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2,177,937

WATER CIRCULATION THERMOSTAT

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Fig. 1

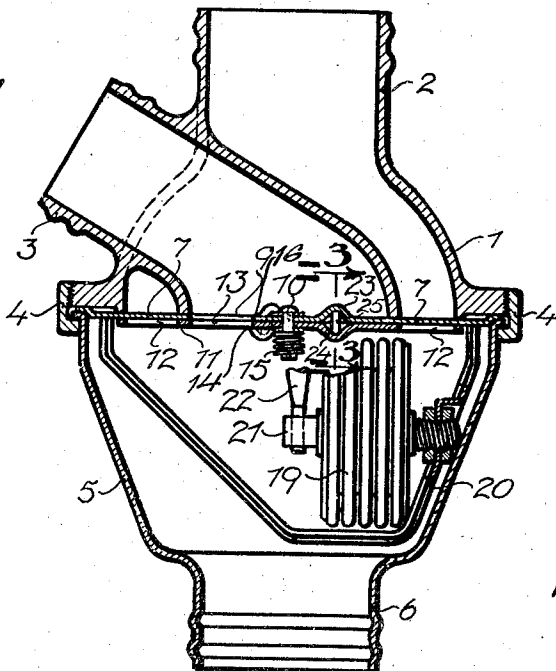


Fig. 3

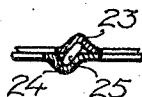


Fig. 2

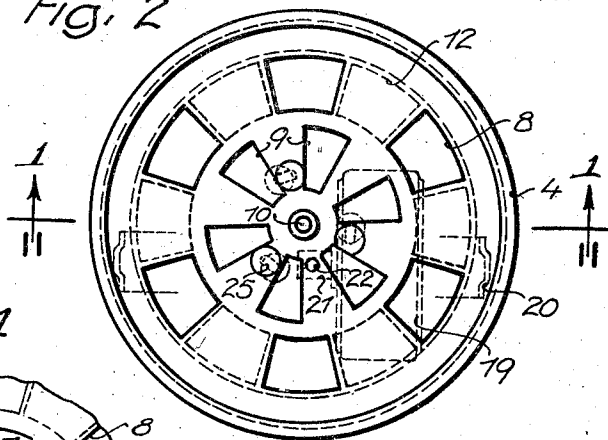


Fig. 4

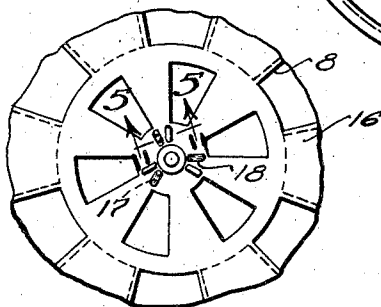
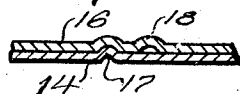


Fig. 5



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WATER CIRCULATION THERMOSTAT

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9 Claims. (Cl. 236—34)

The invention relates to a thermostat, which is designed especially for the control of the circulation of the cooling water on automobiles. In its design it belongs to the thermostats in which the passage ways for the cooling water are controlled by slide valves. In this connection flat slide valves are known, which have the disadvantage that on account of their rectangular form they require a great deal of room, while the requirements of the design point to a circular form of cross section for the thermostat housing, the connections and the like.

One object of the present invention is to provide a thermostatically controlled valve for the purposes set forth, wherein an improved slide valve is used for controlling the water circulation, so as to avoid the disadvantages of the rectangular slide valve above mentioned.

In general the invention provides a rotary slide valve in the water control thermostat. Certain advantages of this arrangement are that only a simple form of bearing is necessary, only a simple movement is required, and that friction may be reduced. Aside from these advantages, it is easier and simpler to manufacture the housing for the valve and easier to design the connections.

The drawing illustrates one form of construction of the invention, wherein:

Figure 1 is a longitudinal section on line 1—1 of Fig. 2;

Fig. 2 is a plan view of the control members, omitting the upper part of the thermostat; and

Fig. 3 is a longitudinal section on line 3—3 of Fig. 1.

