(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 116 002 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
**11.01.2023 Bulletin 2023/02**

(21) Application number: **20725589.4**

(22) Date of filing: **04.03.2020**

(51) International Patent Classification (IPC):
***B21D 22/20*** *(2006.01)* ***B21D 24/16*** *(2006.01)*
***B21D 51/26*** *(2006.01)* ***B21D 51/44*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
**B21D 51/44; B21D 24/16; B21D 51/26; B21D 51/443**

(86) International application number:
**PCT/ES2020/070155**

(87) International publication number:
**WO 2021/176112 (10.09.2021 Gazette 2021/36)**

(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**
Designated Validation States:
**KH MA MD TN**

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# (54) METHOD FOR JOINTLY MANUFACTURING A TIN CONTAINER AND ITS LID WITH A DETACHABLE CENTRAL MEMBRANE

(57) The invention relates to a method for jointly manufacturing a tin container and its lid with a detachable central membrane by means of pressing a sheet metal (1) to obtain a cylindrical body (2) with a closed lower base (3) and an open upper part (4) with a circumferential rim (5). The upper part (4) of the cylindrical body (2) is then trimmed and separated therefrom, the remaining cylindrical body (2) generating a tin container (6), and the separated upper part (4) generating a ring (7), with the circumferential rim having an external edge (11), a central space (8), and an internal edge (12) demarcating said central space (8). A step (9) is made in the ring (7) around the central space (8) for supporting and sealing a central membrane (10) and flanging and bending operations for removing sharp ridges and closing edges (11,12).

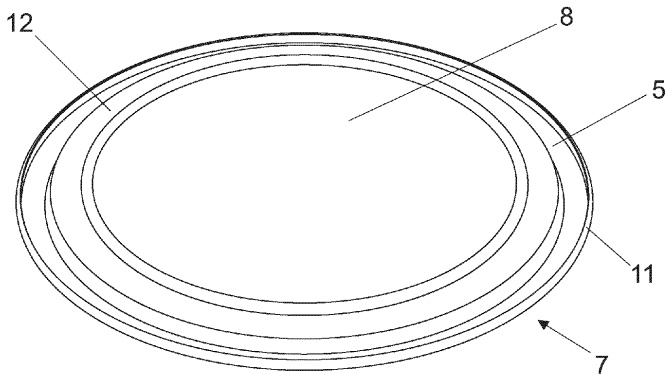


Fig. 14c

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## Description

### Field of the invention

**[0001]** The present invention relates to the technical field of metal containers, specifically tin containers and their lids, and more specifically lids referred to as easy-to-open, which open without the need for tools. The invention specifically relates to jointly manufacturing tin containers and their lids made with a detachable central membrane, known as peel-off lids.

### Background of the invention

**[0002]** There are currently different types of containers with their corresponding lids. In the case of containers used for foodstuffs referred to as easy-to-open, the lid is usually made of tin sheet, although it can be made of different materials such as aluminum, and adopting different shapes such as circular, rectangular, oval, etc.

**[0003]** Containers with easy-to-open lids with a detachable central membrane, also known as peel-off lids, have gained importance in recent years. Lids of this type are formed by an external ring permanently attached to the container, and a central membrane or sheet heat sealed to this ring and blocking the central space, easily detachable by means of a strip or tab. This central membrane or sheet is usually made of aluminum, although it can also be made of plastic and/or another metal.

**[0004]** The manufacture of these peel-off or detachable lids today is based on manufacturing a conventional lid on which a central opening is made in its flat part, forming a ring to which a sheet of aluminum or another material is later heat sealed. This means that the entire central surface of the lid is trimmed and removed. This piece of trimmed metal with its protective lacquers applied to same is considered a process byproduct and wastage, which represents a very large loss of material in addition to being very hazardous for the environment.

**[0005]** Therefore, a method for manufacturing a lid with a central membrane or detachable or peel-off sheet in an efficient manner is desirable, saving material and being environmentally friendly, which avoids drawbacks existing in earlier systems of the state of the art, and furthermore at the same time obtains the container complementary to said lid.

### Description of the invention

**[0006]** The present invention solves the problems existing in the state of the art by means of a method for jointly manufacturing a tin container and its lid with a detachable central membrane, conventionally known as a peel-off lid.

**[0007]** The method has a first step of pressing a sheet metal in which a cylindrical body having a closed lower base and an open upper part is obtained as a result of the operation by means of at least one press. The sheet metal must have sufficient dimensions to meet the diameter and height required for the container.

**[0008]** After pressing, different operations are performed to form both the lid and the container, mainly a step of trimming the upper part of the cylindrical body and separating said upper part. The remaining cylindrical body generates a tin container, while the separated upper part generates a ring complementary to said container. The ring includes a central space and an internal edge demarcating the central space.

**[0009]** According to an optional embodiment of the invention, in the step of pressing the sheet metal a circumferential rim is formed in the open upper part, and the ring generated in the step of trimming the upper part further comprises said circumferential rim, in turn having an external edge. In this case, after the first step of pressing, a step of trimming excess material from the circumferential rim could optionally be performed in a trimming station, for removing the irregular edges that are always left after a process of pressing, and leaving an external edge of the circumferential rim in perfect condition.

**[0010]** According to an alternative embodiment with respect to the preceding embodiment, the circumferential rim is not formed in the first step of pressing, but rather in the ring generated in the step of trimming the upper part, which likewise has an external edge. In this case, after this forming of the circumferential rim, a step of trimming excess material from said circumferential rim could optionally be performed in a trimming station for removing the irregular edges and leaving an external edge of the circumferential rim in perfect condition.

**[0011]** Also performed are a stepping operation, with a step being obtained around the central space, for supporting and sealing a central membrane configured for closing the central space (peel-off lid), and flanging and bending operations in the ring for removing sharp ridges and closing edges.

**[0012]** Before the step of pressing, a layer of lacquer with propylene can be applied to the sheet metal to provide the later heat sealing of the central membrane to the central space of the ring.

**[0013]** Alternatively, instead of applying lacquer with propylene to the entire sheet before pressing, to lower costs lacquer without propylene can be applied only to make machining of the sheet easier, and later once the ring is formed, before fixing the central membrane, applying polypropylene only to said ring to perform the heat sealing of the central membrane.

**[0014]** According to an alternative embodiment with respect to the lacquer, before the step of pressing, a plastic sheet can be applied to the sheet metal, said plastic sheet being what later provides the heat sealing of the central membrane.

**[0015]** According to different embodiments, the step of pressing can be performed either in a single phase or else in two different phases. For the case of containers with a large height, pressing should be performed in two different phases so as to achieve less drawing of the

material and obtain a smoother surface, which makes a later operation for applying images in said container by lithography or stamping easier.

**[0016]** Particularly, in this step of pressing a shape and specific recess can be provided to the closed lower base of the cylindrical body, which will constitute the base of the container.

**[0017]** There are two options for making the step for supporting and sealing the central membrane and the method will continue one way or another according to which of the options is carried out.

**[0018]** According to the first option, the step is made in the step of pressing, before the step of trimming the upper part of the cylindrical body. This provides the advantage of needing less material, about 9 % less material, and furthermore the lid is formed with one less operation.

**[0019]** According to this first option, after the step of pressing during which the step is made, the trimming of the upper part of the cylindrical body would be performed, with the ring being obtained, and then bending of the external edge of the circumferential rim of the ring is performed, with said bending generating a channel.

**[0020]** Given that in this first option the step is made before trimming the upper part of the cylinder, making the step implies a reduction in diameter affecting the container, therefore once the upper part of the cylindrical body has been trimmed, said cylindrical body would have to be expanded in an expander to increase its diameter up to the nominal diameter of the container. Once this expansion is performed, the upper rib would be made in the container and the bottom or base of the container if it had not been made during the step of pressing.

**[0021]** Alternatively, according to the second option, the step is not made during the step of pressing, but rather after that, once the trimming of the upper part of the cylindrical body is performed directly with respect to the ring obtained. This second option provides the advantage that in this case the container would not have to be expanded as it does in the preceding option, and more standard, less special materials can also be used.

**[0022]** According to this second option, after trimming the upper part of the cylindrical body, stepping is performed, and then the bending of the external edge of the circumferential rim of the ring, which generates the channel, is performed.

**[0023]** In this case the container would not have to be expanded, therefore directly making the upper rib in said container and the bottom or base of the container if it had not been made during the step of pressing.

**[0024]** For both options, once the bending of the external edge of the circumferential rim of the ring has been performed, a rolling of the internal edge of the ring is performed, and it can be done either in a single operation or else in two independent and consecutive operations. This embodiment provides in two independent and consecutive operations the advantage that forming is much simpler and the formation of creases and folds, which would render the edge not being completely protected, is prevented.

**[0025]** Likewise, for both options indicated above, after the bending of the external edge of the circumferential rim of the ring, a flanging of said external edge is performed.

**[0026]** Finally, once all the operations of separating the lid from the main body of the container, stepping, and the flanging and bending operations on the ring have been performed, the container and the ring complementary to same are completely formed, and said ring is arranged for receiving gumming of the channel, which provides a leak-tight closure of the container with its lid, as a result of which the gumming forms a sealing gasket in the closure.

**[0027]** According to a particular embodiment of the invention, and in the specific case where the initial lacquer does not incorporate propylene, once the ring is finished, lacquer with propylene is added and heat sealing of the central membrane on the step is performed, closing the central space, with the lid being finished.

