Dec. 31, 1929. C. T. RAULE 1,741,436

HOLLOW PACKING RING FOR PISTONS

Filed April 21, 1923

Fig.1.

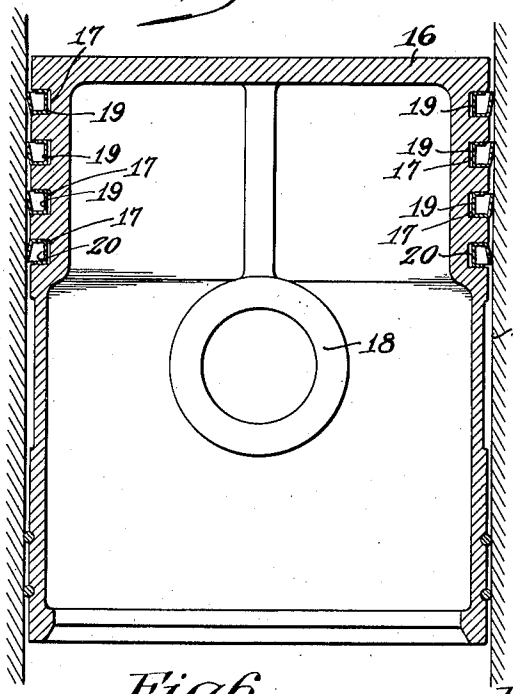


Fig.2.

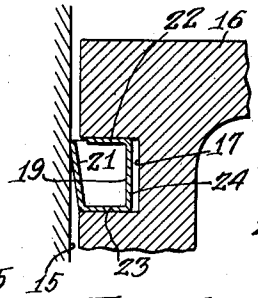


Fig.3.

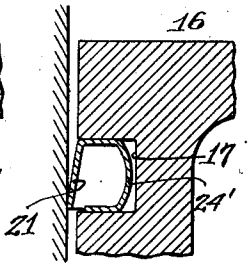


Fig.4.

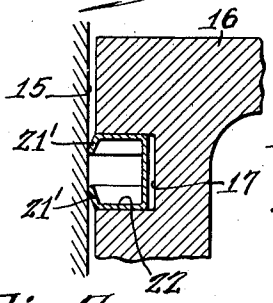


Fig.5.

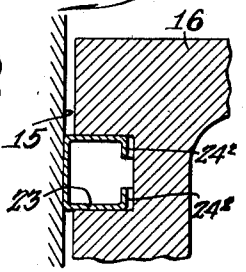


Fig.6.

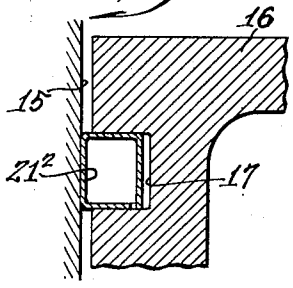


Fig.7.

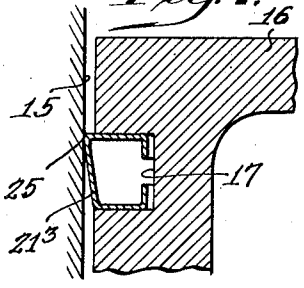


Fig.8.

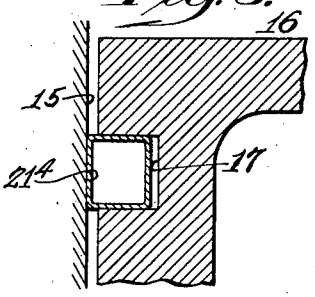


Fig.9.

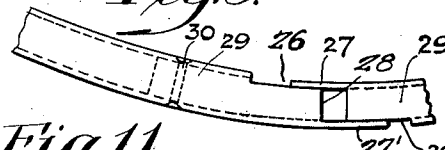


Fig.10.

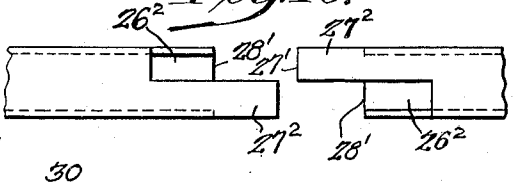
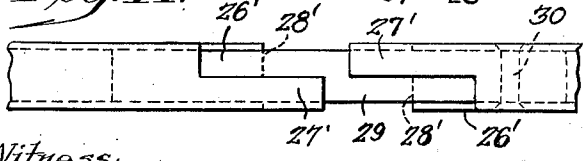


Fig.11.



