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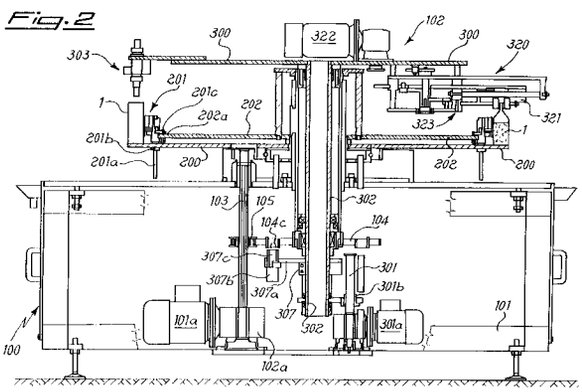
(54) Automatic machine with coaxial discs for the packaging of flexible containers which are conveyed with a continuous movement.

(57) Automatic machine of the carousel type (102) for filling and sealing bag-shaped containers (1) made of flexible material, comprising at least a first horizontal disc (200) to which devices (201) for gripping and holding the containers (1) are rigidly connected, which disc (200) is made to perform a continuous rotating movement about the vertical axis of the machine by associated actuating means (101a, 103), for conveying of the containers themselves, and at least another horizontal disc (300) coaxial with the first one, carrying devices (303) for metering the product to be introduced into the container and devices (320) for sealing the latter, which disc is made to perform an alternate rotating movement by associated first actuating means (103, 104, 104c, 105, 307, 307b, 307c) which cause the rotation thereof together and rigidly with the disc (200) through a predetermined angle and by further actuating means (106, 107) which cause the counter-rotation thereof back into the initial position, with respect to and independently of the disc (200) itself, there also being provided means (301a, 301b, 202) for adjusting the height, from the conveying disc (200), of the gripping devices (201) and the disc (300).

Fig.2



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The present invention relates to an automatic machine for filling and sealing bag-shaped containers made of flexible material, formed by a circular carousel comprising at least two horizontal coaxial discs, the lower disc of which, for conveying the containers, rotates with a continuous circular movement, and the upper disc of which, for supplying the product and sealing the container, is actuated with an alternate circular movement.

It is known how the technology for the packaging of products, liquids or solids is oriented, among other things, towards the production and packaging of flexible bag-shaped containers provided with a bottom part designed to expand following filling so as to form stable support base for the full package.

In this technology it is also known of automatic plants designed to produce said bags from a roll of plastic film material and to fill and hermetically seal said bags thus produced. These plants are substantially formed by a first apparatus for forming the bag and by a second apparatus, arranged in series with the first one, in which the bag is filled and sealed; an example of this type of plant is for example described in Patent Application No. IT-001409 in the name of same Applicant.

This plant, while envisaging that the filling and sealing machine should function with the continuous forward movement of the containers from a first filling carousel to a second sealing carousel, has a few drawbacks due to the fact that the means for gripping and holding the containers themselves are integral with the individual filling and sealing carousels, thereby making it necessary to pick up and release the container itself several times during the course of its travel path inside the machine.

Furthermore, the said packaging machine has a substantially horizontal extension and is better suited for dimensions intended for high hourly outputs.

The technical problem which is therefore posed is that of providing a machine for the filling and automatic sealing of bag-shaped containers made of flexible material, which is suitable for achieving a high production output with minimum dimensions, which does not generate production waste resulting from the spillage of liquid from the containers themselves, which is easy and economical to install and can be supplied with individual bags picked up by suitable loaders associated with the machine itself.

