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(54) **A MULTILAYER SHEET OF PACKAGING MATERIAL FOR PRODUCING A SEALED A PACKAGE**

(57) A multilayer sheet of packaging material (M) for producing a sealed package (1) of a pourable food product comprises: at least one base layer (10) for imparting stiffness; a plurality of lamination layers (11) applied to and covering both sides of said base layer (10); a pre-laminated opening (12) which is formed by a through slot provided in said base layer (10) and is covered by one or more of said lamination layers (11), said pre-laminated opening (12) being configured to receive an opening device for outpouring the pourable food product; a plurality of folding lines (15) configured to define an edge between two adjacent walls of a sealed package, wherein the pre-laminated opening (12) is not intersected by any one of said folding lines (15) and includes an outer rim being arc-shaped so as to define a first portion of a first circumference.

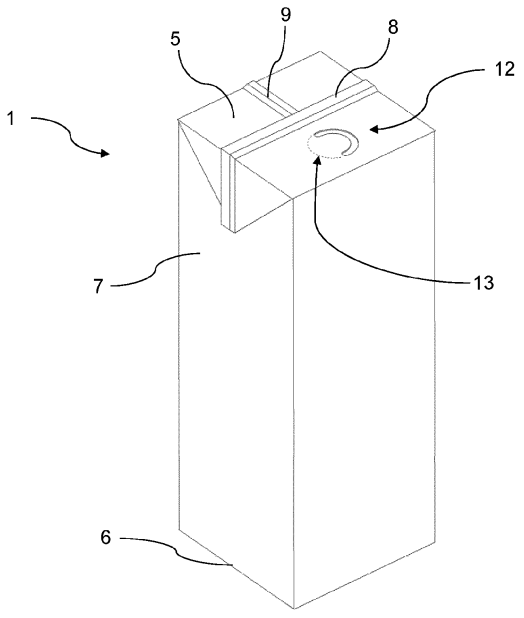

FIG. 2A

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Description

TECHNICAL FIELD

[0001] The present invention relates to a multilayer sheet packaging material for producing sealed packages of pourable food products.

[0002] As is known, many pourable food products, such as fruit juice, UHT (ultra-high-temperature treated) milk, wine, tomato sauce, etc., are sold in packages made of sterilized packaging material. A typical example is the parallelepiped-shaped package for liquid or pourable food products known as Tetra Brik Aseptic (registered trademark), which is made by folding and sealing laminated strip packaging material. The packaging material has a multilayer structure comprising a base layer, e.g. of paper, covered on both sides with layers of heat-seal plastic material, e.g. polyethylene. In the case of aseptic packages for long-storage products, such as UHT milk, the packaging material also comprises a layer of oxygen-barrier material, e.g. an aluminium foil, which is superimposed on a layer of heat-seal plastic material, and is in turn covered with another layer of heat-seal plastic material forming the inner face of the package eventually contacting the food product. Packages of this sort are normally produced on fully automatic packaging machines, on which a continuous tube is formed from the web-fed packaging material; the web of packaging material is sterilized on the packaging machine, e.g. by applying a chemical sterilizing agent, such as a hydrogen peroxide solution, which, once sterilization is completed, is removed from the surfaces of the packaging material, e.g. evaporated by heating; the web so sterilized is then maintained in a closed, sterile environment, and is folded and sealed longitudinally to form a tube, which is fed vertically. In order to complete the forming operations, the tube is filled with the sterilized or sterile-processed food product, and is sealed and subsequently cut along equally spaced cross sections; pillow packs are so obtained, which are then folded mechanically to form respective finished packages. Alternatively, the packaging material may be cut into blanks, which are formed into packages on forming spindles, and the packages are then filled with the food product and sealed. One example of this type of package is the so-called "gable-top" package known by the trade name Tetra Rex (registered trademark).

[0003] To open the above packages, these are normally provided with a removable portion, which is partly detached by an opening device from the rest of the packaging material to free a pour opening through which to pour out the product. The removable portion is formed on the packaging material prior to folding and sealing the packaging material to form the finished package.

[0004] The removable portion normally comprises a so-called "prelaminated" hole, i.e. a hole formed through the base layer only of the packaging material and covered, when the material is laminated, with the layers of heat-seal plastic material and barrier material, which adhere to one another at the hole. The "prelaminated" hole is normally circular, although other shapes may be foreseen as disclosed in patent documents EP2287082A1 and EP3260386A1 in the name of Tetra Laval and patent document EP0577867A1.

[0005] Normally, the package comprises an opening device comprising a frame, defining a spout and fitted about the removable portion of the package, a removable cap, screwed to the outside of the frame to close the spout, and a substantially tubular cylindrical cutter, screwed inside the frame and configured to rupture the removable portion during first aperture of the package. Normally, such opening devices are made of plastic material.

[0006] Recently, research is focusing on reducing plastic consumption in order to increase sustainability of packages.

[0007] In particular, research is focusing on providing reusable opening devices that may be used several times, for several packages. In this case, the packages are not provided with an opening device applied thereto. The final consumer needs to firstly apply the opening device the package, then outpour the liquid product and, once the package is empty, remove the opening device to use it again on another package.

[0008] Hence, need is felt to provide a package which is suitable to receive a re-usable opening device. In particular, need is felt to provide a package having a pre-laminated opening which allows to tightly receive a re-usable opening device, so that during outpour of the liquid product, no drops of liquid product drip along the package.

[0009] In addition, need is felt to provide a package having a pre-laminated opening for receiving a re-usable opening device wherein the pre-laminated opening can be cleanly cut by the cutter of the opening device, with no fraying interfering with pout-out of the food product.

[0010] In addition, need is felt to provide a package having a pre-laminated opening for receiving a re-usable opening device wherein the pre-laminated opening does not inadvertently rupture during storage and transportation of the package.

DISCLOSURE OF INVENTION

[0011] It is therefore an aim of the present invention to provide a multilayer sheet of packaging material, for producing sealed packages of pourable food products, which overcomes one or more of the aforementioned drawbacks. Also, it is aim of the present invention to provide a sealed package of pourable food product which overcomes one or more of the aforementioned drawbacks.

[0012] These aims are fully achieved by the multilayer sheet of packaging material and by the sealed package according to the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] Two non-limiting embodiments of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 illustrates a cross-sectional view of a multilayer sheet of packaging material according to the present disclosure;
Figure 2A illustrates a sealed package according to an embodiment of the present disclosure;
Figure 2B illustrates a multilayer sheet of packaging material for producing the sealed package of figure 2A;
Figure 2C illustrates an enlarged detail of Figure 2B;
Figure 3A illustrates a sealed package according to an embodiment of the present disclosure;
Figure 3B illustrates a multilayer sheet of packaging material for producing the sealed package of figure 3A;
Figure 3C illustrates an enlarged detail of Figure 3B;
Figure 4A illustrates a sealed package according to an embodiment of the present disclosure;
Figure 4B illustrates a multilayer sheet of packaging material for producing the sealed package of figure 4A;
Figure 4C illustrates an enlarged detail of Figure 4B;
Figure 5A illustrates a sealed package according to an embodiment of the present disclosure;
Figure 5B illustrates a multilayer sheet of packaging material for producing the sealed package of figure 4A;
Figure 5C illustrates an enlarged detail of Figure 5B;
Figure 6A illustrates a sealed package according to an embodiment of the present disclosure;
Figure 6B illustrates a multilayer sheet of packaging material for producing the sealed package of figure 6A;
Figure 6C illustrates an enlarged detail of Figure 6B;
Figures 7-10 illustrate respective details of a multilayer sheet of packaging material according to further embodiments of the present disclosure.

