April 21, 1936. L. M. ATWOOD 2,038,404

ENGINE PISTON

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FIG. 1

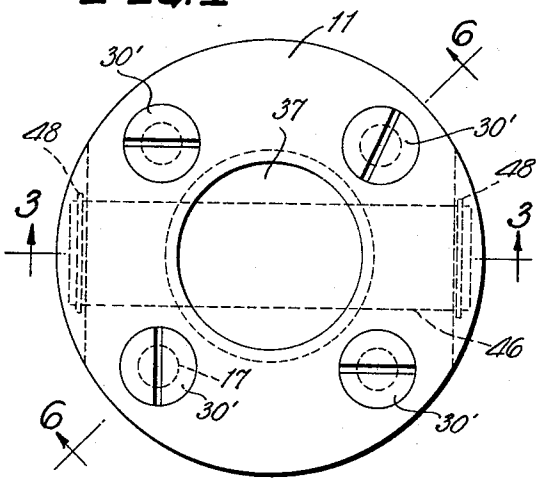


FIG. 2.

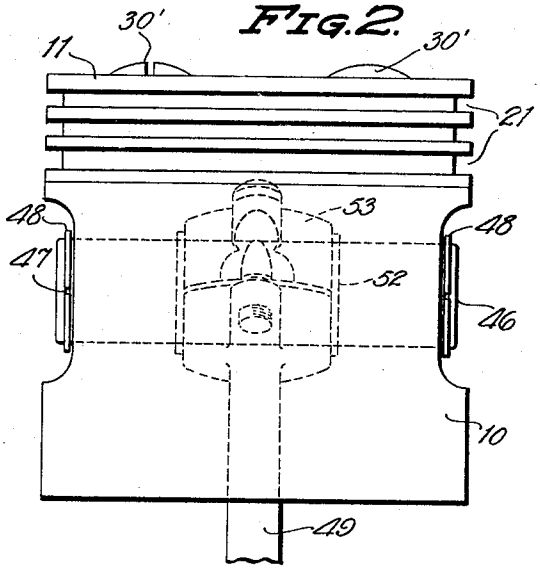


FIG. 3.

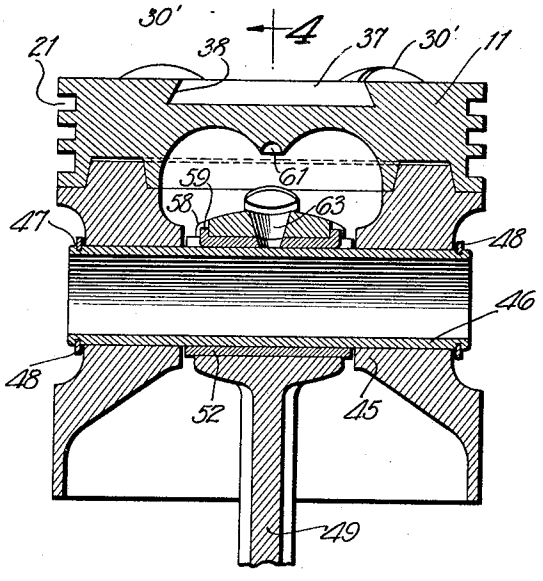


FIG. 4.

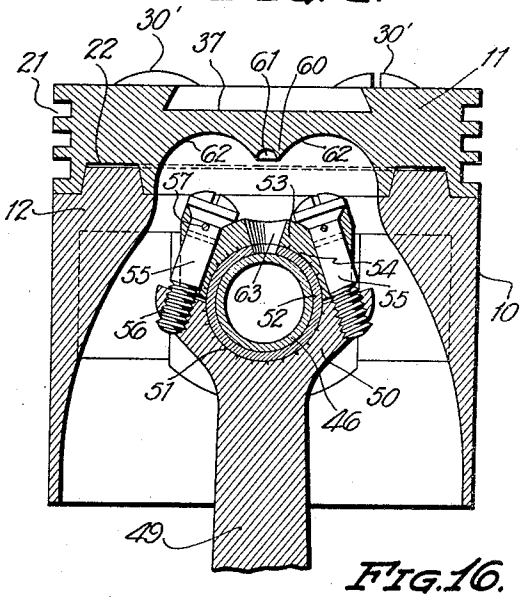
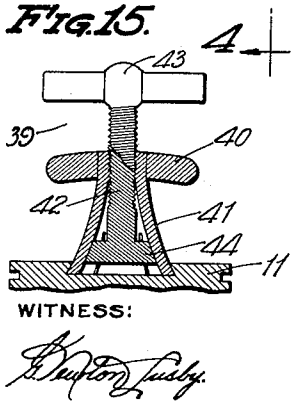


FIG. 15.



