J. J. FUCHS, JR.

PISTON PACKING RING.

APPLICATION FILED APR. 19, 1915.

1,357,392. Patented Nov. 2, 1920.

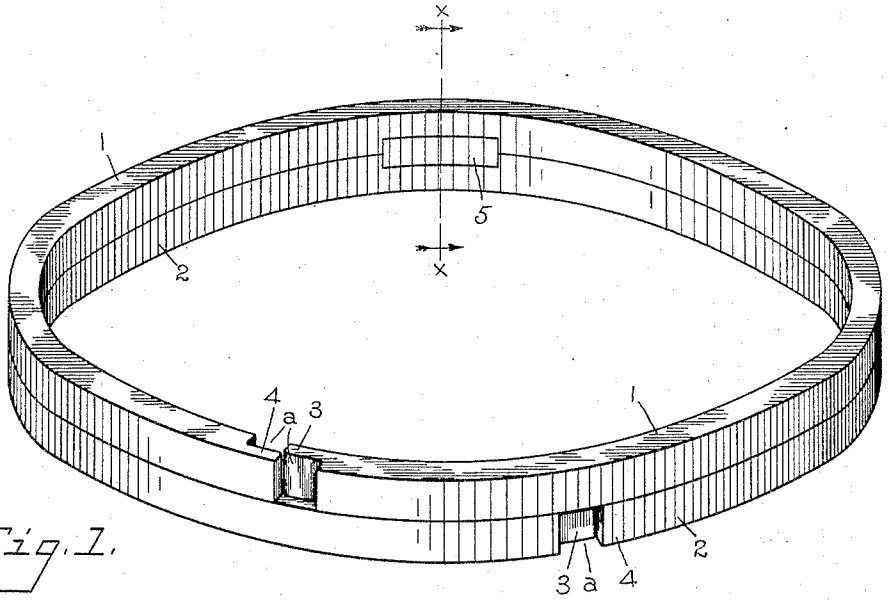


Fig. 1.

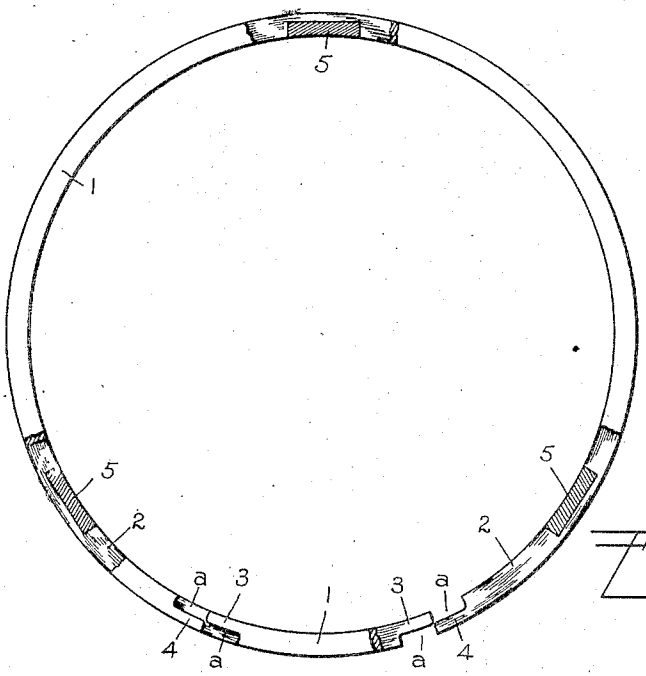


Fig. 2.

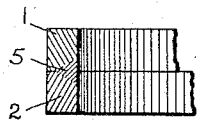


Fig. 3.

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UNITED STATES PATENT OFFICE.

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PISTON PACKING-RING.

1,357,392. Specification of Letters Patent. Patented Nov. 2, 1920.

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To all whom it may concern:

Be it known that I, JOHN J. FUCHS, Jr., a citizen of the United States, and a resident of Benson, in the county of Douglas and State of Nebraska, have invented certain new and useful Improvements in Piston Packing-Rings, of which the following is a specification.

