March 7, 1944. R. M. ULRICH 2,343,719

PISTON RESIZER

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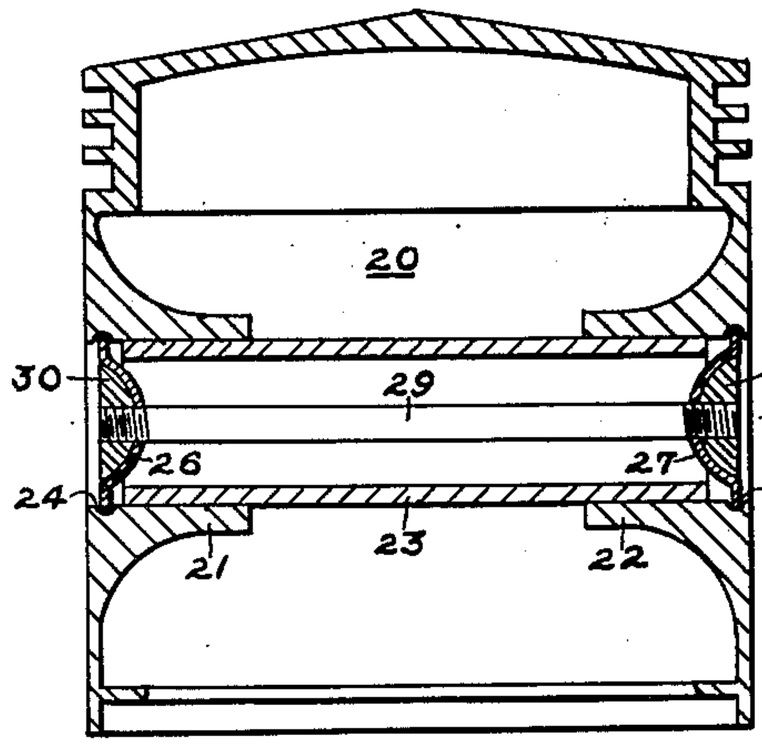

