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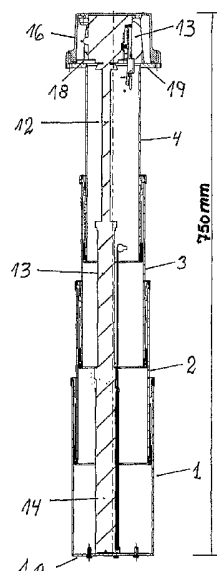
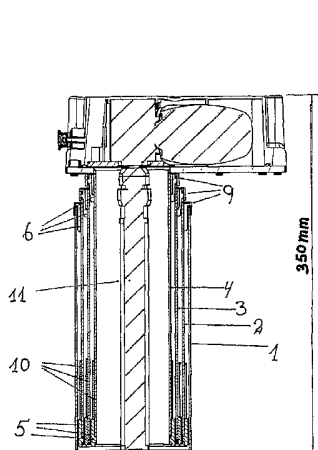
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(54) Title: HOSPITAL OR CARE BED



(57) Abstract: A hospital or care bed comprising a wheeled underframe and an upper frame for a mattress, where a lifting column is provided below the bed at each end on the vertical longitudinal centre plane thereof, said lifting column having respective ends connected with the underframe and with the upper frame, respectively, so as to allow adjustment of the height of the frame by activation of the drive unit (11) of the lifting columns. The lifting column comprises four members (1-4), of which at least three successive members (1-3; 2-4) are of the same or essentially the same length, and the fourth member (4; 1) is at least just as long. When standard pipes of circular cross-section and with sleeve-shaped spacers (10) to determine the overlap between the individual members are used, it is possible to achieve a column having great stability, while keeping the costs low.

Hospital or care beds

The present invention relates to a hospital or care bed of the type which comprises a wheeled underframe and an upper frame for a mattress, and wherein a lifting column having a plurality of mutually telescopic members are provided below the bed at each end in the vertical longitudinal centre plane thereof, said lifting column having respective ends connected with the underframe and with the upper frame, respectively, so as to allow adjustment of the height of the upper frame by activation of a drive unit arranged inside the lifting columns, and wherein the members, at a top end, are provided with an internal slide bearing for the subsequent internal member and, at a lower end, with an external slide bearing for the preceding external member.

Traditionally, the height adjustment of hospital beds is based on the scissors member principle driven by a linear actuator, alternatively integrated longitudinal spindles. By way of example, reference may be made to EP 0 488 552 A1 to Huntleigh Technology plc. Another solution is a lifting column at each corner, as described e.g. in US 6 505 365 to Hill-Rom Inc. Both solutions have a good stability; the drawback is a complex structure which interferes with the general structure of the bed.

As part of the efforts of simplifying the overall bed structure and thereby reducing the manufacturing costs, while having a greater range of options with respect to the construction and design of underframe and upper frame, a bed type has been developed with just two lifting columns arranged below the bed at each end of the longitudinal centre plane thereof. This, however, makes great demands on the stability of the column, particularly in the lateral direction. An example of such a bed is shown e.g. in fig. 6 of DE 196 04 549 to Vaut-Sagel GmbH & Co. This, however, makes great demands on the stability of the column, particularly in the lateral direction. The col-

umn concerned is complex in structure and expensive to manufacture. Another example of such a column is known from WO 01/74198 to Linak A/S, but this, too, is complex and expensive to manufacture.

- 5 When the column is arranged below the bed between underframe and upper frame, a low mounting height is required at the same time, which is in contrast to the maximum/minimum height which the bed must be capable of assuming. The maximum height must be so great as to allow staff to work conveniently in a standing posture at the bed, and the minimum height must
10 be so low as to allow the patient to get out of and into the bed conveniently.

The object of the invention is to provide a hospital or care bed of a simpler nature which also satisfies the stability requirements.

