April 23, 1957 H. M. OLSON 2,789,872

PISTON RING SPACER AND EXPANDER

Filed March 7, 1955

Fig. 1.

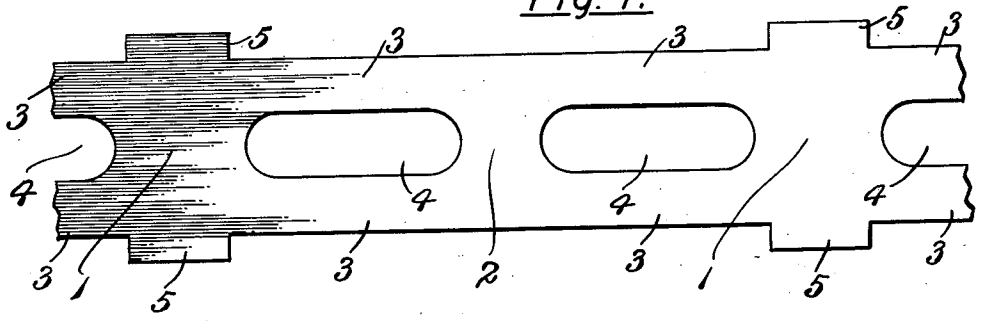


Fig. 2.

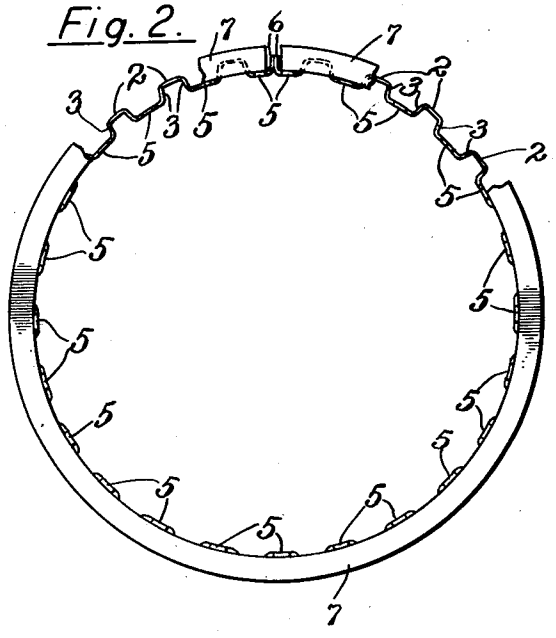


Fig. 4.

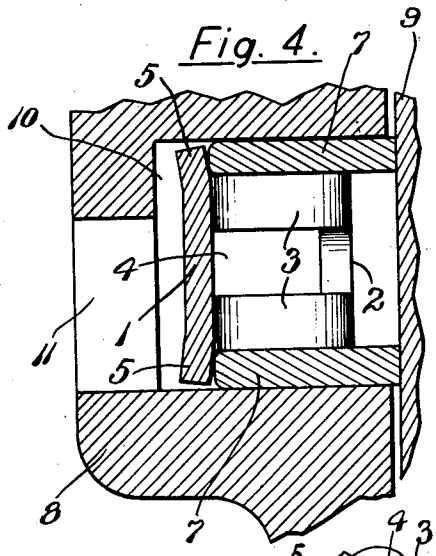
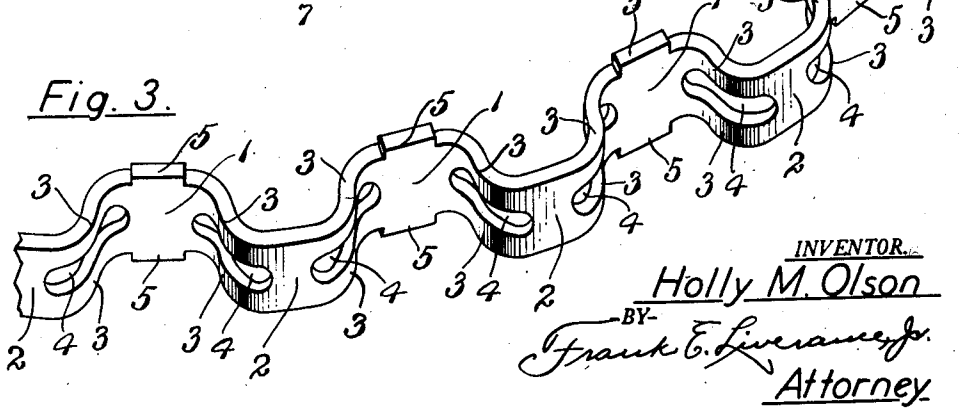


Fig. 3.



