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(54) **METHOD FOR MAKING A TRAY COMPRISING A PLURALITY OF SEPARATABLE CONTAINERS BY THE USER**

(57) Method for making a tray (1) comprising a plurality of containers (4) separatable from each other thanks to a weakened zone (7) configured to break, in which a support (9) comprising a layer of cellulose material and configured to break along a line of weakness (10) as a result of the manual action by a user is picked up, or is made, and a sheet of thermoplastic material (13) is thermoformed on one side of the support (9) with transmittance of less than 50%, covering with covering portions (14) of the sheet of thermoplastic material (13) the lines of weakness (10). Acting on the side of the support (9) on which the sheet of thermoplastic material (13) is located, the sheet of thermoplastic material (13) is finally cut at each line of weakness (10) using a laser light beam (17).

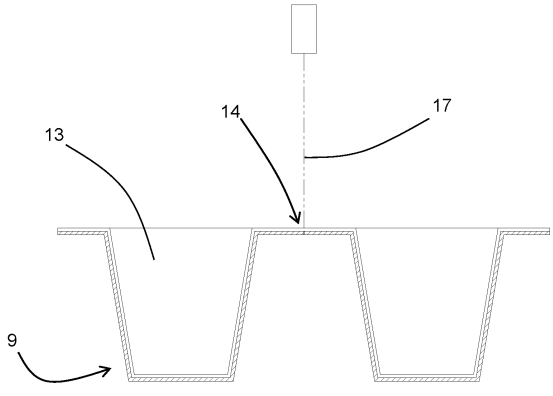

FIG. 6

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Description

[0001] The present invention has as its object a method for making a tray comprising a plurality of containers that are joined together in such a way that they can be separated by the user. In this type of trays, in which each container defines at least one containment compartment open at the top and has at least one connecting edge which is connected to a connecting edge of one of the other containers in such a way as to allow the detachment of the two containers through a mechanical action manually performed by the user. The mechanical action can be exerted through a folding of the containers around the reciprocal connection zone, or a tearing action along that connection zone. Examples of trays of this type are currently used for marketing multipack packages of puddings, creamy desserts and yoghurt.

[0002] According to the known technique, a tray of this type has a weakened zone between each pair of coupled connecting edges. The weakened zone is a zone of the tray which is configured to allow the detachment of the two connecting edges and the separation of the respective containers through the manual action by a user.

[0003] Nowadays, trays of this type are constituted of a plurality of thermoformed containers which have a flat top flange, the outer perimeter thereof defines one or more connecting edges through which the container is connected to other containers adjacent to it. Generally, the tray is made in such a way that the containers are arranged in an ordered manner, for example, aligned along perpendicular rows.

[0004] The most common typologies of this type of trays comprise an even number of containers, generally a number between two and eight.

[0005] In some cases, the weakened zones are created after having thermoformed the entire tray, through a mechanical weakening action.

[0006] In other cases, instead, the containers are individually thermoformed and are then thermo-welded to each other at the edges of the flanges; in this case, the weakened zones correspond to the thermo-welding zones.

[0007] In some cases the containers are constituted of the thermoformed thermoplastic material only.

[0008] However, some embodiments are also known in which the containers comprise a thermoformed main body constituted of a relatively thin thermoplastic material and, to increase the mechanical strength of the individual containers, a paperboard covering tightened around each container.

[0009] Conversely, there are single containers known on the market that comprise an outer skeleton and an inner coating applied to the skeleton, and that can have one or more containment compartments.

[0010] The skeleton is generally constituted of a papermaking article (that is, an article based on cellulosic material-paper, cardboard or paperboard), and is located at an outer side of the container. The skeleton comprises a plurality of material flaps which are connected to each other, generally separated by folding lines, and which, starting from an extended configuration in which they develop mainly in one plane, can be brought into a three-dimensional configuration, corresponding to the shape of the outer skeleton to be formed, by means of appropriate folds and, possibly, connections of the various flaps. Moreover, the outer skeleton can comprise a single piece or a plurality of different pieces.

[0011] The coating is applied to the outer skeleton in such a way as to define the inner side of the container and generally is of plastic material to confer impermeability and, if necessary, act as an oxygen barrier.

[0012] Generally, moreover, the coating is constituted of a substantially transparent material (with a transmittance more than 90% in the visible light band - measured according to United States ASTM D1003-21).

[0013] Nowadays, known single containers of this type can be obtained in many different ways.

[0014] A first typology, provides that the outer skeleton is constituted of one single sheet of cardboard or paperboard that extends continuously over the entire outer surface of the container. Such a sheet, before assuming the three-dimensional shape of the skeleton, has a central zone (the one destined to constitute the bottom wall of the skeleton, surrounded by a main annular portion of material, destined to constitute the lateral wall of the skeleton. During the upward folding step of the lateral wall compared with the bottom wall, wrinkled areas are created in the lateral wall itself to compensate for the reduced surface development that results from the folding. In many applications, the main annular portion is surrounded by an additional secondary annular portion suitable for constituting a perimeter flange of the container, developing outwards from the top edge of the lateral wall. Since the perimeter flange also has a smaller plan development compared with the one of the secondary annular portion, the wrinkled areas also extend onto the annular flange.

[0015] A second known typology, on the other hand, provides that the outer skeleton comprises a single sheet of material in which a main flap, and a plurality of secondary flaps that develop outwards from the main flap are present. The main flap is the one that is positioned at the bottom wall in the container, while the secondary flaps are those that are positioned at the lateral wall in the container. Depending on the embodiments, then, the secondary flaps may or may not comprise outer appendices, which, if present, are positioned at the top perimeter flange of the container.

[0016] Unlike those of the above-described first typology, skeletons of the second typology generally do not have wrinkled zones, and a certain continuity of the perimeter flange is exclusively obtained by trying to bring the edges of adjacent flaps as close together as possible. Examples of containers using outer skeletons of the second typology are described in the following documents: US 3358900, US 3489331, US 4046310, FR

2406522, US 5253801, FR 2826938, FR 2933329, WO 2012/049005 and WO 2018/017783.

[0017] Further embodiments are then known, which are characterized in that, at the perimeter flange, the skeleton comprises a continuous and flat annular portion.

[0018] A first example of this typology, described for example in the patent application WO 2020/033350 A1, provides that the outer skeleton is obtained from a single sheet of material folded back on itself, and that the lateral wall and the bottom wall are defined by wings of the skeleton that develop from the continuous annular portion (or inwards or towards the inside of it in the sheet in a stretched configuration).

[0019] A second example of containers in which the skeleton has a continuous flange is described, for example, in patent applications WO 2019/020863 A2 and WO 1999/067143 A2, and provides that the outer skeleton is constituted of a plurality of distinct sheets, among which one defines the annular frame at the annular flange, and one defines the skeleton at the bottom wall. The various sheets are fixed to each other through an adhesive to realize the skeleton on which the layer of thermoplastic material is then thermoformed. A further typology of containers in which the outer skeleton has a continuous flange is described in the patent application WO 2022/264022 A1 on behalf of this same applicant. In this case, the outer skeleton is constituted of two distinct sheets. A first sheet is developed at both the entire bottom wall and the entire lateral wall, while a second sheet develops at the annular flange and has a series of wings that overlap the first sheet at the lateral walls. The two sheets are fixed to each other directly by the layer of thermoplastic material thermoformed on them.

[0020] In all these known embodiments where the outer skeleton has a continuous upper flange, the skeleton while developing at the entire lateral wall in that zone is not continuous but constituted of a plurality of side-by-side parts. The present invention was born from an idea of the applicant to try to realize trays which comprise a plurality of separatable containers using the technique used today for single containers only, which provides for the combination of a skeleton and a coatingmaterial.

[0021] Although this may seem a priori to be relatively easy to implement, tests carried out by the applicant allowed to highlight some important problems that prevent the direct translation of the technique in use for single containers into the realization of multi-container trays of the type of interest.

[0022] In particular, the applicant has found significant difficulties in making individual containers separable if the entire tray is obtained by coating a single skeleton with a single sheet of thermoformable thermoplastic material. In fact, although it is possible to provide for making a dashed cut (a technique known in the field as scoring) either through the skeleton or through the coating, using mechanical tools, this solution has not proved to be feasible in case the tray is destined to the packaging of food products within food production and packaging sites; in fact, the mechanical cut can cause the formation of micro-slags (in particular of cellulosic material) which can be deposited inside the containers' compartments and which can then subsequently contaminate the content of the final package (obtained by closing the containers with a closing top film).

[0023] The only technical solution that the applicant has detected as viable using the currently known techniques, is to use a single skeleton already arranged for the mechanical separation by the user (e.g., already subjected to a pre-cut), and then to individually cover the individual containers that are part of it. However, it is a technically complicated, expensive and difficult to implement industrial solution.

[0024] In this context, the technical task at the basis of the present invention is to refine a method for making a tray comprising a plurality of separatable containers, which remedies the mentioned drawbacks.

[0025] It is in particular the technical task of the present invention to develop a method for making a tray comprising a plurality of separatable containers, which allows to make trays comprising a skeleton and a thermoplastic coating applied to the skeleton in a relatively simple way.

