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(54) **Winding device for a tape**

(57) Winding device for a tape comprising:
- a drive rotor (2);
- a driven rotor (3), the axis of rotation of the drive rotor (2) and the axis of rotation of the driven rotor (3) being perpendicular to a straight line which extends along a direction (31) of connection;
- means (4) for transmitting motion from the drive rotor (2) to the driven rotor (3), comprising a flexible annular body (40);
- a slider (5) comprising an idling element (51) for said annular body (40);
- tensioning means (6) which press the idling element (51) against the annular body (40);
- means (7) for inverting the motion of the drive rotor (2), activated directly or indirectly by the passage of the slider (5) through a predetermined position during a stroke from a first towards a second position.

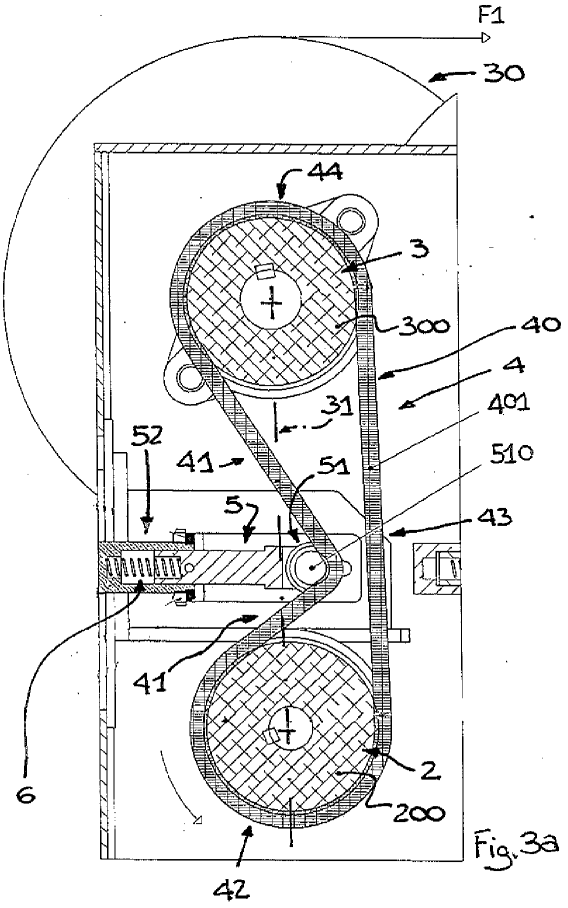

Fig. 3a

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Description

[0001] The present invention has as its subject a winding device for a tape; in particular said device is incorporated into a depalletizing machine for bodies arranged on pallets and bound to each other by means of a tape.

[0002] Machines are known for palletizing cylindrical bodies, known as "snake palletizers". In such machines the bodies are organized into several rows arranged one above the other. Normally the central bodies in each row rest in the concavity formed by two adjacent bodies in the row below. To permit the aggregation of such bodies, normally a tape is used (made of paper, for example) which extends snake-fashion between the rows of bodies. Machines are known which carry out depalletization of bodies organized in this way. In order to be able to carry out this depalletization simultaneously with the removal of the bodies from the pallet, there is a need to wind up the tape which kept the bodies themselves bound together. In this connection machines are known in which there is a spool onto which this tape is wound. This spool is made to rotate by an electric motor whose spindle rotates with respect to the spool according to a constant transmission ratio.

[0003] Machines of this type have a disadvantage connected with the fact that during the winding of the tape the latter could break if the tension of the tape caused by the action of the spool exceeds a breakage value.

[0004] In this context, the technical task at the base of the present invention is to propose a winding device for a tape which will overcome the disadvantages of the known art mentioned above.

[0005] In particular, it is an object of the present invention to make available a winding device capable of preventing the tension of the tape from exceeding a breakage value. An additional object of the present invention is to propose a winding device capable of improving productivity.

[0006] The declared technical task and the specified objects are substantially achieved by a winding device comprising the technical characteristics described in one or more of the attached claims.

[0007] Further characteristics and advantages of the present invention will become clearer from the indicative, and therefore non-limiting, description of a preferred but not exclusive embodiment of a winding device, as illustrated in the attached drawings, in which:

- figures 1 and 2 show a winding device for a tape according to the present invention;
- figures 3a, 4a and 5a show subsequent configurations of a winding device according to the present invention;
- figures 3b, 4b, 5b show in a perspective view what is illustrated in figures 3a, 4a, 5a;
- figure 6 shows a depalletizing machine incorporating a winding device according to the present invention;
- figure 7 shows a pick-up device incorporated into the depalletizing machine shown in figure 6;
- figure 8 shows a component of the device shown in figure 7;
- figure 9 shows a view in section along the plane A-A in figure 8;
- figures 10-12 show different operative configurations of the pick-up device.

[0008] With reference to the attached drawings, reference number 10 indicates a winding device for a tape. Advantageously this winding device 10 is incorporated into a depalletizing machine 1 for bodies held on pallets by means of at least one retaining tape.

[0009] This machine 1 comprises a winding device 10 for the tape which is removed from the pallet.

[0010] The winding device 10 comprises:

- a drive rotor 2;
- a driven rotor 3, the axis of rotation of the drive rotor 2 and the axis of rotation of the driven rotor 3 being perpendicular to a straight line which extends along a direction 31 of connection (of the axis of rotation of the drive rotor 2 and the axis of rotation of the driven rotor 3);
- means 4 of transmitting motion from the drive rotor 2 to the driven rotor 3.

[0011] The transmission means 4 comprise a flexible annular body 40. Perpendicularly to its own extension, said body 40 can therefore be deformed. Annular body 40 is substantially inextensible (at least for the degree of tensioning to which it is subjected). Advantageously annular body 40 is a belt 401, preferably a round belt. In this case advantageously the drive rotor 2 and the driven rotor 3 comprise corresponding pulleys 200, 300 in which the belt 401 engages.

[0012] In an alternative constructive solution (not illustrated) the annular body 40 could be a chain, and in that case the drive rotor 2 and the driven rotor 3 could comprise two toothed elements which mesh with said chain.

[0013] The body 40 extends along a route comprising:

- a first run 41 between the drive rotor 2 and the driven rotor 3;
- a second, bowed run 42 consecutive to the first run 41 in which the annular body 40 is wound around the drive rotor 2;
- a third run 43 consecutive to the second run 42 interposed between the driven rotor 3 and the drive rotor 2;
- a fourth, bowed run 44 consecutive to the first and third runs 41, 43 in which the annular body is wound around the driven rotor 3;

[0014] The winding device 10 comprises furthermore a spool 30 for winding said tape. The spool 30 is dragged in rotation by said driven rotor 3. Advantageously the transmission ratio between said driven rotor 3 and said

belt 401 is constant. Advantageously said spool 30 is integral with the driven rotor 3 (in that case the transmission ratio is unitary). In particular said spool 30 is keyed onto the same spindle as is the pulley 300 which forms part of said driven rotor 3.

[0015] The winding device 10 comprises furthermore:

- a slider 5 comprising an idling element 51 for said annular body 40;
- tensioning means 6 which press the idling element 51 against the annular body 40 along said first run 41;
- guiding means 52 for the slider 5 at least between a first and a second position following a trajectory at least in part transverse to the direction 31 of connection.

[0016] In the preferred solution the guiding means 52 for the slider 5 between the first and the second position extend perpendicularly to the direction 31 of connection, imposing on the slider 5 a trajectory perpendicular to the direction 31 of connection. Advantageously, idling element 51 comprises a roller 510 which facilitates sliding between said annular body 40 and slider 5. Idling element 51 is located at one end of the slider 5. Tensioning means 6 advantageously comprise elastic means 60, for example a spring. In the solution illustrated by way of example but not limitingly, the spring is a helical spring. Tensioning means 6 (preferably elastic means 60) extend between one end in contact with guide means 52 and another end in contact with slider 5.

