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(54) **PROTECTIVE PACKAGING AND ASSOCIATED PACKAGING METHOD FOR FRAGILE OBJECTS SUCH AS BOTTLES OR JARS AND PROCESS AND PUNCHED BLANK FOR FAST FORMATION OF THE PROTECTIVE PACKAGING**

(57) Protective packaging (I100;I200;I300) for fragile objects, in particular bottles (1) or jars, formed by a flat punched blank (100;200;300) extending parallel to a longitudinal lengthwise direction (X-X) of the punched blank and the packaging, transverse widthwise direction (Y-Y) of the punched blank and the packaging, and vertical direction (Z-Z) of thickness and height of the packaging.

The protective packaging (I100;I200;I300) comprises at least a first body (I101;I201;I301) for housing at least one or more fragile objects, formed by a plurality of adjacent planes of the punched blank joined and articulated together by means of transverse folding lines for relative rotation and at least one transverse fixing flap

(I115;I215;I315) glued onto one of said planes (I140;I240;I340), so that the first housing body (I101;I201;I301) is movable between a closed position, in which it is flattened onto the longitudinal-transverse plane, and an open position, folded out in the vertical direction Z-Z, in which the housing body assumes a tubular form with a rectangular cross-section. One or more of said plurality of surfaces, designed to be arranged perpendicular to the longitudinal-transverse plane when the first housing body is in the open position, comprises one or more through-openings (I113;I213;I313,I333) for inserting a fragile object into the first housing body.

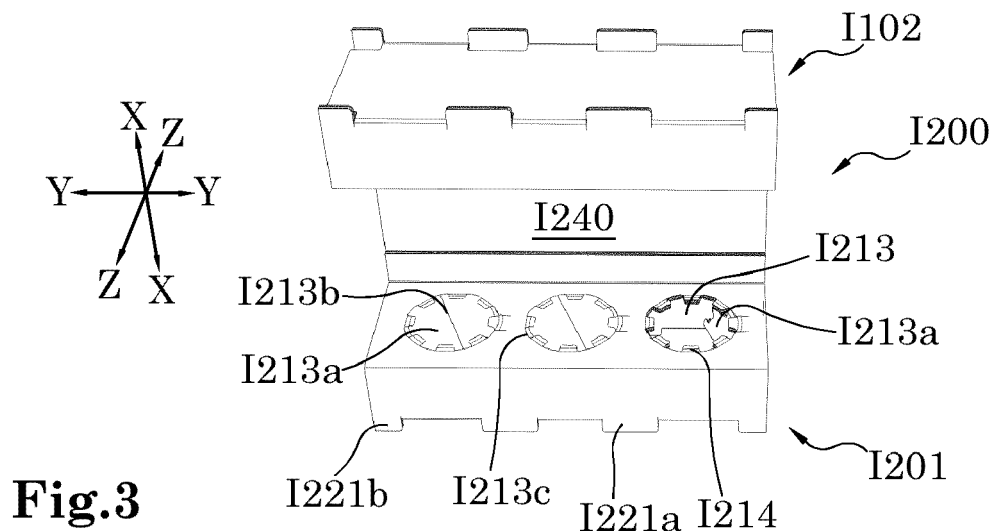


Fig.3

Description

[0001] The present invention relates to a protective packaging for fragile products such as bottles or jars, a punched blank and a process for making the packaging, and a method for using the packaging.

[0002] It is known in the merchandise sector relating to the packaging and despatch of goods and in particular fragile objects such as bottles, jars and similar generally cylindrical or frustoconical objects that there exists the need for containers which are able to protect the fragile objects from damage during transportation.

[0003] In this context it is known that fragile objects such as, in particular, bottles are transported in containers, such as so-called "collapsible boxes" which have, arranged inside them, protective packaging formed from punched cardboard and comprising one or more tubular housing bodies with a rectangular cross-section, arranged one above the other and provided with circular openings for inserting the bottles.

[0004] Examples of such internal protective packaging are known for example from WO2015049702, IT102007901585548 and US6702115B1.

[0005] Although fulfilling their function, the known protective packaging has a number of drawbacks:

- it must be assembled by the end user (the supplier despatching the fragile objects) from flat punched blanks by means of complex manual operations which require a considerable amount of time and resources and are prone to assembly errors by non-specialized users;
- it is not always able to ensure adequate strength and protection for the transportation of fragile objects during which the containers are subject to impacts and stresses which may result in breakage of the objects, in particular following contact with each other, especially in the case of large-size bottles where the space between them inside the packaging is limited.

[0006] A further problem of the known solutions is that they require large quantities of starting material in order to form the packaging from a punched blank. The technical problem which is posed therefore is that of providing a protective packaging for fragile objects such as bottles and jars, designed to solve or at least overcome the aforementioned drawbacks of the known packaging.

[0007] A particular object of the present invention is to provide a protective packaging which may be used more easily and rapidly by the end user.

[0008] In connection with this problem it is particularly desirable that the protective packaging should be able to be made on automatic lines in a simple manner from a flat punched blank, by means of an improved process for formation of the packaging.

[0009] A further particular object of the present invention is to provide a protective packaging of the type described above and optionally an associated container

which offer improved protection of the fragile objects so as to prevent damage thereto during transportation.

[0010] In connection with this problem it is also required that this protective packaging and container should be easy and inexpensive to produce and transport and be able to be easily and quickly assembled for use also by non-specialized users.

[0011] These results are obtained according to the present invention by a protective packaging for fragile objects, in particular bottles or jars, according to Claim 1, comprising at least a first housing body for housing one or more fragile objects which is/are formed by a plurality of adjacent planes of a planar punched blank which can be joined and articulated together by means of transverse folding lines for relative rotation and at least one transverse fixing flap glued onto one of said planes, so that the first housing body is movable between a closed position, where it is flattened onto a longitudinal-transverse plane, and an open position, unfolded in the vertical direction Z-Z, where the first housing body assumes a tubular form with a rectangular cross-section.

[0012] In order to obtain improved protection of the fragile objects, such as bottles and jars, and avoid damage thereto during transportation, according to an advantageous aspect of the present invention a protective packaging for fragile objects is provided where said packaging comprises one or more housing bodies having a tubular form with a rectangular cross-section and is provided with one or more openings for inserting a fragile object such as a bottle, wherein one or more of the openings of the housing body is/are closed at least partially by at least one flap, preferably a pair of flaps for each opening, each flap being able to rotate about a respective folding line with respect to the plane of the opening between an at least partially closed position of the respective opening and an open position, rotated towards the inside of the tubular housing body, so as to free the respective opening and form a respective protective flange extending from the plane of the opening towards the inside of the housing body.

[0013] The one or more protective flanges thus formed, which extend in particular towards the inside of the housing body with their free end side, allow the fragile object to be kept in position, if necessary even if the diameter thereof is smaller than that of the opening, and provide increased and gradual lateral protection of the fragile object inserted inside the opening, both when the packaging is intact and when the packaging is subject to gradual tearing owing to the stresses during transportation.

[0014] An alternative or complementary solution for obtaining improved protection of the fragile objects involves forming a protective packaging comprising an outer plane, arranged in an end position in the longitudinal direction during use of the packaging with the one or more housing bodies in the open position, and feet projecting longitudinally from the outer plane, said feet having a free support edge formed with an undulating profile.

[0015] Surprisingly it has been found that the undulat-

ing structure of the support feet allows, during the transportation of fragile objects, the force of an impact to be absorbed progressively, and therefore in a gradual and sequential manner, reducing the effects thereof on the said objects, thereby favouring improved protection and reliability of the packaging.

[0016] The present invention relates furthermore to a planar punched blank for forming a protective packaging according to Claim 12 and a process for forming a protective packaging according to the characteristic features of Claim 18.

[0017] The present invention relates furthermore to a method of using the packaging for the packaging of fragile objects.

[0018] Further details may be obtained from the following description of non-limiting examples of embodiment of the subject of the present invention, provided with reference to the accompanying drawings, in which:

Figure 1: shows a plan view of the inner surface of a first embodiment of a punched blank according to the present invention;

Figures 2A-2C: shows perspective views, respectively, of a pile of protective packages according to the invention, formed from a punched blank according to Figure 1, and the steps for opening the housing bodies of one of said protective packages.

Figure 3: shows a front perspective view of a second embodiment of a protective packaging unit according to the present invention with a first and a second housing body both in the open position;

Figure 4: shows a plan view of the inner surface of a second embodiment of a punched blank according to the present invention for forming the protective packaging according to Figure 3;

Figures 5-8: show perspective views of the steps for forming the protective packaging according to Figure 3 in the closed position from the punched blank according to Figure 4;

Figure 9: shows perspective views and side views of the operations for performing opening into the open position of the tubular housing bodies and insertion of the bottles inside them;

Figure 10: shows perspective views from above of a first example of embodiment of a container assembly for transporting three bottles according to the invention, with an inner closing lid in the open and closed position respectively;

Figure 11: shows a perspective side view of a pair of protective packages according to Figure 3 combined for use in a container assembly for six bottles;

Figure 12: shows a perspective view from above of operations for assembly of an example of embodiment of a container assembly for six bottles according to the present invention;

Figure 13: shows perspective views from above of operations for assembly of a further example of embodiment of a container assembly for six bottles ac-

cording to the present invention;

Figure 14: shows a perspective view from above of the inner surface of a third embodiment of a punched blank according to the present invention for forming a packaging;

Figures 15-18: show perspective views of the steps for forming, from the punched blank of Figure 14, a third embodiment of a protective packaging pre-glued in a flattened configuration;

Figure 19: shows perspective views of the operations for opening the protective packaging according to Figure 18;

Figures 20a, 20b: show perspective views of the steps for packaging a plurality of bottles by means of a protective packaging according to Figure 19;

Figures 21a-21h: show perspective views of the steps for forming, from a fourth embodiment of the punched blank according to the present invention, a fourth embodiment of a pre-glued protective packaging in the configuration flattened, unfolded and with the protective flanges operative; and

Figures 22a-22d: show perspective views of the steps for packaging a plurality of bottles by means of a protective packaging according to Figure 19 and a further protective packaging according to the present invention.

[0019] As shown in Fig.1 and assuming for the sake of simpler description a set of three reference axes, i.e. in a longitudinal lengthwise direction X-X of a punched blank and a protective packaging according to the invention, transverse widthwise direction Y-Y of the punched blank or the packaging according to the invention, and vertical direction Z-Z of thickness of the punched blank and height of the packaging according to the invention, as well as an inner surface and an outer surface of the punched blank opposite to each other in the vertical direction of thickness Z-Z, a first example of embodiment of a punched blank 100 according to the invention for forming a protective packaging suitable for housing fragile objects, in particular in the form of bottles 1 (Fig. 9) for example with a cylindrical body 1a and small-diameter neck 1b, extends in a longitudinal-transverse plane X-Y and with a thickness in the vertical direction Z-Z.

[0020] The punched blank 100 may for example be formed by a body with one or more layers of corrugated cardboard, the inner and outer surfaces of which situated opposite each other in the direction of thickness Z-Z are formed by a thin lining sheet; the body may be punched using conventional techniques not described here in detail.

[0021] Still with reference to Figure 1, the punched blank 100 comprises preferably:

- a first plane 110 with a substantially rectangular form having sides parallel to the longitudinal direction X-X and transverse direction Y-Y, arranged at a first longitudinal end of the punched blank 100;

- a second plane 120 arranged adjacent, in an inner position in the longitudinal direction, to the first plane 110 and joined thereto by means of a transverse folding line 111 which, in the example shown, coincides with the respectively inner and outer transverse sides, in the longitudinal direction, of the first plane 110 and the second plane 120;
- a third plane 130 arranged adjacent, in an inner position in the longitudinal direction, to the second plane 110 and joined thereto by means of a transverse folding line 121 which, in the example shown, coincides with the respectively inner and outer transverse sides, in the longitudinal direction, of the second plane 120 and the third plane 130;
- a central plane 140 connected by means of a transverse folding line 141 to the inner transverse side of the third plane 130.

[0022] The outer transverse side of the first plane 110 has, connected thereto, by means of a folding line 112, an end flap 115 provided, on its inner face, with a gluing strip 115a suitable for being joined to the inner face of the central plane 140 in order to fix the first plane 110 to the central plane 140 with the possibility of relative rotation about the folding line 112.

[0023] As will become clearer below, by rotating towards the inside the first plane 110 and the second plane 120 with respect to the third plane 130 and the central plane 140 about the transverse folding line 121, it is possible to position the end flap 115 so that it is superimposed on the central plane 140 to which it may be fixed by means of the gluing strip 115a (Fig. 2A). This therefore results in the formation of a first housing body 1101 in a closed position, flattened onto the central plane 140, with a thickness in the vertical direction Z-Z substantially twice that of the flat punched blank 100.

[0024] As will be described in greater detail below, the transverse lines 111, 112, 121, 131 which join together, with the possibility of relative rotation, the adjacent planes 110, 120, 130, 140 and the end strip 115 joined to the first plane 110 and fixed to the inner face of the central plane 140 allow the relative articulation of the said planes so as to move the first housing body 1101 from the flattened closed position (Fig. 2A) into an open position (Fig. 2C), unfolded in the vertical direction Z-Z, in which the first housing body 1101 assumes a tubular form with a rectangular cross-section, the four sides of which are each formed by a respective plane of said four adjacent planes 110, 120, 130, 140 of the punched blank 100. In particular, an inner vertical-transverse side 1110 is formed by the first plane 110, an outer vertical-transverse side 1130 is formed by the third plane 130, while the second plane 120 and a part of the central plane 140 form the two longitudinal-transverse sides which are parallel to each other.

[0025] The first plane 110, the second plane 120 and the third plane 130 therefore form a first set of planes adjacent to each other and connected to the central plane

by means of the folding line 131, said planes being designed to form with the said central plane 140 a first housing body 1101 which is movable between a closed position, flattened onto the central plane 140, and an open position where it assumes a tubular form with rectangular cross-section folded out in the vertical direction Z-Z with respect to the central plane 140. As shown in Figure 2B, the opening movement of the first body 1101 may be easily obtained by means of a simple rhomboid-forming operation, for example by pressing on the outer transverse edge 1121 (formed by the line 121 for folding the second plane 120 with respect to the third plane 130) or for example also by pressing against the outer surface of the third plane 130, so as to move rotationally the first plane 110 and the third plane 130 towards the inside until they are arranged substantially perpendicular to the central plane 140 and parallel to the vertical direction Z-Z.

[0026] As can be seen for example in Figure 2B, the end flap 115 which joins by means of pre-gluing the first plane 110 to the central plane 140 is preferably fixed to the latter in a position which is on the outside of the tubular body 1101 with rectangular cross-section of the formed packaging 1100, allowing in a particular easy manner the articulation of the first set of planes 110, 120, 130 with the central plane 140 for closing in the flattened condition or opening in the unfolded condition the housing body 1101.

[0027] As can be seen in Figure 1, the first plane 110 is provided with a plurality of - for example three - through-openings 113 formed in the vertical direction of thickness of the punched blank and, in the preferred example, aligned in the transverse direction Y-Y.

