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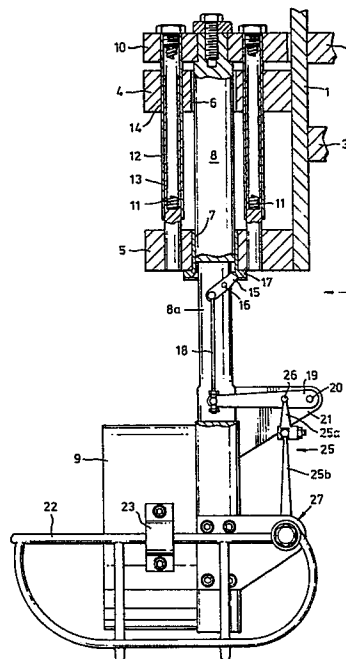
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54 **Propulsion unit protection system.**

57 A sensing cage (22) is located around the propeller of a pendently mountable propulsion unit (9), eg an out-board motor, and arranged so that a blow delivered to the cage from below or in any lateral direction frees a detent means (15) to release energy stored in springs (11) disposed so as to raise the propulsion unit with respect to a support frame (1). The springs are re-energised when the propulsion unit is pushed down again by manual pressure. No replacement of parts is needed before redeploying the unit.



- 1 -

Title: PROPULSION UNIT PROTECTION SYSTEM

This invention relates to a protection system for a propulsion unit which is pendently attachable to a boat or a pontoon, an outboard motor for example.

Protection systems are known which rely upon mounting the
 5 propulsion unit on a horizontal pivot and providing a shear pin to hold the unit in a vertical position. If the unit is struck from the front by an underwater obstruction the pin shears and the unit pivots upwards to clear the obstruction. This system suffers from the disadvantage that the shear pin has to be
 10 replaced before the unit can be deployed. Furthermore the system only protects against blows from the front, no protection being provided against blows in an upwards or sideways direction, such as may occur when a pontoon, for example, is swept sideways by a current or is loaded rapidly in shallow water and its
 15 draught changes in a few seconds crushing the propulsion unit against the bottom.

Other protection systems are known in which the propulsion unit is raised and lowered by means of a pantographic framework but the protection afforded is again limited to blows received
 20 from a substantially forward direction.

The present invention seeks to provide a readily re-deployable system which will protect against blows received in forward, reverse, sideways and upwards directions.

In accordance with the present invention, a propulsion unit
5 protection system includes: a support frame from which a
propulsion unit is slideably protrusible by an externally applied
force; retraction means energisable by protrusion of the
propulsion unit; detent means for maintaining the propulsion unit
in a protruded state against the pressure exerted by the energised
10 retraction means; a sensing cage disposed about the propulsion
unit and resiliently attached thereto; and a release means coupled
between the sensing cage and the detent means so as to release
the detent means when the disposition of the sensing cage relative
to the propulsion unit is disturbed.

15 The release means may be mechanical, hydraulic or pneumatic.
One convenient mechanical arrangement comprises a contractible
release arm which may consist of two articulated rigid members or
alternatively a single flexible member, coupled at one end to the
sensing cage via a ball joint and at the other to the detent means
20 via a deflection amplifying lever. An impact against the cage
in any direction other than outwardly from the support frame will
cause increased cranking or bending of the release arm and hence
contraction of the overall length of the arm so as to deflect the
amplifying lever thereby to release the detent means.

25 An alternative pneumatic arrangement may comprise one or
more pneumatic chambers compressible between the sensing cage and
the propulsion unit, which chambers are pneumatically coupled

with a cylinder and piston arrangement operative upon the detent means so as to release the detent means when any one of the chambers is compressed. Alternatively, the pneumatic chambers may be replaced by piston and cylinder assemblies hydraulically coupled with
5 the release means.

The retraction means may conveniently comprise one or more helical compression springs axially disposed in the direction of sliding and compressible between the propulsion unit and the support frame when the propulsion unit is protruded. Alternatively
10 pneumatic or hydraulic compression springs may be similarly employed or tension springs may be attached between the unit and the frame so as to be extended when the unit is protruded.

