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(54) **MACHINE FOR MANUFACTURING PAPERBOARD TRAYS**

MASCHINE ZUR HERSTELLUNG EINER KARTONSCHALE

MACHINE POUR LA FABRICATION D'UN PLATEAU EN CARTON

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Description

Field of the application

[0001] The present invention relates to the field of packaging machines. In particular, the invention relates to a machine for making paper or paperboard trays.

Prior art

[0002] Paper or paperboard packaging trays are industrially produced from flat blanks. The blank takes on the shape of the tray by an operation, known as forming, which generally involves coupling a male forming member with a female die.

[0003] Interest in paperboard packaging is growing strongly as a result of the drive to eliminate, or at least reduce, plastic in accordance with the objective of making packaging environmentally friendly and recyclable. However, it is well known that paper or paperboard is not always suitable for containing the product, especially a food product and/or one that tends to release liquids.

[0004] Packaging articles, such as trays or tubs, with a paperboard structure and a barrier film covering the surface in direct contact with the product are known. The barrier material is not always environmentally friendly (e.g. it is typically a plastic material) and therefore, in this type of packaging, there is an incentive to reduce the amount of barrier material to the bare minimum.

[0005] A known type of paperboard tray, obtained by forming a blank, has a tub-like part essentially bounded by a bottom and side walls, and a series of perimeter tabs which extend out from the upper edges of the side walls to form a kind of frame. The barrier film is typically applied to said perimeter tabs and covers the inside walls and bottom of the tub.

[0006] Applying barrier film to this type of tray, however, poses some technical problems: however precise the forming step, the tabs are almost never aligned in the same plane and moreover there are inevitably gaps between them. The tabs are folded along the joint edge with the walls, along fold lines provided in the original blank, but the folding angle may diverge slightly from the desired angle, causing the edges of adjacent tabs to be misaligned.

[0007] The frame defined by the tabs takes the form of a non-planar surface with discontinuities due to gaps and misalignments between the tabs. Such a surface is obviously not ideal for application of the barrier film. In particular, the irregularities force the use of a relatively thick film to compensate for the shape defects of the tray, but this requires the introduction of a higher amount of barrier material into the packaging calculation, contrary to the objective stated above.

[0008] In order to solve this problem, it has been proposed to apply (e.g. glue) a closed-loop frame, also made of paperboard, to the inner faces of the tabs, see for example, DE19828381 A1.

[0009] This imparts rigidity and flatness to the upper frame of the tray, substantially eliminates play and misalignment between the tabs, facilitates application of the film and makes it possible to reduce the thickness of the film. Since the frame is made of paperboard, it does not worsen the eco-compatibility of the packaging.

[0010] Application of the frame to the perimeter tabs solves the problems stated above, but the industrial production of the packaging poses certain difficulties, in particular because the coupling between the tray and the frame must be quite precise, otherwise the function of the frame itself is lost. The frame must be cut "to size" and fit precisely over the tray. Achieving this precise fit in a modern high-volume packaging machine is a technical challenge that is not easy to solve.

Summary of the invention

[0011] The invention addresses the problem of providing a machine suitable for quick and accurate production of a packaging article of the type described above comprising a paperboard tub with perimeter tabs and a frame element applied to said perimeter tabs.

[0012] The problem is solved with a machine according to claim 1. Further features are stated in the dependent claims.

[0013] The machine comprises a robot which is configured to receive a blank or preferably a group of blanks; to perform a forming operation resulting, for each blank, in a paperboard tray due to the cooperation between a forming member associated with the robot and an appropriate die; to transfer the trays to a coupling station where a paperboard frame is arranged for each tray; to position the trays, in the coupling station, so as to apply a respective frame to the perimeter tabs of each tray.

[0014] During the operations of transferring the trays from the forming station to the frame coupling station, and during the application of the frames themselves, the trays remain in a relationship of engagement with the forming device associated with the robot. The trays only separate from the forming device mounted on the robot after application of the frame when the assembled trays complete with frames are delivered to an appropriate output conveyor. The idea behind the invention is therefore to maintain the centring of the tray with respect to the robot, which has been obtained during tray forming, even during the subsequent frame application step.

[0015] The engagement between the tray and the robot is preferably maintained by a vacuum system.

[0016] The great advantage of the invention is that there is no need for a new tray centring operation prior to coupling to the frame itself. Since at the end of the forming process the tray remains fitted to the forming device of the robot, the position of the tray is precisely known and the machine (by means of the robot control system) can align it correctly with the frames. This makes production faster and more precise.

[0017] Thanks to the invention, it is possible to use a

frame having a size precisely corresponding to the size of the tray thus resulting in an improved strengthening effect and flatness of the barrier film application surface. It is therefore possible to use a barrier film of small thickness, i.e. with the minimum thickness sufficient to achieve the desired product containment effect.

[0018] The invention also provides a method according to the claims.

Description of the invention

[0019] A machine according to the invention comprises a first magazine which is arranged to accommodate flat blanks intended to form the trays and a second magazine which is arranged to accommodate paperboard frames, shaped as a closed loop, to be applied to the trays. Said magazines are made using technology known in the packaging machine sector and are therefore not described in detail.

[0020] A machine according to the invention further comprises a tray forming station; a station for coupling frames with trays; at least one robot operating between the various stations.

[0021] Preferably, the tray forming station comprises a die suitable for cooperating with a forming device mounted on the robot. Said forming device preferably operates as a male element while the die operates as a female seat in the process of forming the tray from the blank. For instance, the forming device is provided with one or more forming punches each being able to create an individual tray from a blank.

[0022] Typically, the forming process defines a tray with a bottom and side walls, usually rectangular or essentially rectangular in shape, although more complex shapes are possible. The tray also comprises perimeter tabs extending from the upper edges of the walls.

[0023] Advantageously, the robot carries a former which has first lateral inclined surfaces and the die has second lateral inclined surfaces conjugate with said first surfaces. In one embodiment, the forming member of the robot has one or more heads (one for each individual blank) having an essentially truncated-pyramidal shape.

[0024] The machine is equipped with a blank feeding system. Said system is arranged to extract the blanks from said first magazine and convey them to a pick-up zone accessible to said robot, or directly to the forming zone.

[0025] Said blank feeding system advantageously comprises a member configured to extract the blanks from the magazine and a conveyor member (first conveyor member). The extraction member can comprise arms equipped with vacuum suction cups similar to the "sheet feeder" members normally used in packaging machines.

[0026] Said first conveyor member is preferably a transfer member, i.e. with an essentially back-and-forth movement with a linear stroke. Advantageously, said first conveyor member has an essentially planar plate shape and may be provided with appropriate stops to hold the blanks in position.

[0027] In one embodiment, said conveyor member operates by moving between a location for receiving the blanks from the magazine (for example from the described extraction member) and a location for delivery to the robot. Said delivery location may for example be intermediate between the magazine and the forming zone. In this case, the robot picks up the blanks from the conveyor member by means of a vacuum system.

[0028] In another embodiment, the conveyor member reaches the forming zone directly, i.e. there is no intermediate transfer of the blanks. In this second case, the conveyor member, which for example as mentioned above is a transfer plate, is positioned above the forming die and has appropriate windows to enable passage of the former associated with the robot. In other words, in these embodiments, the trays are formed with the blanks still loaded on the conveyor member.

[0029] The choice of one or the other of the above options (i.e. performing the forming directly without extracting the blanks from the conveyor member, or providing an intermediate step of delivery to the robot) may depend on the size and/or complexity of the blank. Generally, for simple and small-sized blanks, the option of direct conveying to the forming zone may be preferable; for larger and/or complex blanks in which forming also comprises ancillary operations such as folding and gluing flaps to be performed by means of additional mobile devices, the option of intermediate delivery to the robot may be preferable because the conveyor member might get in the way of the sub-systems of the forming zone.

[0030] There is also a frame feeding system for feeding the paperboard frames from said second magazine to said coupling station. Said second feeding system for example comprises a member for extracting the frames from the magazine and a dedicated conveyor member (second conveyor member). The extraction member is configured to deliver the frames to the conveyor member; the latter is configured to carry the frames to the coupling station.

[0031] In a preferred embodiment, said conveyor member comprises means for gripping the perimeter of the frames and through-openings for the forming members of the robot. The conveyor member thus can accommodate the forming members of the robot (with which the trays are associated) during the frame application step.

[0032] Said second conveyor member is advantageously a transfer member. The second conveyor member, like the first described above, can also be made in the form of a plate.

[0033] In one embodiment which is of particular interest, the machine is configured to collectively process a plurality of trays and associated frames, with a plurality of assembled trays provided with frames being obtained for each production cycle. For example, the forming device associated with the robot is a multiple former suitable

for receiving and processing a plurality of blanks. The forming station die comprises a corresponding plurality of forming seats.

[0034] The blank feeding system and the paperboard frame feeding system (described above) can be configured to arrange a set of blanks and a set of frames respectively in the blank pick-up zone and in the coupling station such that the arrangement of blanks in the blank pick-up zone, generated by the respective feeding system, is suitable for engaging the blanks with the former of the robot, and that the arrangement of the frames in the coupling zone, generated by the respective feeding system, is suitable for coupling with the trays in engagement on the former of the robot.

[0035] In a preferred embodiment, the set of blanks and the set of frames are represented by rows in which the blanks and frames are aligned with appropriate spacing.

[0036] The frames are preferably applied to the perimeter tabs of the trays by gluing. For this purpose, the machine can comprise appropriate means for dispensing an appropriate amount of glue onto the blanks and/or frames.

[0037] A particularly preferred embodiment provides an array of first glue dispensers which are arranged along the path of the first conveyor member (operating with the blanks). An array of second glue dispensers is further provided which are arranged along the path of the second conveyor member (operating with the frames). Said glue dispensers can be represented by dispensing guns or glue sprayers of a known type.

[0038] For example, the glue dispensers are arranged along the path of respective transfer plates; in a preferred embodiment each of the transfer plates (respectively dedicated to conveying blanks and frames) passes under the respective array of glue dispensers.

