Dec. 20, 1966 W. C. SHAW 3,293,390

BIMETAL OPERATED COOLANT LEVEL SWITCH

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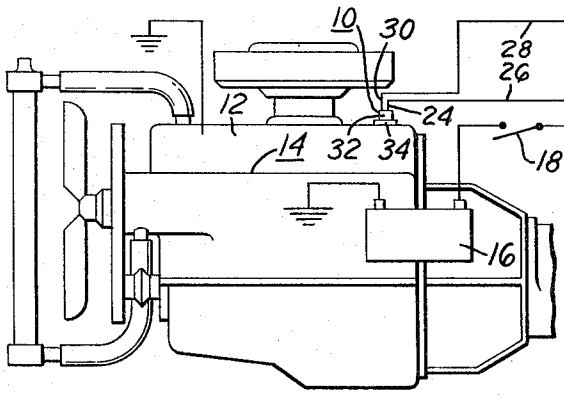


Fig. 1

Fig. 2

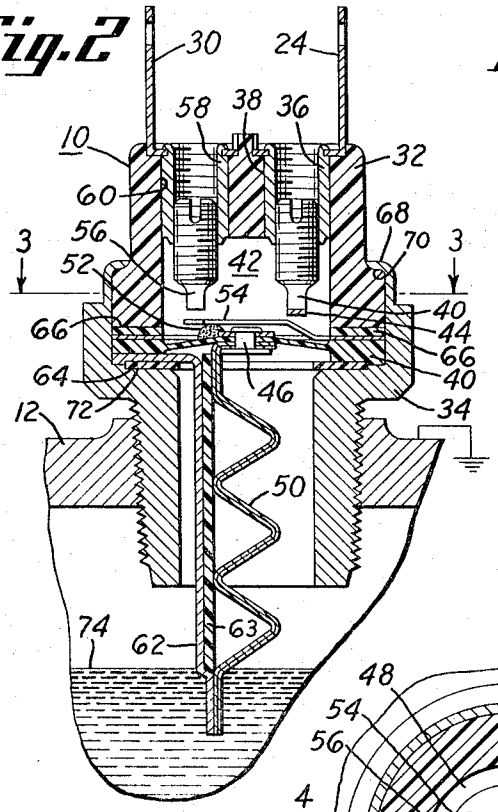
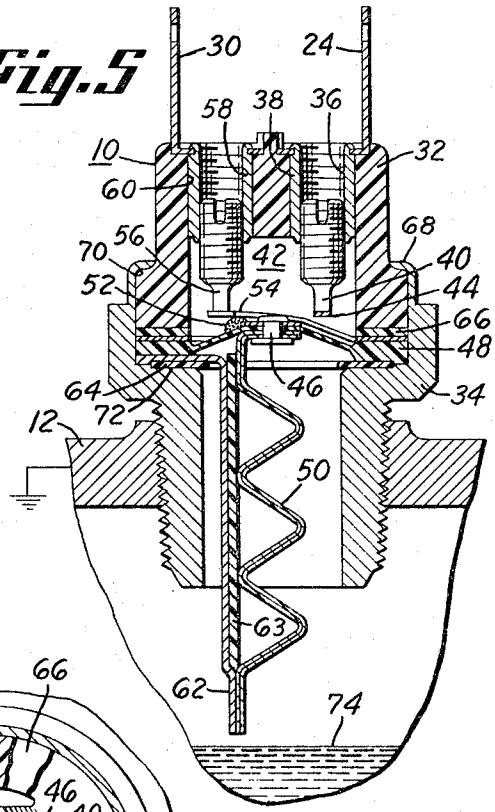


Fig. 5



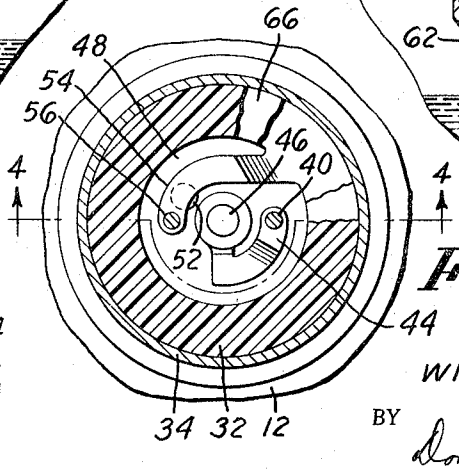
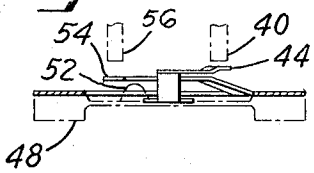


Fig. 3

Fig. 4



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BIMETAL OPERATED COOLANT LEVEL SWITCH

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This invention relates to electric switches and more particularly to a type of switch responsive to the temperature of fluid in a cooling system of a vehicle engine.

