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(54) **TAMPER-EVIDENT COUPLING SYSTEM, PROCESS OF MAKING SAID COUPLING SYSTEM, CONTAINER COMPRISING SAID COUPLING SYSTEM AND USE THEREOF**

(57) The present invention relates to a tamper-evident coupling system (1) comprising: a first base portion (11), a second base portion (12), a first coupling portion (13) borne by the first base portion (11), a second coupling portion (14) borne by the second base portion (12). The first and second coupling portions (13, 14) are configured for defining an arming condition in which they are firmly engaged with each other; wherein at least one of the first and second coupling portions (13, 14) comprises a weakening element (26) configured for defining a removable portion (15) configured for separating from the coupling system following a first disengagement condition of said first and second coupling portion (13, 14) subsequent to the arming condition to prevent a subsequent coupling of said coupling portions (13, 14). The coupling system (1) comprises a through opening defined on the second base portion (12) configured for enabling to display, at least during the arming condition of the coupling system (1), of at least part of the weakening element (26). The present invention also relates to a process for making the coupling system, a container comprising said coupling system as (1) well as a use of the latter.

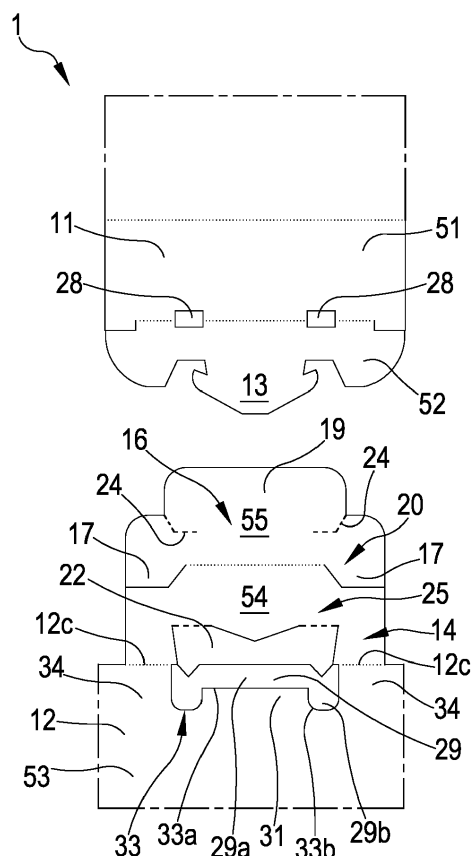


FIG.1

Description

FIELD OF THE INVENTION

[0001] The present invention relates to a tamper-evident coupling system and a process for making the same. The present invention further relates to a container comprising said coupling system and a use of said coupling system for containers, packaging, envelopes and/or bands for the containment and/or wrapping of products of various kinds. The coupling system may find application in all the fields providing for the packaging of products and requiring a degree of security which enables showing a possible tampering of the package. For example, the coupling system may be employed in the fields of packaging, communication (for example, for postal services), transport and logistics.

BACKGROUND OF THE INVENTION

[0002] The employment of packages - made of paper or plastic material - is known, for products of various kinds and equipped with security systems defined as "tamper-evident". In fact, the demand for packaging to ensure to the consumer the integrity of the product is increasing: tamper-evident systems have the purpose of showing a first opening of the package, so as to warn of the danger of possible tampering of the product.

[0003] For example, containers made of paper material are known which use, as tamper-evident system, adhesive labels positioned on the closure of the container and configured for preventing the opening of the latter without the previous removal of the label. Such containers, although equipped with a security system, are certainly more expensive with respect to conventional containers (containers without tamper-evident systems) since they require additional raw materials, such as seals/labels, as well as additional steps for the preparation and application of such elements. However, the adhesive labels do not allow the containers to be effectively made tamper-proof; the labels can easily be removed by removing the same without this operation clearly damaging the package: after opening the container, it is possible to tamper with the contents thereof and replace the same label removed - or a new label - on the closure of the container without the user having evidence of the tampering of the product.

[0004] Given the poor efficacy of the labels described above, tamper-evident containers made of paper material have been manufactured which do not require the application of additional seals to close the container itself.

[0005] A first example, described in patent application BE410524A, relates to a box made of paper material exhibiting a storage provided with an opening delimited by a free edge. The container also has a closing tab engaged on the free edge of the storage and movable by rotation around the latter between a closed condition and an open condition of the container. The closing tab bears a insert-

ing portion adapted to be inserted, in the closed condition of the container, inside the same; on the inserting portion, two folded flaps are defined opposite to each other, joined to the inserting portion by means of a weakened portion.

The container also exhibits a coupling portion defined by a tab integrally joined to the free edge of the storage, V-folded inside the storage itself. On the tab - at the bottom of the "V" shape - a pocket is defined for receiving the coupling portion in the closed condition of the container: the tabs, in the closed condition, the tabs are configured to fit into the pocket and constrain to the coupling portion in such a way as to lock the closure tab to the storage. Upon a first open condition of the container, the flaps are configured for detaching from the inserting portion.

[0006] The container described in the aforementioned application is an improvement with respect to the seal systems described above, at least in relation to product costs. However it is noted that the tamper-evident safety system of the application BE410524A does not allow clear evidence if the container has been previously tampered with: the user must be able to notice the container tampering only on the basis of the perceived resistance which opposes the opening of the container.

[0007] A second example, described in patent application WO2015170203A1 of the same Applicant, relates to a tamper-evident container of sheet material exhibiting a storage provided with an opening delimited by a free edge. The container comprises a closing system associated to the free edge of the storage and movable by rotation around the latter between a closed condition and an open condition of the container. The container comprises a security device exhibiting a first coupling portion associated with the closing system and a second coupling portion arranged inside the storage; the first and the second coupling portions are configured for engaging under a first closed condition of the container. The security device further comprises a removable portion defined by at least one between said first and second coupling portions; the removable portion is configured for breaking and separating from the container under a first opening condition of the latter immediately following the first closed condition. A through opening is present on the storage, enabling the display of the removable portion. The solution described in application WO2015170203A1 is an improvement with respect to the previous solutions described above, since - in addition to enabling an effective closure of the container without the use of additional seals - it is capable of clearly showing the occurred tampering of the container by virtue of the presence of the through opening on the storage, through which the lack of the removable portion of the security device may be immediately identified.

[0008] However, the Applicant has noted that the tamper-evident security devices known today - although widely used - may be further improved.

OBJECT OF THE INVENTION

[0009] The object of the present invention therefore is to substantially solve the drawbacks and/or limitations of the above prior art.

[0010] A first object of the present invention is to provide a coupling system which can ensure a rapid and effective visual verification by the user of the integrity or tampering of the coupling system itself.

[0011] A further object of the invention is to provide a tamper-evident coupling system having a tamper-evident security system which is easily armable (activatable) under a first closed condition thereof. It is a further object of the invention to provide a coupling system of simple and rapid manufacturing, which enables reducing product and production costs to a minimum.

[0012] It is an additional object to provide a coupling system which is flexible in the use thereof, which may be effectively employed on different types of products, such as, for example, containers of sheet material (both made of paper and plastic), envelopes, product wrapping bands. An additional object is to facilitate and make the activation step of the coupling system more reliable during the automatic implementation process.

[0013] One or more of the objects described above and which will become more apparent in the course of the following description are substantially achieved by a tamper-evident coupling system, a manufacturing process and a use of the coupling system itself according to one or more of the accompanying claims and/or of the following aspects, taken alone or in any combination thereof or in combination with any one of the accompanying claims and/or in combination with any of the further aspects or features described below.

SUMMARY

[0014] A 1st aspect provides for a tamper-evident coupling system (1) comprising:

- at least a first base portion (11) of sheet material, optionally extending in thickness between a first and a second surface (11a, 11b),
- at least a second base portion (12) also made of sheet material, optionally extending in thickness between a respective first and a second surface (12a, 12b),
- at least a first coupling portion (13) carried by the first base portion (11),
- at least a second coupling portion (14) carried by the second base portion (12) and configured for cooperating with said first coupling portion (13), optionally said second coupling portion (14) being facing and at least partly in

contact with the second surface (12b) of the second base portion (12),
the first and the second coupling portions (13, 14) being

configured for defining at least one arming condition in which said first and second coupling portions (13, 14) are stably engaged with each other,

- wherein at least one between the first and the second coupling portions (13, 14) comprises at least one weakening element (26) configured for defining, on at least one of said first and second coupling portions (13, 14), at least one removable portion (15), said removable portion (15) being configured for separating from the coupling system (1) following a first disengagement condition of said first and second coupling portions (13, 14) following said arming condition for preventing a subsequent coupling of said first and second coupling portions (13, 14), to show evidence of tampering with the coupling system (1),

wherein the coupling system (1) comprises at least one through opening (29) defined on the second base portion (12) configured for enabling to display - through the through opening (29) itself and at least during the arming condition of the coupling system (1) - at least part of the weakening element (26).

[0015] In a 2nd aspect according to the preceding aspect, the through opening (29) enables displaying - through the through opening (29) itself and at least during the arming condition of the coupling system (1) - at least part of the removable portion (15).

[0016] In a 3rd aspect according to any one of the preceding aspects, the through opening (29) is configured for enabling the display of at least a part of the weakening element (26) according to a front perspective with respect to the first surface (12a) of the second base portion (12).

[0017] In a 4th aspect according to any one of the preceding aspects, the second base portion (12) comprises an end portion (34) delimited by a perimetral edge (12c), wherein the through opening (29) is defined on said end portion (34) of said second base portion (12).

[0018] In a 5th aspect according to any one of the preceding aspects, wherein:

- the through opening (29) is delimited by a cut edge (33) defined on the second base portion (12) and defining on this latter a depression from the perimetral edge (12c), in particular said cut edge (33) extending seamlessly from the perimetral edge (12c) for defining, on said second base portion, said at least one depression, optionally said depression exhibiting an open outline; or
- the through opening (29) is delimited by at least one closed outline spaced from the perimetral edge (12c) of the second base portion (12).

[0019] In a 6th aspect according to any one of the preceding aspects, wherein the through opening (29) is delimited by a cut edge (33) defined on the second base portion (12) and defining on this latter a depression from the perimetral edge (12c), optionally said cut edge (33) extending seamlessly from the perimetral edge (12c) for defining, on said second base portion, said at least one

depression, optionally said depression exhibiting an open outline, optionally the depression defined by the through opening (29) comprising at least one first and at least one second depression (29a, 29b).

[0020] In a 7th aspect according to the preceding aspect, the first depression (29a) enables displaying the removable portion (15), optionally said first lowering depression (29a) enables displaying of the removable portion (15) according to a front perspective with respect to the first surface (12a) of the second base portion (12),

[0021] In an 8th aspect according to the 6th or 7th aspect, the second depression (29b) enables displaying the weakening element (26), optionally said second depression (29b) enables displaying the weakening element (26) according to a front perspective with respect to the first surface (12a) of the second base portion (12).

[0022] In a 9th aspect according to any one of the aspects from the 6th to the 8th, the first depression (29a) faces - at least in the arming condition of the coupling system (1) - to the removable portion (15).

[0023] In a 10th aspect according to any one of the aspects from the 6th to the 9th, the second depression (29b) faces - at least in the arming condition of the coupling system (1) - to the weakening element (26).

[0024] In an 11th aspect according to any one of the aspects from the 6th to the 10th, the first and second depressions (29a, 29b) are respectively delimited at a bottom portion by a first and a second bottom segment (33a, 33b) of the cut edge (33), said first bottom segment (33a) determining - with respect to the perimetral edge (12c) - a depth of the first depression (29a) while said second bottom segment (33b) determining - with respect to the perimetral edge (12c) - a depth of the second depression (29b), in which the maximum depth of the first depression (29a) is less than the maximum depth of the second depression (29b).

[0025] In a 12th aspect according to any one of the aspects from the 6th to the 11th, the first and second depressions (29a, 29b) are in communication with each other to define a single access passing through the second base portion (12).

[0026] In a 13th aspect according to any one of the aspects from the 6th to the 12th, the through opening (29) comprises two second depressions (29b) opposite each other with respect to the first depression (29a).

[0027] In a 14th aspect according to any one of the preceding aspects, the coupling system (1) comprises at least one supporting portion (16) facing - at least in the arming condition of the coupling system (1) - the second coupling portion (14), wherein the supporting portion (16) is configured - at least during an initial step of contact between the first and the second coupling portions (13, 14) of the coupling system (1) preceding the arming condition - for sustaining at least part of said second coupling portion (14).

[0028] In a 15th aspect according to the preceding aspect, the supporting portion (16) is constrained to at least one of the second base portion (12) and the second cou-

pling portion (14).

[0029] In a 16th aspect according to the fourteenth or fifteenth aspect, the supporting portion (16) comprises a reciprocal coupling portion (17) overlapping and stably fastened to at least a respective reciprocal coupling portion (18) of at least one selected between the second base portion (12) and the second coupling portion (14).

[0030] In a 17th aspect, according to the preceding aspect, the supporting portion (16) comprises a thrusting portion (19) emerging from the reciprocal coupling portion (17) of the same supporting portion (16), said thrusting portion (19) being configured for receiving against it, to sustain it, the second coupling portion (14).

[0031] In a 18th aspect, according to the preceding aspect, the thrusting portion (19) being movable, in particular rotatably, with respect to the reciprocal coupling portion (17) of the supporting portion (16) itself.

[0032] In a 19th aspect, according to the seventeenth or the eighteenth aspect, the thrusting portion (19) is not directly constrained to the first coupling portion (13), to the second coupling portion (14), to the first base portion (11) and to the second base portion (12).

[0033] In a 20th aspect, according to any one of the aspects from the 17th to the 19th, the thrusting portion (19) and the reciprocal coupling portion (17) of the supporting portion (16) are integrally joined defining a tab of sheet material.

[0034] In a 21st aspect, according to any one of the aspects from the 17th to the 20th, the reciprocal coupling portion (17) of the supporting portion (16) is defined at a bottom area (20) of the supporting portion (16), the thrusting portion (19) emerging from the bottom portion (20) along a longitudinal development trajectory of the supporting portion (16).

[0035] In a 22nd aspect according to any one of the aspects from the 16th to the 21st, the supporting portion (16) comprises at least two reciprocal coupling portions (17) substantially disposed at longitudinally opposite end portions of the supporting portion (16) itself, optionally the two reciprocal coupling portions (17) symmetrically extend with respect to the longitudinal development path.

[0036] In a 23rd aspect according to any one of the aspects from the 16th to the 22nd, the reciprocal coupling portion (17), optionally each reciprocal coupling portion, of the supporting portion (16) is fixed by means of adhesive material, in particular it is glued, to at least one between the second base portion (12) and the second coupling portion (14).

[0037] In a 24th aspect according to any one of the aspects from the 16th to the 23rd, the reciprocal coupling portion (17) of the supporting portion (16) is exclusively and directly engaged, in particular stuck, with the second base portion (12). In a 25th aspect, according to any one of the preceding aspects, the second coupling portion (14) is facing and in contact with the second base portion (12).

[0038] In a 26th aspect, according to any one of the preceding aspects, the first coupling portion (13) - at least

in the arming condition of the coupling system (1) - is facing and in contact with the second coupling portion (14).

[0039] In a 27th aspect according to any one of the aspects from the 14th to the 26th, the second coupling portion (14) is comprised between at least part of the second base portion (12) and at least part of the supporting portion (16).

[0040] In a 28th aspect, according to any one of the preceding aspects, the removable portion (15) comprises at least one undercut portion essentially defining a coupling edge adapted to receive in engagement said first or second coupling portion (13, 14).

[0041] In a 29th aspect according to any one of the preceding aspects, the second coupling portion (14) comprises at least one hook (22) defining at least one undercut portion delimited by a gripping edge (22a), wherein the first wherein the first coupling portion (13) comprises at least one respective hook (23) defining at least one undercut portion delimited by a respective gripping edge (23a), said hooks (22, 23) of the first and second coupling portion (13, 14), being configured to engage stably to each other at least during the arming condition, optionally said hooks (22, 23) - in the arming condition - having respective concavities facing each other.

[0042] In a 30th aspect, according to the preceding aspect, the first coupling portion (13) comprises at least one pair of undercut portions delimited by a respective pair of the gripping edges (23a) and defining two respective hooks (23), said hooks (23) of the first coupling portion (13) - under the arming condition - being configured for engaging with the hook (22) of the second coupling portion (14), optionally the second coupling portion (14) comprising a single undercut portion to define a single hook (22).

[0043] In a 31st aspect according to any one of the preceding aspects, the second base portion (12) comprises a protuberance (31) at least partially facing the second coupling portion (14), said protuberance (31) of the second base portion (12) being configured for inhibiting - at least in the arming condition of the coupling system - the display of the respective undercut portion of the first and second coupling portion (13, 14) with respect to a front perspective to the first surface (12a) of the second base portion (12).

[0044] In a 32nd aspect according to the preceding aspect, said protuberance (31) is configured for inhibiting - at least in the arming condition of the coupling system - at least part of the gripping edge (22a) of the hook (22) of the second coupling portion (14).

[0045] In a 33rd aspect according to the 31st or 32nd aspect, the protuberance (31) delimits at least in part said first and second depression (29a, 29b) of the through opening (29).

[0046] In a 34th aspect according to any one of the aspects from the 14th to the 33rd, the supporting portion (16) is joined in a single piece to the second coupling portion (14).

[0047] In a 35th aspect, according to any one of the preceding aspects, the second base portion (12) is joined in a single piece to the second coupling portion (14).

[0048] In a 36th aspect according to any one of the aspects from the 14th to the 35th, the second coupling portion (14), the second base portion (12) and the supporting portion (16) are reciprocally joined together to define a single sheet, in particular of paper material, folded.

[0049] In a 37th aspect according to any one of the aspects from the 14th to the 36th, the second coupling portion (14) is interposed - at least during the arming condition - between the second base portion (12) and the supporting portion (16).

[0050] In a 38th aspect according to any one of the aspects from the 14th to the 37th, the second coupling portion (14), the second base portion (12) and the supporting portion (16) are obtained by folding a single sheet, in particular of paper material.

[0051] In a 39th aspect, according to any one of the aspects from the 14th to the 38th, the supporting portion (16) comprises a weakening portion (24) configured for enabling the supporting portion (16) to define at least the following operating condition:

- a holding operating condition - defined during an initial step of the arming condition under which the first coupling portion (13) rests against the second coupling portion (14) - in which the weakening portion (24) is intact and enables the supporting portion (16) itself to sustain the second coupling portion (14) limiting the movement thereof,
- a releasing operative condition- defined at least under the arming condition, in which the breaking of the weakening portion (24) occurs, so that the supporting portion (16) may enable a greater movement of the second coupling portion (14) with respect to the holding operative condition,

said weakening portion (24) being configured for enabling the passage of the supporting portion (16) from the holding operative condition to the releasing one during the definition of the arming condition of the coupling system.

[0052] In a 40th aspect, according to the preceding aspect, the supporting portion (16), under the holding operative condition, exerts a pressure on the second coupling portion (14) to increase a flexural stiffness thereof.

[0053] In a 41st aspect according to the 39th or 40th aspect, the second coupling portion (14) comprises a base body (25) which directly carries the hook (22) of the same second coupling portion (14), said hook (22) of the second coupling portion (14) being movable by rotation with respect to said base body (25), wherein the supporting portion (16) - during the holding operative condition - is configured for receiving in support at least the hook (22) of the second coupling portion (14), for limiting a rotation of said hook (22) nearing the supporting portion

(16) itself.

[0054] In a 42nd aspect according to the preceding aspect, the supporting portion (16), during the holding operative condition - is configured to allow an angular displacement of the hook (22) of the second coupling portion (14) that is smaller than 90°, in particular contained between 0° and 70°, still more in particular contained between 0° and 45°; said angular displacement is understood as the relative rotation of the hook (22) considered between an initial position of the hook (22) - previously the holding operative condition - essentially aligned with the base body (25) and a final position that said hook (22) can assume in the holding operative condition.

[0055] In a 43rd aspect, according to any one of the aspects from the 39th to the 42nd, the supporting portion (16), under the releasing operative condition - is configured for enabling an angular displacement of the hook (22) of the second coupling portion (14) greater than the angular displacement enabled under the holding operative condition.

[0056] In a 44th aspect according to any one of the aspects from the 39th to the 43rd, the supporting portion (16) is configured for counteracting the flexion of at least part of the second coupling portion (14) under the holding operating condition, in particular during the engagement step between the first and the second coupling portion (13, 14), optionally the supporting portion (16) is configured for counteracting the flexion of the hook (22) of the second coupling portion (14) under the holding operating condition.

[0057] In a 45th aspect according to any one of the preceding aspects, the removable portion (15) is defined by at least one part of the second coupling portion (14).

[0058] In a 46th aspect, according to any one of the preceding aspects, the removable portion (15) is defined by the hook (22) of the second coupling portion (14).

[0059] In a 47th aspect according to the preceding aspect, the second coupling portion (14) comprises a weakening element (26) delimiting the hook (22) of the same second coupling portion (14) which defines said removable portion (15).

[0060] In a 48th aspect, according to the 46th or 47th aspect, the second coupling portion (14) exhibits a weakening (26), optionally the weakening (26), between the base body (25) and the hook (22) so that said hook (22) can define said removable portion (15).

[0061] In a 49th aspect according to any one of the aspects from the 29th to the 48th, the through opening (29) enables the display - in the arming condition of the coupling system (1) and through the same through opening - of at least part of the hook (22) of the second coupling portion (14), optionally defining said removable portion.

[0062] In a 50th aspect according to any one of the preceding aspects, the through opening (29) enables the display of the weakening element (26) defining the removable portion (15).

[0063] In a 51st aspect according to any one of the aspects from the 41st to the 50st, wherein the through

opening (29) is configured for enabling the display - at least in the arming condition of the coupling system (1) and through the same through opening - of:

- 5 - at least part of the base body (25) of the second coupling portion (14),
- at least part of the hook (22) of said second coupling portion (14),
- 10 - at least a part of the weakening element (26) connected, on one side, to said hook (22) and, on the other side, to said base body (25) of the second coupling portion (14).

[0064] In a 52nd aspect according to any one of the aspects from the 6th to the 51st, the second depression (29b) faces the weakening element.

