HEATING SYSTEM FOR INTERNAL COMBUSTION ENGINES

Heinz W. Boehmfield and Walter W. Winkman, both of
179 King St. East, Hamilton, Ontario, Canada
Filed Apr. 22, 1968, Ser. No. 722,994

Int. Cl. B60Q 7/02; F01P 11/02

U.S. Cl. 237-123

6 Claims

ABSTRACT OF THE DISCLOSURE

A heating system for an internal combustion engine or car interior characterised by the provision of a heat preserving tank into which is passed a liquid heated by the engine and in which at least a portion of such liquid is retained for subsequent use in warming the engine or the car interior.

FIELD OF THE INVENTION

This invention relates to a heating system for combustion engines.

DESCRIPTION OF THE PRIOR ART

It is well known that it is often very difficult to start combustion engines in conditions of extremely cold weather, without the use of some supplementary heating means, such as an electrical engine heater, so that the engine must be located alongside a suitable source of power. Unless such heaters are used it takes a considerable length of time for the engine to warm up to proper running temperature, if it can be started at all. A cold start causes considerable wear and possible damage to the engine.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a heating system for combustion engines which provides easier starting and shortens the cold running time of the engine in extremely cold weather, and in a manner which is independent of any other power source.

This invention provides a heating system for an internal combustion engine or car interior characterised by the provision of a heat preserving tank into which is passed a liquid heated by the engine and in which at least a portion of such liquid is retained for subsequent use in warming the engine or the car interior.

A specific embodiment of this invention shows a thermo tank which is used connected by means of hoses into the cooling system of the combustion engine between the engine block and the internal car heater.

Another purpose of apparatus in accordance with this invention is to provide a source of instant heating which can be used to warm up the interior of the automobile with which it is associated.

The resulting cooling system requires an additional amount of coolant equal to the volume of the thermo tank, which will usually be approximately double the volume of the coolant which is contained in the engine block, which will usually be about one-ninth of the weight of the engine block. The proper and effective functioning of this heating system requires the use of the engine within twenty four hours of the time that it was last used, otherwise there is too great a loss of stored heat in the thermotank for the system to function satisfactorily.

The actual heat loss from the coolant in the thermo tank will depend, among other factors, upon the shape of the tank, which determines the area of the exposed surface, the nature and amount of the insulation material, the temperature difference between the coolant in the tank and the ambient atmosphere, and the length of time for which the coolant stands without additional heat being supplied thereto. Observations on an actual system have proven that higher starting temperatures on the engine were achieved, than could be obtained in an electric block heater after twelve hours of continuous use of the block heater in extremely cold weather.

The following points are particular features of apparatus in accordance with this invention:

(1) The heating system which includes a thermal reservoir tank.

(2) The system is independent of the geographical location of the combustion engine, as compared to electrical heaters, in that it does not need to be located near to the supplementary source of power.

(3) The operation thereof is safer as compared to electrical or gas heaters.

(4) An instantly available source of heat is provided which can be used to preheat the engine block and/or the interior of the automobile and/or to defrost the windshield etc.

(5) No cost factor is involved in the operation of the system.

(6) Higher starting temperatures for the engine, and/or shorter warm up times can be achieved.

(7) The system is simpler and less expensive as compared to gasoline heaters employed heretofore.

BRIEF DESCRIPTION OF THE DRAWINGS

Specific embodiments of the invention will now be described, by way of example, in conjunction with the attached drawings, wherein: FIGURE 1 shows the arrangement of a thermal reservoir tank in the cooling system of a liquid-cooled internal combustion engine.

FIGURE 2 shows a cross-section through the said thermal tank to illustrate the way in which coolant flows therein through a circuitous path to ensure mixture of hot and cold coolant inside the tank; and

FIGURE 3 shows an embodiment wherein the thermal tank is used as an interior car heater in combination with an air cooled engine.

