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(54) Forming and sealing unit of a machine for packaging pourable food products

(57) A forming and sealing unit (1) for producing aseptic sealed packages from a tube (2) of packaging material filled with a pourable food product, the unit having a fixed structure (3); a pair of forming assemblies (5, 5') interacting alternately and cyclically with the tube (2) of packaging material, and in turn having respective slides (6) movable vertically and in reciprocating manner with respect to the fixed structure (3), and respective pairs of jaws (7) having sealing means and movable between an open position and a closed position in which the sealing means cooperate with the tube (2) of packaging material; a first pair of control rods (15) for controlling the movement of the slides (6); and a second pair of control rods (16) for controlling the opening and closing movement of the jaws (7); the control rods (15, 16) being activated independently by respective servomotors (20, 21, 20', 21') controlled by a programmable control unit (60).

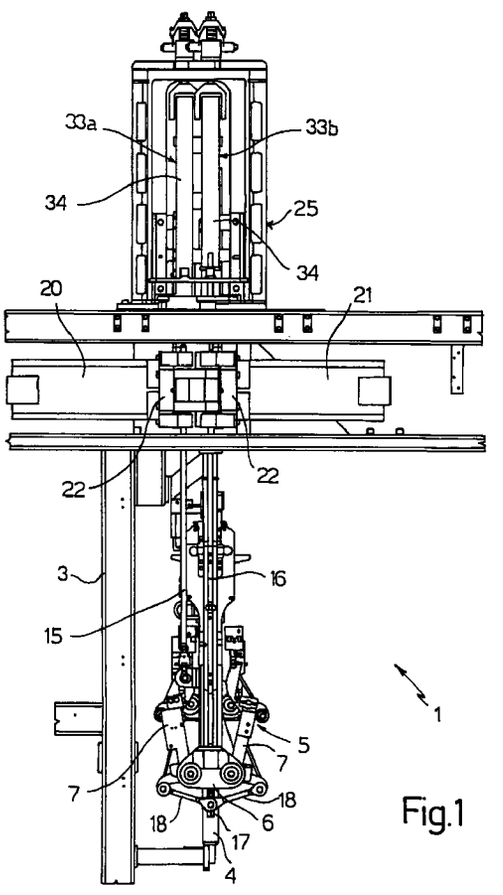

Fig.1

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Description

[0001] The present invention relates to a forming and sealing unit for a packaging machine for packaging pourable food products.

[0002] Machines for packaging pourable food products, such as fruit juice, wine, tomato sauce, pasteurized or long-life (UHT) milk, etc., are known in which the packages are formed from a continuous tube of packaging material defined by a longitudinally sealed web.

[0003] The packaging material has a multilayer structure comprising a layer of paper material coated on both sides with layers of heat-seal material, e.g. polyethylene. For aseptic packaging of preserved products such as UHT milk, the packaging material comprises a layer of barrier material defined, for example, by an aluminium foil, which is superimposed on a layer of heat-seal plastic material and is in turn coated with another layer of heat-seal plastic material defining the inner face of the package contacting the food product.

[0004] Aseptic packages are produced by unwinding the web of packaging material off a roll and through an aseptic chamber, where it is sterilized, for example, by applying a sterilizing agent such as hydrogen peroxide, which is subsequently evaporated by heating, and/or by subjecting the packaging material to radiation of appropriate wavelength and intensity. The sterilized web is then folded into a cylinder and sealed longitudinally to form, in known manner, a continuous vertical longitudinally sealed tube. That is, the tube of packaging material forms an extension of the aseptic chamber, and is filled continuously with the pourable food product and fed to a forming and (transverse) sealing unit for forming the individual packages, and which grips the tube between pairs of jaws for transversely sealing the tube into pillow packages.

[0005] The pillow packages are separated by cutting the sealing portion in between the packages, and are then transferred to a final folding station where they are folded mechanically into the final shape.

[0006] EP-B-O 091 712 illustrates and describes a forming and sealing unit of the above type, in which the reciprocating movement of the jaws is controlled by a cam system. That is, the system comprises an electric motor, the output shaft of which is fitted, for each pair of jaws, with two cams with appropriately differing profiles. By means of respective rocker arms, the cams control the axial reciprocating movement of respective vertical rods, one of which is connected to a slide supporting the jaws and to which the jaws are hinged; while the other rod extends through the slide, without being connected functionally to it, and controls, by means of articulated arms, the reciprocating opening and closing movement of the jaws.

[0007] Two mutually facing forming flaps are hinged to respective jaws in each pair, and are movable between an open position, into which they are pushed by elastic means, and a closed position in which they mate to define a space defining the form and volume of the package to be formed. The forming flaps are closed by cams fixed to the machine frame and which interact with respective rollers carried by the flaps. The specific configuration of the forming flaps is described, for example, in EP-B-O 460 540.

[0008] At the same time, the tube portion compressed between the jaws is sealed transversely by heating means, e.g. induction or ultrasonic, carried by the jaws; and, once sealing is complete, a cutter is activated to cut the tube of packaging material along the center of the sealed portion and so detach a pillow package from the bottom end of the tube. As the bottom end is sealed transversely, the jaws, on reaching the bottom dead center position, may be opened to prevent interfering with an upper portion of the tube. At the same time, another pair of jaws, operated in the same way, moves down from the top dead center position, and the above gripping/forming, sealing and cutting operations are repeated.

[0009] Though highly successful and reliable, even to the extent of requiring very little maintenance even after many years' service, machines of the above type have several drawbacks, particularly as regards adaptability to production changes and the limited extent to which the position of the designs may be corrected, as explained below.

[0010] Machines of the above type do in fact cater for producing packages of various shapes and sizes, but only at the expense of substantially reconstructing some parts of the machine and replacing many others, thus resulting in considerable cost and downtime.

[0011] EP-A-O 140 280 describes a device for producing packages containing a pourable food product, wherein the vertical travel of the slides is controlled, via a rocker arm, by a pulse motor for adjusting the amount of travel. This solution provides for a certain amount of adjustment of the device to produce packages of different heights, but of the same cross section, so that any change in the configuration of the package also involves substantial alterations to the machine.

[0012] To minimize downtime of the machine, a demand therefore exists in this particular field for a forming and sealing unit which provides not only for rapidly adjusting the height of the package, but also for adjusting the configuration of the package as required, to switch, for example, from a package of a given width and depth to one of greater or lesser width and/or depth, or from a square-cornered to a beveled-cornered package in the shortest time possible.

