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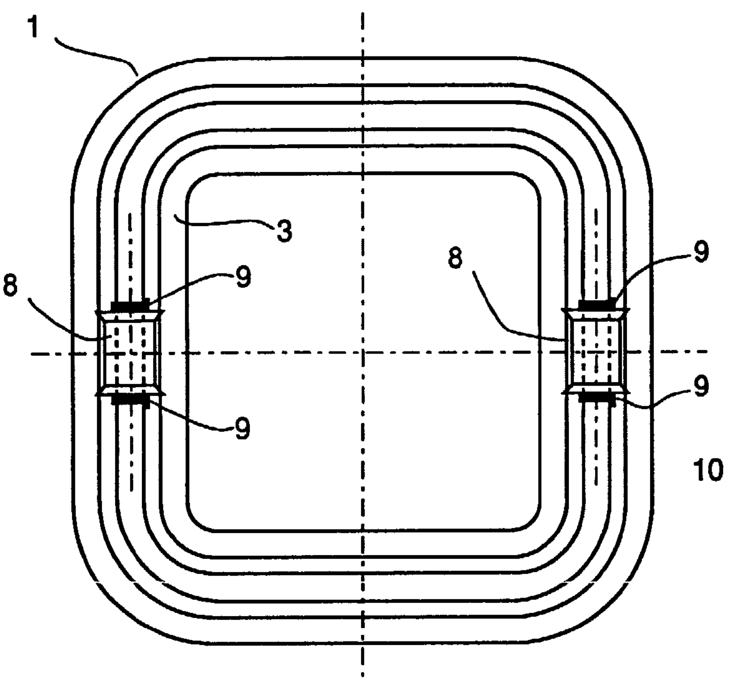
(54) Title: ARRANGEMENT FOR HE SYNCRONISATION OF TELESCOPING TUBES, ITS USE AND A METHOD OF USING SAID ARRANGEMENT



(57) Abstract: Device for controlled telescoping of multistage telescopic tubes in height-adjustable adjusting gear-operated constructions and method of using the device to synchronise the sequence of movements of all moveable and hence visible tube sections (2) of multiple interacting, non-enclosed telescopic tubes (1), essentially characterised in that the tube sections, which are free to move in a multistage telescopic tube and which normally have their sequence of movements uncontrollably influenced by the frictional resistance of the slide bearings, are provided with at least one movement-transmitting guide roller (8) provided with at least two sharp-edged, circular and hardened elevations (10) having a diameter which is greater than the distance between the tube walls of the tube sections most immediately adjacent to the roller, and that said guide rollers are designed, when being assembled into a complete multi-stage telescopic tube, to cut grooves into the tube walls with which they come into contact, and thereby to controllably guide the visible tube sections so that at all times they exhibit a constantly recurring sequence of movements, which at the same time makes it possible in a larger construction to use multiple interacting and identical telescopic tubes, all moveable and hence visible tube sections of which automatically acquire a fully synchronous sequence of movements if all adjusting gear and telescopic tubes in the construction start from a common level.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Arrangement for the syncronisation of telescoping tubes, its use and a method of using said arrangement.

TECHNICAL FIELD

The invention relates to a device for multistage telescopic tubes, frequently used as height-adjustable legs, for example under terminal desks, operating and work tables, patient lifting appliances and beds etc, which are continuously adjustable with the aid manual or power-driven adjusting gear.

The invention relates in particular to a device for producing a controlled telescoping of multistage telescopic tubes forming legs in a construction in which the inner, moveable tube sections lie hidden in the telescopic tubes but become visible as they are extended out from the outer surrounding and immobile tube sections.

The invention also relates to a method, using at least one but preferably more examples of the device according to the invention, fitted in each individual telescopic tube and individually or in concert forming a group of height-adjustable legs in a table construction, for example, of synchronising all individual and visible tube sections of the telescopic tubes with one another, so that within the group they at all times move uniformly and in symmetrical agreement with one another during both raising and lowering movements.

BACKGROUND OF THE INVENTION

Enclosed or visible telescopic tubes are increasingly being used as continuously height-adjustable legs for terminal desks and work tables, beds, operating tables and patient lifting appliances in hospitals and nursing homes etc., their level usually being adjusted by built-in, manual or power-driven adjusting gear.

The main function of the telescopic tubes serving as legs in such constructions is to protect and provide lateral stabilisation for all built-in, continuously adjustable adjusting gear, and when required to be capable of considerable extension to a leg length sometimes more than twice their original length without neglecting the lateral stability of the legs.

