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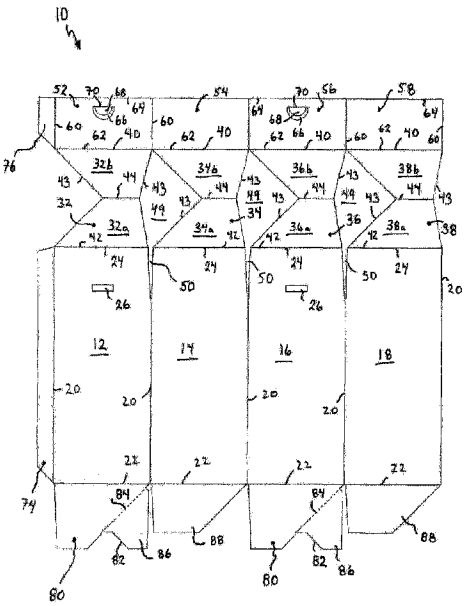

(57) Abrégé/Abstract:
A blank for a box with an integral lid has two opposed major surfaces. The blank comprises a row of side panels in which each pair of adjacent side panels is hingedly articulated together at common side edges thereof. Bottom closure flaps are connected to at least some of the side panels adjacent bottom edges thereof. An end panel is associated with each side panel. Each end panel is articulably connected to a top edge of its respective side panel. Each end panel is foldable between parallel edges thereof. One of the parallel edges coincides with the top edge of the respective side panel. A substantially rectangular border panel is associated with each end panel and is articulably connected to the other of the parallel edges of its respective end panel. The border panels form a row in which each pair of adjacent border panels is hingedly articulated together at common side edges thereof. Glue flaps articulably connect together a) the border panels at extremities of the row of border panels, and b) the side panels at extremities of the row of side panels. At least one of the side panels and at least one of the border panels carry formations that can be brought into engagement when the blank is constructed to form the box and the integral lid thereof is in a closed condition thereby to lock the lid in the closed condition.

ABSTRACT

A blank for a box with an integral lid has two opposed major surfaces. The blank comprises a row of side panels in which each pair of adjacent side panels is hingedly articulated together at common side edges thereof. Bottom closure flaps are connected to at least some of the side panels adjacent bottom edges thereof. An end panel is associated with each side panel. Each end panel is articulably connected to a top edge of its respective side panel. Each end panel is foldable between parallel edges thereof. One of the parallel edges coincides with the top edge of the respective side panel. A substantially rectangular border panel is associated with each end panel and is articulably connected to the other of the parallel edges of its respective end panel. The border panels form a row in which each pair of adjacent border panels is hingedly articulated together at common side edges thereof. Glue flaps articulably connect together a) the border panels at extremities of the row of border panels, and b) the side panels at extremities of the row of side panels. At least one of the side panels and at least one of the border panels carry formations that can be brought into engagement when the blank is constructed to form the box and the integral lid thereof is in a closed condition thereby to lock the lid in the closed condition.

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BOX AND BLANK THEREFOR

FIELD

[0001] The subject disclosure relates generally to foldable boxes for use in packaging, gift-giving, etc. and in particular, to a box and to a blank therefor.

BACKGROUND

[0002] Many boxes have been designed for carrying gifts and the like, and many of these boxes are supplied with lids to enclose the contents. For the most part, box lids are separate from the main bodies of the boxes, and require different blanks and set-up procedures. A desirable feature for boxes of this type is the absence of wasted material when forming the blank (for example by cutting the blank with a steel rule die). Many clever box designs exist, but of these, a large percentage tend to waste material. Consequently, it is desirable to provide a blank in which the amount of wasted material is minimized.

[0003] A box with an integral lid formed from a unitary blank that reduces wasted material has been considered. For example, Canadian Patent No. 2,343,990 discloses a box with an integral top and a blank therefor. The blank has two opposed surfaces and comprises a row of side panels in which each pair of adjacent side panels is hingedly articulated together at common side edges thereof. Bottom flaps are connected to at least some of the side panels adjacent bottom edges thereof. An end panel is associated with each side panel and is articulably connected to the top edge of its respective side panel. Each end panel is bi-trapezoidal in configuration and is geniculate between parallel edges thereof. One of the parallel edges coincides with the top edge of its respective side panel. A substantially rectangular border panel is associated with each end panel and is articulably connected to the other parallel edge of its respective end panel. The border panels form a row in which each pair of adjacent border panels is hingedly articulated together at common side edges thereof. Glue flaps articulably connect together a) the border panels at extremities of the row of border panels, and b) the side panels at extremities of the row of side panels. When the box is constructed from the blank, the box comprises a generally parallelpiped main body having an integral lid that covers the open end of the main body in the closed

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condition. The lid comprises a ring defined by the border panels that can be lifted from the open end of the main body to expose the interior of the box.

[0004] Regardless of box construct, inadvertent opening of boxes to avoid spilling of content stored within the boxes is undesired. Also, depending on the content within the boxes, easy access to the content may also be undesired. Accordingly, there is a need for improved boxes.

[0005] It is therefore an object to provide a novel box and a novel blank therefor.

SUMMARY

[0006] It should be appreciated that this summary is provided to introduce a selection of concepts in a simplified form that are further described below in the detailed description. This summary is not intended to be used to limit the scope of the claimed subject matter.

[0007] Accordingly, in one aspect, there is provided a blank for a box with an integral lid, the blank having two opposed major surfaces and comprising: a row of side panels in which each pair of adjacent side panels is hingedly articulated together at common side edges thereof; bottom closure flaps connected to at least some of the side panels adjacent bottom edges thereof; an end panel associated with each side panel, each end panel being articulably connected to a top edge of its respective side panel, each end panel being foldable between parallel edges thereof, one of the parallel edges coinciding with the top edge of the respective side panel; a substantially rectangular border panel associated with each end panel and articulably connected to the other of the parallel edges of its respective end panel, the border panels forming a row in which each pair of adjacent border panels is hingedly articulated together at common side edges thereof; and glue flaps configured to articulably connect together a) the border panels at extremities of the row of border panels, and b) the side panels at extremities of the row of side panels, wherein at least one of the side panels and at least one of the border panels carry formations that can be brought into engagement when the blank is constructed to form the box and the integral lid thereof is in a closed condition thereby to lock the lid in the closed condition.

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[0008] In one or more embodiments, the formations comprise at least one opening in one of the side panel and border panel, and at least one tab on the other of the side panel and border panel, the at least one tab being orientatable to extend through the at least one opening. In one form, the at least one opening is in the side panel and the at least one tab is on the border panel. The at least one opening may be generally rectangular and the at least one tab may be generally semi-circular.

[0009] In one or more embodiments, multiple side panels and multiple border panels carry the formations.

[0010] In one or more embodiments, each end panel comprises two substantially identical trapezoidal sub-panels, each having two parallel sides of which one is shorter than the other, and oriented so that the shorter parallel sides of the sub-panels coincide at a crease line.

[0011] According to another aspect there is provided a box comprising: a generally rectangular, parallelpiped main body comprising side walls and a bottom wall and defining an interior of the box that is accessible via an open top of the main body; and a lid integral with the main body, the lid being moveable relative to the main body between a closed condition where the lid surrounds an upper portion of the main body and covers the open top and an open condition where the lid is lifted from the open top so that geniculation of panels forming the lid decreases providing access into the interior of the box, wherein the main body and the lid carry at least one set of formations that can be brought into engagement when the lid is in the closed condition thereby to lock the lid in the closed condition.

[0012] In one or more embodiments, the formations of the at least one set are disengageble. In one form, the set of formations comprises an opening in one of a side wall of the main body and the lid, and a tab on the other of the side wall and the lid, the tab being orientatable to extend through the opening. The opening may be in the sidewall and the tab may be on the lid. The opening may be generally rectangular and the tab may be generally semi-circular.

