July 20, 1948. C. L. MEINHOLDT 2,445,625

SAFETY SWITCH FOR INTERNAL-COMBUSTION ENGINES

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Fig. 1.

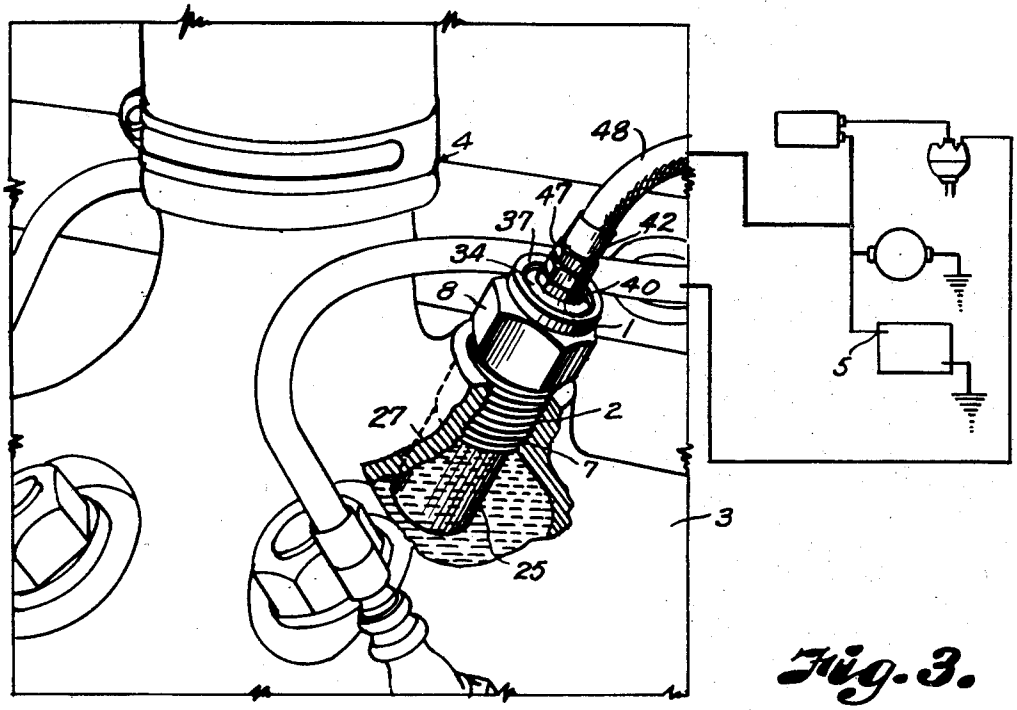


Fig. 2.

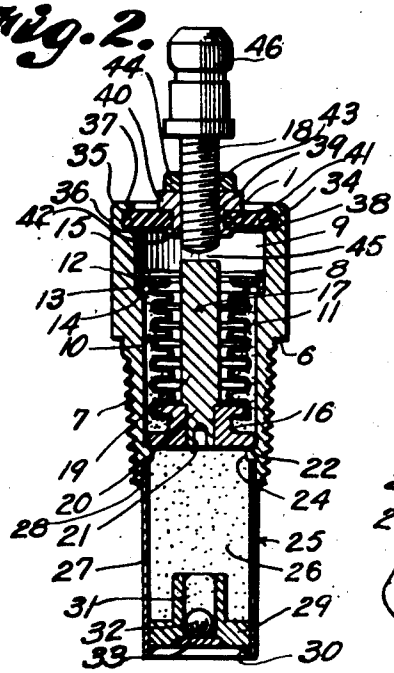
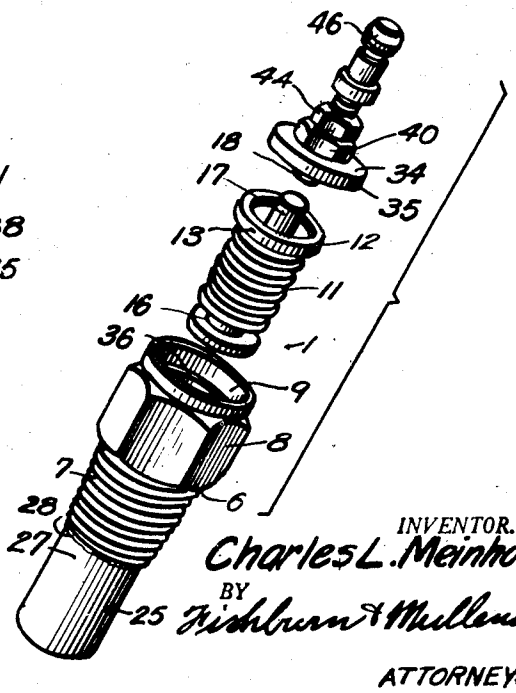


Fig. 3.



