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(54) **Delivery device with adjustable jet orientation**

(57) A delivery device (1) particularly adapted to be used in hydro-massage baths is disclosed, comprising an ejector (2) hydraulically connected to an external duct (C1) supplying a liquid to be delivered and mechanically connected by interposition of articulation means (3) to driving means (4) adapted to put it in motion. The

articulation means (3) comprise an annular surface (5) made of yielding and elastic material which is arranged between a first annular collar (6) defining the outlet (7) of the device (1) and a second annular collar (8) mechanically connected internally to the ejector (2) and externally to the driving units (4).

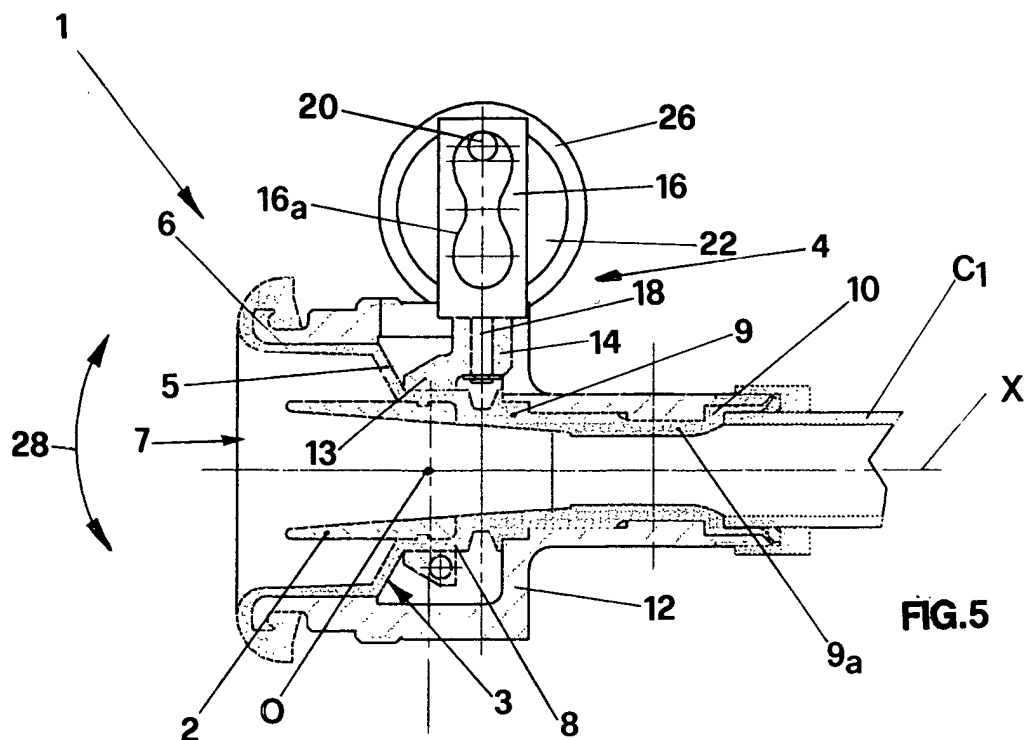


FIG.5

Description

[0001] The present invention relates to a delivery device with adjustable position ejector, particularly adapted to be used for hydro-massage baths.

[0002] It is well known that in the hydro-massage baths a plurality of delivery devices are provided, conveying to the body of the person immersed in the bath a flow of pressurised water to which air is added.

[0003] Each delivery device is provided with an adjustable position ejector allowing to direct the flow at will of the user.

[0004] The ejectors can be oriented manually by the user and this has the drawback of needing continuous interventions by the user any time he wants to modify the jet direction.

[0005] Other versions intended for hydro-massage baths of high cost and therefore for professional use are also known, that still have the manual regulation of the spraying direction of the ejectors but allow a servo-assisted regulation of the delivered flow.

[0006] Irrespective of the kind of hydro-massage baths, movement of the ejectors is obtained by articulation means consisting of two or more mechanical elements pivotally coupled for instance through ball joints, connecting each ejector to the corresponding water supply tube.

[0007] All the known delivery devices therefore have a first drawback consisting of the complex construction of said articulation means.

[0008] Consequently said delivery devices have also the further drawback of a high manufacturing cost and therefore a high selling price.

[0009] Another drawback consists also in that, in view of the complex construction of said articulation means, the operational reliability of the delivery device is rather low and the user is obliged to frequent maintenance interventions.

[0010] Another drawback consists in that, since said articulation means comprise several pieces pivotally connected to each other, they show even deep gaps and sometimes undercut areas that being in contact with water cause deposit of organic residues coming from exfoliation of the skin of the person undergoing the hydro-massage treatment.

[0011] This causes lower hygienic conditions during the treatment and the need to carry out regularly the disinfection of the bath and of the whole water delivery system.

[0012] A last but not least drawback consists in that use of said articulation means increases the dimensions of each delivery device and this generally causes greater overall dimensions of the bath and assembling and disassembling difficulties during installation and/or any maintenance operation.

[0013] The present invention aims to overcome said drawbacks.

[0014] More particularly an object of the present invention is to provide a delivery device that for adjusting the ejector position does not require use of articulation means consisting of two or more mechanical elements pivotally connected to each other.

vention is to provide a delivery device that for adjusting the ejector position does not require use of articulation means consisting of two or more mechanical elements pivotally connected to each other.

[0015] Another object consists in that servo-assisted actuators can be easily associated to the delivery device of the invention for adjusting the spout direction and flow rate.

[0016] A further object is that the delivery device of the invention is less prone to deposit of organic residues in comparison with the known devices.

[0017] Another object is that the delivery device of the invention has a greater reliability of operation in comparison with equivalent devices of known type.

