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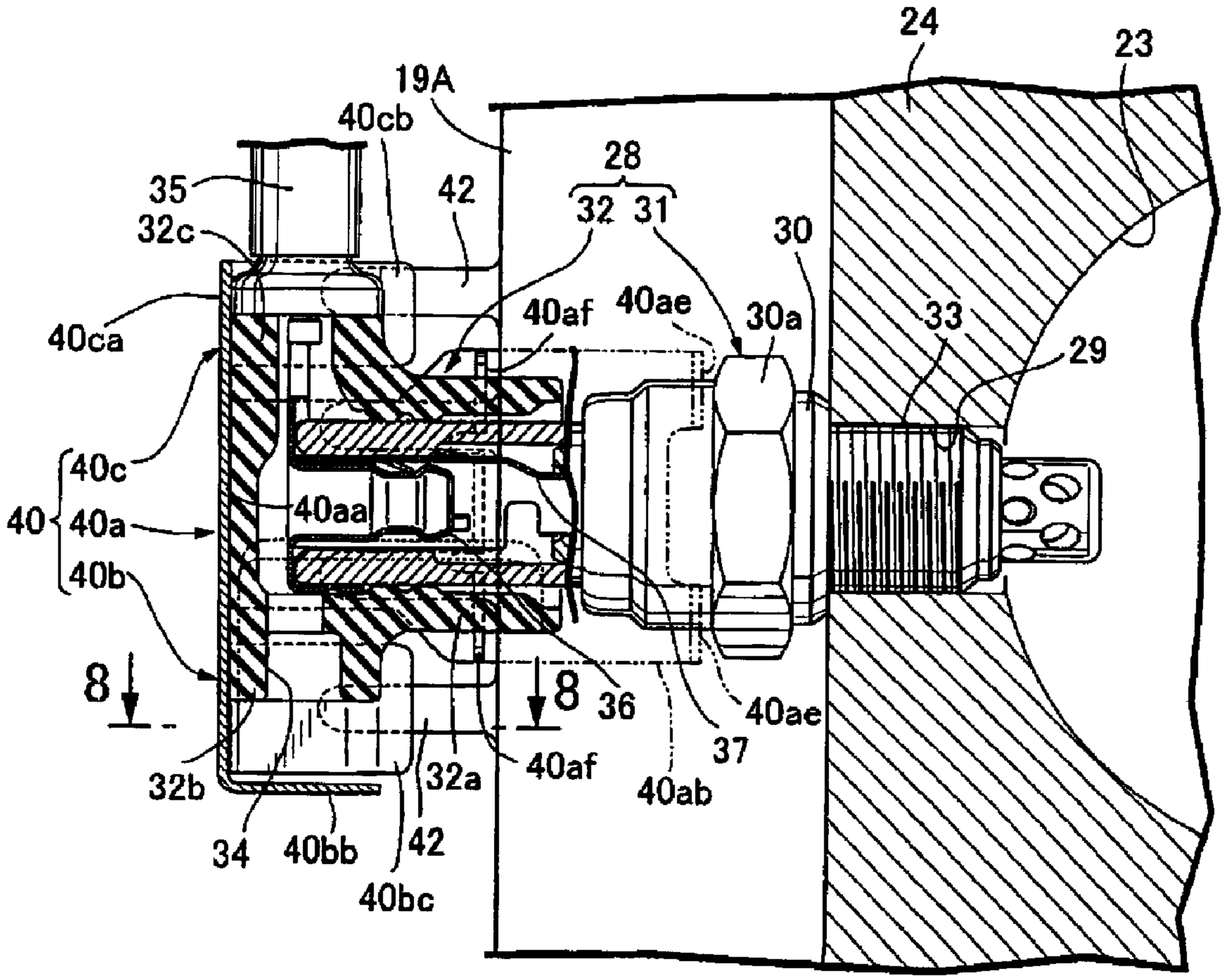
(54) Titre : STRUCTURE D'INSTALLATION DE SONDE LAMBDA POUR MOTEUR A QUATRE TEMPS
(54) Title: EXHAUST GAS SENSOR INSTALLATION STRUCTURE FOR FOUR-CYCLE ENGINE



(57) Abrégé/Abstract:
Providing an exhaust gas sensor installation structure for a four-cycle engine, in which an exhaust gas sensor is installed in a cylinder head of an engine main body, the exhaust gas sensor including a sensor main part an end portion of which is exposed in

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(57) Abrégé(suite)/Abstract(continued):
an exhaust port and a cap which is fitted to a rear portion of the sensor main part and from a side of which a cord extends, the exhaust gas sensor installation structure being such that, when the exhaust gas sensor is installed in the cylinder head, the direction in which the cord extends from the exhaust gas sensor is fixedly defined to make handling of the cord easy. A sensor installation hole for installing a sensor main part is provided in a portion around an exhaust port of a cylinder head, a cap is at least partly covered by a sensor guard fixedly positioned relative to the cylinder head, and a direction in which a cord extends is fixedly defined by the sensor guard relative to the cylinder head.

ABSTRACT OF THE DISCLOSURE

Providing an exhaust gas sensor installation structure for a four-cycle engine, in which an exhaust gas sensor is installed in a cylinder head of an engine main body, the exhaust gas sensor including a sensor main part an end portion of which is exposed in an exhaust port and a cap which is fitted to a rear portion of the sensor main part and from a side of which a cord extends, the exhaust gas sensor installation structure being such that, when the exhaust gas sensor is installed in the cylinder head, the direction in which the cord extends from the exhaust gas sensor is fixedly defined to make handling of the cord easy. A sensor installation hole for installing a sensor main part is provided in a portion around an exhaust port of a cylinder head, a cap is at least partly covered by a sensor guard fixedly positioned relative to the cylinder head, and a direction in which a cord extends is fixedly defined by the sensor guard relative to the cylinder head.

EXHAUST GAS SENSOR INSTALLATION STRUCTURE FOR FOUR-CYCLE ENGINE

FIELD OF THE INVENTION

The present invention relates to an exhaust gas sensor installation structure for a four-cycle engine in which an exhaust gas sensor is installed in a cylinder head of an engine main body, the exhaust gas sensor including a sensor main part an end portion of which is exposed in an exhaust port and a cap which is fitted to a rear portion of the sensor main part and from a side of which a cord extends.

BACKGROUND OF THE INVENTION

There have been exhaust gas sensor installation structures, for example, one disclosed in JP-A No. 2004-316430, in which an exhaust gas sensor is installed in a portion around an exhaust port of a cylinder head.

An exhaust gas sensor has a cap, from a side of which a cord extends. In the installation structure described in JP-A No. 2004-316430, the direction in which a cord extends from an exhaust gas sensor is not fixed when the exhaust gas sensor is installed in a cylinder head. This poses a problem in terms of handling the cord.

The present invention has been made in view of the above problem, and it is an object of the present invention to provide an exhaust gas sensor installation structure for a four-cycle engine wherein, when the exhaust gas sensor is installed in a cylinder head, the direction in which a cord extends from the exhaust gas sensor is fixedly defined to facilitate handling of the cord.

SUMMARY OF THE INVENTION

The present invention provides an exhaust gas sensor installation structure for a four-cycle engine, in which an exhaust gas sensor is installed in a cylinder head of an engine main body, the exhaust gas sensor including a sensor main part an end portion of which is exposed in an exhaust port and a cap which is fitted to a rear portion of the sensor main part and from a side of which a cord extends. In the exhaust gas sensor installation structure, a sensor installation hole for installing the sensor main part is provided in a portion around the exhaust port of the cylinder head, the cap is at least partly covered by a sensor guard fixedly positioned relative to the cylinder head, and a direction in which the cord extends is fixedly defined by the sensor guard relative to the cylinder head.

According to the present invention, the direction in which the cord extends from the cap of the exhaust gas sensor installed in the sensor installation hole provided in a portion around the exhaust port of the cylinder head is fixedly defined by the sensor guard fixedly positioned relative to the cylinder head. Thus, the direction in which the cord extends is fixedly defined with the exhaust gas sensor protected by the sensor guard, so that the cord can be handled with ease.

An aspect of the invention provides the exhaust gas sensor installation structure for a four-cycle engine according to the above, wherein the sensor guard formed discretely from the engine main body is attached to the exhaust gas sensor such that the sensor guard engages with a positioning part provided on the engine main body.

According to this aspect of the invention, the sensor guard formed discretely from the engine main body is attached to the exhaust gas sensor such that it engages with the positioning part provided on the engine main body. This improves workability in attaching the sensor guard, in a fixed position relative to the cylinder head, to the exhaust gas sensor.

Another aspect of the invention provides the exhaust gas sensor installation structure for a four-cycle engine according to the above, wherein: the sensor guard integrally includes a sensor positioning part having an engaging part to engage with the positioning part provided on the engine main body and

covering the cap; a cover part formed continuously with the sensor positioning part such that the cover part covers an outer open end of an air passage communicating with an interior of the sensor main part and opening in an outer surface of the cap; and a cord positioning part formed continuously with the sensor positioning part such that the cord positioning part defines a direction in which the cord extends.

According to this aspect of the invention, the outer open end of the air passage is covered by the cover part of the sensor guard. Therefore, the sensor guard can prevent foreign matter such as dust and water from entering the exhaust gas sensor via the air passage, and the direction in which the cord extends can be easily defined by the cord positioning part formed continuously with the sensor positioning part engaged with the positioning part provided on the engine main body.

A further aspect of the invention provides the exhaust gas sensor installation structure for a four-cycle engine according to above, wherein the positioning part provided on the engine main body includes two adjacent ones of a plurality of cooling fins projectedly formed on an outer circumference of the cylinder head.

According to this aspect of the invention, no special part for positioning the sensor guard relative to the cylinder head is required, so that the position of the sensor guard can be defined without causing an increase in the number of components required.

Yet another aspect of the invention provides the exhaust gas sensor installation structure for a four-cycle engine according to the above, wherein the sensor guard is formed integrally with the cylinder head or a head cover included in the engine main body.

According to this aspect of the invention, the sensor guard is formed integrally with the cylinder head or the head cover, so that the number of components required and the number of man-hours required for installing the sensor guard can be reduced.

