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(54) **A SINGLE-MATERIAL PET CAPSULE FOR PREPARING BEVERAGES**

(57) A single-material capsule (1) for the preparation of soluble or infusion beverages, according to the present invention, is characterized in that it is made of at least 90% polyethylene terephthalate, or polyethylene terephthalate combined with a material that is similar to polyethylene terephthalate and recyclable together with polyethylene terephthalate. Advantageously, with respect to known capsules composed of different plastics materials or paper or aluminum-coupled materials, which are very difficult to separate from each other at the time of collecting waste, the capsule that is the subject matter of the present invention is easily recyclable both for the final consumer and for those industries that decide to invest in green solutions. A capsule made of a plastics single-material that is not coupled to other elements is easier to recycle and may be converted into good quality material that may even be reused to create new packaging.

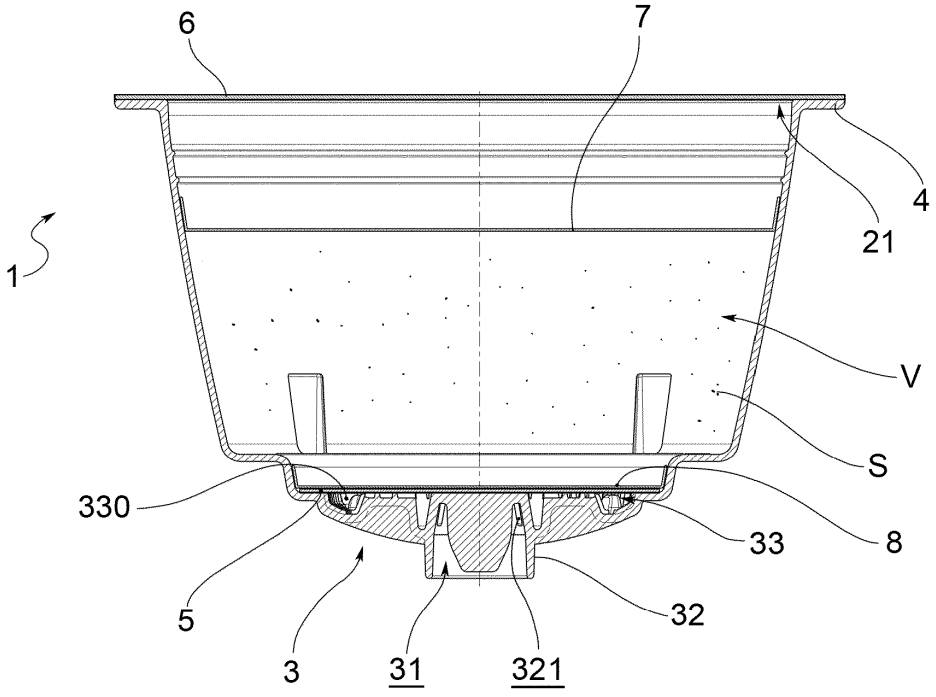

FIG.1a

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Description

[0001] The subject matter of the present invention is a capsule for the preparation of infusion or soluble beverages, in particular a single-material capsule made of polyethylene terephthalate (PET) by injection molding.

[0002] In the sector, capsules are known for the packaging of concentrated products (for example in the form of powder, granules or leaves) in predetermined, single-use doses, for the impromptu preparation of beverages (such as tea, coffee, herbal teas, milk, chocolate, etc.) by means of the introduction, into said capsule, of a pressurized fluid (mostly hot water). Said flow of hot water, delivered by an extraction machine, passes through the essence to be infused or dissolved contained inside the capsule, which results in the impromptu preparation of the beverage.

[0003] Different types of automatic or semi-automatic beverage preparation machines are known in the industry. The capsule that is the subject matter of the present invention is suitable for use in a machine that envisages piercing the capsule on one side only to allow for the injection of pressurized hot water into the cup. The capsule that is the subject matter of the present invention is in fact of the complex type, comprising a cup equipped with an opening for the beverage on one side and a closing cover on the opposite side, as well as the inner opening means thereof. Such opening means are, for example, activated by increasing the pressure within the cup so as to allow the inner sealing disc to detach and thereby allow the beverage to be dispensed from the outlet opening at the bottom of the cup. This type of capsule is rather complex from the construction point of view, especially with regard to the implementation of additional internal functional elements, such as, for example, means for supporting the sealing disc or antidrip means in the form of a labyrinth.

[0004] Typically, to make and dispense the beverage, the flow of hot water is injected inside the capsule with a pressure of about 20 atmospheres for a time ranging from 15 to 90 seconds. It is therefore important for the capsule manufacturer to select a material that provides the features necessary to resist mechanical stresses, in particular pressure, and thermal stresses to which the capsule is subjected during use.

[0005] Furthermore, with an increasing focus on environmental protection, the disposal of such capsules at the end of their use becomes particularly important. Those capsules that are currently commercially available are made using many types of materials and may be confusing with respect to the correct type of container to be used when throwing them away. This ambiguity leads consumers to forgo detailed differentiation and to put everything in one container.

[0006] Examples of capsules with components (cup, cover, sealing disc) made using materials that differ from one another are known from the documents US 11 040 823 B2, WO 2022/123478 A1 and US 2019/023482 A1.

[0007] The object of the present invention is to construct a capsule for the preparation of infusion or soluble beverages that solves the problems of the prior art while taking into account the needs of the industry.

[0008] This object is achieved by a capsule for preparing infusion or soluble beverages according to claim 1. The dependent claims describe preferred embodiments of the invention.

[0009] The features and advantages of a capsule for the preparation of infusion or soluble beverages according to the present invention will become apparent from the following description, given by way of nonlimiting example and according to the accompanying figures, wherein:

- Fig. 1a and 1b show a capsule for preparing infusion or soluble beverages according to the present invention that are self-opening by virtue of the effect of increasing the internal pressure; Fig. 1a shows the capsule closed before dispensing and Fig. 1b shows the capsule open after dispensing;
- Fig. 2a and 2b are an axonometric view from above and a top view, respectively, of a cup for a capsule for preparing infusion or soluble beverages according to the present invention;
- Fig. 3a and 3b are an axonometric view from below and a bottom view, respectively, of the cup of Fig. 2a;
- Fig. 4 shows a sectional view of the cup in Fig. 2a.

