

Description**BACKGROUND OF THE INVENTION****FIELD OF THE INVENTION**

The present invention relates to an Easy Open End having a partially removable section defined by a principal score line (hereinafter abbreviated to EOE), i.e., an EOE which enables a substantial reduction of the initial opening force and tearing force of an removable section of the EOE.

DESCRIPTION OF THE PRIOR ART

An EOE is an end of a container which can be opened by the pulling an opening tab secured to the partially removable section without the use of a tool such as a can opener. Because of this advantage, EOE's are widely used in cans such as food cans, soda drink cans, and beer cans.

In order to reduce the opening force of EOE's, various proposals concerning them have hitherto been made. For instance, Japanese Patent Laid-Open No. 149251/1983 proposes an EOE provided with a principal score and an auxiliary score 7 parallel to the principal score.

U.S. Patent No. 3,422,983 proposes an EOE having an auxiliary score 19 as shown in Fig. 9 which extends outwardly from a portion of a principal score, which is initially ruptured by the action of pulling up a tab, and underlies the longitudinal axis of the lift tab.

The ease or difficulty of opening an EOE as felt by a user largely depends on the required amount of the initial opening force and tearing force of the removable section of the EOE. It is therefore important to reduce the required initial opening force. Reductions in the level of such force ensure easy opening of an EOE. Further, if variation in these forces during the entire process of opening is made smaller as well as this reduction, stable opening with a constant force is ensured, by virtue of which the easiest possible opening is enabled. If a large force is required to tear the removable section away, the removable section is removed with the large force applied thereto. This often produces impact or vibration of the can body, resulting in the contents spilling over.

The auxiliary score proposed in Japanese Patent Laid-open No. 149251/1983 or U.S. Patent No. 3,422,983 ensures a reduction in the required initial opening force. However, it is not reduced to a sufficiently low level, and also it still requires a large force to tear the removable section.

SUMMARY OF THE INVENTION

The present invention is defined in claim 1. It is based on studies made to improve the openability of an EOE. Accordingly, an object thereof is to provide an EOE which enables a reduction in the required initial opening force of a removable section of a can end panel by providing a portion of the non-removable section adjacent to the location at which a tab is secured with a machined portion which serves to locally reduce the rigidity of that portion of the non-removable section to allow it to be easily deformed in the direction of tear when the removable section is pulled open.

In this EOE, the machined portion provided in the non-removable section is formed in such a manner that its starting point is located at any position in an area extending between the apex of the removable section and a straight line which is drawn through the center of the tab secured portion and perpendicular to the tearing direction, and that it extends sideways in two directions continuously or discontinuously within an angle of ± 15 degrees with respect to the direction perpendicular to the tearing direction. This machined portion may be a thin walled portion which may be formed for example with a V-shaped, a U-shaped or a groove-shaped cross-section for example a rectangular groove-shaped cross-section. This machined portion makes possible a local reducing of the rigidity of a portion of the non-removable section adjacent to the pull-tab securing section so that that portion can be easily deformed in the direction of tear of the removable section when it is pulled open, thereby enabling a great degree of reduction in the required initial opening force of the EOE.

In the above-described EOE, for the purpose of further reducing the required initial opening force, it is preferable for the distance between the end of the removable section and the outer periphery of the pull-tab securing portion to be 0.4 mm or less.

An embodiment of the present invention provides an EOE which ensures, in addition to the reduction in the required initial opening force by provision of the machined portions in the portion of the non-removable section adjacent to the securing portion which serves to reduce the rigidity of that section to allow it to be easily deformed in the direction of tear of the removable section, easy and smooth initiation of opening and the subsequent rupture of the removable section. This is achieved by providing the removable section with a plurality of machined portions which lessen the bending rigidity of the removable section in the tearing direction thereof.