[0017] Tensioning means 6 act on the slider 5 opposing the passage of the slider 5 from the first to the second position.

[0018] Advantageously (see solution illustrated) tensioning means 6 oppose the displacement of the slider 5 from the first position to the second position. In the first position idling element 51 makes said first run 41 of the route of annular body 40 assume a bowed configuration; in the second position idling element 51 allows said first run 41 a less bowed configuration.

[0019] The displacement of slider 5 from the first to the second position is brought about by a variation in the degree of tensioning of the annular body 40 along the first run 41, induced by an increase in a resistive torque acting on the driven rotor 3. A similar increase in the resistive torque is accompanied by a variation in the line of extension of annular body 40 along the first run 41. This increase in the resistive torque is brought about by an increase in the resistive force exerted by the tape on the spool. This increase in the resistive force, if no intervention occurs, could reach values such as to cause the breakage of the tape itself. Advantageously, winding device 10 comprises means 7 of inverting the motion of the drive rotor 2, activated directly or indirectly by the passage of the slider 5 through a predetermined position during the stroke from the first towards the second position. Said predetermined position can at its limit also coincide with said second position.

[0020] The inversion of the motion of the drive rotor 2 allows the inversion of the direction of rotation of the driven rotor 3 and thus the direction of rotation of the winding spool 30 which is attached to it, with a consequent reduction in the degree of tension of the tape which is being wound onto the spool 30.

[0021] With reference to the solution illustrated, the inversion means 7 comprise:

- a transducer 71 which converts a signal linked to the position of slider 5 into an electrical signal;
- a motor 72 which drags the drive rotor 2 in rotation;
- a control unit 73 which, depending on said electrical signal, controls the direction of rotation of said motor 72.

[0022] Advantageously the transducer comprises an inductive sensor, preferably of analogue type.

[0023] This inductive sensor comprises an inducer; when the slider 5 moves with respect to the inducer, a variation is caused in the impedance of the inducer and this translates into an output electrical signal from the inductive sensor. For this purpose it is necessary for the slider 5 to be made of an electrically conductive material, preferably metal. The electronic control unit 73 compares said output electrical signal from the transducer 71 with a predetermined value; if the value of the output electrical signal (for example a voltage) is greater than a predetermined value, then the electronic control unit 73 commands said motor 72 to invert its direction of rotation and thus the direction of rotation of the drive rotor 2.

[0024] In the preferred solution the transducer 71 opportunely comprises an inductive sensor 710 located along the stroke of the slider 5, said sensor 710 not being integral with the motion of the slider 5.

[0025] The slider 5 comprises an inclined profile in electrically conductive material facing said sensor 710. Displacement of slider 5 causes a movement of said inclined profile away from or towards said sensor 710, thus bringing about a variation in the output electrical signal from said transducer 71.

[0026] In an alternative solution, not preferred and not illustrated, the slider 5 passing through a predetermined position could move a mechanical switch, bringing about an inversion in the motion of the drive rotor 2 (opportunely this occurs by inverting the direction of rotation of the electric motor coupled to said drive rotor 2).

[0027] Inversion means 7 are activated by the passage of the slider 5 through said predetermined position also during the stroke from the second to the first position.

[0028] In fact inverting the direction of rotation of the drive rotor 2 causes a reduction in the degree of tension of the annular body 40 along the first run 41, and the tensioning means 6 thrust the slider 5 towards the first position. The displacement of the slider 5 towards the first position is accompanied by a displacement of the idling element 51 which further bows the annular body 40 along the first run 41, distancing said first run 41 from

a rectilinear configuration. During this stroke towards the first position, slider 5 once again transits through said predetermined position, again activating inversion means 7. Drive rotor 2 then recommences rewinding the tape in the winding direction. Advantageously the winding device 10 comprises a casing 8 which at least partially encloses at least the following components: drive rotor 2, driven rotor 3, transmission means 4, slider 5. Externally to said casing 8 on the other hand there is said winding spool 30. In particular, spool 30 projects outwards externally to casing 8.

[0029] Advantageously, depalletizing machine 1 comprises a rail along which the winding device 10 is movable (if suitably moved by an electric motor.

[0030] Opportunely, depalletizing machine 1 comprises two winding devices 10 featuring one or more of the characteristics described above. In particular this enables two tapes on two neighbouring pallets to be wound. Advantageously each actuating device 10 is controllable independently of the other. Advantageously the casing 8 partially encloses the two winding devices 10. In particular the drive rotor 2, the driven rotor 3, the transmission means 4 and the slider 5 of each winding device 10 are located inside the casing 8, while the spools 30 of each winding device 10 are located outside the casing 8.

[0031] With reference to the attached drawings, the operation of the winding device 10 is as follows.

[0032] Referring to figure 1: during winding, force F1 acting tangentially to the spool 30 as a result of the pull of the tape generates on the driven rotor 3 a resistive torque to the rotation caused by the drive rotor 2. This confers on the belt 401 a tension insufficient to overcome the resistance to compression of the elastic means 60 and consequently insufficient to significantly move the slider 5. The inductive sensor consequently does not detect any variation in electrical field.

[0033] Referring now to figure 2:

> if during winding the tape reaches excessive tension, force F2 (greater than the average of force F1), tangential to the spool 30, generates on the driven rotor 3 a resistive force such that the belt 401 being tensioned increases the pressure on slider 5. Slider 5 consequently overcomes the resistance to compression of elastic means 60 and travels along guide means 52. The inductive sensor in this case detects variation in the field because of the displacement of the inclined profile of the slider 5.

[0034] Referring now to figure 3:

> the displacement of the slider 5 modifies the field detected by the inductive sensor and consequently the output electrical signal (for example a difference in potential) from the sensor itself. If the signal crosses a limit threshold, control unit 73 (by means of suitable software) inverts the direction of rotation of drive rotor 2. As a result there is a reduction in the tension of the tape being wound, and also of the belt 401, which reduces the pressure on the slider 5, taking it back to a normal working position. At this point the winding device 10 recommences working as indicated in figure 1.

[0035] Opportunely the depalletizing machine 1 comprises a pick-up device 1000 for bodies arranged on a pallet and bound together by the retaining tape. In particular the depalletizing machine 1 comprises a synchronization system for the device 10 for winding the tape and the pick-up device 1000. This synchronization system activates and deactivates the rotation of drive rotor 2, following a preset program which depends on how many bodies there are on the pallet, how they are distributed, the route followed by the tape within the group of bodies on the pallet and possibly also the movement of the pick-up device 1000.

[0036] Pick-up device 1000 for at least one body comprises, in its turn:

- a loadbearing base 70 over which the body to be picked up is positionable;
- a head 201 comprising means 202 of gripping the body;
- a support 301 on which the head 201 is hung;
- means 80 of aligning the head 201 and the base 70 along a first direction (opportunely the alignment means 80 make it possible to place the head 201 over the base 70);
- means 40 of bringing the head 201 and the base 70 along the first direction 50a into relative convergence (the base 70 can advantageously be the traffic-bearing surface below).

[0037] The head 201 comprises at least a first and a second feeler profile 210a, 210b which extend parallel to each other at least along a second direction 50b transverse to the first direction 50a. The perpendicular projection of the gripping means 202 on a plane normal to the first direction 50a is at least in part interposed between the perpendicular projection of the first and the second feeler profile 210a, 210b on said plane normal to the first direction 50a.

[0038] The pick-up device 1000 comprises floating sliding means 600 for the head 201 with respect to the support 301 along a third direction 50c transverse to the first and second directions 50a, 50b, said floating sliding means 600 comprising:

- a slider 610 forming part of the head 201 and integral with the first and second feeler profiles 210a, 210b;
- guide means (620) for said slider 610 which allow the movement of said slider 610 and of said head 201 along the third direction 50c, said guide means 620 forming part of support 301;

[0039] Following the action of the convergence means

40, a force having a component along the third direction 50c is exerted by the body on only one of said first and second feeler profiles 210a, 210b being able to cause a displacement of said head 201 along the third direction 50c to seek the alignment along the third direction 50c of the gripping means 202 and a predetermined area of the body.

