This invention relates to cooling systems and particularly to the cooling system applied to an internal combustion engine used on an automotive vehicle.

In the prior art radiators of the water cooling systems of engines of automotive vehicles have been flat and positioned at the front of the vehicle immediately ahead of the engine. The trend of modern practice is to round and make narrower the front end of the vehicle which has necessitated the narrowing of the radiator and in some instances has caused a decrease in the area of the radiating surface. With a view to maintaining the radiating surface of the radiator core ample for all purposes the radiator is made in angle form, or in the shape of a V, so that the edge of the radiator may extend forwardly immediately behind the usual grille and the sides diverge rearwardly toward the two sides of the engine. This will enable the use of a larger radiator core and give a greater radiating surface and in no way interfere with the narrowing of the front portion of the vehicle.

This making of a radiator into V shape instituted the problem of properly pulling the air through the radiator by the usual blade fan. The blades of the fan are ordinarily in the same plane where a straight core radiator is used, but where a V-shaped radiator is used the ordinary straight plane fan is not applicable so it was necessary to redesign the construction to utilize a blade fan which could be positioned in the angle of the V of the radiator. Accordingly, the fan blades were bent rearwardly so that in their rotation they generated a cone. The shaft on which the fan is mounted projects well forward into the angle between the radiator halves while the blades rotate closer adjacent the radiating surface and are therefore better able to pull the air through the core.

On the drawings

Figure 1 shows in dotted outline the hood and wheels of an automotive vehicle and in full lines the front portion of the engine with the V radiator and novel fan applied.

Figure 2 is a plan view of the novel V-shaped radiator and fan.

Figure 3 is a view similar to Figure 2 of the conventional construction.

Figures 4, 5, and 6 show different modifications of the application of the fan and the manner of driving it from the engine.

Reverting to the drawings, the numeral 2 indicates an automotive vehicle as a whole. The vehicle has the usual hood 4, the grille 6 at the front, the wheels 3, the engine 10 having the oil pan 12. The engine has the usual crankshaft the end 14 of which may be seen in Figure 1. The usual cylinder head is indicated at 16 and from the cylinder head the tube 18 of the water cooling system leads to the upper tank 20 of a radiator indicated as a whole at 22. The crankshaft 14 has the fan belt pulley 24 secured there to and a second fan pulley 25 is mounted on the engine above and in alignment with the fan pulley 24. A fan belt 26 passes around both pulleys 24 and 25 and drives the pulley 25 from the pulley 24. The usual water pump housing is indicated at 30 in which there is positioned the water pump 32 (Figure 4). The water pump 32 draws the water of the cooling system from the bottom tank 33 of the radiator through the tube 34 and passes it into the engine to cool the cylinders and other parts.

Referring to Figure 2 it will be noted that the radiator 22 is of V shape and is formed of the two halves 36 and 38. Behind the radiator 22 there is positioned the fan 40 which is mounted on a shaft 42 to which the pulley 25 is rigidly secured.

Referring to Figure 4 it will be noted that the shaft 42 comprises the rear section 44 and the front section 46 connected to each other in driving relation by the gears 48. The shaft section 46 is mounted at an angle to the shaft section 44. The pump 32 is also secured to the shaft 44 and operated thereby.

The rear shaft section 44 is mounted in a bracket 50 secured to the engine block. The bracket is provided with the bearings 52 at the rear thereof and the roller bearings 54 at the front end thereof. The shaft section 46 is mounted in the roller bearings 58 and 58 and has the fan 40 rigidly mounted thereon by means of the pin 60 passing through the hub 62 of the fan and through the shaft. Machine bolts 64 secure the fan blades 66 to the hub 62. The shaft section 46 is mounted in the auxiliary bracket 68 which is secured to the bracket 50 by means of the machine bolts 70.

The usual means indicated at 72 and 74 for lubricating the shaft sections 44 and 46 are provided.

The structure in Figure 5 differs from that shown in Figure 4 in that no water pump 32 is driven from the shaft section 44. The bracket 50 is used to mount the outer shaft section 45 instead of the inner section 44 and the auxiliary bracket 68' has the bearings 52' and 54' in which
to mount the shaft 44'. The fan pulley 26' is shaped slightly different than the corresponding pulley 26 in Figure 4 but has the same function.

The structure of Figure 6 differs from the structure of Figure 5 in that a universal joint 40" is used instead of the gears 46 in Figures 4 and 5. The universal joint may be any conventional type of joint and per se forms no part of the invention. In the embodiment shown two forked members interengage as shown so that the outer shaft section 46' is driven from the inner shaft section 44'. The bearing 54" is in the form of a sleeve instead of the ball bearing 54 shown in Figure 4. The shaft section 46' is stepped as shown at 76 and has but a single ball bearing 58 to support it. The hub 62' instead of being pinned to the shaft end is secured thereto by a key and slot connection 78.

By referring to Figures 1, 2, and 5 it will be noted that the blades 66 of the fan instead of being of the shape of blades 66 in Figure 3 (which is the conventional shape) are bent rearwardly to form an angle with the shaft 46 to which the fan is attached. Accordingly, each blade, as it is rotated by the shaft 46, generates a conical surface. This has been made necessary because with a fan 40' such as shown in Figure 3 it would be impossible to position the fan close inward toward the two halves 36 and 38 of the radiator for the reason that the tips 80 of the blades would cut into the radiator. By making it angular or diverging toward the rear as shown in Figures 1, 2, and 4, it has been possible to position the end of the shaft 46 well forward into the angle of the V of the radiator and cause the fan blades 66 to rotate in closer proximity to the radiator halves 36 and 38 so that as the fan is driven from the engine the closer interrelation between the fan and radiator will enable the fan better to draw the air through the radiator and to draw substantially equal quantities through the two halves 36 and 38.

In Figure 5 the usual type of radiator 22' and the fan 40' offer no problem because it is possible to position the fan close up to the radiator irrespective of the length or diameter of the fan. This is possible because the surface of the radiator 22' is flat and the fan 40' can easily be positioned closely adjacent the radiator.

I claim:

1. In a cooling system for the engine of an automotive vehicle, a V-shaped radiator mounted on the vehicle, a fan shaft mounted on and driven from the engine, a fan attached to the shaft and positioned immediately behind and within the V of the radiator, blades on the fan, said blades forming an acute angle with the shaft and generating a cone in their rotation whereby to cause air better to pass through both sides of the V of the radiator.

2. In a cooling system for the engine of an automotive vehicle, a V-shaped radiator mounted on the vehicle, a two-sectioned fan shaft mounted on and driven from the engine, means in the shaft to enable one section thereof to be driven at an angle to the other section, a fan secured to the end of the shaft and positioned immediately behind and within the V of the radiator, blades on the fan, said blades forming an acute angle with the shaft section to which the fan is attached to enable the fan better to conform to the V shape of the radiator.

3. In a cooling system for the engine of an automotive vehicle, a radiator secured to the engine, said radiator having one section thereof at an angle to the other section, a two-sectioned fan shaft mounted on and driven from the engine, one section of said shaft being tilted upwardly, means connecting said two shafts, a fan immediately behind the radiator and secured to the shaft, blades on the fan, said blades forming an acute angle with the shaft section to which the fan is attached, the rotation of said fan generating a cone, the sides of the angle formed in the fan cone by passing a plane horizontally through the center of the cone and the radiator being parallel to the sides of the angle formed by the sections of the radiator.

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