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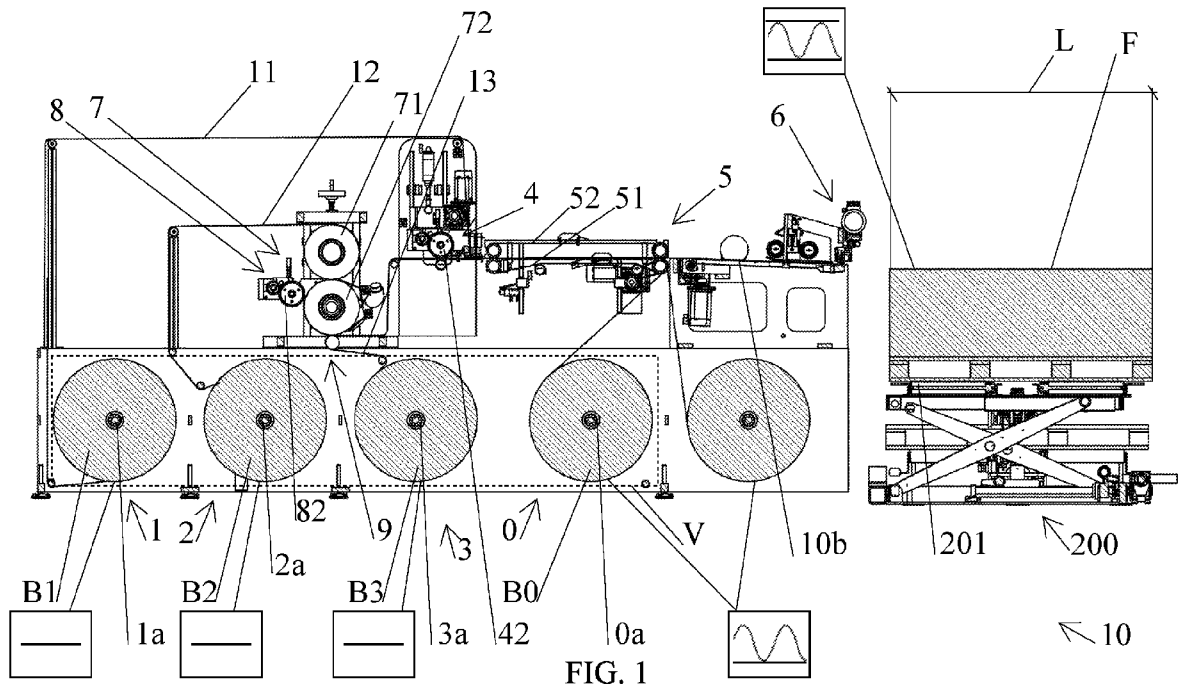


FIG. 1

(57) Abstract: A machine (10) preferably comprising unwinders (1, 2, 3) of reels of cardboard for unwinding a first, second and third strip (N 1, N2; N3), a corrugator (7) for corrugating the second strip (N2), a glue dispenser (4), a second glue dispenser (8), drawing means of strips, means for pressing (9) strips, a cutter (6), support means (200) of sheets, a winder (0) and paths of the strips (N1, N2, N3) to the drawing means comprising a press (5) for pressing and drawing together the second strip (N2) and the third strip (N3) or the first strip (N 1), the second strip (N2) and the third strip (N3), thus forming corrugated cardboard. In a first operating condition the glue dispenser (4) and the first path (11) are active and in a second operating condition are inactive so that the drawing means respectively form single-wall corrugated cardboard or single-face corrugated cardboard. The invention also relates to a method.



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MACHINE AND METHOD FOR REALISING SHEETS AND REELS OF CORRUGATED CARDBOARD

FIELD OF THE INVENTION

The present invention concerns the technical sector relating to the production of corrugated cardboard sheets and reels of corrugated cardboard starting from reels of cardboard, and is especially, but not exclusively, applicable in the production of small batches to be used in machines for packaging articles. In greater detail the present invention concerns a machine and a method for realising sheets and reels of corrugated cardboard, typically sheets of single-wall corrugated cardboard and reels of single-face corrugated cardboard.

DESCRIPTION OF THE PRIOR ART

In the present description, by simple corrugated cardboard, also known as single-wall corrugated cardboard, is meant a cardboard with two external layers of cardboard, typically smooth, between which is interposed a corrugated layer of cardboard while by the term single-face corrugated cardboard is meant a cardboard having two layers: one corrugated layer of cardboard and a layer of cardboard that is typically smooth. By way of example, figure 6 shows a corrugated layer of cardboard, figure 7 shows a layer of smooth cardboard and a corrugated layer of cardboard with the crests facing towards the layer of smooth cardboard covered with glue and figure 8 shows a corrugated layer of cardboard interposed between two layers of smooth cardboard, with the crests covered with glue.

It is known to realise single-wall corrugated cardboard, or single face cardboard, starting from reels of smooth cardboard by means of systems or lines which extend horizontally for tens of metres. Like solutions are suitable for continuous productions and/or for productions of large batches, but are difficult to integrate into an industrial facility upstream of one or more machines for packaging articles, owing to the dimensions, as well as the cost. Examples of like devices are described in EP0146441B1 and in EP2460651A1.

Document FR362835A illustrates a coupling machine for realising single-wall corrugated cardboard starting from a first reel of single-face corrugated cardboard and a second reel of smooth cardboard.

Also known is a machine, described in GB132725A, with an arrangement not in line and which realises a reel of single-face corrugated cardboard starting from a first reel and a second reel of smooth cardboard; the latter reel is positioned in elevation and the cardboard passes through corrugator rollers with application of glue on the crests before being coupled with the smooth cardboard coming from the other reel.

SUMMARY OF THE INVENTION

The present invention intends to obviate one or more drawbacks of the solutions of the prior art. A first aim of the present invention is to provide a machine that can make both reels and sheets. A second aim, especially of some embodiments, is to limit the size of the machine with respect to the known solutions so as to enable integration thereof in facilities for packaging articles.

A further aim of some embodiments is to realise single-wall corrugated cardboard sheets and reels of single-face corrugated cardboard with the use of a single machine.

These and other aims, which will be obvious to the expert in the sector from a reading of the following text, are attained by means of a machine for realising sheets and reels of corrugated cardboard and a method for realising sheets and reels of corrugated cardboard according to the contents of the claims.

According to the teachings of the present description, the machine comprises:

- a first reel unwinder for unwinding a first strip from a first reel of cardboard;
- a second reel unwinder for unwinding a second strip from a second reel of cardboard;
- 10 - a third reel unwinder for unwinding a third strip from a third reel of cardboard;
- a corrugator for corrugating a cardboard strip;
- a glue dispenser for depositing glue on a side of cardboard strip;
- a second glue dispenser for depositing glue on a side of cardboard strip;
- drawing means for drawing cardboard strips;
- 15 - means for pressing cardboard strips to one another;
- a cutter for cutting corrugated cardboard strips so as to obtain corrugated cardboard sheets;
- support means for supporting sheets of corrugated cardboard sheets;
- a reel winder for winding a corrugated cardboard strip;
- 20 - a first path of the first strip which, going from the first unwinder, reaches the drawing means;
- a second path of the second strip which, going from the second unwinder, reaches the drawing means;
- a third path of the third strip which going from the third unwinder reaches the drawing means.

Further:

- the first path or the second path crosses the glue dispenser so that the glue dispenser, in an active condition, deposits glue on the first strip or on the second strip;
- the first path and the second path meet after the glue dispenser and before or at the drawing means in such a way that the glue is interposed between the first strip and the second strip;
- 30 - the second path crosses the corrugator so that the corrugator corrugates the second strip;
- the second path or the third path crosses the second glue dispenser so that the second glue dispenser deposits glue on the second strip or on the third strip;
- the second path and the third path meet after the second glue dispenser and before or at the means for pressing so that the glue is interposed between the second strip and the third strip;
- 35 - the drawing means comprise a press for pressing and drawing strips which is configured to draw together the second strip and the third strip or the first strip, the second strip and the third

strip, thus forming corrugated cardboard.

In a first operating condition the glue dispenser and the first path are active and in a second operating condition the glue dispenser and the first path are inactive so that the drawing means respectively form single-wall corrugated cardboard or single-face corrugated cardboard.

5 According to the teachings of the present description, the method comprises steps of:

- providing a machine according to the present description;
- supplying a first reel of smooth cardboard to the first unwinder;
- supplying a second reel of smooth cardboard to the second unwinder;
- supplying a third reel of smooth cardboard to the third unwinder;
- 10 - supplying the second path with the second strip;
- supplying the third path with the third strip;
- activating the corrugator;
- activating the second glue dispenser;
- activating the drawing means;
- 15 - passing from the second operating condition to the first operating condition, supplying the first path with the first strip and activating the glue dispenser.

BRIEF DESCRIPTION OF THE DRAWINGS

Specific embodiments of the invention will be described in the following part of the present description, according to what is set down in the claims and with the aid of the accompanying
20 figures, in which:

- figure 1 is a section view of the insert of figure 2, passing through the median plane of the unwinding rollers, which enables an appreciation of the functioning of the machine;
- figure 2 is a perspective view of an embodiment of a machine for realising sheets and
25 reels of corrugated cardboard according to the invention;
- figure 3 is another perspective view of the machine of figure 2;
- Figure 4 is another perspective view of the machine of figure 2 with some elements not illustrated to enable a view of the internal components;
- figure 5 is a central detail of figure 1;
- figure 6 is a schematic view of a corrugated layer of cardboard;
- 30 - figure 7 is a schematic view of layers which form a single-face corrugated cardboard;
- figure 8 is a schematic view of layers which form a single-wall corrugated cardboard;
- figure 9 is a detail of an embodiment which shows a technology of a glue dispenser alternative to that of the machine of figure 2;
- figure 10 is a detail of an embodiment which shows the technology of figure 9 positioned
35 differently with respect to figure 9, so as to operate on another strip;
- figure 11 is a detail of an embodiment which shows the technology of figure 9 applied at a successive point of the machine;

- figure 12 is a detail of an embodiment which shows the technology of figure 9 applied at a successive point of the machine and positioned differently with respect to figure 11, so as to operate on another strip;
- figure 13 illustrates an embodiment of a machinery for boxing or packaging articles with corrugated cardboard which comprises the machine of the invention;
- figure 14 is a view of a further embodiment of the press provided with a heater;
- figure 15 is a view of an alternative embodiment of the press of figure 14, with some components not illustrated;
- figure 16 is a view of a further embodiment of the press provided with a heater;
- figure 17 is a view of a still further alternative embodiment of the press provided with a heater.