For various reasons the telescopic tubes of the legs are enclosed and hidden. This may be in order to create an individual leg design, but just as often it is done in order to hide the fact that the moveable tube sections in two or more visible legs do not always follow one another uniformly and synchronously during the raising and lowering movement, even if the level is adjusted equally on all the legs. The inner moveable tube sections follow the law of least frictional resistance and this almost always means that one or more sections will get out of step with the others.

Constructions having only two legs are furthermore provided with a foot construction aligned forwards and backwards transversely to the longitudinal direction of the table and projecting out from each leg along the floor, thereby eliminating the risk of the table tipping over. In order to guide and lock the foot construction transversely, even if the table is moved on the floor, circular tube sections must be provided with rotational stops or made oval and in themselves not rotatable.

Using one or preferably more of the device according to the invention as described below it is possible to mechanically or automatically synchronise the sequence of movements of all visible tube sections forming part of a group of telescopic tubes designed to interact as height-adjustable legs in a table construction, thereby eliminating the need for more expensive enclosure. The device according to the invention also makes it possible to use circular tube sections without the risk of unwanted rotation of the foot construction when moving along the floor.

SUMMARY OF THE INVENTION

The device according to the invention in telescopic tubes proceeds from the prior are set forth in the pre-characterising clause of claim 1, and is essentially characterised in that the tube wall of at least one of the inner, moveable tube sections in a telescopic tube is provided with at least one hole and that a fastener is pressed into each such hole, the fastener having a cavity designed for the fixing and low-friction guidance of a freely rolling guide roller.

The device according to the invention is further characterised in that each guide roller has two or more circular, sharp-edged elevations, symmetrically distributed from the outer ends and all having an outside diameter somewhat larger than the distance between the inner wall of the next outer tube section and the outer wall of the next inner tube section.

The device according to the invention is further characterised in that the material in the guide rollers is always harder than the material in the tube sections.

The method according to the invention for synchronising the sequence of movements of all visible tube sections of multiple interacting telescopic tubes is essentially characterised in that guide rollers of the device according to the invention in each individual telescopic tube have so large a diameter over their hard, sharp-edged and circular elevations that when the tube sections are pushed into one another forming a complete telescopic tube the guide rollers cut into and form durable grooves in the nearest adjacent tube walls and create a significantly greater frictional contact between the guide rollers and the tube walls than the friction created by the spacing and lateral stability bearings against the tube sections, and that with the least upward or downward movement of the adjusting gear all guide rollers begin to rotate in their respective fasteners and to roll in the grooves on the tube walls of the surrounding sections, and by way of the fasteners press and entrain the moveable tube section in the same direction and at half the rate of the adjusting gear.

The method according to the invention is further characterised in that all moveable tube sections provided with guide rollers of the same diameter on the elevations also always have an identical sequence of movements in relation to surrounding tube sections when they follow the adjusting gear in a raising or lowering movement, and that all visible tube sections that form legs in two or more interacting telescopic tubes thereby also move synchronously in relation to one another.

The device according to the invention and the method of synchronising the sequence of movements of visible tube sections of all telescopic tubes are defined in the patent claims attached.

The invention will be described below, starting first with the effects that can occur, for example, in a conventional table construction having height-adjustable adjusting gear built into two visible legs of telescopic tubes where these do not contain the device according to the invention, and thereafter describing in more detail two non-limitative examples of the device fitted in telescopic tubes having square and circular tube sections respectively, and finally in very general terms how the device automatically affects the sequence of movements of all such telescopic tubes and is therefore capable of synchronising individual movements of all visible tube sections when multiple telescopic tubes must interact.

The same consecutive reference numbers are used throughout the figures.

DRAWING

Figs. 1a and 1b symbolically show the leg of a conventional height-adjustable table construction, the legs of which consist of entirely visible two-stage telescopic tubes (1), each concealing an internal power-driven (5) adjusting gear. The telescopic tube (1) stands on a foot construction (6) projecting forwards and backwards along the floor transversely to the longitudinal direction of the table top (4), in order to give the table the necessary stability. In Fig. 1a the telescopic tube is fully nested, whereas Fig. 1b shows the telescopic tube fully extended so that the two inner tube sections (2, 3) are also visible. In this case the inner tube section (3) is fixed both to the motor (5) and to the table top (4) and therefore always follows the movement of the adjusting gear up and down at the same rate. All the tube sections are kept separated from one another by precision-made slide bearings, which constitute spacers and create the required lateral stability. The slide bearings, however, are not shown here.

