CONTAINER WITH PULL-TAB OPENER
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ABSTRACT OF THE DISCLOSURE

There is disclosed hand operable opening means for containers especially adaptable for use in a lid of a tinplate container. Substantially the whole, or a portion, of a lid may be removed by an upward pull on a handle. First, a portion of the handle hinges downwardly to start the opening along a weakened line and then continued upward force on the handle tears out a portion along the remainder of the weakened line. The problem of the handle separating from the lid is overcome by forming a channel with reverse folds, the folds overlying tabs on the handle. A method of forming such folds without tearing the metal is described.

This invention relates to opening means for containers and in particular to a wall for a container provided with opening means which may be operated without the use of tools. It is more particularly, though not exclusively, concerned with a container wall of thin sheet metal provided with opening means, especially a wall formed of tinplate. The invention also relates to a method for the formation of reversed folds in sheet metal, such method being useful in the manufacture of container walls according to the invention.

It has long been recognised as a problem in the manufacture of containers that there is no satisfactory means for providing a tinplate container with opening means which can be operated by hand without the use of tools such as domestic can-openers or keys adapted for engagement with a part of the container.

It has been proposed to use aluminium lids for containers and to form a rivet boss integrally with the lid for securing a tab handle to the lid. It has been found that the handle, which is intended to tear a portion surrounded by a weakened line out of the line, because of the concentrated load on the head of the rivet boss, has often pulled off the rivet before the tear portion can be satisfactorily removed. A further disadvantage has been that it has been necessary to apply a wax or lacquer over the aluminium prior to the process of forming the rivet and this introduces another process operation.

It has not been possible to apply the method to tinplate lids because of the splitting of the tinplate which occurs when it is drawn to make the material into a shape suitable for providing a rivet boss.

A further cause of failure of a rivet boss connection between a tear-off lid and a tab handle arises when the rivet boss provides a pivot for the handle as the handle is lifted, a portion of the material of the lid being downwardly bent into the container. The additional strain on the head of the rivet causes this to collapse and pull through the rivet hole in the tab handle.

It is an object of this invention to provide improved forms of opening means for containers.

It is a further object to provide an improved means of securing a handle to a portion of a container wall to be removed from the container. Such a portion is subsequently referred to as a tearaway element.

It is a further object to provide a method for the formation of reversed folds in sheet metal suitable for the formation of a connection device for a handle used in opening means.

It is a still further object to provide a handle having a part to engage the material of the tearaway element as the handle is lifted to commence the opening of the container.

According to this invention there is provided in a container wall formed of relatively stiff thin sheet metal, opening means for the container comprising a tearaway element in the material of the wall, a weakened line bordering the tearaway element, a handle having at least one fixing tab secured to the tearaway element by a connection device, the connection device being provided by a channelled section formed in the tearaway element having walls comprising reverse folds in the material, the folds overlying the fixing tab on the handle. The channelled section in the tearaway element may be downwardly or upwardly directed. The tabs or tabs of the handle may be inside or outside the channelled section. The handle may have a part to engage a portion of the tearaway element adjacent the weakened line as the handle is lifted to cause the material to break at the weakened line and commence the opening of the container. The container may be further opened by use of the handle to cause the tearaway element to part from the remainder of the material along the weakened line. The invention is applicable to container walls formed either of tin-plate or aluminium and sheets of these materials may be of the thicknesses normally used in container manufacture.

The handle may be hinged so that when it is lifted, a front part rotates downwardly to cause an adjacent portion of the weakened line in the container wall to break through. This hinging may take place along an edge of the channelled section near to (and preferably parallel to or in chordal relationship to) the weakened line so that a portion of the tearaway element lying between the edge and the weakened line is bent down along the plane of the container. The said edge may be provided by a reversed fold in a side-wall of the channelled section underlying a portion of the tearaway element engaged by the front part of the handle. Especially in the case of a tinplate container wall the front part of the handle preferably has a generally spade-like shape comprising a nose portion flanked by wiper blades portions to cause the initial rupture of the weakened line and bend a portion of the tearaway element downwardly preferably about the edge of the channelled section to sever a further length of the weakened line. In this way a sufficient start is made in the opening to allow the remainder of the weakened line to be broken through by upward tearing achieved by an upward pull by hand on the handle.

There may conveniently be one fixing tab on each side of the handle for engagement by the connection device, and by means of the tabs a part of the handle may be secured to the container wall, the remainder of the handle being hingable with respect thereto.

The tearaway element may comprise a part, or substantially the whole of the wall e.g. the lid of the container. The tearaway element may be bordered by a weakened line in the form of a closed figure (i.e. a continuous weakened line) completely surrounding the tearaway element and may be wholly or only partly removed by the user. Alternatively the weakened line may be in the form of an open figure in which case the tearaway element would generally only be partially removable.

