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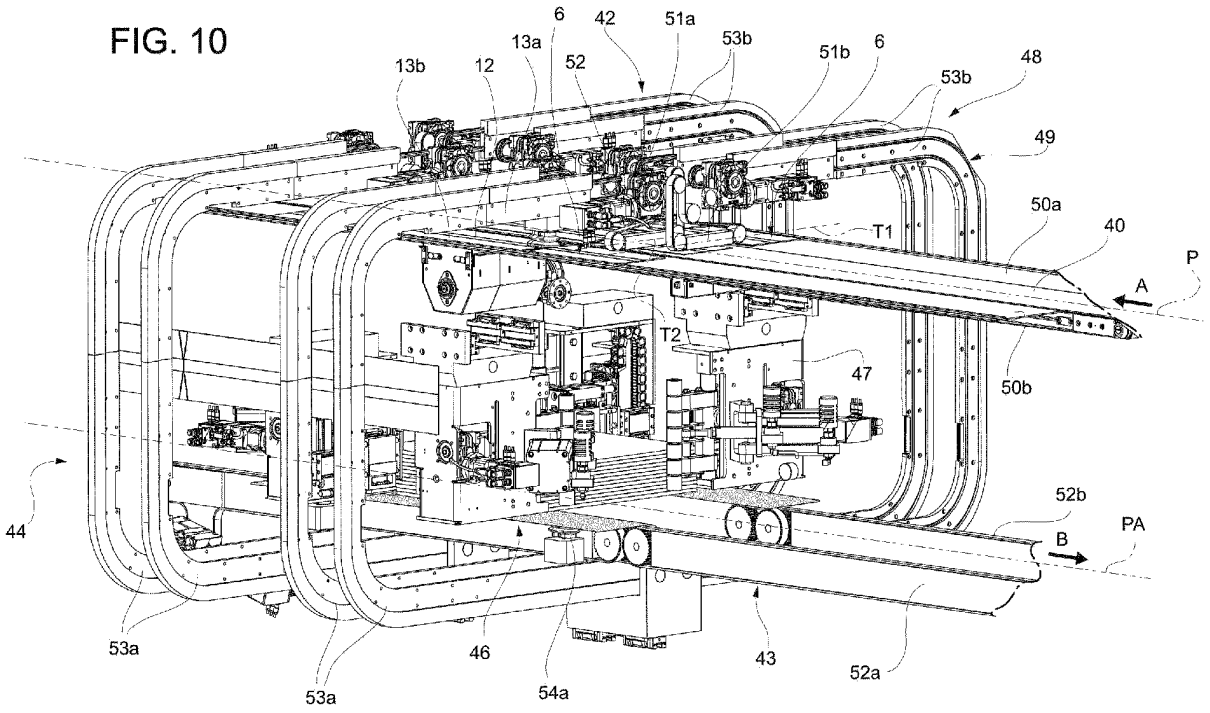
(54) **FEEDING METHOD AND SYSTEM OF BLANKS OF PACKAGING MATERIAL TO A PACKAGING APPARATUS**

(57) Feeding method and system (11) of blanks (6) of packaging material (7) to a packaging apparatus (5); the feeding system (11) comprises: a conveyor (40) for feeding a series of blanks (6) to a sorting station (42); a transporter (43) placed below the conveyor (40) to move a stack of substantially flat articles (100) to a packaging station (45) through at least one station (46); a lifting device (47) at the intermediate station (46) to lower and to lift the stack of substantially flat articles (100); and a sorting unit (48) for transferring pairs of blanks (6) from the sorting station (42) to the intermediate station (46) and placing them appropriately on the transporter (43) which partially receive and support at least part of such a stack of substantially flat articles (100).

FIG. 10



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Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This patent application claims priority from Italian patent application no. 102022000019866 filed on September 27, 2022, the entire disclosure of which is incorporated herein by reference.

TECHNICAL FIELD

[0002] The present invention relates to a method and to a system for feeding blanks of packaging material to a packaging apparatus.

[0003] Specifically, the present invention is advantageously but not exclusively applicable in the field of packaging substantially flat ceramic articles, to which the following description will make explicit reference without any consequent loss in generality. Still more specifically, the present invention is advantageously but not exclusively applicable in the packaging of one or more ceramic tiles or slabs stacked or not stacked together.

BACKGROUND OF THE INVENTION

[0004] In the field of packaging substantially flat articles, even more specifically substantially flat ceramic articles, it is known to stack substantially flat articles together and to package them by wrapping them using two or more blanks of packaging material, typically cardboard, so as to protect at least the lateral edges and corners of said articles.

[0005] Most packaging machines of a known type involve the formation of the blanks that form the package from sheets of packaging material, typically cardboard, which are fed to the packaging machine, specifically to the die-cutting apparatus of said machine, to be cut, shaped and creased in order to obtain blanks suitable to be wrapped around the stack of articles.

[0006] However, the use of sheets of packaging material requires the use of stores of considerable dimensions for the storage of said sheets and involves the use of large quantities of packaging material, inasmuch as each sheet of packaging material of a known type (typically cardboard) is generally formed by three layers of cardboard, two having a planar development and a third, interposed and fixed between the two, having a corrugated development.

[0007] Precisely in an attempt to overcome these drawbacks, packaging machines have been developed with which the aforementioned blanks necessary for the packaging of substantially flat articles are produced by feeding the packaging machine, in particular the die-cutting apparatus of said machine, with packaging material wound on reels, as described, for example, in the documents BO2012A000490 or BO2013A000457 of the present Applicant.

[0008] Reels of packaging material are much less bulky than sheets of packaging material, allowing a reduction in storage volume for the same number of blanks produced, and are typically produced using a smaller amount of packaging material (typically cardboard) per square meter. Indeed, the band of packaging material (typically cardboard) must be flexible enough to be wound without being damaged and at the same time must comprise the minimum amount of cardboard necessary to safely package the substantially flat articles. These requirements are satisfied by using a band of packaging material provided with only two layers of cardboard, a first cardboard layer having a planar development and a second cardboard layer having a corrugated development fixed to the first layer. As a result, packaging machines that use packaging material wound on reels are able to obtain packages capable of protecting substantially flat articles effectively while using a smaller amount of packaging material for blanks of equal dimensions which form the package.

[0009] The result is an overall reduction in the amount of packaging material used with obvious environmental advantages in terms of smaller quantities of wasted paper and economic advantages, inasmuch as packaging material made in this way has a significantly lower cost per square meter than traditional three-layer sheets of packaging material.

[0010] However, packaging machines of this type also have drawbacks, among which the following are mentioned.

[0011] The main drawbacks are related to the rate of production, which in packaging machines of this type cannot exceed ten packages per minute without the risk of compromising the quality of said package. The limitations in terms of production rates are partly related to the type of packaging material; indeed, the packaging material consisting of only two layers of cardboard as described above is slightly less durable than a classic three-layer cardboard, so that if one wishes to avoid risking damaging the packaging material when it comes into contact with the sharp edges of the substantially flat articles, it is necessary to maintain limited conveying speeds.

[0012] In this connection, it should be noted that in known packaging machines, specifically in those for packaging ceramic articles, the wrapping of the blanks around the stack of articles to form an actual package generally occurs by feeding a first, vertically oriented blank at a packaging station, by moving the stack of articles in a conveying direction orthogonal to the plane of the blank towards the first blank so that the stack of articles intercepting (i.e., coming into contact with) the first blank causes, with the aid of fixed intercept elements, the folding of the blank around designated score lines and the wrapping of such first blank around a first end of the stack of substantially flat articles; immediately thereafter a second, vertically oriented blank is fed at the packaging station to wrap the other end of the stack of articles by moving the stack of articles towards the further blank so that, as a result of the contact with the stack of articles

and with the aid of further fixed intercept elements, the second blank is also wrapped around the stack of substantially flat articles, thereby forming the actual package.

[0013] A known solution is, for example, described in document WO2012172485A1, belonging to the same family as the document BO2011A000342 cited below, which describes a method and a system for packaging flat ceramic articles using two blanks.

[0014] It is evident that the stresses to which the packaging material forming the blanks is subjected during the package-forming operations described above will be greater the greater the speeds at which the stack of articles moves, and that, the greater the stresses, the greater the risk of damage to the blanks will be during the packaging operations. It is evident that this issue concerns not only ceramic articles but all substantially flat articles with sharp corners that could damage the blanks.

[0015] Moreover, packaging machines and packaging methods of the type described above (for example those described in the documents BO2012A000490 or BO2013A000457 of the present Applicant) require the frequent replacement of the reels of packaging material. To date, every replacement requires the intervention of an operator, with all the drawbacks associated with manual work both in terms of the time necessary for the operation, and thus of machine downtime, and costs.

[0016] To this it should be added that packaging machines and packaging methods of a known type (think, for example, of those described in the document WO2012172485A1) require long machine downtimes to feed the blanks to be used for the packaging of the articles.

[0017] Known packaging machines, for all the reasons laid out above, thus risk representing a real bottleneck in the lines of production and storage of articles.

DESCRIPTION OF THE INVENTION

[0018] The object of the present invention is to provide a feeding method and system of blanks of packaging material to a packaging apparatus which make it possible to overcome, at least in part, the limitations of the prior art.

[0019] In accordance with the present invention, a feeding method and a feeding system for feeding blanks of packaging material to a packaging apparatus are provided as set out in the following independent claims and, preferably, in any of the claims depending directly or indirectly on the independent claims.

[0020] The claims describe preferred embodiments of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] The invention is described below with reference to the accompanying drawings, which illustrate some non-limiting example embodiments thereof, wherein:

- Figure 1 is a perspective view of a packaging machine according to the present invention;
- Figure 1A is a view analogous to Figure 1 in which parts have been removed for clarity;
- Figure 2 is a view on an enlarged scale of part of the packaging machine of Figures 1 and 1A in order to better visualize the feeding system of packaging material in the form of reels of packaging material;
- Figure 3 is a view on an enlarged scale of a store of the feeding system of packaging material of Figure 2 in which parts have been removed in order to better highlight others;
- Figures 4 to 6 illustrate successive steps of feeding a reel of packaging material to the packaging machine using the feeding system of Figures 2 and 3;
- Figures 7 and 8 illustrate on an enlarged scale successive steps of inserting the free lap of the band of packaging material between two belts designed to clamp and guide the band;
- Figure 9 illustrates part of the packaging machine of Figures 1 and 1A from a different angle in order to better visualize a feeding system of blanks of packaging material to a packaging apparatus;
- Figure 10 illustrates on an enlarged scale the feeding system of blanks of packaging material of Figure 9;
- Figure 11 illustrates part of the packaging machine of Figures 1 and 1A from a different angle in order to better visualize a packaging station where a stack of substantially flat articles, in particular a stack of ceramic tiles, is packaged by means of a designated packaging apparatus; and
- Figure 12 illustrates on an enlarged scale the packaging apparatus illustrated in Figure 11.

PREFERRED EMBODIMENTS OF THE INVENTION

[0022] In the accompanying figures, reference number 1 indicates, as a whole, a packaging machine for the packaging of one or more substantially flat articles 100, stacked or not stacked together.

[0023] In the present invention, article 100 substantially designates an article 100 having a development over a plane much greater than its thickness, advantageously with a polygonal, more specifically quadrangular cross-section.

[0024] More advantageously but not limitatively, the present invention relates to the packaging of one or more substantially flat articles 100 stacked or not stacked together, each comprising, in particular substantially formed from, ceramic material; still more specifically, to the packaging of a polygonal, more specifically quadrangular, ceramic slab or tile. Still more advantageously but not limitatively, the present invention relates to the packaging of one or more substantially flat ceramic articles 100 that can be stacked together to form a stack of substantially flat ceramic articles 100, as illustrated in the accompanying figures which illustrate by way of example tiles with a square geometry that are packaged once stacked together.

[0025] Advantageously, the substantially flat article 100 or the stack of substantially flat articles 100 to be packaged comprises at least an upper face 2 and a lower face 3 opposite the upper face 2, at least a first flank 4a extending orthogonally between the upper face 2 and the lower face 3, a second flank 4b, parallel to and opposite the first flank 4a, a third flank 4c orthogonal to the upper and lower faces 2, 3 and to the flanks 4a, 4b, and parallel to and opposite the third flank 4d (see, for example, Figures 11 and 12).

[0026] Within the scope of the present description, the term "second" component does not imply the presence of a "first" component. These terms are in fact employed as labels to improve clarity and are not to be understood in a limiting manner.

[0027] Furthermore, within the scope of the present invention, the terms "horizontally," "horizontal," "vertically," "vertical," "externally," "internally," "above," and "below" are used with reference to the packaging machine 1 which, in use, rests on a floor or ground (as illustrated, for example, in Figures 1 and 1A) so that "above" or "below" is understood to mean, respectively, "which is above" or "which is below" another component of the packaging machine 1 when the packaging machine 1 is resting on the floor or ground as illustrated by way of example in Figures 1 and 1A, i.e. "which is further away" or "which is nearer" to the floor or ground on which the packaging machine is resting. Similarly, "internally", "externally" is understood to mean "towards the inside" or "towards the outside" of the packaging machine 1.

[0028] With particular reference to Figures 1 and 1A, advantageously, the packaging machine 1 comprises: a packaging apparatus 5 configured to package at least one substantially flat article 100 (for brevity simply "article 100" in the following) using a pair of blanks 6 of (i.e. made of) packaging material 7; a feeding system 8 of packaging material 7 configured to feed a packaging material 7, advantageously in the form of reels 9 of packaging material 7, to the packaging machine 1 (even more specifically, to a die-cutting machine 10 that is part of said packaging machine 1 and is configured) to form blanks 6 of packaging material 7 from the band of packaging material 7; a feeding system 11 of blanks 6 of packaging material 7 for feeding blanks 6 of packaging material 7 (specifically, at least one article 100 - more specifically, a stack of articles 100 - and blanks 6 of packaging material 7) to the packaging apparatus 5; and a control unit CU for controlling the actuation of the various components/systems of said packaging machine 1.

[0029] Advantageously but not limitatively, the packaging material 7 comprises (in particular, is formed by) cardboard. Still more advantageously but not limitatively, the packaging material 7 comprises (in particular, is formed by) a multilayer cardboard comprising, in turn, a first layer of cardboard, having a planar development, and a second layer of cardboard, having a corrugated development fixed to the first cardboard layer. This makes it possible to obtain the right mechanical performance in terms of the mechanical strength of the packaging material 7 while still providing a flexibility that allows the winding of said packaging material 7 onto reels 9.

[0030] It should also be noted that, hereinafter in the present description, blank 6 of packaging material 7 (for brevity simply "blank" in the following) is understood as denoting a sheet of packaging material 7 shaped by the die-cutting machine 10 from the band of packaging material 7; that is to say, it denotes a sheet of packaging material 7 that is suitably cut, creased, and possibly printed by the die-cutting machine 10, which is of a known type and not described and detailed further herein.

[0031] With particular reference to Figures 11 and 12, advantageously but not limitatively, each of these blanks 6 comprises (in particular, is formed by) a central portion 12, a first lateral portion 13a connected to a first edge of the central portion 12 by means of a first score line (visible in Figures 11 and 12), a second lateral portion 13b connected to a second edge of the central portion 12 opposite the first edge by means of a second score line (visible in Figures 11 and 12) parallel to and opposite the first score line, a first lateral flap 14 connected to a third edge of the central portion 12, orthogonal to the aforementioned edges, and a second lateral flap 15 connected to a fourth edge of the central portion 12 opposite the third edge respectively via a third score line and a fourth score line (visible in Figures 11 and 12).

