

Miller et al.

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[54] METHOD OF VENTING AN AEROSOL DOME

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113/120 AA, 121 AA, 121 C, 120 P; 220/44 R. 74

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Primary Examiner—Charles W. Lanham

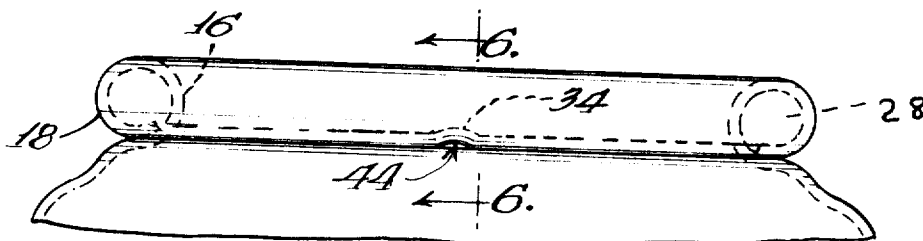
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[57] **ABSTRACT**

A method of forming a bead surrounding an opening in one end of a container body by rolling a neck extending from the body to a position where the free edge and an adjacent end portion of the neck overlap an adjacent outer surface of the body. A method contemplates rolling at least one selected portion of the neck to a smaller internal diameter than the internal diameter of the remainder of the neck so as to space a segment of the free edge from the outer surface of the body to provide a vent opening placing the internal area of the bead in communication with the surrounding outside area. In one embodiment, the smaller diameter portion of the bead is formed by producing projections extending above the free edge of the neck. A second embodiment contemplates outwardly deforming a selected portion of the neck and, in a third embodiment, the reduced diameter portion is deformed by inwardly deforming a selected portion of the neck.