[0026] The indicated technical task and purposes are substantially achieved by a method for making a tray comprising a plurality of separatable containers, according to what is defined in the independent claim 1. Particular embodiments of the present invention are defined in the corresponding dependent claims. Finally, it also forms an object of the present invention the tray comprising a plurality of containers of the type obtainable with the method, according to what is indicated in claim 13.

[0027] Further characteristics and advantages of the present invention will become more evident from the detailed description of some preferred, but not exclusive, embodiments of a method for making a tray comprising a plurality of separatable containers, shown with reference to the attached drawings, in which:

- figure 1 shows in schematic plan view, a support usable in a method according to the present invention, configured to allow to make a tray comprising two separatable containers;
- figure 2 shows, schematically, the support of figure 1 sectioned according to track II-II, during a first step of the method object of the present invention, in which a sheet of thermoplastic material is positioned over the support;
- figure 3 shows the support of figure 2 with the sheet of thermoplastic material thermoformed on it;
- figure 4 shows, magnified, the particular 4 of figure 3;
- figure 5 shows, schematically, the support and the sheet of thermoplastic material of figure 3, in view from the top as in figure 1;
- figure 6 shows, schematically, the beginning of a cutting step laser of the sheet of thermoplastic material of figure 5, according to a first embodiment of the method object of the present invention;

- figure 7 shows the support and the sheet of thermoplastic material at the end of the cutting step of figure 6;
- figure 8 shows, magnified, the particular VIII of figure 7;
- figure 9 shows, schematically, the support and the sheet of thermoplastic material of figure 7, in view from the top as in figure 1;
- figure 10 shows, magnified, the particular X of figure 9;
- figure 11 shows the particular of figure 10 in case of performing the laser cutting step with a different execution mode (dashed instead of continuous);
- figure 12 shows, schematically, the tray of figure 3, in which the containers' compartments were filled with a product, in execution of a filling step part of a second embodiment of the method object of the present invention;
- figure 13 shows, schematically, a closing step of the tray of figure 12 in which a closing film is used and a package is obtained;
- figure 14 shows, schematically, the beginning of a laser cutting step of the closing film and of the sheet of thermoplastic material of figure 13;
- figure 15 shows the package of figure 14 at the end of the cutting step;
- figure 16 shows, magnified, the particular XVI of figure 15;
- figure 17 shows in schematic plan view, a support usable in the method according to the present invention, instead of that of figure 1, to make a tray comprising eight separatable containers;
- figure 18 shows, in plan view, a first sheet usable to make a support to be used in the context of the present invention; and
- figure 19 shows, in plan view, a second sheet usable together with the first sheet of figure 18 to make the support.

[0028] The attached figures show two preferred embodiments of the present invention. Figures 1 to 5 are common to both, while figures 6 to 11 refer to the first embodiment, and figures 12 to 16 to the second embodiment.

[0029] The difference between the two embodiments is that, in the first embodiment, the tray 1 is finished before being used, in particular before being filled. In contrast, in the second embodiment, the tray 1 is finished only after it has been filled and, advantageously, closed, to create the final package 2 (which in turn is a multiple package 2 that comprises as many individual packages 3 as there are separable containers 4 that are part of the tray 1).

[0030] In general, the tray 1 which can be made with the method object of the present invention comprises a plurality of separable containers 4, each of which defines at least one containment compartment 5 open at the top (each container 4 can comprise anyway multiple compartments 5). The present invention can moreover find application for the packaging of any typology of products. In particular, the present invention can find application for making both multipack packages of puddings, creamy desserts and yoghurt, and multipack packages of other products such as cookies, chips, crackers, etc.... Each container 4, moreover, has at least one connecting edge 6 which is adjacent to a connecting edge 6 of one of the other containers 4, in addition to any free edges. A same container 4 can comprise a plurality of connecting edges 6, each of which is adjacent to the connecting edge 6 of another different container 4 part of the tray 1.

[0031] The tray 1 has moreover a weakened zone 7 between each pair of connecting edges 6 which are adjacent to each other. The weakened zone 7 is a part of the tray 1 which connects the two adjacent connecting edges 6 and which is configured to break and to allow the reciprocal detachment of the two connecting edges 6 of the pair of connecting edges 6 connected by it, so as to allow the separation of the respective containers 4. The weakened zone 7 is moreover configured to break in this way as a result of a manual action by a user (of the same type provided for the currently known trays).

[0032] In the preferred embodiments, each container 4 comprises a flat perimetric upper flange 8 which surrounds each access opening of a compartment 5 defined by the container 4. Advantageously, each connecting edge 6 is defined by an edge of the flat perimetric upper flange 8 of the related container 4.

[0033] In some embodiments, the containers 4 can be aligned along a single row (figures 1-16 and 18-19).

[0034] In some embodiments, the containers 4 can be aligned along multiple rows perpendicular to each other (figure 17).

[0035] In other embodiments the containers can be reciprocally arranged in another way (for example quincunx-like).

[0036] The method object of the present invention which allows to make such a tray 1, provides first of all an initial step in which a support 9 comprising at least one layer of cellulose material is picked up, or is made. Advantageously, the support 9 can comprise a plurality of layers of cellulosic material or can be entirely constituted of cellulosic material.

[0037] Preferably the support 9 is constituted of a papermaking article (i.e., an article made from cellulosic material - e.g., paper, cardboard, paperboard, cellulose pulp or fiber).

[0038] The present invention can, however, also find application for supports 9 realized with other materials.

[0039] In some embodiments, the support 9 has a three-dimensional shape (also in terms of size) substantially corresponding or almost identical to the one of the tray 1 to be made.

[0040] More generally, the support 9 has an overall footprint substantially corresponding to the one of the tray 1 to be made although it may have a partly different shape. By way of example, the support 9 may have through openings or may lack some faces at which the

tray 1 is instead defined exclusively by a sheet of thermoplastic material attached to the support 9 (which will be better described below).

[0041] Advantageously, anyway, the support 9 defines at least mainly the shape of the compartments 5 of each container 4 as well as the connecting edges 6. The support 9 comprises moreover a line of weakening 10 at each pair of connecting edges 6 to be obtained in the finished tray 1, i.e. at each weakened zone 7 of the tray 1 to be obtained. The lines of weakening 10 are shown dashed in figures 1 and 17, and each of them is part of the corresponding weakened zone 7 of the tray 1. The support 9 of figure 2 is designed to make a tray 1 comprising only two containers 4. Differently, the support 9 of figure 17 is designed to make a tray 1 comprising eight containers 4.

[0042] In the preferred embodiments, the lines of weakening 10 are constituted of dashed cuts (scoring) that affect the entire thickness of the support 9 or only a part (so cuts completely through or less).

[0043] In the support 9 can be detected two sides, an upper side 11 and a lower side 12, which correspond, respectively, to the upper side and to the lower side of the tray 1 to be obtained.

[0044] In some embodiments, during the initial step the support 9 is made forming and/or folding one or more sheets of a material comprising said layer of cellulose material, analogously to what is known to be done for making the outer skeletons of single containers 4 (i.e. using, for example, any of the techniques mentioned in the description of the known technique). If the support 9 comprises several parts that are detached from each other, their union can be obtained at the end of the next coating step or previously, analogously to what is already known about the single containers 4.

[0045] To one of these embodiments are referred figures 18 and 19, which show, respectively, a first sheet 21 and a second sheet 22 to be used to make the support 9.

[0046] The second sheet 22 is conformed to define the support 9 at the bottom and lateral walls of each container 4, while the first sheet 21 is conformed to define the support 9 at the top flange 8 and lateral walls of each container 4.

[0047] The first sheet 21 comprises a portion of flange 23 which is destined to constitute the support 9 at all the flanges 8 of containers 4 and which delimits within it a plurality of windows 24, one for each compartment 5 to be obtained. At each window 24, the first sheet 21 comprises then a plurality of first flaps 25, each of which is destined to be folded down compared with the flange portion 23, in the finished support 9.

[0048] In the second sheet 22 instead, a plurality of groups 26 of second flaps with similar arrangement can be detected, connected by connecting flaps 27. In each group 26 of second flaps, a central flap 28 destined to constitute the support 9 at the bottom of a container 4, and a plurality of lateral flaps 29 extending outward from the central flap 28 can be detected. Each lateral flap 29 is configured to be folded upwards compared with the central flap 28 and to couple, from below, to one of the first flaps 25 of the first sheet 21. Each first flap 25 has a window 30 through which, in use, the sheet of thermoplastic material 13 can make direct contact with the underlying lateral flap 28; in the preferred embodiment, in fact, the connection between the first sheet 21 and the second sheet 22 is obtained exclusively through the sheet of thermoplastic material 13 adherent to both (see the following description of the coating step). The presence of the windows 30 gives the first flaps 25 a C-shape. In other embodiments, anyway, it is also possible that the first sheet 21 is fixed to the second sheet 22 using also, or only, an adhesive.

