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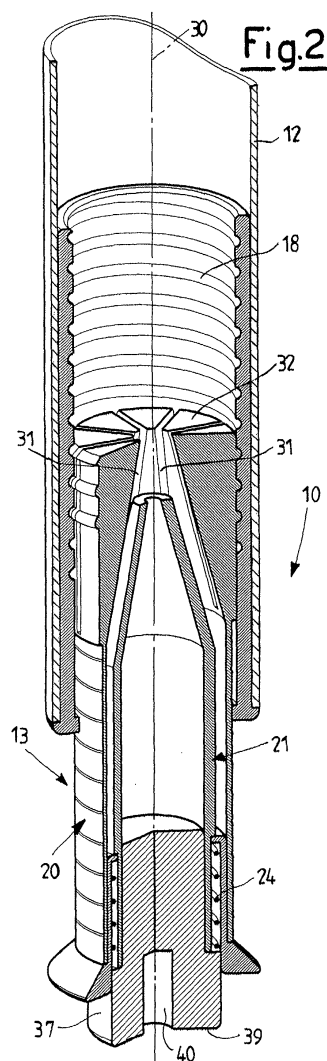
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(54) **Height-adjustable leg for a support surface**

(57) A height-adjustable leg (10, 10', 10'') for a support surface comprises an adjustment device (13, 13') in engagement in a tubular portion (12) of the leg, where said adjustment device (13, 13') is made up of a bush (14, 14') and a foot. Said foot is equipped with adjustment elements, locking elements and elements for resting upon the floor, where: elements for a fast adjustment consist of matching engagement means present on said bush (14, 14') and on an elastic portion (25) of an adjustment sleeve (20, 20'), the engagement means of which can translate step by step along a vertical axis (30) when said leg is in an unloaded rest position, whereas they are forced by expansion by said locking elements into a loaded working position. Said locking elements comprise an expansion stem (21), mobile between rest and working positions, having a shape matching that of said elastic portion (25), as well as a threaded connection for a fine adjustment through rotation.



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Description

[0001] The present invention refers to a height-adjustable leg for a support surface, particularly but not exclusively for tables, desks or work stations.

[0002] As is well known to experts in the sector, the market requires to be able to have support surfaces, the height of which can be adjusted by the user with extreme ease and precision.

[0003] Indeed, there is currently a growing awareness of users with regard to the ergonomic requirements of a work station.

[0004] The health and safety standards regarding those who have to stayed seated for many hours at a desk or at a work station also give greater emphasis to these requirements.

[0005] Great importance is also given to the possibility of adjusting the height of tables used by children, in order to gradually follow the growth of the child and avoid the onset of deformations of the spine.

[0006] Adaptability to the growth of a child, as well as variability in the height of individual persons and the difference between the average heights of different populations make it necessary to be able to have a fairly wide field of adjustment.

[0007] Particular attention must also be given to the stability of a support surface supported by height-adjustable legs.

[0008] Above all, in the case of work tables, the legs are, indeed, subjected to substantial loads both right on top and at the sides.

[0009] Support surfaces are also frequently subjected to vibratory stresses, for example produced by printers or machines which include moving parts.

[0010] A height-adjustable leg which ensures a stable connection in all conditions of use must not, however, be detrimental to its aesthetics, which has become essential also in the field of office furniture.

[0011] Currently, there are legs for support surfaces which use a screw-mother screw connection to carry out the height-adjustment between two telescopic tubular portions of the leg. To fix the leg in the desired position a locking device is often used, for example of the clamp type or of the pin type, which interferes with the mobile parts.

[0012] Alternatively, a second type of height-adjustable leg available on the market foresees adjustment through the translation of two telescopic tubular portions of the leg. The arrangement of a suitably shaped guide with stop seats for a pin takes on the height-adjustment and stop functions.

[0013] Plastic material has been used to make the coupled adjustment elements achieving a good compromise between stability of connection and costs linked to mechanical treatments, which are higher for metallic materials.

[0014] The types of legs described are, nevertheless, unsatisfactory in particular in terms of the ease of ad-

justment of the leg. Indeed, it is would be helpful, for example, to make the adjustment fast and therefore easy even if the support surface, which must be lifted during the adjustment operation itself, is already loaded.

[0015] Moreover, the adjustment should be able to be carried out through a small number of operations and above all without having to remove elements such as pins or the like.

[0016] The general purpose of the present invention is that of overcoming the aforementioned drawbacks of the prior art in an extremely simple, cost-effective and particularly functional way.

[0017] Another purpose is that of realising a height-adjustable leg for a support surface, suitable for realising tables, desks or work stations.

[0018] In view of the aforementioned purposes, according to the present invention, it has been thought of to realise a height-adjustable leg for a support surface, having the characteristics outlined in the attached claims.

[0019] The structural and functional characteristics of the present invention and its advantages compared to the prior art shall become even clearer from the following description, referring to the attached drawings, which show a height-adjustable leg for a support surface realised according to the innovative principles of the invention itself.

[0020] In the drawings:

- figure 1 shows a perspective view of a height-adjustable leg for a support surface, object of the present invention;
- figure 2 shows the leg of figure 1 partially sectioned;
- figure 3 is an exploded partial section assembly view of an adjustment device of the leg of figure 1;
- figures 4 and 5 are cross sections of a first embodiment of an adjustment device applied to a height-adjustable leg in rest position and in working position;
- figure 6 shows a adjustable leg to which a wheel is applied;
- figure 7 shows an adjustable leg equipped with an aesthetic covering element;
- figures 8 and 9 are section views of a second embodiment of an adjustment device for an adjustable leg adjusted on two different heights;
- figures 10, 10a and 11 show a second embodiment of the height-adjustable leg, in a section and front view, respectively;
- figures 12, 12a and 13 show a third embodiment of the height-adjustable leg, in a section and front view, respectively.