[0013] In one or more embodiments, the main body and the lid carry multiple sets of formations. In one form, the sets of formations are positioned on opposite sides of the box.

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[0014] According to another aspect there is provided a non-transitory computer readable medium comprising program code, which when executed, controls an additive manufacturing machine to create the box of one or more of the preceding three paragraphs.

[0014a] According to another aspect there is provided a blank for a box with an integral lid, the blank having two opposed major surfaces and comprising: a row of side panels in which each pair of adjacent side panels is hingedly articulated together at common side edges thereof; bottom closure flaps connected to at least some of the side panels adjacent bottom edges thereof; an end panel associated with each side panel, each end panel being articulably connected to a top edge of its respective side panel, each end panel being foldable between parallel edges thereof, one of the parallel edges coinciding with the top edge of the respective side panel; a substantially rectangular border panel associated with each end panel and articulably connected to the other of the parallel edges of its respective end panel, the border panels forming a row in which each pair of adjacent border panels is hingedly articulated together at common side edges thereof; and glue flaps configured to articulably connect together a) the border panels at extremities of the row of border panels, and b) the side panels at extremities of the row of side panels, wherein at least one of the side panels and at least one of the border panels carry formations that can be brought into engagement when the blank is constructed to form the box, and the integral lid thereof is in a closed condition thereby to lock the lid in the closed condition, wherein the formations comprise at least one opening in the side panel and at least one tab on the border panel, the at least one opening being inwardly spaced from peripheral edges of the side panel and the at least one tab being inwardly spaced from peripheral edges of the border panel, and wherein, when the blank is constructed to form the box with the integral lid and the box is generally upright, the at least one tab is orientatable to extend upwardly through the at least one opening into juxtaposition with the side panel.

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[0014b] According to another aspect there is provided a box comprising: a generally rectangular, parallelpiped main body comprising side walls and a bottom wall and defining an interior of the box that is accessible via an open top of the main body; and a lid integral with the main body, the lid being moveable relative to the main body between a closed condition where the lid surrounds an upper portion of the main body and covers the open top and an open condition where the lid is lifted from the open top so that geniculation of panels forming the lid decreases providing access into the interior of the box, wherein the main body and the lid carry at least one set of formations that can be brought into engagement when the lid is in the closed condition thereby to lock the lid in the closed condition, wherein the set of formations comprises an opening in a side wall of the main body and a tab on the lid, the opening being inwardly spaced from peripheral edges of the side wall and the tab being inwardly spaced from peripheral edges of the lid, and wherein, when the box is generally upright and the lid is in the closed condition, the tab is orientatable to extend upwardly through the opening into juxtaposition with the side wall thereby to lock the lid in the closed condition.

[0014c] According to another aspect there is provided a blank for a box with an integral lid, the blank having two opposed major surfaces and comprising: a row of side panels in which each pair of adjacent side panels is hingedly articulated together at common side edges thereof; bottom closure flaps connected to at least some of the side panels adjacent bottom edges thereof; an end panel associated with each side panel, each end panel being articulably connected to a top edge of its respective side panel, each end panel being foldable between parallel edges thereof, one of the parallel edges coinciding with the top edge of the respective side panel; a substantially rectangular border panel associated with each end panel and articulably connected to the other of the parallel edges of its respective end panel, the border panels forming a row in which each pair of adjacent border panels is hingedly articulated together at common side edges thereof; and glue flaps configured to articulably connect together a) the border panels at extremities of the row of border panels, and b) the side panels at extremities of the row of side panels, wherein at least one of the side panels and at least one of the border panels carry formations that can be brought into engagement when the blank is constructed to form the box, and the integral lid thereof is in a closed condition thereby

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to lock the lid in the closed condition, wherein the formations comprise at least one opening in the border panel and at least one tab on the side panel, the at least one opening being inwardly spaced from peripheral edges of the border panel and the at least one tab being inwardly spaced from peripheral edges of the side panel, and wherein, when the blank is constructed to form the box with the integral lid and the box is generally upright, the at least one tab is orientatable to extend downwardly through the at least one opening into juxtaposition with the border panel.

[0014d] According to another aspect there is provided a box comprising: a generally rectangular, parallelpiped main body comprising side walls and a bottom wall and defining an interior of the box that is accessible via an open top of the main body; and a lid integral with the main body, the lid being moveable relative to the main body between a closed condition where the lid surrounds an upper portion of the main body and covers the open top and an open condition where the lid is lifted from the open top so that geniculation of panels forming the lid decreases providing access into the interior of the box, wherein the main body and the lid carry at least one set of formations that can be brought into engagement when the lid is in the closed condition thereby to lock the lid in the closed condition, wherein the set of formations comprises an opening in the lid and a tab on a side wall of the main body, the opening being inwardly spaced from peripheral edges of the lid and the tab being inwardly spaced from peripheral edges of the side wall, and wherein, when the box is generally upright and the lid is in the closed condition, the tab is orientatable to extend downwardly through the opening into juxtaposition with the lid thereby to lock the lid in the closed condition.

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BRIEF DESCRIPTION OF THE DRAWINGS

[0015] Embodiments will now be described more fully with reference to the accompanying drawings, in which like reference numerals denote like parts throughout the several views, and in which:

[0016] Figure 1 is a plan view of a blank for a box with a lockable integral lid;

[0017] Figure 2 is another plan view of the blank of Figure 1, during construction of the box;

[0018] Figure 3 is a partial perspective view of one region of the blank of Figure 1, showing how bottom flaps of the blank are interconnected to form a collapsible corner of the box;

[0019] Figure 4 shows another partial perspective view of the one region of the blank of Figure 1, further showing how the bottom flaps of the blank are interconnected to form the collapsible corner;

[0020] Figure 5 is another plan view of the blank of Figure 1, during further construction of the box;

[0021] Figure 6 is a side elevational view of a top region of the box constructed from the blank of Figure 1, with the integral lid in its maximum open configuration;

[0022] Figure 7 is a perspective view of the top region of the box, showing the integral lid in an intermediate position;

[0023] Figure 8 is a side elevational view of the top region of the box, showing the integral lid in its closed position; and

[0025] Figure 9 is a perspective view of the top region of the box, showing the integral lid in its closed position.

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DETAILED DESCRIPTION

[0025] The foregoing summary, as well as the following detailed description of certain examples will be better understood when read in conjunction with the appended drawings. As used herein, an element or feature introduced in the singular and preceded by the word "a" or "an" should be understood as not necessarily excluding the plural of the elements or features. Further, references to "one example" or "one embodiment" are not intended to be interpreted as excluding the existence of additional examples or embodiments that also incorporate the described elements or features. Reference herein to "example" means that one or more feature, structure, element, component, characteristic and/or operational step described in connection with the example is included in at least one embodiment and/or implementation of the subject matter according to the subject disclosure. Thus, the phrases "an example," "another example," and similar language throughout the subject disclosure may, but do not necessarily, refer to the same example. Further, the subject matter characterizing any one example may, but does not necessarily, include the subject matter characterizing any other example.

[0026] Unless explicitly stated to the contrary, examples or embodiments "comprising" or "having" or "including" an element or feature or a plurality of elements or features having a particular property may include additional elements or features not having that property. Also, it will be appreciated that the terms "comprises", "has", "includes" means "including but not limited to" and the terms "comprising", "having" and "including" have equivalent meanings.

[0027] As used herein, the term "and/or" can include any and all combinations of one or more of the associated listed elements or features.

