(54) Title: CONTAINER SEAL FOR THE STORAGE OF DANGEROUS LIQUID MATERIAL

The invention relates to a seal between an open body end of a container (2) and an edge of a lid (1) which may be pressed into the open body end in a sealing manner. The sheet metal is bent outwards with a curved radius (11) by about 180°, whereby the lid
(57) **Abstract (continued):**

edge separated from a lid surface (3) by a channelled bead (4), extends with the radially external defining edge (5) thereof from the bead over an axial position of the lid surface (3) and is bent radially outwards around a radius to form a rolled edge (7), for housing an annular sealing material (9) which is stretched downwards. A sheet edge (8) for the rolled edge (7) terminates at a radial separation (d8) before the defining edge (5), said separation being of such a size that on sealing, the body end, with the curved radius (11) thereof in contact with the defining edge (5) of the lid (1), may be inserted, between the same and the sealing material (9), into the rolled edge.
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(54) Title: CONTAINER SEAL FOR THE STORAGE OF DANGEROUS LIQUID MATERIAL
(54) Bezeichnung: BEHÄLTERVERSCHLUSS ZUM AUFBEWAHREN VON FLUIDEM GEFAHRGUT

(57) Abstract: The invention relates to a seal between an open body end of a container (2) and an edge of a lid (1) which may be pressed into the open body end in a sealing manner. The sheet metal is bent outwards with a curved radius (11) by about 180°, whereby the lid edge separated from a lid surface (3) by a channelled bead (4), extends with the radially external defining edge (5) thereof from the bead over an axial position of the lid surface (3) and is bent radially outwards around a radius to form a rolled edge (7), for housing an annular sealing material (9) which is stretched downwards. A sheet edge (8) for the rolled edge (7) terminates at a radial separation (68) before the defining edge (5), said separation being of such a size that on sealing, the body end, with the curved radius (11) thereof in contact with the defining edge (5) of the lid (1), may be inserted, between the same and the sealing material (9), into the rolled edge.

(57) Zusammenfassung: Verschluss zwischen einem offenen Rumpfende eines Behälters (2) und einem Rand eines in das offene Rumpfende abdichtend eingrückbarem Deckels (1). Am Rumpfende ist das Blech unter einem Krümmungsradius (11) um 180° nach außen abgebogen, wobei der von einem Deckelspiegel (3) durch eine kanaelförmi ge Siche (4) befestigte Deckelrand mit seiner radial äußeren Begrenzungslinie (5) der Siche (4) über eine axiale Position des Deckelspiegels (3) hinaus axial auftritt und unter einem Radius radial nach außen unter Bildung eines Rollrandes (7) abgebogen ist; und zwar zur Aufnahme eines den Rollrand füllenden und axial nach unten ausgedehnten ringförmigen Dichtungsmaterials (9). Eine Bleckkante (8) des Rollrandes (7) endet in einem radialen Abstand...
Erklärung gemäß Regel 4.17:
— Erforderklärung (Regel 4.17 Ziffer iv) nur für US

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(d8) vor der Begrenzungsflanke (5), welcher Abstand so bemessen ist, dass beim Verschließvorgang das Rumpfende mit seinem Krümmungsradius (11) in Verschluss zwischen einem offenen Rumpfende eines Behälters (2) und einem Rand eines in das offene Rumpfende abdichtend eindrückbaren Deckels (1) . Am Rumpfende ist das Blech unter einem Krümmungsradius (11) um 180° nach außen abgehoben, der von einem Deckelspiegel (3) durch eine kanalförmige Sicke (4) beobachtete Deckelrand mit seiner radial äußeren Begrenzungsflanke (5) der Sicke (4) über eine axiale Position des Deckelspiegels (3) hinaus axial aufgeraumt und unter einem Radius radial nach außen unter Bildung eines Rollrandes (7) abgebogen ist. Es dient der Aufnahme eines den Rollrand füllenden und axial einer Flanke und unter Bildung eines Rollrandes (7) abgebogen ist. Eine Blechkante (8) des Rollrandes (7) endet in einem radialen Abstand (d8) vor der Begrenzungsflanke (5), welcher Abstand so bemessen ist, dass beim Verschließvorgang das Rumpfende mit seinem Krümmungsradius (11) in Kontakt mit der Begrenzungsflanke (5) des Deckels (1) zwischen dieser und dem Dichtungsmaterial (9) in das Innere des Rollrandes einschiebbar ist.
Container seal for the storage of dangerous liquid material

The invention relates to a seal between the open body end of a container and an edge of a lid that may be pressed into the open body end. The lid is removable. Both components are made from (relatively) light gauge sheet metal. It is of primary concern to provide for a particularly safe seal, in particular for liquid hazardous materials, capable to also withstand mechanical impact such as from shock or fall.

