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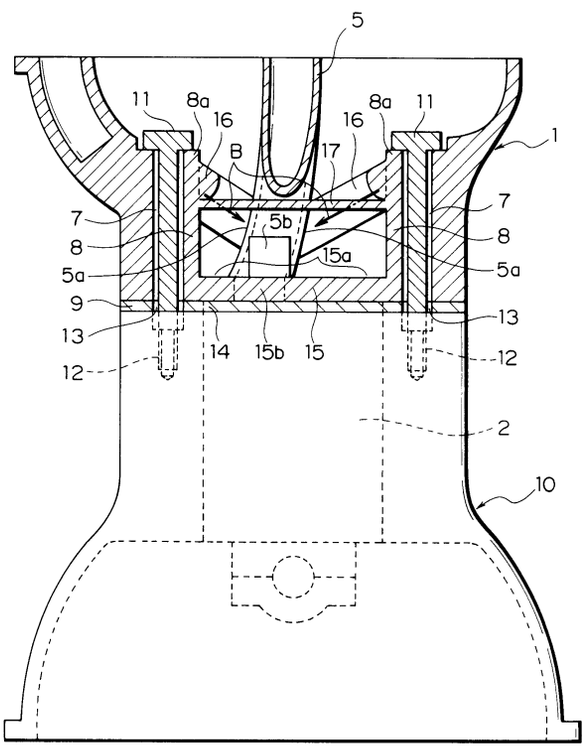
(54) Cylinder head for use in an internal combustion engine

(57) In a cylinder head 1 has boss portions 8 for head bolts 11 which are formed inside of both sides of the cylinder head 1, and a discharge/intake port 5 which extends from an intermediate portion 15a of a lower-surface deck 15 that is in contact with a gasket 9. In this cylinder head 1, ribs 16 are connected and supported from an upper portion 8a of the boss portions 8 toward a lower portion 5a of the intake port 5.

FIG. 1



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to the structure of a cylinder head for use in an internal combustion engine.

2. Description of the Related Art

[0002] Fig. 4 is a cross-sectional view showing the main portion of a cylinder head 31 in a conventional internal combustion engine. In the figure, the cylinder head 31 is fixed to a cylinder block 33 by fastening so as to interpose a gasket 32 therebetween.

[0003] To explain in more detail, a plurality of boss portions 37 having head bolt holes 36 for head bolts 35 are formed on the inner portions of both sides of the cylinder head 31. A lower-surface deck 38 is formed on the lower portion so as to be interposed between those boss portions 37, and a substantially-pipe-shaped intake port 39 is disposed so as to extend upward from an intermediate portion 38a of the lower-surface deck 38. Intake air is supplied from an opening portion 40 positioned below the intake port 39 to a cylinder 41 of the cylinder block 33 through an intake valve (not shown).

[0004] Also, each of the head bolt holes 36, each of through-holes 42 of the gasket 32 and each of screw holes 43 of the cylinder block 33 are allowed to coincide with each other so as to form a communicating hole, and each of the head bolts 35 is inserted and fastened into each of the communicating holes, to thereby fix the cylinder head 31 to the cylinder block 33 by fastening in a state where the gasket 32 is interposed between the cylinder head 31 and the cylinder block 33 so that the air tight property within the cylinder 41 is held by the gasket 32.

[0005] In this case, an inner portion 44 of the respective boss portions 37 is thinner than an outer portion 45 thereof, and the mechanical strength of the inner portion 44 is weakened. As a result, when each of the boss portions 37 is fastened by the head bolts 35, a force A is exerted on the boss portions 37 so that the boss portions 37 are inclined toward the inner portion 44 side, the mechanical strength of which is weaker. For that reason, the head bolts 35 are also inclined toward the inner portion 44 side more as the boss portions 37 incline, resulting in a state in which the head bolts 35 cannot be straightly fastened into the respective boss portions 37.

[0006] In order to relax the above force A that is going to incline toward the inner portion 44 side, ribs 46 extend on an upper portion 37a of the boss portions 37 in a horizontal direction toward the intake port 39, and the boss portions 37 and the intake port 39 are connected and supported. The above force A that is going to incline toward the inner portion 44 is supported in a state where the ribs 46 nip the intake port 39, thereby being capable of straightly fastening the head bolts 35 without any inclination.

