A device for breaking a series of perforations or cuts to open a carton or otherwise separate materials connected by a frangible severance line includes a pair of fold lines that converge away from the severance line, a collapsible line perpendicular to severance line and between the pair of fold lines, and third fold line perpendicular to and intersecting the collapsible line. A tear in the severance line is initiated by applying pressure in vicinity of the intersection of the collapsible line and the third fold line, which causes the device to apply tension to the frangible line, which is further weakened by having an elongated perforation that it centered on the axis of tension, and neighboring perforations that are angled toward the axis of tension. The angle of each perforation with respect to the axis of tension preferably varies depending on its location relative to the axis of tension.
CARTON WITH PRESSURE SENSITIVE OPENING DEVICE

RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Application No. 60/637,826, filed Dec. 20, 2004, the entirety of which is incorporated herein by reference.

TECHNICAL FIELD

[0002] This invention relates generally to cartons for packaging multiple articles such as beverage cans or bottles, and more particularly, to a carton with an article dispenser that is opened using a pressure sensitive opening device.

BACKGROUND OF THE INVENTION

[0003] Cartons for encasing and dispensing multiple articles such as soft drink cans or bottles are useful for enabling consumers to transport, store, and access the articles for consumption. The consumer typically prefers the flexibility of easily accessing the articles without reducing the ability of the carton to enclose the remaining articles. To that end, some cartons have dispensers which allow one or more articles to be removed through an opening as the carton continues to encase the remaining articles. The consumer tears out a portion of the carton to form an opening from which articles may be dispensed.

[0004] Beverage cartons with an article dispenser formed by a removable section are known in the art. Typically, the removable section is defined by a tear line. To open the carton, a finger flap is pressed such that a portion of the removable section is separated from the carton. Then, the removable section is gripped and pulled outwardly, which causes the tear line to break all the way down to the bottom wall. In so doing, the removable section is allowed to swing down together with a part of the bottom end flap, which creates an access opening through which the cans in the carton are exposed. The opening is so dimensioned that at least part of the periphery of the opening serves as a can stopper that prevents the cans from undesirably rolling out of the carton through the opening.

[0005] However, the typical finger flap has been found not to be user-friendly because it is not easy to separate it from the carton wall. This is because the entire side carton wall may yield to the pressing force applied to the finger flap and, as a result, sufficient shearing stress is not induced along the tear line. Moreover, consumers such as children may not be able to apply sufficient force to initiate a tear to open the carton to retrieve an article. Furthermore, even when the finger flap successfully initiates separation of the removable section from the carton wall, the consumer must insert one or more fingers in the narrow space between that portion of the removable section and the remaining carton wall. Thus, the known means for tearing the carton to form the opening can be somewhat difficult, particularly if the consumer is unable to visibly distinguish the finger flap from the remainder of the frangible line so as to find the appropriate point at which to initiate the tear. The addition of a precut aperture such as an insertion flap compromises the structural integrity of the carton and increases its susceptibility to infiltration of light, moisture, and dust.

[0006] What is needed, therefore, is a carton that includes article dispenser that is conveniently opened. Such a carton should have a user-friendly means for initiating the removal of the removable portion, and for grasping and removing the removable portion, as well as a reliable article stopper.

SUMMARY OF THE INVENTION

[0007] The present invention solves the problems identified above by advantageously reducing the effort required to open a carton dispenser to access the articles contained therein. More specifically, the various embodiments of the invention provide an improved means for opening a carton dispenser. The means for opening the carton dispenser is pressure sensitive, and thus, a user simply applies pressure to break the connection between the dispenser and the remainder of the carton. The configuration of the means for opening the carton dispenser reduces the amount of pressure that is required to open the dispenser without significantly degrading the integrity of the carton before and after the dispenser has been opened.

[0008] Generally, the invention is described in the context of a carton having a top wall, a pair of opposed side walls hingedly connected to the top wall, a bottom wall hingedly connected to the side walls, and an end wall hingedly connected to end edges of each of the side, top, and bottom walls.

[0009] The carton includes an article dispenser with a fully or partially removable portion that is formed from one or more of the carton walls. The periphery of the removable portion is defined at least in part by a frangible line or a series of cooperating frangible lines.

[0010] The means for opening the carton dispenser includes an opening device for breaking the frangible line. The opening device is bounded by at least a portion of the frangible line and by a pair of convergent fold lines. Each of the convergent fold lines originates at or near the frangible line and converges toward the other and away from the frangible line. In other words, the convergent fold lines converge toward one another, but do not necessarily meet or intersect one another. The divergent ends of the convergent fold lines approach abut, meet, or intersect the frangible line.

