Aug. 30, 1938. L. C. BURTON 2,128,451

INTERNAL COMBUSTION ENGINE PISTON

Filed March 1, 1932

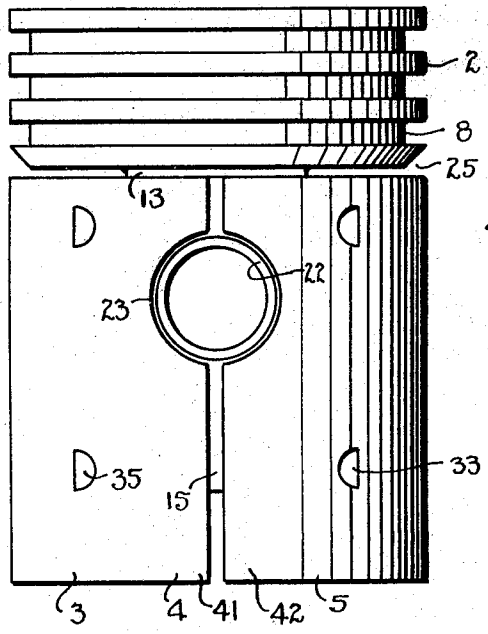


Fig. 1.

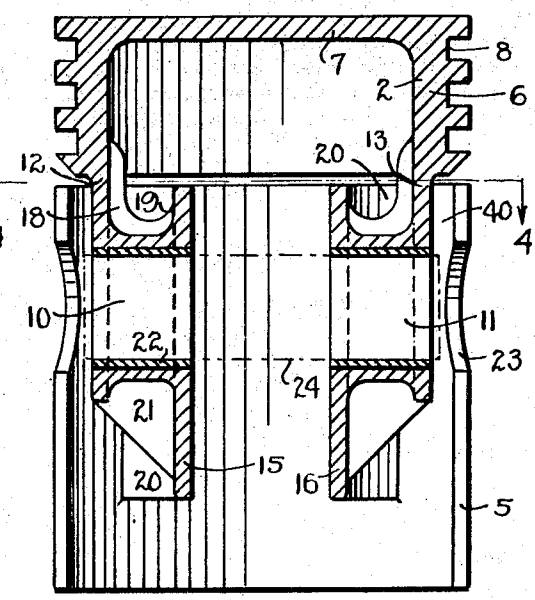


Fig. 2.

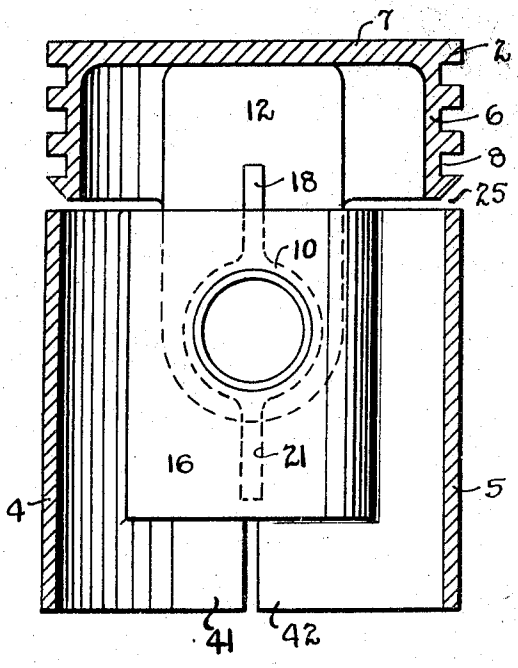


Fig. 3.

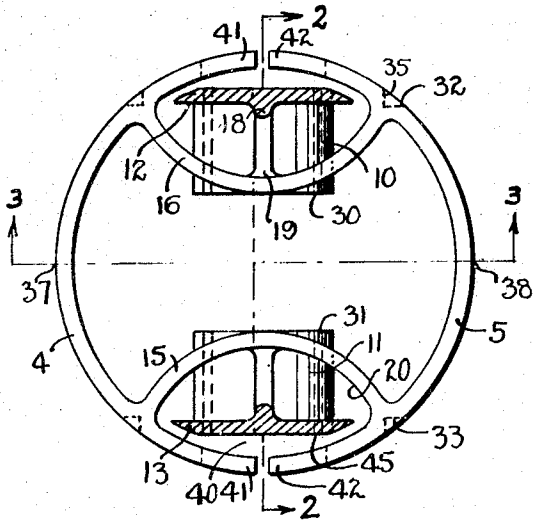


Fig. 4.