- 15 This is achieved according to the invention by constructing the bed with a lifting column having four members, of which at least three successive members are of the same length or essentially the same length, and the fourth member is at least just as long. Hereby, it is possible to provide a constructively simple bed of great stability, in particular if standard pipes of
20 circular cross-section are used. A non-constrained mounting of the intermediate members also contributes to the simplification of the column. With a circular cross-section, it is also of minor importance whether the intermediate members should rotate about their longitudinal axes during extension/retraction. In addition, it is not decisive for the function whether consistent extension of the members takes place. A great overlap may be
25 achieved in a simple manner by using sleeves in the form of slotted plastics pipes which are applied loosely inwards over the members. The use of a linear actuator with three members is also a low cost drive unit. A length of the stroke of the order of 300 to 500 mm, preferably 350 to 450 mm, also
30 provides a reasonable relationship between mounting dimension and maximum height of the column, while providing easy-to-handle articles in

terms of production.

Further features of the invention will be illustrated in connection with the following description of an embodiment of the invention with reference to
5 the accompanying drawing, in which:

- Fig. 1 shows a longitudinal section of the lifting column in the retracted state, seen from the side,
- 10 fig. 2 shows a longitudinal section of the lifting column in a maximally extended state, seen from the rear,
- fig. 3 shows an exploded view of the lifting column, and
- 15 fig. 4 shows an exploded view of a slightly different structure of the lifting column.

As will appear from the drawing, the column comprises four members arranged telescopically in each other, an outer member 1, two intermediate
20 members 2, 3 and an inner member 4. The lower ends of the two intermediate members 2, 3 and the inner member 4 are provided with an external ring-shaped slide bearing 5 in engagement with the inner side of the preceding member. A ring-shaped internal slide bearing 6 is mounted at the
25 upper end of the outer member 1 and the two intermediate members 2, 3 in engagement with the outer side of the subsequent member. It applies to both sets of slide bearing s that they are secured by pins 7 in a snap lock connection with holes 8 in the members. To compensate for play in the column as a consequence of measurement tolerances of the members, the members are calibrated in the area at the slide bearings 5, 6. The
30 calibration is performed by local deformations of the members at the slide bearing until it engages the subsequent member with the desired bias, as

described in WO 03/047389 to Linak A/S. The deformations are inwards at the upper slide bearing s 6 and outwards at the lower slide bearings 5. For this purpose, the ring-shaped slide bearings 5, 6 are slotted so that the circumference conforms to the subsequent member. As a termination, a
5 ring 9 is applied to the top of the outer member 1 and the two intermediate members 2, 3, said ring having an external collar covering the deformations, the holes for the attachment pins of the slide bearing s and the upper edge of the slide bearings 6. This results in a more dirt-repelling surface and improves the imperviousness to ingress of moisture.

10

To achieve great stability, the individual members have a great overlap in the extended position, which is determined by spacers 10 in the form of slotted plastics pipes inserted over the members 2-4. When e.g. the inner member 4 is extended, the spacer 10 will be captured between the upper
15 edge 5a of its slide bearing and the lower edge 6a of the upper slide bearing in the subsequent intermediate member 3. The spacers have a thickness, of course, which allows them to be accommodated in the space between the individual members, and are not secured in any manner.

20

The members 1-4 are expediently made by shortening cylindrical standard pipes. The outer and inner members 1, 4 are secured against rotation about their longitudinal axes when they are fixed to the bed. The two intermediate members 2, 3, in contrast, are not secured against rotation and can rotate about their longitudinal axes. On the other hand, there is nothing in the
25 structure that directly cause them to rotate. Since the cross-section is circular, it would moreover also be immaterial whether the members rotated about their longitudinal axes.