DESCRIPTION OF PREFERRED EMBODIMENTS

With reference to the appended figures, reference numeral 10 denotes a machine for realising corrugated cardboard sheets (F) and reels of corrugated cardboard (B0).

- The references are reported to facilitate understanding of the invention, but are not intended to limit the scope of the invention.

An embodiment of the machine (10) comprises:

- a first reel unwinder (1) for unwinding a first strip (N1) from a first reel (B1) of cardboard;
- a second reel unwinder (2) for unwinding a second strip (N2) from a second reel (B2) of cardboard;
- a third reel unwinder (3) for unwinding a third strip (N3) from a third reel (B3) of cardboard;
- a corrugator (7) for corrugating a cardboard strip;
- a glue dispenser (4) for depositing glue (A) on a side of cardboard strip;
- a second glue dispenser (8) for depositing glue (A) on a side of cardboard strip;
- drawing means for drawing cardboard strips;
- means for pressing (9) cardboard strips to one another;
- a cutter (6) for cutting a corrugated cardboard strip so as to obtain corrugated cardboard sheets (F);
- support means (200) for supporting sheets of corrugated cardboard sheets (F);
- a reel winder (0) for winding a corrugated cardboard strip;
- a first path (11) of the first strip (N1) which going from the first unwinder (1) reaches the drawing means;
- a second path (12) of the second strip (N2) which going from the second unwinder (2) reaches the drawing means;
- a third path (13) of the third strip (N3) which going from the third unwinder (3) reaches the drawing means.

A path between the first path (11) and the second path (12) crosses the glue dispenser (4) so that the glue dispenser (4), in an active condition, deposits glue (A) on the first strip (N1) or on the second strip (N2). In the embodiments of figures 1 and 11 the glue dispenser (4) deposits the glue (A) on the second strip (N2) while in the embodiment of figure 12 the glue dispenser (4) deposits glue (A) on the first strip (N1).

As figures 1 and 2 illustrate, the layout of the first strip (N1), of the second strip (N2) and of the third strip (N3) represent, respectively the first path (11), the second path (12) and the third path (13), and therefore the references are substantially interchangeable.

The first path (11) and the second path (12) meet after the glue dispenser (4) and before or at the drawing means in such a way that the glue (A) is interposed between the first strip (N1) and the second strip (N2), as illustrated by way of example in figure 5.

The second path (12) crosses the corrugator (7) so that the corrugator (7) makes the second strip (N2) corrugated.

A path between the second path (12) and the third path (13) crosses the second glue dispenser (8) so that the second glue dispenser (8) deposits glue (A) on the second strip (N2) or on the third strip (N3).

The second path (12) and the third path (13) meet after the second glue dispenser (8) and before or at the means for pressing (9) so that the glue (A) is interposed between the second strip (N2) and the third strip (N3).

Figure 4 is an example of the description of the second path (12) and the third path (13) illustrated above. In the embodiment of figure 4, the second path (12) and the third path (13) meet before or at the second glue dispenser (8) at the means for pressing (9).

The drawing means comprise a press (5) for pressing and drawing strips which is configured to draw together the second strip (N2) and the third strip (N3) or the first strip (N1), the second strip (N2) and the third strip (N3), thus forming corrugated cardboard.

The press (5) enables drawing the adjacent strips at the same velocity due to a pressure which, in the embodiment of figure 2, is determined by the distance between a first press belt (51) and a second press belt (52), moved by respective rollers. This pressure also enables homogenising the layering so as to obtain a corrugated cardboard of high quality.

The configuration of the press (5) typically varies according to the production type in order to adjust the distance to the layering type.

The machine (10) has a first operating condition, or production condition, and a second operating condition, or production condition. In the first operating condition the glue dispenser (4) and the first path (11) are active while in the second operating condition the glue dispenser (4) and the first path (11) are inactive so that the drawing means respectively form single-wall corrugated cardboard or single-face corrugated cardboard.

The machine (10) of the invention can advantageously produce both corrugated cardboard

sheets (F) and reels of corrugated cardboard (B0).

As can be observed in the illustrative rectangles shown in figure 1, the first reel (B1) of cardboard, the second reel (B2) of cardboard and the third reel (B3) of cardboard are typically made of smooth cardboard; these are of a smaller size, given a same unwinding capability, with respect to a reel of single-face corrugated cardboard (B0), and have a lower cost. The different size can also be deduced from the preferable presence, illustrated in figure 1, of a second winder, entirely alike to the winder (0) for winding a reel of single-face corrugated cardboard.

The machine (10) of the invention has a limited size, for example the embodiment of figure 2, without support means (200), can occupy a space comprised between 5 and 10 metres, typically about 6.5 metres plus 1.5 metres for the support means (200). However the machine (10), with the same arrangement as figure 2, but without the second winder, might be made even more compact up to or nearly up to about the sum of the diameters of the first reel (B1), of the second reel (B2), of the third reel (B3) and of the reel of corrugated cardboard (B0).

Especially in the case where a second winder is present the machine (10) can comprise an aspirated conveyor belt (10b) between the drawing means and the cutter (6).

The machine (10) of the invention can realise the two types of corrugated cardboard most commonly requested and which can be used to produce other types of corrugated cardboard, i.e: single-wall corrugated cardboard, typically required in sheets of corrugated cardboard sheets (F), and single-face corrugated cardboard, typically required in reels of corrugated cardboard (B0). These productions can take place in proximity of the following use, typically in a system comprising of one or more machineries for boxing or packaging articles using corrugated cardboard, as illustrated in figure 13.

The reels of corrugated cardboard (B0) can be used for realising corrugated cardboard by means of a coupling machine which couples the strip of single-face corrugated cardboard with another cardboard strip, typically smooth, in a way alike to what takes place in the machine (10) starting from the glue dispenser (4).

While the single-face corrugated cardboard might be cut into sheets and the single-wall corrugated cardboard wound, not without difficulty, typically the former is wound and the latter cut into sheets.

In the first operating condition the reel winder (0) is preferably inactive and the path of the corrugated cardboard proceeds from the press (5) towards the support means (200) crossing the cutter (6) while in the second operating condition the cutter (6) is inactive and the path of the corrugated cardboard proceeds from the press (5) towards the reel winder (0).

The accompanying figures show a cutter (6) comprising a movable blade according to a path that is transversal to the direction of length of the machine (10). However, other cutters (6) of known type could be used, for example comprising a vertically movable blade that cooperates with a counterblade.

It is possible to use a plurality of types of glue dispensers, as illustrated in the figures.

In the case where the glue dispenser (4) comprises a glue depositing roller (42), it is preferable for the depositing roller (42) to be movable between an active position, for contacting the second strip (N2), and an inactive position, so as to be detached from the second strip (N2).

5 As illustrated in figure 5 and as is known in the sector, the depositing roller (42) typically receives the glue (A) from another respective roller immersed in a tank, usually of glue, preferably of a vinyl type.

If the glue dispenser (4) utilises a glue depositing roller (42), a corrugated cardboard of better quality is obtained by depositing the glue (A) on the crests of the second strip (N2).

10 The same considerations can be applied to the second glue dispenser (8) if it utilises a glue depositing roller (82).

The machine (10) preferably comprises a counter-roller (43) at the depositing roller (42) of the glue dispenser (4) which facilitates the deposition of the glue (A) on the crests of the second strip (N2).

15 The first unwinder (1) preferably comprises a motor for unwinding the first reel (B1) of cardboard which is active in the first operating condition and inactive in the second operating condition.

For example, figure 1 illustrates a motorised roller (1a) of the first unwinder (1). Likewise, the second unwinder (2) and the third unwinder (3) can also comprise a motor for respectively unwinding the second reel (B2) of cardboard and the third reel (B3) of cardboard. For example,
20 figure 1 illustrates a motorised roller (2a) of the second unwinder (2) and a motorised roller (3a) of the third unwinder (3).

The winder (0) also typically comprises a motor for winding a reel (B0) of corrugated cardboard and the motor is preferably active in the second operating condition and inactive in the first operating condition.

25 In the example of figure 1 a motorised roller (0a) of the winder (0) can be observed, this being typically motorised.

The glue dispenser (4) preferably comprises nozzles (41) for spraying glue (A), configured so as to spray glue (A) on a side of a cardboard strip. The nozzles (41) can spray glue or other adhesives, for example *hot melt* glues, without contacting the strip.

30 The installation of a spray glue dispenser (4) enormously simplifies the use of the machine (10) as it offers a simpler management of the glue (A) while awaiting use which, in a glue dispenser (4), is collected in the tank in which the other roller is immersed. Differently, a spray glue dispenser (4) collects, time by time, from a tank substantially the quantity of glue (A) in use, reducing the risk of deterioration of the glue (A), or clogging, or the presence of lumps.

35 This is extremely significant for the aims of the invention.

The second glue dispenser (8) is also preferably of the spray type; the second glue dispenser (8) preferably comprises nozzles (81) for spraying glue (A), configured so as to spray glue (A)

on a side of a cardboard strip.

The nozzles (41) of the glue dispenser (4) or the nozzles (81) of the second glue dispenser (8) can spray glue or other adhesives, for example *hot melt* glues, without contacting the strip.

5 Figures from 9 to 12 illustrate variants of the machine (10) of figure 2 which use spray glue dispensers. Though the spray glue dispensers can apply the glue (A) either on a corrugated or smooth strip, some testing has shown that often a better product is obtained by applying the glue on a smooth strip. In fact, when the glue (A) is sprayed on the corrugated strip, some parts of glue (A) are spread on the gullies between the crests and create incrustations and/or lack of homogeneity which, differently, are not generated when spraying on a smooth strip.

10 As illustrated by way of example in figure 12, the glue dispenser (4) preferably comprises nozzles (41) and the first path (11) crosses the glue dispenser (4) so that the glue dispenser (4), in an active condition, deposits glue (A) on the first strip (N1).

15 As illustrated by way of example in figure 10, the second glue dispenser (8) preferably comprises nozzles (81) and the third path (31) crosses the second glue dispenser (8) so that the second glue dispenser (8) deposits glue (A) on the third strip (N3).