On the side opposite from the tearaway element, the weakened line may be bordered by a shoulder to assist
tearing action of the material of the wall along the weakened line as an upward pull is applied to the handle. Preferably the shoulder is adjacent the weakened line. The shoulder is provided by the weakened edge or by an edge of a battress comprising a reverse fold in the material. The shoulder may overlie the material so that after the initial opening of the container, upward pressure on the handle urges material in the region of the weakened line against the shoulder so that the material in this region is progressively broken through or parted. The battress when used also serves to strengthen the container in the region of the weakened line to avoid undue weakening of the container as a result of the provision of the opening means.

The weakened line may be in the form of a portion of narrow width and reduced thickness. It may be formed e.g. by a scored line or semi-sheared line in the material. The channelled section in the tearyaw element providing the connection device for the handle preferably has a pair of opposite side-walls comprising reverse folds formed in the sheet material which overlie and secure the fixing tab with the tabs of the handle.

The channelled section may be in the form of a closed figure in which case it may comprise an upwardly or downwardly directed recess in the container wall and the recess may have a pair of opposite side-walls as above described. Alternatively the channelled section may in continuous form in the container wall, only a part of it being used for engagement with the fixing tab or tabs of the handle, the remainder providing stiffening and strengthening for the wall. The said part may be in the form of an upwardly or downwardly directed recess and this may have a pair of opposite side-walls as above described. The remainder of the channelled section may have walls which continue the walls of the recess round the container wall so that the whole of the channelled section is in the form of an upwardly or downwardly directed recess which may be of constant cross-sectional shape. Alternatively the remainder of the channelled section may be of a different form e.g. an upwardly or downwardly formed bend of which the open side may face in a different direction from that of the recess and the bend may be of narrower cross section than the recess.

A continuous channelled section is advantageously formed parallel to the edge of the wall. For example in a circular lid, the weakened line may be formed inwardly of and parallel to the edge of the lid and a continuous channelled section may be of annular shape concentric with the edge of the lid and with the weakened line which is formed inwardly of and parallel to the edge of the lid.

A channelled section in the form of a closed figure may have straight parallel walls joined by end walls conveniently half-rounded. At last a part of the weakened line bordering the tearyaw element may have an arcuate shape and the channelled section may be chordal thereto.

The channelled section may be chordal both to the edge of a circular end wall of a container and to the weakened line which is formed inwardly of the edge and parallel thereto.

According to the invention there is provided a container wall formed of relatively stiff thin sheet material having opening means comprising a tearyaw element in the material bordered by a weakened line, a tab handle secured to the tearyaw element by a connection device, the device comprising a channelled section formed in the tearyaw element having walls formed by reverse folds in the material, the folds overlying at least one fixing tab provided on the tab handle, a part of the tab handle secured in fixed relation to the channelled section by the fixing tab, a front part and a finger grip on the tab handle hinged with respect to the said fixed part of the handle, the front part being positioned to engage the material of the tearyaw element adjacent the weakened line as the finger grip on the handle is lifted whereby as the finger grip is lifted the front part hinges downwardly and causes the weakened line to burst through locally and then bends down a portion of material between the weakened line and an edge of the channelled section into the container so as to further break through the material along the weakened line and thereafter as the handle is pulled the remainder of the weakened line is severed and so the tearyaw element is removed from the container lid.

Further according to the invention there is provided a method for the formation of reversed folds in sheet metal comprising forming an upstanding elongated protrusion in the metal, and reshaping the protrusion to form two triangular shaped ears which are flattened inwardly to provide reversed folds. The material may be clamped outwardly of the ears, and the ears partially flattened so that the inward walls of the ears bend inwardly and the outward walls of the ears extend to provide the reversed folds. The protrusion may be dome-shaped in which case preferably a valley section is formed between two upstanding triangular shaped ears when the protrusion is reshaped, and the valley section is compressed as the ears are partially flattened. The folds may be further flattened to secure a fixing tab or fixing tabs of a handle placed beneath the folds, the handle being comprised in opening means for a container e.g. a container wall according to the invention.

Yet further there are provided dies suitable for carrying out the foregoing method which includes a die having a centre plug portion to flatten the inverted valley section in the sheet metal, the centre plug portion being bounded by slanting walls to flatten and reshape the upstanding triangular ears.