[0032] Still more advantageously but not limitatively, such first lateral flap 14, in turn, comprises a central lap 16, a first lateral lap 17a connected to the first central lap 16 via a fifth score line (visible in Figures 11 and 12), parallel to and aligned with the first score line and a second lateral lap 17b connected to the central lap 16 via a sixth score line (visible in Figures 11 and 12) parallel to and aligned with the second score line. Analogously, the second lateral flap 15 comprises a central lap 18, a third lateral lap 17c connected to the central lap 18 via a seventh score line (visible in Figures 11 and 12), parallel to and aligned with the first score line, and a fourth lateral lap 17d connected to the central lap 18 via an eighth score line (visible in Figures 11 and 12), parallel to and aligned with the second score line.

[0033] Furthermore, advantageously but not limitatively, still with reference to Figures 11 and 12, each of these blanks 6 also comprises: a first substantially triangular portion interposed, preferably but not necessarily by means of a pre-incision line, between the first lateral portion 13a and the first lateral lap 17a; a second substantially triangular portion interposed, preferably but not necessarily by means of a pre-incision line, between the first lateral portion 13a and the third lateral lap 17c; a third substantially triangular portion interposed, preferably but not necessarily by means of a pre-incision line, between the second lateral portion 13b and the second lateral lap 17b; and a fourth substantially triangular portion interposed, preferably but not necessarily by means of a pre-incision line, between the second lateral portion 13b and the fourth lateral lap 17d. Such substantially triangular

portions are configured to fold together with the lateral flaps 14 and 15, still more specifically together with the lateral laps 17a, 17b, 17c, 17d to which each of the former is connected during the packaging of the substantially flat article 100 or the plurality of substantially flat articles 100. According to some advantageous but non-limiting embodiments, each of these blanks 6 is produced as described in the document BO2011A000342 of the present Applicant.

[0034] Advantageously but not limitatively, such blanks 6 are formed by means of a die-cutting machine 10 known *per se* that is configured to cut, crease, and potentially print such blanks 6 from the band of packaging material 7.

[0035] Still more advantageously but not limitatively, the die-cutting machine 10 comprises at least one cutting unit, which is known *per se* and not described or illustrated further herein, to cut the band of packaging material 7 so as to obtain blanks 6 of the desired dimensions based on the dimensions of the substantially flat articles 100 to be packaged; a creasing tool, which is known *per se* and not described or illustrated further herein, configured to produce score lines on each of the blanks 6. According to some advantageous but non-limiting embodiments, the die-cutting machine 10 also comprises a printing unit, which is known *per se* and not described and detailed further herein, configured to apply desired prints on at least one face of each blank 6.

[0036] Still more advantageously but not limitatively, the die-cutting machine 10 is of the type described in the documents BO2012A000490 and BO2013A000457 of the present Applicant.

[0037] Advantageously but not limitatively, as mentioned above, the packaging material 7 is fed to the die-cutting machine 10 using the aforementioned feeding system 8 for feeding packaging material 7.

[0038] With particular reference to Figures 2 to 8, advantageously, the feeding system 8 of packaging material 7 comprises a store 19 comprising a plurality of reels 9 of packaging material 7 stacked one on top of the other, typically but not limitatively at least seven reels arranged one on top of the other so that their respective main axes are aligned in a vertical direction Z, and a support rod 20 configured to receive and support a reel 9 of packaging material 7 so as to allow the unwinding of the relative band of packaging material 7 along a conveying direction A (see, for example, Figures 1, 1A and 2).

[0039] Advantageously, each reel 9 of packaging material 7 is formed by a band of packaging material 7 wrapped around itself about a main axis and comprises at least one free lap 22. Still more advantageously but not limitatively, each reel 9 of packaging material 7 (for brevity simply "reel" in the following) is formed by a band of packaging material 7 wrapped around itself about a main axis so as to define a main body 21, advantageously but not limitatively having an outer surface with a circular progression and an inner surface parallel and concentric to the outer surface. Such free lap 22 (advantageously but not limitatively) extends seamlessly from the main body 21 (in particular, from the outer surface).

[0040] With particular reference to Figures 2, 4, 5, and 6, advantageously but not limitatively, the store 19 is configured to support each reel 9 arranged with its respective main axis oriented along a first vertical direction Z; while the support rod 20 extends along a direction C that is orthogonal to the vertical direction Z and transversal to the conveying direction A and advantageously but not limitatively is configured to support a reel 9 arranged inserted on the support rod 20 so that the inner surface of the main body 21 of the reel 9 rests against the support rod 20.

[0041] According to some advantageous but non-limiting embodiments such as those illustrated (see in particular Figures 2 to 6), the store 19 comprises a support surface 23, for example in the illustrated case the upper surface of a pallet, to receive and support each reel 9, and at least one support column 24 that is arranged laterally with respect to the support surface 23 to receive the free lap 22 of each reel 9 placed so as to rest on the support surface 23 and is provided with a plurality of holding tabs 25 arranged one after the other along such support column 24 and each configured to receive and hold in position the free lap 22 of a relative reel 9 of packaging material 7.

[0042] It is understood that according to some embodiments not illustrated, the support surface 23 can coincide with the ground or with the floor.

[0043] Still more advantageously but not limitatively, the holding tabs 25 are arranged along such support column 24 so as to define a plurality of housings (not visible in the accompanying figures), each of such housings delimited, on one first side, by the support column 24 and, on the other side opposite the first side, by a respective holding tab 25. Each of these housings is configured to receive and hold in position the free lap 22 of one of the reels 9 of the plurality of reels 9 placed in the store 19.

[0044] Advantageously but not limitatively, the feeding system 8 also comprises a gripping device 26 that is configured to grab a reel 9, advantageously but not limitatively the main body 21 of such reel 9, and is movable between a first position (see Figures 1, 1A, 2 and 4), in which it is arranged to grab such reel 9 arranged in the store 19, and a second position (see Figures 5 and 6), in which it releases/inserts the reel 9 onto the support rod 20. The gripping device 26 comprises, in turn, a gripping arm 27 provided at one of its ends with a suction head 28 that can be actuated to hold the free lap 22 of the band of packaging material 7 of such reel 9 (see in particular Figures 2, 7 and 8).

[0045] Advantageously but not limitatively, the feeding system 8 further comprises a guide and transport assembly 29 arranged downstream of the support rod 20 along the conveying direction A and configured to receive the relative free lap 22 of the band of packaging material 7 of the aforementioned reel 9 when it (the reel 9) is supported by the support rod 20 and to guide the relative

band of packaging material 7 along a conveying path P in said conveying direction A leading it to the input of a packaging machine 1, in particular into the die-cutting machine 10 (see in particular Figure 2, and Figures 4 to 8).

[0046] With particular reference to Figures 7 and 8, advantageously but not limitatively, the gripping arm 27 can be actuated to feed the free lap 22 of the band of packaging material 7 of the reel 9 to the guide and transport assembly 29 (and thus to the die-cutting machine 10) when the gripping device 26 is in the second position.

[0047] According to some advantageous but non-limiting embodiments (such as, for example, the one illustrated in Figures 1, 1A, 4, 5, and 6), the feeding system 8 comprises a frame 30 which, in turn, comprises at least one horizontal guide 31 which extends from the store 19 to the support rod 20 parallel to such support rod 20, thus along the aforementioned direction C (i.e., transversely to the conveying direction A); and at least a second vertical guide 32 which extends orthogonally to the horizontal guide 31 and is slidingly coupled to a horizontal guide 31; and the gripping device 26 comprises an articulated polygon 33 rotatably coupled to the vertical guide 32 so as to be rotatable about a rotation axis Y parallel to the conveying direction A. This way, in use, the gripping device 26 can be translated and/or rotated to pick up the various reels 9 from the store 19 and release them onto the already described support rod 20 quickly and automatically.

[0048] Still more advantageously but not limitatively, according to some embodiments such as those illustrated in the accompanying figures (see, for example, Figures 1, 1A, 4, 5, and 6), the frame 30 comprises a pair of horizontal guides 31, which are parallel to each other and which extend from the store 19 to the support rod 20 parallel to the support rod 20, and a pair of vertical guides 32, each slidingly coupled to one of the horizontal guides 31, and the aforementioned articulated polygon 33 is rotatably coupled to both of the vertical guides 32, advantageously but not limitatively by interposition of an appropriate joint.

[0049] According to some advantageous but non-limiting embodiments such as those illustrated, the gripping device 26 comprises at least three clamping fingers 34, preferably four clamping fingers 34 (as illustrated in the accompanying figures), which are mounted on the articulated polygon 33 and can be moved towards or away from each other, advantageously but not limitatively by means of a pneumatic cylinder 35, to grab or release an outer surface of said main body of a reel of packaging material 7.

[0050] Advantageously but not limitatively, such clamping fingers 34 are carried by the aforementioned articulated polygon 33 and are arranged so as to define a circumference. Still more advantageously but not limitatively, such clamping fingers 34 can be moved towards or away from each other, between a grabbing configuration, in which they are arranged relative to one another along a substantially circular path having a diameter substantially analogous to that of the outer surface of the main body 21 of each reel 9 placed in the store 19, and a release configuration, in which the clamping fingers 34 are at a distance from one another that is greater than the diameter of the outer surface of said main body 21 of each reel 9 placed in the store 19.

[0051] According to some advantageous but non-limiting embodiments, each of the clamping fingers 34 comprises (in particular, is formed by) a cylindrical bar 34' arranged orthogonally to the articulated polygon 33 so that, when the gripping device 26 assumes the first position, the cylindrical bar 34' is oriented along the vertical direction Z, as well as a profile 34" that extends parallel to the cylindrical bar 34' and is shaped to contact an area of the outer lateral surface of each reel 9 of packaging material 7 so as to improve the grip.

[0052] Still with particular reference to Figures 2 to 8, advantageously but not limitatively, the gripping arm 27 projects from the aforementioned articulated polygon 33, extends parallel to the conveying direction A and comprises a first actuator 36 to move the suction head 28 parallel to the conveying direction A and a second actuator 37 to move the suction head 28 orthogonally to the conveying direction A, thus parallel to the direction C, so that, when the gripping device 26 is in the second position, the suction head 28 is moved by these actuators 36, 37 to feed the free lap 22 of the band of packaging material 7 to the guide and transport assembly 29 (see in particular Figures 3, 7 and 8).

[0053] According to some advantageous but non-limiting embodiments such as those illustrated in the accompanying figures (see in particular Figures 7 and 8), the gripping arm 27 comprises at least one deflector 38 that cooperates with the suction head 28 in order to hold the band of packaging material 7 in position. Advantageously but not limitatively, such deflector 38 comprises (in particular, is formed by) a metal profile, integral with the suction head 28 and configured to cooperate with the suction head 28 to hold the band of packaging material 7 in tension at least while it is moved towards and fed to the guide and transport assembly 29.

[0054] Advantageously but not limitatively, the guide and transport assembly 29 is of a known type and comprises at least a pair of looped guide belts 39 which are arranged immediately downstream of the support rod 20 along the conveying path P, which extend parallel to the conveying direction A, which are opposite each other and can be moved towards or away from each other to receive and clamp the free lap 22 of the band of packaging material 7 and drag it along the conveying path P. In detail, advantageously but not limitatively, the guide belts 39 can be actuated between an open configuration, in which they define a space suitable to receive the free lap 22 of the band of packaging material 7, and a closed configuration in which they clamp such free lap 22 of the band of packaging material 7 to drag the band of packaging material 7 forward (compare Figures 7 and 8 with each

other). In this case, advantageously but not limitatively, the gripping arm 27 is configured to insert the free lap 22 of the band of packaging material 7 between the looped guide belts 39.

[0055] Advantageously but not limitatively, the guide and transport assembly 29 is also configured to guide the band of packaging material 7 (once clamped between the guides 39) along the conveying path P at least up to a forming station 41 (still more specifically, at least up to its introduction into the die-cutting machine 10, advantageously of the type described above), where such band of packaging material 7 is appropriately cut and shaped, according to the type and especially the format of articles 100 to be packaged, to form a plurality of blanks 6.

[0056] Advantageously but not limitatively, such blanks 6 are ejected from the die-cutting machine 10 so that they are arranged in series in relation to one another along a conveyor 40, which will be described better below, which extends along the aforementioned determined path P downstream of the guide and transport assembly 29.

[0057] Advantageously, the aforementioned feeding system 11 of blanks 6 of packaging material 7 is configured to feed such blanks 6 to a packaging apparatus 5; still more advantageously but not limitatively, to feed such blanks 6 of packaging material 7 and at least one stack of substantially flat articles 100 to a packaging apparatus 5, as will be better explained in the following.

[0058] With particular reference to Figures 1, 1A, 9, and 10, the feeding system 11 of blanks 6 comprises the aforementioned conveyor 40 which is configured to feed a series of blanks 6 along a conveying path P in a conveying direction A from such forming station 41, where the blanks 6 are formed, to a sorting station 42, where the blanks 6 are separated and sorted so as to be fed, appropriately arranged and organized, to the packaging apparatus 5.

[0059] Advantageously, the feeding system 11 of blanks 6 further comprises a transporter 43, which is parallel to the conveyor 40, extends below the conveyor 40 and is configured to transport at least one stack of substantially flat articles 100, having a defined width, from an entry station 44, which coincides advantageously but not limitatively with the exit station of a stacking machine (not illustrated) configured to produce stacks of substantially flat articles 100, to a packaging station 45 through at least one intermediate station 46 along a conveying path PA in a conveying direction B, parallel and opposite to the conveying direction A. Still more advantageously but not limitatively, the conveying path PA extends in one plane and the conveying path P extends in a second plane parallel to and above the plane along which the path PA extends.

[0060] Advantageously, the feeding system 11 of blanks 6 further comprises a lifting device 47 arranged at the intermediate station 46 and configured to lower and to lift the stack of substantially flat articles 100 (see in particular Figure 10), and a sorting unit 48 configured to feed pairs of blanks 6 of the series of blanks 6 to the intermediate station 46.

[0061] Such sorting unit 48, advantageously but not limitatively, comprises at least one gripping unit 49 configured to pick up each pair of blanks 6 from the sorting station 42 and to release/place such pair of blanks 6 on the transporter 43, with the blanks 6', 6" of the pair of blanks 6 arranged side by side transversely to the conveying direction B so that the distance between the aforementioned first edge of the central portion 12 of a blank 6' of the pair of blanks 6 and the second edge of the central portion 12 of the other blank 6" of said pair of blanks 6 is substantially equal to the width of the stack of substantially flat articles 100.

[0062] According to some advantageous but non-limiting embodiments (such as, for example, those illustrated in the accompanying Figures), the feeding system 11 of blanks 6 comprises a first support 50a which is arranged at the sorting station 42 so as to be laterally in contact with the outside of the conveyor 40 on a first side of the conveyor 40; a second support 50b which is arranged at the sorting station 42 so as to be laterally in contact with the outside of the conveyor 40 on a second side, opposite the first side, of such conveyor 40, and each of such supports 50a, 50b is configured to support at least one blank 6. The sorting unit 48 comprises at least a first transfer belt 51a and a second transfer belt 51b, which are arranged at the sorting station 42 above the conveyor 40, extend transversely to the conveying direction A, and are movable, advantageously by means of a respective linear actuator 52, respectively, from the conveyor 40 to the first support 50a along a first sorting path T1 in a direction D, transversal to the conveying direction A, and from the conveyor 40 to the second support 50b along a second sorting path T2 in a fourth direction E, parallel and opposite to the direction D, to guide the blanks 6', 6" of each pair of blanks 6 one towards the first support 50a and the other towards the second support 50b (see Figure 10).

[0063] Advantageously but not limitatively, the gripping unit 49 of the sorting unit 48 is configured to pick up the blanks 6 of each pair of blanks 6, respectively, one (blank 6' of the pair of blanks 6) from the first support 50a and the other (blank 6" of the pair of blanks 6) from the second support 50b.

[0064] According to some advantageous but non-limiting embodiments (such as the one illustrated in Figure 10), the sorting unit 48 comprises a plurality of first transfer belts 51a parallel to one another and a plurality of second transfer belts 51b parallel to one another (as illustrated in Figure 10) and configured to sort the blanks 6 arriving at the sorting station 42 and to transfer them alternatively onto the first support 50a and onto the second support 50b (see Figure 10).