[0021] With reference to the drawings, a height-adjustable leg for a support surface in object is wholly indicated with 10 in the illustrated example according to a first embodiment of the present invention and comprises a tubular end portion 12, for example made from

metal or another material, at the base of which an expanding adjustment device 13 is applied.

[0022] The adjustment device 13, according to a first proposed embodiment, shown in figure 1 and partially sectioned in figure 2, comprises a bush 14, capable of being inserted in the free end of the tubular portion 12 of the leg, and a height-adjustable foot.

[0023] In the embodiment shown for illustrative purposes in the exploded assembly view of figure 3, the bush 14 is equipped with longitudinal ribs 16 to carry out the forced connection inside the tubular portion 12 of the leg 10 which is positioned in abutment against a protruding collar 17.

[0024] The bush 14 and an adjustment sleeve 20, housed inside it, are also equipped with matching engagement means which in a first embodiment consists of a connection between respective threaded portions 18 and 26.

[0025] The threading, which in the example is realised on parts made from plastic material, has rounded ridges and a long pitch.

[0026] The foot consists of many coaxial parts capable of moving along a vertical axis 30 including the adjustment sleeve 20 and a locking element and an expansion stem 21. These are integral with means for resting upon the floor, respectively consisting of a support ending 22 and a contour follower element 23, which enclose a return spring 24.

[0027] The adjustment sleeve 20 has an elastic upper portion 25, with an outer cylindrical generatrix and an inner frusto-conical generatrix, tilted with respect to a vertical axis 30 by an angle α , which combines with the stem to realise the expansion lock.

[0028] A tubular lower portion 27, protruding from the leg by a variable amount with the adjustment height, on the other hand is preferably equipped with notches and/or reference numerals 28 which show the adjustment height.

[0029] The elastic portion 25 consists of a wall 29, equipped with cuts 31, which extend radially from the axis 30 on an upper face 32 of the elastic portion 25, and which thus divide it into wedges.

[0030] The expansion stem 21 ends at the top with a frusto-conical portion 33, matching the inner surface of the elastic portion 25, in other words tilted by the same angle α with respect to the axis 30.

[0031] At the bottom, the expansion stem 21 has a tapered portion 34 which constitutes an abutment surface 35 for the ending 22.

[0032] The contour follower element 23 is made up of a first cylindrical portion 36, which engages stably by force-fit in the expansion stem 21, and of a second cylindrical portion 37 with a greater diameter, which realises an annular abutment surface 38.

[0033] The surface for resting upon the floor 39 of the contour follower element 23 foresees, in the embodiments shown, a seat 40 for housing an accessory 41, for example for a felt piece or for a wheel (figure 6).

[0034] The spring 24 which adjusts the relative movements between sleeve 20 and stem 21 is housed in a seat 44 located between the tapered portion 34 of the expansion stem 21 and the cylindrical wall of the ending 22. The points of application of the action of the spring 24 consist of the abutment surface 38 of the contour follower 23 and an annular collar 42 of the support ending 22.

[0035] To increase the contact surface with the floor and thus to ensure maximum stability, the support ending 22 finally has a widened base 45 which can be variously shaped according to aesthetic preferences, and which can adapt to the coupling with a covering element 46, shown in figure 7, slotted over the adjustable foot in order to hide the functional components to improve its aesthetics.

[0036] Figures 8 and 9 show section views of a second embodiment of the expanding adjustment device 13' connected to a tubular end portion 12 of a height-adjustable leg 10. The following description is limited to the constituent elements which are different with respect to that which has already been illustrated.

[0037] A bush 14', slotted over the tubular end 12 of the leg 10 and an elastic portion 25 of an adjustment sleeve 20' are equipped with matching engagement means, consisting of parallel grooves 47 and one or more parallel ribs 48.

[0038] A contour follower element 23' is equipped with an extension cylinder 50 coupled at the bottom through a threaded connection 49. To carry out the fine height-adjustment operations of the leg it is, indeed possible to place the extension cylinder 50 in rotation, modifying the distance of the contour follower 23' from the floor (figures 8 and 9).

[0039] The operation of the height-adjustable leg for a support surface 10, object of the present invention, is described upon the basis of figures 4 and 5, wherein the leg 10 is respectively represented in unloaded rest position, lifted above the floor, and in loaded work position, rested upon the floor.

[0040] In rest position it is possible to carry out both a rapid adjustment through translation according to the arrows X, and a fine adjustment through rotation according to the arrows R, as schematised in figure 4.

[0041] Some possible positions taken up by the adjustable foot, following adjustment operations to modify the height of the leg are schematised with dashed outlines.

[0042] The rapid adjustment is realised by applying an axial action in the desired direction X on the tubular portion 27 of the adjustment sleeve 20, causing its translation by one pitch at a time in the bush 14.

[0043] By effect of the return spring 24, the expansion stem 21 is disengaged from the elastic portion 25 of the sleeve 20, and therefore the respective matching engagement means, which hold the sleeve in position, are not force-fitted together with high friction, constituting a loose constraint.

[0044] The rounded profile of the threads promotes the disengagement of crests and grooves of the threaded portions 18 and 26 which allows the progressive translation by one pitch. This is possible thanks to the presence of the cuts 31 in the wall 29, which promote its flexion in the direction of the vertical axis 30, as schematised by the arrows F.

[0045] When the leg 10 is rested upon the floor (figure 5) the weight of the support surface applied through the tubular portion of the leg 12 to the bush 14 causes the progressive engagement of the wall 29 equipped with a frusto-conical inner surface against the frusto-conical portion 33 with a shape which matches that of the expansion stem 21. The descending motion of the bush under the action of the load also determines the compression of the spring 24, until the base 45 of the ending 22 is rested upon the floor.

