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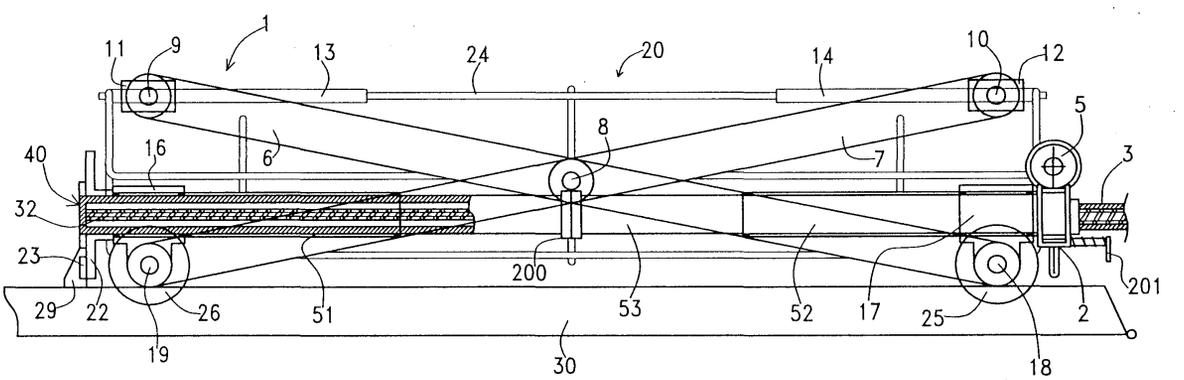
(54) Lifting device for the lower rack of a dishwasher

(57) The invention has as an object a lifting device for the lower rack of a dishwasher. The device comprises two pairs of crossed levers (6-7) that are hinged to each other at a center line (8), suitable to extend in height above the closing door (30) of the dishwasher when this is open. The levers (6-7) have upper ends for the support of the lower rack (20) and lower ends that are controlled to be drawn near and apart from each other by at least one telescopic shaft (40) that is supported by the lower rack (20) and extends horizontally along the bottom wall (50) of the washing tub and that is controlled by motor means (42) that are positioned in proximity of the back wall (44) of the tub.

Fig.1



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Description

[0001] The present invention refers to a lifting device for the lower rack of a dishwasher.

[0002] Known dishwashers usually comprise two racks, an upper one and a lower one, for containing dishes and pans to be washed.

[0003] If loading of the upper rack does not involve any particular difficulty, loading of the lower rack obliges the operator to continuous and sudden bending movements in order to take the dishes and the pans from the kitchen top and to position them between the grids of such rack, that is located at an extremely low position.

[0004] A solution to this problem consists in the realisation of a lifting device for the lower rack of the dishwasher that allows to bring it to a height equal to that of the upper rack.

[0005] The most recent known art exhibits a lifting device in which a lower rack of a dishwasher is placed on a base that is connected with the upper ends of two crossed levers that are hinged so to be able to slide on appropriate guides of the base. The lower ends of the crossed levers are hinged on respective pistons that are capable to slide in two or more hydraulic cylinders that are positioned on the dishwasher door. A hydraulic or pneumatic compressor feeds a fluid to a valve that distributes it through hydraulic circuits to two or more hydraulic cylinders. The latter, that are necessary to balance the rack on two sides, simultaneously transmit opposite movements to the crossed levers and thus cause lifting of the rack.

[0006] However the aforesaid lifting device involves an increase in the thickness of the door of the dishwasher and an increase in the weight of the same.

[0007] In view of the state of the art herein described, object of the present invention is to realise a lifting device for the lower rack of a dishwasher that has a simpler structure and does not make the closing door of the dishwasher heavy, while assuring at the same time its water tightness.

[0008] According to the present invention, such object is attained by means of a lifting device for the lower rack of a dishwasher, the dishwasher comprising a washing tub with a bottom wall, a back wall and a front face provided with a closing door, characterized in that it comprises two pairs of crossed levers that are hinged to each other at a center line, said levers having upper ends for the support of the lower rack and lower ends that are controlled to be drawn near and apart from each other by at least one telescopic shaft that is carried by the lower rack and extends horizontally along the bottom wall of the washing tub and that is controlled by motor means that are positioned in proximity of the back wall of the tub.

[0009] Owing to the present invention it is possible to realise a lifting device for lower rack of dishwashers in a simple way and without making the closing door of the dishwasher heavy, which is as a result unaltered and perfectly standard.

