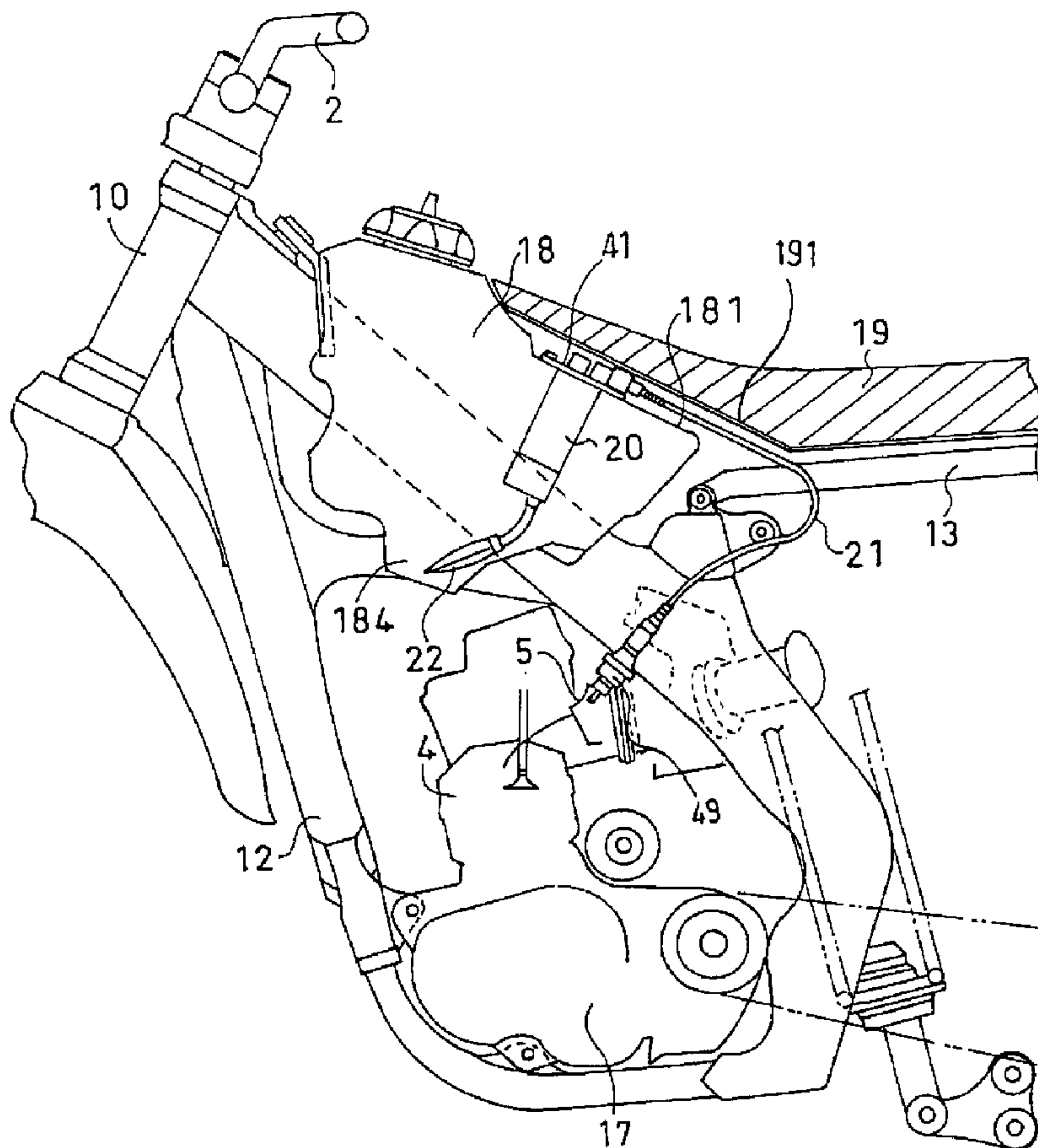




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 (72) Inventeur/Inventor:
YAGISAWA, KATSUICHI, JP
 (73) Propriétaire/Owner:
HONDA MOTOR CO., LTD., JP
 (74) Agent: DENNISON ASSOCIATES

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 (54) Title: FUEL SUPPLY DEVICE



(57) Abrégé/Abstract:

To incorporate a fuel pump in the inside of a fuel tank having a complicated shape with a small width. A motorcycle is of an offroad model and a fuel tank has a complicated shape with a small width. The fuel pump includes a base plate which is fixed to a plate

(57) **Abrégé(suite)/Abstract(continued):**

fitted on an upper surface of the fuel tank. A cylindrical and elongated pump body extends downwardly from the base plate and an intake pipe which has a filter is formed on a distal end thereof. The base plate of the fuel pump and members such as a hose joint arranged on an upper surface of the base plate are covered with a front portion of the rider's seat. An upper portion of the fuel pump is exposed to the outside of the fuel tank and hence, it is possible to easily get access to the fuel pump at the time of performing the maintenance.

ABSTRACT OF THE DISCLOSURE

To incorporate a fuel pump in the inside of a fuel tank having a complicated shape with a small width. A motorcycle is of an offroad model and a fuel tank has a complicated shape with a small width. The fuel pump includes a base plate which is fixed to a plate fitted on an upper surface of the fuel tank. A cylindrical and elongated pump body extends downwardly from the base plate and an intake pipe which has a filter is formed on a distal end thereof. The base plate of the fuel pump and members such as a hose joint arranged on an upper surface of the base plate are covered with a front portion of the rider's seat. An upper portion of the fuel pump is exposed to the outside of the fuel tank and hence, it is possible to easily get access to the fuel pump at the time of performing the maintenance.

FUEL SUPPLY DEVICE

5 FIELD OF THE INVENTION

The present invention relates to a fuel supply device, and more particularly to a fuel supply device for a vehicle which arranges a fuel pump in the inside of a fuel tank which is small and has a small width.

10 BACKGROUND OF THE INVENTION

In mounting a fuel pump in the inside of a fuel tank, the fuel pump is often mounted on a bottom plate side of the fuel tank. For example, JP-A-11-093794 published April 6, 1999 discloses a fuel supply device for a vehicle which fixes a base plate of a fuel pump to a flattened portion
15 formed on a rear end portion of a bottom plate of a fuel tank. Further, JP-A-2002-106440 discloses a fuel supply device for a vehicle which arranges a fuel pump in the inside of a fuel tank which is provided astride a body frame in a state that the fuel pump faces the vehicle frame in an opposed manner.

20

The above-mentioned arrangement of the fuel pump in the conventional fuel supply device is allowable when the bottom plate of the fuel tank has a flat surface on which the fuel pump can be mounted or when the fuel supply device is served for a large-sized vehicle in which the capacity of a
25 fuel tank per se is large. However, with respect to a motorcycle of offroad model or racing model, it is often the case that the capacity of the fuel tank is small or it is difficult to form a flat surface on the bottom plate. Accordingly, in such a vehicle, it is difficult to mount the fuel pump on the bottom plate side of the fuel tank and hence, there has been a demand for
30 a fuel supply device which allows the fuel pump to be mounted in the inside the fuel tank of the motorcycle of offroad model or racing model.

It is an object of the present invention to provide a fuel supply device which can mount a fuel pump in the inside of a fuel tank which has a bottom portion of a complicated shape or has the small capacitance.

5 **SUMMARY OF THE INVENTION**

To achieve the above-mentioned object, the first feature of the present invention lies in that, in a fuel supply device including a fuel pump which is disposed inside a fuel tank which is arranged in front of a rider seating position of a vehicle, the fuel pump includes a base plate which is
10 connected to an upper surface of the fuel tank and on which a fuel discharge joint and a power supply connector are formed, a pump body which is formed on a lower surface of the base plate, and a fuel intake portion which is arranged below the pump body and is directed to a bottom portion of the fuel tank, wherein the base plate is arranged at a
15 position which is covered with a front portion of a rider's seat of the vehicle.

Further, the second feature of the present invention lies in that the vehicle is an offroad vehicle, and the third feature of the present invention lies in
20 that a cover member which covers the fuel pump is provided between the seat and the fuel pump.

Further, the fourth feature of the present invention lies in that the pump body is formed in a cylindrical shape and is provided with, out of a check
25 valve and a pressure regulating valve which are arranged on the extension of a cross-sectional plane of the pump body between the pump body and the base plate, at least the check valve.