[0013] Another technical drawback of known forming and sealing units lies in the so-called "design correction" system.

[0014] As the web of packaging material normally comprises a series of equally spaced printed images or designs on the portions eventually defining the outer surfaces of the packages, the web must be so supplied to the forming and sealing unit that the package form-

ing, sealing and cutting operations are "registered" accurately with respect to the succession of designs. In actual use, however, despite the designs being equally spaced, the position of each design with respect to the jaws on the forming and sealing unit may vary due to varying deformation of the packaging material by the mechanical pressure exerted by the jaws, or due to the pulsating pressure of the pourable food product inside the tube of packaging material, so that a device is required to correct the position of the designs.

[0015] On modern packaging machines, such a device comprises an optical sensor for detecting the position of a bar code on the package; and a control unit for comparing the detected position with a theoretical position.

[0016] Each pair of jaws is provided with a pair of drawing members for pulling the tube of packaging material, and which are movable with respect to the jaws to form triangular flaps at the top and bottom corners of the pillow package. On detecting a design position error, the control unit adjusts the speed of the motor supplying the web of packaging material, and, if this correction is not enough, the drawing members are also controlled to slightly increase or reduce the pull exerted on the packaging material. The above operation is repeated until the position of the design matches the theoretical position, in which case, any packages produced in the meantime must be rejected. At times, even this method fails to ensure correct positioning of the designs, as, for example, when replacing the roll of packaging material with one in which the design pitch is different. In which case, the machine must be stopped and reset manually to the design pitch of the new roll.

[0017] A further object of the present invention, therefore, is to provide a forming and sealing unit enabling fast effective correction to minimize the number of rejects and eliminate the downtime involved in resetting the machine manually.

[0018] According to the present invention, the aforesaid objects are achieved by a forming and sealing unit as claimed in Claim 1.

[0019] A preferred, non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figures 1 and 2 show a side and front view respectively of a forming and sealing unit for a machine for packaging pourable food products, in accordance with the teachings of the present invention;

Figure 3 shows a larger-scale partial side view of the Figure 1 and 2 unit in a different operating condition;

Figure 4 shows a view in perspective of an actuating assembly of the unit;

Figure 5 shows an exploded view in perspective of a transmission unit of the Figure 4 assembly;

Figures 6 and 7 show a front and side view respectively of a detail of the Figure 5 transmission unit.

[0020] Number 1 in Figures 1 and 2 indicates as a whole a forming and sealing unit for a machine (not shown) for packaging pourable food products, such as pasteurized or UHT milk, fruit juice, wine, etc..

[0021] Unit 1, in particular, provides for producing aseptic sealed packages, containing a pourable food product, from a tube 2 of packaging material formed by folding and longitudinally sealing a web of heat-seal sheet material, and filled with the food product upstream from unit 1.

[0022] Tube 2 is fed to unit 1 in known manner along a vertical path defined by an axis A.

[0023] Unit 1 comprises a supporting structure 3 defining a pair of vertical guides 4 located symmetrically with respect to the longitudinal vertical mid plane α of the unit through axis A.

[0024] Unit 1 comprises, in known manner, a pair of forming assemblies 5, 5' movable vertically along respective guides 4, and which interact alternately with tube 2 of packaging material to grip and heat seal cross sections of the tube.

[0025] As assemblies 5, 5' are known and symmetrical with respect to plane α, only one (assembly 5) will be described herein, and only as regards the parts pertinent to the present invention, using the same reference numbers for the corresponding parts of both assemblies 5, 5'.

[0026] Assembly 5 substantially comprises a slide 6 which runs along respective guide 4; and a pair of jaws 7 substantially in the form of appropriately ribbed quadrangular plates, and which are hinged to the slide at the bottom about respective horizontal axes 8a, 8b perpendicular to plane α, and have respective control brackets 9 projecting from respective opposite faces.

[0027] Jaws 7 are fitted integrally with respective supporting arms 10, which are fixed to the top ends of respective jaws 7 and project towards and beyond plane α so as to be positioned on either side of tube 2 (Figure 2).

[0028] The projecting portions of arms 10 are fitted with respective bar-shaped sealing elements (not shown) for interacting with tube 2. Which elements may be defined, for example, by an inductor for generating current in the aluminium layer of the packaging material and melting the thermoplastic layer by virtue of the Joule effect; and by a contrast pad enabling the necessary gripping pressure to be applied to the tube.

[0029] The movement of jaws 7 is controlled in known manner by a pair of vertical rods 15, 16.

[0030] Rod 15 is connected rigidly to slide 6 and therefore controls the vertical movement of assembly 5; while rod 16 extends through, without being connected to, slide 6, and is connected at the bottom end 17 to the control brackets 9 of jaws 7 by means of respective connecting rods 18, so that the downward movement of rod 16 with respect to rod 15 opens jaws 7 (Figure 3).

[0031] Jaws 7 are movable between a closed position (shown in Figure 3 relative to assembly 5') and a fully-

open position (shown in Figure 3 relative to assembly 5). As this movement is superimposed on the vertical reciprocating movement of slides 6, rods 15 move reciprocatingly, while rods 16 perform a periodic axial movement defined by a combination of the reciprocating movement of rods 15 and a further periodic movement for opening and closing jaws 7. Respective known forming flaps 19 are also hinged to arms 10.

[0032] According to the present invention, rods 15, 16 of each forming assembly 5, 5' are controlled independently by respective servomotors 20, 21, 20', 21' (Figure 4).

[0033] All four servomotors 20, 21, 20', 21' are housed in side by side pairs at the top of structure 3. More specifically, motors 20, 21 of assembly 5 are mounted on one side of structure 3, and have respective output shafts (not shown) facing and coaxial with each other, with the respective axes parallel to plane α; and servomotors 20', 21' of assembly 5' are mounted in the same way on the other side of structure 3 and symmetrically with servomotors 20, 21 with respect to plane α.

[0034] Each servomotor 20, 21, 20', 21' is conveniently fitted to a supporting frame 22, which is connected to a respective bracket 24, projecting laterally from structure 3, by means of a respective vertical hinge 23. This provides for troublefree access to servomotors 20, 21, 20', 21' for maintenance purposes, by enabling each to be substantially "extracted", without being dismantled completely, from structure 3 by rotating it outwards about respective hinge 23.