These results are obtained by the present invention, which envisages an automatic machine of the carousel type for the filling and sealing of bag-shaped containers made of flexible material comprising at least a first horizontal disc to which devices for gripping and holding the containers are rigidly connected, which disc is made to perform a continuous rotating movement about the vertical axis of the machine by the associated actuating means, for conveying of the containers themselves, and at least another horizontal disc coaxial with the first one, carrying devices for metering the product to be introduced into the container and devices for sealing the latter, which disc is made to perform an alternate rotating movement by associated first actuating means which cause the rotation thereof together and rigidly with the disc through a predetermined angle and by further actuating means which cause the counter-rotation thereof back into the initial position, with respect to and independently of the disc itself, there being provided moreover means for regulating the height, from the conveying disc, of the gripping devices and the disc carrying the metering and sealing devices, as well as means for opening the mouth of the container, means for synchronised loading of the containers and means for unloading the latter at the end of the cycle.

Further details can be obtained from the following description, with reference to the accompanying drawings, in which:

Figure 1 shows a plan view of the machine according to the invention;

Figure 2 shows a diagrammatic section along the plane II-II of Figure 1;

Figure 3 shows an enlarged view of a detail of the container loading arms;

Figure 4a shows a plan view of the device for effecting opening of the containers;

Figures 4b and 4c show a diagrammatic section of the opening sequence of the containers.

As shown in the Figures, the machine 100 according to the invention is substantially composed of a fixed base 101 which has mounted on it a carousel 102 which comprises two circular coaxial surfaces, i.e. a lower one 200 and upper one 300 respectively.

The lower surface 200, which forms the surface for supporting and conveying the containers 1 removed from a feeder 2 by means of a synchronising loader 400, is made to perform a continuous rotating movement while the upper surface 300, to which the devices for metering the product to be supplied to the container 1 and the devices for sealing the latter are rigidly connected, is made to rotate in accordance with an alternate movement.

In its general configuration, the machine according to the invention is moreover provided with a conveyor belt 500 for conveying away the sealed containers, which are removed from the carousel 102 and deposited onto the belt 500 by means of a synchronising arm 600.

More particularly and with reference to Figure 2, the base 101 has rigidly connected to it a motor 101a which, via the drives 102a, actuates a splined shaft 103, arranged parallel to the vertical axis of the carousel 102, by means of which the surface 200 supporting the containers 1 is made to rotate with a continuous movement.

As illustrated in Figure 2, the disc 200, in the region of its external edge, carries devices 201 for gripping and holding the container 1, which devices form the subject of a contemporary patent application in the name of the same Applicant and will be described only briefly.

Said devices 201 are arranged at regular angular intervals along the entire circumference of the disc 200 and are rigidly connected to the latter by means of a threaded shank 201a and a ring-nut 201b; in this way the holding devices 201 rotate rigidly with the disc 200, travelling simultaneously via rollers 201c on a further disc 202 which is locked in rotation and the upper surface 202a of which has a cam profile designed to cause actuation of the gripping and holding devices 201 by means of the symmetrical movement towards/away and closing/opening of the jaws 201d onto/from the sides of the container 1 (see Figure 4a).

The disc 202 is moreover rigid in the axial direction with the disc 300 and together with the latter adjustable heightwise with respect to the surface 200 by means of a screw 301 actuated by a motor 301a and acting on a female screw 301b connected to a hollow shaft 302, the upper end of which is fixed to the disc 300.

By means of adjustment of the distance of the disc 300 and the disc 202 from the disc 200, it is possible, whenever there is a variation in the dimensions of the container 1, to adjust both the position of the metering devices 303 and the devices 310 for opening and devices 320 for sealing the mouth of the container 1, which are integral with the disc 300 and described in detail below, as well as the relative position of the devices 201 for gripping and holding the container which are instead integral with the conveying disc 200.

The hollow shaft 302 is moreover connected to a first transmission 104 actuated via suitable means 105 by the splined shaft 103 and with a second transmission 106 actuated by a cylinder 107 designed to cause a counter-rotation through a predetermined angle of the surface 300 with respect to the surface 200.

The hollow shaft 302 is moreover keyed onto a bush 307 provided with a radial arm 307s at the end of which there is arranged a cylinder 307b, the rod of which actuates a stud 307c movable axially for coupling with a corresponding seat 104c formed in the transmission 104.

