

(19)



Europäisches
Patentamt
European
Patent Office
Office européen
des brevets



(11)

EP 2 123 413 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

25.11.2009 Bulletin 2009/48

(51) Int Cl.:

B27L 5/02 (2006.01)(21) Application number: **09160131.0**(22) Date of filing: **13.05.2009**

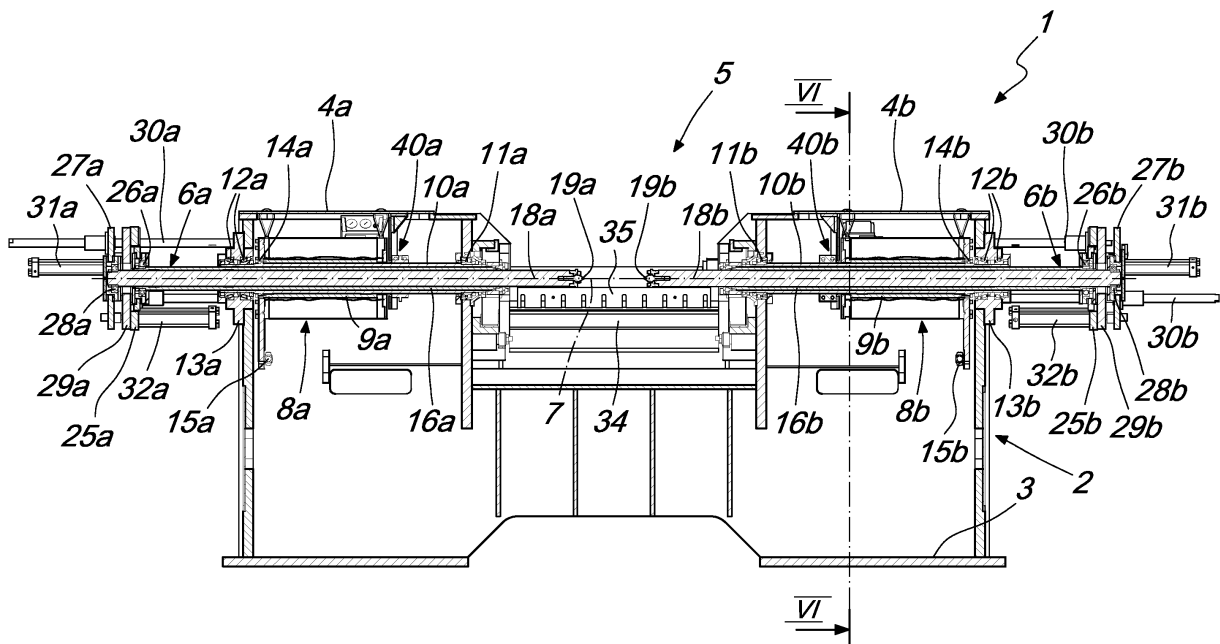
(84) Designated Contracting States:

**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL
PT RO SE SI SK TR**

(30) Priority: **21.05.2008 IT MI20080935**(71) Applicant: **CORALI S.p.A.****24060 Carobbio degli Angeli BG (IT)**(72) Inventor: **Trovenzi, Giuseppe****24060 Carobbio degli Angeli, BG (IT)**(74) Representative: **Modiano, Micaela Nadia****Dr. Modiano & Associati SpA****Via Meravigli 16****20123 Milano (IT)**(54) **Machine for cutting veneers from logs for producing wood strips**

(57) A machine (1) for cutting veneers from logs for producing wood strips, with high structural simplicity comprising a supporting structure (2) and a pair of mutually opposite spindles (6a, 6b), which are coaxial one another and are supported, so that they can rotate about the common axis (7), by the supporting structure (2), the machine further comprising first means (8a, 8b) for the actuation of the pair of spindles (6a, 6b) with a rotary motion about the common axis (7), the spindles being

further movable on command toward or away from each other in order to engage or disengage the opposite axial ends of a log to be sliced, the first actuation means comprising an electric motor (8a, 8b) for each spindle (6a, 6b), which is connected directly by means of its driving shaft (9a, 9b) to the corresponding spindle (6a, 6b), and electronic means being provided for controlling the electric motors for the actuation of the spindles, for their synchronized actuation.

*Fig. 3*

Description

[0001] The present invention relates to a machine for cutting veneers from logs for producing wood strips, with high structural simplicity.

[0002] Machines for cutting veneers from logs to produce wood strips are known. These machines generally comprise a structure for supporting the log to be cut, which is provided with a pair of mutually opposite spindles, which can engage the opposite axial ends of the log, substantially at the axis of the log, and can be actuated with a rotary motion about such axis, so as to turn the log to be cut. A cutting tool is mounted on the supporting structure of the machine and consists substantially of a blade whose length is equal to, or greater than, the length of the log, and which can move along a radial plane with respect to the log, so as to cut progressively into the outer layer of the log, during its rotation, achieving its progressive slicing. The cutting tools are generally provided so as to produce sheets with a thickness that can be preset by way of an adjustment of the tool.

[0003] Machines for cutting veneers from logs currently used for the production of wood strips also comprise a number of cutting rolls, which cut the outer layer of the log and are arranged upstream of the cutting tool, so as to cut into the outer layer of the log before it comes into contact with the cutting tool to divide the veneer formed by the cutting tool into strips. Such cutting rolls, also known as back rolls, are constituted generally by a cylindrical body, whose length is substantially equal to the length of the log and which is provided with a plurality of cutting blades that protrude radially from the body of the roll and are uniformly spaced from each other along the outer layer of the roll. In practice, the cutting blades protrude from the outer surface of the cutting roll by a length that is substantially equal to the thickness of the sheet generated by the interference of the cutting tool with the log, and the distance between two contiguous blades, measured along the circumference of the cutting roll, corresponds to the width of the strips to be produced.

[0004] In known types of veneer cutting machines, actuation of the pair of spindles is achieved by means of a main electric motor, which is connected to the two spindles by means of a mechanical gear transmission, so as to actuate simultaneously the two spindles with the same rotation rate and with mutually opposite directions of rotation.

[0005] The same mechanical transmission is further connected, by means of a gearbox, to another mechanical transmission, which actuates the tool along a radial direction with respect to the log turned by the spindles. In this manner, the advancement speed of the tool is correlated, according to a preset ratio that can be varied on command, to the rotation rate of the log in order to obtain the desired thickness for the strips that are formed.

[0006] In order to obtain a rapid approach motion of the tool to the log, an additional electric motor is provided, which also is connected to the mechanical transmission

that actuates the tool.