[0018] A last but not least object is that the delivery device of the invention has also lower dimensions relative to equivalent known devices.

[0019] The foregoing objects are attained by providing a delivery device particularly adapted to be used in hydro-massage baths that according to the main claim comprises at least an ejector hydraulically connected to at least an outer duct supplying a liquid to be delivered and mechanically connected by interposition of articulation means to driving means adapted to put it in motion, and is characterised in that said articulation means comprise at least an annular surface made of a yielding and elastic material arranged between a first annular collar defining the outlet of said device and a second annular collar mechanically connected internally to said ejector and externally to said driving means.

[0020] According to a preferred embodiment the annular surface, the first collar and the second collar belong to a single tubular element fully made of yielding and elastic material, provided with a first inlet way for connection of an outer duct supplying the liquid to be delivered and a second inlet way for connection of an outer duct supplying a gaseous fluid.

[0021] The delivery device comprises also shutting means to intercept and regulate the flow of liquid to be delivered through said device.

[0022] More particularly said interception and regulation means comprise a pusher put in motion by displacement means, acting outside on the tubular element so as to modify the passage section by elastic deformation.

[0023] The displacement means of said pusher and the driving means of the ejector generally comprise cam means associated to an electric motor.

[0024] More particularly a couple of cam means are associated to the ejector, said cam means being in turn associated to corresponding driving means arranged at right angles to each other allowing to traverse the ejector along planes perpendicular to each other.

[0025] Both motors of the driving means are electrically connected to an electronic control board that combining properly the traverse motion of both means generates a rotary motion of the ejector with space development.

[0026] In a similar way the same electronic control

board is electrically connected to the displacement means to vary the delivery of the ejector from the closed position to the maximum opening position.

[0027] Advantageously the delivery device of the invention allows a greater hygienic condition of the hydro-massage baths and requires less maintenance and cleaning interventions.

[0028] Still advantageously the delivery device has also lower dimensions and costs in comparison with equivalent known delivery devices.

[0029] The foregoing objects and advantages will be better understood from the following description of a preferred embodiment of the invention which is given as an illustrative and non limiting example making reference to the accompanying sheets of drawings in which:

- Figs. 1 to 3 show the delivery device of the invention in three different isometric views;
- Fig. 4 is a top view of the delivery device of Fig. 2;
- Fig. 5 is a partial sectional view of the delivery device shown in Fig. 4 taken along the section line V-V;
- Fig. 6 is a left side view of the delivery device of Fig. 4;
- Fig. 7 is an exploded view of a part of the delivery device of the invention; and
- Fig. 8 is an isometric view of part of the delivery device of the invention.

[0030] The delivery device of the invention is shown in the isometric views of Figs. 1 to 3, where it is generally indicated with reference numeral 1, and also in Figs. 4 and 5 where it is shown in a partial sectional view.

[0031] Moreover the device can be seen also in the general view of Fig. 6 and in the exploded view of Fig. 7 showing only some of its components.

[0032] The delivery device 1 is particularly adapted to be used in hydro-massage baths and comprises an ejector 2 hydraulically connected to an outer duct C1 supplying a liquid to be delivered, which is mechanically connected through articulation means generally indicated with numeral 3 to driving units generally indicated with numeral 4 adapted to put it in motion.

[0033] According to the invention the articulation means 3 comprise an annular surface 5 made of yielding and elastic material, arranged between a first annular collar 6 defining the outlet 7 of the device and a second annular collar 8 mechanically connected internally to the ejector 2 and externally to said driving units 4.

[0034] More particularly one can see that the annular surface 5, the first collar 6 and the second collar 8 belong to a single tubular element 9 which is fully made of yielding and elastic material, preferably but not necessarily an elastomer such as rubber or its mixes.

[0035] In the tubular element 9 a first inlet way 10 for connection to an outer duct C1 supplying the liquid to be delivered, preferably water, and a second inlet way 11 for connection to an outer duct C2 supplying a gaseous fluid, are defined.

[0036] It is to be pointed out that said gaseous fluid is preferably but not necessarily air, which could be replaced or integrated with medical gases of various type.

[0037] Water entering through the first inlet way 10 is mixed with the gaseous fluid entering through the second inlet way 11 and goes out through the ejector 2 conveying it to the body of the person immersed in the bath.

[0038] It is the combination of the effect of pressurised water together with the gaseous fluid dissolved in it that carries out the hydro-massage by Venturi effect.

[0039] The tubular element 9 is removably received in a holding structure 12 constituting the body of the device 1 and used to fix the delivery device to the bath.

[0040] The holding structure 12 is also used to support the driving units 4 for the articulation of the ejector 2, which are externally connected to the second annular collar 8 through an annular ring 13 that can be seen in greater detail in Figs. 7 and 8.

[0041] More particularly one can see that the annular ring 13 is provided with ring nuts 14, 15 arranged orthogonally to each other, each of them receiving the connection of one of the driving units 4.

[0042] Each driving unit 4 comprises a cam 16, 17 provided with a screw 18, 19 of connection to the corresponding ring nut 14, 15 and having a shaped outline 16a, 17a, slidingly co-operating with a pin 20, 21 eccentrically arranged in a disc 22, 23 coupled to the shaft 24, 25 of a corresponding electrical motor 26, 27.

[0043] When the motors 26, 27 are fed, sliding of each pin 20, 21 on the shaped outline 16a, 17a, of the corresponding cam 16, 17 causes a displacement 28, 29 of the cam on the plane α , β containing the cam shown in Fig. 1 and also in the schematic view of Fig. 8.

[0044] As each cam 16, 17 as already stated, is fixed to the annular ring 13, each cam transmits its displacement to the second annular collar 9 to which is connected and therefore to the ejector 2 that is nip inserted in the annular collar 9.