[0011] A collapsible severance line is disposed between the convergent fold lines, preferably effectively bisecting the triangle formed by the convergent fold lines and the frangible line. One advantage of the severance line is that it reduces the amount of pressure required to break the frangible line by encouraging the carton to collapse inward in response to the application of pressure, thereby buckling the top wall of the carton so as to exert force upon the frangible line.

[0012] A transverse fold line extends between the convergent fold lines, and in one embodiment is generally perpendicular to and intersects the collapsible severance line. This fold line directs externally applied pressure away from the frangible line, thereby pulling the frangible line apart.

[0013] In certain embodiments, the opening device also includes an elliptical score line disposed between the convergent fold lines. The elliptical score line preferably has a major axis that coincides with or parallels at least part of the transverse fold line. The elliptical score line provides a target by which the user can identify the appropriate point to apply pressure to open the dispenser, and further encourages inward collapse so as to break of the frangible line.
[0014] The frangible line is advantageously configured to respond to the pressure applied to open the dispenser. To that end, in some embodiments at least a portion of the frangible line is substantially weakened, such as by means of an extended cut line that may be adjacent and perpendicular to said collapsible severance line. Here, this cut line is the weakest portion of the frangible line and is configured to separate first, thereby initiating the separation of the remainder of the frangible line, which is relatively stronger. In other embodiments, the remainder of the shared portion of the frangible line that defines the opening device comprises multiple interrupted cut lines in series with one another and with the cut line. Each of the cut lines is angled toward the collapsible severance line, creating a saw-tooth or zigzag tear when the frangible line is broken. The angled cut lines may be continued along the entirety of the frangible line, or some other combination series of cuts, half cuts, scores, or perforations may be used to complete the periphery of the article dispenser.

[0015] The foregoing has broadly outlined some of the aspects and features of the present invention, which should be construed to be merely illustrative of various potential applications of the invention. Other beneficial results can be obtained by applying the disclosed information in a different manner or by modifying the disclosed embodiments. Accordingly, other aspects and a more comprehensive understanding of the invention may be obtained by referring to the detailed description of the exemplary embodiments taken in conjunction with the accompanying drawings, in addition to the scope of the invention defined by the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] FIG. 1 is a blank for forming an exemplary carton having an article dispenser.

[0017] FIG. 2 is a partial plan view of an opening device according to an exemplary embodiment of the invention.

[0018] FIG. 3 is a perspective view of a carton formed from the blank of FIG. 1, the carton including the opening device of FIGS. 1 and 2.

[0019] FIG. 4 is a partial perspective view illustrating the application of finger pressure to activate the exemplary opening device.

[0020] FIG. 5 is a partial perspective view illustrating a user using the exemplary opening device to access the edge of a removable portion.

[0021] FIG. 6 is a partial side elevation illustrating the carton of FIG. 3 in an opened condition with the removable portion partially removed.

[0022] FIG. 7 is a perspective view illustrating the carton of FIG. 3 in an opened condition with the removable portion completely removed.

DETAILED DESCRIPTION

[0023] As required, detailed embodiments of the present invention are disclosed herein. It will be understood that the disclosed embodiments are merely examples to illustrate aspects of the invention that may be embodied in various forms. As used herein, the word "exemplary" is used expansively to refer to embodiments that serve as an illustration, specimen, model, or pattern. The figures are not necessarily to scale, and some features may be exaggerated or minimized to show details of particular components. In other instances, well-known materials or methods have not been described in detail to avoid obscuring the present invention. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting, but as a basis for the claims and for teaching one skilled in the art to variously employ the present invention.

[0024] Referring now to the drawings in which like numerals indicate like elements throughout the several views, the drawings illustrate certain of the various aspects of exemplary embodiments of a carton opening device according to the teachings of the present invention. In the embodiments detailed herein, the term carton refers, for the non-limiting purpose of illustrating the various features of the invention, to a container for enclosing, carrying, and dispensing articles such as beverage cans. However, it is contemplated that the teachings of the invention can be applied to any container, the opening of which requires the breaking a frangible connection.

