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LIQUID-COOLED CYLINDER HEADS FOR INTERNAL COMBUSTION ENGINES

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FIG. 1

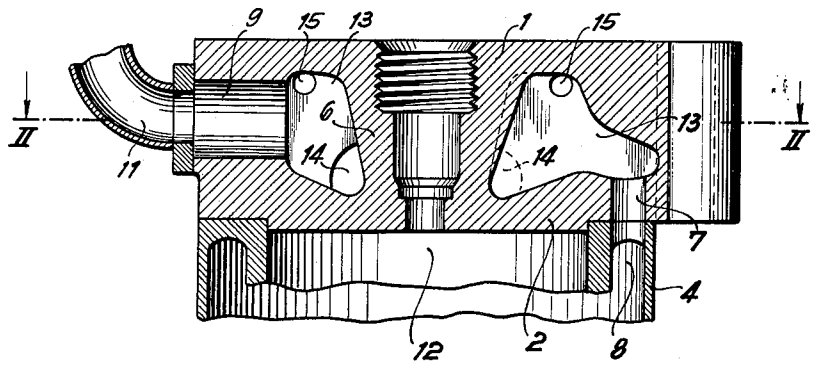
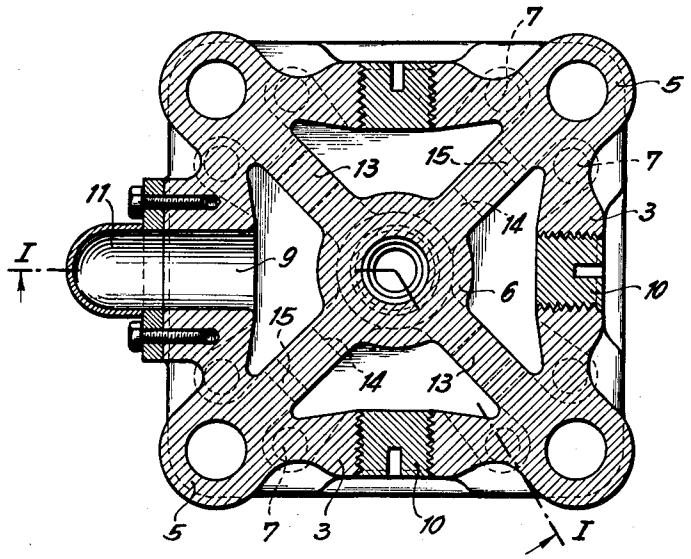


FIG. 2



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LIQUID-COOLED CYLINDER HEADS FOR INTERNAL COMBUSTION ENGINES

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9 Claims. (Cl. 123—41.82)

The invention relates to liquid-cooled cylinder heads for internal combustion engines, more particularly for two-stroke diesel engines, comprising a hollow member with diametrically opposed bosses for accommodating the securing bolts and a centrally arranged boss for receiving the injection nozzle, around which central boss and in lateral contact therewith the cooling medium is guided in a circular path.

Cylinder heads of this type are mainly employed for two-stroke diesel engines in which those structural parts which are directly exposed to the heating action of the burning gases, such as the boss for receiving the fuel injection nozzle and the central portion of the cylinder head base, are subjected to particularly high temperatures. Accordingly, it has for a long time been desirable to construct them in such manner that an adequate cooling of the highly heated structural parts is obtained by a suitable guiding of the flow of the fluid cooling medium. On the other hand, attempts have also been made to obtain the best possible sealing of the cylinder head bearing surface against the edge of the cylinder by a suitable construction of securing means and reinforcing stiffening components of the cylinder head.

It is an object of the invention to provide a cylinder head particularly suited for two-stroke diesel engines, which, while assuring a satisfactory seal, is not only of extremely light weight, but which also provides for an improved cooling of the parts thereof which are most strongly heated, particularly at the centre of the base or bottom wall of the cylinder head.

According to the invention, the solution of this heating problem is achieved by strengthening the cylinder head member by radial stiffening walls, curving or bulging of the external lateral walls and by progressively increasing the thickness of the base in the outward radial direction, and constructing the cylinder head in such manner that the circulation of the cooling medium is considerably accelerated at that part of the cylinder head base which is most highly heated in order to ensure the maximum dissipation of undesired heat.

The invention is diagrammatically illustrated in the accompanying drawing, wherein:

Figure 1 is a longitudinal section through a cylinder head constructed in accordance with the invention, the section being on the line C—D on Figure 2.

Figure 2 is a cross-section through the said cylinder head on the line A—B on Figure 1.

The cylinder head of an internal combustion engine, preferably a two-stroke diesel engine, is provided with an internal water-cooling system and for this purpose is constructed as an integrally formed hollow member. The cylinder head consists essentially of a square cover plate portion 1 and a square base plate portion 2, which are interconnected by four side walls 3 defining a circulation space. In order to secure the cylinder head to the cylinder 4, by means of anchoring bolts not shown in the drawing, the corners of the cylinder head are provided with apertured outer bosses 5. An additional boss

