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TEMPERATURE CONTROL FOR INTERNAL COMBUSTION ENGINE

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FIG. 1.

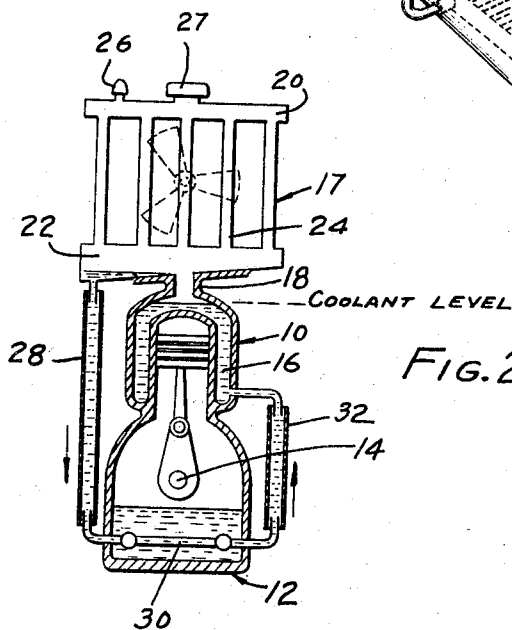
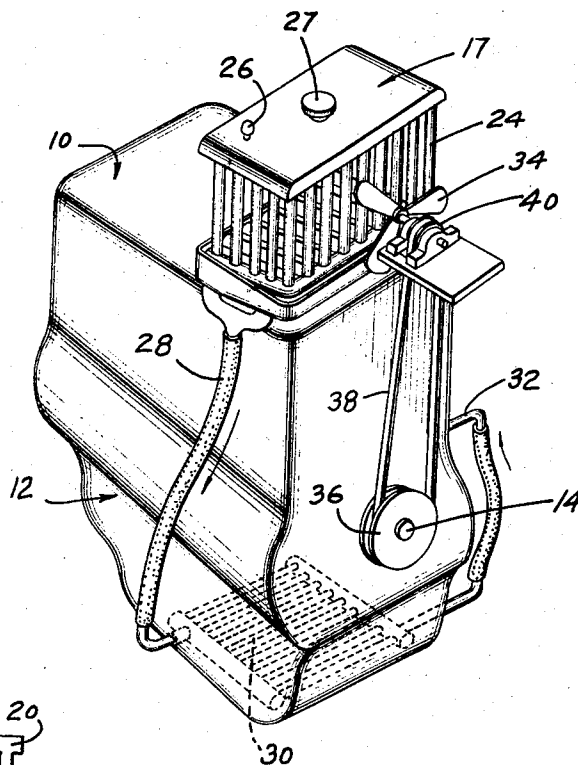


FIG. 2.

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TEMPERATURE CONTROL FOR INTERNAL COMBUSTION ENGINE

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3 Claims. (Cl. 123—41.21)

(Granted under Title 35, U. S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

This invention relates to a system for controlling the temperature of the engine block and of the lubricating oil in an internal combustion engine which may be subjected to extremes of external temperature.

In operations in Arctic regions, the usual radiator of a liquid-cooled engine is larger than needed, and maintains the engine temperature too low for efficient operation. Also, the usual water pump is not needed, since a thermal-gravity system will circulate the coolant sufficiently rapidly to maintain the engine at proper temperature. There is also a need to transfer heat to the oil in the crankcase while the engine is being warmed up, and there is sometimes need to cool said oil when the engine has been fully warmed up.

The present invention aims to provide a system which will accomplish the functions above indicated, and do so in an economical and efficient manner.

An object of the invention is to provide a temperature control system of the type indicated which will operate efficiently at extremely low circumambient temperatures.

A further object of the invention is to provide a simplified cooling system for an internal combustion engine.

Further objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following description wherein

Fig. 1 is a view in perspective of an internal combustion engine provided with a heat exchanging and transferring system which embodies the invention, and

Fig. 2 is a diagrammatic representation of the apparatus shown in Fig. 1.

