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(54) Title: VALVES

(57) **Abstract:** A valve is provided for use in controlling the flow of liquid out of a container, the valve comprising a valve body (10) having an inlet (11) and an outlet (12) for liquid. The valve also has a valve seat (13), a valve member (14) movable in the downstream direction onto the valve (13) to close the valve, and an operating device (20) for the valve member (14), the operating device (20) being positioned downstream of the valve member (14) and the valve member (14) being guided for translational movement between open and closed positions. The translational movement of the valve member (14) has a number of advantages, including the fact that liquid flow is symmetrical all around the valve member which decreases pressure drop and accelerates the discharge of liquid from the container. Other advantages are described in the specification.



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VALVES

The invention relates to valves and particularly, though not exclusively, to valves for use in controlling the flow of liquid out of containers, for example
5 tanker vehicles.

The invention provides a valve for use in controlling the flow of liquid out of a container, the valve comprising a valve body having an inlet and an outlet for liquid, a valve seat, a valve member movable in the downstream direction onto
10 the valve seat to close the valve, and an operating device for the valve member positioned downstream of the valve member, the valve member being guided for translational movement between open and closed positions.

Such a valve has a number of advantages as described later in this
15 specification.

The valve member may comprise a head and a shank, the shank sliding in a guide member to define the translational movement.

20 The operating device preferably contacts the valve member to bring about movement of the valve member, without being connected to the valve member.

The operating device may comprise a pivotally mounted operating lever, part
25 of the operating lever being inserted into a space in the valve member.

The shank of the valve member may have a slot therein, an end of the operating lever being inserted into the slot.

30 There may be a spring arranged to urge the operating lever in a direction to close the valve, the spring being mounted in a housing separate from the valve body.

The spring may pull the valve member closed to ensure tightness.

A rotational shaft may extend from the operating lever to the spring.

5

A control member for applying force to open the valve may be mounted between the valve body and the spring housing.

The control member may comprise a control lever.

10

The invention includes a container for liquid fitted with a valve according to the invention.

The container may comprise a tanker vehicle.

15

By way of example, a specific embodiment of the invention will now be described, with reference to the accompanying drawings, in which:

Figure 1 is a side view of an embodiment of valve according to the invention, in the open position;

20

Figure 2 is a cross-sectional view on line A-A of Figure 1;

Figure 3 is a view on arrow B of Figure 1;

25

Figure 4 is a cross-sectional view showing how a valve member and operating member cooperate in the open position of the valve;

Figure 5 is a view similar to Figure 4 but showing the valve in its closed position;

30

Figure 6 is a view similar to Figure 4 but showing how the valve member may be removed;

Figure 7A shows the valve member in more detail; and

5

Figure 7B shows the cross-section of the shank of the valve member.

The valve shown in the figures is primarily intended to control the flow of liquid out of a container, for example a tanker vehicle. The valve comprises a valve
10 body 10 having an inlet flange 11 and an outlet flange 12. In use the flange 11 is sealingly bolted to the container to enable the valve to receive liquid from the container when the valve is open, and the flange 12 is connected to apparatus which is to receive liquid from the container in use, for example delivery pipework (not shown).

15

As best seen in Figures 4 and 5, the flange 11 defines a valve seat 13 and in the closed position of the valve, a valve member 14 seals against the valve seat 13. The valve member 14 is a poppet valve having a head 15 and a shank 16. The periphery of the head 15 is fitted with an O-ring seal 17.

20

As the head 15 is fitted on the inner side of the valve seat 13 with respect to the inside of the container, fluid pressure within the container tends to maintain the valve member in the closed position shown in Figure 5.

25

Where the shank 16 meets the head 15, there is a slot 18 through the head, best seen in Figure 6. In use the free end 19 of an S-shaped operating lever 20 passes through this slot to enable the lever 20 to control movement of the valve without actually being connected to the valve member.

30

The S-shaped lever 20 is pivotally mounted by connecting it to a shaft 21, best seen in Figure 2.