portion 6, which is centrally disposed at the middle of the cylinder head and is apertured axially to communicate with the interior of the cylinder 4 serves in the conventional manner to receive and accommodate a fuel injection nozzle (not shown). That side of the base plate portion 2 which faces the cylinder 4 is cylindrically reduced or shouldered for the purpose of centering the cylinder head on cylinder 4. The supply of fluid cooling medium is effected through inlet bores 7 formed in the base plate portion 2 on either side of each of the securing bosses 5, said inlet bores opening into the cooling water jacket 8 of the cylinder. The lateral wall portions 3 are arched laterally inwardly intermediate their ends where they terminate at the securing bosses 5 and the lateral wall portions 3 also extend laterally outwardly to provide a central thickened portion in each lateral wall. This inward arching stiffens each lateral wall portion 3 between the securing boss portions 5 and directly over the walls of cylinder 4 so that a better seal between the top of the cylinder and the cylinder head is obtained, particularly between the securing boss portions 5, than would otherwise be possible. This stiffening provides increased resistance against vertical bowing under the influence gas pressure within the cylinder 4. The lateral wall portions 3 of the cylinder head comprise at their thickened centres cylindrical openings 9 which are necessary for holding the cores when casting the cylinder head. These openings, which give access to the circulation space, are closed on three side walls by screw-plugs 10, while the opening left in the fourth wall serves for the discharge of the cooling water by means of a pipe 11 connected to the said opening.

According to the invention, the cylinder head is of strengthened construction both for the securing bolts and also at the bearing surface on the rim of the cylinder and conducts the flow of cooling water in such manner that there is produced an intensive cooling of the structural parts of the cylinder head which are most highly heated, for example, the boss 6 for the injection nozzle and the middle of the base or lower wall portion 2 at 12. The strengthening of the cylinder head is obtained for the securing bolts by the greater thickness of the base plate 2 which increases progressively radially outwardly from the central centre and by partitions 13 extending radially from the central boss portion 6 for the injection nozzle to the securing bosses 5. The bearing pressure necessary for sealing the cylinder head on the cylinder rim is transmitted partly by the partitions 13 extending through the circulation space of the cylinder head and partly by the inwardly curved or centrally thickened side walls 3. In order to achieve an adequate cooling of the most highly heated central boss 6 for the injection nozzle and of the middle of the lower cylinder head wall portion 2, comparatively small apertures 14 are provided in the partitions 13 at those places which adjoin the said structural parts 6 and 12, whereby a very high velocity is imparted to the flow of cooling water in this region and thereby an intensified cooling action is obtained. Additional small openings 15, formed in partitions 13 directly underneath the cover plate portion 1, are provided to prevent the formation of steam pockets in the cooling chambers 16.

We claim:

1. A liquid-cooled cylinder head for internal combustion engines, comprising: a lower wall shaped to fit at one end of said cylinder to close the same, said lower wall having a greater thickness at its peripheral portions than at its central portions; an upper wall spaced from said lower wall; lateral wall means extending between said upper and lower walls and defining therewith a closed space for the circulation of a cooling liquid; and central boss means extending between juxtaposed central

portions of said upper and lower walls, said boss means being apertured to receive means communicating with the interior of said cylinder and having lateral surface portions disposed within said circulation space to be cooled by said cooling liquid.

2. A cylinder head as claimed in claim 1 further comprising at least one partition extending outwardly intermediate said upper and lower walls from said central boss means to said lateral wall means for strengthening said cylinder head.

3. A cylinder head according to claim 2, in which said cylinder head further comprises inlet and outlet means for said cooling liquid communicating with said circulation space on opposite sides of said partition, and wherein said partition is apertured adjacent to said central boss means for permitting circulatory flow of said cooling liquid adjacent to said central boss means from said inlet means to said outlet means.

4. A cylinder head according to claim 3, wherein said partition is apertured adjacent to said lower wall for permitting circulatory flow of said cooling liquid adjacent to the lower portion of said central boss means.

5. An integrally formed liquid cooled cylinder head of the class described, comprising: a bottom wall portion having an under surface shaped to fit at one end of said cylinder to close the same, said bottom wall portion being of increasing thickness proceeding from the central portion thereof outwardly at least to the portion thereof adjacent to the inner wall surface of said cylinder; a central boss portion extending upwardly from the center of said bottom wall portion, said boss portion being apertured to receive fuel injection means communicating with the interior of said cylinder therethrough; a plurality of outer boss portions disposed at outer portions of said bottom wall portion, said outer boss portions being apertured to receive fastening means for securing said cylinder head to said cylinder; lateral wall portions extending upwardly from said bottom wall portion intermediate said outer boss portions; and a top wall portion extending over said lateral wall portions and said central boss portion and defining therewith a closed space for the circulation of a cooling liquid.

6. A cylinder head according to claim 5, further comprising a plurality of partition portions each extending outwardly between said top and bottom wall portions from said central boss portion to one of said outer boss portions, said partition portions being apertured adjacent to said bottom wall portion and said central boss portion to permit the circulatory flow of said cooling liquid therethrough.

7. A cylinder head according to claim 5, wherein each of said lateral wall portions is thickened intermediate its ends, said cylinder head further comprising closure means disposed at each thickened wall portion and permitting access to said circulation space.

8. A cylinder head according to claim 5, wherein each of said lateral wall portions is arched laterally inwardly intermediate its ends for stiffening said cylinder head intermediate said outer boss portions.

9. A one piece cylinder head for an internal combustion engine comprising a square top plate, a square base plate increasing in thickness towards its outer edges, four side walls between and separating said top plate and base plate, said side walls being each of increasing sectional dimension between its ends, apertured bosses at the corners of the cylinder head, a central apertured boss, partition walls extending diagonally of the cylinder head between the corner bosses and the central boss, said partition walls being apertured near the junction of the central boss and the base plate to accelerate the cooling medium at said junction.

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