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DESIGN AND ARRANGEMENT OF THE COOLANT PUMP OF INTERNAL COMBUSTION ENGINES

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FIG. 1

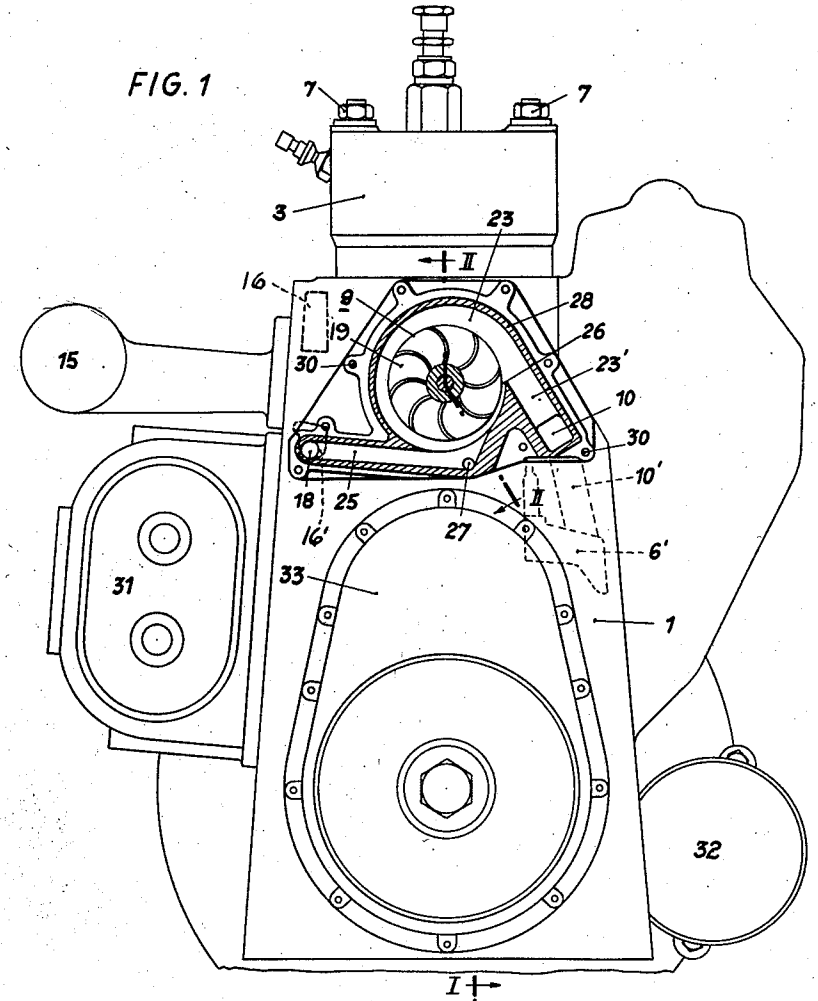
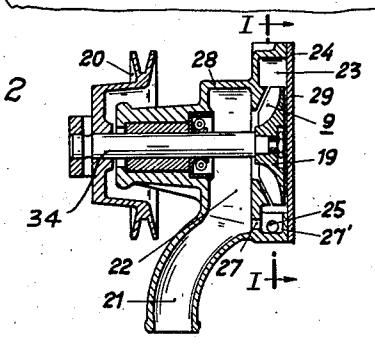
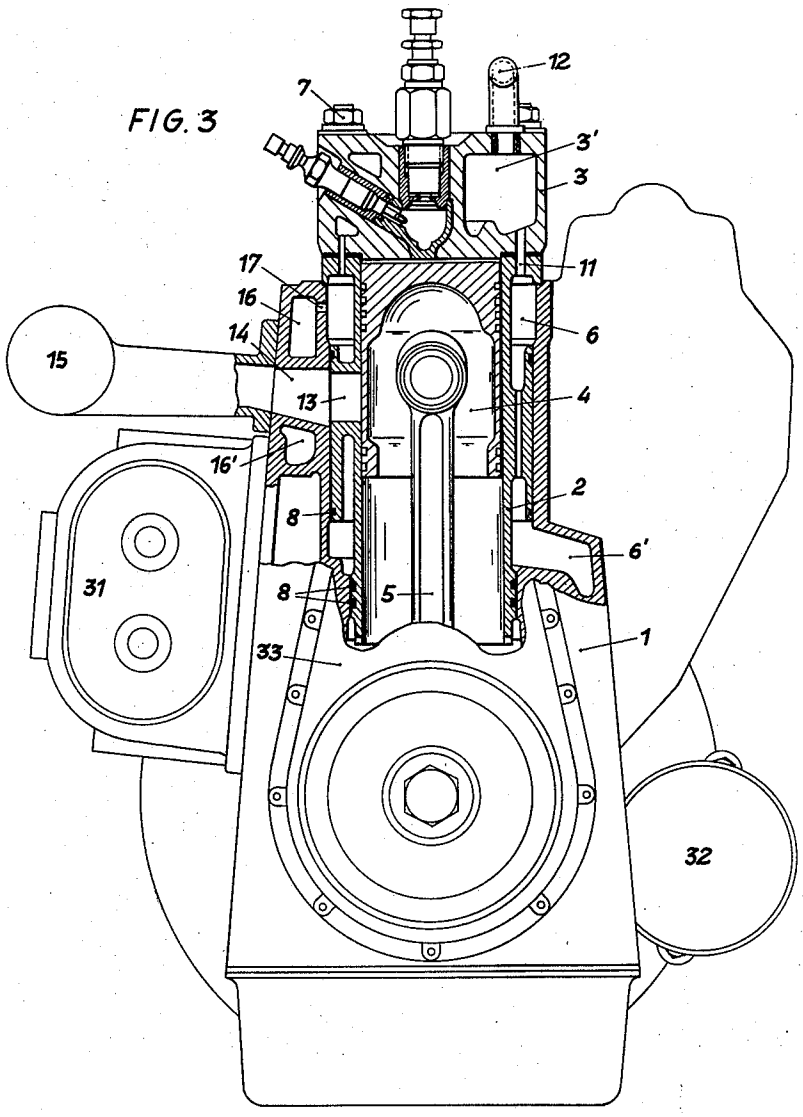