[0007] The mechanical transmissions provided in known types of machines for actuating the spindles and the tool are a considerable complication in the structure of these machines and have a severe effect on their overall production costs.

[0008] Moreover, the presence of these mechanical transmissions requires frequent maintenance interventions in order to maintain adequate reliability and efficiency of the machine over time.

[0009] The aim of the present invention is to solve the problems described above, by providing a machine for cutting veneers from logs for producing wood strips that is structurally simpler than veneer cutting machines of the traditional type.

[0010] Within this aim, an object of the invention is to provide a veneer cutting machine that is highly flexible in use and is capable of meeting the most disparate requirements.

[0011] Another object of the invention is to provide a veneer cutting machine with a high degree of automation.

[0012] Still another object of the invention is to provide a veneer cutting machine that can have highly competitive production costs.

[0013] This aim and these and other objects that will become better apparent hereinafter are achieved by a machine for cutting veneers from logs for producing wood strips, comprising a supporting structure and a pair of mutually opposite spindles, which are coaxial to each other and are supported so that they can rotate about the common axis by said supporting structure, first means being provided for the actuation of said pair of spindles with a rotary motion about the common axis; said spindles being further movable on command toward or away from each other in order to engage or disengage the opposite axial ends of a log to be sliced, **characterized in that** said first actuation means comprise an electric motor for each spindle connected directly by means of its driving shaft to the corresponding spindle, electronic means being provided for controlling the electric motors for the actuation of the spindles, for their synchronized actuation.

[0014] Further characteristics and advantages of the invention will become better apparent from the description of a preferred but not exclusive embodiment of the veneer cutting machine according to the invention, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a schematic top plan view of the veneer cutting machine according to the invention;

Figure 2 is a schematic front elevation view of the veneer cutting machine according to the invention;

Figure 3 is a schematic sectional view of Figure 1, taken along the line III-III;

Figure 4 is a schematic sectional view of Figure 2, taken along the line IV-IV;

Figure 5 is a partially axially sectional view of a spin-

dle of the veneer cutting machine according to the invention;

Figure 6 is a schematic sectional view of Figure 3, taken along the line VI-VI;

Figure 7 is a schematic sectional view of Figure 5, taken along the line VII-VII;

Figure 8 is a schematic perspective view of a portion of the veneer cutting machine according to the invention, with part of the covering housing removed.

[0015] With reference to the figures, the machine for cutting veneers from logs according to the invention, generally designated by the reference numeral 1, comprises a supporting structure 2 that is composed of a suitable footing 3 for resting on the ground, from which two lateral portions 4a, 4b rise which are arranged laterally, on mutually opposite sides, with respect to a central compartment 5, at which a log to be sliced is designed to be arranged. The veneer cutting machine comprises a pair of mutually opposite spindles 6a, 6b, which are coaxial to each other and are supported, so that they can rotate about a common axis 7, by the supporting structure 2. The spindles 6a, 6b can move on command along the axis 7 toward or away from each other, so as to engage or disengage the opposite axial ends of the log to be sliced, which is arranged in the central compartment 5 with its axis at the axis 7, as will become better apparent hereinafter. The machine according to the invention is provided with first actuation means, which are connected to the spindles 6a, 6b to actuate them with a rotary motion about the axis 7, so as to turn about its own axis the log to be sliced that is engaged with such spindles.

[0016] According to the invention, the first actuation means comprise an electric motor 8a, 8b for each spindle 6a, 6b, which is connected directly, by means of its driving shaft 9a, 9b, to the corresponding spindle 6a, 6b. These electric motors 8a, 8b are connected to electronic control means, of a known type, which actuate them in a synchronized manner.

[0017] More particularly, the electric motors 8a, 8b for the actuation of the spindles 6a, 6b are constituted preferably by synchronous motors with a large number of poles with permanent-magnet excitation, of the type commonly termed "torque motors".

[0018] Each one of these electric motors 8a, 8b is provided with a hollow driving shaft 9a, 9b, in which the corresponding spindle 6a, 6b is inserted coaxially and jointly in rotation about its axis 7.

[0019] Each spindle 6a, 6b is supported by one of the lateral portions 4a, 4b of the supporting structure 2 and is composed of three shafts, which are coaxial one another and are arranged so that their axis 7 is horizontal.

[0020] More particularly, each spindle 6a, 6b comprises an outer hollow shaft 10a, 10b, which is supported, so that it can rotate about its own axis 7, by the supporting structure 2 and is locked, in axial translational motion, to the supporting structure 2. The outer hollow shaft 10a, 10b is supported, proximate to one of its axial ends, di-

rectly by the corresponding lateral portion 4a, 4b of the supporting structure 2 by means of bearings 11a, 11b and, proximate to its opposite axial end, by means of other bearings 12a, 12b, by a supporting flange 13a, 13b, which is fixed to the corresponding lateral portion 4a, 4b of the supporting structure 2. The outer hollow shaft 10a, 10b has, in an intermediate region of its axial extension, a flange 14a, 14b, which is bolted directly to the driving shaft 9a, 9b of the electric motor 8a, 8b, whose body is adequately anchored to the supporting structure 2, for example by means of a stabilizing linkage 15a, 15b, so as to avoid its rotation about the axis 7.

[0021] An intermediate hollow shaft 16a, 16b is arranged internally and coaxially to the outer hollow shaft 10a, 10b and is provided, at its axial end that faces the central compartment 5, with engagement means, such as for example spikes 17a, 17b, that can engage an axial end of the log to be sliced. The intermediate hollow shaft 16a, 16b is supported, so that it can slide axially, by the outer hollow shaft 10a, 10b and is jointly connected thereto in rotation about its axis 7.

[0022] Internally and coaxially to the intermediate hollow shaft 16a, 16b there is an inner shaft 18a, 18b, which also is provided, at its axial end directed toward the central compartment 5, which protrudes from the corresponding axial end of the intermediate hollow shaft 16a, 16b, with engagement means, such as for example spikes 19a, 19b, which can engage the corresponding axial end of the log to be sliced. The inner shaft 18a, 18b is supported, so that it can slide axially, by the intermediate hollow shaft 16a, 16b and is jointly connected thereto in rotation about its own axis 7.

