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(54) **HANDLE APPLICATOR FOR APPLYING HANDLES TO FLAT-PACK PACKAGING**

(57) A handle applicator (1) for applying handles to flat-pack packaging is provided comprising a frame (2) designed for suspending a rotating handle applicator (3) over a conveyor belt (4) for transporting packaging; handle dispensing means (5), handle handling means (6) and a U-shaped waiting track (7), placed along one side of a bridge (22); glue application means (8) arranged at the handle handling means (6); a control station (9); a plurality of actuators (10); a plurality of position sensors (30) for handles and packaging; wherein the rotating applicator (3) has a body (31) connected to one or more of said actuators (10), and wherein, at the upper ends of the applicator (3), some rods (34), rotating integrally with said body (31), are fixed, with the possibility of rotating on themselves with mechanical connections (33); each rod is equipped with a row of suction cups (35), designed for picking up the handles from a position defined by the waiting track (7) and coupling them to the packaging moving on the conveyor belt (4).

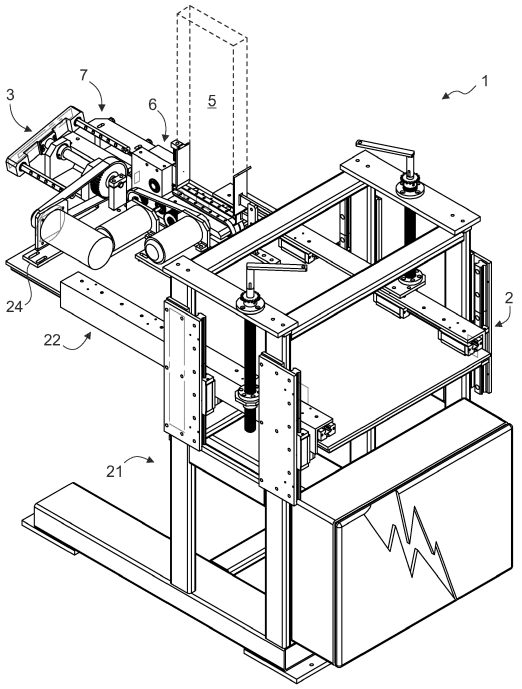

Fig. 1

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Description

[0001] This invention relates to a handle applicator equipped with a frame that suspends a rotating handle applicator above a conveyor belt for conveying packaging. Rods equipped with suction cups, according to claim 1, are connected, with the possibility of rotating, to the handle applicator.

[0002] Within the packaging production sector, an essential step in the production of the finished packaging itself is the application of the handle to the flat-pack packaging before folding; this is carried out by a device commonly called a handle applicator that, placed near a conveyor belt (which is also part of a larger machine that folds and glues the flat-pack packaging until a finished packaging is obtained), applies the handle to the flat-pack packaging using an adhesive, ensuring that the application of the handle is carried out in the correct position and that the pressure received is such as to guarantee a stable adhesion. This application procedure is carried out by an applicator placed suspended above the conveyor belt for flat-pack packaging, which generally receives a single handle to be applied by handle handling means that, in turn, take the single handle from a loader or dispenser, where a stack of handles is stored.

[0003] In patent application CA 1,283,319, for example, handle application equipment where the applicator is designed to process on moving substrates (i.e. on a conveyor belt) is disclosed. In this device, the loader, the handle handling means, and the applicator itself are placed one above the other, located in an area defined above the conveyor belt, while the glue application means are placed directly on the conveyor belt upstream of the device. This configuration just described is due to the nature of the handling means and of the applicator, where the former are characterised by being basically a head capable of picking up a handle, with a suction system, and rotating it towards the applicator. In turn, the applicator consists of a partially hollow cylinder, where the hollow part serves to accommodate part of the handle until the rotation of the applicator crushes the handle itself with the full part on the flat-pack packaging moving along the conveyor belt.

[0004] In the patent application WO 89/02362 equipment operating in the same technical field just described is disclosed. This equipment is characterised by handle handling means consisting of an arm that picks up the handle from the loader and the door in direct contact with a rotating applicator comprising a rotating cylinder with arms equipped with sucking systems that stop the handle on said applicator during its rotation. In this invention too, the adhesive is applied to the moving flat-pack packaging.

[0005] Both solutions described above have well defined drawbacks; in both cases, it is necessary to have a pneumatic circuit connected to moving sections, whether they are the handling means or the handle applicator itself, which complicates the manufacture of these components and makes the machine structure less simple. Considering the equipment described in CA 1,283,319, an obvious drawback is the possibility of dirtying the glue roller when the handling means cause an error in the positioning of the handle. This leads to considerable machine downtime and costs considering that these machines work at around 10,000 pieces produced per hour of operation.

[0006] With reference, on the other hand, to the equipment disclosed in WO 89/02362 this has the already mentioned complications of having a pressure circuit connected to a rotating element, in addition to the fact that the handling means consist of a complex articulated arm that must pick up the handle from the loader and place it in position on a rotating element (the applicator), which must stop to allow this, leading, again, to downtime in the processing.

