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THERMOSTATICALLY CONTROLLED ENGINE COOLING SYSTEM

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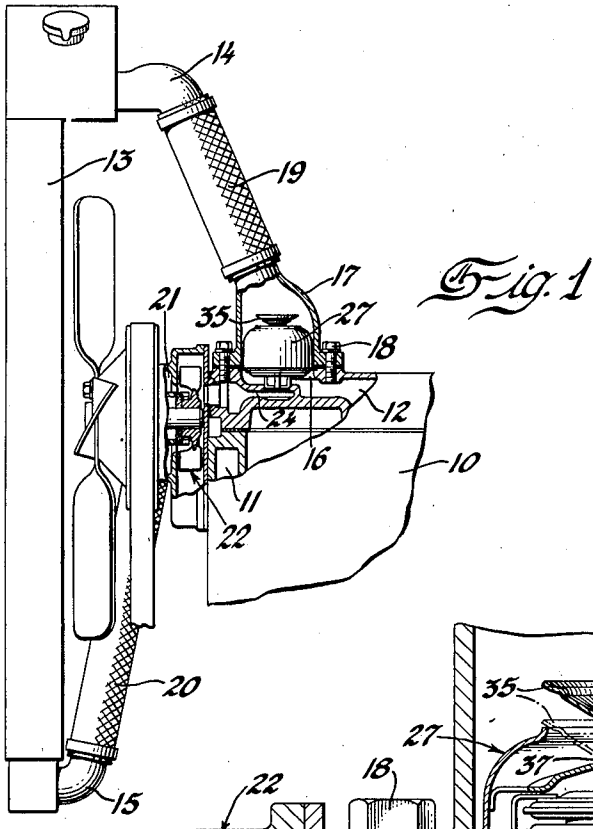


Fig. 1

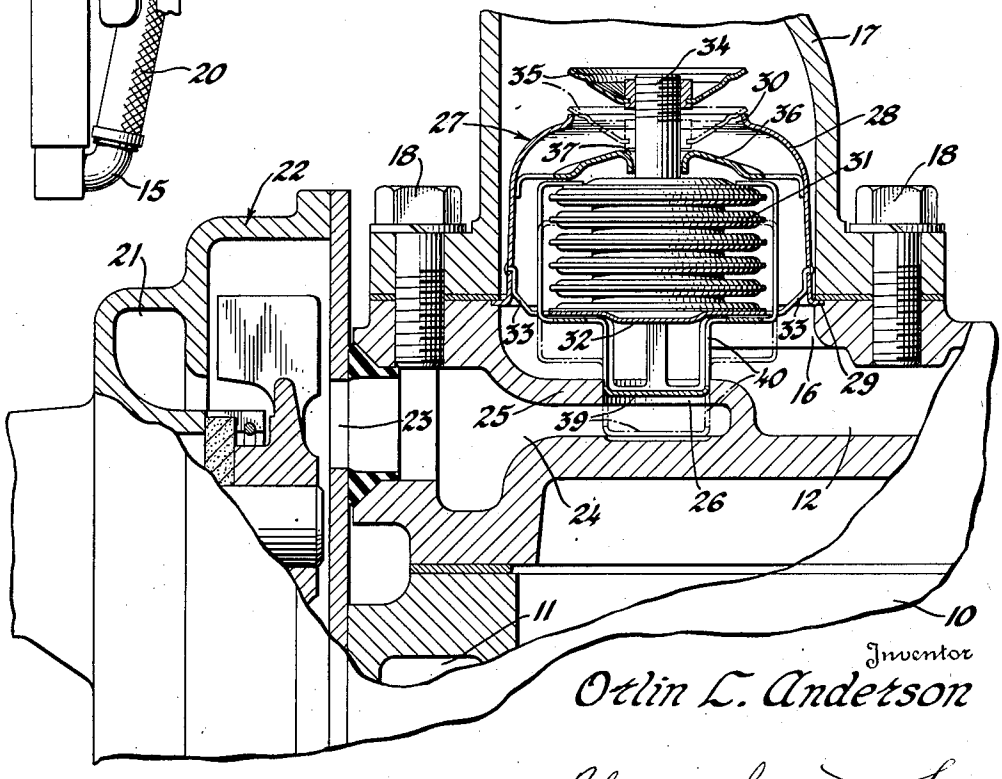


Fig. 2

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THERMOSTATICALLY CONTROLLED ENGINE COOLING SYSTEM

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5 Claims. (Cl. 236—34)

This invention has to do with internal combustion engine cooling systems which include, in addition to the engine water jacket and the water cooling radiator, a by-pass through which engine cooling water may be conducted from the outlet to the inlet of the engine water jacket without passing through the radiator to expedite warming up the engine.