[0049] In the embodiment shown in figures 18 and 19, the first sheet 21 and the second sheet 22 have moreover relative secondary lines of weakening 31 (indicated by dashed lines), positioned in such a way as to overlap in the assembled support 9 (possibly with a tolerance of a few millimeters) and which, overall, define the line of weakening 10 of the support 9.

[0050] In other embodiments, anyway, the first sheet 21 and the second sheet 22 can be devoid of secondary lines of weakening 31, and the line of weakening 10 of the support 9 can be realized after that the two have been joined to each other (in this case using a glue not through the sheet of thermoplastic material 13 which will then be applied during the subsequent coating step).

[0051] In other embodiments, instead, during the initial step the support 9 is made using cellulose pulp.

[0052] During the subsequent coating step the sheet of thermoplastic material 13 is thermoformed and is fixed on one side of the support 9 (analogous to what is known to do for making single containers 4).

[0053] Advantageously the sheet of thermoplastic material 13 has a thickness, before the thermoforming, between 15 μm and 200 μm, preferably between 30 μm and 150 μm, and even more preferably between 50 and 100 μm.

[0054] The coating step is performed in such a way that the sheet of thermoplastic material 13 covers the lines of weakening 10 with its covering portions 14 which, depending on the embodiments, may, or may not, undergo a stretching and a consequent reduction in thickness during the thermoforming process. According to the present invention, the coating step is performed in such a way that the covering portions 14, at the end of the coating step, have a transmittance of less than 50%, preferably less than 40% and even more preferably less than 30%, measured according to United States ASTM International standard D1003-21. It should be noted that any reference to the transmittance made in the context of the present invention should be intended as a reference to a transmittance measured according to that standard.

[0055] To achieve this result, the coating step is advantageously carried out using a thermoplastic material which, before being thermoformed, has a transmittance of less than 50%, preferably less than 40% and even

more preferably less than 30%. In case the covering portions 14 do not undergo thinning, the transmittance of the starting thermoplastic material may be chosen to be equal to the one desired for the covering portions 14. If, on the other hand, thinning is expected, the transmittance of the starting thermoplastic material should be about N times the one desired for the covering portions 14, where N is equal to the ratio of the initial thickness of the sheet of thermoplastic material 13 and the one of the covering portions 14. Preferably, the sheet of thermoplastic material 13 is applied to the upper side 11 of the support 9, but in some embodiments a sheet of thermoplastic material 13 can also be applied, or only, to the lower side 12 of the support 9. The coating step is performed covering with the sheet of thermoplastic material 13 the lines of weakening 10.

[0056] Preferably, during the coating step the sheet of thermoplastic material 13 is thermoformed on the upper side 11 of the support 9 in such a way that the thermoformed sheet of thermoplastic material 13 defines an inner surface of each compartment 5. To this case are referred figure 2, which shows the sheet of thermoplastic material 13 above the support 9, before the thermoforming, figure 3 in which the sheet of thermoplastic material 13 has been thermoformed on the upper side 11 of the support 9 (in such a way as to define the inner surface of the compartments 5 of containers 4 and to be extended above the lines of weakening 10), and figure 5 which shows the support 9 coated with the thermoformed sheet of thermoplastic material 13, in view from the top (at this point the lines of weakening 10 are no longer visible from the top as they are covered by the sheet of thermoplastic material 13 represented as non-transparent).

[0057] When the tray 1 to be obtained has the flat perimetric upper flanges 8, and the coating step is carried out at the top face of the support 9, during the coating step sheet of thermoplastic material 13 undergoes a considerable reduction in thickness at its first portions 15 which are thermoformed within the compartments 5 of containers 4, while it undergoes a reduction in thickness (compared with the initial thickness) less than 10% at an its own second portion 16 positioned at the flat perimetric upper flanges 8. The second portion 16 advantageously extends without a gap around all of the first portions 15.

[0058] After the coating step, in all of its embodiments, the method object of the present invention provides for the execution of a cutting step.

[0059] During the cutting step action is taken on the side of the support 9 at which the sheet of thermoplastic material 13 (above in figure 6) is located, and a laser light beam 17 is used to cut the sheet of thermoplastic material 13 at each line of weakening 10. Advantageously, during the cutting step one or more cuts 18 are made in the sheet of thermoplastic material 13 following the development of each line of weakening 10, preferably in such a way that the cuts 18 in the sheet of thermoplastic material 13 define a line directly superposed on the line of weakening 10. Such cuts 18 are part of the weakened zone 7 of the tray 1. In some embodiments it is anyway possible to provide that the cuts 18 are not directly superposed on the line of weakening 10, but are offset compared with it (advantageously, anyway, not more than 10 mm, preferably not more than 5 mm).

[0060] Figures 9 and 10 show an example of the case where during the cutting step a single continuous cut 18 is made in the sheet of thermoplastic material 13 along the entire extent of a line of weakening 10.

[0061] It should be noted that in figures 8-10, as well as in the subsequent figure 15, the cut 18 is represented with a greater width than the cuts constituting the line of weakening 10 in order to allow a better understanding of the invention; in most embodiments, on the contrary, the width of the cut 18 made by laser light beam 17, is advantageously smaller than the width of the cuts constituting the line of weakening 10 generally mechanically obtained. Figure 11 shows instead the variant in which the sheet of thermoplastic material 13 is cut carrying out, along a line of weakening 10, a dashed cut 18. Depending on the embodiments, and in particular depending on the desired strength or ease of opening, the pattern of the dashed cut 18 can take different configurations. As an example, the pitches and lengths of the individual cut and uncut sections can be constant throughout the cut 18 or less. The individual sections can then have linear or dotted patterns. In a single cut 18 individual cuts with different shapes and lengths may then alternate. And so on.

[0062] Depending on design choices, it is possible to use laser light beams 17 with different physical characteristics.

[0063] As an example it is possible to use a laser light beam 17 with a nominal wavelength of 10.6 μm, or a laser light beam 17 with a nominal wavelength of 10.2 μm or a laser light beam 17 with a nominal wavelength of 9.3 μm. Advantageously, the coating step is carried out in such a way that the lines of weakening 10 are all covered by covering portions 14 of the sheet of thermoplastic material 13 which substantially do not undergo reductions in thickness, and the cutting step is carried out only at these covering portions 14 del sheet of thermoplastic material 13 which have not undergone any reduction in thickness during the coating step (such as the aforementioned second portion 16 in case where the containers 4 comprise the flat perimetric upper flanges 8).

[0064] Advantageously, the cutting step is carried out by preventing that the laser light beam 17 cuts or damages the underlying support 9.

[0065] This result can be advantageously obtained both thanks to the reduced transmittance of the sheet of thermoplastic material 13 at the covering portions 14 (which causes most of the energy of the laser light beam 17 to be absorbed by the covering portions 14), and by properly adjusting the intensity and the duration of the laser light beam 17 (for each material and each thickness of interest, a few experimental trials will be sufficient to detect intensities and durations that will provide the de-

sired results).

[0066] As an example to cut covering portions 14 of a sheet of thermoplastic material 13, which have a transmittance equal to the 25% and thickness equal to 100 μm, either a laser light beam with power equal to 150 W and a cutting speed of 900 mm/s, or a laser light beam with power equal to 250 W and a cutting speed of 1500 mm/s can be used.

[0067] As already anticipated, in some embodiments the cutting step is carried out before the tray 1 is used, as shown in figures from 6 to 10.

[0068] In other embodiments, instead, the cutting step is carried out after the tray 1 has been used to package products 19 (figure 12-16).

[0069] In this latter case, after the coating step and before the cutting step, the method comprises a filling step and a closing step, carried out in this order. During the filling step, a product 19 is inserted in each compartment 5 (figure 12).

[0070] During the subsequent closing step, a closing film 20 is fixed above the sheet of thermoplastic material 13, around each compartment 5, to close the top of each compartment 5 (figure 13). Advantageously, the closing step is carried out superposing the closing film 20 on the sheet of thermoplastic material 13 even at the lines of weakening 10. Above each line of weakening 10 are so both a covering portion 14 of the sheet of thermoplastic material 13, and the closing film 20.

[0071] Subsequently, the cutting step (figure 14) is carried out according to the above-indicated ways, but with the important difference that, using the laser light beam 17, at each line of weakening 10 both the closing film 20, and the underlying sheet of thermoplastic material 13 (figure 15 and 16) are cut in the same way.

[0072] When it is necessary to cut both the closing film 20, and the underlying sheet of thermoplastic material 13, it is possible either to use laser light beams with the above-indicated powers while proceeding with a lower cutting speed (e.g., for plastic or aluminized closing films 20), or to use laser light beams with higher powers (e.g., for closing aluminum films 20 relatively often it is possible to use even powers of 400 or 600 W).

[0073] It finally falls under the object of the present invention also the case where the method comprise two separate cutting steps, firstly the cutting step carried out on only the sheet of thermoformable material 13 (advantageously before the filling step) and then a second cutting step carried out after the filling step, in which the closing film 20 (and, preferably, only that) is cut. Each cutting step can be carried out according to the above-described embodiments.

