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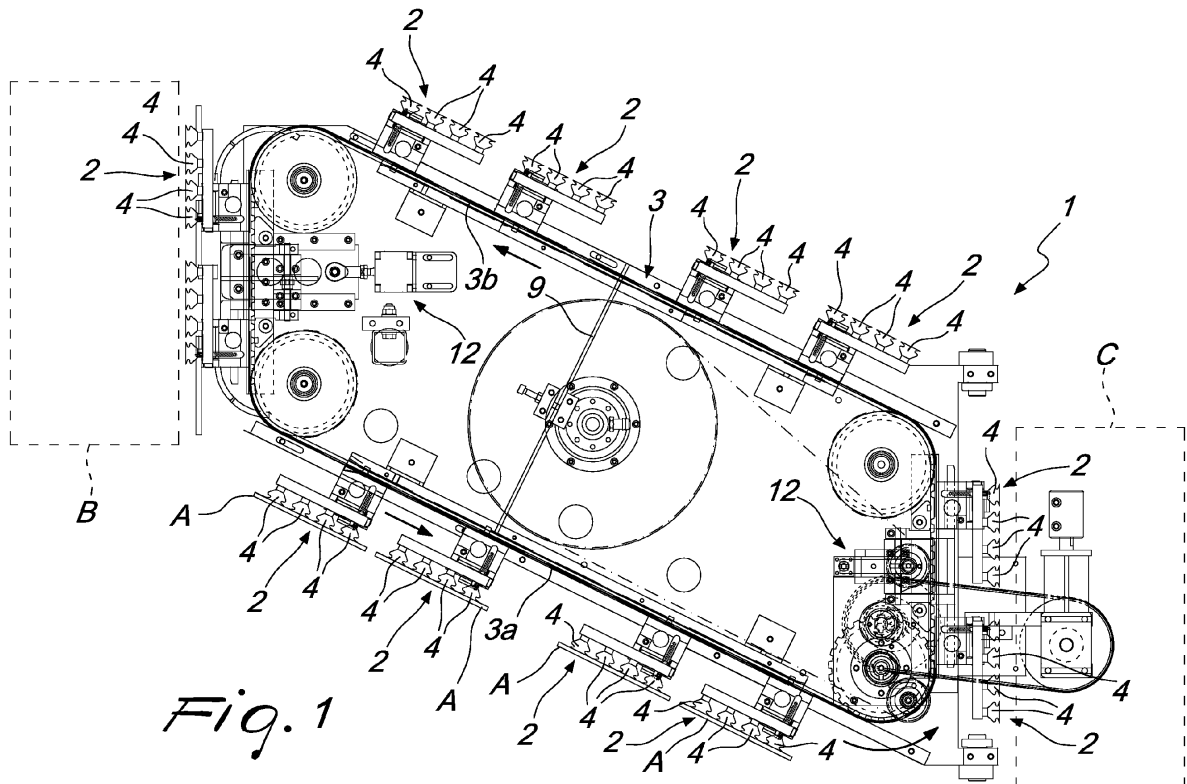
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BA ME(30) Priority: **05.02.2010 IT BO20100065**(71) Applicant: **O.A.M. - Societa' per Azioni**
40065 Pianoro (BO) (IT)(72) Inventor: **Martelli, Antonio**
07021 Arzachena OT (IT)(74) Representative: **Modiano, Micaela Nadia et al**
Modiano & Partners
Via Meravigli, 16
20123 Milano (IT)(54) **Handling process and assembly, particularly for automatic machines**

(57) A process for handling at least one enclosure, preferably of the type of an envelope and the like, which consists in gripping, in a step a., the enclosure (A) with at least one grip element (2), at an upstream station (B) for filling and cutting the enclosure (A), particularly in an automatic machine and preferably substantially simultaneously with the cutting operations; conveying, in a step

b., the enclosure (A), keeping it suspended in a controlled and predefined position preferably corresponding to the position assumed during cutting, by means of the grip element (2), along a transfer line (3) from the upstream station (B) to a downstream station (C); delivering, in a step c., the enclosure (A), keeping it in a controlled and predefined position, to the downstream station (C).

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Description

[0001] The present invention relates to a handling process and assembly, particularly for automatic machines.

[0002] In the vast field of automatic machines, packaging apparatuses are widespread which can insert powders or liquids of various kinds (intended for example for the pharmaceutical or food market) in envelopes.

[0003] According to known techniques and methods, these apparatuses comprise spools from which a sheet of plasticized material is unwound and cut by adapted cutters to be divided into two portions, which are folded several times until they are arranged vertically in a mutually facing and proximate configuration.

[0004] In this configuration, heat-sealing heads operate which mutually heat-seal the facing portions along vertical strips (so as to define the lateral edges of the envelopes being formed) and along a horizontal band (which constitutes the bottom of a set of envelopes), so as to substantially define temporary "pockets" into which the liquid or powders dispensed by adapted dosage means is or are poured.

[0005] At the end of this operation it is possible to perform the upper heat-sealing and cutting of the sheet (in an upper region, in a lower region, and at the sides) for the final forming of the envelopes and for releasing them, allowing them to fall into a plurality of drawers arranged below them and designed to accommodate a respective envelope.