Although the arm 20 pivots, the valve member 14 has a translational movement. Movement of the valve member 14 is guided by a sleeve 22 which surrounds the shank 16. As best seen in Figure 3, the sleeve 22 is secured in position by an arm 23 which projects inwardly from a side of the valve body 10.

5 In an alternative construction there may be two arms projecting from opposite sides of the valve body 10.

Attached to the valve housing 10 is a spring chamber 24 which contains a spiral spring 25 (see Figure 2).

10

One end of the spring 25 is in a rotating housing which is locked in position by a pin 26a (see Figure 3) and the inner end of the spring 25 is connected to the outer end of the shaft 21. The spring is pre-wound during assembly of the valve so that the action of the spring biases the valve member 14 into the closed position.

15

To control the S-shaped operating lever 20, a curved lever 26 is attached to the shaft 21, between the valve body 10 and the spring chamber 24. Pivotaly mounted on the valve body at 27 (see Figure 1) there is a straight lever having a gripping end 28 and an operating head 29.

20

In order to move the valve member 14 from the closed position shown in Figure 5 to the open position shown in Figure 4, the gripping portion 28 is manually forced downwardly as viewed in Figure 1. This causes the head 29 to rise, and come into contact with the outer part of the lever 26. Continued upward movement of the head 29 causes the lever 26 to pivot anti-clockwise as viewed in Figure 1, lifting the valve head 15 off the valve seat.

25

Final upward movement of the head 29 causes the head to move past a cam like portion 30 of the lever 26 (see Figure 5). Thus, the head 29 finally moves into an over-centre position in which the lever 26 moves back slightly under the action of the spring 25, to lock the valve head 15 in the open position.

30

The geometry for the cam portion 30 of lever 26 is designed to apply little force to the lever 28 during the first degrees of rotation which provide the first millimetres of translational movement of the poppet valve 14. This means that
5 when an operator opens the valve under pressure, to decompress the tank, a minimum of force by the operator is required.

The valve can be closed again by moving the gripping portion 28 upwardly, with the help of the spring.

10

The invention provides a valve in which few of the operating parts come into contact with the liquid flowing out of the container. This can have advantages where the liquid may cause corrosion or fouling of the components.

15 The inner end of the shaft 21 is mounted in a blind socket 31 so that no liquid can seep past the shaft 21 at that end.

Within the passage containing the shaft 21 a seal 33 is provided to prevent liquid from seeping to atmosphere. A second barrier for sealing is assured by
20 packing 32, held in place by a gland screw 34.

The fact that the valve member 14 has a translational movement has a number of advantages.

25 Firstly, liquid flow is symmetrical all around the poppet which decreases pressure drop and accelerates the discharge of liquid from the container.

If, prior to opening of the valve, there is any congealed liquid tending to maintain the valve in the closed position, this congealed seal is broken in the
30 most efficient way, since the forces tending to move the poppet into the open position are perpendicular to the surrounding flange 11.

When the valve closes again, the poppet is automatically centred with respect to the valve seat 13.

Maintenance of the valve member 14 is particularly easy. This is because
5 there is no actual connection between the operating lever 20 and the valve member. To remove the valve member for cleaning or replacement of the seal 17, it is simply necessary to carry out further pivotal movement of the lever 20, as shown in Figure 6, until the free end of the lever 20 moves clear of the slot 18. The shank 16 can then be withdrawn from the guide sleeve 22. To get
10 this further pivotal movement, it is necessary to disconnect pin 26a to de-stress or unload the spring.

Re-assembling the valve is equally easy and there are no components such as connecting pins or other mechanical liaison which might be forgotten or mis-
15 assembled.

The spiral spring 25 does not need any special tool to pre-stress the spring.

In the case of a broken spring situation, it is possible to maintain sealing
20 assistance to the valve member 14 by applying a braking force to the shaft 21. This is done by screwing down the gland 34 with a wrench, thus compressing the packing 32. The packing expands laterally to grip the shaft 21 tightly. This frictional gripping of the shaft 21 by the packing 32 resists rotation of the shaft 21 and so helps to maintain the sealing position of the valve member 14.

