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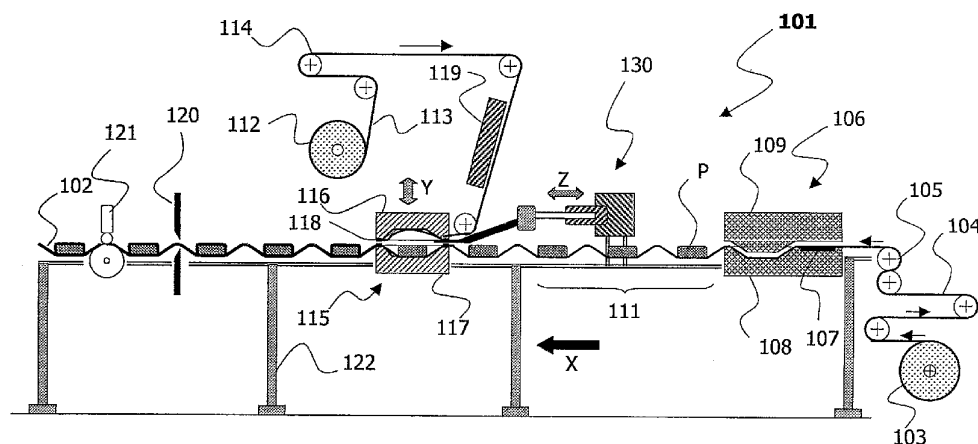
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(54) Title: METHOD AND APPARATUS FOR MANUFACTURING AN EASY-TO-OPEN PACKAGE



(57) Abstract: Disclosed is an apparatus for manufacturing, through a vacuum skin packaging (VSP) method, an easy-to-open package provided with a device for initiating the opening thereof. The apparatus comprises a sealing station (115) wherein a top web (113) is sealed to a bottom web (104) in a first area (A) all around a product (P) arranged on the bottom web by providing heat and vacuum in a fundamentally closed chamber. The apparatus further comprises a local sealing inhibition unit (130) comprising at least one removable local sealing inhibition tool (150) for inhibiting the sealing between the top and bottom webs in at least a second area (B). A method is also disclosed comprising the step of inhibiting the sealing between the top and bottom webs by arranging at least one removable local sealing inhibition tool between the top and bottom webs in at least a second area.

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METHOD AND APPARATUS FOR MANUFACTURING AN EASY-TO-OPEN PACKAGE

5 The present invention relates to an easy to open package wherein an article or product is enclosed between two webs. More in particular, the present invention relates to a method and apparatus for manufacturing such an easy to open package.

10 Packages wherein an article, for instance a food product or the like is enclosed between two webs (or layers) of thermoplastic material are well known. Generally, the so packaged food product is tightly sealed so as to protect it from abuse and exterior contamination during storage, shipment and display.

15 Presently, a wide variety of products, particularly food products, are being offered in visually attractive packages made of two superposed thermoplastic webs, a lower or bottom web and an upper or top web. Generally, the top web is transparent while the bottom web is properly colored and shaped and operates as a support for the packaged product. The package is made by different methods including, among
20 the most popular ones, the vacuum skin packaging method.

In said method the lower, supporting, web has preferably a tray-like configuration defining a receptacle for the article to be packaged having an opening and a rim formed on the periphery of said opening. Said tray-like configuration is generally obtained by a thermoforming step,
25 either in-line or off-line.

The upper web is generally drawn into a concave mold cavity formed into a vertically movable heated molding platen so that it is heated while held by suction in contact with the heated ceiling and walls of the cavity. Then, the vacuumization of the vacuum packaging chamber and the
30 release of the suction applied to the cavity walls of the mold plate draws

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the upper web downwardly to contact with the contours of the product article and with the lower web. The upper web thus forms a tight skin all around the product and is bonded to the lower web by differential air pressure, thus sealing wherever the two webs contact each other.

5 Depending on the temperatures and materials employed for the upper web, a heat-sealing frame may be used to further seal the upper web to the peripheral rim of the lower web.

10 In said packages, the requirement for sufficiently strong heat seals to maintain the integrity of the package through the distribution channels and storage, should be balanced with that for easily openable heat seals to allow the end user to open the package by applying ordinary human hand force. In other words, there is the need to provide a perfect sealed package while having a packet that can be easily opened manually by the end consumer without using knives, scissors or any
15 other dangerous cutting tool.

 Several methods involving the proper selection and combination of materials have been devised in order to achieve the desired compromise.

20 These methods are essentially based either on the concept of having an easily peelable seal layer between the top or bottom webs so that upon application of an ordinary force, the two webs will separate one from the other, or on the concept of having the sealing layer, or one of the layers adjacent to the sealing layer, made of incompatible materials so that opening of the package is obtained by failure of the necessary
25 cohesive force within said layer, upon the application of a tearing force from the outside, with breakage of the sealing layer if said layer of incompatible material is not the sealing one; or, still alternatively on the concept of having one of the layers adjacent to the sealing layer, easily delaminatable therefrom so that opening of the package is obtained
30 upon application of an ordinary force by peeling of said adjacent layers

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and breakage of the sealing one.

For the purposes of the present application the term "easy to open package" is intended to refer to a package, and specifically heat sealed and bonded areas of a package, which, owing to the suitable selection
5 of the composition of the upper and lower webs, and particularly that of the sealing layers and of the layers adjacent thereto, are readily openable.

In any case, independently on the devised easy-to-open mechanism, the opening of said packages still needs to be facilitated by a
10 convenient means for pulling apart the top and bottom webs, namely, a device for the end user to start separating the two thermoplastic sheets one from another.

GB-B-1,360,808 discloses a package formed of superposed sealed webs of thermoplastic material with a corner of the package rendered
15 easily openable by virtue of a paper insert between the webs in order to prevent localized sealing. While the solution according to GB-B-1,360,808 overcomes the main object to provide a device for starting the separation between the top and bottom layers, it has several disadvantages. The paper corner has to be glued to one of the layers.
20 The use of glue with food products is highly undesirable as the food could become contaminated thereby. A special apparatus should be provided for applying the glue and the pieces of paper. A supply of both glue and paper pieces should be provided and an operator should monitor the status of supplies in order to always have glue and paper
25 corners available. The special apparatus for gluing the paper to the layer should be precisely controlled in order to avoid that any excess of glue goes out of the proper area and bounds the top and bottom layers one to each other. The special apparatus is rather difficult to modify in case a different configuration of the bottom layer is provided. The
30 packet is hardly recyclable as the paper is of a different nature with

respect to the top and bottom layers. Finally, the cost of the glues and papers is not negligible.