[0065] In a 53rd aspect according to any one of the aspects from the 6th to the 52nd, the first depression (29a) faces - at least in the arming condition - the first coupling portion (13) or the first base portion (11).

[0066] In a 54th aspect according to any one of the aspects from the 6th to the 53rd, the second depression (29b) is configured for enabling the display - at least in the arming condition of the coupling system (1) and through the second depression itself - of:

- 25 - at least part of the base body (25) of the second coupling portion (14),
- at least part of the hook (22) of said second coupling portion (14),
- 30 - at least a part of the weakening element (26) connected, on one side, to said hook (22) and, on the other side, to said base body (25) of the second coupling portion (14).

[0067] In a 55th aspect according to any one of the aspects from the 13th to the 54th, said two second depressions (29b) are facing the weakening elements (26) which connect the hook (22) to the base body (25) of the second coupling portion (14).

[0068] In a 56th aspect according to any one of the aspects from the 29th to the 55th, the removable portion (15) is defined by at least one part of the first coupling portion (13), optionally the removable portion (15) is defined by the respective hook (23) of the first coupling portion (13).

[0069] In a 57th aspect according to the preceding aspect, the first coupling portion (13) comprises a weakening element (26) delimiting the respective hook (23) of the same first coupling portion (13) which defines said removable portion (15), optionally the first coupling portion (13) has a weakening element (26) between a base body (27) and the respective hook (23) so that the latter can define said removable portion (15).

[0070] In a 58th aspect according to any one of the preceding aspects, the weakening portion (26) of the first or second coupling portion (13, 14) comprises at least one selected from:

- one or more cuts through the sheet material,
- a die-cut of the sheet material,
- a local squashing of the sheet material.

[0071] In a 59th aspect according to any one of the preceding aspects, the first base portion (11) comprises at least one passage opening (28) configured - in the arming condition of the coupling system (1) - for enabling the display of at least part of the removable portion (15).

[0072] In a 60th aspect, according to the preceding aspect, the second coupling portion (14), in particular, the removable portion (15), comprises a projection (30) which is configured for crossing - at least under the arming condition of the coupling system - at least partially, the passage opening (28) of the first base portion (11).

[0073] In a 61st aspect according to any one of the preceding aspects, the first base portion (11) is integrally joined to the first coupling portion (13), said first base portion (11) and the first coupling portion (13) defining a single sheet, for example of paper material, optionally the first coupling portion (13) extends without interruption from the first base portion (11) to define a tab of sheet material.

[0074] In a 62nd aspect a tamper-evident container (100) is provided for, comprising:

- at least one storage (2) of sheet material defining an internal volume (3) and configured for housing products, said storage (2) exhibiting a predetermined number of lateral walls (4) defining at least one passage opening (5) delimited by a free edge (6), said passage opening (5) being configured for putting in communication the internal volume (3) of the storage (2) with the external environment,
- at least one coupling system (1) in accordance with any one of the preceding aspects,

wherein the first base portion (11) is constrained by rotation to the free edge (6) of the storage (2), the first coupling portion (13) is borne by the first base portion (11) so that this latter is interposed between the free edge (6) of the storage (2) and the first coupling portion (13), wherein the first base portion (11) and the first coupling portion (13) are movable, in particular by rotation, relative to the storage (2), and are configured for defining at least one closing condition in which at least part of the first base portion (11) interdicts communication between the internal volume (3) of the storage (2) and the external environment, the first base portion (11) and the first coupling portion (13) being further configured for defining an opening condition in which the latter allows communication between the internal volume (3) and the external environment,

wherein the second base portion (12) of the coupling system (1) defines at least part of the lateral wall (4) of the storage (2), while the second coupling portion (14) is at least partially disposed in the internal volume (3) of said storage (2),

wherein the coupling system (1)- during a first closed condition of the container (100)- is configured for defining the arming condition wherein the first and second coupling portions (13, 14) are engaged with each other,

wherein the coupling system (1)- during a first open condition of the container (100) following the first closed condition- is configured for defining the first disengagement condition in which the removable portion (15) is configured for separating from the coupling system (1) for showing a tampering of the coupling system (1) itself and therefore of the container (100).

[0075] In a 63rd aspect according to the preceding aspect, the supporting portion (16) of the coupling system (1) is arranged in the storage (2), optionally the supporting portion (16) of the coupling system (1) is entirely arranged in the internal volume (3) of the storage (2).

[0076] In a 64th aspect according to the 62nd or 63rd aspect, the second base portion (12) defines at least part of a lateral wall (4) of the storage (2), wherein the reciprocal coupling portion (17) of the supporting portion (16) is engaged to an inner surface of the second base portion (12), optionally of at least one lateral wall (4) of the storage (2), spaced apart of the free edge (6), the thrusting portion (19) of the same supporting portion (16) extends from said reciprocal coupling portion (17) nearing the free edge (6), in particular, the thrusting portion (19) extends up to said free edge.

[0077] In a 65th aspect according to any one of the aspects from the 62nd to the 64th, the first base portion (11) comprises:

- a closing portion (7) directly engaged with the free edge (6) of the storage (2) and movable, in particular rotatably, with respect to the latter,
- at least one inserting portion (8) configured for being inserted, under the closed condition of the container inside the internal volume (3) of the storage (2),

[0078] in which the first coupling portion (13) extends as a prolongation of the first base portion (11) from the opposite part to the storage (2), in which, under the first closed condition of the container (1) and therefore under the arming condition, the first and the second coupling portions (13, 14) are engaged with each other in the internal volume (3) of the storage (2).

[0079] In a 66th aspect, according to the preceding aspect, the closing portion (7) and the inserting portion (8) of the first base portion (11) are integrally joined defining a closing tab (9) of the container (100) made of sheet material, for example paper.

[0080] In a 67th aspect according to any one of the aspects from the 62nd to the 66th, the gripping edge (22a) delimiting the undercut portion of the hook (22) of the second coupling portion (14) is, at least in the arming condition, spaced from the free edge (6) of the storage (2), optionally placed inside the storage (2).

[0081] In a 68th aspect according to any one of the aspects from the 62nd to the 68th, the passage opening

(28) is defined on the closing portion (7) and/or on the inserting portion (8), said passage opening (28) being configured for arrange, at least in the condition of first closure of the container, at the removable portion (15).

[0082] In a 69th aspect according to any one of the aspects from the 62nd to the 68th, the passage opening (28), following the arming condition of the coupling system (1) and before the first disengagement condition, is adapted to allow the passage of the projection (30) of the removable portion (15) and then the exit of the projection itself from the storage (2).

[0083] In a 70th aspect according to any one of the aspects from the 62nd to the 69th, the passage opening (28) is defined, without interruption, at least partly on the closing portion (7) and at least partly on the inserting portion (8) of the closing tab (9).

[0084] In a 71st aspect according to any one of the aspects from the 62nd to the 70th, the second coupling portion (14) is directly connected to at least one lateral wall (4) of the storage (2) and extends at least partly parallel to the latter.

[0085] In a 72nd aspect according to any one of the aspects from the 62nd to the 71st, the through opening (29) is defined on a lateral wall (4) of the storage (2).

[0086] In a 73rd aspect according to any one of the aspects from the 62nd to the 72nd, the through opening (29) is defined on the lateral wall (4) of the storage (2) directly connected to the second coupling portion (14), optionally said lateral wall (4) being substantially parallel to the second coupling portion (14) at least before the closing condition of the container (100).

[0087] In a 74th aspect according to any one of the aspects from the 62nd to the 73rd, the hook (22) of the second coupling portion (14) is arranged - at least in the closed condition of the container (100) - at least partially, optionally entirely, inside the storage (2).

[0088] In a 75th aspect according to any one of the aspects from the 62nd to the 74th, the through opening (29) is configured for enabling the display of the exterior of the container (100) - at least in the closed condition of the latter - at least a part of the weakening element (26).

[0089] In a 76th aspect according to any one of the aspects from 62nd to 75th, the second depression (29b) is configured for enabling the display of the exterior of the container (100) - at least in the closed condition of the latter - at least a part of the weakening element (26), optionally displaying:

- at least part of the base body (25) of the second coupling portion (14),
- at least part of the hook (22) of said second coupling portion (14) defining said removable portion (15),
- at least a part of the weakening element (26) connected, on one side, to said hook (22) and, on the other side, to said base body (25) of the second coupling portion (14).

[0090] In a 77th aspect, a process is provided for the

manufacturing of the coupling system according to any one of the aspects from the 1st to the 61st.

[0091] In a 78th aspect according to the preceding aspect, said process comprising at least the following steps:

- preparing at least one first base portion (11),
- preparing at least one first coupling portion (13),
- preparing at least one second base portion (12),
- preparing at least one second coupling portion (14),
- preparing at least one removable portion (15),
- preparing at least one through opening (29) on the second base portion (12).

[0092] In a 79th aspect according to the preceding aspect, said process comprising at least the following steps:

- preparing at least one supporting portion (16),
- constraining at least one part of the supporting portion (16) to at least one between the second base portion (12) and the second coupling portion (14).

[0093] In an 80th aspect, according to the 78th or 79th aspect, the step of preparing the first base portion (11) comprises:

- a step of preparing a first sheet (51) on a plane surface,
- a step of cutting the first sheet (51) defining the first base portion (11).

[0094] In an 81st aspect, according to any one of the aspects from the 78th to the 80th, the step of preparing the first coupling portion (13) comprises:

- a step of preparing a second sheet (52) on a plane surface,
- a step of cutting the second sheet (52) defining the first coupling portion (13), in particular, said cutting step defining the respective hook (23) of the first coupling portion (13), even more in particular, said cutting step defining the gripping edge (23a) delimiting an undercut portion of the first coupling portion (13).

[0095] In an 82nd aspect, according to any one of the aspects from the 78th to the 81st, the step of preparing the second base portion (12) comprises:

- a step of preparing a third sheet (53) on a plane surface,
- a step of cutting the third sheet (53) defining the second base portion (12).

[0096] In an 83rd aspect, according to any one of the aspects from the 78th to the 82nd, the step of preparing the second coupling portion (14) comprises:

- a step of preparing a fourth sheet (54) on a plane surface,

- a step of cutting the fourth sheet (54) defining the second coupling portion (14), in particular, said cutting step defining the hook (22) of the second coupling portion (14), even more in particular, said cutting step defining the gripping edge (22a) delimiting an undercut portion of the second coupling portion (14).

[0097] In an 84th aspect, according to any one of the aspects from the 78th to the 83rd, the step of preparing the supporting portion (16) comprises:

- a step of preparing a fifth sheet (55) on a plane surface,
- a step of cutting the fifth sheet (55) defining the supporting portion (16), in particular said cutting step defining the reciprocal coupling portion (17) and the thrusting portion (19).

[0098] In an 85th aspect, according to any one of the aspects from the 78th to the 86th, the step of cutting the fifth sheet (55) defines the weakening portion (24) configured for allowing the supporting portion (16) the passage from the holding condition to the releasing one during the definition of the arming condition of the coupling system (1).

[0099] In a 86th aspect, according to any one of the aspects from the 78th to the 85th, the step of preparing the removable portion (15) comprises a step of cutting the second (52) or fourth sheet (54) defining the weakening element (26) of the removable portion (15).

[0100] In an 87th aspect according to any one of the aspects from the 78th to the 86th, the step of providing at least one through opening (29) on the second base portion (12) comprises a cutting step of the third sheet (53), optionally of the third and fourth sheet (53, 54), to define said at least one through opening (29), in particular to define the cut edge (33) delimiting said through opening (29).

[0101] In an 88th aspect according to the preceding aspect, said cutting step defines the depression delimited by the cut edge (33) of the through opening (29) on the second base portion (12),

[0102] in particular, said cutting step defines the first and second depressions (29a, 29b) respectively delimited by the first and second bottom segments (33a, 33b) of the cut edge (33),

[0103] more particularly, said cutting step defines two second depressions (29b) delimited by two bottom segments (33b) of the cut edge (33).

[0104] In an 89th aspect, according to any one of the aspects from the 78th to the 88th, the cutting step provides for at least one operation between: punching, engraving, shearing, laser cutting.

[0105] In a 90th aspect according to any one of the aspects from the 78th to the 89th, the step of constraining at least a part of the supporting portion (16) to at least one of the second base portion (12) and the second coupling portion (14) comprises at least one of:

plunging portion (14) comprises at least one of:

- a step of gluing the supporting portion (16) to at least one of the second base portion (12) and the second coupling portion (14), in particular the gluing of the reciprocal coupling portion (17) of the supporting portion (16) with the respective reciprocal coupling portion (18) of at least one selected between the second base portion (12) and the second coupling portion (14), said gluing step providing a step of dispensing adhesive material on at least one between the first, fourth and fifth sheets (51, 54, 55),
- a step of anchoring the supporting portion (16) to at least one between the second base portion (12) and the second coupling portion (14), by means of at least one operation selected between deformation, cutting and pressing of at least one between the first, fourth and fifth sheet (51, 54, 55).

[0106] In a 91st aspect according to any one of the aspects from the 7th to the 90th, the first and second sheets (51, 52) are joined together to form a single body.

[0107] In a 92nd aspect according to any one of the aspects from the 78th to the 91st, the third, fourth and fifth sheets (53, 54, 55) are joined together to form a single body.

[0108] In a 93rd aspect, according to any one of the aspects from the 78th to the 92nd, the first, second, third, fourth and fifth sheet are made of paper sheet material.

[0109] In a 94th aspect, a process is provided for, for manufacturing a container (100) according to any one of the aspects from the 62nd to the 76th.

[0110] In a 95th aspect according to the preceding aspect, said process comprising at least the following steps:

- preparing the storage (2),
- preparing the coupling system (1) so that:
 - the first base portion (11) and the first coupling portion are borne by the free edge (6) of the storage (2) and are rotatably movable with respect to the latter,
 - the second base portion (12) defines at least part of a lateral wall (4) of the storage,
 - the second coupling portion (14) is arranged at least partly in the internal volume (3) of the storage (2).

[0111] In a 96th aspect, according to the preceding aspect, the preparation of the coupling system (1) occurs by means of the process according to any one of the aspects from the 77th to the 93rd.

[0112] In a 97th aspect according to the 95th or the 96th aspect, the storage preparation step (2) comprises at least the following sub-steps:

- preparing a sixth sheet (56) comprising at least one first and one second portion (57, 59) interconnected

by a central connecting portion (58), said sixth sheet (56) further comprising at least one first and one second lateral connecting portion (60, 61), said central connecting portion (58) being interposed between the first and the second portion (57, 59), the first portion (57) being interposed between the first lateral connecting portion (60) and the central connecting portion (58), the second portion (59) being interposed between the second lateral connecting portion (60) and the central connecting portion (58), each of said portions (57, 58, 59, 60, 61) comprising at least two opposite longitudinal edges and two opposite end edges, said first and second portions (57, 59), central connecting portion (58) and said lateral connecting portions (60, 61) being joined along the longitudinal edges and aligned along a single connection direction,

- folding said sixth sheet (56), joining said lateral connecting portions (60, 61), to form the storage (2) exhibiting the passage opening (5) delimited by the free edge (6),
- preparing a seventh sheet (62) exhibiting at least one portion (63) connected to at least one central and/or lateral connecting portion of the sixth sheet (56) and emerging with respect to the latter,
- folding the portion (63) of the seventh sheet (62) to form a resting portion (80) of the container (100),
- folding the first base portion (11) and the first coupling portion (13) of the first and second sheets (51, 52) to form the closing portion (7) and the inserting portion (8), respectively, of the closing tab (9).

[0113] In a 98th aspect according to any one of the aspects from the 95th to the 97th, the third sheet (53) defining the second base portion (12) of the coupling system (1) is integrally joined to form a single body with at least one of the first and the second portion (57, 59) of the sixth sheet (56), in particular in which said third sheet (53) emerges from the end edges of the sixth sheet (56).

[0114] In a 99th aspect according to any one of the aspects from the 95th to the 98th, the first sheet (51) defining the first base portion (11) of the coupling system (1) is integrally joined to form a single body with the second portion (59) of the sixth sheet (56), in particular in which said first sheet (51) emerges from the end edges of the sixth sheet (56).

[0115] In a 100th aspect according to any one of the aspects from 95th to 99th, the cutting step defining the through opening (29) is carried out on at least one of the first and second portions (57, 59) of the sixth sheet (56).

[0116] In a 101st aspect, a process is provided for, for the arming of the coupling system (1) according to any one of the aspects from the 1st to the 61st, said process comprising the following steps:

- nearing the first coupling portion (13) and the second coupling portion (14) so that the first coupling portion may rest against the second coupling portion,

- during the nearing step, supporting the second coupling portion by the supporting portion (16)
- engaging the first and the second coupling portions (13, 14) defining the arming condition.

[0117] In a 102nd aspect, according to the preceding aspect, the step of nearing the first and the second coupling portions (13, 14) comprises the following sub-steps:

- nearing the hook (23) of the first coupling portion (13) to the hook (22) of the second coupling portion (14),
- putting in contact, optionally pressing, the respective hook (23) of the first coupling portion (13) at the hook (22) of the second coupling portion (14), in particular, so that the respective hook (23) is interposed between the hook (22) of the second coupling portion (14) and the second base portion (12).

[0118] In a 103rd aspect, according to the 101st or the 102nd aspect, the step of nearing the first and the second coupling portions (13, 14) comprises a step of resting the thrusting portion (19) against the hook (22) of the second coupling portion (14), said support step defining the holding operative condition of the supporting portion (16).

[0119] In a 104th aspect, according to any one of the aspects from the 101st to the 103rd, the step of engaging the first and the second coupling portions (13, 14) comprises the following steps:

- inserting the respective hook (23) of the first coupling portion (13) at the gripping edge (22a) of the hook (22) of the second coupling portion (14),
- defining the grip between the undercut portions of the first and of the second coupling portion (13, 14) respectively delimited by the gripping edges (23a, 22a) defining the releasing operative condition, in particular, in which the breaking of the weakening portion (24) of the supporting portion (16) occurs, enabling an upper movement of the hook (22) of the second coupling portion (14) with respect to the holding operative condition.

[0120] In a 105th aspect, according to any one of the aspects from the 101st to the 104th, the process comprises a step of closing the storage (2) so as to interdict the reciprocal communication between the internal volume (3) of the storage (2) and the external environment, said closing step comprising:

- folding the closing portion (7) in rotation with respect to the free edge (6) of the storage (2),
- inserting the inserting portion (8) at least partially inside the internal volume (3) of the storage (2), in particular at the second coupling portion (14),
- performing the steps of exerting a reciprocal thrust between the first and second coupling portion (13, 14) and engaging the first and second coupling portion (13, 14).

[0121] In a 106th aspect, a use of a coupling system (1) according to any one of the aspects from the 1st to the 61st is provided for defining at least one selected from the group of: a container for containing one or more products, an envelope for containing one or more products, a wrapping band of one or more products.

DESCRIPTION OF THE DRAWINGS

[0122] Some embodiments and some aspects of the invention are described below with reference to the accompanying drawings, provided by way of indication and therefore not by way of limitation, in which:

- Figures 1, 2 and 3 are front views of an embodiment of a coupling system according to the present invention arranged in a condition preceding a first arming condition;
- Figures 4, 5 and 6 are perspective views of an embodiment of a coupling system according to the present invention arranged in a first arming condition;
- Figure 6 is a front view of the flat development of an embodiment of a coupling system according to the present invention arranged in a condition preceding a first arming condition;
- Figure 7 is a front view of a container comprising an embodiment of the coupling system according to the present invention arranged in a first arming condition;
- Figure 8 is a sectional view of the container in figure 7;
- Figure 9 is a front view of a container comprising an embodiment of the coupling system according to the present invention arranged in a condition preceding a first arming condition;
- Figure 10 is a sectional view of the container in figure 9;
- Figures 11 and 12 show a perspective view of a further embodiment of the coupling system according to the present invention in a first arming condition;
- Figure 13 is a sectional view of the coupling system in figure 2;
- Figure 13 shows a perspective view of the section of a container comprising a coupling system for blind people according to the present invention arranged in a first arming condition;
- Figures 14, 15 and 16 show a blank for making a container comprising an embodiment of the coupling system according to the present invention;
- Figures 17 and 18 show a front view of an embodiment of the coupling system according to the present invention in an initial arming step;
- Figure 19 is a sectional view of the coupling system in figure 18;
- Figure 20 shows a perspective view of a container comprising an embodiment of the coupling system in a first arming condition;

- Figures 21 and 22 show a further embodiment of the coupling system according to the present invention;
- Figure 23 shows an initial step of an initial arming of a further embodiment of a coupling system according to the present invention;
- Figures 24 and 25 show different views of the further embodiment of the coupling system in a first arming condition;
- Figure 26 shows an initial step of initial arming of the further embodiment of the coupling system according to the present invention;
- Figure 27 shows a first arming condition of the further embodiment of the coupling system according to the present invention;
- Figure 28 is a sectional view of the coupling system in figure 27;
- Figures 29, 30 and 31 show a blank for making a container comprising a further embodiment of the coupling system according to the present invention.

DEFINITIONS AND CONVENTIONS

[0123] It should be noted that in the present detailed description, corresponding parts illustrated in the various figures are indicated by the same reference numerals. The figures may illustrate the object of the invention by representations that are not in scale; therefore, parts and components illustrated in the figures relating to the object of the invention may relate solely to schematic representations.

[0124] By the term product it is instead meant an article or a mixture of articles of any kind. The term product may also mean a package, for example, bearing a plurality of items.

