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(54) **Packaging machine with automatic system for folding the closure flap of the package, and method for packaging**

(57) The invention relates to a packaging machine for packaging in packages provided with closure flaps with a thermoforming station (1) for thermoforming receptacles (2a) in a lower film (2), a flap cutting station (3); a filling station (4), in which products are inserted in said receptacles; a flap folding system (5) with holddown plates (5a, 5b) for gripping between one another the lower

film (2) in an area adjacent to a fold line (2c) of the flaps (2b); raising elements (5c) folding the flap (2b) upwards; a folding plate (5d) which, when the folded flaps pass under it, fold them over the receptacles (2a); a welding station (6) for welding an upper film (7) in areas (2d) of the lower film (2); and a unitary separation station (10) for packages (8), in which individual packages (8) will be formed from the films (2, 7).

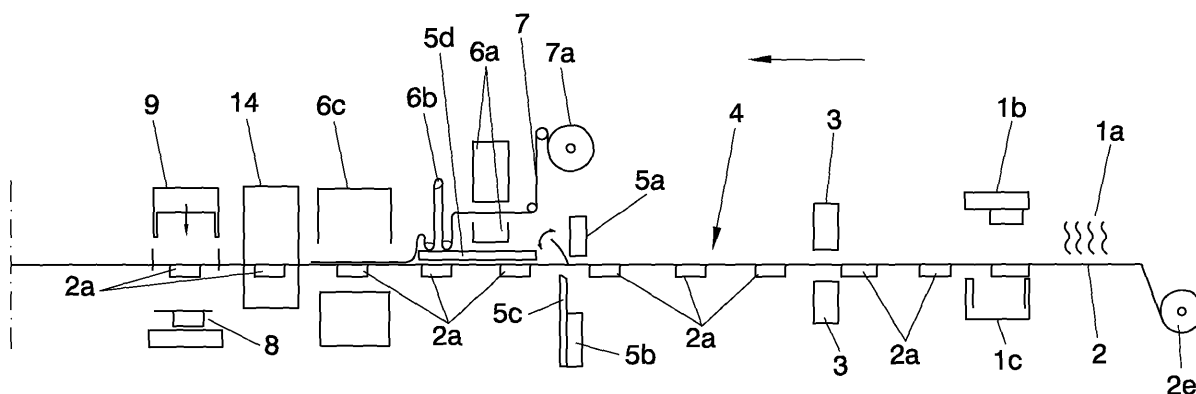


FIG. 2

DescriptionTechnical Field of the Intention

5 **[0001]** The present invention is comprised within the technical field of packaging machines and, particularly, in the sector of thermoforming packaging machines using plastic films, such as, for example, ABS, PVC, HIPS, PP, PET, etc., to form various types of packages, such as, for example, blisters.

Background of the Invention

10 **[0002]** Thermoforming is one of the oldest methods for processing plastics. It basically consists of subjecting a plastic film, such as ABS, PVC, HIPS, PP, PET, etc., arranged on a thermoforming mold and held at the ends by clamps, to a preheating, molding and cooling process. In this process, the previously heated material softens, becoming deformable, and is pressed against the mold such that the material adopts the form of the mold which is cooled. When the heated
15 material enters the cold mold, it cools and becomes rigid, the acquired form being stable. The thickness of wall of the formed piece is always less than the starting thickness of the film used for its manufacture.

[0003] Various methods for thermoforming the films are used depending on the plastic to be thermoformed, the type of pressing that is applied and on the final rigidity final and form of the piece to be obtained, such as compressed air (pressurized air) and/or vacuum forming, or plug-assisted compressed air and/or vacuum forming. The mold used varies
20 depending on these parameters.

[0004] Typically, a line for the continuous manufacture of packages provided with closure flaps, such as blisters, and the packaging of the corresponding products usually comprise a first lower piece thermoforming station, a flap cutting station, a product filling station, possibly a box filling station, a welding station for welding an upper film in the lower piece, and a unitary separation station for packages.

25 **[0005]** In the thermoforming station, the preforms of the lower piece are formed from a first plastic film fed from a first reel and progressively heated as it moves forward throughout a heating system, until reaching a press in which a ram (usually cooled by water) contacts with the hot surface of the film and gives it the form of the mold, such as, for example, a form complementary to the product which will later be housed in the package. The ram can comprise several identical molds, such that parallel rows of package preforms are formed in the film.

30 **[0006]** In the flap cutting station, the outer edges of each flap are cut and a fold line is made, such as, for example, a perforated line, through which the flap will later be folded to partially cover the upper part of the package.

[0007] The film of preforms then passes to the filling station in which the corresponding product is deposited in each mold preform, whereas in the box filling station respective sheets of paper or cardboard are inserted on the products contained in the respective preforms manually or by means of robots.

35 **[0008]** In the welding station, the upper cover is formed from a second plastic film, coated on its lower face with a lacquer, and fed from a second reel which moves forward through die-cutting means making rows of rectangular windows in the upper films. Then, the upper film is superposed on the rows of preforms of the packages such that the windows coincide with the flaps and is welded by pressure and heat to the contours of the preforms, closing them.

[0009] Finally, the rows of preforms already closed by the upper film pass to the unitary separation station in which
40 the unitary packages are cut.

[0010] These blister production lines have a series of drawbacks. For example, the folding of the flaps and their introduction under the second film is complex and requires a special tool, which increases the dimensions of the line and makes it more expensive, or it requires an operator who manually introduces the flap, increasing the production costs. On the other hand, the coating of the lower face of the upper film necessary for being able to perform the weld
45 by heat and pressure makes the price of said film more expensive and furthermore does not allow subjecting the upper film to thermoforming because the lacquer would lose its thickness as well as the uniformity thereof in the thermoforming operation, which involves heating and stretching the upper film. Thus, by way of example, in a film that is 300 microns thick and has a layer of lacquer 50 microns thick, the thickness of the lacquer may be reduced by approximately 90% to about 5 microns, in addition to losing the uniformity of the layer, which makes welding said film to the preforms of
50 package in the lower film difficult. Furthermore, when the upper film is stretched and heated, its layer of lacquer loses its shine and transparency, which are two important qualities in the blisters.

Description of the Invention

55 **[0011]** The object of the present invention is to overcome at least part of the drawbacks of the state of the art described above by means of a novel packaging machine with an automatic system for folding the closure flap of the package, particularly a blister, and by means of a novel method used for packaging.

[0012] Therefore, the machine according to the invention comprises

a thermoforming station in which successive groups of receptacles are heat-molded in a lower film, the receptacles of each group being arranged parallel to one another and transversely with respect to a forward movement direction of the lower film and separated from those of the next group by a transverse strip longer than the flaps,
 a flap cutting station for cutting the flaps in each transverse strip and simultaneously making, transversely with respect to the forward movement direction, fold lines of the flaps between each flap and each receptacle such that each flap is arranged in front of each receptacle in the forward movement direction;
 a filling station, in which products are inserted in said receptacles;
 a flap folding system for folding each flap over at least part of each receptacle;
 a welding station for welding an upper film in areas of the lower film, said areas corresponding to at least one part of the contour of each of the packages and said upper film covering only one part of each folded flap;
 a unitary separation station for packages, in which individual packages are formed from the films;

the folding system comprising:

- hold-down means for gripping between one another the lower film in an area adjacent to said fold line as it reaches the folding system;
- raising elements for the flaps for thrusting upwards the flaps of the lower film gripped by the hold-down means through their fold line;
- a folding plate arranged after the raising means, at a lower height than the height of the flaps thrust upwards in order to, when the lower film moves forward towards the welding station, force the flaps to pass under the folding plate to fold them through their fold lines over the respective receptacles;

[0013] synchronizing means for retracting the hold-down means and the raising means when the lower film with the folded flaps passes under the folding plate.

[0014] According to a preferred embodiment of the folding system, the hold-down means can each comprise an upper hold-down plate connected to an upper drive system for moving the upper hold-down plate in a vertical direction, and a lower hold-down plate connected to a lower drive system for moving the lower hold-down plate in a vertical direction. In this preferred embodiment, the lower hold-down plate and the raising element are assembled in a lower support connected to the lower drive system. The rear face of the lower hold-down plate and the front face of the raising element are in sliding contact through at least one vertical slide in the raising element in which there penetrates at least one lug emerging from the rear face of the lower hold-down plate. Likewise, according to the invention, each upper hold-down plate can be connected to the upper drive system through an upper forward movement position adjustment system, and each lower support can be connected to the lower drive system through a lower forward movement position adjustment system.

[0015] The lower hold-down plate can be assembled in the lower support through shock absorbing means, such that, when the hold-down plates have moved vertically towards one another and grip the transverse film, the upward thrust of the lower drive system causes a subsequent rise of the lower support and of the raising element as well as a compression of the shock absorbing means and an locking of the lower hold-down plate. According to the invention, the upper drive system can be an upper pneumatic cylinder, whereas the lower drive system can be a lower pneumatic cylinder. The upper drive system and the lower drive system are preferably anchored in a fixed frame.

[0016] In one embodiment of the shock absorbing means, the latter each comprise a vertical cylindrical bar with an upper part which is movable inside the lower hold-down plate and a lower part anchored in the lower support, as well as a coil spring with an lower end supported in the lower support and an upper end supported in the lower hold-down plate.

[0017] In another possible embodiment, the shock absorbing means each comprise a pneumatic shock absorber or a hydraulic shock absorber.

[0018] The folding plate can be coupled to a vertical adjustment guide which in turn is coupled to a forward movement position adjustment guide emerging from a rear part of the fixed frame.

[0019] According to a preferred embodiment of the welding station, the latter can comprise a high-frequency welding press with welding and pre-cutting strips emerging from the lower part of an upper welding tool in correspondence with the areas to be welded in the contour of the packages which will subsequently be made individual, as well as a lower welding tool. In this preferred embodiment, each strip can comprise an outer blade part. The blade has in this case a cutting edge with a lower height than the thickness of the lower film and of the upper film, in order to make a pre-cut in the form of a weakening line weak enough to allow the automatic separation of the finished packages from the films in the unitary separation station.

[0020] According to the invention, the unitary separation station can comprise an upper ejection tool arranged above the production line, and a lower ejection tool arranged under the production line and provided with ejection openings for the finished packages. In this case, the upper ejection tool comprises a plurality of support bars between respective two of which there are arranged respective plates forming respective ejection surfaces, whereas the lower ejection tool is vertically movable in an upward and downward direction by means of a lower pneumatic actuator coupled to the lower

frame. Likewise, in this case the plates with the ejection surfaces and the ejection openings have, in the horizontal plane, dimensions similar to those of the packages, and are vertically aligned with one another. In turn, the ejection surfaces are sized and arranged such that each can penetrate an ejection opening of the lower ejection tool, for the purpose of ejecting each package from the assembly formed by the films, for example towards a conveyor belt or collecting container.

[0021] The plates forming the ejection surfaces can be inclined plates, and each of the inclined plates is attached at its end parts to an upper part of the support bars, the lowest end parts being located at the height of the upper part of the support bars.

[0022] The upper ejection tool can furthermore be provided with respective suction cups anchored in an upper horizontal structure emerging from the lower part through respective circular holes in the respective plates and holding the preformed package for the purpose of assuring that each ejection surface passes over the entire contour of the pre-cut package in the lower and upper films, and thus the complete separation of the package from said films is produced.

[0023] In a preferred embodiment of the unitary separation station, the support bars are connected at their respective upper ends to said upper horizontal structure by means of spring shock absorbers, whereas said upper horizontal structure is in turn connected to an upper pneumatic actuator allowing the upper ejection tool to perform upward and downward vertical movements. In this preferred embodiment, the lower ejection tool comprises a lower frame in which there is supported an upper bridge with a horizontal grill with crosspieces between which said ejection openings are located. This arrangement allows that when a group of preformed packages in the films has been arranged in the unitary separation station, the upper ejection tool and the lower ejection tool are vertically moved towards one another until the support bars are supported on the crosspieces of the horizontal grill. Then, when the upper pneumatic actuator continues thrusting the upper ejection tool downwards, the spring shock absorbers are gradually compressed until the ejection surfaces have entered the ejection openings, thus forcing the preformed packages to be separated from the films.

[0024] On the other hand, the method of packaging products in packages, particularly blisters, provided with closure flaps with automatic folding of the flaps, comprises

heat-molding in a thermoforming station successive groups of receptacles in a lower film, the receptacles of each group being arranged parallel to one another and transversely with respect to a forward movement direction of the lower film and separated from those of the next group by a transverse strip longer than the flaps;

cutting, in a flap cutting station, in each transverse strip, the flaps and simultaneously making, transversely with respect to the forward movement direction, fold lines of the flaps between each flap and each receptacle such that each flap is arranged in front of each receptacle in the forward movement direction;

inserting products in said receptacles, in a filling station,

folding each flap over at least part of each receptacle in a flap folding system;

welding an upper film in areas of the lower film, said areas corresponding to at least one part of the contour of each of the packages and said upper film covering only a part of each folded flap, in a welding station;

forming, in a unitary separation station for packages, individual packages from the films;

characterized in that the method comprises the steps of

gripping the lower film in an area adjacent to the fold line by means of hold-down means;

thrusting the flaps upwards by means of raising means, folding them through the fold lines;

folding the flaps thrust upwards, making them pass under a folding plate arranged after the raising means, at a lower height than the height of the flaps thrust upwards in order to, when the lower film moves forward, fold them through their fold lines over the respective receptacles;

retracting the hold-down means and the raising means when the lower film with the folded flaps passes under the folding plate.

