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(54) **Insert for a drum closure**

(57) The present invention is related to an Insert (10) for a drum closure and comprising a flange (1) and a cylindrical collar (2), said collar comprising a lower sleeve portion (3) for inserting a plug (4), and an upper lip portion (5) to be beaded about an edge (12) of a cylindrical neck

(11) surrounding a drum opening (13), said flange (1) extending radially outward from a lower end of said sleeve portion (3), characterized in that an upper surface (6) of said flange adjacent said collar (2) comprises a circumferentially extending depression (7).

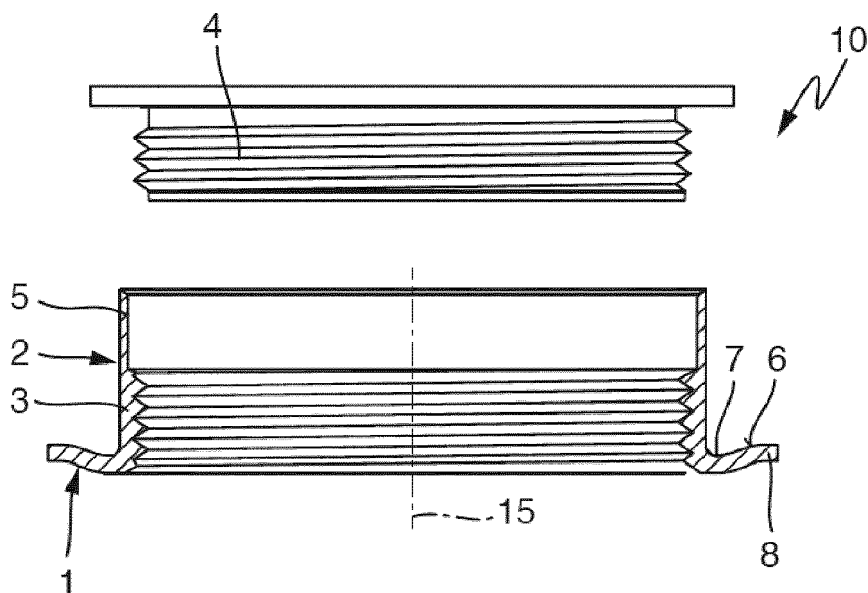


Fig. 1

Description

[0001] The present invention is related to an insert for a drum closure, wherein the insert comprises a flange and a cylindrical collar, said collar comprising a lower sleeve portion for inserting a plug and an upper lip portion to be beaded about an edge of a cylindrical neck surrounding a drum opening, said flange extending radially outward from a lower end of said sleeve portion. Inserts of this kind are typically used for steel drums provided for containing oil, chemical and other liquids such as water, but not restricted to the afore-mentioned liquids.

[0002] Typically, the drum has a circular opening which is surrounded by a more or less cylindrical or conical neck, which may be stamped and pressed from a part of the drum wall. The drum may be of any shape, i.e. having a polygonal or cylindrical cross-section, most commonly in the shape of a cylindrical drum having flat circular top and bottom faces. The opening may be either formed in one of the top and bottom faces and/or in the cylindrical wall.

[0003] The collar of the insert is sized such as to fit within the neck of the drum opening while the flange abuts the inside of the drum wall more precisely a recessed portion of the drum wall receiving the flange. When fitting the insert with the drum opening, the collar is inserted within the neck portion of the drum opening, while the flange is arranged within the recessed portion of the drum wall and pressed against the inner wall of said recessed portion surrounding said neck. The recessed portion has a non circular, most commonly octagonal, periphery and so does the flange so that the insert, once the flange is fitted into the recessed portion, is non rotatable about the insert axis since the flange is in a form locking engagement with the non circular periphery of the recessed wall portion.

[0004] Upon fitting the insert within the drum opening, a stamp or die is pressed from the outside around the neck portion and towards the insert, while the flange is pressed against the inner drum wall from the inside, such that a smoothly curved transition from the recessed drum wall portion above the flange and the neck portion is pressed towards the insert. Thereby, a sealing gasket which is provided about the sleeve portion and immediately above the flange, is compressed and "flows" into the gap remaining between the flange and drum wall and between the cylindrical sleeve portion and neck.