[0010] The characteristics and the advantages of the present invention will become evident from the following detailed description of an embodiment thereof, that is illustrated as a non limiting example in the enclosed drawings, in which:

Figure 1 shows, in longitudinal section, a lifting device according to the present invention with the lower rack of the dishwasher in position extracted outside the tub and of maximum lowering over the closing door of the dishwasher, that is in turn in open position;
Figure 2 is similar to Figure 1 but with the lower rack in position of maximum lift;
Figures 3-5, to be considered the one in continuation of the other, show, in longitudinal section, a more detailed view of a motorised telescopic shaft that provides to the control of the lifting of the lower rack;
Figure 6 shows, in a partially sectioned front view, the left part of the lifting device according to the invention;
Figure 7 shows the lower rack in lowered position and recessed inside the washing tub of the dishwasher;
Figure 8 shows the motorised telescopic shaft of Figures 3-5 in the position of recessed lower rack;
Figure 9 shows a detail of Figure 7.

[0011] In Figures 1 and 2 there is shown a lower rack 20 provided with a lifting device 1 according to the invention, that is placed above the closing door 30 of the dishwasher in open position.

[0012] The lower rack 20 is connected at the sides with two pairs of rectilinear levers 6-7 whose upper ends are turningly hinged in 9-10 on coupling boxes 11-12 that are capable to slide along bushes 13-14 that are fixed on a longitudinal bar 24 belonging to the lower rack 20 of the dishwasher. The two pairs of rectilinear levers 6-7 cross at a center line in a fulcrum point 8 and they extend in height. The lower ends of the levers 6-7 are in turn provided with wheels 25-26 that are capable to slide on horizontal guides 80, in proximity of the sides of the closing door 30 of the dishwasher, as shown in Figure 6. The aforesaid lower ends of the levers 6-7 are in addition hinged in 18-19 on respective supports 16-17, internally threaded, that are controlled to be drawn horizontally near and apart from each other along the sides of the closing door 30 by means of their screw engagement with tubular parts 51-52, that are externally threaded. These latter tubular parts 51-52 are identical but with threads opposite to each other and they are fixed to respective ends of a tubular part 53. The tubular parts 51-52 and the tubular part 53 are made up of two identical pieces that are symmetrically mounted on and fixed to each other by means of flange connection 200.

[0013] Said tubular part 53, as observable in greater

detail in Figures 3-5, is the most external terminal part of a telescopic shaft 40 that extends along the bottom 50 of the washing tub 70 of the dishwasher and that is also made up of an intermediate tubular part 3, that is capable to slide inside the tubular part 53 and that is connected with it for the rotation by means of a coupling key 9 that is positioned at a first end, and by an internal rod 4 that is coaxial to the internal tubular part 3 and connected with it by means of a coupling key 91. An external spring 33 is interposed between the second end of the intermediate tubular part 3 and a round projection 48 of the rod 4. An internal spring 32 is in turn interposed between the external end of the tubular part 53 and the internal end of the rod 4. The rod 4 terminates with a conic part 41 that is inserted in a corresponding cavity of a conic body 43 that is fixed to the back wall 44 of the washing tub 70 of the dishwasher. As shown in Figures 5 and 7, one of the two telescopic shafts 40 that make up the lifting device 1, that is symmetrical in all the rest to a longitudinal median plane, is connected through the conic body 43 to an electric driving motor 42 that is in turn fixed to the back wall 44.

[0014] The rotation motion of the telescopic shaft 40 connected with the electric motor is transmitted to the other telescopic shaft 40 by means of a pair of pinions 2 that are engaged with respective worm screws 5 that are fixed to the ends of a propeller shaft not visible in the figures, that extends transversally of the washing tub 70.

[0015] From the aforesaid structure the following operation of the lifting device according to the invention derives.

[0016] Initially the lower rack 20 is inside the dishwasher, as visible in Figure 7, in the maximum lowering position. The pair of telescopic shafts 40 is in a position of rest with the springs 32 and 33 compressed in order to allow the maximum reversal slide of the external tubular part 53 on the intermediate tubular part 3 and of the latter on the rod 4, as shown more in detail in Figure 8.

[0017] When opening the door 30 the mutual slide of the tubular parts 53 and 3 and of the rod 4 and the extension of the springs 32 and 33 facilitates the extraction of the lower rack 20 from the washing tub of the dishwasher. The rack 20, by means of the wheels 25-26, slides on the open door 30 of the dishwasher up to a position in which a round extension 22 of the tubular part 53 of a telescopic shaft 40 gets in abutment with a lock 29 of the door 30 of the dishwasher (Figure 1). The telescopic shafts 40 are in the position of maximum extension that is possible for them, with the tubular part 3 almost completely out of the tubular part 53 and the rod 4 also almost completely out of the tubular part 53 and of the tubular part 3 (Figures 3-5).

[0018] A contact sensor 23 placed on the lock 29 of the door 30 gives then the consent or even automatically starts the electric motor 42 that provides to the rotation of the rod 4 connected with it. The rotary motion is transmitted by the rod 4 through the key 91 to the tubular intermediate part 3 and from the latter to the external tubular part 53 by means of the key 9. The transmission device made up of the pinions 2 and of the pair of screws without end 5 provides to the rotation of the other telescopic shaft 40.