My invention relates to piston packing, and particularly to packing-rings for the pistons of steam and internal combustion engines, pumps, air and gas compressors, and the like. It is the object of my invention to provide an expansible piston-ring of true cylindrical form, having a long lap-joint formed by ground faces lying in a plane perpendicular to the axis of the ring, and also having joint-portions overlapping on surfaces concentric with the ring-axis, whereby when the ring is properly fitted in the ring-groove of a piston it will effectually prevent leakage, either past the sides of the ring or through the joints of the ring to the space for clearance between the ring and the bottom of the ring-groove. A further object of my invention is to provide a suitable process for making the ring.

In the accompanying drawings Figure 1 is a perspective view of a piston-ring embodying my invention, Fig. 2 is a plan view thereof with portions broken away to show the welds, and Fig. 3 is a detail transverse section through one of the welds, as at the line x—x of Fig. 1.

The ring embodying my invention consists of two similar ring-parts 1 and 2, each made of a suitable metal which, for nearly all purposes, may be cast-iron. When of this material, a grade thereof is chosen which is of smooth, uniform and fine-grained texture, and that is comparatively soft so as to cause a minimum wear of cast-iron cylinders when the ring is used therein. The parts 1 and 2 are at the beginning separate solid or continuous rings, which are formed so as to be slightly larger than the finished ring to be produced. One side of each ring, or ring-part as they will be herein designated, is first finished, preferably by grinding, to a true plane-surface perpendicular to the axis of the ring. Each ring-part is then split at one side by cutting rectangular axial grooves in the inner and outer surfaces at adjacent points, so that when each groove extends half way through the material the corners of the grooves will meet. The ends of each split ring-part are thus provided with tongues 3 and 4 adjacent, respectively, to the inner and outer sides of the ring, the tongues being adapted to overlap each other, and the contacting surfaces a at the lap being substantially concentric with the ring-body.

At a plurality of places the inner corner of each ring-part, at the finished plane-surfaced side thereof, is chamfered or beveled off. The finished plane-surfaced sides of the ring-parts are then placed together with the chamfered places coincident, so that at each of said places there is formed in the inner side of the ring a V-shaped notch or recess of which the bottom or apex is in the plane of the contacting surfaces and near, but not touching, the outer side of the ring. The chamfered places are so located that when in coincidence, as described, the joints of the two ring-parts will be separated by approximately one-sixth of the circumference of the ring, so that the end of one ring-part will overlap the opposite end of the other ring-part in a relation such as shown in Fig. 1, there being one of the chamfered places adjacent to each joint, but none between the joints on the overlapping portions of the ring-parts. The ring-parts, being held coaxial and with the plane-surfaced sides thereof together as described, are then welded together at the chamfered places, being heated locally by means of an oxy-acetylene torch or the like, the V-shaped recesses being filled with molten metal which coalesces with the metal of the ring-parts so as to become integral therewith, and the ring-parts are thus permanently joined by a plurality of integral connecting-members 5. The material used in welding to fill the recesses may be the same as the material from which the ring-parts are made, or the filling or welding material may be one which has a somewhat lower melting-point than that of which the ring-parts are made. In the latter case the welding operation is somewhat easier to perform without injury to the ring-parts by overheating. During the welding operation the ring-parts are allowed to remain in the normal or expanded form thereof, and after welding they are cooled while in the same form. After cooling the ring is compressed to close up the joints thereof, such compression being conveniently done by forcing the ring into a sleeve of suitable internal diameter, and the

inner surface of the ring is then finished off to the desired diameter, any excess of the welding or filling material being removed at the same time. The ring, while in the closed or compressed form, is clamped axially to prevent its return to normal or expanded form and, while so held, its outer or peripheral surface is finished to true cylindrical form and to the desired diameter to fit in the cylinder with which it is to be used. By the use of a suitable mandrel, a plurality of the rings may be clamped axially and all finished at the same time, the finishing being done preferably by grinding. After the finishing of the outer surface the ring is released from the axial clamp, and the remaining unfinished sides are then dressed off so as to be parallel with each other and perpendicular to the ring-axis, and so that the width of the ring will be as desired to fit into the grooves of the piston on which it is to be used. The said final finishing operation is also preferably done by grinding, and during the operation the ring may be conveniently held by means of a magnetic chuck.

