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

Automatische Vorrichtung mit koaxialen Scheiben zum Verpacken von flexiblen, kontinuierlich geförderten Behältern

Machine automatique pourvue de plateaux coaxiaux pour l'emballage de récipients flexibles, transportés en mouvement continu

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EP-A- 0 535 946 **WO-A-86/00597**
FR-A- 1 377 643 **FR-A- 2 331 481**

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Description

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 EP-A-0 576 058 (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.

A further type of automatic machine according to the first part of claim 1 is known from FR-A-1.377.643 that discloses a rotating machine equipped with two coaxial discs respectively holding the devices for gripping/opening the bags and the devices for filling/sealing the bags.

The complexity of the assembly may not allow high production output.

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 according to the features of claim 1.

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 5 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. 10

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. 20

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 actuated by a cylinder designed to cause a counter-rotation through a predetermined angle of the surface 300 with respect to the surface 200. 25

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. 30

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. 40

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. 45

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 50

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. 55

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. 25

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). 35

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. 40

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. 55

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 which follow.

Claims

1. 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 first 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 other disc (300) 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 first disc (200) 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 first disc (200) itself, there also being provided 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, characterised in that there also being provided means (301a, 301b, 202) for adjusting the height from the first disc (200), of the gripping devices (201) and the disc (300) carrying the metering devices (303) and sealing devices (320) and in that said means for continuous actuation of the first 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 connected to the first disc (200) itself, and in that said first actuating means for the alternate rotating movement of the other disc (300) consist of a first transmission (104) keyed onto a vertical hollow shaft (302) rigidly connected to the other 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 first disc (200) via devices (307b, 307c, 104c) for axially coupling said transmission (104) to the splined shaft (302) and in that the further actuating means consists of a second transmission actuated by a cylinder which causes counter-rotation thereof with respect to and independently of the first disc (200) for conveying the containers.
2. 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 first disc (200) by means of threaded rods (201a) and ring-nuts (201b) reacting against the bottom surface of the first disc (200).
3. 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 other disc (300).
4. Machine according to Claim 1, characterized in that said means for adjusting the height, from the first disc (200), of the gripping devices (201) and the other 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 other disc (300).
5. 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.
6. 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 prede-

