

(19)



(11)

EP 4 541 728 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
23.04.2025 Bulletin 2025/17

(51) International Patent Classification (IPC):
B65D 85/804^(2006.01)

(21) Application number: **23203951.1**

(52) Cooperative Patent Classification (CPC):
B65D 85/8043

(22) Date of filing: **17.10.2023**

(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 ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

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(54) BEVERAGE PREPARATION POD AND BEVERAGE PREPARATION CAPSULE

(57) A beverage pod (10, 11) configured for preparing a beverage upon injection of liquid into the pod (10, 11) is provided. The pod (10, 11) comprises: a pouch (12) configured for holding beverage preparation ingredients therein; a ring-shaped support (14) extending at least partially around a top portion of the pouch (12), wherein the ring-shaped support (14) provides a top opening (16) of the pod (10, 11); and a lid (18) connected to the support

(14) and/or the pouch (12) for closing the top opening (16), wherein the pod (10, 11) is configured for receiving liquid through the pouch (12) such that the liquid is mixed with the beverage preparation ingredients inside the pouch for forming a beverage, and wherein the lid (18) is configured for dispensing the beverage from an inside of the pouch (12) to an outside of the pod (10, 11).

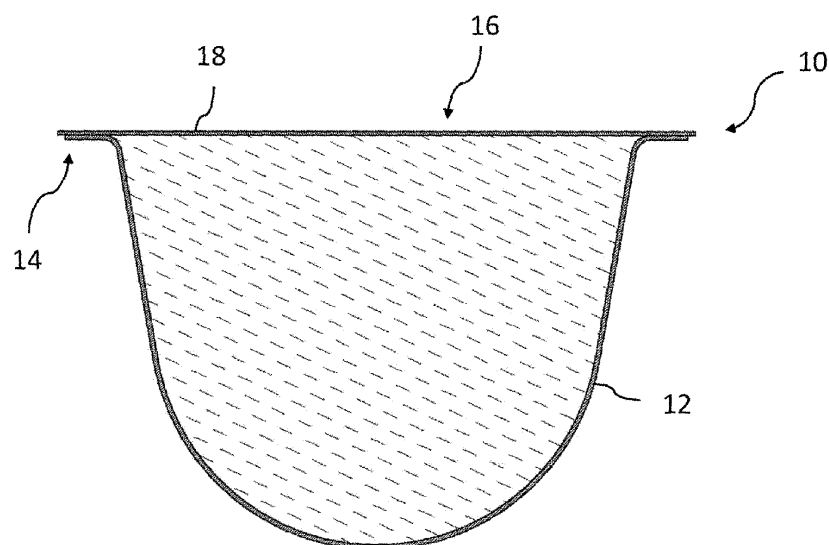


FIG. 1

Description

Field of the invention

[0001] The present invention relates to a beverage pod and a beverage capsule for preparing a beverage in a beverage preparation machine. The present invention further relates to a system of an extraction unit of a beverage preparation machine in combination with such a pod or capsule. The present invention further relates to a use of such a pod or capsule in a beverage preparation machine.

Background of the invention

[0002] Pods or capsules for beverage preparation machines are well known in the art. Pods or capsules are typically used for on demand dispensing of beverages like coffee, tea, hot chocolate or the like and enjoy popularity due to their fresh tasting, variability of flavours and the convenience of the beverage preparation.

[0003] Beverage preparation depends on a high number of parameters and effects, some of which can be attributed to the design of the pod or capsule.

[0004] In an eco-responsible approach, some existing capsules or pods are made of compostable materials. For instance, documents WO 2016/139554 A1, WO 2020/114995 A1 disclose a compostable coffee pod. However, existing compostable capsules or pods may not be ideal for use in coffee machines currently on the market, which may have been originally designed for non-compostable pods or capsules.

[0005] It is thus an object of the present invention to provide a pod and/or capsule configuration particularly for use in a beverage preparation machine that shall ensure high quality and beverage consistency during preparation of the beverage. It is a further object of the present invention to propose a pod and/or capsule configuration wherein all non-reusable parts of the pod or capsule are compostable. It is a further object of the present invention to propose a pod and/or capsule configuration that is fully compatible with widespread machines designed for non-compostable capsules and provide for a proper extraction in these machines.

Solution to the problem

[0006] These and other objects, which become apparent upon reading the description, are solved by the subject-matter of the independent claims. Further embodiments and developments are provided in the dependent claims.

[0007] According to a first aspect of the present invention, a beverage pod is provided. The beverage pod is configured for use in a beverage preparation machine. The pod is configured for preparing a beverage upon injection of liquid into the pod. The pod comprises a pouch configured for holding beverage preparation in-

gredients inside the pouch. The pod further comprises a ring-shaped support extending at least partially around a top portion of the pouch, the ring-shaped support providing a top opening of the pod and functioning as a support of the pod. The pod further comprises a lid connected to the support and/or the pouch for closing the top opening, wherein the pod is configured for receiving liquid through the pouch such that the liquid is mixed with beverage preparation ingredients inside the pouch for forming a beverage, and the lid is configured for dispensing the beverage from an inside of the pouch to an outside of the pod. The lid as used herein may also be referred to as an extraction membrane or more generally as a delivery wall of the pod.

[0008] The pod according to the present invention is based at least partially on the idea that a liquid may be injected into a pouch of the pod and a beverage may be dispensed through a lid of the pod. Such a pod is an ideal candidate for use in a beverage preparation machine, in particular for use in a capsule beverage preparation machine as known, for example, from EP 0 512 470 A1 or EP 2 919 628 A1 which are incorporated by reference herein in their entirety. In such a machine, liquid is typically injected through a bottom of a capsule and beverage is dispensed through a lid of the capsule. The pod according to the present invention is preferably configured such that it can be used as an alternative to capsules in such a machine.

[0009] Preferably, the lid is configured to be pierced by a piercing plate, such as a pyramid plate. The piercing plate, such as a pyramid plate, is configured for creating a plurality of openings in the lid. Pyramid plates include a plurality of reliefs and recessed (pyramid-like) elements. These elements are configured to tear open the lid for creating a plurality of openings in the lid under the effect of rising pressure of the liquid injected into the pod or capsule. Through these openings the beverage is dispensed. Pyramid plates are described, for example, in the aforementioned EP 0 512 470 A1.

[0010] Preferably, the lid is configured as an oxygen and/or moisture barrier, preferably as a bidirectional oxygen and/or moisture barrier, for preventing or at least hindering oxygen and/or moisture from permeating through the lid. In other words, in this preferred embodiment, the lid is non-permeable for gas/vapor. More preferably, the lid is made from a compostable material. Compostable barrier structures for oxygen/moisture are disclosed, for example, in WO 2022/053339 A1 and WO 2020/114995 A2, both of which are incorporated by reference herein in their entirety.

[0011] A diameter of the lid and/or of the support preferably is 5 cm or less, more preferably 4 cm or less, even more preferably 3,8 cm or less.

[0012] Alternatively or additionally, the diameter of the lid and/or of the support preferably is at least 3 cm, more preferably at least 3,5 cm.

[0013] Preferably, the pod is made of compostable material, e.g. home compostable material. By making

the pod from compostable material, the pod as a whole, that is without separating the lid from the pouch, can be disposed and composted after usage in the beverage preparation machine.

[0014] Preferably, the pouch is made of compostable plastic material, more preferably of compostable thermoplastic polymer material.

[0015] Preferably, the pouch is at least partially made from a non-woven material and/or a mesh, more preferably wherein this non-woven or mesh material is compostable. Preferably, the material of the pouch, e.g. the non-woven material, is permeable, in particular permeable to liquids so that liquids can permeate through the pouch and mix with the beverage preparation ingredients contained inside the pouch. In other words, the pouch may be permeable for liquids, the lid may be non-permeable for gas/vapor.

[0016] Additionally or alternatively, the pouch is at least partially made from an alginate material, preferably a compostable alginate material. The alginate material may be non-permeable, preferably non-permeable to liquids or liquid based substances.

[0017] The expression "compostable" may be understood as any material that complies with certain compostability standards. For example, industrial compostability is defined in European Norm EN 13432. Home compostability conditions are adapted based on national standards within certain testing specifications, such as TÜV testing specifications. Materials or products compliant with these standards can be recognized, for example, by a conformity mark stating their home compostability. Some examples of home compostability certifications at a national level include, but are not limited to, the following. For example, the certifier TÜV AUSTRIA BELGIUM offers a home compostability certification scheme, and DIN CERTCO offers a certification for home compostability according to the Australian standard AS 5810. Italy has a national standard for composting at ambient temperature, UNI 11183:2006. In November 2015, the French Standard "NF T 51-800 Plastics - Specifications for plastics suitable for home composting" was introduced. This standard is covered in the DIN CERTCO scheme.

[0018] This may be understood, for example, as meaning that composting can be carried out without reservation. In particular, at the end of a composting process there are no residues of the material, which may be problematic for the environment, or any non-compostable components. Examples for compostable materials may be compostable succinates and/or polyester, more preferably polylactide (PLA), polybutylene adipate terephthalate (PBAT), polycaprolactone (PCL), polybutylene succinate (PBS), poly(butylene succinate-co-butylene adipate) (PBS-A/PBSa), polyglycolide (PGA), polyhydroxyalkanoates (PHA), short-chain length and mid-chain length PHAs and/or co-polymers, combinations or alterations thereof.

