

Nov. 6, 1956

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2,769,438

CYLINDER HEAD RETAINER

Filed Dec. 2, 1953

2 Sheets-Sheet 1

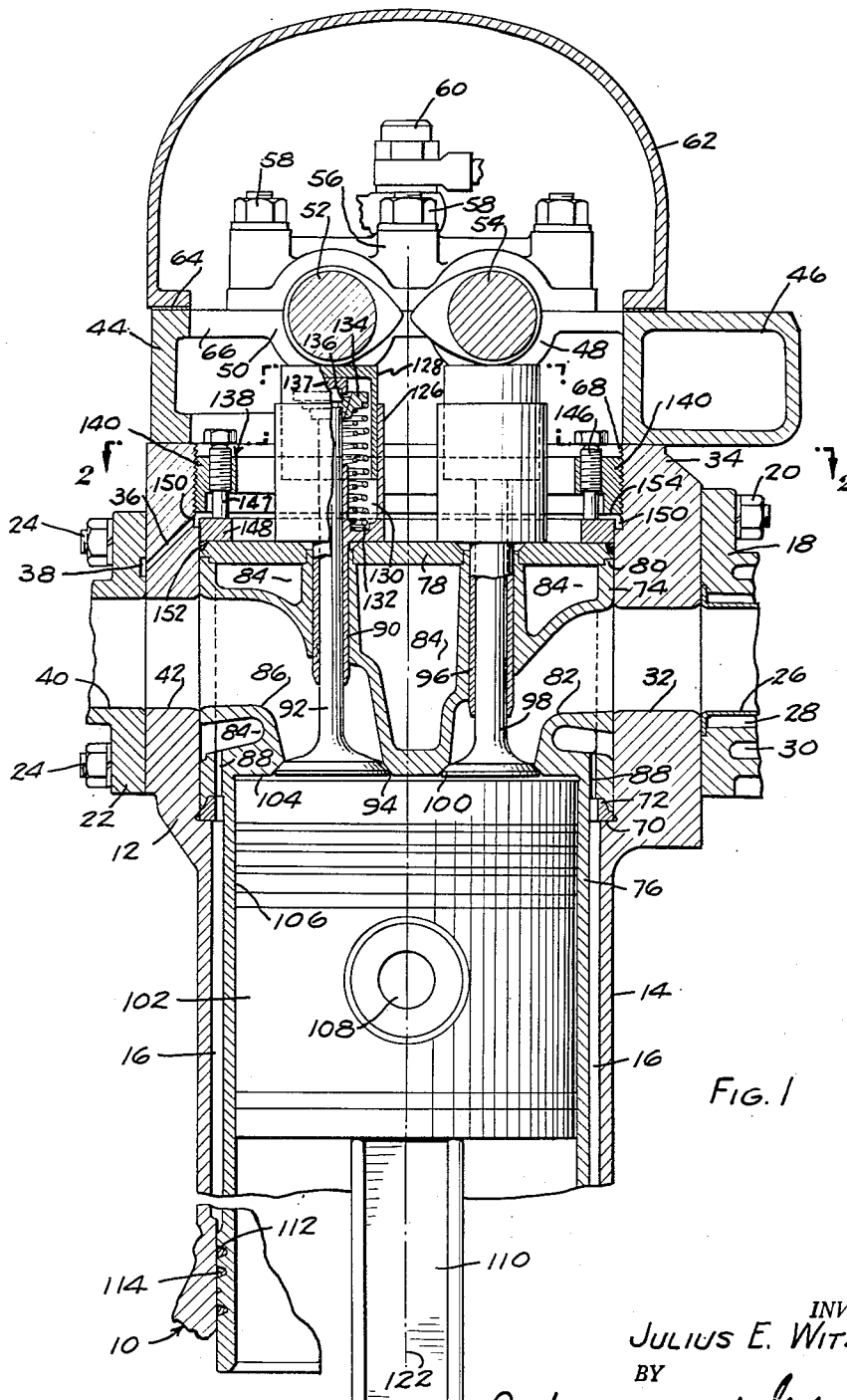


FIG. 1

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2 Sheets-Sheet 2

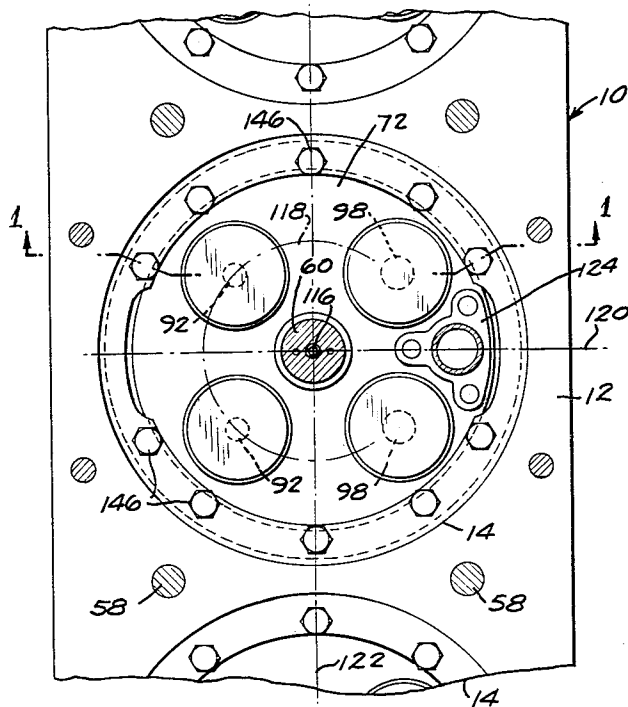


FIG. 2

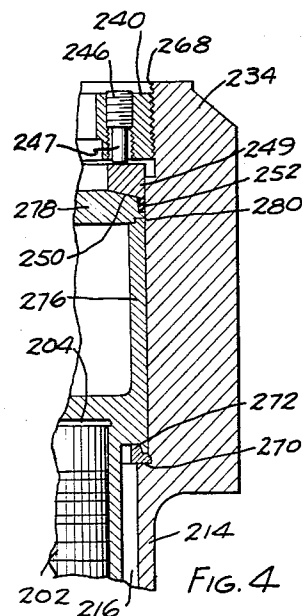


FIG. 4

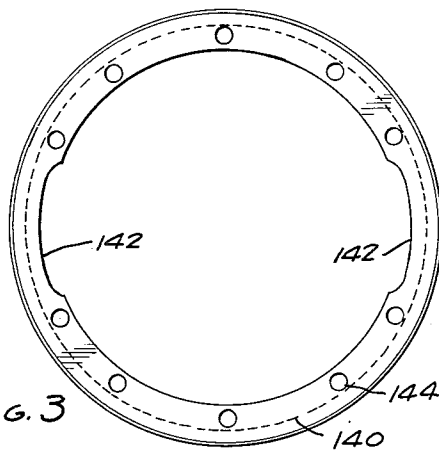


FIG. 3

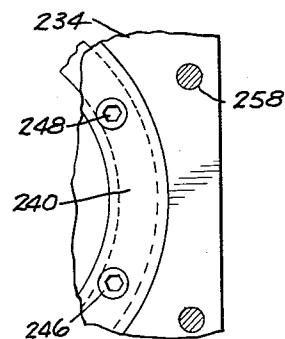


FIG. 5

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1

2,769,438

CYLINDER HEAD RETAINER

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10 Claims. (Cl. 123—193)

The present application relates to a cylinder head retainer for internal combustion engines and particularly to a retainer for the head-end portions of multi-cylinder diesel engines having individual type head and liner members for the respective cylinders thereof.

In the manufacture and assembly of piston-type internal combustion engines of relatively large size it is customary to cast the cylinder block, cooling jacket, and part of the crank case as a unit, providing cylindrical recesses or cylinder openings for the reception of separately formed removable cylinder liners. The cylinder liners themselves receive the reciprocating pistons therein and very obviously are subjected to great wear and are therefore made of high quality alloys; the foregoing method of construction renders the liners readily replaceable when the need for replacement arises. Although aimed at facility in repair and replacement, the provisions heretofore made for securing the cylinder liners within the cylinders of the block have not in the general case been conducive either to ease or efficiency in removing and replacing the liners in protecting the block or cylinder parts or in insuring the clamping of the cylinder liner in place with such uniformity of pressure or force throughout its periphery as to prevent setting up uneven stresses in the assembled structure.

