Nov. 24, 1942. A. E. MELROSE 2,302,970

PISTON RING

Filed Nov. 24, 1941

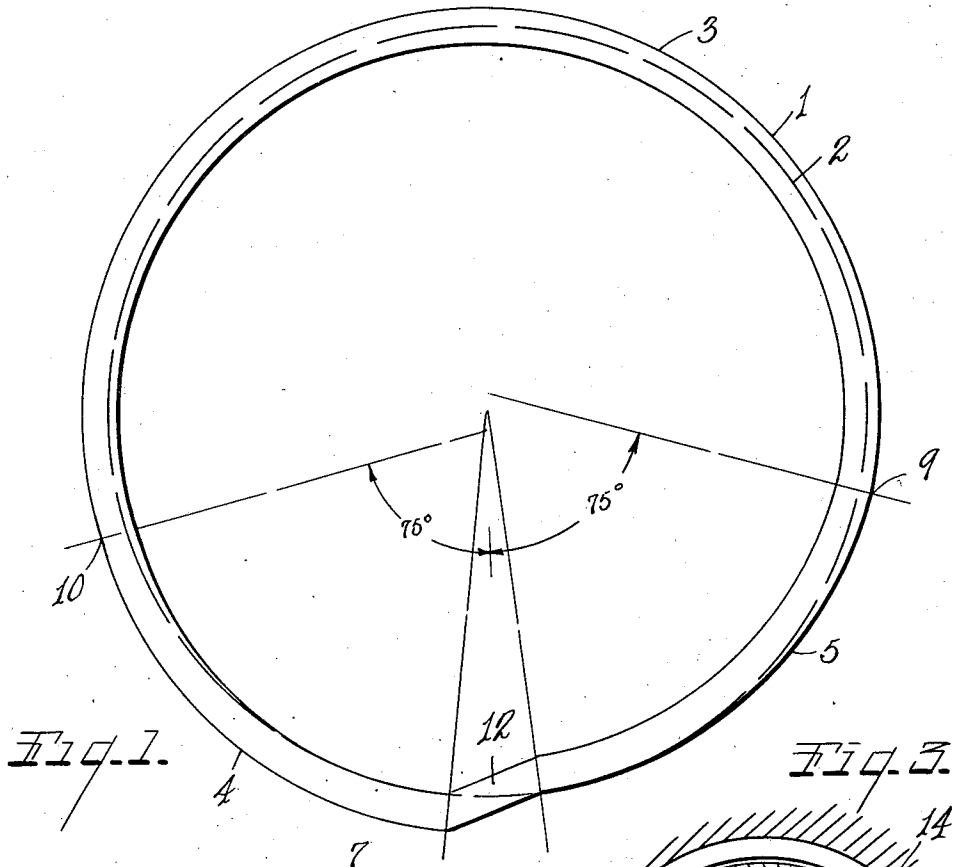


Fig. 1.

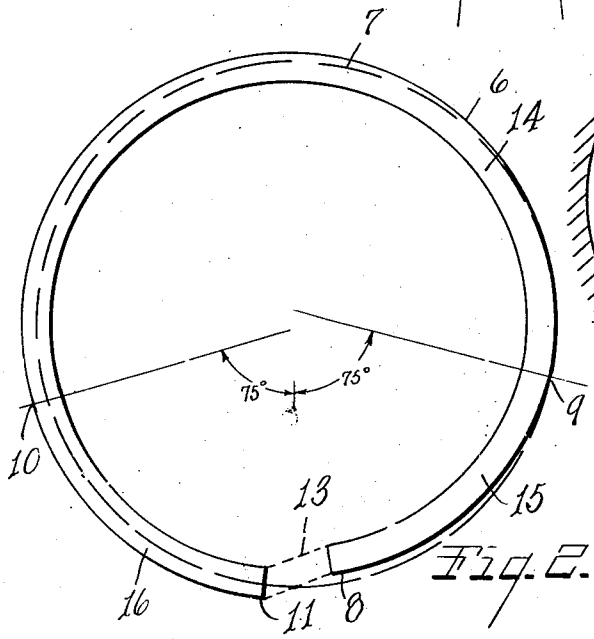


Fig. 2.