30

To bring about the movement of the lifting column, use is made of a three-membered linear actuator 11 having a solid spindle 12 introduced into a hollow spindle 13, which in turn cooperates with a spindle nut at the top of

an upright pipe 14. The actuator is driven by a low volt DC motor 15, typically 24-48 V. The transmission between the motor and the solid spindle is a worm gear. The actuator is inserted into the column, where it is fixed between a bottom plate 1a in the outer member 1 and the ceiling of a motor housing 16. The actuator is fixed in the bottom plate 1a in that the upright pipe 14 is screwed firmly on by two screws. At the upper end of the actuator, a plate-shaped shim 18 is inserted inwards over a ring-shaped projection 17 just below the transmission, said shim resting on a horizontal plate 19 welded to the top of the inner member 4. The motor housing is secured to the plate by screwing, and the upper side of the motor housing internally has two pins which extend into two holes 20, intended for the purpose, in the upper end of the actuator, which is generally plane and rests against the ceiling of the motor housing 16.

The upper frame of the bed rests directly on the plane upper side of the housing and is secured by screws or bolts to the plate 19 through bushings 21 inserted at the four corners of the motor housing. The lifting column is secured to the underframe by inserting the lower end of the outer member 1 down into a bowl-shaped holder which may be clamped around the member.

When the actuator is started, the inner member 4 is ideally extended until the spacer 10 thereon is captured between its slide bearings and the slide bearing on the top of the subsequent intermediate member 3, whereby this is pulled along, and so on until all three members are extended to their full length.

Fig. 4 of the drawing shows an embodiment of the lifting column with a different slide bearing concept. The slide bearing s 23, 24 are secured by clips 25 secured in recesses 26 in the pipe wall. The clips 25 engage an annular groove 23a, 24a in the slide bearing s 23, 24 and thereby secure these. No

calibration as such is carried out, instead the respective slide bearing s 23, 24 are provided in various thicknesses, and a slide bearing having a thickness fitting snugly in the gap is selected. For sealing, a rubber membrane 26 is here arranged between the plate 19 and the motor housing 16. The rubber membrane has integrated therein a small sock 26 which is pulled inwards over the spindle part of the drive unit. It is noted that 27 is an ordinary vent valve of the type used in electronics cabinets to prevent excess pressure. For completeness, it should be noted that 28 is a printed circuit board having a socket which is mounted in the motor housing in connection with the gate 29, and 30 is a plug from a control box with control and power supply.

The lifting column has a mounting dimension of about 350 mm, and with an actuator 11 having a length of stroke of about 400 mm, the height of the lifting column is about 750 mm in the fully extended position. The individual members have a length of between about 270 mm for the inner member and 240 mm for the outer member. The overlap between the individual members is about 110 mm. The diameter of the outer member is of the order of about 110 mm and of the inner member of the order of about 80 mm.

As mentioned before, the actuator has three members 12-14, while there are four telescopic members 1-4, which gives a great overlap and, together with an optional calibration for measurement tolerances, gives a high stability. Since, at the same time, the cross-section is circular, the stability is the same in all directions. As the structure is simple and may be based on standard pipes, the production costs may be kept low.

PATENT CLAIMS

1. A hospital or care bed of the type which comprises a wheeled under-
frame and an upper frame for a mattress, and wherein a lifting column
5 having a plurality of mutually telescopic members are provided below the
bed at each end in the vertical longitudinal centre plane thereof, said lifting
columns having respective ends connected with the underframe and with
the upper frame, respectively, so as to allow adjustment of the height of the
upper frame by activation of a drive unit arranged inside the lifting columns,
10 and wherein the members, at a top end, are provided with an internal slide
bearing (6) for the subsequent internal member and, at a lower end, with an
external slide bearing (5) for the preceding external member, c h a r –
a c t e r i z e d in that the lifting column comprises four members (1-4), of
which at least three successive members (1-3; 2-4) are of the same or es-
15 sentially the same length, and the fourth member (4; 1) is at least just as
long.
2. A bed according to claim 1, c h a r a c t e r i z e d in that the members
have a circular cross-section.
- 20 3. A bed according to claim 2, c h a r a c t e r i z e d in that the members
are made of standard pipes.
4. A bed according to claim 1, c h a r a c t e r i z e d in that the telescopic
25 members (2-4) are provided with spacers (10) to determine the overlap
between the members.
5. A bed according to claim 4, c h a r a c t e r i z e d in that the spacers
(10) cooperate with the slide bearings (5, 6) on the members.
- 30 6. A bed according to claim 4, c h a r a c t e r i z e d in that the spacers

(10) are formed by slotted plastics pipes having a thickness equal to or smaller than the space between two successive members.

