Nov. 30, 1965 K. W. YOUNG 3,221,125

TEMPERATURE SWITCH HAVING SLIDABLE THERMAL EXCHANGER

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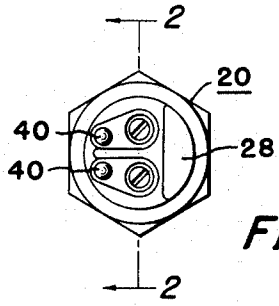


Fig. 1

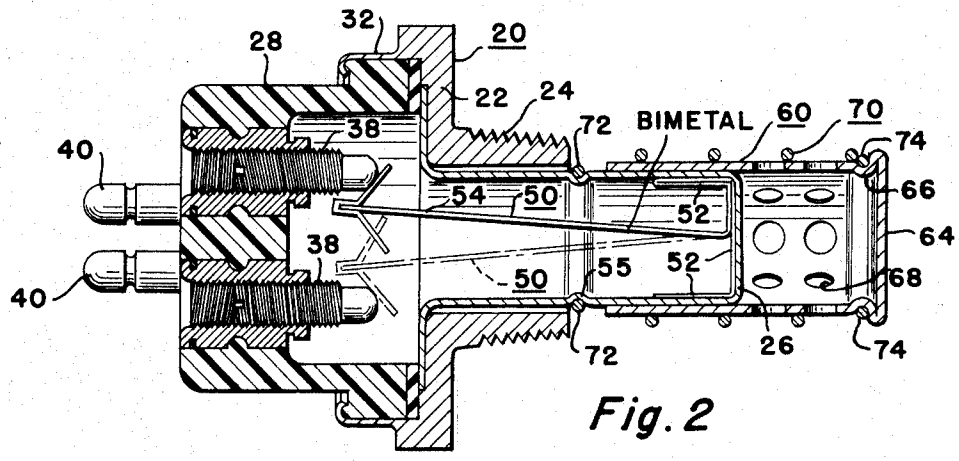


Fig. 2

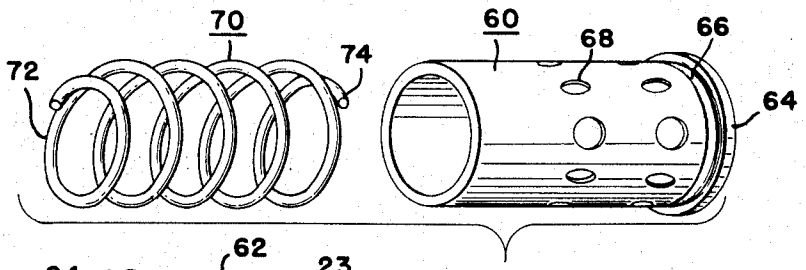


Fig. 3

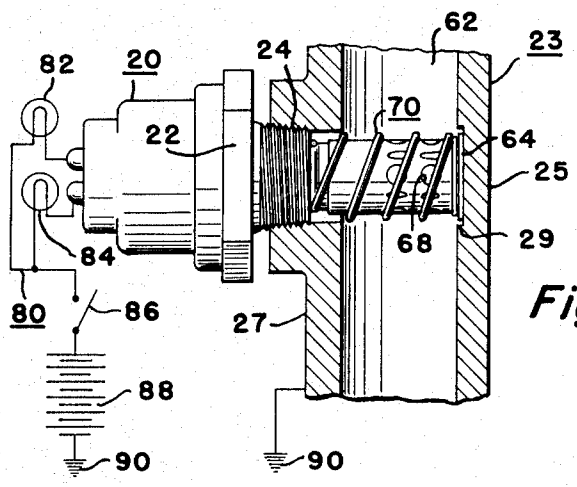


Fig. 4

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TEMPERATURE SWITCH HAVING SLIDABLE THERMAL EXCHANGER

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This invention relates to an improved control and more particularly to a temperature responsive control for use in indicating a temperature range of a fluid in a container or, in the alternative, its container temperature. In previous temperature responsive controls used to indicate temperatures in engine cooling systems and the like, the absence of fluid in such systems caused grossly inaccurate readings.

It is an object of this invention to provide a control which eliminates this problem.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

FIGURE 1 is an end view of a temperature responsive control according to the present invention;

FIGURE 2 is an enlarged sectional view along line 2—2 in FIGURE 1;

FIGURE 3 is an exploded perspective and enlarged view of the sleeve extension and spring arrangement; and

FIGURE 4 is a side elevation of the temperature responsive control mounted in a fluid container, the container shown sectionally.

In FIGURE 2 of the drawings, the numeral **20** designates the temperature responsive switch support or body having a projecting shoulder portion **22** and an extending threaded portion **24** adapted to engage a threaded portion of a container **23** as shown in FIGURE 4, Disposed within the portions **22** and **24** is a cylindrical or cup-shaped metallic and heat conductive member **26**. The member **26** provides an end closure means for the switch support **20** and supports the bimetallic element **50**. The opposite end of the switch support **20** is enclosed by an insulating member **28** which is held in sealing contact with the switch support **20** by the crimped-over extending flange **32** which also serves to hold the heat conductive member **26** in rigid attachment to the switch body **20**.

