

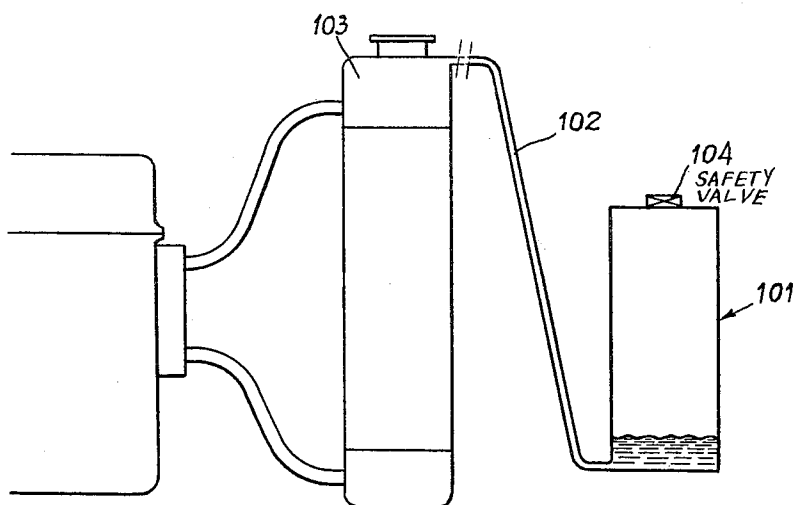
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DEVICES FOR ENSURING THE FLUID-TIGHTNESS OF HYDRAULIC
COOLING SYSTEMS OF ENGINES

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DEVICES FOR ENSURING THE FLUID-TIGHTNESS OF HYDRAULIC COOLING SYSTEMS OF ENGINES

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1 Claim. (Cl. 123—41.51)

This is a continuation-in-part of my co-pending application Ser. No. 93,783, filed on March 6, 1961, now Patent No. 3,083,701, issued April 2, 1963.

A known method of cooling the engine of a vehicle by causing a liquid to circulate in a fluid-tight circuit consists in causing the liquid expansion to be absorbed by an expansion vessel containing under constant-pressure or constant-volume conditions only air or air in the presence of liquid, this vessel being situated in an upper portion of the circuit (in general the upper water chest of the radiator). This arrangement is detrimental on the one hand because it allows the air in this vessel to contact the water issuing directly from the cylinder-head which is therefore at a relatively high temperature, and on the other hand because it occupies a considerable space between the radiator and the hood which, as a rule, are relatively close to each other. Now the increase in volume or pressure in a closed vessel containing air and a liquid at a temperature T depends on the following factors:

- (1) Air compression resulting from the water expansion;
- (2) Air compression resulting from its temperature increase;
- (3) Vapor tension of the liquid at temperature T .

Similarly, the rate of evaporation in a vessel open to the atmosphere increases rapidly with the temperature of the cooling liquid.

It is the object of this invention to provide an improved arrangement for an engine cooling system wherein the air and liquid contained in this expansion vessel are located at any desired location in the circuit, whereby:

(a) The vessel can be placed with greater facility on the vehicle;

(b) A "cold point" can be selected at the same time in order to eliminate the causes (2) and (3) hereinabove of pressure increase (in the case of a closed vessel) or to reduce the risk of evaporation (in the case of an expansion vessel communicating freely with the atmosphere), so that in either case the risks of water leakage are eliminated or reduced.

According to this invention, the expansion vessel is of the constant-volume type; thus, it consists of a fully closed vessel, and a safety valve protects the circuit in case of abnormal accidental overpressure.

This expansion vessel is connected to the uppermost point of the cooling system (for example the upper water chest of the radiator) through a pipe having its lower end opening located short of the bottom of said vessel. Thus, when the engine temperature rises, the overflowing liquid is discharged into the expansion vessel. When the engine cools down, the vacuum created by the liquid contraction causes the liquid to rise from the vessel to the radiator. When the total pressure in the radiator equals the total pressure in the expansion tank, as when the engine is completely cooled off after having been stopped, the respective liquid levels in the radiator and tank will remain stable; i.e., there will be no tendency for one to empty into the other.

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To avoid any risk of boiling, the cooling liquid proper may consist of a mixture of water and high-boiling antifreeze product.

It is another advantage of this arrangement to permit the elimination of any air remaining in the circuit after the first filling thereof; of course, in this case a reserve of water must be provided in the expansion vessel and the latter must be dimensioned accordingly.

Thus, according to this invention, it is possible to place the expansion vessel at a level below the uppermost point of the circuit and notably in a cold location of the vehicle, for example behind the front grille or the wheel-receiving cavity or portion of the body, or in any other suitably ventilated location in close vicinity of the radiator.

The invention will now be described with reference to the accompanying drawing illustrating diagrammatically by way of example the embodiment broadly set forth hereinabove. In the drawing, the only figure illustrates the aforesaid form of embodiment of the invention.

According to this form of embodiment, the expansion vessel 101 containing air and liquid is closed completely. It is connected to the cooling circuit through a pipe 102 extending from the bottom of this vessel directly to an upper point of the cooling circuit, for example the upper water chest 103 of the radiator. A safety valve 104 protects the system from accidental overpressures.

When the temperature of the cooling liquid increases the liquid level rises in the expansion vessel and the liquid compresses the air trapped therein above the liquid level. But whilst the temperature in the circuit is relatively high (say, 194° F.), it remains relatively low (nearly the room value) in the expansion vessel where the vapor tension is therefore moderate (.285 p.s.i. at 68° F. instead of 10 p.s.i. at 194° F.). Thus, in comparison with other conventional devices, the pressure is reduced considerably in the cooling circuit.

Although the present invention has been described in conjunction with preferred embodiment, it is to be understood that modifications and variations may be resorted to without departing from the spirit and scope of the invention, as those skilled in the art will readily understand. Such modifications and variations are considered to be within the purview and scope of the invention and appended claim.

I claim:

A hydraulic cooling system for an engine, comprising a radiator having fluid inlet and outlet means adapted to connect said radiator to an engine to be cooled, said radiator being normally substantially full with cooling liquid, an expansion vessel normally substantially empty of any liquid, open conduit means connecting the uppermost portion of said radiator directly to the lowermost portion of said vessel, the lowermost portion of said vessel being located at a distance below the uppermost portion of said radiator so that a stable liquid level may be maintained in said vessel when equal pressure conditions exist in said vessel and radiator, said radiator, conduit means, and expansion vessel being sealed from atmosphere so that constant above atmospheric pressure conditions may be maintained in said radiator, conduit means, and expansion vessel.

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