Feb. 28, 1939. H. MAACK 2,148,764

PISTON RING

Filed July 30, 1938

Fig. 1.

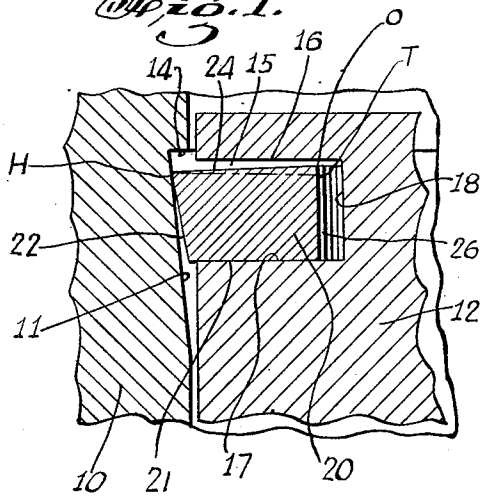


Fig. 3.

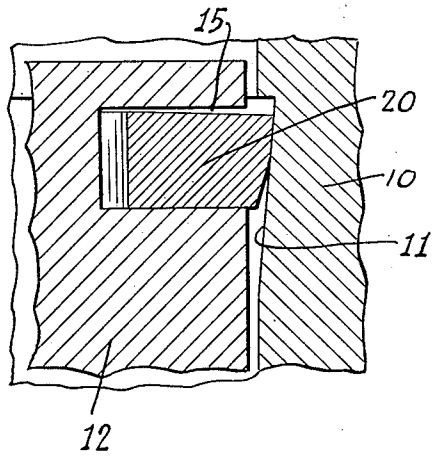


Fig. 2.

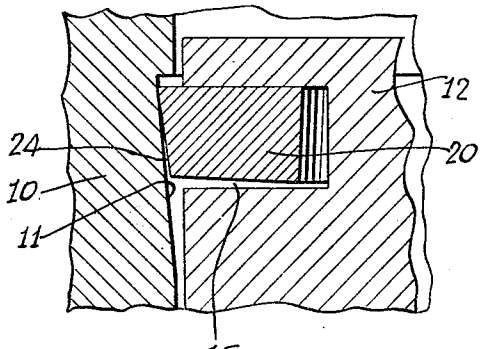
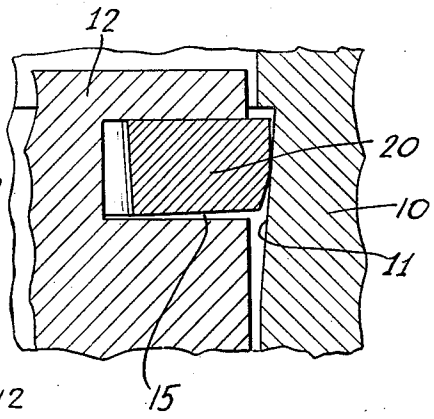


Fig. 4.



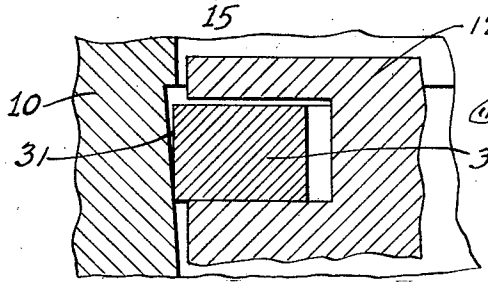


Fig. 5.

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PISTON RING

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Application July 30, 1938, Serial No. 222,076

3 Claims. (Cl. 309—44)

This invention relates to piston rings. It is particularly directed to a combination compression and fire ring for a Diesel or gasoline engine.

An object of this invention is to provide a ring of the character described, which may be effectively used when overhauling an engine which has an out of round or worn liner or cylinder wall at its highest point of ring travel, generally tapering down to a point (depending on the bore and stroke of the piston) of one and one-half inches to two inches below the highest point of ring travel, the construction of the ring being such as to provide a good seal with the inner surface of the cylinder, to prevent gases above the ring from entering between the ring and cylinder, whereby the gases will be forced behind the ring to exert a pressure tending to force the ring outwardly against the cylinder.

Another object of this invention is to provide a piston ring of the character described, having an upper surface tapered upwardly and inwardly and an outer surface tapered downwardly and inwardly, and of greater taper than the taper of the worn portion of the cylinder, whereby on the suction stroke the ring will adapt itself almost to the worn portion of the cylinder, and on the compression stroke, the upper outer peripheral corner of the ring will not strike the upper corner of the worn part of the cylinder.

Yet another object of this invention is to provide a strong and rugged piston ring of the character described, which shall be relatively inexpensive to manufacture and yet practical and efficient to a high degree in use.

Other objects of this invention will in part be obvious and in part hereinafter pointed out.

The invention accordingly consists in the features of construction, combinations of elements, and arrangement of parts which will be exemplified in the construction hereinafter described, and of which the scope of application will be indicated in the following claims.

