April 22, 1941. F. C. EVANS 2,238,881

THERMOSTATIC SWITCH

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FIG. 1

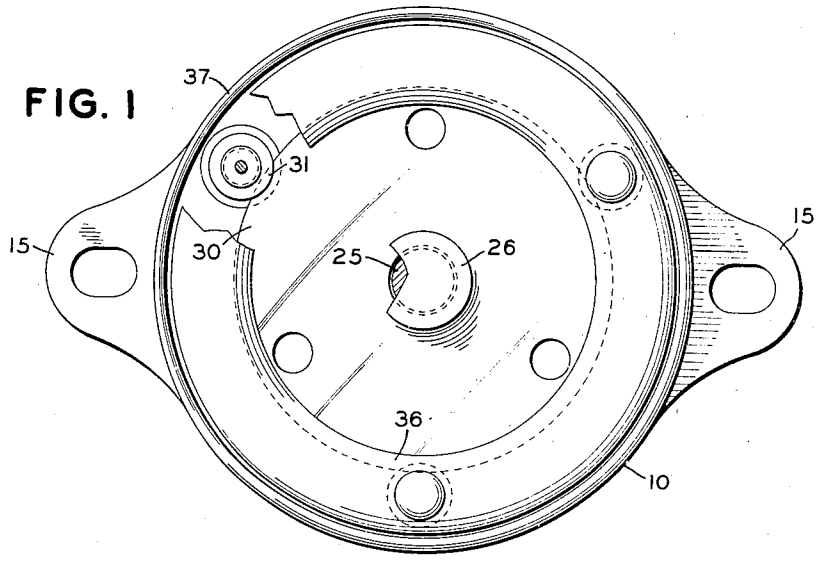


FIG. 2

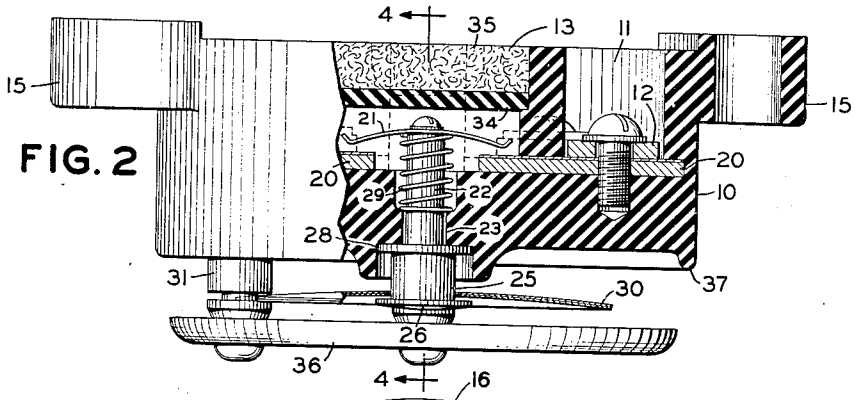
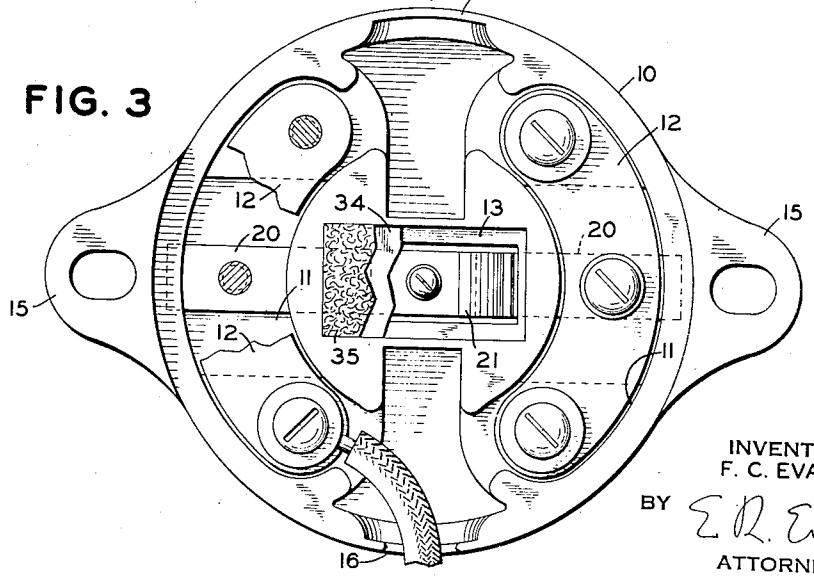