WITNESS:

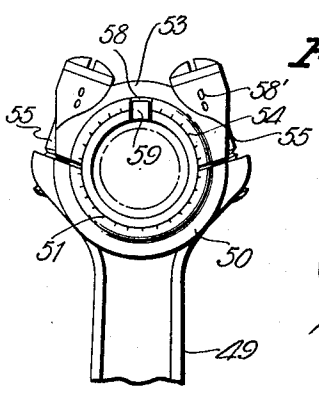
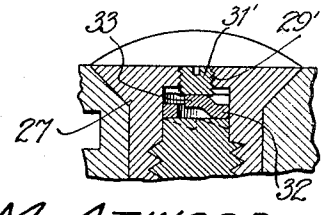


FIG. 5.

FIG. 16.



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FIG. 6.

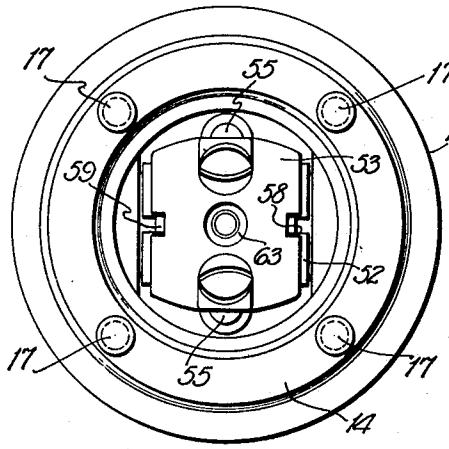


FIG. 7.

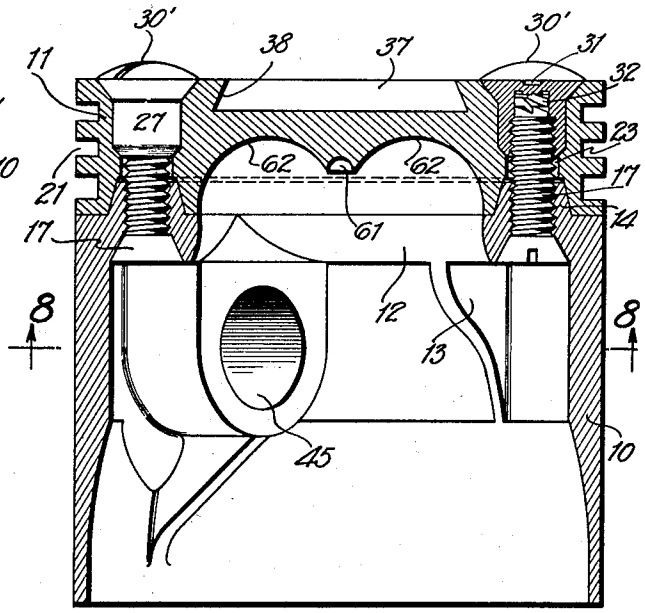


FIG. 9.

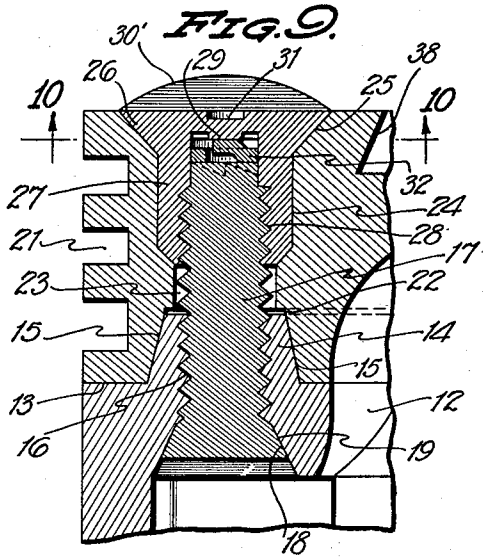


FIG. 8.

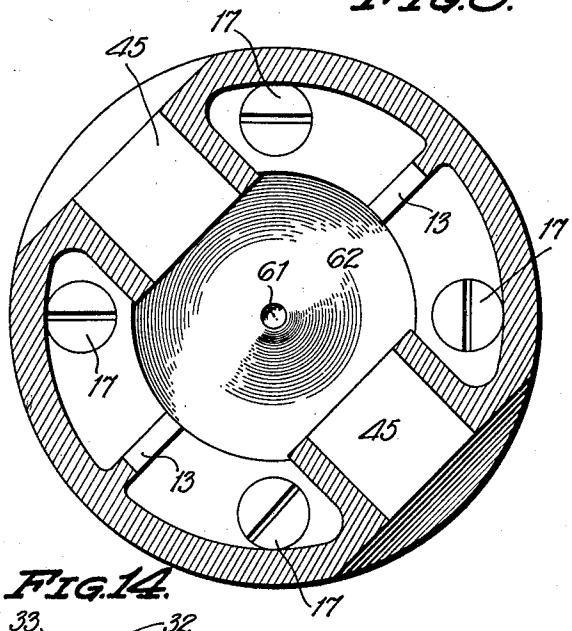


FIG. 10.