[0125] The term "paper material" means paper or cardboard, optionally having at least 50% by weight, optionally at least 70% by weight, of organic material comprising one or more of cellulose, hemicellulose, lignin, derivatives of lignin. The paper sheet material which may be used to manufacture the coupling system, the container or the envelope (optionally a band) may have a basis weight from 50 to 500 g/m², in particular from 200 to 400 g/m². The subject paper material extends between a first and a second prevailing development surface. The sheet paper material used for manufacturing the coupling system and the container (optionally of the envelope or band) can, in an embodiment variant, be covered for at least a part of the first and/or second prevalent development surface by a coating made of plastic material, for example a film, whose purpose is to reinforce the paper material. The coating may also be employed to define a sort of water and/or humidity barrier, useful to avoid the weakening and loss of structurality of the coupling system and of the container (optionally of the envelope or the band) with consequent uncontrolled deformation of the paper material constituting the latter component. The coating can be applied to the paper material in the form of a coating or varnish deposited from solution or sprayed, whose

thickness is generally, without limitation, between 0.2 and 10 μm . Alternatively, the coating may comprise a plastic film, for example, a polyethylene lining, which may be applied by means of a rolling process, on one or both sides of the paper material. In case the coating is applied by rolling, the values of the plastic film (coating) may, for example, vary from 5 to 400 μm , in particular, from 10 to 200 μm , even more in particular, from 10 to 100 μm , of coating material (i.e., polyethylene). The plastic coating material may be selected, by way of example, from the following materials: PP, PE (HDPE, LDPE, MDPE, LLDPE), EVA, polyesters (including PET and PETg), PVdC. The envelope (optionally the band or the container) may be made of at least partly plastic sheet material or, alternatively, at least partly made of plastic material and partly of paper material.

DETAILED DESCRIPTION

Coupling system 1

[0126] Reference numeral 1 overall indicates a tamper-evident coupling system of sheet material, for example, of paper material, associable to packages of various kinds - for example, containers, envelopes or bands also made of sheet material - for the containment and/or wrapping of products.

[0127] The coupling system 1 comprises a first base portion 11, a second base portion 12, a first coupling portion 13 borne by the first base portion 11, a second coupling portion 14 borne by the second base portion 12 and configured for cooperating with the first coupling portion 13. The first and the second coupling portions 13, 14 are configured for defining at least one arming condition in which the first and second coupling portions 13, 14 are stably engaged with each other.

[0128] The first base portion 11 comprises a sheet body spreading in thickness between a first and a second surface. The first base portion 11 stably bears the first coupling portion 13. In greater detail, the first coupling portion 13 is engaged at an end portion of the first base portion 11: such portions 11, 13 are reciprocally engaged to essentially define a single perimetral edge.

[0129] The first coupling portion 13 may be integrally joined to the first base portion 11 and it extends as a prolongation, seamlessly, with respect to said first base portion 11: The first coupling portion 13 has a substantially arrow or trapezoidal shape. The possibility of manufacturing a first coupling portion 13 exhibiting a different shape, for example triangular or rectangular, is not excluded. The first coupling portion 13 is also made of sheet material, for example paper sheet material, and extends in thickness between a first and a second surface. The first surface of the first coupling portion 13 is directly connected and extends continuously without interruption to the first surface of the first base portion 11. Likewise, the second surface of the first coupling portion 13 is directly connected and extends continuously without interruption

to the second surface of the first base portion 11. As shown, for example, in figures 1-5, 21-25, the first coupling portion 13 comprises at least one hook 23 of sheet material defining at least an undercut portion delimited by a respective gripping edge 23a. In one embodiment, the first coupling portion 13 exhibits two respective hooks 23, symmetric to each other with respect to a mid-axis of the first coupling portion 13. In such an embodiment, the two respective hooks 23 define two gripping edges 23a.

[0130] The coupling system 1 comprises at least one passage opening 28 defined on the first base portion 11 and/or on the first coupling portion 13 as shown in figures 1-4, 17-25. In one embodiment, the passage opening 28 has a rectangular shape, optionally it may have a circular, trapezoidal, triangular shape or a combination thereof. The passage opening 28 may be arranged at the joining edge between the first base portion 11 and the first coupling portion 13.

[0131] The second base portion 12 comprises a sheet body extending in thickness between a first and a second surface (12a, 12b). The second base portion 12 stably bears the second coupling portion 14. In greater detail, the second coupling portion 14 is engaged at an end portion of the second base portion 12. In particular, the second base portion 12 is facing and at least partly in contact with a surface, in particular the second surface 12b of the second base portion 12. As will be better described hereinafter, the second coupling portion 14 is joined in one piece to an end portion of the second base portion 12 and bent above it so that said second coupling portion 14 faces the second base portion 12b. The second coupling portion 14 comprises at least one hook 22 made of sheet material. The hook 22 has a substantially "C" or "V" shape. Alternatively, the hook 22 may have a rectangular, trapezoidal, circular or semicircular shape. The hook 22 defines at least one undercut portion delimited by a gripping edge 22a, the latter having a substantially "V" shape, optionally a "C" shape, alternatively trapezoidal or semicircular. The gripping edge 22a is laterally delimited by the two connecting edges of the hook 22 of the second coupling portion 14 to a base body 25 of the second coupling portion 14. The gripping edge 22a is symmetrical with respect to a centerline axis passing through the same hook 22. In detail, the second coupling portion 14 comprises a single undercut portion defining a single hook 22. In greater detail, the second coupling portion 14 comprises a base body 25 which directly carries the hook 22 of the same second coupling portion 14; the hook 22 is integrally joined with the base body 25 and movable by rotation with respect to the latter. In particular, the hook 22 is movable by rotation about an axis defined by the connecting edges 21 of the hook 22 itself. In greater detail, the hook 22 is movable by rotation by angles of less than 90°, in particular between 0° and 70°, even more particularly between 0° and 45°. The rotation is measured starting from a configuration in which the hook 22 is substantially parallel to the second base portion 12

as shown in figure 7, 8, 12.

[0132] In one embodiment, the hook 22 of the second coupling portion 14 and the base body 25 of the second coupling portion 14 may be integrally joined together to form a single body made of paper sheet material. In this embodiment, the second coupling portion 14 and the hook 22 face the second surface 12b of the second base portion 12. In greater detail, the second coupling portion 14 is substantially parallel to the second base portion 12. In one embodiment, the second base portion 12 and the second coupling portion 14 are integrally joined together to define a single folded sheet, in particular of paper material. In an optional embodiment, the second base portion 12 and the second coupling portion 14 represent separate bodies and are joined together by means of an adhesive material. The hooks 23, 22 of the first and second coupling portion 13, 14, are configured to firmly engage with each other during the arming condition of the coupling system 1: the hooks 22, 23 - during the arming condition - have respective concavities facing each other. In greater detail, the gripping edge 22a of the hook 22 and the respective gripping edges 23a of the respective hook 23 are configured for stably engaging with each other under the arming condition of the coupling system 1. The coupling step of the hooks takes place by means of an initial contact condition between the first and second coupling portion 13, 14; in particular, the first coupling portion 13 is inserted in interposition between the hook 22 of the second coupling portion 14 and the second base portion 12: in this condition, the first coupling portion 13 is slid onto the hook 22. After, the first coupling portion 13 is pressed below the second coupling portion 14 so that the hook 23 (optionally the hooks 23) couples with the hook 22 defining the arming condition. Under the arming condition, the first and the second coupling portions 13, 14 are substantially aligned along a same coupling direction (see, for example, the sections in figures 8, 10, 13, 19, 28). In one embodiment, at least the first base portion 11 carrying the first coupling portion 13 is directly interposed between the second surface 12b of the second base portion 12 and the hook 22 of the second coupling portion 14 (figures 1-20). In a further embodiment shown in figures 23-28, at least the hook 22 of the second coupling portion 14 is directly interposed between the second surface 12b of the second base portion 12 and the first coupling portion 13.

[0133] The second base portion 12 comprises an end portion 34 delimited by a perimetral edge 12c. In particular, the end portion 34 is at or adjacent to the second coupling portion 14. Even more in detail, the second base portion 12 comprises two end portions 34, symmetrical to each other with respect to a centerline axis of the second coupling portion 14, wherein the second coupling portion 14 is interposed between the two end portions 34 delimited by perimetral edges 12c. Optionally, the end portion 34 has a vertical development substantially equal to that of the second coupling portion 14, such that the whole or at least most of the latter is interposed between

the two end portions 34.

[0134] The coupling system 1 comprises at least one removable portion 15 of sheet material (figures 1-5, 12-13, 17-28) borne by at least one between the first and the second coupling portions 13, 14; the removable portion 15 is configured for separating from the coupling system 1 upon a first disengagement condition between the first and second coupling portions 13, 14 following the arming condition. The separation of the removable portion 15 (figures 9-10) determines the impossibility of a following engagement between the first and second coupling portions 13, 14, so as to show a tampering of the coupling system 1. In other words, a possible attempt to open or tamper with the coupling system 1, following the arming condition of said system 1, would determine the breaking and therefore the detachment of the removable portion 15 from the coupling system 1 itself. Thereby, by virtue of the removable portion 15, it is possible to highlight the tampering of the coupling system 1 and inhibit a following anchoring between the first and the second coupling portions 13, 14.

[0135] In one embodiment, the removable portion 15 may be carried by the second coupling portion 14. In greater detail, the removable portion 15 is defined by the hook 22 and by the gripping edge 22a of the second coupling portion 14. In said configuration, the second coupling portion 14 comprises a weakening element 26 which delimits the hook 22 and defines the removable portion 15. In greater detail, the second coupling portion 14 has the weakening element 26 placed between the base body 25 and the hook 22, in particular at the connecting edge 21 between the hook 22 and the base body 25 of the second coupling portion. In the embodiment shown in the accompanying figures, the removable portion 15 defined by the hook 22 exhibits two weakening elements 26. The weakening element 26 of the removable portion 15 enables the separation of the removable portion 15 from the base body 25 of the second coupling portion 14 during a first opening attempt of the coupling system 1 upon the arming condition, so as to highlight the tampering thereof and impede a following arming condition. The removable portion 15 defined by the hook 22 of the second coupling portion 14 may exhibit a projection 30, shown in figures 1-13 and 17-20, configured for allowing the user a tactile perception of the removable portion 15 itself. The projection 30 is made of sheet material and exhibits a substantially triangular shape, optionally it exhibits a trapezoidal, rectangular or semi-circular shape. In one embodiment, the removable portion 15 exhibits a single projection 30 of a triangular shape. In a further embodiment shown in the accompanying figures, the removable portion 15 may have two or more projections 30. The projection 30 of the removable portion 15 enables visually-impaired users to verify the presence of the removable portion 15 by means of a tactile perception thereof and therefore to verify the integrity or the tampering of the coupling system 1. In particular, under the arming condition of the coupling system 1, the

passage opening 28 allows the passage of the projection 30 of the removable portion 15 as shown in figures 4-8, so as to allow the tactile perception thereof by the user.

[0136] In a further embodiment not shown in the accompanying figures, the removable portion 15 may be defined by at least one part of the first coupling portion 13, in particular the removable portion 15 is defined by the respective hook 23 of the first coupling portion 13. In greater detail, the removable portion 15 is defined by two respective hooks 23 of the first coupling portion 13. In this latter configuration, the first coupling portion 13 comprises a weakening element 26 which delimits the respective hook 23 and defines the removable portion 15. In particular, the first coupling portion 13 has a weakening element 26 between a base body 27 of the base portion 11 and the respective hook 23 so that the latter can define the removable portion 15.

[0137] The weakening element 26 of the first or second coupling portion 13, 14 may be defined by one or more cuts passing through the sheet material, an incision of the sheet material, a local squashing of the sheet material. The weakening element 26 enables the separation of the removable portion 15 from the coupling system 1, allowing to show the tampering following a first arming condition of the coupling system 1 itself.

[0138] The coupling system 1 further comprises at least one through opening 29 defined at least on the second base portion 12 as shown in figures 1, 7-10, 17-21, 26-27. The through opening 29 is delimited by a cut edge 33 defined on the second base portion 12 on which it defines a downward movement starting from the perimetral edge 12c. The cut edge 33 extends without interruption starting from the perimetral edge 12c to define the depression on the second base portion 12. In one embodiment, said depression has an open outline. In a further embodiment, said depression has a closed outline spaced from the perimetral edge 12c of the second base portion 12.

[0139] The depression defined by the through opening 29 may comprise a first and at least a second depression 29a, 29b. The first depression 29a enables the display of the removable portion 15, in particular according to a front perspective with respect to the first surface 12a of the second base portion 12. The first depression 29a faces, at least in the arming condition of the coupling system 1, to the removable portion 15. Optionally, the first depression 29a faces, at least in the arming condition of the coupling system 1, to the hook 22 of the second coupling portion 14. The first depression 29a is delimited at a bottom portion by a first bottom segment 33a of the cut edge 33, determining, with respect to the perimetral edge 12c, a depth of the first depression 29a. The first abutment has a substantially rectangular shape, optionally trapezoidal, circular or a combination thereof. The second depression 29b enables the display of at least one weakening element 26, in particular according to a front perspective with respect to the first surface 12a of the second base portion 12. The second depression 29

also enables the display of at least part of the second coupling portion 14. The second depression 29b enables the display of the weakening element 26 and at least part of the removable portion 15, at least in the arming condition of the coupling system 1. The second depression 29b is therefore facing, at least in the arming condition of the coupling system 1, at least one of the weakening elements 26. The second depression 29b is delimited at a bottom portion by a second bottom segment 33b of the cut edge 33, determining, with respect to the perimetral edge 12c, a depth of the second depression 29b greater than the maximum depth of the first depression 29a. The second depression 29b has a substantially "U" shape, optionally having a rectangular, trapezoidal, circular shape or a combination thereof. The coupling system 1 may have (as shown) two second depressions 29b delimited at a bottom portion by two second bottom segments 33b of the cut edge 33, wherein the two second depressions 29b are mutually symmetrical with respect to an axis passing through the centerline of the second coupling portion 14. In particular, the two second depressions 29b are opposed to each other with respect to the first depression 29a. In one embodiment, the first and second depressions 29a, 29b are in communication with each other to define a single access passing through the second base portion 12.

[0140] In the accompanying figures, a second base portion 12 is shown, integrally joined to the second coupling portion 14; in this configuration, the through opening 29 is defined at the joining edge between the second base portion 12 and the second coupling portion 14. The through opening 29 is positioned at a centerline axis of the second coupling portion 14 and is symmetrical with respect to the same axis. In detail, the second base portion 12 comprises a protuberance 31 at least partly facing the second coupling portion 14 which extends on the second base portion 12 in a central area below the first bottom segment 33a of the cut edge 33. The protuberance 31 is configured for inhibiting, at least in the arming condition of the coupling system 1, the display of the undercut portion of the first and/or second coupling portion 13, 14 with respect to a front perspective with respect of the first surface 12a of the second base portion 12. In greater detail, the protuberance 31 is configured for inhibiting, at least in the arming condition of the coupling system 1, at least part of the gripping edge 22a of the hook 22 of the second coupling portion 14. Even more particularly, the protuberance 31 delimits at least in part the first and second depressions 29a, 29b of the through opening 29.

[0141] The coupling system 1 further comprises at least one supporting portion 16 (figures 1-6, 8, 10, 19) of sheet material and constrained to at least one between the second base portion 12 and the second coupling portion 14. The supporting portion 16 is configured, at least during an initial step of putting in contact the first and the second coupling portions 13, 14 of the coupling system 1 before the arming condition, for sustaining at least part of the second coupling portion 14. In detail, the supporting

portion 16 comprises a reciprocal coupling portion 17, as shown in figures 5-6, overlapping and stably constrained to at least one respective reciprocal coupling portion 18 of at least one selected from the second base portion 12 and the second coupling portion 14. The reciprocal coupling portion 17, constrained to the respective reciprocal coupling portion 18, enables the supporting portion 16 to keep a substantially fixed position, reducing the possibility of a distancing rotation of the supporting portion 16 itself with respect to the second coupling portion 14 or to the second base portion 12. In particular, said constraint increases a flexural stiffness of the supporting portion 16 and in particular it reduces the flexion of the supporting portion 16, considering the same load applied, when distancing with respect to the second base portion 12 or the second coupling portion 14. The reciprocal coupling portion 17 of the supporting portion 16 is fastened by means of adhesive material to at least one between the second base portion 12 and the second coupling portion 14. In greater detail the reciprocal coupling portion 17 defines a surface of the supporting portion 16 stuck to at least one between the second base portion 12 and the second coupling portion 14. The reciprocal coupling portion 17 of the supporting portion 16 is defined at a bottom area 20 of the supporting portion 16. In one embodiment, the supporting portion 16 comprises two reciprocal coupling portions 17, in particular symmetrical with respect to a longitudinal development path of the supporting portion 16, in which the two reciprocal coupling portions 17 are constrained to two respective reciprocal coupling portions 18 of the second base portion 12, as shown in the accompanying figures.

[0142] The supporting portion 16 comprises a thrusting portion 19 (figures 1-6, 8, 19) emerging from the reciprocal coupling portion 17 of the same supporting portion 16 and configured for receiving the second coupling portion 14 in contact. In particular, the thrusting portion 19 emerges from the bottom portion 20 of the supporting portion 16 along a longitudinal development trajectory of the supporting portion 16 itself and exhibits a rectangular, optionally trapezoidal or triangular or semi-circular shape. In an embodiment, said longitudinal development trajectory is placed in the mid-axis of the supporting portion 16, so that the longitudinal development trajectory defines a symmetry axis of the supporting portion 16. In particular, the thrusting portion 19 is configured for supporting at least part of the second coupling portion 14, in particular during an initial contact step (clearly shown in the section in figure 19) between the first and second coupling portion 13, 14 of the coupling system 1 before the arming condition (shown in figure 8). In one embodiment, the thrusting portion 19 and the reciprocal coupling portion 17 of the supporting portion 16 may be integrally joined defining a tab of sheet material. In particular, the thrusting portion 19 is not directly constrained to the first coupling portion 13, to the second coupling portion 14, to the first base portion 11 and to the second base portion 12. Optionally, the thrusting portion 19 is joined to the

supporting portion 16 by using an adhesive material. In particular, in the arming condition, the supporting portion 16 is positioned in such a way that the second coupling portion 14 is interposed between the second base portion 12 and the supporting portion 16 itself. In particular, the second coupling portion 14, the second base portion 12 and the supporting portion 16 are substantially parallel to one another, at least in an arming condition of the coupling system. In greater detail, the second coupling portion 14, the second base portion 12 and the supporting portion 16 are obtained by the multiple folding of a single sheet, in particular of paper material. Figure 8 shows a section of the coupling system 1 depicted in figure 7 in a first arming condition, highlighting the substantial parallelism between the second base portion 12, the second coupling portion 14 and the supporting portion 16.

[0143] The supporting portion 16 comprises a weakening portion 24 configured for allowing the supporting portion 16 to define a holding operating condition and a releasing operating condition. The weakening portion 24 may be defined by means of one or more cuts, incisions or veinings of the sheet material bearing the supporting portion 16. In one embodiment, the supporting portion 16 exhibits two weakening portions 24, in particular, symmetrical to each other with respect to a mid-axis of the coupling system 1.

[0144] The holding operative condition, shown in figure 18 and in the corresponding section in figure 19, is defined during an initial step of the arming condition under which the first coupling portion 13 rests against the second coupling portion 14, in which the weakening portion 24 is intact and enables the supporting portion 16 itself to sustain the second coupling portion 14 limiting the movement thereof. In particular, the thrusting portion 19 of the supporting portion 16 enables sustaining the hook 22 of the second coupling portion 14. In greater detail, the thrusting portion 19 of the supporting portion 16, under the holding operating condition, exerts a pressure on the hook 22 of the second coupling portion 14 to increase a flexural stiffness thereof. The supporting portion 16, in particular the thrusting portion 19, is therefore configured, under the holding operating condition, for limiting the angular displacement of the hook 22 of the second coupling portion 14 to values below 90°, in particular from 0° to 70°, even more in particular from 0° to 45°. Said angular values are measured as rotation of the hook 22 away from the second base portion 12. The angular displacement is understood as the relative rotation of the hook 22 considered between an initial position of the hook 22 shown in figures 1-3 and 21-22, before the holding operative condition, essentially aligned with the base body 25 and optionally parallel to the second base portion 12, and a final position which the hook 22 may assume under the holding operative condition. The support provided by the supporting portion 16, in particular, by the thrusting portion 19, allows to obtain greater security and efficacy during the initial arming step of the coupling system 1, in particular, during the nearing and putting in contact of

the first coupling portion 13 and the second coupling portion 14 (figures 18 and 19). In other words, since the arming step is automatic, the thrusting portion 19 prevents a possible overturning of the hook 22 of the second coupling portion 14 due to the thrusting force exerted by the respective hook 23 of the first coupling portion 13 during the initial anchoring step of the coupling system 1.

[0145] The releasing operative condition, shown in Figure 7 and in the corresponding section of Figure 8, is defined at least under the arming condition in which the total or partial breaking of the weakening portion 24 occurs, so that the supporting portion 16 may enable a greater movement of the hook 22 of the second coupling portion 14 with respect to the holding operative condition. In particular, the weakening portion 24 is configured for allowing the passage of the supporting portion 16 from the holding operative condition to the releasing one during the definition of the arming condition of the coupling system 1. The release operative condition defines a reduction in the bending stiffness of the supporting portion 16, in particular the release operative condition reduces the thrust exerted by the thrusting portion 19 on the hook 22 of the second coupling portion 14 during the arming condition. The supporting portion 16, under the releasing operating condition, is configured for enabling an angular displacement of the hook 22 of the second coupling portion 14 greater than the angular displacement enabled under the holding operating condition. The greater freedom of movement of the hook 22 of the second coupling portion 14 under the releasing operative condition, with respect to the holding operative condition, increases the security of the coupling system 1, since it makes the tampering thereof more difficult. The releasing operative condition follows the holding operative step.

[0146] The supporting portion 16, in addition to acting as a support element for the second coupling portion 14, may perform the signaling function to more clearly show a tampering of the coupling system 1. As previously described, due to the possibility of verifying the lack of the removable portion 15, it is possible to signal a possible tampering of the system 1. The supporting portion 16 is adjacent to the removable portion; it is therefore possible to arrange a marker on the supporting portion 16 (for example, a change of color with respect to the removable portion 15) so that, in the absence of the removable portion 15, the supporting portion 16 may highlight, by means of the marker, the absence of said removable portion 15. The supporting portion 16 may act as a marker both in case the removable portion 15 is defined on the second coupling portion 14 (the supporting portion would be visible at least from the indentation 29 and/or from the through opening 28) and in case it is defined on the first coupling portion 13 (the supporting portion would be visible at least from the indentation 29 of the second base portion).