In the machine (10) of the invention it is important for the glue (A) deposited by the second glue dispenser (8) between the second strip (N2) and the third strip (N3) to begin guaranteeing adhesion, i.e. to dry, before reaching the glue dispenser (4) and, therefore, the drawing means.

20 The glue dispenser (4) is preferably arranged in a higher position than the means for pressing (9); it is thus possible to arrange a portion in which the second strip (N2) and the third strip (N3) are coupled that has a small impact on the length of the machine (10).

At the same time this characteristic simplifies the management of the corrugated cardboard sheets (F) by the support means, as there can be a support (201) that is vertically movable, as will be described in the following.

25 As can be observed in figure 1, the second path (12) and the third path (13) are preferably conformed in an S-shape between the means for pressing (9) and the glue dispenser (4).

30 In this way there are two horizontal portions, or substantially horizontal portions, after the pressure between the second strip (N2) and the third strip (N3) and before the glue dispenser (4) which improve the final product as they facilitate a more homogeneous distribution of the glue (A).

More preferably, the "S" shape comprises a first portion that is horizontal or slightly inclined, a second portion that is horizontal or slightly inclined and, between them, a vertical portion that is longer than both the first portion, horizontal or slightly inclined, and the second portion, also horizontal or slightly inclined.

35 The support means (200) preferably comprise a support (201) which is vertically movable so as to support a stack of corrugated cardboard sheets (F), and are configured so as to move the support (201) vertically towards the ground surface in the first operating condition.

The raised arrangement of the press (5) simplifies the formation of a stack of corrugated cardboard sheets (F), as illustrated by way of example in figure 1. In the example case a scissor lift can be seen, and the support (201) comprises rollers.

The expert in the field is aware of numerous known alternatives for the support means (200), starting from a support (201) constituted by a fixed platform onto which the corrugated cardboard sheets (F) fall by force of gravity.

In figure 13 the support means (200) are integrated directly in the machine downstream.

There exist numerous presses of known type in the reference sector, others which are provided with or cooperate with heating means, for example in order to dry or activate the glue (A). Figures from 14 to 17 show some examples of presses (5) according to the invention and developed by the applicant and which can be used to replace the press (5) visible in the preceding figures. In detail, figures from 14 to 17 show a press (5) provided with a heater (50) which directly faces onto the first press belt (51), i.e. onto the press belt located inferiorly so as to face directly onto the corrugated cardboard under formation. The heater (50) preferably comprises a plurality of heating strips (50a) and these are preferably perforated. The heater (50) can be moved towards and away from the first press belt (51) so as to prevent damage or overheating the components and/or the corrugated cardboard under formation when the press (5) is not drawing the strips (N1, N2; N3). This can be obtained independently by the second press belt (52), with a movement device (55) as illustrated in figures 14, 15 and 17, or the heater (50) can be moved together with the second press belt (52) by means of actuators that are used to regulate the distance between the second press belt and the first press belt (51). Figure 14 includes three of the four actuators which, in this example, move the second press device (52) and the actuators of the movement device (55) are visible, being two in number in this example. The actuators visible in figure 14, as in figure 1, via the movement of the second press belt (52) with respect to the first press belt (51), allow the press (5) to be configured so as to draw the second strip (N2) and the third strip (N3) together, in the second operating condition, or the first strip (N1), the second strip (N2) and the third strip (N3) together, in the first operating condition.

Figures from 14 to 16 also enable an observation of the conformation of the circuit of the second press belt (52) which presses and retains, together with the first press belt (51), for a first portion (t1) and for a second portion (t2), between which the heater (50) is interposed. Figure 17 illustrates a further version which substantially attains the same effect as the above configuration with a first press roller (53) and a second press roller (54) being moved away from one another in a drawing direction (T) of the strips (N1, N2; N3) and with the heater (50) interposed between the first press roller (53) and the second press roller (54). Figure 17 also illustrates the actuators which enable the variation of the distance between the first press belt (51) and, respectively, the first press roller (53) and the second press roller (54).

While in the known machines the press is continuously operated, the press (5) of the machine (10) of the present invention is preferably configurable to stop and restart, so as to enable cutting the corrugated cardboard sheets (F) from corrugated cardboard strips that are not in movement and, more preferably, which is again arranged horizontally or slightly inclined, i.e. without storage paths downstream of the press (5) which might negatively influence the quality of the product.

The press (5) preferably comprises a first press belt (51) and a second press belt (52) mutually opposite and distanced so as to press and move, between them, the second strip (N2), the third strip (N3) and, possibly, the first strip (N1). As illustrated by way of example in figure 1, and mentioned in the foregoing, the first press belt (51) and the second press belt (52) typically engage respective rollers, with at least one of these being motorised or set in rotation by a motor, typically electrically powered. The control of the respective motorised roller or rollers and/or of the motor or motors enables the stop and restart of the first press belt (51) and the second press belt (52) so as to enable cutting the corrugated cardboard sheets (F).

The corrugator (7) preferably comprises a first corrugator roller (71) and a second corrugator roller (72) and the latter is aspirated. The means for pressing (9) comprise a roller (91) which cooperates with the second corrugator roller (72) so as to press the second strip (N2) and the third strip (N3), so that, at least initially, the coupling takes place with the second strip (N2) retained, by suction, by the second corrugator roller (72).

In this way it is possible to obtain a more defined and precise coupling between the second strip (N2) and the third strip (N3).

Generally one or both, typically both, the first corrugator roller (71) and the second corrugator roller (72) are heated. The absence of heating can negatively influence not only the corrugation of the second strip (N2) but also the action of the glue (A).

The arrangement shown by way of example in figure 1 enables limiting the length of the machine (10) and arranging the first reel (B1), the second reel (B2), the third reel (B3) and the reels of corrugated cardboard (B0) in proximity of the ground surface, thus simplifying the loading and unloading operations, as well as the start.

The first unwinder (1), the second unwinder (2), the third unwinder (3) and the winder (0) are preferably arranged adjacent to one another so that the respective reels (B1, B2, B3, B0) occupy a volume (V) and the corrugator (7), the glue dispenser (4) and the second glue dispenser (8) are arranged so as to stand over the volume (V), i.e. they are on the opposite side of the volume (V) with respect to the ground surface, as illustrated by way of example in figure 1.

More preferably, the press (5) also stands over the volume (V), although it might partially extend beyond the volume (V) above the aspirated conveyor belt (10b).

The machinery (10) can be integrated in a machinery (1000) for boxing or packaging articles (P)

with corrugated cardboard also comprising a machine (100) for boxing or packaging articles (P) of known type and which comprises a corrugated cardboard inlet (101).

The corrugated cardboard inlet (101) is arranged downstream of the cutter (6) so as to receive corrugated cardboard strips of corrugated cardboard sheets (F) in outlet from a machine (10) according to the invention.

The machinery (1000) comprises an articles inlet (102), an articles outlet when boxed or packaged (103) and, preferably, means for defining the desired length of a corrugated cardboard sheet (F) of known type. The means can comprise a sensor or a scanner (104), as illustrated by way of example in figure 13.

10 The machine (10) typically comprises a control unit (10a) configured to cooperate with the means for defining in order to produce corrugated cardboard sheets (F) having a length (L) of the desired length.

The invention also relates to a method for realising corrugated cardboard sheets (F) and reels of corrugated cardboard (B0).

15 An embodiment of the method comprises steps of:

- providing a machine (10) according to the present description;
- supplying a first reel (B1) of smooth cardboard to the first unwinder (1);
- supplying a second reel (B2) of smooth cardboard to the second unwinder (2);
- supplying a third reel (B3) of smooth cardboard to the third unwinder (3);
- 20 - supplying the second path (12) with the second strip (N2);
- supplying the third path (13) with the third strip (N3);
- activating the corrugator (7);
- activating the second glue dispenser (8);
- activating the drawing means;
- 25 - passing from the second operating condition to the first operating condition, supplying the first path (11) with the first strip (N1) and activating the glue dispenser (4).

The method of the invention advantageously produces both corrugated cardboard sheets (F) and reels of corrugated cardboard (B0).

The method uses a machine (10) of a limited size and which is easily integratable in a system that comprises one or more machineries for boxing or packaging articles using corrugated cardboard, as illustrated in figure 13.

Before the step of passing, the method preferably comprises a step of winding a reel (B0) of corrugated cardboard on the winder (0) and after the step of passing the method comprises a step of cutting corrugated cardboard sheets with the cutter (6). As already mentioned in the foregoing, this is not strictly necessary, although it generally takes place since the single-face corrugated cardboard is scarcely used in sheets form and single-wall corrugated cardboard is difficult to wind into reels.

In the step of passing from the second operating condition to the first operating condition the distance between the first press belt (51) and the second press belt (52) is preferably varied, so that the press (5) passes from being configured to draw together the second strip (N2) and the third strip (N3) to being configured to draw the first strip (N1), the second strip (N2) and the third strip (N3) together. In an equivalent way, in the case of the press (5) of figure 17 the distance between the first press roller (53) and the first press belt (51) and the second press roller (54) and the first press belt (51) is varied.

The method preferably comprises the step of passing from the second operating condition to the first operating condition, by deactivating or de-powering the first path (11) and deactivating the glue dispenser (4).

It is understood that the above has been described by way of non-limiting example and that any constructional variants are considered to fall within the protective scope of the present technical solution, as claimed in the following.

