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METHOD, APPARATUS, AND BLANK FOR MAKING PISTON RINGS

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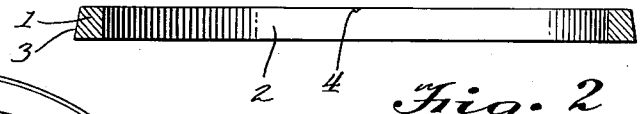


Fig. 2

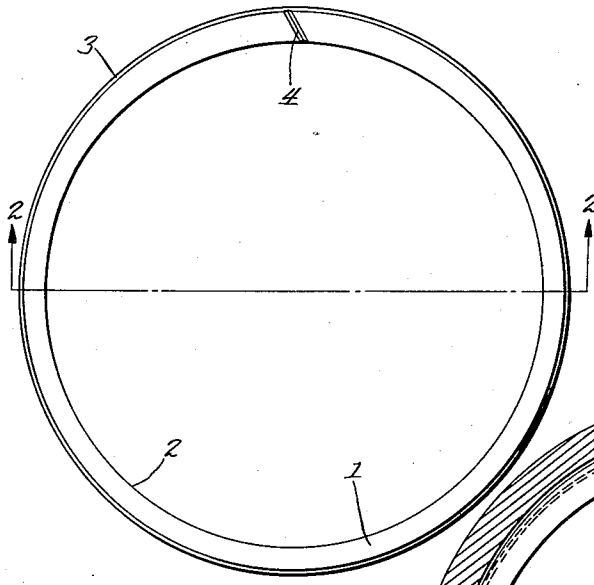


Fig. 1

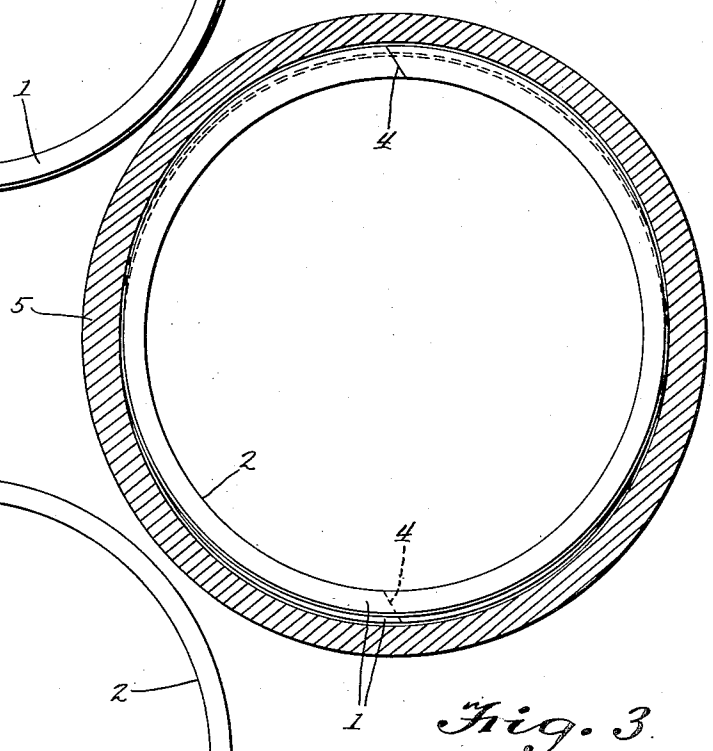
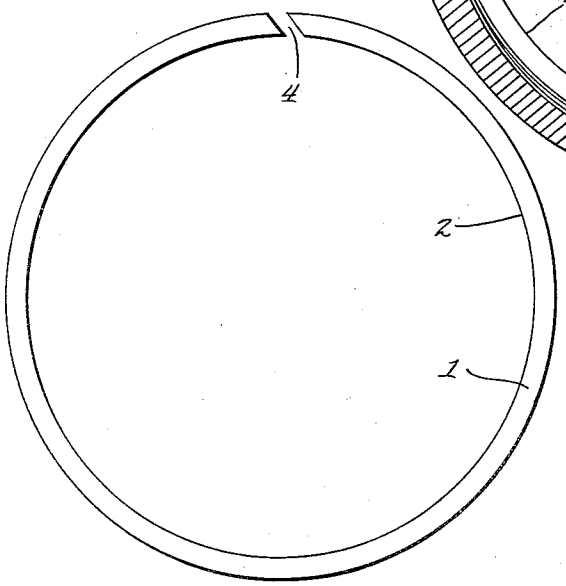


