July 4, 1939. J. V. GIESLER ET AL 2,165,136

TEMPERATURE REGULATOR

Filed June 10, 1935

Fig. 1.

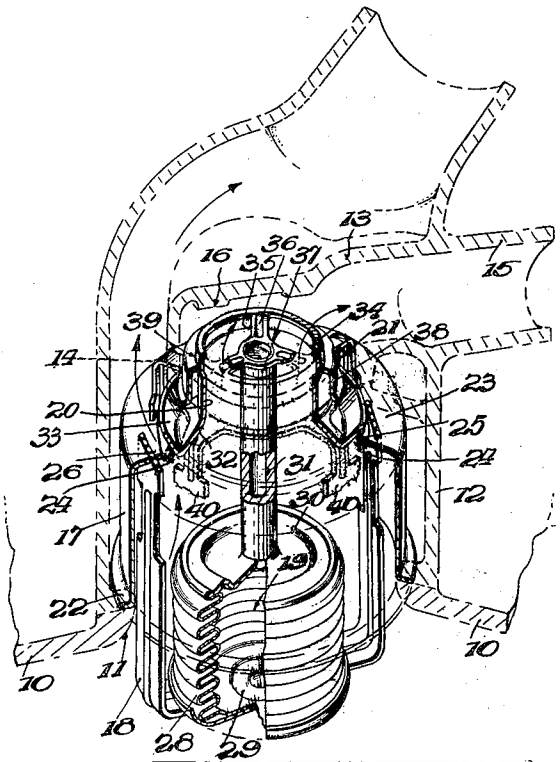
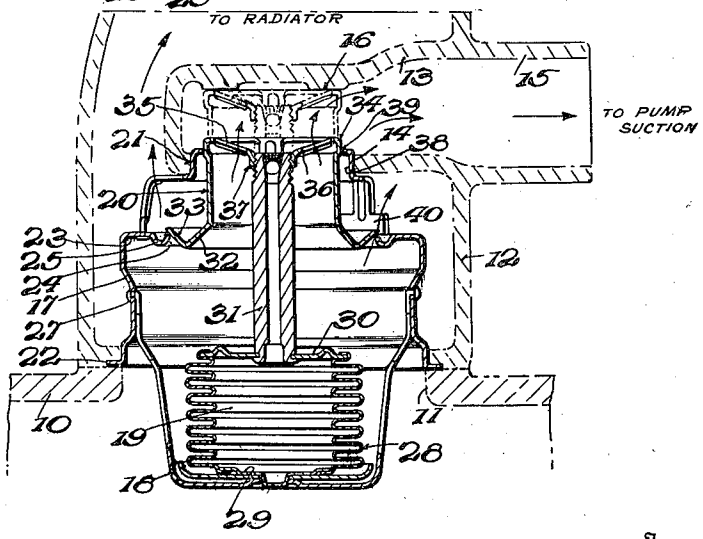


Fig. 2.



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TEMPERATURE REGULATOR

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Application June 10, 1935, Serial No. 25,909

1 Claim. (Cl. 236—34)

This invention relates to temperature regulators for internal combustion engines, and more particularly to a temperature regulator which is particularly useful for controlling the circulation of the cooling medium through the cooling system of an automobile engine.

In the patent to J. A. Kinnard, No. 1,639,299, granted August 16, 1927, there is disclosed a temperature regulator for internal combustion engines employing a sleeve-like valve which cooperates with a seat and a surrounding annular guide member to prevent circulation of the cooling medium when said tubular valve is in engagement with said seat, said tubular valve member providing a tubular passage for the flow of said heating medium when said tubular valve member is moved away from its seat. In the structure as disclosed in said patent to Kinnard, the regulator is of the so-called "choker" type wherein the circulation of cooling medium is substantially prevented in one position of said valve member. It is an object of this invention to provide a device of the type disclosed in said patent to Kinnard which may be used in cooling systems of the type employing a by-pass, i. e., wherein a tubular valve member in one position conducts the circulating cooling medium through the passage in said tubular member to one of the alternative passages of flow employed in the by-pass type of cooling system and wherein said tubular valve member in another position closes the first named of said alternative passages, as by contact with a wall thereof, and permits the circulation of the cooling medium through the other of said alternative passages of flow employed in the by-pass type of cooling system.

More particularly it is an object of the present invention to adapt a device of the type characterized to use in a by-pass type of cooling system as referred to.

A further object of this invention is to so construct the tubular valve member that the temperature at which it starts to open is substantially the same notwithstanding substantial variations in the pressure of the cooling medium to which it is subjected.

A further object of this invention is to provide a construction of a device of the type referred to which minimizes sticking of the valve member and yet at the same time reduces leakage to a relatively small amount.