[0065] According to some advantageous but non-limiting embodiments (such as, for example, the one illustrated in the accompanying figures, see in particular Figures 9 and 10), the transporter 43 is a belt conveyor and

comprises (in particular, is formed by) a first belt 52a and a second belt 52b which are parallel and spaced apart relative to each other so as to support and transport the stack of substantially flat articles 100; and the gripping unit 49 is configured to pick up a blank 6' (of the pair of blanks 6) from the first support 50a and to release it onto the first belt 52a so that it is placed so that the relative first lateral portion 13a rests on the first belt 52a, and to pick up the other (blank 6" of the pair of blanks 6) from the second support 50b and to release it onto the second belt 52b so that it is placed so that the relative second lateral portion 13b rests on the belt 52b.

[0066] Advantageously but not limitatively, the gripping unit 49 comprises: at least a first C-shaped guide 53a which extends from the first support 50a to the first belt 52a of the transporter 43, advantageously but not limitatively two pairs of C-shaped guides 53a, each extending from the first support 50a to the first belt 52a; at least a second C-shaped guide 53b, opposite the first C-shaped guide 53a, which extends from the second support 50b to the second belt 52b of the transporter 43, advantageously but not limitatively two pairs of C-shaped guides 53b, each opposite a relative first C-shaped guide 53a, which extends from the second support 50b to the second belt 52b; at least one first suction head 54a slidingly coupled to the first guide 53a and configured to pick up at least one blank 6 from the first support 50a and guide it up to the first belt 52a (see, for example, Figure 10); and at least one suction head 54a, advantageously but not limitatively a plurality of suction heads 54a each slidingly coupled to a relative guide 52a, a second suction head (not visible in the accompanying figures but analogous to the head 54a) slidingly coupled to the second guide 53b and configured to pick up at least one blank 6 from the second support 50b and guide it up to the belt 52b, advantageously but not limitatively a plurality of second suction heads, each slidingly coupled to a relative guide 53b.

[0067] Advantageously but not limitatively, the guides 53a, 53b each comprise a first branch which extends above the conveyor 40, respectively from a first side or from a second side of the conveyor 40, along a direction traversal to the conveying direction A, a second branch parallel to the first branch which extends below the transporter 43, respectively from a first side or from a second side of such transporter 43, along a direction traversal to the conveying direction C, and a central core which extends substantially vertically between the first and second branches.

[0068] According to some advantageous but non-limiting embodiments (such as those illustrated), the suction heads 54a comprise (in particular, are formed by) suction cups that can be actuated to suck and pick up a blank 6.

[0069] Still more advantageously but not limitatively, each of the suction heads 54a or such second suction heads is carried by one of such guides 53a, 53b with the suction portion turned towards the longitudinal axis of symmetry of the gripping unit 49 (in particular, towards the conveyor 40 or towards the transporter 43; more specifically, towards the conveying path P or the conveying path PA as illustrated in the accompanying figures - see, for example, Figure 10).

[0070] Advantageously but not limitatively, each suction head 54a is configured (i.e., can be actuated by the control unit CU) to release the first lateral portion 13a of a blank 6' so as to rest on the belt 52a and to hold up the remaining portion of such blank 6' (of such pair of blanks 6) that projects cantilevered externally from the first belt 52a, while the suction head 54b is configured to release the second lateral portion 13b of the other blank 6" (of such pair of blanks 6) so as to rest on the belt 52b and to hold up the remaining portion of such blank 6" that projects cantilevered externally from the belt 52b (see, for example, Figure 10).

[0071] Advantageously but not limitatively, the aforementioned lifting device 47 comprises at least a pair of actuators (not visible in the accompanying figures), more specifically a pair of actuators on one side and a pair on the opposite side), which are arranged internally with respect to the belts 52a and 52b of the transporter 43 and can be actuated to lift the stack of articles 100 from (with respect to) the belts 52a and 52b, so that the first suction heads 54a (as well as the second suction heads), moving along the guides 53a and 53b, can release the blanks 6', 6" so as to rest on the belts 52a and 52b, advantageously but not limitatively placed as explained above, or to release the stack of articles 100 onto the blanks 6', 6" placed so as to rest on the relative belts 52a and 52b.

[0072] This way, the feeding system 11 of blanks 6 of packaging material 7 can quickly and efficiently feed a pair of blanks 6 below one or more substantially flat articles 100 to be packaged arranged in an appropriate manner in order to be packaged by the aforementioned packaging apparatus 5.

[0073] Advantageously but not limitatively, the packaging apparatus 5 is placed downstream of the intermediate station 46 along the aforementioned conveying path PA in the direction B (see, for example, Figures 1 and 1A) and is configured to package one or more articles 100 potentially stacked together into a stack of substantially flat articles 100 using a pair of blanks 6.

[0074] The packaging apparatus 5 is advantageously but not limitatively configured to wrap the article 100 or the stack of substantially flat articles 100 to be packaged with a pair of blanks 6 arranged so that at least (all) the flanks 4a, 4b, 4c and 4d and at least part of the upper and lower faces 2, 3 of the article 100 or of the stack of articles 100 are covered by such blanks 6 so as to form a package 200. Such package 200, advantageously but not limitatively, comprises the article 100 or the stack of articles 100 and the two blanks 6 wrapped around the same.

[0075] According to some advantageous but non-limiting embodiments, the packaging apparatus 5 comprises a transporter 43 (which advantageously but not limitatively coincides with, i.e., is in a single body with the

aforementioned transporter 43) configured to move the article 100 or the stack of articles 100 already fed and appropriately placed by the above-described feeding system 11 of blanks 6 of packaging material 7 along the conveying path PA in the conveying direction B. In detail, as explained above, advantageously but not limitatively, the feeding system 11 of blanks 6 is placed immediately upstream of the packaging station 45 along the conveying path PA and is configured to place a pair of blanks 6 at least partially below the article 100 or the stack of articles 100, arranged in relation to each other so that the lower face 3 of the article 100 or of the stack of articles 100 rests on a first lateral portion 13a of a first blank 6' of such pair of blanks 6 and on a second lateral portion 13b of the other blank 6" of the pair of blanks 6.

[0076] Still more advantageously but not limitatively, the transporter 43 extends from the feeding system 11 of blanks 6 to the packaging apparatus 5 along the conveying path PA to connect the feeding system 11 of blanks 6, in particular the aforementioned entry station 44 (which, advantageously but not limitatively, is part of the feeding system 11 of blanks 6) to the packaging apparatus 5, in particular to the packaging station 45 (which, advantageously but not limitatively, is part of the packaging apparatus 5). Still more advantageously but not limitatively, the transporter 43 comprises a first portion along the conveying path PA that is part of the feeding system 11 of blanks 6 and a second portion, downstream of the first portion along the conveying path PA in the conveying direction B, which is part of the packaging apparatus 5 (as clearly illustrated in the accompanying figures; see, for example, Figures 1, 1A, 10, 11, and 12).

[0077] Advantageously but not limitatively, the packaging apparatus 5 comprises: a first lifter 55a placed on a first side of the transporter 43 and a second lifter 55b placed on a second side of the transporter 43, opposite the first side; which lifters 55a and 55b can be actuated (advantageously by the aforementioned control unit CU) to intercept the first lateral portion 13a of the first blank 6' and the second lateral portion 13b of the other blank 6" and to lift such blanks 6 together with the article 100 or the stack of articles 100; at least a first folding unit 56a arranged at the first side of the transporter 43 and a second folding unit 56b arranged at the second side of the transporter 43, advantageously but not limitatively operatively connected to the lifters 55a and 55b, respectively, and configured to intercept the central portions 12 of the blanks 6', 6" placed on the transporter 43 and to fold them against, respectively, the first flank 4a and the second flank 4b of the article 100 or of the stack of articles 100, while it (the article 100 or stack of articles 100) is on the transporter 43 and to fold the second portion 13b of the first blank 6' and the first portion 13a of the blank 6" onto the upper face 2 of the article 100 or stack of articles 100 (see in particular Figures 11 and 12).

[0078] Still with reference to Figures 11 and 12, advantageously, the packaging apparatus 5 also comprises a first pair of pushers 57A configured to close and fold the first lateral flaps 14 of the blanks 6', 6" at least against the third flank 4c of the article 100 or stack of articles 100, so that these lateral flaps 14 overlap at least partially with each other, thus defining a first overlap zone (not visible in the accompanying figures) at such flank 4c; a second pair of pushers 57B configured to close and fold the second lateral flaps 15 of the blanks 6', 6" of the pair of blanks 6 at least against the fourth flank 4d of the substantially flat article 100 or stack of flat articles 100, so that such second lateral flaps 15 overlap at least partially with each other, thus defining at least a second overlap zone S2.

[0079] With particular reference to Figures 11 and 12, advantageously but not limitatively, the first pair of pushers 57A and the second pair of pushers 57B are arranged along the conveying path PA opposite each other and spaced apart by a distance equal to the distance between the third flank 4c and the fourth flank 4d of the article 100 or stack of articles 100, and each pair of pushers 57A, 57B can be actuated between a first configuration (illustrated in Figures 11 and 12), in which the pushers 57A, 57B of such pairs of pushers 57A, 57B are placed externally to the transporter 43, and a second configuration (not visible in the accompanying figures), in which the pushers 57A, 57B of such pairs of pushers 57A, 57B are driven towards each other along a direction F transversal to the conveying direction B to intercept and fold the lateral flaps 14 and 15 of the blanks 6 and 6' against the flanks 4c and 4d of the substantially flat article 100 or stack of substantially flat articles 100, thus defining a package 200, which comprises the substantially flat article 100 or stack of substantially flat articles 100 and the two blanks 6' and 6" wrapped around the same.

[0080] Advantageously but not limitatively, each pair of pushers 57A, 57B comprises two pushers 57A, 57B, arranged parallel to each other along such direction F, each of which is slidingly coupled to a relative shaped bar 59 to slide along the direction F towards or away from the other pusher of said pair of pushers 57A, 57B.

[0081] According to some advantageous but non-limiting embodiments, each of the pushers 57A, 57B of the pair of pushers 57A, 57B has a truncated cone presser 58 that is configured to fold the blanks 6', 6" along the aforementioned third, fourth, fifth, sixth, seventh, and eighth score lines so that, in use, they intercept the flaps 14, 15 of each blank 6', 6" and cause the folding of the flaps 14, 15 (when provided, together with the substantially triangular portions) around, respectively, such third and fourth score lines, and also intercept the central laps 16, 18 and the first lap 17a, second lap 17b, third lap 17c and fourth lap 17d and cause their folding around the fifth, sixth, seventh and eighth score lines so that the central laps 16, 18 cover the flanks 4c and 4d of the article 100 or stack of articles 100 and such first, second, third, and fourth lateral laps 17a, 17b, 17c, and 17d of blanks 6' and 6" are folded against, respectively, the upper face 2 and the lower face 3 (not visible but parallel to and opposite the upper face) of the article 100 or stack of

articles 100 so as to overlap at least partially with the aforementioned lateral portions 13a, 13b of the blanks 6', 6", thus defining first four overlap zones S3 at the corners of the upper face 2 of the article 100 or stack of articles 100 and four further overlap zones (not visible in the accompanying figures) at the corners of the lower face 3 of said article 100 or stack of articles 100.

[0082] Advantageously (but not limitatively), the lifters 55a, 55b, the folding units 56a, 56b, and the aforementioned pairs of pushers 57A, 57B are movable along at least a portion T of said conveying path PA in a synchronous manner with respect to the transporter 43. This way, the packaging apparatus 5 produces the package 200 dynamically, i.e., without the need to block the article 100 or the stack of articles 100 to be packaged, during packaging, with obvious advantages in terms of productivity, i.e., the number of packages formed per unit of time.

[0083] According to some advantageous but non-limiting embodiments, the first folding unit 56a is arranged externally in contact on a first side of the transporter 43; the second folding unit 56b is arranged externally in contact with a second side, opposite the first side, of the transporter 43; and the folding units 56a, 56b each comprise a bar 60 (only partially visible in the accompanying figures) which extends orthogonally to the transporter 43, can slide along a vertical direction Z substantially orthogonal to the transporter 43 so that, in use, it intercepts the central portions 12 of the pair of blanks 6 and slides along the first and second flanks 4a, 4b of the article 100 or stack of articles 100, and a second bar 61 connected to an upper end of said bar 60 and movable with respect to such bar 60 so that, in use, it intercepts the second lateral portion 13b of the first blank 6' and the first lateral portion 13a of the second blank 6" and slides along the upper face 2 of the article 100 or stack of articles 100 to bring about the closure of such portions 13b , 13a of the blanks 6' and 6" on the face 2.

[0084] According to still other advantageous but non-limiting embodiments, the packaging apparatus 5 also comprises a gluing device (not visible in the accompanying figures) configured to apply at least one glue dot at each of the overlap zones S1, S2, S3 of the blanks 6' and 6". Advantageously but not limitatively, such a gluing device is also movable along at least a portion T of the determined path PA synchronously to the transporter 43. Still more advantageously but not limitatively, such a gluing device is configured to apply the glue dots before the folding of the blanks 6' and 6''.

[0085] According to some advantageous but non-limiting embodiments such as those illustrated in the accompanying figures (see, for example, Figures 1, 1A, 2), advantageously but not limitatively, the packaging apparatus 5 also comprises a stabilizing device 62 placed downstream of the packaging station 45 along the determined path PA and configured to apply a pressure on the already formed package 200 at least at each glue dot to stabilize the gluing. Such stabilizing device 62 is advantageously configured as a tunnel.

[0086] Still more advantageously but not limitatively, the stabilizing device 62 comprises a plurality of pairs of belts 63 which extend parallel to the conveying direction B and are parallel and opposite each other orthogonally to the conveying direction B and are arranged to intercept the package 200 at the upper face 2 and at the lower face 3 and to exert a fixed pressure at each of said overlap zones S1, S2 and S3 so as to stabilize the package 200 (see in particular Figures 11 and 12).

[0087] Alternatively or additionally, according to some advantageous but non-limiting embodiments not illustrated herein, the stabilizing device 62 comprises a plurality of rollers arranged to intercept the package 200 at the upper face 2 and at the lower face 3 and exert a fixed pressure at each of the overlap zones S2 and S3 so as to stabilize the package 200.

[0088] According to still other embodiments such as those illustrated schematically in Figures 11 and 12, the packaging apparatus 5 also comprises guides 64 which are arranged side by side transversely to the conveying direction B, are movable along at least a portion T of the determined path PA up to at least the aforementioned stabilizing device 62 synchronously with respect to the transporter 43, and are configured (i.e., can be actuated) to intercept the package 200, in particular at the flank of the package 200 opposite the input of the stabilizing device 62 (with particular reference to the accompanying figures on the flank 4d of the article 100 or stack of articles 100 that forms said package 200) to guide the package up to the input of the stabilizing device 62 and at the same time improve the stabilization of said package 200.

[0089] Also presented in the present disclosure is a feeding method of packaging material 7 for feeding a packaging material 7 to a packaging machine 1, advantageously but not limitatively of the type described above.

[0090] Such feeding method comprises, advantageously (not limitatively), the following steps: a storing step, during which a plurality of reels 9 of packaging material 7 of the type described above (simply reel(s) 9 in the following), is supplied to a store 19; a pick-up step, subsequent to the storing step, during which a gripping device 26 (advantageously but not limitatively of the type described above with reference to the feeding system 8) grabs a first reel 9 of the plurality of reels 9 and a suction head 28, carried by a gripping arm 27 integral with the gripping device 26, holds the free lap 22 of the band of packaging material 7 of such reel 9; a moving step, during which the gripping device 26 moves the first reel 9 from the store 19 up to a support rod 20; a placing step, subsequent to the moving step, during which the gripping device 26 arranges such first reel 9 on the support rod 20 so as to allow the unwinding of the relative band of packaging material 7 along the aforementioned conveying direction A and the suction head 28 feeds the free lap 22 to a guide and transport assembly 29, which is arranged downstream of the support rod 20 along the conveying direction A (and advantageously but not limitatively is of the type described above with reference to

the feeding system 8); and a transporting and guiding step, (at least partially) subsequent to the placing step, during which such guide and transport assembly 29 guides the band of packaging material 7 from the first reel 9 along a conveying path P in the conveying direction A, advantageously but not limitatively, into the entry of the packaging machine 1 (still more advantageously towards the die-cutting machine 10 of the packaging machine 1).