Referring now specifically to FIGURE 1 there is shown the conventional engine block of a liquid cooled internal combustion engine, having the reference 12, the liquid within the engine block being circulated to a radiator 13 by means of a conventional engine-driven water pump which is not shown. A one-way valve 1 is provided in the return pipe from the bottom of the radiator to the engine. In accordance with the invention there is also provided a liquid-filled circuit constituted in this embodiment by the said engine block, and also constituted by a thermal or heat-preserving tank 14 and a heater 17 for the car interior. The tank 14 and the heater 17 are maintained full of liquid, and the liquid can pass from the block 12 via a heat regulator valve 2, a pipe 4, and inlet pressure valve 5 to the interior of the tank 14. This inlet pressure valve prevents loss of hot coolant from the tank 14. Liquid passes out of the tank 14 via an outlet pressure valve 6, and independent circulation pump 8, which is under the control of an electrical switch 9, and a pipe c to the interior of the car heater 17. From the interior of the car heater the liquid returns via a two-way valve 7 to the interior of the engine block.

The liquid moving in the pipe c can also pass into a bypass pipe b via a thermostat valve 3 which is open when cold and is closed when hot. This pipe b is connected to the interior of the car heater 17 by means of a one-way valve 4 which permits liquid to flow from the pipe b into the car heater, but not in the reverse direction. Another pipe e connects the two-way valve 7 to the interior of the thermal tank 14, via another inlet pressure valve
The pump 8 is operated via the switch 9 by an independent control switch 10, which connects the switch 9 and thereby the pump 8 to a source of power. The switch 10 may possibly be a timing switch and its operation causes the illumination of a control indication light 11. The pump 8 will not cause operation of the pump 8, unless the switch 9 is closed because of the elevated temperature of the liquid in the tank 14.

Referring now specifically to FIGURE 2, which shows diagrammatically one possible construction for the interior of the tank 14, it will be noted that the pump and the walls of the tank are relatively thick and are of a highly thermally-insulating material, so as to maintain the contents thereof at the elevated temperature for as long as possible. Moreover, the interior of the tank is provided with oppositely-directed transverse baffles 15, which ensure that the liquid entering the tank must follow a circuitous path, in the cold liquid from the engine block 12 and the hot liquid within the tank will become thoroughly mixed.

Referring now specifically to FIGURE 3, the device shown therein comprises a forced-air vehicle interior heating device which is directly associated with the thermal tank 14. Thus, the thermal tank 14 is mounted within an annular container 16 of thermally-insulating material by means of radial heater ribs 18, which also permit the longitudinal passage of air in the annular space between the tank 14 and the container 16. Air from the car interior enters via an inlet 19 under the action of a fan 20. The air passes through an aperture in the container 16 which can be closed by a movable plug 22, and enters an air chamber 24. The air then flows between the heater ribs 18 being heated by heat exchange with the liquid in the interior of the tank 14 until it reaches the other end of the container 16. The air then passes through an outlet 21, through an opening which can be closed at will by means of a plug 22. The plugs 22 and 23 are connected together by a tie rod 27, which permits the two plugs to be moved simultaneously for opening and closing their respective openings, and for controlling the rate of flow of air through the device. The heated liquid from the engine block 12 enters the tank 14 via an inlet valve 25, and leaves the thermal tank via an outlet valve 26.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The procedure when starting with the system completely cold is that the water pump of the engine 12 passes the coolant via the open heat regulator valve 2 through the tank is operable by a hose 25 and the valve 4 into the interior of the car heater 17. From the heater 17 the liquid passes through valve 7 directly back to the engine block. It will be seen that at this time any coolant contained in the thermal tank does not take part in the circulation. Since the thermostat valve 3 remains open at the low temperature of the coolant and the pressure applied through the valve 5 is too low to open the valve. Upon the coolant reaching the running temperature normal for the engine the thermostat 3 will close, and now the coolant under pressure opens the valve 5 to circulate the coolant through the thermal tank 14 and via the valve 6, Interior heater 17 back to the engine block.

The procedure in starting with hot coolant contained in the thermal tank 14 is to close the electrical switch 10, the thermal contact 9 being closed, whereverupon the electrical control of the pump 8 is disconnected from the thermal tank 14 through the pipe e to the interior car heater, and thence to the engine block, with the result that cold coolant from the engine is passed into the thermal tank 14. After a few minutes in an extremely cold weather the starting temperature of the engine will be considerably higher. The temperature difference that results will cause the thermal contact 9 to stop the action of the pump 10. Now the circulation proceeds as described when operating with a cold system.

