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(54) PROCESS FOR MAKING A DISPOSABLE DISH AND SO-OBTAINED DISH

(57) The process for making an aluminium dish (1), comprises the steps of:
i) providing (A) a preformed element (14) made at least predominantly of aluminium and having a main body, which preformed element (14) is inserted (B) in a deep drawing mould (10) comprising a first, in particular upper, matrix (11), and a second, in particular lower, matrix (12), at least one of the matrices (11, 12) having a predefined shape suitable for defining the external and/or internal profile of the dish (1), one or both matrices (11, 12) being movable between a moving position, wherein these matrices (11, 12) are spaced apart, and a forming position, wherein these matrices (11, 12) are coupled and the preformed element (14) is held between them;
ii) drawing (C) said preformed element (14) by means of the mould (10), wherein the preformed element (14) is plastically deformed, with the main body which is progressively pressed and lengthened until it assumes the predefined shape, so as to obtain a dish (1) having a lateral skirt substantially devoid of wrinkles.

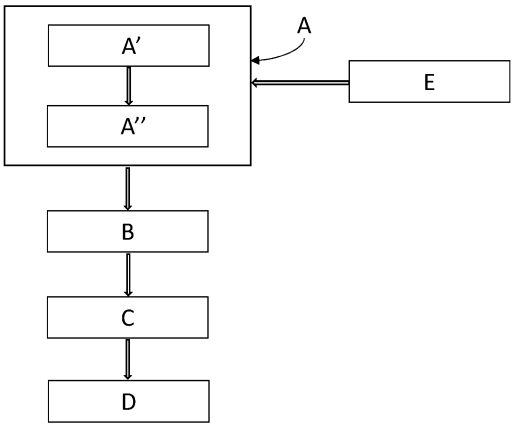

Fig. 1

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Description

Technical field of the invention

[0001] The present invention relates to a process for making a disposable dish and to a so-obtained dish.

Background

[0002] The disposable dishes are very widespread as they are practical, light, easily transportable and they do not require to be washed after use.

[0003] For decades, the disposable plastic dishes have been widely spread among consumers as they offer an economical and practical solution to the need for being able to serve food items under different circumstances, for example in outdoor picnic and similar convivial requiring temporary solutions including moving dishes and tableware, or mass events such as festivals, parties or other events or activities requiring a huge number of dishes to be served.

[0004] The disposable plastic dishes, in fact, are not expensive, light and sufficiently consistent as to sustain the usually served meals.

[0005] The increasingly growing ecological sensitivity is highlighting the big environmental impact of the disposable plastic products, both in terms of consumed resources and in terms of produced waste.

[0006] In this sense, a new European Directive, Nr. 2019/904 of 5 June 2019 was issued, imposing the reduction in the environmental impact of some plastic products and which above all relates to not recyclable and not compostable disposable plastic objects, thereamong the plastic dishes.

[0007] However, the need remains for being able to have disposable dishes, reason why one is trying to find materials alternative to the plastic thereof less impacting disposable dishes are to be made, but which guarantee same practicality, economy and functionality.

[0008] Among the alternative materials the bioplastics, that is bio-degradable or compostable plastics, deriving from renewable resources, can be mentioned. However, these materials, if deriving from edible food substances, subtract resources useful to satisfy the food requirement.

[0009] Still in terms of possible materials alternative to plastic for this type of products, aluminium is surely competitive with bioplastics, but it was not successful since the current production techniques do not allow to obtain dishes with low thickness, then competitive dishes in terms of price and with mechanical resistance suitable to stresses linked to the typical use.

[0010] The traditional aluminium containers, for example, have not a consistence sufficient to guarantee the same functionality of the plastic dishes, resulting to be easily deformable under the effect of twisting, bending and lateral squeezing stresses, apart from having a not adequate design to be served on our tables.

[0011] The poor stiffness of the above-mentioned containers is mostly due to the moulding technology traditionally used to implement the aluminium containers. Such technology, known with the name of *wrinkle-wall,* provides to start from an aluminium sheet, generally having thickness ranging between 40 micrometres and 90 micrometres, preferably between 60 micrometres and 90 micrometres. The aluminium sheet is shaped between one male mould and one female mould, so as to have a rectangular or circular bottom, with possible reinforcing rib structures and a more or less flared perimeter wall, with lateral faces joined by curved angle portions. During moulding, the exceeding material at the curved portions curls on itself by forming wrinkles. For example, in case of trays with substantially rectangular perimeter, the wrinkles form along the angle portions. In case of trays or containers with substantially circular or oval perimeter, the wrinkles form at the whole perimeter.

[0012] As said, the stiffness of the containers produced with traditional technology (*wrinklewall*) does not result to be satisfying, particularly with respect to the twisting, bending and lateral squeezing stresses.

[0013] Moreover, the presence of wrinkles involves drawbacks, one thereof is represented by the difficulty in heat-sealing pellicles or films to seal the subject containers.

[0014] At last, a dish having such folds/wrinkles would risk to hold food residues, or to not succeed in avoiding the food discharge caused by the film bad adhesion due to the presence of an irregular and wrinkled edge, thus resulting to be little functional to the purpose.

Summary of the invention

[0015] The technical problem placed and solved by the present invention is then to provide un process for making a disposable dish allowing to obviate the drawbacks mentioned above with reference to the known art.

[0016] Such problem is solved by a process for making a disposable dish according to claim 1.

[0017] The invention further provides a dish according to claim 8.

[0018] Preferred features of the present invention are set forth in the depending claims.

[0019] The present invention provides some relevant advantages. The main advantage consists in the fact that, thanks to the developed process, it is possible to obtain light aluminium dishes, resistant and suitable to the single use.

[0020] No one, in fact, had sofar devised and implemented a single-use dish made of (bare and/or coated) aluminium with low thickness (lower than 80 micrometres), through *smoothwall* technology, with anti-cut edge closed like a curl, by providing an ecological and sustainable alternative to the current dishes produced in plastics or with other traditional materials.

[0021] Moreover, the obtained single-use dish is implemented with an alloy of aluminium, suitably devised, which contains minimum 97% of secondary aluminium,

that is coming from post-industrial and/or post-consumer recycling.

[0022] Additional advantages are enlisted hereinafter.

