

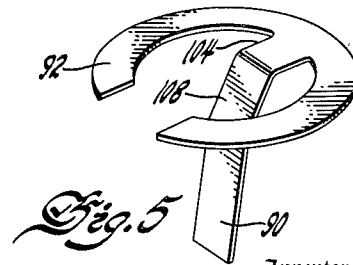
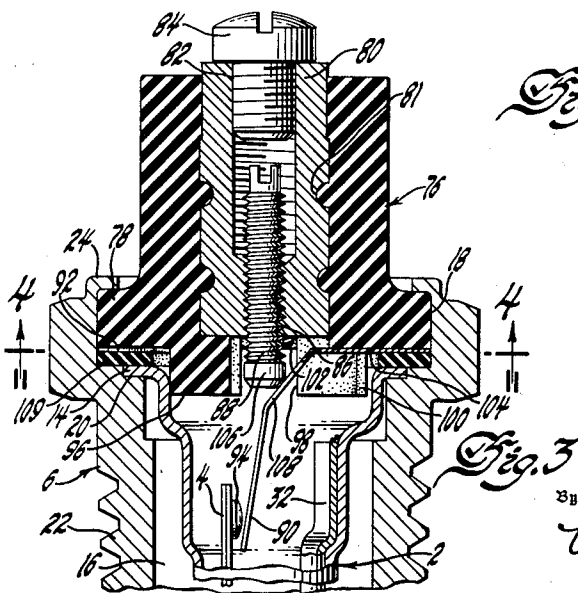
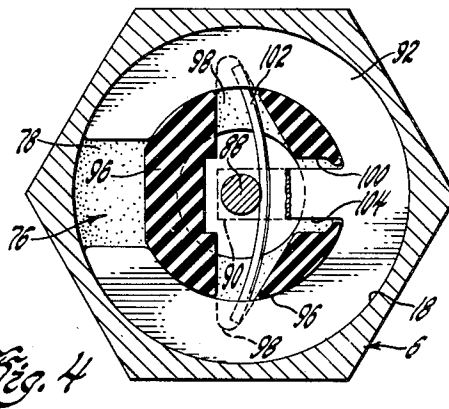
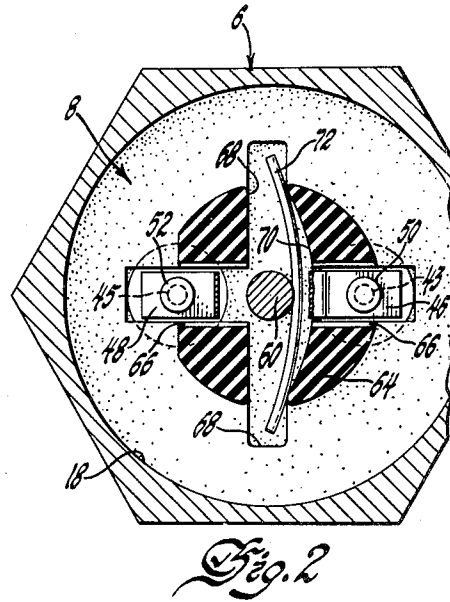
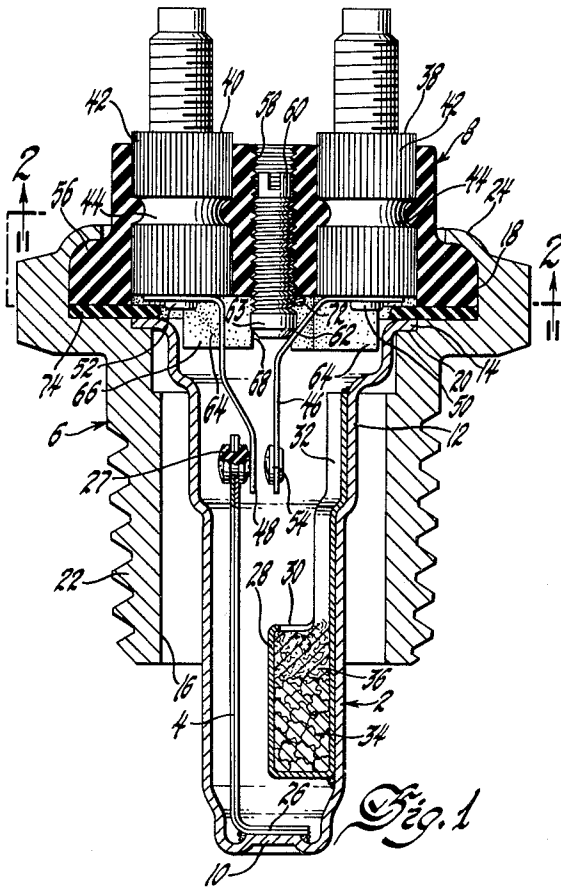
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THERMOSTATIC SWITCH

