



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
18.03.2015 Bulletin 2015/12

(51) Int Cl.:
B21D 51/44 (2006.01) **B21D 51/50** (2006.01)
B65D 51/16 (2006.01)

(21) Application number: **13183964.9**

(22) Date of filing: **11.09.2013**

(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**
Designated Extension States:
BA ME

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(54) **Method for making a reclosable cap, and the reclosable cap obtained**

(57) The present invention relates to a method for making a reclosable cap comprising the steps of (i) providing a metal layer with a plurality of scores at locations defined by an ultimate position in the reclosable caps to be formed out of the metal layer; (ii) providing the scored

metal layer on at least the scored side with a coating; (iii) cutting the shells from the scored metal layer, which shells include a score; and (iv) forming a reclosable cap from the shell, with the score at the ultimate position, and to the reclosable cap made.

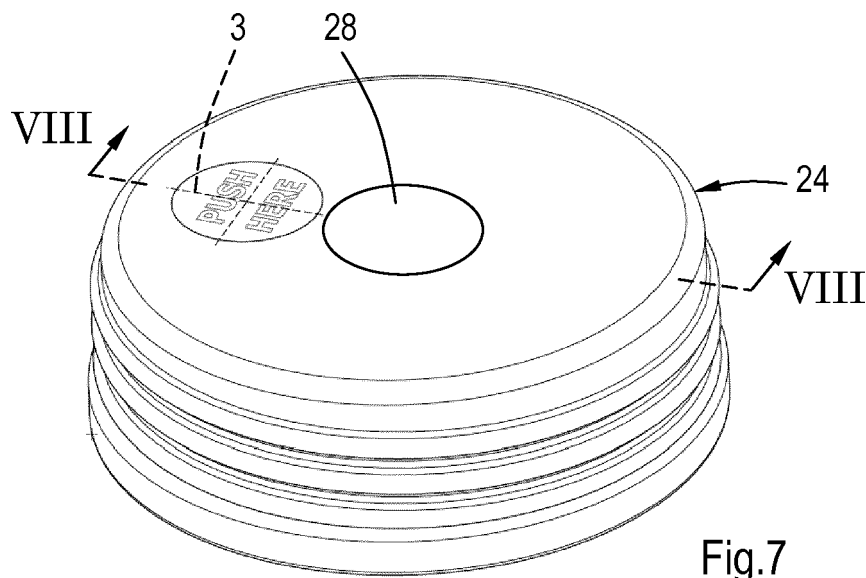


Fig.7

Description

[0001] The present invention relates to a method for making a reclosable cap, such as a reclosable cap reclosable by screwing, and to the reclosable cap obtained.

[0002] A reclosable cap, such as a reclosable cap reclosable by screwing, also known as a screw cap or twist off cap, is generally used as a closure for a container especially a glass bottle or jar, onto which the reclosable cap is applied, such as by screwing or otherwise. The reclosable cap is tightly applied on to the container. In the interior of the container resides a subatmospheric pressure, such as a vacuum. Such atmospheric pressure is generally created when the container is hot filled, subsequently closed off with the reclosable cap, and the content cooled.

[0003] Due to the internal subatmospheric pressure, the container is relatively difficult to open and a relatively high force is to be applied by the consumer either manually or using a tool for removing the reclosable cap, such as by screwing off the screw cap.

[0004] In the prior art, it is disclosed that a screw cap may be provided with a score forming a weakened section in the screw cap. The score is generally designed such, that by breaking the score manually an open communication is formed with the interior of the container and the vacuum released. Thereby the removal of the screw cap requires less force.

[0005] The formation of the score in the metal reclosable cap requires that after scoring the score is to be coated in order to avoid corrosion and/or metal contact with the content of the container. The making of such reclosable cap is difficult, requires specific scoring operations, and is carried out at relatively low production speeds. Such low speed retards the production rate or requires additional parallel scoring operations.

