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RADIAL PACKING FOR ROTARY PISTON MACHINES, ESPECIALLY INTERNAL COMBUSTION ENGINES

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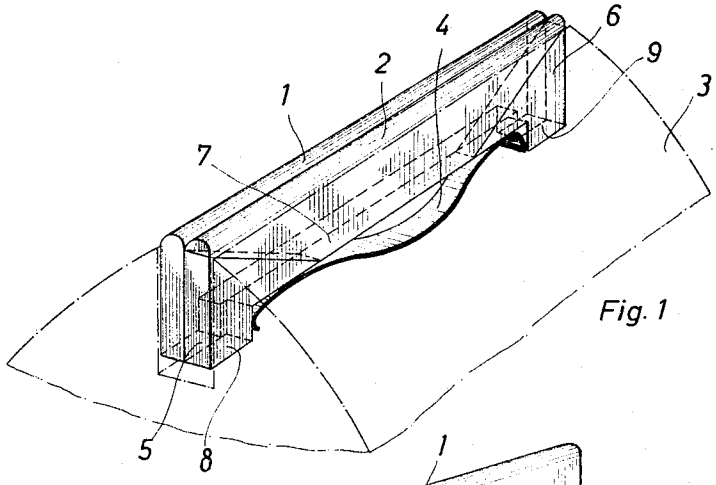


Fig. 1

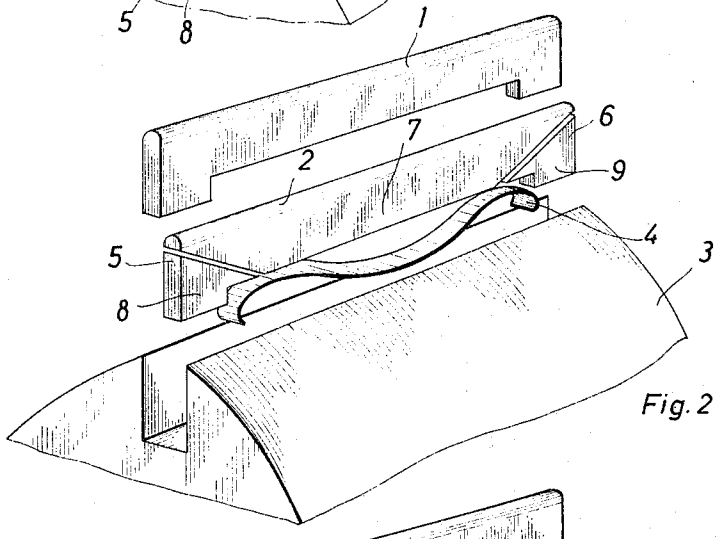


Fig. 2

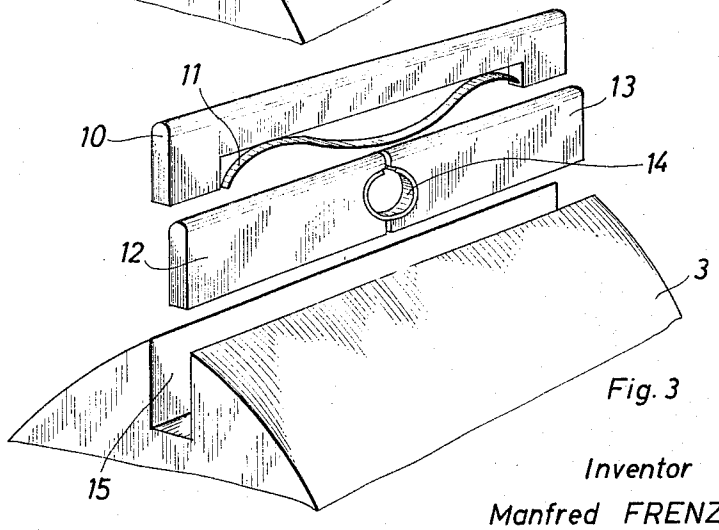


Fig. 3

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RADIAL PACKING FOR ROTARY PISTON MACHINES, ESPECIALLY INTERNAL COMBUSTION ENGINES

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This invention relates to rotary piston machines, and particularly, rotary piston internal combustion engines, and more particularly still, to sealing strip means for sealing the rotary piston of such a machine in its cylinder.

