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EXPANDING DEVICES FOR PISTON RINGS
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Fig. 1

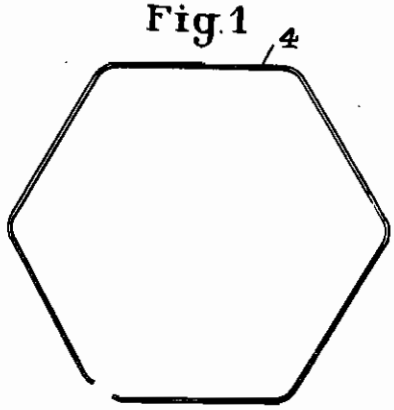


Fig. 2

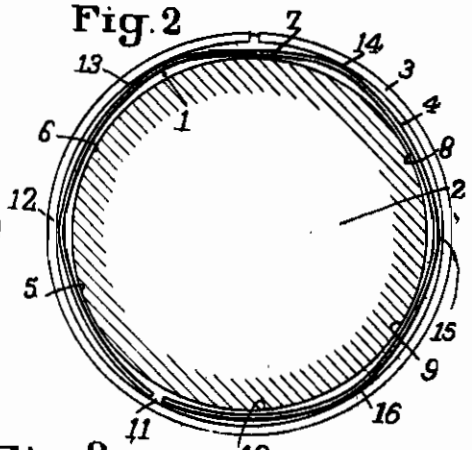


Fig. 3

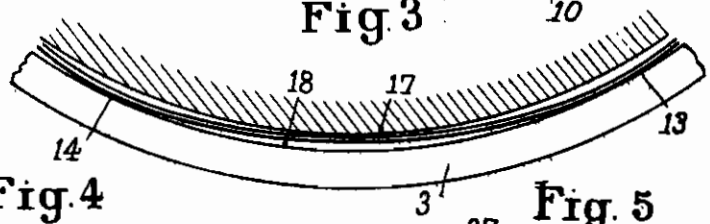


Fig. 4

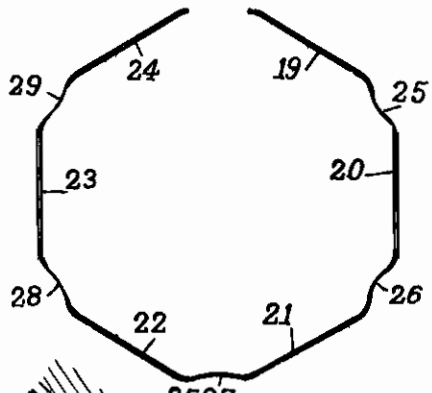


Fig. 5

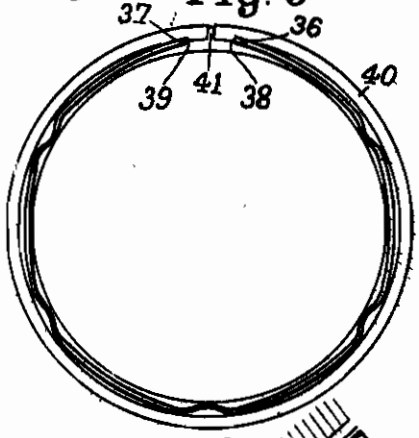
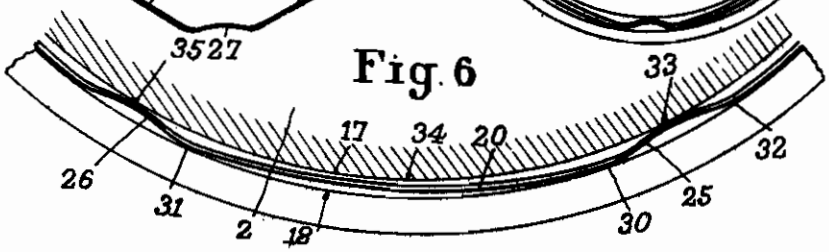


Fig. 6



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EXPANDING DEVICES FOR PISTON RINGS

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This invention relates to the expanding devices for piston rings and more particularly to a compensating device of such a nature.

The usual expanding devices for piston rings are, generally speaking, obtained by bending a steel blade or band so as to bring said band, for instance, to the shape shown in Figs. 1, 2, 3. The shape of said expander is a polygonal one as shown in Fig. 1. The apexes of the polygon may be rounded, while the sides are either straight or curved. The number of said sides is generally speaking from five to eight.

Such expanders are used in the following manner, shown in Figs. 1 to 3:

The expander is introduced into the groove 1 of the piston 2 (Fig. 2). The piston ring 3 is afterwards introduced into said groove and surrounds the expander indicated by the reference 4. As shown in said Fig. 2, the expander abuts in the very bottom of groove 1, as at 5, 6, 7, 8, 9, 10, about in the middle part of the length of each of the sides of the polygon constituted by said expander. Said expander forces the piston ring as at the points 11, 12, 13, 14, 15, 16, that is at the apexes of the polygon.

The distance between the bottom 17 of the piston groove and the internal face 18 of ring 3 is generally speaking a very small one. On another hand, the sides of the polygon constituted by the expander must have a rather important length owing to the fact that the length of such elements is an important condition of the resiliency of the expander.

It results of above two particulars that the curvature of the expander in its position of work takes place in the direction shown in Fig. 3, the center of said curvature being located inside of the geometrical figure constituted by the expander.

The piston ring is kept applied against the cylinder wall so that the external diameter of said ring is always equal to the internal diameter of the cylinder. Said diameter is variable if the cylinder is worn for the reason that the wear of the cylinder is unequal in the several parts of said cylinder, and more particularly in the upper end and in the lower end of the cylinder, so that the internal diameter of the piston ring is also a variable one.

