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CYLINDER HEAD

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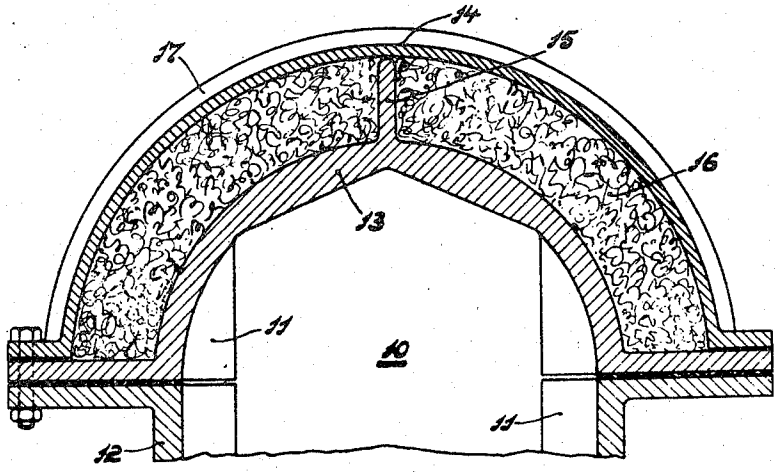


Fig. 1

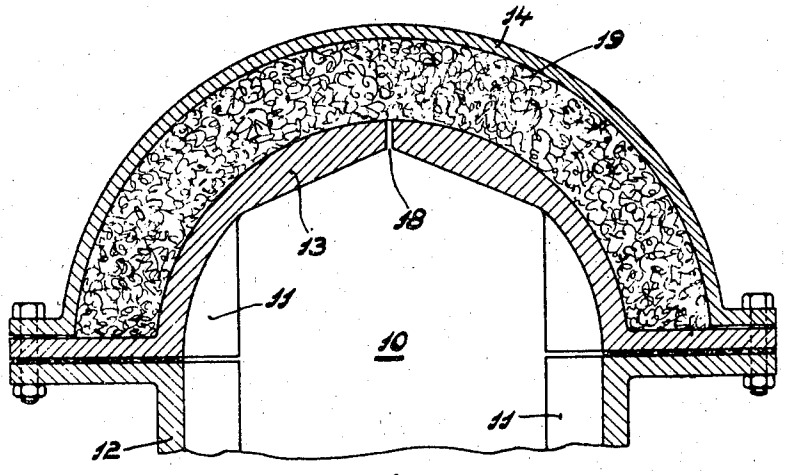


Fig. 2

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CYLINDER HEAD

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9 Claims. (Cl. 123—193)

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The invention relates to cylinder heads and more particularly to cylinder heads for hot gas motors.

The invention has for its object to construct cylinder heads of such kind that the choice of the material from which the head is built up is not restricted too much by the requirements as regards its strength at the operating temperature of the motor.

The cylinder head according to the invention is constructed in such manner that an exterior wall or walls, when the motor is in operation, takes up the force or at least part of the force due to the overpressure prevailing in the cylinder and is thermally insulated from the surface which is in contact with the heated medium. Owing to this step the wall which substantially takes up the force is consequently not subject to a high thermal load. The material of this wall need therefore have the required mechanical strength only at a low temperature. It ensues therefrom that the thickness of this wall may therefore be smaller and that there is a wider choice of materials suitable for use for this purpose. Since, besides, this wall is not in direct contact with the medium in the motor, it is not necessary to satisfy requirements imposed by the medium, for example as regards the property of being not liable to chemical attack.

The cylinder head according to the invention preferably consists of at least two walls whilst the space between these walls acts as a thermal insulator. Of these walls only the inner wall is in direct contact with the heated medium so that this wall has indeed to satisfy the requirements as regards the property of being not liable to chemical attack and, as the case may be, the conduction of heat but the mechanical strength is furnished by the outer walls or by the walls located further to the outside. A large number of materials are therefore available for the manufacture of both walls.

It is not necessary that the inner wall should not take up any force at all. The majority of the materials suitable for the manufacture of the inner wall can also take up a little force at high temperatures. Thus, for example, it is possible to have the average pressure prevailing in the cylinder taken up by the outer wall, the difference between the instantaneous pressure and the average pressure being taken up in this case by the inner wall.

In the drawings:

Fig. 1 shows a vertical sectional view of one embodiment of the invention wherein the forces

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acting on a cylinder head are distributed over two distinct walls.

Fig. 2 shows a similar view of another embodiment of the invention wherein the space between the above walls is utilized as a thermal insulator.

