April 12, 1932. A. G. McCALEB 1,853,870

SHUTTER CONTROL DEVICE

Filed Nov. 15, 1930

Fig. 1.

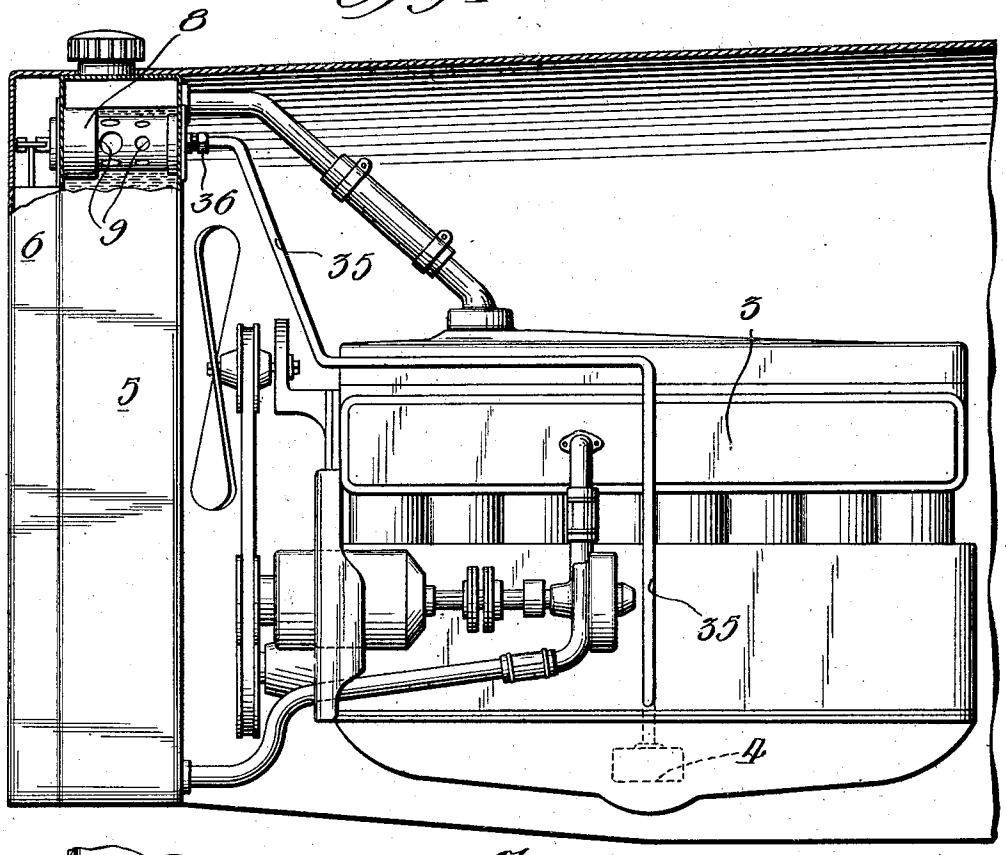
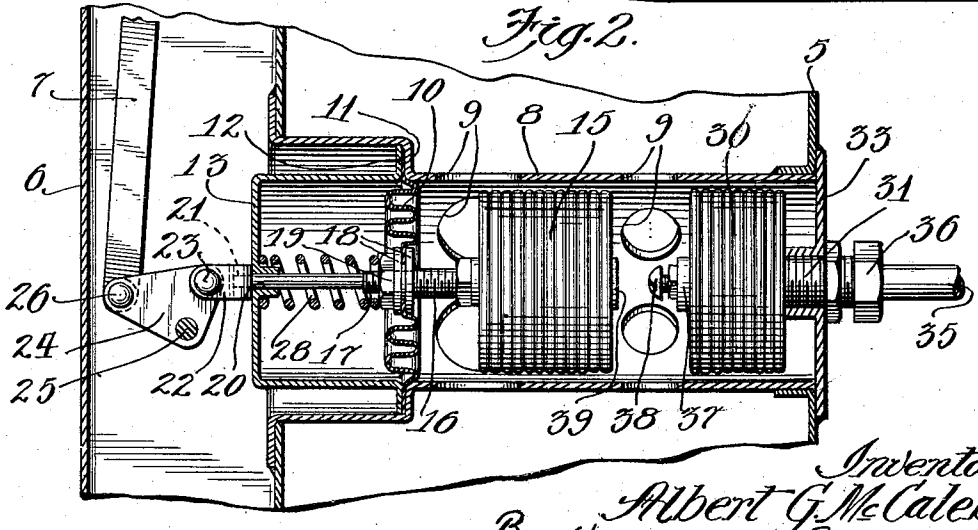