[0019] Preferably, the pouch includes a section having

a first rigidity and the ring-shaped support includes a section having second rigidity higher than the first rigidity. In other words, the ring-shaped support or sections thereof may have a higher rigidity and/or may be stiffer than the pouch or sections thereof. The ring-shaped support may be a ring section of the pouch. The ring section may be heat treated to achieve the desired rigidity. Additionally or alternatively, the ring-shaped support may be a separate ring element with the desired rigidity. The separate ring element may be connected to the pouch for increasing the rigidity of the pouch around the opening. The increased rigidity of the ring-shaped support allows the pod to be safely clamped into a holder of the beverage preparation machine.

[0020] The ring-shaped support may have a first side and a second side as well as an outer peripheral surface connecting the first side to the second side. The first and/or second side may be flat.

[0021] The lid may be attached to the ring-shaped support and/or the pouch via the first side.

[0022] The pouch may be connected to the support via the first side, the second side, and/or an inner peripheral surface of the support. The pouch may extend away from the support on the second side.

[0023] The ring-shaped support may be made from a compostable material (e.g., home compostable material).

[0024] Preferably, the pod is configured to sealingly engage with a cup-shaped receptacle for forming a beverage capsule. The capsule may be insertable into a capsule machine as described, for example, in the aforementioned EP 0 512 470 A1, EP 2 919 628 A1. Alternatively, the pod as such may be configured for being inserted into such capsule machine, for example via a respective dimensioning of the ring-shaped support.

[0025] A length of the cup-shaped support along a longitudinal thereof axis may be at least 2 cm, preferably at least 2,5 cm.

[0026] Alternatively or additionally, the length of the cup-shaped support along its longitudinal axis may be 3,5 cm or less cm, preferably 3 cm or less.

[0027] Preferably, the cup-shaped receptacle is made of recyclable material, in particular recyclable aluminium alloy material. The receptacle may be a single-use (i.e., for preparing a single serving of coffee) receptacle or a reusable receptacle (i.e., for preparing multiple coffee servings).

[0028] Preferably the support includes a rim section configured for sealingly engaging with a receiving section of the receptacle. Preferably, the receptacle is attached on the second side of the support. As such, the receptacle may be attached to the side of the support opposite to the side on which the lid is provided.

[0029] According to a second aspect of the present invention, which may form an independent aspect of the present invention, a beverage capsule configured for preparing a beverage upon injection of liquid into the capsule is provided. The capsule comprises a beverage

pod including a pouch configured for holding beverage preparation ingredients therein, a ring-shaped support extending at least partially around a top portion of the pouch, the ring-shaped support providing a top opening of the pod, and a lid connected to the support and/or the pouch for closing the top opening. The capsule further comprises a cup-shaped receptacle for receiving the pod, wherein the pod and the receptacle are engaged to one another, preferably sealingly engaged to one another, for forming the capsule.

[0030] As will be understood by the skilled reader, the explanations provided for the pod according to the first aspect above are equally applicable to the capsule according to the second aspect. Vice-versa, the skilled reader will also appreciate that the further details described hereinbelow with reference to the second aspect may equally be applied to the first aspect.

[0031] The capsule is based at least partially on the idea that a beverage pod as outlined above may be insertable into a cup-shaped receptacle for forming a beverage capsule. This capsule can be used in a capsule beverage preparation machine and replace known capsules used in such machines.

[0032] The receptacle may be pre-attached to the pod (e.g., sold therewith). In this case, the receptacle may provide an air and moisture barrier around the pouch. This may be beneficial when the pouch itself is permeable, e.g. permeable to moisture and/or air so that air/moisture may enter the pouch, e.g. during storage and transport. Alternatively, the receptacle may not be pre-attached to the pod. In this case, the pod (or a plurality of pods) may be sold within a secondary packaging providing an air and moisture barrier for the ingredients contained in the pouch. The receptacle in this case may be a re-usable component that is intended to be used repeatedly to extract a plurality of pods.

[0033] Preferably, the pod and the receptacle are removable from one another, preferably without using tools, more preferably by hand. This is based at least partially on the idea that, once the beverage is prepared, the capsule can be removed from the machine and the pod can be separated from the receptacle so that the pod and the receptacle can be disposed separately from one another. If, for example, the pod is made of compostable material as described before, the pod can be composted, e.g. home composted. The receptacle, on the other hand, may be made, for example, of non-compostable but recyclable material, in particular of recyclable aluminium alloy material. The receptacle may thus be disposed and/or recycled, for example at a consumer collection station as part of a waste disposal and recycle system.

[0034] Preferably, the engagement between the pod and the receptacle is configured for facilitating a separation of the pod from the receptacle. The engagement may be a detachable (e.g., manually detachable) adhesive bond, friction fit, or form fit. For example, the engagement may be a threaded engagement, a snap-fit or clipping engagement, or any other engagement that allows for a

separation of the pod from the receptacle, preferably without using tools.

[0035] For example when the receptacle is intended to be reused with a plurality of pods, the receptacle is preferably configured to be engageable with a plurality of pods. In other words, the engagement the pod and the receptacle preferably is such that the receptacle may be disengaged from a first pod and subsequently engaged with a second pod.

[0036] Preferably, the support includes a rim section, and the receptacle includes a receiving section in a sealing contact with, or configured to be sealingly engaged with, the rim section.

[0037] Preferably the rim section and/or the receptacle are configured for being clamped into an extracting unit of a beverage preparation machine.

[0038] Preferably the receptacle includes an outer flange configured for being clamped in the extracting unit, preferably wherein the clamping presses the outer flange onto the rim section of the support for providing a sealing contact therebetween.

[0039] Preferably, the receptacle has a cylindrical shape or a frustoconical shape or a domical shape or a frustodomical shape. Preferably, the receptacle may have a shape similar to the shape of a capsule described, for example, in EP 0 512 468 A1, EP 0 512 470 A1, EP 1 646 305 A1, or EP 1 165 398 A1, all of which are incorporated by reference herein in their entirety.

[0040] Preferably, the receptacle is configured to be provided with one or more openings or include one or more openings, such as one or more pre-formed openings, configured for delivering liquid into the receptacle and the pod such that the liquid mixes with the beverage preparation ingredients inside the pod for forming a beverage, and the pod is configured for dispensing the beverage through the lid of the pod. The opening may be formed by an opener of an extracting unit of a beverage preparation machine, as described, for example, in EP 0 512 470 A1, EP 2 919 628 A1. This may be advantageous when the receptacle is configured for single use. One or more pre-formed openings may be provided in the receptacle, for example, when the receptacle is configured to be reusable.

[0041] Preferably, the receptacle is made of non-compostable material, preferably recyclable material, more preferably recyclable aluminium alloy material. The pod may be made of compostable material, preferably compostable plastic material, more preferably compostable thermoplastic polymer material. The pouch may be made of a non-woven permeable compostable material, preferably a non-woven and compostable material that is permeable to liquids.

[0042] Preferably, the pod is a single-serve disposable pod.

[0043] The cup-shaped receptacle may be a single-serve receptacle or a re-usable receptacle.

[0044] Preferably, the re-usable receptacle includes one or more openings configured for liquid to be injected

into the receptacle.

[0045] Preferably, the re-usable receptacle includes a bottom portion, a top portion and an intermediate portion connecting the bottom portion with the top portion, wherein the intermediate portion includes a shoulder portion extending radially outward from the bottom portion and wherein the one or more openings are arranged on the shoulder portion.

[0046] Preferably, the pod is in a removable engagement with the receptacle, preferably in a form-fit (e.g., snap-fit) engagement with the receptacle.

[0047] According to another aspect of the present invention, which may form an independent aspect of the present invention, a system is provided comprising a beverage capsule as outlined above and an extraction unit for extracting a beverage from the capsule. In the system, the extraction unit includes a holder for holding the capsule and an opener for opening the capsule, wherein the opener includes at least one cutting edge for forming an opening into the receptacle and/or the lid for dispensing liquid therethrough.

[0048] Preferably, the capsule opener is arranged such that the at least one cutting edge does not penetrate the pouch.

[0049] Preferably, the at least one cutting edge is movable between a first position and a second position, wherein in the first position the at least one cutting edge is arranged outside the capsule, wherein in the second position the at least one cutting edge is at least partially arranged inside the capsule for forming the opening in the receptacle, and wherein in the second position the at least one cutting edge is arranged outside of the pouch. In other words, the at least one cutting edge may penetrate the receptacle for forming the opening but may be configured to not penetrate the pouch.

[0050] With such configuration, it is ensured that the beverage preparation ingredients remain inside the pouch. Therefore, when the receptacle is separated from the pod after extraction, the ingredients can be disposed (e.g., as compostable waste) together with the pouch, whereas the capsule may be recycled.

[0051] According to another aspect of the present invention, which may form an independent aspect of the present invention, a system is provided comprising an extraction unit and a beverage capsule with a re-usable receptacle. In the system, the extraction unit includes a holder for holding the capsule and a liquid injector for injecting liquid into the capsule, wherein the liquid is injected through the one or more openings provided in the re-usable receptacle.

[0052] Preferably, the re-usable receptacle is arranged inside the holder such that an opener of the extraction unit does not penetrate the re-usable receptacle during preparation of the beverage. In other words, the extraction unit of the beverage preparation machine does not form additional openings in the re-usable receptacle. This is not necessary as the liquid can be injected through the already formed openings of the re-usable receptacle.

[0053] With such configuration, a capsule with a re-usable receptacle may be employed in already existing machines with an opener.

[0054] According to another aspect of the present invention, which may form an independent aspect of the present invention, a system is provided comprising a beverage pod and an extraction unit for extracting a beverage from the pod. In the system, the extraction unit includes a holder for holding the pod and a liquid injector for injecting liquid into the pod, wherein the liquid is injected into the pouch and beverage is dispensed through the lid.

[0055] In all these systems, the holder of the extraction unit may include a cavity, and the capsule or the pod may be received within the cavity for forming a sealing contact with the holder.