The machined portions provided in the removable section may be for example in the form of continuous or discontinuous straight, curved, V-shaped or inverted V-shaped lines, as plan view, such lines all being designed to run across the tearing direction thereof. They may also comprise a plurality of thin walled portions or dimples or the removable section may be provided with other means of reducing the bending rigidity thereof in the tearing direction for example corrugations or beads in cross-section.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic view of an embodiment of an EOE according to the present invention;

Figs. 2A to 2C show examples of the cross-sectional form of a machined portions provided in a non-removable section;

Fig. 3 illustrates an area of the non-removable section in which the machined portions are provided;

Fig. 4 illustrates in an explanatory manner the position of the starting point of the machined portions provided in the non-removable section;

Fig. 5 shows the effect of the direction in which the machined portions are scored in the non-removable section on the required initial opening force;

Figs. 6A to 6G show examples of the form of the machined portions provided in the non-removable section as plan view;

Fig. 7 explains a distance D between the end of the removable section and the outer periphery of the tab securing portion;

Fig. 8 is a graph which shows the effect of the distance D on the required initial opening force;

Fig. 9 shows the configuration of the EOE which is disclosed in the specification of U.S. Patent No. 3,422,983;

Figs. 10A to 10H are plan views of examples of a plurality of machined portions provided in the removable section to reduce the bending rigidity thereof, showing a second embodiment of the present invention;

Figs. 11A to 11E show examples of the cross-sectional form of the machined portions provided in the removable section which are shown in Figs. 10A to 10H;

Fig. 12 is a plan view of an removable section which is provided with a plurality of dimples provided therein;

Fig. 13 is a plan view of a removable section which is provided with a plurality of thin walled portions provided therein;

Figs. 14A to 14D show examples of the cross-sectional form of the machined portions provided in the removable section and which are shown in Figs. 12 and 13; and

Fig. 15 shows the variation in an opening force from the start of opening to completion thereof.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention will be hereinafter described by way of examples by referring to the accompanying drawings.

Referring first to Fig. 1 which shows a first embodiment of the present invention, an EOE 1 has a principal score 2 formed therein to define a removable section 3. The removable section 3 has a press-formed hollow rivet in an end of a portion thereof, that is, at or near the center of the can end. The shank of rivet passes through a small hole of an opening tab 4. The upper end of rivet is formed with an enlarged head which overlies the metal of the tab around the hole to secure the opening tab 4 to the removable section, thereby forming a tab securing portion 5. A non-removable section 6 of the EOE may also be provided with an auxiliary score 7 parallel to the principal score 2.

In the present embodiment, the non-removable section 6 is provided with a machined portion 8 adjacent to the tab securing portion 5 which serves to locally reduce the rigidity thereof to allow it to be easily deformed in the direction 9 at the time of initial opening.

Figs. 2A to 2C show the examples of the cross-sectional form of the machined portion 8. The machined portions may be formed in such a manner that they are either V-shaped grooves, as shown in Fig. 2A, U-shaped grooves, as shown in Fig. 2B, or thin wall portions, as shown in Fig. 2C, by which the rigidity of the non-removable section 6 is locally reduced. The cross-sectional form of the machined portion 8 is not limited to those shown in Fig. 2, but it allows any of various other forms. The machined portion 8 may have, for example, a cross-sectional form which is created by combining thin wall portion and V-shaped groove. Preferably, the remaining thickness t of the machined portion 8 is the same as that of the principal score 2 or is thicker than it.

The position of the machined portion 8 in the non-removable section 6 and the scoring direction therein are of great importance in reducing the rigidity of the portion of the non-removable section 6 adjacent to the tab securing portion 5 to allow it to be easily deformed in the tearing direction 9.

As shown in Fig. 3, the machined portions 8 are provided in a range bounded by inclined lines 10 and 11. The machined portions do not extend beyond that range. The inclined lines 10 are lines which start from the intersections 13 between the score 2 and a straight line 12 which passes through the center of the tab securing portion 5 and runs perpendicular to the tearing direction 9, and which extend sideways in two directions while being inclined toward the tearing direction 9 at angles with respect to the straight line 12. The other inclined lines 11 are defined as those which extend from an end 3a of the removable section 3 sideways in two directions while being inclined toward the direction opposite to the tearing direction 9 at angles with respect to a straight line 14 which passes through the end 3a of the removable section 3 and which runs in the direction perpendicular to the tearing direction 9. The angles θ of the inclined lines 10 and 11 with respect to the straight lines 12 and 14, respectively, are 15 degrees. In other words, the machined portions 8 of this embodiment are provided in the hatched area which is bounded by the inclined lines 10, 11 and the principal score 2.