[0035] Each pair of motors is provided with a respective transmission unit 25, 25'. As both units are identical and located symmetrically with respect to plane α, only unit 25, shown in detail in Figure 5, will be described, the same considerations obviously also applying, mutatis mutandis, to unit 25'.

[0036] Transmission unit 25 comprises a supporting frame 27, in turn comprising an annular base flange 28 fitted to supporting structure 3 of unit 1, over motors 20, 21, and a gantry structure 29 extending upwards from flange 28.

[0037] Frame 27 houses and supports two belt transmissions 33a, 33b interposed respectively between motor 20 and respective rod 15, and between motor 21 and respective rod 16. As transmissions 33a, 33b are substantially identical, only transmission 33a will be described, the elements of transmission 33b being indicated using the same reference numbers as for the corresponding elements of transmission 33a.

[0038] Transmission 33a comprises a toothed belt 34, which meshes with a drive pulley 35 fitted to the output shaft of motor 20, and with a transmission pulley 36 fitted idly to a supporting fork 37 connected to a top cross member 38 of gantry structure 29 by means of a tensioning device 39 shown in Figures 6 and 7 and described in detail later on. The axes of pulleys 35 and 36 lie in a vertical plane parallel to plane α, so that belt 34 comprises a pair of vertical parallel branches.

[0039] One of said branches of the belt is fitted rigidly with a shoe or runner block 42 defined by a slide element 43 inwards of the belt and meshing with the toothing, and by a fastening element 44 outwards of the belt and connected rigidly to element 43 to sandwich the belt.

[0040] Element 43 cooperates in sliding manner with a vertical guide section 55 carried integrally by a supporting frame 56 fixed rigidly inside frame 27.

[0041] Element 44 comprises a fastening portion 45 to which is connected the top end of rod 15.

[0042] With reference to Figures 6 and 7, tensioning device 39 comprises a tubular body 46, which is fitted to the top cross member 38 of gantry structure 29 of frame 27, through an opening 47 in the cross member (Figure 5).

[0043] Device 39 also comprises a vertical shaft 48 fitted through and sliding axially with respect to tubular body 46; and a fastening portion 49 is formed at the bottom end of shaft 48 and connected rigidly to fork 37.

[0044] A coil spring 50, coaxial with shaft 48, is compressed axially between tubular body 46 and a stop ring 51 fitted rigidly to and close to the top end of shaft 48, so as to push shaft 48 and, hence, fork 37 elastically upwards.

[0045] Tensioning device 39 also comprises a pair of cylindrical bushes 52 located diametrically opposite each other with respect to body 46, with their respective axes extending radially with respect to the axis of body 46 and lying along a common straight line C.

[0046] Bushes 52 are fitted in rotary manner to respective pins (not shown), and house respective springs (not shown) for torquing the bushes in opposite directions (e.g. clockwise, with reference to the bush 52 shown in Figure 6). Advantageously, bushes 52 are mounted on non-return needle bearings for uni-directional rotational movement.

[0047] Each bush 52 carries an integral cam 54 extending circumferentially along a fraction of the lateral surface of bush 52; and each cam 54 has a lift profile increasing in the opposite direction to the torque acting on the bush.

[0048] Stop ring 51 comprises a pair of diametrically opposite arms 57, each projecting towards a respective bush 52; and, at the free end, each arm 57 defines a respective internally threaded bush 58 in which is screwed a respective adjustment or setting screw 59 cooperating at the end with respective cam 54.

[0049] Servomotors 20, 21, 20', 21' are connected to a control unit 60, which may be programmed to vary the parameters governing operation of the motors, and therefore to vary the operating cycles of unit 1.

[0050] Unit 1 operates as follows.

[0051] The vertical movement of rods 15, 16 controlling forming assemblies 5, 5' is controlled by servomotors 20, 21, 20', 21'. Rotation of the output shaft 33 of each servomotor is transmitted, via respective drive pulley 35, to toothed belt 34, which produces a vertical

movement of respective shoe or runner block 42 and hence respective rod 15, 16.

[0052] Servomotors 20, 21, 20', 21' are controlled to govern the movement of rods 15, 16 of forming assemblies 5, 5' as required to perform the operating cycle of unit 1.

[0053] Very briefly, jaws 7 of each assembly 5, 5' close during the downward travel of the assembly, so as to grip tube 2 with a vertical downward component of motion equal to the traveling speed of tube 2. Jaws 7 remain closed during the downward travel, and the sealing elements grip the tube with sufficient pressure to heat seal it. Close to the bottom dead center position, jaws 7 open to release tube 2, are opened further during the upward travel, and reach the fully-open position (Figure 3) prior to reaching the top dead center position. The jaws then start closing, and are closed completely after reaching the top dead center position for the reasons explained above.

[0054] Operation of assemblies 5 and 5' is obviously offset by half a cycle : assembly 5 moves up with jaws 7 open as assembly 5' moves down with the jaws closed, so that arms 10 of assembly 5' pass between the arms of assembly 5 without interfering therewith.

[0055] Tensioning devices 39 ensure correct tension - defined by the elastic load of springs 50 - of belts 34, even in the event of the belts stretching. In which case, shaft 48 is pushed upwards by spring 50 to form a clearance between screws 59 and cams 54; which clearance, however, is taken up automatically by bushes 52 rotating and so bringing a higher lift portion of cams 54 into contact with the screws. Devices 39 therefore permit upward movement of respective transmission pulleys 36 to compensate for the stretching of belts 34, but prevent any movement in the opposite direction.

[0056] Control of assemblies 5, 5' by servomotors 20, 21, 20', 21' enables the operating cycle parameters (travel, speed) to be adjusted as required according to the volume and configuration of the packages to be produced, with no major mechanical alterations to the machine. Moreover, as forming assemblies 5, 5' are controllable independently, the position of the designs on the packages may be corrected rapidly and easily, thus reducing the number of rejects.

[0057] More specifically, in the presence of an input signal indicating a position error of the design with respect to the theoretical position, the traveling speed of one of assemblies 5, 5' may be varied with respect to the other within one cycle, with no change in the relative start- and end-of-cycle position. And once the required correction is achieved, the control unit may so control speed as to restore the relative position of forming assemblies 5, 5' before the end of the cycle.