[0023] The connection in rotation about the common axis 7 of the three shafts 10a, 16a, 18a and 10b, 16b, 18b that compose a same spindle 6a, 6b, with the possibility of axial translational motion of the intermediate hollow shaft 16a, 16b and of the inner shaft 18a, 18b, is actuated by means of a coupling, generally designated by the reference numeral 40, that has first tabs 20 for connection of the outer hollow shaft 10a, 10b to the intermediate hollow shaft 16a, 16b, and second tabs 21 for the connection of the three shafts to each other. The first tabs 20 are jointly connected to the outer hollow shaft 10a, 10b, pass radially through the outer hollow shaft 10a, 10b, and are inserted, so as to slide parallel to the axis 7, in slots 22 that are defined in the intermediate hollow shaft 16a, 16b and are longer than the first tabs 20, so as to allow the axial translational motion of the intermediate hollow shaft 16a, 16b with respect to the outer hollow shaft 10a, 10b. The second tabs 21 are jointly connected to the outer hollow shaft 10a, 10b, pass radially through the outer hollow shaft 10a, 10b, pass through slots 23 defined in the intermediate hollow shaft 16a, 16b, are at least as long as the slots 22, and are inserted, so that they can slide parallel to the axis 7, in slots 24, which are defined in the inner shaft 18a, 18b and are longer than the second tabs 21, so as to allow the axial translational motion of the inner shaft 18a, 18b

with respect to the intermediate hollow shaft 16a, 16b and to the outer hollow shaft 10a, 10b.

[0024] The machine according to the invention is provided with means for translational motion, which act on the intermediate hollow shaft 16a, 16b and on the inner shaft 18a, 18b for actuating their translational motion in order to achieve the engagement or disengagement of their axial end directed toward the central compartment 5 with the corresponding axial end of the log to be sliced.

[0025] More particularly, the axial end of the intermediate hollow shaft 16a, 16b that exits from the outer hollow shaft 10a, 10b on the opposite side with respect to the central compartment 5, is connected coaxially to a corresponding disk-like element 25a, 25b with the interposition of a bearing 26a, 26b that allows the intermediate hollow shaft 16a, 16b to rotate about its own axis 7 with respect to the disk-like element 25a, 25b. Likewise, the axial end of the inner shaft 18a, 18b, which protrudes from said axial end of the intermediate hollow shaft 16a, 16b, is connected coaxially to a corresponding disk-like element 27a, 27b with the interposition of a bearing 28a, 28b that allows the inner shaft 18a, 18b to rotate about its own axis 7 with respect to the disk-like element 27a, 27b. A third disk-like element 29a, 29b is interposed between the disk-like elements 25a, 25b and 27a, 27b and is coaxial to them and is fixed, by means of bars 30a, 30b which are parallel to the axis 7, to the supporting flange 13a, 13b. The bars 30a, 30b extend beyond the third disk-like element 29a, 29b and act as a sliding guide both for the disk-like element 25a, 25b and for the disk-like element 27a, 27b. The translational motion means comprise a first pair of fluid-actuated cylinders 31a, 31b which are connected by means of their body to the third disk-like element 29a, 29b, which constitutes an abutment that is jointly connected to the supporting structure 2, and act with the stem of their piston, which is oriented parallel to the axis 7, on the disk-like element 25a, 25b, which is connected to the intermediate hollow shaft 16a, 16b, and a second pair of fluid-actuated cylinders 32a, 32b, which are connected by means of their body to the third disk-like element 29a, 29b and act with the stem of their piston, which is oriented parallel to the axis 7, on the disk-like element 27a, 27b, which is connected to the inner shaft 18a, 18b.

[0026] By way of the actuation of the fluid-actuated cylinders 31a, 31b and 32a, 32b it is possible to engage the axial ends of the log to be sliced both with the spikes 19a, 19b of the inner shaft 18a, 18b, in a region that lies closer to the axis 7, and with the spikes 17a, 17b of the intermediate hollow shaft 16a, 16b, in a region that lies further from the axis 7 at the beginning of the veneer cutting operation, so as to achieve high stability in supporting the log during its rotation, and then disengage the spikes 17a, 17b of the intermediate hollow shaft 16a, 16b from the log to allow completion of its slicing.

[0027] At the central compartment 5, the supporting structure 2 supports, so that it can slide along an actuation direction 33 that is substantially perpendicular to the

axis 7, a tool supporting carriage 34, on which the tool 35 designed to interfere progressively with the lateral surface of the log is mounted; said log being turned about its own axis, which coincides with the axis 7, by the rotation of the spindles 6a, 6b, in order to cause its slicing.

The tool supporting carriage 34 is connected to second actuation means, which can be actuated to move the tool supporting carriage 34 along said actuation direction 33.

[0028] In greater detail, in the illustrated embodiment, the second actuation means are connected to the tool supporting carriage 34 by way of a transmission of the screw-and-nut type which comprises a pair of threaded shafts 36a, 36b which are arranged so that their axes are parallel to the actuation direction 33 and are supported, so as to allow rotation about the respective axes, by the supporting structure 2. Each one of the threaded shafts 36a, 36b engages a corresponding female thread 37a, 37b, which is defined in the tool supporting carriage 34, so that a rotation of the threaded shafts 36a, 36b, about the respective axes, causes a translational motion, parallel to said axes, of the tool supporting carriage 34. The second actuation means can be constituted, in a per se known manner, by an electric motor which is connected, by means of a mechanical transmission, to the threaded shafts 36a, 36b, or, preferably, said second actuation means can comprise, for each one of the threaded shafts 36a, 36b, an electric motor 38a, 38b that is connected directly, by means of its driving shaft, to one of the threaded shafts 36a, 36b, providing, in a manner similar to what is described with reference to the actuation of the electric motors 8a, 8b, electronic means that mutually synchronize the rotation of the driving shafts of said electric motors 38a, 38b.

[0029] The electronic means for synchronizing the rotation of the driving shafts of the electric motors 8a, 8b and optionally of the driving shafts of the electric motors 38a, 38b can be constituted by an electronic axis-following adjustment system of a known type. Thanks to these electronic means, it is further possible to correlate the rotation rate of the driving shafts of the electric motors 38a, 38b, which cause the translational motion of the tool supporting carriage 34 along the actuation direction 33, and the rotation rate of the spindles 6a, 6b so as to adjust, according to the requirements, the thickness of the strips produced by the slicing of the log.

[0030] It should be noted that the use of two electric motors, one for each spindle, in order to actuate directly the spindles 6a, 6b, allows to simplify considerably the overall structure of the veneer cutting machine, since it allows to eliminate the complex mechanical transmission provided in conventional veneer cutting machines to connect the single main motor to the two spindles.

[0031] Moreover, in the machine according to the invention, if the tool supporting carriage 34 is also actuated, in a similar manner, by means of two electric motors 38a, 38b, a further simplification is achieved because the mechanical transmissions that in known types of machine are needed to connect the spindles to the tool supporting

carriage and the secondary motor to said tool supporting carriage are eliminated.

[0032] The use of variable-speed electric motors that can be controlled electronically further eliminates the need to resort to complex mechanical gearboxes.

