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Description

Background of the Invention

The present invention relates to a single-temperature thermostat, provided with a bimetallic element sensitive to a given intervening and restoring temperature and starts from the GB-A-1'094'944.

Various types of thermostats with bimetallic elements are already known from the prior art. These thermostats are, however, of complex structure and thus expensive, and tend to have space requirements that often pose mounting problems.

Thus, for example, from German Patent Publication 2 45 1327 a thermostat is known wherein a bimetallic disc operates a shaft that acts on an elastic strip secured at one end so as to raise the second end and interrupt the electric circuit. This structure is complex and cumbersome, and requires a special configuration for the terminal carrying the stationary contact and for the elastic strip carrying a movable contact.

In UK-A-1,094,944 there is disclosed a thermally operated switch having a bimetallic disc held in place by a lid at the open end of a cup-shaped housing with a movable switch contact capable of interconnecting fixed switch contacts located in the housing. The movable contact is urged towards the fixed contacts by a spring and has attached to it a rod extending towards the centre of the bimetallic disc, so that in one position of the disc the movable contact is held away from the fixed contact and in the other position of the disc the movable contact is held against the fixed contacts by the spring.

FR-A-2,167,696 discloses a similar form of switch having three movable switch contacts symmetrically distributed around the axis of the switch with a central screw for adjustment of the spacing between bimetallic disc and the sliding member supporting the movable switch contacts.

An object of the present invention is therefore to provide a one-temperature thermostat with a bimetallic element having a simple structure and able to assure optimal reliability.

According to the present invention there is provided a thermostat comprising a monolithic base having a chamber open at one end, two terminals attached to the base and connectable to an electrical circuit, each terminal having one end bent at right angles and carrying a stationary contact located in the chamber, a movable connection element movable between a position interconnecting the stationary contacts and a position spaced from the stationary contacts, a spring mounted in a seat on the base to bias the movable connection element into one of its positions relative to the stationary contacts, a snap-action thermally respon-

sive bimetallic element capable of movement between a relaxed state and a thermally produced stressed state, a sliding member operatively connected to move the movable connection element from one to the other of its positions against the biasing of the spring in response to a movement of the bimetallic element resulting from an increase in its temperature, the sliding member having a portion extending from the movable connection element towards the bimetallic element to be suitably spaced therefrom and lid means for retaining the bimetallic element on the base,

CHARACTERISED IN THAT

the sliding member is operatively connected to the movable connection element in such a way as to be adjustable by bending of a part or by sliding of one part relative to the other by force, and the sliding member, the movable connection element or their relative position is adjusted so that the end of the sliding member has a predetermined spacing from the bimetallic element in the relaxed state when the thermostat is assembled and the movable connection element is in the position into which it is biased by the spring.

In one example of the invention, the above object is achieved by providing a monolithic cylindrical base, open at one end, wherein two terminals connectable to an electric circuit are inserted, having one of their ends bent 90° and carrying a stationary contact, an element carrying a movable contact that connects the said two stationary contacts by the action of a spring, and a sliding element able to raise the said movable contact by the effect of a bimetallic element fastened in the said open end of the base by means of a lid.

In addition, the said lid is shaped so as to pass all vertical stresses onto the said rim of the base, thus preventing any interferences on the disc on the part of the lid in consequence of blows or deformations accidentally suffered by the latter.

Description of the Drawings

Other advantages and features of the present invention will become evident from the description of the two embodiments thereof, as illustrated by way of example in the attached drawings, wherein:

Fig. 1 shows a longitudinal view in cross section of a first embodiment of the thermostat;

Fig. 2 shows an enlarged partial cross section view as shown in Fig. 1 illustrating a terminal fastened in the base of the thermostat;

Fig. 3 shows a front view of a terminal similar to that shown in Fig. 2 illustrating an alternate embodiment of the invention;

Fig. 4 shows another alternate embodiment of the thermostat;

Fig. 5 shows a top view of the thermostat of Fig.

4 with the lid removed;

Fig. 6 is a diagrammatic view which shows a method for assembling the bimetallic disc and the lid into the thermostat;

Fig. 7A shows a front view of one embodiment of the lid;

Fig. 7B shows a crosssectional view along line A-A of Fig. 7a;

Figs. 8A and 8B diagrammatically show another alternate method for mounting the terminals by ultrasound;

Figs. 9A, 9B and 9C show a method for calibrating the thermostat with a movable notched plate; Fig. 10A shows a front view of the sliding guide plate for the movable contact as used in the thermostat of Figs. 4 and 5;

Fig. 10B shows a crosssectional view along line B-B of Fig. 10a; and

Fig. 11 shows a view in perspective of the monolithic base of the thermostat diagrammatically illustrating mounting of the thermostat.

Fig. 12 is a section view along the principal axis of an alternate embodiment of the thermostat of the invention;

Fig. 13 is a plan view of the base used in the device of Fig. 12;

Fig. 14 is a section view along line 14-14 of Fig. 13;

Fig. 15 is a partial section view to enlarged scale along line 15-15 of Fig. 12; and

Fig. 16 is a partial section view along line 16-16 of Fig. 12 diagrammatically illustrating a step in the assembly of the device of Fig. 12.

Description of the Preferred Embodiments

Fig. 1 shows a first embodiment of a thermostat according to the invention. The said thermostat consists of a cylindrical base or body 1 of plastic material having a lower cavity 18. In diagrammatically opposite positions, two slits 17 are provided which pass from the lower cavity to the outside through the upper closed wall of body 1. In the upper part of the said body a cylindrical seat 19 is provided in which a helical spring 6 is mounted whose upper end is supported on the bottom of said seat 19. Into the said slits 17 of rectangular configuration terminals 7 and 8 are inserted whose lower ends are bent at right angles and each carrying a contact 9. In spring 6 a rod 4 of ceramic material is inserted on which, with a force fit, a contact plate 5 of steel or other magnetic material is slipped which supports itself on the said two contacts 9 of terminals 7 and 8 so the plate 5 and rod 4 are fixed together and movement of the rod is guided in the seat 19.

The union between rod 4 and contact plate 5 is calibrated so that the lower end of the said rod 4 is

slightly above a conventional thermally responsive, snap-acting bimetallic disc 3 whose rim is captured between a shoulder 1.1 at the mouth of cavity 18 and the upward bent rim of a lid 2. Preferably ends of the plate 5 are guided in a groove 5.1 in the body.

To assemble bimetallic disc 3 and lid 2, a magnetic field is applied to the contact plate 5 by poles N and S so as to attract it toward the base, with compressing of spring 6, as shown schematically in Fig. 6. In this way, also rod 4 is caused to retreat, thus creating a free space for easy insertion of disc 3 and mounting of the lid 2. Subsequently, the magnetic field is removed and the said contact plate 5, by the action of spring 6, returns to its normal position.

Thanks to this calibration of shaft 4, at the moment of reversal of bimetallic disc 3 in consequence of a temperature increase, the latter abruptly strikes shaft 4 thus causing an interruption of the electric current by the lifting of said contact plate 5 from contacts 9 of terminals 7 and 8, against the action of spring 6. In this way, the period of arcing between the contacts is reduced to a minimum.

The same applies to the closing phase of the contacts, that is, the return of the bimetallic disc to its starting position on cooling of the disc.

Thus to assure this abrupt opening and closing of the contact it is necessary to provide, during the assembly phase of the various components of the thermostat, and initial creep-action play between the bimetallic disc and the rod of ceramic material. It should moreover be made sure that this play is kept as small as possible on account of a much larger abrupt or snap acting movement portion than a gradual portion existing in the travel of the said bimetallic disc.

The said lid 2 is shaped cylindrically around on the outside with a flared rim 2.1 so as to allow its application on the base by way of a simple forced insertion of lid 2 resting on the edge 1.2 of base 1 in a simple die of circular configuration. This manner of fastening the said lid is much faster and much more effective than rolling or folding as presently used.