[0005] In prior art closure systems, such as in EP 0 614 434 B1 and in US-A-4,706,836, the upper surface of the flange extends substantially perpendicular to the outside surface of the sleeve portion, which a more or less sharp transition between these surfaces, which in practice may still have a bevelled or rounded shape having a small radius of curvature of typically less than one mm.

[0006] The insert is typically fixed within the neck portion of the drum opening by means of the upper lip portion of the collar being beaded about the upper edge of the

neck while the gasket is compressed between the said neck and adjacent drum wall portion on the one hand and the sleeve portion and flange of the insert on the other hand.

[0007] In the non-compressed state, the sealing gasket may have either a rectangular or circular or L-shaped cross-section. However, when applying sufficient pressure between the insert and the neck portion and adjacent wall of the drum, the applicable sealing gasket will change its cross sectional shape and partly "flow" or creep into the gaps between the insert drum wall, wherein a substantial part of the gasket will creep in between the upper surface of the flange and the opposing part of the drum wall, while only a smaller part of the seal will extend into the hollow cylindrical gap between the sleeve portion of the insert and the neck portion of the drum. After filling the drum, the insert opening may be closed by means of a screw plug.

[0008] This may be sufficient to have a tight connection between insert and drum under normal conditions. However, in use, the drums are sometimes subjected to rough treatment, for instance when they are stacked on top of each other, or may fall with the top side down, wherein substantial pressure or blows may act on the top of the insert, wherein the closure and in particular the insert is pressed inwardly, such that the drum wall surrounding the insert is deformed and the pressure between the flange and the adjacent wall portion and acting on the gasket there between is released. Then, if the major part of the sealing action was provided between the flange at adjacent wall portion and only a minor portion of the gasket extends in between the cylindrical gap between the sleeve and neck portions, the sealing engagement between the insert and the drum opening may get lost and liquid may leak out between the insert and the neck portion of the drum.

[0009] Numerous efforts have been taken in order to cope with this problem, such as the arrangement of two separate seals on top of each other such as in the figure 1 to 3 embodiment of EP 0 614 434 or an L-shaped cross-section of the seal such as in the figure 5 and 6 embodiment of EP 0 614 434. However, none of these attempts are fully satisfactory. The provision of a plurality of gaskets is of course more cumbersome in handling and requires a larger stock of different gaskets. Also the provision of double gaskets being made of different materials is involved with substantial disadvantages because this reduces the choice of available materials which both would have to be compatible with the liquid content of the drum. Also gaskets having particularly designed cross-sections cause more efforts in production and proper handling because they have to be applied in a particular orientation so that when not applied correctly, the likelihood for leakages to occur would even be increased.

[0010] In view of this state of the art, it is the object of the present invention to provide an insert which serves to guarantee a better sealing action with a single sealing

gasket having a standard cross sectional shape.

[0011] According to the present invention, this object is achieved in that an upper surface of the flange adjacent with the sleeve portion comprises a circumferentially extending depression. The depression has the surprising effect that, when pressing the neck wall and adjacent wall portion towards the flange and collar or sleeve of the insert, the flow resistance of the gasket for flowing or creeping towards the gap between the flange and wall portion substantially increases such that the gasket, rather than creeping into the gap between flange and drum wall, flows more prominently into the hollow cylindrical gap between the sleeve portion of the insert and the neck portion of the drum surrounding the drum opening. Accordingly, since this cylindrical gap is better filled up to a higher level, even a deformation of the drum wall in the vicinity of the insert would not cause the gasket to come out of engagement with both, the sleeve portion and the neck portion, i. e. the sealing action is maintained.

[0012] Further, this does not require a particular cross-sectional shape of the gasket which may be of a standard rectangular or simple circular cross sectional shape, and does also not require more than a single gasket to be applied around the sleeve portion.

