

PATENT SPECIFICATION

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COMPLETE SPECIFICATION

DRAWINGS ATTACHED

Method for closing a Container, and Container Closed according to this Method

We, SHELL INTERNATIONAL RESEARCH MAATSCHAPPIJ N.V., a Company organised under the Laws of the Netherlands, of 30 Carel van Bylandtlaan, The Hague, the Netherlands, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 The invention relates to a method for sealing an opening in the wall of a container by means of a closure, in which at least the contact faces of the container and the closure are made of plastics material. According to the invention the method comprises positioning the closure on the opening of the container, exerting pressure between the closure and the container, rotating the closure relatively to the container so that the frictional heat generated between the contact faces of the container and the closure causes at least a portion of the contact faces to fuse, stopping the rotation and maintaining the pressure until the fused material has solidified, at least one of the said contact faces being formed with an annular ridged protrusion of which substantially only the top of the ridge is in contact with the other contact face.

30 The invention also relates to a container with closure sealed thereto according to the above-mentioned method.

Applicants have found that the closure may be very rapidly secured to the container according to the above-mentioned method if use is made of a container and closure, in which at least one of the said contact faces is provided with a plurality of annular and concentric ridged protrusions of which substantially only the ridges are in contact with the other contact face.

These ridges have the advantage that grinding, splinters or chips, formed in carrying out the said method, collect at least in

part, between the said ridges so that contamination of the contents of the container is prevented as much as possible.

Any splinters or chips which nevertheless pass the ridges may be retained by using a container with a closure, in which either the closure or the container is provided with an annular protruding rim situated near that extremity of the contact face which is closest to the said opening. This annular protruding rim preferably fits freely into a corresponding annular groove arranged in either the closure or the container.

In an advantageous embodiment of closure and container at least one of the said contact faces has the shape of a truncated cone surface.

The invention may be carried into practice in various ways but a number of specific embodiments will now be described by way of example with reference to the accompanying drawings in which each of the Figures 1 to 9 shows a cross-section of a part of a container to which a closure is secured by the method according to the present invention.

Referring to all Figures, the containers 1 each having a side wall, and an end wall 2 having in it an opening 3 which is closed by a closure.

In the embodiment according to Figure 1 the closure, for example a cap 4, is provided with an annular contact face 5 adapted to co-operate with a contact face 6, which has the shape of a truncated cone. The contact face 5 is provided with a plurality of annular and concentric ridged protrusions 7. The end wall 2 of the container has an annular protruding rim 8 situated near that extremity of the contact face 6 which is closest to the opening 3. A rim 8 fits freely into a corresponding annular groove 9 arranged in the cap 4.

Referring to Figure 2, the end wall 2 is

provided with a contact face 11 which has the shape of a truncated cone and is provided with annular concentric ridges 12. The cap 4 is provided with a flat annular contact face 13. An annular protruding rim 14 is attached to that extremity of the contact face 11 which is closest to the opening 3. The rim 14 projects into a corresponding annular groove 15 arranged in the cap 4.

10 In the embodiment shown in Figure 3 a frusto-conical contact face 17 is also attached to the end wall 2. The extremity of the contact face 17 situated near the opening 3 is provided with an annular groove 18, which accommodates a protruding annular rim 19 attached to the cap 4. The cap 4 is provided with a flat annular contact face 20 and the contact face 17 has annular concentric ridges 21.

20 The embodiment shown in Figure 4 also has a frusto-conical contact face 23 attached to the end wall 2 which face is adapted to co-operate with a frusto-conical contact face 24 of the cap 4. The contact face 24 is provided with annular concentric ridges 25. The extremity of the contact face 23 situated near the opening 3 is provided with an annular groove 26 accommodating a protruding annular rim 27 attached to the cap 4.

30 Referring to Figure 5, a frusto-conical contact face 29 is attached to the end wall 2, which face is provided with annular concentric ridges 30. The cap 4 has a conical contact face 31. The extremity of the contact face 29 situated near the opening 3 is provided with an annular protruding rim 32, which projects into an annular groove 33 arranged in the cap 4.

40 In the embodiment according to Figure 6 the end wall 2 and the cap 4 are each provided with a pair of conical contact faces designated by the reference numerals 35, 36 and 37, 38 respectively. The contact faces 35 and 37 are provided with annular concentric ridges 39 and 40 respectively.

45 Figure 7 shows an embodiment, in which the conical faces 42 and 43 which are attached to end wall 2 and cap 4 respectively, are each provided with annular concentric ridges 44 and 45 respectively. An annular protruding rim 46 grips behind an annular rim 47 of the cap 4.

50 Also in the embodiment according to Figure 8 co-operating frusto-conical faces are present, designated by the reference numerals 49 and 50 respectively. The contact face 50 is provided with annular concentric ridges 51. An annular rim 52 is present at the extremity of the contact face 49 situated near the opening 3, which rim grips behind an annular rim 53 of the cap 4.

60 The variant according to Figure 9 is provided with frusto-conical contact faces 54 and 55, the contact face 55 having annular concentric ridges 56. A protruding annular

rim 57 of the cap 4 grips behind an annular rim 58 which is attached to the extremity of the contact face 54 situated near the opening 3.

