

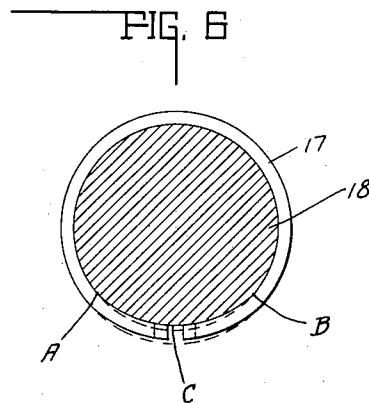
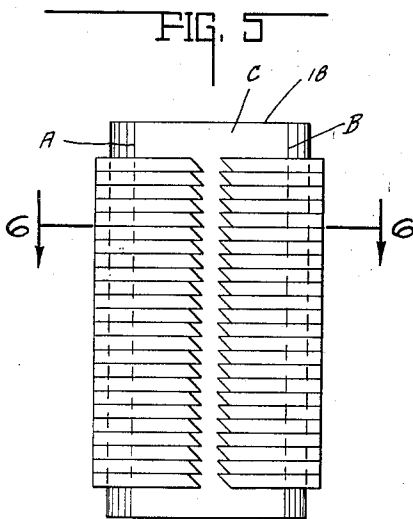
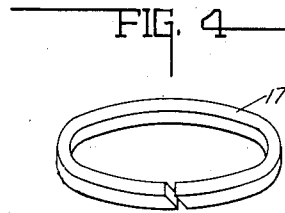
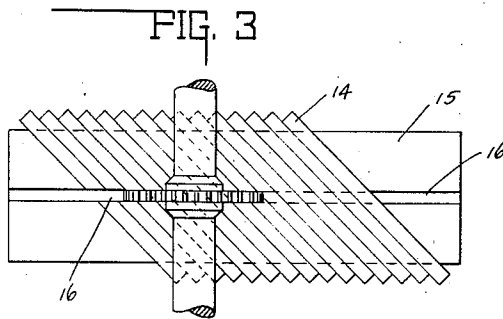
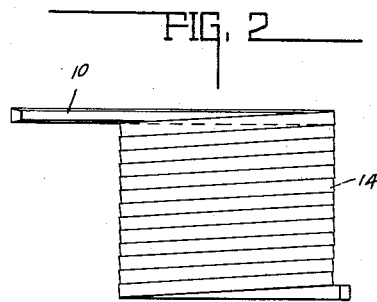
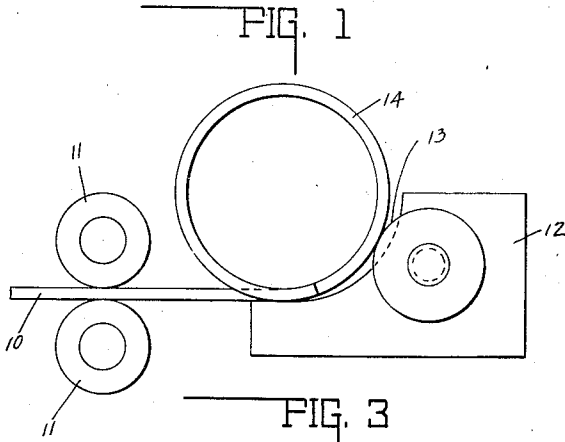
Oct. 9, 1928.

W. J. SIX

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PROCESS OF MAKING PISTON RINGS

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UNITED STATES PATENT OFFICE.

WALTER J. SIX, OF INDIANAPOLIS, INDIANA, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO B. D. EMANUEL, TRUSTEE.

PROCESS OF MAKING PISTON RINGS.

Application filed September 28, 1926. Serial No. 138,242.

This invention pertains to a process of making split rings by forming the metal rather than casting the same.

The object of the process is to form a split ring from straight strips of stock by rolling the stock to proper dimensions in cross section and then coiling it into cylindrical spring-like formation of substantially the desired diameter, after which the coiled material is cut at the proper angle so as to split the same in a plurality of split rings.

The principal feature of the invention resides in the sizing and forming of the ring into a true circle with the proper gap between the split ends, in such a manner that the ring will retain its form against distortion, and its split ends will lie normally in the arc of the circle formed by the ring.

The full nature of the invention will be understood from the accompanying drawings and the following description and claims.

Fig. 1 is a diagrammatic illustration of the means for coiling the strip. Fig. 2 is a perspective view of the coiled strip. Fig. 3 is a diagrammatic illustration of the means for cutting the coil into a plurality of split rings. Fig. 4 is a perspective view of a split ring. Fig. 5 is a front elevation of a shaping arbor. Fig. 6 is a section taken on the line 6-6 of Fig. 5.

The process consists in taking a strip of metal substantially rectangular in cross section, the metal being of steel, iron, bronze or any suitable material, passing the metal through the sizing rollers 11, compressing it to the desired dimensions and forcing it against a fixed forming roller 12 having a curved surface 13 which will cause the metal strip to wind into a cylindrical spring-like formation 14 as shown in Fig. 2.

The cylindrical coil is formed with a slightly less diameter than the rings to be made therefrom, and is then stretched over a cylindrical arbor having a greater outside diameter than the inside diameter of coil when rolled, but slightly less than the inside diameter of the finished ring. The coil thus stretched over said arbor is then heat treated in the usual manner so that the metal will retain its shape and acquire a spring tension so as to cause it to return to its proper dimensions upon being distorted.

