

[54] METHOD OF RIVETING A PULL TAB TO A CAN TOP

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[52] U.S. Cl..... 29/509, 29/522, 113/121 C, 220/54

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[58] Field of Search..... 29/509, 522; 113/121 C; 220/54

[57] ABSTRACT

The invention concerns an integrated rivet and its formation. A square rivet is formed in the metal itself of a container top or cover. It is formed in a series of steps during which a spherical boss is formed first and then the spherical boss is transformed into a boss having a plurality of vertical flat sides. The rivet is used to nonrotatably affix the complementary portion of a gripping member to the tear-off portion of a tear opening in a container.

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3 Claims, 14 Drawing Figures

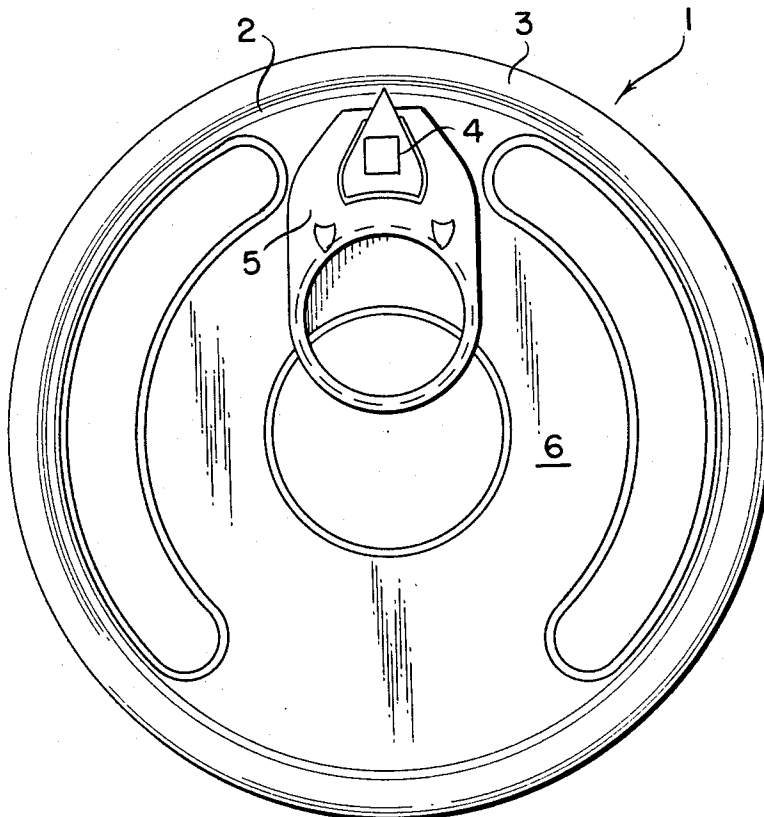


Fig. 1

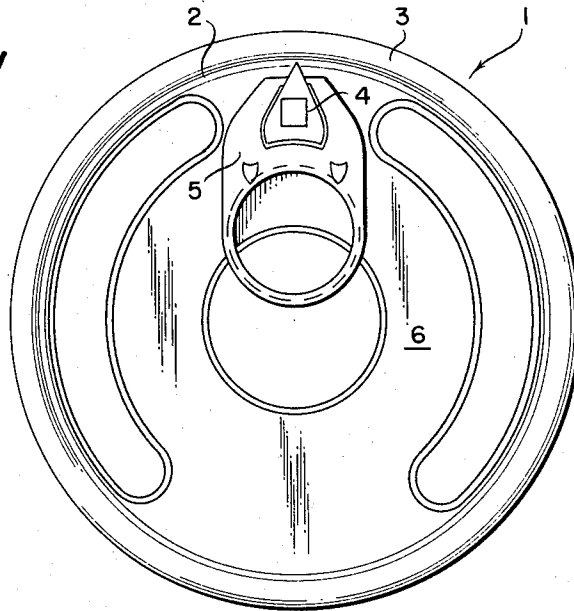


Fig. 2

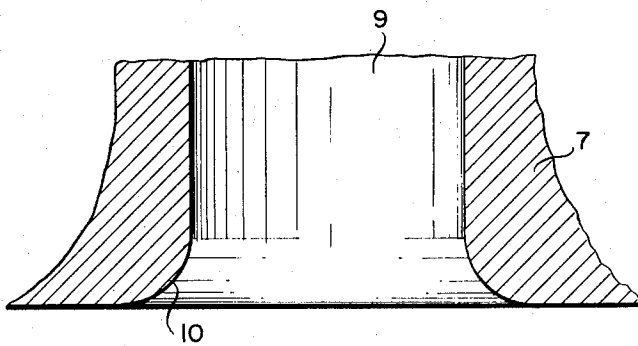


Fig. 3

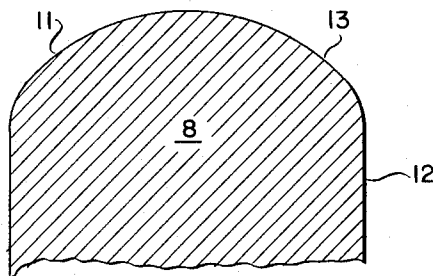


Fig. 4

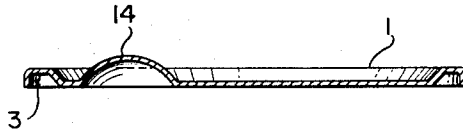


Fig. 5

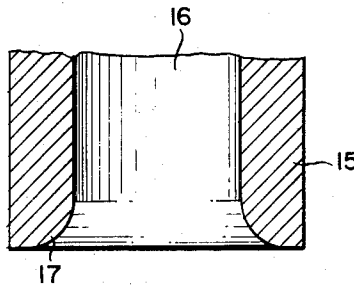


Fig. 6

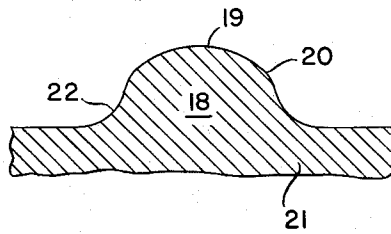


Fig. 7

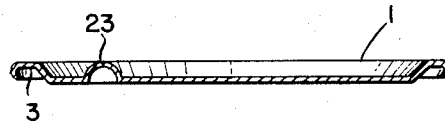


Fig. 8

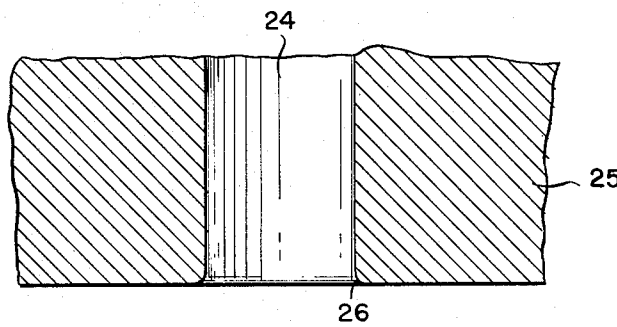
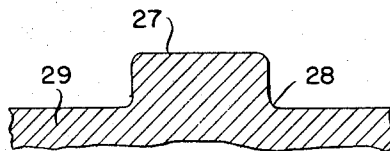
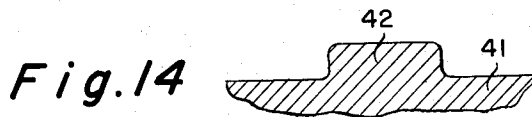
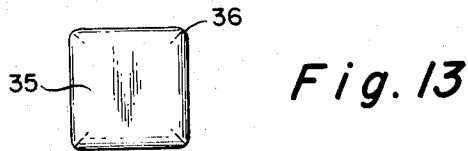
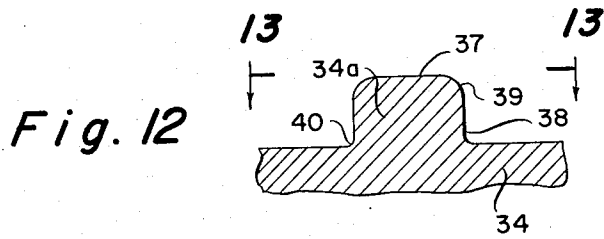
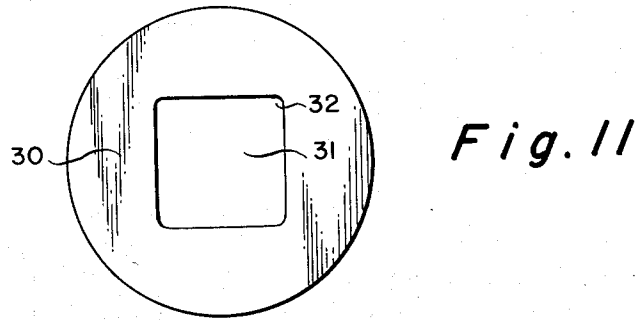
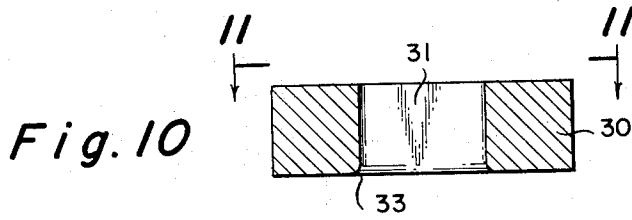


