

Feb. 10, 1970

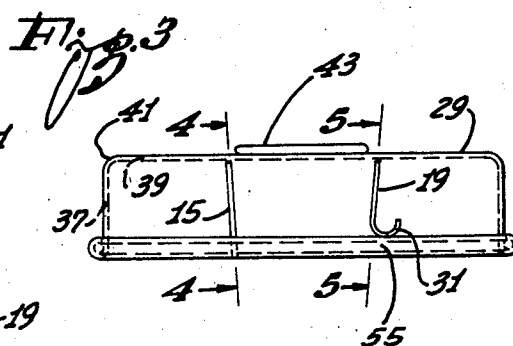
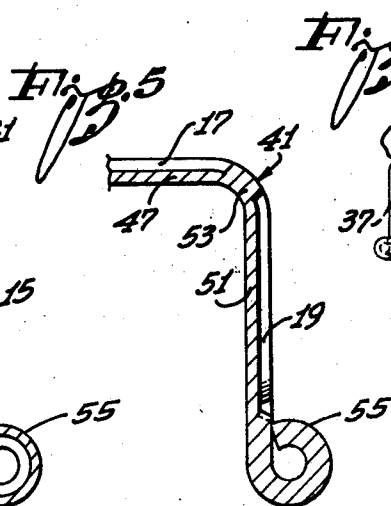
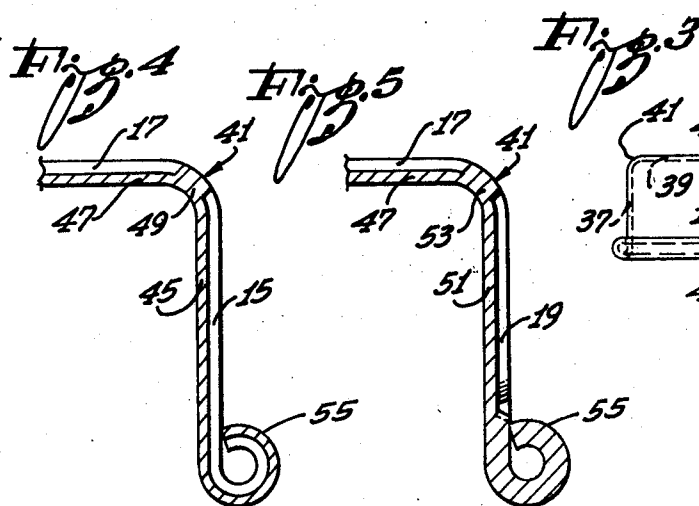
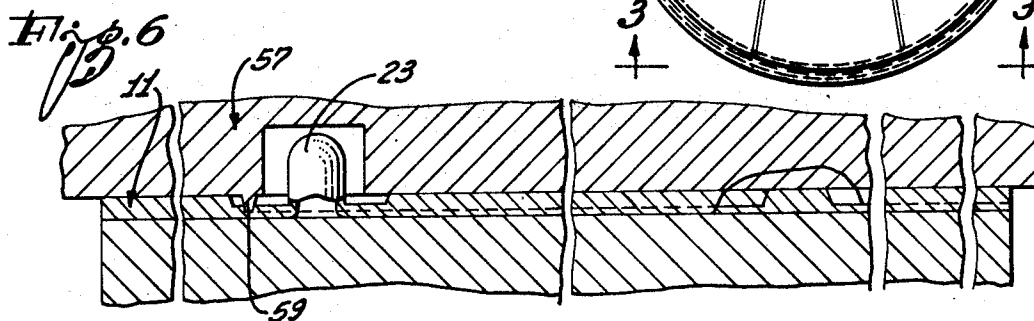