An embodiment of the invention will now be described by way of example only with reference to the attached drawings of which
15 Figures 1 and 2 are part-sectioned side elevations of a propulsion unit protection system having a mechanical detent release means, and drawn respectively with the propulsion unit retracted and protruded, Figure 3 is an end elevation of the same system viewed in the direction A of Figure 2, and
20 Figures 4 and 5 are part views of alternative pneumatic and hydraulic detent release means respectively.

The system illustrated in Figs. 1 and 2 comprises a support frame 1 which is attachable to a vessel to be propelled via members 2 and 3 having any convenient attachment means (not shown). The frame has
25 an upper platform 4 and a lower platform 5 respectively having coaxial bores 6 and 7 within which a cylindrical post 8 is slideable. The post 8 supports at its lower end a propulsion unit 9 and is suspended from a bearer plate 10, within which bearer plate it is captively rotatable about its own axis.

- 4 -

Two helical compression springs 11 disposed so as to be compressible between the bearer plate 10 and the lower platform 5, are each housed within outer and inner telescopic sleeves 12 and 13, the outer sleeve 12 being attached to the bearer plate 10 and slideable within a bore 14 in the upper platform 4 and the inner sleeve 13 being attached to the lower platform 5.

The propulsion unit 9 can be manually protruded in a downwards direction from the frame 1 by pressing the bearer plate 10 towards the upper platform 4. A detent means is provided for holding the propulsion unit in the protruded position which comprises a spring biassed catch 15 rotatably attached to the post 8, within a bifurcated portion 8a thereof, at a transverse pivot 16.

The catch deflects upwardly to pass through the bore 7 when the post 8 is depressed, thereafter to snap into engagement with a lock ring 17 mounted at the lower end of the bore 7. A pull rod 18 rotatably attached to the catch 15 is articulated to a deflection amplifying lever 19 which is rotatable about a pivot 20 laterally disposed between a pair of cheek plates 21 attached to the post 8.

A sensing cage 22 shaped to protect the propulsion unit 9 against upward, sideways, forward and rearward blows, is attached to the unit at clamps 23 via resilient bondings 24 (Figure 3) which bondings ensure relative re-centralisation of the cage and the unit after receipt of a blow.

The sensing cage 22 and the lever 19 are coupled together by a jointed detent release arm 25 consisting of two pivotally interconnected members 25 a and 25 b, member 25 a being attached

- 5 -

to the lever 19 at a pivot 26 and member 25 b being connected to the cage 22 via a ball joint 27 (Figure 3). Any upwardly or laterally acting blow upon the cage will cause the jointed arm 25 to momentarily flex thus shortening its overall length and so rotating the lever 19 anti-clockwise (as drawn). This in turn pulls the pull rod 18 downwards to release the catch 15 from the lock ring 17 thereby releasing the energy stored in the springs 11 to rapidly raise the propulsion unit.

The length and weight of the springs are selected to raise the propulsion unit in approximately 0.1 seconds, the estimated time for preventing damage to the unit when travelling at speeds of up to 7 knots.

An alternative pneumatic detent release means is illustrated in Figure 4 which comprises a plurality of compressible chambers 29 evenly disposed interjacent the propulsion unit 9 and a sensing cage 30 so as to be compressed between them when the cage is struck, at least one being compressed whatever the direction of the blow. The chambers are pneumatically coupled in series connection via a tube 31 to an inlet port 32 of a cylinder block 33 attached to the lower platform 5.

The cylinder block 33 contains a piston 34 bearing a detent stub 35 which engages with a recess 36 in the post 8, the stub being biased into engagement with the recess by a spring 37.

In operation, any impact to the cage 30 causes at least one of the chambers 29 to be compressed, thus transmitting a pressure pulse via the tube 31 which overrides the pressure of the spring 37 to disengage the detent stub 35 from the recess 36.

- 6 -

An alternative, hydraulically operated detent release means is illustrated in Figure 5 in which the compressible chambers 29 of Figure 4 are replaced by piston and cylinder assemblies 40 hydraulically coupled via the tube 31 to the detent release means.

