Dec. 24, 1957 A. M. BRENNEKE 2,817,327

ENGINE BLOCK CONSTRUCTION

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Fig. 1.

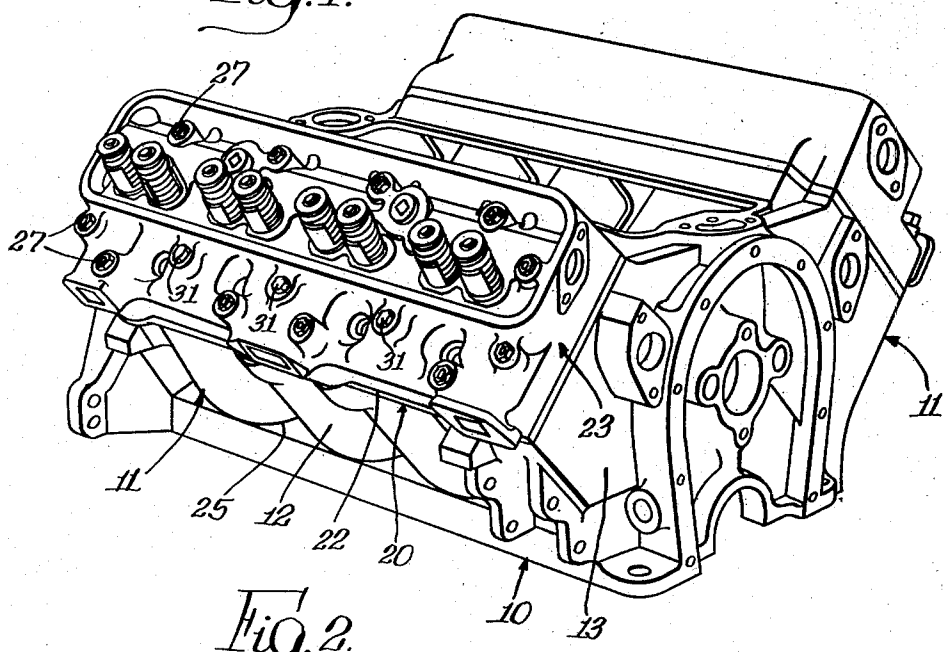

Fig. 2.

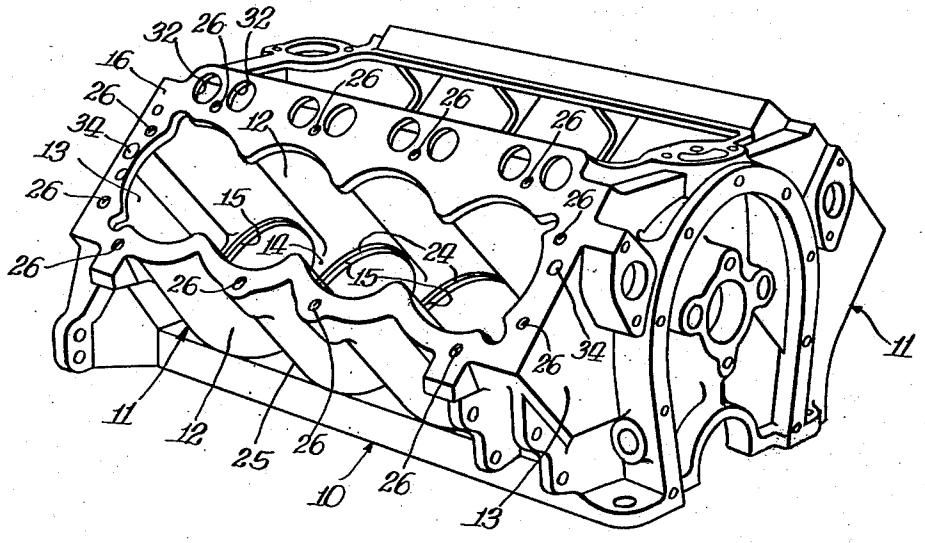

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Fig. 3.