[0025] The features and aspects of the invention are described with reference to an exemplary carton 300 formed from a foldable sheet material such as paperboard, corrugated board, plastic, laminates, any combination thereof, or the like. To encourage an understanding of the various aspects of the invention, the construction of an exemplary carton will now be described in some detail. The foldable sheet material is typically provided as a unitary blank 100, the inside surface of which is shown in FIG. 1. The blank 100 includes a bottom panel 102 hingedly connected along longitudinal fold line 103 to a first side panel 104, which is hingedly connected along fold line 106 to a top panel 108, which is hingedly connected along fold line 110 to a second side panel 112, which is hingedly connected along fold line 114 to an edge flap 116. Each of the panels is hingedly connected, respectively, to end flaps 118a, 120a, 130a, 136a or end wall panels 122a, 124a, which are defined in part by respective transverse fold lines 126a, 130a, 136a, 128a, 132a disposed along one edge of the blank 100. At the opposite edge of the blank 100, the panels may also include hinged connections to similar end flaps 118b, 120b, 130b, 136b or end wall panels 122b, 124b defined in part by transverse fold lines 126b, 130b, 136b, 132b. More specifically, first side panel 104 is hingedly connected to end wall panels 122a, 122b along respective fold lines 128a, 128b. Top panel 108 is hingedly connected to end flaps 120a, 120b along respective fold lines 130a, 130b. Second side panel 112 is hingedly connected to end wall panels 124a, 124b along respective fold lines 132a, 132b. Bottom panel 102 is hingedly connected to end flaps 118a, 118b along respective fold lines 126a, 126b. Edge flap 116 is hingedly connected to end flaps 136a, 136b along respective fold lines 138a, 138b.

[0026] The blank 100 includes a frangible line 140, which when the carton is erected, defines a removable portion T. The removable portion T can have any shape, size, or orientation that is suitable for dispensing articles, and thus, the illustrated version is provided as a non-limiting example. To define the exemplary removable portion T, the frangible line 140 curves somewhat as it extends from the distal edge of end wall panel 122a across fold line 128a and onto side panel 104. The frangible line 140 traverses a portion of side panel 104, extending longitudinally from fold line 128a.
toward end wall panel 122b, transversely toward bottom panel 102, longitudinally again toward end wall panel 122b, and transversely toward top panel 108. The flangible line 140 crosses fold line 106 to traverse top panel 108, then crosses fold line 110 onto side panel 112. The flangible line 140 extends across a portion of side panel 112 and across the length of end wall panel 124a so as to approximate a mirror image of its path across side panel 104 and end wall panel 122a. Thus, the exemplary removable portion T is symmetrical, although symmetry is not requisite for implementation of the systems or methods of the invention. It is contemplated that the flangible line 140 includes, but is not limited to, a line of perforations, a line of short slits, a line of half cuts, a single half cut, any combination of slits, score lines, and half cuts, or the equivalent, as will be understood by those skilled in the art.

[0027] The section of flangible line 140 that traverses the top panel 108 will now be referred to as flangible section 142. FIG. 2 provides an enlarged view of the carton 300 from the perspective of the top panel 108, including the opening device 200. A subsection 144 of flangible section 142 is adjacent to and defines one edge of the opening device 200 of the present invention. The opening device 200 is further defined by a first fold line 202 and a second fold line 204. The fold lines 202, 204 converge toward one another. The direction of convergence 206 of the fold lines 202, 204 is substantially perpendicular to the subsection 144. In the embodiment shown, means for weakening such as a slit, cut, half-cut, or series of slits, cuts or half-cuts form a severance line 208 that is in alignment with the direction of convergence 206. The extent of the severance line 208, as defined by the depth, width, and length of the cuts or slits comprising the severance line 208, is sufficient to compensate for or overcome the stiffness of the carton material when pressure is applied to the opening device 200, so as to encourage the opening device 200 to collapse inward toward the interior of the carton. An additional fold line 212 extends transversely between the fold lines 202, 204, thereby directing the applied pressure away from the flangible subsection 144, which is itself placed in tension. The configuration of the opening device 200 concentrates and focuses the force generated by a user pressing the opening device 200, preferably at or in the vicinity of the intersection of the severance line 208 and the fold line 212. The axis of tension 210 created by this pressure preferably coincides generally with the direction of convergence 206. As the pressure exerted on the opening device 200 increases, the tension applied to subsection 144 also increases. When the tension exceeds the tear strength of the flangible subsection 144, the subsection 144 separates so as to initiate separation of the remainder of flangible line 140. Elliptical score line 213 indicates the preferred pressure point for tearing subsection 144 and further promoting an inward collapse. It is contemplated that each of the fold lines in this embodiment includes, but is not limited to, a line of perforations, a score line, a line of short slits, a line of half cuts, a single half cut, any combination of slits, score lines, and half cuts, or the equivalent, as will be understood by those skilled in the art.

