April 14, 1959 S. MEURER 2,882,106

PISTON FOR INTERNAL COMBUSTION ENGINES

Filed June 23, 1955 2 Sheets-Sheet 1

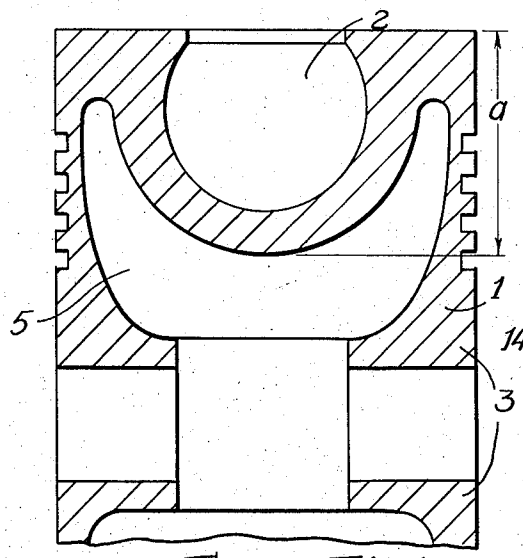


Fig. 1

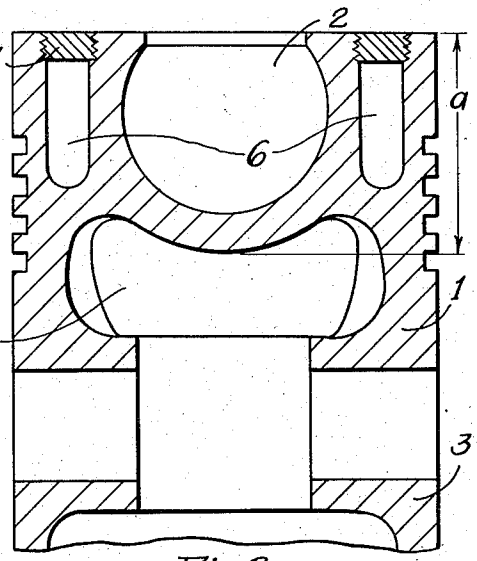


Fig. 2

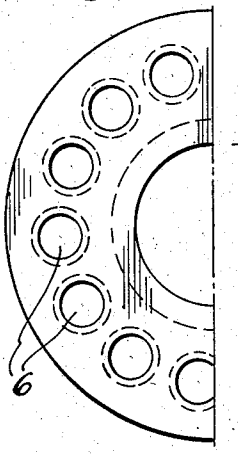


Fig. 2a

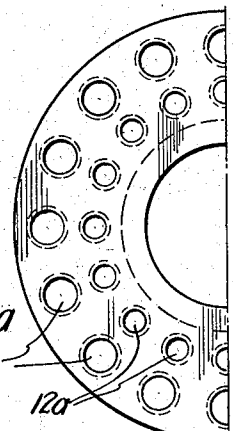


Fig. 3a

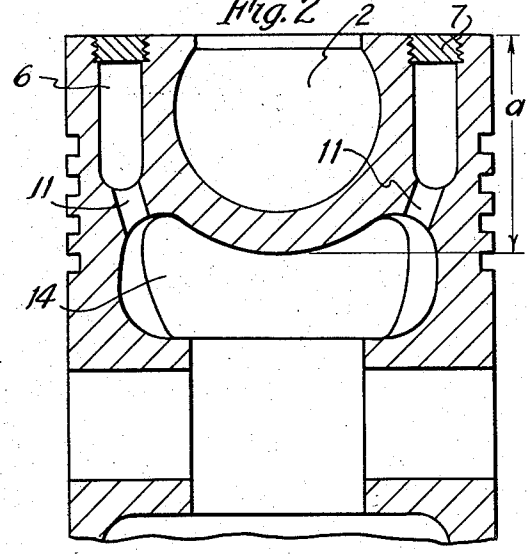


Fig. 7

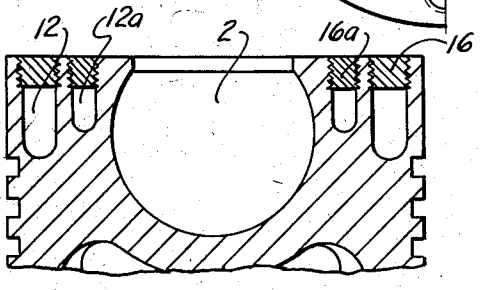


Fig. 3

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PISTON FOR INTERNAL COMBUSTION ENGINES

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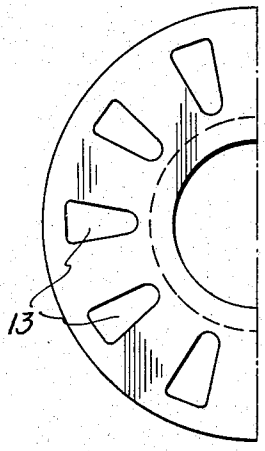