[0006] The drawers can move to convey the freshly formed envelopes, which contain the product, to the subsequent packaging and shipping lines.

[0007] However, this constructive solution is not without drawbacks.

[0008] The choice to convey the envelopes by means of drawers into which the freshly formed envelopes can fall after cutting from the ribbon does not allow constant control of the exact position of such envelopes. Therefore, the envelopes often arrive at the downstream stations in positions that are not altogether defined, and this makes it necessary to solve problems which are often complicated (and the adoption of expensive and complicated devices) in order to proceed with the stacking of such envelopes or in any case with their sorting, for their insertion in the cases in which they are marketed.

[0009] Moreover, the drawers arranged below the dosage devices, for receiving the envelopes, can collect the powders or liquids distributed by such dosage devices if, as a consequence of even minimal positioning errors or of excessive dispensing, part of the product is not accommodated in the envelope for which it is intended.

[0010] This entails the subsequent conveyance of the powders or liquids (and of any dirt that has accumulated in the drawers over time) toward the subsequent work areas and stations, with the risk of contamination of the conveyed envelopes and of the above-cited areas located downstream. Moreover, the envelopes are subject to

the risk of incorrect arrangement and damage as a consequence of falling and of transport in the described manner. Furthermore, it should be noted that foreign materials, such as powders and liquids, unintentionally transferred and introduced in the devices downstream, might cause malfunctions and damage.

[0011] It should also be noted that the choice to resort to drawers that can move along predefined paths does not allow varying at will and easily the dimensions of the envelopes to be treated, since the drawers might be unable to accommodate a bulkier format of such envelopes that exceeds the capacity of the individual drawers.

[0012] The aim of the present invention is to solve the above-mentioned drawbacks, by proposing a process that makes it possible to handle envelopes and similar products while constantly maintaining control over their exact positions.

[0013] Within this aim, an object of the invention is to propose a handling process that allows the conveyance of envelopes and similar products while avoiding the danger of contamination and damage of said envelopes and of the areas downstream.

[0014] Another object of the invention is to propose a process that is adapted for the handling of envelopes and similar products having various dimensions and formats.

[0015] Another object of the invention is to propose a handling process that ensures high reliability in operation and cannot cause malfunctions of the stations downstream.

[0016] Another object of the invention is to propose a process that can be carried through at low cost.

[0017] Another object of the invention is to provide a handling assembly that ensures constant control of the conveyed envelopes and at the same time does not allow contamination or damage of said envelopes and of the areas downstream.

[0018] This aim and these and other objects which will become better apparent hereinafter are achieved by a process for handling at least one enclosure, preferably of the type of an envelope or the like, which consists in gripping at least one enclosure with at least one grip element, at an upstream station for filling and cutting the enclosure, particularly in an automatic machine and preferably substantially simultaneously with the cutting operations; conveying the enclosure, keeping it suspended in a controlled and predefined position preferably corresponding to the position assumed during cutting, by means of said grip element, along a transfer line from the upstream station to a downstream station; delivering the enclosure, keeping it in a controlled and predefined position, to the downstream station.

[0019] Further characteristics and advantages of the invention will become better apparent from the following detailed description of a preferred but not exclusive embodiment of the handling assembly according to the invention, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a top view of the handling assembly according to the invention;

Figure 2 is a front elevation view of the handling assembly according to the invention;

Figure 3 is a strongly enlarged view of a detail of Figure 2.

[0020] The process according to the invention (particularly according to the embodiment that provides for the adoption of an assembly 1 according to the invention) allows the handling of an enclosure A, which is preferably of the type of an envelope and the like.

[0021] It is appropriate to specify immediately that the handling of envelopes is the preferred application of the process according to the invention and shall be referred to constantly throughout the present description.

[0022] In any case, different applications of the process according to the invention, which are in any case within the protective scope claimed herein, as a function of the specific requirements, are not excluded.

[0023] Likewise, the possibility to handle enclosures A of another type or even different types of products, where this is allowed and/or rendered preferable by the shape of the products and the enclosures A, is provided.

[0024] According to the invention, the method consists, in a first step a., in gripping at least one enclosure A with at least one grip element 2, at an upstream station B in which the filling and cutting of the enclosure A are performed, particularly in an automatic machine and preferably substantially simultaneously with the cutting operations.

[0025] According to the preferred application, the handling process according to the invention is particularly suitable for application within automatic envelope packaging machines and the upstream station B is assigned to filling an envelope of plasticized material with the desired product (typically a liquid or a powder, for example intended for the pharmaceutical or food market) and to cutting it.

[0026] As mentioned, preferably it is indeed during cutting that the grip elements grip the enclosure A, so that such enclosure does not cover part of its path by falling due to gravity.

[0027] After picking up of the enclosure A in step a., the method according to the invention provides for conveying it, in a step b., keeping it suspended in a controlled and predefined position preferably corresponding to the position assumed during cutting, by means of the grip element 2, along a transfer line 3 from the upstream station B to a downstream station C.

