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(54) Universal boat lift

(57) A universal lift for boats (2) comprises: some saddles (3) for supporting the keel; two pontoons (4), provided with pneumatic chambers (5), sustaining the saddles (3), oriented transversely; valve means and pressurisation means, associated to the pneumatic chambers (5), to operate in mutual co-ordination and allow the pontoons (4) to sink into and emerge from the water. The saddles (3) are provided with a deep concave central part (6), open upwards, adapted indifferently to receive keels (7) of overlying powerboats or sailboats (2). The lifting device (1) comprises supports (8;12;30) which are movable relative to the saddle (3), opportunely arranged relative to the central part (6); and adjustment means (13,14,15;16,18;31) for adjusting the configuration of the movable supports (8;12;30), according to the actual geometric profile (9) of the keel of the boat (2) positioned over the saddles (3).

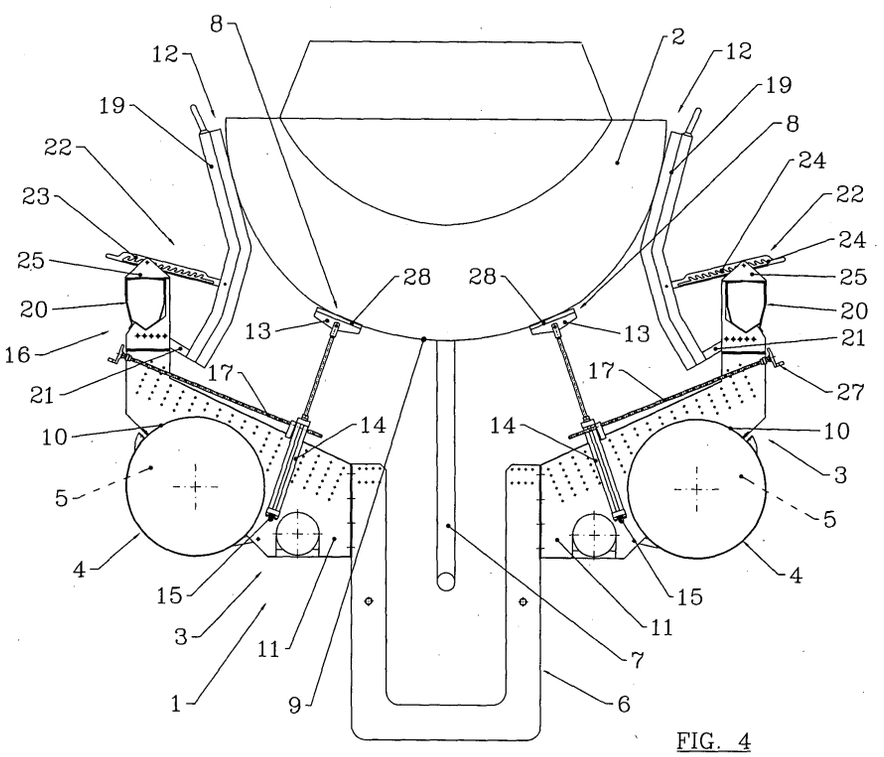

FIG. 4

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Description

[0001] The present invention relates to boat lifting technologies for the execution of hoisting operations and in particular it concerns a universal lift able to lift indifferently both power boats and sailboats with fixed keel, with or without counterweights and other similar accessories.

[0002] For the operations of hoisting power boats, known lifts are provided with supports for sustaining the keel, mounted fixedly on a structure positioned above a pair of parallel pontoons. The latter internally bear pneumatic chambers provided with valve means adapted to allow or to inhibit the fluid exchange of air and water with the exterior of the pontoons. The exchange is brought about by the operation o pressurisation means which, associated to the pneumatic chambers and operating in co-ordination with the valve means, enable to flood the chambers and consequently to sink the pontoons thereby allowing to position the boat above the supports; and they subsequently enable to eject water from the chamber to cause the emergence of the pontoons and the consequent lifting of the boat relative to the free surface of the water. Once the hoisting operations are completed, the execution of the sequence with reversed order of the steps then allows to place the boat back in the water, ready for navigation. A description of a lift of the type recalled above is provided for instance in the document US 5002000.

[0003] To lift sailboats, provided with fixed keel having considerable dimensional development, the document US 4391550 discloses a lift which provides for supporting the boat in three areas ofits cross sections identifiable: one, in correspondence with the end of the keel; the other two, in correspondence with the lateral gunwales of the hull, i.e. in proximity with the two edge areas in which the hull joins the deck of the boat, obviously when said deck is present. The support system is obtained by means of a complex structure with mutually articulated elements, constituted by two long arms for the lateral abutment of the gunwales and by a horizontal cross member whereto the arms are connected and whereon the keel of the boat comes to bear. Said arms are adjustable, as a function of the dimensions of the boat received above the lift, by means of a complex c able s ystem w hich allows t o vary the distance between the arms adapting it to the width of the boat interposed on each occasion.

[0004] The solution described in the first of the aforementioned documents is constructively simple and convenient to use. However, it has fixed hull supports and a structure for sustaining said supports that is mainly suitable to sustain boats provided with keels having low vertical projection, as is the case for most power boards, or for sailboats having a movable, vertically retractable keel. It is not, however, compatible with boats provided with fixed keel which may be fitted with counterweights, as instead is the case in numerous types of sailboats. The boat lift described in the second document mentioned above is instead particularly suitable for hoisting fixed keel sailboats, but on the other hand it is highly complex and its structure is highly bulky.