Still further, the fifth feature of the present invention lies in that the fuel
30 tank has, to allow the fuel tank to be arranged astride a frame member which extends in the fore-and-aft direction of the vehicle, a lower surface thereof formed into a recessed shape directed to the inside of the fuel tank.

According to the present invention having the first feature, since the fuel
35 pump is arranged in the inside of the fuel tank in a downwardly suspended manner from an upper surface of the fuel tank, it is possible to easily mount the fuel pump in the inside of the fuel tank even when a

width thereof is small and a bottom portion thereof has a complicated shape. Further, although the discharge joint of fuel and the power supply connector which are positioned on the upper surface of the fuel tank are covered with a rider's seat, these portions are provided to an appearance
5 portion which is exposed from the fuel tank and hence, the maintenance of these portions is facilitated.

With respect to an offroad vehicle, in general, a width of the fuel tank is small and a shape thereof is complicated and hence, by applying the
10 present invention to the offroad vehicle having such a fuel tank, it is possible to easily perform the fuel pump mounting operation.

According to the third feature, even when the rider moves to a front portion of the seat, an upper portion of the fuel pump is protected with
15 the cover.

According to the fourth feature, the fuel pump has an elongated shape and has no portion which projects from an outer diameter of a pump body and hence, it is possible to easily incorporate the fuel pump in the inside of the
20 fuel tank having a small width and a complicated shape.

According to the fifth feature, by adopting the constitution that the frame which extends in the fore-and-aft direction of the vehicle extends the fuel tank longitudinally, even when the shape of the fuel tank becomes
25 complicated, it is possible to arrange the elongated fuel pump in a state that the fuel pump is suspended from the upper portion of the fuel tank.

BRIEF DESCRIPTION OF THE DRAWINGS

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

Fig. 1 is an enlarged view of an essential part of a motorcycle having a fuel supply device according to one embodiment of the present invention.

35 Fig. 2 is a transverse cross-sectional view of a fuel tank on which the fuel supply device according to one embodiment of the present invention is mounted.

Fig. 3 is a cross-sectional view of a fuel pump in the inside of the fuel tank.

Fig. 4 is a top plan view of the fuel pump shown in Fig. 3.

- 5 Fig. 5 is a side view of a motorcycle having the fuel supply device according to one embodiment of the present invention.

Fig. 6 is a cross-sectional view of a fuel pump according to a modification.

- 10 Fig. 7 is a cross-sectional view of a fuel pump according to another modification.

Fig. 8 is a top plan view of the fuel pump shown in Fig. 7.

- 15 Fig. 9 is a transverse cross-sectional view of a fuel tank showing a state in which a fuel pump having a wide width is assumed to be mounted on a fuel tank.

Fig. 10 is a cross-sectional view of a fuel tank according to a modification.

20

Fig. 11 is a cross-sectional view of a fuel tank according to a further modification.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

- 25 One embodiment of the present invention is explained hereinafter in conjunction with drawings. Fig. 5 is a side view of a motorcycle of an offroad model having a fuel supply device according to one embodiment of the present invention. Here, in the embodiment explained hereinafter, the explanation is made with respect to an example in which the present
30 invention is applied to the motorcycle of an offroad model. In this embodiment, the offroad model or the offroad vehicle is not limited to a two-wheeled vehicle and includes the two-wheeled vehicle, a three-wheeled vehicle and a four-wheeled vehicle which travels on an uneven ground and a so-called buggy vehicle. In the drawing, the motorcycle 1 is
35 provided with a vehicle body frame which includes a head pipe 10 which is positioned at a front portion of a vehicle body, main frames 11 which extend rearwardly and downwardly from the head pipe 10, and a lower

frame 12 which has a front end thereof connected to lower ends of the main frames 11 and extends rearwardly. A rear portion of the lower frame 12 is further raised to form a rear frame 13.

5 A handle 2 is mounted on an upper portion of the head pipe 10. A front wheel 3 is supported on a front fork 14 which extends downwardly from the head pipe 10. An engine 4 is mounted between the main frames 11 and the lower frame 12. An intake pipe 5 and an exhaust pipe 6 are connected to the engine 4, while the exhaust pipe 6 is connected to a
10 muffler 7 which is arranged at a rear portion of the vehicle body. A rear wheel 16 is supported on a stay 15 which extends rearwardly from the vehicle body frame. Power is transmitted to the rear wheel 16 from the engine 4 by way of a transmission 17 and a clutch.

15 Although front portions of the above-mentioned main frames 11 are connected to the head pipe 10, rear portions of the main frames 11 are bifurcated in the vehicle width direction. Further, a fuel tank 18 is provided in a state that the fuel tank 18 is positioned between the main frames 11 and above the engine 4. A rider's seat 19 which extends
20 rearwardly in a state that the rider's seat 19 covers a portion of a rear portion of the fuel tank 18 is supported on the rear frame 13 in a lying state. The seat 19 includes a lock which is engaged with the frame of the vehicle body and a hinge which is connected to the frame of the vehicle body (both of them not shown in the drawing), wherein when the seat 19
25 is opened upwardly about the hinge by unlocking the lock, the rider can get access to an upper portion of a fuel pump 20 (see Fig. 1).

Fig. 1 is an enlarged view of an essential part of the above-mentioned motorcycle, Fig. 2 is a transverse cross-sectional view of the fuel tank, Fig.
30 3 is a cross-sectional view of the fuel pump, and Fig. 4 is an top plan view of the fuel pump. In these drawings, an upper surface 181 of the fuel tank 18 is formed into a flat surface, and a fuel pump 20 is provided in a state that the fuel pump 20 is fixed to the surface 181 and extends toward a bottom portion of the fuel tank 18. To the upper surface 181 of the fuel
35 tank 18, an annular plate 182 for mounting the fuel pump 20 is fixed. An outer peripheral portion of the plate 182 is fitted into a dovetail groove 183 which is an opening formed in the upper surface 181 of the fuel tank 18

and is integrally constituted with the fuel tank 18. The fuel pump 20 is fixed by fastening a base plate 41 which is positioned above the fuel pump 20 to the above-mentioned plate 182 using a plurality of bolts 45.

5 From the upper portion of the fuel pump 20, a hose joint 43 which connects a fuel hose 21 for supplying fuel discharged from a pump body to a fuel injection valve and a connector 48 which is provided for pulling electric lines for the fuel pump 20 and the like project and these parts are covered with the seat 19. The seat 19 includes, as a cover member which is
10 overlapped to at least above the fuel tank 18, a bottom plate 191 which is made of a member less deformable than a body of the seat 19 (a member having a surface on which the rider sits).

The fuel pump 20 is of an elongated cylindrical type which arranges a
15 pressure regulating valve 32 and a check valve 38 therein in a state that the pressure regulating valve 32 and the check valve 38 do not project from an outer diameter of the pump body. Since the fuel pump 20 is arranged vertically and is mounted on the fuel tank 18, it is unnecessary to increase a mounting surface with respect to the fuel tank 18. Accordingly,
20 the fuel pump 20 is suitable for a vehicle such as an offroad model motor cycle which includes the fuel tank 18 having a small vehicle-width directional size.

To a bottom portion of the fuel pump 20, an intake pipe 23 for fuel having
25 a filter 22 is connected. A fuel hose 21 which is pulled out to the outside from the upper portion of the fuel pump 20 is connected to a fuel injection valve 49 mounted on the intake pipe 5 of the engine 4.

A bottom surface of the fuel tank 18 projects downwardly and forms a
30 recessed portion 184 which is suitable for the accumulation of fuel as viewed from an inner surface thereof. The fuel pump 20 is arranged such that the filter 22 is positioned in the inside of the recessed portion 184. Accordingly, even when the fuel in the inside of the fuel tank 18 becomes small, the fuel tank 18 can suck the fuel accumulated in the recessed
35 portion 184. That is, the fuel tank is configured such that even when the motor cycle for racing or the like has such a complicated tank shape and

the remaining fuel becomes small, the motorcycle can continue the traveling as long as possible.

5 In this embodiment, since the fuel pump 20 is configured to be mounted on the upper surface of the fuel tank 18, it is possible to preferably use the fuel tank 18 having such a complicated bottom-surface shape.