5 GB-B-1,510,115 also discloses a package formed of superposed sealed webs of thermoplastic material in which a corner is rendered easily openable by virtue of a patch of ink that should prevent the two webs from bonding one to each other. Also the arrangement according to GB-B-1,510,115 works but has some disadvantages. The use of ink with food products is highly undesirable as the food could become contaminated thereby. Furthermore, the food could become colored by
10 the ink and could result in being unmarketable. A special apparatus should be provided for applying the ink. A supply of ink should be provided and an operator should monitor the supply in order to always have ink enough. The special apparatus for ink application should be precisely controlled in order to avoid that any excess of ink goes out of
15 the proper area. The special apparatus is rather difficult to modify in case a different configuration of the bottom layer is provided.

CA-B-1,164,260 describes a package wherein a corner of the lower web is bent downwardly by a punching device leaving the upper web without surface to adhere to at the sealing step. While this arrangement
20 solves some of the above inconveniences, it still has some drawbacks. In fact, the apparatus needs an at least partial cutting tool. Such tool should be highly sharp otherwise it does not perform a perfect cut. This would result in a corner not perfectly bent and thus it would undesirably adhere to the upper surface. Again, the apparatus is rather difficult to
25 modify in case a different configuration of the bottom layer is provided.

Vacuum skin packaging machines that provide for a pre-cut of a corner of the lower web which is then adhered to the upper web are commercially available. To start opening the package, the pre-cut corner must first be detached from the rest of the lower web by bending
30 it upwardly or/and downwardly along the precut. In the case of the pre-

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cut corner, the corner cannot always be easily detached from the rest of the tray and sometimes bending it downwardly may break the upper web without being able to remove it first.

5 Finally, EP0,748,746 describes an easy to open package wherein it is readily apparent to the end user where to start the separation between the package webs, and gripping of the web to be torn apart and opening of the package is easier than with other known or commercially available means. In EP0,748,746 the lower thermoplastic web has at least one recess at a marginal zone of the peripheral rim
10 providing in the upper web for an area of non-adhesion that can be finger gripped to initiate opening of the package. While this arrangement is rather effective, it still has some drawbacks. In fact, the apparatus needs a cutting tool. Such tool should be highly sharp otherwise it does not perform a perfect cut. Thus, the apparatus needs
15 frequent maintenance and the cutting tools need to be frequently replaced otherwise the cut is not properly performed. Again, the apparatus is rather difficult to modify in case a different configuration of the bottom layer is provided.

The Applicant, in an attempt to solve the above problems, provided
20 an apparatus wherein a removable piece of material was placed between the top web and the sealing dome of a sealing station. The object of such an interposition was to reduce the temperature at a certain area and thus to avoid the sealing in such a certain area. Unfortunately, the obtained results have not been found encouraging for
25 two main reasons. From one side, a removable piece of low thickness was ineffective for reducing the sealing temperature. On the other side, a high thickness removable piece negatively affected the gasket properties and the corresponding vacuum drawn in the sealing chamber. This resulted in a non-perfect sealing.

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According to a first aspect of the present invention, there is provided an apparatus for manufacturing, through a vacuum skin packaging method, an easy-to-open package provided with a device for initiating opening thereof, the apparatus comprising a sealing station wherein a top web is sealed to a bottom web in a first area all around a product arranged on the bottom web by provision of heat and vacuum in a chamber, the apparatus further comprising at least one local sealing inhibition tool and being configured such that a portion of the or each tool lies between the webs, in a further area, during the sealing in the first area, whereby sealing between the webs in the further area(s) is inhibited, and is released from between the webs after the sealing in the first area.

Preferably, the apparatus includes a local sealing inhibition unit, of which the or each tool forms a part, the unit comprising a device for moving the or each removable local sealing inhibition tool in a working position cooperating with the sealing station and back to a position not cooperating with the sealing station.

Preferably, the local sealing inhibition tool is made, at least partially, of a material selected from the group consisting of fluorocarbon resins including polytetrafluoroethylene (PTFE), fluoroethylene polymers (FEP) and copolymers thereof, and more preferably of PTFE.

Preferably, the local sealing inhibition unit comprises a cooling unit for cooling the at least one local sealing inhibition tool.

Further advantageous features of the present invention are set forth in the respective dependent claims. All the claims should be considered as an integral part of the present description.

According to a second aspect of the present invention, there is provided a vacuum skin packaging method for manufacturing an easy-to-open package provided with a device for initiating opening thereof, the method comprising sealing a top web to a bottom web in a first area all around a product that is arranged on the bottom web, including providing heat and vacuum, the method further comprising effecting operation of at least one local sealing inhibition tool such that a portion of the or each tool lies between the webs, in a further area, during the sealing in the first area, to inhibit sealing between the webs in the

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further area(s), and is released from between the webs after the sealing in the first area.

Preferred embodiments of the invention provide a VSP easy-to-open package provided with an effective and reliable device for starting the separation between
5 the top and lower webs and a VSP apparatus and method for manufacturing such an easy-to-open package.

Preferred embodiments of the invention provide an apparatus and method for manufacturing an easy-to-open package wherein the device for starting the separation between the top and lower webs is not obtained through the use of
10 glue.

Preferred embodiments of the invention provide an apparatus and method for manufacturing an easy-to-open package wherein the device for starting the separation between the top and lower webs is not obtained by using paper pieces or the like to be stuck to either the top or bottom webs.

15 Preferred embodiments of the invention provide an apparatus and method for manufacturing an easy-to-open package wherein the device for starting the separation between the top and lower webs is not obtained through the application of ink or the like.

Preferred embodiments of the invention provide an apparatus and method for
20 manufacturing an easy-to-open package wherein the device for starting the separation between the top and lower webs is not obtained by means of a cutting tool or the like.

The basic idea of the present invention is inhibiting the sealing of the top and bottom webs in a predetermined sealing area by inserting a tool portion between
25 the top and bottom webs and removing the tool once the seal has been carried out.

The present invention will become fully clear after reading the following detailed description thereof, given merely as an example and not by limitation, to be read with reference to the attached sheets of drawings, wherein:

30 Fig. 1 schematically shows a prior-art apparatus for manufacturing an easy-to-open package wherein a corner is cut;

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Fig. 2 schematically shows a manufacturing apparatus according to a preferred embodiment of the present invention;

Fig. 3 schematically shows the sealing inhibition unit of the manufacturing apparatus embodying the present invention;

5 Fig. 4 schematically shows a perspective view of the sealing inhibition unit of the manufacturing apparatus embodying the present invention;

Fig. 5 schematically shows a top plan view of the sealing inhibition unit of the manufacturing apparatus embodying the present invention; and

10 Figures 6a-6l show, in top plan view and cross-section, some embodiments of local sealing inhibition tools for use in the apparatus embodying the invention.