Another aspect of the invention provides the exhaust gas sensor installation structure for a four-cycle engine according to the above, wherein: the engine

main body is mounted on a motorcycle such that a side where the exhaust port is provided of the cylinder head faces forward; and the sensor guard is formed to cover the cap from a front side.

According to this aspect of the invention, the exhaust gas sensor can be protected against objects coming flying from the front of the motorcycle.

The oxygen sensor used in the following embodiments corresponds to the exhaust gas sensor according to the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the invention are shown in the drawings, wherein:

Fig. 1 is a side view of an essential part of a motorcycle.

Fig. 2 is an enlarged view of an essential part of Fig. 1.

Fig. 3 is an enlarged cross-sectional view taken along line 3 - 3 in Fig. 2.

Fig. 4 is a perspective view in the direction of arrow 4 in Fig. 2.

Fig. 5 is a perspective view corresponding to Fig. 4 with no sensor guard.

Fig. 6 is a perspective view of a sensor guard.

Fig. 7 is a perspective view of the sensor guard in the direction of arrow 7 in Fig. 6.

Fig. 8 is an enlarged cross-sectional view of the sensor guard taken along line 8 - 8 in Fig. 3.

Fig. 9 is a perspective view, from diagonally below, of a cylinder head and a head cover included in an engine main body according to a second embodiment.

Fig. 10 is a perspective view, from diagonally above, of the cylinder head and the head cover included in the engine main body.

Fig. 11 is a perspective view, from diagonally above, of a cylinder head according to a third embodiment.

Fig. 12 is a perspective view of a part of the cylinder head as seen from diagonally above at an angle different from that of Fig. 11.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Embodiments of the present invention will be described below with reference to attached drawings.

Figs. 1 to 8 show a first embodiment of the present invention. Fig. 1 is a side view of an essential part of a motorcycle. Fig. 2 is an enlarged view of an essential part of Fig. 1. Fig. 3 is an enlarged cross-sectional view taken along line 3 - 3 in Fig. 2. Fig. 4 is a perspective view in the direction of arrow 4 in Fig. 2. Fig. 5 is a perspective view corresponding to Fig. 4 with no sensor guard. Fig. 6 is a perspective view of a sensor guard. Fig. 7 is a perspective view of the sensor guard in the direction of arrow 7 in Fig. 6. Fig. 8 is an enlarged cross-sectional view of the sensor guard taken along line 8 - 8 in Fig. 3.

Referring to Fig. 1, a body frame F of the motorcycle includes a main frame 15 extending rearwardly and downwardly from a head pipe (not shown) provided in a front end portion of the motorcycle. A power unit P including a water-cooled four-cycle engine E and a transmission system T which continuously varies the output of the engine E and enables deceleration is disposed below and suspendedly supported by the main frame 15.

Referring also to Fig. 2, an engine main body 16A of the engine E included in the power unit P includes a crankcase 17, a cylinder block 18 coupled, in a forwardly tilted position, to an upper front portion of the crankcase 17, a cylinder head 19A coupled to an upper portion of the cylinder block 18, and a head cover 20A coupled to the cylinder head 19A.

As shown in Fig. 1, an intake system 22 having, at an upstream end thereof, an air cleaner 21 disposed rearward of the engine main body 16A is connected to an intake port (not shown) which is open in a rear side of the cylinder head 19A. An exhaust connection pipe section 24 forming a forwardly open exhaust port 23 is

projectedly provided on a front side of the cylinder head 19A. An exhaust pipe 25 communicated with the exhaust port 23 is connected to the exhaust connection pipe section 24. The cylinder head 19A has a spark plug 26 fitted thereto from the right side thereof. A radiator 27 disposed forward of the engine main body 16A is supported by the main frame 15.

Referring also to Figs. 3 to 5, an oxygen sensor 28 is installed, as an exhaust gas sensor, in the cylinder head 19A such that it can detect the oxygen concentration in the exhaust gas flowing through the exhaust port 23. To allow the oxygen sensor 28 to be installed, the cylinder head 19A is provided with a sensor installation hole 29 formed around the exhaust port 23. In the present embodiment, the sensor installation hole 29 is provided in the right side of the exhaust connection pipe section 24 forming the exhaust port 23.

The oxygen sensor 28 includes a sensor main part 31 and a cap 32 removably fitted to a rear portion of the sensor main part 31. The sensor main part 31 has a housing 30 which is attached to the cylinder head 19A by having an end portion thereof screwed in the sensor installation hole 29. The sensor main part 31 is installed in the cylinder head 19A with an end portion thereof exposed in the exhaust port 23.

The housing 30 is shaped cylindrically. It has an engaging part 30a provided in an axial intermediate portion thereof, the engaging part 30a radially outwardly projecting so that it can engage with a rotary tool and having, for example, a hexagonal cross-sectional shape. A male thread 33 to be screwed in the sensor installation hole 29 that is a threaded hole is formed on the external surface of a portion of the housing 30, the portion being closer to the end of the housing 30 than the engaging part 30a.

The cap 32 is made of an elastic material, for example, rubber and integrally includes a bottomed cylindrical part 32a which is elastically fitted to a rear portion of the housing 30 included in the sensor main part 31 and a pair of cylindrical projections 32b and 32c laterally projecting from a rear portion of the bottomed cylindrical part 32a. The projections 32b and 32c have an axis disposed over and along a diameter line of the bottomed cylindrical part 32a and project to upward and downward sides, respectively, from the rear portion of the bottomed cylindrical part 32a.

Of the projections 32b and 32c, the projection 32b downwardly projecting from the bottomed cylindrical part 32a forms an air passage 34 for leading air into the sensor main par 31. The air passage 34 is open at an outer end of the projection 32b, i.e., in the external surface of the cap 32. Of the projections 32b and 32c, the projection 32c upwardly projecting from the bottomed cylindrical part 32a is connected with a cord 35 extending sidewardly therefrom. A connection terminal 36 provided in the cap 32 continuously with the cord 35 is electrically connected to a connection terminal 37 provided on the sensor main part 31 side when the cap 32 is fitted to the rear portion of the main sensor part 31. The cord 35 extends to a side opposite to the side where the air passage 34 is open, i.e., upwardly from a rear side of the oxygen sensor 28, i.e., from a side of the cap 32.

The cap 32 of the oxygen sensor 28 is, at least partly, covered by a sensor guard 40 fixedly positioned relative to the cylinder head 19A. The direction in which the cord 35 extends from the oxygen sensor 28 is fixedly defined relative to the cylinder head 19A by the sensor guard 40. The sensor guard 40 is formed discretely from the engine main body 16A and attached to the oxygen sensor 28 with its position relative to the cylinder head 19A fixedly defined by engaging with a positioning part 41 provided on the cylinder head 19A included in the engine main body 16A.

Referring to Figs. 6 and 7, the sensor guard 40 covering the cap 32 integrally includes a sensor positioning part 40a which engages with the positioning part 41 on the engine main body side, a cover part 40b provided continuously with the sensor positioning part 40a such that it covers the outer open end of the air passage 34, and a cord positioning part 40c provided continuously with the sensor positioning part 40a such that it defines the direction in which the cord 35 extends. The sensor guard 40 is produced by bend-forming a flat metal plate.

The sensor positioning part 40a includes: a center end plate part 40aa which is a flat plate part covering the outer-end bottom portion of the bottomed cylindrical part 32a included in the cap 32; a first side plate part 40ab which is formed perpendicularly to and continuously with the center end plate part 40aa so that it faces, from the front side, the outer circumference of the oxygen sensor 28 installed in the cylinder head 19A; a second side plate part 40ac which is formed perpendicularly to and continuously with the center end plate part 40aa such

that it faces, from the rear side, the outer circumference of the oxygen sensor 28 installed in the cylinder head 19A, the second side plate part 40ac being shorter than the first side plate part 40ab; an engaging part 40ad which perpendicularly outwardly projects from a middle portion of the end portion, away from the center end plate part 40aa, of the second side plate part 40ac so that it engages with the positioning part 41 on the engine main body side provided in the cylinder head 19A; a pair of abutting parts 40ae which inwardly perpendicularly project from both sides of the end portion, away from the center end plate part 40aa, of the first side plate part 40ab so that they abut on the outer circumference of the housing 30 included in the sensor main part 31 of the oxygen sensor 28; and a pair of abutting parts 40af which inwardly perpendicularly project from both sides of the end portion, away from the center end plate part 40aa, of the second side plate 40ac so that they abut on the outer circumference of the housing 30.

Referring also to Fig. 8, the cover part 40b includes: a lower end plate part 40ba which downwardly extends from, and in the same plane as, the end plate part 40aa of the sensor positioning part 40a so as to cover the projection 32b of the cap 32 from the right side of the cylinder head 19A; an air passage cover part 40bb which is formed continuously with a lower end portion of the lower end plate part 40ba and perpendicularly to the lower end plate part 40ba so that it covers, from below, the outer open end of the air passage 34 that is open at the outer end of the projection 32b; and a pair of holding parts 40bc which are formed, at both sides of the lower end plate part 40ba, perpendicularly to and continuously with the lower end plate part 40ba so that they elastically engage with the projection 32b from the front and rear sides to elastically hold the projection 32b.

The cord positioning part 40c includes: an upper end plate part 40ca which upwardly extends from, and in the same plane as, the end plate part 40aa of the sensor positioning part 40a so as to cover the projection 32c of the cap 32 from the right side of the cylinder head 19A; and a pair of holding parts 40cb which are formed, at both sides of the upper end plate part 40ca, perpendicularly to and continuously with the upper end plate part 40ca so that they elastically engage with the projection 32c from the front and rear sides to elastically hold the projection 32c.

Of the sensor guard 40, the abutting parts 40ae and 40af of the sensor positioning

part 40a are abutted on the outer circumference of the housing 30 included in the sensor main part 31 of the oxygen sensor 28, the holding parts 40bc of the cover part 40b elastically hold the projection 32b of the cap 32, and the holding parts 40cb of the cord positioning part 40c elastically hold the projection 32c of the cap 32. This allows the sensor guard 40 to be attached to the oxygen sensor 28 in a fixed position relative to the oxygen sensor 28. Also, the engaging part 40ad of the sensor positioning part 40a is engaged with the positioning part 41 on the engine main body side provided on the cylinder head 19A to fixedly define the position relative to the cylinder head 19A of the sensor guard 40, that is, of the oxygen sensor 28.

