Nov. 18, 1958 J. BURNAND 2,860,614

PISTONS

Filed Sept. 6, 1956

5 Sheets-Sheet 1

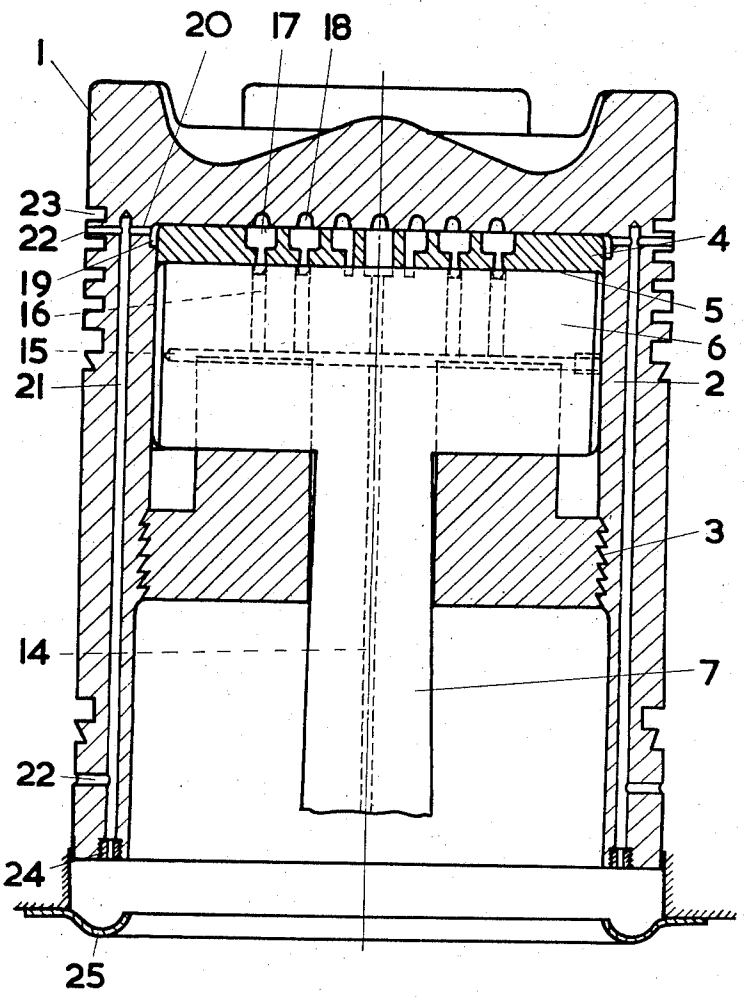


FIG. 1

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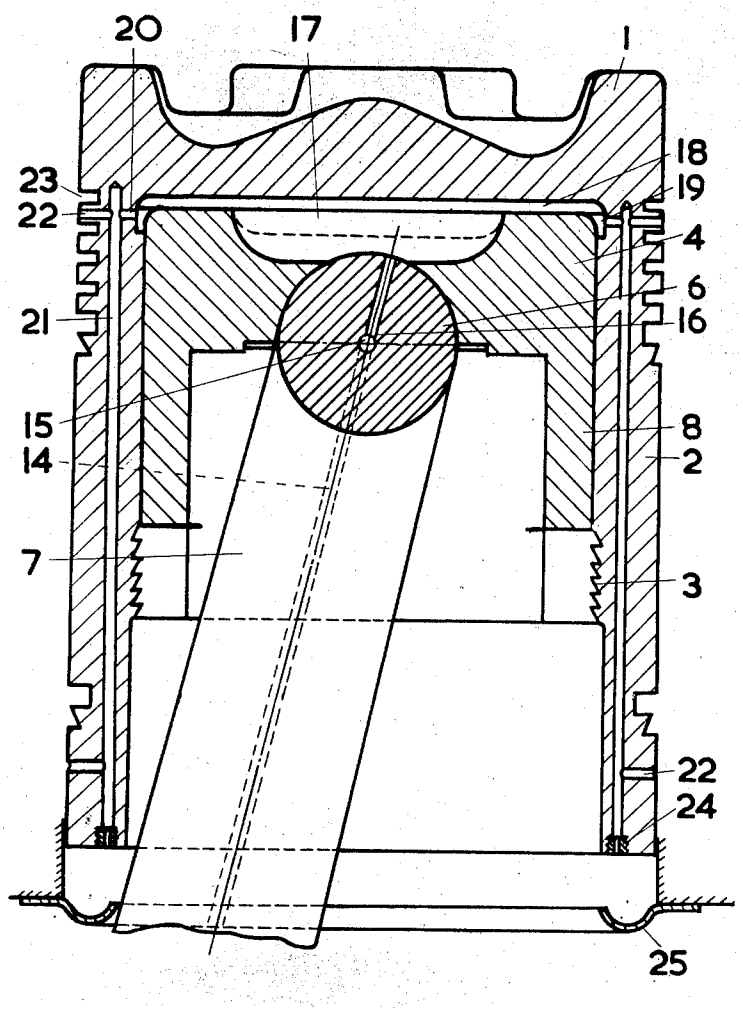


