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ENGINE CYLINDER LINER

Filed June 17, 1935

2 Sheets-Sheet 1

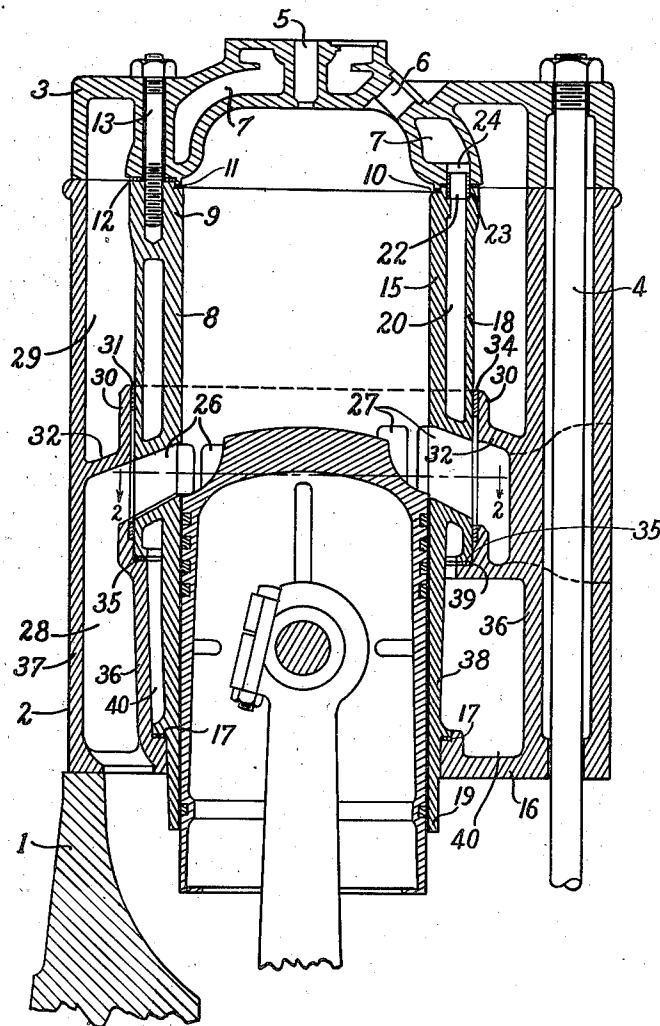


Fig: 1

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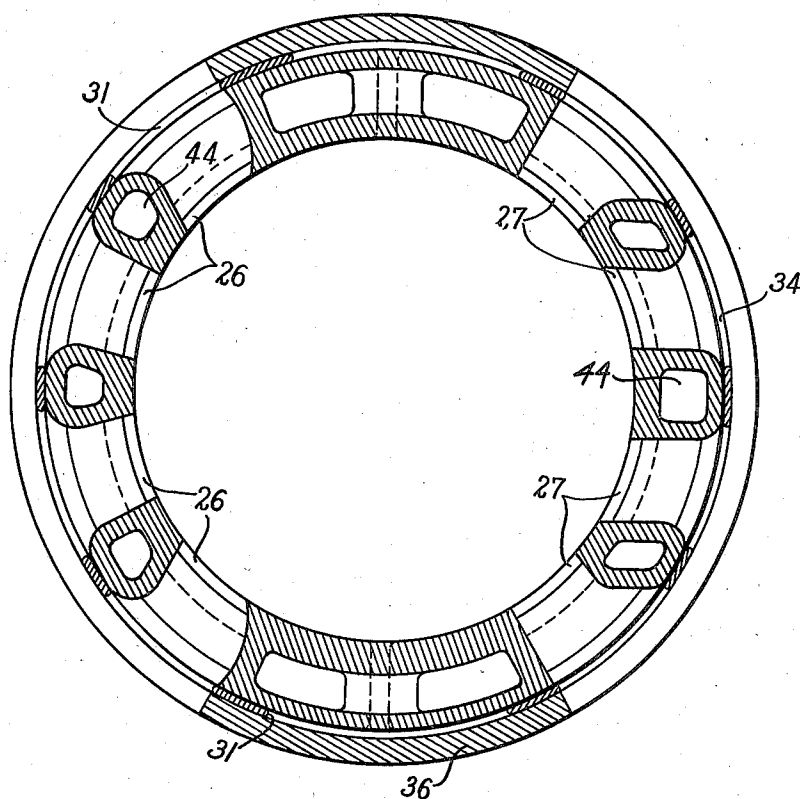
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ENGINE CYLINDER LINER

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2 Claims. (Cl. 123—173)

This invention relates to improvement in internal combustion engines in general and, more particularly, to the improvement in the cylinder liner construction particularly adapted for two cycle engines, especially of the Diesel type.