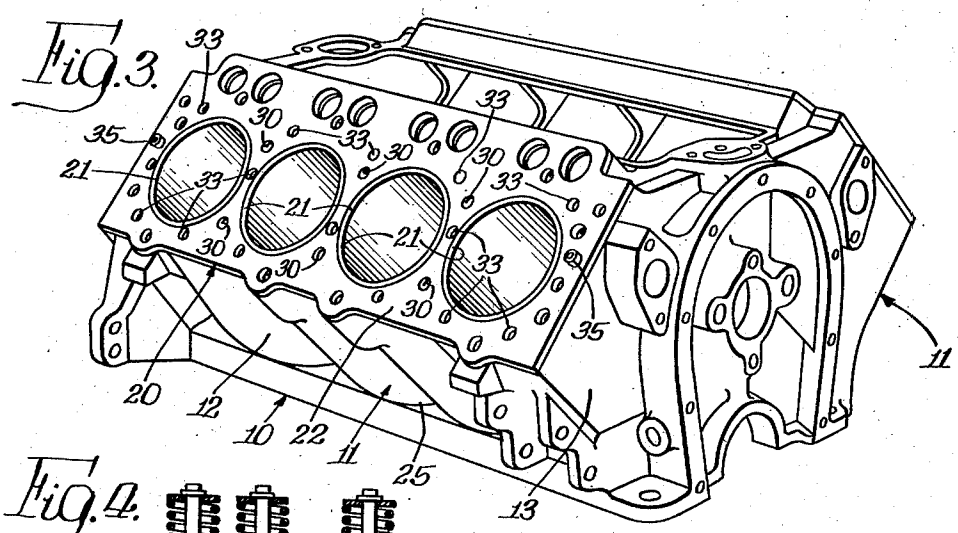


Fig. 4.

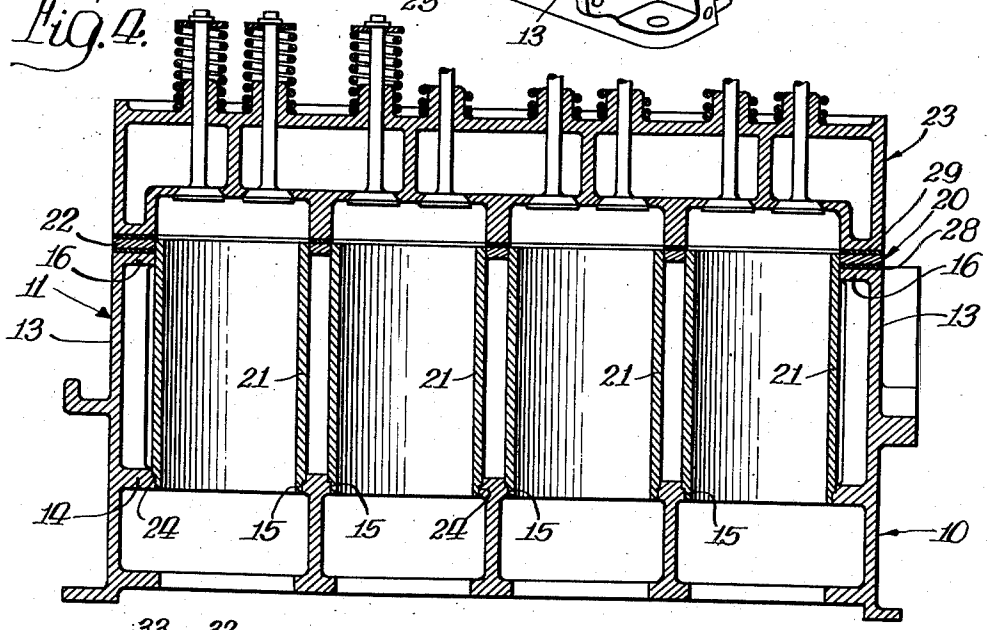
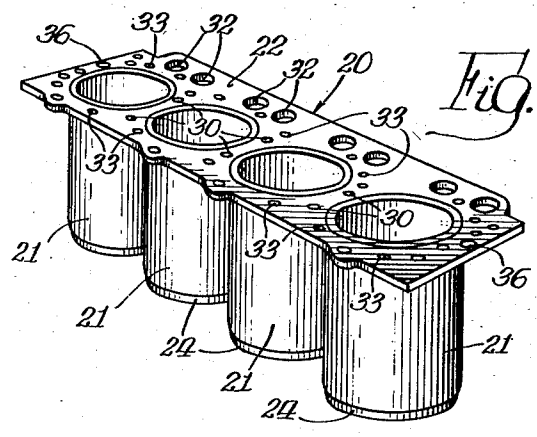


Fig. 5.



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ENGINE BLOCK CONSTRUCTION

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Application July 7, 1955, Serial No. 520,528

8 Claims. (Cl. 123—195)

The invention relates generally to internal combustion engines and more particularly to an engine block construction and an assembly of cylinder liners therefor.

