Aug. 19, 1969 D. J. ROTH 3,461,699

METHOD AND APPARATUS FOR REFORMING CONTAINERS

Filed May 23, 1967

FIG.1

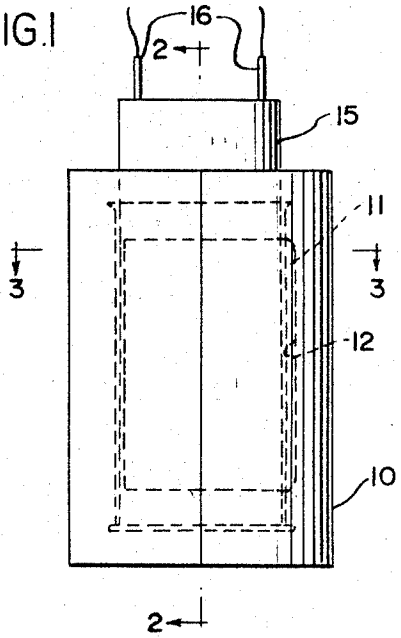


FIG.2

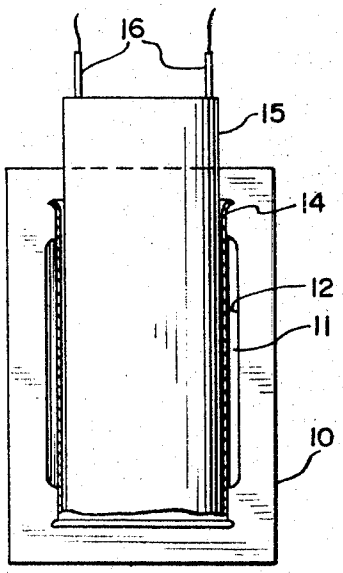


FIG.3

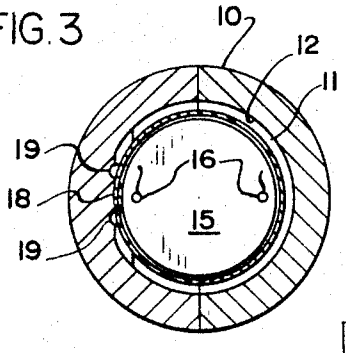


FIG.4

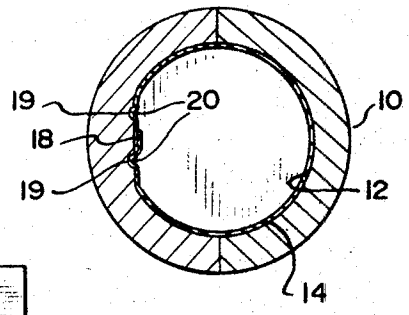
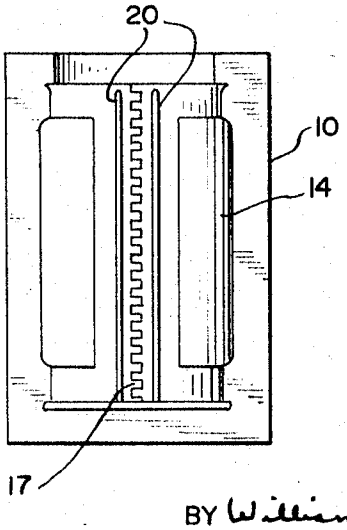


FIG.5



INVENTOR
DONALD J. ROTH

BY William A. Dittmann
ATTORNEY

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METHOD AND APPARATUS FOR REFORMING CONTAINERS

Donald J. Roth, Chicago Heights, Ill., assignor to Continental Can Company, Inc., New York, N.Y., a corporation of New York

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ABSTRACT OF THE DISCLOSURE

A container, having a side seam, is reformed in a die whereby a body wall of the container is embossed or stylized in conformity with the configuration of the die cavity. The stresses which are exerted on the body wall of the container during reforming and which tend to produce rupture at the side seam, are minimized by providing an element having gripping means for engaging an area of the body wall immediately adjacent the side seam. When the container is reformed, the area engaged by the gripping means takes up the stresses to prevent rupture at the side seam.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates to a method and apparatus for reforming containers and, more particularly, to a method and apparatus for reforming containers having a body wall joined by a side seam.

