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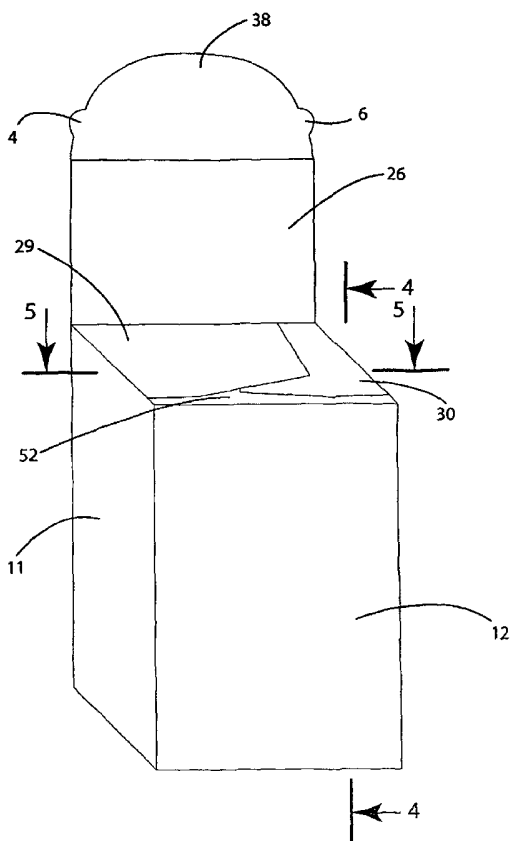
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[Continued on next page]

(54) Title: FOLDING CARTON AND BLANK FOR MAKING FOLDING CARTON



(57) Abstract: A folding carton has a series of panels defining an internal space. A top closure flap (26) is foldable over the top of the internal space. A top locking tab (38) is connected to the top closure flap (26). The top locking tab (38) is folded at angle for insertion into the internal space. A knob lock (4, 6) extends from either side of the top locking tab (38). The knob locks (4, 6) extend sufficiently from the top locking tab (38) so that they form a frictional fit with the two of the side panels (11, 13) defining the internal space. A blank to form such a folding carton is also shown.



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FOLDING CARTON AND BLANK FOR MAKING FOLDING CARTONBACKGROUND OF THE INVENTION

This application claims benefit of U.S. Provisional Application No. 60/403,132, filed August 13, 2002 and entitled "Knob Lock for Folding Carton."

The present invention relates to cartons and, more specifically, to closure means for paperboard folding cartons.

Folding cartons are well known in the packaging art. Cartons are typically constructed from flat blanks that are pre-cut from sheets of paperboard and pre-scored to create fold lines. The carton blank includes a number of panels to form the sides of the carton. A blank for a rectangular carton, for example, will have four main panels, which form the four sides of the carton. A closure flap is generally attached to each of the top and bottom end of the blank to allow the carton to be opened and closed when constructed. Additionally, minor flaps, or dust flaps, may be present at each of the top and bottom end of the blank. The minor flaps aid in keeping dust and debris out of the carton.

The cartons preferably include a structure for securing the closure flap in a closed position. Conventional cartons often include slit locks on the closure flap. Slit locks generally consist of slits cut in the fold line of the closure flap of the carton. For the slit locks to operate properly, each end of the carton must include minor flaps in addition to closure flaps. The minor flaps are first folded down to cover the opening of the carton. The closure flap is then folded over the minor flaps and tucked into the carton. The slit locks interlock with the minor flaps to secure the closure flap in a closed position. This closure method has significant problems. For example, repeated opening and closing of the carton often causes the slit locks to rip further into the closure flap, thus creating a tear in the closure flap and reducing the effectiveness of the closure mechanism. Further, slit locks are considered aesthetically unpleasing, particularly in the field of cosmetics, because they leave exposed edges that are visible along the fold line.

Alternatively, conventional cartons may be secured in the closed position by frictionally fitting the closure flap within the carton. With this method, the closure flap is retained in the closed position by a frictional fit between the closure flap and the side walls of the carton. To ensure this frictional retention, the width of the closure flap must be very precisely controlled. If the closure flap is too wide, it will not fit into the opening of the carton, and thus will not close the carton. It can be difficult for a packaging machine to close a carton having this type of frictionally fit closure flap. Additionally, after a few uses the edges of the closure flap begin to wear, impairing the fit of the closure flap within the carton. If the closure flap is too narrow, a friction fit will not be achieved and the flap will only loosely sit in the carton opening.

### SUMMARY OF THE INVENTION

The aforementioned problems are overcome by the present invention wherein a folding carton is provided with a closure flap including a plurality of protrusions, or knob locks, that help to retain the flap in the closed position. The knob locks protrude from the closure flap a sufficient distance to create a frictional fit between the closure flap and the side walls of the carton. The frictional fit helps to retain the closure flap in the closed position.