[0045] More particularly, looking at Fig. 8 it is to be noted that the displacement 28 of cam 16 gives to the annular ring 13 a rotation around the axis Y laying on plane β and passing by the ring nut 15 of connection of cam 17 and in the same way the displacement 29 of cam 17 gives to the annular ring 13 a rotation around axis Z laying on plane α and passing by the ring nut 14 of connection of cam 16.

[0046] Yield and elasticity of the material of the annular surface 5 connecting the first annular collar 6 to the second annular collar 8, thus allows ejector 2 to oscillate both on plane α and plane β with a traverse motion occurring on both planes relative to a theoretical rotation centre O which is placed substantially at the centre of ejector 2, at the point of intersection of the axis X, Y and Z as shown in Fig. 8.

[0047] More particularly in this way an oscillatory motion around the point O is obtained for ejector 2, on the plane of the drawing of Fig. 5 according to opposite directions indicated by arrow 28 and on the plane of the

drawing of Fig. 4 according to the opposite directions of arrow 29.

[0048] Both motors 26, 27 are electrically connected to an electronic control board not shown in the drawings, which drives properly the speed of both motors, combines the oscillating motions of the ejector 2 so as to generate for said ejector 2 a curved space motion around the rotation centre O allowing to orient the spout in any direction desired by the user.

[0049] Use of the electronic control board allows a fine regulation of the oscillations of ejector 2 and the presence on the disc 22, 23 of each motor 26, 27 of a magnetic element 31, 32 co-operating with a relevant fixed sensor not shown in the drawings, allows detection of the number of the revolutions of each motor as well as the angular position of each cam and therefore of the ejector 2.

[0050] Therefore through the control board it is possible to carry out the following steps: traverse ejector 2 on plane α ; traverse ejector 2 on plane β ; combine the two traverse motions so as to obtain a space rotary motion of the ejector 2; change the spraying position of the ejector setting it along different directions at choice of the user.

[0051] The delivery device comprises also a pusher 40 that can be seen particularly in Fig. 4, acting externally on the tubular element 9 at a zone 9a of said element, comprised between the first inlet way 10 supplying water and the second inlet way 11 supplying the gaseous fluid.

[0052] The pusher 40 is associated to a displacement unit generally indicated with 41, adapted to move it in a rectilinear direction along the lines opposite to each other indicated by arrow 42.

[0053] Like the driving units for the ejector 2, the displacement unit 41 comprises a cam 43 on the inner profile 43a of which a pin 44 is slidingly contacted, belonging to a disc 45 fixed and caused to rotate by the shaft 46 of an electric motor 47.

[0054] In such a way the cam 43 converts the rotary motion of shaft 46 of motor 47 in a vertical motion of pusher 40 causing the formation of the tubular element 9 at the contact zone 9a that can be deformed according to the configuration 9b when it is desired to intersect totally the flow through the ejector 2.

[0055] Magnetic elements 48 are provided also in the disc 45, co-operating with fixed sensors to detect and define the position of pusher 40 and vary the flow rate of the ejector.

[0056] Driving properly rotation of the motor 47 through the mentioned electronic control board, it is possible to vary the position of pusher 40 so as to modify the shutting degree of the tubular element 9 and therefore water delivery through ejector 2.

[0057] From the foregoing it is clear that the invention attains all the intended objects.

[0058] Firstly, connection of ejector 2 to the driving units 4 occurs without using mechanical articulation

means consisting of two or more mechanical elements pivotally connected to each other because the single yielding element consists of the annular surface 5 made of elastomer.

[0059] This makes easier construction and more reliable operation of the ejector.

[0060] Moreover, gaps or undercuts are eliminated and therefore, as shown in Fig. 5, the contact of water from the supply duct C1 to the ejector 2 continues without meeting discontinuity zone where it is possible collection of polluting material.

[0061] Therefore, a delivery device is advantageously obtained warranting a greater hygienic condition, more reliable operation and less expensive in the manufacturing stage.

[0062] In the constructional stage many modifications other than the solutions described and shown in the drawings could be made to the delivery device of the invention.

[0063] It is however to be understood that when said modifications fall within the scope of the appended claims, they should be all considered covered by the present invention.

Claims

1. A delivery device (1) particularly adapted to be used in hydro-massage baths, comprising at least an ejector (2) hydraulically connected to at least an outer duct (C1) supplying a liquid to be delivered and mechanically connected by interposition of articulation means (3) to driving units (4) adapted to put it in motion, **characterised in that** said articulation means (3) comprise at least an annular surface (5) made of yielding and elastic material arranged between a first annular collar (6) defining the outlet (7) of said device (1) and a second annular collar (8) mechanically connected internally to said ejector (2) and externally to said driving units (4).
2. The delivery device (1) according to the claim 1 **characterised in that** said annular surface (5), said first collar (6) and said second collar (8) belong to a tubular element (9) fully made of yielding and elastic material, provided with a first inlet way (10) for connection of said external duct (C1) supplying said liquid to be delivered and a second inlet way (11) for connection of a second external duct (C2) supplying a gaseous fluid.
3. The delivery device (1) according to claim 2 **characterised in that** said tubular element (9) is removably received in a holding structure (12) constituting the body of the device (1) and supporting said driving units (4) of said ejector.
4. The delivery device (1) according to claim 2 **char-**

acterised in that said second inlet way (11) is made at an intermediate position of said tubular element (9) and downstream said first inlet way (10).