CLAIMS

1) A machine (10) for realising corrugated cardboard sheets (F) and reels of corrugated cardboard (B0) comprising:

- a first reel unwinder (1) for unwinding a first strip (N1) from a first reel (B1) of cardboard;
- 5 - a second reel unwinder (2) for unwinding a second strip (N2) from a second reel (B2) of cardboard;
- a third reel unwinder (3) for unwinding a third strip (N3) from a third reel (B3) of cardboard;
- a corrugator (7) for corrugating a cardboard strip;
- 10 - a glue dispenser (4) for depositing glue (A) on a side of cardboard strip;
- a second glue dispenser (8) for depositing glue (A) on a side of cardboard strip;
- drawing means for drawing cardboard strips;
- means for pressing (9) cardboard strips to one another;
- a cutter (6) for cutting a corrugated cardboard strip so as to obtain corrugated cardboard sheets (F);
- 15 - support means (200) for supporting sheets of corrugated cardboard sheets (F);
- a reel winder (0) for winding a corrugated cardboard strip;
- a first path (11) of the first strip (N1) which going from the first unwinder (1) reaches the drawing means;
- 20 - a second path (12) of the second strip (N2) which going from the second unwinder (2) reaches the drawing means;
- a third path (13) of the third strip (N3) which going from the third unwinder (3) reaches the drawing means;

wherein:

- 25 - the first path (11) or the second path (12) crosses the glue dispenser (4) so that the glue dispenser (4), in an active condition, deposits glue (A) on the first strip (N1) or on the second strip (N2);
- the first path (11) and the second path (12) meet after the glue dispenser (4) and before or at the drawing means in such a way that the glue (A) is interposed between the first strip (N1) and
- 30 the second strip (N2);
- the second path (12) crosses the corrugator (7) so that the corrugator (7) corrugates the second corrugated strip (N2);
- the second path (12) or the third path (13) crosses the second glue dispenser (8) so that the second glue dispenser (8) deposits glue (A) on the second strip (N2) or on the third strip (N3);
- 35 - the second path (12) and the third path (13) meet after the second glue dispenser (8) and before or at the means for pressing (9) so that the glue (A) is interposed between the second strip (N2) and the third strip (N3);

- the drawing means comprise a press (5) for pressing and drawing strips which is configured to draw together the second strip (N2) and the third strip (N3) or the first strip (N1), the second strip (N2) and the third strip (N3), thus forming corrugated cardboard;

5 - in a first operating condition the glue dispenser (4) and the first path (11) are active and in a second operating condition the glue dispenser (4) and the first path (11) are inactive so that the drawing means respectively form single-wall corrugated cardboard or single-face corrugated cardboard.

2) The machine (10) of the preceding claim, wherein:

10 - in the first operating condition the reel winder (0) is inactive and the path of the corrugated cardboard proceeds from the press (5) towards the support means (200), crossing the cutter (6);

- in the second operating condition the cutter (6) is inactive and the path of the corrugated cardboard proceeds from the press (5) towards the reel winder (0).

3) The machine (10) of claim 1 or 2, wherein the glue dispenser (4) comprises a glue depositing roller (42) which is movable between an active position, for contacting the second strip (N2), and an inactive position, so as to be detached from the second strip (N2).

4) The machine (10) of any one of the preceding claims, wherein the first unwinder (1) comprises a motor for unwinding the first reel (B1) of cardboard which is active in the first operating condition and inactive in the second operating condition.

20 5) The machine (10) of any one of the preceding claims, wherein the glue dispenser (4) comprises nozzles (41) for spraying glue (A) configured to spray glue (A) on a side of a cardboard strip.

6) The machine (10) of any one of the preceding claims, wherein the glue dispenser (4) is arranged in a higher position than the means for pressing (9).

25 7) The machine (10) of the preceding claim, wherein the second path (12) and the third path (13) are conformed in an S-shape between the means for pressing (9) and the glue dispenser (4).

30 8) The machine (10) of claim 6 or 7, wherein the support means (200) comprise a support (201) which is vertically movable so as to support a stack of corrugated cardboard sheets (F) and wherein the support means (200) are configured so as to move the support (201) vertically towards the ground surface in the first operating condition.

9) The machine (10) of any one of the preceding claims, wherein the press (5) comprises a first press belt (51) and a second press belt (52) opposite and distanced so as to press and move, between them, the second strip (N2), the third strip (N3) and, possibly, the first strip (N1).

35 10) The machine (10) of any one of the preceding claims, wherein:

- the corrugator (7) comprises a first corrugator roller (71) which is heated and a second corrugator roller (72) which is heated and aspirating;

- the means for pressing (9) comprise a roller (91) which cooperates with the second corrugator roller (72) so as to press the second strip (N2) and the third strip (N3), so that, at least initially, the coupling takes place with the second strip (N2) retained by the second corrugator roller (72).

5 11) The machine (10) of any one of the preceding claims, wherein the first unwinder (1), the second unwinder (2), the third unwinder (3) and the winder (0) are arranged flanked so that the respective reels (B1, B2, B3, B0) occupy a volume (V) and the corrugator (7), the glue dispenser (4) and the second glue dispenser (8) are arranged so as to stand over the volume (V).

10 12) A method for realising corrugated cardboard sheets (F) and reels of corrugated cardboard (B0) comprising steps of:

- providing a machine (10) according to one of the preceding claims;
- supplying a first reel (B1) of smooth cardboard to the first unwinder (1);
- supplying a second reel (B2) of smooth cardboard to the second unwinder (2);
- 15 - supplying a third reel (B3) of smooth cardboard to the third unwinder (3);
- supplying the second path (12) with the second strip (N2);
- supplying the third path (13) with the third strip (N3);
- activating the corrugator (7);
- activating the second glue dispenser (8);

20 - activating the drawing means;

- passing from the second operating condition to the first operating condition, supplying the first path (11) with the first strip (N1) and activating the glue dispenser (4).

13) The method of the preceding claim wherein in the step of passing from the second operating condition to the first operating condition the distance between the first press belt (51)
25 and the second press belt (52) is varied.