Fig. 4 is a plan view of a different form of device for avoiding friction between the plate and slide valve; and

Fig. 5 is a cross section taken substantially along line 5—5 of Fig. 4.

The thermostat is mounted in a housing, the upper part 1 of which runs out into the connections 2 and 3 for the main lines to the radiator or to the so-called by-pass line to the cooling water pump. The lower part 5, connected liquid tight with the upper part 1 by means of a cap screw 4, terminates in the connection 6 for the line to the cooling water chamber of the engine. The lower surface of the upper part 1 is of such form that the inner openings corresponding to the connections 2 and 3 lie concentric to each other. They are covered with a plate 7, which is clamped between the upper part 1 and the lower part 5 and which contains two groups of passage ways 8 and 9, concentric with each other,

which permit the passage of the cooling means or water either to the radiator or through the by-pass line directly to the pump. In the middle of the plate 7, a rotary slide valve 11 is movable on a bolt 10, the slide valve also being provided with openings 12 and 13 which can coincide with the openings 8 and 9 of the plate 7. In order that no injurious friction may take place in the friction of the slide valve 11 against the plate 7, which in consideration of the comparatively weak source of power could lead to trouble in the operation of the thermostat, devices are present at the point of rotation of the slide valve 11, which serve the purpose of lifting it during its movement from the surface of the seat.

The devices for accomplishing this result in the form of the inventions shown by Figures 1, 2, and 3, are made in such a manner that on the contact surfaces, adjacent hub portions 14 and 16 of the plate 7 and valve 11, depressions 23 and 24 are provided in a 120° spaced relation in the plate and valve. These depressions are opposed to each other on the plate and valve and serve as step bearings for small supporting levers 25 having rounded ends engaging the depressions respectively. At each of three points, therefore, there will be two depressions and a supporting lever. The plate and valve are pressed resiliently together by a spring 15 mounted on the bolt 10 so that normally the plate and valve have flat contacting relation. It will be apparent that when the rotary valve is turned, the lever will move from one side to the other and during this movement separation of the plate and valve will occur. Furthermore, the lever will serve as a limiting means. Actuation of the slide valve is effected in a known manner by means of a thermostatic element 19 which consists substantially of a corrugated tube and a liquid with a suitable boiling point enclosed case tight therein. The element 19 on the one hand is fastened adjustably to an arch 20 and on the other hand by means of an eye element 21 is connected to an actuating bolt 22, which projects into an opening in the slide valve or which is fastened to the valve in any other suitable manner.

As long as the temperature of the cooling water is below the critical point at which the thermostatic device should begin to work, the arrangement is in the position of rest as shown in the drawing. Under these conditions the water would flow through the passageways 12 and 13 and through the by-pass 3, while the line 2 to the radiator is closed. As soon as the temperature

has passed the critical point, the thermostatic element begins to expand on account of the evaporation of the liquid therein, and by means of the parts 21 and 22 effects movement of the rotary valve 11. Then by means of the relative rotation of the plate and valve, the valve is lifted off of the plate and necessarily during any further movement the dynamic friction between the two is reduced. At the end of the movement, passages 8 and 12 are opened to each other, so that the cooling means then will flow through them and the connection 2 to the radiator. It may be pointed out that as a result of the peculiarity of the arrangement of depressions 23 and 24 and the levers 25, a very small friction occurs between the levers and such depressions or bearings. Moreover a more certain application of the valve on the plate in both end positions is insured without any lost motion in the lifting device, which lost motion would result in a more irregular sliding of the valve on the plate.

In the devices shown by Figures 3 and 4, corrugated radial flutes are provided on the plate and valve and these are of such character that on the plate 3 separated pairs of flutes 18 are provided, each pair being separated 120° from the adjacent pairs. Only three flutes are provided on the valve in 120° spaced relation. Each of these flutes is movable between the two flutes of a pair of flutes on the plate. The angular distance between the two flutes of each pair on the plate is equal to half the angular distance between two of the openings 12 in the valve. The pair of flutes thus forms the grooves for the two end positions of a flute 17 and the movement of the valve effects a lifting thereof from the plate 7, so that the movement takes place practically without friction. Moreover the flutes have such included angularity that it is comparatively easy to cause the flutes 17 to move into and out of the flutes 18. The thermostatic operation of the valve is much the same otherwise as described in connection with Figures 1, 2, and 3.