With the sensor guard 40 attached, in a fixedly defined position relative to the cylinder head 19A, to the oxygen sensor 28, the direction in which the cord 35 extends from the oxygen sensor 28 is defined by the cord positioning part 40c, the air passage cover part 40bb of the cover part 40b covers the outer open end of the air passage 34 that is open in the outer surface of the cap 32, and the first side plate part 40ab of the sensor positioning part 40a covers the cap 32 from the front side.

The cylinder head 19A are integrally provided with plural cooling fins 42 projectedly formed on its outer circumference, the plural cooling fins 42 being spaced out along the cylinder axis. The positioning part 41 on the engine main part side is made up of two adjacent ones of the cooling fins 42. The engaging part 40ad of the sensor guard 40 is engaged between the two adjacent cooling fins 42.

The first embodiment of the present invention has the following effects. The cap 32 of the oxygen sensor 28 installed in the sensor installation hole 29 provided in a portion around the exhaust port 23 of the cylinder head 19A is, at least partly, covered by the sensor guard 40 fixedly positioned relative to the cylinder head 19A, so that the direction relative to the cylinder head 19A in which the cord 35 extends from the oxygen sensor 28 is fixedly defined by the sensor guard 40. Thus, the direction in which the cord 35 extends is fixedly defined with the oxygen sensor 28 protected by the sensor guard 40, so that the cord 35 can be handled with ease.

The sensor guard 40 is formed discretely from the engine main body 16A and

attached to the oxygen sensor 28 such that it engages with the positioning part 41 on the engine main body side provided on the cylinder head 19A included in the engine main body 16A. This improves workability in attaching the sensor guard 40, in a fixed position relative to the cylinder head 19A, to the oxygen sensor 28.

The sensor guard 40 integrally includes the sensor positioning part 40a having the engaging part 40ad to engage with the positioning part 41 on the engine main body side and covering the cap 32 of the oxygen sensor 28, the cover part 40b formed continuously with the sensor positioning part 40a such that it covers the outer open end of the air passage 34 formed in the cap 32 and being open in the outer surface of the cap 32, and the cord positioning part 40c formed continuously with the sensor positioning part 40a such that it defines the direction in which the cord 35 extends. The sensor guard 40 can, therefore, prevent foreign matter such as dust and water from entering the oxygen sensor 28 via the air passage 34. Furthermore, the direction in which the cord 35 extends can be easily defined by the cord positioning part 40c formed continuously with the sensor positioning part 40a that engages with the positioning part 41 on the engine main body side.

The positioning part 41 on the engine main body side is made up of two adjacent ones of the plural cooling fins 42 projectedly provided on the outer circumference of the cylinder head 19A, so that no special part for positioning the sensor guard 40 relative to the cylinder head 19A is required. This makes it possible to define the position of the sensor guard 40 without causing an increase in the number of components required.

The engine main body 16A is mounted on a motorcycle such that the side where the exhaust port 23 is provided of the cylinder head 19A faces forward. Since the sensor guard 40 is formed to cover the cap 32 from the front side, the oxygen sensor 28 is protected against objects coming flying from the front of the motorcycle.

Figs. 9 and 10 show a second embodiment of the present invention. Fig. 9 is a perspective view, from diagonally below, of a cylinder head and a head cover included in an engine main body. Fig. 10 is a perspective view, from diagonally above, of the cylinder head and the head cover included in the engine main body.

The engine main body 16B is mounted on a motorcycle (not shown) such that an exhaust port 23 of a cylinder head 19B included in the engine main body 16B faces forward and obliquely downward. An oxygen sensor 28 is installed in a portion around the exhaust port 23 of the cylinder head 19B such that a projection 32b forming an air passage 34 faces forward and obliquely upward.

A head cover 20B included in the engine main body 16B and coupled to the cylinder head 19B is formed integrally with a sensor guard 44. The sensor guard 44, by engaging with the projection 32b, defines, relative to the cylinder head 19B, the position of the oxygen sensor 28 and the direction in which a cord 35 extends from the oxygen sensor 28 and covers the outer open end of the air passage 34 and at least a part of the cap 32 included in the oxygen sensor 28.

Moreover, the sensor guard 44 is formed such that, with the engine main body 16B mounted on a motorcycle, it covers the cap 32 from the front side.

In the second embodiment, the cap 32 of the oxygen sensor 28 is, at least partly, covered by the sensor guard 44 fixedly positioned relative to the cylinder head 19B, so that the direction relative to the cylinder head 19B in which the cord 35 extends from the oxygen sensor 28 is fixedly defined by the sensor guard 44. Thus, the direction in which the cord 35 extends is fixedly defined with the oxygen sensor 28 protected by the sensor guard 44, so that the cord 35 can be handled with ease.

Since the sensor guard 44 covers the outer open end of the air passage 34, foreign matter such as dust and water can be prevented from entering the oxygen sensor 28 via the air passage 34. Also, since the sensor guard 44 is formed to cover the cap 32 from the front side, the oxygen sensor 28 is protected against objects coming flying from the front of the motorcycle.

Furthermore, since the sensor guard 44 is formed integrally with the head cover 20B, the number of components required and the number of man-hours required for installing the sensor guard 44 can be reduced.

Figs. 11 and 12 show a third embodiment of the present invention. Fig. 11 is a perspective view, from diagonally above, of a cylinder head. Fig. 12 is a perspective view of a part of the cylinder head as seen from diagonally above at

an angle different from that of Fig. 11.

An engine main body 16C is mounted on a motorcycle (not shown) such that an exhaust port 23 of a cylinder head 19C included in the engine main body faces forward and obliquely downward. An oxygen sensor 28 is installed in a portion around the exhaust port 23 of the cylinder head 19C such that a projection 32b forming an air passage 34 faces rearward and such that a projection 32c letting a cord 35 extend outward faces forward.

Moreover, a sensor guard 45 is formed integrally with the cylinder head 19C, the sensor guard 45 covering the outer open end of the air passage 34 and at least a part of the cap 32 of the oxygen sensor 28.

The sensor guard 45 is comprised of a concave portion which is provided in the cylinder head 19C such that its inner side surface faces the outer open end of the air passage 34 and such that it accommodates most part of the oxygen sensor 28. A wall portion 45a covering the oxygen sensor 28 from the front side and forming a part of the side surface of the concave portion is provided with a restrictive concave portion 46 through which the projection 32c of the cap 32 of the oxygen sensor 28 extends and which prevents, by engaging with the projection 32b, the oxygen sensor 28 from turning about its axis.

Of plural cooling fins 47 provided on the outer circumference of the cylinder head 19C, some are provided with a concave portion 48 forming space required to allow the oxygen sensor 28 to be attached to and detached from the cylinder head 19C.

The third embodiment can produce effects similar to those of the second embodiment.

Although various preferred embodiments of the present invention have been described herein in detail, it will be appreciated by those skilled in the art, that variations may be made thereto without departing from the spirit of the invention or the scope of the appended claims.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. An exhaust gas sensor installation structure for a four-cycle engine, in which an exhaust gas sensor (28) is installed in a cylinder head (19A, 19B, 19C) of an engine main body (16A, 16B, 16C), the exhaust gas sensor (28) comprising a sensor main part (31) an end portion of which is exposed in an exhaust port (23) and a cap (32) which is fitted to a rear portion of the sensor main part (31) and from a side of which a cord (35) extends; wherein: a sensor installation hole (29) for installing the sensor main part (31) is provided in a portion around the exhaust port (23) of the cylinder head (19A, 19B, 19C); the cap (32) is at least partly covered by a sensor guard (40, 44, 45) fixedly positioned relative to the cylinder head (19A, 19B, 19C); and a direction in which the cord (35) extends is fixedly defined by the sensor guard (40, 44, 45) relative to the cylinder head (19A, 19B, 19C);

wherein the sensor guard (40) formed discretely from the engine main body (16A) is attached to the exhaust gas sensor (28) such that the sensor guard (40) engages with a positioning part (41) provided on the engine main body (16A);

wherein the sensor guard (40) integrally includes a sensor positioning part (40a) having an engaging part (40ad) to engage with the positioning part (41) provided on the engine main body and covering the cap (32); a cover part (40b) formed continuously with the sensor positioning part (40a) such that the cover part (40b) covers an outer open end of an air passage (34) communicating with an interior of the sensor main part (31) and opening in an outer surface of the cap (32); and a cord positioning part (40c) formed continuously with the sensor positioning part (40a) such that the cord positioning part (40c) defines a direction in which the cord (35) extends;

and wherein said cover part (40b) includes a pair of holding parts (40bc, 40bc) (40cb, 40cb) integrally formed with said cover part (40b), said holding parts elastically engaging projections (32b, 32c) of said cap (32).

2. The exhaust gas sensor installation structure for a four-cycle engine according to Claim 1, wherein the positioning part (41) provided on the engine main body comprises two adjacent ones of a plurality of cooling fins (42) projectedly formed on an outer circumference of the cylinder head 19A).

3. The exhaust gas sensor installation structure for a four-cycle engine according to any one of Claims 1 or 2, wherein: the engine main body (16A, 16B, 16C) is mounted on a motorcycle such that a side where the exhaust port (23) is provided of the cylinder head (19A, 19B, 19C) faces forward; and the sensor guard (40, 44, 45) is formed to cover the cap (32) from a front side.

4. The exhaust gas sensor installation structure for a four cycle engine as claimed in claims 1, 2 or 3 wherein said sensor guard (40) is a bent metal plate bracket.

