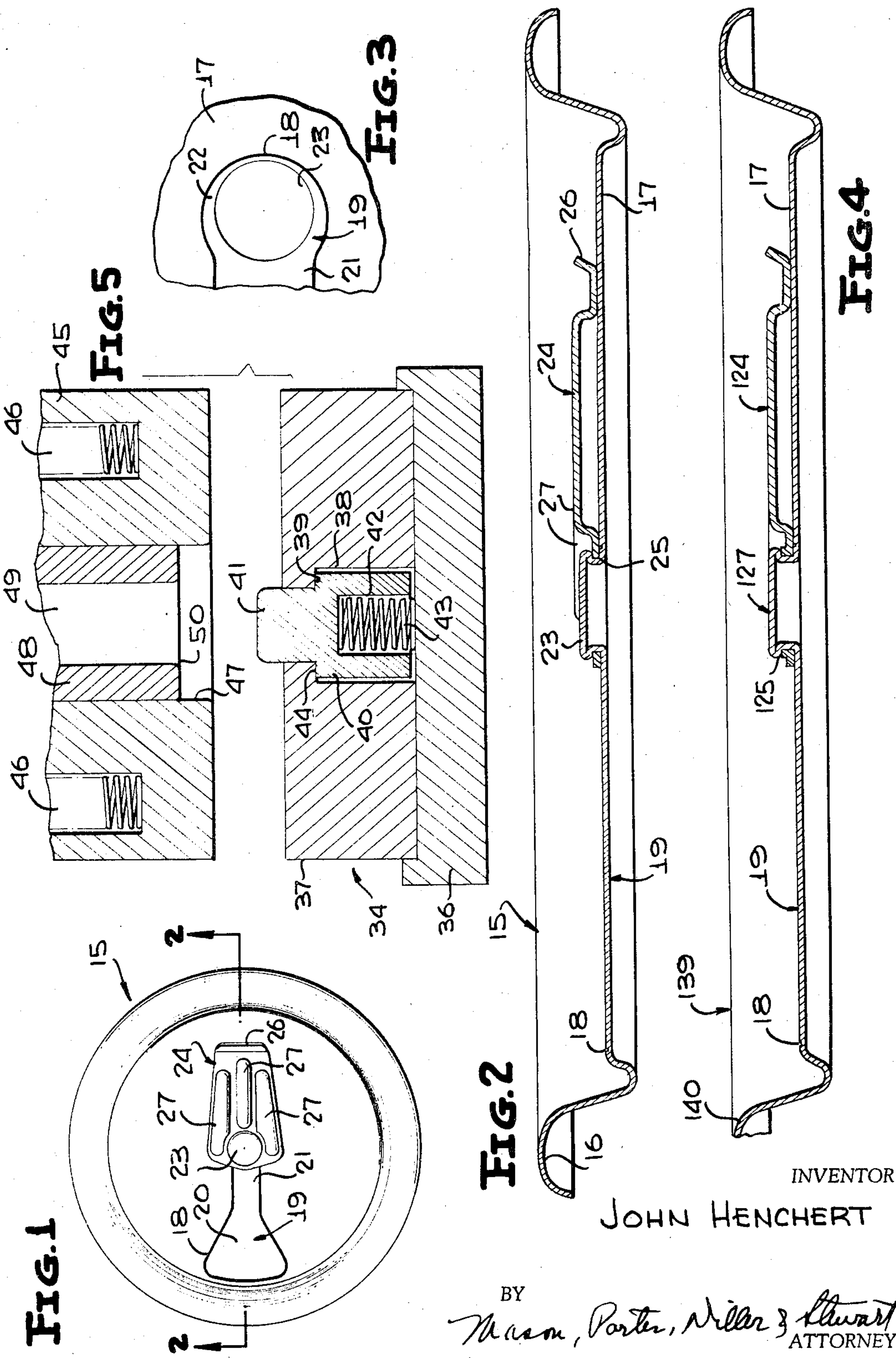
April 29, 1969 J. HENCHERT 3,440,713

METHOD FOR FORMING A RIVET AND ATTACHING A PULL TAB THEREWITH