[0058] Further advantages of unit 1 according to the present invention are greater compactness and lower cost as compared with conventional mechanically cam-controlled units.

[0059] Clearly, changes may be made to the unit as described and illustrated herein without, however, departing from the scope of the accompanying Claims.

Claims

1. A forming and sealing unit (1) for producing aseptic sealed packages, containing a pourable food product, from a tube (2) of packaging material filled with said food product and fed along a vertical path (A), said unit (1) comprising a fixed structure (3); a pair of forming assemblies (5, 5') interacting alternately and cyclically with said tube (2) of packaging material, and in turn comprising respective slides (6) movable vertically and in reciprocating manner with respect to said fixed structure (3), and respective pairs of jaws (7) having sealing means and movable between an open position and a closed position in which said sealing means cooperate with said tube (2) of packaging material; a first pair of control members (15) for controlling the movement of said slides (6); a second pair of control members (16) for controlling the opening and closing movement of said jaws (7); and activating means for activating said first and second control members (15, 16); characterized in that said activating means comprise independently adjustable actuating means (20, 21, 20', 21') for each said control element (15, 16).

2. A unit as claimed in Claim 1, characterized in that said actuating means comprise a servomotor (20, 21, 20', 21') for each said control element (15, 16).

3. A unit as claimed in Claim 2, characterized by comprising a control unit (60) connected to said servomotors (20, 21, 20', 21') and which is programmable to vary the movement of said control members (15, 16).

4. A unit as claimed in Claim 2 or 3, characterized in that said first control members comprise a pair of vertical first rods (15) connected to the respective said slides (6); and said second control members comprise a pair of vertical second rods (16) connected to the respective said pairs of jaws (7); said unit (1) comprising belt transmission means (33a, 33b) interposed between each servomotor (20, 21, 20', 21') and the respective said rod (15, 16).

5. A unit as claimed in Claim 4, characterized in that said belt transmission means (33a, 33b) comprise a toothed belt (34) activated by the servomotor (20, 21, 20', 21') and having at least one portion movable along a vertical plane; and a shoe (42) connected rigidly to said portion of said belt (34) and having connecting means (45) for connection to a said respective rod (15, 16).

6. A unit as claimed in Claim 5, characterized in that said transmission means (33a, 33b) comprise tensioning means (36, 37, 46, 48, 50, 51) for each said belt (34).

7. A unit as claimed in Claim 6, characterized in that said tensioning means comprise a transmission pulley (36) cooperating with said belt (34); supporting means (37, 48, 51) for supporting said transmission pulley (36); fastening means (46) for fastening said supporting means (37, 48, 51) to said fixed structure (3) of said unit (1); and elastic means (50) interposed between said supporting means (37, 48, 51) of said transmission pulley (36) and said fastening means (46), to exert on said supporting means (37, 48, 51) a force for tensioning said belt (34).

8. A unit as claimed in Claim 7, characterized in that said tensioning means comprise one-way retaining means (54, 59) interposed between said supporting means (37, 48, 51) of said transmission pulley (36) and said fastening means (46), and which permit movement of said supporting means (37, 48, 51) of said transmission pulley (36) with respect to said fastening means (46) in the determined stretch direction of said belt (34), and prevent relative movement in the opposite direction.

9. A unit as claimed in Claim 8, characterized in that said one-way retaining means comprise cam means (54) carried by said fastening means (46); and pressure means (59) carried by said supporting means (37, 48, 51) of said pulley (36); said cam means (54) having a variable lift profile, and being pushed elastically to recover any clearance formed between said cam means (54) and said pressure means (59).

10. A unit as claimed in Claim 9, characterized in that said supporting means of said pulley (36) comprise a supporting fork (37); a shaft (48) connected rigidly to said fork (37); and a stop element (51) fitted rigidly to said shaft (48); said fastening means comprising a tubular body (46) fitted to said fixed structure (3) and housing said shaft (48) in sliding manner; and said elastic means comprising a spring (50) compressed between said tubular body (46) and said stop element (51).

11. A unit as claimed in Claim 10, characterized in that said cam means comprise at least one cam (54) rotating about an axis (C) extending radially with respect to said tubular body (46); and in that said pressure means comprise a pressure screw (59) cooperating with said cam (54) and carried by an arm (57) integral with said stop element (51); said cam (54) being charged by said elastic means (50) to bring increasing-lift portions of said profile into contact with said screw (59) in the event of a clearance forming between said cam (54) and said screw (59).

12. A unit as claimed in one of the foregoing Claims from 2 to 11, characterized in that said servomotors (20, 21, 20', 21') are fitted to respective supporting elements (22) so as to be at least partly withdrawable from said structure (3) of said unit (1).

13. A unit as claimed in Claim 12, characterized in that said supporting elements (22) are hinged to said structure (3) of said unit (1).