The said lid 2 is shaped so as to unload vertical stresses, caused by possible deformations of the lid when in operation, onto the rim 1.2 of base 1, thus absolutely preventing any deformations or stresses of the lid from being transmitted to the bimetallic disc and thus altering its characteristics.

In fact, the lid 2 has a circular projection 23 which closely follows the internal flange or shoulder 1.1 of base 1, the said bimetallic disc 3 being wedged between said circular projection 23 and said internal flange of base 1.

Figs. 7A and 7B show another design of lid wherein the circular projection 23 is replaced by four projecting sectors 33 uniformly distributed over a circular circumference, which equally function as support of the disc and assist in calibration of the thermostat.

The terminals 7 and 8, made in one piece, preferably have a tongue 20 as shown in Figs. 1 and 2 which during mounting enmeshes itself in the terminal inside the base until a terminal shoulder 7.1, 8.1 engages the base but which is then dislodged into narrow slot 1.3 in the base for wedging it against a corresponding shoulder 16 on the outside of the said base. The terminals 7, 8 can be bent against above tongue 20 around a shoulder 22 along side the narrow slot 1.3 without their strong fixation inside the base being impaired thanks to the combined action of tongue 20 and shoulder 16 and 22 which act in unison toward improving the said fixation. In an alternate embodiment the terminals have small teeth 21 which engage, during mounting, in corresponding cutouts of said base 1, as shown in Fig. 3.

The insertion of the terminals in the base can be effected by ultrasonic energy. As illustrated schematically in another alternate embodiment in Figs. 8A and 8B, a terminal 7 has three sectors 7, 7' and 7'' of decreasing widths which are joined laterally by marginal grooves 30 and 31 of equal radiuses.

Under the action of ultrasonic vibrations, the said terminal 7 penetrates in base 1 while heating up, the so developed heat superficially melting a thin layer of the material of the base which after completion of the insertion (Fig. 8B) will have filled up again the said cavities 30 and 31, thus assuring a perfect fixation and sealing of terminal 7 in base 1.

Figs. 4 and 5 show a second embodiment of the invention, which differs from that shown in Fig. 1 in that the rod 4 of ceramic material is replaced by a motion transfer guide plate 13 preferably of insulating material such as plastic, ceramic or similar material, which is guided into diametrically opposed grooves 15, made in the cavity 18. On the outer end of spring 6 a contact plate 14 carrying movable contacts is fastened, in the manner similar to plate 5 of the first embodiment. A guide plate 13 preferably has raised edges 13.1 and a central depression 13.2 and the contact plate has grooves 14.1 fitted around parts of the raised edges 13.1 of the guide plate in this case, the guide plate 13 and contact-holding plate 14 also moved together but the movement is guided by the grooves 15 and not by the seat 19 as in the version of Fig. 1.

The said plate 13 has a lug 21 whose distance from bimetallic disc 3 is suitably chosen, in accordance with the type of bimetal used to provide a

desired calibration of the thermostat.

Another kind of calibration is shown schematically in Figs. 9A and 9B. Here, the movable contact plate 14 has a V-shaped notch 35 at its center which facilitates bending of the said plate by a force 35.1 as indicated in Fig. 9A to an extent desired and thus permit the calibration of the distance of the guide plate 13 from the said bimetallic disc. The said notch prevents, moreover, an application of larger bending forces that could damage the rim of the base on which the movable contact plate 14 supports itself.

The guided plate 13 preferably has two lateral projections 34, as shown in Fig. 10, which serve to pose a substantially longer resistance path to the passage of creep surface currents that could otherwise travel from the plate 14 along the insulator 13 and unload onto the bimetallic element and thus on the lid.

The said lid 2 has a circular projection 23 that closely follows the inner flange of base 1, the said bimetallic element being fastened to said inner flange of the base by said circular projection 23 of the lid when the latter is fastened on base 1.

This embodiment of Figs. 4 and 5 is particularly suited for more elevated temperatures, above 200°C. for example, to which the contact plate 5 of Fig. 1 could rise causing local fusions in the groove 5.1 of plastic in which it is guided. In this case, instead, thanks to the guided sliding of plate 13 in the grooves 15 of the base, the said drawback is avoided. In fact, the plate 13, being thermally insulated from the contact plate 14, never reaches temperatures that are dangerous for the plastic of the base in which it is guided.

It should finally be noted that the monolithic base, as shown schematically in perspective view in Fig. 11, has a useful surface 36 for the application of a clip 36.1 for mounting the thermostat on the base to be thermostated, this being made possible by virtue of the fact that terminals 7, 8 are separated from the ring by two barriers 37 formed in the monolithic base itself.

In an alternative embodiment, 100 in Fig. 12 indicates the novel and improved thermostat of this invention which is shown to include a generally cylindrical cup-shaped base 102 of a generally rigid, ultrasonically fusible, electrically insulating organic material or the like having a cavity 104 open at one end, having a pair of terminal slits 106 extending through the bottom 108 of the base, having a pair of locating shoulders 110 on the base at each side of the respective terminal slits 106 inside the base cavity (see Figs. 13 - 14) having a pair of locating shoulders 112 on the outside of the base adjacent the respective terminal slits 106, having a shoulder 114 extending around the base adjacent the open end of the base cavity, and

having a flange part 116 extending around the outer rim of the open base end. A seat 118 is formed in the bottom of the base cavity between the terminal slits 106, and a pair of grooves 120 are provided in the wall of the base cavity at opposite sides of the seat 118.

In accordance with this invention a pair of L-shaped strip terminals 122 are each provided with a plurality of portions 122.1, 122.2 and 122.3 of progressively narrower width in the longer leg 122.4 of the terminal and have scallops or notches 122.5 formed in the edges of that terminal leg. The shorter leg 122.6 of the terminal has a stationary electrical contact 124 secured thereto, preferably by riveting or the like as shown, and, if desired, an opening 122.7 is provided in each terminal to facilitate precise bending of the terminal at the junction of the legs.

As shown in Fig. 16 each terminal 122 has its longer leg inserted into a terminal slit 106 and pressed into the slit as indicated in Fig. 16 by the arrow 122a while ultrasonic energy is applied to the slit area of the base in any conventional manner (not shown) so that the relatively wider strip portions 122.1, 122.2 and 122.3 of the terminal are progressively pushed into a slit 106 and are embedded in the lateral walls of the base adjacent the slit, while the scallops are filed with the ultrasonically fusible base material as will be understood, until respective lateral edges of the shorter base leg 122.6 engage respective locating shoulders 110 on the base, thereby to locate the terminals 122 in the base for precisely positioning the stationary contact 124 as shown in Fig. 12. The distal ends of the longer terminal legs 122.4 are then bent as shown in Fig. 12 to bear against corresponding locating shoulders 114 on the outer side of the base. In that arrangement, pushing of quick connect connectors or the like onto the terminal ends as is diagrammatically illustrated by the broken lines 125 in Fig. 12 in making electrical connection to the terminals does not tend to displace the terminals 122 from their desired assembled position ultrasonically sealed in the slits 106 as will be understood. Preferably the distal terminal ends extend from the thermostat 100 in the direction shown but it will be understood that the terminal ends may be bent in any direction to make desired electrical connection without tending to disturb the seating of the terminals in the base.

In accordance with this invention, a helical coil compression spring 127 is disposed in the base seat 118.