Fig. 1

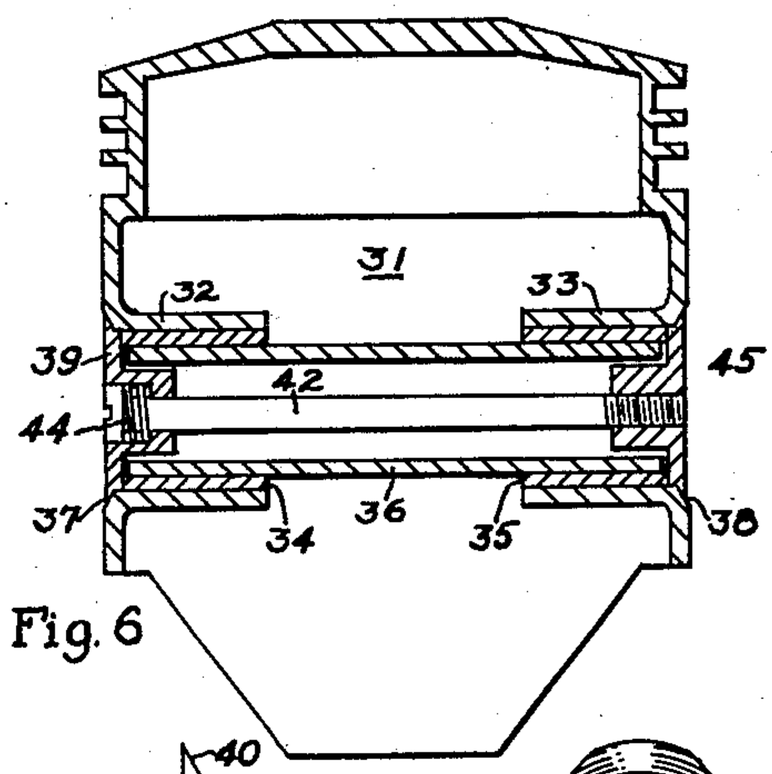

Fig. 6

Fig. 2

Fig. 3

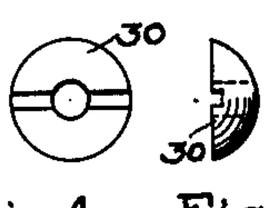

Fig. 4 Fig. 5

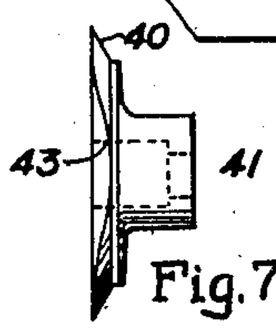

Fig. 7

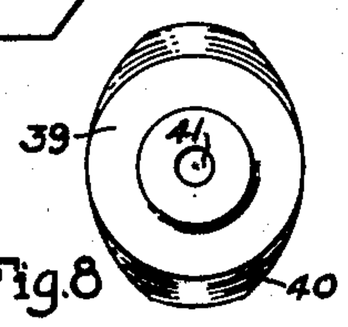

Fig. 8

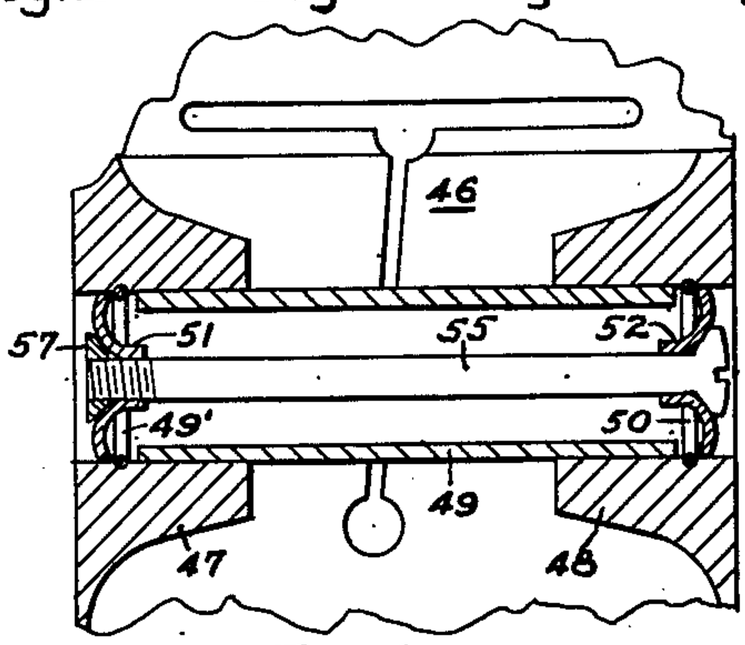

Fig. 9

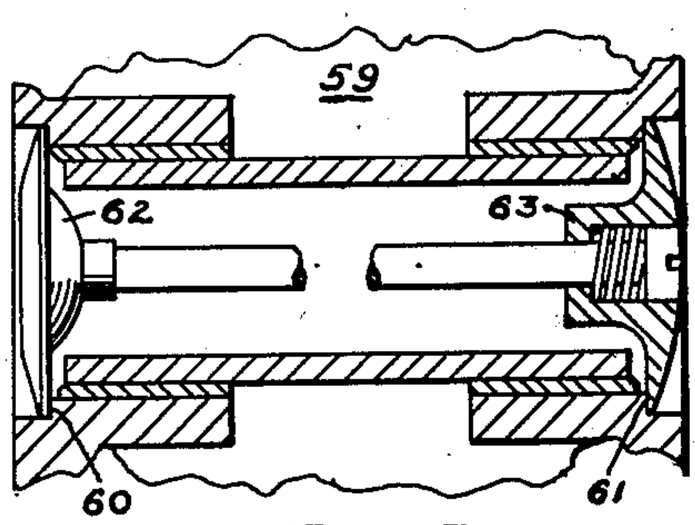

Fig. 13

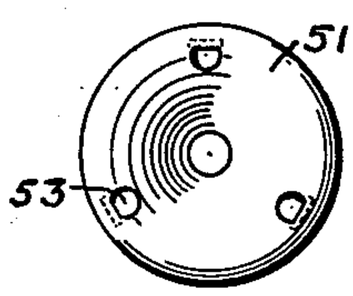

Fig. 10

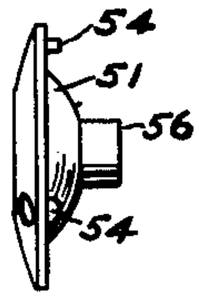

Fig. 11

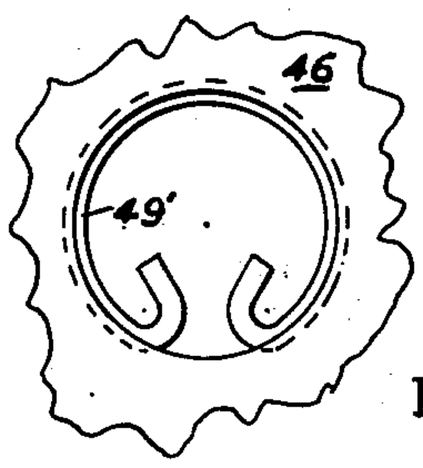

Fig. 12

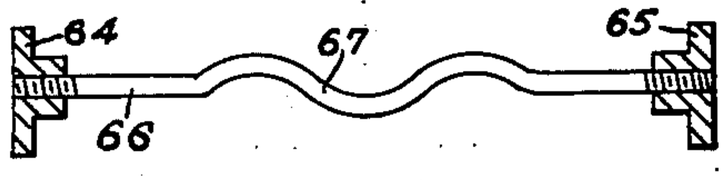

Fig. 14

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PISTON RESIZER

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Application November 19, 1940, Serial No. 366,289