10 A motor 24 which constitutes a pump body of the fuel pump 20 is housed in a space defined by a cylindrical housing 25 and a cap 26. The fuel pump 20 is a Wasco type pump which includes an impeller (not shown in the drawing) in a lower portion, that is, at a position close to a bottom portion of the fuel tank 18. The cap 26 is fitted on an outer periphery of the housing 25 and the cap 26 and the housing 25 are connected with each other due to the engagement between pawl members 27 formed on the housing 25 side and holes 28 formed in the cap 26 side. The cap 26 includes a wall 31 which forms a discharge passage 30 which is, in turn, fitted on a fuel outlet 29 which is mounted on an upper portion of the motor 24 in a projecting manner. An annular wall 33 is formed on a middle portion of the wall 31 for holding a pressure regulating valve 32. 15 20 The pressure regulating valve 32 includes a spherical valve element 35 which is supported on a diaphragm, wherein the valve element 35 closes a hole communicated with the discharge passage 30 at a given pressure. When the fuel pressure in the inside of the discharge passage 30 exceeds the given pressure, the spherical valve element 35 is retracted and hence, 25 the fuel is leaked into the inside of the pressure regulating valve 32 whereby the pressure in the inside of the discharge passage 30 is maintained at the given value. The fuel which flows into the inside of the pressure regulating valve 32 is discharged to the vicinity of the pawl members 27 of the housing 25 from a discharge port A of the pressure regulating valve 32 and is returned to the inside of the fuel tank 18 through an opening not shown in the drawing which is formed in the housing 25. 30

35 A check valve 38 is mounted on an upper portion of the discharge passage 30. The check valve 38 is biased downwardly by a spring 39. Accordingly, when the fuel attempts to flow backwardly, that is, when the fuel attempts

to flow into the pump 20, the check valve 38 closes the discharge passage 30 so as to prevent the backflow.

5 The base plate 41 includes a hose joint 43 having a passage 42 which is communicated with the discharge passage 30. A lower surface of the base plate 41 and an upper surface of the cap 26 are connected with each other by adhesion, melting or the like. Further, a connector 48 for electric lines is formed on the base plate 41. An electric line 46 which extends from the connector 48 is connected to the motor 24 through a receiving portion 37
10 of the electric lines 46.

The base plate 41 includes a skirt 411 which extends downwardly and a gap formed between an outer periphery of the skirt 411 and an inner periphery of a plate 182 which is fitted in an opening formed in the upper surface of
15 the fuel tank 18 is liquid-hermetically sealed by a sealing member 44.

In this manner, since the pressure regulating valve 32 and the check valve 38 are arranged in a state that these parts are accommodated in the inside of a cylinder which is extended along the outer diameter of the motor 24, it
20 is possible to reduce the size of the base plate 41 (that is, the planar area can be reduced). Accordingly, it is possible to mount the base plate 41 on the upper surface of the fuel tank 18 which is narrow in the vehicle-width direction without any trouble.

25 With respect to the above-explained pump 20, the filter 22 is mounted on the pump 20 by way of the intake pipe 23. However, when the pump 20 is provided in the inside of the fuel tank 18 having a small depth, the intake pipe 23 can be omitted. That is, it is possible to directly mount the filter 22 on an intake opening of the motor 24 so as to lower the entire height of
30 the pump 20. Fig. 6 is a cross-sectional view showing an example of the pump 20 from which the intake pipe 23 is omitted, wherein symbols which are equal to those in Fig. 3 indicate identical portions.

Here, the pressure regulating valve 32 is not always limited to the
35 constitution in which the pressure regulating valve 32 is disposed in the inside of the fuel pump 20, that is, in the inside of the cylindrical housing 25 and the cap 26. For example, it may be possible that a pressure

regulating valve is provided to the fuel hose 21 which connects the fuel pump 20 and the fuel injection valve 49 and a return pipe from the pressure regulating valve is additionally connected to the fuel pump 20.

5 Fig. 7 is a cross-sectional view of the fuel pump 20 showing a case in which the pressure regulating valve is not provided in the inside of the fuel pump 20 and Fig. 8 is a top plan view of the fuel pump 20, wherein symbols which are equal to those in Fig. 3 indicate identical or similar parts. In these drawings, the return pipe from the pressure regulating
10 valve not shown in the drawing is connected to a return hose joint 47. According to this example, the discharge passage 30 can be shortened by an amount corresponding to the elimination of the pressure regulating valve from the fuel pump 20 and hence, a total length of the fuel pump 20 can be shortened.

15

For a comparison purpose, assume a state in which other type of fuel pump is mounted on the upper surface of the fuel tank 18. In Fig. 9, with respect to a fuel pump 50 which is mounted on the upper surface of the fuel tank 18, different from the above-mentioned fuel pump 20, a pressure
20 regulating valve 51 is provided at a position offset from a position right above the motor 24. Accordingly, a mounting area with respect to the fuel tank 18 is increased and hence, the fuel tank 18 having a small width cannot ensure a sufficient mounting width on the upper surface of the fuel tank 18 whereby the upper portion of fuel pump 50 having a large
25 width cannot be covered with the rider's seat 19 of offroad model. In this manner, it is not proper to mount the conventional fuel pump on the fuel tank of the motorcycle of offroad model which has a small width and in which the rider may move the seating position on the seat.

30 In the above-mentioned embodiment, a bottom plate 191 of the seat 19 performs an action of a cover member which covers the fuel pump and so that, in a motorcycle of offroad model or for racing or the like, the fuel supply device can more properly cope with the manner of riding that the rider moves the sitting position on the seat. Here, although the bottom
35 plate 191 is formed integrally with the seat 19 as the cover member, the cover member may not be formed integrally with the seat 19 and may be formed of a sheet-like member which is arranged between an upper

portion of the fuel pump 20 and the bottom plate 191 or a cover may be arranged as a separate member in addition to the bottom plate 191. Due to the provision of the cover member which is constituted of the bottom plate 191 or the like, the function of protecting the fuel pump 20 and piping and wiring on the base plate 41 can be further enhanced.

Fig. 10 is a transverse cross-sectional view of an essential part of the vehicle showing the modification of the fuel tank. In this embodiment, the fuel tank is suitable for a vehicle of a type which includes a main frame 52 which extends in the fore-and-aft direction of the vehicle and has a portion close to a rear portion thereof directed downwardly. To allow a main frame 52 to traverse a fuel tank 53 longitudinally, that is, to arrange the fuel tank 53 such that the fuel tank 53 strides over the main frame 52, a retracting portion 54 which is indented toward an inner surface of the fuel tank 53 is formed on a bottom portion of the fuel tank 53. A fuel pump 56 is provided in a state that the fuel pump 56 is suspended in the inside of the fuel tank 53 from the upper portion of the fuel tank 53. The fuel pump 56 is constituted of a motor (pump body) 57, a cap 58 which incorporates a valve mechanism similar to the above-mentioned pressure regulating valve 32 and check valve 38 therein, and a housing 59 which is engaged with the cap 58 so as to hold the motor 57. An intake pipe 60 which is connected with the pump body 57 reaches a bottom portion of the fuel tank 53. The intake pipe 60 is, in the same manner as the constitution shown in Fig. 1, positioned such that a filter which is formed on a distal end of the intake pipe 60 is positioned at a position of the fuel tank 53 as low as possible. An upper portion of the cap 58 and an upper opening of the fuel tank 53 are engaged with each other by fitting engagement by way of a sealing member 61.

On an upper portion of the fuel tank 53, in the same manner as the previous embodiment, the rider's seat 19 is arranged such that a front portion thereof covers the fuel tank 53 and an upper portion of the fuel pump 56 is protected by a bottom plate 191.

As in the case of this embodiment, the fuel pump 56 has an elongated shape as a whole and hence, it is possible to arrange the fuel pump 56 such

that the fuel pump 56 is offset to the left side (right side in the drawing) with respect to the fuel tank 53 so as to avoid the main frame 52.

5 Here, the fuel tank 53 is, to allow the fuel tank 53 to easily stride over the main frames 52, configured such that a lower portion thereof is widened in the lateral direction and an upper portion thereof is narrowed corresponding to a width of the seat 19 to allow the rider to easily stride over the fuel tank 53. Accordingly, as shown in Fig. 11, the fuel pump 56 may be arranged in an inclined manner in conformity with such a flaring
10 shape of the fuel tank 53.

Although the present invention is most suitable for the vehicle of offroad model having the fuel tank of the relatively small width, the present invention may be applied to a large-sized fuel tank so as to cover the
15 upper portion of the fuel pump with the front portion of the seat.