The same reference numbers will be used through the following description for indicating the same or functionally equivalent parts.

With first reference to Fig. 1, an apparatus 1 for manufacturing an easy-to-open package 2 according to the prior-art is shown. The working direction is indicated
15 by arrow X and is from right to left. The apparatus 1 comprises: a first reel 3 for the bottom web (or layer) 4; a first pulley arrangement 5 for unwinding the bottom web 4; an on-line thermo-forming station 6 where the bottom web 4 is tray shaped; a corner cutting device section 10; a (food) product placing area 11 where products P are placed onto the tray shaped web; a second reel 12 for the top web
20 13; a second pulley arrangement 14 for unwinding the top web 13; a sealing station 15; a cross cutting unit 20; and a longitudinal

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cutting unit 21. A finished package 2 is finally obtained. A main frame 22 supports the above listed components.

Typically, the on-line thermo-forming station 6 comprises a heating plate 7, a forming lower plate 8 and an upper forming tray 9.

5 Typically, the corner cutting section 10 comprises at least one cutting tool for performing precise angled short cuttings on the tray shaped bottom layer.

10 Typically, the sealing station 15 comprises an upper sealing dome 16 and a die bottom 17 with a forming plate (and possibly with plates for changing the forming depth, not shown). A gasket 18 is arranged at the edge of either one or both the upper sealing dome and the die bottom. Both the upper sealing dome and the bottom die are provided with slits (not shown) for drawing vacuum and ventilating when the upper dome and the bottom die are closed.

15 The operation of the sealing station is as follows. Before closing the upper dome and the bottom die, one or more lower web trays with products thereon are introduced. A length of upper web, possibly pre-heated by a pre-heating plate 19, is also drawn by the upper dome. When the upper dome and the bottom die are closed, vacuum from
20 above draws the web into the dome while vacuum from below draws the tray(s) into a mould. The upper web is heated up to a certain temperature (for instance, about 200°C) in the dome and air in the package is evacuated through slits. When the vacuum from above ends, gentle ventilation from above causes the upper web to detach
25 from the dome. Through full ventilation from above, the upper web is sealed to the tray(s) all around the product and the tray(s) stabilized in the mould that is cooled. The die bottom is also ventilated and the sealing station is opened in order to move the sealed packages to the cross and longitudinal cutting stations, thus leaving the sealing station
30 ready for sealing a new set of trays.

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The longitudinal cutting station 21 is provided as, generally, more than one tray is formed in a bottom web length. In other words, when the tray shaped bottom web is seen from above, a number of lanes of trays is seen.

Fig. 2 schematically shows a manufacturing apparatus 101 embodying the present invention. The apparatus 101 is similar to the prior-art apparatus 1 and comprises: a first reel 103 for the bottom web (or layer) 104; a first pulley arrangement 105 for unwinding the bottom web 104; a forming station 106 where the bottom web 104 is tray shaped; a (food) product placing area 111 where products P are placed onto the tray shaped web; a second reel 112 for the top web 113; a second pulley arrangement 114 for unwinding the top web 113; a sealing station 115; a cross cutting unit 120; and a longitudinal cutting unit 121. A finished package 102 is finally obtained. Thus, the apparatus 101 lacks a corner cutting station. In addition, at the entrance of the sealing station 115, a local sealing inhibition unit 130 is provided. Possibly, the operation of the forming station 106 is the same as the operation of the forming station 6. Furthermore, also the operation of the sealing station 115 is similar to the one of station 15, except for the cooperation with the local sealing inhibition unit 130, as will be explained below.

The sealing station 115 is such that the top web 113 is sealed (and adherent) to the bottom web 104 in a first area A on and all around the product P. The interposition of a removable local sealing inhibition tool 150 produces a second area B where the top and bottom webs do not adhere one with each other.

With reference to Figure 4, in a preferred form thereof, the local sealing inhibition unit 130 comprises a base 131, an arm 132, one or more extensions 133 connected to the arm 132 at one of their ends and to respective local sealing inhibition tools 150 at the other ends. Possibly, the base is connected to the main frame 122 of the apparatus 101 at a raised position so that the trays (being loaded with the products P) are free to move in the working direction X. It should be noticed that in order to better illustrate the system and its operation, in Figure 4 and 5 the shape of the trays and the product loaded therein, in the last row is not shown.

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In the preferred embodiment the arm is connected to the base 131 through one or more pneumatic or hydraulic actuator 134 having a stroke (see arrow Z) for moving the extensions 133 and the corresponding local sealing inhibition tools 150 both in the working direction X and in the opposite one.

5 As it is shown in Figures 4 and 5, the arm 132 comprises a bar 135 with a slot 136 extending fundamentally transversely to the working direction X. Each of the extensions 133 is connected to the arm 132 by a screw and nut arrangement 137, with the screw being inserted into the slot 136. In this way, advantageously, the extension configuration can be easily changed just by loosening the screw-nut
10 assembly 137, shifting the extensions 133 to the proper position and bolting again the screw-nut arrangement 137. This feature is highly advantageous as more than one tray is generally formed in a bottom web length. With reference to Figures 4 and 5, for instance, three lanes of mutually parallel packages are shown. It should be clear that the present invention applies equally to any number (lower or higher)
15 of lanes of mutually parallel packages.

Thus, the man skilled in the art will recognize that providing a manufacturing apparatus with, for instance, four lanes of trays (namely four smaller trays in the same bottom web width) will be easily carried out by properly moving the three existing extensions and by adding a further extension at a proper position.
20 Analogously, providing a manufacturing apparatus with two lanes of trays (namely two larger trays in the same bottom web width) will be easily carried out by removing one of the three existing extensions and by properly moving the remaining two extensions at proper positions.

Advantageously, in order to easily and promptly locate the correct positions of
25 the extensions, the slotted bar 135 comprises position indicators, possibly a graduated scale in at least one measure unit.

Each extension 133 bears, at the lower end thereof, a local sealing inhibition tool 150. The local sealing inhibition tool 150 comprises a rather thin and elongate plate member 151.

30 According to a first preferred example (see Figures 6a and 6f), the local sealing inhibition tool has a fundamentally rectangular shape.

