Dec. 20, 1932. F. JARDINE 1,891,419

PISTON

Filed April 9, 1926 2 Sheets-Sheet 1

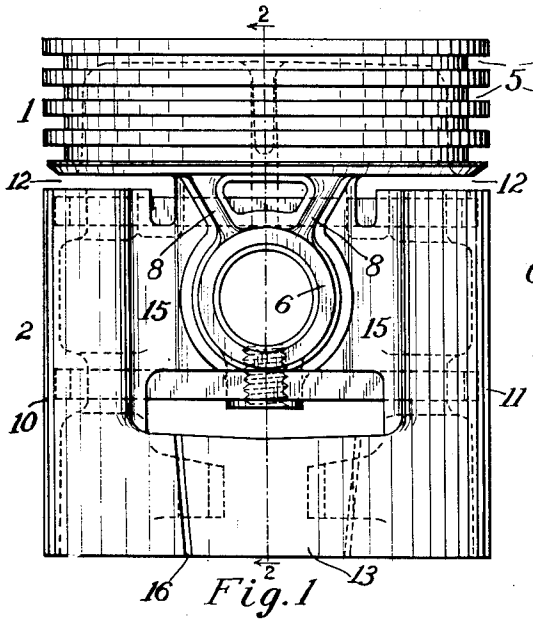


Fig. 1

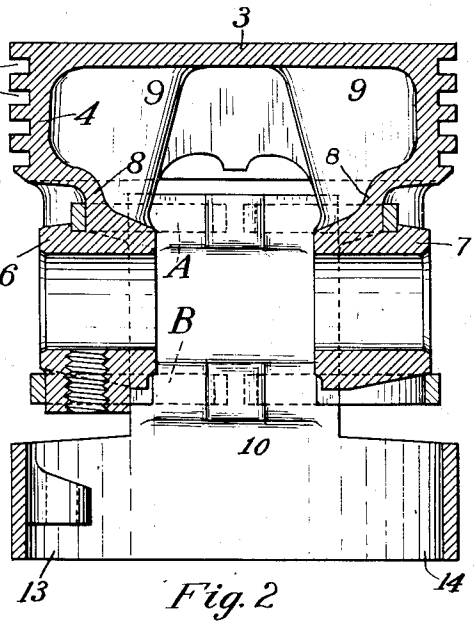


Fig. 2

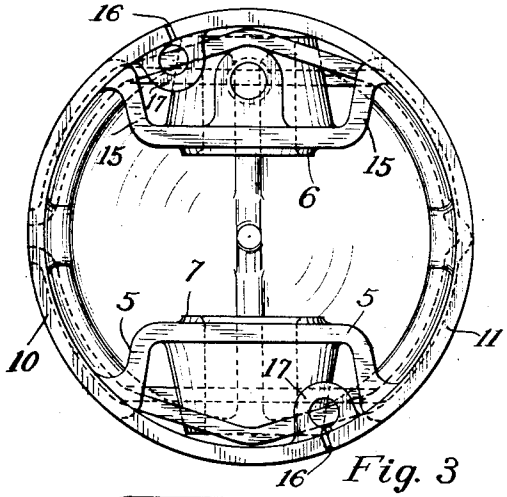


Fig. 3

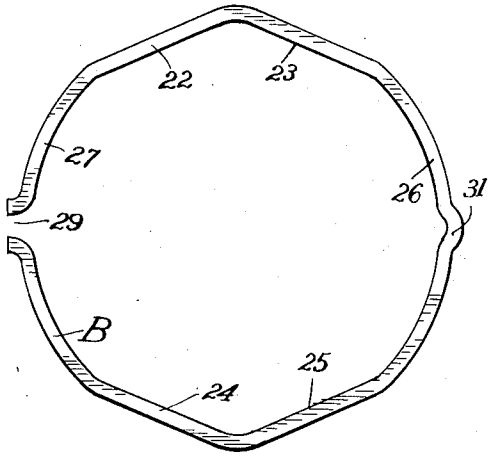


Fig. 5

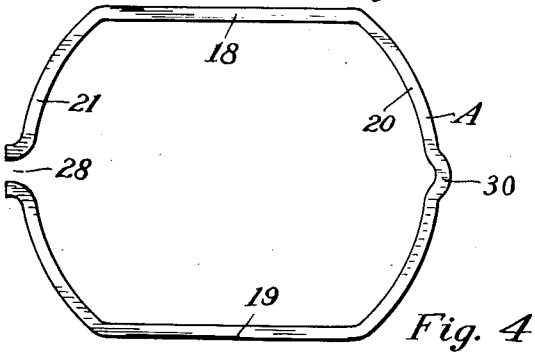


Fig. 4

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PISTON

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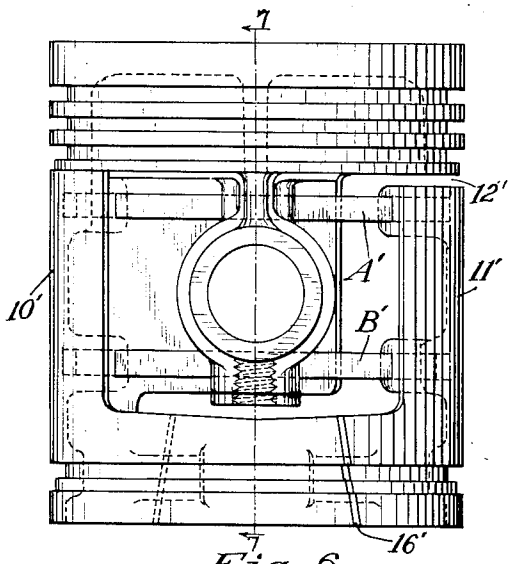