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
20 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. A fuel supply device including a fuel pump which is disposed inside a fuel tank which is arranged in front of a rider seating position of a vehicle, wherein the fuel pump includes a base plate which is connected to an upper surface of the fuel tank and on which a fuel discharge joint and a power supply connector are formed, a pump body which is formed on a lower surface of the base plate, and a fuel intake portion which is arranged below the pump body and is directed to a bottom portion of the fuel tank, and the base plate is arranged at a position which is covered with a front portion of a rider's seat of the vehicle; and wherein said rider's seat is hingedly secured to the vehicle and movable between a closed position and an open position; said rider's seat in said open position allowing access to an upper portion of said fuel pump.
2. A fuel supply device according to claim 1, wherein the vehicle is an offroad vehicle.
3. A fuel supply device according to claim 1 or 2, wherein a cover member which covers the fuel pump is provided between the seat and the fuel pump.
4. A fuel supply device according to any one of the claims 1 to 3, wherein the pump body is formed in a cylindrical shape and is provided with, out of a check valve and a pressure regulating valve which are arranged on the extension of a cross-sectional plane of the pump body between the pump body and the base plate, at least the check valve.

5. A fuel supply device according to claim 4, wherein the fuel tank has, to allow the fuel tank to be arranged astride a frame member which extends in the fore-and-aft direction of the vehicle, a lower surface thereof formed into a recessed shape directed to the inside of the fuel tank.

6. A fuel supply device including a fuel pump which is disposed inside a fuel tank located in front of a rider's seat positioned on a vehicle, comprising:

a base plate connected to an upper surface of the fuel tank;

a fuel discharge joint formed on the base plate;

a power supply connector formed on the base plate;

a pump body formed on a lower surface of the base plate; and

a fuel intake portion located below the pump body and being directed to a bottom portion of the fuel tank;

wherein the base plate is located at a position that is covered by a front portion of the rider's seat of the vehicle, and

wherein a main body of the fuel pump that houses the pump body is mounted via the base plate to the upper surface of the fuel tank such that the main body of the fuel pump contacts the upper surface of the fuel tank, and

the fuel pump extends toward the bottom portion of the fuel tank; and

wherein said rider's seat is hingedly secured to the vehicle and moveable between a closed position covering said fuel pump and an open position allowing access to an upper portion of said fuel pump.

7. The fuel supply device according to claim 6, wherein the vehicle is an offroad vehicle.

8. The fuel supply device according to claim 6, wherein a cover member covers the fuel pump, said cover member is located between the seat and the fuel pump.

9. The fuel supply device according to claim 7, wherein a removable cover member covers the fuel pump, said cover member is located between the seat and the fuel pump.

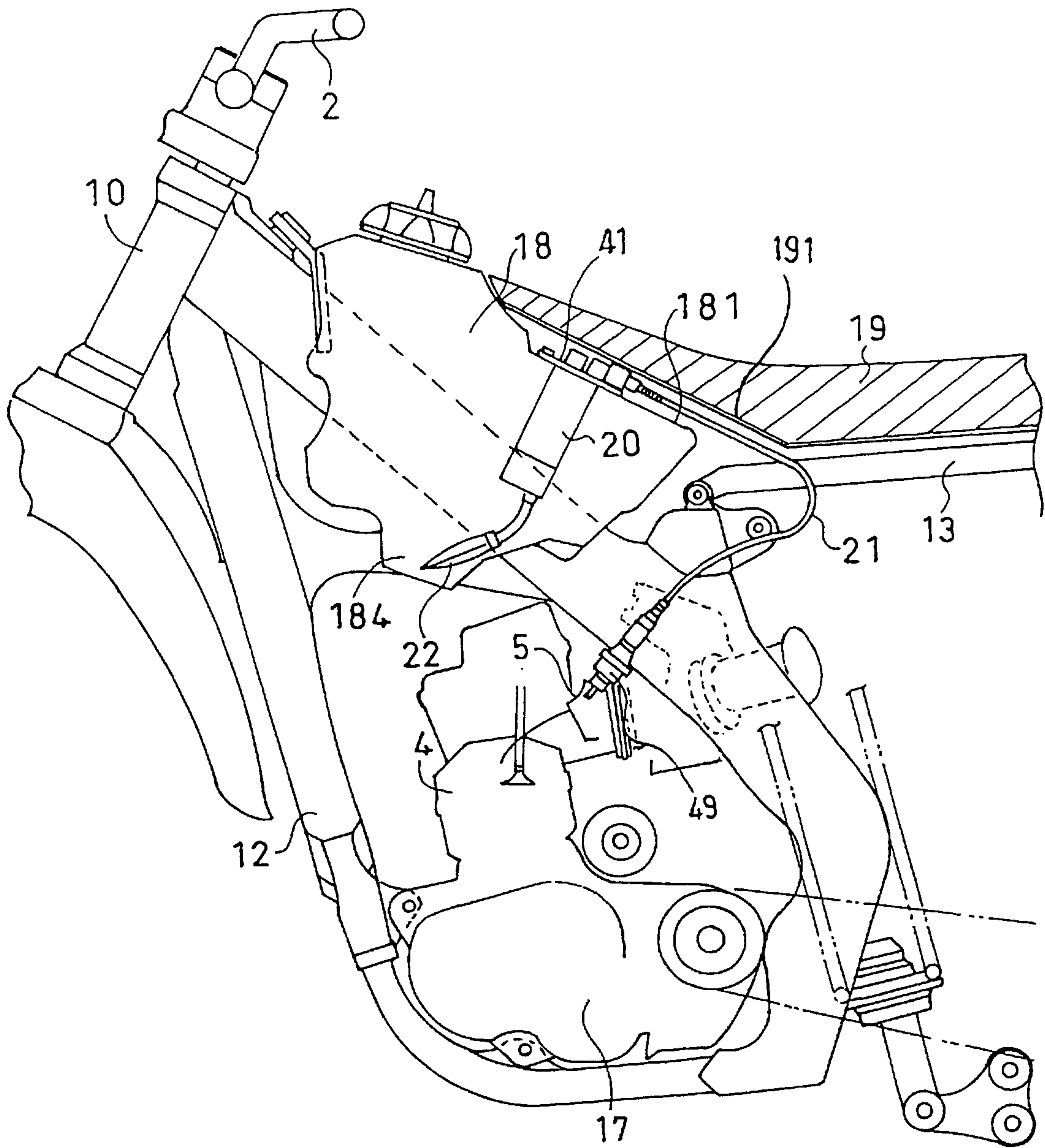
10. The fuel supply device according to claim 6, wherein the pump body is formed in a cylindrical shape and is provided with a check valve and a pressure regulating valve, at least said check valve being arranged on an extension of a cross-sectional plane of the pump body between the pump body and the base plate.

11. The fuel supply device according to claim 7, wherein the pump body is formed in a cylindrical shape and is provided with a check valve and a pressure regulating valve, at least said check valve being arranged on an extension of a cross-sectional plane of the pump body between the pump body and the base plate.