[0074] It forms also object of the present invention a tray 1 comprising a plurality of separable containers 4, e.g. obtainable with the method described so far (what is described in relation to the method, if applicable, should be intended as also applying to the tray 1).

[0075] According to what has already been described, the tray 1 comprises a support 9 and a sheet of thermoplastic material 13 thermoformed and fixed to the support 9, and each container 4 of the tray 1 defines at least one containment compartment 5 open at the top and has at least one connecting edge 6 adjacent to the connecting edge 6 of one of the other containers 4. The support 9 comprises at least one layer of cellulose material, and has two sides, an upper side 11 and a lower side 12.

[0076] The tray 1 has a weakened zone 7 which connects each pair of adjacent connecting edges 6 and which is configured to break and allow the detachment of the respective pair of adjacent connecting edges 6 and the separation of the respective containers 4 as a result of the manual action by a user.

[0077] At the and/or near each line of weakening 10 the sheet of thermoplastic material 13 has a covering portion 14 which has a transmittance of less than 50%, measured according to United States ASTM International standard D1003-21.

[0078] Each weakened zone 7 of the tray 1 comprises both the line of weakening 10 obtained in the support 9, and one or more cuts 18, advantageously made with the laser light beam 17, at covering portion 14 of the sheet of thermoplastic material 13.

[0079] The support 9 is configured to break along the line of weakening 10 as a result of the manual action by a user, as well as the sheet of thermoplastic material 13 is configured to break at the cuts 18 in case these do not already extend along the entire weakened zone 7.

[0080] The present invention achieves important advantages.

[0081] Thanks to the present invention it has indeed been possible to finalize a method for making a tray comprising a plurality of separatable containers, which makes it relatively easy to make trays of this type which comprise an outer skeleton and a thermoplastic coating applied to the skeleton.

[0082] Finally, it should be noted that the present invention is relatively easy to implement and that the cost associated with its implementation is also not very high.

[0083] The invention thus conceived is susceptible to several modifications and variations, all falling within the scope of the inventive concept that characterizes it.

[0084] All the details are replaceable by others that are technically equivalent, and the materials used, as well as the shapes and sizes of the various components, may be any as needed.

Claims

1. A method for making a tray (1) comprising a plurality of containers (4) separatable from each other, each container (4) defining at least one containment compartment (5) open at the top and having at least one connecting edge (6) adjacent to the connecting edge (6) of one of the other containers (4), the tray (1) having a weakened zone (7) which connects each pair of adjacent connecting edges (6), the weakened

zone (7) being configured to break and allow detachment of the respective pair of adjacent connecting edges (6) and separation of the respective containers (4) as a result of a manual action by a user;

the method comprising the following operating steps:

- an initial step in which a support (9) comprising at least one layer of cellulose material is picked up, or is made, the support (9) having two sides, an upper side (11) and a lower side (12), and a line of weakness (10) at each weakened zone (7) of the tray (1) to be obtained, the support (9) being configured to break along the line of weakness (10) as a result of the manual action by a user;
- a coating step in which a sheet of thermoplastic material (13) is thermoformed and is fixed on one side of the support (9), covering with covering portions (14) of the sheet of thermoplastic material (13) the lines of weakness (10); and
- a cutting step in which, acting on the side of the support (9) on which the sheet of thermoplastic material (13) is located, the sheet of thermoplastic material (13) is cut at each line of weakness (10) using a laser light beam (17);

wherein, moreover, the coating step is carried out:

using a thermoplastic material which before the coating step has a transmittance of less than 50% measured according to standard ASTM D1003-21; and
in such a way that the sheet of thermoplastic material (13) covers the lines of weakness (10) with its covering portions (14) which, at the end of the coating step, have a transmittance of less than 50% measured according to standard ASTM D1003-21.

2. The method according to claim 1, wherein, during the cutting step, the sheet of thermoplastic material (13) is cut preventing the laser light beam (17) from cutting the support (9) below it.

3. The method according to claim 1 or 2, wherein, during the coating step, the sheet of thermoplastic material (13) is thermoformed on the upper side (11) of the support (9) in such a way that the thermoformed sheet of thermoplastic material (13) defines an inner surface of each compartment (5).

4. The method according to claim 3, wherein during the coating step the covering portions (14) of the sheet of thermoplastic material (13) undergo a reduction in thickness of less than 10% compared with their initial thickness.

5. The method according to claim 3 or 4, also comprising, after the coating step and before the cutting step, a filling step in which a product (19) is inserted in each compartment (5), and a closing step, carried out after the filling step, in which a closing film (20) is fixed on the sheet of thermoplastic material (13), to close the top of each compartment (5), wherein the closing step is carried out superposing the closing film (20) on the sheet of thermoplastic material (13) even at the lines of weakness (10), and wherein, during the cutting step, using said laser light beam (17), at each line of weakness (10) both closing film (20) and the sheet of thermoplastic material (13) below it are cut.

6. The method according to claim 3 or 4, also comprising, after the coating step and after the cutting step, a filling step in which a product (19) is inserted into each compartment (5), and a closing step, carried out after the filling step, in which a closing film (20) is fixed on sheet of thermoplastic material (13), to close the top of each compartment (5), wherein the closing step is carried out superposing the closing film (20) on the sheet of thermoplastic material (13) even at the lines of weakness (10), and wherein the method also comprises a second cutting step carried out using a laser light beam (17), during which, at each line of weakness (10), the closing film (20) is cut.

7. The method according to claim 1 or 2, wherein during the coating step the sheet of thermoplastic material (13) is thermoformed on the lower side (12) of the support (9).

8. The method according to any one of claims 1 to 7, wherein, during the cutting step, at least at one line of weakness (10) a continuous cut (18) is made along the entire extent of the line of weakness (10).

9. The method according to any one of claims 1 to 8, wherein, during the cutting step, at least at one line of weakness (10) a broken line cut (18) is 10 made along the extent of the line of weakness (10).

10. The method according to any one of claims 1 to 9, wherein, during the initial step, the support (9) is made by forming and/or folding one or more sheets of a material comprising said layer of cellulose material.

11. The method according to any one of claims 1 to 10, wherein each container (4) comprises a flat perimetric upper flange (8), the connecting edges (6) being defined by the flat perimetric upper flanges (8)

of the respective containers (4), and wherein, during the coating step, the sheet of thermoplastic material (13) undergoes a greater reduction in thickness at its first portions (15) which are thermoformed inside the compartments (5) of the containers (4) and a smaller reduction in thickness, of less than 10% compared with its initial thickness, at its second portion (16) placed at the flat perimetric upper flanges (8), the second portion (16) extending without a gap around all of the first portions (15).

12. The method according to claim 11, wherein, during the cutting step, the sheet of thermoplastic material (13) is cut exclusively at covering portions (14) constituted of the second portion (16).

13. A tray comprising a plurality of separatable containers (4) obtainable with the method according to any one of claims 1 to 12.

14. The tray comprising a plurality of containers (4) separatable from each other, wherein:

each container (4) defines at least one containment compartment (5) open at the top and has at least one connecting edge (6) adjacent to the connecting edge (6) of one of the other containers (4);
the tray (1) has a weakened zone (7) which connects each pair of adjacent connecting edges (6);
the weakened zone (7) is configured to break and to allow detachment of the respective pair of adjacent connecting edges (6) and separation of the respective containers (4) as a result of a manual action by a user;
the tray (1) comprises a support (9) and a sheet of thermoplastic material (13) thermoformed and fixed to the support (9);
the support (9) comprises at least one layer of cellulose material, and has two sides, an upper side (11) and a lower side (12);
each weakened zone (7) of the tray (1) comprises a line of weakness (10) made in the support (9);
the support (9) is configured to break along the line of weakness (10) as a result of the manual action by a user;
at and/or near each line of weakness (10) the sheet of thermoplastic material (13) has a covering portion (14) which has a transmittance of less than 50%, measured according to United States ASTM International standard D1003-21; and
at the covering portion (14) the sheet of thermoplastic material (13) has one or more cuts (18) which are part of the weakened zone (7) of the tray (1).

