

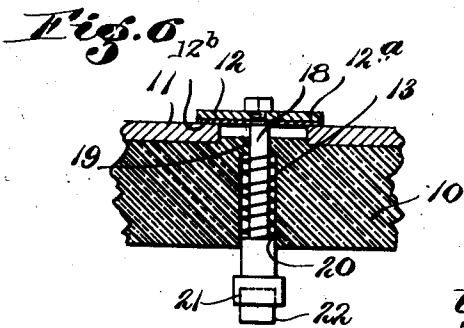
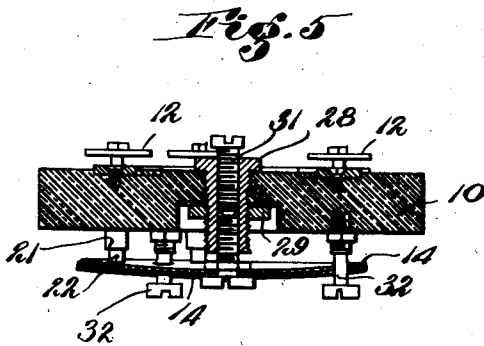
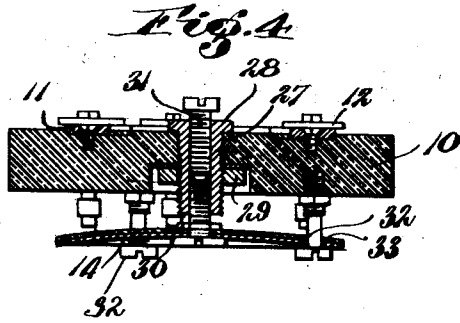
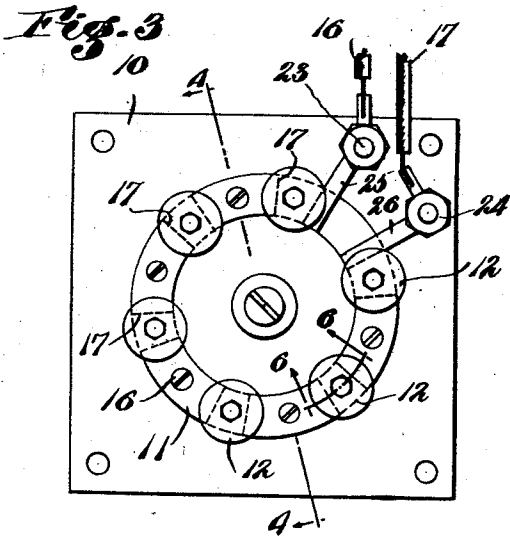
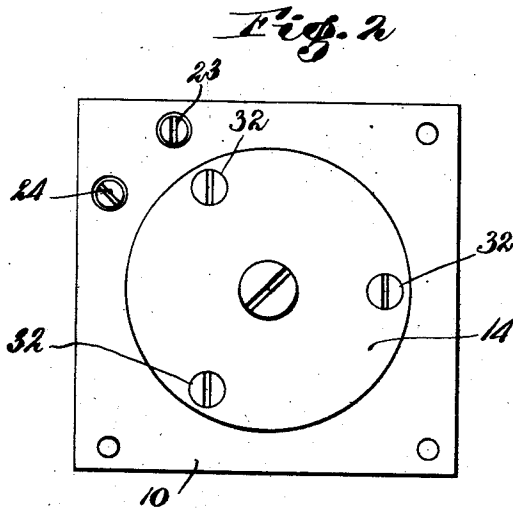
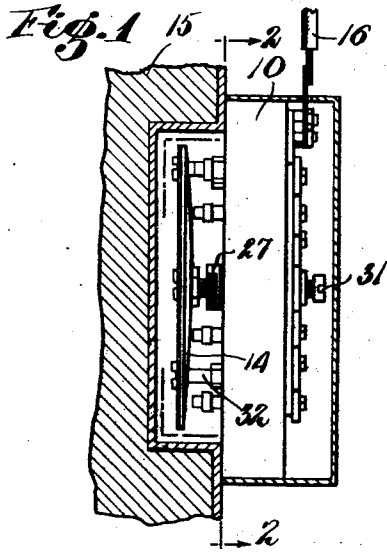
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J. A. SPENCER

1,776,012

ELECTRICAL SWITCH FOR THERMOSTATS, ETC

Original Filed Aug. 9, 1923



Inventor:
John A. Spencer,
by Roberts, Roberts & Liebman
Attys.