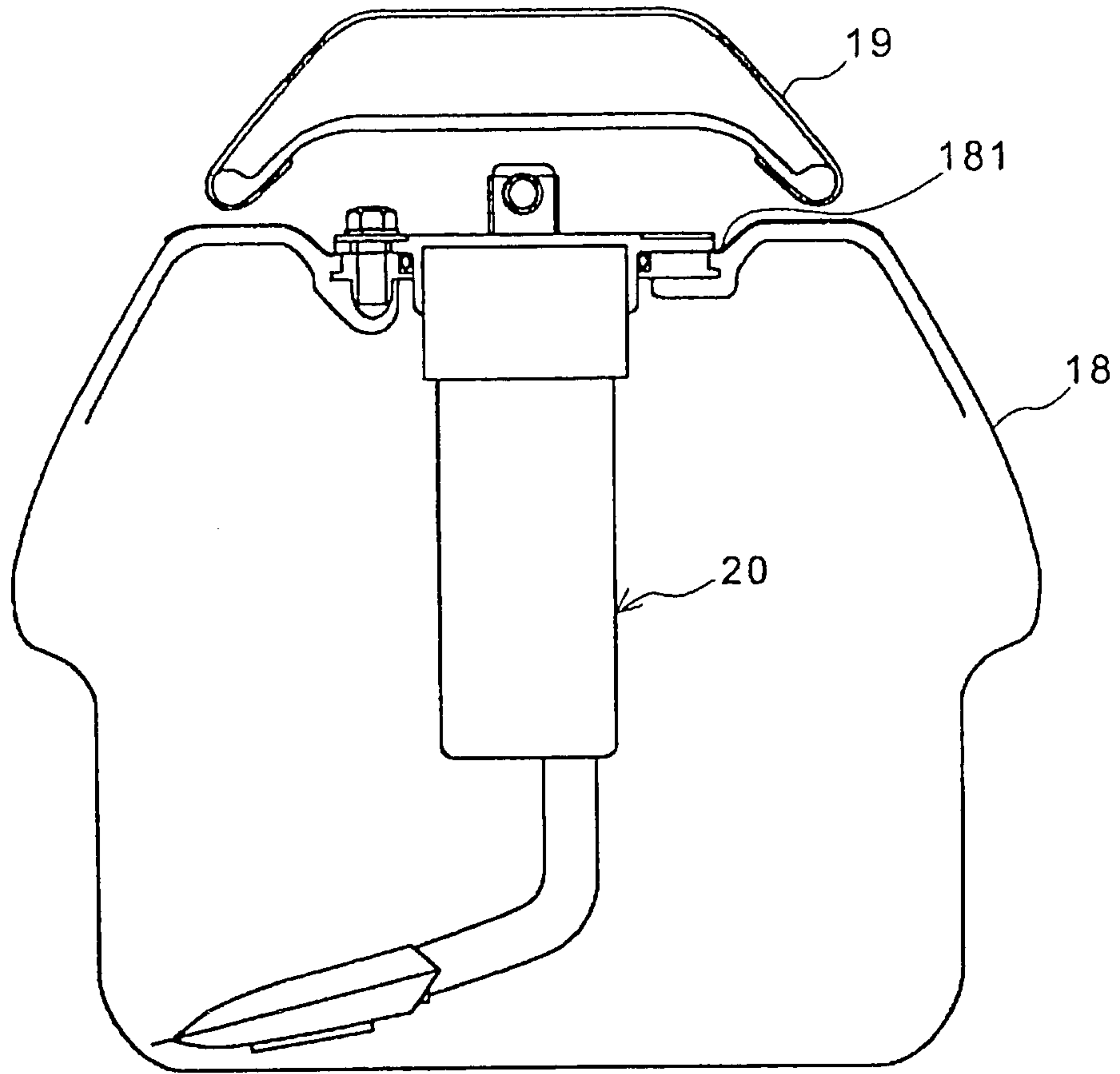
12. The fuel pump adapted to be disposed inside a fuel tank according to claim 9, 10 or 11, wherein the pump body is formed in a cylindrical shape and is provided with a check valve and a pressure regulating valve, at least said check valve being arranged on an extension of a cross-sectional plane of the pump body between the pump body and the base plate.

[Name of Document] Drawings

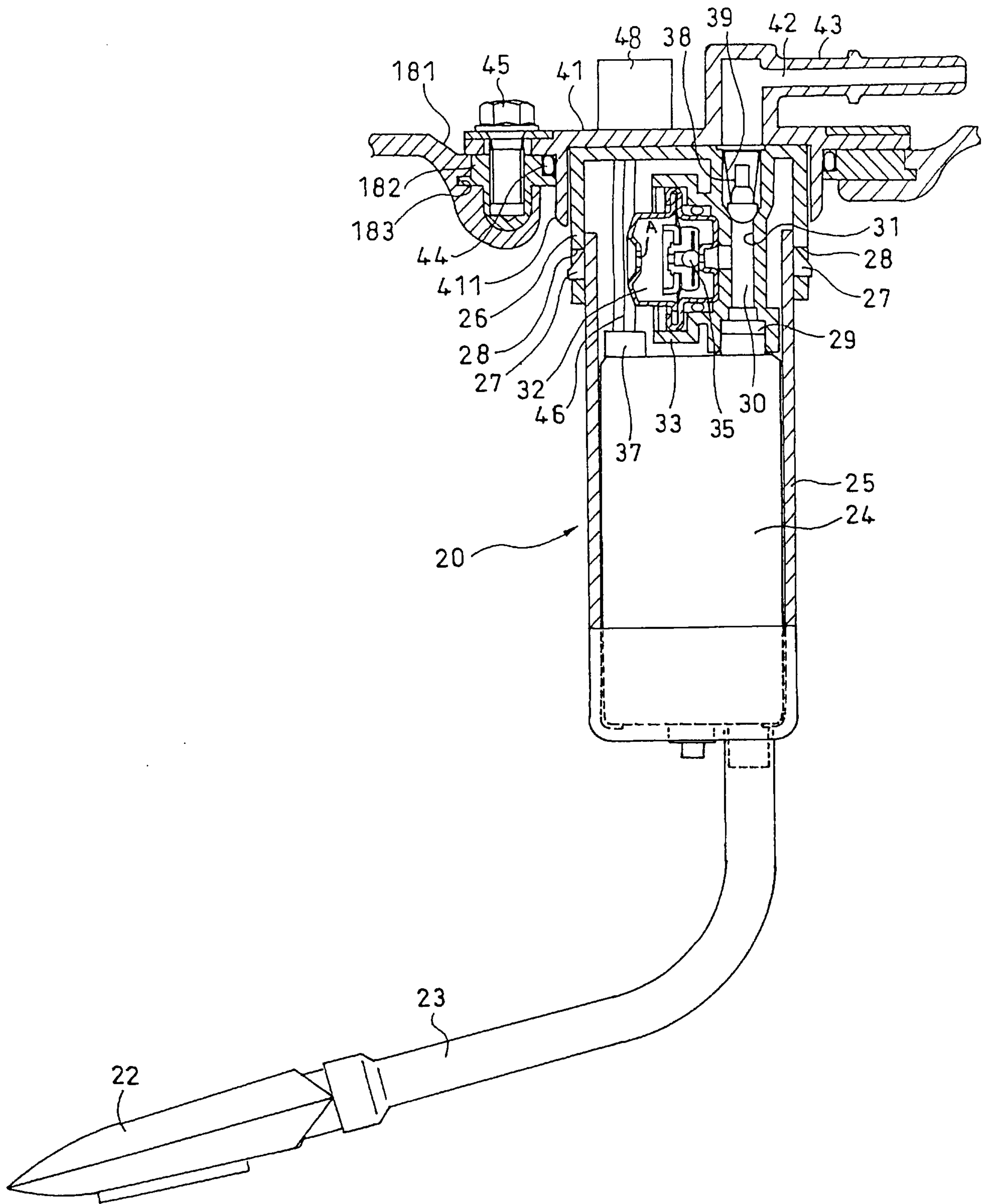
[Fig.1]



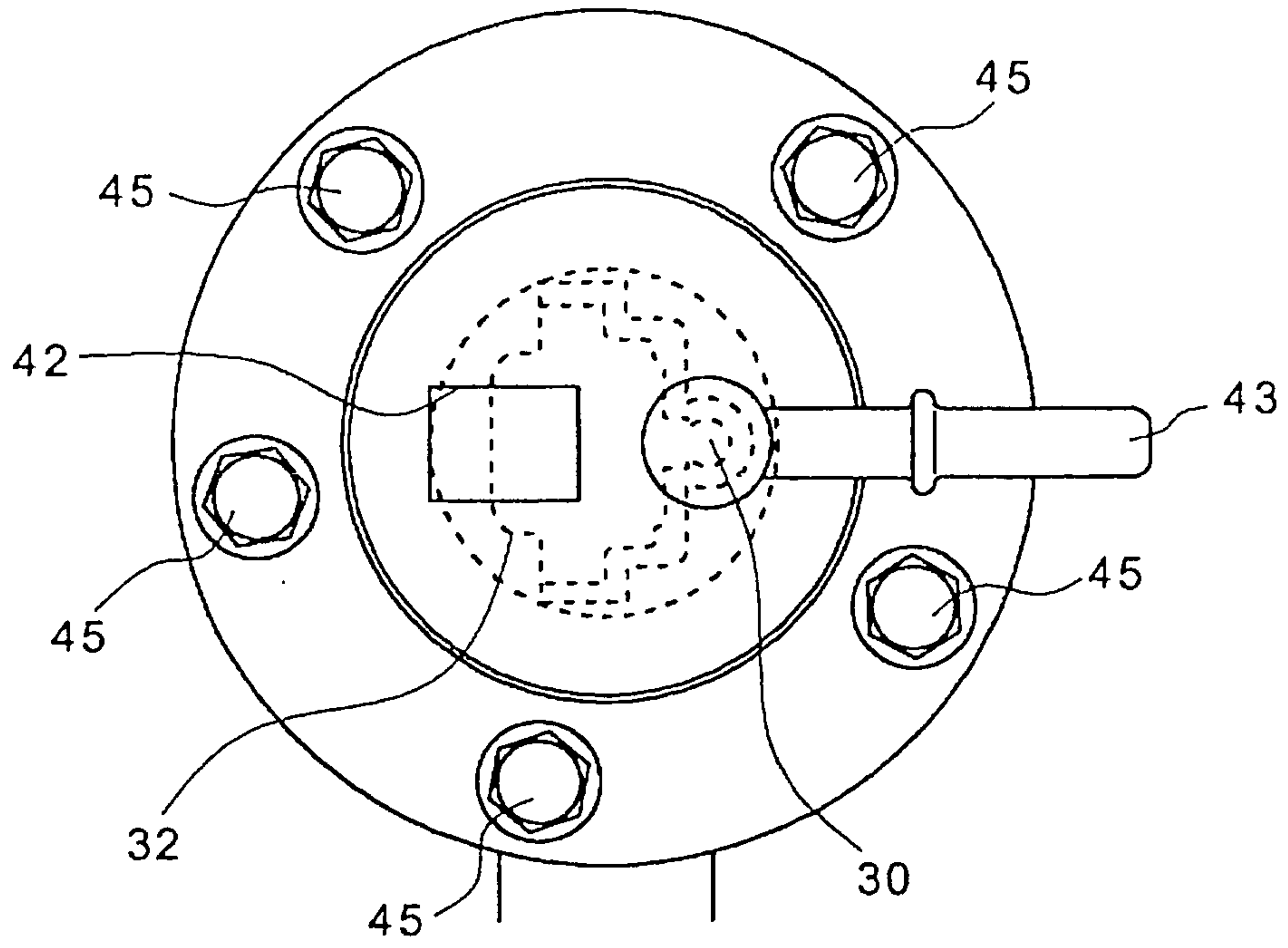
[Fig.2]



