May 17, 1932. W. J. SIX 1,859,057

METHOD OF MAKING PISTON RINGS

Filed Feb. 21, 1931 2 Sheets-Sheet 1

FIG. 1

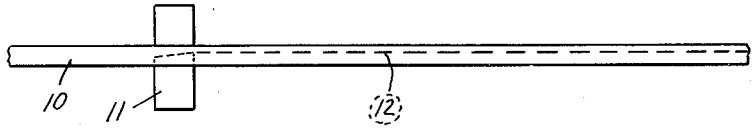


FIG. 2

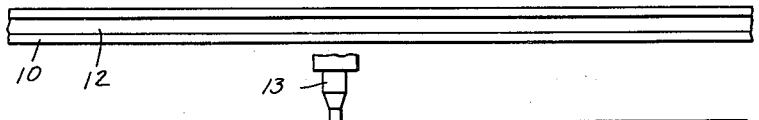


FIG. 3

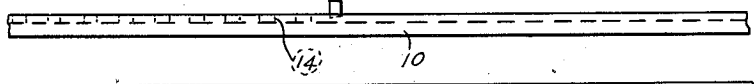


FIG. 4

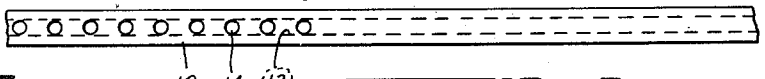


FIG. 5

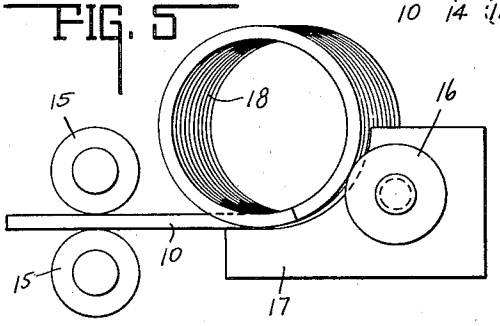


FIG. 6

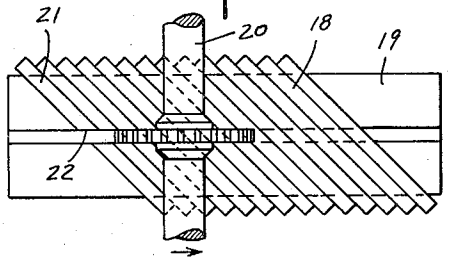


FIG. 7

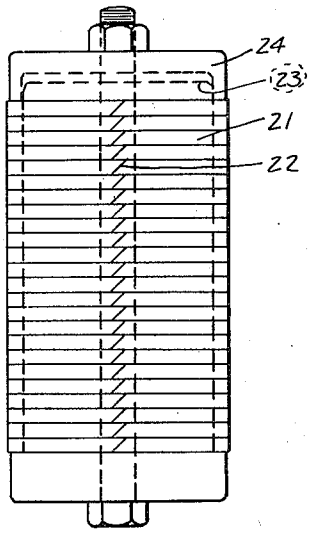


FIG. 8

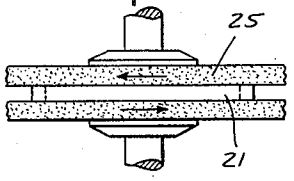
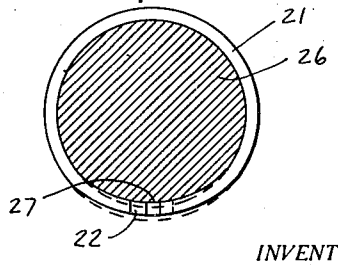


FIG. 9



INVENTOR.
WALTER J. SIX.

BY
Lockwood Lockwood Goldsmith & Galt
ATTORNEYS.