There is also provided a method for the formation of reversed folds in sheet metal preferably from strip material comprising forming an upstanding channel section or bend of substantially curved cross section with a portion of the channel being of deeper section in such manner that in forming dies the metal may be freely drawn inwardly into the curvature of the cross section from the periphery of the metal, and reshaping the said deeper portion to form two upstanding substantially triangular shaped ears which are partially flattened inwardly to provide reversed folds. Conveniently the upstanding channel section or bend of substantially curved cross section may be circular and concentric with the edge of a circular sheet metal blank used e.g. in making a container lid. When the said deeper portion of the channel is reshaped, the remainder of the channel provides a stiffening bead. The folds may be further flattened to secure a fixing tab or tabs of a handle placed beneath the folds, the handle being comprised in opening means for a container lid e.g. a container lid according to the invention.

Still further according to the invention there is provided a method for securing a tab handle to sheet metal in the construction of opening means comprising forming in the sheet metal an upstanding channel or elongated bend of substantially curved cross section which may be conveniently circular and concentric with the edge of a circular tab handle of a container with a portion of the channel being of deeper section in such manner that in forming the metal may be freely drawn inwardly into the curvature of the cross section from the edge of the metal, with the said deeper portion thereafter being reshaped to form two upstanding substantially triangular shaped ears and providing for tab handle means comprised in opening means according to the invention with at least one fixing tab suitably shaped to co-operate in the reshaped portion and inserting said tab into the reshaped portion and compressing the triangular shaped ears so that the inward walls of the ears bend inwardly and the outer walls of the ears extend to provide reversed folds with the tab of the tab handle being securely reshaped and locked beneath the folds.
Still further according to the invention there is provided a method for securing a part of thin material to part of thin sheet metal in the construction of opening means for a container wall, comprising forming in the sheet material a channel or bead of preferably curved cross-section which may conveniently be circular or of other suitable configuration adjacent to the edge of the sheet with a portion of the channel being of larger section in such a manner that in forming dies the material may be freely drawn inwardly into the channel from the periphery of the sheet, the said larger portion thereafter being reshaped to form two upstanding, preferably, triangular shaped ears with a base wall therebetween, the aforementioned part of thin material, e.g. a fixing tab of a handle comprised in opening means according to the invention, being suitably shaped to co-operate in the reshaped portion of the channel so that when compressed the inward walls of the ears bend inwardly and the outer walls of the ears extend to provide reversed folds above the base wall with the part of thin material being securely reshaped and clenchched within the folds of the flattened channel. Where a handle is being secured to a sheet metal blank e.g. a lid, the handle may be provided with two oppositely directed tabs and the middle portions of the ears may be first flattened before assembly of the tab handle to provide clearance for the centre portion of the handle so as to reduce the overall depth of the handle and connection device in the sheet metal and so allow the blanks to be puck assembled prior to their assembly e.g. on can bodies.

Still further according to the invention there is provided a method for securing a part of thin material to thin sheet metal, e.g. securing a handle having fixing tabs to sheet metal in the construction of opening means for a container wall according to the invention comprising forming in the sheet an upstanding channel or bead of preferably curved cross-section which may conveniently be circular or of other suitable configuration adjacent to the edge of the sheet with a portion of the channel being of larger section in such a manner that in forming dies the material may be freely drawn into the channel from the periphery of the sheet, the said larger portion thereafter being reshaped to form a channel having two downstanding preferably triangular shaped ears, the top of the portion being formed to a flat wall, forming in the aforementioned part of thin material fixing tabs suitably shaped to co-operate over the reshaped portion and compressing the reshaped portion of the channel so that the inward walls of the ears bend inwardly and the outer walls of the ears extend to provide reversed folds above the sheet material with the fixing tabs being securely reshaped and clenchched beneath the folds of the flattened channel portion.

Also according to the invention there is provided a method for securing a handle to a circular sheet metal blank in the construction of opening means comprising forming in the blank an upstanding elongated dome-like bead of substantially curved cross-section adjacent to the edge of the blank and located in its radial direction, the said dome-like bead being reshaped to form a channel having two downstanding triangular shaped ears at the sides of the channel with the top of the portion being formed to a flat wall, providing a pair of fixing tabs on the handle suitably shaped to co-operate over the channel so that when the channel is compressed the inner side walls of the ears bend inwardly and the outer walls of the ears extend to provide reversed folds above the blank with the fixing tabs being securely reshaped and clenchched beneath the folds of the flattened channel.