FIG. 3



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FIG. 5

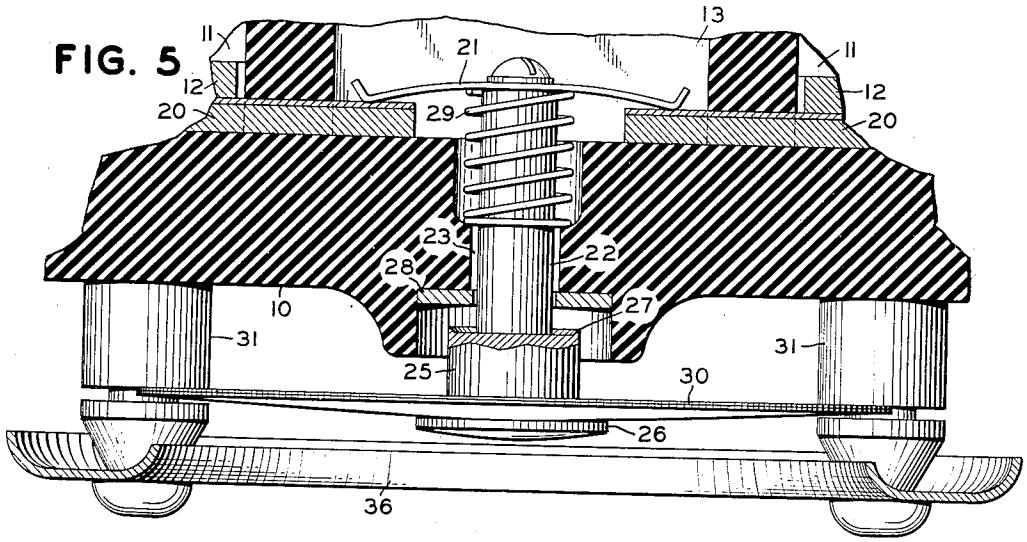
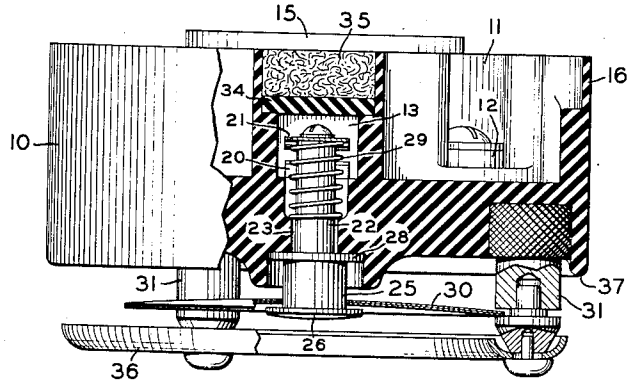


FIG. 4



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THERMOSTATIC SWITCH

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Application November 27, 1937, Serial No. 176,784

9 Claims. (Cl. 200—138)

This invention relates to thermostatic switches or alarm devices, more particularly for fire alarm systems.

Among the principal requirements for thermostats used in connection with fire detection systems may be mentioned the requirement that the thermo-sensitive element be exposed as completely as possible to the ambient medium and to direct radiation from the area in which fire may occur, while on the other hand the possibility of sending in false alarms by pressing against the exposed parts or otherwise tampering with the thermostat should be prevented. In addition the thermo-sensitive element and any other movable exposed element of the thermostat should be so mounted and shielded that it will not be affected by a deposit of dirt, dust, or or even of other foreign material, such as paint, on the exposed members during long periods of use. Furthermore the contacts of a thermostatic switch, where the alarm or temperature-responsive device includes a switch, should be adequately sealed to minimize deterioration of the contact surfaces by dirt, moisture or fumes since the switch may be installed for long periods of time before the occurrence of a fire and upon such occurrence must operate infallibly.

It is an object of the present invention to provide a thermostatic device fulfilling these requirements.

Another object of the present invention is to provide a thermostatic switch embodying an improved sealed contact construction.

Another object of the invention is to provide a thermostatic switch of the type that employs a bi-metallic cupped disc thermostat member for operating the switch contact and arranged so that the connection between the disc member and the switch does not bias the thermostat to affect the adjustment of the same or the temperature at which it operates.

Another object of the invention is to provide a thermostatic device of the type wherein the thermo-sensitive member is exposed in which improved means is provided for shielding the thermostat element and associated parts so that the operation will not be affected by a deposit of dirt or other foreign material.

A still further object of the invention is to provide an electric switch having the contacts thereof sealed in a simple and effective manner.

Other objects and advantages of the invention will appear from the following description of the preferred embodiment thereof shown in the accompanying drawings wherein:

Fig. 1 is a bottom or plan view of a thermostatic switch particularly adapted for use as a ceiling thermostat for a fire alarm system.