Container 100

[0147] The coupling system 1 previously described in each embodiment thereof may be coupled to a container 100 as shown in figures 7-10 and 20. In one embodiment, the container 100 comprises at least one storage 2 defining an internal volume 3 configured for housing products, for example pills, tablets or blister packs (the products are not shown); the storage 2 essentially represents the compartment suitable for housing and supporting the products. In greater detail, the storage 2 comprises a predetermined number of lateral walls 4 defining at least one passage opening 5 delimited by a free edge 6: the passage opening 5 is configured for putting in communication the internal volume 3 of the storage 2 with the external environment. In the accompanying figures a configuration of the storage 2 is shown by way of a non-limiting example, exhibiting two opposite passage openings 5 with respect to the storage 2 itself, so that the latter may substantially define a duct or tube laterally delimited by the wall 4 and open at the longitudinal ends. The possibility of manufacturing, for example, a storage 2 exhibiting a single passage opening 5 or even a number of openings 5 greater than two (conditions not shown in the accompanying Figures) is not excluded. In the accompanying figures, a storage 2 is shown which for example has a rectangular prismatic shape (flat lateral walls 4 having a rectangular shape). However, the possibility of manufacturing a storage 2 having a different shape, for example square, trapezoidal or cylindrical, is not excluded. The storage 2 is made of sheet material and is obtained, for example, by means of folding. In one embodiment, the storage 2 is made of paper sheet material (paper or cardboard).

[0148] The container 100 comprises the coupling system 1 previously described. The first base portion 11 is rotatably constrained to the free edge 6 of the storage 2: the first coupling portion 13 is borne by the first base portion 11 so that this latter is interposed between the free edge 6 of the storage 2 and the first coupling portion 13. The first base portion 11 and the first coupling portion 13 are movable, in particular, rotatably, with respect to the storage 2 and are configured for defining at least one closed condition in which at least part of the first base portion 11 interdicts the communication between the internal volume 3 of the storage 2 and the external environment. The first base portion 11 and the first coupling portion 13 are further configured for defining an open condition in which the latter themselves enable the communication between the internal volume 3 and the external environment. The first base portion 11 is integrally joined to the free edge 6 of the storage 2: in particular, the first base portion 11 is integrally joined to at least one lateral wall 4 of the storage 2 defining a single body of paper material. The second base portion 12 of the coupling system 1 defines at least part of the lateral wall 4 of the storage 2, while the second coupling portion 14 is at least partially disposed in the internal volume 3 of said

storage 2. The coupling system 1, under a first closed condition of the container 100, is configured for defining the arming condition in which the first and the second coupling portions 13, 14 are engaged with each other. The coupling system 1 - under a first open condition of the container 100 following the first closed condition - is configured for defining the first disengagement condition under which the removable portion 15 is configured for separating from the coupling system 1 to show a tampering of the coupling system 1 itself and therefore of the container 100. During the arming condition and therefore of first closure of the container, the first and second coupling portions are entirely arranged in the internal volume 3 of the storage 2, optionally spaced from the free edge 6.

[0149] Also the supporting portion 16 of the coupling system 1 is arranged, particularly in its entirety, in the storage 2 (figures 8, 10, 13). In detail, the supporting portion 16 of the coupling system 1 is entirely arranged in the internal volume 3 of the storage 2. Optionally, the supporting portion 16 is substantially parallel to at least one lateral wall 4, in particular, to the lateral wall 4 defined by the second base portion 12. The reciprocal coupling portion 17 of the supporting portion 16 is engaged with an internal surface of at least one lateral wall 4 of the storage 2 spaced from the free edge 6. The thrusting portion 19 of the same supporting portion 16 extends from said reciprocal coupling portion 17 nearing the free edge 6, in particular, the thrusting portion 19 extends up to the free edge 6.

[0150] The first coupling portion 13 extends as a prolongation of the first base portion 11 from the opposite part to the storage 2, in which, under the first closed condition of the container 1 and therefore under the arming condition, the first and the second coupling portions 13, 14 are configured for engaging with each other in the internal volume 3 of the storage 2. As shown in figures 13, 14, the first base portion 11 comprises a closing portion 7 of sheet material directly engaged with the free edge 6 of the storage 2 and movable, in particular rotatably, with respect to the latter. The closing portion 7 is adapted to delimit the opening 5 of the storage 2, so that, under the closed condition of the container 100, the closing portion 7 may interdict the passage from the internal volume 3 of the storage 2 to the external environment. In one embodiment, the closing portion 7 has a rectangular or square shape. However, the possibility that the closing portion may exhibit geometrical shapes other than those shown in the accompanying Figures is not excluded. The first base portion 11 further comprises at least one inserting portion 8 configured for being inserted, under the closed condition of the container, inside the volume 3 of the storage 2. As can be seen in the accompanying figures, the inserting portion 8 substantially comprises a plane body of sheet material having, by way of non-limiting example, a rectangular shape. As shown, for example, in the sectional view of Figure 8, the inserting portion 8 extends between a first and a second prevalent development surface, respectively facing outwards (di-

rectly facing a lateral wall 4 of the storage 2) and towards an internal volume 3 of the storage 2. In the closing condition of the coupling system 1, at least a portion of the first development surface of the inserting portion 8 faces, in particular contacts, directly a part of a lateral wall 4 of the storage 2: the surface extends at least in part parallel to the wall 4 of the storage 2, in particular to a front wall of the storage 2 opposed to the wall directly connected to the closing portion 7.

[0151] The closure portion 7 and the coupling portion 8 have a reciprocal connection edge opposite to the free edge 2 of the storage 2 with respect to the closure portion 7 itself: the coupling portion 8 is movable by rotation with respect to the closure portion 7 around to this reciprocal connection edge. As can be seen for example in figures 8, 10 and 13, the inserting portion 8, in the arming condition of the coupling system 1, is configured to define, according to a cross section and in cooperation with the closure portion 7, a substantially "L" shape: in this condition, the coupling portion 8 extends substantially parallel to a lateral wall 4 of the storage 2.

[0152] The closing portion 7 and the inserting portion 8 of the first base portion 11 are integrally joined defining a closing tab 9 of the container 100 made of sheet material, for example, paper. The closing portion 7 and the inserting portion 8 are exhibited on each of the openings 5 of the container 100 so as to define the closing system. In particular, the closing tab 9 is integrally joined to the free edge 6 of the storage 2 and, therefore, to at least one lateral wall 4 of the container 100.

[0153] In the accompanying figures, a closing tab 9 exhibiting a rectangular shape, entirely countershaped to free edge 6, has been schematized. The passage opening 28 of the coupling system 1 is defined on the closing portion 7 and/or on the inserting portion 8, and is arranged, under a closed condition of the container 100, in particular, at the removable portion 15 under the arming condition. The passage opening 28, upon the arming condition of the coupling system 1 and before the first disengagement condition, is adapted to allow the passage of the projection 30 and, therefore, the exit thereof from the storage 2 (figures 5-8). The through opening 29 of the coupling system 1 is defined on at least one lateral wall 4 of the storage 2, so as to allow the weakening element 26 to be displayed at least during the arming condition of the coupling system 1.

[0154] As can be seen, for example, in the accompanying figures, the container 100 may further comprise at least one abutment portion 80 engaged on the free edge 6 of the storage 2 adjacent to the closing portion 7: the abutment portion 80, in the closed condition, is configured for being interposed between the internal volume 3 and the closing tab 9 so as to cooperate with the latter to keep it permanently in said closure condition. The abutment portion 80 essentially comprises a plane tab of sheet material integrally joined to the free edge 6 of the storage 2 adjacent to the closing portion 7. The abutment portion 80 has, without limitation, a rectangular or trap-

ezoidal shape. Also the abutment portion 80 is configured for rotating around the free edge 6 to face, at least in the closed condition of the container 1, towards the inside of the storage 2. In greater detail, the abutment portion 80 is constrained to the free edge 6 so as to engage, in the closed condition of the container 100, at least part of the inserting portion 8 and/or of the closing portion 7 to stably keep the closing tab 9 in said condition. In particular, the container 1 comprises two abutment portions 80 opposed to each other with respect to the closing tab 9: the latter is interposed between the two abutment portions 11. In such configuration, the two abutment portions 80 symmetrically work on the closing tab 9 to keep it stably under the closed condition.

Process for the manufacturing of the coupling system 1

[0155] Furthermore, it is an object of the present invention a process for the manufacturing of the tamper-evident coupling system 1, according to one or more of the accompanying claims and/or according to the above detailed description. The process (figures 1-3 and 21-22) comprises at least the following steps:

- preparing at least one first base portion 11,
- preparing at least one first coupling portion 13,
- preparing at least one second base portion 12,
- preparing at least one second coupling portion 14,
- preparing at least one removable portion 15,
- preparing a through opening 29 on the first base portion 11.

[0156] Furthermore, the process for making the coupling system comprises the steps of: preparing at least one supporting portion 16 and constraining at least a portion of the supporting portion 16 to at least one of the second base portion 12 and the second coupling portion 14.

[0157] The step of preparing the first base portion 11 comprises a step of preparing a first sheet 51 on a plane surface and at least one step of cutting the first sheet 51 defining the first base portion 11.

[0158] The step of preparing the first coupling portion 13 comprises a step of preparing a second sheet 52 on a plane surface and a step of cutting the second sheet 52 defining the first coupling portion 13. In particular, this cutting step defines the respective hook 23 of the first coupling portion 13. Even more in detail, the cutting step defines the gripping edge 23a delimiting an undercut portion of the first coupling portion 13. In one embodiment, the first and the second sheet 51, 52 are integrally joined to form a single body.

[0159] The step of preparing the second base portion 12 comprises a step of preparing a third sheet 53 on a plane surface and a step of cutting the third sheet 53 defining the second base portion 12.

[0160] The step of preparing the second coupling por-

tion 14 comprises a step of preparing a fourth sheet 54 on a plane surface and a step of cutting the fourth sheet 54 defining the second coupling portion 14. In particular, said cutting step defines the hook 22 of the second coupling portion 14. Even more in detail, the cutting step defines the gripping edge 22a delimiting an undercut portion of the second coupling portion 14.

[0161] The step of preparing at least one through opening 29 on the second base portion 12 comprises a cutting step of the third sheet 53, optionally of the third and fourth sheet 53-54, to define the through opening 29 itself. In particular, the cutting step of the third sheet 53 defines the cut edge 33 delimiting the through opening 29. Even in more detail, the cutting step defines the depression delimited by the cut edge 33 of the through opening 29 on the second base portion 12. In particular, the cutting step defines the first and second depressions 29a, 29b respectively delimited by the first and second bottom segments 33a, 33b of the cut edge 33. Even more particularly, the cutting step defines two second 29b delimited by two bottom segments 33b of the cut edge 33.

[0162] The step of preparing the supporting portion 16 comprises a step of preparing a fifth sheet 55 on a plane surface and a step of cutting the fifth sheet 55 defining the supporting portion 16. In particular the cutting step defines the reciprocal coupling portion 17 and the thrusting portion 19. In one embodiment, the third, the fourth and the fifth sheet 53, 54, 55 are integrally joined to form a single body. The step of cutting the fifth sheet 55 defines the weakening portion 24 configured for allowing the supporting portion 16 the passage from the holding condition to the releasing one during the definition of the arming condition of the coupling system 1.

[0163] The preparation of the removable portion 15 comprises a cutting step of the second 52 or fourth sheet 54 to define the weakening element 26 of the removable portion 15; this cutting step involves at least one operation between punching, etching, shearing and/or laser cutting of the first or second coupling portion 13, 14.

[0164] The step of constraining at least one part of the supporting portion 16 to at least one between the second base portion 12 and the second coupling portion 14 comprises a step of sticking the supporting portion 16 to at least one between the second base portion 12 and the second coupling portion 14. In particular, the step of constraining provides for the sticking of the reciprocal coupling portion 17 of the supporting portion 16 to the respective reciprocal coupling portion 18 of at least a selected one of the second base portion 12 and the second coupling portion 14. The sticking step provides for a step of dispensing adhesive material on at least one between the first, fourth and fifth sheet 51, 54, 55. In one embodiment, the sticking step provides for a step of dispensing adhesive material on at least one between the first and fifth sheet 51, 55. Optionally, the step of constraining at least one part of the supporting portion 16 to at least one between the second base portion 12 and the second coupling portion 14 comprises a step of anchoring the sup-

porting portion 16 to at least one between the second base portion 12 and the second coupling portion 14, by means of at least one operation selected between deformation, cutting and pressing of at least one between the first, fourth and fifth sheet 51, 54, 55. The first, second, third, fourth and fifth sheet may be of paper sheet material.

Process for the manufacturing of the container 100

[0165] Furthermore, it is an object of the present invention a process for the manufacturing of a tamper-evident container 100, according to one or more of the accompanying claims and/or according to the above detailed description. The process of making the container 100 (figures 14-16 and 29-31) comprises at least the following steps:

- preparing the storage 2,
- preparing the coupling system 1,
- engaging the first sheet 51 having the first base portion 11 of the coupling system 1 at the free edge 6 of the storage 2 to define the closing portion 7,
- engaging the third sheet 53 having the second base portion 12 at at least one lateral wall 4 of the storage 2,
- arranging the second coupling portion 14 of the coupling system 1 at least partly inside the internal volume 3 of the storage 2.

[0166] The step of preparing the storage 2 comprises a step of preparing a sixth sheet 56 comprising at least one first and one second portion 57, 59 interconnected with a central connecting portion 58. The sixth sheet 56 further comprises at least one first and one second lateral connecting portion 60, 61, in which the central connecting portion 58 is interposed between the first and the second portion 57, 59, the first portion 57 is interposed between the first lateral connecting portion 60 and the central connecting portion 58, the second portion 59 is interposed between the second lateral connecting portion 61 and the central connecting portion 58. Each of the portions 57, 58, 59, 60, 61 comprises at least two opposite longitudinal edges and two opposite end edges. The first and second portions 57, 59, central connecting portion 58 and said lateral connecting portions 60, 61 are joined along the longitudinal edges and aligned along a single connection direction.

[0167] The step of preparing the storage 2 further comprises a step of folding the sixth sheet 56, joining the lateral connecting portions 60, 61, to form the storage 2 exhibiting the passage opening 5 delimited by at least one free edge 6. The lateral connecting portions 60, 61 are joined to each other by means of adhesive material. The step of preparing the storage 2 further comprises the step of preparing a seventh sheet 62 exhibiting at least one portion 63 connected to at least one central and/or lateral connecting portion of the sixth sheet 56

and emerging with respect to the latter. The portion 63 of the seventh sheet 62 is adapted to form a resting portion 80 of the container 100. The first base portion 11 and the first coupling portion 13 of the first and second sheets 51, 52 are joined to form the closing portion 7 and the inserting portion 8, respectively, of the closing tab 9 of container 100. The third sheet 53 defining the second base portion 12 of the second coupling portion 14 of the coupling system 1 is integrally joined to form a single body with at least one of the first and the second portion 57, 59 of the sixth sheet 56, in particular the third sheet 53 emerges from the longitudinal edges of the sixth sheet 56. The first sheet 51 defining the first base portion 11 of the coupling system 1 is integrally joined to form a single body with at least one of the first and the second portion 57, 59 of the sixth sheet 56, in particular in which said first sheet 51 emerges from the longitudinal end edges of the sixth sheet 56. In one embodiment, the first, second, third, fourth, fifth, sixth, and seventh sheet may be integrally joined to one another defining a single body of sheet material, in particular of paper sheet material.

Process for the arming of the coupling system 1

[0168] Furthermore, it is an object of the present invention a process for the arming of the tamper-evident coupling system 1, according to one or more of the accompanying claims and/or according to the above detailed description.

[0169] The process comprises a step of separately preparing the first coupling portion 13 and the second coupling portion 14 and a further step of exerting a reciprocal pressure between the first and the second coupling portions 13, 14 defining an initial contact condition of the coupling system 1. Such process, comprising the step of engaging the first and the second coupling portions 13, 14 defining the arming condition.

[0170] The step of exerting a mutual pressure between the first and the second coupling portions 13, 14 comprises a substep of nearing the respective hook 23 of the first coupling portion 13 to the hook 22 of the second coupling portion 14, and of putting in contact, optionally pressing, the respective hook 23 of the first coupling portion 13 at the hook 22 of the second coupling portion 14. As shown in figures 18-19, the respective hook 23, during the step of exerting a reciprocal thrust, may be interposed between the hook 22 of the second coupling portion 14 and the second base portion 12.

[0171] The step of exerting a reciprocal pressure between the first and the second coupling portions 13, 14 comprises a step in which the thrusting portion 19 receives against it, to sustain it, the hook 22 of the second coupling portion 14. The latter step corresponds to the holding operative condition of the supporting portion 16.

[0172] The step of engaging the first and the second coupling portions 13, 14 comprises the steps of inserting the respective hook 23 of the first coupling portion 13 at

the gripping edge 22a of the hook 22 of the second coupling portion 14, and of defining the grip between the undercut portions of the first and of the second coupling portion 13, 14 respectively delimited by the gripping edges 23a, 22a. The latter step corresponds to the releasing operative condition, in particular in which the total or partial breaking of the weakening portion 24 of the supporting portion 16 occurs, enabling an upper movement of the hook 22 of the second coupling portion 14 with respect to the holding operative condition.

Use of the coupling system 1

[0173] Furthermore, it is an object of the present invention a use of the tamper-evident coupling system 1, according to one or more of the accompanying claims and/or according to the above detailed description. The using process provides for the employment of the coupling system 1 to define at least one selected from the group of:

- a container for the containment of one or more products in which the coupling system 1 is used to define a first closed condition of the container. The coupling system 1 is configured for defining a first open condition under which the breaking of the removable portion 15 occurs, so as to show a possible tampering of the container;
- an envelope for the containment of one or more products in which the coupling system 1 is used to define a first closed condition of the envelope. The coupling system 1 is configured for defining a first open condition of the envelope under which the breaking of the removable portion 15 occurs, so as to show a possible tampering of the envelope;
- a band for wrapping one or more products, in which the coupling system 1 - for example borne by end strips opposite to the band - is used to define a first closed condition of the band. The coupling system 1 is further configured for defining a first open condition under which the breaking of the removable portion 15 occurs, so as to show a possible tampering of the band.

Claims

1. Tamper-evident coupling system (1) comprising:

- at least one first base portion (11) of sheet material,
- at least one second base portion (12) of sheet material,
- at least a first coupling portion (13) carried by the first base portion (11),
- at least one second coupling portion (14) carried by the second base portion (12) and configured for cooperating with said first coupling

portion (13), said second coupling portion (14) facing, optionally at least partially contacting, the second base portion (12),

the first and the second coupling portions (13, 14) being configured for defining at least one arming condition in which said first and second coupling portions (13, 14) are stably engaged with each other, wherein at least one between the first and the second coupling portions (13, 14) comprises at least one weakening element (26) configured for defining, on at least one of said first and second coupling portions (13, 14), at least one removable portion (15), said removable portion (15) being configured for separating from the coupling system (1) upon a first disengagement condition of said first and second coupling portions (13, 14) following said arming condition for preventing a subsequent coupling of said first and second coupling portions (13, 14),

characterized by the fact that the coupling system (1) comprises at least one through opening (29) defined on the second base portion (12) configured for enabling to display - through the through opening (29) itself and at least during the arming condition of the coupling system (1) - at least part of the weakening element (26).

2. System according to the preceding claim, wherein the through opening (29) enables displaying - through the through opening (29) itself and at least during the arming condition of the coupling system (1) - at least part of the removable portion (15).
3. System according to any one of the preceding claims, wherein the second base portion (12) comprises an end portion (34) delimited by a perimetral edge (12c), wherein the through opening (29) is defined on said end portion (34) of said second base portion (12).
4. System according to the preceding claim, wherein the through opening (29) is delimited by a cut edge (33) defined on the second base portion (12) and defining on this latter portion a depression from the perimetral edge (12c), optionally said cut edge (33) extending seamlessly from the perimetral edge (12c) for defining, on said second base portion, said at least one depression, optionally said depression exhibiting an open outline.
5. System according to the preceding claim, wherein said depression defined by the through opening (29) comprises at least a first and at least a second depression (29a, 29b), optionally with an open outline, wherein the first depression (29a) enables displaying the removable portion (15), optionally said first depression (29a) enables displaying of the removable portion (15) according to a front perspective with re-

- spect to the first surface (12a) of the second base portion (12),
 wherein the second depression (29b) enables displaying the weakening element (26), optionally said second depression (29b) enables displaying the weakening element (26) according to a front perspective with respect to the first surface (12a) of the second base portion (12).
6. System according to claim 4 or 5, wherein the first depression (29a) faces - at least during the arming condition of the coupling system (1) - the removable portion (15), wherein the second depression (29b) faces - at least during the arming condition of the coupling system (1) - the weakening element (26).
7. System according to claim 5 or 6, wherein the first and second depressions (29a, 29b) are respectively delimited at a bottom portion by a first and second bottom segments (33a, 33b) of the cut edge (33), said first bottom segment (33a) determining - with respect to the perimetral edge (12c) - a depth of the first depression (29a) while said second bottom segment (33b) determining - with respect to the perimetral edge (12c) - a depth of the second depression (29b),
 wherein the maximum depth of the first depression (29a) is less than the maximum depth of the second depression (29b).
8. System according to any one of claims 5 to 7, wherein the first and second depressions (29a, 29b) communicate with each other for defining a single access through the second base portion (12).
9. System according to any one of the preceding claims, wherein the second coupling portion (14) comprises at least one hook (22) defining at least one undercut portion delimited by a gripping edge (22a),
 wherein the first coupling portion (13) comprises at least one respective hook (23) defining at least one undercut portion delimited by a respective gripping edge (23a),
 said hooks (22, 23) of the first and second coupling portions (13, 14), being configured for stably engaging each other during the arming condition, optionally said hooks (22, 23) - during the arming condition - exhibiting respective concavities facing each other.
10. System according to the preceding claim, wherein the second coupling portion (14) comprises a base body (25) directly bearing the hook (22) of the second coupling portion (14) itself, said hook (22) of the second coupling portion (14) being rotatably movable with respect said base portion (25).
11. System according to any one of the preceding claims, wherein the removable portion (15) is defined by at least part of the second coupling portion (14), optionally the removable portion (15) is defined by the hook (22) of the second coupling portion (14).
12. System according to the preceding claim, wherein the second coupling portion (14) comprises the weakening element (26) delimiting the hook (22) of the second coupling portion (14) itself which defines said removable portion (15),
 optionally the second coupling portion (14) exhibits a weakening between the base body (25) and the hook (22) so that said hook (22) can define said removable portion (15).
13. Tamper-evident container (100) comprising:
 - at least one storage (2) of sheet material defining an internal volume (3) and configured for housing products, said storage (2) exhibiting at least one lateral wall (4) defining at least one passage opening (5) delimited by a free edge (6), said passage opening (5) being configured for putting in communication the internal volume (3) of the storage (2) with the external environment,
 - at least one coupling system (1) according to any one of the preceding claims,
 wherein the first base portion (11) is rotatably constrained to the free edge (6) of the storage (2), the first coupling portion (13) is borne by the first base portion (11) so that this latter is interposed between the free edge (6) of the storage (2) and the first coupling portion (13),
 wherein the first base portion (11) and the first coupling portion (13) are movable, particularly by rotation, with respect to the storage (2), and are configured for defining at least one closed condition in which at least part of the first base portion (11) interdicts the communication between the internal volume (3) of the storage (2) and the external environment, the first base portion (11) and the first coupling portion (13) being further configured for defining an open condition in which these latter enable the communication between the internal volume (3) and the external environment,
 wherein the second base portion (12) of the coupling system (1) defines at least part of a lateral wall (4) of the storage (2), while the second coupling portion (14) is at least partially disposed in the internal volume (3) of said storage (2),
 wherein the coupling system (1) - during a first closed condition of the container (100) - is configured for defining the arming condition wherein the first and second coupling portions (13, 14) are engaged with each other,
 wherein the coupling system (1) - during a first open

condition of the container (100) following the first closed condition - is configured for defining the first disengagement condition during which the removable portion (15) is configured for separating from the coupling system (1).