[0006] The present invention has for its object to improve the prior art method for making a reclosable cap, such that this method can be implemented in a standard cap producing process an apparatus, and provides flexibility in the production of various types of reclosable caps, independent of the type and speed of the scoring operation.

[0007] These objects of a method for making a reclosable cap according to the invention are met by providing a method for making a reclosable cap comprising the steps of:

- i) providing a metal layer with a plurality of scores at locations defined by an ultimate position in the reclosable caps to be formed out of the metal layer;
- ii) providing the scored metal layer on at least the scored side with a coating;
- iii) cutting shells from the scored metal layer, which shells include a score; and
- iv) forming a reclosable cap from the shell, with the score at the ultimate position.

[0008] The method according to the invention is based on the insight that by providing the metal part with the score at a location defined by the ultimate position in the reclosable cap, before the metal layer (or metal sheet) is coated the objects of the invention are substantially met and fulfilled. For reasons, that the scored metal layer, or scored metal sheet can be used in the traditional operations and apparatuses for making reclosable caps.

[0009] As indicated above, the method for making the reclosable cap is independent of the ultimate reclosable cap to be made because the presence of the score in a surface does not interfere with the shape and general properties of the reclosable cap, and of the shells. According to a preferred embodiment, the score is formed in the surface of the metal layer forming the outer side of the reclosable cap. On the other hand, according to another preferred embodiment the score is formed in the surface of the metal layer forming the inner side of the reclosable cap. When the score has been made in a surface which ultimately forms the inner side of the reclosable cap, it is not possible for the consumer to monitor the location of the inside score, and does not know where to apply a force for breaking the score. It is therefore preferred, that the non-scored outer surface is provided with a marking for the identification of the location of the inside score.

[0010] Traditionally, any type of lacquer, coating, and/or printing, or the like, may be used for covering the score formed in a metal surface and thereby avoiding exposure of the score. Because such score in the metal surface would be vulnerable to corrosion, and/or make undesired content, in particular food contact. Examples of lacquers, coatings, and printing that could be used, are plastics, such as polyester, polyester-organosol systems, epoxyphenolic systems, acrylic systems, and epoxyanhydride systems. The lacquer or coating may comprise one or more coating layers, such as two or three coating layers of the same or different composition.

[0011] Although the method for making the reclosable cap may be carried out in a continuous manner, by using an endless metal layer which is scored and cut into shelves. In the alternative, it is possible to use a (partly) discontinuous method, whereby in a first procedure the metal layer which forms a metal strip is cut into a metal sheet, which sheets are scored and then temporarily stored, such as in the form of a stack. Subsequently, in a second procedure, the scored metal sheets are taken from the stack and fed in a substantially continuous manner into the coating step (ii) of the method. This provides for flexibility in the production process, particularly for different production rates for on the one hand the scoring and on the other hand the coating step and forming step. Accordingly, it is preferred that the cut and scored metal sheet to be coated in step (ii) originates from a stack of metal sheets.

[0012] The increased flexibility of the method according to the invention allows for the use of a scoring operation which is carried out at a relatively low scoring speed.

An example would be a laser scoring operation, a hammer and anvil operation and/or chemical. Accordingly, the scoring may be carried out at a relatively low speed, and the coating, cutting and forming of the reclosable cap may be carried out at high speed. This overcomes the use of duplication or multiplication of low speed scoring operations in order to produce scored metal sheets at a speed which is comparable to the speed of the remainder method of making reclosable caps. Thus, the method may be implemented into a reclosable cap making method and apparatus functioning at any production speed.

[0013] Another aspect of the invention relates to a reclosable cap comprising a central panel, a circumferential skirt provided with reclosable means for reclosable attachment to the container or jar, such as a snapping edge or a screw thread, and a score provided in a central panel surface, wherein the score and the central panel surface are provided with a unitary coating, which may comprise one or more, such as two or three coating layers. The presence of a unitary or continuous coating or lacquer covering the score and the surface in which the score has been formed, shows that this reclosable cap has been produced with the method according to the invention. Preferably the central panel surface provided with the score forms the inner side of the reclosable cap and the outer side of the reclosable cap comprises a marking for the location of the score. Accordingly, the consumer is guided and alerted to press at a particular location in order to break the score which is not visible from the outside.