As shown in Fig. 4, a starting point 8a of the machined portion 8 is arranged so that a distance d between the starting point 8a of the machined portion 8, and the end 3a of the removable section 3 is in the relationship of $0 < d \leq t$ with respect to a distance t between the end 3a of the removable section 3 and the center of the tab securing portion 5. Preferably, the relationship between these two distances is $0 < d \leq 2/3 t$. The starting point 8a of the machined portion 8 may or may not be connected to the principal score 2. If it is not connected to the principal score 2, it is preferable for a distance a between the starting point 8a of the machined portion 8 and the principal score 2 to be maintained at 1.5 mm or less.

The machined portion 8 may be scored in the direction which is perpendicular to the tearing direction 9 or at an angle ϕ which is $-15 \text{ degrees} \leq \phi \leq +15 \text{ degrees}$, with respect to this perpendicular direction. More preferably, the angle ϕ is $-12.5 \text{ degrees} \leq \phi \leq +12.5 \text{ degrees}$.

Fig. 5 shows the effect of the angle of inclination ϕ on the required initial opening force of the EOE. As can be seen from the figure, the initial opening force starts to drop when the angle of $|\phi|$ is about 20 degrees or less, its effect becomes more apparent at an angle of $|\phi|$ which is 15 degrees or less, and the initial opening force is a minimum when the angle $|\phi|$ is 12.5 degrees or less. The EOE 1 employed in these experiments were those made of tinplate having a thickness of 0.23 mm and a temper degree of T4, with the remaining thicknesses of the principal score 2 and the machined portion 8 being 65 μm .

With the machined portion 8 scored in a portion of the non-removable section 6 adjacent to the tab securing portion 5 from a starting point 8a determined in the above-described way in a direction determined in the above-described way, the bending rigidity of that portion of the non-removable section 6 is locally reduced to allow it to be easily deformed in the tearing direction 9. This causes the stress to be concentrated at the opening starting point, and the initial opening force of the EOE is in turn greatly reduced. In other words, the initial force required to open the can can be reduced, enabling the can to be opened easily.

Figs. 6A to 6G show examples of the form of the machined portion 8 in plan view. As shown in Fig. 6A, the machined portion 8 may comprise a single pair of thin walled portions which run in straight lines and which have a V-shaped or a U-shaped cross-section as viewed in the direction perpendicular to the tearing direction. The machined portion 8 may comprise a plurality of pairs of thin walled portions, as shown in Fig. 6B, which run in straight lines. The thin walled portions of the machined portion pair 8 may be a wide thin wall portion, as shown in Fig. 6C (see Fig. 2C). The machined portion 8 may be a pair of thin walled portions whose starting points 8a are separated from the principal score 2 and which run in straight lines, as shown in Fig. 6D. The machined portion may be a pair of thin walled portions whose starting points are separated from the principal score 2 and which run discontinuously, as shown in Fig. 6E. The machined portion 8 may be as shown in Fig. 6F which is the same as that shown in Fig. 6E but has a wide groove-shaped cross-section. Alternatively, the machined portion 8 may be curved as shown in Fig. 6G. The length of each component of the machined portion pair 8 is preferably 0.5 mm or more.

Table 1 shows the results of experiments in which EOE's each having a different form of machined portion were made from tinplate having a thickness of 0.23 mm and a temper degree of T4, and the initial opening forces of the cans were measured. In the table, Comparison Examples 1 and 2 respectively represent a conventional EOE having no machined portion 8 and a conventional one having an auxiliary score 7 formed on the non-removable section in the tearing direction, as shown in Fig. 9 (as described in the specification of U.S. Patent No. 3,422,983). On the other hand, Examples 1 to 7 were EOE's having the machined portions 8 shown in Figs. 6A to 6G, respectively. A distance D shown in Fig. 7 of the EOE of Examples 1 to 7 was 0.4 mm.

Table 1

Test	Form of Can Lid	Initial Opening Force
Comparison 1	Prior Art	1.80
Comparison 2	Fig. 9	1.75
Example 1	Fig. 6A	1.67
Example 2	Fig. 6B	1.65
Example 3	Fig. 6C	1.63
Example 4	Fig. 6D	1.68
Example 5	Fig. 6E	1.68
Example 6	Fig. 6F	1.68
Example 7	Fig. 6G	1.67

Note: Initial opening forces are expressed in kgf.

