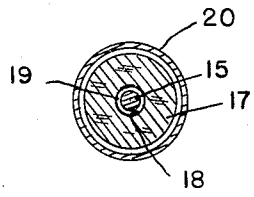
Oct. 12, 1965 L. D. BAKKE 3,211,856

LOW FLUID LEVEL CUT-OFF SWITCH

Filed Jan. 14, 1963

FIG.3.



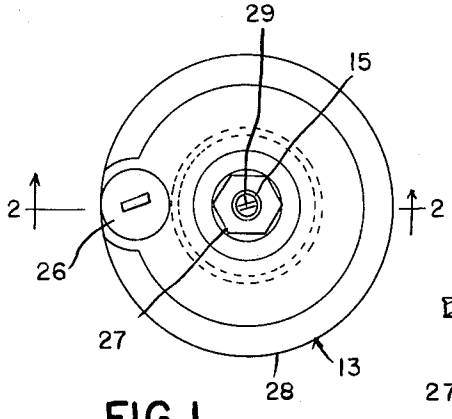


FIG.1.

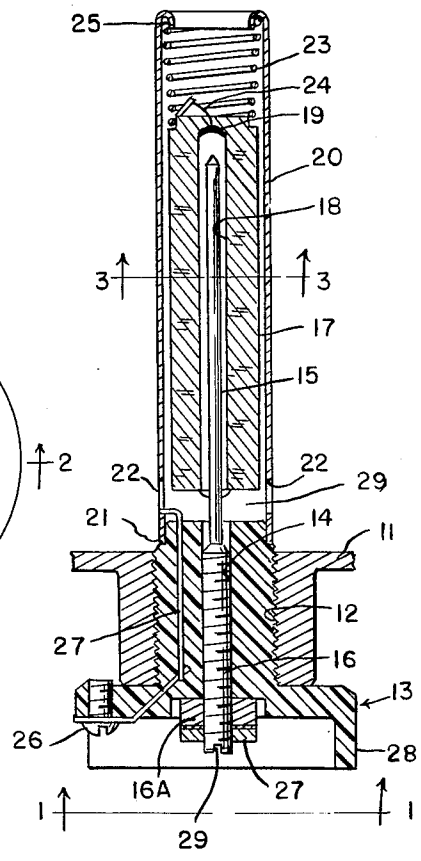


FIG.2.

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LOW FLUID LEVEL CUT-OFF SWITCH

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This invention relates to an electric switch that is activated by the level of fluid contained in a reservoir or sump.

The primary purpose and object of this invention is to provide a safety shut-off switch for internal combustion engines, in case of insufficient lubricating oil in the sump.

Another purpose of the inventoin is to provide a safety device for machines designed to operate with a predetermined amount of lubricating oil in the oil sump, whereas the machine is automatically shut off in the event the lubricating oil reaches a level too low to insure proper lubrication.

It will be apparent from the present disclosure that the present device is adaptable to be actuated by high fluid level as well as low fluid level. The device can thus be used as a high fluid level or a low fluid level indicator. It can be used to actuate a warning signal or to control an action through fluid level such as, for example, starting and stopping fluid transfer pumps, valves, or any other mechanism.

One object of the invention is to protect internal combustion engines by providing an electric switch which closes electric contacts when the fluid reaches a predetermined value in a fluid chamber, and which will maintain the contacts closed until the fluid level is sufficiently changed to open the contacts.

Another object is to improve fluid level actuators by providing an electric switch which is responsive only to predetermined permanent fluid level fluctuations and which is shielded against fluid and air turbulence that may be present within the fluid chamber.

Another object of the invention is to improve fluid actuated mechanisms by incorporating in a fluid level actuated switch electric contacts sealed against oxidation and corrosion by the fluid and made of materials that provide maximum corrosion resistance.

Another object is to increase versatility of fluid level indicators by constructing a switch which is adjustable to be set to operate at a predetermined fluid level.

Another object is to have this switch mounted upon an insulated plug that serves as a combination fluid seal and electrical insulator.

Still another object of the invention is to produce a fluid level responsive switch which is simple and cheap to manufacture, sturdy and foolproof in operation, and whose component parts are so arranged and shielded as to provide protection during handling and assembly into the fluid chamber or sump.

Other objects and advantages will be apparent from the description and claims, and from the accompanying drawings which illustrate a preferred embodiment of the invention, in which like numerals refer to like parts, and in which

FIG. 1 is a bottom view of the switch embodying the invention as seen from line 1—1 of FIG. 2.

FIG. 2 is a cross sectional view taken on the line 2—2 of FIG. 1.

FIG. 3 is a partial cross sectional view taken on the line 3—3 of FIG. 2.

In the drawings, the bottom of the fluid sump or chamber **11** has a threaded hole **12**, into which is screwed a plug **13**. The plug **13** is preferably made of nylon or any other material that is sufficiently resilient to be a good fluid seal and having good dielectric properties so as to act as an electrical insulator.

Substantially in the center of the plug, there is a threaded hole **14** into which is mounted a metal rod-like center contact **15**, preferably made of stainless steel.

The upper diameter of the center contact **15** is such as to allow it to be introduced, during assembly, through the hole **14**. The lower part of the center contact **15** has a thread **16** which screws into the hole **14**, and a nut **16A** is then tightened to lock the center contact securely in position.