[0033] In practice it has been found that the veneer cutting machine fully achieves the intended aim, since the elimination of the mechanical transmission for the actuation of the spindles 6a, 6b achieves a great structural simplification of the machine as a whole.

[0034] Another advantage of the machine according to the invention, which arises from the reduction of the number of mechanical components, is that maintenance interventions are simplified and reduced.

[0035] Another advantage of the machine according to the invention is to use components that can be automated more easily.

[0036] The veneer cutting machine thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims; all the details may further be replaced with other technically equivalent elements.

[0037] In practice, the materials used, as well as the dimensions, may be any according to requirements and to the state of the art.

[0038] The disclosures in Italian Patent Application no. MI2008A000935, from which this application claims priority, are incorporated herein by reference.

[0039] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A machine (1) for cutting veneers from logs for producing wood strips, comprising a supporting structure (2) and a pair of mutually opposite spindles (6a, 6b), which are coaxial to each other and are supported so that they can rotate about a common axis (7) by said supporting structure (2), first means (8a, 8b) being provided for the actuation of said pair of spindles (6a, 6b) with a rotary motion about the common axis (7); said spindles (6a, 6b) being further movable on command toward or away from each other in order to engage or disengage the opposite axial ends of a log to be sliced, **characterized in that** said first actuation means comprise an electric motor (8, 9) for each spindle (6a, 6b) connected directly by means of its driving shaft (9a, 9b) to the corresponding spindle (6a, 6b), electronic means being provided for controlling the electric motors for the actuation of the spindles (6a, 6b), for their synchronized actuation.

2. The machine according to claim 1, **characterized in that** said electric motors (8, 9) for actuating the spindles (6a, 6b) are constituted by synchronous motors with a large number of poles with permanent-magnet excitation ("torque motors").

3. The machine according to claims 1 and 2, **characterized in that** said electric motors (8, 9) for actuating the spindles (6a, 6b) have a hollow driving shaft (9a, 9b) in which the corresponding spindle (6a, 6b) is inserted coaxially, so as to rotate jointly about its own axis (7).

4. The machine according to one or more of the preceding claims, **characterized in that** it comprises a tool supporting carriage (34) that is supported, so that it can slide along an actuation direction (33) that is substantially perpendicular to the axis (7) of said spindles (6a, 6b), by said supporting structure (2), a tool (35) being mounted on said tool supporting carriage (34) and second means (38a, 38b) being provided for the actuation of said tool supporting carriage (34) along said actuation direction (33), said second actuation means (38a, 38b) comprising at least one electric motor (38a, 38b).

5. The machine according to one or more of the preceding claims, **characterized in that** said tool supporting carriage (34) is connected to said second actuation means (38a, 38b) by way of a transmission of the screw-and-nut type, which comprises a pair of threaded shafts (36a, 36b) arranged so that their axes are parallel to said actuation direction (33) and engage corresponding female threads (37a, 37b) defined in said tool supporting carriage (34), said second actuation means (38a, 38b) comprising an electric motor (38a, 38b) for each one of said threaded shafts (36a, 36b), which is connected directly by means of its output shaft to the corresponding threaded shaft (36a, 36b), electronic means being provided for controlling the electric motors (38a, 38b) that actuate the threaded shafts (36a, 36b) for their actuation in a synchronized manner.

6. The machine according to one or more of the preceding claims, **characterized in that** each one of said spindles (6a, 6b) comprises three mutually coaxial shafts (10a, 10b, 16a, 16b, 18a, 18b), arranged so that their axis is horizontal, respectively:

- an outer hollow shaft (10a, 10b), supported so that it can rotate about its own axis (7) by said supporting structure (2) and locked in axial translational motion to said supporting structure (2);
- an intermediate hollow shaft (16a, 16b), arranged inside said outer hollow shaft (10a, 10b) and provided, at one of its axial ends, with means

for engaging an axial end of the log to be sliced;
- and an inner shaft (18a, 18b), arranged inside
said intermediate shaft (16a, 16b) and also provided,
at one of its axial ends, with means for
engaging an axial end of the log to be sliced;

5

said intermediate hollow shaft (16a, 16b) and said
inner shaft (18a, 18b) being able to slide axially with
respect to each other and with respect to said outer
hollow shaft (10a, 10b), translational motion means
(31a, 31b, 32a, 32b) being provided which act on
said intermediate hollow shaft (16a, 16b) and on said
inner shaft (18a, 18b) for their axial translational motion.

10

15

7. The machine according to one or more of the preceding claims, **characterized in that** said translational motion means comprise fluid-actuated cylinders (31a, 31b, 32a, 32b) which are interposed between an abutment that is jointly connected to said supporting structure (2) and disk-like elements (25a, 25b, 27a, 27b, 29a, 29b) which are connected, so that they can rotate about their own axis, respectively to said intermediate hollow shaft (16a, 16b) and to said inner shaft (18a, 18b) and are jointly connected thereto in axial translational motion.

20

25

8. The machine according to one or more of the preceding claims, **characterized in that** the hollow shaft of each electric motor (8a, 8b) for the actuation of the spindles (6a, 6b) is crossed by said outer hollow shaft (16a, 16b) and is bolted directly to said outer hollow shaft (16a, 16b).