[0039] It should be noted that the first dispensers dispense a quantity of glue which will be used to join flaps or other parts of the blank so that the tray retains the three-dimensional shape imparted to it; the second dispensers, on the other hand, dispense a quantity of glue which will be used to join the frames to the edges of the trays.

[0040] The term robot is used in a general sense to refer to a robot or manipulator capable of transferring trays, individually or in groups, from one location to another within the machine. Said robot advantageously has two or more degrees of freedom.

[0041] In a preferred embodiment, said robot comprises: a fixed base associated with the machine frame; a first arm (also referred to as a "link") pivoted about a first axis with respect to said base; a second arm pivoted about a second axis with respect to said first arm; a wrist pivoted about a third axis with respect to said second arm. The forming device is preferably mounted on said wrist. Preferably said axes are horizontal axes. The robot preferably operates from above, i.e. the base of the robot is fixed to the upper part of the machine frame. In any event, the robot can be made using *per* se known technology while remaining within the scope of the present invention.

[0042] The machine frame preferably has a modular structure essentially composed of longitudinal beams, cross beams and columns which may contain electrical, electronic or pneumatic parts.

[0043] The robot is advantageously configured to place the assembled trays, after coupling with the frame, on an output conveyor. Said conveyor is, for example, a conveyor belt.

[0044] The robot grips the trays preferably with a vacuum system. The trays are preferably released onto the output conveyor using vacuum reversal technology. According to this technology, the vacuum system (associated with the robot) comprises a chamber which, when the system is under vacuum, accumulates a slight positive pressure (generally created by a Venturi system).

[0045] A preferred arrangement of the machine is essentially longitudinal in which:

- the first magazine and the second magazine are located at opposite ends of the machine;
- the output conveyor for the assembled trays is located in an intermediate position of the machine;
- the tray forming station is located between the first magazine and the output conveyor;
- the frame application station is located between the second magazine and the output conveyor.

[0046] Said arrangement is optimal for space utilisation and process flow management.

[0047] Advantageously, the conveying directions of the blanks and frames converge towards a central part of the machine where the tray forming operations with centring, frame application and delivery of the assembled framed trays to the output conveyor take place.

[0048] The output conveyor more preferably has a transverse conveying direction. Accordingly, the machine is fed at both ends with blanks and paperboard frames and has a central/transverse output for assembled trays.

[0049] In another embodiment, the robot can be configured to place the assembled trays directly on another production line or production machine adjacent to the machine of the invention.

[0050] The machine achieves the goals and solves the problem stated above in that it enables precise and efficient production of trays with a reinforcing frame.

[0051] The invention also provides a method as defined in the claims. The method is advantageously performed in a machine as described above. The method is directed by a machine control system which manages the robot and the various sub-systems including magazine extraction members, conveyor members, glue ap-

plicators.

[0052] The advantages will become still clearer with the help of the following description of a preferred embodiment.

Description of the figures

[0053]

Fig. 1 shows a machine for forming paperboard trays from blanks, according to one of the embodiments of the invention.

Figs. 2 to 5 show the arrangement of some parts of the machine of Fig. 1 during different steps of the production cycle; for simplicity only some parts of the machine are shown.

Figs. 6 to 8 show some details of the machine of Fig. 1.

Fig. 9 shows parts of the machine and illustrates a production cycle which can be carried out by the machine of Fig. 1.

Figs. 10-13 show an example of a paperboard tray and its constituent parts, which can be made with the machine of Fig. 1.

Detailed description of the invention

[0054] With reference to Figs. 1-5, machine 1 for forming paperboard trays comprises the following main elements:

2 Blank magazine

3 Frame magazine

4 Zone for delivery of the blanks to the robot 7 (zone in which the robot picks up the blanks)

5 Tray forming station

6 Tray and frame coupling station

7 Robot

8 Output conveyor belt for trays assembled with frame

9 Member for extracting blanks from magazine 2

10 Transfer plate for conveying blanks to station 4

11 Member for taking frames from magazine 3

12 Transfer plate for conveying frames to station 6 for coupling with trays

13 Forming member associated with robot 7

14 Forming die located in station 5

15 Glue sprayer assembly for blanks

16 Glue sprayer assembly for frames

[0055] The magazine 2 contains a number of flat blanks 101 (Fig. 2), each of which is arranged to be folded to form a tray. For each production cycle, the extraction member 9 picks up a group of blanks and deposits them on the transfer plate 10.

[0056] Said group of blanks is for example represented by a row 100 as shown in Fig. 9. The transfer plate 10 preferably comprises retaining strikers arranged to hold the blanks in place once deposited on the plate itself.

[0057] The transfer plate 10 has a back-and-forth movement between a position for receiving the blanks by the member 9 and a position for delivering the blanks to the robot 7, more specifically in the pick-up zone indicated by reference 4.

[0058] Glue sprayers 15 are placed along the path of the plate 10 and (as the plate 10 loaded with blanks passes by) dispense glue onto specific portions of the blanks to enable the tray walls to be closed, for example by gluing the tabs 106 (Fig. 10) to the sides of the tray. Thanks to the glue applied by the sprayers 15, the tray will retain the three-dimensional shape imparted by coupling between the forming member 13 and the die 14.

[0059] In a similar way, the member 11 picks up the frames from the magazine 3 and loads them onto the transfer plate 12, which carries the frames to the coupling station 6. Along the path, the glue sprayers 16 apply an appropriate amount of glue to the frames which will be used for adhering the frames to the perimeter edges of the trays. The frames have, for example, the shape shown in Fig. 11.

[0060] It should be noted that during transfer of the blanks towards zone 4, pre-breaking operations may be carried out on the internal edges if necessary (to facilitate tray formation). The machine may be equipped with suitable devices for said edge pre-breaking operations in accordance with this requirement.

[0061] The robot 7 carries a multi-head former 13 capable of simultaneously processing the row of blanks carried by the plate 12. The former 13 is associated with a robot end 70 (see also Fig. 6).

[0062] Fig. 2 shows the robot 7 in a position suitable for picking up the blanks originating from the magazine 2 and conveyed by the plate 10. The robot is equipped with vacuum gripping members, such as suction cups or equivalent, which allow the blanks to be lifted from the plate 10.

[0063] Fig. 3, on the other hand, shows the robot 7 positioned in the tray forming station 5. A downwards

movement of the former 13 in coupling with the die 14 imparts the desired tray shape to the blank, as will be illustrated in more detail below.

[0064] At the end of the forming step of Fig. 3, the robot 7 moves to the station 6 (Fig. 4). During this transfer (i. e. leaving the engagement with the die 14 and moving towards station 6) the gripping members of the robot 7 constantly maintain the vacuum which grips the trays in a relationship of engagement with the former 13 so as to maintain the correct centring.

[0065] A row 200 of frames 201 (see Fig. 9) originating from the magazine 3 and already sprayed with glue as a result of the plate 12 passing under the sprayers 16 is arranged in station 6.

[0066] In the step illustrated in Fig. 4, the robot brings itself into alignment with the row of frames and with a downwards movement precisely fits the frames onto the trays. It should be noted that the frames do not leave the plate 12 and said plate 12 has appropriate through-windows to accommodate the forming member 13 until the edges of the trays are in contact with the frames.

[0067] Fig. 5 shows the machine in the set-up in which the assembled trays (i.e. complete with frame) are delivered to the output conveyor 8. In the example, output proceeds transversely of the machine, i.e. in a direction perpendicular to the drawing plane.

[0068] At the moment of delivery to the output conveyor 8, vacuum gripping members are controlled to release the trays. Preferably, a vacuum reversal system (known *per se*) is provided to create a slight overpressure to facilitate separation of the trays from the former 13.

[0069] Figs. 6 and 7 show further details of a preferred embodiment, with reference to robot 7 and die 14.

[0070] The former 13 has a plurality of heads 130 and each of said heads 130 has an essentially truncated-pyramidal shape with side surfaces 131 inclined and converging downwards; the die 14 has a plurality of seats 140, each suitable for accommodating one of the heads 130; around the seats 140 there are a series of cams 142 provided with side surfaces 141 inclined and conjugate with the surfaces 131. The cams 142 can be adjustable to adapt the seat 140 to a format change and can be mobile (with controlled movement, coordinated with the descent of the former of the robot 13) to perform operations auxiliary to the composition of the tray.

[0071] The blank is wrapped around the truncated-pyramidal head 130 to create the desired tray. The glue previously sprayed from the array of dispensers 15 grips and "closes" the tray by, for example, attaching the tabs 106 to the sides 104 (Fig. 10).

[0072] Fig. 8 shows a tray 102, shown with dotted line, which is in engagement with a head 130. The tray 102 is gripped by the described vacuum gripping members.

[0073] The operation of the machine in Fig. 1 is further illustrated in Fig. 9.

[0074] For each production cycle, the extraction member 9 delivers a row 100 of flat blanks 101 to the transfer plate 10. By way of said plate 10, the row 100 reaches the pick-up zone 4 (receiving the glue while passing under the array of sprayers 15) where it is taken over by the robot 7. The former 13 is not shown in Fig. 9 for simplicity.

[0075] On the opposite side of the machine, the extractor member 11 generates a row 200 of frames 201. The frames, on the transfer plate 12, reach the coupling zone 6 by passing under the array of glue dispensers 16.

[0076] The frames 201 are correspondingly spaced apart from the blanks 101 to interface properly with the robot 7. In other words, the row 100 and the row 200 have the same spacing pitch. Note in station 6 the row 202 of frames already provided with glue ready for joining with the trays.

[0077] After the forming step, the trays 102 remain in engagement with the forming device 13 in the manner illustrated in Fig. 8. The robot 7 then moves to station 6 where the trays 102 are aligned with the underlying row 202 of frames (provided with glue) and by means of an essentially vertical downwards movement of the robot, the frames are fitted onto the trays until they are glued to the perimeter edge tabs.

[0078] A set 300 of assembled trays 301 (complete with frame) is obtained and delivered to the output conveyor 8.