[0091] Advantageously but not limitatively, the guide and transport assembly 29 comprises a pair of guide belts 39 analogous to those described above in relation to the feeding system 8 of packaging material 7 and the placing step comprises an opening sub-step, during which such guide belts 39 are moved away from each other so that a space is defined between them (see Figure 7); an insertion sub-step, during which the suction head 28 places the free lap 22 of the band of packaging material 7 of the first reel 9 into such space (between the guide belts 39, see Figure 7); a clamping sub-step, during which the guide belts 39 are moved towards each other and clamp the free lap 22 of the band of packaging material 7 placed in such space; and a releasing sub-step, during which the suction head 28 releases the free lap 22, which is then dragged by the guide and transport assembly 29 along the path P.

[0092] With particular reference to Figures 4 to 6, according to some advantageous but non-limiting embodiments of the feeding method for feeding packaging material 7 to the packaging machine 1, the aforementioned moving step comprises: a first translating sub-step, during which the gripping device 26 vertically lifts the first reel 9 of packaging material 7 along a vertical direction Z, a second translating sub-step, during which the gripping device 26 translates along at least one horizontal guide 31 which extends from the store 19 to the support rod 20, thus transversely to the conveying direction A and parallel to the direction C (advantageously along a pair of horizontal guides 31 which extend from the store 19 to the support rod 20 as described above in relation to the feeding system 8), and a rotating step, (at least partially) contemporaneous with the second translating sub-step, during which the gripping device 26 rotates about a rotation axis Y parallel to the conveying direction A to place the aforementioned first reel 9 within the support rod 20, in particular, arranged with one of its inner surfaces of the main body 21 in contact with such support rod 20.

[0093] Still more advantageously but not limitatively, the gripping device 26 is of the type described above in relation to the feeding system 8 of packaging material 7 and during the pick-up step the clamping fingers 34 of the gripping device 26 are moved towards each other and intercept the reel 9 of packaging material 7 to grab it.

[0094] Still more advantageously but not limitatively, the aforementioned pick-up step comprises a first placing sub-step, during which the gripping device 26 places itself at the store 19 in order to grab a first reel 9, a grabbing sub-step, during which the clamping fingers 34 of the gripping device 26 are moved towards each other and intercept the first reel 9, in particular the outer surface of the main body 21 of the reel 9, and a second placing sub-step, (at least partially) contemporaneous with the first placing sub-step, during which the suction head 28 sucks and holds (i.e., takes) the free lap 22 of the band of packaging material 7 of said reel 9 so that the movement of the gripping device 26 causes the corresponding movement of the entire reel 9.

[0095] According to some advantageous but non-limiting embodiments of the feeding method, when the store 19 comprises a support column 24 provided with a plurality of holding tabs 25 as described in detail in relation to the feeding system 8, during the aforementioned storing step each free lap 22 of each of the reels 9 of packaging material 7 contained in the store 19 is placed (manually or by means of a designated placing device, for example an anthropomorphic robot) between the support column 24 and a respective holding tab 25, in particular in a housing (not visible in the accompanying figures) which is defined between the support column 24 and the respective holding tab 25, so as to be held in a given position, and during the aforementioned first translating sub-step, the suction head 28 lifts the free lap 22 of packaging material 7 of the first reel 9 in order to remove it from the relative housing.

[0096] Once in the grip of the guide and transport assembly 29, the band of packaging material 7 is guided to a die-cutting machine 10 where it is die-cut (i.e., shaped, cut, creased, and printed) to form a plurality of blanks 6 suitable for wrapping one or more articles 100 to form a package 200 as described above.

[0097] Then, according to a further aspect of the present invention, a feeding method of blanks 6 of packaging material 7 is proposed for feeding the blanks 6 of packaging materials to a packaging apparatus 5, which is advantageously implemented as described above.

[0098] Such feeding method of blanks 6 comprises a first transporting step, during which a conveyor 40 (advantageously but not limitatively of the type described above in relation to the feeding system 11 of blanks 6) moves a series of blanks 6 from a forming station 41 to a sorting station 42 along the aforementioned conveying path P in the conveying direction A; a second transporting step, (at least partially) contemporaneous with respect to the first transporting step, during which a transporter 43 (advantageously but not limitatively of the type described above in relation to the feeding system 11 of blanks 6), which is parallel to the conveyor 40 and placed below the same, moves at least one stack of articles 100, having a defined width, from an entry station 44 to a packaging station 45 while passing through at least one intermediate station 46 along the aforementioned conveying path PA in the conveying direction B. The method further comprises a lifting step, during which a lifting device 47 (advantageously but not limitatively of the type described above in relation to the feeding system 11 of blanks 6)

arranged at the intermediate station 46 lifts the stack of articles 100 from the transporter 43; and a sorting step, (at least partially) subsequent to the first transporting step, during which a sorting unit 48 feeds at least a pair of blanks 6 arriving at the sorting station 42 to the intermediate station 46. Advantageously but not limitatively, all blanks 6 arriving at the sorting station 42 are fed in pairs to the intermediate station 46.

[0099] Advantageously but not limitatively, such sorting step comprises a placing sub-step, subsequent to the lifting step, during which a gripping unit 49 (advantageously but not limitatively of the type described above in relation to the feeding system 11 of blanks 6) releases the pair of blanks 6 on the (advantageously stationary) transporter 43 with the blanks 6 arranged side by side transversely to the conveying direction B so that the distance between the first edge of the central portion 12 of a blank 6' (of the pair of blanks 6) and the second edge of the central portion 12 of the other blank 6" (of the pair of blanks 6) is substantially equal to the aforementioned width of the stack of articles 100 (in particular, of each article 100 forming such stack of articles 100); and a releasing step, subsequent to the placing sub-step, during which the lifting device 47 releases at least part of the stack of articles 100 (in particular at least one article 100) on such blanks 6 resting on the transporter 43, which is advantageously stationary.

[0100] According to some advantageous but non-limiting embodiments, the second transporting step comprises a first transporting sub-step, (at least partially) contemporaneous with the first transporting step, during which the transporter 43 moves the stack of articles 100 from the entry station 44 to the intermediate station 46 along the conveying path PA, and a second transporting sub-step, subsequent to the releasing step, during which the transporter 43 moves the aforementioned at least part of the stack of articles 100 (i.e., an article 100 or a stack of articles 100) together with the pair of blanks 6 on which said part rests from the intermediate station 46 to the packaging station 45 along the conveying path PA. The lifting step, the placing sub-step and the releasing step are subsequent to the first transporting sub-step and precede the second transporting sub-step.

[0101] Alternatively, or additionally, advantageously but not limitatively, the sorting step is (at least partially) subsequent to the first transporting step. Still more advantageously but not limitatively, during the sorting step at least the transporter 43 is stationary for the time necessary at least for the execution of the lifting, sorting and releasing steps.

[0102] According to some advantageous but non-limiting embodiments, the sorting unit 48 is of the type described above in relation to the feeding system 11 of blanks 6 and the sorting step comprises at least one separating sub-step for separating blanks 6, (at least partially) contemporaneous with the first transporting step, during which the aforementioned transfer belts 51a, 51b move, respectively, from the conveyor 40 to a first support 50a, arranged at the sorting station 42 on a first side of the conveyor 40 (as already explained in relation to the feeding system 11 of blanks 6), along a first sorting path T1 in a direction D transversal to the conveying direction A, and from the conveyor 40 to a second support 50b, arranged at the sorting station 42 on a second side, opposite said first side of the conveyor 40 (as already explained in relation to the feeding system 11 of blanks 6), along a second sorting path T2 in a fourth direction E, parallel and opposite to said direction D. Such transfer belts 51a, 51b moving along such paths T1 and T2 guide the pairs of blanks 6 arriving at the sorting station 42 one (i.e., one blank 6' of such pair of blanks 6) towards the first support 50a and the other (i.e., the other blank 6" of such pair of blanks 6) towards the second support 50b. The sorting step further comprises a transferring sub-step, subsequent to the separating sub-step and preceding the placing step, during which the gripping unit 49 picks up the pair of blanks 6', 6", of the aforementioned pair of blanks 6, respectively, from the first support 50a and from the second support 50b and moves them towards the transporter 43.

[0103] Furthermore, advantageously but not limitatively, during the placing sub-step, the gripping unit 49 releases a blank 6' of each pair of blanks 6 on the belt 52a of the transporter 43 so that it is placed so that the relative first lateral portion 13a rests on the first belt 52a and releases the other blank 6" of the pair of blanks 6 on the second belt 52b so that it is placed so that the relative second lateral portion 13b rests on the second belt 52b; and during the releasing step, the lifting device 47 releases at least part of the stack of articles 100 (thus an article 100 or a stack of articles 100) so as to rest on the first lateral portion 13a of a blank 6' and on the second lateral portion 13b of the other blank 6".

[0104] Advantageously but not limitatively, the releasing step comprises a lowering sub-step, during which the lifting device 47 is lowered and places the stack of substantially flat ceramic articles 100 so as to rest on the blanks 6', 6", in particular on the first lateral portion 13a of the blank 6' and on the second lateral portion 13b of the other blank 6", and a lifting sub-step, during which the lifting device 47 lifts part of the substantially flat articles 100 placed again on the blanks 6' and 6" so that at least one substantially flat article 100 remains resting on the first lateral portion 13a of a blank 6' and on the second lateral portion 13b of the other blank 6".

[0105] Once the blanks 6' and 6" are placed below the article 100 or stack of articles 100, as explained above, such article 100 or stack of articles 100 is at least partially wrapped by the blanks 6' and 6" to form a package 200.

[0106] Advantageously but not limitatively, such package 200 is formed using the packaging method illustrated in the following.

[0107] Such packaging method (advantageously but not limitatively) comprises the following steps: a feeding step, during which the article 100, or the stack of articles 100, and the pair of blanks 6 arranged as explained above

are provided (advantageously but not limitatively by means of a placing sub-step, which is part of the feeding step, carried out by means of the feeding method of blanks 6 illustrated above); a transporting step, during which a transporter 43 moves the article 100, or the stack of articles 100, and the appropriately placed pair of blanks 6' and 6" along the aforementioned conveying path PA at least through at least the packaging station 45; and a plurality of folding steps.

[0108] In detail, advantageously, such packaging method comprises: at least a first folding step, contemporaneous with the transporting step, during which the ceramic article 100, or the stack of articles 100, resting on the first lateral portion 13a of the blank 6' and on the second lateral portion 13b of the other blank 6", is lifted and the central portion 12 of the blanks 6', 6" is folded against, respectively, the first flank 4a or the second flank 4b of the ceramic article 100, or stack of articles 100; a second folding step, contemporaneous with the transporting step and (at least partially) subsequent to the first folding step, during which the second lateral portion 13b of the blank 6' and the first lateral portion 13a of the other blank 6" are folded onto the upper face 2 of the ceramic article 100, or stack of articles 100; and at least a third folding step, contemporaneous with the transporting step and (at least partially) subsequent to the first folding step, during which the first lateral flap 14 and the second lateral flap 15 of the blanks 6', 6" are folded, respectively, at least against the third flank 4c and the fourth flank 4d of the article 100, or stack of articles 100, so as to overlap at least partially with each other to define at least a first overlap zone S1, at the third flank 4c, and a second overlap zone S2, at the fourth flank 4d. Advantageously (but not limitatively), the packaging method further comprises a fixing step, (at least partially) subsequent to the third folding step and contemporaneous with the transporting step, during which the blanks 6', 6" are fixed to each other at least at the overlap zones S1, S2 to form the package 200.

[0109] According to an advantageous but non-limiting embodiment of the packaging method, the method further comprises a fourth folding step, contemporaneous with the transporting step and (at least partially) subsequent to the third folding step, during which the first, second, third, and fourth lateral laps 17a, 17b, 17c, and 17d of the blanks 6', 6" are folded against the upper face 2 and the face 3 of the article 100, or stack of articles 100, so as to at least partially overlap with the aforementioned second lateral portion 13b and first lateral portion 13a of the blanks 6', 6" already folded against the faces 2 and 3, to define four further overlap zones S3 at the corners of the upper face 2 of the article 100, or stack of articles 100, and four further overlap zones (not visible in the accompanying figures but analogous to the zones S3) at the corners of the lower face 3 of the ceramic article 100, or stack of articles 100. In this case (i.e., when such fourth step is provided), during the fixing step, the blanks 6' and 6" of the pair of blanks 6 are fixed to each other at the first four overlap zones S3 and at the further four overlap zones to form the aforementioned package 200.

[0110] Advantageously but not limitatively, the fixing step comprises a gluing step, during which a gluing device applies at least one glue dot at each of the overlap zones S1, S2, S3 of the package 200.

[0111] According to some advantageous but non-limiting embodiments, the packaging method also comprises a stabilizing step, (at least partially) subsequent to the gluing step and contemporaneous with the transporting step, during which the package 200 is fed to a stabilizing device 62 and such stabilizing device 62 exerts a pressure on the package 200 at least at each glue dot to stabilize the gluing.

[0112] Advantageously but not limitatively, the stabilizing device 62 is of the type described above in relation to the packaging apparatus 5, i.e., it comprises a plurality of pairs of belts 63 such as those described above; and during the stabilizing step such belts 63 intercept the package 200 while the package advances along said conveying path PA and exert a fixed pressure at least at each of the overlap zones S1, S2, S3 so as to (i.e., for a time sufficient to) stabilize the gluing of the package 200.

[0113] Advantageously but not limitatively, during the first folding step the central portion 12 of the blank 6' is folded by rotating it around the relative first score line and the central portion 12 of the blank 6" is folded by rotating it around the relative second score line; during the second folding step the second lateral portion 13b of the blank 6' is folded by rotating it around the second score line and the first lateral portion 13a of the other blank 6" is folded by rotating it around the first score line of the relative blank; during the third folding step the first lateral flap 14 and the second lateral flap 15 of each blank 6', 6" are folded by rotating them, respectively, along the relative third and fourth score lines. Still more advantageously but not limitatively, during the fourth folding step (when provided), the aforementioned first, second, third, and fourth laps 17a 17b, 17c and 17d are folded against, respectively, the upper face 2 and the lower face 3 by rotating them, respectively, against the fourth, fifth, sixth, and seventh score lines to form the package 200.

[0114] According to one last aspect, a packaging method for the packaging of one or more substantially flat articles 100, stacked together, is proposed, which can be implemented advantageously but not limitatively with a packaging machine 1 like the one described above. The packaging method in question, advantageously but not limitatively, comprises a feeding step of packaging material 7, which is implemented advantageously but not limitatively according to the feeding method for feeding a packaging material 7 to a packaging machine 1 described above, a producing step for producing blanks 6 of packaging material 7 known *per se* and not described further herein (for example implemented as described in the documents BO2012A000490 and BO2013A000457); a feeding step for feeding the blanks 6 to a packaging apparatus 5, advantageously but not

limitatively implemented with the method illustrated above, and a packaging step for forming a package 200, which is implemented advantageously but not limitatively by implementing the packaging method of at least one substantially flat article 100 referred to in the foregoing.

[0115] The present invention has numerous advantages, among which the following are mentioned. The present invention allows the aforementioned packages 200 to be produced quickly and automatically.