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THERMOSTATIC SWITCH

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The present invention relates to electrical switches and more particularly to thermally responsive electrical switches.

The object of the invention is to provide a thermostatic switch which is particularly useful for automotive vehicle applications and is simple, inexpensive and adapted to quantity production.

It is a further object of the present invention to provide a thermostatic switch for automotive vehicles which has improved means for manual adjustment of the switch contacts.

These and other objects are attained in accordance with the present invention by providing an electrical switch in which the switch contacts are controlled by a temperature responsive element of the bimetallic type and so constructing and arranging the switch structure that spacing between switch contacts may be controlled by a manually adjustable device accessible from the exterior of the switch.

For a better understanding of the invention reference may be had to the drawing in which Figure 1 is a cross-sectional view of a thermostatic switch embodying the present invention; Figure 2 is a view taken along the line 2—2 of Figure 1; Figure 3 is a cross-sectional view of a modification of the present invention; Figure 4 is a view taken along the line 4—4 of Figure 3; and Figure 5 is a perspective view of a contact element of the switch illustrated in Figure 3.

Referring now to the drawing and particularly to Figures 1 and 2 there is illustrated one modification of the present invention comprising a tubular member 2 containing a bimetallic element 4 and secured in a shell adapter 6 by an enclosing terminal plate 8. The tubular member 2 is provided with a closed lower end 10 and an enlarged upper end portion 12 which terminates in an outwardly extending circular flange 14. The adapter shell 6 is provided with an internal bore 16 adapted to receive the tubular member 2 and an enlarged internal bore 18 adjacent its upper end which is adapted to receive the terminal plate 8. Intermediate the bore 16 and the enlarged bore 18, the shell adapter is provided with a circular seating recess 20 which is adapted to receive the circular flange 14 extending outwardly from the upper end of the tubular member 2. The adapter shell is provided with a threaded external surface 22 adjacent its lower end adapting the shell to be threadedly secured in the engine of an automotive vehicle. Adjacent the upper end, the shell adapter 6 is enlarged and provided with a polygonal cross section to adapt the shell to turning by suitable turning instruments. A flange 24 extending upwardly and inwardly of the enlarged end of the shell adapter provides means for securing the terminal plate and tubular member in assembled relation in the shell adapter, as shown.

The bimetallic element 4 contained within the tubular member 2, comprises a composite metal strip of metallic materials of different temperature coefficients of expan-

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sion. Such composite metal structures are well known and used extensively in applications in which variations in temperature are utilized for electrical control purposes. The bimetallic element 4 is bent at substantially right angles adjacent its lower end to provide an end portion 26 adapted to be secured to the closed end of the tubular member 2. The bimetallic element 4 is positioned in the tubular member and secured by welding the end 26 to the wall of the closed end 10. The upper end of the bimetallic element 4 is provided with a contact 27 of suitable insulating material such as the material commonly known as "Bakelite." Also secured within the tubular member 2 is a receptacle 28 which is provided with an opening 30 at its upper end and a channel section 32 which extends upwardly from the end of the receptacle provided with the opening. The receptacle 28 is secured to the inner wall of the tubular member 2 by welding or other suitable securing means and provides a compartment internally of the thermostatic switch for storing a deliquescent material 34 such as the salt calcium chloride to absorb moisture and reduce corrosive action of moisture on the switch contacts. The deliquescent material is secured in the receptacle 28 by closing the open end of the receptacle with a material 36 such as cotton which is pervious to the surrounding atmosphere.