[0046] The expansion of the elastic portion 25 forces the threaded portion 26 against the threaded part 18 of the bush 14, creating a friction force which stably locks the expansion adjustment device 13 in the desired position.

[0047] The fine adjustment, on the other hand, is realised by intervening on the threaded portions 18 and 26 through rotation, in particular this is possible both in rest position and in working position with the leg loaded.

[0048] The operating principle of the second embodiment of the expansion adjustment device 13' is totally unchanged.

[0049] The rapid adjustment is carried out by making the parallel ribs 48 of the elastic portion 25 translate by one pitch in the parallel grooves 47 of the bush 14'.

[0050] The fine adjustment, schematised in figures 8 and 9, on the other hand, is carried out by rotating, through 50, the threaded connection 49 of the contour follower element 23'.

[0051] Figures 10-13 show two further embodiments of a height-adjustable leg for a support surface, object of the present invention, respectively indicated with 10' and 10".

[0052] These are two embodiments in which there are additional functional elements to that which has been described, which allow the rapid and/or fine adjustment operations to be carried without having to bend down.

[0053] Figures 10 and 11 show a height-adjustable leg 10' for a support surface, equipped with a handle device 52 for applying the axial action according to the arrows X near to a support plane 11.

[0054] The handle 52 is connected at one or more points, for example through dowels 53, to a telescopic tubular element 54 housed inside the tubular portion 12 of the leg. A free end of the element 54 engages with the elastic portion 25 of the adjustment sleeve 20 so as to allow the relative rotation, but to transfer the axial action applied on the handle 52 according to the arrows X.

[0055] In this embodiment the tubular portion 12 of the leg is equipped with a longitudinal fissure 55 which allows the sliding of the dowels 53 with respect to the leg

itself.

[0056] The fine adjustment is carried out by rotating the lower part of the foot, according to that which has already been described.

[0057] A further embodiment, identified with 10", of a height-adjustable leg, object of the present invention (figures 12 and 13) allows both of the adjustments to be realised without bending down. Indeed, a tubular coating 56, bound at the bottom to the tubular portion 27 of the adjustment sleeve 20, is slotted over the tubular portion 12 of the leg.

[0058] The binding, for example a fixed joint, must transfer both the translational action and the rotary action applied by the user in any point of the tubular coating 56 to the sleeve.

[0059] From that which has been described above with reference to the figures, it is clear how a height-adjustable leg according to the invention is particularly useful and advantageous. The purpose mentioned in the preamble of the description is thus achieved.

[0060] Indeed, as well as allowing an easy and precise adjustment of the height of the leg and having very simple and appreciable aesthetics, it ensures a stable connection in all working conditions.

[0061] The friction which is created between the threads of the bush and expandable sleeve in the first embodiment of the adjustment device prevents the relative rotation following vibratory stress.

[0062] Moreover, the expansion of the elastic portion of the sleeve advantageously allows a possible recovery of the clearance between bush and adjustment sleeve.

[0063] Of course, the shapes of the height-adjustable leg for a support surface, object of the present invention, can be different to that which is shown as an example and not for limiting purposes in the drawings, just as the materials can also be different.

[0064] The scope of protection of the invention is therefore defined by the attached claims.

