



(11)

EP 2 760 744 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
02.11.2016 Bulletin 2016/44

(51) Int Cl.:
B21D 51/26 ^(2006.01) **B65B 7/28** ^(2006.01)
B65B 29/08 ^(2006.01)

(21) Application number: **12759411.7**

(86) International application number:
PCT/EP2012/067620

(22) Date of filing: **10.09.2012**

(87) International publication number:
WO 2013/045263 (04.04.2013 Gazette 2013/14)

(54) PROCESS FOR CLOSING METAL CANS

VERFAHREN ZUM SCHLIESSEN VON METALLDOSEN

PROCÉDÉ POUR LA FERMETURE DE BOÎTES MÉTALLIQUES

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**

(30) Priority: **30.09.2011 EP 11183555**

(43) Date of publication of application:
06.08.2014 Bulletin 2014/32

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(56) References cited:
**EP-A1- 0 127 155 WO-A1-01/19683
US-A- 4 180 959 US-A- 4 967 538
US-A1- 2003 021 920 US-A1- 2010 116 374**

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Description

Technical Field

[0001] The present invention relates to a process for closing a metal can body, suitable for containing an edible product, with a can lid.

Background Art

[0002] Canning is the process of preserving an edible product by processing and sealing it in an airtight metal can. Cans are typically either two-piece or three-piece cans. In the case of a two-piece can, a can body is formed by punching a metal plate to form a cylinder closed at one end. The can is then filled and the open end closed by seaming a lid to the can body during the canning process. In the case of a three-piece can, a can body, open at both ends, is formed by rolling and seaming a metal plate. A first end is closed by seaming a lid to the can body. The can is then filled and the second end closed by seaming a lid to the can body during the canning process.

[0003] Once a metal can has been filled and sealed, it is typically heated in order to cook and/or sterilise the edible product and interior of the can. Heating the can in this way increases the internal pressure of the can. Cooking generally takes place within a cooker referred to as a "retort". The retort pressure is set in an attempt to balance the internal and external pressures to which the can is subjected, i.e. to minimise the pressure differential and the stresses to which the can is subjected. This pressure balancing allows the metal thickness, and therefore costs, of the cans to be reduced because it minimises the possibility that the cans will fail during the cooking process. Nonetheless, in some retorts this pressure balancing is not precise, and cans are still subjected to large pressure differentials during the cooking process, requiring that the cans have some minimum level of structural integrity.

[0004] It is noted that, in some canning processes, cans are filled with a hot product prior to seaming the end closure onto the can body. When the product subsequently cools, the internal pressure is reduced relative to the external pressure. It is sometimes desirable to minimise this negative pressure, again as a way of reducing the metal thickness. FR 1,119,542 and in FR 2,753,684 describe can lid structures and canning processes with the aim of mitigating this problem. Specifically, lids are provided which deform inwardly, in a concave manner, following seaming and cooling. As well as reducing the negative pressure, the lids are able to temporarily return to their original, flat, position when the can and its contents are subsequently heated (e.g. during a cooking and/or sterilisation process) in order to minimise the increase in internal pressure. WO01/19683, EP0127155 and US2003/021920 describe methods of sealing containers.

Disclosure of Invention

[0005] It is an object of the present invention to mitigate the problems that arise from the extreme positive and negative pressure differentials to which metal cans are subjected during a cooking/sterilisation process. This object is achieved by providing an improved process for sealing a metal can such that the can is able to better withstand extreme pressure differentials.

[0006] According to a first aspect of the invention there is provided a process for closing a metal can body, suitable for containing an edible product, with a can lid, to provide a metal can suitable for heating in a retort. The process comprises: placing a metal lid over and in contact with an open end of a metal can body; applying an inwardly directed mechanical force to the lid such that at least a central portion of the lid is deformed into the interior space of the metal can body; and seaming the lid to the can body to form an airtight seal between the lid and the can body. Prior to seaming of the lid to the can body, a seaming panel of the can lid is held off of a flange at the upper edge of the can body using a plurality of dimples disposed around the seaming panel of the can lid.