Various forms of the invention will be described by way of example only, with reference to the accompanying drawings wherein:

FIG. 1 is a part perspective view of a container lid with opening means including a tearaway element with its handle and connection device;

FIG. 2 is a part cross-section view of the container lid shown in FIG. 1 taken on the line II—II;

FIG. 3 is a perspective view of a preferred form of handle prior to assembly;

FIG. 4 is a part perspective view of the container lid shown in FIG. 1 with its handle in the operative position to open the lid;

FIG. 5 is a part cross-section view of the lid shown in FIG. 4;

FIG. 6 is a part cross-section view of a portion of the tearaway element shown in FIG. 1 taken on the line VI—VI;

FIG. 7 is a similar view of the tearaway element to that of FIG. 6 showing the tearaway element in the process of being torn out of the container;

FIG. 8 is a part cross-section view of the first formation stage of the handle engagement means in the lid;

FIG. 9 is a part cross-section view of the second formation stage of the handle engagement means;

FIG. 10 is a part cross-section view of the third formation stage in press tool dies of the handle engagement means prior to pressing;

FIG. 11 is a part cross-section view of the third formation stage shown in FIG. 10 after pressing;

FIG. 12 is a part cross-section view of triangular shaped ears before compressing in dies to form the buttress of the opening means;

FIG. 13 is a part cross-section view of the lid with the handle shown being assembled in the lid engagement means;

FIG. 14 is a part cross-section view of a lid formed without a buttress;

FIG. 15 is a part perspective view of opening means for removing a portion of a lid including a tearaway element with its handle and connection device;

FIG. 16 is a part perspective view of a container lid with opening means including a tearaway element with its handle and another form of connection device;

FIG. 17 is a part cross-section view of the lid shown in FIG. 16 as it is being pulled out of a container;

FIG. 18 is a part perspective view of a further form of container lid with opening means including a tearaway element with its handle and connection device;

FIG. 19 is a part perspective view of the first stage of pressing the container lid shown in FIG. 18;

FIG. 20 is a part perspective view of the second stage of pressing the container lid shown in FIG. 18;

FIG. 21 is a perspective view of the handle prior to assembly;

FIG. 22 is a part cross-section view of the handle partly assembled on the lid;

FIG. 23 is an enlarged part cross-section view of a tearaway element;

FIG. 24 is a part perspective view of alternative opening means for a lid with its handle and connection device;

FIG. 25 is a part perspective view of a pressing for the lid shown in FIG. 24;

FIG. 26 is a perspective view of the handle;

FIG. 27 is a part perspective view of another form of opening means for a lid with its handle and connection device;

FIG. 28 is a part perspective view of a pressing for the lid shown in FIG. 27; and

FIG. 29 is a perspective view of the handle.

In FIG. 1 there is shown a container body 17 and a lid or end cover 19 made of tinplate or other suitable material. Lid 19 is secured to container 17 by means of a conventional lock seam 21. Opening means 23 including a tearaway element in the form of a movable disc 33 and a handle 25 secured to it by a connection device 27 is provided in lid 19.

As shown in FIGS. 1 and 2 the opening means further comprise a buttress 29 at the base of rim 31.
of lid 19 and a scored line 35 constituting a weakened line bounding disc 33 at the position of a shoulder 37 on the edge of the buttress 29. An annular strip 38 of the mating forming side walls adjacent to the scored line on the outward side is closely overlain and reinforced by the buttress 29. Buttress 29 is formed in dies as will hereinafter be explained. Connection device 27 comprises a round-ended upwardly directed channel section or recess 39 in chordal relationship to rim arc 32, the channel section comprising side walls 41 in the form of recessed folds providing recesses 43 which afford engagement means 45 for securing fixing tabs of the handle 25.

In FIG. 3 handle 25 made from tinplate, or other suitable material, comprises a wall 47, including a portion 49 which is suitably shaped with a hemmed edge 51 which can be easily gripped by the user's fingers and a front spade shaped part comprising a central nose portion 55 merging through curved walls with portions of a wiper blade 56 disposed on either side thereof, the front part being hingeably connected to a part 53 securable in fixed relation to the channel section 39 by two curved extension fixing tabs 57 and 59. Slits 61 and 63 are provided in wall 47 to allow the handle when lifted to bend on a hinge line 65 (shown double dotted). A stiffening bead 67 is provided in wall 47.

The lid and opening device is press formed in a sequence of suitable dies and the method of forming the channel section 39 is shown in FIGS. 8, 9, 10 and 11. In FIG. 8 a lid blank 69 is formed in suitable dies with protuberance 71 of sufficient depth to provide the material for reshaping to desired ear formations 73 shown in FIG. 9 made in the next set of dies, and sufficiently elongated to provide a horizontal lid adjacent to the desired length. The ear formations 73 comprise two uppermost triangular shaped ears 75 and 77 having vertical inward walls 81 and 83. Between walls 81 and 83 is a base wall 85 provided with an inverted valley section 87. In FIGS. 10 and 11 are shown dies 88 and 89, the top die 88 having a top portion 91 and a center portion 93 provided at its base with two slanting walls 95 and 97 and a center plug portion 99. Center portion 93 slides between two pressure pads 101 and 103. Bottom die 89 is a flat platen on which is positioned the lid blank 69. Two springs 102 and 104 are provided between top die 88 and pressure pads 101 and 103.