Fig. 9





METHOD OF RIVETING A PULL TAB TO A CAN TOP

The present invention relates to a new form of integrated rivet, i.e., a rivet formed in the material itself of the tear-off portion of a metal top for cans, and it is used to affix the member which constitutes the opening tool.

To insure that the pulling effort exerted by the consumer upon this gripping member, generally called the tab, causes the beginning of the tear and the tearing out of the intended portion under optimum conditions, it is necessary that this tab be oriented in very precise manner. This is especially true for the tops in which the tear-off portion includes practically all of the surface inside of the crimped rim.

For this purpose, the tip of the tab which is opposite the gripping ring must play a specific role at a precise place, i.e., plumb with the weakened or tear-off line which is to be perforated. Any rotation of the tab around its fixation point modifies these conditions and, consequently, reduces the efficacy of the system. An additional effort is therefore required to effect the opening operation, and this additional effort often causes material accidents, such as the separation of the rivet from the tear-off portion of the container.

To secure the gripping tab in the desired position, several expedients have been used. In one example, positioning bosses, i.e., deformations in the surface have been formed in the top in the immediate vicinity of the tab to preclude rotation of the tab. However, the blocking thus obtained is insufficient since the accidental rotation of the tab around the rivet causes a slight upward shifting which can result in the unintentional opening of the can or, which is more serious, an imperceptible perforation of the top either on the tear line or behind the rivet. Even if this perforation is not visible, it can destroy the biological tightness of the can.

It is therefore a primary object of the present invention to secure the tab to the can cover in an immutable orientation which does not present the above mentioned disadvantages; by employing a rivet formed with substantially parallel side walls and the process for forming said rivet.

The base of the rivet according to the preferred embodiment of this invention has a substantially square shape. It is to be understood that other shapes for said rivet may be employed including any polygonal shape within the nonrupturing deformation capabilities of the removable portion of the container. The angles of this square are slightly rounded to avoid weakening the metal along the edges of the rivet. The four straight lines of the sides of the rivet are substantial enough to secure the gripping tab against any rotation.

To achieve maximum cooperation between the square rivet and the prehension tab, the latter comprises a fixation opening of substantially square shape, two of the parallel sides of this opening being substantially perpendicular to the longitudinal axis of the prehension tab.