**[0028]** That is, a pressed capsule from which the upper part is trimmed in a later process is manufactured by means of the new method. This upper part is formed to produce a ring to which a sheet of aluminum is later heat sealed. In turn, the lower part is formed to produce a pressed container. The container and the lid complementary to same are obtained with the same cylindrical body. Therefore, a detachable central membrane lid, or peel-off lid, is obtained with the opening already made and a surface on the outer ring arranged for heat sealing, not from a conventional lid with its subsequent unusable metal, but rather from another completely different process where a ring is formed, without wastage. The opening is not made in a disc-shaped material for obtaining a ring, but rather a ring is obtained directly from another manufacturing process.

**[0029]** The main advantage of the method object of the present invention is that since the center of the lid does not have to be trimmed from already existing sheet, waste is not generated. That is, to make the same product (a peel-off lid), less raw material is used and less waste is generated, with the subsequent benefits this entails, that is, economic benefits, environmental benefits, etc.

**[0030]** Peel-off lids are an interesting alternative for many packaging solutions, beyond the metal container. It is very appealing due to the convenience and safety for the consumer, but at present it conflicted with environmental sustainability, due to the enormous waste of material (about 32 %) produced in the manufacture thereof. Therefore, with the new method of manufacture object of the present invention, a 32 % savings in materials presents an indisputable not only environmental but also economic advantage.

**[0031]** Up until now manufacture of the container and of the lid were seen as two different independent and unrelated processes. The novelty and inventive step of the method object of the present invention is that it completely changes the process of manufacturing the two-

piece container for obtaining the metal, already in the form of a ring, needed to form the lid with the surface needed for being closed on the container and for heat sealing the detachable sheet. That is, the two elements to be attached, lid and container, are obtained in the same process. This is a radical change to the concept of manufacture by greatly reducing the cost. Packing entities and users of this lid can continue to use the same container closing equipment in their factories without speed limitations compared to other solutions which, while dispensing with the cost of the lid by allowing heat sealing in the container directly, are severely penalized by the operating speed and loss of efficacy.

**Brief description of the drawings**

**[0032]** In order to make the invention more readily understandable, by way of illustration and not limitation, an embodiment of the invention that refers to a series of figures is described below.

Figures 1a and 1b show the output of a sheet metal of a first phase of a step of pressing according to a particular embodiment of the invention.

Figures 2a and 2b show the output of the cylindrical body of a second phase of the step of pressing according to a particular embodiment of the invention, according to a first option. As can be observed, in said first option the step is performed in the phase of pressing.

Figures 3a and 3b show the output of the cylindrical body according to a preceding particular embodiment, according to the first option, of a step of trimming excess from the circumferential rim.

Figures 4a to 4d show the output of the cylindrical body according to a preceding particular embodiment, according to the first option, of a step of trimming the upper part of the cylindrical body, generating the ring (Figures 4a and 4b) and the container (Figures 4c and 4d).

Figures 5a, 5b and 5c show the output of the ring, according to the first option, of the step of trimming the upper part of the cylindrical body.

Figures 6a and 6b show the output of the cylindrical body of a second phase of the step of pressing according to a particular embodiment of the invention, according to a second option. As can be observed, in this second option the step is not performed in the phase of pressing.

Figures 7a and 7b show the output of the cylindrical body according to a preceding particular embodiment, according to the second option, of a step of trimming excess from the circumferential rim.

Figures 8a to 8d show the output of the cylindrical body according to a preceding particular embodiment, according to the second option, of a step of trimming the upper part of the cylindrical body, generating the ring (Figures 8a and 8b) and the container (Figures 8c and 8d). As can be observed, in this second option the step is not yet produced in the ring.

Figures 9a, 9b and 9c show the output of the ring, according to the second option, of the step of trimming the upper part of the cylindrical body. The step is not yet produced in the ring.

Figures 10a, 10b and 10c show the output of the ring, according to the second option, of the step of making the step. In this case the step is now produced in the ring.

Figures 11a, 11b and 11c show the output of the ring of the step of bending the external edge of the circumferential rim of the ring.

Figures 12a, 12b and 12c show the output of the ring of the step of rolling the internal edge of the circumferential rim of the ring.

Figures 13a, 13b and 13c show the output of the ring of the step of flanging the external edge of the circumferential rim of the ring.

Figures 14a, 14b and 14c show the output of the ring of the step of gumming the channel.

Figures 15a, 15b and 15c show the final appearance of the lid once the heat sealing of the central membrane has been performed in the step of the ring, which blocks the central space.

**[0033]** These figures refer to a set of elements which are:

1. sheet metal
2. cylindrical body after pressing a sheet metal
3. lower base of the cylindrical body
4. upper part of the cylindrical body
5. circumferential rim of the upper part of the cylindrical body
6. tin container
7. ring
8. central space
9. step of the lid
10. central membrane
11. external edge of the circumferential rim of the ring
12. internal edge of the ring
13. channel
14. upper rib of the container
15. lid

**Detailed description of the invention**

**[0034]** The object of the present invention is a method for jointly manufacturing a tin container 6 and its lid 15 with a detachable central membrane, conventionally known as a peel-off lid 15.

**[0035]** The present method has a first step of pressing a sheet metal 1 in which a cylindrical body 2 having a closed lower base 3 or bottom and an open upper part 4 is obtained as a result of the operation by means of at least one press.

**[0036]** After pressing, different operations are per-

formed to form both the lid 15 and the container 6, mainly a step of trimming the upper part 4 of the cylindrical body 2 and separating said upper part 4. The remaining cylindrical body 2 thus generates the tin container 6, while the separated upper part 4 generates a ring 7 complementary to said container 6. The ring 7 includes a central space 8 and an internal edge 12 demarcating the central space 8, as can be observed in the figures.

**[0037]** According to an optional embodiment of the invention, in the step of pressing the sheet metal 1 a circumferential rim 5 is formed in the open upper part 4, and the ring 7 generated in the step of trimming the upper part 4 further comprises said circumferential rim 5, in turn having an external edge 11. Figures 1a-1b, 2a-2b and 6a-6b show the output of this step of pressing. In this case, after the first step of pressing, as can be observed in Figures 3a-3b and 7a-7b, a step of trimming excess material from the circumferential rim 5 could optionally be performed in a trimming station, for removing the irregular edges that are always left after a pressing process, and leaving an external edge 11 of the circumferential rim 5 in perfect condition.

**[0038]** According to an alternative embodiment with respect to the preceding embodiment, the circumferential rim 5 is not formed in the first step of pressing, but rather in the ring 7 generated in the step of trimming the upper part 4, which likewise has an external edge 11. In this case, after this forming of the circumferential rim 5, a step of trimming excess material from said circumferential rim 5 could optionally be performed in a trimming station for removing the irregular edges and leaving an external edge 11 of the circumferential rim 5 in perfect condition.

**[0039]** Also performed are a stepping operation, which generates a step 9 around the central space 8, for supporting and sealing a central membrane 10 configured for closing the central space 8, and flanging and bending operations in the ring 7 for removing sharp ridges and closing edges.

**[0040]** Before the step of pressing, a layer of lacquer with propylene can be applied to the sheet metal 1 to provide the later heat sealing of the central membrane 10 to the central space 8 of the ring 7.

**[0041]** Alternatively, instead of applying lacquer with propylene to the entire sheet metal 1 before pressing, to lower costs lacquer without propylene can be applied only to make machining of the sheet easier, and later once the ring 7 is formed, before fixing the central membrane 10, applying polypropylene only to said ring 7 to perform the heat sealing of said central membrane 10.

**[0042]** According to an alternative embodiment with respect to the lacquer, before the step of pressing, a plastic sheet can be applied to the sheet metal 1, said plastic sheet being what later provides the heat sealing of the central membrane 10.

**[0043]** According to different embodiments, the step of pressing can be performed either in a single phase or else in two different phases. For the case of containers 6 with a large height, pressing should be performed in two different phases so as to achieve less drawing of the material and obtain a smoother surface, which makes a later operation for applying images in said container 6 by lithography or stamping easier.

**[0044]** Particularly, in this step of pressing a shape and specific recess can be provided to the closed lower base 3 of the cylindrical body 2, which will constitute the base of the container 6.

**[0045]** There are two options for making the step 9 for supporting and sealing the central membrane 10 and the method will continue one way or another according to which of the options is carried out. These are the first option and the second option, which will be explained below based on the figures.

**[0046]** According to the first option, the step 9 is made during the step of pressing, before the step of trimming the upper part 4 of the cylindrical body 2. Figures 2a-2b, 3a-3b, 4a-4d, 5a-5c specifically refer to this first option.

**[0047]** According to this first option, and as can be observed in the indicated figures, after the step of pressing during which the step 9 is made, trimming the upper part 4 of the cylindrical body 2 is performed, with the ring 7 that will generate the lid 15 being obtained, and then bending of the external edge 11 of the circumferential rim 5 of the ring 7 is performed, with said bending generating a channel 13.

**[0048]** Since in this first option the step 9 is made before trimming the upper part 4 of the cylindrical body 2, making the step 9 implies a reduction in diameter affecting container 6, therefore once the upper part 4 of the cylindrical body 2 has been trimmed, said cylindrical body 2 would have to be expanded in an expander to increase its diameter up to the nominal diameter of the container. Once this expansion is performed, the upper rib would be made in the container 6 for the later attachment of the lid 15, and the bottom or base 3 of the container if it had not been made during the step of pressing.