Filed June 11, 1963 Sheet 1 of 3



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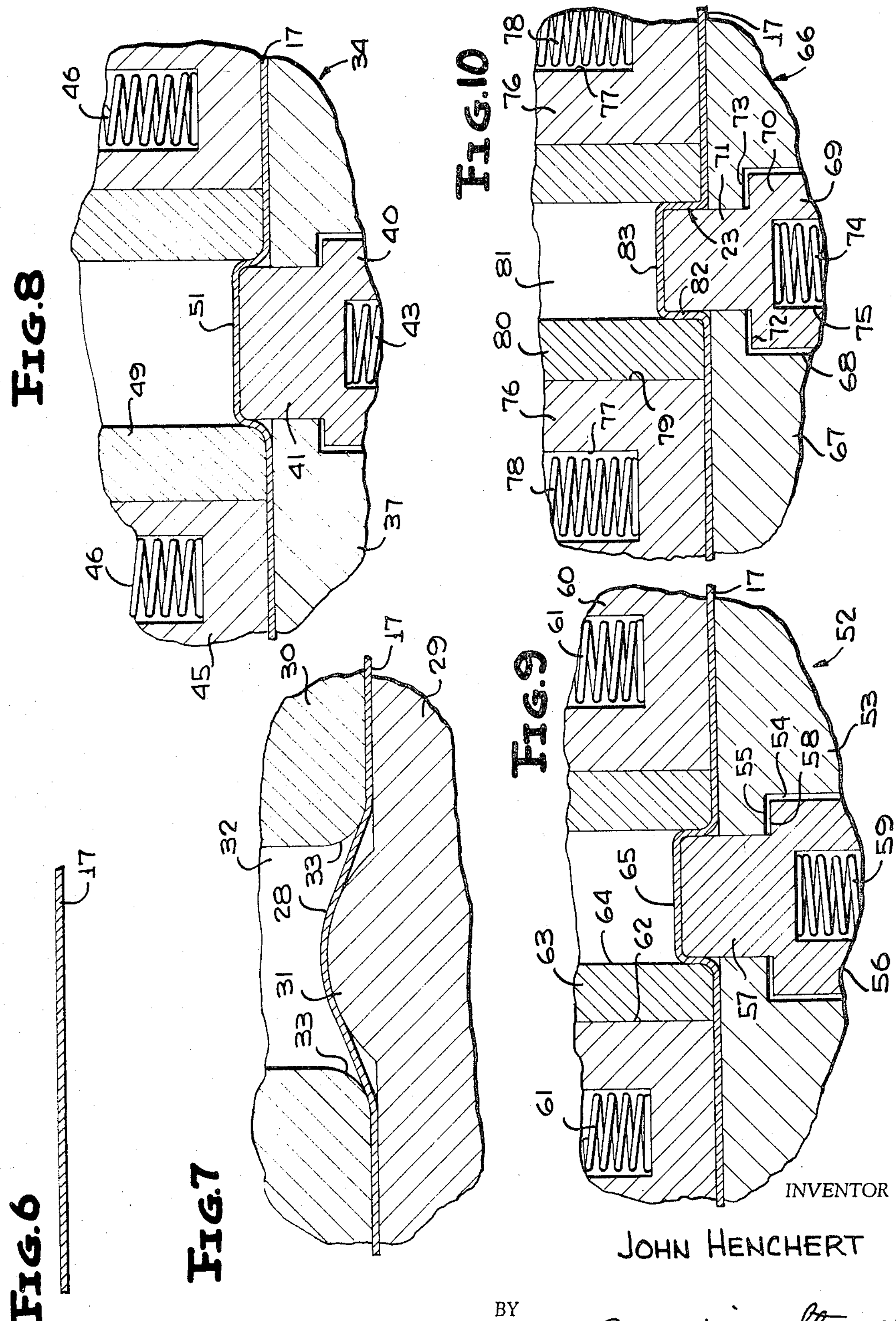