30

35

40

45

50

55

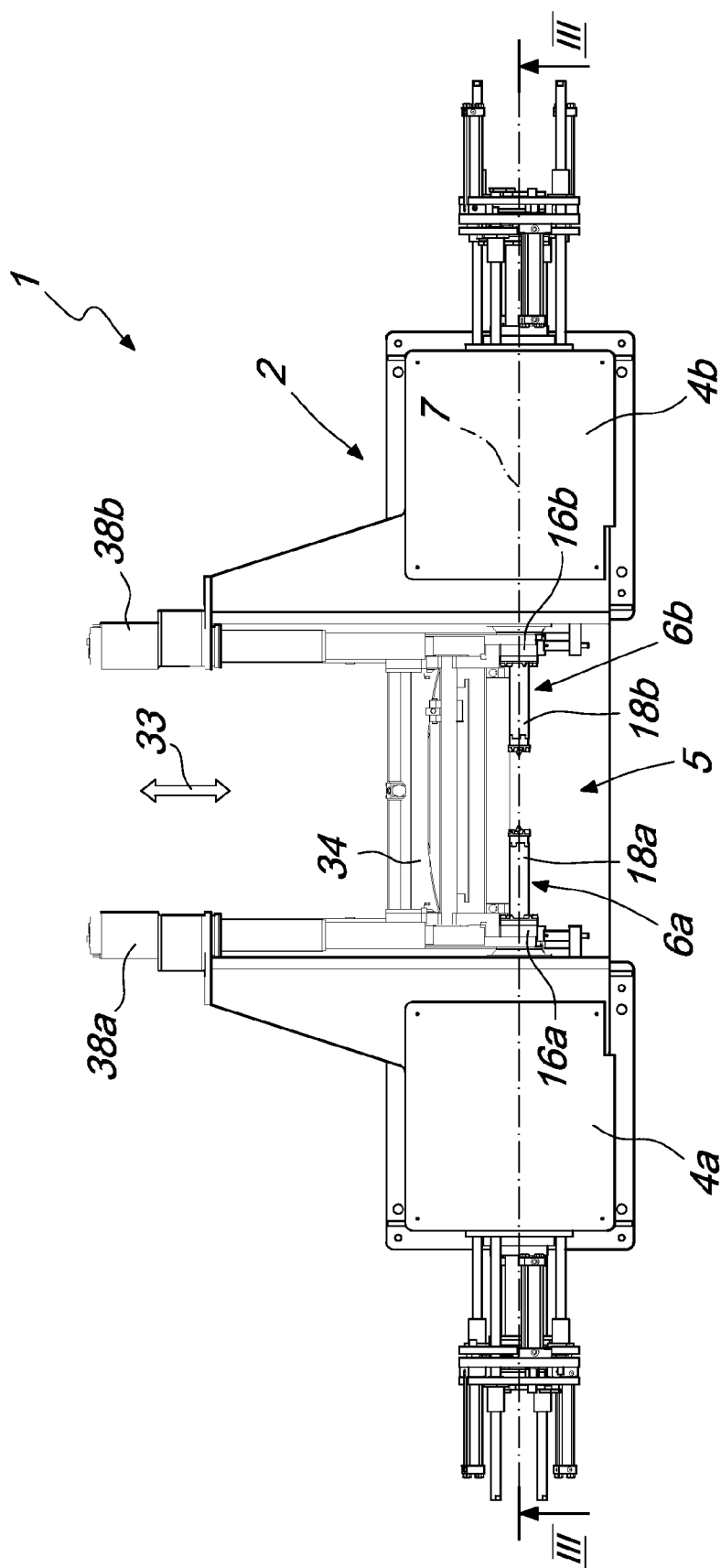


Fig. 1

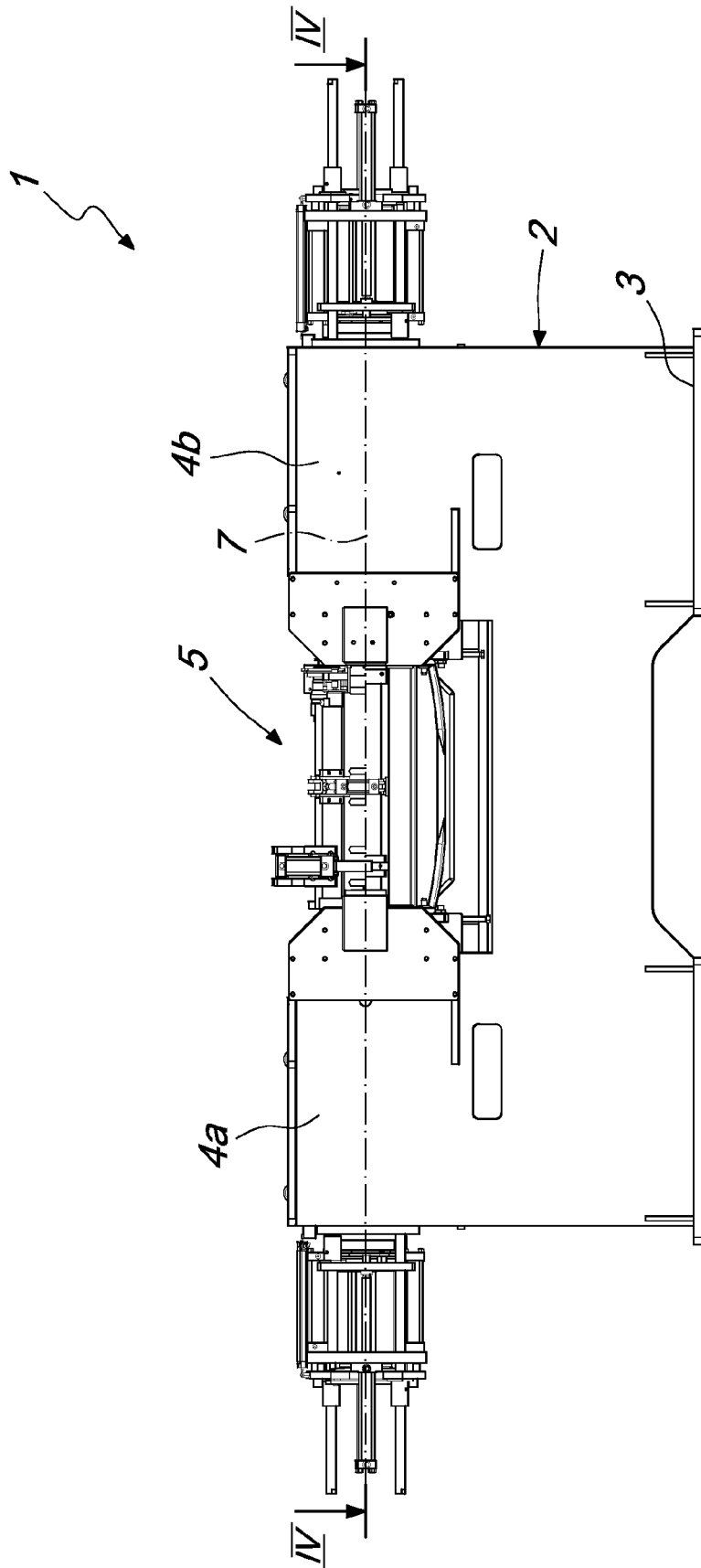


Fig. 2

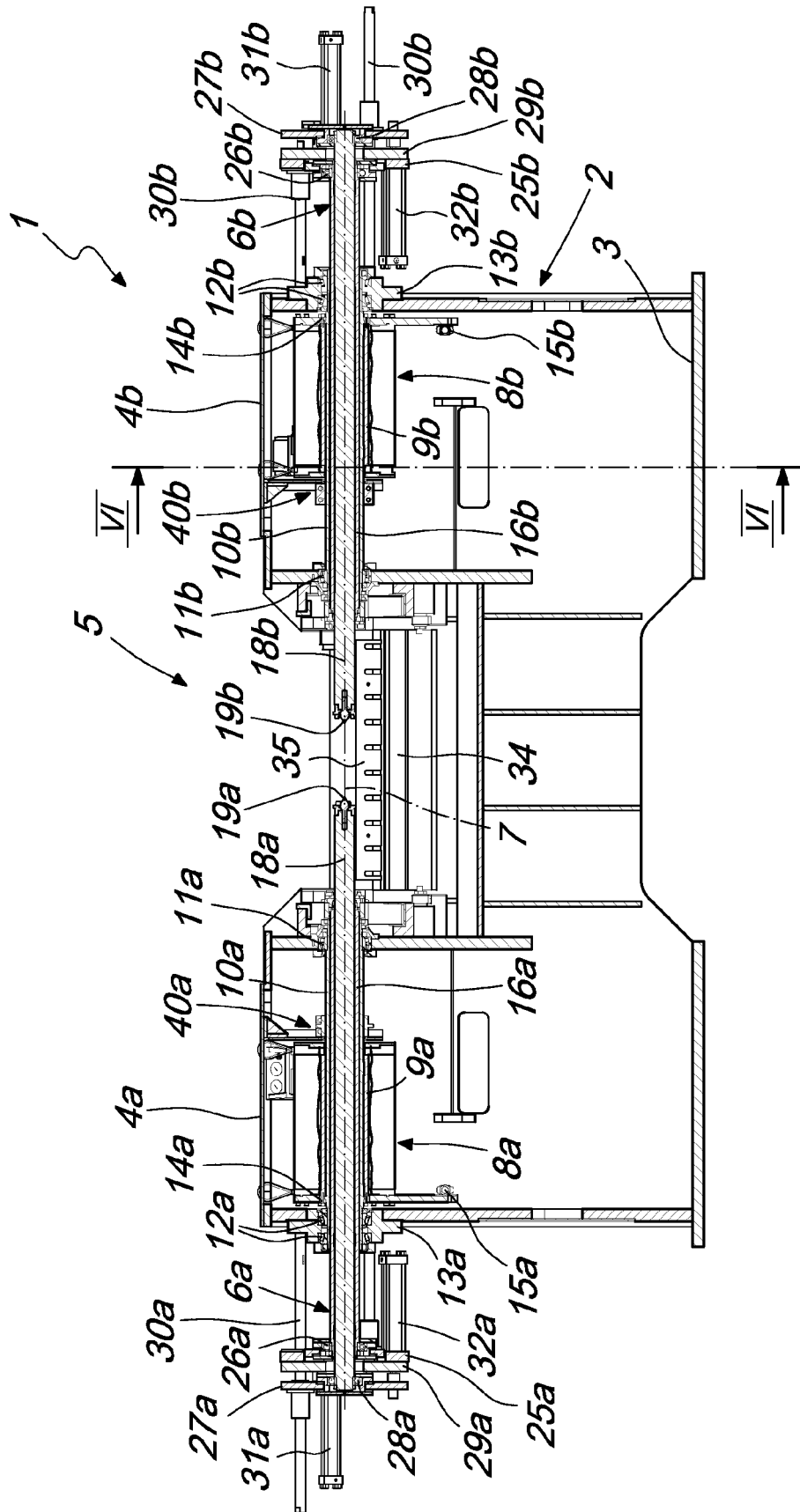


Fig. 3

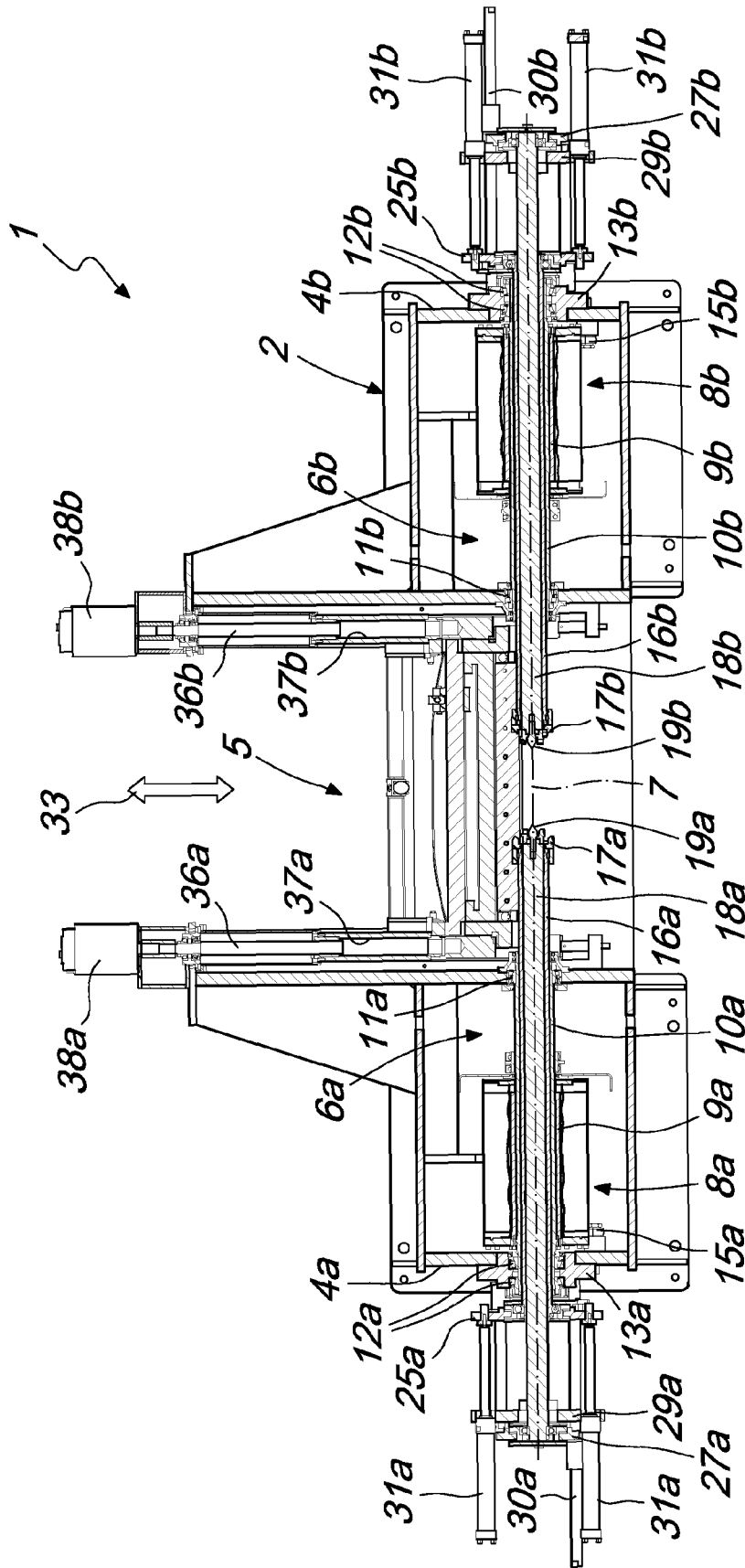


Fig. 4

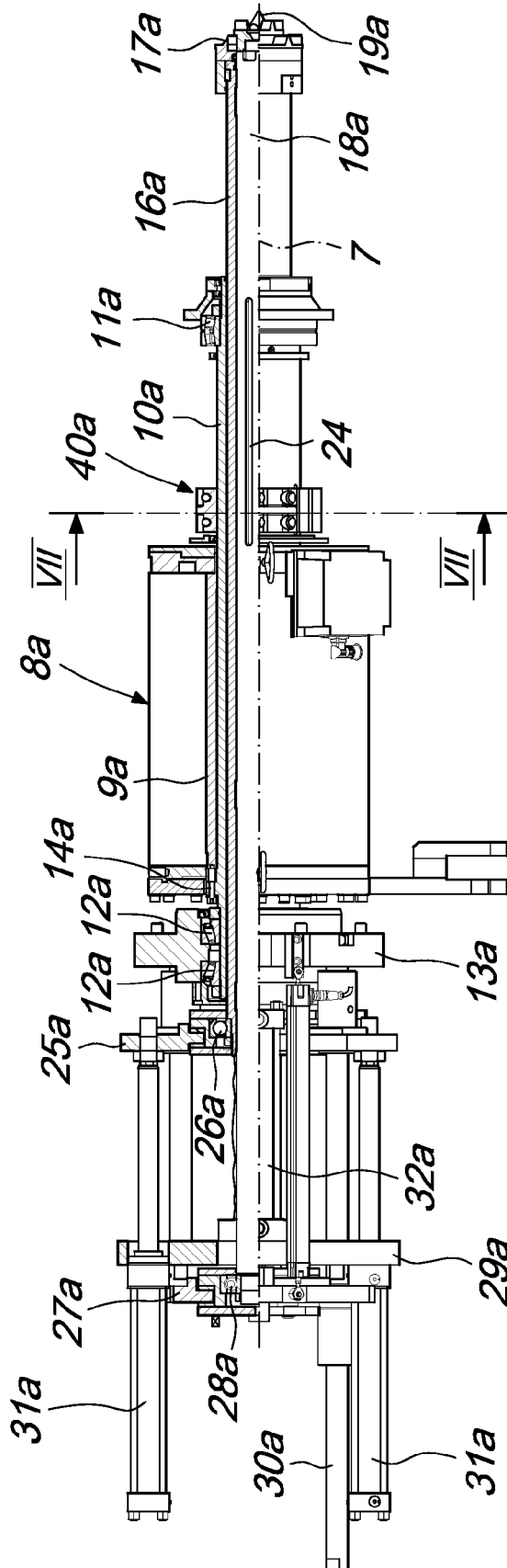


Fig. 5

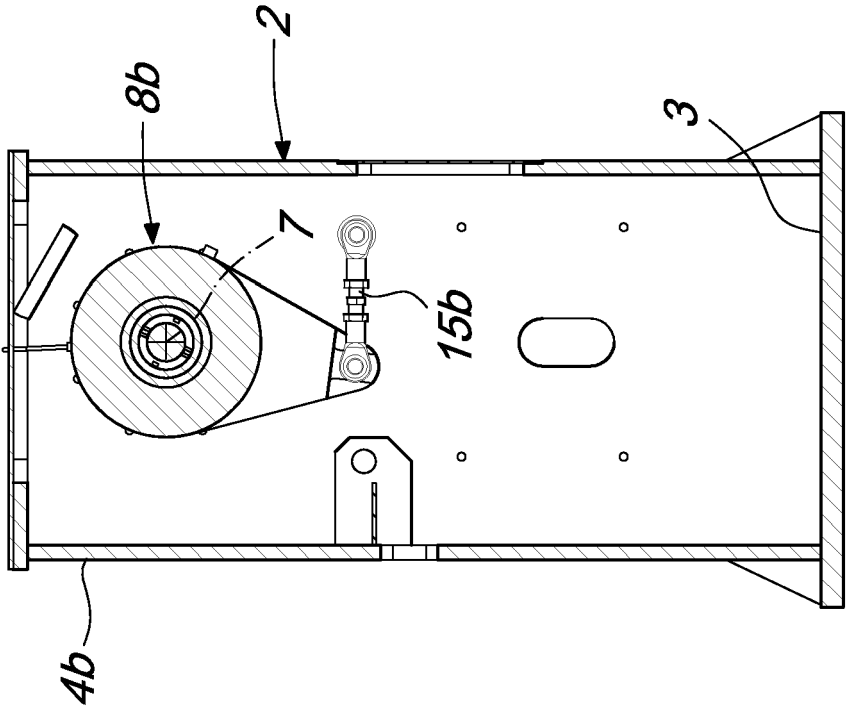


Fig. 6

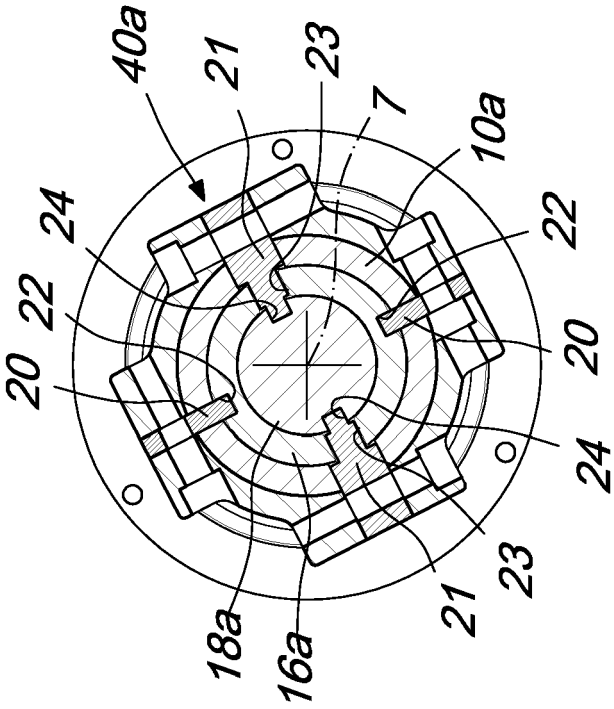


Fig. 7

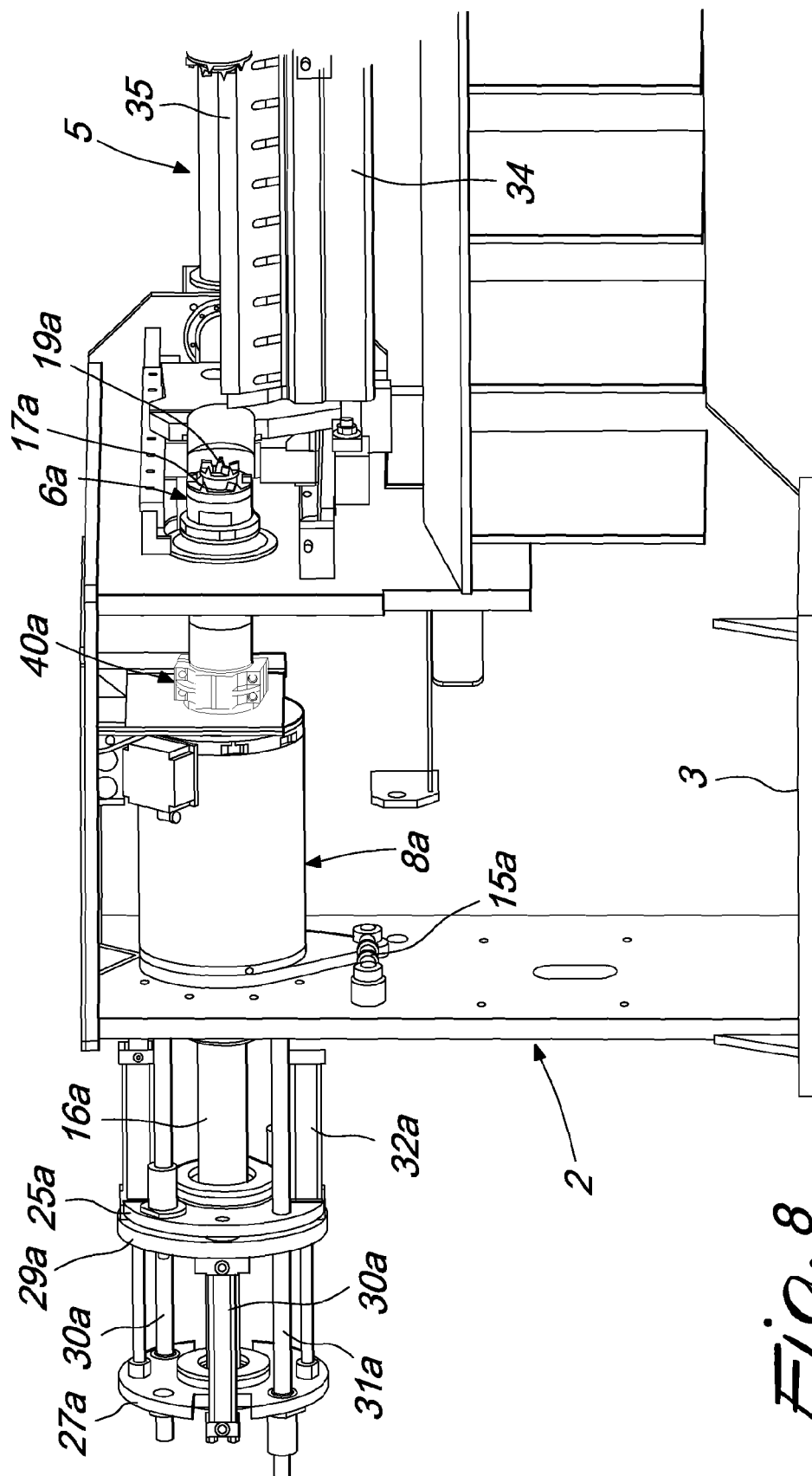


Fig. 8



EUROPEAN SEARCH REPORT

Application Number
EP 09 16 0131

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 89/12535 A1 (RAUTE OY [FI]) 28 December 1989 (1989-12-28)	1-3,6-8	INV. B27L5/02