[0040] As illustrated by way of example in the attached drawings, the first direction 50a is vertical.

[0041] In particular the first direction 50a is perpendicular to the second direction 50b. Preferably the third direction 50c is perpendicular to the first and second directions 50a and 50b.

[0042] Floating sliding means 600 comprise return means 630 for the slider 610 to a predetermined equilibrium position with respect to guide means 620.

[0043] Return means 630 comprise:

- first return means 6310 interposed between a first surface 6110 of the slider 610 and a first surface 6210 of the guide means 620, said first surface 6110 of the slider 610 and said first surface 6210 of the guide means 620 counterfacing each other and lying on planes perpendicular to the third direction 50c;
- second return means 6320 interposed between a second surface 6120 of the slider 610 and a second surface 6220 of the guide means 620, the second surface 6120 of the slider 610 and said second surface 6220 of the guide means 620 counterfacing each other and lying on planes perpendicular to the third direction 50c.

[0044] The slider 610 comprises a central body 640 extending along said third direction 50c; perpendicularly to the third direction 50c, a first and a second end 650a, 650b of the slider 610 have a greater overall size than the central body 640.

[0045] The guide means 620 comprise a short tube 6230 having a through hole 6240 into which is inserted said central body 640, said short tube 6230 being interposed between the first and the second ends 650a, 650b of the slider 610. The first return means 6310 are interposed between the first end 650a and said short tube 6230, said second return means 6320 being interposed between said second end 650b and said short tube 6230. Both the first and the second return means 631, 632 comprise an elastic spring.

[0046] The head 201 comprises a housing 220 which forms a concavity facing towards an imaginary reference plane integral with the housing 220, said housing 220 comprising a bottom 230 counterfacing said imaginary reference plane and at least one first and one second lateral wall 240a, 240b which extend away from said bottom 230 respectively as far as a first and a second edge 250a, 250b. The first and second edges 250a, 250b support respectively the first and second feeler profiles 210a, 210b.

[0047] The gripping means 202 in the preferred solution comprise a magnet 2000.

[0048] In particular the winding device 1000 comprises means 2010 of moving said magnet 2000 which are movable between a first configuration in which the magnet 2000 is inside the housing 220 and proximal to said bottom 230, and a second configuration in which the magnet 2000 is distal from said bottom 230 and approached to the first and the second feeler profiles 210a, 21b.

[0049] At least said magnet 2000 and the first and the second feeler profile 210a, 210b form an operative unit 2020, said head 201 comprising a plurality of operative units 2020 side by side (in this way several bodies can be moved simultaneously.

[0050] During operation the pick-up device 1000 provides for the following stages:

- positioning in front of the body 90 a pick-up head 201 comprising gripping means 202 and at least one first and one second feeler profile 210a, 210b; said stage provides for counterfacing with an area interposed between the first and the second feeler profiles 210a, 210b a portion 900 of the body 90 in which there is a junction of two superficial portions 910 of the body which, projecting towards said head 201 approach one another;
- converging said head 201 with body 90 by means of a relative displacement along a first direction 50a until at least one of the first and second feeler profiles 210a, 210b on head 201 comes into contact with the body 90; the second feeler profile 210b extends parallel to the first feeler profile 210a along a second direction 50b transverse to the first direction 50a.

[0051] If during the convergence stage of said head 201 with the body 90 one of the first or second feeler profiles 210a, 210b comes into contact with one of said two superficial portions 910 of the body before the other profile 210a, 210b, the following stages are implemented:

- exerting a force along the first direction 50a to press together head 201 and body 90, thus permitting slider 610 to slide with respect to guide means 620 and therefore permitting head 201 to slide with respect to the support 301 according to a component parallel to the third direction 50c until both the first and the second feeler profiles 210a, 210b come into contact with the body 90;
- activating the gripping means 202 to secure said body to the head 201.

[0052] The method provides furthermore for lifting the head 201 and the body 90 attached to it along the first direction 50a. This brings about an elastic return of the head 201 and support 301 to the relative position occupied immediately before the stage of exerting a force along the first direction 50a to press together head 201 and body 90.

[0053] The invention achieves important advantages.

[0054] First of all, it allows maximum versatility and flexibility of operation. In particular during depalletizing it makes it possible to avoid breaking the tape which is wound round the bodies on the pallet. This has positive advantages in terms of reduction in human interventions and increase in productivity. The invention thus conceived is susceptible of numerous modifications and variants all falling within the scope of the inventive concept which characterizes it. All the details, furthermore, are replaceable by other technically equivalent elements. In practice, all the materials employed, as well as the dimensions can be any that suit the requirements.

Claims

1. A winding device for a tape comprising:

- a drive rotor (2);
- a driven rotor (3), the axis of rotation of drive rotor (2) and driven rotor (3) being perpendicular to a straight line which develops along a connecting direction (31);
- means (4) for transmitting motion from the drive rotor (2) to the driven rotor (3), comprising a flexible annular body (40), substantially inextensible, which runs along a route comprising: a first run (41) between the drive rotor (2) and the driven rotor (3), a second, bowed run (42) consecutive to the first run (41) in which the annular body (40) is wound around the drive rotor (2), a third run (43) consecutive to the second run (42) interposed between the driven rotor (3) and the drive rotor (2), a fourth, bowed run (44) consecutive to the first and third runs (41, 43) in which the annular body is wound around the driven rotor (3);
- a spool (30) for winding said tape, said spool (30) being dragged in rotation by said driven rotor (3);
- a slider (5) comprising an idling element (51) for said annular body (40);
- tensioning means (6) which press the idling element (51) against the annular body (40) along said first run (41);
- guiding means (52) for the slider (5) at least between a first and a second position following a trajectory at least in part transverse to the connecting direction (31); the displacement of said slider (5) from the first towards the second position being determined by a variation in the degree of tensioning of the annular body (40) along the first run (41), induced by an increment in a resistive torque acting on the driven rotor (3), this being accompanied by a variation in the line of extension of the annular body (40) along the first run (41);
- means (7) for inverting the motion of the drive rotor (2), activated directly or indirectly by the passage of the slider (5) through a predetermined position during the stroke from the first towards the second position.

2. A device according to claim 1, **characterized in that** the inversion means (7) are activated by the passage of the slider (5) through said predetermined position also during the stroke from the second to the first position.

3. A device according to any of the preceding claims, **characterized in that** the guide means (52) for the slider (5) between the first and the second position extend perpendicularly to the connecting direction (31), imposing on the slider (5) a trajectory perpendicular to the connecting direction (31).

4. A device according to any of the preceding claims, **characterized in that** the tensioning means (6) act on the slider (5) opposing the passage of the slider (5) from the first to the second position.

5. A device according to any of the preceding claims, **characterized in that** the tensioning means (6) oppose the displacement of the slider (5) from the first position in which the idling element (51) causes said first run (41) of the route of the annular body (40) to assume a configuration bowed towards the second position in which said idling element (51) allows said first run (41) a less bowed configuration.

6. A device according to any of the preceding claims, **characterized in that** said annular body (40) is a belt.

7. A device according to any of the preceding claims, **characterized in that** said spool (30) is integral with the driven rotor (3).

8. A device according to any of the preceding claims, **characterized in that** the inversion means (7) comprise:

- a transducer (71) which converts a signal linked to the position of the slider (5) into an electrical signal;
- a motor (72) which drags the drive rotor (2) in rotation;
- a control unit (73) which depending on said electrical signal controls the direction of rotation of said motor (72).

