Oct. 29, 1935. J. R. RIPPE 2,019,058

SWITCH

Filed June 26, 1933

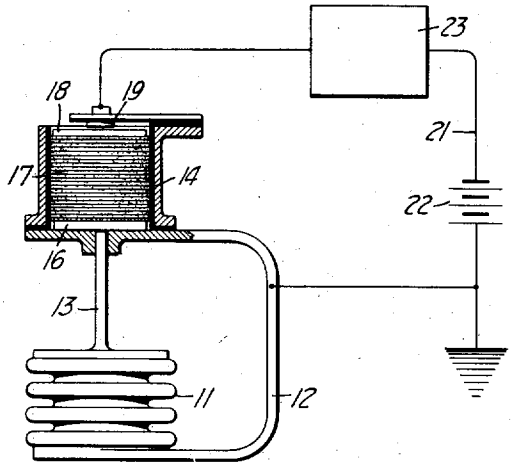


FIG_1_

FIG_2_

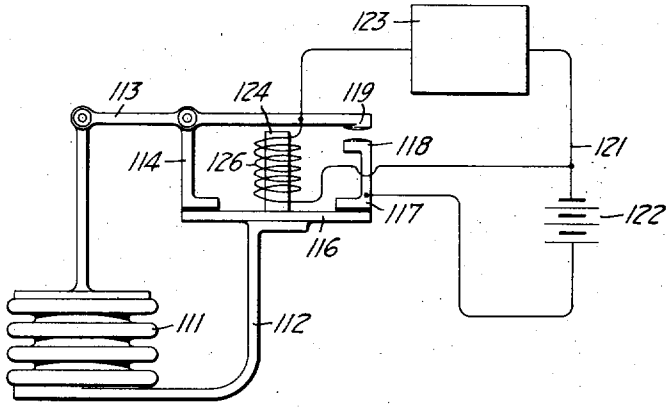
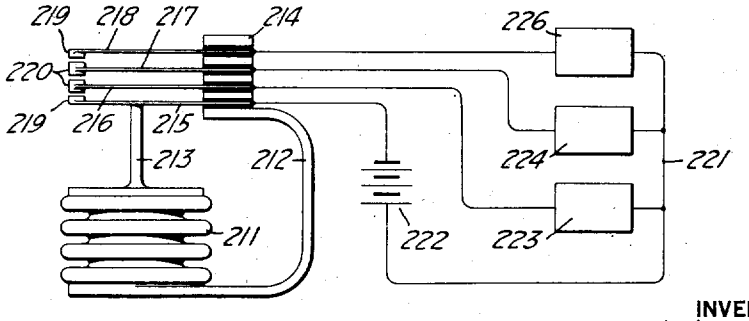


FIG_3_



INVENTOR
John R. Rippe
BY
White, Prost, Flehr & Lothrop
ATTORNEYS

'atented Oct. 29, 1935 2,019,058

UNITED STATES PATENT OFFICE

2,019,058

SWITCH

John R. Rippe, Fresno, Calif.

Application June 26, 1933, Serial No. 677,621

1 Claim. (Cl. 201—51)

The invention, generally, pertains to means for making and breaking an electrical circuit and, in particular, relates to means of such character which are thermo-responsive.

The switch of my invention has been designed primarily for use in connection with cooling system of automotive vehicles and, accordingly, reference will be made herein to the location of the switch in such a combination.

An object of the invention is to provide means for automatically placing into and out of operation units for circulating air or cooling water, or for controlling the flow of cooling water, about an internal combustion engine in response to variations in temperature of the engine.

Another object of the invention is to provide a switch which is readily and inexpensively installed and which requires a minimum of attention for relatively long operation.

A still further object of the invention is to provide a switch of the aforementioned character which is inexpensive to manufacture.

Other objects of the invention as well as the foregoing will appear from the following description of the preferred embodiment and of the two modified embodiments of the invention which are illustrated in the accompanying drawing. While but three embodiments of the invention are shown, it is to be understood that the invention is to be accorded a scope commensurate with the state of the prior art.

In the drawing:

Figure 1 is an elevation, partly in section, of an embodiment of the invention together with a diagram of the electrical circuit.

Figure 2 is an elevation of a modified embodiment of the invention, illustrating diagrammatically the electrical circuit which it controls.

Figure 3 is an elevational view of another modification of the invention, together with a diagrammatic view of an electrical circuit which it is adapted to control.

The switch of my invention is especially suitable for controlling the operation, either in definite sequence or in combination, of one or more units of a cooling system of an internal combustion engine, and in its preferred form preferably comprises a pair of relatively movable contacts interposed in an electrical circuit which includes an operating unit or units, together with thermo-responsive means for moving one of said contacts relative to the other to make and break the circuit.