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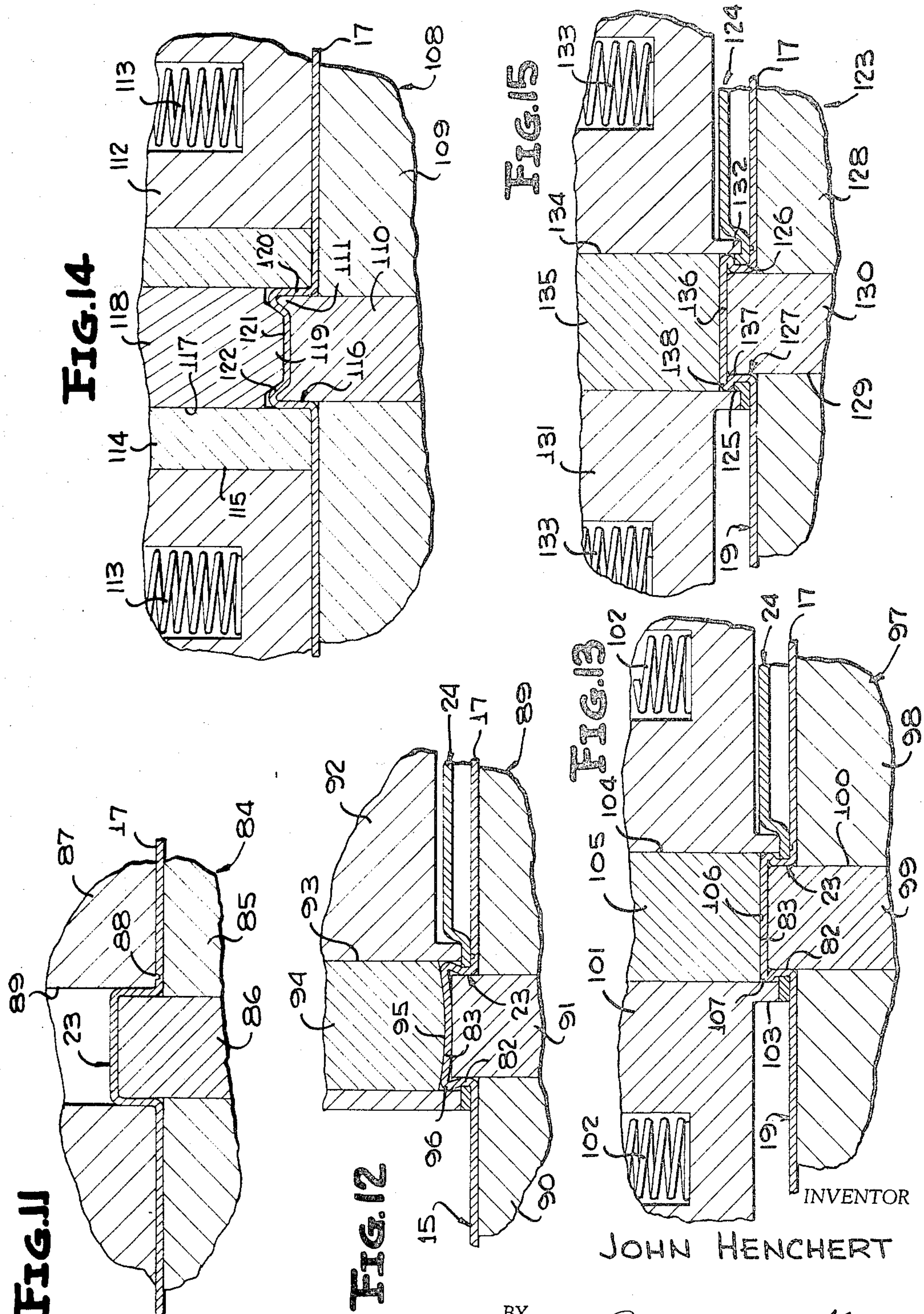

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METHOD FOR FORMING A RIVET AND ATTACHING A PULL TAB THEREWITH

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ABSTRACT OF THE DISCLOSURE

This disclosure has to do with the forming of a rivet and attaching a pull tab therewith. The rivet is formed by first drawing a relatively large protuberance, and thereafter reshaping the protuberance in a series of steps to reduce the diameter of the protuberance and to increase the thickness of the metal thereof so as to define a rivet having a wall thickness substantially equal to the original thickness of the metal. The rivet, after a pull tab has been positioned thereon, is upset or folded so as to define a bead which retains the pull tab in place.

This invention relates in general to new and useful improvements in container elements having means for facilitating the opening thereof without the use of any type of tool, and more particularly relates to a novel method of attaching pull tabs to removable portions of containers.

For many years it has been desirable to provide container ends which have self-opening features in order that the contents of the container may be readily dispensed. This is particularly true of beverage containers. In the past numerous types of tear strips have been provided. However, when the beverage is disposed within the container under pressure, the tear strips have not proven to be economically feasible in that special precautions must be taken in outlining the tear strip by a scoring operation and more particularly in securing the pull tab to the tear strip.

Recently, it has become economically feasible to form can ends of aluminum which, as compared to steel, is relatively soft and easily tears. A practical way for attaching a pull tab to a tear strip of an aluminum container end has been found to be providing the tear strip with an integral rivet and then utilizing the rivet in the attachment of the pull tab to the tear strip. With this arrangement no opening is formed in the container end which must be sealed against escape of gases and liquid under pressure. It has proved feasible to upset the end of a rivet formed in the manner stated above for the purpose of securing the pull tab to the tear strip when the container end is formed of a relatively thick aluminum, for example aluminum having a thickness of approximately 0.015 inch. However, in order to reduce the cost of containers, it is desirable to utilize a relatively hard aluminum instead of the customary soft aluminum with the result that container ends previously formed of 0.015 inch soft aluminum sheet may now be formed from 0.008 inch hard aluminum sheet. On the other hand, such a relatively thin and hard sheet does not permit the previous forming of a rivet and then the upsetting of the rivet in that the upsetting of the rivet results not only in the thinning of the metal, but extremely sharp bends which are subject to cracking and loss of pressure within the container.

The current trend towards cost reduction has further led to the development of thin gauge tinplate for commercial use in metal cans, and this invention makes possible the provision of a rivet formation in a can end made of this thin gauge tinplate which otherwise could not be achieved by presently known methods.