It is an object of the present invention to provide an improved electric switch adapted to be inserted into a wall of the cooling system of a vehicle engine which is responsive to an overheat condition therein.

It is another object of the present invention to provide an improved electric switch for sensing an overheat condition in a cooling system of vehicle engine, said switch using a bimetallic element deflectable along its longitudinal axis.

It is still another object of the present invention to provide an improved electric switch for use in sensing an overheat condition in a cooling system of a vehicle engine which has a novel means for sealing the operative area of the switch body from the cooling system.

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 elevational view of the subject invention shown in its operative environment;

FIGURE 2 is a sectional view of the subject invention, the switching mechanism shown in a configuration it would assume under normal temperatures in the cooling system;

FIGURE 3 is a sectional view taken along line 3—3 of FIGURE 2;

FIGURE 4 is a sectional view taken along line 4—4 of FIGURE 3;

FIGURE 5 is a sectional view of the subject invention, the switching portion shown in the configuration it would assume during an overheat condition in the cooling system.

Referring to FIGURE 1, a temperature sensitive switch **10** is illustrated as being inserted into a wall **12** of the cooling system of a vehicle engine, generally designated by the numeral **14**. A battery **16** supplies power through an ignition switch **18** to a light **20** through lead **22** and to a terminal **24** of the switch **10** through a lead **26**. The switch **10** is grounded directly to the wall **12** of the engine **14** as is the battery **16**. The light **20** is grounded selectively in a manner to be hereinafter described through lead **28** and a terminal **30** of the switch **10**.

Referring to FIGURE 2, the switch **10** includes a non-conductive portion **32** and a threaded conductive portion **34** adapted to be threaded into the wall **12**. A conductive sleeve **36** engaging the terminal **24** is pressed into an aperture **38** in the non-conductive portion **32** of the switch body **10**. A threaded conductive slug **40** is threaded into the sleeve **36** to a point in a switching compartment **42** wherein it can be conductively engaged by a first contact **44**. The contact **44** is carried by a conductive rivet **46** passing through a resilient member **48**. The rivet **46** also engages a sinusoidal shaped bimetallic element **50**.

An integrally formed raised portion or nipple **52** formed on the resilient element **48** is engageable with a resilient conductive strip **54** to drive said strip into engagement with a threaded slug **56** similar to the slug **40**. The conductive strip **54**, sometimes referred to herein as a second contact means, and the first contact means **44** are better seen in FIGURE 3 and FIGURE 4. The slug **56** is

threaded into a sleeve **58** pressed into an aperture **60** of the non-conductive portion **32** in much the same manner as the sleeve **36** and the slug **40**. The sleeve **58** conductively engages the terminal **30**.

The bimetallic element **50** is attached on an opposite end from the end engaging the rivet **46** by a conductive element **62**. An insulating member **63** is disposed between the major portion of the element **50** and the element **62**. The element **62** conductively engages the conductive portion **34** of the switch body **10** that is grounded to the wall **12**. An insulating ring **64**, the element **62**, the resilient element **48**, the second contact means **54**, and an insulating ring **66** are sandwiched in assembly of the subject switch between the non-conductive portion **32** and the conductive portion **34** by a crimped-over lip **68** engaging a pad **70** of the non-conductive portion **32** bearing against a wall **72** of the conductive portion **34**.

It should be noted that a conductive path normally exists through the terminal **24** connected to the battery **16**, to the sleeve **36**, the slug **40**, the first contact **44**, through the bimetal **50**, through the conductive element **62** to ground. Therefore, the bimetallic element **50** is normally heated and would deflect but for the cooling supplied it by a fluid **74** normally disposed in the cooling system of the vehicle. Therefore, the bimetallic element **50** and the coolant **74** are at an equilibrium temperature in a predetermined range of temperatures, for example, 0° to 240° F., which is the normal acceptable range of temperature in an engine cooling system. Another path for current flow potentially exists from the power source **16** and the light **20** to the terminal **30**, the sleeve **58**, and to the slug **56**. The slug **56** is selectively grounded by movement of the second contact means **54** engaging the slug **56** in response to a deflection of the bimetallic element **50**. It should be noted that the switch is constructed so that the slug **56** is grounded directly through the second contact means **54** directly engaging the conductive portion **34** of the switch **10**. Therefore, it is seen that the nipple **52** effectively advances the second contact means **54** ahead of the first contact means **44** while both contact means respond to movement of the resilient element **48** in a diaphragm-type manner engendered by the bimetallic element **50** during its deflection. It should be understood that resilient strip **44** is movable away from terminal **40** when the fluid **74** cools down sufficiently to contract the bimetal toward one extreme of movement.