terminated 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. 5

Patentansprüche

1. Automatische Maschine in Karussellausführung (102) zum Abfüllen und Schweißen von beutelförmigen Behältnissen (1) aus weichem Material, bestehend aus mindestens einer waagerechten Scheibe (200), an der Vorrichtungen (201) zum Greifen und Festhalten der Behältnisse (1) befestigt sind, wobei sich die erste Scheibe (200) zur Förderung der Behältnisse im Durchlauf um die Maschinenhochachse über entsprechende Antriebsvorrichtungen (101a, 103), dreht; außerdem bestehend aus mindestens einer anderen waagerechten Scheibe (300), koaxial zur ersten, an der Vorrichtungen (303) zum Abfüllen des Produkts in das Behältnis, sowie Vorrichtungen (320) für dessen Versiegelung befestigt sind, wobei diese Scheibe (300) durch zugeordnete erste Antriebsvorrichtungen (103, 104, 104c, 105, 307, 307b, 307c) eine alternierende Rotationsbewegung ausführt, so daß sie sich zusammen und in fester Verbindung mit der ersten Scheibe (200) um einen vorgegebenen Winkel dreht, sowie durch zusätzliche Antriebsvorrichtungen, die ihre Gegendrehung veranlassen, so daß die Scheibe in ihre Ausgangsposition in bezug auf und unabhängig von der ersten Scheibe (200) zurückkehrt; vorgesehen sind auch Mittel (310) zum Öffnen des Behältnisses (1), Mittel (400) für die synchronisierte Förderung des Behältnisses (1), sowie Mittel (600, 500) für dessen Auslauf am Ende des Zyklus; dadurch gekennzeichnet:
 - daß auch Mittel (301a, 301b, 202) für die Einstellung der Höhe von der ersten Scheibe (200) aus, der Greifvorrichtungen (201), sowie der Scheibe (300), die die Füllvorrichtungen (303) und Schweissvorrichtungen (320) trägt, vorgesehen sind;
 - daß besagte Mittel für die kontinuierliche Betätigung der ersten Scheibe (200), die die Behältnisse (1) fördert, im wesentlichen aus einem Antrieb (101a) bestehen, der durch Vorgelege (102a) eine Keilwelle (103) betätigt, die senkrecht parallel zur Drehachse des Karussells (102) montiert ist und deren oberes Ende an der ersten Scheibe (200) befestigt ist;
 - daß diese ersten Mittel für die alternierende Rotationsbewegung der anderen Scheibe (300) aus einem ersten Getriebe (104) bestehen, das auf einer senkrechten Hohlachswelle (302) verkeilt ist, die fest mit der anderen Scheibe (300) verbunden ist und so ausgelegt ist, daß sie von dieser Keilwelle (103) durch entsprechende radial ausgelegte Verbindungsstücke (105) angetrieben wird, die wiederum deren Drehung zusammen mit der ersten Scheibe (200) über die Vorrichtungen (307b, 307c, 104c) für die Axialkupplung dieses Getriebes (104) mit der Keilwelle (302) veranlassen; wobei die anderen Antriebsvorrichtungen aus einem zweiten Getriebe, das von einem Zylinder betätigt wird, der dessen Gegendrehung in bezug auf und unabhängig von der ersten Scheibe (200) zur Förderung der Behältnisse veranlaßt, bestehen.
2. Maschine gemäß Anspruch 1, dadurch gekennzeichnet, daß diese Vorrichtungen (201) zum Greifen und Festhalten der Behältnisse mit dem äußeren Rand der Scheibe (200) durch Spannbolzen (201a) und Nutmutter (201b), die auf den Boden der ersten Scheibe (200) einwirken, fest verbunden sind.
3. Maschine gemäß Anspruch 1, dadurch gekennzeichnet, daß diese Vorrichtungen (201) zum Greifen und Festhalten der Behältnisse von einem Nockenprofil (202a) betätigt werden, das die obere Fläche einer zusätzlichen Scheibe (202) bildet, deren Drehung gesperrt ist, die sich aber senkrecht in fester Verbindung mit der anderen Scheibe (300) bewegt.
4. Maschine gemäß Anspruch 1, dadurch gekennzeichnet, daß diese Mittel zur Einstellung der Höhe von der ersten Scheibe (200) aus, der Greifvorrichtungen (201) und der anderen Scheibe (300), die die Füllvorrichtungen (303) und Schweissvorrichtungen (320) trägt, im wesentlichen aus einer von einem Antrieb (301a) betätigten Schraube (301) besteht, die mit einer an der Keilwelle (302) befestigten Mutterschraube (301b) verbunden ist, deren oberes Ende fest mit der anderen Scheibe (300) verbunden ist.
5. Maschine gemäß Anspruch 1, dadurch gekennzeichnet, daß diese Mittel (310) zum Öffnen des Behältnisses (1) im wesentlichen aus einer Klaue (311) bestehen, die sich infolge einer Stoß- und Rückzugbewegung eines Zylinders (312), längs eines Kreisbogens konzentrisch zum Karussell bewegt, wobei an der Klaue (311) ein Zylinder (313) befestigt ist, der sich in radialer Richtung erstreckt und einen Querbalken (314a) mit einem Saugkopf (315) antreibt, sowie über doppelte Gelenke (314b) mit einem zweiten Querbalken (314c) verbunden ist, der einen weiteren, dem ersten gegenüberliegenden Saugkopf (315) trägt,

so daß beide Saugköpfe perfekt symmetrisch radial in beide Richtungen von und zu den Oberflächen der Vorderseiten der Behältnisse bewegt werden können, um die Behältnisse vor dem Füllen zu öffnen.

6. Maschine gemäß Anspruch 1, dadurch gekennzeichnet, daß diese Mittel (400) zur synchronisierten Förderung der Behältnisse (1) im wesentlichen aus einem waagerechten Arm (401) bestehen, der sich in einem Winkel um eine Achse dreht, die durch einen vorgegebenen Winkel parallel zur Karussellachse läuft, und an dessen Ende, gegenüber dem gekeilten Ende, ein weiterer Arm (402) befestigt ist, der senkrecht zum ersten Arm (401) steht und sich um seine vertikale Symmetrieachse dreht, an dem die Saugköpfe (403) quer zum senkrechten Arm fest angebracht sind.