In operation top die 88 approaches bottom die 89 compressing springs 102 and 104 so holding pressure pads 101 and 103 tightly onto the lid blank 69 on bottom die 89. The center portion 93 of the ears being extended 75 and 77 and flattened valley section 87. This process causes the ears 75 and 77 to slightly flatten collapsing walls 81 and 83 and lengthening base wall 85 to a flat condition thus providing semi-reversed folds 105 and 107 as shown.

In FIG. 12 is shown buttress 29 prior to being formed to the shape shown in FIGS. 1 and 2. The triangular ear shaped formations are made in suitable dies with ear 109 upstanding from the surface of lid 19 made at the base of rim 31 and ear 111 projecting below the surface of lid 19, the ears providing between them a vertical wall 113. Similar types of dies to those used for forming the recess 39 compress the ears 109 and 111 to collapse vertical wall 113.

Handle 25 is assembled in recess 39 as shown in FIG. 13. The curved extension tabs 57 and 59 are inserted in the recess and the assembly flattened in suitable dies with the tabs being secured interlocked in engagement means 45 (see FIGS. 1 and 2). In this manner the loading pressure on the connection when the handle is lifted is distributed over a considerable portion of the channelled section 39. Lid 19 is assembled on the container body 17 by means of lock seam 21.

To operate the opening device, handle 25 is lifted as shown in FIGS. 4 and 5, causing the nose portion 55 to swivel downwardly about hinge line 65 along the length of an underlying supporting shoulder 119 of connection device 27 thus exerting pressure along bend line 66 (shown by dotted lines) on the curved surface between shoulder 119 and buttress 29 to initially burst through scored lines 35. At the same time wiper blade 56 presses on segment 121 and bends along this shoulder 119 down into the container, to break through the scored line 35 along the length of rim arc 32. In this manner the material is easily broken through and its resistance to bending along bend line 66 considerably diminished by the support of the underlying shoulder 119. Apart from the broken scored line in rim arc 32, the remainder of the scored line round the buttress 29 remains undisturbed as shown in FIG. 6. Next, handle 25 is pulled upwardly to apply upward pressure to the disc 33 which causes scored lines 35 to be sheared through against shoulder 37 of buttress 29 simultaneously on each side of the connection device 27 (see FIG. 7) until tearaway element or disc 33 is fully torn out of container body 17. The shearing action is assisted by the reinforcement for the strip 38 provided by the buttress 29. By such means the disc 33 is easily and safely removed from the container.

For such easily rupturable material such as aluminium, buttress 29 may be omitted from the opening means. In FIG. 14 a lid 123 is provided with a scored line 125 adjacent to and forming part of the rim 113. A connection device 129 is provided for attaching a handle (not shown) in the manner as previously described. Operating the opening means enables the disc to be removed from the container. This construction however, is more easily damaged than when a buttress is provided as the folds comprising the buttress strengthen and stiffen up the rim portion of the lid of the container.

In FIG. 15 a modified form of opening means is shown as applied to the removal of a portion only of the lid. A container body 133 and a lid 135 are secured together with a lock seam 137. The lid 135 is provided with opening means comprising a tearaway element 139 having a connection device 141 securing a handle 143. Tearaway element 139 is preferably made in an approximately triangular configuration and it is bounded by a buttress 145 comprising reversed folds 147 providing a shoulder 149 adjacent to and forming part of the rim 113. A scored line 151 which is in arcuate form where parallel to the edge of the lid. The channelled section providing the connection device 141 is chordal to the arcuate portion of the scored line. Handle 143 is secured in connection device 141 as previously explained. The portion 153 is bent downwardly about hinge line 155 and underlying shoulder 157 of connection device 141 to initially burst through scored line 151 and then with wiper blade 162 bend down segment 159 along bend lines 160 into the container by the pressure of wiper blade 162 on the segment so breaking through the portion of scored line in rim arc 164. Pulling the handle 143 upwardly shears off the remaining portions of scored line 151 against shoulder 149 so removing the tearaway element from the container. For easily rupturable material such as aluminium the buttress 145 may be omitted from the construction although, to some extent, this is thereby weakened.