As can be seen from Table 1, the required initial opening force of the EOE is reduced in Examples 1 to 7 in which the bending rigidities of the portions of the non-removable section adjacent to the tab securing portions 5 were locally reduced in order to facilitate the deformation thereof in the tearing direction by impressing of the machined portions 8. Opening of the EOE can start without imparting a large force thereto.

The initial opening force can be further reduced by maintaining a distance D at a predetermined value, the distance D being the spacing between the end 3a of the removable section 3 and the outer periphery of the tab securing portion 5 in the direction of the X - X axis which is parallel to the tearing direction 9. Fig. 7 shows the periphery of the securing portion 5 in an enlarged scale. More specifically, in the present invention, the distance D between the end 3a of the removable section 3 defined by the principal score 2 and the outer periphery of the securing portion 5 is preferably 0.4 mm or less, more preferably, 0.3 mm or less.

Fig. 8 shows the effect of the distance D on the required initial opening force.

As the distance D becomes smaller, the initial opening force drops suddenly at a distance D of about 0.4 mm. This is considered to be because the highly rigid tab securing portion 5 ensures that stress is concentrated more locally at the end 3a bordering on the principal score 2. When the distance D is 0.3 mm or less, the initial opening force remains substantially constant at a low value. When the ease of press forming by using a metal mold is taken into consideration, the distance D is preferably 0.1 mm at the lowest.

In Fig. 8, a curve (a) indicates how the initial opening force of the EOE of this embodiment, i.e., one having machined portions 8, varies as the distance D changes, while a curve (b) is for comparison, showing how the initial opening force of the EOE having no machined portion 8 is related to the distance D.

In either case, it has been found that the required initial opening force drops suddenly when the distance D is about 0.4 mm.

Another embodiment of the present invention will be described below with reference to Fig. 10.

Figs. 10A to 10D show examples of the form of a plurality of machined portions 15 as plan view, the machined portions 15 being formed to reduce the bonding rigidity of the removable section 3 in the tearing direction and in such a manner that they cross the longitudinal center line X - X of the removable section 3. Figs. 10E to 10H are plan views of the machined portions 15 which are provided on the removable section 3 in such a manner that they do not cross the longitudinal center line X - X thereof.

Figs. 11A to 11D show examples of the cross-sectional form of the linear or arcuate machined portions 15 which are shown in Figs. 10A to 10H. The machined portions 15 may have a V-shaped groove or thin wall portion, as shown in Fig. 11A or Fig. 11B. They may comprise a portion with square or curved corrugations, as shown in Figs. 11C or 11D. The cross-section of the machined portions 15 may be a U-shaped groove as shown in Fig. 11E. The machined portions 15 may alternatively be beads in cross-section inwardly or outwardly.

Impressing of the plurality of machined portions 15 enables the bending rigidity of the removable section 3 with respect to the tearing direction 9 to be reduced. In consequence, the removable section 3 can be continuously bent along the X - X axis while it is being torn in the tearing direction 9. This concentrates the tearing force at the principal score 2, thereby making tearing of the removable section 3 along the principal score 2 easier. Therefore, it is possible to prevent any excessive force when it is separated from the can end panel.

Preferably, pitch b (see Figs. 10A to 10H) between each of the adjacent machined portions 15 formed on the removable section 3 is between 2 and 5 mm. With the pitch b in this range, the reduced bending rigidity of the removable section 3 provided by each machined portion 15 is spread so as to be continuous, ensuring that the tearing force is effectively reduced by the machined portions 15. When the pitch b exceeds 5 mm, the tearing force required greatly varies along the score in the tearing direction 9, inhibiting stable tearing. A pitch b of less than 2 mm makes the removable section 3 bend more easily than required. This may cause the removable section 3 to tear off midway.

In the case wherein the machined portions 15 have a V-shaped or inverted V-shaped form as plan viewed from above, it is preferable for the angle β (see Fig. 10A to 10H) between one side of the V- or inverted V-shaped machined portion 15 and a line normal with respect to the X - X axis to be made 45 degrees or less. With the angle β exceeding 45 degrees, the effect of the machined portions 15 on the reduction in bending rigidity, which serves to facilitate bending of the removable section 3 along the X - X axis, is reduced.