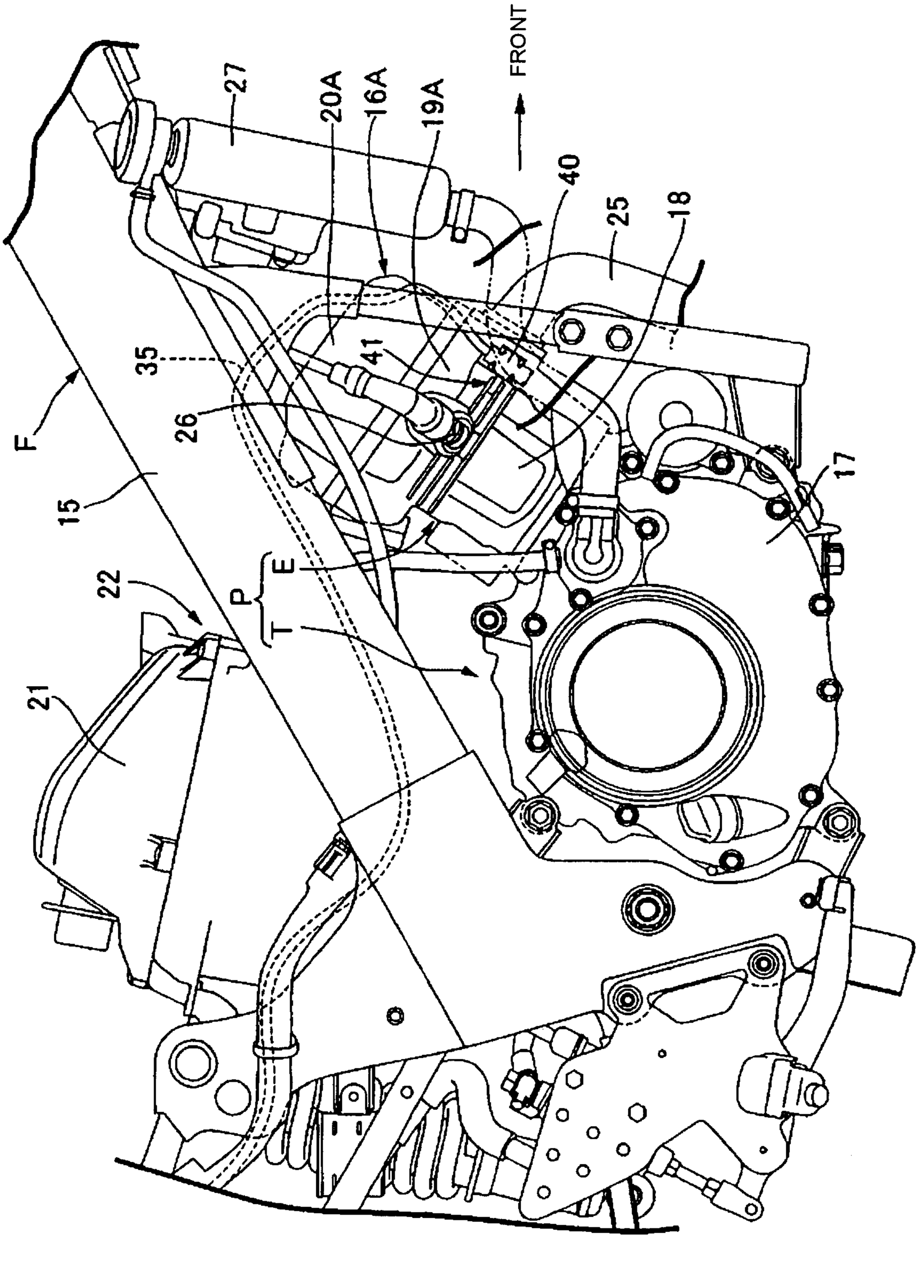

FIG. 1

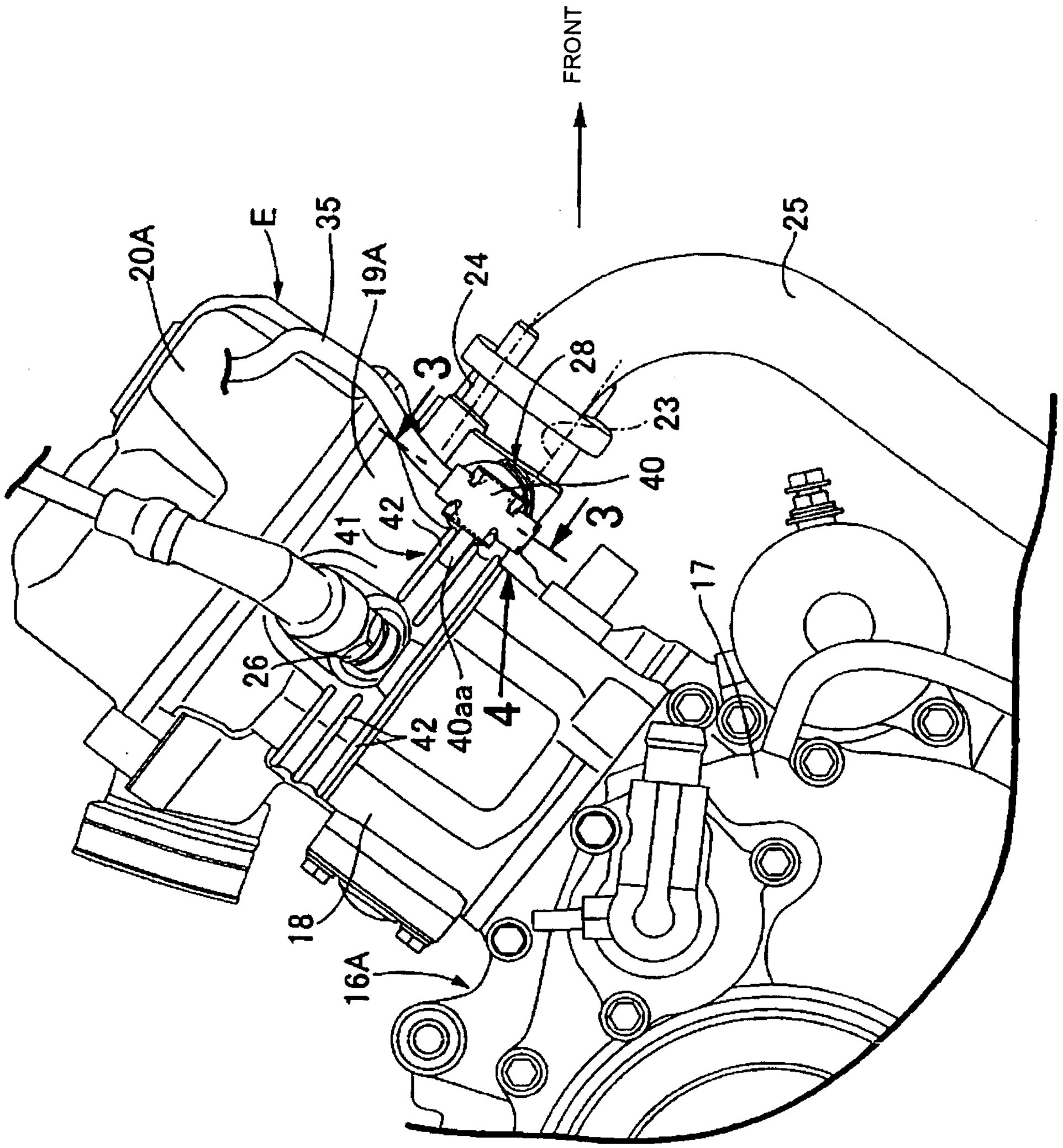

FIG. 2

FIG. 3

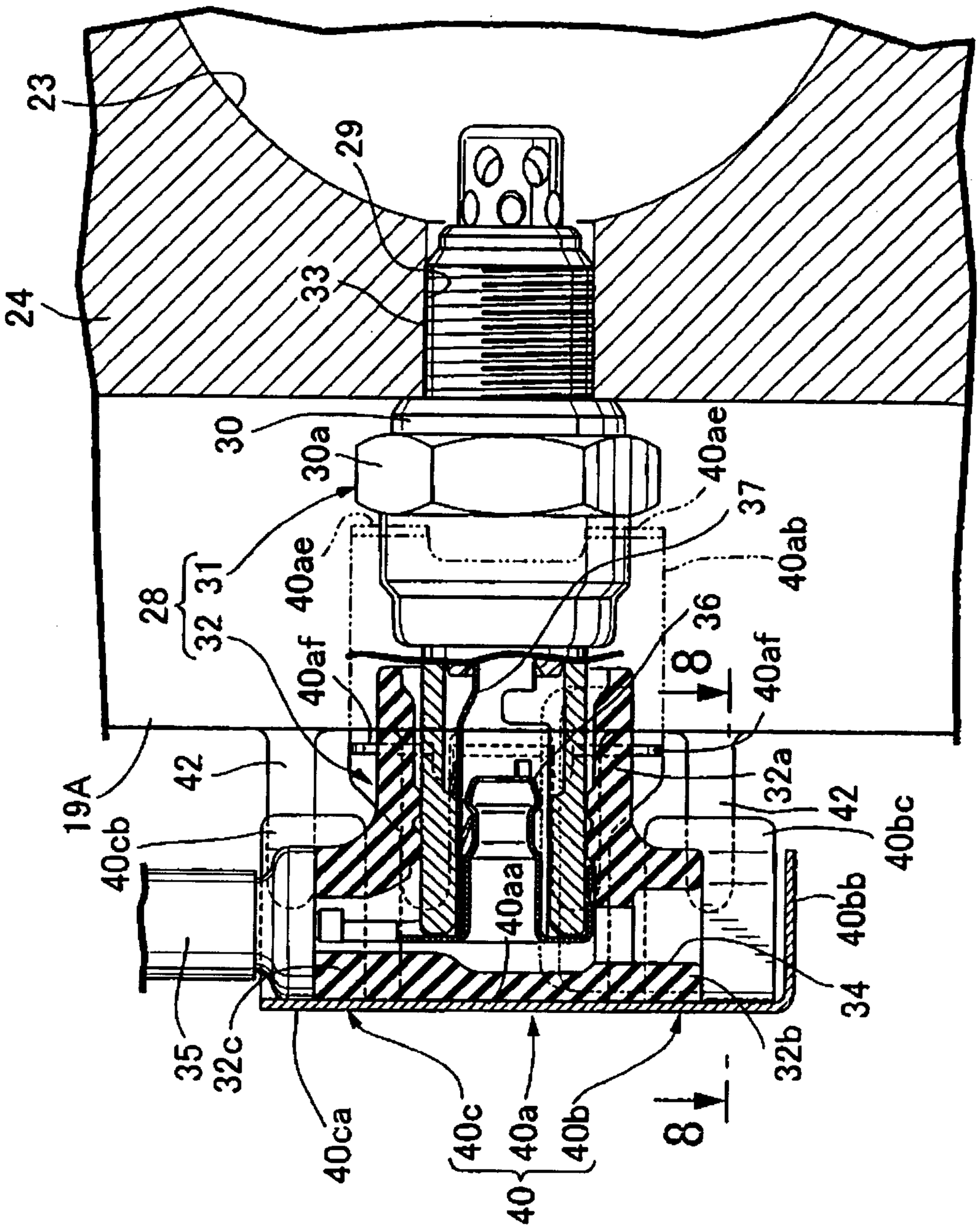
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FIG. 4