5 Claims. (Cl. 309—12)

My invention relates to a method and means of resizing pistons to remove piston slap from internal combustion engines, and more particularly to a method and means for ovalizing the piston skirt of ferrous pistons.

Heretofore it has been common to utilize one of a number of devices for expanding the piston skirt of aluminum alloy pistons. More generally such devices were utilized with pistons having expansible piston skirts of the slotted type. In the aluminum alloy pistons, it has frequently been found that the piston skirt wears and collapses so that slap develops in the internal combustion engine. In ferrous pistons of the cast-iron or semisteel type, piston skirt collapse does not occur as frequently as in aluminum alloy pistons; nevertheless, it does occur at times, and the normal wear of the piston in the engine cylinder produces enough taper and clearance to cause the piston to slap. In the cases where this clearance is not very great it has frequently been desired to provide some arrangement, whereby new piston rings might be inserted without the necessity of reboring the cylinder and purchasing new pistons. It has been a substantially universal opinion that, in internal combustion engines utilizing cast-iron or semisteel pistons, it was impossible to remove the piston slap without reboring the cylinder and inserting oversize pistons. Because the metal and structure of ferrous pistons differs from aluminum alloy pistons, expanders suited for these later pistons can not successfully be utilized with ferrous pistons. In accordance with my invention, I propose to provide a method and means whereby the piston slap may be removed and new rings inserted without the necessity of reboring the cylinder.

It is, therefore, an object of my invention to provide a method and means for resizing pistons, particularly, those of the ferrous type.

A further object of my invention is to provide a method and means for ovalizing the piston skirt by increasing the diametric dimension of the skirt on the thrust sides at right angles to the axis of the piston pin bearings.

Still another object of my invention is to provide an improved device for ovalizing the skirt of a piston, such as ferrous pistons, with a minimum of labor and preparation for the installation of these devices.

The novel features which I believe to be characteristic of my invention are set forth with particularity in the appended claims. My invention itself, however, both as to its organization and method of operation, together with further objects and advantages thereof, will be understood better by reference to the following description taken in connection with the accompanying drawing in which Fig. 1 shows a piston utilizing my invention; Figs. 2, 3, 4 and 5 show parts of my invention as utilized in Fig. 1; Fig. 6 shows the application of my invention to a different type piston; Figs. 7 and 8 are side and end views of one portion of my invention utilized in the piston shown in Fig. 6; Fig. 9 shows another type of piston utilizing my invention; Figs. 10 and 11 are end and side views of one portion of my invention; Fig. 12 is an end view of the bearing opening in the piston for the piston pin together with a retaining spring; Fig. 13 illustrates several other embodiments of my invention as applied to pistons; and Fig. 14 shows another form of my invention.

Referring to Fig. 1 of the drawing, I have illustrated therein a piston 20 to which the method and means of my invention have been applied. The piston 20 represents one of the semisteel pistons in common use at the present time, such as, for example, pistons used in Ford automobiles. The piston 20 is provided with a pair of piston pin bosses 21 and 22 which are provided with bearing surfaces to receive a piston pin 23. Adjacent to the outer extremities of the pin bearings of the piston pin bosses 21 and 22 there are provided grooves 24 and 25, respectively. My invention comprises means utilizing a pair of circular disk-like members 26 and 27 which engage the grooves 24 and 25, respectively. Fig. 2 is an end view, and Fig. 3 is a side view of the circular disk-like members such as 26 and 27. From these figures, it will be apparent that along the circumference of a member such as 26 there are provided, at equally spaced distances, indentations 28 which together with the concave shape of the device 26 form a resilient member which snaps into the grooves 24 and 25. These members 26 and 27 are preferably made of steel so that they may be tempered to provide the proper degree of resiliency. The members 26 and 27 are connected together by means of a double-ended bolt 29, each end of which is provided with nut members 30 and 31, respectively. These nut members are shown in greater detail by the end and side views of Figs. 4 and 5, respectively. In order to lock into position the members 30 and 31, the ends of the double-ended bolt may be slotted so that the end of the bolt may be spread sufficiently to lock into position on the nut members 30 and 31 or the ends of the bolt may be locked by peening as the nut member may be