[0028] Each opening 113 is designed, once the protective packaging 1101 has been formed, to allow the insertion of a respective bottle 1 in the first housing body 1101 open in the unfolded condition so as to have a tubular form with rectangular cross-section. The openings 113 are in form of circular holes for housing the bottles 1, but may also have different shapes in the case of fragile objects with a different cross-sectional form.

[0029] As described above, the first plane 110 and the third plane 130 directly joined to the central plane 140 by means of the transverse folding line 131 and the fixing flap 115, respectively, are designed to be arranged perpendicularly with respect to the central plane 140 of the packaging and therefore to a longitudinal axis of each bottle 1, when the housing body 1101 is open in the unfolded condition where it has a tubular form.

[0030] According to preferred embodiments of the present invention, at least one of said planes 110, 130 of the first set of planes for forming the first housing body 1101 will be provided with one or more through-openings 113 for inserting the fragile objects to be packaged. According to a further preferred aspect, at least one different plane 1130 of said planes perpendicular to the central plane 140 which, in the open condition of the housing body, will be arranged in an outer position in the longitudinal direction X-X, will act as an outer (for example upper or lower) support plane 1130 for the packaging 1101 and,

for this purpose, will have preferably feet 1121a, 1131a projecting in the longitudinal direction X-X from the said plane 1130 and preferably formed according to the art known per se by configuring the folding lines 121, 131 which connect the third plane 130 respectively to the second plane 120 and to the central plane 140 with two or more discontinuous zones 121a, 131a where there are cut-out parts extending towards the inside of the third plane 130, so as to remain coplanar with the respective second plane 120 or central plane 140 when the third plane 1130 is rotated with respect thereto about the folding lines 121, 131.

[0031] With reference again to Figure 1, the central plane 140 has, connected thereto, a second set of adjacent planes 150, 160, 170 designed to form a second housing body 1102 of the packaging 1101, said planes 150, 160, 170 of the second forming set being also generally rectangular, and connected to the central plane 140 by means of a transverse folding line 141 arranged on the opposite side in the longitudinal direction X-X with respect to the transverse folding line 131 which connects the central plane 140 to the first set 110, 120, 130 of planes.

[0032] As can be seen, in the preferred embodiment shown, the second set of forming planes comprises:

- a fourth plane 150 adjacent to the central plane 140 to which it is directly connected by means of the folding line 141 about which it may rotate with respect to the said central plane 140;
- a fifth plane 160, connected by means of a transverse folding line 151 to the fourth plane 150, so as to be able to rotate relative thereto; and
- a sixth plane 170, connected by means of a transverse folding line 161 to the fifth plane 160, so as to be able to rotate relative thereto.

[0033] As can be seen, the sixth plane 170 is arranged in an end position in the longitudinal direction X-X and, in a manner similar to the first plane 110, it is joined by means of a transverse folding line 171 to an end flap 175 designed to rotate with respect to the sixth plane 170 about the said folding line 171 and provided with a gluing strip 175 for articulated fixing of the sixth plane 170 onto the inner face of the central plane 140.

[0034] In the preferred embodiment shown, the second set of forming planes 150, 160, 170 is arranged and configured in a substantially similar and specular manner compared to the first set of forming planes 130, 120, 110, so that the fourth plane 150 has an arrangement and function similar to that of the third plane 130 and the fifth plane 160 has an arrangement and function substantially similar to those of the second plane 120, so that the planes of the second set are designed to form with the central plane 140 a second housing body 130 which is movable between a closed position, flattened onto the central plane 140, and an open position, where it assumes a tubular form with rectangular cross-section un-

folded in the vertical direction Z-Z with respect to the central plane 140.

[0035] The second housing body 1102 is arranged at an opposite end in the longitudinal lengthwise direction X-X of the packaging with respect to the first housing body 1101 and, situated above it in the longitudinal direction; a suitable distance between the two housing bodies in the longitudinal direction may be set during production based on the longitudinal length of the objects to be packaged, by suitably designing the dimensions of the central plane 140 in the lengthwise direction X-X.

[0036] As shown in Figure 2B, the opening movement of the second housing body 1102 may also be easily obtained by means of a simple rhomboid-forming operation, in a manner similar to that described with reference to the first housing body 1101, until the sixth plane 170 and the fourth plane 150 are arranged substantially perpendicular to the central plane 140 and parallel to the vertical direction Z-Z.

[0037] As can also be seen, the end flap 175 which joins by means of gluing the sixth plane 160 to the central plane 140 is also preferably fixed to the latter in a position which is on the outside of the tubular body 1102 with rectangular cross-section of the formed packaging 1100, thus allowing in a particularly easy manner the articulation of the second set of planes with the central plane 140 for closing in the flattened condition or opening in the form of a rhomboid the housing body 1102.

[0038] As can be seen in Figure 1, the sixth plane 170 is provided with a plurality - for example three - through-openings 173 formed in the vertical direction Z-Z of thickness of the punched blank 100 and aligned in the longitudinal direction X-X with the through-holes 113 of the first housing body, so as to allow the insertion of a different part for example the neck 1b of the bottle 1 inserted inside the respective opening 113 of the first plane 110. In the example shown, the holes 173 of the sixth plane 170 therefore have a smaller diameter than the holes 113 of the first plane 110, although it will be clear to the person skilled in the art that other dimensions are possible depending on the format of the fragile objects to be transported.

[0039] As can be seen in Figs. 2A-2C, the protective packaging 1100 of the present invention formed by the punched blank 100 in Fig. 1 has first and second housing bodies 1101, 1102, each movable from the closed position, flattened onto the central plane 140 (Fig. 2A), into the open position, unfolded into the form of a tube with a rectangular cross-section (Fig. 2C), which allows the end user to be provided with the packaging 1100 in the flattened configuration with the sets of forming planes pre-glued to the central plane already during the production stage. As a result of this solution it is possible to provide a plurality of flattened packages 1100 (Fig. 2A) which are stacked on top of one another in the vertical direction of thickness Z-Z, as shown in Figure 2A, whereby each of the packages 1100 may be removed and converted into the configuration with the housing bodies

open, as shown in Figure 2C, by means of simple and very quick rhomboid-forming operations, thus resulting in significant simplification and time-saving for the end user without, however, substantially increasing the overall volume of the flattened packaging 1100 with respect to the thickness of the punched blank 100.

[0040] It is therefore clear to the person skilled in the art that the first and second housing bodies could also be formed as separate protective packages, from respective single punched blanks, and then combined in a container to form a container assembly.

[0041] In connection with the present description it also understood that the central plane is not necessarily a plane arranged exactly in the centre of the punched blank or the packaging, but indicates a longitudinal-transverse plane of the packaging with respect to which a housing body is flattened or unfolded in the vertical direction.

[0042] With reference to Figure 3, a second embodiment of a protective packaging 1200 according to the present invention has a configuration similar to that of the packaging according to Fig. 2C, with a first housing body 1201 and a second housing body 1202 which are arranged open in the unfolded condition in the form of a tube with rectangular cross-section and arranged opposite each other in the longitudinal direction X-X.

[0043] The protective packaging 1200 is characterized in that at least the openings 1213 for inserting the bottles 1 of the first housing body are closed at least partially by pairs of flaps 1213a separated by a separation line 1213b, which may be for example a cut formed in the punched blank 200 or a pre-weakened breakage line.

[0044] Each flap 1213a is designed to rotate about a respective folding line 1213c with respect to the associated plane 210 towards the inside of the tubular housing body 1201, so as to open the opening 1213 and allow the insertion of the fragile object to be protected.

[0045] Preferably each flap 1213a closes a respective semi-circle of the hole 213 so that the separation line 1213b is a diametral line of the hole 213, although other different arrangements of the separation line are possible, such as only partial closures of the opening. Preferably, the separation line 213b of the punched blank 200 is inclined with respect to the transverse direction Y-Y and the longitudinal direction X-X.

[0046] As shown, the folding line 1213c of each flap 1213a is formed along a respective section of the semi-perimeter of the respective semi-opening closed by the flap 1213a, in particular a respective circumferential arc in the case of circular holes 213 such as those shown.

[0047] Preferably the perimeter of each opening 1213 is also provided with locking means, in particular in the form of crenellations 1214 projecting towards the inside of the opening 1213 and arranged along the perimeter of the hole 1213, so that the folding line 1213c of each flap 1213a is preferably included between two of said crenellations 1214.

[0048] As will become clearer below, the flaps 1213a for closing the openings 1213, which can be opened, are

designed to form, once rotated into the open position, respective flanges 1213a for protecting the side of the bottles 1 inserted into the respective holes 1213, improving the protection from lateral knocks which are particularly dangerous during transportation and often cause the bottles to hit each other and break.

[0049] As shown for example in Figs. 3, 9c-9f, the protective flange 1213a, once open, is arranged projecting towards the inside of the housing body, with its free end side 1213b.

[0050] In other words, once the flap is open, the corresponding flange 1213a remains connected to the housing body only by means of the respective folding line 1213c, while the opposite free side 1213b and the perimeter of the flange 1213a are not fixed either to the bottom or to other parts of the housing body or the packaging.

[0051] The flaps 213a which form protective flanges 1213a allow an improved protection to be obtained owing to different technical effects:

- once the bottle is inserted inside the opening 1213a, the protective flange allows the bottle to be held in position better, preventing sideways movements which could result in breakage or damage both to the bottle and to the housing body;
- during transportation with the cardboard of the housing body intact, the flange 1213a acts in the manner of a dynamic bumper;
- when the cardboard of the housing body gradually breaks, for example owing to knocks or jolting during transportation, the protective flange 1213a acts as a gradual shock absorber, compensating for the reduced capacity of the opening 213 and the locking means 1214 to keep the bottle in position;
- when the cardboard of the housing body arranged between two adjacent bottles is completely torn, one or more protective flanges 1213a arranged in the respective openings act as protective dividers, preventing damage to the bottles.

[0052] The open position of each flap 1213a can also be adjusted by means of rotation about the folding line 1213a, so that it is possible to correctly keep in position also fragile objects with a smaller diameter than that of the opening 1213 and/or the locking means 1214.

[0053] An inclined separation line 1213b between two flaps 213a of a same opening is particularly preferred since it allows the folding lines 1213c of the flaps of a same opening to be arranged not axially aligned with the longitudinal diameter of the opening. In this way the longitudinal distance between adjacent bottles is not reduced and at the same time the two protective flanges 1213a are staggered in the transverse direction and occupy a greater transverse space inside the housing body.

[0054] Particularly preferably the two flaps 213a of each opening 213 open so as to be arranged in planes which are converging or parallel with each other and/or so as to be arranged each situated between the opening

1213 and an opening or an edge adjacent thereof in the transverse direction Y-Y. Therefore, the packaging according to Fig. 3 is designed to provide better protection for the bottles 1 during transportation. It is understood that the openings of the second housing body may also be configured with closing flaps movable between a position for at least partially closing the respective opening, coplanar with the respective plane, and an opening position where they allow the insertion of the object through the opening and form respective protective flanges, if required by the shape of the fragile object.

[0055] Although it is possible to close the openings also with a single flap, it is also preferable to use at least one pair of flaps for each opening, so that the same, once open, form a double protective layer between adjacent products or form with a side wall of an external container a further layer for protecting a product arranged in an end position in the packaging.

[0056] The one or more closing flaps may be implemented in any protective packaging for fragile objects comprising one or more housing bodies having a tubular form with rectangular cross-section and provided with one or more openings for inserting a fragile object such as a bottle.

[0057] With reference to Figure 4, a second example of embodiment of a punched blank 200 according to the present invention is configured to form the protective packaging 1200 shown in Figure 3 and comprises a substantially rectangular central plane 240 with longitudinal and transverse sides. A first transverse side of the central plane is connected by means of a transverse folding line 231a to a first set of planes 230, 220, 210 adjacent in the longitudinal direction X-X and connected together by transverse folding lines 221, 211 which allow the relative rotation thereof and are designed to form with the central plane 240 the first housing body 1201 of the packaging 1200. In a similar manner to the punched blank of Fig. 1, the first set of planes includes a first outer plane 210 in the longitudinal direction, a second plane 220 adjacent to the first plane 210 and a third plane 230, an outer transverse side of which is connected to the second plane and the inner transverse side of which is connected, by means of the folding line 231, to the central plane 240.

[0058] In this embodiment also, the first plane 210 has a transverse end flap 215 joined by means of the transverse folding line 212 to the first plane 210 and provided with means for performing gluing to the inner face of the central plane 240, for formation of the first housing body 1201.

[0059] As can be seen, the punched blank 200 of this embodiment differs from that of Fig. 1 in particular owing to the presence of flaps 213a for closing the openings 213 of the first plane 210.

[0060] In greater detail, each opening 213 of the first plane 210 is closed by a respective pair of cut flaps 231a which are separated from each other by a separation line 213b and from the perimeter of the opening 213 by means of respective perimetral separation lines which are pref-

erably shaped in the manner of a plurality of crenellations 214 which are arranged along the perimeter of the opening 213.

[0061] The separation lines may be through-cuts formed in the punched blank or also scoring or punching or the like, designed to allow easy breakage of the punched blank along the separation line.

[0062] For each flap 213a, the crenellated perimetral line for separation from the plane 210 is interrupted along a respective circle arc 213c included between two crenellations 214, so as to form a respective folding line for rotational opening of the flap 213a designed to form the protective flange 1213a which will remain connected to the plane 210 only by means of the said folding line 213c.

[0063] As can be seen, the punched blank 200 has a set of planes 250, 260, 270 for forming with the central plane 240 a second housing body, similar to those of the punched blank of Fig. 1 and therefore not described in detail.

[0064] As can be seen, the transverse folding lines 221, 231 and 241, 251 are preferably interrupted by pairs of cut-out regions designed to form projecting feet 1231a, 1231b for supporting the packaging 1200, i.e. end regions 221b in the transverse direction, designed to form corner feet 1221b; and inner regions 221a in the transverse direction Y-Y designed to form respective at least two feet 1221a projecting in the longitudinal direction X-X from the respective plane 220 once the packaging 1200 has been formed.

[0065] With reference to Figs. 5-8 an example of a process for forming a protective packaging 1200 from a punched blank 200 comprises the following steps:

-) arranging the punched blank extended in a longitudinal-transverse direction (Fig. 5);
-) forming a first housing body 1201 in a closed position, flattened in the vertical direction Z-Z on the central plane, in particular by means of:

- rotation (Figs. 6,7) of the first plane 210 and the second plane 220 with respect to the central plane 240, about a transverse folding line 221 which connects the second plane 220 to the third plane 230 adjacent thereto, until they are arranged in a plane substantially parallel to the central plane 240 and so as to superimpose (Fig. 8) said first plane 210 at least partially on said central plane 240, in particular over a length x1 in the longitudinal direction X-X substantially corresponding to the length x2 of the second plane 220;
- fixing (Fig. 8) of the transverse end flap 215 connected to the first plane 210, to the central plane 240, in particular by means of gluing 215a of the respective inner surfaces.