5 7. A bed according to claim 4, c h a r a c t e r i z e d in that the spacers (10) are without means for securing these against movements on the members (2-4).

10 8. A bed according to claim 2, c h a r a c t e r i z e d in that the two intermediate members (2, 3) are freely movable in the longitudinal direction between respective slide bearings and without means for preventing rotation about the longitudinal axis.

15 9. A bed according to claim 1, c h a r a c t e r i z e d in that the members (1-4) have a length of the order of 200 to 350 mm, preferably 250 to 300 mm.

10. A bed according to claim 1, c h a r a c t e r i z e d in that the length of the stroke is of the order of 300 to 500 mm, preferably 350 to 450 mm.

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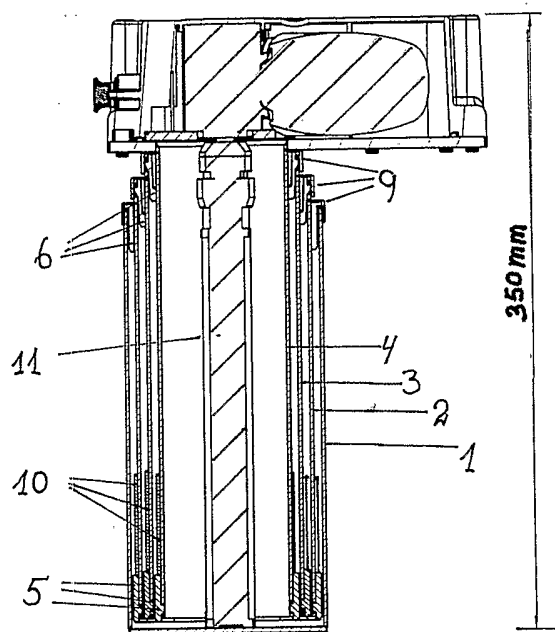


