June 24, 1930. H. S. FRANK 1,766,498

PISTON RING SPREADER

Filed Sept. 13, 1926

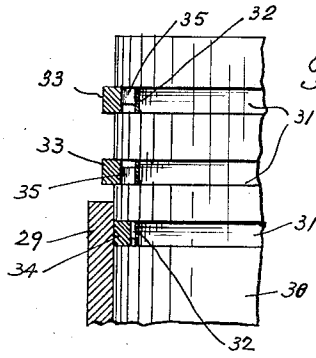

Fig. 10.

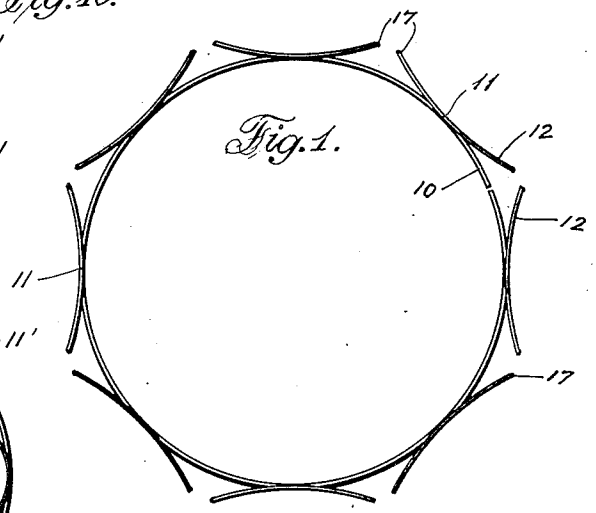

Fig. 1.

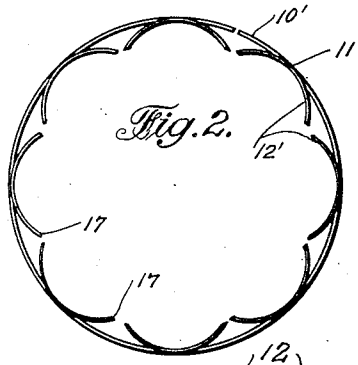

Fig. 2.

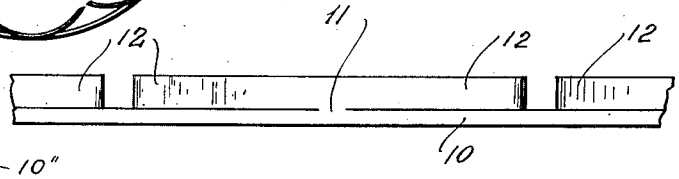

Fig. 4.

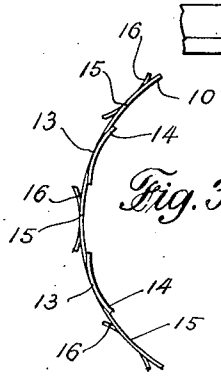

Fig. 3.

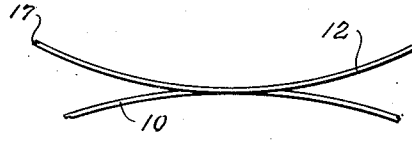

Fig. 5.

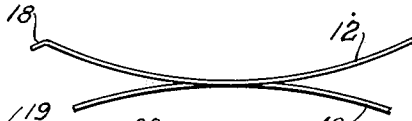

Fig. 6.

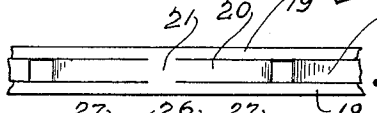

Fig. 7.

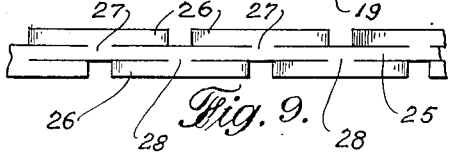

Fig. 9.

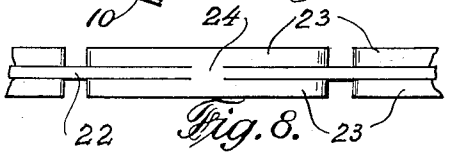

Fig. 8.

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PISTON-RING SPREADER

Application filed September 13, 1926. Serial No. 135,005.

This invention relates to piston ring spreaders adapted to impart additional expanding force to the inherent expanding tendency of the piston ring itself.

One object of my invention is to provide a device of this sort, which will assure the exertion of a uniform pressure against the entire circumference of the inner face of the piston ring, when the latter is in engagement with the cylinder.

Another object of my invention is to so construct the spreader as to provide a plurality of independent spring elements of uniform expansion pressure which will individually press outward portions or sections of the piston ring into intimate contact with the cylinder wall, and particularly in places where the cylinder wall is not perfectly round.