The invention resides in an arrangement of main and by-pass engine water jacket outlet ports and a thermostat which includes valves which regulate the passage of engine cooling water through the ports and may be installed in or removed from the engine cooling system as a unit.

For a better understanding of the nature and objects of the invention, reference is made to the following specification wherein there is described the embodiment of the invention which is illustrated in the accompanying drawing.

In the accompanying drawing:

Figure 1 is a fragmentary side elevation, with parts in section, of an internal combustion engine equipped with a cooling system in accordance with my invention.

Figure 2 is an enlarged view, mainly in section, of the upper part of the front end of the engine shown in Figure 1.

In the drawing, the reference character 10 indicates an internal combustion engine with cooling water passages 11 and 12 in its cylinder block and cylinder head and the reference character 13 a water cooling radiator with water inlet and outlet fittings 14 and 15. In the upper wall of the cylinder head, there is a water outlet port 16 which connects the cooling water passage 12 in the cylinder head with a water outlet fitting 17 which is secured by screws 18 to the upper wall of the cylinder head. The outlet fitting 17 is connected to the radiator inlet fitting 14 by a length of hose 19. The radiator outlet fitting 15 is connected by another length of hose 20 to the main inlet 21 of an engine driven water pump 22 which is mounted on the front of the cylinder block with its outlet communicating with the cooling water passage 11 in the cylinder block.

From a point beneath the water outlet port 16 in the upper wall of the cylinder head to an auxiliary water inlet 23 in the pump 22, there extends a passage 24 which is separated from the cooling water passage 12 in the cylinder head by a horizontal web 25 through which extends a port 26 which is coaxial with the port 16.

The reference character 27 indicates a thermostat with a body 28 which is shaped generally like an inverted cup with an external annular flange 29 on its lower end and an orifice 30 in its upper end. Within the body 28, there is disposed an extensible and contractible metal bellows 31 with its lower head seated on and secured to a spider-like member 32 whose legs 33 are connected at their outer ends to the body 28 near its lower end. The bellows contains a volatile liquid and, consequently, tends to extend and contract when its temperature rises and falls. To the upper head of the bellows, there is secured through the intermediary of a stem 34 a poppet valve 35 which is moved away from and to a position in which it is seated on the upper end of the body 28 around and closes the orifice 30 when the bellows extends and contracts. To limit extension of the bellows 31 and to constrain it to move in a straight line path there is secured in the body 28 above the bellows a member 36 with an orifice 37 in it through which the valve stem 34 extends. Below the spider-like member 32, there is a disk-like valve 39 with legs 40 which extend upwardly and then outwardly below the spider-like member and then upwardly between the legs of the spider-like member into the body 28 between it and the bellows 31 and are connected at their upper ends to the upper head of the bellows. The valve 39 is, of course, moved toward and away from the body 28 when the bellows extends and contracts.

As the drawing shows, the thermostat 27 is installed in the engine shown in the drawing with the flange 29 on the lower end of the body of the thermostat clamped between the outlet fitting 17 and the upper wall of the cylinder head around the port 16 and the disk-like valve 39 within the port 26 in the web 25. It is, of course, apparent that the thermostat may be installed or removed from the engine as a unit by simply removing the outlet fitting 17.

When the engine is cold, the bellows will, of course, be contracted, the valve 35 seated on the upper end of the body 28 of the thermostat around the orifice 30 and the valve 39 in the passage 24 below the lower wall of the web 25. Under this condition, the water forced by the pump 22 into the cooling water passages 11 in the cylinder block and, thence, into the cooling water passage 12 in the cylinder head will leave the latter through the port 26 in the web 25 and return to the pump through its auxiliary inlet 23 without passing through the radiator 13. The water will, consequently, be heated and the temperature of the engine raised rapidly.

