July 3, 1956 C. S. MERTLER 2,753,421

THERMOSTATIC SWITCHES

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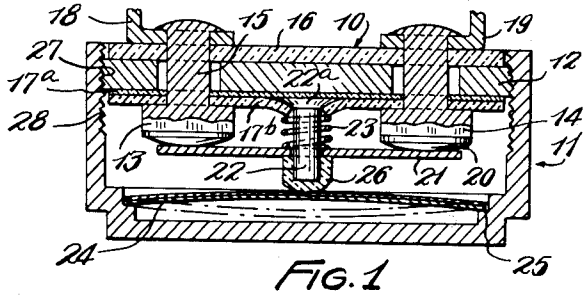


FIG. 1

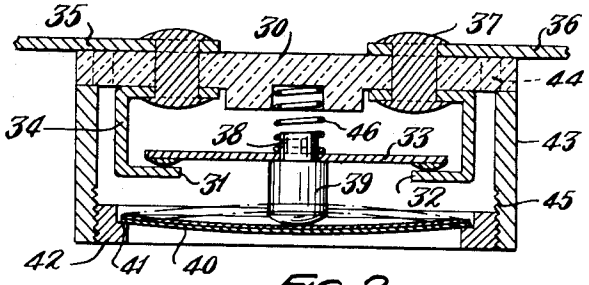


FIG. 2

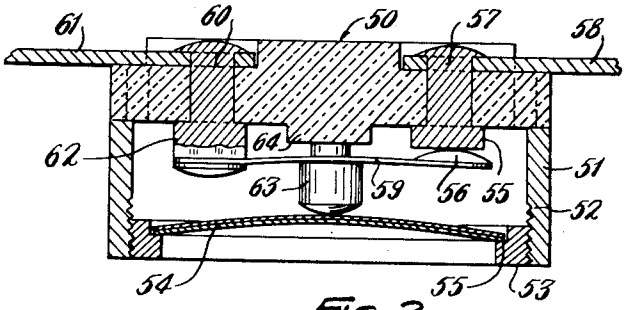


FIG. 3

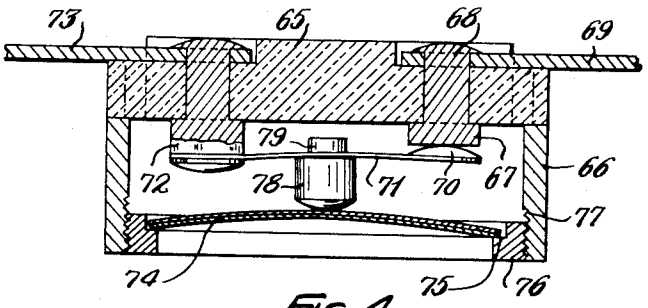


FIG. 4

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THERMOSTATIC SWITCHES

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21 Claims. (Cl. 200—138)

This invention relates to thermostatic switches and, more particularly, to thermostatic switches of the type commonly known as snap acting.

One type of thermostatic switch employs a curved bimetallic member in the form of a substantially dish-shaped or convexo-concave disc. Such a disc "snaps through center," i. e., rapidly reverses its curvature upon attaining a predetermined temperature. This reversal of curvature is utilized to control the movement of a contact or contacts of the switch. However, in prior switches of this type the bimetallic disc is either firmly clamped, adjacent the periphery or the central portion thereof, or the disc is provided with openings and/or has contacts or the like connected thereto. Such clamping of the disc, provision of openings therein, and connection of parts thereto alters the response of the disc with the result that the switch operation tends to be erratic and requires a comparatively large temperature differential.

An object of the invention is to provide an improved snap acting thermostatic switch of the bimetallic disc-type which is reliable and rapid in action and which may be readily calibrated after assembly.

Another object of the invention is to provide an improved snap acting thermostatic switch employing a bimetallic disc in which the disc has no operating parts connected thereto and is supported in a manner such that flexing thereof is unrestrained whereby the switch operation effected by the said flexing occurs substantially uniformly at a predetermined temperature.

An additional object of the invention is to provide an improved snap acting switch as defined above wherein "creepage" or other lost motion of the bimetallic operating disc may be eliminated, thereby preventing frying of the contacts, without affecting the uniformity of response of the switch upon attainment of a predetermined temperature.

A further object of the invention is to provide an improved snap acting switch employing a bimetallic disc as the operating member, which disc is freely supported adjacent its periphery and is engaged by a motion transmitting member adjacent the center for effecting the switch operation, the member supporting the disc having a threaded connection with a base member carrying the stationary contact means of the switch so that the switch operation may be regulated by relative rotation of the members.

A still further object of the invention is to provide an improved snap acting switch as defined above wherein the movable contact is carried by a resilient arm so mounted that there is a wiping action between the movable and stationary contacts when said switch is operated.

A more specific object of the invention is to provide an improved snap acting thermostatic switch as heretofore defined wherein the said disc supporting member has a planar surface upon which the said bimetallic disc is supported adjacent its periphery with the central portion of the disc unsupported and free to flex.

A still more specific object of the invention is to provide an improved thermostatic switch as defined above and wherein the bimetallic disc supporting member is substantailly cup-shaped with the disc supporting surface interiorly thereof and spaced below the rim of the member, the said member and the base member on which the stationary switch contact means are mounted being provided with the aforementioned cooperating screw threads which permit the switch operation to be adjusted by relative rotation of the members.

