July 31, 1923. 1,463,253

J. F. CERMAK

TIME SWITCH

Filed Nov. 24, 1920 2 Sheets-Sheet 1

Fig. 1.

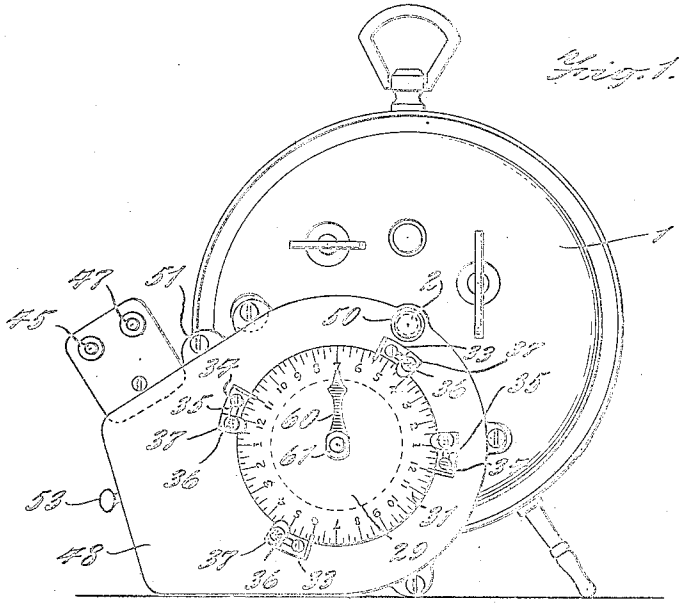


Fig. 2.

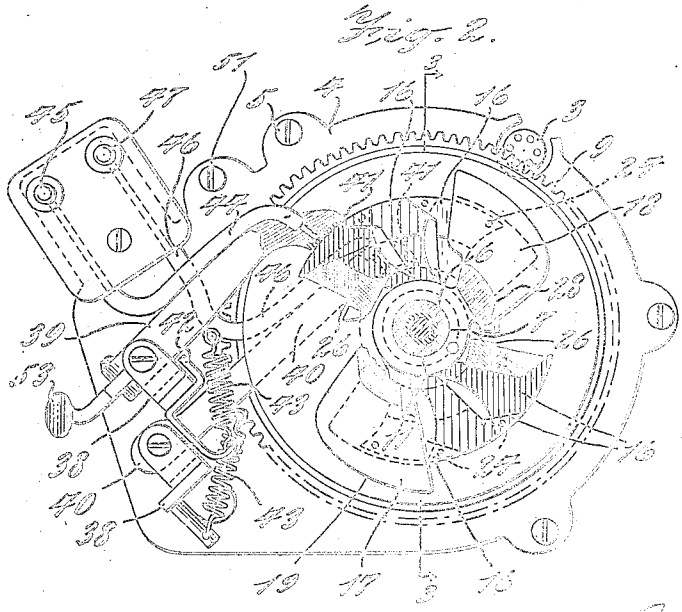
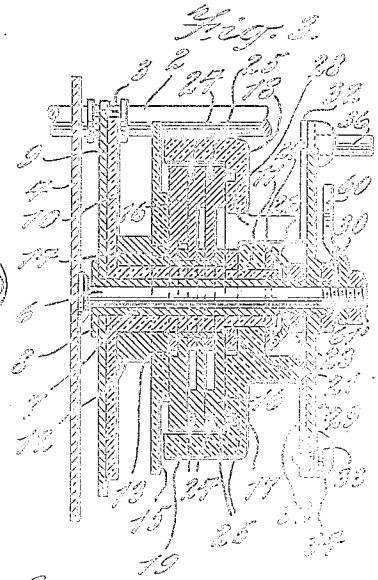


Fig. 3.



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Rowland, Hastings & Boot ATTORNEYS

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Fig. 4.

