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(54) **APPARATUS FOR THE MANIPULATION OF POUCH ENVELOPES**

(57) Apparatus for the manipulation of envelopes (4) having an opening (48) delimited by two free edges (19', 19''), comprising:

- a first device (6) which is provided at a first station (33) and which comprises:
- a gripping member (8) configured to grasp and hold, at one of said two free edges, a portion (17') of an envelope when it is arranged substantially horizontally,
- means (32) for moving said gripping member (8) to open up said opening (48),
- a pick-up and handling apparatus (50) comprising a

transfer device (54) with a gripping head (66) for transferring an envelope from said first station to a second station (34), said gripping head comprising:

- gripping means (72) for gripping a substantially horizontally arranged envelope at said first station and for holding it during its transfer to the second station,
- spreading means (62) configured to fit into the opened opening (48) of said envelope and to maintain the free edges of said envelope spaced apart once said at least one envelope is dissociated from said gripping member (8) of the first device.

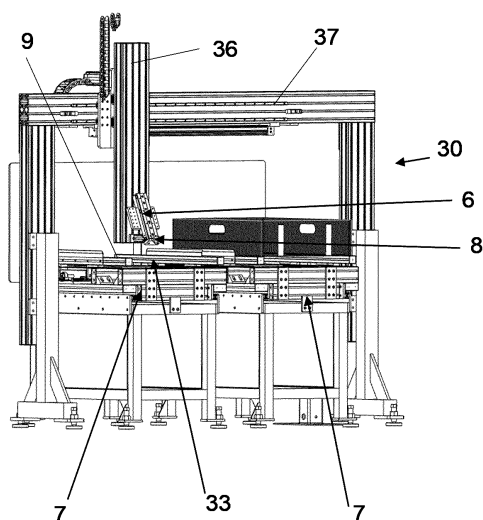
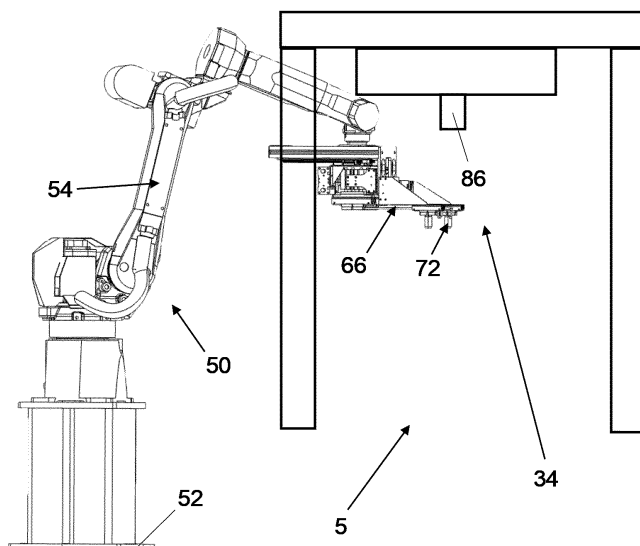


FIG. 1B



Description

[0001] The present invention relates to an apparatus for the manipulation of pouch envelopes and, in particular, for the separation and handling of envelopes, in fabric or other material, which have an opening on one side, and are closed on the others, in such a way to be taken to a machine configured to perform workings and/or operations on each envelope, for example to fill it with a padding material.

[0002] In particular, the present invention relates to an apparatus for moving fabric envelopes (also said "liners") from a pick-up station, in which a plurality of stacked envelopes are arranged, to a filling station in which each envelope is filled with a suitable stuffing material, for example artificial fibers, wool, feathers or synthetic materials (such as foam rubber or rubber latex), in order to obtain a cushion.

[0003] For the production of cushions and other products (for example upholstered products for the furniture, automotive and even toys sectors), the use of a series of consecutive operations normally carried out by mutually independent stations and in which, in correspondence of each station, the intervention of one or more operators is generally foreseen is already known.

[0004] The production process for the preparation of a cushion generally involves the following main phases:

- bagging, within which the padding material of the cushion is inserted inside the envelope, which generally has the desired cushion shape with 3 closed (sewn) sides and one that is at least partially open; suitably, the bagging is carried out on the open side;
- seam, in which the open side of the envelope is closed, thus completing the cushion;

[0005] Suitably, the process then includes further steps of:

- control and arrangement of the cushion, during which the contents of the cushion is homogenized in all its volume and the most critical points of the cushion such as corners and seams are checked;
- enveloping which involves inserting one or more cushions into a packaging container;
- closing the envelope by heat-sealing it or with specific hinges and pressing it (to reduce its size);
- boxing and palletizing of packaged cushions.

[0006] Each of these phases is performed by an at least partially automated operating station.

[0007] Currently, the bagging and sewing phases are partially automated only in some specific cases. In particular, automatic bagging is generally provided in cases where the material making up the padding consists of a single piece. When the padding material is instead made up of a plurality of single discrete elements (small units of elastically deformable material that are soft to the

touch, such as units made with expanded polymers or feathers or woollen flakes or other fibers and the like) the presence of an operator is normally required for checking and providing assistance in filling the lining.

[0008] Therefore, in the production of padded cushions with small discrete elements, the constant presence of an operator is required, thus causing an increase in production costs.

[0009] Furthermore, in the context of the production of cushions in general, the loading into the bagging machine (i.e. of the machine configured for the injection/insertion of the padding material) of the empty envelopes to be filled takes place mainly manually by the operator. In particular, the operator picks up the envelopes to be filled one by one and positions them in said machine in correspondence with the injection nozzle of the padding material.

[0010] It is easy to understand how this is not satisfactory since it causes a slowdown of the automated production line, with a consequent decrease in productivity of the entire plant. Furthermore, these loading operations require the use of dedicated personnel, with a consequent increase in costs.

[0011] The known solutions proposed to automate, at least partially, the separation and positioning of the envelopes to be filled in correspondence with the injection nozzle of the padding material are still not very reliable and, in particular, the operation of spreading the two free edges of the envelope so as to define an opening suitable for receiving the filler material injection nozzle, it is highly dependent on the type of fabric and the dimensions of the envelope to be picked up and handled. Furthermore, the known solutions are particularly laborious and slow since they generally manage to move only two envelopes per minute.

[0012] Furthermore, in the known solutions, the positioning of the withdrawal area, in which the warehouse with the stack of empty envelopes to be filled is provided, is imposed by the position of the filling machine and, moreover, their mutual arrangement always remains only that defined in system design and installation phase, without any possibility of subsequent modification or adaptation.

[0013] US3509689 describes a solution in which the upper envelope of a stack of envelopes is transferred to a loading area provided with means for causing rotation of the envelope from a horizontal position to a vertical position. Only when the envelope is raised and vertically there is an action of adhesive means which cause the envelope to open so as to allow the insertion of spreader elements, which also act as gripping elements. In fact, when the envelope, in a vertical position, is spread apart it is retained/clamped between the enlarged and movable portions of the spreading elements and the guide and fixed portions of the same spreading elements.

[0014] US4687462 describes a solution for handling one bag at a time to insert it, in an open condition, into corresponding boxes. The various bags are fed into the

apparatus by means of corresponding carriages where, in particular, each carriage holds/clamps a corresponding bag in a vertically hanging condition. A gripping element is then provided to open/spread each bag at its inlet and then allow the insertion of a retractor device which, in particular, is configured to spread the bottom of the bag, and thus put the latter under tension. Furthermore, further vices are mounted on the retractor device to hold the bag at its inlet once it has been spread apart and tensioned; more in detail, after the vices have been activated, the retractor device can be retracted/folded. Furthermore, the retractor device is associated with a movement device which allows it to be moved vertically and horizontally. In US4687462, during all the handling operations of the bags, the latter always remain hung in a vertical position. Furthermore, this solution initially requires that each bag be mounted individually and manually on the gripping means with which each carriage is provided.

[0015] The object of the invention is to propose an apparatus for the management of bag envelopes, in particular for the separation, handling and loading of bag envelopes in a machine for their filling, which overcomes the drawbacks of traditional solutions and which makes the aforementioned picking, handling and loading operations highly and/or fully automated.

[0016] Another object of the invention is to propose an apparatus which allows to speed up the loading of the envelopes stacked in a machine for their processing or for carrying out an operation on them, for example for their filling.

[0017] Another object of the invention is to propose an apparatus which eliminates or reduces manual interventions by the operator.

[0018] Another object of the invention is to propose an apparatus which can also be used with existing and operational machines and/or systems.

[0019] Another object of the invention is to propose an apparatus which is simple and easy to use, as well as to reduce maintenance operations.

[0020] Another object of the invention is to propose an apparatus which can be used with envelopes of substantially any shape, size, material and/or fabric.

[0021] Another object of the invention is to propose an apparatus which allows a high flexibility of mutual positioning between the station for picking up the envelopes and the subsequent station which is equipped with a machine for processing them or for carrying out an operation on them, for example for their filling.

[0022] Another object of the invention is to propose an apparatus which has an alternative characterization, both in construction and functional terms, with respect to the traditional ones.

[0023] Another object of the invention is to propose an apparatus which can be used and installed in line in plants for the production of cushions or the like.

[0024] Another object of the invention is to propose an apparatus which allows to obtain cushions of high-quality.

ity.

[0025] Another object of the invention is to propose an apparatus which can be manufactured simply, quickly and with low costs.

[0026] These objects, both individually and in any combination thereof, as well as other purposes which will emerge from the following description, are achieved, according to the invention, with an apparatus for handling pouch-like envelopes as defined in claim 1.