**[0049]** Alternatively, according to the second option, the step 9 is not made during the step of pressing, but rather after that, once trimming the upper part 4 of the cylindrical body 2 is performed, i.e., directly in the ring 7 obtained. Figures 6a-6b, 7a-7b, 8a-8d, 9a-9c, 10a-10c refer to this second option.

**[0050]** According to this second option, as can be observed in these figures, after trimming the upper part 4 of the cylindrical body 2 stepping is performed, with the step 9 being obtained, and then the bending of the external edge 11 of the circumferential rim 5 of the ring 7, which generates the channel 13, is performed.

**[0051]** In this case the container 6 would not have to be expanded, therefore directly making the upper rib in said container 6 and the bottom or base 3 of the container if it had not been made during the step of pressing.

**[0052]** The following Figures 11a-11c, 12a-12c, 13a-13c, 14a-14c, 15a-15c apply for both options (first option and second option), given that after this point the method is identical for both. Once the bending of the external edge 11 of the circumferential rim 5 of the ring 7 has been

performed, a rolling of the internal edge 12 of the ring 7 is performed, and it can be done either in a single operation or else in two independent and consecutive operations.

**[0053]** After the bending of the external edge 11 of the circumferential rim 5 of the ring 7, a flanging of said external edge 11 can be performed.

**[0054]** Finally, once all the operations of separating the upper part 4 from the main body 2 of the container 6, stepping, and the flanging and bending operations on the ring 7 have been performed, the container 6 and the ring 7 complementary to same are completely formed, and said ring 7 is arranged for receiving gumming of the channel 13, which provides a leak-tight closure of the container with its lid, since the gumming acts as a sealing gasket.

**[0055]** According to a particular embodiment of the invention, and in the specific case where the initial lacquer does not incorporate propylene, once the ring is finished 7, lacquer with propylene is added and heat sealing of the central membrane 10 on the step 9 is performed, closing the central space 8, with the lid 15 being finished and ready to be fixed to the container 6, closing same, once the contents have been introduced.

## Claims

1. A method for jointly manufacturing a tin container and its lid with a detachable central membrane, **characterized in that** it comprises:

   - a step of pressing a sheet metal (1) in which a cylindrical body (2) with a closed lower base (3) and an open upper part (4) is obtained by means of at least one press,
   - a step of trimming the upper part (4) of the cylindrical body (2) and separating said upper part (4), the remaining cylindrical body (2) generating a tin container (6), and the separated upper part (4) generating a ring (7), comprising

     - a central space (8),
       and an internal edge (12) demarcating said central space (8),

   - a step (9) being formed in the ring (7) by means of a stepping operation around the central space (8), for supporting and sealing a central membrane (10) configured for closing the central space (8), and
   - flanging and bending operations in the ring (7) for removing sharp ridges and closing edges.

2. The method for jointly manufacturing a tin container and its lid with a detachable central membrane according to claim 1, wherein in the step of pressing the sheet metal (1) a circumferential rim (5) is formed in the open upper part (4), and the ring (7) generated in the step of trimming the upper part (4) further comprises said circumferential rim (5), in turn comprising an external edge (11).

3. The method for jointly manufacturing a tin container and its lid with a detachable central membrane according to claim 1, wherein in the ring (7) generated in the step of trimming the upper part (4) there is formed a circumferential rim (5) in turn comprising an external edge (11).

4. The method for jointly manufacturing a tin container and its lid with a detachable central membrane according to any of the preceding claims, wherein before the step of pressing the sheet metal (1) a lacquer comprising propylene is applied to same.

5. The method for jointly manufacturing a tin container and its lid with a detachable central membrane according to any of claims 1 to 3, wherein propylene is applied to the ring (7) for sealing the central membrane (10).

6. The method for jointly manufacturing a tin container and its lid with a detachable central membrane according to any of claims 1 to 3, wherein before the step of pressing, a plastic sheet is applied to the sheet metal (1).

7. The method for jointly manufacturing a tin container and its lid with a detachable central membrane according to any of the preceding claims, wherein the step of pressing the sheet metal (1) is performed in two different phases.

8. The method for jointly manufacturing a tin container and its lid with a detachable central membrane according to the preceding claim, wherein the two different phases of the step of pressing the sheet metal (1) are performed in two different presses.

9. The method for jointly manufacturing a tin container and its lid with a detachable central membrane according to any of the preceding claims, wherein in the step of pressing a shape and specific recess are imparted to the closed lower base (3) of the cylindrical body (2).

10. The method for jointly manufacturing a tin container and its lid with a detachable central membrane according to any of the preceding claims, wherein the step (9) for supporting and sealing the central membrane (10) is performed in the step of pressing, before the step of trimming the upper part (4) of the cylindrical body (2).

11. The method for jointly manufacturing a tin container and its lid with a detachable central membrane ac-

cording to the preceding claim, wherein after the step of trimming the upper part (4) of the cylindrical body (2) a bending of the external edge (11) of the circumferential rim (5) of the ring (7) generating a channel (13) is performed.

**12.** The method for jointly manufacturing a tin container and its lid with a detachable central membrane according to any of claims 1 to 9, wherein the step (9) for supporting and sealing the central membrane (10) is performed after the step of trimming the upper part (4) of the cylindrical body (2).

**13.** The method for jointly manufacturing a tin container and its lid with a detachable central membrane according to the preceding claim, wherein after the stepping operation a bending of the external edge (11) of the circumferential rim (5) of the ring (7) generating a channel (13) is performed.

**14.** The method for jointly manufacturing a tin container and its lid with a detachable central membrane according to any of claims 11, 13, wherein after the bending of the external edge (11) of the circumferential rim (5) of the ring (7) a rolling of the internal edge (12) of the ring (7) is performed.

**15.** The method for jointly manufacturing a tin container and its lid with a detachable central membrane according to the preceding claim, wherein the rolling of the internal edge (12) of the ring (7) is performed in two consecutive independent operations.

**16.** The method for jointly manufacturing a tin container and its lid with a detachable central membrane according to any of claims 11, 13, wherein after the bending of the external edge (11) of the circumferential rim (5) of the ring (7) a flanging of said external edge (11) is performed.

**17.** The method for jointly manufacturing a tin container and its lid with a detachable central membrane according to any of the preceding claims, wherein after performing the stepping, flanging and bending operations in the ring (7) a gumming of the channel (13) is performed.

**18.** The method for jointly manufacturing a tin container and its lid with a detachable central membrane according to any of the preceding claims, comprising a step of trimming excess material from the circumferential rim (5) in a trimming station, after the step of pressing the sheet metal (1).