In my patent application Serial No. 179,493, now U. S. Patent No. 2,654,357, I have shown a novel and improved means for clamping a removable cylinder liner in place in the block of an internal combustion engine which will correct these deficiencies and obtain the desired facility, safety, and accuracy of installation. I therein disclose a combined head and liner member for each cylinder. In the present application I show an improvement for clamping this combined head and liner member in place, simplifying the actual final clamping procedure to a one-man purely manual operation.

In ordinary practice the cylinder liners in engines have been secured in place through the expedient of a common cylinder head having head hold down bolts or studs which are present in great numbers requiring a corresponding great number of tightening operations and giving rise to undesirable stresses due to the lack of uniformity of the application of tightening pressure over the entire head. These current practices also create undesirable concentration of stress at the local cylinders due to the application of the tightening load at points separate and remote therefrom according to the layout of the actual cylinder head which is common to and encompasses all cylinders. The present engine, however, contemplates the provision of a single large cylindrical retaining nut threaded into the mouth of the cylinder recess or opening in the engine block casting, a plurality of separately adjustable screws carried in the periphery thereof, and an annular spacer engaging the top surface of the cylinder head. The application of a uniform clamping force around the peripheral edge of the top surface of the cylinder head is a simple one-man operation accomplished by means of a tighten-

2

ing operation in which the stresses are transmitted from the nut to the head by means of the intermediary of the screws which directly engage the stress distributing annular spacer.