UNITED STATES PATENT OFFICE

JOHN A. SPENCER, OF NEWTON, MASSACHUSETTS, ASSIGNOR TO SPENCER THERMOSTAT COMPANY, OF CAMBRIDGE, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS

ELECTRICAL SWITCH FOR THERMOSTATS, ETC.

Application filed August 9, 1923, Serial No. 656,528. Renewed June 7, 1928.

Objects of the present invention are to provide an electrical switch which will satisfactorily interrupt a substantial current with little or no sparking, which will insure positive completion of the current at the points of interruption thereof as well as positive and simultaneous interruption of the current, which will positively retain the circuit completing members in proper circuit closing position, which may be readily adjusted to control the operation of the current breaking mechanism, and which shall be extremely compact in form and occupy minimum space proportionate to the current controlled thereby.

In one aspect the invention comprises mechanism for simultaneously breaking a circuit at a sufficient number of points in series to keep the potential substantially within the non-arcing range for the material constituting the contacts, and separate and independent means for actuating the contact members into operative position and into inoperative position, in this respect distinguishing from copending application 627,855, filed March 26, 1923. Other aspects of the invention will be evident from the following description and claims.

The invention accordingly comprises the elements and combinations of elements, features of construction, and arrangements of parts which will be exemplified in the structure hereinafter described, and the scope of the application of which will be indicated in the following claims.

To assist in understanding the invention, one concrete embodiment is shown in the accompanying drawings in which:—

Fig. 1 is a sectional view of a supporting member with the improved switch applied thereto;

Fig. 2 is a rear view of the switch mechanism removed, being taken on line 2—2 of Fig. 1;

Fig. 3 is a front view with cover removed;

Fig. 4 is a sectional view on the line 4—4 of Fig. 3 showing the switch elements in closed position;

Fig. 5 is a similar view illustrating the separation of the switch elements; and,

Fig. 6 is a detailed sectional view on the line 6—6 of Fig. 3.

The particular embodiment of the invention chosen for the purpose of illustration comprises a base block 10 bearing a plurality of spaced stationary switch elements 11, held by fasteners 16, and separated by gaps 17, and a plurality of movable switch elements 12. Independent actuating means such as springs 13 serve to press the several elements 12 against the spaced elements 11 to complete the circuit therebetween, while a suitable actuating means is employed for shifting the movable switch elements into inoperative position. This actuating means is preferably independent of the means for moving the elements 12 into operative position and may be either a mechanical, manually operable mechanism or an automatic device such as the cupped thermostatic disc 14 shown in the drawings.

In the particular embodiment illustrated the device is shown as applied to a heated element 15 to automatically regulate the heating thereof through the electrical circuit 16, 17 which may be connected directly in the heating circuit in case of electrical heating or indirectly through a control circuit in case of gas, coal or electrical heating.

The switch elements 12 are shown in the form of discs 12 mounted on the ends of guides or plungers 18 which are slidable through apertures 19 in block 10. The guides have enlarged portions providing shoulders 20. Springs 13 in pockets in the base 10 bear at one end against the base and at the other against the shoulders 20 to actuate the same to hold the discs normally in tight engagement with the plates 11 at opposite sides thereof, thus completing the electrical circuit. Beyond shoulders 20 the guides are provided with socketed portions receiving nonconducting blocks 22. By mounting the switch elements 12 loosely upon the plungers 18 the elements may turn on the plungers and thereby equalize the wear.

Binding posts 23 and 24 carried by the base adjacent the circular row of contacts serve to connect current leads 16 and 17 with conductor fingers 25 and 26 which contact

with the adjacent discs 12 respectively. The complete electrical circuit through the switch is from one of the terminals 16 or 17 through its conducting finger, thence through the alternate contact discs and plates to the other contacting finger, and out through the second terminal.

In the particular form illustrated six discs or connector plates 12 are illustrated. It will be understood that when the members 12 are simultaneously shifted out of engagement with the plates 11, the current is interrupted at each side of each disc 12 so that in this particular form the current is simultaneously interrupted at twelve different points in series. Experiments have shown that with a switch no larger than that illustrated in the drawings a 500 volt 15 ampere current may be interrupted without substantial arcing.