[0079] It should be noted that the embodiment of the figures provides for the robot 7 to transfer the blanks from the transfer plate 10 (Fig. 2) to the forming zone 5. In other embodiments, it is possible for the transfer plate 10 directly to reach the forming zone 5 by moving over the die 14. In this case, the robot 7 acts on the blanks while they are still loaded on the plate 10. Clearly, the plate 10 has appropriate windows to allow the passage of the forming member 13 which will engage with the underlying die 14.

[0080] In order to better understand the machine of the invention and the problem addressed, it is useful to consider also Figs. 10-13 which show an example of a paperboard tray (or tub) which can be produced with the machine of the present invention.

[0081] Fig. 10 shows an exemplary embodiment of a tray or tub 102 comprising a bottom 103, long side walls 104 and short side walls 105, and perimeter tabs 106, 107 extending outside the edges of the walls 104, 105. The short walls 105 have tabs 108 which fold down and become glued to the long walls 104.

[0082] Fig. 10 shows the tray 102 in an inverted position, see also Fig. 13. The bottom and side walls define a tub for containing a product, for example a food product.

[0083] Fig. 11 shows a closed-loop frame 201 essentially formed of two long sides 205 and two short sides 206. A preferred embodiment is shown in which the frame 201 comprises two tabs 202 extending from the short sides 206 towards the interior of the frame itself, intended to adhere to the short side walls 105 (Fig. 12). Advantageously, such tabs 202 have a trapezoidal shape.

[0084] The frame 201 defines an opening 203 that allows the frame to be applied to the bottom 103 of the tray

until the sides 205 and 206 are brought into line with the tabs 106, 107.

[0085] Fig. 12 shows an assembled tray 301 (seen from below), obtainable by applying the frame 201 to the tray 102. Observing this figure, it is possible to note the positioning precision required by the coupling between the frame and the display, which is obtained thanks to the invention.

[0086] Fig. 13 shows the tray 301 from above, it is possible to note the compartment 302 (for containing the product) which substantially follows the shape of the truncated pyramidal head 130.

[0087] The corners of the tray 301, such as for example the corner 110 shown in Fig. 13, are formed correctly without coupling errors thanks to the underlying frame 201 which joins the perimeter edge tabs together and creates a uniform plane.

Claims

1. Machine (1) for forming paperboard trays comprising:

   a first magazine (2) arranged to accommodate flat blanks (101) intended to form trays;
   a second magazine (3) arranged to accommodate closed-loop paperboard frames (201) applicable to the trays;
   a tray forming station (5);
   a station (6) for coupling said frames with said trays;
   a robot (7) suitable for operating between said machine stations;
   a blank feeding system (9, 10) which is arranged to pick up the blanks from said first magazine (2) and deliver them to said robot (7) or carry them to the forming station (5);
   a frame feeding system (11, 12) arranged to pick up the frames from
   said second magazine (3) and carry them to said coupling station (6);

   wherein:
   the robot (7) carries a forming member (13) suitable for forming at least one paperboard tray from a respective blank, cooperating with a die (14) which is located in the forming station (5) and is suitable for accommodating said forming member (13);
   and wherein the robot (7) is configured to:

   perform in said forming station (5) a forming operation by coupling said former (13) to said die (14), resulting in a paperboard tray (102) which is in a relationship of engagement with the former (13) of the robot, the resultant paperboard tray having a tub for holding the product delimited by a bottom (103) and by side walls (104, 105) and perimeter tabs (106, 107) extending from the upper edges of said side walls;
   position the paperboard tray in the coupling station (6) so as to apply the frame (201) to the inner surfaces of said perimeter tabs facing towards the bottom of the tray;
   in which the tray remains in a relationship of engagement with the former of the robot, resulting from the forming process, during transfer towards the coupling station and during coupling with the frame.

2. Machine according to claim 1, in which the former associated with the robot has a male member (130) with first inclined surfaces (131) and the die has a female seat (140) which is suitable for accommodating the male of the robot and has second inclined surfaces (141) conjugate with said first surfaces (131).

3. Machine according to claim 2, in which the relationship of engagement between the tray and the former of the robot is created by a vacuum grip.

4. Machine according to any one of the preceding claims, configured to collectively process a plurality of trays (100) and associated frames (200), resulting in a plurality of assembled trays provided with frames for each production cycle, wherein:

   the blank feeding system (9, 10) and the frame feeding system (11, 12) are configured to process one set of blanks and one set of frames respectively in each production cycle;
   the former (13) of the robot (7) has a plurality of heads (130) and the die has a plurality of seats (140), each head cooperating with a respective seat to form a tray.

5. Machine according to any one of the preceding claims in which the blank feeding system comprises a conveyor member (10) movable between a zone for receiving the blanks from the magazine (2) and a zone (4) for delivering the blanks to the robot.

6. Machine according to any one of claims 1 to 4 in which the blank feeding system comprises a conveyor member (10) movable between a receiving zone for blanks from the magazine and the forming station (5), in which the conveyor member (10), when in the forming station (5), is positioned above the die (14).

7. Machine according to any one of the preceding claims comprising an array (15) of first glue dispensers arranged along the path of the conveyor member (10) of the blanks, said glue dispensers being configured to selectively apply glue onto parts of the

blank intended to be joined together in the tray forming step.

8. Machine according to any one of the preceding claims, in which the frames are applied to the tabs of the trays by gluing, and in which the frame feeding system comprises a conveyor member (12) movable between the second magazine and the coupling station, and the machine comprises an array (16) of second glue dispensers arranged along the path of said conveyor member, said glue dispensers being configured to apply an appropriate amount of glue to the frames.

9. Machine according to any one of the preceding claims, in which:

the machine comprises an output conveyor (8) for assembled trays and the robot (7) is configured to place the assembled trays, once each tray has been coupled with its frame, on said output conveyor, or
the robot is configured to place the assembled trays directly on another production line or machine.

10. Machine according to any one of the preceding claims, wherein the machine has an essentially longitudinal arrangement and wherein, along the longitudinal extent of the machine:

the first magazine (2) and the second magazine (3) are located at opposite ends of the machine;
the output conveyor (8) of the assembled trays is located in an intermediate position of the machine;
the tray forming station (5) is located between the first magazine (2) and the output conveyor (8);
the frame application station (6) is located between the second magazine (3) and the output conveyor (8).

11. Method for manufacturing a paper or paperboard tray in a packaging machine, comprising:

forming a group of paperboard trays starting from blanks, by coupling a forming member (13) associated with a robot (7) and a die (14), resulting for each blank in a paperboard tray (102) which is in a relationship of engagement with the former (13) of the robot, the resultant paperboard tray having a bottom (103), side walls (104, 105) and perimeter tabs (106, 107) extending from said side walls;
arranging a group of closed-loop paperboard frames in a coupling station, the frames being equal in number to the number of blanks, and being arranged in a configuration suitable for fitting on the paperboard trays in engagement with the former (13) of the robot;
moving the robot (7) in the coupling station (6) so as to slip the frames (201) around the trays until the frames come into contact with the perimeter tabs, so as to be joined to the tabs preferably by gluing;
in which the paperboard trays remain in the relationship of engagement with the former of the robot, resulting from the forming process, during transfer towards the coupling station and during coupling with the frames.

12. Method according to claim 11 in which:
the blanks (101) are fed from a magazine (2) of the machine and the method comprises:

extracting the blanks from the respective magazine (2) and loading said blanks onto a first conveyor member (10);
moving said first conveyor member (10) until it reaches a zone (4) where the blanks are delivered to the robot (7) or directly to a forming zone;
applying glue to the blanks by means of glue dispensers (15) arranged along the path of said first conveyor member, wherein the glue is applied to portions of the blank intended to be joined together during the formation of the tray;
and the step of feeding the frames to said coupling station further comprises:

extracting the frames from a magazine (3) and loading them onto a second conveyor member (12);
moving said second conveyor member towards said coupling station (6);
applying glue to the frames by means of second glue dispensers (16) arranged along the path of said second conveyor member to enable gluing between frames and tray tabs.

13. Method according to claim 11 or 12 in which: a paperboard tray is formed from a blank by cooperation between first inclined surfaces of a male element of the former and second inclined surfaces conjugate with the first inclined surfaces and belonging to a female seat of the die.

14. Method according to any one of claims 11 to 13 in which the relationship of engagement between the paperboard trays and the former is maintained by vacuum gripping members associated with the former.

15. Method according to any one of claims 11 to 14, in which the tray is formed from the blank with a vertical

stroke of the former (13) within the die (14) and vertical sliding of the blank itself into the die, with folding and gluing of outer flaps of the blank by one or more cams provided at the die.

16. Method according to any one of claims 11 to 15, the method being performed in a machine according to any one of claims 1 to 10, and wherein the method is governed by a machine control system.

Patentansprüche

1. Maschine (1) zum Ausbilden von Kartonschalen, umfassend:

ein erstes Magazin (2), das angeordnet ist, um flache Zuschnitte (101) aufzunehmen, aus denen Schalen ausgebildet werden sollen;
ein zweites Magazin (3), das angeordnet ist, um geschlossene Kartonrahmen (201) aufzunehmen, die für die Schalen anwendbar sind;
eine Schalenausbildungsstation (5);
eine Station (6) zum Koppeln der Rahmen mit den Schalen;
einen Roboter (7), der zum Betreiben zwischen den Maschinenstationen geeignet ist;
ein Zuschnittzuführsystem (9, 10), das angeordnet ist, um die Zuschnitte von dem ersten Magazin (2) aufzulesen und sie an den Roboter (7) abzugeben oder sie zu der Ausbildungsstation (5) zu tragen;
ein Rahmenzuführsystem (11, 12), das angeordnet ist, um die Rahmen von dem zweiten Magazin (3) aufzulesen und sie zu der Kopplungsstation (6) zu tragen;
wobei:

der Roboter (7) ein Ausbildungselement (13) trägt, das zum Ausbilden von mindestens einer Kartonschale von einem entsprechenden Zuschnitt geeignet ist, der mit einer Matrize (14) zusammenwirkt, die sich in der Ausbildungsstation (5) befindet und für das Aufnehmen des Ausbildungselements (13) geeignet ist;
und wobei der Roboter (7) konfiguriert ist zum:

Durchführen, in der Ausbildungsstation (5), eines Ausbildungsvorgangs durch das Koppeln des Ausbilders (13) mit der Matrize (14), resultierend in einer Kartonschale (102), die mit dem Ausbilder (13) des Roboters in Eingriffsbeziehung steht, wobei die resultierende Kartonschale eine Wanne zum Halten des Produkts, die durch einen Boden (103) und durch Seitenwände (104, 105) begrenzt ist, und Umfangslaschen (106, 107) aufweist, die sich von den oberen Kanten der Seitenwände erstrecken;
Positionieren der Kartonschale in der Kopplungsstation (6), um den Rahmen (201) an den Innenoberflächen der Umfangslaschen anzubringen, die dem Boden der Schale zugewandt sind;
wobei die Schale während einer Übergabe an die Kopplungsstation und während des Koppelns mit dem Rahmen in einer Eingriffsbeziehung mit dem Ausbilder des Roboters verbleibt, resultierend aus dem Ausbildungsprozess.

