March 3, 1936. M. B. COVERT 2,033,093

MANUFACTURE OF PISTON RINGS

Filed June 8, 1933

Fig. 1

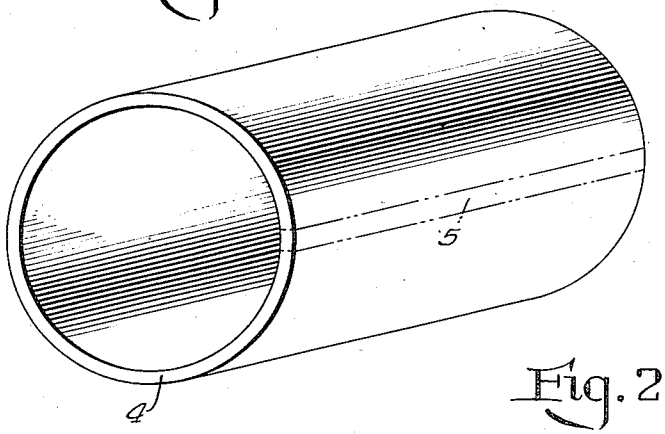


Fig. 2

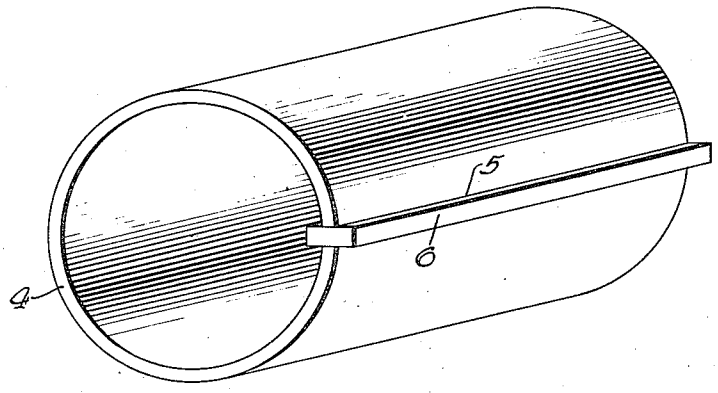
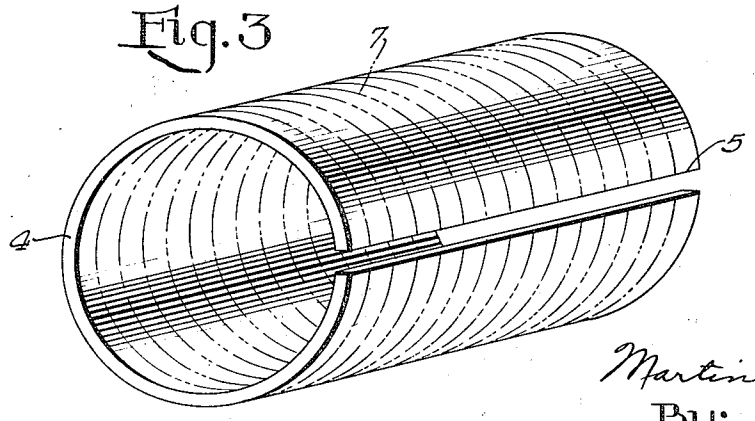


Fig. 3



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MANUFACTURE OF PISTON RINGS

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3 Claims. (Cl. 29—156.62)

This invention relates to improvements in the manufacture of piston rings and the like.

In the manufacture of piston rings it has been the practice to make a pattern of substantially the same diameter and cross section as required for the piston ring casting. To provide for outward pressure of the piston ring when it is installed on a piston reciprocal in a cylinder the pattern is split and the ends expanded and then an insert or slug is positioned between the ends thereby throwing the pattern, and then, consequently, a casting made in a mold formed by the pattern, out of round. In the finishing of a ring so cast the insert or slug is cut away and then when the ring is installed on a piston it is compressed to substantially circular form but the innate forces therein tend to restore it to its cast shape and therefore the ring forcibly bears against the cylinder wall. However, the pressure exerted on the cylinder wall by a ring made in this manner is not uniform for the pressure is relatively high adjacent the split but is quite low adjacent the part of the ring diametrically opposite the split. If a ring is cast in truly circular form and then subsequently split and expanded it exerts substantially uniform pressure on a cylinder wall when in operating position. One of the objects of my invention is to expedite the manufacture of piston rings which exert substantially uniform pressure on a cylinder wall.

It is difficult to cast a piston ring of small cross-sectional area because the heavy molten metal often will not uniformly flow through a small mold cavity. However, the molten metal will flow satisfactorily through a narrow but elongated cavity, that is to say, it is not difficult to cast a sleeve having a thin wall in contradistinction to casting a ring of small cross-sectional area. In casting an elongated sleeve, in an ordinary mold, the impurities in the iron rise to the top of the mold cavity and often the upper end of the sleeve is of a poor grade of metal because of this. Furthermore, when sleeves are cast in sand molds, hard spots are found to be prevalent due to moisture in the sand which chills the hot metal. Such castings are also found to be subject to foundry strains as well as the hard spots and other objectionable characteristics. However, in the manufacture of piston rings, sleeves having a thin wall have been cast and piston ring blanks have been cut therefrom. Such blanks have not been uniform because of the above set forth difficulties encountered in casting a sleeve. It is therefore another object of my invention to so cast a sleeve that substantially uniform piston ring blanks can be subsequently cut therefrom.

A further object is to heat treat the sleeve prior to the time it is divided into ring blanks so as to free the sleeve of foundry strains, hard spots and the like to thereby insure that the rings into which the sleeve is divided will have uniform metallurgical characteristics.