Fig. 6

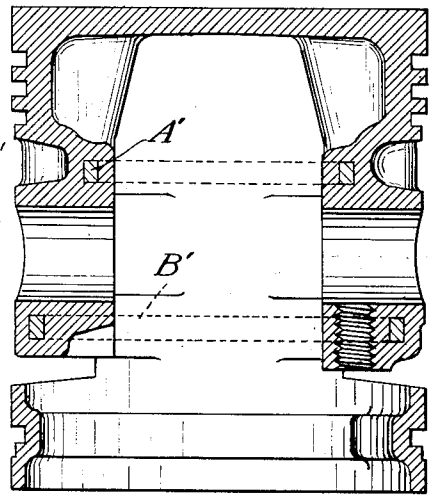


Fig. 7

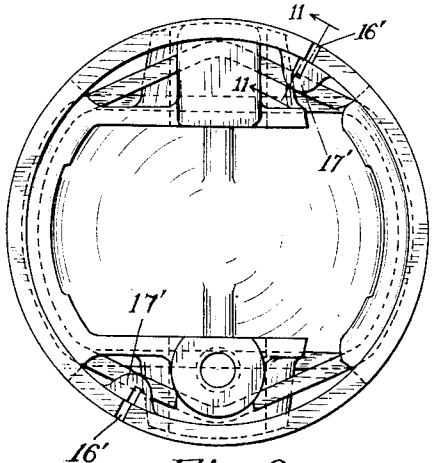


Fig. 8

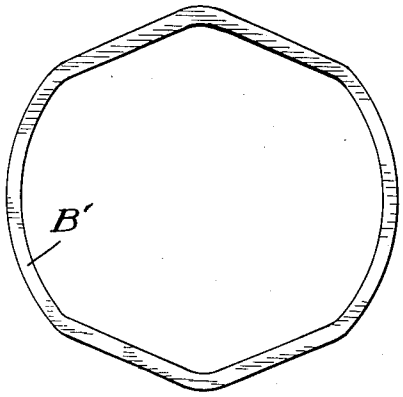


Fig. 10

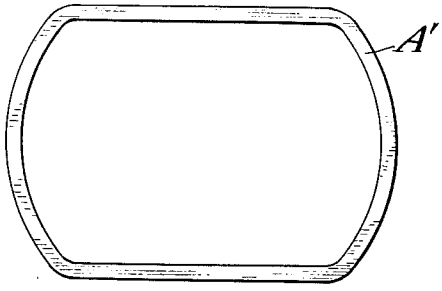


Fig. 9

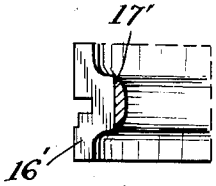


Fig. 11

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Patented Dec. 20, 1932 1,891,419

UNITED STATES PATENT OFFICE

FRANK JARDINE, OF CLEVELAND, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE CLEVELAND TRUST COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO, AS TRUSTEE

PISTON

Application filed April 9, 1926. Serial No. 100,774.

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 practical embodiments of the invention which are illustrated in the accompanying drawings, in which—

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

Fig. 2 is a longitudinal section thereof on the line 2—2 of Fig. 1;

Fig. 3 is a bottom plan view thereof;

Figs. 4 and 5 are plan views of the upper and lower controlling members, A and B, respectively;

Figs. 6 to 10 are views corresponding to Figs. 1 to 5, respectively, of another form of piston embodying the invention, and

Fig. 11 is a fragmentary section on line 11—11 of Fig. 8.

The piston claimed herein is an improvement in the controlled skirt type of piston claimed broadly in my prior co-pending application, Serial No. 47,214, filed July 31, 1925.

In the form of piston illustrated in Figs. 1 to 5, the piston consists of a head 1 and a skirt 2. The head has a flat top 3 and a depending cylindrical flange 4 provided with circumferential grooves 5 for the usual piston rings. Wrist pin bearings or bosses 6 and 7 are positioned below the head and are firmly connected thereto by webs 8 and 9 depending therefrom.

The skirt consists of bearing faces 10 and 11, spaced from the head by air gaps 12. The bearing faces are connected together at their lower ends to permit expansion and contraction thereof by strap-like portions 13 and 14 and to the wrist pin bearings by webs 15. The strap-like portions are split at 16 and the splits bridged by arches or culverts 17, which permit expansion of the skirt without material deformation thereof.