The terminal plate 8 comprises a disc-like member of suitable thermosetting insulating material such as "Bakelite" with a pair of electrical terminals 38 and 40 secured in the disc, as for example, by molding the disc around the terminals. The terminals are provided with knurled surfaces 42 and grooves 44 which serve to securely lock the terminals in the disc. The upper ends of the terminals 38 and 40 are reduced and provided with threaded surfaces to permit the attachment of electrical leads (not shown) to the terminals. Resilient metal terminal strips 46 and 48 are secured respectively to the terminals 38 and 40 by reduced portions 50 and 52 extending from the lower ends of the terminals through ports 43 and 45 respectively in the terminal strips 46 and 48. Attachment to the electrical terminals is obtained by peening over the ends of the reduced portions 50 and 52. As shown, the terminal strip 48 extends downwardly from the electrical terminal 40 with its end substantially juxtaposed and in engagement with the "Bakelite" contact 27. Adjacent the end of this terminal strip electroplated contact surfaces of silver are provided. Terminal strip 46 extends downwardly from electrical terminal 38 into a position juxtaposed to the lower end of terminal strip 48 and spaced therefrom. The lower end of terminal strip 46 is provided with an electrical contact 54 which is of suitable electrical conducting material such as silver.

To provide means for securing the terminal plate 8 in the adapter shell 6 the disc-like terminal plate is enlarged adjacent its lower end to provide a flange portion 56 adapted to be recessed in the enlarged bore 18 of the shell adapter. A threaded bore 58 at substantially the center of the terminal plate 8 is adapted to receive a threaded adjusting screw 60, the lower end of which engages the terminal strip 46 along an inclined portion 62. With such an arrangement of the threaded member 60 and terminal strips 46 and 48 it will be obvious from Figure 1 that as the threaded member is turned, it will cam the terminal strip 46 with its contact 54 either into or away from the juxtaposed end of the terminal strip 48, thus providing a convenient means for adjusting the spacing between contact surfaces. To prevent removal of the threaded screw 60 from the upper end of the threaded bore 58 the screw 60 is not threaded throughout its entire length thus forming a portion 63 adjacent the lower end which will not enter the threaded bore 58.

Extending downwardly from the terminal plate 8 is a

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portion 64 of reduced diameter which is provided with transverse channels 66 for receiving the upper ends of terminal strips 46 and 48 and channel 68 extending at right angles thereto. As shown in Figure 2, channel 68 has one wall 70 which is curved. With this arrangement an elongated resilient member 72 is disposed in channel 68 with its midportion in yielding engagement with the threaded member 60 and its end portions in engagement with the end edges of the curved wall of the channel 68, thus providing means for frictionally engaging the threaded member to prevent undesirable turning due to vibration of the device.

The switch is assembled by first inserting the tubular member 2 containing the bimetallic element 4 in the shell adapter 6 with the circular flange 14 seated in the circular recess 20 formed in the adapter shell. With the tubular member in position the flange is secured to the shell adapter by soldering. A circular gasket washer 74 is then seated in the enlarged bore of the shell adapter so that it is in surface engagement with the outwardly extending flange 14. Thereafter the terminal plate assembly is seated in the enlarged bore of the shell adapter and the upwardly extending flange 24 is crimped inwardly on the enlarged portion 56 of the terminal plate, as shown, thereby securing the tubular member 2, washer 74, terminal plate 8 and shell adapter in assembled relationship.

In the thermostatic switch illustrated in Figures 1 and 2 the terminals 38 and 40 are insulated from each other and from the shell adapter and tubular member thus requiring two lead wires for electrical circuit operation.