[0116] In detail, the feeding method and system 8 of packaging material 7 described above make it possible to change the reels 9 of packaging material 7 automatically with considerable advantages in terms of time and thus productivity, accuracy as well as saved labour.

[0117] In addition, thanks to the feeding method and feeding system 11 for feeding blanks 6 described above, it is possible to arrange blanks 6 of packaging material 7 below the article 100 or stack of articles 100 to be packaged quickly and automatically, which reduces machine downtimes.

[0118] Furthermore, the packaging method and the packaging apparatus 5 allow a dynamic packaging of the article 100 or stack of articles 100 to be packaged, which makes it possible to increase the rate of production. At the same time, the synchronous movement of the packaging apparatus 5 and of the article 100, or stack of articles 100, minimizes the stresses transmitted from the article 100 or from the stack of articles 100 to the blanks 6, which reduces the risk of damaging the blanks 6 and thus of wasting the package 200.

Claims

1. Feeding system (11) of blanks (6) of packaging material (7) for feeding blanks (6) of packaging material (7) to a packaging apparatus (5); each of said blanks (6) comprising a central portion (12), a first lateral portion (13a) connected to a first edge of the central portion (12) by means of a first score line, a second lateral portion (13b) connected to a second edge of said central portion (12), opposite the first edge, by means of a second score line parallel and opposite the first score line, a first lateral flap (14) connected to a third edge of said central portion (12), orthogonal to said first edge and second edge, by means of a third score line, and a second lateral flap (15) connected to a fourth edge of said central portion (12) opposite said third edge by means of a fourth score line; the feeding system (11) of blanks (6) of packaging material (7) comprises:

   a conveyor (40) configured to feed a series of said blanks (6) along a conveying path (P) in a conveying direction (A) from a forming station (41) to a sorting station (42);
   a transporter (43), which is parallel to the conveyor (40), extends below said conveyor (40) and is configured to move at least one stack of substantially flat articles (100), having a defined width, from an entry station (44) to a packaging station (45) through at least one intermediate station (46) along a conveying path (PA) in a conveying direction (B), parallel to and opposite to the conveying direction (A);
   a lifting device (47) arranged at said intermediate station (46) and configured to lower and to lift said stack of substantially flat articles (100);
   a sorting unit (48) configured to feed pairs of blanks (6) of said series of blanks (6) to said intermediate station (46) of said transporter (43);
   the sorting unit (48) comprising at least one gripping unit (49) configured to pick up each pair of blanks (6) from said sorting station (42) and to place the blanks (6', 6") of said pair of blanks (6) arranged side by side transversely to said conveying direction (B) so that the distance between said first edge of said central portion (12) of a blank (6') of said pair of blanks (6) and the second edge of said central portion (12) of the other blank (6") of said pair of blanks (6) is substantially equal to said width of said stack of substantially flat articles (100).

2. Feeding system (11) of blanks (6) of packaging material (7) according to claim 1, comprising:

   a first support (50a) which is arranged at said sorting station (42) on a first side of said conveyor (40) and is configured to support at least one blank (6', 6") of said series of blanks (6);
   a second support (50b) which is arranged at said sorting station (42) on a second side of said first conveyor (40), opposite to said first side, and is configured to support at least one blank (6', 6") of said series of blanks (6);
   said sorting unit (48) comprising at least a first transfer belt (51a) and a second transfer belt (51b), which first transfer belt (51a) and second transfer belt (51b) are arranged at said sorting station (46) above said conveyor (40), extend transversely to said conveying direction (A), and are movable, respectively, from said conveyor (40) to said first support (50a) along a first sorting path (T1) in a third direction (D), transversal to said conveying direction (A), and from said conveyor (40) to said second support (50b) along a second sorting path (T2) in a fourth direction (E), parallel and opposite to said third direction (D), to guide said blanks (6', 6") of each of said pairs of blanks (6) one towards said first support (50a) and the other towards said second support (50b);
   said gripping unit (49) of said sorting unit (48) being configured to pick up the blanks (6', 6") of each pair of blanks (6), respectively, one from

said first support (50a) and the other from said second support (50b).

3. Feeding system (11) of blanks (6) of packaging material (7) according to claim 1 or 2, wherein:

said transporter (43) is a conveyor belt and comprises (in particular, is formed by) a first belt (52a) and a second belt (52b) parallel and spaced apart relative to each other so as to support and move the stack of substantially flat articles (100);
said gripping unit (49) being configured to pick up a blank (6') of each pair of blanks (6) from said first support (50a) and release it on said first belt (52a) so that it is placed so that the relative first lateral portion (13a) rests on said first belt (52a) and to pick up the other blank (6") of said pair of blanks (6) from said second support (50b) and release it on said second belt (52b) so that it is placed so that the relative second lateral portion (13b) rests on said second belt (52b).

4. Feeding system (11) of blanks (6) of packaging material (7) according to claim 3, wherein the gripping unit (49) comprises: at least a first C-shaped guide (53a) which extends from said first support (50a) to said first belt (52a) of said transporter (43); at least a second C-shaped guide (53b), opposite the first C-shaped guide (53a), which extends from said second support (50b) to said second belt (52b) of said transporter (43); at least one first suction head (54a), slidingly coupled to the first guide (53a) and configured to pick-up at least one blank (6') from said first support (50a) and guide it up to said first belt (52a) of said transporter (43); and at least a second suction head (54b), slidingly coupled to said second guide (53b) and configured to pick up at least another blank (6") from said second support (50b) and guide it up to said second belt (52b) of said transporter (43).

5. Feeding system (11) of blanks (6) of packaging material (7) according to claim 3 or 4, wherein: said lifting device (47) comprises at least a pair of actuators, which are arranged internally with respect to said first belt (52a) and second belt (52b) of said transporter (43) and can be actuated to lift said stack of substantially flat articles (100) from said first belt (52a) and second belt (52b) of said transporter (43), or to release the stack of substantially flat articles (100) so as to rest on said first belt (52a) and second belt (52b) of said transporter (43).

6. Method of feeding of blanks (6) of packaging material (7) for feeding blanks (6) of packaging material to a packaging apparatus (5) of articles (100); each of said blanks (6) comprising a central portion (12), a first lateral portion (13a) connected to a first edge of the central portion (12) by means of a first score line, a second lateral portion (13b) connected to a second edge of said central portion (12), opposite the first edge, by means of a second score line parallel to and opposite the first score line, a first lateral flap (14) connected to a third edge of said central portion (12), orthogonal to said first edge and second edge, by means of a third score line, and a second lateral flap (15) connected to a fourth edge of said central portion (12) opposite said third edge by means of a fourth score line; the feeding method comprises the following steps:

a first transporting step, during which a conveyor (40) moves a series of said blanks (6) from a forming station (41) to a sorting station (42) along a conveying path (P) in a conveying direction (A);
a second transporting step, at least partially contemporaneous with said first transporting step, during which a transporter (43), which is parallel to said conveyor (40) and extends below said conveyor (40), moves at least one stack of substantially flat articles (100), having a defined width, from an entry station (44) to a packaging station (45) through at least one intermediate station (46) along a conveying path (PA) in a conveying direction (B), parallel to and opposite to the conveying direction (A);
a lifting step, during which a lifting device (47), arranged at said intermediate station (46), lifts said stack of substantially flat articles (100) from said transporter (43) ;
a sorting step, at least partially subsequent to said first transporting step, during which a sorting unit (48) feeds at least a pair of blanks (6) arriving at the sorting station (42) to said intermediate station (46); said sorting step comprising a placing sub-step, subsequent to said lifting step, during which a gripping unit (49) of said sorting unit (48) releases the blanks (6', 6") of said pair of blanks (6) on said transporter (43) arranged side by side transversely to said conveying direction (B) so that the distance between said first edge of said central portion (12) of a blank (6') of said pair of blanks (6) and the second edge of said central portion (12) of the other blank (6") of said pair of blanks (6) is substantially equal to said width of said stack of substantially flat articles (100); and
a releasing step, subsequent to said placing sub-step, during which said lifting device (47) releases at least part of said stack of substantially flat articles (100) on said blanks (6', 6") of said pair of blanks (6) placed on said transporter (43).

7. Method of feeding of blanks (6) of packaging material (7) according to claim 6, wherein:

said second transporting step comprises a first transporting sub-step, at least partially contemporaneous with said first transporting step during which said transporter (43) moves said stack of substantially flat articles (100) from the entry station (44) to said intermediate station (46) along said conveying path (PA), and a second transporting sub-step, subsequent to said releasing step, during which said transporter (43) moves said at least part of said stack of substantially flat articles (100) and said blanks (6', 6") of said pair of blanks (6), on which said at least part of said stack of substantially flat articles (100) rests, from said intermediate station (46) to said packaging station (45) along said advancement path (PA);
said lifting step, said placing sub-step and said releasing step being subsequent to said first transporting sub-step and prior to said second transporting sub-step.

8. Method of feeding of blanks (6) of packaging material (7) according to claim 6 or 7, wherein said sorting step is at least partially subsequent to said first transporting step.

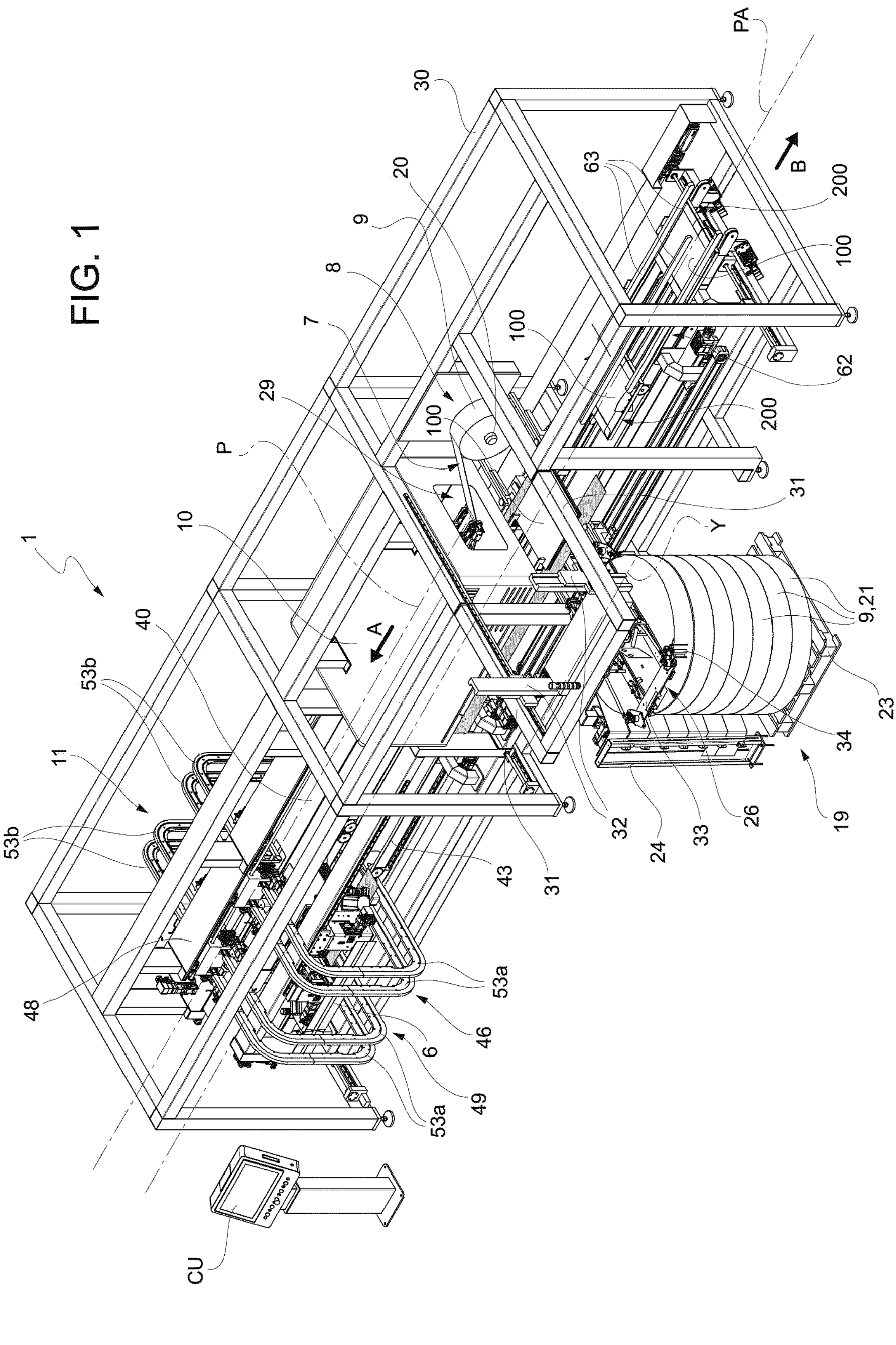
9. Method of feeding of blanks (6) of packaging material (7) according to any claims from 6 to 8, wherein:

said sorting unit (48) comprises at least a first transfer belt (51a) and a second transfer belt (51a) which are arranged at said sorting station (42) above said conveyor (40) and which extend transversely to said conveying direction (A);
said sorting step comprises at least one separating sub-step to separate the blanks (6), at least partially contemporaneous with said first transporting step, during which said first transfer belt (51a) and said second transfer belt (51b) move respectively from said conveyor (40) to a first support (50a), arranged at said sorting station (42) on a first side of said conveyor (40) along a first sorting path (T1) in a third direction (D), transversal to said conveying direction (A), and from said conveyor (40) to a second support (50b), arranged at said sorting station (42) on a second side of said conveyor (40), opposite to said first side, along a second sorting path (T2) in a fourth direction (E), parallel and opposite to said third direction (D), and guide said blanks (6', 6") of said pair of blanks (6) arriving at the sorting station (42) one towards said first support (50a) and the other towards said second support (50b), and a transferring sub-step, subsequent to said separating sub-step and preceding said placing step, during which said gripping unit (49) picks up said blanks (6', 6") of said pair of blanks (6), respectively, from said first support (50a) and from said second support (50b) and moves them towards the transporter (43).

10. Method of feeding of blanks (6) of packaging material (7) according to any claims from 6 to 9, wherein:

said transporter (43) is a belt conveyor (43) and comprises (in particular is formed by) a first belt (52a) and a second belt (52b) parallel and spaced apart relative to each other so as to receive, support and move said stack of substantially flat articles (100);
during said placing sub-step, said gripping unit (49) releases a blank (6') of each pair of blanks (6) on said first belt (52a) so that it is placed so that the relative first lateral portion (13a) rests on said first belt (52a) and releases the other blank (6") of said pair of blanks (6) on said second belt (52b) so that it is placed so that the relative second lateral portion (13b) rests on said second belt (52b);
during said releasing step, said lifting device (47) releases at least part of said stack of substantially flat articles (100) so as to rest on said first lateral portion (13a) of a blank (6') and on the second lateral portion (13b) of the other blank (6'').

11. Method of feeding of blanks (6) of packaging material (7) according to any claims from 6 to 10, wherein said releasing step comprises: a lowering sub-step, during which said lifting device (47) lowers and places said stack of substantially flat articles (100) so as to rest on said first lateral portion (13a) of a blank (6') and on said second lateral portion (13b) of the other blank (6"), and a lifting sub-step during which said lifting device (47) lifts part of the substantially flat articles (100) of said stack of substantially flat articles (100) resting on said first lateral portion (13a) of a blank (6') and on said second lateral portion (13b) of the other blank (6") so that at least one substantially flat article (100) remains resting on said first lateral portion (13a) of a blank (6') and on said second lateral portion (13b) of the other blank (6").