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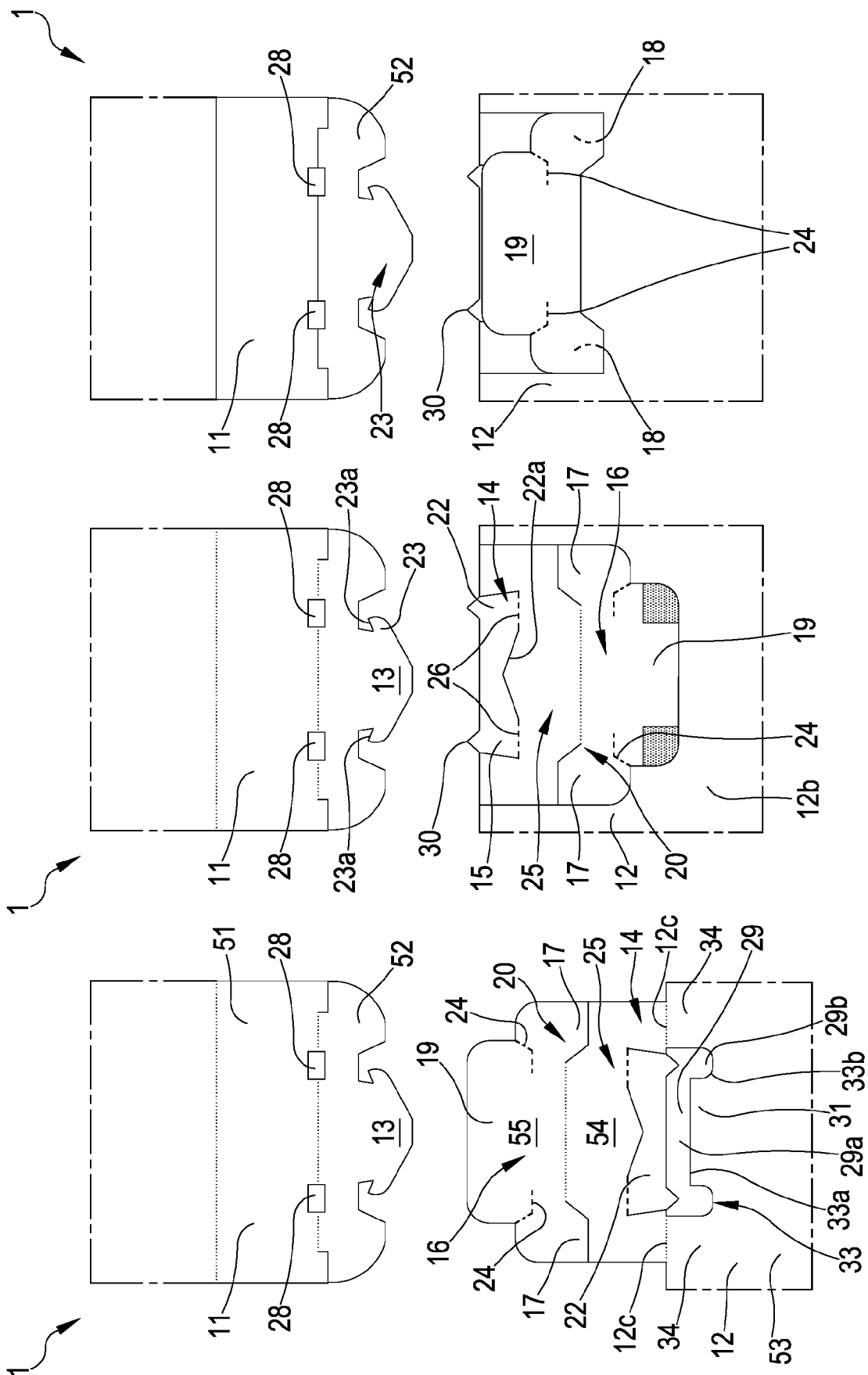


FIG.3

FIG.2

FIG.1

FIG.4

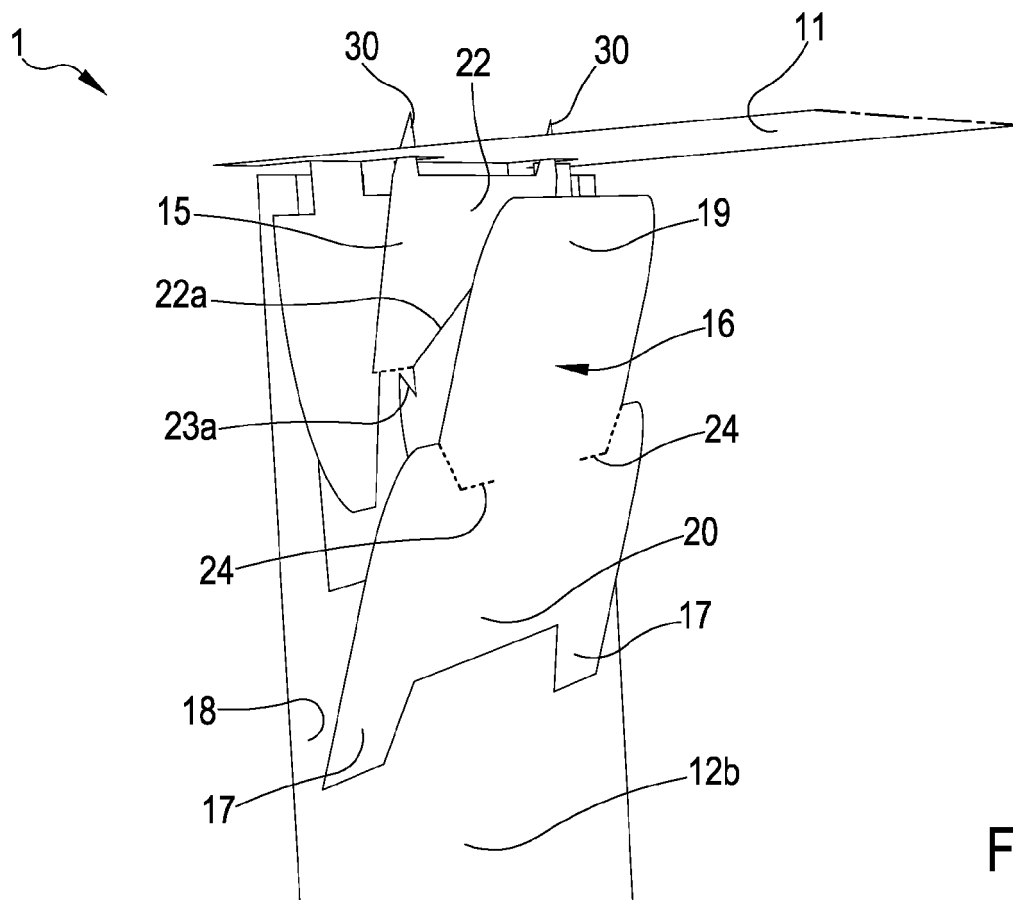
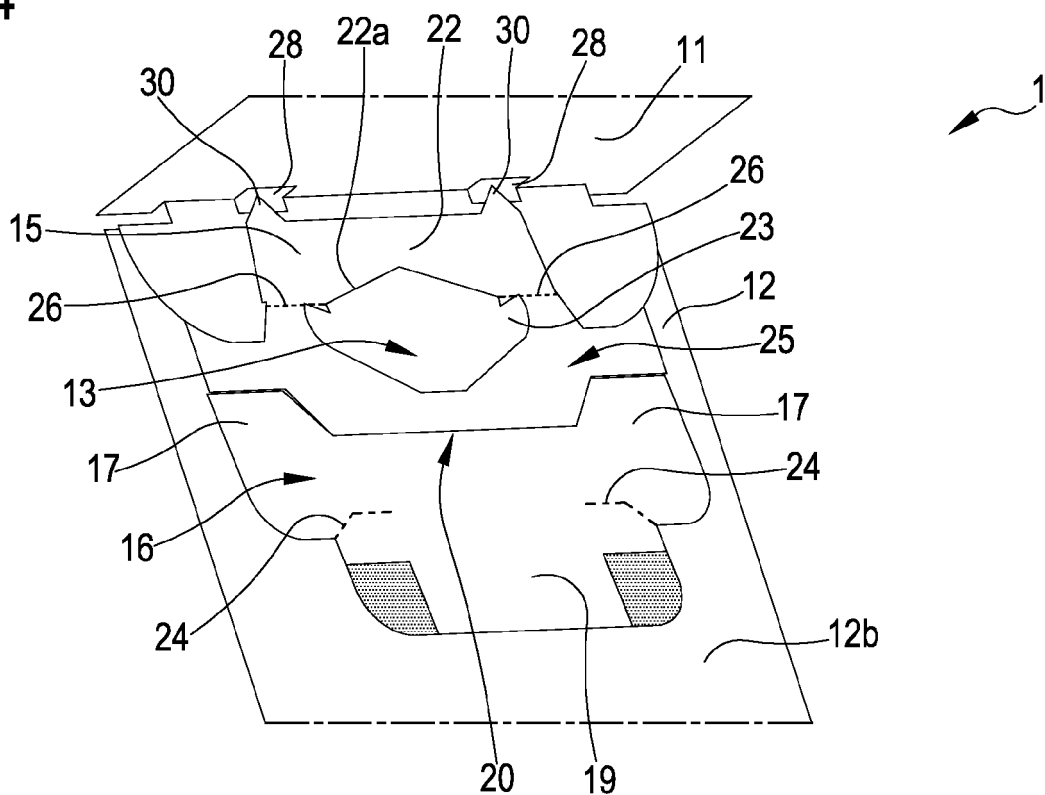