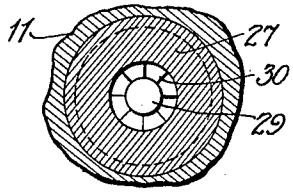


FIG. 11.



FIG. 12.

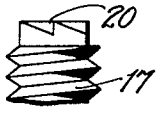


FIG. 13.

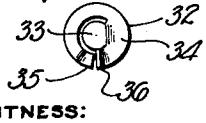
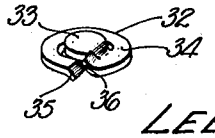


FIG. 14.



WITNESS:

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Patented Apr. 21, 1936 2,038,404

UNITED STATES PATENT OFFICE

2,038,404

ENGINE PISTON

Lee M. Atwood, Ridgefield, N. J.

Application September 6, 1934, Serial No. 742,875

4 Claims. (Cl. 309—15)

This invention relates to improvements in engine pistons.

This invention relates to improvements in construction of pistons for internal combustion engines, having removable heads and consists of means hereinafter fully described and particularly set forth in the claims, the purpose of which is to make it possible to remove from the cylinders of said engines the entire piston body, piston ring, piston pin and bearing, for the complete replacement of the entire assembly, or each of its parts, or adjust them from overhead without dropping the bottom of crank-case or disturbing the adjustment of main connecting rod bearings in any way, or even drawing off the oil in the crank-case, thereby reducing the labor and time required for a repair of this nature, and making access to the piston assembly simpler, by necessitating only the removal of the head of the said motor to accomplish the repair of these parts of said internal combustion engines.

With these and other objects in view, the invention resides in the certain novel construction, combination and arrangement of parts, the essential features of which are hereinafter described, are particularly pointed out in the appended claims, and are illustrated in the accompanying drawings, in which:

Figure 1 is a top plan view of my improved engine piston.

Figure 2 is a side elevational view thereof.

Figure 3 is a vertical longitudinal sectional view on the line 3—3 of Figure 1.

Figure 4 is a vertical longitudinal sectional view on the line 4—4 of Figure 3.

Figure 5 is a side elevational view of the upper end of the connecting rod and piston pin bearing.

Figure 6 is a top plan view of the skirt unit of the piston.

Figure 7 is an enlarged vertical sectional view through the piston head and skirt.

Figure 8 is a horizontal sectional view on the line 8—8 of Figure 7.

Figure 9 is an enlarged detail vertical sectional view through one of the fastening devices for connecting the ring unit and skirt unit of the piston together.

Figure 10 is a horizontal sectional view on the line 10—10 of Figure 9.

Figure 11 is a top plan view of one of the fastening studs.

Figure 12 is a side elevational view of the top end of the fastening stud.

Figure 13 is a top plan view of the lock washer.

Figure 14 is a perspective view of the lock washer.

Figure 15 is a sectional elevational view of the ring unit lifting tool.

Figure 16 is a detail sectional view of a slight modification.

Referring to the drawings by reference characters, the numeral 10 designates the skirt unit of my improved piston, the top of which supports a removable piston ring carrying unit 11, the ring unit 11 being removably fastened to the skirt unit 10 in a novel manner presently to be explained.

The skirt unit 10 has its annular side walls relatively thin at the bottom open end thereof and which walls increase in thickness toward the top, the top of the skirt unit 10 being provided with an annular inwardly extending flange 12 which is braced or reinforced by radially arranged webs 13 which are formed integral with the under side of the flange 12 and with the upper portions of the side wall of the skirt unit. The web 13 acts as a strengthening factor against the downward thrust upon the inwardly overhanging flange 12 on which the ring carrying section 11 is mounted in a manner now to be described.