2. Maschine nach Anspruch 1, wobei der Ausbilder, der dem Roboter zugeordnet ist, ein männliches Element (130) mit ersten geneigten Oberflächen (131) aufweist und die Matrize eine weibliche Auflage (140) aufweist, die zum Aufnehmen des männlichen des Roboters geeignet ist, und zweite geneigte Oberflächen (141) aufweist, die mit den ersten Oberflächen (131) konjugiert sind.

3. Maschine nach Anspruch 2, wobei die Eingriffsbeziehung zwischen der Schale und dem Ausbilder des Roboters durch einen Vakuumgriff hergestellt wird.

4. Maschine nach einem der vorstehenden Ansprüche, die konfiguriert ist, um gemeinsam eine Vielzahl von Schalen (100) und zugehörigen Rahmen (200) zu verarbeiten, resultierend in einer Vielzahl von zusammengesetzten Schalen, die für jeden Produktionszyklus mit Rahmen versehen sind, wobei:

das Zuschnittzuführsystem (9, 10) und das Rahmenzuführsystem (11, 12) konfiguriert sind, um in jedem Produktionszyklus einen Zuschnittsatz bzw. einen Rahmensatz zu verarbeiten;
der Ausbilder (13) des Roboters (7) eine Vielzahl von Köpfen (130) aufweist und die Matrize eine Vielzahl von Auflagen (140) aufweist, wobei jeder Kopf mit einer jeweiligen Auflage zusammenwirkt, um eine Schale auszubilden.

5. Maschine nach einem der vorstehenden Ansprüche, wobei das Zuschnittzuführsystem ein Förderelement (10) umfasst, das zwischen einer Zone zum Empfangen der Zuschnitte von dem Magazin (2) und einer Zone (4) zum Abgeben der Zuschnitte an den Roboter bewegbar ist.

6. Maschine nach einem der Ansprüche 1 bis 4, wobei das Zuschnittzuführsystem ein Förderelement (10) umfasst, das zwischen einer Empfangszone für Zuschnitte von dem Magazin und der Ausbildungssta-

tion (5) bewegbar ist, wobei das Förderelement (10) in der Ausbildungsstation (5) über der Matrize (14) positioniert ist.

7. Maschine nach einem der vorstehenden Ansprüche, umfassend eine Reihe (15) von ersten Klebstoffspendern, die entlang des Pfads des Förderelements (10) der Zuschnitte angeordnet sind, wobei die Klebstoffspender konfiguriert sind, um selektiv Klebstoff auf Teile des Zuschnitts aufzutragen, die in dem Schalenausbildungsschritt miteinander verbunden werden sollen.

8. Maschine nach einem der vorstehenden Ansprüche, wobei die Rahmen durch das Kleben auf die Laschen der Schalen aufgebracht werden, und wobei das Rahmenzuführsystem ein Förderelement (12) umfasst, das zwischen dem zweiten Magazin und der Kopplungsstation bewegbar ist, und die Maschine eine Reihe (16) von zweiten Klebstoffspendern umfasst, die entlang des Pfads des Förderelements angeordnet sind, wobei die Klebstoffspender konfiguriert sind, um eine geeignete Menge von Klebstoff auf die Rahmen aufzutragen.

9. Maschine nach einem der vorstehenden Ansprüche, wobei:

die Maschine einen Ausgabeförderer (8) für zusammengesetzte Schalen umfasst und der Roboter (7) konfiguriert ist, um die zusammengesetzten Schalen, nachdem jede Schale mit ihrem Rahmen gekoppelt wurde, auf den Ausgabeförderer zu platzieren, oder
der Roboter konfiguriert ist, um die zusammengesetzten Schalen direkt auf einer anderen Produktionslinie oder Maschine zu platzieren.

10. Maschine nach einem der vorstehenden Ansprüche, wobei die Maschine eine im Wesentlichen längliche Anordnung aufweist und wobei entlang der Längsausdehnung der Maschine:

sich das erste Magazin (2) und das zweite Magazin (3) an gegenüberliegenden Enden der Maschine befinden;
sich der Ausgabeförderer (8) der zusammengesetzten Schalen in einer Zwischenposition der Maschine befindet;
sich die Schalenausbildungsstation (5) zwischen dem ersten Magazin (2) und dem Ausgabeförderer (8) befindet;
sich die Rahmenanbringungsstation (6) zwischen dem zweiten Magazin (3) und dem Ausgabeförderer (8) befindet.

11. Verfahren zum Fertigen einer Papier- oder Kartonschale in einer Verpackungsmaschine, umfassend:

Ausbilden einer Gruppe von Kartonschalen ausgehend von Zuschnitten durch das Koppeln eines Ausbildungselements (13), das einem Roboter (7) zugeordnet ist, und einer Matrize (14), resultierend für jeden Zuschnitt in einer Kartonschale (102), die mit dem Ausbilder (13) des Roboters in Eingriffsbeziehung steht, wobei die resultierende Kartonschale einen Boden (103), Seitenwände (104, 105) und Umfangslaschen (106, 107) aufweist, die sich von den Seitenwänden erstrecken;
Anordnen einer Gruppe von geschlossener Kartonrahmen in einer Kopplungsstation, wobei die Rahmen zahlenmäßig der Anzahl der Zuschnitte gleichen und in einer Konfiguration angeordnet sind, die zum Aufstecken auf die Kartonschalen in Eingriff mit dem Ausbilder (13) des Roboters geeignet ist;
Bewegen des Roboters (7) in der Kopplungsstation (6), um die Rahmen (201) um die Schalen zu schieben, bis die Rahmen mit den Umfangslaschen in Kontakt kommen, um sie vorzugsweise durch Kleben mit den Laschen zu verbinden;
wobei die Kartonschalen während der Übergabe an die Kopplungsstation und während dem Koppeln mit den Rahmen in der Eingriffsbeziehung mit dem Ausbilder des Roboters verbleiben, resultierend aus dem Ausbildungsprozess.

12. Verfahren nach Anspruch 11, wobei:
die Zuschnitte (101) von einem Magazin (2) der Maschine zugeführt werden und das Verfahren umfasst:

Entnehmen der Zuschnitte von dem jeweiligen Magazin (2) und Laden der Zuschnitte auf ein erstes Förderelement (10);
Bewegen des ersten Förderelements (10), bis es eine Zone (4) erreicht, wo die Zuschnitte an den Roboter (7) oder direkt an eine Ausbildungszone abgegeben werden;
Auftragen von Klebstoff auf die Zuschnitte mittels Klebstoffspendern (15), die entlang des Pfads des ersten Förderelements angeordnet sind, wobei der Klebstoff auf Abschnitte des Zuschnitts aufgetragen wird, die während der Ausbildung der Schale miteinander verbunden werden sollen;
und der Schritt des Zuführens der Rahmen zu der Kopplungsstation ferner umfasst:

Entnehmen der Rahmen von einem Magazin (3) und Laden derselben auf ein zweites Förderelement (12);
Bewegen des zweiten Förderelements in Richtung der Kopplungsstation (6);
Auftragen von Klebstoff auf die Rahmen

mittels zweiter Klebstoffspender (16), die entlang des Wegs des zweiten Förderelements angeordnet sind, um ein Verkleben zwischen den Rahmen und den Schalenlaschen zu ermöglichen.

13. Verfahren nach Anspruch 11 oder 12, wobei: von einem Zuschnitt durch Zusammenwirken zwischen ersten geneigten Oberflächen eines männlichen Elements des Ausbilders und zweiten geneigten Oberflächen, die mit den ersten geneigten Flächen konjugiert sind und zu einer weiblichen Auflage der Matrize gehören, eine Kartonschale ausgebildet wird.

14. Verfahren nach einem der Ansprüche 11 bis 13, wobei die Eingriffsbeziehung zwischen den Kartonschalen und dem Ausbilder durch Vakuumgreifelemente aufrechterhalten wird, die dem Ausbilder zugeordnet sind.

15. Verfahren nach einem der Ansprüche 11 bis 14, wobei die Schale von dem Zuschnitt durch einen vertikalen Hub des Ausbilders (13) innerhalb der Matrize (14) und ein vertikales Gleiten des Zuschnitts selbst in die Matrize ausgebildet wird, wobei äußere Klappen des Zuschnitts durch eine oder mehrere Nocken gefaltet und verklebt werden, die an der Matrize bereitgestellt sind.

16. Verfahren nach einem der Ansprüche 11 bis 15, wobei das Verfahren in einer Maschine nach einem der Ansprüche 1 bis 10 durchgeführt wird und wobei das Verfahren durch ein Maschinensteuersystem geregelt wird.

