

[54] **WATER-COOLED RECIPROCABLE PISTON ENGINE WITH A SINGLE PIECE INTEGRAL CYLINDER AND CYLINDER HEAD**

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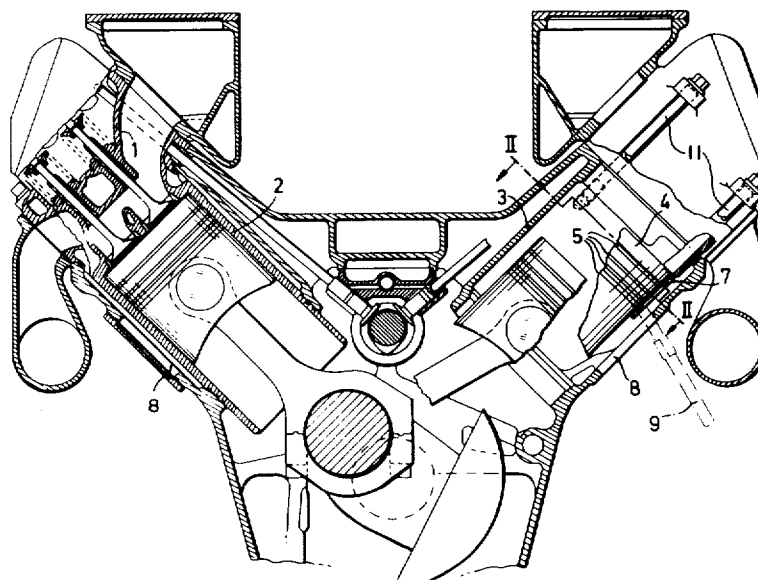
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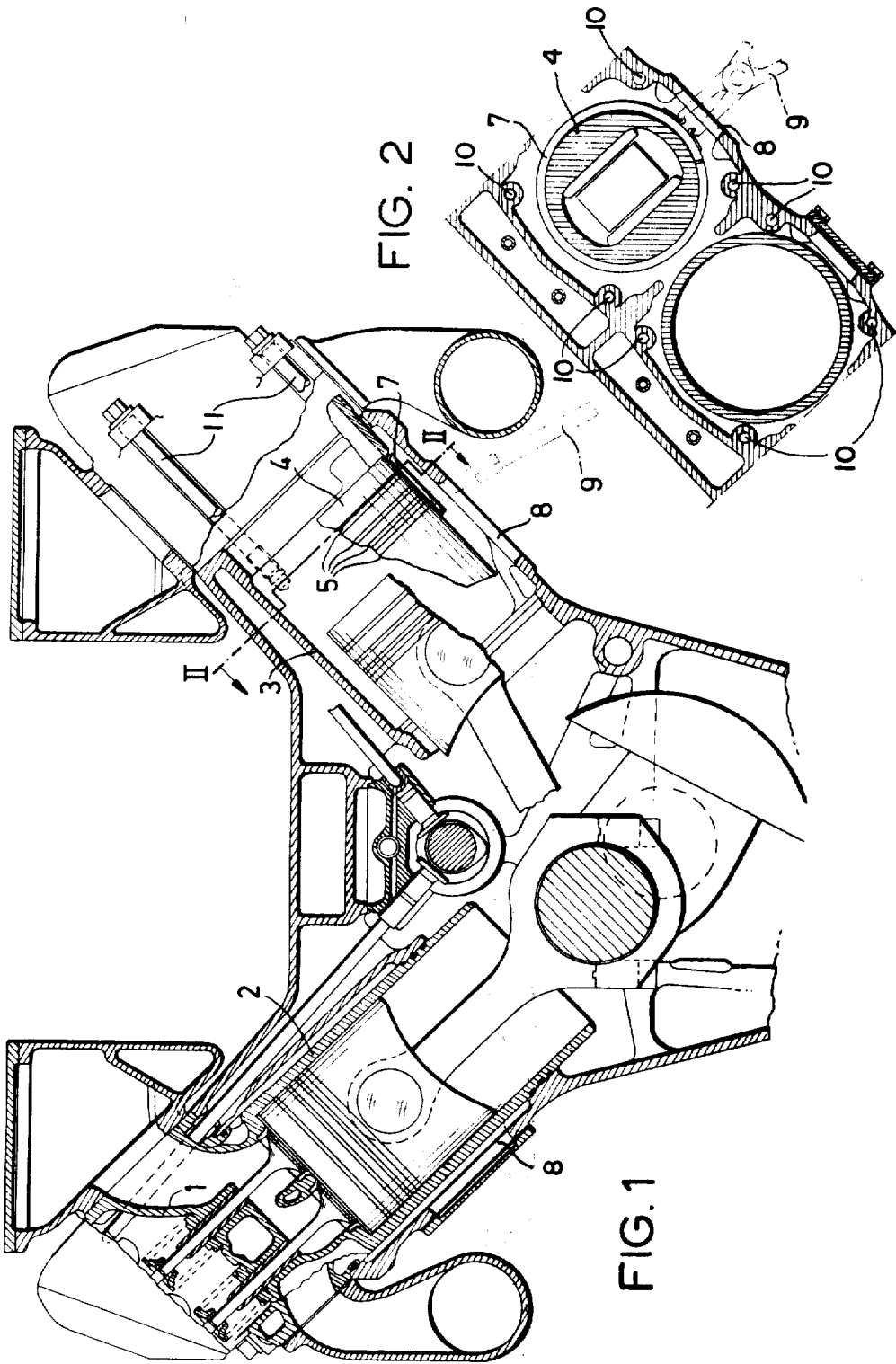
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[57] **ABSTRACT**

A water-cooled reciprocable piston engine having its cylinder head and cylinder made as an integral single piece inserted into a cylinder mantle housing, while the cylinder mantle housing for each cylinder has a lateral opening adapted selectively to be closed and opened. The height of this opening is greater than the axial length of the range of the piston rings on the reciprocable piston while the lateral opening in the cylinder mantle housing extends from the lower portion of the range of piston rings to at least approximately the free end of the piston skirt when the piston occupies its upper dead center position.