[0019] The rotation of the tubular parts 53 allows the rotation of the parts 51, 52 that are fixedly mounted to it and, owing to the threaded engagement of the latter with the supports 16 and 17, the consequent movement of mutual approach of the supports 16-17 and likewise consequent greater inclination upward of the levers 6-7. The upper ends of the levers 6-7 therefore get near to each other by sliding with their coupling boxes 11-12 along the respective bushes 13-14 and they move upward thus causing as a consequence the lifting of the rack 20, shown in Figure 2. The maximum lifting, that is fixed by an appropriate lock not shown in the drawings, corresponds to the positioning of the lower rack 20 at a height substantially equivalent to the height of an upper rack of the dishwasher so that the loading of dishes and of pans to be washed becomes easier. In addition it is possible control manually the lifting of the rack in intermediate position between the ones of Figures 1 and 2.

[0020] Once the loading has been carried out, by means of a second control, the inverse rotation of the shafts 40 is obtained and therefore the inverse movement of the supports 16-17 and of the levers 6-7, that tilt increasingly downward and thus determine the lowering of the rack 20 up to the position shown in Figure 1.

[0021] Subsequently the rack 20 gets pushed inside the washing tub of the dishwasher with consequent shortening of the telescopic shafts 40 and compression of the springs 32 and 33. The load of pans and dishes in the rack 20 exceeds the load of the springs 32 and 33 in order to maintain the rack 20 inside the dishwasher.

[0022] It is possible to complete the extraction of the rack, in conditions of rack completely lowered, and when the same is inside the washing tub of the dishwasher (Figure 7), by operating manually on disks 201 that are elastically connected with the pinions 2, that allow the locking of the rod 4, with the telescopic shafts 40 in rest position and the springs 32 and 33 compressed, as it can be observed in Figure 9.

[0023] A variation of the movement system of the telescopic shaft 40 connected with the electric driving motor 42 provides a connection of the telescopic shaft 40 to said electric motor by means of a flexible wire with appropriate connector, that can be partially extracted during the stage of the rack extraction.

Claims

1. Lifting device for the lower rack of a dishwasher, the dishwasher comprising a washing tub (70) with a bottom wall (50), a back wall (44) and a front face

provided with closing door (30), characterized in that it comprise two pairs of crossed levers (6-7) that are hinged to each other at a center line (8), said levers (6-7) having upper ends for the support of the lower rack (20) and lower ends that are controlled to be drawn near and apart from each other by at least one telescopic shaft (40) that is carried by the lower rack (20) and extends horizontally along the bottom wall (50) of the washing tub and that is controlled by motor means (42) that are positioned in proximity of the back wall (44) of the tub.

2. Lifting device according to claim 1, characterized in that said at least one telescopic shaft (40) is made up of mutually sliding parts (53, 3, 4) that are connected with each other for rotation by means of coupling means (9, 91).

3. Lifting device according to claim 2, characterized in that said motor means (42) comprise an electric motor that provides for the rotation of said at least one telescopic shaft (40).

4. Lifting device according to claim 3, characterized in that it comprises two telescopic shafts (40) extending along the respective sides of the washing tub (70) of the dishwasher, one of said telescopic shafts (40) directly receiving the motion from said electric motor (42) and transmitting the motion to the other telescopic shaft (40) by means of a transmission with pinions (2) and worm screws (5) that extend transversally of the washing tub.

5. Lifting device according to claim 2, characterized in that said lower end of the pairs of crossed levers (6-7) are hinged on respective supports (16-17) that can be drawn near and apart from each other in horizontal direction by means of screw engagement with a external tubular part (53) of said at least one telescopic shaft (40).

6. Lifting device according to claim 5, characterized in that said supports (16-17) bear respective wheels (26-25) that are capable to slide in respective guides (80) of said closing door (30) of the dishwasher when it is in open position.

7. Lifting device according to claim 1, characterized in that said upper ends of the levers (6-7) are hinged on respective coupling boxes (11 - 12) that are slidingly mounted on slide bushes (13-14) that are fixed to the lower rack (20).

8. Lifting device according to claim 5, characterized in that said external tubular part (53) of said at least one telescopic shaft (40) bears fixedly mounted tubular parts (51-52) that are externally threaded but with threads opposite to each other, being said tubular parts (51-52) in screw engagement with said supports (16-17) of said crossed levers (6-7).