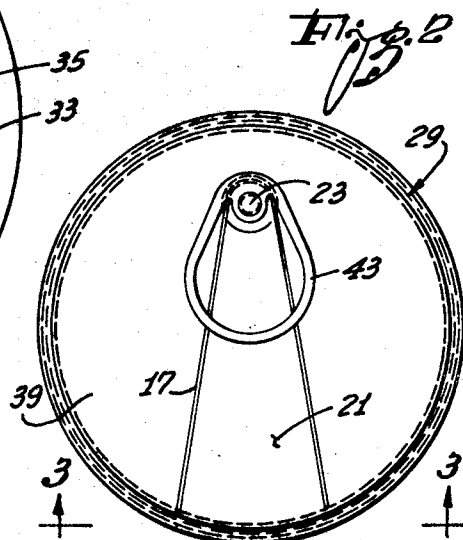
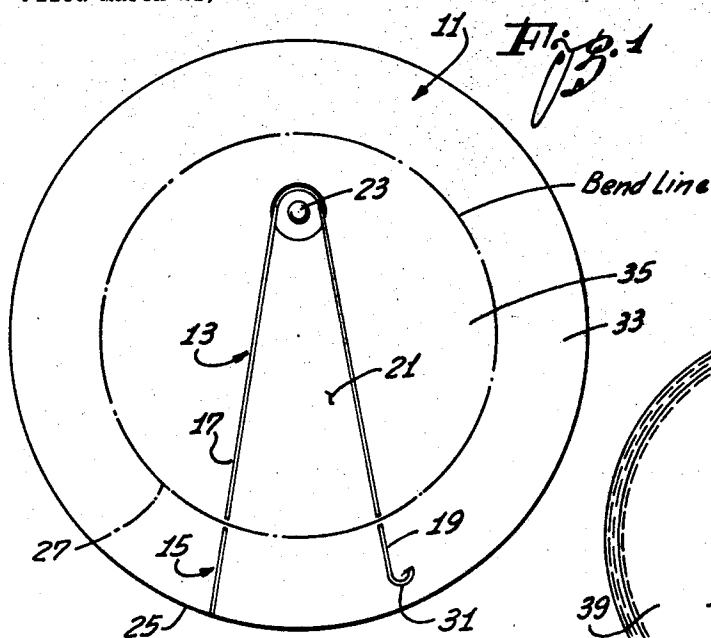
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3,494,501

