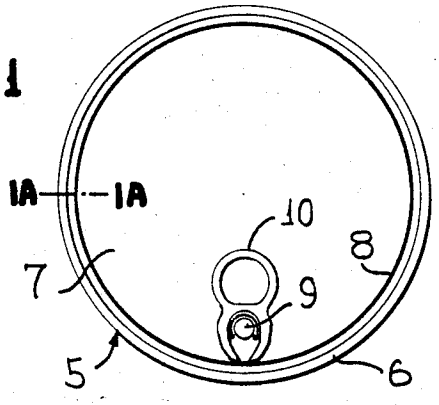
Oct. 22, 1968 J. C. JASPER 3,406,866

CONTAINER PANEL WITH ANTI-FRACTURE SCORE

Filed June 16, 1967

FIG. 1



PRIOR ART

FIG. 1A

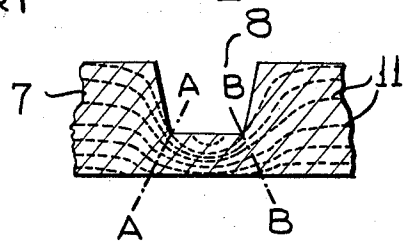


FIG. 2

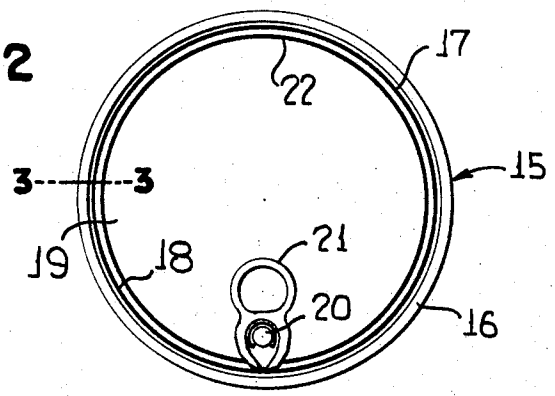
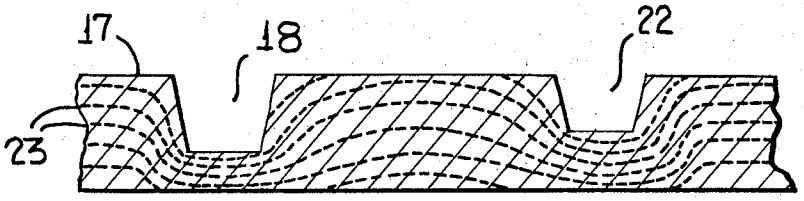


FIG. 3



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CONTAINER PANEL WITH ANTI-FRACTURE SCORE

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ABSTRACT OF THE DISCLOSURE

This disclosure has to do with the provision of an anti-fracture score in a removable panel portion of an easy opening container immediately adjacent the normal weakening score line. The anti-fracture score results in the flow of metal towards the weakening line score and the metal relieves stress areas at the weakening line score so as to prevent the accidental fracture of the container panel along the weakening line score.

This invention relates in general to new and useful improvements in easy opening container ends, and more particularly to the improvement of such container ends by the provision of an anti-fracture score therein.

Easy opening can ends are each provided with a score line defining a weakening line along which the can end may be ruptured to facilitate the removal of a panel portion. The score lines are formed by a punch press operation with the result that there is not a cutting away of the metal, but a compressing of the metal. The score lines are generally trapezoidal in cross section and when formed in sheet metal, strain risers are formed at the bottom corners thereof. As a result, when any undue force or load is applied against the removable panel portion, there is a tendency for the can end to rupture along the line of one of the strain risers. This invention relates to the elimination of this undesired condition.

It has been found, in accordance with this invention, that if a further score is formed in the removable panel portion immediately adjacent the weakening score line, the strain risers normally associated with the weakening score line are greatly relieved. At the same time, the usual strain risers at the second score line are not as great as those which exist when a single score line is formed.

In accordance with the foregoing, the secondary score line formed in the removable panel portion may be considered an anti-fracture score. Rupture of the end panel along the anti-fracture score as opposed to rupture along the weakening score line does not occur because of the reduction of strain risers therealong due to its association with the weakening score line, and because the anti-fracture score is of a lesser depth than the weakening score line.

With the above and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claims and the several views illustrated in the accompanying drawing:

In the drawing:

FIGURE 1 is a plan view of a conventional type of easy opening container end formed prior to this invention.

FIGURE 1A is an enlarged fragmentary transverse sectional view taken along the line 1A—1A of FIGURE 1 and shows the arrangement of strain forces in the container panel at the score line.

FIGURE 2 is a plan view similar to FIGURE 1 and shows a container end provided with an anti-fracture score line in accordance with this invention.

FIGURE 3 is an enlarged fragmentary vertical sectional view taken along the line 3—3 of FIGURE 2 and shows the strain pattern in the end panel in the area of the two score lines.

Referring now to the drawings in detail, it will be seen that there is illustrated in FIGURE 1 a conventional type of container end which is generally referred to by the numeral 5. The container end includes a peripheral seam forming portion 6 and an end panel 7. A major portion of the end panel 7 is removable in the opening of the associated container, this removal of the end panel major portion being facilitated by means of a score line 8. The removable panel portion has attached thereto by means of a rivet 9 a pull tab 10 of a conventional type. The pull tab 10 functions as a lever and results in the fracture of the end panel 7 along the score line 8 with the result that the portion of the end panel 7 defined by the score line 8 may be removed as a unit utilizing only the pull tab 10.