In line with the foregoing, an object of the invention is to provide, in conjunction with an annularly continuous nut for clamping a combined cylinder head and liner member in place, a plurality of threaded fasteners or screws in the periphery of the nut and an interposed annularly continuous spacer for distributing the separate loads of the screws and transmitting them to the combined head and liner member with uniform tightening pressure.

Another object is to provide a coating nut and spacer which clamp a liner member in place in an assembly arrangement incorporating a crushable seal on one side of the member which permits a gap of travel to be established between the nut and spacer, the resulting gap serving as a predetermined drain gap for pools of lubricating oil which tend to collect within the confines of the spacer.

Another object of the invention is to provide a pool-collecting retainer spacer and a spaced apart retaining nut for a liner within a cylinder in an arrangement whereby an oil drain passage is formed in the wall of the cylinder adjacent the top of the final position of the spacer so as to drain off all excess oil which spills through the resulting gap in the space between the spacer and the retaining nut. According to one feature, the spacer is a short ring seated on the valve-carrying head of a liner member and a plurality of tall bottom seated valve stem cups is provided as guide extensions for the upper ends of the respective valves which pass downwardly through the head. Thus, the resulting shallow pool of oil within the short ring will have no harmful effect on the valve operation inasmuch as the tall inverted valve cups prevent access of unwanted oil to the valve stems.

A further object of the invention is to provide, in a cylinder head arrangement formed with valve guides surrounded by leakage-preventing cups, a short spacer member of which the periphery is annularly continuous so as to tend to collect a shallow pool of oil and adjacent to which a chamber and a passage are provided to collect and permit discharge of spilled over oil across the outside edge of the spacer.

Further features, objects, and advantages will either be specifically pointed out or become apparent when, for a better understanding of the invention, reference is made to the following written description taken in conjunction with the accompanying drawings in which,

Figures 1 and 2 are transverse elevational and plan views of an engine taken along the lines 2—2 and 1—1 of these respective figures;

Figure 3 is a plan view of a retainer part according to the invention; and

Figures 4 and 5 are fragmentary transverse elevational and plan views of a modification of the invention.

In Figures 1, 2, and 3, an internal combustion engine 10 is shown provided with preferably one but possibly more than one bank 12 each formed of a plurality of vertically disposed cylinders 14 in line with one another. The bank 12 is traversed longitudinally by a set of sinuous water cooling passages 16 which provide for the circulation of coolant for the cylinders from one end of the bank to its opposite end. At one of the lateral sides of each cylinder 14, an exhaust manifold 18 is secured as by means of a plurality of stud and nut fasteners 20, and similarly an intake manifold 22 is secured to the opposite side as by a set of fasteners 24. The exhaust manifold 18 is readily identified by a liner 26 which may be of stainless steel and which forms an annular air space 28 in order to insulate the manifold from the extreme heat of

3

the internal exhaust gases therein. A conventional water jacket 30 for conducting liquid coolant is also provided in the exhaust manifold structure 18. An opening 32 is formed in the upper end portion 34 of the cylinder 14 and registers with the liner 26 of the exhaust manifold so as to transmit the exhaust gases thereto. The end portion 34 of the cylinder 14 has a lubricating oil drain passage 36 through which oil for lubricating the hereinafter described cam shaft and overhead valve gear, may be drained off and returned to the crank case for the engine 10.

Oil return means may be provided for continually communicating with the lower end of the oil drain passage 36.

Illustrative of one example of such oil return means is a longitudinally extending drain passage 38 formed in the inside face of the upper flange of the intake manifold 22. The intake manifold 22 has an outlet passage 40 communicating with a supply port or opening 42 formed in the upper end 34 of the cylinder 14. A box-like longitudinal cage 44 is provided which is co-extensive in length with the cylinder bank 12. A longitudinally extending chamber 46 formed therein may be utilized for receiving wiring or other conduit useful in the operation of heat gauge instruments which may be desirably fitted to the engine. Longitudinally aligned sets of cam shaft bearings such as at 48 and 50 are formed in the box-like member 44 and each is respectively adapted to receive a lobed cam shaft such as an intake cam shaft indicated at 52 and an exhaust cam shaft indicated at 54. A common bearing cap 56 is secured as by a set of stud and nut fasteners 58 to the box-like member 44 and contains a set of sleeve-type bearings in which the cam shafts 52 and 54 are journaled to rotate. Each cylinder 14 in the engine is provided with a centrally disposed depending fuel injector device 60 which is repetitively operated in timed sequence with respect to the operating cycle of the engine. A cover 62 sealed as by a cover gasket 64 is clamped or otherwise firmly secured to the box-like member 44 so as to cooperate therewith in defining a central cam shaft and valve chamber 66.