In view of the foregoing, it is the primary object of this invention to provide a novel method of forming a can end having an integral rivet for the attachment of a pull tab wherein the rivet has a wall thickness throughout substantially the same as the thickness of the can end from which it is formed and which rivet has sufficient material for the folding or crimping of the rivet to retain a pull tab thereon without the undesired thinning of the rivet in a manner which would subject the rivet and adjacent portions of the can end to failure under pressure.

Another object of this invention is to provide a novel method of forming an integral rivet on a removable portion of a can end wherein a large area of the can end is first punched from the plane of the can end followed by the reforming of this large area by a series of operations into a rivet of a greatly reduced size as compared to the original deformed area and wherein in the reforming of the metal, that metal which becomes the rivet is compressed and any tendency to unduly thin the metal in the forming of the rivet is eliminated.

Another object of this invention is to provide a novel method of forming a can end having a removable portion which is formed with an integral rivet for the attachment of a pull tab thereto to facilitate the removal thereof, the rivet being initially formed by deforming a large area of the can end, and then through a series of punching operations, the large deformed area is first shaped into a large diameter rivet formation which is followed by a series of reformations in the diameter and the height thereof so that the finally formed rivet is shaped by compressive forces, and during the reforming of the metal, there is a tendency to increase the thickness of the metal as opposed to the usual tendency of thinning the metal as occurs in customary drawing operations, the removable portion of the can end then being outlined by a score line formed in the can end around the rivet.

Yet another object of this invention is to provide a novel method of securing pull tabs to removable portions of can ends in accordance with the foregoing wherein it is feasible to provide the pull tab with an upstanding annular flange surrounding a rivet receiving opening therein so that the pull tab is reinforced at the point of attachment to the can end by the rivet.

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

IN THE DRAWINGS

FIGURE 1 is a plan view of a can end formed in accordance with this invention and shows the general arrangement of the tear strip and pull tab thereof.

FIGURE 2 is an enlarged vertical sectional view taken through the can end of FIGURE 1 substantially along the line 2—2 of FIGURE 1, and shows the specific details of the riveted connection between the tear strip and the pull tab.

FIGURE 3 is an enlarged fragmentary plan view of the can end prior to the securement of the pull tab thereto and shows the eccentric relationship of the rivet with respect to the generally circular end of the tear strip.

FIGURE 4 is a vertical sectional view similar to FIGURE 2 and shows a slightly modified form of pull tab and the manner in which it is secured to the tear strip of the can end.

FIGURE 5 is a schematic vertical sectional view taken through a typical die assembly utilized in the forming of the integral rivet on the can end.

FIGURE 6 is a vertical sectional view taken through a central portion of a blanked out can end prior to the provision of the can end with the easy opening feature of this invention.

FIGURE 7 is a schematic vertical sectional view taken through the can end portion of FIGURE 6, and shows the same after an initial forming operation wherein a large area dimple is formed in the can end.

FIGURE 8 is a schematic vertical sectional view taken through a die assembly, such as that shown in FIGURE 5, wherein the dimple in the can end is being re-formed by a punching operation with the metal being re-formed being under compression and a large diameter rivet being shaped.

FIGURE 9 is a schematic vertical sectional view taken through a next die unit in accordance with this invention and shows the details of a second re-forming operation wherein the diameter and height dimensions of the rivet shown in FIGURE 8 are altered.

FIGURE 10 is another fragmentary schematic vertical sectional view taken through a third re-forming die unit and shows the diameter and height dimensions of the rivet of FIGURE 9 being further modified.

FIGURE 11 is a schematic fragmentary vertical sectional view taken through a scoring die unit wherein the tear strip is outlined by a score line formed in the upper surface of the can end.

FIGURE 12 is a schematic vertical sectional view taken through a precrimping die unit utilized for the purpose of precrimping the rivet after the pull tab has been applied thereto.

FIGURE 13 is a schematic fragmentary vertical sectional view taken through the final crimping die unit wherein the rivet is finally crimped to a pull tab retaining portion.

FIGURE 14 is a schematic fragmentary vertical sectional view taken through a modified form of precrimping die unit wherein the rivet is precrimped prior to the application of the pull tab thereto.

FIGURE 15 is a schematic fragmentary vertical sectional view showing a slightly modified form of the final crimping die unit of FIGURE 13 particularly adapted for crimping a rivet over an upstanding annular flange of a pull tab.

Referring now to the drawings in detail, reference is first made to FIGURES 1, 2 and 3 wherein there is illustrated a can end formed in accordance with this invention, the can end being generally referred to by the numeral **15**. The can end, except for an easy opening feature thereof which will be described hereinafter, is of a conventional construction and includes a peripheral curl **16** for facilitating the attachment thereof to a can body by means of a conventional seaming operation.