11 Claims, 12 Drawing Figures



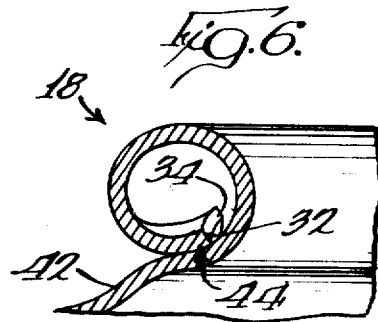
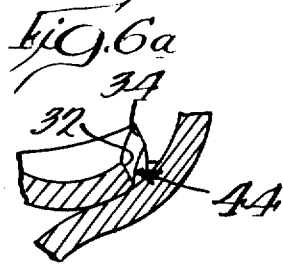
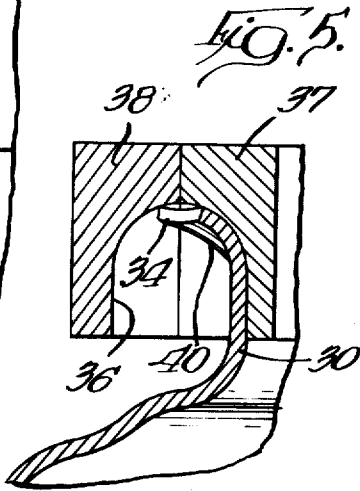
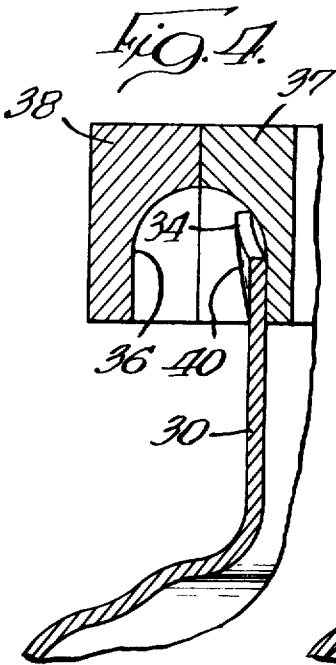
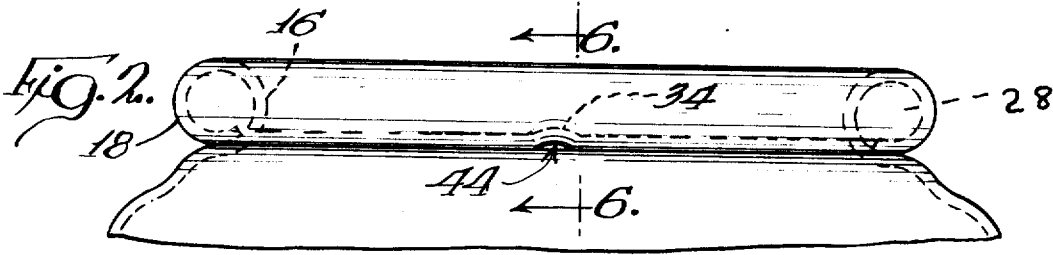
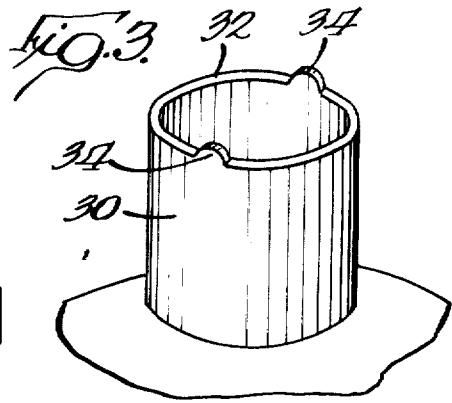
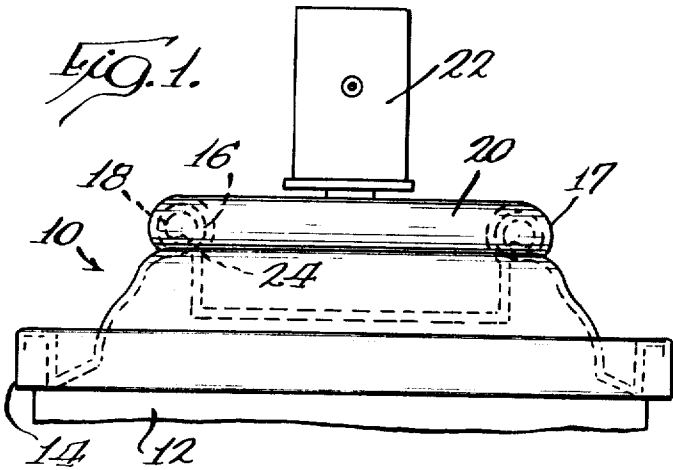


Fig. 7.

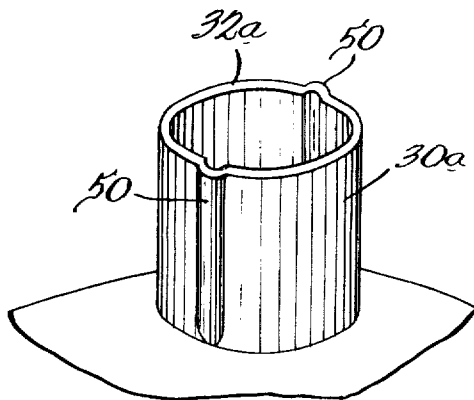


Fig. 9.