[0007] The metal lids of the invention are typically at least semi-rigid and have a thickness greater than 100pm of metal such as single-reduced steel. Thus the lids of the invention may be conventional can ends which are fixed to the can body by double seaming.

[0008] Embodiments of the present invention provide an improved process for closing metal cans with lids that are able to withstand an increase in internal pressure without having to increase thickness of the metal used to form the can body and/or the lid. Particularly preferred embodiments may provide an improved process for closing metal cans with lids that are able to withstand an increase in internal pressure even when the thickness of the metal used to form the can body and/or the lid is reduced close to the minimum thickness of 100pm. The improved process forms a concave deformation in the lid which is independent of the filling temperature of the metal can, and which enables the metal can to better withstand extreme positive and negative pressure differentials. In a particularly preferred embodiment, the process can be carried out without requiring existing canning machines to be modified in order to accommodate a lid with a side profile of greater thickness.

[0009] The method typically includes providing a seaming apparatus which comprises a seaming chuck (or "punch") and seaming rolls. The step of applying an inwardly directed mechanical force to the lid is provided by moving the seaming chuck into contact with the lid and maintaining that contact throughout the remainder of the step of seaming the lid to the can body. Thus the process of the present invention preferably takes place in a seaming apparatus and the single change part required is that of the seaming chuck. The lid requires handling independently of the can body using conventional

machinery and prior to being deformed in the seaming apparatus.

[0010] The central portion of the lid may be deformed inwardly to the extent that the headspace volume inside the metal can is reduced by between 50% and 100%.

[0011] The metal can may be cylindrical and the lid may be circular.

[0012] The lid may be deformed by the inwardly directed force to a generally more dished shape.

[0013] Prior to being deformed, the lid may be capable of passing horizontally through a slot having an opening of less than 6mm for a lid of nominally 153mm diameter.

Brief Description of Drawings

[0014]

Figure 1 is a flow diagram outlining steps of a process according to an embodiment of the present invention;

Figures 2 and 3 are cross-sections through a lid showing application of a mechanical forming force in a seaming apparatus;

Figure 4 is the lid of Figures 2 and 3 on completion of seaming;

Figure 5 is the lid of Figure 4 deformed outwardly during a cooking process;

Figure 6 is a lid that can be seamed to a metal can body and suitable for use with the process of Figures 1 to 5; and

Figure 7 is a cross-section through the lid of figure 6, prior to it being seamed to a metal can.

Mode(s) for Carrying Out the Invention

[0015] As previously discussed, the extreme positive and negative pressure differentials to which metal cans are subjected during a cooking/sterilisation process can cause the structural integrity of the can to fail. A new process for seaming a lid onto a can will now be described, with reference to the figures, that mitigates these extreme positive and negative pressure differentials and the problems arising from them. The sealed can resulting from the process is capable of withstanding both negative and positive internal pressure with respect to an ambient external pressure. This is facilitated by deforming a substantially flat lid in a seaming apparatus immediately before seaming the lid onto the can body. Substantially flat in this context is taken to mean that the overall profile of the lid is flat, such that any corrugations in the centre panel profile (i.e. the central portion of the lid) do not project above the seaming panel or below the bottom of the countersink.

[0016] Figure 1 is a flow diagram which describes the steps of a canning process which includes a process for closing the metal can according to an embodiment of the present invention. The steps of the process are as follows:

1. Transfer the edible product into an empty open metal can body.
2. Place a substantially flat lid over and in contact with the open end of the can.
3. Apply downwards pressure on central region of the lid to deform the lid into the interior space of the can and allow displaced air to escape.
4. Seam the lid to the can body.
5. Heat the can in order to cook and/or sterilise the contents.

[0017] In Step A1, as there is no fill temperature requirement, the edible product can be hot or cold as it is transferred into the can body. The can body may be intended to form a "two-piece" can, whereby the first piece is the body of the can which is formed by punching the body from a sheet of metal, and the second piece is the lid that is used to seal close the open end of the metal can. Alternatively the can body may be intended to form a "three-piece" can, whereby the body of the can has two open ends, and is closed at each open end by a lid. In the context of this process, an "open can" may be a two-piece can with no lid, or a three-piece can which is closed by a lid at only one of the two open ends.