The switch **20** is of the general type shown in U.S. Patent No. 2,759,066 and is provided with a pair of contacts **38** arranged to effect good electrical contact with the bimetallic element. As is clearly shown in the drawings and which will be more fully explained later, the heat conductive member **26** is provided with an axially slidable, sleeve-type member hereinafter referred to as the thermal conductive member **60**. This thermal conductive member **60** is shown in FIGURE 3 in exploded view with its attaching spring means **70**. Thermal conductive member **60** fits over the heat conductive member **26** and is of a dimension that allows it to be moved axially over the heat conductive member **26** but yet maintains substantial contact between the two surfaces and is attached thereto by spring means **70**.

One end of the spring means **70** forms the spring retaining loop **72** which is of smaller diameter than the main loops of the spring means **70** and thus retains the spring firmly in retaining groove **55** of the heat conductive member **26**. Likewise, the opposite end of the spring means **70** forms a spring retaining loop **74** which is of a smaller diameter than the main loops of the spring means **70** and thus retains this end of the spring

means **70** firmly in retaining groove **66** of the thermal conductive member **60**.

In operation, the temperature responsive switch **20** is mounted as illustrated in FIGURE 4. The threaded portion **24** is threaded into container **23** by means of a tapered pipe thread arrangement. This mounting method also provides an electrical connection between the container **23** and the switch body **20** at the threaded portion **24** which is a portion of electrical circuit **80**. The circuit **80** comprises a battery **88**, a circuit breaker **86**, alternate indicating means **82** or **84**, contacts **38**, bimetallic element **50**, heat conductive member **26**, switch support **20** and a container as ground. It is clearly seen in FIGURE 4 that, even with a variance in dimension of the fluid space **62**, the contact between the flat conductive plate **64** and a rear wall **25** of the container **23** is kept positive due to the pressure of the spring means **70** which allows the thermal conductive member **60** to move along the surface of the heat conductive member **26**.

In operation, the fluid is circulated in fluid space **62** of container **23** and is allowed free movement past the switch and is caused to engulf the thermal conductive member **60** by passing through apertures **68** provided in the walls of the member **60**. This fluid will impart its temperature to both the thermal conductive member **60** and the heat conductive member **26** when mounted in the position shown in FIGURE 4. Thus, the bimetallic element **50** will sense the temperature of the fluid due to its contiguous mounting on the heat conductive member **26**. Depending on the temperature range desired, the bimetallic element **50** will be caused to bend toward one of the contacts **38** and will complete the electrical circuit **80** to an indicator means **82** or **84**. In the event the fluid in space **62** of container **23** is lost, this invention allows the continued indication of temperature by means of the thermal conductive member **60** and its constant contact with the rear wall **25** of the container **23**. The end of member **60** is in the form of a flat conductor plate **64** which is held in contact with the flat recess **29** in rear wall **25** by the spring means **70**. Thus, when the fluid whose temperature is being monitored escapes, the temperature of the rear wall **25** becomes the sensed temperature and heat from the rear wall is conducted to the flat conductor plate **64** through the thermal conductive member **60** to the enclosed portion of the heat conductive member **26**. In this manner, the bimetallic element **50** will respond to a high or low temperature just as though fluid were still present in the fluid space **62**.

The utility of this feature of the temperature responsive switch becomes particularly apparent in the example of an automobile cooling system. It being understood that an automobile cooling system is used by way of example and not by way of limitation. In such a system, without the invention, if the cooling fluid escapes, a misleading "NORMAL" indication continues until serious damage is done for the lack of a conductive means to the heat conductive member suspended in a now empty cooling system. With the present invention installed, the operator knows of a hot or cold engine block while the cooling fluid is circulating and, then, when it is of primary importance, knows the existence of an overheat condition when the cooling fluid has escaped.

While the embodiment of the present invention, as herein described and disclosed, constitutes a preferred form, it is to be understood that other forms, keeping within the spirit of this invention, might be adopted.

What is claimed is as follows:

1. The combination of a temperature responsive control for sensing the temperature of an automobile water jacket and an engine water jacket having a flat machined recess therein, said temperature responsive control comprising; a control body having a threaded portion and

received in a cooperating threaded aperture in a water jacket opposite the point where the flat machined recess is disposed, a heat sensitive element carried by a portion of the control body, a heat conductive member forming a closure means for the control body and being disposed to surround said heat sensitive element, a thermal conductive member disposed in sliding contact with an outer surface of said heat conductive member and during certain extremes of movement effecting an extension thereto, spring means carried by said heat conductive member and arranged to bias said thermal conductive member away from said control body towards the flat recess in the container wall, and means associated with said thermal conductive member for allowing the free flow of fluid in the container past the thermal conductive member, said thermal conductive member kept in biased engagement with the container wall thereby effecting a positive conductive relationship therewith, said thermal conductive member being arranged to transmit heat to said heat sensitive element thereby moving said heat sensitive element into engagement with electrical contacts carried by said control body, the electrical contacts being in conductive relationship to a series of indicating lights which are selectively energized in response to a direction of movement of the heat sensitive element.