[0028] Then the process according to the invention provides, in a step c., for delivering the enclosure A, keeping it in a controlled and predefined position, to the downstream station C.

[0029] This allows the falling of residues of the substance intended for filling the enclosures A which are possibly present on their outside, avoiding contamination of the downstream station C (and/or of other devices

along the path of the enclosure A) with them.

[0030] It is therefore found from the outset that the process according to the invention achieves the intended aim and objects, since it allows transferring the envelopes while maintaining constant control thereof (since they remain in the grip of the elements 2) and without such envelopes falling or otherwise lying in drawers that run along guides of various kinds, as occurs in automatic machines of the known type.

[0031] Moreover, the choice to keep the enclosures A suspended, thanks to the presence of the grip elements 2, which further are responsible for pick-up and delivery, avoids the risk of damage and contamination.

[0032] The position in which the enclosures A are handled can preferably be the one that corresponds to the one assumed already during cutting, in the upstream station B.

[0033] Conveniently, the delivery step c. consists first of all in receiving, in a step c1., the enclosure A, substantially at the downstream station C, by means of a handling unit preferably of the pick and place type.

[0034] The handling unit, too, therefore allows keeping the enclosures A suspended; moreover, the precise and accurate passage of the envelopes from the grip elements 2 to the handling unit is ensured by the possibility of keeping the position of such envelopes under control.

[0035] In turn, the handling unit arranges, in a step c2., the enclosure A in a predefined receptacle according to a predetermined spatial configuration, in particular to allow its subsequent insertion in cases, boxes and secondary containers in general.

[0036] It is thus evident that from the upstream station B for cutting the envelope to the receptacles from which the envelopes are inserted directly into the cases, the position of such envelopes is kept constantly under control, ensuring optimum operation and preventing incorrect arrangements (even minimal ones) from causing problems and/or interruptions or malfunctions along the transfer line 3 and more generally in the machine.

[0037] It should also be noted that it is possible to provide receptacles constituted by vertical containment walls, in which the handling unit inserts and deposits a predefined number of envelopes (typically in a flattened and stacked configuration): these vertical walls can have, along their internal faces, retention elements capable of retaining the envelopes so as to keep them in a substantially suspended configuration with respect to the bottom of such receptacles.

[0038] The retention elements can be constituted by transverse ribs, steps, thickened portions of the walls which are positioned conveniently; whatever solution is adopted, these retention elements are capable of preventing the envelopes from falling to the bottom.

[0039] With reference to the cited figures, the handling assembly according to the invention, generally designated by the reference numeral 1, is preferably part of an automatic envelope filling machine and is substantially interposed between the upstream station B for filling and

cutting the enclosure A and the downstream station C.

[0040] More precisely, typically the automatic machine comprises a reel from which a ribbon of plasticized material unwinds which is subsequently cut into two parallel bands; in turn, the bands are folded until they are conveyed to the upstream station B in a facing and parallel configuration, to allow their heat-sealing along at least two vertical lines and a lower horizontal line.

[0041] A pocket (or a horizontal row of pockets, depending on the width of the bands and on the number of envelopes to be formed) is thus substantially defined and the product is poured into it from above.

[0042] At this point further heat-sealing is performed for the upper edge, while completion of the forming of the envelope (or envelopes) occurs by means of cutters or other cutting apparatus which operate at the heat-sealed edges.

[0043] The handling assembly 1 is thus capable, in the manner that will be described hereinafter, of picking up the envelopes and delivering them to the downstream station C, in which additional operations (such as for example the printing of the external faces of the envelopes or their insertion in boxes) can be performed and which is preferably of the type that comprises a pick-and-place handling unit, as already described.

[0044] According to the invention, the handling assembly 1 comprises at least one grip element 2 for at least one of the enclosures A cited above; the grip element 2 can move along a line 3 for the transfer of the enclosure A from the upstream station B to the downstream station C.

[0045] The grip element 2 is provided with at least one suction port 4 for the controlled coupling of the enclosure A at an outgoing portion 3a, substantially from the upstream station B to the downstream station C, of the transfer line 3 (so as to allow the conveyance of such envelopes).

[0046] In particular, the grip element 2 comprises a carriage 5, which is movable along the transfer line 3 and provided with at least one suction port 4, which in turn is constituted by a sucker 6. The sucker 6 is adapted to pick up on command the enclosure A at the upstream station B and to secure it along the entire outgoing portion 3a, to subsequently release it at the downstream station C, thus constantly maintaining precise control over the position of the enclosure A.

[0047] Conveniently, the handling assembly 1 according to the invention comprises a device for generating a pneumatic depression (for example a compressor, a vacuum pump or others) which is associated, by means of its suction duct 7, with the grip element 2, and is thus capable of generating in the port 4 the suction required for the coupling action that the sucker 6 applies to the enclosures A.

[0048] According to a first possible embodiment, the generation device can therefore be activated on command to produce and maintain the suction condition in the entire outgoing portion 3a (and optionally, according

to a possible mode of operation, the generation device can be kept deactivated along the remaining part of the transfer line 3).