[0007] Incidentally, when the cylinder head 31 is fastened by the head bolts 35, because a fastening force of the head bolts 35 is directly applied to a side portion 38b of the lower-surface deck 38 in the vicinity of the head bolts 35, the gasket 32 is strongly pushed toward the cylinder block 33 side, as a result of which the air tight property is excellent. However, because the fastening force of the head bolts 35 is applied to the cylinder block 33 side through an intermediate portion 38a of the lower-surface deck 38 disposed between the head bolts 35, the gasket 32 under the intermediate portion 38a is pushed toward the cylinder block 33 side by a force weaker than the side portion 38b of the lower-surface deck 38. That is, the force urging the gasket 32 by the intermediate portion 38a is weaker than that of urging the gasket 32 by the side portion 38b of the lower-side deck 38, resulting in such a problem that the air tight property of the gasket on the intermediate portion 38a side is weakened.

SUMMARY OF THE INVENTION

[0008] The present invention has been made in order to eliminate the above problem, and therefore an object of the present invention is to provide a cylinder head for use in an internal combustion engine which is capable of unifying the air tight property of a gasket.

[0009] In order to achieve the above object, according to the present invention, there is provided a cylinder head for use in an internal combustion engine comprising: boss portions for head bolts; a lower-surface deck which is in contact with a gasket; and an intake or exhaust port formed to extend upward from an intermediate portion of the lower-surface deck which is disposed between the boss portions; characterized in that comprises ribs that connect an upper portion of the boss portion and a lower portion of at least one port or the intermediate portion of the lower-surface deck in the vicinity of a root of the port.

[0010] In the present specification, "the lower portion of the port" means a portion lower than a portion (upper portion) where one end of the ribs is connected to the boss portions.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011]

Fig. 1 is a cross-sectional view showing the main portion of a cylinder head in an internal combustion engine in accordance with an embodiment of the present invention;

Fig. 2 is a top view showing a portion of the cylinder head in the internal combustion engine in accordance with the embodiment of the present invention;

Fig. 3 is a schematic side cross-sectional view showing a portion of the cylinder head in the internal combustion engine in accordance with the embodiment of the present invention; and

Fig. 4 is a cross-sectional view showing the main portion of a conventional cylinder head.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0012] Hereinafter, a description will be given in more detail of a cylinder head for use in an internal combustion engine in accordance with a preferred embodiment of the present invention with reference to Figs. 1 and 2.

[0013] As shown in Fig. 2, in a cylinder head 1, a plurality of intake valves 3 and a plurality of exhaust valves 4 are positioned within a plurality of cylinders 2 of a cylinder block 10 (see Fig. 1), and intake ports 5 and exhaust ports 6 are formed from those valves 3 and 4 as the respective intake and exhaust ports. Also, a plurality of boss portions 8 each having a head bolt hole 7 are disposed on the cylinder head 1 side between the respective cylinders 2 of the cylinder block 10. Fig. 2 schematically shows the positional relationship of the intake ports 5, the exhaust ports 6 and the boss portions 8, but an upper-surface deck 17 and a lower-surface deck 15 which will be described later are omitted from Fig. 2.

[0014] Fig. 1 shows a cross-sectional view of the main portion of the cylinder head 1 taken along a line X-X in Fig.2. The cylinder head 1 is fixed to the cylinder block 10 by fastening the head bolts 11 in a state where the gasket 9 for holding air tight is interposed between the cylinder head 1 and the cylinder block 10.

[0015] In more detail, in Fig. 1, the cylinder block 10 has the cylinders 2 and screw holes 12 for fastening the head bolts 11, and the gasket 9 has through-holes 13 for the head bolts 11 and through-holes 14 for the cylinders 2. Then, each of the head bolt holes 7 of the cylinder head 1, each of through-holes 13 for the head bolts 11 of the gasket 9 and each of screw holes 12 of the cylinder block 10 are allowed to coincide with each other so as to form a communicating hole. Each of the head bolts 11 is inserted and fastened into the respective communicating holes, to thereby fix the cylinder head 1 to the cylinder block 10 by fastening in a state where the gasket 9 is interposed between the cylinder head 1 and the cylinder block 10.

[0016] Subsequently, the structure of the cylinder head 1 will be described in more detail. A plurality of boss portions 8 having head bolt holes 7 are formed on the inner portions of both sides of the cylinder head 1. Also, an upper-surface deck 17 is formed on an upper portion interposed between the boss portions 8 in the form of a plane whereas a lower-surface deck 15 is formed on a lower portion interposed between the boss portions 8 in the form of a plane, and a substantially-pipe-shaped intake port 5 is disposed so as to extend upward from an intermediate portion 15a of the lower-surface deck 15. Intake air flows from the intake ports 5 toward the intake valves 3 (see Fig. 2) disposed within the opening portions 15b of the lower-surface deck 15 so that the intake air is supplied to the interior of the cylinders 2. Also, cooling water is circulatively supplied to a space defined between the upper-surface deck 17 and the lower-surface deck 15.