[0014] Mentioned and another characteristic features of the method and reclosable cap according to the invention will become apparent from the description from various embodiments of the method and reclosable cap according to the invention which are given for illustrative purposes without the intention to restrict the invention thereto. For the description reference is made to the various drawings wherein:

Figure 1 shows a metal coil decoiled for providing a metal strip;

Figure 2 shows the scored metal strip at locations defined by the ultimate position for the score in a screw cap;

Figure 3 shows a perspective view of a stack of scored metal sheets;

Figures 4 and 5 show flow diagrams of two embodiments of the method according to the invention;

Figures 6 and 7 show perspective views of embodiments of reclosable cap according to the invention; Figure 8 is a cross section over the line VIII-VIII in figure 7; and

Figure 8a a droplet magnification of droplet VIIIa in figure 8.

[0015] The invention will be further illustrated in the description by reference to a reclosable cap according

to the invention. But it will be evident that other types of reclosable caps, such as a reclosable by snapping, clamping, or the like. But preferred is a cap reclosable by screwing.

[0016] Figure 1 shows a metal coil 1 which is decoiled providing a metal strip 2. The width of the metal strip is dependent on size and number of screw caps to be made and ranging generally from about 30cm to 150cm, such as 80 to 120cm. The thickness of the metal strip ranges generally from about 0.10mm to about 0.30mm, preferably from about 0.14mm to about 0.25 mm, typically about 0.16 mm). The metal for the reclosable cap may be steel, a steel alloy, tin plate, aluminum, aluminum alloy, and mixtures thereof, as well as laminates of metal and a suitable plastic.

[0017] Turning to figure 2, the metal strip 2 is provided with scores 3 at locations defined by the ultimate position in the reclosable cap 15, of which the outer profile is illustrated by phantom circles 4. Rows 5 of scores 3 are at mutually offset locations such as to use maximum material from the metal strip 2 and avoid as much as possible metal waste. The metal strip 2 may be cut according to a scroll line 6 following again the offset positions of the rows 5 of scores 3. The cut metal sheets 7 provided with the scores 3 are stored in a stack 8. In the method according to the invention these cut and scored metal sheets 7 are introduced into a coating step for providing at least the scored side of the metal sheet with a coating 9. A suitable coating or lacquer material may be a plastic, such as polyester, polyester-organosol systems, epoxy-phenolic systems, acrylic systems, and epoxyanhydride systems. The lacquer or coating may comprise one or more coating layers, such as two or three coating layers of the same or different composition. For a printing coating may be used also for instance a polyester, conventional inks and top coat polyester, and further also conventional UV system. After coating, lacquering and/or printing, and cutting the metal layer 2, or metal sheet 7 into shells, the screw cap is formed in a traditional manner (not further described).

[0018] An embodiment of the method for making a screw cap 15 according to the invention is illustrated by the flow sheet of figure 4. A metal strip 2 is fed in a continuous manner to a scoring unit 10, in which, as illustrated in figure 2, the metal strip 2 is provided with scores 3 at locations defined by the ultimate position in the screw caps 15. The scoring operation may be carried out using a number of scoring units, of which the number could be equal to the scores to be provided by one or more rows 5, see figure 2. Each such scoring unit 10 may comprise a laser scoring unit, or a hammer and anvil scoring unit, and/or chemical scoring unit. It is also possible to use a massive pair of rolls provided with projections for imprinting the scores 3 into the metal strip 2. The scored metal strip 11 is fed to a lack ring and/or printing unit 12. At least the side of the metal strip 11 provided with the scores 3, is provided with a lacquer or other type of coating. Particularly, when the score 3 is to be present at the

inside of the screw cap, the other surface of the scored metal strip is provided with a coating or printing, comprising preferably directions or information for the location for the inside score 3. The coated/lacquered and/or printed metal strip 13 is then fed to a unit 14 for cutting shells and forming the screw cap 15 according to the invention.