In FIGS. 16 and 17 is shown a lid of a container made of tinplate or other suitable material having another form of connection device. Container body 161 is joined to a lid 163 by a lock seam 165. Lid 163 is provided with opening means 167 comprising a removable portion 169 and a removable portion of the lid 171 forming a tearaway element bounded by a scored line 173 at the position of a shoulder 175 is provided by the buttress 169. Connection device 177 comprises a channel section 179 having two reversibly bent side walls 181 and 183, the channel section being formed concentrically with the edge of the removable portion 171 and the buttress 169 and near to the scored line 173.
Particularly for material of fairly hard temper it is preferable to provide a circular or other suitably shaped continuous channel section concentric or otherwise similarly disposed to the rim of the lid (as is provided in this embodiment) to facilitate the forming of the lid by means of dies and to provide a support for the lid material under pressure of the dies. This facilitates the press forming operations as the lid blank material under pressure of the dies can flow evenly into the channel at a constant rate of movement in the direction of the centre of the blank from its periphery so avoiding the setting up of unbalanced stresses which can result in wrinkling, splitting and tearing of the sheet metal.

Location of the handle in the channel section is also facilitated in the manufacturing process as this can take place at any point of the circumference of the section, the channel section at this stage providing an upwardly directed recess of constant cross section right round the lid.

Handle 185 in FIGS. 16 and 17 is made from tinplate or other suitable material and it comprises a wall 187 of which one end may be suitably formed as a ring 189 to facilitate being gripped by the user's fingers. The ring 189 has suitable hemmed edges 191 and 193. Wall 187 has a nose wall 195 and a v-shaped extension 197 and 199 shaped to fit in channel 179. Two side portions 201 and 203 are provided in wall 187 together with two slits at 205 and 207. Side portions 201 and 203 extend inwardly beyond tabs 197 and 199 and they are provided with stiffening beads 209 and 211. A centre stiffening bead 213 may also be provided in wall 187.

As previously explained handle 185 is secured to connection device 177 in press tools. In the pressing process the side walls 181 and 183 are collapsed to clamp tabs 197 and 199 in channel section 179 with side portions 201 and 203 above the inner edge 215 of the channel. At the same time a stiffening bead 217 is provided in channel section 179 on each side of tabs 197, 199 as the section is flattened in the dies.

The opening of the container is illustrated in FIG. 17 and is similar to the opening operations previously described. Bend lines for the metal between the edge of channel section 179 and the scored line 173 are shown at 216.

In FIG. 18 there is shown a container body 219 and a lid 221 made of tinplate or other suitable material. Lid 221 is secured to the container body 219 by means of lock seam 223. Opening means 225 provided in lid 221 comprises a tearaway element in the form of a central portion of disc 225 with a weaken line in the form of a semi-sheared line 229 and a tab handle secured to it by a connection device 223.

As shown in FIGS. 18 and 22 the opening means further comprises a buttress 235 at the base of a rim 237 of lid 221 with the semi-sheared line 229 (see FIG. 23) constituting a weakened line bounding disc 227 at the position of a shoulder 239 on the edge of buttress 235.

Material 240 radially outwardly of the semi-sheared line and adjacent thereto is closely overlain and reinforced by buttress 235. Connection device 223 comprises a wide upwardly directed channel section 241 with inwardly bent side portions 243 and 245 (side views 18 and 19) for securing handle 231. Walls 243 and 245 merge into a channel section 247 which provides a stiffening bead 249. Bend line 250 for lid material bent downwardly in the initial opening movement later described for most of its length is supported by an edge 316 of a locking ledge 317 adjacent to the semi-sheared line 229.

The first stage pressing 251 for lid 221 as shown in FIG. 19 is formed in suitable dies. It has an ear formation 253 comprising a slanting wall 255 and a vertical wall 257. Raised channel section 247 has a more highly raised and widened portion 259 formed essentially parallel to ear formation 253. Between channel section 247 and ear formation 253 is formed an inverted valley section 261. The middle portion of pressing 251 has a shallow depression 263 for stiffening the centre of the lid.

In FIG. 20 the second stage pressing 265 formed in suitable dies has the ear formation 253 shown in FIG. 19 flattened to form buttress 267. In the process valley section 261 shown in FIG. 19 is flattened to provide extra material under vertical wall 257 to facilitate this collapsing under the die pressures. At the same time formation 259 of channel section 247 is reshaped in the dies to provide ear formations 269 and 271 both of which are flattened down at their centre portions to provide clearances 273 and 275 and thus also providing two pairs of engagement means 277, 279 and 281, 283 for securing tabs 285 and 287 of handle 221 (see FIGS. 18 and 22). Between the ear formations 269 and 271 is provided a base wall 289, the ear formations merging into channel 247 at each end of the base wall 289.

In FIG. 21 tab handle 231 made from tinplate or other suitable material comprises a wall 291 of which one end may be suitably formed as a ring 293 with hemmed edges 295 and 297 providing a finger grip. Handle 231 is also provided with a stiffening bead 299 having a nose portion 301, a hinged line 303 (shown double dotted) a wiper blade 305 and two oppositely disposed curved fixing tabs 285 and 287. Slits 307 and 309 are provided each side of bead 299 to allow engagement of the nose portion and wiper blade. Slits 308 and 310 are provided to allow the front edges of the fixing tabs to be secured under the locking ledge 317 adjacent to the semi-sheared line 229 (see FIG. 18). Small stiffening beads 311 and 313 may be provided on wall 291.