FIG.5

FIG.6

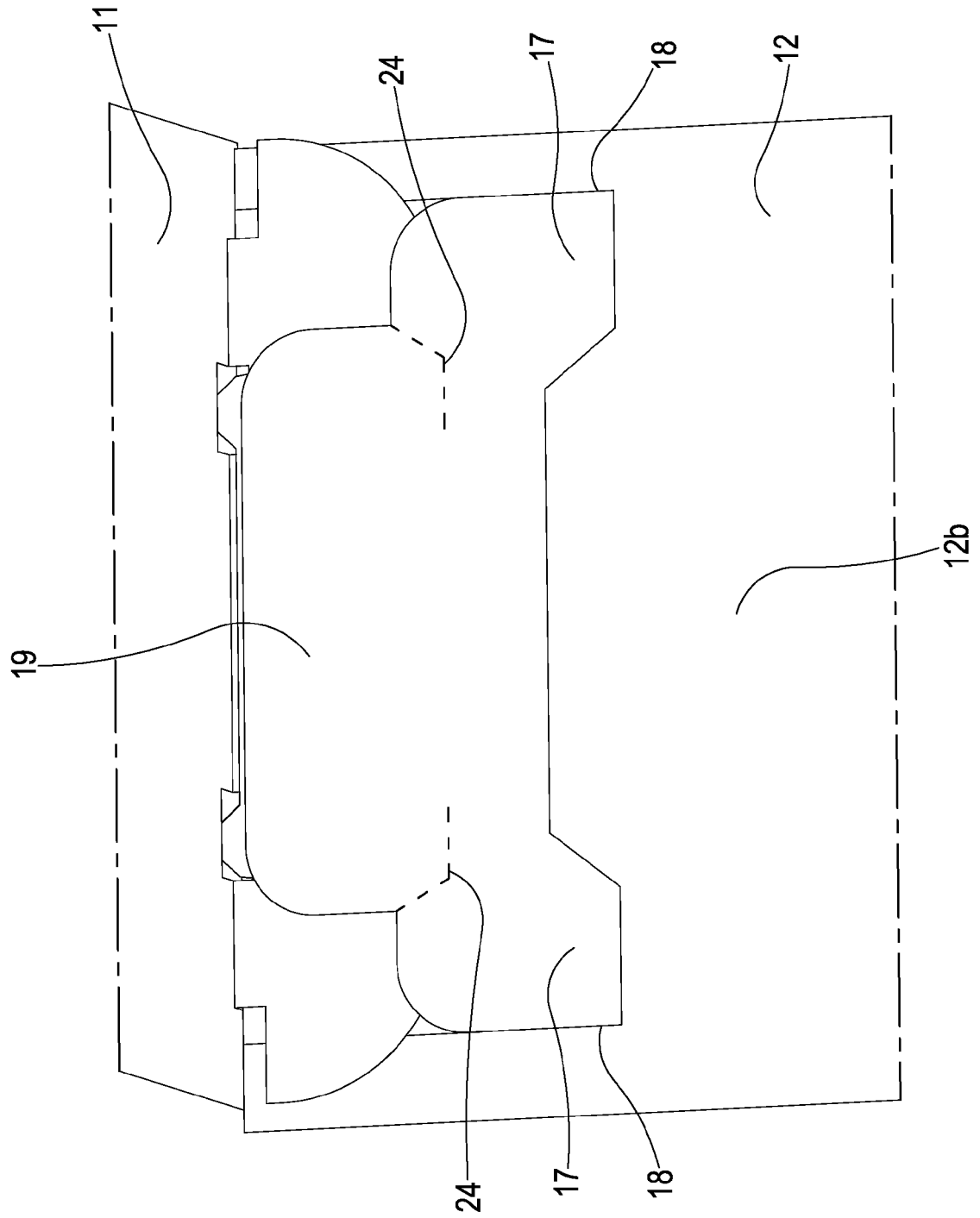


FIG.7

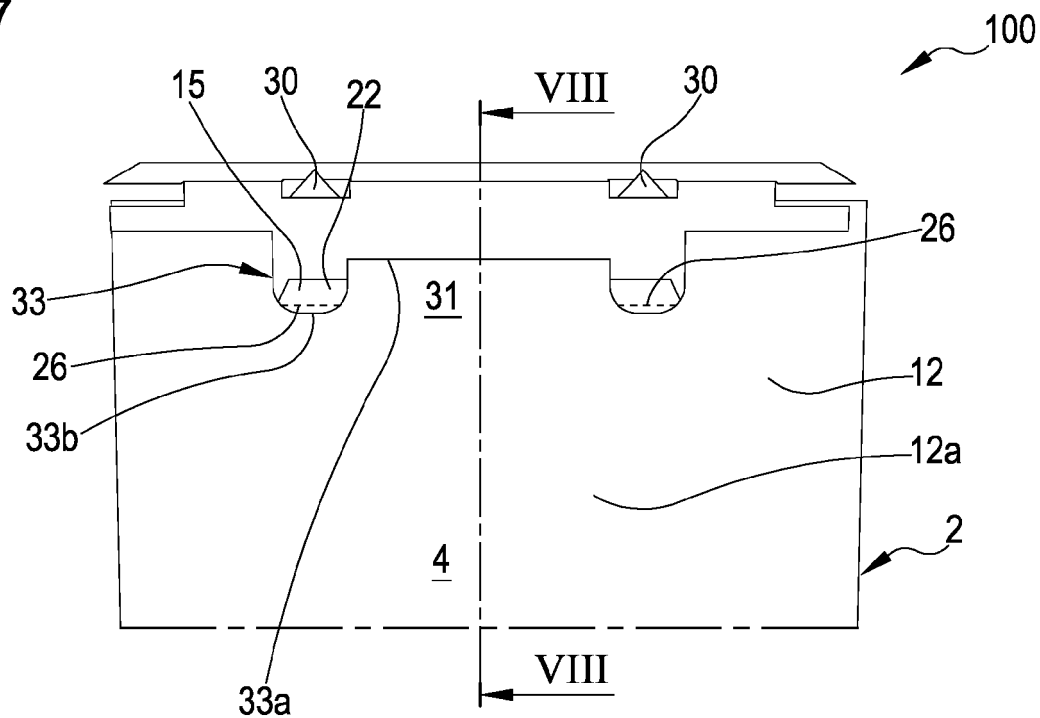


FIG.8

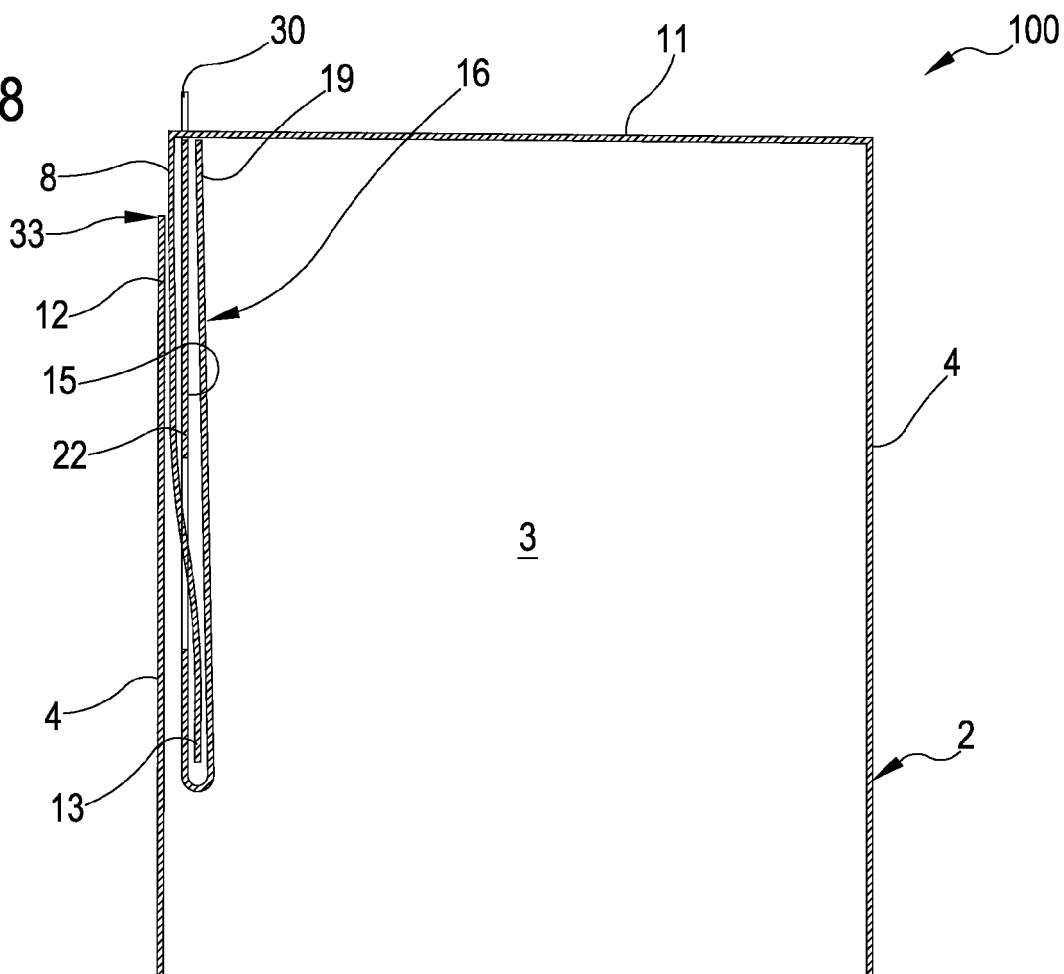


FIG.9

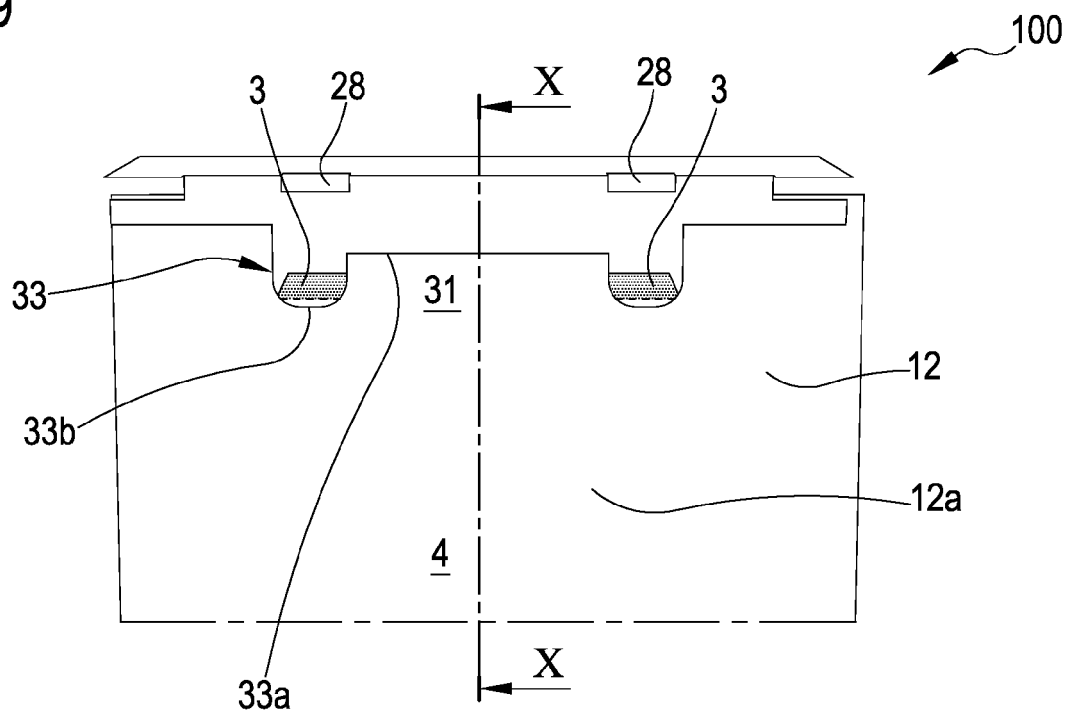
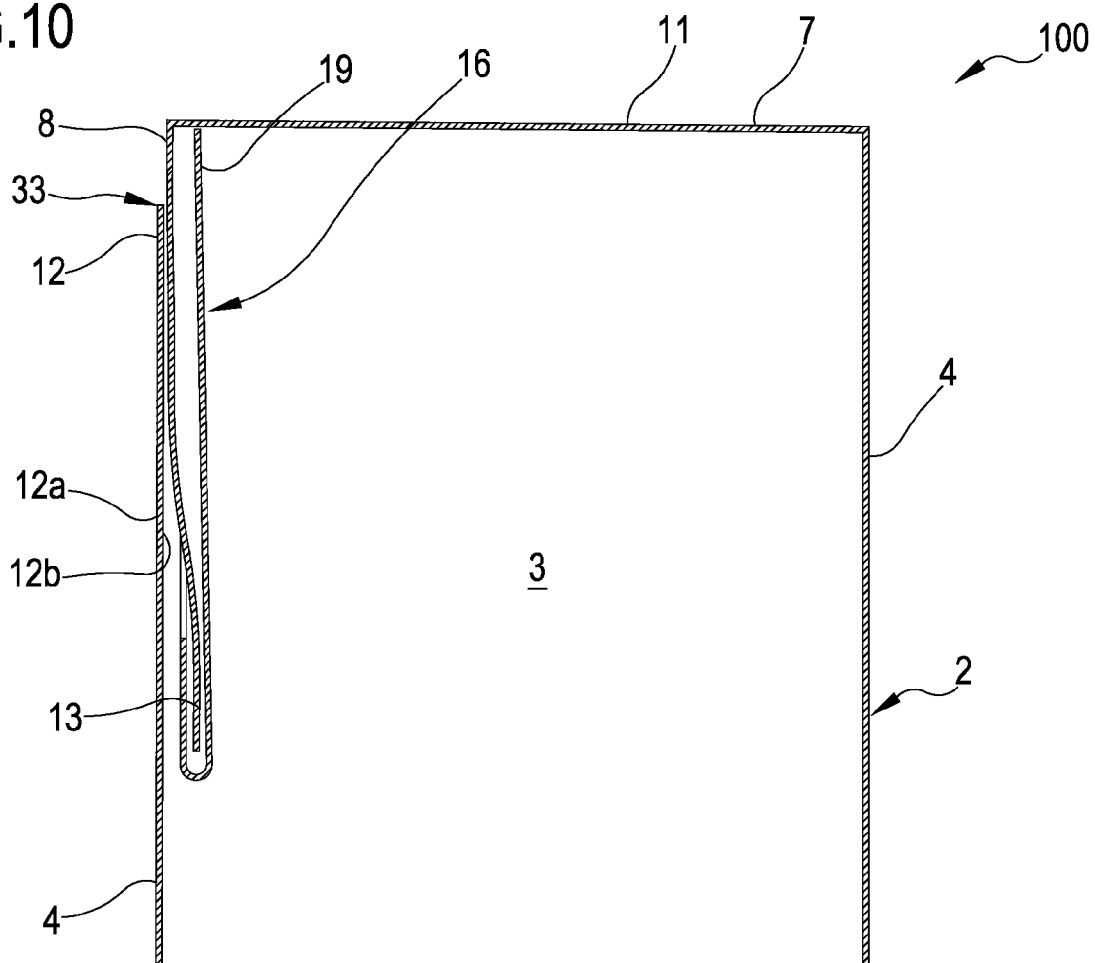


FIG.10



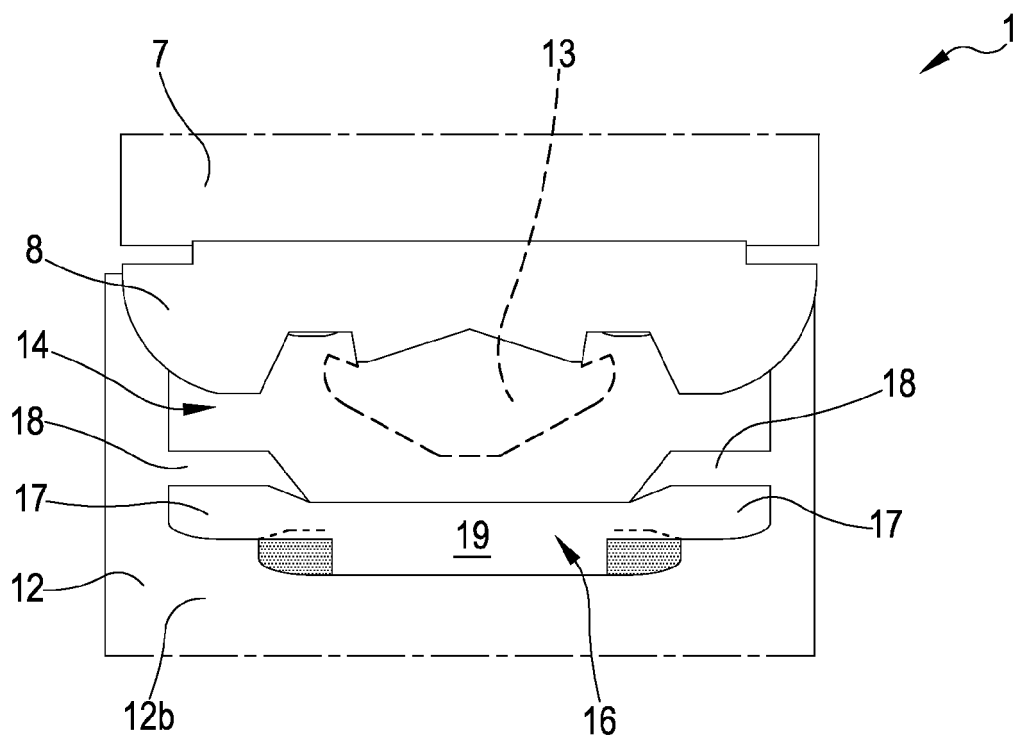


FIG.11

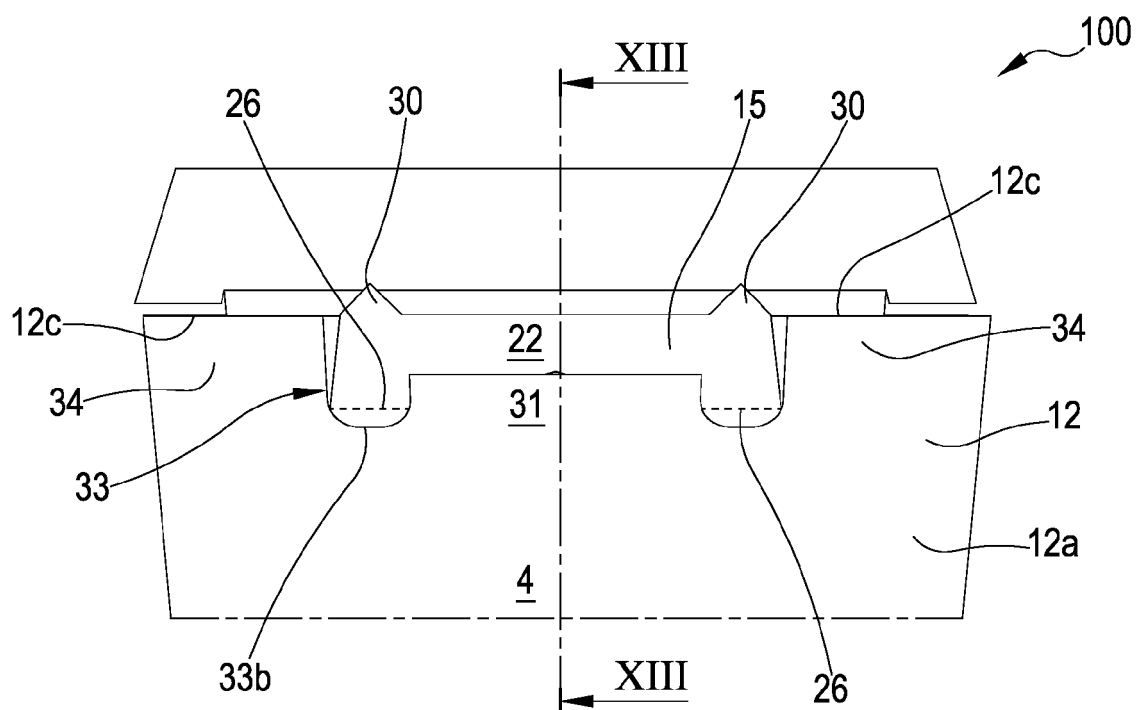


FIG.12

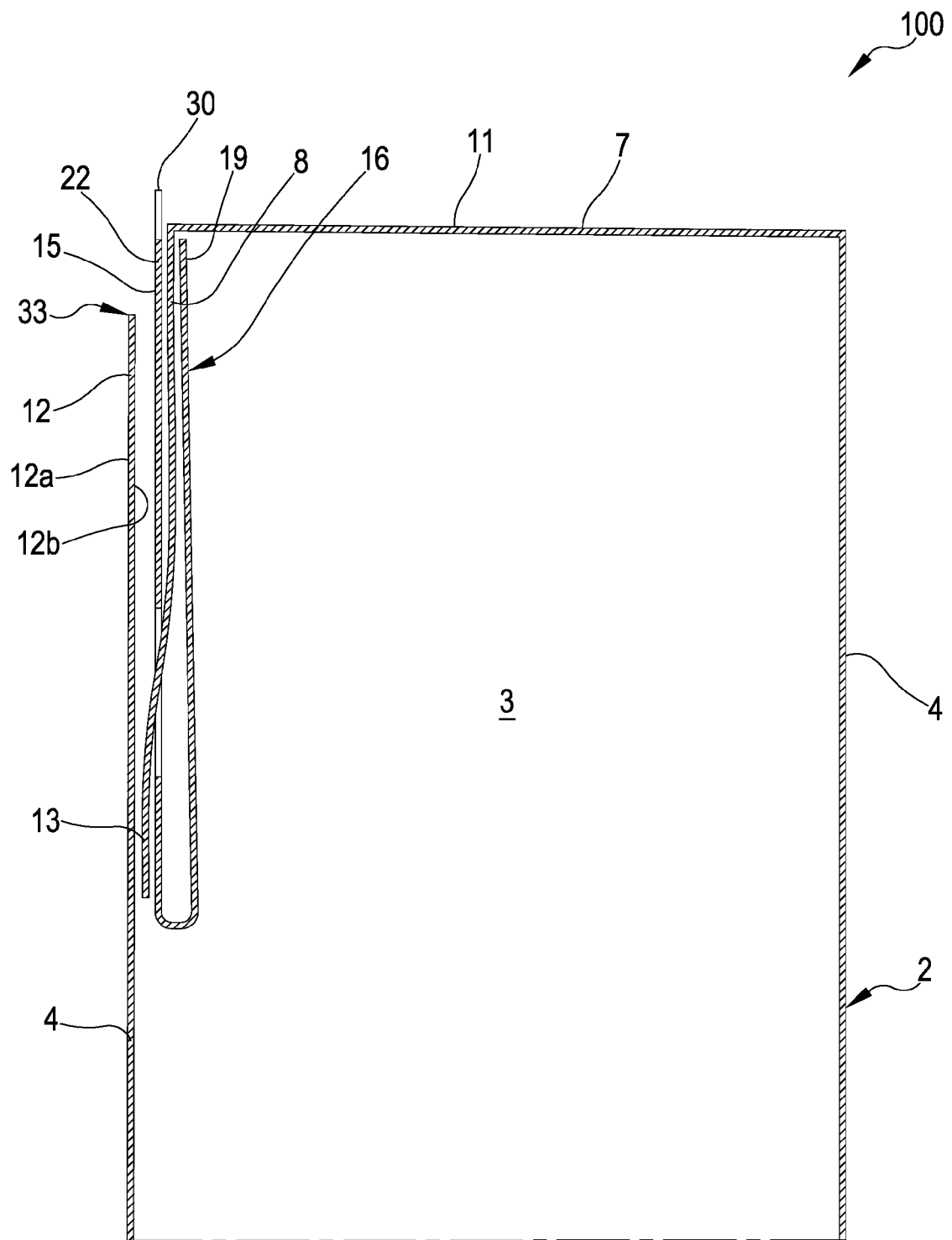


FIG.13

FIG.14

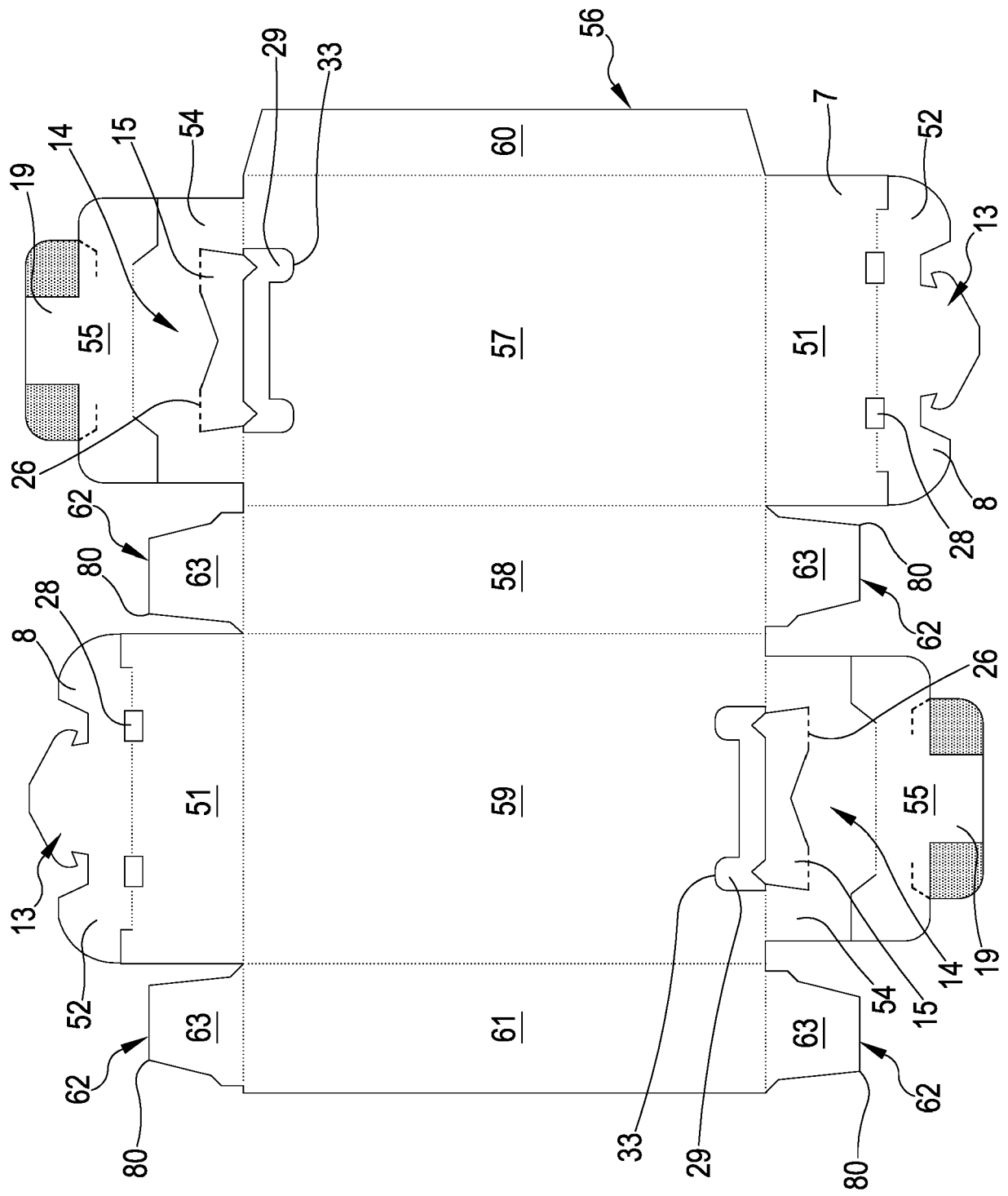
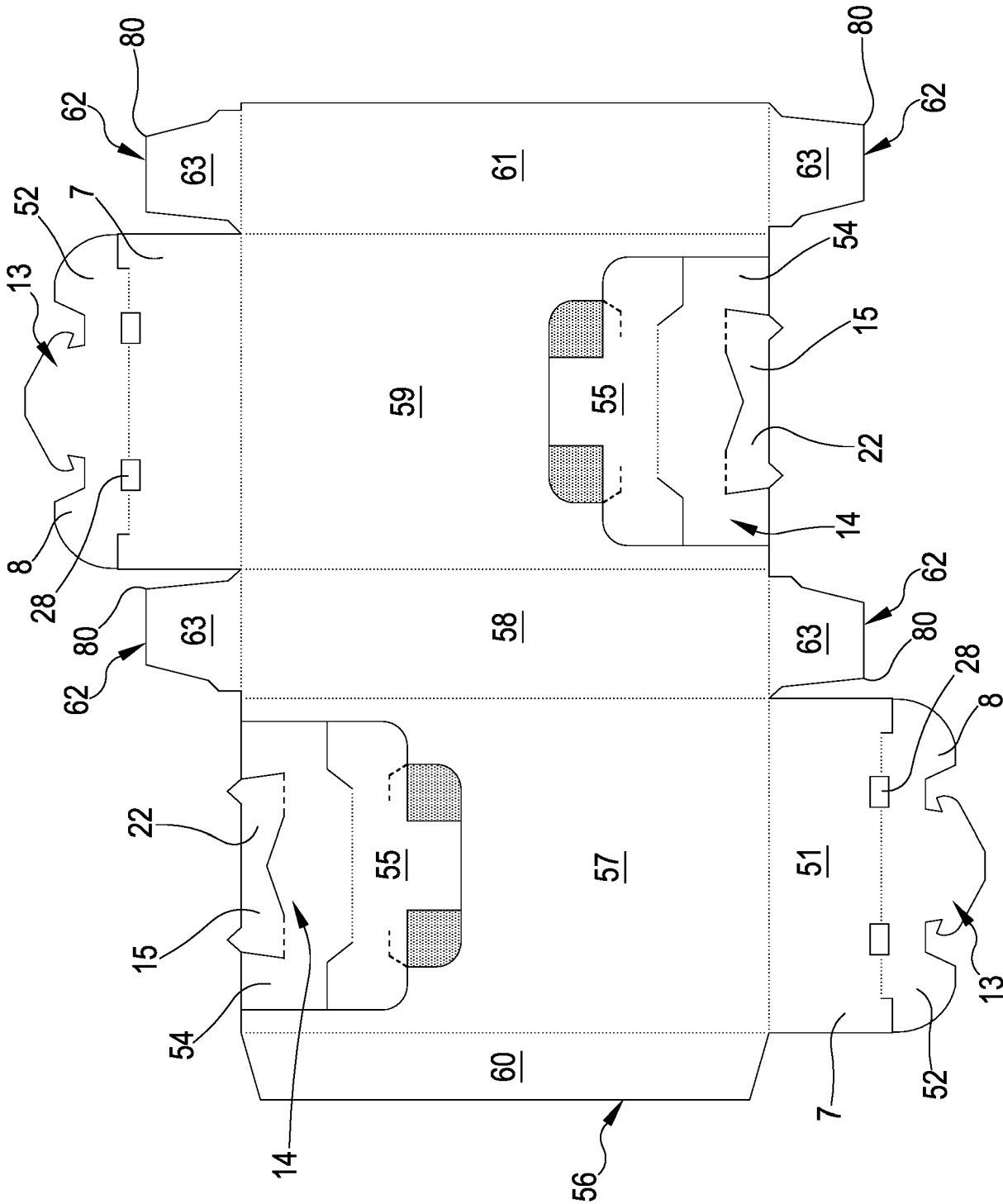