EASY-OPENING CLOSURE

Filed March 21, 1968

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 9

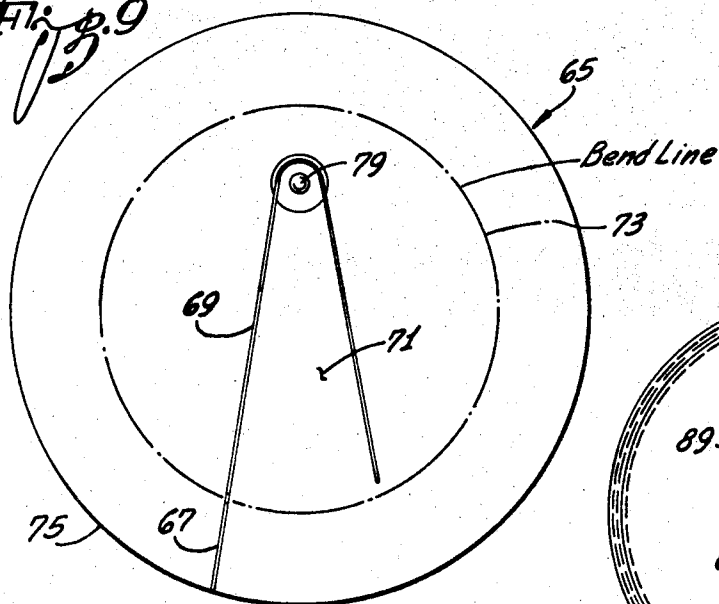


Fig. 10

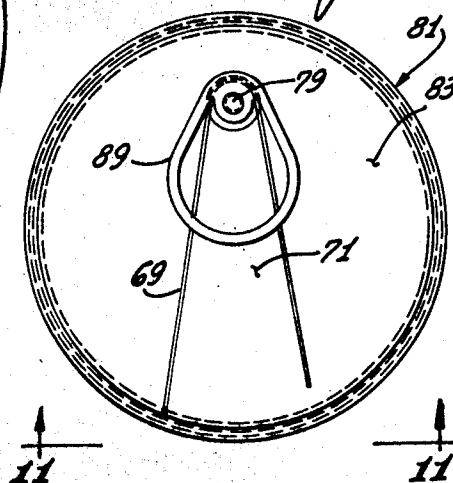


Fig. 7

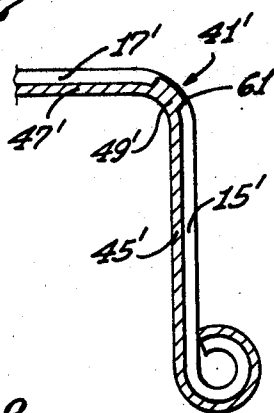


Fig. 8

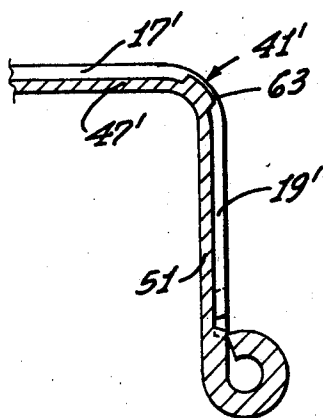
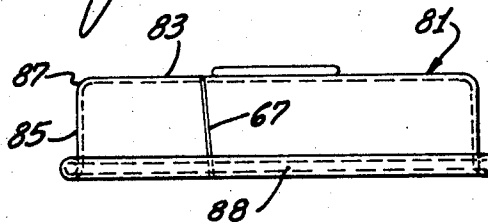


Fig. 11



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3,494,501

EASY-OPENING CLOSURE

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U.S. Cl. 220—54

9 Claims

ABSTRACT OF THE DISCLOSURE

This disclosure describes a cap for use in closing the open end of a container. The cap is constructed of sheet material and is scored to form a tear portion at least partially removable from the cap. The cap has an end wall and a peripheral wall joined by a bend portion and the score is either discontinuous at the bend portion or of increased residual at the bend portion.

BACKGROUND OF THE INVENTION

The easy-opening cap of this invention is particularly adapted for use as an outer cap of a dual cap closure assembly. A dual cap closure assembly is described in a copending application, Ser. No. 599,124, now abandoned, entitled Container End And Method of Making Same, and filed on Dec. 5, 1966.

Dual cap closure assemblies typically include a metal outer cap and a plastic insert or inner cap within the outer cap or a sealing agent may be used in lieu of the plastic insert. The outer cap has a line of weakness therein forming a removable tear portion and a tab is attached to, or integral with, the tear portion for the purpose of removing the tear portion. With the tear portion removed, the entire outer cap can be removed and discarded, and thereafter, the inner cap alone is used as a removable closure element. This type of closure assembly can be used, for example, on a glass jar, bottle, or a special metal container and is particularly adapted for use on the container for a product which is not ordinarily entirely consumed shortly following the opening of the container.

The outer cap of dual cap closure assemblies is typically constructed of sheet material and includes an end wall and a peripheral wall or flange extending transversely to the end wall and integrally joined thereto by a bend portion. The outer cap is scored to form a line of weakness which extends continuously from the peripheral wall over the end wall to define a removable tear portion. The tab for removal of the tear strip may be formed integrally with the outer cap or formed separately and then attached to the tear portion.

A very difficult problem arises in the scoring of the metal outer cap to form the tear portion. According to a prior art method, the scoring operation is carried out in the flat. That is, the closure blank is scored while the blank is in a flat condition and prior to the time that it is shaped or bent to form the peripheral wall. The line of score extends from the portion of the flat blank that will form the peripheral wall over a segment of the end wall to form the tear portion. Following the scoring operation, the blank is deformed or bent to convert a peripheral region of the blank into the peripheral wall and a central region of the blank into the end wall.