Fig. 2.



Inventor:
Albert G. McCaleb
By Williams, Bradbury,
McCaleb & Hinkle. Attys.

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UNITED STATES PATENT OFFICE

ALBERT G. McCALEB, OF EVANSTON, ILLINOIS, ASSIGNOR TO PINES WINTERFRONT COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF DELAWARE

SHUTTER CONTROL DEVICE

Application filed November 15, 1930. Serial No. 495,890.

My invention relates to improvements in engine shutter apparatus and more particularly to an improved automatic control means therefor.

In automatic radiator shutters for automotive vehicles it has been found desirable to cause the shutters to assume a closed position whenever the engine is shut off, thus maintaining the heat within the hooded engine compartment to provide easier re-starting of the engine during cold weather and resulting in numerous other advantages.

It is an object of my invention to provide an improved means for automatically causing the shutters of an automotive engine to close when the engine stops.

It is another object of my invention to provide means for closing the shutters of an automotive engine when the engine has stopped, which means is responsive to oil pressure created by the engine itself.

It is still another object of my invention to provide oil pressure control means for cooperating with a thermostatic operating means of a radiator shutter apparatus to cause the shutters to assume a closed position when the engine stops.

Further objects and advantages of my invention will become more apparent throughout the following description and the accompanying drawings, in which:

Fig. 1 is a partly diagrammatic side elevation of an automative engine and radiator illustrated with the shutter operating device of my invention attached thereto, parts being broken away to show certain parts more clearly; and

Fig. 2 is an enlarged cross sectional plan view of the operating parts of the automatic control of my invention.

Referring now to the drawings, in which like numerals designate like parts throughout the several views, in Fig. 1 is shown an automotive engine 3 having an oil pump 4 for supplying oil under pressure to the bearings and other parts of the engine to be lubricated. A radiator 5 comprising the usual core and water tank is shown mounted in the conventional manner in front of the engine. A radiator shutter 6 of the type which comprises a plurality of shutters joined to a common operating bar 7, whereby they are all opened and closed simultaneously, is mounted on the radiator by bolts, riveting, spot-welding, or in some other suitable manner. Such shutter apparatus may be of well-known design.

I have illustrated a thermostat shell 8 mounted in a leak-proof manner in the water tank of the radiator by welding or some other suitable means. This shell, as shown in Fig. 2, has a plurality of openings 9 therein, allowing the water which circulates in the cooling system to flow through the shell. A corrugated metallic diaphragm 10 is mounted within the shell 8 between a shoulder 11 formed in one end thereof and a flange 12 of a cup-shaped housing member 13 by means of welding or in some other suitable manner which will provide a leak-proof connection.