5. The delivery device (1) according to claim 1 or 2 **characterised in that** said yielding and elastic material is an elastomer. 5
6. The delivery device (1) according to claim 1 **characterised in that** said ejector (2) is internally nip coupled to said second annular collar (8). 10
7. The delivery device (1) according to claim 1 **characterised in that** an annular ring (13) is provided externally and coaxially to said second annular collar (8), said ring being provided with ring nuts (14, 15) adapted to receive the connection of said driving means (4). 15
8. The delivery device (1) according to claim 7 **characterised in that** said ring nuts (14, 15) of said annular ring (13) are two and are arranged orthogonally to each other, each ring nut being adapted to receive a screw (18, 19) belonging to a corresponding driving unit (4). 20
9. The delivery device (1) according to claim 8 **characterised in that** said driving units (4) each comprise at least a cam (16, 17) provided with said screw (18, 19) connecting to the corresponding ring nut (14, 15) of said annular ring (13) and a shaped outline (16a) slidingly co-operating with a corresponding pin (20, 21) arranged eccentrically in a disc (22, 23) coupled to the shaft (24, 25) of an electric motor (26, 27). 25
10. The delivery device (1) according to claim 9 **characterised in that** the shaped outline (16a, 17a) of each cam (16, 17) co-operates with the corresponding eccentric pin (20, 21) of said disc (22, 23) of said motor (26, 27) and converts the rotary motion of said motor into an oscillating motion of said ejector (2) corresponding to a traverse motion (28, 29) of said ejector on the plane α , β containing said cam (16, 17) and around a rotation axis (Y, Z) belonging to the longitudinal axis of said ring nut (14, 15) fixing the other cam (17, 16) to the same annular ring (13). 30
11. The delivery device (1) according to claim 10 **characterised in that** said ejector (2) rotates around a point (O) laying at the intersection between the axis (Y, Z) defined by each screw (18, 19) of each cam (16, 17) and the corresponding ring nut (14, 15) of said annular ring (13). 35
12. The delivery device (1) according to claim 2 **characterised by** comprising at least a pusher (40) acting externally to said tubular element (9) and adapt-

ed to deform it to obtain interception or regulation of the flow of said liquid to be delivered.

13. The delivery device (1) according to claim 12 **characterised in that** said pusher (40) is in contact with said tubular element (9) at a zone (9a) comprised between said first inlet way (10) and said second inlet way (11). 40
14. The delivery device (1) according to claim 12 or 13 **characterised in that** said pusher (40) is associated to a displacement unit (41) adapted to define a generally rectilinear displacement direction (42) for said pusher (40). 45
15. The delivery device (1) according to claim (14) **characterised in that** said displacement unit (41) comprises a cam (43) connected to said pusher (40) provided with a shaped outline (43a) slidingly co-operating with a corresponding pin (44) eccentrically arranged in a disc (45) coupled to the shaft (46) of an electric motor (47). 50
16. The delivery device (1) according to claim 1 or 15 **characterised in that** said driving units (4) and said displacement unit (41) are electrically connected to an electronic control board. 55
17. The delivery device (1) according to any of claims 9 or 15 **characterised in that** said driving units (4) and said displacement unit (41) are provided with means detecting the angular position of the shaft of each electric motor (26, 27, 47). 60
18. The delivery device (1) according to claim 17 **characterised in that** said position detecting means comprise one or more magnetic bodies (31, 32, 48) inserted in the disc (22, 23, 45) associated to the shaft of each motor (26, 27, 47), co-operating with corresponding fixed reference elements. 65