5 A particular advantage of the invention is that the propulsion unit can be speedily reset to the protruded position once an obstruction has been cleared, by simple manual pressure upon the bearer plate, no replacement of components being necessary.

10 The specific propulsion unit illustrated has a hydraulic drive (not shown) but the invention is of course equally applicable to conventional propulsion units having mechanical drive.

CLAIMS

1. A propulsion unit protection system including a support frame (1) from which a propulsion unit is slideably protrusible by an externally applied force, characterised by having retraction means (11) energisable by protrusion of the propulsion unit; detent means (15) for maintaining the propulsion unit in a protruded state against the pressure exerted by the energised retraction means; a sensing cage (22) disposed about the propulsion unit and resiliently attached thereto; and a release means (25) coupled between the sensing cage and the detent means so as to release the detent means when the disposition of the sensing cage relative to the propulsion unit is disturbed.
2. A system as claimed in Claim 1 characterised in that the retraction means comprises at least one compression spring (11) or tension spring axially disposed in the direction of sliding and respectively compressible or extendable between the propulsion unit and the support frame when the propulsion unit is protruded.
3. A system as claimed in either one of the preceding claims characterised in that the release means comprises a contractible release arm (25) coupled at one end to the sensing cage via a ball joint (27) and at the other to the detent means via a deflection amplifying lever (19).
4. A system as claimed in Claim 3 characterised in that the contractible release arm consists of two articulated rigid members.
5. A system as claimed in Claim 3 characterised in that the contractible release arm consists of a single flexible member.

6. A system as claimed in any one of the preceding claims characterised in that the detent means comprises a spring biased catch (15) pivotally engageable between the propulsion unit and the support frame.

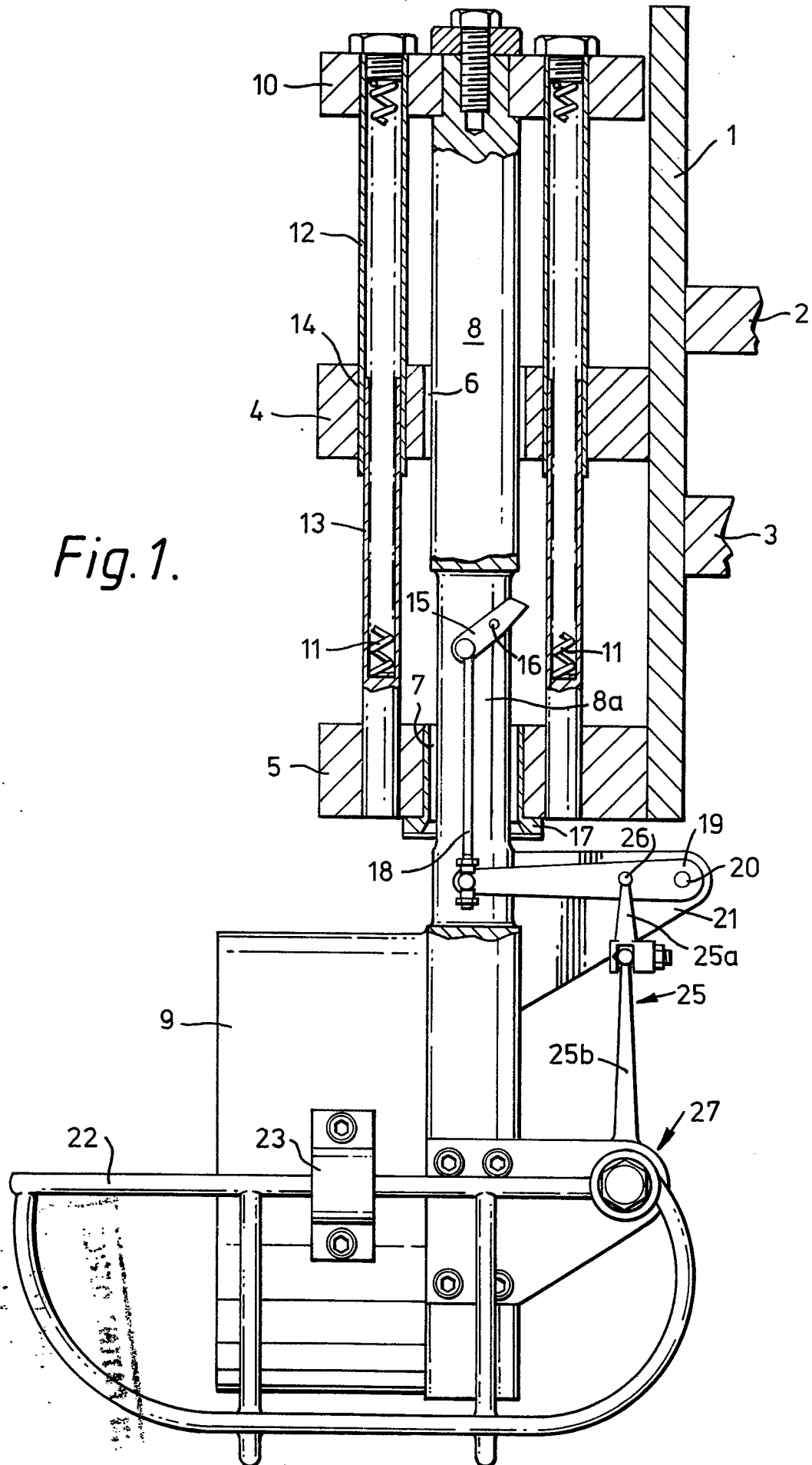
7. A system as claimed in either one of Claims 1 and 2 characterised in that the release means comprises at least one pneumatic chamber (29) compressible between the sensing cage and the propulsion unit, and pneumatically coupled with the detent means.