In a preferred embodiment, the closure flap is slightly narrower than the carton so that it fits freely into the carton. The knob locks extend from the closure flap a sufficient distance so that the combined width of the closure flap and knob locks exceeds the width of the carton. When the closure flap is first closed, interaction with the side walls of the carton causes the knob locks to fold perpendicularly to the closure flap, thereby "setting" the width of the closure flap to correspond with the width of the carton. Because the width is set by interference, a frictional fit is created between the closure flap and the side walls.

In another preferred embodiment, one knob lock protrudes from each of the left and right sides of the upper closure flap. Each knob lock protrudes a sufficient distance from the closure flap to extend beyond the corresponding side wall of the carton. As a result,

both knob locks engage the side walls and are folded perpendicularly when the closure flap is closed for the first time. This creates a friction fit on both sides of the closure flap, significantly increasing the retention force on the closure flap.

In another preferred embodiment, the carton includes minor flaps, or dust flaps, disposed beneath the closure flap. The position of the knob locks on the closure flap is such that, when minor flaps are used, the perpendicularly-folded portions of the knob locks catch underneath the minor flaps to further secure the closure flap in a closed position. The interaction between the knob locks and the minor flaps provides a notable “snap” when the closure flap is opened and closed.

The present invention offers significant advantages over prior art folding cartons. The dual fastening method – using both a frictional fit and interlocking members – reduces the degree of precision necessary to form the carton. More specifically, because the entire closure flap does not frictionally engage the side walls (only the knob locks do), the cutting and folding of the carton does not have to be absolutely precise for the carton to be properly closed by a packaging machine. This is because the first time the closure flap is inserted into the carton the knob locks deform where necessary to provide a frictional fit. Thus, instead of having to precisely control the width of the closure flap when cutting, the carton walls set the width of the flap. Further, the interaction of the knob locks and dust flaps provides a firm closure with a notable “snap” as the closure is opened and closed. Further, because there are no slit locks, the folding carton is aesthetically pleasing and less likely to rip.

These and other objects, advantages and features of the invention will be more readily understood and appreciated by reference to the detailed description of the drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of a carton in accordance with a preferred embodiment of the invention;

Fig. 2 is a top plan view of a carton blank in accordance with a preferred embodiment of the invention;

Fig. 3 is a top plan view of a top closure flap;

Fig. 4 is a fragmentary left side cross-sectional view of the carton in the closed position taken along line 4-4;

Fig. 5 is a top cross-sectional view of the carton in the closed position taken along line 5-5; and

Fig. 6 is a top plan view of an alternate embodiment of the top closure flap.

#### DETAILED DESCRIPTION OF THE DRAWINGS

A folding carton 1 in accordance with a preferred embodiment of the present invention is shown in Fig. 1. The illustrated carton 1 is a generally rectangular carton intended to contain a tube of cosmetics or other similar contents. As perhaps best shown in Fig. 2, the carton 1 generally includes a plurality of panels 11, 12, 13 and 14 that define the side walls of the carton 1 as well as a dust flaps 27, 28, 29, 30, top closure flap 26, and bottom closure flap 25 that define the top and bottom of the carton 1. The top closure flap 26 includes a pair of outwardly extending knob locks 4,6. The knob locks 4,6 interact with the side walls and dust flaps of the carton to retain the closure flap in the closed position. Although the present invention is described in connection with a rectangular carton intended to contain a tube of cosmetics or other similar contents, the present invention is well suited for use with cartons of essentially any size, shape or configuration and for holding essentially any contents.

As noted above, the carton 1 is generally rectangular defining an internal space 52 for containing one or more products. During manufacture, the carton blank 10 is preferably folded and glued to provide a carton 1 with an open top closure flap 26 that permits insertion of a product into the internal space 52 of the carton 1. Insertion of the product (not shown) and closure of the top closure flap 26 generally occurs in a conventional

packaging assembly line. In use, the top closure flap 26 of the carton may be repeatedly opened and closed to provide repeated access to the product housed in the carton 1.

Typically, the bottom closure flap 25 of the carton 1 will remain in the closed position. It may, however, be opened and closed in some application, and accordingly, may be provided with knob locks, as desired.

In a preferred embodiment, the panels 11, 12, 13 and 14 are arranged in a rectangular shape, and are retained in this shape by an adhesive panel 15. The adhesive panel 15 preferably extends from the back panel 14 and is adhesively secured to the interior surface of the right panel 11.

The carton 1 will now be described in greater detail with reference to Figs. 2 and 3, which show the carton blank 10 used in the manufacture of the carton 1 of the preferred embodiment. Fig. 2 shows the front surface 80 of a blank 10 for forming the carton 1. The back surface is essentially a mirror image of the front surface, and therefore will not be discussed further. As shown, the carton 1 is preferably manufactured from a one-piece, paperboard blank 10 that is folded in a conventional manner to form the carton 1. In the preferred embodiment, the paperboard blank is manufactured from conventional paperboard materials having a thickness of approximately 0.010 to 0.024 inches. The specific paperboard will vary from application to application based primarily on the desired characteristics of the carton.