[0027] The present invention is hereinafter further clarified in a preferred embodiment thereof, given by way of non-limiting example only with reference to the attached drawings, in which:

- 15 figure 1a shows a perspective view of the apparatus according to the invention in correspondence with the first station for the manipulation of pouch envelopes,
- figure 1b shows it at the second station,
- 20 figure 2 shows a front view of the first device of the apparatus of fig. 1a,
- figure 3 shows a side view of the device of fig. 2,
- figure 4 shows a front view of the gripping head of the pick-up and handling apparatus of the apparatus of fig. 1a,
- 25 figure 5 shows a side perspective view of the head of fig. 4,
- figures 6-8 show, according to a schematic front view, the sequence of the steps carried out at the first station by the first device and by the means of the gripping head,
- 30 figure 7 shows, according to a schematic front view, a first step of the pick-up phase of the two-dimensional enveloping of the pile,
- 35 figure 8 shows a schematic front view of a subsequent step of the picking step of fig. 7,
- figure 9 shows a schematic view in horizontal section of a first step of the loading phase of the envelope, previously taken, on the injection mouth of the filling machine,
- 40 figure 10 shows the step of fig. 9 according to a schematic front view.
- figure 11 shows a schematic view in horizontal section of a subsequent step of the loading phase of the envelope, previously taken, on the injection mouth of the filling machine,
- 45 figure 12 shows the step of fig. 11 according to a schematic front view.
- 50

[0028] As can be seen from the figures, the apparatus according to the invention-indicated as a whole with the reference number 1 - is configured for the handling and management of bag containment envelopes 4 and, in particular, it is configured for:

- removing at least one empty envelope 4 at a time

from at least one stack 3 of said envelopes provided at a first station 33, and

- transferring the withdrawn envelope 4 to a second station 34 which is provided with a machine 5 arranged for carrying out a process or operation on said envelope, preferably for filling said envelope with a padding material.

[0029] Preferably, the bag envelopes 4 to be managed have an opening 48 on at least one side and are closed on the remaining sides.

[0030] In particular, when empty, the bag envelopes 4 have a substantially "laminar" conformation, i.e. the extension of the thickness is much inferior with respect to the other two dimensions (length and width). Therefore, suitably, at the opening 48, the free edges delimiting said opening must be mutually spaced so as to define a passage section suitable for allowing the entry of the padding material.

[0031] Suitably, the envelopes 4 can be made of fabric, based on natural or synthetic fibers, leather, natural or synthetic, or other materials. Preferably, the envelopes 4 are made of flexible and/or soft material.

[0032] Preferably, the envelopes 4 consist of two portions 17', 17" facing each other and joined together along the entire perimeter with the exception of a section in which the free (i.e. not joined together) edges, respectively 19' and 19", of the two facing portions define/delimit the opening 48. Conveniently, said section with the free edges 19', 19" can be present on all or part - preferably at least the central area - of a side 49 of said envelope.

[0033] Preferably, the envelopes 4 are cushion envelopes to be filled with feathers, or other soft materials such as wool, wadding or felt or synthetic fibers, such as expanded polystyrene, however they can include other bags to be filled and padded, such as for example training bags for boxing, or parts of furniture that need padding, or clothes including padded parts, for example goose quilted jacket, or quilt envelopes.

[0034] Preferably, the filling machine 5 is configured, for example, to insert a filling material (feathers, wool, cotton, or other materials, preferably soft) by means of an injection nozzle 86 into the envelopes to be filled, for example within the linings, so as to obtain cushions. Suitably, it is understood that the machine 5 can be configured to carry out another type of processing, for example stitching, on the envelopes taken and moved at the machine itself.

[0035] Apparatus 1 includes:

- a first device 6 which is provided in correspondence with at least a first station 33 so as to act on at least a loader 7 on which a stack of empty envelopes is positioned; in particular, the first device 6 is configured to hold and lift a free edge 19' of a portion 17' (i.e. the edge of the upper portion) of the envelope 4 so as to move it away from the other free edge 19" of the other portion 17" (i.e. the edge of the small-

er portion) of the same envelope, thus causing a first (preferably partial) expansion of the opening 48 of the envelope so that this defines a first passage section 40,

- a pick-up and handling apparatus 50 which is suitably positioned and configured so as to pick up an envelope 4 from the first station 33 and transfer it to the second station 34 where the machine 5 is provided for carrying out a subsequent processing/operation on the single picked up envelope and transferred.

[0036] Suitably, the apparatus 1 comprises at least one command and control unit - in particular at least one processor, preferably a programmable logic controller (PLC) - for controlling, commanding and synchronizing with each other the operation of the first device 6 and of the handling apparatus 50 and, suitably, of the entire apparatus 1.

[0037] Advantageously, the apparatus 1 comprises a user interface (not shown), preferably of the touch screen type, to allow the operator to set, start/stop, and in general, command, control and manage the overall functioning of the equipment.

[0038] In particular, the device 6 is positioned above the loader 7 which, suitably, comprises a loading surface 9 in which the envelopes 4 are stacked on each other (thus defining a stack 3), preferably all with the side 49 in which is provided with the opening 48 facing in the same direction.

[0039] Advantageously, the loader 7 comprises a support structure for the loading surface 9 and, preferably, the loader 7 can be equipped with means (for example wheels, not shown) for its movement within the environment or environments of work.

[0040] Advantageously, the loading surface 9 of the loader 7 can be adjusted in height so as to ensure that the upper envelope 4 of the stack 3, which is the one intended to be picked up and handled, always remains at the same height as the stack 3 is reduced. Conveniently, for this purpose, an actuator, for example a piston or a chain driven by motorized wheels, can be associated with the loading surface for its vertical movement. Advantageously, each loader 7 can also comprise a sensor, for example a photocell, for detecting the height of the stack 3 of envelopes 4 to be picked up. In particular, the sensor detects the level of the upper envelope 4 of the stack. The sensor is connected to a control unit (not shown) which appropriately controls the actuator to cause a corresponding vertical rise of the loading surface so that the upper envelope 4 of the stack 3 is always at the same height with respect to the device 6.

[0041] The first device 6 comprises at least one gripping member 8 for grasping the free edge 19' of the upper portion 17' of the envelope 4 - which is arranged substantially horizontally and, preferably, is superimposed on other envelopes so as to form a pile - and move it away from the free edge 19" of the smaller portion 17"

of the same envelope so as to cause a partial expansion of the opening 48 of said envelope and, in particular, an expansion which defines a first passage section 40.

[0042] More in detail, the gripping member 8 grasps and retains only one of the two free edges, i.e. the free edge 19' of the upper portion 17'.

[0043] Conveniently, the first device 6 comprises at least a gripping member 8 for grasping the free edge 19' of the upper portion 17' of the envelope 4 when it is arranged substantially horizontally in an extended and closed condition (i.e. when the opening 48 is substantially closed with the two edges 19' and 19" close together and/or in mutual contact).

[0044] In particular, at the first station 33, there is a stack of envelopes 4 arranged substantially horizontally (i.e. the corresponding surface extension of the upper 17' and smaller 17" portions lies on a substantially horizontal or slightly inclined plane with respect to the horizontal).

[0045] Advantageously, the gripping member 8 comprises suction elements 11 and/or 13 (see figs. 2 and 3) configured to suck/grasp and retain the free edge 19' of the upper portion 17' of the upper envelope 4 of the stack 3 arranged on the underlying loader 7, thus making the gripping member integral with said free edge 19'.

[0046] In particular, the suction elements 11 and/or 13 comprise respective suction ports 14' and 14", at least one vacuum source (not shown, preferably a vacuum pump), a corresponding circuit 15' and 15" (preferably comprising respective pipes) to connect the vacuum pump to the suction ports 14' and 14", and control valves (not shown) associated with said circuits.

[0047] Advantageously, the suction elements 11 and/or 13 are configured so that the vacuum source creates a depression inside the circuits 15' and/or 15" and, consequently, in the respective suction ports 14' and 14". Advantageously, the vacuum source is controlled and set in such a way so as to create a suitable vacuum level according to the fabric of which the envelope 4 is to be taken.

[0048] Advantageously, the gripping member 8 comprises a first suction element 11 configured to suck/grasp and retain the lighter envelopes 4 and a second suction element 13 (preferably with a suction cup) configured to suck/grasp and retain - preferably in combination with the first suction element 11 - the heaviest envelopes 4. Conveniently, the second suction element 13 is positioned posteriorly with respect to the first element 11.

[0049] Advantageously, the first suction element 11 comprises a tube 20 whose termination defines the corresponding suction port 14' of the first element. Advantageously, the second element 13 of the gripping member 8 comprises a suction cup 16, with a body having a preferably circular or polygonal shape and provided with a central hole which defines the corresponding suction port 14" of the second element.

[0050] Advantageously, the command and control unit of the apparatus 1, and preferably that of the first device

6, is configured to control the operation of the vacuum pump and/or to control the opening and closing of the valves associated with the circuits 15' and 15".

[0051] Conveniently, according to an embodiment not shown here, the gripping member 8 could comprise adhesive means and, in particular, an adhesive portion, which is intended to come into contact with the free edge 19' of the upper portion 17' of the envelope 4 to be removed in order to make said edge integral with the gripping member. Conveniently, according to a further embodiment not shown here, the gripping member 8 could comprise needle grippers, also intended to come into contact with the free edge 19' of the upper portion 17' of the envelope 4 to be picked up.

[0052] The first device 6 also comprises a group for moving the gripping member 8 to space the free edge 19', which is gripped and held by said member, on the other free edge 19" of the envelope 4 so that the opening 48 of the latter defines a first passage section 40.

[0053] Advantageously, the movement group 32 moves the gripping member 8 towards/away from the underlying loader 7. In particular, the movement group 32 is configured to vertically move the gripping member 8. Preferably, the gripping member 8 is also orientable and, preferably, it can be tilted with respect to the vertical away from a vertical support section 36.

[0054] Advantageously, the movement group 32 comprises an element 29 for the support of the gripping member 8 above each loader 7, a guide element 28 and an actuator for sliding the support element - and therefore the gripping member 8 - along the guide element 28 towards and away from the underlying loader 7.

[0055] Preferably, therefore, the movement group 32 is configured to cause the gripping member 8 to descend and ascend and, in particular, the descent of the gripping member allows the suction port 14' and/or 14" of said member to come into contact with or near the upper envelope 4 of the stack 3 so as to suck/grasp and hold - in the face of activation of the suction elements 11 and/or 13 - only the upper portion 17' of said envelope, in correspondence with its free edge 19' (see fig. 6). Therefore, once this upper portion is made integral with the gripping member (since it is sucked in/retained by the suction elements 11 and/or 13 of said gripping member), the subsequent ascent of the latter causes the free edge 19' of said upper portion 17' to be raised which is thus moved away from the free edge 19" (which is not retained by the gripping member 8) of the smaller portion 17" (see fig. 7). Suitably, the lifting of the upper portion 17' of the envelope 4 also causes the lifting of the entire envelope - given that, around the free edges, the upper portion 17' is joined to the smaller portion 17" - and this causes a further reciprocal separation of the two free edges 19' and 19" since that of the smaller portion (not being held by the gripping member) tends to go downwards.