[0019] An alternative method for making a screw cap 24 according to the invention is illustrated in the flow sheet of figure 5. The metal strip 2 is fed to a unit 16 for cutting the metal strip into metal sheets 17. The metal sheet 17 is subsequently carried to a storage unit 18 where the cut metal sheets 17 are stored in stacks 8. After storage, the metal sheets are fed to a unit 19 for scoring the metal sheets 17. The scored metal sheets 7 are transported to a storage unit 20, where the cut and scored metal sheets 7 are stored in stacks. Thereafter, the scored metal sheets 7 are fed to a lacquering/coating/printing unit 21 for providing at least the side provided with the scores 3, with a lacquer or coating. If relevant or preferred, the other side may be provided with a coating and/or printing. The scored and at least coated metal sheets 22 are transported to a unit 23 for cutting shells and forming screw cap 24 from the shells.

[0020] Figure 6 shows a screw cap 15 according to the invention. The screw cap 15 comprises a central panel 25, a circumferential skirt 26 which is provided at its inner surface with a screw thread 27. In the alternative the thread is formed by the skirt curl 34. The central panel is provided with the score 3. The central panel is further provided with a vacuum button 28 indicating to the consumer whether a desired vacuum is still present in the closed container.

[0021] Figures 7 and 8 show a screw cap 24 according to the invention. The screw cap comprises the central panel 25 and a skirt 26 provided at its inner surface with the screw thread 27. The central panel is provided at its center with the vacuum button 28. The score 8 is provided in the inner surface of the central panel 25. The inner surface 9 is provided with the coating 9. This coating 9 is unitary for the coating of the score 8 and of the entire inner surface 29 of the central panel 25. The outer surface 30 of the central panel 25 is provided with a coating 31, and at the ultimate position 32 for the score 8 formed into the inner surface 29 of the central panel 25, with a printing reading "PUSH HERE", see also figure 8a. Accordingly, the consumer is directed to the position at the outer surface 30 overlying the score 8 which is to be opened in order to form an open connection in between the interior of the container and the outer atmosphere for release of the vacuum. Obviously, the coating 9 and the coating 31 are such, that when breaking the score 8 also an open connection is formed through the coatings 9 and 31.

[0022] Although the scores have been described in the form of crossed lines, it will be apparent that any form of score is suitable for use within the ambit according to the invention, as long as by the application of some manual force by the consumer the score will be broken and an open communication with the interior of the container

formed for vacuum release. The score generally has a residual material thickness of about 30 μ m to about 70 μ m, such as about 40 μ m to about 60 μ m, typically about 50 μ m. The force required for breaking the score is dependent on the residual material thickness and the type of material, and generally is in the order of about 20N to about 70N, such as about 30N to about 60N, such as 40N. Other forms suitable are a crescent curved line, closed and open circles, closed and open ovals and the like.

[0023] The reclosable caps according to the invention may have a diameter of about 2-30cm, such as 3-30cm and the like. The reclosable cap generally has a circular form but also other forms, such as circular forms.

[0024] If required for a proper air tight closing of the reclosable cap on the container, the reclosable cap may also be provided with a compound at the inner surface and to be connected with the free end of the container opening.