The general object of the invention is to provide a novel engine block construction utilizing wet cylinder liners, which greatly simplifies the block casting and hence reduces the cost of making it.

It is also an object to provide a novel engine block construction utilizing wet cylinder liners, which requires a minimum of space between the respective cylinders and thus may be shorter than a block of ordinary construction.

Another important object is to provide a novel engine block construction utilizing wet cylinder liners, in which all the liners are replaceable as a single unit.

A further object is to provide a novel engine block construction utilizing wet cylinder liners, in which the effect of the stresses resulting from securing the cylinder head to the block is minimized, and which provides great latitude in the location of the studs for securing the head to the block.

Still another object is to provide a novel engine block construction utilizing wet cylinder liners, in which a metal coolant seal is provided at the upper end of the block.

Other objects and advantages will become apparent from the following description taken in connection with the accompanying drawings, in which:

Fig. 1 is a perspective view of an engine block construction embodying the features of the invention;

Fig. 2 is a perspective view of the cylinder block alone;

Fig. 3 is a perspective view of a cylinder block with a liner assembly mounted thereon;

Fig. 4 is a longitudinal sectional view of the engine block construction shown in Fig. 1; and

Fig. 5 is a perspective view of the liner assembly utilized in the engine block construction illustrated herein.

The usual engine block construction of the type used in automotive vehicles comprises a cylinder block and a cylinder head. Of course, if the engine is of the V type, then two cylinder heads are used on the respective sides of the engine. In constructions of this kind, the cylinder block has the cylinder bores formed therein so that the cylinder walls are an integral part of the block casting, and the character of metal used to make such a casting is determined by the requirements for the cylinder walls. A casting of this type is difficult and expensive to make both because of the character of metal used and because of the intricacies of the coring necessary to provide passages in the block for coolant. A cylinder block of this character must also be provided with openings in its top to conduct coolant to the cylinder head, and with passages for conducting oil to the rocker arm mechanisms mounted in the cylinder head.

At the present time many engines are provided with wet cylinder liners which eliminate some of the difficulties in connection with a cylinder block of the type first described.

Thus, with wet liners, only the liner need be made of

metal having the proper characteristics for the cylinder walls. The cylinder block itself may be made of any metal that has the desired strength and may be easily cast. The use of liners also simplifies the casting of the block since the coolant passages open into the bores which receive the liners. The coring for the casting is thus simplified.

The present invention simplifies the casting for the cylinder block still further in that the cylinder block casting can be made of a relatively simple box-like construction open at its top so that the coring for such casting is more easily accomplished and the casting can be more thoroughly cleaned to remove the coring. The present construction also provides for a minimum of space between the respective cylinders so that the cylinder block can be made shorter than in the case where the cylinder walls are integral with the block or the case where separate liners are utilized. The present construction also minimizes the effect of stresses resulting from securing the cylinder head to the block and permits great latitude for the location of the studs which secure the cylinder head to the block. The present construction further provides a metal seal for the upper end of the coolant space in the block and permits the replacement of all of the liners as a single unit.

The preferred embodiment of the invention comprises generally a cylinder block of box-like form comprising side walls and a bottom wall, the latter having a plurality of aligned openings, one for each cylinder. Mounted on the block is a liner assembly comprising a plurality of aligned liners and a plate provided with a plurality of openings in which the upper ends of the liners are rigidly secured. The plate is adapted to rest on the top of the block and to be clamped thereon by the cylinder head, and the liners extend downwardly into the block in spaced relation to the side walls thereof to provide coolant space, with the lower ends of the liners extending into and seated in the openings in the bottom of the block.

In the preferred embodiment of the invention illustrated in the drawings, the cylinder block is indicated generally at **10**. In an engine where the cylinders are in a single row, the cylinder block would comprise a single casting of box-like form. For purposes of illustration, I have shown the invention embodied in a V type engine where the cylinder block **10** comprises two box-like portions, indicated generally at **11**, positioned at an angle to each other.

The cylinder block casting alone is shown in Fig. 2 and each portion **11** comprises a box-like structure having side walls **12**, end walls **13**, and a bottom wall **14**. The bottom wall **14** is provided with a plurality of longitudinally aligned openings **15**, one for each cylinder. Below the bottom wall **14** is the usual crankcase portion of the engine. The top of each box-like portion **11** is open except for a flange **16** formed integrally as a part of the casting. Preferably the flange would extend outwardly from the side and end walls to simplify the coring of the casting, but in the present instance the flange **16** is shown as extending inwardly because of the spacing of the liners from the side and end walls.