[0056] Advantageously, the activation/deactivation of the actuator of the movement group 32 to cause the ascent/descent of the gripping member 8 and the activa-

tion/deactivation of the suction elements 11 and/or 13 of the gripping member 8 are suitably controlled and synchronized so as to allow the aforesaid operations and thus obtain a preferably partial expansion of the opening 48 of said envelope. In particular, this expansion of the opening 48 obtained by the action of the first device 6 is such as to cause said opening 48 to define a first passage section 40.

[0057] Conveniently, the guide element 28 of the movement group 32 is then fixed to a vertical section 36 at the smaller end of the latter; suitably, the vertical section 36 is in turn provided with means for its movement along a vertical direction Z so as to bring its smaller end - and therefore the device 6 comprising the gripping member 8 with its movement group 32 - closer/further away from the underlying loader 7.

[0058] Advantageously, the first station 33 comprises a frame 30, which is positioned and develops above the loaders 7 for the support of the vertical section 36 and its vertical movement means. Advantageously, in an embodiment not shown, the frame 30 rests on the ground by means of wheels which allow it to be moved.

[0059] Advantageously, the first station 33 also comprises means for moving the vertical section 36 and the device 6 between the various loaders 7. Preferably, the vertical section 36 is mounted on a support crosspiece 37 of the frame 30 and, by means of corresponding motor means, is moved back and forth on the latter along a direction defined by the development of the traverse itself.

[0060] As said, the apparatus 1 further comprises a pick-up and handling apparatus 50 which, at the first station 33, picks up a single envelope, in particular picks up the top envelope 4 of the stack 3 having the top layer 17' raised by the first device 6, and transfers it to the second station 34 in which the machine 5 is provided for carrying out the subsequent processing/operation on the single envelope picked up and moved.

[0061] Preferably, the pick-up and handling apparatus 50 acts on the envelope 4 of the stack 3 having the two free edges 19' and 19", which delimit the opening 48, which have been partially spread apart from one another so as to cause a first expansion, preferably partial, of the opening 48 which thus defines said first passage section 40.

[0062] Advantageously, the pick-up and handling apparatus 50 is also configured to further move away the free edges 19' and 19" of the two facing portions 17' and 17" of the envelope 4 and thus causing a further spreading/expansion of the opening 48 provided in said envelope so as to define a second passage section 41 which is larger than that obtainable with the only action of the first device 6.

[0063] Conveniently, the pick-up and handling apparatus 50 is configured to cause such expansion of the two free edges 19' and 19" of the two portions 17' and 17" of the envelope 4 so that the opening 48 defines a passage section suitable to receive inside the injection

nozzle 86 provided in the machine 5 for the injection of the padding material inside the envelope. Preferably, the pick-up and handling apparatus 50 is configured to position the envelope 4 picked up at the machine 5 so that the injection nozzle 86 of the latter enters the opening 48 which is obtained, separating the free edges of the two facing portions of the envelope, by means of the combined action of the first device 6 and of the spreading means 62 mounted on said apparatus 50.

[0064] Advantageously, the pick-up and handling apparatus 50 comprises a transfer device 54 provided with a gripping head 66.

[0065] Preferably, the transfer device 54 is a robotic manipulator, preferably anthropomorphic and/or of the type used in the industrial context, which has the fixed end mounted on a smaller base 52 while in correspondence with the floating end a gripping head 66 is mounted. Suitably, the robotic manipulator is mounted on a base 52 which can advantageously be equipped with means (not shown) for its handling. Preferably, the robotic manipulator has a structure with at least 4 degrees of freedom.

[0066] Conveniently, in a different embodiment not shown, the transfer device 54 comprises a suitable frame with handling units provided with actuators and configured to rotate the gripping head 66 around corresponding axes and/or to make it translate along corresponding guides so as to cause the transfer of said head between the first station 33 and the second station 34.

[0067] On the gripping head 66 are mounted gripping means 72 for grasping an envelope 4, which/when it is arranged substantially horizontally, at the first station 33 and to retain it during its transfer to the second station 34. In particular, at the first station 33 the gripping means 72 act on the envelope 4 of which the edge 19' of the upper portion has been raised by the first device 6.

[0068] Conveniently, the gripping means 72 are configured to clamp the envelope 4 - which/when it is arranged substantially horizontally zonal - so as to make it integral with the head itself which is mounted at the mobile end of the transfer device 54. Preferably, the gripping means 72 are configured to clamp the envelope 4 by contacting the external surfaces of the two portions 17' and 17" of the envelope itself. Conveniently, the gripping means 72 are configured to clamp the envelope 4 at the tract 67, around the opening 48, in which the portions 17' and 17" are mutually joined.

[0069] Furthermore, spreading means 62 are mounted on the gripping head 66 which are configured to fit inside the opening 48 of the envelope 4 when the latter is arranged substantially horizontally and when said opening 48 has said first passage section 40 and to maintain the edges 19', 19" of said envelope spaced apart once the envelope is released and/or is detached/disassociated from the gripping member 8 of the first device 6 to be moved towards the second station 34.

[0070] Suitably, at the second station 34, the envelope 4 is arranged substantially vertically (i.e. the correspond-

ing surface extension of the upper 17' and smaller 17" portions lies on a substantially vertical or slightly inclined plane with respect to the vertical).

[0071] Advantageously, the spreading means 62 are also configured to cause a second and further expansion of the free edges 19' and 19" of the two portions 17' and 17" of the envelope 4 so that the opening 48, delimited by said two free edges, defines said second passage section 41 which is larger than the first passage section 40.

[0072] Conveniently, the transfer device 54 of the pick-up and handling apparatus 50 is configured to move the gripping head 66 between the first station 33 and the second station 34, as well as to cause the movement of said gripping head 66 between a first orientation (to be taken at the first station 33, see fig. 1a) and a second orientation (to be taken at the second station 34, see fig. 1b).

[0073] Preferably, in said first orientation (see Figures 1a and 4), the gripping head 66 is substantially arranged vertically and is perpendicular to the plane defined by the empty envelope 4 to be picked up at the first station 33. Preferably, instead, when it is in said second orientation (see figures 1b and 5), the gripping head 66 is substantially arranged horizontally and is perpendicular to the withdrawn envelope which, being held by the gripping means 72 of the head itself, is hung vertically.

[0074] In particular, the gripping head 66 comprises a frame 70 which develops along a first direction X1 along which a slide structure 58 slides.

[0075] Conveniently, the frame 70 is associated with the mobile end of the transfer device 54, preferably of the robotic manipulator. Conveniently, when the gripping head 66 is in said first orientation the frame 70 is arranged substantially vertically, while when said gripping head 66 is in said second orientation the frame 70 is arranged substantially horizontally.

[0076] Suitably, the frame 70 supports the gripping means 72 for picking up the envelope 4 having the edge 19' of the upper portion 17' raised by the device 6. Conveniently, the gripping means 72 are mounted on the frame so as to be able to move reciprocally approaching and moving away along a second direction Y1 which is perpendicular to the first direction X1. Preferably, the gripping means 72 can be mounted on respective support wings 78 which in turn are mounted, at one end of the frame 70, so as to be able to move in mutual approach and departure.

[0077] Advantageously, the slide structure 58 supports a frame 60 on which the spreading means 62 are mounted. Conveniently, the frame 60 is mounted on the slide structure 58 so as to be able to move towards and away from the latter along a third direction Z1 which is perpendicular with respect to the first direction X1 and the second direction Y1 thus completing the set of Cartesian axes of the gripping head 66. Conveniently, in other words, the first direction X1 corresponds to the main development direction of the frame 70, the third direction

Z1 is perpendicular to the plane defined by the frame 70 while the second direction Y1 corresponds to the direction perpendicular to the other two to complete the Cartesian triad.

[0078] Advantageously, the gripping means 72 comprise two pincers 74, 74' (but could also be one or more than two), configured to pinch the envelope 4 around its opening 48, preferably at the tract 67 in which the two portions 17', 17" are joined together. Advantageously, each of the pincers 74, 74' comprises at least two elements 76, preferably shaped like a pin - or they could also be joined with a hinge - which approach and move away from each other to pinch and release the envelope to be picked up.

[0079] More in detail, the pins 76 of the pincers 74, 74' are slidably mounted on respective rails 81, fixed to the support fins 78, so as to allow the opening and closing of the pincers 74, 74'. Advantageously, this movement is motorized and, preferably, it is automated.

[0080] As mentioned, the spreading means 62 are mounted on the gripping head 66, which have (at least) a basic configuration (see fig. 7) in which the means themselves delimit an insertion section 42 of each other (discontinuously or continuously) which is preferably smaller than the first passage section 40, so as to allow the insertion of the spreading means 62 into the opening 48 of the envelope which has said first passage section 40 and which was obtained following the action for lifting the edge 19' of the upper portion 17' exercised by the first device 6 of the first station 33.

[0081] Advantageously, the presence of the spreading means 62 also allows to maintain the dilated condition of the two free edges 19', 19" of the upper 17' and smaller 17" portion of the envelope 4 even when the first device 6 no longer acts on it and/or during the transfer of the envelope - which has been clamped by the gripping means 72 - from the first station 33 to the second station 34.

[0082] Conveniently, in an embodiment not shown, the spreading means 62 are configured to assume only this configuration (i.e. they are not actuated to move away from each other).

[0083] Advantageously, in the embodiment shown, the spreading means 62 are associated with movement means to assume the same two configurations means, and in particular:

- a first configuration (insertion or compact, see fig. 7), corresponding to the aforementioned basic configuration, in which the means themselves delimit one from the other (discontinuously or continuously) an insertion section 42 which is suitably smaller than the first passage section 40 of the opening 48; in particular, this first passage section 40 of the opening 48 is that obtained following the lifting action of the edge 19' of the upper portion 17' exerted by the first device 6 of the first station 33,
- a second configuration (operative or dilated, see fig.

8) in which the means themselves delimit one from the other (in a discontinuous or continuous way) a dilated section 43 which is preferably larger than the insertion section 42 that the means themselves delimit when found in said first configuration.

[0084] Conveniently, the spreading means 62 comprise at least a pair of spreading arms 82, 82', 82", 82''' which define with their ends the dimensions of said insertion section 42 and which, once inserted in said opening 48 of the envelope 4, are intended to come into contact with the internal surface of said envelope 4. Preferably, the arms 82, 82', 82", 82''' of each pair are movable in mutual approach and separation.