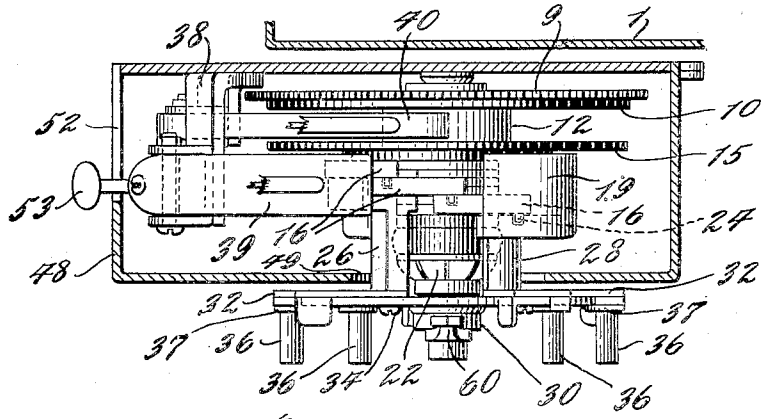


Fig. 6.

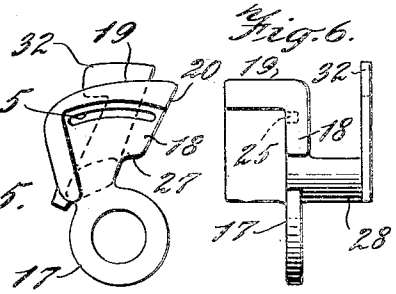


Fig. 8.

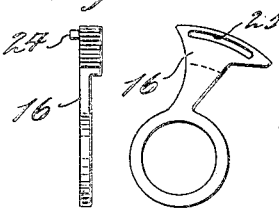


Fig. 5.

Fig. 7.

Fig. 9.

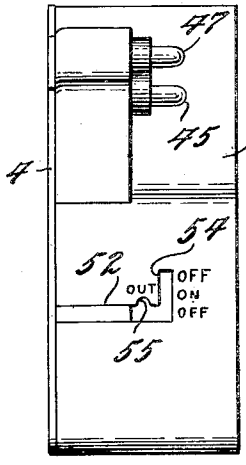
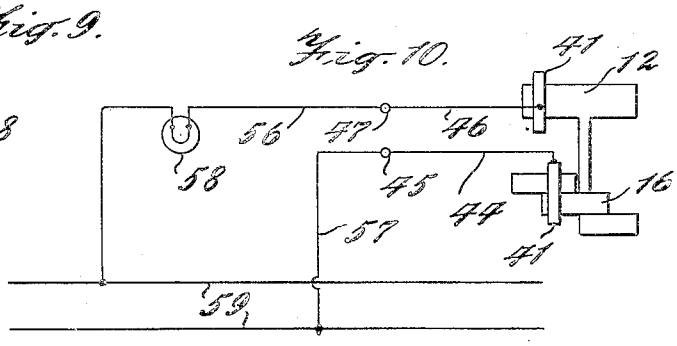


Fig. 10.



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Rosenbaum & Hochbridge & Root ATTORNEY.

Patented July 31, 1923. 1,463,253

UNITED STATES PATENT OFFICE.

JEROME F. CERMAK, OF BROOKLYN, NEW YORK.

TIME SWITCH.

Application filed November 24, 1920. Serial No. 426,193.

To all whom it may concern:

Be it known that I, JEROME F. CERMAK, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Time Switches, of which the following is a full, clear, and exact description.

This invention relates to time switches of the type which may be set to cause a current to be automatically turned on and off at certain hours of the day or night, and has for an object to provide a switching attachment which may be readily and easily attached and connected to an ordinary alarm or other similar clock so as to be operated by the time train mechanism thereof, which has a wide range of adjustment of the periods of a day during which the current will be turned on or off, which has a quick movement in making and breaking the circuit, and which is inexpensive to manufacture, simple in adjustment, reliable and durable in use. Other objects and advantages will be apparent from the following description and the novel features of my invention will be particularly pointed out in claims.

