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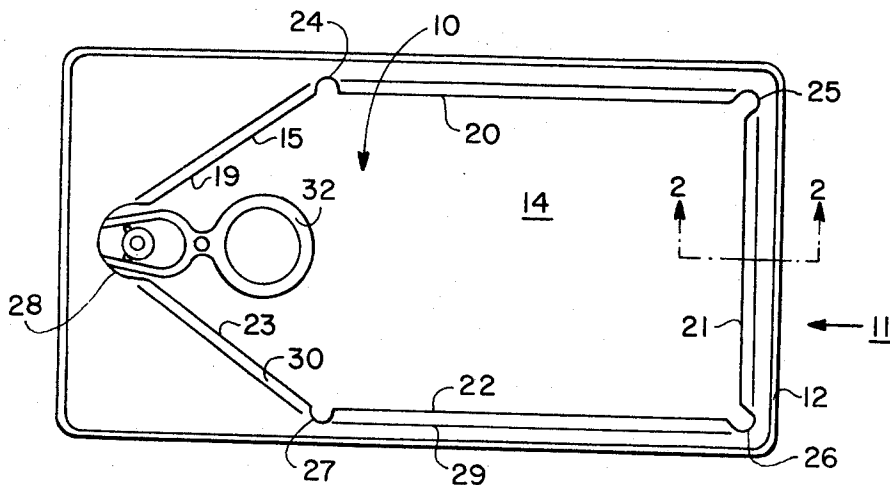
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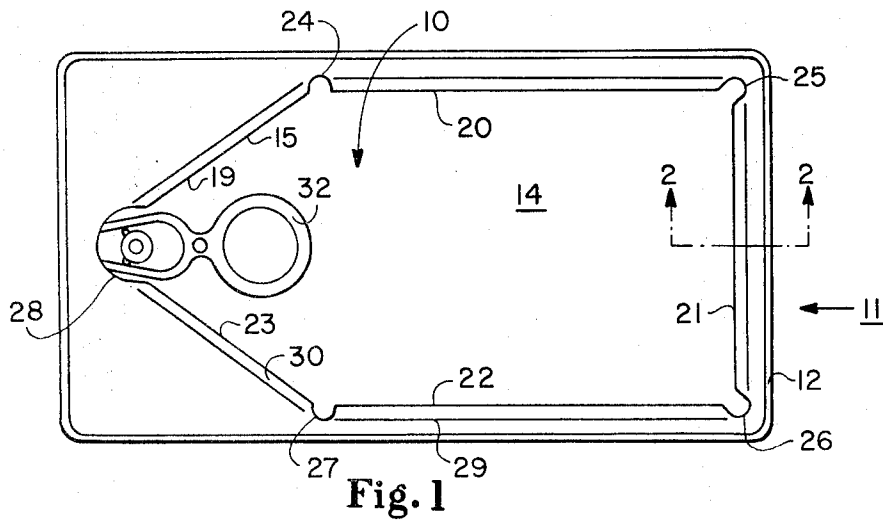
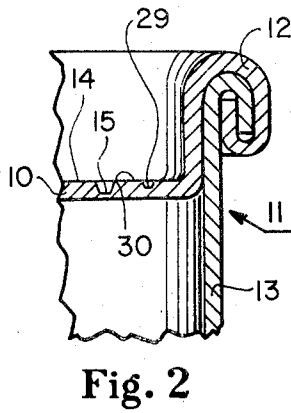
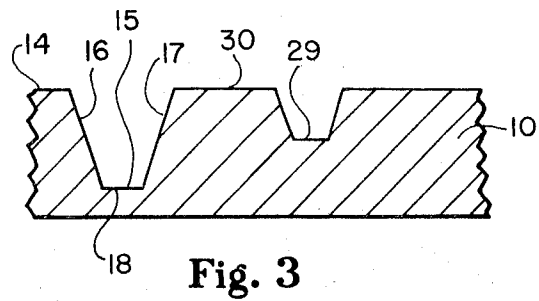
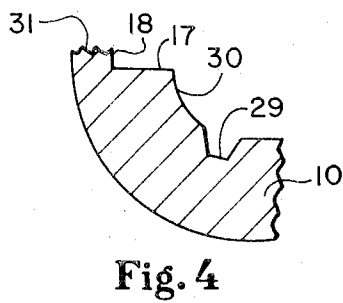
[54] **SCORE-LINE STRUCTURE**
9 Claims, 4 Drawing Figs.