[0085] Conveniently, the gripping means 72 are defined by elements distinct from those that define the spreading means 62. More in detail, while the gripping means 72 comprise pincers 74 and 74', the spreading means 62 comprise at least two arms 82, 82', 82" and 82'''.

[0086] Advantageously, said gripping means 72 are arranged and act externally with respect to said spreading means 62. Preferably, while the gripping means 72 act on the external surfaces of the portions 17' and 17" of the envelope 4, the spreading means act on the surfaces inside the portions 17' and 17" of the envelope 4.

[0087] Advantageously, the spreading means 62 comprise at least two, preferably four, spreader arms 82, 82', 82", 82''' . Advantageously, said four arms mainly extend along the direction X1, and in particular define with their ends the vertices of a polygon, preferably of a rectangle. Preferably, the ends of said at least four spreading arms 82, 82', 82", 82''' are coplanar.

[0088] Preferably, the four spreading arms are arranged in pairs and, in particular, each end of said arms is aligned along the direction X1 with the end of yet another arm and along the direction Y1 with the end of another arm (see fig. 4).

[0089] Advantageously, the spreading arms 82, 82', 82", 82''' can have a curved outer end and, preferably, the apex of the arms is slightly folded inwards.

[0090] Suitably, as shown in fig. 4, when the spreading arms 82, 82', 82", 82''' are in their basic configuration, connecting the apex of the adjacent arms to each other, an imaginary perimeter is defined that circumscribes/delimits the size of the insertion section 42.

[0091] Preferably, means for moving them are associated with the spreading arms 82, 82', 82", 82''' so as to make them assume said first configuration (which corresponds to said basic configuration) and, also, said the second configuration.

[0092] Advantageously, for this purpose, the frame 60 comprises two parallel profiles 64, 64' which are movable in mutual approach/separation along the second direction Y1. Advantageously, two supports 68 and 68' are mounted on each profile 64, 64' of said frame 60, which are movable in mutual approach/separation along the first direction X1; suitably, a support arm 82, 82', 82", 82'''

is associated with each support 68 and 68' mounted on each section 64 and 64'.

[0093] Conveniently, in this way, when the spreading arms 82, 82', 82", 82''' are in their first configuration (corresponding to the basic configuration) they can be inserted into the opening 48 (see fig. 7) which has already been dilated as a result of the lifting action carried out by the first device 6; in particular, suitably, the action of the first device 6 is such that the opening 48 of the envelope 4 defines a first passage section 40 which is larger than the insertion section 42 defined/occupied by the spreading arms 82, 82', 82", 82'''.

[0094] Therefore, once inserted/penetrated into the opening 48, the spreading arms 82, 82', 82", 82''' can be moved in mutual approach/separation along the first direction X1 and/or along the second direction Y1, to be thus brought into said second configuration. In particular, in this way, the spreading arms 82, 82', 82", 82''' come to define/circumscribe the dilated section 43 and thus cause a further divarication of the two free edges so that the opening 48 of the envelope defines a second passage section 41 larger than the first section 40 (see fig. 8).

[0095] Advantageously, the presence and action of the spreading arms 82, 82', 82", 82''' also allows to maintain the spread configuration of the two free edges 19', 19" of the upper 17' and smaller 17" portion of the envelope 4, as well as the second passage section 41 of said opening 48 (second section which is larger than the first passage section 40 provided for the insertion of the spreading arms 82, 82', 82", 82''') also during the transfer of the envelope - which has been clamped by the gripping means 72 - from the first station 33 to the second station 34.

[0096] Suitably, the passage section of said opening 48 obtained and maintained as a result of the action of the spreading arms 82, 82', 82", 82''' is such as to allow the insertion, inside said opening, of the injection nozzle 86 of the machine 5 for filling provided in the second station 34.

[0097] Advantageously, the action spreader arms 82, 82', 82", 82''' - and in particular the amplitude of their movements along the first direction X1 and along the second direction Y1 - is suitably defined on the basis of the envelope 4 to be picked up in such a way as not to cause an excessive spread that can damage it and, also, it is defined so as to create a passage section of said opening suitable to allow the insertion of the injection nozzle 86 of the filling machine 5.

[0098] Advantageously, the actuators of the transfer device 54 of the pick-up and handling apparatus 50 are controlled and commanded, in a synchronized way, by a suitable control and command unit on the basis of the detections carried out by a suitable sensor system mounted on the pick-up and handling apparatus 50.

[0099] Suitably, the drives of the gripping means 72 and of the spreading means 62 of the gripping head 66 are motorized and, advantageously, are controlled to be automated and synchronously activated with the move-

ments of the transfer device 52 and of the first device 6. Advantageously, the actuation of the gripping means 72 and of the spreading means 62 is commanded and controlled by a control and command unit on the basis of the detections carried out by a suitable sensor system mounted on the gripping head 66 and on the transfer device 52, as well as, possibly, on the first device 6.

[0100] Preferably, the apparatus 1 comprises a first control and command unit for the pick-up and handling apparatus 50 and, in particular of the transfer device 52, and a second control and command unit of the first device 6. Conveniently, said first control unit and said second control unit are connected and communicate with each other to suitably synchronize the various operations performed by the components of said apparatus. Conveniently, both said first unit and said second unit are configured to command and control the gripping means 72 and the spreading means 62 of the gripping head 66.

[0101] Advantageously, the apparatus 1 can comprise a single unit for controlling and commanding both of the pick-up and handling apparatus 50 and of the first device 6.

[0102] The operation of the apparatus 1 according to the invention clearly derives from what has already been explained.

[0103] In particular, on the loader 7 positioned at the first station 33 are arranged a stack 3 of empty bag envelopes 4 to be picked up and manipulated by means of the apparatus 50 so that they can then be processed, preferably filled, by means of the machine 5 of the second station 34. Conveniently, the envelopes 4 are arranged on the loader 7 so that their free edges 19' and 19" delimiting the opening 48 are oriented and facing towards the action area of the pick-up and handling apparatus 50.

[0104] Advantageously, the device 6 is moved to be brought above a loader 7 so that the gripping member 8 - following its descent stroke caused by the movement group 32 - can act on the upper envelope 4 of the stack 3 positioned on said loader 7.

[0105] Conveniently, the loader 7 with the stack 3 of envelopes is positioned inside the first station 33 and/or the group the movement group 32 of the gripping member 8 is suitably controlled so that said gripping member is substantially facing the area of the upper portion 17' of the envelope 4 provided at its free edge 19', i.e. near the opening 48 of the housing.

[0106] Subsequently, the movement group 32 causes the gripping member 8 to descend and approach the envelope and - in a suitably controlled and synchronized manner - the suction elements 11 and 13 are therefore activated, which are suitably set to grasp/suck only the free edge 19' of the upper portion 17' of the envelope 4 (see fig. 6). In particular, the activation of the suction means makes the free edge 19' of the upper portion 17' of the envelope 4 with the gripping member 8 integral (i.e. grasps and retains).

[0107] Conveniently, the movement group 32 causes

the ascent of the gripping member 8 - which holds the upper portion 17' of the envelope by means of the suction elements 11 and 13 which remain activated - by a stretch suitable for causing a first dilation of the opening 48 delimited by the free edges 19' and 19" of the envelope. In particular, the opening thus dilated defines a first passage section 40.

[0108] Conveniently, as will become clearer later, this partial expansion defines a first passage section 40 of said opening 48 such as to allow the entry of the spreading means 62 (which delimit the insertion section 42) when they are in their basic configuration or in any case in their first configuration.

[0109] At this point, therefore, preferably automatically, the pick-up and handling apparatus 50 is activated. Advantageously, the pick-up and handling apparatus 50 can be activated already during the operation of lifting the free edge 19' of the upper portion 17' of the envelope 4 by the first device 6 so as to bring - down during the aforesaid lifting operation - the gripping head 66 to the action zone of the first device 6 of the first station 33, thus speeding up the whole process.

[0110] In particular, the transfer device 54 is suitably controlled so as to bring the gripping head 66 to the first station 33 so that it is substantially facing the opening 48 which has been partially dilated so as to define the first passage section 40 (see fig. 7). Conveniently, the transfer device 54 is controlled so that the gripping head 66 at the first station 33 is arranged in a first orientation in which the frame 70 of said gripping head 66 is substantially arranged vertically and is substantially perpendicular with respect to the plane defined by the stacked envelopes 4.

[0111] Conveniently, the plane identified by the frame 70 of the head 66 is perpendicular to the opening 48, so that the pincers 74, 74' of the gripping means 72 close, closing the upper envelope 4 of the stack 3, the upper portion of which is held by the gripping member 8 of the first device 6. Conveniently, the gripping means 72 clamp the envelope around its opening 48 at the areas where the two portions of the envelope are joined/sewn together.

[0112] Conveniently, the spreading means 62 of the gripping head 66 - which are in their basic configuration and define/delimit the insertion section 42 - insert and penetrate enter the first passage section 40 of the opening 48 of the upper envelope 4 of which the edge 19' of the upper portion 17' is held and raised by the device 6 (see fig. 7).

[0113] Advantageously, once the spreading means 62 have been inserted into the opening 48 of the envelope, the suction elements 11 and/or 13 of the gripping member 8 are deactivated, thus releasing the upper portion 17' of the envelope 4 which had previously been retained and relieved.

[0114] Advantageously, the spreading means 62 - once inserted within the opening 48 when they are in their basic configuration - are moved to be brought into

the second configuration (operational or dilated) in which the means themselves delimit each other (discontinuously or continuous) a dilated section 43 which is preferably larger than the insertion section 42 (see fig. 8). Suitably, the dilated section 43 of the spreading means 62 further expands the opening 48 thus bringing it from the first passage section 40 to the second passage section 41.

[0115] In particular, the spreading arms 82, 82', 82'', 82''' of the spreading means 62 are moved outwardly so as to widen the opening 48. More in detail, the arms 82, 82' are moved in the positive verse of the direction X1 while the arms 82'', 82''' are moved in the negative verse of the direction X1; moreover, the arms 82, 82'' are moved in the negative verse of the direction Y1 while the arms 82', 82''' are moved in the positive verse of the direction Y1.

