

Nov. 11, 1952

F. RIPPINGILLE

2,617,401

CYLINDER LINER

Filed Jan. 3, 1949

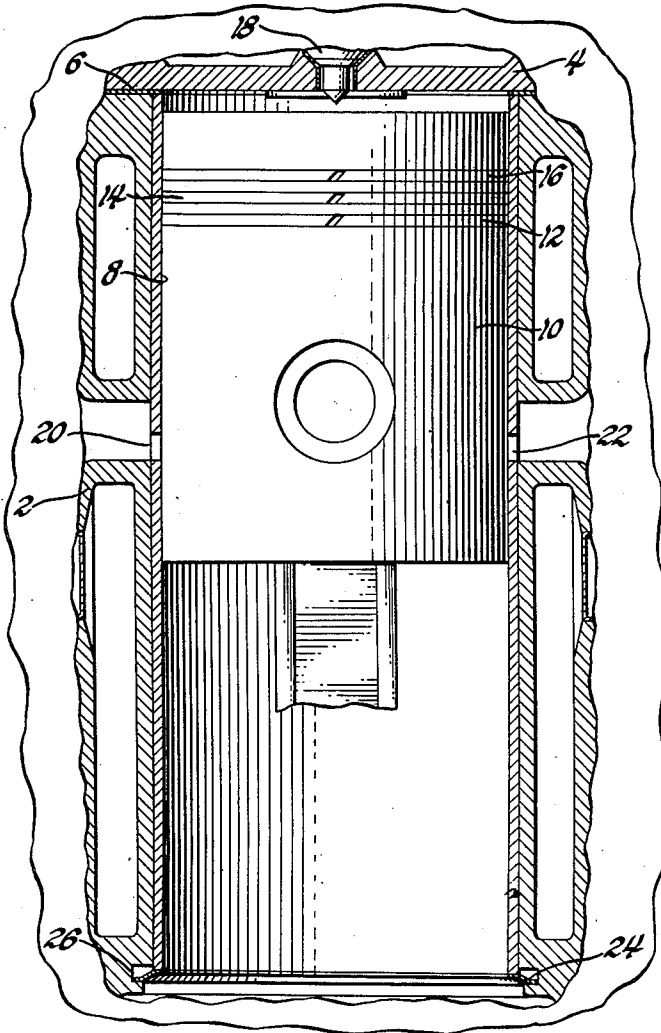


Fig. 1

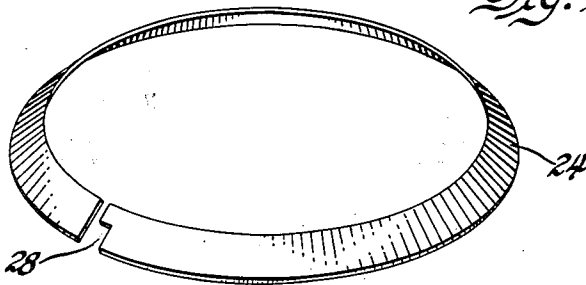


Fig. 2

Inventor
Frank Rippingille
By
Spencer, Willits, Kluing & Caillio
Attorneys

UNITED STATES PATENT OFFICE

2,617,401

CYLINDER LINER

Frank Rippingille, Detroit, Mich., assignor to
General Motors Corporation, Detroit, Mich., a
corporation of Delaware

Application January 3, 1949, Serial No. 68,825

5 Claims. (Cl. 123—193)

1

The present invention relates to internal combustion engines and more particularly to cylinder liners for these engines.

The pistons and cylinders of an internal combustion engine usually exhibit such wear, after a long period of operation, as to decrease the efficiency of the engine considerably. In order to recondition these engines, it is necessary to refit pistons and rings to the cylinders. Two methods of such refitting have been employed in the past. Both of these methods involve replacing the worn pistons with new pistons. In engines having liners the problem is simplified by permitting the installation of a previously fitted liner and piston assembly. In engines not having cylinder liners the cylinder wall must be enlarged and resurfaced to match the new pistons. This latter type of fitting increases the cost of repairing worn engines a great amount.

Cylinder liners have in the past been quite expensive and subject to certain difficulties which have made it inadvisable to use them in certain installations. The present invention provides an economical liner having certain advantages over the prior art. This liner is easy to install and replace and may be manufactured from material having a different coefficient of expansion than the engine block.

It is therefore an object of the present invention to provide a cylinder liner which is economical to produce and easy to install.

It is a further object of the present invention to provide a cylinder liner which minimizes the cylinder head sealing problem by permitting a high contact pressure between the liner and the cylinder head gasket under all conditions of use.

It is a further object of the present invention to provide a cylinder liner having high axial dimension tolerance to decrease initial cost and to permit unequal expansion between the cylinder liner and engine block without materially effecting the head gasket sealing pressure.

Other objects of the present invention will appear from reading the following description and inspection of the drawings and will be particularly pointed out in the claims.

Referring to the figures in the drawings, Figure 1 is a cross section view showing the present invention.

Figure 2 shows the cylinder liner retaining washer.

Referring more particularly to Figure 1, 2 is an engine block and 4 is the cylinder head of an internal combustion engine. These two members may be made from a cast metal preferably alumi-

2

num or iron. The gasket 6 which may be of soft copper or other gasket material permits a gas tight seal between the engine block 2 and the cylinder head 4 as well as between the liner 8 and the cylinder head 4. 10 is a conventional piston carrying piston rings 12, 14 and 16 of conventional design. In the specific embodiment here shown a fuel injector 18 is included for illustration purposes only and may be replaced by any other suitable fuel introducing means without departing from the scope of the present invention. This specific embodiment of the present invention shows a two cycle Diesel engine with ports 20 and 22 in the sleeve 8. This sleeve valve porting means may of course be replaced by poppet valve means.