Fig. 3

Fig. 4



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METHOD, APPARATUS, AND BLANK FOR MAKING PISTON RINGS.

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This invention relates to improvements in piston rings and the method and apparatus for making the same.

In the making of piston rings heretofore one of the usual practices has been to make a casting of true circular form, such casting having the same cross sectional dimension at all points around the circumference thereof; and another practice has been to make piston ring castings of an off-center form, that is, with a more or less flattened portion, the cross sectional dimension being substantially the same at all points around the circumference of the casting. Piston rings made from castings of these two forms however, have certain objectionable features which it is the purpose of the present invention to overcome.

In the first form of casting just referred to it has been found that upon cutting the vent in the ring the free ends thereof form a peak when again brought together, with the result that the wall of the cylinder is considerably damaged by this projecting portion of the ring. Furthermore, such a ring does not properly fit the cylinder wall. The other form of casting has been found objectionable for the reason that the coarse grinding or turning operation, which is generaly performed at least upon the outside thereof before cutting the vent, cannot be done upon a mandrel but only in a manner cross-wise of the ring, or in other words in a direction substantially parallel with the axis of the ring. This is true because of the fact that this particular form of casting is not a true circle. Furthermore, in this form of casting there is the added danger of destroying a part of the "skin" upon the inner periphery.

Accordingly it is the object of this invention to devise an improved piston ring casting and also an improved method and apparatus for use in connection with the same wherein the labor involved in forming the same can be reduced and hence the cost of manufacture correspondingly reduced by making it possible to perform the coarse as well as fine grinding operation upon the mandrel.

It is also an object of this invention to devise a method and appartus for producing a piston ring in which the "skin" will be preserved intact and hence the serviceability of the ring increased.

It is a further object of this invention to provide a piston ring casting in which the draw is formed only on the outside thereof so as not to interfere with the "skin" upon the inner periphery.

Another object of the invention consists in the provision of a convenient means of assembling a number of castings preparatory to the grinding down of the excess portions on the outside of the ring in the region of the vent.

Other objects of the invention will appear from the following description and claims when considered together with the accompanying drawings.

Fig. 1 is a plan view of my improved piston ring casting; Fig. 2 is a sectional view on the line 2—2, Fig. 1; Fig. 3 is a cross sectional view through the substantially cylindrical sleeve within which the rings are mounted preparatory to removing the excess portions in the region of the vent; and Fig. 4 is a plan view of the piston ring in its finished form.

The castings illustrated by reference numeral 1 are made in individual molds with the run-off preferably provided on the outside so as not to interfere with the "skin" on the inner periphery 2. The draw 3 is provided also only on the outer periphery of the casting for the purpose also of not interfering with the "skin". The location of the vent is indicated at reference numeral 4. It will be observed that this casting, before cutting the vent, has its outer periphery of true circular form but that the inner periphery is somewhat flattened throughout the region of the vent. This region, as shown on the drawing, extends throughout about one-third (⅓) or 120° of the entire ring, although this will vary according to amount of vent. The purpose of this particular form of casting will later appear. The casting formed according to the showing in Figs. 1 and 2 is then put through the coarse grinding operation by means of grinding or turning, which operation is performed upon the outer periphery and the two side faces of the ring. The next step is to cut the vent at the point already indicated, it being understood that any form of vent may be provided as may be desired.