As the line of weakness extends from the peripheral wall continuously to the end wall, such deformation or bending also bends the material of the outer cap along the line of weakness. This bending of the prescored metal often results in fracture of the outer cap along the line of weakness adjacent the bend portion which integrally joins the end wall and the peripheral wall. When the flat blank is bent in this manner, the material of the peripheral flange adjacent the bend portion is forced and

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squeezed together circumferentially because of the inherent nature of forming the generally cylindrical peripheral flange at a right angle to the end wall. Simultaneously, at least some of the material of the bend portion is radially stretched. As the cap is weakened along the line of weakness, it deforms along the line of weakness under the influence of these forces and not infrequently completely fractures the material of the outer cap. Generally, the results of this prior art scoring operation is quite erratic and in some instances the squeezing together of the metal adjacent the bend portion along the line of weakness causes the edges of the tear strip to be overlapped by the adjacent portions of the outer cap. This captivates the tear portion and makes removal thereof much more difficult.

To avoid this problem it has been proposed to first convert the flat closure blank into a cap by bending a peripheral region thereof to form the peripheral wall. The scoring is then carried out after the cap has been formed. Although this solves the above noted problem, there are certain advantages to scoring the closure blank in the flat prior to formation of the cap. For example, by scoring in the flat, a single scoring tool may be utilized to form all of the score lines whereas at least two of such scoring tools should be used if the scoring operation is carried out subsequent to formation of the cap. Accordingly, it is desired to provide a method of making an easy opening cap of this type in which the scoring operation is carried out in the flat and which solves the problems heretofore experienced with the scoring of such caps in the flat.

Another problem with easy-opening caps of this type is that not infrequently the entire tear portion is torn from the outer cap thereby leaving two separate metal pieces which must be removed from the container to provide access to the opening thereof. This endangers the user because the portion of the cap remaining on the container has relatively sharp edges exposed because of the removal of the tear portion and it is now quite difficult and dangerous to accomplish such removal. Accordingly, prevention of complete removal of the tear portion from the cap is highly desirable.

SUMMARY OF THE INVENTION

The present invention permits scoring of the closure blank in the flat without any of the disadvantages heretofore experienced with scoring in the flat and then bending of the blank to form the cap. The present invention teaches carrying out the scoring operation in the flat to form two score line segments while leaving a region of the sheet material intermediate the ends of the segments of greater thickness than the thickness of the sheet material along the segments. The blank is then converted into a cap by bending a peripheral region of the blank to convert the latter into a peripheral wall and to convert a central region of the blank into an end wall. The end wall and peripheral wall of the cap are joined by a bend portion which extends through the high residual region.

With this arrangement, the resulting article is a cap having a score line segment on the peripheral wall and a score line segment on the end wall with a region of the material of the bend portion between such segments being of greater thickness than the material along the score line segments. The region of greater thickness may be completely unscored. Alternatively, the region of the bend portion may be scored only slightly to thereby leave a higher residual than is present along the retaining portions of the score line. In either case, the region of the bend portion between the score line segments is sufficiently thick to avoid the problems noted above in connection with prior art methods.

To prevent the tear portion from separating completely from the remainder of the cap, the present invention teaches terminating the score line at one end on the end wall of the cap rather than on the peripheral wall as has been customary heretofore. By terminating the score line at one end on the end wall, there is a greater amount of metal to prevent complete tear off of the tear portion.

Although exemplary embodiments of the invention have been shown and described, many changes, modifications, and substitutions may be made by one having ordinary skill in the art without necessarily departing from the spirit and scope of this invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of a flat section of sheet material after the same has been scored to form a tear portion partially removable therefrom.

FIG. 2 is a top plan view illustrating the completed outer closure cap.

FIG. 3 is an elevational view taken along line 3—3 of FIG. 2.

FIGS. 4 and 5 are enlarged fragmentary sectional views taken respectively along lines 4—4 and 5—5 in FIG. 3 and illustrating the score line adjacent the bend portion of the cap.

FIG. 6 illustrates typical scoring tooling for carrying out the scoring operation in a single step.

FIGS. 7 and 8 are enlarged fragmentary sectional views similar to FIGS. 4 and 5, respectively, and illustrating a second embodiment of the present invention.

FIG. 9 is a top plan view similar to FIG. 1 illustrating a third embodiment of the invention.

FIG. 10 is a top plan view of a completed outer cap.