- The environmental impact of the obtained dishes is very low and absolutely competitive with other possible materials such as bioplastics or other recyclable materials, starting from secondary raw material.
- The dishes implemented and obtained with the process of the invention can be used to heat food directly in the dish, both in traditional ovens and in microwave ovens; this double use condition cannot be guaranteed by the actual dishes made of plastics and/or bioplastics, due to the chemical-physical properties of such materials.
- If necessary, the disposable aluminium dishes can be sealed with a sealable film/tape in case food should be transferred for example from industrial kitchens to public refreshment places (hospitals, school canteens, offices, and so on). This is possible since the process of the invention allows to implement on the surface of the dish a flat circular crown to perform the heat-sealing/sealing of a polymeric film or of a thin aluminium tape.
- With respect to other dishes, for example the dishes made of cellulose pulp, the disposable aluminium dish can be used even to consume liquid food (broths, soups, etc.) since it does not absorb liquids;
- As well as the dishes made of plastics, those made of aluminium can be implemented in various colours, but additionally with logos, inscriptions, drawings, on the external side of the dishes; moreover, they can be made with internal colouring different from the external one, or it is possible to implement on the internal surface of the dish an edge having different colour with respect to the bottom colour. These things currently are not implemented with the plastic materials.
- The dishes made of aluminium are odourless both in the bare and painted version as, since the *coating* are cured at temperatures higher than 200° C, they do not hold solvent residues.
- The dishes can be implemented even in the multi-compartment type with dividing septa to allocate separately several food items.

[0023] Other advantages, features and use modes of the present invention will result evident from the following detailed description of some embodiments, shown by way of example and not for limiting purposes.

Brief description of figures

[0024] The figures of the enclosed drawings will be referred to, wherein:

- Figure 1 shows a flow diagram which synthetizes the main steps of an embodiment of the process according to the present invention;
- Figures 2, 4, 6 and 8 show each one a perspective side view of a respective embodiment of a dish according to the present invention;
- Figures 3, 5, 7 and 9 show each one an axonometric view of a respective dish according to the embodiments of the preceding Figures 2, 4, 6 and 8;
- Figures 10A, 10B and 10C show each one a schematic view of a sub-step of an embodiment of the process according to the invention;
- Figure 11 shows schematically a detail of Figure 10B.

[0025] The thicknesses and the curvatures represented in the above-mentioned figures are to be meant as purely exemplifying, they are generally magnified and not necessarily shown in proportion.

Detailed description of preferred embodiments

[0026] Several embodiments and variants of the invention will be described hereinafter and this with reference to the above-mentioned figures.

[0027] Analogous components are designated in the different figures with the same numeral reference.

[0028] In the following detailed description, additional embodiments and variants with respect to embodiments and variants already treated in the same description will be illustrated limitedly to the differences with what already shown.

[0029] Moreover, the different embodiments and variants described hereinafter are subjected to be used in combination, where compatible.

[0030] By firstly referring to Figure 1, an embodiment of a process for making an aluminium dish is exemplified, the latter too according to a preferred embodiment of the invention.

[0031] The process comprises a first step, designated with reference letter A, in which an aluminium preformed element is provided, commonly called slice, provided with a perimeter edge and a main body, the latter designated hereinafter with the wording "central body". Such element is shown, for example, in Figure 10A and herein designated with 14. Said perimeter edge and central body can correspondingly be recognized, once having underwent the forming process, in the final dish, the latter shown in Figure 2, and herein designated with 3 and 2, respectively.

[0032] Again, even with reference to Figure 10A, the process then comprises a subsequent step, designated with the reference letter B, for inserting the preformed element between a first matrix 11, otherwise called "upper matrix" or "female mould", and a second matrix 12, otherwise called "lower matrix", "punch" or "male matrix",

of one deep drawing mould 10. The latter has a basket 13 surrounding at least the lower matrix 12.

[0033] The deep drawing mould 10, preferably, has two configurations, associated to the different mutual position of the matrices 11 and 12. In particular, in a first moving, or preparation or rest, configuration, the matrices 11 and 12 are spaced apart therebetween, whereas in a pressure or forming operating configuration the matrices 11 and 12 are approached to one another, in particular abutted or coupled therebetween.

[0034] The mould 10 can be of type known to the state of art, wherein, as said, the lower matrix 12 is of the type of a punch and the upper matrix 11 is counter-shaped to receive by engagement the lower matrix 12.

[0035] Usefully, the upper matrix 11 has a predetermined conformation, which is substantially concave and defines the shape of a dish and the lower matrix 12 has a profile complementary to that of the upper matrix 11. In the present embodiment - and with further reference, for example, to Figure 2 - the matrices can have a predefined conformation to shape a side wall 6 and a bottom 5 of the dish 1.

[0036] The side wall 6 can be substantially smooth or, advantageously, it can have reinforcing ribs or rib structures 4 or other, in case projecting, elements, similar for example to webs. Such rib structures allow to increase the overall stiffness of the obtained dish and then to use reduced aluminium thicknesses, the possibility of using the dish itself being equal.

[0037] The bottom 5 can be smooth or provided with reinforcements or embossing. Moreover, the bottom 5 can be provided with relief inscriptions, for example mechanical coining designating the aluminium recycling logo, as provided for by EC Regulation 1935/2004, or the name and/or logo of a *brand.*

[0038] The process then provides an additional deep drawing step, designated with the reference letter C, of the preformed element 14 by means of the mould 10.

[0039] The configuration is so that, in the passage between the moving configuration and the forming configuration, the preformed element 14 is plastically deformed, with its central body which is progressively elongated and pressed by the upper matrix 11 on the lower matrix 12, or vice versa, until it assumes the shape predefined by the matrices themselves.

[0040] As exemplified in Figure 10A, in a first sub-step of the deep drawing step C the perimeter edge of the preformed body remains held, whereas in a second sub-step (Figure 10B) it is left to slide between the two matrices, in particular on the lateral skirt of the second matrix 12.

[0041] Usefully, the first above-mentioned sub-step lasts few milliseconds, with respect to a total duration of the deep drawing step equal to about 1 second.

[0042] The above-described process produces a dish according to anyone of the embodiments represented in Figures 2 to 9, having a curved lateral skirt substantially, or almost wholly, devoid of wrinkles.

[0043] Advantageously, each dish has a thickness lower than 80 micrometres, still more preferably comprised between 40 micrometres and 80 micrometres, and advantageously equal to about 70 micrometres.

