Dec. 19, 1967 R. L. JOOSTEN ETAL 3,358,876

REVERSE SEAM CAN WITH HERMETIC DRUMHEAD

Filed Sept. 14, 1964

FIG. 1

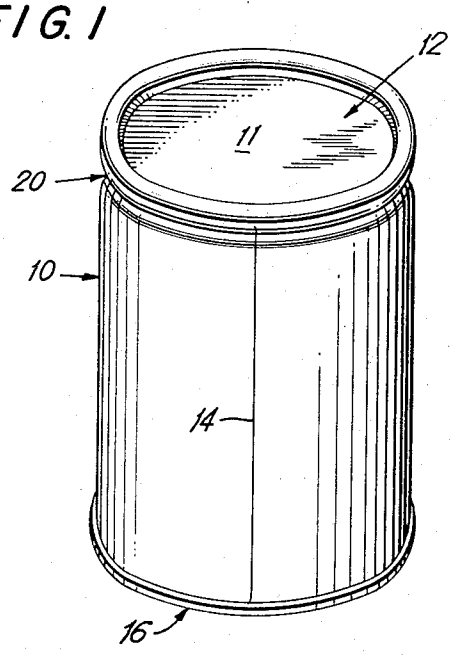


FIG. 2

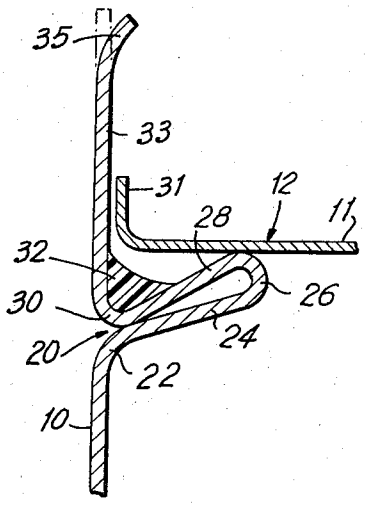


FIG. 3

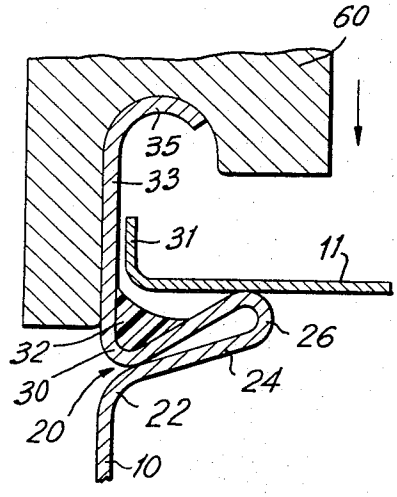


FIG. 4

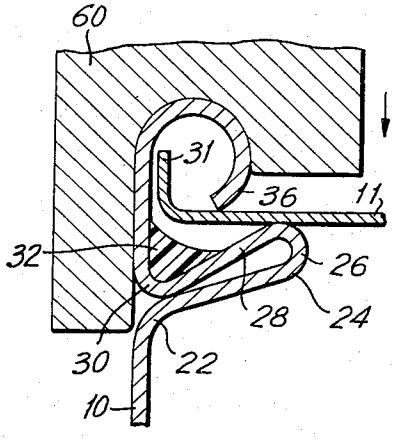
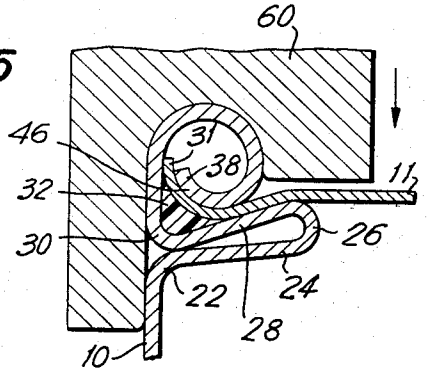


FIG. 5



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REVERSE SEAM CAN WITH HERMETIC DRUMHEAD

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This invention relates to a container seam and a method of forming the seam. It has particular reference to a seam which tightly clamps an end closure along its peripheral edge, and a method of forming the same.

One of the few disadvantages of the conventional double-seam is that the unseamed portion of the end closure is provided with a countersink wall adjacent the double-seam. This countersink wall allows the central unseamed portion of the end closure to panel or deflect when the end closure is subjected to pressure or vacuum. This condition necessitates employing an end closure with substantial thickness which will provide the necessary resistance against such paneling. The countersink wall also allows the end closure to buckle, i.e. a permanent deformation of the countersink wall. Theoretically, the best solution to the problem of end closure paneling and buckling is to seam the end closure while it is maintained in a flat disposition.

