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THERMOSTATIC VALVE DEVICE

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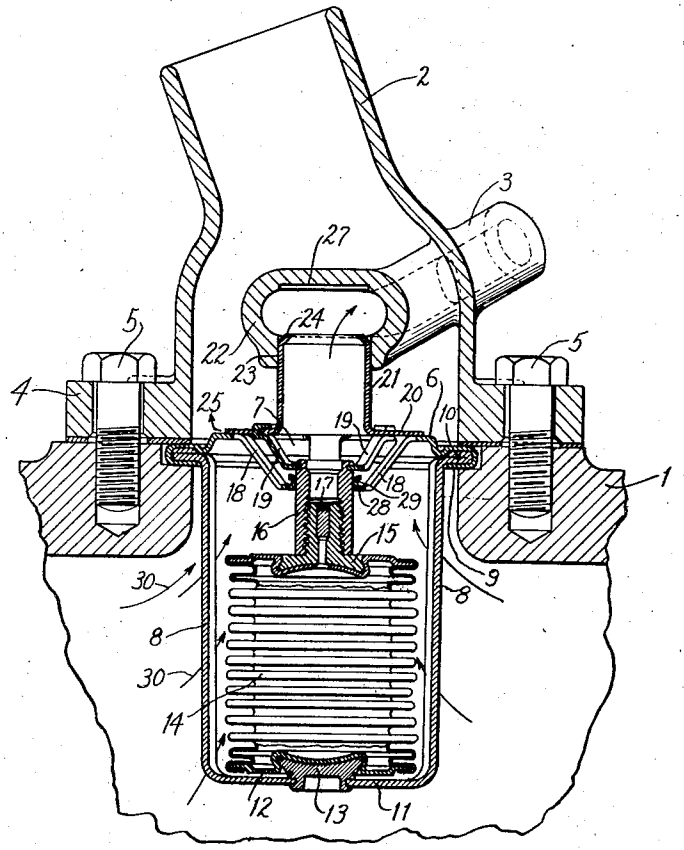


Fig. 1.

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THERMOSTATIC VALVE DEVICE

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4 Claims. (Cl. 236—34)

My invention relates to thermostatic valve mechanisms, and particularly to mechanisms of this type especially adapted to effect the circulation of water or other fluid cooling mediums through the cooling system of an internal combustion engine, although being not limited thereto.

An object of my invention is to provide an improved thermostatic valve mechanism of simplified construction, and which is relatively economical of manufacture and assembly.

Another object of my invention is to provide an improved thermostatic valve mechanism, the parts of which are generally susceptible of being formed by relatively inexpensive stamping and machine screw operations to provide a light, low-cost mechanism which is durable and efficient in operation.

Another object of my invention is to provide an improved thermostatic valve mechanism particularly adapted for the cooling system of internal combustion engines for automotive vehicles and which may be easily and economically installed in the cooling system of such vehicles.

Another object of my invention is to provide an improved thermostatic valve mechanism of the bypass type, whereby in addition to a thermostatic control of the circulatory cooling fluid for an internal combustion engine cooling system which includes a cooling radiator, a control is effected over a bypass circuit for the cooling fluid to effect a more efficient operation of the said engine.

Another object of my invention is to provide an improved thermostatic valve device for the cooling system of internal combustion engines for automobiles wherein improved guide means for the movable valve parts are provided.

Other objects of my invention and the invention itself will become increasingly apparent from a consideration of the following description and drawing, wherein:

Fig. 1 is a vertical medial sectional view of a preferred embodiment of my invention disposed in the cooling system of an internal combustion engine for automobiles.

Referring now to the drawing, I have indicated at 1 the head forming a closure unit for the cooling water jacket encasing the cylinders of an internal combustion engine for an automobile, and which is provided with a cooling water outlet port adapted to discharge fluid heated through contact with the cylinder walls into a conduit 2. The conduit 2 is generally tubular in form having a relatively reduced and preferably inclined upper end adapted to be telescoped within and sealingly secured to a flexible coupling interconnecting the conduit 2 with the conventional cooling radiator of the vehicle.

The discharge conduit 2 is provided with a generally laterally extending bypass discharge conduit 3 preferably formed integrally therewith whereby varying amounts of cooling fluid may be diverted through the bypass conduit 3 and redirected to the cooling jacket of the engine without traversing the cooling radiator in a manner later to be described.

The conduit 2 is provided at its lower end with an outwardly and laterally extending flange 4 perforated at spaced points whereby the conduit may be sealingly secured to the head 1 by means of bolts 5 projected through the flange perforations and threadedly engaging the head. A sealing washer, formed of any suitable material, is preferably disposed intermediate the head 1 and flange 4 of conduit 2. The upper face of head 1 is provided with an annular recess surrounding the outlet therethrough forming a seat for a transversely disposed ported valve element 6 which cooperates with a valve generally indicated at 7 to control the flow of cooling fluid through the conduit 2.

