May 27, 1969 R. E. HEFFNER 3,446,390

OPENING MEANS FOR SEALED CONTAINERS

Filed April 10, 1968

Sheet 1 of 2

FIG. 1.

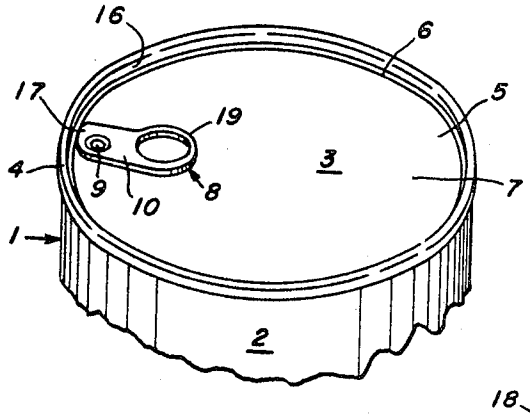


FIG. 2.

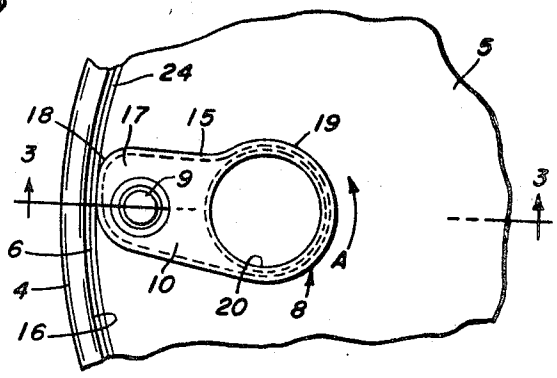


FIG. 3.

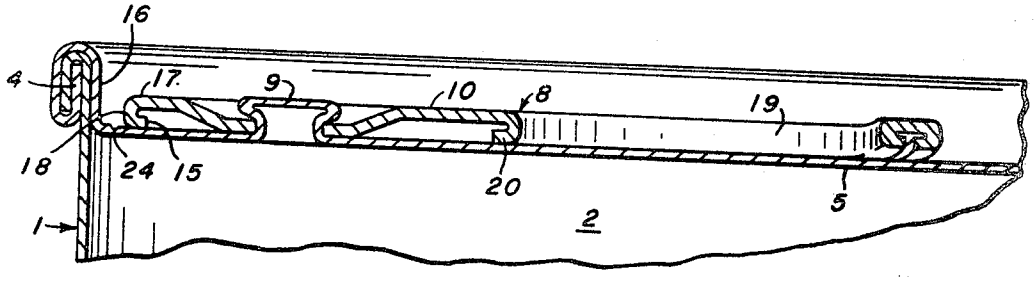
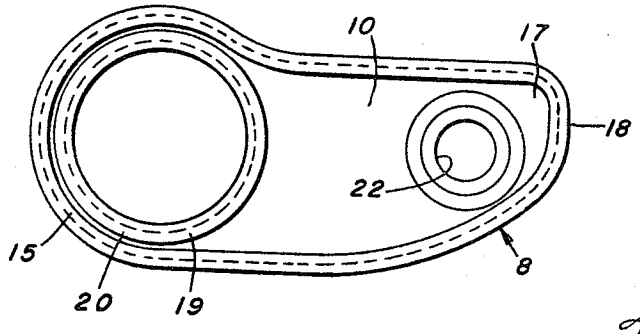


FIG. 4.



INVENTOR.
ROBERT E. HEFFNER
By
Frederick O. Weidner, Jr.
Attorney

May 27, 1969 R. E. HEFFNER 3,446,390

OPENING MEANS FOR SEALED CONTAINERS

Filed April 10, 1968

Sheet 2 of 2

FIG. 5.

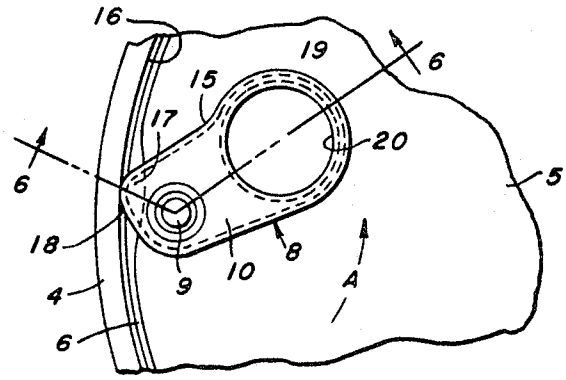


FIG. 6.