BEST MODES FOR CARRYING OUT THE INVENTION

[0014] Number 1 indicates as a whole a sealed package for pourable food products, which is made of multilayer sheet packaging material M and is designed to receive an opening device for outpouring the pourable food product. In particular, the sealed package 1 is designed to receive a re-usable opening device on a top portion or top wall of package 1. Preferably, the opening device includes a cutter configured to rupture a pre-laminated opening 12 so as to define a pour opening.

[0015] In a non-limiting example, opening device is of the type described in EP3260386A1. It should also be noted that other opening devices may be used. In particular, re-usable opening device may be used, which are applicable to the sealed package by the final consumer and are removable once the package is empty, to be applicable to another package.

[0016] Package 1 may be a parallelepiped- or prismatic-shaped packages, or a "gable-top" package. According to a non-limiting embodiment, package 1 has the parallelepiped shape described in WO2015/169656A1.

[0017] With reference to 2A, 3A, 4A, 5A, 6A, package 1 comprises a quadrilateral (in particular, rectangular or square) top wall 5, a quadrilateral (in particular, rectangular or square) bottom wall 6, four lateral walls 7, extending between top wall 5 and bottom wall 6. The opening device is configured to be applied to the top wall 5. Preferably, package 1 comprises a transversal sealing line 8 across the top wall 5 and a further transversal sealing line, not visible in the figures, across the bottom wall 6. Preferably, package 1 comprises a longitudinal sealing line 9 perpendicular to the transversal sealing line 8.

[0018] The packaging material M for producing the sealed package 1 has a multilayer structure comprising at least one base layer 10, e.g. made of paper, configured for imparting stiffness, and a plurality of lamination layers 11 applied to and covering both sides of base layer 10.

[0019] In the example shown, lamination layers 11 include a layer 11a made of oxygen-barrier material, e.g. an aluminum foil, and a number of layers 11b of heat-seal plastic material covering both sides of both base layer 10 and layer 11a. In other words, the packaging material comprises, in succession and from the side eventually forming the inside of package 1, a layer 11b of heat-seal plastic material, a layer 11a of oxygen-barrier material, another layer 11b of heat-seal plastic material, base layer 10, and another layer 11b of heat-seal plastic material.

[0020] The inner layer 11b of heat-seal plastic material contacting the food product, in use, may, for example, be made of strong, in particular, high-stretch, metallocene-catalyzed, low-linear-density (LLD) polyethylene.

[0021] Normally, layers 11b of heat-seal plastic material are laminated on the base layer 10 and/or oxygen-barrier material layer 11a in a melted state, with successive cooling.

[0022] As a possible alternative, at least the inner layers of plastic material 11b may be provided as prefabricated films, which are laminated on base layer 10 and/or oxygen-barrier material layer 11a; this technique allows to reduce any risk of formation of holes or cracks at or around removable portion during the forming operations for producing sealed package 1.

[0023] Preferably, said plurality of lamination layers 11 includes at least a first lamination layer applied to a first side of the base layer 10 and a second lamination layer 11 applied to a second side of the base layer 11. For example, the first lamination layer may include said oxygen-barrier layer 11a and/or one heat-seal plastic material layer 11b; the second lamination layer may include another heat-seal plastic material layer 11b. At the pre-laminated opening 12, the first lamination layer and the

second lamination layer are sealed together.

[0024] Figures 2B, 3B, 4B, 5B, 6B show a basic unit of packaging material M, by which to produce package 1, and which may be a precut blank, or a portion of a web of packaging material M comprising a succession of units.

[0025] In the first case, the basic unit is folded on a known folding spindle (not shown), is filled with the food product, and is sealed at the top to form package 1. In the second case, the web of packaging material, comprising a succession of basic units, is: folded into a cylinder to form a vertical tube; filled continuously with the food product; and sealed transversely and cut into basic units, which are then folded to form respective packages 1.

[0026] Said packaging material M comprises a plurality of folding lines (or crease lines) 15 configured to define an edge between two adjacent walls of the sealed package 1 formed by folding and sealing the packaging material M. In particular, each basic unit of packaging material M has a crease pattern, i.e. a number of folding lines (or crease lines) 15, along which the packaging material M can be folded to form the finished package 1. Preferably, the folding lines 15 are obtained by pressing the base layer 10 between a pair of tools such that the base layer 10 is locally deformed, prior to coupling the base layer 10 with the lamination layers 11.

[0027] In the example shown, crease pattern comprises first folding lines, extending horizontally, second folding lines, extending vertically (i.e. perpendicularly to the first fold lines), and third folding lines, sloping (at an acute angle) with respect to first and second fold lines. Folding lines 15 define, in known manner, the edges between the various walls of the formed package 1.

[0028] The packaging material M further comprises a pre-laminated opening 12 which is formed by a through slot provided in said base layer 10 and covered by one or more of said lamination layers 11. The pre-laminated opening 12 is configured to receive an opening device (in particular, a re-usable opening device) for outpouring the pourable food product from the package 1. The pre-laminated opening 12 is configured to be ruptured by a cutter of the opening device, so as to define a pour opening. In particular, under the action of a cutter of the opening device, the removable portion can be detached partly from the rest of packaging material M so to define the pour opening.

[0029] Preferably, the pre-laminated opening 12 is formed on packaging material M prior to folding and sealing the packaging material M to form the package 1. Preferably, the pre-laminated opening 12 is not intersected by any one of said folding lines 15. In other words, the folding lines 15 are at a distance from the pre-laminated opening 12. As a consequence, in the formed package 1, the pre-laminated opening 12 is completely included in the top wall 5 and does not extend in any one of the lateral walls 7.

[0030] Preferably, the pre-laminated opening 12 includes an outer rim 120 extending between a first end 120a and a second end 120b distanced from the first end 120a. The outer rim 120 is arc-shaped (or curved) so as to define a first portion C11 of a first circumference C1.

[0031] The curved arc-shape of the outer rim of the pre-laminated opening is useful in order to provide a guidance for rotating the cutter of the opening device during insertion of the opening device through the opening, to define a pouring hole. Through said rotation of the cutter, the rupture of the pre-laminated opening is precisely controlled such that the opening device can tightly adhere to the packaging material M. Furthermore, the fact that the first end 120a is distanced from the second end 120b, so that the outer rim defines only a portion of a circumference, is useful to avoid that small parts of the packaging material M fall into the container during insertion of the opening device.