[0010] With reference to the figures, a capsule 1 for the preparation of infusion or soluble beverages is shown, indicated with the reference numeral 1.

[0011] The capsule 1 comprises a body or cup 2 suitable to define an inner volume V wherein at least one substance S to be infused or dissolved, typically in powder or granular form, is contained.

[0012] The cup 2 is provided, on one side, with a bottom 3, and, on the opposite side, with an inlet opening defined by an externally projecting edge 4.

[0013] The capsule 1 comprises a cover 6 fastened to the edge 4 to seal the cup 2 on top. The cover is for example a multi-layer cover, comprising at least one barrier layer. For example, the cover 6 comprises an outer barrier layer, made of metallized polyethylene terephthalate, joined by means of adhesive to an inner sealing layer, made of polyethylene terephthalate. In an alternative variant, the two outer and inner layers are co-extruded.

[0014] The capsule 1 comprises a sealing disc 5, arranged within the cup 2, which closes the bottom of the capsule 1. The sealing disc 5 is for example a multi-layer sealing disc, comprising at least one barrier layer. For example, the sealing disc 5 comprises an upper barrier layer, made of polyethylene terephthalate with a barrier coating, joined by means of an adhesive to a lower layer, made of lacquered polyethylene terephthalate. In an alternative variant, the upper

and lower layers are co-extruded.

[0015] In effect, between the cover 6 and the disc 5 the inner volume V is defined wherein the substance S to be infused or dissolved is contained.

[0016] At the bottom 3, the cup 2 is provided with an outlet opening 31 that is suitable for allowing the infused beverage to be dispensed. The opening 31 is the end opening of a duct called a nozzle. The nozzle comprises a substantially cylindrical outer portion 310 and an inner portion 313 that is provided with connection openings 314 between the inner volume V of the cup 2 and the outside of the capsule 1.

[0017] Preferably, the connection openings 314 are at most six and large in size and are uniformly distributed along the inner portion 313.

[0018] The expression "large" means that the width of the connecting openings 314 is greater than the thickness of the inner portion 313.

[0019] The presence of a maximum of six large connection openings 314 allows for an easy and rapid dispensing of the beverage, thus avoiding an excessive increase in pressure at the base during the beverage dispensing step. Advantageously, moreover, large openings make closing the mold easier, and less prone to burrs, especially given the molding difficulties of this family of materials.

[0020] The nozzle is closed at the top by a wall 311 which forms, internally to the cup 2, a fastening point for the sealing disc 5.

[0021] Inside the nozzle, protruding from the wall 311, there is a flow director 9 that serves to direct the flow of the beverage towards the opening 31 and then towards the cup of the consumer thereby greatly reducing uncontrolled leakages and splashes. Preferably, the flow director 9 is a pin with three tips 91, each triangular in shape and with rounded edges, as is clearly visible in Fig. 3b. Preferably, the profile of the flow director 9 has a minimum mold release of 3° to render it easier to mold the cup. This solution makes it possible to facilitate the extraction of the cup 2 from the mold, without risk of breakage or deformation of the injection molded part.

[0022] Preferably, the bottom 3 of the cup 2 is provided with outer reinforcement flaps 92, with a rounded profile. Preferably, the profile of the outer reinforcement flaps 92 has a minimum mold release of 5° to render it easier to mold the cup. Preferably, the outer reinforcement flaps 92 are at least ten, preferably twelve and are evenly distributed. Such solution allows the bottom 3 of the cup 2 to be adequately reinforced in order to withstand the high usage pressures of the capsule 1.

[0023] The cup 2 comprises therein a base 33 provided with a plurality of vertically protruding ridges on which surface the sealing disc 5, which closes the capsule 1, is in fact fastened by gluing or welding.

[0024] The base 33 comprises a perimeter edge 360 on which the sealing disc 5 is attached by gluing or welding.

[0025] The base 33 preferably comprises a labyrinth portion 320 with a drip-reducing function, arranged about the outlet opening 31. The labyrinth portion 320 is a single annular ridge provided, on the upper surface, with a plurality of grooves forming capillary channels. The labyrinth portion 320 is in fact provided with a plurality of capillary channels, i.e., with a reduced cross-section, preferably of less than 1 mm2, closed at the top by the disc 5, and adapted to hinder the passage of the beverage due to the capillary effect when the pressure inside the capsule 1 drops below a threshold value. When the capsule is disengaged from the dispensing machine, the labyrinth helps to reduce dripping of the beverage at the end of dispensing.

[0026] Preferably, the capillary channels have a Greek key pattern, i.e., they are formed by an uninterrupted series of segments alternately arranged in a substantially perpendicular manner, as is clearly visible in Fig. 2b. Advantageously, the length of each capillary channel is much greater than the length of the labyrinth portion 320 when measured along the radius of the base 33.

[0027] Preferably, as may be seen in Fig. 2b, the labyrinth portion 320 occupies a portion that is equal to or less than the portion occupied by a valley 330 (described below), measured along the radius of the base 33.

[0028] The base 33 is provided, between the peripheral edge 360 and the labyrinth portion 320, with a valley 330 that defines a space suitable to accommodate, without obstructing it, the deformation of the sealing disc 5, or at least a portion thereof, when the pressure exerted by the fluid within the capsule 1 reaches a certain opening threshold level. The valley 330 defines a recess in the base 33 having a greater depth than those grooves that define the capillary channels of the labyrinth portion 320. The walls defining the valley 330 are preferably inclined walls for facilitating the extraction of the cup 2 from the mold without risk of breakage or deformation of the injection molded part.

[0029] Preferably, inside the valley there are supports 317, in the form of ridges with rounded walls for the disc 5. For example, there are six supports 317 that are evenly distributed.

[0030] A beverage collection basin 318 is defined between the labyrinth portion 320 and the nozzle. The collection basin 318 defines a recess in the base 33 having a much greater depth than the grooves that define the capillary channels of the labyrinth portion 320. Preferably, the walls defining the collection basin 318 are inclined walls for facilitating the extraction of the cup 2 from the mold, without risk of breakage or deformation of the injection molded part.

[0031] The disc 5 is fastened to the base 33 in an at least partially releasable manner such that it at least partially detaches therefrom by virtue of the increase in pressure within the volume V wherein the food substance S is contained.