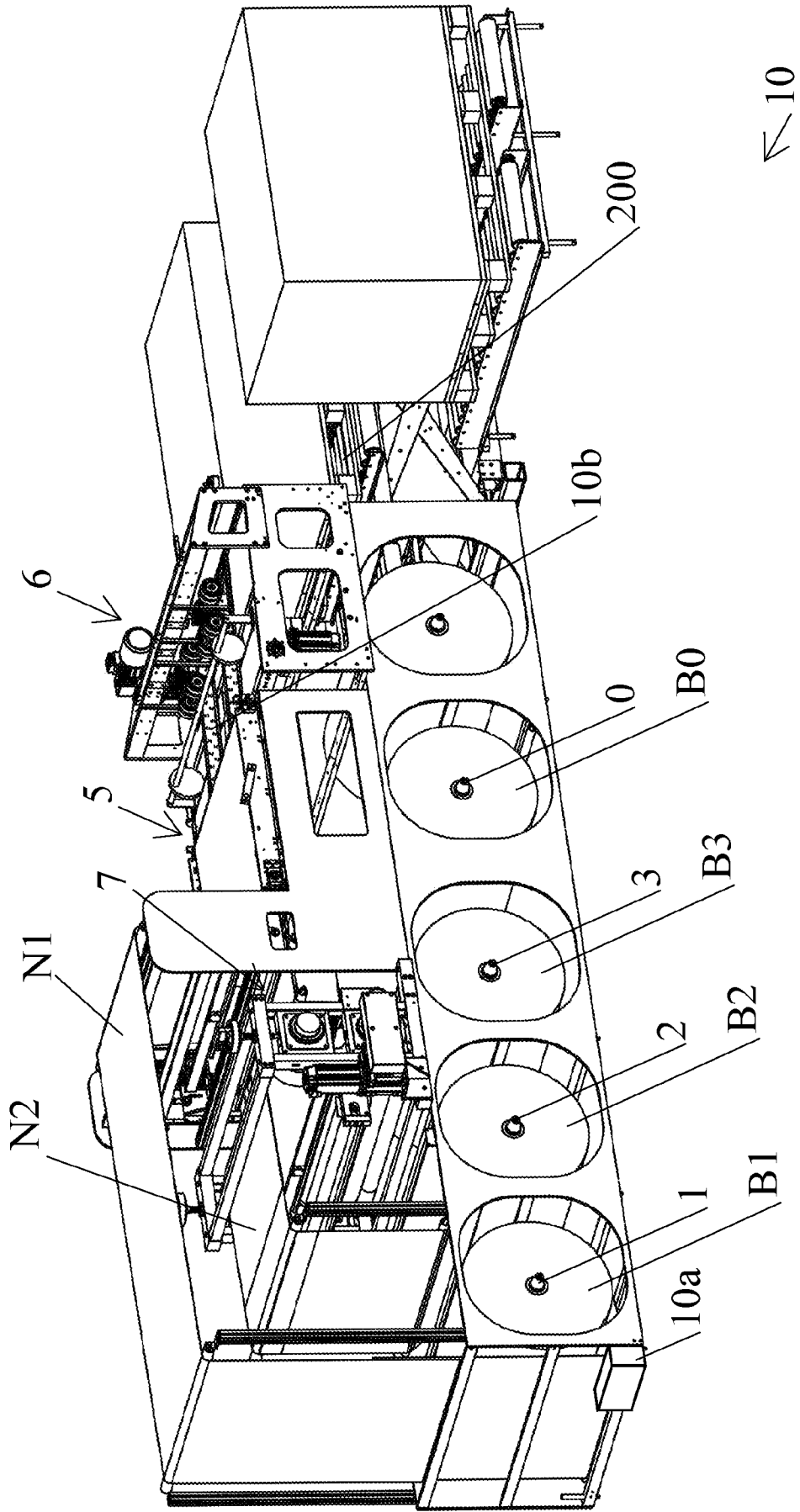


FIG. 2

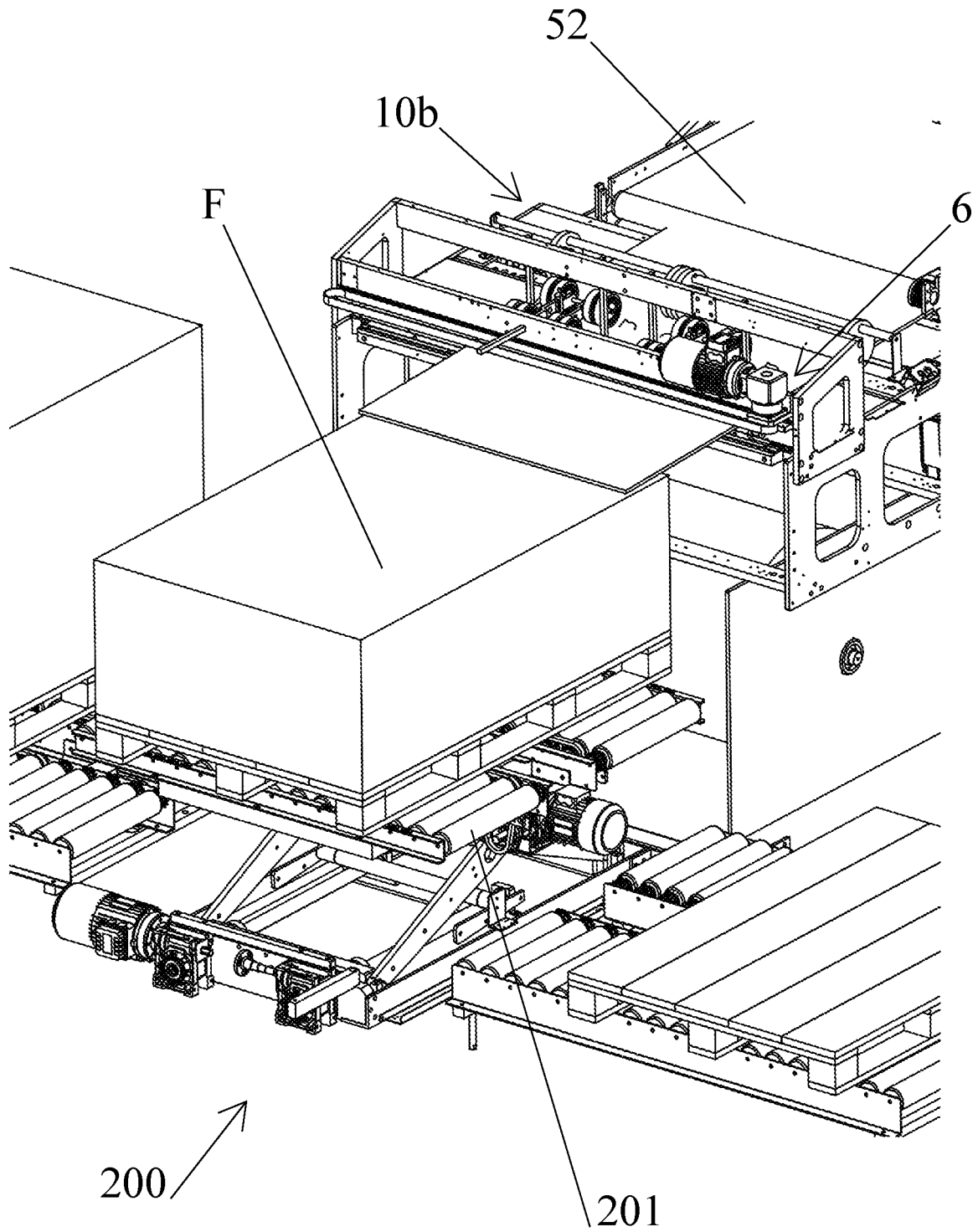


FIG. 3

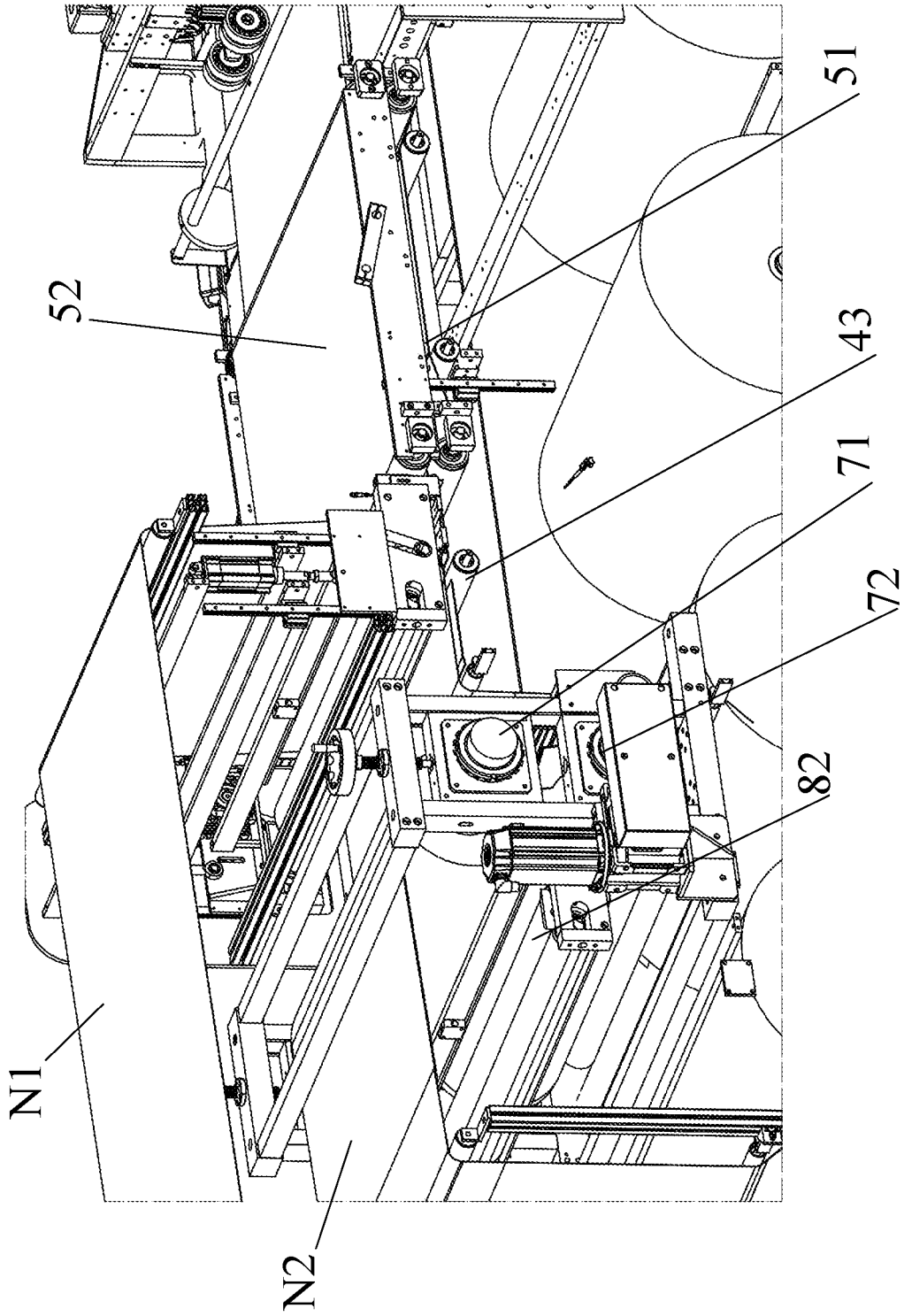


FIG. 4

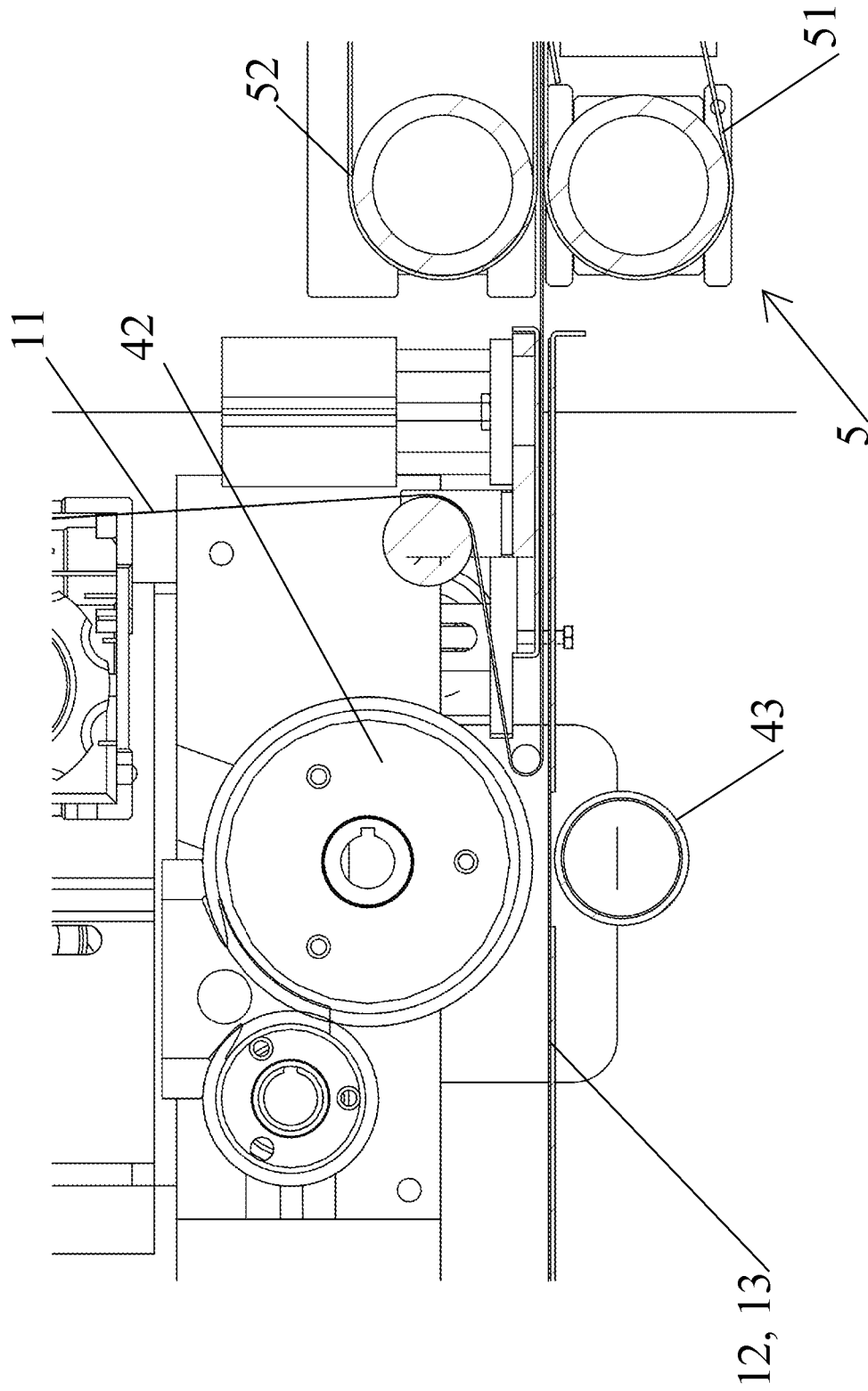


FIG. 5



FIG. 6

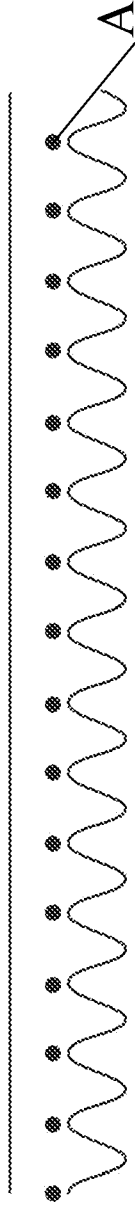


FIG. 7

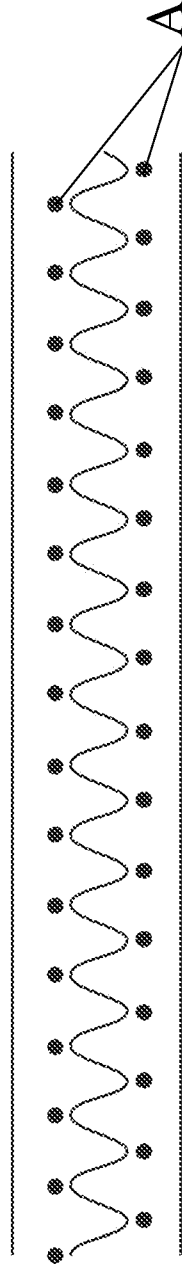


FIG. 8

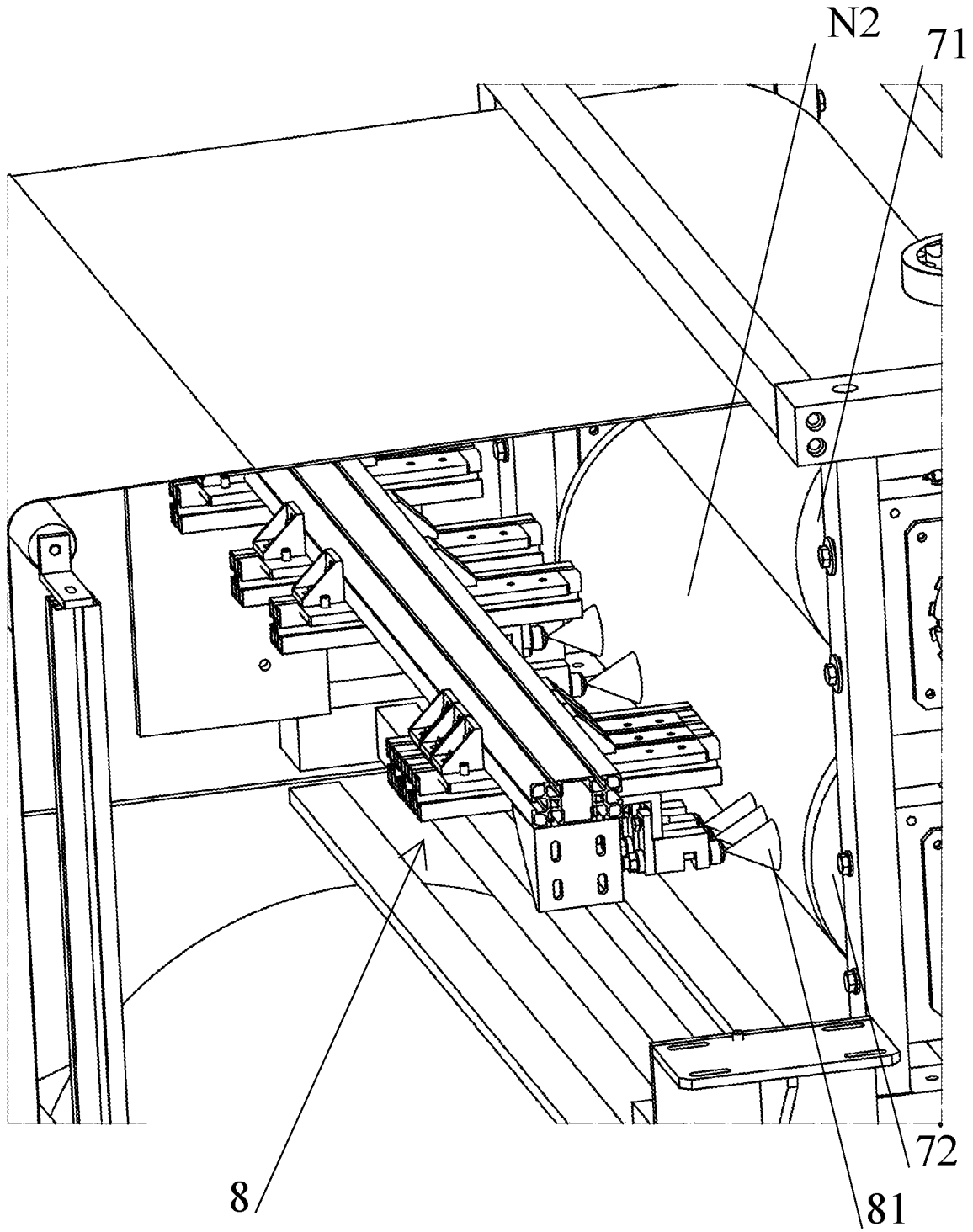


FIG. 9

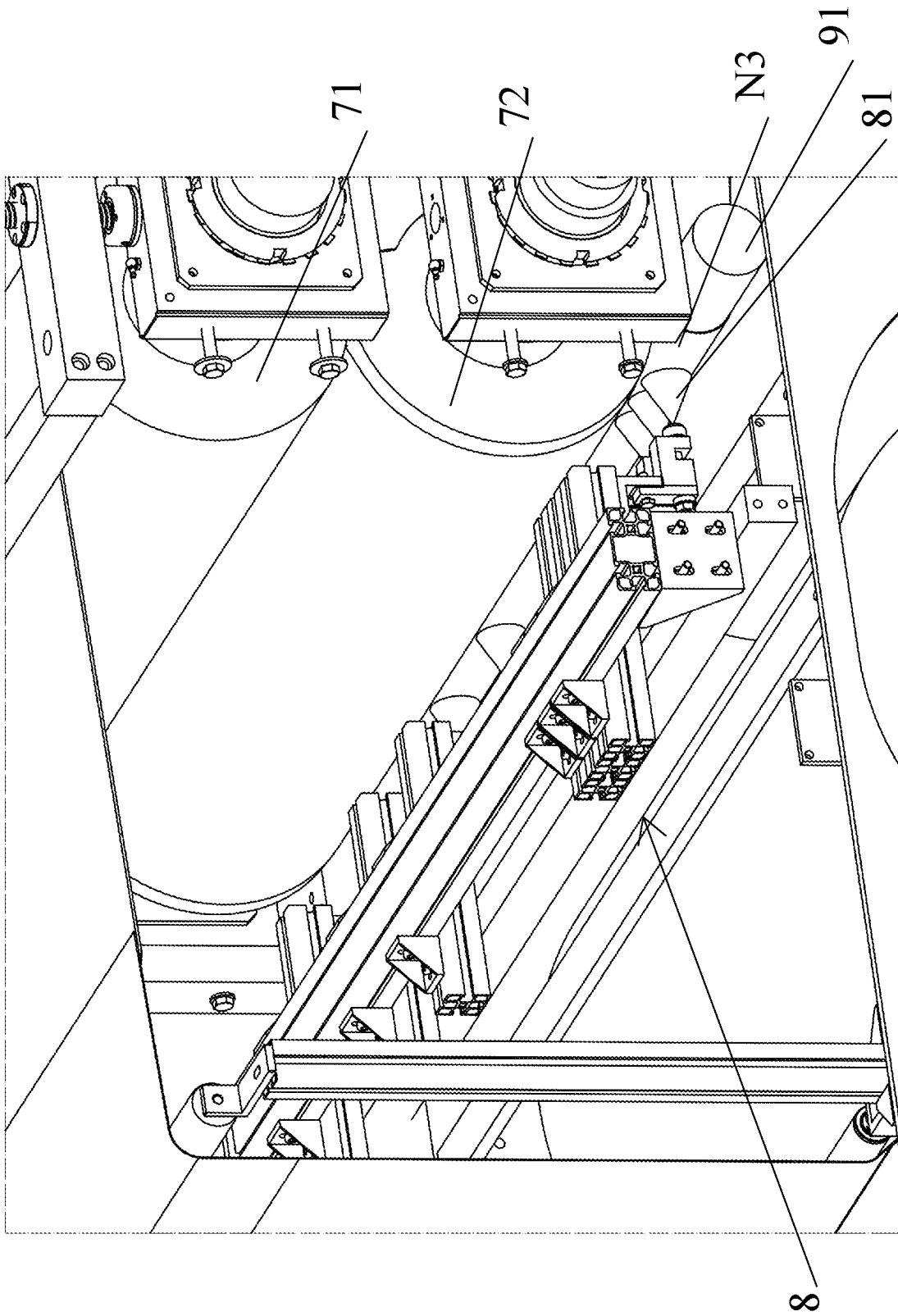


FIG. 10

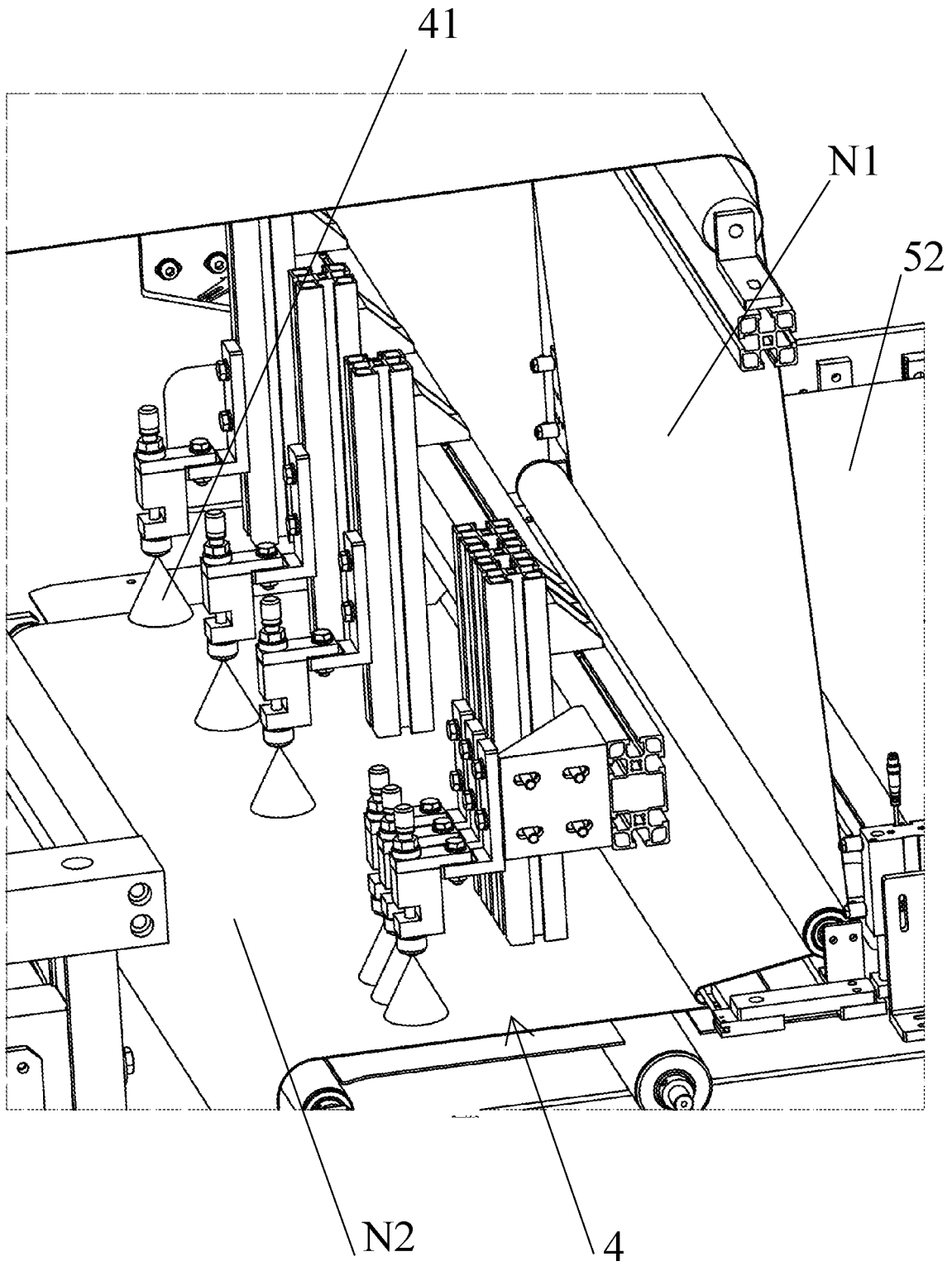


FIG. 11

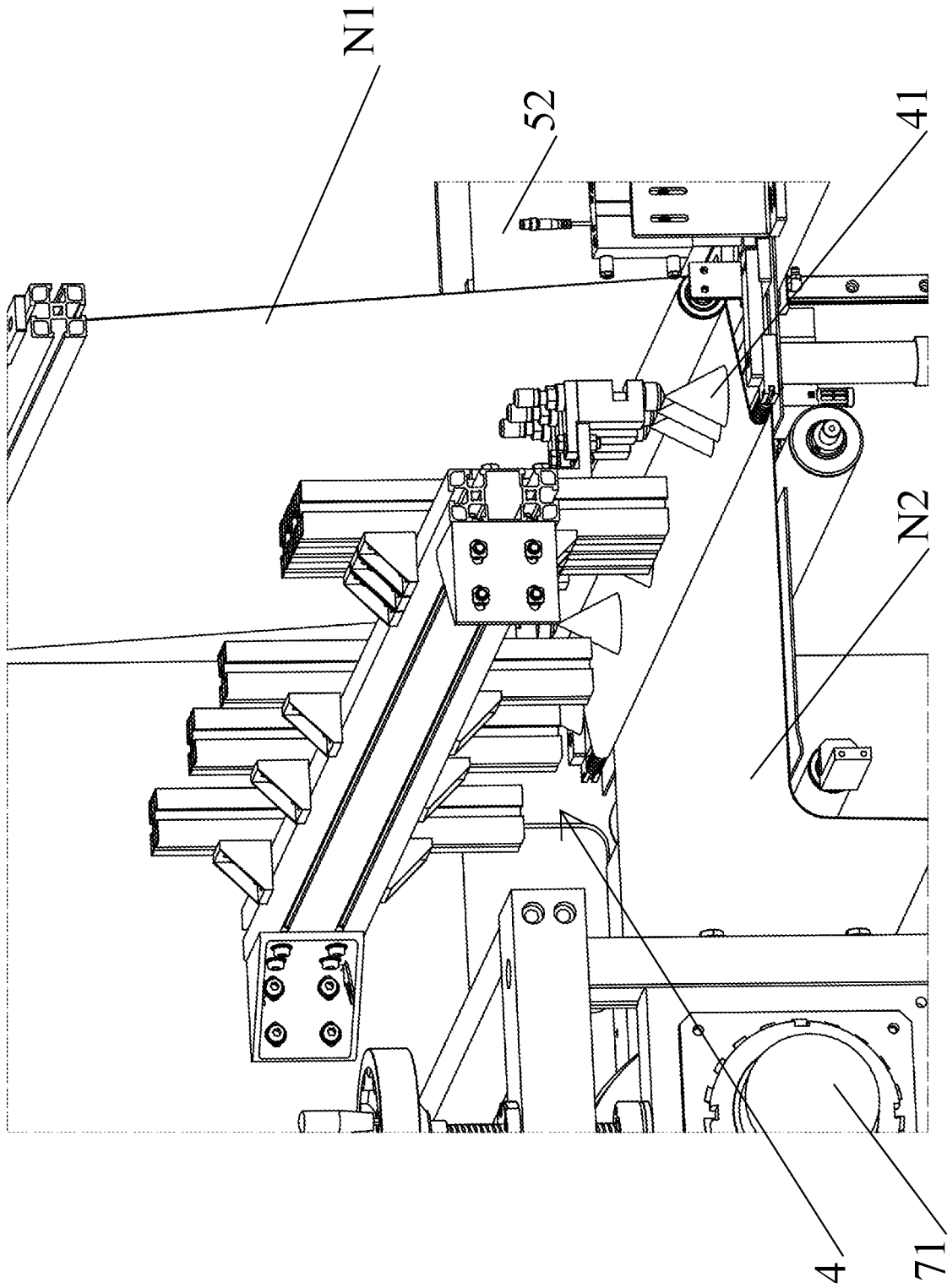