Another object of this invention is to provide a device of the type characterized wherein the valve member has some freedom of lateral movement as it passes from one extreme position to the other.

Another object of this invention is to provide a device of the type characterized which is simple in construction, inexpensive to manufacture, and available for installation in different ways and at different positions in a cooling system so as to conform with the needs of the design of the engine and its cooling system.

Further objects will appear as the description of the invention proceeds.

The invention is capable of receiving a variety of mechanical expressions two of which are shown on the accompanying drawing, but it is to be expressly understood that the drawing is for purposes of illustration only, and is not to be construed as a definition of the limits of the invention, reference being had to the appended claim for that purpose.

Referring in detail to the drawing wherein the same reference characters are employed to designate corresponding parts in both figures,

Fig. 1 is a perspective view of an embodiment of the present invention with a phantom showing of one manner in which the regulator may be combined with a cooling system of the by-pass type; and

Fig. 2 is an axial section of a second embodiment of the invention.

Referring more particularly to the drawing, the regulator is shown as mounted on the wall 10 of an engine cylinder, although as will be readily appreciated, the regulator may be mounted in any other suitable portion of the system. Surrounding the aperture 11 through which the regulator is designed to project into the cooling jacket of the engine is a tubular member 12 which may be connected in any suitable way with the inlet to the radiator and into which projects a tubular member 13 having a closed end and a lateral aperture 14, and providing a passage 15 which may be connected in any suitable way with the by-pass. The wall of said member 13 opposite said aperture 14 is preferably flattened as shown at 16 for a purpose to be explained.

The regulator of the present invention comprises a tubular supporting element 17, a thermostat support 18, a thermostat 19, a valve member 20 having a tubular portion operatively connected to said thermostat and a guide member 21.

The tubular supporting member may be of any suitable size, construction and material, but it is preferably formed of sheet metal having an outwardly directed flange 22, at or adjacent one end

thereof, whereby said member 17 may be clamped in position in any suitable way, as between the member 12 and the jacket wall 10, said supporting member having an inwardly directed flange 23 at or adjacent its opposite end, terminating in a centrally arranged aperture providing a valve port 24. As shown said flange 23 is curved inwardly and then outwardly so as to provide a substantially knife edge or line engagement 25 with the valve member as hereinafter explained.

The thermostat support may take a variety of forms, as a strap or a spider having a plurality of arms or a cup-shaped member provided with apertures in its lateral wall. As shown in Fig. 1 the support 18 takes the form of a strap whose ends are passed into or through apertures 26 in the flange 23 and secured therein in any suitable way. In Fig. 2 the thermostat support 18 is shown as passed into or through apertures 27 in the lateral tubular wall of the supporting member 17 and secured therein in any suitable way. In both embodiments the ends of the support may be secured in the apertures by staking, upsetting, splitting and spreading, spot welding, etc., after they have been introduced into said apertures in the member 17.

The thermostat 19 may be of any suitable size, form and construction. As shown said thermostat has its lateral wall composed of a deeply corrugated tubular metal wall or bellows 28 and provided with a stationary end wall 29, integral therewith or suitably attached thereto, secured to the support 18 in any suitable way. The opposite and movable end wall 30 is attached in any suitable way to the end of the wall 28, as by brazing or soldering, and has suitably attached thereto a valve stem 31, here shown as tubular in form so as to provide a filling opening through which any suitable charge may be introduced into the chamber provided within the bellows 28.

The valve member 20 has a central body portion of tubular or cylindrical form, as shown, and at its free or skirt end said tubular member is flared outwardly approximately at an angle of 45° as shown at 32 and then bent at substantially right angles to said portion 32 as shown at 33, although it is to be expressly understood that the angles illustrated are not essential. It is preferred to make the angles of the portions 32 and 33 to the axis of the tubular valve member substantially equal for a purpose which will hereinafter appear. The opposite end of said tubular valve member 20 is bulged outwardly as shown at 34, and integral therewith or suitably attached thereto is a spider for attachment to the end of the valve stem 31. As shown this end of the valve member is made integral with the tubular wall thereof, as by forming the same as a cup-shaped blank which has been punched out to provide a suitable number of apertures 35. The central portion of the spider 36 so former has a threaded central aperture 37 by which the valve member may be attached to the threaded outer end of the valve stem 31.

