Aug. 29, 1967 W. E. TAYLOR 3,338,199

SCORING APPARATUS AND METHOD

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Fig. 1.

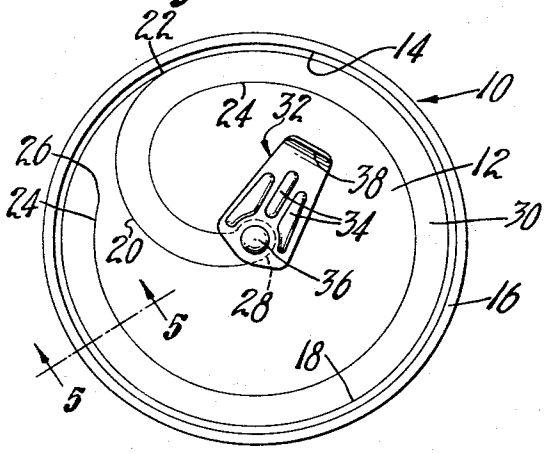


Fig. 4.

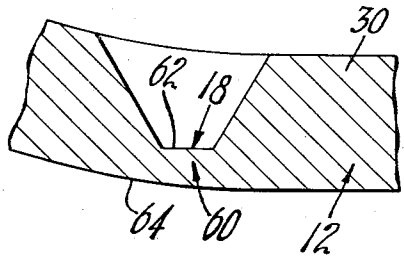
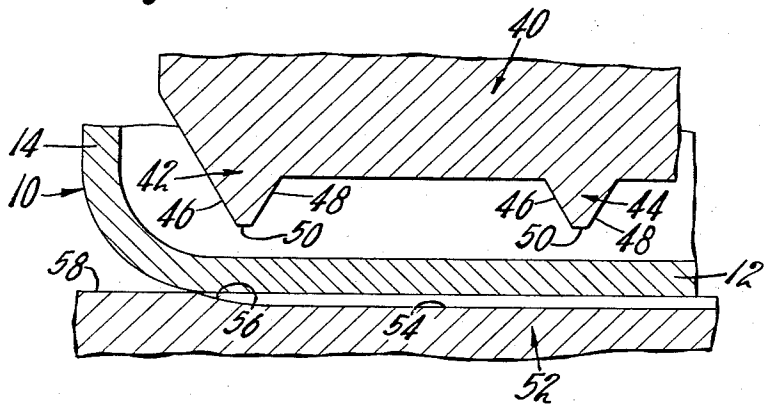


Fig. 2.



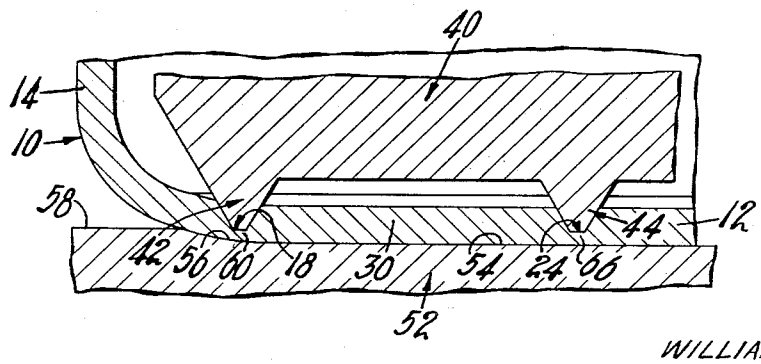


Fig. 3.

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Fig. 5.

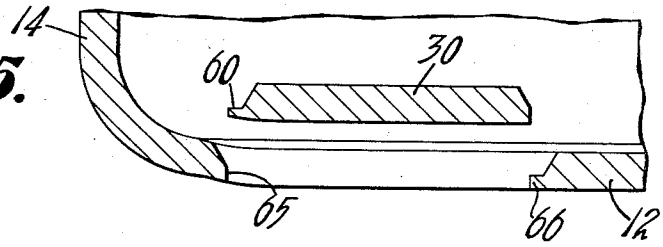


Fig. 6.