[0066] For formation of the second housing body in a closed position, flattened in the vertical direction Z-Z on

the central plane, a similar procedure is used:

- rotation (Figs. 6,7) of the fifth plane 260 and the sixth plane 270 with respect to the central plane 240, about a transverse folding line 251 which connects the fourth plane 250 to the fifth plane 260 adjacent thereto, until they are arranged in a plane substantially parallel to the central plane 240 and so as to superimpose (Fig. 8) said sixth plane 270 at least partially on said central plane 240, in particular over a length in the longitudinal direction X-X substantially corresponding to the length of the fifth plane 260;
- fixing (Fig. 8) of the transverse end flap 275 connected to the sixth plane 270, to the central plane 240, in particular by means of gluing 275a of the respective inner surfaces.

[0067] Advantageously, this process may be implemented on automatic production lines.

[0068] In particular, after preparing the punched blank with gluing strips 275a, 215a which, as mentioned, may be obtained using techniques per se conventional, it is sufficient to then use a standard so-called "folding and gluing" machine, in which for example a system of mechanical arms folds the punched blank and causes it to be glued at the gluing points.

[0069] It is therefore clear how with a process according to the present invention it is possible to form a protective packaging in a flattened, substantially flat configuration suitable for transportation to the end user, the packaging being however already provided with one or more housing bodies 1201, for housing fragile objects, which are formed and arranged in the closed position, flattened onto the central plane, and which may be converted by the end user into the open position, unfolded into the form of a tube with a rectangular cross-section, by means of a simple rhomboid-forming operation which does not require particular attention or skills, being very quick to perform and designed to avoid assembly errors.

[0070] With reference to Figs. 9a-9f, an example of a method for the protective packaging of one or more bottles 1 by means of the packaging 1200 according to the invention may comprise the following steps:

-) an opening movement of the first housing body 1201 from the flattened closed position into the open position, unfolded in the vertical direction Z-Z, so as to shape the first housing body into a tubular form having a rectangular cross-section, with at least one plane 210 provided with insertion openings 213 arranged perpendicular to the central plane 240 (Fig. 9a);
- insertion (Figs. 9b-9c) of one or more bottles 1 into the housing body 1201 through respective one or more openings 1213;
-) an opening movement (Figs. 9d-9f) of the second housing body 1201 from the flattened closed position (Fig. 9c) into the open position, unfolded in the ver-

tical direction Z-Z, so as to shape the second housing body into a tubular form having a rectangular cross-section, with at least one plane 1270 provided with insertion openings 1273 arranged perpendicular to the central plane 240 (Fig. 9f);

- insertion (Figs. 9d-9f) of the one or more bottles 1 into the second housing body through respective one or more openings 1273.

[0071] In the case of openings 1213 provided with closing flaps 213a it is also envisaged performing a step of opening the flaps 213a, by means of rotation about the respective folding line 213c, from the position for at least partially closing the respective opening 231a into the rotated open position (Figs 9c, 9e, 9f) in which they form protective flanges 1213a extending from the plane 1210 of the openings 1213 towards the inside of the housing body 1201, in particular so as to protect better the bottles 1 laterally.

[0072] In fact, in the packaging with multiple openings, a first lateral protection is provided by the material of the respective plane situated between the holes in which the products are arranged. However, if following an impact/falling movement the said material is torn, the flanges act as a further separation layer which prevents direct contact between two fragile products where even a scratch may constitute a defect.

[0073] The packaging is designed to contain bottles and objects with variable dimensions and weight. As a result the dimensions of the material between the openings, in the case of the packaging of the present invention, may be further reduced so as to allow larger-size fragile objects to be housed (for example 1.5 litre bottles). Moreover, as explained above, the protective flanges may be opened towards the inside of the housing body with different angles of rotation, allowing also objects with diametral dimensions smaller than those of the corresponding opening to be stably housed.

[0074] This step of opening the flaps 213a may be advantageously performed at the same time as insertion of the bottle 1, by simply forcing the flaps 213a into the open position by means of the bottle 1 itself.

[0075] The steps involving the opening movement of the second housing body and insertion of the one or more bottles inside the first housing body may also be performed in the reverse order, for example in the case where the first or second housing bodies have through-openings in both faces 210, 230; 240, 260 of the tubular body perpendicular to the central plane 240.

[0076] Figure 10 shows a first example of embodiment of a container assembly 1200 according to the present invention, comprising an external container 1000 and a protective packaging 1200 inserted inside the container 1000.

[0077] The container 1000 has a container body 1010 which defines an internal housing volume with dimensions suitable for stably containing inside it the protective packaging 1200 in the configuration with housing bodies

1210,1202 open; the container body 1010 may for example be a box generally with a rectangular base having the longitudinal-transverse bottom surface parallel to the central plane 240, vertical-longitudinal walls 1012 situated opposite each other in the transverse direction Y-Y and vertical-transverse walls 1011 parallel to the planes 1220, 260 perpendicular to the central plane 240; the vertical-transverse planes 1220,1260 are in particular designed to abut by means of their projecting tongues 1221,1231 (if present) against said vertical-transverse walls 1011 of the container so as to keep the packaging in position inside the container.

[0078] In the embodiment shown, the container 1000 is configured to receive the packaging in a position laid flat with the central plane 1240 resting on the bottom plane of the container 1000, the vertical walls 1011, 1012 having preferably a vertical height substantially corresponding to the vertical height of the unfolded housing bodies 1201, 1202.

[0079] A top opening of the container 1000 may be closed by means of an inner lid 1020 and an outer lid 1030, designed to rotate about a respective folding line 1021, 1031 with respect to a respective wall of said vertical-transverse walls 1012 between an open position disengaged from the top opening of the container and a closed position for at least partially closing the top opening. Advantageously, the inner lid 1020 may comprise a pair of flaps 1022, each designed to rotate about a respective longitudinal folding line 1022a between a position coplanar with the lid 1020 and a position perpendicular to the lid, so as to arrange the flaps in vertical-longitudinal planes situated between two adjacent bottles 1 when the lid 1020 is rotated into the closing position (Fig. 10b). For this purpose, a distance y1 in the transverse direction Y-Y between the two flaps 1022 of the lids 1020 may be designed with suitable dimensions by the person skilled in the art, for example less than an interaxial distance between the openings 1213 and greater than a diameter of the said openings.

[0080] As can be seen, the folding lines 1022a which allow the formation of the protective flaps 1022 may be formed on the lid 1020:

-) at a suitable distance x3 in the longitudinal direction X-X from the associated vertical-transverse wall 1011 of the container, generally corresponding to an extension in the longitudinal direction of the housing body 1201 resting thereon (equal to the distance x2 plus the longitudinal height of the feet 221,231),
-) at a suitable distance y2 in the transverse direction from the vertical-longitudinal walls 1012, such as to allow the insertion of the flaps 1022 between adjacent fragile objects housed in the housing bodies of the packaging.

[0081] Figure 11 shows a pair of packaging units 1200 joined together along the outer faces of the respective central planes 1240 for the packaging of six bottles 1 in-

side a container 2000, 3000 so as to form a container assembly 2200, 3200. Preferred embodiments of such a container assembly are shown in Figures 12 and 13.

[0082] As regards the container assembly 2200 shown in Fig. 12, the pair of combined packaging units 1200 is inserted in the longitudinal direction X-X inside the internal housing volume of the container 2000 through the top opening thereof, which may be closed by means of inner closing lids 2020 and outer closing lids 2030. Advantageously, the inner closing lids 2020 have transverse flaps 2022 designed to be arranged against the projecting support feet 1231a,1231b so as to obtain better stability of the packaging 1200 inside the closed container 2000.

[0083] As regards the container assembly 3200 shown in Fig. 13, the pair of combined packaging units 1200 is inserted in the vertical direction Z-Z inside the internal housing volume of the container 3000 through the top opening thereof, which may be closed by means of inner closing lids 3020 and outer closing lids 3030, rotatable about respective longitudinal and transverse folding lines.

[0084] Advantageously, a transverse-longitudinal base 3040 of the container 3000 parallel during use to the central plane 1240 may comprise vertical-longitudinal partitions 3041, each extending towards the inside of the housing inside the vertical direction and over a suitable length in the longitudinal direction X-X so as to be arranged between two adjacent bottles 1 in the transverse direction Y-Y when the container assembly is assembled together the packaging units 1200 inserted inside the container 3000. Advantageously, the inner closing lids 3020 may have vertical-longitudinal flaps 3022, each extending in the vertical direction and over a suitable length in the longitudinal direction X-X so as to be arranged between two adjacent bottles 1 in the transverse direction Y-Y, when the container assembly is assembled together with the packaging 1200 inserted inside the container 3000 and the insertion opening is closed by the inner closing flaps 3020. The container assembly 3020, as well as the assembly in Fig. 10, allow the side of the product 1 to be left visible, this solution being particularly liked by users.

[0085] With reference to Figure 14, a third example of embodiment of a punched blank 300 according to the present invention is configured to form a protective packaging 1300 designed to move between a flattened configuration (Fig. 18) and an unfolded configuration (Figure 19b) and comprises a substantially rectangular central plane 340 with longitudinal and transverse sides.

[0086] A first transverse side of the central plane 340 is connected by means of a transverse folding line 331 to a first set of planes 330, 320, 310 adjacent to each other in the longitudinal direction X-X and connected by transverse folding lines 321, 311 which allow the relative rotation thereof and are designed to form with the central plane 340 a first housing body 1301 of the packaging 1300 which is movable between a closed position, flattened onto the central plane (Fig. 18) and an open posi-

tion (Fig. 19b), in which it assumes a tubular form, with rectangular cross-section, unfolded in the vertical direction Z-Z with respect to the central plane I340.

[0087] In a similar manner to the punched blank of Fig. 4, the first set of planes includes a first outer plane 310 in the longitudinal direction, a second plane 320 adjacent to the first plane 310 and connected thereto by means of a folding line 311 for relative rotation of the two planes, and a third plane 330, an outer transverse side of which is connected to the second plane 320 along the folding line 321 and the inner transverse side of which is connected, by means of the folding line 331, to the central plane 340.

[0088] In this embodiment also, the first plane 310 has a transverse end flap 315 joined by means of the transverse folding line 312 to the first plane 310 and provided with means for performing gluing to the inner face of the central plane 340, for formation of the first housing body I301.

[0089] As described above, the first plane 1310 and the third plane I330 directly joined to the central plane 340 by means of the transverse folding line 331 and the fixing flap 315, respectively, are designed to be arranged perpendicularly with respect to the said central plane I340 and therefore to a longitudinal axis of each bottle 1, when the housing body 1301 is open in the unfolded condition where it has a tubular form.

[0090] In the preferred embodiment shown in Fig. 14, said first and third planes 310,330 are both provided with a series of through-openings 313,333 for inserting the fragile objects to be packaged. The openings 313,333 of each of said planes 310,330 are arranged aligned in the transverse direction Y-Y and each aligned in the longitudinal direction X-X with a respective opening 333,313 of the other plane 330,310.

[0091] Preferably, the openings 333 of the third plane 330 are closed by closing flaps 313a similar to the flaps 213a of the punched blank according to Fig. 4 and therefore are not described in greater detail.

[0092] The central plane 340 has, connected thereto, a second set of adjacent planes 350,360 which are designed to form a second housing body I302 of the packaging I300. Said planes 350,360 of the second forming set are connected to the central plane 340 by means of a transverse folding line 341 arranged on the opposite side in the longitudinal direction X-X to the transverse folding line 331 which connects the central plane 340 to the first set of planes 310,320,330.

[0093] As can be seen, in the preferred embodiment shown, the second set of forming planes comprises:

- a fourth plane 350 adjacent to the central plane 340 to which it is directly connected by means of the folding line 341 about which it may rotate with respect to the said central plane 340;
- a fifth plane 360, connected by means of a transverse folding line 351 to the fourth plane 350, so as to be able to rotate relative thereto.

[0094] As can be seen, the fifth plane 360 is arranged in an end position in the longitudinal direction X-X and is provided with a gluing strip 365a. The strip 365a is designed to fix the fifth plane 360 with its inner surface onto the outer surface of the second plane 320 already folded onto the central plane, so as to form a second housing body I302 which in the unfolded position will have a tubular form with a rectangular cross-section arranged directly above in the longitudinal direction X-X the first housing body 1301 and comprising vertical-transverse sides 1310,1350 perpendicular to the central plane 340 and respectively formed by the first plane 310 (which is common to the two housing bodies) and by the fourth plane 350 and longitudinal-transverse sides I360 formed by the central plane 340 and by the fifth plane 360 (Fig. 19b).

[0095] As shown in Fig. 19b, in this embodiment, the third plane 330 is designed to form an outer plane I330 for inserting objects 1 to be packaged inside the first housing body 1301 open in the position unfolded into a tubular form, while the fourth plane 350 is designed to form an outer plane I350 - opposite in the longitudinal direction X-X to the insertion plane I330 - for supporting the packaging I300 and, for this purpose, will have preferably feet I341a,I351a projecting in the longitudinal direction X-X from the said plane 350 when the packaging is open with the second housing body I302 in the unfolded position.

[0096] For this purpose, the folding lines 341, 351 which connect the fifth plane 350 to the central plane 340 and to the fifth end plane 360, respectively, may be formed with a plurality of discontinuous zones 341a,351a where there are cut-out parts extending towards the inside of the fourth plane 350, so as to remain coplanar with the respective central plane 340 or to the fifth plane 360 when the fourth plane 350 is rotated with respect thereto about the folding lines in order to unfold the second housing body I302.

[0097] According to a particularly advantageous preferred aspect, the cut-out regions 341a,351a designed to form the support feet I341a,I351a have a free transverse edge, intended to form the free supporting edge of the feet I341a,I351a of the packaging I300, formed with an undulating profile 341b,351b.

[0098] Surprisingly it has been noted that the undulating structure of the support feet I341,1351 allows the absorption, during the transportation of fragile objects, of the force of an impact progressively, i.e. in a gradual and sequential manner, thus reducing the effect thereof on the said objects, while ensuring better and more reliable protection of the packaging.

[0099] The central plane 340 is preferably provided with elongated through-slots 343,344 in the longitudinal direction, arranged in at least one transverse row, preferably at least two rows of slots alternating with each other in a staggered position at at least two different "heights" in the longitudinal direction X-X.

[0100] Similar slots 363,364 are preferably formed in

the fifth plane 360.

[0101] During experimental tests, it was surprisingly noted that the slots help absorb the impact of the knock in a different way. Moreover, the air present inside the housing body may exit from the slots 343, 344 more easily, facilitating the insertion of the packaging inside an external container for formation of a container assembly. The slots also facilitate the extraction of the products, avoiding the so-called vacuum effect during extraction of the packaging.

[0102] The support feet with an undulating profile and/or the slots in the central plane may be applied to all the embodiments of punched blanks and protective packaging according to the present invention.