[0028] It will be understood that when an element or feature is referred to as being "on", "attached" to, "affixed" to, "connected" to, "coupled" with, "contacting", etc. another element or feature, that element or feature can be directly on, attached to, connected to, coupled with or contacting the other element or feature or intervening elements may also be present. In contrast, when an element or feature is referred to as being, for example, "directly on", "directly attached" to, "directly affixed" to, "directly

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connected" to, "directly coupled" with, "directly contacting" etc. another element of feature, there are no intervening elements or features present.

[0029] It will be understood that spatially relative terms, such as "under", "below", "lower", "over", "above", "upper", "front", "back", "top", "bottom", "vertical", "horizontal", "upright" and the like, may be used herein for ease of description to describe the relationship of an element or feature to another element or feature as illustrated in the figures. The spatially relative terms can however, encompass different orientations in use or operation in addition to the orientation depicted in the figures.

[0030] Reference herein to "configured" denotes an actual state of configuration that fundamentally ties the element or feature to the physical characteristics of the element or feature preceding the phrase "configured to."

[0031] Unless otherwise indicated, the terms "first," "second," etc. are used herein merely as labels, and are not intended to impose ordinal, positional, or hierarchical requirements on the items to which these terms refer.

[0032] As used herein, the terms "approximately", "about", "substantially", "generally" and the like represent an amount close to the stated amount that still performs the desired function or achieves the desired result. For example, these terms may refer to an amount or orientation that is within engineering tolerances that would be readily appreciated by a person skilled in the art.

[0033] In general, a blank and a box with an integral lid formed from the blank are described and illustrated herein. The blank has two opposed major surfaces and comprises a row of side panels in which each pair of adjacent side panels is hingedly articulated together at common side edges thereof. Bottom closure flaps are connected to at least some of the side panels adjacent bottom edges thereof. An end panel is associated with each side panel. Each end panel is articulably connected to a top edge of its respective side panel, and each end panel is foldable between parallel edges thereof. One of the parallel edges coincides with the top edge of the respective side panel. A substantially rectangular border panel is associated with each end panel and is articulably connected to the other of the parallel edges of its respective end panel. The border panels form a row in which each pair of adjacent border panels is hingedly articulated together at common side edges thereof. Glue flaps are configured to

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articulably connect together a) the border panels at extremities of the row of border panels, and b) the side panels at extremities of the row of side panels. At least one of the side panels and at least one of the border panels carry formations that can be brought into engagement when the blank is constructed to form the box and the integral lid thereof is in a closed condition thereby to lock the lid in the closed condition. The box comprises a generally rectangular, parallelpiped main body comprising side walls and a bottom wall and defining an interior of the box that is accessible via an open top of the main body. A lid is integral with the main body. The lid is moveable relative to the main body between a closed condition where the lid surrounds an upper portion of the main body and covers the open top and an open condition where the lid is lifted from the open top so that geniculation of panels forming the lid decreases providing access into the interior of the box. The main body and the lid carry at least one set of formations that can be brought into engagement when the lid is in the closed condition thereby to lock the lid in the closed condition. Further specifics of the blank and box with an integral lid will now be described.

[0034] Turning now to Figure 1, a generally planar, unitary blank for a box with a lockable integral top is shown and is generally identified by reference numeral 10. For clarity of the following discussion, it is convenient to recognize that the blank 10 comprises two major opposed surfaces. The hidden side of the blank 10 in Figure 1 will be identified as the first major surface, and the visible surface of the blank 10 in Figure 1 will be identified as the second major surface. In this embodiment, the blank 10 is of one-piece construction and is formed of paperboard or other suitable foldable material.

[0035] As can be seen, the blank 10 comprises first, second, third, and fourth substantially identical, elongate, substantially rectangular side panels 12, 14, 16, and 18, respectively. Each of the side panels 12, 14, 16, and 18 has two side edges 20, a bottom edge 22 and a top edge 24. The side panels 12, 14, 16, and 18 are connected to form a row or concatenation of side panels in which each pair of adjacent side panels is hingedly articulated together at the common side edges 20 thereof. Substantially rectangular cutouts or openings 26 are provided in the side panels 12 and 16. The cutouts 26 are generally centered between the side edges 20 of the side panels 12 and

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16 and are positioned closer to the top edges 24 of the side panels 12 and 16 than to the bottom edges 22 of the side panels 12 and 16.

[0036] The blank 10 further comprises first, second, third, and fourth end panels 32, 34, 36, and 38, respectively. Each end panel is associated with a respective one of the side panels 12, 14, 16, and 18. Each end panel has a bi-trapezoidal configuration and comprises two substantially trapezoidal sub-panels 32a, 32b, 34a, 34b, 36a, 36b, 38a, and 38b, respectively, which are substantially identical but are mirror images of each other. Each sub-panel has two generally parallel sides, one of which is longer than the other. Each end panel 32, 34, 36, and 38 has substantially parallel top and bottom edges 40 and 42 and two side edges 43. The top and bottom edges 40 and 42 of the end panels define the longer parallel sides of the sub-panels. Each end panel 32, 34, 36, and 38 exhibits a geniculation between the top and bottom edges 40 and 42. More specifically, the geniculation in each end panel is constituted by a crease or fold line 44 that coincides with the shorter parallel sides of the sub-panels. Those of skill in the art will appreciate that the geniculation provided by the crease line 44 could be replaced by a series of closely spaced crease lines that effectively function together as a single crease line. Each sub-panel also includes a longer oblique side extending from one end of the shorter parallel side, and a shorter oblique side extending from the other end of the shorter parallel side. Each end panel is contiguously connected to its respective side panel at the top edge 24 of the side panel and the bottom edge 42 of the end panel. Cutouts 49 are defined between each pair of adjacent end panels. Each cutout 49 comprises a narrow elongate extension 50 that extends partially downward along the side edges 20 of the side panels that are associated with the adjacent end panels that define the cutout 49.

[0037] The blank 10 further includes first, second, third and fourth substantially rectangular border panel 52, 54, 56, and 58, respectively. Each border panel is associated with a respective one of the end panels 32, 34, 36, and 38. Each border panel has two side edges 60, a bottom edge 62 and a top edge 64. The border panels 52, 54, 56, and 58 are connected to form a row or concatenation of border panels in which each pair of adjacent border panels is hingedly articulated together at the common side edges 60 thereof. Each border panel is contiguously connected to its

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respective end panel at the top edge 40 of the end panel and the bottom edge 62 of the border panel. Shallow U-shaped cutouts or openings 66 are provided in the border panels 52 and 56. The cutouts 66 define downwardly extending, generally semi-circular tabs 68 that are hingedly articulated to the border panels 52 and 56 at crease or fold lines 70. The cutouts 66 are generally centered between the side edges 60 of the border panels 52 and 56 and are positioned closer to the top edges 64 of the border panels 52 and 56 than to the bottom edges 62 of the border panels 52 and 56. In this manner, the cutouts 26 and 66 are bisected by lines coincident with central longitudinal axes of the side panels 12 and 16.

[0038] The tab 68 on border panel 52 and the cutout 26 in the side panel 12 form a first set of formations and the tab 68 on border panel 56 and the cutout 26 in the side panel 16 form a second set of formations. The sets of formations are brought into general alignment and are engageable when the box is constructed from the blank 10 as will be described. To achieve this, the distance between the top edge of each cutout 26 and the top edge 24 of the respective side panel 12 and 16 is slightly different than the distance between each crease line 70 and the bottom edge 62 of the respective border panel 52 and 56. In particular, there is approximately a 5mm difference between the distances to account for the thickness of the foldable material used to form the blank 10. Those of skill in the art will appreciate that this difference can vary depending on the thickness of the foldable material used to form the blank 10.