FIG. 11 is an elevational view taken along line 10—10 in FIG. 9.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings and in particular to FIG. 1 thereof, reference numeral 11 designates a flat section of sheet material or a closure blank. The sheet material 11, in the embodiment illustrated, is in the form of a circular segment of aluminum. A score line 13 which includes three score line segments 15, 17 and 19 is formed in the blank 11 to form a tear portion 21 which is partially removable from the remainder of the sheet material. The tear portion 21 may be of any suitable shape such as the shapes illustrated in my copending patent application Ser. No. 599,124. While the sheet material 11 is still in the flat, a hollow rivet 23 is formed integrally with the material of the tear portion 21 by any suitable known method.

The score line segment 15 extends from the outer periphery 25 generally radially inwardly toward a bend line or zone 27 and terminates prior to contacting the bend line. In the form shown in FIG. 1, the bend line 27 is a preselected line about which the material of the blank 11 is bent to form a cap 29, as shown in FIGS. 2 and 3.

The score line segment 17 begins on the side of the bend line 27 opposite the score line segment 15 and extends further inwardly. Thus, both of the segments 15 and 17 are spaced from the bend line and are preferably generally aligned adjacent the bend line. The score line segment 17 may extend over any suitable preselected area of the blank 11 but preferably extends over a substantial dimension of the blank. The other end of the segment 17 also terminates closely adjacent the bend line 27 in spaced relationship to a confronting and aligned end portion of the score line segment 19. To assist in preventing complete tear out of the tear portion 21 the outer end of the score line segment 19 is preferably in the form of a reverse bend 31, as illustrated.

In the embodiment illustrated, the bend line 27 is circular and concentric with the blank 11. The portion of

the blank 11 lying outwardly of the bend line 27 constitutes a peripheral region 33 and a portion of a blank lying inwardly of the bend line may be defined as a central region 35. The bend line extends between the score line segments 15, 17 and 19 and none of the score lines crosses over the bend line 27. The rivet 23 may be formed before, after, or simultaneously with the formation of the score line 13.

The next step of the method is to bend the peripheral region 35 about the bend line or zone 27 to form the cap 29 shown in FIGS. 2 and 3. This bending operation, which may be carried out with conventional tooling, converts the peripheral region 33 into a peripheral wall or flange 37 and converts the central region 35 into an end wall 39 with the walls 37 and 39 being joined by a relatively small radius curved bend portion 41.

Either before or after the bending of the blank 11 about the bend line 27, a tab 43 or other suitable pull member is affixed to the tear portion 21. In the embodiment illustrated, the tab 43 is a ring tab and is secured to the tear portion 21 by staking of the hollow rivet 23.

With reference to FIG. 4, it can be seen that the score line segments 15 and 17 leave thin residual webs 45 and 47, respectively, which extend toward the bend portion 41 and terminate closely adjacent thereto. The webs 45 and 47 are spaced by a region 49 of the bend portion 41. The region 49, in the embodiment shown in FIGS. 1-6, is significantly thicker than either of the webs 45 and 47 and is not scored. Consequently, the bending of the material of the blank 11 about the bend line 27 causes no disruption of the score line at the bend line 27 because no score line crosses such bend line. The precise point for stopping the score line segments 15 and 17 will depend upon several factors. First, the score lines 15 and 17 should be sufficiently close together so that the failure to score through the region 49 will not unduly impede removal of the tear portion 21 and so that tearing of the score line 13 will continue smoothly from the segment 17 to the segment 15. The score line segments 15 and 17 may extend somewhat into the bend portion 41; however, they should not extend completely across the bend portion 41 or extend into the bend portion a sufficient distance to cause rupture of the material during the bending operation or capturing of the tear portion 21.

Similarly, the score line segment 19 defines a residual web 51 as shown in FIG. 5 which is spaced from the other end of the residual web 47 by region 53 of the bend portion 41. The region 53 is similar to the region 49 in that it is thicker than either of the webs 47 or 51 and is not scored. Thus, the bending about the bend line 27 can be carried out without distorting of the score line 13. A lower peripheral portion of the cap is turned upwardly to form a bead or curl 55.