A seal for a sheet metal container is shown in WO-A 1992/04248 (Baltics). This seal assembly provides for an intermediate ring that receives a seal ring and that contributes to the mechanical safeguarding of the appropriate engagement of the lid in the closed position. For safety an adhesive is applied to the respective interacting sealing surfaces which interconnects the compound.

It is the object of the present invention to provide a seal possessing the requisite high standards pertaining to such seal applications, which, however is simpler and more economical to produce. This object is accomplished through claim 1, also according to claim 11, claim 10, or according to claim 12 or 13.

The insertable lid herein may be essentially similar to existing shapes of lids, allowing for the use of prevailing manufacturing methods and tools. Technical modifications can thus be held to a minimum, constituting an attendant objective of the invention rather than impeding the same.

According to the invention, a high degree of leak tightness is achieved through the (direct) interaction between open body end (end of body) and lid edge (edge of the lid), rendering the use of an additional intermediate ring redundant. In the area of a sharp bend, the open body end abuts against (directly, or indirectly through a residual compound welt) the lid sheet metal (the defining edge) within its at least partially rolled edge (rolled edge) and thus provides for a seal through direct contact, preferably with an expandable surface, under a reciprocal radial preload (claims 3, 15).
This area is, at the same time, covered in the radially peripheral area by the sealing material (compound) provided within the rolled edge of the lid, in particular provided as a swelling compound.

In the course of a closing process, the body end with its bending radius comes into contact with the sealing material on the outside of the defining edge of the lid.

Subsequently several exemplary embodiments illustrate and supplement the invention:

**Fig. 1** shows the components of the lid and the open body end of a sealed, or sealable container, or a container that can be opened, which are relevant to the seal, each in an axial sectional view and with the seal open.

**Fig. 2** shows the components as in Fig. 1, but in the closed position.

**Fig. 3** shows a further embodiment.

The lid 1 as a component of the seal has an edge (edge section 1) with the lid surface 3 connected through a relatively deep, channel-like bead 4, which can also serve to dampen for example mechanical impacts. Its outer defining edge 5 extends in axial direction past the lid surface 3 and transitions into an outward bent rolled edge 7, whose sheet edge 8 ends at a (distinct) radial distance from the upper section 5a of the defining edge 5. The rolled edge has a sufficiently sized bending radius allowing for a sealing material 9 of appropriate volume to be received within it, which extends downward beyond the lower opening slot d8 of the rolled edge 7, over a certain distance alongside the defining edge 5.

The barrel 2a,10 of the container 2 (the body) is bent outward by 180° with a small bending radius 11 in order to provide for the opening of the body or container. The sheet metal 18 extends from the bending radius in the radial distance $\Delta r$ predetermined by the dimension of the bending radius, in parallel with the barrel 10 of the body and axially downward with a longitudinal dimension L18, which distinctly exceeds the diameter d7 of the rolled edge 7 of the lid 1.
Subsequently, the sheet metal is bent outward in a radially and axially rising manner in order to form a support shoulder 12. At the peripheral edge of the support shoulder, the sheet metal is axially bent downward and ends in a roll-in 13 provided with a large diameter as compared to the rolled edge 7 of the lid or to the diameter dimension \( d_{11} \) of the small or sharp bend 11, the diameter being chosen such that the roll-in 13 is adjacent to the body wall 10 with its radially interior section or even abuts against it.

In a modification the body sheet metal can be shaped, at least in a given section, between the support shoulder 12 and the roll-in 13, into an outwardly protruding opening aid 16, as depicted in dashed lines in Fig. 1, as a protruding lug 16.