The liner assembly, indicated generally at **20** and shown separately in Fig. 5, comprises a plurality of cylindrical liners **21** secured at their upper ends to a flat plate **22**. The plate **22** is adapted to rest on the flange **16** of the cylinder block and to be secured thereto by the cylinder head, indicated generally at **23**. The liners **21** extend downwardly within the block into the openings **15** formed in the bottom wall thereof. Preferably, each opening **15** and the associated liner is provided with an inter-engaging shoulder structure **24** to support the liner at the lower end thereof and to provide for a seal. Such

seal may be formed by an O-ring or by an adhesive such as an epoxy resin.

The liners **21** are of course spaced from the side walls **12** and the end walls **13** to provide a coolant area within the block, and the side walls **12** may be shaped to give the desired amount of coolant space. In the present instance, the side walls are shown as being scalloped, as indicated at **25**, to conform generally to the curvature of the liners so that the coolant space is of approximately uniform width throughout the circumference of each cylinder. The scalloping thus reduces the coolant capacity so that it is less than if the side walls of the block were straight, and the scalloping also provides increased strength and rigidity. The top flange **16** may also be correspondingly scalloped at its inner edge, as shown in Fig. 2.

As mentioned above, the liners **21** at their upper ends are rigidly secured to the plate **22** in openings therein. Any suitable means may be provided for securing the liners to the plate, such as screw-threads or by brazing the liners into the plate. In the present instance, brazing has been used. The liners are thus rigidly held by the plate at their upper ends and are seated at their lower ends in the cylinder block.

The liner assembly is adapted to be secured on the top of the cylinder block by being clamped between the block and the cylinder head **23**. The cylinder head may be secured to the block in the usual manner, that is, by the use of studs threaded into the block and extending upwardly through the plate **22** and through the head **23**. In the present instance, the studs are threaded into the flange **16** of the block, and holes **26** (see Fig. 2) are provided for this purpose. The presence of the flange **16** at the upper end of the block permits wide latitude in selecting the particular locations for the studs around the perimeter of the block. As mentioned above, the studs utilized are of the usual form, that is, they are threaded into the holes **26** and extend upwardly through the plate and through the head **23** for engagement with nuts **27** (see Fig. 1) on their upper ends. To provide a suitable seal for the coolant, a gasket **28** (see Fig. 4) may be placed between the flange **16** and the plate **22**. Similarly, a gasket **29** may be placed between the plate **22** and the head **23** to provide a seal against combustion gases.

Since the area within the flange **16** is open in the block but is closed by the plate **22**, the cylinder head **23** may be secured to the plate in this area by providing a plurality of threaded holes **30** in the plate. Screws **31** (see Fig. 1) are then provided, which extend through the head and are threaded in the holes **30**.

The plate **22** may also be provided with large openings **32** to permit push rods for operating the valves of the engine to extend therethrough. The coolant for the cylinder head is usually supplied from the coolant cavities in the cylinder block. In the present construction, since the coolant space in the block lies between the liners **21** and the side walls **12** and end walls **13**, the top plate **22** is apertured in this area to permit the flow of coolant to the cylinder head. Thus, as shown in Figs. 3 and 5, holes **33** are provided for this purpose.

The cylinder block of in engine is usually provided with one or more passages aligned with passages in the cylinder head to supply oil to the rocker arm mechanism mounted on the head. In the present instance such passages in the cylinder block are shown at **34** in Fig. 2. It is also desirable to provide dowel pins in the block to properly position the liner assembly thereon before the head is secured in place. In the present instance, I provide dowel pins **35** (see Fig. 3) which are tubular in form and are mounted in the oil passages **34**. The dowel pins **35** extend through apertures **36** (see Fig. 5) in the plate **22** and are of sufficient length to enter the oil passages in the cylinder head. Thus, the dowel pins provide for oil flow therethrough and also serve to position both the liner assembly and the cylinder head on the block.

With the foregoing construction, it will be evident that I have provided a novel engine block construction utilizing wet cylinder liners, which simplifies the cylinder block casting. Thus, the casting can be made merely in a box-like form so that when the liners with their top plate **22** are in position, a coolant space is provided between the liners and the side and end walls of the block casting. The construction requires a minimum of space between the respective cylinders since no part of the cylinder block is located between the liners. The liner assembly comprising the plate **22** and the liners **21** is replaceable as a single unit and because of its rigidity the effect of the stresses resulting from securing the cylinder head to the block is minimized. The construction also provides wide choice for the location of the studs for securing the head to the block and the plate provides a metal coolant seal.