The element 6 forms a support for a generally cup-shaped preferably sheet metal stamping provided with upwardly extending spaced arms 8 terminating at their upper ends in an outwardly extending radial flange 10, the flange 10 preferably being reinforced by having the peripheral portions thereof reversely folded and secured to the element 6 by flanging the peripheral portions thereof inwardly as indicated at 9. The flange portion of element 6 will thus be sealingly secured intermediate the lower face of the sealing washer and the base of the annular seat provided in the head 1 due to the pressure exerted by the securing bolts 5.

The lower ends of the arms are integral with a generally circular plate 11 centrally perforated and having a collar 13 secured thereto in any suitable manner as by projecting a reduced portion of collar 13 through the perforated portion of plate 11 and flaring the same outwardly to interlock the plate and collar. The collar 13 is provided with an enlarged head adapted to have a sheet metal or the like circular base affixed thereto by crimping a central portion of the base over the enlarged portion of the collar head. The base 12 will thus be maintained in fixed position and is connected by means of a corrugated flexible tube 14 to a movable head similar in construc-

tion to the fixed base 12 and which head is secured to a centrally perforated and externally threaded element 15 having an enlarged shoulder at the lower end thereof crimpingly engaged by centrally depressed portions of the head. The bellows thus formed is adapted to be filled in a well known manner with a volatile fluid inserted through the perforation of element 15 and the perforation is sealed by a plug and a top coating of solder as indicated at 17.

A sleeve 16 provided with an internally threaded portion engages the element 15 and may be moved axially relative thereto for a purpose later to be described.

The ported element 6 has its central portion stamped in the form of a spider providing radially inwardly and axially downwardly extending arms 18 integral with an annular ring 28 provided with an axially upwardly extending shoulder flared radially outwardly at the upper ends as indicated at 29 and forming a guiding support for sleeve 16. The upper end of sleeve 16 is rigidly secured to upwardly and outwardly extending spaced arms 19 in any suitable manner as by relatively reducing said end to form a seat for a circular flange linking the lower ends of arms 19 and flaring outwardly a portion of the sleeve projected therethrough.

The upper ends of arms 19 are secured to a radially outwardly extending flange 20 of an axially disposed sleeve 21 in any suitable manner as by projecting the upper ends of the arms through spaced perforated portions of the flange and bending said portions to interlock the flange therebetween.

The inner end of the bypass discharge conduit 3 is relatively enlarged as indicated at 22 and the lower portion is provided with an opening 23 coaxially disposed relative to sleeve 21 and adapted to provide a sliding fit therewith. The upper end of sleeve 23 is beveled upwardly inwardly as indicated at 24 whereby it may be more easily centered in opening 23 and also more accurately seats within a recessed portion 27 provided at the upper inner face of the enlarged portion 22 of the bypass conduit 3.

The operation of the valve mechanism is as follows: Assuming the motor to be relatively cool, the cooling fluid in contact with the cylinders thereof will also be relatively cool, and upon starting the motor and when it is desired that the same warm up quickly, the bellows element immersed in the cooling fluid will be contracted and the movable head thereof will be in the position indicated in Fig. 1 whereby the flange 20 will seat upon the ported valve element 6 prohibiting flow through the discharge conduit 2 leading to the cooling radiator, and the entire flow will be directed intermediate arms 18 and 19 through tube 21 and bypass discharge conduit 3 and thence returned to the engine jacket without traversing the radiator.

The engine will thus quickly warm up consequently raising the temperature of the cooling fluid and expanding the bellows element under the influence of the heat-responsive volatile liquid, relatively raising the movable head thereof, flange 20 secured in fixed relation to said head, and tube 21. Raising of the flange 20 will permit a portion of the fluid flow to be directed through the discharge conduit 2 and thence through the cooling radiator; and raising of the tube 21 within the enlarged portion 22 of the bypass discharge conduit will relatively restrict flow therethrough whereby a portion of the cooling fluid will be cooled and the remainder bypass around the radiator in a relatively heated condition. Continued warming of the motor and the cooling fluid will progressively raise the flange 20 and close the flow through the bypass conduit until such time that the portion 24 of tube 21 sealingly abuts the recessed portion 27 of the bypass conduit 3, shutting off flow through the bypass conduit, and the entire flow will then be directed through the conduit 2 and the cooling radiator.

Upon a relative cooling of the fluid, the reverse operation will occur and the engine will thus be maintained at a desired efficient operating temperature.

The direction of fluid flow intermediate the ported valve element 6 and its cooperating valve flange 20 is indicated at 25 and the flow of cooling fluid intermediate the longitudinally extending arms 8 and upwardly through the discharge conduit and by-pass conduit is indicated by arrows 30.