[0013] In order to further improve the effect of the sealing gasket predominantly creeping up into the cylindrical gap between the sleeve portion and the neck portion, the depression is defined by a surface which in cross-section is either smoothly curved and/or comprised of straight sections joining one another under relative angles of at most 45 and preferably 30 degrees or less than 30 degrees.

[0014] In particular, in cross-section, the depression should comprise a round or only bevelled transition towards the outer surface of the sleeve portion. In general, to improve the desired movement or flow of the sealing gasket upon compression, the depression should have the form of a shallow groove.

[0015] The groove or depression may also be defined in the following way. When considering the cross-section of the (circumferentially extending) depression and applying a circle being tangent to any of at least 3 adjacent straight or curved portions of the depression, the minimum radius of curvature should be at least 0,5 mm, preferably at least 1,5 mm and more preferred at least 2 mm. Of course, these figures will also depend on the size of the drum closure and the cross sectional area of the sealing gasket. I. e. smaller sized closures (f. i. a $\frac{3}{4}$ " closure may have smaller radii of such curvature of the groove than a 2" closure). An example of such a depression is defined in cross sectional shape by a curved portion with Radius R ($>0,5$ mm) starting tangentially from the cylindrical wall (collar) of the insert and extending about an angle of slightly more than 90° with a smooth (tangential) transition to a straight, flat portion slightly raising by an angle α (10 to 20 degrees increase) and merging into the flat horizontal radially outer portion of the flange, whereby a flat groove is defined having a depth between 0,6 and

1,5 mm, depending on the pitch and radial extension of the increasing flat portion.

[0016] Preferably, when starting from an apex of the depression and proceeding radially outward from this apex, a maximum angle by which the surface of the depression may be inclined with respect to a radially outer portion of the flange should be smaller than 45° and preferably within the range from 10 to 30° . Such an increase from the apex of the depression towards the radially outer portion of the flange provides a sufficient resistance for the gasket against flowing towards the radially outward portions while still leaving the possibility to have the flange and depression being produced by a simple pressing action.

[0017] In one embodiment of the present invention the depth of the depression, when measured from the level defined by the radially outward portion of the flange, should be less than 4 mm but definitely more than 0,3 mm, preferably in the range from 0,5 to 2,5 mm, in particular 0,6 to 1,5 mm. In one embodiment the width of the respective depression, measured from the wall of the sleeve portion, should be more than 3 mm and less than 12 mm, typically around 5 mm

[0018] In one embodiment of the invention, the flange portion radially outward of said depression extends along a plane perpendicular to the axis of the closure has a flat annular shape, in particular a flat rectangular cross-section.

[0019] The periphery of the flange may have a polygonal, preferably an octagonal shape in a top view on the insert (i. e. seen along the axis thereof).

[0020] Moreover, in one embodiment of the invention the flange has a substantially uniform thickness, the depression being formed by forging or pressing a flat annular flange, such as by clamping a radially outer portion of the flange between two oppositely arranged jaws and pressing the sleeve and a radial inward portion of the flange downward, whereby the radii and slopes of the depression are determined by the material parameters of the flange and collar, the wall thickness and generally geometry thereof etc. The flange may also be formed between a corresponding stamp and die in order to get a well defined cross sectional shape of the depression.

[0021] For inserting a threaded plug, the sleeve portion may comprise a female thread, while the lip portion to be beaded about the upper edge of a neck portion surrounding the drum opening may have a wall thickness which is substantially less than that of the sleeve portion. In particular, the lip portion may have a wall thickness in the order of $1 \text{ mm} \pm 0,5 \text{ mm}$, while the sleeve portion is between 50 and 100 % thicker than the lip portion.

[0022] The insert may also be provided with a gasket, wherein a single annular gasket is sufficient in order to provide an improved sealing action. The respective gasket should be made from a pliable, resilient plastic material and the plastic material may be one of or a combination of two or more of the materials of the group which includes EPDM, resin and nitrile rubber resin.