[0007] Another problem with both technical solutions is that they are not easy to move, as they have complex equipment operating in combination with very limited dimensional tolerances and, above all, this equipment is not mounted on a single structure (see the applicator and handling means that are not connected to a rigid frame, and, in addition, the glue application means placed separately on the conveyor belt in WO 89/02362).

[0008] In this situation, the technical task underlying this invention is to devise a handle applicator that is specifically designed to carry out easy and comfortable movements on any packaging transport line (conveyor belt) as it is equipped as a whole with all the components necessary for line production operations. More specifically, a handle applicator composed of a number of components installed on the same frame, the latter equipped with wheels, will be illustrated.

[0009] Another important purpose of this invention is to provide a structurally simple applicator that is quick and precise in applying handles to moving packaging. At the same time it is a purpose of this invention to provide an applicator that can apply more than a single handle during a complete 360° rotation around its axis. Another purpose of this invention is to provide handle handling means that enable a precise and uncomplicated positioning of the same handles before they are collected and applied by the applicator on the moving packaging.

[0010] In addition, another purpose of this invention is to provide an applicator that does not require a suction system with a pressure circuit for applying the handle to moving packaging on the conveyor belt.

[0011] The technical problem and the specified purposes are achieved with a handle applicator for applying handles to moving flat-pack packaging comprising a rotating applicator equipped with a central body and several rods equipped with suction cups. Said rods equipped with suction cups, rotate integrally with the body of the applicator, pick up the handles from a position and couple them to the moving packaging on the conveyor belt. Said rods with suction cups preferably rotate parallel to the rotation axis of the central body but also have the freedom

to rotate on themselves to hold the suction cups in position.

[0012] Said applicator preferably has a central body shaped according to the number of rods involved in the specific application.

[0013] Even more preferably, said rotating applicator is connected to several actuators that control the motion thereof, said actuators being connected to a PLC and to one or more sensors that control the operation of the actuators.

[0014] Said handle applicator preferably has a movable frame that can be adjusted to more than one size.

[0015] Even more preferably, said applicator, by means of the rods with suction cups, picks up the single handle to be applied from an area where it is rigidly held in a predetermined position. After this operation, a rod with suction cups, together with a handle, carries the latter to a moving packaging.

[0016] Even more preferably, the glue application means apply said glue to the handle and not to the moving packaging.

[0017] Even more preferably, said handle applicator can be easily moved.

[0018] The handle applicator of this invention is preferably coupled to a conveyor belt conveying cardboard flat-pack packaging.

[0019] The technical task and specified purposes are achieved with a handle applicator for applying handles to flat-pack packaging as claimed in the appended claim 1. Preferred technical solutions are set forth in the dependent claims.

[0020] The features and advantages of the invention are clarified below in the detailed description of preferred embodiments of the invention, with reference to the accompanying drawings, wherein:

Fig.1 shows a perspective view of the handle applicator for applying handles to flat-pack packaging, showing the frame and the components mounted on it;

Fig.2 illustrates a view from above of the handle applicator for applying handles to flat-pack packaging mounted on a conveyor belt, showing the frame, the handle handling means, the actuators, the photocell sensor, and the rotating applicator in one of the preferred embodiments of the invention;

Fig.3 is a side view of the handle applicator for applying handles to flat-pack packaging, showing the frame, the adjustment means connected to it, the handle dispensing means, the handle handling means, and the glue application means;

Fig.4 represents an enlarged perspective view of the rotating applicator alone in one of the preferred embodiments of the invention; and

Fig.5 shows a view from above of the rotating applicator in Fig. 4.

[0021] In this document, when measurements, values, shapes, and geometric references (such as perpendicularity and parallelism) are associated with words like "approximately" or other similar terms, such as "almost" or "substantially", they shall be understood as except for errors of measurement or imprecisions due to errors of production and/or manufacturing and, above all, except for a slight divergence from the value, measurement, shape, or geometric reference with which it is associated. For example, if associated with a value, such terms preferably indicate a divergence of no more than 10% from the value itself.

[0022] Furthermore, when terms such as "first", "second", "upper", "lower", "main" and "secondary" are used, they do not necessarily identify an order, relationship priority or relative position, but they can simply be used to distinguish different components more clearly from one another.

[0023] Unless otherwise stated, the measurements and data reported in this text shall be considered as performed in International Standard Atmosphere ICAO (ISO 2533:1975).

[0024] With reference to the figures, the reference number **1** globally denotes the handle applicator for applying handles to flat-pack packaging according to the invention.

[0025] A handle applicator 1 for applying handles to flat-pack packaging, said packaging moving along a conveyor belt **4,** is here described coupled and above said conveyor belt 4 (Fig. 2) in order to suspend on the latter a rotating handle applicator **3** for handles to be applied by gluing. In the preferred embodiment, said handle applicator 1 and said conveyor belt 4 are connected in order to transmit data using an encoder (not shown).

[0026] Said handle applicator 1 is connected to an external electric power supply and a pressure circuit, neither of which is shown.