Between the slide bearings and the tube walls, a friction is generated which varies with the precision of the two slide bearings and tube sections. This can mean as a result that the moveable tube section (2) may remain either entirely or partially in the telescopic tube (1) until such time as the entire upper tube section (3) has been fully drawn out by the adjusting gear before it brings the moveable tube section (2) with it. On the other hand, the friction between the moveable tube section (2) and the inner tube section (3) moving with the table may be so great that these fully or partially accompany each other until the middle tube section (2) is fully drawn out of the telescopic tube (1) before starting to draw the innermost tube section (3) out. Both of these extremes and all variants between them may occur depending on the individual friction of the slide bearings against the tube walls.

Fig. 2 therefore symbolically shows how non-enclosed and hence entirely visible tube sections can get out of step (7) with one another when two or more telescopic tubes must interact in a height-adjustable table construction. Such a simple reason alone has hitherto meant that the telescopic tubes have had to be enclosed and hidden. Fig. 2 also shows how circular tube sections in telescopic tubes without rotational stops can twist so that, if the table is dragged along the floor, the foot construction (6) shifts into the wrong position and can cause the table to become unstable and even topple over.

All figures numbered from 3 upwards describe in increasing detail the device according to the invention double-fitted in telescopic tubes with square and circular tube sections respectively. In the case of single fitting the device may be located anywhere. In the case of double fitting, although not essential it is recommended that the two devices be fitted at the same height and diametrically opposite one another. In the case of multiple fitting they should also be fitted ay the same height and their positions distributed symmetrically or with equal spacing around the circumference of the tube section.

Fig. 3 therefore shows a cross-section through the guide roller (8) and fastener (9) of the device according to the invention double-fitted, each in its recess on either of two diametrically opposite sides in the moveable tube section (2) of a square, two-stage telescopic tube (1). The square space in the inner tube section (3) is designed to accommodate a two-stage, power-driven adjusting gear.

Fig. 3b in a section at right angles to the tube wall of the moveable tube section (2) shows how the guide rollers (8) are each pressed into and fastened so that they are free to roll in their respective fasteners (9), which are in turn pressed into the matching recesses in the moveable tube section (2).

Fig. 3c in a partially enlarged cross-section further shows how the two sharp-edged elevations (10) of the guide roller (8), the diameter of the elevations being greater than the distance between the nearest adjacent tube walls, cut grooves into the inner wall of the telescopic tube (1) and the outer wall of the inner tube section (3).

Figs. 4a, 4b and 4c show, in a comparable way, an example of the guide roller (8) and fastener (9) of the device according to the invention double-fitted, each in its respective recess on either of the two diametrically opposite sides in the moveable tube section (2) in a circular, two-stage telescopic tube (1).

Fig. 4c, in a partially enlarged cross-section, likewise shows how the guide roller (8), here provided with three sharp-edged elevations (10), the diameter of which is greater than the distance between the nearest adjoining tube walls, cuts two grooves into the inner wall of the telescopic tube (1) and owing to the circular design of the tube sections cuts only one groove in the outer wall of the inner tube section (3).

Fig. 5 symbolically shows a cross-section through one half of a compressed two-stage telescopic tube (1) containing the guide roller (8) according to the invention, fitted in its fastener (9) and pressed into the recess in the moveable tube section (2) intended for this purpose. The inner tube section (3) is securely connected to the motor (5) of the adjusting gear (11) located along the centre-line, and the table top (4) is furthermore securely connected to the motor (5). The outer visible tube section of the telescopic tube (1), here shown without the foot construction (6) previously described , remains immobile on the floor at all times, and since the inner tube section (3) always follows the motor and the table top as soon as the adjusting gear commences its raising movement, there is in this example only one moving tube section (2), which without the aid of the device according to the invention would move uncontrollably and independently of the other tube sections. From a further consideration of the device according to the invention in this figure, it will be appreciated that it is the friction of the slide bearings against the tube walls which determines when and at what rate the moveable tube section (2) is uncontrollably entrained in the sequence of movements of the adjusting gear.