[0023] Further advantages and features may be taken from the following description of a preferred embodiment in connection with the accompanying drawings, in which

- Figure 1 is an axial cross-section through an embodiment of a drum closure insert according to the present invention,
- Figure 2 is a slightly enlarged cross-sectional view of
- (a) an insert according to the prior art,
 - (b) an insert according to the present invention,
 - (c) another embodiment of an insert according to the present invention
- Figure 3 is another cross-sectional view including gaskets as applied (a) according to the prior art and (b) according to the present invention,
- Figure 4 shows a comparison of a (a) drum closure according to the prior art with (b) a drum closure corresponding to the present invention when applied in the opening of a drum wall,

[0024] Figure 1 shows an axial cross-section through an insert 10 which is basically comprised of a substantially cylindrical collar 2 and a circumferential flange 1 extending about the periphery of the lower edge of collar 2. The collar 2 in turn is comprised of two portions, namely a lower sleeve portion adjacent to the flange 1 having a thicker wall than an upper lip portion 5 which is intended to be beaded about the upper edge of a drum neck as will be shown in figure 4 and 5, respectively.

[0025] The periphery of the flange 1 may be polygonal, in particular octagonal.

[0026] The lip portion 5 of the collar 2 is beaded about the upper edge of a drum neck in order to firmly connect the insert with the drum wall in the finally mounted position.

[0027] The sleeve portion 3 is provided with a female thread for receiving in a threaded plug 4 after the drum is filled with any liquid or generally fluid material.

[0028] As can be seen, the flange in turn is comprised of an outer, flat annular section 8 and an inner beaded portion 9, forming a depression 7, which has the shape of a shallow groove.

[0029] The upper surface 6 within the depression 7 may be smoothly curved in cross-section, i.e. comprising a minimum radius of curvature which is 1 mm, preferably about 2 to 3 mm. Rather than being smoothly curved, the surface of the depression 7 when seen in a cross-section according to figure 1, might also be comprised of straight portions slightly angled with respect to each other, wherein the angle between adjacent portions should be at most 45° and preferably smaller than 30°. Of course, the cross-section of the depression 7 may also comprise both,

curved and straight sections such as shown in figures 2b and 2c. While the cross section of the depression in figure 2b is comprised of alternating curved and straight portions, the in cross sectional shape of the embodiment of figure 2c is defined by a curved portion with Radius R (about 2,5 mm) from the cylindrical wall (collar) of the insert extending about an angle of slightly more than 90° (more precisely about 100° to 110°, such as 105°) with a smooth transition to a straight, flat portion b slightly raising by an angle α (10 to 20° increase, such as 15°) and merging into the flat horizontal radially outer portion of the flange, whereby a flat groove is defined having a depth d between 0,6 and 1,5 mm, depending on the pitch and radial extension of the increasing flat portion. The width w of such depression may be in the range of 3 to 8 mm, preferably about 5 mm.

[0030] As a consequence, the outer, flat annular portion 8 of flange 1 is raised above the bottom of the depression 7. as already mentioned, the depth d of the depression 7, when measured from the surface 6 on flange portion 8 may be in the order of 0,5 to 2 mm. In contrast, and as can be seen in figure 2a, a prior art insert 10' comprising substantially the same kind of sleeve 3 and lip 5, has a plane, flat annular flange without any depression adjacent the sleeve portion. Rather, the transition from the flange towards the sleeve portion may be slightly bevelled or rounded. In the remainder, however, the upper surface of the flange 1' is completely planar. In contrast, as can be seen in figure 2b, the transition from the flange towards the sleeve portion may be about the same, i.e. comprising a 45° bevel or preferably a smoothly curved transition, however, in the remainder the flange comprises a depression 7 immediately adjacent the transition towards the sleeve portion 3. In total, the depression 7 has substantially the shape of a shallow groove, which still has a remarkable effect when applying a gasket about the sleeve portion immediately above said depression 7.