[0044] The preformed element 14, in fact, during the progressive lengthening between the matrices 11 and 12, assumes a substantially concave three-dimensional shape, defined by a lateral wall, or skirt, and by a bottom. The portions of preformed element 14 which, in the passage to dish, are necessarily curved and/or folded with the purpose of assuming the final shape, result to be substantially devoid of wrinkles thanks to the above-described progressive lengthening.

[0045] Consequently, the resulting dish is stiffer and more resistant to twisting, bending and lateral squeezing stresses and this also thanks to the above-mentioned rib structures.

[0046] Advantageously, the process can comprise an additional folding step, designated with D in Figure 1, which indeed folds the perimeter edge of the preformed element so as to implement a cantilevered balcony suitable to be grasped by a user, ending with an anti-cut edge closed like a curl.

[0047] The folding step D usefully can take place during the second sub-step of the deep drawing step C, as exemplified in Figures 10B and 11. In fact, when the perimeter edge 3 is no more held, it slides inside the second matrix 12, or however between the two matrices 11 and 12, in particular along the walls of the above-mentioned basket 13. Pushed by the action of the first matrix 11, the perimeter edge 3 slides in the second matrix 12 until meeting a matching seat 15 in which it is refolded.

[0048] At the end of the folding step D, the preformed element 14 is transformed into the dish 1, as exemplified in Figure 10C.

[0049] As illustrated in Figure 1, the step A preferably comprises the implementation of the preformed element 14 starting from an aluminium sheet element.

[0050] In particular, the implementation of the preformed element 14 can comprise the following sub-steps designated with reference letters A' and A":

- holding (A') an aluminium sheet element between the upper matrix 11 and the lower matrix 12;
- cutting (A") the sheet element by cutting means configured to form the preformed element 14, the latter remaining held between the upper matrix 11 and the lower matrix 12 substantially at the perimeter edge 3, at the beginning of the step B.

[0051] The preformed element 14, then, can be obtained from an aluminium sheet element held directly between the portions of the mould 10. The cutting means can provide to cut the sheet element by defining directly on the mould 10 the preformed element 14.

[0052] Preferably, the preformed element 14 can be made with an alloy which has minimum 97% of recycled

metal coming from processing waste (for example post-industrial waste) inside and outside the production firm. Consequently, the environmental impact (*Life Cycle Assessment,* L.C.A.) results to be very low and competitive with other alternative materials.

[0053] Alternative solutions are not excluded wherein the preformed element 14 is made of alloys mainly consisted of primary aluminium.

[0054] Advantageously the process can comprise a coating step E of the sheet element, or of the preformed element, with at least a thermosetting, in case heat-sealing, polymeric substance, to implement a *coating* which coats at least partially the element. The element can be coated on the internal side with a *coating* suitable to the food contact, and capable of subjecting thermal stresses (in traditional or microwave oven) and/or a heat-sealing with cover. The same element can be coated even on the external side with a *coating* of any colour and *gloss* and in case rotogravure or flexography printed with a logo of any colour, still suitable to the (even indirect) contact with food, by keeping into consideration the *set-off* problem governed by the EC European Regulation 2023/2006.

[0055] It is necessary to specify that the terms "internal side", "external side", "internally" and "externally" referred to the sheet or laminated element designate the surfaces of the element itself which, after the forming process, can be seen as internal or external surface of the formed dish 1.

[0056] Usefully, both internal and external *coating* can be of various chemical nature, for example it can comprise at least one thermosetting, if needed heat-sealing, polymeric substance, selected from the following group of substances suitable to the food contact: epoxy, polyurethane, polyester, epoxy-polypropylene, polyester-polypropylene, acrylic, silicone.

[0057] The above-described substances can be applied with *coil-coating* technology, cured thermally at temperatures comprised between 220 and 255°C, without any solvent residue in the final manufact.

[0058] The *coating* can be applied to the element portion which will correspond to the perimeter edge 3 of the dish 1 and/or to other selected areas of the dish 1.

[0059] Thanks to the *coating* it is possible to seal the dishes with a sealable film made of polypropylene (PP) or polyethylene terephthalate (PET) in case food should be transferred for example from industrial kitchens to public refreshment places (hospitals, school canteens, offices or other). This is possible since, as already described, the process of the invention allows to implement a dish 1 having a perimeter edge 3 devoid of wrinkles and, then, suitable to perform heat-sealing/sealing with a polymeric film or with a thin tape made of aluminium coated with sealing *coating.*

[0060] Preferably, as already said, the process provides the implementation of stiffening elements, such as the above-mentioned rib structures 4, on the lateral skirt of the forming dish and/or the bottom. Usefully, the implementation of stiffening elements can take place during the deep drawing step C.

[0061] Advantageously, said elements can be part of the predefined shape of one or both matrices 11 and 12.

[0062] As already said, the process described above according to several implementation variants allows to obtain a disposable dish described hereinafter, in its embodiments and variants, with reference to Figures 2 to 9.

[0063] The dish, as already said, is designated with reference 1. The different embodiments can be obtained by using different predefined shapes for the upper matrix of the deep drawing mould. The illustrated and described embodiments are exemplifying, but not exclusive.

[0064] Moreover, the role of the upper matrix and of the lower one can be reversed.

[0065] The dish 1 is substantially made of aluminium. The dish can be made of "bare" aluminium or aluminium properly coated with transparent or coloured polymeric substances. As said, the dish 1 comprises an anti-cut perimeter edge 3, closed like a curl, and a substantially concave central body 2.

[0066] According to the invention, the dish 1 has curved or bent portions, in particular the lateral skirt, almost wholly devoid of wrinkles. Such feature makes it suitable to be sealed with PET or PP pellicles by means of heat-sealing and thus suitable to transport food from a place to another one without altering the organoleptic and qualitative features, by preserving it from external contaminations.

[0067] To this purpose, the dish 1 can comprise a polymeric coating or otherwise called, if necessary, heat-sealing *coating,* applied at least partially to the perimeter edge 3.

[0068] According to preferred embodiment, the *coating* is applied on the whole, both internal and external, surface of the dish 1, but alternative solutions are not excluded, in which only one portion of the dish 1 is coated.