This application further relates to a process for the formation on a metal top of an integrated rivet defined by parallel side walls, which process consists of initial formation of a spherical boss in the metal sheet and re-shaping of this boss in at least one subsequent step to convert the spherical boss to a substantially square rivet body.

With the above and other objects that will hereinafter appear, the nature of the invention will be more clearly understood from reference to the accompanying drawings.

FIG. 1 is a top plan view of the surface of an easy-opening top equipped with a square rivet according to the invention;

FIGS. 2 and 3 are side views in section of the two tools used for the first deformation of the top in the formation of the rivet;

FIG. 4 is a side elevation in section of the container top after deformation by the tools illustrated in FIGS. 2 and 3;

FIGS. 5 and 6 are side views in section of two tools used for the second deformation of the top;

FIG. 7 is a side elevation in section of the top after deformation by the tools illustrated in FIGS. 5 and 6;

FIGS. 8 and 9 are side elevations in section of the two tools used for the final formation of the round rivet step;

FIGS. 10 and 12 are side elevations in section of the two tools used for shaping the round blank into the final formation of the square rivet;

FIG. 11 is a sectional view of the tool along the lines XI—XI of FIG. 10;

FIG. 13 is a sectional view of the tool along XIII—XIII of FIG. 12;

FIG. 14 is a sectional side elevation of the die-stamp or punch used for the final riveting step.

Referring now to FIG. 1, a top 1 is of a current type, comprising a tear line 2 along the crimping edge 3. The only visible difference with known tops is the square rivet 4 employed to affix the prehension member or tab 5 on the tear-off portion 6 of top 1.

On all prior tops of this type of which I am aware, the tab was affixed by means of a round rivet. Referring now to FIGS. 2-9, the prior art rivets were formed by making a first cut, or passage of the top over the tool, producing the formation of a spherical excrescence on the top, as seen in FIG. 4. To accomplish this step the top is held between the two parts of the tool, i.e., the lower half of the die 7 of FIG. 2, and the punch 8 of FIG. 3. The lower half of the die comprises essentially a cylindrical opening 9 with a rounded edge 10.

Punch 8 includes a cap portion 11, a cylindrical base portion 12, and a torus segment 13.

The next step in the formation of the rivet is the reduction of boss 14 to bring it to the necessary cylindrical shape.

This transformation is effected in two or more steps depending on the thickness of the sheet and its nature, in particular, the malleability of the metal. In the example illustrated, i.e., a sheet of a thickness of 0.254 mm made of a malleable metal; such as an aluminum alloy with a count of 2.5% Mg, even in a partially hammer-hardened condition, two operations are sufficient to transform the spherical deformation into a cylindrical deformation having the desired diameter. On thicker or less malleable metal sheets, this number may be increased without departing from the scope of the present invention.

The tools which are used for the first reduction step are illustrated in FIGS. 5 and 6. The lower half of the die 15 comprises a cylindrical recess 16 with a slightly rounded edge defining a quarter torus 17.

A corresponding punch 18 comprises an upwardly curved portion 19 with its upper portion terminating in a spherical radius surrounded with a torus segment 20. The curved portion is connected to the base 21 by means of a torus portion 22.

After being subjected to the impact of the tool of the first reduction step, the deformation 23 of the top 1 has substantially assumed the form illustrated diagrammatically in FIG. 7.

As mentioned above, the first reduction may be followed immediately by the sizing or jiggling, i.e., the second reduction to the cylindrical shape which is used to receive the tab.

The tools used in this operation are illustrated in FIGS. 8 and 9.

The recess 24 in the lower half of the die 25 is cylindrical over substantially its whole height terminating in a rounded portion 26 at the lower edge. The overall height of punch 27 is reduced from the preceding step and the groove portion 28 at the intersection of the punch 27 and its base 29 is of a reduced radius over the preceding step.

In the prior art, the cylindrical excrescence thus formed penetrates into an adequate aperture in the tab and the rivet is subjected to a last deformation through the crushing and spreading of its upper part.