[0103] With reference to Figs. 15-18, an example of a process for forming a protective packaging I300 from the punched blank 300 shown in Fig. 14 involves the following steps:

-) arranging the punched blank 300 extended in a longitudinal-transverse plane (Fig. 14);
-) forming a first housing body 1301 in a closed position, flattened in the vertical direction Z-Z on the central plane 340, which in a manner similar to that described above may be performed in particular by means of:

- rotation (Figs. 15, 16) of the first plane 310 and the second plane 320 with respect to the central plane 340 and the third plane 330, about a transverse folding line 321 which connects the second plane 320 to the third plane 330 adjacent thereto, until they are arranged in a plane substantially parallel to the central plane 340 and so as to superimpose said first plane 310 at least partially on said central plane 340;
- fixing (Fig. 16) the transverse end flap 315 to the central plane 340, in particular by means of gluing 315a of the respective inner surfaces.

[0104] For formation of the second housing body I302 in a closed position, flattened in the vertical direction Z-Z, instead the following steps are performed:

- rotation (Fig. 17) of the fourth plane 350 and the fifth plane 360 with respect to the central plane 340, about a transverse folding line 341 which connects the fourth plane 350 to the central plane, until it is arranged in a plane substantially parallel to the central plane 340 and so as to superimpose said fifth plane 360 at least partially on the outer surface of the second plane 320, in particular over a longitudinal length X-X such as to include the fixing strip 365a of the fifth plane 360;
- fixing (Fig. 18) the fifth plane 360 to the second plane 320, in particular by means of gluing 365a of the respective inner and outer surfaces along said transverse fixing strip 365a.

[0105] Advantageously, this mode of implementation of the process may also be performed on automatic production lines, by means of simple "folding and gluing" operations.

[0106] As can be seen in Fig. 18, the protective packaging I300, in its flattened configuration with both the housing bodies closed, has extremely compact dimensions both in the longitudinal direction X-X and in the vertical direction Z-Z of thickness.

[0107] Once the protective packaging 1300 has been formed in its pre-glued flattened configuration shown in Fig. 18, it is possible to use it for packaging products by opening it into the unfolded configuration (Fig. 19) by means of a simple rhomboid-forming operation which will position the first plane 1310, the third plane 1330 and the fourth plane 1350 in a position perpendicular to the central plane 1340, and the second plane 1320 and fifth plane 1350, glued together, in a position substantially parallel to the central plane 1340.

[0108] In the unfolded configuration, the packaging I300 comprises a first housing body 1301 in the form of a tube with a rectangular cross-section having vertical-transverse (respectively insertion and inner) sides I330, 1310 formed by the third plane 330 and by the first plane 310, and a second housing body I302 in the form of a tube with a rectangular cross-section arranged directly above, in the longitudinal direction X-X, the first housing body 1301 and comprising vertical-transverse sides 1310, 1350, perpendicular to the central plane 1340, respectively formed by the first plane 310 which is common to the two housing bodies and by the fourth plane 350, and longitudinal-transverse sides I360 formed by the central plane 340 and by the fifth plane 360.

[0109] With reference to Figs. 20, the outer plane I330 allows (Fig. 20b) the insertion of the objects 1 to be packaged inside the first housing body 1301 through its openings I333.

[0110] A bottle 1, once inserted through the insertion plane I330, may enter into the second housing body I302 through the openings 1313 of the inner side 1310 and rest against the inner face of the outer plane I350.

[0111] As described above, the outer plane I350 is provided with feet I341a, I351a for supporting the packaging I300, which project in the longitudinal direction X-X from the said plane I350.

[0112] A particular advantage of this embodiment of the punched blank is that it allows the formation of a packaging with two tubular housing bodies using only six articulated planes and an end gluing strip, resulting in a significant saving in the amount of material used.

[0113] With reference to Figure 21a, a fourth example of embodiment of a punched blank 300b according to the present invention is configured to form a protective packaging I300b (Figs. 21g, 21f), similar to the packaging I300 formed from the punched blank 300 shown in Fig. 14, designed to move between a flattened configuration (Fig. 21e) and an unfolded configuration (Figure 21g) and comprises a substantially rectangular central plane 34

with longitudinal and transverse sides.

[0114] For this embodiment of the punched blank 300b and packaging I300b, corresponding elements maintain the alphanumerical references, any variations in embodiment being indicated by the suffix "b".

[0115] A first transverse side of the central plane 340b is connected by means of a transverse folding line 331 to a first set of planes 330b, 320, 310b adjacent to each other in the longitudinal direction X-X and connected by transverse folding lines which allow the relative rotation thereof and are designed to form with the central plane 340 a first housing body I302b of the packaging I300b which is movable between a closed position, flattened onto the central plane I340 (Fig. 21e) and an open position (Fig. 21g), in which it assumes a tubular form, with rectangular cross-section, unfolded in the vertical direction Z-Z with respect to the central plane 1340.

[0116] In a similar manner to the punched blank of Fig. 14, the first set of planes includes a first outer plane 310b in the longitudinal direction, a second plane 320 adjacent to the first plane 310b and connected thereto by means of a folding line for the relative rotation of the two planes, and a third plane 330b, the inner transverse side of which is connected, by means of the folding line 331, to the central plane 340.

[0117] In this embodiment also, the first plane 310b has a transverse end flap 315 joined by means of the transverse folding line to the first plane 310b and provided with means for performing gluing to the inner face of the central plane 340 for formation of the first housing body I302b.

[0118] As described above, when the packaging has been formed the first plane I310b and the third plane I330b directly joined to the central plane 340 by means of the transverse folding line 331 and the fixing flap 315, respectively, are designed to be arranged perpendicularly with respect to the said central plane I340 and therefore to a longitudinal axis of each bottle 1, when the housing body I302b is open in the unfolded condition where it has a tubular form.

[0119] In the preferred embodiment of Fig. 20a, the first plane 310b is provided with a series of through-openings 313b for inserting the fragile objects to be packaged. The openings 313b of the first plane 310b are arranged aligned in the transverse direction Y-Y. In the example shown, the packaging is a top packaging designed to cooperate with a corresponding bottom packaging or for example with the bottom packaging shown in Figs. 20a, 20b. Therefore, the openings 313b of the first plane are configured to stably receive the neck 1a of a bottle.

[0120] The same structure can be adapted however to the formation of a bottom packaging.

[0121] The central plane 340 has, connected thereto, a second set of adjacent planes 350, 360 which are designed to form a second housing body I301b of the packaging I300. Said planes 350b, 360b of the second forming set are connected to the central plane 340 by means of a transverse folding line arranged on the opposite side,

in the longitudinal direction X-X, to the transverse folding line 331 which connects the central plane 340 to the first set 310b, 320, 330b of planes.

[0122] As can be seen, in the preferred embodiment shown, the second set of forming planes comprises a fourth plane 350b, adjacent to the central plane 340 to which it is directly connected by means of a transverse folding line about which it may rotate with respect to the said central plane 340.

[0123] The fourth plane 350b comprises a plurality of openings 353, each aligned in the longitudinal direction X-X with a respective opening 313b of the first plane 310b.

[0124] Preferably, the openings 353 of the fourth plane 350b are closed by closing flaps 353a similar to the flaps 313a of the punched blank according to Fig. 14. In the preferred example shown, a single flap 353a partially closes the outer openings in the longitudinal direction, leaving free an opening portion 353 which is external in the transverse direction and directed towards the respective longitudinal side of the fourth plane. Advantageously, this results in a further saving in the amount of material used, a protective flange between the bottle 1 and the outer side of the container not being strictly necessary.

[0125] The central opening has instead a pair of flaps similar to those described above in connection with Figures 4 and 14.

[0126] A fifth plane 360b is connected by means of a transverse folding line to the fourth plane 350b so as to be able to rotate relative thereto.

[0127] As can be seen in Figs. 21a-f, the fifth plane 360b is arranged in an end position in the longitudinal direction X-X and is provided with a gluing strip 365b. The strip 365b is designed to fix the fifth plane 360b with its inner face onto the outer face of the second plane 320b already folded onto the central plane (Fig. 21d), so as to form a second housing body I301b which in the unfolded position will have a tubular form with a rectangular cross-section arranged directly above, in the longitudinal direction X-X, the first housing body I302b (Fig. 21g).

[0128] As shown in Fig. 21g, in this embodiment, the fourth plane 350b is designed to form an outer plane I350b for inserting the objects 1 to be packaged inside the second housing body I301b open in the position unfolded into a tubular form, while the third plane 330b is designed to form an outer plane I330b - opposite in the longitudinal direction X-X to the insertion plane I350b - for supporting the packaging I300b and, for this purpose, will preferably have a first row of feet I331a projecting in the longitudinal direction X-X from the said plane when the packaging is open in the unfolded position. The first row of feet I331a is formed by a plurality of discontinuous zones 331a of the folding line 331, where there are cut-out parts extending towards the inside of the third plane 330b so as to remain coplanar with the central plane 340 when the third plane 330b is rotated in order to unfold the second housing body I301b.

[0129] A second row of feet 361a is instead formed on the outer transverse edge of the fifth plane 360b so as to be arranged projecting in the longitudinal direction from the outer plane I330b, parallel to the first row of feet I331a, when the packaging I300b is formed and open (Figs. 21g, 21h).

[0130] Figure 21h shows the formed packaging I300b, with flaps open so as to form protective flanges I353a extending from the insertion plane I350b towards the inside of the housing body I30b with the end side opposite to the folding line which is free inside the housing body I301b.

[0131] In this embodiment also, the free support edge of the feet of the packaging I300b is preferably configured with an undulating profile.

[0132] Advantageously this embodiment of the punched blank is such that it also allows the formation of a packaging with two tubular housing bodies using punched blank with only six articulated planes and an end gluing strip, resulting in a significant saving in the amount of material used.

[0133] As shown in Figs. 22a-22d, a pair of packaging units I300, I300b, i.e. bottom and top in the longitudinal direction X-X, may be joined together in the longitudinal direction X-X so as to place the respective sides I330, I330b for inserting objects against each other (Figs. 22c, 22d).

[0134] The two packaging units I300, I300b may if necessary be configured with insertion openings I333, I313, I313b having different diameters, depending on the format of the bottle 1 to be packaged; in the example shown the insertion openings formed in the first plane of the second housing body of the top packaging I300b are designed with dimensions having a small diameter for inserting the neck 1b of the bottle 1.

[0135] Both the top packaging and the bottom packaging may, as chosen by the designer, be formed in accordance with the embodiment shown in Figs. 14-19, suitably defining the dimensions of the openings for inserting the products.

[0136] The multiple packaging I3000 thus formed may be inserted inside a container, per se conventional, for forming a transportation container assembly.

[0137] It is therefore clear how the protective packaging of the present invention may be used extremely easily and rapidly, even by non-specialized users. Advantageously, the packaging may be formed by a flat punched blank in a simple and rapid manner, also on automatic lines.

[0138] Owing to the possibility of making initially the packaging in a flattened pre-glued form the overall dimensions may be reduced and storage and transportation thereof are made easier; at the same time it is possible to perform in an extremely quick and rapid manner the operations for conversion into an unfolded configuration, with one or more tubular bodies having a rectangular cross-section for housing the fragile objects, such as in particular generally tubular objects for example bot-

ties, jars, etc.

[0139] With the preferred embodiments of the packaging and/or container assemblies of the present invention it is possible to obtain an improved protection of the fragile objects, in particular against the knocks which inevitably occur during transportation.

[0140] A further advantageous aspect of the present invention is that the packaging may be closed again into the flattened position and then opened again into the unfolded position. This is advantageous in particular for easy disposal or for further use, for example in the case of the product being returned. In particular the embodiments according to Figs. 1-13, with two independent housing bodies which can be opened and closed independently and the container assemblies, in particular that shown in Fig. 12a, allow products to be extracted very easily without even having to extract the internal packaging from the external container.

[0141] Although not shown in detail, it is envisaged that each of the folding or separation lines may be realized with different forms, such as Shark lines, punched shapes, scoring, half-cuts, or a combination of alternate perforations and scoring.

[0142] Although not shown, it is also envisaged in preferred variations of embodiment of the punched blank or packaging according to the invention:

- there may be a different number of openings for inserting objects to be packaged, greater than or equal to one; and/or
- the insertion openings in different planes are axially offset in the transverse direction, for example for the packaging of asymmetrical objects which have body and neck with unaligned longitudinal axes;
- the adjacent planes of the punched blank do not have the same transverse width; and/or
- the packaging has only one housing body or the punched blank has only one set of forming planes; and/or
- the gluing strips are arranged on the central plane instead of on the outer flaps;
- the rectangular cross-section of a tubular body is preferably square; and/or
- the rectangular shape of one or more of the planes of the punched blank is preferably square.

[0143] Although described in connection with a number of embodiments and a number of preferred examples of implementation of the invention, it is understood that the scope of protection of the present patent is determined solely by the claims below.

Claims

1. Protective packaging (I100; I200; I300; I1300B) for fragile objects, in particular bottles (1) or jars, formed by a planar punched blank (100; 200; 300; 300b) ex-

tending parallel to a longitudinal lengthwise direction (X-X) of the punched blank and the packaging, a transverse widthwise direction (Y-Y) of the punched blank and the packaging and a vertical direction (Z-Z) of thickness of the punched blank and height of the packaging,

the protective packaging (I100;I200;I300;I300B) comprising at least a first housing body (I101;I201;I301;I302b) for housing one or more fragile objects, formed by a plurality of adjacent planes of the punched blank joined and articulated together by means of transverse folding lines for relative rotation and at least one transverse fixing flap (115;215;315) glued onto one of said planes (I140;I240;I340), such that the first housing body (I101;I201;I301;I302b) is movable between a closed position, in which it is flattened onto the longitudinal-transverse plane, and an open position, unfolded in the vertical direction (Z-Z), in which the housing body assumes a tubular form with a rectangular cross-section;

wherein one or more of said plurality of planes, designed to be arranged perpendicular to the longitudinal-transverse plane when the first housing body is in the open position, comprises one or more through-openings (I113;I213;I313;I333;I131b) for inserting a fragile object into the first housing body.

2. Protective packaging according to Claim 1, wherein the first housing body (I101;I201;I301) is formed by:

- at least part of a longitudinal-transverse central plane (140;240;340) with longitudinal and transverse sides,
- a first plane (110;210;310) joined by means of a transverse folding line (112;212;312) to a transverse fixing flap (115;215;315) which is glued onto the central plane;
- a third plane (130;230;330) arranged adjacent in the longitudinal direction to the central plane and joined to a first transverse side of the central plane by means of a transverse folding line (131;231;331);
- at least one second plane (120;220;320) arranged between the first plane and the third plane.

3. Protective packaging according to Claim 2, wherein:

- in the flattened, closed position of the first housing body, said first plane and at least second plane are arranged in a plane substantially parallel to the central plane and at least partly superimposed in the vertical direction (Z-Z) on at least one of the central plane and the third plane;

and/or

- in the open position, unfolded with a tubular form having a rectangular cross-section, said first plane and said third plane are arranged perpendicular to the longitudinal-transverse central plane and said at least one second plane is arranged parallel to the central plane.