[0049] Advantageously, according to the preferred embodiment, the handling assembly 1 according to the invention comprises at least one suction interruption device 8, which is interposed between the generation device and the grip element 2: the interruption device 8 can be actuated on command to interrupt the suction at least substantially at the downstream station C to allow the release of the enclosure A.

[0050] According to the preferred embodiment, the generation device can thus be kept in a condition of constant operation even when such suction is not required.

[0051] When the coupling of the enclosure A is not required, for example at the downstream station C and substantially along all of the return portion 3b of the transfer line 3 (from the downstream station C to the upstream station B), the interruption device 8 can prevent suction into the grip element 2.

[0052] According to an embodiment of substantial practical interest, mentioned by way of non-limiting example of the application of the invention, the generation device is connected, by means of a pneumatic circuit 9, to a plurality of carriages 5, which are distributed along the transfer line 3 and provided with respective series of suckers 6 (in the embodiment shown in the accompanying figures, for example, each carriage 5 supports a series composed of four suckers 6).

[0053] Each series is thus associated, by means of a respective branch of the circuit 9, with the generation device and is adapted to pick up and secure the enclosure A, while along each branch there is a respective interruption device 8.

[0054] The choice to resort to a larger number of suckers 6 allows positively to convey envelopes that have various formats (or a larger number of envelopes) with the same carriage 5, without requiring any modification or setup of the carriage 5 or of the other components.

[0055] If it is necessary to convey a large-format envelope, two or more suckers 6 in fact can operate on it, whereas if the enclosure A is smaller, only some suckers 6 (or only one) are used while the others, despite remaining in suction, are unused.

[0056] Moreover, if two or more envelopes are cut from the bands of ribbon, each one can be picked up by a respective sucker 6, thus allowing the use of the handling assembly 1 according to the invention for the preparation of a larger number of envelopes for each cycle, with the consequent possibility of achieving higher productivity.

[0057] According to a first possible embodiment, the interruption device 8 is constituted by a bistable valve, which is capable of operating stably and remaining stable both in the configuration for throttling the circuit 9 and in the configuration for the free passage of the fluids.

[0058] According to the preferred embodiment, which is a non-limiting example of the application of the invention, each interruption device 8 comprises a stem 10

which has a portion 10a arranged, in a first configuration, so as to substantially throttle the pneumatic circuit 9.

[0059] When the stem 10 is arranged in this configuration, it is capable of obstructing the circuit 9 and thus of opposing the free passage of fluids, preventing the aspiration of the envelopes at the grip elements 2.

[0060] The stem 10 can perform an axial translation on command, and this allows it to move into a second, open, configuration, in which it thus allows the passage of the fluids and suction in the grip element 2.

[0061] Conveniently, each series of suckers 6 can move in a direction that is substantially transverse with respect to the direction defined by the transfer line 3, to allow the movement of the port 4 at least toward the upstream station B to pick up the enclosure A (and/or toward the downstream station C to release it).

[0062] Therefore, if the upstream station B and/or the downstream station C are even slightly spaced from the transfer line 3, the suckers 6 are capable of moving away from it to provide the pick-up and release of the envelopes.

[0063] In particular, according to a possible embodiment, each grip element 2 comprises a bracket 11 which is elastically and rotatably associated with the carriage 5 and supports a respective series of suckers 6; its controlled oscillation with respect to the carriage 5 causes the movement of the suckers 6 for picking up or releasing the enclosures A (Figure 3, in this regard, illustrates two positions of the bracket 11, obtained by means of its oscillation).

[0064] More particularly, according to a possible embodiment of considerable practical interest, which however does not limit the application of the invention, the assembly 1 according to the invention comprises at least one central control and management unit that is adapted to actuate at least one pusher 12 arranged along the transfer line 3 proximate to the upstream station B.

[0065] The pusher 12 is movable along a path for affecting respective components integral with the bracket 11 and/or with the stem 10. In this manner, the controlled translation of the pusher 12 along the path determines simultaneously the oscillation of the bracket 11, with consequent movement of the sucker 6, and the translation of the stem 10, with a consequent change of configuration of the stem 10.

[0066] In even more detail, according to the preferred embodiment, a first pusher 12 is used which actuates the simultaneous movement of the stem 10 and of the bracket 11 at the upstream station B, to allow the beginning of suction and the movement of the suckers 6 required to pick up the envelopes. Moreover, a second pusher 12 is assigned to the actuation of the stem 10 alone at the downstream station C, to interrupt the suction in the respective grip element 2.

[0067] Moreover, it is useful to note that it is possible to provide the handling assembly 1 according to the invention with sensors, arranged along the transfer line 3, which are capable of detecting the passage of the car-

riages 5 and consequently of sending the associated information to the central control and management unit to actuate the translation of the stem 10 and the oscillation of the bracket 11.

[0068] As an alternative, for example, it is possible to associate an encoder with the control and management unit which encoder measures the position of the rotor of the electric motor that drives the carriages 5.