It will be found that upon again bringing together the free ends of such a ring after cutting of the vent, such free end portions will naturally protrude or extend outwardly so as to form a peak. Depending upon this

phenomenon and having already taken this into consideration in the calculation of the thickened portion throughout the vent region, it will be found that for a given ring of a certain desired strength or gauge the inner periphery of the ring will upon closing together the ends thereof form a perfect circle, while the outer periphery of the ring in the region of the vent will protrude outwardly so as to be recognized as excess portions.

In order now to remove such excess portions a number of such rings are assembled within the particular form of sleeve indicated by reference numeral 5, the inner wall of which is provided at diametrically opposite points with longitudinally extending recesses or grooves to receive the excess portions and at the same time permit the inner periphery of each ring to assume its true circular form. These recesses or grooves are of suitable depth according to the grade or gauge of rings which are placed within the same and the grooves or recesses merge gradually into the main wall of the sleeve as clearly indicated in the drawings. Having so arranged the rings within the sleeve with the vents of successive rings placed at 180° to each other, as shown in Fig. 3, such battery of rings is then transferred to a mandrel for removal of the excess portions of the outer periphery of the rings by the turning operation or in any other suitable manner. The battery of rings is placed upon the mandrel while they are still in the sleeve and clamps or bolts on the ends of the mandrel are secured against the end rings so as to maintain the rings in the same closed position as shown in Fig. 3. The final step in the method consists in the removal of the burrs from the inner periphery of the rings which may be done by grinding or turning.

These rings are thus made of true circular form but without sacrificing the "skin" which determines the efficiency of a piston ring. Furthermore, by simplifying the grinding of the several surfaces of the ring the operation is rendered considerably less expensive. Hence my improved method means a saving in the cost of production of any of the different forms of piston rings with maximum efficiency.

What I claim is:

1. A piston ring casting comprising a closed ring having its inner periphery formed concentric with its outer periphery except at the vent region, the inner periphery throughout said vent region being of a less degree of curvature than that of the outer periphery.

2. A piston ring casting comprising a closed ring having a substantially true circular outer periphery and having its inner face formed concentric with said outer periphery except in the vent region, the inner surface throughout said vent region being of a less degree of curvature than that of the outer periphery.

3. A piston ring casting comprising a closed ring having a substantially true circular outer periphery and having its inner face formed concentric with the outer periphery except for about 120° in the vent region, the inner surface throughout said region of approximately 120° being of less degree of curvature than that of the outer periphery.

4. The method of forming piston rings consisting in making a closed ring casting of substantially uniform radial thickness throughout except in the vent region where it is of increased thickness, the outer periphery of the ring being of uniform curvature, grinding the outer periphery of the ring, forming a vent substantially midway of the thicker portion, and removing the excess portions on the two sides of the vent by grinding or turning the outer periphery of the ring so as to obtain a ring of uniform thickness throughout.

5. The method of forming piston rings consisting in making a closed ring casting of substantially uniform radial thickness throughout except in the vent region where it is of increased thickness, the outer periphery of the ring being of uniform curvature, forming a vent substantially midway of the thicker portion, causing the inner periphery of the ring to take the form of a uniform curve, and removing the excess portions on the two sides of the vent by grinding the outer periphery of the ring while the inner periphery occupies such position.

6. A device for setting piston ring castings for grinding the same comprising a sleeve having a substantially cylindrical bore and formed with longitudinal recesses in the inner surface thereof, said recesses being disposed at approximately 180° to each other.

7. A device for setting piston ring castings for grinding the same comprising a sleeve having a substantially cylindrical bore and formed with longitudinal recesses in the inner surface thereof, said recesses being disposed at approximately 180° to each other and merging gradually from its two sides into the main portion of the inner surface of the sleeve.

8. A piston ring casting comprising an open ring having a substantially true circular inner periphery and having its outer periphery concentric with the said inner periphery except in the vent region, the outer periphery throughout said vent region being of a greater degree of curvature than that of the inner periphery.

In testimony whereof I hereby affix my signature.

THOMAS W. LLOYD.