Dec. 7, 1954 M. C. HUNT 2,696,038

METHOD OF MAKING CHROME PLATED PISTON RINGS

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Fig. 1.

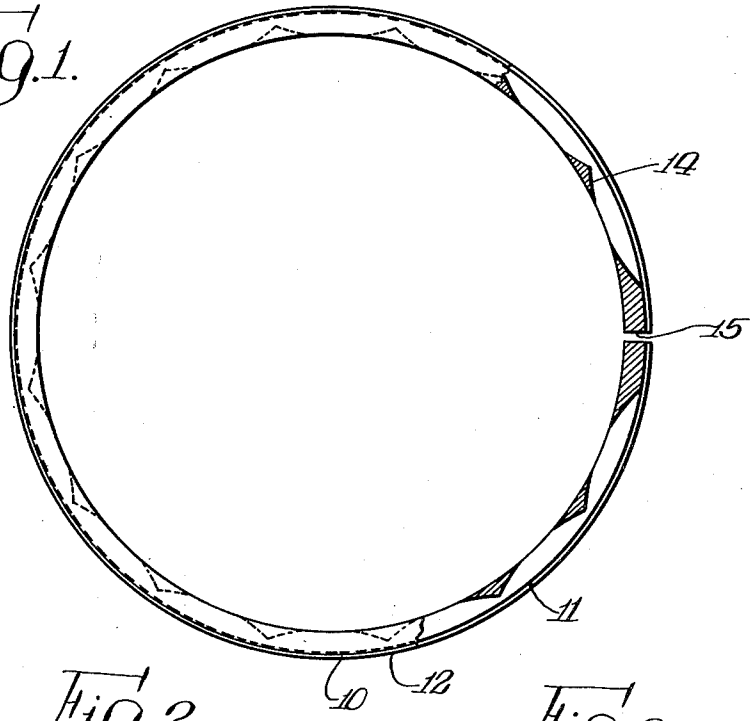


Fig. 2.

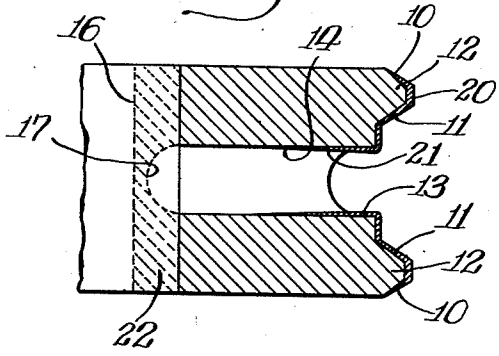
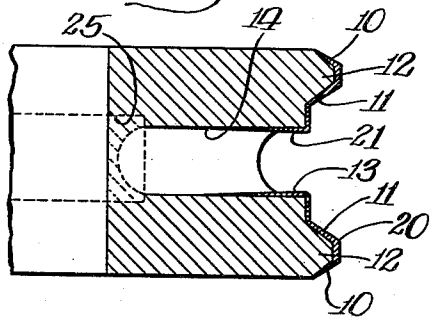


Fig. 3.



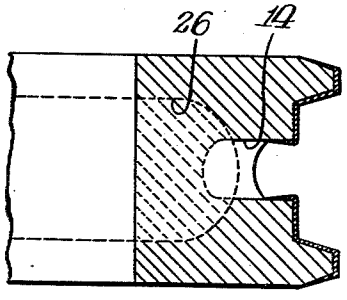


Fig. 4.

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METHOD OF MAKING CHROME PLATED PISTON RINGS

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4 Claims. (Cl. 29—156.63)

The invention relates generally to chrome plated piston rings and more particularly to a method of making rings of this character which are provided with radially extending slots.

The general object of the invention is to provide a novel method of making a slotted and chrome plated piston ring, which tends to preserve a desired shape for the ring and which results in a relatively even distribution of the chrome plate on the ring.