[0025] In a preferred embodiment the method further comprises

superposing an upper film on the film after the film has passed under the folding plate such that openings of the upper film coincide with a part of the flaps;

welding the films in a welding press, in which the upper film is welded in areas of the film corresponding to the contour of the packages.

[0026] A pre-cut can furthermore be made in the welding press which surrounds the welded areas in the contour of each of the packages which will subsequently be made individual. According to this embodiment, each of the packages can be extracted from the films in the unitary package station, separating each package through the corresponding pre-cut.

Brief Description of the Drawings

[0027] Aspects and embodiments of the invention are described below based on several drawings in which

Figure 1 is a general side elevational schematic view of an embodiment of a machine according to the present invention;

Figure 2 schematically illustrates the jobs performed in the various stations of the machine shown in Figure 1;

Figure 3 is a general schematic view showing the films resulting from the jobs performed in the stations of the machine shown in Figure 2;

Figure 4 schematically shows with greater detail an embodiment of the steps performed by the machine of Figure 1 after having inserted the product in one of the receptacles in the lower film until welding the upper film on the lower film;

Figure 5A schematically shows the configuration of the film in the steps shown in Figure 4;

Figure 5B is a view of an embodiment of a package manufactured by means of the present invention;

Figure 6 is a front perspective view showing the entrance of the lower film already provided with receptacles in a flap cutting station according to an embodiment of the present invention;

Figure 7 is a partial upper plan view of the lower film exiting the flap cutting station shown in Figure 6, in which the flaps cut in said film can be seen;

Figure 8 is a rear side perspective view showing an embodiment of the flap folding system;

Figure 9 is a side elevational view showing the folding system of Figure 8 as well as a die-cutting device for the upper film and an applicator device for applying the die-cut upper film on the lower film;

Figure 10 is a side elevational view of the folding system shown in Figures 8 and 9;

Figure 11 is a partial side elevational view of the assembly formed by the hold-down means, the flap raising means and the folding plate shown in Figure 10;

Figure 12 is a lower front perspective view of the raising means shown in Figures 8-11 and with the lower hold-down means disassembled;

Figure 13 is an upper side perspective view of the folding plate shown in Figures 8-11;

Figure 14 is a partial rear side schematic perspective view showing how the die-cut upper film is arranged on the lower film and the flaps thereof;

Figure 15 is a side view of the welded films exiting the welding station, and of an embodiment of the unitary separation station for packages;

Figure 16 is a lower plan schematic view of the upper tool of the welding press;

Figure 17 is an upper plan schematic view of the lower tool of the welding press;

Figure 18 is a partial schematic section view by line A-A' appearing in Figure 16 of a welding strip according to the present invention

Figure 19 is a front-side perspective view of the unitary separation station for packages shown in Figure 15;

Figure 20 is a side elevational view of the unitary separation station for packages shown in Figures 18 and 19;

Figure 21 is a partial front-side perspective view of the unitary separation station for packages shown in Figures 15, 19 and 20.

[0028] Reference numbers are seen in these figures which identify the following elements:

- 1 thermoforming station
- 1a heating system
- 1b thermoforming press
- 1c press ram
- 1d forming tool
- 2 lower film
- 2a receptacle
- 2b flap
- 2c fold line
- 2d areas of the lower film corresponding to the contour of each of the packages
- 2e reel of the lower film
- 2f notch left by the cut flap
- 3 flap cutting station
- 3a cutting press
- 4 filling station
- 5 flap folding system
- 5a upper hold-down means
- 5b lower hold-down means
- 5c flap raising element
- 5d folding plate

	5e	deflecting flat bar
	5f	vertical cylindrical bar
	5g	upper pneumatic cylinder
	5h	upper forward movement position adjustment system
5	5i	lower pneumatic cylinder
	5j	lower forward movement position adjustment system
	5k	fixed frame
	5l	lower support
	5m	forward movement position adjustment guide
10	5n	vertical adjustment guide
	5o	coil spring
	5p	lug
	5q	slide
	6	welding station
15	6a	die cutter
	6b	feeding system
	6c	welding press
	6d	upper welding tool
	6e	lower welding tool
20	6f	upper opening
	6g	lower opening
	6h	welding and pre-cutting strip
	6i	blade part
	6j	planar part
25	7	upper film
	7a	reel of the upper film
	7b	opening in the upper film
	8	package
	9	unitary separation station
30	9a	upper ejection tool
	9b	lower ejection tool
	9c	upper pneumatic actuator
	9d	ejection opening
	9e	ejection surface
35	9f	suction cup
	9g	lower frame
	9h	support bar
	9i	circular hole
	9j	upper bridge
40	9k	horizontal grill
	9l	upper horizontal structure
	9m	spring shock absorber
	10	scrap winding device
	11	hanging hole
45	12	hydraulic unit
	13	control panel
	14	hanging hole cutting station
	15	outgoing conveyor belt

50 Embodiments of the Invention

[0029] Figures 1-4 show an embodiment of a machine for manufacturing packages in the form of blisters -8- provided with thermoformed receptacles -2a- and closure flaps -2b- of the type such as the one shown with more detail and in a merely illustrative manner in Figure 5B, as well as the steps of the thermoforming, loading and finishing process performed by such machine. In these figures, the vertical arrows indicate the forward movement direction of the machine.

[0030] In this embodiment, the machine comprises a thermoforming station -1- conventional in itself, a flap cutting station -3- conventional in itself, a filling station -4- conventional in itself, a flap folding system -5-, a welding station -6-, and a unitary separation station -10- for the packages.

[0031] In the thermoforming station -1- a lower film -2-, for example made of PET or PVC, coming from a reel -2e- first passes through a heating system -1a-, which can be formed, for example, from an assembly of infrared tiles located above the film -2a-, the temperature of which increases as the film -2a- moves forward towards the outlet of the heating system -1a-. At the outlet of the heating system -1a- there is located a thermoforming press -1 b- provided with an upper press ram -1c- cooled by water as well as a lower molding tool -1d-. The thermoforming press -1 b- molds successive groups of receptacles -2a- in the film -2a- arranged parallel to one another and transversely to the forward movement direction of the film -2- in the machine. The groups are separated from one another by means of respective transverse strips of the film -2a-, from which, as well be described below, the closure flaps -2b- of the finished packages -8 - will be cut. By way of example, Figures 2 and 3 show groups respectively formed by four parallel receptacles -2a-.

[0032] Upon exiting the thermoforming station -1-, the film -2- passes through a flap cutting station -3- in which, by means of a cutting press -3a- (see also Figure 6) the outer edges of the flaps -2b- are cut and fold lines -2c- of the flaps -2b- between each flap -2b- and each receptacle -2a- are simultaneously made, transversely with respect to the forward movement direction, such that, seen in the forward movement direction, each flap -2b- is arranged in front of each receptacle -2a- (see also Figures 5A, drawing (I) and Figure 7).

[0033] The film -2- provided with the receptacles -2a-, the cut flaps -2b- and the fold lines -2c- then moves forward through a filling station -4- in which respective products (not shown in the figures) are inserted in the receptacles -2a-. This insertion can be carried out conventionally by means of an automatic system (not shown in the figures) or manually.

[0034] When the film -2- continues moving forward, it enters a folding system -5- in which the film -2- is first gripped between an upper hold-down means -5a- and a lower hold-down means -5b- in an area adjacent to the fold line -2c- of the cut flaps -2b-. Once the film -2- is gripped, each cut flap -2b- is folded upwards through its fold line -2c- due to the action of a raising element -5c- (see also Figure 5A, drawing (II)). When the film -2- resumes its forward movement, the upwardly folded flaps contact an inclined deflecting flat bar -5e- arranged in the transverse edge of a folding plate -5d-, at which time the hold-down plates -5a, 5b- open and the raising element -5c- moves downwards, the hold-down plates -5a, 5b- and the raising element -5c- waiting for the arrival of the next group of cut flaps -2b- in the lower film -2-. The film -2- then moves forwards under the folding plate -5d- towards the welding station -6-. Given that the folding plate -5d- is arranged on the film -2- at a lower height than the height of the upwardly folded flaps -2b-, when the latter pass under the folding plate -5d- they are forced to be folded over the lower film -2- through their respective fold lines -2c-, such that each of the flaps -2d- is arranged on a part of the receptacle -2a- which it precedes.

[0035] According to the embodiment of the raising system shown in Figures 8 and 10-13, the upper hold-down plate -5a- is connected to an upper pneumatic cylinder -5g- through an upper forward movement position adjustment system -5h-, whereas the lower hold-down plate -5b- is connected to a lower pneumatic cylinder -5i- through a lower support -51- and a lower forward movement position adjustment system -5j-. The raising element -5c- is also locked in the support. The adjustment systems -5h, 5j- allow moving the position of the hold-down plates -5a, 5b- forwards and backwards to adapt to the length of the flaps -2b- of the packages -8- which are being manufactured. The pneumatic cylinders -5g, 5i- are anchored in a fixed frame -5k-, from the rear part of which there emerges horizontally a forward movement position adjustment guide -5m- to which a vertical adjustment guide -5n- attached to the folding plate -5d- is coupled. These guides -5m, 5n- allow adapting the relative position of the folding plate -5d- with respect to the characteristics of the flap -2b- of the type of packages -8- which are being manufactured in each production cycle.

[0036] The lower hold-down plate -5b- is assembled in a sliding manner on a vertical cylindrical bar -5f- anchored in the lower support -51- and surrounded by a coil spring -5o- which at its lower end is supported in the lower support -51- and at its upper end is supported in the lower hold-down plate -5b-. The rear face of the lower hold-down plate -5b- and the front face of the raising element -5c- are in sliding contact through vertical slides -5g- in the raising element -5c- in which there penetrate one or more lugs -5p- emerging from the rear face of the lower hold-down plate -5b-.

[0037] To fold a flap -2b-, the pneumatic cylinders -5g, 5i- are first actuated to vertically move the hold-down plates -5a, 5b- until they collide with one another, gripping the fold line -2c- of the flap -2b-. In this position, the upper pneumatic cylinder -5g- stops whereas the lower pneumatic cylinder -5i- continues thrusting the support -51- upwards, such that the support -51- continues rising and thrusting the cylindrical bar -5f- into the lower hold-down plate -5b- while at the same time the spring -5o- is compressed. This in turn causes the raising element -5c- to continue rising and folding the flap -2b- upwards. When the raising element -5c- has reached a predetermined vertical position, the lower pneumatic cylinder -5i- also stops.

[0038] When the lower film -2- continues moving forward after having passed through the folding system -5-, it enters the welding station -6- (see also Figure 9) in which it meets an upper film -7- supplied from reel -7a- through a feeding system -6b- formed by an assembly of rollers, and provided with transverse rectangular openings -7b-. The upper film -7- is superposed on the lower film -2- such that its openings -7b- coincide with a part of the flaps -2b- (see Figures 14 and 5A, drawing (III)). It is thus achieved on one hand that the flaps -2b- remain folded to the lower film -2- on the side of the upper film -7- which is superposed on a part of the flaps -2b- and, on the other hand, that in the finished package -8- there is a part of the flap -2b- that is not covered by the upper film -7- from which the flap -2b- can be opened.

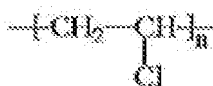
[0039] The thus superposed upper and lower films -2,7- then move forward to the welding press -6c-, in which the

upper film -7- is welded in areas -2d- of the lower film -2- corresponding to the contour of the packages -8- which will subsequently be made individual in a unitary separation station -10-, as will be described below in the present specification. An assembly of films -2,7- is thus formed in which there are preformed packages attached to said films -2,7-. In the case of the embodiment shown in Figure 17, there is evidently no welding of the films -2,7- in the contour areas in which the opening -7b- of the upper film -7- is located.

[0040] In the embodiment shown in the figures, the welding press -6c- performs high-frequency welding which allows welding films -2,7- made of popular plastics such as PET (having bonds to O atom) and PVC (having bonds to Cl atoms) without needing lacquers, as shown by the following formulas:



PET



PVC

[0041] With this type of welding, the films -2,7- are excited to their resonance frequency corresponding to a nominal frequency of about 27.2 MHz, which must be conventionally adjusted according to the specific material, the thickness of the films, etc. In the resonance frequency, the atoms determining the polar nature of the material of the films, such as, for example, chlorine in the case of PVC and oxygen in the case of PET, change their orientation as many times as the polarity, such that during their movement they rub against the rest of the molecules and cause the heating of the welding area until the films -2,7- can be welded to one another. Thus, unlike the welding by pressure and heat conventionally used in this type of packaging machine, in which the welding is performed by heat conduction from the outer surfaces of the films towards the inside, in high-frequency welding the heat is transmitted from the surface of the films -2,7- which are in contact with one another, i.e., from the inside towards their outer surfaces.

[0042] To achieve a good high-frequency welding, the thicknesses of the films can usually have a value comprised between 100 nanometers and 1 mm. In the manufacture of the packages with the machine of the present invention, the lower film -2- must have a thickness of about 300 to 500 nanometers, preferably about 400 nanometers, and that of upper film -7- a thickness of 100 to 300 nanometers, preferably about 200 nanometers.

[0043] To perform the high-frequency welding, the welding press -6c- comprises welding and pre-cutting strips -6h- (see Figures 19 and 21) emerging downwards from the lower face of an upper welding tool -6h- (see Figures 1 and 19) in correspondence with the areas to be welded in the contour of the packages -8- which will subsequently be made individual, as well as a lower welding tool -6i- (see Figure 20).