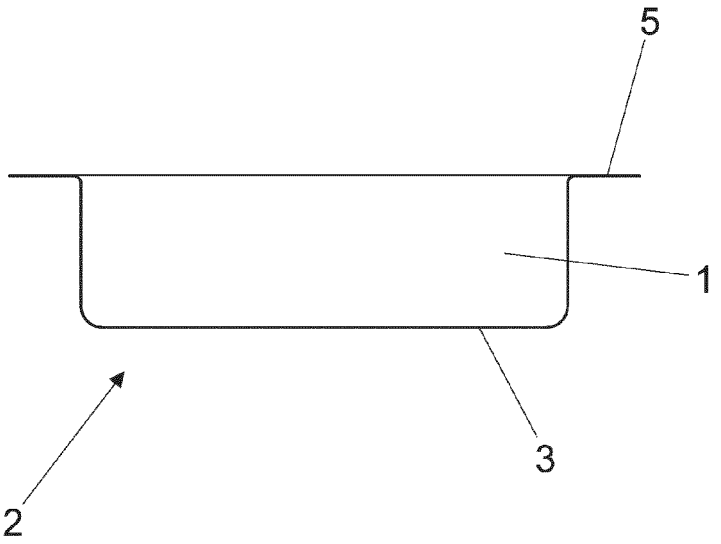



Fig. 1a

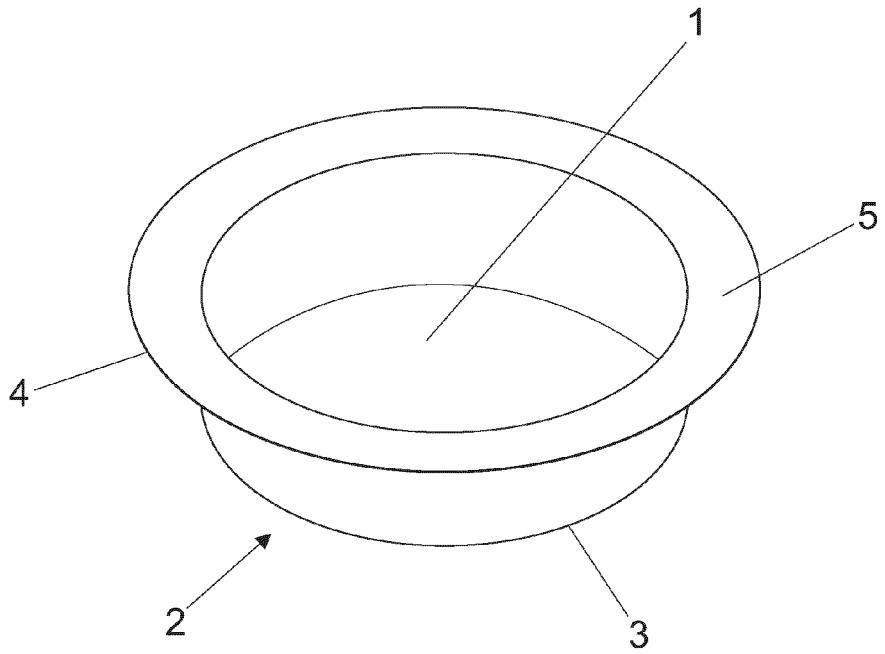



Fig. 1b

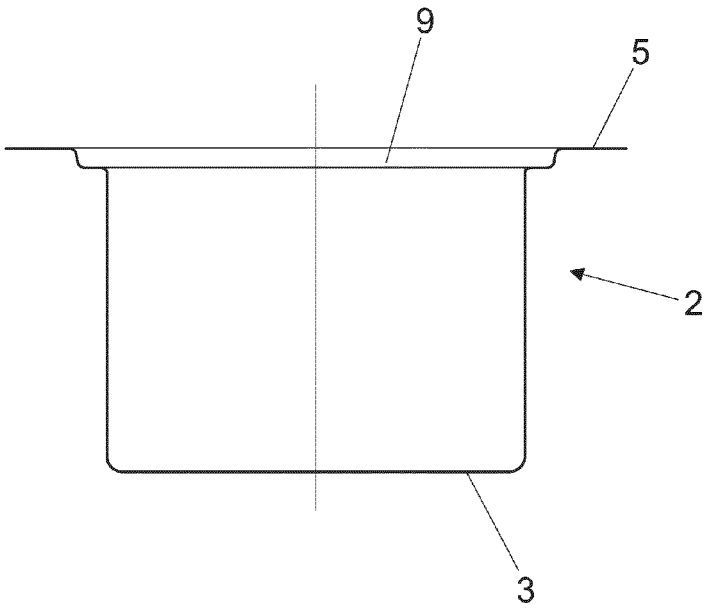



Fig. 2a

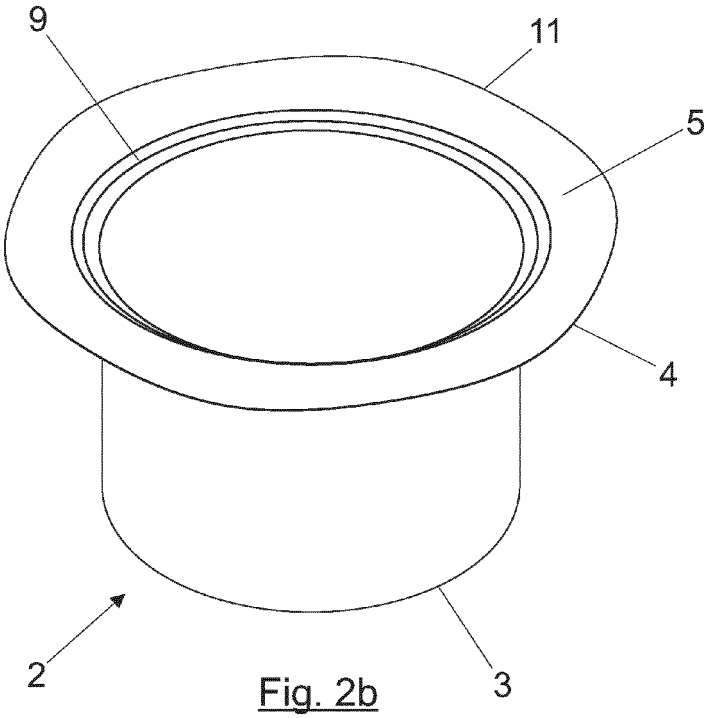



Fig. 2b

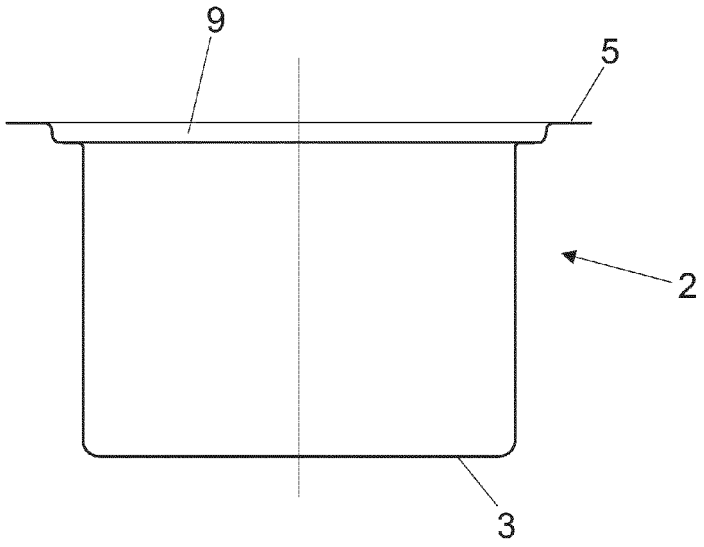



Fig. 3a

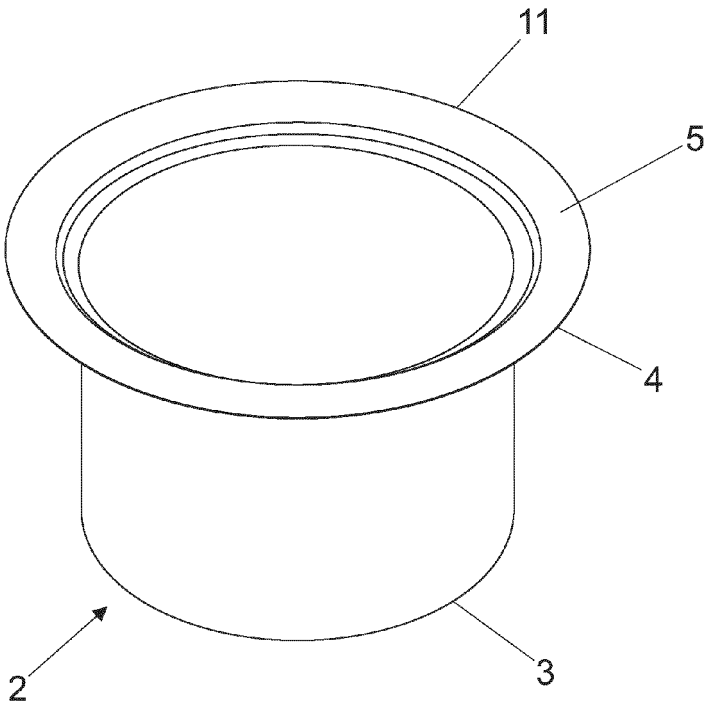



Fig. 3b

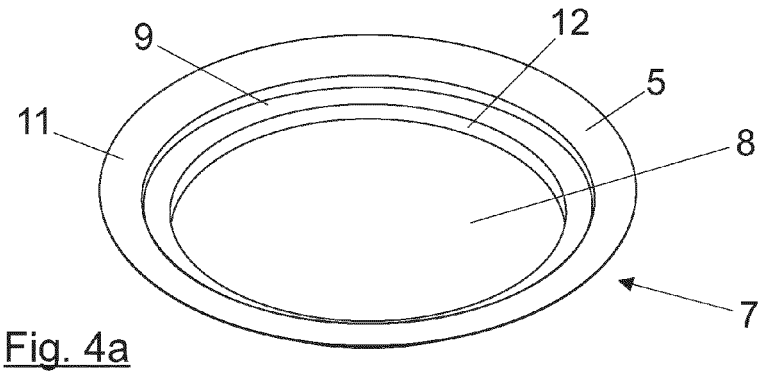



Fig. 4a

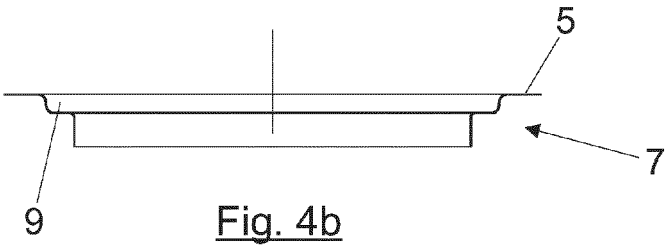



Fig. 4b

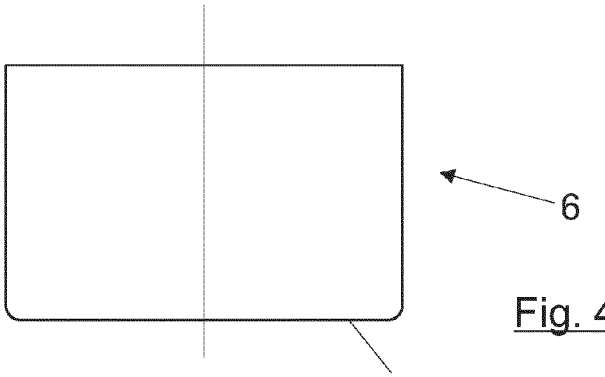