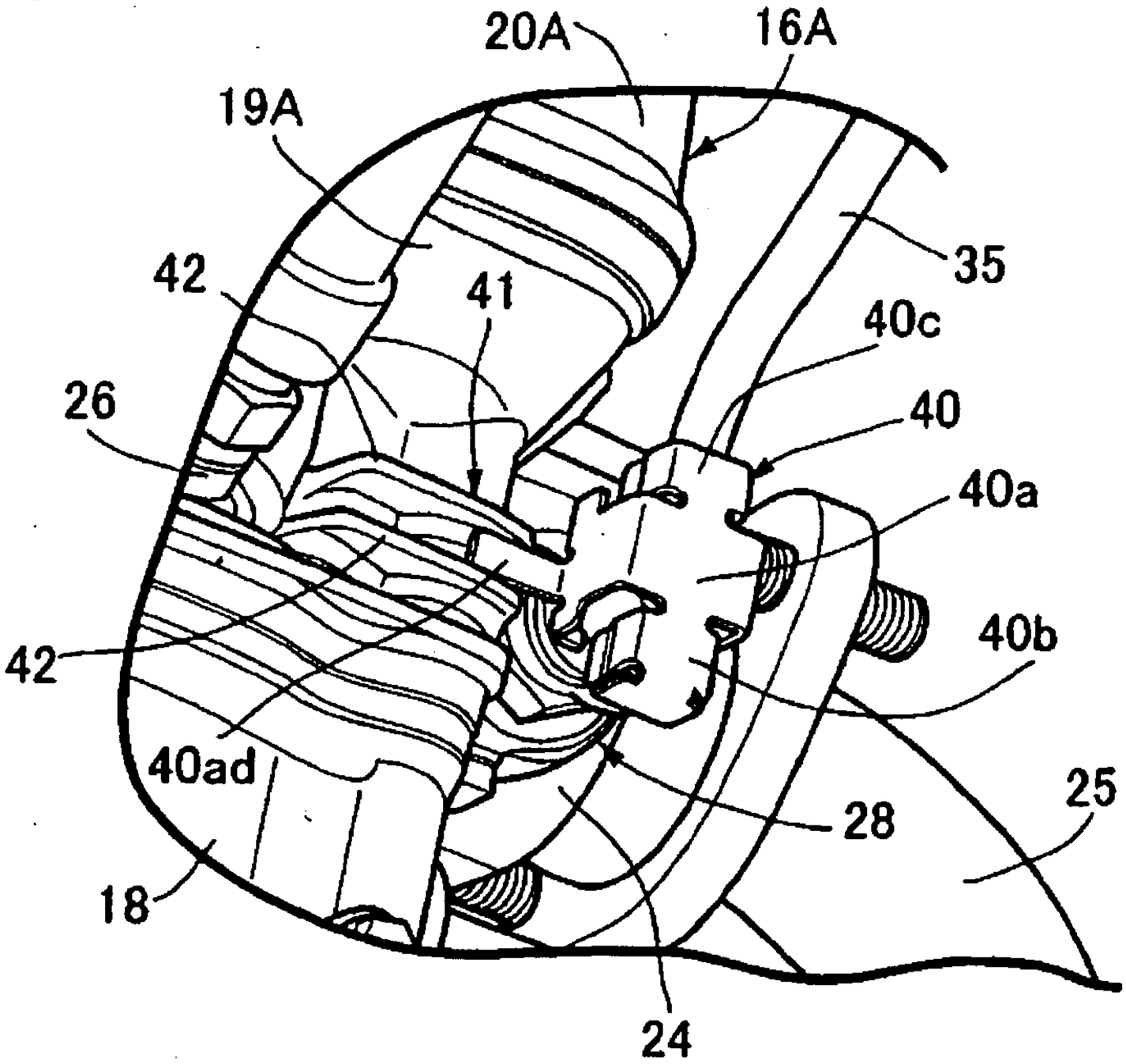
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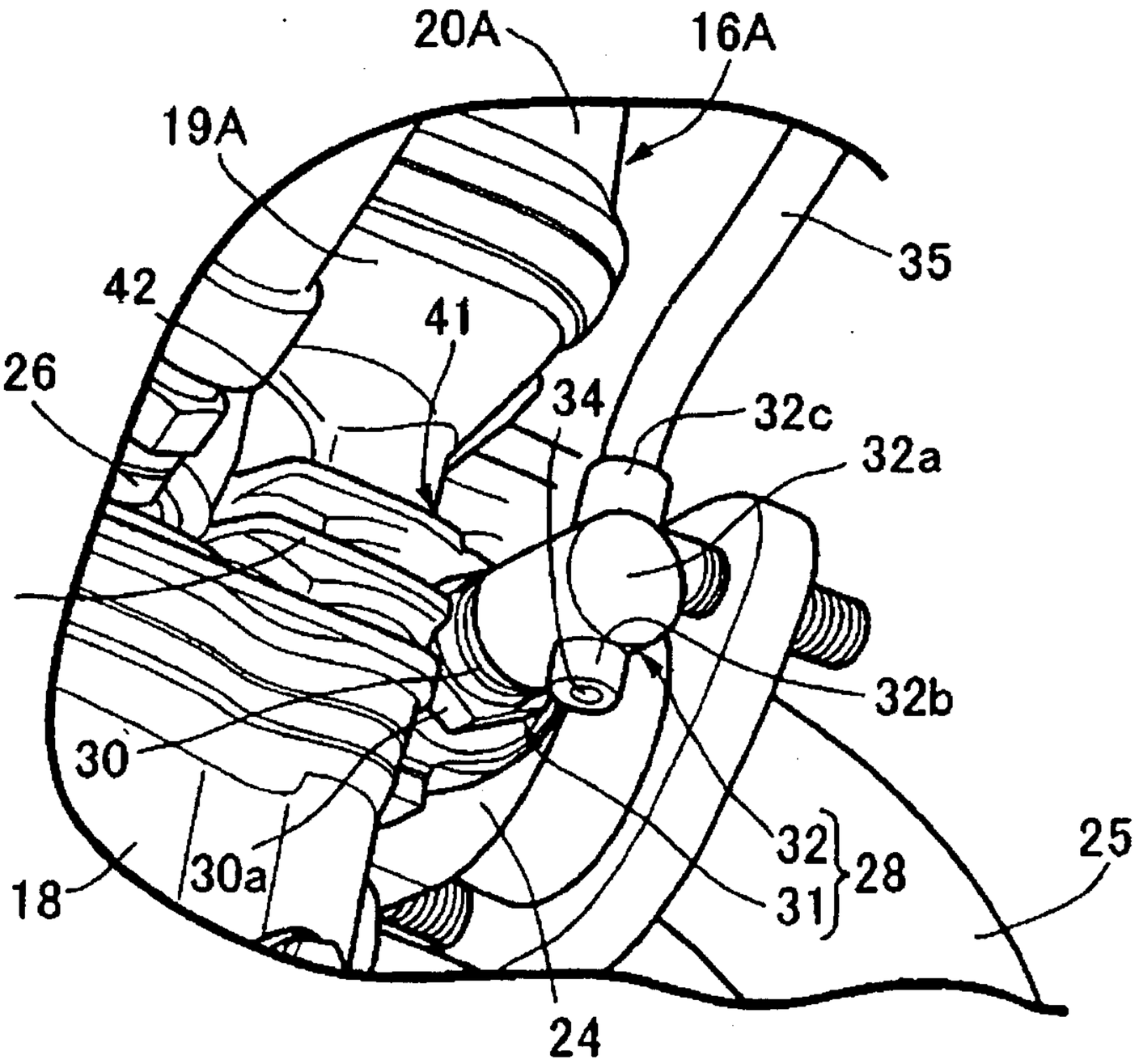
FIG. 5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34
32c
32a
42
32b
30
32
28
31
25
30a
18
24