[0044] The welding and pre-cutting strips -6h- comprise an outer blade part -6i- exterior and an inner horizontal planar part -6j-, with a width of for example 0.4-0.5 nanometers. The cutting edge of the blade -6h- is not very sharp and has a height-e-considerably lower than the thickness of the lower film -2- and the upper film -7-. The blade -6i- thus allows obtaining a pre-cut in the form of a weakening line weak enough to allow the automatic separation of the finished packages -8- from the films -2,7- in the unitary separation station -9-, obtaining an efficient welding of the upper film -7- in the lower film -2-, as well as an attachment of the packages -8- to the films -2,7- strong enough so as to not be detached therefrom before reaching the unitary separation station -9-. To achieve these effects simultaneously, the welding and pre-cutting strips -6h- must be adapted, in terms of the length of the blade -6i-, to the thickness of the films used to manufacture the packages -8-.

[0045] Once the welding has been performed in the welding and pre-cutting press -6c-, the assembly of the films -2,7- with the preformed packages -8- moves forward to a hanging hole cutting station -14- in which a hanging hole -11-, such as, for example, a "Eurolock" type hole, is made in an area of the preformed packages -8- different from the welding area and different from that occupied by the receptacle.

[0046] The groups of preformed packages move forward from the cutting station -14- towards the unitary separation station -9- in which the preformed packages -8- are extracted from the films -2,7- by means of the action of an upper ejection tool -9a- arranged above the production line and a lower ejection tool -9b- arranged under the production line (see Figures 19 - 21).

[0047] The upper ejection tool -9a- comprises five support bars -9h- between respective two of which there are arranged respective inclined plates forming respective ejection surfaces -9e-, as well as respective suction cups -9f- emerging from the lower part through respective circular holes -9i- in the respective inclined plates. The four inclined plates are attached at their respective end parts to an upper horizontal structure -91-, the lowest end parts being located at the height of the upper part of the support bars -9h-. The respective upper ends of the support bars -9h- are also connected to the upper horizontal structure -91- by means of spring shock absorbers -9m-. The upper horizontal structure -91- is in turn connected to an upper pneumatic actuator -9c- allowing the upper ejection tool -9a- to perform upward and downward vertical movements. The lower ejection tool -9b- of the unitary separation station -9- in turn comprises a lower frame -9g- in which there is supported an upper bridge -9j- with a horizontal grill -9k- comprising four ejection openings -9d-. The lower ejection tool -9b- is also vertically movable in an upward and downward direction by means of a lower pneumatic actuator (not shown in the figures) coupled to the lower frame -9g-. The four inclined plates with the ejection surfaces -9e- and the four ejection openings -9d- have, in the horizontal plane, dimensions similar to those of the packages -8-, and are vertically aligned with one another.

[0048] When a group of preformed packages -8- in the films -2,7- has been arranged in the unitary separation station -9-, the upper ejection tool -9a- and the lower ejection tool -9b- are moved vertically towards one another until the support bars -9h- are supported on the crosspieces of the horizontal grill -9k-. At this time, the lower pneumatic actuator stops conferring upward movement to the lower ejection tool -9b- but the upper pneumatic actuator -9c- continues thrusting the upper ejection tool -9a- such that the spring shock absorbers -9m- are gradually compressed until the ejection surfaces -9e- have entered the ejection openings -9d-, thus forcing the preformed packages -8- to be separated from the films -2,7- and to fall on the outgoing conveyor belt -15-.

[0049] As the successive groups of preformed packages -8- are ejected in the unitary separation station -9-, the scraps of the films -2,7- move forwards towards the scrap winding device -10- in which a scrap reel is formed.

Claims

1. Packaging machine for packaging in packages, particularly blisters, provided with closure flaps with automatic folding of the flaps, comprising
 a thermoforming station (1) in which successive groups of receptacles (2a) are heat-molded in a lower film (2), the receptacles (2a) of each group being arranged parallel to one another and transversely with respect to a forward movement direction of the lower film (2) and separated from those of the next group by a transverse strip longer than the flaps (2b),
 a flap cutting station (3) for cutting the flaps (2b) in each transverse strip and simultaneously making, transversely with respect to the forward movement direction, fold lines (2c) of the flaps (2b) between each flap (2b) and each receptacle (2a) such that each flap (2b) is arranged in front of each receptacle (2a) in the forward movement direction;
 a filling station (4), in which products are inserted in said receptacles;
 a flap folding system (5) for folding each flap (2b) over at least part of each receptacle (2a);
 a welding station (6) for welding an upper film (7) in areas (2d) of the lower films (2), said areas (2) corresponding to at least one part of the contour of each of the packages (8) and said upper film (7) covering only a part of each folded flap (2b);
 a unitary separation station (10) for packages (8), in which individual packages (8) are formed from the films (2,7);
characterized in that the folding system (5) comprises:

- hold-down means (5a, 5b) for gripping between one another the lower films (2) in an area adjacent to said fold line (2c) as it reaches the folding system (5);
- raising element (5c) for the flaps (2b) for thrusting upwards the flaps (2b) of the lower film (2) gripped by the hold-down means (5a, 5b) through their fold line (2c);
- a folding plate (5d) arranged after the raising means (5c), at a lower height than the height of the flaps (2b) thrust upwards in order to, when the lower film (2) moves forward towards the welding station (6), force the flaps (2) to pass under the folding plate (5d) to fold them through their fold lines (2c) over the respective

receptacles (2a);

- synchronizing means for retracting the hold-down means (5a, 5b) and the raising means (5c) when the lower film (2) with the folded flaps (2b) passes under the folding plate (5d).

- 5 **2.** Packaging machine according to claim 1, **characterized in that**
the hold-down means (5a, 5b) each comprise an upper hold-down plate (5a) connected to an upper drive system (5g) for moving the upper hold-down plate in a vertical direction, and a lower hold-down plate (5b) connected to a lower drive system (5i) for moving the lower hold-down plate (5b) in a vertical direction;
the lower hold-down plate (5b) and the raising element (5c) are assembled in a lower support (51) connected to the
10 lower drive system (5i);
the lower hold-down plate (5b) is assembled in the lower support (5i) through shock absorbing means (5f, 5o), such that, when the hold-down plates (5a, 5b) have moved vertically towards one another and grip the transverse film (2a), an upward thrust of the lower drive system (5i) causes a subsequent rise of the lower support (51) and of the raising element (5c) as well as a compression of the shock absorbing means (5f, 5o) and a locking of the lower
15 hold-down plate (5b).

- 3.** Packaging machine according to any of the previous claims, **characterized in that** each upper hold-down plate (5a) is connected to the upper drive system (5g) through an upper forward movement position adjustment system (5h).

- 20 **4.** Packaging machine according to any of claims 2 to 3, **characterized in that** each lower support (51) is connected to the lower drive system (5i) through a lower forward movement position adjustment system (5h).

- 5.** Packaging machine according to any of the previous claims, **characterized in that** the folding plate (5d) is coupled to a vertical adjustment guide (5n) coupled in turn to a forward movement position adjustment guide (5m) emerging from a rear part of the fixed frame (5k).
25

- 6.** Packaging machine according to any of claims 2 to 4, **characterized in that** the rear face of the lower hold-down plate (5b) and the front face of the raising element (5c) are in sliding contact through at least one vertical slide (5g) in the raising element (5c) in which there penetrates at least one lug (5p) emerging from the rear face of the lower
30 hold-down plate (5b).

- 7.** Packaging machine according to any of the previous claims, **characterized in that** the welding station (6) comprises a high-frequency welding press (6c) for welding the upper film (7) in areas (2d) of the film (2) corresponding to the contour of the package and making a pre-cut in the form of a weakening line weak enough to allow the automatic separation of the finished packages (8) from the films (2,7) in the unitary separation station (9).
35

- 8.** Packaging machine according to any of the previous claims, **characterized in that**
the unitary separation station (9) comprises an upper ejection tool (9a) arranged above the manufacturing line, and a lower ejection tool (9b) arranged under the manufacturing line and provided with ejection openings (9d) for the finished package(8);
40 the upper ejection tool (9a) comprises a plurality of support bars (9h) between respective two of which there are arranged respective plates forming respective ejection surfaces (9e);
the lower ejection tool (9b) is vertically movable in an upward and downward direction by means of a lower pneumatic actuator coupled to the lower frame (9g);
45 the plates with the ejection surfaces (9e) and the ejection openings (9d) have, in the horizontal plane, dimensions similar to those of the packages (8), and are vertically aligned with one another;
the ejection surfaces (9e) are sized and arranged such that each can penetrate an ejection opening (9d) of the lower ejection tool (9b).

- 50 **9.** Machine according to claim 8, **characterized in that** it comprises respective suction cups (9f) emerging from the lower part through respective circular holes (9i) in the respective plates and anchored in an upper horizontal structure (9l).

- 10.** Machine according to claim 8 or 9, **characterized in that** the support bars (9h) are connected at their respective upper ends to said upper horizontal structure (9l) by means of spring shock absorbers (9m);
55 the upper horizontal structure (9l) is connected to an upper pneumatic actuator (9c) allowing the upper ejection tool (9a) to perform upward and downward vertical movements,
the lower ejection tool (9b) comprises a lower frame (9g) in which there is supported an upper bridge (9j) with a

horizontal grill (9k) with crosspieces between which said ejection openings (9d) are located;
 such that when a group of preformed packages (8) in the films (2,7) has been arranged in the unitary separation
 station (9), the upper ejection tool (9a) and the lower ejection tool (9b) are moved vertically towards one another
 until the support bars (9h) are supported on the crosspieces of the horizontal grill (9k), and the upper pneumatic
 actuator (9c) continues thrusting the upper ejection tool (9a) downwards, the spring shock absorbers (9m) are
 gradually compressed until the ejection surfaces (9e) have entered the ejection openings (9d), thus forcing the
 preformed packages (8) to be separated from the films (2,7).

- 11.** Method of packaging products in packages, particularly blisters, provided with closure flaps with automatic folding
 of the flaps, comprising
 heat-molding in a thermoforming station (1) successive groups of receptacle (2a) in a lower film (2), the receptacles
 (2a) of each group being arranged parallel to one another and transversely with respect to a forward movement
 direction of the lower film (2) and separated from those of the next group by a transverse strip longer than the flaps (2b),
 cutting, in a flap cutting station (3), in each transverse strip, the flaps (2b) and simultaneously making, transversely
 with respect to the forward movement direction, fold lines (2c) of the flaps (2b) between each flap (2b) and each
 receptacle (2a) such that each flap (2b) is arranged in front of each receptacle (2a) in the forward movement direction;
 inserting products in said receptacles, in a filling station (4),
 folding each flap (2b) over at least part of each receptacle (2a) in a flap folding system (5);
 welding an upper film (7) in areas (2d) of the lower films (2), said areas (2) corresponding to at least one part of the
 contour of each of the packages (8) and said upper film (7) covering only a part of each folded flap (2b), in a welding
 station (6);
 forming, in a unitary separation station (10) for packages (8), individual packages (8) from the films (2,7);
characterized in that the method comprises the steps of
 gripping the lower film (2) in an area adjacent to the fold line (2c) by means of hold-down means (5a, 5b);
 thrusting the flaps (2b) upwards by means of raising means (5c), folding them through the fold lines (2c);
 folding the flaps (2b) thrust upwards, making them pass under a folding plate (5d) arranged after the raising means
 (5c), at a lower height than the height of the flaps (2b) thrust upwards in order to, when the lower film (2) moves
 forward, fold them through their fold lines (2c) over the respective receptacles (2a);
 retracting the hold-down means (5a, 5b) and the raising means (5c) when the lower film (2) with the folded flaps
 (2b) passes under the folding plate (5d).
- 12.** Method of packaging according to claim 11, **characterized in that** it further comprises
 superposing an upper film (7) on the film (2) after the film (2) has passed under the folding plate (5d) such that
 openings (7b) of the upper film (7) coincide with a part of the flaps (2b);
 welding the films (2,7) in a welding press (6c), in which the upper film (7) is welded in areas (2d) of the film (2)
 corresponding to the contour of the packages (8).
- 13.** Method of packaging according to claims 11 or 12, **characterized in that** in the welding press (6) a pre-cut (6h) is
 furthermore made, which pre-cut surrounds the welded areas in the contour of each of the packages (8) which will
 subsequently be made individual.
- 14.** Method of packaging according to claims 13, **characterized in that** each of the packages (8) is extracted from the
 films (2,7) in the unitary package station (10), separating each package (8) through the corresponding pre-cut (6h).