9. A device according to claim 8, **characterised in that**:

- the transducer (71) comprises an inductive sensor (710) positioned along the stroke of the

slider (5), said sensor (710) not being integral with the movement of the slider (5);
- said slider (5) comprises an inclined profile (711) in electrically conductive material facing said sensor (710), a displacement of the slider (5) causing a movement of said inclined profile (711) away from or towards said sensor (710), this bringing about a variation in the output electrical signal from said transducer (71).

10. Depalletizing machine for bodies held onto the pallet by means of at least one retaining tape, said machine (1) being **characterized by** comprising a winding device (10) for the tape removed from the pallet, according to any of claims 1-9.

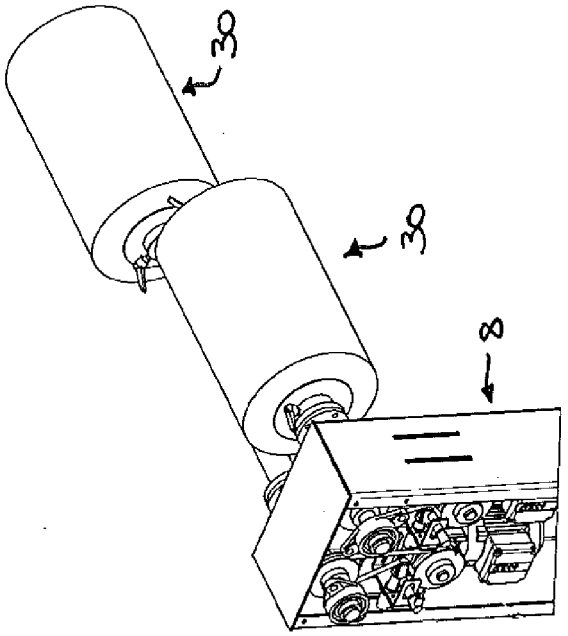


Fig. 2

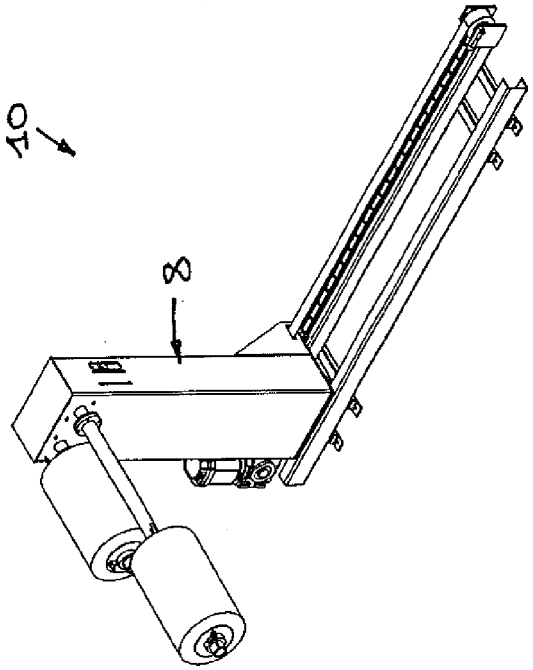


Fig. 1

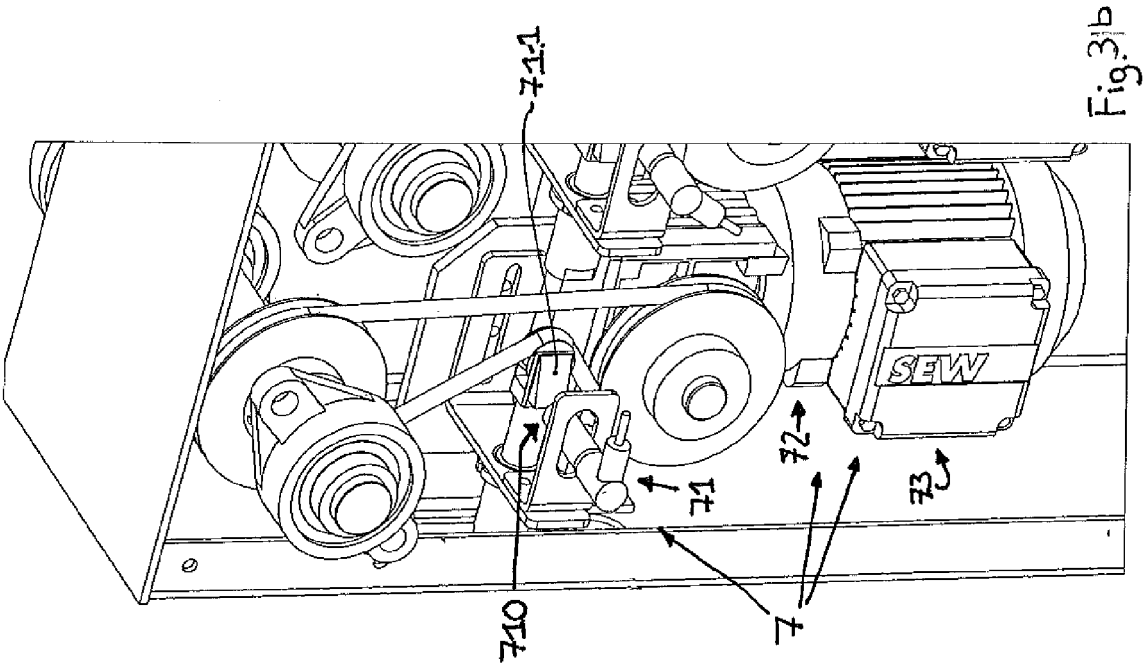

711
SEW
72
71
73
710
7

Fig. 3b

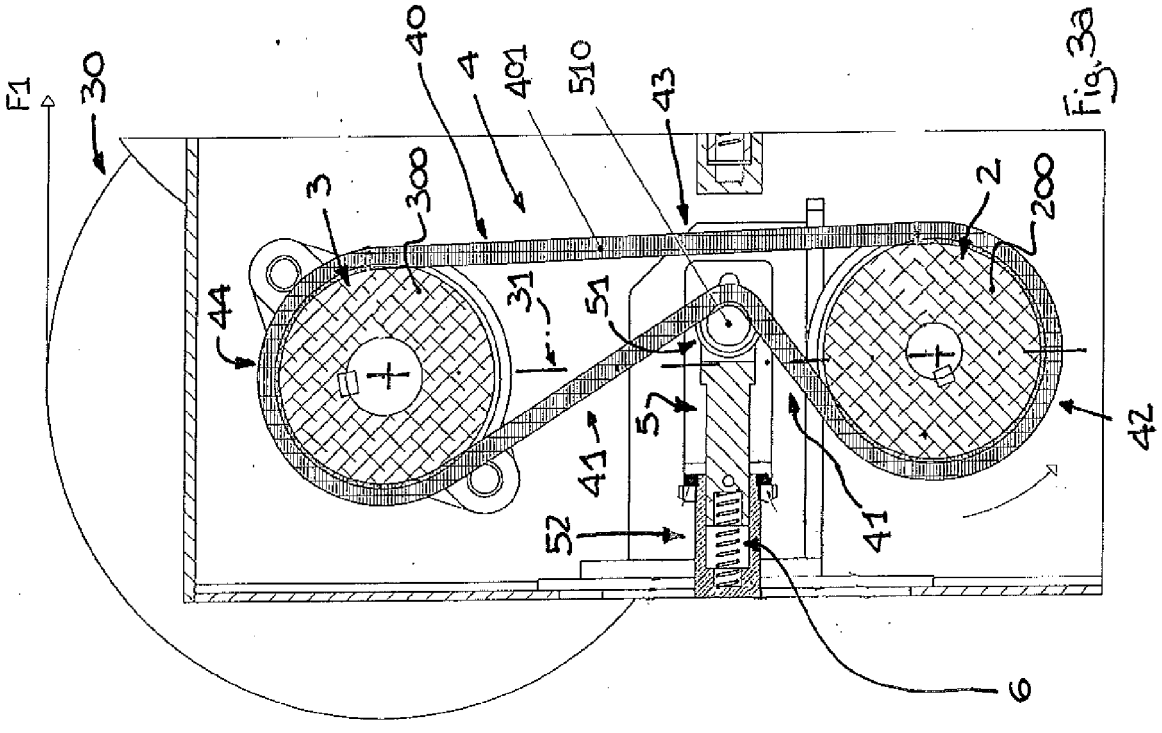

F1
30
40
4
401
510
43
3
300
2
200
44
31
51
57
41
52
42
6

Fig. 3a

Fig. 4b

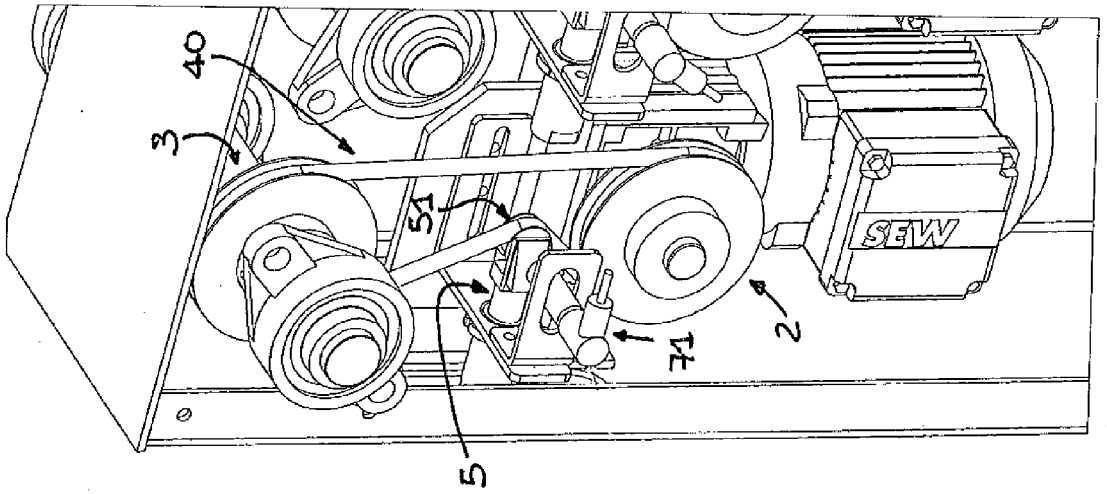


Fig. 4a

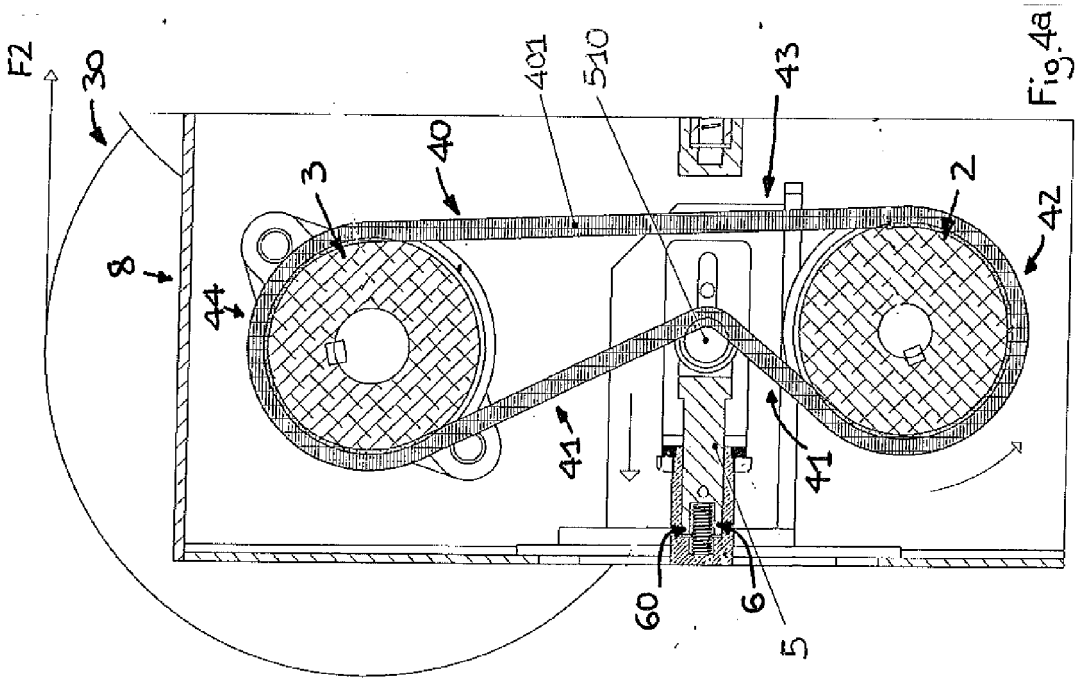


Fig. 5b

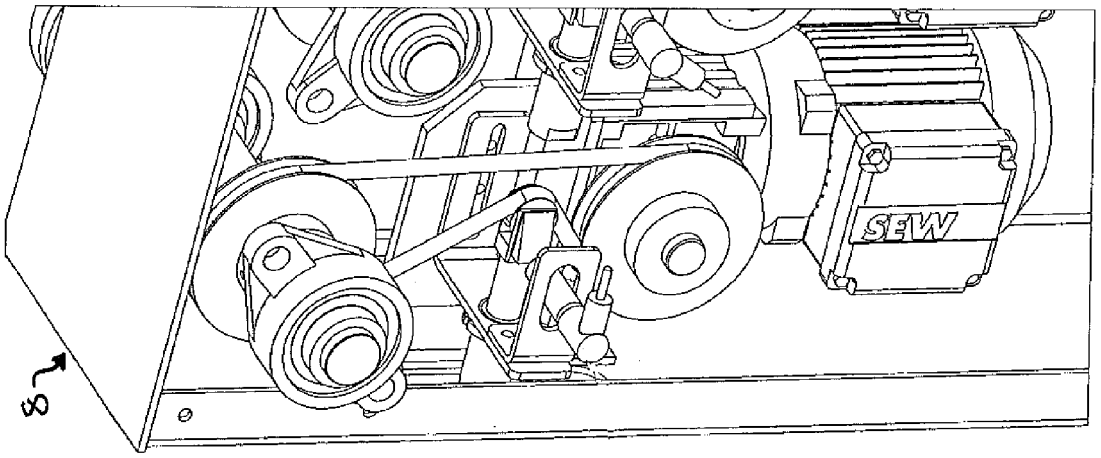
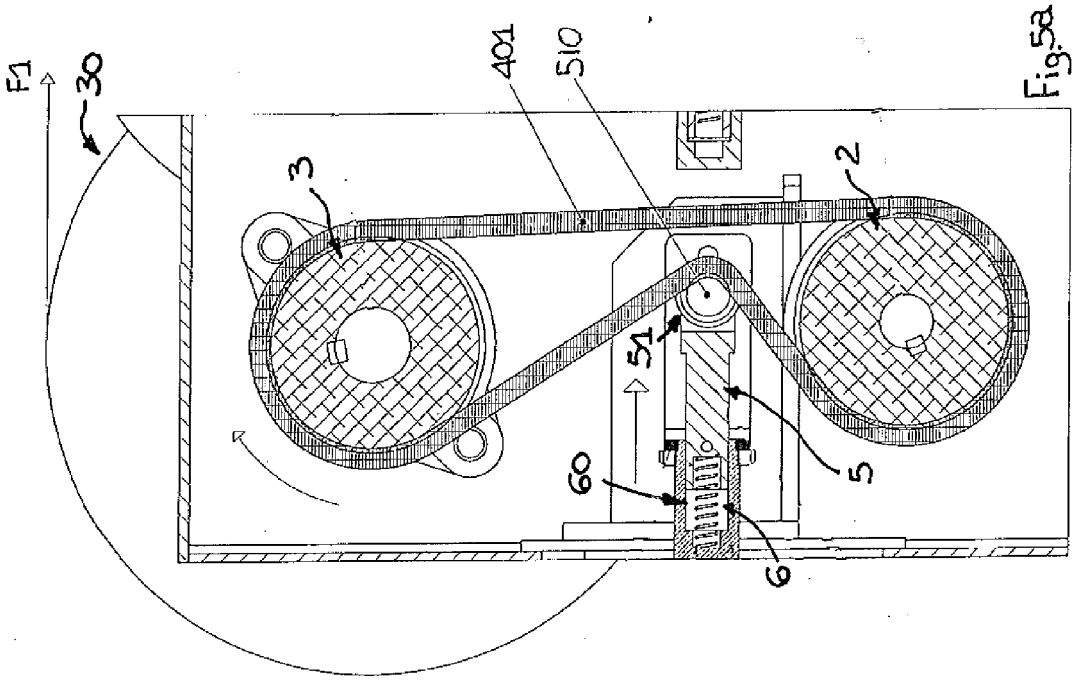