Fig. 4c

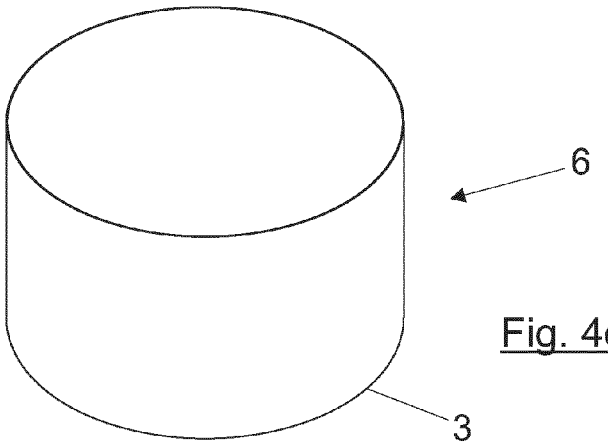



Fig. 4d

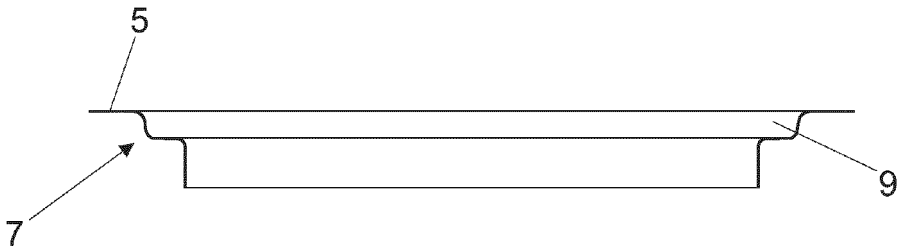



Fig. 5a

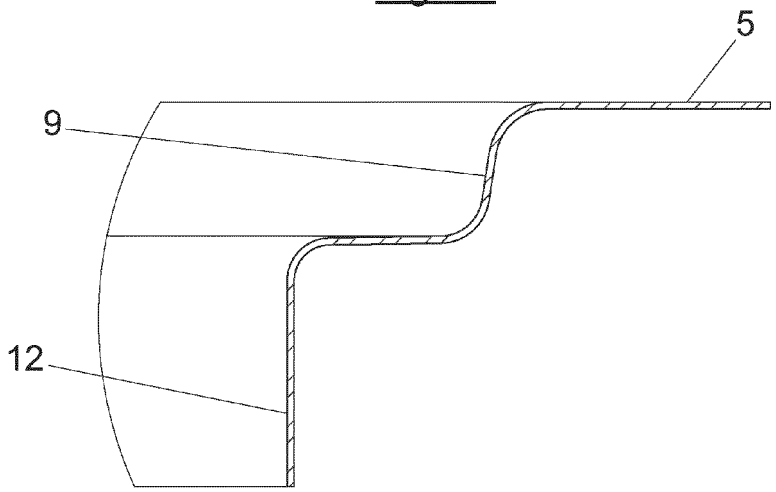



Fig. 5b

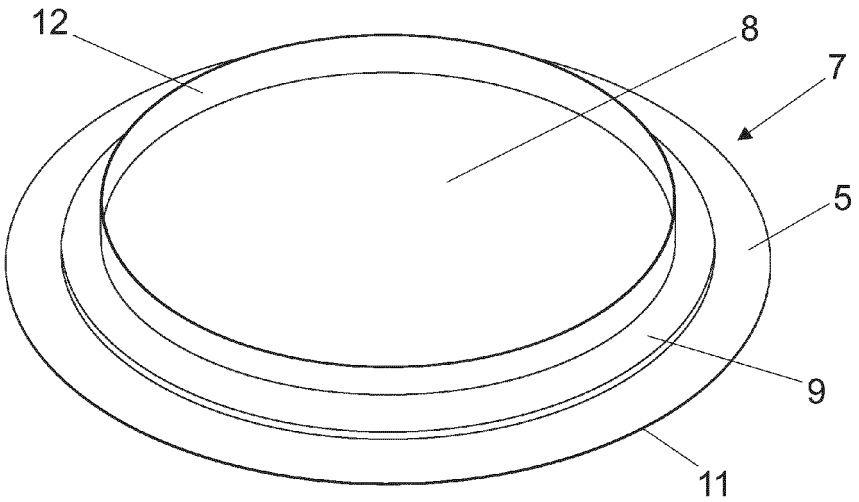



Fig. 5c

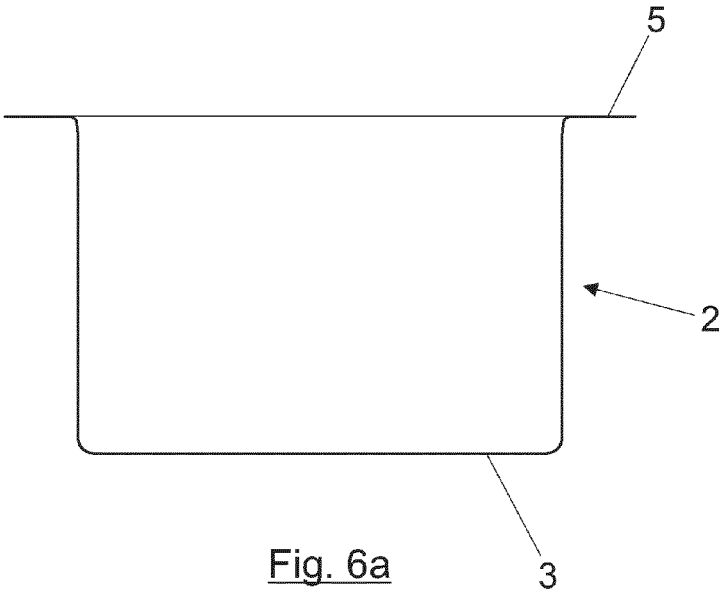



Fig. 6a

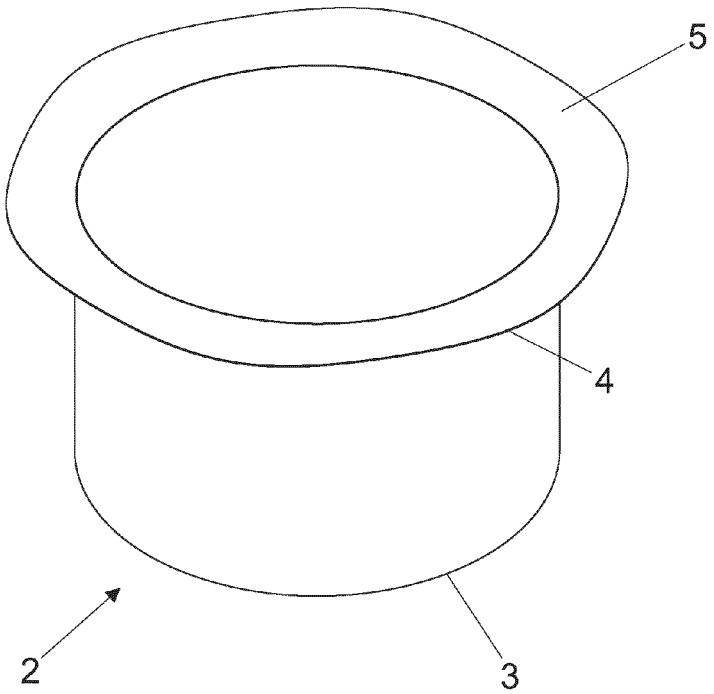
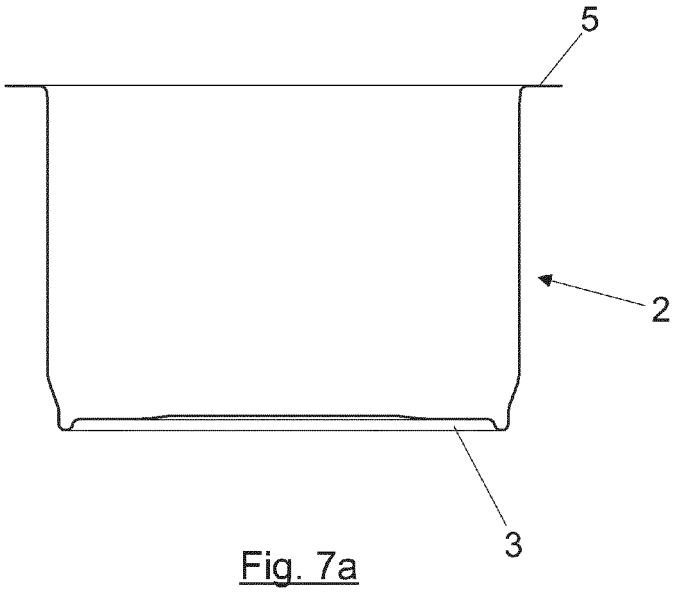



Fig. 6b

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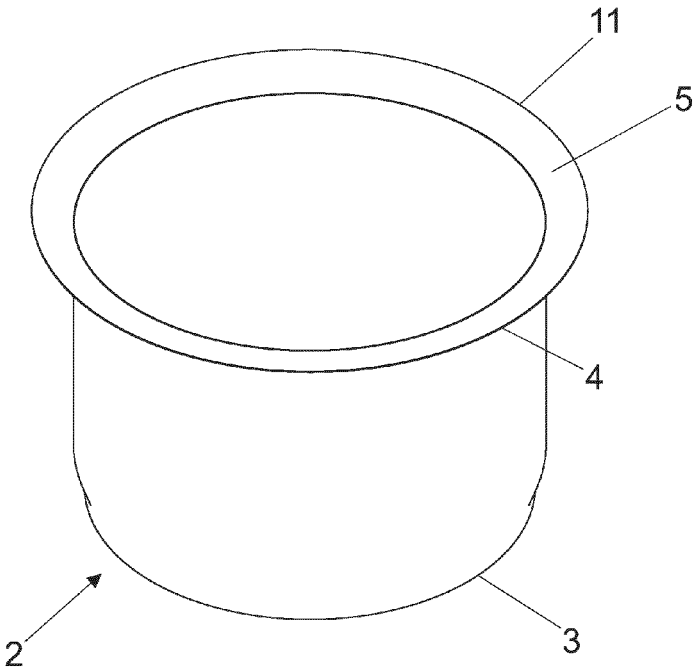