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According to a second preferred example (see Figures 6b and 6f), the local sealing inhibition tool 150 has a fundamentally rectangular shape with a half-arrow shape at one end (the free end 152 opposite to the one connecting to the corresponding extension).

- 5 According to a third preferred example (see Figures 6d and 6f), the local sealing inhibition tool 150 has a fundamentally rectangular shape with a one fourth of circumference curved free end 152.

- 10 According to a fourth preferred example (see Figures 6c and 6f), the local sealing inhibition tool has a fundamentally rectangular shape with a full-arrow shape at the free end 152. From one side, a so shaped tool allows for reducing the number of extensions and tools as one tool operates for two adjacent trays. From the other side, a so shaped tool allows for creating an easy-to-open package wherein two corners can be gripped by the end user for separating the top and bottom webs.

- 15 According to a fifth preferred example (see Figures 6e and 6f), the local sealing inhibition tool has a fundamentally rectangular shape with a semicircular shape at the free end 152. The advantages are the same as for the fourth embodiment.

According to a sixth preferred example (not shown), the local

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sealing inhibition tool has a fundamentally rectangular shape and it has a width as the width of the package. A so shaped tool allows for creating an easy-to-open package wherein an entire side can be gripped by the end user for separating the top and bottom webs. When the web contains two or more lanes it is possible to use a local sealing inhibition tool with a substantially rectangular shape as wide as the web. In such a case, in order to avoid any interference between said strip and the products loaded in the trays, the strip is inclined downwardly relative to the path of advance of the web.

With reference to Figure 4 and Figure 5, the local sealing inhibition unit 130 further comprises a cooling unit 140 for cooling the local sealing inhibition tools 150, possibly after each sealing cycle. The cooling unit 140 comprises a source (not shown) of cooling medium, possibly a source of compressed air, tubes 141 for bringing the cooling medium near the local sealing inhibition tools 150, and corresponding nozzles 142 for blowing the cooling medium towards the local sealing inhibition tools.

The operation of the local sealing inhibition unit 130 will be now described. Through the pneumatic or hydraulic actuator 134, the arm 132 is moved towards the sealing station 115 so that the free end 152 of the local sealing inhibition tool 150 reaches a position wherein it is under the edge of the upper sealing dome 116 (and up to the edge of the bottom die 117). When the upper sealing dome and the bottom die close, the sealing inhibition tool 150 (or at least its free end 152) is sandwiched between the top and the bottom webs. The interposition of the tool 150 at least in a location between the upper and lower webs inhibits, i.e. avoids, the adhesion of the two webs in such a localized area. At the end of the sealing process, when one or both of the sealing dome and the bottom die vertically move and separate, the arm 132 is returned to the starting position (so that the

sealing inhibition tools become out of the influence area of the sealing station); the sealed packages are moved in the working direction and further packages to be sealed are moved to the sealing station itself.

5 When the tools 150 are not operating, namely after a sealing cycle, preferably the sealing inhibition tools are cooled through the tool cooling unit 140. While this cooling operation is optional, especially when proper materials are selected for the local sealing inhibition tools, profitably it increases the operating life of the local sealing inhibition tools that are subject to high temperatures during the sealing cycle.

10 It is well known that a good sealing is obtained through a high vacuum between the upper sealing dome and the bottom die. For this reason, conventionally the gasket 118 is placed at the edge of the dome and/or the bottom die. In any case, notwithstanding the gasket, it is highly advisable to have thin local sealing inhibition tools. A possible
15 thickness for the local sealing inhibition tools could range between about 0.3 mm and about 0.8 mm, preferably between about 0.4 mm and about 0.6 mm, and still preferably is about 0.5 mm. When a 0.5 mm thick tool has been used, good sealing results have been obtained.

20 The local sealing inhibition tools 150 are made of a material with thermal insulating, high temperature resistance and heat dispersion characteristics. In any case, the selected material should not be sticking even at high temperatures. In addition, the selected material should have other mechanical characteristics as compression resistance and rather high flexibility.

25 According to a preferred embodiment of the present invention, the local sealing inhibition tools are made of fluorocarbon resins, including polytetrafluoroethylene (PTFE), fluoroethylene polymers (FEP) and various copolymers. Particularly preferred would be local sealing inhibition tools made of Teflon®, DuPont trademark covering all of its
30 fluorocarbon resins. In a most preferred embodiment of the present

invention, the local sealing inhibition tools are made of polytetrafluoroethylene plastic, a highly crystalline plastic with a very high thermal stability, excellent electrical insulation properties and low coefficient of friction in a wide temperature range.

5 According to a further preferred embodiment of the present invention (see Figures 6g and 6i), the local sealing inhibition tool 150 comprises a thin core 153 of metal or the like and one or two coatings 154 of Teflon®, PTFE or any mixture thereof. Advantageously, only the free ends 152 of the sealing inhibition tools 150 are coated (see Figures 6h and 6l). The thin metal core 153 could be about 0.3 mm thick and each
10 of the upper and lower coatings 154 could be about 0.1 mm thick.

 While the local sealing inhibition unit 130 has been shown and described upstream of the sealing station, in principle it could be arranged downstream thereof, laterally or according a combination of
15 the various arrangements.

 The dimensions of the local sealing inhibition tools and of the area of non-adhesion between the bottom and the top webs (that at most corresponds to the size of the seal inhibition tool but is generally smaller, typically corresponding to the size of the free end 152) can vary
20 according to the dimensions of the package and of the peripheral rim, provided however that it is sufficient to allow for an easy gripping by an ordinary hand. Generally, packages from about 8 cm to about 20 cm in width and from about 15 cm to about 30 cm in length are manufactured with a rim width ranging from about 1.0 cm and about 3.0 cm. In view of
25 this, each local sealing inhibition tool is generally about 1-3 cm large and 3-8 cm long, and the size of the non sealed area that can suitably be obtained using such seal inhibition tools would typically be 1-3 cm in width and 1-4 cm in length, preferably about 1-2 cm in width and 1-3 cm in length. Needless to say that where a strip is used having the same
30 width as the package, then the dimensions of the non-sealed ones will

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vary accordingly.