1
PA
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B
200
63
100
20
9
8
7
29
P
10
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53b
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48
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62
200
31
Y
9,21
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26
33
24
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31
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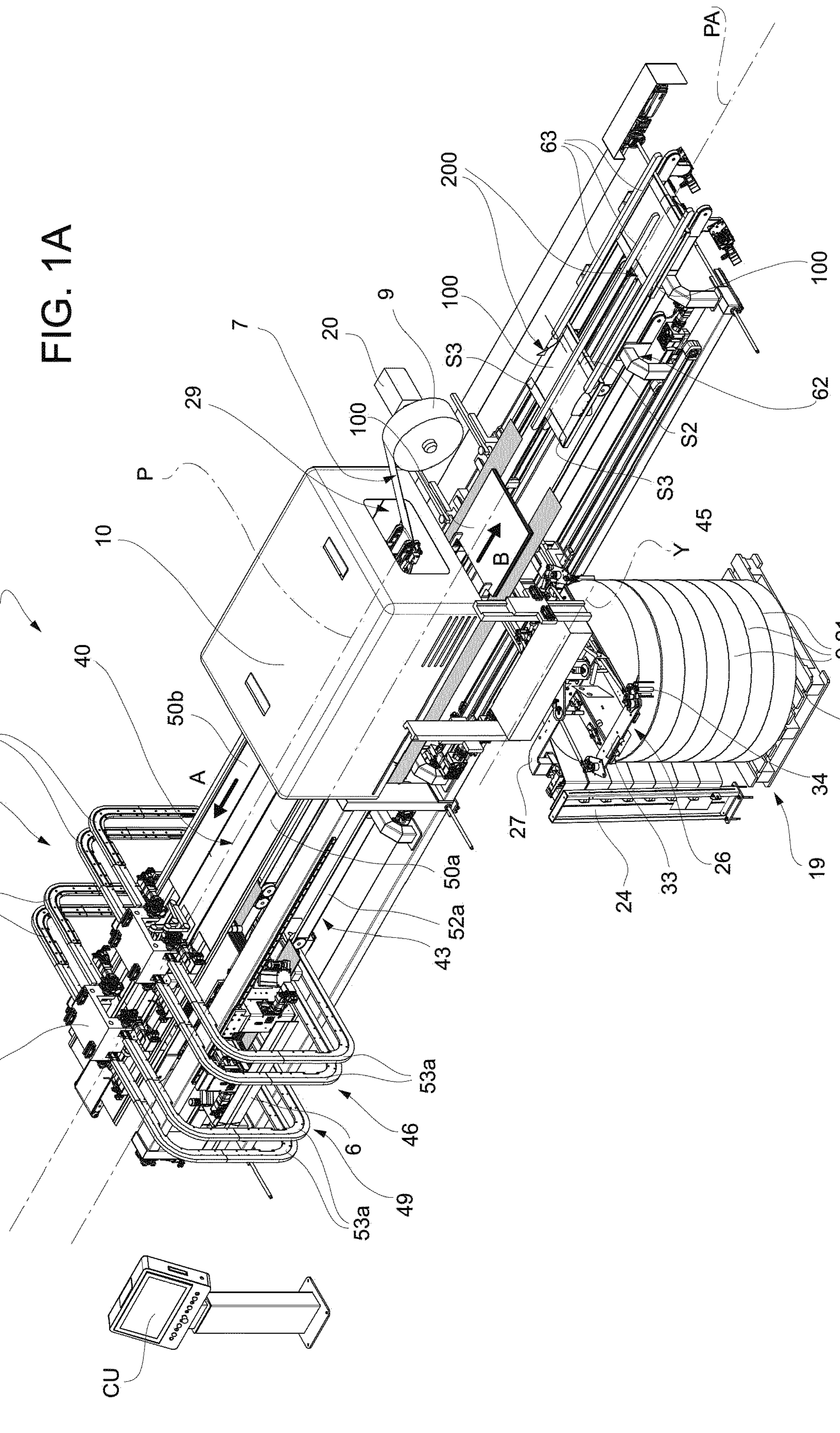
53a
46
6
49
A
CU

FIG. 1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19
26
33
24
27
50a
52a
43
40
50b
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B
53b
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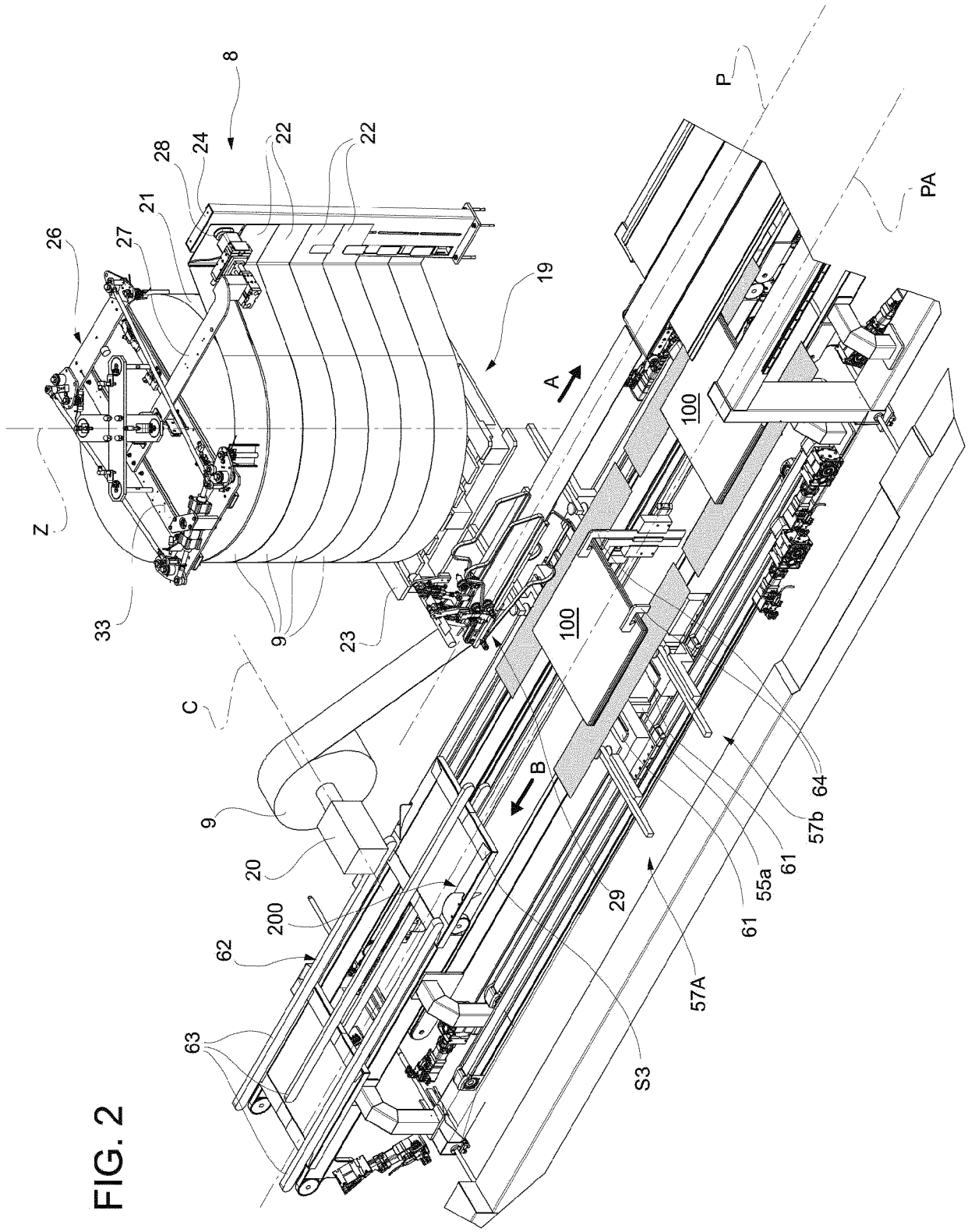
53a
46
6
49
CU

FIG. 1A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27
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P
PA
A
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33
9
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20
200
62
63
29
57A
S3
61
55a
61
57b
64