[0039] A substantially trapezoidal glue flap 74 is contiguous with the side panel 12 and projects outwardly from the free side edge 20 of the side panel 12. A substantially trapezoidal glue panel 76 is contiguous with the border panel 52 and projects outwardly from the free side edge 60 of the border panel 60. The glue panel 76 facilitates connecting together the remote free side edges of the first and fourth border panels 52 and 58, and the glue panel 74 facilitates connecting the remote free side edges 20 of the first and fourth side panels 12 and 18 during construction of the box from the blank 10, as will be described.

[0040] A substantially rectangular flap 80 is hingedly articulated to each side panel 12 and 16 at the bottom edge 22 thereof. Each flap 80 has an intermediate recess 82 formed therein. A crease or fold line 84 delimits a sub-flap 86 adjacent one

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comer of the flap 80. A substantially trapezoidal panel 88 is hingedly articulated to each side panel 14 and 18 at the bottom edges 22 thereof. Thus, the shapes of the flaps 80 and 88, taken sequentially from right to left in Figure 1, is trapezoidal, rectangular, trapezoidal, and rectangular, respectively.

[0041] The steps to form the box from the blank 10 will now be described with particular reference to Figures 2 to 9. Initially, all of the border panels 52, 54, 56, and 58 are folded about their connections to their respective end panels 32, 34, 36, and 38 (that is along common edges 40, and 62) in a direction into the drawing page of Figure 1 so that each border panel lies in overlapping juxtaposition against the first major surface of the blank 10 as shown in Figure 2. With the border panels thus positioned, the cutouts 66 and tabs 68, which are not visible in Figure 2, are inverted.

[0042] Next, a first bottom corner region is constructed from the blank 10. During construction of the first corner region, the flap 80 associated with side panel 12 is folded from its coplanar configuration with respect to the side panel 12 in the direction of arrow 100 as shown in Figure 3. The sub-flap 86 is folded outwardly in the direction of arrow 102 along crease line 84. The outward folding of the sub-flap 86 facilitates the application of adhesive to the visible surface 86a of the sub-flap 86. The flap 88 is folded inwardly in the direction of arrow 104.

[0043] After adhesive has been applied to the sub-flap 86, the side panels 12 and 14 are raised in the direction of arrow 106 into a position in which they extend at substantially 90° from each other as shown in Figure 4. The adhesive-carrying surface 86a of the sub-flap 86, not visible in Figure 4, and the visible surface 88a of the flap 88 are brought towards one another in the direction of arrows 108 and 110 and into contact thereby to adhere the flaps 80 and 88 together. Because the adhesive is applied only to the sub-flap 86, by virtue of the crease line 84, the bottom flaps 80 and 88 are enabled to swing into a position where the flaps 80 and 88 are sandwiched between the side panels 12 and 14.

[0044] The first side panel 12 and its corresponding end panel 32 and border panel 52 are then folded in a direction out of the drawing page about the side edges 20 and 60 common to the second side panel 14 and its corresponding border panel 54 as shown in Figure 5, such that the first side panel 12 lies in overlapping juxtaposition

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against the second side panel 14, and the first end panel 32 lies in overlapping juxtaposition against the second end panel 34. In this configuration, the first border panel 52 and the second border panel 54 sandwich between them portions of the end panels 32 and 34, and the side panel 12 and the side panel 14 sandwich between them the flaps 80 and 88. Also in this configuration, the free side edge 20 of the first side panel 12 substantially coincides with the side edge 20 common to the second and third side panels 14 and 16, with the glue flaps 74 and 76 being accessible.

[0045] Next, a second bottom corner region is constructed from the blank 10 using the flap 80 associated with side panel 16 and the flap 88 associated with side panel 18 in the same manner as previously described with reference to Figures 3 and 4.

[0046] An adhesive is then applied to the upward facing surfaces of the glue flaps 74 and 76 and is identified by the shading in Figure 5. The fourth side panel 18, along with its corresponding end panel 38 and border panel 58, are then folded in a direction out of the drawing page about the side edges 20 and 60 common to the third side panel 16 and its corresponding border panel 56, such that the fourth side panel 18 lies in overlapping juxtaposition against the third side panel 16, and the fourth end panel 38 lies in overlapping juxtaposition against the third end panel 36. In this configuration, the fourth border panel 58 and the third border panel 56 sandwich between them portions of the end panels 38 and 36, and the side panel 18 and the side panel 16 sandwich between them the flaps 80 and 88. Also, in this configuration, the free edge 20 of the fourth side panel 18 substantially coincides with the side edge 20 common to the second and third side panels 14 so that the glue flap 74 contacts and adheres to the fourth side panel 18 and the glue flap 76 contacts and adheres to the fourth border panel 58. As a result, the free side edges 20 of the side panels 12 and 18, and the free side edges 60 of the border panels 52, and 58 are effectively joined.

[0047] At this stage, construction of the box in a collapsed condition or state from the blank 10 is complete. The interconnected side panels 12, 14, 16, and 18 define the main body of the box and the interconnected flaps 80 and 88 define the bottom of the box. The interconnected border panels 52, 54, 56, and 58 in conjunction with the end panels 32, 34, 36, and 38 define the lid of the box.

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[0048] To condition the box from the collapsed state to the expanded state, the side panels 12, 14, 16, and 18 are brought into a rectangular parallelpiped configuration. When this occurs, the two pair of interconnected flaps 80 and 88 fold out of the interior of the main body of the box and assume a generally planar orientation and form the bottom of the box. At this stage, the border panels 52, 54, 56, and 58 are at their highest level and form a ring 120 above the main body of the box that surrounds the sub-panels 32b, 34b, 36b, and 38b of the end panels 32, 34, 36, and 38 as shown in Figure 6. In this maximum open configuration, the end panels 32, 34, 36, and 38 interconnecting the border panels and the side panels are generally upright with little to no folding of the sub-panels about the crease lines 44 resulting in the interior of the box being exposed and allowing contents to be placed in or removed from the box.

[0049] In order to close the box, the ring 120 formed by the border panels 52, 54, 56, and 58 can be pushed down towards the side panels. As the ring 120 moves downward towards the side panels, the end panels fold about the crease lines 44 bringing the sub-panels of the end panels towards one another. Figure 7 shows the ring 120 partially pushed down, where it can be seen that the somewhat bent (geniculated) end panels 32, 34, 36, and 38 hold the ring 120 of border panels 52, 54, 56, and 58 above the top edges 24 of the side panels 12, 14, 16, and 18. As the ring 120 formed by the border panels is pushed further down from the position shown in Figure 7 and along the main body of the box, the bi-trapezoidal end panels 32, 34, 36, and 38 increase in geniculation, until the box assumes the closed condition, whereby the sub-panels of each end panel are in juxtaposition and lie folded in a generally horizontal plane to define the lid of the box as shown in Figures 8 and 9. The extensions 50 of the cutouts 49 provide for a certain amount of resilience or "play", allowing the lid of the box to easily fit on to the main body. As will be appreciated, in this position, the ring 120 formed by the border panels in conjunction with the end panels, forms an integral lid for the box.

[0050] When the box is in the closed condition, the rectangular cutouts 26 in the side panels 12 and 16 substantially align with the distal ends of the cutouts 66 in the border panels 52 and 56. In order to lock the lid in place to inhibit the lid from being lifted from the main body of the box, the now upwardly extending tabs 68 can be pushed

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inward so that they fold about the crease lines 70 and pass through the rectangular cutouts 26 and into the interior of the main body of the box. With the tabs 68 in this position, lifting of the lid from the main body of the box is inhibited as a result of the upper edges of the cutouts 26 abutting the border panels 52 and 56 at the crease lines 70. In order to allow the box to be opened, it is necessary to pull the tabs 68 back through the rectangular cutouts 26 and out of the interior of the main body of the box. Once this has been done, ring 120 formed by the border panels can be lifted off of the main body of the box until the end panels decrease in geniculation and assume a generally upright orientation where they are out of the way exposing the interior of the box.