The invention comprises the details and arrangements of parts which will be described in detail in connection with the accompanying drawings, wherein

Fig. 1 is an elevation of the time switch;

Fig. 2 is an elevation of the switch with the clock and cover removed;

Fig. 3 is a section taken substantially along the line 3—3 of Fig. 2;

Fig. 4 is a horizontal section of the mechanism shown in Fig. 2;

Fig. 5 is a rear elevation of one of the insulating elements;

Fig. 6 is a side elevation of the same;

Fig. 7 is a front elevation of one of the contact segments;

Fig. 8 is a side elevation of the same;

Fig. 9 is an end elevation of the casing; and

Fig. 10 is a diagram illustrating the application of a switch to an electric circuit.

In the illustrated embodiment I provide a clock 1 of any suitable construction which may conveniently be of the type of the well known alarm clock. In place of the usual setting button for the minute hand arbor I provide a special button 2 having a small pinion 3 thereon. A plate 4 is secured to the rear face of the clock in any suitable manner such as by screws 5 and acts as a support for the switching mechanism. Projecting from this plate is a rod 6 upon which is rotatably mounted a sleeve 7 having a flange 8 at one end and external screw threads at the other end, the flange 8 being adjacent the plate 4. Upon the sleeve 7 and abutting against the flange 8 I mount by a force fit or by a key a gear 9 having teeth meshing with the pinion 3 when the attachment is secured to the clock. A disc 10 of suitable insulating material having an integral sleeve 11 concentrically extending therefrom is also supported upon the sleeve 7 by a force fit or by a key with the insulating disc 10 abutting the gear 9. Surrounding the sleeve 11 and connected for rotation therewith by means of a force fit or key is a conducting sleeve 12 having two reduced shoulders 13 and 14 thereon. Upon the sleeve and abutting the shoulder 13 is fixed an insulating disc 15 and upon the sleeve and abutting against the shoulder 14 are a plurality of contact arms or segments 16. These arms are reduced in thickness at the end passing over the sleeve 12 so that the arms will have upon their outer end a contact surface equal to the thickness of two of the arms at the inner ends. The contact elements in the embodiment illustrated are arranged in two groups, each group comprising alternate arms or segments, and by reason of the reduced inner ends, the outer ends of the arms of either group will have abutting faces. Upon the insulating sleeve 11 are loosely mounted a pair of insulating elements 17, each of which has an arm 18 with an aperture through which the sleeve passes and a flange 19 extending perpendicularly from the outer end and from one side edge. The flange extending from the side edge curves backwardly and outwardly with respect to the direction of rotation of the arms so as to form a cam surface leading to the flange portion upon the outer end of each arm. The side edge 20 opposite to the flanged side edge of the arm is either radial with respect to the axis of rotation or slightly undercut. The contact arms 16 and the arms 18 of the insulating elements are held against displacement along the sleeves upon which they are mounted by

means of a split washer 22 and a nut 23 threaded upon the end of the sleeves 7, a flat washer 24 being preferably interposed between the split washer and the arms of the insulating elements.