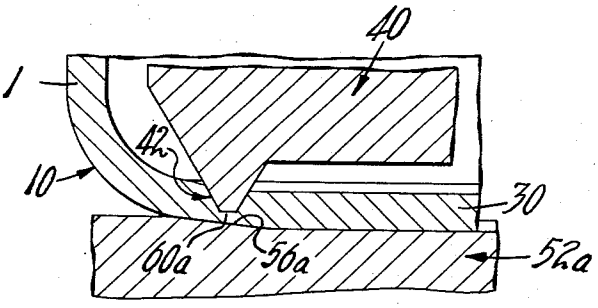


Fig. 7.

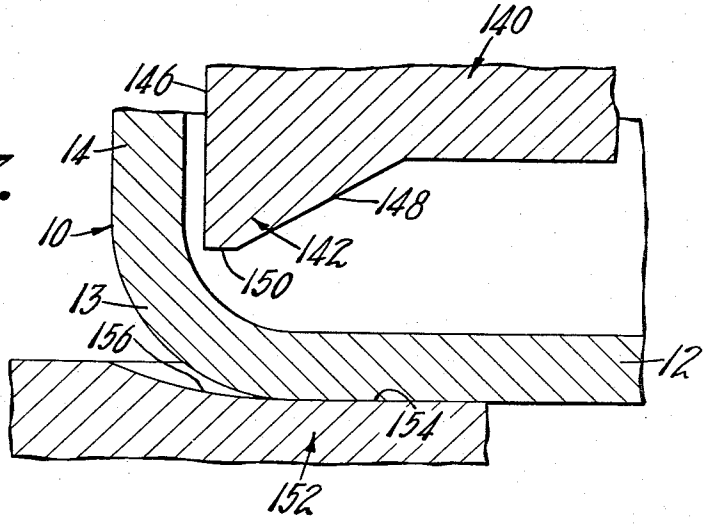
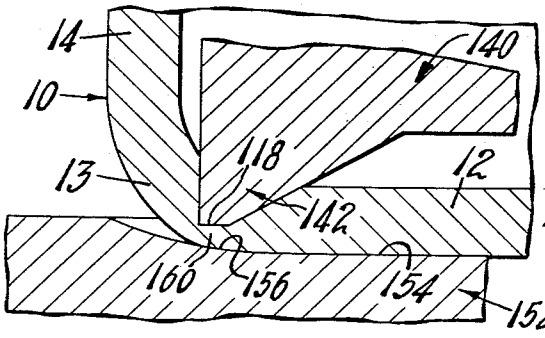


Fig. 8.



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United States Patent Office 3,338,199 Patented Aug. 29, 1967

3,338,199

SCORING APPARATUS AND METHOD

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Filed Mar. 17, 1965, Ser. No. 440,382
13 Claims. (Cl. 113—15)

The present invention relates generally to metal containers of the type which are provided with an opening feature in the form of a removable section defined by one or more score lines, and more particularly to a novel method and apparatus for so forming the score line in such a container as to insure that the torn metal edge which remains on the container after the opening action has been effected is smooth and free of thin, sharp fins or burrs which might tend to cut the consumer.

At the present time, many cans are provided with removable sections which are outlined by one or more score lines that are produced either by scoring rolls or scoring dies. When the cans are formed of tin plate or coated steel, these scoring tools are provided with relatively sharp V-shaped scoring edges. Such sharp edges, however, are subject to rapid wear and provide serious maintenance problems. It has been found possible, especially when the cans are made of a softer metal such as an aluminum alloy, to provide more consistently uniform scores if the scoring tools are formed with cutting portions which comprise a pair of spaced, gently converging side edges that are joined by a generally horizontal leading or inner edge of considerable width which is not as susceptible to wear as a sharp V-shaped edge. Such relatively blunt-edged tools are capable of producing sufficiently sharp scores in the metal without excessive wear.

The score produced by such a relatively wide leading edge is normally defined by a thin bottom wall of uniform thickness and substantial width. Since this wall is of uniform thickness, the tearing action may take place at any point along the width thereof, and thus the specific location of the tearing action is not predictable. Usually, such tearing action occurs at one of the ends of the thin bottom wall defining the score, and frequently it occurs on the side of the score adjacent the removable metal section of the container. As a result, all or a major portion of the thin bottom wall remains on the container after the section is removed therefrom, and, since the wall is much thinner and thus much sharper than the full-thickness metal of the container, it in effect becomes a thin, sharp fin or burr which presents a cutting hazard to the consumer throughout the life of the container.