[0051] As will be appreciated, the blank 10 is of design that reduces material waste while allowing a box with a lockable integral lid to be constructed. This inhibits unwanted opening of the box thereby to secure the contents of the box and provides the constructed box with access-proof characteristics.

[0052] Although a box with a lockable integral lid is described above as being formed from paperboard material or the like, depending on the material selected to form the box, the box may also be formed using additive manufacturing techniques, such as 3D printing. As will be appreciated, when the box is formed using additive manufacturing techniques, the glue flaps 74 and 76, the bottom flaps, and the adhesive can be omitted as the components forming the box are integral. In this case, program code in a suitable 3D file format such as STL or 3MF, to control operation of the additive manufacturing machine, is employed so that when the program code is executed by the additive manufacturing machine, the additive manufacturing machine creates the desired box with the lockable integral lid. The program code may be stored on one or more non-transitory computer readable media. The computer readable media may for example comprise volatile and/or non-volatile system memory, other non-removable or removable computer-readable memory (e.g., a hard disk drive, RAM, ROM, EEPROM, CD-ROM, DVD, flash memory, etc.).

[0053] If desired, the positions of the cutouts 26 and 66 may be reversed so that the cutouts 26 are provided on the border panels and the cutouts 66 are provided in the side panels. In this configuration, the cutouts are rotated by 180 degrees. During

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locking of the lid to the main body of the box, the tabs 68 are pulled out through the cutouts 26 rather than being pushed in through the cutouts.

[0054] Although the cutouts 26 and 66 are described as being generally rectangular and shallow U-shaped, respectively, those of skill in the art will appreciate that the cutouts may take other geometrical shapes.

[0055] Although in the embodiments described above, a set of formations, comprising mating tabs and cutouts, is provided on two opposite sides of the box, those of skill in the art will appreciate that alternatives are available. A set of formations may be provided on three sides or on all four sides of the box. Also, a set of formations may only be provided on one side of the box. Depending on the size of the box and the degree of security desired, multiple sets of formations may be provided on one or more sides of the box.

[0056] Although an exemplary bottom for the box comprising flaps 80 and 88 is shown and described, those of skill in the art will appreciate that alternative flap configurations to form the bottom of the box may be employed.

[0057] Although embodiments have been described, those of skill in the art will appreciate that variations and modifications may be made without departing from the scope thereof as defined by the appended claims.

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What is claimed is:

1. A blank for a box with an integral lid, the blank having two opposed major surfaces and comprising:

a row of side panels in which each pair of adjacent side panels is hingedly articulated together at common side edges thereof;

bottom closure flaps connected to at least some of the side panels adjacent bottom edges thereof;

an end panel associated with each side panel, each end panel being articulably connected to a top edge of its respective side panel, each end panel being foldable between parallel edges thereof, one of the parallel edges coinciding with the top edge of the respective side panel;

a substantially rectangular border panel associated with each end panel and articulably connected to the other of the parallel edges of its respective end panel, the border panels forming a row in which each pair of adjacent border panels is hingedly articulated together at common side edges thereof; and

glue flaps configured to articulably connect together a) the border panels at extremities of the row of border panels, and b) the side panels at extremities of the row of side panels,

wherein at least one of the side panels and at least one of the border panels carry formations that can be brought into engagement when the blank is constructed to form the box, and the integral lid thereof is in a closed condition thereby to lock the lid in the closed condition,

wherein the formations comprise at least one opening in the side panel and at least one tab on the border panel, the at least one opening being inwardly spaced from peripheral edges of the side panel and the at least one tab being inwardly spaced from peripheral edges of the border panel, and

wherein, when the blank is constructed to form the box with the integral lid and the box is generally upright, the at least one tab is orientatable to extend upwardly through the at least one opening into juxtaposition with the side panel.

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2. The blank of claim 1, wherein the at least one opening is generally rectangular and the at least one tab is generally semi-circular.

3. The blank of claim 1, wherein multiple side panels and multiple border panels carry the formations.

4. The blank of claim 3, wherein each opening is generally rectangular and each tab is generally semi-circular.

5. The blank of any one of claims 1 to 4, wherein each end panel comprises two substantially identical trapezoidal sub-panels, each having two parallel sides of which one is shorter than the other, and oriented so that the shorter parallel sides of the sub-panels coincide at a crease line.

6. A box comprising:

a generally rectangular, parallelpiped main body comprising side walls and a bottom wall and defining an interior of the box that is accessible via an open top of the main body; and

a lid integral with the main body, the lid being moveable relative to the main body between a closed condition where the lid surrounds an upper portion of the main body and covers the open top and an open condition where the lid is lifted from the open top so that geniculation of panels forming the lid decreases providing access into the interior of the box,

wherein the main body and the lid carry at least one set of formations that can be brought into engagement when the lid is in the closed condition thereby to lock the lid in the closed condition,

wherein the set of formations comprises an opening in a side wall of the main body and a tab on the lid, the opening being inwardly spaced from peripheral edges of the side wall and the tab being inwardly spaced from peripheral edges of the lid, and

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wherein, when the box is generally upright and the lid is in the closed condition, the tab is orientatable to extend upwardly through the opening into juxtaposition with the side wall thereby to lock the lid in the closed condition.

7. The box of claim 6, wherein the opening is generally rectangular and the tab is generally semi-circular.

8. The box of claim 6, wherein the main body and the lid carry multiple sets of formations.

9. The box of claim 8, wherein the sets of formations are positioned on opposite sides of the box.

10. The box of claim 8 or 9, wherein each opening is generally rectangular and each tab is generally semi-circular.

11. A blank for a box with an integral lid, the blank having two opposed major surfaces and comprising:

a row of side panels in which each pair of adjacent side panels is hingedly articulated together at common side edges thereof;

bottom closure flaps connected to at least some of the side panels adjacent bottom edges thereof;

an end panel associated with each side panel, each end panel being articulably connected to a top edge of its respective side panel, each end panel being foldable between parallel edges thereof, one of the parallel edges coinciding with the top edge of the respective side panel;

a substantially rectangular border panel associated with each end panel and articulably connected to the other of the parallel edges of its respective end panel, the border panels forming a row in which each pair of adjacent border panels is hingedly articulated together at common side edges thereof; and

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glue flaps configured to articulably connect together a) the border panels at extremities of the row of border panels, and b) the side panels at extremities of the row of side panels,

wherein at least one of the side panels and at least one of the border panels carry formations that can be brought into engagement when the blank is constructed to form the box, and the integral lid thereof is in a closed condition thereby to lock the lid in the closed condition,

wherein the formations comprise at least one opening in the border panel and at least one tab on the side panel, the at least one opening being inwardly spaced from peripheral edges of the border panel and the at least one tab being inwardly spaced from peripheral edges of the side panel, and

wherein, when the blank is constructed to form the box with the integral lid and the box is generally upright, the at least one tab is orientatable to extend downwardly through the at least one opening into juxtaposition with the border panel.

12. The blank of claim 11, wherein the at least one opening is generally rectangular and the at least one tab is generally semi-circular.

13. The blank of claim 11, wherein multiple side panels and multiple border panels carry the formations.

14. The blank of claim 13, wherein each opening is generally rectangular and each tab is generally semi-circular.

15. The blank of any one of claims 11 to 14, wherein each end panel comprises two substantially identical trapezoidal sub-panels, each having two parallel sides of which one is shorter than the other, and oriented so that the shorter parallel sides of the sub-panels coincide at a crease line.