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SAFETY SWITCH FOR INTERNAL-COMBUSTION ENGINES

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2 Claims. (Cl. 200—140)

1

This invention relates to safety devices for internal combustion engines and the like and has for its principal object to suspend operation when the working temperature reaches a predetermined maximum; for example, when the cooling water supply becomes low, when the radiator fan belt slips on its pulleys, when there is a shortage of oil, or when some other condition arises that is hazardous to continued operation of the engine.

Other objects of the invention are to provide a device of this character adapted to be operated responsive to temperature of the cooling liquid; to provide a safety device that is of inexpensive construction and which is adapted to be installed in any one of the usual plugged openings of a cylinder head or block of an engine; to provide a safety device equipped with electrical contacts for connection with the electrical or other supply system which maintains operation of an engine; and to provide a safety device that is adjustable to actuate at a selected temperature.

In accomplishing these and other objects of the invention, I have provided an improved structure, the preferred form of which is illustrated in the accompanying drawing wherein:

Fig. 1 is a perspective view of a safety device constructed in accordance with the present invention and applied to the head of an internal combustion engine and which is shown as connected with the ignition system, the ignition system being illustrated in diagram.

Fig. 2 is a vertical section through the safety device.

Fig. 3 is a perspective view of the parts of the safety device shown in disassembled spaced relation.

Referring more in detail to the drawing:

1 designates a safety device constructed in accordance with the present invention and which is especially designed for mounting in one of the plugged openings 2 that are usually provided in the head 3 of an internal combustion engine 4 so that it is energized when the working temperature of the engine reaches a predetermined maximum to suspend operation of the electrical system 5 and thereby render the electrical system sufficiently ineffective to stop operation of the engine.

The safety device includes a shell 6 having an externally threaded wall portion 7 adapted to be threaded in the opening 2 and having an upper hexagonal portion 8 to be engaged by a wrench or the like for turning the shell into the opening. The shell 6 has a through bore 9 forming a chamber 10 for containing an accordion-type bellows 11, one end of which is rigidly attached relative to

2

the shell by an annular ring 12 having a flange portion 13 seated upon an internal annular seat 14 of the bellows chamber, the ring being soldered to the shell as at 15 to form a gas-tight seal thereabout. The lower end of the bellows carries a piston-like guide 16 that is slidable in the shell and adapted to shift a contact element 17 into engagement with a fixed contact element 18 later described. The contact element 17 includes a rod-like stem 19 having a reduced portion 20 sealed within an axial opening 21 of the piston-like guide to support the opposite portion of the rod-like guide coaxially within the bellows so that it projects through the anchoring ring 12. The piston-like guide normally seats upon an annular shoulder 22 that is formed by an internally extending flange 24 on the inner face of the shell as shown in Fig. 2. Sleeved within the open end of the bore on the side of the flange opposite the shoulder 22 is a bulb element 25 for containing an expansive fluid indicated at 26. The bulb 25 is formed of a cylindrical sleeve 27 formed of relatively thin material so as to provide rapid heat conduction therethrough to the expansive fluid contained therein. The sleeve is suitably retained within the open end of the shell to form a fluid-tight joint as by soldering or the like as indicated at 28. The lower end of the sleeve is closed by an inset head 29 sealed therein by soldering or the like 30. The head 29 may have a fill opening 31 through which the expansive fluid is inserted in the bulb and which is adapted to be closed to retain the heat expansive fluid by a ball valve 32 and a sealing material such as solder 33 that closes the outer open end of the opening 31.

The opposite end of the shell is closed by an insulating head 34 having the periphery 35 thereof seated upon an internal shoulder 36 and the hexagonal portion of the shell and which is retained thereon by turning over the rim 37 as shown in Fig. 2. Carried within an opening 38 of the insulator 34 and coaxially with the contact element 17 is an internally threaded bushing 39 mounting the contact element 18. The bushing 39 includes a head portion 40 engaging the outer side of the insulating head and which has a neck portion 41 extending through the opening 38 of the head and which has an edge 42 turned over the inner face of the head to securely anchor the bushing therein.

The contact element 18 comprises an externally threaded stud mounted in a threaded axial opening 43 of the bushing and carries a lock nut 44 which is adapted to be turned against the bushing after the threaded contact element has

been adjusted relative to the movable contact element 19 to provide a proper spacing 45 therebetween so that the bellows may operate responsive to expansion and contraction of the fluid 26 under the proper working temperatures of the engine without causing the engagement of the contacts. The outer end of the threaded contact element carries a terminal 46 that is suitably shaped to connect a snap socket 47 of an electrical conductor 48 which is adapted to be connected with the electrical system 5 to ground the ignition circuit through the shell 6 of the safety device.