As the temperature of the engine rises, the bellows, of course, extends and moves the valves 35 and 39 upwardly. When the valves have reached the limit of their movement in this direction, the valve 35 will, of course, be off its seat and the valve 39 will be within the port 26 between the upper and lower walls of the web 25 and close the port 26. Under this condition, the water forced by the pump 22 into the cooling water passages 11 in the cylinder block and, thence, into the cooling water passage 12 in the cylinder head will leave the latter through the port 16 in the upper wall of the cylinder head and return to the pump through its main inlet 21 by way of the radiator 13 which will reduce its temperature and thus tend to prevent further rise in the temperature of the engine.

I claim:

1. In a thermostat, a generally cup-shaped body with an external annular supporting flange on its open end and an orifice in its closed end, a spider-like member near the open end of the body with the outer ends of its legs connected thereto, an extensible and contractible metal bellows which contains a fluid which expands and contracts when its temperature rises and falls mounted within the body with one of its heads seated on and secured to the spider-like member, a valve on the same side of the spider-like member as the bellows connected to the other head of the bellows so that it moves away from and toward a position in which it is seated on the closed end of the body around the orifice in it when the bellows extends and contracts and cooperates with the body to regulate the passage of fluid through the latter, and a disk-like valve on the side of the spider-like member opposite the bellows with legs which extend toward the spider-like member, then outwardly and then between the legs of the spider-like member into the body between the body and the bellows and are connected at their ends distant from the disk-like valve to the second mentioned head of the bellows so that the disk-like valve moves toward and away from the body as the bellows extends and contracts, the disk-like valve being free to cooperate with a member from which the thermostat is separable to regulate the passage of fluid through a port in the latter.

2. In a thermostat, a member which includes a generally cylindrical element and a supporting element joined one to the other, an extensible and contractible metal bellows which contains a fluid which expands and contracts when its temperature rises and falls mounted within the generally cylindrical element with one of its heads seated on and secured to the supporting element, a valve on the same side of the supporting element as the bellows connected to the other head of the bellows so that it moves away from and toward the supporting member when the bellows extends and contracts and cooperates with the generally cylindrical element to regulate the passage of fluid through the latter, and a valve on the side of the supporting member opposite the bellows connected to the second mentioned head of the bellows so that it moves toward and away from the supporting member when the bellows extends and contracts and free to cooperate with a member from which the thermostat is separable to regulate the passage of fluid through a port in the latter.

3. In a thermostat, a supporting member, a member which extends and contracts when its temperature rises and falls mounted on the supporting member, a valve on one side of the supporting member connected to the second specified member on the mentioned side of the supporting member so that it moves away from and toward the supporting member when the second specified member extends and contracts, and a valve on the side of the supporting member opposite the first specified valve connected to the second specified member on the same side of the supporting member as the first specified valve so that it moves toward and away from the supporting member when the second specified member extends and contracts, one of the valves being free to cooperate with a member from which the thermostat is separable to regulate the passage of fluid through a port in the latter.

4. The combination, with a member which has in it a plurality of ports through which fluid may pass, of a thermostat which is separable as a unit from the member, the thermostat including a member which includes a generally cylindrical element and a supporting element joined one to the other and mounted on the first specified member with the generally cylindrical element around one of the ports in it, an extensible and contractible metal bellows which contains a fluid which expands and contracts when its temperature rises and falls disposed within the generally cylindrical element and mounted on the supporting element with one of its heads secured to the latter, a valve on the same side of the supporting element as the bellows connected to the other head of the bellows so that it moves away from and toward a position in which it in conjunction with the generally cylindrical element obstructs passage of fluid through the last mentioned port when the bellows extends and contracts, and a valve on the side of the supporting element opposite the bellows connected to the second mentioned head of the bellows so that it moves toward and away from a position in which it in conjunction with the first specified member obstructs passage of fluid through the other of the ports when the bellows extends and contracts.

5. The combination, with a member which has in it a plurality of ports through which fluid may pass, of a thermostat which is separable as a unit from the member, the thermostat including a supporting member seated on the first specified member, a member which extends and contracts when its temperature rises and falls mounted on the supporting member, and valves of which one is on one side and the other on the other side of the supporting member connected to the third specified member on the same side of the supporting member so that one moves away from and toward a position in which it obstructs passage of fluid through one of the ports and the other moves toward and away from a position in which it obstructs passage of fluid through the other of the ports when the third specified member extends and contracts.

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