[0069] In any case, it is the central unit that regulates the transition from the first configuration to the second one, and vice versa, for the stem 10, and the movement of the suckers 6 along a direction which is transverse with respect to the direction defined by the transfer line 3.

[0070] Therefore, by means of the pushers 12 one obtains both the actuation of the interruption or start of the suction and the actuation of the movement of the grip elements 2.

[0071] The operation of the handling assembly according to the invention is as follows.

[0072] As shown, the handling assembly 1 according to the invention allows picking up the envelopes directly from the upstream station B, in which they are preferably filled and cut.

[0073] More precisely, upon arrival of the carriage 5 proximate to the upstream station B, the central unit is capable of actuating the movement of the stem 10, which reaches the second configuration to actuate the suction in the suckers 6, and the oscillation of the bracket 11, to allow the suckers 6 to move away from the transfer line 3 and pick up the envelopes (by resting and adhering, by suction, to one of their faces).

[0074] As noted, these movements occur, according to a possible non-limiting embodiment of the application of the invention, thanks to the action of the pusher 12, which operates on the stem 10 and the bracket 11.

[0075] Picking up can occur preferably during the final forming operations, for example during the cutting of the upper edge, therefore preventing the envelope separated from the bands of ribbon from covering part of its path by falling due to gravity (as instead occurs in known solutions), thus avoiding the consequent risk of incorrect arrangements or damage.

[0076] The port 4 then remains in suction along the entire outgoing portion 3a so as to allow the conveyance of the enclosure A toward the downstream station C, while the bracket 11 returns to the proximity of the transfer line 3 for example by the elastic reaction of a spring.

[0077] Pick-up and conveyance of the envelopes occurs, therefore, without resorting to containment drawers, as in known handling assemblies; the envelopes are instead kept constantly in a controlled position and suspended: the danger of incorrect positioning and of contamination of such envelopes (and of the downstream station C) by powders/liquids intended for the envelope (or also by dirt) and incorrectly collected and transferred from the containment drawer due to imperfect dispensing in the upstream station B is thus avoided.

[0078] Upon arrival of the carriage 5 at the downstream

station C, the central unit actuates the translation of the stem 10, which returns to the first configuration to stop the suction and cause the release of the envelope (release also can occur in a controlled manner thanks to the action of the pick-and-place handling unit).

[0079] Once this operation has been completed, the carriage 5 follows the return path 3b toward the upstream station B to restore the initial arrangement and thus prepare itself for the start of a new cycle.

[0080] It should also be noted that it is possible to resort to an indexing drive 13, which in relation to a continuous motion of the pneumatic circuit 9 and of the various branches associated with the respective carriages 5 is capable of imparting to the carriages 5 and to the suckers 6 stops at the upstream station B and the downstream station C.

[0081] It is thus possible to obtain, for the carriages 5, an intermittent motion to make them stop at the pick-up and release of the envelopes, while the pneumatic circuit 9 and its branches (which are allowed to perform elongations and contractions of the elastic type) move continuously.

[0082] In practice it has been found that the handling method according to the invention fully achieves the intended aim, since by gripping the enclosure with the grip element at the upstream station and by conveying it by means of such element in a suspended configuration and in a controlled and predefined position, along the transfer line, to the downstream station, to which it is delivered still in a controlled and predefined position, the handling of envelopes and similar products while maintaining constant control over their exact positions is achieved.

[0083] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims; all the details may further be replaced with other technically equivalent elements.

[0084] In the exemplary embodiments cited above, individual characteristics, given in relation to specific examples, may actually be interchanged with other different characteristics that exist in other exemplary embodiments.

[0085] Moreover, it is noted that anything found to be already known during the patenting process is understood not to be claimed and to be the subject of a disclaimer.

[0086] In practice, the materials used, as well as the dimensions, may be any according to requirements and to the state of the art.

[0087] The disclosures in Italian Patent Application No. BO2010A000065 from which this application claims priority are incorporated herein by reference.

[0088] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of exam-

ple by such reference signs.

Claims

1. A process for handling at least one enclosure, preferably of the type of an envelope or the like, which consists in:
 - a. gripping at least one enclosure (A) with at least one grip element (2), at an upstream station (B) for filling and cutting the enclosure (A), particularly in an automatic machine and preferably substantially simultaneously with the cutting operations;
 - b. conveying the enclosure (A), keeping it suspended in a controlled and predefined position preferably corresponding to the position assumed during cutting, by means of said grip element (2), along a transfer line (3) from the upstream station (B) to a downstream station (C);
 - c. delivering the enclosure (A), keeping it in a controlled and predefined position, to the downstream station (C).
2. The process according to claim 1, **characterized in that** said delivery step c. consists in
 - c1. receiving the enclosure (A), substantially at the downstream station (C), by means of a handling unit preferably of the pick and place type;
 - c2. arranging the enclosure (A), by means of said handling unit, in a predefined receptacle according to a predetermined spatial configuration, in particular to allow its subsequent insertion in cases, boxes and secondary containers in general.
3. A handling assembly particularly for automatic machines, substantially interposed between an upstream station (B), for filling and cutting at least one enclosure (A) preferably of the type of an envelope and the like, and a downstream station (C), **characterized in that** it comprises at least one grip element (2) for the at least one enclosure (A), movable along a transfer line (3) for said enclosure (A) from the upstream station (B) to the downstream station (C), said grip element (2) being provided with at least one suction port (4) for the controlled coupling of the enclosure (A) at an outgoing portion (3a), substantially from the upstream station (B) to the downstream station (C), of said transfer line (3).
4. The handling assembly according to claim 3, **characterized in that** said at least one grip element (2) comprises a carriage (5), which is movable along said transfer line (3) and provided with at least one suction port (4), constituted by a sucker (6), adapted to pick up on command the enclosure (A) at the upstream station (B) and to secure it along said outgo-

ing portion (3a).