The invention further resides in certain novel features of the construction and in the combination of the parts of apparatus in which the invention is embodied, and further objects and advantages of the invention will be apparent to those skilled in the art to which the invention pertains from the following description of certain embodiments thereof described with reference to the accompanying drawing, forming a part of this application, in which,

Fig. 1 is an enlarged longitudinal sectional view through the presently preferred form of a thermostatic switch embodying the invention, the switch being shown in circuit closing position;

Fig. 2 is an enlarged longitudinal sectional view through a modified form of a thermostatic switch constructed in accordance with this invention, the switch contacts being illustrated in circuit closing position;

Fig. 3 is an enlarged longitudinal sectional view through another modified form of a thermostatic switch constructed in accordance with this invention, the switch contacts being shown in circuit closing position, and

Fig. 4 is an enlarged longitudinal sectional view through a further modified form of a thermostatic switch constructed in accordance with this invention, the switch contacts being shown in circuit closing position.

The thermostatic switch illustrated in Fig. 1 of the drawings is of the enclosed type and comprises a base member **10** which is adjustably connected with a substantially cup-shaped member **11**. As here shown, the base member **10** is formed by a metal disc **12** and is provided with spaced stationary contacts **13** and **14**, which are secured to and insulated from the disc or member **12**. Thus, the illustrated contacts **13** and **14** are the headed portions of rivets or studs, the reduced diameter shanks **15** of which passes through openings of larger diameter in the plate or disc **12** with the contact studs being insulated from the member **12** by sheets of insulating material **16**, **17***a* and **17***b*, such as mica or the like, placed on opposite sides of the member of disc **12**. The contacts **13** and **14** are connected, respectively, with angle-shaped terminal members **18** and **19** by having the shank **15** of a contact stud pass through an opening in one leg of the corresponding terminal member, the contact studs being secured to the base member or disc **12**, and to the terminal members, by peening or otherwise upsetting the outer end of the shank **15** of the studs as will be apparent from Fig. 1 and as will be readily understood by those skilled in the art. The contact surfaces of the contact members **13** and **14** may be plated or otherwise provided with a layer **20** of silver or other suitable contact material.

The stationary contacts **13** and **14** are adapted to be connected in an electrical circuit, which is to be controlled by the switch, through the connection of suitable wires to the terminal members **18** and **19** and the opening and closing of this circuit is then effected by means of a conductive member **21** which is movable to and from bridging engagement with the contacts **13** and **14**. In the illustrated embodiment, the conductive member **21** is shown as formed of metal and has a substantially disc shape with a central opening through which a guide stud **22** freely extends. The guide stud **22** has an enlarged head **22***a* located between the sheets of insulating material **17***a* and **17***b* with the shank of the stud extending through an opening in the sheet **17***b* substantially cen-

trally of the stationary contacts **13** and **14** as will be apparent from Fig. 1. The size of head **22***a* and the thickness of the sheet **17***b* are such that the stud is firmly retained in place and the sheets **17***a* and **17***b* also serve to insulate the stud from the base.

The conductive member **21** is continuously urged to circuit opening position by a spring means **23** acting between the base and conductive member **21**. In the preferred construction, the spring means **23** is a helical compression spring disposed about the stud **22** and positioned between the base **10** and the conductive member **21** so that the force of the spring normally tends to separate the member **21** from engagement with contacts **13** and **14**.

The position of the conductive member **21**, and hence the operation of the switch, is controlled by a bimetallic disc **24** which is convexo-concave or dish-shaped and is loosely supported adjacent its periphery with the disc free to reverse its curvature in response to a predetermined temperature change which reversal of curvature is employed to control the movement of the conductive member **21**. In the preferred construction, the support for the thermostatic switch disc **24** is an annular shoulder providing a substantially planar surface **25** in the cup-shaped member **11** adjacent the bottom thereof with the peripheral region of the bimetallic member freely supported thereon, the height of the surface **25** from the base of the cup-shaped supporting member being such that the central portion of the bimetallic disc **24** does not contact the said supporting member when it flexes from the position shown in solid lines in Fig. 1 to its other position as indicated in broken lines in that figure. This reversal of curvature of the bimetallic member controls the switch operation by means of a motion transmitting means positioned between the central portion of the bimetallic disc **24** and the conductive member **21**. As here illustrated, the motion transmitting means is a thimble-like member **26**, formed of insulating material such as ceramic or the like, which is freely slidable on the outer portion of the guide stud **22**. The lower curved end of the motion transmitting member **26** engages the bimetallic disc **24** adjacent the central portion thereof and is maintained in contact therewith by the spring means **23**.