May 17, 1932. W. J. SIX 1,859,057

METHOD OF MAKING PISTON RINGS

Filed Feb. 21, 1931 2 Sheets-Sheet 2

FIG. 10

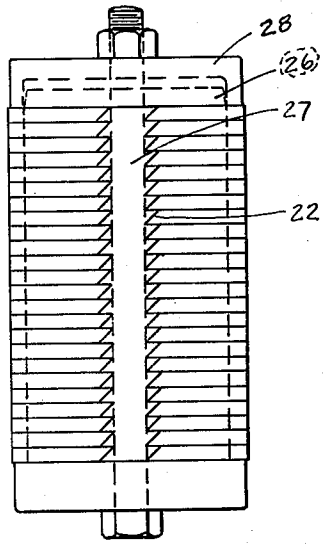


FIG. 11

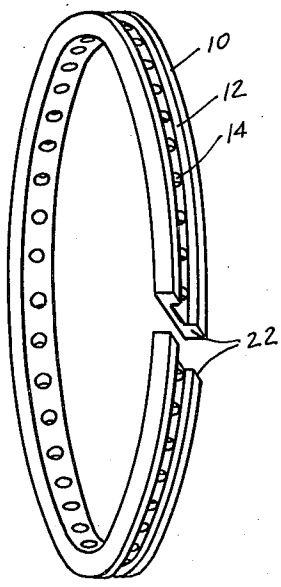


FIG. 12

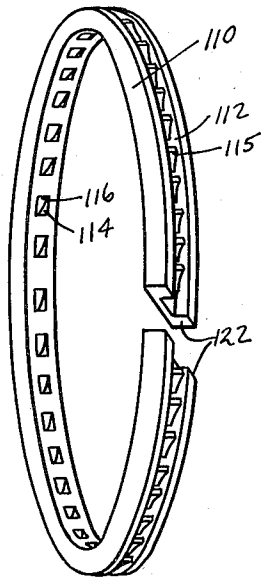


FIG. 13

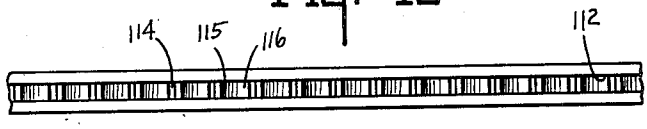
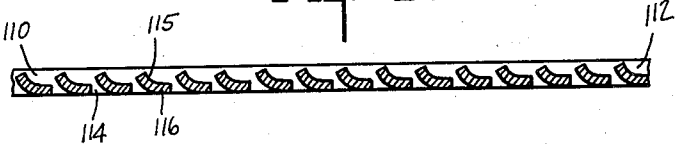


FIG. 14



INVENTOR.
WALTER J. SIX.

BY
Lockwood Lockwood Goldsmith & Galt
ATTORNEYS.

Patented May 17, 1932 1,859,057

UNITED STATES PATENT OFFICE

WALTER J. SIX, OF INDIANAPOLIS, INDIANA

METHOD OF MAKING PISTON RINGS

Application filed February 21, 1931. Serial No. 517,424.

This invention relates to a piston ring and particularly the method of making the same, reference being had to my prior Patent No. 1,686,937 issued October 9, 1928.

One object of the invention is to produce a ring from a continuous strip of metal as distinguished from the usual cast iron rings, which may be peripherally grooved and/or perforated with baffles formed to extend between the side walls of the groove for supporting and strengthening the same.

A further object of the invention is the process of producing a grooved and/or perforated ring from a strip of metal whch enables the grooves and/or perforations to be more conveniently formed therein while the metal is still in the strip formation and prior to its being formed to the completed circular or individual ring formation.

Another object of the invention is to form a ring from a strip of metal either plain or perforated, and heat treating it with its free ends in closed aligned position during the process of manufacture, whereby the ring will hold such closed aligned position while passing through the grinder for grinding the side walls thereof, and for other purposes as will more fully appear from the following specifications and claims.

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

Fig. 1 is a side elevation of a strip of metal rectangular in cross section adapted to be passed through a drawing tool for forming a groove in one side thereof. Fig. 2 is a plan view of the strip with the groove formed therein after having passed through the drawing tool. Fig. 3 is a side elevation of the grooved ring of Fig. 2 passing through a punch for punching perforations in the groove thereof. Fig. 4 is a plan view of the strip showing the groove and perforations formed therein. Fig. 5 is a diagrammatic illustration of the method of coiling the grooved and perforated strip into a spiral of a diameter suitable for the production of the finished ring. Fig. 6 diagrammatically illustrates the coil of Fig. 5 mounted upon a mandrel for cutting the same into individual rings. Fig. 7 shows a plurality of the split rings mounted on a cylindrical mandrel and clamped in position with their free ends in abutting alignment for heat treating the same. Fig. 8 is a diagrammatical illustration of the rings passing between surface grinders. Fig. 9 is a diagrammatical illustration of the ring placed upon a cylindrical mandrel having a relieved portion for heat treating the ring with its free ends spread apart. Fig. 10 is a side elevation of the mandrel with the rings mounted thereon as shown in Fig. 9. Fig. 11 is a perspective view of the finished ring of the perforated groove type. Fig. 12 is a perspective view of a modified form of ring having baffles formed in the groove thereof. Fig. 13 is the same as Fig. 4 showing the modified form. Fig. 14 is a central longitudinal section through the strip shown in Fig. 13.