A solution to this problem is presented in United States application S.N. 332,049, filed Dec. 20, 1963, and issued as United States Letters Patent No. 3,244,315 on April 5, 1966, by William E. Taylor. This application teaches the formation of a score line wherein the thin bottom wall, instead of being of uniform cross-sectional thickness, tapers gradually in cross-sectional thickness from a section of greatest thickness to a section of least thickness. Since this latter section offers the least resistance to tearing, the tearing action is invariably located in it, with the result that the location of the tear is completely predictable. By locating this section of least thickness on the side of the bottom wall which is spaced from the removable section of the container, the tearing action will take place on the side of the score which is in spaced relation to the removable area. Thus, the thin bottom wall fin or burr will remain attached to and be discarded with the removable section after the container has been opened. As a result, the edge of the metal which remains on the container is of maximum thickness and has a greatly reduced cutting potential.

The present invention provides a novel method and apparatus for forming such a tapered bottom wall for a score line in a container. In accordance with the invention, a scoring punch is provided with a cutting portion comprising converging side edges which terminate in a generally horizontal, leading or inner edge of considerable width, as hereinbefore described. An anvil plate is disposed beneath the punch and is provided with an inclined portion which is disposed beneath the portion of the container in which the score line defining the removable area is to be formed. When the container is scored by the punch, the score line produced by the wide leading edge of the punch will be defined by a thin bottom wall having a generally horizontal upper surface. This bottom wall will not be of uniform thickness, however, since its lower surface is inclined because of the inclined portion of the anvil on which it is supported during the scoring operation. Thus, the thin bottom wall beneath the score, instead of being of uniform cross-sectional thickness, is gradually tapered, as hereinbefore described. The anvil plate portion disposed beneath the wall is so inclined as to form the wall with a section of least thickness disposed at the end thereof which is spaced from the removable section of the container, thereby insuring that the thin bottom wall fin will remain attached to and be discarded with the removable section after the container has been opened.

The instant apparatus and method are advantageous in that a score with a tapered bottom wall, and thus a predictable tearing action, can be formed in a container with a scoring punch having a relatively blunt, generally horizontal leading or scoring edge, thereby avoiding the necessity of having to provide and maintain an inclined leading edge on the punch by difficult and involved grinding operations.

An object of the present invention, therefore, is to provide a novel apparatus and method for forming a score line in a container to define a removable area therein, the score line being so formed as to provide a predictable tearing action when the area is removed from the container.

Another object is to provide such an apparatus and method for producing a score line which will leave a clean, smooth edge of maximum thickness on the container when the removable area is torn therefrom.

A further object is to provide such a method and apparatus for producing a score line defined by a thin bottom wall which is tapered gradually in cross-sectional thickness to provide a section of least thickness along which the tearing action is most likely to occur.

Still another object is the provision of a novel apparatus for forming a score line defined by a relatively wide bottom wall which is tapered in cross-sectional thickness, said apparatus comprising a scoring punch having a relatively blunt and flat leading edge which is not subject to rapid wear.

A still further object is to provide such an apparatus comprising a scoring member having a relatively blunt, substantially horizontal cutting edge, and an anvil plate with an inclined surface disposed beneath the cutting edge so that a score line can be formed in a thickness of metal positioned on the anvil which will be defined by a thin bottom wall of tapered cross-sectional thickness to provide a wall section of least thickness along which the tearing action is most likely to occur.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description which, taken in connection with the accompanying drawing, discloses a preferred embodiment thereof.

Referring to the drawing:

FIGURE 1 is a plan view of the top end of a container

which is an example of an article which can be scored by the apparatus and method of the instant invention;

FIG. 2 is an enlarged fragmentary sectional view of a scoring apparatus constructed in accordance with the principles of the instant invention, showing the apparatus prior to the scoring of the container end;

FIG. 3 is a view similar to FIG. 2, showing the scoring apparatus after the container end is scored;

FIG. 4 is an enlarged fragmentary sectional view of the outer portion of the container end panel, showing the score formed therein by the apparatus shown in FIGS. 2 and 3;

FIG. 5 is an enlarged fragmentary sectional view taken substantially along line 5—5 in FIG. 1, showing the position of the tear in the bottom wall of each score when the removable section is torn from the container end; and

FIG. 6 is a view similar to FIG. 3, showing a modified form of the scoring apparatus of the instant invention; and

FIGS. 7 and 8 are views similar to FIGS. 2 and 3, respectively, showing another modified form of the instant scoring apparatus.