The heat treated coil is then removed from the arbor and placed upon a cutting arbor

15 of an oval shape in cross section so as to permit the coils to be clamped in position at an angle thereto as illustrated in Fig. 3. A cutting tool is then passed through the coil along the groove 16 whereby the coil is cut into a plurality of split rings 17. By reason of the angular position of the coil the rings are thus split on an angle in the usual manner.

Upon the rings being removed from the arbor 15 they are placed upon the arbor 18 which is cylindrical in its general form but which has a relieved side extending longitudinally thereof throughout substantially a third of its peripheral surface as illustrated in Fig. 5 by the dotted lines A-B and as shown in Fig. 6 wherein the true circle between the lines A-B is shown dotted. Intermediate of the relieved surface the arbor is marked by an indicating line C for the convenience of the workman. The said arbor is of the proper diameter for the rings to be made, which is slightly greater than the diameter of the split ring before mounting the same thereon. This causes the ring to be spread so as to slightly increase the gap between the free ends thereof, and also causes said free ends to be drawn inwardly to conform to the relieved surface A-B.

The arbor with the rings mounted thereon is then placed in a heat treating furnace so that the second heat treating action causes the rings to maintain their size, shape, and wall tension.

The rings thus formed of the proper diameter and proper gap between the free ends are thereupon finished by grinding and polishing the surfaces thereof, which action causes a certain stress and strain to be set up in the middle, which has the action of causing the free split ends to be forced outwardly from their relieved position to that of the true circle, whereby the completed ring remains in the form of a true circle throughout its entire circumference.

This process as above described has the effect of overcoming the difficulty heretofore experienced wherein the ring formed in this manner normally was out of round or not a true circle, the free ends protruding outwardly from the circle so that it was of greater diameter in a plane through the split portion than at right angles thereto. This difficulty has been overcome by heat treating the rings on a relieved arbor to such an ex-

tent as to cause this normal action of the free ends in the grinding and finishing of the ring to be compensated for. In this connection, it may be noted for example that a ring of 1.75 inches diameter is heat treated on the arbor having its surface A—B relieved substantially .015 of an inch. On the other hand, a ring of 3.75 inches diameter should be heat treated on an arbor having its surface A—B relieved substantially .060 of an inch.

The invention claimed is:

1. The process of forming split rings consisting in distorting said rings so that the adjacent free ends thereof will extend within a true circle passed thereabout, heat treating said rings in such deformed condition, and thereafter grinding or turning the same so as to vary the stress of the metal and cause said ends to resume their normal circular position.

2. The process of forming split rings consisting of spirally winding a strip of metal into a helical coil, cutting the coil to form individual split rings, deforming the abutting free ends of said rings out of round, heat treating the same in their deformed condition, and thereafter grinding or turning the same so as to vary the stress of the metal and cause them to return to their normal circular formation.

3. The process of forming split rings consisting of spirally winding a strip of metal into a cylindrical coil, cutting the coil to form individual rings, heat treating said rings with the free abutting ends formed slightly inwardly, and thereafter grinding or turning the surface of said rings so as to vary the stress of the metal whereby the ends thereof will be brought to conform to a true circle.

4. The process of forming split rings consisting of spirally winding a strip of metal into a helical coil, cutting the coil to form individual rings, mounting the same on an arbor having a portion of its face relieved adjacent the split ends of the rings, heat treating the rings thereon, and thereafter grinding or turning the rings so as to vary the stress of the metal and bring them back to normal circular formation.

5. The process of forming split rings consisting of spirally winding a strip of metal into a helical coil, heat treating the same, cutting the coil to form individual rings, mounting said rings on an arbor of the diameter desired therefor, said arbor having that portion thereof adjacent the split ends of the rings relieved, and being of sufficient diam-

eter to cause the free ends of said rings to be drawn inwardly against said relieved surface, heat treating said rings thereon and thereafter grinding or turning said rings so as to vary the stress of the metal and cause the deformed ends thereof to return to true circular position.

6. The process of forming piston rings consisting of spirally winding a strip of metal into a helical coil, mounting the same over a cylindrical arbor so as to stretch said coil into true cylindrical form, mounting said coil over a supporting arbor and clamping the same in angular relation thereto, cutting said coil at an angle so as to form individual split rings, mounting said individual rings over an arbor of the desired diameter and having that portion thereof adjacent the split ends of the rings relieved, whereby said free ends may be drawn inwardly thereagainst, heat treating said rings on said arbor, and thereafter grinding or turning said rings so as to vary the stress of the metal whereby their ends will resume a true circular formation.

7. The process of forming split rings consisting of spirally winding a strip of metal into a helical coil, heat treating the same, cutting the coil to form individual rings, mounting said rings on an arbor of the diameter desired therefor, said arbor having that portion thereof adjacent the split ends of the rings relieved and being of sufficient diameter to cause the free ends of said rings to be drawn inwardly against said relieved surface, heat treating said rings thereon, thereafter cooling said rings while remaining on said arbor so as to set up the desired wall tension, and then grinding or turning said rings so as to vary the stress of the metal and cause the deformed ends thereof to return to true circular position.

8. The process of forming split rings consisting of mounting said rings on an arbor having a portion of its face relieved adjacent the split ends of the rings, said arbor being of slightly larger diameter than the normal diameter of said rings for spreading the same and drawing the free spread ends thereof inwardly adjacent the relieved portion whereby said ends will extend within a true circle, heat treating the rings on said arbor, and thereafter grinding the rings so as to vary the stress of the metal and bring them back to normal circular formation.

In witness whereof, I have hereunto affixed my signature.

WALTER J. SIX.