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PACKING RING

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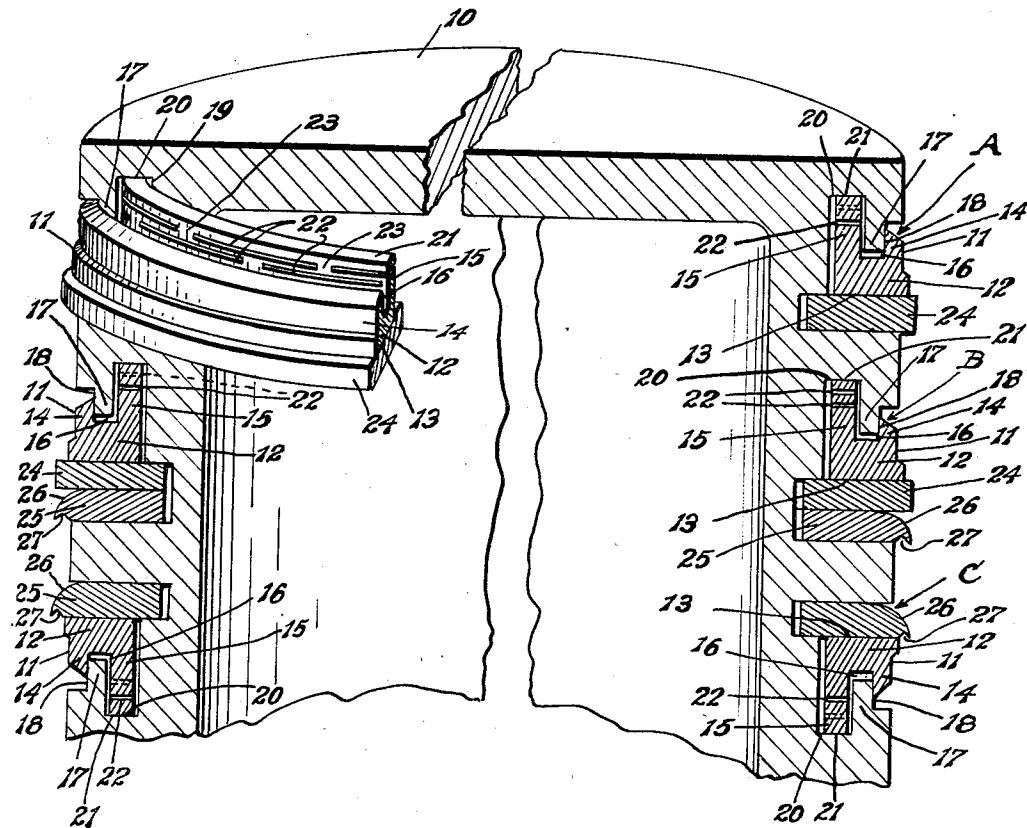


Fig. 1.

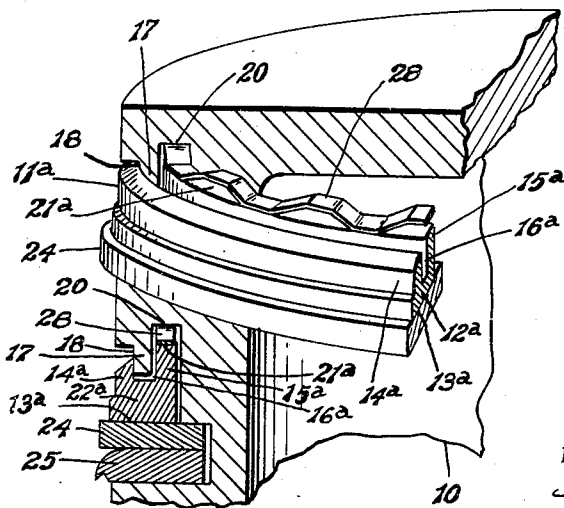


Fig. 2.

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PACKING RING

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3 Claims. (Cl. 309—28)

This invention relates particularly to metallic piston packing rings of the split type commonly used in internal combustion engines.