[0027] The handle applicator 1 according to this invention is composed of a frame **2** on which several components are installed thanks to sites **24** for fixing said components of the handle applicator 1 on said frame 2. Again, the frame 2 consists in a bed **21** and a bridge **22,** the first extending vertically and the second forming a horizontal plane where the components of the handle applicator are installed. The frame 2 is additionally equipped with wheels **25** and brakes **26,** not shown in the figures, designed to enable the handling of the handle applicator 1. Again, said frame 2 is equipped with adjustment means **23** for adjusting the height of the bed and the position of the bridge in space. Said adjustment means 23 can be pneumatic or mechanic; in the embodiment shown in Fig. 3, said adjustment means 23 are envisaged as threaded connections (e.g. adjustment screws) adjusted using knobs. Said adjustment means 23 are used in this embodiment of the handle applicator 1 since the latter is designed so that it can be coupled to different types of conveyor belts 4 and in different areas of the same, thanks to the whole machine's being mounted on a movable frame, without the need to couple the equipment

with external elements. Said adjustment means 23 are used in this embodiment of the handle applicator 1 to enable the handle applicator 3 to be positioned on a plane, which is basically parallel to the conveyor plane of the conveyor belt. The latter degree of freedom in adjusting the position of said handle applicator 3 enables the machine to have even more application flexibility, not only in relation to a conveyor belt 4 that is different in its dimensions, but also in relation to a sudden change in the packaging to be processed.

[0028] Again, on the horizontal plane defined by the bridge 22 of the handle applicator 1, there are handle dispensing means **5,** handle handling means **6,** and a U-shaped waiting track **7.** These handle applicator 1 components are arranged and installed along one side of the bridge 22, as can be seen in Fig. 2 (handle dispensing means 5 not shown in Fig. 2). More specifically, in the preferred embodiment, said handle dispensing means 5 consist in a pair of profiled sheets enclosing a stack of handles. The pair of profiled sheets is open above for restocking handles and below to enable said handling means 6 to pick up the last handle in the pile to send to the waiting track 7. Again, said handle dispensing means 5 can be adjusted in size to enable the handle applicator 1 to operate with different types of handles. With reference to Fig. 2, the handle handling means 6 are shown there in detail in the preferred embodiment of this invention. Said handling means 6 pick up the last handle of the pile to be sent to the waiting track 7. With reference to Fig. 2, there are handle handling means 6 in contact with the last handle of the stack of handles inside the handle dispensing means 5; the handle handling means comprise a belt that works by friction that enables the extraction of the last handle in the stack and the sending thereof to a pair of rollers that, additionally, enables the transfer of the handle itself to a waiting track 7. Said passage of the handle is controlled thanks to sensors **30** arranged along the path of the handle (e.g. photo cells) and the same passage is powered thanks to an actuator **10,** which, in the preferred embodiment, is physically and functionally connected (see Fig. 3) to said handle handling means 6 and is an electric motor **13.** An additional feature of the handle handling means 6 is that of being open in the lower part to enable, before the handle reaches the waiting track 7, to apply a layer of glue to it by means of glue application means **8.** Said glue application means 8 are arranged at the handle handling means 6 and are, in the preferred embodiment, hot-melt systems. In detail, the above-mentioned glue application means 8 are positioned below the plane along which the handle is moved by said handling means 6, thus applying a layer of glue onto the lower face of the handle conveyed along by the handle handling means 6. The final component of said handle handling means 6 is a waiting track 7, where a single handle with glue on its lower face is borne by the handling means 6. In the preferred embodiment, said waiting track 7 is U-shaped and consists of two plates connected to each other, the connection being closed at the distal end of the track 7 and open at the proximal end of the track 7 in relation to the handle handling means 6. Both plates have the shape of a U, in which the width of each individual plate is such as to accommodate a handle sent by the handle handling means 6 and in which the space between the two plates is such as to enable the release of a handle from the waiting track 7 when the rotating applicator 3 passes. In this way, the waiting track 7 ensures a stable position - free of the inaccuracies of the previous, prior art equipment - with which the rotating applicator 3 can interact, maintaining high degrees of precision in arranging the handle on the packaging.

[0029] In addition, the handle applicator 1 for applying handles to flat-pack packaging additionally comprises, outside the horizontal plane defined by the bridge 22, said rotating handle applicator 3. Said rotating applicator 3 has a body **31** connected to one or more actuators 10, wherein some rods **34** are fixed at the upper ends, with the possibility of rotating on mechanical connections **33.** Each rod is equipped with a row of suction cups **35.** There are, preferably, two rods 34, equipped with suction cups 35. The actuators 10 in the preferred embodiment are a pair of electric motors and, in detail, a so-called master motor **11** and a so-called CAM motor **12** for creating an electronic cam drive, both the motors in this brushless embodiment. Said rods 34 equipped with suction cups 35, rotating integrally with the body of the applicator, pick up the handles from a position by the waiting track 7 and couple them to the packaging moving on the conveyor belt 4. Said rods 34 with suction cups 35 preferably rotate parallel to the rotation axis of the body 31 but also have the freedom to rotate on themselves to hold the suction cups 35 in position.