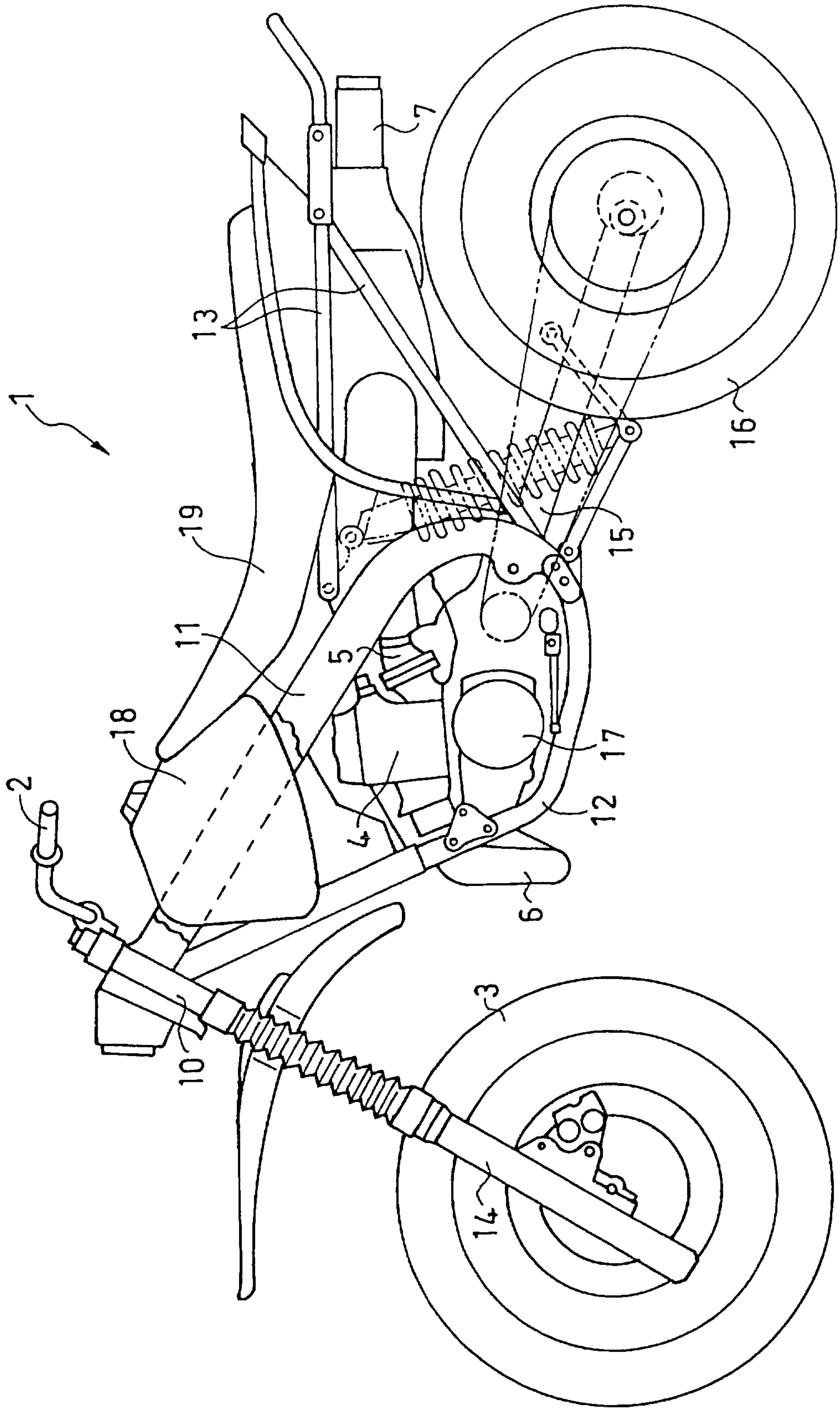
[Fig.3]



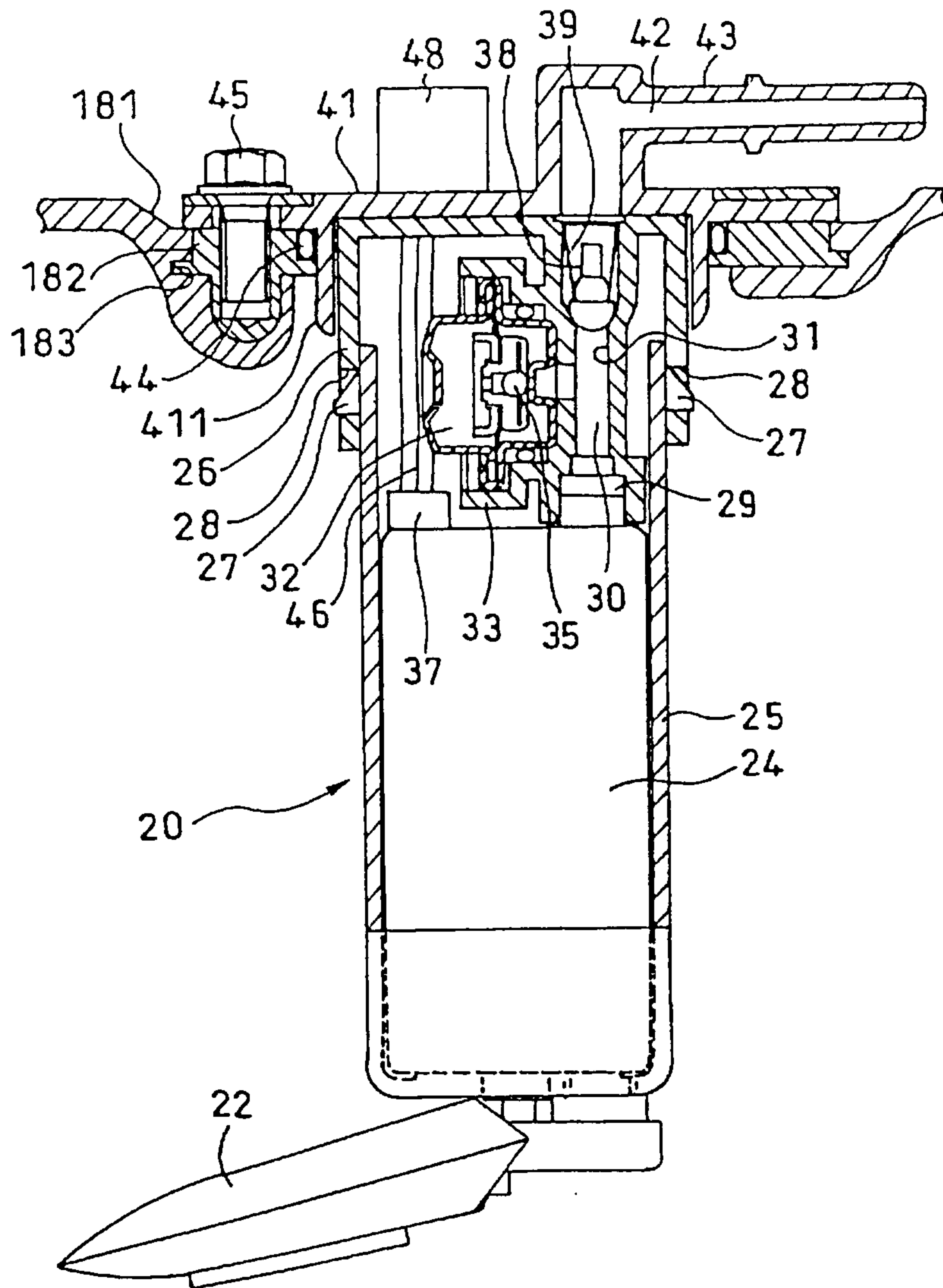
[Fig.4]