Handle 231 is first assembled on lid 221 as shown in FIG. 22 by placing its stiffening bead 299 in clearances 273 and 275 (see FIG. 20) with curved tabs 285 and 287 inserted between engagement means 277, 279 and 281, 283 respectively, the assembly being next folded together as shown in FIG. 1 in suitable dies. In the process the ear formations are reshaped to provide locking ledge 317 and 319 with the curved tabs 285 and 287 straightening out as the edges of curved tabs 285 and 287 become trapped under locking ledges 317 and 319. In this manner the tab handle is positively secured to the lid, the tab connections ensuring that the load when lifting the handle is distributed over a much wider area of the lid than is possible with any form of rivetted or equivalent connection.

The opening device is operated as previously explained, the spade-like nose portion 301 and wiper blade 305 rotating downwardly ahead of the fixing tabs 385, 387 as the finger grip is lifted causing initial rupturing of the weakened line followed by folding down of the segment of the lid between bend line 250 and the arc of weakened line 229 which it intersects. This bending is facilitated by the underlying reverse folded edge 316 which acts as a folding bar and it further separates the material along the arc of the weakened line. Without the wiper blade 305, that is using only centre bead 299 and nose portion 301, only a local break through of the segment would be made in tinplate because of the resistance to bending of tinplate (unlike aluminium). It is most desirable in tinplate that the full arc of the weakened line bounding the segment should be broken through otherwise when the handle is pulled to complete the opening of the container by tearing out the tearaway element against the buttress 235, the remaining portion of the weakened line would not start to tear. The wiper blade 305 having a greater width than the nose portion 301 ensures that a sufficient length of the weakened line is separated.

A small breakthrough of the weakened line in aluminium might be sufficient to enable subsequent upward tearing of the tearaway element but not in tinplate.

In FIG. 23 is shown the weakened line made by semi-shearing the material adjacent to shoulder 239 of buttress 235. Semi-sheared lines 229, 249 and 263 are shown which under controlled compression partly thins and partly shears through the lid material as shown, in the process forming step 321. In this way, opening means 225 is pro-
vided with a weakened portion leaving a residual of material 0.004 in. which can be easily severed as the centre portion 237 is pulled out of the lid. A semi-sheeted line similar to the line 229 may be used in place of a scored line in any of the embodiments of the invention previously described.

In FIG. 24 a lid made of thin sheet material 323 has a modified connection device 325 for a tab handle 327 comprising a downwardly directed (upwardly formed) channel section or recess 329 with a top wall 331 and the side walls inwardly shaped to provide tab fixing means, having locking ledges 333 and 335 and engagement recesses 337 and 339. Channel section 329 merges at each end into a smaller channel section 341 which provides an opening for the handle 343.

In FIG. 25 the lip pressing 345 is reshaped from a protuberance as previously explained to form a channelled recess 347 having a top wall 349 and two side walls 351 and 353. At the base of the side walls 351 and 353 are provided two ear formations 355 and 357. Tab handle 327 as shown in FIG. 26 is made of tinplate or other suitable material and has a base wall 359 and a ring handle 361 with hemmed edges. Side walls comprising fixing tabs 363, 365, 367 and 369 are provided on wall 359 and is also a stiffening bead 371 with a nose portion 373. Stiffening beads 375 are provided on each side of bead 371. The front portion of wall 359 provides a wiper blade 379 and a hinge line 381 (shown by dotted lines).

Handle 327 is assembled on the outside of channelled recess 347 with fixing tabs 363, 365, 367 and 369 engaging over channel walls 351 and 353 and the assembly is compressed in suitable dies. In the process ears 355 and 357 are flattened causing walls 351 and 353 to collapse inwardly in the process securely clinching over the handle fixing tabs as shown in FIG. 24.

The opening device is operated as previously explained. In FIG. 27 an alternative form of connection device for a lid 383 and a handle 385 made of tinplate or other suitable material is shown. It comprises a downwardly directed chordally formed section or recess 387 having tab fixing means similar to those shown in FIG. 24. The channelled section is positioned in the radial direction on lid 383. The portion of the channel adjacent to the weakened line (not shown) may have a substantially square end wall to provide a supporting shoulder 389 for the wiper blade 391 of handle 393 (shown by dotted lines). There is also provided a ring handle 405 as shown. Two slits 407 and 409 are provided on the side of the blade 399.

