

Feb. 1, 1955

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2,700,964

HOUSING OF INTERNAL-COMBUSTION ENGINES

Filed Sept. 30, 1949

Fig. 1.

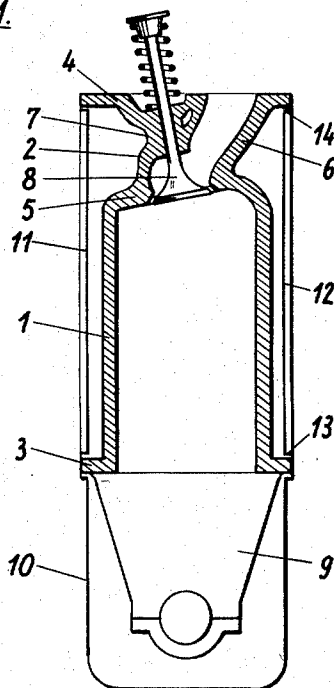


Fig. 2.

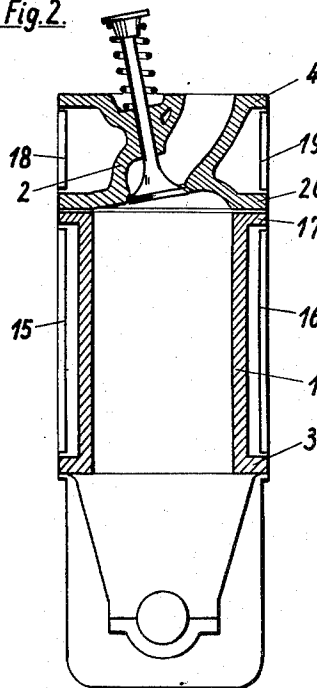
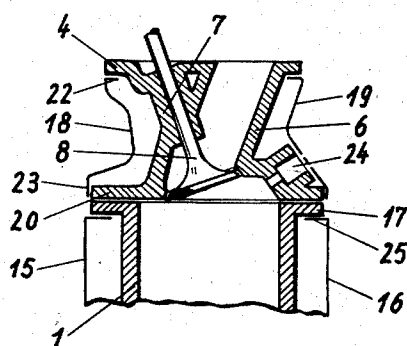


Fig. 4.

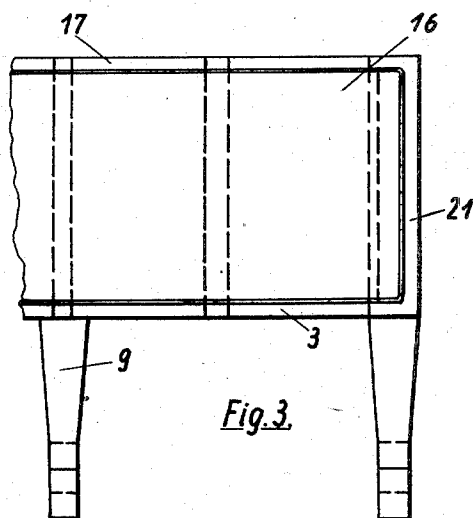


Fig. 3.

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## HOUSING OF INTERNAL-COMBUSTION ENGINES

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Application September 30, 1949, Serial No. 118,733

Claims priority, application Germany October 1, 1948

14 Claims. (Cl. 123—41.77)

The present invention relates to a simplified and lightweight housing for an internal combustion engine.

Accordingly, it is an object of the present invention to provide a simplified and lightweight housing for internal combustion engines.

The main feature of the present invention lies in the fact that the casting of the engine comprises primarily inner walls, and a lower and upper terminal partition wall, whereby the outer walls, particularly the walls surrounding the cooling water jacket, are formed primarily of special sheet metal covers which are subsequently connected to the casting. If the cylinder and the cylinder head are made out of one unitary casting, it is advisable that the outer sheet metal walls extend uninterruptedly over the cylinder block and the cylinder head. On the other hand, if the cylinder block and the cylinder head are separate castings, then each of the castings should be provided with individual sheet metal partitions or covers. The sheet metal partitions or covers may be detachably connected to the casting in any suitable manner, as by means of screws, or preferably are connected undetachably by welding, soldering or spurring. The spurring may be done, for example, by means of a spurt of the schoch type by means of which the crevices and interstices between the sheet metal jacket and the casting are spurred with metal. The sheet metal partitions or covers are preferably turned flangelike along the edges thereof and are placed between the projecting walls or flanges of the casting. However, they may also be placed flatly upon the outer walls or upon the outer edges of the flanges of the casting. Furthermore, the sheet metal partitions or walls may be used either as flat plates or possibly with bent edges, or possibly they may be formed, for example, corresponding to the inner walls of the casting so as to decrease the volume of the cooling water jacket.