The can end **15** including an end panel **17** which is provided with a score line **18** defining a removable portion or tear strip **19**. The tear strip **19** is of a shape to facilitate drinking from a can of which the can end **15** is a part and includes an outer triangular portion **20** and an inner generally straight portion **21**. The straight portion **21**, as is best shown in FIGURE 3, terminates in its inner end in a generally circular starting portion **22**. The starting portion **22** is provided with an integral rivet **23** which is utilized to secure a pull tab **24** to the tear strip **19** to facilitate the removal thereof without the use of any tools or other implements separate from the can of which the can end **15** is a part.

At this time it is pointed out that the rivet **23** is eccentrically positioned with respect to the generally circular starting portion **22** and is positioned more closely to that extreme inner part of the tear strip **19**. By positioning the rivet **23** as closely as possible to the inner part of the score line **18**, a maximum leverage is obtained to facilitate the opening of the can. Further, by restricting the length of the tear strip between the rivet and the score line to a minimum, insufficient material is available for bending of the tear strip without effecting a rupture of the end panel **17** along the score line **18**.

Thus, the specific position of the rivet **23** with respect to the score line **18** permits the opening of a can with a minimum twisting which is being exerted on the rivet and thereby reduces the necessary strength of the connection the tear strip **19** and the pull tab **24**.

Referring once again to FIGURE 2, it will be seen that the pull tab **24** is provided with an opening **25** adjacent one end thereof through which the rivet **23** passes. The opposite end of the pull tab **24** is provided with an upwardly sloping terminal flange **26** to facilitate the lifting of the pull tab to effect the removal of the tear strip **19** from the end panel **17**. The pull tab **24** is reinforced against transverse bending by a plurality of longitudinally extending ribs **27**.

As the first step in the forming of the rivet **23**, the end panel **17** is provided with a protrusion **28** by a pair of the elements or parts **29** and **30**. The die element **29** is provided with a generally part spherical projection **31** disposed in alignment with an opening **32** of the die part **30**. The opening **32** is provided with a lower rounded corner **33** to facilitate the shaping of the metal in the forming of the protrusion **28**.

In FIGURE 6 there is illustrated the end panel **17** as it appears before the protrusion **28** is formed. It is to be understood that the protrusion **28** may be formed after the can end **15** has been blanked out in a normal blanking operation, or the protrusion **28** may be formed at the same time the can end is blanked out and shaped. If the protrusion **28** is formed during the blanking and shaping of the can end **15**, then the die parts **29** and **30** will be portions of the conventional dies utilized in the blanking out and shaping of the can ends.

Reference is now made to FIGURE 5 in particular, wherein there is illustrated the details of a die unit of the general type utilized hereinafter in the re-forming of the protrusion **28** to form the rivet **23**. The die unit **34** includes a back-up block **36** which may be mounted in a press structure in any desired manner. The back-up block **36** has seated therein a die center pad **37** which is provided with a stepped opening **38** therethrough defining an intermediate shoulder **39**. A die center pad insert **40** of a stepped construction is positioned within the opening **38** and includes an upper portion **41** of a reduced cross section. The lower portion of the insert **40** is provided with a centrally located bore **42** in which there is positioned a spring **43**. The spring **43** has its lower end seated on the back-up block **36** and normally retains the insert **40** in an uppermost position with a shoulder **44** of the insert **40** in abutting engagement with the shoulder **39** of the die center pad **37**.

The die unit **34** also includes a pressure ring **45** which is mounted for upward movement with respect to an upper portion of a press (not shown) by means of springs **46**. The pressure ring **45** is provided with a central opening **47** in which there is mounted for relative movement a punch center **48**. The punch center **48** is provided with a bore **49** having a rounded lower corner **50**.

Referring now to FIGURE 8 in particular, it will be seen that in the use of the die unit **34** in re-forming the protrusion **28**, the pressure ring **45** first clamps the portion of the end panel **17** surrounding the protrusion **28** against the die center pad **37**. Then the punch center **49** comes into engagement with the protrusion **28** and forces the outer material of the protrusion downwardly and inwardly about the upwardly projecting upper portion **41** of the insert **40**. The material of the protrusion **28** is thus re-formed about the insert **40** in the manner shown in FIGURE 8 to define a generally tubular member **51**. Since the re-forming of the protrusion **28** into the tubular member **51** is accomplished with the metal being in compression, it will be seen that there is a slight increase in the thickness of the metal, which increase is relatively minute as is the decrease in the thickness of the metal of the end panel **17** in the formation of the protrusion **28**.