A flat metal movable contact element 128, preferably of a steel or other magnetic, electrically conductive metal material has a pair of movable contacts 30 secured thereto, preferably by riveting or the like, in spaced relation to each other to

engage the stationary contacts 124 and a slit 128.1 is provided in the movable contact element. In that configuration the movable contact element 128 is adapted to be readily blanked from a strip material in a low cost manufacturing procedure. A flat metal motion transfer element 132 is also adapted to be inexpensively blanked from a strip material with a configuration as shown generally in Fig. 15 wherein a tab 132.1 is located at one edge of the strip adapted to be inserted into the movable contact element slit 128.1 and to be riveted or expanded therein for securing the motion transfer element in the movable contact element together as is diagrammatically illustrated in Fig. 15. Lateral edges 132.2 of the motion transfer element are proportioned to be slidably received in the respective grooves 120 in the base and an opposite edge of the motion transfer element has an extending portion 132.3. The movable contact element with the attached motion transfer element is then disposed on the spring 127 so that the spring biases the movable contact element into electrical engagement with the stationary contacts 124 for interconnecting the stationary contacts and for disposing the extending portion 132.3 of the motion transfer element at a selected location adjacent the open end of the base 102.

A conventional dished, thermostat metal disc element 134 is disposed with its perimeter 134.1 resting on the base shoulder 114 and a thin pliable film 136 of an electrically insulating material such as a polyimide material or the like sold under the name Kapton is disposed over the thermostat element as shown in Fig. 1. Preferably a magnet is positioned to draw the movable contact element 128 and motion transfer element 132 down into the base cavity 104 against the bias of the spring 118 as shown in the noted copending patent application to facilitate assembly of the disc and film in the thermostat 100. A cup-shaped metal lid 138 is then disposed over the open base end and has its rim 138.1 swaged or otherwise formed over the base flange 116 for securing the lid to the base, the base having an annular ridge 138.2 formed therein to be positioned adjacent the rim 134.1 of the thermostat element, thereby to cooperate with the base shoulder 114 in precisely locating the thermostat element 134 with a selected spacing relative to the extending portion 132.3 of the motion transfer element.

In that arrangement, the thermostat element 134 is adapted to move to an inverted dished configuration with snap action in conventional manner when the thermostat element is heated to a selected actuating temperature, thereby to engage the extending portion 132.3 of the motion transfer element as will be understood for moving the movable contact element 128 against the bias of the

spring 118 to disengage the stationary contacts 124 and open the circuit between the device terminals 122. Then, upon subsequent cooling down to a relatively lower reset temperature, the thermostat element is adapted to return to its original dished configuration as shown in Fig 12 with snap action for permitting the bias of the spring 118 to reengage the movable contact element with the stationary contacts for reclosing the device circuit. As will be understood, the lid 138 is thermally conductive for readily transmitting heat to the thermostat element 134 from a temperature zone being monitored by the thermostat 100.

In accordance with this invention, the motion transfer element 132 preferably has a slit 132.4 therein located between the tab 132.1 and the extending portion 132.3 of the element, whereby, when the transfer element is secured together with the movable contact element 128 by pressing in the direction diagrammatically illustrated by the arrows 140 in Fig.15 the motion transfer element is adapted to be selectively compressed as is diagrammatically illustrated at 132.5 for providing a precise spacing between the movable contact 128 and the extending portion 132.3 of the transfer element. In that arrangement the extending portion 132.3 of the motion transfer element is adapted to be easily and precisely located so it is accurately spaced relative to the thermostat element 134 to permit initial creep action of the thermostat element without causing opening of the thermostat contacts but is then adapted to provide sharp snap acting movement of the movable contact element when the thermostat circuit is to be opened in response to the selected temperature change. In that way, the thermostat 100 is characterized by utilizing low cost, easily manufactured and assembled components and is also characterized by accurate thermal response characteristics as assembled, each thermostat component being individually characterized by low cost manufacture and by ease of assembly and the thermostat as a whole being characterized by reliable and accurate assembly.

Claims

1. A thermostat (100) comprising a monolithic base (1,102) having a chamber open at one end, two terminals (7,8,122) attached to the base and connectable to an electrical circuit, each terminal (7,8,122) having one end bent at right angles and carrying a stationary contact (9,124) located in the chamber, a movable connection element (5,128,130) movable between a position interconnecting the stationary contacts and a position spaced from the stationary contacts, a spring (6,127) mounted in a seat (19,118) on the base to bias the movable

connection element into one of its positions relative to the stationary contacts, a snap-action thermally responsive bimetallic element (3,134) capable of movement between a relaxed state and a thermally produced stressed state, a sliding member (4,132) operatively connected to move the movable connection element (5,128,130) from one to the other of its positions against the biasing of the spring (6,127) in response to a movement of the bimetallic element (3,134) resulting from an increase in its temperature, the sliding member (4,132) having a portion extending from the movable connection element (5,128,130) towards the bimetallic element to be suitably spaced therefrom and lid means (2,138) for retaining the bimetallic element (3,134) on the base (1,102),

CHARACTERISED IN THAT

the sliding member (4,132) is operatively connected to the movable connection element (5,128,130) in such a way as to be adjustable by bending of a part or by sliding of one part relative to the other by force, and the sliding member (4,132), the movable connection element (5,128,130) or their relative position is adjusted so that the end of the sliding member (4,132) has a predetermined spacing from the bimetallic element (3,134) in the relaxed state when the thermostat is assembled and the movable connection element (5,128,132) is in the position into which it is biased by the spring.

2. A thermostat as set forth in claim 1, being further characterised in that the said sliding member (4,132) consists of a rod joined by means of a force fit with said movable connection element (5,128,132), the said joint having no elastic return so that the end of rod can be set to exactly the required distance from the said bimetallic element.
3. A thermostat as set forth in claim 1, being further characterised in that said sliding member (13) has lateral edges (13.1) slidable in grooves in the base, in that said sliding member has an arcuate lug (21) thereon of a radius not greater than the part guided between said grooves so as to allow the said sliding member possible movements and/or adjustments inside said grooves with a minimum of friction and without altering the calibration distance between said lug and the bimetallic element, and in that the sliding member (13) has two lateral projections (34) to impose a substantial creep surface resistance to the passage of creep surface currents from the movable contact

plate to prevent those currents being fed to the bimetallic element (3,134) and the lid (2,138).

4. A thermostat as set forth in claim 1, being further characterised in that said terminals (7,8) are each made in one piece and are held in place in the base by means of a tongue (20) integral with the terminal. 5
5. A thermostat as set forth in claim 4, being further characterised in that said terminals (7,8) are adapted to be bent at an angle above said tongue (20) around a shoulder (22) on the base (1). 10
6. A thermostat as set forth in claim 1, being further characterised in that said lid (2) has a circular projection (23) that closely follows an internal flange (1.1) of said base (1), said bimetallic element (3) being captured between said internal flange of the base and said circular projection of the lid so as not to suffer vertical deformations or stresses to which the lid may be subjected. 15
7. A thermostat as set forth in claim 3, being further characterised in that said lid (2) has projections (33) equidistant from one another, disposed on a common circumference, said projections functioning as supports for the bimetallic element (3) so that, after determination of the actual point at which the lug (21) on the sliding member (13) lies with the contacts in the closed position, further adjustment of the thermostat can be made by squeezing the said projections to alter the play between the bimetallic element (3) and the lug (21), the projections being of such configuration as to exclude error due to elastic return. 20
8. A thermostat as set forth in claim 1, being further characterised in that the said movable connection element (14) has a V-shaped notch (35) at its centre to permit calibration of the thermostat by application of a bending force to the movable connection element. 25
9. A thermostat according to claim 1 characterised in that the movable connection element (128) comprises a flat metal sheet element having a slit (128.1) therein, the sliding member (132) comprises a flat metal sheet element having a tab (132.1) at one edge fitting into the slit (128.1) for securing the sliding member to the movable connection element, the sliding member also having an opposite edge portion remote from the tab for engagement by the bimetallic element (134), lateral edge parts 30