[0032] In one or more embodiments, illustrated in Figures 2C, 3C, 4C, 5C, 6C, 10, the first end 120a and the second end 120b of the outer rim 120 are located along the first circumference C1. So, said first portion C11 of the first circumference C1 is defined (or extends) between the first end 120a and the second end 120b outer rim 120, i.e. from the first end 120a to the second end 120b of the outer rim 120.

[0033] In other embodiments, illustrated in figures 7, 8, 9, the first end 120a and/or the second end 120b of the outer rim 120 are located outside the first circumference C1. In these cases, the outer rim 120 extends partially along the first circumference C1 and partially outside the first circumference C1.

[0034] Preferably, the multilayer sheet of packaging material M comprises a line of weakness 13 in said base layer 10. Preferably, the line of weakness 13 extends from the pre-laminated opening 12. In particular, the line of weakness 13 extends from the first end 120a and/or the second end 120b of the outer rim 120 of the pre-laminated opening 12.

[0035] Preferably, the line of weakness 13 extends at least partially along a second portion C12 of the first circumference C1. Preferably, the first portion C11 of the first circumference C1 (including the outer rim 120) does not overlap with the second portion C12 of the first circumference C1 (including the line of weakness 13).

[0036] According to some embodiments, the first portion C11 of the first circumference C1 (including the outer rim 120) is longer than the second portion C12 of the first circumference C1 (including the line of weakness 13). According to some other embodiments, the first portion C11 of the first circumference C1 (including the outer rim 120) is shorter than the second portion C12 of the first circumference C1 (including the line of weakness 13).

[0037] According to some non-limiting embodiments, the first circumference C1 includes: the first portion C11, having the outer rim 120 of the pre-laminated opening 12, the second portion, having the line of weakness 13, and a third portion which is free of both the outer rim 120 of the pre-laminated opening 12 and the line of weakness

13.

[0038] According to some non-limiting embodiments illustrated in Figures 2C and 6C, the base layer 10 is at least partially cut along said line of weakness 13. In particular, the line of weakness 13 has a depth in said base layer 10 that is smaller than a thickness of the base layer 10. In particular, the base layer 10 is cut dotted along said line of weakness 13.

[0039] According to some non-limiting embodiments illustrated in Figures 3C, 7, 9, the base layer 10 is creased along said line of weakness 13. Preferably, the creasing defining the line of weakness 13 is obtained by pressing the base layer 10 between a pair of tools such that the base layer 10 is locally deformed, prior to coupling the base layer 10 with the lamination layers 11.

[0040] The line of weakness 13 provides a guidance for the opening device during first aperture of the package 1. In particular, the opening device is inserted through the pre-laminated opening 12 such that the lamination layers 11 covering the pre-laminated opening 12 are ruptured so to form the pouring hole. Furthermore, the pouring hole is enlarged by also rupturing the base layer 10 along the line of weakness 13. In such a way, the formation of the pouring hole is finely controlled, and the final size and shape of the pouring hole are finely predictable. As a result, the opening device will tightly adhere to the packaging material M.

[0041] According to one or more embodiments, illustrated in figures 2C, 3C, 4C, 5C, 6C, 7, 8, 9 the pre-laminated opening 12 includes an arc-shaped inner rim extending along a second circumference C2. The second circumference C2 is smaller than the first circumference C1. The pre-laminated opening 12 is at least partially delimited by the inner rim of the second circumference C2 and by the outer rim 120 of the first circumference C1.

[0042] Preferably, the first circumference C1 and the second circumference C2 have a common center. Hence, the inner rim of the second circumference C2 and the outer rim 120 of the first circumference C1 are parallel to each other. In other embodiments, the first circumference C1 and the second circumference C2 have different centers, such that the inner rim of the second circumference C2 and the outer rim 120 of the first circumference C1 are not parallel to each other.

[0043] In particular, in these embodiments, the pre-laminated opening 12 is C-shaped. Hence, the pre-laminated opening 12 partially surrounds a central portion of base layer. The C-shape is particularly useful to provide enhanced robustness to the pre-laminated opening 12, in order to avoid that it is inadvertently ruptured during transportation.

[0044] According to an alternative embodiment illustrated in Figure 10, the pre-laminated opening 12 is delimited by the arc-shaped outer rim 120, extending along the first portion C11 of the first circumference C1 from the first end 120a to the second end 120b, and by a line connecting the first end 120a to the second end 120b internally to the first circumference C1. Preferably, the line of weakness 13 extends along the first circumference C1 in the second portion C12 not having the outer rim 120.

[0045] According to one or more embodiment, the packaging material M includes an additional pre-laminated opening (not shown in the figures) which is formed by an additional through slot provided in said base layer 10 and covered by one or more of said lamination layers 11. The additional pre-laminated opening is configured to receive a straw connected to the opening device. Said straw is configured to allow air to exit the package 1 during outpouring of the liquid food product through the pre-laminated hole and the opening device coupled thereto. Preferably, said additional pre-laminated opening is shaped as a circle. Preferably, the pre-laminated opening 12 and the additional pre-laminated opening are located in an area of the sheet not crossed by any folding lines 15; as a consequence, the pre-laminated opening 12 and the additional pre-laminated opening will both be included in the top wall 5 of the formed package 1.

[0046] According to an embodiment, shown in Figure 8, the packaging material M includes a further pre-laminated opening 16 which is formed by a further through slot provided in said base layer 10 and covered by one or more of said lamination layers 11. The further pre-laminated opening 16 cooperates with the pre-laminated opening 12 to surround the central portion of the base layer 10 (which is useful to provide enhanced robustness to the pre-laminated opening 12) . Preferably, the pre-laminated opening 12 and the further pre-laminated opening are located in an area of the sheet not crossed by any folding lines 15; as a consequence, the pre-laminated opening 12 and the additional pre-laminated opening will both be included in the top wall 5 of the formed package 1. It is noted that the further pre-laminated opening 16 can be provided in combination with, or in addition to, said additional pre-lamination opening configured to receive the straw.

Claims

1. A multilayer sheet of packaging material (M) for producing a sealed package (1) of a pourable food product, said packaging material (M) comprising:

   - at least one base layer (10) for imparting stiffness;
   - a plurality of lamination layers (11) applied to and covering both sides of said base layer (10);
   - a pre-laminated opening (12) which is formed by a through slot provided in said base layer (10) and covered by one or more of said lamination layers (11), said pre-laminated opening (12) being configured to receive an opening device for outpouring the pourable food product;
   - a plurality of folding lines (15) configured to define an edge between two adjacent walls of a sealed package formed by folding and sealing

the packaging material (M), wherein the pre-laminated opening (12) is not intersected by any one of said folding lines (15),

wherein the pre-laminated opening (12) includes an outer rim (120) extending between a first end (120a) and a second end (120b) distanced from the first end (120a), wherein the outer rim (120) is arc-shaped so as to define a first portion (C11) of a first circumference (C1),
wherein the pre-laminated opening (12) includes an arc-shaped inner rim extending along a second circumference smaller than the first circumference,
characterized in that the pre-laminated opening (12) is C-shaped.