The functions of these handling and mutual coupling devices will become clear from the remainder of the description with reference to operation of the entire machine.

As illustrated in Figures 4a, 4b and 4c, the devices 310 for opening the upper mouth of the container 1 are integral with the disc 300 and substantially consist of a bracket 311 movable along a circumferential arc concentric with the carousel and defined by a guide 311a along which the support travels via rollers 311b and as a result of the thrusting and recall action of the rod 312a of a cylinder 312.

On the top part of the bracket 311 there is fixed a cylinder 313, extending in the radial direction, which actuates a cross-member 314a carrying a suction cup 315 and connected via double articulations 314b to a second cross-member 314c carrying a second suction cup 315 located opposite to the first cup. Said suction cups can therefore be actuated symmetrically in the radial direction both towards and away from the surfaces of the front sides of the container 1 so as to cause opening thereof prior to filling.

Figures 1 and 2 also show the devices 320 for sealing the container, substantially consisting of heat-welding grippers 321 actuated so as to open/close via a motor 322 arranged on the plate 300 and drives only schematically indicated by 323 and designed to cause the said grippers to open and close symmetrically with respect to the container.

As illustrated in Figures 1 and 3, the containers 1 are removed from a feeder 2 via a synchronising loading arm 400 consisting of a horizontal arm 401 which rotates through a predetermined angle about an axis parallel to the axis of the carousel and the end of which opposite to the end hinged with the base 101 has mounted on it an arm 402 perpendicular to the arm 401 and rotating about its own axis of vertical symmetry. The suction cups 403, arranged in the transverse direction with respect to the vertical arm, are rigidly connected to said vertical arm.

Operation of the machine is as follows:
The containers 1 are removed from the feeder 2 (Figures 1 and 3) by means of the suction cups 403 arranged on the arm 402 of the synchronising loader 401 and from here brought into a predetermined angular position with respect to which the container is arranged in a tangential position at a relative speed of zero compared to the disc 200 carrying the gripping devices 201 which, in said angular position, close around the lateral edges of the container (Figure 4a), removing it and starting to convey it along the circular path inside the carousel.

During the first part of the rotating movement, the container passes underneath the device 310 (Figure 4a) for opening the mouth of the container 1, the device actuated by the cylinder 312 follows the container along a section of the circumference, causing opening thereof by means of actuation of the suction cups 315 towards and then away from each other in the radial direction (Figures 4b, 4c).

At this point the container is ready to be filled and is brought by the disc 200 underneath the filling station 303 rigid with the disc 300 which during this stage is rigidly connected to the splined shaft 103 by means of the transmission 104 so that the conveying disc 200 and the upper disc 300 carrying the metering devices 303 and the sealing grippers 321 travel integrally along a predetermined circumferential arc corresponding to the production capacity of the machine.

This circumferential arc is determined by the time required to carry out filling and sealing of the container. As can be seen from the Figures and as is obvious for a person skilled in the art, in the example shown this circumferential arc is divided up, filling and sealing also being divided up so as to allow simultaneous filling and sealing of a plurality of containers in order to increase the productivity of the machine.

Once the container 1 has been sealed, the transmission 104 is disengaged from the shaft 103 and at the same time the stud 307c is retracted from the seat 104a which caused coupling of the disc 300 to the disc 200 and instead the transmission 106 activated which, actuated by the cylinder 107, brings the disc 300 back into the initial position with a counter-rotational movement, while the disc 200 for conveying the containers 1 proceeds along its continuous path transporting the containers 1 as far as the arm 600 for unloading them onto the belt 500.

Many variants may be introduced as regards the construction of the parts forming the invention, without thereby departing from the protective scope of the present patent as defined by the claims whuch follow.