[0056] The holder may further include a first part and a second part relatively movable to one another between a loading position and an extraction position, wherein upon moving the first and/or second part from the loading position into the extraction position, a face of the first part may contact the lid and/or support of the pod such that the holder and the pod or capsule form a sealing contact therebetween.

[0057] A further aspect of the present invention, which may form an independent aspect of the present invention, relates to a use of a capsule, in particular to a use of a capsule in a beverage preparation machine. The use includes the steps of: inserting the capsule into a beverage preparation machine, preparing a beverage by injecting liquid into the receptacle whereby liquid is mixed with beverage preparation ingredients inside the pod for forming a beverage inside the pod and dispensing the beverage through the lid of the pod, removing the capsule from the beverage preparation machine, and separating the pod from the receptacle for disposing and/or composting the pod.

[0058] Preferably the step of separating the pod from the receptacle is performed manually, preferably without using tools, more preferably by hand.

[0059] A further aspect of the present invention, which may form an independent aspect of the present invention, relates to a use of a pod, in particular to a use of a pod in a beverage preparation machine. The use includes the steps of: inserting the pod into a beverage preparation machine, preparing a beverage by injecting liquid into the pouch of the pod whereby liquid is mixed with beverage preparation ingredients inside the pouch for forming a beverage inside the pouch and dispensing the beverage through the lid of the pod, and removing the pod from the beverage preparation machine. Preferably, the pod is disposed and/or composted without separating any components of the pod.

[0060] Further embodiments and aspects of the present invention are explained using the accompanying schematic figures, which are incorporated herein and constitute a part of the specification. These figures are merely exemplary. They are not to be understood as

limiting the scope of the present disclosure.

Brief description of the drawings

[0061]

Figure 1 is a schematic view of an example of a beverage pod.

Figure 2 is a schematic view of another example of a beverage pod.

Figure 3 is a schematic view of the pod of **Figure 1** inserted into a holder of a beverage preparation machine, wherein the holder is in a loading position.

Figure 4 is a schematic view of the pod of **Figure 1** inserted into the holder of the beverage preparation machine, wherein the holder is in an extraction position.

Figure 5 is a schematic exploded view of an example of a beverage capsule with the pod of **Figure 1**.

Figure 6 is a schematic cross-sectional view of the beverage capsule of **Figure 5**.

Figure 7 is a schematic exploded view of another example of a beverage capsule with the pod of **Figure 2**.

Figure 8 is a schematic cross-sectional view of the beverage capsule of **Figure 7**.

Figure 9 is a schematic view of the capsule of **Figure 7** inserted into a holder of a beverage preparation machine, wherein the holder is in a loading position.

Figure 10 is a schematic view of the capsule of **Figure 7** inserted into the holder of the beverage preparation machine, wherein the holder is in an extraction position.

Figure 11 is a schematic view of another example of a beverage capsule with a pod of **Figure 1** and a re-usable receptacle.

Figure 12 is a schematic view of the capsule of **Figure 11** inserted into a holder of a beverage preparation machine, wherein the holder is in a loading position.

Figure 13 is a schematic view of the capsule of **Figure 11** inserted into the holder of the beverage preparation machine, wherein the holder is in an extraction position.

Figure 14 is a schematic view of another example of

a beverage capsule with a pod of **Figure 1** having a pouch made of alginate material.

Figure 15 is a detailed section view of the embodiment shown in **Figure 14**.

Figure 16 is a schematic view of another example of a beverage capsule with a pod of **Figure 2** having a pouch made of alginate material.

Figure 17 is a detailed section view of the embodiment shown in **Figure 16**.

Figure 18 is a schematic view of the capsule of **Figure 14** inserted into a holder of a beverage preparation machine, wherein the holder is in a loading position.

Figure 19 is a schematic view of the capsule of **Figure 14** inserted into the holder of the beverage preparation machine, wherein the holder is in an extraction position.

Figure 20 is a schematic view of another example of a beverage capsule with a pod of **Figure 2** having a pouch made of alginate material and a re-usable receptacle.

Figure 21 is a detailed section view of the embodiment shown in **Figure 20**.

Figure 22 is a schematic view of the capsule of **Figure 20** inserted into a holder of a beverage preparation machine, wherein the holder is in a loading position.

Figure 23 is a schematic view of the capsule of **Figure 20** inserted into the holder of the beverage preparation machine, wherein the holder is in an extraction position.

Figure 24 is a schematic cross-sectional view of an example of a lid structure including a barrier against oxygen and/or moisture.

Figure 25 is a schematic cross-sectional view of another example of a lid structure including barrier against oxygen and/or moisture.

Detailed description

[0062] Within the figures, same components are referenced by the same reference numerals.

[0063] **Figure 1** shows a schematic view of an example of a beverage pod 10. Beverage pod 10 is configured for preparing beverage such as coffee, tea, hot chocolate, or the like upon injecting liquid into the pod 10. The beverage pod 10 is particularly suited to be used in connec-

tion with a beverage preparation machine explained later on. Beverage pod 10 may be a single-serve disposable pod.

[0064] Beverage pod 10 includes a pouch 12 configured for holding beverage preparation ingredients. Pouch 12 is made of a permeable material so that liquid can permeate through pouch 12. Pouch 12 is made of a non-woven material, preferably a compostable material. Examples for compostable materials may be compostable succinates and/or polyesters, more preferably polylactide (PLA), polybutylene adipate terephthalate (PBAT), polycaprolactone (PCL), polybutylene succinate (PBS), poly(butylene succinate-co- butylene adipate) (PBS-A/PBSa), polyglycolide (PGA), , polyhydroxyalkanoates (PHA), short-chain length and mid-chain length PHAs and/or co-polymers, combinations or alterations thereof.

[0065] Pod 10 further includes a ring-shaped support 14. Ring-shaped support 14 extends at least partially around a top portion of pouch 12 and delimits and/or defines a top opening 16 of pod 10. Ring-shaped support 14 functions as a support for pod 10. Ring-shaped support 14 supports pod 10, for example, when pod 10 is inserted into a holder of an extraction unit of a beverage preparation machine. Ring-shaped support 14 has an increased rigidity compared to, for example, pouch 12 to provide for the necessary support. Ring-shaped support 14 extends substantially in a radial direction of pod 10. In the exemplary embodiment shown, ring-shaped support 14 is formed as a ring section of pouch 12. The ring section may be heat treated to obtain an increased rigidity compared to a remaining portion of pouch 12.

[0066] Pod 10 further includes a lid 18, which may also be referred herein as a "membrane". Lid 18 is connected to support 14 and/or pouch 12 and is configured for closing top opening 16 of pod 10. Pod 10 is configured for receiving liquid through pouch 12 wherein liquid is mixed with beverage preparation ingredients contained inside the pouch 12 for forming a beverage. The beverage is then dispensed through lid 18. Lid 18 may therefore be referred to as an (extraction) membrane or more generally speaking as a delivery wall of pod 10. As will be explained in connection with **Figures 3 and 4**, lid 18 is configured to be pierced by a piercing plate, such as a pyramid plate, of an extraction unit of a beverage preparation machine. The pyramid plate forms multiple openings in lid 18 through which beverage can be delivered and/or dispensed.

[0067] Lid 18 is connected to pouch 12 and/or support 14 using any suitable means, for example using heat treatment. Preferably, lid 18 is in a sealing engagement with ring-shaped support 14, so that liquid cannot permeate through the sealing engagement between ring-shaped support 14 and lid 18.

[0068] Lid 18 may be made of compostable material so that lid 18, pouch 12 and support 14 can be (home) composted as a whole, i.e. without separating lid 18 from pouch 12 and/or support 14. Examples of compostable

lid material(s) are provided in WO 2020/114995 A2, WO 2022/053339 A1, which are incorporated herein in their entirety.

[0069] Lid 18 may be configured as an oxygen and/or moisture barrier preventing oxygen and/or moisture permeating through lid 18. Examples of lid structures including an oxygen/moisture barrier are provided in **Figures 24 and 25**.

[0070] Referring to **Figure 2**, a schematic view of a further example of a beverage pod 11 is shown. In the example of **Figure 2**, ring-shaped support 14 is formed as a separate ring element 20. Separate ring element 20 is connected to pouch 12 and is configured for increasing the rigidity of pod 10 for providing the support functionality. Separate ring element 20 includes an increased rigidity, in particular a rigidity that is higher than the rigidity of pouch 12. Separate ring element 20 acts as support of pod 10, for example, when pod 10 is inserted into a holder of an extraction unit. Ring element 20 may be made of a compostable material so that beverage pod 11 as a whole may be composted. Ring element 20, pouch 12 and lid 18 are connected to one another by any suitable means, for example by heat treatment. Preferably, ring element 20, pouch 12 and lid 18 are in a sealing engagement with one another, so that liquid cannot permeate through the sealing engagement between ring element 20, pouch 12 and lid 18. Ring element 20 may be provided, e.g., on the side of the pouch 12 opposite the lid 18 or between the pouch 12 and the lid 18.

[0071] Referring to **Figure 3**, an example of a system including pod 10 of **Figure 1** and an extraction unit 22 of a beverage preparation machine is shown.

[0072] Extraction unit 22 includes a holder 24 for holding pod 10. Holder 24 includes a cavity 26 configured for receiving pod 10. Holder 24 includes a first part 28 and a second part 30 relatively movable to one another between a loading position for loading pod 10 and an extraction position for extracting beverage from pod 10. **Figure 3** shows holder 24 in the loading position. **Figure 4** shows holder 24 in the extraction position.