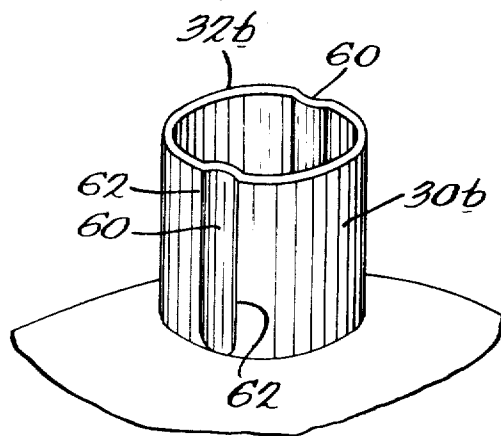
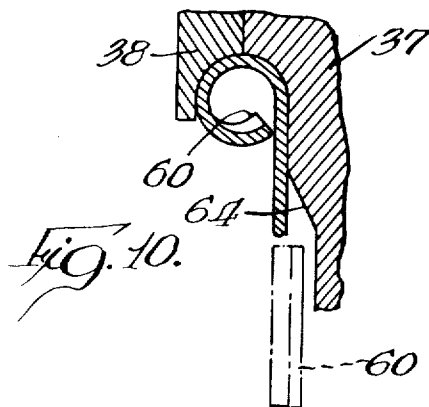
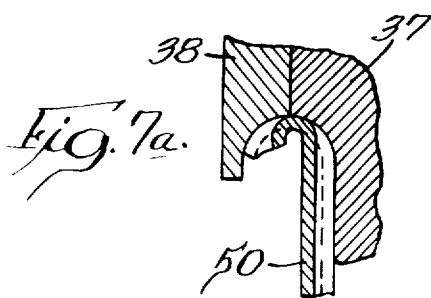
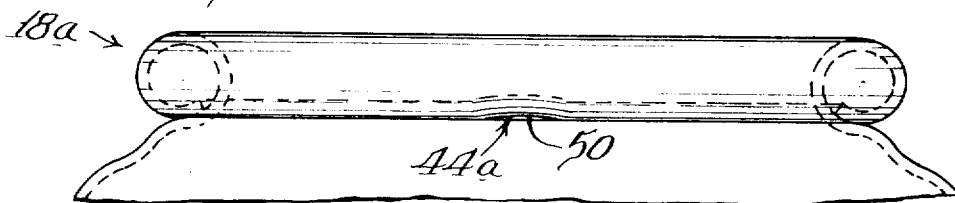


Fig. 8.



METHOD OF VENTING AN AEROSOL DOME

BACKGROUND OF THE INVENTION

The present invention relates generally to containers and more particularly to an improved method for forming a bead adjacent the open end of a container body.

In the formation of containers which are subsequently utilized for dispensing liquids through the use of a propellant, it has become customary to produce and end on the container body which defines an opening for receiving a mounting cup for a valve. The opening is surrounded by a bead or curl that serves as a support for the mounting cup which is crimped to the container end. The container end is generally referred to as an aerosol dome which is formed separately and which is sealed to the main body of the can with a double seam.

One of the problems encountered in a container of this type is that many times propellant and product are forced into the interior of the bead during a filling operation. In one type of filling or charging operation, it is common to cover the entire domed end of the container with a charging head before the mounting cup for the valve is crimped to the dome. The charging head is in engagement with the dome at a point spaced from the bead or curl surrounding the open end of the dome. The charging head is utilized first for producing a vacuum within the container and, subsequently, for introducing pressurized propellant and product between the mounting cup and the domed end of the container. After the container is filled, the mounting cup is crimped to the end of the container. During such a filling operation, which is generally referred to as "under-the-cap" filling, there is a tendency for propellant and product to be forced into the interior of the curl. Many times the propellant and product are trapped in the bead after the crimping operation has been completed.

After the container has been pressure filled and the mounting cup has been sealed within the opening of the dome, it is customary to test the containers for "leakers" by immersing the entire container into a heated water bath. During such testing operation, the propellant within the bead, which is in a gaseous state at atmospheric pressure and room temperature, tends to escape and produce bubbles in the bath resulting in the false interpretation that the container is a "leaker," when, in reality, the container is of sound construction and no leakage of product from within the container itself has taken place. In other instances, the product may be forced out of the bead while the container is on display, again indicating that the container is leaking.

Thus, there is a need for a simple and effective method for venting the bead of an aerosol dome.