In the illustrated embodiment, the bimetallic disc **24** is shown as being so curved and mounted that the conductive member **21** is maintained in circuit closing position, that is, in bridging engagement with the stationary contacts **13** and **14**, against the force of the spring **23**. However, upon the attainment of a predetermined temperature, the bimetallic disc **24** will reverse its direction of curvature with a snap action whereupon the motion transmitting member **26** and the conductive member **21** will move axially of the stud **22** under the force of the spring **23**. This movement of the conductive member **21** from engagement with the stationary contacts **13** and **14** is rapidly effected and hence may be termed a "snap action." When the temperature to which the bimetallic disc **24** is subjected returns to a value which causes the disc to again reverse its direction of curvature, the reversal will again occur with a snap action and the movement of the central portion of the disc will be transmitted by the member **26** to the conductive member **21** so that the latter reengages the stationary contacts **13** and **14**. It will be evident that all portions of the bimetallic disc **24** are free to flex in effecting such reversals of curvature since no part of the disc is clamped or otherwise held rigid. Also, the disc has no openings therein or parts rigidly connected thereto which would alter the flexing of the disc. Hence, the reversals of curvature of the disc, and therefore switch operations, are stable and occur within a comparatively narrow temperature differential.

An important feature of this invention resides in the manner in which the switch mechanism is constructed so that its operation may be readily adjusted after the switch has been assembled and without unequally stressing different parts of the bimetallic disc. This is achieved by providing a screw threaded connection between the base and the bimetallic disc supporting members so that compression of the spring **23**, and hence the force exerted on the bimetallic disc **24**, which determines the switch operating temperature, may be adjusted by relative rotation between the members **10** and **11**. Thus, as shown in Fig. 1, the base **10** has the periphery of the metal disc or plate **12** provided with a screw thread **27** that mates with an internal screw thread **28** on the inner wall surface of the cup-shaped member **11**. Hence, by simply rotating the cup-shaped member relative to the base, or conversely, the switch may be adjusted to provide contact operation at a predetermined temperature.

The adjustability provided by the threaded connection between the base **10** and member **11** also permits elimination of contact frying by removing creepage of the bimetallic disc. That is to say, when an unrestrained convexo-concave bimetallic disc is subjected to a temperature change the first response is a relatively slow increase in the radius of curvature of the disc and the "snap action" does not occur until a critical point is reached whereupon the disc snaps through center. This relatively slow change of curvature is known as "creepage" and frequently results in contact frying since the contact pressure is reduced by the creepage to the place where slight vibrations, jolts or the like will cause momentary separation of the movable contact from the stationary contact or contacts. This difficulty may be eliminated with switches of the construction here disclosed by effecting relative rotation between the base and disc supporting members until the motion transmitting member **26** engages the bimetallic disc **24** with sufficient force so that the latter is deflected an amount substantially corresponding to the aforementioned "creepage" change in curvature. Consequently, the first movement of a bimetallic disc thus adjusted is a reversal of curvature, which occurs with a snap action, and there is no unstable position wherein the contacts can intermittently open and close due to vibrations or similar disturbances.

When the switch is intended for operation at a single predetermined temperature, the aforementioned adjustment for operation at a predetermined temperature and/or to eliminate creepage is made at the factory, in the nature of a calibration, after which suitable means, such as a drop of sealing wax or solder, may be provided between the base and cup-shaped members to prevent unauthorized relative rotation therebetween. It will be understood, however, that adjustment of the switch will not be varied simply by repeated operation of the movable contact in response to changes in temperature. Consequently, if an adjustable thermostat is desirable, either the base or the cup-shaped member may be provided with a means for indicating its rotative position in terms of the resulting operating temperatures of the switch as will be readily understood.

The presently preferred embodiment of the switch illustrated in Fig. 1 of the drawings is of the type in which the movable conductive member is normally held in circuit closing position by the bimetallic disc **24**. It will be apparent, however, that the novel features of the switch construction may also be employed with a bimetallic disc which normally permits the conductive member **21** to be spaced from the stationary contacts and is only moved into engagement therewith upon attainment of a predetermined temperature different from that to which the switch is normally subjected. It will also be apparent that changes may be made in the construction of the switch especially with respect to the materials employed therein. Thus, the base member **10** need not be made of metal and provided with separate insulating discs such as **16**, **17***a* and **17***b*, since this base member may be made of insulating material, such as one of synthetic resins or the like.

As mentioned heretofore, the switch shown in Fig. 1

is of the enclosed type and is therefore readily adapted for hermetical sealing. It will be apparent, however, that the operating principles of the switch would not be changed if the construction was other than that of an enclosed switch. That is to say, the substantially cup-shaped member **11** need not be provided with an impervious bottom portion since the material centrally of the annular shoulder or surface **25** may be omitted in certain instances as, for example, if it is desired to have the bimetallic disc **24** more directly subjected to radiant heat. Consequently, where the term cup-shaped member is employed in the subjoined claims, it is to be understood as including not only an impervious cup-shaped member but also one which, although substantially cup-shape, has portions of the bottom or wall omitted.

Another embodiment of the invention is illustrated in Fig. 2 of the drawings. As shown therein, the switch comprises a base member **30** which may be formed of insulating material such as one of the synthetic resins. This base member is provided with a plurality of spaced stationary contacts **31** and **32**, which are adapted to be bridged by a movable conductive member **33**. In this embodiment of the invention, the stationary contacts **31** and **32** are each one leg of a pair of substantially U-shaped members, such as **34**, the other leg of each member **34** is secured to the base **30** and to a terminal member **35**, **36** respectively, by means of a rivet **37**. The conductive member **33** is preferably disc-shaped and has a central opening through which extends a reduced diameter shank **38** of a motion transmitting member **39** formed of insulating material, such as ceramic or the like.