[0017] Further, ribs 16 are disposed in the form of V from an upper portion 8a of the boss portions 8 toward a lower portion 5a of the intake ports 5, and the boss portions 8 and the intake ports 5 are connected and supported by the ribs 16 straightly at the shortest distance. The boss portions 8 are supported in a state where the ribs 16 interpose the intake port 5 therebetween.

[0018] As shown in Fig. 3, a strut 5b is formed on the lower portion 5a of each of the intake ports 5 and pushes a portion of the lower-surface deck 15 corresponding to the vicinity of the outer periphery of the cylinder 2.

[0019] Subsequently, the features of this embodiment structured as described above will be described.

(1) In the above embodiment, in Fig. 1, when the cylinder head 1 is fixedly fastened by the head bolts 11, because a force B that is going to incline the head bolts 11 inward is supported by the ribs 16 in a state where the ribs 16 interpose the intake ports 5 therebetween, the head bolts 11 can be fastened without any inclination. In addition, because the inclination force B is exerted in a direction indicated by an arrow (obliquely downward in Fig. 1) so as to push the intake ports 5 downward through the ribs 16, the intake ports 5 pushes the intermediate portion 15a of the lower-surface deck 15, which is a mounting surface of the intake ports 5, downward. That is, the intermediate portion 15a of the lower-surface deck 15 can more strongly push the gasket 9 toward the cylinder block 10 side. Accordingly, the air tightness of the gasket 9 can be unified.

(2) In the above embodiment, because the ribs 16 are formed in the form of beams, an influence of the ribs 16 on a cooling water flowing in a space defined between the upper-surface deck 17 and the lower-surface deck 15 can be suppressed to the minimum.

(3) In the above embodiment, since the ribs 16 are connected and supported in the form of V, the ribs 16 can be connected and supported straightly at the shortest distance from the upper portion 8a of the boss portions 8 toward the lower portion 5a of the intake ports 5. Accordingly, the length of the ribs 16 can be shortened, and the cost of materials can be reduced.

(4) In the above embodiment, because the ribs 16, formed in beams, are connected to the lower portion 5a of the intake ports 5, there is no case in which the ribs 16 obstruct the flow of cooling water in the vicinity of the upper surface of the lower-surface deck 15 for which the cooling water is most required.

[0020] The present invention is not limited to the above embodiment but may be implemented as follows:

[0021] In the above embodiment, the ribs 16 are connected and supported from the upper portion 8a of the boss portions 8 for the head bolts 11 toward the lower portion 5a of the intake ports 5. However, the intake ports 5 may be replaced by whatever extends upward from the intermediate portion 15a of the lower-surface deck 15 and can support the boss portions 8. For example, the exhaust ports 6 or the like may be replaceably disposed at the position of the intake ports 5 in the above embodiment.

[0022] Also, in the above embodiment, the ribs 16 are connected and supported from the upper portion 8a of the boss portions 8 for the head bolts 11 toward the lower portion 5a of the intake ports 5. However, the ribs may be connected and supported toward the lowermost of the intake ports 5, that is, toward the intermediate portion 15a of the lower-surface deck 15 in the vicinity of a root of the intake ports 5. With this structure, the force B, which is exerted on the ribs 16 and is going to incline the head bolts 11, is applied directly to the intermediate portion 15a of the lower-surface deck 15, whereby the gasket 9 can be more strongly pushed toward the cylinder block 10 side, and the air tight property of the gasket 9 is improved.

[0023] In a cylinder head 1 has boss portions 8 for head bolts 11 which are formed inside of both sides of the cylinder head 1, and a discharge/intake port 5 which extends from an intermediate portion 15a of a lower-surface deck 15 that is in contact with a gasket 9. In this cylinder head 1, ribs 16 are connected and supported from an upper portion 8a of the boss portions 8 toward a lower portion 5a of the intake port 5.