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PISTON RING SPACER AND EXPANDER

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2 Claims. (Cl. 309—45)

The present invention relates to a novel, one-piece, circumferentially, resistingly compressible spacer and expander adapted to be located between upper and lower thin metallic rails in the oil groove of a piston in an internal combustion engine. The construction devised which embodies my invention is expeditiously and economically made from flat ribbon stock having considerable resistance to strain but which in my invention, at generally equally spaced intervals, has portions which are reduced in cross-sectional area and formed so that the strain and deformation which is required to circumferentially compress the spacer-expander is reduced and controlled within desired limits.

The invention is an improvement upon and in connection with my Patent No. 2,637,607, granted May 5, 1953, the structure of which is altered and modified by providing oil venting slots at spaced intervals. The slots are centrally located between the rails which are associated with the spacer expander and provide ample oil passage direct to the bottom of the piston ring groove in which installed, with a return of excess oil to the crankcase of the engine. Such slots are also located so as to provide a controlled flexing tension when the spacer expander is compressed and the rails associated therewith closed at their partings. The inner edges of the rails are pressed against by upwardly and downwardly extending lips or pads of a height slightly less than the thickness of the rails, the rails being pressed against at spaced intervals, and all flexing of the spacer expander when circumferentially compressed occurs at such slotted portions of the expander. Such pads or lips at the sides where they bear against the inner edges of the rails may be inwardly inclined at an angle to the plane of the portions of the spacer expander with which integrally connected, whereby the rails are brought into a better and closer sealing engagement with the sides of the piston ring groove in which the installation of the spacer expander with its associated rails is made. Such desirable functions arise from such compressible character of the spacer expander which, made in one piece, there is no necessity for a bottom rest against which the expander engages. Equal and uniform performance is attained irrespective of the usual variations of the piston ring groove depth or its bottom construction, whether substantially closed or largely open.

An understanding of the invention may be had from the following description, taken in connection with the accompanying drawing, in which,

Fig. 1 is a fragmentary plan view of a portion of a length of the ribbon stock from which the spacer expander is made after the first step of manufacture has been completed for forming and shaping the material with outwardly extending pads or lips and spaced venting slots.

Fig. 2 is a plan view of the spacer expander of my invention having associated therewith the thin rails which

are used to complete a piston ring with such spacer expander closed at its parting at one side thereof.

Fig. 3 is a fragmentary perspective view, somewhat enlarged, of a section of the spacer expander made in accordance with my invention, and

Fig. 4 is a fragmentary enlarged vertical section through a piston and associated cylinder in which installed at the lower oil groove of such piston, with a piston ring including rails and the spacer expander of my invention installed in such groove.

Like reference characters refer to like parts in the different figures of the drawing.

The spacer expander of my invention comprises a member generally circular in outline, parted at one side and consisting in the main of a consecutive series of alternate inward and outward corrugations. The inner corrugations have crowns **1** and the outer crowns **2** which are connected by upper and lower connecting legs **3** separated by slots **4**. Such slots **4** paralleling the upper and lower edges of the spacer expander extend from the edges of the crowns **1** to and partly into the crowns **2** as shown in Fig. 3. From each of the inner crowns **1** a short lip or pad **5** extends at both upper and lower edges. Such pads extend upwardly above and downwardly below the edges of the spacer expander respectively and are of narrow width. The ends of the spacer expander member are turned outwardly in terminal lips **6**. (Fig. 2) which at adjacent sides abut against each other. It is apparent, as fully shown in Fig. 3, that each connecting leg **3** and each part thereof above and below the slot **4** therein has reversely curved end portions extending from a middle portion and that slots **4** reach from one curved end portion to the other, providing a readily controlled, uniform flexibility in the several connecting legs in circumferentially contracting the spacer and expander.

Such structure is made from a single length of flat metal material. The connecting portions between the inner and outer crowns, because of their location and because of the removal of the metal when the slots **4** are made, have flexibility so that they yield when the spacer expander member is contracted circumferentially, the abutting end portions **6** pressing against each other. It is evident that such spacer expander member is readily made from flat ribbon stock of a desired thickness, the openings provided by the slots at **4** being easily made by punching metal from the strip stock, the lips or pads **5** being left upon cutting metal between successive lips or pads at the side edges of the stock.