Referring now to FIGURE 9 in particular, it will be seen that there is illustrated another die unit **52** which generally corresponds to the die unit **34** and which may be mounted in a press in the same manner. The die unit **52** includes a die center pad **53** having a stepped opening **54** therethrough. The opening **54** in part defines an intermediate transverse shoulder **55**. A die center pad insert **56** is positioned within the opening **54** and is of a stepped construction to provide a projecting upper portion **57** of a reduced cross section. The formation of the upper portion **57** of a reduced cross section results in the formation of a shoulder **58** which opposes the shoulder **55** and in the open position of the die unit **52** engages the shoulder **55** to limit the movement of the insert **56**. The lower portion of the insert **56** is provided with a spring **59** which normally urges the insert **56** upwardly. It is to be understood that the die unit **52** will include a back-up block, such as the back-up block **36**, and the spring **59** will be seated thereon. Also, the downward movement of the insert **56** to the position shown in FIGURE 9 will be limited by the back-up block.

The die unit **52** also includes an upper pressure ring **60** which is resiliently mounted by means of a plurality of springs **61**. The pressure ring **60** is provided with a centrally located bore **62** in which there is mounted for relative movement a punch center **63**. The punch center **63** is provided with a central opening **64** aligned with the upper portion **57** of the insert **56** and cooperating therewith to reshape the tubular member **51**.

In the second re-forming operation on the can end **15**, the end panel **17** is first clamped against the die center pad **53** by the pressure ring **60**, after which the tubular member **51** is compressively engaged by the punch center **63**. As the punch center **63** moves downwardly, the material of the tubular member **51** is forced inwardly about the upper portion **57** of the insert **56** to effect a reshaping of the tubular member **51** under compression to define a second tubular member **65** which is reduced in diameter and increased in height as compared to the tubular member **51**. Since the tubular member **65** is formed from the tubular member **51** with the metal under compression, there is a slight increase in the thickness of the metal forming the tubular member **65**.

Reference is now made to FIGURE 10 wherein there is illustrated a die unit **66** which is also of a construction similar to the die unit **34**. The die unit **66** includes a die center pad **67** which is provided with a stepped opening **68** therein. A die center pad insert **69** is positioned within the opening **68** and includes a large diameter lower portion **70** and a smaller diameter upwardly projecting upper portion **71**. The differential in diameters of the portions **70** and **71** results in the formation of an upwardly facing shoulder **72** which opposes a downwardly facing shoulder **73** resulting from the formation of the opening **68**. The insert **69** is normally urged upwardly by means of a spring **74** which has its upper end seated in an opening **75**. The spring **74** has its lower end resting upon a typical back-up block (not shown) and the downward movement of the insert **69** is restricted by the back-up block.

The die unit **66** also includes a pressure ring **76** having a plurality of openings therein in which there are seated springs **78** resiliently mounting the pressure ring **76** for upward movement. The pressure ring **76** is provided with a central bore **79** in which there is mounted for relative movement a punch center **80** of a tubular construction while having a bore **81** aligned with the insert **69**.

In the use of the die unit **66**, the can end **15** with the tubular member **65** formed therein is positioned on the die center pad **67** and the die unit **66** is closed with the pressure ring **76** first engaging and clamping the end panel **17** surrounding the tubular member **65**, after which the tubular member **65** is engaged by the punch center **80** and the material thereof forced inwardly around the upper portion **71** of the insert **69** to define the rivet **23**.

It is to be noted that the rivet **23** has a tubular body portion **82** and a closed end **83**.

It is to be noted that the forming of the rivet **23** from the tubular member **65** is accomplished by the punch center **80** in a manner wherein the material of the tubular member **65** is under compression and due to the restraint of the material against flow outwardly, in the reduction of the diameter of the tubular member **65** to form the rivet **23**, there is a further slight increase in the wall thickness so that the wall thickness of the rivet **23**, for all practical purposes, is the same as that of the original wall thickness of the end panel **17**. Thus, there is no reduction in strength of the end panel **17** in the forming of the rivet **23** therefrom.

Referring now to FIGURE 11 in particular, it will be seen that the can end **15** is next placed in a die unit **84**. The die unit **84** includes a die center pad **85** in which there is resiliently mounted a die center pad insert **86** for supporting and centering the rivet **23**. The die unit **84** also includes an upper die member **87** which is provided with a downwardly projecting rib **88** engageable with the upper surface of the end panel **17** to form the score line **18**. The die member **87** is provided with a central bore **89** for snugly receiving the rivet **23** during the scoring operation.

After the rivet forming and scoring operations have been completed on the can end **15**, the can end **15** is positioned in a prestaking die unit **89**. The prestaking die unit **89** includes a die center pad **90** having resiliently mounted therein a die center pad insert **91** for reception within the rivet **23**. The pull tab **24** is positioned over the rivet **23** and is then loosely staked in place by the upper portion of the die unit **89** which includes a pressure ring **92** having a shape for engaging the pull tab **24** around the rivet **23**. The pressure ring **92** is provided with a central bore **93** aligned with the insert **91**. A punch **94** having a convexly curved lower end **95** is mounted within the bore **93** for movement relative to the pressure ring **92** and when brought into engagement with the end wall **83** of the rivet **23** effects a slight outward folding of the tubular body portion **82** at its intersection with the end wall **83** to form a slightly projecting bead **96** of a size to retain the pull tab **24** on the rivet **23**.