In order to mechanically secure the engagement of the lid with the body end after closing, the body wall 10 and the outer defining edge 5 of the lid 1 each possess a corrugation 15 or 14, or a similar engaging element.

**Fig. 1** shows the lid in a position facing the open body end immediately prior to the initiation of the insertion process according to the arrow 17. **Fig. 2** shows the final closed position.

The open body end 10 with the bend 11 extends as far as possible into the interior of the rolled edge 7, approximately to the transition 6 between the outer defining edge 5 and the rolled edge 7 of the lid. The body barrel 10 enters into (direct or indirect) contact with the outer defining edge 5. This contact extends along the surfaces of the wall segments 5 and 10 and preferably occurs under a radial preload as suggested schematically in Fig. 2 by the overlap of the sheet metal sectional surfaces. A residual layer of compound 9, which was displaced here, may be present on the outside. This also represents a contact of the defining edge 5 by the open body end.

By means of this contact, which is being established under preload, a reliable seal is already being accomplished by mechanical means between the two participating elements of the seal.

**Fig. 2** further illustrates, that the radial distance of the sheet edge 8 from the defining edge 5 is selected so that on the one hand the container neck with its bending radius 11
safely slide itself into the rolled edge 7 and that on the other hand the sealing material 9 within the rolled edge 7 and also outside in the area of the support shoulder will maintain a reliably continuous cross section. The sealing material herein is maintained under pressure within the rolled edge 7, as well as between same and the support shoulder 12, thus substantially augmenting the sealing effect and making the application of an adhesive in the area of the sealing surfaces redundant.

The deep and wide channeled bead 4, the large rolled edge 7, the radial distance between the wall sections 10 and 18, the beveled support shoulder 12, and the large volume roll-in 13 at least adjacent to the body 10, in combination form a very effective cushioning and damping system, which is capable of safely absorbing any impacts from pressure or shock, that may affect the area of the seal from the outside, without compromising seal effectiveness under these impacts.

The description and illustration of the seal clarifies, that the body end 10 with all elements of the seal – 11, 18, 12, 13, and, if applicable, 16 – can be formed from a single sheet metal blank. An additional intermediary ring is not required.

The lid can be essentially manufactured with known methods and means. The entire seal can thus be produced in a simple and economical manner, providing for excellent stability and tightness, thus making it suitable for hazardous materials containers.

In a further embodiment according to Fig. 3, reference can be made for the purpose of illustration to the unsealed state (depicting the state at the beginning of the closing process) - according to Fig. 1. Similarly, the closed state according to Fig. 2 can be transposed to Fig. 3 and is not depicted separately here.

The modification compared to the earlier described embodiments pertains to the body corrugation 15, which is formed as a corrugation 15' in a more pronounced radial and outward manner, thus providing for a supporting effect to the annular roll-in 13. According to Fig. 1, the annular roll-in is provided adjacent to the container body 10 (specifically the upper body section of container body 2), in particular in a contacting manner. If the corrugation 15 is moved to a higher axial position, a radial support of the roll-in 13 will result over a certain distance, thus additionally stabilizing the position of
the support shoulder 12, possibly also the opening aid 16 as depicted (dashed lines) in a further exemplary embodiment.

The body or container corrugation 15' may also be provided axially more extended, but similarly also less extended, for example such as illustrated in Fig. 1.

The section 14' of the lid which is engaging into the corrugation 15' is formed such that positive locking and/or a friction engagement is achieved when assuming its closed position within the corrugation 15'. An at least partial degree of lateral support is also provided, whereby the axial upward pressure of the corrugation 14' within the lid can be utilized for the further support of the corrugation 15' in the container, wherein both corrugations can jointly support the annular roll-in 13 in the radially inward, and the axially downward direction.

An interconnection of support corrugations and roll-ins, which join from all adjacent elements of the seal area, is created.
1. A seal between an open body end of a container body (2) and an edge of a lid (1) which may be pressed into the open end of the body in a sealing manner, both made from sheet metal, wherein at the end of the body the sheet metal is bent outward by 180° with a bending radius (11), the lid edge, which is separated from a lid surface (3) by a channelled bead (4), extending axially upward with its radially external defining edge (5) of the bead (4) beyond an axial position of the lid surface (3) and being bent outwards with a radius which is (substantially) larger than the bending radius (d11) at the body end, to form a rolled edge (7) for receiving an annular sealing material (9) filling the rolled edge and extending downwards, wherein a sheet edge (8) of the rolled edge (7) terminates at a radial distance (d8) before the defining edge (5), said distance being dimensioned such that during the sealing process the body end, with the bending radius (11) thereof in contact with the defining edge (5) of the lid (1), may be inserted between the same and the sealing material (9) into the interior of the rolled edge.

