June 17, 1930. J. WILLIAMS 1,764,815

PISTON RING

Filed Dec. 3, 1927

Fig. 2.

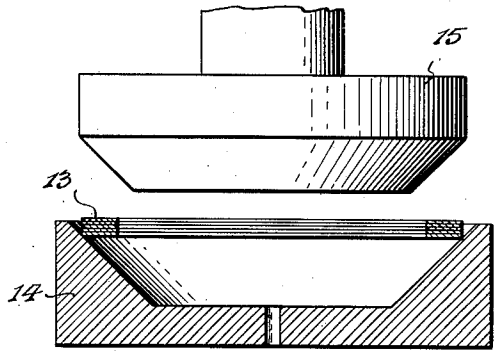


Fig. 3.

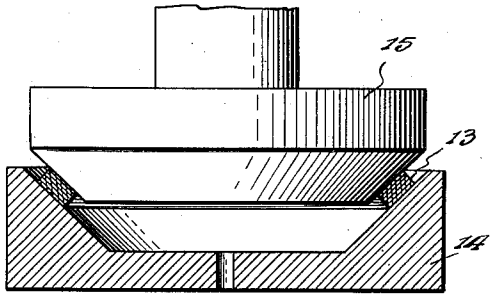


Fig. 1.

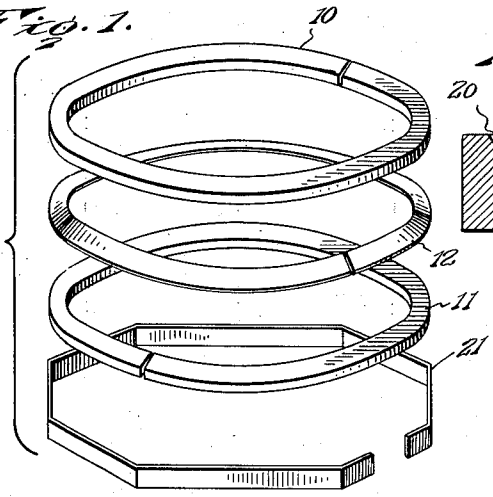


Fig. 4.

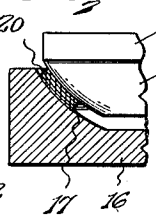


Fig. 5.

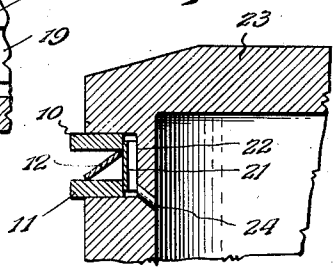


Fig. 6.

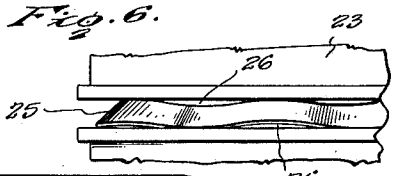
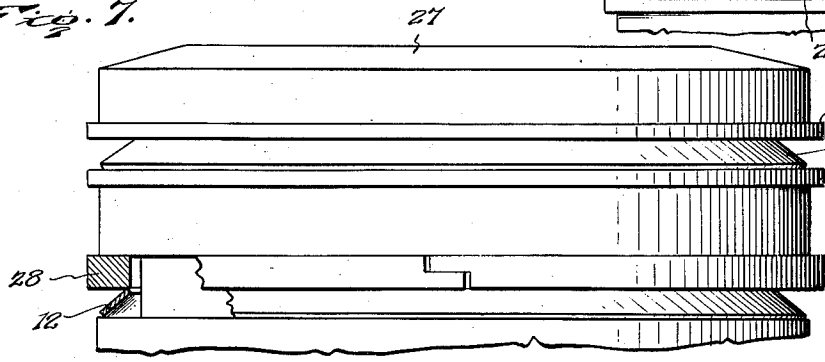


Fig. 7.



Inventor

Judson Williams.

By Lacey & Lacey, Attorneys

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UNITED STATES PATENT OFFICE

JUDSON WILLIAMS, OF PHILADELPHIA, PENNSYLVANIA

PISTON RING

Application filed December 3, 1927. Serial No. 237,454.

This invention relates to an improved piston ring and seeks, among other objects, to provide a ring capable of uniformly conforming to the contour of a cylinder wall so as to at all times provide an effective seal between the piston and the cylinder.

A further object of the invention is to provide a ring peculiarly adapted to effect wiping of the cylinder wall and accommodate free drainage of the oil collected therefrom so that oil pumping will be substantially prevented.

And the invention seeks, as a still further object, to provide a ring embodying a novel tensioning element.

Other objects of the invention not specifically mentioned in the foregoing will appear during the course of the following description.

In the drawings,

Figure 1 is a perspective view of the ring assembly,

Figure 2 is a view partly in section and partly in elevation showing one of the steps involved in the shaping of the tensioning element employed,

Figure 3 is a view similar to Figure 2 showing another step in the shaping of said tensioning element,

Figure 4 is a detail sectional view similar to Figure 3 but showing the shaping of a slightly modified form of tensioning element,

Figure 5 is a fragmentary sectional view showing the assembly of Figure 1 in position within the upper ring groove of an engine piston,

Figure 6 is a fragmentary elevation showing a further modified form of tensioning element, and

Figure 7 is a fragmentary elevation showing the ring assembly of Figure 1 in the uppermost groove of a piston and the use of the tensioning element of the present invention in connection with a conventional ring in the next lower groove of the piston.