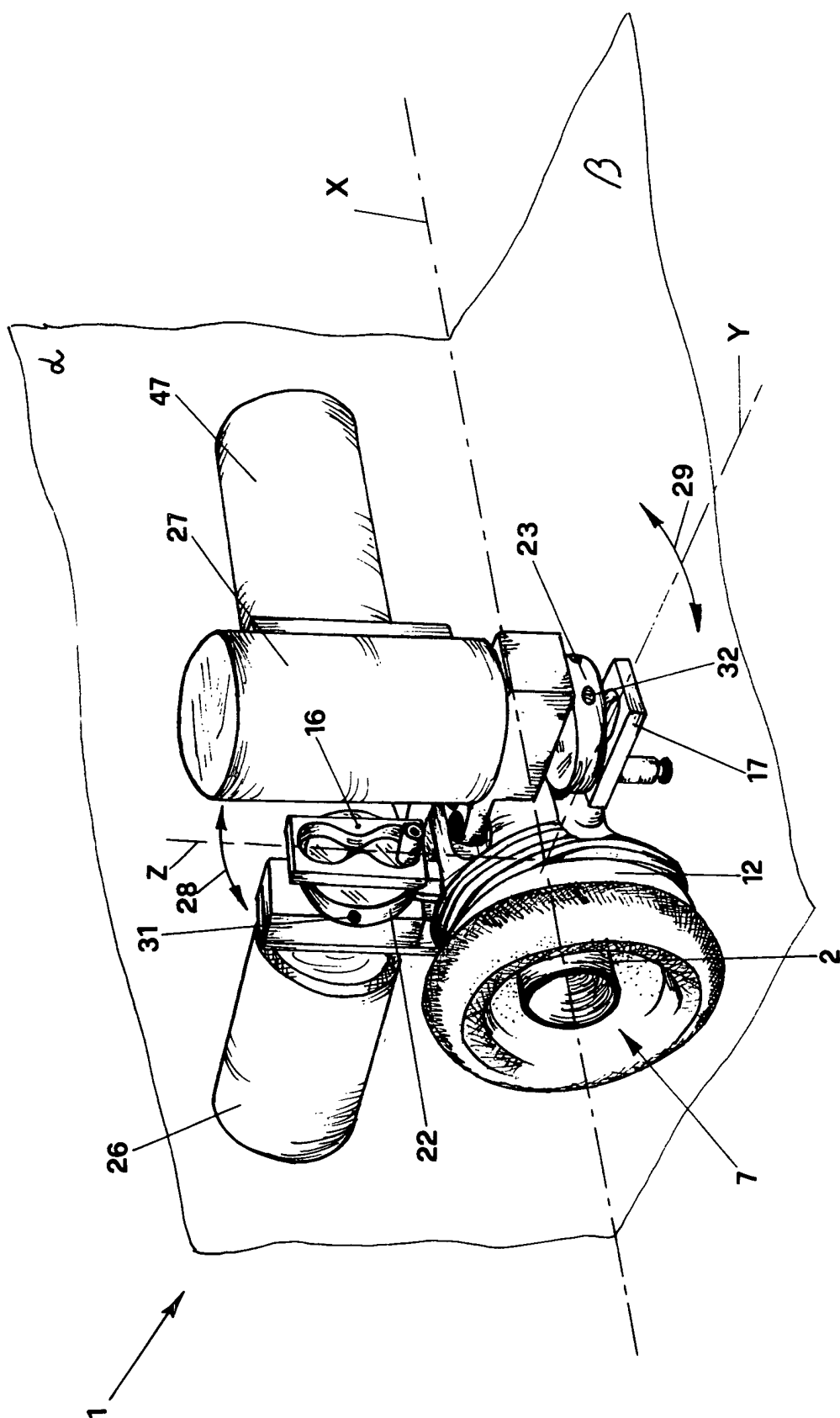
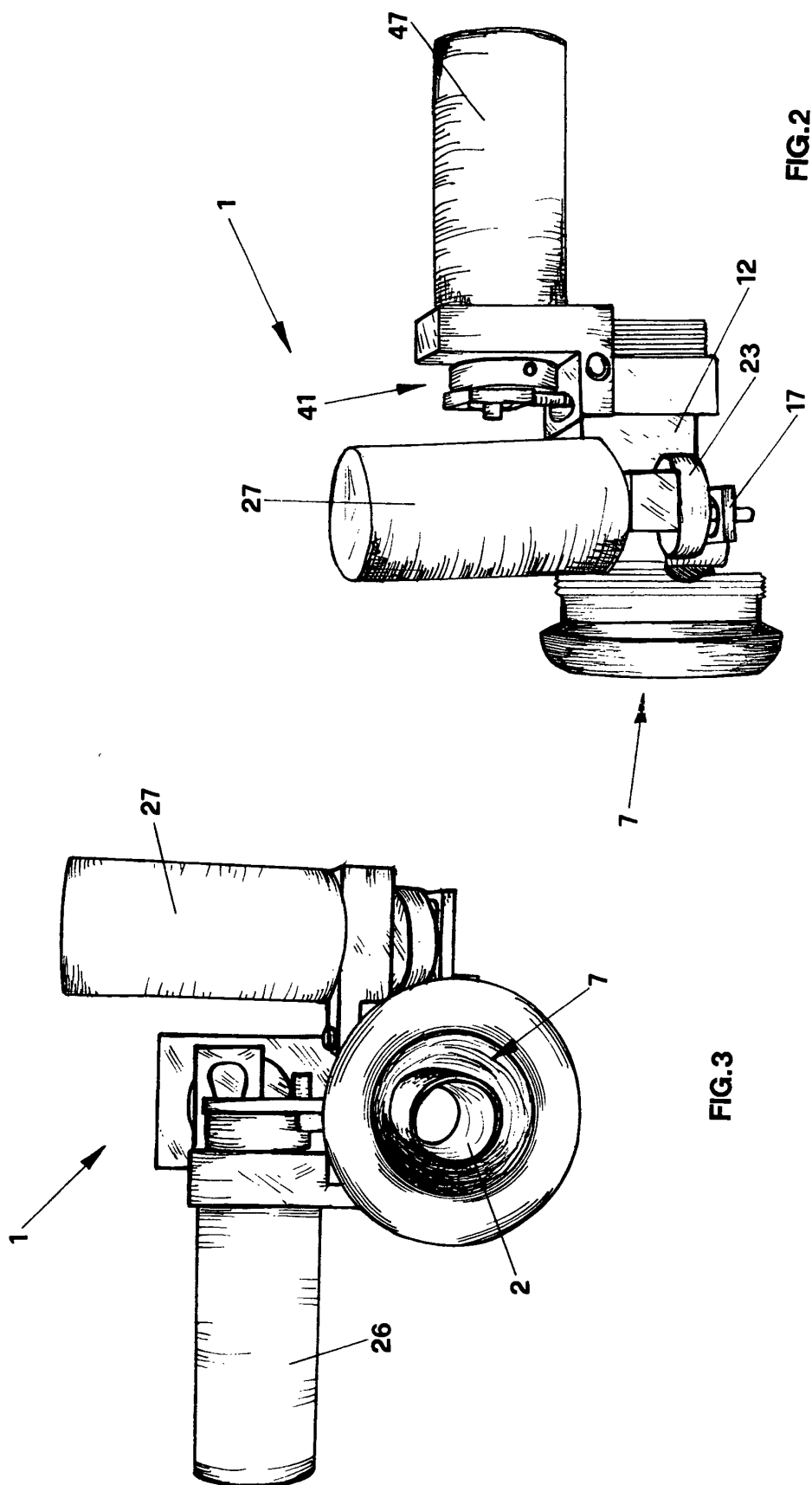