What is claimed is:

1. A thermostatic valve device for controlling water circulation comprising a plate having an opening, a slide valve having an opening adapted to coincide with the opening in the plate in one position, means for slightly separating the slide valve from the plate when it is moved and for bringing the plate and valve into flat contact at the ends of the movement, and thermostatic means for moving the valve, said first means comprising flutes on the plate and valve respectively that fit one another at the ends of the valve movement and which slide relatively on the plate and valve during movement of the latter.

2. A thermostatic valve device for controlling water circulation comprising a plate having an opening, a rotary slide valve having an opening adapted to coincide with the opening in the plate, a pin rotatably connecting the plate and valve together, means resiliently urging the plate and valve together, means for separating the plate and valve slightly during movement of the valve and plate, and thermostatic means for turning the valve.

3. A thermostatic valve device for controlling water circulation comprising a plate having an opening, a rotary slide valve on the plate and which is adapted to be turned from one position to another to alternately open and close the opening in the plate, means rotatably connecting the plate and valve together, thermostatic means for

turning the valve, and cooperating cam means on the valve and plate for separating them slightly during turning of the valve from one position to the other but allowing the valve and plate to come together in each of said positions.

4. A thermostatic valve for controlling water circulation comprising a member having separated openings, a valve adapted to be alternately moved from one position wherein one opening is closed and the other open to another position where said one opening is open and said other opening is closed, means for slightly separating the valve from the member when the valve is moved from one position to the other, resilient means for bringing the valve substantially against the member when the valve reaches each of said positions, and thermostatic means for moving the valve from one position to the other depending upon temperature variations of the water.

5. A thermostatic valve for controlling water circulation comprising a member having separated openings, a valve adapted to be alternately moved from one position wherein one opening is closed and the other open to another position where said one opening is open and said other opening is closed, means for slightly separating the valve from the member when the valve is moved from one position to the other, resilient means for bringing the valve substantially against the member when the valve reaches each of said positions, and thermostatic means for moving the valve from one position to the other depending upon temperature variations of the water, said separating means including flutes on the member and valve respectively that fit one another at the ends of the valve movement and which separate the valve and member when the valve is moved from one position to the other.

6. A thermostatic valve for controlling water circulation comprising a member having separated openings, a valve adapted to be alternately moved from one position wherein one opening is closed and the other open to another position where said one opening is open and said other opening is closed, means for slightly separating the valve from the member when the valve is moved from one position to the other, resilient means for bringing the valve substantially against the member when the valve reaches each of said positions, and thermostatic means for moving the valve from one position to the other depending upon temperature variations of the water, said separating means including opposed depressions in the member and valve and lever elements in such depressions.

7. A thermostatic valve device for controlling water circulation comprising a plate having openings, a rotary valve on the plate and which is adapted to be turned back and forth from one position to another to alternately open the openings in the plate, thermostatic means for turning the valve, and means between adjacent sides of the plate and valve for separating them slightly during turning of the valve from one position to the other while allowing them to be brought into contact in each position.

8. A thermostatic valve device for controlling water circulation comprising a plate having openings, a rotary valve on the plate and which is adapted to be turned back and forth from one position to another to alternately open the openings in the plate, thermostatic means for turning the valve, means between adjacent sides of the plate and valve for separating them during

turning of the valve from one position to the other while allowing them to be brought into contact in each position, and resilient means normally urging the valve and plate into such contacting relation.

5 9. A thermostatic valve for controlling water circulation comprising a plate having openings, a valve adapted to be alternately moved over the plate from one position to another to alternately
10 open the openings in the plate, thermostatic means for moving the valves alternately from one

position to the other depending upon variations in temperature, cam means between the valve and plate for separating them when the valve is moved from one position to the other while allowing the valve to move into contact with the
5 plate at each of said positions, and means normally urging the valve and plate together so as to bring them into contact in each of said positions.

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