2. A multilayer sheet of packaging material (M) according to claim 1, wherein the first end (120a) and the second end (120b) of the outer rim (120) are located along the first circumference, so that said first portion of the first circumference is defined from the first end (120a) to the second end (120b) of the outer rim (120).

3. A multilayer sheet of packaging material (M) according to claim 1 or 2, further comprising a line of weakness (13) in said base layer (10), wherein the line of weakness (13) extends from the pre-laminated opening (12).

4. A multilayer sheet of packaging material (M) according to claim 3, wherein the line of weakness (13) extends from the first end (120a) and/or the second end (120b) of the outer rim (120) of the pre-laminated opening (12) .

5. A multilayer sheet of packaging material (M) according to claim 3 or 4, wherein the line of weakness (13) extends along a second portion (C12) of the first circumference (C1).

6. A multilayer sheet of packaging material (M) according to claim 5, wherein the first portion (C11) of the first circumference (C1) is as long as or longer than the second portion (C12) of the first circumference (C1).

7. A multilayer sheet of packaging material (M) according to claim 5 or 6, wherein the first circumference (C1) includes: the first portion (C11), having the outer rim (120) of the pre-laminated opening (12), the second portion (C12), having the line of weakness (13), and a third portion which is free of both the outer rim (120) of the pre-laminated opening (12) and the line of weakness (13).

8. A multilayer sheet of packaging material (M) according to any one of previous claims 3 to 7, wherein the base layer (10) is at least partially cut along said line of weakness (13).

9. A multilayer sheet of packaging material (M) according to claim 8, wherein the line of weakness (13) has a depth in said base layer (10) that is smaller than a thickness of the base layer (10)

10. A multilayer sheet of packaging material (M) according to claim 8 or 9, wherein the base layer (10) is cut dotted along said line of weakness (13).

11. A multilayer sheet of packaging material (M) according to any one of previous claims 3 to 10, wherein the base layer (10) is creased along said line of weakness (13).

12. A multilayer sheet of packaging material (M) according to any one of the previous claims, wherein said plurality of lamination layers (11) includes a first lamination layer applied to a first side of the base layer (10) and a second lamination layer (12) applied to a second side of the base layer (11), wherein at the pre-laminated opening (12) the first lamination layer and the second lamination layer are sealed together.

13. A sealed package for pourable food products, formed by folding and sealing a packaging material (M) as claimed in any one of the previous claims, and configured to receive an opening device for outpouring the pourable food product, wherein the pre-laminated opening (12) is configured to be ruptured by a cutter of the opening device, so as to define a pour opening.