Another object of my invention is to form such independent spring elements from a band of resilient material in such a manner as to leave one or more relatively narrow supports or carriers for said elements which supports are looped or curved to readily slip into and stay in the ring groove, while permitting a relatively independent movement for each of said elements.

An other object of my invention is the manner of connection between such supports or carriers and said individual spring elements, which latter form an integral part of the band from which both carriers and spring elements are made. This connection constitutes virtually a tangential point of union, assuring the desired independent movement of each of said spring elements, which movement is neither restricted nor influenced by the carrier in any way, due to the fact that the elements are comparatively stronger and less flexible than the carrier, the latter being longer dimensionally and weaker in construction.

Another object of my invention is to equip the engaging ends of such individual spring elements with antifriction bearing faces to minimize or prevent the wear and tear of the parts engaged by the spreader.

The foregoing and further objects will be more fully apparent from the following description and the accompanying drawings showing a few of the preferred forms of my device, but which by no means are intended to restrict it to the construction shown.

Referring to the drawings, Figure 1 is a top view of one form of my device,

Figure 2 is a top view of another form of my device,

Figure 3 is a partial top view of my device showing a combination between the construction seen in Figure 1 and that illustrated in Figure 2,

Figure 4 is an elevation of a part of my device as shown in either Figures 1 or 2.

Figures 5 and 6 show top views in detail of portions of my device,

Figure 7 illustrates a modified form of my device in elevation,

Figure 8 shows another modified form of my device in elevation,

Figure 9 shows another modified form of my device in elevation,

Figure 10 illustrates a partial cross section view through a cylinder and a piston equipped with my device.

Referring to the drawings, in Figure 1 will be seen my piston ring spreader consisting of a carrier 10 bearing tangentially at points 11 a plurality of individual spring elements 12. The carrier 10 is curved circularly so as to readily slip into and stay within the piston ring groove while the spring elements 12 extend with their arms outwardly from that groove.

It will be seen in Figure 1 that the spring elements 12 are curved in opposite direction to the curvature of carrier 10.

In Figure 2, a carrier 10′ is shown, also curved circularly, and bearing at points 11′, spring elements 12′. In this case, the spring elements are curved inwardly so that the piston ring groove is engaged by their extreme points, while the rounded part of said elements engages the inner face of the piston ring.

In Figure 3, there will be seen a carrier 10″ which supports at points 13 upper spring elements 14 and at points 15 lower spring elements 16. Spring elements 14 are curved inwardly while spring elements 16 are curved outwardly.

The detail view shown in Figure 4 corresponds to either Figure 1 or 2. Carrier 10 is shown to be a continuous strip of practically one-third of the width of the entire band from which the carrier is made. The spring elements 12 are practically twice as wide as the carrier 11. The connection or joint between carrier 10 and individual spring element 12 is indicated at 11 and for all practical purposes may be termed a point of connection.

The construction of such a narrow point of connection is highly important when it is considered that the intention of this invention is to provide a plurality of independent, individually operable spring elements, exerting against certain sections of the piston ring the desired pressure to force the latter against the cylinder wall, no matter whether the latter is perfectly round or out of round. This feature is highly important, particularly in cases where replacement of the piston rings is made in engines, the cylinders of which have been worn out in one part of the cylinder or another.

The fact that even an out of round cylinder may be fitted correctly with piston rings so that they will at all points bear against the cylinder walls, in itself constitutes an important saving to both the owner and the mechanic replacing rings in an engine.

If the construction of my spreader would be such, that the carrier would be as stiff or stiffer than the individual spring elements, the pressure of one spring element would affect the function of the other spring elements. In such case, the intended advantage gained by my construction would be entirely lost for the reason, that the individual pressure exerted over comparatively small sections of the ring would be greatly impaired and instead of being uniform, would become one-sided.

To explain this function more clearly, a simple comparison, evolved by experiments, may be made between a solid spring member of a corrugated or octagonal shape placed between the piston ring, and the wall of the piston groove, and my device placed in the same manner. When the piston equipped with the aforementioned shaped spring is moved from one side to the other, the ring will stay in the position into which it is pushed. By moving the piston ring equipped with my device, it will assume its concentric position the moment the pressure is released.

From the foregoing it will be evident that the pressure of my individual springs exerted against the piston ring wall is uniform over the entire circumference of the ring, while the pressure exerted by the corrugated spring is not uniform. Furthermore, the stiffness and the friction caused by a substantially solid spring behind the piston ring does not provide the desired flexibility achieved by the individual spring tension exerted by my spring elements.

In order to reduce the friction between my spreader and the parts against which it bears, I have provided, as will be seen in Figures 5 and 6, rounded off bearing portions 17 or 18 at the extreme points of my spring members 12.