[52] U.S. Cl. 220/54
[51] Int. Cl. B65d 17/24
[50] Field of Search 220/54, 27,
53, 48; 215/46.5

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ABSTRACT: A score-line structure wherein a first score line defines a dispensing opening and a second score line is positioned outwardly of the first and parallel thereto. The second score line has a lesser depth than the first score line so that when the first score line is ruptured the portion of the end wall intermediate the first and second score lines curves upwardly to cause the sharp edge which results from the severance of the first score line to be pointed upwardly rather than inwardly. The result is to thereby decrease the cut hazard around the edge of the dispensing opening when a consumer passes his hand through the dispensing opening to withdraw a quantity of the product packaged within the container.





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SCORE-LINE STRUCTURE

BACKGROUND OF THE INVENTION

This invention relates to improved score-line structures for reducing the cut hazards to consumers which result when conventional score lines are ruptured. More particularly, the invention relates to the provision of a shallow, second score line spaced outwardly of a first, deeper score line to provide an axis of rotation whereby the wall material intermediate the two score lines rotates about the second score line to thereby cause the sharp resulting edge to project in an upward direction rather than inwardly.

The provision of dispensing openings defined by score lines has increased markedly in recent years. The conventional score line is formed by a trapezoidally shaped die which is impressed into the surface of the end wall in which the score is to be formed to provide a trapezoidally shaped depression having a flat bottom defining a wall of reduced thickness along which the tear takes place. When such score lines are ruptured the thin fin which previously formed the bottom wall of the score frequently remains attached to the nonremovable portion of the end wall. This fin is generally quite thin and poses a serious cut hazard to a consumer because it results in a sharp, knifelike edge along the periphery of the dispensing opening by which a consumer's hand can be cut when the hand is brought adjacent the edge when withdrawing product from within the container. It is an object of the present invention to obviate this difficulty.

SUMMARY OF THE INVENTION

Briefly stated, in accordance with one aspect of the present invention, a first score line is provided to define a removable panel which, when removed, provides a dispensing opening in a wall of a container. Spaced outwardly of the first score line is a second score line which has a lesser depth than the first score line. The second score line serves to define an axis of rotation whereby the end wall material lying between the first and second score lines is caused to rotate upwardly when the first score line is severed to thereby position the sharp fin in an upwardly oriented position and thereby reduce the cut hazard to a consumer using a container in which such a dispensing opening is provided.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a plan view of a wall of a container including a score line according to the present invention.

FIG. 2 is fragmentary cross-sectional view taken along the line 2-2 of FIG. 1 and showing the score line arrangement in greater detail.

FIG. 3 is an enlarged fragmentary view showing the score line structure of the invention enlarged to illustrate the relative positions and sizes of the score lines.

FIG. 4 is an enlarged fragmentary view of the wall after the first score line has been severed, and showing the upward curving of the end wall to cause the raw edge to project upwardly rather than inwardly.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawing, and particularly to FIG. 1, there is shown a plan view of an end wall 10 of a container 11 having a double-seam bead 12 interconnecting end wall 10 with a sidewall 13 (see FIG. 2), and including a removable panel 14 which, when removed, provides a dispensing opening in end wall 10. Pull tab 32 can be of the type described in U.S. Pat. No. 3,366,270, which issued Jan. 30, 1968, to N. S. Khoury, the disclosure of which is hereby incorporated herein by reference. Although shown as of generally rectangular cross section, container 11 may take on any desired shape, such as, for example, circular, elliptical, and the like. Furthermore, sidewall 13 of container 11 can be formed either of metals, plastics, paperboard, or combinations thereof. However, end wall 10 in which the score line is impressed is a metallic wall since it is with that material that the cut hazard is greatest.