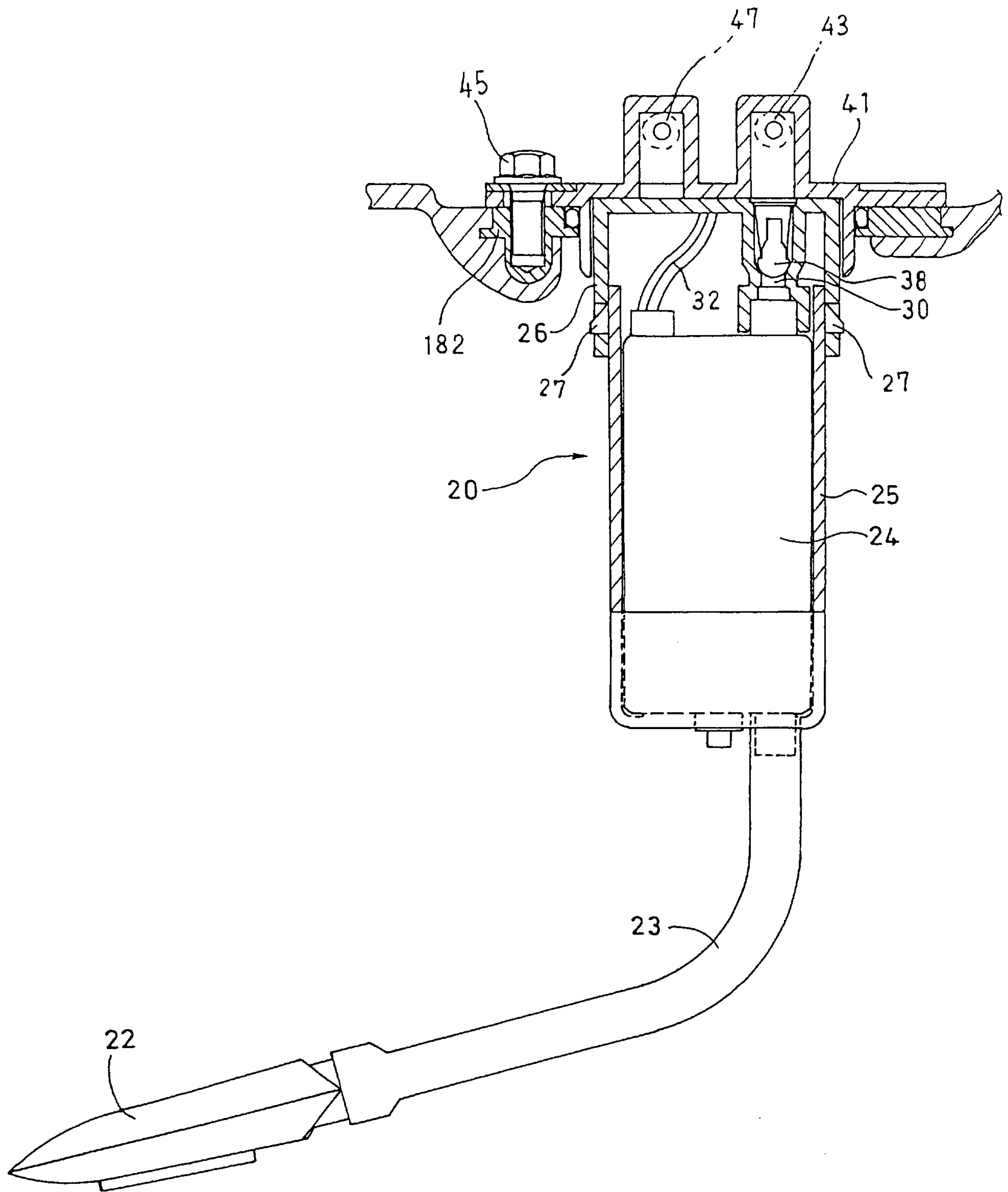
[Fig.5]



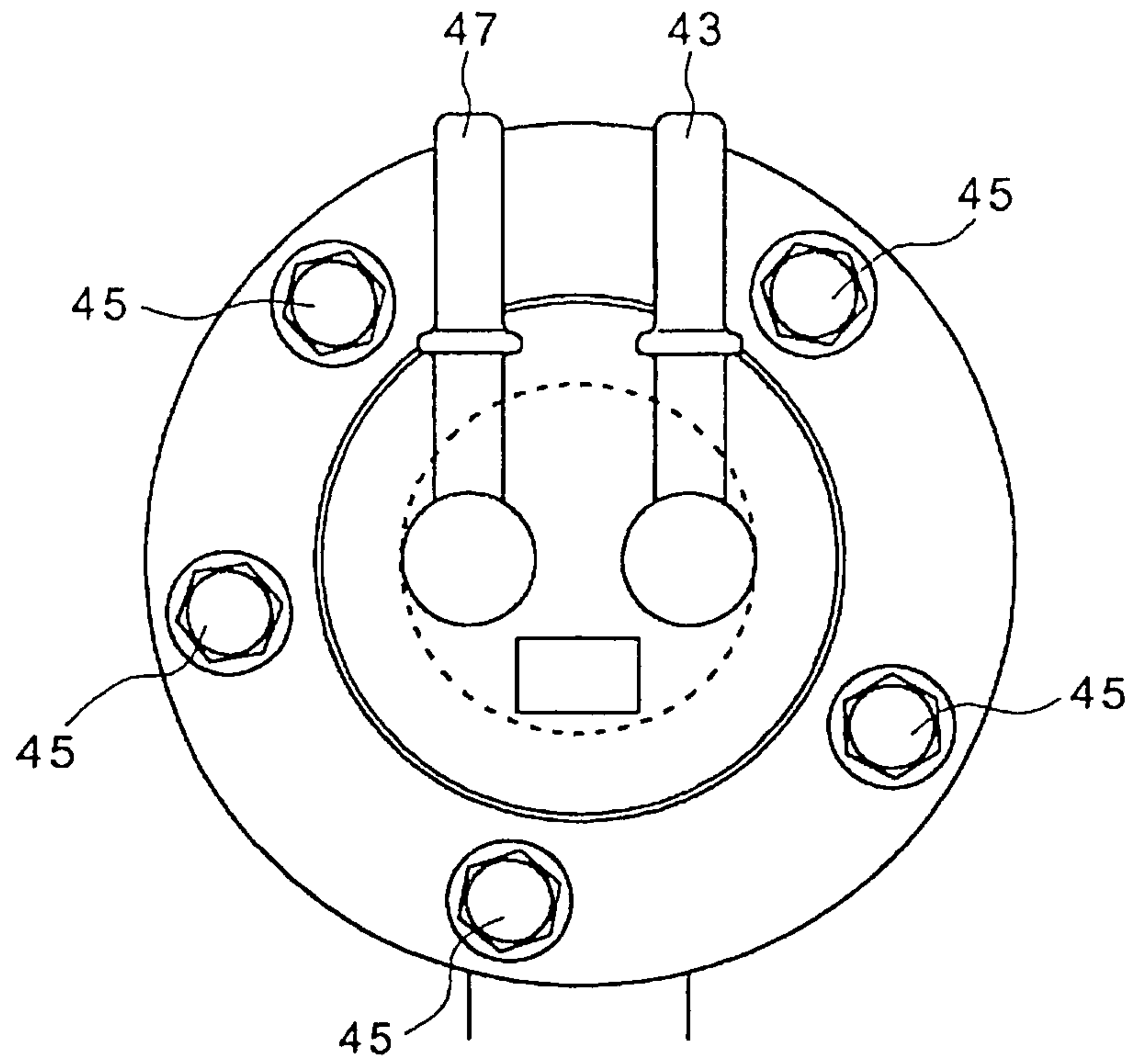
[Fig. 6]