The inside walls of internal combustion engines are subject to intense heat of combustion in the cylinder. This heat causes an expansion far in excess of the expansion of the outer walls, and introduces serious problems, particularly where air passages and exhaust passages through the cylinder are demanded, necessitating the making of an irregular section. This causes warping and distortion of the cylinder bore.

To overcome this difficulty, cylinder liners have been installed in various ways to allow for free linear and radial expansion of the liner. This is common in the four cycle engines, where no porting is necessary in the cylinder walls. In two cycle engines, however, where ports are provided in the cylinder wall, and are essential to the functioning of the engine, certain problems arise due to the unequal expansion of the cylinder and the outer walls. It is an object of the present invention to provide a new and improved cylinder liner construction for two cycle engines, where the ports extend through the cylinder wall, which will allow gasketing those ports and packing the liner for water circulation.

Heretofore, cylinder liners have been clamped between the cylinder head and the cylinder block by the bolts which held the cylinder head in place. This has necessitated a great tightening pressure on the bolts in order to maintain the gasket between the head and the liner under sufficient compression to offset the loosening effect of the high internal pressure developed by the burning gas. This repeated compression and expansion of the gasket materially lessens its life. The prior construction also tended toward the production of stresses tending towards distortion of the cylinder liner if the bolts were unequally tightened. It is, therefore, a further object of the present invention to provide an improved mounting for a cylinder liner which will overcome this objection.

It is a still further object of the present invention to provide a two cycle engine cylinder liner which will include, as an integral part thereof, a water jacket for the part that is subjected to the intensest heat.

It is a still further object of the present invention to provide an improved liner construction wherein the liner is mounted in a way independently of the means used for securing the cylinder block in place.

Another object of the present invention resides in the provision of an improved gasket construction for each of the junctures between the cylinder block and the liner.

In the practice of the present invention, the liner is double walled from its top to the air intake and exhaust ports, to provide a circulating water jacket, and is single walled therebelow adjacent the water sump. The liner is suspended from the head, and means is provided to facilitate positioning of an intermediate gasket to augment leakage-prevention while permitting the free longitudinal and radial expansion of the cylinder liner with respect to the cylinder block. Separate bolts extend through the cylinder head and cylinder block or housing and into the lower frame of the engine to hold the parts in assembly. The liner is radially supported at its outer wall by the cylinder block through gaskets which surround the air passageways for the intake air and the exhaust gases, and by other gaskets which provide a seal for preventing the leakage of water from the sump, while permitting the free expansion of the liner.

The attainment of the above and further objects of the present invention will be apparent from the following specification taken in conjunction with the accompanying drawings forming a part thereof.

In the drawings:

Figure 1 is a longitudinal sectional view through a cylinder structure of a two cycle Diesel engine, embodying the principles of the present invention; and

Figure 2 is a cross-sectional view taken along the line 2—2 of Figure 1.

Referring now to the drawings, an engine frame or base 1 carries a cylinder block or housing 2, which is surmounted by a cylinder head 3. Bolts 4 extending through the head and housing and into the frame serve to assemble these parts and also to withstand the stresses resulting from the pressure developed in the cylinder. The head is provided with a fuel inlet 5 and an opening 6 to receive an electric coil heater for starting purposes, in a manner well known in the art. The head is double walled to provide a space 7 for the reception of circulating cooling water.

A cylinder liner forming one essential feature of this invention is indicated at 8. Its upper end 9 is preferably rabbeted at 10 with the cylinder head 3, and the juncture is sealed by copper or other suitable gaskets 11 and 12 in stepped relation. Supporting bolts 13, extending down through the head 3, are threaded into the upper end 9 of the liner 8, and are tightened merely to an extent necessary to seal said juncture against leakage. These bolts serve to suspend the liner from the head. The bolts 13 and the liner are not subjected to any impulses from pressures developed in the cylinder. The gaskets 11 and 12 are thereby subjected to smaller extremes of pressure than would be true if they were held by stress-withstanding means such as the bolts 4,

and are therefore more dependable and durable.

The liner 8 is sealed with the lower part 16 of the cylinder block by a yieldable gasket 17, of rubber or other suitable material, which prevents water leakage while allowing for linear expansion of the liner.

The cylinder liner has an outer water jacket wall 18 which extends from the top of the liner for substantially half of the length thereof. There is thus formed a water chamber or compartment 20 which communicates with the head water chamber 7 by means of nipples 22 snugly fitted in registering sets of openings 23 and 24 in the respective parts.