Revendications

1. Machine (1) pour la formation de plateaux en carton comprenant :

un premier magasin (2) agencé pour recevoir des découpes plates (101) destinées à former des plateaux ; un deuxième magasin (3) agencé pour recevoir des cadres en carton en boucle fermée (201) applicables aux plateaux ;
une station de mise en forme (5) de plateaux ;
une station (6) pour coupler lesdits cadres auxdits plateaux ;
un robot (7) apte à fonctionner entre lesdites stations de machine ;
un système d'acheminement de découpes (9, 10) qui est agencé pour prélever les découpes à partir dudit premier magasin (2) et les distribuer audit robot (7) ou les transporter vers la station de mise en forme (5) ;
un système d'acheminement de cadres (11, 12) agencé pour prélever les cadres à partir dudit deuxième magasin (3) et les transporter vers ladite station de couplage (6) ;

dans laquelle :
le robot (7) transporte un élément de mise en forme (13) apte à mettre en forme au moins un plateau en carton à partir d'une découpe respective, coopérant avec une matrice (14) qui est située dans la station de mise en forme (5) et est apte à recevoir ledit élément de mise en forme (13) ;
et dans laquelle le robot (7) est configuré pour :

réaliser dans ladite station de mise en forme (5) une opération de mise en forme en couplant ledit élément de mise en forme (13) à ladite matrice (14), ce qui permet d'obtenir un plateau en carton (102) qui est dans une relation de mise en prise avec l'élément de mise en forme (13) du robot, le plateau en carton obtenu présentant une cuve pour maintenir le produit délimité par un fond (103) et par des parois latérales (104, 105) et des languettes périmétriques (106, 107) s'étendant à partir des bords supérieurs desdites parois latérales ;
positionner le plateau en carton dans la station de couplage (6) de manière à appliquer le cadre (201) sur les surfaces internes desdites languettes périmétriques orientées vers le fond du plateau ;
dans laquelle le plateau reste dans une relation de mise en prise avec l'élément de mise en forme du robot, résultant du processus de mise en forme, pendant un transfert vers la station de couplage et pendant un couplage avec le cadre.

2. Machine selon la revendication 1, dans laquelle l'élément de mise en forme associé au robot présente un élément mâle (130) avec des premières surfaces inclinées (131) et la matrice présente un siège femelle (140) qui est apte à recevoir l'élément mâle du robot et présente des deuxièmes surfaces inclinées (141) conjuguées auxdites premières surfaces (131).

3. Machine selon la revendication 2, dans laquelle la relation de mise en prise entre le plateau et l'élément de mise en forme du robot est créée par un élément de préhension à vide.

4. Machine selon l'une quelconque des revendications précédentes, configurée pour traiter collectivement une pluralité de plateaux (100) et de cadres associés (200), ce qui permet d'obtenir une pluralité de plateaux assemblés dotés de cadres pour chaque cycle de production, dans laquelle :

le système d'acheminement de découpes (9,

10) et le système d'acheminement de cadres (11, 12) sont configurés pour traiter un ensemble de découpes et un ensemble de cadres respectivement dans chaque cycle de production ;
l'élément de mise en forme (13) du robot (7) présente une pluralité de têtes (130) et la matrice présente une pluralité de sièges (140), chaque tête coopérant avec un siège respectif pour former un plateau.

5. Machine selon l'une quelconque des revendications précédentes dans laquelle le système d'acheminement de découpes comprend un élément transporteur (10) mobile entre une zone destinée à recevoir les découpes en provenance du magasin (2) et une zone (4) destinée à distribuer les découpes au robot.

6. Machine selon l'une quelconque des revendications 1 à 4 dans laquelle le système d'acheminement de découpes comprend un élément transporteur (10) mobile entre une zone de réception pour des découpes en provenance du magasin et la station de mise en forme (5), dans laquelle l'élément transporteur (10), lorsqu'il est dans la station de mise en forme (5), est positionné au-dessus de la matrice (14).

7. Machine selon l'une quelconque des revendications précédentes comprenant un réseau (15) de premiers distributeurs de colle agencé le long du trajet de l'élément transporteur (10) des découpes, lesdits distributeurs de colle étant configurés pour appliquer sélectivement de la colle sur des parties de la découpe destinées à être jointes ensemble dans l'étape de mise en forme de plateau.

8. Machine selon l'une quelconque des revendications précédentes, dans laquelle les cadres sont appliqués aux languettes des plateaux par collage, et dans laquelle le système d'acheminement de cadres comprend un élément transporteur (12) mobile entre le deuxième magasin et la station de couplage, et la machine comprend un réseau (16) de deuxièmes distributeurs de colle agencé le long du trajet dudit élément transporteur, lesdits distributeurs de colle étant configurés pour appliquer une quantité appropriée de colle sur les cadres.

9. Machine selon l'une quelconque des revendications précédentes, dans laquelle :

la machine comprend un transporteur de sortie (8) pour plateaux assemblés et le robot (7) est configuré pour placer les plateaux assemblés, une fois que chaque plateau a été couplé avec son cadre, sur ledit transporteur de sortie, ou
le robot est configuré pour placer les plateaux assemblés directement sur une autre ligne de production ou machine.

10. Machine selon l'une quelconque des revendications précédentes, dans laquelle la machine présente un agencement sensiblement longitudinal et dans laquelle, le long de l'étendue longitudinale de la machine :

le premier magasin (2) et le deuxième magasin (3) sont situés à des extrémités opposées de la machine ;
le transporteur de sortie (8) des plateaux assemblés est situé dans une position intermédiaire de la machine ;
la station de mise en forme (5) de plateaux est située entre le premier magasin (2) et le transporteur de sortie (8) ;
la station d'application de cadres (6) est située entre le deuxième magasin (3) et le transporteur de sortie (8).

11. Procédé de fabrication d'un plateau en papier ou en carton dans une machine d'emballage, comprenant :

la mise en forme d'un groupe de plateaux en carton à partir de découpes, par couplage d'un élément de mise en forme (13) associé à un robot (7) et à une matrice (14), résultant en ce que chaque découpe dans un plateau en carton (102) qui est dans une relation de mise en prise avec l'élément de mise en forme (13) du robot, le plateau en carton obtenu présentant un fond (103), des parois latérales (104, 105) et des languettes périmétriques (106, 107) s'étendant à partir desdites parois latérales ;
l'agencement d'un groupe de cadres en carton en boucle fermée dans une station de couplage, les cadres étant égaux en nombre aux nombres de découpes, et étant agencés dans une configuration apte à ajuster sur les plateaux en carton en prise avec l'élément de mise en forme (13) du robot ;
le déplacement du robot (7) dans la station de couplage (6) de manière à faire glisser les cadres (201) autour des plateaux jusqu'à ce que les cadres entrent en contact avec les languettes périmétriques, de manière à être joints aux languettes de préférence par collage ;
dans lequel les plateaux en papier restent dans la relation de mise en prise avec l'appareil de mise en forme du robot, ce qui est obtenu par le processus de mise en forme, pendant un transfert vers la station de couplage et pendant un couplage avec les cadres.

12. Procédé selon la revendication 11 dans lequel :
les découpes (101) sont acheminées à partir d'un magasin (2) de la machine et le procédé comprend :

l'extraction des découpes à partir du magasin respectif (2) et le chargement desdites découpes sur un premier élément transporteur (10) ;
le déplacement dudit premier élément transporteur (10) jusqu'à ce qu'il atteigne une zone (4) où les découpes sont distribuées au robot (7) ou directement à une zone de mise en forme ;
l'application de colle sur les découpes au moyen de distributeurs de colle (15) agencés le long du trajet dudit premier élément transporteur, dans lequel la colle est appliquée à des parties de la découpe destinées à être jointes ensemble pendant la mise en forme du plateau ;
et l'étape d'acheminement des cadres vers ladite station de couplage comprend en outre :

l'extraction des cadres en provenance d'un magasin (3) et leur chargement sur un deuxième élément transporteur (12) ; le déplacement dudit deuxième élément transporteur en direction de ladite station de couplage (6) ;
l'application de colle sur les cadres au moyen de deuxièmes distributeurs de colle (16) agencés le long du trajet dudit deuxième élément transporteur pour permettre un collage entre des cadres et des languettes de plateau.

13. Procédé selon la revendication 11 ou 12 dans lequel : un plateau en carton est mis en forme à partir d'une découpe par une coopération entre des premières surfaces inclinées d'un élément mâle de l'élément de mise en forme et des deuxièmes surfaces inclinées conjuguées aux premières surfaces inclinées et appartenant à un siège femelle de la matrice.

14. Procédé selon l'une quelconque des revendications 11 à 13 dans lequel la relation de mise en prise entre les plateaux en carton et l'élément de mise en forme est maintenue par des éléments de préhension à vide associés à l'élément de mise en forme.

15. Procédé selon l'une quelconque des revendications 11 à 14, dans lequel le plateau est mis en forme à partir de la découpe avec une course verticale de l'élément de mise en forme (13) à l'intérieur de la matrice (14) et un coulissement vertical de la découpe elle-même dans la matrice, avec un pliage et un collage de rabats externes de la découpe par une ou plusieurs cames disposées au niveau de la matrice.

16. Procédé selon l'une quelconque des revendications 11 à 15, le procédé étant réalisé dans une machine selon l'une quelconque des revendications 1 à 10, et dans lequel le procédé est gouverné par un système de commande de machine.