In carrying the invention into effect I employ upper and lower split resilient ring members 10 and 11, the outward radial tension of which may be as desired. These ring members are provided with flat upper and lower faces and, at their ends, are preferably provided with straight joints. However, any other suitable joint may be chosen if preferred.

In conjunction with the ring members 10 and 11 I provide a split annular frusto-conical tensioning element or ring 12 of cast iron. In practice, a suitable number of blanks 13 are cut or sawed from an ordinary pot casting, when, as shown in Figure 2, a number of said blanks are placed within a die in superposed registering relation, lying flat one upon the other. In Figures 2 and 3 of the drawings I have shown a die base at 14 and a plunger at 15, the base being provided with a conical cavity to receive the superposed blanks, as just noted, and the plunger being tapered to conform to the inclination of said cavity. As initially cut or sawed from the pot casting, the blanks are flat as shown in Figure 2.

Having placed the blanks in the cavity of the die base, the plunger is then forced downwardly into said cavity for compressing the blanks between the plunger and the die base and causing said blanks to assume a frusto-conical shape. The blanks may be heated before being placed in the die and shaped while heated or may be placed in the die, shaped and subsequently heated by heating the entire die. The purpose of heating the blanks is, of course, to ultimately cause the blanks to set in their frusto-conical shape so that the finished tensioning elements will permanently possess this shape.

In Figure 4 I have shown a slight variation of the invention wherein I employ a die base 16 having a spherically shaped face 17, in conjunction with which I provide a plunger 18 having a spherical face 19 conforming to the curvature of the face 17. Blanks 20 are placed in the die cavity and compressed between the plunger and base and, as will be perceived, the blanks will thus be given a frusto-conical or ogive shape, the blanks being set as previously described in conjunction with the blanks 13, so that the tensioning elements will permanently possess such shape. The blanks 20 are, of course, cut or sawed from an ordinary pot casting, in the

same manner as described in connection with the blanks 13 and the blanks 20 are, therefore, originally flat.

The ring assembly of the present invention further includes a split resilient expansion spring 21 and in Figure 5 I have shown the assembly in position in the uppermost ring groove 22 of an engine piston 23, the groove being provided with flat parallel top and bottom walls and having a series of drain passages 24 leading from the lower inner corner thereof. As illustrated, the upper ring member is disposed to seat flat against the top wall of the ring groove, while the lower ring member 11 is disposed to seat flat against the bottom wall of said groove, and compressed between said members is the tensioning element 12 while the expansion spring 21 is confined by the inner peripheries of said members. The spring 21 will thus press the ring members outwardly to coact with the cylinder wall and conform to the contour thereof so that said members will constantly provide an effective seal between the piston and cylinder. At the same time, the tensioning element 12 will yieldably press the ring members apart. However, as the piston moves upwardly, the member 10 will, due to the frictional engagement of said member with the cylinder, tend to leave the top wall of the ring groove so that oil may enter said groove above said member while, as the piston moves downwardly, the ring member 11 will, for a like reason, tend to leave the bottom wall of the ring groove so that oil may enter beneath this latter member into the groove. Furthermore, since the ring members 10 and 11 will at all times be held apart by the tensioning element 12, the annular oil passage defined between said members will be constantly open to the free flow of oil through said passage past the tensioning element into the ring groove to drain therefrom through the passages 24 into the piston. The ring will thus provide an effective oil wipe and oil pumping will be reduced to a minimum. Should it be found necessary or desirable to increase the flow of oil through the passage between the ring members, a lineally waved tensioning element 25, as shown in Figure 6, may be provided. The element 25 is of cast iron and is set in the same manner as described in connection with the tensioning element 12, the only difference between these elements being that the element 25 is lineally waved. As will be perceived, oil escapement passages 26 are defined above and below the tensioning element 25 at spaced points throughout the circumference of said element so that the oil entering the passage between the ring members 10 and 11 may readily flow through the escapement passages 26 to enter the ring groove.

In Figure 7 I have shown a piston at 27 having the ring assembly of Figure 1 arranged in the uppermost ring groove of the piston. In the next lower ring groove of said piston I have shown the use of the tensioning element 12 of the present invention in conjunction with a conventional split resilient piston ring 28. As will be observed, the tensioning element 12 is well adapted for such use and when arranged below a conventional piston ring, as shown, will yieldably press said ring against the top wall of the ring groove. Should it be found desirable to arrange the tensioning element above the piston ring, said element would, of course, yieldably press the ring against the bottom wall of the groove.

Having thus described the invention, what I claim is:

1. The combination with a piston having an annular groove therein, of upper and lower sealing rings engaged, respectively, with the top and bottom walls thereof, an expanding ring in the groove bearing against the inner wall thereof and the inner peripheries of said rings, and a tensioning ring frusto-conical in shape extending diagonally between said sealing rings and bearing against the sealing rings and the expanding ring.

2. As a new article of manufacture, a tensioning element for piston rings formed of a relatively thin resilient frusto-conical annulus of cast iron to withstand the heat of operating conditions of an engine cylinder without losing its resiliency and split at one point only whereby axial pressure on said annulus will be distributed substantially uniformly throughout the length thereof, the inner and outer peripheries of said annulus being unbroken except at said split.

In testimony whereof I affix my signature.

JUDSON WILLIAMS. [L. S.]