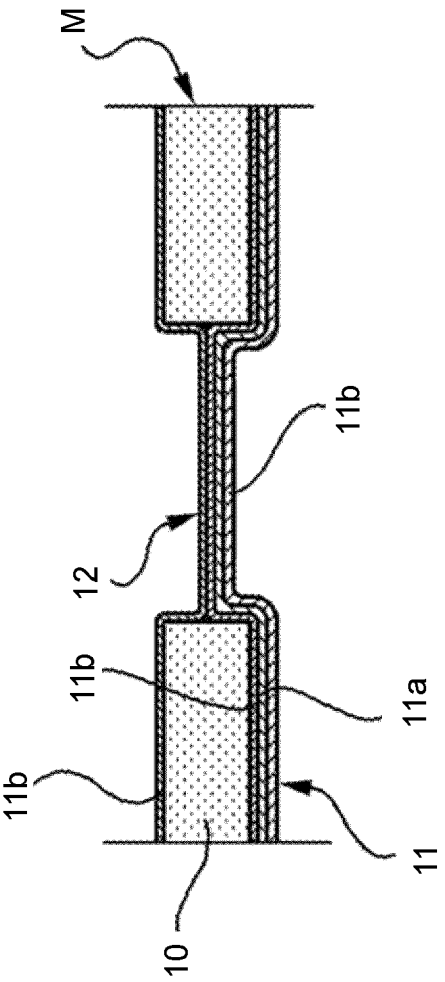

FIG. 1

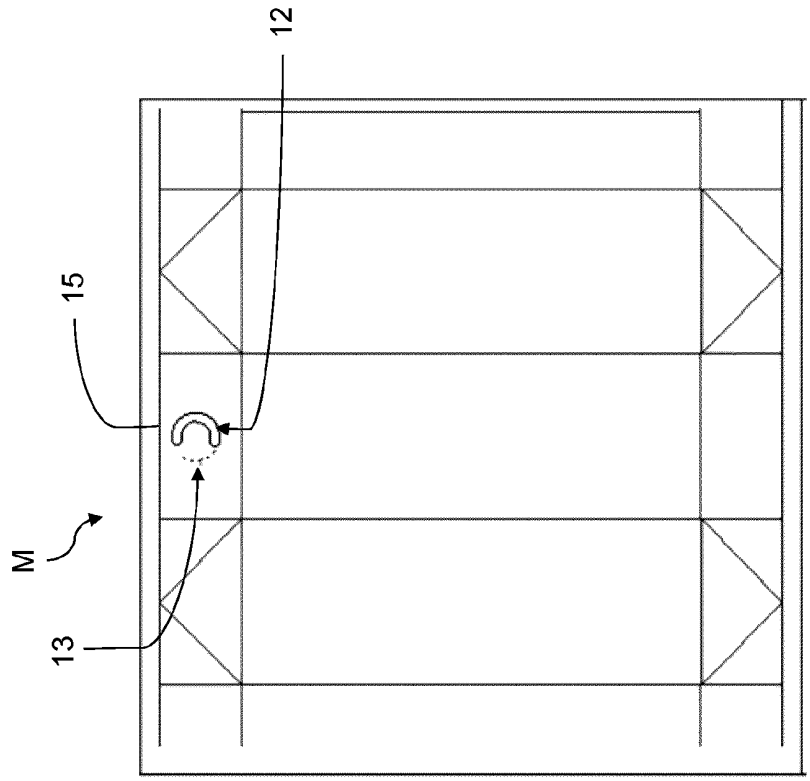

FIG. 2B

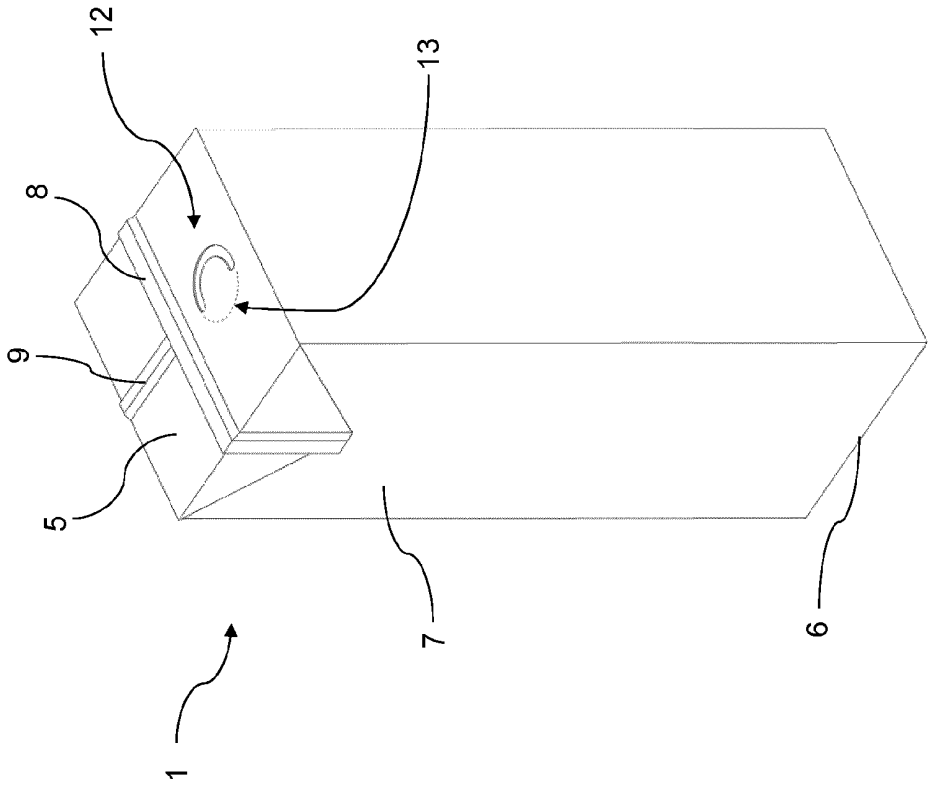

FIG. 2A

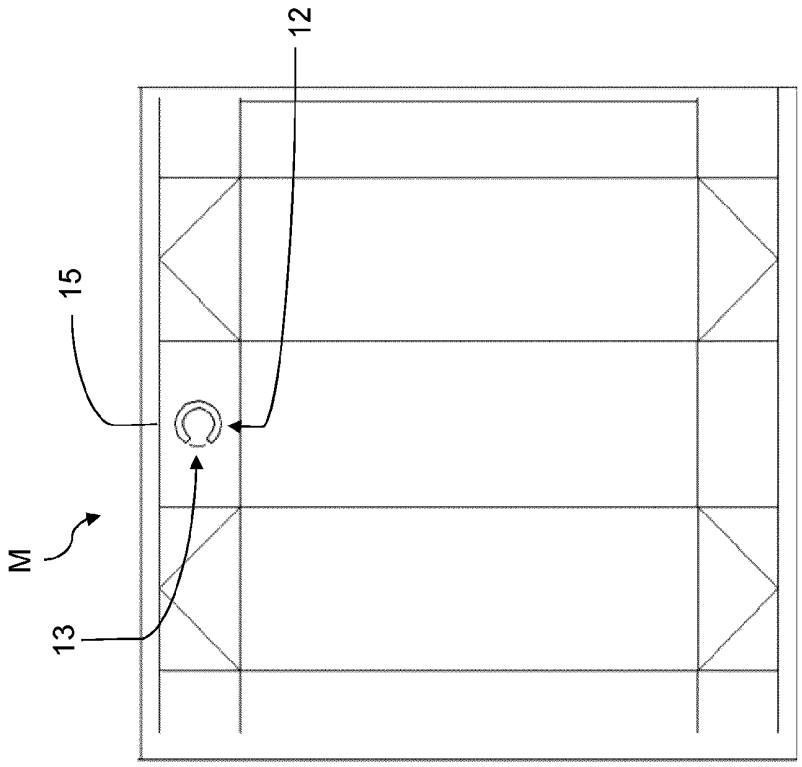

FIG. 3B

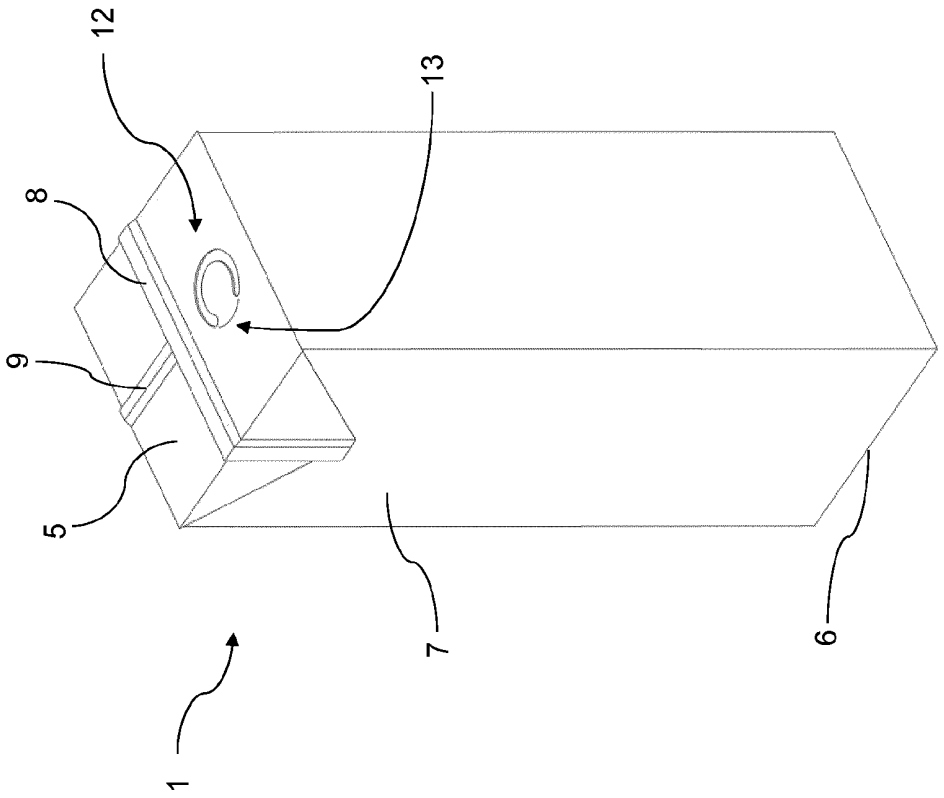

FIG. 3A

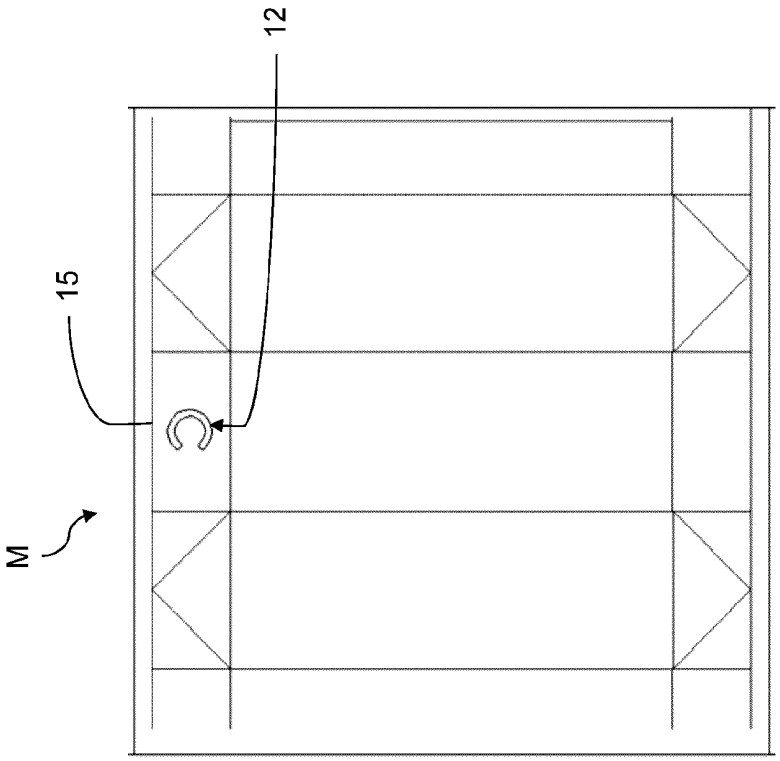