Fig. 2 is a side elevational view of the thermostatic switch shown in Fig. 1 in which a part of the base is shown in section in order to illustrate the internal construction more clearly;

Fig. 3 is a top plan view of the switch shown in Figs. 1 and 2;

Fig. 4 is a cross section taken on the line 4—4 of Fig. 2; and

Fig. 5 is a fragmentary view on an enlarged scale of the movable contact and operating member with the thermostatic disc shown in the "operated" position.

Referring to the drawings, the thermostatic switch illustrated comprises a substantially circular base member 10 which may be molded of "Bakelite" or other suitable insulating material. The base member 10 is provided with a peripheral recess 11 to receive the terminal plates or contacts 12 and a central recess 13 forming a contact chamber. The diameter of the body portion of the base member 10 is preferably so chosen that the switch may be mounted on the cover of an outlet box and project through a knockout hole of the box. The upper or rear portion of the base member 10 is provided with two apertured lugs 15 to facilitate the mounting of the switch either in an outlet box or by means of screws to the ceiling of the space protected by the alarm system. Obviously the shape and construction of the switch base may be widely varied in accordance with the requirements of any particular installation without departing from the scope of the invention.

As shown, the lugs 15 project beyond the body portion of the base so that a cover may be fitted to the rear of the base between said lugs to enclose the circuit terminals. The base member 10 is further provided with peripheral portions 16 of reduced cross section adjacent the terminal plates 12 whereby openings for the circuit wires or conductors may be provided by breaking out these portions, as indicated in the lower part of Fig. 3.

The switch further comprises two stationary contact members 20 adapted to be bridged by a movable contact member 21 which is mounted on the end of a movable operating member or stud 22. The contact members 20 may be molded in the base member 10 and be either integral with or extend into contact with the terminal plates 12 whereby the conductors or wires secured to said plates are connected together

when the operating stud 22 moves the bridging contact member 21 into engagement with the stationary contact members 20. The switch may also be arranged to break instead of make an alarm circuit when the operating stud 22 moves from its normal to its operated position by reversing the position of the contact members 20 with respect to the movable contact member 21.

The movable operating stud 22 for actuating the switch contact 21 projects through an aperture 23 in the base member 10, the cross-section of the aperture 23 being larger than that of the stud 22 to obviate frictional engagement between the stud and the base. The stud 22 is also provided with an enlarged shank portion 25 adjacent the head 26, the inner end of said shank portion being formed with a narrow or sharp sealing ring 27 adapted to effect a tight seal for the contact chamber by engagement with a sealing gasket or washer 28 (see Fig. 5). The operating stud 22 is normally urged in an upward direction by a helical spring 29 to maintain the sealing ring 27 against the gasket or washer 28, the length of the stud being sufficient to prevent contact between the head 26 thereof and the thermostat disc 30, as clearly shown in Figs. 2 and 4, when the stud is in its normal or upper position.

In the embodiment shown, the thermo-sensitive element 30 comprises a bi-metallic cupped thermostatic disc member having a central aperture to receive the operating stud 22, and supported at its edges by a plurality of grooved supporting members 31 projecting from the base member 10. The disc member 30 is thus mounted in spaced relation to the opposing surface of the base member 10 with the low expansion convex surface of the disc adjacent said base member whereby the thermostatic member is exposed to free circulation of the ambient medium and the high expansion metal on the underside of said member is directly exposed to radiant heat. It will be evident that maximum sensitivity and rapidity of operation is insured by this relationship. The bimetallic cupped disc member 30 per se is well known and requires no detailed description. The disc member snaps from the position shown in Figs. 2 and 4 to that shown in Fig. 5 when the member is heated above the operating temperature. The mounting of the disc member as shown has the further advantage that the switch can not be operated by pressing on the exposed outer surface so that accidental or malicious false operation of the alarm is practically impossible.

Since the head 26 of the stud 22 is disengaged from the disc member 30 until the disc member snaps to the alternate position shown in Fig. 5, the adjustment or operating temperature of the thermostatic element is not affected as would be the case if the center of the disc member were restrained in its initial movement. Furthermore the disc member, in operating, strikes the head of the stud 22 a hammer blow which breaks loose any deposit of dirt or paint which may have accumulated on the exposed parts. As shown, the sealing gasket 28 is preferably disposed in a recess in the base member 10 to prevent the formation of a heavy deposit of dirt or other foreign matter at this point.

The contact chamber may be sealed at the rear by a cover 34 and a layer 35 of suitable sealing composition. Thus a hermetic seal is obtained without imposing a frictional load on the operating stud 22, which seal is effective until the sealing ring 27 breaks contact with the gasket 28, and the contact surfaces of the contact members 20 and 21 do not oxidize or tarnish even after the device has been installed for a long period.