Removable panel 14 is defined by a first score line 15 which can be of the conventional trapezoidal cross section to provide obliquely positioned sidewalls 16, 17 (see FIG. 3) and a flat bottom wall 18, which is generally parallel with the upper and lower surfaces of end wall 10 of container 11. In the configuration shown in FIG. 1, first score line 15 comprises a series of linear portions 19, 20, 21, 22, and 23 which are interconnected by curved portions 24, 25, 26, 27, and 28, respectively. The linear portions 19, 20, 21, 22, and 23 generally define the periphery of the dispensing opening and the curved portions 24, 25, 26, 27, and 28 provide a series of slight, outwardly directed portions in removable panel 14, the function of which will be hereinafter described in greater detail. Although the dispensing opening shown in FIG. 1 is of a specific shape, it is not necessary that the particular shape be employed and variations employing other arrangements of linear and curved portions can also be utilized.

Spaced outwardly of each of the linear portions 19, 20, 21, 22, and 23 of first score line 15 is a second score line 29 which is preferably parallel to first score line 15 and which can have the same cross-sectional configuration as that of the latter. Second score line 29 can be spaced from 25 mils to 65 mils, on a center-to-center basis, from first score line 15. Preferably, the lateral spacing between the score lines is at least 40 mils.

Second score line 29 defines a line or axis of rotation about which the portion 30 of end wall 10 intermediate the two score lines 15, 29 can rotate upwardly after rupture of first score line 15. A portion of end wall 10 prior to rupture of first score line 15 is shown in FIG. 3, and after rupture is shown in FIG. 4. As shown in FIG. 4, the sharp fin 31 which results when first score line 15 is ruptured is caused to point upwardly by virtue of the bending of the intermediate portion 30 about second score line 29.

In order to provide a first score line that is easy to rupture, yet one that will withstand shipping and handling loads without fracturing and one which will permit the packaging of pressurized products, it is preferred that the residual depth of the first score line be about 2 mils (0.002 inch) when conventional 90-pound TH tinplate is utilized. The residual depth is that portion of an end wall which lies between the bottom wall of a score line and the lower surface of the end wall. When an aluminum alloy is utilized to provide the end wall, the residual depth can range from about 2.5 mils to about 5.0 mils. In terms of overall thickness, when the end wall is of tinplate, the thickness can range from about 5 mils to about 14 mils, with 9 mils being a typical thickness. On the other hand, when aluminum is utilized to form the end wall, the thickness can range from about 10 mils to about 20 mils with about 10.5 mils being a typical thickness.

The residual depth at second score line 29 must be selected so that the tearing action takes place along first score line 15 in order to provide the benefits of the present invention. Thus, second score line 29, which is spaced outwardly of first score line 15, has a greater residual depth than that of first score line 15 so that tearing will take place along first score line 15 and not along second score line 29. Stated otherwise, second score line 29 is of a lesser depth than first score line 15. When the material of which the end wall is formed is tinplate, the residual depth for the second score line can range from 3 mils to 6 mils, preferably 5 mils. When an aluminum alloy is utilized to form the end wall, the residual depth of the second score line can range from 6 mils to 8 mils, preferably 7 mils.

It can thus be seen that the second score line, by virtue of its lesser depth, or greater residual, is not intended to define a line of rupture, but as can be seen in FIG. 4 is to define a line or axis of rotation about which the intermediate portion 30 between first and second score lines 15 and 29, respectively, can rotate upwardly and thereby position sharp fin 31 associated with first score line 15 after rupture thereof in an upwardly direction to minimize the cut hazard when a consumer inserts his hand through the dispensing opening to withdraw product from the container. The upward rotation of intermediate portion 30 is accomplished by virtue of the upward force applied to rupture first score line 15 and thereby sever

removable panel 14 from end wall 10. A portion of that force is transmitted to intermediate portion 30, causing it to bend about second score line 29 and assume the orientation shown in FIG. 4.