To insure best contact surfaces and conduction effects the several parts 12 and 13 are preferably of bi-metallic form, having a heavy body portion 12^a (Fig. 6) of copper or suitable conducting material and a face portion 12^b of silver or other good contact material, preferably a material having a high critical arcing voltage, thereby to minimize arcing.

Carried centrally by the base 10 is a bushing 27 having head 28 and nut 29 bearing against opposite faces of base 10 to secure the bushing in position. This bushing is interiorly threaded for engagement with post 30 supporting a cupped thermostatic disc 14, the threaded engagement permitting adjustment of the disc relative to the bushing and to the projecting contacts 22 of the switch members. Lock screw 31 serves to secure threaded post 30 in adjusted position. Guide members 32 may be adjustably engaged in the base, these members being loosely received within apertures 33 of the disc, thus holding it against angular displacement and guiding it in its snapping action.

The action of cupped thermostatic discs is well known and is particularly described and claimed in Patent 1,448,240, dated March 13, 1923. They are ordinarily formed of bi-metallic material in concave, convex or cupped form, and under normal temperature will be cupped in one direction and when heated above a predetermined temperature, due to difference in the coefficients of expansion of the materials of which they are composed, will suddenly change shape or reverse their concavo-convexity as indicated in Figs. 4 and 5 of the drawings. It is to be understood that while this particular mechanism for controlling movement of the discs 12 is here illustrated and described other mechanism for producing an equivalent result either automatically or otherwise may be employed for actuating the switch elements 12

without departing from the spirit of the present invention in its broad aspect.

In operation the thermostatic disc will normally be in the shape shown in Fig. 4 or out of engagement with contacts 22. Springs 13 on individual controls for the several discs 12 then hold the discs in tight circuit-closing engagement with the adjacent plates 11. When the temperature rises above a predetermined amount the disc 14 will snap to the position shown in Fig. 5, automatically engaging the several contacts 22 and pressing the guides 18 through base plate 10 and thus simultaneously breaking the circuit at a multiplicity of points by shifting discs 12 away from plates 11 against the pressure of the independent actuating means therefor. When the temperature again drops to a predetermined value the disc 14 will snap in the reverse direction and thereby permit the discs 12 again to close circuit.

It will be seen from the above that the disc 14 is operatively associated with, but not connected to the contact assemblies such as shown in Fig. 6. When the switch is opened it touches these assemblies but it is not connected to them in the sense that it is linked or fastened thereto.

It should be understood that the present invention is not limited to any particular combination of materials having different thermal coefficients of expansion but is intended to embrace in its scope any combination of materials having dissimilar coefficients of expansion sufficient to cause the characteristic reversal of curvature. Furthermore, the materials comprising the composite thermostatic sheet may be secured together in any desired manner by riveting, soldering, brazing or otherwise, although it is preferred to unite the materials comprising the sheet by welding or similar means to secure a substantially indivisible sheet.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As many changes could be made in carrying out the above construction without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. A switch comprising relatively movable contacts, means for yieldingly holding said contacts in interengagement, and a bi-metallic, snap-action thermostatic device unconnected to said contacts but arranged to disengage the contacts in its snap action at a variable predetermined temperature.

2. A switch comprising an annular series of relatively movable contacts, means for yieldingly holding the contacts in interengagement, and a bi-metallic, snap-action

thermostatic disc mounted at the center of said annular series, the disc being unconnected to said contacts, but arranged to disengage the contacts in its snap action.

3. An electrical switch comprising a plurality of stationary contacts, a plurality of contacts movable into and out of contact with said stationary contacts, and a temperature responsive device including a cupped sheet having a peripheral portion free to snap back and forth, said movable contacts being operatively associated with but not connected to said device to move when said sheet snaps.

4. A switch comprising a base, a plurality of fixed spaced contacts carried by the base, resiliently actuated contacts for closing the spaces between the fixed contacts, and means comprising a bi-metallic, snap-action thermostat for shifting at predetermined temperatures the resiliently actuated contacts in opposition to the action of the resilient actuating means.

5. An electrical switch comprising a member carrying a stationary set of contacts spaced from each other in an annular row and a movable set of contacts disposed in an annular row to bridge certain of the spaces between the contacts of the other set whereby a circuit connected to spaced contacts may be broken simultaneously in a plurality of points in series by disengaging said sets from each other, means carried by said member and movable longitudinally of the axis of said annular row for shifting the movable contacts into circuit closing position, other means carried by said member for shifting the movable contacts to interrupt the circuit, and means for controlling the action of said last means.