[0073] Referring to **Figure 4**, in the extraction position, first and second parts 28, 30 of holder 24 are moved towards one another such that a first face 32 of first part 28 contacts lid 18 while a second face 33 of second part 30 contacts support 14 to form a sealing contact between holder 24, support 14 and lid 18. In other words, in the extraction position, pod 10 is safely clamped within holder 24 and a sealing engagement between pod 10 and holder 24 is formed.

[0074] Extraction unit 22 further includes a liquid injector 34 configured for injecting liquid into cavity 26. Liquid injector 34 injects liquid into cavity 26. The liquid then permeates through pouch 12 and forms a beverage. Due to the rising pressure of the liquid being injected into cavity 26, lid 18 is pressed against a lid opening structure of extraction unit 22. The lid opening structure may be a piercing plate, such as a pyramid plate 36. The pyramid plate 36 may include a number of reliefs and recessed

(pyramid-like) elements 38 onto which lid 18 is pushed and tears open under the effect of the internal pressure of the liquid. Once lid 18 is torn open, the beverage can be dispensed through the openings formed in lid 18.

[0075] Corresponding pyramid plates are explained in more detail, for example, in EP 0 512 470 A1, which is incorporated by reference herein in its entirety.

[0076] Extraction unit 22 further includes an opener 40. Opener 40 is typically used to open a beverage capsule clamped and sealed within holder 24. Opener 40 includes at least one cutting blade 42 with a cutting-edge, preferably two or three cutting blades 42, which is configured for forming an opening in commercially available coffee capsules such that liquid can be injected through the opening and into the capsules.

[0077] In **Figures 3 and 4**, extraction unit 22 is used with pod 10 as such. Since the pouch 12 is permeable to liquid, the creation of one or more openings by the opener 40 is not required. Hence, there is no need for an opener 40. Nevertheless, pod 10 may be used in extraction units 22 with such opener, such as Nespresso™ machines, in particular when the pod 10 is dimensioned such that the opener 40 does not penetrate pouch 12. As can be seen in **Figure 4**, in the extraction position of holder 24, the cutting blades 42 of opener 40 do not penetrate pouch 12. Hence, pouch 12 remains intact even during preparation of the beverage.

[0078] Extraction units similar to extraction unit 22 are explained in more detail, for example, in EP 0 512 470 A1, EP 2 919 628 A1, both of which are incorporated by reference herein in their entirety. These extraction units are typically used for holding and opening beverage capsules, but could be used in combination with pod 10, as explained.

[0079] It should be noted that any suitable pod may be used in connection with extraction unit 22, as long as liquid is injected into the pouch and beverage is dispensed through the lid of the pod. Likewise, a person skilled in the art would understand that instead of pod 10, pod 11 explained in connection with **Figure 2** may be used in combination with extraction unit 22.

Referring to **Figure 5**, a schematic exploded view of an example of a beverage capsule 44 is shown.

[0080] Beverage capsule 44 includes a pod 10 (shown in an exploded view) and a cup-shaped receptacle 46 configured for receiving pod 10. In other words, pod 10 is received within cup-shaped receptacle 46 for forming a beverage capsule 44.

[0081] Referring to **Figure 6**, a schematic cross-sectional view of beverage capsule 44 is shown. Pod 10 includes pouch 12, support 14 (formed as a ring section of pouch 12), and lid 18. Pod 10 and receptacle 46 are in a sealing engagement. Support 14 includes a rim section 48 and receptacle includes a receiving section 50 in a sealing contact with rim section 48.

[0082] Cup-shaped receptacle 46 and pod 10 are removably attached to one another. As a consequence, an engagement between pod 10 and receptacle 46 is such

that pod 10 can be removed from receptacle 46, preferably without using tools, more preferably by hand. For facilitating a separation of pod 10 from receptacle 46, pod 10 and receptacle 46 may be attached to one another via an adhesive connection, a threaded connection, a press-fit connection, form-fit connections (such as a snap-fit connection), or any other suitable removable connection. Removable connections are preferably such that during the connection between pod 10 and receptacle 42 a sealing engagement is maintained.

[0083] As already mentioned, pod 10 as a whole may be made of compostable material. Receptacle 46 may, on the other hand, be made of a non-compostable but recyclable material. In particular, receptacle 46 may be made of a recyclable aluminum alloy material which can be recycled once pod 10 is separated from receptacle 46. The removable engagement between pod 10 and receptacle 46 therefore allows the pod 10 to be composted and the receptacle to be recycled once the capsule has been used in the beverage preparation machine. Meanwhile, the receptacle 46, e.g. when configured as a single use component, may provide an air and/or moisture barrier for the beverage ingredients contained in the pouch 12 (if the pouch is air and/or moisture permeable) before the beverage is prepared (e.g., during storage and transport).

[0084] In the exemplary embodiment shown, receptacle 46 includes a substantially frustoconical shape with an inclined side wall 52 extending from a bottom portion 54 to a top portion 56 of receptacle 46. In the exemplary embodiment shown, the bottom portion 54 includes a dome-shaped portion 58. Dome-shaped portion 58 is configured to be pierced by an opener of an extraction unit. Opener forms one or more openings (e.g., three openings) in the dome-shaped portion 58 such that liquid can enter receptacle 46. An opener similar to opener 40 of extraction unit 22 may be used. In the exemplary embodiment shown, top portion 56 further includes a flange portion 60. Flange portion 60 is configured to be clamped into an extraction unit of a beverage preparation machine. The flange portion 60 may include a sealing section having an increased axial dimension, such as by rolling back or folding the material forming the receptacle. Alternatively or additionally, a compressible sealing material, such as cardboard may be provided at least partially around the flange portion 60.

[0085] A person skilled in the art will understand, however, that receptacle 46 may have any suitable shape as long as 10 can be received in and removably engaged with receptacle 46.

[0086] Referring to **Figure 7**, a schematic exploded view of another example of a beverage capsule 62 is shown.

[0087] Beverage capsule 62 includes pod 11 from **Figure 2** (shown in an exploded view) and cup-shaped receptacle 46. In other words, pod 11 and receptacle 46 together form a beverage capsule 62.

[0088] Referring to **Figure 8**, a schematic cross-sec-

tional view of beverage capsule 62 is shown. Pod 11 includes a pouch 12, a support 14 (formed as separate ring element 20 in pod 11), and a lid 18. Pod 11 is removable from, and preferably sealingly attached with, receptacle 46 so that pod 11 can be separated from receptacle 46. For example, the ring element 20 may be removably attached to receptacle 46, e.g. via an adhesive connection, a threaded connection, a press-fit connection, a form-fit connection (such as a snap-fit connection) or any other suitable removable connection. The removable connection may preferably be such that during the connection of pod 11 and receptacle 42, a sealing engagement between pod 11 and receptacle 42 is maintained.

[0089] Since pod 11 is removably engaged with receptacle 46, pod 11 may be separated from receptacle, preferably without tools, more preferably by hand, and pod 11 and receptacle 46 may be disposed separately from one another. If pod 11 as a whole is made of a compostable material, pod 11 can be composted. Receptacle 46 may be made of a recyclable material so that receptacle 46 can be recycled.

[0090] The shape, size and function of beverage capsules 44 and 62 may be the same. The difference between capsule 44 and capsule 62 is mainly that in capsule 44 a ring-shaped section of pouch 12 functions as the support 14, whereas in capsule 62 a separate ring element 20 of pod 11 functions as the support 14.

[0091] Referring to **Figure 9**, an example of a system including a capsule 62 as described in **Figures 7 and 8** and an extraction unit 22 as described in **Figures 3 and 4** is shown. **Figure 9** shows holder 24 of extraction unit 22 in a loading position. **Figure 10** shows holder 24 of extraction unit 22 in an extraction position.

[0092] As can be seen in **Figure 9**, in the loading position, capsule 62 can be inserted into cavity 26 and cutting edges 42 of opener 40 remain outside of capsule 62.

[0093] As can be seen in **Figure 10**, in the extraction position, first and second parts 28, 30 of holder 24 are moved towards one another such that a first face 32 of first part 28 contacts lid 18 and a second face 33 of second part 30 contacts a side of the flange 60 of the receptacle 46 facing away from the lid 18 to form a sealing contact between holder 24, lid 18 and receptacle 46. In other words, in the extraction position, capsule 62 is safely clamped within holder 24 so that a sealing engagement between holder 24 and capsule 62 exists. Support 14 formed as separate ring element 20 may improve the sealing engagement between holder 24 and capsule 62.

[0094] As can be further seen in **Figure 10**, in the extraction position of holder 24, cutting blades 42 penetrate into the receptacle 46 to form one or more openings 43 (e.g., three openings) in receptacle 46. Cutting blades 42 do not penetrate pouch 12. Hence, pouch 12 remains intact even during preparation of the beverage.

[0095] Once opening 43 is formed in receptacle 46, liquid injector 34 injects liquid into cavity 26. Cavity 26 is

filled with liquid. The liquid enters the receptacle 46 through the opening 43 formed in receptacle 46. The liquid permeates through pouch 12 and forms a beverage. Due to the rising pressure of the liquid being injected into cavity 26, lid 18 is pressed against pyramid plate 36 which tears open lid 18 under the effect of the internal pressure of the liquid. Once lid 18 is torn open, the beverage can be dispensed through the openings formed in lid 18.

[0096] A person skilled in the art will understand, that instead of capsule 62, capsule 44 described in **Figures 5 and 6**, or any other suitable capsule may be used.