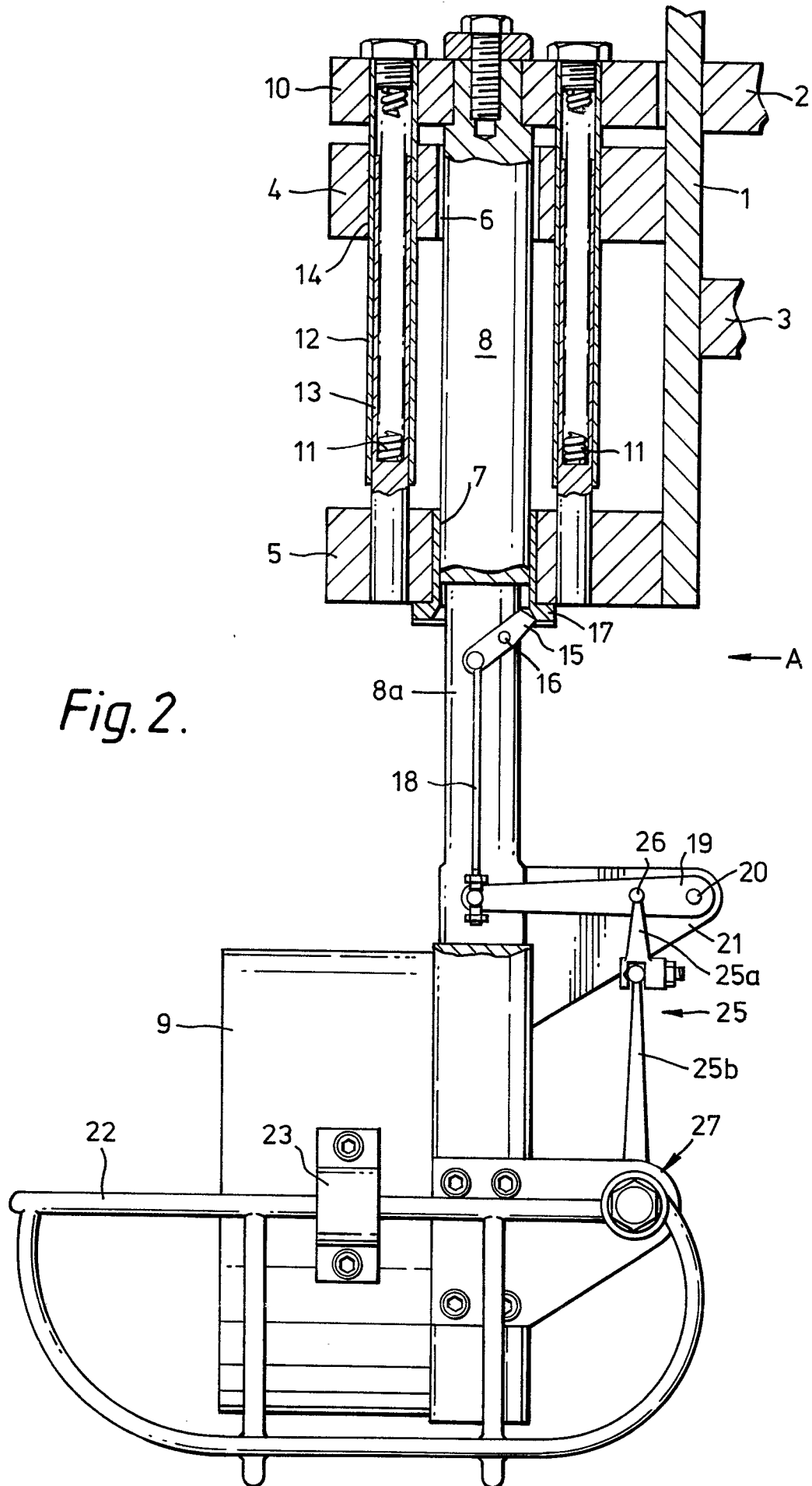
8. A system as claimed in either one of Claims 1 and 2 characterised in that the release means comprises at least one piston and cylinder arrangement (40) compressible between the sensing cage and the propulsion unit, and hydraulically coupled with the detent means.