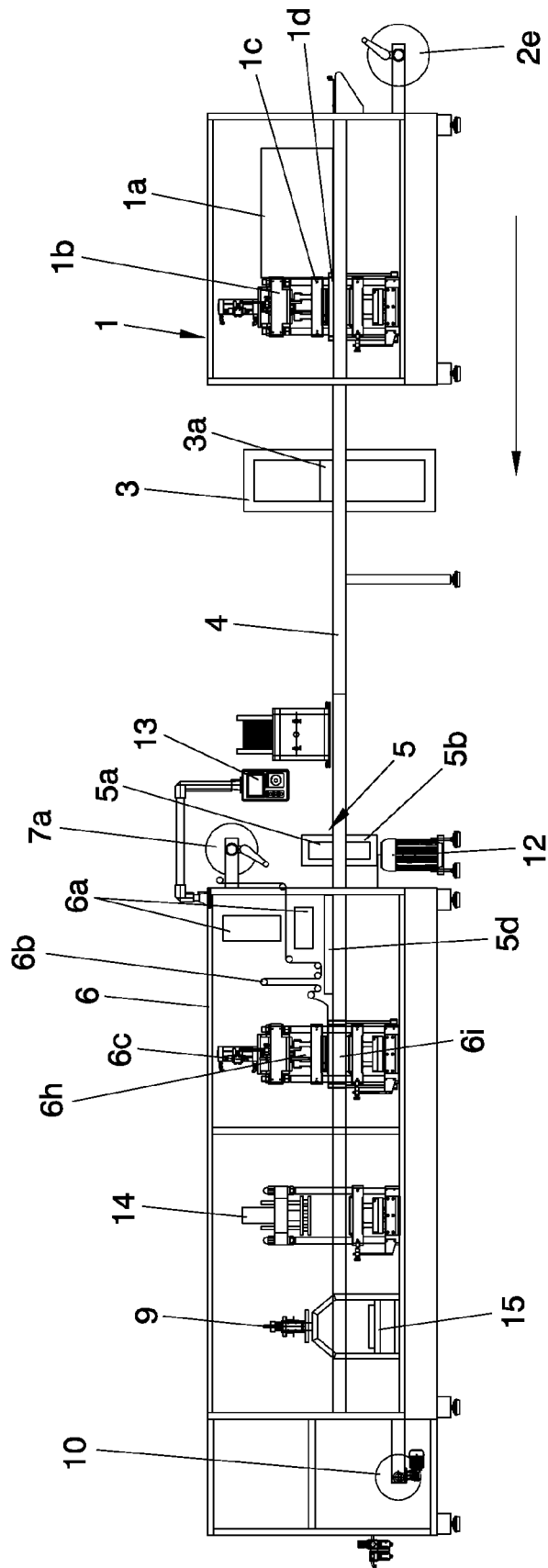


FIG. 1

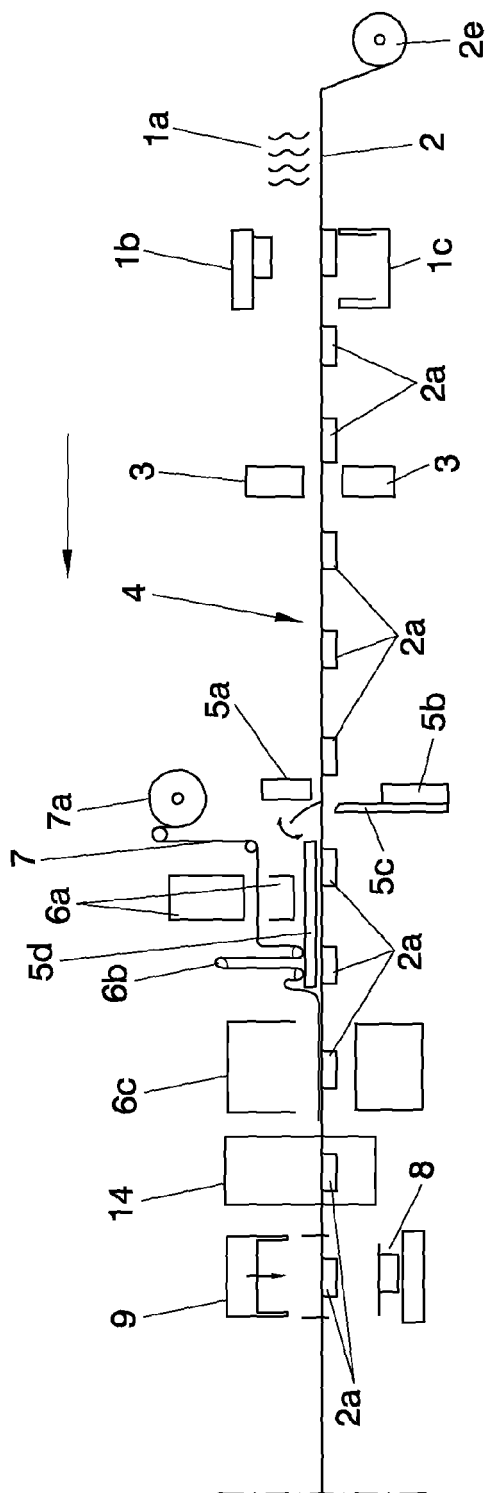


FIG. 2

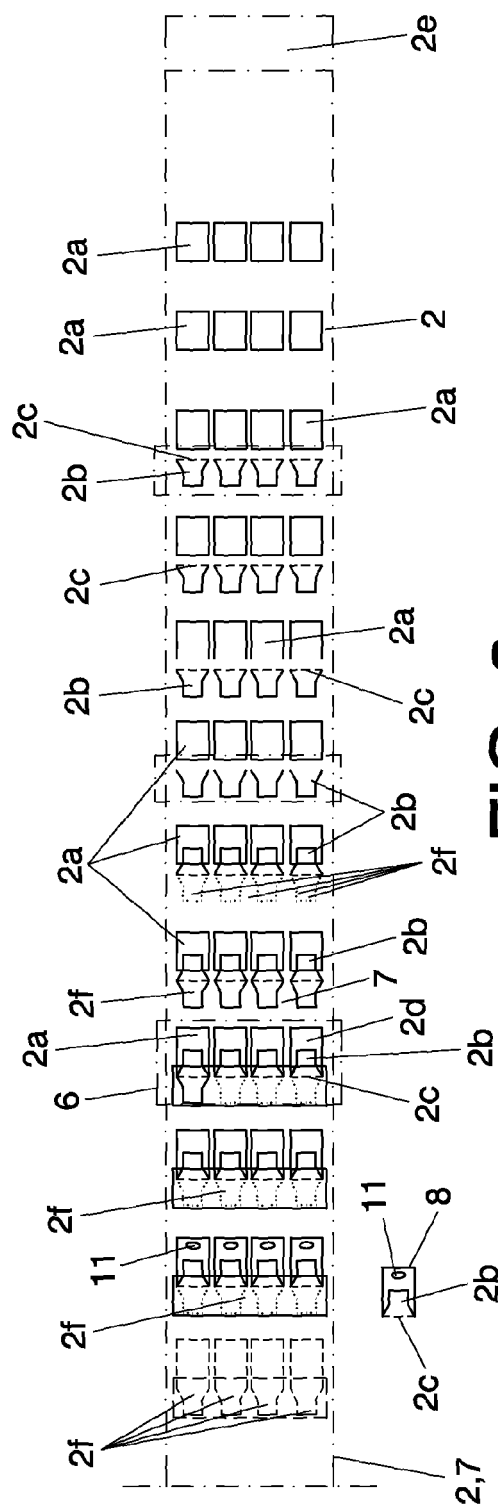


FIG. 3

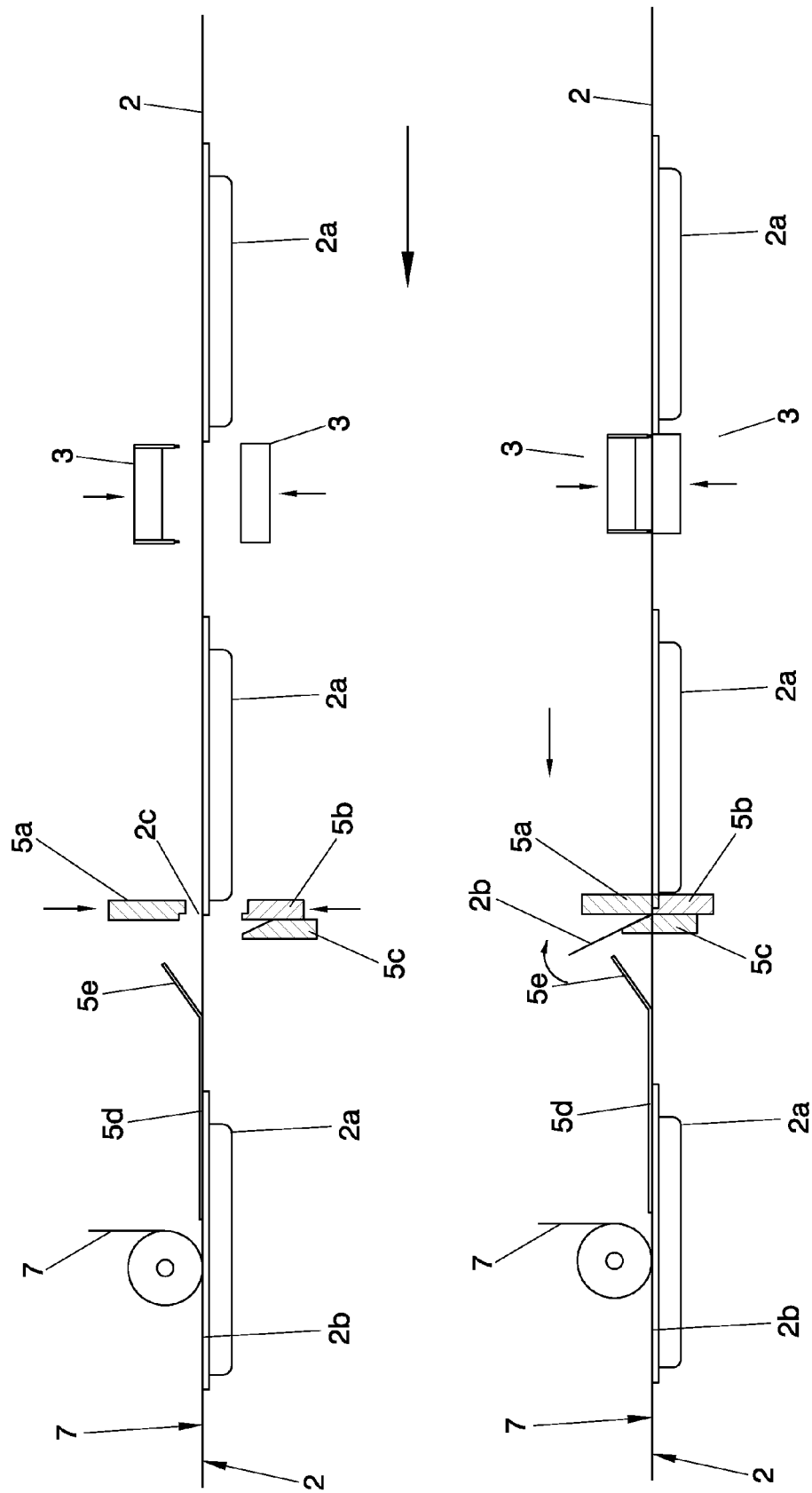


FIG. 4

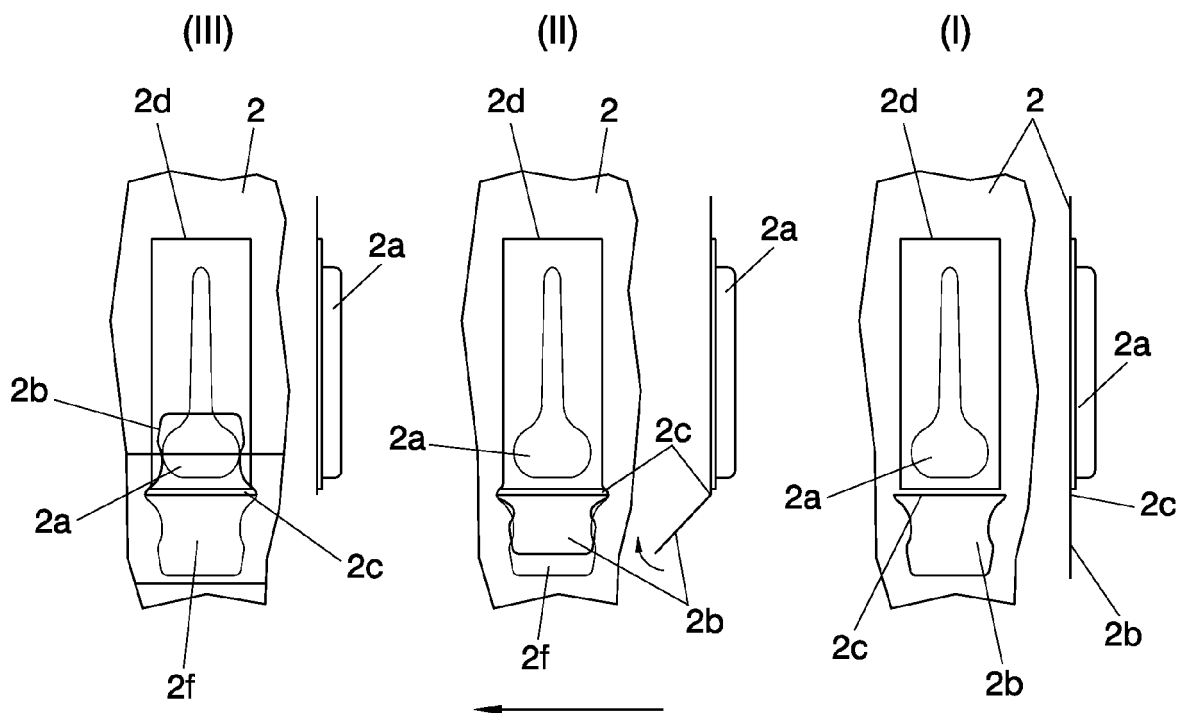