The cylinder sleeve 8 is of tubular form having its external diameter ground to fit properly in the engine block 2 and its internal diameter ground to fit properly with the piston 10. This tubular shape with an absence of flanges on the cylinder liner permits its being formed from drawn tubular stock with a minimum of metal to be removed. This metal may be removed by centerless grinding or other conventional means.

Certain attempts have been made in the past to use a perfect tubular shape for liner construction. An example of this type of construction is shown in Jackson Patent 1,321,792. It is well known however that cylinder liners being exposed directly to hot combustion gases are subject to greater expansion than the mating engine block surfaces thereby causing relative movement between the liner and the engine block. In order to prevent the escape of hot combustion gases under the extreme high pressure used in Diesel engines, it is very desirable that a uniform high pressure be maintained on the gasket between the cylinder head and the liner. As this area is decreased by use of a small tubular liner, as shown in Figure 1, the unit pressure and hence the sealing efficiency between the liner 8 and the cylinder head 4 on the gasket 6 may be increased. Under conditions of unequal expansion the liner must be maintained under uniform axial force with freedom of movement in the engine block so as to compensate for the unequal expansion and maintain this high uniform sealing pressure on the gasket. The solving of this problem is made more difficult when the cylinder block and the liner have unequal non-compensating coefficients of expansion. In order to solve this problem, I have provided a force exerting means at the bottom of the cylinder liner. This means is shown as a Belleville washer device 24. This

3

washer is snapped into the circumferential slot 26 in the cylinder block 2 and is biased so as to exert a high axial force on the cylinder liner 8. This Belleville washer engages the cylinder liner circumferentially on its lower edge exerting an upward force of several hundred pounds thus maintaining the liner pressure on the gasket high under all conditions of operation.

Referring to Figure 2, the Belleville washer 24 is shown in the unstressed condition. This washer has a slotted portion 28 to permit its introduction and removal into and from the slot 26 of the cylinder block 2. It may thus be seen that by the use of a resilient retaining means the use of a tubular-shaped cylinder liner is made possible and practical regardless of the unequal expansion between the liner and the cylinder block.

Having thus described my invention in one particular embodiment thereof, it is not intended that it should be limited to this specific embodiment but should be interpreted by limiting only as made necessary by the following claims.

I claim:

1. An internal combustion engine including: an engine block having a cylinder bore therein, a cylinder liner of substantially uniform wall thickness having its external surface slidably fitted in close thermal conducting contact substantially throughout its entire length with said cylinder bore, a head for said engine attached to said block and closing one end of said cylinder bore, an inwardly opening annular groove in said bore near the lower extremity of said cylinder liner, and an annular resilient means disposed in said groove, said resilient means being removable from the open end of said bore and abutting the end of said cylinder liner to thereby urge said cylinder liner resiliently against said head.

2. An internal combustion engine including: a cylinder block having a bore closed at the head end and open at the crank end, the wall of said bore having an annular groove therein adjacent its open end, a liner comprising a plain cylindrical body of substantially uniform cross-section fitting within said bore and extending from said head end to a point near said annular groove, an annular resilient locking means removably disposed in said annular groove and capable of exerting an axial force upon the end of said liner whereby said liner is held tightly endwise against the head end of said bore while permitting expansion and contraction of said liner.

3. An internal combustion engine including: a cylinder block having a bore closed at the head end and open at the crank end, the wall of said bore having an annular groove therein adjacent its open end, a liner comprising a plain cylindrical body of substantially uniform cross-section

4

fitting within said bore and extending from said head end to a point near said annular groove, and an axially resilient washer disposed in said annular groove in abutting relation to the free end of said liner urging said liner against said head end of said bore while permitting axial expansion and contraction.

4. An internal combustion engine including: a cylinder block having a bore closed at the head end and open at the crank end, the wall of said bore having an annular groove therein adjacent its open end, a liner comprising a plain cylindrical body of substantially uniform cross-section fitting within said bore and extending from said head end to a point near said annular groove, and a frusto-conical resilient split washer having its outside diameter disposed within said annular groove and abutting one side thereof and having its inside diameter abutting the free end of said liner to thereby resiliently urge said liner against the head end of said bore while permitting expansion and contraction of said liner.

5. An internal combustion engine including: an engine block having a cylindrical bore therein, a head closing one end of said bore, a smooth cylindrical liner disposed in said bore in close thermal contact with said bore substantially throughout the length of said liner, a gasket located between said head and said liner, an inwardly opening annular groove in the wall of said bore adjacent one end of said liner, an annular resilient locking means removably disposed in said groove and capable of exerting an axial force on the end of said liner whereby said liner is held tightly at an axial direction against said gasket to allow the expansion and contraction of said liner while maintaining pressure on said gasket between said head and said liner.

FRANK RIPPINGILLE.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,301,254	Gunn et al.	Apr. 22, 1919
1,525,755	Link	Feb. 10, 1925
2,094,254	Brubaker	Sept. 28, 1937
2,127,825	Mader	Aug. 23, 1938
2,203,885	Wilcken et al.	June 11, 1940
2,378,045	Sorensen et al.	June 12, 1945

FOREIGN PATENTS

Number	Country	Date
324,236	Germany	Sept. 8, 1920
217,996	Great Britain	June 27, 1924