Another object is to provide a novel method of making a chrome plated piston ring of the type having a plurality of slots extending radially therethrough, which avoids the difficulty of "gassing" during plating due to the presence of slots in the ring and also avoids the necessity of cutting through a plated portion of the ring.

Other objects and advantages will become apparent from the following description taken in connection with the accompanying drawing, in which:

Figure 1 is a plan view, partially in section of a ring embodying the features of the invention.

Figure 2 is an enlarged fragmentary sectional view of the ring shown in Figure 1.

Figure 3 is a view similar to Figure 2 but showing a modified form of ring.

Figure 4 is a view similar to Figures 2 and 3 but showing still another modified form of ring.

The ring disclosed herein is adapted for use as an oil ring in an internal combustion engine or the like. It is of a type which is beveled at its two outer corners, as at **10**, and is provided with a groove in its outer periphery having beveled sides **11** which, with the beveled corners **10**, form a pair of outwardly extending cylinder-engaging flanges **12**. The groove in the outer periphery of the ring includes a central inwardly extending portion **13** in which oil scraped from the cylinder walls by flanges **12** collects. Such oil is permitted to flow inwardly through the ring to the ring-receiving groove in the piston by means of a plurality of slots **14** extending radially through the ring.

Such a ring when not plated presented no particular difficulty in its manufacture. However, when it is desired to chrome plate the outer periphery of the ring in order to provide a hard surface, particularly on the flanges **12** to reduce the rate at which these flanges wear down, a number of difficulties are encountered. Usually in a plated product, the article is first formed and the plating is placed thereon as substantially the last operation in the process of manufacturing the article. With the present type of ring, if the outer periphery of the ring were completely formed and the slots **14** were cut entirely through the ring before plating, the difficulty known as "gassing" occurred during the plating operation. This resulted in the deposit of an improper unevenly distributed plate on the ring which was not acceptable under commercial standards.

If the ring were plated before the slots **14** were cut so as to avoid the difficulty of gassing, the saws used for cutting the slots would very quickly wear out since they had to cut through the hard chrome plate on the outer periphery of the ring. Moreover it was found that the ring would have a better shape if it were slotted before plating rather than after plating. While the reason for this is not entirely clear, it may be that the pressures necessary to force the cutter through the hard chrome plate caused a distortion of the ring.

The present invention provides a method of making rings of this character, which avoids the uneven distribution of the chrome plate resulting from gassing due to the presence of the slots, but at the same time avoids the necessity of cutting through any plated portion of the ring. To accomplish this result, the slots **14** are only partially cut in the ring so that they extend only part-way through the ring from the outer periphery inward. Such partial cutting of the slots is performed prior to the plating step. After such slotting, a finishing cut is taken on the outer periphery and the ring is plated in a manner which deposits chrome only on or adjacent the outer periphery of the ring. Metal is then removed from the inner periphery of the ring to open the slots inwardly, such metal at the inner portion of the ring being free of any plating and thus readily machinable. This permits the attainment of a ring having a proper shape since the slotting is performed before the plating and no distortion of the shape will occur from cutting through a plated portion.

To describe the various steps in the manufacture of a ring of the character herein disclosed, an annular ring blank first undergoes certain preliminary operations such as grinding the two sides of the ring, turning the ring to the desired inner and outer diameters and cutting the gap, indicated at **15** in Figure 1. The beveling **10** at the outer corners of the ring and cutting the groove forming the bevels **11** and the inwardly extending portion **13** are then performed. At this time the ring has an inner diameter indicated at **16**. The slots **14** are then cut in the ring by suitable slotting saws, but rather than cutting the slots entirely through the ring, the slotting operation is terminated so that the inner ends of the slots do not open into the interior of the ring but terminate short of the inner periphery of the ring as indicated at **17** in Figure 2. The ring may then be plated without encountering any difficulty from gassing. Such plating is herein indicated at **20** and is located only on the outer periphery of the ring. Because of characteristics inherent in a plating operation of this type, the metal deposits chiefly on the outer peripheral portions of the ring, and within the slots **14**, the plating feathers out, as indicated at **21**, so that in the inner portions of the slots **14**, no plating metal whatever is deposited.