FIG. 2



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FIG. 3



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DESIGN AND ARRANGEMENT OF THE COOLANT PUMP OF INTERNAL COMBUSTION ENGINES

Andreas Scheiterlein and Othmar Skatsche, Graz, Austria, assignors to Gustav Ospelt, Vaduz, Liechtenstein

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4 Claims. (Cl. 123—41.46)

This invention relates to a two-stroke internal combustion engine with vertical cylinders arranged in a row, each cylinder having a piston-controlled exhaust port, and wet cylinder liner, the liner being surrounded by a coolant chamber and a separate coolant chamber surrounding the exhaust passages in the cylinder block. For this type of engine it has been known to arrange the coolant pump on the front side of the cylinder block and to feed the two aforementioned coolant chambers with coolant through separate hose lines. This affords efficient cooling both for the cylinder liners and the exhaust ports in the cylinder block by means of fresh, cooled-down coolant. Since the amount of heat to be extracted from the cylinder liners is considerably larger than for the exhaust passages, the coolant chamber around the cylinder liners will have to receive a correspondingly larger supply of coolant than the coolant chamber around the exhaust passages. Usually the amount of coolant delivered by the coolant pump is predetermined by the use of different passage sections for the hose lines and by providing chokes of appropriate dimensions along the coolant flow.

The disadvantage of the above arrangements resides in the fact that the allocation of supply depends on factors which are liable to differ too freely from the proposed values or are subject to alterations in the course of time. Consequently, the uniform cooling of all parts is not positively assured.

According to the invention, these drawbacks are avoided by providing a centrifugal coolant pump with two delivery channels, each of which is assigned to one of the coolant chambers, one of said channels feeding the coolant chamber around the cylinder liners being connected at one end and the other at the other end of the pressure groove of the coolant pump. Thus the pressure head and the delivery of the pump are divided at a fixed predetermined ratio. The distance between the delivery channel leading to the exhaust ports and the other end of the pressure groove will determine the portion of the overall pressure head which is allocated to this delivery channel. Besides, the allocation of deliveries is largely independent of the pipe section used.

According to a further feature of the invention the housing of the coolant pump and the two delivery channels constitute a single casting, the delivery channels being connected to the coolant chambers through the surface of attachment of the coolant pump on the cylinder block. This eliminates the need for hose connections, simplifies installation and increases the safety of operation. In addition since the sections of the delivery channels are determined in advance, it is impossible for the cooling conditions to be adversely affected by the use of hose connections of unsuitable section, as may happen during repairs for instance.