Fig. 6 therefore finally shows a symbolic cross-section through one of two or more interacting two-stage telescopic tubes (1) in a power-driven height-adjustable table construction, in which the hard, sharp-edged elevations on the guide rollers (8) of the device according to the invention are given a diameter which is so large that even in the telescopic tube assembly stage these elevations inevitably cut into and make durable grooves in the softer wall material of the nearest adjacent tube sections. The friction between the sharp-edged elevations of the guide rollers (8) and the grooves in the tube walls thereby becomes so great that, simply by rotating in their fasteners (9), and thereby rolling in the grooves like gears on a geared rack, the guide rollers are capable of carrying the moveable tube section (2) with them in the direction of movement of the adjusting gear.

It can also be seen from Fig. 6 that when the adjusting gear (11) and the inner tube section (3) are moving upwards the guide rollers (8) then take on a direction of rotation (12, 13) such that they begin to "climb" upwards in the grooves on the inside of the inner wall of the telescopic tube (1) immobile on the floor, at a controlled rate (14) equal to just half the rate (15) at which the adjusting gear (11) is moving. All other similarly designed interacting telescopic tubes (1) in a height-adjustable table construction will therefore also automatically exhibit just the same, that is to say fully synchronised, sequence of movements for the constituent moveable tube sections (2), which all become visible as soon as the adjusting gear starts upwards and are then seen continuously through the downward movement.

The sharp-edged elevations, which previously cut grooves into the tube walls, also form effective rotational stops, so that even circular telescopic tubes can be used without a risk of any foot constructions being twisted out of their positions if the table is moved along the floor.

CLAIMS

1. Device for controlled telescoping of multistage telescopic tubes (1), intended to conceal, protect and provide lateral stabilisation for adjusting gear, manual or power-driven, and continuously adjustable as legs in height-adjustable constructions such as terminal desks, operating and work tables, patient lifting appliances and beds etc., **characterised in that** the device comprises at least one guide roller (8) which is pressed into but left free to roll in a fastener (9), which on two opposing sides leaves a part of the circumferential surface of the roller exposed, and that each guide roller (8) with associated fastener (9) is pressed into and fixed in a recess, shaped to accommodate the fastener, in the tube section (2) that is freely moveable in relation to other tube sections if the telescopic tube is two-stage, and that each guide roller (8) is provided with two or more sharp-edged and circular elevations (10), symmetrically distributed from the outer ends and the diameter of which is greater that the distance between the outer wall of the next inner tube section (3) and the inner wall of the next outer tube section (1), the guide rollers (8) being designed when fitting the tube sections (2,3) in the telescopic tube (1) to cut durable grooves into the tube walls with which they come into contact, and thereafter being compelled to roll in these grooves and by way of their associated fasteners (9) to press and controllably entrain the moveable tube section (2) in the direction of movement of the adjusting gear (11), at a constant rate of movement (14), which for a two-stage telescopic tube is always equal to half the actual rate (15) of the adjusting gear.

2. Device for controlled telescoping according to Claim 1, **characterised in that** each guide roller (8), or at least sharp-edged, circular elevations thereof are made of or hardened to a material harder than the material in the tube sections.

3. Device for controlled telescoping according to Claim 1 and 2, **characterised in that** each guide roller (8) with associated sharp-edged circular elevations (10) is designed when being fitted to cut such deep grooves into the tube walls of the adjoining tube

sections (1, 3) that these rollers and groves together form adequate rotational stops for telescopic tubes based on circular tube profiles.

4. Use of a device for controlled telescoping according to Claims 1 to 3, **characterised in that** at least one such device is fitted in each of the tube sections, free to move in relation to the other tube sections, in a three or multi-stage telescopic tube, each additional and freely moveable tube section beyond that required for a two-stage telescopic tube having its controlled rate of movement further halved.

5. Method using a device for controlled telescoping according to Claims 1 to 4 in order to synchronise the sequence of movements of moveable and hence visible tube sections (2) of non-enclosed and interacting telescopic tubes (1) in a construction continuously height-adjustable by means of an adjusting gear, in which all telescopic tubes (1) of the construction are of equal length and always equal in number, but at least two in number, internal tube sections (2, 3) or so-called telescoping stages, and all internal tube sections occupying the same place in the respective telescopic tube are of equal length, **characterised in that** all the tube sections (2) which are free to move in each telescopic tube (1) are provided with at least one device for controlled telescoping, before they are pushed together with their inner tube section and are thereafter together pushed into the external telescopic tube, guide rollers (8) of the device with their sharp-edged, circular and hardened elevations (10) cutting grooves in the tube walls with which they come into contact, and thereafter at all times guiding all moveable tube sections of the telescopic tube in a constantly recurring sequence of movements, multiple identical telescopic tubes of this design interacting in a construction also causing all moveable and hence visible tube sections to move synchronously by simultaneously starting all adjusting gear and telescopic tubes in the construction from a common level.