The objects of the invention are to provide a sectional ring wherein different sections are tensioned differently one from another; to provide one section tensioned to engage the cylinder wall and another to engage a circumferential wall of the piston; to provide one section tensioned to press in a direction normal to the direction of pressure exerted by the tensioning of another; to seat one section against the side wall of its groove by tension exerted by another section; to provide contiguous ring sections of which one section is expanding and the other contracting and of which the contracting section also presses laterally with respect to the other section and ring-receiving groove; to obtain better sealing against passage of compression gases in one direction and against passage of oil in the opposite direction between cylinder wall and piston; to obtain positive sealing of a ring with respect to the cylinder and yet maintain the ring responsive to proper flexing influences; to secure simplicity of construction, installation and operation; and to obtain other advantages and results as may be brought out in the following description.

Referring to the accompanying drawing in which like numerals of reference indicate similar parts throughout the several views:

Figure 1 is a perspective sectional view of a broken-away portion of a piston showing our invention associated therewith; and

Figure 2 is a similar perspective sectional view of an even more broken-away part of a piston, showing a modified construction of our invention.

Description:

In the specific embodiment of the invention illustrated in said drawing and particularly with reference initially to Figure 1, there is shown a conventional piston 10 having circumferential ring-receiving grooves wherein are mounted rings of the present invention. The illustration follows the now generally accepted practice of providing a "compression" ring A next the top of the piston, a "combination" compression and oil control ring B in the groove next below, and an "oil control" ring C in a groove still further down the piston. These several rings are each sectional, that is, each comprises contiguous sections and each section is mounted to have a limited radial movement within the groove.

According to the present showing of the inven-

tion we employ one section 11 which is the same in each groove. Said section 11 is shown in corresponding upper position in the upper two grooves and in inverted position in the lower groove and at the bottom of that groove. In each case, said section preferably has an inherent tension by which said section normally contracts or tends to hug the bottom of the groove. For convenience, therefore, section 11 will be referred to as the contracting section. This said contracting section is likewise arranged to be actuated laterally of the groove toward the other section in a direction from one side wall of the groove to the other. It will, therefore press against the side wall of the next adjacent section in the groove. According to the construction depicted in Figure 1, this lateral tension is obtained as an inherent quality of the section itself. In Figure 2 a separate means, hereinafter described more in detail, is employed.

Describing the said contracting section of Figure 1 in detail, the same comprises a radially disposed circular body portion 12 one side 13 of which engages flatwise against the contiguous ring section. At the other side of said body portion the section provides a pair of concentric ribs, referred to as outer rib 14 and inner rib 15. The ribs are separated from each other thereby forming an annular mortise 16. A co-operating tenon 17 projects from the side wall of the groove and into said mortise 16. The outer or circumferential wall of this tenon 17 is ground or otherwise constructed to provide a circumferential seat for the contiguous face of the outer rib, thereby providing a sealing contact surface 18. Both the inherent contracting tensioning of the ring section of the upper groove and the contracting moments of force applied by the compression of gases within the cylinder obtain a constant sealing at surface 18 between said rib and tenon. Oil pressure which builds up between piston and cylinder wall tends to seat the contracting ring-section of the lower two grooves.

Inner rib 15 of the contracting ring section projects further from the body portion 12 of said section than the outer rib, and is received in an undercut annular recess 19 of the groove. This recess has a radial dimension greater than the corresponding radial dimension of the rib so as to permit the ring section to respond to the contracting influences and seat the outer rib as above described. Said recess has its end wall 20 in a plane normal to the axis of ring and piston. The corresponding wall 21 of the rib toward said end wall 20 of the recess is likewise preferably

in a plane normal to the axis of ring and piston so in use the two side walls 20, 21 are parallel. In Figure 1, these two said walls are in flatwise engagement.