In assembling the safety device, the sleeve 27 forming the bulb 25 is inserted in the open end of the threaded portion 7 of the shell 6 and sealed therein by the solder 28. Then the bellows carrying the guide 16 and anchoring ring 12 is inserted through the opposite end of the shell so that the flange 13 on the ring 12 seats upon the shoulder 42 with the guide 21 resting on the shoulder 22. The ring 12 is then sealed in position by the solder 15. The insulating head 34 carrying the bushing 39, threaded contact element 18, and the lock nut 44 is applied to the shell 6 so that the periphery thereof seats against the shoulder 36. The outer projecting portion 37 of the shell is then turned over the outer face of the insulating head 34 as shown in Fig. 2. The bulb is then filled through the opening 31 with an expansive fluid which is adapted to operate the bellows when the working temperature of an engine protected by the safety device reaches a predetermined maximum. After filling of the bulb, the opening is sealed by the solder 33. The safety device is readily applied to an engine by unscrewing the plug (not shown) which normally closes the internally threaded opening 2. The safety device is then applied by inserting the bulb portion thereof through the opening 2 and turning the shell of the safeaty device so that the threads 7 engage the threads of the opening 2.

When in position, the bulb 25 projects within the water space of the cylinder head and is entirely surrounded with the cooling liquid when the cooling liquid supply is adequate. The contact element 18 is then adjusted relative to the movable contact element 17 to provide a desired space 45 therebetween. After adjustment, the lock nut is tightened to engage the bushing so as to prevent rotation of the fixed contact element. The conductor 48 is then applied to the head 46 and connected with the electrical system so as to provide a ground through the shell 6 of the safety device whenever the contact 17 carried by the bellows engages the end of the fixed contact 18.

In operation, the spacing 44 will be maintained between the contact elements 17 and 18 under normal working temperatures of the engine; however, should the cooling water rise above a predetermined temperature, the expansion of the fluid in the bulb acts on the lower end of the bellows to bring the movable contact 17 into engagement with the fixed contact element 18, thereby providing a direct ground through the cylinder head 3 to cause suspension of the engine operation until such a time that the temperature falls within the working temperature range.

It is thus obvious that should the supply of cooling liquid become exhausted so that the engine tends to operate above the normal working temperature, the safety device will function to

stop operation thereof; likewise if the fan belt should become loose so that the fan does not properly cool the cooling liquid, the safety device will function; or the safety device will function in case of an inadequate lubricant supply; ineffective cooling of the cooling liquid, or for many other causes which are apt to be injurious to the engine should the engine continue to operate.

If desired, the safety device may be used as a switch for closing circuit to a signal which would indicate too high engine temperature without stopping the engine.

While I have particularly illustrated the invention as applied to an internal combustion engine, it is obvious that the device may be used in connection with any heat transmitting body which requires the use of a cooling liquid or wherein the bulb portion is adapted to be located in a position to be responsive to temperature of the heat transmitting body.

What I claim and desire to secure by Letters Patent is:

1. A safety device including a shell having an end adapted for mounting in an opening of an internal combustion engine, a bulb connected with said end of the shell and projecting coaxially therefrom for emersion in cooling liquid of the engine, said shell having axially spaced shoulders inset from the opposite end of the shell, a bellows in the shell having open and closed ends and adapted to be operated by heat responsive medium in said bulb, said open end of the bellows having an annulus engaging the inner of said shoulders, sealing means fixing the annulus to the shell for retaining the heat responsive medium, an insulator seated on the outer shoulder of the shell, a fixed contact carried by the insulator, a movable contact carried by the closed end of the bellows and extending coaxially through the bellows to project from the open end in registry with the fixed contact and adapted to engage the fixed contact responsive to contraction of the bellows by the heat responsive medium in said bulb, a guide on the closed end of the bellows and adapted for sliding contact with the shell during contraction of the bellows to retain said movable contact in coaxial alignment with the fixed contact, and means on the shell for retaining the insulator on the outer of said shoulders.

2. A safety device including a shell having an end adapted for mounting in an opening of an internal combustion engine, a bulb connected with said end of the shell and projecting coaxially therefrom for emersion in cooling liquid of the engine, said shell having axially spaced shoulders inset from the opposite end of the shell, a bellows in the shell having open and closed ends and adapted to be operated by heat responsive medium in said bulb, said open end of the bellows having an annulus engaging the inner of said shoulders, sealing means fixing the annulus to the shell for retaining the heat responsive medium, an insulator seated on the outer shoulder of the shell, a fixed contact carried by the insulator, a movable contact carried by the closed end of the bellows and extending coaxially through the bellows to project from the open end in registry with the fixed contact and adapted to engage the fixed contact responsive to contraction of the bellows by the heat responsive medium in said bulb, a guide on the closed end of the bellows and adapted for sliding contact with the shell during contraction of the bellows to retain said movable contact in coaxial alignment with the fixed contact,

means on the shell for retaining the insulator on the outer of said shoulders, and a stop in said shell for contact by the guide to support the closed end of the bellows when the contacts are in spaced relation.

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