[0031] To better explain the difference and effect of the present invention, figures 3 and 4 are showing the comparison of a prior art insert equipped with two different gaskets around the sleeve portion on top of each other with an insert and gasket according to the present invention. The gaskets of the prior art device in figure 3a are provided in the form of two sealing rings having a rectangular cross-section. In order to provide an appropriate sealing action even upon deformation of the drum surface in the vicinity of the insert, the gaskets have a different size and are made of different materials. However, this may require to keep a lot of different types of gaskets having different sizes in stock, in order to cope with the situation that the sealings must be compatible with the content of the drum, while the content of the drum may have different properties which still would have to be met by both seals.

[0032] In contrast, the present invention only requires a single gasket which is placed at least partly within or immediately above the depression 7 and surrounds the

lower part of the sleeve portion 3.

[0033] In use, the insert is placed against the inside of a drum wall 12 as shown in figure 4, such that the sleeve portion is received substantially concentrically with respect to a neck portion 11 of the drum wall while the flange 1 is received within a correspondingly shaped depression provided in the drum wall about the periphery of the neck portion 11, wherein the lip portion, originally extending beyond the upper edge of the cylindrical neck 11 is beaded and folded back about the upper edge of the neck 11 as shown in figures 4a and 4b, respectively.

[0034] For the final mounting and sealing, corresponding tools are provided which are pressing the neck 11 and in particular the transition portion from the neck 11 towards the wall 12 extending parallel to the flange 1 and forming a depression in the drum wall, is pressed towards the gasket, such that the gasket(s) is (are) compressed and starts to flow and creep into the gap which still remains between the neck 11 and the sleeve portion 3 and between the wall portion 12 and flange 1, respectively.

[0035] However, according to the prior art, a substantial part of the lower gasket 20' will remain between flange 1 and wall 12, which requires provision of the second gasket 21' on to p of gasket 20'.

[0036] In contrast, due to the depression 7 in the upper face of the flange 1 according to the present invention, the same type of gasket 20 as gasket 20' has a stronger tendency to deform and flow or creep upward into the cylindrical gap between neck 11 and sleeve portion 3 while only a minor part of the gasket 20 remains between flange 1 and wall portion 12.

[0037] This means, that, even though only a single gasket 20 is used, the substantial part of the sealing action is guaranteed and ensured by that part of the gasket 20 extending way up into the gap between neck 11 and sleeve portion 3, so that any deformation of the drum wall (cf. figures 3 and 6 in EP 0 614 434) which is mainly affecting the engagement between the gasket 20 and the wall 12 and flange 1 and the gasket extending there between, respectively, would not affect the sealing action obtained by the remaining part of the gasket.

[0038] Therefore, due to the depression 7, the sealing action is maintained with a single gasket even under extreme conditions and upon substantial deformation of the drum wall 12 in the vicinity of the insert 10. Moreover, it would not be required to use different types of gaskets or a plurality of gaskets to be kept in stock and to be applied about the sleeve portion 3. Accordingly, this new type of insert having a flange with a depression in the upper surface and extending adjacent an about a sleeve portion 3, saves cost and improves the tightness of the sealing action.

[0039] For the purpose of original disclosure it is to be noted that any features which may be gathered by a skilled person from the present description, the drawings and the claims, even if only described in connection with particular further features, may be combined individually as well as in arbitrary combinations with any other of the

features or groups of features disclosed herein, unless this is explicitly excluded or technical conditions would render such combinations impossible or senseless. The comprehensive, explicit discussion of any combinations of features which might be thought of is dispensed with just for the sake of brevity and legibility of the description and claims.