Fig. 5a



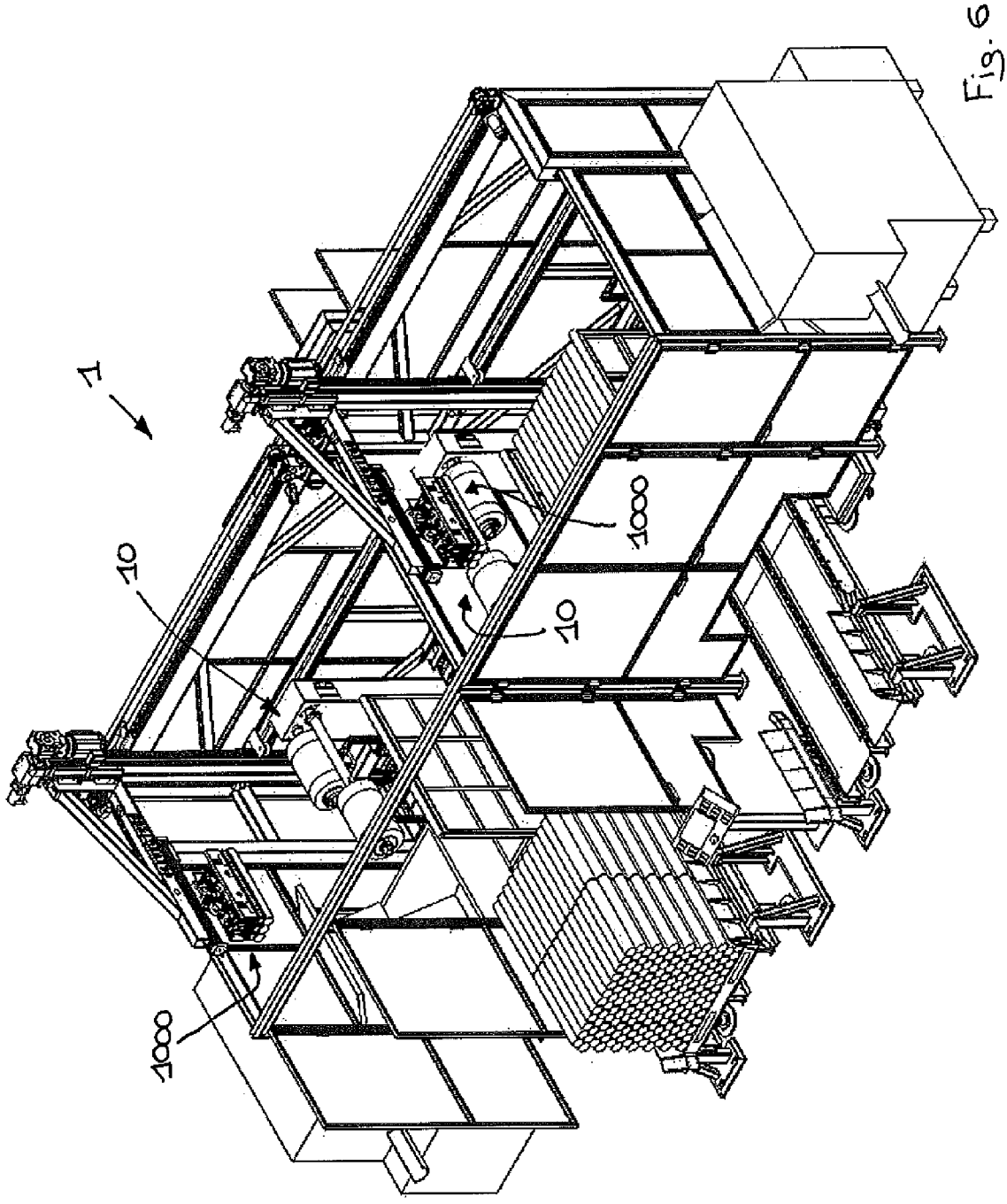


Fig. 6

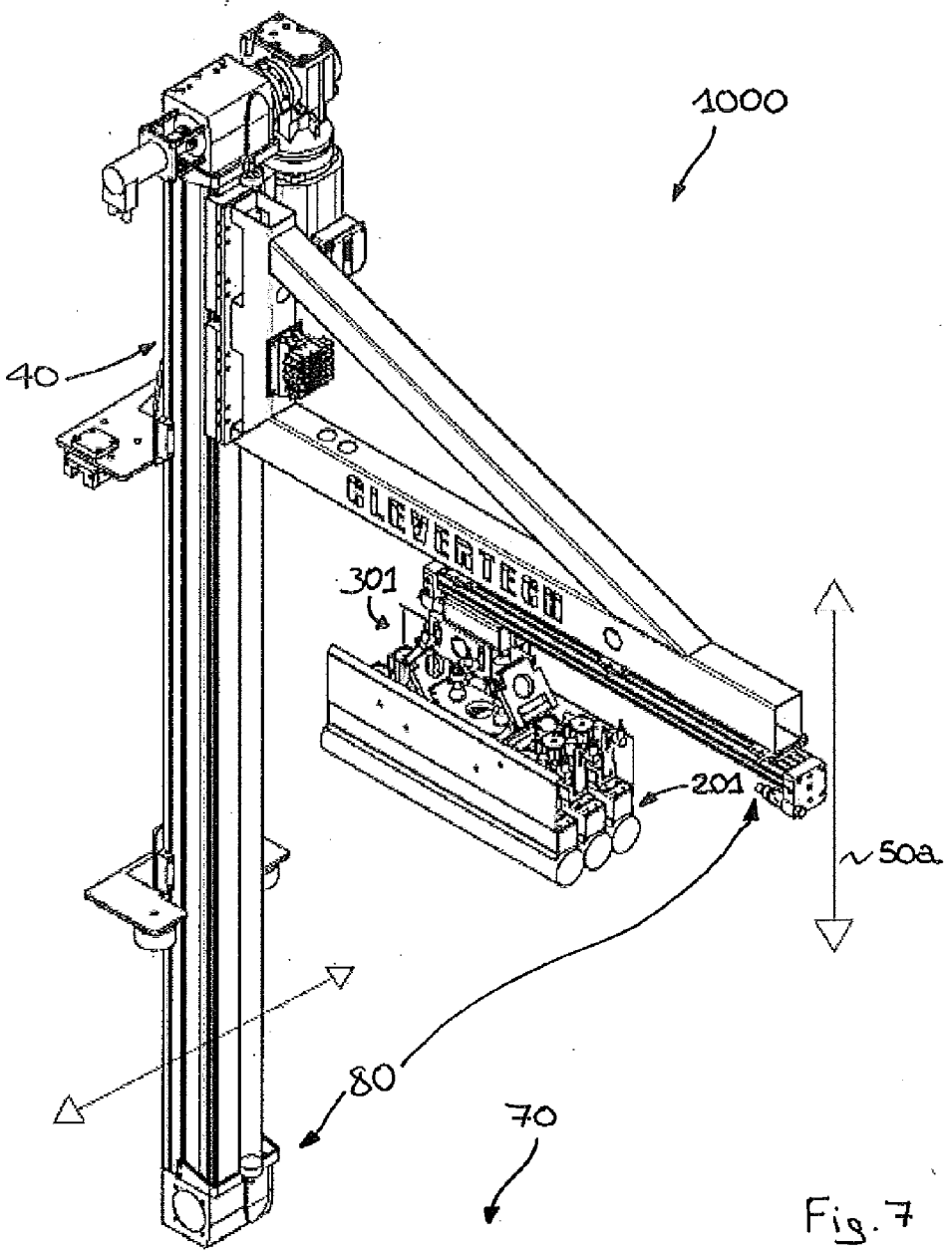