FIG. 5A

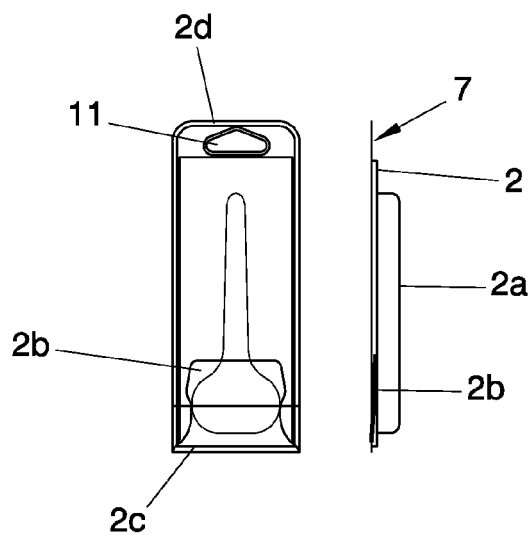


FIG. 5B

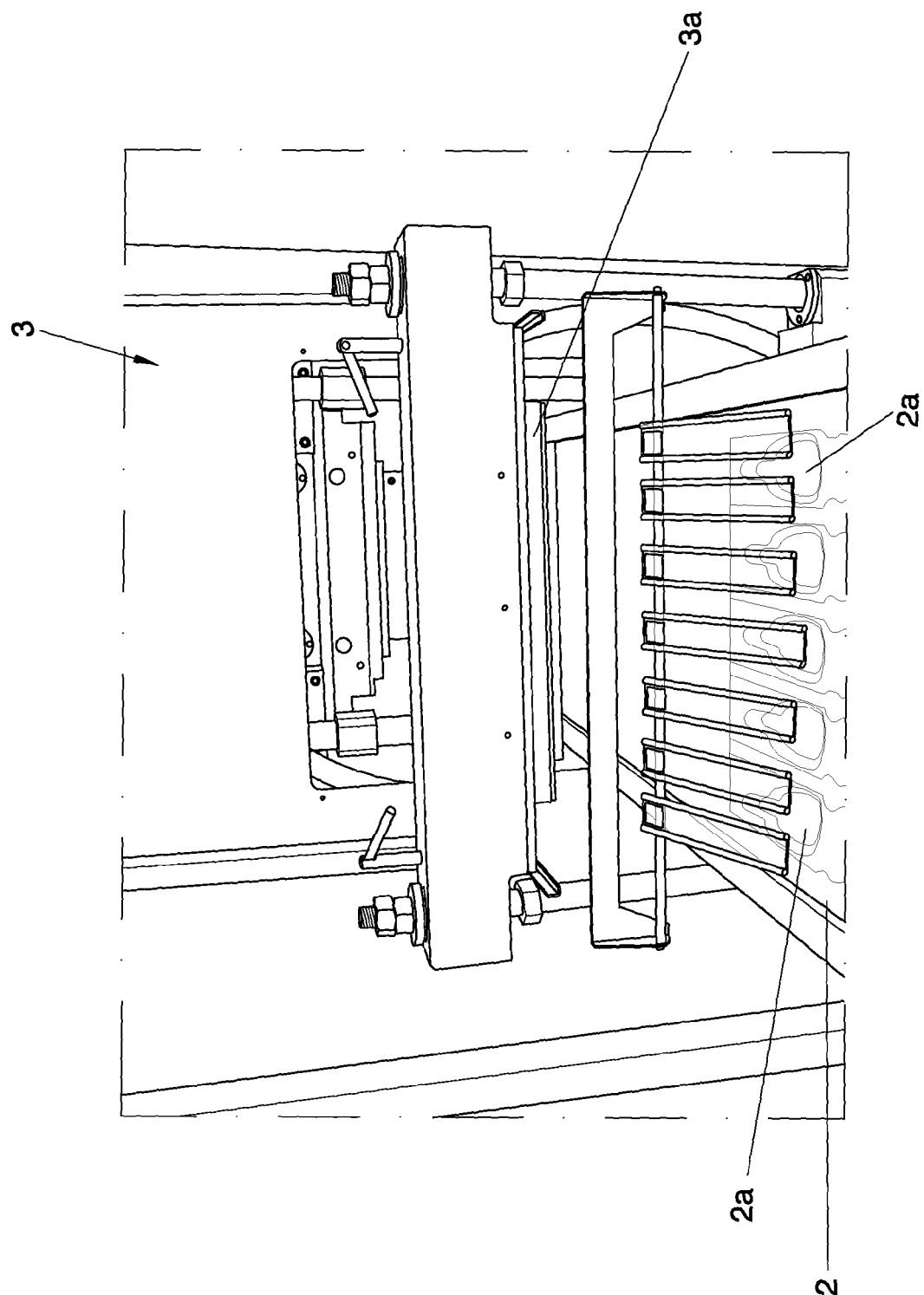


FIG. 6

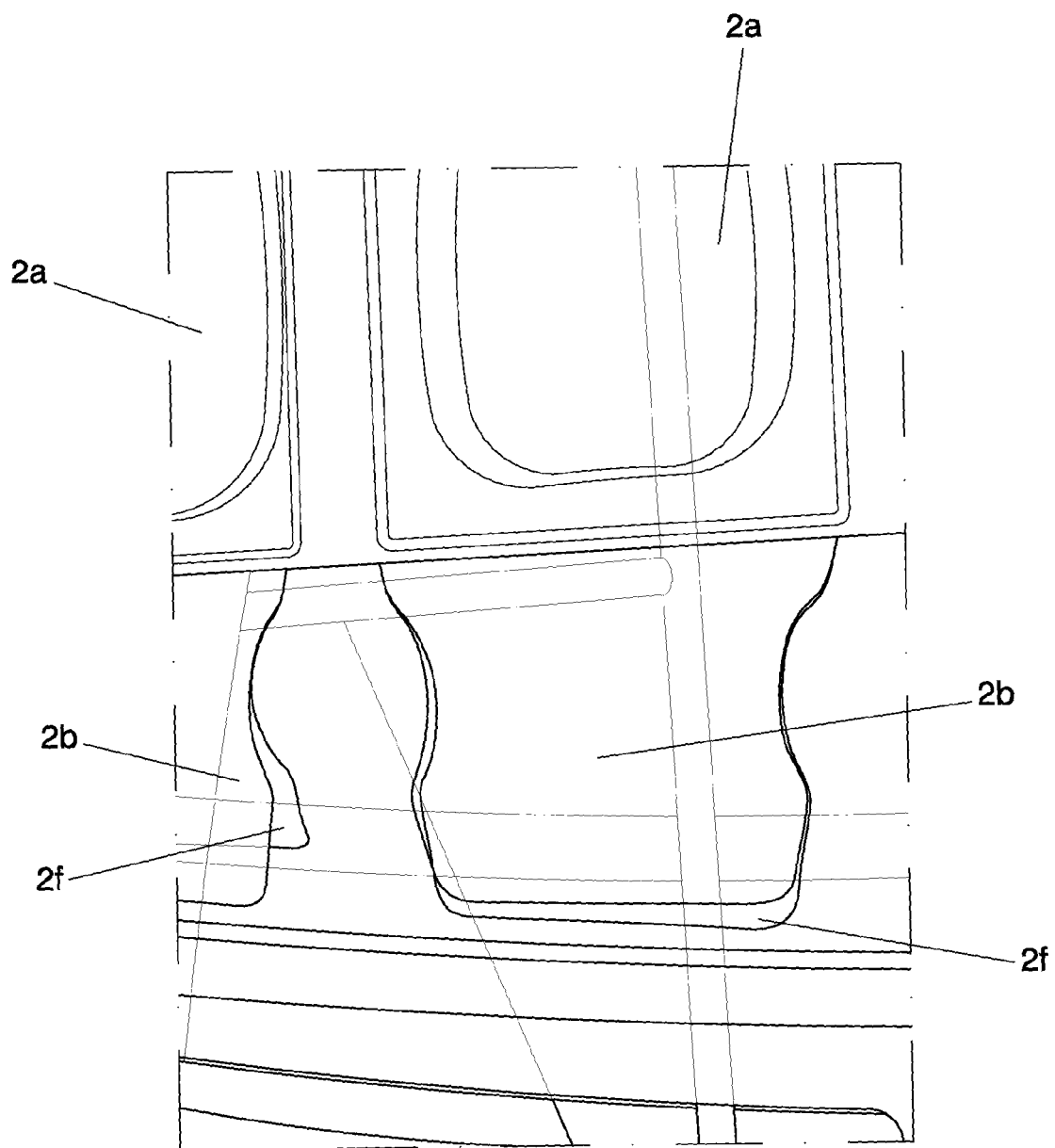


FIG. 7

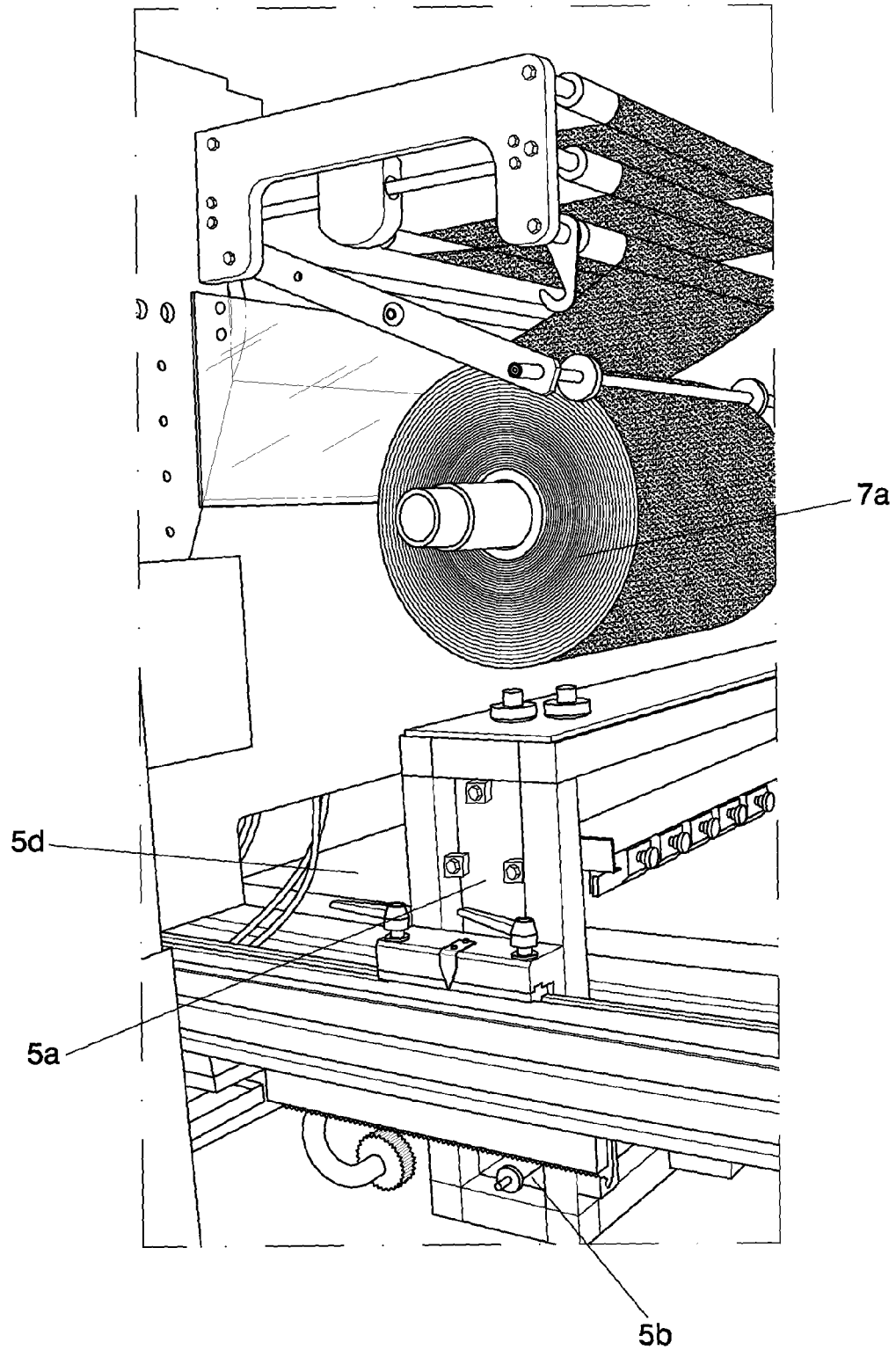