[0030] Said body 31 of the rotating applicator 3 is equipped, at one lower end, with a fitted pulley **32** that is connected in power transmission with the actuators 11 and 12 by any power transmission system, such as a gear train, a chain, or a belt (the latter shown in the embodiment in Fig. 1). Again, said body 31 of the rotating applicator 3 is equipped with a number of upper ends where rods 34 are connected via mechanical connections 33. Each of the above-mentioned rods 34 has a row of suction cups 35; this latter feature, thanks to the nature of the mechanical connection 33 that in the preferred embodiment of the invention consists in a sphere or roller mechanical bearing, enables the rods to have one part of the lateral surface strongly unbalanced in weight, a part that corresponds to the surface equipped with the row of suction cups 35, which, as a consequence, always face downwards to couple the upper face of the handle during the rotation of the applicator 3. In one of the embodiments of the rotating applicator 3, shown in Fig. 4, the latter is provided adjacent to said waiting track 7, and has a T-shaped body 31 on the base of which there is a pulley 32 fitted to said body 31 and wherein two rods 34 are fixed at the upper ends of the T via mechanical connections 33. Each rod is equipped with suction cups 35; said suction cups 35 in this embodiment having the same

orientation as those mentioned above.

[0031] In the preferred embodiment of the handle applicator 1 for applying handles to flat-pack packaging, the rods 34, the body 31 of the rotating applicator 3, and the U-shaped waiting track 7 are dimensionally in such a relation as to enable said rods 34 to pass through the groove formed at the centre of the U-shaped waiting track 7 and wherein the distance between the groove formed at the centre of the waiting track 7 and the rotation axis of the rotating applicator 3 is equal to the distance between the rotation axis of the rotating applicator 3 and the rods 34.

[0032] This last dimensional feature of the handle applicator 1 described in this document is due to the necessity for the applicator to convey the handle with the glue already applied, waiting on the waiting track 7, towards the packaging moving below the rotating applicator 3 and the whole handle applicator 1. The suction cups 35 of the rods 34 described above hook the handle that, partially held on the lateral section by the waiting track 7 (with the central cross-section of the U a little smaller than the width of the handle), offers a resistance that creates a physical connection between the handle and the suction cups 35. Thanks to this resistance, it is possible to convey the handle on the packaging moving on the conveyor belt 4 via the integral rotation of suction cups 35, rods 34, and body 31 of the rotating applicator 3. The dimensions of the body 31 of the rotating applicator 3 are such as to ensure the correct pressure between handle and packaging so as to enable the glue to make said handle adhere to said packaging. The distance between the rotation axis of the rotating applicator 3 and the centre of the waiting track 7 is around equal to the distance between the rotation axis of the rotating applicator 3 and the conveyor belt 4. The rotating applicator 3 of this embodiment of the invention can, thanks to two or more upper ends, deposit two or more handles on the packaging for each 360° rotation of the applicator 3.

[0033] The handle applicator 1 for applying handles to flat-pack packaging described here additionally comprises a plurality of handle and packaging position sensors 30, including a photocell sensor **300** that, placed upstream of the handle applicator 1, inspects the conveyor belt 4 to identify the moment when the packaging passes, so as to activate, when the latter passes, both the handle handling means 6 and the rotating applicator 3. Additionally, said sensors 30 can be used along the handle handling means 6 to time the extraction of the handles by the handle dispensing means 5 and, again, to time the glue application means 8.

[0034] This type of communication and inter-operability between the components of the handle applicator 1 can occur because the handle applicator 1 itself is equipped with a PLC **91** forming part of a control station **9** equipped, in turn, with a control panel **92** and a touch screen **93,** not shown in the figures, to allow adjustments and any man-machine or man-process interaction. Each component of the handle applicator 1 is connected operationally and for the transmission of data to said PLC 91. Said PLC 91 adjusts and times the operations of the handle applicator 1 via the plurality of actuators 10 and as a function of the parameters set in said PLC 91 or as a function of the parameters detected by said plurality of sensors 30.

[0035] It should be noted that only a few preferred embodiments have been described and illustrated here, but that numerous variants, additions, modifications, and/or different combinations of the individual elements can be made, without deviating from the general innovative concept, nor going beyond its scope of protection, as is also apparent from the dependent claims.

[0036] The handle applicator for applying handles to flat-pack packaging according to the invention achieves important advantages.

[0037] In fact, the above-mentioned handle applicator is designed to enable the application of handles, on which a layer of adhesive is applied while it is conveyed to an applicator, to flat-pack packaging moving along a conveyor belt so that the positioning and application of pressure is carried out by means of a structurally simple, precise, and very fast applicator between two successive applications. The invention is susceptible to variations falling within the scope of the inventive concept defined by the claims.

[0038] In this context, all details can be replaced by equivalent elements, and the materials, shapes, and dimensions may be any materials, shapes, and dimensions.

Claims

1. A handle applicator (1) for applying handles to flat-pack packaging comprising:

- a frame (2) designed for suspending a rotating handle applicator (3) over a conveyor belt (4) for transporting packaging;
- handle dispensing means (5),
- handle handling means (6) and a U-shaped waiting track (7), placed along one side of a bridge (22);
- glue application means (8) arranged at said handle handling means (6);
- a control station (9);
- a plurality of actuators (10);
- a plurality of sensors (30) for positioning handles and packaging;

and **characterised in that**

- said rotating applicator (3) has a body (31) connected to one or more of said actuators (10),
- at the upper ends of said applicator (3), a plurality of rods (34), rotating integrally with said body (31), are fixed, with the possibility of rotating on themselves with mechanical connections (33); each rod is equipped with a row of suction

cups (35), designed for picking up the handles from a position defined by said waiting track (7) and coupling them to the packaging moving on said conveyor belt (4).