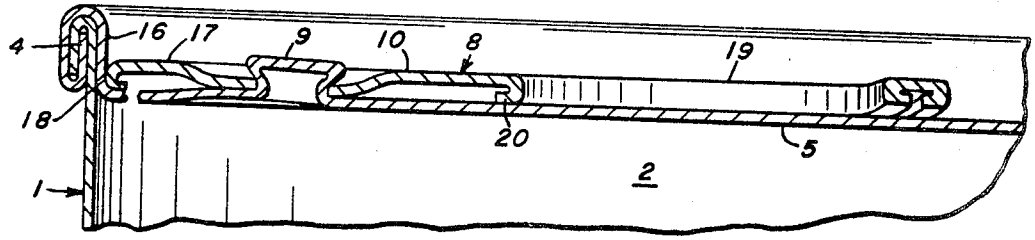
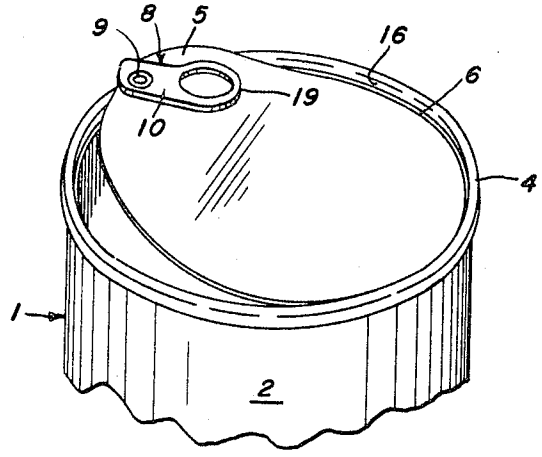


FIG. 7.



INVENTOR.
ROBERT E. HEFFNER
By
Frederick O. Maidner, Jr.
Attorney

United States Patent Office 3,446,390 Patented May 27, 1969

3,446,390

OPENING MEANS FOR SEALED CONTAINERS

Robert E. Heffner, Lower Burrell, Pa., assignor to Aluminum Company of America, Pittsburgh, Pa., a corporation of Pennsylvania

Filed Apr. 10, 1968, Ser. No. 720,012
Int. Cl. B65d 17/24
U.S. Cl. 220—54 7 Claims

ABSTRACT OF THE DISCLOSURE

This disclosure concerns container ends or closures for containers that have an end panel that is recessed respecting a shoulder and is provided with a score line to define a tear-out section. A tab opening device having a cam portion is rotatably attached to the tear-out section in a position such that rotation of the tab opening device about the attachment means brings the cam portion of the tab opening device to bear against the shoulder and causes the score line to rupture.

BACKGROUND OF THE INVENTION

The invention to which this application pertains relates to container ends or closures having a tab opening device attached to an end panel provided with a tear-out section to enable the container to be opened manually, without the use of a special opening tool. More particularly, the invention is advantageously employed in such container ends as are used with containers for solids or semi-solids where a large opening in the closure is desired to facilitate easy access to the contents. Heretofore, there were several ways of gaining access to the contents of a container by removing a large portion of the end panel. One way is to provide a peripheral tear strip consisting of two substantially parallel score lines extending around the end wall of the container in close proximity to the periphery. An example of this type of opening means is shown in U.S. Patent No. 3,334,777. This means of gaining access to the container contents, however, is not well adapted to large diameter container ends as the tear strip is quite long in overall length and it becomes awkward to handle while the container is being opened. Moreover, a tear strip of this type is susceptible of breaking before the end of the container is removed.

Another method of removing a large portion of the panel of a container end is by providing one score line extending from the center of the panel to the peripheral edge of the container end and completely around the periphery with a second inner score joining the first behind the opening device attachment means and terminating a short distance from said attachment means. This type of opening means is shown in U.S. Patent No. 3,335,899.