[0097] Capsules 44 and 62 may be designed to be used in an extraction unit 22 similar to the one described in, for example, EP 0 512 470 A1, EP 2 919 628 A1. The advantage of using capsules 44 or 62 instead of known capsules is that once the beverage is prepared in the beverage preparation machine, capsule 44, 62 can be removed from the machine and pods 10, 11 can be separated from the receptacle 46 and disposed and/or composted separately from receptacle 46. Receptacle 46, on the other hand, may be recycled. It should be noted that most of the beverage preparation ingredients contained inside pouch 12 remain in the pouch 12 after preparation of the beverage. Hence, the entire capsule 44, 62 may be conveniently disposed of in an eco-responsible way while the risk of soiling the beverage preparation space (e.g., the kitchen) is minimized.

[0098] Referring to **Figure 11**, a schematic cross-sectional view of another example of a beverage capsule 64 is shown.

[0099] Beverage capsule 64 includes pod 10 and a cup-shaped receptacle 66 that is re-usable. The expression "re-usable" shall mean that receptacle 66 can be used multiple times as compared to the single-use receptacle 46 previously explained. The receptacle 66 may be dish-washer safe.

[0100] Pod 10 includes a pouch 12, a support 14 and a lid 18, as previously explained with reference to **Figure 1**. Pod 10 is removably inserted into the re-usable receptacle 66. For example, pod 10 may be in a form-fit engagement (e.g., via a snap-fit) with receptacle 66 (not shown in the cross section of Fig. 11). The engagement between pod 10 and receptacle 66 may be a sealing engagement, but this is not necessarily required. However, the engagement between pod 10 and receptacle 66 preferably is such that upon clamping capsule 64 into a holder of an extraction machine, a sealing engagement between pod 10 and receptacle 66 is established (for example, by the pressure exerted on the pod 10 and the receptacle 66 by first and second parts 28, 30 of a holder 24 of such machine).

[0101] Lid 18 may be configured to be torn open by a pyramid plate and may include an oxygen and/or moisture barrier.

[0102] Re-usable receptacle 66 includes a bottom portion 68, a top portion 70 and an intermediate portion 72 connecting bottom portion 68 with top portion 70. In the

exemplary embodiment shown, intermediate portion 72 includes a shoulder portion 74 extending radially outward of bottom portion 68. Shoulder portion 74 may provide a substantially planar face 76.

[0103] As can be seen in **Figure 11**, re-usable receptacle 66 includes a plurality of openings 78. These openings have not been produced by an opener of an extraction unit. These openings have been formed after or during production of re-usable receptacle 66.

[0104] In the specific embodiment shown, openings 78 are formed on shoulder portion 74. Openings 78 allow liquid to enter re-usable receptacle 66. Bottom portion 68 may protrude from shoulder portion 74 such that openings 78 are in a recessed position compared to a bottom face 80 of re-usable receptacle 66.

[0105] As pod 10 is removably engaged with receptacle 66, pod 10 may be separated from receptacle, preferably without tools, more preferably by hand, and pod 10 and receptacle 66 may be disposed separately from one another. If pod 10 is made of compostable material, pod 10 can be composted. Re-usable receptacle 66 may be re-used, for example, with another pod.

[0106] Re-usable receptacle 66 may be made of any suitable material, for example aluminium material. Receptacle 66 may not necessarily be made of a recyclable material but might be made of a recyclable material.

[0107] Referring to **Figure 12**, an example of a system with a capsule 64 as described in **Figure 11** and an extraction unit 22 as described in **Figures 3 and 4** is shown. Figure 12 shows holder 24 of extraction unit 22 in a loading position. Figure 13 shows holder 24 of extraction unit 22 in an extraction position.

[0108] As can be seen in **Figure 12**, in the loading position, capsule 64 can be inserted into cavity 26. Cutting blades 42 of opener 40 remain outside of capsule 64.

[0109] As can be seen in **Figure 13**, in the extraction position, first and second parts 28, 30 of holder 24 are moved towards one another such that a face 32 of first part 28 contacts lid 18 and thereby applies pressure to support 14 to form a sealing contact between holder 24, support 14, lid 18 and re-usable receptacle 66. More precisely, an outer flange 82 of re-usable receptacle 66 is pressed onto rim section 48 of support 14 for forming a sealing contact. In other words, the capsule 64 is safely clamped within holder 24 and a sealing engagement between holder 24 and capsule 64 is established.

[0110] Furthermore, as can be seen in **Figure 13**, receptacle 66 is preferably designed such that in the extraction position of holder 24, cutting blades 42 of opener 40 do not penetrate receptacle 66. Hence, cutting edges 42 do not form an opening in re-usable receptacle 66. Bottom portion 68 and intermediate portion 72 may be designed to ensure that in the extraction position of holder 24, cutting edges 42 do not penetrate re-usable receptacle 66. The bottom portion 68 may be formed, as shown in **Figures 11 to 13**, as an axial (e.g., cylindrical or conical) protrusion. The bottom portion may be dimensioned to fit between a plurality of cutting blades 42 of the

holder 24. As shown in **Figure 13**, this may be helpful for stabilizing the position of the capsule 64 in the holder 24 in the extraction position.

[0111] The maximum width and/or diameter of the bottom portion 68 in a cross section perpendicular to the longitudinal axis of the capsule 64 preferably is 2 cm or less, more preferably 1,6 cm or less, even more preferably 1,2 cm or less.

[0112] Once holder 24 is in the extraction position, liquid injector 34 injects liquid into cavity 26. Cavity 26 is filled with liquid. The liquid enters receptacle 66 through openings 78 already formed in re-usable receptacle 66. The liquid then permeates through pouch 12 and extracts the beverage ingredients. Due to the rising pressure of the liquid being injected into cavity 26, lid 18 is pressed against pyramid plate 36 which tears open lid 18 under the effect of the internal pressure of the liquid. Once lid 18 is torn open, the beverage can be dispensed through the openings formed in lid 18.

[0113] A person skilled in the art will understand, that instead of pod 10, any other suitable pod, for example pod 11 may be used in combination with re-usable receptacle 66 as long as beverage can be dispensed through the lid of the pod.

[0114] Capsule 64 is designed such that it can be used in an extraction unit 22 similar to the one described in, for example, EP 0 512 470 A1, EP 2 919 628 A1. The advantage of using capsule 64 instead of known capsules is that once the beverage is prepared in the beverage preparation machine, capsule 64 can be removed from the machine and pods 10, 11 can be separated from the re-usable receptacle 66 and disposed and/or composted separately from the re-usable receptacle 66. Re-usable receptacle 66 may be re-used, for example with another pod (that may be compostable as well).

[0115] Referring to **Figure 14**, a schematic cross-sectional view of another beverage capsule 84 is shown. Capsule 84 includes receptacle 46 and pod 10. As compared to the beverage capsules previously described, pouch 12 of pod 10 is made of an alginate material. The alginate material may be compostable, e.g. home compostable. Examples of alginate materials may be sodium alginate, soluble alginates such as alginic acid and its calcium, ammonium, and potassium salts, or esters of alginic acid, such as propylene glycol alginate. The alginate material may be non-permeable. In particular, the alginate material may be non-permeable to liquids. In other words, liquids may be prevented from permeating through pouch 12 by the alginate material.

[0116] In the specific embodiment shown, pouch 12 is shaped such that pouch 12 extends to bottom portion 54 and/or dome-shaped portion 58 of receptacle 46. In other embodiments, this may not be the case.

[0117] Referring to **Figure 15**, a detailed section view of **Figure 14** indicated by the circle in **Figure 14** is shown. As can be seen in **Figure 15**, capsule 84 includes lid 18 connected to pouch 12. Pouch 12 is engaged with receptacle 46 to form capsule 84.

[0118] Referring to **Figure 16**, a schematic cross-sectional view of another beverage capsule 86 is shown. Capsule 86 includes pouch 12 which is made of an alginate material similar to the alginate material described in connection with capsule 84. In the specific embodiment shown, pouch 12 extends to bottom portion 54 and/or dome-shaped portion 58 of receptacle 46. In other embodiments, this may not be the case.

[0119] **Figure 17** shows a detailed section view of **Figure 16** indicated by the circle in **Figure 16**. As can be seen in **Figure 17**, capsule 86 includes a separate ring element 20. Separate ring element 20 may increase the stability of pouch 12. Additionally or alternatively, separate ring element 20 may increase a sealing engagement between lid 18, pouch 12 and receptacle 46.

[0120] The shape and/or size of beverage capsules 84, 86 may be similar to the shape and/or size of capsules 44, 62 which is why no further details are given here.

[0121] Referring to **Figure 18**, an example of a system including a capsule 84 as described in **Figures 14 and 15** and an extraction unit 22 as described in **Figures 3 and 4** is shown. **Figure 18** shows holder 24 of extraction unit 22 in a loading position. **Figure 19** shows holder 24 of extraction unit 22 in an extraction position. A skilled reader will understand that the system may be equally used with capsule 86 described in connection with **Figures 16 and 17**.

[0122] Referring to **Figure 18**, in the loading position, capsule 84 is inserted into cavity 26. In the loading position, cutting edges 42 of opener 40 remain outside of capsule 84.

[0123] Referring to **Figure 19**, in the extraction position, first and second parts 28, 30 of holder 24 are moved towards one another such that first face 32 of first part 28 contacts lid 18 and second face 33 of second part 30 contacts flange 60 of receptacle 46 to form a sealing contact between holder 24, lid 18 and receptacle 46.

[0124] As can be further seen in **Figure 19**, in the extraction position of holder 24, cutting blades 42 penetrate into receptacle 46 and penetrate into pouch 12 to form one or more openings 43 (e.g., three openings) in receptacle 46 and pouch 12. Once the one or more openings 43 are formed, liquid injector 34 injects liquid into cavity 26. Cavity 26 is filled with liquid. The liquid enters the inside of pouch 12 through the one or more openings 43, mixes with the beverage preparation ingredients and forms a beverage. Due to the rising pressure of the liquid being injected into cavity 26, lid 18 is pressed against pyramid plate 36 which tears open lid 18 under the effect of the internal pressure of the liquid. Once lid 18 is torn open, the beverage can be dispensed through the openings formed in lid 18.