At its upper end 34 the cylinder 14 has a set of threads 68 immediately inside the mouth thereof; at a location in spaced apart relationship with respect to the threads 68, the cylinder 14 has two adjacent portions of different inside diameters presenting a radially inwardly deflected annular shoulder 70. A plurality of elements may be provided which have an applied position within the mouth of the cylinder 14 and resting on the shoulder 70. A yieldable sealing ring 72 rests directly on the shoulder 70 and has a tongued inter-engagement with and sealingly supports the head or compression end portion 74 of an individual head and liner member 76 for the cylinder 14. The portion 74 of the head and liner member 76 is extensively internally passaged as shown but is of a generally unitary integrated construction and at points of fabrication juncture such as with a head closing plate 78 is welded as at 80. A valve controlled exhaust passage 82 constitutes one of the principal internal passages formed in the head portion 74 and directly communicates exhaust combustion gases to the port 32 and thence to the exhaust manifold 18. A plurality of longitudinally extending water cooling passages 84 is formed in the head portion 74 and also an inlet passage 86 for a combustible cylinder gas mixture is formed and communicates with the supply port 42 and with the intake manifold 22. The lowermost cooling passages 84 of Figure 1 are connected with the longitudinal block cooling passages 16 by means of the restrictively small passages indicated at 88 which extend vertically upwardly through the head portion 74. An intake valve guide 90 cooperates with one of a pair of identical thin-stemmed intake valves 92 each of which controls an intake port 94 formed in the head and liner member 76. An exhaust valve guide 96 in the head portion 74 of the member 76 cooperates with one of a pair

4

of identical thick-stemmed exhaust valves 98 each controlling an exhaust port 100 formed in the head and liner member 76. The exhaust port 100 communicates with the exhaust opening 32 which registers with the exhaust passage 82 to conduct exhaust gases away from the liner member 76.

The head and liner member 76 slidably receives a reciprocating piston 102, which in its uppermost position shown in solid lines in Figure 1, cooperates with the head and liner member 76 to define an end clearance volume chamber 104 at the upper end of the overall combustion chamber contained within a working cylinder portion 106 of the head and liner member 76. The piston 102 shown by way of illustration in Figure 1 is a diesel piston of conventional design having a wrist pin as at 108 and a connecting rod 110 which is attached at its lowermost end to a throw portion of an engine crank shaft, not shown. The lowermost end of the head and liner member 76 contains a series of co-axial annular grooves 112 in which sealing rings as at 114 are received for sealing the same to the interior surface of the cylinder 14. In their applied position, each of the individual head and liner members 76 is readily removable from its supporting cylinder 14 and the shoulder 70 upon which the liner member rests. The closing plate 78, which is incorporated in the head portion by the weld 80 previously noted at the upper end of the head and liner member 76, supports the depending injector nozzle 60 such that the latter is concentrically arranged with respect to the vertically disposed central longitudinal axis of the cylinder 14 indicated at 116 in Figure 2. At equally spaced-apart intervals about the axis 116 so as to define a circular path of revolution at 118 the pairs of intake and exhaust valves 92, 98 are arranged so as to be symmetrically disposed with respect to a transverse plane 120 which contains the axis 116 and is perpendicular to the general plane of the cylinders as indicated at 122. One of a pair of diametrically opposed water connections is provided at 124 which communicates with the water coolant chambers 84 in the head portion of the member 76. The closing plate 78 further supports the upper end of the respective intake and exhaust valve guides 90, 96 which are formed as integral appendages depending from a pair of upwardly open cup-like parts as at 126 each of which telescopically receives a complementary inverted cup-like tappet part as at 128.

The aligned cylinders of the bank 14 may form only one of a plurality of angularly spaced banks of cylinders in the engine 10, but in the position as herein disclosed the bank 14 is vertically disposed and gives the appearance of only a single bank, line type engine. Accordingly the lower cup of each pair of telescoping parts 126, 128 extends vertically upwardly a predetermined distance above the upper surface of the closing plate 78 in the head portion 74. Thus the upper portions and mouth of the cup part 126 are considerably removed at all times from exposure to any liquids which may tend to pool or otherwise accumulate atop the closing plate 78.