The prior art

Heretofore, reforming of containers having side seams was limited to containers, the side seams of which were sufficiently strong to withstand the hoop stresses exerted during reforming. Since properly welded side seams were the only ones generally able to withstand the above stresses, reforming was thus confined to containers having welded side seams. The disadvantage of the old method lies in its restrictiveness to strong side seams, so that containers having comparatively weak side seams cannot be reformed as the stresses exerted during reforming cause a rupture of such side seams, thereby destroying the container.

SUMMARY OF THE INVENTION

The present invention overcomes the disadvantage of the prior art and enables reforming, such as embossing and stylizing, of a container having any type of a side seam in its body wall. The reforming of the container is accomplished by expansion of the body wall of the container held in a die cavity until the wall conforms to the configuration of the cavity. An element having suitable gripping means is provided in the die, the container being situated to enable the gripping means to engage an area of the body wall of the container immediately adjacent the side seam when the expansion of the body wall begins.

The gripping means forms shallow protuberances, or the like, on both sides of the side seam which absorb the hoop stresses and prevent them from acting directly upon the side seam when expansion of the remaining body wall area takes place, thus eliminating the rupture at the side seam.

The more detailed aspects of this invention will become more apparent from the following description taken in connection with the accompanying drawing.

DRAWING

FIGURE 1 is a side elevational view of the apparatus embodying the present invention and used for carrying out the method of this invention;

FIGURE 2 is a sectional view taken generally along the line 2—2 of FIGURE 1;

FIGURE 3 is a sectional view taken generally along the line 3—3 of FIGURE 1;

FIGURE 4 is a sectional view similar to FIGURE 3, but showing the position of the container after completion of the reforming operation; and

FIGURE 5 is a side elevational view of the reformed container within one die half of the split die of the apparatus of this invention.

SPECIFICATION

While this invention is susceptible of embodiment in many different forms, there is shown in the drawing and will herein be described in detail an embodiment of the invention 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. The scope of the invention will be pointed out in the appended claims.

Referring now to the drawing, more specifically to FIGURES 1–3, there is shown means for carrying out the function of this invention, that is, stylizing or embossing a container having a side seam, without rupturing said container at said side seam. The following detailed description of parts represents but one way of accomplishing the above function.

Reforming of a container takes place in a die, such as die **10** illustrated in the drawing. To allow easy removal of the reformed container, the die is a readily openable split die having two halves joined by conventional means. The die **10** has a cavity **11** which has a configuration corresponding to a desired reformed configuration of the container to be reformed therein. An interior wall **12** of the die **10** may have a desired design formed thereon, which design is to be embossed on the body wall of the container.

The reforming operation is accomplished by placing a container, such as can **14**, into die cavity **11** of the die **10**. To reform the can **14**, in accordance with the dictates of the configuration of the die cavity **11**, the body wall of the can must be expanded within die cavity **11** in such a way that said body wall will engage interior wall **12** of the die **10** and assume the configuration of said cavity **11**.

Various means can be used for supplying the necessary force for the expansion of the container, or can, situated within the die cavity **11**. In the exemplary embodiment illustrated an electro-hydraulic force is utilized with an elastomeric membrane **15** inserted into the can **14**. Expansion can be produced by a variety of other forces, such as: hydraulic, pneumatic, rubber-bulging, etc.

The elastomeric membrane **15** has in its interior (not shown) a pressure shock wave conducting medium, or fluid, and electrode means normally comprising a pair of electrodes. A pair of leads **16** connect the electrodes positioned within the elastomeric membrane **15** to a power source, such as an electric generator or the like. When power is supplied by the source and, through leads **16**, reaches the electrodes positioned within the membrane **15**, a spark is produced between the electrodes causing a formation of a shock wave in the medium within the membrane **15**. This shock wave, transmitted by the medium, hits the walls of the membrane **15** causing the same to expand thereby expanding the body wall of the can **14**, with which the membrane **15** is in contact. The

body wall is moved outwardly until it reaches the interior wall **12** of the die **10** and assumes the configuration of the die cavity **11** and the design of said wall **12**.

Means for preventing rupture of the can **14** at its side seam **17** comprises a part of the interior wall facing the cavity and includes an element **18** having gripping means, as best seen in FIGURE 3. The element **18** can be integrally formed with the die or it can be inserted as a separate member against the interior wall in the die cavity. The particular example illustrated, shows the element **18** as being integrally formed with the die **10**.