Guide member 21 has a tubular portion 38 adapted to fit the aperture 14 in the tubular member 13, and the outer end of said tubular portion 38 provides an aperture 39 which substantially fits the bulged portion 34 of the valve member 20. The inner end of the member 21 is formed into a plurality of legs 40 whose inner ends are suitably attached to the flange 23 as by projecting said ends into and securing the same in apertures in said flange, as by expanding said ends therein. Thereby the guide member takes the form of a spider which is secured in unitary relationship with the tubular supporting member 17, and said supporting member 17, thermostat support 18, thermostat 19, valve member 20 and the spider 21 constitute a self-contained unit.

When the parts are in the position shown in Fig. 2 the cooling medium may flow through the apertures provided by the thermostat support 18, through the tubular portion of the valve member 20, and into the by-pass conduit 15. When the temperature of the cooling medium rises to a predetermined degree the thermostat 19 expands, moving the valve member away from its seat at port 24 whereby part of the circulation may take place between said valve member and its seat, to and through the radiator. Continued expansion of the thermostat 19 engages the end of the tubular portion of the valve member 20 with the seat 16, thereby closing the passage through said valve member into the passage 15 and causing the entire flow to take place between the valve member and its seat, to and through the passage to the radiator.

In order that the valve member may start to move away from its seat at substantially a predetermined temperature under different pressures, so that the same instrument may be standardized for cooling systems using different water pressures and so that the temperature of operation will not fluctuate materially in any given system under different water pressures, the present invention employs a construction of the valve member which will effectuate this result. Investigation has demonstrated that if the skirt of the valve member is reversely bent as shown at 32 and 33 so as to provide surfaces which are substantially symmetrical in cross section with respect to a line parallel to the axis of the valve member and inclined in the direction in which the cooling medium flows through or around said valve member, variations of pressure have little or no effect on the temperature at which the valve member starts to open. Therefore, in conformity with the present invention the seating portion of the valve member is flared in the direction in which the water tends to flow between said valve member and its seat, and adjacent thereto is an oppositely and symmetrically flared section leading to the tubular passage through the valve member. The projected area of the valve is substantially equal to the effective area of the bellows, and thus in so far as static pressures are concerned there is no tendency for the opening temperature to change under different pressures. When the valve opens, however, a velocity effect is produced by the flow of the cooling medium past the surface of flared portion 33 which renders the valve member streamlined.

When the valve member is in contact with its seat the bulged portion 34 of the valve member substantially fills the aperture 39 and minimizes leakage therebetween. As soon as the valve member starts to move away from its seat, however, the main tubular portion of said valve member, which is of smaller external diameter, comes into radial alignment with the wall of the aperture 39, leaving a substantial clearance therebetween, so that considerable freedom for lateral movement of the valve member is provided throughout its range of movement, and sticking is thereby minimized. Furthermore, as

heretofore described, the flange 23 which provides the valve port 24 is so deflected that in place of having its end wall cylindrically disposed with respect to the axis of the valve member it is bent so that its end wall is at an angle to the axis and substantially a line or knife edge 25 is presented for contact with the seating portion 33 of the valve member. Thereby sticking at the valve seat is minimized, and at the same time likelihood of the valve member being held out of proper contacting relationship with its seat, as by foreign material being caught therebetween, is substantially eliminated.

It will be additionally observed that a regulator built in conformity with the present invention is not only a self-contained unit but all parts thereof with the exception of the thermostat proper and its valve stem may be formed of sheet metal by simple stamping operations and the parts cheaply but rigidly secured together by passing the ends of one member into apertures in another member and securing the same therein as by staking, spreading, peening over, spot welding, etc., the ends projecting into said apertures. Thereby the structure is simple and inexpensive in the construction of its component parts and in the assembly thereof into the self-contained unit which is provided.

While the embodiments of the invention illustrated on the drawing have been described with considerable particularity, it is to be expressly understood that the invention is not restricted thereto, as the same is capable of receiving other mechanical expressions, some of which will now readily suggest themselves to those skilled in the art, while changes may be made in the details of construction, arrangement, size, proportion, material, etc., without departing from the spirit of this invention. Reference is therefore to be had to the appended claim for a definition of this invention.

What is claimed is:

A self-contained temperature regulator unit for internal combustion engines comprising the combination of a tubular member adapted to be mounted at one end so as to constitute a portion of the cooling system of the engine and formed at its opposite end to provide a valve seat, a support for a thermostat mounted on said tubular member, a thermostat mounted thereon, a valve member having a flange at an angle to its axis adapted to cooperate with said valve seat and having a centrally arranged tubular portion open at both ends, means connecting said valve member and thermostat, and a spider-like element having a central aperture embracing said valve member at its free end, when in closed position, and spaced axially extending arms attached at their inner ends to said tubular member in unitary relationship therewith, said element constituting a tubular guide for said valve member as a part of said unit and its spaced arms providing apertures for cooling medium flow when said flange is disengaged from said seat.

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