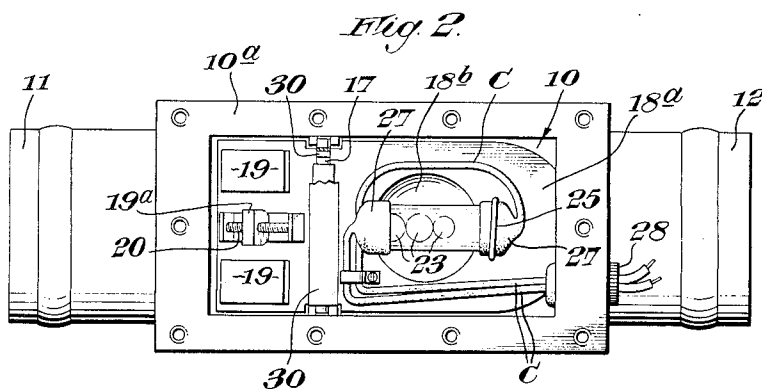


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ADJUSTABLE FLOW-RESPONSIVE TILT SWITCH

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2 Claims. (Cl. 200—81.9)

This invention concerns electrical switches, particularly, gravity switches for detecting faults in internal combustion engines and the like, wherein a liquid cooling system is used, the failure or incorrect functioning of which may result in serious damage to the engine.

An object of the invention is to provide a switch which can be connected for example, in a fluid passageway of the cooling system of an engine easily and simply, and which, when connected, will give an indication of malfunctioning of the cooling system, for example, a leaky hose coupling, leaking core plugs or other leakage or faulty operation of a water pump or impeller. Another object is to provide a switch, as stated above, which will indicate to the driver of a vehicle when a fault develops.

According to this invention there is provided a switch comprising first and second terminals, said first terminal consisting of an end portion and a projecting trough-like portion, said second terminal being spaced from said projecting trough-like portion remote from said end portion, and a ball of material of good electrical conductivity arranged to roll along said trough-like portion between a first position wherein it contacts said trough-like portion and a second position wherein it contacts both said trough-like portion and said second terminal to complete an electrical circuit between said first and second terminals.

The invention finds particular use as a means for detecting faults in internal combustion engines comprising a chamber with parts enabling same to be connected in the cooling system so that the coolant flows through the chamber. Pressure-sensitive means, disposed in said chamber are arranged to tilt the switch under abnormal operating conditions so that the ball moves from the first to the second position and an indicator is energised to provide a warning.

Preferably, the pressure-sensitive means consists of a flap valve, the position of which depends on the coolant liquid pressure in the system. The flap valve movement conveniently is transferred to the electric switch by mounting the switch thereon, said switch tilting according to the position of the flap valve. This tilting thus closes an electric circuit when the coolant pressure falls below a predetermined amount.

Thus the flap valve can be mounted to turn on an axis, and is located within the flow path of the coolant in the chamber. Pressure on the one side of the valve raises same to permit normal flow. The valve preferably is counterbalanced to ensure rapid operation. The counterbalance can be by means of weights which can be adjustable, i.e. towards and away from the axis of turning.

In order that a clear understanding of the invention may be obtained, reference will now be made to the accompanying drawings, illustrating a preferred embodiment in accordance with the invention. In the drawings:

FIGURE 1 is a sectional elevation of a unit controlled by water pressure according to this invention, and

FIGURE 2 is a plan view thereof with cover plate removed.

As shown in the drawings, 10 is a chamber having inlet and outlet ducts 11, 12, respectively, each arranged for connection in the liquid cooling system of an internal combustion engine so that the flowing liquid passes through the chamber. The chamber has a cover plate 13 which is attached by bolts 14, a suitable sealing washer

or plate 15 being provided, the cover plate being secured to an upstanding wall structure 10a of the chamber. From the inlet side of the chamber a plate 16 is fitted, this forming a throat or venturi.

A shaft 17 is mounted to extend across the chamber, and a flap plate 18 is mounted on the shaft to swing about the shaft axis. It will be noted that the one side 18a of the plate with respect to the pivot serves as a flap valve which, in the position shown, is lowered, the pressure of the flow of liquid through the chamber causing the flap to move. The other side of the plate carries a counterbalance weight assembly, consisting of fixed weights 19, 19, and an adjustable weight 19a, this latter being adjustable towards or away from the shaft 17 due to its mounting on a threaded rod 20. This weighting, due to its counterbalance adjustment, serves as a means whereby the pressure to move the flap side 18a can be set to requirements, for example, differences due to variations in pressure of different pumping systems.

An electric switch is provided, arranged so that when the pressure against the flap 18a falls below a predetermined amount, with consequent falling of the said flap, contacts close to energise a suitable warning device (not shown). This switch consists of a gravity-weight switch. This switch consists of a spoon terminal 21, a casing 22—which can be of a transparent material—metal balls 23, and a second terminal 24. The arrangement is such that the balls complete the electric circuit between the terminals 21, 24, when the plate falls to a certain position. The switch is held to the flap 18a at its end nearest the pivot shaft 17 by clips (not shown), and at its other end by a ring member 25 having an extending leg 25a, which latter passes through a hole through the flap 18a, and is secured by a locking collar and screw 26, this arrangement permitting the inclination of the switch with respect to the flap to be adjusted.

