Nov. 19, 1940. D. L. BENNETT 2,221,752

THERMOSTAT

Filed June 3, 1938

Fig. 2

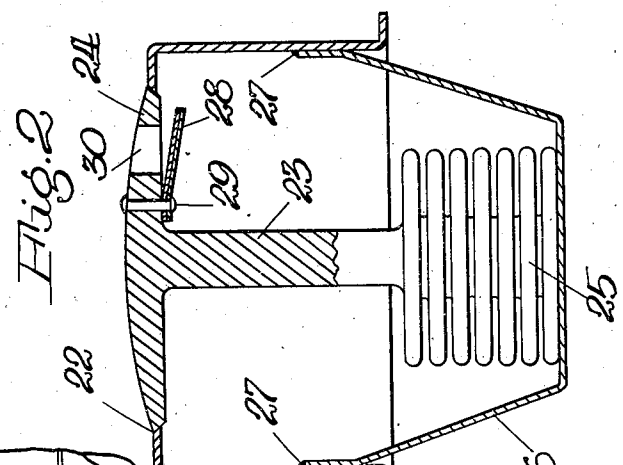
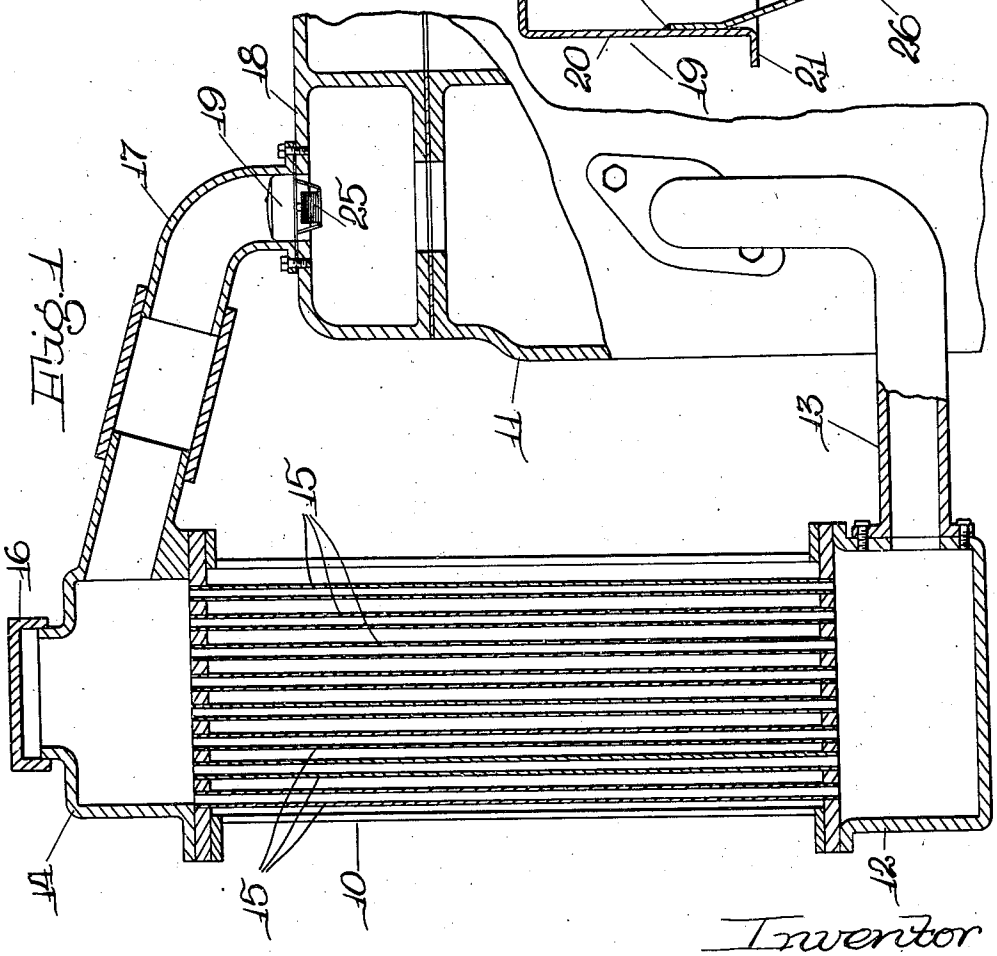


Fig. 1



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THERMOSTAT

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2 Claims. (Cl. 236—34)

This invention relates to a cooling system and more particularly to a means interposed in the outlet conduit of the system for controlling the passage of cooling medium therethrough, the means further embodying means for releasing pressure within the system.

Cooling systems for internal combustion engines comprise generally a radiator and a water jacket about the block and cylinder head of the engine, the jacket and the radiator being connected by an inlet and an outlet conduit. Ordinarily, a thermostat or some heat responsive means is located in the outlet conduit. This means prevents or limits circulation of the cooling medium in the system until a predetermined temperature is reached, after which the means opens to permit complete circulation. When the system is cold, or at least below the temperature required to open the thermostat, it is substantially sealed against the escape of pressure. When it is desired to add cooling medium to the system through the conventional filler in the radiator, it is found that sufficient cooling medium to completely fill the system cannot be put in until the temperature has increased sufficiently to open the thermostat. This condition is the result of the substantial sealing of the system by the closed thermostat, and the incoming cooling medium, when the system is cold, cannot displace the amount of air within the system. Thus, it is necessary to operate the engine until the temperature increases, after which the necessary additional cooling medium may be added. However, this procedure involves considerable loss of time and effort.

The principal object of the invention is to provide a means in a cooling system for an internal combustion engine for permitting the release of the pressure therewithin in order to completely fill the same with cooling medium at low temperatures.