The basic structure of a carton blank is shown in Fig. 2. The blank 10 has a top end 16 and a bottom end 17. The blank 10 further has a right panel 11, a front panel 12, a left panel 13, a back panel 14, and an adhesive panel 15. The right panel 11 is connected to the front panel 12 along fold line 21. The front panel 12 is connected to the left panel 13 along fold line 22. The left panel 13 is connected to the back panel 14 along fold line 23. The back panel 14 is connected to the adhesive panel 15 along fold line 24. The size, shape and configuration of the various panels can vary from application to application as desired.

Further, there is a bottom closure flap 25 and a top closure flap 26 that, as noted above, close the top and bottom ends of the carton 1. The bottom closure flap 25 is connected to the bottom end 17 of the front panel 12 along fold line 32, and the top closure flap 26 is connected to the top end 16 of the back panel 14 along fold line 31. In addition, the bottom closure flap 25 includes a bottom locking tab 37 defined by fold line 39. Similarly, the top closure flap 26 includes a top locking tab 38 defined by fold line 40. The bottom closure flap 25 and top closure flap 26 could be alternatively connected to different panels.

There are four dust flaps, 27, 28, 29 and 30 in the preferred embodiment. The dust flaps 27, 28, 29 and 30 are closed over the top and bottom ends of the carton 1 before the closure flaps 25 and 26 are closed. The top dust flaps 29 and 30 extend from the top end 16 of the right panel 11 and left panel 13, respectively. Top dust flap 29 is connected to the right panel 11 along fold line 33. Top dust flap 30 is connected to the left panel 13 along fold line 35. Similarly, the bottom dust flaps 27 and 28 extend from the bottom end 17 of right panel 11 and left panel 13, respectively. Bottom dust flap 27 is connected to right panel 11 along fold line 34 and bottom dust flap 28 is connected to left panel 13 along fold line 36.

As can be seen in Fig. 2 and, more clearly, in Fig. 3, knob locks 4, 6 protrude from each of left top locking tab side 50 and right top locking tab side 52 of the top locking tab 38. Optionally, knob locks could protrude from each of the left flap side 54 and right flap side 56 of bottom locking tab 37. Although the invention is explained with reference to knob locks 4,6, it is to be understood that if knob locks are present on the bottom locking tab 37, they function similarly to knob locks 4,6. The construction of knob locks on bottom locking tab 37 is essentially identical to the construction of knob locks 4,6 on top locking tab 38. Alternatively, the bottom locking tab 37 can include slit locks, as shown in Fig. 2, or close by way of a conventional frictional fit.

Each knob lock 4,6 preferably protrudes a sufficient distance from the side of the top locking tab 38 to create a frictional fit with a side wall when the top locking tab 38 is

inserted into the carton 1. In a preferred embodiment, the knob locks 4,6 are substantially semicircular protrusions extending from opposite sides of top locking tab 38. In a preferred embodiment, the radius of each knob lock 4,6, and thus the protrusion from the top locking tab 38, is between 1/32" and 1/64". In this embodiment, the total height of the knob locks 4,6 is approximately equal to the diameter of the knob locks 4,6. The height of the knob locks 4,6 at the point of interface with the side walls will typically affect the retention force resulting from the frictional fit with the side walls. Generally speaking, knob locks of greater height at the interface location will have more surface area in engagement with the side walls and typically result in increased retention force. Accordingly, knob locks of greater height may be used with larger cartons to provide increased retention of the top closure flap 26. The precise size, shape, number and location of the knob locks may vary from application to application to, among other things, control the amount of force required to open and close the carton. For example, the knob locks 4,6 can be substantially rectangular 70 (See Fig. 6), have one square edge and one rounded edge 72 (See Fig. 6), or have one or more angled edges.

In a preferred embodiment, the knob locks 4,6 are configured to interact with the dust flaps 29,30 to provide a recognizable 'snap' when the closure flap is opened and closed. The interaction between the knob locks 4,6 and the dust flaps 29,30 provides additional retention force and a tactile indication when the top locking tab 38 is inserted into and removed from the carton 1. Preferably, the knob locks 4,6 extend from the top locking tab 38 beyond the width of the side walls of the carton 1 so that they are folded rearwardly by interaction of the knob locks 4,6 and the side walls when the closure flap is first closed (described in more detail below). As perhaps best shown in Figs. 4 and 5, the knob locks 4,6 are positioned on the top locking tab 38 so that when the top locking tab 38 is fully inserted into the carton 1, the knob locks 4,6 are disposed below the top dust flaps 29,30. The folded

portion of each knob locks 4,6 extends rearwardly a sufficient distance to catch on the corresponding dust flaps 29,30 as the carton 1 is opened and closed.