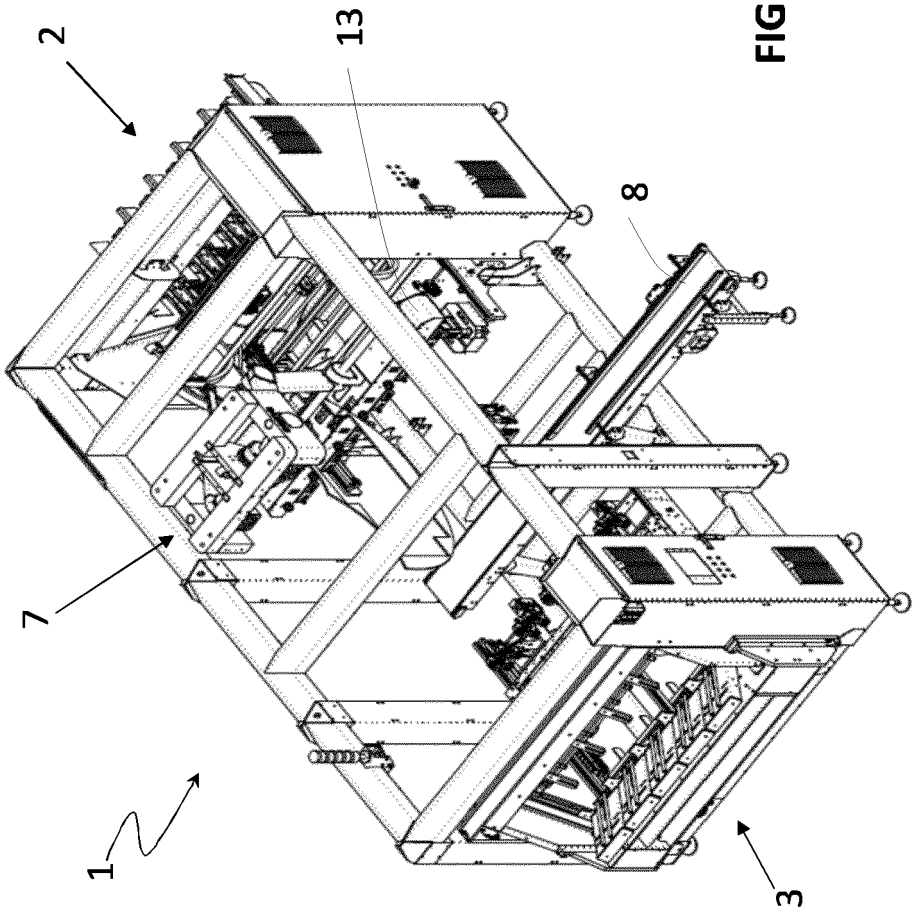

FIG. 1

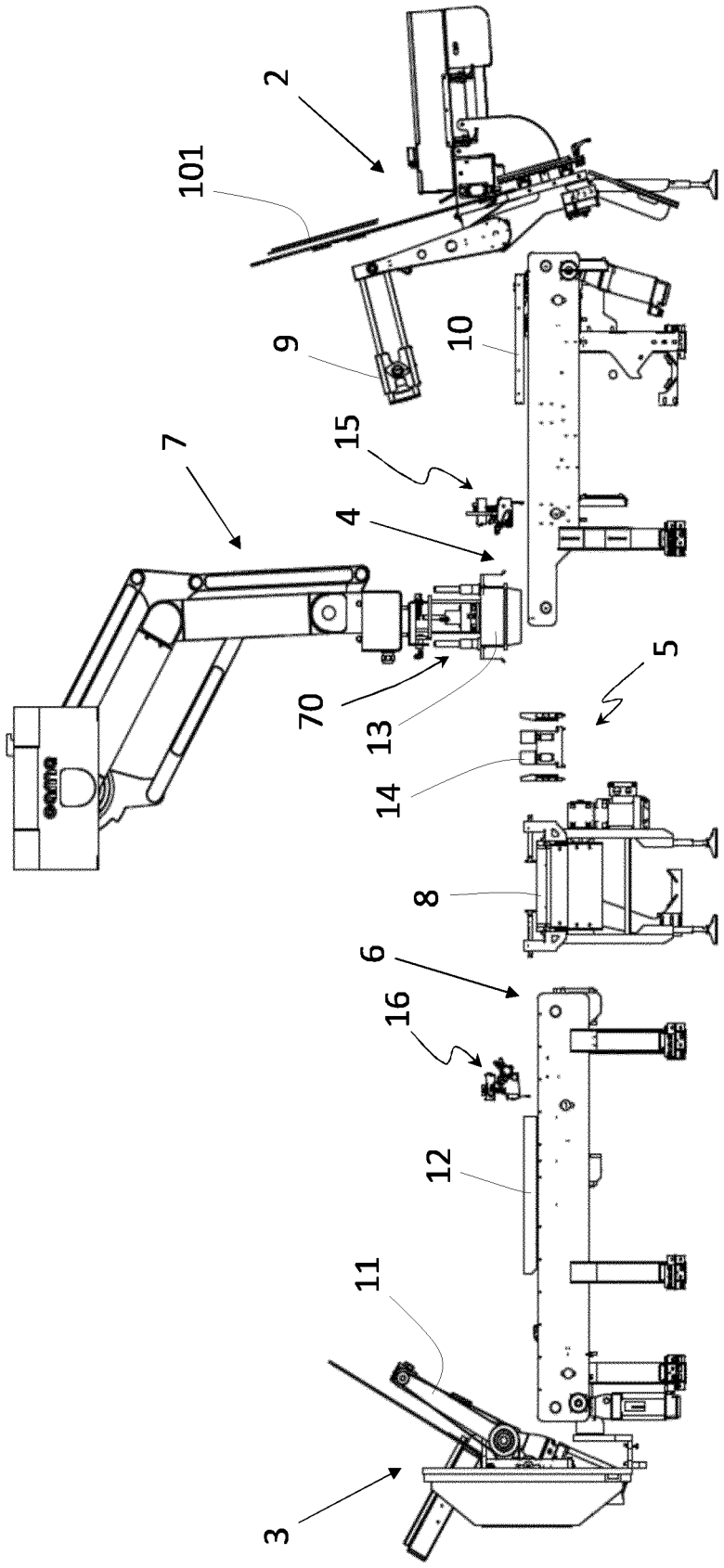

FIG. 2

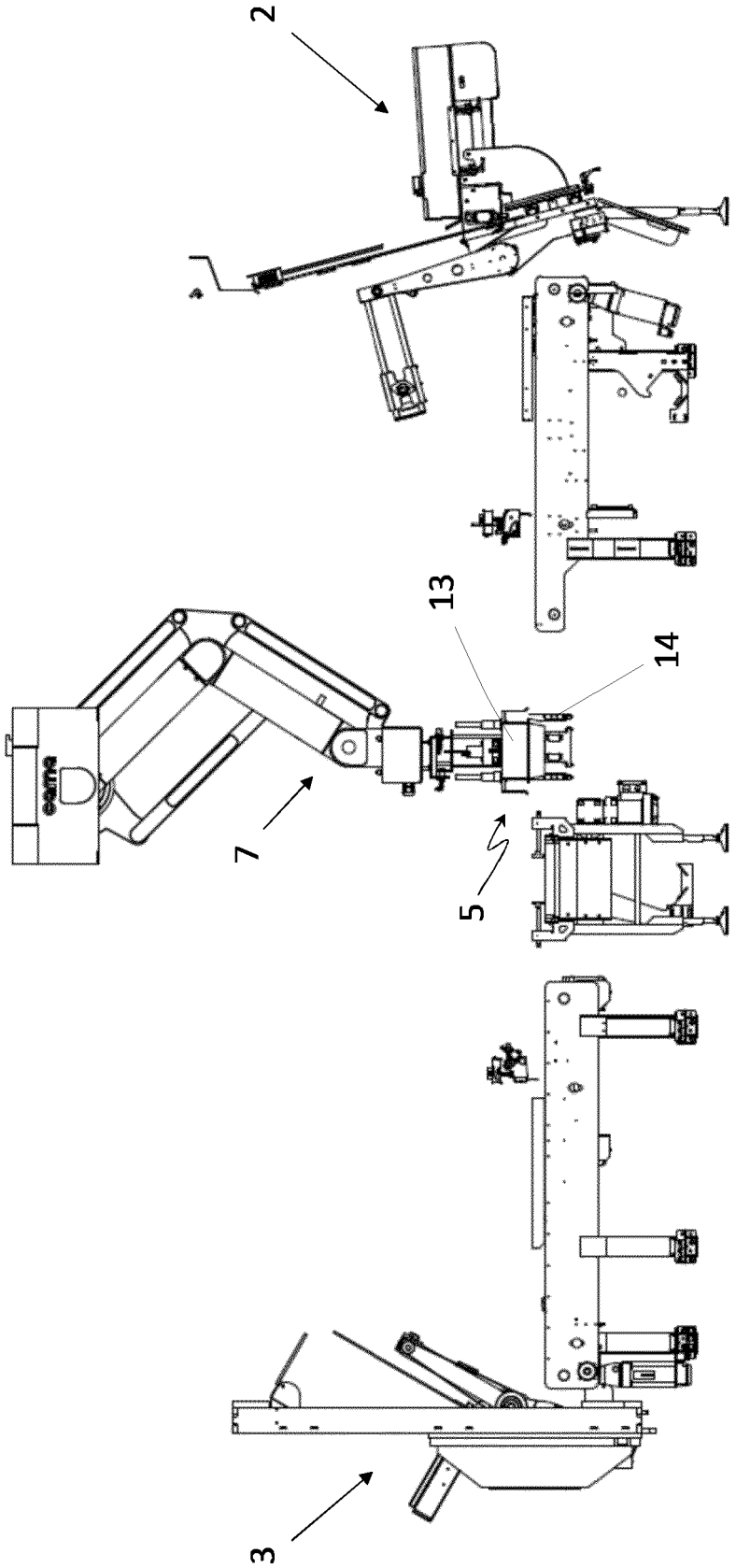

FIG. 3

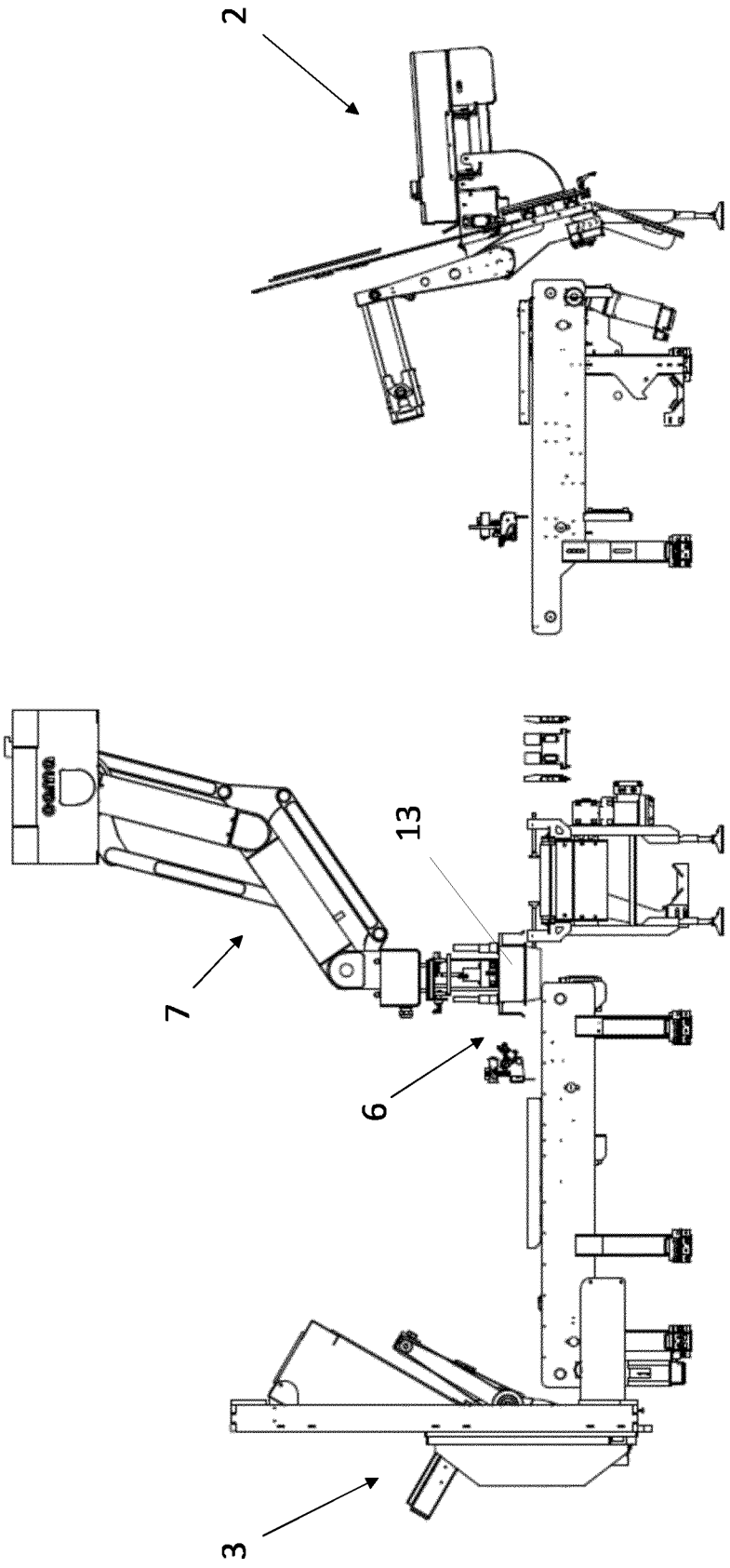

FIG. 4

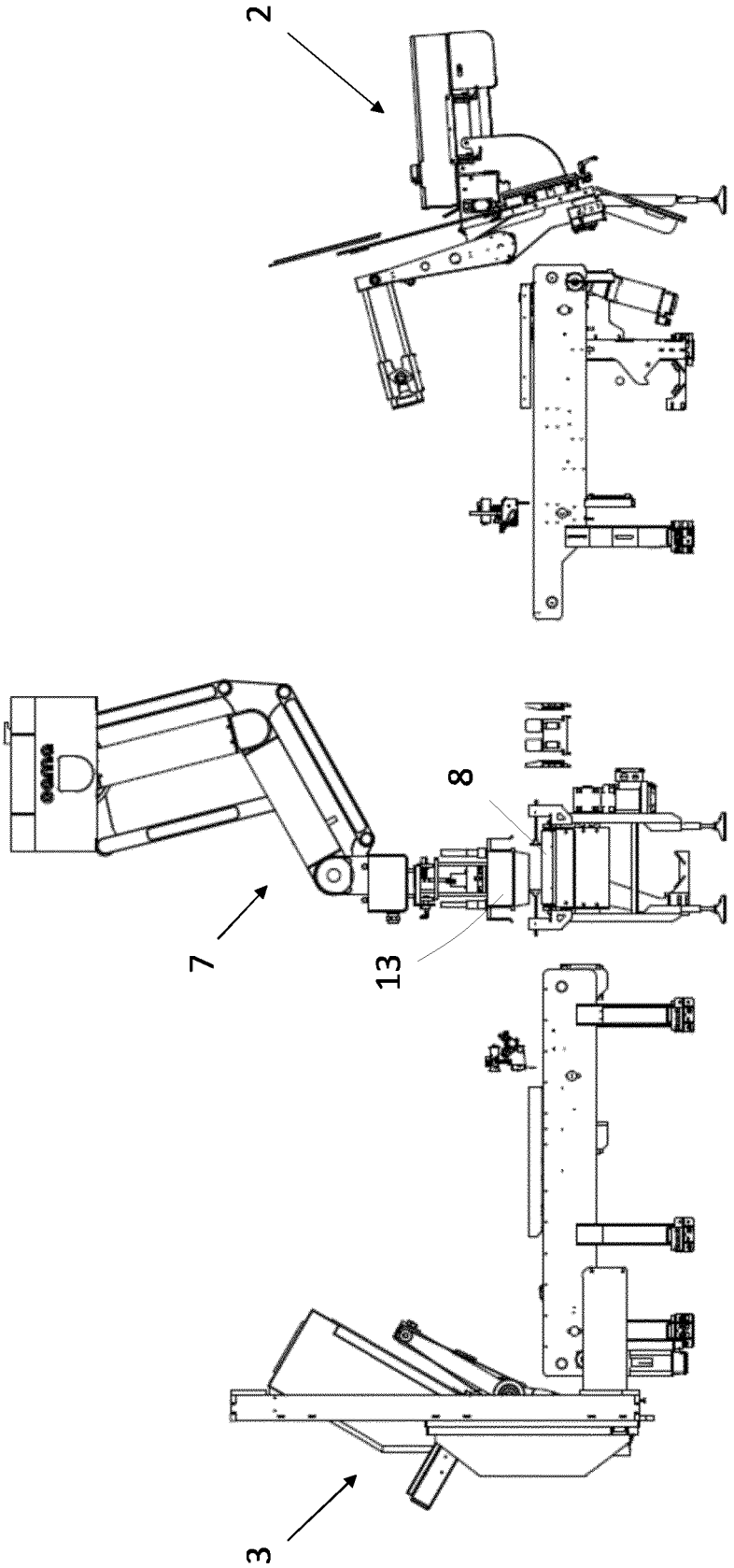