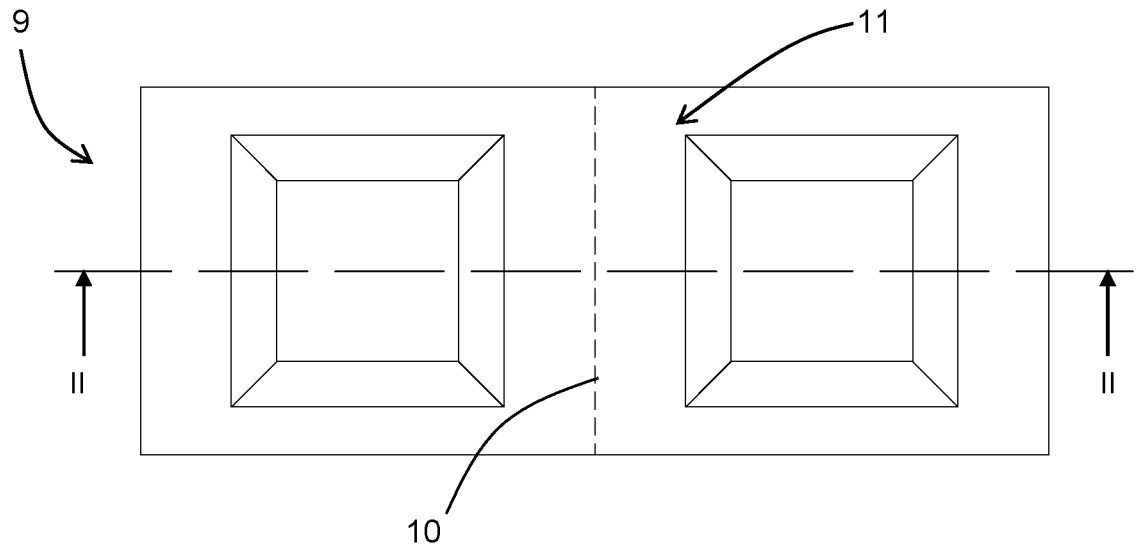

FIG. 1

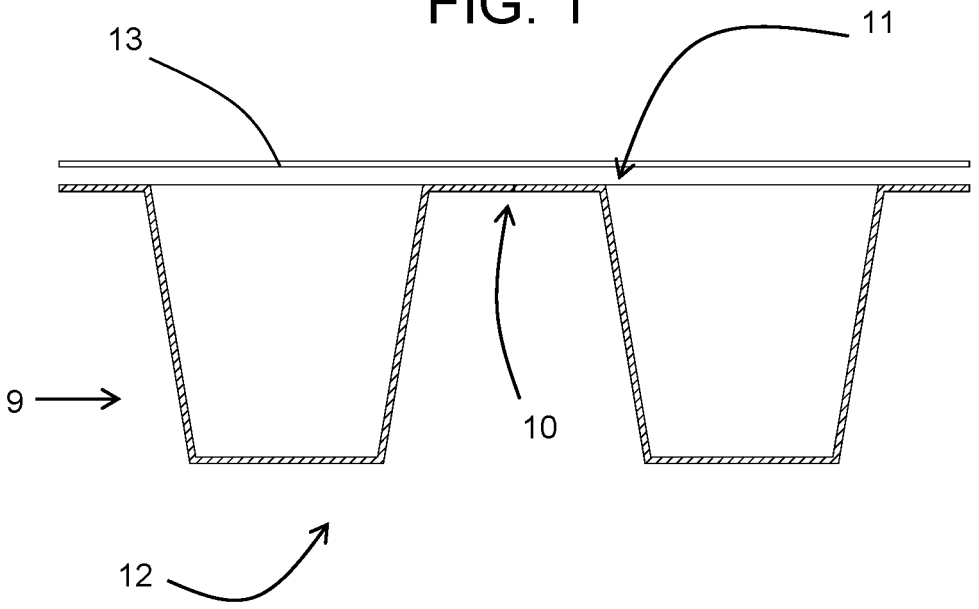

FIG. 2

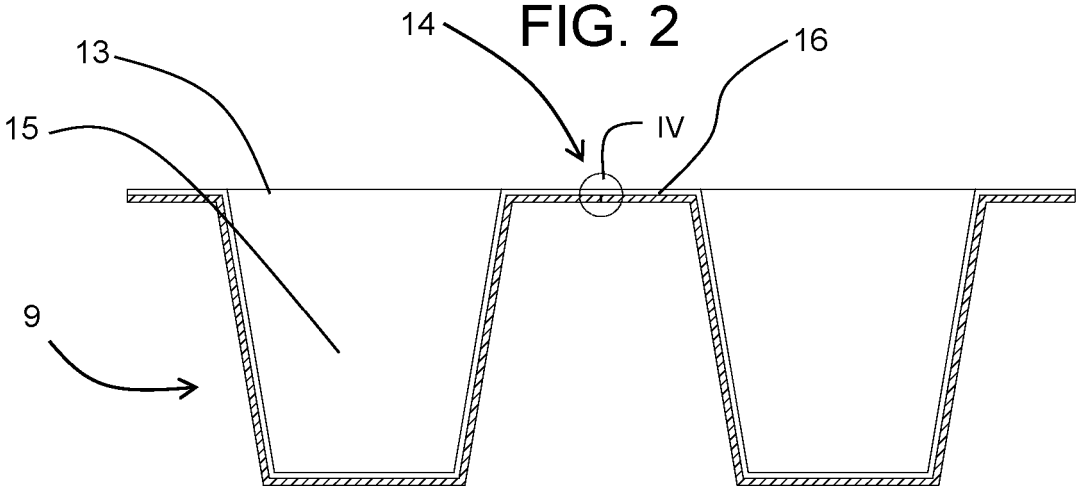

FIG. 3

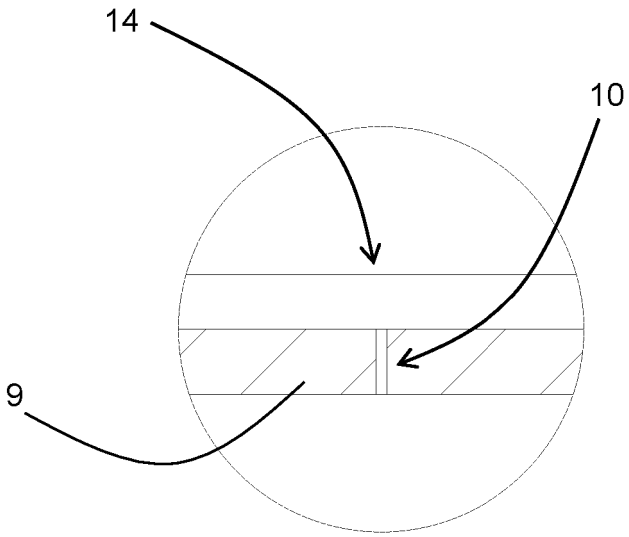

FIG. 4

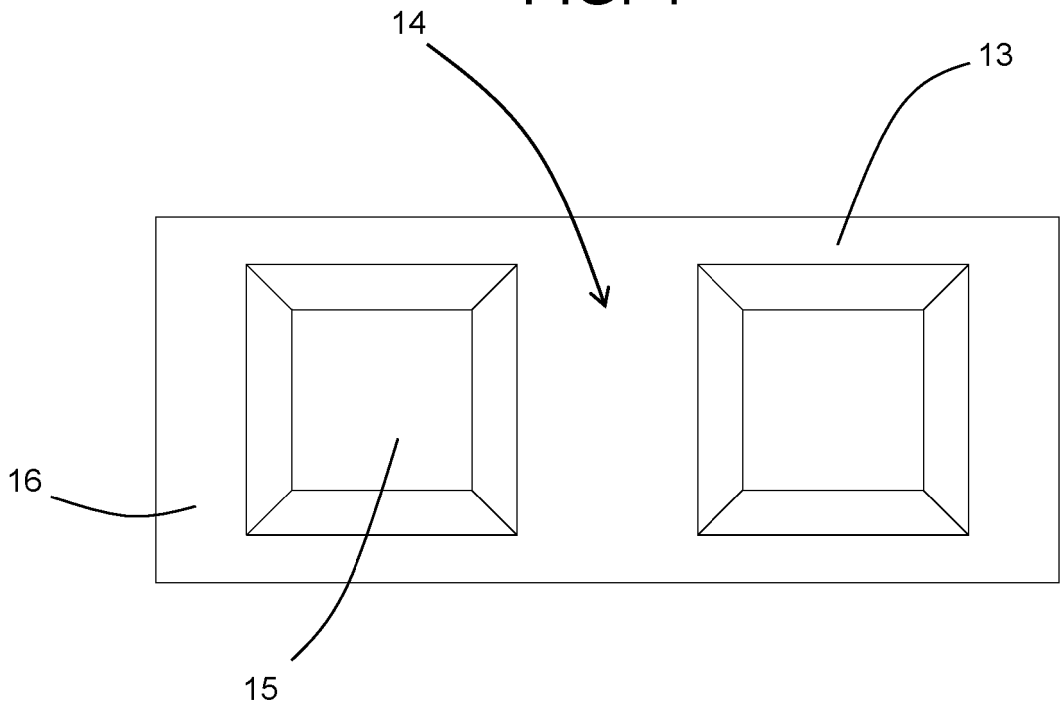

FIG. 5

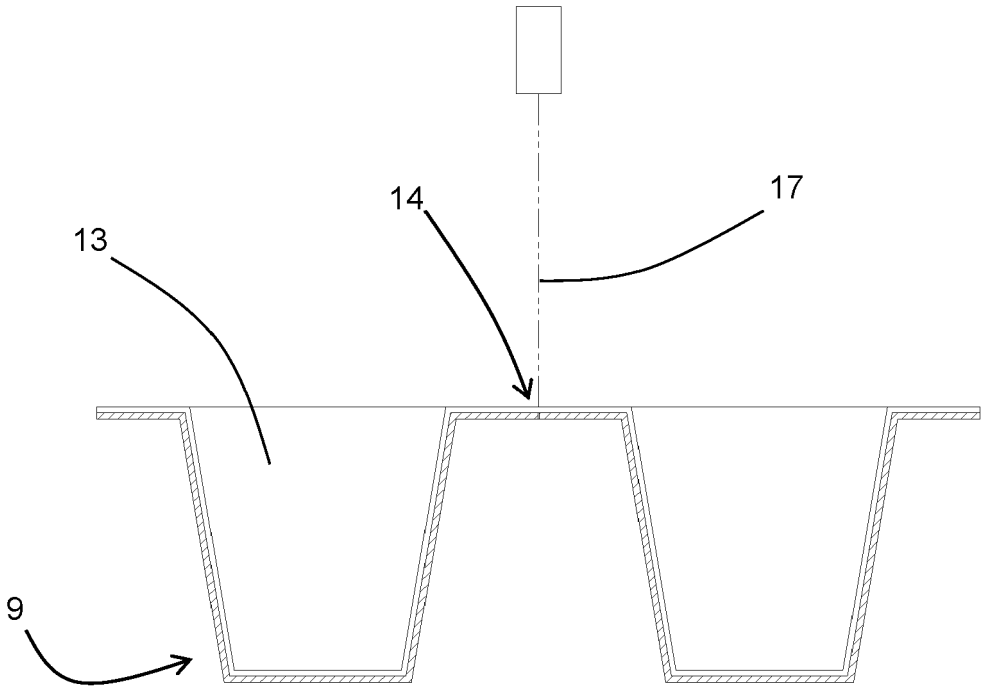

FIG. 6

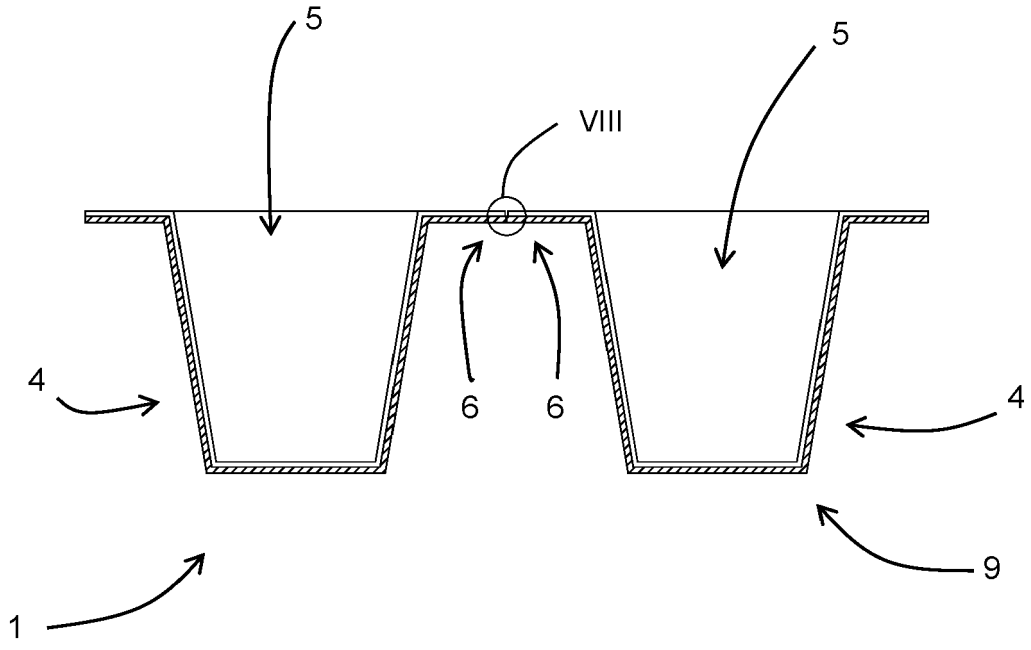

FIG. 7

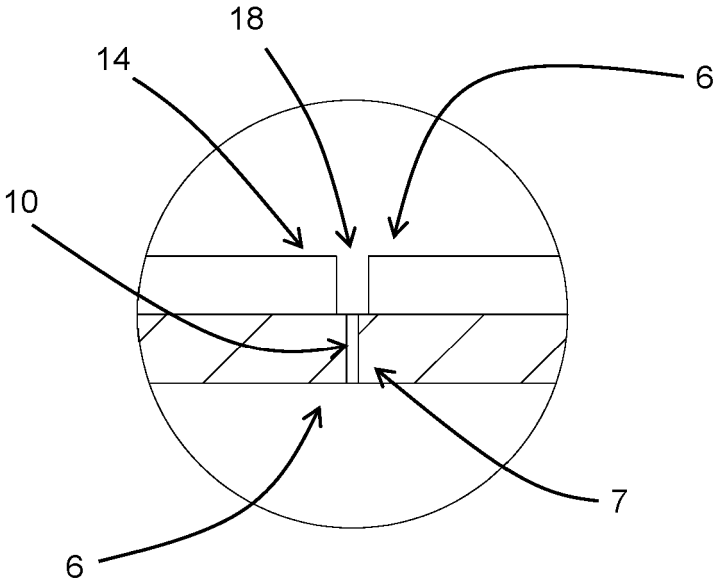

FIG. 8