In the drawings there is shown in Fig. 1 a strip of metal 10 of indefinite length and having a cross section substantially that or slightly greater than the desired cross section of the ring to be finally produced. The strip 10 is passed through a drawing tool 11 of any suitable character for cutting therein the groove 12, as best shown in Fig. 2. As shown in Fig. 3, the grooved strip 10 is passed through a punching tool 13 of any suitable character for punching the perforations 14 through the bottom wall of the grooved portion 12 as best shown in Fig. 4. The groove and the perforations are thus formed in the strip of metal by passing the same through suitable tools while in its straight and unformed condition.

As best shown in Fig 5, the grooved and perforated strip 10 is coiled to substantially the desired diameter of the finished ring by passing the same between the rollers 15 against the roller 16 mounted in the coiling block 17 whereby the coil 18 is formed.

As shown in Fig. 6, the coil 18 is mounted upon a mandrel 19 which, as shown herein, is oval in cross section so as to permit the coil to be clamped against the side walls thereof disposed at an angle for permitting the cutting tool 20 to pass thereacross in the

direction of the arrow to cut the coil into individual rings 21 having bevelled free ends 22. Wherein it may be desired to have the free ends cut straight, the mandrel 19 would be of circular cross section.

As shown in Fig. 7, the individual rings 21 are placed upon a cylindrical mandrel 23 and secured thereon by the clamping head 24 with their free ends 22 in abutting alignment. In this form, the rings are heat treated. By reason of this step in the process, the formation of the rings is changed from a spiral section wherein the free ends are out of alignment, and spaced apart due to the cutting thereof. They are caused to take form by the heat treating process with the ends abutting each other in substantially true alignment. Thus, the normal spiral form with a gap is changed to a closed true ring formation.

The rings, after the heat treating process, are removed from the mandrel to have their side walls ground and dressed as by passing the same between the grinders 25 shown in Fig. 8. As the grinders therein rotate in opposite directions, the side walls of the rings passing therethrough, will be ground and dressed down to the desired dimension. Substantial advantage is obtained by the fact that the rings have been previously heat treated in aligned position with their free ends abutting. Wherein the rings are passed through the grinders 25 without the preceding step in the process, the cocked and spaced ends of the ring cause the same to become entangled and caught in the grinding action resulting in substantial damage to the rings and grinders. This difficulty is eliminated by the heat treating process of the preceding step.

After the side walls of the rings have been duly ground to the proper dimensions, the rings are then placed over the mandrel 26 shown in Fig. 9, which mandrel is peculiarly shaped in cross section so as to spread the rings whereby their free ends 22 are spaced apart to substantially the extent desired for the free position thereof. That surface of the mandrel indicated at 27 which is adjacent the free ends of the rings is relieved so that in the spreading action exerted on the rings, the free ends thereof will be drawn inwardly out of the substantially true circular form. At the same time, the mandrel will exert an outward pressure on the rings in holding them in expanded position, throughout the entire inner surface thereof. In this position the rings are heat treated on the mandrel 26 with the free ends 22 of the rings extending inwardly from the substantially true circular position while the rings are held by the clamping head 28.

Thereafter, the rings have their outer surface ground which grinding removes the peripheral case and permits the free ends of the ring to move outwardly toward their circular form by reason of the variation in stress of the metal due to the grinding action. The mandrel 26 is so formed that the ring, after the processing above described, assumes a substantially true circular formation when in its normal or operative position. The heat treating of the rings on the relieved mandrel as shown in Fig. 9, tends to cause said ends to exert, when in normal condition, a radial outward pressure approaching that of the remainder of the ring.

In the modified form of the ring 110 as illustrated in Figs. 12, 13 and 14, the perforations 114 are formed in the groove 112 by cutting the metal and forcing up the tongues 115, said tongues being bent outwardly to extend between the side walls of the groove and bent thereagainst so as to strengthen the same and provide a baffle for oil passing therethrough to direct the same through the perforations 114. The base portion or bottom 116 of the groove intermediate the cutaway portion forming the ears, remains rigid and integral with the ring.

The perforations and outwardly turned tongues or baffles may be formed in any suitable manner in the strip of metal before it is coiled into annular formation for ultimate production into the finished ring structure.

The invention claimed is:

1. The process of forming split rings consisting in spirally winding a strip of metal into a helical coil, cutting the coil to form individual split rings, securing the individual split rings in position with their free ends abutting and in alignment with each other heat treating the same while in this position and thereafter finishing the rings to the desired form.