[0116] Advantageously, the movement of the spreading means 62 to reach the dilated section 43 brings the opening 48 into the second passage section 41 which is such as to allow the subsequent processing of the envelope 4 by the apparatus 50 of the second station 34. Preferably, the second passage section 41 of the opening 48 of the envelope 4 is such as to allow injection nozzle 86 of the apparatus 50 for the injection of the padding material (see fig. 9).

[0117] Suitably, even when the action of the device 6 is interrupted (i.e. when for example the suction elements 11 and/or 13 are deactivated) and/or in any case when the envelope, previously dilated by the action of said device, is removed from the first station 33, the spreading means 62 inserted inside the housing keep the edges 19', 19'' of said housing spaced apart.

[0118] The action of the first device 6, the clamping action of the spreading means 62, the insertion of the gripping means 72 - and preferably also their possible movement to pass from the first (compact) configuration to the second (dilated) configuration - carried out on the upper envelope 4 of the stack 3 are suitably synchronized; preferably, the actions carried out by the spreading means 62 and the gripping means 72 can take place substantially simultaneously.

[0119] Subsequently, the envelope 4 - held by the spreading means 62 and kept dilated by the gripping means 72 - is brought, by means of a specific movement of the transfer device 54 of the apparatus 50 to the machine 5 of the second station 34 (see figures 9-12). Conveniently, during the transfer between the first station 33 to the second station 34, the transfer device 54 of the pick-up and handling apparatus 50 causes the movement of said gripping head 66 - and therefore of the envelope clamped by the spreading means 62 - to bring it from the first orientation to the second orientation.

[0120] Conveniently, the machine 5 of the second station 34 can have an injection nozzle 86 directed downwards. In this case, the transfer device 54 is suitably controlled so as to rotate the head 66 to bring it in the second orientation so that the opening 48 of the envelope, dilated by the spreading means 62, is oriented upwards to thus

allow the penetration of the injection nozzle 86 into the opening thus dilated.

[0121] It is also understood that in case of need, the transfer device 54 can be operated so as to move the head 66 in different positions and/or orientations according to the subsequent processes/operations provided for in the second station 34.

[0122] Subsequently, at the second station 34, as shown in figures 11 and 12, the opening 48 of the envelope 4, which has been picked up and moved, is suitably inserted and closed around the injection nozzle 86.

[0123] Advantageously, to do this, the gripping means 72 are moved in such a way to be extracted from the opening 48 of the envelope. Preferably, moreover, the spreading means pass from the second (dilated) configuration to the first (compact) configuration. At the same time, the two pincers 74, 74' of the gripping means 72 are mutually moved apart from one another, dragging with them the edges of the envelope 4 so as to stretch it.

[0124] Conveniently, therefore, the gripping means 72 and the spreading means 62 of the gripping head 66 are controlled and commanded so as to operate in a synchronized manner and/or in such a way as to cooperate with each other, in particular to first carry out the insertion of the opening 48 of the envelope 4 around the injection nozzle 86 and then to close/approach the edges, defining said opening, around said filler.

[0125] In particular, the spreading arms 82, 82', 82'', 82''' are first made to move towards the center according to movements contrary to those previously described and, subsequently, they are extracted from the opening 48 (see figures 11 and 12) by a movement of the slide structure 58 along the direction Z1, so as to allow the curved end of the spreading arms to disengage the opening 48 of the envelope, and are subsequently withdrawn, for example by means of a horizontal movement of the supports 62 and 62' along the direction X1.

[0126] Conveniently, in essence, the gripping means 72 and the spreading means 62 cooperate so as to reduce the dimensions of the opening 48 of the envelope 4. Preferably, at the end of these movements, the opening 48 of the envelope has a passage section slightly larger than the injection nozzle 86 of the machine 5 which is inserted inside it (see fig. 11).

[0127] Advantageously, the envelope 4, which is still firmly held by the pincers 74, 74', can be made to slide vertically by means of a corresponding movement of the transfer device 54 so as to insert the injection nozzle 86 of the machine 5 more deeply inside of the opening 48, preferably for injecting the padding material inside the envelope (lining).

[0128] Conveniently, therefore, the machine 5 (preferably automatically) which injects - through the nozzle 86 inserted in the opening 48 - the padding material inside the envelope is then activated, thus obtaining a suitably filled/padded envelope.

[0129] Finally, the gripping means 72 of the gripping head 66 release the envelope thus filled with the padding

material and, advantageously, the pick-up and handling apparatus 50 returns to the first station 33 to act on the next upper envelope 4' of the pile 3 arranged on the loader 7, envelope 4' of which the edge of the upper portion has in the meantime been suitably raised by the first device 6.

[0130] From what has been said it is clear that the apparatus for handling pouch-like envelopes according to the invention is particularly advantageous because:

- allows a fully automated handling of the pouch envelopes, preferably empty linings to be filled with a padding material to obtain corresponding cushions,
- allows precise, even complex, handling of pouch envelopes,
- it allows to handle envelopes also of different sizes and/or different materials and, in particular, also of different fabrics,
- it can be used within a fully automated production line, even existing ones. and
- it allows to speed up, and thus make highly efficient, the loading of the stacked envelopes in a machine configured for their filling.

[0131] In particular, unlike US3509689 and US4687462, in the solution according to the present invention, the first device, with its gripping member, holds, grasps and lifts only one edge (the upper one) of the envelope while the other edge of the envelope falls/hangs by gravity downwards and this happens because the envelope is arranged substantially horizontally in the first station. Advantageously, therefore, while the upper edge is held by the gripping member, the smaller edge, although not being held by the gripping member, is also spaced from the upper edge, thus suitably causing an expansion of the opening, delimited by said edges, such as to define a passage section suitable for inserting the retractor means. Furthermore, unlike US3509689 and US4687462, in the solution according to the present invention, the gripping means of the gripping head are configured to grasp the envelope when it is arranged horizontally and, suitably, the spreading means are configured to fit inside the opening of the envelope when the latter is arranged horizontally.

Claims

1. Apparatus for the manipulation of bag-shaped envelopes (4), in particular of envelopes which have on one side (49) an opening (48) delimited by two free edges (19', 19''), comprising:

- at least a first device (6) which is provided at at least a first station (33) and which comprises:
 - a gripping member (8) configured to grasp and hold, at one of said two free edges (19'), a portion (17') of at least one envelope (4)

when it is arranged substantially horizontally,

- a movement group (32) of said gripping member (8) to remove said free edge (19'), which is held by said member, from the other free edge (19'') of the same envelope (4), which it is not retained by said member (8), so that the opening (48) of said envelope (4), when it is arranged substantially horizontally, defines a first passage section (40),

- at least one pick-up and handling apparatus (50) comprising at least one transfer device (54) which is provided with at least one gripping head (66) and which is configured to transfer at least one envelope (4) from said at least one first station (33) to at least a second station (34) which is provided with at least one machine (5) configured to perform a machining operation or an operation on said at least one envelope (4), said gripping head (66) comprising:

- gripping means (72) for gripping at least one envelope (4), when it is arranged substantially horizontally, at said at least one first station (33) and for holding it during its transfer to the second station (34),

- spreading means (62) configured to fit into the opening (48) of said at least one envelope (4) when it is arranged substantially horizontally and when said opening (48) has at least said first passage section (40) and to maintain the free edges (19', 19'') of said envelope spaced apart once said at least one envelope is dissociated from said gripping member (8) of the first device (6) to be moved towards said second station (34).

2. Apparatus according to claim 1, **characterized in that** said spreading means (62) are mounted on said gripping head (66) so as to define a basic configuration in which the spreading means (62) delimit an insertion section (42) which is smaller than the first passage section (40) of said opening (48) so as to allow the insertion of the spreading means (62) within said opening (48) obtained following the action of retracting the edge free (19') carried out by the first device (6) of the at least one first station (33).

3. Apparatus according to claim 2, **characterized in that** said spreading means (62) are configured and controlled to maintain said basic configuration once said envelope is dissociated from said gripping member (8) of the first device (6) be moved towards said second station (34).

4. Apparatus according to one or more of the preceding

claims, **characterized by** the fact that said spreading means (62) are associated with movement means configured to make the means themselves assume two configurations:

- a first compact configuration in which the spreading means (62) delimit an insertion section (42) from each other which is smaller than the first passage section (40) of said opening to thus allow the insertion of the spreading means (62) within said opening (48) obtained as a result of the action of removing the free edge (19') carried out by the first device (6) of said at least one first station (33), and
 - a second dilated configuration in which the spreading means (62) delimit between them an dilated section (43) which is larger than the insertion section (42) and which causes a further expansion of said opening (48) so as to define a second passage section (41) which is larger than said first passage section (40).
5. Apparatus according to claim 4, **characterized in that** said spreading means (62) are configured and controlled to keep said second dilated configuration once said at least one envelope (4) is dissociated from said gripping member (8) of the first device (6) and/or while it is moved towards said second station (34).
6. Apparatus according to one or more of the preceding claims, **characterized in that** the transfer device (54) of the handling apparatus (50) is configured to cause the movement of said gripping head (66) between a first orientation to be assumed at said at least a first station (33), wherein said envelope (4) held by the gripping means (72) of said head (66) is intended to be disposed substantially horizontally, in a second orientation different from the first orientation, to be taken at said at least a second station (34) wherein said envelope (4) held by the gripping means (72) of said head (66) is intended to be arranged substantially vertically.
7. Apparatus according to one or more of the preceding claims, **characterized in that** said gripping member (8) comprises at least one suction element (11, 13) configured to suck/grip and retain a portion (17') of said at least one envelope (4) in correspondence with only one of said free edges (19').
8. Apparatus according to one or more of the preceding claims, **characterized in that** said transfer device (54) is a robotic manipulator.
9. Apparatus according to one or more of the preceding claims, **characterized in that** said gripping means (72) comprise at least two pincers (74, 74') for grip-

ping said envelope (4) so as to make it integral with the pickup head (66) which is mounted on the movable end of the transfer device (54), said at least two pincers (74, 74') are associated with means for causing their opening and closing.

10. Apparatus according to one or more of the preceding claims, **characterized in that** said at least one first station (33) comprises:

- at least one loader (7) provided with a loading surface for a stack (3) of envelopes (4), and
- means for supporting said first device (6) and for moving it towards/away from said underlying at least one loader (7).

