

May 30, 1933.

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1,912,154

COOLING DEVICE FOR INTERNAL COMBUSTION ENGINES

Filed July 15, 1931

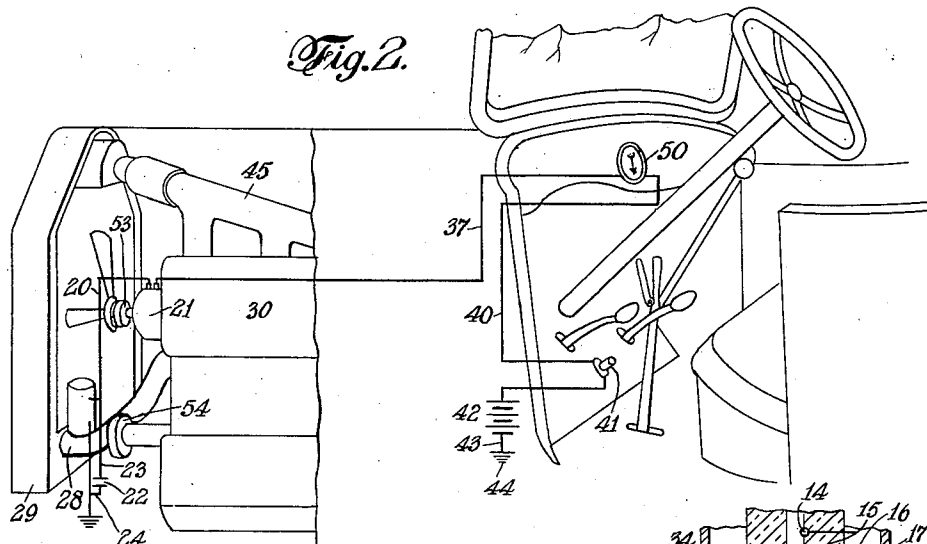


Fig. 3.

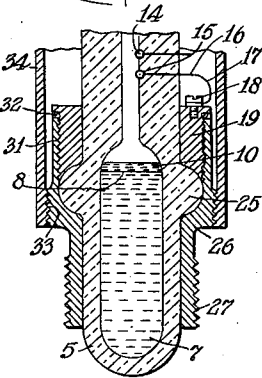
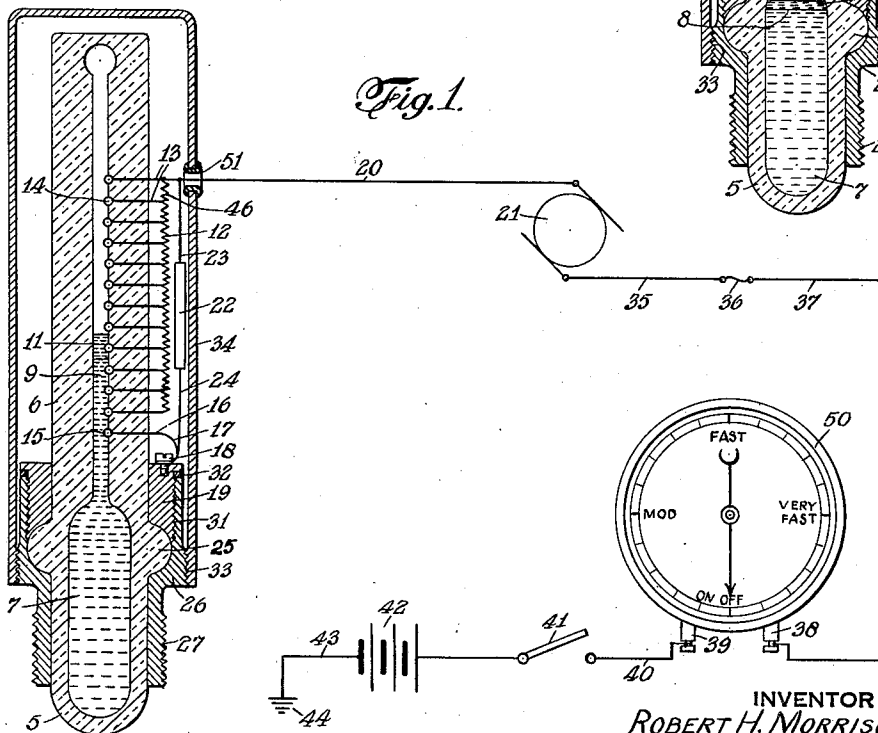


Fig. 1.



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COOLING DEVICE FOR INTERNAL COMBUSTION ENGINES

Application filed July 15, 1931. Serial No. 551,013.

This invention relates to thermostatically cutting in and out the units of a resistance coil located in the circuit of an electric device having blades for producing a current in a fluid surrounding the blades as for instance air in an air cooled engine. In the preferred form of my improved device the resistance coil is located in the circuit of the motor of an electric fan.

One of the objects of the invention is to control an electric fan or similar device by varying the resistance in the fan circuit by means of a thermostatic device responsive to changes of temperature in the body or mass subjected to the cooling influence of the fan.