Claims

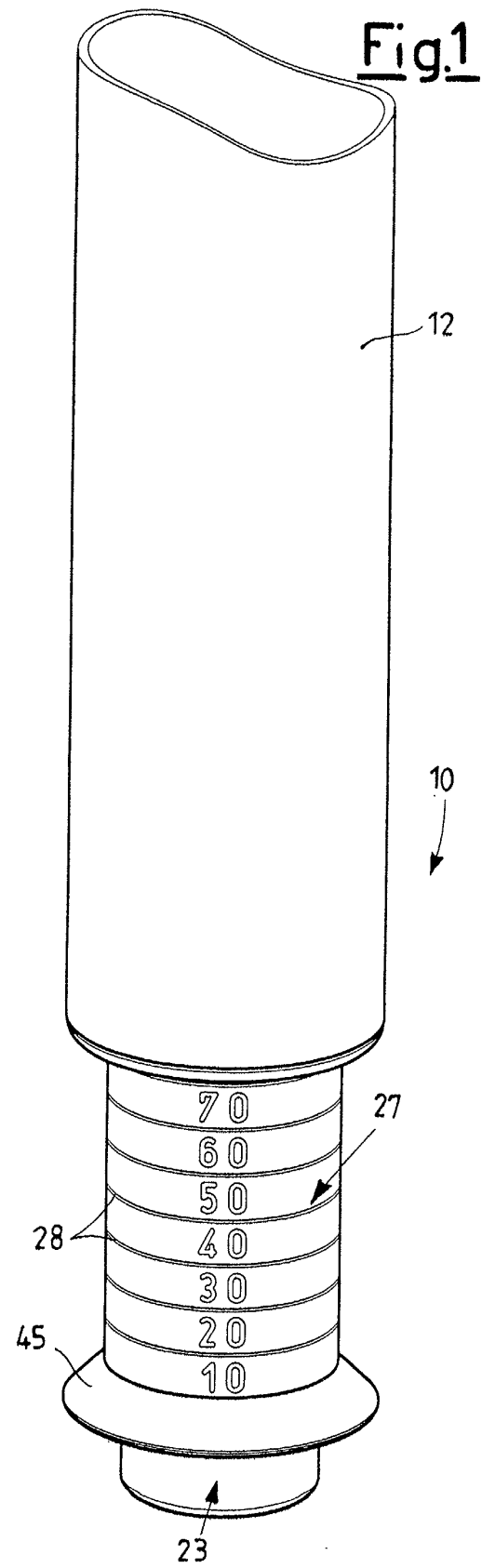
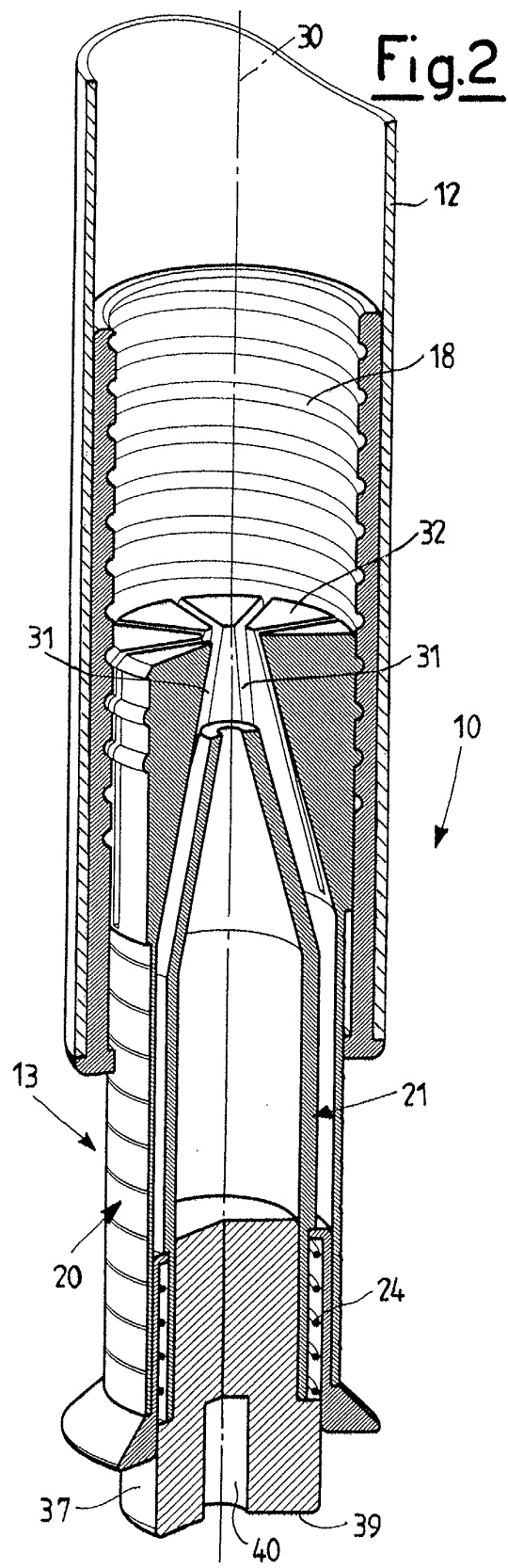
1. Height-adjustable leg (10, 10', 10") for a support surface comprising an adjustment device (13, 13') in engagement in a tubular portion (12) of the leg, where said adjustment device (13, 13') is made up of a bush (14, 14') and a foot, **characterised in that** said foot is equipped with adjustment elements, locking elements and elements for resting upon the floor, where: elements for a fast adjustment consist of matching engagement means present on said bush (14, 14') and on an elastic portion (25) of an adjustment sleeve (20, 20'), the engagement means of which can translate step by step along a vertical axis (30) when said leg is in an unloaded rest position, whereas they are forced by expansion by said locking elements into a loaded working position, where said locking elements comprise an ex-

pansion stem (21), mobile between rest and working positions, having a shape matching that of said elastic portion (25), as well as a threaded connection for a fine adjustment through rotation.

2. Adjustable leg (10, 10', 10'') according to claim 1, **characterised in that** said matching engagement means consist of a threaded portion (18) formed on the inner diameter of said bush (14) and of a threaded portion (26) realised on said elastic upper portion (25) of said adjustment sleeve (20). 10
3. Adjustable leg (10, 10', 10'') according to claim 1, **characterised in that** said complementary engagement means consist of parallel grooves (47) formed on the inner diameter of said bush (14') and parallel ribs (48) realised on said elastic upper portion (25) of said adjustment sleeve (20'). 15
4. Adjustable leg (10, 10', 10'') according to claim 1, **characterised in that** said threaded connection for a fine adjustment consists of said threaded portions (18, 26). 20
5. Adjustable leg (10, 10', 10'') according to claim 1, **characterised in that** said threaded connection (49) for a fine adjustment is realised between two parts of a contour follower element (23') and an extension (50). 25
6. Adjustable leg (10, 10', 10'') according to claim 1, **characterised in that** said elements for resting upon the floor consist of a support ending (22) integral with said adjustment sleeve (20, 20') and a contour follower element (23, 23') integral with said expansion stem (21). 30
7. Adjustable leg (10, 10', 10'') according to claim 1, **characterised in that** said expansion stem (21) is mobile between said rest position and said working position under the action of a return spring (24) and of the load applied to said leg. 35
8. Adjustable leg (10, 10', 10'') according to claim 1, **characterised in that** said expansion stem (21) ends at the top with a frusto-conical portion (33), tilted by an angle (α) with respect to a vertical axis (30), matching an inner surface of said elastic portion (25). 40
9. Adjustable leg (10, 10', 10'') according to claim 1, **characterised in that** said elastic portion (25) consists of a wall (29) equipped with cuts (31), which extend radially from said axis (30) on an upper face (32) of said elastic portion (25) of the adjustment sleeve (20, 20'). 45
10. Adjustable leg (10, 10', 10'') according to claim 7, 50

characterised in that said spring (24) has points of application of the force on said elements for resting upon the floor.