Claims

1. A cylinder head (1) for use in an internal combustion engine comprising: boss portions (8) for head bolts; a lower-surface deck (15) which is in contact with a gasket (9); and an intake or an exhaust port (4, 5) formed to extend upward from an intermediate portion (15a) of said lower-surface deck (15) which is disposed between the boss portions (8);

   characterized in that

   the cylinder head (1) comprises ribs (16) that connect an upper portion (8a) of the boss portion (8) and a lower portion (5a) of at least one port (4, 5) or said intermediate portion (15a) of said lower-surface deck (15) in the vicinity of a root of said port (4, 5).

2. The cylinder head for use in an internal combustion engine as claimed in claim 1, characterized in that said ribs (16) connect said boss portions (8) and the lower portion (5a) of said port (4, 5) straightly at the shortest distance.

3. The cylinder head for use in an internal combustion engine as claimed in claim 2, characterized in that said ribs (16) are formed in the form of beams.

FIG. 1

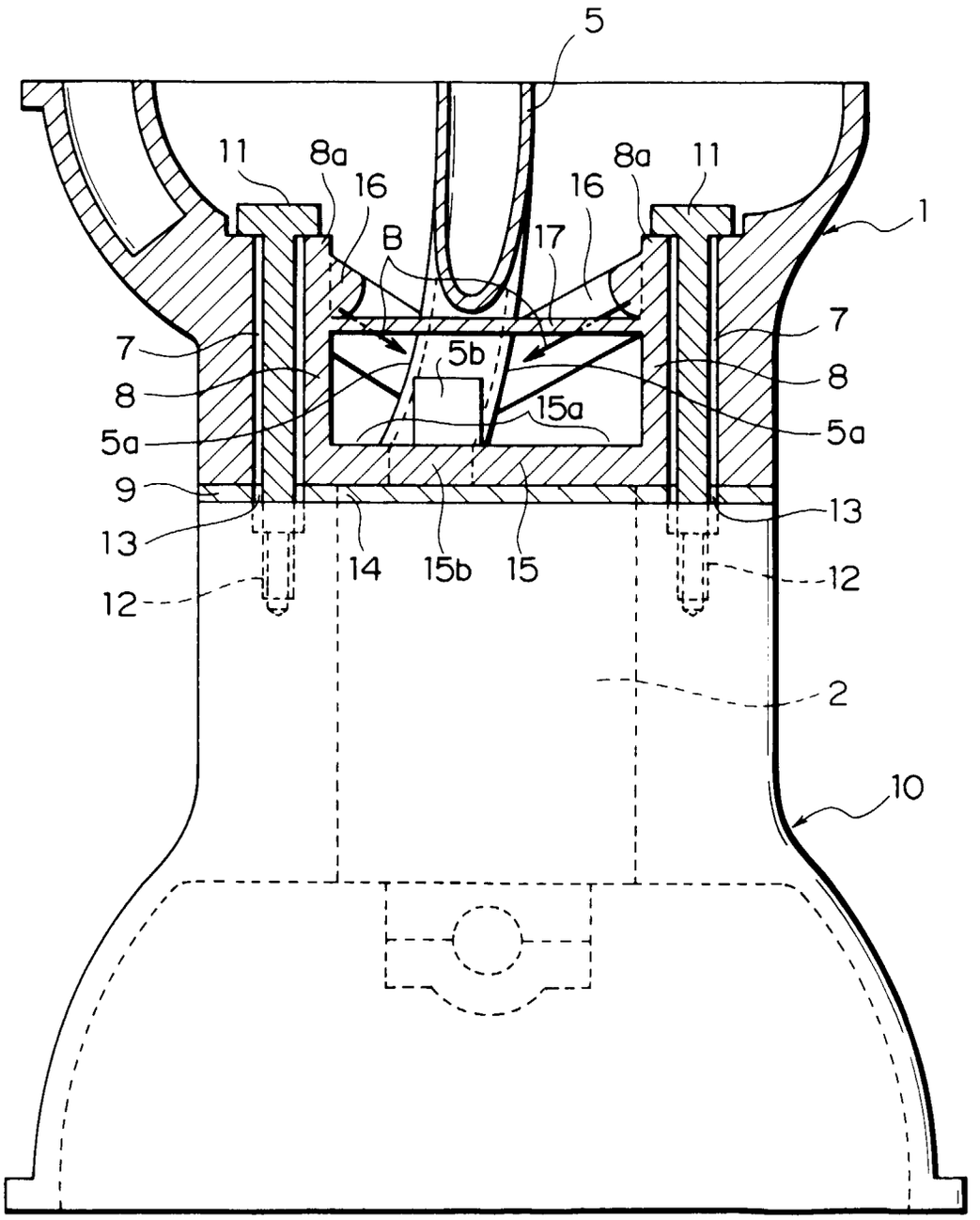


FIG. 2

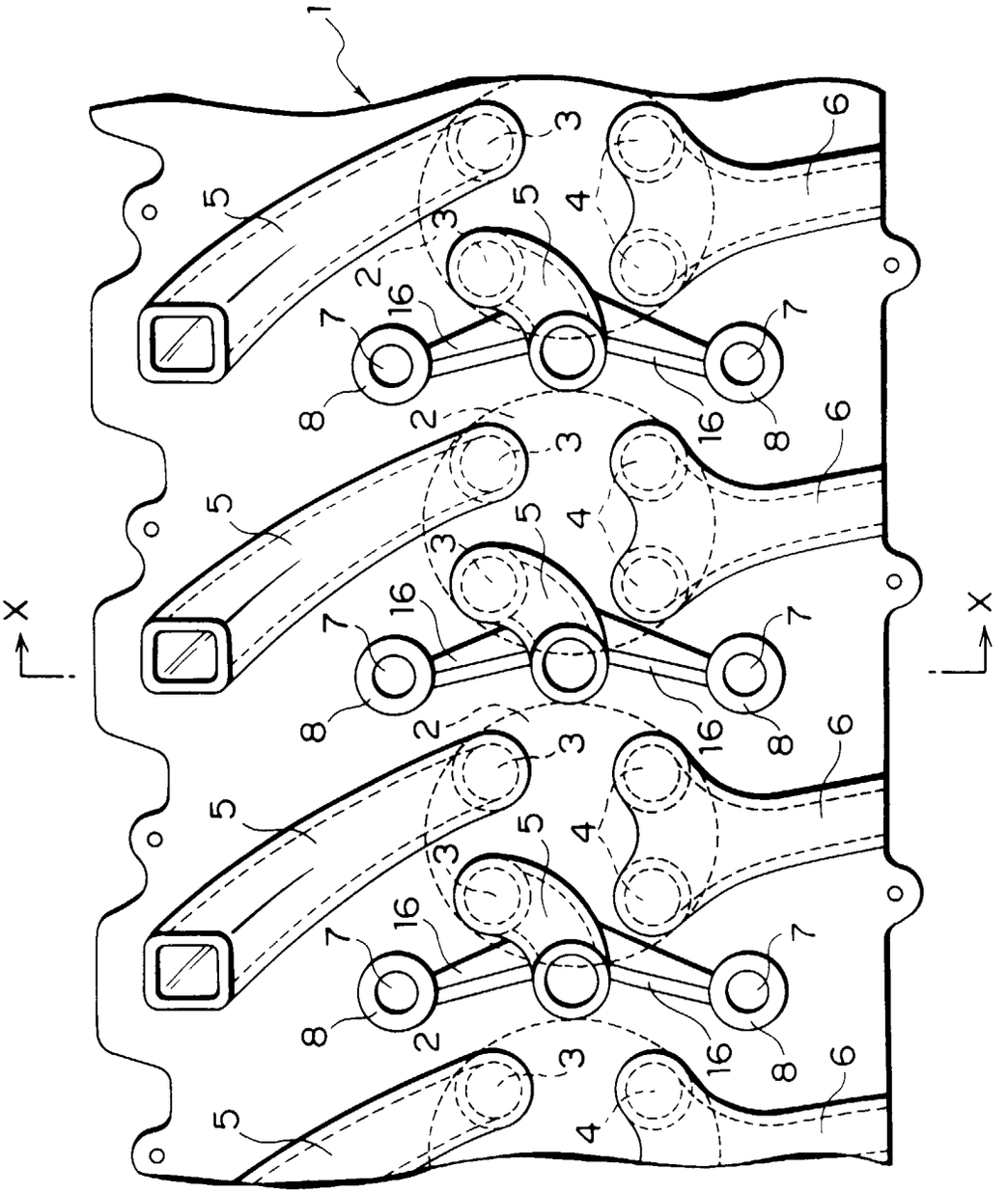


FIG. 3

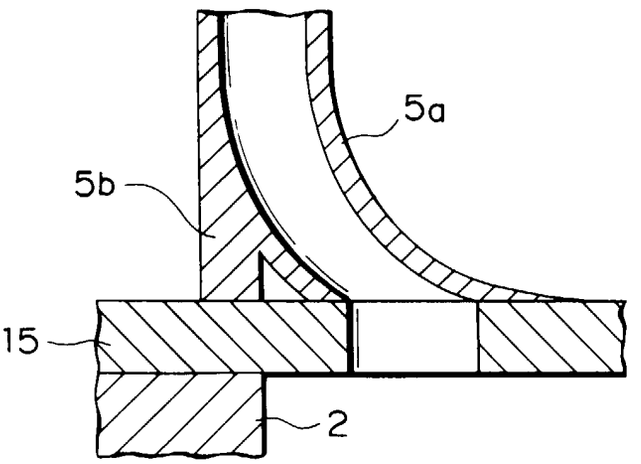
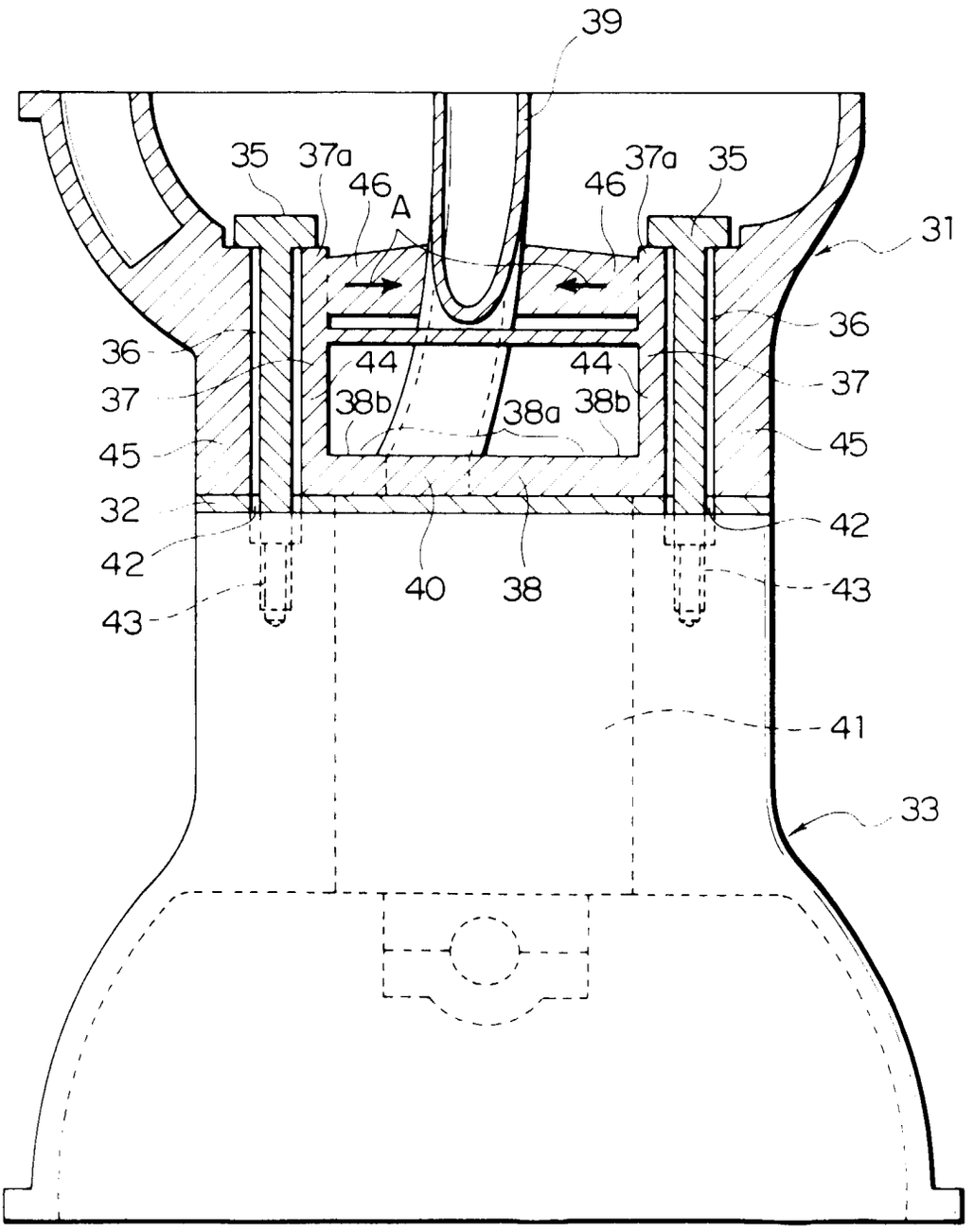


FIG. 4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