According to further embodiments of the invention, provision has been made for the delivery channels and the coolant pump being drained completely during the discharge of the coolant. This is achieved by appropriately positioning the delivery channel leading to the exhaust ports either horizontally or slightly inclined toward the center of the pump and by providing a small connecting duct at the lowest point of the delivery channel leading to the suction chamber of the coolant pump.

The invention is illustrated by way of example in the accompanying drawings wherein:

Figure 1 shows a front view of the two-stroke engine with the coolant pump in section along the line I—I of Figure 2. Figure 2 shows the coolant pump in section along the line II—II of Figure 1 and Figure 3 a partial vertical section through the axis of a cylinder.

The cylinder block of the two-stroke engine is designated by **1**, the cylinder liner by **2**, the cylinder head by **3**, the piston by **4** and the connecting rod by **5**. The cylinder liner **2** is inserted in the cylinder block **1** and both together constitute the coolant chamber **6**, the lower portion **6'** of which is enlarged. It is clamped at the upper end and fixed together with the cylinder head **3** by means of cylinder head screws **7**. At other points the cylinder liner is slidable for axial expansion and sealed by means of rubber rings **8**. The coolant is delivered into the coolant chamber **6'** by the coolant pump **9** through an aperture **10** and the connecting passage **10'** in the cylinder block and flows through said chamber **6'** and the chamber **6** while cooling the cylinder liner **2**, and then passes through passage apertures **11** into the cavity of the cylinder head **3**. A nipple **12** is provided on the cylinder head for the discharge of the coolant.

The exhaust ports **13** of the engine are controlled by a piston **4** and lead to discharge channels **14** of the cylinder block and from there into the exhaust manifold **15**. The discharge channels **14** in the cylinder block are surrounded by a separate coolant chamber **16**, the upper portion of which communicates with the coolant chamber **6** by means of apertures **17**. The coolant is delivered into the coolant chamber **16** through a passage aperture **18** located at its lowest point **16'**.

The coolant pump **9** consists of a rotor **19** driven in the usual manner (not shown in the drawings) from a V-belt pulley **20** via a shaft **34** by the crankshaft. The pump intake is designated by **21** and the suction chamber by **22**. The pressure groove **23** surrounding the rotor **19** communicates at one end with a short delivery channel **23'** communicating with the passage aperture **10** in the cylinder block via the surface of attachment **24** of the pump. A second pressure channel **25** is located near other end of the pressure groove and connected to the latter and leads also through the surface of attachment **24** to the passage opening **18** of the cylinder block. The delivery channel **25** is slightly inclined from the outside toward the center of the pump. At its lowest point a small connecting duct **27** has been provided. These measures ensure the complete discharge of the coolant pump and the delivery channels during the draining of the coolant. The bore **27'** is required for manufacturing purposes only and otherwise closed. The housing **28** of the coolant pump including the delivery groove **23** and the delivery channels **23'** and **25** are formed by a single casting. The pump is fixed with the interposition of a plate **29** by means of screws inserted in the bores **30**.

The scavenging air blower is designated by **31**, the starter by **32** and the front cover of the casing by **33**.

I claim:

1. In a two-stroke internal combustion engine, the combination comprising a cylinder block having vertical cylinders arranged in a row, with reciprocating pistons, wet cylinder liners surrounded by a coolant chamber, piston-controlled exhaust ports, exhaust channels in the cylinder block surrounded by a separate coolant chamber, a coolant pump of the centrifugal type arranged at the front end of the cylinder block, with a pressure groove

and two delivery channels, each of which is assigned to one of the coolant chambers, one of said channels feeding the coolant chamber around the cylinder liners being connected at one end of the pressure groove of the coolant pump, whereas the other channel feeding the coolant chamber surrounding the exhaust passages is connected at the other end of said pressure groove.

2. The combination according to claim 1 and wherein the housing of said coolant pump and its two delivery channels are formed by a single casting, said delivery channels communicating with said coolant chambers through the surface of attachment of the coolant pump.

3. The combination according to claim 2 and wherein

the delivery channel connected between the other end of the pressure groove is either horizontal or slightly inclined toward the center of the pump, said channel being connected at the lowest point of said pressure groove.

4. The combination according to claim 3 and wherein a small connecting duct is provided at the lowest point of the delivery channel leading to the suction chamber of the coolant pump.

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