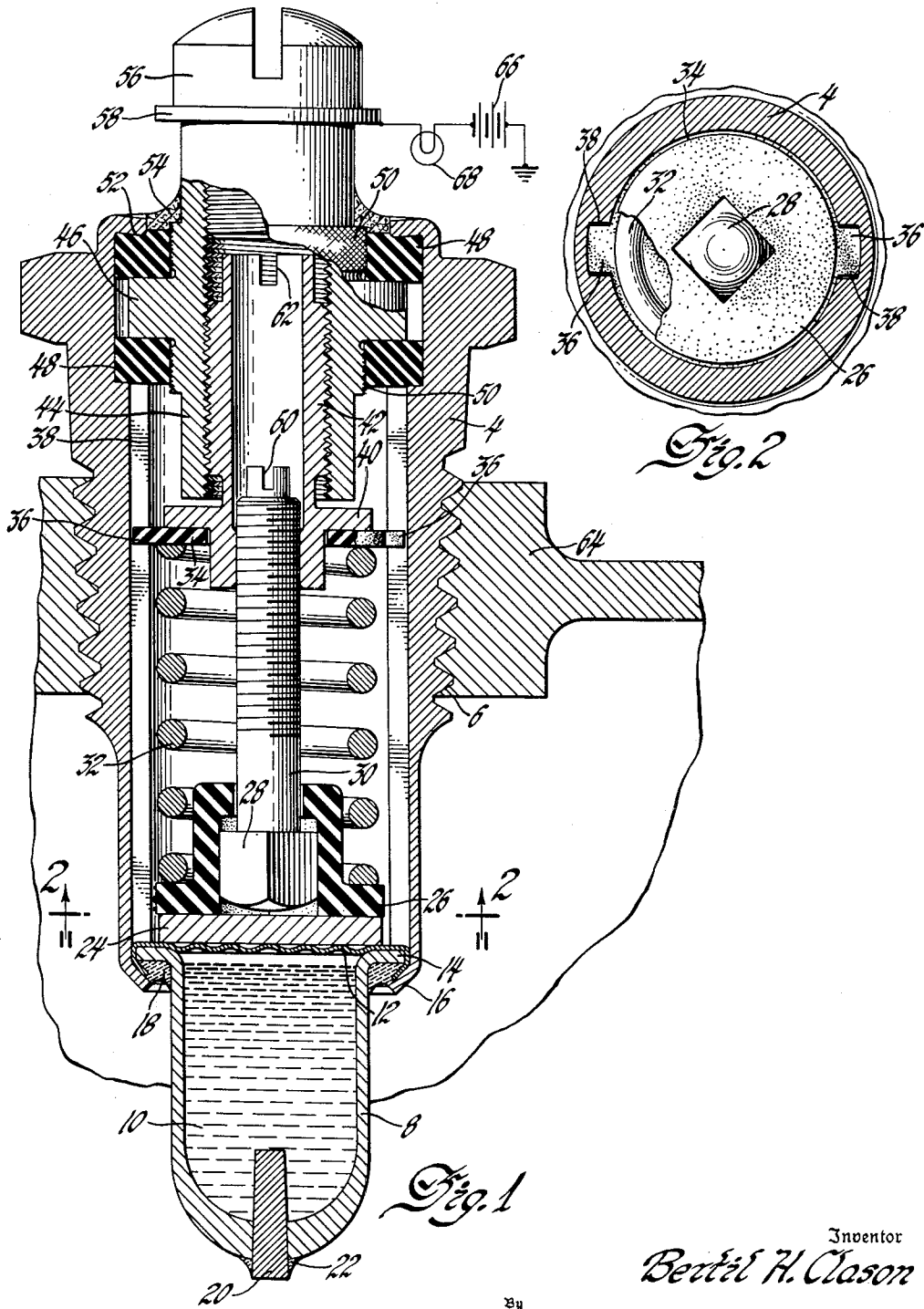


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B. H. CLASON
TEMPERATURE RESPONSIVE SWITCH

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Inventor
Bertel H. Clason
By *Spencer W. Little, William C. Baillie*
Attorneys

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TEMPERATURE RESPONSIVE SWITCH

Bertil H. Clason, Flint, Mich., assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

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This invention relates to the construction of a temperature responsive switch which is capable of general application but is particularly adapted for use in connection with a warning signal for an engine cooling system to close a circuit to a signal device when the temperature has reached some predetermined point.

One object of the invention is the provision of a switch unit of simple construction which can be relatively small in size and yet extremely reliable and accurate in operation.

A further object is to provide a switch construction which includes means to adjust the contact gap and readily calibrate the switch to operate at the desired predetermined temperature.

Other objects and features of the present invention will be apparent from the following description of the embodiment shown in the accompanying drawings.

In the drawings:

Figure 1 is substantially a central sectional view, with parts in elevation, of the switch as applied to an engine cooling system.

Figure 2 is a sectional view, with parts broken away, taken substantially on line 2—2 of Figure 1.

The present switch unit is shown as provided with an outer shell or casing 4 which may be externally screw-threaded, as indicated at 6, for a portion of its length to facilitate the mounting of the unit in any desired installation such as an engine cooling system.