The lower web used for the manufacture of the

easy to open package preferably comprises a

multilayer laminated structure having flexibility characteristics which

may vary depending on the end use. Rigid and semi-rigid gas barrier
structures are generally preferred. Typically they comprise one or more

bulk layers, such as polystyrene, polypropylene, or polyester-based
layers, a gas-barrier layer if the bulk layer does not confer sufficient

gas-barrier properties, a suitably selected sealant layer, that may be

peelable, optionally an inner layer adjacent to the sealable layer that
may comprise incompatible resins or may easily delaminate from the

adjacent sealant layer, to provide for an easy openable structure, tie

layers, if and where necessary to increase the bond between the

various layers, and the like layers. These structures may be solid or

partially foamed, where at least the gas-barrier layer is solid. Thickness

of the lower web is generally comprised between 100 and 1,000 μm ,

preferably between 150 and 800 μm and more preferably between 150

and 350 μm for solid structures and between 350 and 700 μm for the

partially foamed ones. The top web is typically a multi-layer formable

structure, preferably non oriented, comprising one or more bulk layers

of ethylene homo- or copolymers, an ionomer, a polyester or any other

thermoformable resin, a gas-barrier layer, preferably comprising

ethylene-vinyl alcohol copolymer and/or polyamides, and a suitably

selected sealing layer, typically comprising an ethylene homo- or

copolymer or an ionomer. Preferably the structure of the top web is

cross-linked by irradiation. Thickness of typical upper webs to be used

in VSP is from about 40 to about 300 μm , preferably from about 50 to

about 250 μm and more preferably from about 60 to about 180 μm .

It should be clear that in both Figures 4 and 5, the top web 113 and

the sealing station 115 have not been shown for clarity. In addition, in

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Fig. 5, also the product P has not been shown for clarity.

Throughout the present description, the shape of the thermoformed lower web has been described and shown as being fundamentally rectangular as this is the shape that is conventionally used. It will however be understood that virtually any
5 shape of the superposed webs can be provided. Of course, when the tray shape is circular, elliptical or has rounded corners, the device for pulling apart the package will not be at a corner of the package as, in principle, there are no corners.

In some instances, particularly when a clear bottom web is employed, it might
10 be advisable to facilitate the identification of the unsealed corner by the end user. This can be done e.g. by suitably printing the top web in correspondence of the unsealed corner or by suitably thermoforming the bottom web so as to distinguish the corner that will be unsealed from the other ones, e.g. by creating a protuberance, either downwardly or upwardly, in correspondence with the
15 unsealed corner. The presence of such a protuberance in addition to enable the identification of the unsealed corner, would also help in pulling the top film to open the package.

Briefly, with reference to the various figures and in particular to Figures 4 and 5, a preferred embodiment of the present invention provides an apparatus
20 for manufacturing, through a vacuum skin packaging method, an easy-to-open package provided with a device for initiating the opening thereof, the apparatus comprising a sealing station 115 wherein a top web 113 is sealed to a bottom web 104 in a first area A on and all around a product P arranged on the bottom web by providing heat and vacuum in a fundamentally closed chamber, and further
25 comprising a local sealing inhibition unit 130 comprising at least one removable local sealing inhibition tool 150 for inhibiting the sealing between the top and bottom webs 113, 104 in at least a second area B.

A preferred embodiment of the present invention also provides a vacuum skin packaging method for manufacturing an easy-to-open package provided with a
30 device for starting the aperture thereof, the method comprising the step of sealing a top web 113 to a bottom web 104 in a first area A all around a product P that is

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arranged on the bottom web, said sealing step comprising the step of providing heat and vacuum in a fundamentally closed chamber, and the step of inhibiting the sealing between the top and bottom webs 113, 104 in at least a second area B by arranging at least one removable local sealing inhibition tool 150 between the top
5 and bottom webs 113, 104, in said second area.

Many changes, modifications, variations and other uses and applications of the subject invention will, however, become apparent to those skilled in the art after considering the specification and the accompanying drawings which disclose preferred embodiments thereof. All such changes, modifications, variations and
10 other uses and applications that do not depart from the scope of the invention are deemed to be covered by the invention.

Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" and "comprising", will be understood to imply the inclusion of a stated integer or step or
15 group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.

The reference in this specification to any prior publication (or information derived from it), or to any matter which is known, is not, and should not be taken as an acknowledgment or admission or any form of suggestion that that prior
20 publication (or information derived from it) or known matter forms part of the common general knowledge in the field of endeavour to which this specification relates.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. An apparatus for manufacturing, through a vacuum skin packaging method, an easy-to-open package provided with a device for initiating opening thereof, the
5 apparatus comprising a sealing station wherein a top web is sealed to a bottom web in a first area all around a product arranged on the bottom web by provision of heat and vacuum in a chamber, the apparatus further comprising at least one local sealing inhibition tool and being configured such that a portion of the or each tool lies between the webs, in a further area, during the sealing in the first area,
10 whereby sealing between the webs in the further area(s) is inhibited, and is released from between the webs after the sealing in the first area.
2. An apparatus according to claim 1, wherein the or each tool in the working position is arranged such that said portion thereof is between the top and bottom
15 webs and at least partially within the chamber of the sealing station.
3. An apparatus according to either one of claims 1 and 2, wherein the or each tool comprises a plate member having a free end which defines said portion.
- 20 4. An apparatus according to claim 3, wherein the or each free end is substantially arrow-shaped.
5. An apparatus according to claim 3, wherein the or each free end is shaped substantially according to a circle arc.
25
6. An apparatus according to any one of the preceding claims, wherein the or each tool is made at least partially of a material selected from the group consisting of fluorocarbon resins including polytetrafluoroethylene (PTFE), fluoroethylene polymers (FEP) and copolymers thereof.
30
7. An apparatus according to claim 6, wherein said material is PTFE.

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8. An apparatus according to any one of the preceding claims, wherein the or each tool comprises a core and at least one coating that is made of a material selected from the group consisting of Teflon and PTFE and any mixture thereof.
- 5 9. An apparatus according to any one of the preceding claims, comprising a local sealing inhibition unit of which the or each tool forms a part.
10. An apparatus according to claim 9, wherein the unit includes a device for moving the or each tool between a working position, in which it cooperates with the sealing station, and a non-working position, in which it does not cooperate with the sealing station.
- 10 11. An apparatus according to claim 10, wherein said device comprises a pneumatic or hydraulic piston arrangement.
- 15 12. An apparatus according to any one of claims 9 to 11, wherein the local sealing inhibition unit comprises a cooling unit for cooling the or each tool.
- 20 13. An apparatus according to any one of claims 9 to 12, wherein the unit comprises an arm and one or more protruding extensions supported from the arm, the or each extension carrying a said tool at an end thereof, the arm comprising a bar provided with a slot extending therealong via which the or each extension is coupled to the arm to be movable along the slot, whereby the or each tool is adjustable in position according the positioning of the further area(s).
- 25 14. A vacuum skin packaging method for manufacturing an easy-to-open package provided with a device for initiating opening thereof, the method comprising sealing a top web to a bottom web in a first area all around a product that is arranged on the bottom web, including providing heat and vacuum, the method further comprising effecting operation of at least one local sealing inhibition tool
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such that a portion of the or each tool lies between the webs, in a further area, during the sealing in the first area, to inhibit sealing between the webs in the further area(s), and is released from between the webs after the sealing in the first area.