Operation of the knob locks 4,6 will be described in more detail with reference to knob lock 4 attached to left top locking tab side 50 of top locking tab 38. It is to be understood that the configuration of knob lock 6 on right top locking tab side 52 is essentially a mirror image thereof. When the carton 1 is first formed, the knob locks 4,6 and top locking tab 38 extend along a common plane because the carton is formed from an initially planar blank 10. When the top closure flap 26 is inserted into the carton 1 for the first time, the knob locks 4,6 engage the top edge of the side walls at some point before the top closure flap 26 is fully closed. After the knob locks 4,6 have engaged the top edge of the side walls, further insertion causes the knob locks 4,6 to deform so that the top closure flap 26 can be fully closed. More specifically, the interaction between the side walls and the knob locks, causes the knob locks 4,6 to deform until the overall width of the top closure flap 26 (including the knob locks) is approximately equal to the width of the side walls. For example, in the preferred embodiment, this causes knob lock 4 to fold rearwardly at approximately the point of intersection between the knob lock 4 and the side wall 11. As a result, the knob lock 4 is bent into a substantially L-shaped configuration with its outer portion extending along the inner face of the right panel 11. A frictional fit is thereby created between the knob lock 4 and right panel 11. Further, the rearward folding of the knob lock 4 creates an interference fit between the folded portion of the knob lock 4 and the corresponding dust flap. When the top closure flap 26 is opened and closed, the knob locks 4,6 cause a friction fit with the side walls and an interference fit with the top dust flaps 29,30. When the user wishes to open the carton 1, the top closure flap 26 is pulled upward with sufficient force to overcome the friction between the closure flap 26 and the side walls, and to force the knob locks 4,6 past the top dust flaps 29,30. As the knob locks 4,6 pass the dust flaps 29,30, the previously discussed recognizable 'snap' will occur. Because the knob locks

are deformed by interaction with the side walls, the overall width of the closure flap (including the knob locks) for any given carton is determined by the side walls of that carton. This means that the overall width of the closure flap will automatically be set to correspond with the width of the side walls and provide a frictional fit, even when the carton width varies from carton to carton.

The carton 1 is manufactured using generally conventional techniques and apparatus. As noted above, the carton 1 is preferably manufactured from a conventional paperboard material having a thickness ranging from 0.010 to 0.024 inches. The precise material and its thickness may, however, vary from application to application. The blank 10 is preferably folded using conventional folding machinery. The left panel 13 and right panel 11 are folded 90 degrees upward along fold lines 22 and 21. The back panel 14 is folded 90 degrees in the direction of right panel 11 along fold line 23. Adhesive panel 15 is folded 90 degrees downward along fold line 24. Adhesive panel 15 is placed inside right panel 11.

The adhesive panel 15 is affixed to the right panel 11 using conventional adhesives, such as water-based adhesives, solvent-based adhesives or hot melts. The adhesive is preferably applied in a line extending substantially along the entire length of the adhesive panel 15. It is known in the art that the adhesive used can be applied to the adhesive panel 15, right panel 11 or both.

After the right panel 11 and adhesive panel 15 are sealed, dust flaps 28 and 30 are folded at 90 degree angles toward right panel 11 along fold lines 36 and 35 respectively. Dust flaps 27 and 29 are folded at 90 degree angles toward left panel 13 along fold lines 34 and 33 respectively. Bottom closure flap 25 is folded upward at a 90 degree angle along fold line 32 and top closure flap 26 is folded downward at a 90 degree angle along fold line 31. The locking tab 37 of the bottom closure flap 25 is folded at a 90 degree angle toward back panel 14 along fold line 39.

The locking tab 37 of the bottom closure flap 25 is inserted into the carton 1 so the front surface 80 of locking tab 37 is in contact with the back surface of back panel 14. If knob locks are present on bottom locking tab 37, pressure is placed on the bottom locking tab 37 until the knob locks deform to frictionally fit within the carton 1. As the bottom locking tab is closed, a recognizable “snap” will occur as the knob locks pass the dust flaps 27,28. In this state, the carton 1 can be readily filled with the desired content.

After the carton 1 is filled, the top of the carton 1 is closed. The top locking tab 38 of the top closure flap 26 is likewise folded at a 90 degree angle toward front panel 12 along fold line 40. The top locking tab 38 of the top closure flap 26 is folded under front panel 12 so the front surface 80 of top locking tab 38 is in contact with the back surface of front panel 12. Pressure is placed on the top locking tab 38 until the knob locks 4,6 deform to frictionally fit within the carton 1. As the top locking tab 38 is closed, a recognizable “snap” will occur when the knob locks 4,6 pass the dust flaps 29,30 to alert the user that the top locking tab 38 is locked within the carton 1.

To open the carton 1, the top closure flap 26 is pulled upward until the top locking tab 38 is removed from the carton 1. As the top closure flap 26 is pulled upward, the knob locks 4,6 will pass the dust flaps 29,30 and the recognizable “snap” will occur. To reclose the carton 1, the top locking tab 38 is inserted back into the carton 1 as previously explained. This process of removing and inserting the top locking tab 38 can be repeated by the user as necessary.

The above description is of the preferred embodiment. Various alterations and changes can be made without departing from the spirit and broader aspects of the invention as defined in the appended claims, which are to be interpreted in accordance with the principles of patent law including the doctrine of equivalents. Any references to claim elements in the singular, for example, using the articles “a,” “an,” “the,” or “said,” is not to be construed as limiting the element to the singular.