Rising upwardly from the flat top face 13 of the flange 12 is an annular rib 14, the inner and outer side walls of which taper or converge upwardly as at 15. Threaded openings 16 are provided in the flange 12 and extend through the rib 14, there being four of such openings shown and the same are arranged in suitable spaced relation. Threaded through the openings 16 are threaded studs 17, said studs being inserted into the openings 16 from the underside of the flange 12, and their inner ends are provided with beveled heads 18 which frictionally engage beveled recesses 19 in the flange 12 when the studs are tightly screwed home. As shown in Figures 11 and 12, the upper end of each stud 17 is provided with a series of ratchet teeth 20.

The ring carrying unit 11 has its periphery provided with the usual piston ring groove 21, while the underside of the unit 11 is provided with an annular groove or channel 22, the depth and side walls of which are such as to snugly receive the annular rib 14. The flat top 13 of the flange 12 acts as a horizontal seat for the bottom of the ring carrying unit 11. The ring carrying unit 11 is provided with a series of clear openings 23 corresponding in number to the number of studs 17 and being of a size to permit of the studs passing therethrough when the ring unit 11 is placed in position upon the skirt

unit 10. One end of the openings 23 communicates with the annular groove 22, while the other end of the said opening enters an enlarged recess 24 which in turn opens onto the top of the ring carrying unit 11. The walls of each enlarged recess 24 adjacent the top are beveled as at 25 to receive the beveled head 26 of a lock nut 27. The lock nut 27 is provided with a threaded bore 28 for threading engagement with the free end of the threaded stud 17 whereas the closed end of the bore 28 is provided with a flat inwardly extending head 29. The closed end of the bore surrounding the head 29 is formed with a series of ratchet teeth 30. The beveled head 26 of the lock nut 27 is provided with a rounded crown 30 having a kerf therein, while an annular detent or recess 31 is provided in the exterior of the head centrally thereof for a purpose to be presently explained. Interposed between the top end of each threaded stud 17 and the closed end of the bore of its related lock nut 27, is a lock washer 32. The lock washer 32 is formed from a single piece of resilient metal and includes a central head 33 which is integral with a ring like body 34. The ring like body 34 is split and the ends thereof terminate in downwardly and upwardly extending teeth 35 and 36, respectively. The teeth 35 and 36 are on different planes so that the same respectively engage the ratchet teeth 20 and 30, respectively, when the lock nut 27 is screwed into position upon the stud 17. Thus it will be seen that each of the lock nuts 27 may be screwed home upon a threaded stud 17 and securely held against accidental loosening or displacement by reason of the ratchet connection between the spring washer 32 and the adjacent portion of the lock nut 27 and threaded stud 17. In the event that it should be desired to unscrew the lock nut 27, a blunt instrument or tool such as a nail set or punch may be inserted in the recess 31 and given a couple of sharp blows by a hammer to drive this surface inwardly which forms a dent or burr such as a ball on the underside of the portion 29, which contacts with the head 33 of the washer 32 and flattens the said washer sufficiently to cause the tooth 36 to disengage the ratchet teeth 30 whereupon the lock nut 27 is free to be unscrewed from the stud 17.

From the description thus far, it is apparent that the ring carrying unit 11 after being seated on top of the skirt unit 10 may be securely fastened by means of the fastening devices just described. In the event that it is necessary to remove the ring carrying unit 11 to replace the piston ring, this may be done without disturbing the crank case or the piston pin connection between the piston and rod, and the piston head. It is only necessary to deform the lock washers 32 in the manner just described, and by the insertion of a screw driver through the top of the engine cylinder, the lock nut 27 may be removed. Thus the piston ring carrier 11 is free to be lifted from the skirt unit 10.

For facilitating the removal or handling of the ring unit 11, I provide a recess 37 in the top of the ring unit 11, the annular wall of the recess being undercut as at 38. In Figure 15, a view is shown illustrating one form of tool 39 which may be employed in association with my invention. The tool 39 includes a member 40 having resilient expandible jaws 41, whereas threaded to the member 40 is a screw 42 having a handle portion 43 and a cross head 44. The jaws 41 converge upwardly and it will be appreciated that by turning the screw 42 to move the cross head 44 inwardly the jaws 41 will be expanded into engagement with the undercut 38. Turning movement of the screw 42 in an opposite direction will tend to release the expanding jaws 41 sufficient to disengage the tool 39 from the ring carrier 11.

Extending inwardly from diametrically opposite sides of the skirt unit 10 are bearings 45 for receiving the tubular piston pin 46. The opposite ends of the piston pin 46 extend beyond the bearings 45 and are provided with annular grooves 47 for receiving split resilient washers 48 which serve to prevent accidental longitudinal movement with respect to the bearings 45.