The lower end of the member **39** engages the central portion of a dished bimetallic disc **40**. The peripheral portion of the bimetallic disc **40** is supported upon the planar surface of an annular shoulder **41** on a member **42** which is adjustably connected with the base **30**. As here shown, the base **30** is provided with a cylindrical flange portion **43** which is formed of metal and is secured to the base **30** by having spaced portions, such as **44** thereof received in notches or recesses in the periphery of the base **30** and spun or bent over the base in a well-known manner. The interior of the cylindrical member **43**, adjacent its rim, is provided with a screw thread **45** which mates with a cooperating thread on the member **42**. Consequently, the position of the bimetallic disc **40** may be adjusted relative to the base **30** by relative rotation between the base **30** and supporting member **42** in the same manner that adjustment was effected in the embodiment of the switch illustrated in Fig. 1.

As disclosed in Fig. 2, the switch is intended to have the conductive member **33** normally engaged with the stationary contacts **31** and **32** under the force of a spring **46**, which is preferably of the helical compression type, acting between the member **33** and the base **30**. Thus, one end of the spring **46** is received in a recess in the base **30** while the other end of the spring surrounds the shank **38** of the motion transmitting member **39**. In this position of the conductive member **33**, the bimetallic disc **40** has the convex side disposed outwardly with respect to the contacts, the disc being adapted to reverse its direction of curvature so as to occupy the position indicated in broken lines in Fig. 2 upon attainment of a predetermined temperature. This reversal of curvature will move the conductive member **33** with a snap action from engagement with the stationary contacts **31** and **32** thereby opening the circuit through the switch. The stationary switch contacts are again engaged by the member **33** when the temperature to which the switch is subjected returns to the predetermined value at which the bimetallic disc **40** snaps back to the position illustrated in solid lines in Fig. 2. Adustment of the switch operating temperature and removal of creepage is effected, as mentioned above, by relative rotation between the base **30** and the disc supporting member **42**.

The switch illustrated in Fig. 3 comprises a base member **50** which is preferably formed of an insulating material and is provided with a cylindrical flange or portion **51**, that may be formed of metal and attached to the base in any suitable manner as, for example, in the manner explained above for connection of the base **30** and flange **43** in the switch embodiment shown in Fig. 2. The interior of the flange **51**, adjacent the rim thereof, is provided with a screw thread **52** which mates with a cooperating screw thread on an annular member **53** that is similar to the member **42**. The member **53**, like the member **42**, serves as an adjustable support for a dished bimetallic disc **54**, the peripheral portion of which freely rests upon the planar surface **55** of an annular flange provided on the member **53**.

The base **50** is provided with a stationary contact means **55** with which a movable contact **56** cooperates, the position of the latter being governed by the position of the bimetallic disc **54**. As here shown, the stationary contact **55** is the enlarged head of a stud or rivet **57** the shank of which extends through an opening in the base **50** and a suitable opening in a terminal member **58**, the terminal member and contact being secured to the base by peening or otherwise upsetting the outer end of the shank of the contact stud **57**. The movable contact **56** is preferably a raised portion of suitable material on one end of a resilient arm **59**, the other end of which arm is secured to the base by a stud or rivet **60** which also passes through an opening in a terminal member **61** and thereby securing the latter to the base **50**. The inner end of the rivet or stud **60** is preferably provided with suitable spacing means, such as an integral shoulder or the like **62**, between the resilient arm **59** and the adjacent portion of the base **50** so that the arm **59** is spaced from the base.

The portion of the resilient arm **59** intermediate its ends is provided with an opening through which extends the reduced diameter or shank portion of a motion transmitting member or pin **63**, the lower end of which member is curved and continuously maintained in engagement with the central portion of the bimetallic disc by the resiliency of the arm **59**. The reduced diameter portion or shank of the member **63** extends beyond the member **59** and is adapted to abuttingly engage a stationary surface to limit movement of the motion transmitting member **63** under influence of the action of the bimetallic disc **54** since, in this embodiment of the switch, the distance between the resilient arm **59** and the central portion of the bimetallic disc **54**, when the latter has taken the position shown in full lines in Fig. 3, exceeds the value necessary to effect engagement of the movable contact **56** with the stationary contact **55**. Moreover, the strength of the arm **59** is such that it is insufficient to resist movement of the bimetallic disc **54** to its fully operated position shown in Fig. 3. Consequently, when the bimetallic disc **54** is in the illustrated position, the resilient arm **59** is bowed or flexed towards the base **50** intermediate the stud **60** and the stationary contact **55**. Preferably, the base **50** is provided with a raised portion or boss **64**, intermediate the contact **55** and the arm supporting stud **60**, with which the inner end of the reduced diameter portion of the pin **63** engages for the aforementioned limiting of the flexing of the arm **59**.

In the form of the switch illustrated in Fig. 3, the normal position of the bimetallic disc is as shown in the drawing and hence the switch is normally in circuit closing condition. However, upon a predetermined change in temperature, the bimetallic disc **54** will reverse its curvature with a snap action whereupon the resiliency of the arm **59** will cause the contact **56** to snap from engagement with contact **55** thereby breaking the circuit through the switch. The motion transmitting member or pin **63** will remain in engagement with the bimetallic member **54** throughout its movement due to the resiliency of the arm **59**. Hence, when the temperature of the bimetallic disc again returns to normal, the curvature of the bimetallic disc will be reversed with a snap action,

returning to the position shown in Fig. 3, whereupon the resilient arm 59 will be moved to again engage the contact 56 with the contact 55. The circuit through the switch is completed as soon as the contacts have thus reengaged but, as noted heretofore, the central portion of the resilient arm 59 moves beyond the extent necessary to effect reengagement of the contacts, this movement being terminated only when the end of the member or pin 63 engages the abutment 64. This additional movement of the arm 59 effects a slight wiping action between the contacts 55 and 56 thereby maintaining the latter in good electrical conductive condition.