(132.2) slidably engaged in grooves (120) for guiding the member in the base and a slit (132.4) between the tab and the portion remote from the tab permitting adjustment of the distance between the tab and the remote portion for enabling the precise positioning of the remote portion relative to the movable connection element. 35

10. A thermostat as set forth in claim 9 further characterised in that a thin electrically insulating film (136) is secured over the bimetallic element (134) between it and the sliding member (132) electrically isolating the bimetallic element (134) and the lid (138) from the sliding member (132). 40
11. A thermostat as set forth in claim 9 or 10 further characterised in that the base has a pair of slits (106) in the base bottom, locating shoulder means inside the base adjacent the respective terminal slits and locating shoulder means (112) on the outside of the base adjacent the respective terminal slits, each terminal (122) comprises an L-shaped terminal member having a longer leg and a shorter leg, having a stationary contact (124) secured to the shorter leg, and having a plurality of sections (122.5) of the longer leg of progressively narrower width scalloped along lateral edges thereof, and the longer terminal legs are inserted into and ultrasonically sealed in the respective terminal slits in the base bottom with the shorter terminal legs abutted with locating shoulder means inside the base cavity, the longer terminal legs being further bent outside the base into engagement with said respective locating shoulder means outside the base, thereby to positively receive the terminals in the desired position in the base bottom and to retain the terminals therein even when subjected to axially applied forces while interconnecting the terminals in an electrical circuit. 45

Patentansprüche

1. Thermostat (100), der eine monolithische Basis (1,102) mit einer offenen Kammer an einem Ende aufweist, sowie zwei Anschlüsse (7,8,122), die an der Basis befestigt sind und mit einer elektrischen Schaltung verbunden werden können, wobei jeder Anschluß (7,8,122) ein rechtwinklig gebogenes Ende aufweist, das einen stationären Kontakt (9,124) trägt, der sich in der Kammer befindet, ein bewegliches Verbindungselement (5,128,130), das zwischen einer Position, die die stationären Kontakte untereinander verbindet, und ei-

ner von den stationären Kontakten beabstandeten Position bewegbar ist, eine Feder (6,127), die in einem Sitz (19,118) an der Basis gelagert ist, um das bewegliche Verbindungselement in eine seiner Positionen relativ zu den stationären Kontakten vorzuspannen, ein mit Schnappwirkung thermisch ansprechendes Bimetallelement (3,134), das in der Lage ist, sich zwischen einem entspannten und einem thermisch erzeugten, gespannten Zustand zu bewegen, ein Gleitelement (4,132), das wirksam verbunden ist, um das bewegliche Verbindungselement (5,128,130) gegen die Vorspannung der Feder (6,127) in Reaktion auf eine Bewegung des Bimetallelements (3,134), die sich aus einer Erhöhung seiner Temperatur ergibt, aus der einen in die andere seiner Positionen zu bewegen, wobei das Gleitelement (4,132) einen Abschnitt aufweist, der sich von dem beweglichen Verbindungselement (5,128,130) zu dem Bimetallelement in geeignetem Abstand erstreckt, sowie Deckelmittel (2,138) zum Halten des Bimetallelements (3,134) an der Basis (1,102), dadurch gekennzeichnet, daß das Gleitelement (4,132) mit dem beweglichen Verbindungselement (5,128,130) wirksam so verbunden ist, daß es durch Biegen eines Teils oder durch Gleiten eines Teils relativ zu dem anderen durch Kraft eingestellt werden kann, und daß das Gleitelement (4,132), das bewegliche Verbindungselement (5,128,130) oder ihre relative Position so eingestellt ist, daß das Ende des Gleitelements (4,132) einen vorbestimmten Abstand von dem Bimetallelement (3,134) im entspannten Zustand aufweist, wenn der Thermostat zusammen gesetzt ist und das bewegliche Verbindungselement (5,128,132) sich in der Position befindet, in die es durch die Feder vorgespannt ist.

2. Thermostat nach Anspruch 1, weiter dadurch gekennzeichnet, daß das Gleitelement (4,132) aus einem Stab besteht, der über einen Preßsitz mit dem beweglichen Verbindungselement (5,128,132) verbunden ist, wobei die Verbindung keine Rückfederung aufweist, so daß das Ende des Stabes genau auf den erforderlichen Abstand von dem Bimetallelement eingestellt werden kann.
3. Thermostat nach Anspruch 1, weiter dadurch gekennzeichnet, daß das Gleitelement (13) in Nuten in der Basis verschiebbare seitliche Kanten (13.1) aufweist, daß das Gleitelement einen gekrümmten Ansatz (21) mit einem Radius aufweist, der nicht größer ist als der zwischen den Nuten geführte Teil, so daß dem

Gleitelement mögliche Bewegungen und/oder Einstellungen innerhalb der Nuten mit minimaler Reibung sowie ohne Änderung des Kalibrierungsabstands zwischen dem Ansatz und dem Bimetallelement erlaubt sind, und daß das Gleitelement (13) zwei seitliche Vorsprünge (34) aufweist, um einen bedeutenden Oberflächenkriechwiderstand dem Durchgang von Oberflächenkriechströmen von der beweglichen Kontaktplatte aufzuerlegen, um zu verhindern, daß diese Ströme dem Bimetallelement (3,134) und dem Deckel (2,138) zugeführt werden.

4. Thermostat nach Anspruch 1, weiter dadurch gekennzeichnet, daß die Anschlüsse (7, 8) jeweils aus einem Stück hergestellt sind und mittels einer an den Anschluß angeformten Zunge (20) an ihrem Platz in der Basis gehalten sind.
5. Thermostat nach Anspruch 4, weiter dadurch gekennzeichnet, daß die Anschlüsse (7, 8) in einem Winkel über der Zunge (20) um eine Schulter (22) an der Basis (1) gebogen werden können.
6. Thermostat nach Anspruch 1, weiter dadurch gekennzeichnet, daß der Deckel (2) einen kreisförmigen Vorsprung (23) aufweist, der einem inneren Flansch (1.1) der Basis (1) dicht folgt, wobei das Bimetallelement (3) zwischen dem inneren Flansch der Basis und dem kreisförmigen Vorsprung des Deckels gefangen ist, so daß es keine vertikalen Verformungen oder Belastungen erleidet, denen der Deckel unterworfen sein kann.
7. Thermostat nach Anspruch 3, weiter dadurch gekennzeichnet, daß der Deckel (2) Vorsprünge (33) aufweist, die im gleichen Abstand voneinander an einem gemeinsamen Umfang angeordnet sind, wobei die Vorsprünge als Stützen für das Bimetallelement (3) fungieren, so daß nach der Bestimmung des tatsächlichen Punktes, an dem der Ansatz (21) an dem Gleitelement (13) mit den Kontakten in der geschlossenen Position liegt, eine weitere Einstellung des Thermostats dadurch vorgenommen werden kann, daß die Vorsprünge zusammengedrückt werden, um das Spiel zwischen dem Bimetallelement (3) und dem Ansatz (21) zu verändern, wobei die Vorsprünge so ausgestaltet sind, daß sie einen Fehler aufgrund einer Rückfederung ausschließen.
8. Thermostat nach Anspruch 1, weiter dadurch gekennzeichnet, daß das bewegliche Verbin-

dungselement (14) eine V-förmige Kerbe (35) in seiner Mitte aufweist, um eine Kalibrierung des Thermostats durch Aufbringen einer Biegekraft auf das bewegliche Verbindungselement zu ermöglichen.