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Patented Dec. 31, 1929 1,741,436

UNITED STATES PATENT OFFICE

CLIFFORD T. RAULE, OF BROOKLINE, PENNSYLVANIA

HOLLOW PACKING RING FOR PISTONS

Application filed April 21, 1923. Serial No. 633,584.

My invention relates to piston rings to prevent leakage past pistons in cylinder engines.

The main object of my invention is to make a hollow ring of pressed or spun metal that will at once adequately meet the requirements of service and be easy to manufacture, low in cost and easy to install.

A further object is to provide a hollow, one-piece, pressed or spun metal ring with a solid insert joint that will not leak.

A further object is to provide a ring that during the explosion or high pressure period within the cylinder will fit more snugly within its groove around the piston by reason of the higher pressure causing a lateral outward expansion of the ring.

A further object is to provide a ring that during the explosion or high pressure period within the cylinder will fit more snugly against the cylinder wall, by reason of the higher pressure causing a radial expansion of the ring.

A further object is to provide a ring that will also be a reservoir for oil and thereby serve to increase the efficiency with which the cylinder surface is oiled.

A further object is to provide a ring adapted to leave oil on the cylinder wall during the up or forward stroke of the piston and to gather oil from the cylinder wall on the down or return stroke, thereby resulting in more efficient and more economic oiling.

A further object is to provide a one-piece ring more easy put in place than the usual solid ring, being less stiff, and at the same time better adapted to meet the conditions of actual service in that its contact pressure against the cylinder wall automatically adjusts itself to existing need, varying automatically with the existing pressure, and in that further it is more locally resilient and thus better able to adjust itself to contact with the cylinder in local irregularities of the cylinder surface.

A further object is to provide a ring that is at once lighter, cheaper, easier to make, easier to put in place and more efficient in operation than existing rings.

Further objects will appear in the specification and claims.

In illustrating my invention I have preferred to show one main form with several modifications, selecting a form that well illustrates my invention and which at the same time is easy to make, practical and highly efficient.

Figure 1 is a broken section through a cylinder and piston with my rings in position.

Figure 2 is an enlarged broken section showing my ring in place.

Figures 3 to 8 are views similar to Figure 2 and show modified forms.

Figure 9, Figure 10 and Figure 11 illustrate different forms of joint between the ends of the ring.

In the drawings similar numerals indicate like parts, and the description following is in illustration, not in limitation.

Referring to Figures 1 and 2, 15 is the cylinder wall in broken section, 16 is the piston, grooved for rings at 17, with bearing for connecting rod at 18; 19 and 20 are my piston rings shown in place in sectional contour. This contour is such as to adapt it to fit rectangular grooves of the piston with the outer face slightly flaring to contact along one edge with the cylinder wall and form incomplete closure of the contour to leave a circumferential opening into the interior of the ring, with the result that this interior fills with oil and keeps the ring cool. The ring is reversible within the piston groove so that the flare of the outer side may be in either direction longitudinally of the cylinder, and the rings in the upper and lower grooves of the piston preferably are turned different ways, the flare and opening into the interior of the rings being in reverse direction in the upper and lower rings.

Thus in Figure 1, the flare and opening into the interior of the ring is upward in the upper rings, an arrangement that makes pressure within the ring responsive to the fluctuating pressure of the cylinder, and the contact pressure of the bearing edge against the cylinder wall automatically adjusts itself to existing need, increasing when the cylinder pressure and the consequent tendency to leak increases and diminishing when this pressure and the consequent tendency to leak

diminishes. Incidentally, the ring fills with oil and this reservoir of oil is of material assistance in keeping the ring cool, as it cannot overheat until all of the oil in this reservoir has volatilized.

With the lower ring, the flare and opening into the interior of the ring is downward, the arrangement being one in which the reservoir gathers oil on the down stroke and distributes it around the cylinder wall on the up stroke, thereby giving simultaneously greater efficiency and greater economy in the use of oil.

The flaring face 21 bearing against the cylinder wall circumferentially along one edge is locally resilient and thus able to adapt itself to local irregularities of the cylinder surface to an extent that is materially greater than is possible with solid rings. The sides 22, 23, and inner wall are here straight.

In the form shown in Figure 3, the inner side 24′ of the ring is made curved instead of substantially straight as in Figures 1 and 2; otherwise it is the same. This makes a ring slightly lighter but with principal characteristics as already described.