2. A temperature responsive switch according to claim 1 wherein the means for allowing the free flow of fluid in the container is a plurality of randomly spaced apertures in the thermal conductive member.

3. The combination of a temperature responsive switch and an automobile water jacket having a flat recess therein, said temperature responsive switch comprising; a switch body having a threaded portion which is received in a threaded aperture in one wall of the automobile water jacket opposite a point where the flat recess is disposed, indicating means in conductive relationship the power source and a plurality of terminals mounted on the exterior of the switch body, a plurality of contacts carried in one wall of said switch body and having portions extending thereinto, said contacts being in conductive relationship to the exterior terminals, a bimetallic element disposed between said contacts and being adapted to selectively engage either of said contacts in response to temperature changes therein, heat conductive member forming a closure means for said switch body and being arranged to carry said bimetallic element, a sleeve type thermal conductive member slidably disposed on the exterior of said heat conductive member and being in conductive relationship therewith, and spring means carried by said heat conductive member and being arranged to bias said thermal conductive member toward the recess in the wall of the water jacket, said thermal conductive member being disposed in a position where it is in contact with water flowing through said water jacket and in the absence of water flowing in said water jacket being responsive to the temperature of the passage wall in the recess area.

4. A temperature responsive control for sensing a temperature range in a container, said control comprising: a control body supported on one wall of said container and extending into the container, a heat sensitive element carried on one portion of the control body, electrical leads electrically connected to a heat sensitive element, a heat conductive member enclosing said heat sensitive element, a thermal conductive member disposed in sliding juxtaposition with said heat conductive enclosing member so as to provide for adjustment of said thermal conductive member relative to said enclosing member effecting an extension thereto, and spring means constantly biasing said sliding thermal conductive member away from said switch body into engagement with the container wall, whereby said heat sensitive element is maintained in thermal exchange relationship with said container wall, said sliding thermal conductive member having a plurality of randomly spaced apertures for allowing the free flow of fluid in said container while the thermal conductive member is in any adjusted position.

5. A temperature responsive control for sensing a temperature range in a container, said control comprising: a control body supported on one wall of said container, a heat sensitive element carried by one wall of said control body, electrical leads electrically connected to a heat sensitive element, a heat conductive member enclosing said heat sensitive element, and a thermal conductive member disposed in sliding juxtaposition with the outer surface of said heat conductive enclosing member so as to provide for adjustment of said thermal conductive member relative to said enclosing member, effecting an extension thereto, spring means for biasing said thermal conductive member away from said control body and toward another wall of the container, said sliding thermal conductive member being attached to the switch body by said spring means, said sliding thermal conductive member having randomly spaced apertures to allow free fluid movement in said container, and having one portion biased into contact with the wall of said container whereby said heat sensitive element is responsive to fluid temperature or in the absence of fluid in said container, is responsive to container temperature.

6. A temperature responsive control for sensing a temperature range in a container, said control comprising: a control body supported on one wall of said container, electrical leads electrically connected to internally mounted contacts, a heat sensitive element, a heat conductive end member enclosing said heat sensitive element, spring means carried by said heat sensitive element, and a thermal conductive member disposed in sliding juxtaposition with the outer surface of said heat conductive end closing member so as to provide for adjustment of said thermal conductive member relative to said enclosing member and effecting an extension thereto, said sliding thermal conductive member being attached to the switch body by spring means, said sliding thermal conductive member having randomly spaced apertures to allow free fluid movement in said container, said sliding thermal conductive member having a flat conductive plate of corresponding size and biased toward a flat cast or machined recess in the container wall opposite the said switch mounting position and biased into contact with the wall of said container by said spring means whereby said heat sensitive element is responsive to fluid temperatures or in the absence of fluid in said container, is responsive to container temperature.

7. A temperature responsive control for sensing a temperature range in a container, said control comprising: a control body supported on one wall of said container, electrical leads electrically connected to internally mounted contacts, a heat sensitive element adapted to selectively engage the internally mounted contacts, a heat conductive end member enclosing said heat sensitive element, a thermal conductive member disposed in sliding juxtaposition with the outer surface of said heat conductive end enclosing member and effecting an extension thereto, and spring means engaging said thermal conductive member and said heat conductive end member to bias the thermal conductive member toward a wall of the container, said sliding thermal conductive member having randomly spaced apertures to allow free fluid movement in said contaienr, said sliding thermal conductive member having a flat conductive plate of corresponding size to a flat cast or machined recess in the container wall opposite the said switch mounting position, said flat conductive plate held in positive contact with said flat wall portion or recess by said spring means, whereby said heat sensitive element is responsive to fluid temperatures or in the absence of fluid in said container, is responsive to container temperature.

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