In each embodiment the cap is secured in a liquid and gas-tight manner by placing the cap 4 on the opening 3 in such a way that the contact faces of container and cap touch each other. Thereupon pressure is exerted on the cap 4, for example by means of a shaft normal to the cap, while the shaft is being rotated. The extremity of the shaft and the cap are so designed that the cap 4 is engaged by the shaft and consequently also rotates. To this end the cap 4 may be provided with suitable recesses or cams (not shown). During the rotation of the cap 4 the container is held stationary so that the cap 4 rotates relatively to the container. This rotation causes heat to develop on the contact faces of container and cap. This heat causes the material of the contact faces to melt to some extent. After sufficient melting has taken place the shaft (and the cap) are brought to a standstill, whereas the pressure exerted on the cap is maintained for some time, viz. until the melted material has solidified again. Once the material has solidified again, the cap is united to the container very solidly, and in a liquid- and gas-tight manner.

Owing to the annular concentric ridges the material of the contact faces melts very rapidly during the said operation. Any chips, splinters or grindings of material, coming off during the operation largely collect in the "recesses" between the annular ridges, as a result of which they are prevented from finding their way into the contents of the container and from contaminating the contents. An extra safeguard against contamination of the contents of the container by chips, splinters or grindings of material may be obtained by using the annular protruding rims 8, 14, 19, 27, 32, 46, 52 or 58, respectively situated near that extremity of the contact face 6, 11, 17, 23, 29, 42, 49 or 54 which is closest to the said opening. The rim may project, for example, into an annular groove 9, 15, 18, 26, 33 or grip behind an annular rim 47, 53 or 57. The said protruding rim retains any chips, splinters or grindings that have come off and thus forms an extra safeguard against contamination of the contents of the container.

In the embodiment according to Figure 6 such a protruding annular rim is not provided. In this case the contact faces 35 and 36 are arranged in such a way that together they are V-shaped in cross-section. In other words, the faces 35 and 36 together form a V-shaped channel, in which any splinters, chips or grindings that have come off, may collect.

The container may be used for the gas

and liquid-tight packing of pulverulent materials or of liquids, for example, for the packing of lubricating oil.

WHAT WE CLAIM IS:—

- 5 1. A method of sealing an opening in a container with a closure, in which at least the contact faces of the container and the closure are made of plastics material, comprising positioning the closure on the opening of the container, exerting pressure between the closure and the container, rotating the closure relatively to the container so that the frictional heat generated between the contact faces of the container and the closure causes at least a portion of the contact faces to fuse, stopping the rotation and maintaining the pressure until the fused material has solidified, at least one of the said contact faces being formed with an annular ridged protrusion of which substantially only the top of the ridge is in contact with the other contact face.
2. A container with a closure sealed thereto by the method of Claim 1.
- 25 3. A container with closure as claimed in Claim 2, in which at least one of the said contact faces is formed with a plurality of annular and concentric ridged protrusions of which substantially only the ridges are in contact with the other contact face.
- 30 4. A container with closure as claimed in any one of Claims 2 to 3, in which at least

one of the said contact faces has the shape of a truncated cone.

5. A container with closure as claimed in any one of Claims 2 to 4, in which the closure or the container is provided with an annular protruding rim positioned near the contact faces of the closure or the container at the side of the opening of the container.

6. A container with closure as claimed in Claim 5 in which the said annular protruding rim in the closure or the container fits freely into an annular groove arranged in the container or the closure.

7. A container with closure as claimed in any one of Claims 2 to 6, in which, the container and closure are made of polyethylene.

8. A method for sealing an opening in the wall of a container with a closure, substantially as described herein with reference to any one of the Figures of the accompanying drawings.

9. A container with closure sealed thereto, substantially as described herein with reference to any one of the Figures of the accompanying drawings.

KILBURN & STRODE,
Chartered Patent Agents,
Agents for the Applicants.

Reference has been directed in pursuance of Section 9, subsection (1) of the Patents Act, 1949, to patents Nos. 1,018,514 and 999,025.

and liquid-tight packing of pulverulent materials or of liquids, for example, for the packing of lubricating oil.

WHAT WE CLAIM IS:—

- 5 1. A method of sealing an opening in a container with a closure, in which at least the contact faces of the container and the closure are made of plastics material, comprising positioning the closure on the opening of the container, exerting pressure between the closure and the container, rotating the closure relatively to the container so that the frictional heat generated between the contact faces of the container and the closure causes at least a portion of the contact faces to fuse, stopping the rotation and maintaining the pressure until the fused material has solidified, at least one of the said contact faces being formed with an annular ridged protrusion of which substantially only the top of the ridge is in contact with the other contact face.
2. A container with a closure sealed thereto by the method of Claim 1.
- 25 3. A container with closure as claimed in Claim 2, in which at least one of the said contact faces is formed with a plurality of annular and concentric ridged protrusions of which substantially only the ridges are in contact with the other contact face.
- 30 4. A container with closure as claimed in any one of Claims 2 to 3, in which at least

one of the said contact faces has the shape of a truncated cone.

5. A container with closure as claimed in any one of Claims 2 to 4, in which the closure or the container is provided with an annular protruding rim positioned near the contact faces of the closure or the container at the side of the opening of the container.

6. A container with closure as claimed in Claim 5 in which the said annular protruding rim in the closure or the container fits freely into an annular groove arranged in the container or the closure.

7. A container with closure as claimed in any one of Claims 2 to 6, in which, the container and closure are made of polyethylene.

8. A method for sealing an opening in the wall of a container with a closure, substantially as described herein with reference to any one of the Figures of the accompanying drawings.

9. A container with closure sealed thereto, substantially as described herein with reference to any one of the Figures of the accompanying drawings.

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