CLAIMS

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A carton comprising:

a first panel, a second panel, a third panel, and a fourth panel arranged to form an internal space, with the first panel adjacent to the second panel and the fourth panel, the second panel adjacent to the first panel and the third panel, the third panel adjacent to the second panel and the fourth panel, and the fourth panel adjacent to the third panel and the first panel, the first panel and the third panel being substantially parallel, and the second panel and the fourth panel being substantially parallel, the internal space having a top enclosure end and a bottom enclosure end;

a top closure flap connected to the third panel and foldable over the top enclosure end;

a top locking tab connected to the top closure flap, the top locking tab folded at angle for insertion between the first panel and the third panel, the top locking tab having a first flap side and a second flap side; and

a first knob lock extending from the first flap side of the top locking tab a sufficient distance to form a frictional fit with the first panel.

2. The carton of claim 1 further comprising a second knob lock extending from the second flap side a sufficient distance to form a frictional fit with the third panel.

3. The carton of claim 2 where the first knob lock has a first knob lock outer edge and the second knob lock has a second knob lock outer edge, and the distance from the first knob lock outer edge to the second knob lock outer edge is greater than the distance from the first panel to the third panel.

4. The carton of claim 3 where the first knob lock and the second knob lock are configured such that upon initial placement of the locking tab between the first panel and the

third panel, the first knob lock is deformed so as to rest at least partially on the first panel and the second knob lock is deformed so as to rest at least partially on the third panel.

5. The carton of claim 4 where the first knob lock is deformed so that at least a portion of the first knob lock is perpendicular to the locking tab.

6. The carton of claim 5 where the second knob lock is deformed so that at least a portion of the second knob lock is perpendicular to the locking tab.

7. The carton of claim 6 where the first knob lock and the second knob locks are substantially semicircular.

8. The carton of claim 7 where first knob lock and the second knob lock have a radius, and the radius is between about 1/32 inch and about 1/64 inch.

9. The carton of claim 8 where first knob lock and the second knob lock have a height, and the height is greater than the radius.

10. A unitary blank of foldable paperboard for use in forming a carton, the unitary blank being cut and scored to provide:

a back panel foldably joined along a first fold line to a left panel, the left panel foldably joined along a second fold line to a front panel, the front panel foldably joined along a third fold line to a right panel;

a top closure flap foldably joined along a fourth fold line to the front panel;

a top locking tab foldably joined along a fifth fold line to the top closure flap, the top locking tab having a first top locking tab side and a second top locking tab side; and

a first knob lock attached to the first top locking tab side, the first knob lock extending beyond the first fold line.

11. The unitary blank of claim 10 further comprising an adhesive panel, the adhesive panel connected to the back panel along a sixth fold line.

12. The unitary blank of claim 11 further comprising a second knob lock attached to the second top locking tab side, the second knob lock extending beyond the sixth fold line.

13. The unitary blank of claim 12 where the first knob lock and the second knob lock are substantially semicircular.

14. The unitary blank of claim 13 where the first knob lock and the second knob lock have a radius, and the radius is between about 1/32 inch and about 1/64 inch.

15. The unitary blank of claim 10 where the back panel has a back panel width, the first knob lock has a first knob lock end, the second knob lock has a second knob lock end, and the distance from the first knob lock end to the second knob lock end is greater than the back panel width.

16. The unitary blank of claim 15 where the top locking tab has a top locking tab width and a top locking length, and the top locking width is substantially less than the back panel width over most of the top locking width.

17. The unitary blank of claim 16 further comprising an adhesive panel, the adhesive panel connected to the back panel along a sixth fold line.

18. The unitary blank of claim 17 further comprising a first dust flap connected to the left panel along a seventh fold line, a second dust flap connected to the left panel along an eighth fold line, a third dust flap connected to the right panel along a ninth fold line, and a fourth dust flap connected to the right panel along a tenth fold line.

19. The unitary blank of claim 18 further comprising a bottom closure flap connected to the front panel along an eleventh fold line.

20. The unitary blank of claim 19 further comprising a bottom locking tab connected to the bottom closure flap along a twelfth fold line.