Each contact arm or segment is provided with a pin 24 upon corresponding faces and adjacent the outer ends of the arms. The inner faces of the insulating elements 17 against which the groups of contact segments abut, and the faces of the contact segments in each group against which the pins of that group abut are provided with elongated arcuate grooves or slots 25 having centers of curvature in the axis of rotation. By this pin and slot arrangement between each insulating element and the contact arms of its related group, the arms can be separated in a fan like manner with respect to each other and their related element, so as to provide a contact surface upon their outer ends of a variable length and extending variable distances from beneath the peripheral flange 19. When the arms and related element are completely contracted, the contact arms will be completely concealed beneath the flange 19 and thus may be said to be concealed within a recess or cavity in the related insulating element. The end contact arm or segment 16 of each group has a radial or undercut trailing edge and is provided with an arm 26 extending parallel with the axis of rotation and outwardly for adjustment to extend or contract the arms of each group. The side edge 20 of each insulating element is provided with a recess 27 into which the arm 26 may move and permit the attached segment 16 to be moved entirely beneath the flange 19. The insulating elements are also provided with outwardly extending arms 28 by means of which their adjustment on the sleeve 11 can be accomplished. A dial plate 29 is threaded upon the end of sleeve 7 and can be locked in adjusted positions thereon by a lock nut 30. The periphery of the dial plate is provided with graduations 31 representing the hours of the day and suitable subdivisions thereof. The arms 26 and 28 are provided with angular extensions 32 which extend from the arms toward the periphery of the dial plate and carry on their outer ends clamping means by which they can be secured in adjusted positions to the dial. Small indicator plates 33 each having a finger overhanging the dial are adjustably carried by the extensions 32 by means of screws 34 passing through slots 35 of the plates and into the extensions. Operating buttons 36 are secured to the extensions 32 by means of reduced threaded ends which pass through clamping plates 37 overhanging the dial plate. Turning a button in one direction or the other will clamp the dial plate between the cooperating plate 37 and the extension 32 which carries that button and plate. Each insulating element and the contact arms or segments at the ends of the groups can be adjusted as desired around the dial plate and extend the exposed peripheral surface of the segments any desired amount, or the segments can be entirely disposed beneath the peripheral flange 19, and the elements and segments clamped in these positions.

A pair of brackets 38 extend from the plate 4 and pivotally mount contact brushes or arms 39 and 40, preferably of insulating material, each having a contact plate 41 upon its free end. The contact plate 41 of the arm 40 bears upon the conducting sleeve 12, and that of the arm 39 bears upon the insulating elements and the contact arms or segments, being limited in its movement toward the axis of rotation of the segments by a projection 42 of its supporting bracket 38. The arms 39 and 40 are yieldingly urged toward the axis of rotation of the contact segments and into engagement with their cooperating parts by springs 43 connected between the arms or brushes and their supporting brackets 38. The arm 39 is provided with a wire 44 which connects its contact plate 41 with a stationary terminal contact 45, and the arm 40 is provided with a wire 46 which connects its contact plate 41 with a stationary terminal contact 47.

The plate 4 also supports a shell 48 of insulating material or having an insulating lining which together with the plate 4 forms a casing enclosing the major portion of the switch mechanism, the shell having an aperture 49 permitting the passage of the rod 6, sleeve 7, and arms 26 and 28, and another aperture 50 for the passage of the removable setting button 2. The shell is secured to the plate 4 by screws 51 or other suitable means. The shell is provided with an L shaped slot 52 in the end adjacent the contact brushes, and an operating button 53 which is pivoted to the end of contact brush arm 39 for movement sidewise of the arm, extends through the slot of the casing so as to be manually operable from the exterior thereof. The vertical branch 54 of the slot lies in the plane of oscillations of the contact brush arm, and the normal oscillations of the brush arm, as it is cammed outwardly by the insulating element, then allowed to snap upon the conducting segments and then free of the segments, do not carry the button away from the closed end portion of the branch 54. Suitable indications upon the casing show the condition of the switch by the position of the button. If the button 53 is depressed to the bottom of the branch 54 the brush arm 39 will be swung upwardly away from the rotating switch parts so as to be unaffected thereby

with the circuit open. The button can be latched in this position by swinging it laterally into the other or horizontal branch of the slot. The spring 43 shifts the button against the upper wall of the horizontal branch of the slot and into a notch 55 therein to lock the button against accidental movement back into the vertical branch 54 of the slot. One manner of connection of my improved time switch to an external circuit is illustrated diagrammatically in Fig. 10, wherein the terminal contacts 45 and 47 are connected to wires 56 and 57 of a representative circuit having a light 58 and line wires 59 included therein.