In operation, referring to FIGURE 2, the configuration of parts herein typifies the relative position of the components during the normal functioning of the subject switch. By normal functioning is meant an operating condition of the cooling system of the vehicle wherein the coolant is within predetermined temperature limits. During this normal condition of operation, the heating of the bimetal **50** through the circuit entering the switch at the terminal **24** is offset in that the heat generated in the bimetal **50** is dissipated in the coolant or fluid **74**. The bimetallic element **50** is thereby restrained and no deflection takes place thereby maintaining a spaced relationship between the second contact means **54** and the slug **56**. It is therefore obvious that, during this condition of operation, the lamp **20** cennected to the terminal **30** is not grounded and is therefore not energized.

Referring to FIGURE 5, it is seen that the coolant or fluid **74** has receded to a point below the bimetallic element **50**. During this condition of operation, the heat generated in the bimetallic element **50** is not dissipated into the fluid **74** and, therefore, is free to deflect. The sinusoidal shaped bimetallic element **50** is deflectable substantially along its longitudinal axis and, therefore, slides along the insulating member **63**. As previously stated, the bimetallic element **50** directly engages the rivet **46**, the

sealing resilient member **48**, and the second contact means **54** indirectly through the nipple **52**. Therefore, as a deflection of the bimetallic element **50** takes place, the second contact means **54** is driven into conductive engagement with the slug **56**. Ground for the lamp **20** through the terminal **30**, the sleeve **58** and the slug **56** is therefore provided and the lamp **20** will become energized. It should be noted that the lamp **20** is preferably placed in the driving compartment of a vehicle wherein it is visible to the operator thereof.

The resilient element **48** can be of any elastomeric material that is an electric insulator and that is impervious to chemical substances normally found in cooling systems of vehicles. The element **48** also serves as a water seal between the cooling system of the vehicle and the compartment **42** wherein the switching action takes place. The combination of the linearly deflectable bimetallic element **50** and the resilient member **48** engaging the contacts **44** and **54** make possible a water proof switch that is easily insertable into a cooling system of a vehicle at any desired point to provide an indication of an overheat condition therein. It should be noted that the bimetallic element **50** normally has its heat dissipated in the fluid **74**. The bimetallic element **50** is preferably made responsive to a temperature of the fluid **74** above the normal desired operating temperature of the cooling system. It is clear that no fluid in the cooling system will have the same effect as an overheated fluid in that the heat from the element **50** will not be dissipated in either case.

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

What is claimed is as follows:

1. A temperature sensitive switch comprising: a switch body having a threaded body adapted to be threaded into a wall of a fluid container; a first terminal carried by said switch body and adapted to conductively engage a lead to a power source; a second terminal carried by said switch body and adapted to conductively engage an indicating lamp; a bimetallic element carried by said switch body and having a portion arranged to be suspended into a fluid passage, said bimetallic element being deflectable substantially along its longitudinal axis in response to temperature changes of fluid in the fluid passage; first movable contact means carried by said bimetallic element and being drivable into engagement with said first terminal; second contact means carried by said switch body and being grounded therethrough; and resilient means engaging said bimetallic element insulating an area of said switch body in which the switching takes place and adapted to be driven by said bimetallic element during a deflection thereof in response to a temperature change of the fluid in the container into conductive engagement with the second terminal means, said first contact means being deflectable while engaging the first terminal means and deflecting during the time when said second contact means deflects into said second terminal.

2. A temperature sensitive switch comprising: a switch body having a threaded body adapted to be threaded into a wall of a fluid container having a fluid passage; a first terminal carried by said switch body and adapted to conductively engage a lead to a power source; a second terminal carried by said switch body and adapted to conductively engage an indicating lamp; a bimetallic element carried by said switch body and having a portion arranged to be suspended into the fluid passage, said bimetallic element being deflectable substantially along its longitudinal axis in response to temperature changes of fluid in the fluid passage; first movable contact means carried by said bimetallic element and being drivable into engagement with said first terminal; second contact means carried by said switch body and being grounded therethrough; and a resilient member stretched between opposed portions of the switch body and effectively isolating an area within the switch body in which the first and second terminals and first and second contact means are disposed from fluid in the container, said resilient member having an integrally formed raised portion engaging said second contact means during a linear deflection of said bimetallic element thereby completing an electric circuit to the indicating lamp as the fluid in the container exceeds a temperature contained within said predetermined limits.

3. The temperature sensitive switch according to claim **2** wherein the bimetallic element is attached to the resilient member by a conductive rivet, said conductive rivet operatively carrying the first contact means.

4. The temperature sensitive switch according to claim **2** wherein the bimetallic element has a cross section of multiple sinusoidal shape thereby being arranged to be deflectable substantially along the longitudinal axis of said bimetallic element.

5. A temperature sensitive switch according to claim **2** wherein the first contact means is a resilient arcuately shaped deflectable metallic strip carried by said resilient means and said second contact means is an arcuately shaped resilient strip carried by said switch body in a complementary manner with respect to said first contact means.

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