Rotary piston machines are, of course, well known, and include not only internal combustion engines, but also compressors, pumps, and the like. Such devices have a cylinder with a cavity consisting of a curved axial wall and radial end walls, and disposed in the cavity is the piston which rotates on a predetermined axis, and which at one or more points is required to be sealed to the inside of the cylinder along the axial and radial portions of the internal wall thereof.

It is known in such rotary piston machines to seal the piston to the cylinder by a plurality of packing strips positioned in a groove or a slot in the piston and movable relative to each other in both radial and axial directions for sealing the piston to the cylinder. In order to maintain effective sealing, particularly against the radial end walls of the cylinder during rotation of the piston, it was necessary to urge the strip laterally away from each other by means of springs, several of which are usually required for this purpose.

The primary objective of the present invention is the provision of an improved sealing or packing strip of the nature referred to, which produces superior sealing results than have heretofore been accomplished.

It is a further objective to provide a sealing or packing strip for a rotary piston which is more inexpensive to make heretofore known multiple-piece sealing or packing strips.

A still further object of this invention is the provision of a packing or sealing strip for a rotary piston in which the necessary number of springs is reduced over what have been required heretofore, thus making for economy and ease of assembly.

In general, the objectives of this invention are accomplished by mounting in a groove or slot in the piston, at least two strips, including a one-piece strip and at least one multiple-piece strip. The one-piece strip seals against the curved surface of the cylinder, whereas the principal purpose of the multiple-piece strip is to seal against the end faces of the cylinder at the ends of the piston. In this manner improved sealing is provided and the several parts of the sealing strip can be readily urged into sealing engagement with the cylinder.

In one form of the invention, the multiple-piece strip is formed of a center section and two end portions which engage each other by sliding surfaces that converge toward the center of the piston. In this modification a single leaf spring can be employed for urging all parts of the sealing or packing strip into effective engagement with the cylinder walls.

In another form of the invention, the multiple-piece strip comprises two end portions which approach each other in about the center of the axial length of the slot, and in this case one spring is employed for urging these end portions away from each other in the axial direction of the slot, while another spring urges the one-piece strip radially outwardly in the slot.

The single-piece strip is preferably on the advancing side and this will lead to improved results as the sealing or packing strip is required to move radially in the slot or groove as the packing strip passes over cam regions in the cylinder.

It is also contemplated to form the strip of different materials, the single-piece strip preferably being a high grade cast iron, while the multiple-piece strips are formed of carbon or a sintered material having good anti-friction properties, such as a sintered material containing graphite. Still further, the one-piece strip on the advancing side may merely have a hardened outer or advancing edge which might be provided by plating or by tipping the strip with a harder material.

The exact nature of the present invention will be better understood upon reference to the following specification, taken in conjunction with the accompanying drawing, wherein:

FIGURE 1 is a semi-diagrammatic, perspective view showing a sealing or packing strip according to the present invention, assembled in a slot or groove of a rotary piston;

FIGURE 2 shows the sealing or packing strip of FIGURE 1, disassembled; and

FIGURE 3 is a view like FIGURE 2, but shows a modified form which the strip can take.

In FIGURE 1, the packing or sealing strip comprises the individual strip members **1** and **2** located in a groove or slot extending axially in the outer periphery of piston **3**. The individual strip members are freely slidable in the slot so that they can follow the contours of the cylinder wall. A single leaf spring **4** is operable for urging the strip members radially outwardly in the case of member **1**, and both radially and axially in the case of strip member **2**.

Strip member **2** is composed of two opposite end portions **5** and **6** having radial end surfaces for engagement with the end walls of the cavity in which the piston rotates. Strip member **2** also comprises the center part **7**, and it will be observed that parts **5**, **6** and **7** are fitted together along inclined surfaces that converge from the outer ends of the strip member toward the middle of the strip member and towards the center of the piston.