4. Protective packaging according to one of Claims 2 or 3, wherein the fixing flap (115;215;315) is glued onto an inner face of the longitudinal-transverse central plane (140;240;340) in a position on the outside of the tubular body with a rectangular cross-section.

5. Protective packaging according to one of the preceding claims, further comprising a second housing body (I102;I202;I302;I301b) for housing one or more fragile objects, formed by a plurality of planes of the punched blank and movable between a closed position, flattened on the longitudinal-transverse plane, and an open position, with a tubular form having a rectangular cross-section unfolded in the vertical direction (Z-Z), arranged opposite to the first body (I101;I201;I301;I1302b) in the longitudinal direction (X-X);

one or more of said plurality of planes, designed to be arranged perpendicular to the longitudinal-transverse plane when the second housing body is in the open position, comprising one or more through-openings (I173;I273;I353) for inserting a fragile object into the second housing body.

6. Protective packaging according to the preceding claim and one of Claims 2-4, wherein the second housing body is formed at least with:

- at least part of the longitudinal-transverse central plane (140;240;340) of the punched blank;
- a fourth plane (150;250;350) adjacent to the central plane (140;240;340) to which it is directly connected by means of a transverse folding line (141;241;341) about which it may rotate with respect to the said central plane;
- a fifth plane (160;260;360) connected by means of a transverse folding line (151;251;351) to the fourth plane so as to be rotatable relative thereto.

7. Protective packaging according to the preceding claim, wherein:

- the second housing body is furthermore formed by a sixth plane (170;270) connected by means of a transverse folding line (161;261) to the fifth plane (160;260) so as to be rotatable with respect thereto and joined by means of a transverse folding line (171) to an end fixing flap (175;275) designed to rotate with respect to the

- sixth plane about the said folding line, the end flap being glued onto the central plane (140;240) for articulated fixing of the sixth plane (170;270) onto the inner face of the central plane; or
- the second housing body is furthermore formed by the first plane (310), and the fifth plane (360) is glued with its inner face onto the outer face of the second plane (320), in order to form a second housing body (I302) which in the position unfolded in a tubular form with a rectangular cross-section has vertical-transverse sides (1310;1350) perpendicular to the central plane (340) and respectively formed by the first plane (310;310b) and by the fourth plane (350;350b) and longitudinal-transverse sides (I340;I360;I340b;I306b) formed by at least part of the central plane (340) and by the fifth plane (360;360b).
8. Protective packaging according to one of the preceding claims, wherein one or more of the through-openings of the first and/or second housing body is/are at least partially closed by at least one flap (I213a;I233a;I333a), each flap (I213a;I233a;I333a) being rotatable about a respective folding line (I213c) with respect to the associated plane (1210;1310) between a closing position for at least partially closing the respective opening and an open position, rotated towards the inside of the tubular housing body (I201;I301), wherein each flap frees the respective opening and forms a respective protective flange (I213a) extending from the plane of the openings towards the inside of the housing body (I201;I301) for lateral protection of the fragile object inserted inside the opening.
 9. Protective packaging according to Claim 8, wherein one or more of said openings is closed by a respective pair of flaps (I213a;I233a;I333a) separated from each other by a separation line, wherein the separation line (I213b) is preferably a diametral line of the opening and/or is a line inclined with respect to the transverse direction (Y-Y) and the longitudinal direction (X-X).
 10. Protective packaging according to Claim 8 or 9, wherein the protective flange (I213a), once opened, extends towards the inside of the housing body with its free end side (I213b).
 11. Protective packaging according to one of the preceding claims, comprising an outer plane (I350), arranged in an end position in the longitudinal direction during use of the packaging with the at least first housing body in the open position, the packaging also comprising feet (I341a;I351a) projecting in the longitudinal direction (X-X) from the outer plane (I350) and lying in planes parallel to the central plane; wherein one or more, preferably all, of said feet (I341a;I351a) has/have a free support edge formed with an undulating profile (341b;351b).
 12. Planar punched blank (100;200;300;300b) for forming a protective packaging, extending parallel to a longitudinal lengthwise direction (X-X) of the punched blank, transverse widthwise direction (Y-Y) and vertical thickness direction (Z-Z) of the punched blank, and with an inner face and an outer face situated opposite each other in the vertical direction, the punched blank comprising:
 - a longitudinal-transverse central plane (140;240;340);
 - a first set of planes adjacent to each other and connected to the central plane by means of a transverse folding line (131;231;331) and designed to form with the central plane (140;240;340) a first housing body (I101;I201;I301;I302b) of the packaging which is movable between a closed position, flattened onto the central plane (140;240;340) and an open position in which it assumes a tubular form with a rectangular cross-section unfolded in the vertical direction (Z-Z) with respect to the central plane, said first set of planes comprising:
 - a first longitudinal-transverse plane (110;210;310;310b) arranged at a first longitudinal end of the punched blank (100;200;300;300b);
 - a third longitudinal-transverse plane (130;230;330;330b) arranged adjacent in the longitudinal direction to the central plane and joined to a first transverse side of the said central plane by means of a transverse folding line (131;231;331);
 - a second longitudinal-transverse plane (120;220;320) joined to the third plane and to the first plane by means of a respective transverse folding line; wherein a free transverse side of the first plane (110;210;310;310b) has, connected thereto by means of a transverse folding line (112;312), an end flap (115;215;315), the inner face of which is designed to be fixed by means of a gluing strip (115a;215a;315a) to the inner face of the central plane, in order to fix the first plane to the central plane thereby forming said first housing body;
- at least one of the first and third planes further comprising one or more openings (113;213;3313;333;313b) for inserting a fragile object.
13. Punched blank according to the preceding claim, fur-

ther comprising, for the formation of a second housing body (I102;I202;I302) movable between a flattened closed position and an open position in which it assumes a tubular form with a rectangular cross-section unfolded in the vertical direction (Z-Z) with respect to the central plane (140;240;340):

- a fourth longitudinal-transverse plane (150;250;350;350b), adjacent to the central plane (140;240;340) on the opposite side in the longitudinal direction (X-X) with respect to the third plane and connected to the central plane (140;240;340) by means of a transverse folding line (141;241;341) about which it is able to rotate with respect to the said central plane;
- a fifth plane (160;260;360;360b) connected by means of a transverse folding line (151;251;351) to the fourth plane (150;250;350;350b) so as to be able to rotate relative thereto.

14. Punched blank according to the preceding claim, further comprising:

- a sixth longitudinal-transverse plane (170;270) connected by means of a transverse folding line (161) to the fifth plane (160;260) so as to be rotatable with respect thereto;
- a transverse end flap (175;275) joined by means of a transverse folding line (171) to the sixth plane, the inner face of which is designed to be fixed by means of a gluing strip (175a;275a) to the inner face of the central plane, in order to fix the sixth plane (170;270) to the central plane (140;240) thereby forming the second housing body;

at least one of the fourth and sixth planes further comprising one or more openings (173;273) for inserting a fragile object.

15. Punched blank according to one of the preceding claims 12-14, wherein one or more of the insertion openings (213;233;333;353) is closed by means of at least one respective flap, preferably by a respective pair of flaps (213a;333a;353a) separated from each other and from the perimeter of the opening (213;333) by means of respective separation lines (213b), each flap being joined to the plane of the opening by a respective folding line which allows, once the packaging has been formed, a rotation for opening of the flap (213a;333a) towards the inside of the respective housing body (I201;I301) so as to form a protective flange (I213a;I333a).

16. Process for forming a protective packaging (I100;I200;I300;I1300B) according to one of Claims 1-11 from a punched blank (200) according to one of Claims 12-15, comprising the following steps:

-) arranging the punched blank extended in a longitudinal-transverse plane;
-) forming a first housing body (I101;I201;I301) in a closed position, flattened in the vertical direction (Z-Z) on the central plane, in particular by means of:

- rotation of the first plane (110;210;310) and the second plane (120;220;320) with respect to the central plane, about a transverse folding line (121;221;321) which connects the second plane to the third plane (130;230;330) adjacent thereto, until they are arranged in a plane substantially parallel to the central plane (140;240;340) and so as to superimpose said first plane (110;210;310) at least partially on said central plane (140;240;340);
- fixing of the transverse end flap (115;215;315) connected to the first plane (110;210;310), to the central plane, in particular by means of gluing of the respective inner faces (115a;215a;315a).

17. Process according to the preceding claim, wherein:

..) the punched blank is realized according to one of Claims 13-15 and the process further comprises the formation of a second housing body (I102;I202;I301) in a closed position, flattened in the vertical direction (Z-Z) on the central plane, by means of:

- rotation of the fifth plane (160;260) and the sixth plane (170;270) with respect to the central plane (140;240), about a transverse folding line (151;251) which connects the fourth plane (150;250) to the fifth plane (160;260) adjacent thereto, until they are arranged in a plane substantially parallel to the central plane and so as to superimpose said sixth plane (170;270) at least partially on said central plane, in particular over a longitudinal length (X-X) substantially corresponding to the length of the fifth plane (160;260);
- fixing of the transverse end flap (175;275) connected to the sixth plane (170;270), to the central plane (140;240), in particular by means of gluing (175a;275a) of the respective inner faces; or

-) the punched blank is realized according to one of Claims 11 to 13 and the process further comprises the formation of a second housing body (I302) in a closed position, flattened in the vertical direction (Z-Z) on the central plane, by means of:

-- rotation of the fourth plane (350) and the fifth plane (360) with respect to the central plane (340) about a transverse folding line (341) which connects the fourth plane (350) to the central plane, until they are arranged in a plane substantially parallel to the central plane (340) and so as to superimpose said fifth plane (360) at least partially on the outer face of the second plane (320);
-- fixing of the fifth plane (360) to the second plane (320) already folded, by means of gluing (365a) of the respective superimposed inner and outer faces, along a transverse gluing strip (365a).

18. Process according to one of Claims 16-17, **characterized in that** the steps of formation of the first and optionally the second housing body are performed on an automatic production line, in particular by means of a folding and gluing apparatus, preferably comprising a system of mechanical arms designed to fold the punched blank and perform gluing of the gluing points.
19. Method for using a protective packaging according to one of Claims 1-11, comprising moving the first housing body and optionally a second housing body from the closed position, flattened in the vertical direction (Z-Z), to the open position, unfolded in the vertical direction (Z-Z) and the insertion of at least one fragile object through one or more openings of the first housing body and optionally through one or more openings of the second housing body.