BRIEF SUMMARY OF THE INVENTION

The present invention contemplates a method for forming a vented bead surrounding the open end of a container body. The bead or curl surrounding the opening of the container body is produced by rolling a neck extending from the body to a position where the free edge and an adjacent end portion of the neck overlap an adjacent outer surface of the body to produce a closed area having a predetermined internal radius. At least one circumferential portion of the bead is rolled to a reducing radius adjacent the free edge so that the overlapped portion of the bead forming part of the reducing radius portion is spaced from the adjacent outer surface of the container body. The reducing radius or substantially spiral portion is formed by producing at least one irregular contour on the free edge of the neck, which extends above the body of the container end, and thereafter engaging the free edge with a curling surface having a constant radius to roll the free edge to the overlapping relation. The longitudinal portion of the neck adjacent the irregular contour is rolled to reducing radius smaller than the predetermined constant radius of the remainder of the bead. In the device of my invention the free edge is uninterrupted in configuration along the major circumferential portion thereof by bends or irregular contours of any type. The bead of the finished container has an appearance essentially the same as that of a completely uniform bead.

One method for producing the irregular contour is to form at least one projection extending above the free edge, which is placed in engagement with the curling surface before the remainder of the body and results in a reducing radius adjacent the free edge or reduced diameter portion along a small circumferential portion of the bead.

In an alternate embodiment, the irregular contour of the free edge is produced by outwardly deforming a vertical column portion of the neck and subsequently engaging the free edge of the neck with the curling surface. In this embodiment, the outwardly deformed column will again be rolled to a reducing radius adjacent the free edge.

In the third embodiment, the irregular contour on the free edge of the neck is produced by inwardly deforming a column longitudinally of the neck which will initially contact the curling surface and result in substantial areas on opposite sides of the vertical column being curled to reduced diameter portions.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. 1 shows a fragmentary side elevation view of the container end constructed in accordance with the present invention and having a mounting cup and valve secured therein;

FIG. 2 is an enlarged fragmentary view of the free end of the container shown in FIG. 1;

FIG. 3 is a perspective view of the neck portion which ultimately forms the bead shown in FIG. 2;

FIG. 4 shows a vertical sectional view through one side of the neck shown in FIG. 3 and showing the initial engagement of the free edge of the neck with a curling surface;

FIG. 5 is a view similar to FIG. 4 showing the intermediate stage of the partially curled neck;

FIG. 6 is a vertical sectional view taken generally along line 6-6 of FIG. 2 and showing the final configuration of the vented bead;

FIG. 6a is an exploded fragmentary view of FIG. 6;

FIG. 7 is a view similar to FIG. 3 showing an alternative method of producing an irregular contour on the neck;

FIG. 7a is a view similar to FIG. 5 showing the intermediate stage of curling the neck of FIG. 7;

FIG. 8 is a fragmentary side elevational view of the modified aerosol dome;

FIG. 9 is a further embodiment of the neck similar to FIG. 3; and

FIG. 10 is a view similar to FIGS. 5 and 7a showing the intermediate stage of the neck disclosed in FIG. 9.

DETAILED DESCRIPTION

While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail one specific embodiment, with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiment illustrated.

FIG. 1 of the drawings discloses an aerosol dome 10 constructed in accordance with the present invention and secured to the upper end of a cylindrical body or container 12 through a sealed joint 14, which may be in the form of a commercially known double seam.

The upper end of the dome 10 has an opening 16 which is surrounded by a bead or curl 18. A mounting cup 20 supporting a discharge valve 22 is received in the opening 16 with a downwardly opening channel 17 secured to the bead 18, as by crimping or outwardly deforming selected areas 24 into engagement with the internal surface of the container end.

As was indicated above, when utilizing "under-the-cap" filling method for filling the container, it is customary to loosely insert the mounting cup 20 having the valve 22 therein into the open end of the container and thereafter to place a charging head over the entire structure with the lower edge of the charging head engaging the outer surface or wall of the dome 10 at the point outwardly spaced from the bead or curl. A

vacuum is then produced in the container and the high pressure propellant, in liquid form, and product are forced into the container between the adjacent surfaces of the bead 18 and the cooperating channel 17 of the mounting cup 20. When the container 12 has been filled with the desired amount of propellant and product, the mounting cup 20 is crimped, as at 24, and sealed to the upper end of the dome 10. Such a filling operation many times results in the trapping of propellant and/or product within the internal area of the bead 18, which is undesirable for the reasons set forth above.