The end portions **5** and **6** have feet **8** and **9** which extend somewhat further inwardly toward the center of the piston than the corresponding portions of strip member **1**. These feet **8** and **9** are availed of for engaging the ends of leaf spring **4** so that the said end portions **5** and **6** are pushed axially outwardly into sealing engagement with the end walls of the cylinder. Spring **4** also acts on one-piece strip member **1** and center portion **7** of strip member **2** and urges these members radially outwardly into sliding sealing engagement with the curved axial portion of the cylinder wall.

In the FIGURE 3 modification, the one-piece strip member is shown at **10**, and it is provided with an individual spring **11** which urges it radially outwardly in the slot or groove **15**. The multiple-part sealing strip member consists of the two end portions **12** and **13** having radial end surfaces to engage the end walls of the cylinder cavity, and with the two end portions approaching each other at their inner ends and being provided therebetween with a biasing piece **14** which urges the end portions axially away from each other in slot **15**. The radial faces acting on the multiple part strip member are derived from centrifugal force as the piston rotates.

The present invention provides for a relatively simple packing or sealing strip arrangement which is relatively inexpensive to make and assemble, but which provides for

good sealing engagement with both the axial and radial walls of the cavity in which the piston rotates.

It will be understood that this invention is susceptible to modification in order to adapt it to different usages and conditions and, accordingly, it is desired to comprehend such modifications within this invention as may fall within the scope of the appended claims.

What is claimed is:

1. Sealing strip means for sealing between a rotary piston, having at least one axial slot to receive the strip means, and a cylinder in which the piston rotates, comprising; at least two strip members in face-to-face relation slidably mounted in the slot in the piston, one of said strip members being a unitary member extending substantially the full length of the slot and having a continuous outer edge for sliding sealing engagement with the axial inner wall of the cylinder, and at least one other of said strips comprising a multiple part member having at least opposite end portions with radial end surfaces for sliding sealing engagement with the end walls of the cylinder at the ends of the piston.

2. The arrangement according to claim **1**, which includes spring means biasing said members toward the cylinder walls for effecting sealing engagement of the edges of said members with said walls.

3. The arrangement according to claim **1**, in which a single leaf spring is provided engaging both said unitary member and said multiple-part member and urging said unitary member radially outwardly in said slot, while simultaneously urging said end portions of said multiple-part member axially away from each other in said slot.

4. The arrangement according to claim **1**, in which individual spring means is provided for each said strip member urging said unitary member radially outwardly in said slot and urging the said end portions of said multiple-part member axially away from each other in said slot.

5. The arrangement according to claim **2**, in which said unitary member is disposed on the advancing side of said slot in the direction of rotation of said piston.

6. The arrangement according to claim **2**, in which said multiple-part strip comprises a central portion in addition to the said end portions, and interengaging inclined sliding surfaces on the ends of said center portion of the inside thereof, and on the outside of the inner ends of said end portions, said surfaces being inclined toward the center of the piston from the opposite ends thereof.

7. The arrangement according to claim **2**, in which the said end portions of said multiple-part strip member have their inner ends in closely spaced relation in said slot, and said spring means including an individual spring for urging said unitary strip member radially outwardly, and a spring positioned between the inner ends of the said end portions of said multiple-part member urging the said end portions axially away from each other in said slot.

8. The arrangement according to claim **6**, in which said spring means comprises a single leaf spring engaging said unitary strip member, and the center part of said multiple-part strip member, and urging the same radially outwardly in said slot and also engaging the said end portions of said multiple-part strip member and urging the same axially away from each other in said slot.

9. The arrangement according to claim **2**, in which said strip members are formed of respectively different materials.

10. The arrangement according to claim **2**, in which the said unitary member is on the advancing side of said slot in the direction of rotation of said piston, and comprises harder material than said multiple-part member, at least in the region of engagement of the unitary strip member with said cylinder.

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