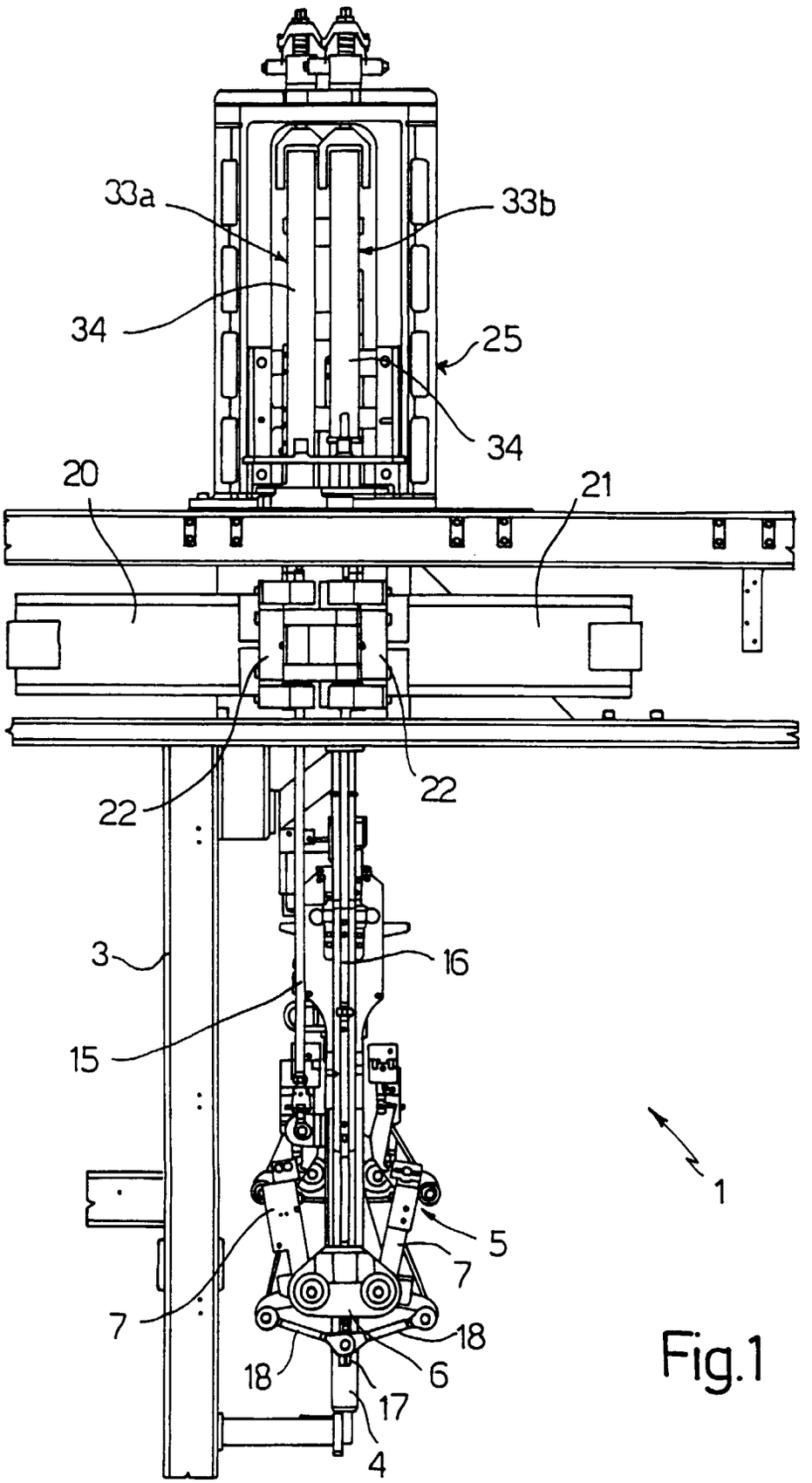

Fig.1

Fig.2

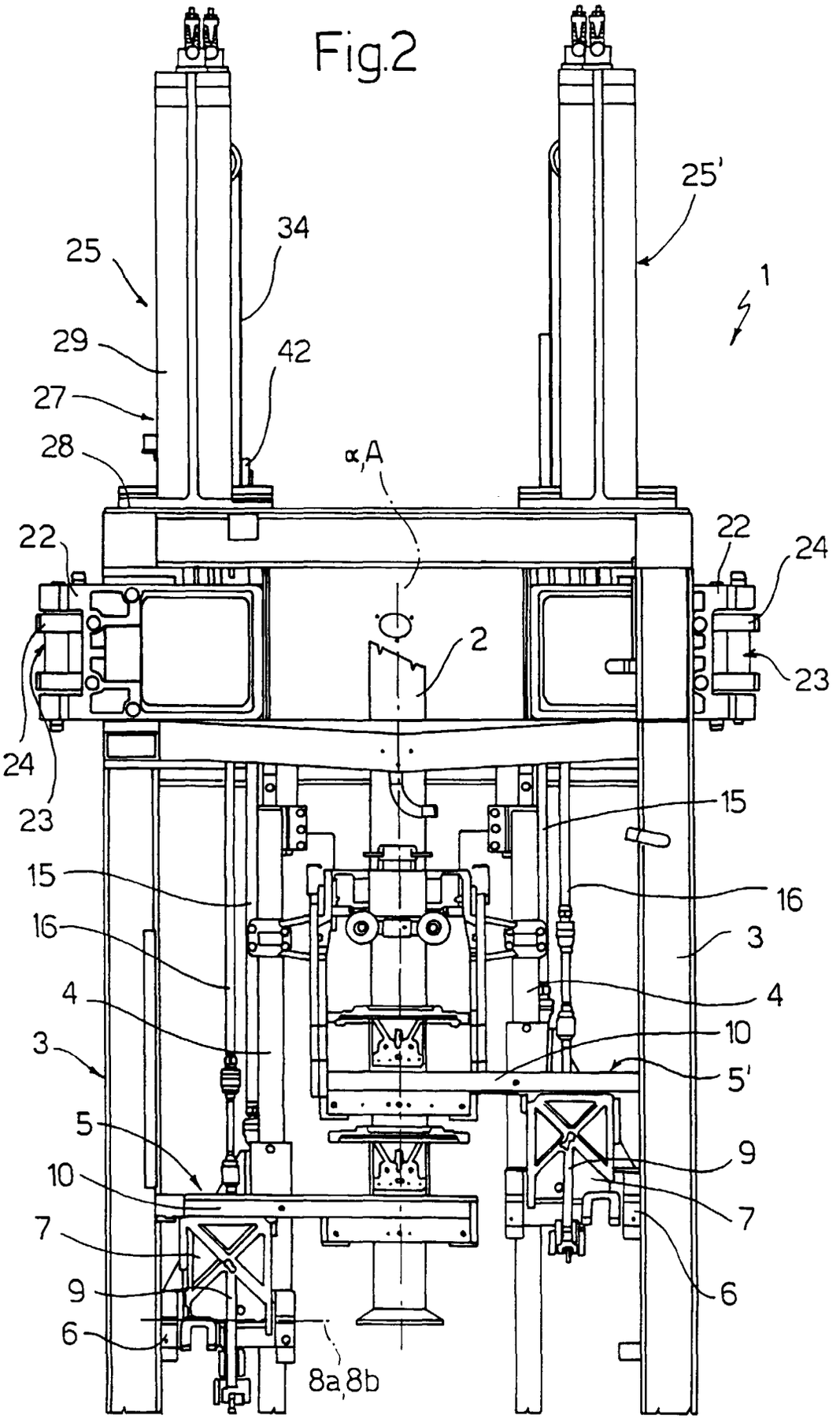