25 Because there is no direct connection between the lever 20 and the valve member 14, a further advantage is that if the lever 20 should break, there is nothing to prevent closing translational movement of the valve so the valve is fail-safe in that it will always return to the closed position, under the influence
30 of pressure within the container, in the event of breakage.

Since the shank 16 of the valve is a simple X cross-section, as shown in Figure 7B, it is easy to clean.

Before the lever 20 can be moved into the extreme position shown in Figure 6,
5 to enable removal of the valve member 14, it may be necessary to remove the
pin 26a, and de-stress the spring 25. This has an added advantage. The
valve member 14 has to be removed manually. If the spring is still stressed
during the removal procedure, there is a risk that the valve member 14 may
snap back into the closed position, before it could be removed, under the
10 action of the spring, thus possibly trapping the fingers of the person trying to
remove the valve.

The reader's attention is directed to all papers and documents which are filed
concurrently with or previous to this specification in connection with this
15 application and which are open to public inspection with this specification, and
the contents of all such papers and documents are incorporated herein by
reference.

All of the features disclosed in this specification (including any accompanying
20 claims, abstract and drawings), and/or all of the steps of any method or
process so disclosed, may be combined in any combination, except
combinations where at least some of such features and/or steps are mutually
exclusive.

25 Each feature disclosed in this specification (including any accompanying
claims, abstract and drawings), may be replaced by alternative features
serving the same, equivalent or similar purpose, unless expressly stated
otherwise. Thus, unless expressly stated otherwise, each feature disclosed is
one example only of a generic series of equivalent or similar features.

30

The invention is not restricted to the details of the foregoing embodiment(s).
The invention extend to any novel one, or any novel combination, of the

features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

CLAIMS

1. A valve for use in controlling the flow of liquid out of a container, the valve comprising a valve body having an inlet and an outlet for liquid,
5 a valve seat, a valve member movable in the downstream direction onto the valve seat to close the valve, and an operating device for the valve member positioned downstream of the valve member, the valve member being guided for translational movement between open and closed positions.
10
2. A valve as claimed in Claim 1, comprising a head and a shank, the shank sliding in a guide member to define the translational movement.
3. A valve as claimed in Claim 1 or Claim 2, in which the operating
15 device contacts the valve member to bring about movement of the valve member, without being connected to the valve member.
4. A valve as claimed in Claim 3, in which the operating device
20 comprises a pivotally mounted operating lever, part of the operating lever being inserted into a space in the valve member.
5. A valve as claimed in Claim 4, in which the shank of the valve
25 member has a slot therein an end of the operating lever being inserted into the slot.
6. A valve as claimed in Claim 5, in which there is a spring arranged to
urge the operating lever in a direction to close the valve, the spring
being mounted in a housing separate from the valve body.
- 30 7. A valve as claimed in Claim 6, in which the spring pulls the valve member closed to ensure tightness.

8. A valve as claimed in Claim 7, in which a rotational shaft extends from the operating lever to the spring.
- 5 9. A valve as claimed in Claim 8, in which a control member for applying force to open the valve is mounted between the valve body and the spring housing.
- 10 10. A valve as claimed in Claim 9, in which the control member comprises a control lever.
- 11 11. A container for liquid, fitted with a valve as claimed in any one of the preceding claims.
- 12 12. A container as claimed in Claim 11, comprising a tanker vehicle.
- 15 13. A valve constructed and arranged substantially as herein described with reference to the accompanying drawings.