1/4

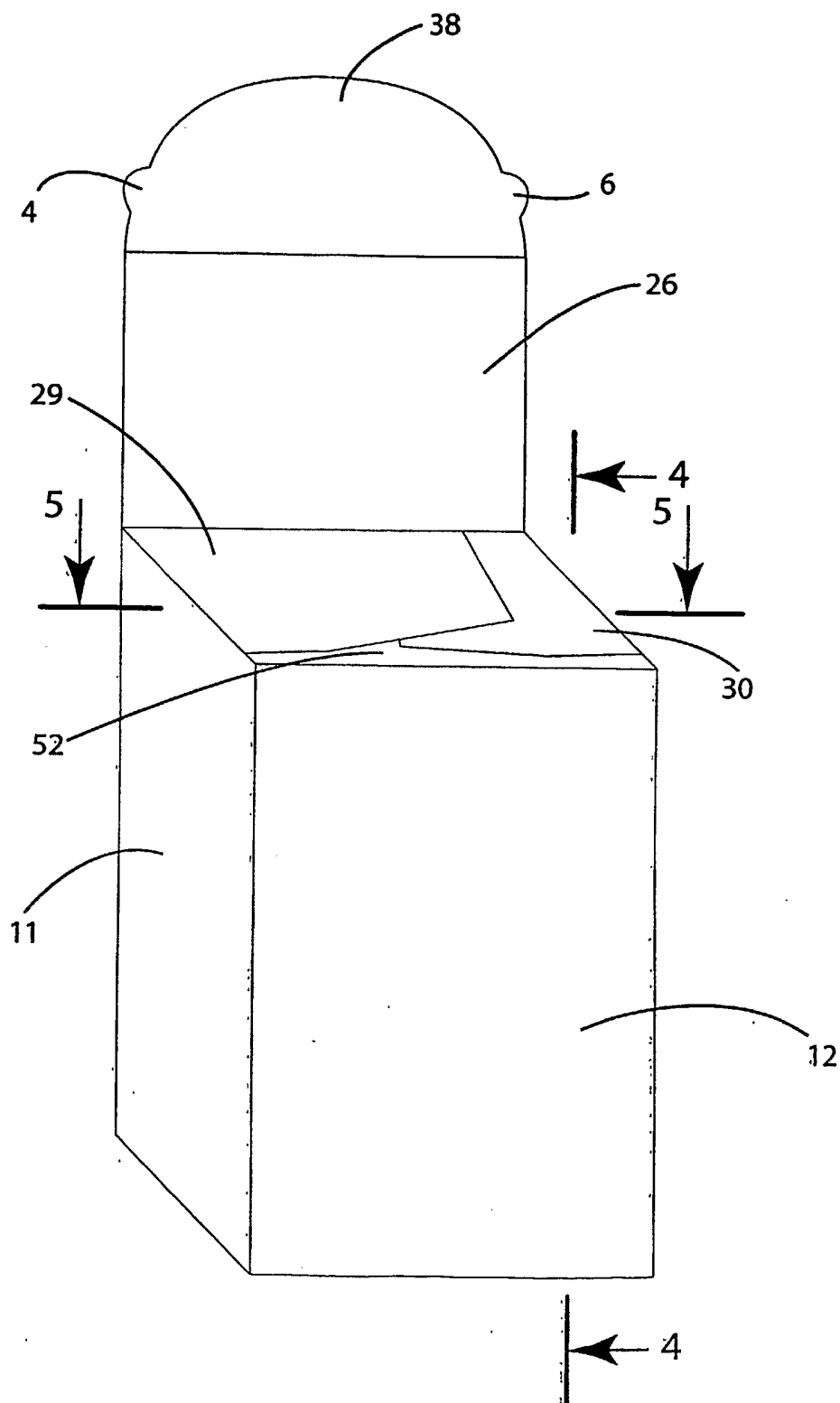


Fig. 1

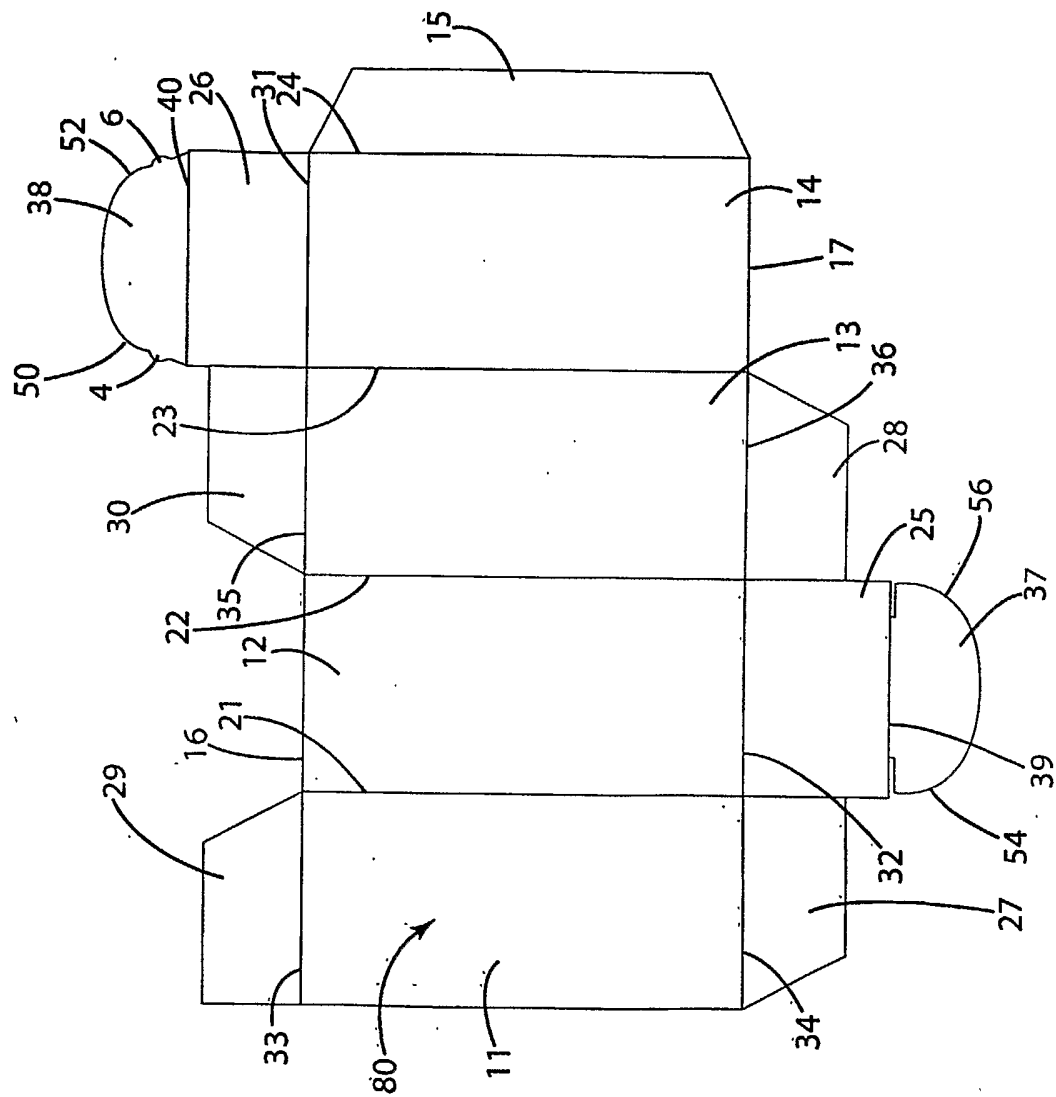


Fig. 2