Substantially concentrical to the center contact is a float **17**, made of low density moulded material, and having a bore **18** designed to enable the float to completely surround the rod **15**. The top of the bore **18** carries a contact **19**, made preferably of tungsten alloy, and positioned high above the fluid level.

Surrounding the float is a can-like metal shield or turbulence guard **20**, having its lower end fastened to the plug **13** as at **21**. Near this lower end there are a series of ports **22**, whose purpose is to allow the fluid level in the float chamber **29** to remain at all times the same as the level in the fluid sump. The shield **20** protects the float from air and fluid turbulence in the fluid chamber, from the effect of instantaneous changes of fluid level in the sump due to sloshing or agitation of the fluid and also from mishandling during assembly of the device into the fluid sump.

The contact **19** is connected to a contact spring **23** through a wire **24**. The contact spring **23** is fastened to the shield **20** as at **25**. The lower end of the shield is connected to a terminal **26** through a metal element **27**, imbedded in the insulated plug **13**. The other terminal **27** is at the lower end of the center contact **15**. A flange **28** of the insulated plug **13** acts as a guard to protect the terminals **26** and **27**.

The switch is connected in series in the circuit to be controlled through the terminals **26** and **27**. The path of the electrical circuit is as follows: from the terminal **26** to the element **27**, to the shield **20**, to the spring **23**, to the contact **19**; when the contacts **19** and **15** are engaged, the path continues through the contact **15** to terminal **27**.

As long as the fluid in the sump is above a predetermined level, the circuit is normally open, the float **17** being caused to rise against the contact spring **23**. The contacts **19** and **15** engage only when the fluid and, consequently, the float **17** drop below the predetermined level. The circuit then closes, actuating whatever control has been selected to be operated. The circuit will remain closed until the fluid level is raised sufficiently to make the float disengage the contacts.

The lower end of the center contact **15** has a slot **29**. A screw driver can thus be used to adjust the length of the center contact protruding within the float chamber, thereby determining with precision the level of fluid at which the switch will become operative.

It is to be understood that the invention is not to be limited to the specific embodiment herein illustrated and described, but may be used in other ways without departing from the scope of the invention and spirit of the appended claims.

I claim:

1. In combination with a fluid sump, an electric switch actuated by the level of fluid in said sump, and comprising

(a) an insulated plug-like base fastened in an opening in the bottom of said fluid sump,

(b) a stationary electric contact comprising an elongated vertical metal rod fastened to said base and

connected to one terminal on the outside of said base,

(c) a float operable to rise and drop in response to the rising and dropping of the fluid level in said sump and comprising an elongated cylinder of low density material and being provided with an elongated axially extending bore, said stationary contact rod extending into said bore and being encompassed by said float,

(d) a second electric contact connected to said float and operable to be engaged and disengaged with said stationary contact,

(e) means to electrically connect said contact to another terminal on the outside of said base,

(f) a tubular turbulance shield surrounding said float and said shield being radially spaced from said float and having perforations to admit fluid within said shield, and

(g) means to adjust said contacts to engage at a predetermined fluid level.

2. An electric switch actuated by variations in fluid level, comprising in combination a plug-like base fastened into an opening in the bottom of a fluid sump, one electric terminal on the outside of said base being connected to a tubular metal shield mounted upon said base on the inside of said sump and forming a float chamber, said shield having at its lower end ports to admit fluid into the float chamber, an elongated substantially cylindrical float within said float chamber radially spaced from the sides thereof and having an elongated bore along its longitudinal vertical axis, an electric contact secured in the top of the bore near the top of said float, said contact being connected to a spring means urging said float downward, and said spring being in turn connected to the shield near its top, a threaded hole substantially at the center of the plug-like base, an elongated rod-like metal contact screwed into said hole, its lower end forming the other electric terminal and its upper end projecting within the bore of said float and being caused to engage with the float contact when said float descends within the float chamber, the fluid level at which said contacts engage and disengage being determined by the respective linear dimensions of the elements with further precise adjustment effected by screwing or unscrewing said rod-like contact to make it protrude more or less within said float chamber.

3. The combination claimed in claim **2** in which the float contact is of tungsten alloy and the rod-like stationary contact is of stainless steel.

4. A fluid level responsive switch comprising

(a) a stationary vertically extending contact rod element,

(b) an elongated float being provided with an elongated axially extending bore, said stationary contact rod element extending into said bore and being encompassed by said float,

(c) a contact carried in said bore to be engaged and disengaged with said contact rod element upon axial movement of said float, and

(d) said float and rod being disposed in a fluid sump structure whereby variations in fluid level will effect contact and separation of said elements upon axial movement of said float.

5. The switch as defined in claim **4** and including means resiliently urging said float downwardly in opposition to the buoyancy of said float in the fluid.

6. The switch as defined in claim **4** and including a housing structure secured to said sump structure, said housing structure being radially spaced from and substantially enclosing said float, said housing having ports near its lowermost portion for entrance and egress of fluid.

7. The switch as defined in claim **6** and having a resilient element connecting said housing to said float and operable to urge said float downwardly in opposition to the buoyancy of said float in the fluid within said housing.

8. The switch as defined in claim **6** and having means electrically connecting the float contact with said housing, two terminals located outside of said sump, and means electrically connecting said contact rod element and said housing respectively to the terminals.

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