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(54) **FOOD PACKAGING CONTAINER WITH STAR SHAPED CAVITIES ON THE BOTTOM**

(57) The invention relates to a food packaging container made of a plastic material and having a floor (2) with star shaped cavities (4). The container is formed by side walls (1) with a retention edge (3), while its floor (2) has star shaped cavities (4) formed by sides (5) creating acute dihedral angles. A result of its shape is the maximum coverage of the floor area, due to nesting, while at the same time both surface tension and capillary effect are enhanced, resulting to a maximum retention of quantities of liquids in the cavities (4). The container is manufactured from polyethylene terephthalate or other plastic material, and the container is ideal for use in fresh-foodstuff packaging.

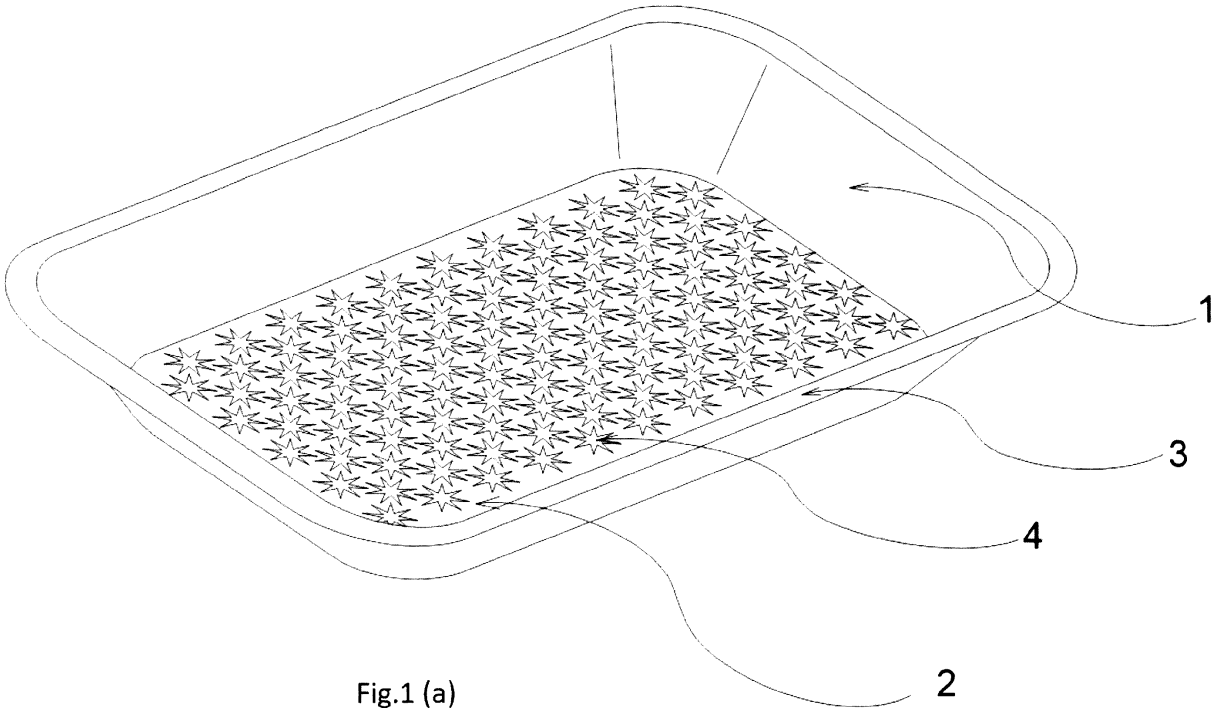

Fig.1 (a)

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to the field of containers for packaging, storage and transportation of foodstuffs, and in particular containers and packages for products requiring drainage or absorption or retaining of their liquids.

BACKGROUND OF THE INVENTION

[0002] The container with a floor having star shaped cavities has not been disclosed in the prior art.

[0003] Until now, the known foodstuff packages which are mainly used for packaging and selling fresh protein foodstuff such as meat, poultry, fisheries and similar products, usually consist of a container, in which the product is positioned and which is covered with a transparent, outer, plastic housing or film. There are several variations of this package, such as trays comprising of an absorbent pad, usually in the form of a sublayer, between the product and the tray, in order to retain liquids. These sublayers are typically produced from absorbent paper pulp, while externally they have a coating with flexible polyethylene or other plastic film, so that the pieces of paper pulp that come in contact with the foodstuff do not stick nor come in contact thereto. Such a product is presented for example on US4275811, aiming at the absorption of liquids, the extension of the lifetime of the foodstuff, the prevention of contamination when the product is kept within liquids for an extended period, and naturally for the aesthetically better appearance thereof to the consumer. Usually, these sublayers are perforated, so that the liquids of the meat pass through the covering film into the hydrophilic paper mass and not remain on the surface.