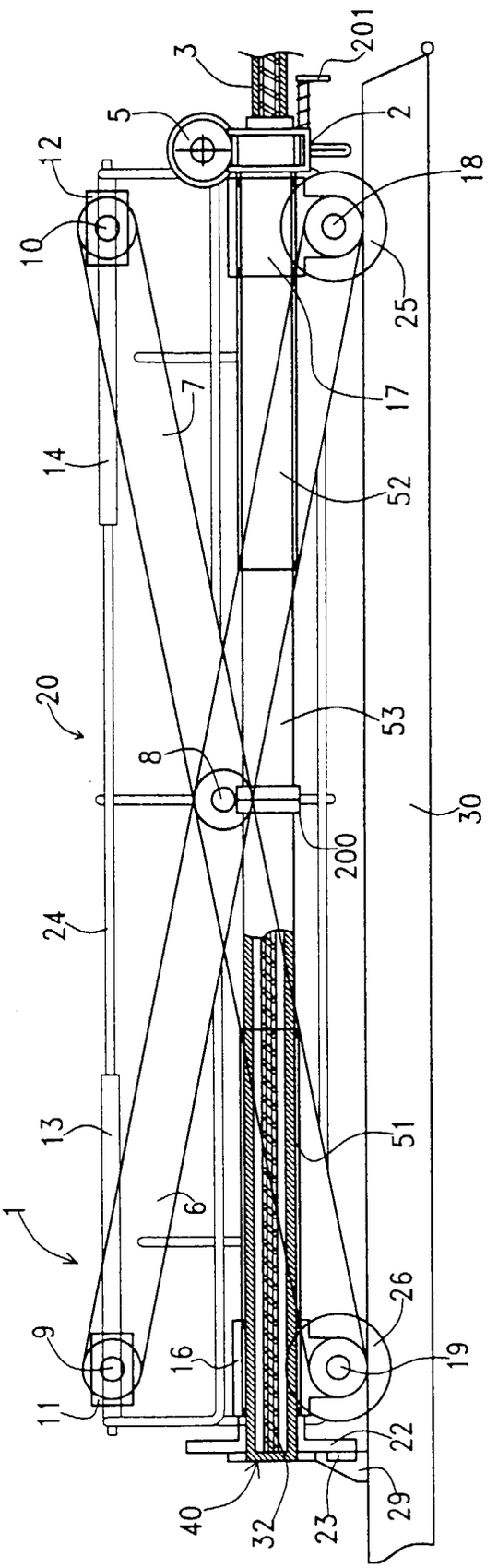
9. Lifting device according to claim 8, characterized in that said tubular parts (51-52) and said external tubular part (53) of said at least one telescopic shaft (40) are made up of two identical pieces that are symmetrically mounted and fixed to each other by means of flange connection (200).

10. Lifting device according to claim 2, characterized in that it comprise elastic means (32, 33) that are interposed between said reciprocally sliding parts (53, 3, 4) of said at least one telescopic shaft (40) in order to bias the latter in condition of maximum axial extension.

11. Lifting device according to claim 10, characterized in that it provides locking means (201) that are elastically connected with said pinions (2) in order to allow locking of said at least one telescopic shaft (40) in condition of maximum axial compression.