Recently, there have been a great number of easy open containers on the market which have an end with only a single peripheral score line with an opening device attached to the tear-out section near the periphery. Upon lifting the opening device, the nose of the device is plunged downwardly to rupture the score line and then the entire tear-out section is removed by pulling outwardly on the opening device. One form of this type of opening means is shown in U.S. Patent No. 3,322,296.

In all of the prior opening devices the container end is initially ruptured at the score line by a shearing action produced by lifting or pulling up on the tab opening device. By exerting enough lifting force the yield strength of the residual material of the score line, that is, the material remaining beneath the bottom of the score line after the scoring operation, is finally overcome by the shear stress imparted to it and rupture occurs at the score line. By pulling outwardly on the opening device the tear strip

is progressively severed along the score line until the entire tear-out section is removed from the container end. To rupture the residual material beneath the bottom of the score line in this fashion requires considerable shear force, and in many cases it has been desirable, if not necessary, to reduce the score residual to the barest minimum in the vicinity of the initial rupture without impairing the integrity of the container, thereby enabling the person opening the container to sever the score line more easily. Moreover, the manner in which these prior devices function requires, as a practical matter, the tab opening device to be a rigid lever, and the initial rupture at the score line requires considerable lifting force applied to the tab and in turn by the tab in lever multiplied degree. As a result severe stress is placed on the opening device attachment with attendant difficulties in assuring adequate attachment strength.

By my invention initial rupture of the score line is achieved in an entirely different fashion; namely, by placing the residual material at the score line in tension to an extent that the yield strength of the residual material is overcome with consequent local rupture. This initial rupture is achieved with a minimum of effort, and the tear-out section is thereupon easily removed from the container by pulling on the attached opening device to complete severance along the score line. For this reason the score residual does not need to be reduced to a bare minimum. Moreover, the strength of the attachment is not as critical as required for the prior art opening devices.

SUMMARY OF THE INVENTION

In accordance with this invention a container end or closure is provided having a shoulder and recessed relative thereto, an end panel with a score line to define a tear-out section of the desired shape and size. To the tear-out section in rather close proximity to the score line defining the tear-out section, is rotatably attached a tab opening device. One end of the tab opening device is a cam portion and the other end is a handle portion. The opening device is attached to the tear-out panel suitably close to the score line and to the shoulder so that upon rotating the opening device about the vertical axis of the attachment means the cam portion bears upon the upright portion of the container end. A portion of the score line lies between the tab opening device attachment means and the bearing zone of the opening device cam portion upon the container end shoulder. To open the container, the tab opening device is rotatably moved about the vertical axis of the attaching means in a plane substantially parallel to the recessed end panel of the container end, so that the cam portion of the tab opening device contacts the shoulder of the container end. By continuing the rotational movement, the cam portion forcibly bears against such upright portion to produce sufficient force resisted by the tab opening device attachment means to rupture locally the residual material at the score line. After the initial rupture of the score line is accomplished, the handle portion of the tab opening device is pulled outwardly of the panel, and severance along the score line is continued progressively in opposite directions around the tear-out section until it is completely removed.

It is an object of this invention to provide a simple, efficient tab opening container end.

It is another object of this invention to provide a novel tab opening device that will rupture locally the residual material of a score line defining a tear-out panel in a container end and will facilitate easy removal of the entire tear-out panel.

It is also an object of this invention to provide a novel tab opening device for a container end or closure having a score line defined panel to be removed, which is in-

tended to rotate in a plane generally parallel to that of the panel and to generate sufficient tension on the residual material at the score line to rupture that material locally.

Another object of this invention is to provide a highly satisfactory opening means of the type just stated for large diameter container ends wherein the panel of the container end has a relatively large tear-out section.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a fragmentary top perspective view of an easy opening container end embodying the invention shown affixed to a container.

FIGURE 2 is an enlarged fragmentary plan view of the container end of FIGURE 1, and shows the specific details of the easy opening features thereof.

FIGURE 3 is an enlarged fragmentary vertical sectional view taken along line 3—3 of FIGURE 2 and shows further the details of the easy opening features.

FIGURE 4 is a bottom plan view of the tab opening device showing specifically the details of the underside of said tab.