The form of Figure 4 is like that in Figure 2 except that there are two flaring faces, 21′, one from each side, and two edges of contact with the cylinder wall. While this form is less locally resilient and less responsive to adjust its contact pressure against the cylinder wall with variation in existing need as determined by variation in cylinder pressure, it has the advantage of contact with the cylinder wall along two edges instead of one.

In Figures 5 to 8 are shown forms with no outer opening into the annular interior of the ring. In Figure 5 the inner wall 24^2 is interrupted. In Figure 6 the division takes place at the inner edge of one of the sides. In Figure 7 the outer or front face 21^3 is at an angle to the axis of the ring and engages chiefly at the edge 25.

In Figure 8 the tube is closed.

In Figure 9 the two mating ends of a ring are shown in which the inner wall of the left end and the outer wall of the right end are cut away at 26, 26′ respectively to receive extensions of the inner wall at 27 and of the outer wall at 27′ respectively upon the right and left ends of the ring. The side walls terminate at 28 even with plug inserts 29, 29′ held in place by rivets 30, filling the interiors of the ends to shut off leakage across the otherwise hollow ring ends.

Instead of having the inner and outer walls cut all the way across at one end and extending in full width at the other end to fill the space, either or each of these cuts or overlaps can be arranged as seen in Figure 10 where the cut 26′ extends but half the width of the wall and the other half width of the wall is extended as at 27^2. In either event the plug 29 may be terminated at 28′ or may extend into the other end as in 29′, Figure 11.

These forms of joint are shown for the purpose merely of indicating that there are various ways in which the ends can be joined to prevent leakage capable of cooperation with the different forms of ring shown.

It will be noted that in most of my forms I add minor local resilience at the circumference to major resilience of the ring at its entirety thus obtaining more intimate contact of the ring edges throughout the width of the cylinder than could otherwise be attained. Along with this I obtain by-product advantages due to the effect of the explosion upon the flanges of the ring and the wiping of the oil from the interior of the cylinder to force it within the ring.

It will be obvious that my invention will suggest to others skilled in the art different ways in which the invention may be practiced, to follow the whim or preference of the designer or to avoid too close copying of my invention; it is my purpose herein to include all such other forms as follow within the reasonable spirit and scope of my invention even though they may not secure it full advantage.

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

1. In a piston ring, a hollow resilient metal ring adapted to be seated within a groove around a piston, the sectional contour of the ring presenting four sides, one at each end axially of the ring extending substantially radially of the piston and two, one of them uniting the other two, extending substantially longitudinally of the piston, the sectional contour of the ring being open and the ring interior being adapted to fill with oil.

2. In a piston ring, a hollow resilient metal ring adapted to be seated within a groove around a piston, the sectional contour of the ring presenting four sides, two extending substantially radially of the piston and two extending substantially longitudinally of the piston, one of the latter being open at the middle and flared from both sides toward the middle.

3. In a piston ring, a hollow resilient ring adapted to be seated within a groove around a piston, the sectional contour of the ring having four sides, two extending substantially radially of the piston and two extending substantially longitudinally of the piston, one of the substantially longitudinally of the piston extending sides being flared to contact with a cylinder wall and the ring being open adjacent the outer edge of the flaring side.

4. In a piston ring, a hollow resilient metal ring adapted to be seated within a groove around a piston, the sectional contour of the ring having four sides, two extending substantially radially of the piston and two ex-

tending substantially longitudinally of the piston, the open ends of the ring mating in a scarf joint, having a portion of one side at one end overlapping another portion of the same side at the other end, and the scarf being longitudinal of the piston, and a solid insert filling the hollow of the ring at the joint.

5. A piston grooved circumferentially to provide bottom and side groove walls and a hollow four-sided piston ring lying within the groove and having sides imperforate from edge to edge of its section and free to expand into engagement with the side groove walls and whose interior is open to the gas leakage pressure, whereby the leakage pressure is utilized to tighten the piston against the side walls of the piston groove.

6. A hollow piston ring of thin resilient material having four sides in cross section closing three of the sides of a generally rectangular section completely and partly closing the fourth side, of such size as substantially to fill the groove in the piton and the resilience making its sides expansible with leakage gas pressure to fill the width of the piston groove in a direction parallel to the length of the piston.

CLIFFORD T. RAULE.