5. The handling assembly according to claims 3 and 4, **characterized in that** it comprises a device for generating a pneumatic depression associated, by means of its suction duct (7), with said at least one grip element (2), said generation device being able to be activated on command to produce and maintain suction at said outgoing portion (3a). 5
6. The handling assembly according to one or more of the preceding claims, **characterized in that** it comprises at least one suction interruption device (8), interposed between said generation device and said at least one grip element (2), said interruption device (8) being able to be actuated on command to interrupt the suction at least substantially at the downstream station (C) for release of the enclosure (A). 10
7. The handling assembly according to one or more of the preceding claims, **characterized in that** said generation device is connected by means of a pneumatic circuit (9) to a plurality of carriages (5), which are distributed along said transfer line (3) and provided with respective series of suckers (6), each of said series being associated, by means of a respective branch of said circuit (9), with said generation device and being adapted for picking up and securing the enclosure (A), a respective interruption device (8) being provided along each of said branches. 15 20 25 30
8. The handling assembly according to one or more of the preceding claims, **characterized in that** each of said interruption devices (8) comprises a stem (10) having a portion (10a) arranged, in a first configuration, so as to substantially throttle said pneumatic circuit (9) to obstruct the free passage of fluids and prevent suction in said grip element (2), said stem (10) being axially translatable on command to move to a second, open, configuration to allow the passage of fluids and suction in said grip element (2), and vice versa. 35 40
9. The handling assembly according to one or more of the preceding claims, **characterized in that** each series of said suckers (6) is movable in a direction that is substantially transverse with respect to the direction defined by said transfer line (3), to allow the movement of said suction port (4) at least toward the upstream station (B) to pick up the enclosure (A). 45 50
10. The handling assembly according to claim 7, **characterized in that** each grip element (2) comprises a bracket (11) which is elastically and rotatably associated with said carriage (5) and supports a respective series of said suckers (6), the controlled oscillation of said bracket (11) with respect to said carriage (5) causing the movement of said suckers 55

(6) to pick up and release the enclosures (A).

11. The handling assembly according to one or more of the preceding claims, **characterized in that** it comprises at least one central control and management unit that is adapted to actuate at least one pusher (12) arranged along said transfer line (3) proximate to the upstream station (B), said pusher (12) being movable along a path for affecting respective components integral with said bracket (11) and with said stem (10), the controlled translation of the pusher (12) along said path determining simultaneously the oscillation of said bracket (11) and the translation of said stem (10), with a consequent movement of said sucker (6) and change of configuration of said stem (10).