The assembled pull tab and can end are then worked upon by a final staking die unit, generally referred to by the numeral **97**. The die unit **97** includes a die center pad **98** having a die center pad insert **99** resiliently mounted within a center bore or opening **100** therein. The insert **99** is of a size to be received within the rivet **23**.

The die unit **97** also includes a resiliently mounted pressure ring **101** which is engaged by springs **102**. The pressure ring **101** is provided with a downwardly projecting central boss **103** for engaging and clamping the pull tab **24** surrounding the rivet **23** and holding the pull tab **24** in engagement with the end panel **17**.

The pressure ring **101** is also provided with a central bore **104** in which there is mounted for relative movement a punch **105** having a flat lower end **106** which is engageable with the end wall **83** of the rivet **23**. The relative proportions of the components of the die unit **97** are such that the die unit **97** effects a further outwardly folding of the outer portion of the tubular body portion **82** to define a definite annular bead **107** which clamps the pull tab **24** to the tear strip **19**. The connection between the pull tab **24** and the tear strip **19** is such that when the right-hand end of the pull tab **24** is lifted, as is shown in FIGURE 2, the score line **18** will rupture immediately adjacent the rivet **23** and continued upward movement of the pull tab **24** will result in the tearing of the tear strip **19** from the end panel **17**.

It is to be noted that in the staking of the rivet **23** to secure the pull tab **24** to the tear strip **19**, it is merely a folding operation wherein there is no material reduction in the wall thickness of the rivet **23**. Thus, the staking operation in no way decreases the strength of the end panel 17. Accordingly, the above-disclosed method of forming the rivet 23 and staking the rivet 23 to secure the pull tab 24 to the tear strip 19 is suitable for use wherein the can end 15 is formed of a relatively thin and hard aluminum or tin plate as compared to the presently utilized relatively thick and soft aluminum or tin plate. The disclosed method of securing a pull tab to the tear strip 19 makes it possible to utilize relatively economical hard aluminum having a thickness in the vicinity of 0.008 inch as compared to the presently utilized more expensive soft aluminum having a thickness of 0.015 inch, or relatively thin gauge tin plate.

Reference is now made to FIGURE 14 wherein there is illustrated a die unit 108 which constitutes a modification of the die unit 66. The die unit 108 includes a die center pad 109 which carries a resiliently mounted die center pad insert 110. The insert 110, in lieu of having a flat upper end as in the case of the insert 69, is provided with an upper end having an outer upwardly projecting annular rib 111 for a purpose to be described hereinafter.

The die unit 108 also includes a pressure ring 112 which is resiliently mounted by a spring 113. A punch center 114 is seated in a center bore 115 of the pressure ring 112 for effecting a re-forming of the tubular member 65 and the reduction of the diameter thereof.

The punch center 114 is provided with a central bore 117 in which there is mounted a further punch 118. The punch 118 is provided with a wedge-shaped lower portion 119 which is centrally located and which is generally complementary to the upper end of the insert 110.

When the can end having the tubular member 65 is worked upon by the die unit 108, there results a rivet 116 having a tubular wall portion 120 of the same diameter as the tubular wall portion 82 of the rivet 23. The rivet 116 also has a closed end 121 of which the outer portion is in the form of an outwardly directed annular bead 122 to facilitate the folding of the rivet in the securement of the pull tab 24 to the tear strip 19.

It is to be understood that after a pull tab 24 has been placed over the tubular rivet 116, the tubular rivet 116 may be folded in the manner disclosed with respect to the tubular rivet 23.

In FIGURES 4 and 15 there is illustrated a modified form of pull tab which is generally referred to by the numeral 124. The pull tab 124 differs from the pull tab 24 only in that it is provided with an upstanding flange 125 surrounding the rivet receiving opening 126 therein. The flange 125 reinforces the pull tab 124 around the opening 126 to prevent any possible tearing of the pull tab out from the opening 126 and off of the rivet on which the pull tab 124 is mounted.

It is to be understood that due to the upstanding flange 125, the end panel 17 must be provided with a rivet which is increased in height as compared to the rivet 23. This rivet is generally referred to by the numeral 127.

A modification of the die unit 97 is required to stake the rivet 127 and secure the pull tab 124 in place thereon. This die unit is generally referred to by the numeral 123 and includes a die center pad 128 with a central bore 129 in which there is resiliently mounted a die center pad insert 130 for reception within the rivet 127. The die unit 123 also includes a pressure ring 131 which is provided with a depending central portion 132 for cooperation with the die center pad 128 in clamping the pull tab 124 around the rivet 127 to the end panel 17. The pressure ring 131 is resiliently mounted by means of springs 133 and is provided with a central bore 134 in which there is mounted for relative movement a punch 135.