In order that the approximate time may be read from the rear of the clock and to assist in setting the dial plate, I thread upon the free end of the rod 6, an indicator pointer 60 and clamp it in any adjusted angular position, preferably vertical, by means of a lock nut 61. The dial can be rotated until the correct time, as indicated by the face of the clock, is represented by the relative positions of the dial graduations and indicator 60, and then secured in that position by the tightening of the lock nut 30.

In use, the button 53 is shifted into the vertical branch 54 of the slot 52 and released, which permits the brush arm 39 to move inwardly within the range of the rotating parts. The buttons 36 are loosened and shifted about the dials until their positions, as indicated by the associated indicator plates 33, represent the times at which the current in the external circuit is to be turned on and off, and then clamped to the dial for rotation therewith. The adjustment of the insulating element and insulating arms 26 of each group in this manner causes an extension or contraction of the conducting segments or arms so as to expose more or less of their combined peripheral contact surface for engagement by the contact plate 41 of the brush arm 39. The operation of the clock train rotates as a unit the gear 9, sleeves 7, 11, 12, dial plate 29 and the adjusted segments and insulating elements. The brush arm 40 contacts continuously with the conducting sleeve 12 and thus connects the terminal contact 47 with the conducting segments. The brush arm 39 will be engaged by the flange 19 of an insulating element and cammed outwardly against the action of its spring 43. As the flange of the insulating element passes from beneath the brush arm, the latter will be snapped inwardly by its spring 43 and against the extended segments 16, to close the circuit, which rapid closing movement is permitted by the undercut side edge 20 of the arm. The continued rotation of the segments will carry them from beneath the brush arm and the latter because of the radial or undercut trailing edge of the end segment will again be snapped inwardly by its spring 43 to break the circuit, the inward movement last mentioned being limited by the engagement of the arm with the projection 42 of the supporting bracket. The circuit will remain broken until the next group engages the brush arm 39 and the above operation is repeated. If it is desired to render one or both groups inactive, the arm 26 and insulating element of that group are brought together by the adjustment of the appropriate buttons 36 around the dial, which causes the conducting segments or arms to be concealed beneath the flange 19 of the insulating element of that group. The brush arm will be cammed outwardly by this insulating element in the usual manner but when it snaps off of the same the brush arm will miss the contact arms or segments and pass at once to its innermost position as limited by the projections 42 and the circuit will remain broken. It will be noted that the movement of the contact brush arm in both the making and breaking of the circuit is a quick movement which avoids arcing of a nature likely to injure the contact surfaces. This quick make and break is important where slow moving contacts such as those moving with the dial are employed. To render the switch inoperative without disturbing the adjustment of the segments, the button 53 can be depressed and shifted sidewise into the horizontal branch of the slot 52, which movement shifts the brush arm 39 out of the range of the rotating parts and thus maintains the circuit broken.

It will be obvious that various changes in the details herein described and illustrated as a preferred embodiment may be made within the principle and scope of my invention.

I claim:

1. In a time switch the combination of a clock having a minute hand arbor, a setting button removably attached thereto and having a pinion thereon exteriorly of the clock, a plate carried upon the rear wall of the clock and having a rod extending perpendicularly therefrom, a gear meshing with the pinion and rotatably carried on the rod, a contact element carried by the gear and adjustable in its contact surface, and contact means carried by the plate and contacting with the contact element for controlling an external circuit.

2. In a time switch, the combination of a gear, a clock time train, means for connecting the gear to the clock time train to be driven thereby, a conducting sleeve mounted for rotation with the gear and insulated therefrom, a plurality of conducting segments mounted to rotate on said sleeve, and having a fan like expansion and contraction to thereby lengthen or shorten the effective

peripheral distance along their combined outer edge, means for adjusting said segments expansively or contractively and for holding them in adjusted positions and secured for rotation with the sleeve, a stationary contact element yieldingly held against the combined periphery of the segments, means for limiting inward movement of the contact element when out of contact with the segments, and circuit connections to said sleeve and said element.