It will be apparent that although the switch described and shown in Fig. 3 is intended to normally maintain the contacts thereof in circuit closing position, the switch construction can be readily altered so that it can be employed with the contacts normally in circuit opening position. Adjustment of the operating characteristics of the switch in Fig. 3 is effected in the same manner as is the embodiment illustrated in Fig. 2, by relative rotation between the disc supporting member 53 and base 50. Consequently, the switch may be readily calibrated after assembly and the disc supporting member secured in adjusted position relative to the flange 51 by means of solder or the like. Alternatively, the switch may be employed for response to different predetermined temperatures by providing either the flange 51 or the supporting member 53 with a convenient manipulating handle and a dial or other suitable indicia to represent the operating condition of the switch for a given relative position of the members 51 and 53.

The embodiment of the invention shown in Fig. 4 is constructed substantially like that shown in Fig. 3 in that it comprises a base 65 and an attached cylindrical member or flange 66, corresponding respectively with the base and flange 50 and 51 of the previously described embodiment. Likewise, the base 65 in the instant embodiment is provided with a stationary contact 67 at one end of a rivet or stud 68 which also secures the contact and a terminal member 69 to the base 65. The movable contact 70 is carried by a resilient arm 71, the other end of which is secured to a rivet or stud 72 that also secures a terminal member 73 to the base 65 in the same manner that the resilient arm 59 and terminal 61 are secured in the embodiment shown in Fig. 3. In a similar manner, the switch shown in Fig. 4 is operated by a dished bimetallic disc 74, the peripheral portion of which rests upon a planar surface on an annular shoulder 75 provided in a disc supporting member 76 that has an external screw thread mating with an internal screw thread 77 in the flange 66. The movement of the bimetallic disc 74 is communicated to the resilient arm 71 by a motion transmitting member or pin 78 which has a reduced diameter portion 79 extending through an opening intermediate the ends of the resilient arm 71.

The switch shown in Fig. 4 differs from that shown in Fig. 3 in that the resilient arm 71 is somewhat less flexible and it is not necessary to provide a raised boss or other abutting surface for the end of the portion 79 of the motion transmitting member. However, the arm 71 is sufficiently flexible so that it is bowed or curved slightly intermediate its ends when the bimetallic disc 74 has taken the position indicated in the drawing and which causes engagement of the contacts of the switch. Therefore, there is a wiping action between the contacts as in the form of switch shown in Fig. 3. The operation of the switch disclosed in Fig. 4 is substantially the same as explained above in conjunction with Fig. 3 and hence need not be redescribed. Suffice it to note that, in this form of the switch as in each of the other embodiments of the invention, adjustment of the operating characteristics of the switch can be readily effected by relative rotation between the base and the bimetallic disc supporting member.

The embodiments of the invention shown in Figs. 2, 3 and 4 have been illustrated as comprising flange portions 43, 51 and 66 which are formed of metal and secured to the base members 30, 50 and 65, respectively, that are formed of insulating material. It will be evident however that, if desired, these flanges could be formed integrally with the bases, both being formed either of insulating material or of metal. In the event the base should be formed of metal, suitable insulating means would, of course, be provided for the terminals and contacts. It will also be apparent that instead of forming the disc supporting member 42, 53 or 76 in these embodiments as an annular member threaded into a flange of the base, the disc supporting member could be made substantially cup-shaped and have a threaded engagement with the base in the manner illustrated in Fig. 1. Also, as mentioned heretofore, while the several switches have been shown as being of the type which normally maintains the contacts in closed condition, they could be readily constructed, in accordance with the invention, so that the contacts are normally open. These and other changes, which are within the purview of those skilled in the art, are considered as falling within the ambit of the invention and, consequently, the latter is not to be construed as restricted to the specific details here shown and described except as may be required by the spirit and scope of the appended claims.

Having thus described the invention, I claim:

1. A thermostatic switch unit comprising a substantially planar base member, a supporting member interconnected with the base member, and forming therewith a switch housing, said supporting member having a supporting surface located interiorly of said housing in a plane parallel to the adjacent substantially planar side of said base member, stationary electrical contact means carried by said base member and extending within said housing toward the plane of said supporting surface, electrical contact means in said housing and movable to and from engagement with the stationary contact means and normally biased to one of those positions, a dished bimetallic disc within said housing and adapted to reverse its direction of curvature upon attaining a predetermined temperature and having its periphery freely supported by said supporting surface of said supporting member, and motion transmitting means between the center of said disc and said movable contact means.