-1/3-

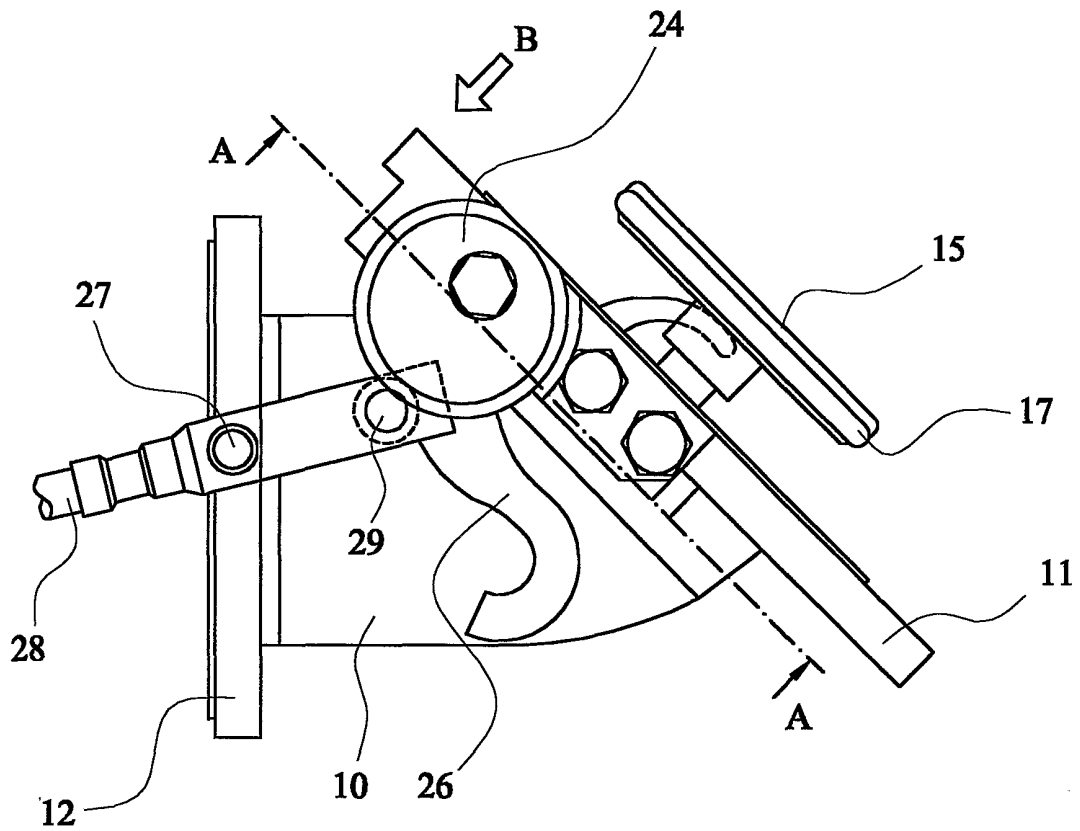


FIG. 1