12. Lifting device according to claim 11, characterized in that said locking means (201) are made up of disks.

Fig.1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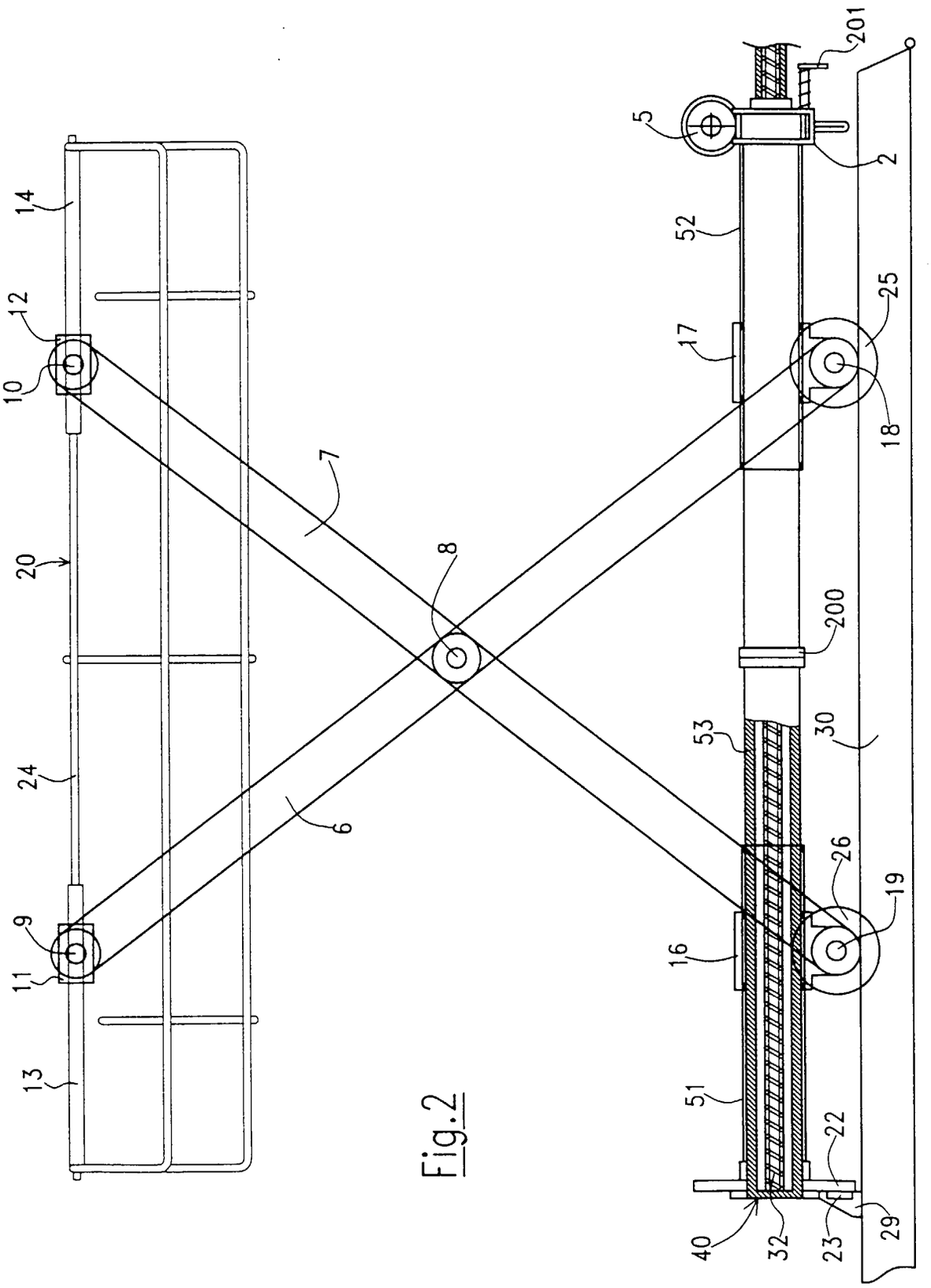
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Fig.2

Fig.3

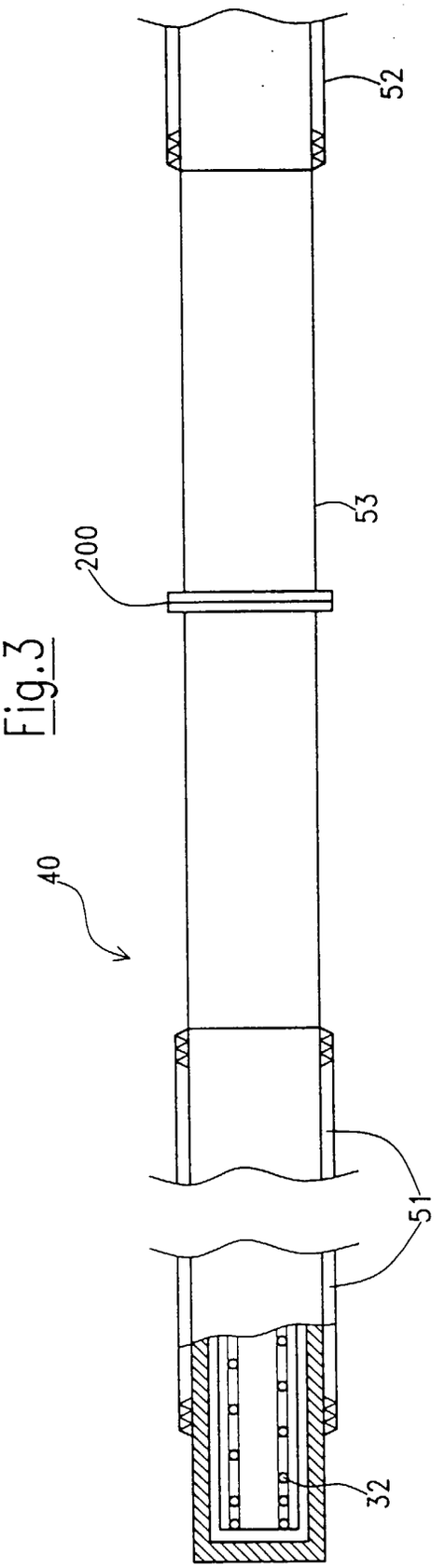
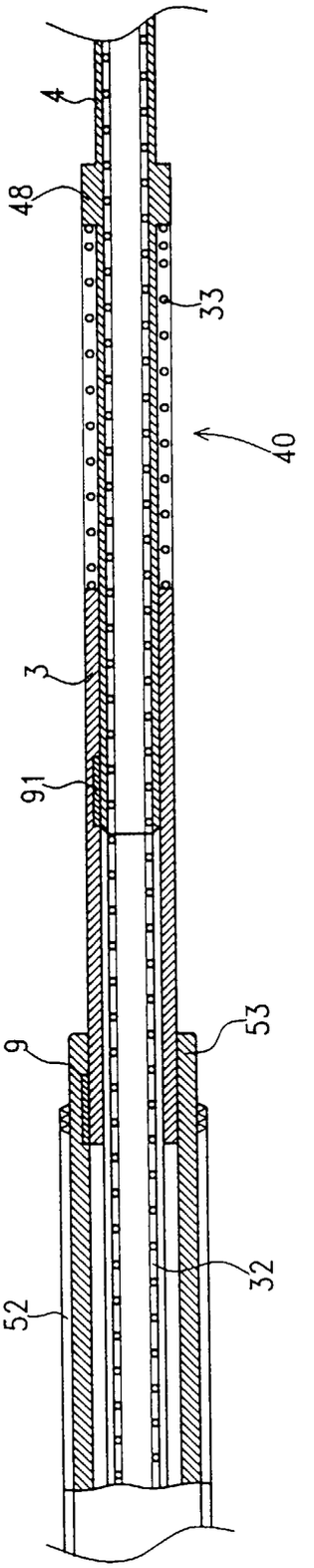