FIG. 2

FIG. 3

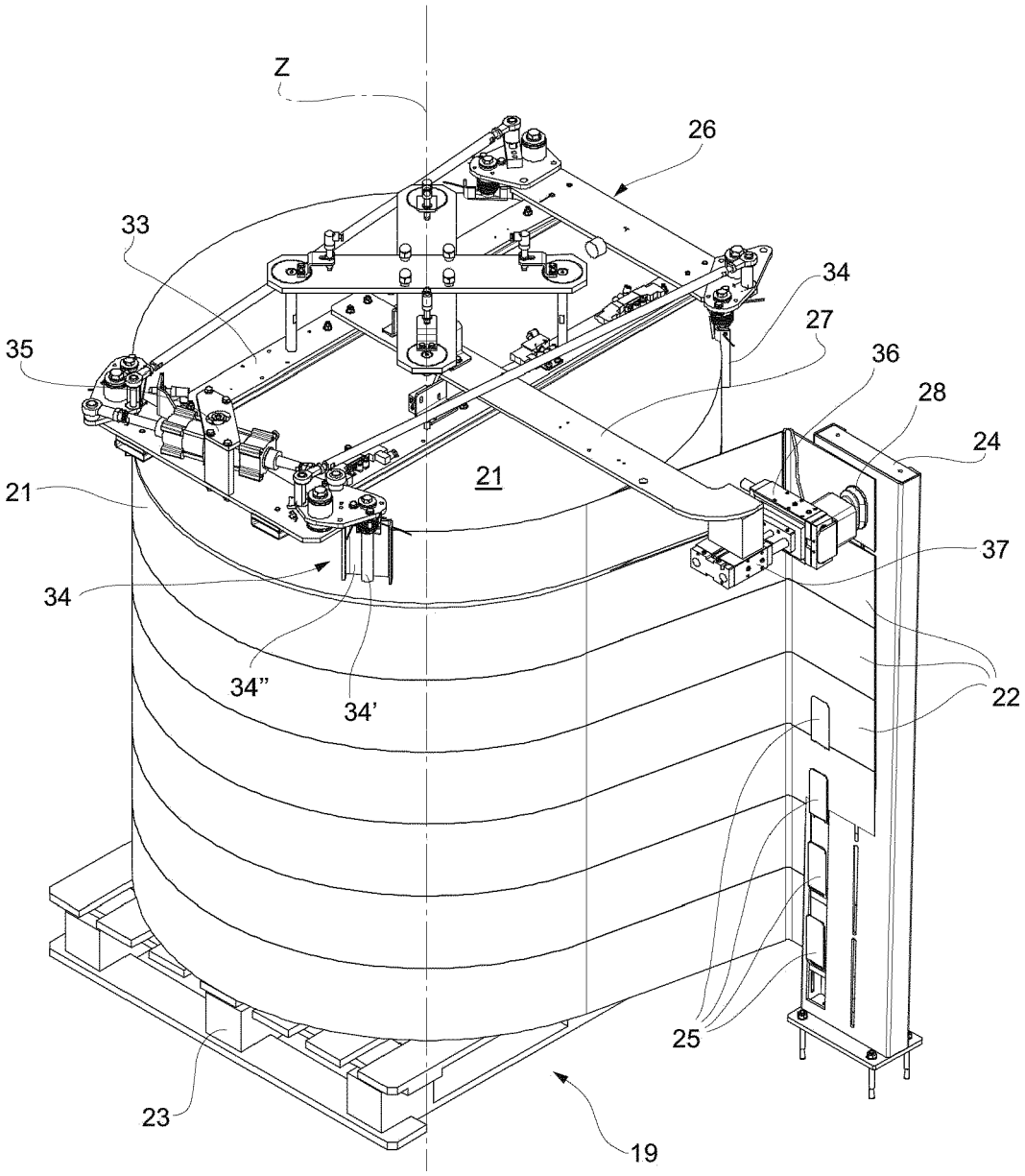


FIG. 4

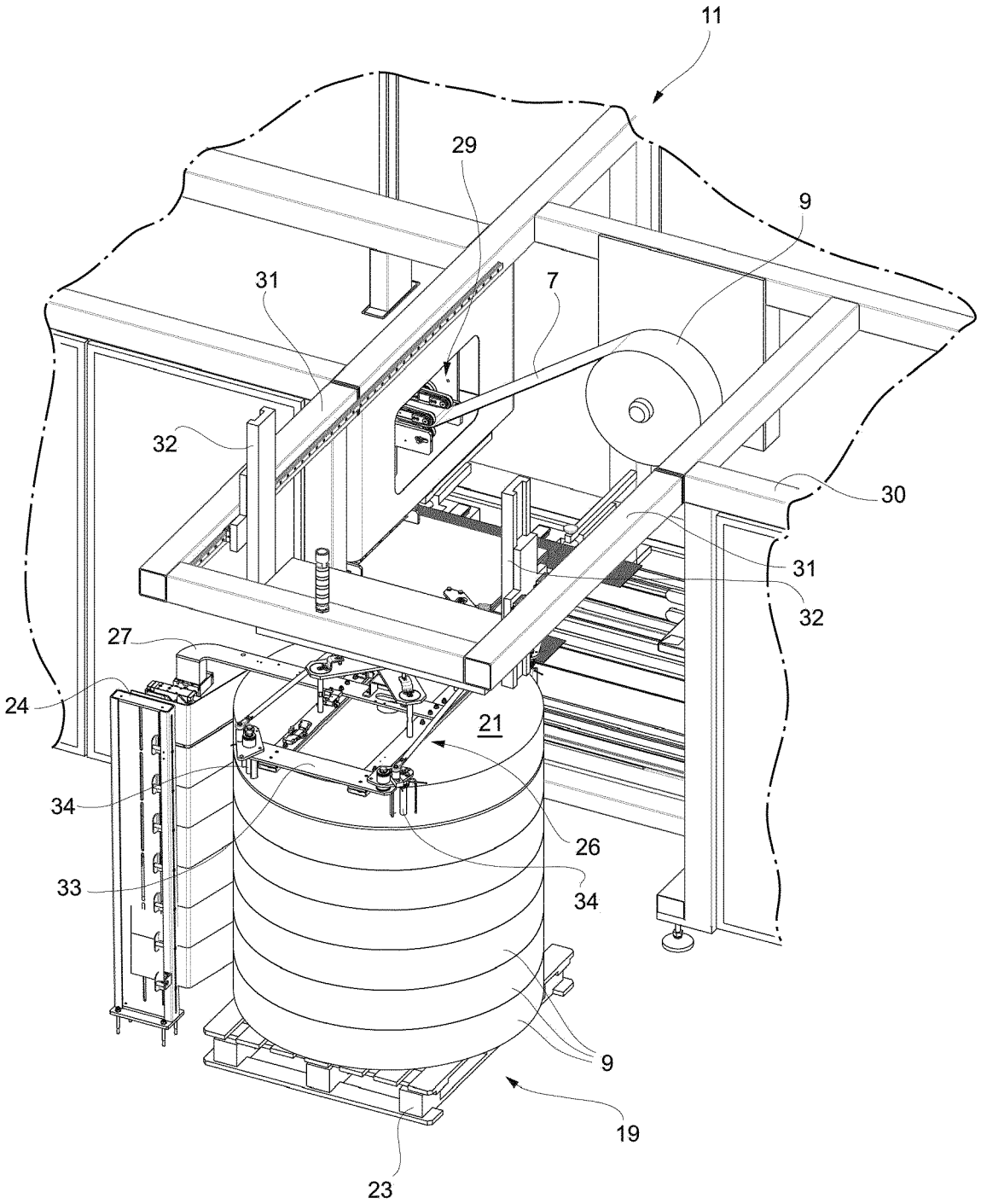


FIG. 5

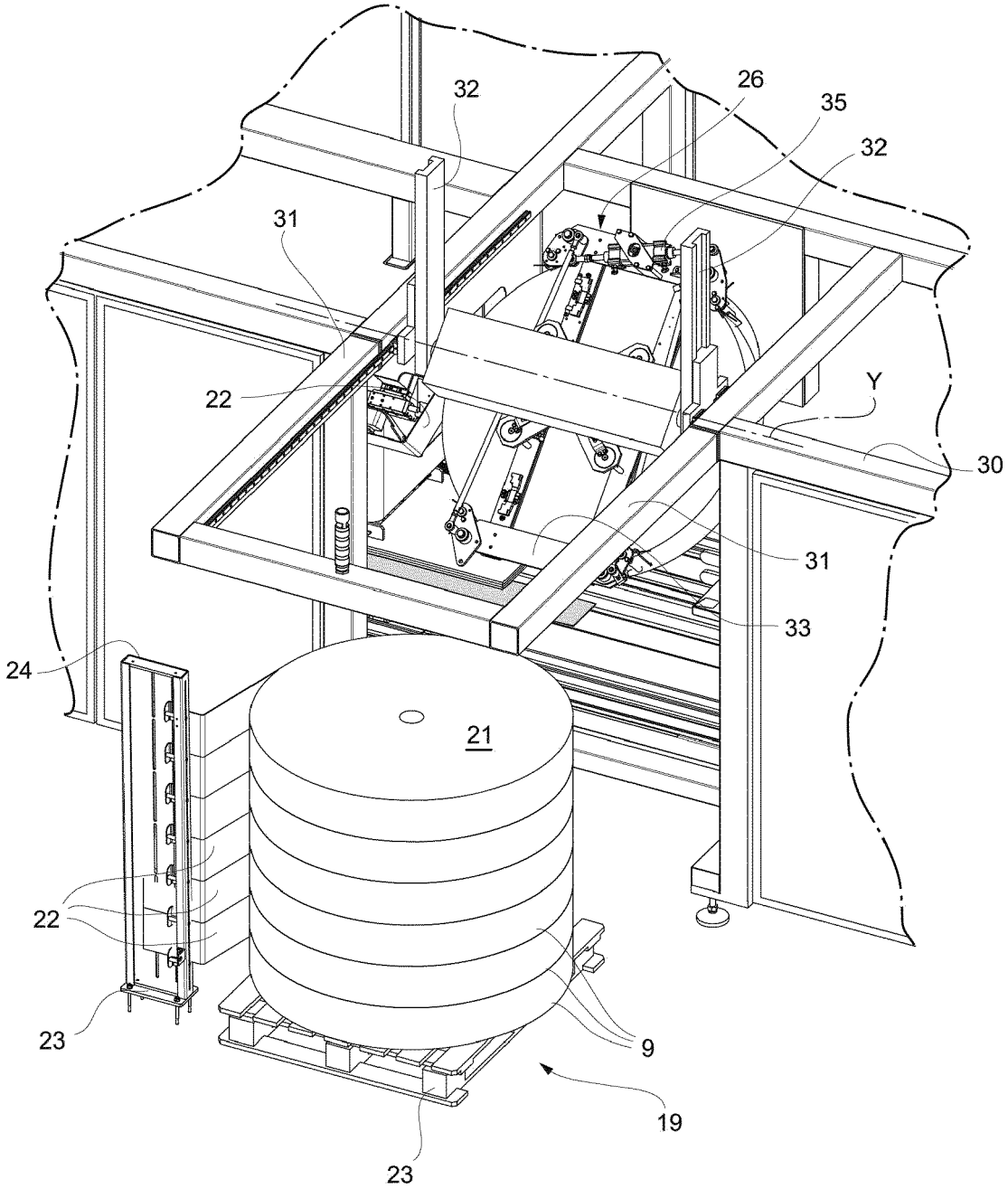


FIG. 6

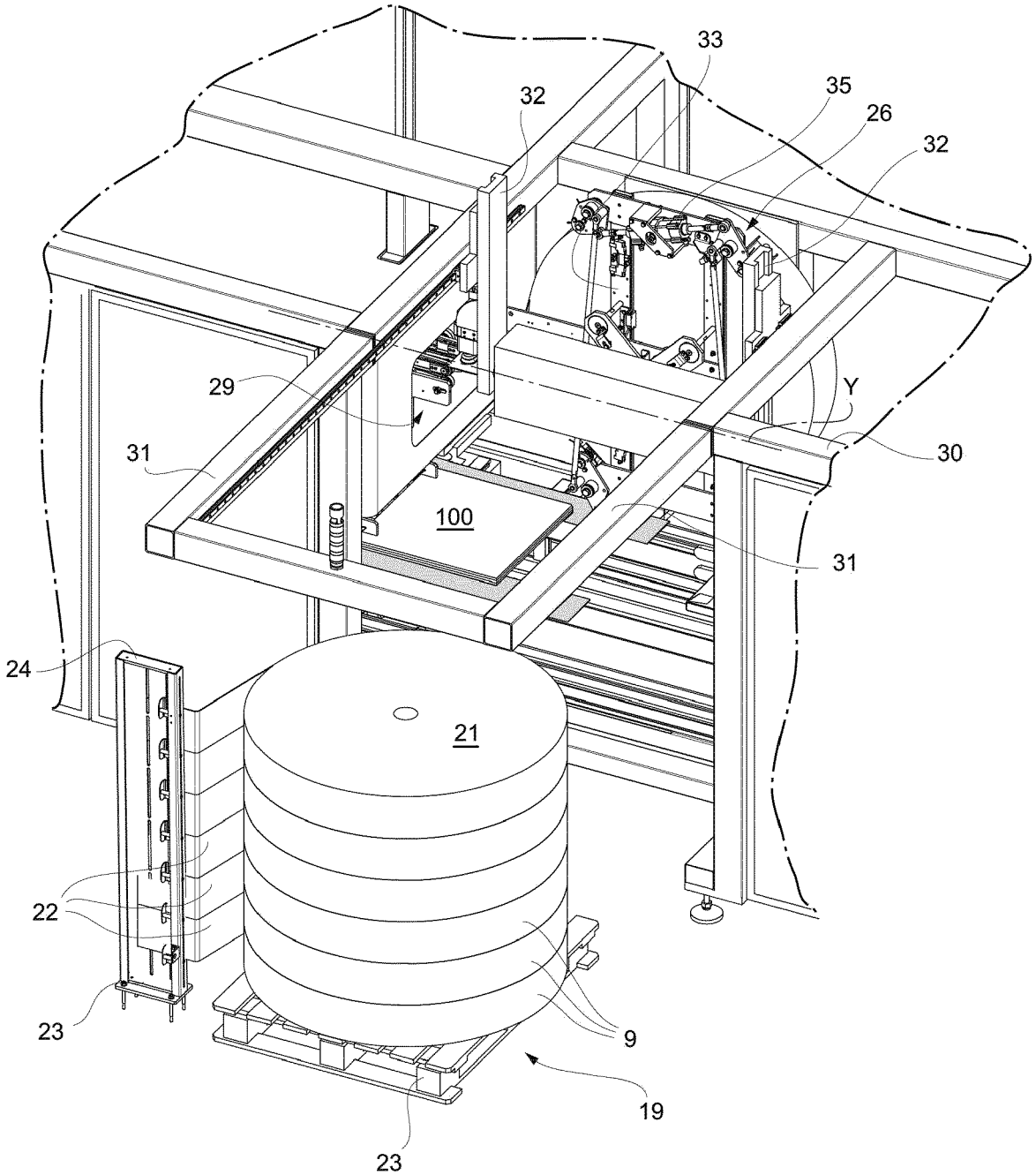


FIG. 7

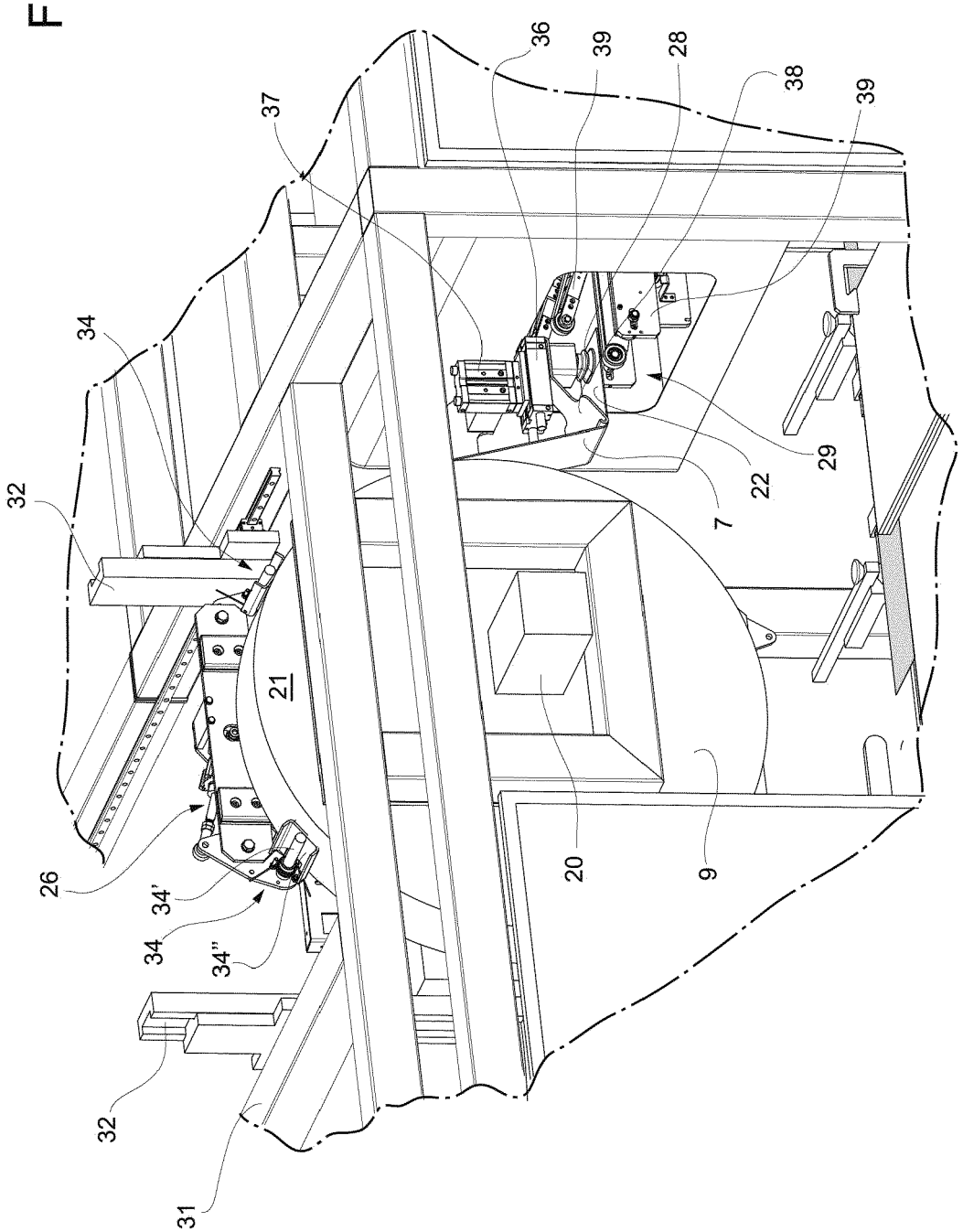
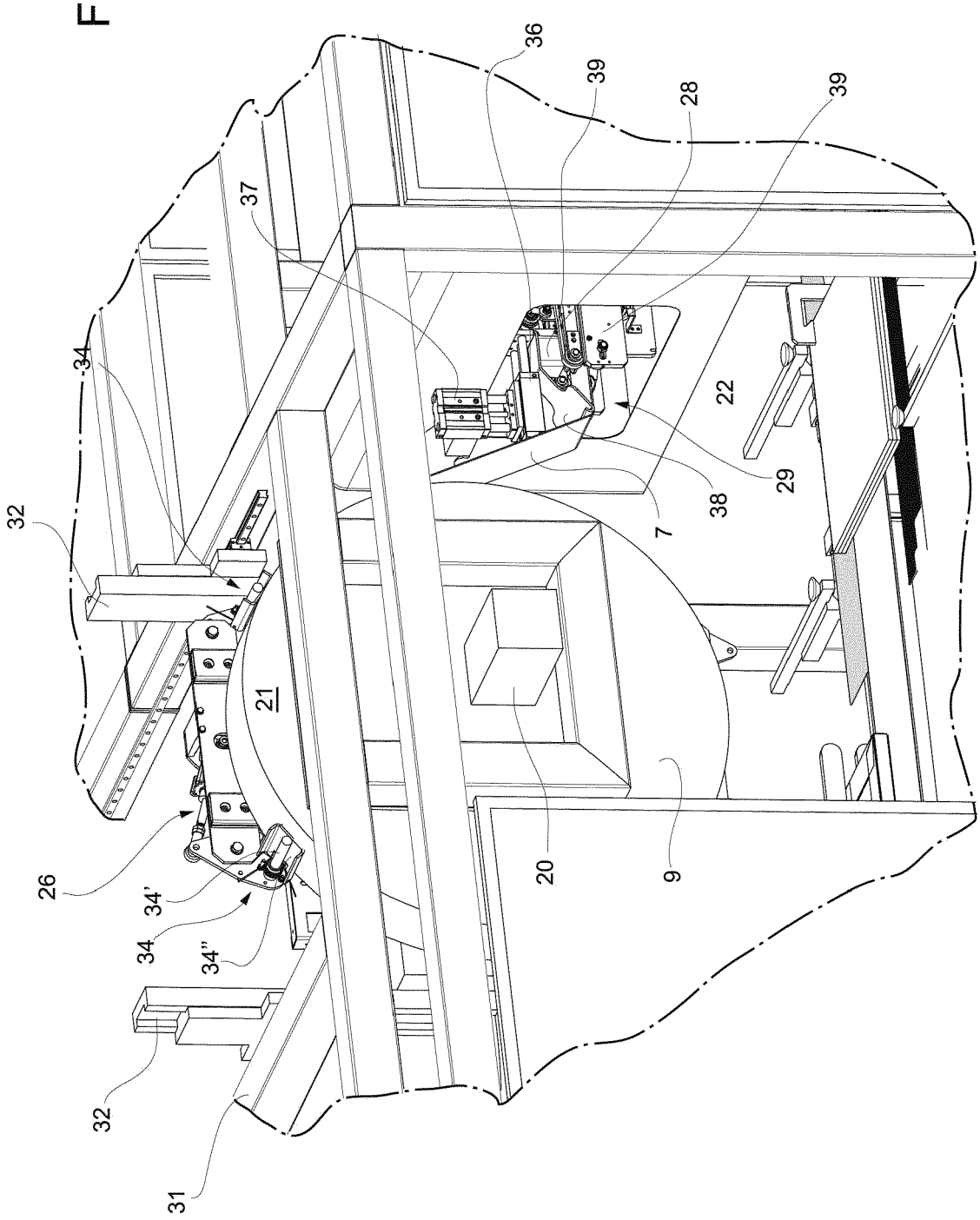