2. A thermostatic switch unit comprising a base, stationary contact means mounted on said base, contact means movable to and from engagement with said stationary contact means and normally biased to one of those positions, a dished bimetallic disc adapted to reverse its direction of curvature upon attaining a predetermined temperature and having an imperforate center portion, a member connected with said base and forming a housing therewith, said member loosely supporting said bimetallic disc adjacent the periphery thereof, motion transmitting means between the center portion of said disc and said movable contact means and having a free bearing engagement with said imperforate center portion of the disc, and means providing a threaded connection between the said member and base whereby relative rotation therebetween adjusts the position of said bimetallic disc relative to said base and thereby adjusts the operation of the switch.

3. A thermostatic switch unit comprising a base, stationary electrical contact means mounted on said base, electrical contact means movable to and from engagement with said stationary contact means and normally biased to one of those positions, a dished bimetallic disc adapted to reverse its direction of curvature upon attaining a predetermined temperature and having an imperforate center portion, a member having a planar surface thereon upon which the peripheral portion of said bimetallic disc freely rests, a motion transmitting means engaging said movable contact means and freely resting upon the center portion of said disc, and means providing

a threaded connection between said base and the said member whereby said base and interconnected member form a housing for enclosing the aforementioned switch elements and whereby the position of the disc and the operation of the switch are adjusted by relative rotation between the member and base.

4. A thermostatic switch unit comprising a base, stationary electrical contact means mounted on said base, electrical contact means movable to and from engagement with said stationary contact means and normally biased to one of those positions, an imperforate convexo-concave bimetallic disc adapted to reverse its direction of curvature upon attaining a predetermined temperature, a member having an annular portion with a surface thereon upon which the peripheral portion of said bimetallic disc freely rests, a motion transmitting means between said movable contact means and the central portion of said disc and having a free bearing engagement therewith, and means providing a threaded connection between said base and the said member whereby the latter mentioned interconnected elements form a housing for the aforementioned switch elements whereby the position of the disc and the operation of the switch are adjusted by relative rotation between the member and base.

5. A thermostatic switch comprising a base, a first electrical contact mounted on said base, a resilient arm provided with a second electrical contact adjacent one end thereof, means supporting the other end of said arm upon said base in a position such that the second contact is movable to and from engagement with the first contact and is normally urged to one of those positions, a dished bimetallic disc adapted to reverse its direction of curvature upon attaining a predetermined temperature and having an imperforate central portion, an annular member interconnected with said base and forming a switch housing therewith; said member having an annular portion upon which the peripheral portion of said bimetallic disc is supported, motion transmitting means between said central portion of said disc and the said resilient arm and having a free bearing engagement with said central portion of said disc, and means providing a threaded connection between said base and the said member whereby the position of said disc relative to said base and the operation of said switch are adjusted by relative rotation between the member and base.

6. A thermostatic switch as defined in claim 5 wherein the said arm is sufficiently flexible to bow towards said base intermediate its ends when said first contact is held in engagement with said second contact by said bimetallic disc whereby a wiping action is effected between said contacts when said bimetallic disc reverses its direction of curvature upon attainment of a predetermined temperature.

7. A thermostatic switch unit comprising a base, a first electrical contact mounted on said base, a resilient arm provided with a second electrical contact adjacent one end thereof and an opening intermediate its ends, means supporting the other end of said arm upon said base in a position such that the second contact is movable to and from engagement with the first contact and is normally urged to one of said positins by the resiliency of said arm, an imperforate convexo-concave bimetallic disc adapted to reverse its direction of curvature upon attaining a predetermined temperature, an annular member interconnected with said base and forming a switch housing therewith, said annular member having a surface upon which the peripheral portion of said bimetallic disc is supported, motion transmitting means having a portion received in the opening of said arm and another portion abutting the center of said disc with a free bearing engagement, and means providing a threaded connection between said base and the said member whereby the position of said disc relative to said base and the

operation of said switch are adjusted by relative rotation between the member and base.

8. A thermostatic switch comprising a base, means mounted on said base providing an electrical contact surface, a resilient arm provided with an electrical contact adjacent one end thereof, means supporting the other end of said arm upon said base in a position such that the contact on said arm is normally biased from engagement with the said contact surface but is movable into engagement with said contact surface, a convexo-concave bimetallic disc adapted to reverse its curvature upon attaining a predetermined temperature and having an imperforate center portion, an annular member interconnected with said base and forming a switch housing therewith, said annular member having a surface upon which said bimetallic disc is supported adjacent its periphery, a motion transmitting member between said disc and arm engaging the disc substantially at the center portion thereof with a free bearing engagement and engaging the arm intermediate its ends, the effective length of the last-mentioned member being greater than the least distance between the undeflected arm and the central portion of the disc when the latter is curved to effect contact engagement, whereby the said movable contact engages the said contact surface before the bimetallic disc has completed flexure to its position causing contact engagement so that when the disc has fully reached that position the said arm is flexed intermediate its ends towards said base thereby producing a wiping action between said movable contact and contact surface, and means providing a threaded connection between said base and the first-mentioned member whereby the position of the disc relative to said base and the operation of said switch are adjusted by relative rotation between the first-mentioned member and base.

9. A thermostatic switch as defined in claim 8 and further comprising means on said base limiting the flexure of said arm.

