United States Patent [19]

Glassey et al.

[11] **3,800,751**

[45] **Apr. 2, 1974**

[54] **CYLINDER LINER WITH CENTERING TABS DEFINING COOLANT PASSAGES THERE-BETWEEN**

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[22] Filed: **Dec. 22, 1972**

[21] Appl. No.: **317,521**

[52] **U.S. Cl.**..... **123/41.84,** 123/193 R, 123/193 C, 123/193 CH, 92/171

[51] **Int. Cl.**..... **F02f 1/10**

[58] **Field of Search** ..... 123/193 R, 193 C, 193 CH, 123/41.84, 41.81, 41.83, 41.79, 41.8; 92/171

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[57] **ABSTRACT**

An internal combustion engine comprises a block having a plurality of cylinder liners mounted therein. Interconnecting passages continuously circulate a coolant through the block and around each liner during engine operation. Each liner has a plurality of circumferentially spaced tabs formed therearound to center the liner in a cylinder bore and to define passages therebetween for communicating coolant to an upper, radial support flange seated on the block.

10 Claims, 3 Drawing Figures

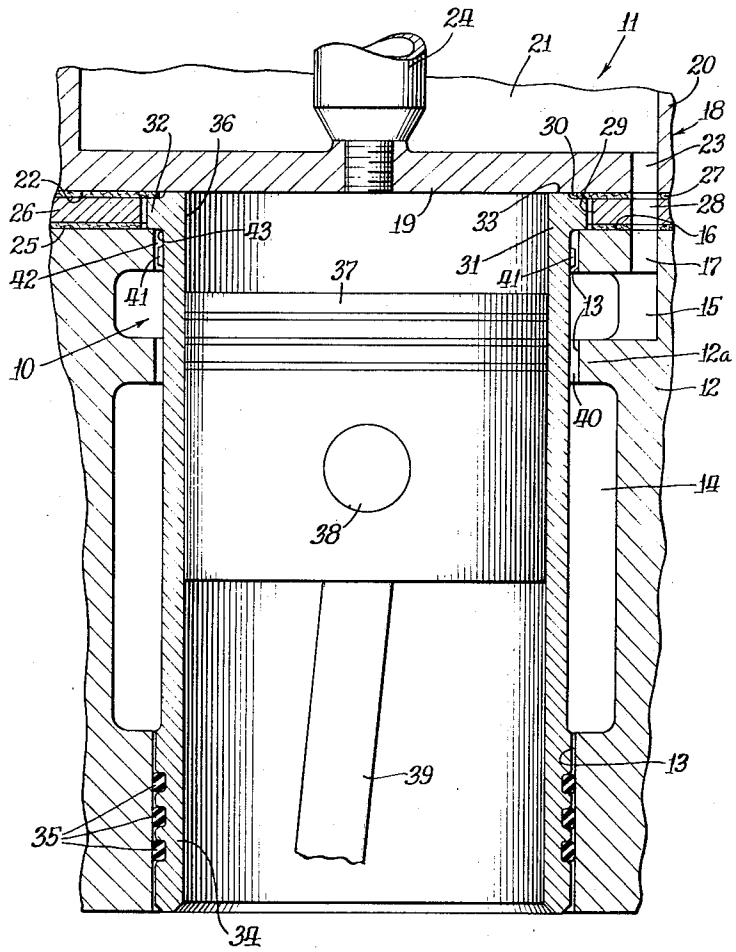
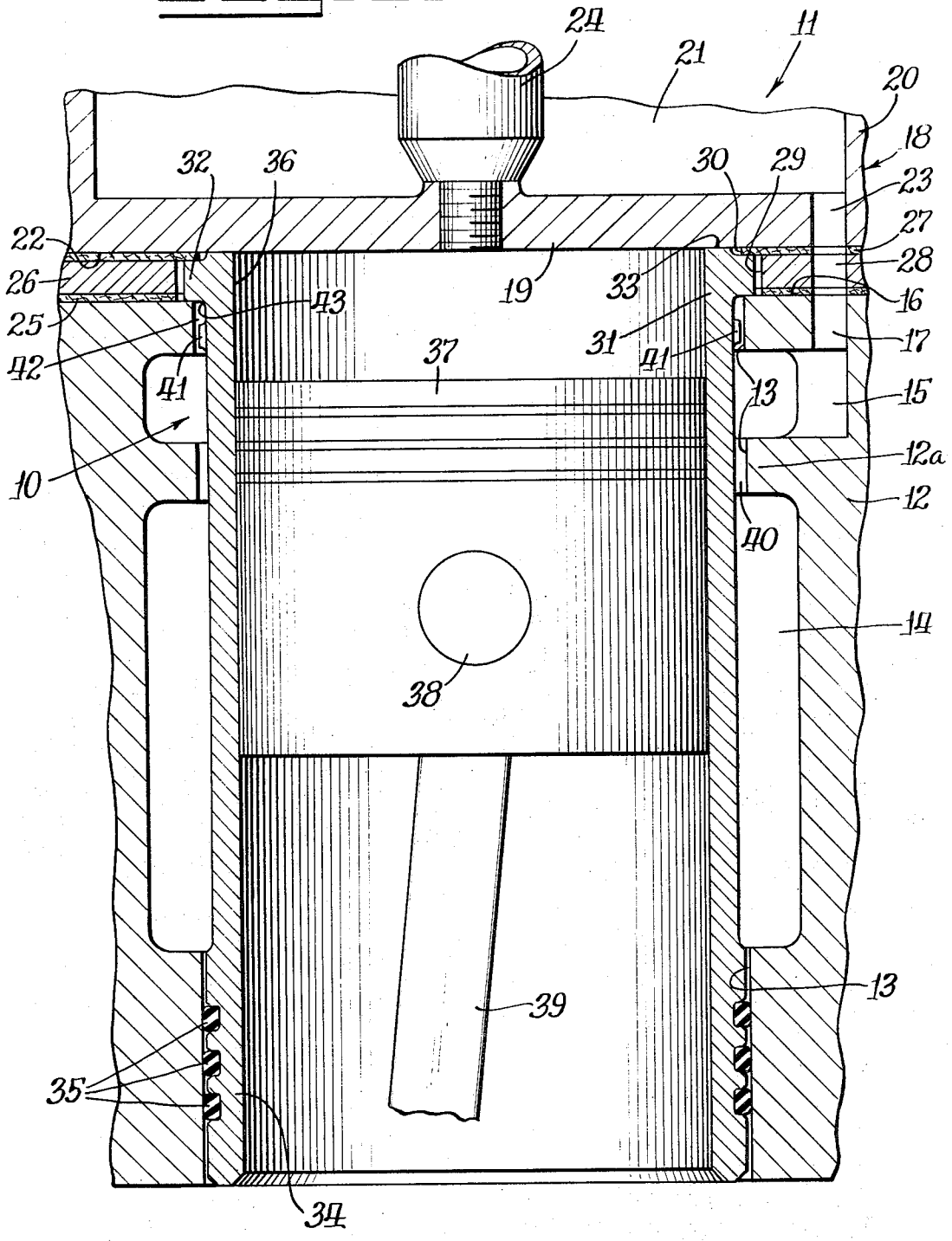


