Dec. 9, 1969 R. W. MURDOCK 3,483,355

WELDING

Original Filed Sept. 29, 1965 2 Sheets-Sheet 1

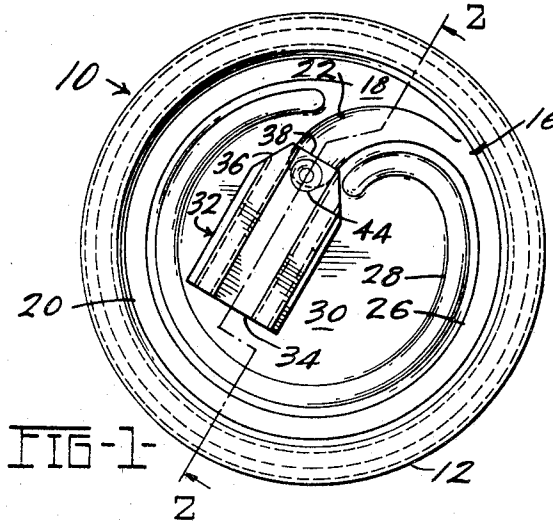


FIG-1-

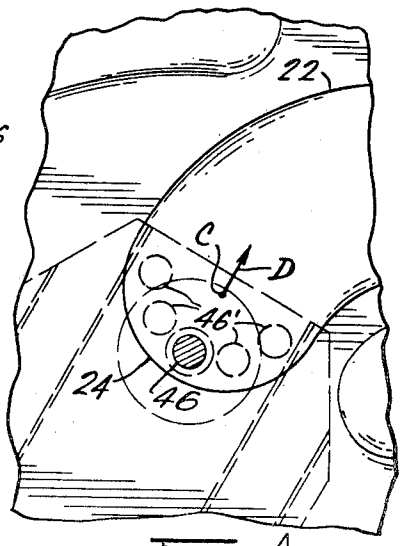


FIG-4-

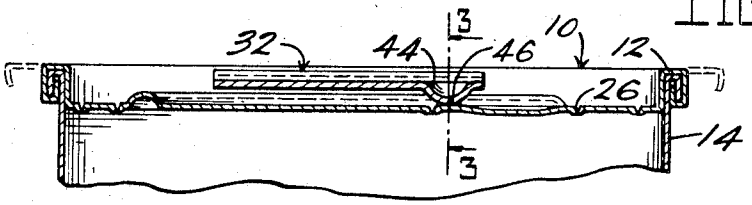


FIG-2-

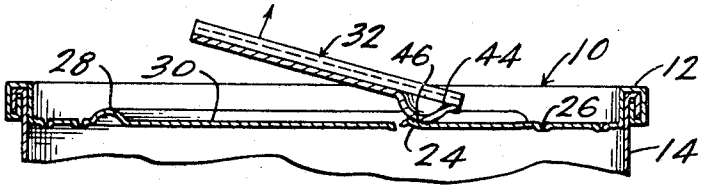


FIG-5-

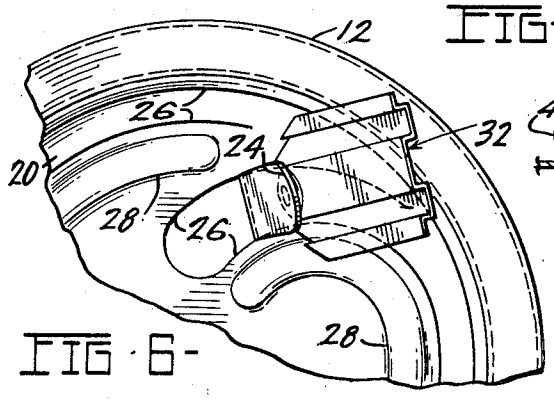


FIG-6-

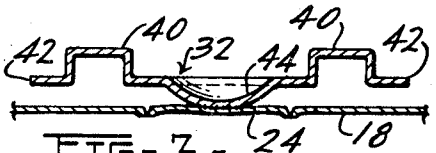


FIG-3-

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WELDING

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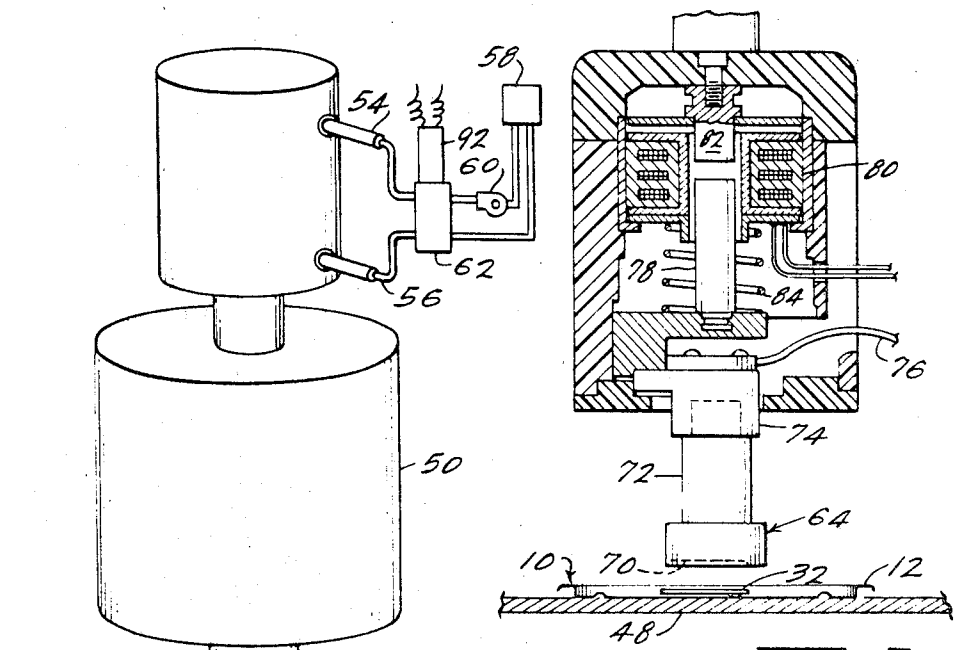


FIG-8-

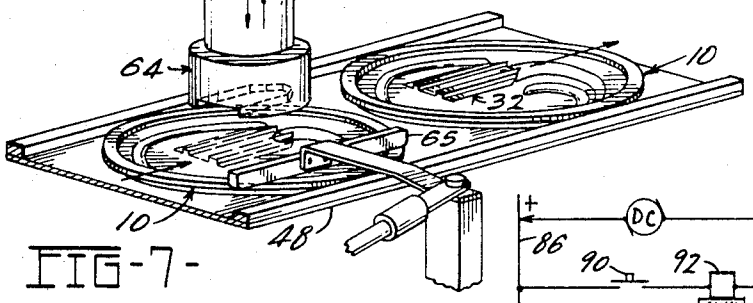


FIG-7-

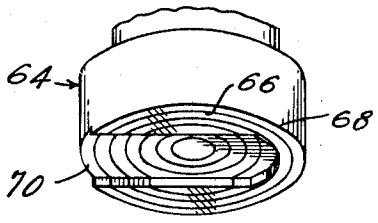


FIG-9-

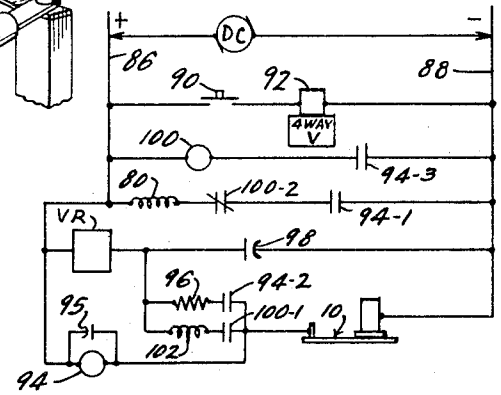


FIG-10-

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3,483,355

WELDING

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Original application Sept. 29, 1965, Ser. No. 491,154. Divided and this application June 16, 1967, Ser. No. 646,701

Int. Cl. B23k 9/00, 11/04

U.S. Cl. 219—137 2 Claims

ABSTRACT OF THE DISCLOSURE

Opening tabs are welded to an end portion of a tear strip of a metal can lid by a drawn arc welding method. The opening tabs preferably are welded close to an edge of the tear strip to enable the lid to be opened more easily.

This application is a division of my application, Ser. No. 491,154, filed Sept. 29, 1965, and allowed Apr. 19, 1967, now Patent No. 3,339,790.

This invention relates to lids for containers such as tin cans and more particularly ot such lids with opening tabs welded thereto.