FIG.15



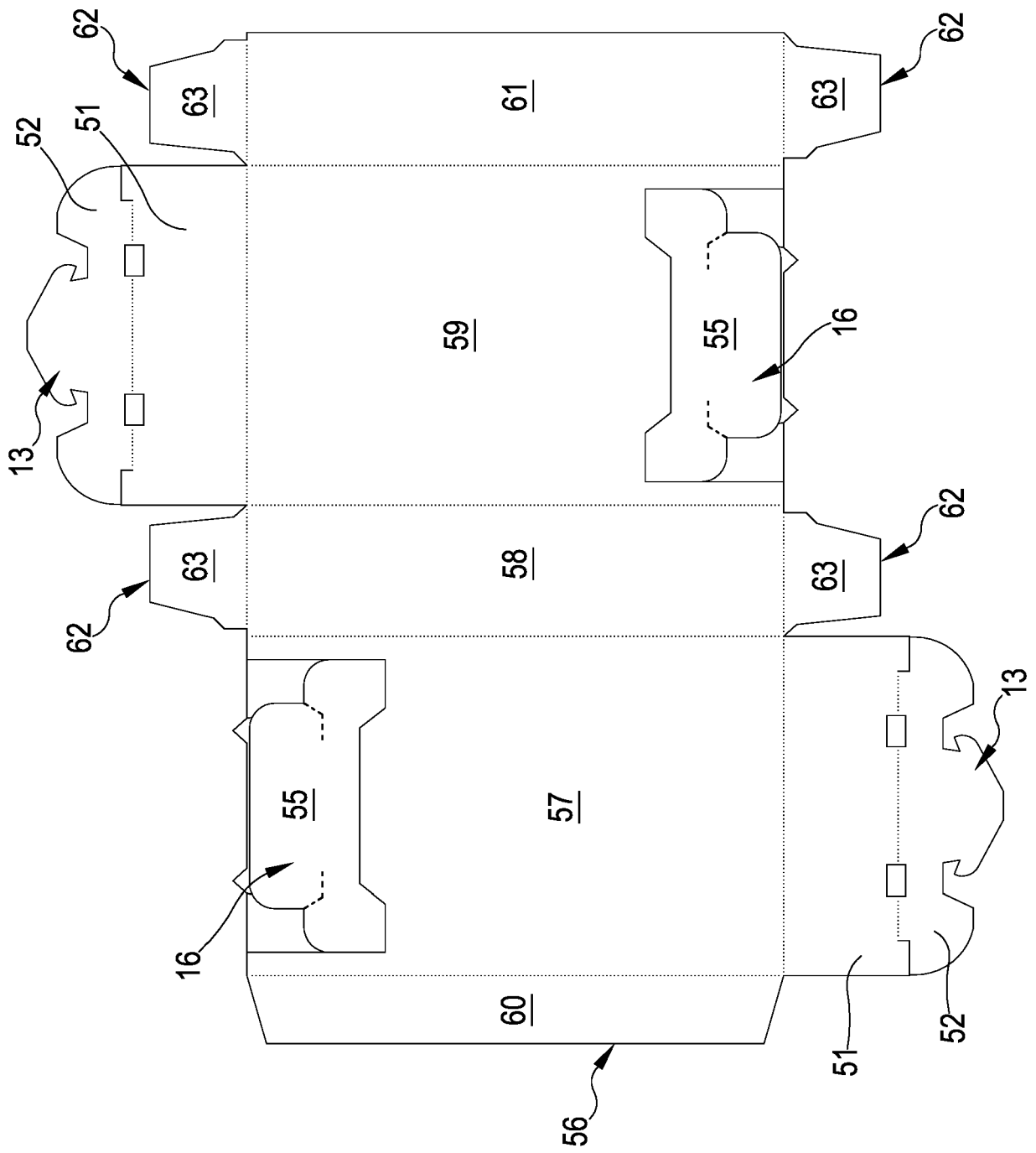


FIG. 16

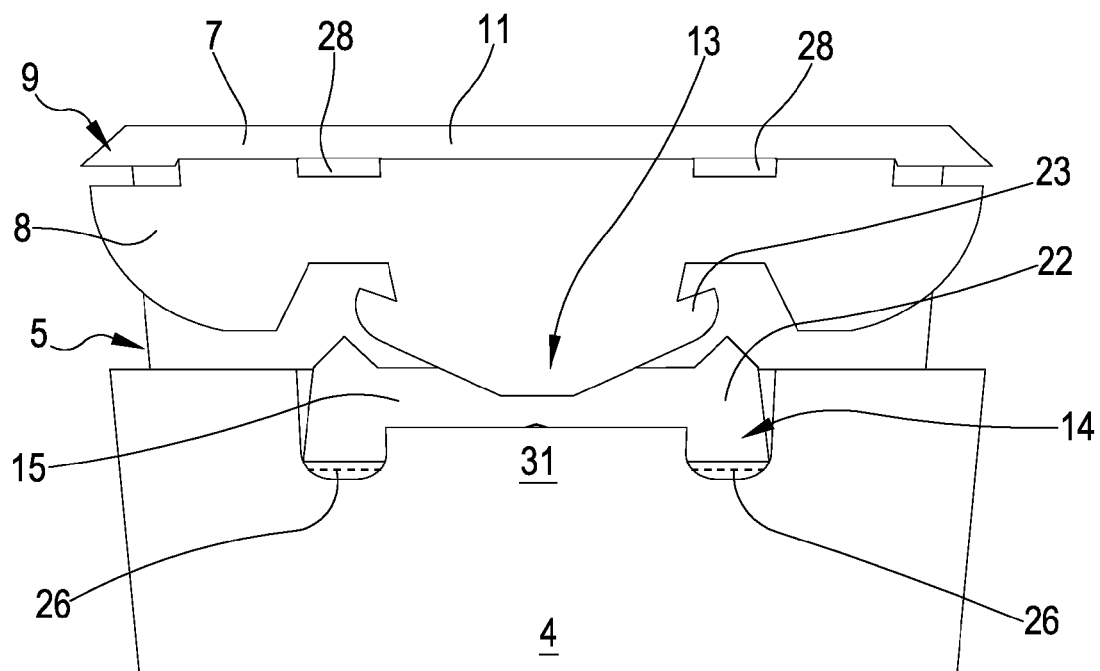


FIG.17

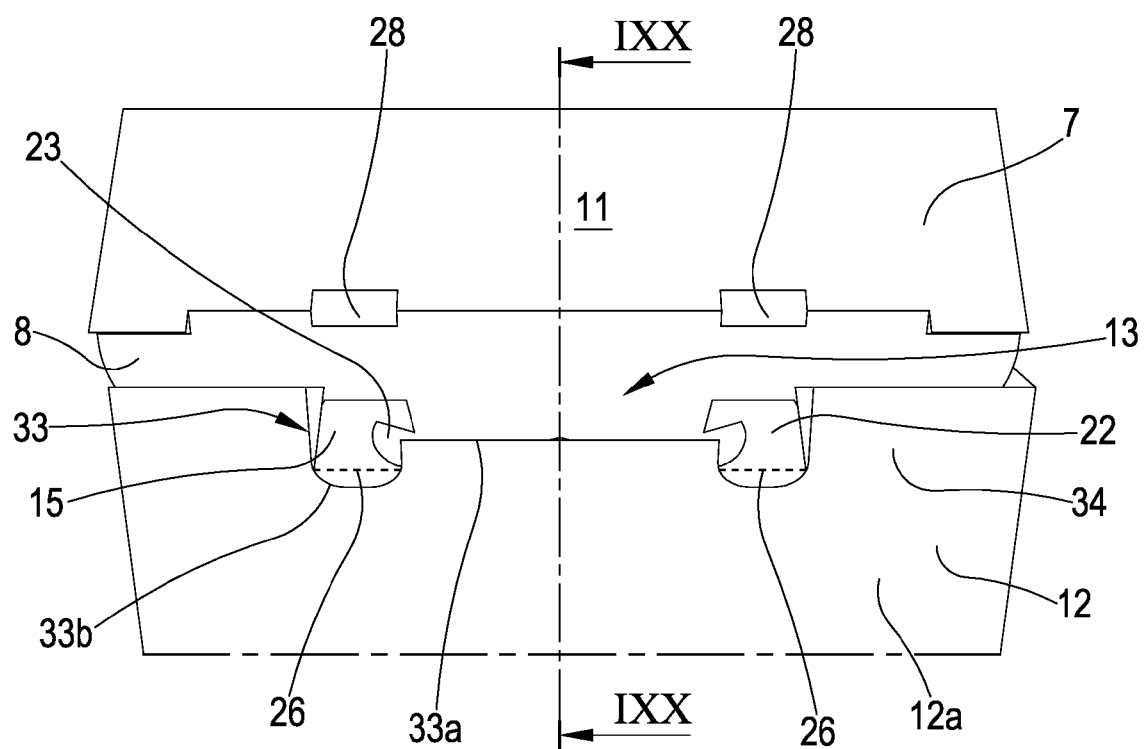


FIG.18

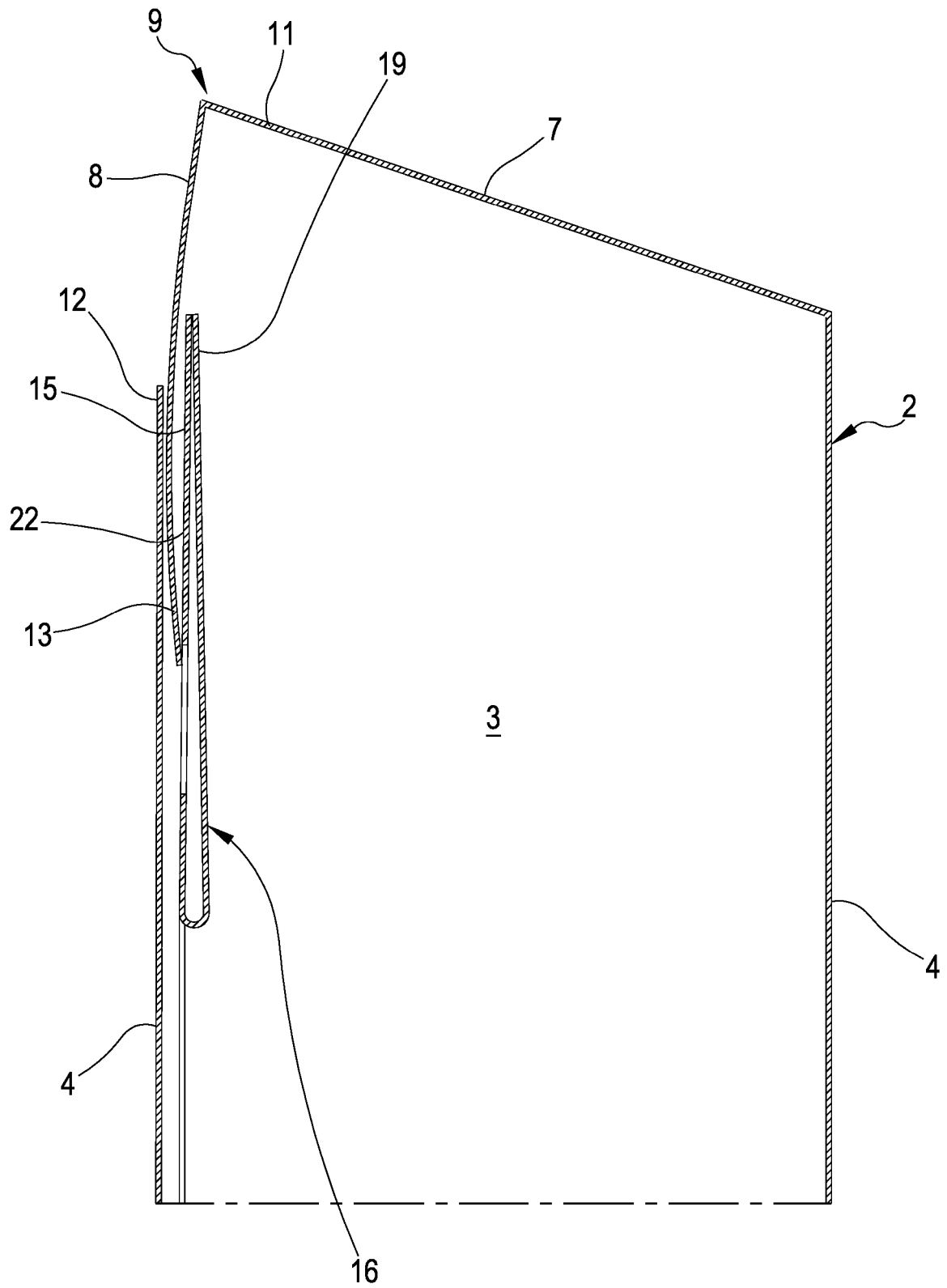


FIG.19

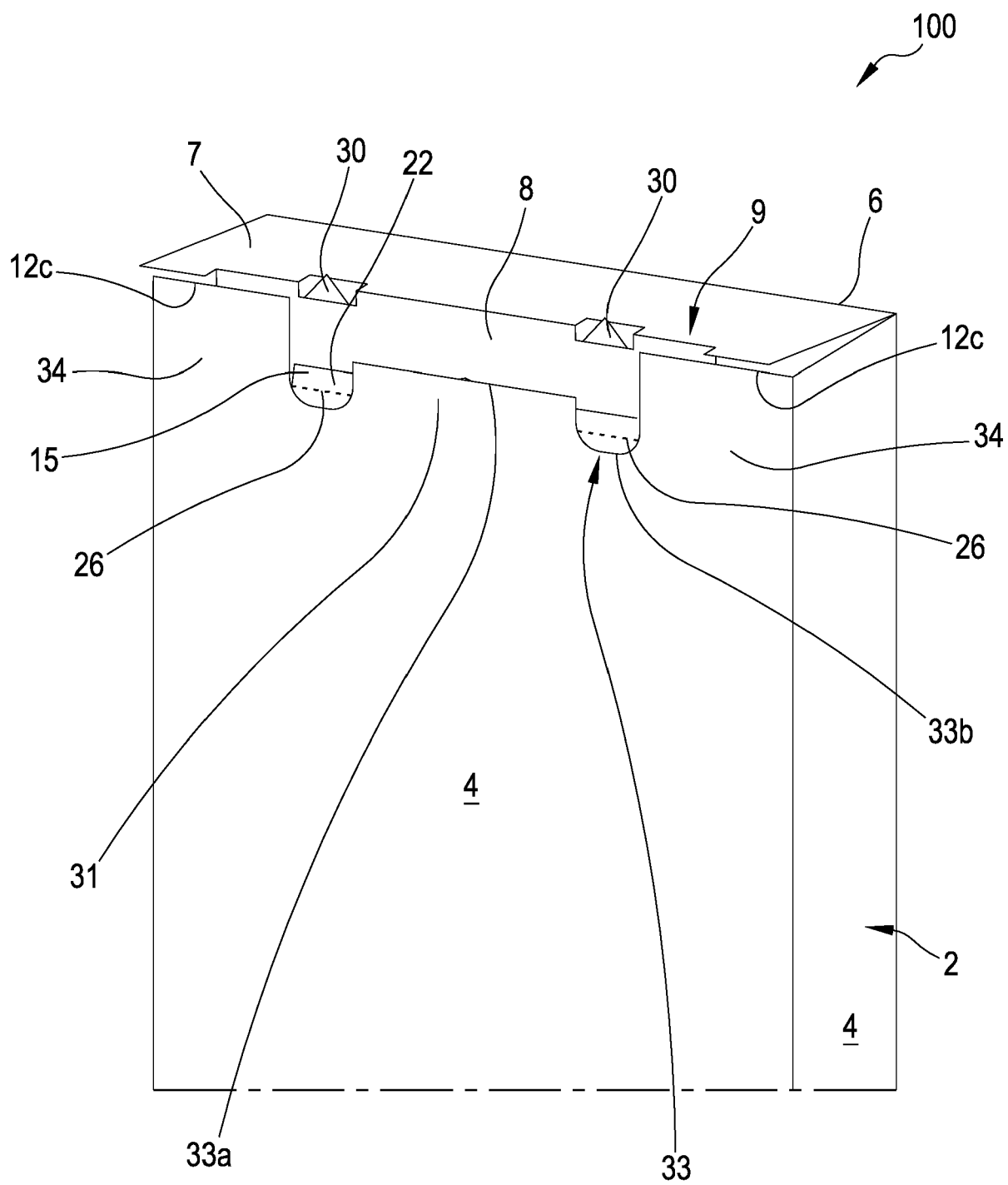
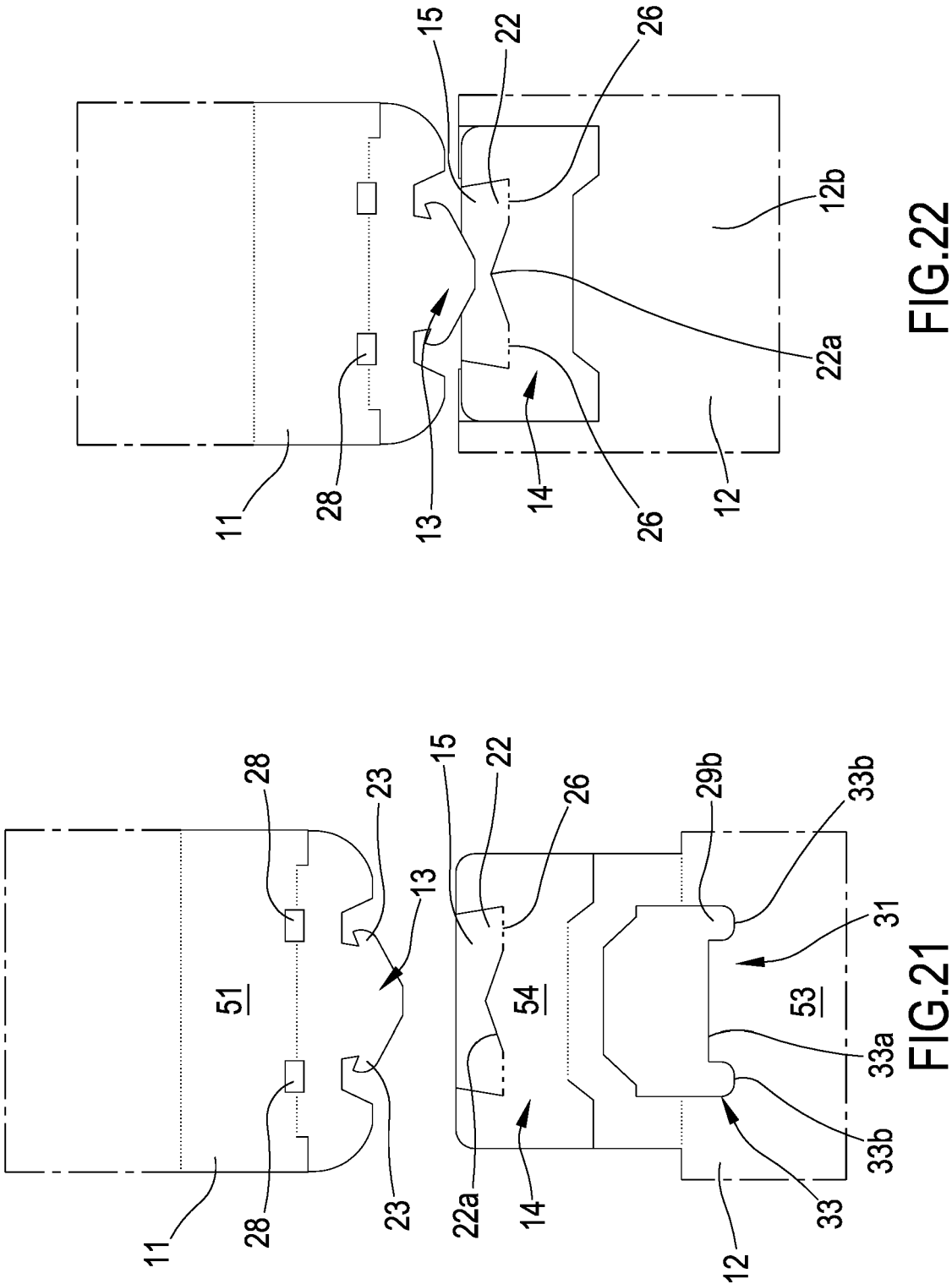