In the switch illustrated in Figures 3, 4 and 5 an electrical circuit connection to ground of the automotive vehicle engine may be made by connecting one electrical lead wire to the switch; the switch being so constructed and arranged that the shell adapter acts as a grounding terminal for one of the contacts. In this modification the tubular member, and the details of its construction, is the same as the tubular member of Figure 1. Likewise the adapter is the same. The switch of Figures 3, 4 and 5 differs in the details of structure of the terminal plate assembly 76. In this terminal plate structure, the external form of the plate is substantially the same to provide an enlarged portion 78 adjacent the lower end to adapt the terminal plate to be secured in the shell adapter as described in connection with the switch of Figures 1 and 2. To provide an electrical terminal, a bushing 80 which is preferably brass is centrally secured in the terminal plate by molding the terminal plate around the bushing. To lock the bushing in the terminal plate a plurality of annular grooves 81 are provided on the bushing. The bushing is provided with a threaded central bore comprising an upper enlarged bore 82 adapted to receive a threaded terminal screw 84 and a bore section 86 of reduced diameter adapted to receive a contact spacing adjusting screw 88. In this modification a resilient metal terminal strip 90 extends downwardly into the tubular member 2 with its contact end in juxtaposition with the upper end of the bimetallic element 4. The terminal strip 90 extends downwardly from and is integral with a split ring 92, shown in Figure 5. The lower end of the terminal strip 90 is provided with electrical conducting surfaces of silver or other suitable conducting material by electroplating the end of the terminal strip. In this modification the upper end of the bimetallic element 4 is provided with an electrical contact 94 of silver or other suitable electrical conducting material.

A reduced portion 96 at the lower end of the terminal plate 76 is provided with channels 98 and 100, channel 98 being adapted to receive an elongated resilient member 102 and channel 100 being adapted to receive the upper end portion 104 of the terminal strip 90 where it joins the split ring 92. As described in connection with the switch of Figures 1 and 2 the resilient member 102 is positioned in the channel 98 with its ends in engagement with the wall surfaces adjacent the ends of the channel

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and its mid-portion yieldingly engaging the adjusting screw 88, to provide a frictional engagement which resists turning of the screw. The screw 88 is provided with an unthreaded portion 106 to prevent removal of the threaded screw through the upper end of the threaded bore 86. Terminal strip 90 is provided with an inclined portion 108 which engages the end of the threaded screw 88 thus permitting the camming of the terminal strip 90 into varying spaced positions with respect to contact 94.

In the assembly of the switch of Figures 3, 4 and 5 the tubular member 2 is secured in the shell adapter as described above in connection with the device of Figures 1 and 2. A gasket 109 is then positioned in the enlarged bore of the shell adapter to engage the outwardly extending circular flange of the tubular member 2. With the gasket in position the terminal strip 90 with the integral split ring 92 is positioned on the gasket with the terminal strip 90 extending downwardly into juxtaposition with the contact 94. Thereafter the terminal plate is placed in the enlarged bore of the adapter shell and the assembly is secured by crimping the axially extending flange 24 inwardly and downwardly on the enlarged portion 78 of the terminal plate.

While the embodiments of the present invention as herein disclosed, constitute preferred forms, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A thermally responsive switch for automotive vehicles comprising an adapter shell for securing said switch in the engine of a vehicle, a tubular member secured in said adapter shell, said tubular member having a bimetallic contact member axially secured therein, a terminal plate of insulating material secured in said shell, said terminal plate having a terminal contact member secured thereto and extending downwardly and angularly into said tubular member into juxtaposition with said bimetallic contact member and means adjustably secured in said terminal plate to directly engage and regulate the relative position of said terminal contact member relative to said bimetallic contact member.

2. A thermally responsive electrical switch for automotive vehicles comprising an adapter shell for securing said switch in the engine of a vehicle, a tubular member secured in said adapter shell, said tubular member having a bimetallic member axially secured therein, a terminal plate of insulating material secured in said shell, said terminal plate having a pair of spaced terminal contacts secured thereto and extending into said tubular member, one of said terminal contacts being in engagement with said bimetallic member and movable thereby into engagement with the other of said terminal contacts in response to temperature variations and means adjustably secured in said terminal plate to engage and regulate the relative position of said other terminal contact.