FIG. 8



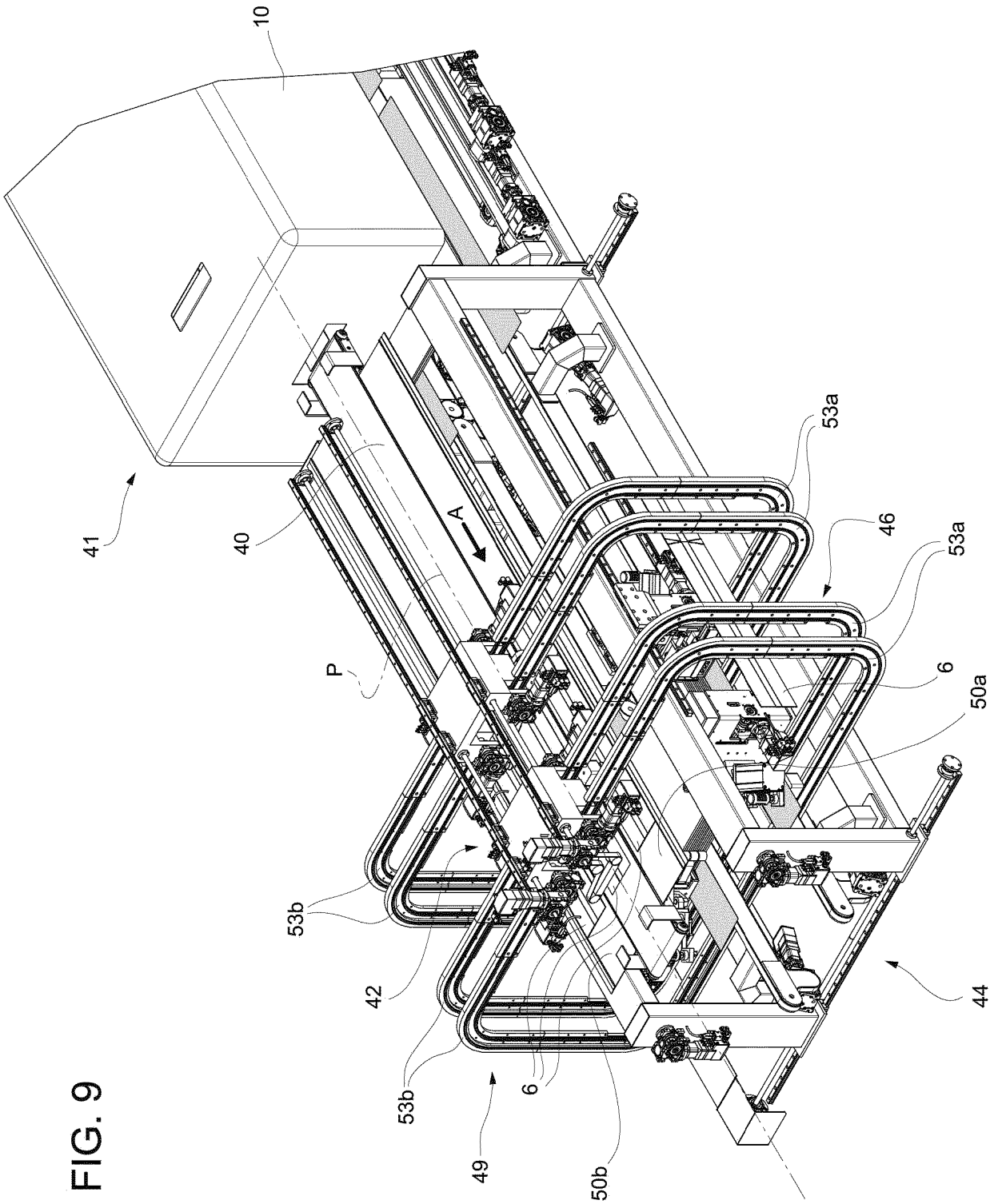
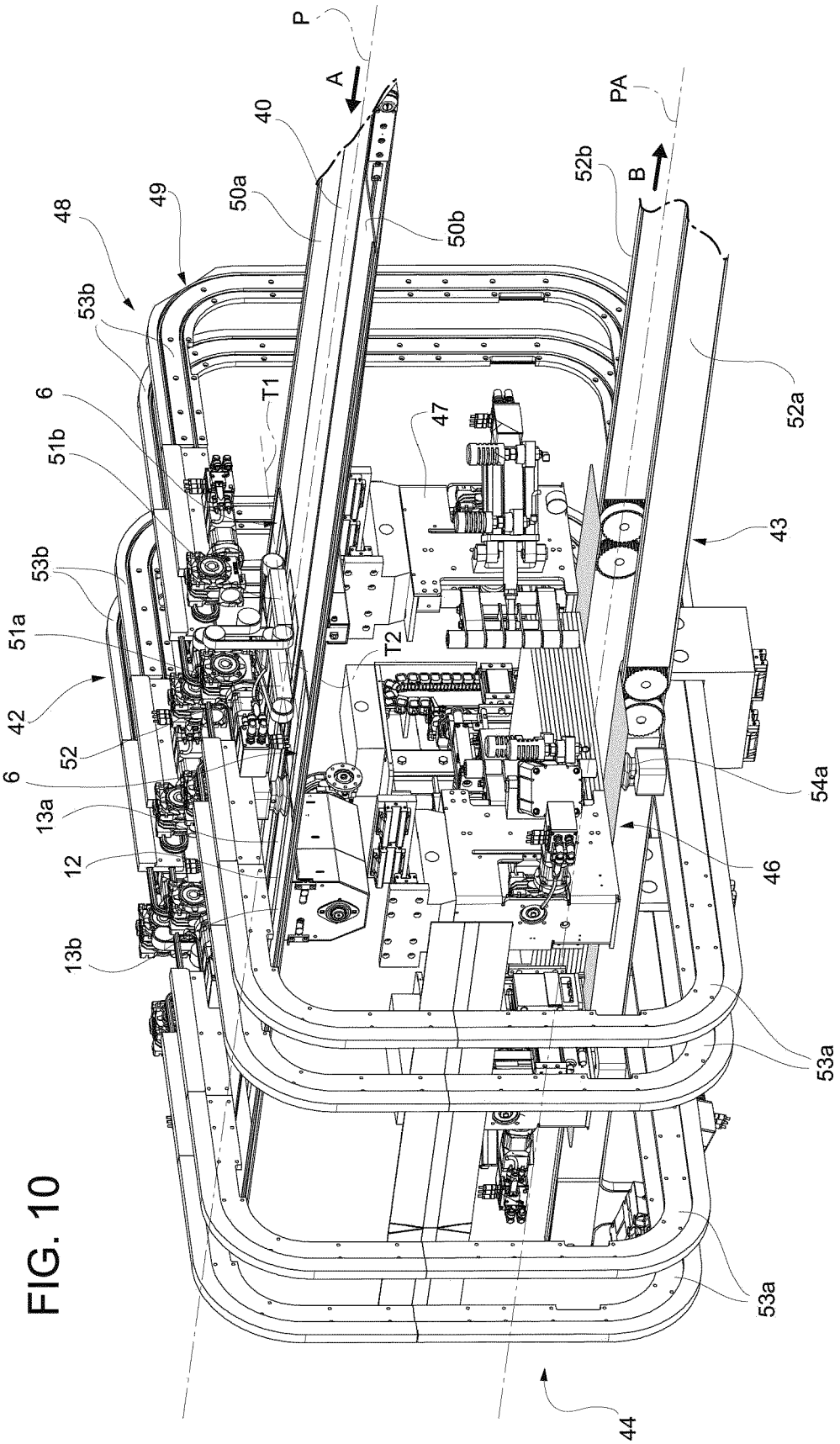


FIG. 9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A
PA
40
52b
B
48
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50a
50b
53b
T1
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47
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51b
43
53b
51a
T2
42
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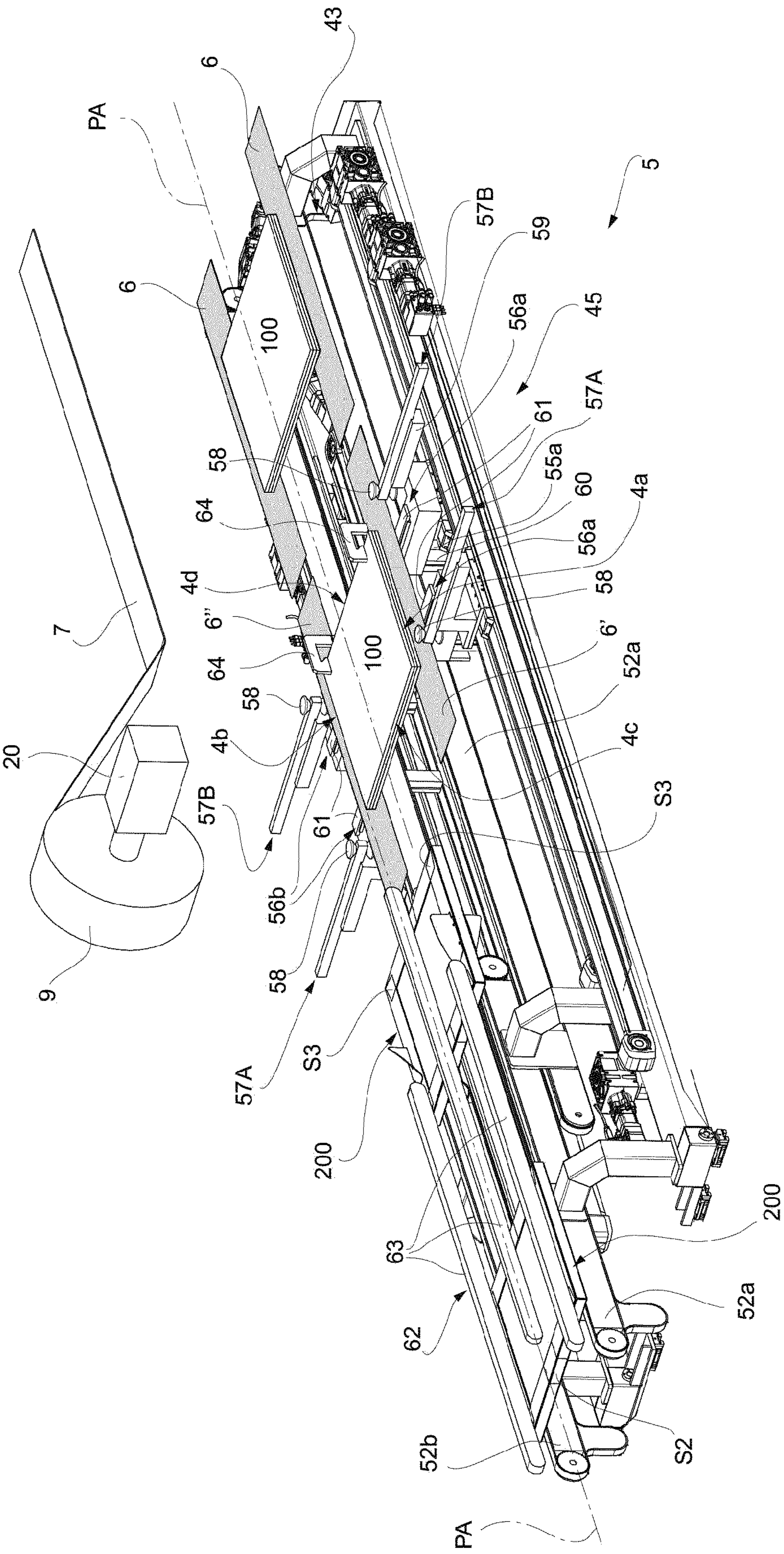
6
54a
13a
46
12
13b
53a
53a
44

FIG. 10

FIG. 11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45
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55a
58
60
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58
6''
6'
7
64
100
52a
58
20
4b
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S3
200
200
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52a
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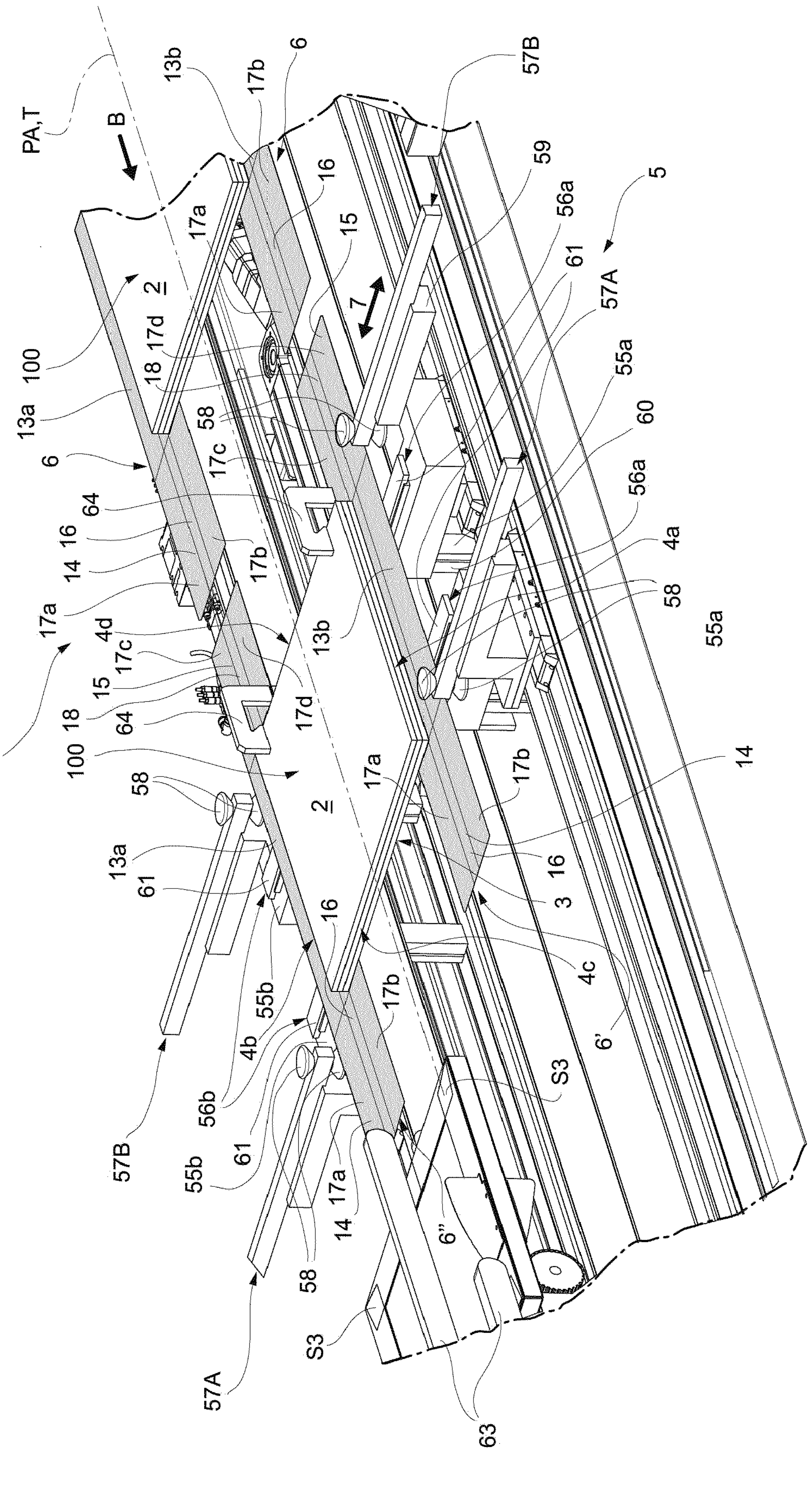
S2
52b
PA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56a
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57A
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17a
16
15
2
7
17d
18
100
13a
58
17c
6
64
16
14
17b
17a
4d
13b
17c
15
18
64
17d
45
100
2
17a
17b
16
3
4c
6'
S3
58
13a
61
16
55b
4b
56b
61
57B
55b
17a
14
6"
58
S3
57A
63

FIG. 12

Europäisches Patentamt
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EUROPEAN SEARCH REPORT

Application Number
EP 23 19 9700

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	WO 2014/091320 A1 (NUOVA SIMA SPA [IT]) 19 June 2014 (2014-06-19) * abstract * * figures 1-3 *	1-11	INV. B65B23/20 B65B43/12
A	US 2019/039762 A1 (TORO ANDREA [IT]) 7 February 2019 (2019-02-07) * abstract * * figures 10-12 *	1-11	
A	WO 2012/172485 A1 (NUOVA SIMA SPA [IT]; BARDI MAURIZIO [IT]) 20 December 2012 (2012-12-20) * abstract; claim 1 * * figures 1-3 *	1-11	
A	WO 2010/061312 A2 (SACMI [IT]; CARNEVALI FABIO [IT] ET AL.) 3 June 2010 (2010-06-03) * abstract * * figures 17A-17C *	1-11	
			TECHNICAL FIELDS SEARCHED (IPC)
			B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	2 February 2024	Damiani, Alberto

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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