10 Claims

1. Insert (10) for a drum closure and comprising a flange (1) and a cylindrical collar (2), said collar comprising a lower sleeve portion (3) for inserting a plug (4), and an upper lip portion (5) to be beaded about an edge (12) of a cylindrical neck (11) surrounding a drum opening (13), said flange (1) extending radially outward from a lower end of said sleeve portion (3), **characterized in that** an upper surface (6) of said flange adjacent said collar (2) comprises a circumferentially extending depression (7).
2. Insert according to claim 1, **characterized in that** the depression (7) is defined by a surface which in cross section is either smoothly curved and/or comprised of straight sections adjoining one another under relative angles of at most 45 degrees
3. Insert according to any of the preceding claims, **characterized in that** the depression in cross section has a rounded or slightly angled transition towards the wall of the lower sleeve portion
4. Insert according to any of the preceding claims, **characterized in that** a circle being tangent to any of at least three adjacent straight or curved portions has a minimum radius of curvature of at least 1 mm, preferably at least 1.5 mm
5. Insert according to any of the preceding claims, **characterized in that** the depression is in the form of a shallow groove (8)
6. Insert according to any of the preceding claims, **characterized in that** in cross section and radially outward of an apex of the depression a maximum angle by which the surface of the depression is inclined with respect to a plane extending perpendicular to the insert axis is smaller than 45°, preferably smaller than 30°
7. Insert according to the preceding claims, **characterized in that** the depth of the depression is less than 4 and more than 0.5 mm, preferably about 1.5 mm.
8. Insert according to any of the preceding claims, **characterized in that** the width of the depression is more than 4 and less than 12 mm, in particular about

5 to 6 mm.

9. Insert according to any of the preceding claims,
characterized in that the flange portion radially out-
ward of said depression has a flat annular shape, in
particular a flat rectangular cross section 5
10. Insert according to any of the preceding claims,
characterized in that in a top view the periphery of
the flange has polygonal, preferably an octagonal,
shape 10
11. Insert according to any of the preceding claims,
characterized in that the flange has a substantially
uniform thickness, the depression being formed by
forging a flat annular flange between a stamp and
die to a flange having a flat, annular radially outer
portion and a inner bead forming a shallow groove
in the upper surface of the flange 15
20
12. Insert according to any of the preceding claims,
characterized in that the sleeve portion comprises
a female thread
13. Insert according to any of the preceding claims, 25
characterized in that the lip portion has a wall thick-
ness less than the sleeve portion
14. Insert according to any of the preceding claims,
characterized in that wherein a single annular gas-
ket is provided around the collar. 30
15. Insert according to any of the preceding claims,
characterized in that the gasket is made from a
pliable, resilient plastic material. 35
16. Insert according to any of the preceding, **character-
ized in that** the plastic material is one of or a com-
bination of two or more of the materials of the group
which includes: EPDM, resin and nitrile rubber resin. 40

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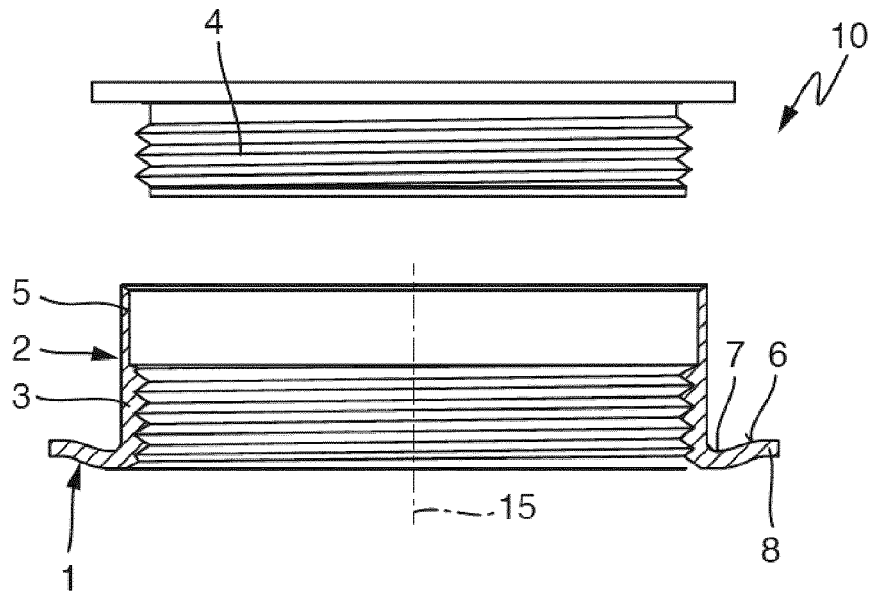