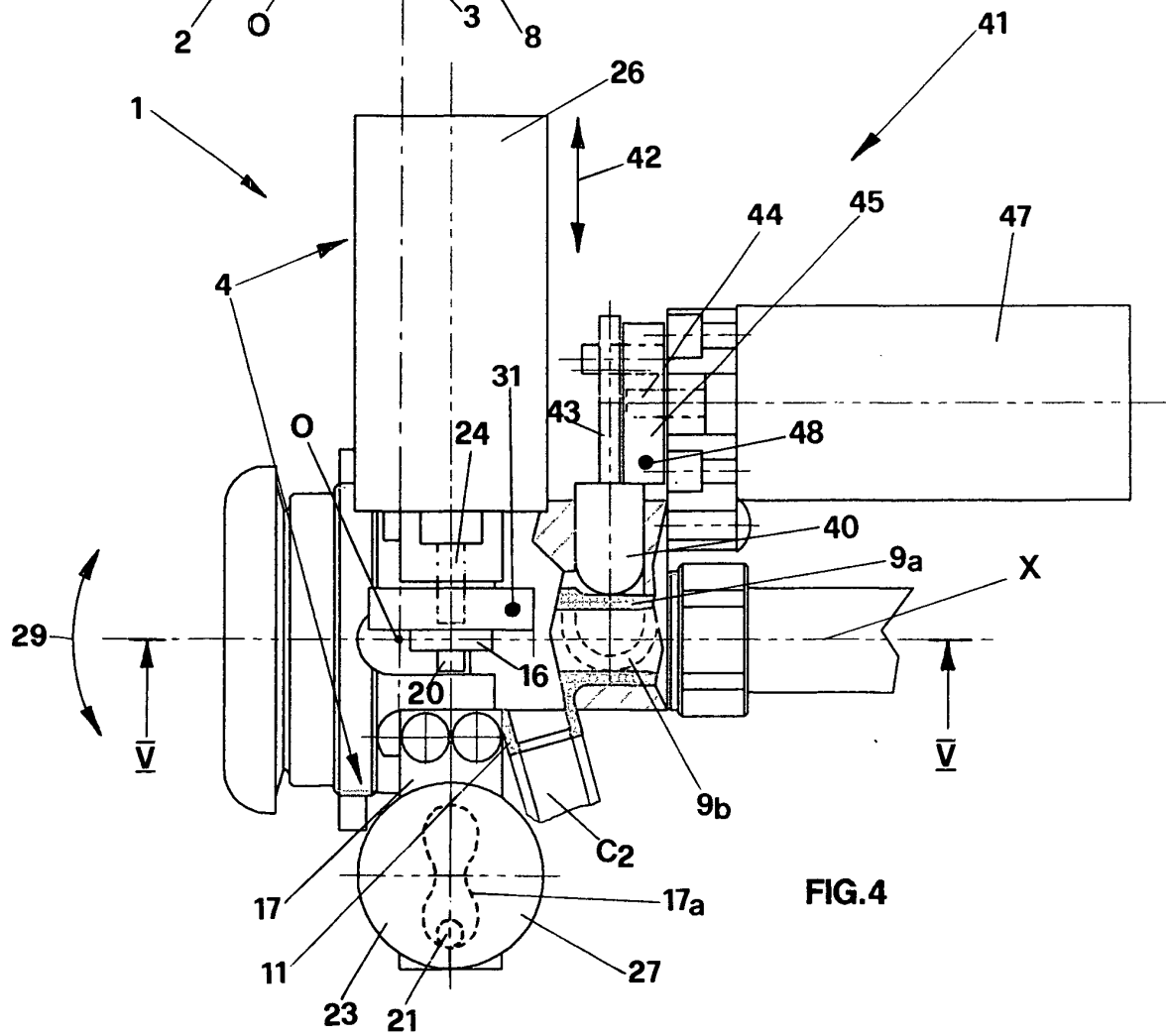
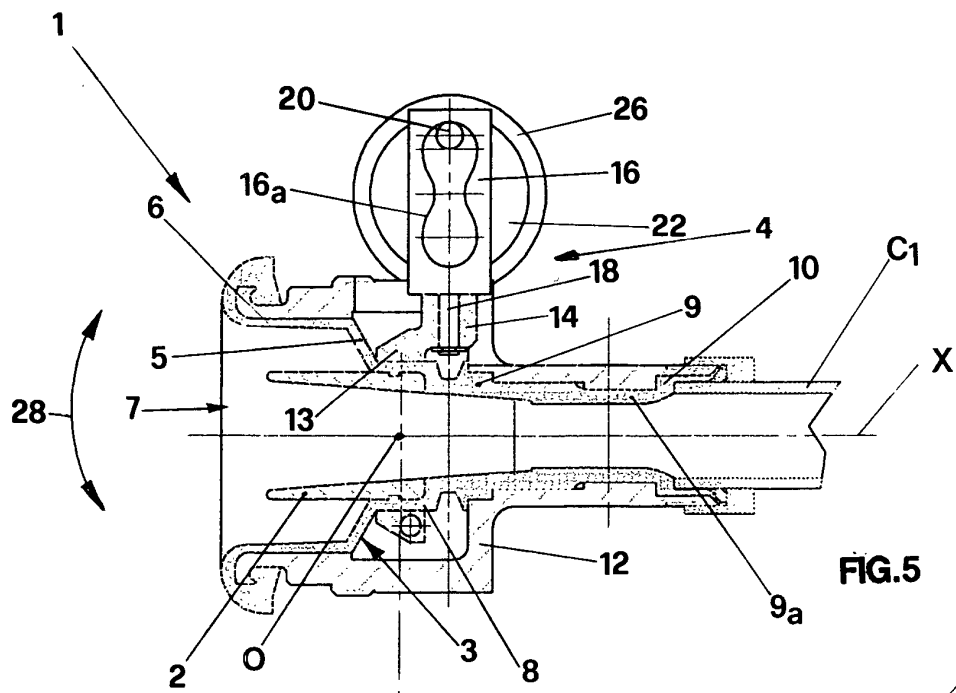