Fig. 7b

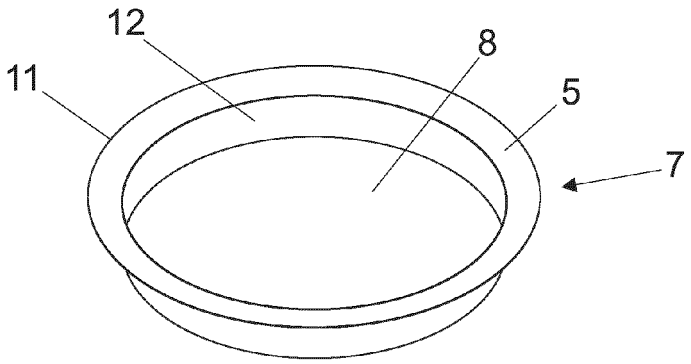
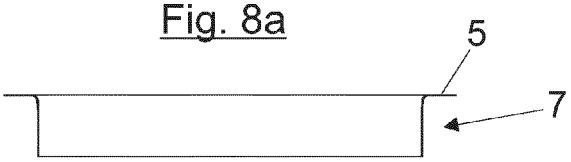



Fig. 8a

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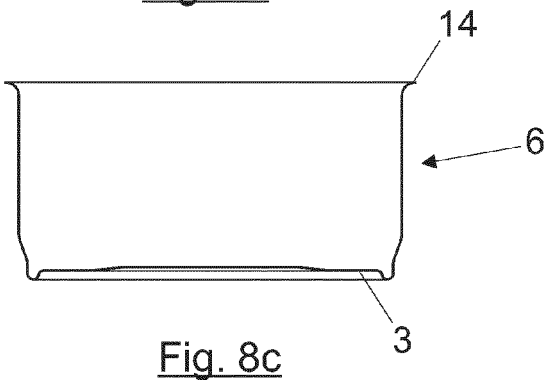



Fig. 8c

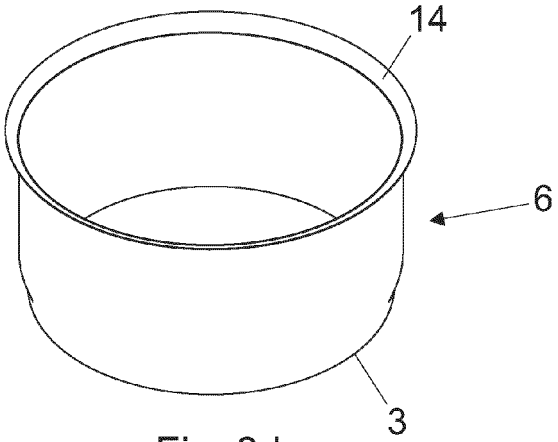



Fig. 8d

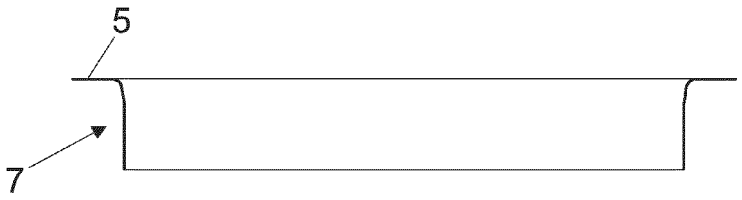



Fig. 9a

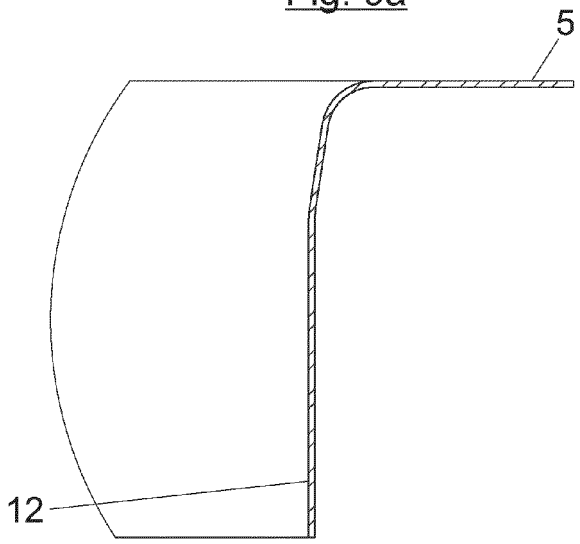



Fig. 9b

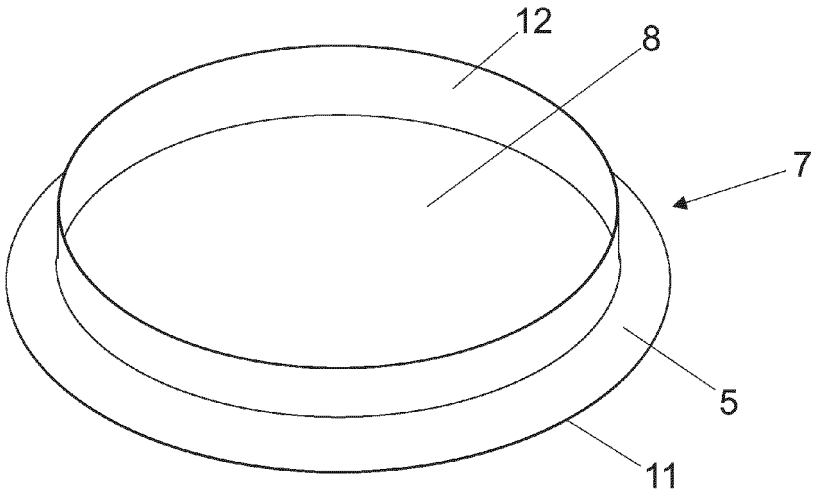



Fig. 9c

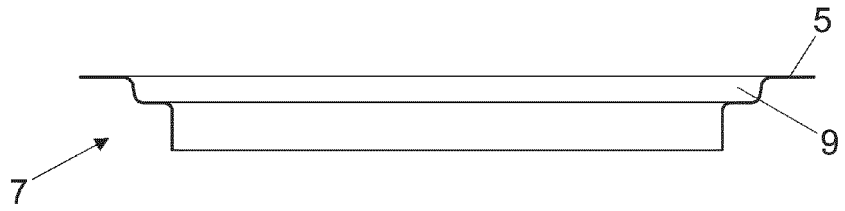
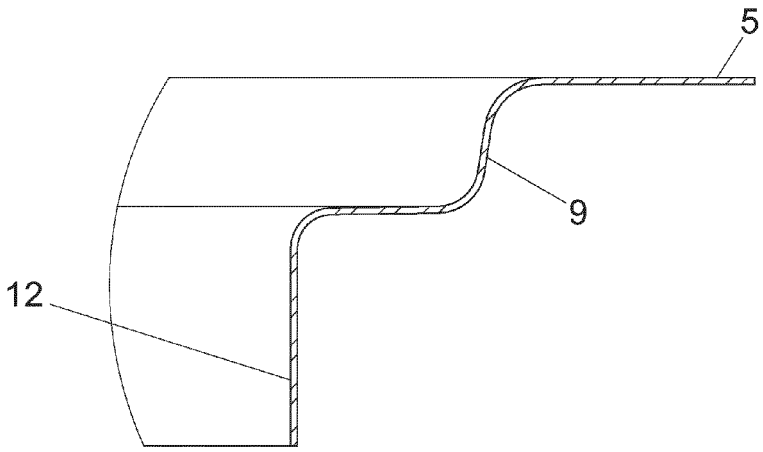



Fig. 10a

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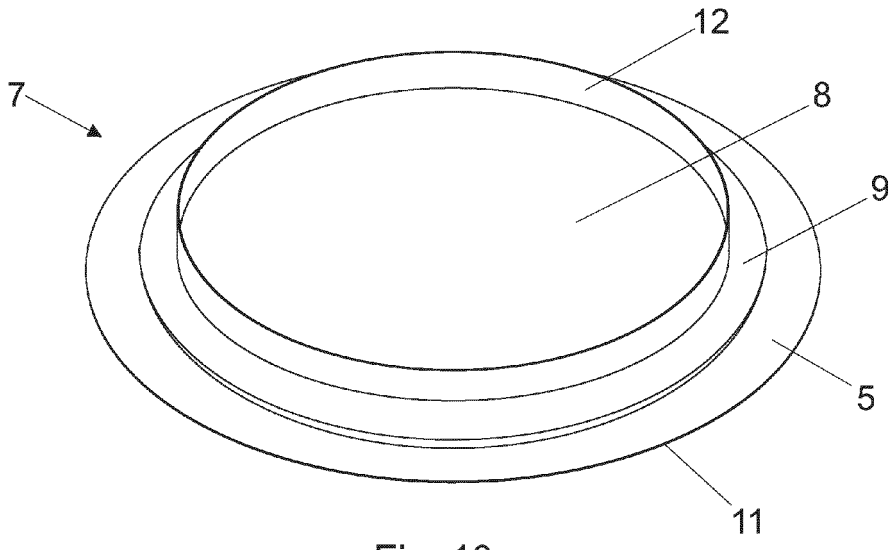