FIG. 2

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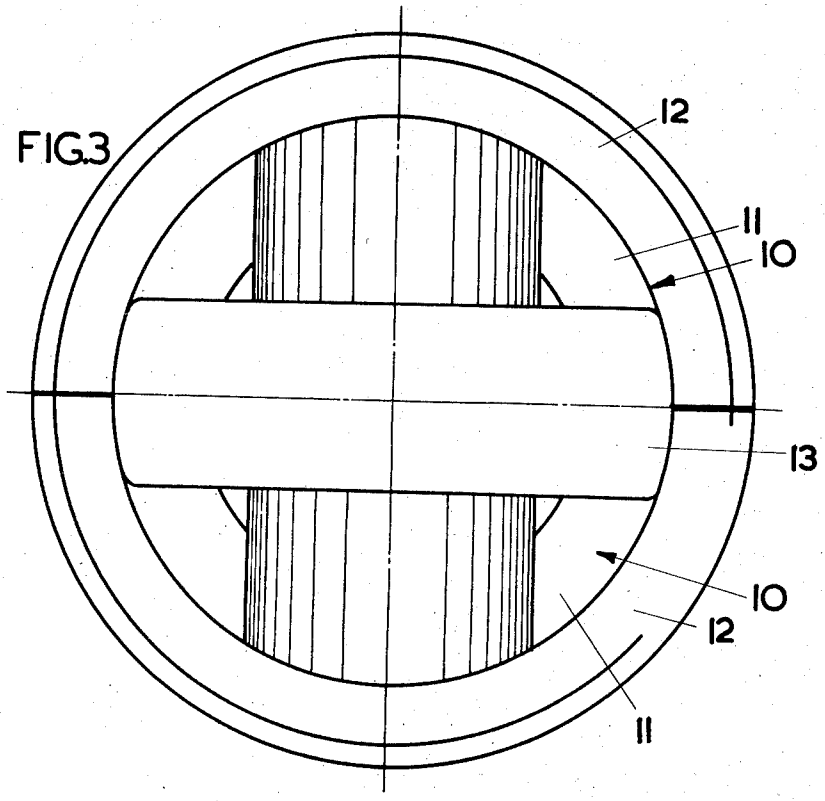
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FIG.3