Referring once again to FIG. 1, the configuration of the removable panel is defined by a series of linear portions 19, 20, 21, 22, and 23 interconnected by curved portions 24, 25, 26, 27, and 28 which extend outwardly of the linear portions. The outwardly extending curved portions in the first score line extend to the outer, second score line and are provided so that there are discrete straight line portions of the end wall which can pivot about second score line 29 without the requirement for stretching the material of which the end wall is formed in a plane parallel to score line 15.

If, on the other hand, the dispensing opening were circular or formed completely of curved portions, it would be necessary that the portion of the end wall intermediate the first and second score lines be stretched in directions both parallel and perpendicular to the first score line so that the sharp fin projects upwardly. Since the initial diameter of the innermost edge of the residual fin is smaller than the diameter after it is rotated into an upwardly directed position, such as shown in FIG. 4, it would be necessary that the material be stretched peripherally as well as radially so that the diameter can increase to permit the upward orientation of the edge. Since this is not practicable with most metallic materials because they have a high tensile strength and thus require large forces to cause stretching, it is therefore necessary that the spaced score line structure of the present invention be confined to the straight line portions of the dispensing opening and that the portions intermediate the straight line portions be so configured that rotation of the portion intermediate the score line can be accomplished without peripheral stretching of the end wall material. Thus, as shown in FIG. 1, the outwardly extending curved portions 24, 25, 26, 27, and 28 are necessary to eliminate peripheral stretching of the metal in the intermediate linear areas and thereby reduce the force necessary to cause the upward bending of intermediate portion 30.

Of course, the lowermost surface of end wall 10 at portion 30 between the score lines is, of necessity, stretched in a direction perpendicular to that of score line 15 in the course of causing portion 30 to be so oriented that sharp fin 31 points upwardly. To impose the additional requirement that the material at portion 30 be caused to be stretched even further and in a direction parallel to score line 15 would require that a very ductile material be utilized. Because such a material would readily deform under loads, it would not be practicable in this particular type of application. Thus, the spaced score line structure of the present invention is most advantageous when used with dispensing openings having at least one straight line portion defining the opening.

Although second score line 29 as shown in FIG. 1 is discontinuous in that it is interrupted at outwardly extending curved

portions 24, 25, 26, 27, and 28 of first score line 15, it can, if desired, be made continuous and in that event the outermost portions of outwardly extending curved portions 24, 25, 26, 27, and 28 would be coincident with second score line 29. While second score line 29 can be either continuous or discontinuous, first score line 15 must obviously be continuous in order to effect complete removal of removable panel 14.

While particular embodiments of the invention have been illustrated and described, it will be apparent to those skilled in the art that various changes and modifications can be made without departing from the spirit and scope of the invention, and it is intended to cover in the appended claims all such changes and modifications that are within the scope of this invention.

I claim:

1. In a container having a removable portion to provide a dispensing opening in one end wall thereof, said removable portion defined by a first score line forming a line of reduced thickness in said wall to facilitate severance of said removable portion from said wall and thereby provide said dispensing opening, the improvement comprising a second score line spaced outwardly of and generally parallel to said first score line, said second score line having a lesser depth than said first score line and defining an axis of rotation whereby the portion of said end wall between said first and said second score lines is rotated about said axis of rotation to orient the sharp edge thereof in an upward direction upon severance of said first score line.
2. The container of claim 1 wherein the center-to-center spacing between said first and said second score lines ranges from 25 mils to 65 mils.
3. The container of claim 2 wherein said first score line includes at least one linear portion.
4. The container of claim 3 wherein said second score line includes at least one linear portion.
5. The container of claim 4 wherein the linear portions of said second score line are parallel to the linear portions of said first score line.
6. The container of claim 5 wherein the residual thickness at said first score line ranges from 2 mils to 5 mils and the residual thickness at said second score line ranges from 3 mils to 8 mils.
7. The container of claim 6 wherein the difference in depth between said first and second score lines ranges from 1 mils to $5\frac{1}{2}$ mils.
8. The container of claim 7 wherein said second score line is discontinuous.
9. The container of claim 7 wherein said second score line is continuous.

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