9. A system as claimed in either one of Claims 7 and 8 wherein the detent means comprises a piston and cylinder arrangement (33, 34) engageable between the propulsion unit and the support frame.

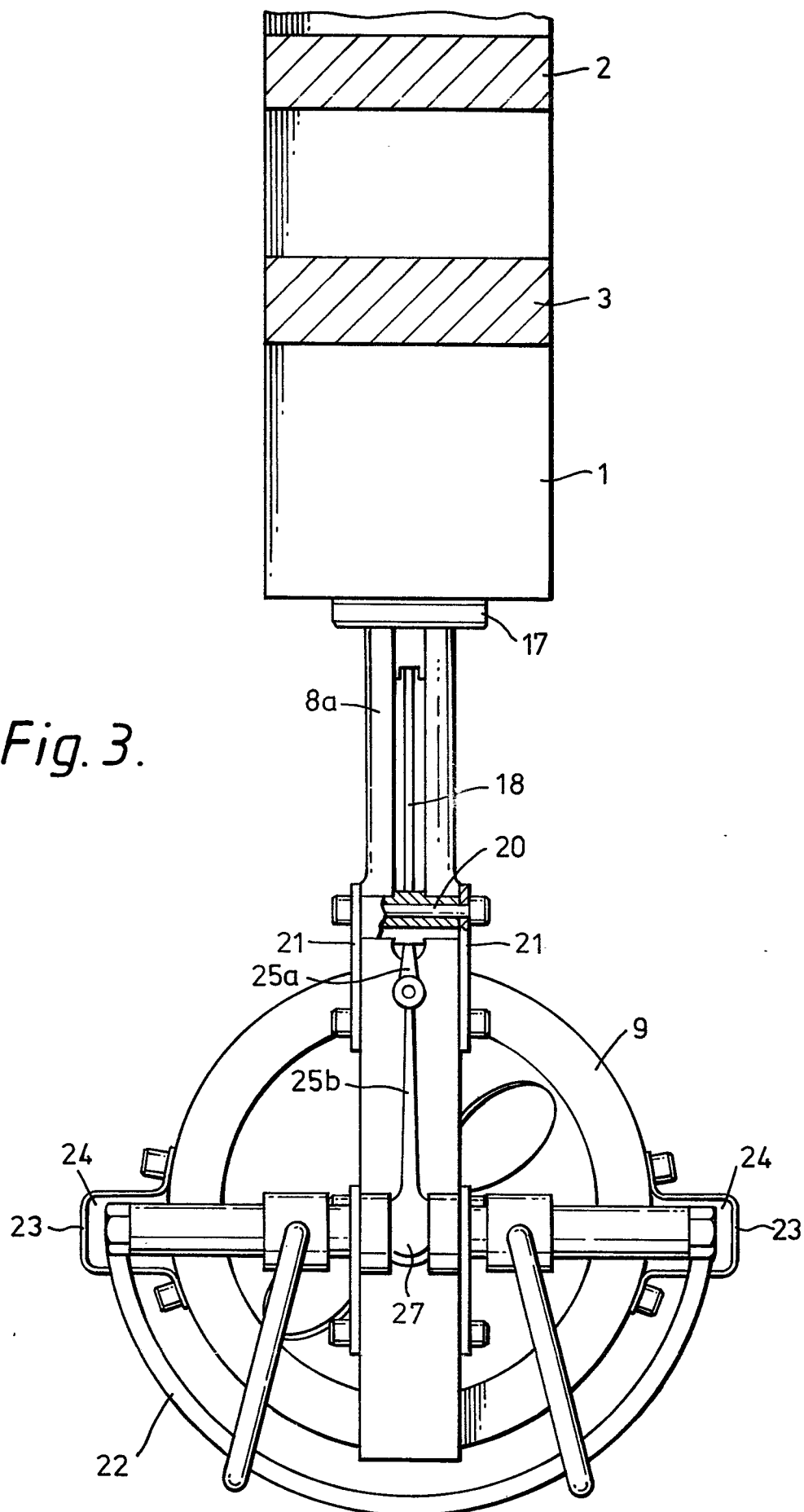
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Fig. 1.