3. A thermally responsive electrical switch for automotive vehicles comprising an adapter shell for securing said switch in the engine of a vehicle, a tubular member secured in said adapter shell, said tubular member having a closed end and a bimetallic contact member secured to said closed end and extending axially of said tubular member, a terminal plate of insulating material secured in said shell to close the other end of said tubular member, said terminal plate having a terminal contact member secured thereto and extending downwardly and angularly into said tubular member into juxtaposition with said bimetallic contact member and means adjustably secured in said terminal plate to directly engage and regulate the relative position of said terminal contact member relative to said bimetallic contact member.

4. A thermally responsive electrical switch for automotive vehicles comprising an adapter shell for securing said switch in the engine of a vehicle, a tubular member secured in said adapter shell, said tubular member having

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a closed end and a bimetallic member secured to said closed end and extending axially of said tubular member, a terminal plate of insulating material secured in said shell to close the other end of said tubular member, said terminal plate having a pair of spaced terminal contacts secured thereto and extending into said tubular member, one of said terminal contacts being in engagement with said bimetallic member and movable thereby into engagement with the other of said terminal contacts in response to temperature variations and means adjustably secured in said terminal plate to engage and regulate the relative position of said other terminal contact.

5. A thermally responsive electrical switch for automotive vehicles comprising an adapter shell for securing said switch in the engine of a vehicle, a tubular member secured in said adapter shell, said tubular member having a closed end and a bimetallic member secured to said closed end and extending axially of said tubular member, a terminal plate of insulating material secured in said shell to close the other end of said tubular member, said terminal plate having a pair of terminal members secured therein, spaced contact terminal strips secured to said terminal members and extending into said tubular member, one of said contact terminal strips being in engagement with said bimetallic member and movable thereby into engagement with the other of said contact terminal strips in response to temperature variations and a threaded member adjustably secured in said terminal plate with one end in engagement with one of said contact terminal strips, said threaded member being adapted to vary the spacing between said contact terminal members.

6. A thermally responsive electrical switch for automotive vehicles comprising an adapter shell for securing said switch in the engine of a vehicle, a tubular member secured in said adapter shell, said tubular member having a closed end and a bimetallic member secured to said closed end and extending axially of said tubular member, a terminal plate of insulating material secured in said shell to close the other end of said tubular member, said terminal plate having a terminal bushing located substantially centrally therein, a transverse channel provided in the inner face of said terminal plate, a contact terminal strip secured between said terminal plate and said tubular member in said channel and extending downwardly and angularly into said tubular member into juxtaposition with said bimetallic member, a threaded member adjustably secured in said terminal bushing with one end in engagement with said terminal strip, said threaded member being adapted to vary the spacing between said contact terminal strip and said bimetallic member.

7. A thermally responsive switch for automotive ve-

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hicles comprising an adaptor shell for securing said switch in the engine of a vehicle, a tubular member secured in said adaptor shell, a bimetallic member within said tubular member and secured thereto, a terminal plate of insulating material secured in said shell, said terminal plate having a terminal contact secured thereto and extending angularly into said tubular member into juxtaposition with said bimetallic member, a second contact movable by said bimetallic member in response to temperature changes to vary the position of said second contact with respect to said terminal contact and means adjustably secured in said terminal plate to directly engage and regulate the relative position of said terminal contact with respect to said movable contact.

8. A thermally responsive electrical switch for automotive vehicles comprising an adaptor shell for securing said switch in the engine of the vehicle, a tubular member secured in said adaptor shell, said tubular member having a bimetallic member axially positioned therein and secured thereto, a terminal plate of insulating material secured in said shell, a transverse channel provided in the inner face of said terminal plate, said terminal plate having a terminal contact in said channel and extending angularly into said tubular member, a second contact within said tubular member positioned for movement by said bimetallic member into engagement with said terminal contact in response to temperature changes, and a threaded member adjustably secured in said terminal plate with one end in engagement with said terminal contact, said threaded member being adapted to vary the spacing between said terminal contact and said movable contact.

9. A thermally responsive electrical switch as set forth in claim 6 including a second transverse channel in the inner face of said terminal plate, a resilient member positioned in said second channel and in contact with said threaded member for resisting its adjustment in said bushing, said threaded member being adapted to complete the electrical circuit between said terminal bushing and said contact strip.

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