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16. A box comprising:

a generally rectangular, parallelpiped main body comprising side walls and a bottom wall and defining an interior of the box that is accessible via an open top of the main body; and

a lid integral with the main body, the lid being moveable relative to the main body between a closed condition where the lid surrounds an upper portion of the main body and covers the open top and an open condition where the lid is lifted from the open top so that geniculation of panels forming the lid decreases providing access into the interior of the box,

wherein the main body and the lid carry at least one set of formations that can be brought into engagement when the lid is in the closed condition thereby to lock the lid in the closed condition,

wherein the set of formations comprises an opening in the lid and a tab on a side wall of the main body, the opening being inwardly spaced from peripheral edges of the lid and the tab being inwardly spaced from peripheral edges of the side wall, and

wherein, when the box is generally upright and the lid is in the closed condition, the tab is orientatable to extend downwardly through the opening into juxtaposition with the lid thereby to lock the lid in the closed condition.

17. The box of claim 16, wherein the opening is generally rectangular and the tab is generally semi-circular.

18. The box of claim 16, wherein the main body and the lid carry multiple sets of formations.

19. The box of claim 18, wherein the sets of formations are positioned on opposite sides of the box.

20. The box of claim 18 or 19, wherein each opening is generally rectangular and each tab is generally semi-circular.

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21. One or more non-transitory computer readable media comprising program code, which when executed, controls an additive manufacturing machine to create the box of claim 6 or 16.

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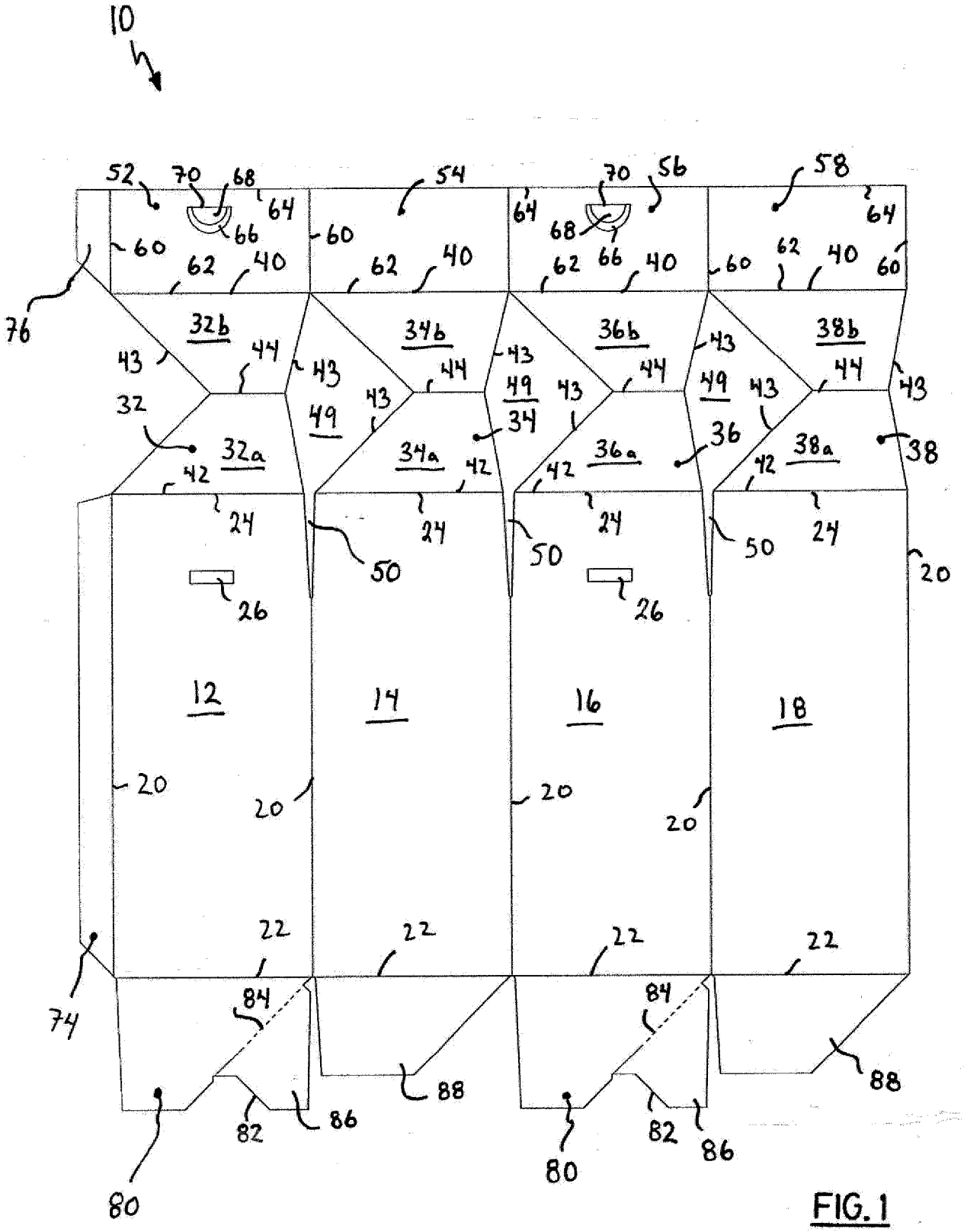

FIG. 1

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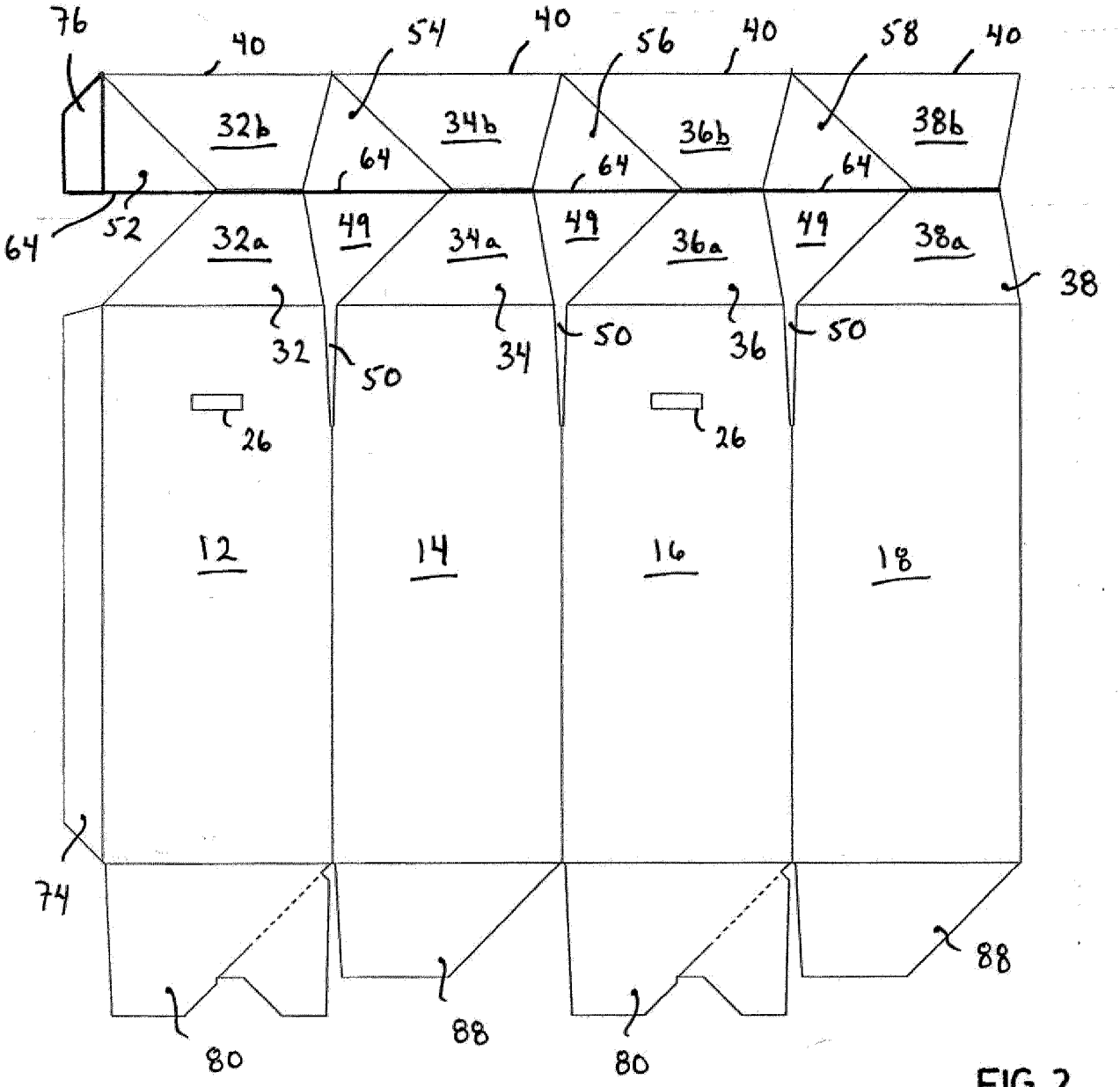