Claims

1. Method for making a reclosable cap, such as a reclosable cap reclosable by screwing, comprising the steps of:
 - i) providing a metal layer with a plurality of scores at locations defined by an ultimate position in the reclosable caps to be formed out of the metal layer;
 - ii) providing the scored metal layer on at least the scored side with a coating;
 - iii) cutting the shells from the scored metal layer, which shells include a score; and
 - iv) forming a reclosable cap from the shell, with the score at the ultimate position.
2. Method as claimed in claim 1, wherein the score is formed in the surface of the metal layer forming the outer side of the reclosable cap.
3. Method as claimed by claim 1, wherein the score is formed in the surface of the metal layer forming the inner side of the reclosable cap.
4. Method as claimed in claim 3, wherein the non-scored outer surface is provided with a marking for the location of the inward score.
5. Method as claimed in claims 1-4, wherein the coating is a lacquer or print.
6. Method as claimed in claims 1-5, wherein the metal layer comprises a metal sheet cut from a metal strip forming the metal layer.
7. Method as claimed in claim 6, wherein the cut and

scored metal sheet to be coated in step (ii) originates from a stack of metal sheets.

8. Method as claimed in claims 1-7, wherein the scoring is carried out by low speed scoring, such as laser scoring. 5
9. Method as claimed in claims 1-8, wherein the reclosable cap is provided with external lacquer or coloured coating or printing. 10
10. Reclosable cap, such as a reclosable cap reclosable by screwing, comprising a central panel, a circumferential skirt provided with reclosable means, such as a screw thread, and a score provided in a central panel surface, wherein the score and the central panel surface are provided with a unitary coating layer. 15
11. Reclosable cap according to claim 10, wherein the central panel surface provided with the score forms the inner side of the reclosable cap and the outer side of the screw cap comprises a marking for the location of the score. 20

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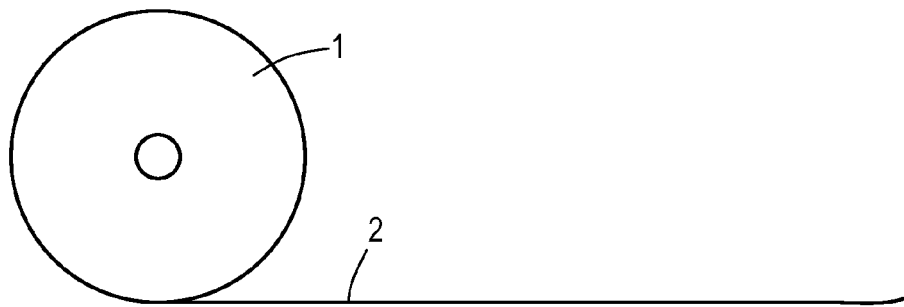