The noted cup-like parts 126, 128 telescopically reciprocate one within the other and mutually contain and define a valve spring chamber 130. Within the chamber 130 a pair of concentric valve springs 132 is disposed so as to seat at the closed end of their respective associated cup-like parts 126 and thrust at their upper ends against a spring seat 134 which is locked as at 136 to the top end of each of the stems of the intake and exhaust valves 92, 98. Each tappet part 128 is cam actuated as at 52, 54 so as to thrust against an interposed spacer 137 and associated valve so as to displace the same downwardly against the resistance of the valve return springs 132 and open the appropriate valve controlled port in the member 76. Force-fed lubricant for the bearings of the cam shafts 52, 54 and splash-fed lubricant for the telescoping parts 126, 128 and valve stems is supplied in abundance and the excess portion thereof is allowed to

5

flow by gravity down onto the upper surface of the closing plate 78 which, as previously noted, is unitarily welded to the individual head and liner member 76. The excess oil may thus be trapped and tend to accumulate in a pool covering the closing plate 78.

Means associated with the head portion 74 may be provided for holding the same in a retained position within the upper end 34 of the cylinder 14. Illustrative of one such holding means is a centrally open ring nut assembly generally indicated at 138. An annularly continuous centrally open nut part shown at 140 in Figure 1 forms an essential element of the ring nut assembly and will be noted to have a pair of diametrically opposed internally relieved portions presenting notches at 142 best seen in Figure 3. These portions 142 permit adequate clearance between the ring nut element 140 and the water connections or fittings 124 previously discussed. A series of circumferentially spaced bolt receiving openings 144, in the aggregate amount of ten for instance, is provided in the ring nut 140 and each is tapped throughout its length for threadably receiving a hexagon headed screw 146 of a like total number in the aggregate. Each screw or bolt 146 has a smooth cylindrical shank 147 of reduced diameter at the lower end thereof. If desired an intervening stress distributing spacer ring 148 may be disposed between the closing plate 78 and the annular nut element 140 and as shown is flat sided on its opposed faces. The screw shanks 147 foot on the upper face of the spacer ring 148 and thrust thereagainst at equal circumferentially spaced intervals.

The spacer ring 148 is annularly continuous and will be noted to be relatively thin in its vertical dimension compared to the vertical depth of the upwardly open cup parts 126 whose bottoms seat on the closing plate 78.

Means may be provided for establishing a threadable engagement between the nut element 140 and the mouth of the cylinder 14. As illustrative of one form of threadable engagement means, a helical thread insert may preferably be employed in accordance with the disclosure of my previously noted Patent No. 2,654,357 but as herein shown the nut 140 has a set of external threads which directly engage the threads 68 in the cylinder 14 without the intermediary of a helical thread or heli-coil insert.

Within the mouth of the upper end 34 of the cylinder 14 below the threads 68 an annular recess 150 may be formed which communicates with the oil drain passage 36 and through which trapped lubricating oil received on the upper surface of the closing plate 78 may be conducted into the drain passage 38 and thence into the engine crank case not shown.

During assembly of the engine of Figures 1, 2 and 3, the sealing ring 70, the head and liner member 76, and the spacer ring 148 are sequentially introduced through the mouth of the open end 34 of the cylinder 14 and are lowered to a stacked position of rest against the shoulder 70 within the cylinder 14. Thereupon the screw carrying ring nut element 140 is introduced and started in the threads 68 by hand and progressively is screwed down finger tight against the interposed spacer 148 which rests directly on the closing plate 78. A seal between the latter two members may be provided at 152 and be ultimately clamped under stress therebetween to establish a fluid-tight sealed relationship in the manner hereinafter specified. Through use of an appropriate hexagonal socketed tool, the individual bolts or screws 146 are brought down tight in equalized stages so as to press against the upper face of the stress distributing spacer ring 148 and preload the nut element against turning in the threads 68 with which the nut element 140 is engaged. As the yieldable seal 70 begins to crush somewhat under the resulting progressive pressure, a separating action occurs between the stress distributing spacer ring 148 and the threaded nut element 140 so as to form an intervening gap of predetermined clearance at 154. This gap at 154 has the function of completing a path of

6

communication leading from any pool or accumulation of lubricating oil confined by the spacer ring 148 and the closing plate 78, thence over the upper face of the spacer ring 148 and between the shanks 147 of the spaced apart screws 146, thence across the outside upper edge of the spacer ring 148, and finally through the annular recess 150 and the downwardly directed oil drain passage 36. Increased tension imparted to the screws 146 places the head portion 74 under considerable compression and forms a gas-tight and fluid-tight seal both at 72 and 152. Subsequent explosions in the clearance volume chamber 104 due to engine operation force the piston 102 to be driven downwardly without the escape of any explosion gas upwardly from the working cylinder 106. The upward pressure on the bottom side of the head member 74 is readily opposed due to the non-rotatable reaction of the pre-loaded nut member 140 against turning and backing out of the threads 68 formed in the upper end of the cylinder 14.