9. Thermostat nach Anspruch 1, dadurch gekennzeichnet, daß das bewegliche Verbindungselement (128) ein flaches Blechelement mit einem Schlitz (128.1) aufweist, das Gleitelement (132) ein flaches Blechelement mit einem Dorn (132.1) an einer Kante aufweist, der in den Schlitz (128.1) paßt, um das Gleitelement an dem beweglichen Verbindungselement zu sichern, wobei das Gleitelement auch einen von dem Dorn entfernten, gegenüberliegenden Kantenbereich für den Eingriff des Bimetallelements (134) sowie seitliche Kantenteile (132.2) aufweist, die mit den Nuten (120) verschiebbar in Eingriff stehen, um das Element in der Basis zu führen und einen Schlitz (132.4) zwischen dem Dorn und dem von dem Dorn entfernten Bereich, wodurch die Einstellung des Abstandes zwischen dem Dorn und dem entfernten Bereich erlaubt wird, um die genaue Positionierung des entfernten Bereichs relativ zu dem beweglichen Verbindungselement zu ermöglichen.

10. Thermostat nach Anspruch 9, weiter dadurch gekennzeichnet, daß ein dünner, elektrisch isolierender Film (136) über dem Bimetallelement (134) zwischen ihm und dem Gleitelement (132) angebracht ist, der das Bimetallelement (134) und den Deckel (138) von dem Gleitelement elektrisch isoliert.

11. Thermostat nach Anspruch 9 oder 10, weiter dadurch gekennzeichnet, daß die Basis zwei Schlitze (106) im Basisboden aufweist, Fixierschultermittel innerhalb der Basis, angrenzend an die betreffenden Anschlußschlitze, und Fixierschultermittel (112) an der Außenseite der Basis, angrenzend an die betreffenden Anschlußschlitze, wobei jeder Anschluß (122) ein L-förmiges Anschlußelement mit einem längeren und einem kürzeren Schenkel aufweist, mit einem stationären Kontakt (124), der an dem kürzeren Schenkel angebracht ist, sowie mehrere Abschnitte (122.5) des längeren Schenkels mit zunehmend engerer Breite und mit bogenförmigen Ausschnitten entlang seitlicher Kanten, und wobei die längeren Anschlußschenkel in die betreffenden Anschlußschlitze im Boden der Basis eingefügt und ultraschallversiegelt werden, wobei die kürzeren Anschlußschenkel an Fixierschultermitteln innerhalb der Basishöhlung anliegen, wobei die län-

geren Anschlußschenkel außerhalb der Basis weiter in Eingriff mit den betreffenden Fixierschultermitteln außerhalb der Basis gebogen sind, wodurch die Anschlüsse formschlüssig in der gewünschten Position im Boden der Basis aufgenommen sind und darin gehalten werden, selbst wenn sie axial aufgebrachten Kräften unterworfen werden, wenn die Anschlüsse in einer elektrischen Schaltung angeschlossen werden.

Revendications

1. Thermostat (100) comprenant une base monolithique (1,102) possédant une chambre ouverte à une extrémité, deux bornes (7,8,122) fixées à la base et pouvant être raccordées à un circuit électrique, chaque borne (7,8,122) possédant une extrémité repliée à angle droit et portant un contact fixe (9,124) situé dans la chambre, un élément mobile de connexion (5,128,130) déplaçable entre une position dans laquelle il raccorde les contacts fixes et une position dans laquelle il est distant des contacts fixes, un ressort (6,127) monté dans un siège (19,118) sur la base de manière à solliciter l'élément mobile de connexion dans l'une de ses positions par rapport aux contacts fixes, un élément bimétallique à action d'encliquetage (3,134), qui répond thermiquement et est apte à se déplacer entre un état relaxé et un état contraint produit thermiquement, un élément coulissant (4,132) raccordé de façon opérationnelle de manière à déplacer l'élément mobile de connexion (5,128,130) de l'une dans l'autre de ses positions à l'encontre de la sollicitation exercée par le ressort (6,127) en réponse à un déplacement de l'élément bimétallique (3,134) résultant d'un accroissement de sa température, l'élément coulissant (4,132) possédant une partie s'étendant depuis l'élément mobile de connexion (5,128,130) en direction de l'élément bimétallique de manière à en être espacé de façon appropriée, et des moyens formant couvercle (2,138) servant à retenir l'élément bimétallique (3,134) sur la base (1,102),

CARACTÉRISÉ EN CE QUE

l'élément coulissant (4,132) est raccordé de façon opérationnelle à l'élément mobile de connexion (5, 128,130) de manière à être ajustable par pliage d'une partie ou par glissement à force d'une partie par rapport à l'autre, et l'élément coulissant (4,132), l'élément mobile de connexion (5,128,130) ou leur position relative est ajusté de telle sorte que l'extrémité de l'élément coulissant (4,132) est séparée, par un espacement prédéterminé, de l'élément bi-

métallique (3,134) dans l'état relaxé, lorsque le thermostat est assemblé et que l'élément mobile de connexion (5,128,132) est dans la position dans laquelle il est sollicité par le ressort.

2. Thermostat selon la revendication 1, caractérisé en outre en ce que ledit élément coulissant (4,132) est constitué par une tige réunie au moyen d'un ajustement à force audit élément mobile de connexion (5,128,132), ladite liaison ne présentant aucun rappel élastique de sorte que l'extrémité de la tige peut être positionnée exactement à la distance requise par rapport audit élément bimétallique. 5
3. Thermostat selon la revendication 1, caractérisé en outre en ce que ledit élément coulissant (13) possède des bords latéraux (13.1) aptes à glisser dans des rainures ménagées dans la base, en ce que ledit élément coulissant comporte une patte courbe (21) possédant un rayon non supérieur à celui de la partie guidée entre lesdites rainures de manière à permettre d'éventuels déplacements et/ou réglages dudit élément coulissant à l'intérieur desdites rainures avec un frottement minimum et sans modification de la distance de calibrage entre ladite patte et l'élément bimétallique, et en ce que l'élément coulissant (13) possède deux parties saillantes latérales (34) servant à imposer une résistance de surface élevée au passage de courants de fuite superficiels à partir de la plaque mobile de contact pour empêcher l'envoi de ces courants à l'élément bimétallique (3,134) et au couvercle (2,138). 10 15 20 25 30 35
4. Thermostat selon la revendication 1, caractérisé en outre en ce que lesdites bornes (7,8) sont formées chacune d'une seule pièce et sont maintenues en place dans la base par l'intermédiaire d'une languette (20) solidaire de la borne. 40
5. Thermostat selon la revendication 4, caractérisé en outre en ce que lesdites bornes (7,8) sont adaptées pour être pliées en faisant un angle au-dessus de ladite languette (20) autour d'un épaulement (22) sur la base (1). 45
6. Thermostat selon la revendication 1, caractérisé en outre en ce que ledit couvercle (2) possède une partie saillante circulaire (23) qui suit étroitement une bride interne (1.1) de ladite base (1), ledit élément bimétallique (3) étant retenu captif entre ladite bride interne de la base et ladite partie saillante circulaire du couvercle de manière à ne subir aucune déformation ou contrainte verticale, à laquelle le cou-

vercle peut être soumis.