[0028] As is also illustrated in FIG. 2, the subsection 144 includes multiple angled perforations 214 that include any means for controllably weakening the carton, including slits, cuts, or half-cuts. The perforations 214 are interrupted by ties or nicks 216 that maintain the integrity of the subsection 144 until it is desirable to initiate tearing thereof. It is known to relate the depth and length of the perforations 214 and the width of the ties 216 that interrupt the perforations 214 to create a flangible line with sufficient tear strength to withstand the forces generated by carrying, stacking, or otherwise handling the carton 300 prior to opening the carton 300, and to prevent the flangible line from excessively reducing the burst strength of the carton wall. Thus, such determinations are design choices dependent at least in part upon the size of the package, configuration, and weight of the contents. The angle of each perforation 214 is preferably determined by referencing the axis of tension 210, so that at least some of the perforations 214 comprising the top panel section 142 of the flangible line 140 are angled toward the axis of tension 210. The perforation 214a at the center of the subsection 144 is preferably elongated to comprise the weakest segment of subsection 144, thereby encouraging the tear to initiate at the center of top panel 108 and to radiate toward either side panel 104, 112. This result can be intensified if the centermost perforation 214a is also centered on and perpendicular to the axis of tension 210. The angle of each perforation 214 with respect to the axis of tension 210 preferably varies depending on its location with respect to the axis of tension 210. For example, the angle of perforations 214 may decrease in inverse proportion to their distance from the axis of tension 210 such that the angle of perforation 214d is less than that of the adjacent perforation 214e that is less than the angle of center perforation 214a. It is also preferred that the length of each perforation 214 varies depending on its location with respect to the axis of tension 210. For example, the length of perforations 214 may decrease in inverse proportion to their distance from the axis of tension 210 such that the length of perforation 214d is less than that of the adjacent perforation 214c that is less than the length of center perforation 214a.

[0029] To erect the carton 300 shown in FIG. 3, the bottom panel 102 of the blank 100 is glued or is otherwise secured to the edge flap 116 to form the composite bottom wall 102/116 of carton 300, which is at this point opened and tubular. End flaps 136a, 136b are secured to respective end flaps 118a, 118b to form composite end flaps 118a/136a and 118b/136b. The first side panel 104 becomes the first side wall 304 of the erected carton 300. Similarly, the top panel 108 becomes the top wall 308, and second side panel 112 forms the second side wall 312 of the erected carton 300.

[0030] After articles are grouped and loaded through either or both of the open ends of the carton 300, the end flaps and end wall panels are folded and secured together to form opposing end closure structures of carton 300. End wall panel 124a is secured to the inside surface of end wall panel 122a. Additionally, end flaps 120a, 118a/136a may optionally support the integrity of the carton 300 by being secured to end wall panel 122a and/or to end wall panel 124a. The end flaps 120a, 118b/136b, and end wall panels 122a and 124b cooperate similarly to form the opposing end closure structure. As readily apparent from FIG. 3 (showing the carton 300 in a closed condition), the end closure structures form respective end walls 302a and 302b.

[0031] The exemplary carton 300 illustrated in the drawings is adapted to hold a group of similarly dimensioned, cylindrical articles C (best shown in FIG. 6), in one or more vertically arranged rows. The articles in each row are disposed on their sides in a side-by-side parallel fashion.
What is claimed is:

1. A carton, comprising:
   - a first wall having a frangible line formed therein; and
   - an opening device for breaking said frangible line, said opening device being defined by at least a portion of said frangible line and by a pair of convergent fold lines each originating near said frangible line, the opening device comprising a collapsible line disposed between said convergent fold lines such that said collapsible line is disposed transversely to said frangible line;
   - wherein said convergent fold lines and said collapsible line cooperate to break said frangible line when pressure is applied proximate to said collapsible line.

2. The carton of claim 1, wherein the opening device further comprises a transverse fold line disposed between said convergent fold lines such that said transverse fold line is disposed substantially perpendicular to and intersects said collapsible line.

3. The carton of claim 2, wherein said opening device further comprises:
   - an elliptical score line disposed between said convergent fold lines and having a major axis that coincides at least in part with said transverse fold line.

4. The carton of claim 1, wherein at least a portion of said frangible line defining said opening device comprises a weakened portion that is adjacent to said collapsible line.