Fig. 1b

Fig. 1a

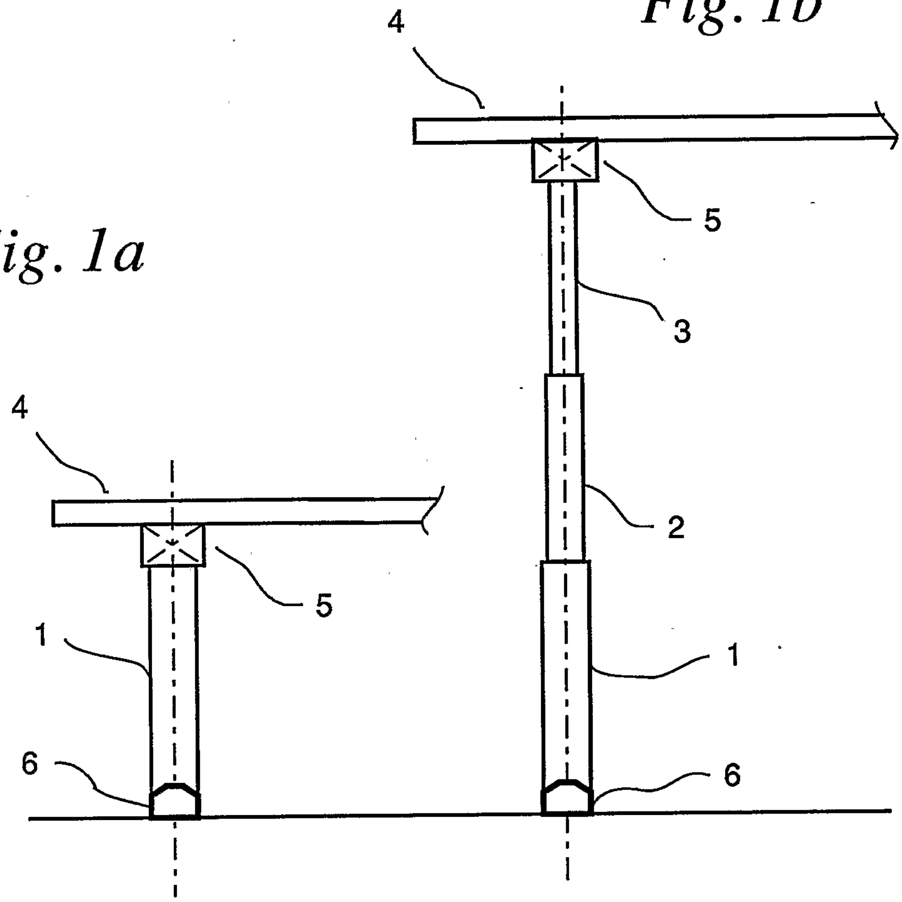


Fig. 2

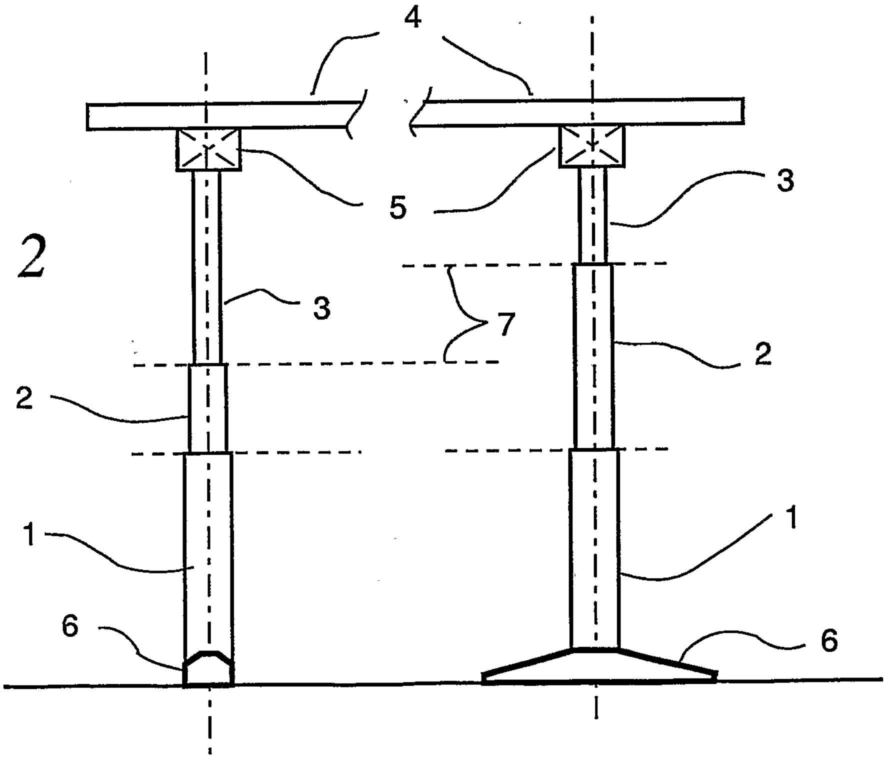