[0069] As already described, both internal and external *coating* could be of various chemical nature, formed with at least one, if necessary heat-sealing, thermosetting polymeric substance, selected from the following group of substances: epoxy, polyurethane, polyester, epoxy-polypropylene, polyester-polypropylene, acrylic, silicone. Such substances are selected among those suitable to food contact according to the provisions of MD 21/03/73 and subsequent amendments and EU Regulation 10/2011 and subsequent amendments, and they can be applied with *coil-coating* technology, thermally cured at temperatures comprised between 220 and 255°C, without any solvent residue in the final manufact. Even painting technologies different from those currently used and in development can be used for the coating.

[0070] Advantageously, the central body 2 can have a thickness lower than 80 micrometres, preferably comprised between 40 micrometres and 80 micrometres and still more preferably equal to about 70 micrometres.

[0071] The dish 1, then, results to be light, resistant and practical, particularly suitable to the single use. The

dish 1 in fact, is mostly made of aluminium, which is infinitely recyclable and its chemical-physical properties do not decay, differently from what it happens for other organic materials subjected to recovery and recycle.

[0072] Advantageously, the dish 1 can comprise stiffening elements, for example stiffening ribs 4 or other reinforcing elements, obtained at least at one between the side wall 6 and the bottom 5 of the dish 1.

[0073] The stiffening elements confer to the dish greater resistance to stresses, by making it particularly suitable for use.

[0074] Figures 2 and 3 show a first embodiment of the dish 1. The illustrated dish 1 is of the type of a "flat dish", having central body 2 defined by a substantially smooth surface. The dish has tapered shape and it has two or more stepped cross sections, or perimeter rib structures, 7, which define progressive decreases in section from the perimeter edge 3 to the bottom 5. The dish 1 has substantially circular plan and overall geometry.

[0075] Preferably, in this one and in subsequent embodiments, the rib structures have each one thickness of about 1.0 mm and mutual distance equal to about 9.1 mm.

[0076] Figures 4 and 5 show a second embodiment of the dish 1. The illustrated dish 1 is of the type of a flat dish, having central body 2 defined by a surface reinforced by longitudinal ribs 4 useful to confer greater resistance to the dish and which extend on a lateral skirt of the dish itself. Even the longitudinal ribs 4 result to be devoid of wrinkles.

[0077] Usefully, the longitudinal ribs 4 can be arranged on equi-spaced angular positions. Such feature confers a better distribution of the efforts, consequently the mechanical features of the dish 1 result improved.

[0078] The longitudinal ribs 4, moreover, extend from the bottom 5 towards the perimeter edge 3.

[0079] Figures 6 and 7 show a third embodiment of the dish 1. In this case the illustrated dish is of the type of a "hollow dish" or soup dish, having central body 2 defined by a substantially smooth tapered lateral surface, whereon however stepped cross sections 7 can be seen, with less height difference between adjacent sections with respect to the embodiment of Figure 2.

[0080] Figures 8 and 9 show a fourth embodiment of the dish 1. In this case the illustrated dish is of the type of a "hollow dish" or soup dish, having central body 2 defined by a surface reinforced by ribs 4 useful to confer greater resistance to the dish itself and analogous to those of the embodiment of Figure 5. Even in this case the ribs 4 result to be devoid of wrinkles. Moreover, the ribs 4 have a converging profile proceeding from the bottom 5 towards the perimeter edge 3.

[0081] Such shape improves the mechanical resistance of the dish 1, in particular against the greater twisting and bending efforts due to the greater height of the soup dish with respect to other types of dishes.

[0082] The dishes illustrated in the above-described embodiments have circular bottom, and overall geometry, but solutions are not excluded in which different shapes are provided, for example oval or ellipsoidal, or polygonal (squared, rectangular, hexagon and so on) shape.

[0083] It is possible to provide the implementation of mechanically rusticated and/or coined bottoms both to put a brand logo or symbols of other type linked to the design of the dish. It is possible to provide even the possibility of multi-compartment dishes with dividing septa to arrange separately different food items.

[0084] The present invention has been sofar described with reference to preferred embodiments. It is to be meant that other embodiments belonging to the same inventive core may exist, as defined by the protective scope of the herebelow reported claims.

Claims

1. A process for making an aluminium dish (1), comprising the steps of:

   (i) providing (A) a preformed element (14) made at least predominantly of aluminium and having a main body, which preformed element (14) is inserted (B) in a deep drawing mould (10) comprising a first, in particular upper, matrix (11), and a second, in particular lower, matrix (12), at least one of said matrices (11, 12) having a predefined shape suitable for defining the external and/or internal profile of the dish (1), one or both of said matrices (11, 12) being movable between a moving position, in which these matrices (11, 12) are spaced apart, and a forming position, in which these matrices (11, 12) are coupled and said preformed element (14) is held between them;
   (ii) drawing (C) said preformed element (14) by means of said mould (10), wherein said preformed element (14) is plastically deformed, with said main body which is progressively pressed and lengthened until it assumes said predefined shape, so as to obtain a dish (1) having a lateral skirt substantially devoid of wrinkles,

   wherein said dish (1) has a thickness comprised in a range of 40-80 micrometres and preferably equal to about 70 micrometres,
   and wherein said dish (1) preferably comprises stiffening elements (4), in particular transverse or longitudinal rib structures, formed at the lateral skirt or the bottom of the dish itself.

2. The process according to claim 1, comprising, in said step (i), the following sub-steps of making said preformed element (14):

   - holding (A') an aluminium sheet element be-

tween said first matrix (11) and said second matrix (12);
- cutting (A") said sheet element so as to eliminate a portion thereof arranged outside said deep drawing mould (10), in which said preformed element (14) preferably remains held between said first and second matrix (11, 12) substantially at its own perimeter edge.

3. The process according to one or more of the preceding claims, comprising a folding step (D) of a perimeter edge of said preformed element (14), to implement a cantilevered edge of the dish (1), which folding step is preferably performed during said phase (ii).

4. The process according to one or more of the preceding claims, comprising a coating step (E) of at least part of said preformed element (14) or of said sheet element, preferably with a heat-sealing polymeric substance to implement a *coating.*

5. The process according to the preceding claim, wherein said heat-sealing polymeric substance is selected from the following group: epoxy, polyurethane, polyester, epoxy-polypropylene, polyester-polypropylene, acrylic, silicone.

6. The process according to one or more of the preceding claims, wherein said stiffening elements (4) are obtained in said deep drawing step (C).

7. The process according to one or more of the preceding claims, wherein said dish includes a percentage equal to or greater than 97% of secondary aluminium, i.e. coming from post-industrial and/or post-consumer recycling.