I claim:

1. An engine block construction comprising a block of generally rectangular box-like form having a bottom wall provided with a plurality of laterally spaced liner receiving openings, said block being open at its top, and a liner assembly secured to the top of said block and comprising a plurality of laterally spaced cylindrical liners of substantially uniform external diameter throughout their length positioned within the block and extending into the respective liner receiving openings, and a plate having a plurality of laterally spaced openings to receive said liners with the plate secured thereto, said plate overlying the top of said block and closing the space within said block and outside of said liners.

2. An engine block construction comprising a block of generally rectangular box-like form having a bottom wall provided with a plurality of laterally spaced cylinder openings, said block being open at its top, a liner assembly secured to the top of said block and comprising a plurality of separate cylindrical liners positioned within the block and extending at their lower ends into said cylinder openings, and a plate having a plurality of laterally spaced openings to receive the upper ends of said liners with the plate secured thereto, said plate overlying the top of said block to close the space within said block and outside of said liners, and a cylinder head overlying said plate and secured to said block and clamping said plate against the top of said block, said liners being held in laterally spaced relation to each other by said plate at the upper ends of the liners and by said block at the lower ends of the liners.

3. An engine block construction comprising a block of box-like form having a side wall and a bottom wall, said bottom wall having a plurality of laterally aligned spaced liner openings, and the side wall at its top having a flange throughout the perimeter of the block, and a liner assembly comprising a plate resting on and secured to said flange and having a plurality of laterally spaced aligned openings, and a plurality of cylindrical liners secured at their upper end to said plate in the aligned openings thereof and extending into the liner openings in the bottom wall of said block, said liners being laterally spaced from each other and from said side wall and being laterally supported solely by said plate and said bottom wall.

4. An engine block construction comprising a block of box-like form having a side wall and a bottom wall, said bottom wall having a plurality of laterally spaced aligned liner receiving openings with the margin of each opening provided with an upwardly facing shoulder, and a liner assembly comprising a plate resting on and secured to the top of said side wall and having a plurality of laterally spaced aligned openings, and a plurality of liners secured to said plate in the aligned openings thereof and extending downwardly therefrom in spaced relation to each other and seated on said shoulders.

5. An engine block construction comprising a block of box-like form having a side wall and a bottom wall, said bottom wall having a plurality of aligned cylinder openings, and the side wall at its top having a flange throughout the perimeter of the block, a liner assembly comprising a plate resting on and secured to said flange and having a plurality of aligned openings, and a plurality of liners secured to said plate in the aligned openings thereof and extending into the cylinder openings in the bottom wall of said block, and a cylinder head overlying said plate and clamping said plate against said flange, said block having a plurality of studs extending from said flange through said plate and said head for securing the head to said flange, and said head having a plurality of screws threaded into said plate in the area inside of said flange.

6. An engine block construction comprising a block of box-like form having an end wall, a side wall and a bottom wall, said bottom wall having a plurality of aligned openings, said side wall being of scalloped form with the scallops concentric with said openings, said end and side walls having a flange at the top with the block entirely open in the area within said flange, and a liner assembly comprising a plurality of liners mounted in said block in substantially uniform spaced relation to said scallops and to each other and having their lower ends secured in said aligned openings, and a plate for supporting the upper ends of said liners and having a plurality of aligned openings in which said liners are secured, said plate being secured adjacent its outer edge to said flange and closing the open area within said flange.

7. A cylinder liner assembly for a cylinder block, comprising a plate adapted to be mounted on the upper surface of said block and to be clamped thereto, said plate having a plurality of laterally spaced aligned openings, and a plurality of separate cylindrical liners rigidly secured at their upper ends in said openings and adapted at their lower ends to seat in said block.

8. A cylinder liner assembly for a cylinder block, comprising a plate adapted to be mounted on the upper surface of said block and to be clamped adjacent its edges of said block, said plate having a plurality of laterally spaced aligned openings, and a plurality of separate cylindrical liners, of substantially uniform diameter throughout their length having their upper ends mounted in said openings and brazed to the margins thereof, said liners being adapted at their lower ends to be seated in said block.

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U. S. DEPARTMENT OF COMMERCE

PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,817,327 December 24, 1957

Arthur M. Brenneke

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, lines 53 and 54, for "aligned spaced" read -- spaced aligned --.

Signed and sealed this 25th day of March 1958.

(SEAL)
Attest:
KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents