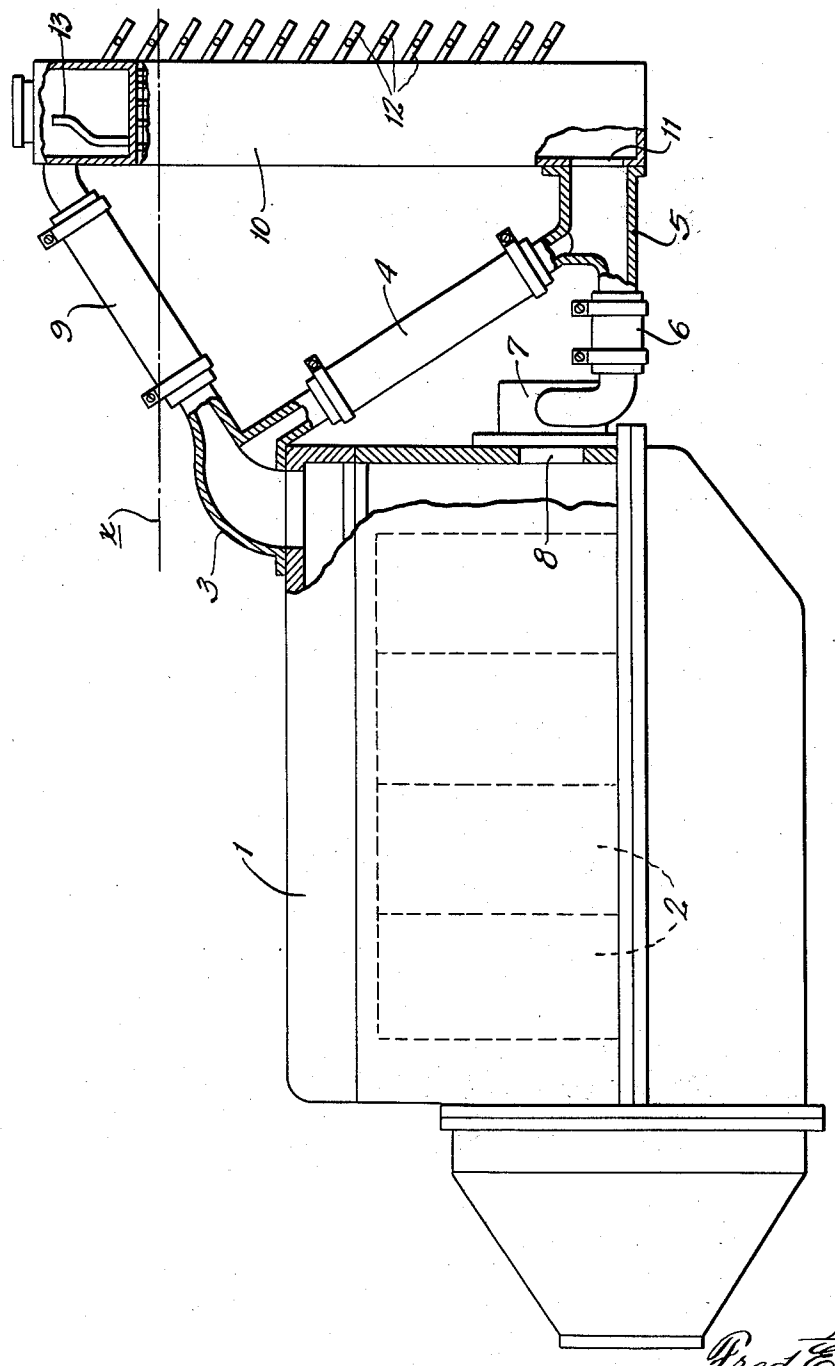
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TEMPERATURE CONTROL SYSTEM FOR INTERNAL COMBUSTION ENGINES

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TEMPERATURE CONTROL SYSTEM FOR INTERNAL COMBUSTION ENGINES

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13 Claims. (Cl. 123—174)

This invention which relates to an improved means and method of temperature control for an internal combustion engine is concerned with the provision therefor of a circulation system through which a liquid coolant may be flowed, together with a communicating reservoir system wherein a second body of liquid coolant is maintained. By the provision of two such systems in intercommunication, liquid in the one may be interchanged with liquid in the other, whereby the higher temperature in the circulatory system will be influenced downwardly and the lower temperature in the reservoir system will be influenced upwardly, until a state of equilibrium, as determined by the various factors present, is reached. In this way I maintain under all conditions of engine operation a more satisfactory control of the engine temperature which is confined within a relatively narrow optimum range whereby to attain a greater operating efficiency, particularly in cold weather.