- 5 11. Adjustable leg (10, 10', 10'') according to claim 7, **characterised in that** said spring (24) has points of application of the force consisting of an abutment surface (38) of said contour follower element (23, 23') and an annular collar (42) of said support ending (22). 10
12. Adjustable leg (10, 10', 10'') according to claim 1, **characterised in that** said adjustment sleeve (20, 20') is equipped with reference notches (28). 15
13. Adjustable leg (10') according to claim 1, **characterised in that** it is equipped with a handle device (52) connected at one or more points to a telescopic tubular element (54) present inside said tubular portion (12) of the leg, wherein said tubular element (54) is connected to the elastic portion (25) of the adjustment sleeve (20, 20'). 20
14. Adjustable leg (10'') according to claim 1, **characterised in that** it is equipped with a tube (56) slotted over the tubular portion (12) of the leg bound at the bottom to said adjustment sleeve (20, 20') with a fixed joint binding. 25



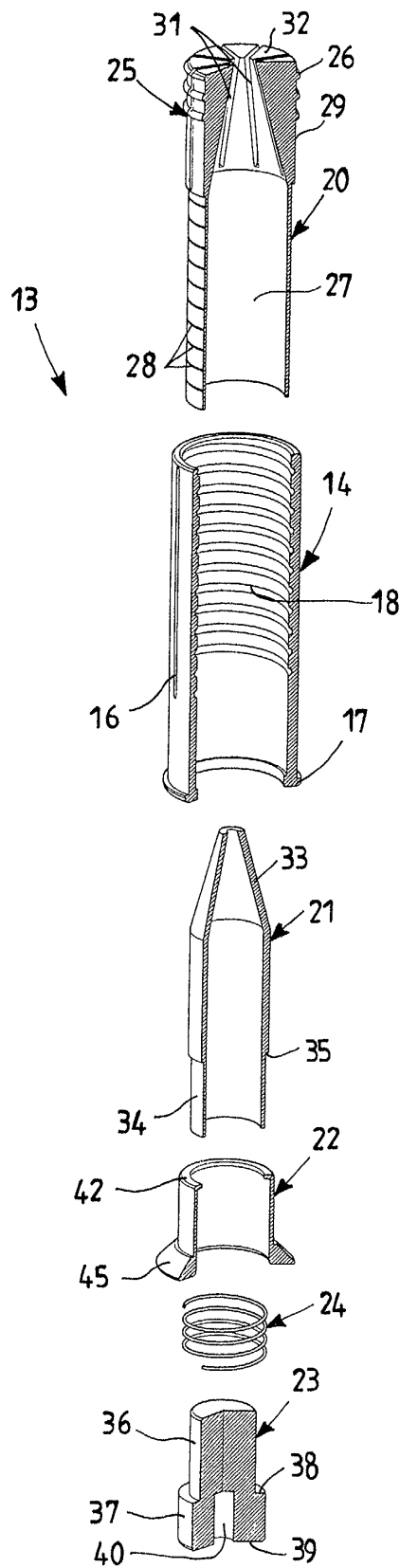


Fig.3

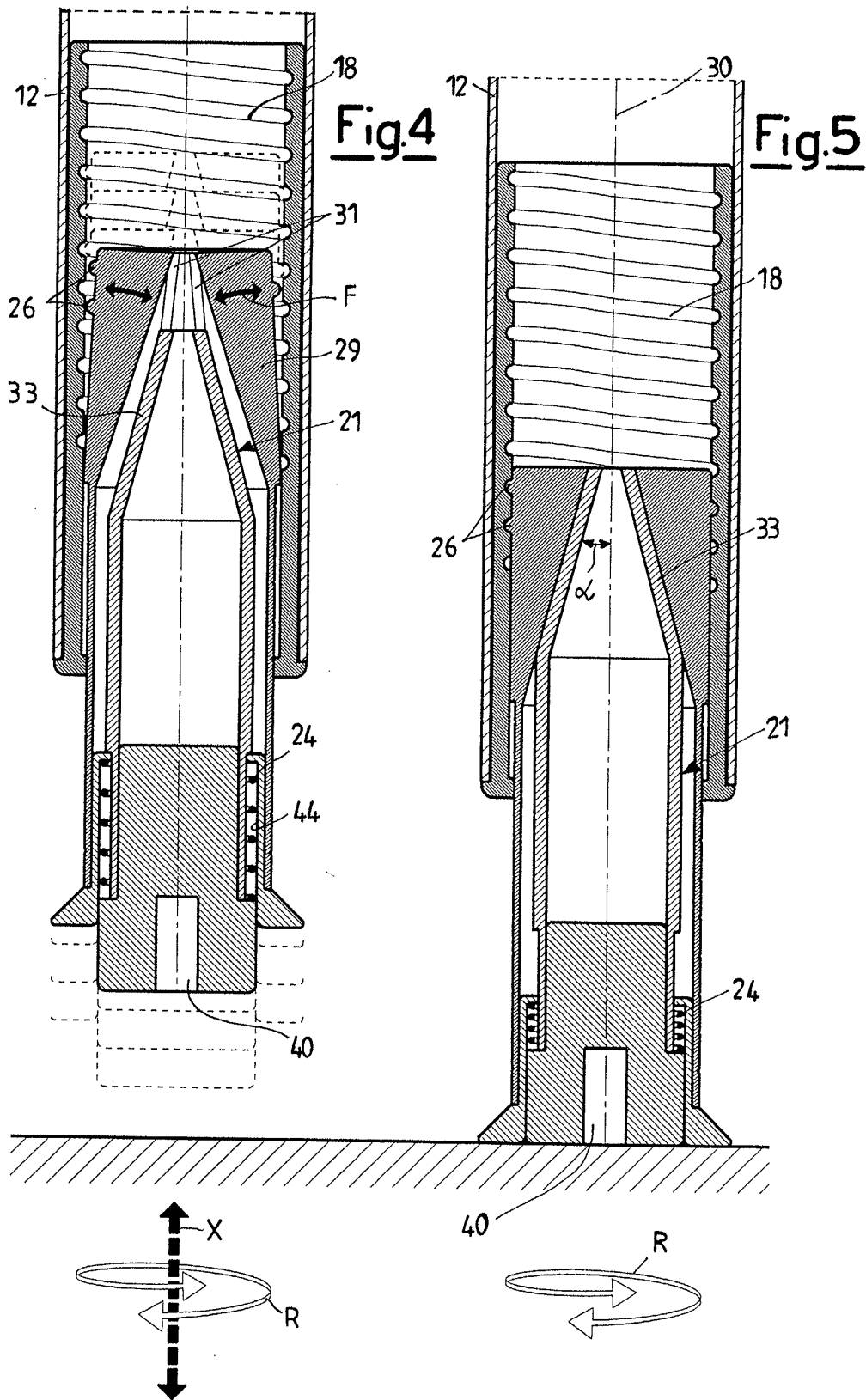


Fig.6

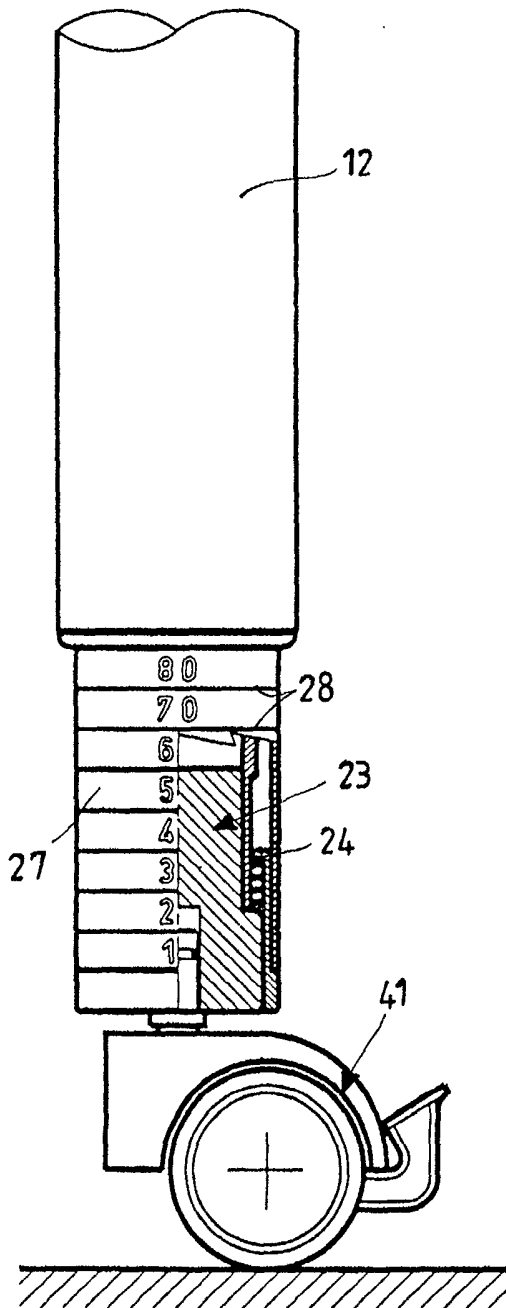


Fig.7

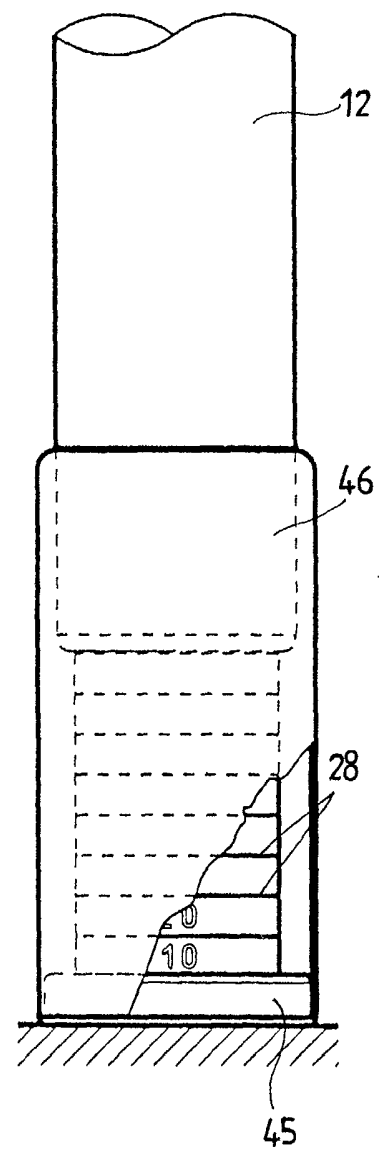


Fig.8

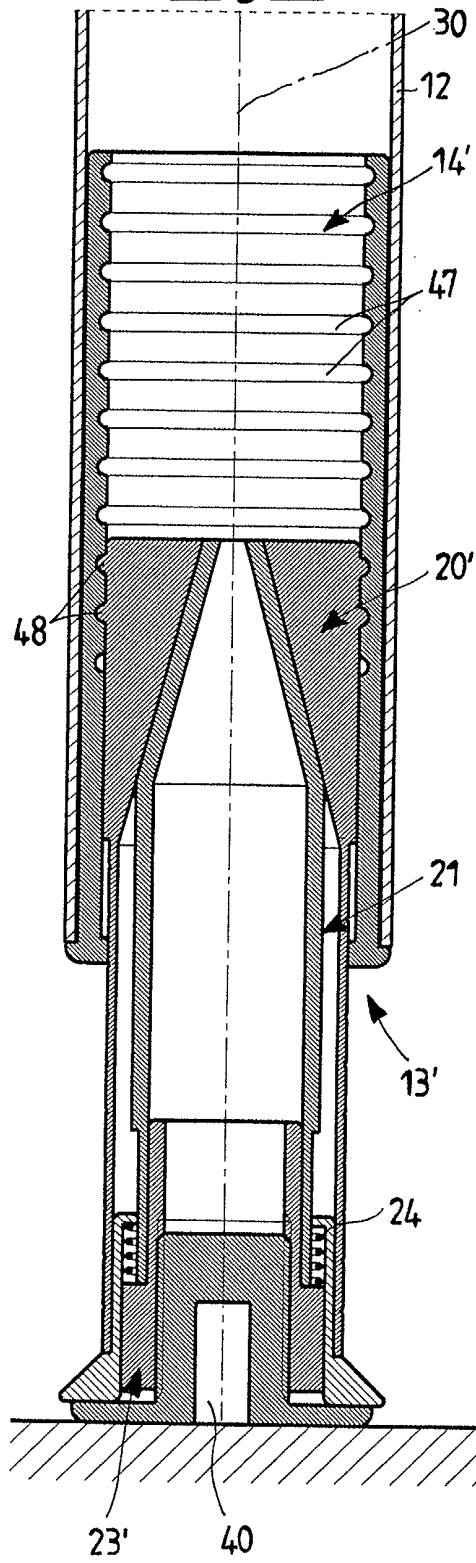
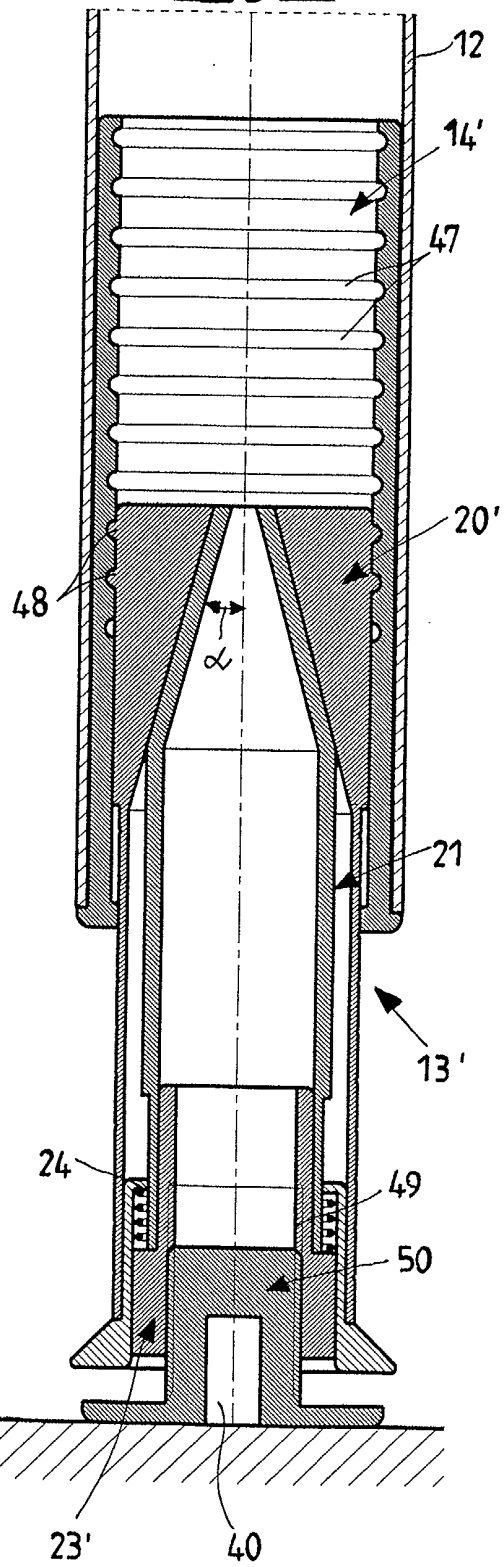
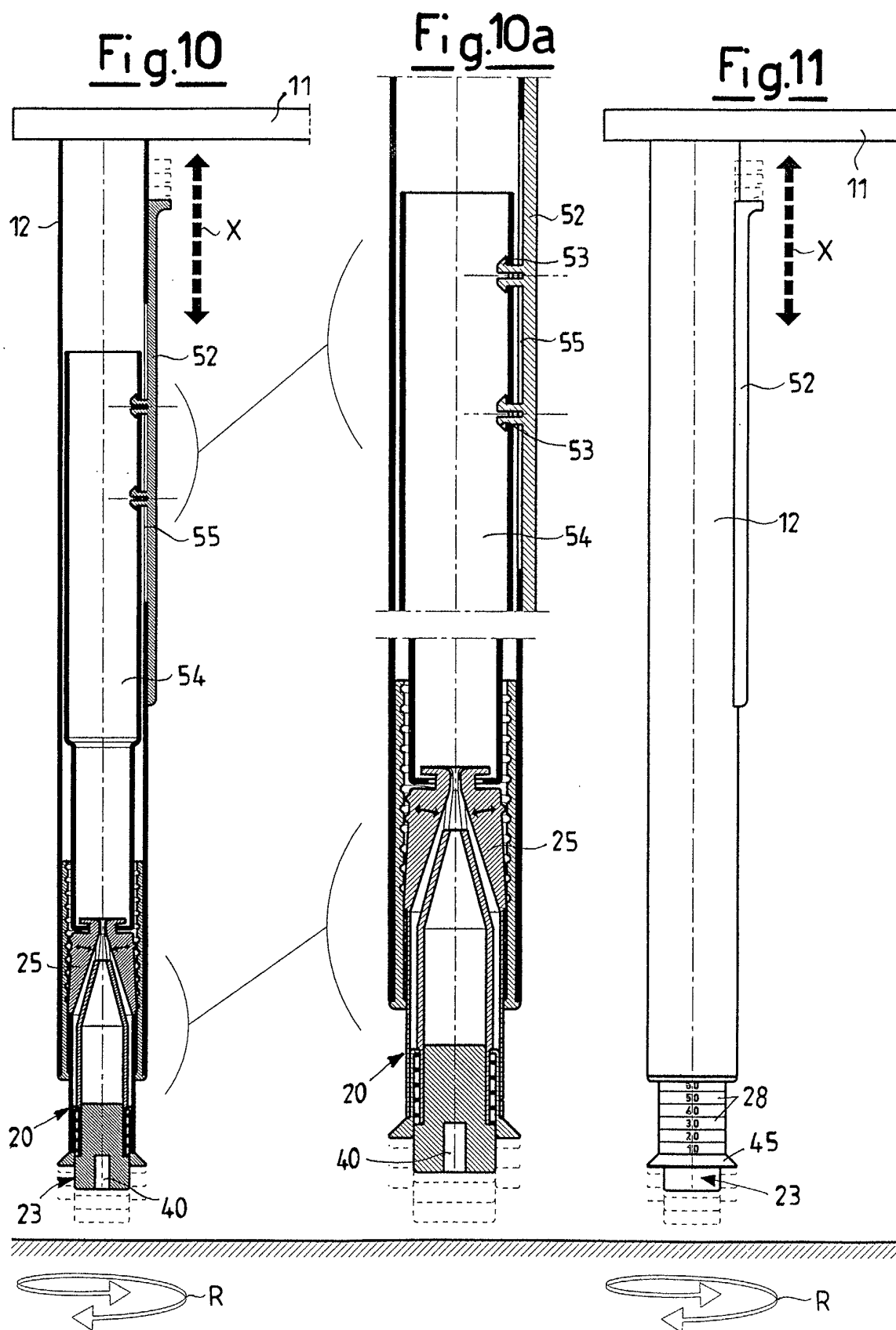