The welded places or connecting-portions 5 are preferably spaced apart equally, and the number thereof may be varied as required to hold the two ring-parts in permanent and fixed relation to each other, so that they form in effect an integral ring having an axial joint with a long circumferential offset formed by slidably-contacting plane-surfaces extending perpendicularly to the ring-axis. For rings up to six or eight inches in diameter, three of the weld-connections, as shown in the drawings, are sufficient. For larger rings a greater number of the welds may be made, according to the size of the ring.

It will be seen that as the outer or peripheral surface of the ring is finished to a true cylindrical form while the ring is compressed, it will fit perfectly in the cylinder with which it is used, and will be capable of expanding as required to compensate wear or expansion of the cylinder, until the body of the ring reaches the normal or unstressed form thereof. The form of the ring will not be appreciably altered by the welding operations thereon, since the ring parts are in their normal form when heated, and they are cooled while in such unstressed condition. Any minute distortions that might result from the heat of the welding operation do not affect the form of the completed ring, since all the external surfaces are finished after the welding.

The overlapping surfaces of the two-ring parts, being ground to a perfect plane-surface, form the circumferential offset of the axial joint and will effectually prevent leakage past the ring between the piston and the walls of the cylinder when in use. The lapped ends of the ring-parts form circumferentially-offset radial joints which serve to prevent leakage through one joint into the clearance-space at the bottom of the ring-groove, and thence around to the other joint so as to pass the ring-body by going between it and the body of the piston.

Now, having described my invention, what I claim and desire to secure by Letters Patent is:—

1. A piston-ring comprising two annular parts of equal diameter disposed coaxially and having contacting plane-surfaced sides, each annular part having its end-portions oppositely shouldered and overlapped and contacting slidably on a surface intermediate the inner and outer surfaces of the ring to form a joint closed radially of the ring, said joints of the annular parts being spaced circumferentially of the ring so that the end-portion of one part overlaps slidably the opposite end-portion of the other part to form a joint closed axially of the ring, the circumferential extent of the latter joint being less than one-third that of the entire ring, and means permanently securing said annular parts to each other except at the portions thereof which overlap to form the last-named joint.

2. A resilient metal piston-ring comprising two annular parts of equal diameter disposed coaxially and having contacting plane-surfaced sides, each annular part having overlapping end-portions forming an expansion-joint closed radially of the ring, an end-portion of one annular part overlapping slidably the opposite end-portion of the other annular part to form an expansion-joint closed axially of the ring, the circumferential extent of the latter joint being less than one-third that of the entire ring, and a plurality of welds forming connecting-portions integral with both annular parts and holding their contacting sides permanently in fixed relation to each other except at the overlapped end-portions thereof forming the last-named joint.

3. A piston ring comprising two annular parts of equal diameter disposed coaxially and having contacting plane-surfaced sides, each annular part having its end portions oppositely shouldered and overlapped and contacting slidably on a surface intermediate the inner and outer surfaces of the ring to form a joint closed radially of the ring, said joints of the annular parts being spaced circumferentially of the ring so that the end portion of one part overlaps slidably the opposite end portion of the other part to form a joint closed axially of the ring, and a plurality of integral relatively short members connecting the annular parts at spaced points, the said contacting plane-surfaced sides being located between the short members and the said joints being located between two of the connecting mem-

bers and the space occupied by the said joints being less than one-third of the circumference of the entire ring.

4. A piston ring comprising two annular parts of equal diameter disposed coaxially and having contacting plane-surfaced sides, each annular part having its end portions oppositely shouldered and overlapped and contacting slidably on a surface intermediate the inner and outer surfaces of the ring to form a joint closed radially of the ring, said joints of the annular parts being spaced circumferentially of the ring so that the end portion of one part overlaps slidably the opposite end portion of the other part to form a joint closed axially of the ring, said annular parts being provided in their contacting sides with registering V-shaped notches or recesses arranged at spaced points, and connecting members consisting of welds arranged in the said V-shaped notches, the said plane-surfaced contacting sides being located between the connecting members, the said joints being located between two of the connecting members and occupying less than one-third of the circumference of the entire ring.

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