C. A. MARIEN.

PISTON RING POT CASTING AND METHOD OF MAKING PISTON RINGS THEREFROM.

APPLICATION FILED APR. 15, 1920.

1,394,633. Patented Oct. 25, 1921.

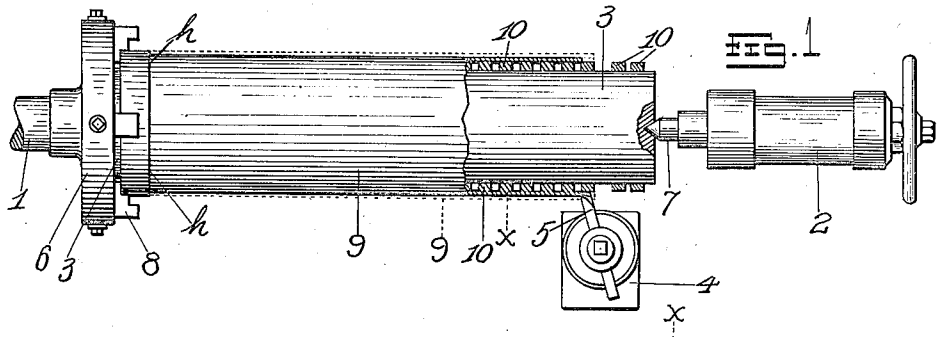


Fig. 1

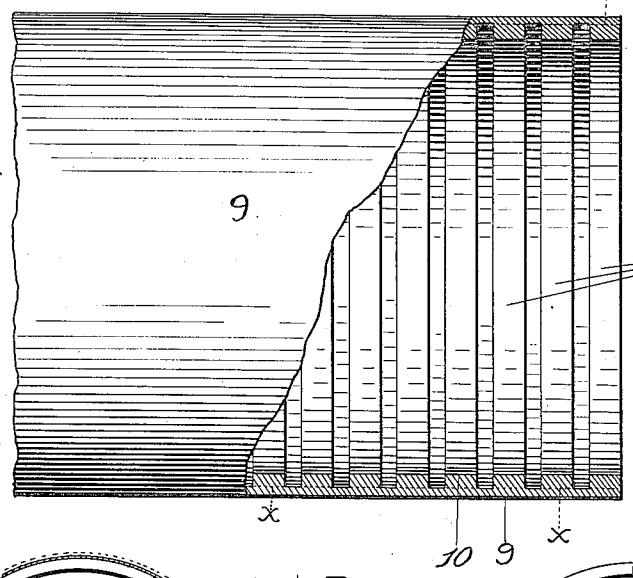
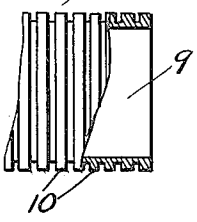


Fig. 2

Fig. 6.



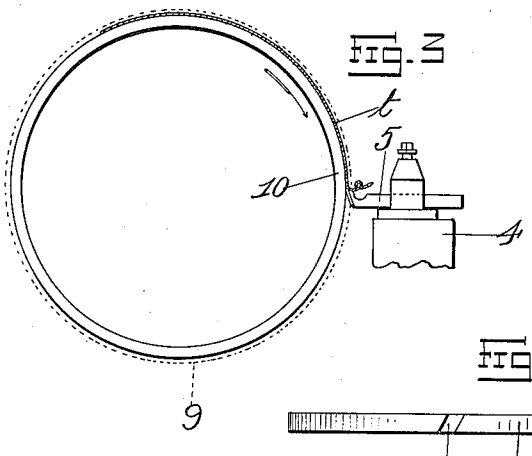


Fig. 3

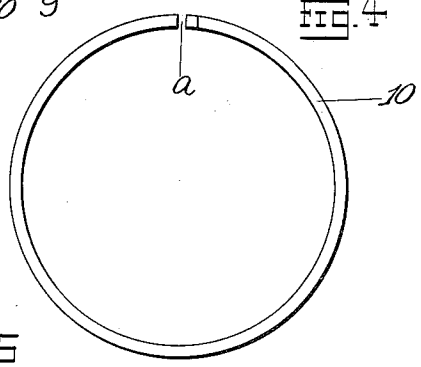


Fig. 4

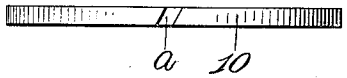


Fig. 5

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UNITED STATES PATENT OFFICE.

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PISTON-RING POT-CASTING AND METHOD OF MAKING PISTON-RINGS THEREFROM.

1,394,633. Specification of Letters Patent. Patented Oct. 25, 1921.