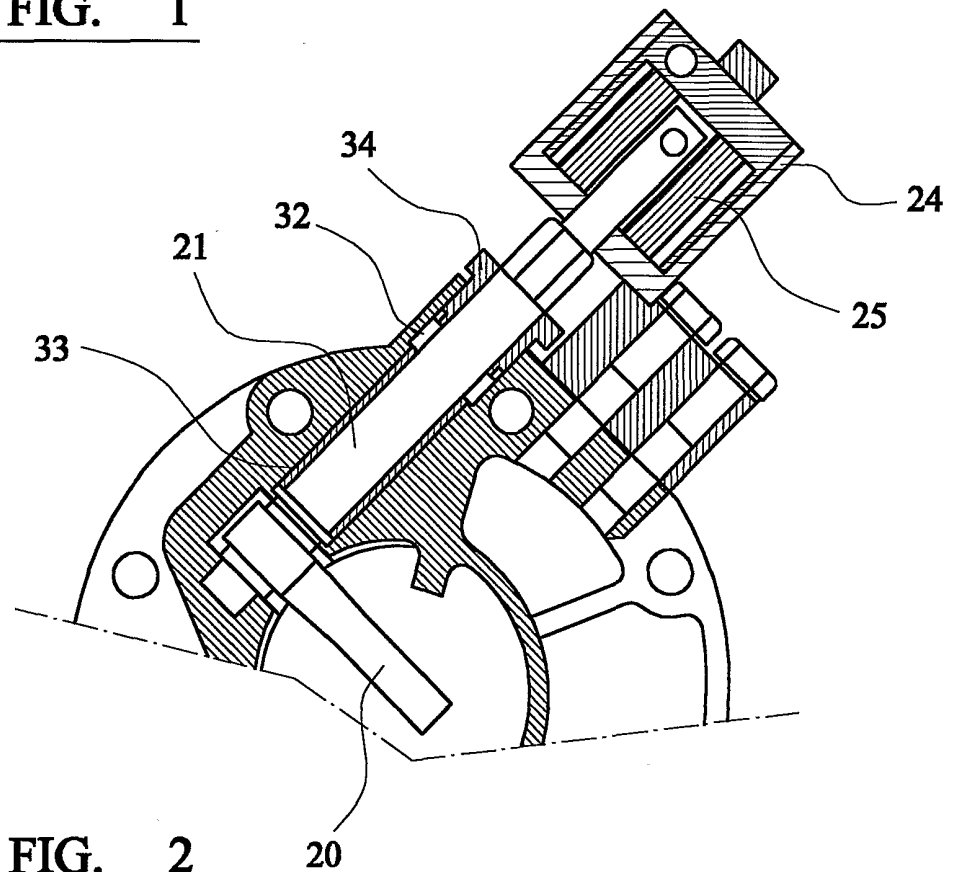
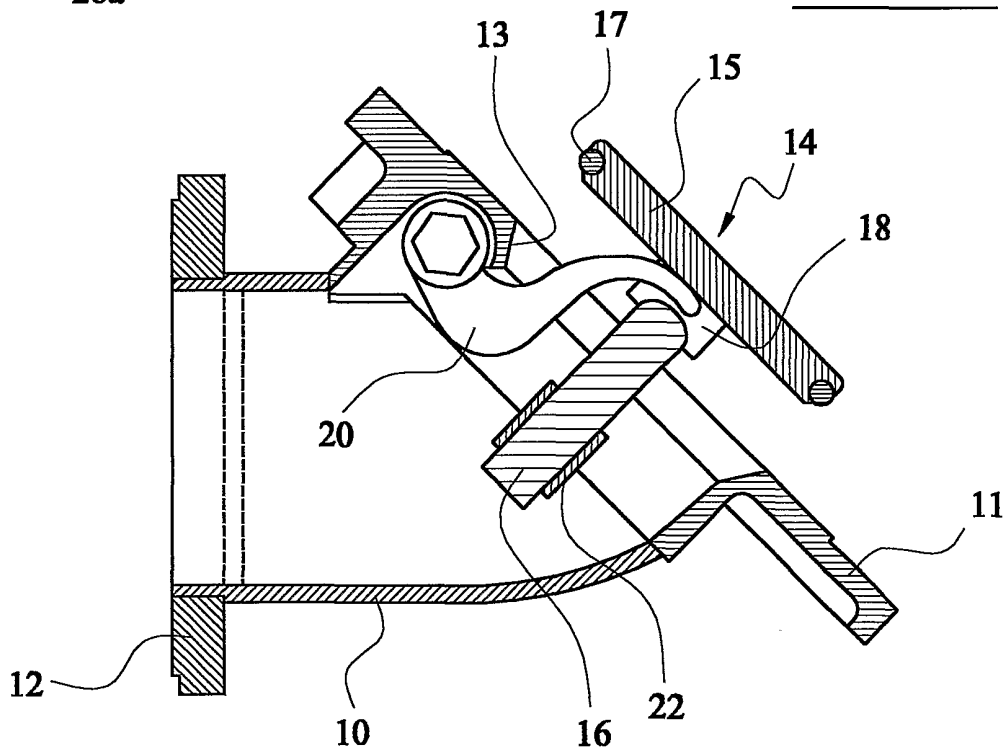