The liner is provided with air intake, and exhaust ports 26 and 27, respectively, approximately midway of its length. The intake ports 26 communicate with and form a continuation of an air intake passageway 28 for supplying air at the usual pressures, to the cylinder. At the ports 26 the cylinder block 2 is provided with a cylindrical flange 30. A gasket 31, of copper, asbestos, or other suitable material is snugly fitted between this flange and the outer liner wall 18 about the ports 26.

The exhaust ports 27 likewise are continuations of an exhaust passage 32 formed in the housing 2. Between the flange 30 and the outer wall 18 of the liner a gasket 34 of copper, asbestos, or other suitable material is snugly fitted.

The outer wall 18 of the liner terminates below the ports 26 and 27 in a free horizontal edge 35. The lower part of the housing 2 has an eccentric inner wall 36 which forms a water sump chamber 40 in conjunction with the single liner wall portion 38. The upper portion of the housing wall 36 affords a ledge 39 below the edge 35. A rubber or like gasket is fitted between the edge 35 and ledge 39 to seal the water chamber from the air space 29 and additionally seal the water chamber from the intake and exhaust passages, while at the same time allowing expansion of the liner.

Water is circulated in the cylinder head and through the water jacket 20 by any suitable pump and associated means (not shown), thus effectively cooling the hot upper part of the engine. The pump has its intake side connected to receive water from the sump 40, and its output side is connected to deliver water to the water chamber 7 in the manner usual in the art. The water circulates around the cylinder head and thence through the passages 24 to the water jacket 20, thus cooling the cylinder head and the cylinder liner, and then flows back into the sump 40. The lower part of the cylinder liner is cooled by contact with the water in the sump 40.

The partitions between the adjacent intake passageways and between adjacent exhaust passageways are preferably hollow, as indicated at 44 to provide adequate water cooling of the cylinder liner even around the ports.

From the above description it is apparent that I have provided a cylinder liner of the type adapted for a two cycle engine, particularly a Diesel engine, which liner is so mounted and gasketed as to prevent leakage around the ports while at the same time permitting free linear and radial expansion of the liner within the cylinder block. Also, the liner is suspended from the cylinder head, rather than clamped in place by the cylinder head. By this arrangement canting of the

cylinder liner is effectively prevented. Furthermore, it may be seen that the upper part of the cylinder liner, which is subjected to the intense heat of combustion of the gases in the cylinder, has a water jacket formed as an integral part thereof. This simplifies the problem of providing adequate gasketing around the ports.

In compliance with the requirements of the patent statutes, we have here shown and described a preferred embodiment of our invention. It is, however, to be understood that the invention is not limited to this precise construction, the same being merely illustrative of the principles of the invention. What we consider new, and desire to secure by Letters Patent is:

1. A two cycle internal combustion engine of the type wherein air is admitted into the cylinder under pressure, said engine including a cylinder block and a cylinder head, means for securing the head and block together, and a cylinder liner in the block, means for securing the liner to the cylinder head, said cylinder block having an intermediate wall surrounding the lower end of the liner and spaced therefrom to form a water chamber, and forming an air supply passageway between itself and the outer wall of the block, said cylinder liner being double walled at its upper end to form a water jacket, and having a projecting portion extending over and forming a closure for the top of said water chamber, said projecting portion resting on said intermediate wall of the cylinder block, with gasket means interposed between said projecting portion and said wall to form a liquid-tight seal while permitting relative expansion of the liner with respect to the block, ports formed in the wall of the liner and communicating with said air passageway, and yielding gaskets surrounding the ports between the liner and the cylinder block and forming a liquid tight seal around the ports while permitting relative expansion of the liner with respect to the cylinder block.

2. A two cycle internal combustion engine of the type wherein air is admitted into the cylinder under pressure, said engine including a cylinder block, and a cylinder head secured together, and a cylinder liner in the block, said cylinder liner being suspended from the cylinder head and free to expand longitudinally and diametrically within the cylinder block, said cylinder block having an intermediate wall surrounding the lower end of the liner and spaced therefrom to form a water chamber, and forming an air supply passageway between itself and the outer wall of the block, said cylinder liner being double walled at its upper end to form a water jacket, and having a projecting portion extending over and forming a closure for the top of said water chamber, said projecting portion resting on said intermediate wall of the cylinder block, with gasket means interposed between said projecting portion and said wall to form a liquid-tight seal while permitting relative expansion of the liner, ports formed in the wall of the liner and communicating with said air passageway, and yielding gaskets surrounding the ports between the liner and the cylinder block and forming a liquid-tight seal around the ports while permitting relative expansion of the liner with respect to the cylinder block.

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