According to the broadest aspect of the present invention, the head 18 is formed by rolling a cylindrical upstanding neck 30 to a position where the free edge of the neck overlaps an adjacent outer surface of the dome 10. The neck is rolled to produce a closed area 28 having an internal diameter or a substantially constant internal radius. At least one selected portion of the neck is rolled to a smaller diameter than the diameter of the remainder of the neck to thereby space a portion of the free edge from the adjacent outer surface of the dome or container end and provide a vent opening for the internal area of the bead.

Stated another way, at least one small circumferential portion of the neck is rolled to a reducing radius adjacent the free edge so as to produce a substantially spiral cross-sectional configuration. The smaller or reduced radius portion of the internal area of the bead is formed by initially producing at least one irregular contour on the free edge of the neck which is ultimately rolled or displaced to produce the bead 18. Subsequently, the free edge of the neck is engaged with a curling surface having a constant radius to displace the neck outwardly and form a bead having an internal radius with the free edge being in overlapping relation to the outer surface of the container. The irregular contour of the free edge will cause at least the end area of a longitudinal portion of the neck to be displaced to a smaller radius than the remainder of the neck and, thus, space the free edge of this longitudinal portion from the outer surface of the container body end.

In the embodiment illustrated in FIGS. 1-6, prior to attachment of the dome to the container body 12, an upwardly extending cylindrical neck 30 extends from the main body of the dome 10 to define a free upper edge 32. An irregular contour of the free upper edge in the initial embodiment is produced by projections 34 which extend above the free edge. The projections 34 may be formed simultaneously to the formation of the free edge 32, which is normally accomplished by stamping an opening into a cup shaped member extending above the main portion of the dome 10. Alternatively, the projections 34 may be formed as a separate operation, as by welding small beads or other protrusions to extend above the surface or free edge 32.

In the embodiment illustrated in FIGS. 2-6, it is desirable that the projections be located within the confines of the inner and outer surfaces of the neck 30. The bead 18 is thereafter formed by engaging the free edge 32 of the neck 30 with a curling surface 36 formed in a curling die having interconnected portions 37 and 38. The curling surface takes the form of a downwardly opening recess formed in the die sections 37 and 38 with the base of the recess defining an arcuate surface having a constant radius.

The actual curling or displacement of the cylindrical neck 30 is accomplished by relative movement between the curling surface 36 and the neck 30. As is clearly shown in FIG. 4, the initial contact of the upper edge 32 with the curling surface 36 is through the upwardly extending projections 34. These upwardly extending projections will thus follow the contour of the curling surface 36 and will initially cause outward deformation of a small circumferential area 40, which is in longitudinal alignment with the projection 34. After this initial deformation or outward displacement of the portion 40 of the neck, the remainder of the free edge 32 will be placed in contacting engagement with the curling surface, as shown in FIG. 5, and will ultimately be displaced or curled to the configuration shown in FIG. 6. In the final configuration shown in FIG. 6, it

will be noted that the free edge 32 and an adjacent end portion of the neck 30 are in overlapping relationship with the outer surface 42 of the dome 10. Furthermore, a cross-sectional area through any portion of the bead 18 will show that the neck has been rolled or displaced to a closed area of substantially cylindrical cross-sectional configuration having a substantially constant internal diameter or radius. However, the longitudinal portions of the neck which are in alignment with the projections 34 will be rolled or displaced in a manner to produce a reducing internal radius adjacent the free edge. This will result in having the portions 34 of the upper free edge 32 spaced from the adjacent outer surface 42 of the body of the container to produce an opening 44 as is clearly illustrated in FIG. 6a. This will place the internal area of the bead in communication with the surrounding atmosphere at all times. Thus, any gaseous propellant or product, which may be in the internal area of the bead after a filling operation, can readily escape through the openings 44 defined by the respective reduced diameter portions 40.