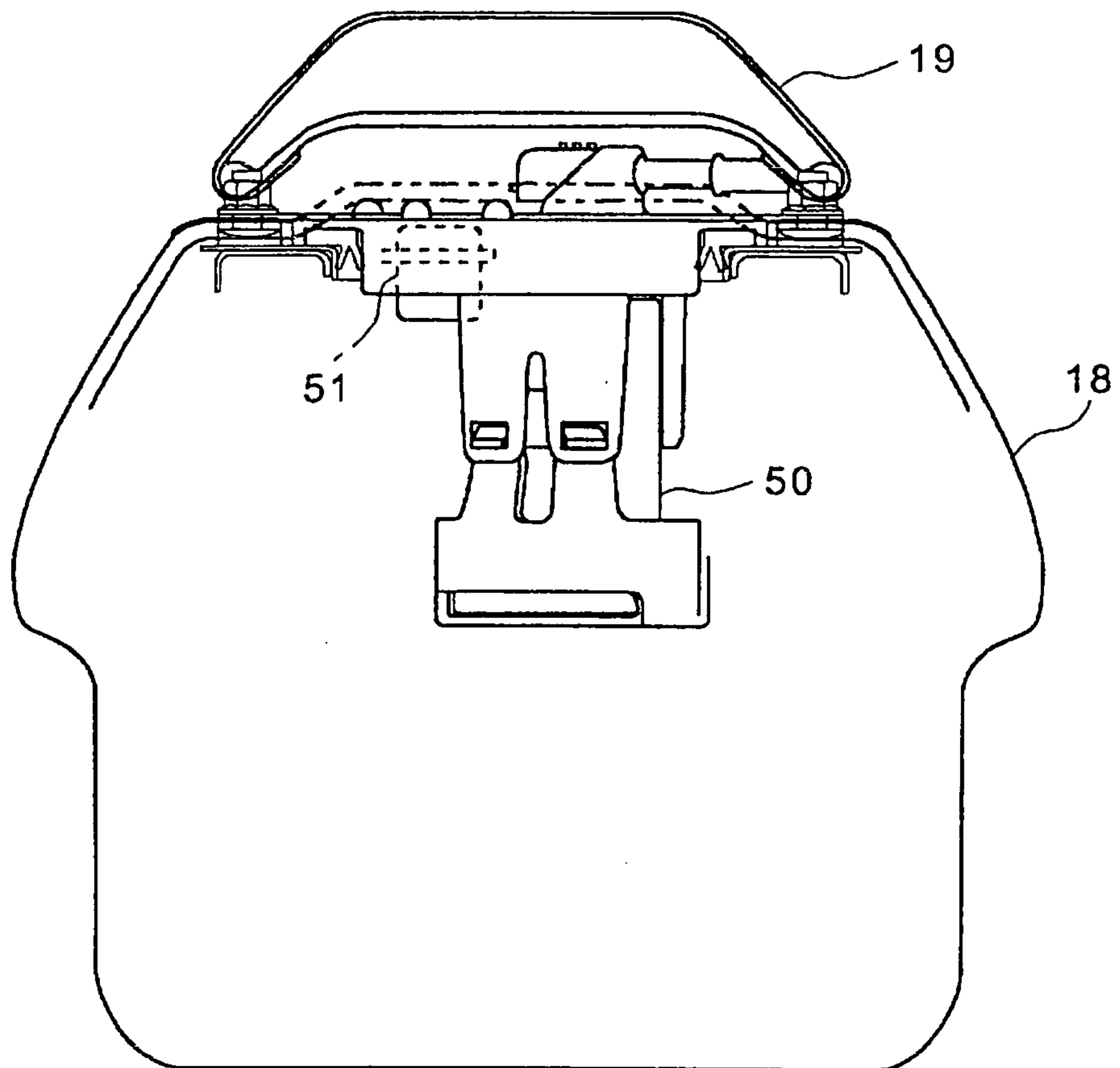
[Fig. 7]



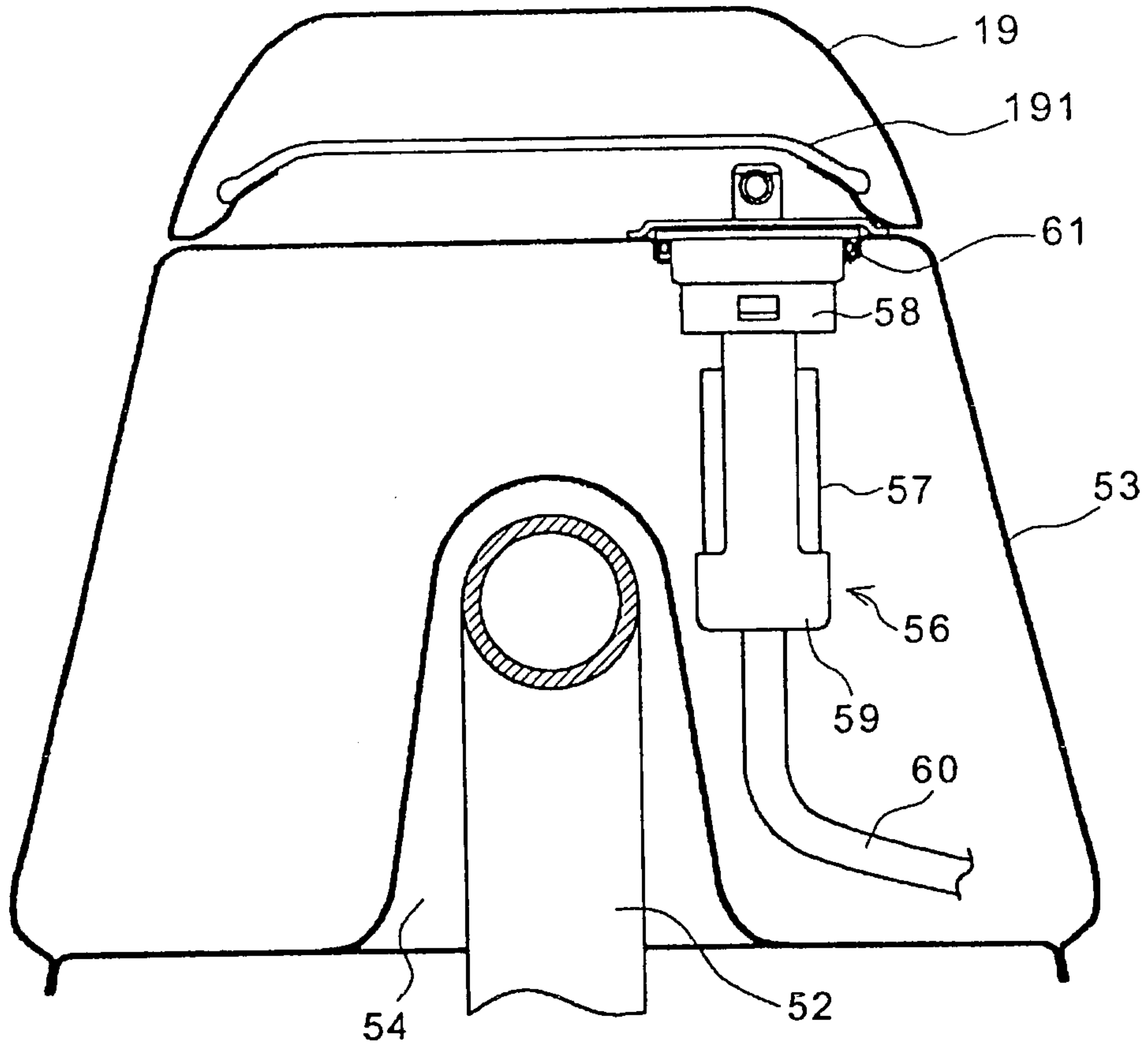
[Fig.8]



[Fig.9]



[Fig.10]



[Fig.11]