[0125] Referring to **Figure 20**, a schematic cross-sectional view of another example of a beverage capsule 88 is shown.

[0126] Beverage capsule 88 includes pouch 12 made of alginate material, as described earlier. Beverage capsule 88 further includes a cup-shaped receptacle 90.

Cup-shaped receptacle 90 is re-usable, similar to re-usable receptacle 66. As already explained, the expression "re-usable" shall mean that receptacle 90 can be used multiple times as compared to the single-use receptacle 46. Receptacle 90 may be dish-washer safe.

[0127] Re-usable receptacle 90 includes at least one opening 78. The at least one opening 78 has not been produced by an opener of an extraction unit. The at least one opening 78 has been formed after or during production of re-usable receptacle 90. In the specific embodiment shown, the at least one opening 78 is formed on bottom face 80 of re-usable receptacle 90. A diameter of the at least one opening 78 may be such that pouch 12 cannot protrude through the at least one opening 78. In other words, bottom face 80 may still support pouch 12 despite of opening 78 being formed in bottom face 80. A diameter of the at least one opening 78 may be such that an opener of an extraction unit may have access to pouch 12 through the at least one opening 78, preferably without damaging the re-usable receptacle 90.

[0128] Referring to **Figure 21**, a detailed section view of a section of beverage capsule 88 is shown. As can be seen in **Figure 21**, re-usable receptacle 90 is removably engaged with pouch 12. A separated ring element 20 is arranged between re-usable receptacle 90 and pouch 12 to increase stability of pod 11 and/or a sealing engagement between lid 18, pouch 12 and re-usable receptacle 90. Pod 11 may be separated from re-usable receptacle 90, preferably without using tools, more preferably by hand, and pod 11 and re-usable receptacle 90 may be disposed separately from one another. If pod 11 is made of compostable material, e.g. if lid 18 is made of compostable material and pouch 12 is made of compostable alginate material, pod 11 can be composted. Re-usable receptacle 90 may be re-used, for example, with another pod. Re-usable receptacle 90 may be made of any suitable material, for example aluminum material and may be recyclable, but not necessarily.

[0129] A removable engagement between pod 11 and re-usable receptacle 90 may be similar to the removable engagement described in connection with re-usable receptacle 66.

[0130] Referring to **Figure 22**, an example of a system including a capsule 88 as described in **Figures 20 and 21** and an extraction unit 22 as described in **Figures 3 and 4** is shown. **Figure 22** shows holder 24 of extraction unit 22 in a loading position. **Figure 23** shows holder 24 of extraction unit 22 in an extraction position. A skilled reader will understand that the system may be equally used with any other suitable capsule.

[0131] Referring to **Figure 22**, in the loading position, capsule 88 is inserted into cavity 26. In the loading position, cutting edges 42 of opener 40 remain outside of capsule 88.

[0132] As can be seen in **Figure 23**, in the extraction position, first and second parts 28, 30 of holder 24 are moved towards one another such that first face 32 of first part 28 contacts lid 18 and thereby applies pressure to

separate ring element 20 to form a sealing contact between holder 24, ring element 20, lid 18 and re-usable receptacle 90. In other words, capsule 88 is safely clamped within holder 24 and a sealing engagement between holder 24 and capsule 88 is established. A skilled reader will understand that a sealing engagement may still be validly formed without using the separate ring element 20. In other words, the separate ring element 20 is not necessary for providing a sealing engagement, but may assist in improving the sealing engagement.

[0133] As can be seen in **Figure 23**, re-usable receptacle 90 and/or opening 78 are preferably designed such that in the extraction position of holder 24, cutting blades 42 of opener 40 do not damage re-usable receptacle 90. Additionally or alternatively, re-usable receptacle 90 and/or opening 78 may be dimensioned such that a plurality of cutting blades 42 can fit through the at least one opening 78. Additionally or alternatively, a dimension of the at least one opening 78 may be such that capsule 88 is stabilized when the holder 24 is in the extraction position.

[0134] Once the holder 24 moves from the loading position into the extraction position, cutting blades 42 penetrate pouch 12 and form one or more openings 43 in pouch 12. Then, liquid injector 34 injects liquid into cavity 26. Cavity 26 is filled with liquid. The liquid enters the inside of re-usable receptacle 90 through opening 78. The liquid then enters the inside of pouch 12 through openings 43 formed by cutting blades 42. The liquid then mixes with beverage preparation ingredients contained inside the pouch 12 and forms the beverage. Due to the rising pressure of the liquid being injected into cavity 26, lid 18 is pressed against pyramid plate 36 which tears open lid 18 under the effect of the internal pressure of the liquid. Once lid 18 is torn open, the beverage can be dispensed through the openings formed in lid 18.

[0135] A person skilled in the art will understand that any suitable pod may be used in combination with re-usable receptacle 90 as long as beverage can be dispensed through the lid of the pod.

[0136] Capsule 88 is designed such that it can be used in an extraction unit 22 similar to the one described in, for example, EP 0 512 470 A1, EP 2 919 628 A1. The advantage of using capsule 88 instead of known capsules is that once the beverage is prepared in the beverage preparation machine, capsule 88 can be removed from the machine and pods can be separated from the re-usable receptacle 90 and disposed and/or composted separately.

[0137] Referring to **Figure 24**, a schematic cross-sectional view of an example of a lid 18 including a barrier structure against oxygen and/or moisture is shown. The barrier structure is described in more detail in WO 2022/53339 A1, which is incorporated herein by reference in its entirety. As such, only a briefly explanation is given.

[0138] As can be seen in **Figure 24**, lid 18 is connected to rim section 48 of pod 10. The connection between lid 18

and rim section 48 may be accomplished, for example, by heat-sealing or adhesive bonding. An adhesive layer or a sealable coating 92 may be provided between lid 18 and rim section 48.

[0139] A filter layer 94 of lid 18 is configured to filter out particles from the prepared beverage. Filter layer 94 may be a film, membrane or ply with a defined thickness. Filter layer 94 may be made of compostable material, preferably a non-woven compostable material such as cellulose fibres or PLA. Further examples may be wood pulp, sugarcane pulp, rayon fibres, PBS, PBS-a, and/or PHB.

[0140] A retention layer 96 of lid 18 is configured to be opened upon interaction with a lid opening structure of a beverage preparation machine as previously described. Retention layer 96 may be a film, membrane or ply with a defined thickness and preferably with a substantially planar surface. Retention layer 96 may be made of compostable material. Additionally or alternatively, retention layer 96 or a material thereof may have a defined fibre structure, such as a closed fibre structure. For example, a material of retention layer 96 may be a fibre structure with at least 50% of weight corresponding to softwood pulp. Further examples for the material of retention layer 96 may be one or any combination of the group of cellulose fibres, paper, biopolyesters, PHA, PHB and co-polymers, PBS, PBS-A, PVOH and/or polymers where at least one of the monomer units is vinyl alcohol.

[0141] A protective layer 98 may be provided. Protective layer 98 provides a barrier, preferably a bidirectional barrier, against oxygen and/or moisture. Protective layer 98 may be made of a compostable material, such as biopolymers or bioplastic families such as PHB and co-polymers, PBS, PBS-A, PLA, PBAT, Cellulose Acetate, starch, PVOH, and it may include polymers where at least one of the monomer units is vinyl alcohol, as well as compounds or laminates of any of the above mentioned materials. Protective layer 98 may be part of the adhesive layer 92 providing the sealable coating between lid 18 and rim section 48. Protective layer 98 may be provided at a portion or across the entire lid 18. Protective layer 98 may form a layer of lid 18. Additionally or alternatively, retention layer 96 or a material thereof may be configured such that it provides a barrier, preferably a bidirectional barrier, against oxygen and/or moisture. Lid 18 may comprise additional layers not shown.

[0142] A person skilled in the art will understand that a similar structure may be provided in the pod 11 described with reference to **Figure 2**.

[0143] Referring to **Figure 25**, a schematic cross-sectional view of another example of a lid 18 including a barrier structure against oxygen and/or moisture is shown. The barrier structure is described in more detail in WO 2020/114995 A1, which is incorporated herein by reference in its entirety. As such, only a briefly explanation is given.

[0144] Lid 18 includes a paper layer and a plastic laminate layer (or "plastic laminate sealing layer", or "sealing layer"). Preferably, the paper layer forms an

outer side 18b of lid 18 and the plastic laminate layer (or "sealing layer") forms an inner side 18a of lid 18. In another embodiment not shown, the multilayer material of lid 18 may include a plastic layer, a paper layer and a plastic laminate layer (or "sealing layer"). Preferably, the plastic layer forms the outer side 18b of lid 18, the paper layer forms an intermediate layer, and the plastic laminate layer forms the inner side 18a of lid 18. Multilayer lid 18 and in particular the plastic laminate layer may form an oxygen/moisture barrier so that liquid and/or gaseous substances cannot penetrate lid 18.

[0145] A skilled reader will understand that any of the described embodiments may be combined in any suitable way.