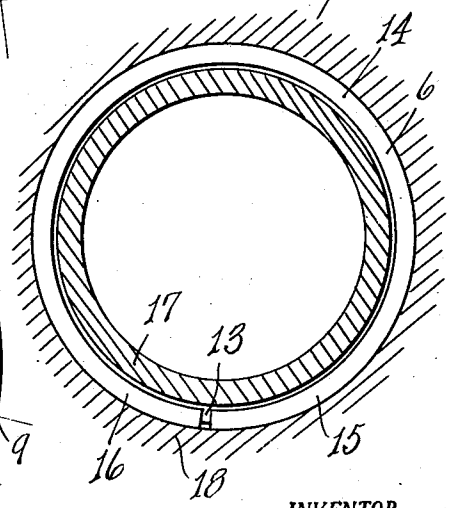


Fig. 3.

INVENTOR.
Adolph E. Melrose
BY
Earl O. Shaffer

Patented Nov. 24, 1942

2,302,970

UNITED STATES PATENT OFFICE

2,302,970

PISTON RING

Adolph E. Melrose, Hastings, Mich., assignor to Hastings Manufacturing Company, Hastings, Mich.

Application November 24, 1941, Serial No. 420,248

4 Claims. (Cl. 309—44)

This invention relates to improvements in piston rings.

The main objects of this invention are:

First, to provide a piston ring which when in use contacts the cylinder wall with approximately uniform radial pressure throughout the periphery of the ring.

Second, to provide a piston ring having these advantages which may be manufactured quite economically.

Objects relating to details and economies of the invention will appear from the description to follow. The invention is defined and pointed out in the claims.

A preferred embodiment of the invention is illustrated in the accompanying drawing, in which:

Fig. 1 illustrates a pattern employed in making a casting or ring blank of my improved piston ring.

Fig. 2 is a plan view of a piston ring embodying the invention when relaxed or uncompressed.

Fig. 3 is a fragmentary section illustrating a ring in its relation to a piston and cylinder.

In the manufacture of piston rings it has been found extremely difficult to produce a ring which will exert uniform radial pressure on the cylinder wall throughout the periphery of the ring. Thus in conventional rings heretofore employed there have been zones around the periphery thereof at which unequal expansive pressure was exerted on the cylinder wall, with resultant loss of compression, uneven wear on the rings and excessive localized wear on the cylinder wall. In the great majority of rings the expansive force is greatest at points 90° from the split or gap therein, resulting in failure of the ring to bear fully against the cylinder wall at other points on its periphery.

By the present invention a ring is produced which, when in operative position contacting the cylinder wall, exerts a substantially uniform radial pressure thereon throughout its periphery.

Referring to Fig. 1 of the drawing, the reference numeral 1 designates a pattern employed in producing the casting or ring blank for the ring of my invention and the reference numeral 2 designates a layout circle by reference to which the pattern is designed and will presently be generally described.

Aside from the fact that the pattern is proportioned to allow for shrinkage of metal and to provide extra radial and axial thickness for machining, the pattern and the ring casting or blank are of identical outline. Generally stated, they have a progressively increasing radius throughout an intermediate portion 3 opposite the ring gap and a progressively reduced radius throughout the two portions 4, 5 of said intermediate portion extending to the ring gap, thus giving the pattern (and likewise the ultimate ring) a contour of the general form of a flat spiral.

Referring specially to Fig. 2, wherein the piston ring 6 is illustrated with reference to a base or working circle 7 corresponding approximately in diameter to the diameter of the cylinder wall in which the final ring is to be employed, it will be noted that one end 8 of the ring is within this circle, progressively increasing in radius from this point for an angular distance of approximately 75° to a point 9 adjacent which the ring outline crosses the base circle 7. It progressively increases its radial extent to a point designated 10 (these points are similarly indicated in Fig. 1) approximately 75° from the opposite end 11, when the radius begins to decrease progressively but at a slight enough rate to leave said end 11 of the ring beyond the base circle.

The drop or fall 12 of pattern 1 represents material which is cut away or removed from the ring blank to provide the split 13 of the ring.