Y	* page 3, paragraph 1 - paragraph 2 * * page 4, paragraph 1 * * figure *	4-5	
Y	----- US 4 979 120 A (ELY GARY W [US]) 18 December 1990 (1990-12-18) * column 3, line 25 - line 37; figure 1 *	4-5	
X	----- US 2007/204933 A1 (FEZER CARLOS ALBERTO F [BR] FEZER CARLOS ALBERTO FERNANDO [BR]) 6 September 2007 (2007-09-06) * paragraph [0026] *	1-3	
X	----- US 2 340 532 A (JACKSON JESSE O) 1 February 1944 (1944-02-01) * page 1, right-hand column, line 32 - line 35; figure 1 *	1	
A	----- WO 2007/068075 A1 (ARROW SPEED CONTROLS LTD [CA]; OLDHAM JOHN) 21 June 2007 (2007-06-21)	1	
A	----- EP 1 127 666 A2 (MEINAN MACHINERY WORKS [JP]) 29 August 2001 (2001-08-29) * paragraph [0050]; figure 1 *	5	B27L
A	----- FR 2 633 864 A1 (DEV MATERIELS EMBALLAG [FR]) 12 January 1990 (1990-01-12) * figure 3 *	6-7	
A	----- US 3 132 673 A (BAMFORD CHARLES F) 12 May 1964 (1964-05-12) * figure 6 *	6-7	
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 24 July 2009	Examiner Huggins, Jonathan
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

 1
EPO FORM 1503 03 82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 09 16 0131

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

24-07-2009

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 8912535 A1	28-12-1989	FI 882937 A IT 1230076 B JP 3503265 T US 5067534 A	21-12-1989 05-10-1991 25-07-1991 26-11-1991
US 4979120 A	18-12-1990	NONE	
US 2007204933 A1	06-09-2007	CA 2541095 A1 EP 1837146 A1 JP 2007237731 A	03-09-2007 26-09-2007 20-09-2007
US 2340532 A	01-02-1944	NONE	
WO 2007068075 A1	21-06-2007	CA 2530579 A1 EP 1960167 A1 US 2007157992 A1	16-06-2007 27-08-2008 12-07-2007
EP 1127666 A2	29-08-2001	CA 2337455 A1 CN 1312149 A DE 60104341 D1 DE 60104341 T2 ID 29329 A KR 20010085433 A NZ 510044 A US 2001016050 A1	23-08-2001 12-09-2001 26-08-2004 21-07-2005 23-08-2001 07-09-2001 29-06-2001 23-08-2001
FR 2633864 A1	12-01-1990	NONE	
US 3132673 A	12-05-1964	NONE	

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- IT MI20080935 A [0038]