[0005] A primary object of the present invention is to overcome the drawbacks of known solutions by means of a universal boat lift, i.e. a boat lift that is able indifferently to allow hoisting boats with or without keel which may also be very prominent from the hull and which is able to receive boats having the most widely different hull profiles, obviously within the dimensional limits of the boat lift.

[0006] A second object of the invention is to have a boat lift in which the bearing reactions exerted by the supports against the hull of the boat are rigorously controlled and have nearly uniform local intensities in all points of the hull during the lifting and the lowering of the boat relative to the free surface of the water, and this regardless of the shape and dimensions of the hull and of the weight of the boat to be hoisted.

[0007] Another object of the invention is to have bearings that are capable of being configured very rapidly and very simply, according to overall arrangements that can be varied every time it is necessary to use the boat lift to service a different type of boat and a different hull profile.

[0008] A further object of the invention is to provide a boat lift which is fitted with shoulders for the lateral abutment of the hull profile, able to allow the rapid activation and deactivation and also have simple and reliable structure, suitable to allow even a very high number of uses, without manifesting any sort of problems.

[0009] Yet another object of the invention is to provide a boat lift having a simple and small overall structure, which can easily and repeatedly be used remaining constantly moored in the boat slip reserved for a certain boat also to allow the lifting and dry-docking of the boat itself after each utilisation thereof: this being particularly advantageous to eliminate the danger that seaweed and/or fouling concretions may accumulate on the hull and/or to reduce the frequency of execution of the costly antifouling treatments normally required by boats moored within harbours.

[0010] In accordance with the invention said objects are achieved by a universal boat lift comprising: at least a hull support saddle; a pair of pontoons, sustaining in mutual combination said one or each saddle, oriented transversely, and internally provided with pneumatic chambers; valve means and pressurisation means associated with the pneumatic chambers and able to operate in mutual co-ordination to allow said pontoons to sink into, and emerge from the water: the boat lift being characterised in that said one or each saddle is provided with a central part having deep concave shape, open upwards, adapted to house, between said pontoons, indifferently keels of overlying powerboats or sailboats; said boat lift comprising at least a pair of supports, movable relative to the saddle, appropriately positioned rel-

ative to its central part; and adjustment means to adjust the configuration of said movable supports according to the actual geometric hull profile of the boat positioned over said one or each saddle.

[0011] The technical characteristics of the invention, according to the aforesaid objects, can clearly be noted from the content of the claims set out below and its advantages shall become more readily apparent in the detailed description that follows, made with reference to the accompanying drawings, which represent an embodiment provided purely by way of non limiting example, in which:

- Figure 1 is a front global elevation view of the boat lift according to the invention;
- Figure 2 is a global lateral view of the boat lift of Figure 1;
- Figures 3 and 4 are front views of the boat lift, illustrating t he steps according to which the loading and subsequent lifting of a boat is conducted;
- Figure 5 is a lateral view of the boat lift with a related boat supported above it;
- Figure 6 is a front view of the boat lift constructed in accordance with a second, alternative, embodiment.

[0012] With reference to Figures 1 and 2 of the accompanying drawings, the number 1 globally designates a boat lift advantageously usable to lift boats during hoisting operations for the inspection and maintenance of submerged parts and, or also, for the simple lifting meant to raise the hull out of the water, to minimise the permanence of the boat in water, whereon depends the formation on the hull of fouling and vegetation which notoriously reduce boat speed when underway.

[0013] The boat lift 1 essentially comprises: hull support saddles, globally designated as 3 and pontoons globally designated as 4. The saddles 3, preferably in the number of three, are oriented transversely to the pontoons 4 and distributed regularly over the entire length thereof.

[0014] The saddles substantially have the overall shape of a planar plate, constituted by three mutually interconnected parts of stainless steel.

[0015] A central part 6 has a shape that is concave; U-profiled; deep, open upwards. The U-profiled concavity is dimensioned in such a way as to be able to receive between the pontoons 4 keels 7 of various lengths, indifferently belonging to powerboats or sailboats 2 with fixed keel: this feature providing for wide versatility of use, i.e. a so-called universality of the boat lift 1 described herein. The two lateral parts 11 have planar development with polygonal contour and have curvilinear edges 10 profiled to complement the lateral contour surface of the pontoons 4; thereby externally encompassing a peripheral arc thereof, along which saddles 3 and pontoons 4 are mutually welded.

[0016] The central part 6 is removably fastened to the lateral parts 11 of the saddle 3 by means of mutually opposite and complementary planar bolted flanges 26. The flanges 26 thus allow to render the central part 6 removable and replaceable with greater or lesser depth in order to enlarge or reduce the field of dimensions of the keels 7 receivable on the saddle 3 both in terms of the actual application requirements and in terms of the water depth actually available in the harbour where the boat lift 1 is used.

[0017] The arrangement of the pontoons 4 is wholly conventional. They are constituted by cylindrical bodies, preferably made of fibreglass-reinforced plastic, entirely hollow and provided with pneumatic chambers 5. The pontoons 4 are also fitted with valve means (not shown herein as they are wholly conventional) which can be associated to the pneumatic chambers 5, to allow or inhibit their exchange of air and water with the exterior.

Pressurisation means, also not shown because they are wholly conventional, are associated to the pneumatic chambers 5 and interact in operative co-ordination with the valve means in such a way as to allow - as the case may be - the pontoons 4 and the saddles 3 associated therewith to sink into the water and emerge therefrom.

[0018] To each of the lateral parts 11 of the saddles 3, i.e. positioned bilaterally to the central part 6 of each saddle 3, are associated movable bearings 8, which can be adjusted according to the actual geometric hull profile 9 of the boat 2 which is positioned above the saddles 3.

