A cooling system for a liquid cooled internal combustion engine having an internal water jacket, a water pump having an outlet connected to an inlet of the water jacket, a thermostat housing including a thermostat and having an inlet connected with an outlet of the water jacket, a heat exchanger connected between an outlet of the thermostat housing and an inlet of the water pump for cooling the liquid in the cooling system, includes a coolant shunt extending from the water pump outlet to the inlet of the thermostat housing whereby when the thermostat is open, coolant flow through the heat exchanger is greater than coolant flow thorough the engine so that heat exchanger cooling is increased and parasitic losses across the water pump are minimized.
FIG. 2
ENGINE COOLING SYSTEM WITH COOLANT SHUNT

TECHNICAL FIELD

[0001] This invention relates to a cooling system for a liquid cooled internal combustion engine and more particularly to a system that provides different coolant flow rates to the engine and vehicle radiator respectively and reduces parasitic losses.

BACKGROUND OF THE INVENTION

[0002] Often a pressurized cooling system employing a circulating fluid such as water and/or other coolant is used for cooling an internal combustion engine including gasoline and diesel fueled engines. Engine heat is transferred from the engine to the circulating fluid through a water jacket which surrounds certain parts of the engine and the heat absorbed in the circulated coolant is dissipated by a radiator into the air.

[0003] The engine requires a nominal coolant flow to maintain proper temperature of internal components whereas a greater coolant flow through the radiator may be desirable to increase heat rejection of the radiator. If a high flow rate water pump is applied to such a conventional full flow cooling system, the pressure differential across the pump will be increased, creating a significant increase in parasitic losses.

SUMMARY OF THE INVENTION

[0004] The present invention provides a cooling system for an internal combustion engine including a coolant shunt from the water pump outlet to the engine side of the thermostat housing to create a greater flow through the radiator than the engine water jacket, using a conventional water pump.

[0005] The present invention also lowers the pressure differential across the water pump and minimizes parasitic losses.

[0006] Furthermore, the present invention directs all the coolant flow to the radiator when the engine is up to temperature, and prevents coolant flow to the radiator when the engine is not up to temperature.

[0007] Accordingly, an improved cooling system for a liquid cooled internal combustion engine having an internal water jacket, a water pump having an outlet connected to an inlet of the water jacket, a thermostat housing including a thermostat and having an inlet connected with an outlet of the water jacket, a heat exchanger connected between an outlet of the thermostat housing and an inlet of the water pump for cooling the liquid in the cooling system, includes a coolant shunt extending from the water pump outlet to the inlet of the thermostat housing. With such a construction, when the thermostat is open, coolant flow through the heat exchanger is greater than coolant flow through the engine so that heat exchanger cooling is increased and parasitic losses across the water pump are minimized.

[0008] In one embodiment of the invention a bypass is provided between the thermostat housing inlet and water pump inlet, and the thermostat controls coolant flow through the radiator and bypass. Also, the shunt bypasses about one third of the liquid flow around the engine water jacket.

[0009] These and other features and advantages of the invention will be more fully understood from the following detailed description of the invention taken together with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] In the drawings:

[0011] FIG. 1 is an environmental view of a cooling system for an internal combustion engine constructed in accordance with the present invention; and

[0012] FIG. 2 is a schematic view of the cooling system of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0013] With reference to FIGS. 1 and 2 of the drawings, a cooling system for a liquid cooled internal combustion engine constructed in accordance with the present invention is generally indicated by reference numeral 10 and is used to provide different coolant flow rates to an engine and vehicle radiator respectively and reduce parasitic losses. As is hereafter more fully described, the cooling system 10 creates a greater coolant flow through the radiator than the coolant flow through the engine, and uses a conventional water pump.

[0014] As illustrated in the drawings, the cooling system 10 is shown applied to a liquid cooled internal combustion engine 12. Internal combustion engine 12 includes an internal water jacket 14, as is well known. A water pump 16 has an outlet 18 connected to an inlet 20 of the water jacket 14. A thermostat housing 22 including a full blocking thermostat has an inlet 24 connected with an outlet 26 of the water jacket 14. The system 10 includes a radiator bypass 28 as is known. A heat exchanger 30 illustrated as a conventional tube and fin type radiator, is connected between an outlet 32 of the thermostat housing and an inlet 34 of the water pump for cooling the liquid coolant in the cooling system. The full blocking thermostat blocks 100% of the coolant flow to the radiator 30 when closed and blocks 100% of the coolant flow through the bypass 28 when open.

[0015] A coolant shunt 38 extends from the water pump outlet 18 to the inlet 24 of the thermostat housing 22. When the thermostat is open, coolant flow through the heat exchanger 30 is greater than coolant flow through the engine 12 so that heat exchanger cooling is increased and parasitic losses across the water pump 16 are minimized.

[0016] In the illustrated embodiment the thermostat controls flow through both the radiator 30 and bypass 28. Also, the shunt 38 bypasses about one third of the liquid flow around the engine water jacket 14.

[0017] By way of example for illustration and not limitation, if the internal combustion engine 12 requires 85 gpm coolant flow to maintain proper temperature of internal components and the radiator requires 120 gpm coolant flow to dissipate heat, the cooling systems lines and fittings would be sized so that about 85 gpm passes through the engine and 35 gpm passes through the coolant shunt. This results in the
desired coolant flow, 85 gpm, to the engine, and 120 gpm to the vehicle radiator, while using a conventional water pump.

[0018] With this arrangement, the pressure differential across the water pump 16 is lower than that of a full flow system and parasitic losses are minimized. The thermostat directs all the coolant flow to the radiator 30 when the engine 12 is up to temperature and prevents coolant flow to the radiator when the engine is not up to temperature.

[0019] Although the invention has been described by reference to a specific embodiment, it should be understood that numerous changes may be made within the spirit and scope of the inventive concepts described. Accordingly, it is intended that the invention not be limited to the described embodiment, but that it have the full scope defined by the language of the following claims.

What is claimed is:

1. A cooling system for a liquid cooled internal combustion engine including an internal water jacket, a water pump having an outlet connected to an inlet of the water jacket, a thermostat housing including a thermostat and having an inlet connected with an outlet of the water jacket, a heat exchanger connected between an outlet of the thermostat housing and an inlet of the water pump for cooling the liquid in the cooling system, said system comprising:

   a coolant shunt extending from the water pump outlet to the inlet of said thermostat housing, whereby when the thermostat is open, coolant flow through said heat exchanger is greater than coolant flow through the engine so that heat exchanger cooling is increased and parasitic losses across said water pump are minimized.

2. The cooling system of claim 1 including a bypass extending from the thermostat housing inlet to said water pump inlet.

3. The cooling system of claim 1 wherein said thermostat controls flow through both heat exchanger and bypass.

4. The cooling system of claim 1 wherein said shunt bypasses about ⅓ of the liquid flow to the heat exchanger around the engine water jacket.

5. A method of increasing coolant flow through the radiator in a cooling system for a liquid cooled internal combustion engine including an internal water jacket, a water pump having an outlet connected to an inlet of the water jacket, a thermostat housing including a thermostat and having an inlet connected with an outlet of the water jacket, the radiator connected between an outlet of the thermostat housing and an inlet of the water pump for cooling the liquid in the cooling system, the method comprising the steps of:

   providing a coolant shunt that extends from the water pump outlet to the inlet of the thermostat housing, whereby when the thermostat is open, coolant flow through the radiator is greater than coolant flow through the engine so that heat exchanger cooling is increased and parasitic losses across the water pump are minimized.

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