An important object is to provide a simple and efficient means which may be readily installed in any type cooling system, and which in most instances is readily adapted to any conventional type thermostat.

Another object is to provide this means in the form of a heat responsive element which will permit release of the pressure within the system through the outlet conduit at or below the temperature at which the thermostat closes.

And still another object is to dispose this means in a manner resisting passage of water through the air pressure opening or leak so that interference will not be had with the "warming up" of the system.

A comprehensive understanding of the objects and desirable features of the invention may be had from the following detailed description of one preferred form of the invention as illustrated in the accompanying sheet of drawings, wherein—

Figure 1 is a diagrammatic sectional view of that portion of a cooling system necessary to the illustration and description of the invention; and,

Figure 2 is an enlarged detail sectional view of the heat responsive means embodying the invention.

The cooling system illustrated in Figure 1 is more or less conventional, and parts unnecessary to an understanding of the invention have been omitted. The system comprises generally a radiator 10 and the water jacket portion of an internal combustion engine 11. The radiator 10 is provided with a lower water tank 12, which is connected to the water jacket of the engine 11 by an inlet 13. The radiator is provided at its top with an upper water tank or header 14, which is connected by a plurality of usual cooling tubes 15 with the lower water tank 12. The header 14 is closed by a removable cap 16 and is connected by an outlet conduit 17 to a head portion 18 of the water jacket of the system.

A thermostat 19, or similar heat responsive means, is located in the outlet conduit 17. The thermostat in the present instance comprises a casing 20 formed with an annular flange 21, which, when located in position, fits between a flange on the conduit 17 and the upper surface of the head portion 18. The casing 20 is provided with an opening 22, which is adapted to be closed by a heat responsive means 23, which includes a valve 24 of the poppet type, which is operative to open and close the opening 22. This valve may be generally referred to as a thermostatic valve and is controlled by a conventional type of heat responsive element, as at 25. Means in the form of a bail or strip member 26 is rigidly secured to the casing, as at 27, and supports the thermostatic valve means.

The description of the thermostat so far approximates that of most conventional devices of this type and is disposed in the cooling system in the usual manner and for the usual purpose. These are well understood by those skilled in the art, and only a general description of the operation of the thermostat in conjunction with the system will be necessary. When the temperature

of the system is below a medium temperature, as for instance 160° F., the valve 24 closes the opening 22 in the thermostat casing 20 and circulation of the cooling means through the syystem is prevented or limited until the temperature rises above that aforesaid. When the valve 24 opens, cooling medium, of course, circulates entirely through the system.

The thermostat illustrated and described in conjunction with the present invention also embodies means for providing a restricted opening or leak for permitting the release of pressure within the system, as previously mentioned. This means is in the form of a heat responsive element 28, or second thermostatic valve, and comprises a bi-metallic element secured to the underside of the valve 24, as at 29. This element cooperates with a small opening 30 formed in the valve 24. The two metal strips comprising this element are arranged in a manner permitting closure of the opening 30 at a temperature lower than the temperature at which the valve 24 closes. This second valve or element, however, remains entirely open below a predetermined temperature, preferably at about 100° F. The properties of the strips comprising the element are such that the element preferably closes the opening 30 before the opening of the valve 24, so that proper "warming up" of the cooling medium may be effected.

When the cooling system is cold, that is, below the predetermined temperature of 100° F., the parts of the thermostat are in the positions shown in Figure 2; that is, the valve 24 closes the opening 22 and the second valve or element 28 opens the opening 30. With the system thus cold, an adequate supply of cooling medium may be added thereto, the air within the system being displaced by the added cooling medium and passing through the opening 30. Thus, this pressure, that so adversely affected previous systems, is released by the provision of the second thermostatic valve or heat responsive element 28.

In warming up the system, the element 28 remains open until a predetermined temperature, as 100° F., is reached, after which it closes and circulation of the cooling medium is prevented throughout the system until the predetermined temperature is reached, at which the valve 24 begins to open. In the present invention, the element 28 remains closed while the temperature of the system is above 160° F., although it is immaterial whether or not it is permitted to open. However, because of the arrangement of the two strips comprising the element, as previously mentioned, the opening 30 will remain closed above 100° F., or whatever temperature is chosen as desirable.

From the foregoing description, it will be readily seen that an improved cooling system has been provided as embodying one preferred form of the present invention. It will be appreciated however, that the thermostatic device, or heat responsive means, is readily usable in cooling systems of various types, and it will be further understood that numerous modifications and alterations may be made in the construction and operation of the device without departing from the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. A thermostat for a cooling system comprising a casing having an outlet, a heat responsive means including a valve adapted to open and close the outlet at predetermined higher and lower temperatures, said valve having an opening therein, and second valve means for opening and closing said opening, said means comprising a heat responsive metallic strip carried at one end by the first valve and responsive to open said opening at a predetermined temperature lower than either of the aforesaid temperatures to permit venting of the system during filling of the system while the first valve is closed, said strip being responsive to close said opening at a higher temperature to prevent circulation until the first valve opens.

2. A temperature regulator for the cooling system of an internal combustion engine, comprising means providing a generally circular valve port, a generally circular valve associated with said port, said valve having a smaller port offset radially from its center, heat responsive means for openings and closing the valve at predetermined higher and lower temperatures and including a connection to the valve at a point spaced radially from the smaller opening, and a second heat responsive means associated with said smaller opening and comprising a bimetallic strip carried at one end by the valve and extending across said opening, said strip being responsive to open said opening at a predetermined temperature lower than either of the aforesaid temperatures to permit venting of the system during filling of the system while the first valve is closed, said strip being responsive to close said opening at a higher temperature to prevent circulation until the first valve opens.

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