[0019] Said bearings 8 in particular comprise respective supports 13 oscillating in rotary fashion, borne by struts 14 oriented upwards ad projecting from the saddle 3 in overhang towards the hull. The supports 13 include bearing bodies which are capable of swivelling about pivots 28 with horizontal axis, freely or with their mobility slightly checked by a suitable friction means.

[0020] The struts 14 are fastened to the saddle 3 in such a way as to be able to oscillating in rotary fashion about an axis of rotation 15 that is transverse to the plane of lay of the saddle 3 itself, passing through a pivot located in correspondence with the end of the struts 14 that is opposite the one bearing the supports 13.

[0021] Adjustable locking means - globally designated as 16 - are provided to vary in adjustable fashion the overall angular excursion of the struts 14 about said axis of rotation 15, according to the geometry of the various hull profiles of the boats 2 which can be associated to the saddles 3 when the boat lift 1 is in use.

[0022] Said locking means, in accordance with a preferred embodiment, comprise a lead screw 17 laterally associated to the struts 14 by means of a helical coupling with a lead nut integrally borne by the struts 14 themselves. A crank 27 for operating the lead screw 17 enables to make the struts 14 rotate about the axis of rotation 15 with angular excursion amplitudes which can be modulated according to the positioning requirements of the bearings 8.

[0023] Comparing Figures 3 and 4, one can observe

that the struts 14 in addition to being free to rotate about the axis of rotation 15, are also capable of being lengthened and shortened longitudinally at a direction substantially radial to the transverse profile 9 of the hull. This allows to lift the boat 2 over the saddles 3 and the pontoons 4, as is convenient to cause the emergence of the hull itself, to facilitate its inspection, maintenance and exposure to air.

[0024] For the aforementioned purposes, the struts 14 are preferably constructed in such a way as to include linear fluid actuators, with controlled operation, connected to a hydraulic fluid unit.

[0025] Such an actuation means allows to regulate thrust on the various points of the hull in optimal and uniform fashion; and this obviously regardless of the geometric profile of the hull; the type, the size and the weight of the lifted boat 2.

[0026] Means 18 for detecting isobaric pressure mounted on the linear actuators allow to verify that such conditions of uniform application of the loads are actually achieved.

[0027] Figures 1 through 4 also show that the boat lift 1 is further provided with a second pair of bearings 12 which includes movable shoulders 19, able to abut against the opposite bulwarks of the boat 2 positioned above the saddles 3. The shoulders 19 are fastened to a fixed structure 20 by means of an articulation 21 and selectively adjustable fastening means, globally designated by the number 22.

[0028] The fastening means 22 are able to allow the rapid locking and unlocking of the shoulders 19 and for this purpose they are devised in such a way as to comprise elements 24 provided with toothed meshing surfaces 23, complementary and facing each other, which can be rapidly fastened and unfastened to each other. A walkway 25 hinged to the fixed structure 20 allows to move with ease along the structure of the boat lift 1 to perform all desired operations.

[0029] In use, the operations of hoisting, launching and lifting the boat are extremely simple. The operative steps can be summarised as follows:

- in the first place, the inclination of the lifting struts 14 is adjusted according to the shape of the hull profile of the boat 2;
- the boat lift 1 is then completely immersed by flooding the pneumatic chambers 5 and evacuating the air contained therein;
- the boat 2 is then inserted into the space defined by the set of saddles 3 of the boat lift 1 immersed to the surface of the water;
- at this point, the isobaric extension of the oleodynamic actuators 14, which embody the struts, is performed, monitoring operations by means of the related pressure measuring devices 18;
- the boat lift 1 is then made to re-emerge together with the boat 2 by operating the pneumatic pump which send air into the chambers 5 of the pontoons 4; this operation is performed taking care to keep the assembly comprising the boat lift 1 and the boat 2 appropriately balanced;
- the shoulders 12 at this point are fastened onto the bulwarks of the boat and automatically locked in their working position.

[0030] Once these operations are completed, it is possible to perform all ordinary and extraordinary maintenance operations on the boat.

[0031] The boat lift 1 described above fully achieves the objects set out above, being able to lift any type of boat, be it a sailboat, a powerboat, a boat with surface transmissions, stem feet, axis lines, bulb, fixed keel - within the dimensional limits of the central U-shaped part - and with any kind of hull.

[0032] The invention thus conceived is clearly suitable for industrial application; moreover, it can be subjected to numerous modifications and variations without thereby departing from the scope of the inventive concept. All details can lastly be replaced with technically equivalent elements.

[0033] Figure 6 shows a possible, alternative, embodiment of the boat 1 that is particularly simple and economical to construct. In this solution, the bearings movable relative to the saddle 3 are embodied by a band designated by the number 30 which is positioned above the saddle 3 and has its own end segments 32 associated to the adjustment means (31) which comprise rotary drums 33 about which said segments 32 are wound. The rotary drums 33 can be manual or motorised winches, which are supported by the structure 20 of the boat lift 1.

[0034] As has been noted from the above description, the adjustment means (13,14, 15, 16, 18, 31) generally comprise the supports (13) borne by the struts (14) oscillating in rotary fashion about the axis of rotation (15), with possible adjustable locking means (16) and with or without the measuring means (18), or the aforesaid adjustment means (31), depending on the various proposed solutions.

[0035] By the appropriate arrangement of the bands 30 around the hull and relative to the keel 7 of the boat 2, the appropriately co-ordinated phased operation of the drums 33 allows to lift the boat 2 from a lowered position, in which the band 30 is loose and the hull bears over the saddle 3, to a raised position, in which the boat 2 is supported by the band 30 at a certain height relative to the saddle 3. To counter the uncontrolled flotation of the band 30 at rest, the band 30 itself can naturally be ballasted so it lies in controlled configuration above the saddle 3.