Containers, particularly cans for food and drink, frequently are now made with tabs affixed thereto by means of which the cans are opened by hand without the requirement of a can opener. Heretofore, the tab has commonly been affixed to the lid by forming a hole in the tab and by forming an upwardly-extending projection on the lid. The projection was then inserted through the opening and peened over to rivet the tab to the lid, the rivet being a structurally integral part of the lid. This technique of affixing the tab has had several disadvantages. The method of attachment has been relatively slow and has been limited to the use of certain metals, particularly aluminum, for the can lid, since the metal has had to be highly ductile in order for the rivet projection to be formed therein. Furthermore, the can lids have been somewhat difficult to open with this type of tab because, as will be more apparent later, the tab has had to be located centrally with respect to a starting end of the opening strip scored in the top of the can. This meant that a large part of the scored line separated all at once as the tab was lifted, requiring considerable extra force for the initial opening step.

The present invention provides a new lid and opening tab in which the tab is welded to the lid to enable the tab to be attached rapidly and inexpensively. The lid also can be made of other metal than aluminum since the ductility of the metal is not important. Further, with the new tab and the welding technique, the tab can be attached to the lid in an off-center position adjacent the score line thereon so that only a small portion of the score line is initially parted, requiring a minimum of force.

It is, therefore, a principal object of the invention to provide a method for attaching an opening tab to a can lid more rapidly and inexpensively than heretofore.

Another object of the invention is to provide an attachment for an opening tab and can lid which does not require that the lid be made of soft, ductile metal.

Still another object of the invention is to provide a can lid with an opening tab affixed thereto in a position which enables the lid to be opened with much less force than heretofore required.

Numerous other objects and advantages of the invention will be apparent from the following detailed description of a preferred embodiment thereof, reference being made to the accompanying drawings, in which:

FIG. 1 is a plan view of a scored can lid, prior to being assembled with a can, and an opening tab affixed to the lid in accordance with the invention;

FIG. 2 is a somewhat enlarged view in transverse cross section taken along the line 2—2 of FIG. 1;

FIG. 3 is a further enlarged view in vertical cross section taken along the line 3—3 of FIG. 2;

FIG. 4 is a greatly enlarged, fragmentary view of a portion of the lid and a portion of the opening tab, showing the position of attachment of the tab to the lid;

FIG. 5 is a fragmentary view in vertical cross section similar to FIG. 2 but showing the opening tab and lid in a partly opened position;

FIG. 6 is a fragmentary plan view of the can lid with the tab pulled farther than in FIG. 5 to open the lid further;

FIG. 7 is a partly schematic view in perspective of apparatus for affixing the tab to the lid;

FIG. 8 is a view in vertical cross section of a welding tool of the apparatus shown in FIG. 7;

FIG. 9 is a view in perspective of a chuck of the welding tool; and

FIG. 10 is a wiring diagram of an electrical source and controls for the welding tool.

As shown in FIGS. 1–6, a can lid capable of being opened withon a can opener is indicated at **10** and includes a rim **12** by means of which the lid can be connected to a can body **14** in a conventional manner, as shown in FIG. 2. The manner in which the lid is connected to the body is not part of the invention and the rim **12** can be of the usual design, although preferably being slightly higher. The lid **10** has an opening strip **16** of spiral configuration, in this instance, which includes a terminal portion **18**, a peripheral portion **20** adjacent the rim **12**, and an inwardly-extending starting portion **22** terminating in a rounded initiating or leading edge **24**. The opening strip **16** is defined by a score line **26** which extends partly through the thickness of the metal of the lid **10** to enable it to be more easily separated. A reinforcing rib **28** also is of spiral configuration and lies adjacent the opening strip **16**, separating it from a central portion **30** of the lid. The reinforcing rib **28** stiffens the central portion **30** and reduces its tendency to bend as the strip is pulled and bent outwardly.

An opening tab **32** is affixed to the lid **10** by being welded to the inwardly-extending portion **22** near the edge **24**, as will be discussed in detail subsequently. In the specific form shown, the tab **32** is of sheet metal from 0.011 to 0.017 inch in thickness and preferably from 0.012 to 0.015 inch. It has been found that thinner stock will bend too easily when the lid is opened and possibly even burn through at the weld, whereas thicker stock is unnecessary and increases the overall cost of the lid. As shown particularly in FIG. 1, the tab **32** has a squared free end **34** and a tapered fastened end **36** terminating in a short edge **38**. The length of the short edge **38** preferably is substantially no greater than the width of the inwardly-extending portion **22** of the strip **16**, over which the edge **38** of the tab is positioned. Particularly, the end **36** is tapered to space the edge **38** from the reinforcing rib **28**, eliminating the corner which might otherwise contact or almost contact the rib **28** and cause arcing therebetween rather than at the desired point of attachment.