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To all whom it may concern:

Be it known that I, CHARLES A. MARIEN, a citizen of the United States, residing at St. Louis, State of Missouri, have invented certain new and useful Improvements in Piston-Ring Pot-Castings and Methods of Making Piston-Rings Therefrom, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

The present invention is directed to improvements in piston-ring pot castings and the manufacture of piston-rings therefrom, the object sought being to provide a casting which will yield the precise quality of metal that a piston ring should possess to serve as an effective packing and lubricator for the piston on which the same is mounted. As well understood in the art piston rings are cast either individually, or in the form of "pots" or tubes from which the individual rings are afterward cut. Each method has its advantages and its disadvantages. Where the rings are cast individually the danger of a sudden chilling of the metal is imminent, such sudden chilling giving rise to an undesirably hard casting which has the effect of cutting the walls of the cylinder. On the other hand the rings cut from the conventional pot casting are apt to be soft and lack resiliency so that they do not form a perfect packing. These shortcomings result from a lack of proper control over the cast metal while cooling in the mold, the individually cast ring being apt to chill too suddenly and become hard by reason of an excess of combined carbon, and the pot casting on account of the thickness of its walls cooling slowly and causing the carbon to separate out as graphite, thereby not only imparting to the casting an undesirable softness but impairing its resiliency to such an extent as to impair the usefulness of the metal for purposes of a packing ring. Under my invention I cast a pot or tube, on the inside of which are disposed a plurality of annular concentric ribs or ring formations corresponding to the cross-section of the piston ring desired, these ribs being connected by a comparatively thin outer shell forming the peripheral wall of the pot, which may be readily severed or cut off from the series of ribs or rings by the application thereto of a suitable cutting tool, the rings thus severed requiring only to be split and finished after the usual manner of finishing piston rings, whether cast individually or sliced from a pot casting. By the peculiar cross-section of the walls of my improved pot the cooling of the casting is more rapid along the thin portions of the outer shell by which the rib formations are connected, the latter cooling at a comparatively slower rate than said connecting portions, the resultant period of cooling for the casting being such as to enable me to carefully regulate the temper, hardness, and tensile strength of the casting, thereby producing a ring which possesses the necessary resilience, hardness and wearing qualities of a piston ring especially where the same is intended to operate in the cylinder of an internal combustion engine. The advantages of my improved pot casting will be made apparent from the following detailed description of the invention in connection with the accompanying drawings in which—

Figure 1 represents a plan of a conventional head-stock, tail stock, mandrel and cutting tool of a lathe showing the application of the cutter to the improved pot casting; Fig. 2 is an enlarged plan partly in section of a portion of the improved casting; Fig. 3 is a diagrammatic end view of the casting showing the manner of applying the cutting tool thereto; Fig. 4 is a side view of the piston ring as severed from the casting and subsequently split; Fig. 5 is a face view of the split ring; and Fig. 6 is a modified form of the invention with the ring formations cast in the outside of the pot.

Referring to the drawings, 1 represents the head-stock, 2 the tail-stock, 3 the mandrel, 4 the tool carriage and 5 the tool of any conventional form of lathe, the mandrel being held in position between the head chuck 6 and the spindle 7 of the tail-stock as well understood in the art. In the illustration here shown one end of the pot-casting passed over the mandrel is likewise held by the jaws 8 of the head-chuck 6. The pot casting comprises a tubular or cylindrical shell 9 on the inside of which are formed a series of annular ribs or rings 10, spaced suitable distances apart, the depth of each ring, that is to say the dimension measured radially from the axis of the cylinder, corresponding to the thickness of the piston ring, and the width of the ring or the dimension measured parallel to the axis of the cylinder, corresponding to the width of the piston ring.

The thickness of the shell 9 from the inner walls of which the several rings or ribs project is in the present example substantially one half the thickness of the ring, the inner boundary of the shell being indicated by the dotted lines x (Fig. 2).