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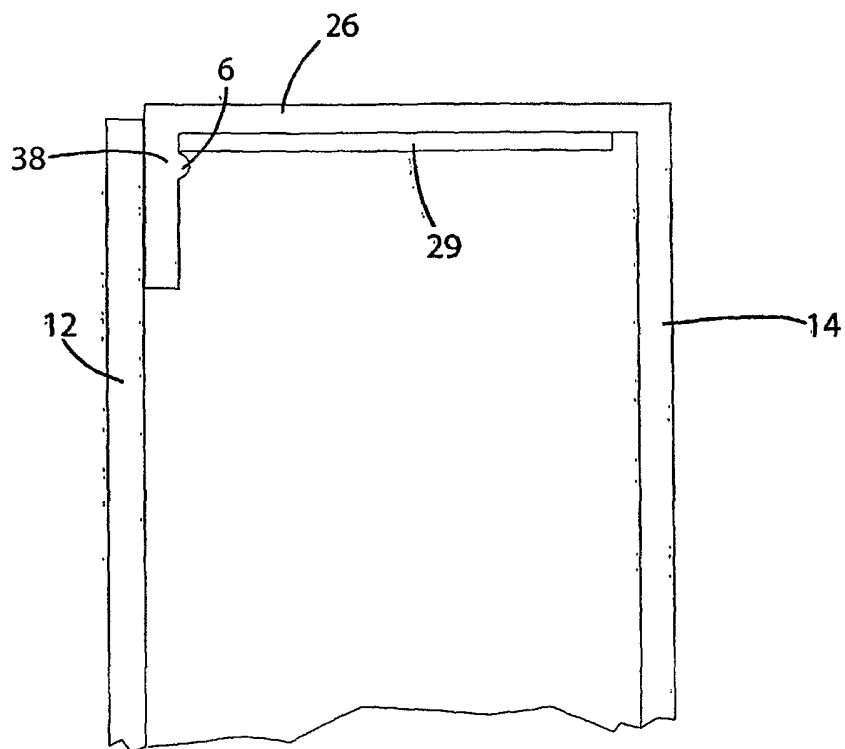
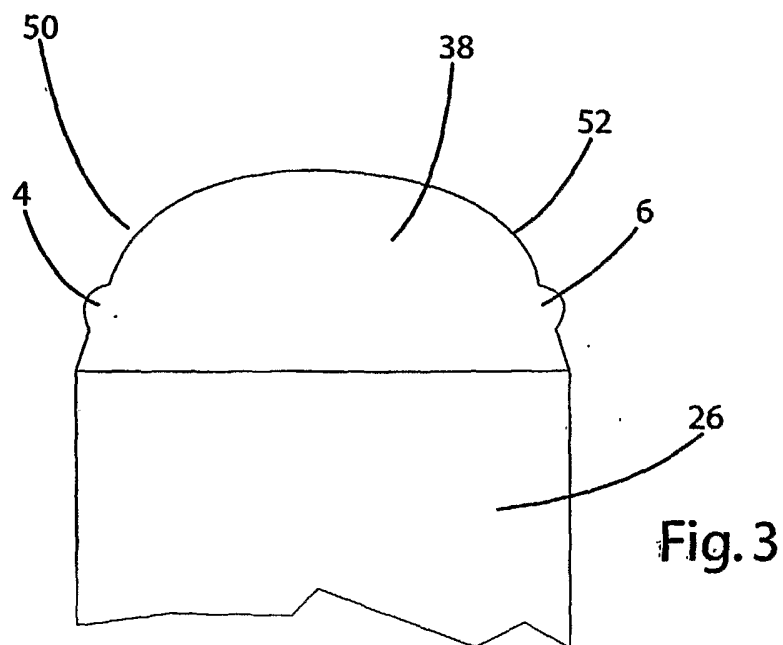