Fig. 1

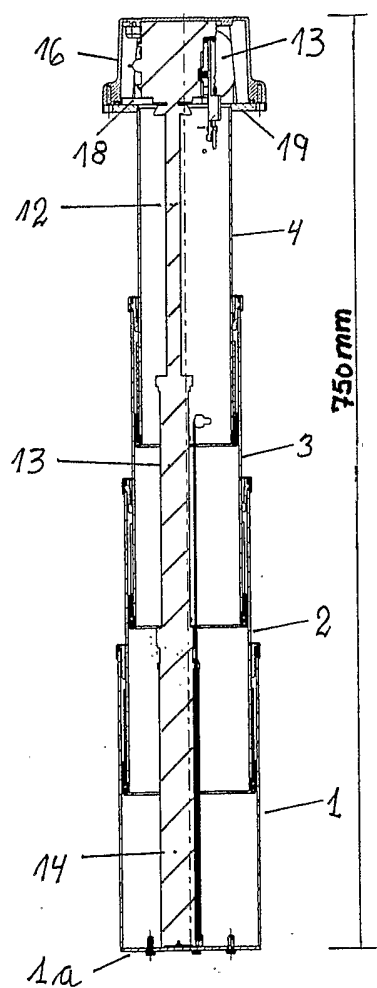


Fig. 2

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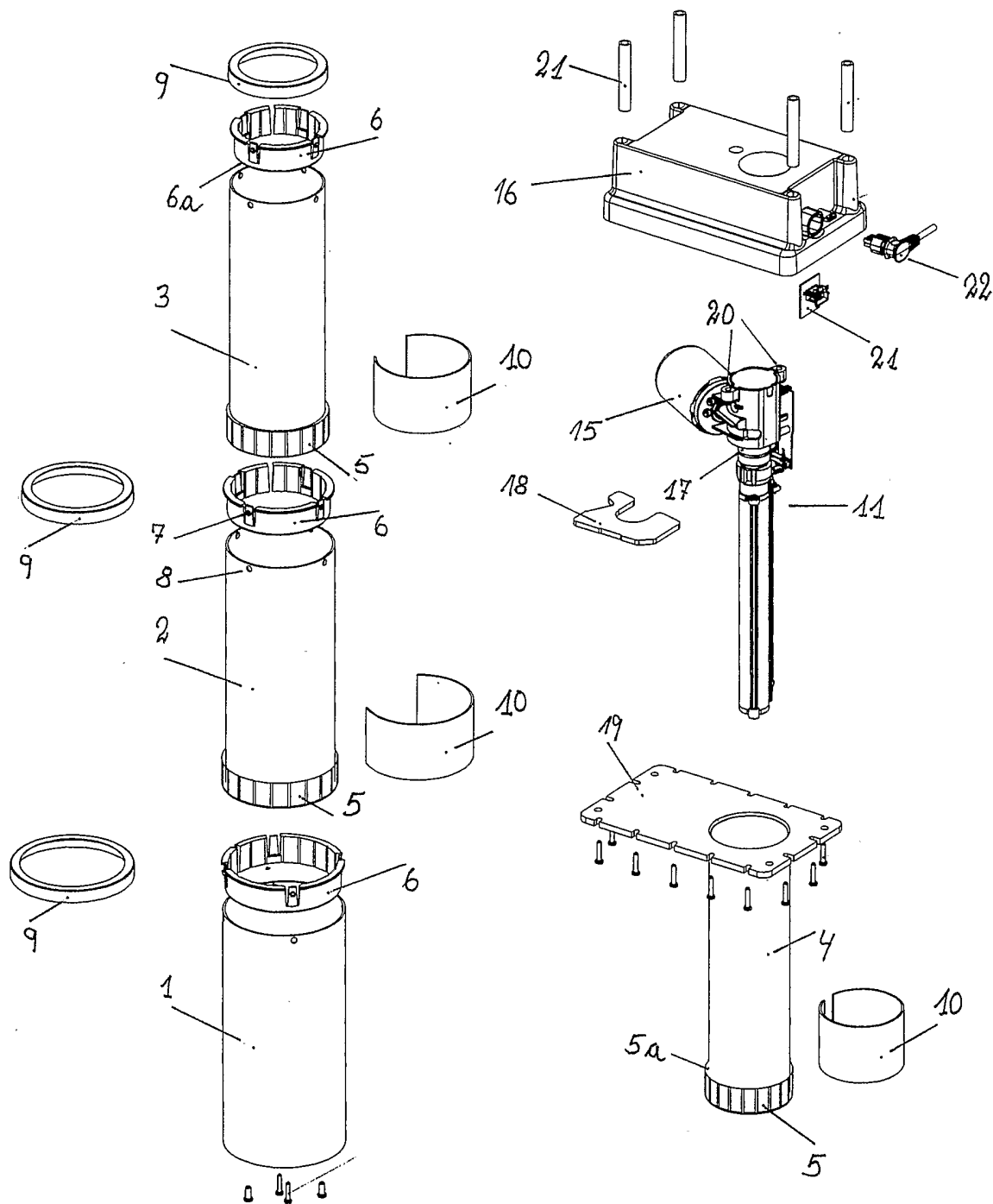
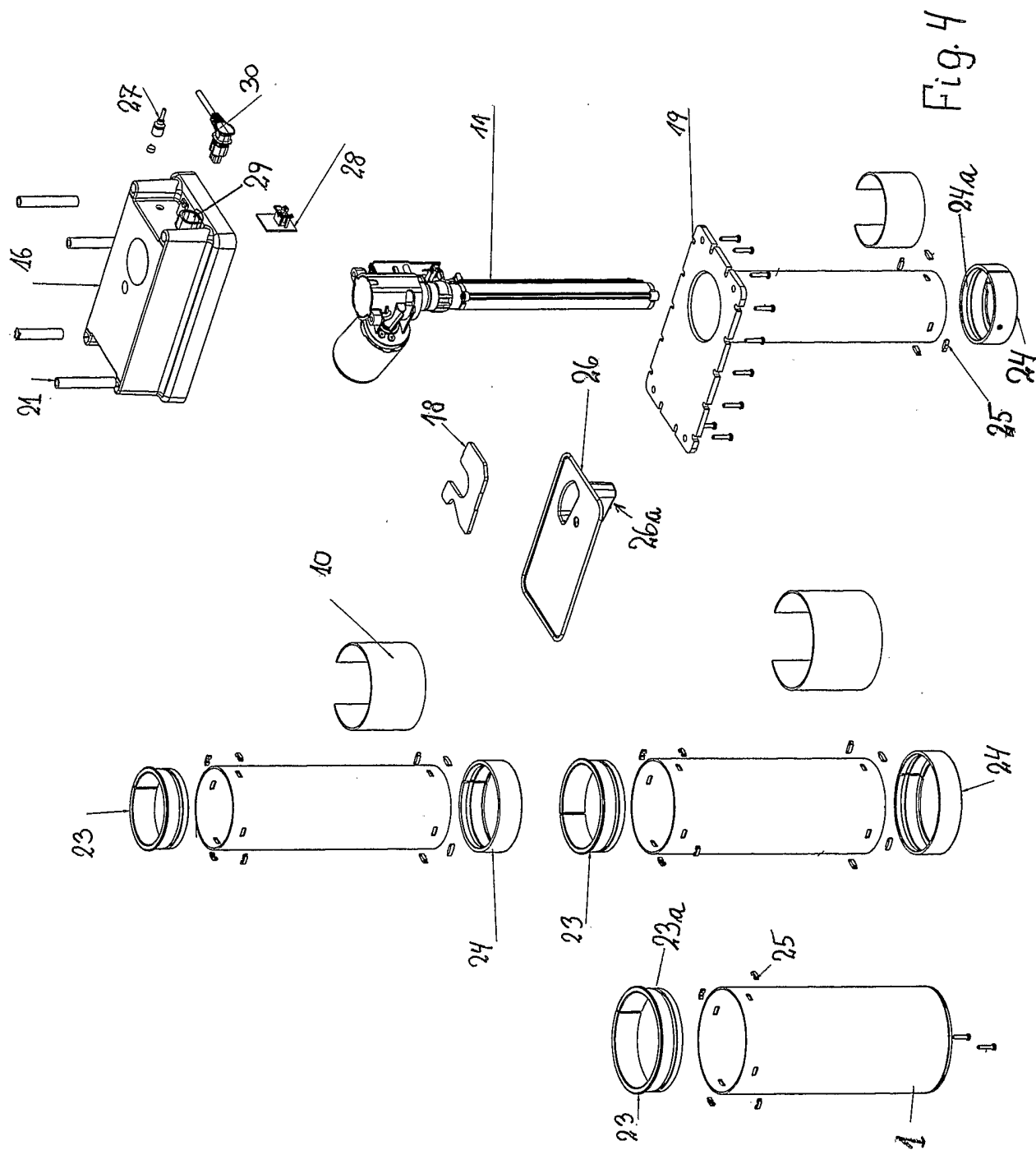


Fig. 3

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 2004/000795

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A61G 7/018

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: A61G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 1230872 A1 (LINAK A/S), 14 August 2002 (14.08.2002), abstract, fig --	1-10
A	WO 03047389 A1 (LINAK A/S), 12 June 2003 (12.06.2003), abstract, fig --	1-10
A	WO 03056976 A1 (LINAK A/S), 17 July 2003 (17.07.2003), abstract, fig --	1-10
A	SE 513249 C2 (MPI TEKNIK AB), 7 August 2000 (07.08.2000), abstract, fig --	1-10

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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INTERNATIONAL SEARCH REPORT

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PCT/DK 2004/000795

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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A	DE 19604549 A1 (VAUTH-SAGEL GMBH & CO), 14 August 1997 (14.08.1997), abstract, fig 6 --	1-10
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