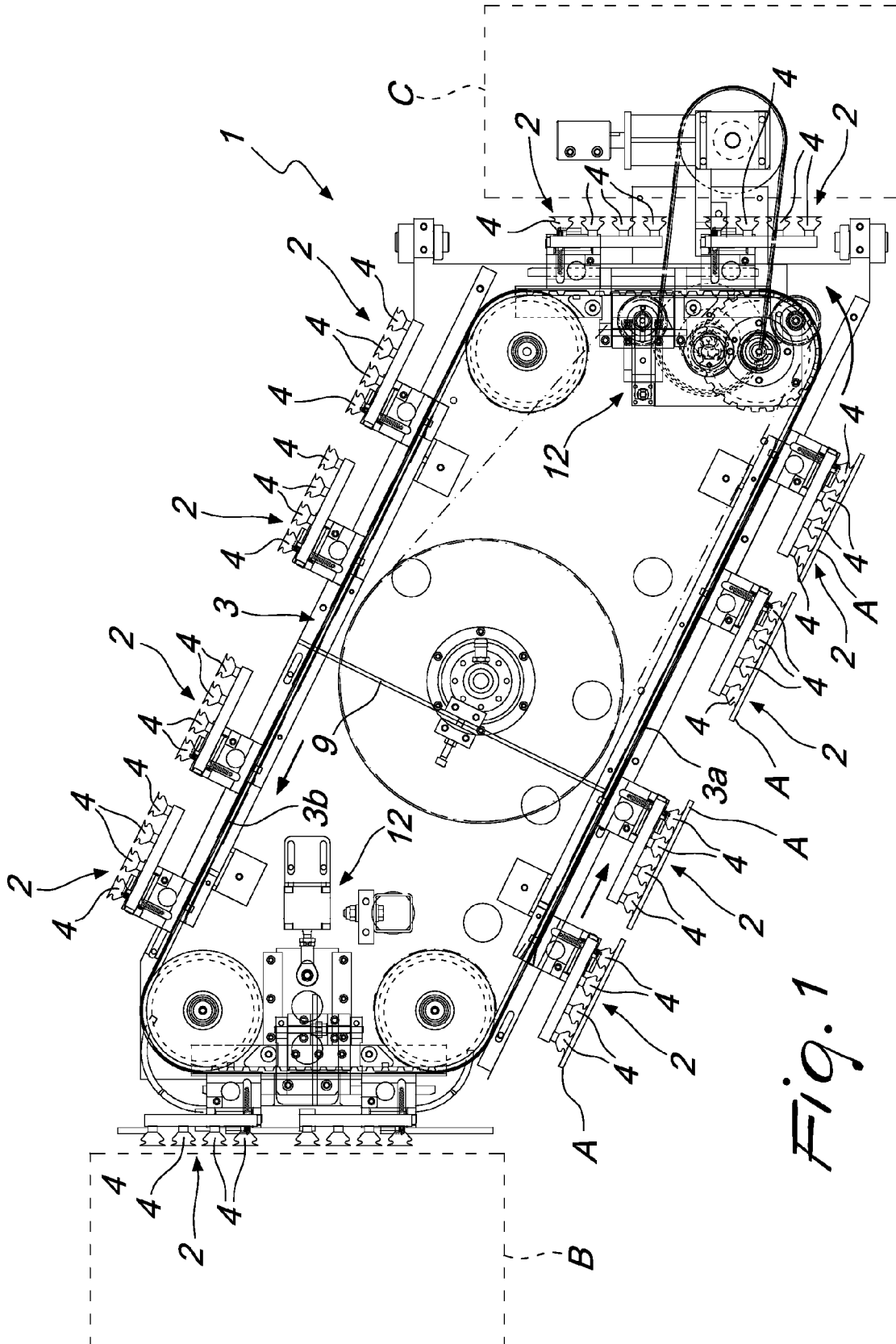


Fig. 1

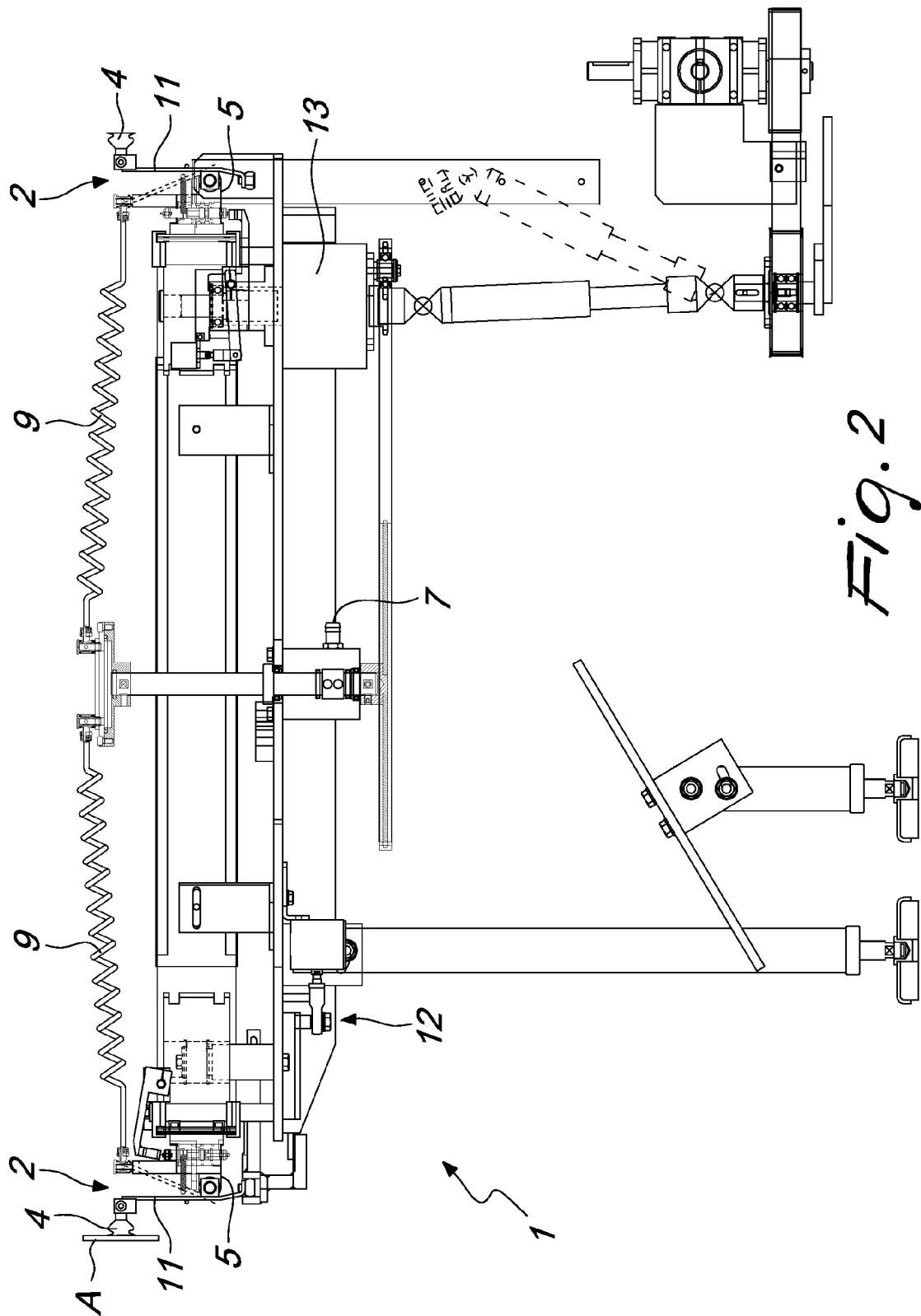
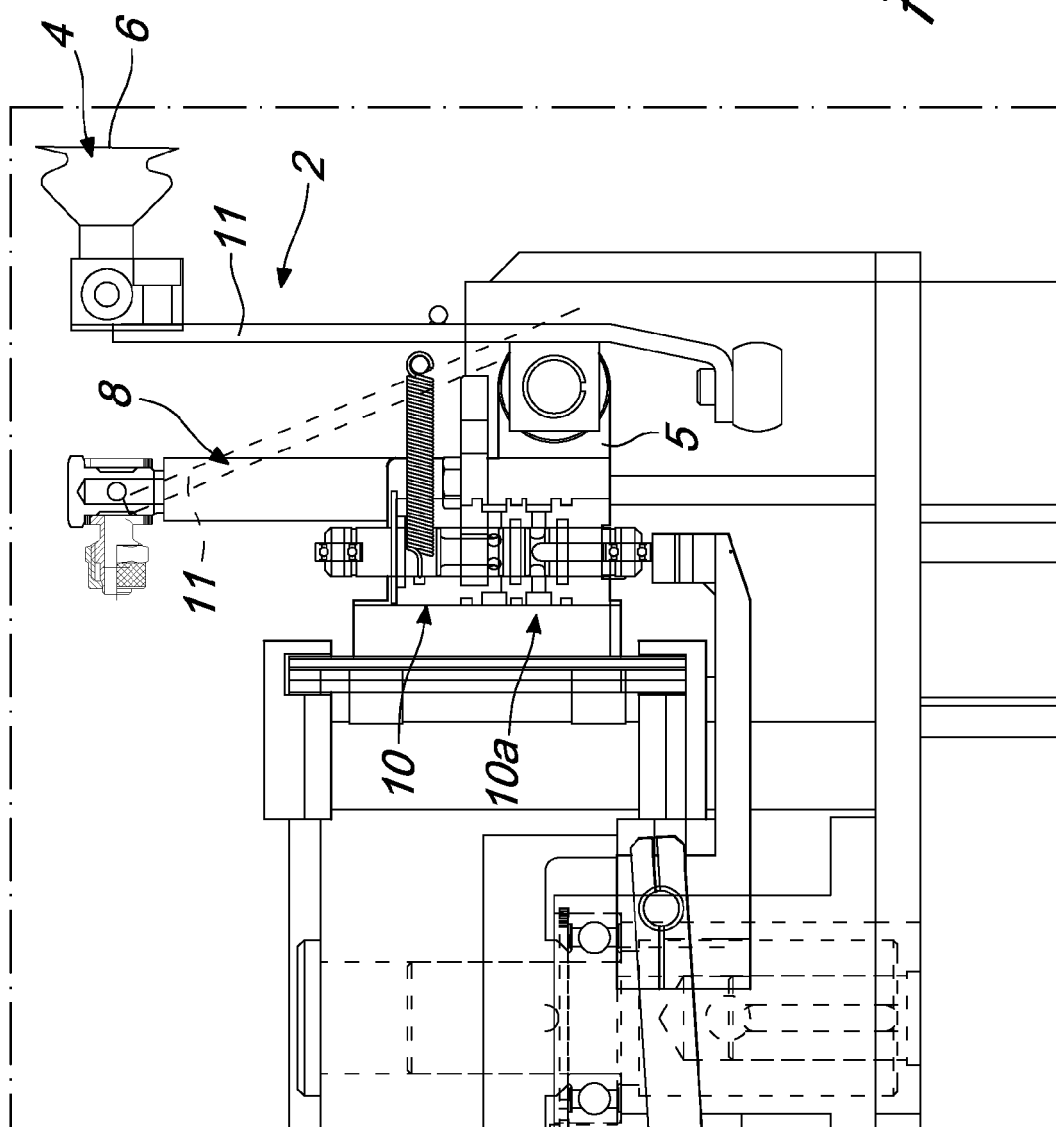


Fig. 3





EUROPEAN SEARCH REPORT

Application Number
EP 11 15 2865

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Y	US 3 553 934 A (JOHNSON KENNETH R ET AL) 12 January 1971 (1971-01-12) * figures 2,22,23 *	2	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 16 May 2011	Examiner Johne, Olaf
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

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

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