In the present embodiment shown in Figs. 10A to 10H, a portion of the non-removable section 6 which is adjacent to the tab securing portion 5 is provided with a single pair or a plurality of pairs of machined portions 8 which are formed in such a manner as to be symmetrical with respect to the X - X axis. This arrangement of the machined portions 8 enables the initial opening force to be reduced. The machined portions 8, together with the plurality of machined portions 15 formed in the removable section 3 which function to reduce the bending rigidity thereof with respect to the tearing direction, ensure that the EOE can be opened smoothly and with a small force, making it openable as easily as possible.

Instead of providing the machined portions 15, it is possible to divide the removable section into a plurality of parts and provide a thin-wall portion 18 in each part, as illustrated in Fig. 13. Such a thin-wall portion 18 may be formed in either the upper or lower surface of the removable section 3.

Fig. 12 illustrates a modification of the removable section 3 in which a plurality of dimples 17 are provided in place of the thin-wall portion 18. As shown in Figs. 14A to 14D, the dimples 17 may be formed in either the upper or lower surface, or by forming irregular surfaces in the removable section 3. In addition, the cross-sectional configuration of the dimple may be rectangular, U-shaped, circular, or trapezoidal.

By virtue of the thin-wall portion 18 or dimples 17, the bending rigidity of the removable section 3 in the tearing direction 9 is reduced. Also in the case where the irregular surfaces are provided, the bending rigidity of the removable section 3 can be reduced. Therefore, the removable section 3 can be deformed easily at the start of an opening operation, thereby allowing the deformation of the removable section 3 at the start of the opening to concentrate on a portion of the principal score 2 which borders on the end 3a of the removable section 3 and is around the tab securing portion 5. As a result, it is possible not only to reduce the opening force required at the starting of the opening, but also to facilitate tearing of the removable section 3 along the principal score 2. In addition, since the tearing conducted in this way requires a small force, it is possible to prevent any excessive force when it is separated from the end panel.

When the plurality of dimples 17 shown in Fig. 12 are formed, the spacing S between two adjacent dimples 17 is preferably 0.5 to 2 mm. That is, when the spacing S is set at a value within this range, the

bending motion of each portion of the removable section 3 which has its bending rigidity reduced by dimples 17 can be followed by a similar motion of the adjacent portion, thus ensuring that the overall effect of reducing the tearing force can be positively obtained. On the other hand, if the spacing S exceeds 2 mm, the tearing force varies, thus obstructing a smooth tearing operation. If the spacing S is less than 0.5 mm, the bending rigidity of the removable section is reduced to an excessive degree, thus leading to a risk that the removable section might be partially torn off.

The present invention is not limited to these embodiments illustrated in Figs. 10 to 14 and includes other ways of machining so long as they are capable of achieving a reduction in the bending rigidity of the removable section along the tearing direction by the machined portions. For instance, in stead of the thin-wall portion 18 or dimples 17, we can apply the letters, indicating the tradename or contents of the can.

The EOE of the present invention may be of the type which has a shallow auxiliary score 7 formed along and in parallel with a principal score 2.

Fig. 15 is a graph of the fluctuation of this opening force as from the start of opening to final removal of the removable section 3.

In the figure, the solid line J indicates variations in the force required to open the EOE of this invention having a non-removable section and a removable section which are respectively provided with the machined portions 8 and the machined portions 15, while the broken line K denotes that of a conventional EOE having neither the machined portions 8 nor the machined portions 15.

As can be seen from the figure, in the case of can opening as shown by the broken line K, a large opening force is required and the opening force varies greatly. This may impart impact or vibration to the can body, while it is being opened, preventing smooth opening. In the case of opening an EOE of this embodiment shown by the solid line J, on the other hand, opening requires a smaller force from the start thereof right through the removal of the removable section 3, and the degree of variation in the force required is reduced. This enables the can to be opened easily with a small force without any impact or vibration being imparted to the can body.

Compared with such an EOE as described above in which the required opening force is decreased and fluctuations thereof are reduced, the initial opening force can be further reduced by making the spacing D (see Fig. 7) between the end 3a of the removable section 3 and the outer periphery of the securing portion 5 smaller in the above-described manner.