3. In a time switch, the combination of a gear, a clock time train means for connecting the gear to the clock time train to be driven thereby, a conducting sleeve mounted for rotation with the gear and insulated therefrom, a plurality of conducting segments mounted to rotate on said sleeve, and having a fan like expansion and contraction to thereby lengthen or shorten the effective peripheral distance along their combined outer edge, means for adjusting said segments expansively or contractively and for holding them in adjusted positions and secured for rotation with the sleeve, a stationary contact element yieldingly held against the combined periphery of the segments, means for limiting inward movement of the contact element when out of contact with the segments, and circuit connections to said sleeve and said element.

4. In a time switch, the combination of a gear, a clock time train means for connecting the gear to the clock time train to be driven thereby, a conducting sleeve mounted for rotation with the gear and insulated therefrom, a plurality of conducting segments mounted to rotate on said sleeve, and having pin and slot connections between themselves so as to have a fan like expansion and contraction and thereby lengthen or shorten the effective peripheral distance along their combined outer edge, an insulating element mounted to rotate on said sleeve and also having a pin and slot connection with an end conducting segment, said insulating element having a cavity therein into which the segments can move when contracted, an arm carried by the other end segment, means for adjusting the arm and insulating element about the sleeve to expose any desired length of the periphery of the segments and secure them in adjusted position for rotation with the sleeve, a spring operated contact arm adapted to be cammed outwardly against the action of its spring by the insulating element and allowed to snap inwardly upon the exposed peripheral portion of the segments and then off of the end of the exposed segment, and a second contact arm in continuous engagement with the sleeve.

5. In a time switch, the combination of a gear, a clock time train means for connecting the gear to the clock time train to be driven thereby, a conducting sleeve mounted for rotation with the gear and insulated therefrom, a plurality of conducting segments mounted to rotate on said sleeve, and having pin and slot connections between themselves so as to have a fan like expansion and contraction and thereby lengthen or shorten the effective peripheral distance along their combined outer edge, means for adjusting said segments expansively or contractively and for holding them in adjusted positions and secured for rotation with the sleeve, a stationary contact element yieldingly held against the combined periphery of the segments, means for limiting inward movement of the contact element when out of contact with the segments, means for shifting the contact element out of contact with the segments and latching it in that position and circuit connections to said sleeve and said element.

6. In a time switch, the combination of a gear, a clock time train means for connecting the gear to the clock time train to be driven thereby, a conducting sleeve mounted for rotation with the gear and insulated therefrom, a plurality of conducting segments mounted to rotate on said sleeve, and having pin and slot connections between themselves so as to have a fan like expansion and contraction and thereby lengthen or shorten the effective peripheral distance along their combined outer edge, an insulating element mounted to rotate on said sleeve and also having a pin and slot connection with an end conducting segment said insulating element having a cavity therein into which the segments can move when contracted, an arm carried by the other end segment, means for adjusting the arm and insulating element about the sleeve to expose any desired length of the periphery of the segments and secure them in adjusted position for rotation with the sleeve, a spring operated contact arm adapted to be cammed outwardly against the action of its spring by the insulating element and allowed to snap inwardly upon the exposed peripheral portion of the segments and then off of the end of the exposed segment, means for shifting the contact arm against the action of its spring and out of contact with the segments and insulating element and for locking the arm in this position and means for connecting a external circuit to said sleeve and contact arm.

7. In a time switch the combination of a support having a post, a gear rotatably carried by said post and having a sleeve, clock mechanism for driving said gear, a dial carried by the sleeve for rotation therewith, a pointer carried by the post and cooperating the dial, an insulating sleeve carried by said gear sleeve for rotation therewith, a conducting sleeve carried by the insulating sleeve, a plurality of segments rotatably

mounted on the conducting sleeve and having arcuate peripheral edge portions, co-operating means between each segment and the adjacent segment for causing the segments to separate in a fan-like manner and form a conducting element of variable length, means for adjustably securing the first and last segments to the dial for rotation therewith, means for connecting one branch of an external circuit to the conducting sleeve, and a conducting arm connected to the other branch of the external circuit and adapted to contact with the peripheral edge portions of the segments for a period determined by the length of the conducting element formed by the segments during each revolution of the sleeve.