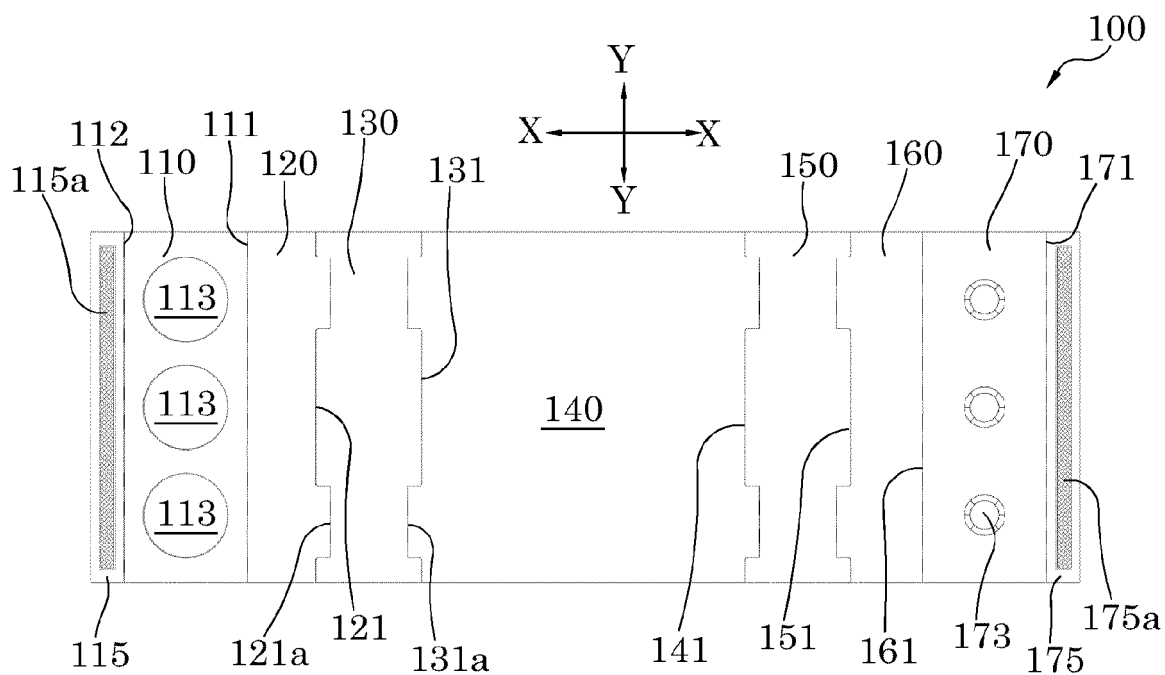


Fig.1

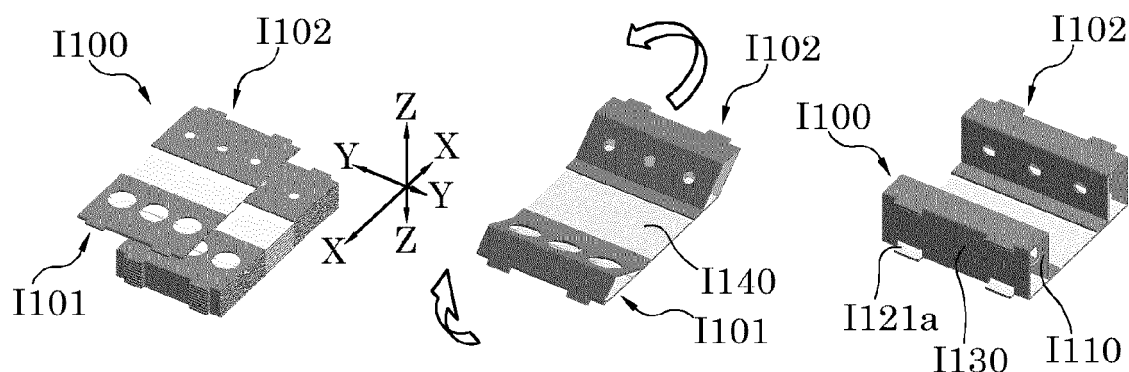


Fig.2A

Fig.2B

Fig.2C

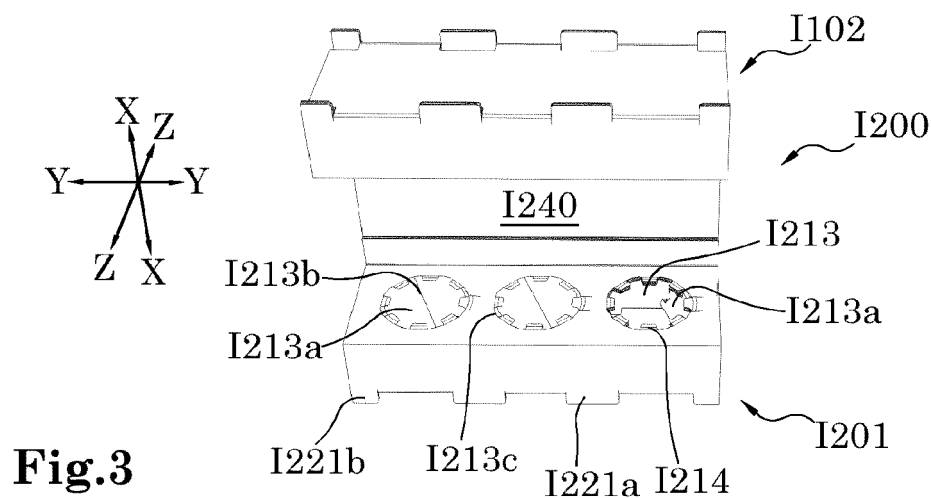


Fig.3

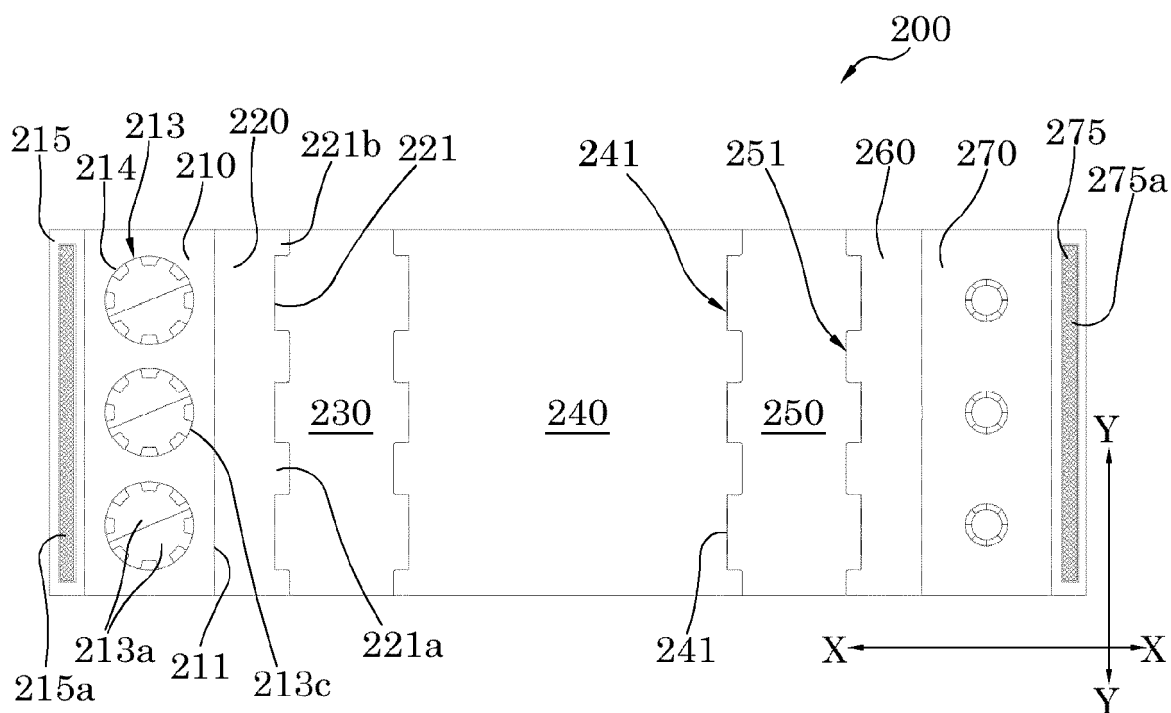


Fig. 4

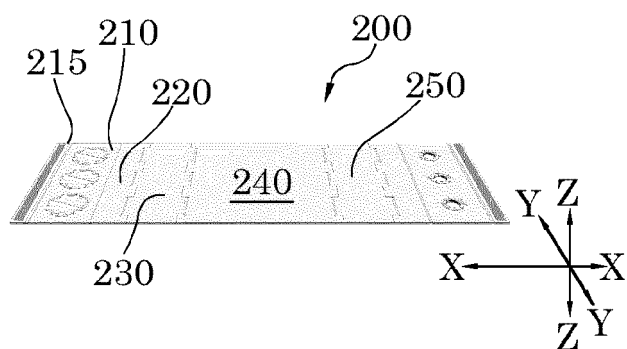


Fig. 5

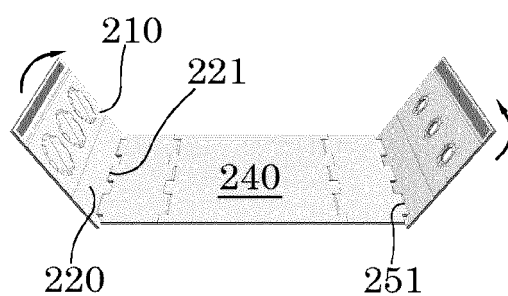


Fig. 6

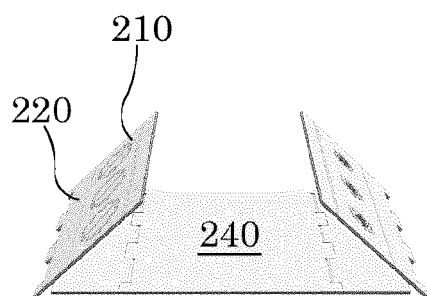


Fig. 7

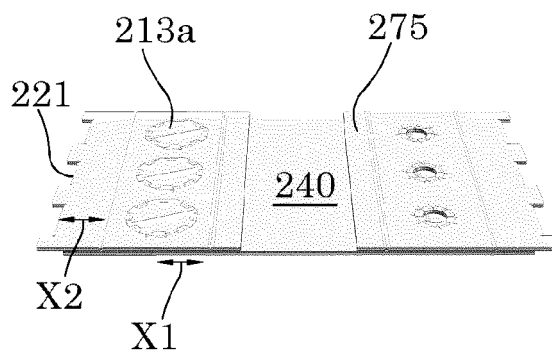