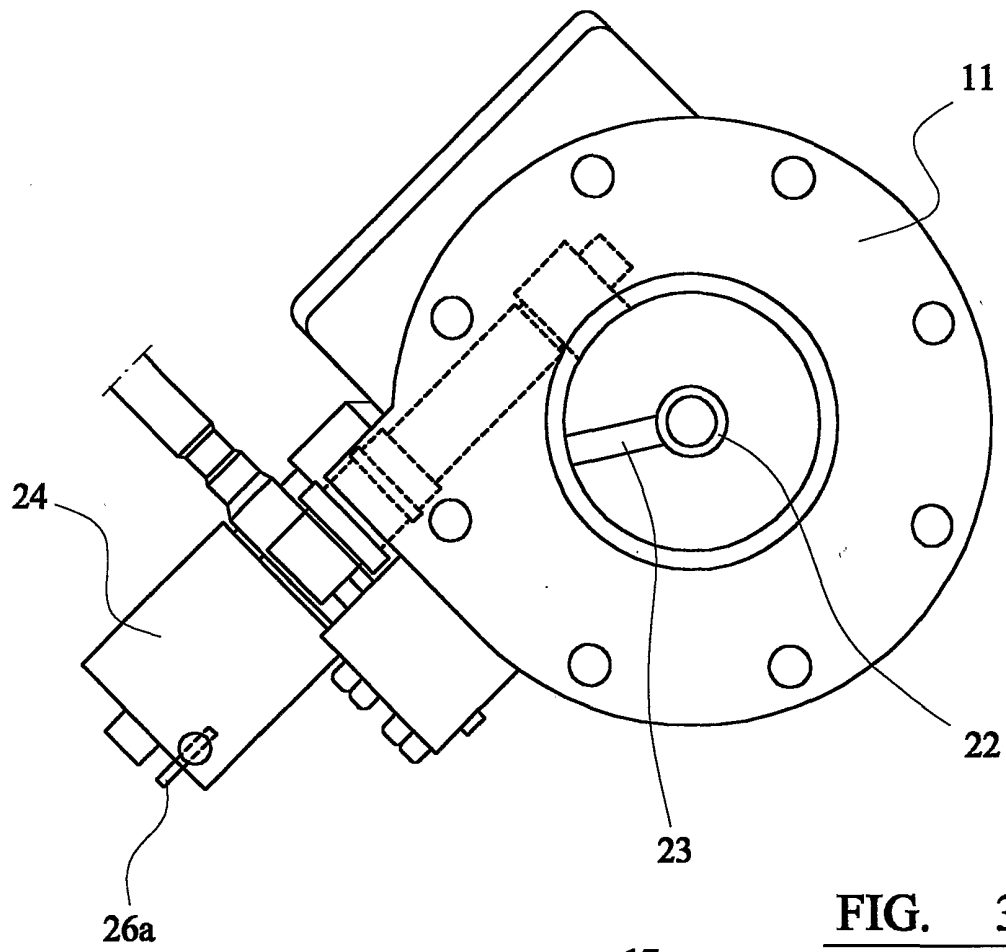