Fig. 1

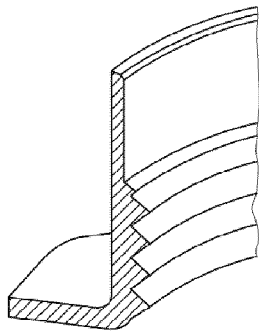


Fig. 2a
(Prior Art)

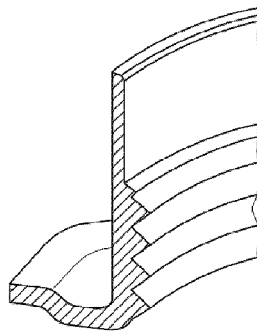


Fig. 2b

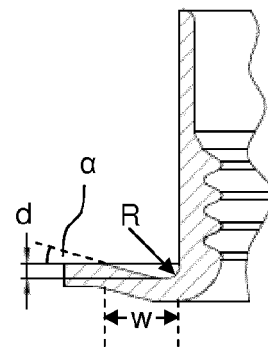


Fig. 2c

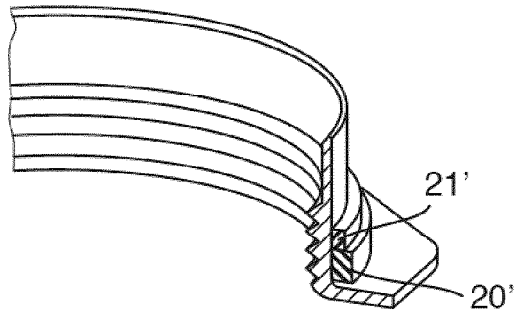


Fig. 3a
(Prior Art)

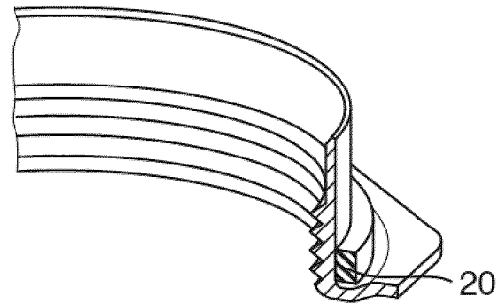


Fig. 3b

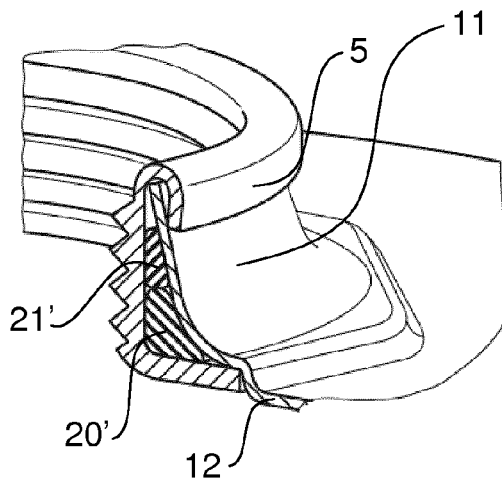


Fig. 4a
(Prior Art)

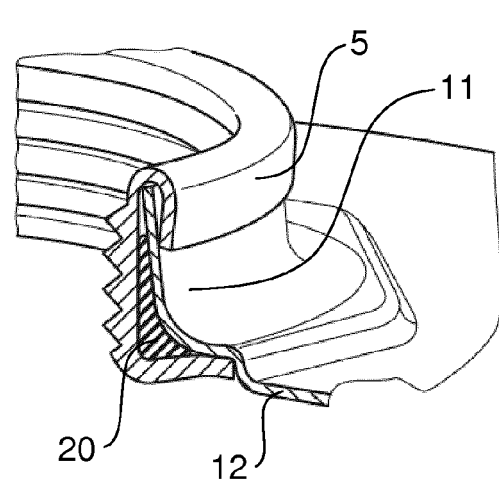


Fig. 4b



EUROPEAN SEARCH REPORT

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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 21 August 2013	Examiner Mans-Kamerbeek, M
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REFERENCES CITED IN THE DESCRIPTION

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