Fig. 8

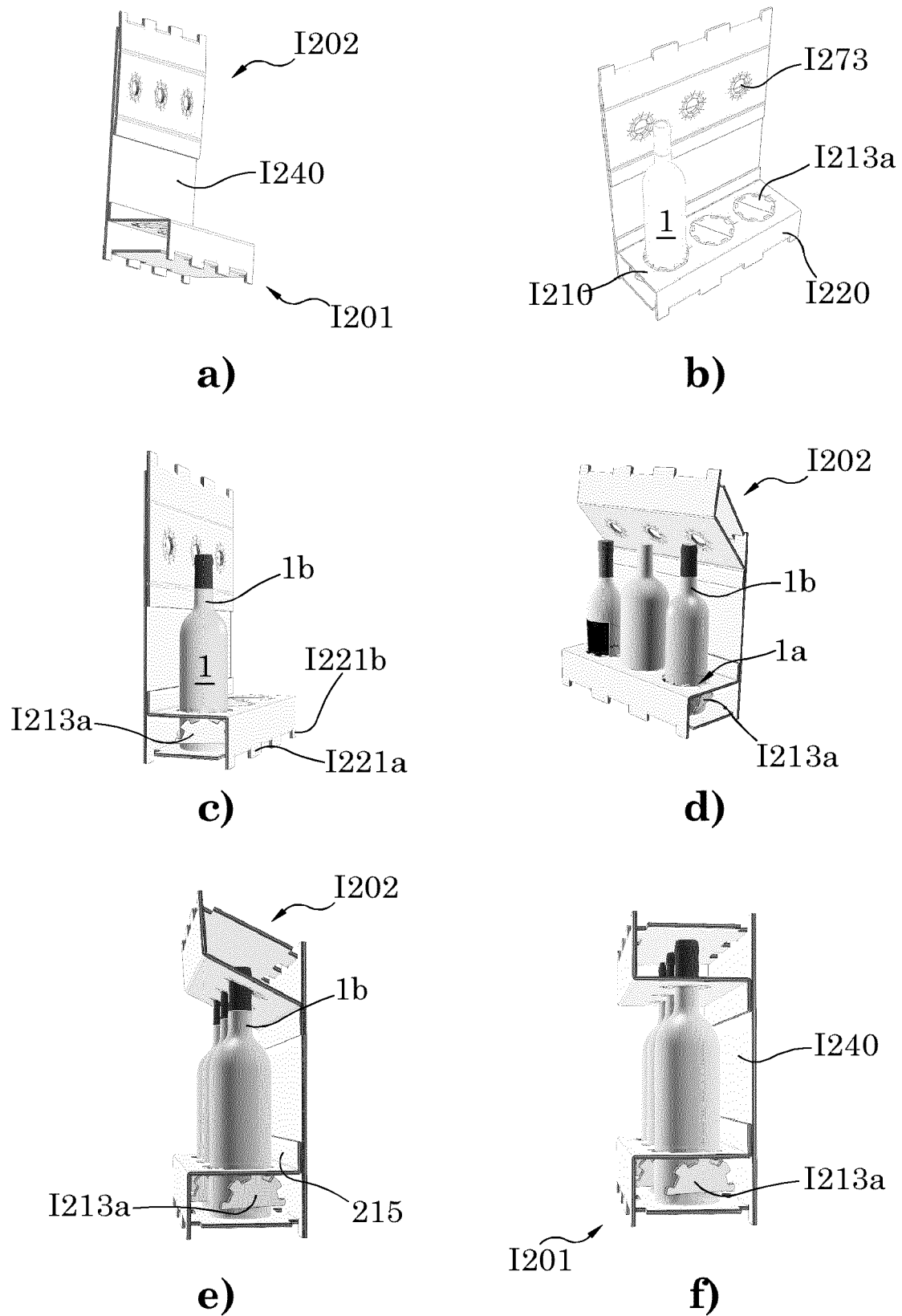


Fig.9

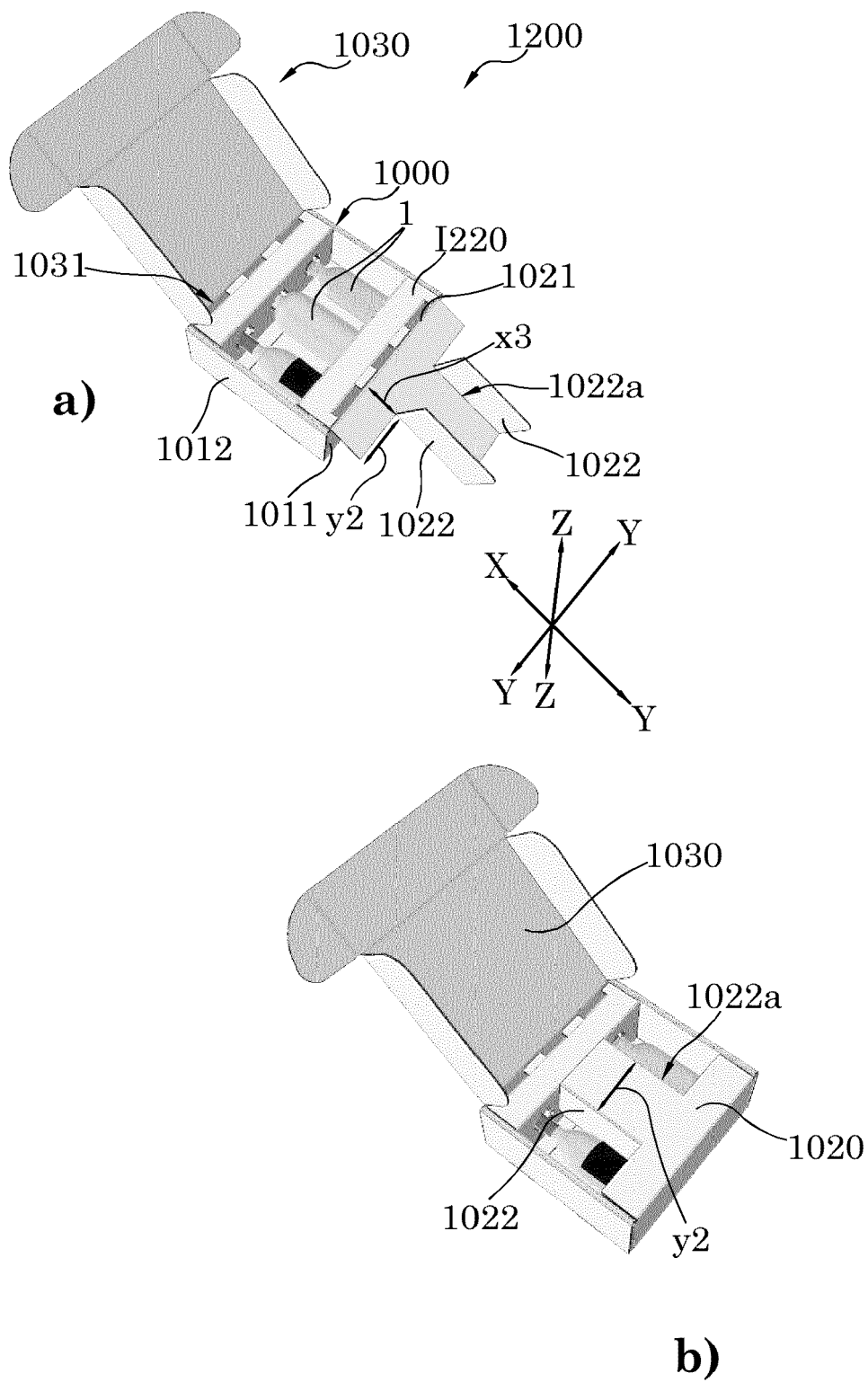


Fig.10

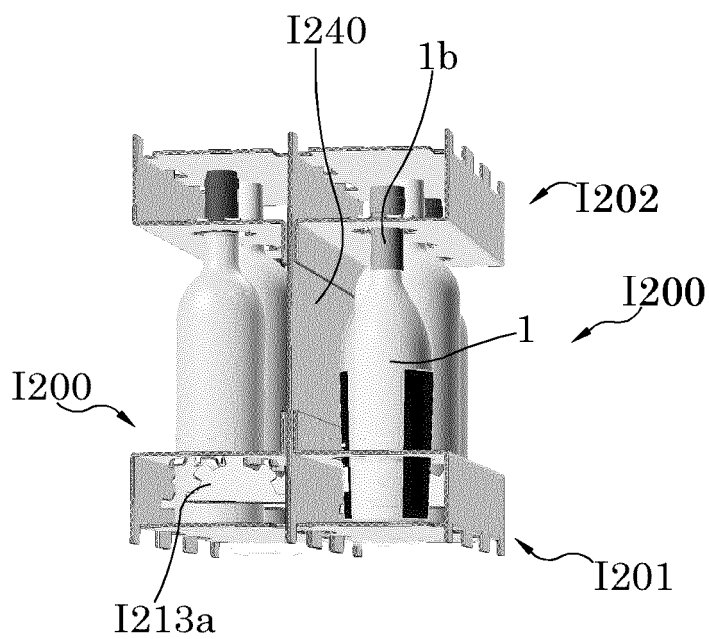


Fig.11

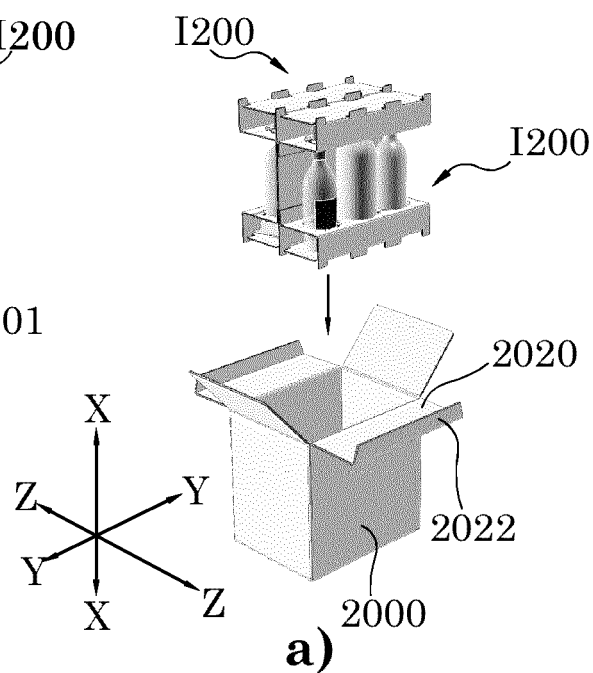
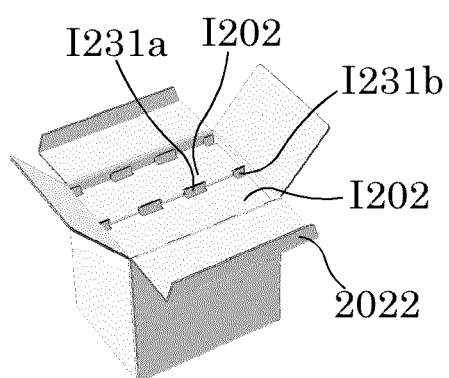
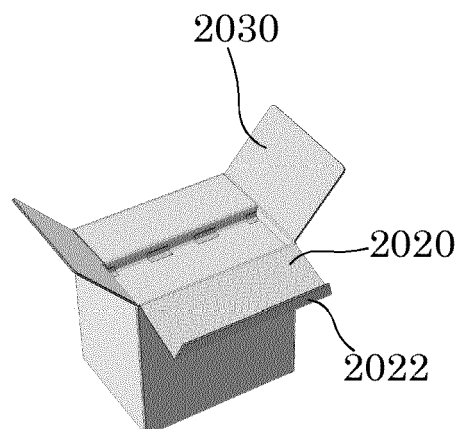


Fig.12



b)



c)

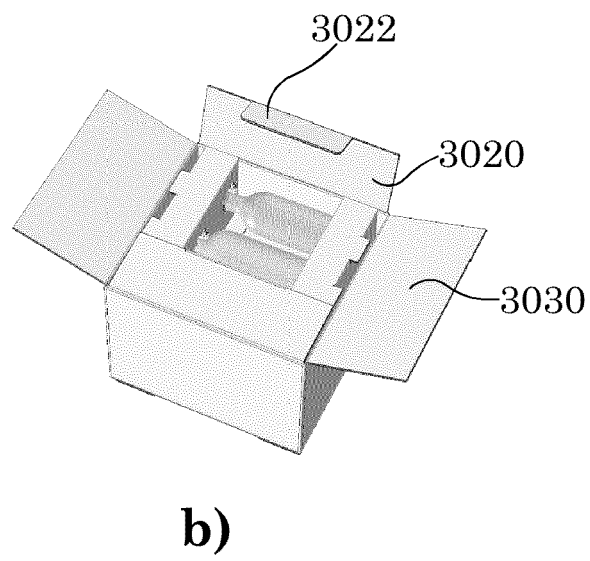
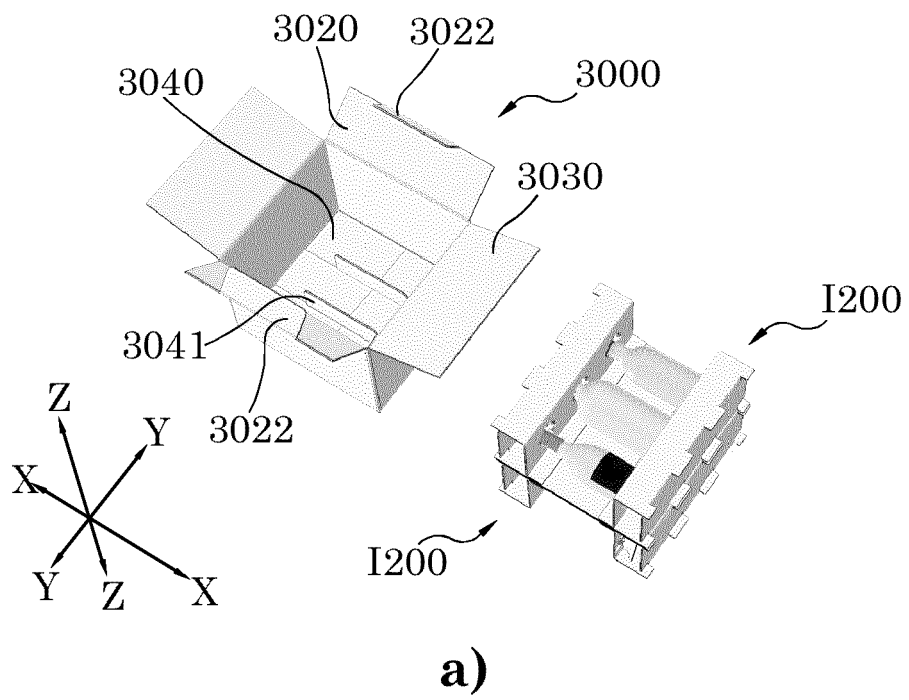