In Figures 1, 2 and 3, I have shown single carriers 10, 10′ and 10″, respectively.

In Figure 7, there will be seen a modification of my device where I provide a double carrier, indicated at 19, between which may be seen individual spring members 20 joined with the carriers at 21.

Another construction is shown at Figure 8 where against a single carrier 22 is illustrated. Instead of one individual spring member at one side of the carrier, there are provided in this construction two individual spring elements 23 arranged symmetrically at both sides of the carrier and joined with the same at points 24.

In Figure 9, a similar construction is shown where the carrier 25 bears individual elements 26 arranged staggered relative to each other. The upper spring elements are joined at points 27 while the lower spring elements are joined at points 28 with the carrier,

In Figure 10, I have illustrated, for the purpose of better understanding, a cylinder 29 and a piston 30 provided with grooves 31 into which are placed spreaders indicated at 32. In the upper two grooves there will be seen piston rings 33 extending beyond the face of the piston. In the lowermost groove there will be shown a piston ring 34 flush with the outer face of the piston. In the upper two grooves there will be seen that the spreader 32 with its individual spring elements 35 expand the ring 33 in outward direction and far beyond its natural, inherent expansion. In the lowermost groove the spreader 35′ is shown depressed, since ring 34 has been forced into the groove, having passed into the cylinder.

It is needless to say, that when employing my spreader, a much more flexible piston ring may be used, which means, that such ring may be of fairly lighter construction than rings used heretofore. It is a known practice that the construction of the rings of today is made in such a way, that when the rings enter the cylinder, they substantially completely fill the piston ring groove. Such heavy piston rings are naturally fairly stiff, and are very likely to break when expanded over the diameter of the piston, while being pressed into the groove. A flexible ring is therefore far more desirable, not only from the point of breakage, but also for the reason that a flexible ring will

more readily shape itself to the curvature of the cylinder, which in a great many cases is out of round, due to the wear exerted by the flapping piston. Objections to a light, flexible piston ring has been found in the lack of available outward pressure exerted by the ring against the cylinder wall. This disadvantage I have readily overcome by the employment of my spreader, which so-to-speak, reinforces the light ring and enables its successful employment.

Having thus described my invention, I claim:

1. A piston ring spreader, comprising a resilient band, divided longitudinally into two portions of uneven width, the one portion of lesser width forming a continuous strip or carrier of a certain curvature, the other portion constituting a continuous chain of adjacent, individual springs of other curvatures and of greater width than that of the carrier, said springs and said carrier being integral parts and formed from the material of said band, the joint between said springs and said carrier constituting minute tangential connections, each serving as fulcrum for its respective spring.

2. A piston ring spreader, comprising a resilient member divided longitudinally into continuous joint strips of unequal width, the strip of lesser width forming a continuous undivided carrier of a certain curvature, the strip of greater width forming a chain of individual springs of other curvatures extending from and connected with said carrier at relatively small tangential points.

3. A piston ring spreader, comprising a resilient member divided longitudinally into parallel, continuous, joint strip-like portions of unequal width, the width of each strip-like portion for itself being uniform, the portion of lesser width forming a continuous, undivided band of a certain curvature and serving as carrier for the wider portion, the latter consisting of a continuous chain of individual springs, having curvatures other than that of the carrier, and joined with the latter at relatively small, tangential points, each of which constitutes fulcrum for its individual spring.

4. A piston ring spreader, comprising a resilient member divided longitudinally into two parallel continuous joint strip-like portions of unequal width, the width of each strip-portion for itself being uniform over its entire length, the portion of lesser width forming a continuous, undivided, smooth ring-shaped band, and serving as carrier for the wider member portion, the latter consisting of a continuous chain of adjacent, individual springs, curved differently from the ring-shaped carrier, and divided transversely from each other, said springs being joined with said carrier at their center portions, which latter form relatively small points of connection and constitute a fulcrum for each individual spring.

5. A piston ring spreader, comprising a resilient band divided longitudinally into two parallel, strip-like portions of unequal width, separated longitudinally at intervals and remaining joined together at predetermined points, the width of each strip-like portion for itself being uniform over the entire length of the band, the portion of lesser width forming a continuous, undivided, smooth ring, serving as carrier for the wider portion, the latter consisting of a continuous chain of adjacent, individual springs, curved differently from the curvature of the ring, and separated from each other transversely, each spring forming substantially an equal-armed lever, the arms of which extend symmetrically from their tangential point of connection between the springs and the ring, which joint constitutes a fulcrum for the spring.

Signed at New York, in the county of New York and State of New York this 1st day of September, A. D. 1926.

HARRY S. FRANK.