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HEAT CONTROL VALVE FOR INTERNAL COMBUSTION ENGINES

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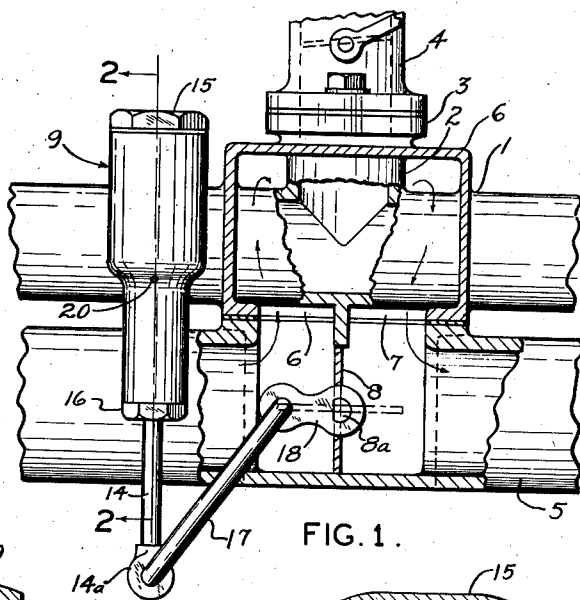


FIG. 1.

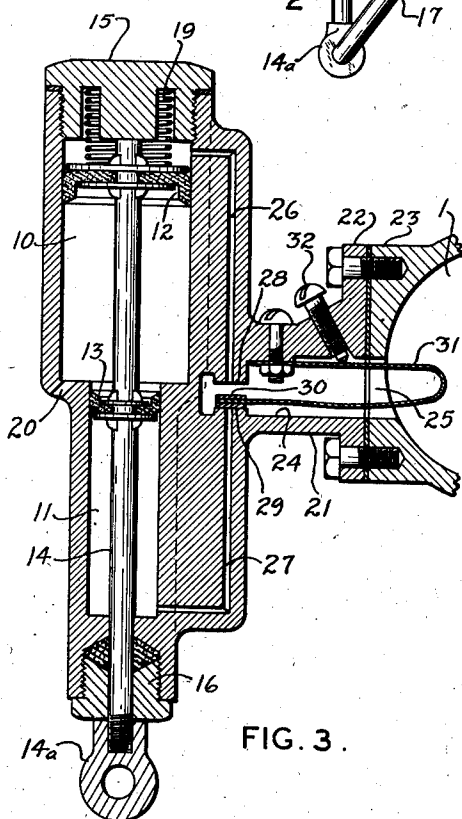


FIG. 3.

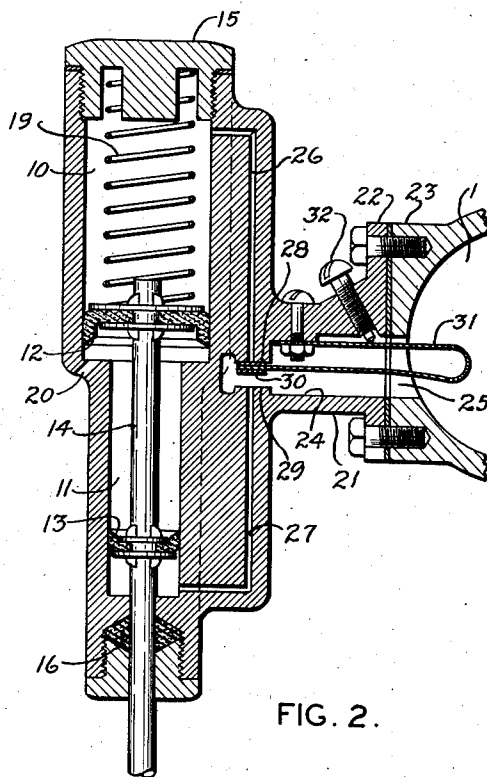


FIG. 2.

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HEAT CONTROL VALVE FOR INTERNAL COMBUSTION ENGINES

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5 Claims. (Cl. 123—122)

This invention relates to internal combustion engines and more particularly to means for controlling the temperature of combustible mixtures fed to the engine.

The present invention employs the usual method of heating the intake charge by directing various amounts of hot exhaust gases through a heating jacket surrounding the intake manifold.

It is the primary object of the present invention to provide novel, automatic means for controlling the application of heat to the intake manifold in accordance with requirements for efficient engine operation.

Other objects and advantages will appear in the following description and accompanying drawing in which:

Fig. 1 schematically illustrates an engine intake manifold and an associated exhaust manifold incorporating a preferred form of my invention.

Fig. 2 is a vertical view taken on line 2—2 of Fig. 1. In this view the control device is in a "heat-on" position.

Fig. 3 is also a sectional view taken on line 2—2 of Fig. 1. In this view the control device is in a "heat-off" position.

Numeral 1 indicates the central portion of an engine intake manifold having a vertical branch 2 equipped with a flange 3 to which is attached a conventional carburetor, the lower portion of which is indicated at 4. Below the intake manifold and parallel therewith a portion of an exhaust manifold is indicated at 5. Surrounding a portion of the intake manifold and the branch 2 is a jacket 6 forming a so-called hot spot. The jacket communicates with the exhaust manifold 5 through ports 6 and 7. A valve 8 attached to a valve shaft 8a which is pivotally mounted in the exhaust manifold between the ports 6 and 7 functions to direct the flow of exhaust gases upwardly through port 6, when in the position shown in full line in Fig. 1. It will be understood that the direction of flow of the exhaust gases is from left to right as indicated by arrows. The outlet of the exhaust pipe (not shown) lies to the right.