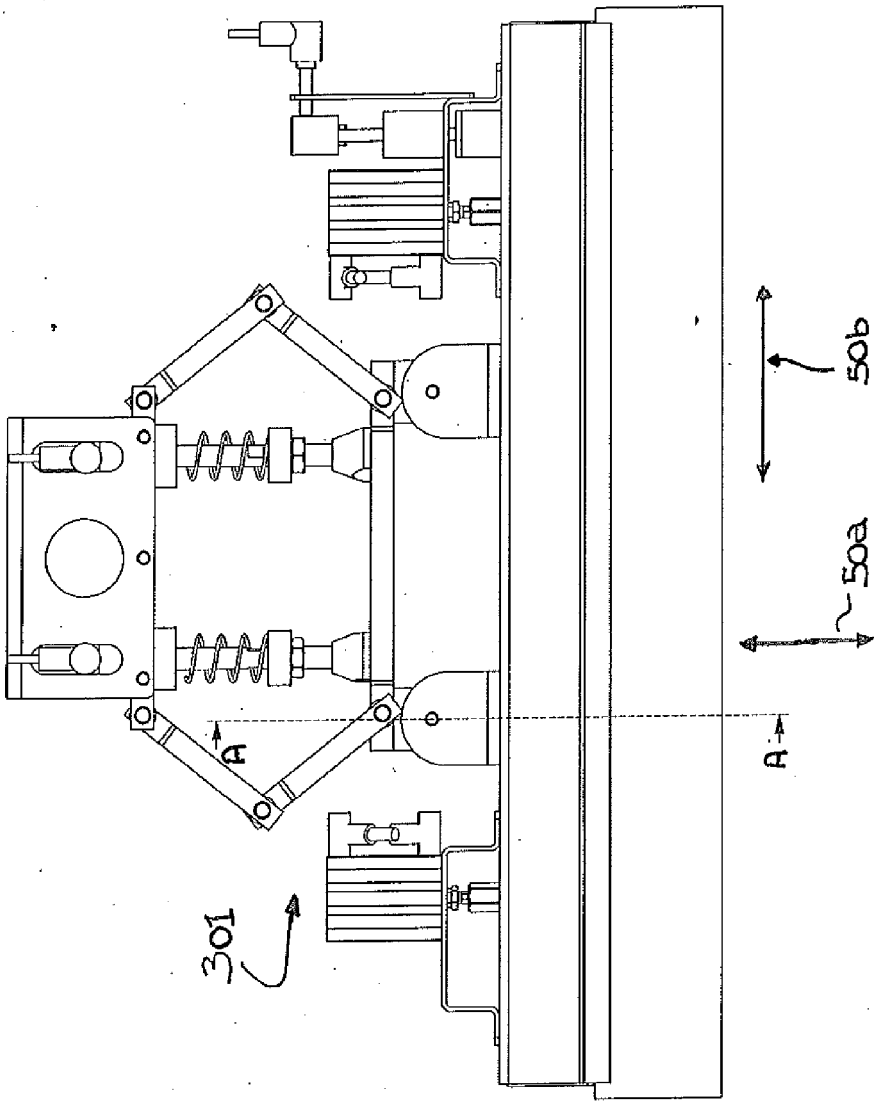
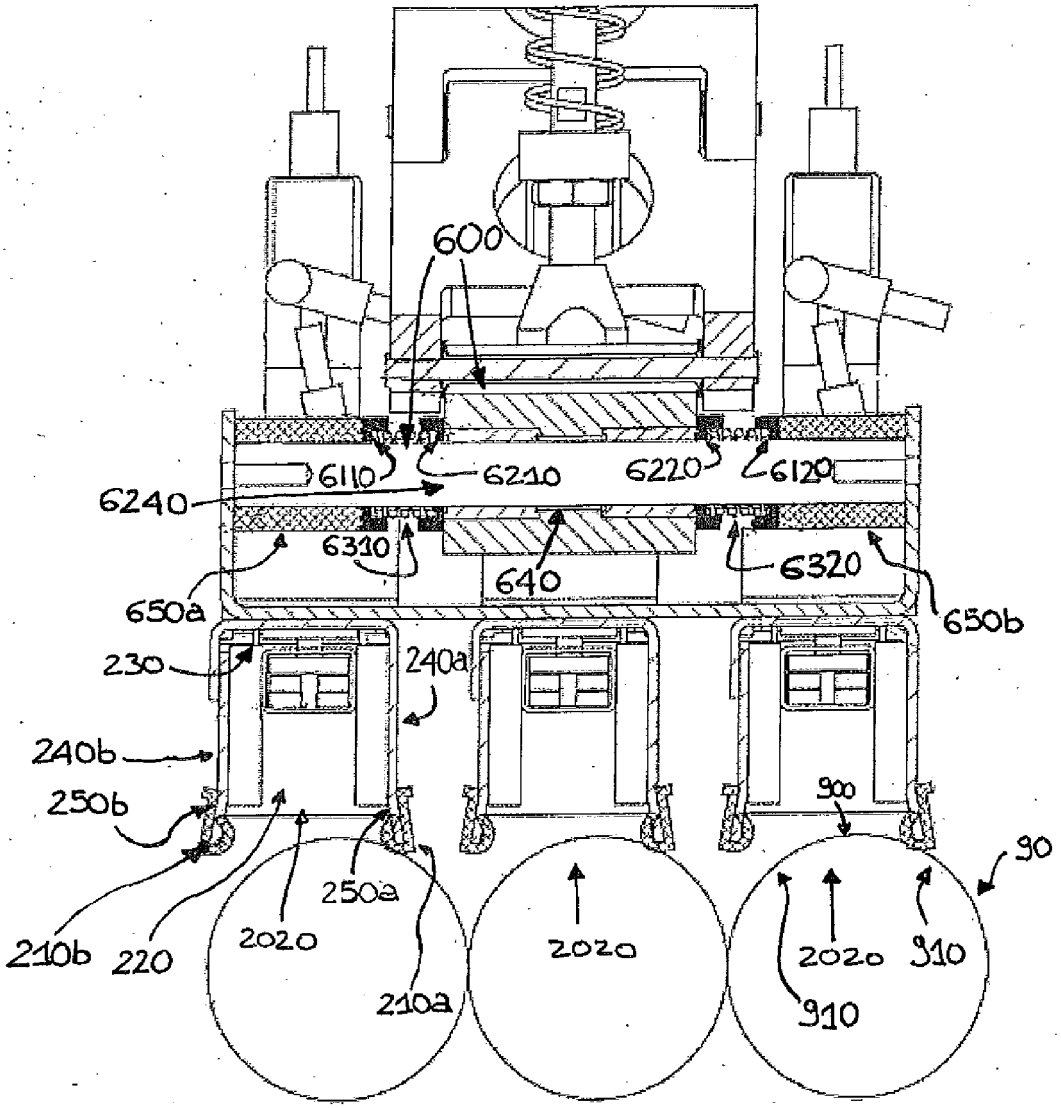