Table 2 shows the results of measurements of the initial opening force and the tearing force required for various EOE's made from tinplate having a thickness of 0.23 mm and a temper degree of T4. In the Table, Comparison Examples 1 and 2 respectively represent a conventional EOE having no machined portions and a conventional one (as disclosed in U.S. Patent No. 3,422,983) having an auxiliary score 19 formed in the non-removable section in the tearing direction 9, as shown in Fig. 9. On the other hand, examples 1 to 8 are the EOE's which are shown in Figs. 10A to 10H, respectively. These EOE's of this embodiment have a distance D of 0.4 mm, which is illustrated in Fig. 7.

Table 2

Test	Form of Can Lid	Initial Opening Force	Tearing Force
Comparison 1	Prior Art	1.80	3.20
Comparison 2	Fig. 9	1.75	3.20
Example 1	Fig. 10A	1.65	2.50
Example 2	Fig. 10B	1.66	2.80
Example 3	Fig. 10C	1.67	2.80
Example 4	Fig. 10D	1.66	2.50
Example 5	Fig. 10E	1.66	2.50
Example 6	Fig. 10F	1.67	2.80
Example 7	Fig. 10G	1.68	2.40
Example 8	Fig. 10H	1.65	2.50

Note: Initial opening forces are expressed in kgf.

As can be seen from Table 2, the initial opening force and tearing force required are reduced in Examples 1 to 8 in which the bending rigidities of the portion of the non-removable sections 6 adjacent to the tab securing portions 5 were locally reduced in order to facilitate deformation thereof in the tearing direction 9 by the machined portions 8, and in which the bending rigidities of the removable sections 3 in the tearing direction were also reduced. It was thus possible for the EOE's of this embodiment to be opened easily without the need to impart a large force thereto.

Tinplate or aluminum sheet is usually used as the material for the EOE 1. However, this is not limitative, and for example any of the following materials can be used:

- (1) Iron and iron alloys, or non-ferrous metals such as aluminum and aluminum alloys;
- (2) A metal material obtained by subjecting a material according to Item (1) to a surface treatment such as plating or coating;
- (3) A composite metal material obtained by bonding a layered organic material such as resin to a material according to Item (1) and/or a metal material according to Item (2);
- (4) A composite metal material obtained by superposing layers of a material according to Item (1) and/or different metal materials according to Item (2).

The present invention has made possible a great reduction in the initial opening force required, with the result that opening can be started very easily.

Claims

1. An Easy Open End of a can, comprising a panel having a removable section (3) defined by a principal score (2) and an opening tab (4) secured to said removable section at a tab securing portion (5) in the vicinity of an end (3a) of the removable section, in order to locally reduce the bending rigidity of a portion of a non-removable section (6) adjacent to said tab securing portion to allow it to be easily

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Example 5	Fig. 10E	1.66	2.50
Example 6	Fig. 10F	1.67	2.80
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Example 8	Fig. 10H	1.65	2.50

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- (4) A composite metal material obtained by superposing layers of a material according to Item (1) and/or different metal materials according to Item (2).

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Claims

1. An Easy Open End of a can, comprising a panel having a removable section (3) defined by a principal score (2) and an opening tab (4) secured to said removable section at a tab securing portion (5) in the vicinity of an end (3a) of the removable section, in order to locally reduce the bending rigidity of a portion of a non-removable section (6) adjacent to said tab securing portion to allow it to be easily



- deformed in the tearing direction (9), said non-removable section (6) is provided with a machined portion (8), characterised in that the machined portion (8) is formed in such a manner that its starting point is located at any position in an area extending between the end (3a) of said removable section and a straight line which is drawn through the center of said tab securing portion perpendicular to the tearing direction (9), and that it extends sidewise in two directions continuously or discontinuously within an angle of ± 15 degrees with respect to the direction perpendicular to the tearing direction (9).
2. An EOE according to Claim 1, wherein said machined portion is a thin walled portion which is provided by machining on said non-removable section such that its cross-section is in a V-shape, U-shape or groove-shape.
 3. An EOE according to Claim 1, wherein a distance between the end of said removable section and the outer periphery of said tab securing portion is 0.4 mm or less.
 4. An EOE according to Claim 1, wherein said removable section (3) is provided with a plurality of machined portions (15) which serve to reduce the bending rigidity thereof.
 5. An EOE according to Claim 4, wherein said machined portions provided in said removable section comprise a plurality of machined portions which run across the tearing direction.
 6. An EOE according to Claim 5, wherein said machined portions provided in said removable section comprise a plurality of machined portions which run across the tearing direction but do not cross the center line of said removable section that runs in the tearing direction thereof.
 7. An EOE according to Claim 1, wherein said removable section (3) is provided with a plurality of machined portions (15) which serve to reduce the bending rigidity thereof, which machined portions either cross or do not cross the longitudinal centre line of the removable section, the pitch between adjacent machined portions being between 2 mm and 5 mm and the angle between the machined portions and a line normal to the longitudinal centre line being 45 degrees or less.
 8. An EOE according to Claim 4 or Claim 7, wherein said machined portions formed in said removable section comprise a plurality of thin walled portions or grooves.
 9. An EOE according to either one of claims 4, 5, 6 and 7, wherein said machined portions provided in said removable section are straight, curved, V-, U-, or inverted V-shaped scores, a thin walled portion, a corrugated portion, or beads.