By reason of the fact that the castings may be manufactured without outer walls, it is possible to simplify the shape of the castings. The mould utilized in accordance with the present invention requires only simple cores whereby the casting may be cleaned easily, thoroughly and reliably by means of sand. The simplicity of the forming of the mould considerably reduces the danger of stresses occurring in the casting and therewith the occurrence of waste. But above all, a considerable decrease in weight is accomplished. On the one hand, a portion of the walls which normally have a thickness of about  $\frac{1}{8}$  to  $\frac{3}{16}$  of an inch is replaced by sheet metal having a thickness of approximately  $\frac{1}{32}$  or  $\frac{1}{64}$  of an inch, and, on the other hand, the remaining casting walls may be formed of reduced thickness.

It is particularly advantageous that the inlet and outlet channels are not brought out to the lateral wall of the cylinder head, as is customary, but instead are brought out to the upper side thereof. On the one hand, an additional simplification of the casting can be obtained thereby, and, on the other hand, the sheet metal jacket laterally surrounding the casting of the cylinder head is not interrupted by the channels.

Further objects, features and advantages of the present invention will become more obvious from the following description when taken in connection with the accompanying drawing which shows for purposes of illustration only several preferred embodiments of the present invention, and wherein:

Figure 1 is a vertical sectional view of an engine with a cylinder block and a cylinder head consisting of one piece.

Figure 2 is a similar sectional view of an engine with

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the cylinder head formed separately from the cylinder block.

Figure 3 is a side view of the engine shown in Figure 2, and

Figure 4 is a sectional view showing another embodiment of the cylinder head.

Referring now more particularly to the drawing, wherein like reference numerals are used throughout the various views thereof to designate like parts, and more particularly to Figure 1, reference numeral 1 designates the cylinder block and reference numeral 2 the cylinder head. The cylinder block 1 and cylinder head 2 are formed as a unitary casting which is terminated at the lower end thereof by terminal wall 3, and which is terminated at the upper end thereof by terminal wall 4.

The cylinder head is formed essentially by the covering wall 5 for the cylinder space or chamber and the upper terminal wall 4, by the inlet and outlet channels and by the valve guides, of which only one channel 6 and one valve guide 7 is shown in the cross sectional view, which houses the slantwise arranged intake and exhaust valves, of which only one valve 8 is shown in the cross sectional view. The channels 6 thereby extend S-shaped upwardly and terminate in the terminal wall 5. In engines with a carburetor it is preferable that a down draft carburetor located above the cylinder head be used. The internal actuating mechanism (not shown) which may include, for example, a cam shaft arranged above the cylinder head, may be mounted in a special housing located on the cylinder head, which housing may, in a given case, form at least partly a unitary piece with the cylinder head. The bearing supports 9 for the crank shaft are likewise joined by being cast integrally with the cylinder block, but may also be detachably fastened thereto, if so desired. The bearing itself may consist of one or of two parts. A hood or trough 10 made of sheet metal is fastened to the lower terminal wall 3 of the cylinder block 1 by screws.

According to the present invention, the outer walls of the cooling water jackets are formed of sheet metal covers 11 and 12. One each of these sheet metal covers is arranged on either side of the cylinder and extends essentially over the entire length and the height of the casting. The borders or rims of these sheet metal covers which are otherwise flat are bent so as to form flanges 13 and 14, by which the sheet metal covers are emplaced in the openings between the terminal walls 3 and 4 in such a manner that they touch the flange-like projecting edges of these walls. The flanges 13 and 14 are connected with the walls 3 and 4 of the casting in any suitable manner as, for example, by welding, soldering or metal spraying. The frontal sides of the cylinder block may form parts of the casting, or may also be formed of sheet metal which may consist of parts emplaced individually or may be formed as parts of the corresponding sheet metal covers 11 and 12, respectively.