Fig. 3a

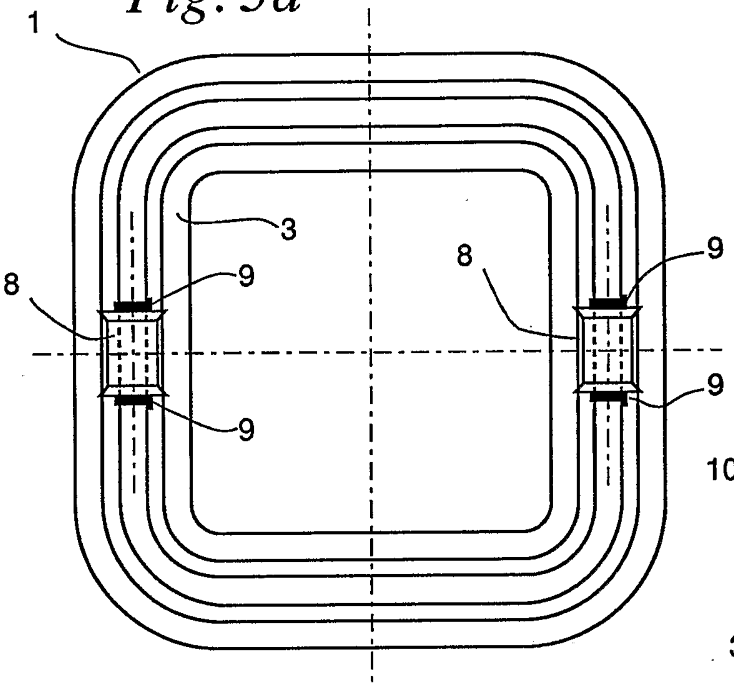
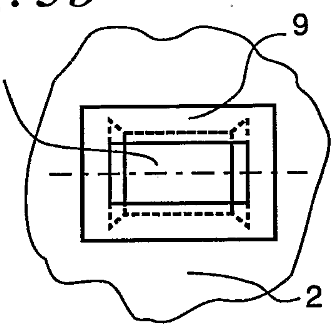