[0032] The disc 5 is instead permanently fastened to the labyrinth portion 320.

[0033] In use, the capsule 1 is inserted into a slot provided in the extraction machine, which pierces the cover 6 and introduces a pressurized fluid (mostly hot water) into the inner volume V in which the substance S is contained. The pressure exerted by the fluid inside the capsule 1 rises until it reaches a certain threshold level, or opening pressure (for example, between 4 and 8 bars), which pushes against the disc 5 until it at least partially deforms it and detaches it from the perimeter edge 360 on which it is fastened.

[0034] The cup 2 is made of polyethylene terephthalate (PET) by injection molding.

[0035] The cup 2 is made entirely of polyethylene terephthalate, or else of polyethylene terephthalate combined with a material that may be similar to polyethylene terephthalate and recycled together with polyethylene terephthalate.

[0036] In one embodiment, the cup 2 is provided with a gas and/or vapor barrier, obtained by means of additives added to the polyethylene terephthalate.

[0037] The cup 2 is preferably made at least partially of recycled polyethylene terephthalate r-PET.

[0038] Recycled polyethylene terephthalate r-PET (recycled PET) is a polymer obtained through processes of recovering and recycling common PET which involve the sorting, washing, shredding, and melting of plastics materials. Preferably, the material used is recycled polyethylene terephthalate (r-PET) obtained from post-consumer PET bottle flakes and/or PET bottle scraps from industrial production.

[0039] The cup 2 is therefore made entirely or predominantly of polyethylene terephthalate PET wherein a part thereof is recycled r-PET. The percentage of recycled polyethylene terephthalate r-PET is preferably between 20% and 100% of the total polyethylene terephthalate PET.

[0040] The polyethylene terephthalate, also when recycled, makes it possible to obtain a cup 2 with high thermal and mechanical resistance that may be penetrated by a flow of liquid at high temperature (between 90° and 95°C) and pressure (between 10 and 12 bar) for the entire dispensing time (about 1 minute) without softening and deforming (for example, at the bottom and at the nozzle) and without breaking (for example, at the side walls).

[0041] In one exemplary embodiment, the cup 2 is made of a plastics material consisting of polyethylene terephthalate PET (also in a recycled r-PET version) and a copolyester that is comparable to PET and recyclable together with PET.

[0042] For example, the cup 2 is made of between 20% and 50% polyethylene terephthalate PET, wherein a part thereof may be recycled (r-PET), and for the remaining part made from a copolyester that is similar to PET and recyclable together with PET.

[0043] A copolyester that is comparable to polyethylene terephthalate and recyclable together with polyethylene terephthalate is, for example, glycol-modified polyethylene terephthalate PETG. PETG is obtained by adding modified glycol to the polyethylene terephthalate composition during polymerization.

[0044] In one example, the cup 2 is made of a plastics material comprising 48% PET (wherein 25% thereof is r-PET) and 52% a copolyester that is similar to PET and recyclable together with PET.

[0045] In one example, the cup 2 is made of a plastics material comprising 48% PET (wherein 25% thereof is r-PET) and 52% PETG. In this exemplary embodiment the material of the cup 2 has the following properties:

- a density of between 1.25 g/cm3 and 1.35 g/cm3 (ISO 1183-1 standard);
- a melting temperature of between 230°C and 247°C;
- a melt-mass flow rate (MFR) of between 25 and 35 g/10' (ISO 1133 standard);
- a melt volume-flow rate (MVR) of between 20 and 30 cm3/10' (ISO 1133 standard);
- a Vicat temperature of between 85°C and 95°C (ISO 306 standard).

[0046] Preferably, the cup 2 has a wall thickness of between 0.4 mm and 0.8 mm, preferably of between 0.5 mm and 0.6 mm.

[0047] It should be noted that the cup 2, made entirely or predominantly of polyethylene terephthalate, does not require the addition of additives or barrier layers insofar as the base material is already sufficient to ensure an optimal gas and/or vapor barrier.

[0048] The capsule 1 is made of polyethylene terephthalate PET, i.e., all of the components that comprise the capsule are made, entirely or predominantly, of polyethylene terephthalate PET.

[0049] The term "single-material" means that the capsule is entirely made using a certain base material, or may also contain a material that may be similar to the base material and recyclable together with the base material, or may contain negligible traces of other materials in such a way that it may be recycled in the container of the base material.

[0050] The capsule 1 is preferably free of metallic elements, such as, for example, aluminum, or paper, and is therefore easily differentiated by the consumer.

[0051] The cup 2, the cover 6, the containment wall 7 where present, the filtering wall 8 where present, and the sealing disc 5 are therefore made, entirely or predominantly, of polyethylene terephthalate PET.

[0052] In other words, the cover 6 and the sealing disc 5 are made of the same material as the cup 2 on which they are welded. In contrast, in prior art solutions, the cover and disc are made of materials that are thermally compatible

with the constituent material of the cup, but not the same constituent material as the cup. The fact of selecting a material that is thermally compatible with the constituent material of the cup allows good welding between the cover/disc and the cup to be obtained, but does not allow for the continuity of the material of the joined parts to be obtained. That is why, in the solutions of the prior art, there are risks of delamination due to high pressures such as those to which an infusion coffee capsule is subjected, i.e., greater than 10 bar, even around 15 bar. In contrast, as seen in accordance with the present invention, the fact of selecting the same constituent material of the cup for the cover and for the disc allows for the continuity of the material of the joined parts to be obtained, i.e., a weld that allows for the physical/chemical union of the two elements, and therefore a permanent connection.

[0053] Below are two embodiments of the capsule 1 according to the present invention.