FIGURE 5 is an enlarged fragmentary plan view of the easy opening container end in the initial opening stage.

FIGURE 6 is an enlarged fragmentary vertical sectional view taken along line 6—6 of FIGURE 5 and shows the easy opening container end in the initial opening stage.

FIGURE 7 is a fragmentary top perspective view of the easy opening container end of the invention showing partial removal of the tear-out section.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings in detail, it will be seen that there is illustrated a container which generally is referred to by numeral **1**. The container, for purposes of illustration and description, has been shown as a can, but it could be of other conventional container construction. The can includes a conventional can body **2** the upper end of which is closed by means of a container end **3**, preferably made of suitable aluminum alloy sheet which is secured to the can body **2** by means of a conventional double seam **4**. The container end **3** includes an end panel **5** which is disposed in recessed relation with respect to the double seam **4**. Extending between the end panel **5** and the double seam **4** is a shoulder **16** shown in this instance as a flange which is generally disposed parallel to the longitudinal axis of the container **1**. This shoulder or flange is usually referred to in the trade as the "chuck wall," since it is this portion of a can end that is supported by an inside seaming chuck during the double seaming operation.

The end panel **5** is provided with a peripheral weakening line in the form of a score **6** (conventionally made by indentation) which is continuous and defines a removable tear-out section **7**. It is to be noted that the tear-out section **7** shown in the drawings constitutes practically all of the end panel **5**. However, the tear-out section **7** may be of other shapes or configurations within the scope of this invention.

A tab opening device **8** is rotatably secured to the tear-out section **7** by means of a headed integral rivet **9**, although other attachment means may be utilized as long as the tab opening device is permitted to rotate about the vertical axis of the attaching means and is suitably secured against removal. An integral rivet is preferred so that the metal of the can end remains continuous, that is, without any break in the metal, thus providing greater assurance of a hermetically sealed container. The tab opening device **8** includes a tab body which is generally referred to by the numeral **10**. An aperture **22** is provided in the tab body through which the attachment means passes. One end of the tab opening device is the cam portion **17**, which when said device is rotated about the vertical axis of integral rivet **9** in the direction indicated by the arrow designated A in FIGURE 2, contacts the shoulder **16**. The cam portion **17** includes a cam surface **18** at the forward end thereof. The tab body **10** when made from sheet metal, preferably has an inwardly turned flange **15** which extends around at least a major part of the periphery of the tab body including the cam portion. This peripheral flange serves the purposes of rigidifying the tab opening device, of concealing the raw edge and of reinforcing the cam portion **17**. However, other suitable stiffening means or shapes may be employed. If desirable, the peripheral flange may be made wider in the cam portion **17** while maintaining the desired tab body shape thereby increasing the amount of reinforcement in this area. The tab opening device **8** also includes a handle portion **19** which is located at the opposite end of the tab body **10** from the cam portion **17**. The handle portion **19** as shown in the drawings is a pull ring. The pull ring **19** is reinforced by an outwardly turned inner flange **20**. The flanges **20** and **15** are in opposed relation, and being so positioned the pull ring **19** is doubly hemmed with both raw edges removed from finger contact.

Referring now to FIGURES 2, 3, 5 and 6 in particular, the procedure for opening a container utilizing the end of this invention will be stated. The intended position of the tab opening device of my invention during the shipping and storage of the container should be approximately that shown in FIGURES 2 and 3. In this position the cam portion **17** of the tab opening device **8** is not in contact with the shoulder **16** of the container end. To open the container the tab opening device **8** is rotated about the vertical axis of the integral rivet **9** in the direction of the arrow designated A in FIGURE 2. By so rotating the tab opening device the cam surface **18** of the cam portion **17** will come in contact and forcibly bear against the shoulder **16** of the can end **3**. By continuing the rotation of the tab in this manner the cam action induces lateral localized spreading force between the container end shoulder **16** and the column of integral rivet **9** so that tensional stress is exerted on the residual material at the score line **6** between the shoulder **16** and the integral rivet **9**. The farther the tab opening device is rotatably moved in the direction A the greater the tensional stress produced by cam action. When sufficient tensional stress is placed on the score line by the cam action, the yield strength of the residual material **24** is overcome and that material ruptures locally at the score line between the integral rivet **9** and the shoulder **16**. After such initial and local rupture at the score line, the pull ring **19** of the tab opening device **8** is lifted outwardly of the end panel and pulled upwardly and backwardly from the zone of initial rupture to continue severance of the score line **6** in opposite directions completely around the end panel **5** thereby removing said panel. FIGURE 7 shows the end panel **5** partly removed in the fashion discussed above.