Fig.4



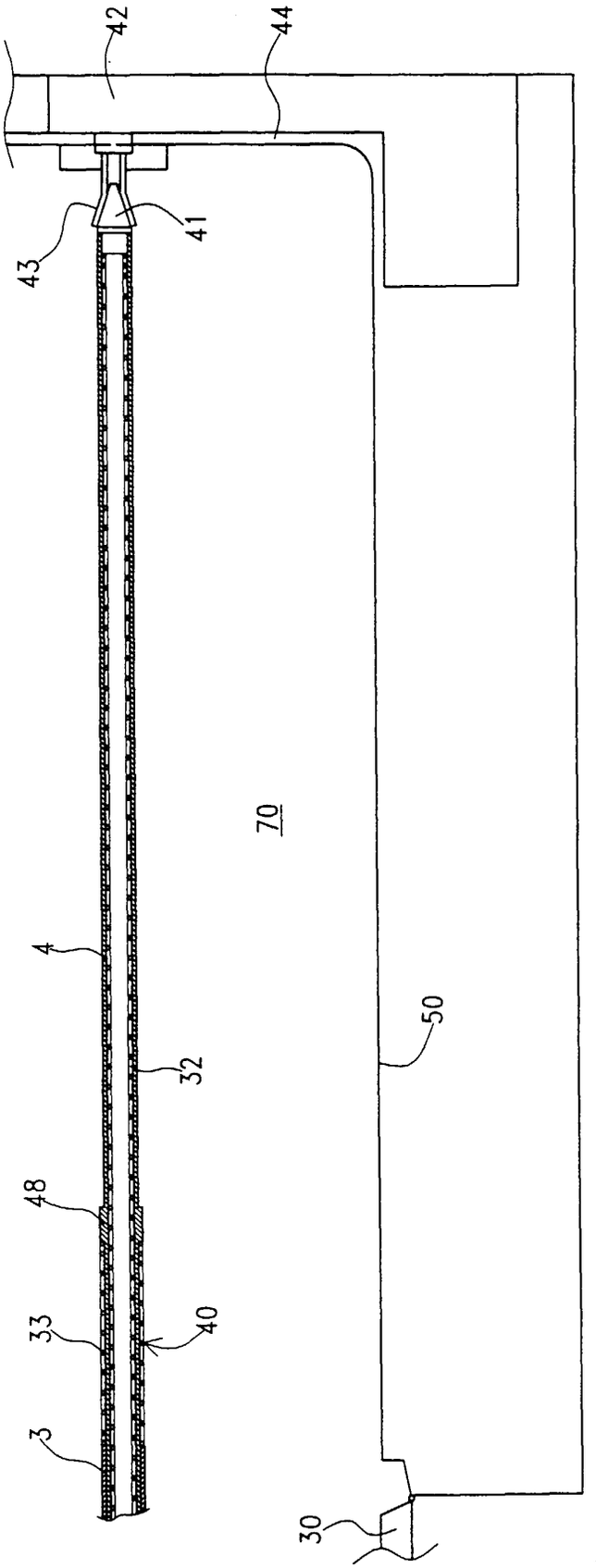


Fig.5