CAPSULE FOR INFUSION BEVERAGES

COMPONENT	COMPOSITION	WEIGHT (g)	WEIGHT (%)
Cover (multilayer film: outer layer, adhesive, inner layer)	Outer layer: PET with metallization in order to have a high Barrier	0.21	3.9
	Inner layer: PET welding		
Sealing disc (multilayer film: outer layer, adhesive, inner layer)	Outer layer: PET with an added coating in order to have a Barrier	0.05	0.9
	Inner layer: PET welding		
Containment wall (Microperforated film, monolayer)	PET	0.04	0.7
Filtering wall (Microperforated film, monolayer)	PET	0.06	1.1
Cup	rPET + PETG	5.05	93.3
TOTAL		5.41	100

CAPSULE FOR SOLUBLE BEVERAGES

COMPONENT	COMPOSITION	WEIGHT (g)	WEIGHT (%)
Cover (multilayer film: outer layer, adhesive, inner layer)	Outer layer: PET with metallization in order to have a high Barrier	0.21	4.0
	Inner layer: PET welding		
Sealing disc (multilayer film: outer layer, adhesive, inner layer)	Outer layer: PET with an added coating in order to have a Barrier	0.05	0.9
	Inner layer: PET welding		
Cup	rPET + PETG	5.05	95.1
TOTAL		5.31	100

[0054] Advantageously, therefore, the capsule 1 is of a single-material, i.e., it is made of at least 90%, preferably at least 95%, polyethylene terephthalate or polyethylene terephthalate combined with a material that is similar to polyethylene terephthalate and recyclable together with polyethylene terephthalate.

[0055] A capsule according to the present invention may be used for packaging concentrated products (in the form of powder or granules or leaves) in predetermined, single-use doses, for the impromptu preparation of beverages such as leaf or soluble tea, ground or instant coffee, herbal teas, milk, chocolate, or other dehydrated and soluble products.

[0056] In the embodiment variant for infusion beverages, shown for example in Fig. 1a, wherein the substance S is coffee powder which remains as a layer of coffee at the end of dispensing, the capsule 1 comprises, below the cover 6 and above the substance S, fastened internally to the cup 2, a containment wall 7, provided with holes adapted to allow for the passage of the pressurized liquid and to retain the substance S. The containment wall 7 is generally a microperforated film made of polyethylene terephthalate or a nonwoven fabric (NWF) based on polyethylene terephthalate.

[0057] In the embodiment variant for infusion beverages, wherein the substance S is ground coffee which remains as a layer of coffee at the end of dispensing, the capsule 1 comprises, below the substance S and above the sealing disc 5, fastened internally to the cup 2, a filtering wall 8, provided with holes adapted to allow the passage of the beverage and to hold the substance S. The filtering wall 8 is preferably a micro-perforated film made of polyethylene terephthalate or a non-woven fabric (NWF) based on polyethylene terephthalate.

[0058] Advantageously, in the embodiment variant for soluble beverages, shown for example in Fig. 1b, wherein the substance S is food powder that entirely dissolves during the preparation of the beverage without leaving any residues or layers inside the cup 2, the capsule 1, insofar as it is entirely recyclable, may be thrown directly into a plastics container.

[0059] Innovatively, a capsule for the preparation of infusion or soluble beverages according to the present invention is of a single-material, made of polyethylene terephthalate, and is therefore easily recyclable by the consumer and has a low environmental impact, while ensuring high mechanical strength and high temperatures.

[0060] Advantageously, in one embodiment, the capsule for preparing infusion or soluble beverages according to the present invention is entirely of a single-material made of polyethylene terephthalate that is at least partially recycled.

[0061] The capsule, according to the present invention, is advantageously made entirely of the same material. In particular, the cover and the sealing disc are made of the same material as the cup on which they are welded, thereby ensuring continuity of the material within the joined parts and creating a permanent connection which is not subject to risks of delamination.

[0062] With respect to known capsules composed of different plastics materials or paper or aluminum bonded materials that are very difficult to separate from each other at the time of collecting waste, the capsule that is the subject matter of the present invention is easily recyclable both for the final consumer and for those industries that decide to invest in green solutions. A capsule made of a plastics single-material that is not coupled to other elements is easier to recycle and may be converted into good quality material that may even be reused to create new packaging.

[0063] It is clear that those skilled in the art may make changes to the cup and to the capsule for preparing infusion or soluble beverages described above, all falling within the scope of protection as defined by the following claims.

Claims

1. A single-material capsule (1) for preparing soluble beverages, consisting of:

- a cup (2) suitable for defining an inner volume (V), wherein a soluble substance (S) is contained, said cup (2) being provided with:

  -- an inlet opening defined by an outwardly protruding edge (4);
  -- a bottom (3) with a nozzle defining an outlet opening (31) for dispensing the beverage, said nozzle comprising an outer portion (310) and an inner portion (313), said inner portion (313) being provided with connection openings (314) between the inner volume (V) and the outlet opening (31);
  -- an inner base (33) provided with a plurality of vertically protruding ridges, one of these ridges being a peripheral edge (360);

- a cover (6) fastened to the edge (4) for sealing the cup (2) at the top;
- a sealing disc (5) forming the bottom closure of the capsule (1), engaged inside the cup (2) at least at the peripheral edge (360);

characterized in that at least 90% thereof is made of: polyethylene terephthalate or polyethylene terephthalate combined with a material similar to polyethylene terephthalate and recyclable together with polyethylene terephthalate, and **in that** all of the components (2, 5, 6) that comprise the capsule (1) are entirely or predominantly, made of polyethylene terephthalate.

2. A single-material capsule (1) for preparing infusion beverages, consisting of:

- a cup (2) suitable for defining an inner volume (V) wherein an infusion substance (S) is contained, said cup (2) being provided with:

  -- an inlet opening defined by an outwardly protruding edge (4);
  -- a bottom (3) with a nozzle defining an outlet opening (31) for dispensing the beverage, said nozzle comprising an outer portion (310) and an inner portion (313), said inner portion (313) being provided with connection openings (314) between the inner volume (V) and the outlet opening (31);

-- an inner base (33) provided with a plurality of vertically protruding ridges, one of these ridges being a peripheral edge (360);

- a cover (6) fastened to the edge (4) for sealing the cup (2) at the top;
- a perforated containment wall (7), arranged below the cover (6) and above the substance (S);
- a sealing disc (5) forming the bottom closure of the capsule (1), fastened inside the cup (2) at least at the peripheral edge (360);
- a filtering wall (8) arranged below the substance (S) and above the sealing disc (5);

characterized in that at least 90% thereof is made of:
polyethylene terephthalate or polyethylene terephthalate combined with a material similar to polyethylene terephthalate and recyclable together with polyethylene terephthalate, and **in that** all of the components (2, 5, 6) that comprise the capsule (1) are entirely or predominantly made of polyethylene terephthalate.