5. The carton of claim 4, wherein a portion of said frangible line comprises a plurality of interrupted cut lines in series with one another and with said weakened portion, the plurality of cut lines being angled toward said collapsible line.

6. The carton of claim 1, wherein said collapsible is disposed along the direction of convergence of said convergent fold lines.

7. The carton of claim 4, wherein said weakened portion is perpendicular to said collapsible line.

8. A carton, comprising:
   - a top wall;
   - a pair of opposed side walls each having upper and lower edges and each hingedly connected along said upper edges to said top wall;
   - a bottom wall having side edges hingedly connected to said lower edges of said side walls;
   - an end wall hingedly connected to end edges of each of said side, top, and bottom walls;
   - an article dispenser including a removable portion formed from at least a portion of said side, top, and end walls, the removable portion being defined by a frangible line; and
   - an opening device for breaking said frangible line, said opening device being defined by at least a portion of said frangible line and by a pair of convergent fold lines each originating near said frangible line, the opening device comprising:
     - a severance line disposed between said convergent fold lines, said severance line being disposed along the direction of convergence of said convergent fold lines; and
     -
a fold line disposed between said convergent fold lines
and perpendicular to said severance line.

9. The carton of claim 8, wherein said frangible line is
continuous.

10. The carton of claim 8, further comprising a collapsible
line disposed between said convergent fold lines, said col-
lapsible line being disposed along the direction of conver-
gence of said convergent fold lines.

11. The carton of claim 10, wherein a portion of said
frangible line comprises a plurality of interrupted cut lines in
series with one another and with a weakened portion, the
plurality of cut lines being angled toward said collapsible
line, and the weakened portion being adjacent and perpen-
dicular to said collapsible line.

12. An opening device for breaking a frangible line
connecting a first section of material to a second section of
material, said opening device being defined by at least a
portion of said frangible line and by a pair of convergent fold
lines each originating near said frangible line, the opening
device comprising:

a collapsible line disposed between said convergent fold
lines; and

a fold line disposed between said convergent fold lines
and perpendicular to and intersecting said collapsible
line;

wherein said fold line, said convergent fold lines, and said
collapsible line cooperate to break said frangible line
when pressure is applied proximate to the intersection
between said fold line and said collapsible line.

13. The opening device of claim 12, wherein said col-
lapsible line is disposed along the direction of convergence
of said convergent fold lines.

14. The opening device of claim 12, wherein said col-
lapsible line is perpendicular to said frangible line.

15. The opening device of claim 12, wherein said first
section of material and said second section of material are
disparate.

16. The opening device of claim 12, wherein said first
section of material and said second section of material are
constructed of the same kind of material.

17. A method for opening a carton, wherein the carton
includes a top wall, a pair of opposed side walls each having
upper and lower edges and each hingedly connected along
said upper edges to said top wall, a bottom wall having side
dges hingedly connected to said lower edges of said side
walls, an end wall hingedly connected to end edges of each
of said side, top, and bottom walls, and an article dispenser
including an at least partially removable portion formed
from at least one of said side, top, end, and bottom walls, the
removable portion being defined at least in part by at least
one frangible line, the method comprising:

applying downward pressure to an opening device for
breaking said frangible line, said opening device being
defined by at least a portion of said frangible line and
by a pair of convergent fold lines each originating near
said frangible line, the opening device comprising:

a collapsible line disposed between said convergent
fold lines, said collapsible line being disposed along
the direction of convergence of said convergent fold
lines;

a fold line disposed between said convergent fold lines
intersecting said collapsible line;

discontinuing the application of pressure when said fran-
gible line tears sufficiently to grasp an edge of said
removable portion, said edge being defined by said
frangible line;

graping said edge; and

tearing at least a portion of the remainder of said frangible
line until the carton is open.

18. A carton, comprising:
a first wall having a frangible line formed therein; and
an opening device for breaking said frangible line, said
opening device being defined by at least a portion of
said frangible line and by a pair of convergent fold lines
each originating near said frangible line, the opening
device comprising:

a fold line extending between said convergent fold lines
such that said fold line is disposed transversely to
said convergent fold lines;

wherein said fold line and said convergent fold lines
cooperate to break said frangible line when pressure
is applied proximate to said fold line.

19. An opening device for breaking a frangible line
connecting a first section of material to a second section of
material, comprising a collapsible line disposed perpen-
dicular and adjacent to said frangible line;

wherein said frangible line is broken when pressure is
applied proximate to said collapsible line.

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