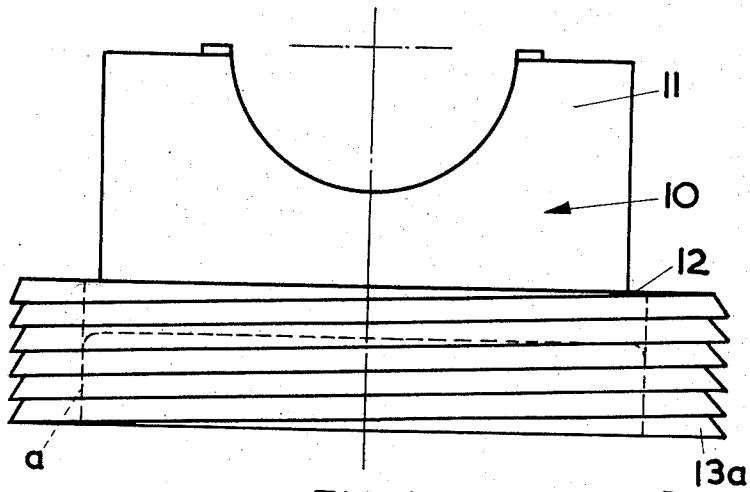


FIG.4

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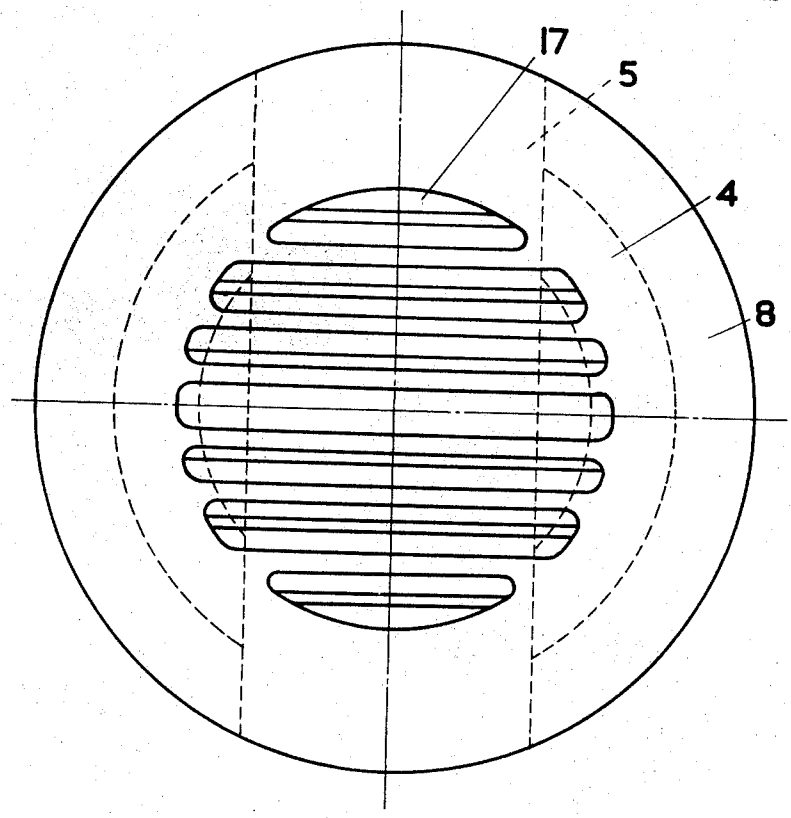