Connected to the piston pin 46 is the upper end of a connecting rod 49, the said connecting rod having a lower yoke support 50 formed integral therewith, the bearing wall of the yoke 50 being provided with scores or incisions 51 extending parallel to the axis of the piston pin for the purpose of grasping the piston pin bearing 52 which surrounds the piston pin 46 and is disposed intermediate the opposed bearing 45.

Associated with the lower yoke 50 formed integral with the connecting rod 49, is a removable top yoke 53 which overlies the top of the pivot pin bearing 52 and the inner circumferential surface of the yoke 53 is provided with scored incisions 54 similar to the scores 51 hereinbefore mentioned. The scores 54 extend parallel to the axis of the pivot pin and serve to grip the top of the bearings 52. The top yoke 53 is fastened to the lower yoke 50 by threaded screws 55 which freely pass through openings provided in the upper yoke 33 but which have their threaded ends received in threaded openings 56 in the lower yoke 50. The bolts 55 are arranged in upwardly converging relation as best seen in Figure 4 and are prevented from accidental turning or loosening by cotter pins 57 which pass through transverse openings in the screws and registering openings 58 in the top bearing yoke 53. The openings for the passage of the cotter pins may be so arranged as to permit of their insertion during each quarter turn of the screws.

In order to prevent the wrist pin bearing 52 from turning with respect to the yoke 50 and yoke 53, opposite ends of the yoke 53 are notched as at 58, while struck out from opposite ends of the bearing 52 are fingers 59 which seat in the notches 58. This construction forms a key connection between the bearing 52 and its surrounding yoke.

Formed on the underside of the ring carrier unit 11 is a central depending portion 60 provided with a dome shaped recess 61. The walls of the under side of the ring unit 11 merge into the depending portion 60 and provide curved deflecting walls 62. By this construction, oil from the crank case of an engine is splashed into the skirt unit 10 and by reason of the curvature of the walls 62, is directed toward the recess 60 and a small amount of oil is accumulated therein. During the upward stroke of the piston, this oil will drop by gravity and fall into a well 63 provided in the top of the yoke 53 and piston pin bearing 52. Thus the piston pin bearing is oiled on each stroke of the engine which insures long life to the bearing between the connecting rod and the piston head.

By constructing the lower walls of the skirt unit 10 relatively thin, the same may expand under the heat of an engine and resiliently engage the walls of the engine cylinder.

In Figure 16 I have shown a slight modification wherein a screw 31' is threaded into a threaded bore 29' in the head end 26 of the lock nut

27. The outer end of the screw has a key to receive a screw driver whereby inward turning of the screw beyond the position shown, will result in the head 33 becoming compressed to disengage the tooth 36 from the teeth 30. Thus, the necessity of mutilating the head end of the lock nut to remove the same is dispensed with.

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

1. A piston including a skirt section, a piston ring section seated upon said skirt section, studs rising from said skirt section and entering openings provided in said piston ring section, elements fitting over said studs and entering said openings through the top of said piston ring section, and releasable locking means between said elements and said studs.

2. A piston including a skirt section, a piston ring section, threaded studs carried by the top of said skirt section and extending therebeyond and entering enlarged openings in said piston ring section, and nuts entering said openings and threaded to the respective threaded studs, and means between said nuts and said studs for locking the same together to prevent retrograde turning movement of one relative to the other.

3. In a piston and connecting rod assembly, a piston, a wrist pin mounted in said piston, a bearing sleeve mounted on said wrist pin, a connecting rod having a separate yoke bearing surrounding said bearing sleeve, notches provided in opposite ends of said yoke bearing, and fingers formed integral with said bearing sleeve and extending into said notches for keying said connecting rod bearing yoke and said bearing sleeve together.

4. A piston comprising an annular skirt section, an annular rib provided on the top of said skirt section, the side walls of said rib converging upwardly, a piston head having an annular groove in the under side thereof, the side walls of said groove diverging downwardly, said piston head being seated on said skirt section with the side walls of said rib in seating engagement with the side walls of said groove, threaded studs rising from said rib and freely entering openings provided in said piston head section, and retaining elements threaded to the free ends of said studs whereby tightening of said retaining elements imparts a direct clamping force in line with the seating of said rib with the walls of said groove.

LEE M. ATWOOD.

CERTIFICATE OF CORRECTION.

Patent No. 2,038,404. April 21, 1936.

LEE M. ATWOOD.

It is hereby certified that the residence of the assignee in the above numbered patent was erroneously described and specified in the grant and heading to the printed specification as "Ridgefield, New Jersey" whereas said residence should have been described and specified as Ridgefield Park, New Jersey as shown by the records of this office; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 26th day of May, A. D. 1936.

Leslie Frazer

(Seal)

Acting Commissioner of Patents.