[0004] Other variations may include the formation of trays incorporating the adsorbent surface, such as the disk presented on US5709897, or are focused on the improvement of the adsorbent surfaces, as with the invention described on WO2004099009. Furthermore, there are disks as the one proposed on WO2007008874, which apart from the individual adsorbent sublayer they also have a grid, on which the foodstuff is placed in order that it is elevated in relation to the bottom of the disk and not come in direct contact with the liquids.

[0005] All the above inventions, as well as those available in the market, although providing solutions for the storage, packaging and transport of liquids, present disadvantages which do not make them practical and preferable choices. The most important disadvantage of the simple trays, with or without an adsorbent sublayer, is that the meat remains in contact with the sublayer or the base of the disk and thus with its liquids. Apart from the emerging hygiene issues, there is an issue of elegance, since the consumer obtains a product fully wetted with blood when unpacking said product.

[0006] A further disadvantage of the trays with the adsorbent sublayers is the increased cost, which inevitably is conveyed to the final consumer, since the consumer needs to obtain the specific laminated paper pulp sublayer. Given that the paper sublayer is frequently glued to the bottom of the container, further issues emerge, since additional expenses are required for the positioning and gluing, either for the materials, and for the necessary labor, even for the consumed energy.

[0007] Another disadvantage is that these trays are difficult to recycle, thus further issues regarding environmental friendliness arise, especially in the modern era. Given that the sublayer consists of different materials, such as paper pulp and polyethylene films bonded between them, and that the sublayer itself is bonded to the bottom of the container, these materials in total must be separated before being recycled. These bonds are technically difficult to separate and also particularly costly. As a result, the said separation is considered expensive, making the recycling of these materials practically impossible, and these materials are simply buried when discharged, or burned.

[0008] Another variation of a draining container is presented on US4533585A whereas there are molded cells in several shapes to retain the liquids within these cells by capillary action. This invention addresses, to some extent, the disadvantages of the previously mentioned inventions, but experiments and employment in practice of these cells on containers available in the market have shown negative result. The negative result includes specifically the spillage of the liquids out of the cells. The capillary action was insufficient to withhold the liquids and by a slight shake of the container with the foodstuff results in spilling the liquids all around the inner volume of the container. In practice, all containers in the market with molded cells as described on US4533585A carry additionally an absorbent paper pulp pad in between the foodstuff and the bottom of the container.

[0009] It is an object of the present invention to address advantageously the above disadvantages and deficiencies of the prior art, by proposing a container with a bottom having star shaped cavities.

[0010] A further object of the present invention is to provide the proposed container with a bottom having star shaped cavities, which is manufactured from the same material constituting the container, (polyethylene terephthalate), also known as PET. PET is a fully recyclable material, does not have toxic ingredients, it is generally safe for use in packaging of most kinds of foodstuffs. Also it has a high mechanical strength with a respective low weight, and it has a low permeability to oxygen, carbon dioxide, and water, keeping the packaged products in optimal condition for extended time period. Finally, it should not be ignored that due to the great transparency of the material it provides cleanness and an optimal visual contact of the consumer with the packaged foodstuffs.

[0011] A further object of the present invention is to provide a container with a bottom having star shaped

cavities, which retains the liquids within the cavities, by exhausting the capillary force phenomenon.

[0012] A further object of the invention, in order to make the container with a bottom having star shaped cavities of the present invention useful, is the formation of star shaped cavities with acute dihedral angles, which can enclose and withhold the liquids stronger than previous inventions, due to the surface tension of the liquids being increased at acute recesses.

[0013] A further object of the invention is to provide a container with a bottom having star shaped cavities, which exploits the shape of the cavities, occupying the maximum portion of the bottom area, due to the nesting of the angles of the stars, between them.

[0014] Another object of the invention is to provide a container with a bottom having star shaped cavities, which has a better liquid retention in the cavities than any other currently available container with or without a sublayer.