Claims

1. Automatic machine of the carousel type (102) for filling and sealing bag-shaped containers (1) made of flexible material, characterized in that it comprises at least a first horizontal disc (200) to which devices (201) for gripping and holding the containers (1) are rigidly connected, which disc (200) is made to perform a continuous rotating movement about the vertical axis of the machine by associated actuating means (101a, 103), for conveying of the containers themselves, and at least another horizontal disc (300) coaxial with the first one, carrying devices (303) for metering the product to be introduced into the container and devices (320) for sealing the latter, which disc is made to perform an alternate rotating movement by associated first actuating means (103, 104, 104c, 105, 307, 307b, 307c) which cause the rotation thereof together and rigidly with the disc (200) through a predetermined angle and by further actuating means (106, 107) which cause the counter-rotation thereof back into the initial position with respect to and independently of the disc (200) itself, there also being provided means (301a, 301b, 202) for adjusting the height, from the conveying disc (200), of the gripping devices (201) and the disc (300) carrying the metering devices (303) and sealing devices (320), as well as means (310) for opening the mouth of the container (1), means (400) for synchronised loading of the container (1) and means (600, 500) for unloading the latter at the end of the cycle.

2. Machine according to Claim 1, characterized in that said means for continuous actuation of the disc (200) conveying the containers (1) substantially consist of a motor (101a) which, via drives (102a), actuates a splined shaft (103) which is arranged vertically parallel to the axis of rotation of the carousel (102) and the upper end of which is rigidly connected to the disc (200) itself.

3. Machine according to Claim 1, characterized in that said means for actuating the alternate rotating movement of the disc (300) consist of a first transmission (104) keyed onto a vertical hollow shaft (302) rigidly connected to the disc (300) and designed to receive movement from the said splined shaft (103) via associated radial coupling means (105) which cause rotation thereof together with the disc (200) via devices (307b, 307c, 104c) for axially coupling said transmission (104) to the splined shaft (302) and of a second transmission (106) actuated by a cylinder (107) which causes counter-rotation thereof with respect to and independently of the disc (200) for conveying the containers.

4. Machine according to Claim 1, characterized in that said devices (201) for gripping and holding the containers are rigidly connected to the external edge of the conveying disc (200) by means of threaded rods (201a) and ring-nuts (201b) reacting against the bottom surface of the disc (200).

5. Machine according to Claim 1, characterized in that said devices (201) for gripping and holding the container are actuated by means of a cam profile (202a) forming the upper surface of a further disc (202) locked in rotation, but movable in the vertical direction rigidly with the disc (300).

6. Machine according to Claim 1, characterized in that said means for adjusting the height, from the conveying disc (200), of the gripping devices (201) and the disc (300) carrying the metering devices (303) and sealing devices (320) substantially consist of a screw (301) actuated by a motor (301a) and connected to a female screw (301b) fixed to the hollow shaft (302), the upper end of which is rigid with the disc (300).

7. Machine according to Claim 1, characterized in that said means (310) for opening the mouth of the container (1) substantially consist of a bracket (311) movable along a circumferential arc concentric with the carousel as a result of the thrusting and recall action of a cylinder (312), the bracket (311) having fixed to it a cylinder (313), extending in the radial direction, which actuates a cross-member (314a) carrying a suction cup (315) and connected via double articulations (314b) to a second cross-member (314c) carrying a second suction cup (315) located opposite to the first one, said suction cups therefore being able to be actuated in a perfectly symmetrical manner in the radial direction both towards and away from the surfaces of the front sides of the containers so as to cause opening thereof prior to filling.

8. Machine according to Claim 1, characterized in that said means (400) for the synchronised loading of the containers (1) substantially consist of a horizontal arm (401) which rotates angularly about an axis parallel to the axis of the carousel through a predetermined angle and the end of which, opposite to the hinging end, carries an arm (402), perpendicular to the arm (401) and rotating about its own vertical axis of symmetry, to which suction cups (403) arranged in the transverse direction with respect to the vertical arm are rigidly connected.