FIG. 6

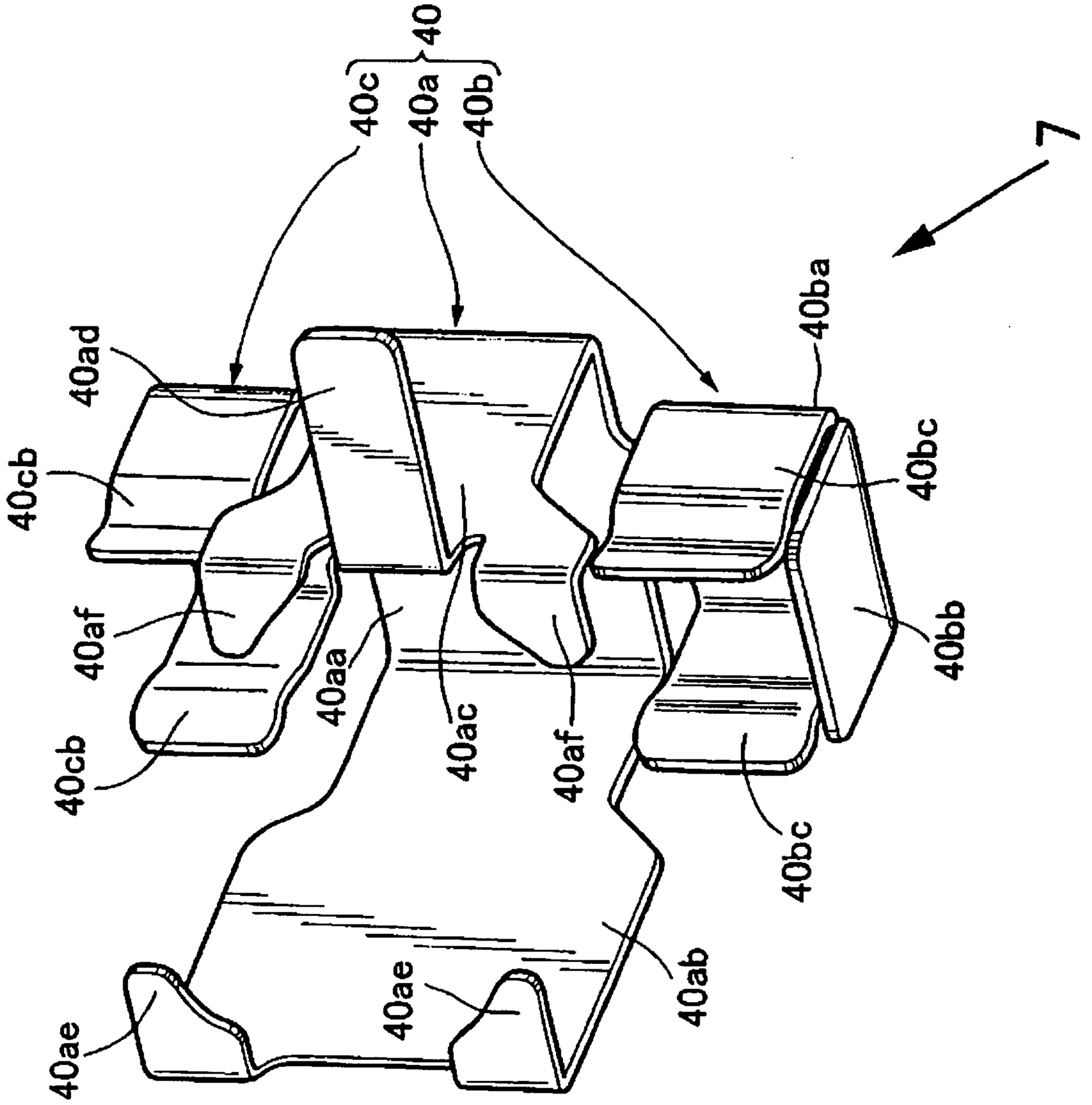

40
40c
40a
40b
7
40ad
40ba
40cb
40bc
40af
40aa
40bb
40ac
40af
40cb
40bc
40ae
40ae
40ab