5

15.A method according to claim 14, wherein the or each tool is moveable into a working position, in which said portion thereof is arranged between the webs and in which the tool cooperates with the sealing station, and a non-working position, in which it does not cooperate with the sealing station.

10

16.A method according to either one of claims 14 and 15, wherein the or each tool is made at least partially of a material selected from the group consisting of fluorocarbon resins including polytetrafluoroethylene (PTFE), fluoroethylene polymers (FEP) and copolymers thereof.

15

17.A method according to claim 16, wherein said material is PTFE.

18.A method according to any one of claims 14 to 17, further comprising cooling the or each tool subsequent to sealing between the webs.

20

19.An apparatus according to any one of claims 1 to 13, substantially as hereinbefore described with reference to the accompanying drawings.

20.A method according to any one of claims 14 to 18, substantially as hereinbefore described with reference to the accompanying drawings.

25

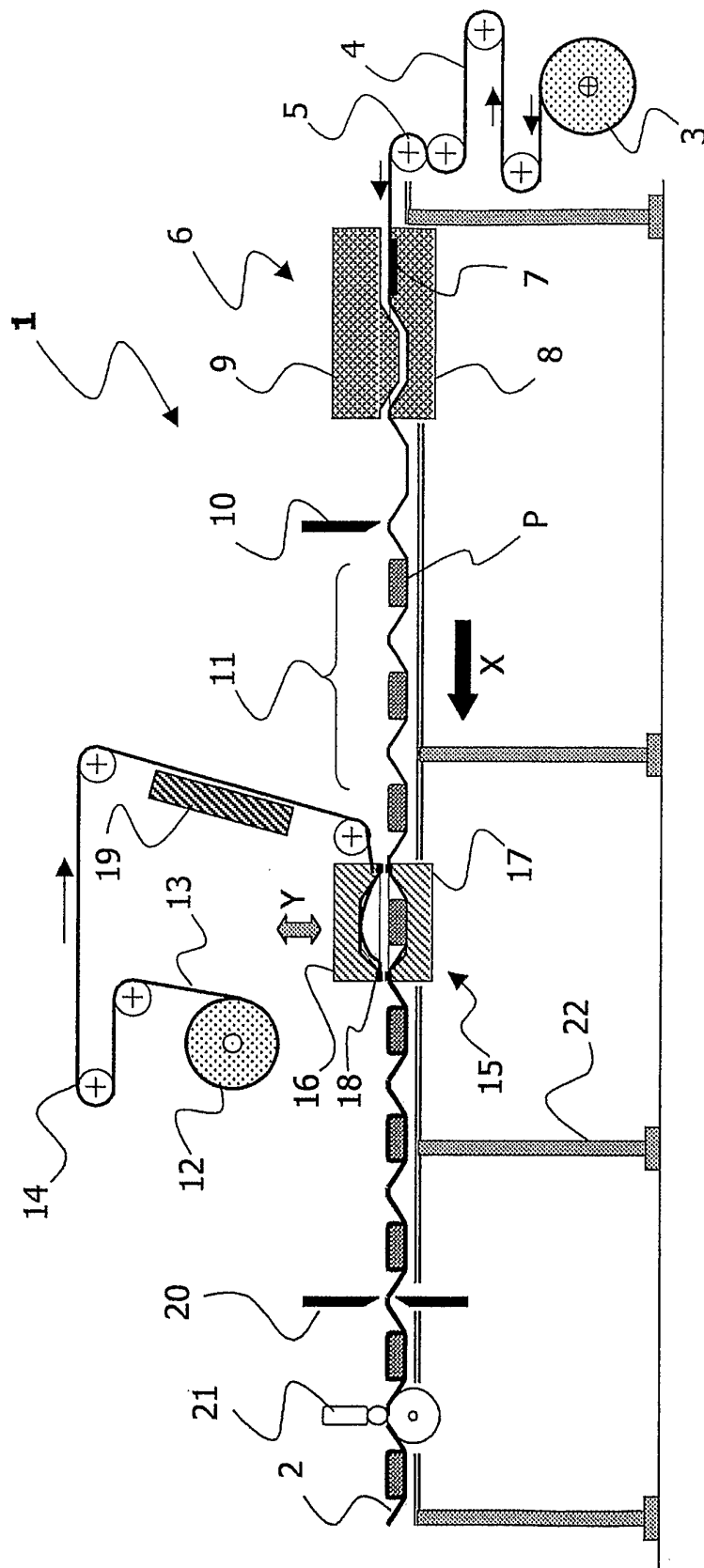


Fig. 1
(prior-art)