The prevention of rupture of the can **14** at its side seam is accomplished by restricting deformation of the area of the body wall of the can immediately adjacent the side seam **17** while the remaining area of the body wall of the can is deformed. For this purpose, the can **14** is inserted into the die cavity **11** in such a manner that the side seam **17** faces the element **18** and the gripping means is opposite both sides of the side seam. The gripping means comprises a pair of vertical grooves **19**, the function of which is to be explained in detail later. Other means, such as knurled indentations, can be provided in place of grooves **19** is desired. The function, however, of the grooves and of the knurled indentations will be the same.

Because of the position of the element **18** in relation to the cavity **11**, the element is in closer proximity to the can **14** when the same is located within the die cavity, than the can is to the rest of the interior wall **12** of the die. Immediately after a start of the electrohydraulic pulse, the elastomeric membrane **15** begins to expand, thereby forcing the can **14** outwardly toward the interior wall **12** of the die **10**. During the expansion process, the grooves **19** form a pair of shallow protuberances **20**, as best seen in FIGURES 4 and 5, in the area of the body wall adjacent the side seam. The formation of protuberances does not place the side seam of the can under a sufficient stress to cause rupture at the side seam. As the can continues to be pushed outwardly, the hoop stresses on its body wall increase and rapidly build up to a level which may rupture the side seam were it not for the aforementioned grooves **19** which firmly hold the previously formed protuberances **20**, preventing the hoop stresses or hoop tension force from acting directly upon the side seam.

With the concept and apparatus as above described, it is now possible to form, reform, emboss and stylize as well as perform related operations on containers having a variety of side seams, including such normally weak side seams as soldered or adhesive.

FIGURE 5 illustrates a reformed can **14** positioned within a cavity of a die **10** which has been opened for clarification purposes. It can be observed that the can **14** is reformed in accordance with the configuration of the die cavity **11**, where a pair of protuberances **20**, appearing on both sides of the side seam **17**, have been caused by the vertical grooves **19** of the element **18**.

What is claimed is:

1. A method of reforming a container having a body wall joined by a side seam without rupturing the side seam comprising the steps of:

placing a mold part having paired gripping means adjacent to the length of said side seam of said container with each said gripping means being placed adjacent opposite sides of said side seam,

placing the forming part of said mold generally more remote from said container wall than said mold part and said gripping means, and

applying forming pressure to said container wall whereby said container wall is reformed by first striking said mold part having said gripping means and then is formed into the rest of said die so that a part of the container body wall adjacent said side seam attaches to said gripping means and prevents hoop stresses from being applied to said side seam when the container body is reformed.

2. An apparatus for reforming a container having a body wall joined by a side seam comprising:

a die having an interior wall defining a cavity for receiving a container to be reformed;

means insertable within said cavity for deforming the body wall of said container; and

means comprising part of said cavity wall located opposite the side seam of said container and lying generally closer than other portions of said cavity wall to said container wall and having paired gripping means positioned on opposite sides of said side seam and running parallel to said side seam for reducing the effect of stresses exerted on said side seam when said body wall is deformed.

3. An apparatus as defined in claim **2** wherein said gripping means for reducing the effect of stresses exerted on said side seam comprises at least a pair of longitudinal protuberances.

4. An apparatus as defined in claim **2** wherein said gripping means for reducing the effect of stress exerted on said side seam comprises at least a pair of grooves formed in said wall means for receiving said gripping portions of said body wall in close proximity to and on both sides of said side seam.

5. An apparatus as defined in claim **2** wherein said cavity wall means is integrally formed with said die.

6. An apparatus as defined in claim **2** wherein said means for deforming the body wall of said container comprises an elastomeric membrane containing a power transmitting medium and electrode means operatively connected to a power source and positioned in said medium.

7. A die for reforming a tubular container body blank having a side seam in its body wall comprising:

a die having an interior wall defining a cavity of a configuration substantially corresponding to the desired configuration of said container;

a raised portion of said wall lying near to said side seam and in opposition to the side seam of said container and extending laterally somewhat beyond said side seam; and

paired gripping means extending along the length of said raised portion for engaging areas of said container along each side of the said side seam whereby as the container enlarges, the gripping means engage the container wall and relieve the side seam of hoop stress.

8. A die as defined in claim **6** in which said paired gripping means comprise each a series of indentions formed in said raised portion for engaging said body wall of said container.

References Cited

UNITED STATES PATENTS

2,070,906	2/1937	Kruse.	
2,966,872	1/1961	Schmocker	72—54
3,222,902	12/1965	Brejcha et al.	72—56

RICHARD J. HERBST, Primary Examiner

U.S. Cl. X.R.

72—61; 113—120