10. A thermostatic switch comprising a base, a stationary electrical contact mounted on said base, a resilient arm provided with an electrical contact adjacent one end thereof and an opening intermediate its ends, means supporting the other end of said arm upon said base in a manner such that the contact on said arm is normally biased from engagement with the stationary contact and is movable into engagement therewith, a convexo-concave bimetallic disc adapted to reverse its curvature upon attaining a predetermined temperature and having an imperforate central portion, an annular member interconnected with said base and forming a switch housing therewith, said annular member having a planar surface upon which the peripheral portion of said bimetallic disc is supported, a motion transmitting pin having one end in free bearing engagement with the central portion of said disc and a reduced diameter portion at the other end extending through the opening in said arm, an abutment surface on said base aligned with the said other end of said pin for engagement thereby, the dimensions of said pin and abutment being such that the former contacts the latter in response to action of said disc only after the contacts have engaged thereby producing a wiping action between the latter, and means providing a threaded connection between said base and member whereby the position of the disc relative to the base and the operation of the switch may be adjusted by relative rotation between the base and member.

11. A thermostatic switch comprising a base, stationary electrical contact means mounted on said base, movable electrical contact means movable to and from engagement with the stationary contact means and normally biased to one of those positions, a convexo-concave bimetallic disc adapted to reverse its direction of curvature upon attaining a predetermined temperature and having an imperforate central portion, a member interconnected with said base and forming a switch housing therewith, said member having a surface upon which the said bimetallic disc

is freely supported adjacent its periphery, a force transmitting member extending between the central portion of said bimetallic disc and the movable contact means and having a free bearing engagement with said central portion, a cylindrical flange extending outwardly from said base member with the said contact means and bimetallic disc disposed therein, and cooperating screw threads upon said flange and the disc supporting member whereby the position of the disc relative to the base and the operation of the switch may be varied by rotating the last-mentioned member relative to the flange.

12. A thermostatic switch comprising a switch housing including a base provided with an outwardly extending cylindrical flange having a screw thread on the wall thereof, a stationary electrical contact mounted on said base within said flange, a resilient arm provided with an electrical contact adjacent one end thereof, means supporting the other end of said arm upon said base within said flange in spaced relationship from the stationary contact in a manner such that the contact on said arm is movable to and from engagement with the stationary contact, the movable contact being normally biased from engagement with the stationary contact by the resiliency of said arm, a member provided with a screw thread mating with the thread on said flange and having an annular planar surface disposed towards said base, a convexo-concave bimetallic disc with its periphery freely resting upon said surface and having an imperforate central portion, and motion transmitting means between said disc and arm and having a free bearing engagement with said central portion whereby the movable contact is moved to and from engagement with the stationary contact in response to reversal of curvature of the bimetallic member upon predetermined changes of temperature with the operation of said switch being adjusted by rotating said member relative to said flange.

13. A thermostatic switch comprising a base, a plurality of stationary electrical contacts mounted in spaced relationship upon said base, a rigid electrical conductive member movable to and from bridging engagement with said stationary contacts, spring means between said base and conductive member acting in a direction to urge said conductive member to a predetermined position relative to said stationary contacts, a convexo-concave bimetallic disc adapted to reverse its direction of curvature upon attaining a predetermined temperature and having an imperforate center portion, a member interconnected with said base and forming a switch housing therewith, said member having an annular planar surface upon which the bimetallic disc is supported adjacent its periphery with the center portion of said disc free to move, a motion transmitting means between the center portion of said bimetallic disc and said conductive member and having a free bearing engagement with said center portion, and cooperating screw threads intermediate said base and disc supporting member whereby the operation of said switch may be regulated by relative rotation between the base and the disc supporting member.

14. A thermostatic switch comprising a base member, a plurality of stationary electrical contacts mounted upon said base member in spaced relationship to the latter and to each other, a rigid electrical conductive member adapted to be moved to and from bridging engagement with said stationary contacts, spring means between said base and conductive member normally acting to maintain the latter in engagement with the said contacts, a cylindrical flange extending outwardly from said base member with the said stationary contacts and conductive member disposed therein, a convexo-concave bimetallic disc adapted to reverse its direction of curvature upon attaining a predetermined temperature and having an imperforate central portion, a member interconnected with said base member and forming a switch housing therewith, said member having an annular planar surface upon which the bimetallic disc is supported adjacent its periphery with the central portion of said disc free to move, a motion transmitting means between the central portion of said bimetallic disc and said conductive member and having a free bearing engagement with said central portion, and cooperating threads upon the interior of said flange and the exterior periphery of said disc supporting member whereby the operation of said switch may be regulated by relative rotation between the base and disc supporting members.

15. A thermostatic switch comprising a base, a plurality of stationary electrical contacts mounted in spaced relationship upon said base, a rigid electrical conductive member movable to and from bridging engagement with stationary contacts, spring means between said base and conductive member normally acting to separate the said member from the said contacts, a member interconnected wth said base and forming a switch housing therewith, said member having an annular planar surface, a convexo-concave bimetallic disc resting upon said surface with the center portion of said disc being imperforate and free to move in response to change in temperature, a motion transmitting means between the center portion of said bimetallic disc and said conductive member and having a free bearing engagement with said center portion of said disc, and means adjustably interconnecting said base and disc supporting member including cooperating screw threads whereby the operation of said switch may be regulated by relative rotation between the base and disc supporting member.