[0146] The following aspects are preferred embodiments of the invention:

1. A beverage pod (10, 11) configured for preparing a beverage upon injection of liquid into the pod (10, 11), the pod (10, 11) comprising:
 - a pouch (12) configured for holding beverage preparation ingredients therein,
 - preferably a ring-shaped support (14) extending at least partially around a top portion of the pouch (12), wherein the ring-shaped support (14) provides a top opening (16) of the pod (10, 11), and
 - a lid (18) connected to the support (14) and/or the pouch (12) for closing the top opening (16), wherein the pod (10, 11) is configured for receiving liquid through the pouch (12) such that the liquid is mixed with the beverage preparation ingredients inside the pouch for forming a beverage, and
 - wherein the lid (18) is configured for dispensing the beverage from an inside of the pouch (12) to an outside of the pod (10, 11).
2. The pod (10, 11) of aspect 1, wherein the lid (18) is configured to be pierced by a pyramid plate (36).
3. The pod (10, 11) of aspect 2, wherein the pyramid plate (18) is configured for creating a plurality of openings in the lid (18) for dispensing the beverage therethrough.
4. The pod (10, 11) of any one of aspects 1-3, wherein the lid (18) is configured as an oxygen and/or moisture barrier, preferably as a bidirectional oxygen and/or moisture barrier for preventing oxygen and/or moisture permeating through the lid (18).
5. The pod (10, 11) of any one of aspects 1-4, wherein the pod (10, 11) is compostable, preferably wherein the pod (10, 11) is made of a compostable plastic material, more preferably a compostable thermoplastic polymer material.

6. The pod (10, 11) of any one of aspects 1-5, wherein the pouch (12) is made of a compostable material, preferably a compostable non-woven plastic material, preferably wherein the material is permeable to liquid.

7. The pod (10, 11) of any one of aspects 1-5, wherein the pouch (12) is made of alginate material, preferably compostable alginate material, preferably wherein the material is non-permeable to liquid.

8. The pod (10, 11) of any one of aspects 1-7, wherein the pouch (12) includes a first rigidity and the ring-shaped support (14) includes a second rigidity higher than the first rigidity.

9. The pod (10) of aspect 8, wherein the ring-shaped support (14) is a ring section of the pouch (12).

10. The pod (10) of aspect 9, wherein the ring section is formed by a heat treatment of a portion of the pouch (12).

11. The pod (11) of aspect 8, wherein the ring-shaped support (14) is a ring element (20) connected to the pouch (12).

12. The pod (10, 11) of any one of aspects 1-11, wherein the pod (10, 11) is configured to sealingly engage with a cup-shaped receptacle (46, 66) for forming a beverage capsule (44, 62, 64).

13. The pod (10, 11) of aspect 12, wherein the support (14) includes a rim section (48) configured for sealingly engaging with a receiving section (50) of the cup-shaped receptacle (46, 66).

14. A beverage capsule (44, 62, 64, 84, 86, 88) configured for preparing a beverage upon injection of liquid into the capsule (44, 62, 64, 84, 86, 88), the capsule (44, 62, 64, 84, 86, 88) comprising:

- a beverage pod (10, 11) including
 - a pouch (12) configured for holding beverage preparation ingredients therein,
 - a ring-shaped support (14) extending at least partially around a top portion of the pouch (12), wherein the ring-shaped support (14) provides a top opening (14) of the pod (10, 11),
 - a lid (18) connected to the support (14) and/or the pouch (12) for closing the top opening (16), and
- a cup-shaped receptacle (46, 66, 90) for receiving the pod (10, 11), wherein the pod (10, 11) and the receptacle (46, 66, 90) are engaged, pre-

ferably sealingly engaged, for forming the capsule (44, 62, 64, 84, 86, 88).

15. The capsule (44, 62, 64, 84, 86, 88) of aspect 14, wherein the pod (10, 11) is removable from the receptacle (46, 66, 90), preferably wherein the pod (10, 11) is removable from the receptacle (46, 66, 90) without using tools, more preferably wherein the pod (10, 11) is removable from the receptacle (46, 66, 90) by hand.

16. The capsules (44, 62, 64, 84, 86, 88) of any one of aspects 14-15, wherein the engagement is configured for facilitating a separation of the pod (10, 11) from the receptacle (46, 66, 90), preferably without using tools, more preferably by hand.

17. The capsule (44, 62, 64, 84, 86, 88) of any one of aspects 14-16, wherein

- the support (14) includes a rim section (48), and
- the receptacle (46, 66, 90) includes a receiving section (50) in a sealing contact with, or configured to be sealingly engaged with, the rim section (48).

18. The capsule (44, 62, 64, 84, 86, 88) of aspect 17, wherein the rim section (48) and/or the receptacle (46, 66, 90) is configured for being clamped in an extraction unit (22) of a beverage preparation machine.

19. The capsule (44, 62, 64, 84, 86, 88) of aspect 18, wherein the receptacle (46, 66, 90) includes an outer flange (82) configured for being clamped in the extraction unit (22), preferably wherein the clamping presses the outer flange (50) onto the rim section (48).

20. The capsule (44, 62, 64, 84, 86, 88) of any one of aspects 14-19, wherein the receptacle (46, 66, 90) has a cylindrical shape or a frustoconical shape or a domical shape or a frustodomical shape.

21. The capsule (44, 62, 64, 84, 86, 88) of any one of aspects 14-20, wherein the receptacle (46, 66, 90) includes an opening (43, 78) configured for delivering liquid into the pod (10, 11) such that a beverage is formed, wherein the pod (10, 11) is configured to dispense the beverage through the lid (18).

22. The capsule (44, 62, 64, 84, 86, 88) of any one of aspects 14-21, wherein the receptacle (46, 66, 90) is made of non-compostable material, preferably wherein the receptacle (46, 66, 90) is made of a recyclable material, in particular a recyclable aluminium alloy material.

23. The capsule (44, 62, 64, 84, 86, 88) of any one of aspects 14-22, wherein the pod (10, 11) is made of compostable material, preferably wherein the pod (10, 11) is made of a compostable plastic material, more preferably a compostable thermoplastic polymer material.

24. The capsule (44, 62, 64, 84, 86, 88) of any one of aspects 14-23, wherein the pouch (12) is made of a compostable material, preferably a compostable non-woven plastic material, more preferably a material that is permeable to liquid, or, wherein the pouch (12) is made of alginate material, preferably of compostable alginate material, more preferably of a material that is non-permeable to liquid.

25. The capsule (44, 62, 64, 84, 86, 88) of any one of aspects 14-24, wherein the pod is a single-serve disposable pod (10, 11).

26. The capsule (64, 88) of any one of aspects 14-25, wherein the cub-shaped receptacle is a re-usable receptacle (66, 90).

27. The capsule (64, 88) of aspect 26, wherein the re-usable receptacle (66, 90) includes one or more openings (78) configured for liquid to be injected into the receptacle (66).

28. The capsule (64) of any one of aspects 26-27, wherein the re-usable receptacle (66) includes a bottom portion (68), a top portion (70) and an intermediate portion (72) connecting the bottom portion (68) with the top portion (70), wherein the intermediate portion (72) includes a shoulder portion (74) extending radially outward from the bottom portion (68), wherein the one or openings (78) are arranged on the shoulder portion (74).

29. The capsule (64, 88) of any one of aspects 26-28, wherein the pod (10, 11) is in a removable engagement with the re-usable receptacle (66, 90).

30. A system comprising a beverage capsule (44, 62, 84, 86) according to any one of aspects 14-25 and an extraction unit (22) for extracting a beverage from the capsule (44, 62, 84, 86), wherein

- the extraction unit (22) includes a holder (24) for holding the capsule (44, 62, 84, 86) and an opener (40) for opening the capsule (44, 62, 84, 86),
- wherein the opener (40) includes at least one cutting edge (42) for forming an opening (43) into the receptacle (46) and/or the lid (18) for dispensing liquid therethrough.

31. The system of aspect 30, wherein the opener (40) is arranged such that the at least one cutting edge (42) does not penetrate the pouch (12), or wherein the opener (40) is arranged such that the at least one cutting edge (42) penetrates the pouch (12) for forming an opening (43) therein. 5

32. The system of any one of aspects 30-31, wherein the at least one cutting edge (42) is moveable between a first position and a second position, wherein in the first position the at least one cutting edge (42) is arranged outside the capsule (44, 62, 84, 86), wherein in the second position the at least one cutting edge (42) is at least partially arranged inside the capsule (44, 62, 84, 86) for forming the opening (43) in the receptacle (46), and wherein in the second position the at least one cutting edge (42) is arranged outside of the pouch (12) or arranged inside the pouch (12). 10 15

33. A system comprising a beverage capsule (64, 88) according to any one of aspects 26-29 and an extraction unit (22) for extracting a beverage from the capsule (64, 88), wherein 20

- the extraction unit (22) includes a holder (24) for holding the capsule (64, 88) and a liquid injector (34) for injecting liquid into the capsule (64, 88), 25
- wherein the liquid is injected through the one or more openings (78) provided in the re-usable receptacle (66, 90). 30

34. The system of aspect 33, wherein the re-usable receptacle (66, 90) is arranged in the holder (24) such that an opener (40) of the extraction unit (22) does not penetrate the re-usable receptacle (66, 90) during preparation of the beverage. 35

35. A system comprising a beverage pod (10, 11) according to any one of aspects 1 to 13 and an extraction unit (22) for extracting a beverage from the pod (10, 11), wherein 40

- the extraction unit (22) includes a holder (24) for holding the pod (10, 11) and a liquid injector (34) for injecting liquid into the pod (10, 11), 45
- wherein the liquid is injected into the pouch (12) of the pod (10, 11) and beverage is dispensed through the lid (18) of the pod (10, 11).