1 Claim, 2 Drawing Figures





WATER-COOLED RECIPROCABLE PISTON ENGINE WITH A SINGLE PIECE INTEGRAL CYLINDER AND CYLINDER HEAD

The present invention relates to water-cooled reciprocable piston engines in which the cylinder head together with the cylinder forms one single integral piece and is inserted into a cylinder mantle housing. With internal combustion engines, for purposes of obtaining maximum outputs, supercharging is increasingly employed. In this connection weak areas form at various structural elements which reduce the function and life span of the parts; in particular the seal between the cylinder head and the cylinder is affected.

In order to overcome these difficulties, the cylinder head is sometimes made one piece with the cylinder. With water-cooled engines it is preferred to design the cylinder mantle housing as a separate part, because in this way simpler cast pieces are obtained for the cylinder with the cylinder head and for the cylinder mantle housing. It is known with a water-cooled internal combustion engine to design the cylinder head with the cylinder as a single integral piece and to insert the same into a cylinder mantle housing which simultaneously forms one part with the crank-casing. With this and similar constructions there is encountered the difficulty of the cylinder assembly after preceding disassembly. The transmission parts, such as piston and connecting rod, which are not removed during the disassembly do not permit any sliding over of the cylinder with the cylinder head, in view of the protruding piston rings. The application of known auxiliary members such as clamping band for compressing the piston rings is not possible due to lack of space. Thus, there remains only the possibility of disengaging the connecting rod bearing on the crankshaft and from outside the engine to slip the piston together with the connecting rod into the cylinder. To this end, with small engines it is usually necessary to remove the oil pan so that the connecting rod bearing will be accessible. With larger engines, to this end frequently assembly openings are provided in the side walls of the crankcase which, however, permit only a limited movability and make it rather difficult to assemble and re-assemble the connecting rod bearing.

It is, therefore, an object of the present invention to design a water-cooled engine with a one-piece cylinder head-cylinder in such a manner that its assembly will be possible with the transmission parts in built-in condition.

These and other objects and advantages of the invention will appear more clearly from the following specification in connection with the accompanying drawing, in which:

FIG. 1 is a cross section through a water cooled reciprocable piston internal combustion engine of the V-type.

FIG. 2 is a section taken along the line II—II of FIG. 1.

The internal combustion engine according to the present invention is characterized primarily in that in the cylinder mantle housing for each cylinder there is provided a lateral opening which is adapted to be closed and which has a height greater than the width of

the range of the piston rings, while the position of said opening extends from the lower portion of the piston ring range toward the cylinder foot portion, while said piston is in its upper dead center position.

Through such assembly opening in the cylinder mantle housing it is possible, by means of pliers or a similar tool, to hold a clamping band placed around the annular region of the piston, whereas from above, the cylinder is passed over the piston. This opening in the cylinder mantle housing results in greatly facilitating the assembly, which fact represents a particular advantage with repairs on built-in engines, in particular due to the frequently rather limited space conditions.

Referring now to the drawings, FIG. 1 shows a water-cooled reciprocable piston internal combustion engine in which the cylinder head 1 and the cylinder 2 form a single integral piece. The cylinder unit 1, 2 is, as shown more clearly in the left-hand cylinder row, inserted into a water conducting cylinder mantle housing 3. In the right-hand cylinder row, the cylinder 2 is illustrated during the phase of pushing the cylinder over a piston 4 with piston rings 5. In order to make sure that the cylinder 2 can be pushed over the piston rings 5, a clamping band 7 is placed around the annular range. The band 7 is compressed, by means of pliers 9, through the opening 8 in the wall of the cylinder mantle housing 3. The cylinder 2 is then slipped with slight pressure in downward direction over the compressed piston rings 5 so that the clamping band 7 is pushed ahead of the cylinder 2. At the level of the opening 8, the entire ring range of the piston is covered by the cylinder so that the flexible clamping band 7 can be removed through the opening 8. This represents a considerable improvement in the assembly, which is of particular importance during a partial disassembly for checking the valve seats and also when repairs are to be carried out. Structural connection between the mantle housing 3 and the integral head and cylinder unit 1, 2 exists by way of threaded holes 10 into which screws 11 are threaded as shown by the drawings.

It is, of course, to be understood that the present invention is by no means limited to the specific showing in the drawing, but also comprises any modifications within the scope of the appended claims.

What we claim is:

1. A water-cooled reciprocable piston engine which includes in combination a cylinder head, a cylinder forming one single integral piece with said cylinder head, a piston skirt with a free end and being provided with piston rings and being reciprocable in said cylinder, a cylinder mantle housing extending upwardly as far as to said cylinder head and surrounding said cylinder head to form a water chamber therewith and having a laterally closable opening therein freely accessible for piston assembly in said cylinder and which in the axial direction of said piston extends over a length greater than the axial extension of the range of said piston rings and in the upper dead center position of said piston extends from that end of said piston ring range which is closest to the free end of said piston skirt to approximately said free end of said piston skirt.

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