- 5 Near and parallel to the said wall 21 of the inner rib and extending radially through the thickness of the rib are a series of elongated narrow slits 22, consisting, if desired, of saw kerfs extending through the metal. The said slits are
- 10 made substantially in an end-to-end arrangement or series spaced apart at their opposite ends by solid portions 23 of the rib. Reasonably close to the first series of slits 22 is another series of slits 22 also having a similar end-to-end arrangement and spaced apart at their ends by solid
- 15 portions 23. The slits of the two series are arranged in staggered relation, each solid separating portion of the rib between adjacent ends of slits of each series being substantially opposite the mid-portion of a slit of the other series.
- 20 Thus is obtained means for providing pressure or compressive moment in the ring section in an axial direction or lateral to the inherent contracting tension of the said section.
- 25 Cooperating with the contracting section we provide one or more expanding sections in the same groove therewith. In groove for ring A is shown a single conventional expansion ring section 24 normally expanding against the cylinder
- 30 wall and radially slidable in the groove. This expanding section is shown with one side face flatwise against the opposite side face of the groove from the face thereof receiving the contracting ring, and is shown with the contracting
- 35 ring in flatwise engagement with the other side face of the said expanding section. The proportions of section and groove thicknesses, rib height and recess depth are such that the rib has to be compressed in height by virtue of the staggered
- 40 slits in order to admit conventional expanding section 24 in the ring groove with the contracting section. Thus the two sections are held in flatwise but slidable engagement with each other at their contiguous faces and the opposite face
- 45 of the expanding section or face thereof next the groove side wall is also held in flatwise slidable engagement therewith. A far better sealing against passage of compression gases and of oil over prior art rings is secured.
- 50 Bottom or oil control ring C is much the same in construction as the above-described compression ring but with these notable exceptions; the contracting section is the other side up in the oil control ring from its position shown where
- 55 used as a compression ring section, and presses against the under side of a conventional or other oil control ring section 25. The various parts, including ribs, recess, tenon and so forth, however, are the same. The oil control section differs from a compression section in permitting oil
- 60 to pass the ring on up-stroke of the piston. This function is accomplished by rounding the upper outer corner of the section, as at 26. The lower outer corner of this or any expansion ring section may be made more effective for scraping oil
- 65 by sharpening such corner, shown here done by an annular recession 27 on the under side of the section next its outer edge or periphery.

More than one expanding ring section may be used in a groove and those sections pressed toward each other and a side wall of the groove by a laterally compressible section, as shown in respect of middle ring B. That ring is shown with a contracting section 11 identical in structure and situation in the groove as described

with respect to the compression ring A. In this case, however, the groove is wider so as to receive two expanding sections contiguous one to the other and here shown as a compression section 24 and an oil-control section 25. The operation thereof will be understood from the foregoing.

In the modification of Figure 2, we have shown the section compressing means as a separable part from the contracting section. In this view, the contracting ring section and its parts are identified by same numerals as heretofore with addition of exponent α . The expanding ring section and sections as well as the piston may be identical with corresponding parts of Figure 1 and are identical by same numerals as in Figure 1. So far, therefore, as these parts are identical repetition of the description is not deemed necessary. The rib of the contracting ring-section in this instance is not the full height of its receiving recess and does not have the series of slits heretofore described. Instead, there is disposed at the flat wall 21 α of the rib, between said wall and the flat wall 20 of the recess 19, a wavy strip or other metal spring 28 which may be and must be compressed when locating the several sections in the groove. This metal spring 28 will accordingly hold the sections in flatwise radially slidable juxtaposition to each other and will hold the expanding section or sections seated at their opposite sides.

The invention is not limited to the sizes, proportions or clearances shown, as these have been exaggerated in some respects for greater clarity as to salient features described and hereinafter claimed.

We claim:

1. A piston ring comprising an annular body portion having a plane face at one side extending from the inner to outer circumferences of the ring, annular ribs integral with and at the opposite side of said ring from said plane face, said ribs being respectively next to the inner and outer circumferences of the rings and parallel to each other for providing a mortise groove therebetween opening in a direction directly opposite from the plane face, the rib next the inner circumference of the ring having means at the part thereof most remote from said plane face of the ring for resiliently pressing the ring when mounted in a piston in a direction toward and normal to said plane face of the ring.

2. A piston ring comprising an annular body portion having inner and outer circumferential faces and side faces at top and bottom of the ring, one of said side faces having an annular integral rib projecting in a direction away from the other side face and next the outer circumference of the ring, and the said one side face also having another integral rib parallel to the first said rib and next the inner circumference of the ring and projecting a greater distance than said first rib, the second mentioned rib having staggered slits extending circumferentially of the rib and entirely through the rib at a part thereof which projects further than the first said rib, said slits providing inherent resiliency of the rib in the direction of projection of the rib, and said ribs providing a mortise groove therebetween opening in the direction of projection of the ribs from the body portion.

3. A piston ring comprising an annular body portion having inner and outer circumferential faces and side faces at top and bottom of the ring, one of said side faces having an annular

integral rib projecting in a direction away from the other side face and next the outer circumference of the ring, and the said side face also having another integral rib parallel to the first said rib and next the inner circumference of the ring and projecting a greater distance than said first rib, resilient means situated upon the second mentioned rib which has the greater pro-

jection, said resilient means pressing upon the rib and urging the ring in use, and said ribs providing a mortise groove therebetween opening in the direction of projection of the ribs from the body portion.

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