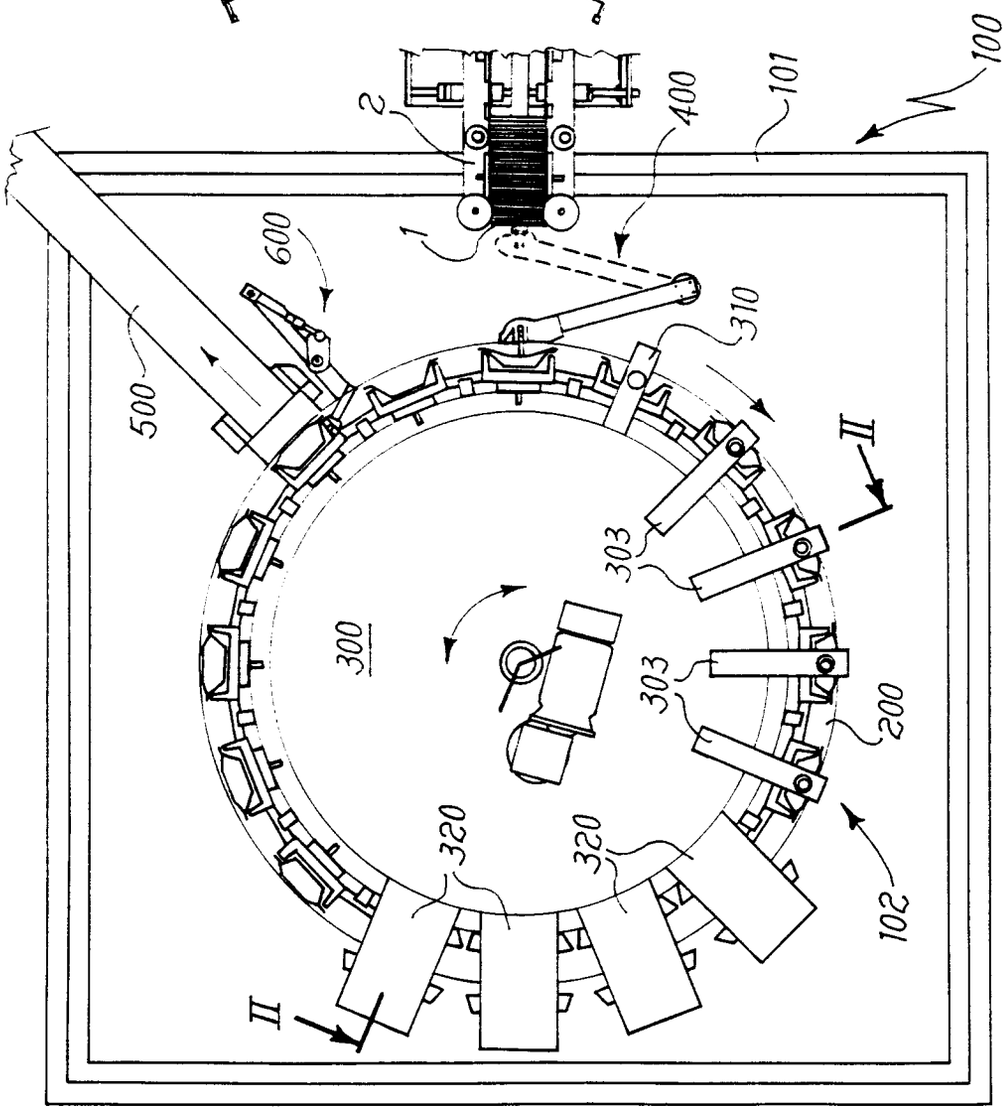
100
101
102
200
300
303
303
310
320
320
400
400
500
600
II
II