The score line 8 is formed in the end panel 7 by a punching operation utilizing a conventional type of scoring die (not shown). The resultant score line 8 has a generally trapezoidal cross section, as is shown in FIGURE 1A. Inasmuch as the score line 8 is formed by a punching or pressing operation, there is no removal of metal. On the other hand, the metal of the end panel 7 is compressed and there exists in the metal of the end panel 7 in the vicinity of the score line 8 highly concentrated internal pressures as indicated by the metal flow or strain lines 11. The concentration of stress forces results in strain risers generally along the lines A—A and B—B of FIGURE 1A. Accordingly, when the end panel 7 is unduly stressed, accidental rupture thereof will occur at the score line 8 along one of the strain risers. This invention has to do with the elimination of the strain risers.

Referring now to FIGURE 2, it will be seen that there is illustrated a can end which constitutes an improvement over the can end 5 of FIGURE 1, the can end of FIGURE 2 being generally referred to by the numeral 15. The can end 15 includes a peripheral seam forming portion 16 and an end panel 17. The end panel 17 is provided with a score line 18 defining a removable panel portion 19. Like the can end 5, the can end 15 has formed in the removable panel portion 19 a rivet 20 which is utilized to secure in place a pull tab 21. The pull tab 21 is of the lever type and is utilized for the purpose of initiating rupture of the end panel 17 along the score line 18, followed by the tearing out of the removable panel portion 19.

The can end 15 differs from the can end 5 in that the removable panel portion 19 thereof is provided with a second score line 22. The score line 22 is an anti-fracture score line and is formed in the removable panel portion 19 immediately adjacent the score line 18. However, the anti-fracture score line 22 is shallower than the weakening score line 18, as is clearly shown in FIGURE 3.

The score lines 18 and 22 are both formed by a punching or pressing operation during which the metal of the end panel 17 is compressed and closed generally laterally. The score forming operations result in the forming of internal compressive stresses within the end panel 17, as is generally defined by the strain lines 23. A comparison of the strain lines 23 with the strain lines 11 of FIGURE 1A will clearly show that there is a better distribution of the compressive forces within the end panel 17 in the vicinity of the score line 18 than there exists in the end panel 7 in the vicinity of the score line 8. Furthermore, it will be readily apparent that the strain risers found in the end panel 7 are greatly diminished in the end panel 17.

In addition to the reduction of the stress risers found with a single score, it is to be noted that the stress risers with respect to the anti-fracture score **22** are also at a minimum. In view of the fact that the score **22** is shallower than the score **18**, it will be readily apparent that the provision of the score **22** will not provide a line of primary fracture failure as opposed to the weakening score line **18**. Tests have proved that where there is failure of the end panel **17** due to accidental fracture, it will occur along the weakening score line **18** and not along the anti-fracture score **22**.

The anti-fracture score **22** has been found to be effective with respect to can ends formed from sheet metal having a thickness ranging from 0.008 inch to 0.014 inch. It also has been found that there is a limit as to the center-to-center spacing of the scores **18** and **22**. When the scores are brought too close together, the end panel is too greatly weakened in the narrow area and when the scores are too far apart, the forming of the anti-fracture score has no influence on the weakening score line. The practical range of the center-to-center spacing between the score line **18** and the anti-fracture score **22** is from 0.050 inch to 0.125 inch with the optimum spacing being on the order of 0.080 inch. Also, it has been found that there is a most effective differential in score depths irrespective of the score depths. This differential is on the order of 0.003 inch with the anti-fracture score **22** being shallower than the weakening score line **18**.

Although only a preferred embodiment of the invention has been specifically illustrated and described herein, it is to be understood that minor variations may be made in the anti-fracture score of this invention without departing from the spirit and scope thereof, as defined by the appended claims.

I claim:

1. In a container panel having a score line defining a removable panel portion, said score line being of the type which is formed by compressing the material of said panel and normally resulting in stressed areas along the bottom corners of said core, the improvement comprising an anti-fracture score formed in said removable panel portion adjacent said score line, and said score line being relieved of the normal stressed areas by the position of the anti-fracture score adjacent the first-mentioned score line.

2. The container panel of claim **1** wherein said anti-fracture score is shallower than said score line.

3. The container panel of claim **1** wherein said anti-fracture score is shallower than said score line by a dimension on the order of 0.003 inch.

4. The container panel of claim **1** wherein the center-to-center spacing of said score line and said anti-fracture score is on the order of 0.080 inch.

5. The container panel of claim **1** wherein the center-to-center spacing of said score line and said anti-fracture score ranges from 0.050 inch to 0.125 inch.

6. The container panel of claim **1** wherein said score line and said anti-fracture score are circular in outline and disposed in concentric relation.

7. The container panel of claim **1** wherein said anti-fracture score is uniformly spaced from said score line.

8. The container panel of claim **1** wherein said panel is an end panel of a container end.

9. The container panel of claim **1** wherein said anti-fracture score is shallower than said score line, and the center-to-center spacing of said score line and said anti-fracture score is on the order of 0.080 inch.

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Disclaimer and Dedication

3,406,866.—*John C. Jasper*, Hinsdale, Ill. CONTAINER PANEL WITH ANTI-FRACTURE SCORE. Patent dated Oct. 22, 1968. Disclaimer and dedication filed May 22, 1969, by the assignee, *Continental Can Company, Inc.*

Hereby disclaims and dedicates to the Public the entire term of said patent. [*Official Gazette July 15, 1969.*]