FIG. 2

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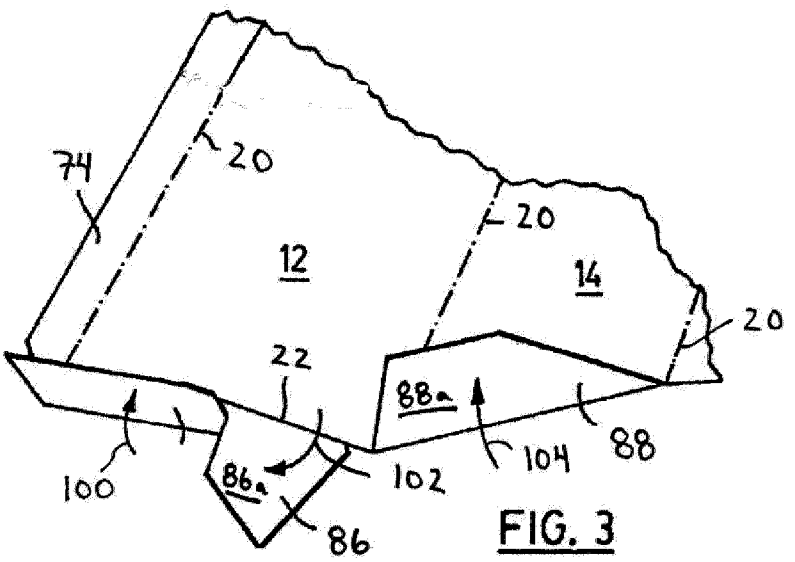

FIG. 3

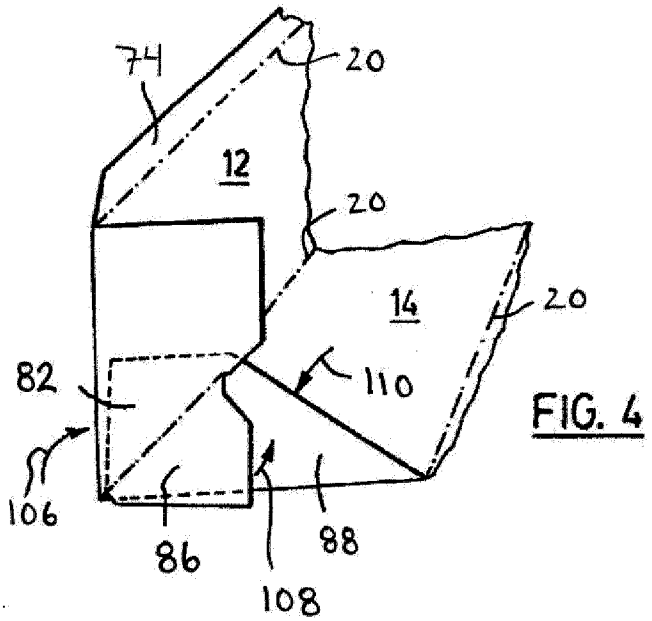

FIG. 4

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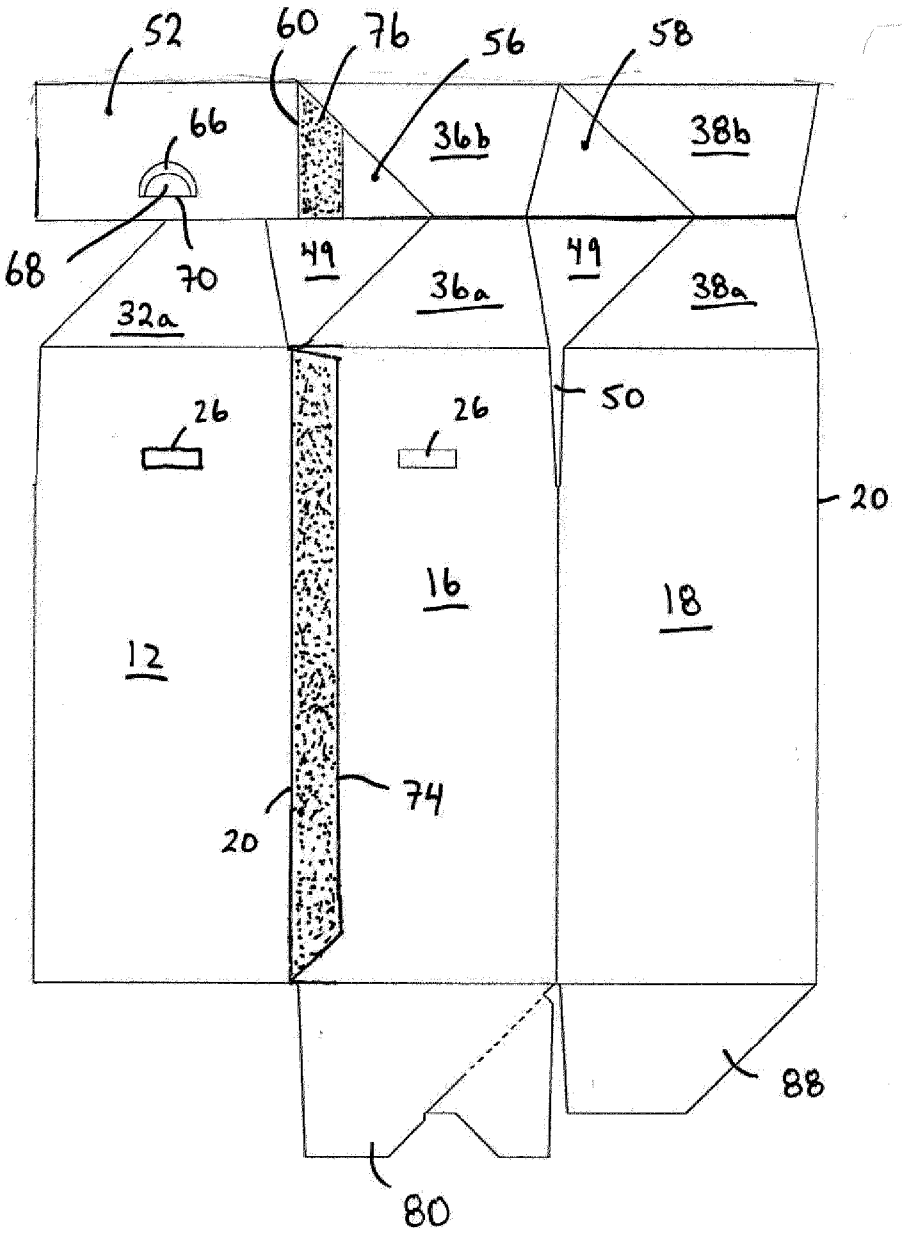