8. In a time switch, clock mechanism, a conducting sleeve connected to be driven thereby, a plurality of arms mounted to rotate on the sleeve and having arcuate peripheries on their outer ends, means for adjusting the arms in a fan-like manner to provide an arcuate contact surface on their outer ends of variable length and for securing them to the sleeve in adjusted positions, a relatively stationary contact arm adapted to engage the arcuate contact surface, and means for connecting the contact arm and sleeve to an external circuit.

9. In a time switch, clock mechanism, a conducting sleeve connected to be driven by said mechanism, a plurality of contact elements adjustable in a fan-like manner on said sleeve and having arcuate contact surfaces on their outer ends to provide a contact surface of variable length, a contact arm for engaging and making electrical contact with the contact surface during its movement for an interval dependent upon the variable length of the surface, and a second contact arm engaging and making electrical contact with the sleeve to complete the circuit through the switch.

10. In a time switch, clock mechanism, a moving support, a conducting sleeve carried by the support, an insulating element adjustable on the support and having a recess in one radial wall, a plurality of contact elements having contact surfaces on their outer ends, mounted on the sleeve so as to move into and out of the recess in the insulating element, a pin and slot connection between the contact elements and the insulating element for causing said elements to extend and contract in a fan-like manner with the insulating element at one end, the elements when completely retracted lying entirely within the recess of the insulating element, an arm connected to the other end contact element, means for adjusting the arm and insulating element to extend or contract the elements and to secure them in adjusted positions to the support for movement therewith, a contact brush biased toward the support and adapted to be cammed outwardly by the insulating element, allowed to snap onto the contact elements if extended, and at the end of the latter snap free thereof, and a brush contacting with the sleeve to complete a circuit through the sleeve and contact elements.

11. In a time switch, clock mechanism, a moving support, a conducting sleeve carried by the support, an insulating element adjustable on the support and having a recess in one radial wall, a plurality of contact elements having contact surfaces on their outer ends mounted on the sleeve so as to move into and out of the recess in the insulating element, co-operating means between the contact elements and the insulating element for causing said elements to extend and contract in a fan-like manner with the insulating element at one end, the elements when completely retracted lying entirely within the recess of the insulating element, an arm connected to the other end contact element, means for adjusting the arm and insulating element to extend or contract the elements and to secure them in adjusted positions to the support for movement therewith, a contact brush biased toward the support and adapted to be cammed outwardly by the insulating element, allowed to snap onto the contact elements if extended, and at the end of the latter snap free thereof, and a brush contacting with the sleeve to complete a circuit through the sleeve and contact elements.

12. In a time switch, clock mechanism, a rotating support driven by the clock mechanism, a conducting sleeve carried by the support, an insulating element having an arm mounted for rotation about the axis of rotation of the support and a flange extending at right angles to the arm along one radial side edge and the outer end, a plurality of conducting segments adjutably carried by the conducting sleeve, said segments and insulating element forming a group having pin and slot connections between them permitting a fan like extension or contraction of the segments and elements, the segments when in contracted position being entirely beneath the flange and when in extended positions projecting variable distances from beneath the flange, means for adjusting the insulating element and the opposite end segment of the group for extending or contracting the segments and elements and for securing them for rotation with the support, a contact brush bearing upon the conducting sleeve, and a second contact brush biased toward the axis of rotation of the segments and adapted as the rotation of the support proceeds to be cammed outwardly by the flange and allowed to snap upon the extended segments to make the

circuit and then subsequently snap away from the end of the latter to break the circuit.