Another object of the invention is to control an electrically operated fan in an internal combustion engine cooling system by means of a variable resistance coil controlled by a form of thermometer, the bulb of which is located in position to receive the influence of the heat of the engine. In a water cooled system the bulb is preferably located in the radiator system and in the pipe connecting the lower portion of the radiator and the engine casing.

Another object of my invention is to employ the column of a mercurial thermometer for engaging electrical contacts and for the purpose of preventing amalgamation with the contacts which are preferably made of metal, and the incidental fouling of such contacts, I float a neutral fluid upon the top of the column so that the contact point is bathed in this neutral fluid at the time the contact between it and the mercury column is made and also at the time the contact between it and such mercury column is broken.

In the drawing accompanying this specification one practicable form of my invention is illustrated, in which drawing:

Figure 1 shows the device partly sectional and partly diametric.

Fig. 2 shows the application of the device to the cooling system of an internal combustion engine of an automobile, and

Fig. 3 is a detail of the thermometer.

The primary purpose of the form of my invention illustrated herein is to control the

operation of an electrically driven fan in an automobile cooling system by means of a variable resistance coil controlled by a thermometer located in the radiator system. By means of this device, when the motor is started and until it throws off enough heat to raise the temperature of the water, the fan remains still, and until the car starts to move at a rapid speed the radiator has but little influence upon the temperature of the water surrounding the motor casing. As the engine heats up the water, the water acts upon the thermostatic device which is illustrated in the form of a thermometer and controls the amount of electric current which passes in the circuit of the motor of the fan by cutting out the coils of a resistance unit. At the lower temperatures the entire resistance unit is in circuit. As the temperature rises portion after portion of the resistance is cut out permitting the motor to speed up and the fan to exert its influence upon the radiator.

In carrying out my invention I employ a modified form of mercurial thermometer, it having a bulb portion 5 and a column tube 6. The column tube is shown as having a closed top as is customary in thermometers of this general type. Owing to the severe conditions to which everything associated with an automobile is subjected I find it preferable to make the tube of the thermometer rather heavier than ordinary.

Within the bulb 5 is represented a body of mercury 7 which, under most idle and starting engine temperatures, is not sufficient to rise up into the column tube 6. For the purpose of the present illustration what might be regarded as the normal volume of the mercury in the bulb is represented at 8, (see Fig. 3), and for purposes of the further description a column 9 is represented in the column tube in Fig. 1.

For purposes presently to be described in detail a lighter fluid 10 is shown in Fig. 3 floating on top of the mercury 8 in the bulb and this same body of lighter fluid is illustrated at 11 on top of the column 9 in Fig. 1.

A resistance unit is illustrated at 12 which

is connected by means of a number of lead wires 13 to contact points 14 located within the column tube and in position to be engaged by the column of mercury as it rises.

Below the series of contacts connected to the coils of the resistance unit there is located a contact 15 which is in position to be the first to be contacted by the rising column and the last to be uncovered by the falling column. A lead wire 16 is connected with this contact point 15 and is shown having a wire 17 which is grounded, in the present illustration, a binding screw 18 being connected to a clamping nut 19 which, through the intermediation of other parts, is connected to the engine casing.

The upper part of the resistance unit 12 is shown connected by means of a wire 20 in the circuit at one side of the electric motor 21. The electric motor and many of the other parts are illustrated conventionally. An electric condenser represented at 22 is connected by means of a wire 23 to the circuit wire 20, and by means of a wire 24 to ground through the binding screw 18.

The glass of the thermometer is provided with an enlarged ring 25 at about the upper portion of the bulb. This ring is shown resting in a coupling device 26 which has a downwardly extending, externally screw threaded end 27 which, according to the present design, is screwed into the water circulating pipe 28 which extends from the lower part of the radiator 29 to the engine casing 30. The coupling member 26 has an upwardly extending sleeve 31 which is internally screw threaded for receiving the nut 19. It will be obvious that by screwing down the nut 19 against the collar 25 and against the packing ring 32 that the glass portion of the thermometer is securely held in the coupling member 26. The intermediate portion 33 of the coupling member 26 is externally screw threaded for carrying a metal jacket 34 which not only encases the thermometer tube but also the resistance unit and the condenser.

From the motor 21 the circuit extends in a wire 35 through a fuse 36 to wire 37 to the binding post 38 of an ammeter 50, which circuit leaves at the binding post 39, wire 40, switch 41, source of electrical current in the conventional form of a battery 42, wire 43 to ground 44.

When the parts are in substantially the form illustrated in Fig. 1 and the screw member 27 of the coupling device is located in position in the pipe 28 of the cooling system, and the temperature of the coolant is low, the fan does not rotate, as is the present practice, upon starting the engine. By reason of this the radiator does not act as a radiator and the coolant in the engine casing remains practically still until it has been heated sufficiently to pass out of the

engine casing by means of the pipe 45 into the radiator 29 and back into the lower portion of the casing through the pipe 28.