In order to further protect the exposed thermostatic disc member 30 against the formation of dirt or paint deposits at the points of support of the edge of said disc member sufficient to affect the adjustment and sensitivity of the device, means such as a guard ring 36 is provided to envelop or shield the edge of said disc member, at least where the same engages the supporting members 21. The guard ring is also carried by the members 21 as shown or may be supported in any convenient manner. Thus if the thermostatic switch is subjected to a paint spray or installed in a dust-laden atmosphere, the guard ring 36 collects the foreign matter which would otherwise impinge upon the edge of the disc member 30 without substantially shielding the thermo-responsive element from convection currents or radiant heat. The guard ring also serves the additional purpose of protecting the thermostatic disc from accidental injury, such as that which might be caused by a person inadvertently hitting or brushing against a mounted thermostat with a ladder or other body. The ring also guards the thermostat against injury which might be caused by a careless installer dropping the thermostat from the ceiling while making an installation. The base member 10 is also provided with a depending lip 37 outside the periphery of the thermostatic disc member 30 to prevent dripping of moisture on the member 30 where condensation occurs on the underside of the base of the switch.

It will be apparent from the foregoing description of the preferred embodiment of the invention that I have devised a novel thermostatic device which may be exposed for long periods of time to relatively adverse conditions of use and which after such exposure will operate infallibly. As described, the connection between the thermostatic disc and the operating stud will insure the proper functioning of the device at a definite predetermined temperature. The positioning of the electrical contacts in a sealed chamber protects these contacts from corrosion or other deterioration which would occur if they were left exposed to ordinary atmospheric conditions.

The device provided by the present invention is susceptible to a number of modifications, which will be obvious to one skilled in the art, within the scope of the appended claims.

I claim:

1. A thermostatic electric switch comprising a base, cooperating contact members in a recess in said base, means for sealing said recess, thermostatic means outside of said recess and a frictionless actuating connection from the thermostatic means to said contact members whereby the thermostatic means is unbiased by friction during operation.

2. A thermostatic electric switch comprising a base having a recess and an aperture, a movable contact member in said recess, thermostatic means including an operating member for said contact member projecting through the aperture in said base and having a lateral sealing contact surface engaging the base, the cross-section of said operating member being smaller than that of said aperture whereby said means is unbiased by friction during operation.

3. A thermostatic electric switch comprising a base having a recess, a movable contact member

in said recess, an operating member for the contact member extending through the base, a flange on said operating member for engaging said base and sealing said recess and a bimetallic cupped thermostatic disc member on said base and operatively related to the operating member but normally disengaged therefrom until snapped from its normal shape by a change in temperature.

4. A thermostatic electric switch comprising a base having a recess, a movable contact member in said recess, an operating member for said contact member extending through the base, a bimetallic thermostatic disc member mounted on said base and adapted to engage said operating member, a sealing washer surrounding said operating member, and resilient means for holding said operating member in sealing engagement with said washer.

5. A thermostatic electric switch comprising a base having a recess, a movable contact member in said recess, an operating member for the contact member extending through the base, a bimetallic thermostatic disc member mounted on said base and adapted to engage said operating member, said base being further provided with a recess surrounding said operating member on the exterior of the base and a sealing washer disposed in said last mentioned recess whereby said washer is shielded from dirt or foreign matter to which the switch is exposed.

6. A thermostatic electric switch comprising a base, a bi-metallic cupped thermostatic disc member, grooved projecting members for supporting said disc member in spaced relation to said base, a contact member and operating means therefor cooperating with said disc member but normally disengaged therefrom for providing impact movement thereof by said disc, said supporting members and said operating means thereby providing for the unbiased operation of said disc member.

7. A thermostatic electric switch comprising a base having a sealed chamber, cooperating contact members disposed in said chamber, operating means for said contact members, said means extending outside of said chamber, an annular sealing surface formed on said operating means, a sealing gasket surrounding said operating means and resilient means for effecting engagement between said sealing surface and said gasket.

8. A thermostatic electric switch comprising a base having a chamber therein, cooperating contacts disposed in said chamber, an externally extending operating member for said contacts, a bimetallic thermostatic disc member operatively related to said operating member, a seal for said chamber associated with said operating member and resilient means for maintaining said seal until the operation of said contacts.

9. An electric switch comprising a base having a sealed recess, movable contact members in said recess, a movable frictionless contact-operating member projecting through a wall of said recess, an annular sealing means carried by said contact-operating member and a seat in the recess wall against which the annular sealing means rests to provide a seal.

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