In the accompanying drawing, in which is shown one of the various possible illustrative embodiments of this invention,

Fig. 1 is an elevational, cross-sectional view of a portion of a cylinder and piston ring embodying the invention, illustrating the compression stroke;

Fig. 2 is a view similar to Fig. 1, but illustrating the suction stroke;

Fig. 3 is a view similar to Fig. 1, but illustrating a ring when about half its outer surface is worn to conform to the worn portion of the cylinder;

Fig. 4 is a view similar to Fig. 2, but illustrating the piston ring when the same has been worn; and

Fig. 5 is a view similar to Fig. 1, but illustrating a conventional piston ring.

Referring now in detail to the drawing, 10 designates a liner or cylinder having a downwardly and inwardly tapered worn surface 11 at the upper height of the stroke of the piston 12. The length of the worn portion depends upon the bore of the cylinder and stroke of the piston, usually extending one and one-half to two inches below the upper end of the stroke of the uppermost piston ring. At the upper end of the worn tapered surface 11 is a shoulder 14 indicating the highest point of ring travel.

In the drawing, the piston 12 is shown to be formed with a ring groove 15 having an upper land 16 and a lower land 17, and an inner surface 18. The groove 15, shown in the drawing, is the uppermost groove on the piston 12. Within the groove is a fire or compression piston ring 20 embodying the invention.

The ring 20 is annular and has a flat annular horizontal bottom surface 21, adapted to be seated on the lower land 17 of the groove 15 during the compression stroke. The ring 20 has an outer surface 22, tapering downwardly and inwardly, and preferably of greater taper than the taper of the worn surface 11 of the liner or cylinder, so that the upper edge of the outer surface 22, designated by letter H contacts the surface 11.

The upper surface 24 of the ring 20 tapers upwardly and inwardly. The point T where a horizontal plane passing through the point H cuts the inner surface 26 of the ring 20 is .001 inch to .0015 inch below the upper edge O of the inner surface of the ring. The angle between the surfaces 22 and 24 is preferably about 88 degrees.

Since the upper edge H of the piston ring at the upper end of the outer surface 22 contacts the worn surface 11, no gases can enter between the piston ring and the cylinder from the top, the gases passing between the upper surface 24 of the ring, and the upper land 16 of groove 15, and between the inner surface 26 of the piston ring, and the inner surface 18 of the groove causing pressure tending to force the ring against the liner for making a better seal.

Where a conventional piston ring 30 is used, as illustrated in Fig. 5 of the drawing, of rectangular, transverse cross-section, gases can enter the space 31 between the outer surface of the ring and the inner worn surface of the cylinder to equalize the outer pressure tending to keep the ring away from the cylinder wall. This condi-

tion often permits excessive amounts of gases at high temperature to pass to the next compression ring.

Since it takes considerable time for a new piston ring to wear down to conform to the inner surface of the cylinder, if a conventional ring is used, considerable gases will pass the second and third compression ring, causing break down of the oil and carbon on the piston and in the ring grooves, and often causing the engine to develop blow-by or passage of gases into the crankcase. Such a condition, with the use of a conventional ring piston in Fig. 5, is due to ineffective sealing during travel of the ring on the worn surface 11, where the efficiency of the top or fire ring should be highest.

Such ineffective sealing is obviated with the use of the improved piston ring 20, shown in the drawing, wherein the taper of the outer surface of the ring is downward and inward, as is also the taper of the worn surface 11 of the cylinder.

By making the taper 22 somewhat greater than the taper 11, the upper edge of the piston ring contacts the surface 11, hence, effectively preventing passage of gases above the cylinder, from passing between the piston ring and the surface 11.

In Fig. 2, the piston ring is shown during the suction stroke of the piston. During such stroke, the upper surface of the piston ring contacts the upper land of the groove 15. During said suction stroke, the outer surface 22 of the piston ring comes closer to the worn surface 11 of the liner; and furthermore, the clearance between the inner surface 26 of the piston ring and the inner surface 18 of the groove is greater at the bottom than at the top, due to the taper of the upper surface 24 of the ring.

Figs. 3 and 4 show a portion of the ring after it has been worn in about half of its surface. Due to the upward inclination or taper of the surface 24 of the piston ring, the upper edge H of the ring will not contact the inner edge A of the shoulder 14.

It will thus be seen that there is provided a device in which the several objects of this invention are achieved, and which is well adapted to meet the conditions of practical use.

As various possible embodiments might be made of the above invention, and as various changes might be made in the embodiment above set forth, it is to be understood that all matter herein set forth or shown in the accompanying drawing is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. A piston ring having a horizontal bottom surface, a cylindrical inner surface, an upwardly and inwardly tapering upper surface, and a downwardly and inwardly tapering outer surface.

2. A piston ring having a horizontal bottom surface, a cylindrical inner surface, an upwardly and inwardly tapering upper surface, and a downwardly and inwardly tapering outer surface, the distance between the upper edge of the inner surface of the piston ring and a horizontal plane passing through the upper edge of the outer surface of said piston ring, being between .001 inch and .0015 inch.

3. A piston ring having a horizontal bottom surface, a cylindrical inner surface, an upwardly and inwardly tapering upper surface, and a downwardly and inwardly tapering outer surface, the distance between the upper edge of the inner surface of the piston ring and a horizontal plane passing through the upper edge of the outer surface of said piston ring, being between .001 inch and .0015 inch, there being an angle of 88 degrees between said outer and upper surfaces of said ring.

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