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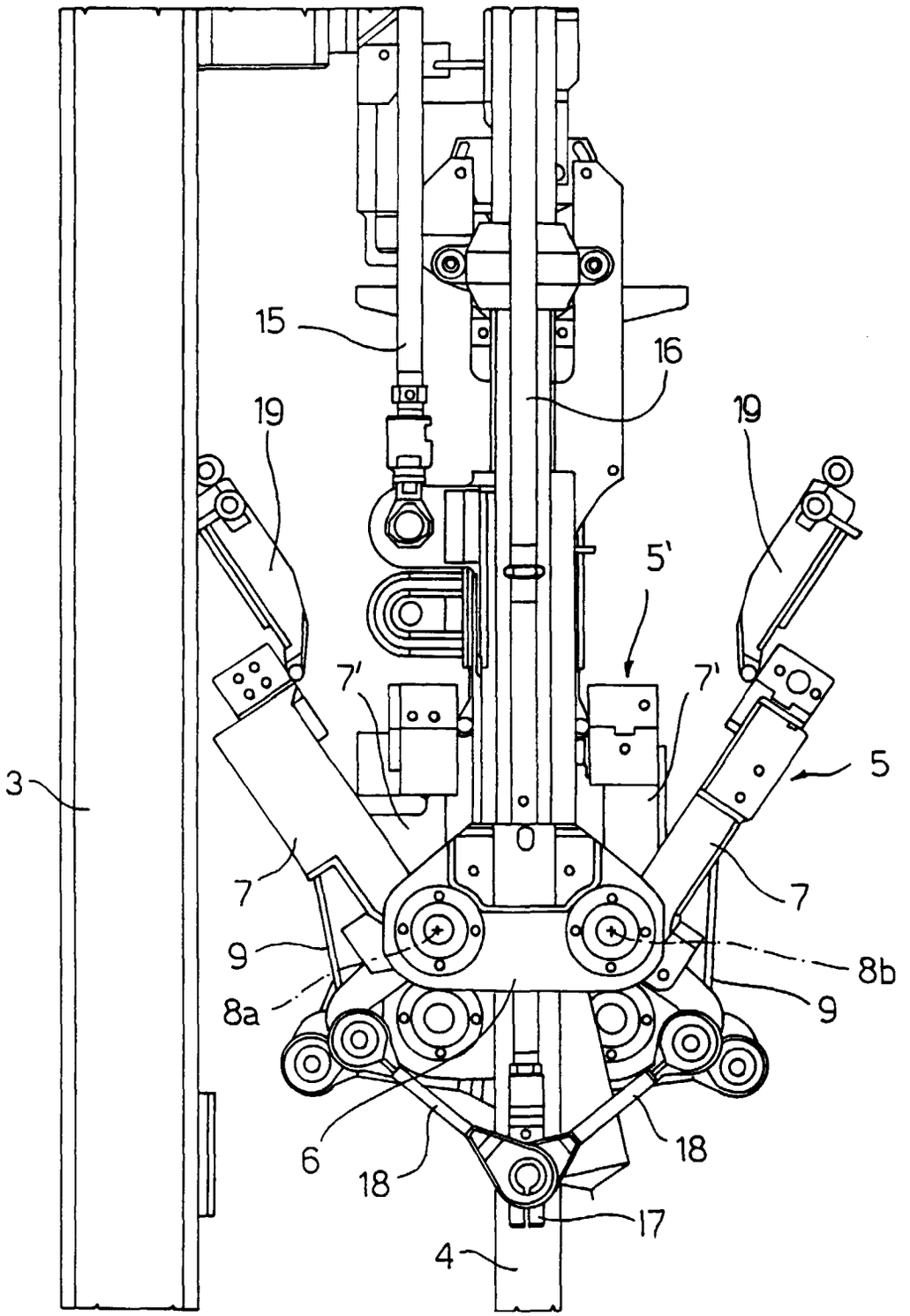
Fig.3