While any number of such projections 34 may be circumferentially spaced along the free edge 32, it is desirable that the respective projections be formed in diametrically opposed pairs on the free edge 32 of the cylindrical neck 30. The diametrically opposed pairs will equalize the forces which are encountered by the neck 30 during the initial deformation of the longitudinal column portions of the neck which are below each of the respective projections 34.

An inspection of FIG. 2 shows that the circumferential extent of the reduced diameter portion is extremely small and may result in what may be termed a "pinpoint" opening 44. However, it will be appreciated that only a small opening is necessary for the venting of the propellant, which is in a gaseous state when it is at room temperature and atmospheric pressure, or the product.

A slightly modified embodiment of the present invention is disclosed in FIGS. 7 and 8 in which the upper free edge 32a of the neck 30 has an irregular contour produced by outwardly deforming selected portions of the neck 30. In the embodiment illustrated in FIG. 7, first and second outwardly deformed columns 50 are produced at diametrically located points on the neck. It has been determined that the outwardly deformed columns will result in a final configuration of the bead or curl very similar to the bead shown in the previous embodiment. While this phenomenon is not completely understood, it is believed to result, at least in part, from the fact that during initial engagement and curling of the internal surface of the major portion of the neck, the outwardly deformed columns will remain in substantially columnar form as shown in FIG. 7a. This will cause the crest portions of the columns to engage the curling surface at points transversely spaced from the point of engagement of the remainder of the internal surface of the neck.

The engagement of the crests at an angularly related area of the surface, spaced from the tangential point of contact of the remainder of the surface of the neck will cause at least the upper end portion of the columns to be rolled to a reducing radius similar to the embodiment shown in FIGS. 2-6. As the distance from the free edge 32a of the neck 30a increases the internal stresses tending to maintain the columns in columnar form will be overcome by the internal forces developed in the neck during the rolling process.

Alternatively, it may be that at least the upper end of the outwardly deformed column will remain in its outwardly deformed condition during the rolling process. It is believed that this condition results from the excessive material as well as the additional strength of the outwardly deformed column.

During the rolling process, as the distance from the free edge 32a increases, the forces tending to return the outwardly deformed column into alignment with the main body of the neck likewise increases. This will result in the outwardly deformed column gradually disappearing as the spacing from the free edge of the neck increases.

In either event, the final configuration of the column portions of the neck will be substantially identical to the projection portions of the neck in the principal embodiment. That is to say the columns will be rolled to a cross-sectional configuration having a minimum radius at the free edge with a gradually increasing radius as the distance from the free edge increases and ultimately the radius of the column portions will equal the radius of the remainder of the rolled bead or curl. The final configuration of each of the column portions of the bead will be a spiral configuration in one segment adjacent the free edge and a second segment having a radius equal to the corresponding segment of the remainder of the neck.

The final configuration of the bead will have "pinpoint" openings or apertures 44a (FIG. 8) of small circumferential extent similar to that discussed in connection with the embodiment of FIGS. 2-6. As in the previous embodiment, the remainder of the free edge 32a and an adjacent portion will be in contacting engagement with the outer surface of the dome.

A further modified embodiment of the present invention is disclosed in FIGS. 9 and 10 wherein the irregular contour of the upper free edge 32b of the neck 30b is produced by inwardly deforming diametrically opposed portions 60. The diametrically opposed portion 60 extends substantially the length of the neck 30b and merge with the main body of the neck along lines generally designated by the reference numeral 62. In the embodiment of FIGS. 9 and 10, the curling surface 36 has an inclined portion 64 formed on the lower inner edge thereof.

During the rolling or displacement of the neck 30b, the crest portions of the respective columns 60 will initially engage the inclined surface 64 to be outwardly deformed. It has been found that in some instances the inwardly deformed columns will deform outwardly to produce a single pin point openings similar to openings 44a while in other instances the root portions 62 of the respective columns 60 will be deformed outwardly of the remainder of the edge 32b. Subsequently, the main portion of the upper edge 32b will engage the curling surface 36 and will produce a rolled bead, similar to bead 18a.