Thus it will be noted that the inner periphery is free of any plating, in addition to the inner portions of the slots, and metal may then be removed from the inner periphery to open up the slots. In the form of ring shown in Figures 1 and 2, removal of metal from the inner periphery of the ring is accomplished by boring the ring to remove the portion indicated at **22**. Consequently after such boring cut is taken, the slots **14** extend completely through the ring so that the proper oil passages are provided in the finished ring. After the slots are opened by such boring operation, the outer surface of the ring may be lapped as desired.

With this method of manufacture, the desired shape of the ring is preserved since the slotting is performed before the plating operation. Moreover, the slotting saws do not encounter any hard chrome plate in cutting such slots so that their life is thereby extended. With the slots terminating short of the inner periphery of the ring, no gassing will occur during the plating operation and an even distribution of the plate on the outer periphery of the ring is attained. The boring operation opens up the slots fully so that there is sufficient oil drainage in the finished ring.

In the forms of ring shown in Figures 3 and 4, metal is removed at the inner periphery of the ring to open up the slots by means of a channel-shaped cut in the inner periphery. In the form shown in Figure 3, such channel-shaped cut is indicated at **25** and is of a width only slightly greater than the axial width of the slot **14** so that the oil collected by the cylinder-engaging flanges of the ring may flow freely inwardly of the ring.

The form of ring shown in Figure 4 is adapted to be expanded by means of a coil spring (not shown) placed in a groove in the inner periphery of the ring. Consequently the removal of metal necessary to open up the inner ends of the radially extending slots may be performed by cutting a groove suitable to receive such a coil spring. Such groove is indicated at **26** in Figure 4 and is substantially wider than the slots **14**.

From the foregoing, it will be apparent that I have provided a novel method of making a chrome plated ring provided with radially extending slots. But cutting the slots

only partially through the ring prior to the plating, both the advantage of easily performing the cutting operation and the avoidance of gassing during the plating are attained. The slots may then be readily opened either by boring out the interior of the ring as shown in Figure 2, or by cutting a groove in the inner periphery of the ring as shown in Figures 3 and 4.

I claim:

1. The method of making a chrome plated radially slotted piston ring, which comprises cutting circumferentially spaced slots extending inwardly from the outer periphery of the ring but terminating short of the inner periphery to leave an uninterrupted inner surface, chrome plating the outer periphery of the ring, and thereafter making an annular cut at the inner periphery of the ring to open the slots at their inner ends.

2. The method of making a chrome plated radially slotted piston ring, which comprises cutting separated slots extending inwardly from the outer periphery of the ring but terminating short of the inner periphery to leave an imperforate inner surface, chrome plating the outer periphery of the ring, and thereafter cutting an annular groove in the inner periphery of the ring of a width at least equal to the axial width of the slots and radially aligned with the slots and of a radial depth sufficient to open into the inner ends of the slots.

3. The method of making a chrome plated radially slotted piston ring, which comprises cutting circumferentially spaced slots extending inwardly from the outer periphery of the ring but terminating short of the inner periphery to leave an unbroken inner surface, chrome plating the outer periphery of the ring, and thereafter boring through the ring to increase the inner diameter of the ring to meet the inner ends of the slots to open them.

4. The method of making a chrome plated radially slotted piston ring, which comprises cutting a series of circumferentially spaced slots in the ring extending inwardly from the outer periphery of the ring but terminating short of the inner periphery to leave a solid inner surface, chrome plating the outer periphery of the ring, and thereafter cutting an outwardly extending spring-receiving groove of greater axial width than the slots in the inner periphery of the ring, with the groove extending outwardly to and opening the inner ends of the slots.

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