Reinforcing ridges **40** extend longitudinally of the tab **32** near side edges **42** and should extend at least to positions transverse to a portion of an attaching dimple or projection **44** to prevent bending of the tab as it is pulled upwardly. The dimple **44** is located at the tapered end **36** of the tab **32** between the ridges **40** and near the short edge **38**. The dimple **44** preferably is spaced

slightly from the short edge **38** but can be tangential thereto or even intersect the edge slightly. The size of the dimple **44** is very important. As shown, the dimple or projection is generally arcuate in vertical cross section taken longitudinally of the tab and has a radius of from three-thirty-seconds inch to one-fourth inch. The dimple **44** also should extend downwardly below the plane of the main handle portion of the tab a distance of from one-thirty-second inch to one-fourth inch. The bottom of the dimple **44** can be slightly flattened if desired to provide a slightly broader base for the weld. The base should not be too large, however, since the larger size increases the area of attachment of the dimple to the lid and increases the chance for this area to incorrectly bridge the score line forming the leading edge **24**. It is even more important that the dimple should not be too small in diameter or too sharp at the base since this will concentrate the weld current excessively and cause the lid **10** to be burned through at the point of attachment or at least destroy the protective coating on the metal at the lower surface thereof, thereby leaving the lid susceptible to attack by the contents of the can.

The dimple **44** preferably is attached to the inwardly-extending portion **22** of the strip at a small shaded area **46**, as shown in FIG. 4. The area of attachment preferably is located adjacent the leading edge **24** and is out-of-center or eccentric wtih respect to the geometric center of the edge **24**, so as to be much closer to one portion of the edge than other portions. This is accomplished by locating the area **46** between the center of curvature designated C and the leading edge **24**, with the area being preferably closed to the edge than the center C, but not so close, of course, as to overlap the edge **24** and partially contact the central portion **30** of the lid.

The leading edge of the strip **16** may be defined as any portion of the strip edge facing in a direction at least partially opposite to the direction in which the strip **16** is pulled, represented by an arrow P in FIG. 2, and extending transversely to this direction. Ideally, the area **46** should be near a portion of the edge which is perpendicular to the direction P. While, with the rounded edge **24**, the preferable position of the area **46** is symmetrical with respect thereto, the area can be located to one side or the other of this position, as indicated by the dotted areas designated **46'**. Whether the edge **24** is arcuate, triangular, square, or whatever, the area **46** will be satisfactorily positioned if the portion of the edge to which it is the closest is a leading edge as defined above. As noted in FIG. 4, even the extreme two dotted areas **46'** are adjacent leading edge portions facing partially away from the direction P and transversely to this direction.

With this positioning, whenever the tab **32** is raised, a relatively concentrated force will be applied to that part of the score line representing the edge **24** adjacent the area **46** or **46'** and thus initiate separation of the score line at a very small portion thereof. In contrast, with the integral rivet type of tab connection heretofore employed, the rivet had to be located at the center of the edge **24** in order not to rupture or separate the score line as the rivet projection was being formed. Consequently, when the tab was subsequently lifted, substantially the entire leading edge **24** around the periphery separated at once with a definite popping sound and with considerable force being required. The large initial force also was needed because the parting was accomplished under tension rather than shear. By separating only a small portion of the score line at a time by shearing, the force required to initiate the opening of the lid is a fraction of the force heretofore required.

Apparatus for welding the tabs to the lids is shown in FIGS. 7 and 8. In this instance, the lids **10** are supported and aligned by a guide **48** beneath a welding tool **50** which is moved toward and away from the lids **10** by a hydraulic cylinder **52**. The cylinder **52** is of the double-acting type, moving the tool **50** toward the lid **10** when fluid is supplied under pressure to an upper line **54**, and moving the tool away from the lid when fluid under pressure is supplied to a lower line **56**. As schematically shown in FIG. 7, the fluid can be supplied from a reservoir **58** through a pump **60** to one of the lines **54** and **56** by an electrically controlled four-way valve **62**. When fluid is supplied through one of the lines, it is returned through the other of the lines to the reservoir **58**. In this instance, when the valve **62** is not energized, the fluid under pressure supplied to the line **56** so as to position the tool **50** above the lid to be welded.

The tool **50** includes a magnetic chuck **64** consisting of a plurality of concentric rings **66** and **68** as shown in FIG. 9 with the lower surface of the chuck having a recess **70** of a contour to receive the tab **32**. The tab can be quickly assembled with the chuck **64** by being slipped into the recess **70** with the tapered end forward. In this manner, the tabs can be welded at a relatively high rate of speed because of the quick loading made possible by the magnetic chuck. After the tab is welded to the lid, and the tool **50** is raised, the tab is automatically separated from the chuck **64**, the lid and affixed tab being held down by a suitable electrical contact **65**.