[0015] An advantage of the present invention is also the manufacturing of a container with a bottom having star shaped cavities, which presents a reduced production cost, due to the elimination of the paper sublayer, while in parallel the cost is further reduced by the elimination of the positioning and bonding of the sublayer to the bottom of the container.

[0016] Another advantage of the present invention it is easily recycled, since it is manufactured exclusively of only one material, the PET, which is fully and easily recyclable.

[0017] Another advantage of the present invention is that it can be produced of recycled PET, thus its production will consume recycled PET which is the most available plastic material, in quantity, in the market of recycled plastics, due to the high consumption of PET water and beverage bottles.

[0018] Another advantage is the appearance of the packaged product to the consumer, since the liquids are substantially or fully separated from the product, and are kept in the star shaped cavities, without the use of blood-wetted sublayers.

[0019] These and further objects, features and advantages of the invention will be fully apparent by the following detailed description.

BRIEF DESCRIPTION OF THE FIGURES

[0020] The invention will be understood to those skilled in the art with reference to the accompanying figures, in which it is shown in an exemplary, non-limiting way.

[0021] Figure 1(a) shows in perspective view an exemplary embodiment of the container with a bottom having star shaped cavities and Figure 1(b) shows in detail the bottom and the formed star shaped cavities.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

[0022] Referring now to the accompanying figures, exemplary embodiments of the container with a floor having star shaped cavities will be described, so that its features and advantages will be better understood.

[0023] The container with a floor having star shaped cavities of the invention, as shown in Fig. 1, consists of side walls (1) and a floor manufactured from polyethylene terephthalate. This specific material, known also as PET, is a fully recyclable material, suitable for use in foodstuff applications, since it practically does not present migration of the materials to the packaged common foodstuffs. It is completely transparent, with a high mechanical strength and easy to form, so that packages of various shapes and sizes can be obtained. It is apparent that other suitable plastic materials can be used for this application, including polypropylene, polystyrene, polylactic acid, also transparent or colored plastic materials, suitable for use in foodstuff applications. The container has a retaining edge (3), which extends over the length of the walls (1) and which functions as a flange on which the individual package lidding film is sealed.

[0024] The bottom (2) consists of star shaped cavities (4) over its length and width, which have an exemplary width of 2 mm, without being limited to that, for the retention of the liquids. The star shaped cavities (4) are derived from sides (5), Fig. 1 (b), which form acute dihedral angles. The formation of the star shaped cavities (4) contributes in the retention of the liquids due to the capillary force effect. As it is known, when liquids come in contact with solid body, attractive forces are developed, both between molecules of the liquid, and between molecules of the liquid and the solid. Since the value of both forces is different, the liquids are retained in the cavities in an efficient manner. The retention is further enhanced due to surface tension. Surface tension arises in liquids, mainly due to the fact that the molecules that are on the surface of a liquid tend to experience intermolecular forces only on the one side, resulting to a total force tending to move the molecules towards the interior of the liquid. A result of the above phenomenon is that the molecules on the surface have more energy than the molecules present within the cell and further away from the surface. Thus, there is a stored surface energy and given that each system tends to reduce its energy, the liquid tends to reduce its surface. Thus, forces are developed microscopically, which tend to cause constriction of the surface and the surface tension phenomenon emerges. The phenomenon is further enhanced due to the presence of acute recesses, as those in the star shaped cavities (4) of the invention. More specifically, following specific trials it has been found that star shaped cavities with at least 8 legs per star shaped cavity and maximum 18° of dihedral angle at the end of each triangular star-leg, provide greater retaining forces. To this end, tests done show that in common wholesale and consumer utilization and

transportation of the packaging, the liquids existing on the bottom are held safely within the said bottom star shaped cavities, and do not spill in general within the whole volume of the packaging. The star shaped cavities, with triangular star leg extensions contribute in the almost absolute covering of the floor (2) of the container, since in the space between two successive triangles another triangle may be further positioned reversely. The nesting of the triangles allows the utilization of the maximum portion of the floor area, and as a result a significant quantity of liquid is retained, which may amount to 0.3 gr/cm^2. This means that in a medium-sized foodstuff packaging container the total quantity of retained liquid may amount to 60 gr held within the star shaped cavities (4), a value far larger than that of a relevant paper pulp sublayer.

[0025] It should be noted that the description of the invention was made with reference to an exemplary non-limiting embodiment. Thus, any variation or modification as regards the shape, dimensions, morphology, construction and assembling materials and components employed, as long as not constituting a new inventive step and not contributing to the technical advance of the already known are considered as encompassed in the scope of the present invention.