11. Apparatus according to one or more of the preceding claims, **characterized in that** said spreading means (62) comprise at least a pair of arms (82, 82', 82'', 82''') which define with their ends l' overall dimensions of said insertion section (42) and which, once inserted in said opening (48) of the envelope (4), are intended to come into contact with the internal surface of said envelope (4).

12. Apparatus according to one or more of the preceding claims, **characterized in that** said spreading means (62) comprise at least four arms (82, 82', 82'', 82''') which define with the respective ends, mutually coplanar, the vertices of a polygon.

13. Apparatus according to one or more of the preceding claims, **characterized in that** said spreading means (62) are configured to maintain the free edges (19', 19'') of said at least one envelope spaced to allow insertion within the opening (48), delimited by said free edges (19', 19''), of an injection nozzle (86) of said machine (5), provided in said at least a second station (34), for the injection of a padding material.

14. Apparatus according to one or more of the preceding claims, **characterized in that** said gripping head (66) is configured to move said spreading means (62):

- along two directions (X1, Y1) substantially perpendicular to each other so as to cause their mutual approach/separation, thus causing the corresponding separation/approach of the free edges (19', 19'') which delimit said opening (48),
- along a third direction (Z1), perpendicular to said at least two directions (X1, Y1), so as to cause the insertion of said spreading means (62) into said opening (48) of said envelope and/or disengagement/exit of said spreading means (62) from said opening (48).

15. Apparatus according to one or more of the preceding

claims, **characterized in that** it comprises at least one unit of control and command of the operations carried out by said at least one first device (6) and said at least one pick-up and handling apparatus (50), and to synchronize them with each other, thus automating the operation of the entire device. 5

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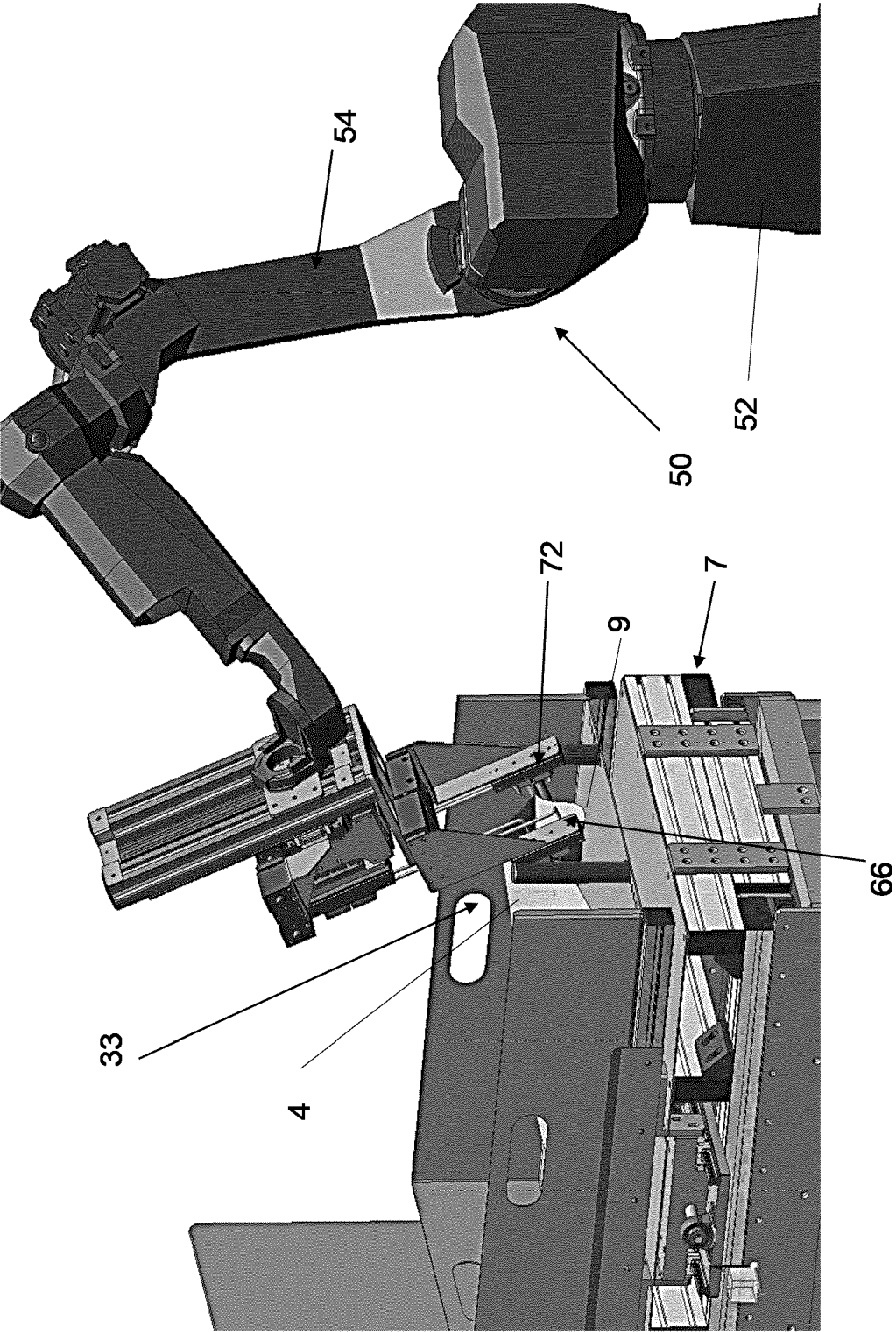