In the final configuration of the curled bead, either the free end of the crest portions or root portions of the columns 60 will be rolled to a reduced diameter and will result in a bead configuration similar the beads 18 and 18a. While the phenomenon of the formation of the reducing radius in this embodiment is not clearly understood, it is believed that the reversal of the position of the upper edges of the columns relative to the main portion of the neck results from the internal forces developed during the formation of the column 60. In cases where the root portions 62 of the neck are rolled to a reducing radius, it is believed that this results from the resistance of the columns to being deformed to the original position in alignment with the main body of the neck.

In each embodiment, the lower edge of the bead or curl will thus have a serpentine or sinuous configuration of very small amplitude. Also, the lower edge of the bead is disposed directly above an adjacent portion of the outer surface of the dome and a major, in fact most all of the lower edge, is in engagement with the dome surface.

Each of the embodiments of the present disclosure are capable of being incorporated into a conventional method of forming a bead or curl so that it is only necessary to produce the irregular contour on the free edge either as part of one of the steps for forming the dome 10 or as a separate step during the forming process. In all embodiments, the vented bead is formed by obstructing the normal flow of metal of the neck during the curling process.

We claim:

1. In a method of forming a vented bead surrounding the opening in the dome body of an aerosol container of the type including the step of rolling the free edge of the neck of said dome body outwardly to produce an integral bead having a predetermined internal radius, the improvement comprising: rolling a major portion of said free edge of said neck to a contacting engagement with the outer surface of said neck, said free edge being substantially uninterrupted in configuration along the major circumferential portion thereof; and concurrently rolling the remaining minor portion of said free edge of said neck toward, but short of engagement with, said outer surface of said neck such that the internal radius of said bead along said minor portion is less than said predetermined internal radius.
2. A method as defined in claim 1, in which said minor portion of said free edge is produced by deforming the neck before said neck is rolled.
3. A method as defined in claim 2, in which said neck is deformed inwardly along substantially the entire axial length thereof.
4. A method as defined in claim 3, in which said neck is inwardly deformed at opposed locations to produce at least two selected free edge minor portions.
5. A method as defined in claim 2, in which said neck is outwardly deformed at least adjacent the free edge of said neck.
6. A method as defined in claim 1, in which said minor portion of said free edge portion is formed by producing projections extending above the free edge of said neck.
7. A method of producing a vented bead surrounding an opening in a container end comprising the steps of producing at least one irregular contour on the free edge of a neck extending above the container end, said free edge remaining substantially uninterrupted in configuration along the major circumferential portion thereof; and engaging said free edge with a curling surface having a constant radius to displace said neck to a bead having an internal diameter with the free edge in overlapping relation to the outer surface of the container, said irregular contour causing a longitudinal portion of said neck to be displaced to a smaller diameter to space the irregular contour portion of the free edge from said outer surface and produce a vent for said bead.
8. A method as defined in claim 7, in which said irregular contour is produced by deforming a portion of said neck inwardly.
9. A method as defined in claim 7, in which said irregular contour is produced by outwardly deforming a portion of said neck.
10. A method as defined in claim 7, in which said irregular contour is produced by forming a projection extending above the free edge.
11. A method of producing a vented bead surrounding an opening in one end of a container dome body with a free edge in overlapping relation to the adjacent outer surface of the dome body which comprises the steps of rolling a minor circumferential portion, commencing at said free edge of a neck extending above said body, to a substantially spiral configuration having an increasing radius; rolling the remainder of said neck to a predetermined constant radius; continuing said rolling until the radius of said spiral equals said predetermined constant radius; and, thereafter, rolling all of said neck to said predetermined constant radius until said free edge is in overlapping relation with the adjacent surface of said dome body whereby the major portion of said free edge is in contacting relation with said adjacent surface while the free edge of said spiral portion is spaced from said adjacent surface.

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