FIG. 7

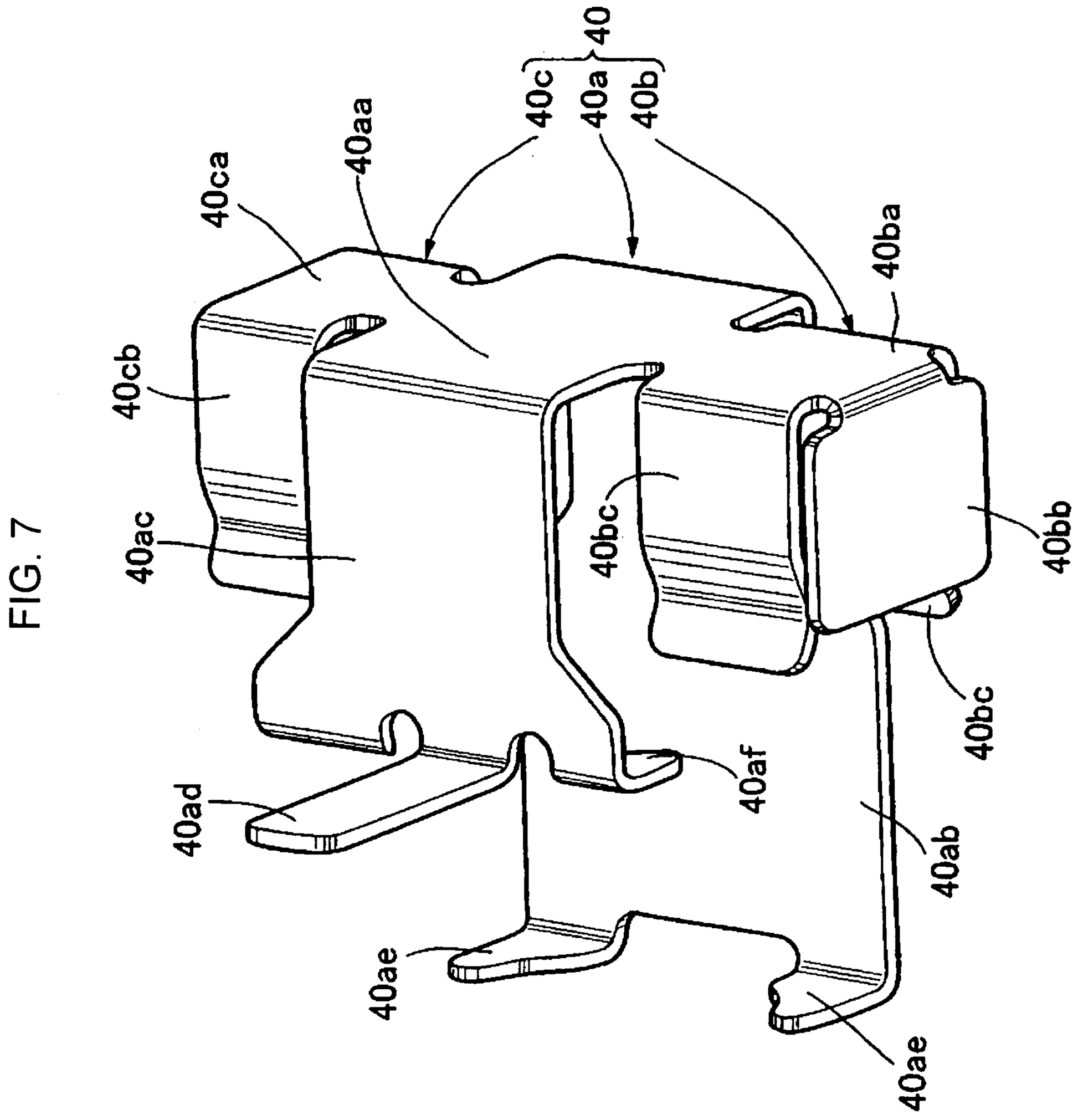

40
40c
40a
40b
40ca
40aa
40ba
40cb
40ac
40bc
40bb
40af
40ad
40bc
40ab
40ae
40ae

FIG. 8

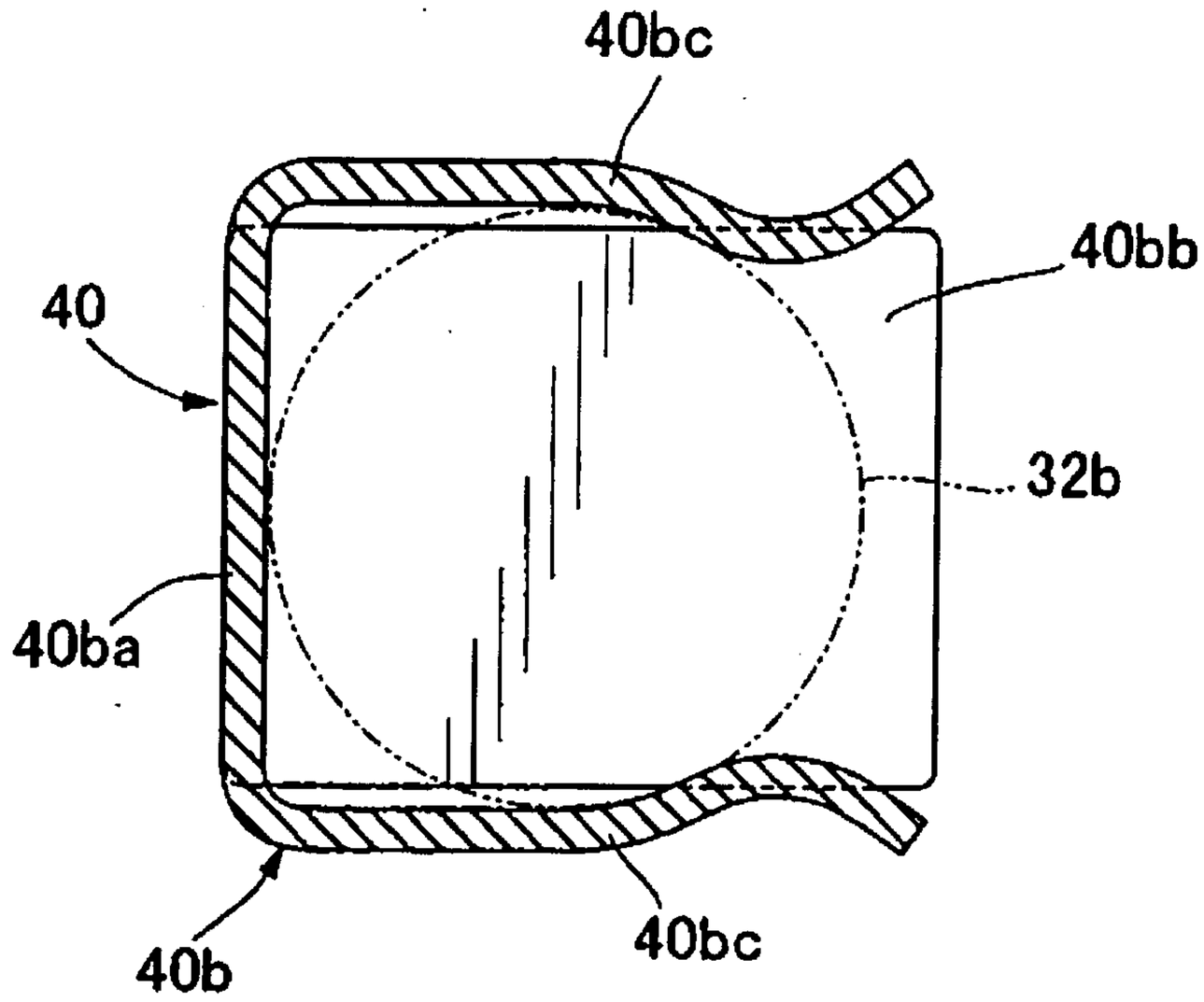
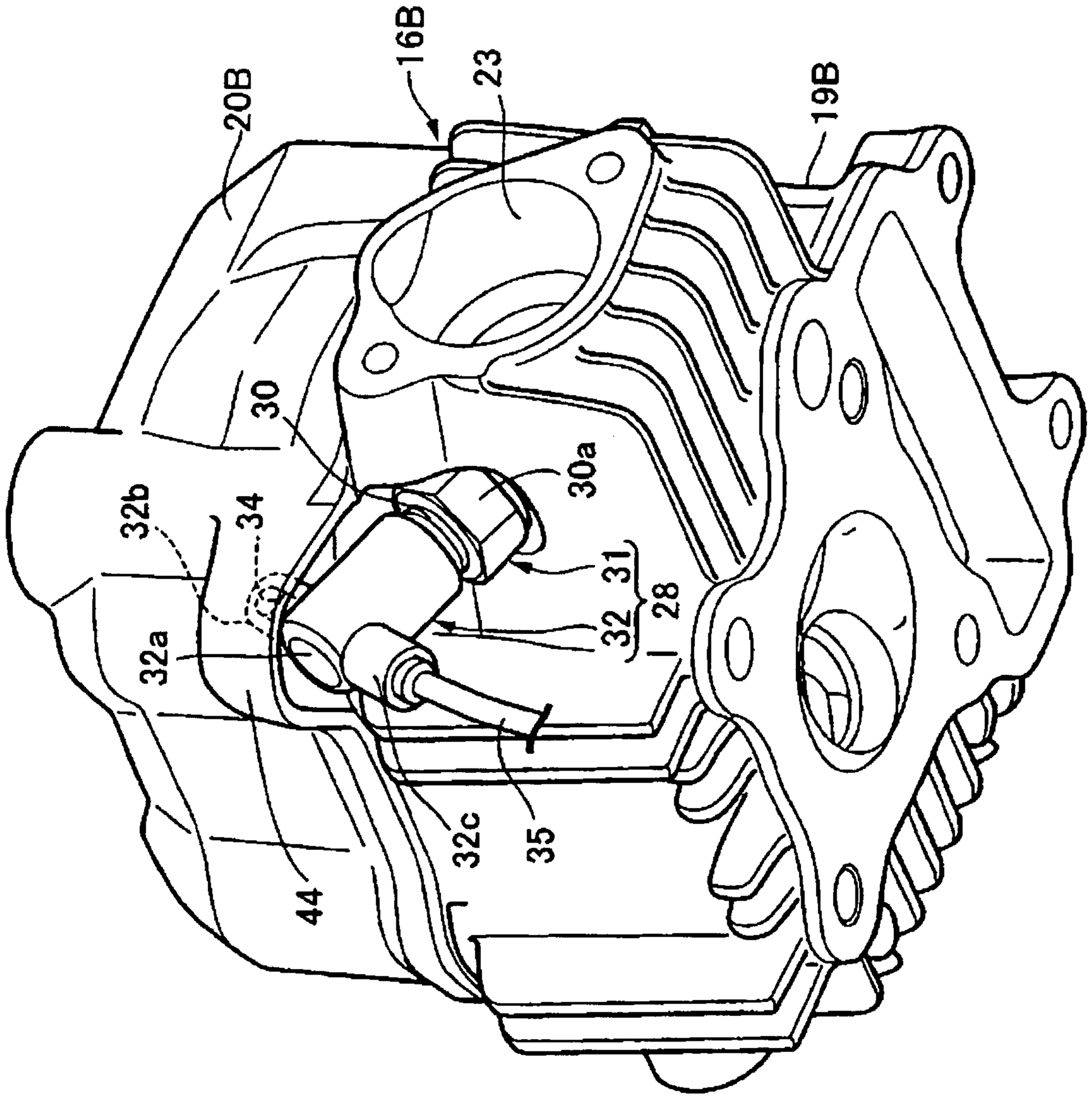