7. Thermostat selon la revendication 3, caractérisé en outre en ce que ledit couvercle (2) comporte des parties saillantes équidistantes (33), disposées sur une circonférence commune, lesdites parties saillantes agissant en tant que supports pour l'élément bimétallique (3) de sorte qu'après détermination du point effectif, au niveau duquel la patte (21) présente sur l'élément coulissant (13) se situe avec les contacts dans la position fermée, un réglage ultérieur du thermostat peut être réalisé par serrage desdites parties saillantes de manière à modifier le jeu entre l'élément bimétallique (3) et la patte (21), les parties saillantes possédant une configuration qui exclut toute erreur due à un rappel élastique. 50
8. Thermostat selon la revendication 1, caractérisé en outre en ce que ledit élément mobile de connexion (14) possède une encoche en forme de V (35) au niveau de son centre de manière à permettre le calibrage du thermostat par application d'une force de flexion à l'élément mobile de connexion. 55
9. Thermostat selon la revendication 1, caractérisé en ce que l'élément mobile de connexion (108) comporte un élément plat formé d'une tôle comportant une fente (128.1), l'élément coulissant (132) comporte un élément plat formé d'une tôle possédant, au niveau d'un bord, une languette (132.1), qui pénètre dans la fente (128.1) de manière à fixer l'élément coulissant à l'élément mobile de connexion, l'élément coulissant possédant également une partie de bord opposée distante de la languette et contre laquelle vient s'appliquer l'élément bimétallique (134), des parties de bord latérales (132.2) qui s'engagent avec possibilité de glissement dans des rainures (120) pour guider l'élément dans la base, et une fente (132.4) située entre la languette et la partie distante de la languette et permettant le réglage de la distance entre la languette et la partie distante de manière à permettre le positionnement précis de la partie distante par rapport à l'élément mobile de connexion. 60 65 70 75 80 85 90 95
10. Thermostat selon la revendication 9, caractérisé en outre en ce qu'une pellicule mince électriquement isolante (136) est fixée au-dessus de l'élément bimétallique (134) entre ce dernier et l'élément coulissant (132) de manière à isoler électriquement l'élément bimétallique (134) et le couvercle (138) par rapport à l'élément coulissant (132).

11. Thermostat selon la revendication 9 ou 10, caractérisé en outre en ce que la base comporte un couple de fentes (106) à sa partie inférieure, des moyens formant épaulements de positionnement situés à l'intérieur de la base au voisinage des fentes de borne respectives et de moyens formant épaulements de positionnement (112) situés sur l'extérieur de la base au voisinage des fentes de borne **respectives**, chaque borne (122) comporte un élément en forme de L possédant une branche plus longue et une branche plus courte et un contact fixe (124) fixé à la branche plus courte, une pluralité de sections (122.5) de la branche la plus longue possédant une largeur qui se rétrécit progressivement avec un profil dentelé le long des bords latéraux de ses sections, et les branches de borne les plus longues sont insérées dans et étanchéifiées par **ultrasons** dans les fentes respectives ménagées dans la partie inférieure de la base, les branches les plus courtes étant en butée avec les moyens formant épaulements de positionnement à l'intérieur de la cavité de la base, les branches de borne les plus longues étant en outre repliées à l'extérieur de la base de manière à s'appliquer contre lesdits moyens respectifs formant épaulements de positionnement à l'extérieur de la base, ce qui permet de loger efficacement les bornes dans la position désirée dans la partie inférieure de la base et de retenir les bornes dans cette partie lorsqu'elles sont soumises à des forces appliquées axialement, avec interconnexion des bornes dans un circuit électrique.

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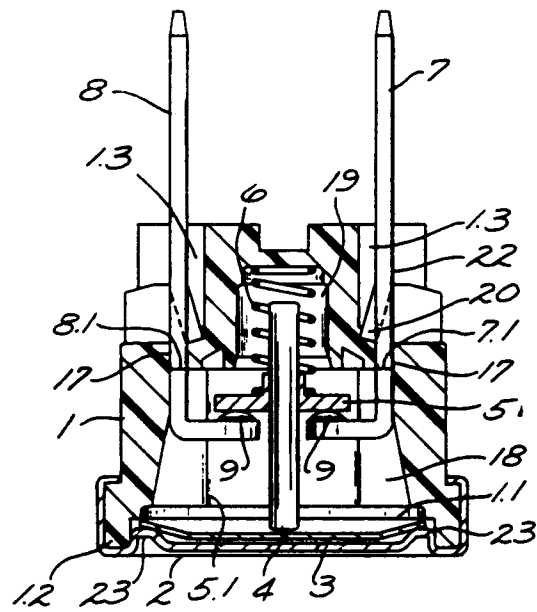