2. The process of forming split rings consisting in spirally winding a strip of metal into a helical coil, cutting the coil to form individual split rings, mounting the individual rings on a substantially cylindrical arbor, clamping the same in place thereon with their free ends in abutting alignment thereafter heat treating the rings while in this position and thereafter finishing the rings to the desired form.

3. The process of forming split rings consisting in spirally winding a strip of metal into a helical coil, cutting the coil to form individual split rings, securing the individual split rings in position with their free ends abutting and in alignment with each other, heat treating the same while in this position, and thereafter passing each of the heat treated rings with its ends in abutting alignment through a grinder for finishing the side edges thereof to the prescribed dimensions.

4. The process of forming split rings consisting in spirally winding a strip of metal into a helical coil, cutting the coil to form individual split rings, mounting the indi-

vidual rings on a substantially cylindrical arbor, clamping the same in place thereon with their free ends in abutting alignment and thereafter heat treating the rings while in this position, passing the heat treated rings with their ends in abutting alignment through a grinder for finishing the side edges thereof to the prescribed dimensions, and thereafter heat treating said rings with their free ends held in spaced relation and drawn inwardly from a true circle.

5. The process of forming split rings consisting in spirally winding a strip of metal into a helical coil, cutting the coil to form individual split rings, mounting the individual rings on a substantially cylindrical arbor, clamping the same in place thereon with their free ends in abutting alignment and thereafter heat treating the rings while in this position, passing the heat treated rings with their ends in abutting alignment through a grinder for finishing the side edges thereof to the prescribed dimensions, mounting said rings over a mandrel adapted to increase the diameter thereof by exerting an outward radial pressure thereagainst so as to spread the rings and cause the free ends to be spaced from each other, a portion of said mandrel being relieved for permitting the free ends to be drawn inwardly from a true circle, heat treating the rings when in this position and thereafter grinding the same to cause the said rings when in normal operative position to approach a true circle.

6. The process of forming split rings consisting in developing a longitudinal groove in a straight strip of metal, cutting oil passages in said groove, passing the strip of metal with the groove and passages formed therein through a spiraling device for causing it to assume a spiral formation, cutting the same to provide a plurality of split rings, spreading the rings to cause the separation of the free ends thereof and permitting said free ends to be drawn inwardly, heat treating the same and thereafter grinding the rings whereby they will be caused to resume their normal operative position.

7. The process of forming split rings consisting in developing a longitudinal groove in a straight strip of metal, cutting oil passages in said groove, passing the strip of metal with the groove and passages formed therein through a spiraling device for causing it to assume a spiral formation, cutting the coil into a plurality of individual rings, mounting said rings upon a substantially cylindrical arbor with their free ends in abutting alignment, heat treating the same in this position, passing said treated rings through a grinder for grinding the side surfaces thereof, mounting said rings upon a spreading arbor having a relieved portion for permitting the spaced free ends to extend inwardly from a true circle, heat treating the rings in this position and thereafter grinding them, whereby they will be caused to resume their normal operative position.

8. The process of forming an oil ring consisting in providing a strip of metal with a groove in one face thereof, punching perforations in said groove and bending the perforated portions thereof into said groove to extend between the side walls thereof and thereafter forming said strip into a substantially circular ring having spaced free ends.

9. The process of forming an oil ring consisting in providing a strip of metal with a groove in one face thereof, punching perforations in said groove and bending the perforated portions thereof into said groove to extend between the side walls thereof, spirally winding the strip of metal into a cylindrical coil, cutting the coil to form individual rings, mounting the individual rings about a spreading mandrel having a relieved portion whereby the free ends of the rings are drawn inwardly from a true circle, and heat treating the same.

10. The process of forming an oil ring consisting in providing a strip of metal with a grove in one face thereof, punching perforations in said groove and bending the perforated portions thereof into said groove to extend between the side walls thereof, spirally winding the strip of metal into a cylindrical coil, cutting the coil to form individual rings, mounting the individual rings on a cylindrical arbor and clamping the same in position with their free ends in abutting alignment, heat treating the same and thereafter passing said rings through a side wall grinder to finish them to dimension, mounting said rings upon a second expanding arbor having a relieved portion for drawing the free ends of the rings inwardly, heat treating the same and thereafter grinding the outer walls thereof.

11. The process of forming oil rings consisting in forming oil vents comprising openings therethrough while the material of the ring is in a continuous strip and prior to its circular formation, spirally winding the strip into a helical coil, cutting the coil to form individual split rings, securing the individual split rings in position with their free ends abutting and in alignment with each other, heat treating the same while in this position, and thereafter finishing said rings to the desired form.

In witness whereof, I have hereunto affixed my signature.

WALTER J. SIX.