Fig. 4a

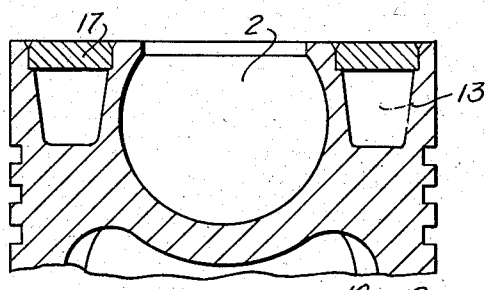


Fig. 4

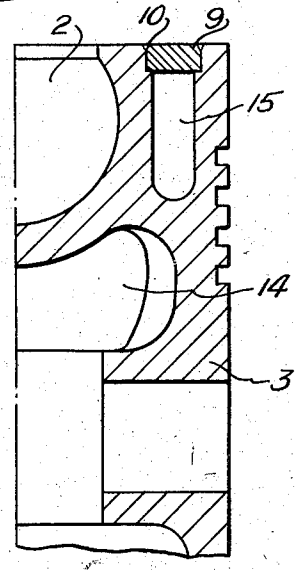


Fig. 5

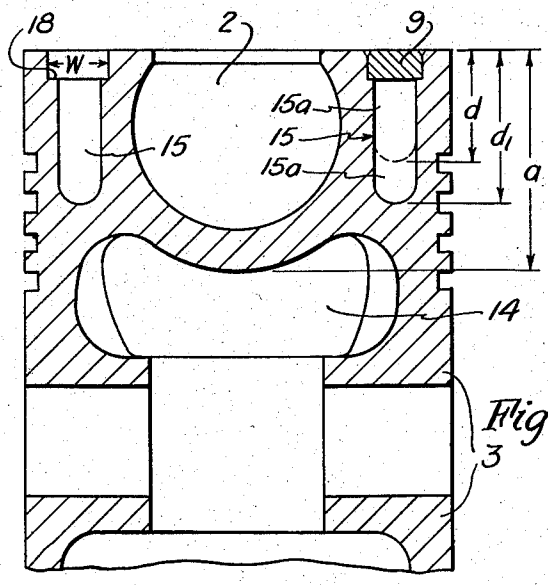


Fig. 6

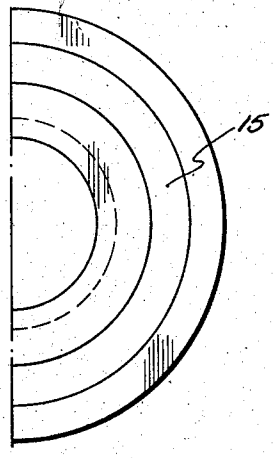


Fig. 5a

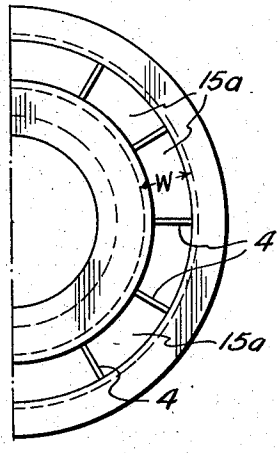


Fig. 6a

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PISTON FOR INTERNAL COMBUSTION ENGINES

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Application June 23, 1955, Serial No. 517,591

Claims priority, application Germany June 24, 1954

10 Claims. (Cl. 309—9)

This invention relates to a piston for internal combustion engines, more particularly for combustion engines of high speed, in which the combustion chamber is arranged entirely or substantially in the piston.

It is an object of the invention to provide a piston of the type referred to in which the weight of the reciprocating masses is reduced.

In a frequently used type of such internal combustion engines, the combustion chamber is arranged in a plunger type piston. The most favorable shape of the combustion chamber proved to be a nearly hemispherical hollow space or cavity, because the spherical shape has the smallest surface-to-volume ratio. However, the disadvantage of such spherical or nearly spherical combustion chambers consists in the fact that their height in the direction of the axis of the combustion chamber cannot be reduced at will, because a certain compression ratio must be adhered to, which requires a certain volume of the combustion chamber. Such pistons therefore have a very thick piston plate, which is recessed to form the spherical combustion chamber, with the result that relatively high mass forces are produced, especially in high speed engines, which is undesirable. On the other hand, for technological reasons of the casting process, the internal shape of the piston, especially above the piston pin bosses, cannot be designed in such a way that the thickness of the piston plate is reduced.

It is an object of the present invention to eliminate these difficulties and to provide means which permit a reduction of the mass of the piston while maintaining the required thickness of the plate forming the piston head.

With this and further objects in view, according to the invention cavities are provided or spared around the combustion chamber, so as to extend into the piston head from the outer face thereof, each of said cavities being gastightly closed by a cover plate. These cavities may be bores of equal or different diameter which are gastightly closed by plugs, or by way of alternative an annular slot or groove may be provided around the combustion chamber. In the latter case, an annular cover plate will be provided.