The engine shown in the drawing comprises the usual engine block 10, crankcase 12, and crankshaft 14. Details of the engine mechanism are omitted because they may vary widely. The engine is provided with a water jacket 16 of any usual type.

Mounted above the engine, and replacing the usual radiator, is a separator and condenser 17 connected to the water jacket 16 by a tube 18 and comprising an upper tank 20 and a lower tank 22 connected by heat-exchange tubes 24. The level of coolant in the water jacket is maintained at about the level of the tube 18 as shown. The upper tank is provided with an air vent 26 of the type used in steam radiators, and a filler cap 27 which may incorporate a pressure release mechanism (not shown) of the type commonly used in automobile radiators. The

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lower tank has an inclined bottom, as shown, which leads to the bifurcated upper end of condensate line 28 which connects with a heat exchanger 30 in the crankcase of the engine below the level of oil therein. The heat exchanger is in turn connected by a condensate return tube 32 to the water jacket 16.

Forwardly of the condenser 17 is a small fan 34 to circulate air past the tubes 24. The fan may be driven from the crankshaft 14 by means of a pulley 36 and a belt 38 which engages a second pulley 40 on the fan shaft.

If the engine is started while cold, the coolant in the water jacket will become heated and will eventually boil, the resulting steam flowing into the condenser 17 to be cooled and condensed, the condensate flowing downwardly through line 28 to heat exchanger 30, where it gives up heat to the oil in the crankcase, and then through tube 32 back to the water jacket. Circulation in this manner is maintained because the coolant in water jacket 16 is warmer than that in the condensate line 28. Along with the steam (or other vapor) passing through tube 18 a certain amount of liquid coolant will be carried over into tank 22, and this process will continue until the liquid level in line 28 is higher than that in the water jacket, which further aids the circulation.

When the engine is fully warmed up, the condensate in heat exchanger 30 may act to absorb heat from the oil in the oil pan if the temperature of said oil becomes unduly high.

It will be seen that the condenser 17 may be made much smaller than the usual radiator, that no water pump is required, and that the capacity of fan 34 may be materially less than that of the usual fan.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. In a liquid cooled internal combustion engine having a liquid coolant jacket and a crankcase for containing oil, a boiling-condensing cooling system comprising a condenser disposed above the upper level of the liquid coolant in the jacket and connected to the latter to receive therefrom vapors at the boiling point of the liquid coolant, a heat exchanger disposed below the condenser and in the crankcase, conduit means for conducting condensate substantially at the boiling point directly from the condenser to the heat exchanger without substantial loss of heat, and conduit means for returning the condensate from the heat exchanger to the coolant jacket, the construction and arrangement being such that circulation of the condensate is effected by its difference in density in the system.

2. Apparatus in accordance with claim 1 including an engine driven fan for passing ambient air in heat exchange relation to the condenser for extracting heat of vaporization from the coolant to thereby condense the vapor delivered to the condenser.

3. In a cooling system for a liquid cooled internal combustion engine of the type normally provided with a liquid coolant radiator having sufficient cooling capacity for maintaining the engine at optimum operating temperature when the engine is operated in ambient air above a certain temperature but of excessive cooling capacity when said engine is operated in ambient air below said certain temperature, whereby under the last named operation the

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engine operates below said optimum temperature, said engine also having a crankcase for containing oil for lubricating the engine, which oil would remain below optimum temperature with the engine operating with said coolant radiator, the improvements comprising; a condenser in heat exchange relationship with ambient air adapted to condense coolant vapors formed in said engine adapted to be employed with said engine in lieu of said radiator and having lesser cooling capacity than said radiator but of cooling capacity sufficient to maintain said engine at said optimum temperature when the engine is operated below said certain temperature, a heat exchanger disposed within said crankcase in heat exchange relation to said

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oil, and means for conducting condensate from said condenser to said heat exchanger without substantial loss of heat whereby the temperature of said oil may be raised as rapidly as practicable during the period the engine temperature is increasing toward its optimum temperature of operation, and means for returning said condensate from the heat exchanger to said engine.

References Cited in the file of this patent

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