Fig. 4

4/4

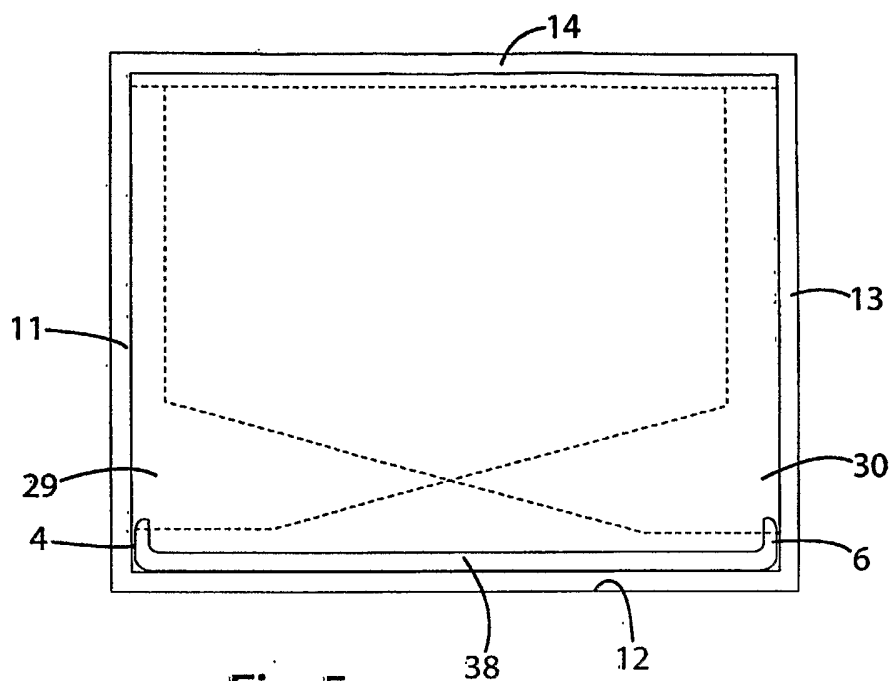


Fig. 5

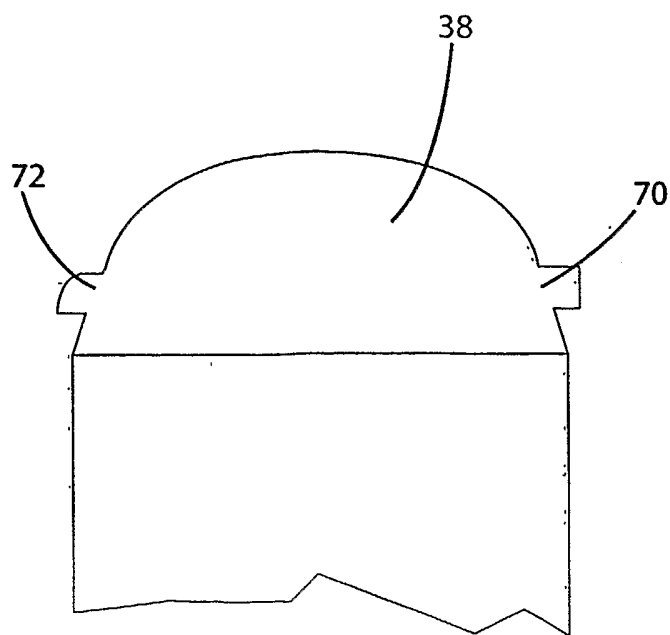


Fig. 6

## INTERNATIONAL SEARCH REPORT

Internatic      pplication No  
PCT/US 03/25242

| A. CLASSIFICATION OF SUBJECT MATTER<br>IPC 7    B65D5/02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                         |                                                                      |
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| According to International Patent Classification (IPC) or to both national classification and IPC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                         |                                                                      |
| B. FIELDS SEARCHED                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                         |                                                                      |
| Minimum documentation searched (classification system followed by classification symbols)<br>IPC 7    B65D                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                         |                                                                      |
| Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                         |                                                                      |
| Electronic data base consulted during the international search (name of data base and, where practical, search terms used)<br>EP0-Internal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                         |                                                                      |
| C. DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                         |                                                                      |
| Category *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Citation of document, with indication, where appropriate, of the relevant passages                      | Relevant to claim No.                                                |
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| * Special categories of cited documents :<br>*A* document defining the general state of the art which is not considered to be of particular relevance<br>*E* earlier document but published on or after the international filing date<br>*L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)<br>*O* document referring to an oral disclosure, use, exhibition or other means<br>*P* document published prior to the international filing date but later than the priority date claimed<br>*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention<br>*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone<br>*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.<br>*&* document member of the same patent family |                                                                                                         |                                                                      |
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