The chuck **64** is affixed to a connecting leg **72** which is electrically connected to a cable clamp **74** to which a welding cable **76** is affixed. The cable clamp **74** is connected to a movable core **78** which extends into a lifting coil **80**. When the coil **80** is energized, it pulls in the core **78** against a stop **82**, and when the coil is de-energized, a plunge spring **84** moves the clamp **74** downwardly until the tab **32** engages the lid **10**, with the welding arc preferably applied between the tab and the lid during the plunge stroke. The welding current establishes a molten pool of metal at the extremity of the dimple **44** and at the closest portion of the lid **10** with the molten metal joining the two pieces when they are placed in contact under pressure at the end of the plunge stroke.

The operation of the tool **50** and the ram **52** can be controlled with a circuitry shown in FIG. 10. Accordingly, a source of direct current is established between leads **86** and **88**. When a manually-controlled operating trigger **90** is closed, power is supplied to a coil **92** of the four-way valve **62** to cause the cylinder **52** to move the tool **50** downwardly until the tab carried by the chuck **64** moves into contact with the lid **10**; specifically, the dimple **44** engages the inwardly-extending portion **22** of the strip. When this occurs, a circuit is established through a control relay **94**. This causes normally-open contacts **94–1** to close and complete a circuit through the lifting coil **80**, thereby retracting the tab from the lid. The relay **94** can be held in during the welding cycle by a capacitor **95**, positioned thereacross. At the same time, a pilot arc is established between the tab dimple and the lid by the closing of normally-open contacts **94–2** which establishes a circuit through a resistance **96** across a main capacitor **98**.

The control relay **94** has a third set of normally-open contacts **94–3** located in series with a contactor **100** which is energized when the contacts **94–3** are closed. The contactor **100** then closes heavy contacts **100–1** thereby to establish a main welding arc through an impedance **102** and across the tab and lid to form the molten pools of metal thereon. This arc is established by the capacitor **98**, which arc is of short duration and effects a weld without destroying any protective coating on the underside of the lid. At approximately the time the main welding arc is established, contacts **100–2** in series with the coil **80** open to de-energize the coil **80** and enable the plunge spring **84** to move the tab toward the lid and complete the weld. The relay **94** is subequently de-energized, when the trigger **90** is released and the capacitor **95** is discharged, to open its corresponding contacts, de-energize the contactor **100**, and return the welding circuitry to its original condition. At this time, the capacitor **98** is recharged to a predetermined voltage by a voltage

regulation circuit designated VR, as discussed more fully in Glorioso Patent 3,136,880, for example.

When the trigger **90** is released, the tool **50** is raised and the tab separates from the magnetic chuck **64**, remaining with the lid **10**. A new tab can then be inserted quickly into the recess **70** of the chuck **64** and a new lid positioned therebelow. An extremely rapid attaching operation is thereby effected which can be made even faster by the use of suitable automated feeding devices.

From the above, it will be appreciated that a fast and inexpensive method has been achieved by the use of the invention for attaching opening tabs to can lids. The particular attachment of the tab requires no special metals and also enables the lid to be opened much more easily than heretofore.

Various modifications of the above described embodiment of the invention will be apparent to those skilled in the art, and it is to be understood that such modifications can be made without departing from the scope of the appended claims.

I claim:

1. A method for attaching an opening tab having a projection thereon to a can lid having an opening strip provided with an opening end, said method comprising holding the tab in a predetermined position spaced from said lid and parallel thereto with the tab projection facing said lid and positioned opposite said opening end, moving said tab toward said lid until said projection contacts said opening end, retracting said tab from said lid a predetermined distance, simultaneously drawing a pilot arc between said projection and said opening end, moving said tab toward said lid after a predetermined period, initiating a main welding arc between said projection and said lid, and subsequently contacting a portion of said opening end to complete a weld therebetween, said portion of said opening end being positioned closer to one edge portion of said opening end than the remainder of the edge, whereby when said tab is raised to shear said end portion from the remainder of the lid, the shearing force will be initially concentrated at one small part of said edge and then progress over the remainder of the edge.

2. A method according to claim **1** wherein said opening end has a rounded leading edge and said tab is engaged with a portion of said opening end closer to said edge than to the center of curvature of said rounded leading edge.

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U.S. Cl. X.R.

113—121; 219—99; 220—54