Other objects and advantages will be readily apparent from the description to follow, wherein reference is made to a suggestive embodiment of my invention as illustrated in the accompanying drawing, wherein the figure is a side elevation of an internal combustion engine, as designed for automobile use, showing, partly in section, a successful form of temperature control system in operative communication therewith.

The illustrated combustion engine 1 is of conventional type, in that it comprises water jacketed cylinder walls 2. A chambered fitting 3 is located at the engine top at the outlet of its jacket, and leading downwardly from this chamber is a pipe 4 in connection with a chambered fitting 5 from which is laterally extended a pipe 6 leading to a centrifugal pump 7 for promoting circulation of the liquid coolant which re-enters the engine jacket as at 8. From the fitting 3 a vent pipe 9 may be upwardly extended to connect with the top of a reservoir, here shown as a radiator 10 of ample capacity, the radiator having, if desired, the usual fins by which to increase the area of its surface which is exposed to the air. At or near the bottom of the radiator, connection is made with the chambered fitting 5 through a generous opening 11. Shutters 12 may be fitted to the radiator to control the volume of air that is permitted to flow past the exposed surfaces thereof. The vent pipe is desirable to permit the release of excessive pressure, steam, etc., into the radiator from which it may escape through the usual overflow pipe 13.

In operation, the circulating liquid coolant leaves the engine jacket to flow uninterruptedly through the chamber 3 and then downwardly through the pipe 4 to the chambered fitting 5, from which it passes through the pipe 6 and into the pump 7 to be impelled continuously on its way. The level of liquid to be maintained in the system under normal operating conditions is about as indicated by the line x. Any air or pressure that may be trapped within the circulating system is permitted to escape through the vent pipe 9 and into the radiator reservoir wherein is contained a relatively static body of liquid coolant.

It will be noted that I utilize two intercommunicating liquid cooling systems one of which comprises the jacketed space which extends substantially completely around the heated parts of the engine, and through which the liquid is flowed, leaving at the chamber 3, and then proceeding downwardly through the pipe 4 and chamber 5, to re-enter the engine jacket at a somewhat lower point. In the second system, the liquid remains as a relatively static body, but because communication is maintained with the circulating system, it is possible for liquid in the one to transfer by convection some of the heat to the liquid in the other. This point of interchange is at the opening 11, where the liquid movement such as it is, is both ways at once.

A feature of the present cooling system is the practical confinement of circulation to the one system which is connected in series to the engine jacket. The temperature of the liquid coolant circulated through this system rises rapidly when the engine is first started, and it tends to remain always at a higher temperature than is the liquid coolant in the static system which remains always in communication therewith. The transfer by convection of heat units from liquid in one system to that in the other will promote an absorption into the reservoir system of excess heat from the relatively hot circulating system. An equilibrium is soon established therebetween, effective under all operating conditions of the engine, to maintain the temperature thereof within a relatively narrow range in which the engine may be operated most efficiently.

This application is a continuation in part of my previous applications—

Serial No. 39,646, filed September 7, 1935.
Serial No. 159,233, filed August 16, 1937.
Serial No. 255,435, filed February 9, 1939.
Serial No. 313,271, filed January 10, 1940.
Serial No. 361,092, filed October 14, 1940.

I claim:

1. The method of controlling the temperature

of an internal combustion engine having a surrounding jacket which comprises the maintenance of an uninterrupted flow of liquid coolant through a high temperature circulation system of unvarying resistance extending exteriorly of the engine and through the jacket thereof, and the concurrent counterflow interchange with said liquid coolant only at or near the lowermost point in the circulation system of other liquid coolant in an always relatively static body contained in a communicating low temperature reservoir system.

2. The method of controlling the temperature of an internal combustion engine having a surrounding jacket which comprises the maintenance of an uninterrupted flow of liquid coolant through a circulation system of unvarying resistance extending exteriorly of the engine and through the jacket thereof, and the concurrent absorption of heat units from said liquid coolant, at a point close to the bottom of a communicating reservoir system of relatively high radiating capacity, into other liquid coolant in an always relatively static body contained in the reservoir system by maintaining a concurrent counterflow of said liquid coolants at a single point and preventing circulation through said reservoir system.

3. The method of controlling the temperature of an internal combustion engine having a surrounding jacket forming part of a high temperature circulation system which comprises the maintenance of a positive flow of liquid coolant through the circulation system, and a concurrent counterflow interchange of liquid coolant at a single point and at or near the lowermost point in the circulation system with other liquid coolant in an always relatively static body contained in a communicating reservoir system of relatively high radiating capacity, while preventing circulation of said other liquid coolant in said reservoir.