FIG. 1A

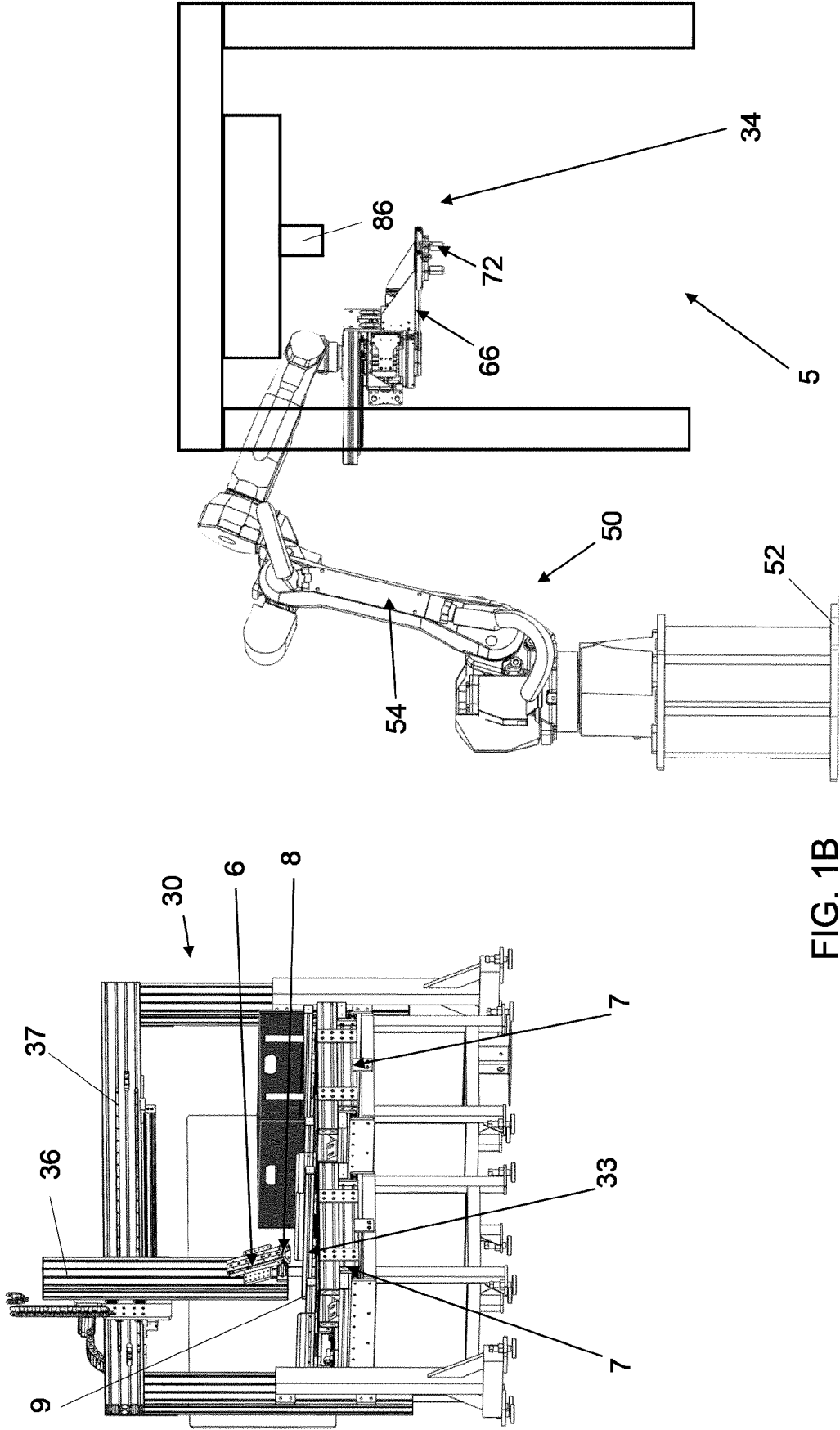


FIG. 1B

FIG. 2

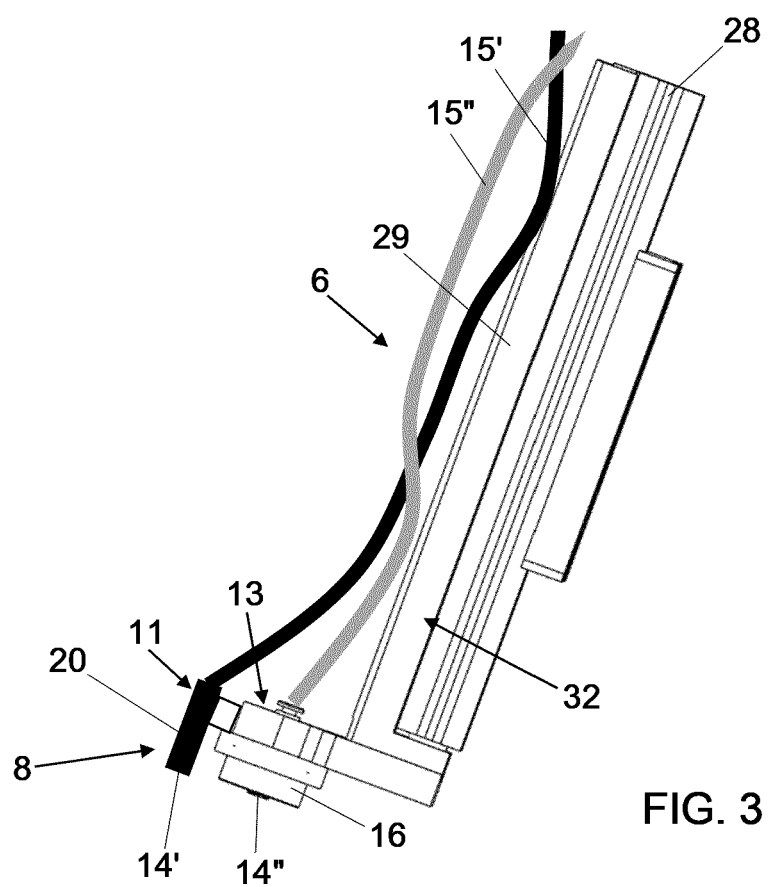
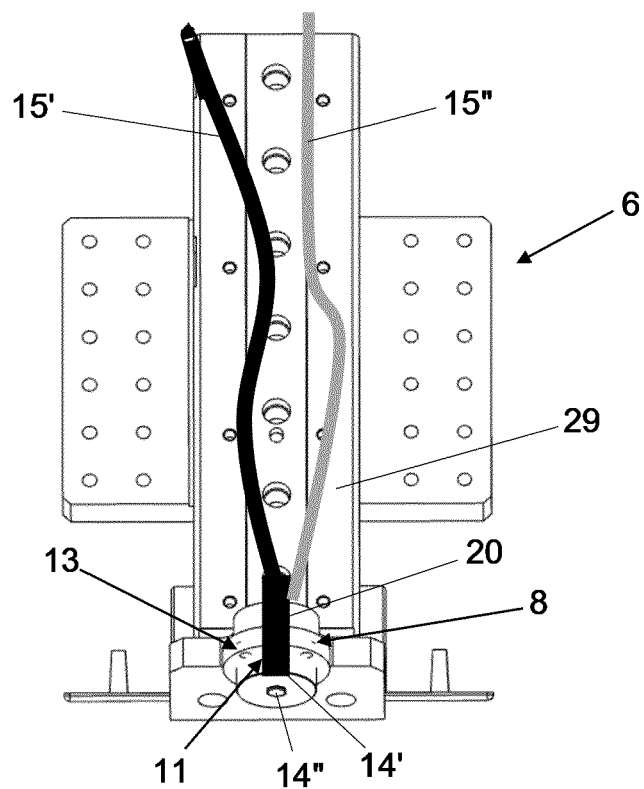
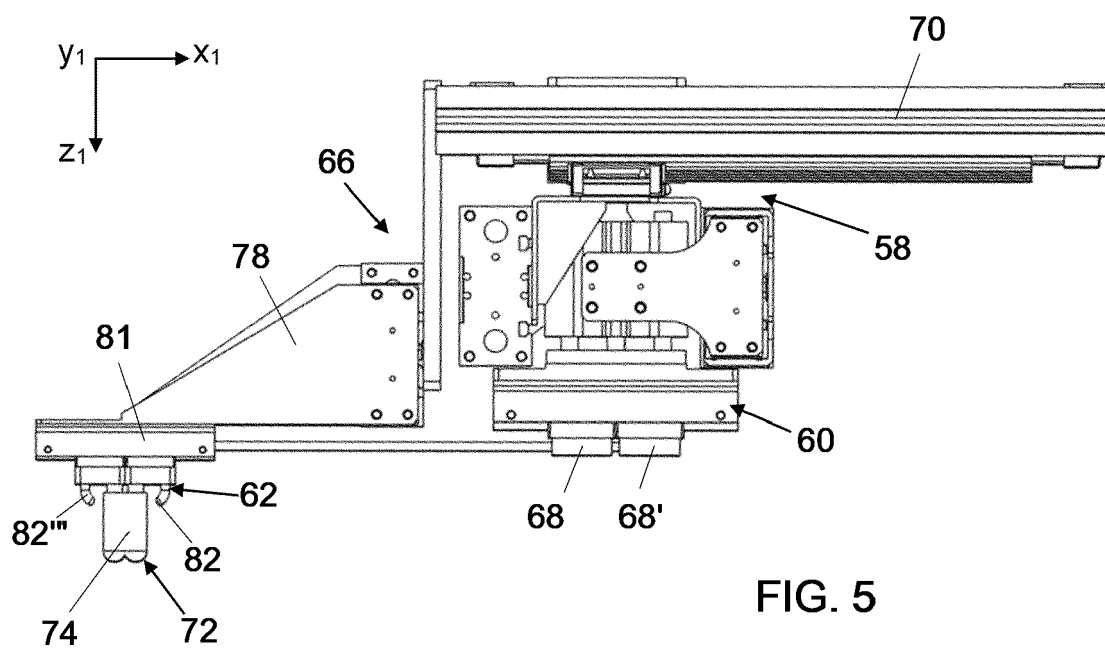
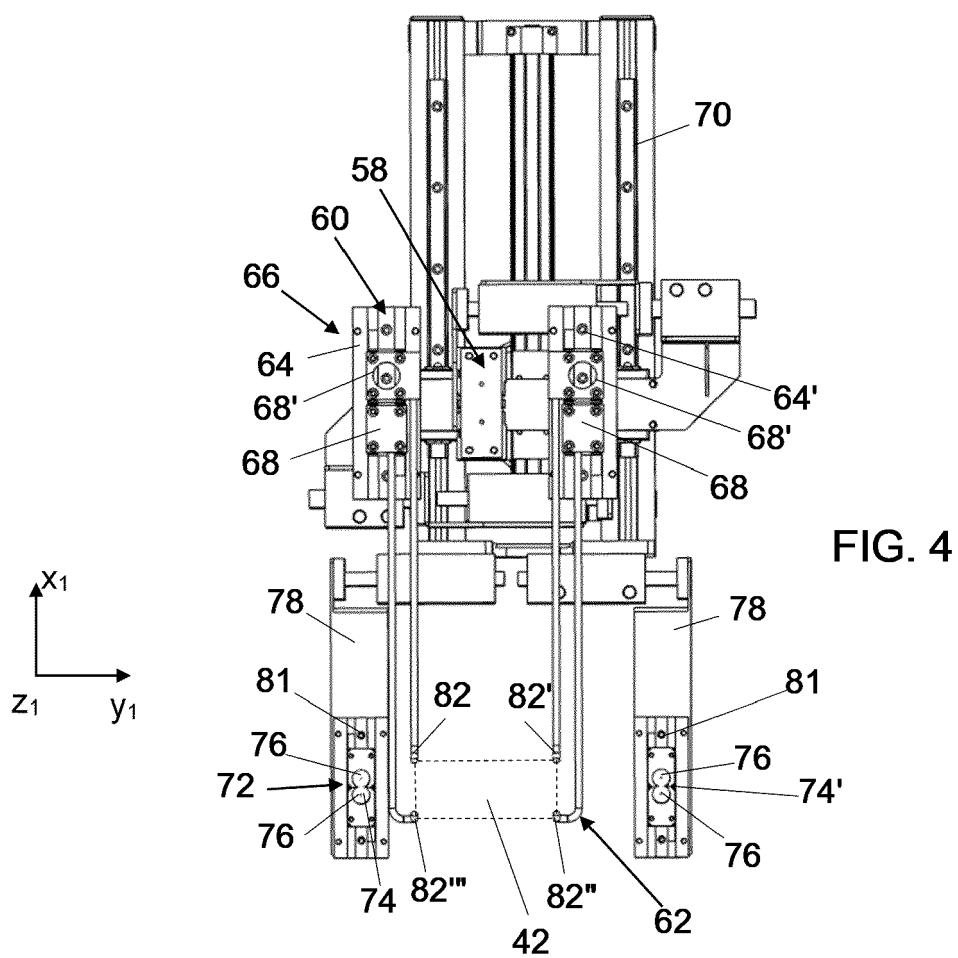
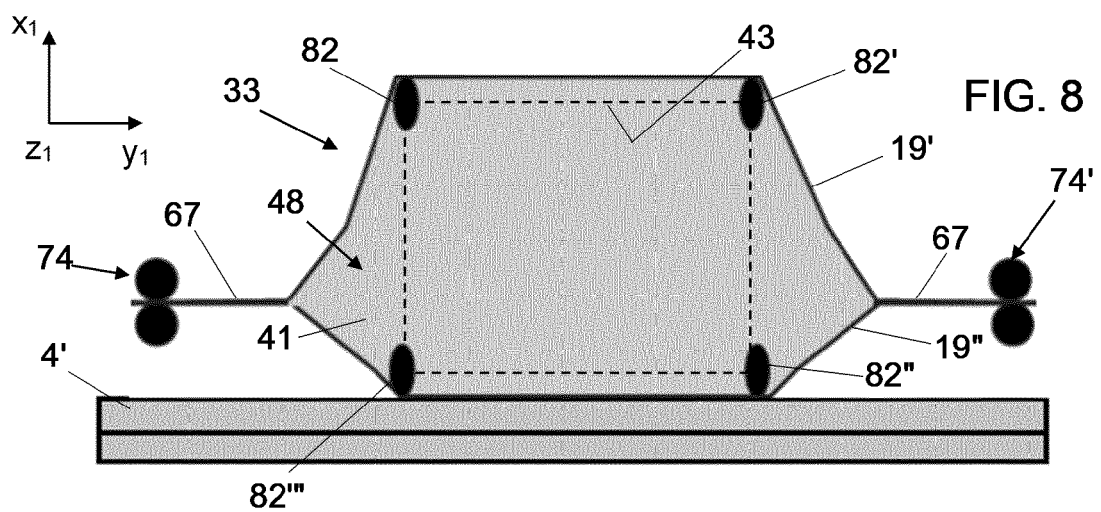
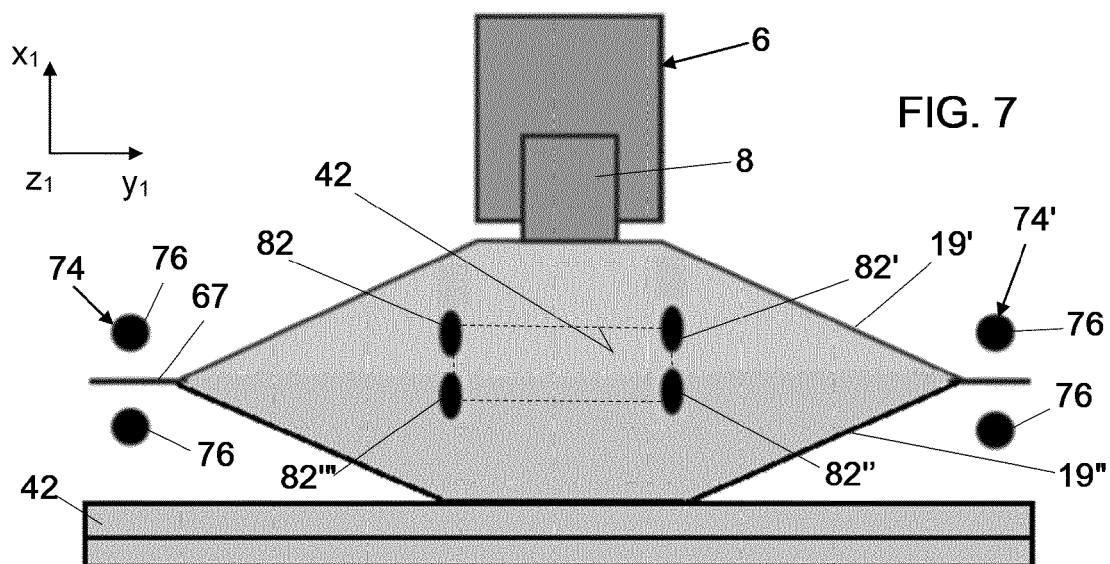
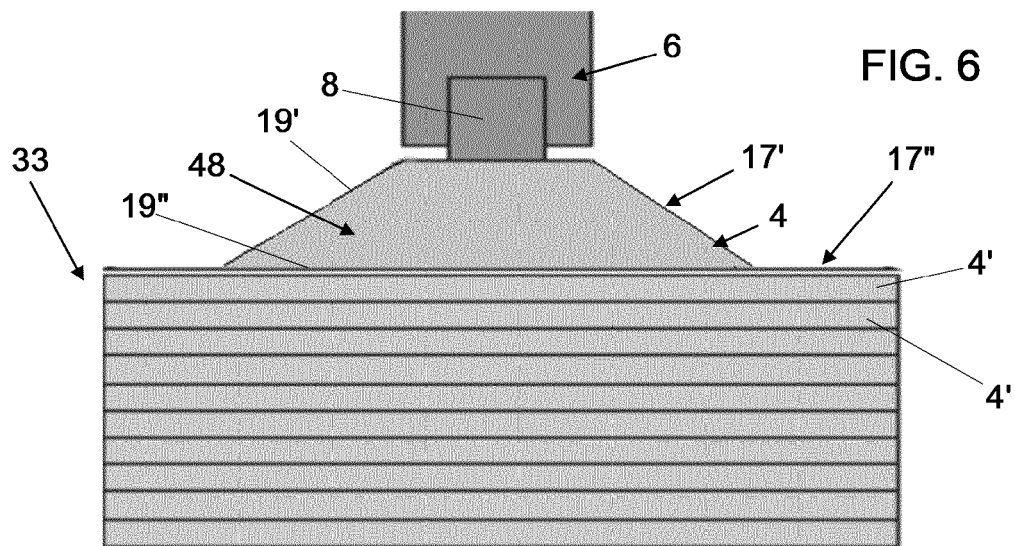
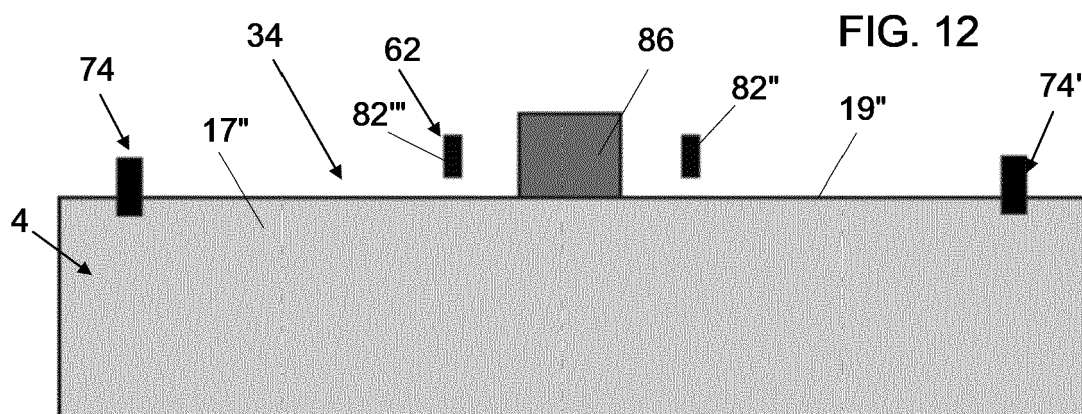
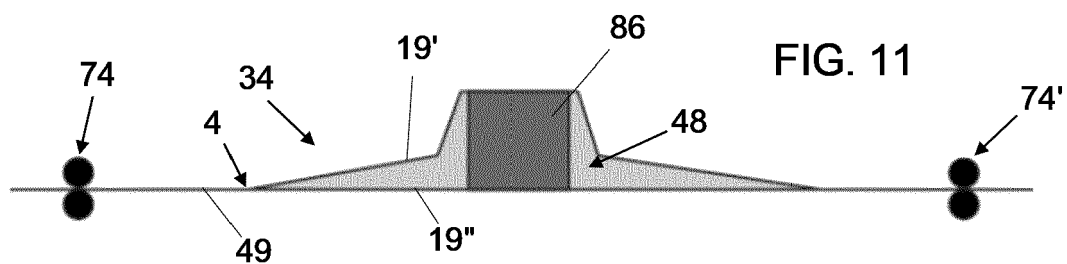
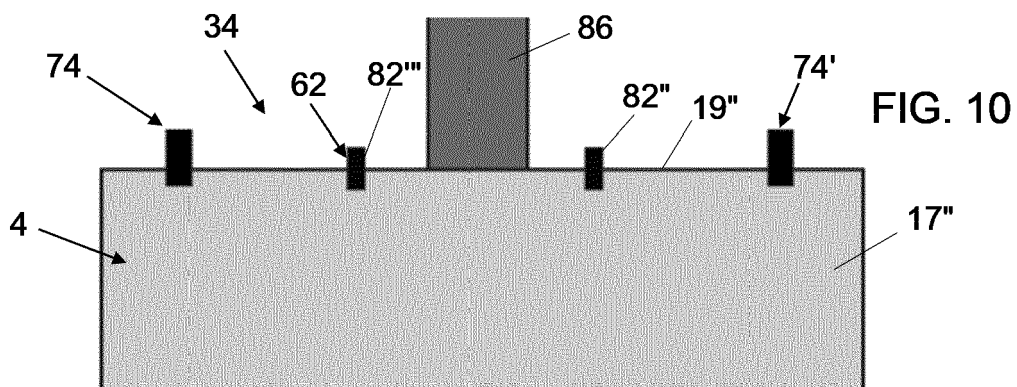
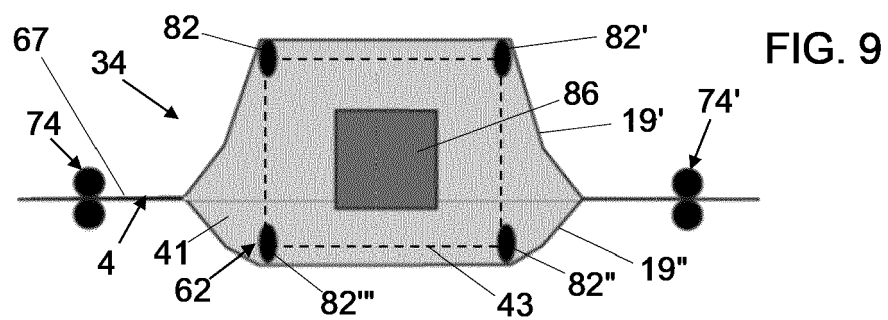