Fig. 7

Fig. 8

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6120
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6310
640
6320
650a
650b
230
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240b
250b
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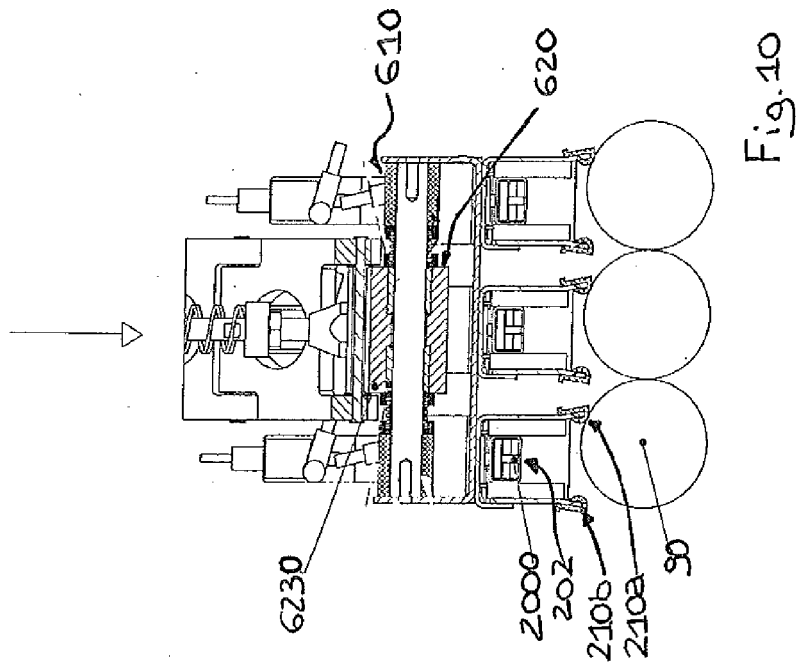
90
250a
2020
2020
2020
910
910
210b
220
210a

Fig. 3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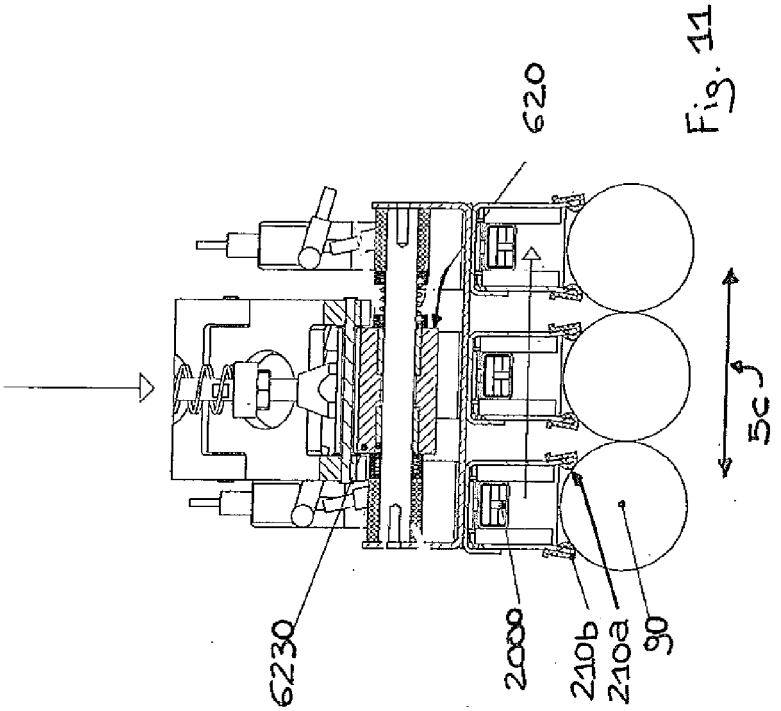
620
6230
2000
202
210b
210a
90

Fig. 10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6230
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210b
210a
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5c

Fig. 11

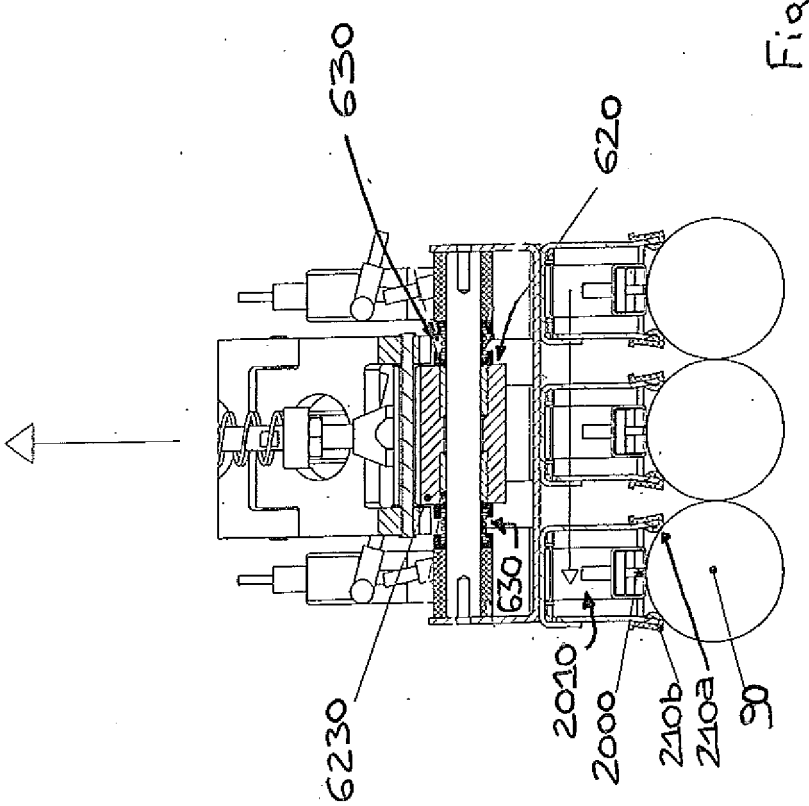

Fig. 12

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EUROPEAN SEARCH REPORT

Application Number
EP 11 15 8213

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 5 911 666 A (LANCASTER III PATRICK R [US] ET AL) 15 June 1999 (1999-06-15) * column 5, line 29 - column 7, line 44; figures 4A, 4B *	1	INV. B65H26/04 B65H18/10
A	US 3 977 621 A (HUFFMAN HAROLD WALTER) 31 August 1976 (1976-08-31) * column 4, line 55 - column 5, line 18; figure 1 *	1	
A	EP 1 889 805 A1 (SATO KK [JP]) 20 February 2008 (2008-02-20) * claim 1 *	1	
A	US 2007/079713 A1 (KOEDA AKIHIRO [JP] ET AL) 12 April 2007 (2007-04-12) * claim 1 *	1	
A	GB 2 316 676 A (YKK CORP [JP]) 4 March 1998 (1998-03-04) * figure 6 *	1	TECHNICAL FIELDS SEARCHED (IPC)
A	GB 820 501 A (POENSGEN G M B H GEB) 23 September 1959 (1959-09-23) * figure 1 *	1	B65H B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	24 August 2011	Haaken, Willy

CATEGORY OF CITED DOCUMENTS

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24-08-2011

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5911666 A	15-06-1999	NONE	
US 3977621 A	31-08-1976	NONE	
EP 1889805 A1	20-02-2008	CA 2561363 A1	08-06-2006
		JP 2006151652 A	15-06-2006
		WO 2006059552 A1	08-06-2006
US 2007079713 A1	12-04-2007	NONE	
GB 2316676 A	04-03-1998	JP 10072150 A	17-03-1998
		TW 393438 B	11-06-2000
		US 5927640 A	27-07-1999
GB 820501 A	23-09-1959	NONE	

EPO FORM P0459

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