3. Capsule (1) according to claim 1 or 2, at least 95% thereof being made of: polyethylene terephthalate or polyethylene terephthalate combined with a material similar to polyethylene terephthalate and recyclable with polyethylene terephthalate.

4. Capsule (1) according to any one of the preceding claims, wherein the cup (2) is made of: polyethylene terephthalate (PET), or polyethylene terephthalate (PET) combined with glycol-modified polyethylene terephthalate (PETG).

5. Capsule (1) according to any one of the preceding claims, wherein the cup (2) is made of: between 20% and 50% polyethylene terephthalate (PET), the rest being made of glycol-modified polyethylene terephthalate (PETG).

6. Capsule (1) according to any one of the preceding claims, wherein the cup (2) is at least partially made of recycled polyethylene terephthalate (r-PET), and wherein the percentage of recycled polyethylene terephthalate is between 20% and 100% of the total polyethylene terephthalate.

7. Capsule (1) according to any one of the preceding claims, wherein the cover (6) comprises an outer barrier layer of metallized polyethylene terephthalate, joined to an inner welding layer of polyethylene terephthalate.

8. Capsule (1) according to any one of the preceding claims, wherein the sealing disc (5) comprises an upper barrier layer of polyethylene terephthalate with a barrier coating, joined to a lower layer of lacquered polyethylene terephthalate.

9. Capsule (1) according to any one of the preceding claims, wherein the disc (5) is fastened to the peripheral edge (360) in an at least partially yielding manner, so as to become detached due an increase in pressure inside the volume (V).

10. Capsule (1) according to any one of the preceding claims, wherein the connection openings (314) are at most six.

11. Capsule (1) according to any one of the preceding claims, wherein, inside the nozzle there is a pin-shaped flow director (9) with three points (91), each one being triangular with rounded edges.

12. Capsule (1) according to any one of the preceding claims, wherein the bottom (3) of the cup (2) is provided with at least ten, preferably twelve, outer reinforcement flaps (92) with a rounded profile.

13. Capsule (1) according to any one of the preceding claims, wherein the base (33) comprises a labyrinth portion (320) in the shape of an annular ridge provided with a plurality of grooves on an upper surface, and wherein the sealing disc (5) is engaged with said upper surface to close said grooves at the top to form capillary channels.

14. Capsule (1) according to the preceding claim, wherein, between the peripheral edge (360) and the labyrinth portion (320), the base (33) is provided with a valley (330) being deeper than the grooves of the labyrinth portion (320).

15. Capsule (1) according to the preceding claim, wherein the labyrinth portion (320) occupies a portion of the base (33) equal to or smaller than a portion occupied by the valley (330) when measured radially.