FIG.1

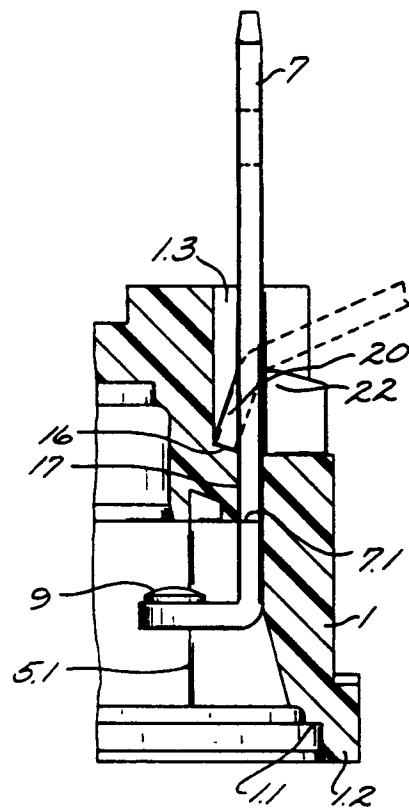


FIG.2

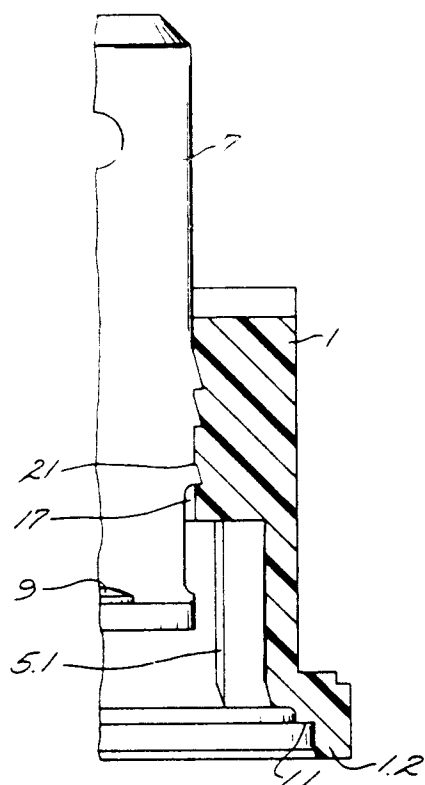


FIG.3

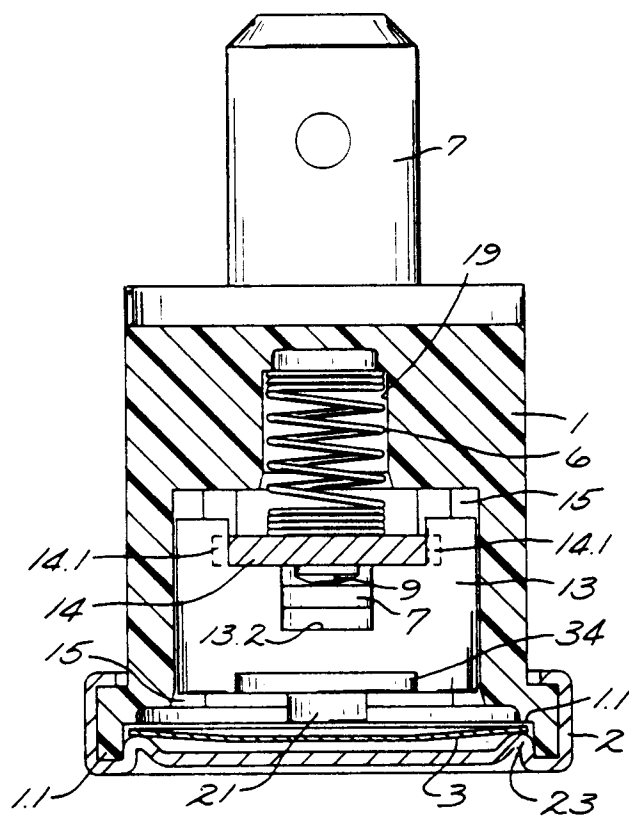


FIG.4

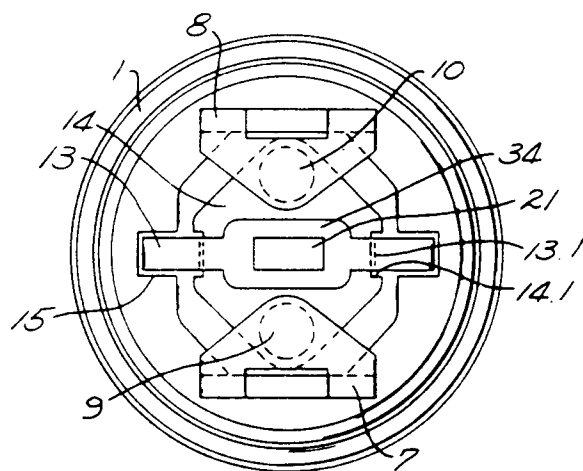


FIG. 5

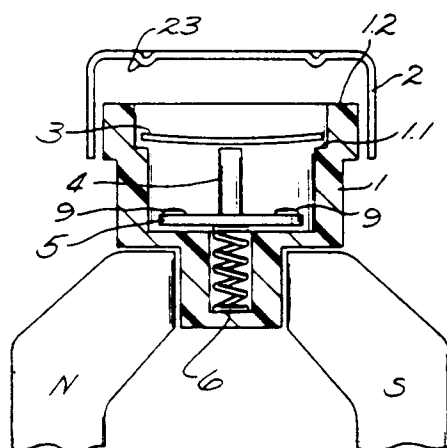


FIG. 6

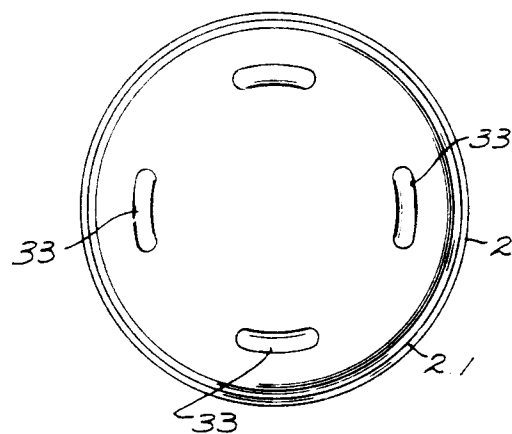


FIG. 7 A

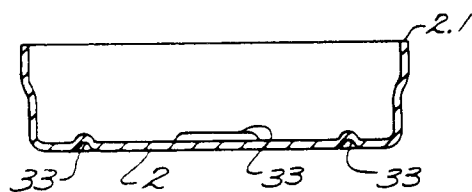


FIG. 7 B

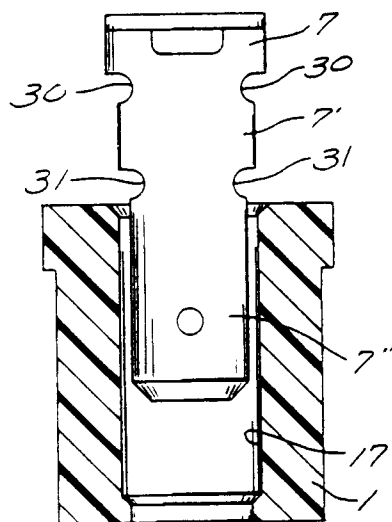


FIG. 8 A

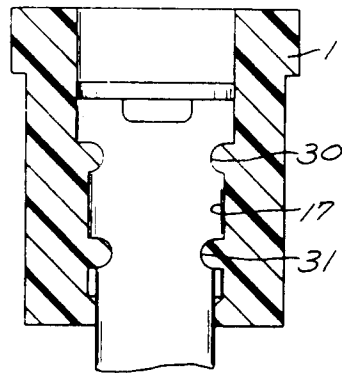


FIG. 8B

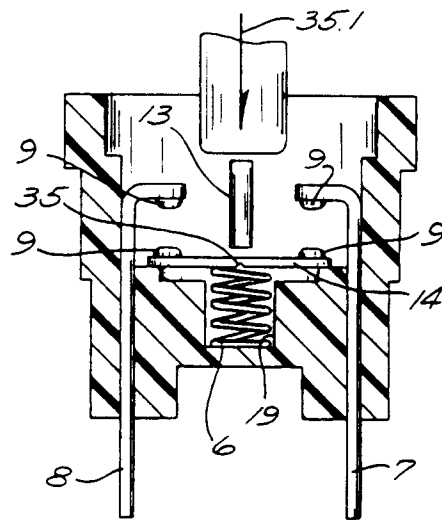


FIG. 9 A