As an example of an article which can be scored by utilizing the method and apparatus of the instant invention, FIG. 1 illustrates a can end **10** formed of a suitable tearable metal, such as an aluminum alloy or lightweight tinplate, which is of substantially uniform thickness so that its upper and lower surfaces are generally parallel to each other. The end **10** comprises a substantially flat central panel **12** which merges outwardly into an annular countersink wall **14** and a curled marginal flange **16** which is adapted to be secured to a complementary can body (not shown) in a double seam of conventional construction.

A first score line **18** is formed in the central panel **12** and extends completely therearound in closely adjacent relation to the countersink wall **14**. A second curved score line **20** extends inwardly from the score line **18** at a point **22** and is directed generally towards the center of the end panel **12**. A third score line **24** formed in the end panel **12** begins at a point **26** disposed radially inwardly of the score line **18** extends from the point **26** around the end panel **12** in substantially parallel relation to the first score line **18** and then towards the center of the end panel in substantially parallel relation to the second score line **20**. The score line **24** merges with the score line **20** approximately at the center of the central panel in a curved score line **28**. The score lines **18**, **20**, **24** and **28**, therefore, define a removable rip strip section **30** in the end panel **12** which extends from the center thereof in a curved path substantially radially outwardly to the periphery of the end panel and substantially completely therearound.

Secured to the removable section **30** at its innermost end adjacent the curved score line **28**, is a substantially rigid, generally flat lift tab or opening lever **32**. The lever **32** is punched or cut from a strip of flat metal stock and, to incease its rigidity, there are formed therein a plurality of longitudinally extending reinforcing ribs or embossments **34**. The lever **32** is secured at its innermost end to the removable area **30** by a peened-over embossment or rivet **36** which is integral with and drawn from the central panel **12**, the rivet **36** extending upwardly through an aperture in the innermost end of the lever **32** and having its upper end peened outwardly to secure the lever in place. The outer or free end **38** of the lever is upturned slightly away from the adjacent panel **12**, thereby allowing the fingertip of the consumer to be readily inserted under the free end **38** of the lever for the purpose of tearing the removable section **39** from the end panel to open the container.

As a preferred or exemplary embodiment of the instant invention, there is illustrated in FIG. 2 apparatus for forming the parallel score lines **18**, **24** in the central panel **12** of the container end **10**. The scoring apparatus comprises a vertically reciprocable scoring punch **40** having depending cutting members or portions **42** and **44** which are complementary in configuration to and form the score lines **18** and **24**, respectively. The cutting members **42**, **44** have a substantially identical cross-sectional shape, and each comprises substantially straight, downwardly converging side edges **46** and **48** which terminate in a flat, generally horizontal leading edge **50** of considerable width.

During the scoring operation, the container end **10** is supported on an anvil plate **52** which is disposed beneath the punch **40**. The anvil plate **52** is provided with a flat, generally horizontally extending central portion **54** which is disposed beneath the cutting member **44** of the punch **40** (see FIG. 2). The central portion **54** merges outwardly with an upwardly and outwardly curved portion **56** which is disposed beneath the cutting member **42** of the punch and which in turn merges outwardly with a second substantially flat portion **58** which is disposed above the central portion **54** of the anvil plate. The container end initially rests on the upper flat portion **58** in spaced relation to the central portion **54** and the curved portion **56** of the anvil plate.

When the punch **40** is moved downwardly to score the container end panel **12**, as shown in FIG. 3, it will be seen that the panel **12** is pressed downwardly and deformed into engagement with the flat central portion **54** and the curved portion **56** of the anvil plate. Owing to the curvature of the anvil plate portion **56**, it is disposed closer to the junction of the outer side edge **46** and leading edge **50** of the punch cutting member **42** than to the junction between the leading edge **50** and the inner side edge **48** of the member **42**. Thus, the score line **18** produced in the central panel **12** of the end **10** by the cutting member **42** is defined by a thin bottom wall **60** of non-uniform cross-sectional thickness. The wall **60** comprises a flat upper surface **62**, which is parallel to the leading edge **50** of the cutting member, and an upwardly and outwardly curved lower surface **64** which is formed substantially parallel to the curved portion **56** of the anvil plate **52** (see FIG. 4). This bottom wall **60**, therefore, is tapered to provide a section of least thickness which is disposed at the end thereof that is spaced from the removable section **30** of the container end **10**.