FIG.20



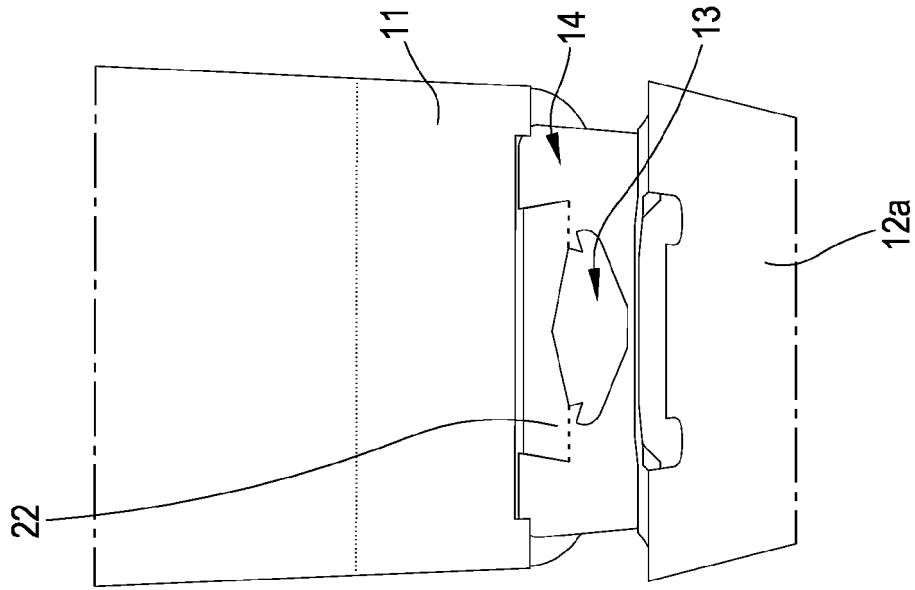


FIG.25

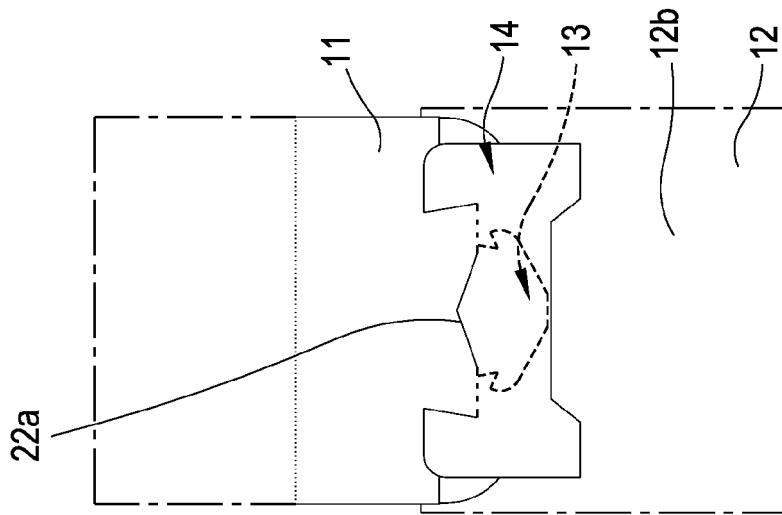


FIG.24

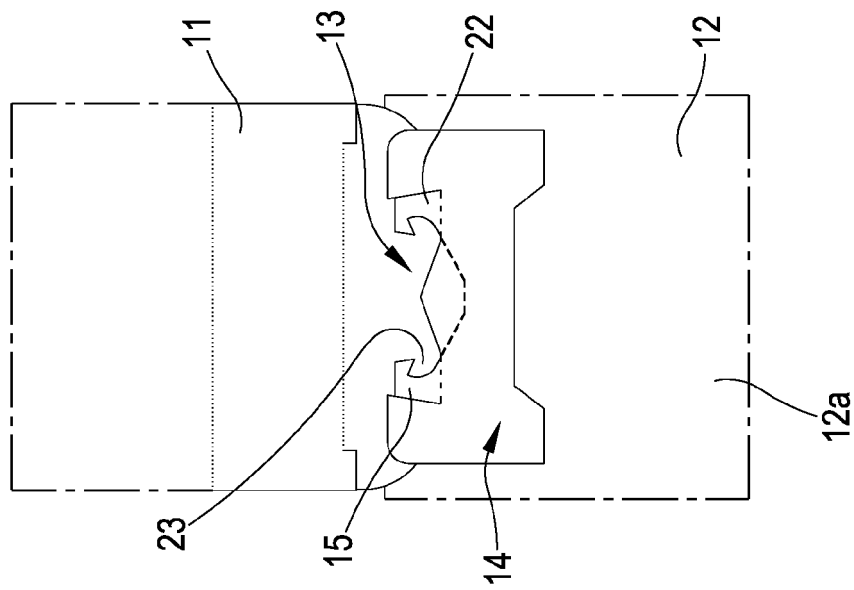


FIG.23

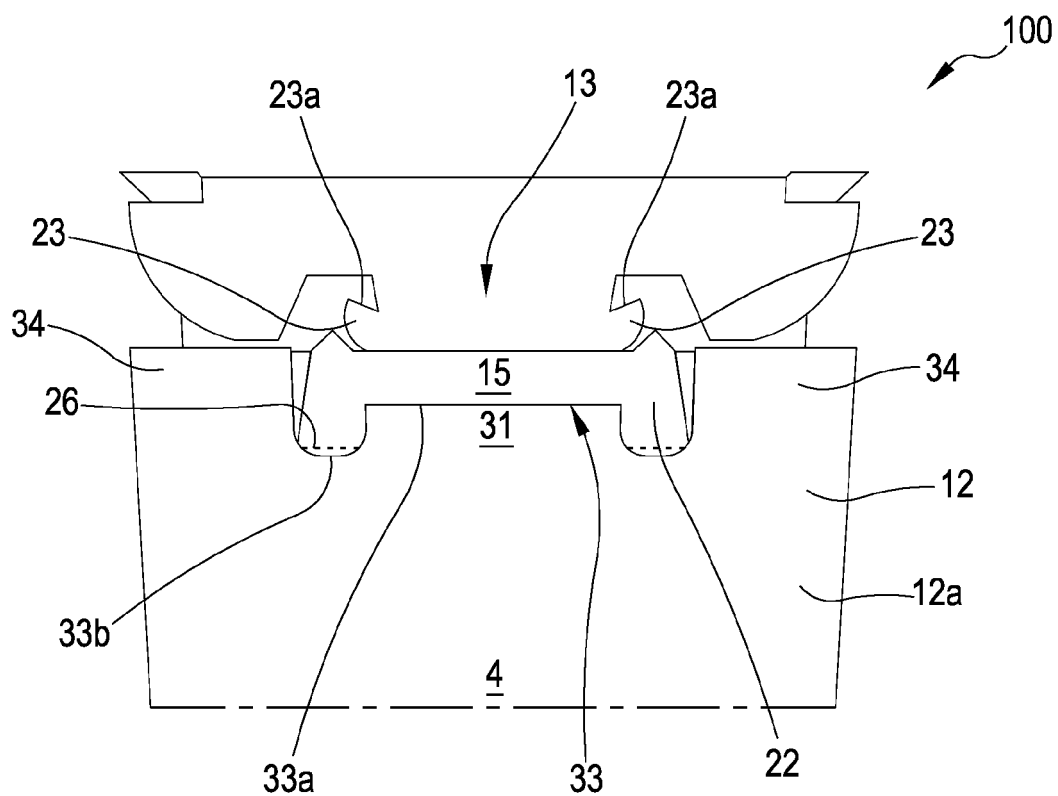


FIG. 26

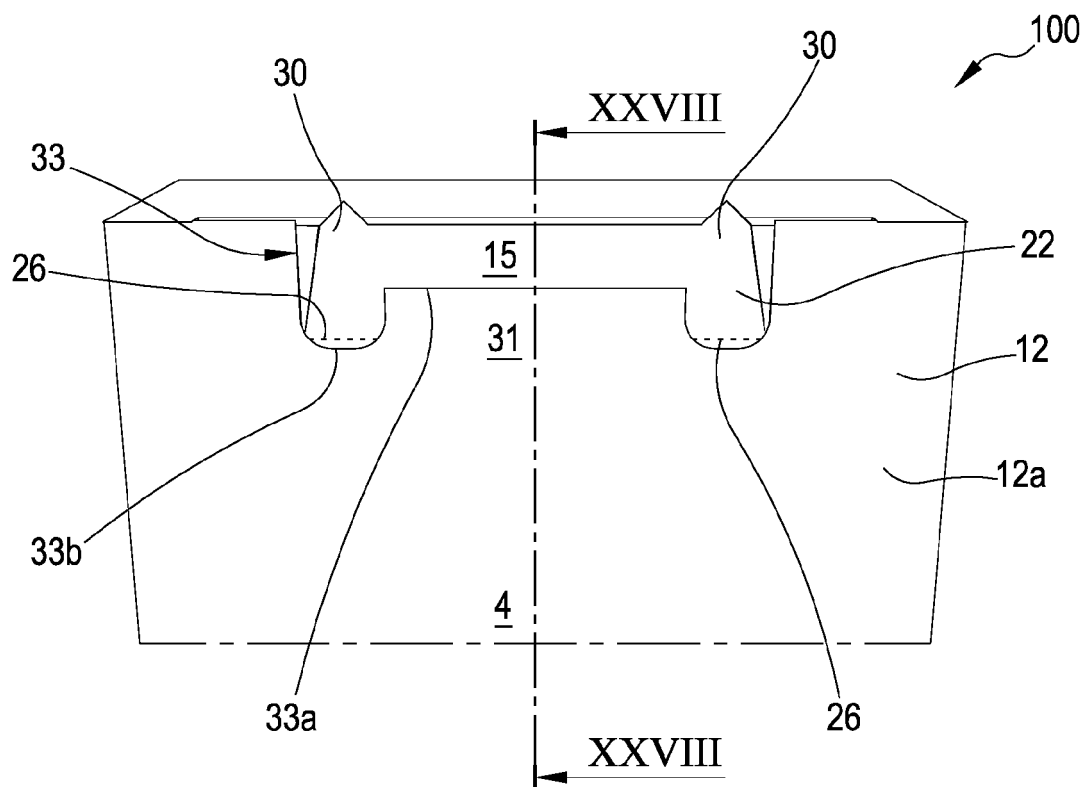


FIG. 27

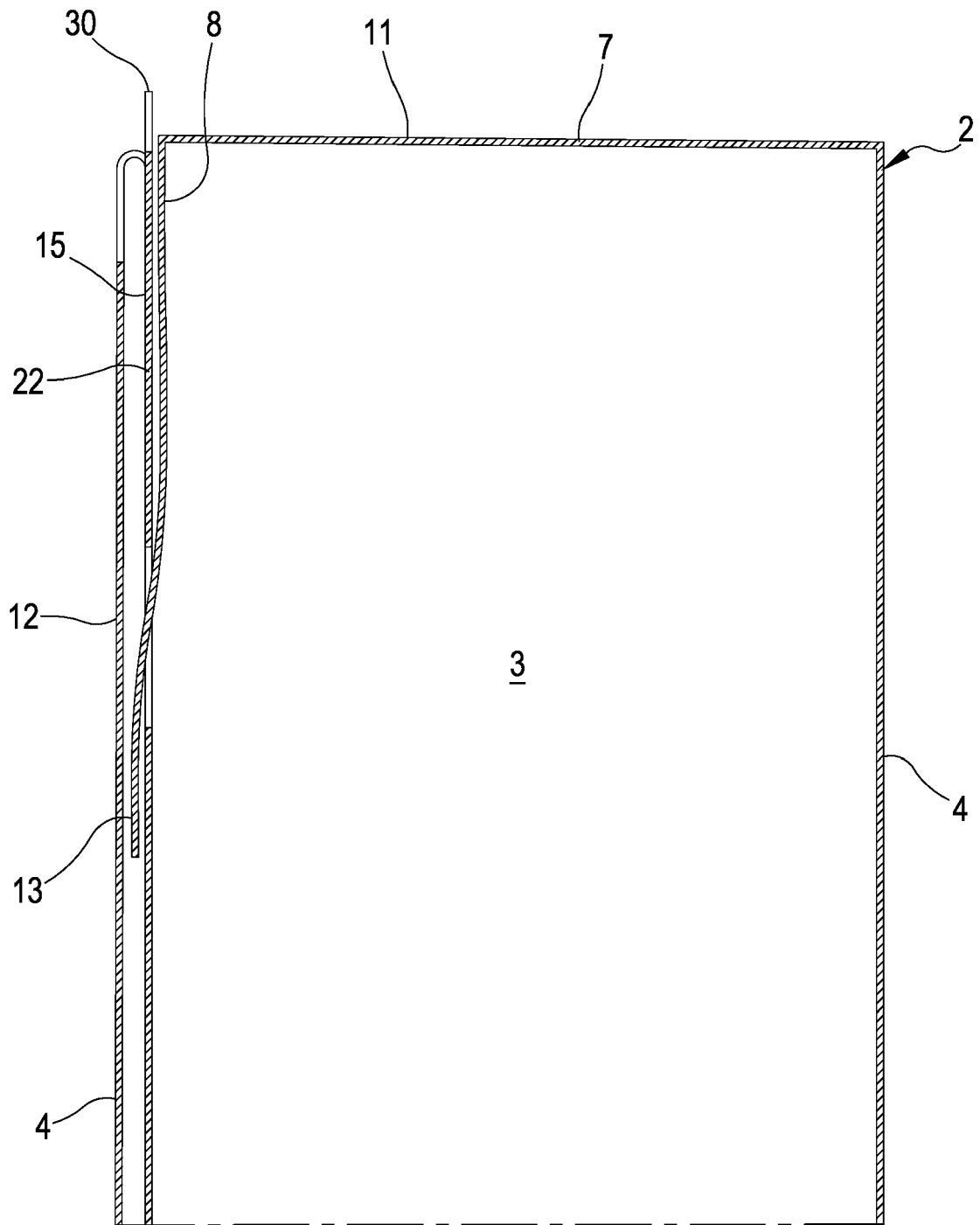


FIG.28

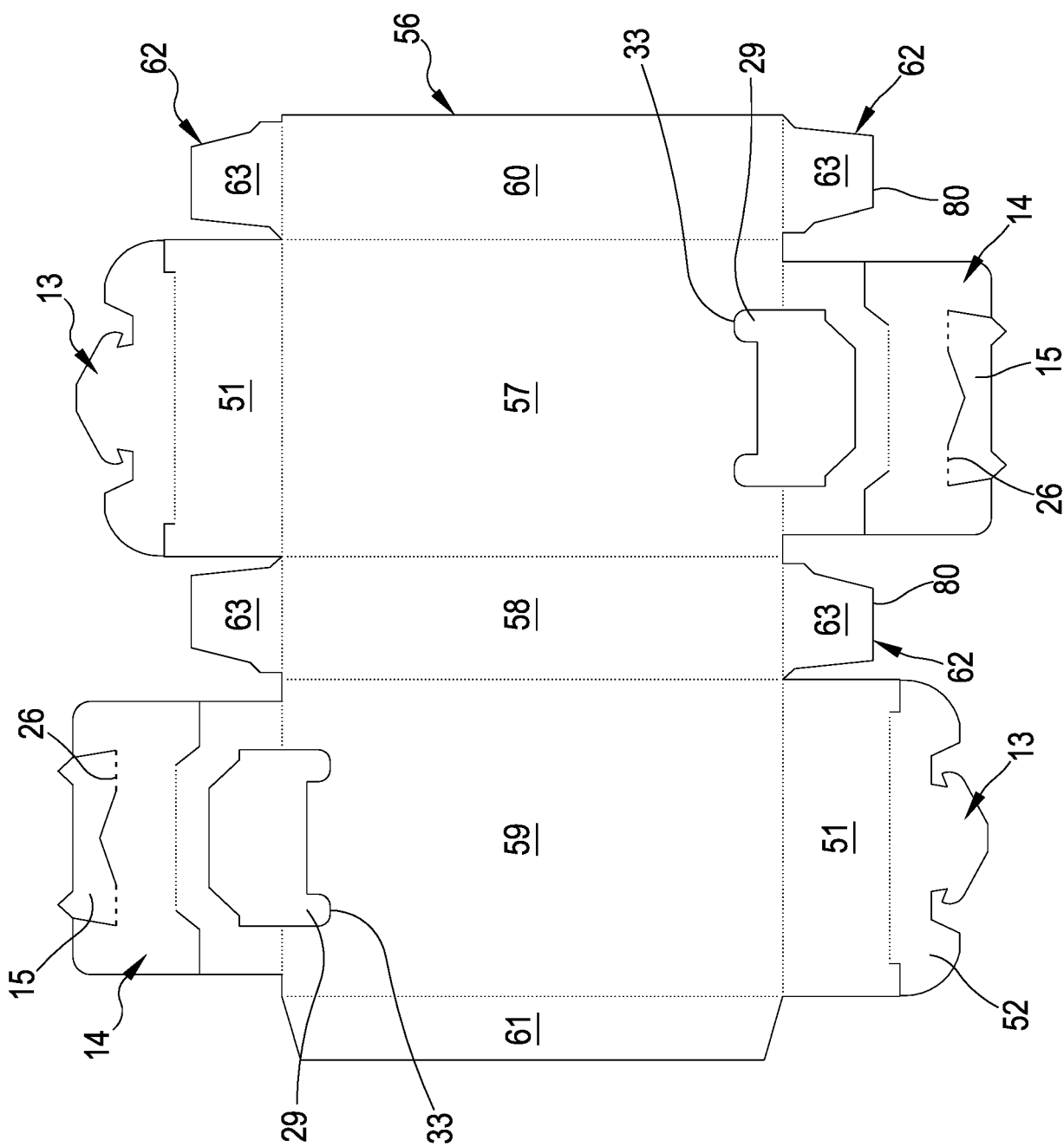
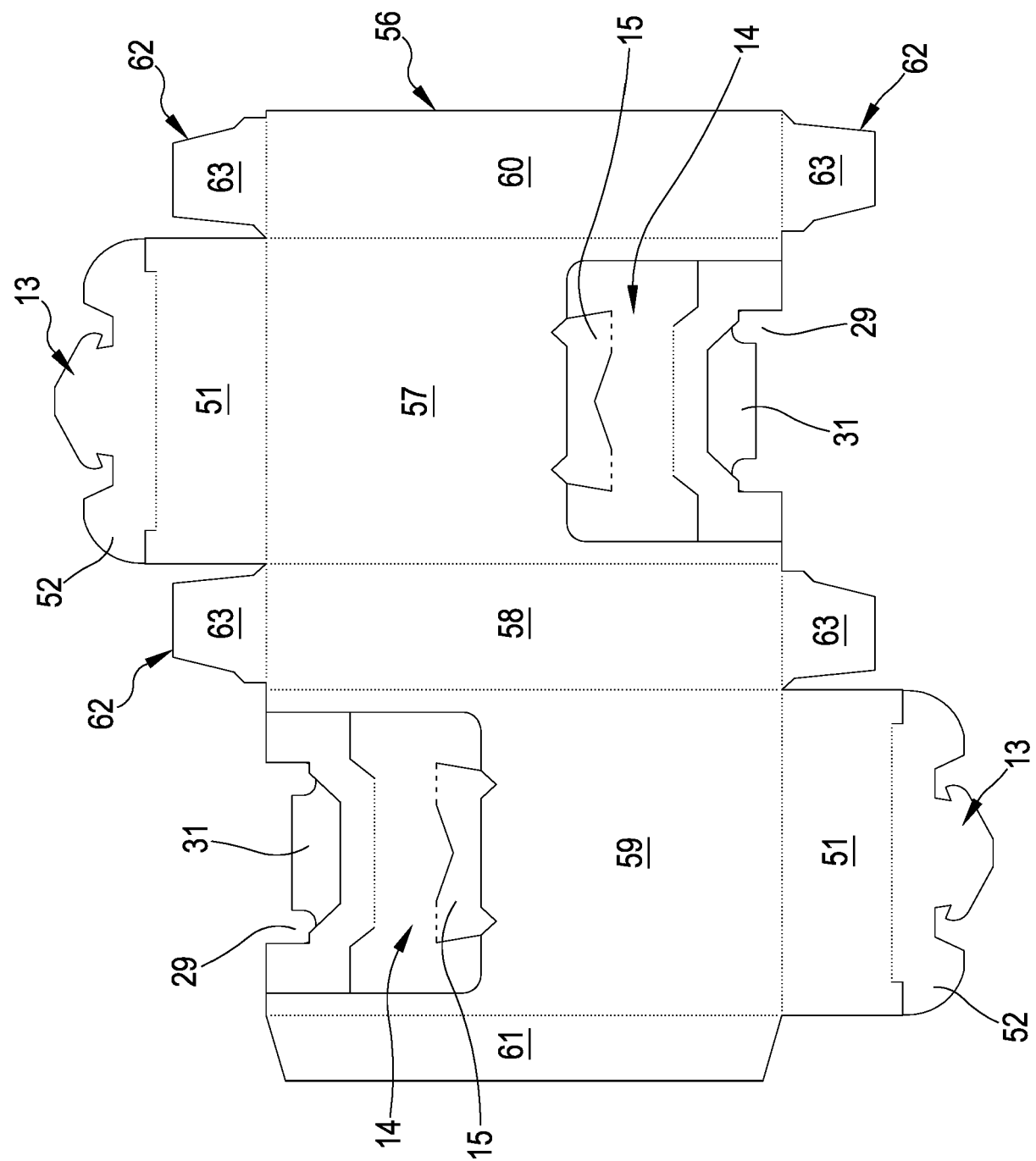


FIG. 29

FIG.30



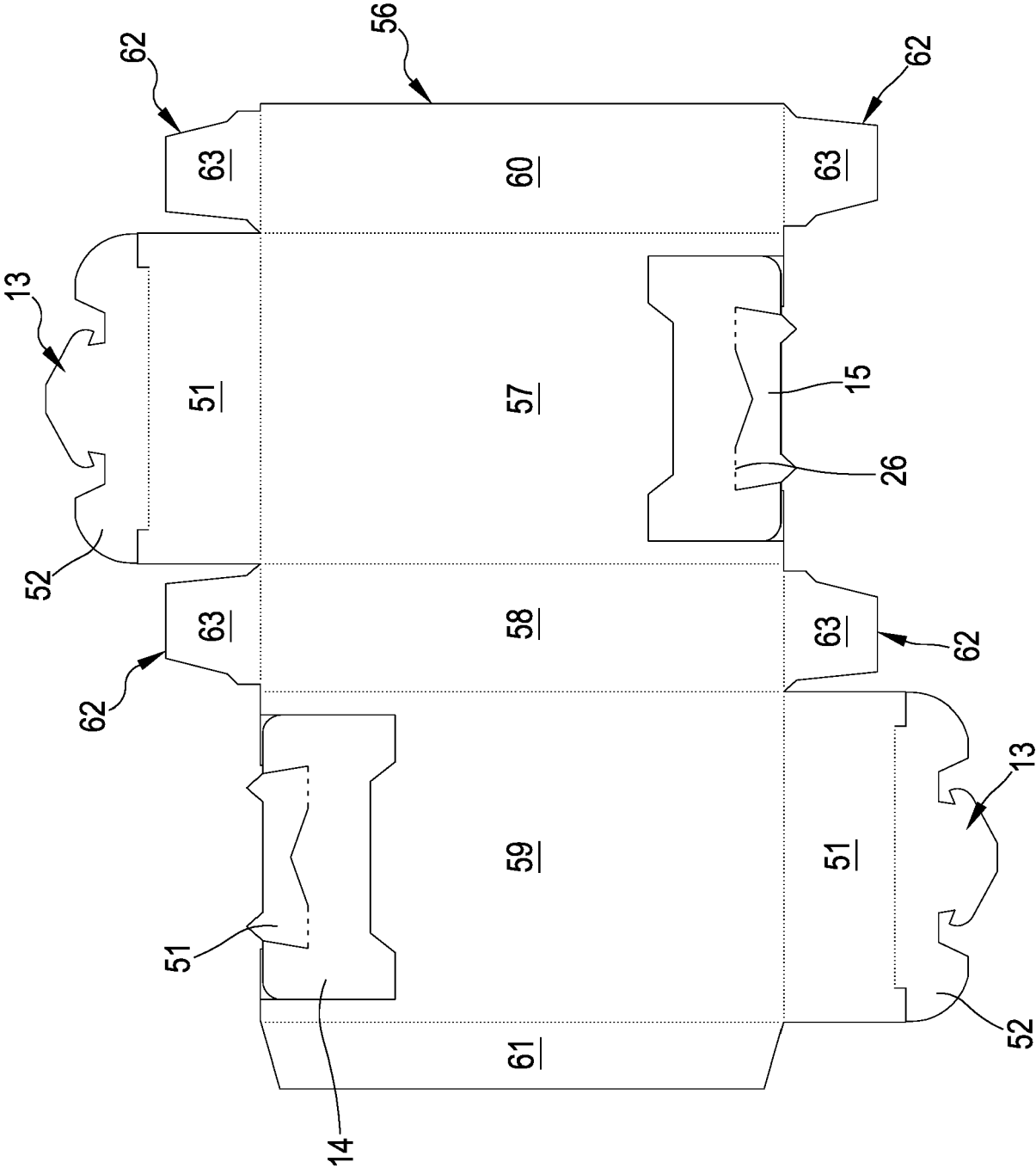


FIG.31



EUROPEAN SEARCH REPORT

Application Number
EP 18 19 0328

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			B65D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 7 November 2018	Examiner Jervelund, Niels
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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