Fig.13

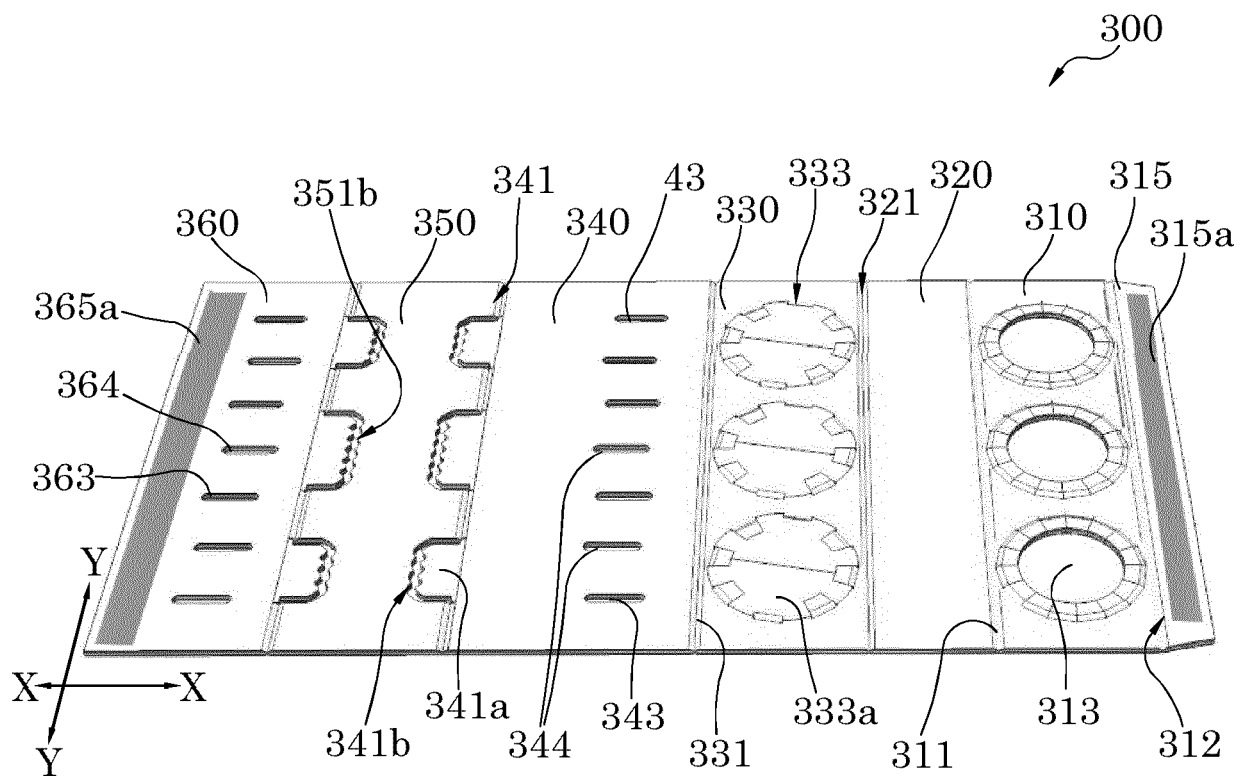


Fig.14

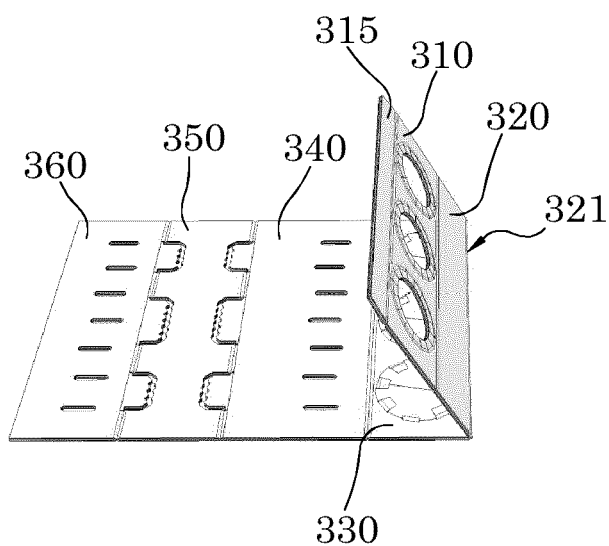


Fig.15

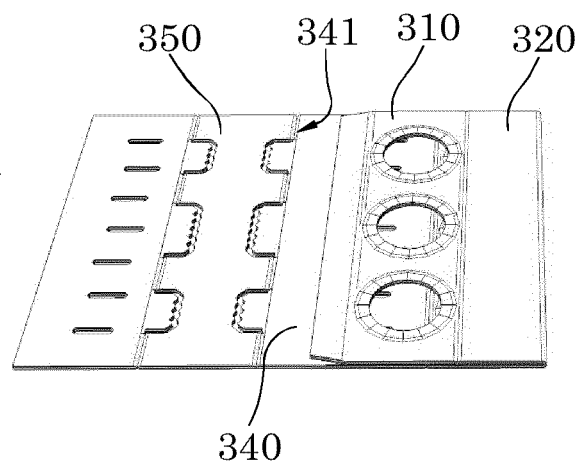


Fig.16

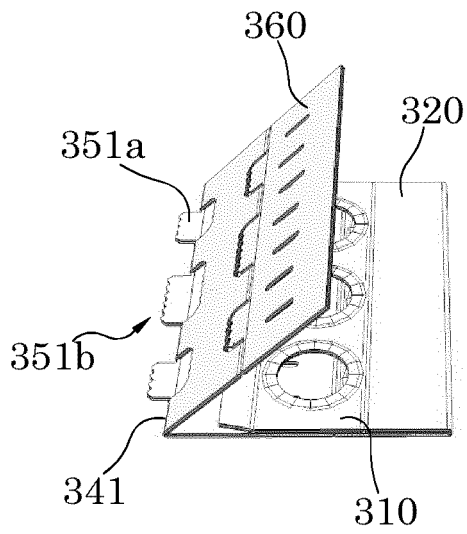


Fig.17

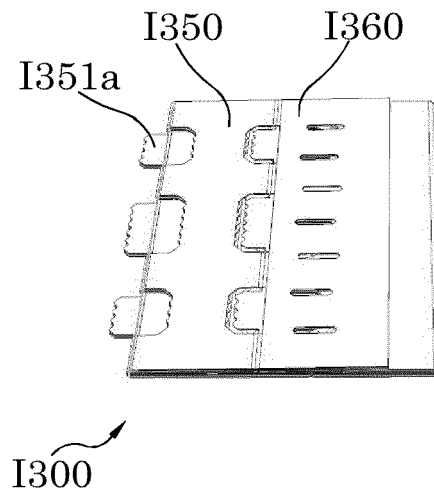


Fig.18

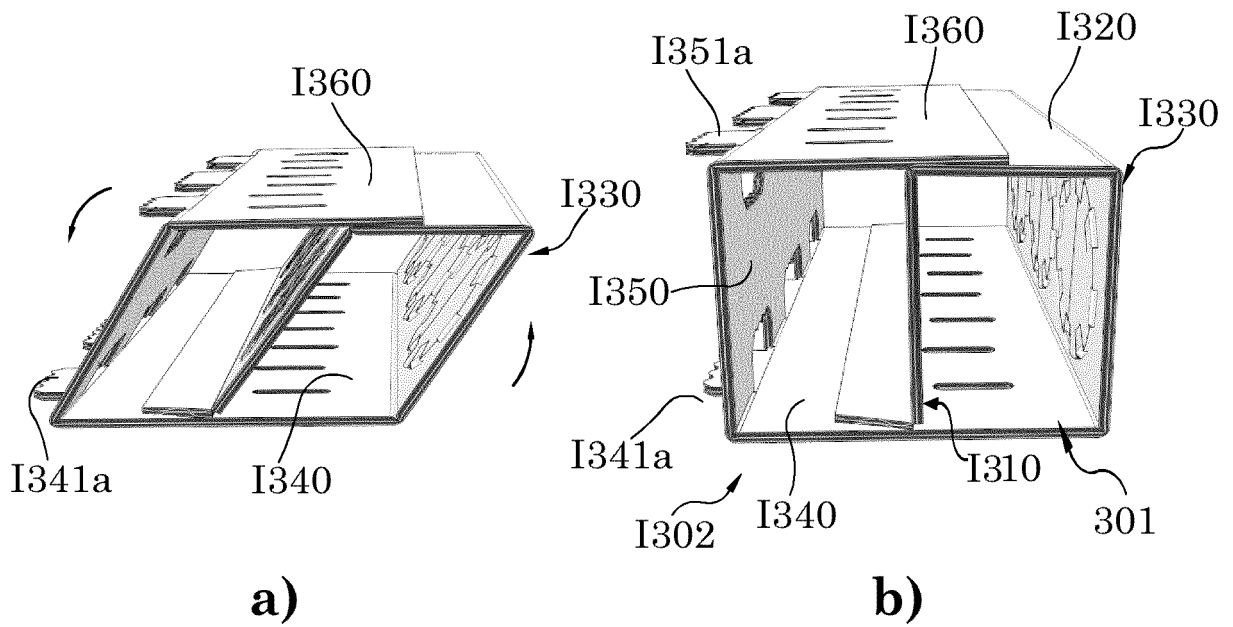
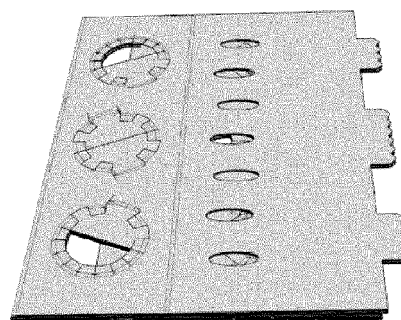
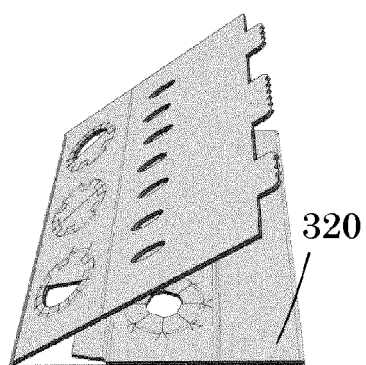
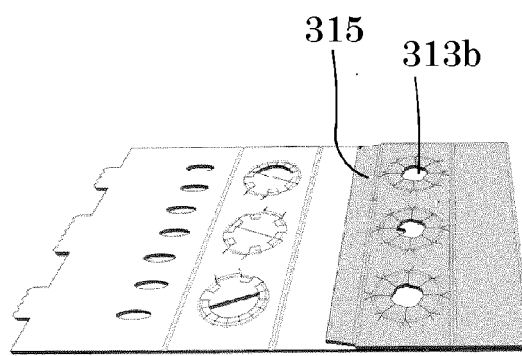
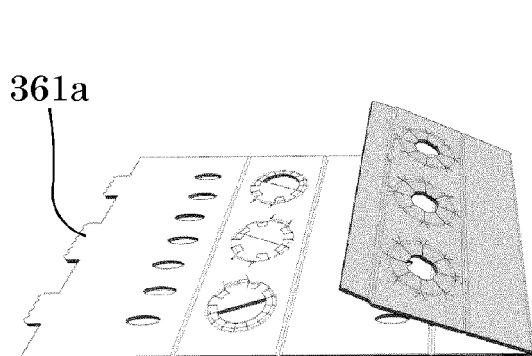
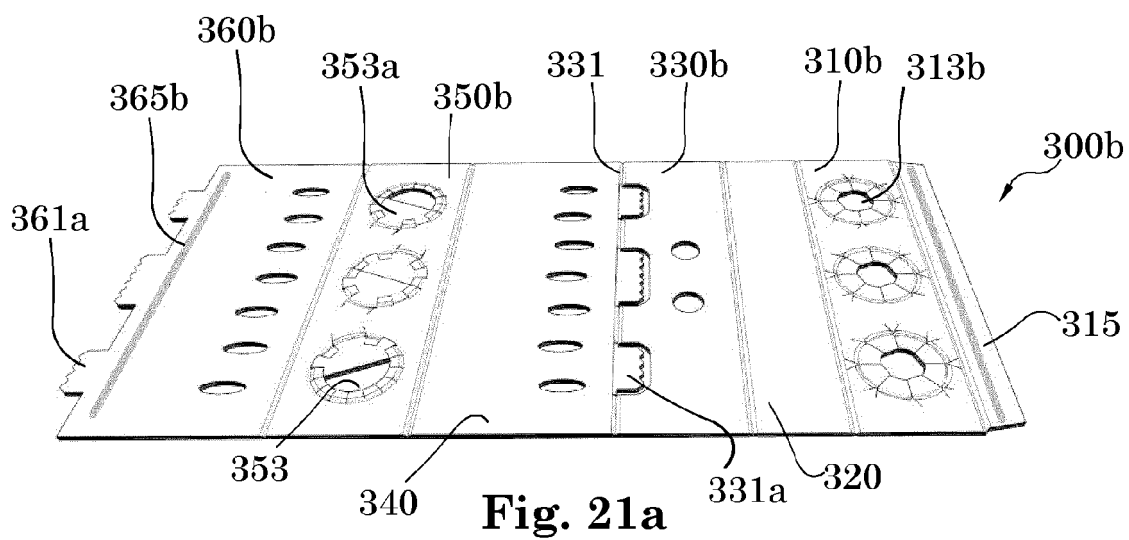


Fig.19



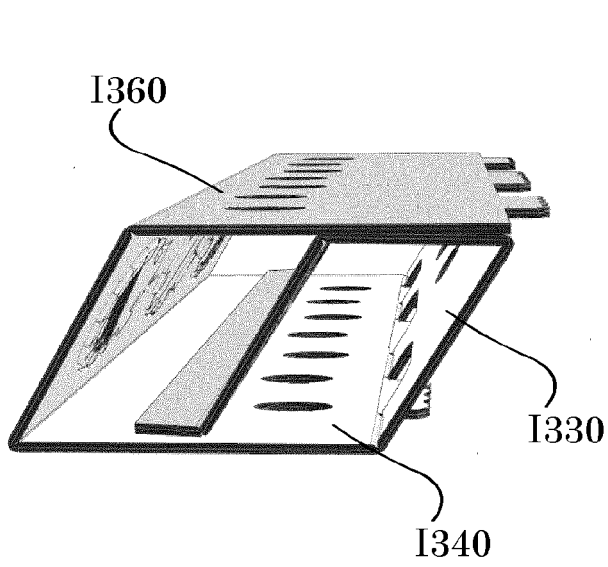


Fig. 21f

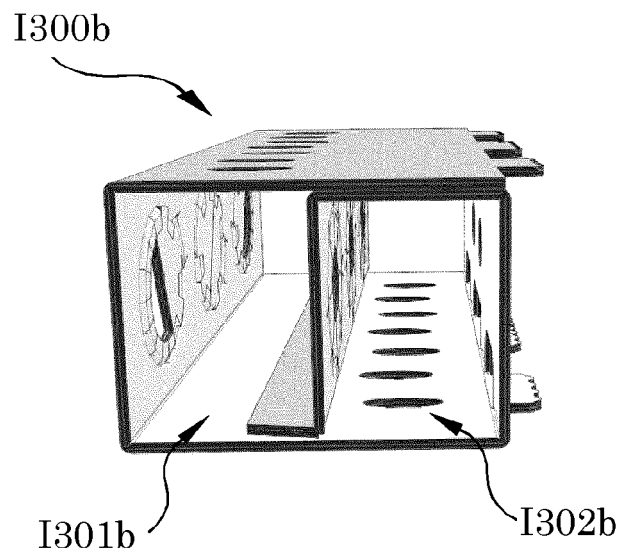


Fig. 21g

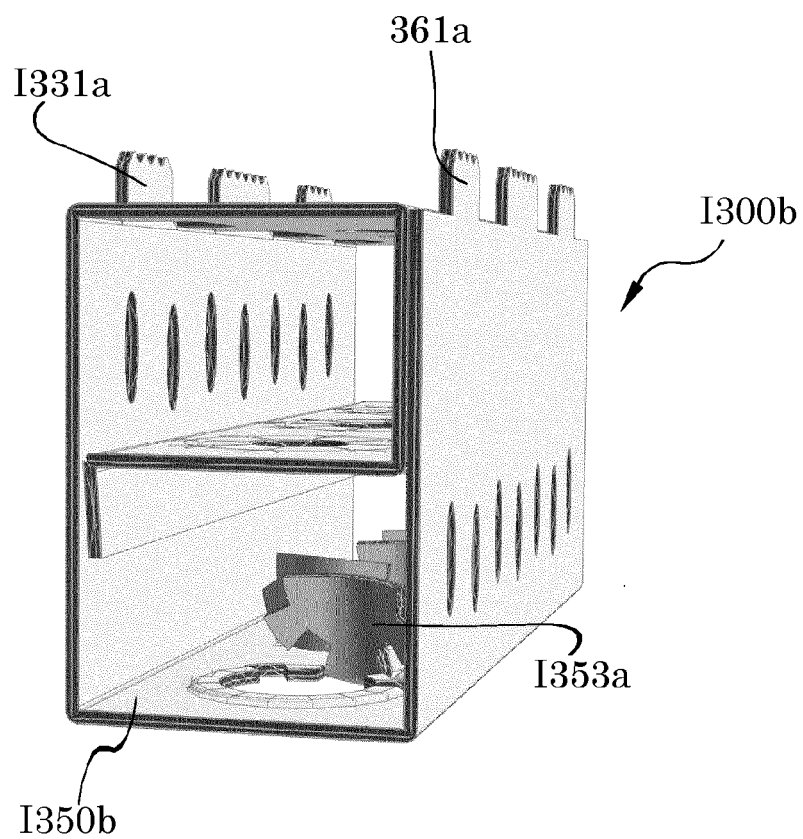


Fig. 21h

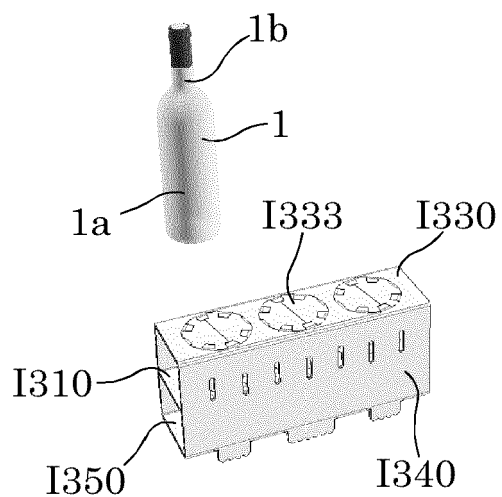


Fig. 20a

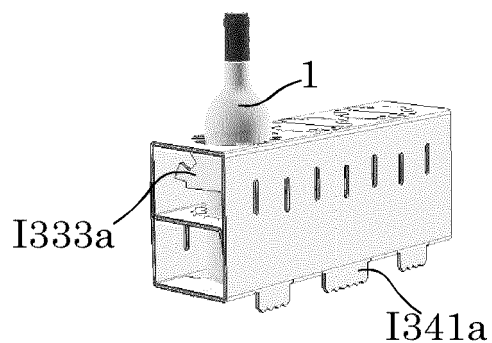


Fig. 20b

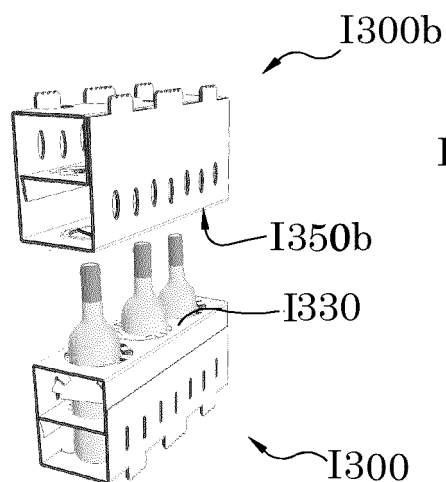


Fig. 22a

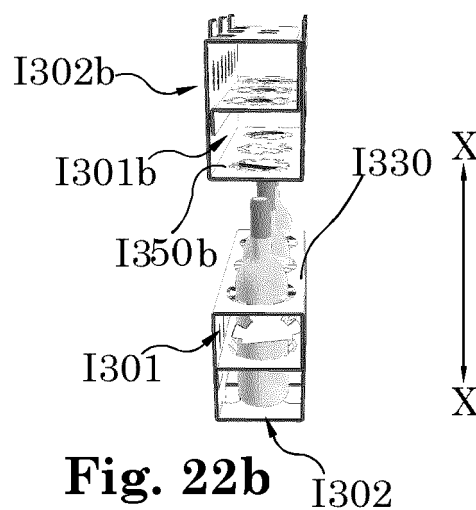


Fig. 22b

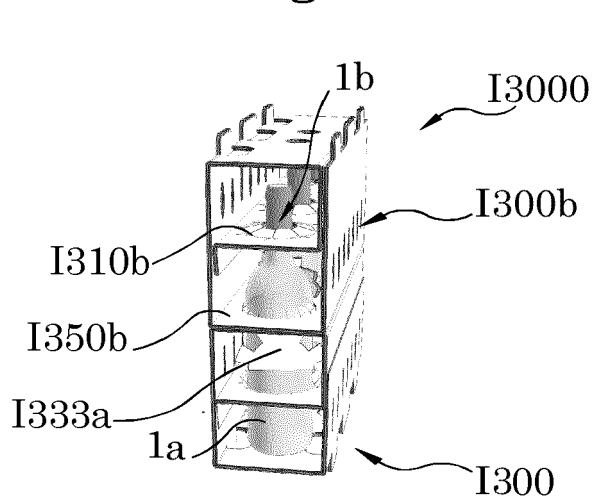


Fig. 22c

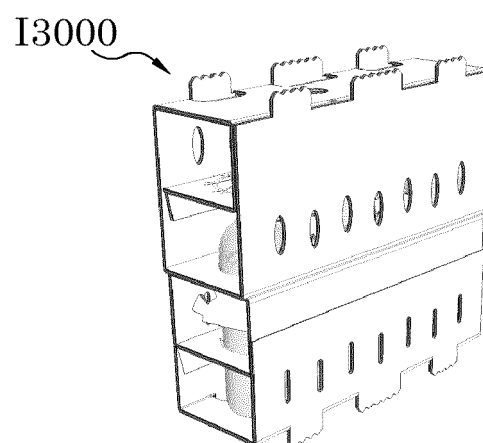


Fig. 22d



EUROPEAN SEARCH REPORT

Application Number

EP 21 19 5730

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EPO FORM 1503 03.82 (P04C01)

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	FR 3 082 189 A1 (SAS MAUBRAC [FR]) 13 December 2019 (2019-12-13)	1-7, 11-14, 16-19	INV. B65D5/50 B65D77/04
Y	* figures 3a, 7b * -----	8-10,15	
Y	US 3 181 770 A (COE MERRILL J) 4 May 1965 (1965-05-04) * the whole document * -----	8-10,15	
X	FR 1 141 058 A (LEDUC PIERRE-PASCAL-AUGUST) 26 August 1957 (1957-08-26)	1-3,5-7, 9-12, 14-19	
A	* figures 1,3 * -----	4,8,13	
X	GB 395 043 A (PEDRO MENTEN) 13 July 1933 (1933-07-13)	1-3,5-7, 11-14, 16-19	
A	* figures 4,5 * -----	4,8-10, 15	
X	FR 2 618 410 A1 (DUPUY ENG SA [FR]) 27 January 1989 (1989-01-27)	1-7, 11-14, 16-19	TECHNICAL FIELDS SEARCHED (IPC)
A	* figures 1,2 * -----	8-10,15	B65D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 21 December 2021	Examiner Wimmer, Martin
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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EP 21 19 5730

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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21-12-2021

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 3082189	A1	13-12-2019	NONE
US 3181770	A	04-05-1965	NONE
FR 1141058	A	26-08-1957	NONE
GB 395043	A	13-07-1933	NONE
FR 2618410	A1	27-01-1989	NONE

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2015049702 A [0004]
- IT 102007901585548 [0004]
- US 6702115 B1 [0004]