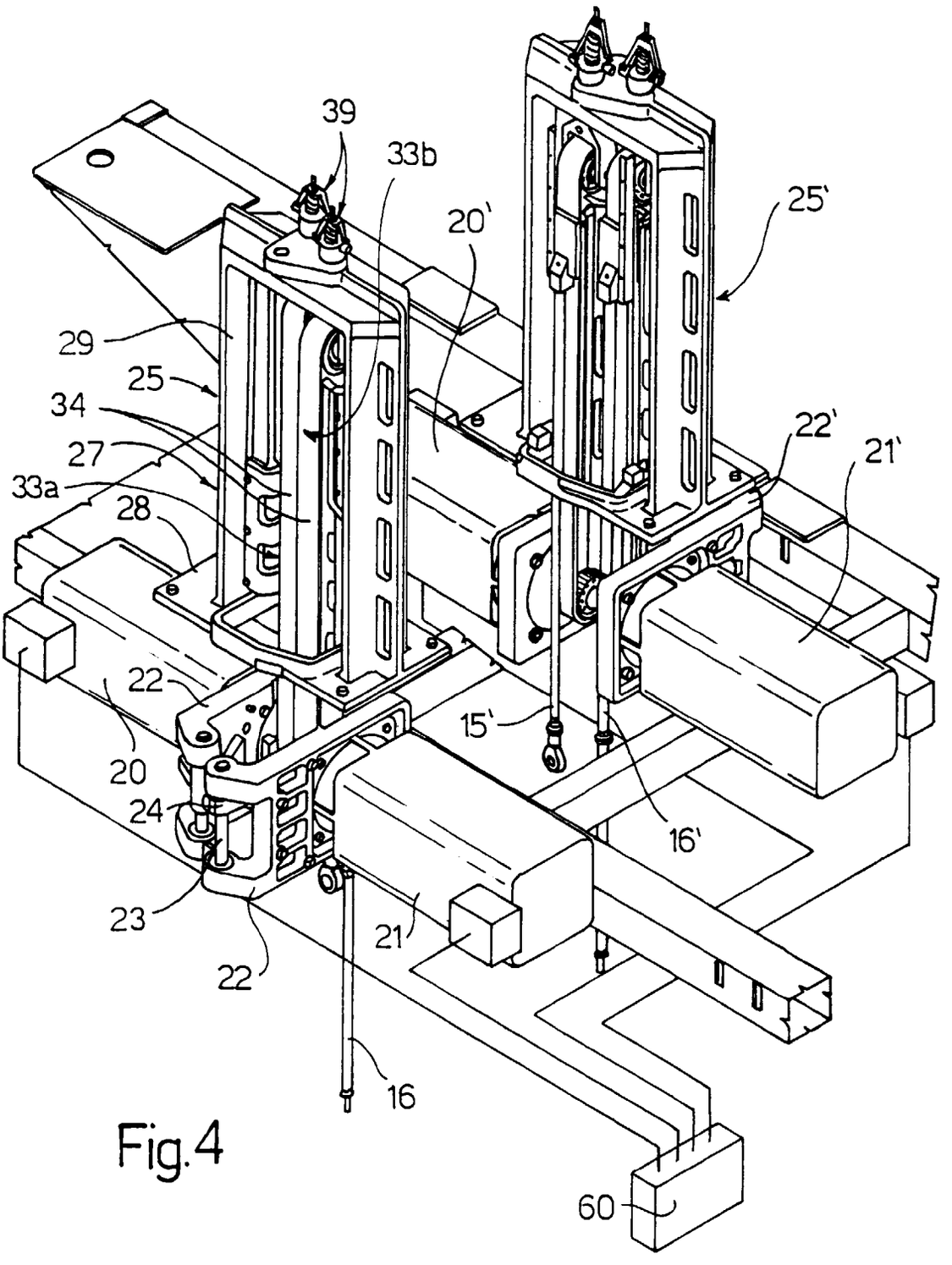


Fig.4

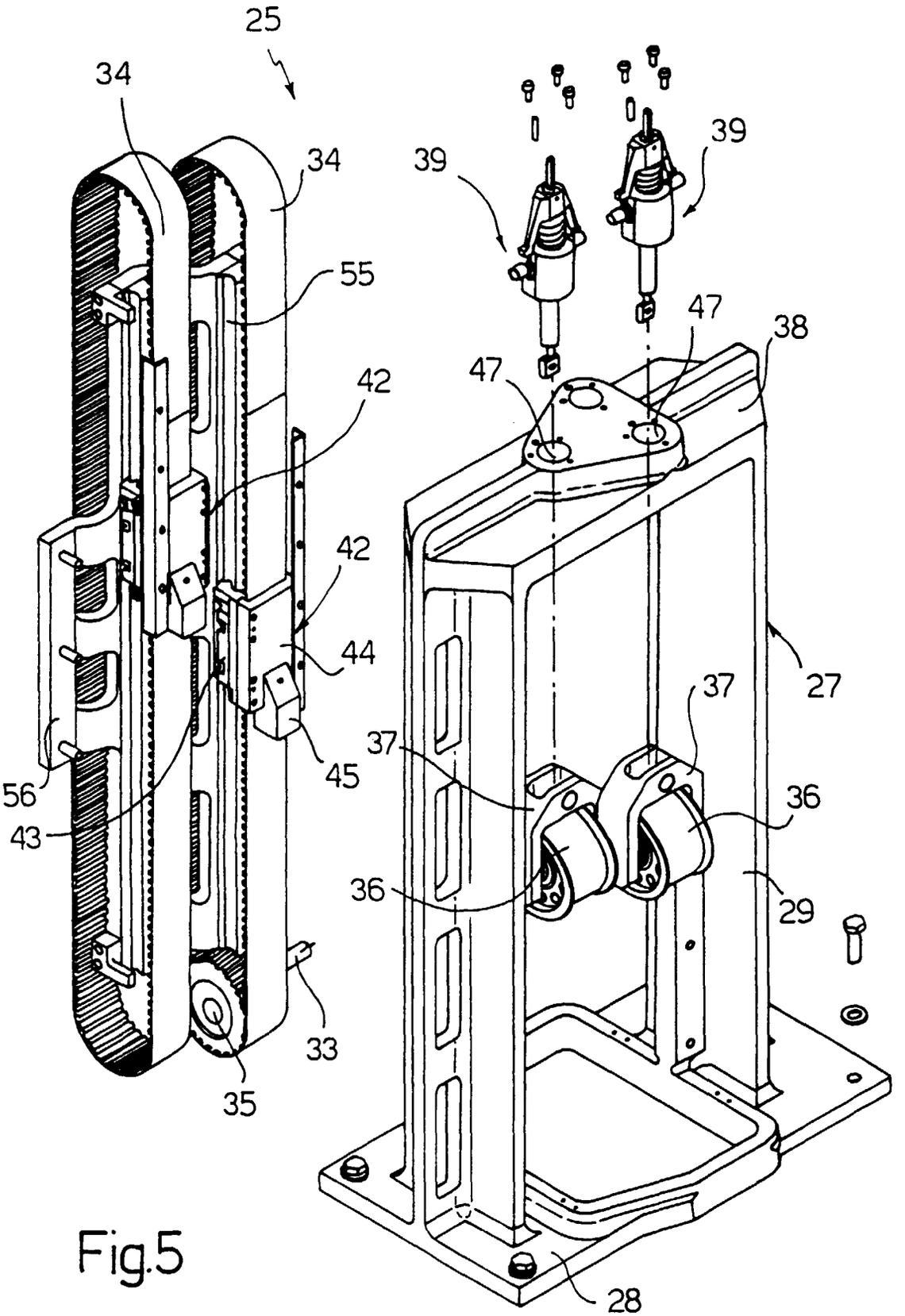


Fig.5

Fig.7

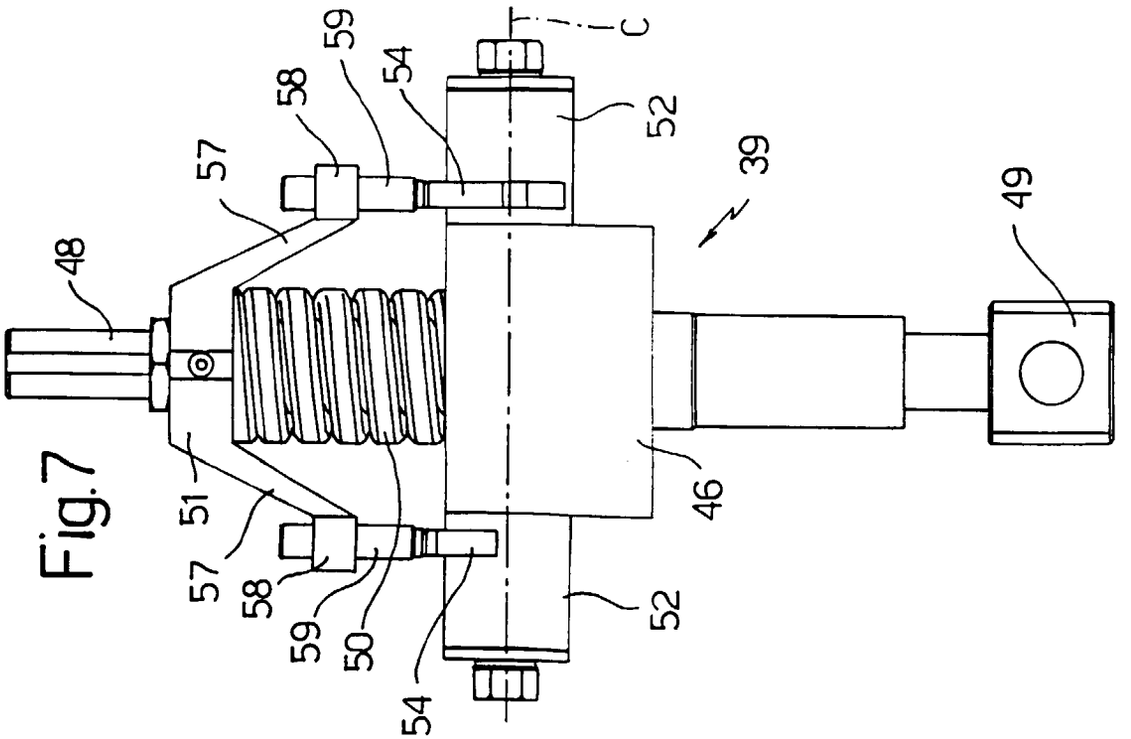

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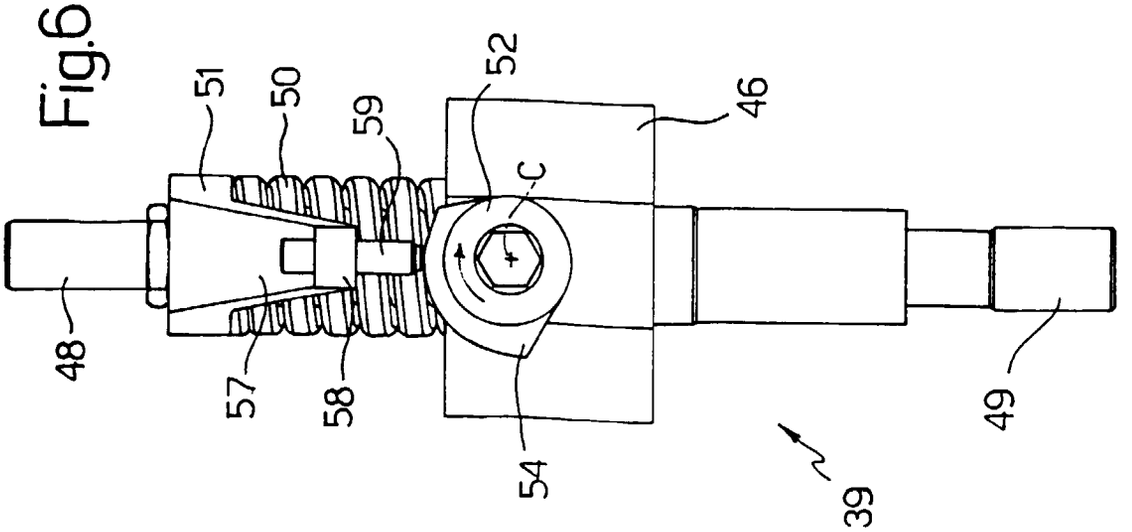
Fig.6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EUROPEAN SEARCH REPORT

Application Number
EP 98 10 9367

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.6)
X Y	EP 0 764 580 A (ROVEMA) 26 March 1997 * column 8, line 49 - column 9, line 58; figures 1-9 *	1-3,12 4	B65B51/30
X A	EP 0 380 868 A (KLIKLOK CORP.) 8 August 1990 * column 6, line 58 - column 10, line 11; figures *	1-3 4	
D,Y A	EP 0 091 712 A (TETRA PAK) 19 October 1983 * page 7, line 10 - page 9, line 27 * * page 13, line 3 - line 31; figures *	4 5-7	
A	GB 2 311 759 A (SANKO MACHINERY) 8 October 1997		
A	WO 96 17773 A (KLIKLOK CORP.) 13 June 1996		

TECHNICAL FIELDS SEARCHED (Int.Cl.6)
B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	5 October 1998	Jagusiak, A

CATEGORY OF CITED DOCUMENTS

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05-10-1998