FIG. 3









EUROPEAN SEARCH REPORT

Application Number
EP 19 21 9797

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 5 305 579 A (KADER KARL-WILHELM [DE]) 26 April 1994 (1994-04-26)	1-3,6,7, 9-11,13, 15	INV. B65B43/30 B31D5/00 B31B70/00
Y	* column 2, line 10 - column 5, line 54; claims 1-19; figures 1-3 *	4,5,8, 12,14	
Y	DE 26 34 754 B1 (BEHN VERPACKUNG ERWIN) 1 December 1977 (1977-12-01) * figures 2-7 *	4,5,12, 14	ADD. A47G9/10
Y	US 2 950 589 A (ALEXANDER LITCHARD) 30 August 1960 (1960-08-30) * figures 1-4 *	4,5,12, 14	
Y	DE 36 40 581 A1 (GREIF WERK MASCH [DE]) 9 June 1988 (1988-06-09) * figures 1-7 *	4,5,12, 14	
Y	WO 2012/034219 A1 (PREMIER TECH TECHNOLOGIES LTEE [CA]; DUMONT PATRICK [CA] ET AL.) 22 March 2012 (2012-03-22) * figures 2-4 *	8,14	
			TECHNICAL FIELDS SEARCHED (IPC)
			B31D B31B B65B A47G
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 30 April 2020	Examiner Sundqvist, Stefan
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EPO FORM 1503 03.82 (P04C01)

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

EP 19 21 9797

5

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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30-04-2020

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5305579 A	26-04-1994	AT 129473 T CA 2085332 A1 DE 4141253 A1 EP 0548463 A1 US 5305579 A	15-11-1995 15-06-1993 17-06-1993 30-06-1993 26-04-1994
DE 2634754 B1	01-12-1977	NONE	
US 2950589 A	30-08-1960	NONE	
DE 3640581 A1	09-06-1988	NONE	
WO 2012034219 A1	22-03-2012	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 3509689 A [0013] [0131]
- US 4687462 A [0014] [0131]