The temperature at which the valve controlling flow through the discharge conduit 2 will open and the temperature at which the flow through the by-pass conduit will be cut off may be controlled by altering the axial distance of the movable head of the thermostatic bellows through rotation of the sleeve 16 threadedly engaging the upstanding externally threaded portion of the movable head. Increasing the axial distance in this manner between the valve flange 20 and the movable head insures that the initiation of flow through the discharge conduit 2 will be at a relatively lower temperature, and the flow through the by-pass conduit 3 will be cut off at a relatively lower temperature; and the reverse will be true when the aforementioned axial distance is decreased.

The valve mechanism described is supported intermediate the conventional jacket head for the engine and a discharge conduit therefor whereby it may be easily inserted within and removed from the circulatory system and may be installed as a unit adapted for operation with any discharge conduit having a by-passing portion cooperating with the by-passing valve of the device.

Although I have shown and described a preferred embodiment of my invention, I contemplate that numerous and extensive departures may be made therefrom without departing from the spirit of my invention and the scope of the appended claims.

I claim:

1. In a unitary by-pass type thermostatic valve mechanism, a frame comprising a transversely extending ported wall, a valve comprising a tube having a lateral flange normally seated on said wall at its discharge side to prevent substantial main flow said valve normally covering substantially the entire area of said wall port, said valve unitarily movable axially of its tube portion to effect increased main discharging flow laterally of the tube, said tube conducting by-passing flow from the mechanism and having an end valve portion adapted when moved to variably restrict the flow therethrough, said frame comprising a journal extension for guiding said tube axially and preventing lateral movements thereof, and a bellows thermostat for effecting axial adjusting movements to the valve, said thermostat carried by said frame on the approach of said wall, said flange being so subjected to pressure of fluid on its approach side as to tend

to move it to an operative safety position effecting a substantial main flow.

2. In a thermostatic valve mechanism for controlling the main and by-pass flows of liquid from the cooling jacket of an internal combustion engine to and around the cooling radiator therefor, a valve comprising a tube having a lateral flange for conducting the by-pass flow from the mechanism, a frame comprising a transversely extending ported wall, a bellows thermostat carried by the frame disposed on the approach side of said wall, a stem for communicating valve adjusting movements effected by the thermostat to axially adjust the valve to seat its flange on the wall over its port or variably space it on its discharge side and also to axially adjust the tube to variably restrict the flow through the tube, said flange when moved from said wall effecting an increased main discharging flow from the mechanism laterally of the tube, said frame comprising an extension providing a guiding journal for the movable parts of the mechanism to prevent lateral movements thereof, said annulus being so subjected to pressure of fluid on its approach side as to tend to move it to an operative safety position effecting a substantial main flow.

3. In a thermostatic valve mechanism of the by-pass type adapted to control the flow of engine cooling fluid circulated in an engine cooling system during operation thereof, in combination with the main discharge conduit leading to a cooling radiator of the system and a by-pass conduit for shunting a by-passed discharge flow around said radiator, a supporting frame for the mechanism, said frame comprising a transversely extending ported wall, a single valve element in the form of a tube with a radial flange unitarily joined to the tube, a bellows thermostat supported by the frame on the approach side of said wall, a stem for communicating thermally effected movements of an operative end of said thermostat to said valve element to move it to differently adjusted positions whereby said valve element radial flange will approach the port of said wall or be variably spaced therefrom at the discharge side thereof, said valve, stem, and thermostat end comprising the moving system of the mechanism, said moving system being journalled in an extension of said frame to effect axially directed movements of the valve, said valve tube adapted to conduct said by-passed flow from the mechanism and having a valve portion axially movable to variably restrict said flow, said valve radial flange adapted to be seated on said ported wall to substantially direct all of the flow passing the mechanism through said tube and when moved axially in the direction of discharging flow adapted to direct discharging flow from the mechanism laterally of the tube to the main discharge conduit in progressively increased volume according to adjustably increased spacing of said radial flange from said wall.

4. In a unitary by-pass type thermostatic valve mechanism, a frame comprising a transversely extending ported wall, valve means comprising a tube and a flattened laterally extending annulus encircling the tube said annulus normally seated by an outer edge portion on the discharge side of said wall and having its other portions so disposed as to bridge the space between said tube and the radially outer borders of said wall port, said tube conducting by-passing flow from the mechanism, a bellows thermostat for effecting axial adjusting movements to said annulus to variably space it from its seat at the discharge side thereof to effect a valve opening between its peripheral edges and its seat to effect a controlled main flow therethrough laterally of said tube, said frame supporting said thermostat on the approach side of said wall and comprising a journal extension for guiding the movements of said annulus in axial directions only and preventing movements thereof in lateral direction, said thermostat also effective to variably control the by-passing flow through the tube in an opposite manner to the control exercised thereby over said main flow through the instrumentality of said annulus.

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