Claims

1. A universal lift for boats (2) comprising: at least a hull support saddle (3); a pair of pontoons (4), sup-

porting in mutual combination said one or each saddle (3), oriented transversely, and provided internally with pneumatic chambers (5); valve means and pressurising means associated to the pneumatic chambers (5) and able to operate in mutual co-ordination to allow said pontoons (4) to sink into, and emerge from, the water: the boat lift (1) being **characterised in that** said one or each saddle (3) is provided with a central part (6) having deep concave shape, open upwards, able to receive, between said pontoons (4), indifferently keels (7) of overlying boats (2), be they powerboats or sailboats; said boat lift (1) comprising at least a pair of bearings (8; 12;30), m ovable relative to the saddle (3), opportunely positioned relative to its central part (6); and adjustment means (13,14,15;16,18;31) for adjusting the configuration of said movable bearings (8; 12;30), according to the actual geometric hull profile (9) of the boat (2) positioned above said one or each saddle (3).

2. A boat lift, as claimed in claim 1, **characterised in that** said saddle (3) has the shape of a plate.

3. A boat lift, as claimed in claim 2, **characterised in that** said plate has contour edges (10) profiled with a design that complementarily encompasses a part of the contour of said pontoons (4).

4. A boat lift, as claimed in any of the previous claims, **characterised in that** said concave central part (6) is "U" shaped.

5. A boat lift, as claimed in claim 4, **characterised in that** said concave central part (6) is removably fastened to two distinct lateral parts (11) of the saddle (3) integral with a corresponding pontoon (4).

6. A boat lift, as claimed in claim 1, **characterised in that** said adjustment means are applied to a first pair of bearings (8) and include supports (13) oscillating in swivelling fashion borne by struts (14) projecting in overhang from said saddle (3).

7. A boat lift, as claimed in claim 6, **characterised in that** said struts (14) are fastened to said saddle (3), in such a way as to be oscillating in swivelling fashion about an axis of rotation (15) that is transverse to the plane of lay of said saddle (3); and with the concurrence of adjustable means (16) for locking the angular excursion of said struts (14) about said axis of rotation (15).

8. A boat lift, as claimed in claim 7, **characterised in that** said adjustable locking means (16) comprise at least a lead screw (17) associated to a said strut (14) which is able to impart to the strut (14) a rotation of adjustable amplitude about said axis of rotation (15).

9. A boat lift, as claimed in one of the claims from 6 to 8, **characterised in that** said struts (14) can be lengthened and shorted longitudinally at a direction that is substantially radial to the transverse profile (9) of the hull.

10. A boat lift, as claimed in claim 9, **characterised in that** said struts (14) include linear fluid actuator with controlled operation.

11. A boat lift, as claimed in claim 10, **characterised in that** said linear actuators can be operated by the action of a hydraulic fluid.

12. A boat lift, as claimed in claim 1, **characterised in that** the adjustment means include pressure measuring means (18) to allow ascertaining whether the pressure is isobaric on said linear actuators.

13. A boat lift, as claimed in claim 1 or 6, **characterised in that** a second pair of bearings (12) includes movable shoulders (19) able to abut the opposite bulwarks of a boat (2) positioned above said one or each saddle (3).

14. A boat lift, as claimed in claim 13, **characterised in that** said shoulders (19) are fastened to a fixed structure (20) by means of an articulation (21) and of selectively adjustable fastening means (22).

15. A boat lift, as claimed in claim 14, **characterised in that** said fastening means (22) are able to allow the rapid locking and unlocking of the shoulders (19) relative to the fixed structure (20).

16. A boat lift, as claimed in claim 15, **characterised in that** said fastening means (22) comprise elements (24) provided with mutually opposite meshing surfaces (23), able to be mutually engaged and disengaged in rapid fashion.

17. A boat lift, as claimed in claim 1, **characterised in that** it comprises at least a walkway (25) fastened to its own fixed structure (20).

18. A boat lift, as claimed in claim 1, **characterised in that** said bearings comprise at least a band (30) positioned above a corresponding saddle (3) and having its own end segments (32) associated to said adjustment means, said band (30) being actuated by said adjustment means in such a way as to determine the lifting and lowering of the boat (2) relative to the saddle (3).

19. A boat lift, as claimed in claim 18, **characterised in that** said adjustment means include rotary drums

(33) of winches, simultaneously with whose rotation said end segments (32) of the band (30) are wound or unwound determining said lifting and lowering.