Revendications

1. Fermeture de boîte à ouverture facile, comportant un panneau présentant une section séparable (3) définie par une rainure principale (2) ainsi qu'une patte d'ouverture (4) fixée à ladite section séparable, en une portion (5) de fixation de la patte au voisinage d'une extrémité (3a) de la section séparable; pour réduire localement la rigidité, au cintrage, d'une portion de la section non séparable (6) près de ladite portion de fixation de la patte, pour lui permettre de se déformer facilement dans la direction d'arrachement (9), ladite section non séparable (6) présente une portion usinée (8), le fond étant caractérisé par le fait que la portion usinée (8) est formée de façon que son point de départ soit situé en une position quelconque dans une zone qui s'étend entre l'extrémité (3a) de ladite section séparable et une ligne droite passant par le centre de ladite portion de fixation et perpendiculaire à la direction d'arrachement (9), et par le fait que cette portion usinée s'étend latéralement, en continu ou en discontinu, selon deux directions situées à l'intérieur d'un angle de ± 15 degrés par rapport à la direction perpendiculaire à la direction de l'arrachement (9).
2. Fermeture de boîte à ouverture facile selon la revendication 1, dans lequel ladite portion usinée est une portion à paroi mince obtenue en usinant ladite section non séparable de façon que sa section droite soit en forme de V, de U ou de rainure.
3. Fermeture de boîte à ouverture facile selon la revendication 1, dans lequel la distance entre l'extrémité



de ladite section séparable et la périphérie extérieure de ladite portion de fixation de la patte est de 0,4mm ou moins.

4. Fermeture de boîte à ouverture facile selon la revendication 1, dans lequel ladite section séparable (3) présente une pluralité de portions usinées (15) qui servent à en réduire la rigidité au cintrage.
5. Fermeture de boîte à ouverture facile selon la revendication 4, dans lequel lesdites portions usinées prévues dans ladite section séparable comportent une pluralité de portions usinées qui vont d'un côté à l'autre de la direction d'arrachement.
6. Fermeture de boîte à ouverture facile selon la revendication 5, dans lequel lesdites portions usinées prévues dans ladite section séparable comportent une pluralité de portions usinées qui vont d'un côté à l'autre de la direction d'arrachement, mais sans intersecter l'axe de ladite section séparable orienté dans sa direction d'arrachement.
7. Fermeture de boîte à ouverture facile selon la revendication 1, dans lequel ladite section séparable (3) présente une pluralité de portions usinées (15) qui servent à en réduire la rigidité au cintrage, portions usinées qui soit intersectent, soit n'intersectent pas l'axe longitudinal de la section séparable, le pas entre les portions usinées voisines étant compris entre 2 mm et 5 mm et l'angle entre les portions usinées et une droite normale à l'axe longitudinal étant de 45 degrés ou moins.
8. Fermeture de boîte à ouverture facile selon la revendication 4 ou la revendication 7, dans lequel lesdites portions usinées formées dans ladite section séparable comportent une pluralité de portions à paroi fine ou de rainures.
9. Fermeture de boîte à ouverture facile selon l'une quelconque des revendications 4, 5, 6 et 7, dans lequel lesdites portions usinées prévues dans ladite section séparable sont des rainures droites, incurvées, en forme de V, de U, ou de V renversé, une portion à paroi mince, une portion ondulée ou des moulures.