FIG.5

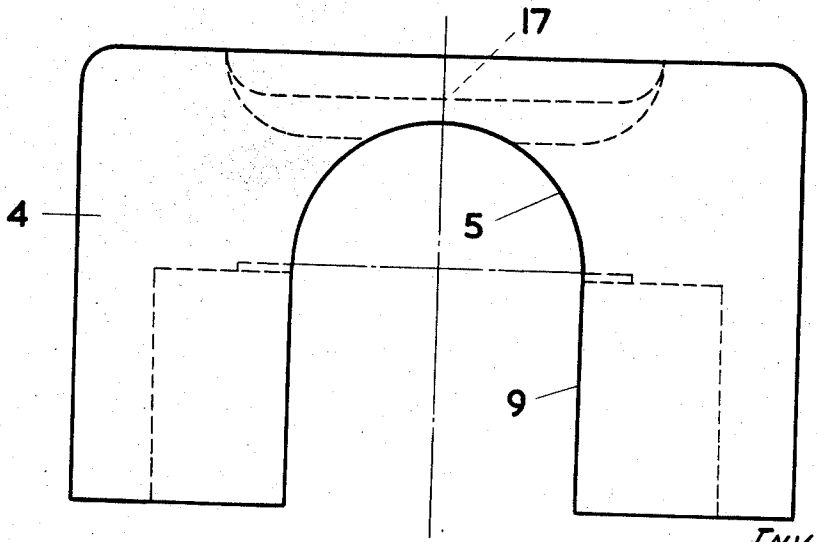


FIG.6

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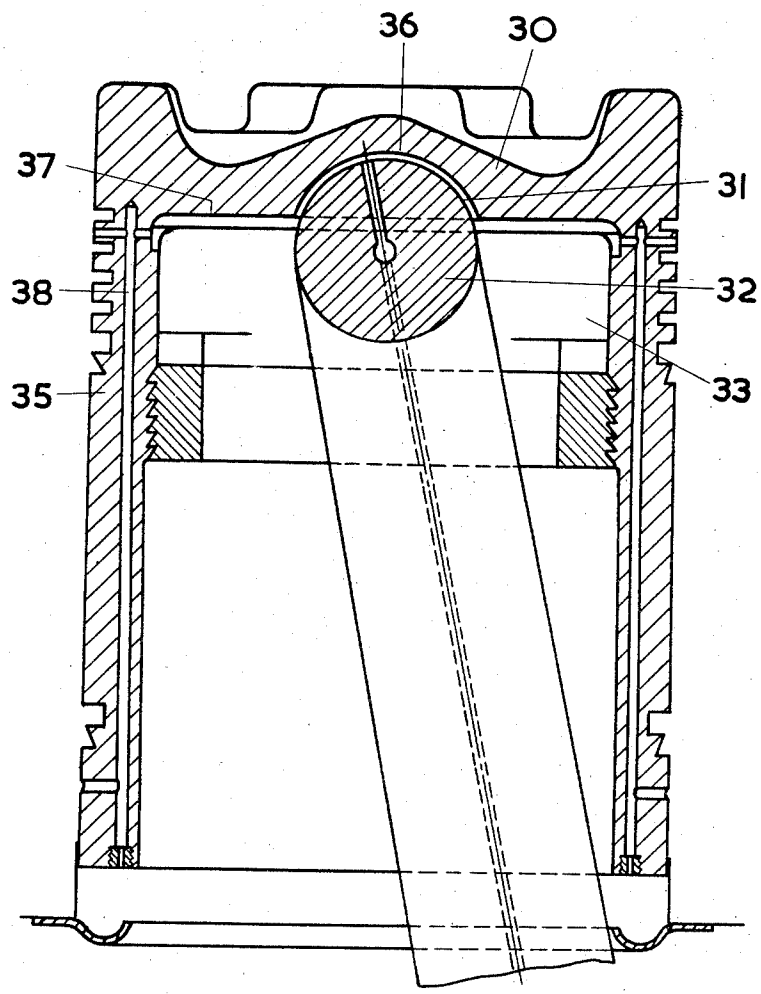


FIG. 7

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United States Patent Office 2,860,614 Patented Nov. 18, 1958

2,860,614

PISTONS

John Burnand, Teddington, England

Application September 6, 1956, Serial No. 608,235

7 Claims. (Cl. 123—41.38)

This invention is concerned with improvements in or relating to pistons for internal combustion engines.

Features and advantages of the present invention will appear from the following description of two embodiments of piston, given by way of example only, reference being made to the accompanying drawings in which:

Figure 1 is a longitudinal cross section of the piston,

Figure 2 is a longitudinal cross section of the piston on the line II—II of Figure 1,

Figure 3 is a plan view of the lower bearing incorporated in the piston,

Figure 4 is an elevation of the lower bearing,

Figure 5 is a plan view of the upper bearing,

Figure 6 is an elevation of the upper bearing and

Figure 7 is a cross section of another embodiment of piston.

The piston comprises a head **1** having an annular depending skirt **2**, internally threaded as at **3**, preferably with a buttress thread.

Within the piston fits a member **4** which forms a strut supporting the underface of the piston head and which forms an upper bearing, as at **5** for a gudgeon pin **6**, which preferably is formed integrally with a connecting rod **7**.

The member **4** externally has the appearance somewhat of a piston, being circular to fit in the skirt **2**, and having an annular skirt **8**, the bearing surface **5** being formed in the under face of the head of the member **4**. The skirt **8** is provided with diametrically opposed slots **9** whereby the member **4** may be placed upon the gudgeon pin.

Also in the piston skirt **2** is a lower bearing comprising two lower bearing pieces **10** each of which comprises a part **11** forming a saddle bearing for the lower face of an arm of the gudgeon pin, and a plate **12** which is generally semi-circular, has a recess **13** in its straight edge and is buttress threaded as at **13***a*. If desired the plate **12** may be reduced in volume by forming a skirt as at *a* Figure 4 depending from the plate **12** around its curved edge.

To assemble the piston the head may be placed upside down upon for example a bench, the member **4** is placed in the head, the gudgeon pin with its connecting rod is placed in position in the upper bearing, the lower bearings are held at the mouth of the piston skirt, the connecting rod extending through the aperture formed by the recesses **13** and the head is rotated for example by rotating the connecting rod so that the lower bearing is drawn into the skirt. Any suitable means may be used for holding the lower bearing during rotation of the head. The lower bearings are then locked in position by any suitable means.

The connecting rod has a central gallery **14** which leads to a passage **15** in the gudgeon pin. From the passage **15** lead passages **16** which extend to the upper surface of the gudgeon pin.

In the head of the member **4** are openings **17** and in

the underface of the piston head **1** are grooves **18**. Oil or other suitable lubricant material, preferably having cooling, lubricating and detergent properties, is passed up the connecting rod gallery **14** and moves out by the passages **15** to the gudgeon pin upper surface, and through the member **4** to the underface of the piston head thus cooling the head. If desired the dimensions of the passages **17** may be so selected in relation to the angle of movement of the connecting rod and passages **16** that the flow of lubricant is intermittent to the head, the passages **16** being opened and closed as they register and pass out of register with the passages **17**.