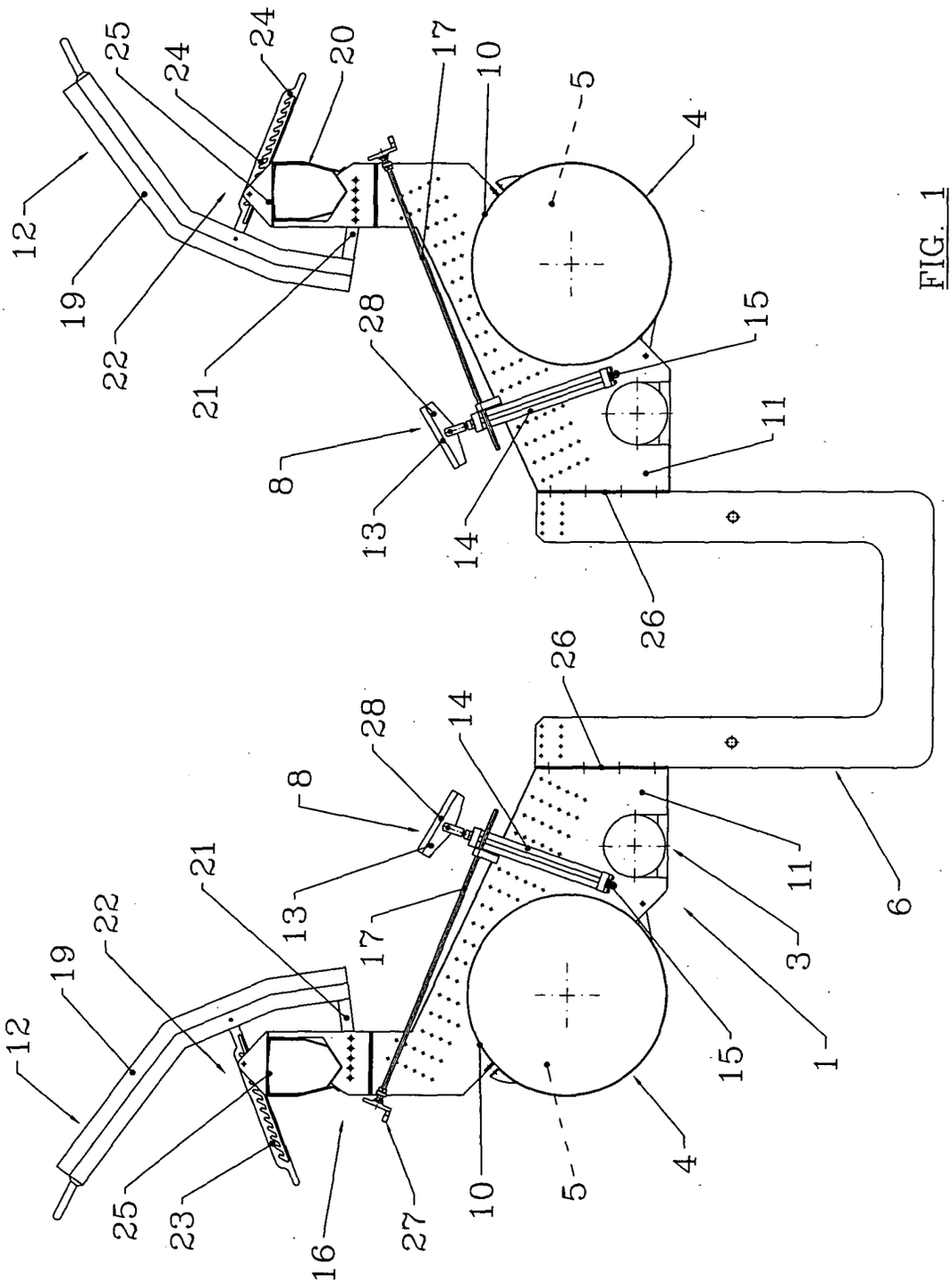
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FIG. 1