The connecting wires c, c to the contacts are brought out through insulating sleeves 27, 27, and a gland nut sealing outlet 28. Thus the switch contacts and wires are sealed against the liquid in the system.

In order to ensure that the flap 18a closes with sufficient rapidity and remains in its closed position despite slight pressure fluctuations, a dish part 18b is provided in the flap on the low pressure side. It will be seen that in the event of the failure of the liquid impeller, liquid on the suction side will result in an almost instantaneous closing of the switch.

In the case where the engine may be idling, there is the possibility that the consequent low pressure from the impeller may not be sufficient to lift the flap. In order to obviate this danger, a venturi system is provided by means of the curved baffle plate 16. This ensures the development of sufficient pressure in conjunction with correct balance and switch position, to prevent the warning from taking place when an engine is idling.

In order to secure the shaft 17 in position, a locking clip 30 is provided, this being of inverted U-form, the limb ends reaching down to the shaft 17. This holds the plate 18 on to the shaft. The ends of the limbs are bent inwardly to keep them clear of the walls of the chamber. The base of the clip is wider than the limbs, the base being fixed to or held in position by the plate 15.

When the engine is operating normally, there is a flow of coolant which will lift the flap, turning same on its pivots. This breaks the electrical circuit. Should any fault develop so that the flow fails or reduces to a predetermined extent, the circuit is established to give a warning.

The switch mounted as herein described will function due to the pressure obtained from the usual water pump, although this can be assisted electrically if desired.

I claim:

1. A gravity switch comprising a mounting plate adapted for mounting in a fluid passage rearward of a venturi therein, a horizontal axis whereabout said mounting plate is arranged to pivot under the action of fluid flowing in said fluid passage, a cylindrical switch casing pivotally secured by one end, to said mounting plate so as to extend transversely relative to said horizontal axis, to one side thereof, slidable locking means attached to the end of said casing remote from said one end, said slidable locking means securing said switch casing to said mounting plate so as to be adjustable about its pivot in a plane perpendicular thereto, end caps each arranged sealingly to enclose a respective end of said switch casing, a first terminal and a second terminal mounted at opposite ends of said switch casing, said terminals, being spaced by a switch gap, said first terminal having an end portion and a trough-like portion projecting therefrom towards said second terminal, first and second electrical leads respectively ducted by said end caps to said first and second terminals, a plurality of balls of good electrical conductivity arranged to roll in said trough-like portion between a first position in response to movement of said plate due to fluid flow in said fluid passageway wherein said balls contact said trough-like portion and a second position in response to gravity due to the absence of fluid flow in said fluid passageway wherein a first one of said balls contacts said trough-like portion, a second one of said balls contacts said second terminal and a third one of said balls, interposed between said first and second balls, ensures electrical contact therebetween whereby to complete an electrical circuit between said first and second electrical leads, and adjustable counterbalancing means disposed, on said plate, at the other side of said horizontal axis to said switch casing, said counterbalancing means being adjusted so as to cause said mounting plate to pivot, and said balls to move from said first position to said second position, when the flow of fluid in said passageway drops below a predetermined level.

2. A gravity switch comprising a mounting plate adapted for mounting in a fluid passageway rearward of a venturi therein, a horizontal shaft arranged to extend transversely of said fluid passageway whereabout said mounting plate is arranged to pivot clip means for locating said shaft in its position and for maintaining said plate on said shaft, a cylindrical transparent switch casing pivotally secured by one end, to said mounting plate so as to extend transversely relative to said horizontal shaft,

to one side thereof, slidable locking means attached to that end of said casing remote from said one end, said slidable locking means securing said switch casing to said mounting plate so as to be adjustable about its pivot in a plane perpendicular thereto, end caps each arranged sealingly to enclose a respective end of said transparent switch casing, a first and a second terminal mounted at opposite ends of said switch casing, said terminals being spaced by a switch gap, said first terminal having an end portion and a trough-like portion projecting therefrom towards said second terminal, first and second electrical leads respectively insulatingly ducted by said end caps to said first and second terminals, a plurality of metal balls arranged to roll in said trough-like portion between a first position, corresponding to a position of said mounting plate due to fluid flow in said fluid passageway, wherein said balls contact said trough-like portion, and a second position, corresponding to a position of said mounting plate in the absence of a predetermined minimum fluid flow in said passageway wherein a first one of said balls contacts said trough-like member, a second one of said balls contacts said first ball and a third one of said balls and said third ball contacts said second terminal whereby to complete an electrical circuit between said first and second electrical leads, and adjustable counterbalancing means disposed, on said plate, at the other side of said horizontal shaft to said switch casing, said counterbalancing means being adjusted so as to cause said mounting plate to pivot, and said balls to move from said first position to said second position, when the flow of fluid in said fluid passageway drops below said predetermined minimum fluid flow.

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