Ansprüche

1. Einfach zu öffnendes Ende einer Dose mit einer Fläche, die ein entfernbares Teil (3), das durch eine Hauptkerbe (2) definiert ist, hat, und einer Öffnungslasche (4), die an dem entfernbaren Teil an einem Laschenbefestigungsabschnitt (5) in der Nähe eines Endes (3a) des entfernbaren Teils befestigt ist, zum lokalen Verringern der Biegesteifigkeit eines Abschnitts eines nicht entfernbaren Teils (6), benachbart zu dem Laschenbefestigungsabschnitt, so daß dieses leicht in der Zugrichtung (9) deformierbar ist, wobei der nicht entfernbare Teil (6) mit einem maschinell bearbeiteten Abschnitt (8) versehen ist, **dadurch gekennzeichnet**, daß der maschinell bearbeitete Abschnitt (8) in solcher Weise ausgebildet ist, daß sein Startpunkt an einer beliebigen Stelle in einem Bereich angeordnet ist, der sich zwischen dem Ende (3a) des entfernbaren Teils und einer geraden Linie erstreckt, die durch die Mitte des Laschenbefestigungsabschnitts senkrecht zur Zugrichtung (9) gezogen ist und daß sich dieser seitwärts in zwei Richtungen kontinuierlich oder diskontinuierlich in einem Winkel von $\pm 15^\circ$ in Bezug auf die Richtung senkrecht zu der Zugrichtung (9) erstreckt.
2. Leicht zu öffnendes Ende nach Anspruch 1, wobei der maschinell bearbeitete Abschnitt ein dünnwandiger Abschnitt ist, der bereitgestellt wird durch maschinelle Bearbeitung des nicht-entfernbaren Teils, so daß sein Querschnitt V-förmig, U-förmig oder nutförmig ist.
3. Leicht zu öffnendes Ende nach Anspruch 1, wobei der Abstand zwischen dem Ende des entfernbaren Teils und dem Außenrand des Laschenbefestigungsabschnitts 0,4 mm oder weniger beträgt.
4. Leicht zu öffnendes Ende nach Anspruch 1, wobei der entfernbare Teil (3) mit mehreren maschinell bearbeiteten Abschnitten (15) versehen ist, die dazu dienen, dessen Biegesteifigkeit zu verringern.
5. Leicht zu öffnendes Ende nach Anspruch 4, wobei die an dem entfernbaren Teil vorgesehenen maschinell bearbeiteten Abschnitte mehrere maschinell bearbeitete Abschnitte aufweisen, die quer zur



Zugrichtung verlaufen.

- 5 6. Leicht zu öffnendes Ende nach Anspruch 5, wobei die an dem entfernbaren Teil vorgesehenen maschinell bearbeiteten Abschnitte mehrere maschinell bearbeitete Abschnitte aufweisen, die quer zur Zugrichtung verlaufen, aber nicht die Mittellinie des entfernbaren Teils kreuzen, die in dessen Zugrichtung verläuft.
- 10 7. Leicht zu öffnendes Ende nach Anspruch 1, wobei das entfernbare Teil (3) mit mehreren maschinell bearbeiteten Abschnitten (15) versehen ist, die zur Verringerung dessen Biegesteifigkeit dienen, wobei die maschinell bearbeiteten Abschnitte entweder die längsgestreckte Mittellinie des entfernbaren Teils kreuzen oder nicht kreuzen, wobei der Abstand zwischen benachbarten maschinell bearbeiteten Abschnitten zwischen 2 mm und 5 mm beträgt und der Winkel zwischen den maschinell bearbeiteten Abschnitten und einer Linie senkrecht zu der längsgestreckten Mittellinie 45° oder weniger beträgt.
- 15 8. Leicht zu öffnendes Ende nach Anspruch 4 oder Anspruch 7, wobei die in dem entfernbaren Teil ausgebildeten maschinell bearbeiteten Abschnitte mehrere dünnwandige Abschnitte oder Nuten aufweisen.
- 20 9. Leicht zu öffnendes Ende nach einem der Ansprüche 4, 5, 6 und 7, wobei die in dem entfernbaren Teil vorgesehenen maschinell bearbeiteten Abschnitte gerade, gekrümmte, V-, U- oder umgekehrt V-förmige Kerben, ein dünnwandiger Abschnitt, ein gestufter Abschnitt oder Perlen sind.
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