2. The seal according to claim 1, wherein the diameter of the open body end in the area of the tight bend (11) with the bending radius (d11) and a lid edge diameter in the area of the transition (6) of the defining edge (5) into the rolled edge (7) are matched, so that the body end will abut, while in the closed position, inwardly with its bend arc (11) at the transition (6) between the defining edge and the rolled edge, while being under a radially inward preload.

3. The seal according to claim 1 or 2, wherein the sealing material (9) is a swelling compound.

4. The seal according to one of the preceding claims, wherein the sheet metal of the body (2) extends from the small bending radius (11) axially downward (L18), at a radial distance and approximately in parallel with the body wall, in particular extending beyond the lower edge of the rolled edge (7), or further than the diameter (d7) of the rolled edge, and wherein the body sheet metal is then bent radially, thus forming a support shoulder (12) for supporting the sealing material (9) in the closed position.
5. The seal according to claim 4, wherein a shoulder surface (12) is provided rising radially outward and slanted upward.

6. The seal according to claims 1,4 or 5, wherein the body sheet metal is bent axially downward from the peripheral radial end of the, or a support shoulder (12), followed by it being rolled in radially inward (13), wherein the bending radius of this roll-in (13) is selected such that it is outwardly adjacent to the body end or abuts against it, in particular against a radial circumferential protrusion (15) of the body or of the body wall (10, 2a).

7. The seal according to claims 4, 5, or 6, wherein the body sheet metal between the support shoulder (12) and the, or a roll-in (13) is formed into a radially and/or axially protruding lug (16), in particular as an opening aid.

8. The seal according to one of the preceding claims, characterized in that the body end and all body specific elements (11,18,12,13,16) of the seal are integrally formed from the same sheet metal blank.

9. The seal according to one of the preceding claims, wherein the lid (1) and the body end (2,10) are held in the closed position through a positively locking engagement of in particular circumferential corrugations (14,15) in the outer defining edge (5) and in the body sheet metal (10) in a positively locking and/or frictionally locking manner, wherein both areas rest against each other with their surfaces in one radial dimension under a radial preload.

10. The seal according to claim 1, wherein lid and body are connected in a detachable manner, as a closed container.

11. The seal according to claim 1, wherein it is not yet closed as a body (2) with a seal edge suitable for sealing closure with the sheet metal lid (1).
12. A seal edge between an open body end of a container (2) and the edge of a lid (1) which can be inserted into the open end of the body in a sealing manner, both made from sheet metal, wherein the sheet metal is bent outward at the end of the body by essentially 180° with a bending radius (11) and bent radially outward with a radius which is (significantly) larger than the bending radius (d11) at the body end while forming a rolled edge (7), the rolled edge receiving an annular sealing material (9) filling the rolled edge and extending axially downward, wherein a sheet metal edge (8) of the rolled edge (7) ends at a radial distance (d8) from the defining edge (5) of the body end, the distance being dimensioned such that during the sealing process the body end with its bend arc (11) can be inserted into the interior of the rolled edge of the lid (1).

13. A container body with a wall (10), the upper end (5) of which having a relatively sharp end (11) and a relatively planar end (12);

the former (11) for the purpose of penetrating between a compound (9) and an exterior wall surface (5) of an insertable lid (1);

the latter (12) for providing a sealing support of an axially downward extending portion of the compound (9) as a sealing material, wherein the sharp end (11) extends axially beyond the planar end (12).

14. The container body according to claim 13, wherein the planar end (12) transitions into a roll-in (13), which is supported in particular on a body corrugation (15,15').

15. The seal according to one of the preceding claims, wherein during the sealing process, the body end (10,11) with its bending radius (11) enters into contact with the sealing compound (9) on the exterior of the defining edge (5) of the lid (1).