In FIG. 28 the lid pressing 411 is reshaped from a dome-like protuberance. It comprises a channel section 413 having a top wall 414 side walls 415 and 417, a front wall 419 and a curved end wall 421. At the base of side walls 415 and 417 are provided ear formations 423 and 425. Handle 385 is assembled on channel section 413 with fixing tabs 395 and 397 engaging side walls 415 and 417 and the assembly is then compressed in suitable dies to provide the connection device as shown in FIG. 27, reverse folds formed by the walls 415, 417 overlying interunited lips formed by the reshaped fixing tabs 395, 397.

The opening device is operated as previously explained. It will be understood that the lever action of the tab handle in all the embodiments of the invention shown by the drawings has its fulcrum point beyond the tab fixing device which therefore is not subject to the strain caused by bending the tearaway element through and across fixing devices which hitherto have been used for securing tab handles to lids of containers. The underlying shoulder ensures controlled bending of the portion of the tearaway element between the channelled section and the weakened line as the handle is first lifted and initial separation along the weakened line takes place. The part of the handle engaging said portion of the tearaway element makes extended rather than point contact with the sheet material and so acts as a wiper blade acting on the material against the shoulder which acts as a folding bar.

The connection device can be made in tinplate without the use of any lubricants on the sheet material which is in clear distinction from the manufacture of rivet bosses in aluminum lids previously mentioned in which a wax or lacquer has to be applied to the aluminum prior to the process of forming the rivet.

The invention can be applied to the manufacture of other walls of containers besides the lid, whether of circular, oval, rectangular or other shapes. The channel section may be made of a shape to correspond with the edge of the container wall and may thus be made in non-circular forms such as oval or rectangular with preferably rounded corners. The invention may be used with containers formed of materials e.g. glass or earthenware that are different from the materials of the lid.

What I claim and desire to secure by Letters Patent is:

1. In a container wall formed of relatively stiff thin sheet material, opening means for the container comprising a tearaway element in the material of the wall, a weakened line bordering the tearaway element and a handle having a pair of aligned fixing tabs extending transversely to the handle, one on each side thereof, the handle being secured to the tearaway element by a connection device, the connection device being provided by an elongate channelled section formed in the material of the tearaway element and extending adjacent the weakened line, the channelled section having opposed side walls comprising reverse folds in the material providing recesses, the folds overlapping the channel and the length of the fixing tabs engaged within the recesses and securing the handle to the tearaway element.

2. A container wall according to claim 1 wherein clearances are provided in the opposed side walls of the channelled section to receive a central part of the handle, the reverse folds on each side of the said central part of the handle overlying the fixing tabs.

3. A container wall according to claim 1 wherein the handle on the opening means comprises on each side a part secured in fixed relation to the connection device by one of the fixing tabs and hingedly connected to the other of said fixing tabs as the handle is first lifted or rotated downwardly as the finger grip is lifted to cause a portion of the weakened line adjacent the end of the front part to break through.

4. A container wall according to claim 1 wherein the channelled section is in continuous form in the container wall having an inner wall enclosing a part of the tearaway element, part of the channelled section providing the opposed side walls and the remainder, merging with said side walls, comprising a bead, the bead providing strengthening and stiffening for the wall.

5. A container wall according to claim 4 in the form of a circular lid wherein the channelled section is annular and concentric with both the edge of the lid and the weakened line which is formed inwardly of and parallel to the edge of the lid.

6. A container wall according to claim 1 wherein the elongate channelled section is in the form of a closed figure having substantially parallel side walls joined by curved end walls, the fixing tabs being located within the channelled section and the parts of the reverse folds in the side walls which overlie the fixing tabs being inwardly directed towards each other.

7. A container wall according to claim 6 wherein at least a part of the weakened line bordering the tearaway element has an arcuate shape and the channelled section is chordal thereto.

8. A container wall according to claim 6 wherein the
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13. A container wall according to claim 6 made from tinplate.

14. A container wall according to claim 6 made from aluminum sheet.

11. A container wall according to claim 3 wherein the front part of the handle has a generally spade-like shape comprising a nose portion flanked by wiperblade portions to cause the initial rupture of the weakened line and to bend a portion of the tearaway element downwardly to sever a further length of the weakened line.

15. A container wall according to claim 14 wherein the uprising elongate protuberance is of substantially curved cross-section and in continuous form round the perimeter of the wall, a portion of the protuberance being of deeper section, the protuberance being formed in such a manner that in forming dies the metal is freely drawn inwardly into the curvature of the cross-section from the periphery of the metal, said deeper section being reshaped to form the two triangular shaped ears.

16. A container wall according to claim 15 made from a circular sheet metal blank wherein the uprising elongate protuberance is made circular and concentric with the edge of the blank, and when the portion of deeper section is reshaped, the remainder of the protuberance provides a stiffening bead.

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