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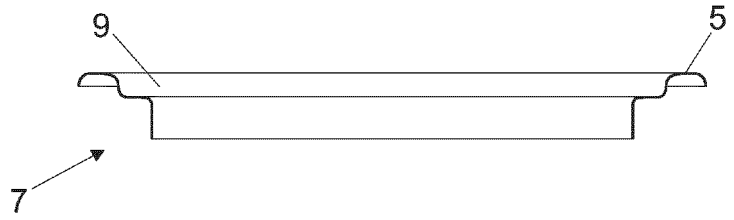



Fig. 11a

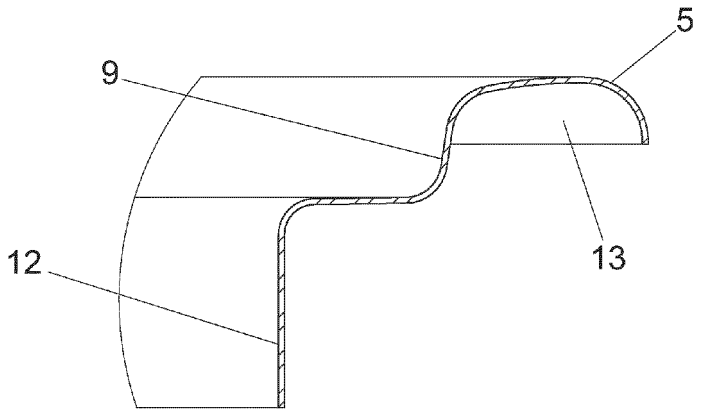



Fig. 11b

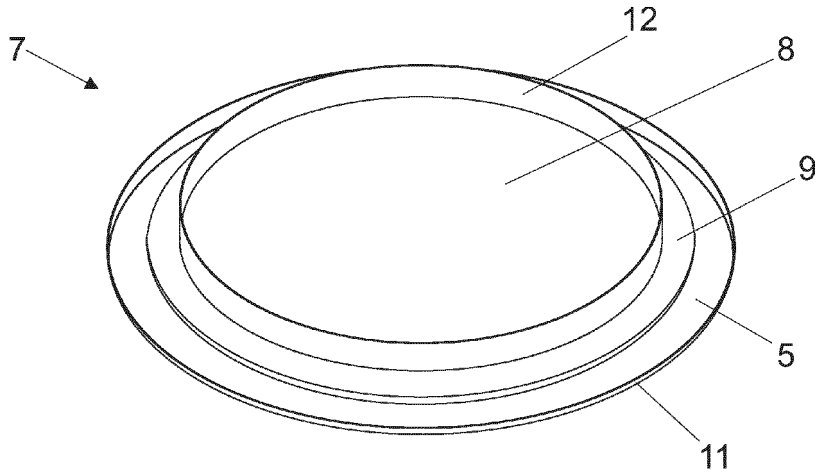



Fig. 11c

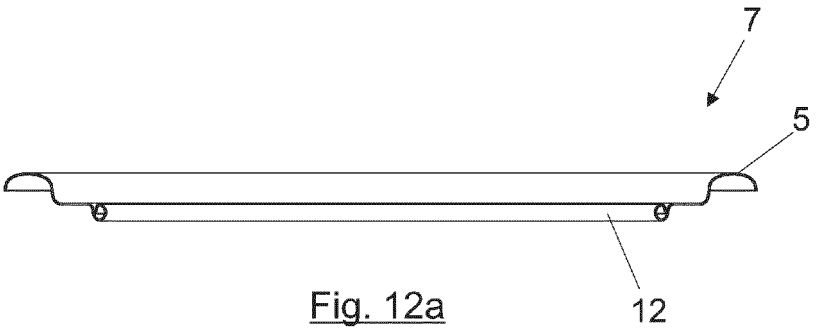
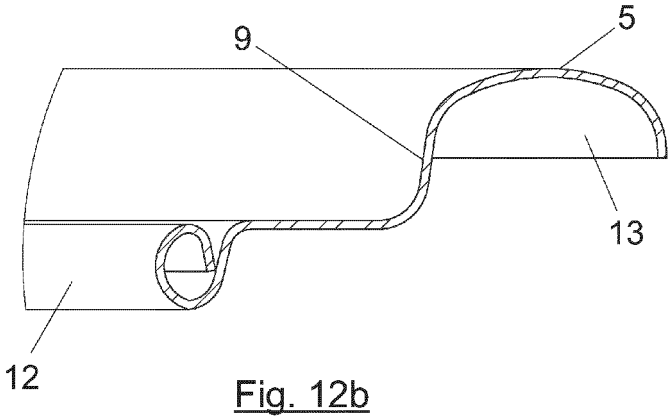



Fig. 12a

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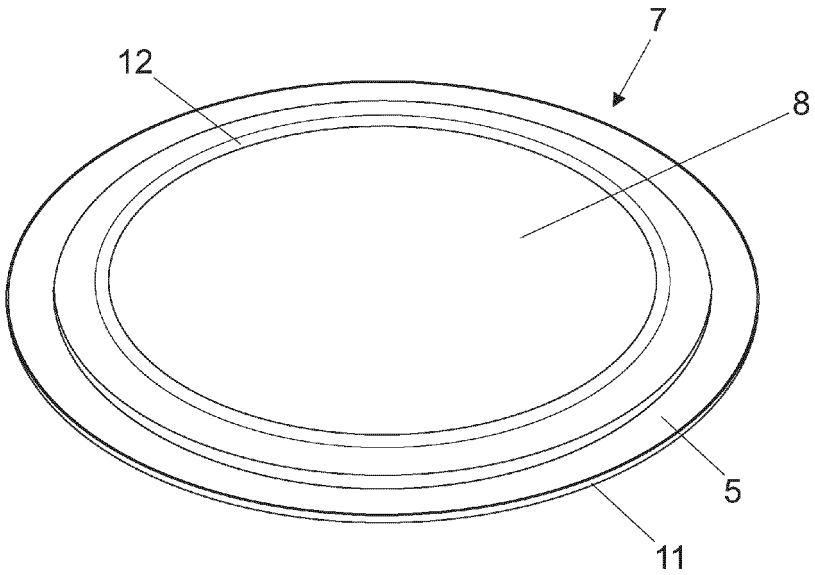
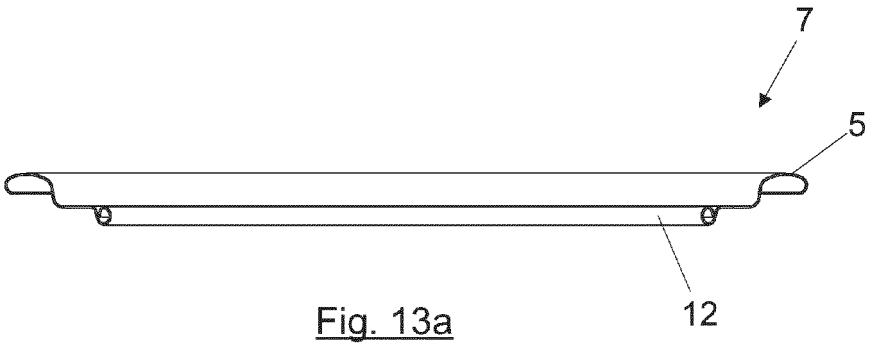



Fig. 12c

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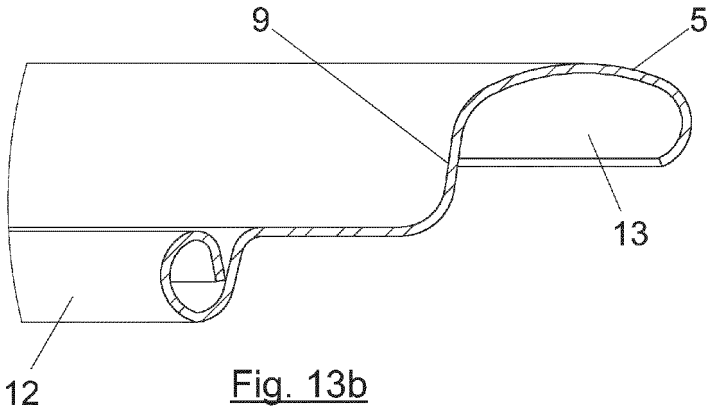