Attached to the intake manifold is a valve control device generally indicated at 9. The control device comprises a casing having a larger upper cylinder 10 and a concentric, smaller lower cylinder 11 having pistons 12 and 13, respectively, fitted therein. The pistons 12 and 13 are mounted on a common piston rod 14 which extends downwardly beyond the casing. The upper end of cylinder 10 is sealed from the atmos-

phere by the closing plug 15 and the lower end of cylinder 11 is provided with a packing gland 16. The lower end of piston rod 14 is provided with a fitting 14a for pivotal attachment thereto of a link 17. Rigidly attached to valve shaft 8a is an operating lever 18 having a perforation at its outer end for pivotal attachment of the opposite end of link 17. A spring 19 in the upper part of cylinder 10 normally urges the piston and rod assembly downward and, consequently, urges the valve 8 toward a "heat-on" position. A vent to atmosphere at the lower end of cylinder 10 is indicated at 20.

The control casing is provided with a lateral projection 21 having an integral flange 22 at the end thereof for attachment to a matching flange 23 on the intake manifold. A lateral chamber 24 formed in extension 21 communicates with the intake manifold through the opening 25. Communication between the upper part of cylinder 10 and the lower part of cylinder 11 and the intake manifold is provided by passages 26 and 27, the chamber 24, and opening 25. At the juncture of passages 26 and 27 with the chamber 24, valve seats 28 and 29 are formed and a valve 30 carried by a thermo responsive bi-metal element 31 is arranged to alternately engage the valve seat and effectively close communication with one or the other of cylinders 10 and 11. The bi-metal element is constructed with the high expansive metal on the inside so that with increasing temperature the valve 30 will be moved toward valve seat 29. An adjustment of the thermo responsive element is provided for by the adjusting screw 32. It will be noted that the loop end of element 31 extends into the intake manifold and that the element generally is exposed to the temperature of the mixture being conveyed therethrough.

The diameters of pistons 12 and 13 are so proportioned and the spring 19 so calibrated that when the valve 30 is in an intermediate position, permitting communication between the ends of both cylinders and the intake manifold, a balance will be reached somewhere intermediate of the "heat-on" and "heat-off" position of valve 8, depending, of course, upon the degree of suction in the intake manifold. It is the intention, however, to calibrate these elements so that the valve 8 will be in at least a partial "heat-on" position under these conditions and when subject to suction in the intake manifold consequent to normal engine operation.

In operation, upon starting a cold engine, valve 8 will be in the "heat-on" position as shown in

Fig. 1, in full line. The control mechanism will be in the position as shown in Fig. 2. Hot gases will be directed through the jacket under these conditions. As the intake mixture exceeds a predetermined temperature, thermo responsive element 31 will move the valve 30 from the seat 28 permitting the communication of intake manifold suction to the top of cylinder 10 which will result in piston 12 being drawn upward to move valve 8 toward a "heat-off" position to a greater or lesser degree depending upon the manifold suction, it will not, however, be moved to a complete "heat-off" position. If conditions of atmosphere and operation are such that the temperature of the mixture continues to rise, the valve 30 will be moved to seat 29, as shown in Fig. 3. Under these conditions, with the passage 27 to opposing piston 13 being closed, if the engine is operating under normal or light load the intake suction will be sufficient to move piston 12 to its uppermost limit and, consequently, move valve 8 to a full "heat-off" position as indicated by dotted lines in Fig. 1, thereby permitting the exhaust gases to by-pass the jacket 6. If, however, the engine is operated under a heavy load resulting in a low manifold vacuum, the spring 19 will overcome this vacuum and move the piston downward and the valve 8 toward a "heat-on" position.

The foregoing description and drawing are intended to be illustrative and not limiting and the exclusive use of all modifications within the scope of the appended claims is contemplated.

I claim:

1. A heat valve control for an internal combustion engine "hot-spot" comprising a pair of resiliently expansible chambers, the movable walls thereof being connected together and being adapted for connection to the valve for control thereof, passages for connecting said chambers with the engine induction conduit so that suction tends to move said walls in opposing directions, and thermostatic valve means selectively controlling said passages for varying the relative differential pressures applied thereto.

2. A heat valve control as specified in claim 1 in which the movable walls of said chambers

are of different sizes whereby the control may assume various intermediate positions in accordance with the heat and suction conditions applied thereto.

3. A heat valve control as specified in claim 1 in which said movable walls are resiliently urged in one direction by a spring, said walls being of different sizes and the larger thereof being disposed so that suction thereon opposes said spring.

4. A heat valve control as specified in claim 1 in which said thermostatic valve means is constructed and arranged to close one of said suction passages at low temperatures so that said movable walls and said control valve will be maintained by suction in the "heat-on" position, and to close the other suction passage at high temperatures so that the suction will be effective to urge said walls and control valve toward the "heat-off" position.

5. A heat valve control for an internal combustion engine "hot-spot" comprising opposing cylinders of different diameters having connected pistons fitted therein, means for connecting said pistons to the heat valve, spring means urging said pistons and valve toward the "heat-on" position, suction connections for respectively connecting opposite ends of said cylinders to the engine intake manifold, exposing the inner portions of said cylinders to atmospheric pressure, the larger of said pistons being located so that suction applied thereto opposes said spring means, and thermostatic valve means controlling said suction connections in accordance with the temperature of the engine intake gases so that at low temperatures suction is applied to said smaller piston only for maintaining said heat valve in the "heat-on" position, at higher temperatures suction is applied to both pistons for maintaining said heat valve in an intermediate position, and at still higher temperatures suction is applied to said larger piston only whereby the full portion of intake suction is available for urging said heat valve to the "heat-off" position.

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