An expansible thermostat 15 of any well-known type is suitably mounted on a screw-threaded shaft 16 which passes through an aperture in the metallic diaphragm 10. The shaft 16 is reduced at 17 to form a shoulder, against which may be seated one of a pair of leak-proof washers 18 which are disposed on each side of the bellows 10 surrounding the aperture therein, and compressed together by a nut 19 screw-threaded upon the reduced portion 17 of the shaft 16, thereby rigidly securing the shaft 16 to the diaphragm 10 and forming a leak-proof connection. The other end of the shaft 16 passes through an opening 20 formed in a boss in the cup-shaped housing 13 and is secured by a nut 21 to a bifurcated arm 22. The arm 22 is pivotally secured at 23 to a triangular arm 24, one corner of which is pivotally mounted on the stud 25. As shown in Fig. 2, the other corner of the triangular arm 24 is pivotally secured to the shutter operating bar 7 at 26 in a suitable manner. It will thus be seen that reciprocating movements of the shaft 16 will flex the diaphragm 10 and rotate the arm 24 about the pivot stud 25, moving the shutter operating bar to open and close the shutters. A compression spring 28 surrounds the shaft 16 and is seated at one end against the cup-shaped housing 13 and

at the other end against the nut 19, normally urging the shutter operating bar to a closed position such as shown in Fig. 2.

An expansible bellows 30 is disposed within the other end of the shell 8 and has a screw threaded inlet bushing 31 formed thereon by which the bellows is mounted in a plate 33. The plate 33 is secured to the end of the shell 8 and to the external wall of the water tank of the radiator by means of welding or in some other suitable manner. An oil supply line 35 connected with the pressure oiling system of the engine at the oil pump, or some other desirable connecting point in the oil supply line, is suitably connected with the inlet 31 of the bellows 30 by means of the bushing 36 or other leak-proof connecting means to supply oil to the bellows. A stud 37 is formed on one side of the expansible bellows 30 and has a set screw 38 screw threaded therein which is in alignment with a stud 39 formed at one end of the thermostat 15 and adapted to contact therewith when the bellows is expanded. The expansible bellows 30 is in direct communication with the oil pressure system of the automotive engine and is adapted to be filled with oil from the engine and expanded thereby when the engine is operating. The bellows are designed to expand at the normal operating oil pressures of the engine.

It will be noted that the thermostat 15 may expand without moving the arm 16 when the bellows 30 are in a contracted position, as illustrated in Fig. 2, until the stud 39 seats against the adjustable set screw 38 of the bellows 30.

In the operation of my device, the running of the engine will cause the oil pump to build up pressure in the supply line 35, which pressure will cause the bellows 30 to expand bringing the head of the adjustable screw 38 in contact with the stud 39 of the thermostat 15. As shown in Fig. 2, the thermostat 15 is contracted and the shutters are in a closed position, which condition will exist when the engine temperature and the water in the radiator tank are cool. As the engine operates and the temperature increases, the thermostat 15 will expand and the stud 39 will become firmly seated against the set screw 38 of the bellows 30, which are in expanded condition while the engine is operating. The continued expansion of the thermostat 15, being resisted in the one direction by the expanded bellows 30, will reciprocate the shaft 16 outwardly, flex the diaphragm 10 and compress the spring 28, thereby rotating the arm 24 about the pivot 25, and moving the shutter operating bar 7 to cause the shutters to open. If the temperature of the engine drops during operation, the thermostat 15 will contract and the spring 28 reciprocate the shaft 16 inwardly to close the shutters. In other words, the thermostat 15 always operates to open the shutters against the tension of the compression spring 28.

While the engine is operating and the engine temperature is of sufficiently high degree to expand the thermostat 15 and open the shutters, the thermostat will be firmly seated against the adjustable set screw 38 of the bellows 30. When the engine is shut off the oil pump ceases to build up pressure in the oil line 35, and the bellows 30 collapse, causing the shaft 16 to be reciprocated inwardly by the spring 28 to close the shutters since the collapse of the bellows removes the seat for the thermostat stud 39.

Having thus described my invention, what I claim is new and desire to secure by Letters Patent of the United States is:

1. In an engine radiator shutter apparatus, thermostat means responsive to changes in engine temperature to open and close the shutters, and automatic means responsive to changes in the oil pressure of the engine to render the thermostat means effective when the engine is operating and ineffective when the engine is stopped.