The easy-opening cap 29 can be operated in a conventional manner by first pivoting of the tab 43 to initiate rupture of the web 47 adjacent the rivet 23. Continued rupture of the web 47 and ultimately of the webs 45 and 51 is accomplished by directing an outward pulling force of the tab 43. When the full length of the webs 45, 47 and 51 are ruptured, the tear portion 21 will be affixed to the cap 29 by a narrow neck of material (FIG. 3). Thus, the entire outer tab can be removed from the container (not shown) as a single unit.

FIG. 6 illustrates how the blank 11 may have the score line segments 15, 17 and 19 formed simultaneously therein by a single scoring tool 57 having a scoring element 59. The scoring element 59 is discontinuous at the bend line 27 so as not to score the region intermediate the score line segments 15 and 17 and 17 and 19.

FIGS. 7 and 8 illustrate a modification of the present invention in which parts corresponding to portions of the embodiment of FIGS. 1-5 are designated by corresponding primed reference characters. In the form shown in FIGS. 7 and 8, a region 49' of the bend portion 41' has a score line segment 61 which interconnects the score line

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segments 15' and 17'. The thickness of the material along the score line segment 61 is thicker, however, than the thickness of the residual webs 45' and 47', which is to say that the residual along the score line segment 61 is higher than the residual along the score line segments 15' and 17'. In actual practice of the invention, the score line 61 may be only a few thousandth deep and in no event of sufficient depth to permit fracture therealong during the bending operation or captivation of the tear portion.

FIG. 8 is similar in illustrating a score line segment 63 which extends across the bend portion 41' to interconnect score line segments 17' and 19'. The thickness of the material along the score line 63 is greater than the thickness of the material of the residual webs 47' and 51'. In all other respects, the embodiment shown in FIGS. 7 and 8 is identical to the embodiment shown in FIGS. 1-5.

FIGS. 9-11 illustrate a third form of the invention which is directed to preventing complete tear out of the tear portion. FIG. 9 illustrates a blank 65 which is identical to the blank 11 in every respect except as specifically noted herein. The blank 65 has score line segment 67 and 69 formed therein to define a tear portion 71 which is partially removable from the blank 65. The segment 67 is aligned with the segment 69 and is spaced therefrom to avoid extending across a bend line 73. The score line segment 67 preferably extends all the way to an outer edge 75 of the blank 65. One end of the score line segment 69 terminates adjacent the bend line 73 and the segment 67 and the other end of the score line segment 69 terminates closely adjacent the bend line 73 and on the inner side thereof. A hollow rivet 79 is suitably formed at one end of the tear portion 71.

Next, the material of the blank 65 is bent about the bend line 73 to form a cap 81 shown in FIGS. 10 and 11. The cap 81 has an end wall 83 and a peripheral wall 85 joined to the end wall by a bend portion 87. The score line segment 67 does not extend across the bend portion 87 and appears substantially as shown in FIG. 4. The score line segment 69 terminates on the end wall 83 and there is no score line segment corresponding to the score line segment 71 of FIG. 1. At any suitable time, either before or after the bending operation, a tab 89 can be suitably secured to the tear portion 71 as by staking of the hollow rivet 79.

It can be seen, therefore, that the embodiment of FIGS. 9-11 also avoids crossing of the bend portion 87 with a score line. Furthermore, the termination of the score line 69 on the end wall 83 rather than on the peripheral wall 85, provides additional material for resisting complete severance and separation of the tear portion 71 from the remainder of the cap 81. A bead 88 may be formed by rolling a peripheral portion of the cap upwardly.

Although exemplary embodiments of the invention have been shown and described, many changes, modifications, and substitutions may be made by one having ordinary skill in the art without necessarily departing from the spirit and scope of this invention.

I claim:

1. An easy-opening cap of sheet material comprising: an end wall and a peripheral wall joined by a bend portion, said peripheral wall extending generally transverse to the end wall and terminating in an outer edge;

the sheet material of said end wall and said peripheral wall being of reduced thickness along a preselected line of weakness to define a tear portion at least partially removable from the cap, said line of weakness having a first imperforate segment lying on said end wall and a second imperforate segment lying on said peripheral wall, said segments of said line of weakness being separated by a region of said bend portion having a thickness greater than the thickness of the sheet material along said first and second segments; and

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a pull member joined to said tear portion to facilitate removal of the tear portion from the cap.