A typical commercial seam for securing a flat end closure comprises an inwardly directed seam which clamps the end closure at a single peripheral location above an inwardly directed ledge. While the single peripheral clamping of the end closure is adequate when container pressures are approximately atmospheric, the single peripheral clamping is incapable of maintaining the edge closure against displacement when the interior of the container is under pressurized or vacuumized conditions. In consequence, the commercial application of flat end closures has heretofore been limited to packages which are maintained at atmospheric pressures.

To function under pressures and/or vacuums, the periphery of the flat end closure must be tightly clamped or secured to eliminate relative movement between the periphery of the flat end closure and the elements which clamp or secure the end closure periphery. When such relative movement is eliminated, the strength of the end closure is determined by the tensile strength of the end closure material rather than the rigidity of the end closure, as explained above in the discussion of the problems presented by the countersink wall of the conventional end closure. An example of such high-tensile strength material is polyvinyl chloride, which also allows the customer to view the contained product. Additionally, the employment of a flat end closure eliminates the countersink wall and, therefore, the buckling problem presented by permanent deformations of the countersink wall.

It is therefore an object of the present invention to provide a tight seam construction between an end closure and a container body.

Another object is to provide a tight seam construction, for securing an end closure, which can be formed in an economical manner.

A further object is to provide a seam which tightly clamps an end closure along the margin edge thereof.

An additional object is to provide a seam which maintains an end closure in a buckle resistant manner with reduced plate weights.

Still another object is to provide a seam construction which will resist buckling and paneling, even when thin end closures are employed under pressurized or vacuumized conditions.

Still a further object is to provide a seamed construction

which will maintain an hermetic seal between an end closure and a container body.

Yet another object is to provide a method of forming a seam which will tightly secure an end closure.

Numerous other objects and advantages of the invention will be apparent as it is understood from the following description, which, taken in conjunction with the accompanying drawings, discloses a preferred embodiment thereof.

The above objects are accomplished by a reverse seam construction which clamps the end closure along two non-planar peripheral surfaces to tightly secure the flat central portion of the end closure.

Referring to the drawings:

FIG. 1 shows a perspective view of a container embodying the invention; and

FIGS. 2 through 5 are enlarged fragmentary sectional views showing the sequence of steps in forming the instant end seam, FIG. 5 also showing the completed seam.

As a preferred or exemplary form of the instant invention, FIG. 1 illustrates a metallic tubular container having a metallic body generally designated **10** and a metallic end closure generally designated **12**. The end closure **12** may instead be fabricated from any material having high tensile strength, such as polyvinyl chloride, which is preferred when the packaged product is to be inspected by the consumer prior to purchase.

The container body is formed by a body blank whose longitudinal margins meet in a side seam generally designated **14**, and at the end of the container body opposite the end closure **12**, after the container has been filled, a metallic closure is affixed to the container body by a conventional doubleseam **16** or, if desired, the container body may be closed by a reverse seam of the type specifically disclosed hereinafter with reference to end closure **12**. The container body **10** may have a cross-section of circular, rectangular or elliptical configuration.

The tubular can body **10** is provided with an inwardly directed ledge **20** as shown in FIG. 2. This ledge is formed by turning the tubular wall **10** inwardly at **22** to form a radially extending annular wall **24**. Adjacent the inner end of the annular wall **24** the container body is turned outwardly to form an inwardly directed bead **26** and an inclined wall **28** which merges at its outer end with a curved annular channel into which suitable sealing compound **32** is placed. Above the curved annular surface **30**, the container body is provided with a tubular wall **33** which merges with an annular arcuate surface **35** located at the extremity of the container body.

The end closure **12** includes a central disc-like portion **11** and an integral peripheral vertical flange **31** which contacts the inside surface of the tubular wall **33** and maintains the end closure in position until the seaming operation is partially completed. The central disc-like portion **11** is placed over the inclined wall **28** and the sealing compound **32**.

In the completed seam the tubular wall is turned downwardly and inwardly to form a curl **36** which clamps the flat central portion **11** and the tubular vertical flange **31**. The flat central portion **11** is clamped by the curl **36** and the inwardly directed bead **20** and the peripheral flange **31** is clamped between an arcuate wall **38** and the curl **36** as shown in FIG. 5. Between the two clamped positions the curl **36** forces the end closure against the sealing compound **32** to improve the sealing effect as will be more fully explained hereinafter.