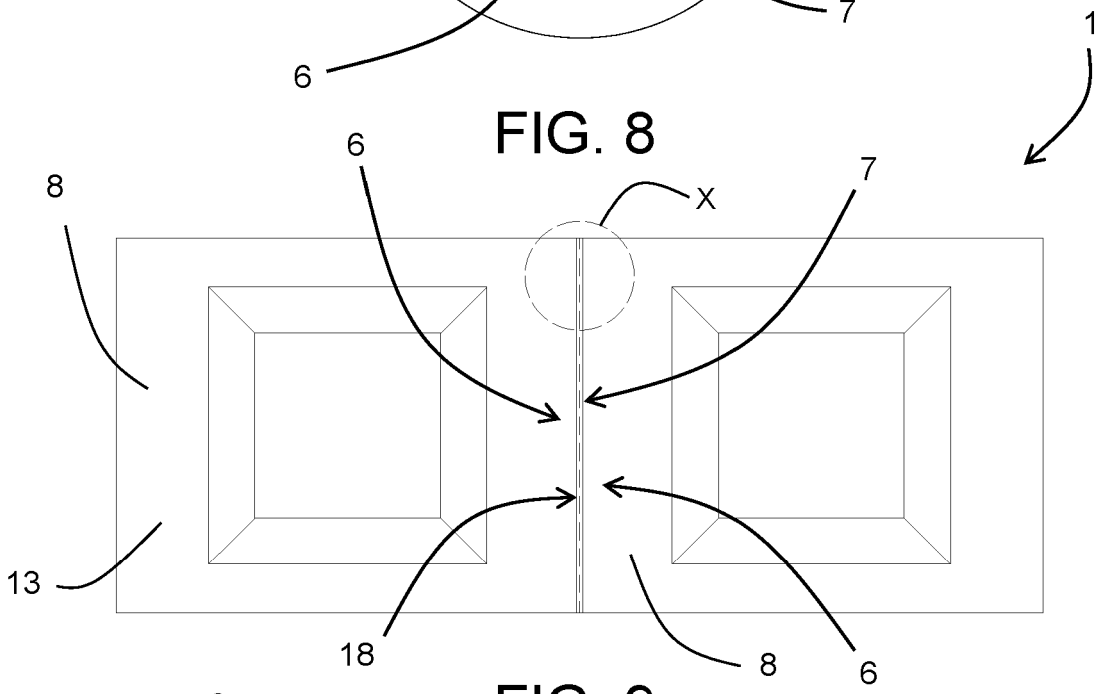

FIG. 9

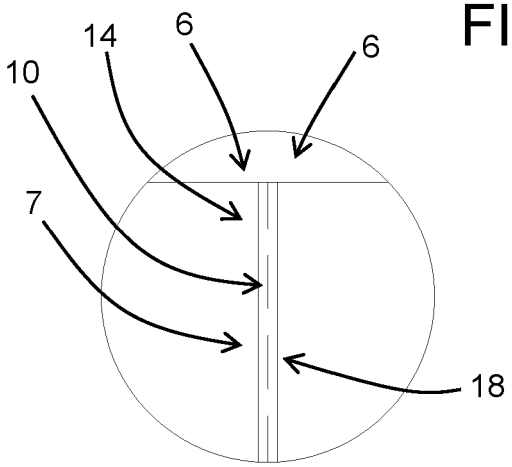

FIG. 10

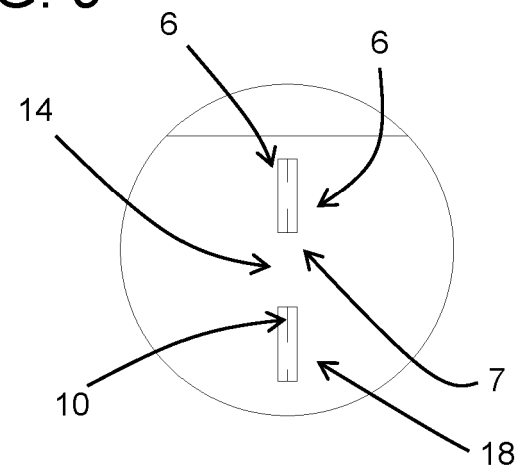

FIG. 11

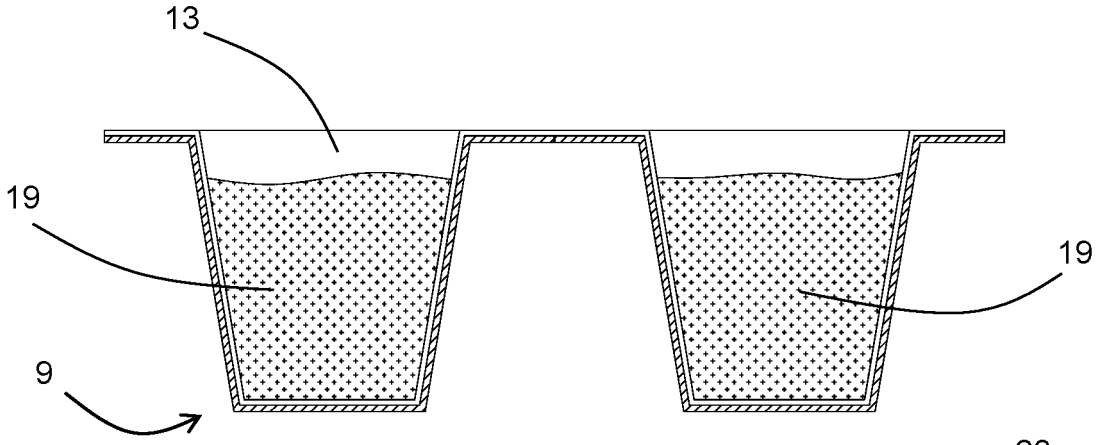

FIG. 12

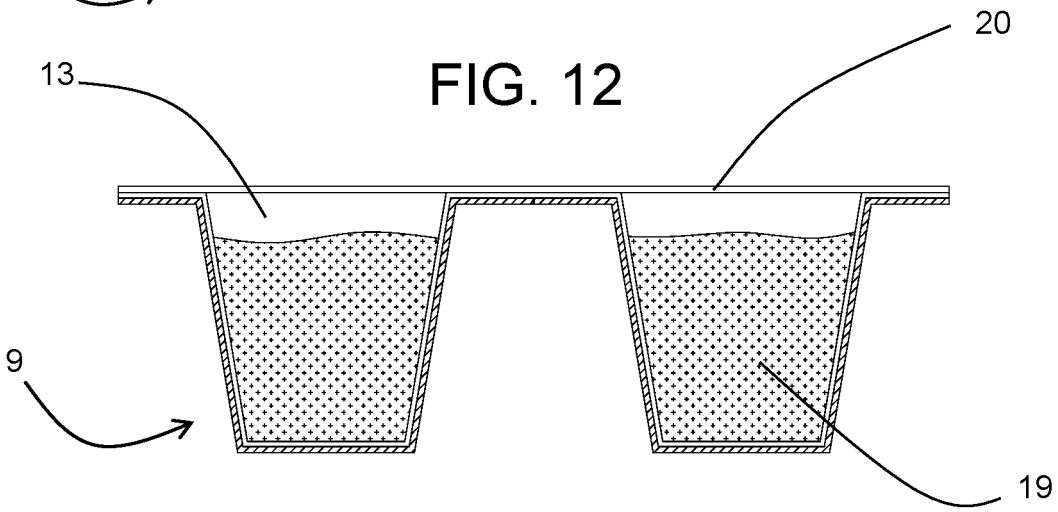

FIG. 13

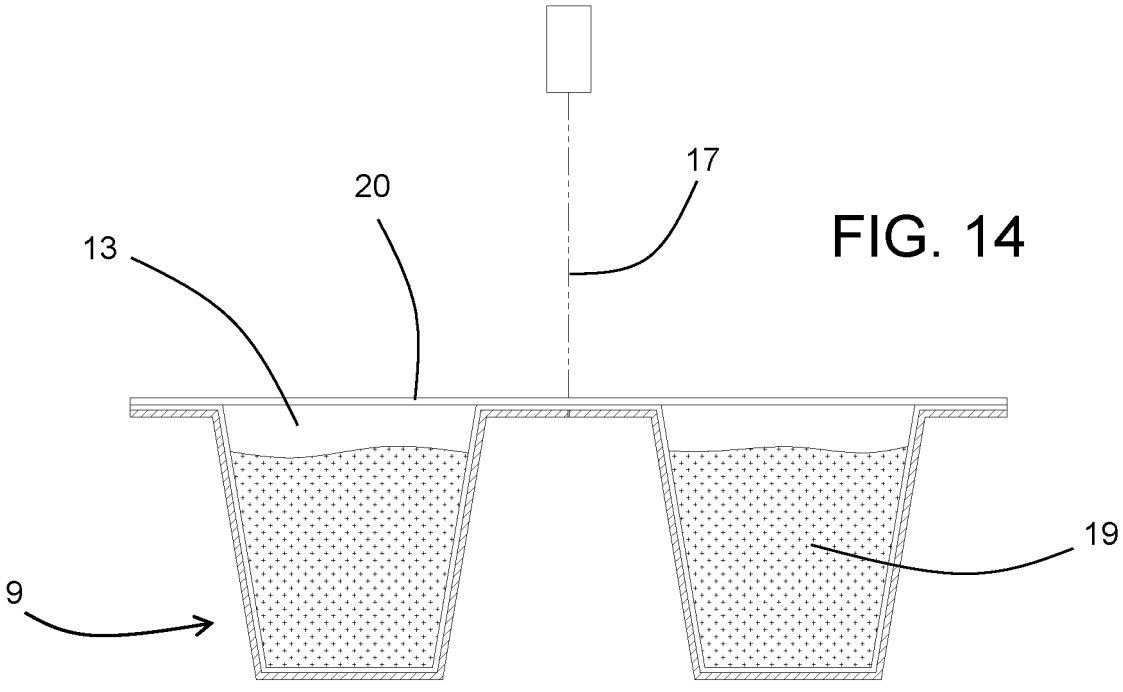

FIG. 14

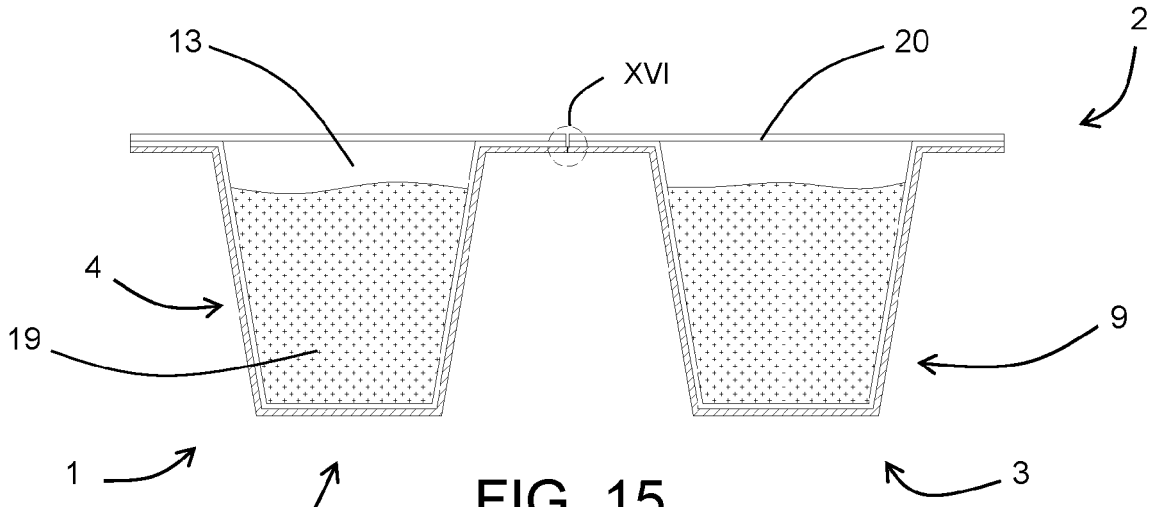

FIG. 15

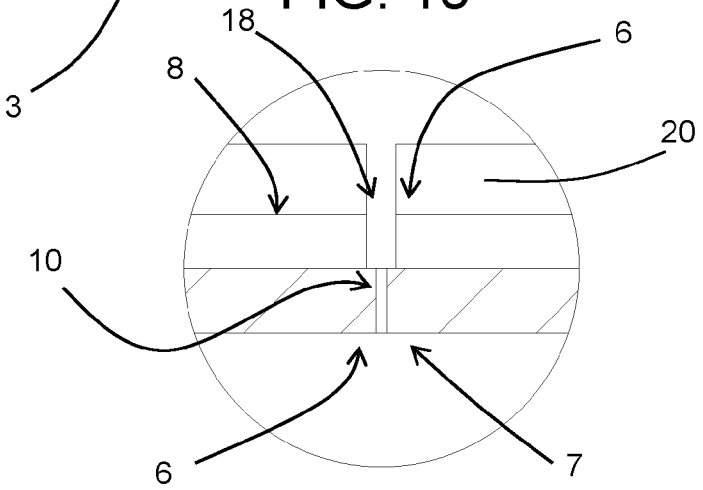

FIG. 16

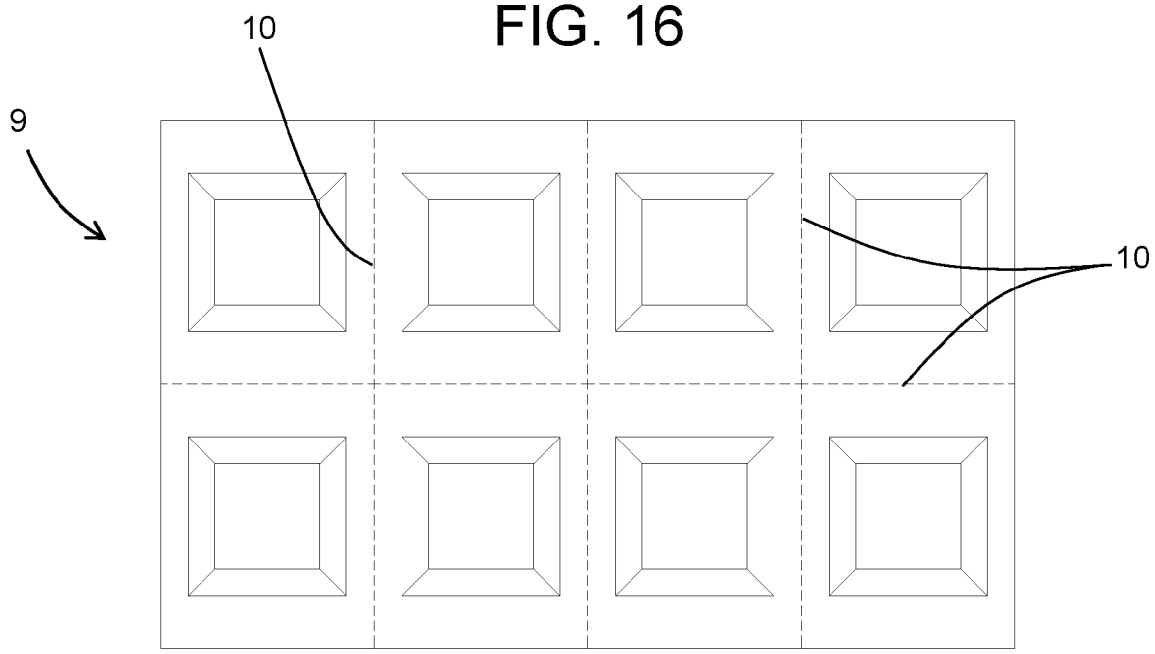