Of course it is to be understood that the sizes and proportions of the various parts of the thermometer and the location of the contacts and the strength of the resistance unit and the capacity of the condenser will be regulated to the engine and for the service for which the device is to be put. Upon the warming up of the engine sufficiently to cause a rise in temperature of the cooling fluid it will have an influence upon the body of mercury 7, causing this to rise, forcing before it the neutral liquid 10 and eventually closing the first contact 15 which grounds the thermometer end of the electric circuit. At this point, however, there is no movement of electric current.

A further rise in temperature and further rise of the column 9 forces the column of neutral liquid 11 past the various contacts 14 bathing them before their actual contact with the mercury of the column 9. Upon the contacting of the column of mercury 9 with the lowest of the contact points 14 the current passes from the source of electrical energy 42 to the motor 21 and through the entire resistance unit 12, through the lower lead wire 13 to the lower contact point 14, the mercury column 9, the point 15 to ground.

As the temperature continues to rise in the cooling fluid the mercury column rises and contacts with one after another of the contact points 14 thereby cutting out in turn various coils or elements until the entire resistance coil is cut out. The uppermost of these coils is designated by the reference character 46.

The wire 20 leading from the uppermost of the contact points 14 is shown passing out of the casing 34 through an opening which is preferably shielded and insulated by means of a button 51.

While it is not necessary, yet it is desirable to employ the ammeter 50 because it is very convenient when one is starting the engine and it is well for practical purposes to know when the engine has heated up the water sufficiently to start the fan or when it has not heated it up sufficiently. It is then also desirable to know whether the fan is going at a high rate of speed or at a low rate, which fact is indicated by the ammeter and shows the temperature of the water or other coolant in the circulating system.

In Fig. 2 the usual belt pulleys 53 and 54 are shown. The belt, of course, will be left off, but one may be applied to these pulleys in case some accident befalls the thermometer device.

Having thus described my invention, what

I claim and desire to secure by Letters Patent is:

1. The combination with a cooling radiator, of an electric fan for passing a current of air over the radiator, a source of electrical energy for the fan, a thermometer associated with the radiator and having a column tube and a column of electrically conductive material in the tube, a plurality of contacts disposed in such tube in positions to be serially contacted by the column in the tube in its movements, a variable resistance unit connected to the electric circuit at one side of the fan, one of the said contacts being connected to circuit at the other side of the fan, and lead wires connecting the other of the said contacts with the elements of the resistance unit.

2. The combination with an electric fan, of a thermometer having a closed top column tube, a column of electrically conductive material in the tube, and a plurality of contacts disposed in such tube in positions to be serially contacted by the column in its movements, a variable resistance unit adapted to be connected to the fan circuit at one side, one of the said contacts being adapted to be grounded and lead wires for connecting the other of the said contacts with the elements of the resistance unit, a condenser adapted to be connected to the resistance unit and to ground, and an electric circuit including the fan, the resistance unit and the contacts.

3. The combination with an electric device having blades for producing a current in a fluid which may surround the blades, a source of electrical energy for the electric device, a thermometer having a column tube, a column of electrically conductive material in the tube, and a plurality of contacts disposed in such tube in positions to be serially contacted by the column in its movements, and having a bulb located in position to be thermally affected by such current of fluid, a plurality of contacts disposed lengthwise of the thermometer and in positions to be contacted by the column in the tube in its movements, a variable resistance unit connected to the electric circuit at one side of the electric device, one of the said contacts being connected to circuit at the other side of the electric device, and lead wires connecting the other of the said contacts with the elements of the resistance unit.

4. The combination with a cooling radiator, of an electric fan for passing a current of air over the radiator, a source of electrical energy for the fan, a mercurial thermometer associated with the radiator and having a plurality of contacts disposed in its column tube, a neutral liquid riding on top of the mercury column, a variable resistance unit and means connecting it to the said contacts,

and an electric circuit including the fan, the resistance unit, and the contacts.

5. The combination with a cooling radiator, of an electric fan for passing a current of air over the radiator, a source of electrical energy for the fan, a mercurial thermometer associated with the radiator and having a plurality of contacts disposed in its column tube, a neutral liquid riding on top of the mercury column, a variable resistance unit and means connecting it to the said contacts, an electric circuit including the fan, the resistance unit, and the contacts, and a condenser connected to the circuit across the resistance unit.

6. A cooling device for internal combustion engines comprising a water circulating system, an electric fan for acting thereon, and a source of electric energy for the fan, a thermometer having a bulb located in such water circulating system, a column tube rising from the bulb, and electrically conductive material in the bulb adapted to rise and fall as a column within the bore of the tube, a plurality of contacts disposed along the tube within the bore thereof in positions to be serially contacted by the column in its movements, a circuit for connecting the lower of the said contacts to ground, a variable resistance unit connected to the electric circuit at one side of the fan, lead wires connecting the elements of the resistance unit with the other of the said contacts, and a condenser connected to circuit across the resistance unit.

Signed at Morristown, New Jersey, this 11th day of July, 1931.

ROBERT H. MORRISON.