2. In an engine radiator shutter apparatus, thermostat means responsive to changes in engine temperature to open and close the shutters, and automatic means responsive to changes in the oil pressure of the engine operating to close the shutters independently of the thermostat action when the engine is stopped.

3. In an automotive engine radiator shutter apparatus, a plurality of shutters, a thermostat to expand and open the shutters upon increases in engine temperature, a spring to cause the shutters to close upon contraction of the thermostat when the engine temperature decreases, an oil pump in the engine, and means responsive to the oil pressure created by said pump to render the thermostat ineffective when the engine is stopped and allow the spring to close the shutters regardless of the temperature of the engine.

4. In combination with an engine and shutters for controlling the flow of air which cools the engine, an engine operated oil pump, a thermostat for opening and closing the shutters upon changes in engine temperature, an expansible bellows to receive oil from the oil pump and be expanded thereby when the engine is running to maintain the thermostat in operative position, and a spring to close said shutters when the engine is stopped and the bellows collapse.

5. In combination with an engine and shutters for controlling the flow of air which cools the engine, an expansible thermostat for opening the shutters upon increases in engine temperature and allowing the shutters to close upon decreases in engine temperature, a spring for urging said thermostat in a direction to close said shutters, and an expansible

bellows expanded by the oil pressure developed by the engine to resist movement of the thermostat in a shutter closing direction by the spring when the engine is running and adapted to collapse and allow such movement when the engine is stopped.

6. In combination with an engine and shutters for controlling the flow of air which cools the engine, a shutter control unit comprising a thermostat housing disposed within the water tank of the radiator, an expansible thermostat therein, a shutter operating shaft connected with said thermostat and reciprocable therewith to open the shutters when the thermostat expands and the shaft is moved outwardly, a spring to urge said shaft and attached thermostat inwardly to close the shutters when the thermostat contracts, and an expansible bellows operated by the oil pressure developed by the oil pump of the engine, disposed within said housing in alignment with said thermostat to provide a seat therefor and resist inward movement of the shutter operating shaft when the engine is running and allow such movement when the engine is stopped.

7. In combination, shutters for controlling the flow of cooling air to an engine, a thermostat, responsive to the temperature of the engine, adapted to open said shutters in response to increased engine temperature when said thermostat is provided with an abutment against which it may bear when exerting opening force on the shutters, and means utilizing oil pressure created by the engine when operating to provide such abutment when and only when the engine is operating.

8. In combination, shutters for controlling the flow of cooling air to an engine, a thermostat, responsive to the temperature of the engine, adapted when held against expansion in one direction to expand in the other direction to effect the opening of the shutters, and means for utilizing the oil pressure of the engine for preventing expansion of the shutters in said first-mentioned direction when and only when the engine is in operation.

9. In an engine shutter apparatus, a chamber adapted to receive liquid from the cooling liquid circulating system of the engine, a first expansible vessel in said chamber, said first expansible vessel expanding and contracting in response to changes in the temperature of the liquid, a second expansible vessel in said chamber, said second expansible vessel affording an abutment for the first expansible vessel, means for causing said second expansible vessel to be expanded when the engine is in operation, shutters, and means affording an operating connection between the shutters and the first expansible vessel.

10. In an engine shutter apparatus, a chamber adapted to receive liquid from the cooling liquid circulating system of the engine, a first expansible vessel in said chamber, said first expansible vessel expanding and contracting in response to changes in the temperature of the liquid, a second expansible vessel in said chamber, said second expansible vessel affording an abutment for the first expansible vessel, means for causing said second expansible vessel to be expanded when the engine is in operation, shutters, and means affording an operating connection between the shutters and the first expansible vessel, said last mentioned means comprising a flexible diaphragm constituting a closure for the aforesaid chamber and an operating rod extending through and having liquid tight connection with said diaphragm.

In witness whereof, I hereunto subscribe my name this 13th day of November, 1930.

ALBERT G. McCALEB.