According to a further modification of the invention, additional bores may be provided to connect the recesses or cavities with the interior space of the hollow piston, for increasing the cooling action.

Other and further objects, features and advantages of the invention will be pointed out hereinafter and appear in the appended claims forming part of the application.

In the accompanying drawings several now preferred embodiments of the invention are shown by way of illustration and not by way of limitation.

Figure 1 is a longitudinal sectional view of a prior art piston;

Figure 2 is a similar view of a piston of this invention;

Figure 2*a* is a partial plan view of Figure 2;

Figure 3 is a longitudinal sectional view of a modified form of piston;

Figure 3*a* is a partial plan view of Figure 3;

Figure 4 is a longitudinal sectional view of another modified form of piston;

Figure 4*a* is a partial plan view of Figure 4;

Figure 5 is a partial longitudinal sectional view of a further form of piston;

Figure 5*a* is a plan view of Figure 5;

Figure 6 is a longitudinal sectional view of still another form of piston;

Figure 6*a* is a partial plan view of Figure 6; and

Figure 7 is a longitudinal sectional view of a still further form of piston.

As will be seen from Figures 1 to 7, the piston **1** is formed with an approximately spherical cavity **2** in the piston head, defining the combustion chamber, and with piston pin bosses **3**. Thus, a piston head of the relatively large thickness *"a"* is obtained. It would not be feasible to reduce the weight of the piston by recesses **5**, as shown in Figure 1, since it would not be possible to remove a solid core of this shape from the piston after the solidification of the casting. Therefore, a very complicated split core would have to be provided, whereby the production cost of the piston would be greatly increased.

Therefore, according to the present invention, recesses, e.g. in the form of bores **6**, are provided in the piston head, i.e. in the face thereof, and closed by threaded plugs **7**, as shown in Figures 2 and 2*a*.

Alternately, several bores **12** and **12***a* of different diameter, as shown in Figures 3 and 3*a*, or sector-shaped recesses **13**, as shown in Figures 4 and 4*a*, may be provided in order to retain as much as possible a uniform cross-section in a radial direction for the conduction of heat from the combustion chamber to the outer circumference of the piston. These bores **12**, **12***a* or recesses **13** are closed by plugs **16**, **16***a* and **17**, as shown in Figures 3 and 4.

In Figures 5 and 5*a*, the modified piston has an annular recess or slot **15** cast in the piston head, said slot being closed by an annular plate or ring **9** fastened to the piston head by welded seams **10** or by threads (not shown).

In order to improve the cooling of the piston head, annular recess **15** may be interrupted by bridge or web portions **4**, as shown in Figure 6*a*. The upper portion W of the annular recess is of greater width and is closed by a ring **9** whose peripheral edge extends both over the recess **15***a* and over the webs **4** in a simplified construction. Thus the annular recess **15** is composed of alternate deep and shallow portions, as indicated by the dimensions d and d_1, Figure 6.

In Figure 7, bores **11** connect the bores **6**, or **12** of Figure 3, or the recesses **13** or **15** of Figures 4 and 6, respectively, with the interior space **14** of the piston to provide means for the additional cooling of the piston.

In general, the closure members **7**, **9**, **16**, **16***a* and **17** are mounted flush with the surface of the piston.

While the invention has been described in detail with respect to certain now preferred examples and embodiments of the invention it will be understood by those skilled in the art after understanding the invention that various changes and modifications may be made without departing from the spirit and scope of the invention and it is intended, therefore, to cover all such changes and modifications in the appended claims.

I claim:

1. A piston for internal combustion engines comprising a thick piston head and a skirt depending therefrom, a combustion chamber extending from the top face of said piston into said head, a recess arrangement surrounding said chamber and extending from said face into said head close to the level of the bottom of said chamber for reducing the weight of said piston about one-third, and

gas tight closure members in said recess arrangement, said members being flush with said face.

2. A piston as in claim 1, said recess arrangement further comprising bores, and said closure members comprising plugs.

3. A piston as in claim 2, said bores having different diameters.

4. A piston as in claim 1, said recess arrangement further comprising non-circular bores, and said closure members comprising plugs secured in said bores.

5. A piston as in claim 4, said non-circular bores being downwardly tapered.

6. A piston as in claim 1, said recess arrangement further comprising an annular slot, and said closure members comprising at least one annular plate.

7. A piston as in claim 6, further comprising integrally formed webs extending transversely of said slots beneath said plate.

8. A piston as in claim 7, said webs subdividing said slots into sections of different depths.

9. A piston as in claim 8, further comprising welded joints between said plates and the piston head.

10. A piston as in claim 1, further comprising bores extending from the piston interior into said recesses for the passage of cooling fluid.

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