A still further object is to split and expand the sleeve prior to dividing it into rings and to impart a permanent set to the sleeve so that rings cut therefrom will exert uniform pressure on the cylinder wall when installed on a piston in a cylinder.

In the following description reference is made to the accompanying drawing wherein

Fig. 1 is a perspective view illustrating a cast sleeve divisible into piston ring blanks;

Fig. 2 is a perspective view showing the sleeve in an intermediate step in the manufacture of the rings; and

Fig. 3 is a perspective view of a sleeve ready to be divided into ring blanks and illustrating the manner in which the sleeve is so divided.

The preferred embodiment of my invention resides in first providing a permanent mold either of metal or refractory material and having a mold cavity of an outside diameter substantially equal to the desired outside diameter of the ring blank, and wherein the cavity is of such a length that a sleeve cast therein may be divided evenly into a predetermined number of ring blanks of a desired thickness. The width of the cavity is substantially equal to the desired width of the ring blanks into which the sleeve is to be divided. Each of the dimensions may be slightly greater than desired in the finished rings so that there will be sufficient metal to permit the finishing operations on the ring blanks.

The sleeves are preferably cast in the molds under a centrifugal action so that the metal will be uniformly distributed throughout the mold cavities which therefore prevents the collection of impurities in the metal in any one part of the cavities and because of this the cast sleeves are substantially uniform throughout. A sleeve so cast is indicated by 4 in the accompanying drawing.

The next step in the manufacture of the rings is to slit the sleeve axially, as indicated at 5, and to then expand the same. The slit is spread and spacing bar 6 is inserted in the slit to retain the expanded sleeve out of round, that is to say, to retain the sleeve in an eccentric shape.

After the sleeve has been expanded out of

round it is heated to a temperature above that to which the rings will be subjected in use to impart a permanent set to the sleeve in the out of round shape, that is to say, to set the tension of the metal. This heat treatment also removes foundry strains, hard spots and the like, if any are present, and produces uniform hardness throughout the sleeve.

After the sleeve has been heated for a sufficient length of time to impart the permanent set, it is permitted to cool and the spacing bar 6 is then removed. The sleeve will then appear as illustrated in Fig. 3, that is to say, the ends thereof adjacent the slit will be spaced apart after removal of the spacing bar and the sleeve will be slightly out of round. The sleeve is then clamped in a suitable machine tool, such as a lathe, and individual ring blanks are cut therefrom at spaced intervals such as, for example, those indicated by the broken lines 7 in Fig. 3. Preferably the sleeve is of such a length that it may be divided into a number of ring blanks of uniform thickness.

After the ring blanks have been cut from the sleeve the finishing operations are performed, such as machining or grinding to size, slotting to provide oil grooves, filing to remove burrs, or any other desired operation.

My novel method for manufacturing piston rings may be summarized as consisting in casting a sleeve having substantially uniform metallurgical characteristics throughout; axially slitting the sleeve; expanding the sleeve to an eccentric shape and holding it in this eccentric shape; subjecting it to a temperature above that to which the rings will be subjected in use for a sufficient period of time to impart a permanent set to the sleeve when cooled; permitting the sleeve to cool; and then dividing the sleeve into ring blanks and subsequently performing the desired finishing operations thereon.

Since the sleeve is cast under a centrifugal action the impurities are prevented from collecting in any one part of the sleeve, and since the sleeve is subjected to such a heat treatment that undesirable metallurgical characteristics such as foundry strains and hard spots are removed, it is manifest that the sleeve may be divided into a number of ring blanks having substantially uniform metallurgical characteristics. Furthermore, since the sleeve is cast round and subsequently expanded out of round and then given a permanent set in the out of round or eccentric shape, the rings made from blanks cut from this sleeve will exert substantially uniform pressure against the cylinder wall when arranged in operating position on a piston in a cylinder.

I have illustrated and described the preferred manner of practice for my novel method for the manufacture of piston rings but it is to be understood that this is capable of variation and modification and I therefore do not wish to be limited to the precise details set forth but desire to avail myself of such changes and alterations as fall within the purview of the following claims.

I claim:

1. The method of manufacturing uniform piston rings of thin cross section which consists in casting a sleeve of a thickness substantially equal to one cross sectional dimension of the piston rings, axially slitting the sleeve, installing a spacing bar in the sleeve to expand the sleeve to an eccentric shape, heating the expanded sleeve to a temperature above that to which the rings will be subjected in use to remove foundry strains, hard spots and the like from the sleeve and to impart a permanent set to the sleeve, and then dividing the sleeve at spaced intervals substantially equal to the other cross sectional dimension of the rings to provide uniform ring blanks on which finishing operations may be subsequently performed.

2. The method of manufacturing uniform piston rings or the like which includes axially slitting a metallic sleeve, installing a spacing bar in the slit to expand the sleeve to an eccentric shape, heating the expanded sleeve to a temperature above that to which the rings will be subjected in use to remove strains, hard spots and the like from the sleeve and to impart a permanent set to the sleeve, and then dividing the sleeve into ring blanks on which finishing operations may be subsequently performed.

3. The method of manufacturing a metallic sleeve which may be divided into uniform ring blanks or the like which consists in forming a sleeve, subsequently axially slitting the metallic sleeve and expanding the slit sleeve to an eccentric shape, and heating the expanded sleeve to a temperature above that to which the ring blanks or the like will be subjected in use to remove strains, hard spots and the like from the sleeve and to impart a permanent set to the sleeve.

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