The lower end of the casing 4 is connected to a metal reservoir or bulb 8 which is partly filled with some suitable material 10, such as ethyl ether, whose vapor pressure changes in response to temperature changes. The upper end of the bulb 8 is closed by a flexible metal diaphragm 12 which may be formed with a series of circular, concentric corrugations in the central portion thereof. The marginal portion of the diaphragm engages and extends downwardly around an outwardly extending flange 14 on the upper end of the bulb 8, and the diaphragm and bulb are secured to the casing 4 by crimping the bottom edge of the casing inwardly, as shown at 16, and sealing the joint between these parts by solder 18. The bulb 8 may be provided with an opening at the bottom through which the material 10 is introduced and this opening thereafter closed and sealed by the tapered plug 20 and solder 22.

A metal disk 24, which is adapted to function as one contact member of the switch, rests upon and extends slightly beyond the corrugated portion of the diaphragm 12. The disk 24 supports a retainer cup 26 of suitable insulating material

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having a square recess to slidably but non-rotatably receive the square head 28 of a screw 30 with a rounded end surface on the head 28 which is adapted to function as the other contact of the switch as will be hereinafter more fully described.

A coil spring 32 extends between the cup 26 and a disk or washer 34 of suitable insulating material which is slidably but non-rotatably mounted in the casing with outwardly extending lugs or ears 36 which are received in vertical guide slots 38 in the casing 4. The washer 34 is interposed between the upper end of the spring 32 and an outwardly extending flange 40 on a hollow, calibrating screw 42 which is adjustably mounted by means of external screw threads in a sleeve 44.

The sleeve 44 is rigidly secured to the casing 4 by means of an outwardly extending shoulder 46 on the sleeve which is clamped between upper and lower washers 48 of suitable insulating material. To prevent any rotation of the sleeve relative to the casing, the sleeve may be knurled, as indicated at 50, and after the upper end of the casing 4 has been crimped over the upper washer 48, the crimped edge may be staked at several places, as shown at 52, to keep the upper washer from turning relative to the casing. The joint between the upper end of the casing and the sleeve 44 is sealed with a suitable cement 54.

The upper end of the hollow sleeve 44 extends above the casing 4 and the internal screw threads for the calibrating screw 42 extend to the end of sleeve 44 to also receive a terminal screw 56 with washer 58 to provide for the connection of an electrical conductor to the switch unit. To facilitate the calibration of the unit in the manner to be hereinafter described, the contact screw 30 extends upwardly through the lower end of the hollow screw 42 in threaded engagement therewith and is provided with a cross slot 60 in its reduced upper end, and the screw 42 is also provided with a cross slot 62 at its upper end.

Although it will be understood that the present switch construction may be used in various applications it has been diagrammatically shown herein as associated with a warning signal for the cooling system of an engine to warn the operator if for any reason the temperature in the cooling system reaches a dangerous point. For such an installation the casing 4 may be conveniently threaded into an opening in a wall 64 of the engine head to locate the inner end of the unit with the bulb 8 within the usual water cool-

ing jacket of the engine. The engine block is customarily grounded and the warning signal circuit has been diagrammatically shown as including merely a storage battery 66 and a suitable warning signal such as a light bulb 68 connected to the switch unit by the terminal screw 56.

If the temperature of the water or other liquid in the engine cooling system reaches some predetermined danger point, the pressure which is generated within the bulb 8 and exerted on the flexible diaphragm 12 by increase of vapor pressure in the bulb, when heated in response to the increase in temperature of the surrounding engine cooling liquid, will become sufficient to move the diaphragm and disk 24 against the tension of spring 32 to complete a circuit to energize the signal light 68. It will be seen that this circuit extends through the switch unit from the terminal screw 56 and sleeve 44 to the hollow screw 42, contact screw 30, disk 24, diaphragm 12 and casing 4 to the engine head wall 64 which is grounded.

With reference now to the calibration of the unit so that the disk 24 constituting the movable contact of the switch will engage the end of the screw 30 constituting the relatively fixed contact of the switch to close the switch at the desired predetermined temperature, the initial spacing of the end of contact screw 30 from the disk 24 can be first adjusted by applying a suitable tool to the slotted upper end of the contact screw and rotating the screw relative to the hollow screw 42 in which it is threaded. It has been found that the desired contact spacing can be readily obtained after assembly of the unit with the terminal screw 56 removed by connecting the switch unit in a circuit with a light, rotating the contact screw 30 until it makes contact with the disk 24 to complete the light circuit and then backing up or rotating the screw 30 in the opposite direction about 45° to 60° beyond the point when the contact breaks the circuit.

Contact screw 30, calibrating screw 42 and sleeve 44 all have same number of threads to the inch. Thus calibrating screw 42 can be turned to compress spring 32 without changing the contact adjustment, as contact screw 30 is held stationary by retainer cup 26.