FIG. 1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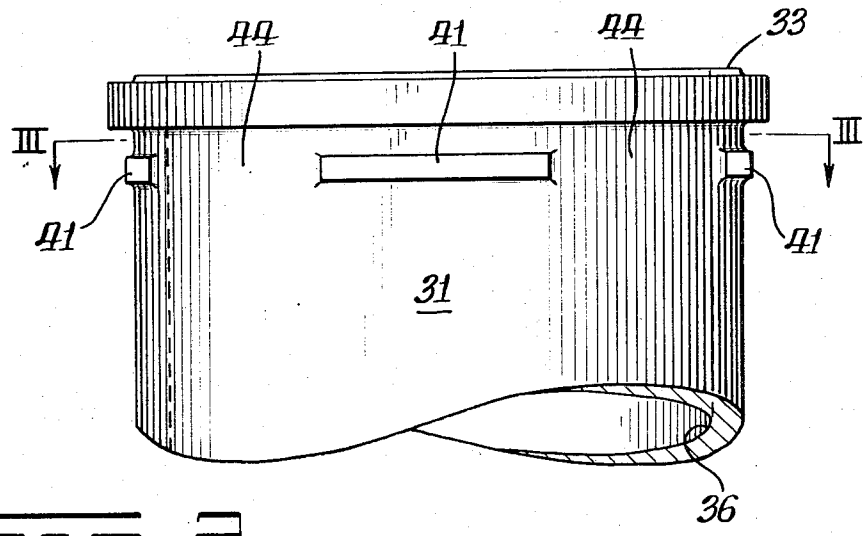

Fig-2-

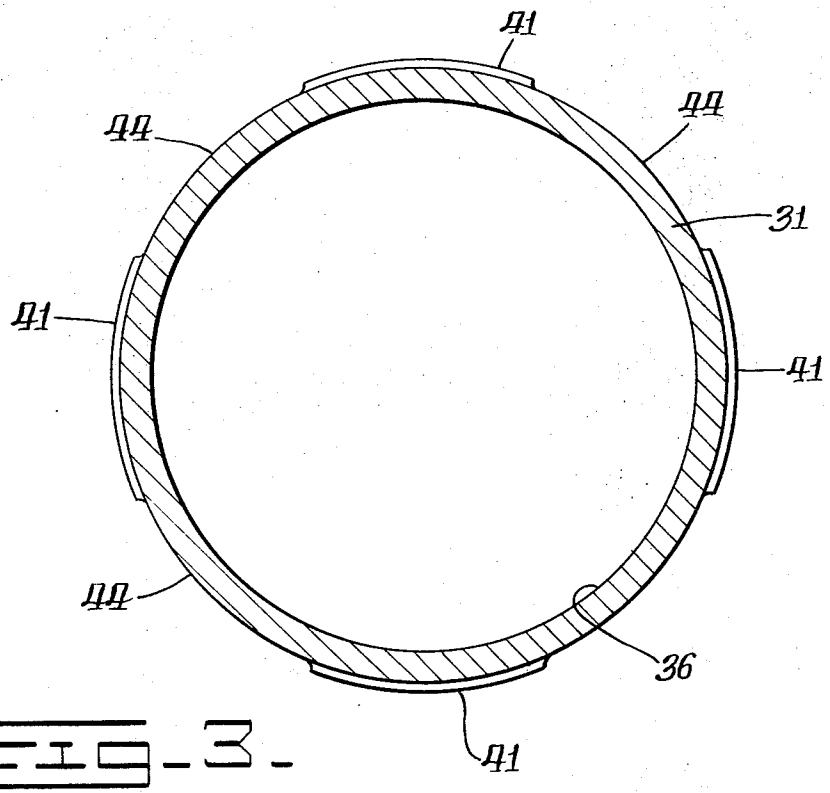

Fig-3-

CYLINDER LINER WITH CENTERING TABS DEFINING COOLANT PASSAGES THERE-BETWEEN

BACKGROUND OF THE INVENTION

A conventional internal combustion engine comprises interconnecting passages and chambers formed in its block and head for circulating a coolant therethrough and around its cylinder liners during engine operation. Each cylinder liner comprises an upper, radial flange which is seated on the block and a lower, radial flange for centering the liner in a cylinder bore. The lower flange normally has a diameter which is slightly less than the bore diameter to define a radial clearance therebetween when the engine is cold to compensate for thermal expansion of the lower flange when the engine is warmed to its operating temperature.

