

Dec. 9, 1930.

F. JARDINE

1,784,291

PISTON

Filed April 9, 1926

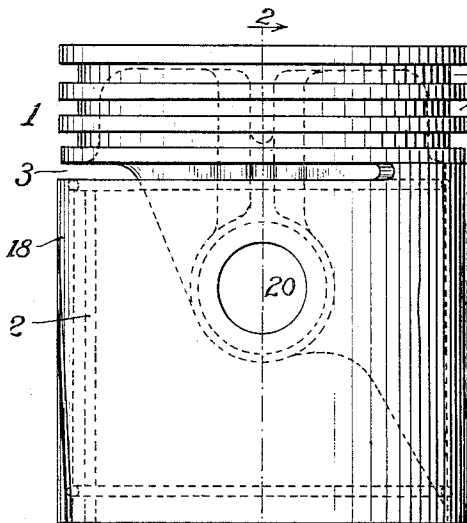


Fig. 1

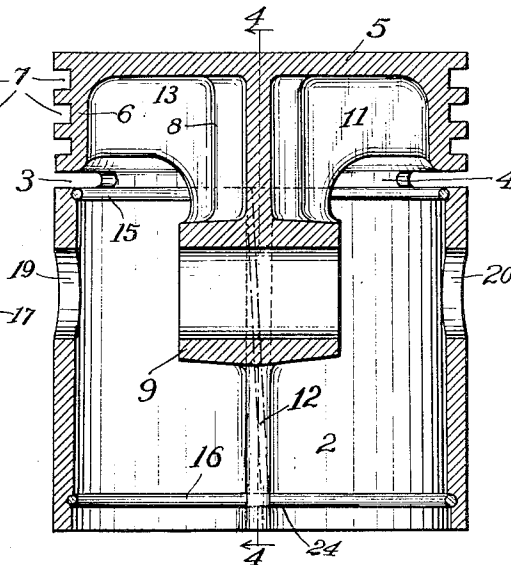


Fig. 2

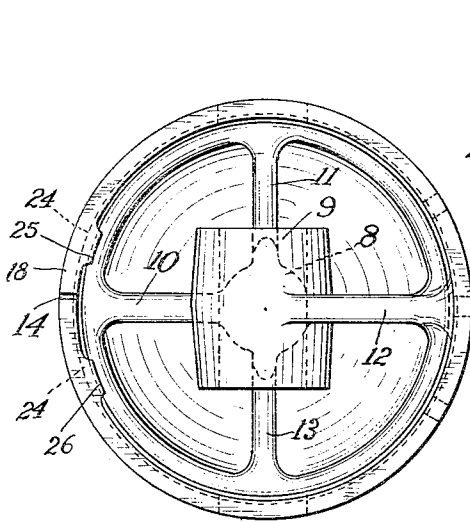


Fig. 3

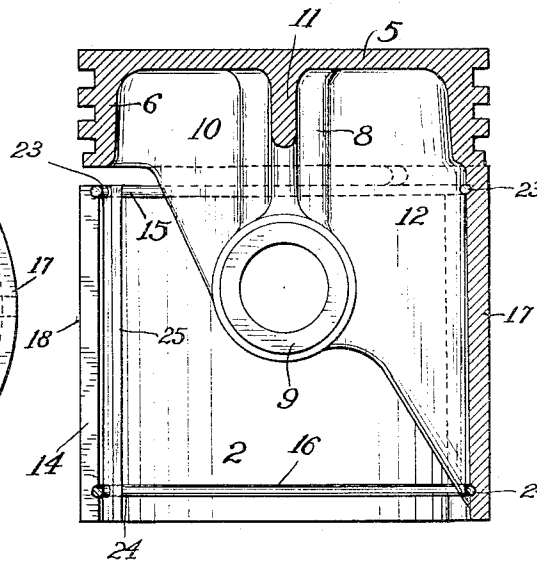


Fig. 4

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PISTON

Application filed April 9, 1926. Serial No. 100,771.

This invention relates to pistons and more particularly to pistons composed of a material having a higher or different co-efficient of expansion than that of the cylinders in which they are to operate, as for instance, where aluminum or aluminum alloy pistons are used in cylinders of cast iron or the like.