In the modified showing of Figures 4 and 5, a cylinder 214 is provided an upper end portion 234 which has a set of internal threads 268 immediately inside the mouth thereof to receive a threaded ring nut element 240 similar to the element 140 of the preceding embodiment. The tension screws which are indicated at 246 and of a number of approximately ten, are of the Allen wrench type, so-called, and have an internal hexagonal opening as at 248 for receiving an Allen bar or wrench to adjust and tighten the same. The screws 246 are received in suitable threaded bores of a like number in the ring nut element 240 and have smooth cylindrical shanks 247 of reduced diameter which engage a flat topped stress distributing spacer ring 249 having a frusto conical lower surface 250. A companion frusto conical surface is formed on a closing plate 278 which is welded at a juncture 280 to an individual head and liner assembly 276. An interposed seal at 252 is clamped between the closing plate 278 and the frusto conical spacer ring 249. The ring 249 is relatively thin in its vertical dimension similarly to the preceding spacer ring 148. The head and liner member 276 slidably receives a diesel piston 202 and therewith defines an end clearance volume chamber indicated at 204, the piston 202 being shown in solid lines in its uppermost position of reciprocation. A yieldable sealing ring 272 of deformable material has tongued interengagement with and supports the head portion of the member 276 in compression and rests on an annular shoulder 270 formed by dissimilar diametered interior portions within the cylinder 214. A conventional water passage as at 216 is provided between the liner portion of the member 276 and the cylinder 214. A set of block anchored, cam shaft bearing hold-down bolts may be provided as at 258.

In the embodiments of Figures 1 and 4 it will be noted that the head or compression portion of the respective members 76, 276 has substantially the same outside diameter as the diameter of the retainer nut 40, 240 and substantially the same diameter as the inside diameter of the retainer nut threads 68, 268 formed at the mouth of the upper ends 34, 234 of the cylinders. Thus, essentially all elements retained in the cylinders in their applied position are within the confines of the cylinder and the selected diameter at the mouth of the cylinder is, in most respects, a minimum size compared to the overall cylinder dimensions. The self-confinement that results within the closed-ended cylinder yields a highly satisfactory and stiff engine structure requiring no excessive spacing between cylinders and permitting a multi-cylinder engine of relatively short axial length to be constructed. The stage by stage tightening operation of the screws 146, 246 in the embodiments of Figures 1 and 4 is essentially a one-man operation and no undue amount of torque is required at any one time in order progressively to precompress the head and its supporting seal and place a considerable amount of preloading on the internal

cylinder threads which the respective retainer nuts 68, 268 engage. Removal of the head is likewise a simple operation requiring merely the progressive stages of unscrewing the threaded fasteners 146, 246 in any of a number of predetermined known sequences. Reducing the tension of such fasteners may result in some cases in the disappearance of a considerable portion of the clearance gap 154 but enough clearance is inherently retained due to permanent deformation of the seals 70, 270 such that at all times during disassembly there will be adequate clearance between the ring nuts 140, 240 and their associated structures to permit unscrewing of the nuts simply by hand.

The principal advantage of the frusto conical surface 250 shown in the embodiment of Figure 4, is that it may permit a slightly discernible self-centering action of the spacer 249 to occur during the prestressing of the compression head of the liner member 276, it being understood that design tolerances between the outside circumference of the spacer ring 249 and the inside circumference of the companion portion of the cylinder 234 may result in a slight lateral clearance occurring therebetween under the variable conditions of manufacture. Thus the ring 249 may tend to shift somewhat in its own plane as it is progressively drawn down against the frusto-conical surface 250 on the head closing plate 278.

In the clamping arrangements herein disclosed, each retainer nut for the cylinder heads is threaded inside the individual engine cylinder at the upper outer end thereof. It is evident that in many readily conceived applications not limited to engine-type cylinders, the present clamping arrangement may be used to advantage where the nut and its associated compression member are disposed on the outside of a threaded cylinder and the nut is internally threaded and disposed at the outer end of the cylinder in threaded engagement with external threads on the cylinder. So also the drawing shows opposed engageable transverse surfaces formed on the nut and cylinder members between which the compression member is clamped and further shows that adjusting screws pass through the transverse surface of the nut member and are carried by the latter member, but self-evidently the cylinder member may carry the screws in certain applications and where such an arrangement is found desirable the screws will therefore protrude through the transverse surface of the cylinder member. In the latter instance, it is desirably the case that the crushable seal will be at one side of the compression member and the spacer ring will be adjacent the screws and on the opposite side of the compression member, but indeed it is not essential that a spacer be necessarily used and it may be found advantageous under some circumstances to have the screws directly engage the head or compression member.