With such spacer expander, thin parted metal rails **7** are used, one at the upper and one at the lower side, the inner edges of which come against the outer sides of the lips or pads **5**. The corrugations extending outwardly from the crowns **1** lie between the upper and lower sides of the lower and upper rails respectively, providing support therefor and holding them spaced. The rails at their outer edges extend beyond the spacer expander a short distance but such outwardly extending corrugations provide ample and stable support for the rails. In practice it may be desirable to incline the lips or pads **5** at an angle, which may be between 5° to 25°, to the planes of the inner crowns **1** as shown in Fig. 4, so that the inner edges of the rails **7** pressing thereagainst will cause the inner portions of said rails to tend to move into a sealing engagement against the opposite sides of a ring groove in a piston in which the piston ring, consisting of the rails and novel spacer expander of my invention, is installed. The width of the lips **5**, that is, the distance they extend above and below the upper edges of the spacer expander member is such that the lips are readily received in the ring groove but do not reach to the opposite sides thereof.

In Fig. 4 a fragmentary portion of a piston **8** and its

location within a cylinder 9 is shown. The lower oil groove 10 in the piston has a drainage outlet 11 from the bottom of such groove to the interior of the piston. The piston ring installed in such groove, consisting of the rails 7 and the novel spacer expander of my invention, has the rails at their outer sides against opposed sides of the ring groove 10 and their outer edges bearing with pressure against the cylinder walls. The inner edges of the rails 7 are in tight engagement with the outer edges of the lips 5. The spacer expander is circumferentially compressed, causes forces therein which, because of the resistance of the spacer expander member to such compression, generates radial forces imparted by the lips or pads 5 to the rails 7 at their inner edges to cause them to bear at their outer edges with a desired unit pressure against the cylinder walls.

The spacer expander of my invention is sturdy and may be made of relatively heavy ribbon stock with the required flexibility coming from decreasing the cross sectional area of such stock by cutting the slots 4 therein which slots, being located in the legs of the corrugations which connect the inner and outer crowns, provide not only ample venting for the flow of lubricating oil through the spacer expander to the bottom of the ring groove, but lessen the resistance to bending or flexing which would be present if such slots were not used or made at the crown portions of the spacer expander.

Such spacer expander retains its necessary properties for effective operation in an increasing degree because of the strong and sturdy nature of the metallic ribbon material from which made. The life of use of such expander is thereby markedly increased.

The invention is defined in the appended claims and is to be considered comprehensive of all forms of structure coming within their scope.

I claim:

1. A spacer and expander for supporting, spacing and outwardly pressing generally flat, parted, thin rails in a piston ring comprising, a generally circular, corrugated length of flat metal ribbon stock having abutting ends and parallel longitudinal edges, the corrugations comprising an outer circular series of crowns having a straight outer portion and an inner circular series of crowns, the crowns

of the two series alternating with respect to each other and said two series of crowns being concentric, said alternate inner and outer crowns having integral generally diverging connecting legs extending from one to the other, each of said legs having a central portion and oppositely curved end portions integral with adjacent crowns, said legs each being longitudinally slotted between opposite edges, said slots extending into the crowns associated therewith, each leg having two spaced portions generally paralleling each other, the outer edges of said leg portions and edges of the outer crown portions being located between two spaced parallel planes, and each inner crown at each end thereof having an integral lip extending therefrom a predetermined distance beyond said planes.

2. A spacer and expander for supporting, spacing and outwardly pressing generally flat, parted, thin rails in a piston ring comprising, a generally circular, corrugated length of flat metal ribbon stock having abutting ends and parallel longitudinal edges, the corrugations comprising an outer circular series of crowns and inner circular series of crowns, the crowns of the two series alternating with respect to each other and said two series of crowns being concentric, said alternate inner and outer crowns having integral generally diverging connecting legs extending from one to the other, each of said legs having a central portion and oppositely curved end portions integral with adjacent crowns, said legs each being longitudinally slotted between opposite edges, said slots extending into the crowns associated therewith, each leg having two spaced portions generally paralleling each other, the outer edges of said leg portions and edges of the outer crowns being located in two spaced parallel planes, and each inner crown at each end thereof having an integral lip extending therefrom a predetermined distance beyond said planes, said lip being inclined away from the series of crowns.

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