FIG. 17

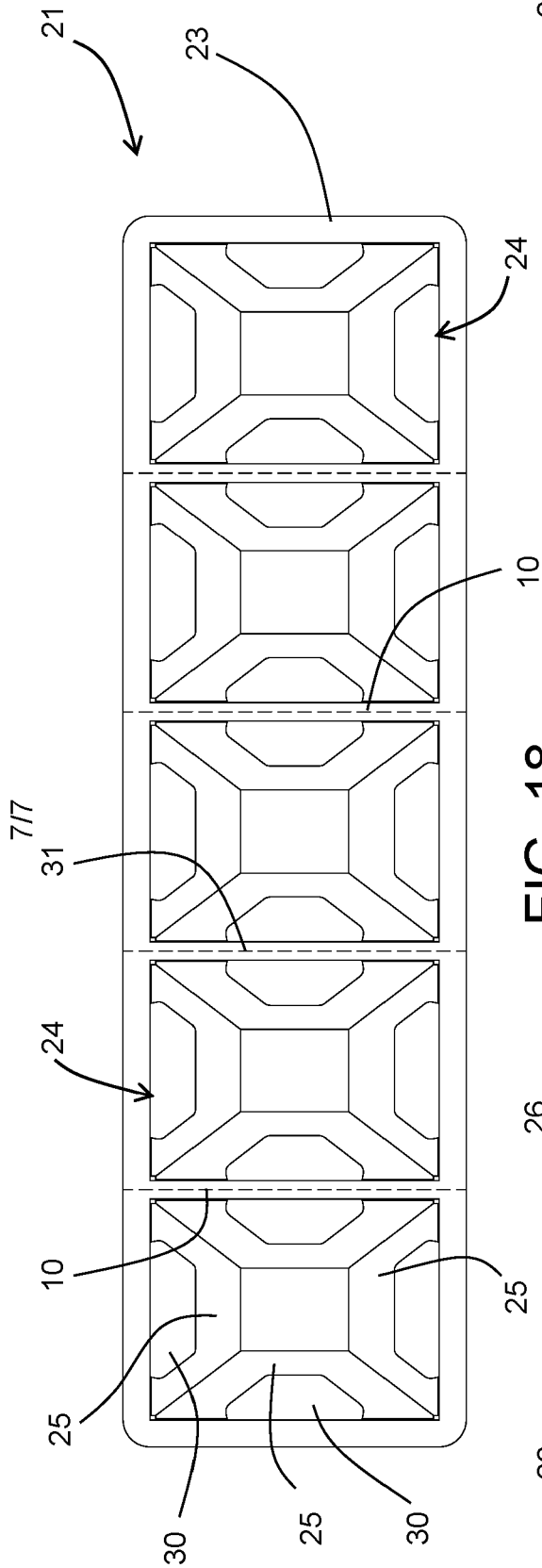

FIG. 18

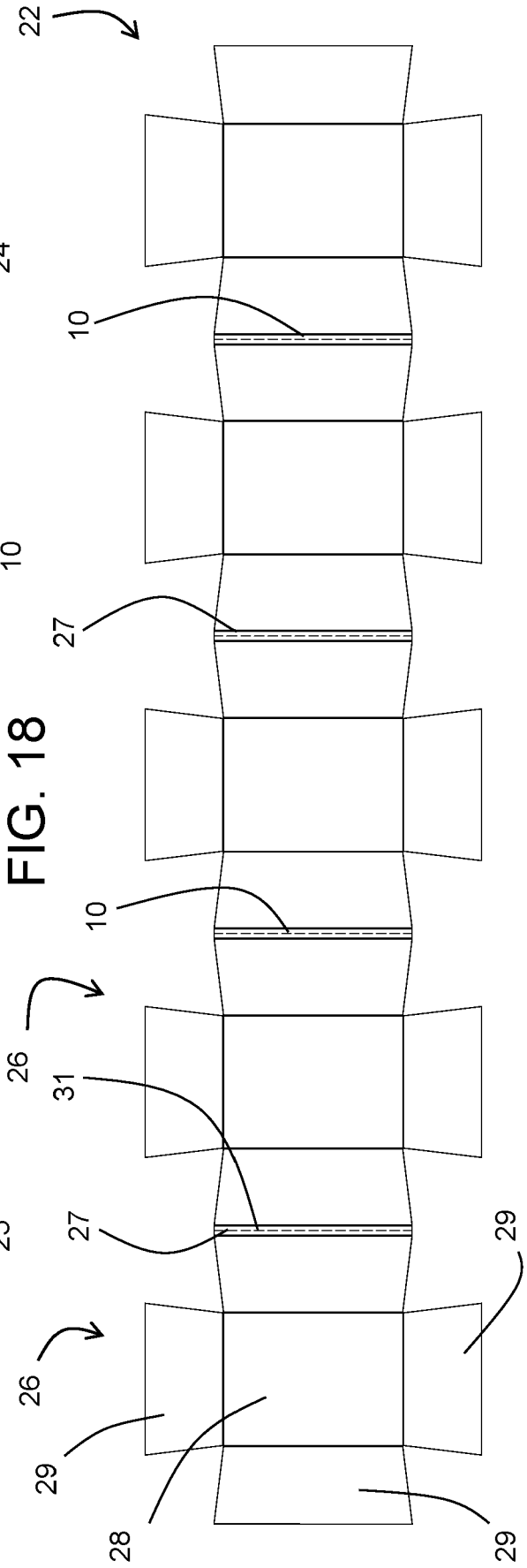

FIG. 19

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EUROPEAN SEARCH REPORT

Application Number
EP 24 21 6647

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	DE 198 28 381 A1 (DIETRICH JOCHEN [DE]; EUROPA CARTON FALTSCHACHTEL [DE] ET AL.) 30 December 1999 (1999-12-30) * column 9, line 47 - column 10, line 42; figures 1,8 *	1-14	
A	EP 0 683 035 A1 (PARISIENNE IMPRESSION [FR]) 22 November 1995 (1995-11-22) * column 11, line 28 - column 12, line 35; figures 12-22 *	1-14	

TECHNICAL FIELDS SEARCHED (IPC)
B31B
B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	28 May 2025	Johne, Olaf

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

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