To effect the instant seaming method, a die **60** is located above the container and moved against the arcuate surface **35** to bend the upper extremity of the tubular wall **32** downwardly and outwardly as shown in FIG. 3. While the die **60** is preferred, other seam forming apparatus such

as rollers may be employed. The bending of the upper end of the tubular wall is effected by an annular channel **62** which contacts the upper surface of the curl **36** and causes the leading edge of the curl to contact the closure member **12** along an annular surface **37** in the manner illustrated in FIG. 4. Continued downward movement of the die forces the surface **37** to move radially outwardly along the end closure **12**. At this point, the inwardly extending ledge **22** is flexed downwardly to effect a first clamping action of the end closure **12** between the curl **36** and the wall **28**. The wall **28** is flexed to a generally horizontal position as shown in FIGS. 4 and 5 and due to its tendency to return to the unflexed position the central portion **11** of the end closure is maintained tightly clamped between the curl **36** and the wall **28** of the ledge.

In the completed seam construction the periphery of the curl is curved to form an annular arcuate wall **38** as shown in FIG. 5. When the die **60** is moved to its lowermost position, the vertical flange **31** of the end closure **12** is clamped between the annular arcuate wall **38** and an abruptly curved surface **46** formed by the curl **36**. As the curl **36** is moved from the position illustrated in FIG. 4 to the position illustrated in FIG. 5, the lower surface of the end closure **12** is pressed into sealing engagement with the compound **32**. During this movement the leading end of the curl **36** is turned upwardly, causing the abruptly curved surface **46** to contribute a large clamping force.

The above described method of forming a seam insures a tight connection between the tubular body and the end closure by clamping the end closure along two annular surfaces. Such clamping is a critical feature of the instant seam construction. Effective clamping of the end closure **12** is made possible by the elasticity of the container body. The inwardly directed ledge is flexed downwardly during the formation of the curl **36**. The tendency of the ledge to return to its original position (FIG. 2), however, causes the end closure to be clamped between the curl **36** and the ledge **20**. A second clamping is produced on the vertical flange **31** by the tendency of the curl **36** to return to its original or uncurled position. The abruptly curved surface **46** of the curl **36** insures a large clamping force along the vertical flange **31**.

This clamping of the end closure allows the employment of thin end closures without any danger of buckling. The instant seam construction adds rigidity to the container body. Additional body rigidity is achieved by extending the curl **36** along the vertical flange **31**. The tendency of the curl **36** to return to its previous uncurled condition provides a radial force which supports the container body via the vertical flange **31**. This tendency also increases the rigidity and abuse resistance of the curl per se.

The instant seam construction maintains a hermetic seal for a variety of foods. Maximum sealing effect of the compound **32** is realized because, during the seam formation, the compound is compressed and forced into sealing relation with the end closure **12**. During the seam formation, the lower position of the curl **36** is forced into the annular sealing compound-containing channel, and in consequence the sealing compound is displaced both outwardly between the vertical flange **31** of the closure and the arcuate wall **38** and inwardly along the inclined wall **28**. This displacement of the sealing compound provides an elongated seal effectively preventing leakage of air or gas therethrough.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description and it will be apparent that various changes may be made in the steps of the method described and their order of accomplishment without departing from the spirit and scope of the invention or sacrificing its material advantages, the method and form hereinbefore described being merely a preferred embodiment thereof.

We claim:

1. A container comprising a container body, said body including an annular ledge adjacent to one end of said body and extending radially inwardly and axially upwardly, a tubular wall extending axially upwardly from and merging at its lower end with the outermost face of said ledge in alignment with the remainder of the container body, an annular channel between said ledge and said tubular wall, sealing compound within said channel, an annular curl connected with and extending upwardly and inwardly from the free end of said tubular wall, the free end of said curl projecting generally upwardly and radially outwardly, said container body being in combination with an end closure the peripheral portion of which extends between said ledge and the bottom of said curl and between the upper portion of said tubular wall and the free end of said curl, said ledge being flexed downwardly to urge said end closure upwardly against the bottom of said curl, said curl having a tendency to straighten so that said curl end urges said end closure against said tubular wall.

2. The container defined in claim **1** wherein said ledge comprises two layers, the uppermost of which is a downwardly and outwardly inclined wall, merging with said tubular wall at its lower portion the lowermost of said layers being an annular wall which merges with said container body.

3. The container defined in claim **2** wherein said upper and lower layers are joined at their radially inner ends by an inwardly directed bead.

4. The container defined in claim **2** wherein said sealing compound extends between the location where said end closure is urged against said cylindrical wall and the location where said end closure is urged against said curl.

References Cited

UNITED STATES PATENTS

636,646	11/1899	Draper	220—67 X
1,364,640	1/1921	Plats	220—67
2,100,480	11/1937	Hirshman	220—67 X
2,251,987	8/1941	Conway	220—67 X
2,744,217	5/1956	Aikman	220—67
2,979,224	4/1961	Henchert	220—67
3,128,008	4/1964	Henchert	229—5.6 X

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