8. A dish (1) made of aluminium, comprising an anticut perimeter edge (3), closed like a curl, and a substantially concave main body (2), the latter having a lateral skirt substantially devoid of wrinkles, which dish (1) has a thickness comprised in a range of 40-80 micrometres and preferably equal to about 70 micrometres, which dish (1) preferably includes stiffening elements (4), in particular transverse or longitudinal rib structures, formed at the lateral skirt and/or the bottom.

9. The dish (1) according to the preceding claim, comprising a heat-sealing polymeric coating applied on the entire internal surface of the dish and/or on said perimeter edge (3).

10. The dish (1) according to the preceding claim, wherein said coating comprises at least a heat-sealing polymeric substance selected from the following group: epoxy, polyurethane, polyester, epoxy-polypropylene, polyester-polypropylene, acrylic, silicone.

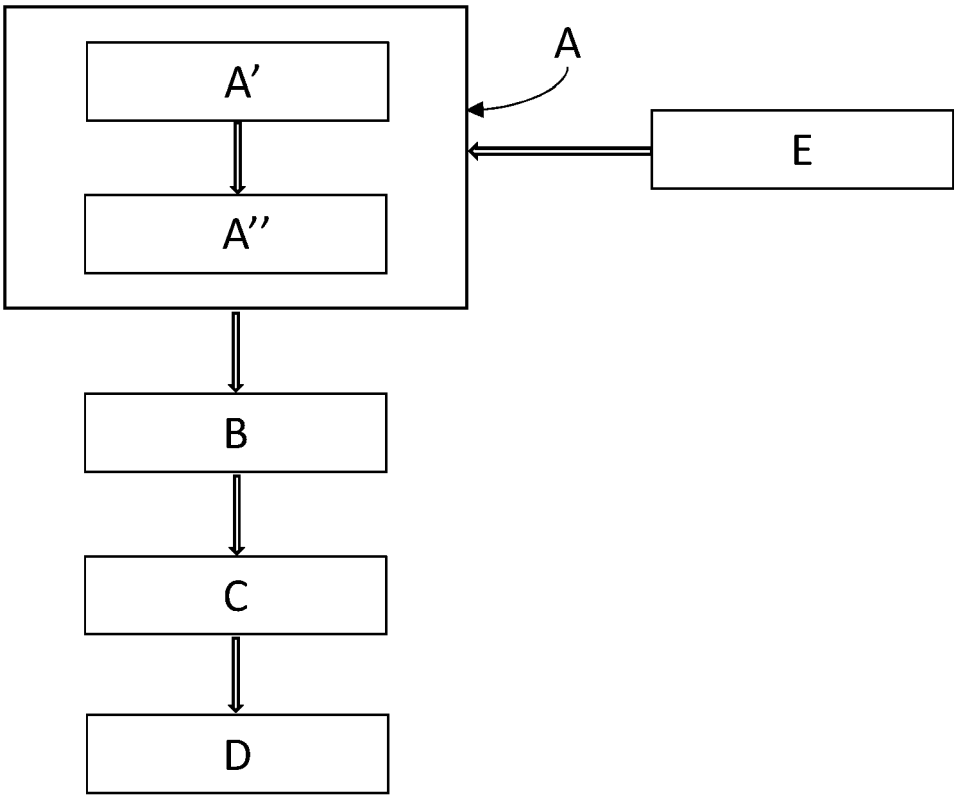

Fig. 1

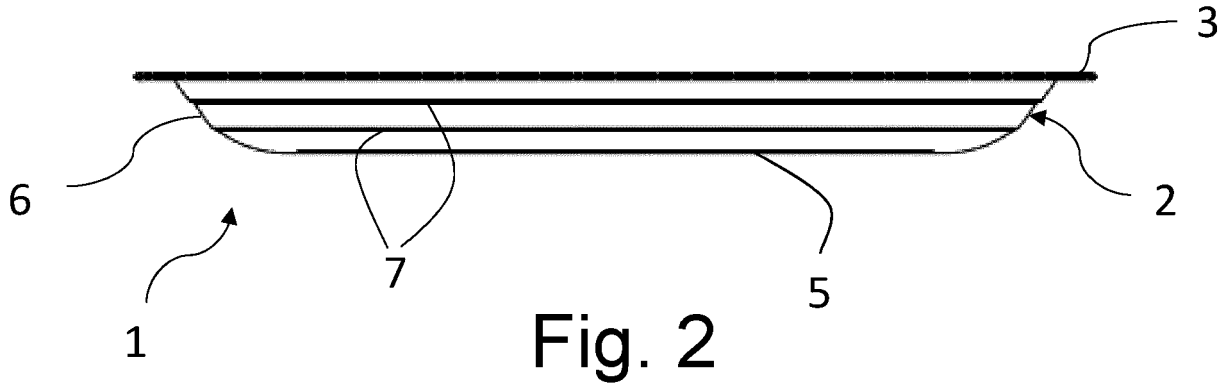

Fig. 2

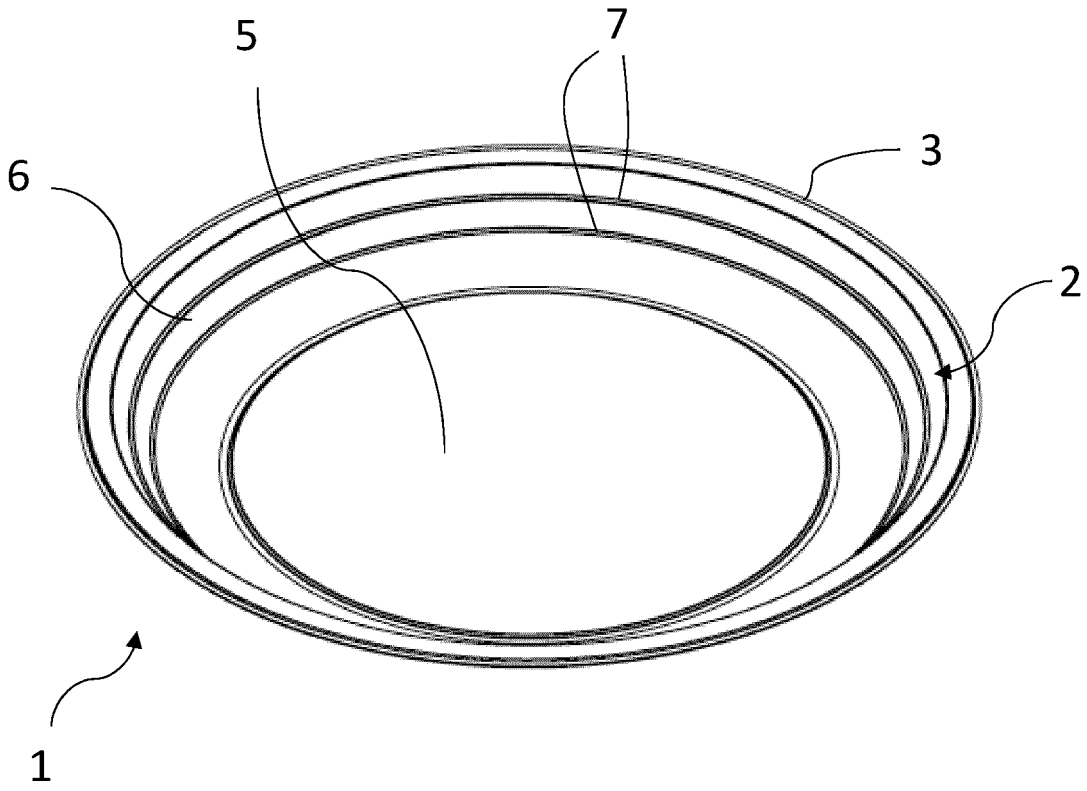

Fig. 3

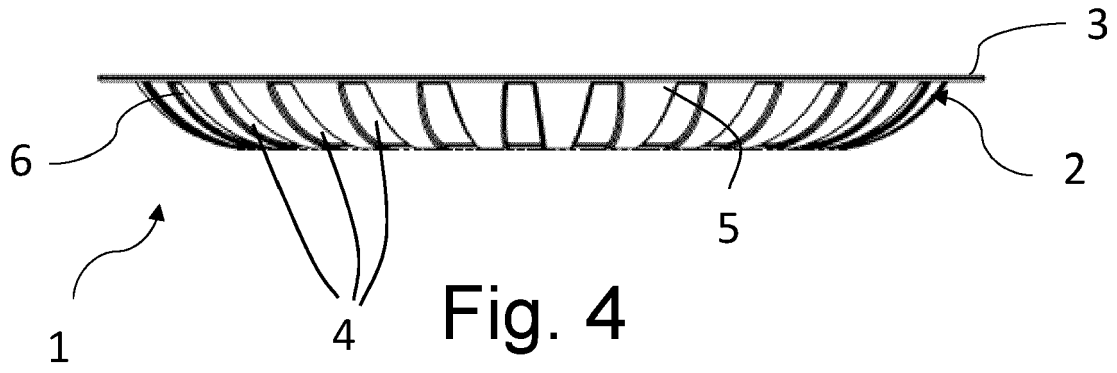

Fig. 4

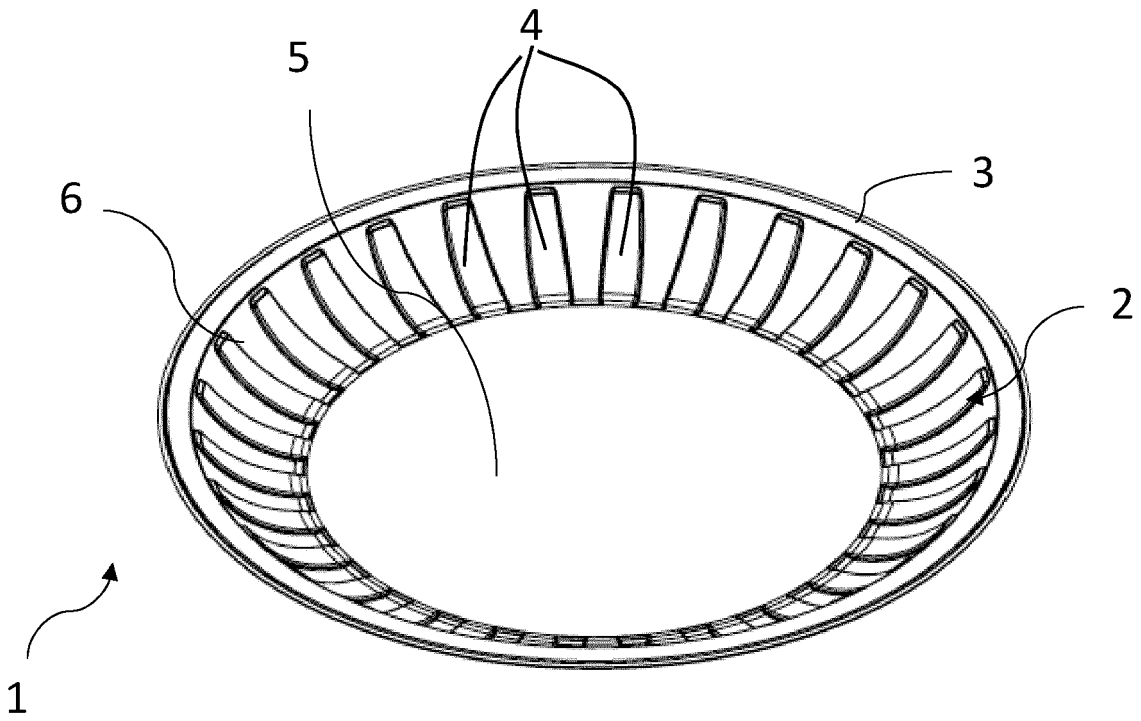

Fig. 5

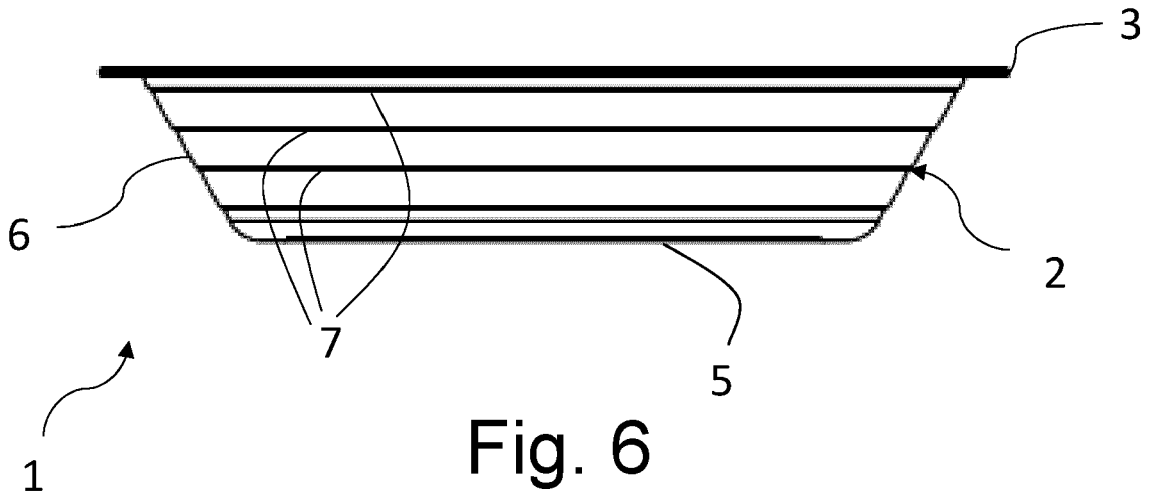

Fig. 6

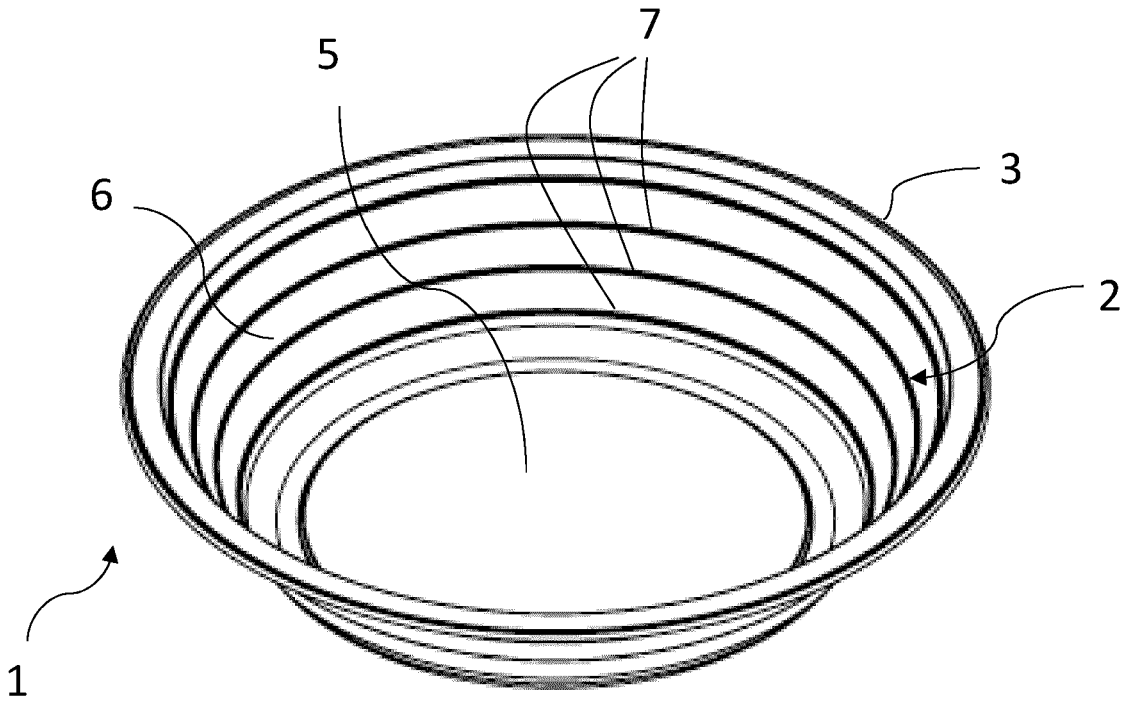

Fig. 7

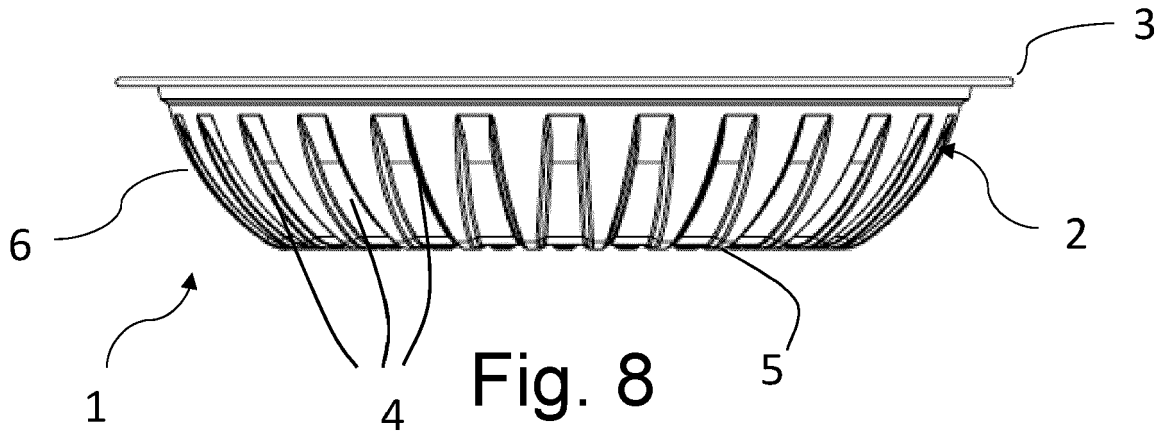

Fig. 8