In Fig. 1, 10 denotes the cylinder chamber governed by the displacer piston. Around this chamber are provided a set of ribs 11 by which the heat is transferred to the gas present in the chamber 10. These ribs are heated either from the outside through a cylinder casing 12 or by a source of heat (not shown) which is provided in the interior of the motor. The cylinder head itself substantially consists of two walls 13 and 14 of which the wall 13 directly adjoins the cylinder chamber. This wall is made of material which, under the action of the gas present in the cylinder and at the operating temperature of the motor, which temperature amounts to 500° C. or upwards, is not attacked by the internal gas of the motor. If, for example, this internal gas consists of air, the wall 13 is made of a metal alloy which does not corrode at a high temperature, aluminium bronze being particularly suitable for this purpose. This metal has, however, the drawback of having at a temperature of 500° C. and upwards a mechanical strength which is greatly insufficient for a cylinder head, the second wall 14 of the cylinder head being therefore arranged parallel to the wall 13. This wall 14 is not in direct contact with the hot gases in the motor. The choice of material for this wall may therefore be made exclusively out of considerations of mechanical strength. Use may be made for this purpose, for example, of ingot steel.

The force between the walls 13 and 14 is transferred, on the one hand, by a rib 15 which has been cast to the wall 13 and which bears against the wall 14, and, on the other hand, by rigid filling material 16 provided in the space between these walls. This filling material consists, for example, of a layer of ceramic material baked in this shape which opposes a sufficient resistance against compression to transfer the force from the wall 14 to the wall 13.

In addition to the rib 15, still further metallic stiffening pieces may be present between the walls 13 and 14, owing to which a unilateral heat-conducting contact is established between the walls 13 and 14 so that it is unavoidable that also the temperature of the wall 14 slightly increases, for example to 200° C. In order to avoid unnecessary loss of heat due to radiation from this wall, an insulating layer 17, for example of asbestos wool, is provided on the wall 14.

The form of construction according to Fig. 2 is similar to that of Fig. 1 as to the construction of the cylinder, similar parts being denoted by the same reference numerals. Here, instead of being transferred by a solid substance present between the walls 13 and 14 the force is transferred between these walls by a gas under pressure. This gas under pressure might be introduced from the outside through the wall 14 and might be maintained at the required pressure by supplying the losses due to leakage. This entails the drawback that if the motor stops and cools down the gas pressure decreases in the cylinder 10 but does not decrease in the space between the two walls so that the latter are exposed to unnecessarily high stresses. It is therefore more efficacious to make the gas pressure in the space between these walls equal to the average pressure of the gas in the cylinder 10 during operation and to cause this gas pressure, when the motor is put out of service, to flow off to the interior of the cylinder. To that end the wall 13 is provided with a capillary aperture 18 which establishes communication between the cylinder chamber 10 and the space 19 between the two walls. Since this aperture has capillary dimensions, the gas flows through this aperture only at a low speed. After the motor has been in operation for some time, the pressure prevailing in the space 19 adjusts itself to the average pressure prevailing in the cylinder chamber 10. When the motor is stopped and the latter cools down, the gas flows slowly from the space 19 back into the cylinder chamber 10 so that the wall 14 is likewise relieved.

If during the process of operation the average pressure prevailing in the cylinder varies, the pressure in the space 19 adjusts itself thereto, the wall 13 being consequently relieved on the average during the process of operation. This wall has only to take up periodically the difference between the maximum pressure and the average pressure as tensile stress on the wall and the difference between the average pressure and the minimum pressure in the cylinder as compressive stress varies upon this wall. Since, however, the average force in the wall is zero, the material of the wall is prevented from creeping at a high temperature.

The layer of stagnant gas in the space 19 acts in itself as a thermal insulator so that the wall 14 is practically not heated so that a separate insulating layer on this wall may frequently be dispensed with. In order to avoid any circulation of gas in the space 19 the latter may be filled with heat-proof material which prevents the gas from flowing, for example with slag wool.

It may, however, be premised, that the transfer of force between the walls is effected exclusively by the gas pressure and not by the filling material, such being in contradistinction to the

form of construction described with reference to Fig. 1.

What I claim is:

1. A hot gas engine cylinder head comprising a thin corrosive resistant internal wall and a spaced heavy external wall insulated therefrom and means for transmitting pressure exerted on said internal wall to said external wall whereby the engine pressure is substantially exerted on the external wall.

2. A cylinder head as claimed in claim 1 wherein a thermal insulator fills the space between said internal and said external walls.

3. A cylinder head comprising an internal wall, an external wall spaced therefrom, and a pressurized heat-proof solid material between said external wall and said internal wall whereby the engine pressure is effectively felt only at said external wall.

4. A cylinder head comprising an external wall, an internal wall spaced therefrom, and insulating material separating said walls, said internal wall having vent means to said insulation, whereby the average cylinder pressure prevails therein.

5. A cylinder head as claimed in claim 4 wherein said vent means comprises a narrow aperture.

6. A hot gas engine cylinder head comprising an inner light and heat resistive cylinder wall, said wall being substantially corrosive proof from normal engine gases, an outer wall effectively insulated therefrom, and an exterior insulating covering for said outer wall.

7. A cylinder head comprising an outer casing, an inner casing, and insulating material, and metallic stiffening pieces therein, separating said respective casings.

8. A cylinder head as claimed in claim 7 wherein the outer casing is surrounded by a thermal insulator.

9. A cylinder head comprising an external wall, an internal wall spaced therefrom, said internal wall having vent means to the space between said external wall and said internal wall, whereby the average cylinder pressure prevails therein.

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