[0018] It is noted that for a three-piece can, the first lid may be seamed to the can body during application of an inwardly directed force so as to form an airtight seal between the lid and the can body prior to filling the can body. This results in a three-piece can with is already closed by a deformed lid at one end. For this embodiment, steps A1 and A5 of figure 1 are omitted.

[0019] Once the open metal can has been filled to the desired level with the edible product, a substantially flat lid is placed over and in contact with the open end of the can. The substantially flat lid may be a lid such as that described in FR 1,119,542.

[0020] The lid is substantially flat such that it can pass through existing size restrictions within standard machines used in a manufacturing and/or canning factory without any substantial adjustments being required to the machinery. Typically, size restrictions within such machinery are such that the lids of nominally 153mm diameter would be able to pass horizontally through a slot with a height of less than 6 mm.

[0021] The substantially flat lid includes an array of circumferentially spaced recesses, known in the canmaking trade as "Swedish dimples" and as described below with reference to figures 6 and 7.

[0022] The lid is made deformable by circular beads that form an area of circular corrugation 2 extending radially inwards from the outside edge of the lid 3 towards a flat central part of the lid 4 and shown in the cross sectional view of a lid at step A2 of the process in figure 2. At this point, the lid is loosely placed onto the open end of a metal can body. The dimples 12 hold the seaming panel 14 up off a flange at the upper edge of the can body 16. The corrugated portion is shown in area 2 of the lid, and the flat central portion is shown in area 4 of

the lid. Figure 2 also shows a forming block, seaming chuck, or "punch" 5, which may be part of a can seaming tool.

[0023] The punch 5 may have a lower surface that conforms to the shaped profile of the lid. The punch 5 (which is also referred to as a seaming chuck) is used to apply a downward force F on the lid 1 in Step A3 and as shown in Figure 3. The side wall of the metal can body provides an opposing force to hold the outside edge of the lid in place. By applying a downwards force, a central region of the lid is deformed part way into the interior space of the metal can. This deformation gives the lid a generally more inwardly dished shape.

[0024] Some of the air from the top of the can between the edible product and the lid (known as the "headspace") is displaced. At this stage, the lid is only held in place on top of the metal can body by the punch 5 that is applying the force F, and is not yet fully seamed to the can body, although the seaming process may be considered to have been initiated by the contact of the seaming chuck or punch with the can end. Therefore, the air displaced from the headspace is able to escape the metal can through the unsealed gap between the lid and the side wall of the can body.

[0025] The presence of dimples (figure 6, reference 12) prevents build-up of pressure in the headspace of the can body by venting while the centre panel of the lid is pushed down during application of the punch. Once the lid has been deformed by the desired amount, the lid is then fully seamed to the metal can by folding metal of the lid and the can body together in step A4 (figure 1) to create an airtight seal between the lid and the can body. During formation of a double seam, any dimples are hidden within the seam and serve no further purpose. The force F may still be applied to the lid while the seaming process is carried out.

[0026] Figure 4 is a cross section through the lid after step A4. The dotted line 8 in Figure 4 shows the original position and shape of the lid in Step A2, and the arrow A shows the extent of the concave deformation. The lid is deformed to the extent that the headspace volume of the metal can (i.e. the volume of air in the headspace of the can) is reduced by between 50% and 100%.

[0027] The can is then heated in a retort in order to cook and/or sterilise the edible product inside in Step A5. During the heating process, the lid can be "pushed out" by the rise in internal pressure within the metal can to form a convex deformation, or dome, such as that shown in Figure 5. In figure 5, the dotted line 10 shows the position and shape of the lid after seaming and prior to the can being heated. The arrow B shows the extent to which the lid is deformed by the increase in internal pressure.

[0028] Figure 6 shows an example of a lid 1 that may typically be used in the process according to an embodiment of the present invention as shown in figure 1. The lid 1 includes dimples 12 in the panel 14 of the lid which will form part of a seam when the lid is fixed to the can body.