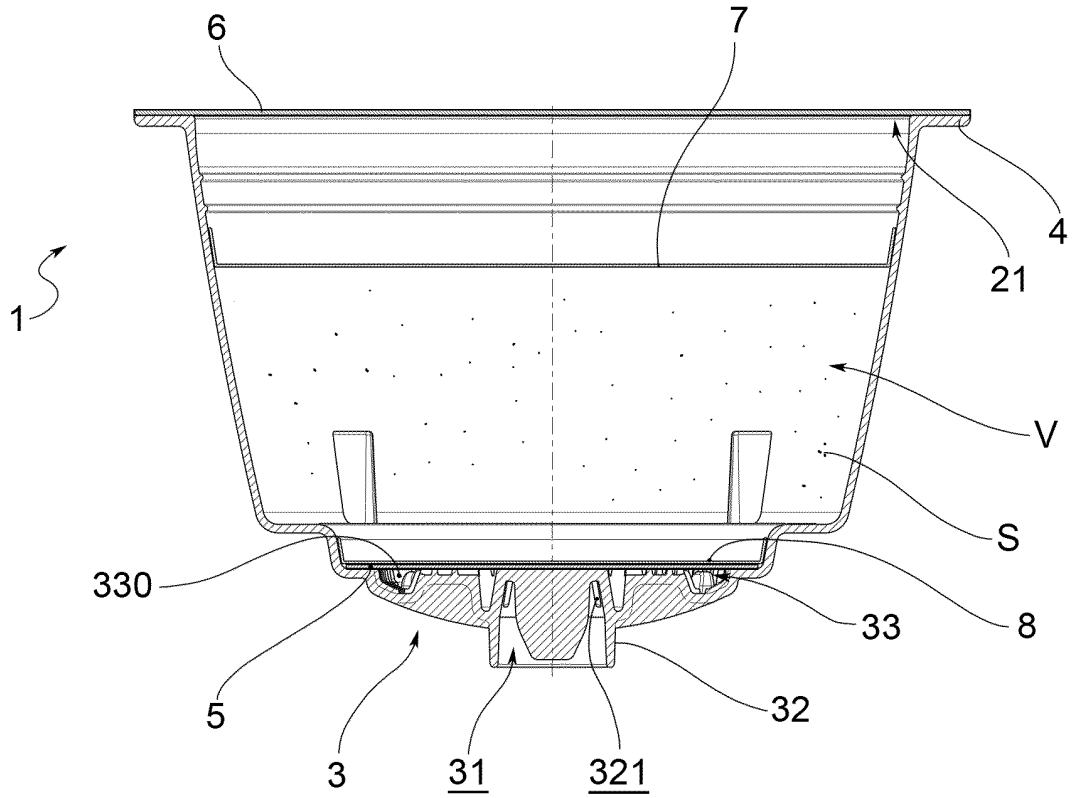

FIG.1a

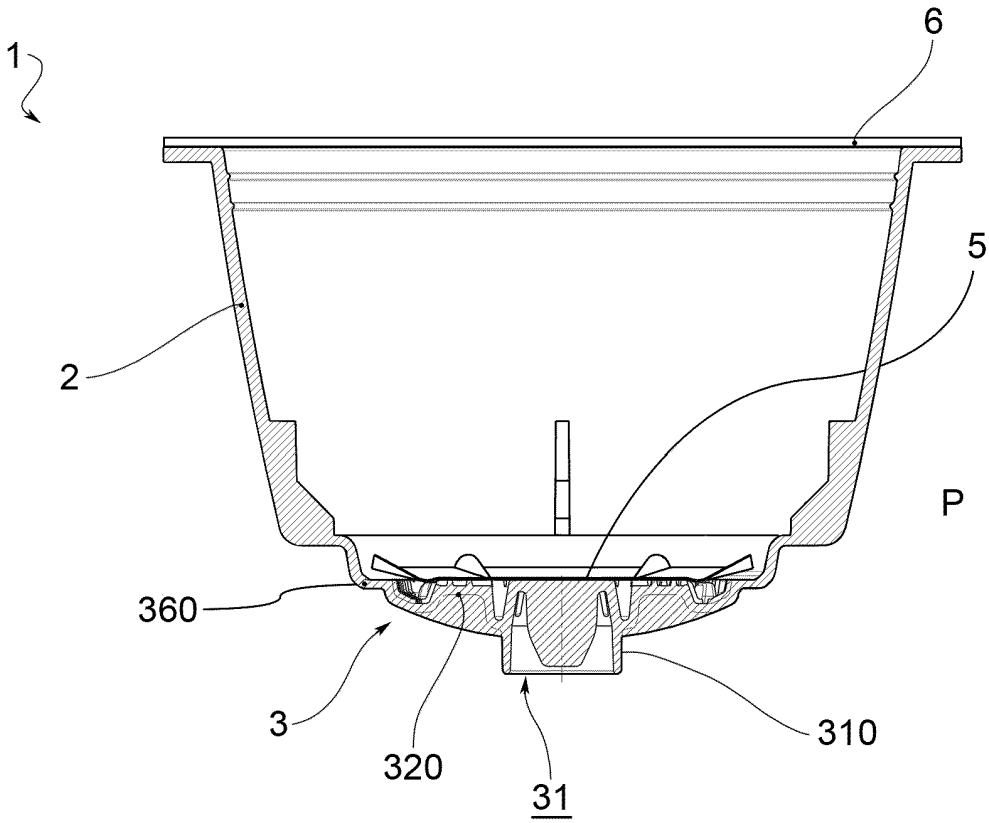

FIG.1b

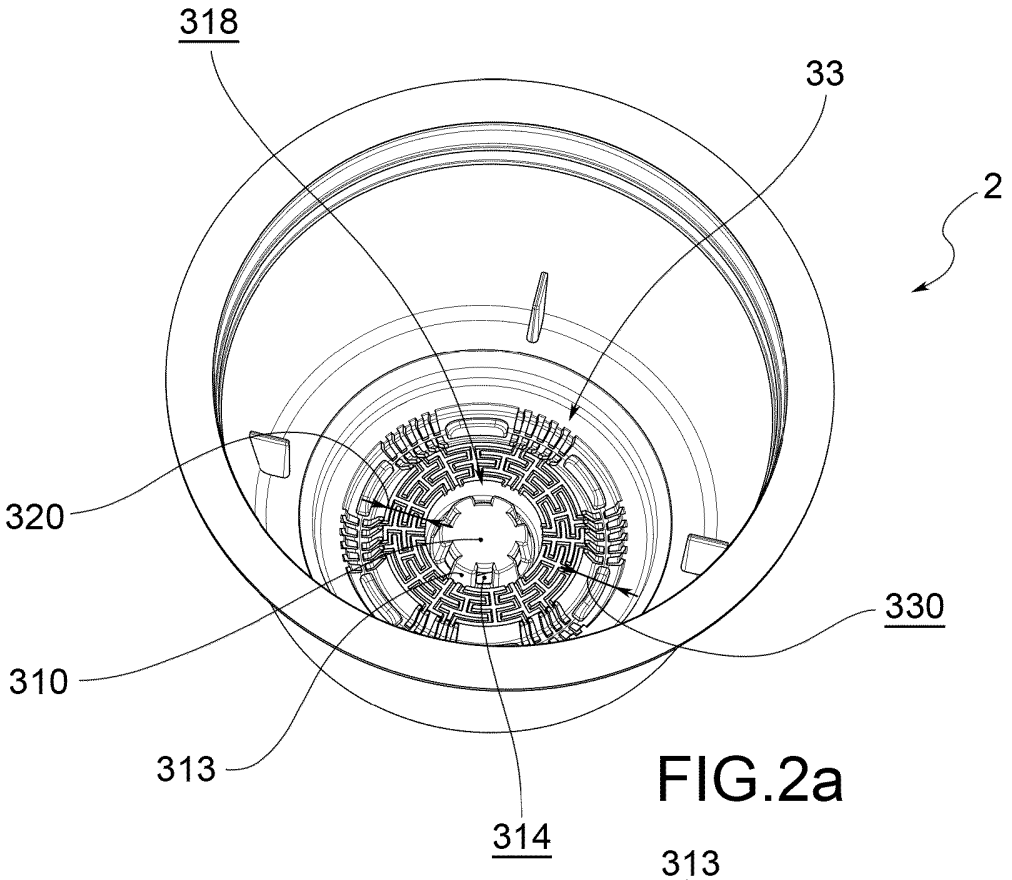

FIG.2a

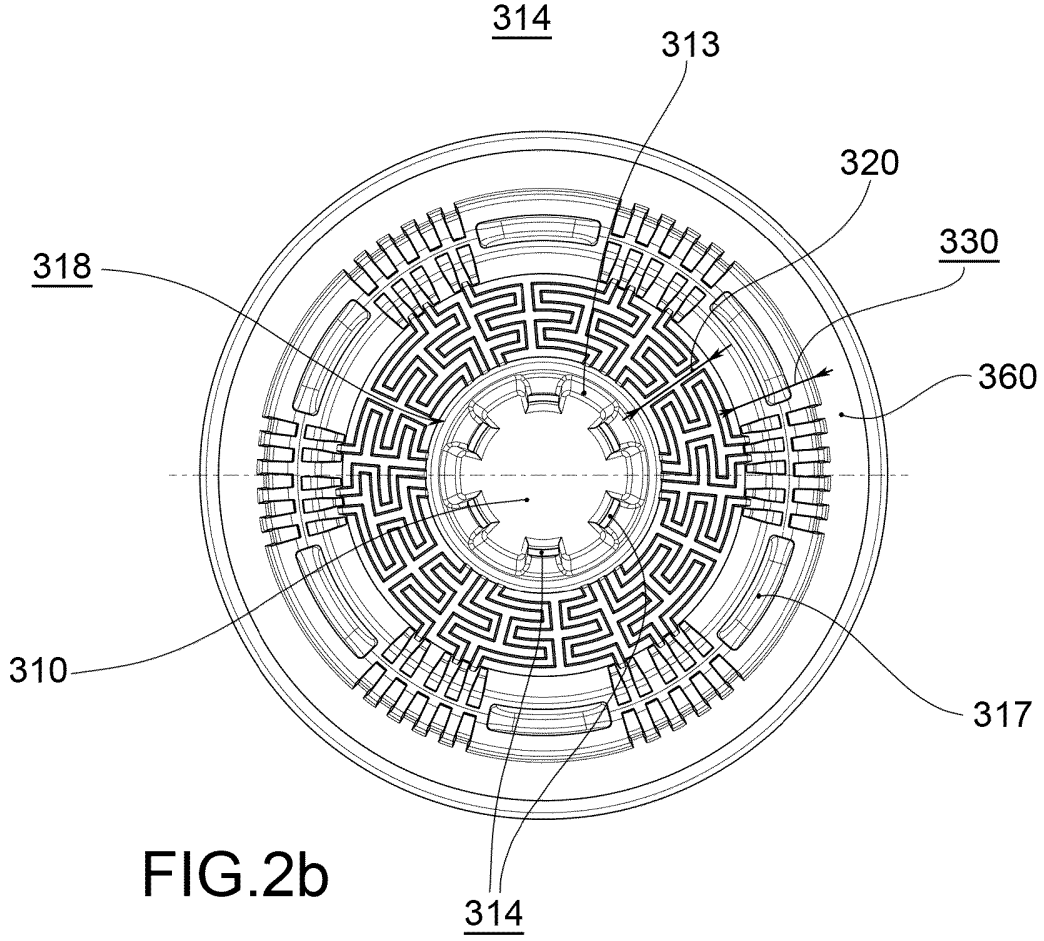

FIG.2b

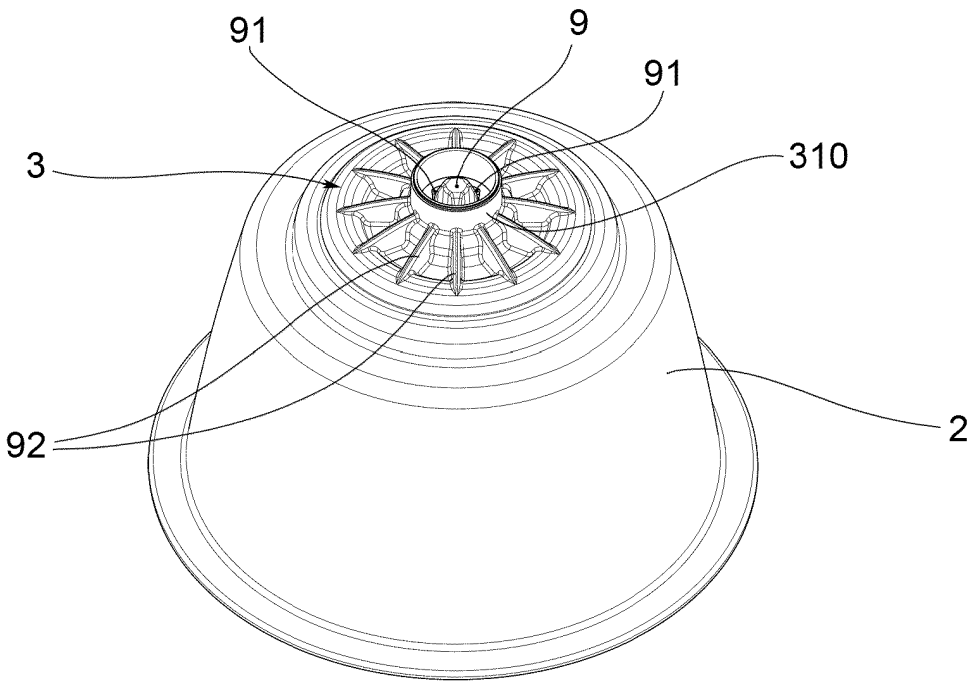

FIG.3a

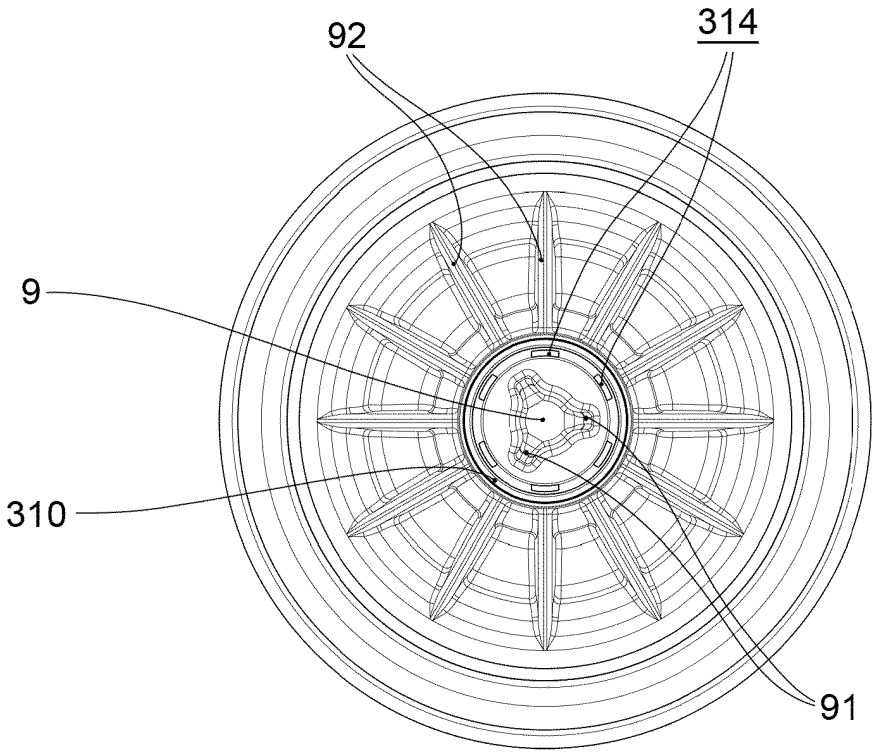

FIG.3b

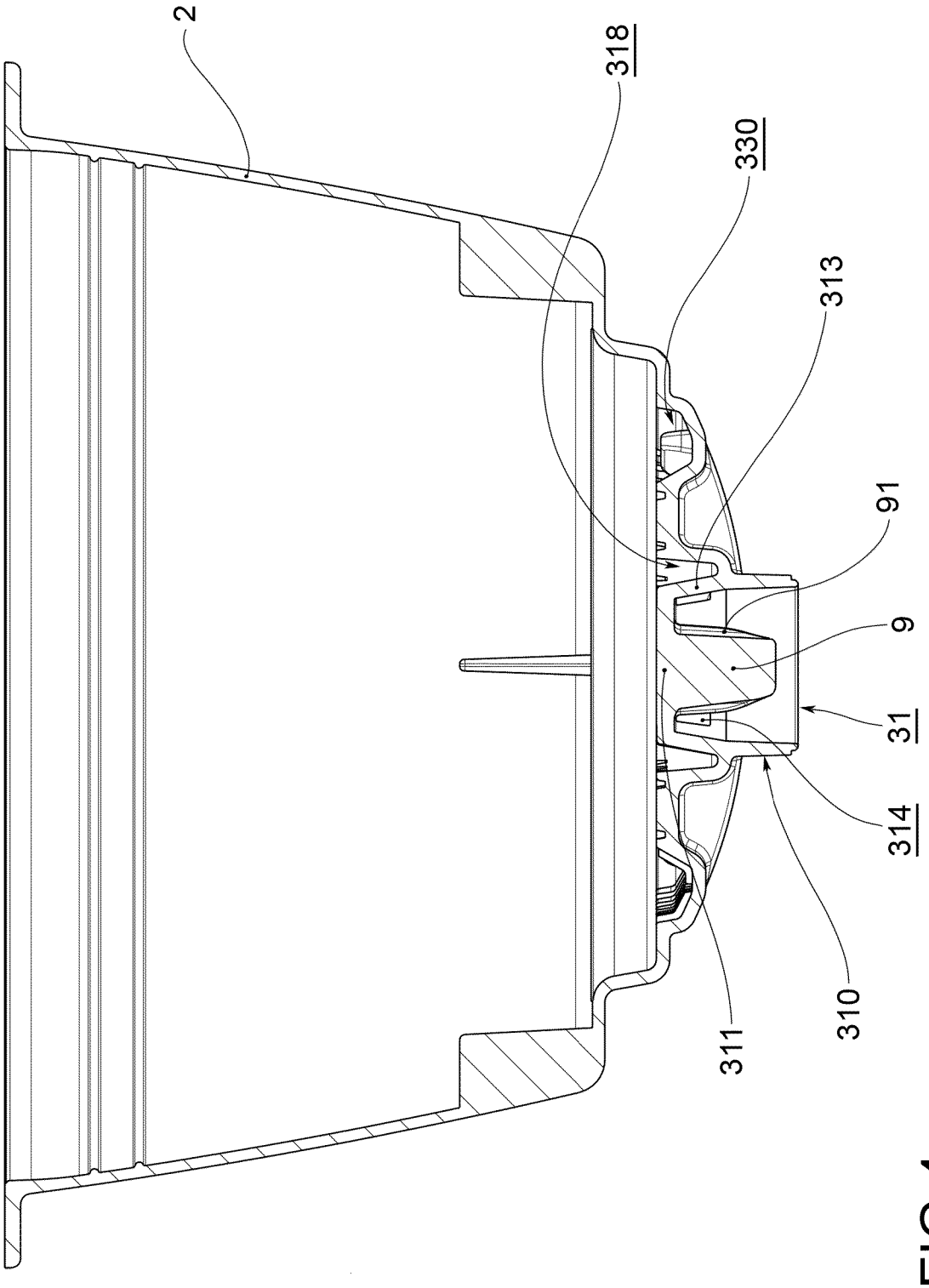

FIG.4

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EUROPEAN SEARCH REPORT

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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	US 11 040 823 B2 (BISIO PROGETTI SPA [IT]) 22 June 2021 (2021-06-22)	1-11,13	INV. B65D85/52
Y	* column 7, line 55 - column 8, line 4; figures 1-5 * * column 5, line 35 - line 37 *	1-15	B65D85/804