4. The method of controlling the temperature of an internal combustion engine having a surrounding jacket forming part of a high temperature circulation system of unvarying resistance, which comprises the maintenance of an uninterrupted flow of liquid coolant through the circulation system, and the concurrent counterflow interchange with said liquid coolant at a single point of other liquid coolant at or near the lowermost point in a communicating low temperature system exteriorly of the engine and of relatively high radiating capacity, while maintaining a relatively static condition of said other liquid coolant.

5. The method of controlling the temperature of an internal combustion engine having a surrounding jacket forming part of a high temperature system, which comprises the maintenance of a flow of liquid coolant into and out of the high temperature system, and the concurrent counterflow interchange with said liquid coolant at a single point proximate to the lowermost point in the circulation system of other liquid coolant at or near the lowermost point in a communicating low temperature system exteriorly of the engine and of relatively high radiating capacity, while maintaining a relatively static condition of said other liquid coolant.

6. In combination with a jacketed internal combustion engine, a temperature control therefor comprising two fluid systems through one only of which is a circuit path in series with the engine jacket, and means providing an intercommunicating passage between the system having the circuit path and the other system at a point close to its bottom and remote from the engine jacket, said intercommunicating passage providing a concurrent counterflow of liquid coolants, and means for maintaining a relatively static condition in said system not in circulation with the engine jacket.

7. In combination with a jacketed internal combustion engine, a temperature control therefor comprising in series with the engine jacket and exteriorly thereof a circulatory system defining a circuit path through which a fluid coolant is free to flow, and a second system of relatively high radiating capacity in communication at a single point at or near its bottom with the first system and affording a reservoir for a static body of relatively cool fluid coolant adapted to absorb heat units from the fluid coolant in the first system by a concurrent counterflow of said liquid coolants at said single point of communication.

8. In combination with a jacketed internal combustion engine, a temperature control therefor comprising in series with the engine jacket and exteriorly thereof a circulatory system defining a circuit path through which a coolant is free to flow, and a second system of relatively high radiating capacity in communication at a single point at or near its bottom with the first system at a point at or near the bottom thereof and affording a reservoir for a static body of relatively cool fluid coolant adapted to absorb heat units from the fluid coolant in the first system.

9. In combination with a jacketed internal combustion engine, a temperature control therefor comprising a relatively static fluid system and a circulatory fluid system in series with the engine jacket, and means providing a heat transference passage between the two fluid systems at one point only and arranged to permit a concurrent counterflow of fluid from one system to the other.

10. In combination with a jacketed internal combustion engine, a temperature control therefor comprising a fluid system having a circuit path in series with the engine jacket, means in the circuit path remote from the engine jacket providing an enlarged mixing chamber through which the fluid circulation proceeds at reduced speed, a reservoir system in which a relatively static body of fluid is contained, and means providing an intercommunicating passage between the mixing chamber and the reservoir system at a point close to the bottom of the latter, said intercommunicating passage permitting a concurrent counterflow of liquid in said mixing chamber.

11. The method of controlling the temperature of an internal combustion engine having a surrounding jacket which comprises the maintenance of an uninterrupted flow of liquid coolant through a high temperature circulation system extending through the engine jacket and exteriorly thereof through an enlarged mixing chamber wherein the circulatory rate of flow is reduced, and the concurrent counterflow interchange with said liquid coolant, at a point adjacent the mixing chamber through which the coolant is flowed at a reduced rate of speed, of other liquid coolant in an always relatively static body contained in a communicating low temperature reservoir system.

12. In combination with a jacketed internal combustion engine, a temperature control therefor comprising a fluid system having a circuit path in series with the engine jacket, means in the

circuit path remote from the engine jacket providing an enlarged mixing chamber through which the circulation proceeds at reduced speed, a reservoir system in which a relatively static body of fluid is contained, and means providing an intercommunicating passage between the mixing chamber and the reservoir system located at a point in the mixing chamber substantially opposite the fluid current entering thereinto and at a point in the reservoir system which is close to the bottom thereof, said intercommunicating passage permitting a concurrent counterflow of liquid in said mixing chamber.

13. The method of controlling the temperature of an internal combustion engine having a surrounding jacket forming part of a high temperature circulation system which comprises the maintenance of a flow of liquid coolant through the circulation system, and a concurrent counterflow interchange of said liquid coolant with other liquid coolant in an always relatively static body contained in a communicating reservoir system of relatively high radiating capacity, the counterflow interchange of liquid coolants being confined to a single point relatively distant from the top of the reservoir system.

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