The bearing faces are connected together and to the wrist pin bearings by horizontal rings or links A and B of material having a co-efficient of expansion substantially the same as that of the cylinder in which the piston is to be used, iron or steel being suitable for pistons for use in cast iron cylinders. The links are better illustrated in Figs. 5 and 4. As shown, link A consists of two straight sides 18 and 19 and curved ends 20 and 21, while link B consists of sides having angularly disposed straight portions 22, 23 and 24, 25 and curved ends 26 and 27. The links need not be continuous and are shown as having one end broken or split at 28 and 29. The ends at the breaks are bent outwardly and an outwardly extending bend, 30 or 31, is provided in the other end opposite the break.

The outwardly projecting ends and bends firmly anchor the links in place.

As shown, in casting, the ends of the links are completely embedded in the bearing

faces while the sides are left exposed throughout substantially their entire length.

The links are preferably made of steel or some similar material which expands less rapidly than the aluminum and controls the distance between the bearing faces. They also embrace the wrist pin bearing and resist any tendency these may have to move outwardly. The straight or chord parts 22, 23, 24 and 25 act as stays to restrain the outward expansion of the wrist pin bosses.

The piston shown in Figs. 6 to 11 is very similar to the form above described. In this form, however, the bearing face 10′ is integrally joined to the head and the bearing face 11′ has no web connecting it to the wrist pin bearings, but is held thereto solely by the links A′ and B′. These links differ from those above described in being continuous and in having no locating and anchoring projections.

The ends of the links are embedded in the bearing faces and the central portions of the sides are embedded in the wrist pin bearings. The splits 16′ are spanned by bosses 17′ into which the splits extend, as shown in Fig. 11, and which take the place of the arches shown in Figs. 1 to 3.

The action of the links in controlling the expansion of the piston across the bearing faces is the same in both forms, and permits fitting the pistons to their cylinders with comparatively small clearance.

While I have described the two forms of piston illustrated in some particularity, it is obvious that many modifications, variations, and adaptations thereof will occur to those skilled in this art and I do not limit myself to the precise embodiments shown, but claim as my invention all modifications, variations, the equivalent structures which come within the scope of the subjoined claims.

I claim:—

1. A piston comprising a head, depending wrist pin bearings carried thereby, a skirt composed of two spaced bearing faces, means resiliently connecting said bearing faces together and to the wrist pin bearings and means controlling the distance between the bearing faces and resisting outward movement of the wrist pin bearings.

2. A piston having a skirt composed of two spaced bearing faces, two horizontally disposed links controlling the distance therebetween, one link having curved ends embedded in the bearing faces and straight sides extending between the same and the other link having curved ends embedded in the bearing faces and sides consisting of a plurality of angularly disposed portions extending therebetween.

3. A piston having a skirt composed of two spaced bearing faces resiliently connected together and to the piston head, horizontal links controlling the distance between the bearing faces, each link being split and the ends projecting outwardly and another outward projection on the link opposite said split, said projections constituting anchors securing said links to said piston.

4. A piston having a skirt consisting of spaced bearing faces, and split rings controlling the distance therebetween, each ring having out-turned ends and an outwardly projecting bend opposite said ends, said out-turned ends and projecting bends securing the rings to the piston.

5. A piston comprising a head, walls depending therefrom, wrist pin bearings carried by said walls, a skirt having spaced bearing faces intermediate said bearings and flexibly connected together below the bearings, flexible webs connecting said bearing faces to said depending walls, all of a material having a high co-efficient of expansion, and controlling means of a material of a lower co-efficient of expansion connecting said bearing faces, said controlling means comprising horizontally disposed links having arcuate portions embedded in the bearing faces and chordally extending portions between said arcuate portions and extending between the bearing faces and wrist pin bearings.

6. A piston comprising a head, walls depending therefrom and carrying wrist pin bearings, a skirt having bearing faces flexibly connected together below said wrist pin bearings, flexible webs connecting said bearing faces to said depending walls, all of a material having a relatively high co-efficient of expansion, and expansion controlling means of a material having a lower co-efficient of expansion connecting said bearing faces, said controlling means comprising horizontal links having arcuate ends embedded in the bearing faces and chordally extending sides with their centers embedded in said depending walls, the ends having outwardly extending anchoring projections embedded in said bearing faces.

7. A piston comprising a head, walls depending therefrom and carrying wrist pin bearings, a skirt having bearing faces flexibly connected together below said wrist pin bearings, flexible webs connecting said bearing faces to said depending walls, all of a material having a relatively high coefficient of expansion, and expansion controlling means of a material having a lower co-efficient of expansion connecting said bearing faces, said controlling means comprising horizontal links having arcuate ends embedded in the bearing faces and chordally extending sides with their centers embedded in said depending walls, the ends having outwardly extending anchoring projections embedded in said bearing faces, one of said ends being split between adjacent projections.

8. A piston comprising a head, walls depending therefrom and carrying wrist pin

bearings, a skirt having bearing faces flexibly connected to the depending walls, all of aluminum alloy, and steel horizontal links for controlling the expansion of said skirt, said links having arcuate ends embedded in said bearing faces, one end being split and the ends bent outwardly and the other having an outwardly projecting bend, and chordally extending sides embedded at their centers in said depending walls.

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

FRANK JARDINE.