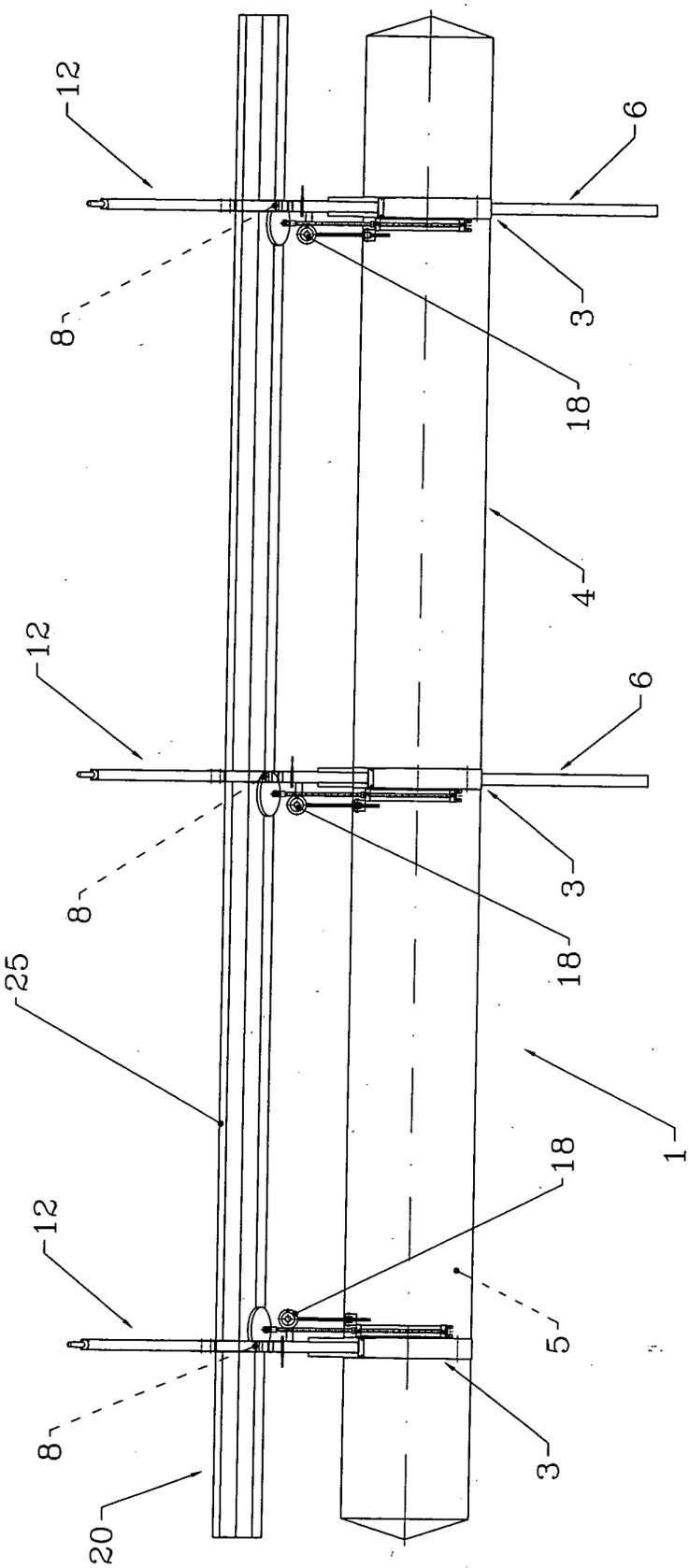

FIG. 2

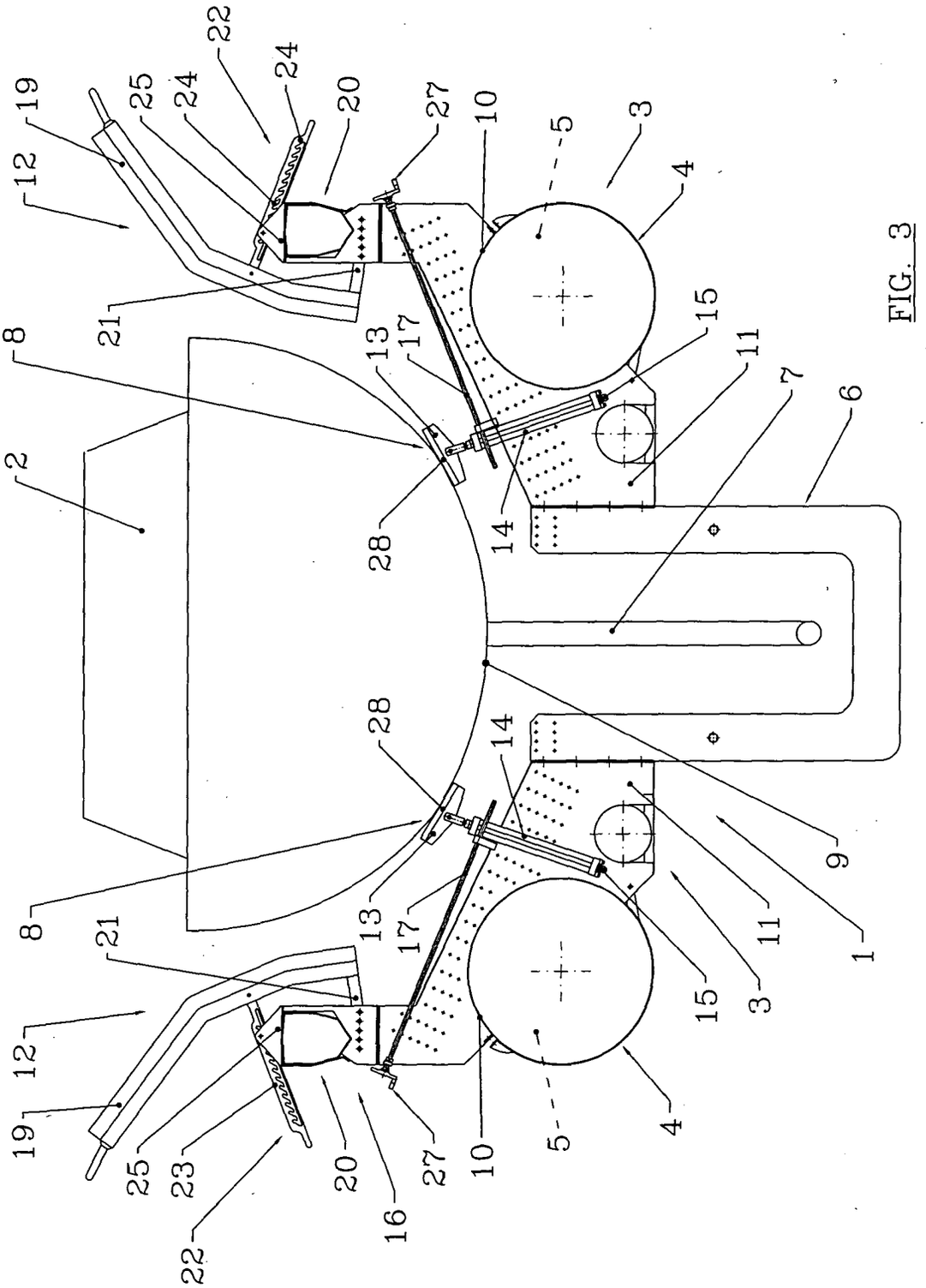

FIG. 3

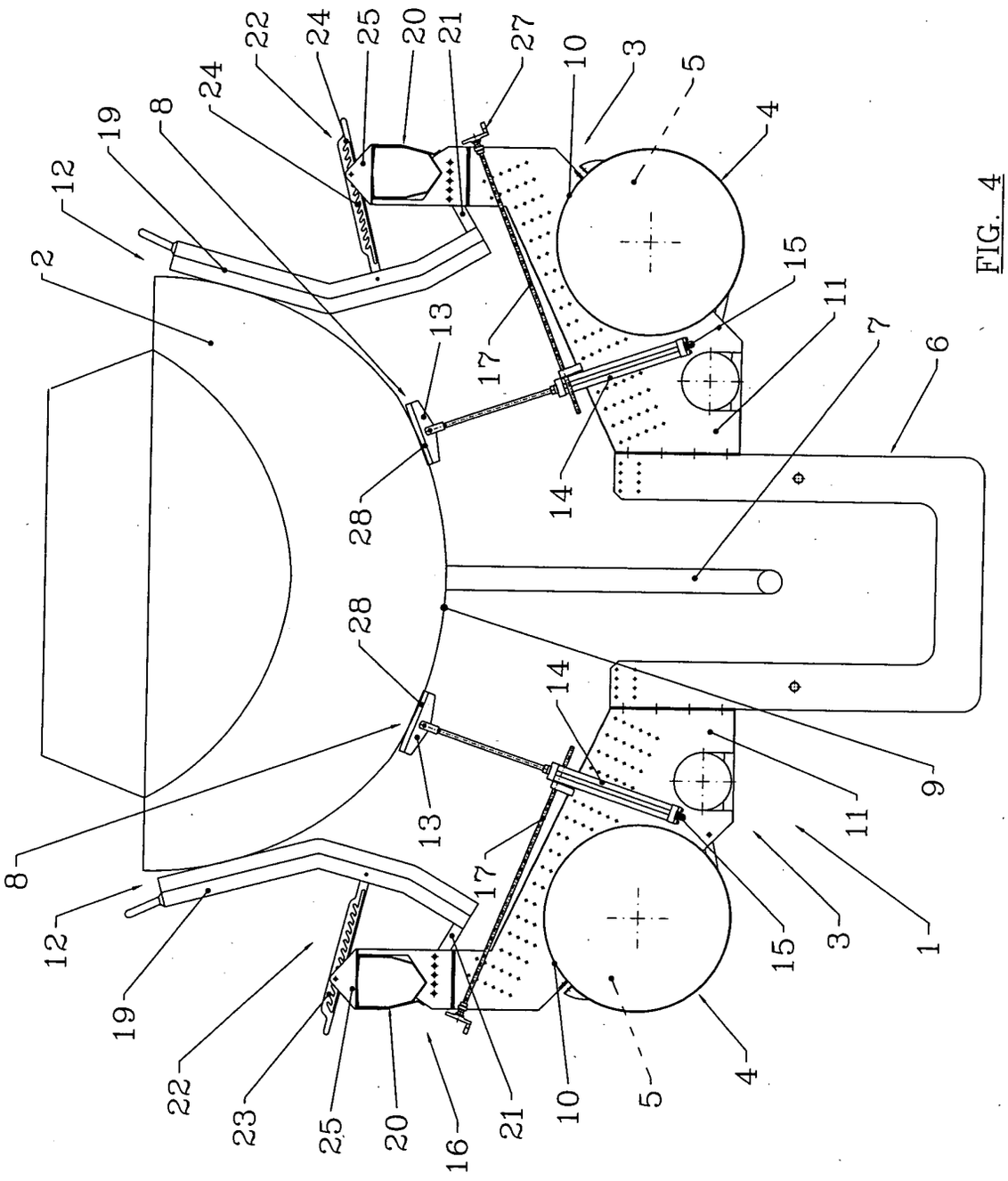

FIG. 4

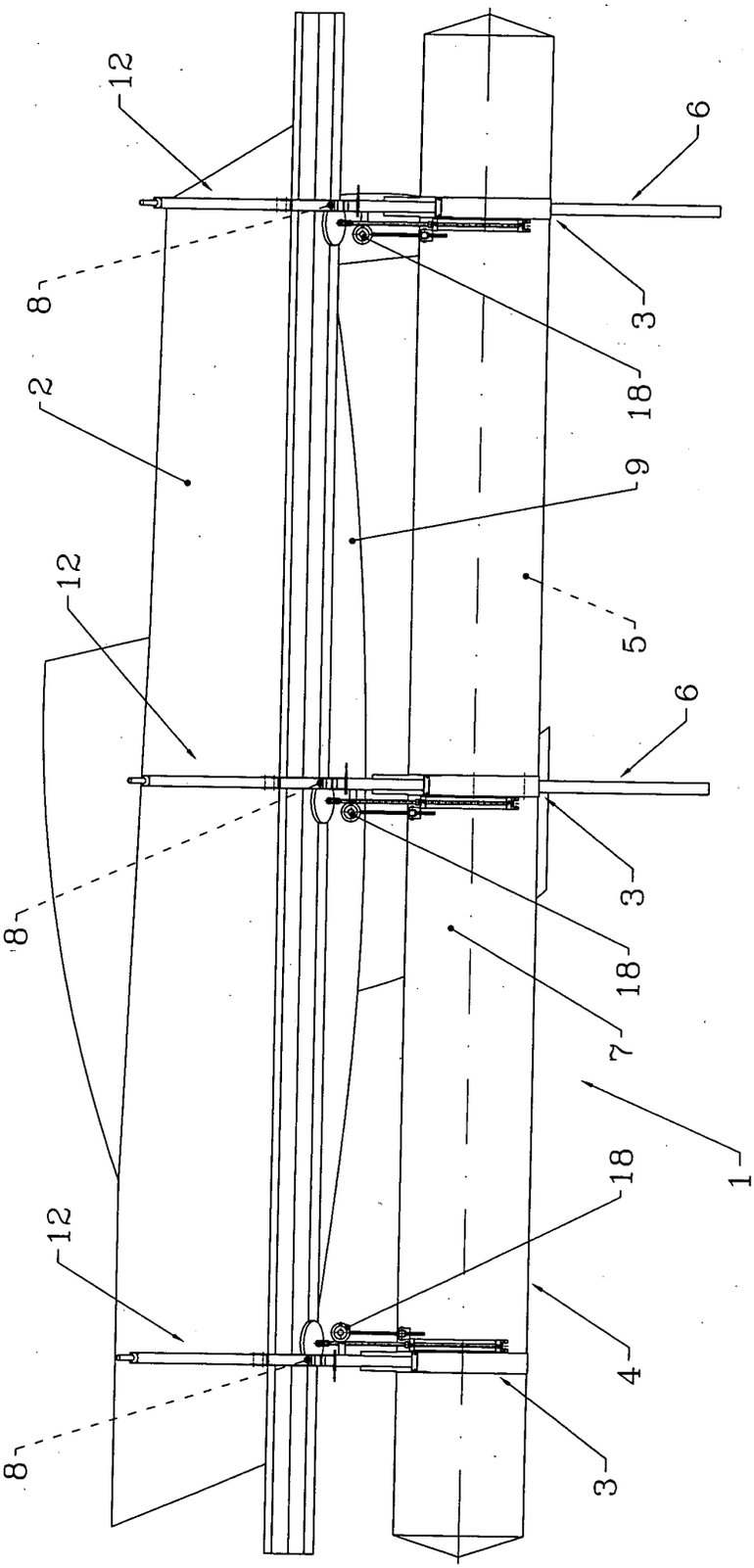

FIG. 5