FIG. 4B

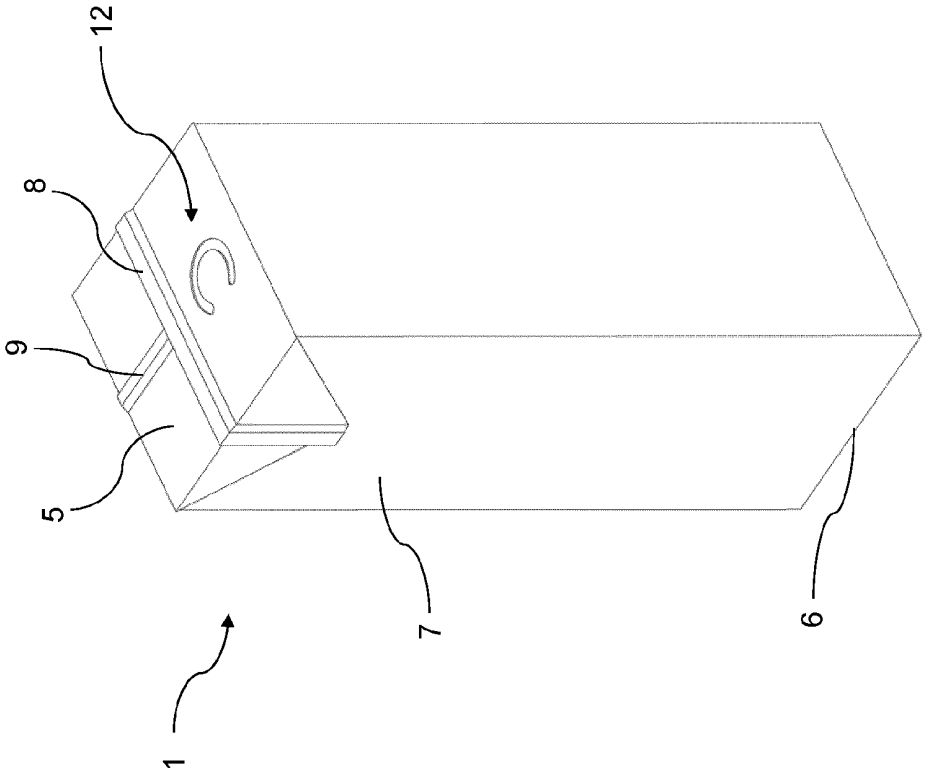

FIG. 4A

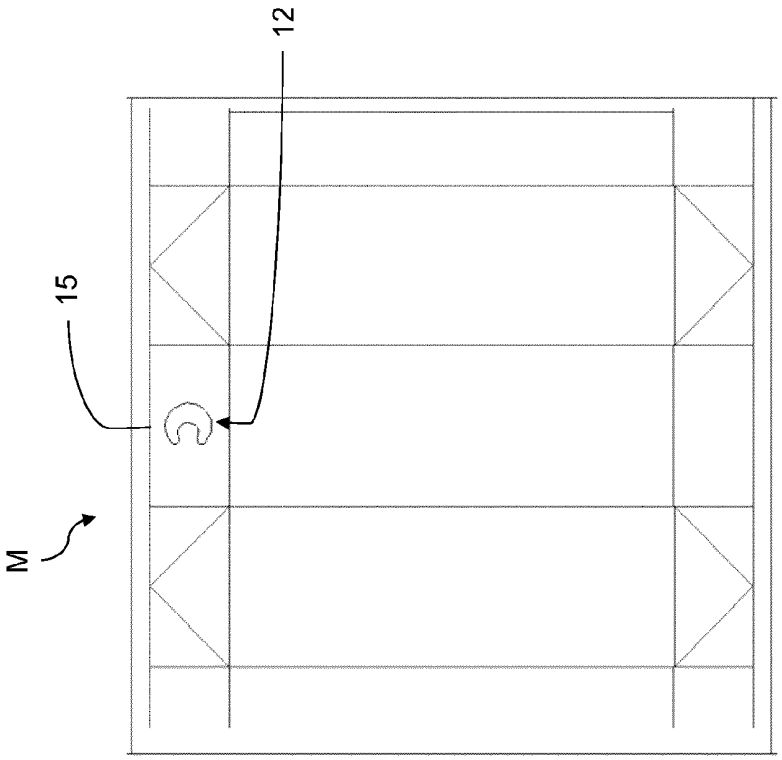

FIG. 5B

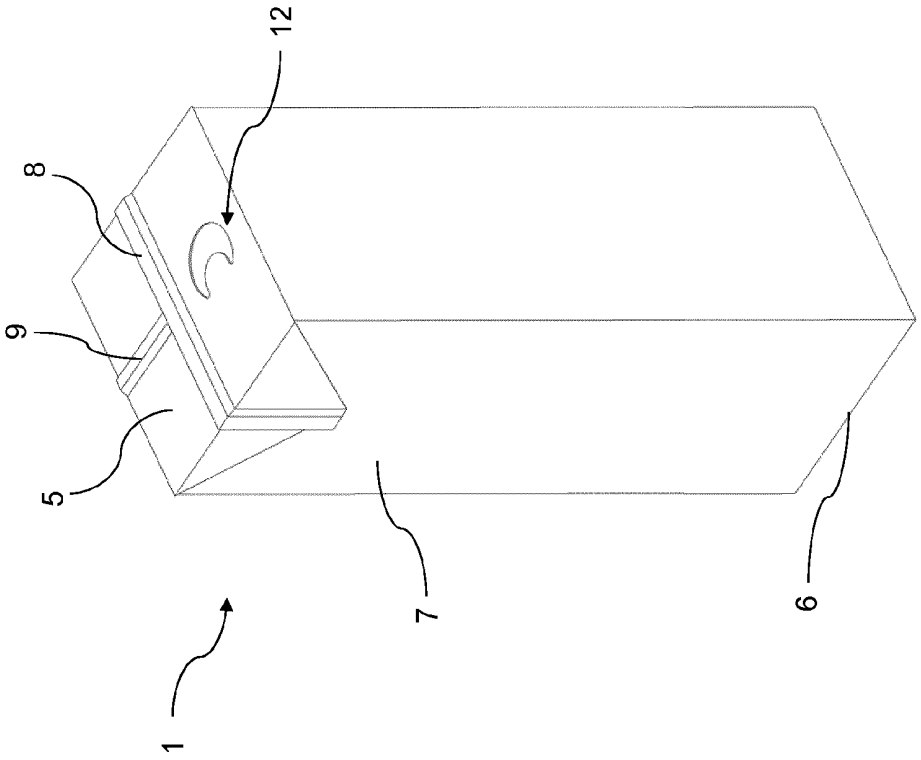

FIG. 5A

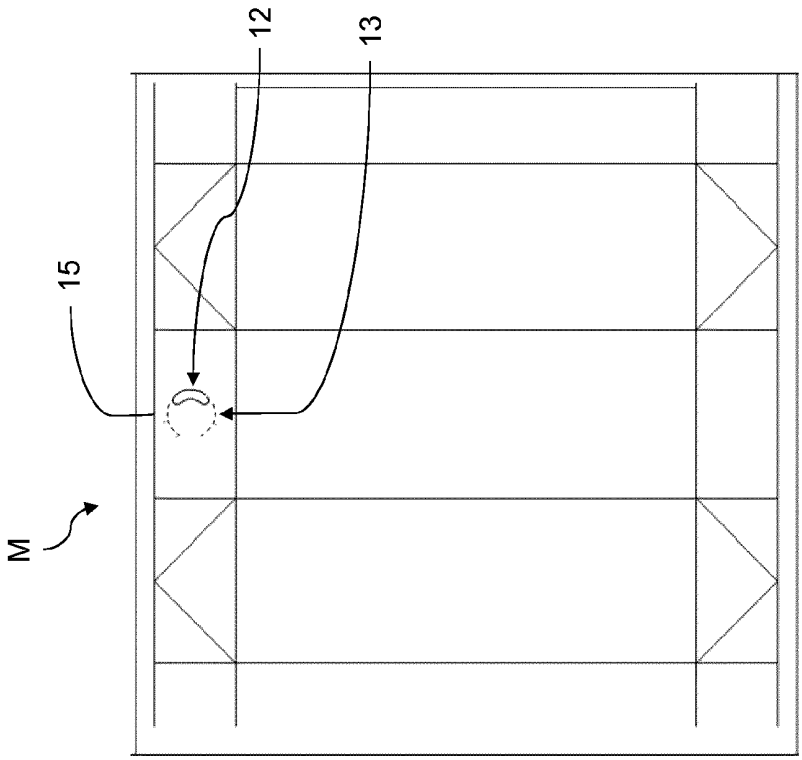

FIG. 6B

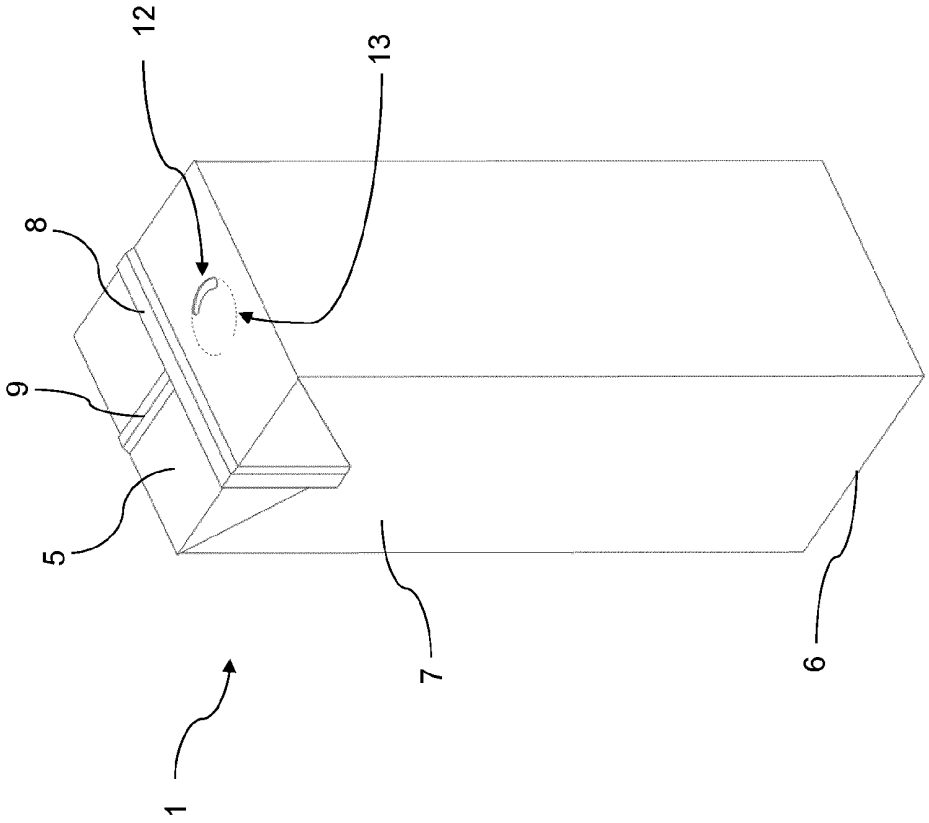