As is well known, such pistons possess many desirable qualities such as lightness, high heat conductivity and the like. However, the differences in expansion of the pistons and cylinders produce various difficulties and disadvantages, for example, the pistons will either stick when hot or will slap when cold.

The principal object of my invention is to provide a piston which may be made of aluminum, aluminum alloy, or the like, which can be fitted with a very small clearance and which will maintain this clearance substantially unchanged throughout the temperature ranges met in practice, without slapping, binding, scoring of the cylinder, or undue wear in the piston itself.

These and other objects of my invention, as well as the invention itself, will be better understood from the description of one practical embodiment of the invention which is illustrated in the accompanying drawings, in which—

Fig. 1 is a side elevation of a piston embodying this invention;

Fig. 2 is a central longitudinal section taken on line 2—2 of Fig. 1;

Fig. 3 is a bottom plan view; and

Fig. 4 is a central longitudinal section at right angles to that of Fig. 2.

The piston shown has a head 1 and a skirt 2, separated part way of their circumference by an air gap 3 and integrally joined for the remainder as at 4.

The head is preferably cup-shaped and is shown as having a top 5 and a depending, annular flange 6 which may be provided with circumferential grooves 7 for the piston rings.

The skirt is provided with thrust faces intermediate the openings 19 and 20 through the skirt and in alignment with the opening through the wrist pin bearing. The skirt

thrust face 17 which bears the load on the expansion stroke is integral with the head as shown at 4. In the embodiment shown the groove 3 extends for about two hundred and seventy degrees about the piston.

Depending from the center of the top is a column 8 which carries a wrist pin bearing or boss 9. Webs 10, 11, 12 and 13 radiate from the central column and are integrally joined to the top and flange of the head and to the wrist pin bearing. The bearing member 9 is also connected to the skirt in the embodiment shown by web 12 which is extended downwardly and outwardly to the skirt and integrally joined thereto from the member 4 to the bottom of the skirt, thus materially strengthening and stiffening the connection as well as the head and skirt separately. The portion of the piston which bears the thrust load is thus greatly strengthened to bear the explosion load. In the embodiment shown, the web 12 is substantially rectangular from the top to the lower part of the boss, filling in the space between and joining the top of the head, the inside wall of the side of the head, the cross webs 11 and 13 and the inside wall of the thrust face 17 of the skirt. Below the boss, the web 12 is tapered off until it is triangular in shape. The web 10 is likewise rectangular in shape to the lower edge of the side wall of the head; from there it tapers to the boss to which it is joined at about the center. The webs are thus constructed to take the working strains and so strengthen and brace the piston that there be no danger of flexing the head, top or otherwise distorting the top or the thrust face 17 relative to each other or the bearing 9. This is all the more important since the other portions of the piston must be made flexible to allow for the difference in expansion between the aluminum piston and the iron cylinder. In the embodiment shown this flexibility is accomplished by a slit 14 in the thrust face 18. Preferably this slit extends the entire length of the skirt.

To limit the expansion and contraction of the skirt to, or substantially to, that of the cylinder in which it operates, I span this slit with members made of material having sub-

stantially the same co-efficient of expansion as the cylinder. In the embodiment shown I have employed bands 15 and 16 of iron since the cylinder in which this piston is to be employed is iron. The bands are shown as rods and are mounted in grooves 23 and 24 in the inside of the skirt. The ring 15 is above the boss and just below the slit 3. The ring 16 is just above the lower end of the piston. The rings are maintained in place by some suitable means such as bearings formed in the web 12 and ribs 25 and 26 formed on the inside of the piston wall.

Preferably the rings are placed in the mold in which the piston is cast so that the skirt is cast around them. When the skirt shrinks on cooling, the shrinkage of the aluminum being greater than that of the steel, the rings are placed under compression and the skirt under tension, thus holding the skirt tightly upon the rings under all service conditions. Thus it will be seen that the size of the skirt is controlled by the expansion of the rings. The split furnishes room for any circumferential expansion of the skirt.

I do not wish to be limited to the embodiment of my invention shown, or the details thereof, since it will be apparent that many departures may be made from both this embodiment and its details, without departing from the spirit of the invention.

I claim:

1. A piston comprising a head, a central depending wrist pin boss and a skirt connected to the head at one side and separated from the head at the opposite side.