[0029] A partial side section of a lid with Swedish dimples is shown in figure 7. In the section of figure 7, a dimple 12 is clearly shown in the seaming panel 14.

[0030] The embodiments described herein refer to a metal can body of circularly cylindrical shape and a circular lid. However, the can body and lid are not restricted to these shapes, and may, for example, be generally square cylindrical and square respectively. Further examples may include elliptical or rectangular lids, and suitably shaped respective can bodies.

[0031] It will be appreciated by the person of skill in the art that various modifications may be made to the above described process without departing from the scope of the present invention. For example, the process may also comprise in Step A3 applying an inwardly directed force on a central region of a second lid that is seamed to the bottom of a three piece metal can to elastically deform the bottom lid into the can to allow a larger volume of air to be displaced from inside the can prior to seaming the top lid onto the open end of the can body.

[0032] A further alternative may be that the can body does not contain the edible product

Claims

1. A process for closing a metal can body, suitable for containing an edible product, with a can lid (1), to provide a metal can suitable for heating in a retort, the process comprising:

placing a metal lid over and in contact with an open end of a metal can body;
applying an inwardly directed mechanical force to the lid such that at least a central portion (4) of the lid is deformed into the interior space of the metal can body; and
seaming the lid to the can body to form an airtight seal between the lid and the can body,

the process **characterized by**,
prior to seaming of the lid to the can body, holding a seaming panel (14) of the can lid off of a flange at the upper edge of the can body using a plurality of circumferentially spaced recesses, known as dimples (12), disposed around the seaming panel of the can lid.

2. A process as claimed in claim 1, further comprising providing a seaming apparatus which comprises a seaming chuck and seaming rolls.
3. A process as claimed in claim 2, in which the step of applying an inwardly directed mechanical force to the lid is provided by moving the seaming chuck into contact with the lid and maintaining that contact throughout the remainder of the step of seaming the lid to the can body.

4. A process as claimed in any one of claims 1 to 3, wherein, for a filled metal can body with a closed bottom, the step of seaming the lid to the can body is carried out after the step of applying an inwardly directed mechanical force. 5
5. A process as claimed in claim 4, wherein the central portion of the lid is deformed inwardly to the extent that the headspace volume inside the metal can is reduced by between 50% and 100%. 10
6. A process as claimed in any one of the preceding claims, wherein the metal can is cylindrical and the lid is circular.
7. A process as claimed in any one of the preceding claims, wherein the lid is deformed by the inwardly directed force from a generally flat shape to a generally dished shape. 20
8. A process as claimed in any one of the preceding claims, wherein the lid comprises one or more beads extending across the surface.
9. A process as claimed in any one of the preceding claims, wherein, prior to being deformed, the lid is capable of passing horizontally through a slot with a height of less than 6mm for a lid of nominally 153mm diameter. 25

Patentansprüche

1. Verfahren zum Schließen eines Metalldosenkörpers, ausgebildet zum Enthalten eines Nahrungsmittelprodukts, mit einem Dosendeckel (1), so dass eine zur Erwärmung in einer Retorte geeignete metallische Dose geschaffen wird, wobei das Verfahren umfasst: 35

Aufsetzen eines metallischen Deckels auf das und in Kontakt mit dem offenen Ende eines metallischen Dosenkörpers;

Ausüben einer einwärts gerichteten mechanischen Kraft auf den Deckel, so dass zumindest ein zentraler Abschnitt (4) des Deckels in den Innenraum des Metalldosenkörpers hinein verformt wird; und 45

Falzen des Deckels auf dem Dosenkörper, um eine luftundurchlässige Dichtung zwischen dem Deckel und dem Dosenkörper zu bilden, 50

wobei das Verfahren **gekennzeichnet ist durch**, vor dem Falzen des Deckels auf dem Dosenkörper, Fernhalten eines Falzrandes (14) des Dosendeckels von einem Flansch am oberen Rand des Dosenkörpers, indem eine Mehrzahl von umfangsseitig beabstandeten Aussparungen verwendet wird, welche

als Dellen (12) bekannt sind, und welche um den Falzrand des Dosendeckels angeordnet sind.