FIG. 6A

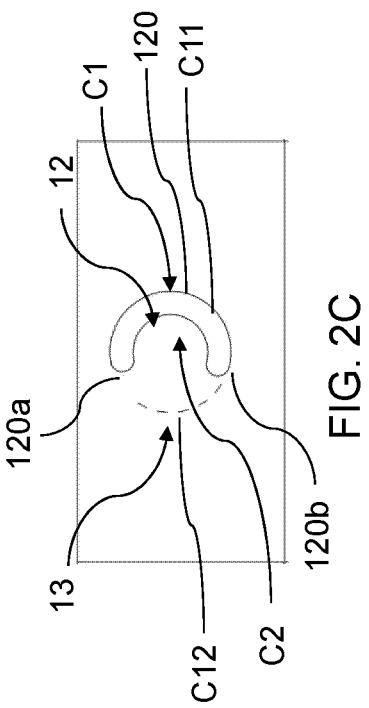

FIG. 2C

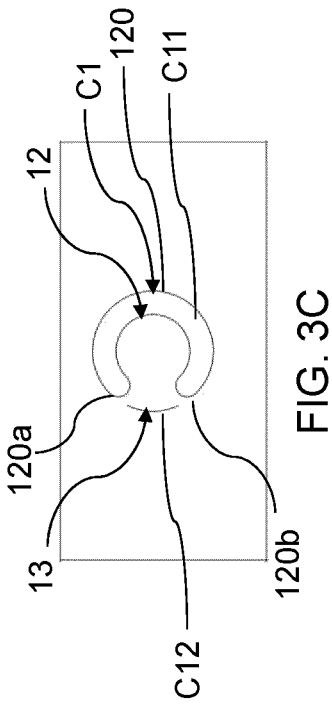

FIG. 3C

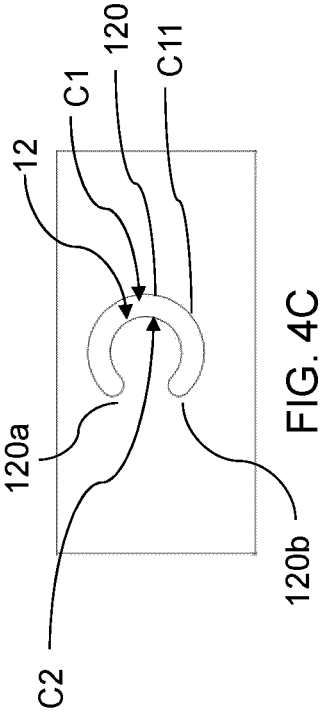

FIG. 4C

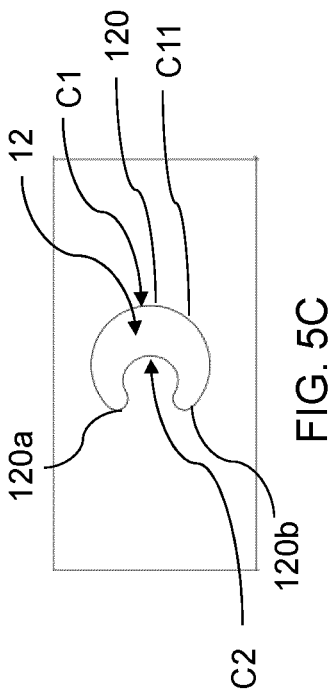

FIG. 5C

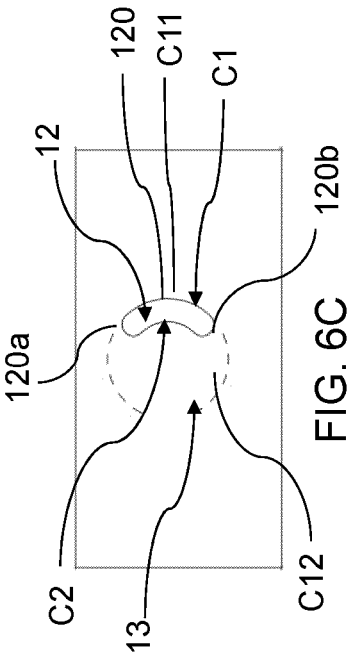

FIG. 6C