FIG. 9



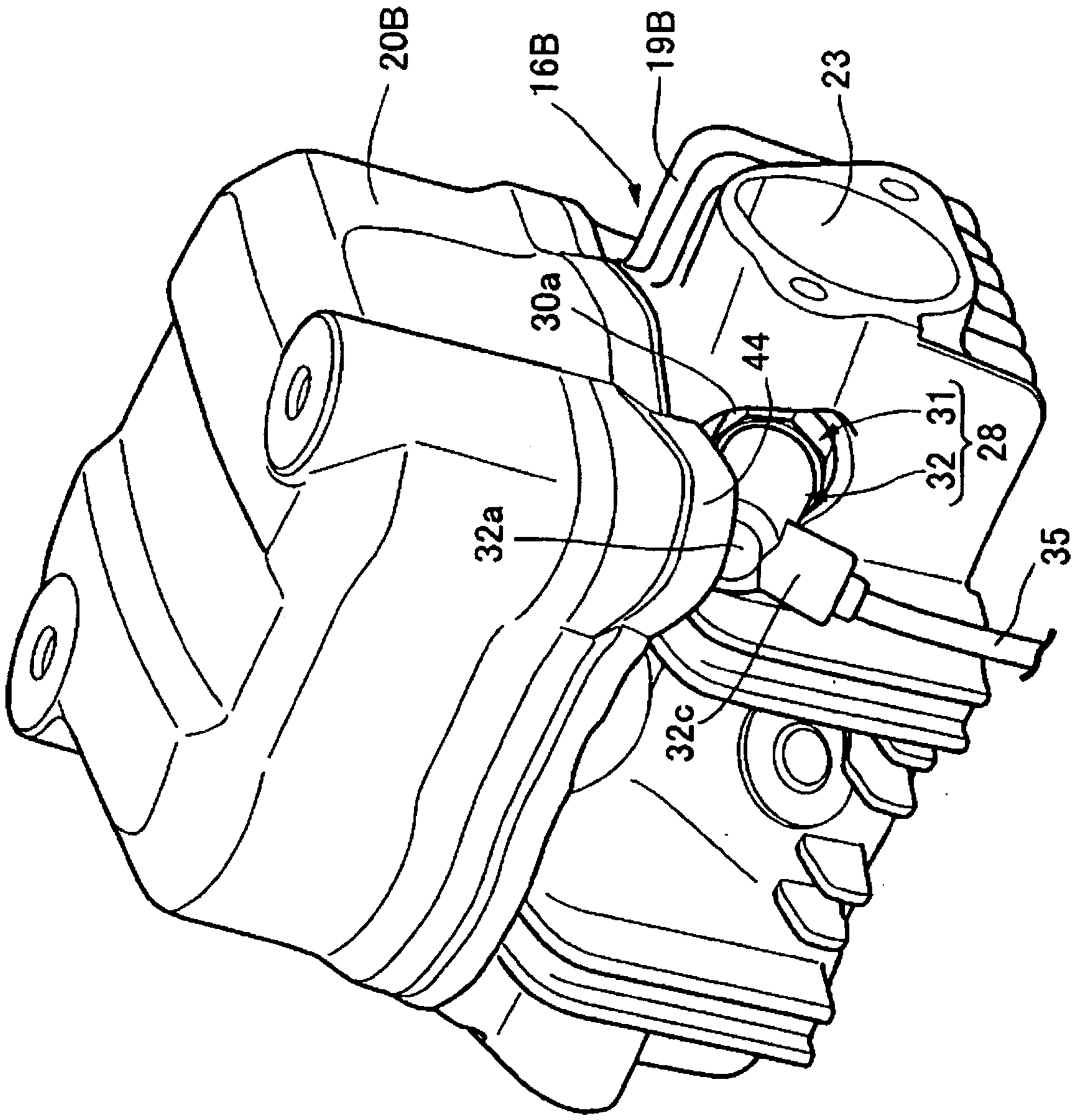


FIG. 10

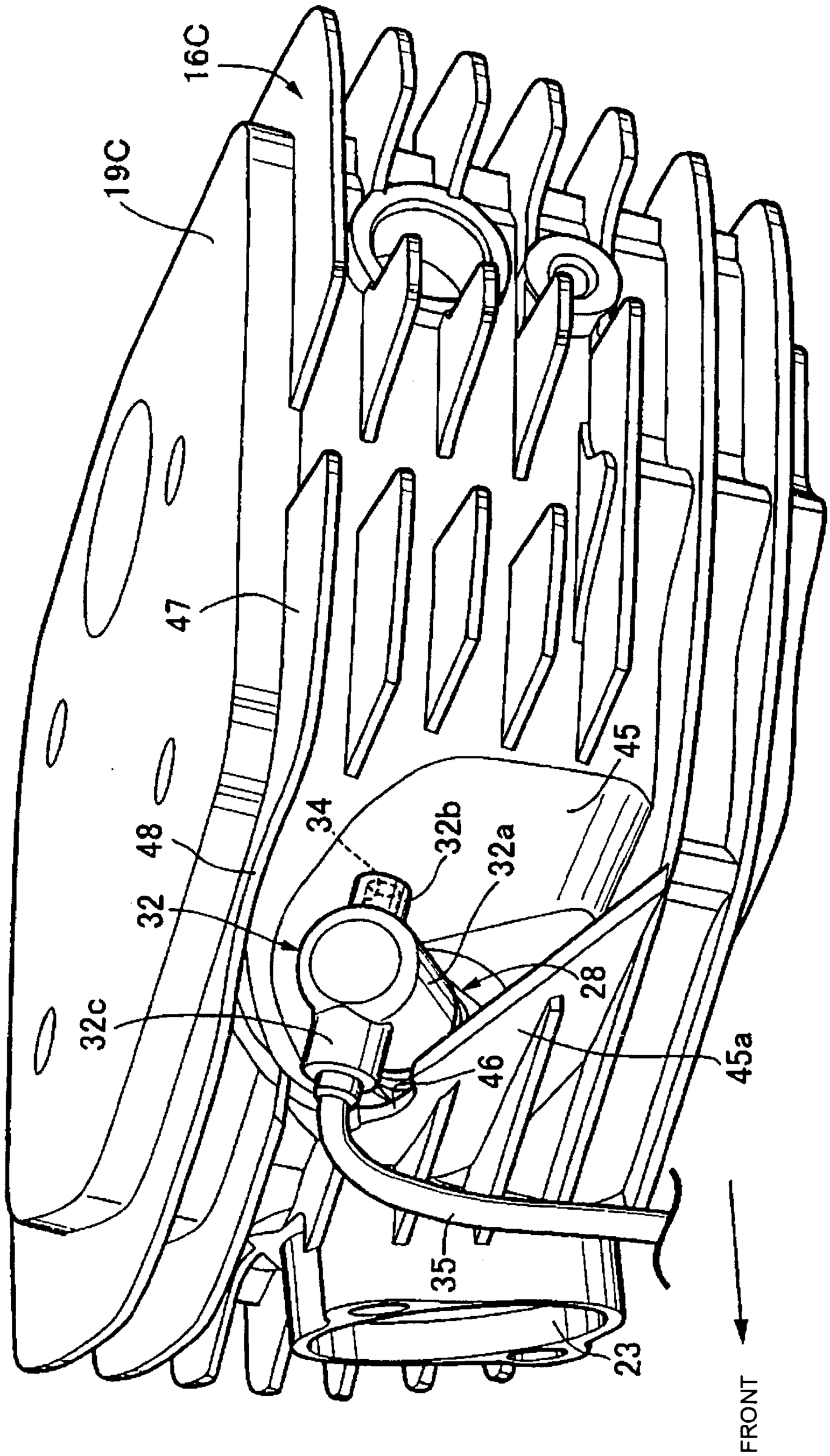


FIG. 11

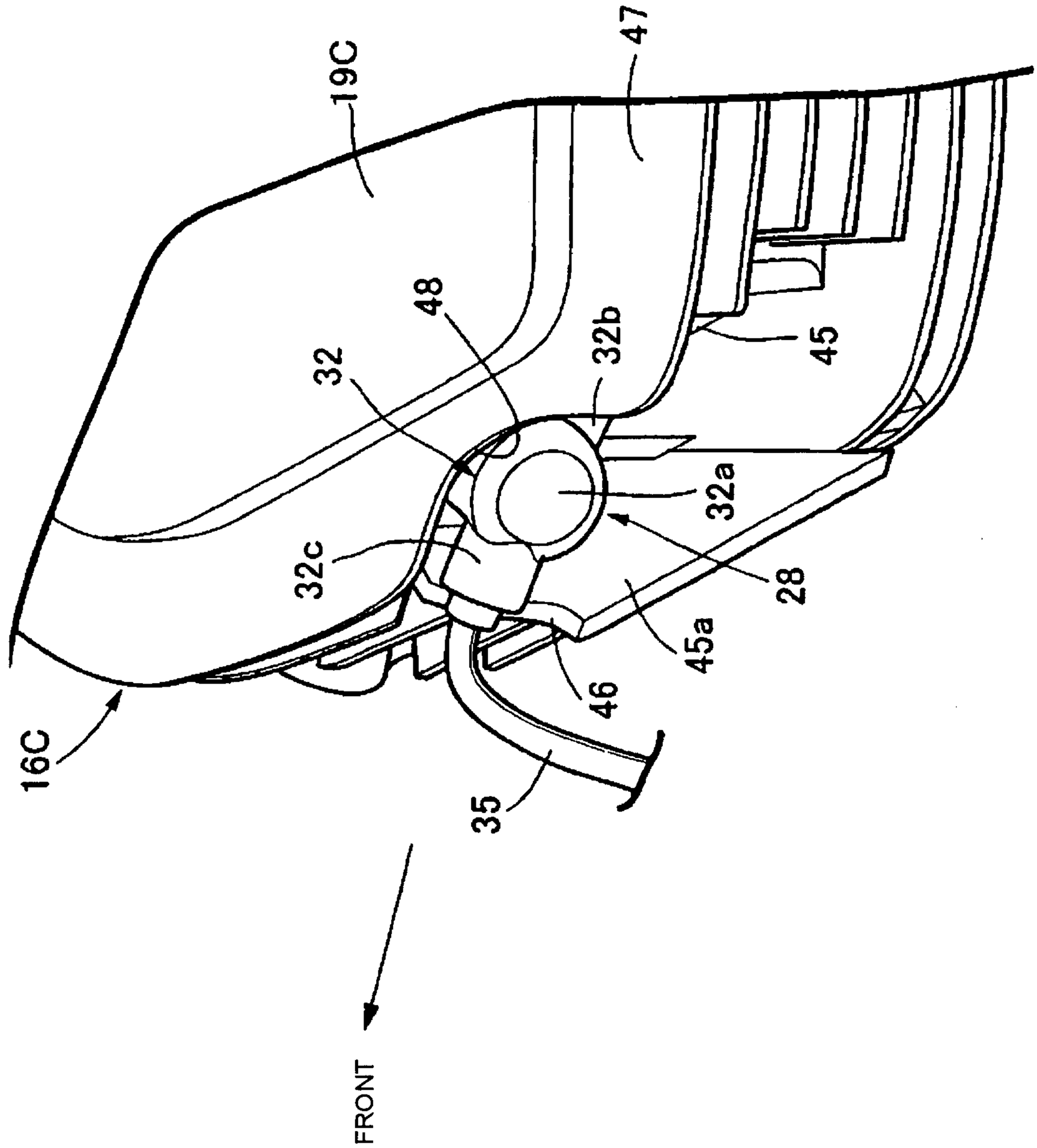
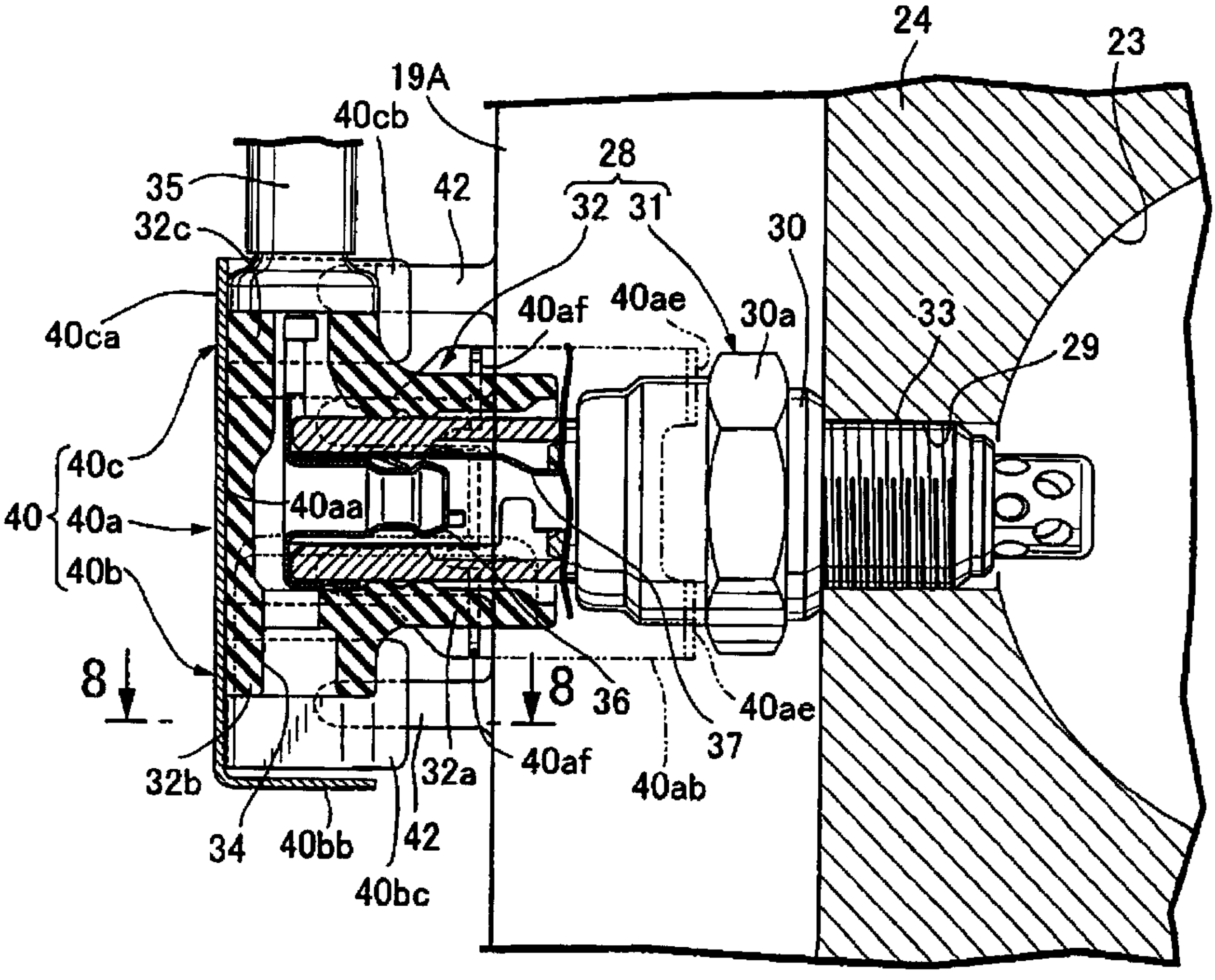


FIG. 12


24
23
19A
40cb
28
35
42
32 31
32c
30
40af
40ae
30a
33
40ca
29
40c
40
40aa
40a
40b
8
8
36
40ae
37
40af
32b
32a
40ab
34
40bb
42
40bc