FIG. 5

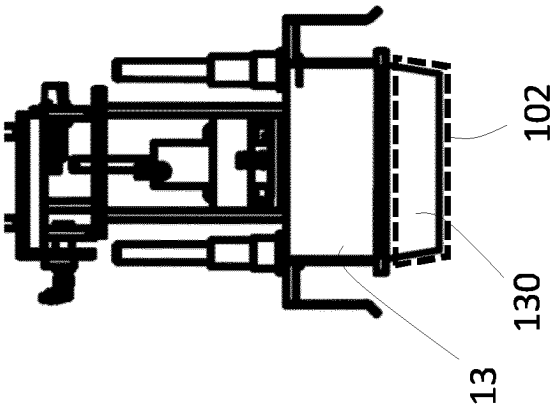

FIG. 8

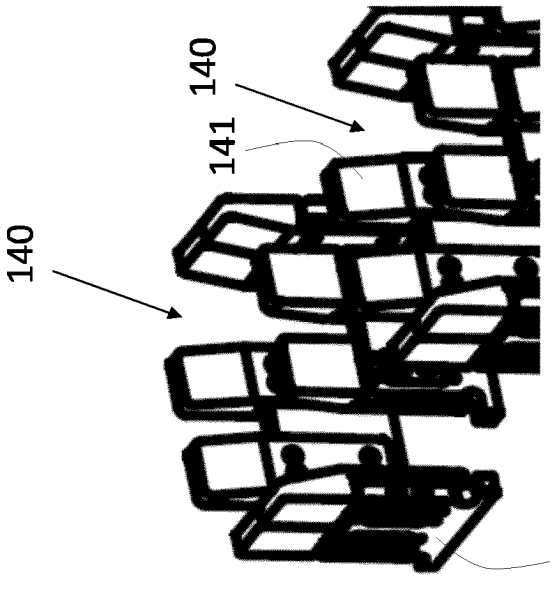

FIG. 7

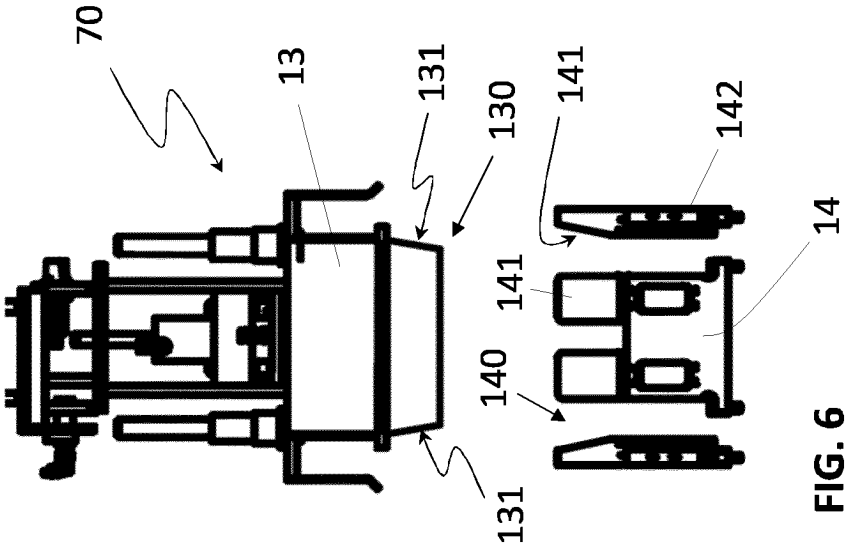

FIG. 6

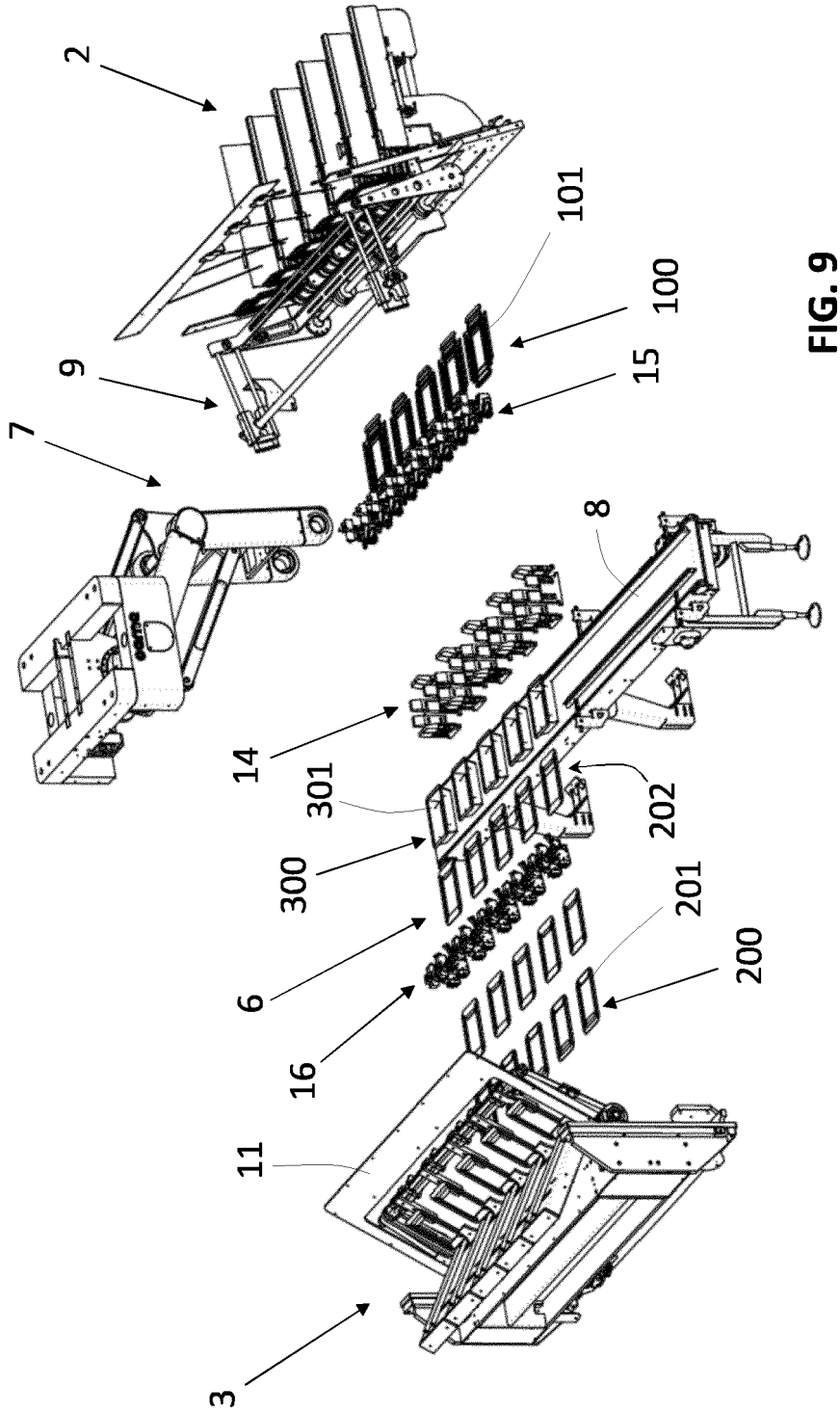

FIG. 9

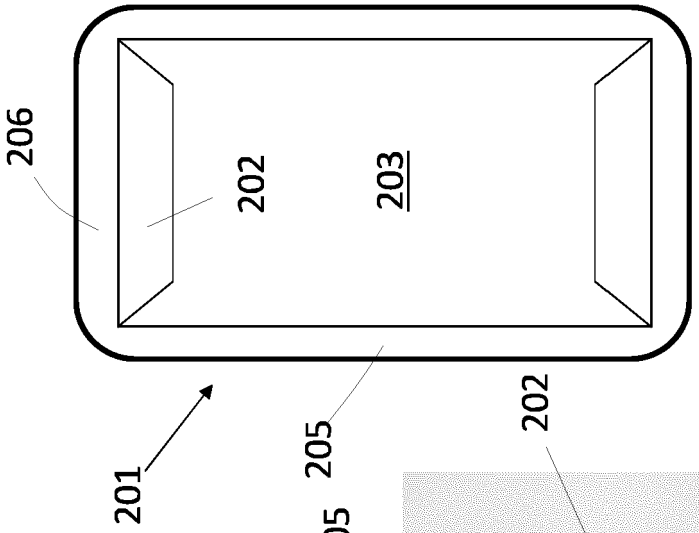