Fig.1

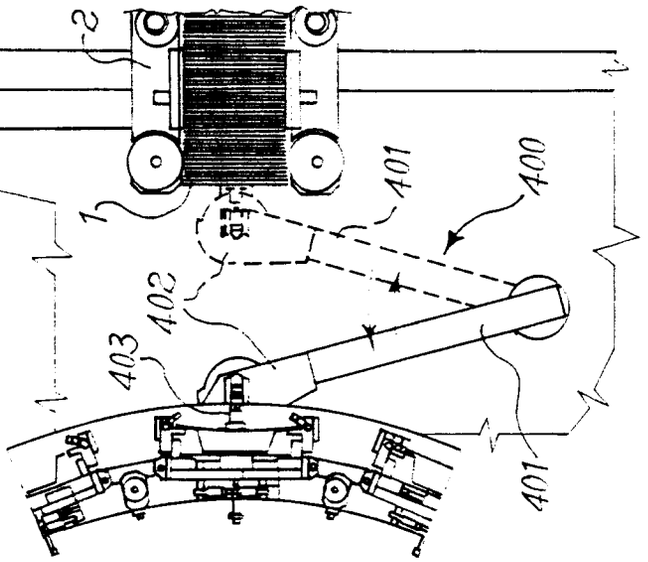
1
1
2
2
401
400
402
403
401

Fig.3

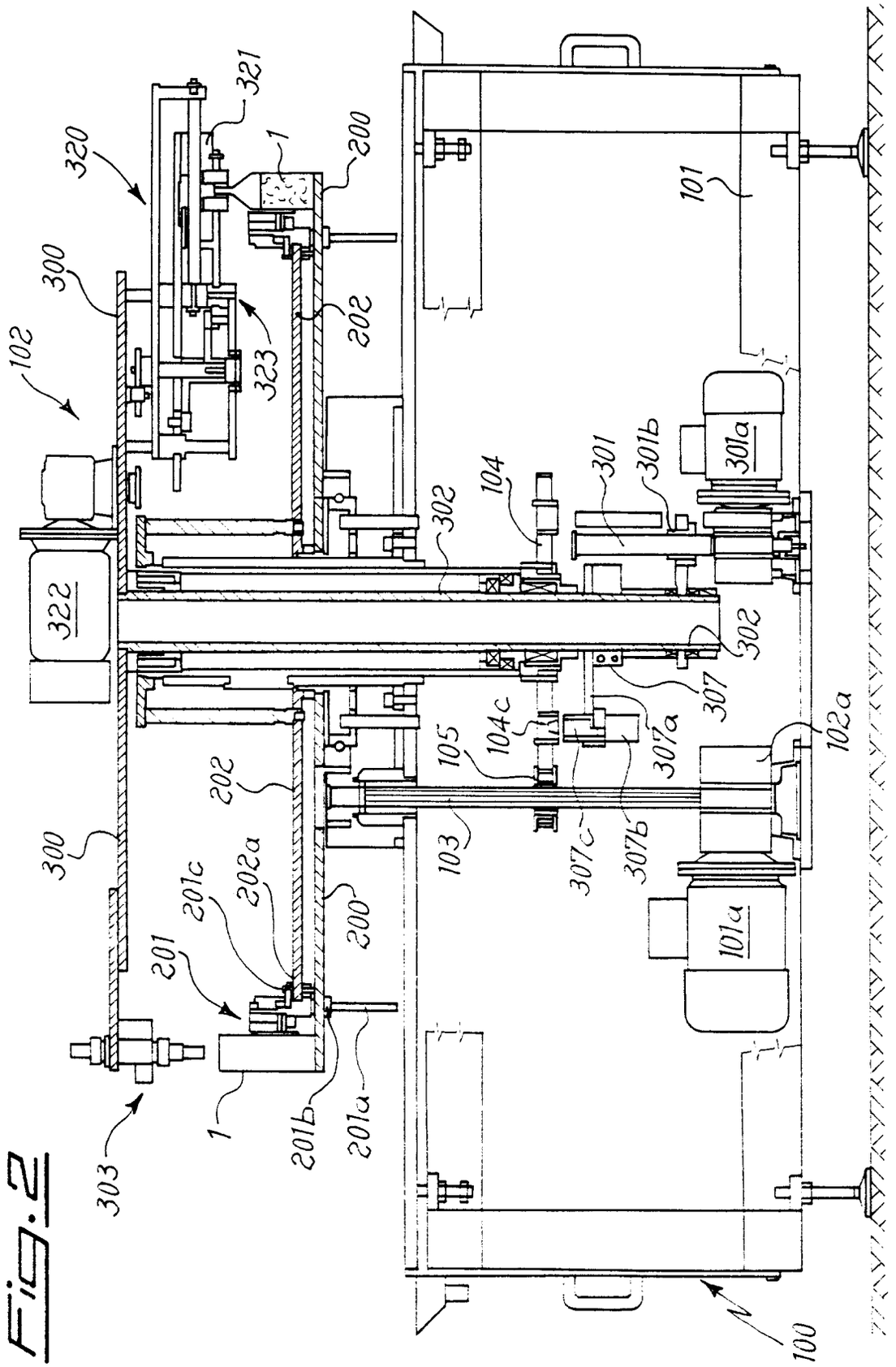
321
320
1
200
300
202
323
102
101
322
301a
301b
301
104
302
307
307a
307b
307c
105
104c
102a
103
201c
202a
201
200
1
303
201b
201a
101a
100