Claims

1. Food packaging container with star shaped cavities on the bottom, manufactured from a plastic material and consisting of side walls (1) with a retention edge (3) and a floor (2), on the surface of which star shaped cavities (4) are arranged, **characterized by** the fact that the cavities (4) are formed from sides (5) creating dihedral acute angles with maximum 18° of dihedral end angles (6).

2. Container with star shaped cavities on the bottom, according to claim 1, **characterised in that** it is made of polyethylene terephthalate.

3. Container with star shaped cavities on the bottom, according to claim 1, **characterised in that** it is made of polypropylene.

4. Container with star shaped cavities on the bottom, according to claim 1, **characterised in that** it is made of polylactic acid.

5. Container with star shaped cavities on the bottom, according to claim 1, **characterised in that** it is made of polystyrene.

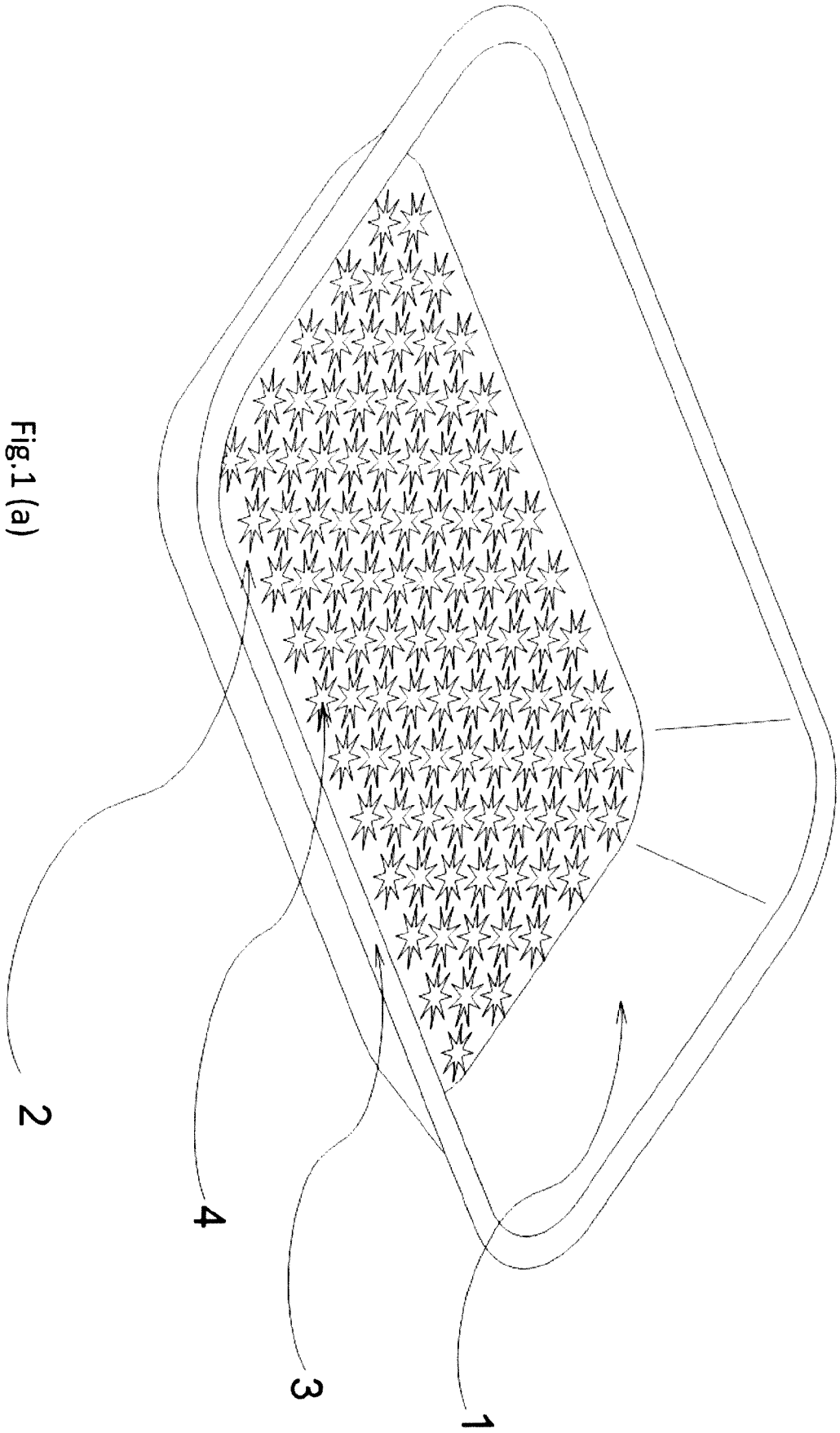

Fig.1 (a)