The central portion of the liner, immediately below the lower flange, is circumvented by an annular chamber for circulating coolant around the liner to dissipate combustion heat. The above-mentioned radial clearance permits coolant to seep into an annular space defined between the upper and lower flanges when the engine is cold. When the engine warms to its operating temperature, thermal expansion of the lower flange will close the radial clearance to trap coolant in the annular space.

The trapped coolant normally includes additives, such as antifreeze and rust inhibitors, which breakdown into chemical corrosive agents when they are overheated to temperatures approximating 250°. Such agents tend to corrode the seating area for the upper flange on the block whereby the liner may move downwardly a few thousandths of an inch. As a result, an annular metal-to-metal seal normally provided between an upper surface of the liner and an abutting lower surface of the cylinder head may separate to permit the ingress of hot combustion gases into the area of the head gasket to deteriorate same.

SUMMARY OF THIS INVENTION

An object of this invention is to overcome the above, briefly described problems by providing a cylinder liner with a plurality of circumferentially spaced centering tabs therearound which define coolant passages therebetween when installed in a cylinder bore of an internal combustion engine. The passages are strategically positioned in close proximity to an upper, radial flange formed on the liner to seat on the engine block to continuously cool same.

BRIEF DESCRIPTION OF THE DRAWING

Other objects of this invention will become apparent from the following description and accompanying drawing wherein:

FIG. 1 is a cross sectional view of a cylinder liner and attendant structures, operatively assembled in an internal combustion engine;

FIG. 2 is an elevational view of a top portion of the cylinder liner; and

FIG. 3 is a cross sectional view of the cylinder liner, taken in the direction of arrows III-III in FIG. 2.

DETAILED DESCRIPTION

FIG. 1 illustrates a cylinder liner **10** of the present invention operatively assembled in a partially shown internal combustion engine **11**. The engine includes a block **12** having a plurality of cylinder bores **13** (one shown) suitably formed therein. The block has an annular shelf or baffle **12***a* formed thereon, in part defining the bore and annular coolant chambers **14** and **15** which circumvent a hereinafter described cylinder liner for cooling purposes. The block further includes an upper mounting and sealing surface **16** which intersects radially disposed coolant passages **17** (one shown).

A head **18** includes a bottom deck **19** and walls **20** which define coolant chambers **21** therein (one shown). The bottom deck defines a flat mounting and sealing surface **22** thereunder and has radially disposed passages **23** (one shown) formed therethrough in alignment with passages **17**. The head also supports a precombustion chamber **24**, fuel injection equipment and intake and exhaust valves thereon (not shown). A gasket **25**, a spacer **26**, and a head gasket **27** are sandwiched between mounting surfaces **16** and **22** to form a static seal therebetween. The gaskets and spacer have coolant passages **28** formed therethrough in alignment with passages **17** and **23** to continuously communicate coolant from chamber **15** to chamber **21**.

An annular opening **29**, spaced radially outwardly from cylinder bore **13**, is in part defined by gasket **25** and spacer **26** for purposes hereinafter explained. Head gasket **27** has a circular opening **30** formed therethrough, having a diameter which is equal to or slightly less than the diameter of cylinder bore **13**. The head gasket thus has a portion formed thereon which overlies an exposed annular seating area of surface **16** which defines the lower end of annular opening **29**.

A cylindrical liner **31** is concentrically disposed in cylinder bore **13** and is supported on surface **16** of the engine block by a continuous upper, radial support flange **32**. It should be noted that annular opening **29** provides for the thermal expansion of the flange when the engine warms to its operating temperature. Also, the annular portion of gasket **27** which overlies opening **29** extends radially inwardly to also overlie flange **32**.

An upper annular surface **33** of the liner sealingly engages bottom surface **22** of the head to prevent the leakage of combustion gases thereby. Such gases are thus blocked from entering into the critical area whereat head gasket **26** sealingly engages an upper surface of flange **32**. A lower end **34** of the liner is concentrically supported and sealed within cylinder bore **13** by a plurality of elastomeric O-ring seals **35**.