Y	US 2019/023482 A1 (BISIO LUIGI [IT]) 24 January 2019 (2019-01-24) * figures 1-15 *	1-15	
Y	WO 2022/123478 A1 (BISIO PROGETTI SPA [IT]) 16 June 2022 (2022-06-16) * figures 1-4 *	1-7,9-15	

TECHNICAL FIELDS SEARCHED (IPC)

B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	17 September 2024	Sacepe, Nicolas

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17-09-2024

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 11040823 B2	22-06-2021	AU 2016225132 A1	15-03-2018
		BR 112017018271 A2	10-04-2018
		CN 107406189 A	28-11-2017
		EP 3261958 A1	03-01-2018
		ES 2714869 T3	30-05-2019
		KR 20180008396 A	24-01-2018
		PL 3261958 T3	28-06-2019
		RU 2017129830 A	25-02-2019
		US 2018044105 A1	15-02-2018
		WO 2016135581 A1	01-09-2016
		ZA 201706300 B	27-02-2019
US 2019023482 A1	24-01-2019	AU 2016272928 A1	06-09-2018
		BR 112018016435 A2	26-12-2018
		CN 108698753 A	23-10-2018
		EP 3423380 A2	09-01-2019
		ES 2790672 T3	28-10-2020
		KR 20180120676 A	06-11-2018
		RU 2698127 C1	22-08-2019
		US 2019023482 A1	24-01-2019
		WO 2016193961 A2	08-12-2016
WO 2022123478 A1	16-06-2022	CN 116547219 A	04-08-2023
		EP 4259542 A1	18-10-2023
		US 2024017912 A1	18-01-2024
		WO 2022123478 A1	16-06-2022

EPO FORM P0459

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Patent documents cited in the description

- US 11040823 B2 **[0006]**
- WO 2022123478 A1 **[0006]**
- US 2019023482 A1 **[0006]**