Revendications

1. Machine automatique du type à carrousel (102) pour le remplissage et le soudage de conteneurs (1) à forme de sachet en matériel flexible, comprenant au moins un premier disque (200) horizontal auquel des dispositifs (201) pour le serrage et la prise des conteneurs (1) sont montés de façon rigide, ou ce premier disque (200) est réalisé pour effectuer un mouvement rotatif continu autour de l'axe vertical de la machine par des moyens d'activation associés (101a, 103) pour le transport des conteneurs, ainsi que d'un autre disque horizontal (300) coaxial au premier, portant les dispositifs (303) pour le dosage du produit à remplir dans le conteneur ainsi que les dispositifs (320) pour leur soudage, ou l'autre disque (300) est conçu pour effectuer un mouvement rotatif par des premiers moyens d'activation (103, 104, 104c, 105, 307, 307b, 307c) associés, qui le font tourner ensemble et de façon solidaire avec le premier disque pour un angle préétabli, ainsi que par des ultérieurs moyens d'activation, qui en permettent la contre-rotation en le ramenant à sa position initiale par rapport au et indépendamment du premier disque (200) même, étant pourvu aussi de moyens pour l'ouverture de l'embouchure du conteneur (1), moyens (400) pour l'alimentation synchronisée du conteneur (1) et moyens (600, 500) pour leur déchargement à la fin du cycle, caractérisée par la présence de moyens (301a, 301b, 202) pour le réglage en hauteur, dès du premier disque (200), des dispositifs de serrage (201) ainsi que du disque (300) pourvu des dispositifs de dosage (303) et de soudage (320), et par le fait que ces moyens pour l'activation continue du premier disque (200) pour le transport des conteneurs (1) se composent essentiellement d'un moteur (101a) qui, par des renvois (102a), actionne un arbre (103) cannelé, monté en

position verticale, parallèle à l'axe de rotation du carrousel (102), dont l'extrémité supérieure est connectée au premier disque (200) et par le fait que ces premiers moyens pour le mouvement rotatif alterné de l'autre disque (300) se composent d'une première transmission (104) calée sur un arbre (302) creux vertical, solidaire avec l'autre disque (300) et conçu pour recevoir le mouvement de cet arbre (103) cannelé par intermédiaire de moyens (105) d'accouplement radiaux, qui en permettent la rotation avec le premier disque (200) par des dispositifs (307b, 307c, 104c) pour l'accouplement axial de cette transmission (104) à l'arbre (302) cannelé, où les autres moyens d'activation se composent d'une seconde transmission actionnée par un cylindre pour son contre-rotation par rapport et indépendamment du premier disque (200) pour le transport des conteneurs.

2. Machine suivante la revendication 1, caractérisée par le fait que ces dispositifs (201) pour le serrage et la prise des conteneurs sont fixés rigidement au bord extérieur du premier disque (200) par des tiges (201a) filetées et des embouts (201b) qui agissent contre la surface de fond du premier disque (200).
3. Machine suivante la revendication 1, caractérisée par le fait que ces dispositifs (201) pour le serrage et la prise des conteneurs sont actionnés par un profil (202a) de la came qui forme la surface supérieure d'un autre disque (202), dont la rotation est bloquée, mais mobile en direction verticale solidairement avec l'autre disque (300).
4. Machine suivante la revendication 1, caractérisée par le fait que ces dispositifs pour le réglage de la hauteur, dès le premier disque (200), des dispositifs de serrage (201) tandis que de l'autre disque (300) avec les dispositifs de dosage (303) et les dispositifs de soudage (320) consistent essentiellement d'une vis (301) actionnée par un moteur (301a) et connectée à une vis femelle (301b) fixée à l'arbre creux (302), dont l'extrémité supérieure est solidaire avec l'autre disque (300).
5. Machine suivante la revendication 1, caractérisée par le fait que ces moyens (310) pour l'ouverture de l'embouchure du conteneur (1) consistent essentiellement d'un étrier (311) qui se déplace le long d'un arc concentrique avec le carrousel comme conséquence de l'action de poussée et rappel d'un cylindre (312), où à l'étrier (311) est fixé un cylindre (313), s'étendant en direction radiale, qui actionne un élément transversal (314a) qui porte une ventouse (315) et connecté par des doubles articulations (314b) à un second élément transversal (314c), qui porte une seconde ventouse (315) pla-

cée en face de la première, de façon que ces ventouses peuvent être actionnées de façon parfaitement symétrique en direction radiale vers et loin de la surface frontale des conteneurs pour leur ouverture avant le remplissage.