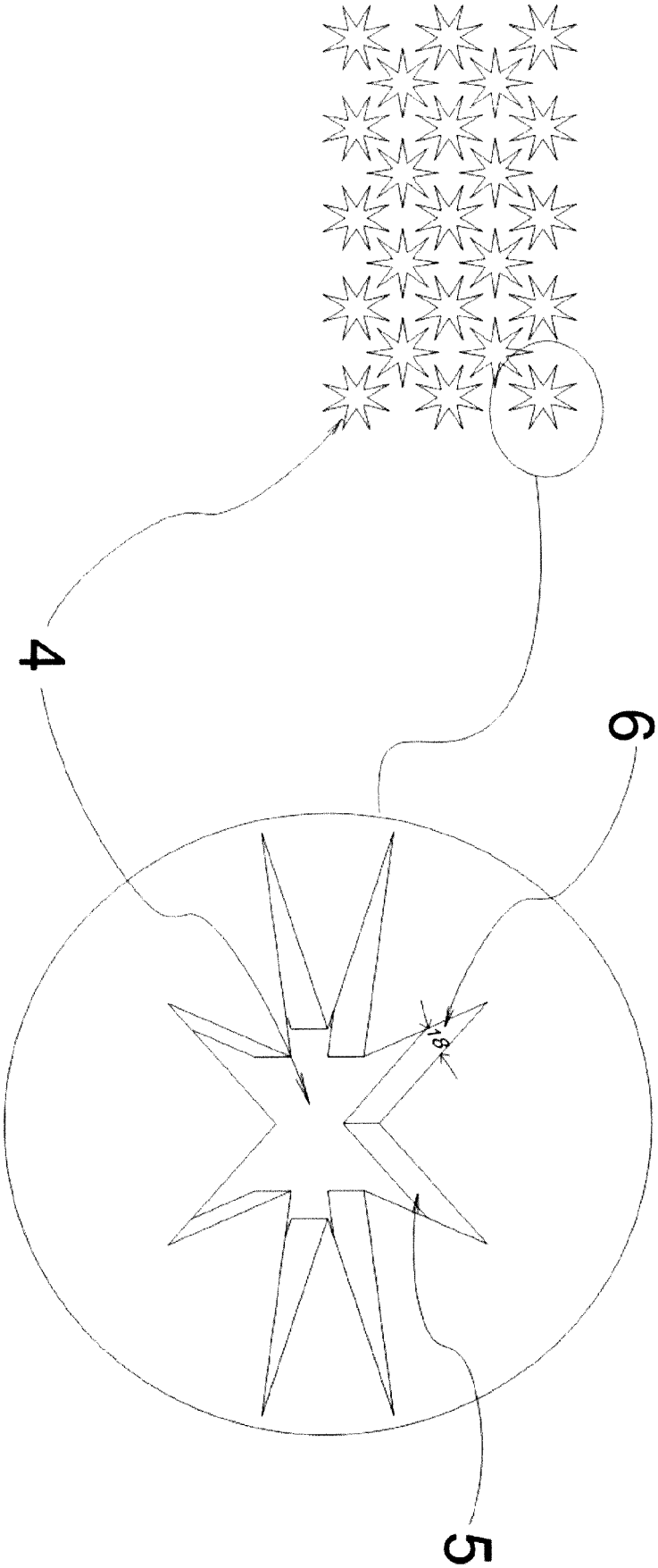

Fig.1 (b)

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EUROPEAN SEARCH REPORT

Application Number
EP 20 38 6035

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 3 243 763 A1 (PALAMIDIS ANONIMI ETAIREIA ANOKSEIDOTA PROIONTA PAL [GR]) 15 November 2017 (2017-11-15) * paragraph [0021] - paragraph [0022]; figure 1 *	1-5	INV. B65D1/34 B65D81/26
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A	* paragraph [0054] - paragraph [0156]; figure 15B *	3,5	
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A	* page 1, line 127 - page 2, line 99; figure 4 *	2-5	
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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	25 September 2020	Lämmel, Gunnar

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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