FIG.1





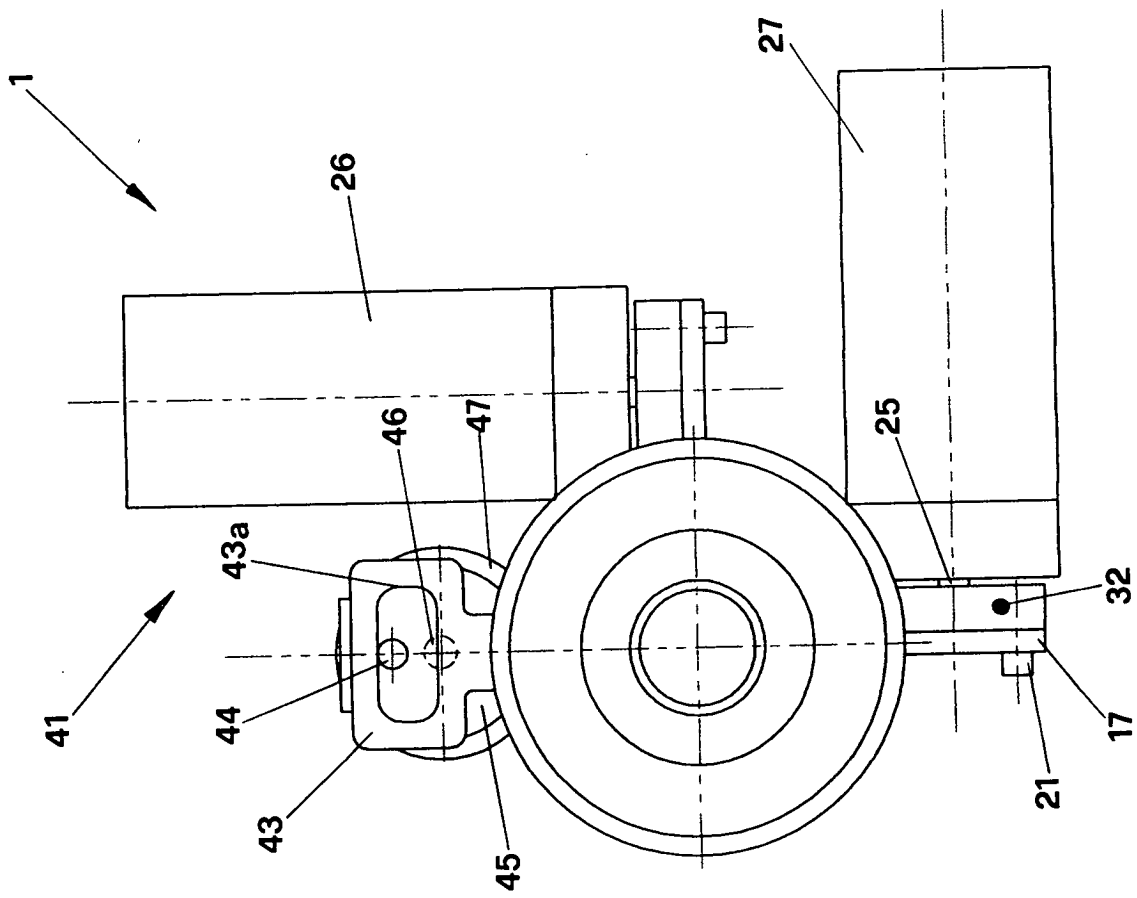


FIG. 6

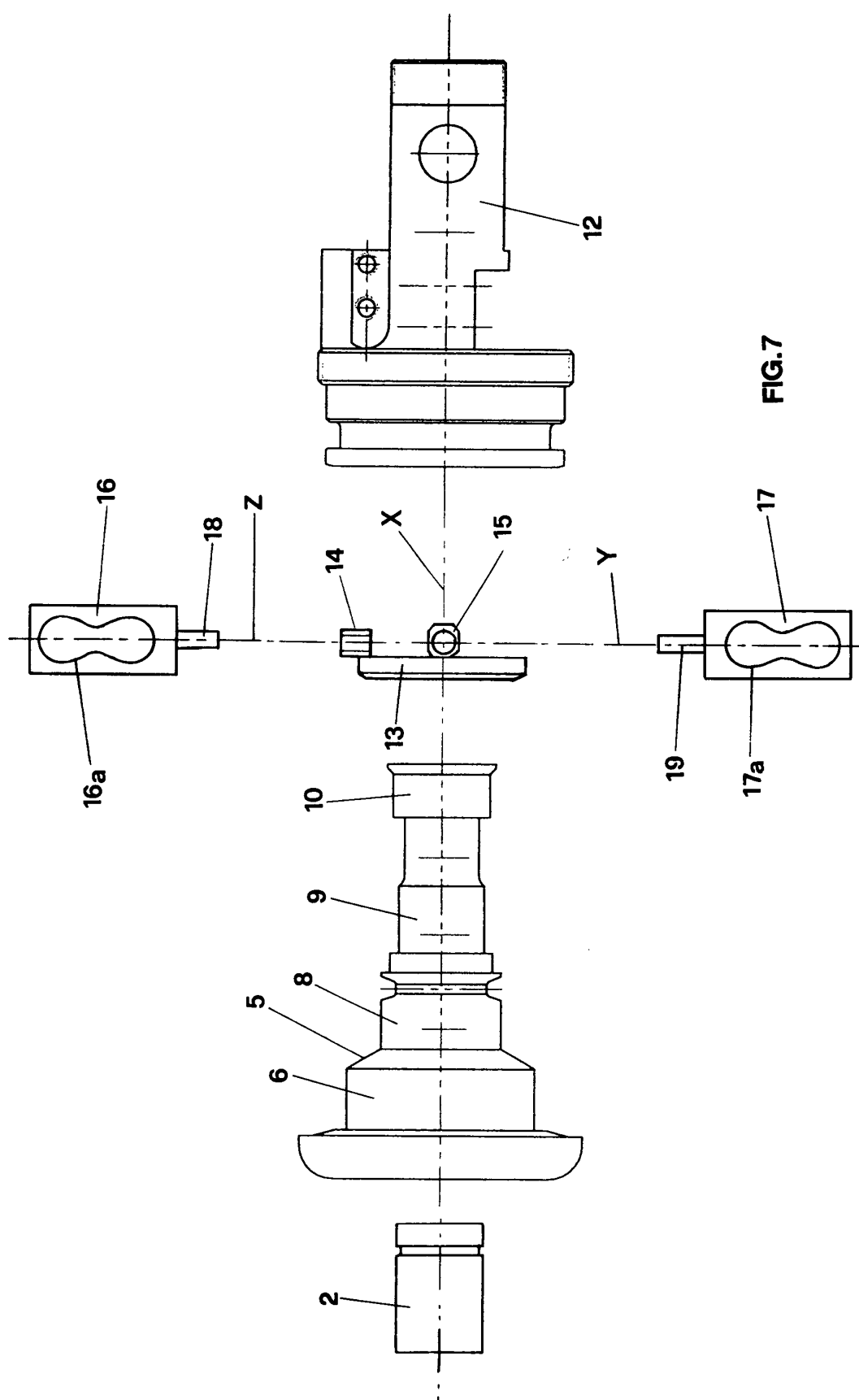


FIG. 7

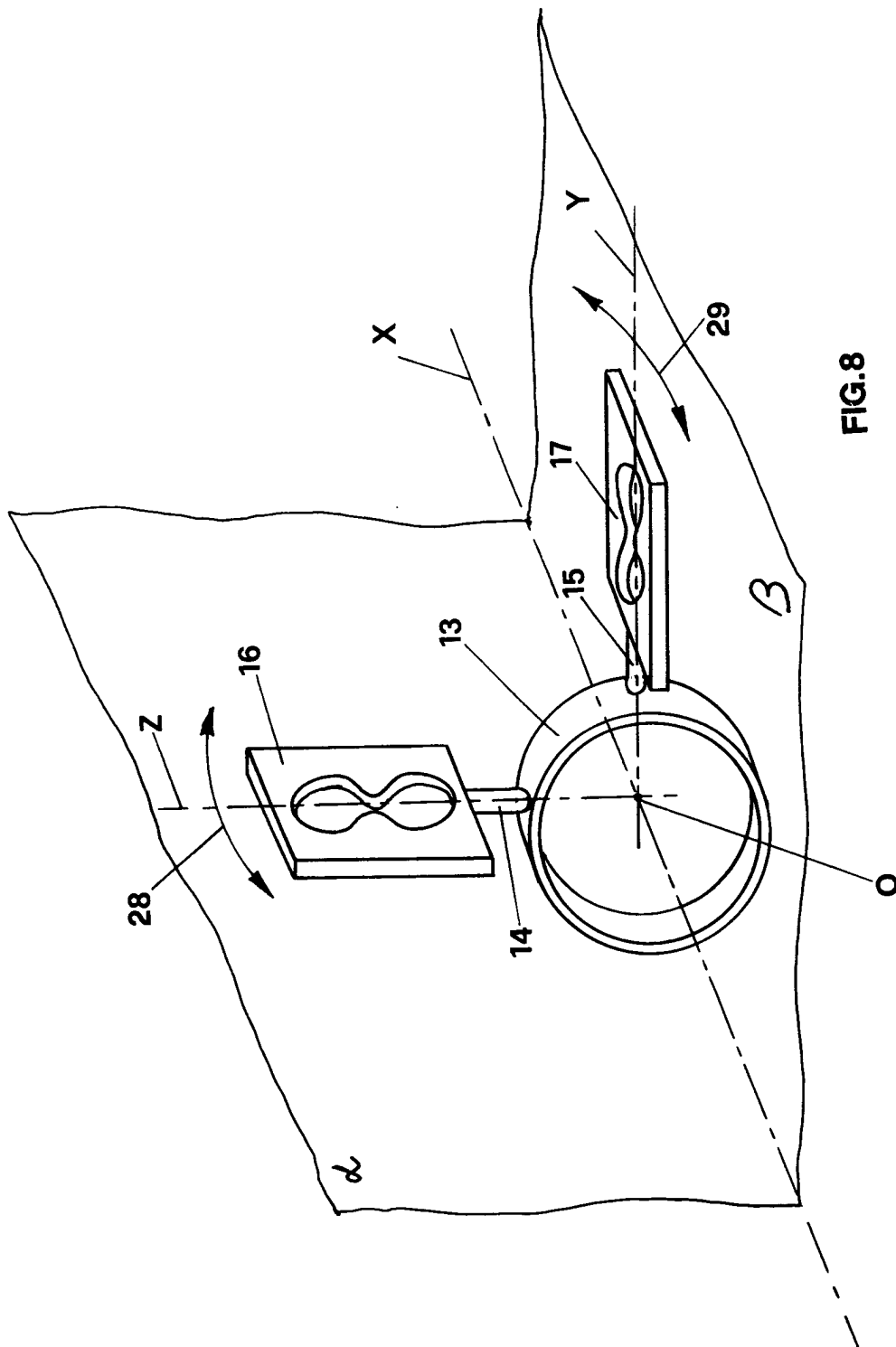


FIG. 8



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 00 6157

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	US 5 003 646 A (STAMP ROGER A ET AL) 2 April 1991 (1991-04-02) * column 3, line 3 - line 5; figure 2 *	1	A61H33/00 A61H33/02
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			A61H A47K B05B F16L
The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 21 May 2002	Examiner Franz, V
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03/82 (P04001)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 02 00 6157

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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