It will be seen that when the die unit 123 is utilized, the resultant rivet 127 has an end wall 136 and a tubular body portion 137 which is outwardly folded to form an annular bead 138 at the intersection of the tubular body portion 137 with the end wall 136. The annular bead 138 is of a size to fully clamp the pull tab 124 to the tear strip 19.

Although only a die unit corresponding to the die unit 97 has been illustrated and described with respect to the pull tab 124 and the rivet 127, it is to be understood that a prestaking die unit corresponding to the prestaking die unit 89 may be provided.

It will be readily apparent from the foregoing that there has been devised a novel can end having a self-opening feature which is positive in operation, which may be formed from relatively inexpensive thin gauge metals, such as aluminum, tin plate or other suitable materials, and which easy opening feature is of a nature wherein leakage through the can end is eliminated while assuring the opening of the can end when desired. It is to be noted that all of this has been accomplished due to the fact that there is substantially no thinning of the material of the resultant rivet as compared to the original thickness of the sheet from which the rivet is formed.

Although only preferred embodiments of the invention have been specifically illustrated and described herein, it is to be understood that minor modifications may be made in the several disclosed embodiments of the invention within the spirit and scope thereof, as defined in the appended claims.

I claim:

1. A method of securing a pull tab to a removable portion of a sheet comprising the steps of forming a large diameter relatively shallow protrusion, then acting on the protrusion in a series of compressive forming steps to reform the protrusion by decreasing the diameter thereof and forcing material of the protrusion laterally inwardly to form a closed tubular rivet having a wall thickness of substantially the same thickness as the original thickness of the sheet, positioning the pull tab on the rivet, prestaking the rivet to define a minor laterally extending outer bead loosely retaining the pull tab on the rivet, and then finally staking the rivet to further shape the laterally extending outer bead with the bead clamping the pull tab to the removable portion, all of said steps being performed without materially reducing the thickness of the sheet adjacent the rivet and while maintaining the external configuration of the sheet.

2. A method of securing a pull tab to a removable portion of a metal container panel comprising the steps of forming a large diameter protrusion in said container panel, then acting on the protrusion in a series of combined punching and compressive forming steps wherein the metal of said protrusion is progressively reduced in diameter and decreased in axial extent until a tubular rivet having a body and an integrally closed end is formed integrally with said container panel, the combined efforts of said combined punching and compressive forming steps substantially maintaining the thickness of the metal of said protrusion wherein the thickness of the metal of the rivet is substantially the same as that of the container panel and the formed rivet being of an axial extent materially greater than the thickness of the pull tab; positioning the pull tab on the rivet in telescoped relation with the rivet extending through and beyond the pull tab; and then staking the rivet and thereby reversely folding that portion of the rivet body extending beyond the pull tab to form a laterally extending outer bead clamping the pull tab to the removable panel portion.

3. The method of claim 2 wherein in at least one of the combined punching and compressive forming steps the metal of the protrusion is first axially elongated and then compressively formed.

4. The method of claim 2 wherein in at least one of the combined punching and compressive forming steps the metal of the protrusion is first axially elongated about a punch element and then compressively radially inwardly formed about the punch element.

5. The method of claim 2 wherein in at least one of the combined punching and compressive forming steps the metal of the protrusion is first axially elongated about a punch element, the panel clamped in place around the

protrusion, and then compressively radially inwardly formed about the punch element.

6. The method of claim **2** wherein the combined effect of the punching and compressive forming steps is a minute increase in the thickness of the metal of the rivet as compared to the thickness of the metal of the protrusion.

7. The method of claim **2** wherein the bead is formed in the rivet body without reducing the thickness of the rivet closed end.

8. A method of securing a pull tab to a removable portion of a metal container panel comprising the steps of forming a large diameter protrusion in said container panel, next reshaping the protrusion to decrease the diameter and height thereof by forcing the metal of the protrusion laterally inwardly, and then further re-forming the protrusion by performing at least one combined punching and compressive forming step wherein the protrusion is further reduced in diameter and increased in axial extent and thereby forming the protrusion into a rivet having a body and an integral closed end with the thickness of the metal of the rivet being substantially the same as that of the container panel and the formed rivet being of an axial extent materially greater than the thickness of the pull tab; positioning the pull tab on the rivet in telescoped relation with the rivet extending through and beyond the pull tab; and then staking the rivet and thereby reversely folding that portion of the rivet body extending beyond the pull tab to form a laterally extending outer bead clamping the pull tab to the removable panel portion.

9. The method of claim **8** wherein the forming steps performed on the protrusion to shape the protrusion into the rivet reduce the height of the protrusion with the height of the rivet being less than that of the protrusion.

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CHARLIE T. MOON, *Primary Examiner.*

U.S. Cl. X.R.

29—522; 113—121; 220—54