6. An electrical switch comprising a base, a series of contact plates spaced in a row on the base, the base having guide apertures therein intermediate adjacent plates, guides slidable in the apertures, circuit closing members carried by the guides and adapted to bridge the spaces between adjacent plates, and thermostatic means common to said guides for actuating said members.

7. An electrical switch comprising a base, a series of contact plates spaced in a row on the base, guide apertures in the said base intermediate adjacent contact plates, guides slidable in the apertures, circuit closing members carried by the guides and adapted to bridge the spaces between adjacent plates, means for actuating the guides to hold the plates and circuit closing members in engagement and bi-metallic thermostatic means common to said guides for separating said plates and members.

8. An electrical switch comprising a base, a series of contact plates spaced in a row on the base, guide apertures in said base intermediate adjacent plates, guides slidable in the apertures, circuit closing members carried by the guides and adapted to bridge the

spaces between adjacent plates, yielding means for actuating the individual guides to hold the circuit closing members and plates in engagement, and bi-metallic thermostatic means common to the guides for suddenly separating the members and plates against the action of said yielding means at substantially predetermined temperatures.

9. An electrical switch comprising a base, a series of contact plates spaced in a row on the base, guide apertures in said base intermediate adjacent plates, guides slidable in the apertures, circuit closing members carried by the guides and adapted to bridge the spaces between adjacent plates, means for actuating the individual guides to yieldingly hold the bridging members and plates in circuit closing engagement, and a bi-metallic thermostat for simultaneously shifting the several guides to move the bridging members into inoperative position.

10. An electrical switch comprising a base, a series of contact plates spaced in a row on the base, guide apertures in said base, intermediate adjacent plates, guides slidable in the apertures, circuit closing members carried by the guides and adapted to bridge the spaces between adjacent plates, independent means for actuating the individual guides to hold the bridge members and plates in circuit closing engagement, and bi-metallic thermostatically operable means for simultaneously shifting the several guides within predetermined temperature limits to move the bridge members into inoperative position.

11. A thermally-actuatable switch comprising a contact table, a plurality of fixed contact members mounted on one face thereof, a plurality of co-operating movable contact bridging members supported and guided by the contact table, resilient means for normally yieldingly holding the bridging members in operative engagement with the fixed contact members, and a snap acting element for effecting sudden and substantially simultaneous movement of said bridging members by impact therewith.

12. A thermostatic control comprising a cupped disc, a base, means for supporting the center of said disc on said base, and means symmetrically located with respect to the center of said disc for guiding the peripheral portion of said disc when said disc changes shape in response to temperature variations.

13. A thermostatic control comprising a cupped disc having a plurality of apertures in the peripheral portion thereof, a base, means for supporting the center of said disc on said base, guide members passing through the holes in said disc, and adjustably secured to said base.

14. A thermostatic control comprising a cupped disc, said disc having a plurality of apertures in the peripheral portion thereof, a base, means for supporting the center of

said disc on said base, and screws passing through the apertures of said disc and engaging the base.

15. A thermostatic control comprising a member adapted to snap back and forth suddenly in response to heat strains, a base, means for supporting said member on said base, said member having a plurality of holes therethrough, screws passing through said holes and engaging said base.

16. A thermostatic control comprising a cupped disc having a plurality of holes in the peripheral portion thereof, a base, means for adjustably supporting the center of said disc on said base, and a plurality of members passing through the holes of said disc and adjustably engaging said base.

17. A thermostatic switch comprising a cupped disc having peripherally disposed apertures, a base, means for supporting the center of said disc on said base, electrical switching mechanism in operative relationship to said disc and screws passing through the apertures of said disc and engaging the base.

18. A thermostatic switch comprising a cupped disc having peripherally disposed apertures therethrough, a base, means for adjustably supporting the center of said disc on said base, electrical switching means in operative relationship to said disc, and screws passing through said apertures and engaging said base.

19. An electrical switch comprising a plurality of contacts, a second plurality of contacts movable into and out of contact with the first-named plurality of contacts, and a temperature responsive device including a cupped sheet having a peripheral portion free to snap back and forth, said device being operatively associated with but not connected to one set of contacts and adapted to move the other plurality of contacts when said sheet snaps.

Signed by me at Cambridge, Massachusetts,
this 6th day of August, 1923.

JOHN A. SPENCER.

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