Variations within the spirit and scope of the invention described are equally comprehended by the foregoing description.

What is claimed is:

1. In a multi-cylinder engine each cylinder of which is adapted to receive a central liner and is provided with spaced apart shoulder and threaded portions inside one end of the cylinder, means individual to said cylinders and each including a first member internally received in the one end of one cylinder, said first member being disposed adjacent said shoulder portion and having a seal clamped therebetween, a second member in threaded engagement with said threaded portion in closely spaced adjacency to the first member, and means for separating said members under prestressed conditions so as to crush said seal against leakage and preload the engaged threads against turning including a plurality of separately adjustable elements all carried by one of the members.

2. In a multi-cylinder engine each cylinder of which is adapted to receive a central liner and is provided with spaced apart shoulder and threaded portions inside one end of the cylinder, means individual to said cylinders

and each including a first member internally received in the one end of one cylinder, said first member having an upper area exposed to the impingement of leaked oil subject to accumulation in a pool thereupon and having a lower portion disposed adjacent said shoulder portion and together having a seal clamped therebetween, valve guide means including an upstanding cup-like part seated on a portion of the aforesaid upper area of the first member with the walls thereof extending a predetermined distance vertically upwardly, a second member in threaded engagement with said threaded portion in closely spaced adjacency to the first member, and means acting between the two said members under prestress including a ring member having one face against which the nut member is initially screwed finger tight within said threaded portion and having another face seated on said head member so as to encircle said upper area in surrounding relation to said cup-like part, said ring member having a depth of thickness of a dimension less than the dimension of said predetermined distance such that the level of said one face is below the upper portion of the walls of the cup-like part, and a plurality of separately adjustable elements all carried by the nut member and finally preloaded so as to press against the one face of the ring member and separate the just-named two members with a predetermined clearance gap forming an oil escape path across an edge of said one face of the ring member for conducting away a flow of excess oil from said pool so as to limit the depth of the pool to a value less than enough to immerse the upper portion of the walls of the cup-like part.

3. In a multi-cylinder engine each cylinder of which is adapted to receive a central liner and is provided with spaced apart shoulder and threaded portions inside one end of the cylinder, means individual to said cylinders and each including a head member internally received in the one end of one cylinder, said head member having an upper area exposed to the impingement of leaked oil subject to accumulation in a pool thereupon and having a lower portion disposed adjacent said shoulder portion and together having a seal clamped therebetween, valve guide means including an upstanding cup-like part seated on a portion of the aforesaid upper area of the head member with the cup walls extending a predetermined distance vertically upwardly, a centrally open nut member in threaded engagement with said threaded portion in closely spaced adjacency to the head member, and means acting between the head and centrally open nut members under prestress including a ring member having one face seated on said head member and an opposite face against which the bottom of the nut member is initially screwed finger tight within said threaded portion so as to encircle said upper area in surrounding relation to said cup-like part, said ring member having a depth of thickness of a dimension less than the dimension of said predetermined distance such that the level of said one face is below the upper portion of the walls of the cup-like part, there being a drain passage formed in said threaded portion adjacent the normal position of the bottom of said nut, and a plurality of separately adjustable elements all carried by one of the members and finally preloaded so as to press against the opposite one of the members and separate the same with a resulting predetermined clearance gap which is in continuous communication with said drain passage.

4. In a multi-cylinder engine each cylinder of which is provided with spaced apart shoulder and threaded portions inside one end of the cylinder, means individual to said cylinders and each including an internally received head member in the space in the one end of the cylinder between the shoulder and threaded portions and supported by the shoulder portion, a nut member in threaded engagement with said threaded portion in closely spaced adjacency to the head member, said members being of substantially the same order of outside diameters, and means for separating said members under prestress so as

to preload said engaged threads against turning of the nut member including a ring having a first face seated on said head member, and a plurality of separately adjustable circumferentially spaced apart elements all carried by the nut member as its pre-loading devices and pressing against a second face on the ring.

5 5. In a piston engine, an elongated cylinder within which a multiplicity of members is applied in position for reciprocally receiving and power driving a piston, and including an individual head and liner member supported in the cylinder, a ring member adapted to seat thereon, and a seal member effective to be clamped between the head and ring members, and means for securing the members in applied position including similar supported first parts separately adjustably engageable with the ring member and a supporting second part for the first parts and threadably engaged thereto and to the interior surface of said cylinder, there being an oil drain passage formed in said cylinder adjacent the bottom of the last named means, said second part comprising an open centered nut member initially adjusted in finger tight threaded engagement against the ring member, said first parts subsequent thereto being prestressed into engagement with the ring member so as to separate the nut and ring members with a predetermined clearance gap establishing constant communication with said oil drain passage.