The switch is then calibrated by placing the lower end of the casing 4 with the bulb 8 in a reservoir of liquid at any desired predetermined temperature such as 190° F. until the material in the bulb reaches the temperature of the surrounding liquid, and then rotating the hollow screw 42 within the threaded sleeve 44 by applying a tool to the slotted upper end of the screw to compress the spring 32 until the tension thereof balances the disk 24 against the pressure being exerted thereon through the diaphragm 12 by the material in the bulb or until the contact between disk 24 and contact screw 30 is just broken. During this adjustment of the spring tension it will be apparent that the spring 32 will not be turned or rotated by the rotation of hollow screw 42 since the spring abutment washer 34 is held against rotation by the engagement of ears 36 in the slots 38 of casing 4, and that rotation of the contact screw 30 by the hollow screw 42 such as would change the initial contact spacing between the end of screw 30 and disk 24 is prevented by the engagement of the square head 28 of screw 30 within the square recess of the cup 26.

Although only a specific embodiment has been shown and described herein, it will be understood

that modifications and changes in the details of construction will be obvious to those skilled in the art and are contemplated as coming within the scope of the present invention as defined in the claims appended hereto.

I claim:

1. In a temperature responsive switch, a casing, a contact disk in said casing adjacent one end thereof, an internally threaded sleeve in said casing adjacent the other end thereof, a hollow screw threaded within said sleeve, a spring interposed between said hollow screw and said contact disk, a contact screw threaded in said hollow screw with one end thereof adjacent said contact disk, and means to move said contact disk against the tension of said spring into engagement with said contact screw in response to temperature changes.

2. In a temperature responsive switch, a casing, a contact disk in said casing adjacent one end thereof, an internally threaded sleeve in said casing adjacent the other end thereof, a hollow screw threaded within said sleeve, a spring interposed between said hollow screw and said contact disk, means between said spring and hollow screw to prevent rotation of said spring during rotation of said hollow screw relative to said sleeve to adjust the tension of said spring, a contact screw threaded in said hollow screw with one end thereof adjacent said contact disk, and means to move said contact disk against the tension of said spring into engagement with said contact screw in response to temperature changes.

3. In a temperature responsive switch, a casing, a contact disk in said casing adjacent one end thereof, an internally threaded sleeve in said casing adjacent the other end thereof, a hollow screw threaded within said sleeve, a spring interposed between said hollow screw and said contact disk, means between said spring and hollow screw to prevent rotation of said spring during rotation of said hollow screw relative to said sleeve to adjust the tension of said spring, a contact screw threaded in said hollow screw with one end thereof adjacent said contact disk, means to prevent rotation of said contact screw during rotation of said hollow screw, and means to move said contact disk against the tension of said spring into engagement with said contact screw in response to temperature changes.

4. In a temperature responsive switch, a casing, a closed chamber at one end of said casing having a diaphragm which is movable in response to temperature changes, a contact disk in said casing in engagement with said diaphragm, an insulating cup engaging said contact disk, an internally threaded sleeve secured to and insulated from said casing adjacent the other end thereof, a hollow screw threaded within said sleeve, an insulating washer engaging said screw, a spring interposed between said washer and said insulating cup, and a contact screw threaded in said hollow screw with one end thereof extending through said insulating cup in proximity to said contact disk to be engaged thereby on movement of said disk by said diaphragm.

5. In a temperature responsive switch, a casing, a closed chamber at one end of said casing containing a high volatile material and having a diaphragm which is movable thereby, a contact disk in said casing in engagement with said diaphragm, an insulating cup engaging said contact disk, an internally threaded sleeve secured to and insulated from said casing adjacent the other end

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thereof, a hollow screw threaded within said sleeve, an insulating washer engaging said screw and provided with outwardly extending ears mounted within slots in said casing to prevent rotation of said washer, a spring interposed between said washer and said insulating cup, and a contact screw threaded in said hollow screw with one end thereof extending through said insulating cup and provided with a square head engaging within a square recess in said cup to prevent relative rotation between said contact screw and cup with said end of the contact screw in proximity to said contact disk to be engaged thereby on movement of said disk by said diaphragm, whereby said contact screw can be rotated within said hollow screw to adjust the spacing between the end of said screw and said contact disk, and said hollow screw can be rotated in said threaded sleeve to adjust the tension of said spring with said spring and contact screw held against relative rotation by said insulating washer and said insulating cup, respectively, during rotation of said hollow screw.

6. In a temperature responsive switch, a casing, a contact member movably mounted in said casing adjacent one end thereof, means tending to move said contact member in one direction in response to increase in temperature, spring means tending to move said contact member in an opposite direction, means adjustably mounted in

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said casing to adjust the tension of said spring, and a contact mounted on said spring adjusting means adapted to be engaged by said contact member on movement thereof at some predetermined temperature.

7. In a temperature responsive switch, a casing, a contact member movably mounted in said casing, means tending to move said contact member in one direction in response to increase in temperature, spring means tending to move said contact member in an opposite direction, means adjustably mounted in said casing to adjust the tension of said spring, and a contact adapted to be engaged by said contact member on movement thereof at some predetermined temperature, said contact being adjustably mounted on said spring adjusting means to provide for adjustment of the spacing of said contact from said movable contact member.

BERTIL H. CLASON.

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