Fig.1

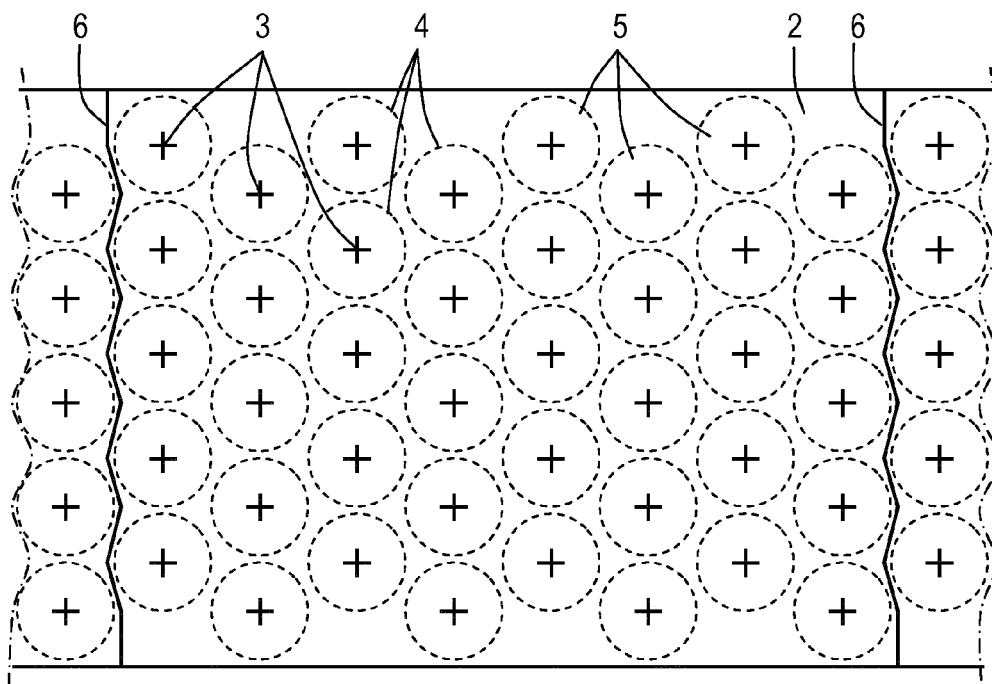


Fig.2

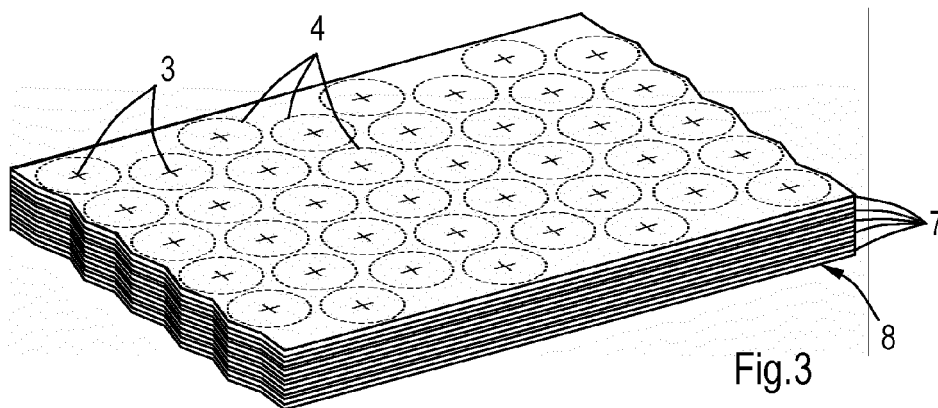


Fig.3

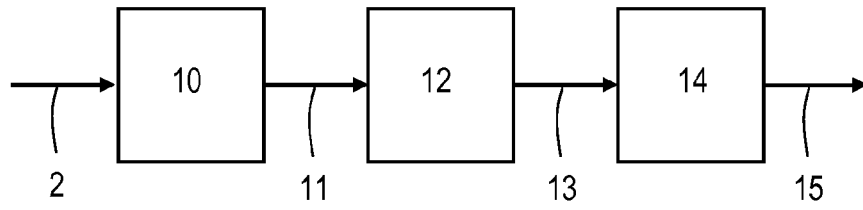


Fig.4

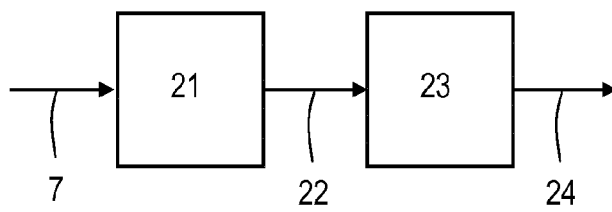
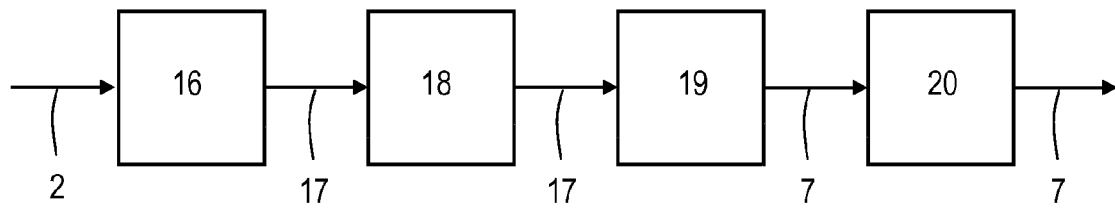