In final form the peripheral contour of the ring 6 is the same as that of pattern 1, the segment 14 being that segment in which the radius is progressively increased and the segments 15, 16 the segments in which the radius is progressively reduced from the points where they connect with the segment 14. It is evident that pattern 1 may be produced in any suitable manner, for example, employing a suitable platted master cam of shape similar to that of the pattern. Details of such practice and of the production of the ring from the ring blank are conventional and per se do not constitute a part of this invention. Obviously the cast ring blank and the final ring have similar outline save for the fact that the former has added material allowing for machining to the final dimensions of the ring.

I have illustrated the finished ring 6 as having a plain butt joint at its ends. However, it will be appreciated that the ring ends may be finished in any desired manner to provide the desired type of joint.

After milling out the segment of the ring blank which fills the split or gap 13 of the ring and providing the kind of joint desired, the ring casting is then finished according to conventional practice as by setting the ring in a ring arbor

for the exterior diameter to be turned to proper size.

In final relaxed form the ring appears as illustrated in Fig. 2 with one end 8 thereof lying within the base circle 7, said perimeter crossing the base circle adjacent the intermediate segment 14, in which there is a progressive increase of the radius of the ring beyond the base circle up to the segment 16. The radial extent beyond the base circle gradually decreases in the segment 16 to the end 11 of the ring adjacent the gap, which end is, however, outside the base circle. Base circle 7 corresponds approximately in diameter to the diameter of the cylinder for which the ring is designed.

To further explain the principles involved in the foregoing description it is to be understood that while the low or inner end 8 of the ring can be made to lie within the base circle approximating the cylinder diameter, the radius of the section starting at the low end and adjacent to it can at no time be less than the radius of the aforementioned base circle.

My spiral ring or the layout of my spiral ring may be superimposed on a base circle approximating the cylinder diameter by a shift of the center of the layout or ring with relation to the center of the aforementioned base circle in such a way that one end of the ring will lie within the base circle and one end will lie without the base circle, the arcs or segments increasing and diminishing in radius as described above, subject to the limitations as to radius of the low end given in the preceding paragraph.

In further explaining the invention, if a ring were constructed so that any part of the radius was actually produced or generated to be less than the radius of the base circle, such a ring would not contact the cylinder wall with uniform pressure even if it contacted it at all where the radius was less than that of the base circle.

When a ring so formed is placed in the groove of a piston 17, then inserted in a cylinder 18, as illustrated in Fig. 3, the compression of the arcs of the segments 14 and 16 into arcs of reduced radius tends to lengthen the radius of the arc of the segment 15. In such a ring there is no undue bearing radially of the ring against the cylinder wall at any point. For all practical purposes the ring bears uniformly against the cylinder wall at all points throughout its periphery.

An embodiment of the invention which incorporates the principles of the invention in a highly desirable manner has been illustrated and described. It should be understood that the foregoing terminology is used only descriptively rather than in a limiting sense, and with full intention to include equivalents of the features shown and described within the scope of the following claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. A piston ring of progressively diminishing radius extending throughout segments having an angular extent of approximately 75° from its ends, the intervening segment being of progressively increasing radius.

2. A piston ring inherently resilient with its extremities lying respectively within and without a base circle of the approximate diameter of the cylinder wherein it will be used, the radius of the ring progressively increasing from the inner end through an arc of approximately 285° and thereafter progressively diminishing to the remaining end.

3. A piston ring of progressively diminishing radius extending throughout segments having an angular extent of approximately 75° from its ends, the intervening segment being of progressively increasing radius, the opposite ends of the ring lying respectively within and without a base circle of approximately the same radius as the cylinder within which the ring will be used.

4. A resilient split and normally end-gapped flat spiral piston ring having a major intermediate body segment of progressively increasing radius throughout the length thereof and the outer peripheral face of the segment being entirely outside a base circle of approximately the same diameter as the cylinder within which the ring will be used, and two continuity completing lesser segments respectively extending from the ends of said major intermediate segment to the free ends of the ring, both of said lesser segments progressively diminishing in radius from the intermediate segment to their respective ends, the lesser segment which extends from the end of the intermediate segment of shortest radius crossing, at a point in its length, the base circle so that its free end terminates within the circle and the other lesser segment having its outer peripheral face entirely outside the base circle.

ADOLPH E. MELROSE.