Fig.2

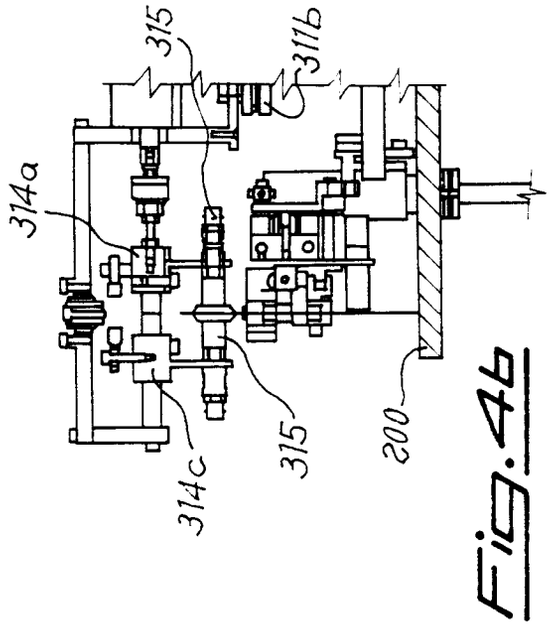

Fig.4b

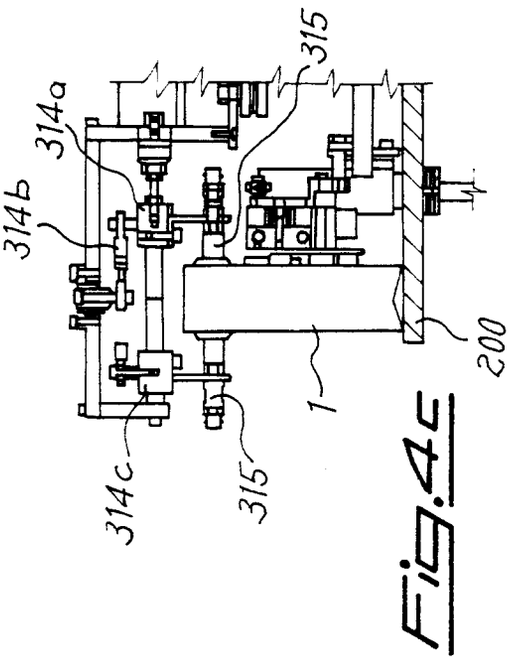

Fig.4c

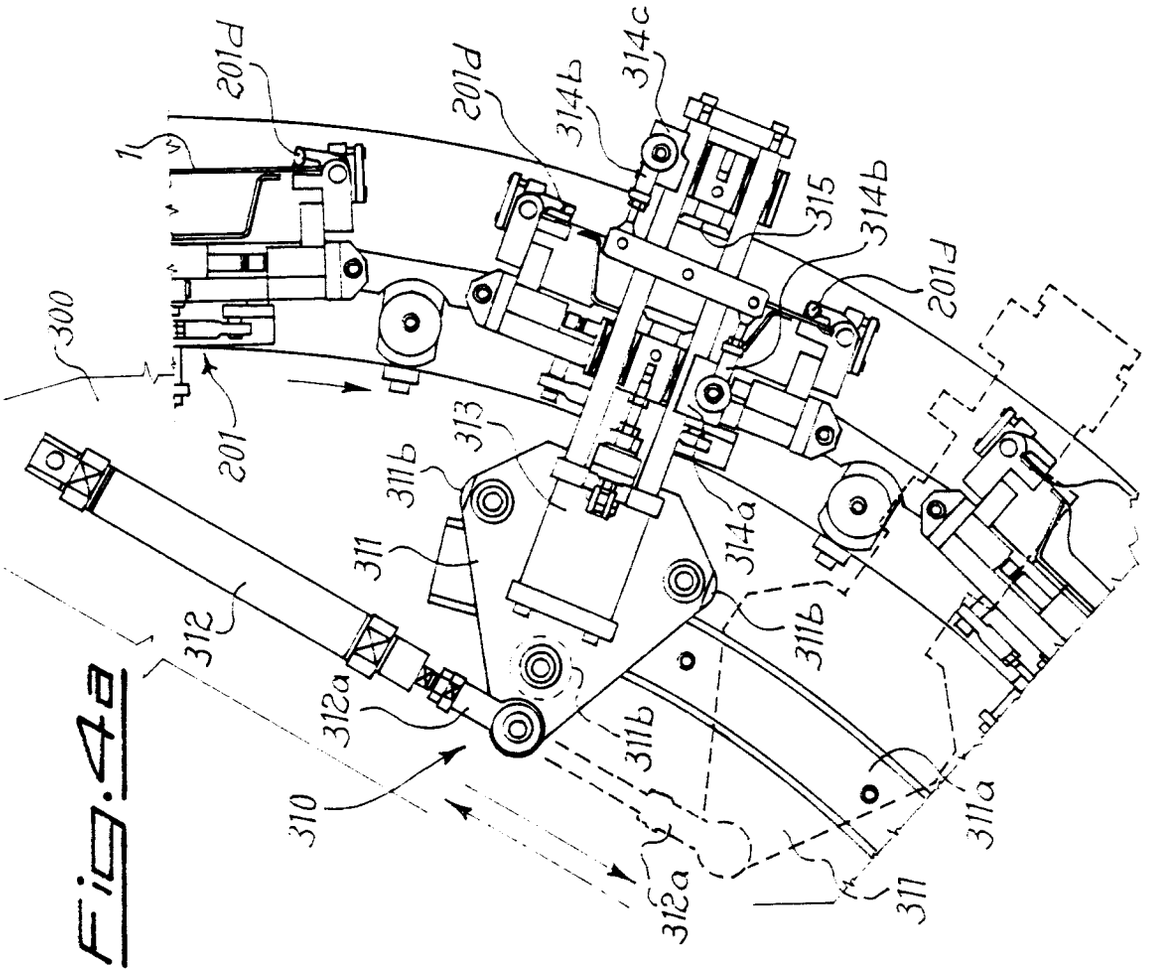

Fig.4a

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EUROPEAN SEARCH REPORT

Application Number
EP 95 20 0548

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)
A	EP-A-0 535 946 (KAO CORP.) * column 15, line 52 - column 18, line 25; figure 10 *	1,2	B65B43/60
A	FR-A-2 331 481 (SHIONOGI) * page 7, line 29 - page 11, line 39; figures *	1	
A	FR-A-1 377 643 (CENTRA ANSTALT) * claims; figures *	1	
A	WO-A-86 00597 (AMF)		

TECHNICAL FIELDS SEARCHED (Int.Cl.6)
B65B B67C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	11 July 1995	Jagusiak, A

CATEGORY OF CITED DOCUMENTS

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