The formation of the square rivet according to the present invention follows exactly the same steps.

The first two operations, i.e., the formation of the boss FIGS. 2 and 4 and the first reduction FIGS. 5 to 7 are exactly the same for the square rivet of my invention as for the round rivet of the prior art. It is only in the last phase of the shaping that the tool described above with reference to FIGS. 8 and 9 is replaced by another tool which is illustrated diagrammatically in FIGS. 10 to 13. In a single step, the rivet is imparted by this tool its final square shape.

Referring now to FIGS. 10 and 11, the die 30 of this new tool includes a square recess 31. It will be noted that the diagonal of this opening, even taking into account the rounding of corners 32, is larger than the diameter of opening 24 of the die used in the corresponding step for the formation of the round rivet. The recess 31 terminates in a rounded lower edge 33.

The lower tool 34, seen best in FIGS. 12 and 13, includes a punch portion 34A which is seen in FIG. 13 to comprise a substantially square configuration 35 and is provided with slightly rounded edges 36 terminating at its upper extremity in a substantially flat upper face 37, vertical sides 38 connected by rounded portions 39. The punch 33 is connected to the base 34 by a slightly curved portion 40.

After this tool has imparted its prismatic shape to the rivet, the latter is crowned by the tab 5 which includes a complementary opening corresponding to the shape of the rivet.

As a final step, the top equipped with the tab is placed on a tool 41 carrying a punch 42. The transversal section of said punch parallel to the surface of the top is identical to the corresponding cross-section of the punch 33 used in the preceding operation, however, the height of said punch is reduced.

The difference in heights permits the crushing of the

upper portion of the rivet and its spreading beyond the edges of the opening of the tab 5.

The result of this last operation, carried out with a flat surface riveting machine, is a square rivet head 4 such as illustrated in FIG. 1.

The tab affixed in this manner can no longer turn around the rivet and is retained in its position until the moment when the can is opened.

It is to be noted that preferably two of the sides of the base of the rivet are perpendicular to the longitudinal axis of the tab; in this manner, the force exerted by the pull upon manner, prehension member is distributed over a wider area of the deformed portion of the top.

I claim:

1. The method of nonrotatably securing a prehension member to the removable portion of a thin walled metallic container opening comprising the steps of forming a spherical excrescence in the removable portion without substantially reducing the thickness thereof, reducing said excrescence in at least one further step to a substantially cylindrical shape, shaping without substantially thinning the cylindrical walls of said excrescence to define a substantially square walled rivet configuration, positioning a complementary opening in said prehension member over said square walled excrescence and deforming the portion of said excrescence extending through said prehension member to nonrotatably stake said prehension member to said removable portion of said container by said deformation of said rivet.

2. The method of nonrotatably securing a pull tab to the removable portion of a thin walled metallic container comprising the steps of forming a shallow spherical protuberance in said removable portion of said container without substantially reducing the thickness thereof, reducing said protuberance in at least one additional forming step to define a substantially cylindrical rivet body while maintaining substantially the same thickness, reshaping said cylindrical rivet body without substantial thinning in at least one further step to impart substantially parallel side walls to said rivet, positioning a complementary opening of a pull tab over said rivet and nonrotatably staking said tab to said container portion by deformation of the portion of said rivet extending through said opening.

3. The method of nonrotatably securing a pull tab to the removable portion of a thin walled metallic container comprising the steps of forming a shallow spherical protuberance in said removable portion of said container without substantially reducing the thickness thereof, reducing said protuberance in at least one additional forming step to define a substantially cylindrical rivet body while maintaining substantially the same thickness, reshaping without substantial thinning said cylindrical rivet body in at least one further step to impart a plurality of substantially vertical side walls to said rivet, positioning a complementary opening of a pull tab over said rivet and nonrotatably staking said tab to said container portion by deformation of the portion of said rivet extending through said opening.

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