2. The handle applicator (1) for applying handles to flat-pack packaging according to claim 1, wherein the size, including the suction cups (35), of the rods (34) connected to the body (31) of the applicator (3) are such as to enable said rods (34) to pass through the groove formed at the centre of the U-shaped waiting track (7) and wherein the distance between the groove formed at the centre of the waiting track (7) and the rotation axis of the rotating applicator (3) is equal to the distance between the rotation axis of the rotating applicator (3) and the rods (34).

3. The handle applicator (1) for applying handles to flat-pack packaging according to claim 1, wherein the U-shaped waiting track (7) consists of two plates connected to each other, the connection being closed at the distal end of the track (7) and open at the proximal end of the track (7) with respect to the handle handling means (6), both U-shaped plates, in which the width of each individual plate is such as to accommodate a handle sent by the handle handling means (6), and in which the space between the two plates is such as to enable the release of a handle from the waiting track (7) to the passage of the rods (34) with suction cups (35) of the rotating applicator (3).

4. The handle applicator (1) for applying handles to flat-pack packaging according to claim 1, wherein the glue application means (8) arranged at the handle handling means (6) are hot-melt systems and are positioned below the plane along which the handle is moved by said handling means (6).

5. The handle applicator (1) for applying handles to flat-pack packaging according to claim 1, wherein one of the plurality of sensors (30) for positioning handles and packaging is defined as a photocell sensor (300) for packaging, is positioned upstream of the handle applicator (1) directed towards the packaging conveyor belt (4), and is connected to the PLC (91) to detect the position of the packaging and transmit it to said PLC (91) that, in turn, controls the timing of the rotary movement of the rotating applicator (3) by means of the actuators (10).

6. The handle applicator (1) for applying handles to flat-pack packaging according to claim 1, wherein the plurality of actuators (10) comprise:

- a master electric motor (11) and a CAM electric motor (12) electronically connected to the PLC (91) and physically connected to said mechanical connection (32) connected to the body (31) of the rotating applicator (3); and
- an electric motor (13) physically connected with said handle handling means (6) and electronically connected to said PLC (91).

7. The handle applicator (1) for applying handles to flat-pack packaging according to claims 5 and 6, wherein the PLC (91) regulates and times, by means of the plurality of actuators (10), the operations of the handle applicator (1) according to parameters set in said PLC (91) or according to parameters detected by said plurality of sensors (30) for positioning handles and packaging.

8. The handle applicator (1) for applying handles to flat-pack packaging according to any of the previous claims, wherein the frame (2) is equipped with wheels (25) and brakes (26) for handling the handle applicator (1) for applying handles to flat-pack packaging anywhere on a conveyor belt (4).

9. The handle applicator (1) for applying handles to flat-pack packaging according to any of the previous claims, wherein said handle applicator (1) and said conveyor belt (4) are connected for the transmission of data by means of an encoder (40).

10. The handle applicator (1) for applying handles to flat-pack packaging according to claim 1, wherein said rotating applicator (3) is positioned adjacent to said waiting track (7), has a T-shaped body (31) on the base of which there is a pulley (32) fitted to said body (31), and in which at the upper ends of the T two rods (34) are fixed each equipped with suction cups (35), in which said rods (34) passively maintain, thanks to mechanical connections (33), said suction cups (35) facing downwards during the rotation of the body (31) of the rotating applicator (3).

11. The handle applicator (1) for applying handles to flat-pack packaging according to claim 1, wherein said rods (34) extend parallel to the rotation axis (31a) of said body (31) and are equally spaced apart from said body (31).