Fig.5

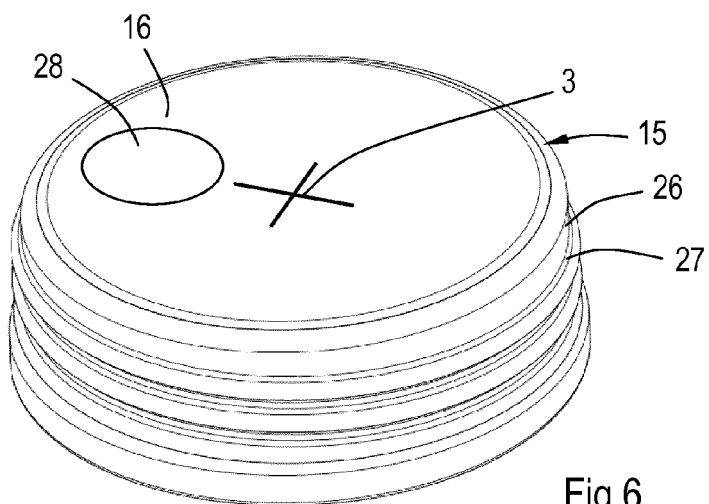


Fig.6

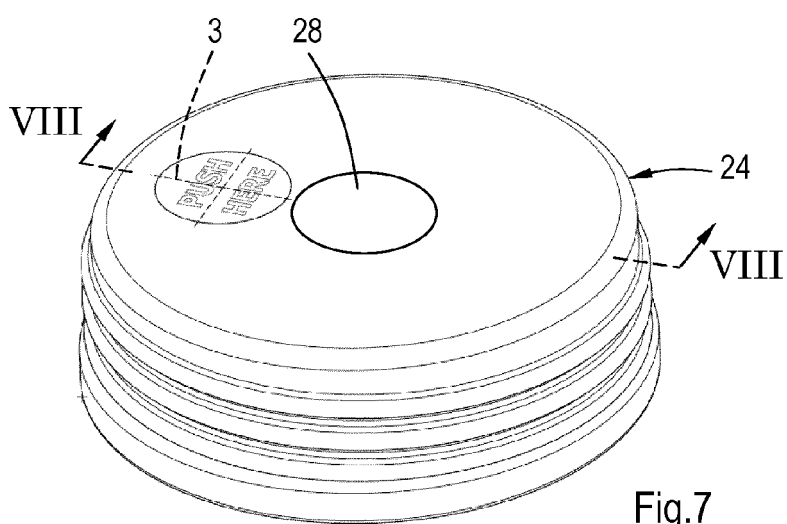


Fig.7

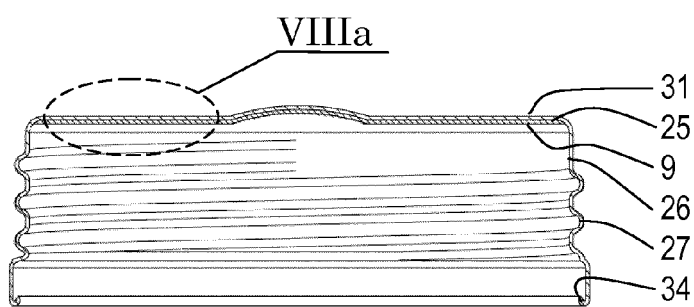


Fig.8

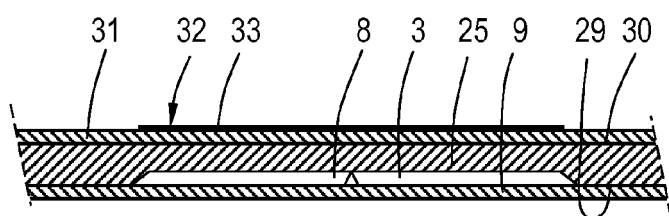


Fig.8a



EUROPEAN SEARCH REPORT

Application Number
EP 13 18 3964

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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
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Place of search		Date of completion of the search	Examiner
Munich		14 January 2014	Knecht, Frank
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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