The ease of initially rupturing the residual material at the score line **6** may be enhanced by increasing the mechanical advantage of the lever incorporated in my tab opening device. Preferably, the point of affixation of the tab opening device to the end panel is in the half portion of the tab opening device in which the cam portion **17** is present. The mechanical advantage of the tab opening device may be increased for any given tab length by positioning the integral rivet **9**, which acts as the fulcrum point of the lever, as near as practical to where the cam surface **18** of the tab contacts the shoulder **16** of the container end. By doing this, the ratio of the length of the lever effort-arm to the length of the lever resistance-arm would be greater thereby increasing the mechanical advantage of the tab.

The eccentricity of the cam surface **18** that bears against the shoulder **16** while the tab is being rotated also affects the mechanical advantage of the tab, and consequently the ease of rupturing the residual material at the score

line **6**. Generally, the greater the eccentricity of the cam surface, the less the mechanical advantage of the cam and the less the tab needs to be rotated to initially rupture a given amount of residual material. As a practical matter the lever arm ratio and the eccentricity of the cam surface are chosen to provide relative ease of manipulation of the tab during the opening process. The tab opening device shown in the drawings has been found to give very satisfactory opening characteristics.

It should be noted that by my invention precise orientation of the tab opening device relative to the score line is not required. In the case of prior art rigid lever plunger-type opening devices utilizing a single peripheral score line the nose of the device should precisely overlie the score line. Since my tab opening device is adapted to rotate to effect opening, the position of the cam surface **18** in respect of the score line **6** is inconsequential. The important consideration is that upon rotation the cam surface **18** bears with sufficient force against the shoulder or flange **16** of the container end. Moreover, by my invention enough space may be provided between the shoulder **16** of the container end and the cam surface **18** of the tab opening device to afford clearance for the inside seaming chuck to support the shoulder **16** during the seaming operation. This desirable feature can be accomplished while maintaining the position of the score line very close to the shoulder **16** which is also a desirable feature.

It is to be understood that the tab opening device **8** is advantageously formed of sheet metal and is of a one piece construction. However, it will be readily apparent that it is feasible to form the tab body **10** of materials other than sheet metal. It is to also be understood that some other type of handle or lifting means may be provided. The handle portion may, if desired, be upturned slightly or have formed therein a raised lug that can be utilized to assist the person opening the container to rotate the tab opening device by pushing on the handle portion in the direction of arrow A.

What is claimed is:

1. A container closure comprising a panel having a shoulder element and a portion recessed respecting said shoulder element, said recessed portion having therein a score line defining a tear-out section, and a tab opening device one end of which is a cam portion and the other a handle portion, said tab opening device being rotatably affixed to the tear-out section by attachment means whereby upon rotation of the tab opening device about the attachment means the cam portion of the tab opening device bears against said shoulder element thereby causing rupture.

2. The container closure of claim **1** wherein the score line defining the tear-out section is a single peripheral score line.

3. The container closure of claim **1** wherein the attachment means is an integral rivet.

4. The container closure of claim **1** wherein the handle portion of the tab opening device is of the ring pull type.

5. The container closure of claim **1** wherein the tab opening device is sheet metal.

6. The container closure of claim **5** wherein at least a major part of the periphery of the sheet metal tab opening device including the cam portion has an inwardly turned flange.

7. The container closure of claim **1** wherein the point of affixation of the tab opening device is in the half portion of the tab opening device in which the cam portion is present.

References Cited

UNITED STATES PATENTS

2,029,328	2/1936	Ljungstrom	220—48
3,250,425	5/1966	Stec et al.	220—54

GEORGE T. HALL, *Primary Examiner.*

U.S. Cl. X.R.

220—48; 222—541