The device which is illustrated in Figure 1 constitutes a slow-acting thermo-responsive switch which includes a metallic bellows 11 supported on a frame 12 which can be secured adjacent to the engine of an automotive vehicle and arranged so that the bellows is in contact with the water cooling system of the engine or in any such position on or near the engine that the bellows is influenced by the heat of the cooling liquid used as a cooling medium in the engine. If desired, however, the bellows 11 can be supported so as to be immersed in the water flowing through one of the pipes or in the water of the water cooling system of the engine. The bellows is filled with any suitable liquid which is expansible upon heating, such as a mixture of alcohol and water. Preferably the mixture is such that when the engine reaches a temperature of approximately 200° Fahrenheit the liquid boils and vaporizes and increases in volume, and the bellows expands correspondingly. When the temperature of the engine drops below a value of approximately 200° Fahrenheit, the vapor in the bellows condenses to liquid form and decreases to its initial volume, and the bellows correspondingly contracts to its initial or normal position. The temperature of the boiling point of the liquid used in the bellows may be varied by varying the proportions of alcohol and water so as to vary the temperature at which the bellows expands and so obtain the desired operating temperature of the engine.

The bellows 11 carries a rod 13 which is slidably supported in the framework 12 and which pierces a cylindrical casing 14 mounted upon the framework to engage a metal disc 16 disposed in the bottom of the casing. Preferably, the casing 14 is filled with a plurality or pile of carbon discs 17 or, if desired, granulated carbon may be utilized in place of the carbon discs, the discs 17 supporting a metal disc 18 which is adapted to be moved into engagement with a contact 19 which is insulated from the casing 14 and which is connected in an electrical circuit 21. The casing 14 is insulated from the framework 12 of the device, as well as from the metal disc 16, the carbon discs 17, the metal disc 18, and the contact 19. The framework 12 also is interposed in the electrical circuit 21 which may have as its source of power the standard or conventional storage battery 22 of the automotive vehicle in connection with which the switch of my invention is employed. The electrical circuit 21 also may include an operating unit 23 of the cooling system of an internal combustion engine, such as a variable speed motor for driving the fan and the pump, or either, of the cooling system.

In operation, and assuming that the engine is cold, the bellows 11 remains contracted or in its normal state. However, after the engine has become heated and attains a temperature of approximately 200° Fahrenheit, the liquid in the bellows boils and the increase in volume of the vaporized liquid causes an expansion of the bellows, the rod 13 thereby moving upward to bring the carbon discs 17, which are supported by the metal disc 16, into engagement with the metal disc 18, hence pushing the latter into engagement with the contact 19 and closing the circuit 21. Initially, the pressure upon the carbon discs 17 is relatively small, so that but a small amount of current flows in the circuit 21 which is sufficient to drive the variable speed motor 23 at a relatively slow speed. As the temperature of the engine increases, the pressure of the rod 13 on the metal disc 16 increases the pressure on the carbon discs 17, and the resistance to current flow decreases, so that a greater current flow results in the circuit 21 and the motor 23 is driven at an increased speed. Conversely, as the temperature of the engine decreases and falls below 200° Fahrenheit, the rod 13 lowers, due to the contraction of the bellows 11, thus gradually reducing the pressure upon the discs 17 and finally breaking the circuit 21 to cut out the operation of the motor 23. If desired, a simple make-and-break or quick action switch can be made with the above-described device, by eliminating the carbon discs 17 and permitting direct engagement of the metal discs 16 and 18 upon a raising of the rod 13 which forces the disc 18 into direct engagement with the contact 19.

While I have stated that the unit 23 may be a variable speed motor which is controlled by the variable resistance afforded by the carbon discs 17, the unit 23 may be any one or more of several operating units of the cooling system of an internal combustion engine. For example, an electric clutch can be interposed in the circuit 21 and used in conjunction with an electric motor for driving the fan or the pump of the cooling system. Further, two clutches may be utilized, if desired. The clutch can be made slow acting, so that when a relatively small current flows through the circuit 21 the pump or the fan is driven relatively slowly. As the resistance of the carbon discs 17 is decreased and the current in the circuit 21 is increased, the clutch engages more firmly to increase the speed of the pump or the fan. Moreover, if desired, the unit 23 may be an electrically-operated valve for controlling the flow of water in the cooling system of the engine. When the current of the circuit is small, the arrangement is such that the valve opens a relatively small amount, and as the current increases the valve opens correspondingly.

In Figure 2 of the drawing I have illustrated a modified embodiment of the invention in which a metallic bellows 111 is supported upon the framework 112 in contact with the engine of an automotive vehicle, or in such a position as to be influenced by the heat of the liquid used as a cooling medium for the engine. The bellows is adapted to expand and contract in response to increases and decreases, respectively, in volume of a heat-responsive liquid contained in a chamber of the bellows. The liquid in the bellows can be a mixture of alcohol and water which, at a temperature of approximately 200° Fahrenheit, more or less, depending upon the proportion of alcohol to water used, causes an expansion of the bellows and which, when the temperature falls below 200° Fahrenheit, more or less, causes a contraction of the bellows.