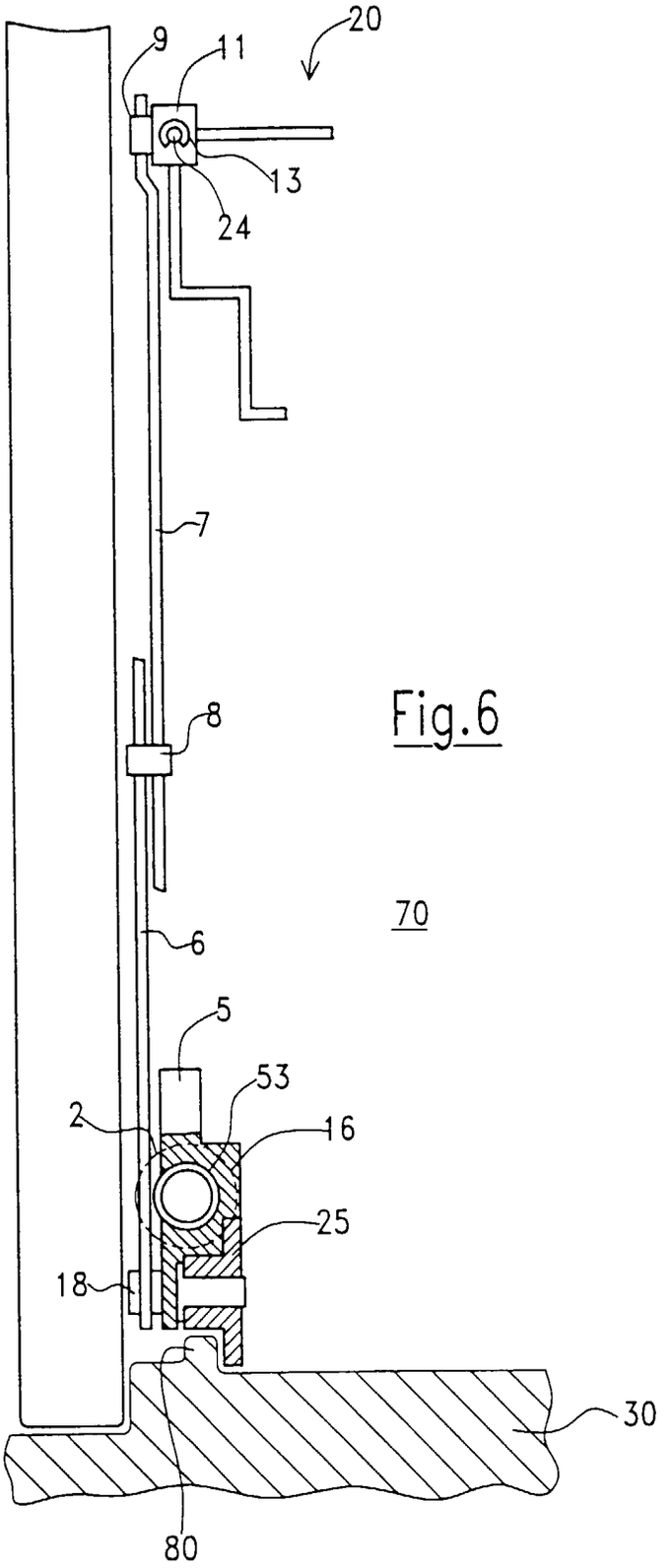
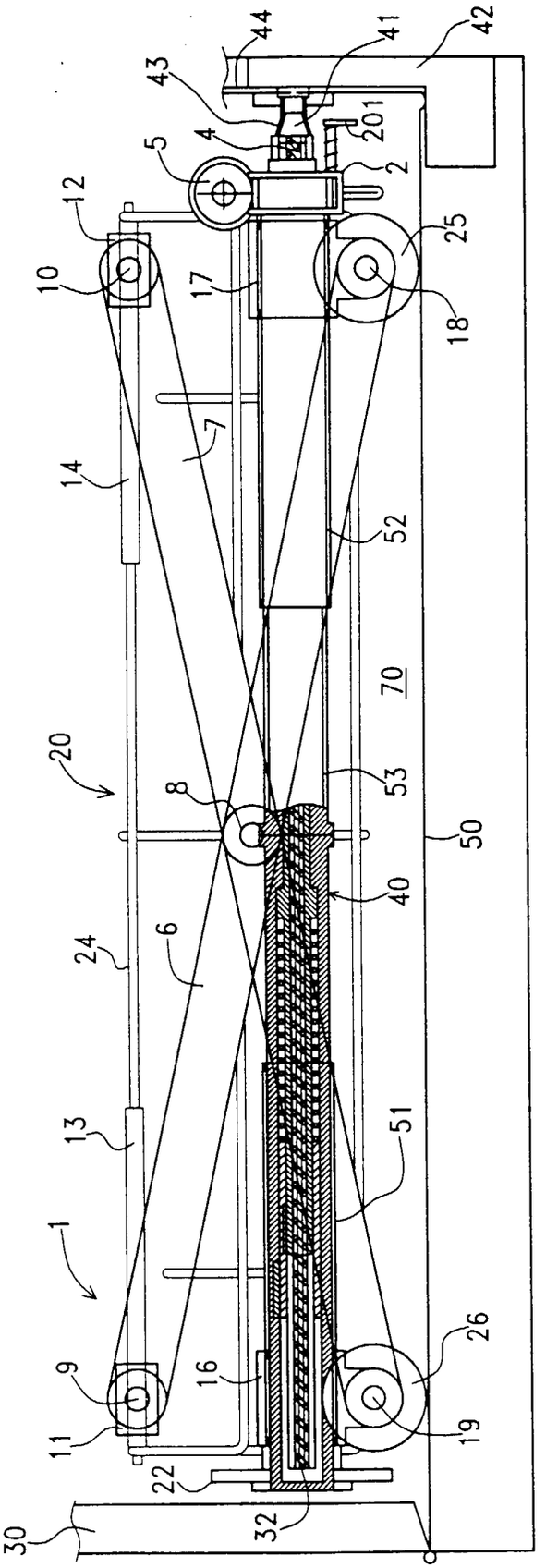