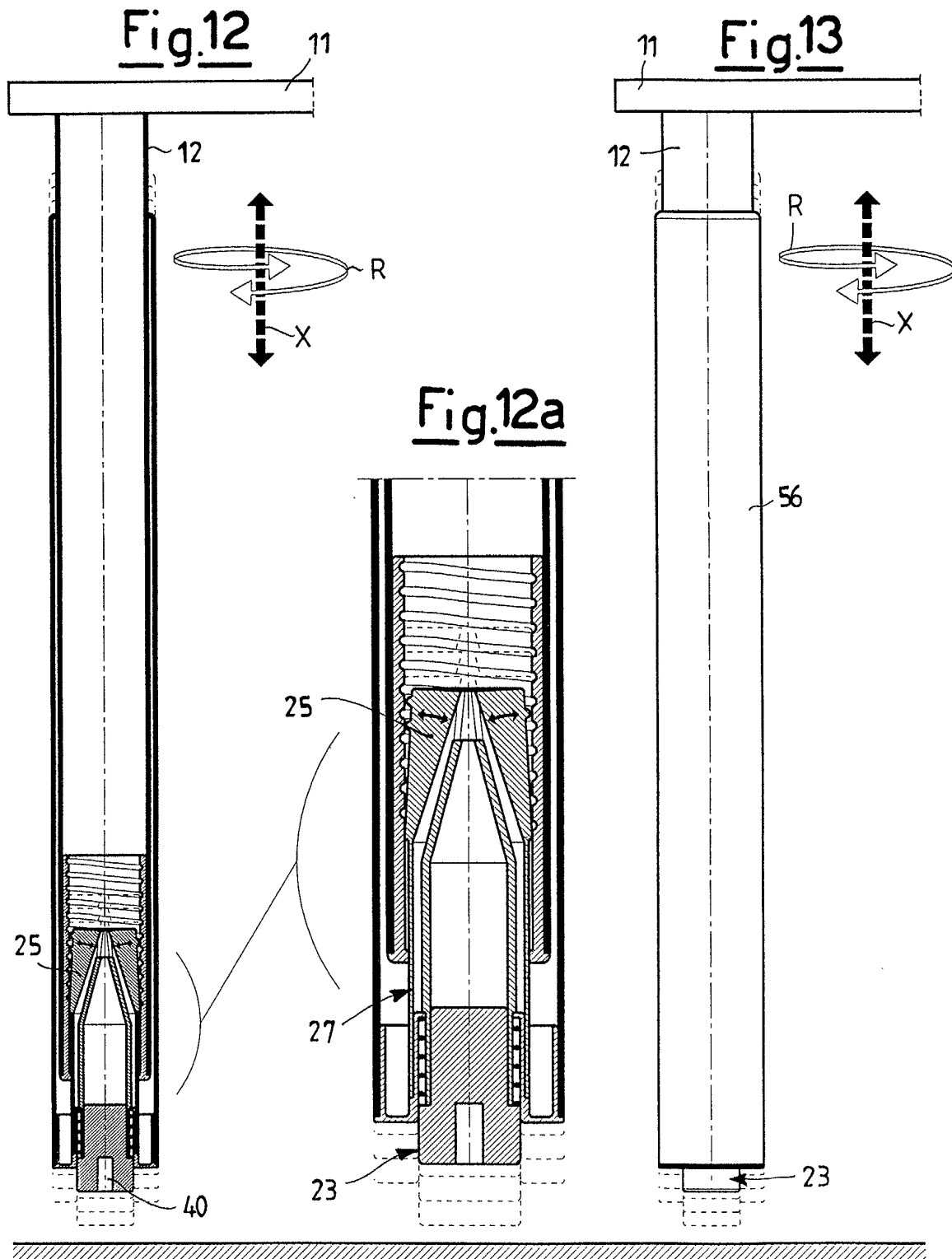


Fig.9









European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 02 07 9049

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			TECHNICAL FIELDS SEARCHED (Int.Cl.7) A47B F16M F16B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 24 January 2003	Examiner van Hoogstraten, S
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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