The illustrated embodiment according to Figures 2 and 3 differs from the embodiment of Figure 1 in that the cylinder block and the cylinder head form individual separate castings.

In the place of the sheet metal covers extending from bottom to top, as shown in Figure 1, corresponding special sheet metal covers 15 and 16 for the cylinder are placed between the terminal walls 3 and 17, and special sheet metal covers 18 and 19 for the cylinder head are placed between the covering walls 20 and 4. All of these sheet metal covers are connected with the castings in any of the aforementioned ways.

Figure 3 shows a sheet metal cover 16 arranged laterally between the flange-like projecting terminal walls 3 and 17, and an end wall or a flange-shaped bridge 21 of the cylinder block. However, in that case, the laterally arranged sheet metal covers 15 and 16 may also extend over the front ends of the cylinder casting.

The cylinder head according to Figure 4 shows an essentially rectilinear inlet and outlet channel 6 which again is controlled by a valve 8 arranged slantingly in a direction opposite of that of the channel 6. In the embodiment illustrated in Figure 4 the outer walls of the cooling water jacket are formed by sheet metal covers 18 and 19 which are curved inwardly following the con-

tours of the inner walls 4, 7, 6 and 20 so as to reduce the volume of the cooling water jacket to the required amount. As contrasted with the embodiments illustrated above, the joining or securing of the sheet metal covers takes place in a somewhat different manner. The upper border 22 of the sheet metal covers which is connected with the terminal wall 4, is bent inwardly, while the lower border 23 of the sheet metal cover rests flatly on the outer border of the terminal wall 20. A corresponding sheet metal cover 19 may be provided at the bore hole 24 which serves for the insertion of a spark plug or the like. The sheet metal cover may also be provided with an opening around which it is also closely connected with a casting unless a special seal or gasket is provided therefor.

The sheet metal covers 15 and 16 for the cylinder block may also be provided with borders or edges 25 which are bent inwardly.

The present invention may be applied to diesel engines and engines with a carburetor and to all other kinds of internal combustion engines, and is especially suitable for cheap and small engines, and particularly for motor vehicles. Ultimately, the upper covering wall of the cylinder head may also be formed of sheet metal. The designation "upper" and "lower" is to be understood as applied to engines having upright cylinders, and is to be understood correspondingly with engines having a different arrangement of cylinders.

What I claim is:

1. A housing for an internal combustion engine having an inner unitary casting extending upwardly approximately from the crank case of the engine to the cylinder head inclusive, said housing comprising essentially the inner walls of the cylinder head and an outer jacket made of sheet metal which is connected with the casting, said casting comprising cylinder walls, walls forming valve channels and a lower flange-like final wall situated towards the crankcase, and an upper wall covering the cylinder head at the top thereof, said sheet metal jacket being one piece extending uninterruptedly from the lower wall to the upper wall and connected to the lower and upper wall.

2. A housing of an internal combustion engine according to claim 1, wherein the inner walls of the cylinder head comprise the walls of the valve channels which extend through the cylinder head from bottom to top.

3. A housing of an internal combustion engine according to claim 1, wherein the inner walls of the cylinder head comprise the walls of the valve channels said walls extending through the cylinder head from bottom to top and in a slant to the axis of the cylinder.

4. A housing of an internal combustion engine according to claim 1, wherein the inner walls of the cylinder head comprise the walls of the valve channels, which extend through the cylinder head from bottom to top and in a slant to the axis of the cylinder, and valve guides which are arranged in a slant to the main direction of the valve channels.

5. A housing for an internal combustion engine having an inner unitary casting extending upwardly approximately from the crank case of the engine to the cylinder head inclusive, said housing comprising essentially the inner walls of the cylinder head and an outer jacket made of sheet metal which is connected with the casting, said casting comprising cylinder walls, walls forming valve channels and a lower flange-like final wall situated towards the crankcase, and an upper wall covering the cylinder head at the top thereof, said sheet metal jacket being one piece and connected to the lower and upper wall, and forming a continuous limited cooling water space around the entire casting, which space surrounds the cylinders and the heads.