FIG. 12

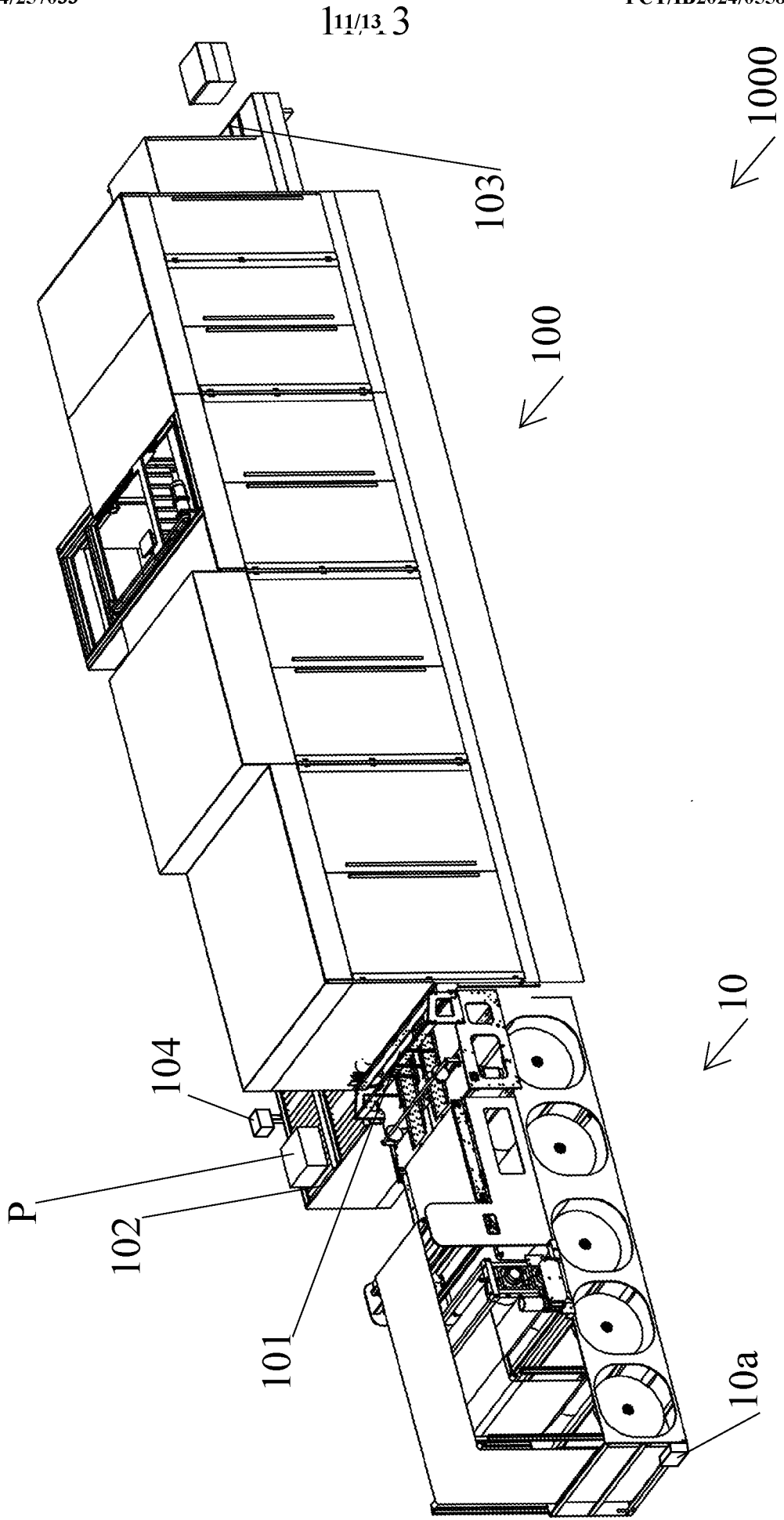


FIG. 13

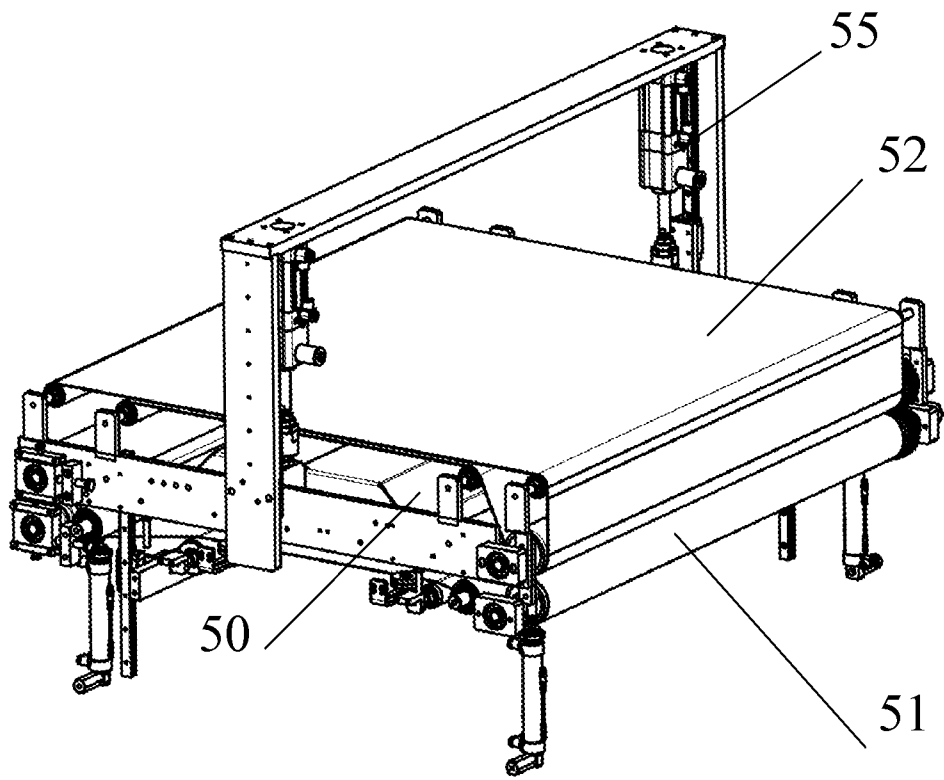


FIG. 14

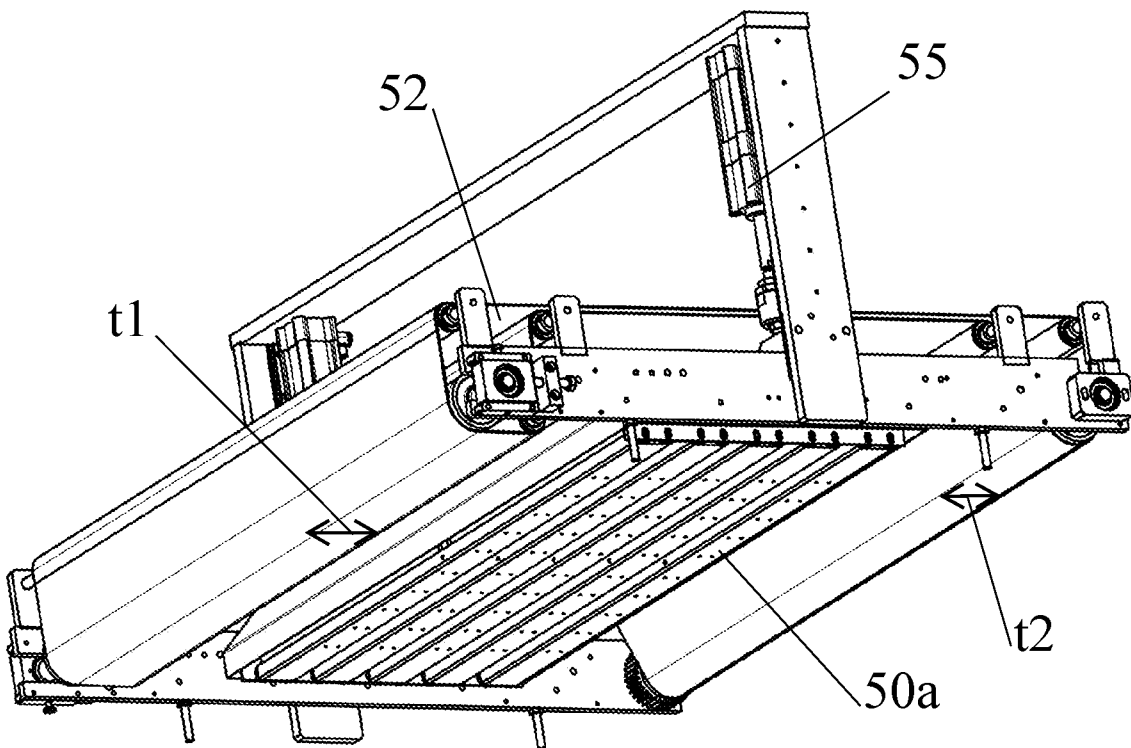


FIG. 15

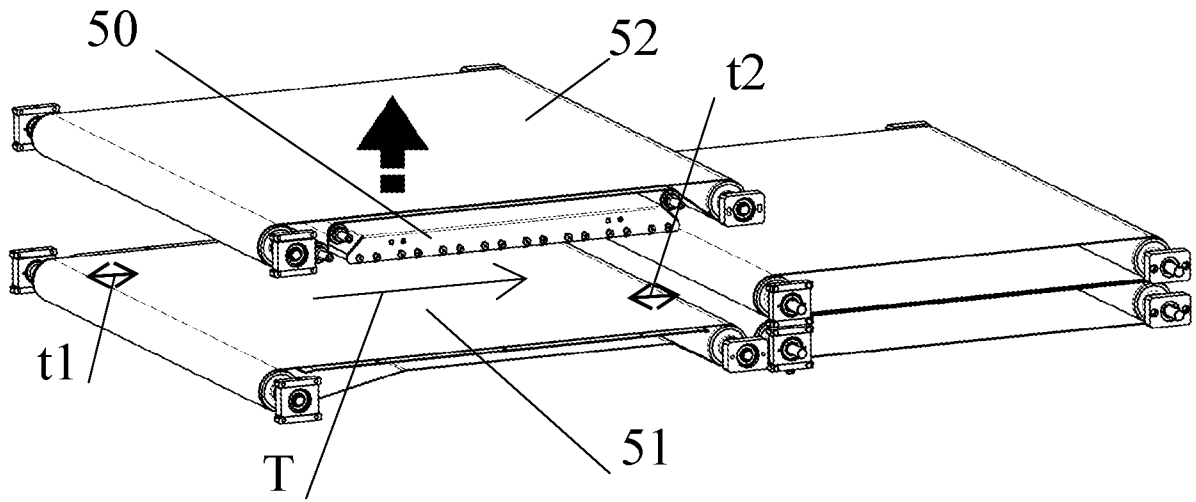


FIG. 16

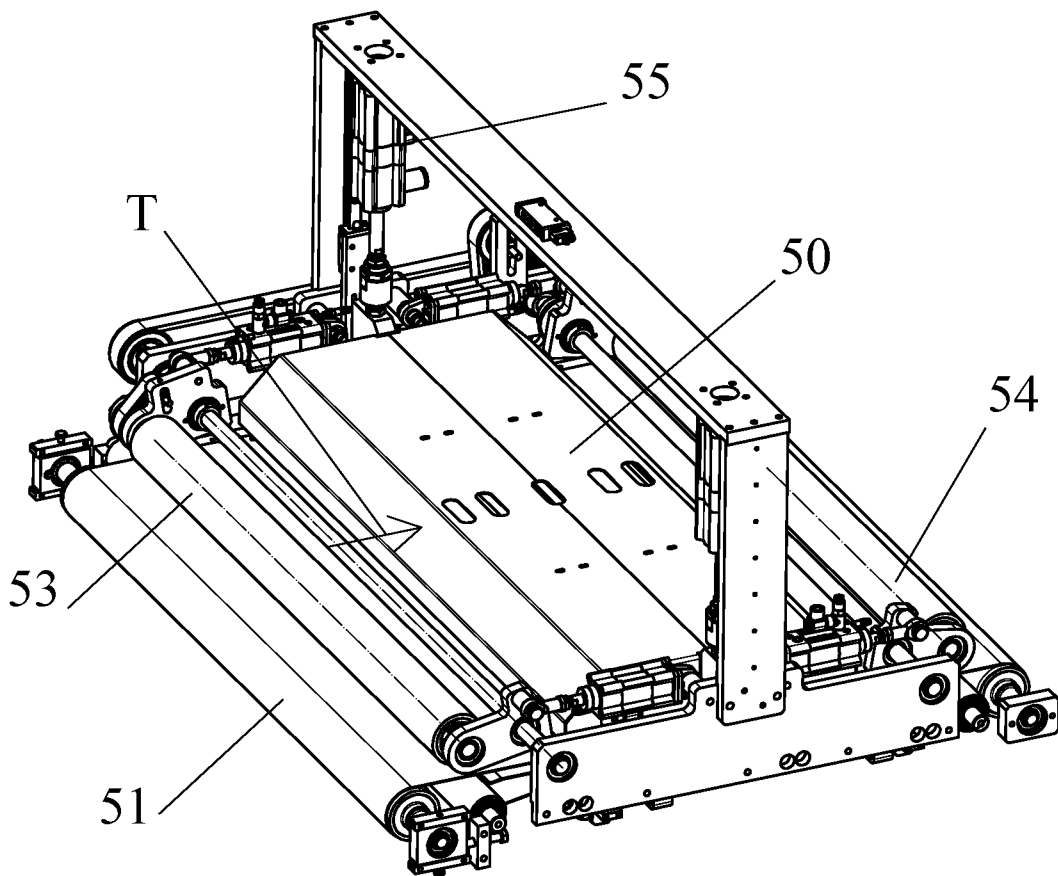


FIG. 17

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2024/055831

A. CLASSIFICATION OF SUBJECT MATTER INV. B31F1/28 ADD.		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) B31F		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 10 2005 032014 A1 (HOLL HELMUT [DE]; STOLZ RUDOLF [DE]) 16 November 2006 (2006-11-16) paragraph [0072] - paragraph [0074]; figures 1,2 -----	1-13
A	FR 522 545 A (GABRIEL SUTRE [FR]) 1 August 1921 (1921-08-01) the whole document -----	1-13
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A	DE 12 18 278 B (WEYERHAEUSER CO) 2 June 1966 (1966-06-02) column 5, line 63 - column 6, line 5; figures 1,2 -----	1,9,12
-/-		
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
* Special categories of cited documents :		
"A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family	
Date of the actual completion of the international search	Date of mailing of the international search report	
26 September 2024	09/10/2024	
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Johne, Olaf	

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2024/055831

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Information on patent family members

International application No PCT/IB2024/055831

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