recessed to permit this. The bolt 28 together with the nut members 30 and 31 apply compressive force to the piston skirt adjacent to the bearing surfaces for the piston pin at points adjacent to the outer extremities of the pin bearings by means of the resilient members 26 and 27. The members 26 and 27 are preferably resilient so that they will readily retain their position in the grooves 24 and 25, and also, so that, under varying operating conditions of the piston 20, the dimensions of the piston skirt may also vary. The compressive forces introduced into the piston skirt by this method and these means increases the diametric dimension of the piston skirt on the thrust sides at right angles to the axis of the piston pin bearings throughout the entire length of the piston skirt. To thus ovalize the piston skirt is deemed to be in accordance with good engineering practice, since in a number of instances internal combustion engines have been provided with cam ground pistons, a cross-section of the skirt of which is not a true circle. The increase in the diametric dimension of the piston skirt at right angles to the piston pin, retains the position of the piston within the cylinder wall, so that when new rings are utilized with such a piston, they will have a long life thus producing continued efficient operation.

In Fig. 6 there is shown another type of piston in common use in automotive internal combustion engines. This piston 31 is provided with a pair of piston pin bosses 32 and 33 which are each provided with piston pin bearings 34 and 35, respectively, which generally are of a bearing material such as bronze. A piston pin 36 is mounted in the bearing members 34 and 35. Adjacent to the outer surfaces of the piston skirt in the proximity of the inner surface of the piston pin bosses 32 and 33 there are provided inclined surfaces such as 37 and 38 which may be utilized as bearing surfaces for the device embodying my invention. In this modification shown in Fig. 6, there is provided a member 39 which has a somewhat elliptical outline as will be apparent from Fig. 8, and which has inclined surfaces 40 as shown in Fig. 7 which engage the inclined surfaces of the piston such as 37 or 38. The member 39 is provided with a small opening 41 through which may be extended the body of a bolt 42. This member is further provided with a slightly larger opening 43, which is arranged to receive a spring member 44 and the head of the bolt 42. Another member 45 is provided for the other side of the piston, and this member is provided with a threaded opening for receiving the threaded portion of the bolt 42. In other respects the outer configuration of this member 45 is similar to the configuration of the member 39. The spring 44 serves as a resilient means to permit a certain degree of flexibility in the operation of the piston 31 to conform to the operating conditions and due to any taper which may occur in the cylinder wall.

In Fig. 9 I have shown the application of the method and means of my invention to a piston of the cast-iron type such as is commonly utilized in Chevrolet automobiles. The fragmentary view of the piston shown in Fig. 9 shows that this piston is of the T slotted type. This piston 46 is provided with a pair of pin bosses 47 and 48 which support a piston pin 49. The inner surfaces or pin bearing surfaces of the piston pin bosses 37 and 38 are each provided with a groove in which are mounted retainer spring rings 49 and 50, respectively. One of these spring ring arrangements is shown in greater detail in Fig. 12, which is an end view looking into the piston through the pin bearing. In this instance I utilize the spring members 49 and 50 as means for providing bearing surfaces adjacent to the outer dimensions of the piston, and adjacent to the piston pin bearing surfaces for applying compressive force to ovalize the piston skirt. In the arrangement illustrated in Fig. 9, there are provided a pair of members 51 and 52 which are preferably made of spring steel so as to be resilient. These members 51 and 52 are substantially equal to the diameter of the piston bearing openings in the bosses 47 and 48. The members 51 and 52 are also provided with a plurality of projecting members which have not been shown in Fig. 9 for the sake of clarity, but have been shown in Figs. 10 and 11. The device shown in Figs. 10 and 11 comprises the member 51 which has several openings therein, such as 53, and the metal punched from these openings is bent inwardly to form projections such as 54. These projections 54 are such that they serve to retain in position the spring members 49 and 50 when a compressive force is placed upon the members 51 and 52 by means of a bolt 55. The member 51 is provided with an extended portion 56 which is threaded to receive the threaded portion of the bolt 55. In order to provide a simple manner of locking the bolt 55 into position, there is provided a lock nut 57 which engages the outer extremity of the bolt 55.