In accordance with the invention, a metallic lever 113 is insulated from and flexibly secured, through the rod shown, to the bellows 111 and is fulcrumed about a metallic upright 114 carried upon and insulated from a support 116 which is mounted upon the framework 112. Another metallic upright or standard 117, having a contact member 118 thereon, is carried upon and insulated from the support 116, as illustrated, and movement of the lever 113 upon expansion and contraction of the bellows 111 places a contact 119, which is carried by the lever 113, into and out of engagement, respectively, with the contact 118, thereby making and breaking an electrical circuit 121.

The circuit 121 may have as its source of power the storage battery 122 of the automotive vehicle in which the switch of my invention is employed. One conductor of the circuit 121 is connected to one side of the battery 122 and through an operating unit 123 to the metallic lever 113, and another conductor leads from the other side of the battery to the metallic upright 117. The circuit 121 may include one or more operating units 123, as desired, which are controlled by the switch. A core 124 of magnetizable material, about which a winding 126 is coiled and which is energized when the circuit is closed, can, if desired, be interposed in the circuit and mounted upon the support 116 adjacent the metallic lever 113. The core serves to hold the lever 113 when the circuit is closed, to prevent chattering of the contacts 118 and 119.

In Figure 3 of the drawing I have illustrated still another modification of the invention, in which is provided a metallic bellows 211 similar to the bellows hereinabove described and included in the modification of Figures 1 and 2. The bellows is supported on a framework 212 so as to be in contact with or in proximity to the engine of an automotive vehicle, or in such a position that it may be influenced by the heat of the cooling medium of the engine. The frame carries a metallic rod 213 which is insulated from the bellows 211. The frame 212 also supports a plurality of metallic blocks 214 which are insulated from one another and from the frame, each block holding a metallic flexible strip 215, 216, 217 and 218. The strips 215 and 218 carry single-face contacts 219, while the intermediate strips 216 and 217 carry double-face contacts 220, as illustrated. The separate blocks of the group of blocks 214 are separately connected through operating units 223, 224 and 226 into an electrical circuit 221 which has a battery 222 as the source of power, the battery being, if desired, the storage battery of the automotive vehicle in connection with which the switch is to be used. One side of the battery 222 is connected to the insulated metallic block which is adjacent the frame 212 and which is connected to the strip 215, and the other side of the battery is connected independently, through each of the operating units 223, 224 and 226, to each of the other insulated metallic blocks, which are in turn in contact respectively with the connected metallic strips 216, 217 and 218.

In accordance with the invention, different operating units 223, 224 and 226 are connected in the circuit 221, but separately or independently, as shown, to the separate insulated metallic blocks of the group of blocks 214, the lower one of which, holding the strip 215, leads to one side

e battery 222. The unit 223 may be an elec-ly-operated clutch or a pair of clutches, for ng the pump or the fan, or both, of the ng system of the engine into driving con-on with an electric motor 224. The unit 226 be an electrically-operated valve for con-ng the flow of water in the water cooling m of the engine. It is to be understood that not to be limited to an arrangement where-ll three units are placed into operation, in ination or in sequence, but that any arrange-of units in the circuit 221, more or less than , can be effected within the scope of the in-on. The elimination or the addition of a llic strip and its metallic block and con-ors will afford a variety of hook-ups for the ation of units, either singly or in combination. e expansion and contraction of the bellows unctions to place first one, then another, and ly all three of the units into operation and, spondingly, functions to take these units in out of operation. As the bellows expands, od 213 rises into engagement with the me-strip 215 and gradually flexes the strip so the contact 219 thereon engages the contact of the strip 216 to close the circuit 221 which ides the battery 222 and the unit 223. As od 213 further rises, the metallic strip 216 is flexed to bring the contact 220 thereon engagement with the contact 220 on the 217 and thus places the unit 224 as well as nit 223 into operation. A further rise of the 213 flexes the metallic strip 217 to bring the act 220 thereon into engagement with the contact 219 on strip 218 and thus complete a circuit which includes not only the units 223 and 224 but also the unit 226. It is obvious that the arrangement may be such that any one of the several units of a cooling system can be placed into operation ahead of the others, and vice versa, in accordance with the operating conditions of the engine and the will of the user of the device, and this can be effected merely by changing the leads from such units to the separate metallic blocks of the group of blocks 214 which are separately connected through the operating units 223, 224 and 226 to the opposite side of the battery 222 from which the lower block with the strip 215 is connected.

While I have shown in the accompanying drawing the preferred embodiment and certain modifications thereof, it is to be understood that the invention can take a plurality and variety of forms, all within the scope of the invention as defined in the appended claim.

I claim:

A switch for use in controlling an operating unit in the cooling system of an engine comprising a frame, a stationary contact at one end of said frame, a movable contact, a thermally responsive expansible bellows at one end fastened to the other end of said frame, a compressible resistance interposed between said movable contact and said bellows, and a stem on said bellows and guided by said frame for transmitting movement of said bellows first to abut said movable contact with said stationary contact and then to compress said resistance.

JOHN R. RIPPE.