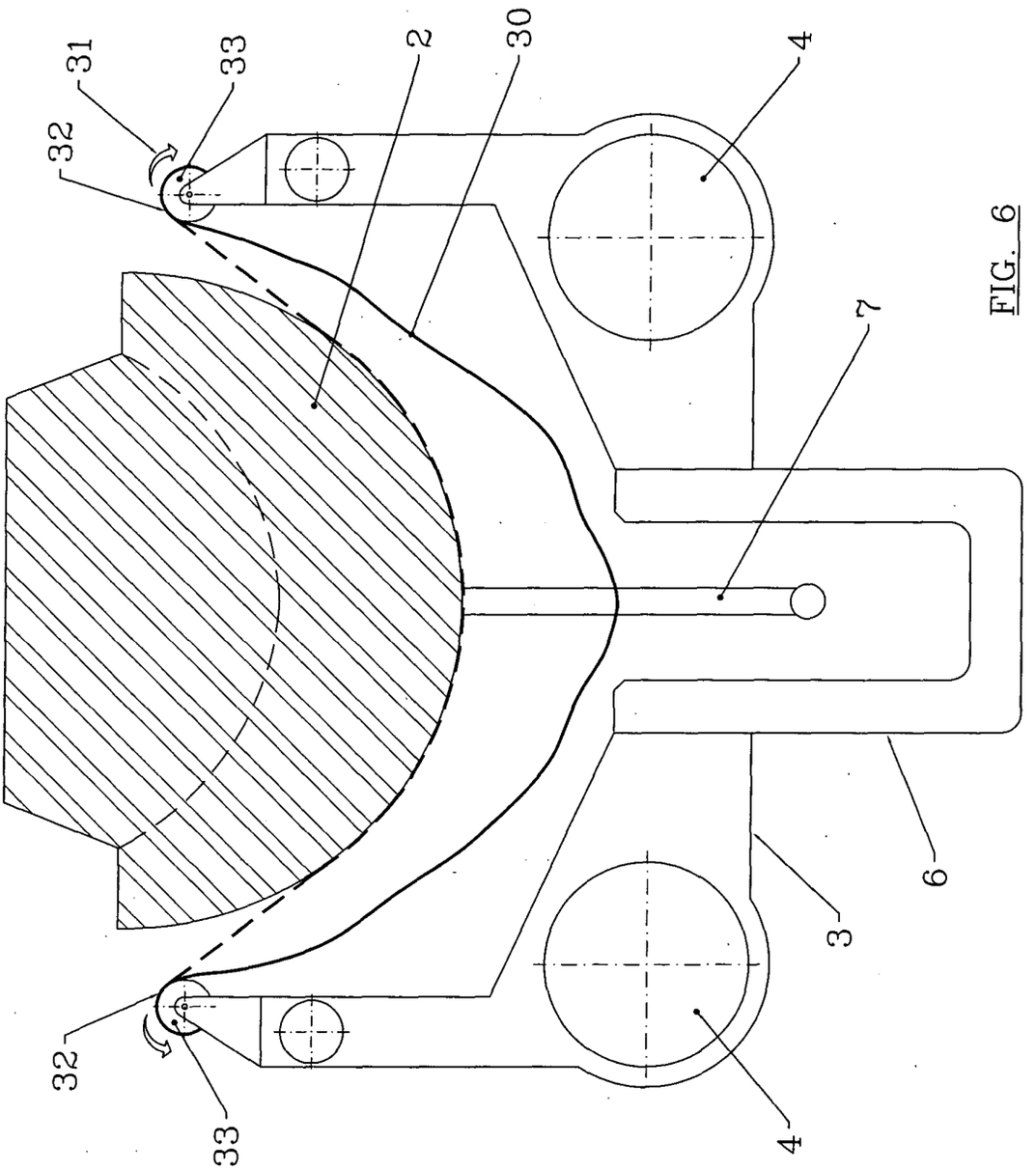

FIG. 6

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 42 5783

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			TECHNICAL FIELDS SEARCHED (Int.Cl.7) B63C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	5 April 2004	Nicol, Y

CATEGORY OF CITED DOCUMENTS

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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