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INTERNAL COMBUSTION ENGINE PISTON

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3 Claims. (Cl. 309—11)

The invention relates to an improvement in pistons particularly of the type adapted for use in internal combustion engines.

In pistons now in general use the head and the skirt are composed of a unitary structure having a solid periphery. In event of expansion due to heat during the operation of the engine there is no provision for relative resiliency in the piston construction so that scoring of the cylinder wall will be avoided. When the cylinder wall becomes worn and is rebored it is then necessary to replace the piston with others of larger diameter. It is understood that various types of pistons adapted to be enlarged by the action of bolts or wedges have been devised but even in such pistons the construction is still rigid and does not permit of relative spring-like action of the piston with respect to the cylinder wall. In this invention a piston having relative movement of the various parts is contemplated and also a construction which can be expanded and still retain its elastic properties.

It is one of the objects of the invention to provide a piston having an independent skirt which is adapted for relative expansion and contraction.

Another object of the invention is to provide a skirt portion for pistons wherein the segments of the skirt are connected with an extensible portion formed integral with the segments of the skirt.

Another object of the invention is to provide an integral piston construction including independent relatively expansible head and skirt portions.

Another object of the invention is to provide a split skirt for pistons wherein the portions of the skirt are connected together with an integral spring-like arch so that there can be relative expansion and contraction of the skirt.

Another object of the invention is to provide a piston wherein the head portion has no direct connection with the skirt portion.

Another object of the invention is to provide a bearing support for pistons which bearing serves as the sole connection between the head and the skirt.

Another object of the invention is to provide a piston having a bearing construction which is indirectly connected to the skirt so that the skirt can be relatively moved with respect to the bearing.

Other and further objects of the invention will be readily apparent to those skilled in the art when the following description is considered in connection with the accompanying drawing wherein

Fig. 1 is a side elevation of the piston embodying the invention;

Fig. 2 is a central vertical section taken through the bearing and wrist pin illustrated in Fig. 1 and illustrating the structure along the section line 2—2 of Fig. 4;

Fig. 3 is a section taken at right angles to the section illustrated in Fig. 2 and illustrating the construction along the line 3—3 of Fig. 4;

Fig. 4 is a section taken on the line 4—4 of Fig. 2 and looking in the direction of the arrows.

The invention as here disclosed embodies the piston head 2 and the skirt 3, which is composed of the segments 4 and 5. While two of these segments have been illustrated, the piston may be made up with a different number. Viewing the section of Fig. 2, the head 2 is comprised of the side wall 6 and the top 7. These portions are preferably formed integral and provided with the annular grooves 8 to receive the usual piston ring. It is intended that any number of these grooves 8 will be provided and three have been illustrated in the present construction.

In order that the piston will be suitably connected to the wrist pin and connecting rod, two spaced bearings 10 and 11 have been provided. These bearings serve as a support for the struts 12 and 13, respectively. These struts are seen in horizontal section in Fig. 4 and comprise a flat, narrow bar which serves as the sole connection between the head and the remaining parts of the piston. The skirt is thus free of the head and has no direct connection therewith, because the connection of the skirt segments 4 and 5 to the bearings 10 and 11 is accomplished through the provision of bridges or arches 15 and 16 which are illustrated as being formed integral with each of the bearings 10 and 11 and connected to each of the skirt segments 4 and 5. One of these bridges is seen in front elevation in Fig. 3 and in section in Fig. 2, while Fig. 4 shows a top plan view illustrating the manner in which the bridge arches over the bearings 10 and 11 and is connected to the segments 4 and 5 intermediate their ends. The bridge 15 is connected to the bearing 11 while the opposite bridge is indicated at 16.