Since the section of least thickness of the bottom wall **60** for the score line **18** is spaced from the removable section **30**, and offers the least resistance to tearing, when the removable section **30** is torn from the central panel **12** (as seen in FIG. 5), the thin wall **60** remains attached to and is discarded with the removable section. The edge **65** of the metal which remains on the container end, therefore, is relatively blunt and is free of any sharp burrs or fins which might tend to cut the consumer. It will be readily seen that, because of the tapered cross-sectional thickness of the bottom score wall **60**, the tearing action along the score **18** is invariably located in the wall section of least thickness, with the result that the location of the tear is completely predictable.

This advantageous result is accomplished through the use of the instant apparatus and method, without having to provide the cutting member **42** with a tapered or inclined edge which would be subject to rapid wear and consequent maintenance problems.

As shown in FIGS. 2, 3 and 5, if the wall **60** beneath the score **18** were not tapered in cross-sectional thickness, but instead were formed of uniform cross-sectional thickness, as is the thin wall **66** beneath the score **24**, the tearing action through the wall would not be predictable. Thus, the tearing action could occur at the end portion of the score wall which is disposed adjacent to the removable section **30** to thereby leave the wall **66** on the container end when the section **30** is removed therefrom, and provide on the opened container a sharp fin or burr on which the consumer might be cut. This latter condition is illustrated in FIG. 5 with respect to the thin wall **66** of uniform thickness disposed beneath the score **24**.

While the panel portion **12** on which the wall fin **66** remains is removed with the section **30** from the type of container end **10** shown in FIG. 1, in other types of ends where only the section within the scores is removed, the wall fin **66** remaining on the container would present a definite hazard to the consumer.

FIG. 6 discloses a modified form of the instant apparatus in which the punch **40** is of the same construction as that shown in FIGS. 2 and 3. The anvil plate **52***a*, however, is modified in that it is provided with an upwardly and outwardly extending, substantially straight portion **56***a* which is disposed beneath the cutting member **42** of the punch **40**. This inclined, straight portion **56***a*, like the curved plate portion **56** shown in FIG. 2, produces a thin wall **60***a* beneath the score having a non-uniform or tapered cross-sectional thickness, and thus having a section of least thickness along which the tearing action will most likely occur. In most instances, however, the use of the curved anvil portion **56** is preferred because it is easier to form mechanically.

FIGS. 7 and 8 illustrate another modified form of the apparatus of the instant invention. In this embodiment, the scoring punch **140** is provided with a cutting member **142** which is positioned above the curved corner **13** joining the central panel **12** and the countersink wall **14** of the container end **10**. The cutting member **142** comprises an outer, vertically extending side edge **146** disposed adjacent the countersink wall **14** and an inner, tapered side edge **148** which merge downwardly in a flat, horizontally extending leading edge **150**. As shown in FIG. 7, the end panel **12** is initially seated on the central, generally flat, recessed portion **154** of the anvil plate **152** which comprises an upwardly and outwardly curved portion **156** that is disposed below the corner **13** of the end **10** and the cutting member **142**.

When the punch **140** is moved downwardly to bring the cutting member **142** into engagement with the cointainer end corner **13**, as shown in FIG. 8, the portion of the corner **13** beneath the cutting member is pressed downwardly and deformed into engagement with the curved anvil plate portion **156** as the score **118** is cut in the container end. Because the curved anvil portion **156** is variably spaced from the flat cutting edge **150** of the cutting member **142**, the score **118** is defined by a bottom wall **160** of non-uniform cross-sectional thickness which has a predictable tearing action, as hereinbefore explained.

It is obvious that the apparatus and method of the instant invention may be utilized to form a score or scores having predictable tearing characteristics, as described above, in any type of an article other than a container end or part. Also, it is within the scope of this invention to provide the anvil plate with any suitable type of supporting surface disposed beneath the scoring member, other than the uniformly curved or inclined surfaces disclosed herein, the only requirement being that the anvil surface be so shaped as to be variably spaced from the cutting or scoring member to produce a section of least thickness in the bottom score wall and thus a predictable location of the line of tear through the wall.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

What is claimed is:

1. Apparatus for forming a score in an article to define a removable or tear-out section therein, said apparatus comprising:

means having a relatively blunt edge for cutting said score in said article, and

means disposed beneath said cutting means for supporting said article during the scoring thereof, said supporting means comprising a portion disposed beneath and in oblique relation to said blunt cutting edge,

whereby when said article is scored by said cutting means, said score is defined by a thin bottom wall disposed on said oblique supporting portion and having a non-uniform cross-sectional thickness to provide a section of least thickness through which the tearing action will occur when said removable section is torn from said article.