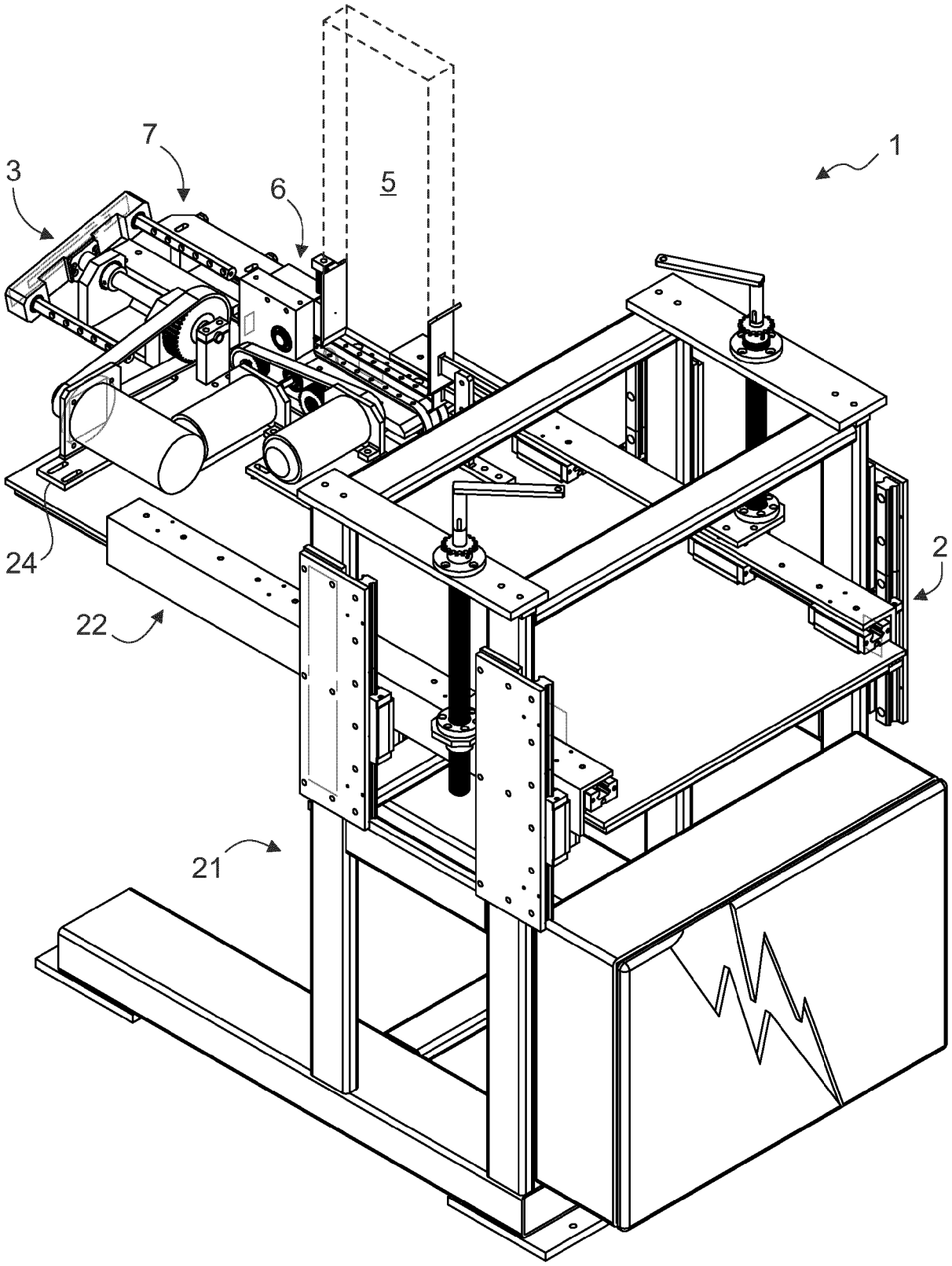

Fig. 1

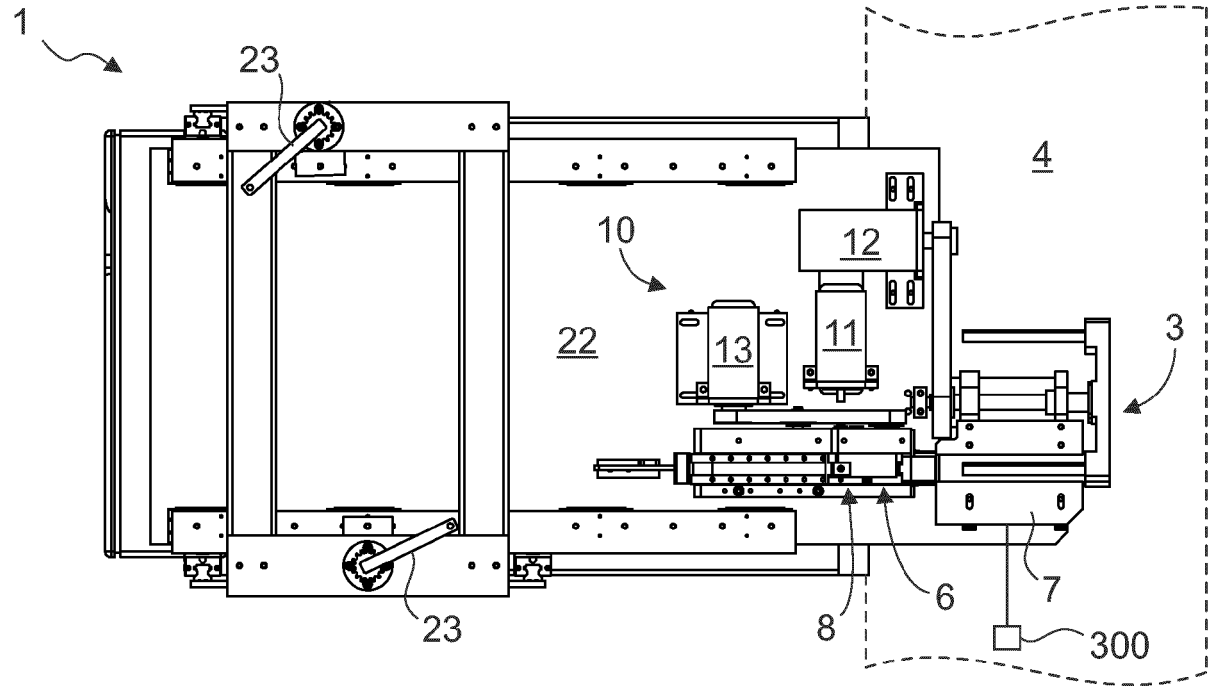

Fig. 2

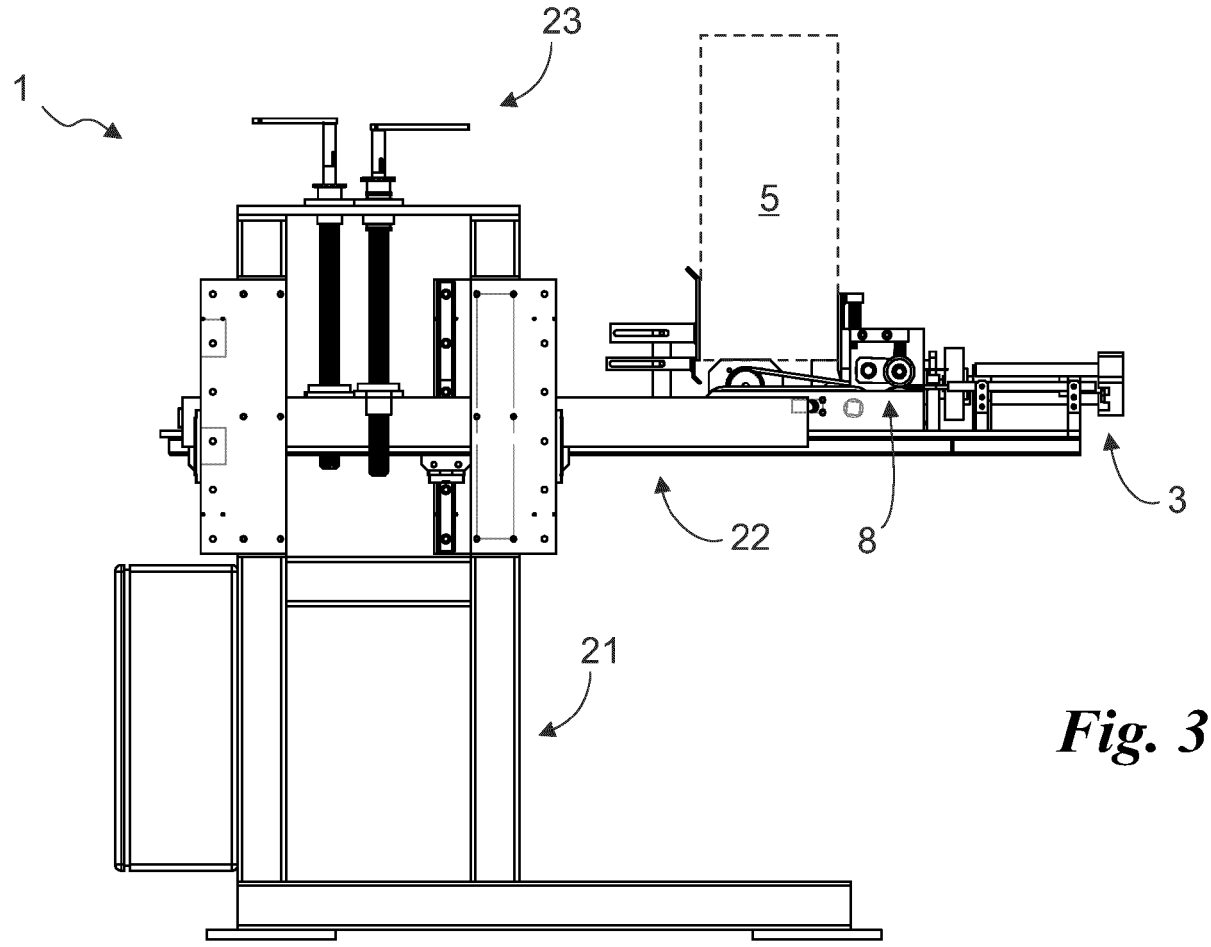

Fig. 3

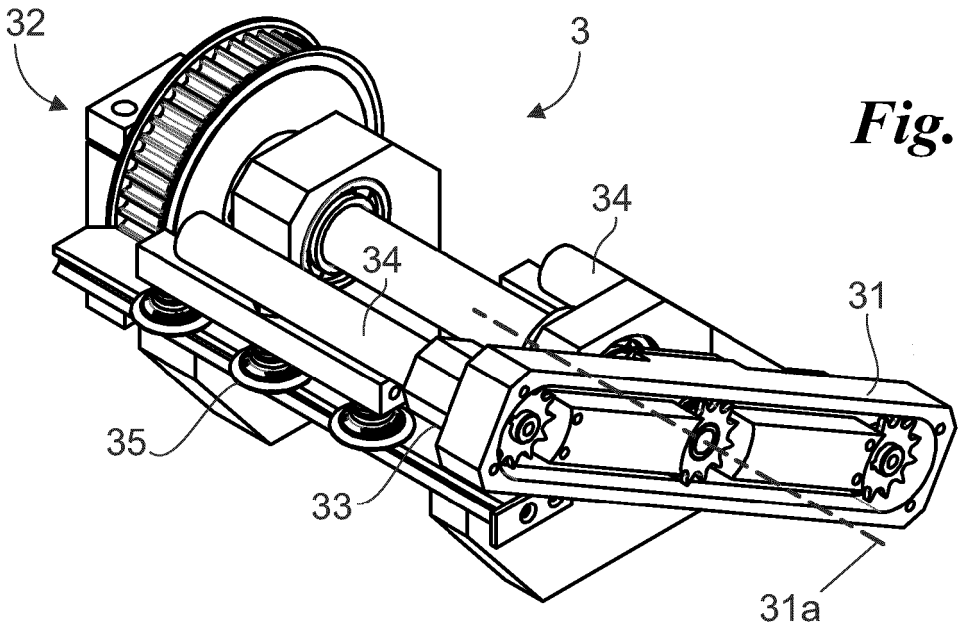

Fig. 4

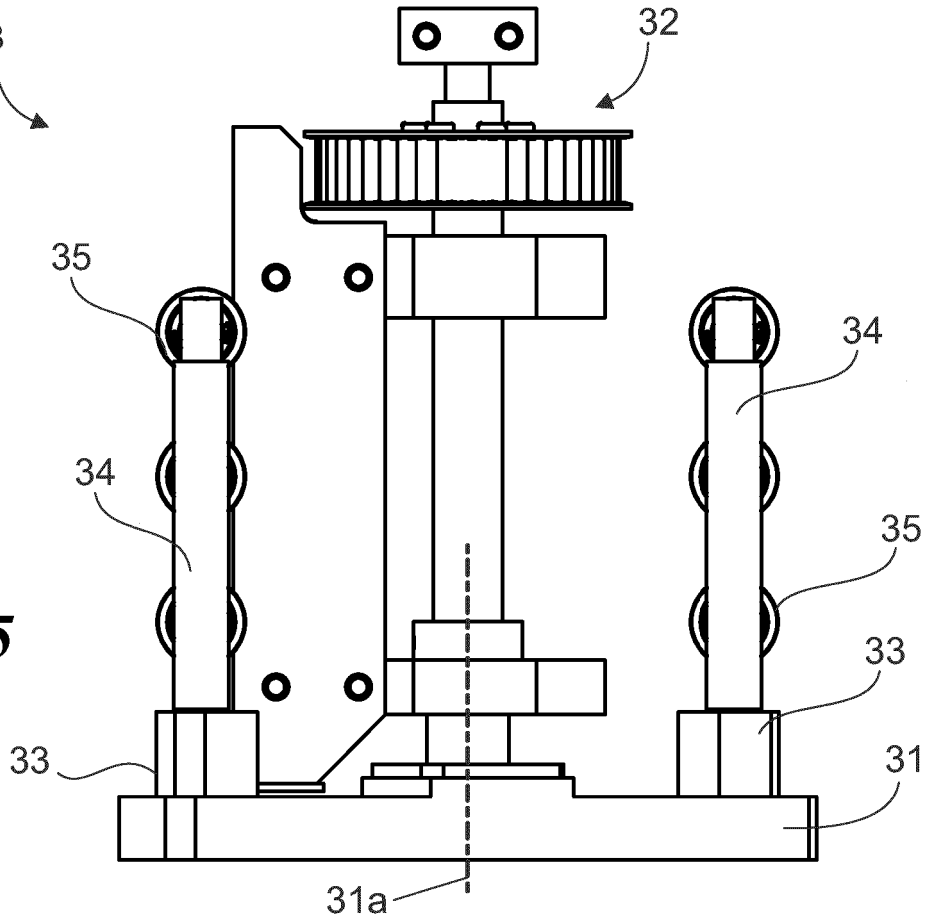

Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 20 19 9330

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	US 5 437 594 A (MATTSON LARRY J [US] ET AL) 1 August 1995 (1995-08-01)	1	INV. B31B70/86
A	* column 2, line 28 - column 5, line 30; figures 1-8 *	2-11	B31B50/86
Y,D	WO 89/02362 A1 (MANVILLE CORP [US]) 23 March 1989 (1989-03-23)	1	
A	* page 7, line 1 - line 4; figure 8 *	2-11	

TECHNICAL FIELDS SEARCHED (IPC)

B31B
B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	20 January 2021	Sundqvist, Stefan

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 20 19 9330

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
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5437594 A	01-08-1995	NONE	
WO 8902362 A1	23-03-1989	BR 8807191 A	17-10-1989
		CA 1290182 C	08-10-1991
		DE 3884377 T2	20-01-1994
		DK 220989 A	05-05-1989
		EP 0333800 A1	27-09-1989
		ES 2010789 A6	01-12-1989
		FI 892199 A	08-05-1989
		IE 61628 B1	16-11-1994
		JP H0788066 B2	27-09-1995
		JP H02500898 A	29-03-1990
		KR 890701343 A	20-12-1989
		NO 173858 B	08-11-1993
		NZ 226088 A	26-04-1990
		US 4816014 A	28-03-1989
		WO 8902362 A1	23-03-1989
		ZA 886210 B	30-05-1989

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- CA 1283319 **[0003] [0005]**
- WO 8902362 A **[0004] [0006] [0007]**