6. A piston engine including a generally cylindrical part having a hollow interior within which a multiplicity of members is applied in position for reciprocally receiving and power operating a piston and including an individual head and liner member supported in the cylindrical part, a ring member adapted to seat thereon, and means for securing the members in applied position including similar supported first parts separately adjustably engageable with the ring member and a supporting second part for the first parts disposed in closely spaced adjacency to the ring member and threadably engaged with the first parts and with the interior surface of said cylindrical part in pre-loaded condition against turning of the latter part.

7. In combination, a generally elongated supported hollow element, a nut element in threaded engagement therewith at the outer end of the hollow element, said hollow element having a transverse inner surface facing toward the counterpart transverse inner surface of the nut element, a ring-like part juxtaposed to each inner surface, at least one of the ring-like parts comprising a yieldable member and disposed in axially spaced apart relationship with respect to the other part, a compression member disposed in the space between the ring-like parts and adapted to be initially clamped thereby when the nut is rotated down finger tight against the juxtaposed ring-like part in its threaded engagement with the hollow element, and means for predeterminedly preloading the compression member including a plurality of threaded elements protruding through the transverse inner surface of one of the elements and separately adjustably engageable with the adjacent ring-like part.

8. In combination, a generally elongated supported hollow element, a nut element in threaded engagement therewith at the outer end of the hollow element, said hollow element having a transverse inner surface facing toward a counterpart transverse inner surface of the nut element, a ring-like part juxtaposed to each inner surface and axially spaced apart with respect to the other ring-like part, a compression member disposed in the space between the ring-like parts and adapted to be initially clamped thereby when the nut element is rotated down finger tight in its threaded engagement with the hollow element, and a plurality of screw fasteners individually adjustably carried by one of the elements and protruding through the transverse inner surface thereof into engagement with the adjacent ring-like part, the just-said part comprising a rigid spacer ring for transmitting a compression preload from the screw fasteners to the compression member.

9. In combination, a generally elongated supported hollow element, open centered nut element in threaded engagement therewith at the outer end of the hollow element said hollow element having a transverse surface which is inwardly opposite from a counterpart transverse surface of the nut element, a first ring-like part comprising a rigid open centered spacer at the outer end of the hollow element in juxtaposition to the transverse surface of the nut element, a second ring-like part comprising a yieldable seal juxtaposed to the transverse surface of the hollow element, said first and second parts being disposed in axially spaced apart relationship with respect to one another, a compression member disposed in the space between the ring-like parts and adapted to be initially clamped thereby when the nut element is drawn down finger tight in its threaded engagement with the outer end of the hollow element, and a plurality of tool-adjusted threaded elements carried by the nut element in a manner to protrude through the transverse surface thereof into engagement with the rigid spacer for precompressing the compression member.

10. In a multi-cylinder internal combustion engine each cylinder of which is adapted to receive a central liner and is provided with spaced apart shoulder and threaded portions inside one end of the cylinder, means individual to said cylinders and each including a head member internally received in the one end of one cylinder, said head member having an upper area exposed to the accumulation of leaked oil in a pool thereupon, and having a lower portion disposed adjacent said shoulder portion and together having a seal clamped therebetween, valve guide means including an upstanding cup-like part seated on a portion of the aforesaid upper area of the head member with the cup walls extending a predetermined distance vertically upwardly, a centrally open nut member in threaded engagement with said threaded portion in closely spaced adjacency to the head member, and means acting between the head and centrally open nut members under prestress including a ring member having one face seated on said head member and an opposite face against which the bottom of the nut member is initially screwed finger tight within said threaded portion so as to encircle said upper area in surrounding relation to said cup-like part, said ring member having a depth of thickness of a dimension less than the dimension of said predetermined distance such that the level of said one face thereof is below the upper portion of the walls of the cup-like part, there being a chamber forming annular recess formed in said threaded portion adjacent the normal position of the bottom of said nut and having a drain port formed adjacent thereto and communicatively connected therewith, and a plurality of separately adjustable elements carried by one of the members and finally preloaded so as to press against the opposite one of the members and separate the same with a resulting predetermined clearance gap forming an oil escape path across an edge of said one face of the ring member for conducting away a flow of excess oil from said pool so as to limit the depth of the pool to a value less than enough to immerse the upper portion of the walls of the cup-like part, said oil escape path intersecting said drain port connected chamber.

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2,282,502	Suth	May 12, 1942
2,349,170	Jackman	May 16, 1944
2,424,449	Gasche	July 22, 1947
2,563,949	Magnuson	Aug. 14, 1951
2,595,592	Magnuson	May 6, 1952
2,650,868	Waldron	Sept. 1, 1953
2,654,357	Witzky	Oct. 6, 1953