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 764580 A	26-03-1997	NONE	
EP 380868 A	08-08-1990	US 4996825 A	05-03-1991
		CA 1323830 A	02-11-1993
		DE 68915734 D	07-07-1994
		DE 68915734 T	15-12-1994
		JP 2242708 A	27-09-1990
		US 5062253 A	05-11-1991
EP 91712 A	19-10-1983	SE 454584 B	16-05-1988
		AU 555396 B	25-09-1986
		AU 1345583 A	20-10-1983
		AU 576963 B	08-09-1988
		DE 3376640 A	23-06-1988
		EP 0228362 A	08-07-1987
		JP 6013325 B	23-02-1994
		JP 58193206 A	10-11-1983
		JP 6345014 A	20-12-1994
		JP 6321208 A	22-11-1994
		JP 7049283 B	31-05-1995
		JP 6298208 A	25-10-1994
		JP 6298209 A	25-10-1994
		JP 7049284 B	31-05-1995
		JP 6298210 A	25-10-1994
		JP 7049285 B	31-05-1995
		JP 2015450 C	02-02-1996
		JP 5032207 A	09-02-1993
		JP 7041883 B	10-05-1995
		SE 8202302 A	14-10-1983
		SU 1422989 A	07-09-1988
		US 4580392 A	08-04-1986
GB 2311759 A	08-10-1997	JP 9272511 A	21-10-1997
		DE 19710241 A	06-11-1997
		IT RM960862 A	15-06-1998
WO 9617773 A	13-06-1996	US 5540035 A	30-07-1996
		AU 693623 B	02-07-1998
		AU 4281696 A	26-06-1996
		EP 0794900 A	17-09-1997

EPO FORM P0459

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