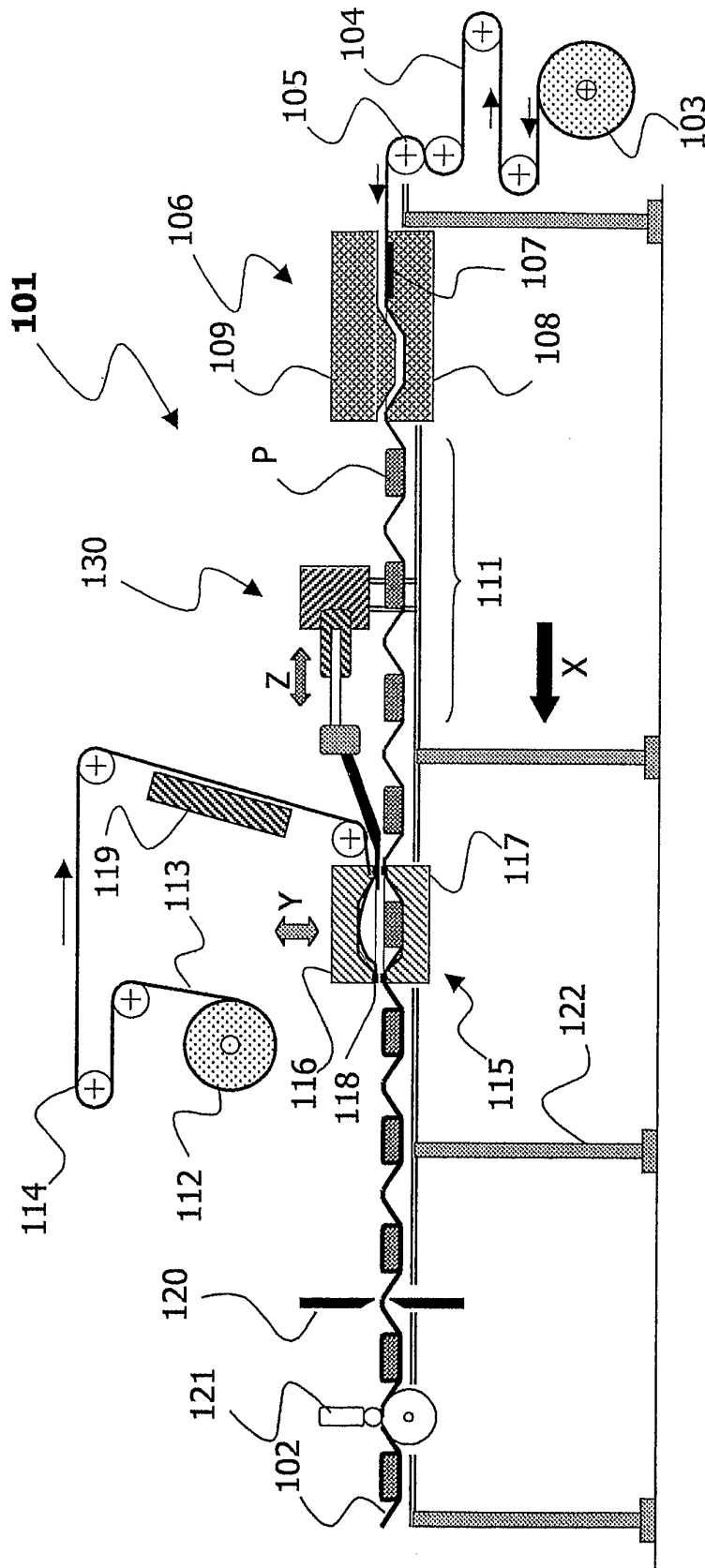


Fig. 2

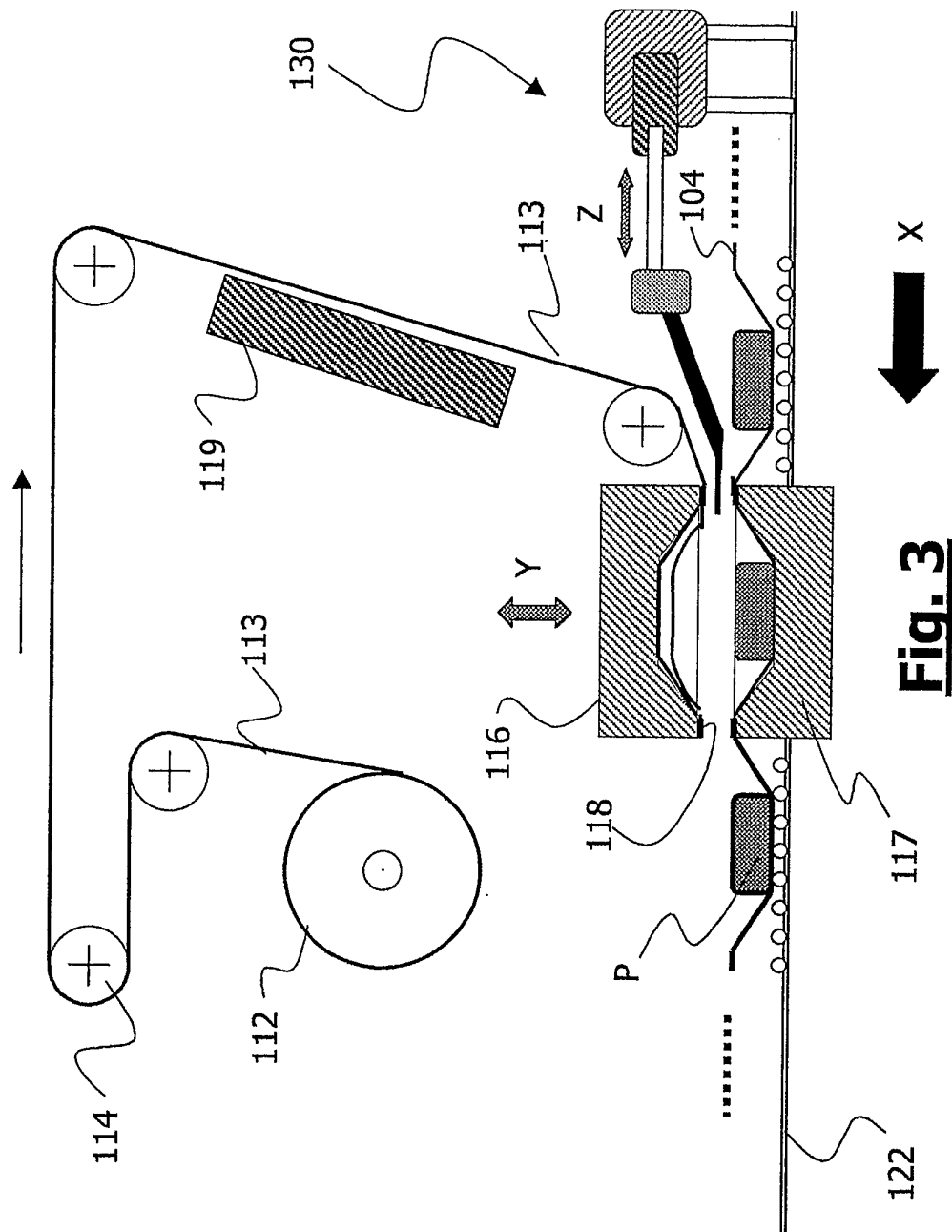


Fig. 3