Liner **31** defines a cylindrical bore **36** having a piston **37** reciprocably mounted therein. A wrist pin **38** pivotally connects the piston to a rod **39** which has its lower end suitably attached to the engine's crankshaft (not shown). An annular venturi throat **40** is defined between the liner and shelf **12***a* to increase the velocity of coolant flow from chamber **14** to chamber **15**.

A plurality of centering tabs or tab means **41**, having an outside diameter slightly less than the inside diameter of bore **13** to allow for thermal expansion thereof are formed around a top portion of the liner (FIGS. 2 and 3) to concentrically locate the liner in bore **13**. The liner must be properly aligned with the appropriate crankshaft journal and must assume a proper attitude with respect to engine block **12** to assure proper reciprocation of piston **37** in bore **36**. The tabs are spaced axially downwardly from upper supporting flange **32** to define an annular groove **42** therebetween which facili-

tates the roll forming of a flange radius 43 on the liner to increase its structural integrity thereat.

Tabs 41 are circumferentially and equally spaced around the liner to define axially disposed coolant passage means 44 of approximately equal circumferential length therebetween. Such coolant passage means allow relatively unrestricted circulation of coolant therethrough and to annular groove 42 (FIG. 1). Such circulation substantially cools a critical "hot spot" at the upper portion of the liner and also prevents the trapping of coolant thereat.

As suggested above, the non-trapping function thus prevents the coolant from breaking-down into corrosive agents which would tend to erode and eventually destroy the seating and sealing relationship required between flange 32 and surface 16 of the block. Accordingly, upper liner surface 33 is continuously maintained in sealing contact with surface 22 to prevent the seepage of hot combustion gases thereby to fully protect the head gasket against deterioration.

Alternately, tabs 41 could be formed by being cast integrally on the periphery of the bore 13 with such tabs having an inside diameter slightly more than the outside diameter of the liner without departing from the spirit of the present invention.

What is claimed is:

1. In an internal combustion engine having a block, a head mounted on said block, a cylindrical bore formed in said block, a cylindrical liner mounted in said bore and having an upper, continuous radial flange abutting a top surface of said block in sealing engagement therewith, and interconnecting passage and chamber means defined in said block and said head and around said liner for continuously circulating a coolant therethrough during engine operation, the improvement comprising a plurality of tab means, spaced axially downwardly from said upper flange, disposed around the outer periphery of said liner in circumferentially spaced relationship to define coolant passage means therebetween for communicating coolant from said chamber means to said upper flange.

2. The invention of claim 1 wherein said upper flange and said tab means define an annular groove therebetween.

3. The invention of claim 1 wherein said tab means are formed on said liner and have outer diameters slightly less than an inside diameter of said bore to aid in centering and locating the upper portion of said liner in said bore.

4. The invention of claim 1 further comprising a pair of gaskets and a spacer plate sandwiched between said gaskets, said gaskets and spacer plate mounted between said block and said head.

5. The invention of claim 4 wherein one of said gaskets has an annular portion extending radially inwardly to overlie said upper flange.

6. A cylinder liner adapted for use in an internal combustion engine comprising a continuous annular radial flange formed adjacent to a top of said liner to extend radially outwardly therefrom and a plurality of tab means, spaced axially downwardly from said radial flange, formed on the outer periphery of said liner in circumferentially spaced relationship therearound to define coolant passage means therebetween for communicating coolant from said chamber means to said radial flange when said liner is installed in said engine.

7. The liner of claim 6 wherein said radial flange and said tab means define an annular groove therebetween.

8. The liner of claim 6 wherein said tab means have outer diameters slightly less than an outside diameter of said radial flange.

9. The liner of claim 6 wherein four of said tab means are equally spaced circumferentially about said liner.

10. The liner of claim 9 wherein the circumferential lengths of each of said coolant passage means and said tab means are at least approximately equal to each other.

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