It should be noted, as seen in Fig. 2, that the struts 12 and 13 are connected to one edge of the bearings 10 and 11, respectively, whereas the bridges 15 and 16 are connected to the opposite ends of the bearings. In this manner additional flexibility will be had so that both the head and

the skirt segments can have relative movement with respect to each other and with respect to the bearing supports by which they are carried. In order that the thrust applied to the piston head 2 by the explosion in the engine can be transmitted properly to the bearing, a reenforcing rib 18 has been formed which tends to back up the struts 12 and 13 and blends itself in with the bearing 10 and terminates as at 19 against the inside face 20 of the bridge. A similar flange 21 is provided beneath the bearings to lend rigidity to the single line of contact of the bridge with the bearing. A suitable liner 22 may or may not be inserted in the bearing. Each of the skirt segments 4 and 5 is provided with suitable cutout areas 23, where they encircle the bearing so that the wrist pin may be inserted through the opening provided by these areas and properly positioned within the bearings 10 and 11. The wrist pin is shown in dotted lines at 24 in Fig. 2. The circular skirt segments or sections form a complete circle and are adapted to contact the cylinder wall over their entire area. Such a piston is generally termed a barrel type piston as distinguished from those pistons wherein parts of the skirt are set radially inward so that the skirt does not form a barrel or circle.

From the foregoing description it will be readily apparent that a piston has been provided wherein the heat transfer from the head of the piston to the skirt segments is indirect, in that it must pass through the bearing portions. There is a considerable area, as at 25, between the piston head and the top of the skirt, and the only portion through which the heat may pass is through the struts 12 and 13. These are of such small cross section that a very small amount of heat will be transferred and the skirt segments 4 and 5 will be practically independent of any influence due to excessive heating of the piston head.

One of the particular advantages of the present invention is the formation of the bridges 15 and 16. These bridges or arches serve as a more or less flexible or spring-like connection between the two segments or sections 4 and 5. This bridge is of a material which is suitable to be deformed and to maintain at all times a resilient pressure upon the respective segments.

With a solid piston construction it is necessary to leave a clearance when assembling the engine of .003 or .004 of an inch due to the fact that the piston is rigid and when subjected to heat will expand in the cylinder. Sufficient area is required to accommodate this expansion and if a relatively snug fit is provided on the piston the cylinder will be scored when the piston expands. With the present invention it has been found that the piston can be fitted to the cylinder with a clearance of only .001 or .002 of an inch because of the springlike or resilient connection between the segments 4 and 5. Thus, if desired, a ring clamp can be placed about the skirt of the piston and it can be inserted in the cylinder. This ring clamp will tend to arch the bridges 15 and 16 to cause a slight reduction in the diameter of the piston. There is no unyielding force, however, created against the cylinder wall because the bridges 15 and 16 will be arched in accordance with the pressure against the cylinder wall. When the piston is heated, if the pressure against the cylinder wall is increased, the bridges 15 and 16 will absorb any excess pressure and in this manner no scoring of the cylinder wall will occur.

The bridges 15 and 16 are of such construction that when the piston is properly fitted in the cylinder and under working temperatures they will normally exert an outward pressure on the segments 4 and 5 and maintain the segments in engagement with the cylinder wall to obtain a perfect fit of the piston at all times. The resilient mounting of these segments 4 and 5 is one of the essential features of the invention.

After the piston has been in use for some time or if it is desired to fit the piston to a slightly larger bore than that for which it is originally sized, the piston may be readily expanded or extended to increase its size at least several thousandths of an inch. This expanding or extension of the piston is accomplished due to its construction embodying the bridges 15 and 16. It seems readily apparent that if the bridges 15 and 16 are flattened to some extent the span will be accordingly lengthened. Any lengthening of the arch or bridge tends to move the segments 4 and 5 away from each other and in this manner increase the size of the piston. No adjusting bolts or rivets are required to obtain a larger diameter piston in the present invention. When it is desired to extend the diameter of the piston it is only necessary to attach a suitable clamp to the segments 4 and 5 and apply a pressure which will tend to flatten the bridges 15 and 16. Obviously when these bridges are flattened, the ends where they are joined to the skirt will be spaced further apart and the span of the bridge lengthened. One manner of accomplishing this extending movement is to place a wedge or block between the surfaces 30 and 31 of the bearings 10 and 11 and to then apply pressure at the points 32 and 33. This pressure will be axial with respect to the bearings and toward the center of the piston so that the bridges or arches will be flattened or elongated sufficiently to take a set after the pressure is released. The amount of permanent deformation of the arch will represent the amount of enlargement of the piston.