If instant heating is required of the car interior, this can be obtained by a separate circulation of hot fluid from the thermal tank 14 by means of the pump 8, the pump passing the hot fluid through the interior of the car heater 17. In this instance the valve 7 is regulated so that the fluid from the car heater 17 passes through hose e and the pressure valve 5a back into the interior of the thermal tank 14.

In the case of an air cooled engine, there is of course no cooling fluid immediately available as in the case of a liquid cooled engine. If this is the case the embodiment illustrated by FIG. 3 is employed, and a heat exchanger is connected to the engine manifold and a fluid with a high boiling point flows through the exchanger and then to the interior of the tank 14 via the inlet 25 and outlet 26. To prevent overheating of the fluid in the tank 14 it may be provided in the system. In this case the thermal tank itself is used as the internal car heater, over which cold air is blown, to be heated and then passed to the car interior.

Therefore, the control rod 27 to the left as shown in FIGURE 5 moves the plugs 22 and 23 out of their respective openings and permits the fan 20 to pass air via inlet 19 through the respective aperture over the exterior of the tank 14, and thence to the outlet 21 from which it is delivered to the interior of the car.

To sum up, the functioning of this thermal tank system is that after the use of the engine 12 for a sufficient time a quantity of hot liquid is trapped inside the thermal tank 14, which is specifically arranged and insulated to reduce as much as possible the loss of the heat from the said liquid. In the case of a liquid-cooled engine this thermal tank preferably is located in the coolant circulating system thereof between the engine block and the interior car heater. The tank can be disposed in any convenient location, such as the trunk of the car. The coolant of the engine flows through the said thermal tank after reaching the running temperature of the engine, or of the specified heat exchanger. The trapped hot coolant inside the thermal tank may be used for the following purposes:

1. To preheat the engine block for starting.
2. To accelerate the rise of temperature that is obtained after starting of the engine.
3. For instant heating of the interior of the car.

It will be noted particularly that the interior of the tank 14 is provided with intervening partitions 15 which produce a circuitous path for the flow of coolant through herein to prevent a direct flow from the inlets to the outlets thereof.

What we claim is:

1. A heating system for an internal combustion engine and the interior of a vehicle in which the engine is mounted comprising a liquid heated circuit not only by a liquid-filled container in heat-exchange relation with the engine for the liquid therein to be heated by heat from the engine, and for the engine to be heated by the liquid there in, a liquid-filled heat-preserving tank, pipe means connecting the said container and said tank to provide circulation of liquid from the container to the tank and return from the tank to the container, pump means in said pipe means operable independently of the engine for circulating liquid from the tank to the container to warm the engine with residual heat stored by the liquid in the tank, vehicle interior warming means, and means operable independently of the engine for circulating hot fluid from the tank to the said vehicle interior warming means to heat the vehicle interior with residual heat stored by the liquid in the tank.

2. A heating system as claimed in claim 1, wherein the said pipe means include bypass pipe means for bypassing the liquid from the interior of the said tank and thermally-operated valve means operative to bypass the said
liquid until it attains a predetermined elevated temperature.

3. A heating system as claimed in claim 2, wherein the said liquid-filled container comprises the engine block of a water-cooled engine.

4. A heating system as claimed in claim 1, wherein the said vehicle interior warming means comprises a liquid-heated device connected in the pipe means between the said tank and the container.

5. A heating system as claimed in claim 1, wherein the said tank also comprises the said vehicle interior warming means, the said means comprising a container enclosing the tank to provide a passage for the movement of air through the container in heat exchange relation with the tank, fan means for moving air through the said passage, and means for controlling the flow of air through the said container.

6. A heating system as claimed in claim 5, wherein the container includes an inlet for cold air and an outlet for warmed air, and the said means for controlling the flow of air comprise respective inlet and outlet valves and means for operating the said valves simultaneously.

References Cited

UNITED STATES PATENTS

1,158,691 11/1915 Kohnle 123—41.14
1,273,007 7/1918 Shaten 237—12.3
1,289,734 12/1918 Gould 237—66
1,722,884 7/1929 Aitrey 237—8 X
1,789,283 1/1931 Usborne 123—41.14
2,408,183 9/1946 Wood 123—41.14
2,834,548 5/1958 Olsen 236—34

EDWARD J. MICHAEL, Primary Examiner

123—41.14

U.S. Cl. X.R.