2. An easy-opening cap as set forth in claim 1 wherein said region of said bend portion is unscored whereby the first and second segments define a line of weakness which is discontinuous at said region of said bend portion.

3. An easy-opening closure of sheet material comprising:

an end wall and a peripheral wall joined by a bend portion, said peripheral wall extending generally transverse to the end wall and terminating in an outer edge;

said end wall being scored to define a first rupturable residual web of reduced thickness which extends over a preselected area of said end wall and terminates in an end adjacent said bend portion, said first rupturable residual web at least partially defining a tear portion at least partially removable from the end wall; said peripheral wall being scored to define a second rupturable residual web of reduced thickness, said second rupturable residual web having an end lying adjacent said bend portion and adjacent said end of said first rupturable residual web, said second rupturable residual web extending from said end thereof generally toward said outer edge to partially define said tear portion;

said ends of said first and second rupturable residual webs being separated by a region of said bend portion having a greater thickness than the thickness of either of the adjacent portions of said first and second rupturable residual webs; and

a pull member joined to said tear portion to initiate rupture of said first rupturable residual web and to at least partially separate said tear portion from said closure.

4. An easy-opening cap of sheet material comprising: an end wall and a peripheral wall joined by a bend portion, said peripheral wall extending generally transverse to the end wall and terminating in an outer edge;

the sheet material of said end wall and said peripheral wall being of reduced thickness along a preselected line of weakness to define a tear portion at least partially removable from the cap, said line of weakness having a first segment lying on said end wall and a second segment lying on said peripheral wall, said segments of said line of weakness being separated by a region of said bend portion having a thickness greater than the thickness of the sheet material along said first and second segments;

a pull member joined to said tear portion to facilitate removal of the tear portion from the cap; and

said region of said bend portion being scored to define a third segment of said line of weakness joining said first and second segments the sheet material along said third segment being thicker than the sheet material along said first and second segments.

5. A closure as defined in claim 3 wherein each of said residual webs is imperforate.

6. A closure as defined in claim 3 wherein the portion of said cap adjacent said outer edge forms a curl which has a lesser dimension axially of the closure than the peripheral wall and the second residual web extends through said curl and terminates at the outer edge of the closure.

7. An easy-opening closure for use on a container having an opening therein and a container wall around said opening, said closure comprising:

a cap of sheet material having an end wall for closing the opening of the container and a peripheral wall extending generally transverse to the end wall, said peripheral wall having an outer edge and being adapted to at least partially surround the wall of the container, said end wall and peripheral wall being integrally joined by a bend portion;

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said cap being scored to define a rupturable residual web of reduced thickness extending from a first location substantially at the outer edge of the peripheral wall over a region of the end wall and then back generally toward said first location to terminate on said end wall adjacent said peripheral wall, said line of weakness defining a tear portion which is at least partially removable from said cap; and

5 a pull member joined to said tear portion to facilitate removal of said tear portion from said cap.

10 8. An easy-opening closure for a container having an opening therein and a container wall around said opening, said closure comprising:

15 a cap of sheet material having an end wall for closing the opening in the container and a peripheral wall extending generally transverse to the end wall for at least partially surrounding the container wall, said end wall and said peripheral wall being integrally joined by a substantially 90° bend portion;

20 said peripheral wall terminating in an edge, a peripheral portion of the sheet material of said peripheral wall adjacent said edge being turned to form a curl, the axial dimension of said curl being substantially less than the axial dimension of said peripheral wall;

25 said cap having an imperforate line or weakness therein

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defining a tear portion partially removable from said cap, said line of weakness extending from a first location on said peripheral wall at least substantially at said edge, through said curl, over a region of said end wall and then back generally toward said first location to terminate on said end wall adjacent said bend portion; and

a tab connected to said tear portion for initiating rupture of said line of weakness, said tab lying on said end wall on the exterior of said cap.

9. A closure as defined in claim 8 wherein said bend portion is a small curved portion and said curl is turned outwardly.

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GEORGE T. HALL, Primary Examiner

U.S. Cl. X.R.

215—46