Fig. 3b



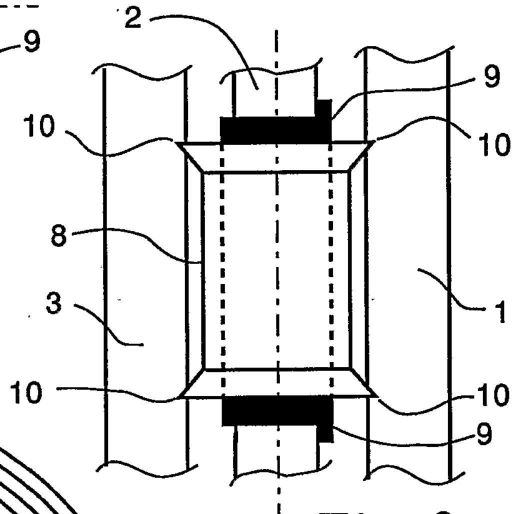


Fig. 3c

Fig. 4a

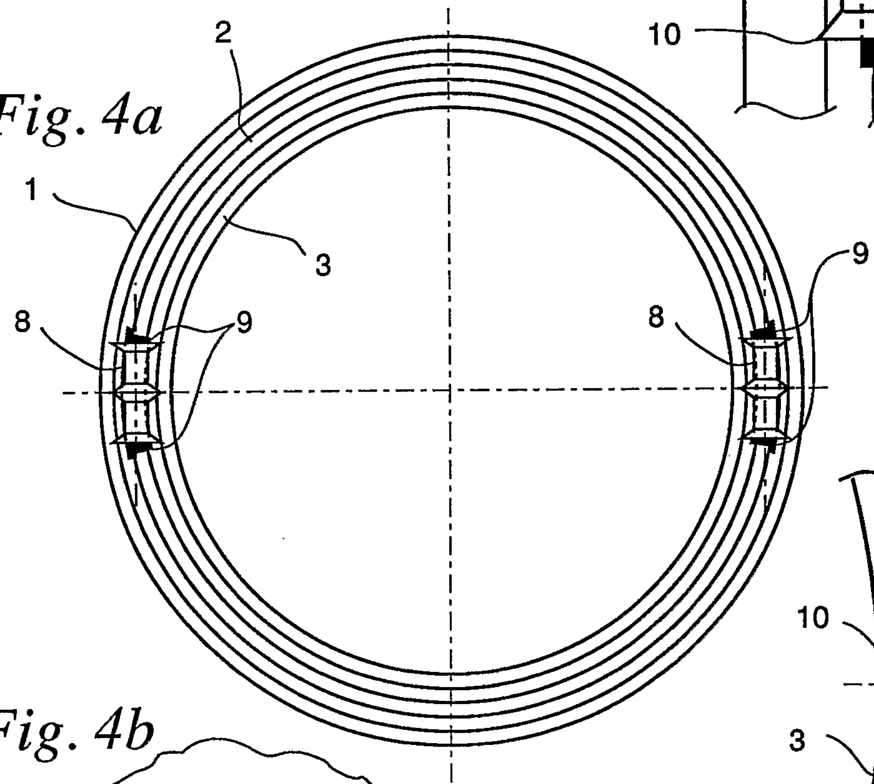
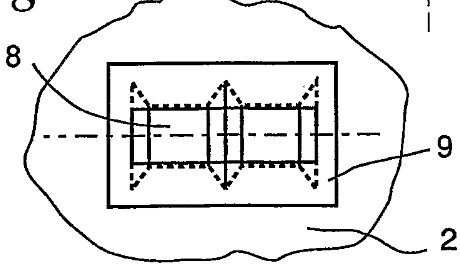