FIG. 8

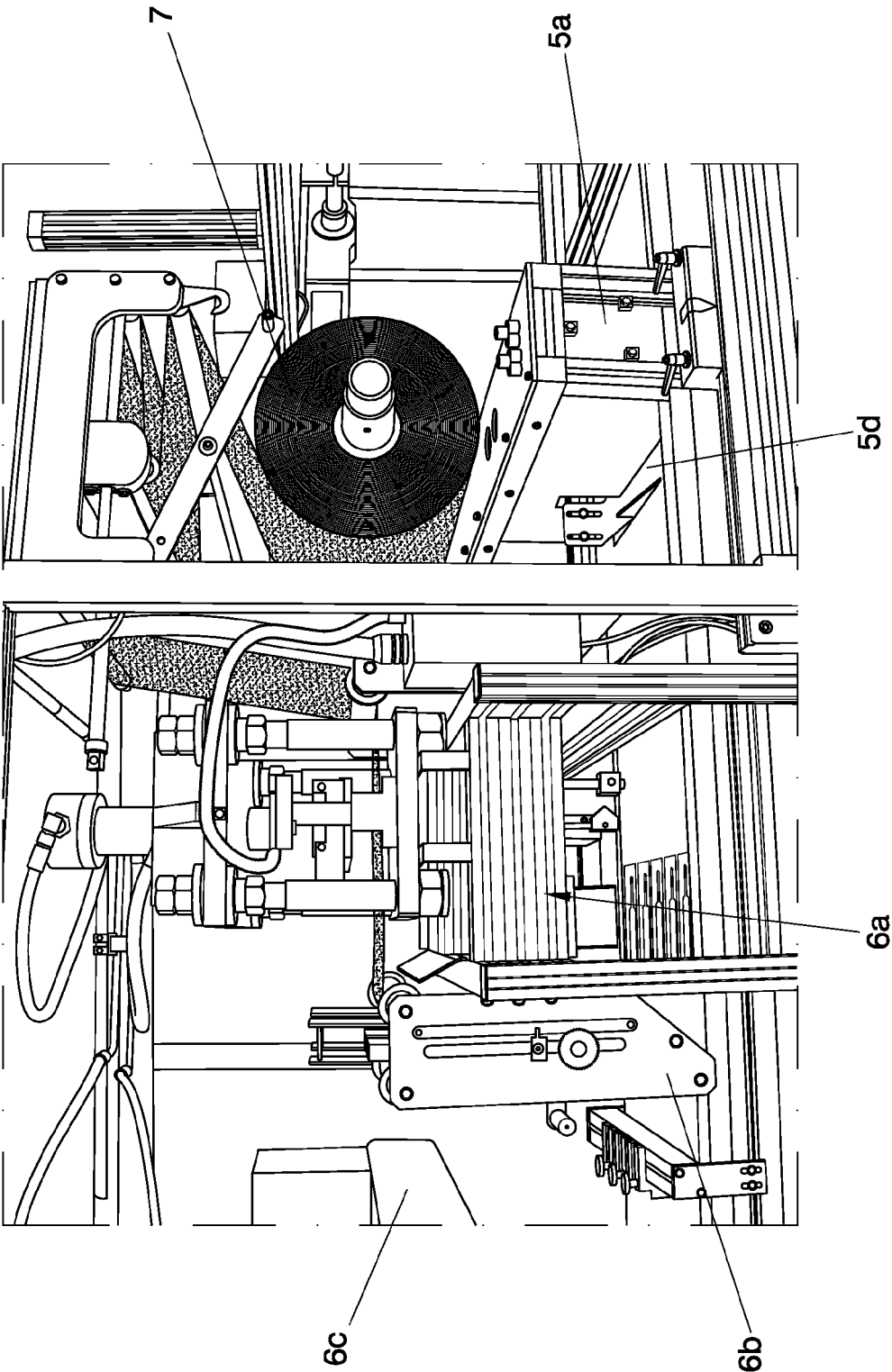


FIG. 9

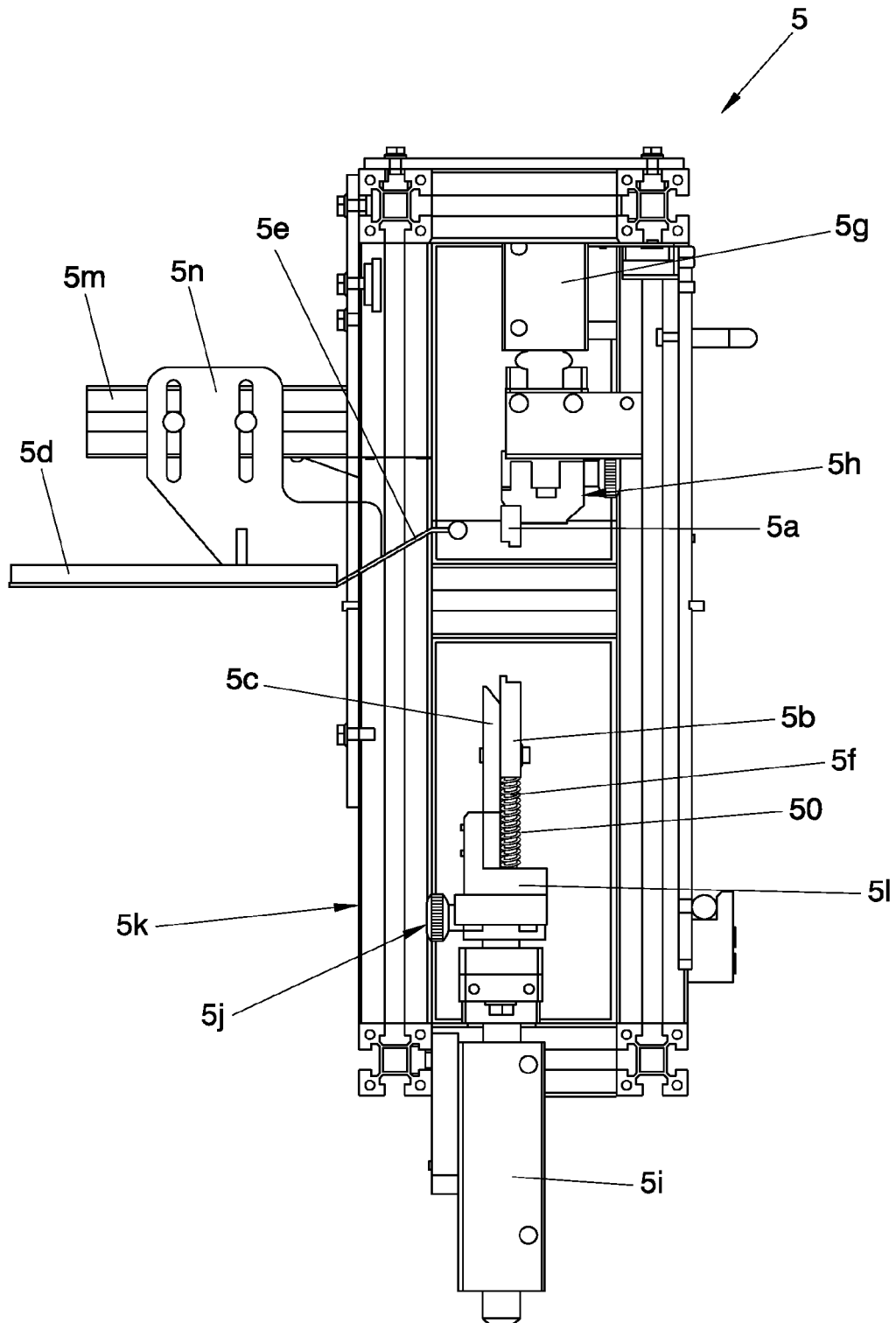


FIG. 10

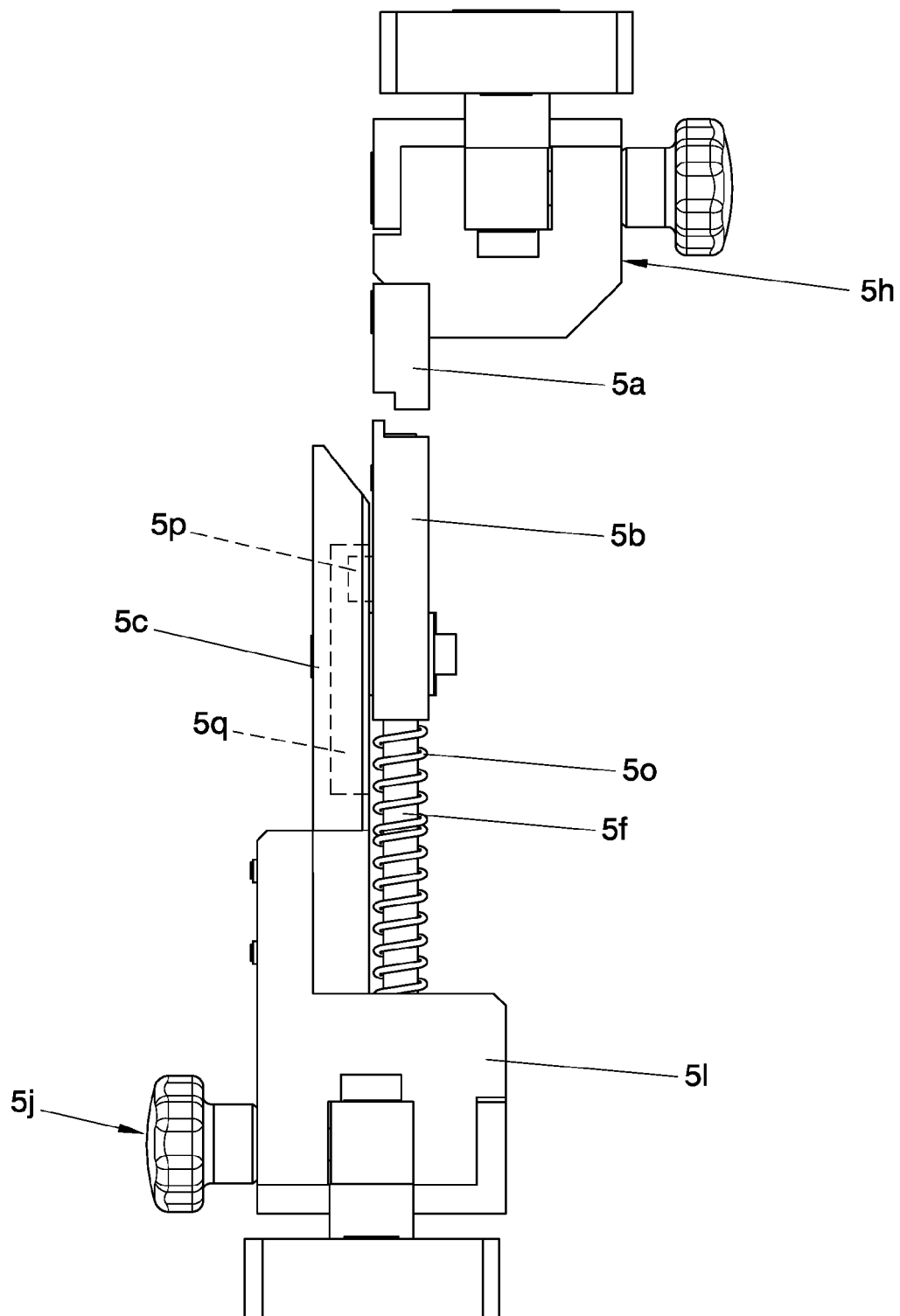


FIG. 11

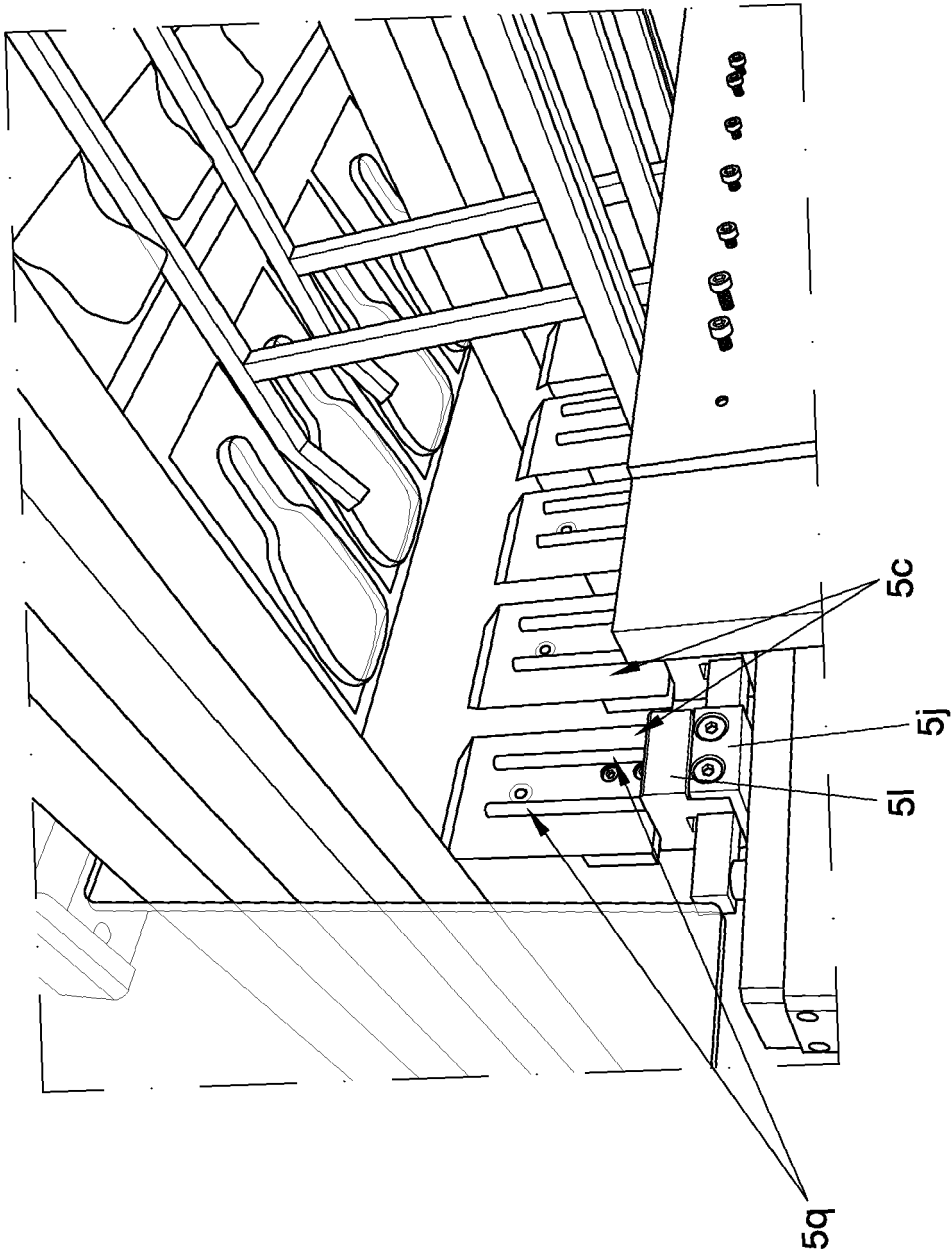


FIG. 12