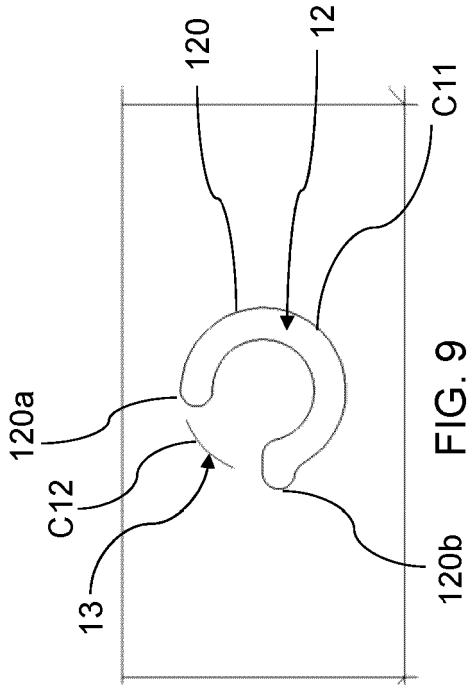

FIG. 9

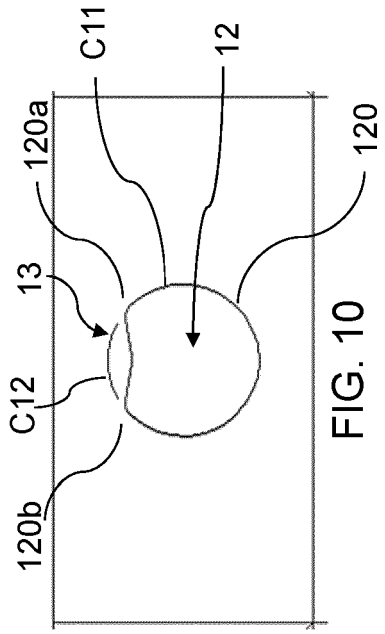

FIG. 10

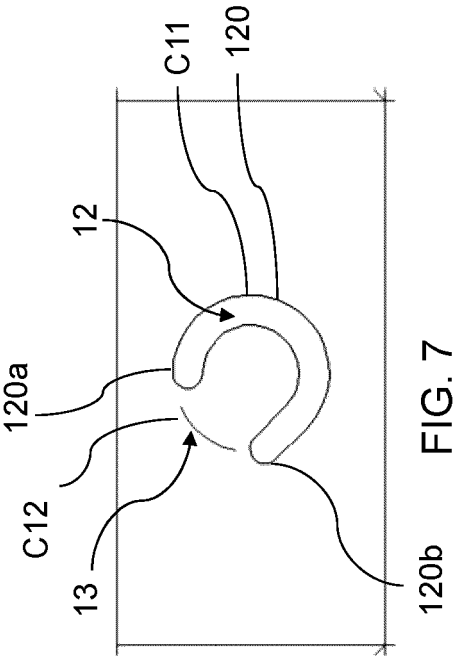

FIG. 7

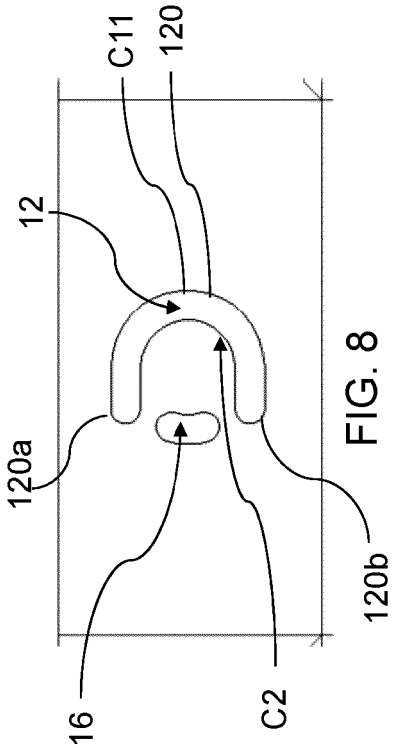

FIG. 8

REFERENCES CITED IN THE DESCRIPTION

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