6. An internal combustion engine housing comprising a cylinder head and block having two parts, namely a cast inner part and an outer part formed of sheet metal, said cast inner part comprising cylinder walls, the inner walls of the cylinder head provided with valve channels and including cooled limiting walls for said valve channels, and at least part of the crank shaft bearing, and said outer part consisting of sheet-metal jacket plating shutting off and enclosing substantially the entire height of said cylinder head and block from the outside thereof, said outer part being separate from the engine crank case.

7. A housing for an internal combustion engine having

an inner casting comprising essentially cylinder block and cylinder head walls and upper and lower end walls, and an outer jacket of sheet metal joined with said upper and lower end walls, said outer sheet metal jacket having at least two lateral sheet metal covers fixed to the sides of the casting, said lateral walls bearing separately against said inner casting and forming a closed hollow space therewith for accommodating a liquid coolant therein, said sheet metal covers being bent off on the edges thereof and abutting against said casting with said bent-off edges, and being inserted between the end walls of said casting so that said edges lie against said end walls from the side of the intermediate space formed between said end walls.

8. A housing for an internal combustion engine according to claim 7, wherein said edges are bent off inwardly.

9. A housing for an internal combustion engine having an inner casting comprising essentially cylinder block and cylinder head walls and upper and lower end walls, and an outer jacket of sheet metal joined with said upper and lower end walls, said outer sheet metal jacket having at least two lateral sheet metal covers fixed to the sides of the casting, said lateral walls bearing separately against said inner casting and forming a closed hollow space therewith for accommodating a liquid coolant therein, said sheet metal plates being bent off outwardly at the edges thereof and abutting against said end walls with said bent-off edges.

10. A housing for an internal combustion engine according to claim 9, wherein said cylinder block includes as upper end wall a flange-like wall forming simultaneously the separating wall with the cylinder head, and as lower end wall a flange-like wall connected to the crank case.

11. A housing for an internal combustion engine according to claim 9, comprising a first casting for said cylinder block walls and another casting for said cylinder head walls, and separate sheet metal covers for said first casting and said another casting.

12. A housing for an internal combustion engine according to claim 7, wherein at least some of said sheet metal covers are formed essentially in accordance with the external contours of corresponding inner walls to reduce the volume of the jacket.

13. A housing for an internal combustion engine according to claim 7, further comprising a part affixed to said casting and extending through an opening provided therefor in said sheet metal jacket, and means for sealing said sheet metal jacket around said opening against said part.

14. An internal combustion engine housing with a crank case comprising a cylinder head and block having two parts, namely a single cast inner part and an outer part formed of sheet metal, said cast inner part comprising essentially cylinder walls, the inner walls of the cylinder head provided with valve channels and including cooled limiting walls for said valve channels, a substantially transverse wall delimiting the cylinder head toward the cylinder space, and a transverse wall delimiting the cylinder head toward the opposite side, and said outer part consisting of sheet metal jackets shutting off and enclosing the entire height of said cylinder head and block from the outside thereof, said outer part being separate from said engine crank case.

#### References Cited in the file of this patent

##### UNITED STATES PATENTS

|           |                 |               |
|-----------|-----------------|---------------|
| 816,062   | Barnett         | Mar. 27, 1906 |
| 923,491   | Coffee          | June 1, 1909  |
| 943,408   | Heinze, Jr.     | Dec. 14, 1909 |
| 1,280,760 | Kirkham         | Oct. 8, 1918  |
| 1,347,477 | Allyne et al.   | July 20, 1920 |
| 1,357,538 | Bentley         | Nov. 2, 1920  |
| 1,402,695 | Wall            | Jan. 3, 1922  |
| 1,471,408 | Mertz           | Oct. 23, 1923 |
| 2,020,461 | Dennison et al. | Nov. 12, 1935 |
| 2,036,269 | Good            | Apr. 7, 1936  |
| 2,324,705 | Huber           | July 20, 1943 |
| 2,395,712 | Bachle          | Feb. 26, 1946 |

##### FOREIGN PATENTS

|         |           |               |
|---------|-----------|---------------|
| 814,385 | France    | June 21, 1937 |
| 106,179 | Australia | Dec. 14, 1938 |