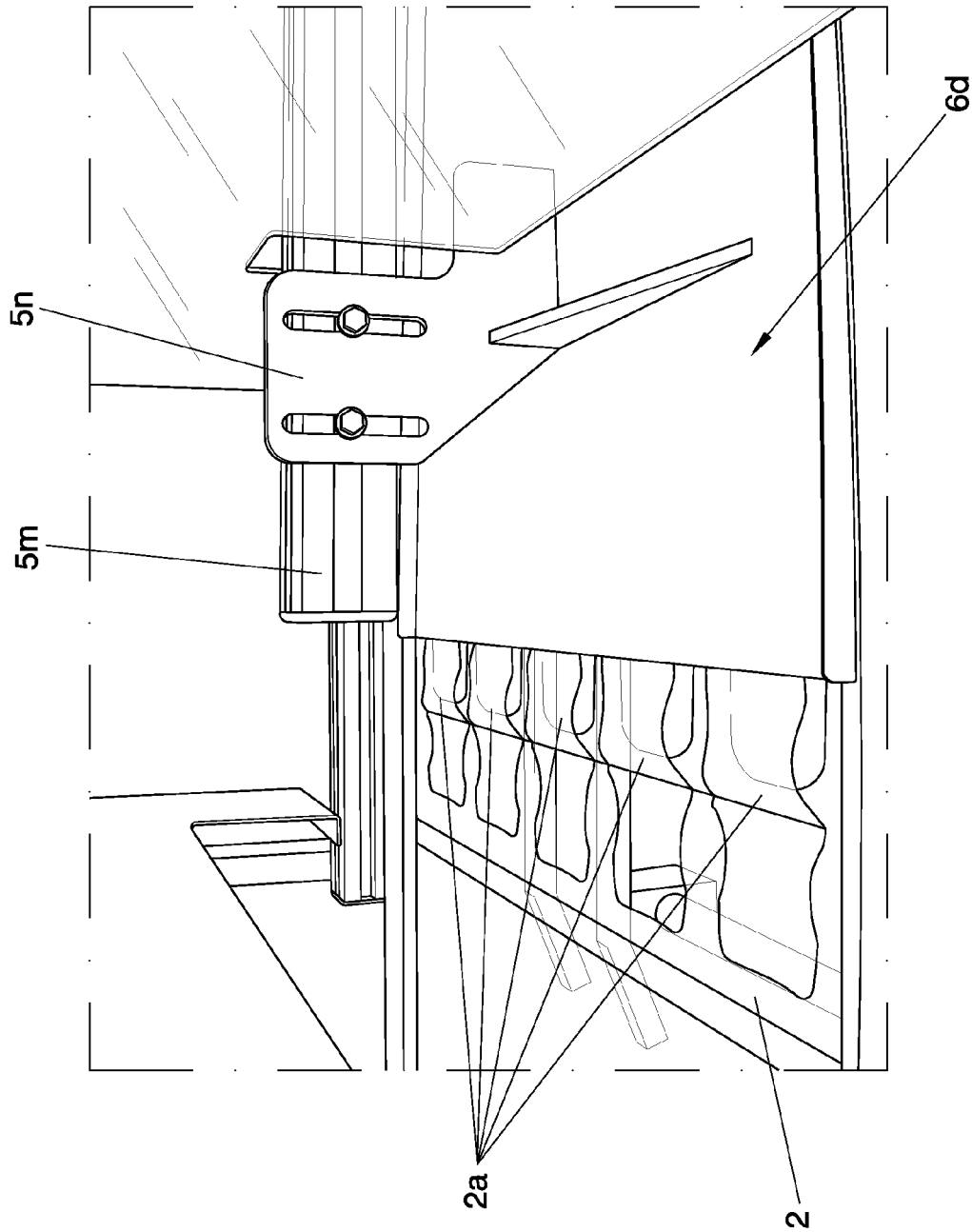


FIG. 13

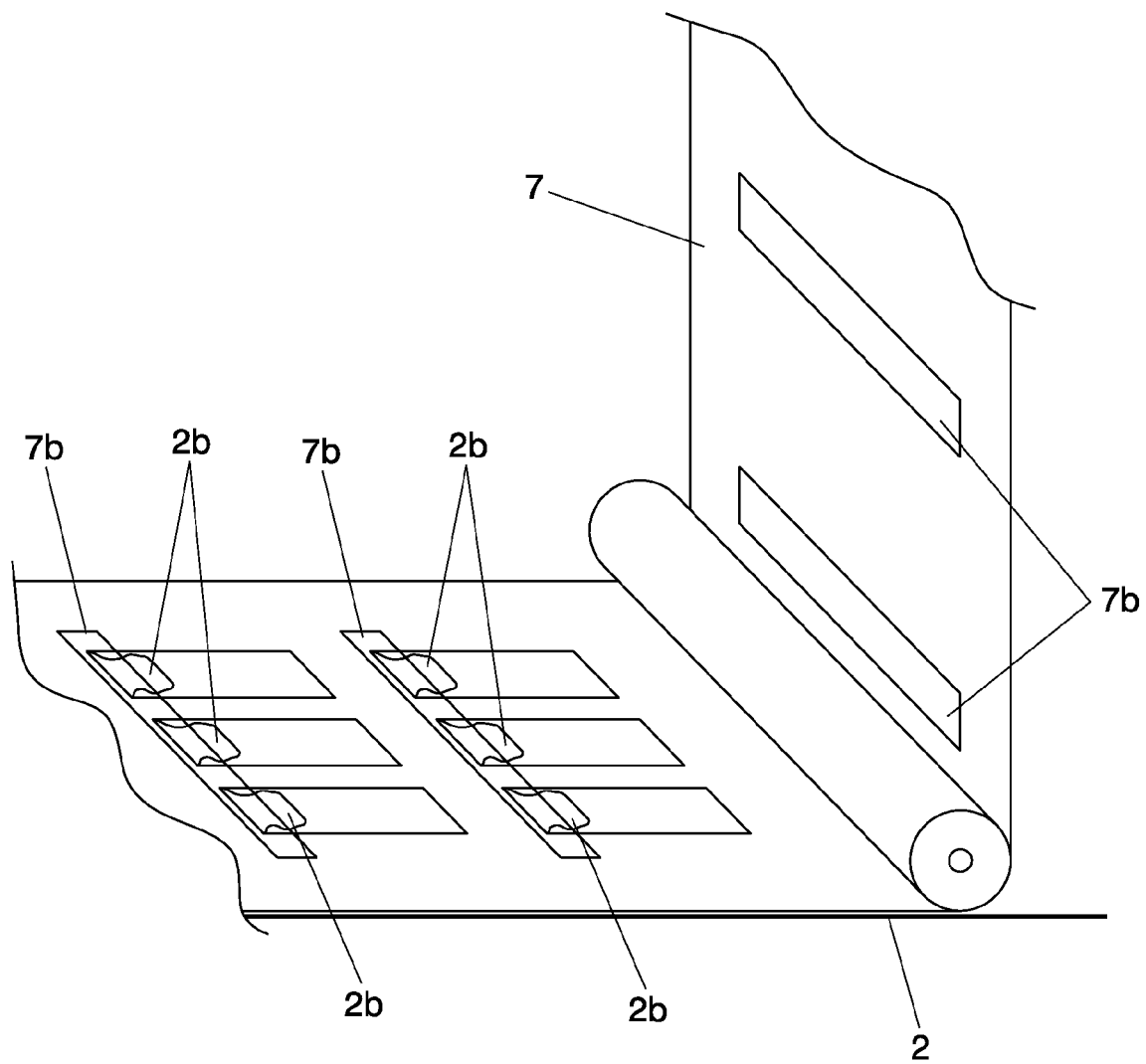


FIG. 14

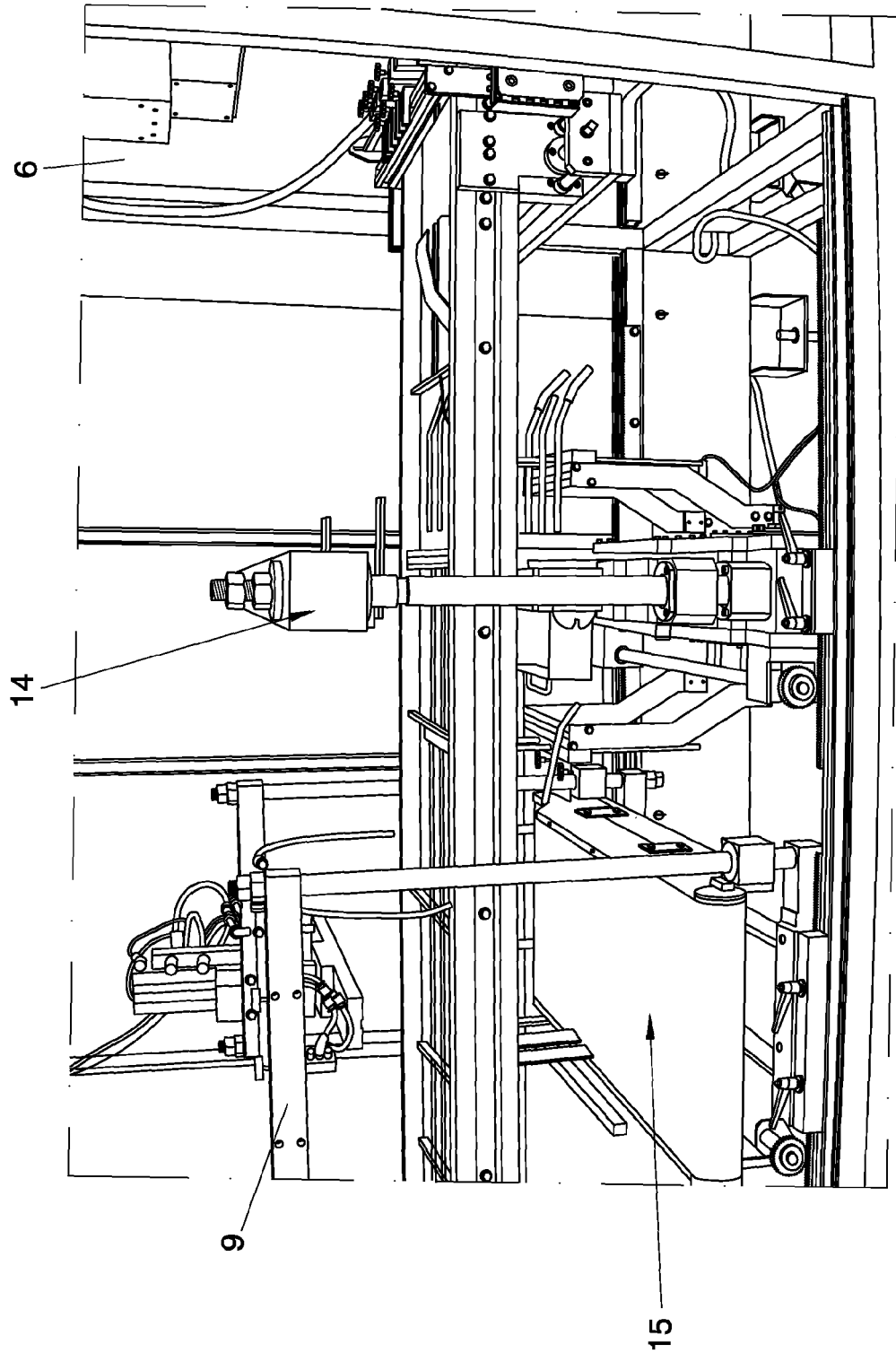


FIG. 15

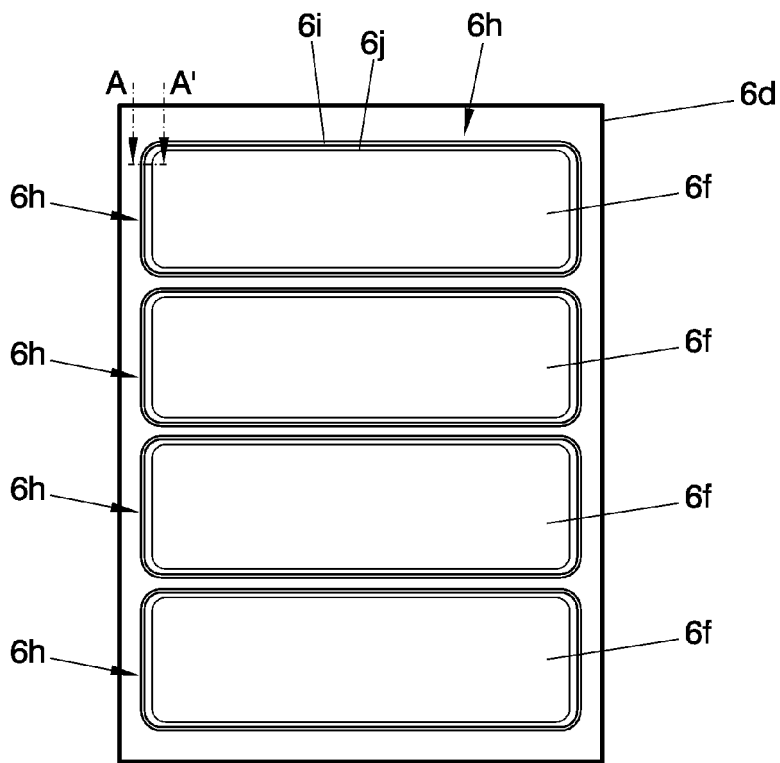
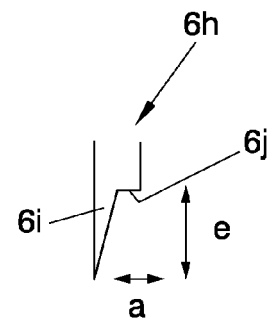