2. Verfahren nach Anspruch 1, ferner umfassend das Bereitstellen einer Falzvornrichtung, welche ein Falzfutter und Falzrollen umfasst. 5
3. Verfahren nach Anspruch 2, in dem der Schritt des Ausübens einer einwärts gerichteten mechanischen Kraft auf den Deckel durch Bewegen des Falzfutters in Kontakt mit dem Deckel und Halten des Kontakts bis zum Ende des Schritts des Falzens des Deckels auf dem Dosenkörper bewerkstelligt wird. 10
4. Verfahren nach einem der Ansprüche 1 bis 3, wobei, für einen gefüllten Metalldosenkörper mit einem geschlossenen Boden, der Schritt des Falzens des Deckels auf dem Dosenkörper nach dem Schritt des Ausübens einer einwärts gerichteten mechanischen Kraft ausgeführt wird. 20
5. Verfahren nach Anspruch 4, wobei der zentrale Abschnitt des Deckels nach innen soweit verformt wird, dass das Luftraumvolumen innerhalb der Metalldose um zwischen 50% und 100% verringert wird. 25
6. Verfahren nach einem der vorhergehenden Ansprüche, wobei die Metalldose zylinderförmig und der Deckel kreisförmig ist. 30
7. Verfahren nach einem der vorhergehenden Ansprüche, wobei der Deckel durch die einwärts gerichtete Kraft von einer im Wesentlichen flachen Form zu einer im Wesentlichen schalenartigen Form verformt wird. 35
8. Verfahren nach einem der vorhergehenden Ansprüche, wobei der Deckel einen oder mehrere sich über die Oberfläche erstreckende Wülste umfasst. 40
9. Verfahren nach einem der vorhergehenden Ansprüche, wobei, vor seiner Verformung, der Deckel in der Lage ist, einen Schlitz horizontal zu durchdringen, welcher eine Höhe von weniger als 6 mm für einen Deckel mit einem Nenndurchmesser von 153 mm aufweist. 45

Revendications

1. Procédé de fermeture d'un corps de boîte métallique, adapté pour contenir un produit comestible, avec un couvercle de boîte (1), pour fournir une boîte métallique appropriée pour un chauffage dans un autoclave, le procédé comprenant les étapes ci-dessous : 55

mise en place d'un couvercle métallique au-des-

sus d'une extrémité ouverte d'un corps de boîte métallique, et en contact avec celle-ci ;
 application d'une force mécanique dirigée vers l'intérieur au couvercle, de sorte qu'au moins une partie centrale (4) du couvercle est déformée dans l'espace interne du corps de la boîte métallique ; et
 sertissage du couvercle sur le corps de la boîte pour former un joint étanche à l'air entre le couvercle et le corps de la boîte ;

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le procédé étant **caractérisé par** l'étape ci-dessous :

avant le sertissage du couvercle sur le corps de la boîte, maintien d'un panneau de sertissage (14) du couvercle de la boîte à l'écart d'une collerette au niveau du bord supérieur du corps de la boîte, par l'intermédiaire de plusieurs évidements à espacement circonférentiel, connus comme fossettes (12), agencés autour du panneau de sertissage du couvercle de la boîte .