Fig.6

Fig.7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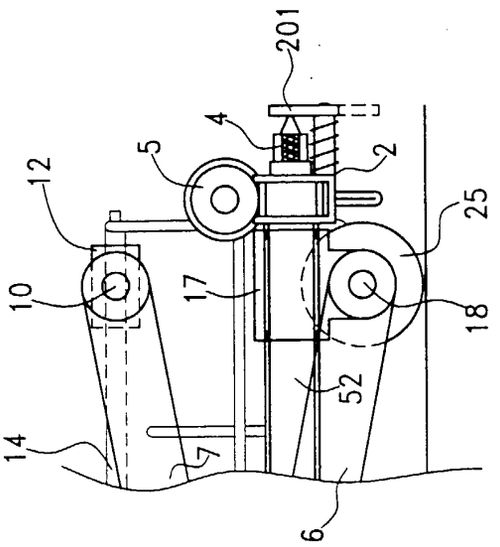

Fig.9

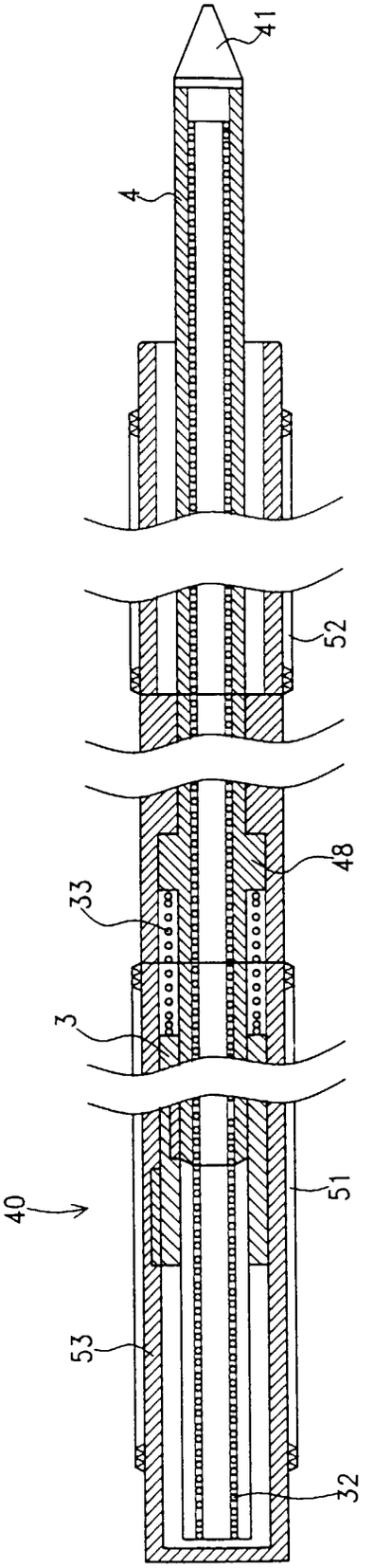

Fig.8

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EUROPEAN SEARCH REPORT

Application Number
EP 00 20 2106

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 5 115 822 A (W.E. NICHOLS) 26 May 1992 (1992-05-26) * the whole document * ---	1	A47L15/50
A	PATENT ABSTRACTS OF JAPAN vol. 1998, no. 12, 31 October 1998 (1998-10-31) & JP 10 179495 A (MATSUSHITA ELECTRIC IND CO LTD), 7 July 1998 (1998-07-07) * abstract * ---	1	
A,P	US 5 971 513 A (A.B. CASSALIA) 26 October 1999 (1999-10-26) * column 4, line 25 - column 5, line 14; figures 1,2,10 * -----	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

A47L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	6 November 2000	Courrier, G

CATEGORY OF CITED DOCUMENTS

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06-11-2000

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5115822 A	26-05-1992	NONE	
JP 10179495 A	07-07-1998	NONE	
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