In certain types of pistons where the commercial embodiments do not provide readily available surfaces for the application of compressive force to the piston adjacent to the outside of the piston in the proximity of the piston pin bearings, bearing surfaces may be readily formed by utilizing a cutting tool of proper size which is provided with a guide member which engages the piston pin bearing surface. Such a cutting tool is preferably provided with a suitable stop member so that the bearing surface thus formed is but a short distance beneath the outer surface of the piston. In Fig. 13 I have shown a fragmentary view of a piston 59 in which bearing surfaces 60 and 61 have been formed. I have shown how a device 62 similar to that shown in Figs. 9, 10 and 11 may be applied to the bearing surface 60, but it will be apparent that such a device which is similar to device 51 of Fig. 10 does not require the projections 54. Thus the member 62 is very similar to the members 51 and 52 shown in Fig. 9. Engaging the bearing surface 61, I have shown a device 63, having members similar to members 39 and 45 shown in Figs. 6, 7 and 8. From these examples it will be apparent that certain modifications may be made in the configuration of the device embodying my invention without departing from the spirit and scope of my invention.

In Fig. 14 I have shown another manner in which to provide a certain degree of resiliency between the cylinder and members of the device embodying my invention. In this arrangement the end members 64 and 65 are formed from relatively rigid metal, and these members engage bearing surfaces adjacent to the outside of the piston in the proximity of the piston pin bearing surfaces. The bolt member 66 is formed with a helical convolution or a plurality of sinusoidal wave portions 67 to provide the desired degree of resiliency. Such an arrangement may be particularly suitable to pistons of relatively

small dimensions such as, for example, pistons used in motorcycles.

While my invention is of particular value when applied to ferrous pistons, it has been found that it is also applicable to other alloy pistons.

While I have shown and described my invention in connection with certain specific embodiments, it will of course, be understood that I do not wish to be limited thereto, since it is apparent that the principles herein disclosed are susceptible of numerous other applications, and modifications may be made in the method and the instrumentalities employed without departing from the spirit and scope of my invention as set forth in the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. The combination comprising a piston and means for ovalizing the skirt thereof, said piston having a pair of piston pin bosses, a piston pin therein, a pair of recessed bearing surfaces located in the proximity of the outer surface of said piston and concentric to the piston pin bosses, said ovalizing means comprising a resilient member for each of said bearing surfaces, said member being concave and having a relatively thin uniform cross section and a bolt passing through the piston pin and both of said members, said bolt and said members cooperating to apply a resilient compressive force to said piston at said bearing surfaces thereby to increase the diametric dimension of said piston skirt at right angles to the axis of said pin bosses.

2. The combination comprising a piston having a skirt and a pair of pin bearings, each of said pin bearings being provided with a groove located adjacent the exterior of said piston, and means for applying to said piston at said grooves a compressive force, said means comprising a resilient pair of disk-like members and a bolt connecting said members together, whereby compressive force applied to said piston increases the diametric dimension of the piston skirt at right angles to said bolt.

3. The combination comprising a piston having a skirt and a pair of pin bearings, each of said pin bearings being provided with a groove located adjacent the exterior of said piston, a spring wire retainer located in each of said grooves for retaining in position a piston pin, and means for applying to said piston at said grooves through said spring wire retainers a resilient compressive force, said means comprising a pair of resilient disk-like members engaging said retainers and being provided with means for retaining in position said retainers, and a bolt connecting said members together whereby a compressive force applied to said piston increases the diametric dimension of the piston skirt at right angles to said bolt.

4. The combination comprising a piston having a skirt, a pair of pin bosses, a pin bearing in each of said bosses, a piston pin mounted in said bearings, a recessed surface for each pin bearing concentric therewith and located adjacent the surface of said piston skirt, with means for applying to said skirt a resilient compressive force to increase the diametric dimension of said skirt at right angles to the axes of said piston pin and bosses to change the cross sectional configuration of said piston skirt and to permit changes to occur in said configuration in accordance with temperature variations, said means comprising a resilient concave apertured disk-like spring member having a relatively thin cross-sectional thickness for each of said recessed surfaces, a bolt and nut for said members, said bolt passing through said piston pin and the apertures of said members.

5. The combination comprising a piston having a skirt, a pair of pin bosses, a pin bearing in each of said bosses, a piston pin mounted in said bearings, a recessed surface for each said pin bearing concentric therewith and located adjacent the surface of said piston skirt, with means for applying to said skirt a resilient compressive force to increase the diametric dimensions of said skirt at right angles to the axes of said piston pin and bosses to produce a distortion of the cross section of said skirt which may vary with temperature changes, said means comprising a bolt and nut, said bolt passing through said piston pin, and resilient means each interposed between one of said recessed surfaces and said bolt and nut.

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