FIG. 5

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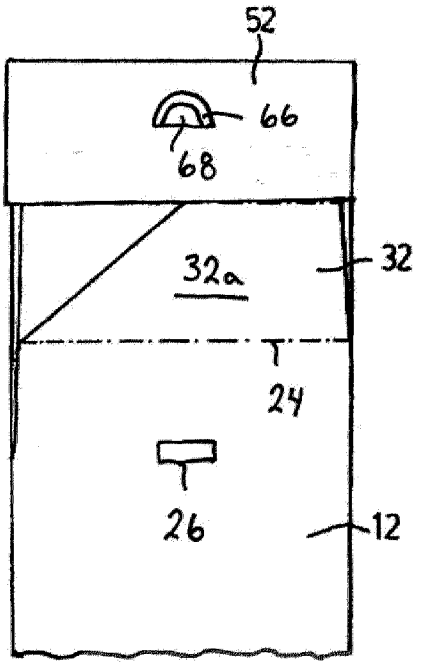

FIG. 6

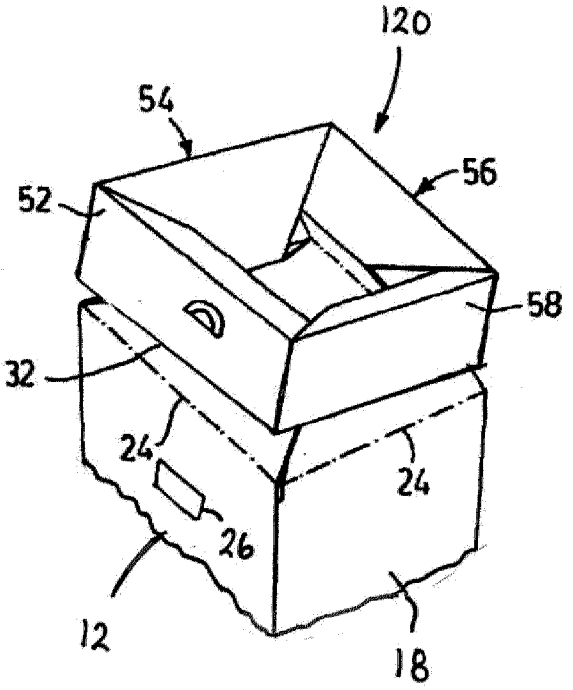

FIG. 7

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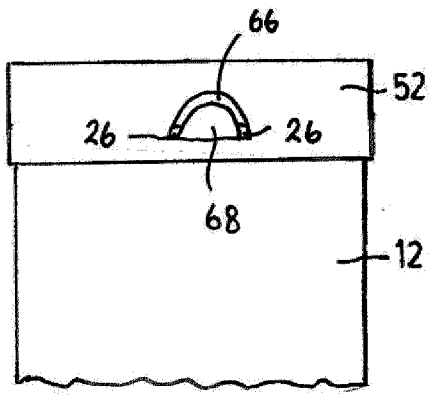

FIG. 8

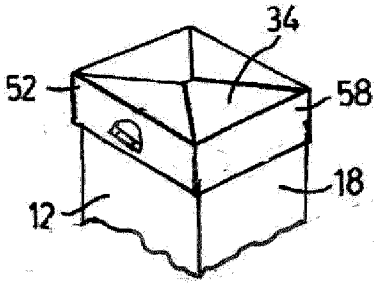

FIG. 9

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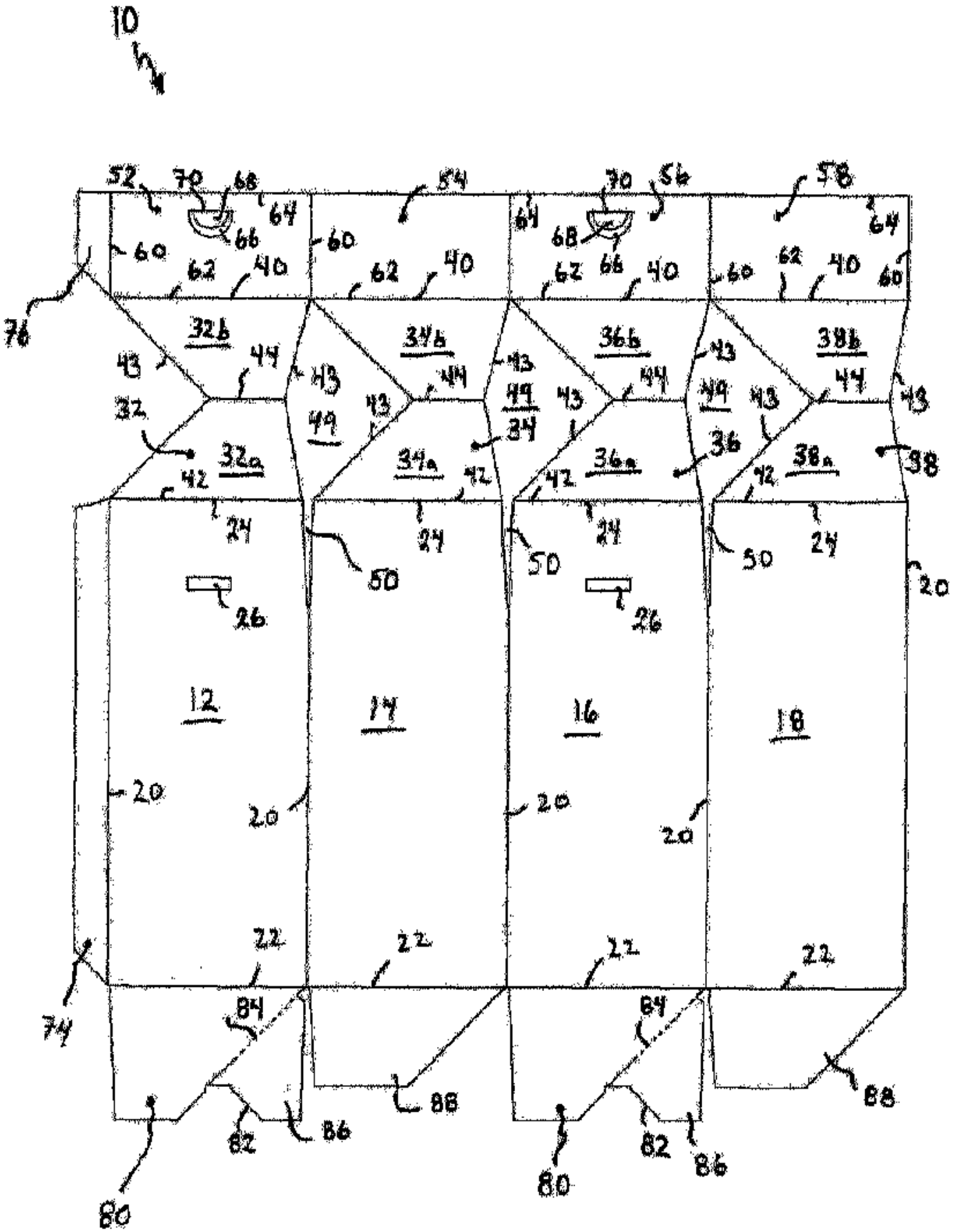
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