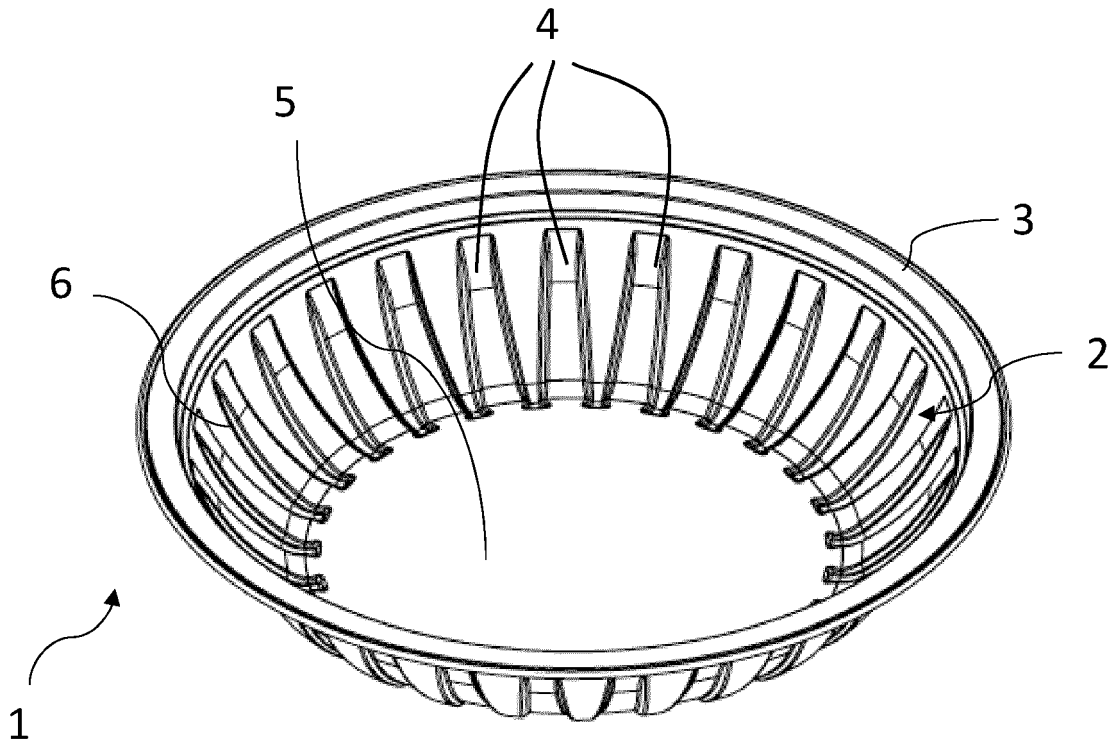

Fig. 9

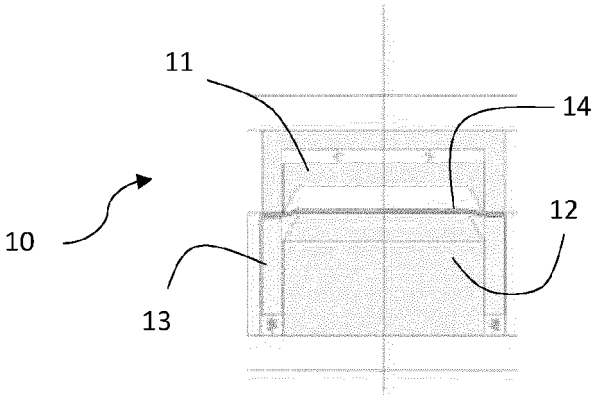

Fig. 10A

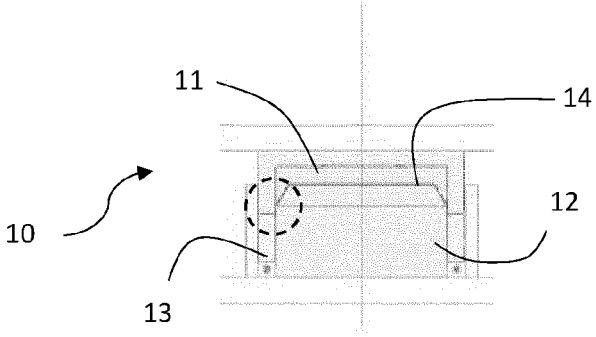

Fig. 10B

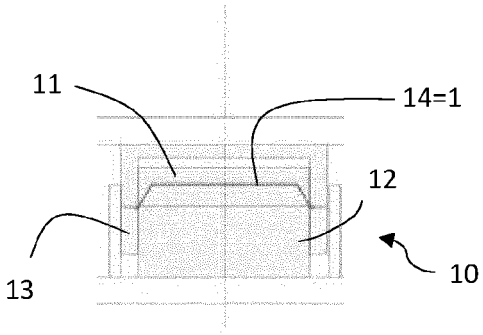

Fig. 10C

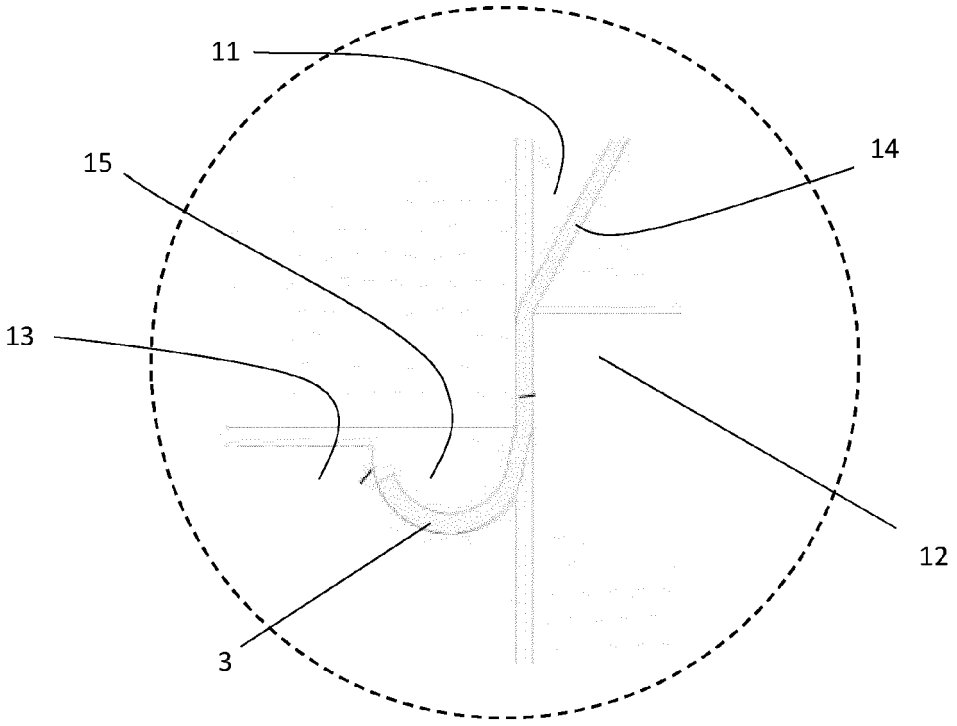

Fig. 11

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EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	26 February 2021	Vesterholm, Mika

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