Lubricant escapes from the underface of the piston head to an annular recess **19** whence it passes by openings **20** to passages **21** in the skirt **2**. From each passage **21** lead holes **22** project to the outer surface of the skirt. I at present prefer to provide one below a top recess **23** for a piston ring and one adjacent the bottom of the skirt **2**. The passages **21** are preferably blocked off at the ends as at **24**, but it may be desirable to provide an adjustable opening to control the flow of lubricant to the outer surfaces of the piston skirt.

A channel **25** may be provided at the base of the cylinder bore to collect the lubricant as it runs down the cylinder walls and as it leaves the passages **21**, whence it may be returned in any suitable way to the lubricant source.

Whilst I have described the strut as having an integral upper bearing surface, it will be understood that in some cases a separate upper bearing surface may be preferred.

This piston is primarily intended for short stroke high speed engines but is of a construction applicable to other uses. The piston being built up of a number of interfitting parts, the danger of cracking is reduced and the top surface of the piston head is shown as having a particular shape but it may be preferred in some cases to provide a flat, concave or other shaped top surface. Any suitable piston ring may be employed. At present I prefer to provide a plurality of rings adjacent the top of the piston, being compression rings, and to provide a ring adjacent the base of the piston to act as a scraper to remove impurities from the cylinder walls.

It will be seen that the connecting rod has an angular travel limited only by the rim of the piston skirt.

The lower bearing if desired may be made in the form of two plates, from each of which extends a part forming a saddle bearing, the two lower bearings being held in place by a complete ring engaging the threads in the piston skirt.

Referring now to Figure 7 there is shown in cross section a piston which is of similar construction but in which no removable strut is provided. In this embodiment the piston comprises a somewhat thicker head **30** on the underface of which is a bearing recess **31** for gudgeon pin **32**. Two lower bearing pieces, only one, **33**, of which is shown, are received by a skirt **35** of the piston and abut the under side of the head. Channels **36** are formed in the upper bearing surface and these communicate with channels **37** formed in the underside of the head, channels **37** communicating with return passages **38** in the skirt as in the previously described embodiment.

Instead of the head illustrated I may adopt the head illustrated in Figures 1 and 2 of my copending application No. 510,787 which includes a threaded ring for clamping piston rings against chatter and hence preventing a pumping action by the rings tending to pump lubricant up into the combustion chamber.

It will be seen that a piston may be provided of which the parts can be made by automatically operating machinery and these parts may be assembled by machine.

I claim:

1. A piston comprising a solid head having a load-receiving outside surface and an internal surface, parallel channels formed in said internal surface and extending over that surface, a gudgeon pin upper bearing surface channels in said upper bearing surface communicating with said channels in said internal surface, removable gudgeon pin lower bearing means and a lower bearing retaining member.

2. A piston comprising a solid head having a load-receiving outside surface and an internal surface, channels formed in said internal surface and extending over that surface, a gudgeon pin upper bearing surface channels in said upper bearing surface communicating with said channels in said internal surface, removable gudgeon pin lower bearing means, a lower bearing retaining member and a gudgeon pin, oil galleries therein communicating with the exterior of said gudgeon pin and the channels in the gudgeon pin upper bearing surface.

3. A piston according to claim 1 in which at least one gallery is provided in a skirt depending from said head, said gallery communicating with said channels in said internal surface.

4. A piston comprising a solid head having a load-receiving outside surface and an internal surface, channels formed in said internal surface and extending over that surface, a strut engaging said internal surface, a gudgeon pin upper bearing surface associated with the underface of said strut, channels in said upper bearing surface and extending through the strut to that face abutting said internal surface of said head, removable gudgeon pin lower bearing means and a lower bearing retaining member.

5. A piston comprising a solid head having a load-receiving outside surface and an internal surface, channels joined in said internal surface and extending over that surface, a strut engaging said internal surface, a gudgeon pin upper bearing surface associated with the underface of said strut, channels in said upper bearing surface and extending through the strut to that face abutting said internal surface of said head, removable gudgeon pin lower bearing means, a lower bearing retaining member, and a gudgeon pin, oil galleries therein communicating with the exterior of said gudgeon pin and the channels in the gudgeon pin upper bearing surface.

6. A piston according to claim 4 in which at least one gallery is provided in a skirt depending from said gallery communicating with said channels in said internal surface.

7. A piston comprising a solid head having a load-receiving outside surface and an internal surface, said internal surface defining a gudgeon pin upper bearing surface, channels formed in said internal surface and in said upper bearing surface said channels in said surfaces being in communication with removable gudgeon pin lower bearing means and a lower bearing retaining member.

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