Fig. 4b



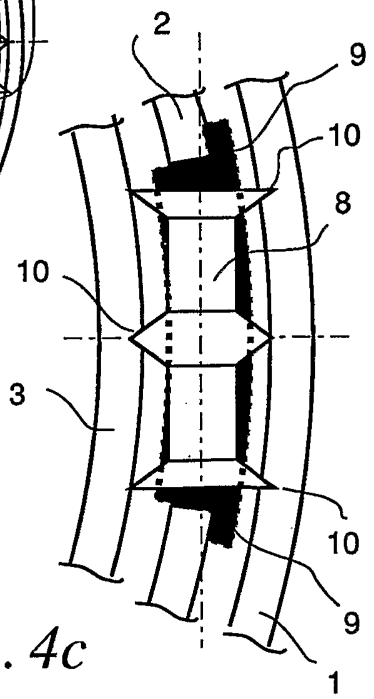


Fig. 4c

Fig. 6

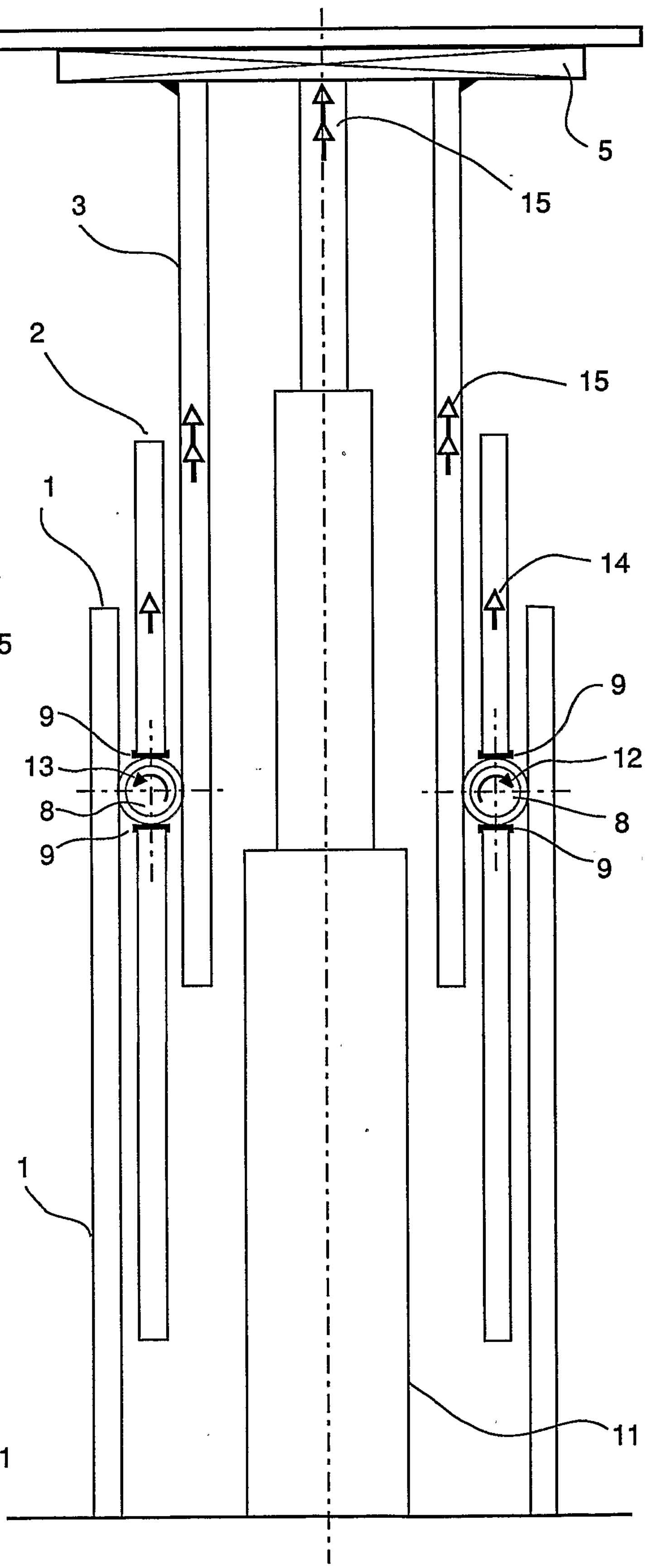
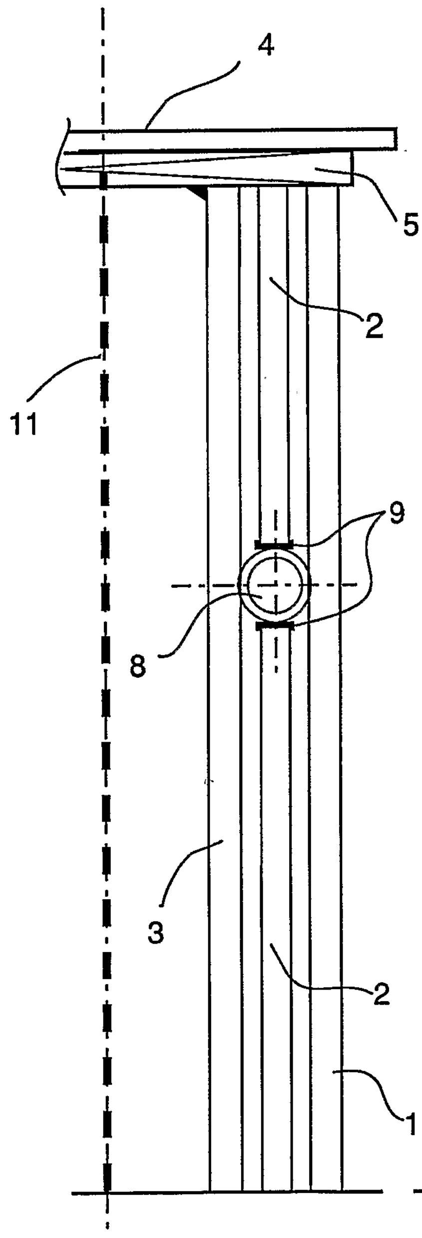


Fig. 5



INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 2003/001717

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A47B 9/20

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: A47B, B25H

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 20104662 U1 (SPITZNER, LOTHAR), 25 October 2001 (25.10.2001), whole document --	1-5
A	DE 29705117 U1 (OELSCHLÄGER METALLTECHNIK GMBH), 3 Sept 1998 (03.09.1998), whole document -- --------	1-5

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Date of the actual completion of the international search	Date of mailing of the international search report
5 February 2004	17 -02- 2004
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Leif Vingård / JA A Telephone No. +46 8 782 25 00

DE	20104662	U1	25/10/2001	NONE
DE	29705117	U1	03/09/1998	NONE