2. A piston having a skirt split throughout its entire height on one side and spaced from the head for the majority of its circumference and closed one piece rings of a different material inside said skirt contacting the same throughout their length and maintained under compression thereby.

3. A piston having a head, a depending wrist pin boss carried thereby, a central web perpendicular to the axis of the boss and connecting the boss to the head, and a split skirt connected to the head and to one side of the web.

4. A piston having a head, a depending wrist pin boss carried thereby, a split skirt connected to the head at one side, a diametric web integral with the head, boss and skirt, and rings within the skirt and exerting outward pressure thereon.

5. A piston having a head, a skirt, a diametric web integral with the head and skirt, the head and skirt being integrally connected in the vicinity of the web, and a split through-out the height of the skirt and opposite the junction of the skirt and web.

6. In a piston for an internal combustion engine, the combination of a head and a skirt portion, each made of a material of a relatively high co-efficient of expansion under

heat, the skirt being connected to the head at one side only, the remainder of the skirt being separated from the head, said skirt being provided with an opening to permit expansion and contraction of the skirt, and rings of a material having a lower co-efficient of expansion than the material of which the skirt is made connected to the skirt spanning said opening, and regulating the expansion and contraction of the skirt.

7. In a piston for internal combustion engines, the combination of a head, a skirt and piston pin bearing all made of a material of a relatively high co-efficient of expansion, the skirt comprising thrust faces, one of which only is connected to the head, the other thrust face being provided with an opening to permit the expansion and contraction of the skirt and means of a material of a lower co-efficient of expansion than the material of the skirt mounted in said skirt and regulating the expansion and contraction of the skirt.

8. In a piston for internal combustion engines, the combination of a head, a skirt and a wrist pin bearing made of a material of a relatively high co-efficient of expansion, the skirt comprising thrust faces, one of which only is connected to the head, the other portion of the skirt being separated from the head by an air gap, the other thrust face being provided with an opening extending the length of the skirt permitting the expansion and contraction of the skirt and rings of a lower co-efficient of expansion than the material of the skirt mounted in the skirt spanning said openings and regulating the expansion and contraction of the skirt.

9. In a piston for an internal combustion engine, the combination of a cup-shaped head, a skirt and a bearing for a wrist pin made of material of a relatively high co-efficient of expansion, said skirt comprising thrust faces, a substantially triangular shaped web extending from the lower portion of the head on one side of the piston to the lower portion of the skirt on the other and connecting the top and bottom portions of the inside of the head, the piston pin bearing and the inside of one of the thrust faces of the skirt, the thrust face of the skirt thus connected to the web being also connected to the head, the other portions of the skirt being separated from the head, the other thrust face being split from end to end and rings of a material of a different co-efficient of expansion than that of the skirt being mounted in said skirt spanning said slit in the other thrust face and regulating the expansion and contraction of the skirt.

10. In a piston for an internal combustion engine, the combination of a cup-shaped head, a skirt and a wrist pin bearing, said skirt being connected to the head by a substantially triangular shaped web which also connects the boss to the skirt and web and

which extends from the head to the lower portion of one side of the inside of the skirt, uniting that portion of the skirt and the wrist pin bearing with the top and bottom of the inside of the head.

5 11. In a piston for an internal combustion engine, the combination of a cup-shaped head, a skirt and a wrist pin bearing, said skirt being connected to the head by a substantially triangular shaped web which also connects
10 the boss to the skirt and web and which extends from the head to the lower portion of one side of the inside of the skirt, uniting that portion of the skirt and the wrist pin
15 bearing with the top and bottom of the inside of the head, and webs extending substantially perpendicular to said triangular-shaped web and joining the said triangular-shaped web to other portions of the top and side
20 walls of the head.

12. A piston comprising an integrally cast head and skirt, the skirt being split throughout its entire height on one side and separated from the piston head throughout the majority of its periphery and spaced closed one
25 piece rings of a different material inside the skirt, and maintained under compression thereby.

13. A piston comprising an integrally connected head and skirt, the skirt being longitudinally split and two closed rings of a different material inside the skirt and maintained under compression thereby, one controlling the expansion of the skirt above the
35 wrist pin and the other controlling the expansion of the skirt below the wrist pin.

In testimony whereof I hereunto affix my signature this 5 day of April, 1926.

FRANK JARDINE.

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