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6. Machine suivante la revendication 1, caractérisée par le fait que ces moyens (400) pour le chargement synchronisé des conteneurs (1) consistent essentiellement d'un bras horizontal (401) qui tourne angulairement autour d'un axe parallèle à l'axe du carrousel par un angle préétabli et à la fin duquel, de l'autre coté de l'extrémité agrafée, est fixé un bras (402), perpendiculaire au bras (401) et tournant autour de son axe vertical de symétrie, auquel les ventouses (403) placées en direction transversale par rapport au bras vertical sont fixées de façon solidaire.

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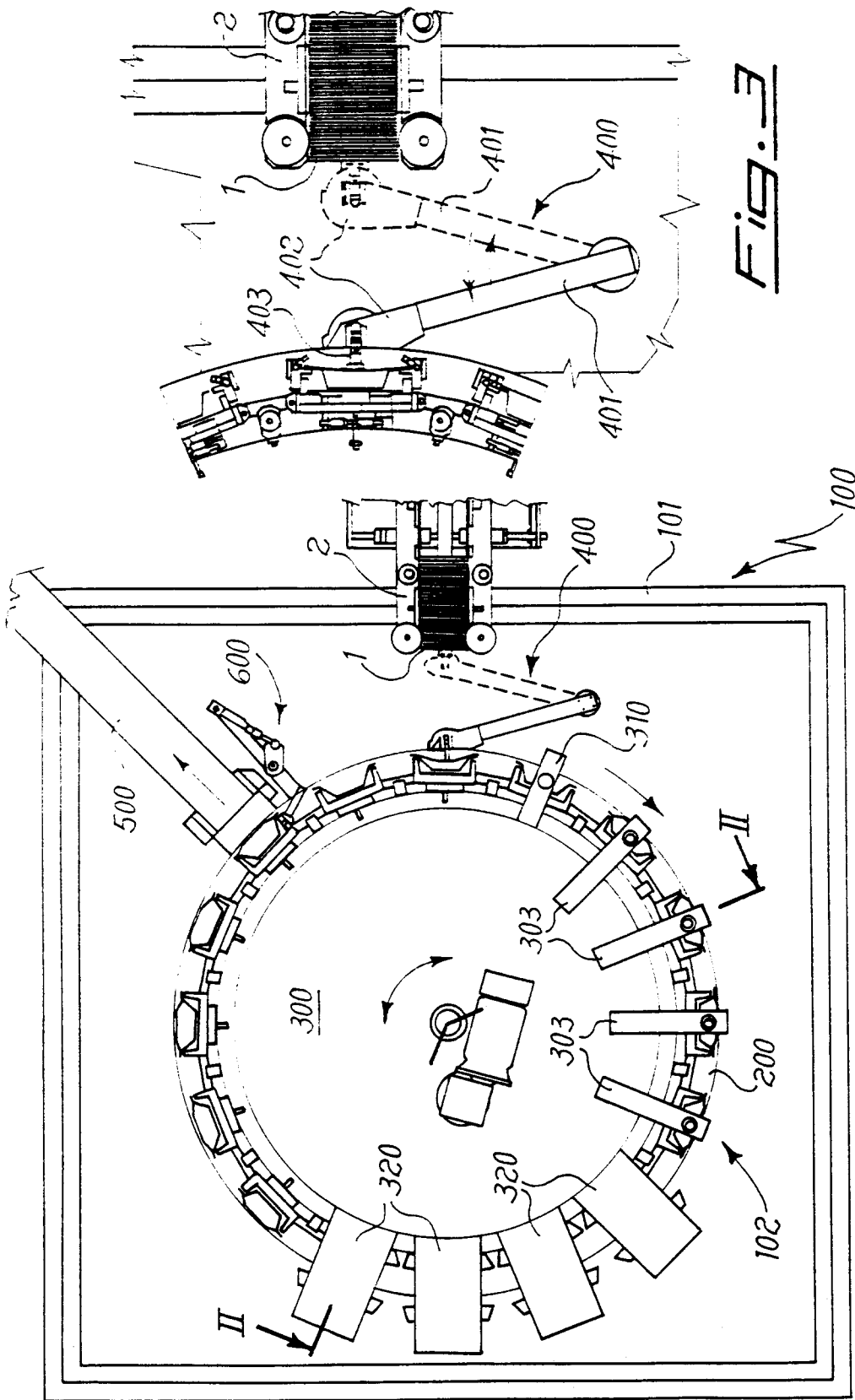