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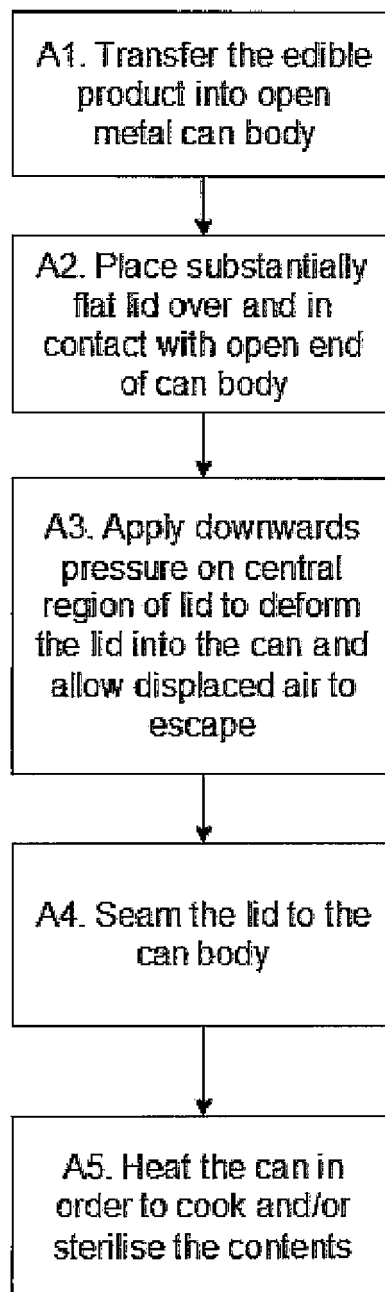
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2. Procédé selon la revendication 1, comprenant en outre l'étape de fourniture d'un appareil de sertissage comprenant un mandrin de sertissage et des rouleaux de sertissage. 25
3. Procédé selon la revendication 2, dans lequel l'étape d'application d'une force mécanique dirigée vers l'intérieur au couvercle est assurée en déplaçant le mandrin de sertissage en contact avec le couvercle et en maintenant ce contact au cours de la partie restante de l'étape de sertissage du couvercle sur le corps de la boîte. 30
35
4. Procédé selon l'une quelconque des revendications 1 à 3, dans lequel, pour un corps de boîte métallique rempli avec un fond fermé, l'étape de sertissage du couvercle sur le corps de la boîte est exécutée après l'étape d'application d'une force mécanique dirigée vers l'intérieur. 40
5. Procédé selon la revendication 4, dans lequel la partie centrale du couvercle est déformée vers l'intérieur, d'une manière telle que le volume de l'espace libre à l'intérieur de la boîte métallique est réduit entre 50% et 100%. 45
6. Procédé selon l'une quelconque des revendications précédentes, dans lequel la boîte métallique est cylindrique, le couvercle étant circulaire. 50
7. Procédé selon l'une quelconque des revendications précédentes, dans lequel le couvercle est déformé par la force dirigée vers l'intérieur, d'une forme généralement plate vers une forme généralement concave. 55

8. Procédé selon l'une quelconque des revendications précédentes, dans lequel le couvercle comprend une ou plusieurs nervures s'étendant à travers la surface.

9. Procédé selon l'une quelconque des revendications précédentes, dans lequel, avant sa déformation, le couvercle est capable de passer horizontalement à travers une fente ayant une hauteur inférieure à 6 mm, pour un couvercle d'un diamètre nominal de 153 mm.

