, and this result is attained in a novel and convenient manner such that a user may readily incorporate or remove the mechanism required to attain such additional switching operations.

What is claimed is:

1. In a time switch mechanism, the combination of a shiftable switch mechanism having at least two positions, a clock mechanism having a rotatable time indicating means providing concentric annular mounting surfaces, an actuating dog mounted on said annular mounting sur-

faces for movement to various adjusted positions thereabout, clamping means on said dog operable to secure said dog in adjusted position on said annular surfaces, and means on said dog and separate from said clamping means for engaging one of said annular surfaces and acting to hold said dog against outward radial displacement when said clamping means is released.

2. In a time switch mechanism, the combination of a shiftable switch mechanism having at least two positions, a clock mechanism having a rotatable time indicating means providing concentric annular mounting surfaces, a switch-actuating dog mounted on said annular mounting surfaces for movement to various adjusted positions thereabout, clamping means on said dog operable to secure said dog in adjusted position, and means on said dog and separate from said clamping means for engaging two oppositely facing ones of said annular surfaces and acting against said oppositely facing surfaces to hold said dog against both inward and outward radial displacement when said clamping means is released.

3. In a time switch mechanism, the combination of a shiftable switch mechanism having at least two positions, a clock mechanism having a rotatable time indicating means providing concentric annular mounting surfaces, two of the surfaces being oppositely faced radially outwardly and inwardly, an actuating dog for actuating said switch mechanism mounted on said annular mounting surfaces for movement to various adjusted positions thereabout, clamping means on said dog operable to secure said dog in adjusted position, and means on said dog and separate from said clamping means for engaging one of said oppositely faced annular surfaces at peripherally spaced points to hold said dog against rocking movement relative to said annular surfaces.

4. In a control mechanism of the character described, a clock actuated rotatable member, a pair of discs mounted in concentric relation on said rotatable member for rotation in unison therewith and with their edge portions spaced apart in an axial direction, said discs being mounted in a manner providing for yieldingly resisted relative separation of the two discs from a normal generally parallel relation to increase the normal space between the edge portions thereof, means on one of said discs forming an anular retaining surface adjacent to its outer edge and facing radially inwardly, and an actuating control element formed with a retaining lug adapted to be inserted into the space between said discs when said discs are separated beyond their normal spacing and to be held in engagement with and restrained against outward displacement by said annular retaining surface when said discs are in their normal spaced relation.

5. In a control device of the character described, a clock actuated rotatable member, a pair of discs mounted in concentric relation on said rotatable member for rotation in unison therewith and in normally spaced relation, said discs being mounted in a manner providing for yieldingly resisted relative movement of the two discs from a normal generally parallel relation to vary the space therebetween to a releasing position, means on one of said discs forming an annular retaining surface adjacent to its outer edge and facing radially inwardly, and an actuating control element mounted for circumferential adjustment on one of said discs and having abutment means adapted to be engaged with said annular retaining surface when said discs are in their normal spaced relation and to be disengaged and released from the retaining action of said annular retaining surface when said discs are relatively moved to said releasing position.

6. An actuating dog for adjustable association with a clock actuated control device, said dog comprising, in combination an inner clamping jaw, an outer clamping jaw, a clamping screw operatively connected therebetween and having an enlarged actuating head located on the outer surface of said outer jaw, a supporting portion formed integral with and projecting rearwardly from said outer jaw, means forming a pivoted connection between said supporting portion and said inner jaw, and a cam member carried by said supporting portion.

7. An actuating dog for adjustable association with a clock-actuated control device, said dog comprising, in combination an inner clamping jaw, an outer clamping jaw, a clamping screw operatively connected therebetween and having an enlarged actuating head located on the outer surface of said outer jaw, a supporting portion formed integral with and projecting rearwardly from said outer jaw, means forming a pivotal connection between said supporting portion and said inner clamping jaw, lug means on said outer jaw having oppositely facing surfaces adapted to engage annular guiding and retaining surfaces on the mounting element of a controlling clock means, and a cam member carried by one of said jaws.

8. In a clock actuated timer, an actuating dog comprising an L-shaped sheet metal member having two legs, a clamping element mounted in opposed relation to a first leg of said L-shaped member, a clamping screw acting between said clamping element and said first leg, an actuating cam surface formed on the second leg, and a plurality of lugs formed on said first leg of said L-shaped member and projecting therefrom in spaced relation to each other in a direction parallel to said second leg.

9. An actuating dog for adjustable association with a mounting disc of a clock actuated control device, said actuating dog comprising, in combination a rear clamping jaw, a forward clamping jaw, a clamping screw operatively connected therebetween and having an enlarged actuating head located on the forward surface of said forward jaw, an actuating cam element carried by one of said jaws, and means for locating said dog in a predetermined position on the edge of said mounting disc, said means comprising a first pair of lugs formed on opposite edges of said forward jaw and projecting rearwardly therefrom for engagement with the edge of said mounting disc at spaced points, and a second pair of lugs formed adjacent opposite edges of said forward jaw and projecting forwardly therefrom for engagement with an annular restraining means to maintain said second pair of lugs in engagement with the edge of said mounting disc.

10. In a time switch mechanism, the combination of, a clock driven shaft, a clock driven member rotated by said shaft, said member providing a generally annular mounting surface, a pivoted switch lever having a follower arranged adjacent the periphery of said annular mounting surface, switching mechanism associated with the switch lever and adapted to be shifted from one position to another thereby, and means for actuat-

ing said switch lever from one of its positions to another, said actuating means comprising a pair of actuating riders each located at a different position on said mounting surface and each including front and rear clamping jaws engaging opposite sides of said member, said follower being located in the path of movement of said actuating riders, set screws for releasably clamping the clamping jaws of each actuating rider to said clock driven member whereby said actuating riders can be shifted to any desired position, and cooperating means separate from said set screws on said clamping jaws and said member for preventing the removal of said actuating riders from said annular member while they are being shifted and for preventing rocking movement relative to said member while the actuating riders are clamped in position.

11. In a time switch mechanism, the combination of, a clock driven shaft, a clock driven member rotated by said clock driven shaft, said member providing an annular mounting surface, a pivoted switch lever having a follower arranged adjacent the periphery of said annular mounting surface, switching mechanism associated with said switch lever and adapted to be shifted from one position to another thereby, and means for actuating said switch lever from one of its positions to another, said actuating means comprising a pair of actuating riders each located at a different position on said annular mounting surface and each including front and rear clamping jaws engaging opposite sides of said member, the follower being located in the path of movement of said actuating riders, set screws for releasably clamping the clamping jaws of each actuating rider to said member whereby said actuating riders can be shifted to any desired position, cooperating means separate from said set screws on said clamping jaws and said member for preventing the removal of said actuating riders from said member while they are being shifted and for preventing rocking movement relative to said member while the actuating riders are clamped in position, and oppositely inclined cam surfaces arranged on said actuating riders for engaging and shifting said follower from one of its positions to the other as said clock driven member is rotated.

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