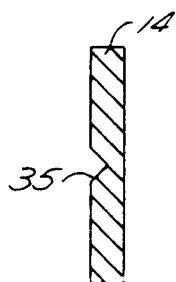


FIG. 9B

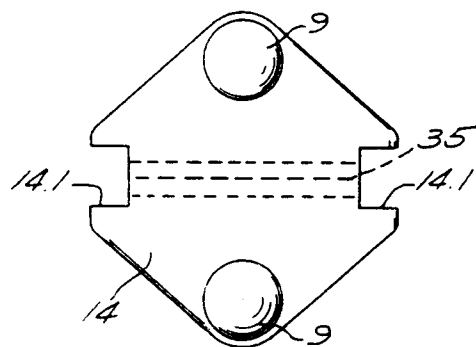


FIG. 9C

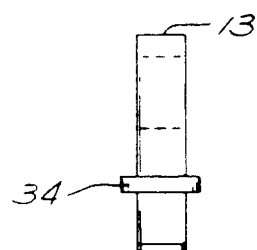


FIG. 10B

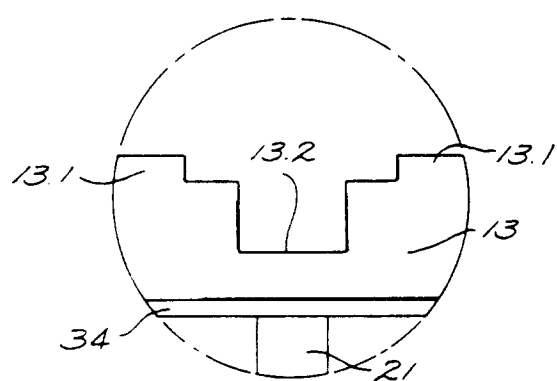


FIG. 10A

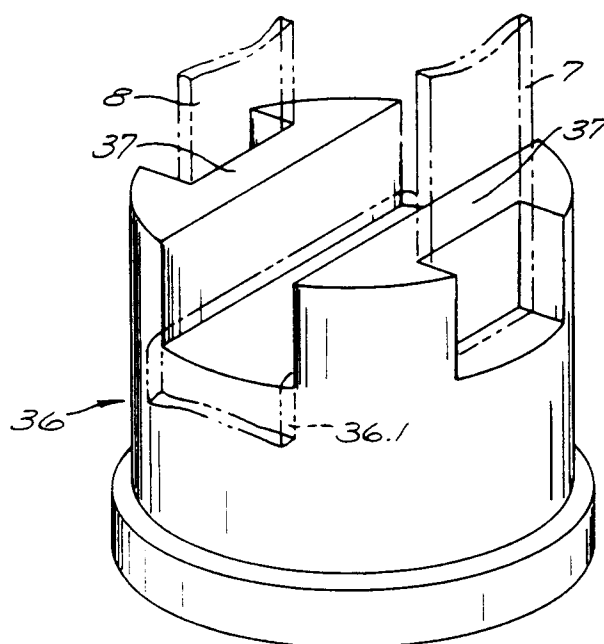


FIG. 11

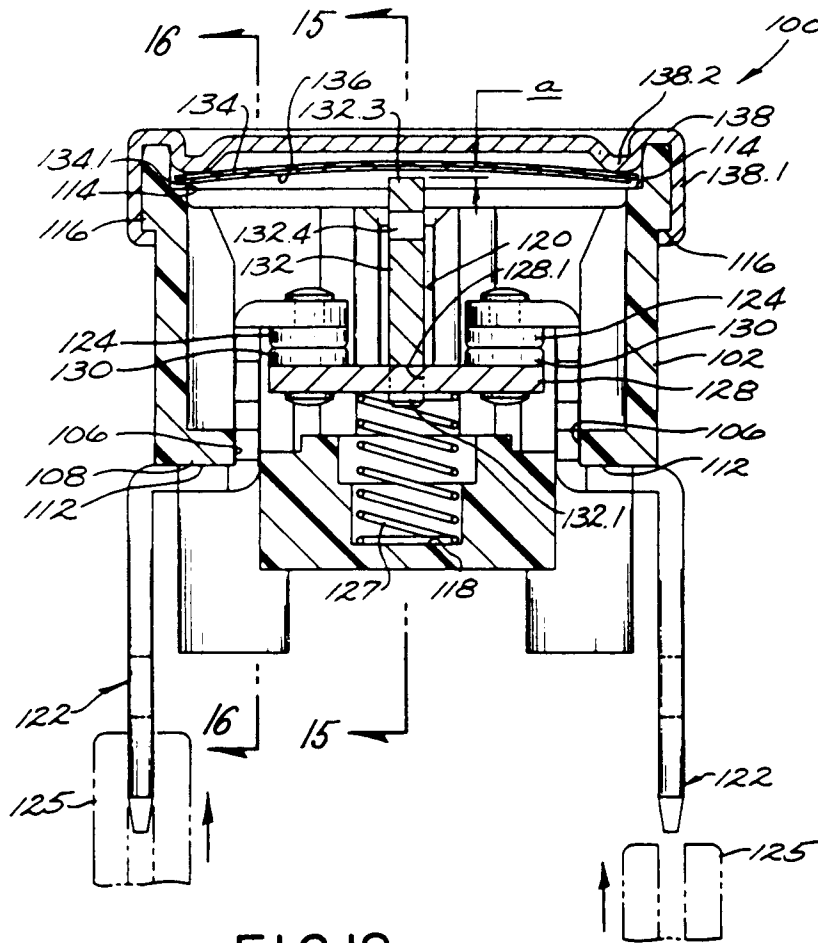


FIG. 12

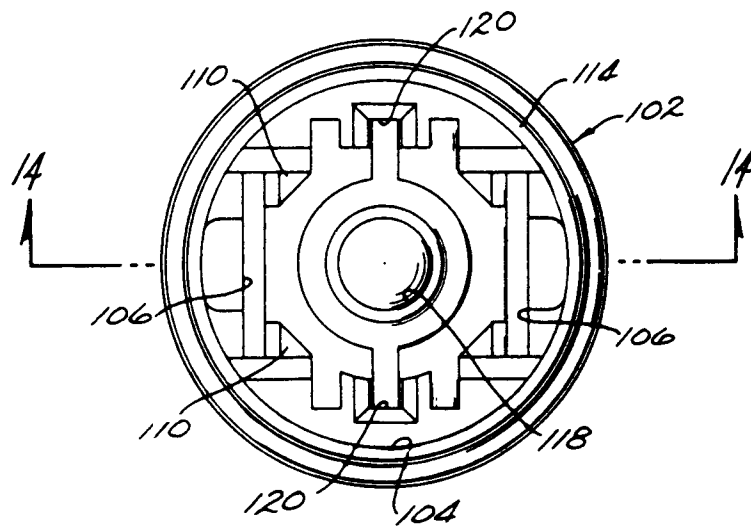


FIG. 13

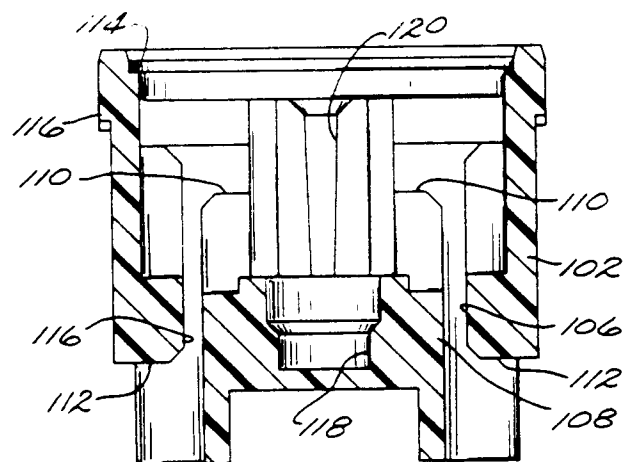


FIG.14

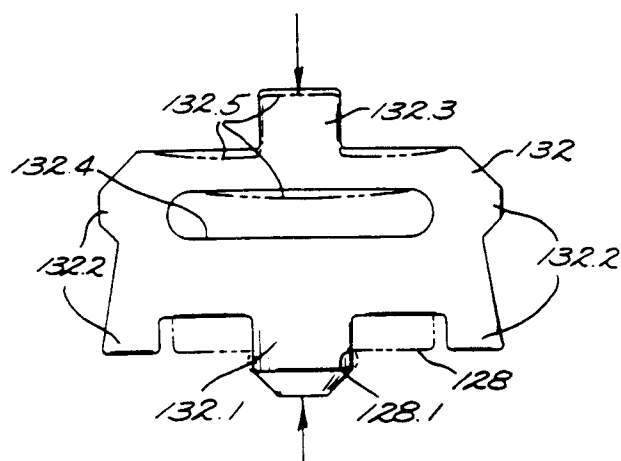


FIG.15

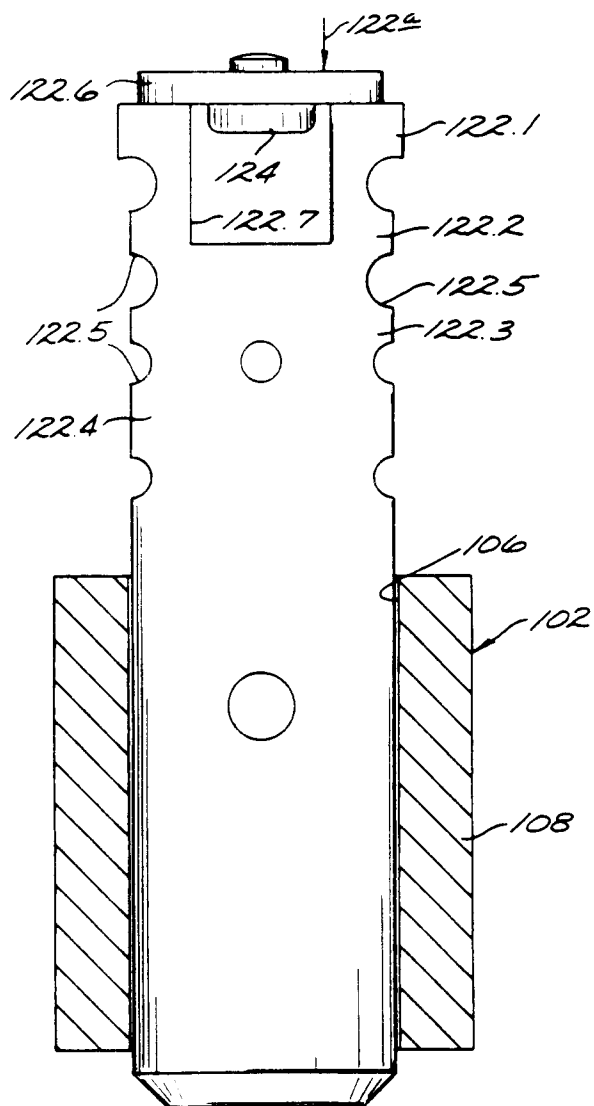


FIG.16