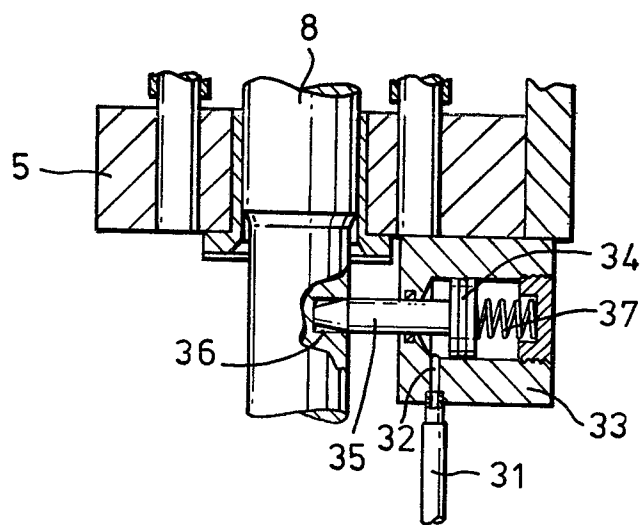
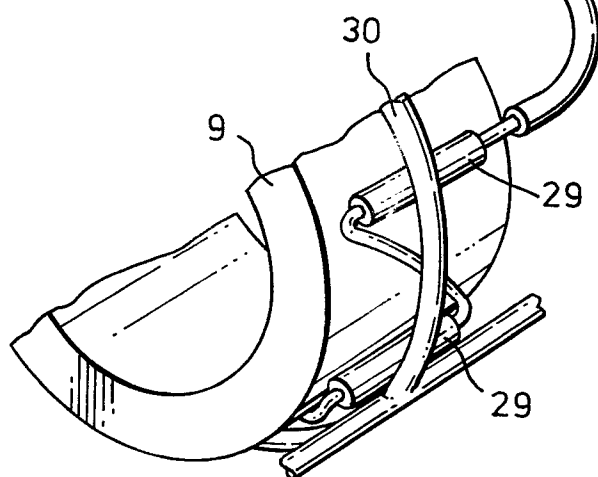




3/4



4/4

*Fig. 4.**Fig. 5.*