By mounting the casting on the mandrel 3 and imparting rotation thereto as well understood in the art, and applying the cutter 5 to the end of the shell, it follows that with a rotation of the casting and a longitudinal advance of the cutting tool, the latter will shave off the metal constituting the shell 9 proper, and by the time the cutter has reached a depth indicated by the line x which corresponds to an element of the inner cylindrical surface of the shell, it will have completely severed from the shell a ring 10, the rings being severed one at a time as the cutting tool advances from the tail-stock to the head-stock. As each ring is severed it may be moved out of the way by moving it along the mandrel toward the tail-stock (Fig. 1). Assuming that the shell proper is one-sixteenth of an inch thick it is probable that a single traverse of the cutting tool may not shave off that thickness of metal and it may be necessary for the tool to pass a second time over the casting to shave off the necessary thickness of metal to sever or release the rings. In the diagram Fig. 3, the dotted circle represents the original outer boundary of the shell, and the hatched layer t which the tool is shaving from the ring 10 represents the thickness of metal left after a previous layer had been shaved off, the removal of the layer t completely releasing the ring 10 from the shell. It will be seen from Fig. 2 that the annular ribs 10 form complete piston ring blanks, and only require the removal of the thin outer shell 9 to a depth indicated by the lines x to be released or severed from the casting. After the ring blanks are severed or released from the shell they are split so as to leave a gap a and then finished in any of the well known ways practised in the art. In the casting of a pot with a thin shell of which the rings form an integral part, the casting neither cools too slowly nor too rapidly as a whole. It is true that the thin walls of the shell between the rings will chill more quickly than the thicker walls opposite the rings, but the cooling rate of the latter will be more or less under control of the former which cannot be the case where the rings are cast individually; and, where pot castings are of a uniform thickness corresponding to the thickness of the rings, there we have an excess of metal which requires more time to cool than will assure for the ring the desired resiliency, the slower cooling due to the excess metal tending to produce rings which are too soft and yielding to hug the cylinder walls with sufficient pressure to insure good packing. By therefore providing a cross-section of pot casting which insures against a too sudden cooling of the molten metal on the one hand, and a too prolonged cooling on the other, we can eliminate the objections to which the individual cast piston ring and the conventional pot casting give rise, and thereby provide a casting in which the thickness of the outer shell relatively to the cross-section of the ring may be so proportioned that a perfect casting may be secured, possessing all the requisites of temper, tensile strength, resiliency, and hardness, and other qualities which an ideal piston ring should possess.

The illustration Fig. 2 shows a pot with rings substantially one-eighth inch thick, one-quarter of an inch wide and three and one-half inches in diameter when compresed to working size. In that case the outer shell would be about one-sixteenth of an inch thick. These relative dimensions of course are only by way of example and may be varied in practice as clearly obvious to the skilled mechanic. The manner of holding the pot in the lathe is immaterial, but in the present example the mandrel is held at the center of the chuck head 6, and one end of the casting is gripped by the jaws of the chuck so that the mandrel and casting may rotate as a unit, it being observed that the mandrel does not hold the casting with a drive fit. Other methods of mounting the casting in a lathe may be resorted to, so long as it may be rotated and the cutter 5 may advance longitudinally along the work to shave off the outer shell of the casting. In Fig. 1 we see that the cutter has made one traverse along the casting, the cut thus made leaving a shoulder h at the chuck end of the casting. The cutter is now making its second traverse to completely shave off the outer shell and release the rings. Two of the severed rings are shown on the right moved toward the end of the mandrel. The shifting of the severed rings of course is not necessary, but the same are here shown moved to one side to better bring out the operation of the cutting tool. The spaces between the ribs in the example before us are approximately one-half the width of the ring, but I do not wish to be understood as being restricted to this dimension as practical considerations may require a different spacing between the rings. The casting of the rings or ribs 10 on the outside of the shell (Fig. 6) instead of on the inside as shown (Figs. 1, 2 and 3) would come within the spirit of my invention.

Having described my invention what I claim is—

1. A piston-ring pot casting comprising a tubular shell, and a series of ring formations disposed circularly about the axis of the shell and spaced apart.

2. A piston-ring pot casting comprising an outer tubular shell, and a series of ring formations disposed circularly on the inside of the shell and spaced apart.

3. A piston-ring pot casting comprising an outer cylindrical shell, and a series of ring formations disposed circularly on the inside of the shell and spaced apart.

4. A piston-ring pot casting comprising an outer cylindrical shell, and a series of ring formations disposed on the inside of the shell, the radial dimensions of the side faces of the rings or portions leading from the inner wall of the shell corresponding substantially to the dimensions of the sides of the piston ring.

5. A piston-ring pot casting comprising a series of concentric rings spaced apart and disposed about a common axis, and an outer shell concentric with said axis connecting the rings.

6. A method of manufacturing piston-rings which consists in forming a pot casting or tube having a series of ring formations disposed on the inside and spaced apart, mounting said tube in position for engagement with a cutter, and causing the cutter to traverse the walls of the tube axially, circumferentially, and radially toward the axis of the tube thereby severing the shell of the tube from the rings and releasing the rings.

In testimony whereof I affix my signature, in presence of two witnesses.

CHARLES A. MARIEN.

Witnesses:
EMIL STAREK,
JOS. A. MICHEL.