In order that a clamp may be suitably attached at this point the indentations or clamp seats 35 have been provided. If the bearings 10 and 11 are suitably braced and pressure is applied at the points 32 and 33, the bridges 15 and 16 will be flattened so that the points 37 and 38 on each of the skirts will be moved radially outward. It should be recalled that it is only intended to increase the diameter of the piston by a distance of several thousandths of an inch in order that it will be available to properly fit the worn bore of the engine or a rebored cylinder, or to fit a bore which is slightly larger than the original diameter of the piston.

In enlarging the diameter of the piston it may be necessary to insert a wedge in the space 40 between the flanges 41 and 42 of the segments 4 and 5, respectively. Such a wedge would be driven in between the end 45 of the bearing and the strut 13, so that the flanges 41 and 42 would be moved radially outward. After the clamping action and expansion of the flanges, if necessary the piston can then be properly ground or turned down to insure a perfect circle and to obtain the exact diameter of the piston required for the particular cylinder bore. While this operation may result in springing the parts slightly beyond their original elastic limit it has been found in practice to adapt the piston for a larger bore. In view of the very slight increase in size it has been found to be not detrimental to the piston. The resilient construction of the piston will avoid piston slap and prolong the service to be obtained.

As stated heretofore the present piston may

be fitted to the cylinder with a lesser clearance than pistons having a solid skirt, or with pistons having a split skirt whose adjustment is accomplished by means of extensible bolts due to the fact that the skirt segments are resiliently mounted with respect to the bearing. It should be noted that the arches 15 and 16 extend substantially the length of the skirt portion so that they will insure a proper support for the skirt and provide a sturdy construction. The action of the skirt in its resilient movement is entirely independent of the head which carries the piston rings and due to the springlike action of the bridges 15 and 16 the skirt segments will be pressed against the cylinder wall with a very small clearance at all times. In other words, the segments 4 and 5 will be permitted to have a relative movement with respect to the bearing supports so that they will fit themselves to the cylinder wall. It is believed that such a construction is of advantage because the segments 4 and 5 are capable of blending themselves into the contour of the cylinder wall regardless of whether such cylinder is a perfect circle or not.

While a specific form of the invention has been here shown and described it is contemplated that the relative resiliency of the skirt segments can be accomplished by other forms of construction and that the invention will only be limited by the scope of the appended claims.

What I claim as new is:

1. A piston including a head and a skirt, two spaced wrist pin bearings having struts extending from the outer ends thereof and connected to said head, said skirt being split into two sections along the axis of the wrist pin bearings and encircling said struts and bearings, and arcuate bridges having their arches attached to the inner ends of said bearings and one end of each bridge being attached to each section whereby said skirt may have relative movement with respect to said head or said bearings.

2. A barrel type piston having a separated head and skirt, two struts disposed within the confines of the head and skirt, a wrist pin bearing on each strut and extending inwardly therefrom, an arch bridge connected to the inner end of each bearing and curved with its ends connected on a radius on each side of the bearing to the skirt, and a split in the skirt radially outward from each bearing whereby expansion of the piston when confined in a cylinder will be absorbed by the arching of the bridges.

3. In a barrel type separated head and skirt piston wherein the wrist pin bearings are suspended from inside the head, a split skirt made in two sections, a bridge spanning each split in the skirt and a bearing so that expansion of the piston when confined will be absorbed by said bridges, said bridges being connected to said bearings and arching outwardly to connect to the skirt.

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