FIG. 1

FIG. 3

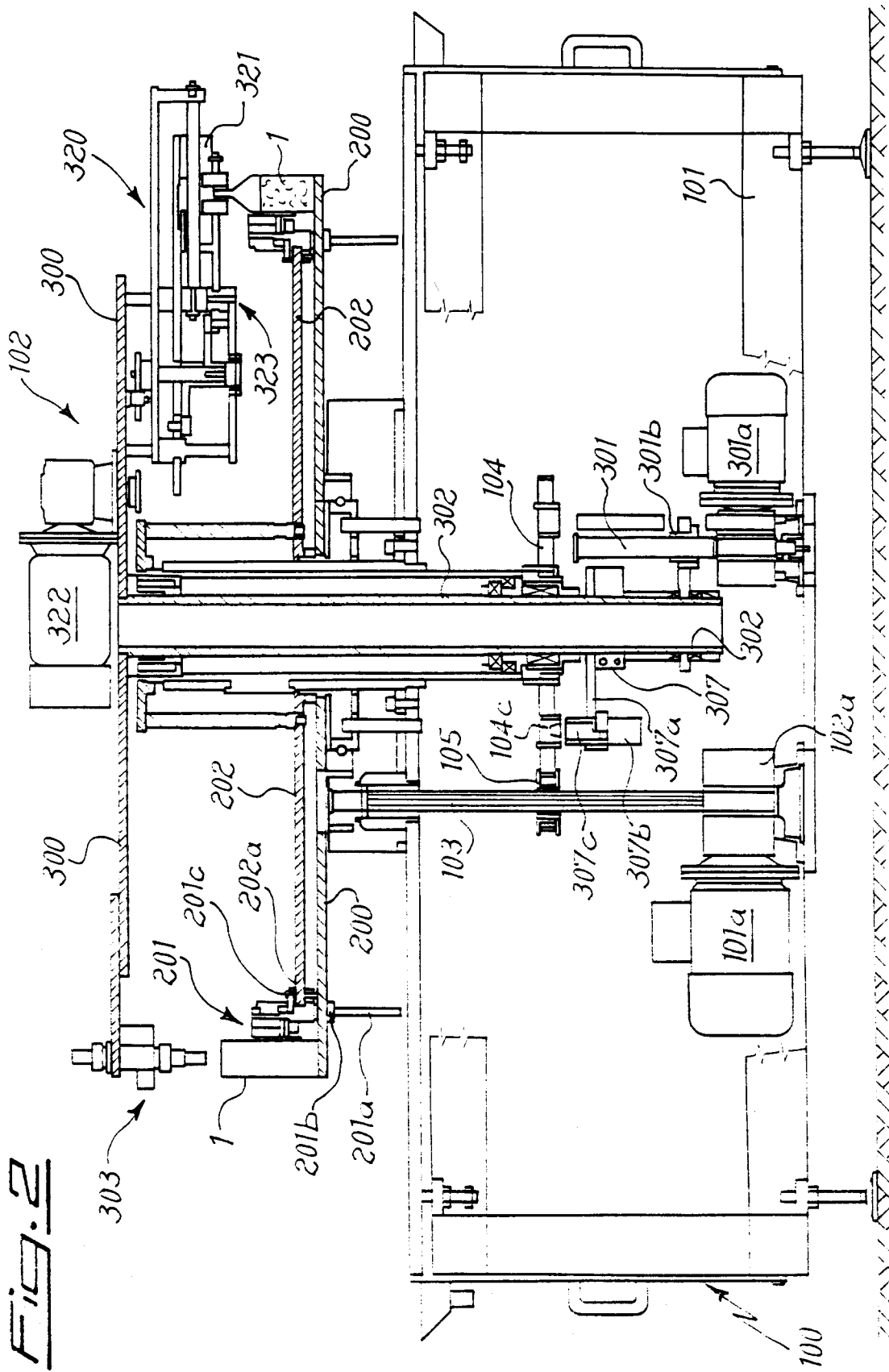


Fig. 2