16. A thermostatic switch comprising a substantially cup-shaped housing member having an annular surface on the interior thereof, a convexo-concave bimetallic disc freely resting upon said surface in the region of the periphery of the disc and having the central portion thereof unsupported, a base member, cooperating screw threads upon said cup-shaped member and upon said base member whereby said members are relatively adjustable, stationary electrical contact means mounted upon said base member, electrical contact means movable to and from engagement with the stationary contact means and normally biased to one of those positions, and motion transmitting means between the center of said disc and said movable contact means whereby said movable contact means is moved relative to the stationary contact means when the bimetallic disc reverses its curvature upon attaining a predetermined temperature and the operation of said switch is adjusted by effecting relative rotation between the base and cup-shaped members.

17. A thermostatic switch comprising a substantially cup-shaped housing member having an annular planar surface on the interior thereof, a convexo-concave bimetallic disc freely resting upon said surface in the region of the periphery of the disc and with the central portion thereof unsupported, a base member, cooperating screw threads upon the interior of said cup-shaped member and upon the periphery of said base member whereby said members are relatively adjustable, stationary electrical contact means mounted upon said base member, electrical contact means movable to and from engagement with the stationary contact means, means normally biasing said movable contact means from engagement with the stationary contact means, and motion transmitting means between the center of said disc and said movable contact means, whereby said movable contact means is moved relative to the stationary contact means when the bimetallic disc reverses its curvature upon attaining a predetermined temperature and the operation of said switch is adjusted by effecting relative rotation between the base and cup-shaped members.

18. A thermostatic switch comprising a base member, a plurality of stationary electrical contacts mounted in spaced relationship upon said base member, a rigid electrical conductive member movable to and from engagement with said contacts, guide means carried by said base member cooperating with said conductive member to

constrain its movement to a predetermined path, spring means between said base member and conductive member tending to move the latter away from the former, a cup-shaped housing member having an interior annular planar surface spaced beneath the rim thereof, a convexo-concave bimetallic disc supported in the region of its periphery upon said surface with the central portion of said disc unsupported, a motion transmitting means between the central portion of said disc and said conductive member, and cooperating screw threads upon said cup-shaped member and said base member whereby the operation of said switch may be regulated by relative rotation between the base and cup-shaped members.

19. A thermostatic switch comprising a base member, a plurality of stationary contacts mounted in spaced relationship upon said base member, a guide member supported upon said base member and extending at right angles from the face thereof carrying said stationary contacts and substantially centrally of the latter, a rigid conductive disc adapted to engage and bridge said stationary contacts, the said disc having a central opening through which said guide member extends, spring means between said base and conductive disc normally acting to separate the said disc from the said contacts, a cup-shaped housing member having an interior annular planar surface spaced beneath the rim thereof, a convexo-concave bimetallic disc supported in the region of its periphery upon said surface with the center portion of said bimetallic disc unsupported, a motion transmitting means between the central portion of said bimetallic disc and said conductive disc, and cooperating screw threads upon said cup-shaped member and the said base member whereby the operation of said switch may be regulated by relative rotation between the base and cup-shaped members.

20. A thermostatic switch comprising a base member provided with a threaded portion, a supporting member for a bimetallic disc and having a threaded portion cooperating with the threaded portion of the base member whereby said members are adjustably interconnected, said supporting member having a supporting surface located in a plane parallel to the side of said base member which is adjacent to said supporting surface, stationary contact means carried by said base member and extending from said side thereof toward the plane of said supporting surface, a contact means movable to and from engagement with the stationary contact means and normally biased to one of those positions, a dished bimetallic disc adapted to reverse its direction of curvature upon

attaining a predetermined temperature and having its periphery freely supported by said supporting surface of said supporting member, and motion transmitting means between the center of said disc and said movable contact means wherefore relative rotation between said base member and said supporting member varies the distance between said side of said base member and said disc to adjust the operation of said switch.

21. A thermostatic switch comprising a base member having a substantially cylindrical extension projecting from one side of the base member adjacent the periphery of the latter, said extension at its free end being provided with internal screw threads, a ring-like member having an internal annular shoulder providing a supporting surface located in a plane parallel to the plane of the inner side of the base member within said cylindrical extension, said ring-like member being provided externally with threads wherefore said ring-like member can be adjustably screwed into the internally threaded free end of said extension to vary the distance between the supporting surface of the ring-like member and the inner side of the base member, stationary contact means mounted on said base member and extending within said cylindrical extension, contact means movable to and from engagement with the stationary contact means and normally biased to one of those positions, a dished bimetallic disc adapted to reverse its direction of curvature upon attaining a predetermined temperature and having its peripheral portion freely supported upon said supporting surface of said ring-like member, and motion transmitting means between the center of said disc and said movable contact means, wherefore screwing said ring-like member inwardly or outwardly of said cylindrical extension varies the distance between the inner side of the base member and said disc to adjust the operation of the switch.

References Cited in the file of this patent

UNITED STATES PATENTS

1,725,296	Paige	Aug. 20, 1929
1,733,085	Thomas	Oct. 22, 1929
1,897,316	Marshall	Feb. 14, 1933
1,972,832	Spencer	Sept. 4, 1934
2,015,545	Bletz et al.	Sept. 24, 1935
2,060,836	Taxner	Nov. 17, 1936
2,230,770	Van Almelo	Feb. 4, 1941
2,238,881	Evans	Apr. 22, 1941
2,508,991	Butler	May 23, 1950