13. In a time switch, a clock mechanism, a support operated by the mechanism, an insulating element carried thereby and having an abrupt trailing end, a contact device of conducting material, adapted to be disposed beneath the insulating element and extensible to project variable distances from the abrupt end thereof, means for adjusting the device to project a desired distance from the abrupt end, means for connecting one side of an electric circuit to said device, a contact brush connected to the other side of said circuit and biased toward the element and device whereby as the support moves the brush will be cammed outwardly by the element and allowed to snap over the abrupt end and inwardly upon the device to complete the circuit and to subsequently upon a continued movement of the device, snap off of the abrupt end thereof and open the circuit.

14. In a time switch, a casing, rotary contact mechanism disposed within the casing, clock mechanism for rotating the mechanism, a pivoted contact brush adapted to engage with the rotary mechanism and make and break the circuit, means for biasing the brush into engagement with the mechanism, an operating button pivoted to the contact brush for movement in a plane transverse to the plane of movement of the brush, said casing having an angular slot in a wall thereof through which the button passes, one branch of the slot being parallel with the plane of movement of the brush and in which branch the button oscillates during the normal operation of the device, said button being operable when shifted to the intersection of the branches to shift the brush out of engagement with the rotating mechanism and permanently open the circuit controlled thereby, and by lateral movement into the other branch of the slot lock the brush in disengaged position.

15. In a time switch, a casing, rotary contact mechanism disposed within the casing, clock mechanism for rotating the mechanism a pivoted contact brush adapted to engage with the rotary mechanism and make and break the circuit, means for biasing the brush into engagement with the mechanism, an operating button connected to the contact brush for movement in a plane transverse to the plane of movement of the brush, said casing having an angular slot in a wall thereof through which the button passes, one branch of the slot being parallel with the plane of movement of the brush and in which branch the button oscillates during the normal operation of the device, said button being operable when shifted to the intersection of the branches to shift the brush out of engagement with the rotating mechanism and permanently open the circuit controlled thereby, and by lateral movement into the other branch of the slot lock the brush in disengaged position.

16. In a time switch, a switch mechanism having a rotary device, clock mechanism for rotating the device, a dial plate rotatable with the device, said device having relatively adjustable insulating and contact members each of said members having an operating arm extending adjacent the periphery of the dial plate and accessible for varying the amount that the contact member extends in the rear of the insulating member and thereby varying the periods in which the current will be turned on and off, an indicator plate adjustably carried by each arm and overhanging the dial plate, and means for adjusting the arms about the dial plate and securing them thereto.

17. In a time switch, a switch mechanism having a rotary device, clock mechanism for rotating the device, a dial plate rotatable with the device, said device having adjustable members with operating arms extending adjacent the periphery of the dial plate for varying the periods in which the current will be turned on and off, an indicator plate adjustably carried by each arm and overhanging the dial plate, a button having a reduced end threaded into the end of each arm and projecting forwardly past the dial plate, and a clamping plate on the reduced end of each button and overlying the dial plate whereby when a button is threaded into its arm the dial plate will be clamped between the clamping plate and the arm and the arms thereby secured to the dial plate for movement therewith.

18. In a time switch, a switch mechanism having a rotary device, clock mechanism for rotating the device, a dial plate rotatable with the device, said device having adjustable members with operating arms extending adjacent the periphery of the dial plate for varying the periods in which the current will be turned on and off, an indicator plate for each arm having a slot therein and an indicating portion, a screw passing through the slot into each arm for adjustably securing each indicator plate to its arm with its indicating portion adjacent the dial plate, a button having a reduced end threaded into the end of each arm and projecting forwardly past the dial plate, and a clamping plate on the reduced end of each button and overlying the dial plate whereby when a button is threaded into its arm the dial plate will be clamped between the clamping plate and the arm and the arms thereby secured to the dial plate for movement therewith.

In witness whereof, I hereunto subscribe my signature.

JEROME F. CERMAK.