Owing to the fact that the piston and the cylinder are both subjected to the wear, the piston has some clearance in the cylinders and may displace itself transversely in said cylinder.

Above consideration explains that the distance between the bottom 17 of the groove and the internal face 18 of the piston ring 3 is variable.

Let us consider an expanding element such as the one shown in Fig. 3; such element is comparable to a spring blade or sheet. The variations of the distance between the bottom of the groove 17 of the piston and the internal diameter 18 of ring 3 cause flexions of the spring sheet constituted by the expanding element of Fig. 3 to take place, said flexions being accompanied with displacements of the points 13 and 14 where the expander forces the internal face of ring 3.

The expander parts which are adjacent to the part of said expander shown in Fig. 3, are submitted to the same flexion as said part and even all parts of the expander are simultaneously subjected to said flexions. The simultaneous displacements of points 11, 12, 13, 14, 15, 16 add together and cause a considerable friction to take place between the expander and both the ring and the piston groove. Such friction reduces the resiliency of the expander and it may also in some way even prevent the action of said expander, which may result in the piston rings to be early worn.

The expander according to this invention, which remedies above drawbacks, comprises in combination with sides or parts of straight or curved active spring elements, compensating elements connecting the spring elements, said compensating elements having a resiliency different from that of the active resilient elements of the expander, for what concerns either the degree, or the importance, or the direction of the resiliency, or the combination of two or more of said particulars, with a view of preventing the totalisation of the displacements of the leaning points of the spring elements constituting the expander thus considerably reducing the friction of the expander, the resiliency of said expander being thus not hindered thus obtaining a better action of said expander.

In the accompanying drawings which show as an example of an embodiment of the invention, a preferred constructional form of expander according to said invention:

Figs. 1 to 3 are explaining figures showing the usual expander hitherto applied to piston rings,

Fig. 4 is a plan view of an expander according to this invention,

Fig. 5 shows said expander in a position of operation on a piston,

Fig. 6 shows on a larger scale a detail of the expander of Fig. 5, for showing the mode of operation of said expander.

The expander according to this invention com-

prises as shown in Fig. 4 a metal band bent under the shape of a polygon, the sides of which, 18, 20, 21, 22, 23, 24, which may be either straight or curved and which constitute the spring elements of the expander, are connected with each other by compensating elements 25, 26, 27, 28, 29, which have a sufficiently small length so as to allow said compensating elements to possess and keep in position of operation a curvature which is opposed to that of the spring elements constituted by the sides of the polygon.

It is clearly seen in Fig. 6, which shows the parts in position of operation, that the centers of curvature of the compensating elements such as 25, 26, are located outside of the polygon constituted by the expander, whilst for such a position of work the center of curvature of the spring elements constituted by the part 28 of the expander is located inside of the said polygon.

It is seen in Fig. 4 that the compensating elements 25, 26, 27, 28, 29, comprise a reduced thickness which is designed for increasing the resiliency of the spring elements of the expander. Such a result could also be obtained by reducing the width of the band which constitutes the expander at the places of the band which form compensating elements, or by perforating said band in the said places or in any other manner.

The points 30, 31 which constitute the ends of the part 20 of the expander, through which said part 20 leans against the internal face of the ring 3, tend to come nearer each other if the distance between the face 17 of the groove bottom and that 19 of ring 3, is reduced.

It is thus easily seen that the leaning points 30, 31 of the corresponding compensating element 25 tend to depart.

It is thus seen that a modification of the spacing apart of surfaces 19 and 17 results for instance in a reduction of length of arc 25, and an increase of the length of arc 20.

The shape of the expander is such that the total of the lengths of both arcs 20 and 25, remains unaltered for all the conditions of operation of said expander. The displacements of the leaning points 30 and 31 (Fig. 3) are thus absorbed by the friction of the compensating elements.

It results that the displacements of the leaning points of the spring elements constituted by the parts 18, 20, 21, 22, 23, 24 of the expander, are not to be totalised in the contrary of what happens in the hitherto used expanders shown in Figs. 1 to 3.

The leaning points 33, 34, 35 of the expander, on the bottom 17 of the piston groove 1, are unmovable. The friction of the expander is thus extremely reduced and the resiliency of same is not hindered.

The compensated expander may be rendered stationary relatively to the ring, for instance by locating the ends 36, 37, of said expander into recesses 38, 39 of the ring 40 located on either side of the gap 41 of said ring, as shown in Fig. 5. Of course, the compensated expander may be used without being hooked with said ring and it may be mounted in the manner shown in Fig. 2 for the known expander.

The expanders may be applied either to usual piston rings or to piston scraping rings. In the latter event the expander may be notched or perforated in order to allow the oil to pass inside the expander.

Instead of constituting the expander as a continuous band having a resiliency increased at the places of the compensating elements, said expander could be constituted by independent blades or sheets constituting spring elements, said blades or sheets being connected for instance by means of wires or blades, which may be thinner than the expander sheets themselves and having consequently a conveniently different resiliency, the connection of the compensating elements and of the sheets constituting spring elements being effected by riveting, soldering, pivoting, or anyhow.

The expander could also be constituted by a thin band or sheet having the polygonal conformation shown in Fig. 4, the parts which are to constitute spring elements corresponding to parts 19 to 24 of Fig. 4, being conveniently reinforced, said reinforcement being effected either by bringing on said parts additional sheets or blades, or in any other way.

The invention applies to expanders used for the tightening rings for pistons of motors, pumps, and like machines.

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