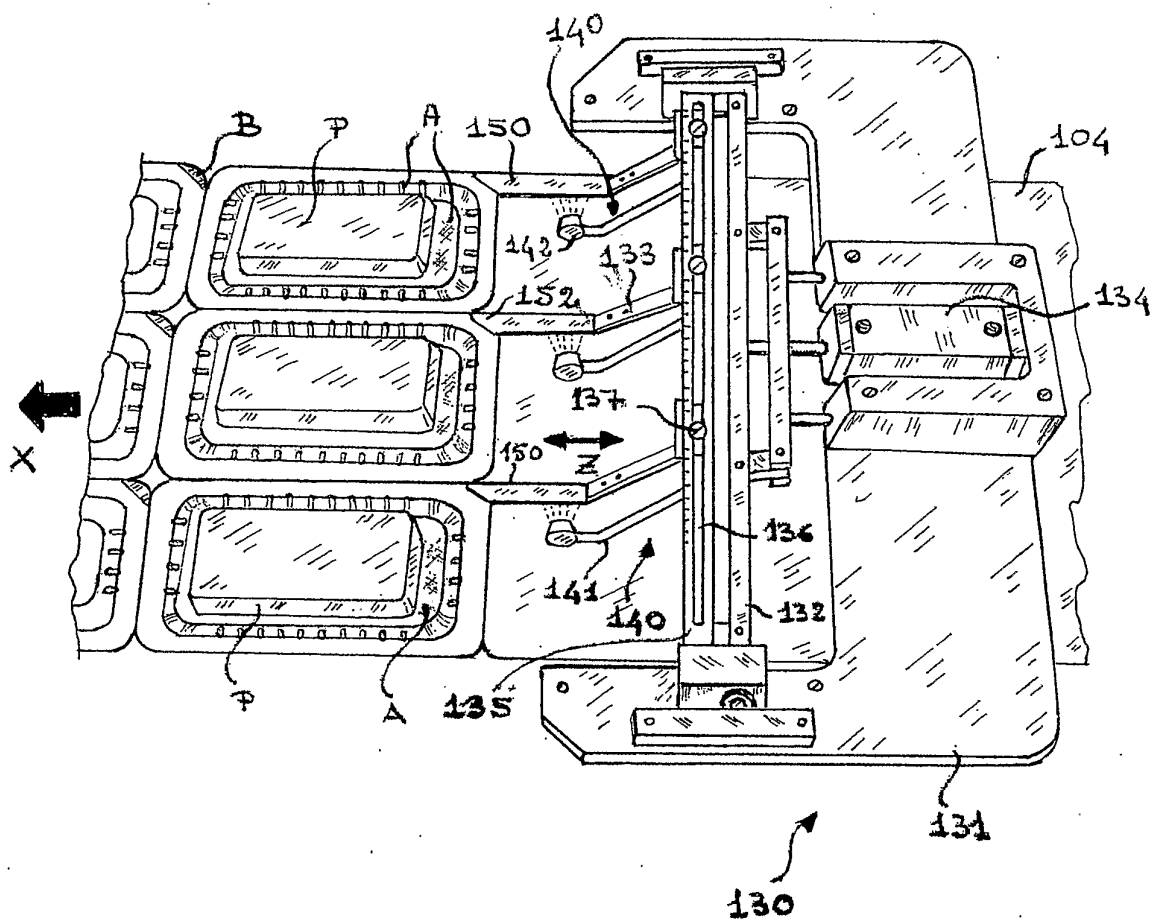


Fig. 4

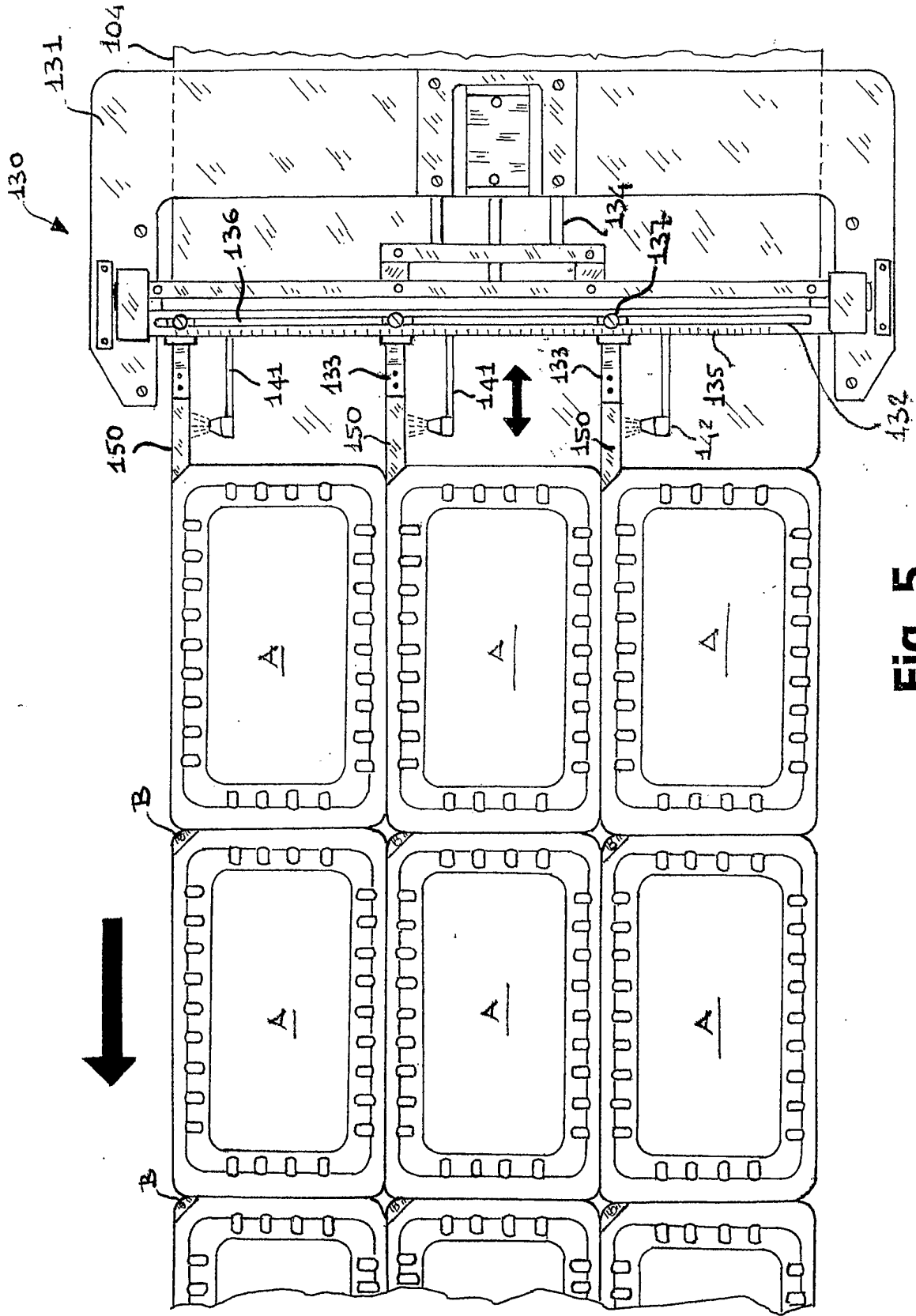


Fig. 5