Fig. 13b

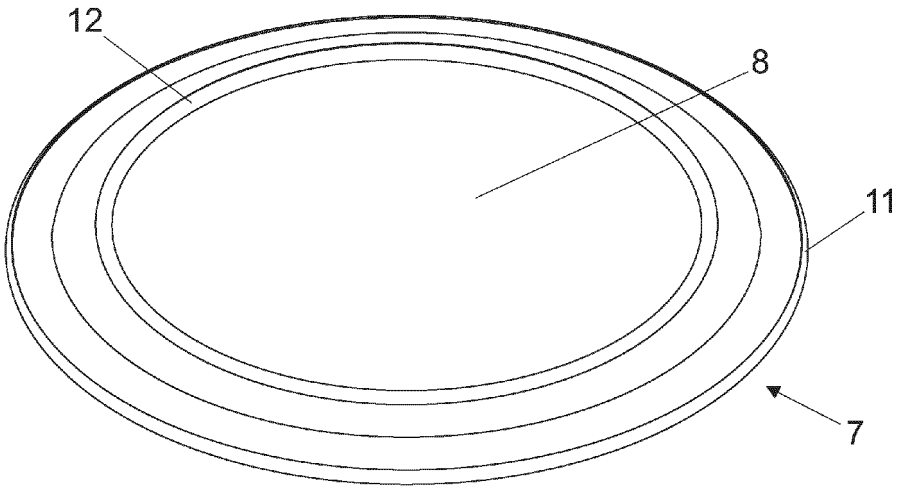


Fig. 13c

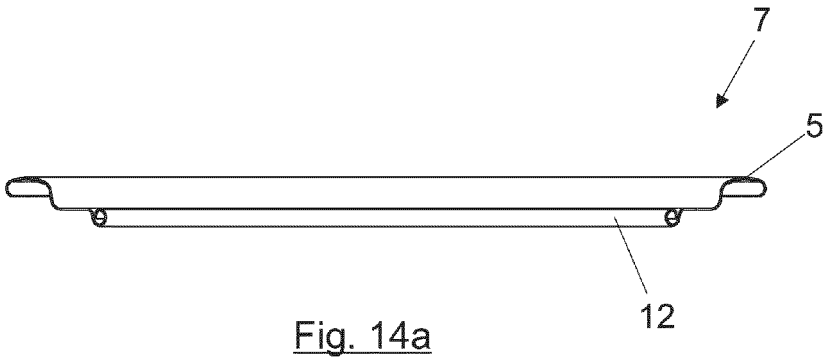


Fig. 14a

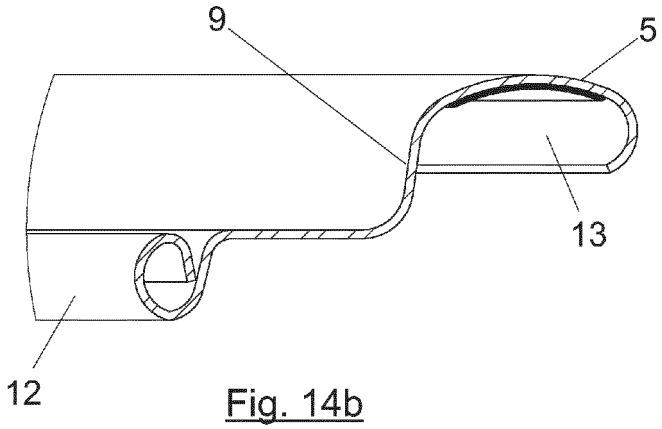


Fig. 14b

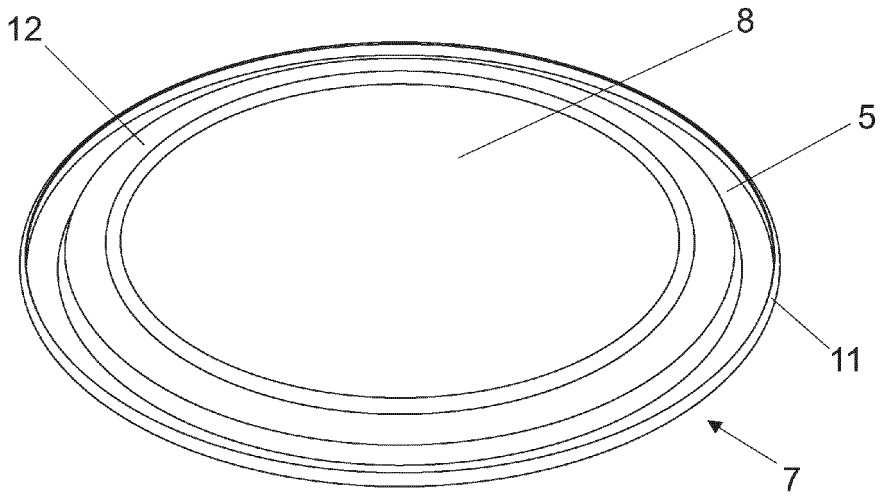


Fig. 14c

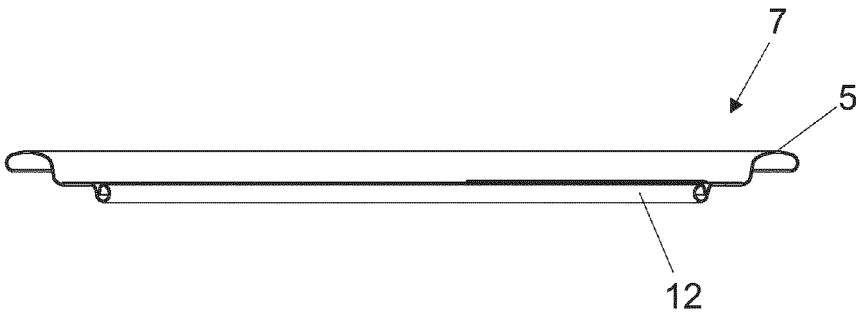


Fig. 15a

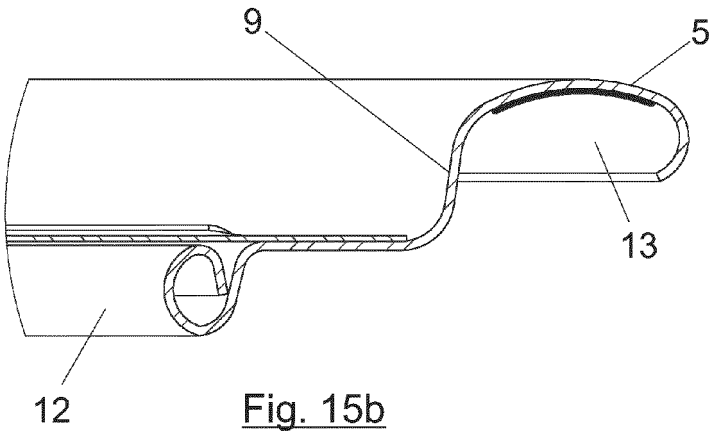


Fig. 15b

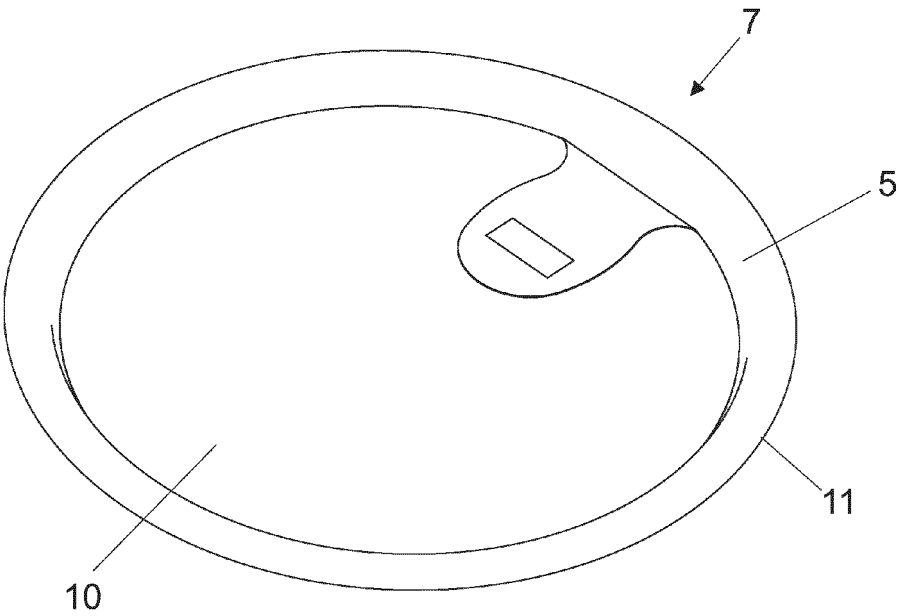


Fig. 15c

# INTERNATIONAL SEARCH REPORT

International application No
PCT/ES2020/070155

A. CLASSIFICATION OF SUBJECT MATTER
INV. B21D22/20 B21D24/16 B21D51/26 B21D51/44
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B21D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
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| Y | paragraph [0009] - paragraph [0015]; figures 1a, 1b, 3a-d | 4-8,17, 18 |
| Y | EP 1 375 025 A1 (ALCAN TECH & MAN AG [CH]) 2 January 2004 (2004-01-02) paragraph [0011] | 4-6 |
| Y | EP 1 029 613 A1 (IMPRESS GMBH & CO OHG [DE]) 23 August 2000 (2000-08-23) paragraph [0010] | 7,8 |
| Y | EP 1 410 859 A1 (PENALVER GARCIA JOSE [ES]) 21 April 2004 (2004-04-21) paragraph [0018] | 17 |
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| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 26 November 2020 | 04/12/2020 |

| Name and mailing address of the ISA/ | Authorized officer |
|---|---|
| European Patent Office, P.B. 5818 Patentlaan 2<br>NL - 2280 HV Rijswijk<br>Tel. (+31-70) 340-2040,<br>Fax: (+31-70) 340-3016 | Vesterholm, Mika |

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## INTERNATIONAL SEARCH REPORT

International application No
PCT/ES2020/070155

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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