2. The apparatus of claim **1** wherein said oblique portion of said supporting means is positioned closest to the side of said blunt cutting edge which is disposed in spaced relation to said removable section when said score is being cut in said article, whereby said score wall section of least thickness will be disposed on the end of said wall in spaced relation to said removable section.

3. Apparatus for forming a score in an article to define a removable section therein, said apparatus comprising:

means comprising a blunt edge for cutting said score in said article, and

means disposed beneath said cutting means for supporting said article during the scoring thereof, said supporting means comprising a portion which is disposed beneath and is variably spaced from said blunt cutting edge,

whereby when said article is scored by said cutting edge, said score is defined by a thin bottom wall disposed on said supporting portion and having a section of least thickness through which the tearing action will occur when said removable section is torn from said article.

4. The apparatus of claim **3** wherein said supporting means portion is positioned closest to the side of said cutting edge which is disposed in spaced relation to said removable section when said score is being cut in said article.

5. Apparatus for forming a score in an article to define a tear-out area therein, said apparatus comprising:

means having a relatively blunt, straight edge for cutting said score in said article, and

means disposed beneath said cutting means for supporting said article during the scoring thereof, said supporting means comprising a curved portion disposed beneath said straight cutting edge,

whereby when said article is scored by said cutting edge, said score is defined by a thin bottom wall disposed on said curved supporting portion and having a non-uniform cross-sectional thickness to provide a section of least thickness which has the least resistance to tearing.

6. Apparatus for forming a score in a container end to define a tear-out area therein which may be torn from the end without leaving a sharp edge thereon, said apparatus comprising:

a vertically movable punch having a cutting member comprising downwardly converging side edges and a flat, substantially horizontal leading edge, and

an anvil plate disposed beneath said punch for supporting said container end during the scoring thereof, said plate comprising an upwardly and outwardly inclined portion which is positioned beneath said cutting member,

whereby when said punch cutting member is moved downwardly into engagement with said container end to cut said score therein, said inclined plate portion serves to produce a thin bottom wall beneath said score having a section of least cross-sectional thickness on the outer end thereof which is spaced from said removable area, thereby insuring that said thin wall will be removed with said area from said container end.

7. The apparatus of claim **6** wherein said inclined anvil plate portion is defined by a curved line.

8. The apparatus of claim 6 wherein said inclined anvil plate portion is defined by a straight line.

9. A method of forming a score in an article to define a removable area therein, comprising the steps of:

cutting a score in said article with a cutting member having a blunt edge, and

simultaneously supporting the portion of said article to be scored on a surface which is variably spaced from said blunt cutting edge to produce in said article a thin wall of non-uniform cross-sectional thickness which is disposed beneath said score.

10. The method of claim 9 wherein said supporting surface is inclined with respect to said blunt cutting edge to produce a section of least thickness at the end of said wall which is spaced from said removable area.

11. A method of forming a score in an article to define a removable area therein, comprising the steps of:

cutting a score in said article with a cutting member having a substantially straight, blunt edge, and

simultaneously supporting the portion of said article to be scored on a curved surface to produce in said article a thin wall of non-uniform cross-sectional thickness which is disposed beneath said score.

12. The method of claim 11 wherein said supporting surface is so curved as to produce a section of least thickness at the end of said wall which is spaced from said removable area.

13. A method of forming a score in a container end to define a tear-out area therein which may be torn from the end without leaving a sharp edge thereon, comprising the steps of:

cutting a score in said end with a vertically movable punch comprising a cutting member having a substantially straight, horizontal edge, and

simultaneously supporting the portion of said end to be scored on an anvil plate surface which is inclined with respect to said horizontal cutting edge to produce in said container end a thin tapered wall disposed beneath said score and having a section of least thickness at one end thereof along which the tearing action will occur.

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