FIG. 2

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-3/3-

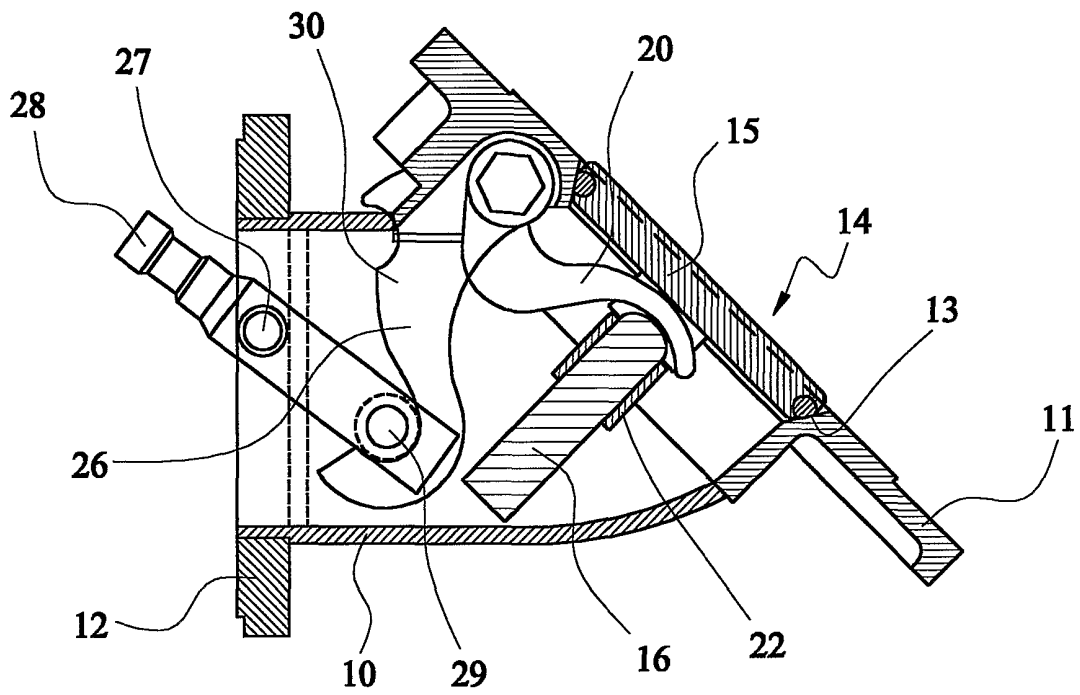


FIG. 5

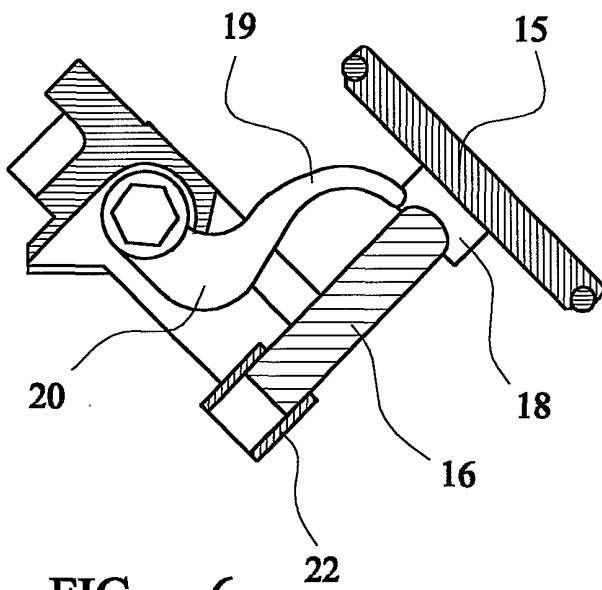


FIG. 6

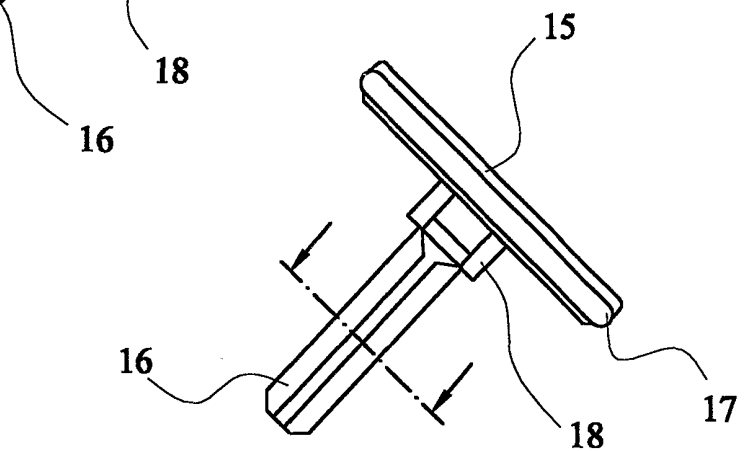


FIG. 7A

FIG. 7B