FIG. 16



A-A'
FIG. 18

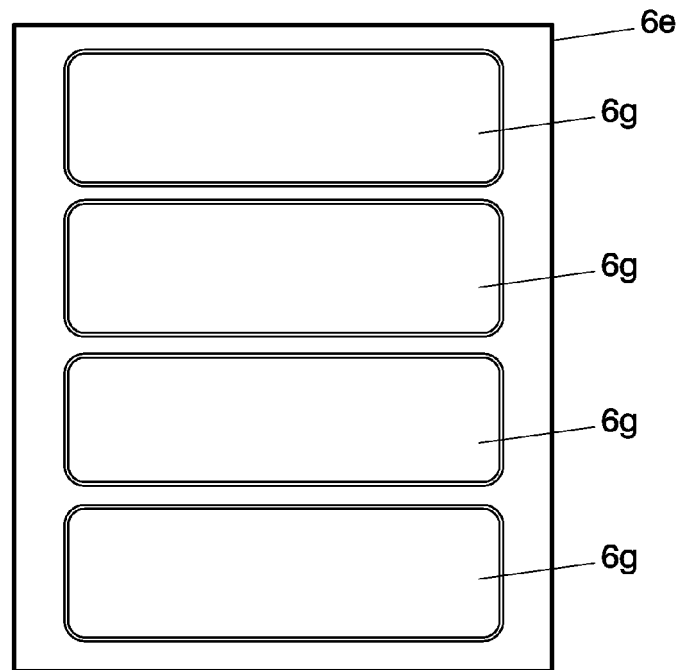


FIG. 17

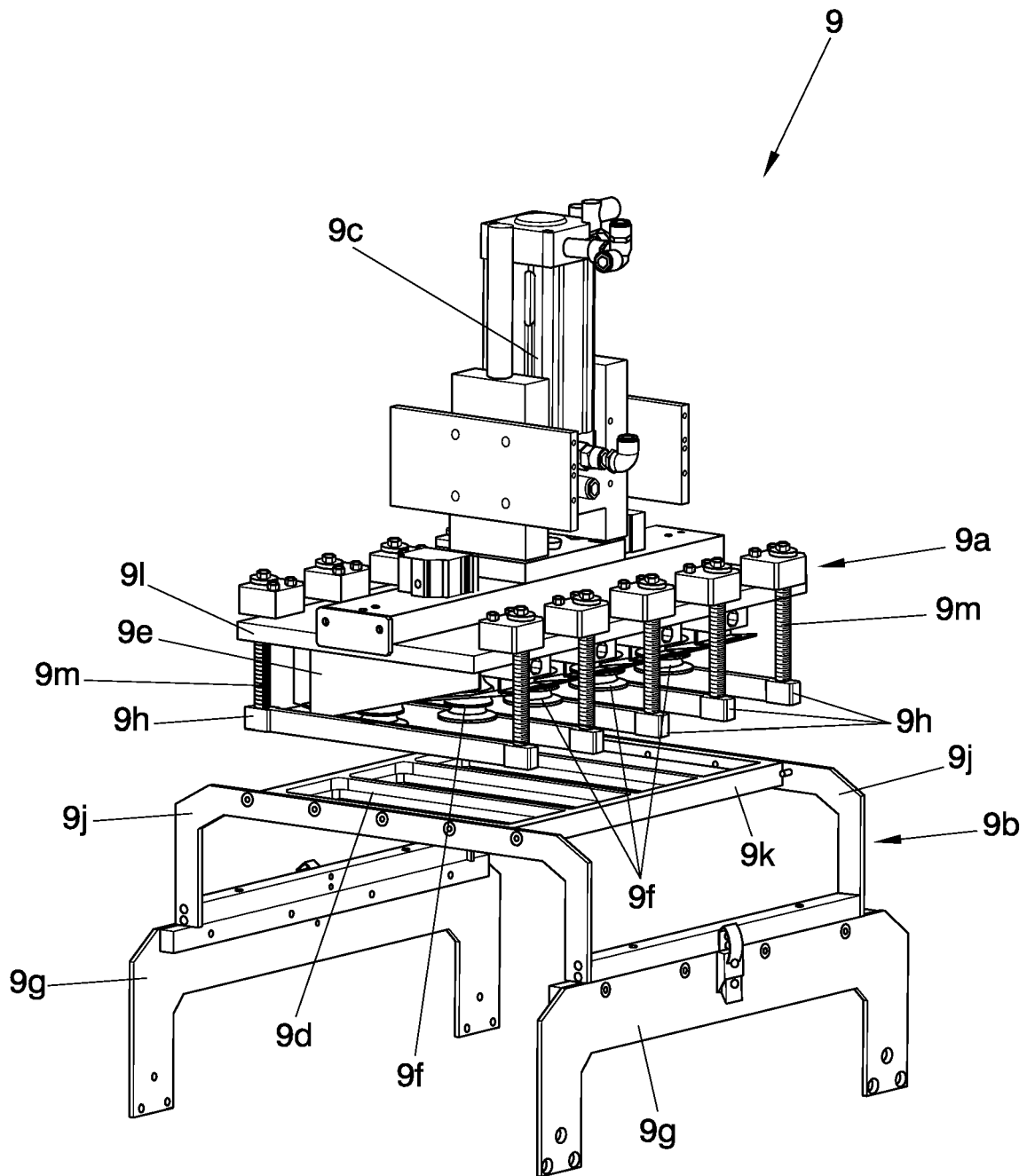


FIG. 19

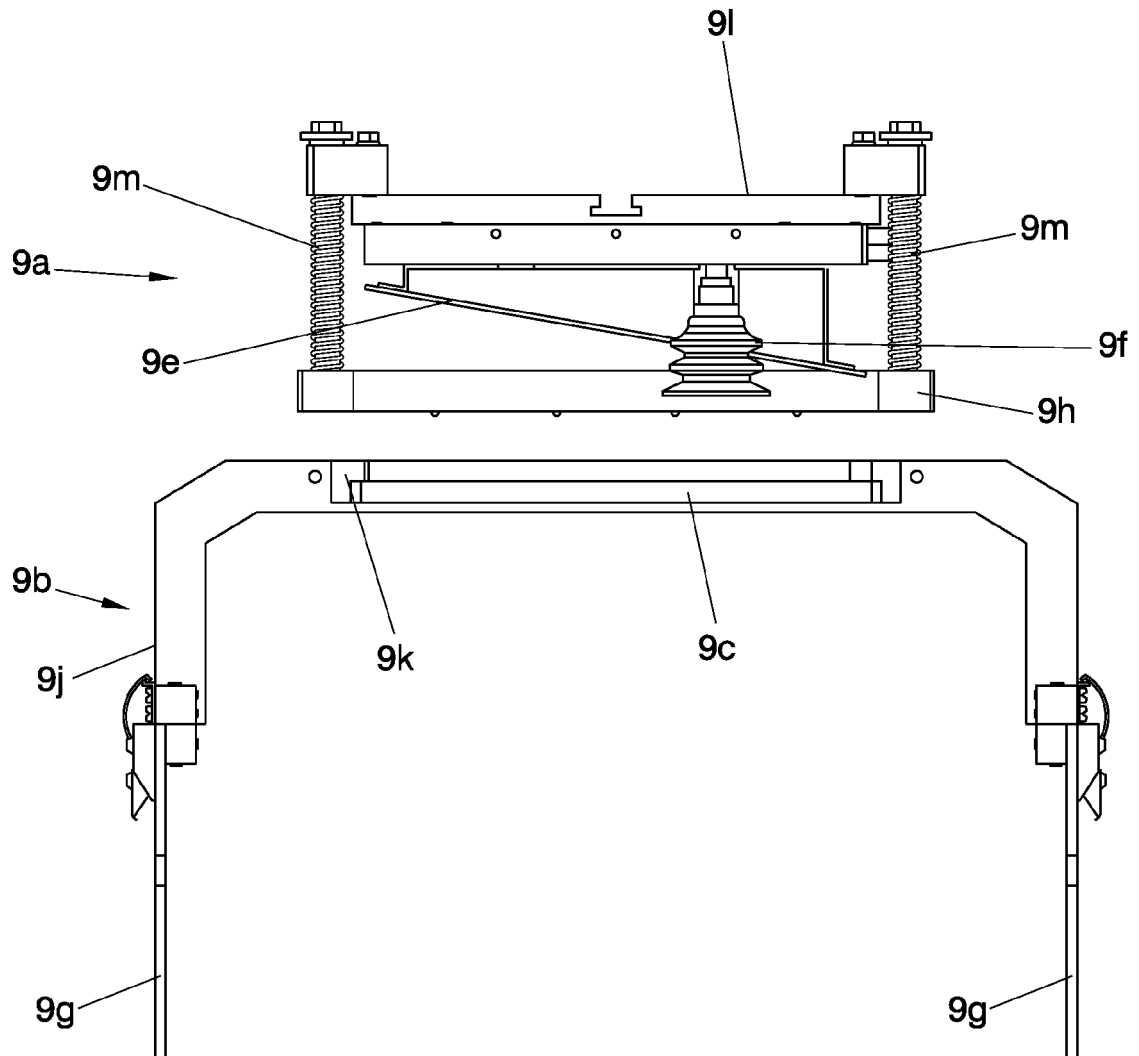


FIG. 20

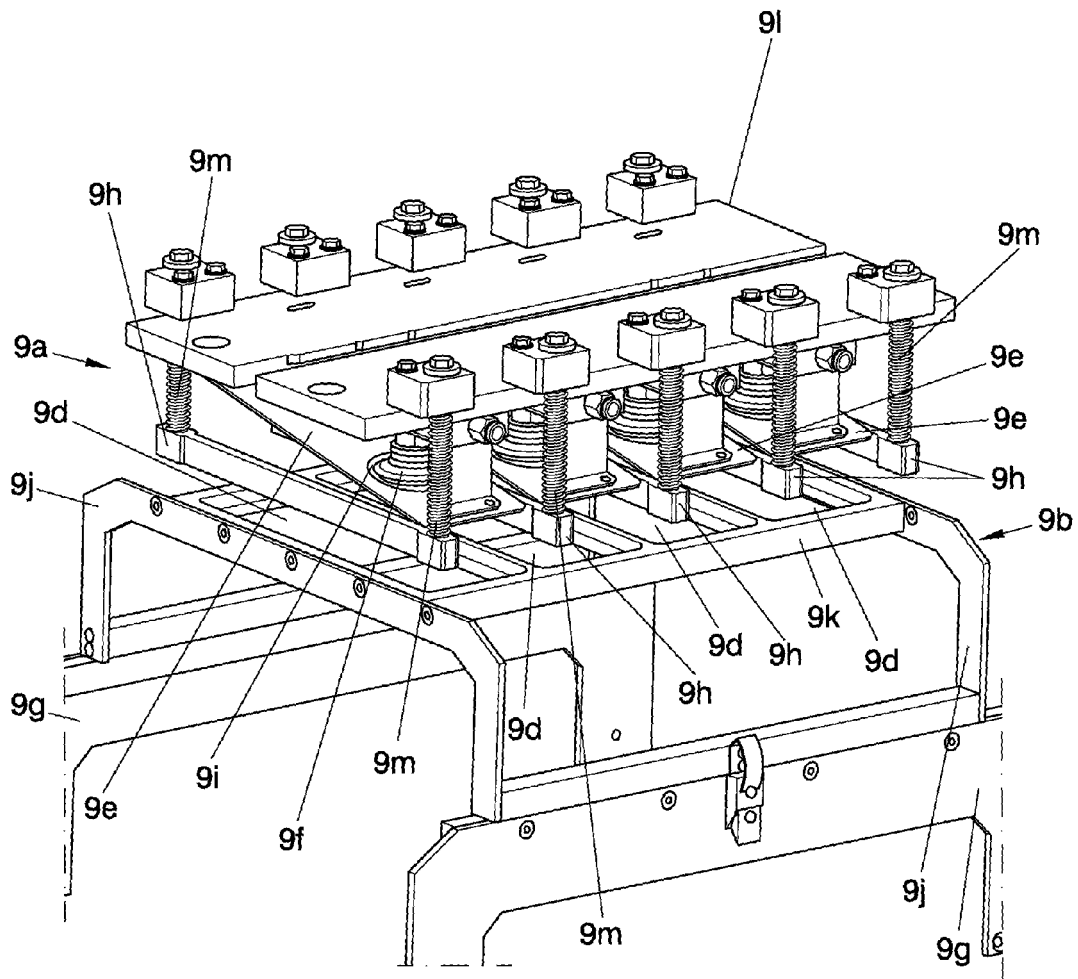


FIG. 21



EUROPEAN SEARCH REPORT

Application Number
EP 09 38 2072

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	JP 07 257505 A (SEIKOSHA KK) 9 October 1995 (1995-10-09) * figure 7 *	1	
A	WO 2004/054886 A (REDMOND SANFORD [US]) 1 July 2004 (2004-07-01) * figure 1 *	1,11	
			TECHNICAL FIELDS SEARCHED (IPC)
			B65B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 3 November 2009	Examiner Ungureanu, Mirela
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 09 38 2072

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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03-11-2009

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