Fig. 1



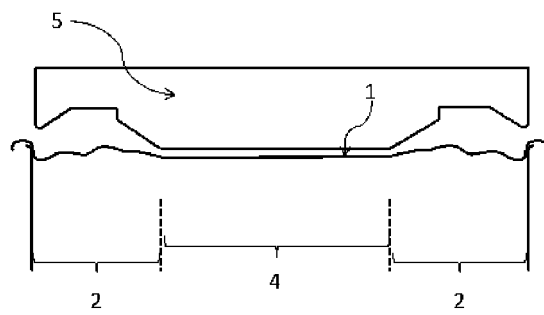


Fig. 2

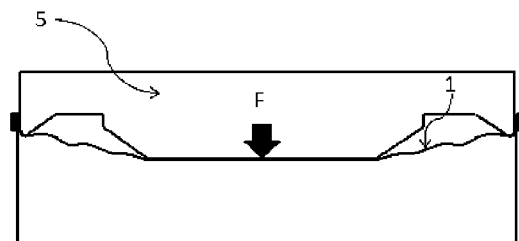


Fig. 3

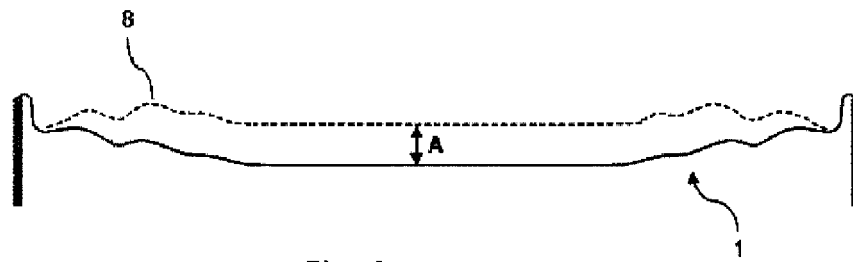


Fig. 4

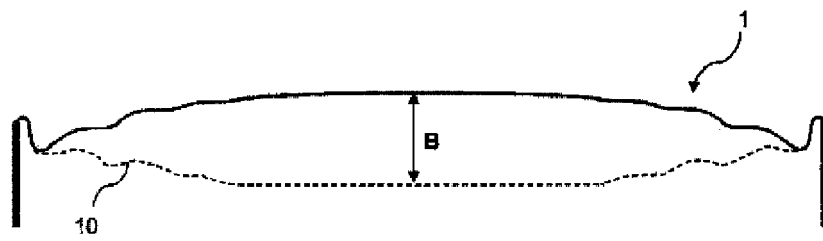


Fig. 5

Fig. 6

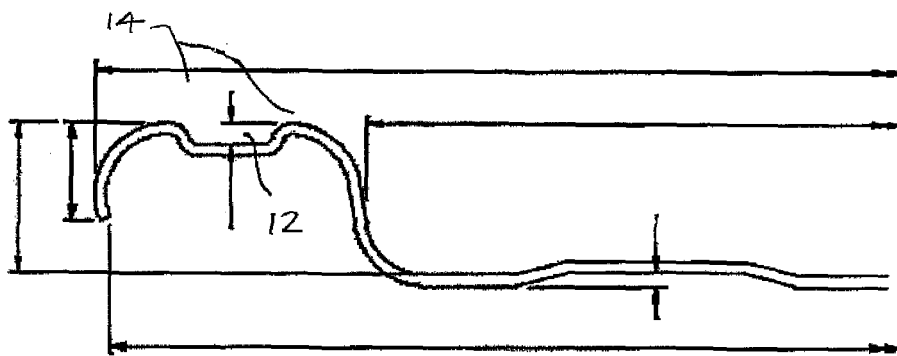
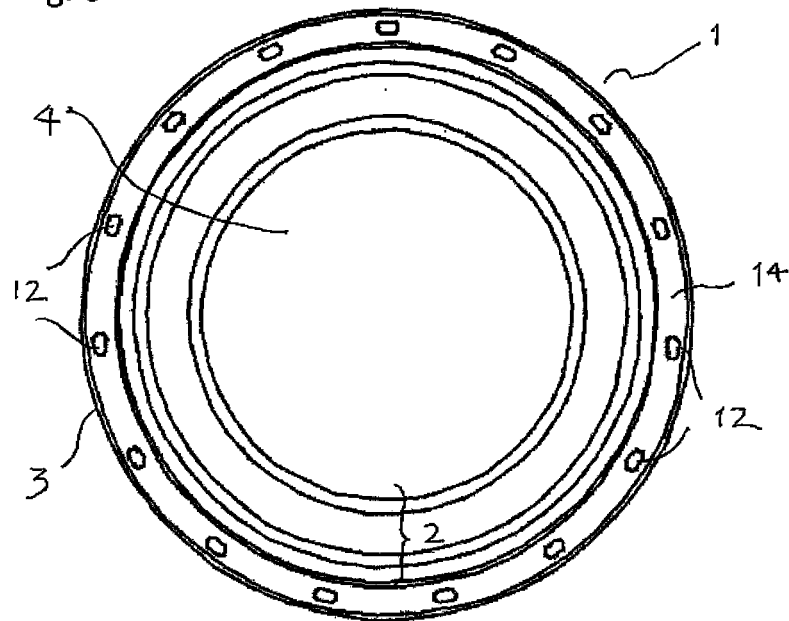


Fig. 7

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- FR 1119542 [0004] [0019]
- FR 2753684 [0004]
- WO 0119683 A [0004]
- EP 0127155 A [0004]
- US 2003021920 A [0004]