FIG. 11

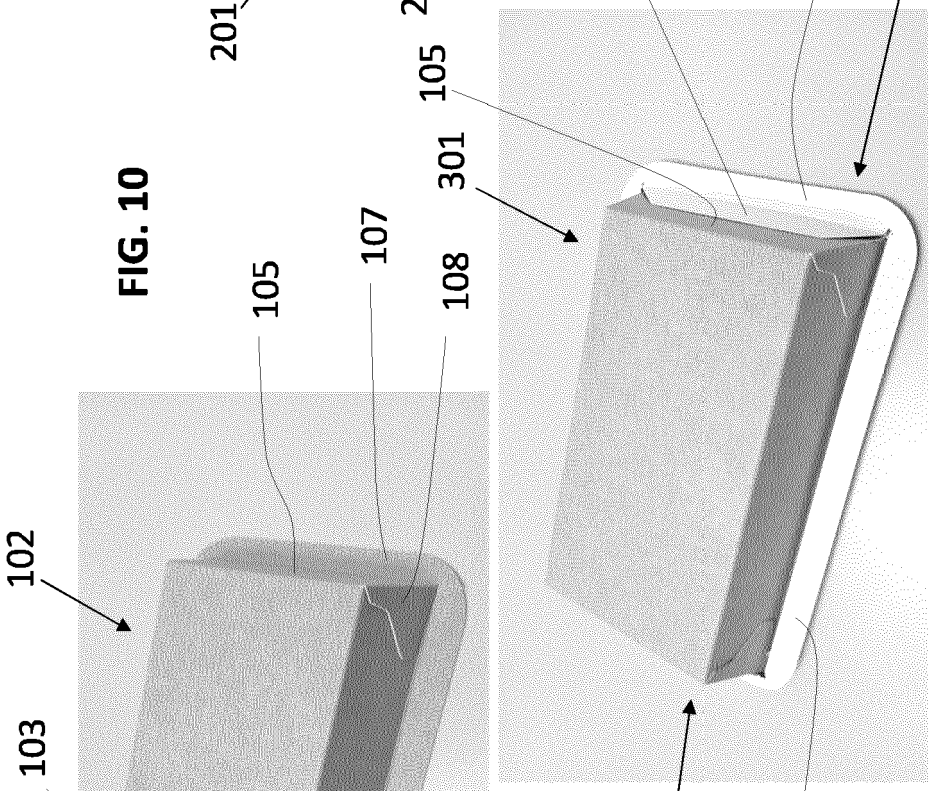

FIG. 12

FIG. 10

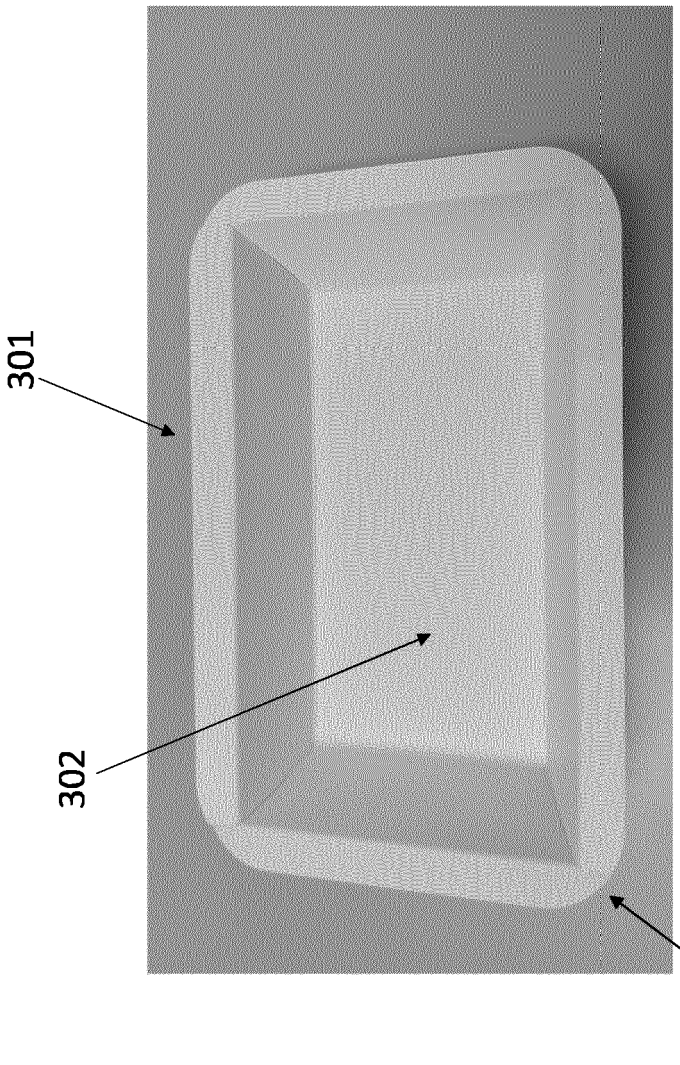

FIG. 13

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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