36. The system of any one of aspects 30-35, wherein 50

- the holder (24) includes a cavity (26), and
- the capsule (44, 62, 64, 84, 86, 88) or pod (10, 11) is received in the cavity (26) for forming a sealing contact with the holder (24). 55

37. The system of any one of aspects 30-36, wherein the holder (24) includes a first part (28) and a second

part (30) relatively movable to one another between a loading position and an extraction position, wherein upon moving the first and/or second part (28, 30) from the loading position into the extraction position, a face (32) of the first part (28) contacts the support (14) of the pod (10, 11) such that the holder (24) and the support (14) form a sealing contact therebetween.

38. Use of a capsule (44, 62, 64, 84, 86, 88) according to any one of aspects 14-29, the method including the steps of:

- inserting the capsule (44, 62, 64, 84, 86, 88) into a beverage preparation machine,
- preparing a beverage by injecting liquid into the receptacle (46, 66, 90) whereby liquid is mixed with beverage preparation ingredients inside the pod (10, 11) for forming a beverage that is dispensed through the lid (18) of the pod (10, 11),
- removing the capsule (44, 62, 64, 84, 86, 88) from the beverage preparation machine, and
- preferably separating the pod (10, 11) from the receptacle (46, 66, 90).

39. The method of aspect 38, wherein the step of separating the pod (10, 11) from the receptacle (46, 66, 90) is performed manually, preferably without using tools, more preferably by hand.

40. Use of a pod (10, 11) according to any one of aspects 1-13, the method including the steps of:

- inserting the pod (10, 11) into a beverage preparation machine,
- preparing a beverage by injecting liquid into the pouch (12) of the pod (10, 11) whereby liquid is mixed with beverage preparation ingredients inside the pouch (12) for forming a beverage that is dispensed through the lid (18) of the pod (10, 11),
- removing the pod (10, 11) from the beverage preparation machine, and
- preferably disposing the pod (10, 11) without separating any components of the pod (10, 11).

41. The method of aspect 40, wherein the pod (10, 11) is compostable and the step of disposing the pod (10, 11) includes composting the pod (10, 11) as a whole.

Claims

1. A beverage pod (10, 11) configured for preparing a beverage upon injection of liquid into the pod (10, 11), the pod (10, 11) comprising:

- a pouch (12) configured for holding beverage preparation ingredients therein,
 - a ring-shaped support (14) extending at least partially around a top portion of the pouch (12), wherein the ring-shaped support (14) provides a top opening (16) of the pod (10, 11), and
 - a lid (18) connected to the support (14) and/or the pouch (12) for closing the top opening (16),
 - wherein the pod (10, 11) is configured for receiving liquid through the pouch (12) such that the liquid is mixed with the beverage preparation ingredients inside the pouch for forming a beverage, and
 - wherein the lid (18) is configured for dispensing the beverage from an inside of the pouch (12) to an outside of the pod (10, 11).
2. The pod (10, 11) of claim 1, wherein the lid (18) is configured to be pierced by a pyramid plate (36), wherein the pyramid plate (18) is configured for creating a plurality of openings in the lid (18) for dispensing the beverage therethrough.
3. The pod (10, 11) of any one of claims 1-2, wherein the pouch (12) includes a section having a first rigidity and the ring-shaped support (14) includes a section having a second rigidity higher than the first rigidity, preferably wherein the ring-shaped support (14) is a ring section of the pouch (12) and/or a separate ring element (20) connected to the pouch (12).
4. The pod (10, 11) of any one of claims 1-3, wherein the pod (10, 11) is configured to sealingly engage with a cup-shaped receptacle (46, 66) for forming a beverage capsule (44, 62, 64), preferably wherein the support (14) includes a rim section (48) configured for sealingly engaging with a receiving section (50) of the cup-shaped receptacle (46, 66).
5. A beverage capsule (44, 62, 64, 84, 86, 88) configured for preparing a beverage upon injection of liquid into the capsule (44, 62, 64, 84, 86, 88), the capsule (44, 62, 64, 84, 86, 88) comprising:
- a beverage pod (10, 11) including
 - a pouch (12) configured for holding beverage preparation ingredients therein,
 - a ring-shaped support (14) extending at least partially around a top portion of the pouch (12), wherein the ring-shaped support (14) provides a top opening (14) of the pod (10, 11),
 - a lid (18) connected to the support (14) and/or the pouch (12) for closing the top opening (16), and
 - a cup-shaped receptacle (46, 66, 90) for receiving the pod (10, 11), wherein the pod (10, 11) and the receptacle (46, 66, 90) are engaged, preferably sealingly engaged, for forming the capsule (44, 62, 64, 84, 86, 88).
6. The capsule (44, 62, 64, 84, 86, 88) of claim 5, wherein the pod (10, 11) is removable from the receptacle (46, 66, 90), preferably wherein the pod (10, 11) is removable from the receptacle (46, 66, 90) without using tools, more preferably wherein the pod (10, 11) is removable from the receptacle (46, 66, 90) by hand, preferably wherein the engagement is configured for facilitating a separation of the pod (10, 11) from the receptacle (46, 66, 90), preferably without using tools, more preferably by hand.
7. The capsule (44, 62, 64, 84, 86, 88) of any one of claims 5-6, wherein
- the support (14) includes a rim section (48), and
 - the receptacle (46, 66, 90) includes a receiving section (50) in a sealing contact with, or configured to be sealingly engaged with, the rim section (48),
 - preferably wherein the rim section (48) and/or the receptacle (46, 66, 90) is configured for being clamped in an extraction unit (22) of a beverage preparation machine,
 - preferably wherein the receptacle (46, 66, 90) includes an outer flange (82) configured for being clamped in the extraction unit (22), preferably wherein the clamping presses the outer flange (50) onto the rim section (48).
8. The capsule (44, 62, 64, 84, 86, 88) of any one of claims 5-7, wherein the receptacle (46, 66, 90) includes an opening (43, 78) configured for delivering liquid into the pod (10, 11) such that a beverage is formed, wherein the pod (10, 11) is configured to dispense the beverage through the lid (18).
9. The capsule (44, 62, 64, 84, 86, 88) of any one of claims 5-8, wherein
- the receptacle (46, 66, 90) is made of non-compostable material, preferably wherein the receptacle (46, 66) is made of a recyclable material, in particular a recyclable aluminum alloy material, and/or wherein
 - the receptacle (46, 66, 84, 86, 88) is a re-usable receptacle (66, 88), preferably wherein the re-usable receptacle (66, 88) includes one or more openings (78) configured for liquid to be injected into the receptacle (66, 88).
10. The pod (10, 11) of any one of claims 1-4 or the capsule (44, 62, 64, 84, 86, 88) of any one of claims 5-9, wherein the pod (10, 11) is made of compostable

material, preferably wherein the pod (10, 11) is made of a compostable plastic material, more preferably a compostable thermoplastic polymer material, preferably wherein the pouch (12) is made of a compostable non-woven plastic material or of an alginate material. 5

11. A system comprising a beverage capsule (44, 62, 84, 86) according to any one of claims 5-10 and an extraction unit (22) for extracting a beverage from the capsule (44, 62, 84, 86), wherein 10

- the extraction unit (22) includes a holder (24) for holding the capsule (44, 62, 84, 86) and an opener (40) for opening the capsule (44, 62), 15
- wherein the opener (40) includes at least one cutting edge (42) for forming an opening (43) into the receptacle (46) and/or the lid (18) for dispensing liquid therethrough, preferably wherein the opener (40) is arranged such that the at least one cutting edge (42) does not penetrate the pouch (12) or penetrates the pouch (12) for forming an opening (43) therein. 20

12. A system comprising a beverage capsule (64, 88) according to any one of claims 5-10 including a re-usable receptacle (66, 90) and an extraction unit (22) for extracting a beverage from the capsule (64, 88), wherein 25

- the extraction unit (22) includes a holder (24) for holding the capsule (64, 88) and a liquid injector (34) for injecting liquid into the capsule (64, 88), 30
- wherein the liquid is injected through the one or more openings (78) provided in the re-usable receptacle (66, 90), preferably wherein the re-usable receptacle (66, 90) is arranged in the holder (24) such that an opener (40) of the extraction unit (22) does not penetrate the re-usable receptacle (66, 90) during preparation of the beverage. 35 40

13. A system comprising a beverage pod (10, 11) according to any one of claims 1-4 and an extraction unit (22) for extracting a beverage from the pod (10, 11), wherein 45

- the extraction unit (22) includes a holder (24) for holding the pod (10, 11) and a liquid injector (34) for injecting liquid into the pod (10, 11), 50
- wherein the liquid is injected into the pouch (12) of the pod (10, 11) and beverage is dispensed through the lid (18) of the pod (10, 11). 55

14. Use of a capsule (44, 62, 64, 84, 86, 88) according to any one of claims 5-10, the method including the steps of:

- inserting the capsule (44, 62, 64, 84, 86, 88) into a beverage preparation machine,
- preparing a beverage by injecting liquid into the receptacle (46, 66, 90) whereby liquid is mixed with beverage preparation ingredients inside the pod (10, 11) for forming a beverage that is dispensed through the lid (18) of the pod (10, 11),
- removing the capsule (44, 62, 64, 84, 86, 88) from the beverage preparation machine, and
- separating the pod (10, 11) from the receptacle (46, 66, 90), preferably wherein the step of separating the pod (10, 11) from the receptacle (46, 66, 90) is performed manually, preferably without using tools, more preferably by hand.

15. Use of a pod (10, 11) according to any one of claims 1-4, the method including the steps of:

- inserting the pod (10, 11) into a beverage preparation machine,
- preparing a beverage by injecting liquid into the pouch (12) of the pod (10, 11) whereby liquid is mixed with beverage preparation ingredients inside the pouch (12) for forming a beverage that is dispensed through the lid (18) of the pod (10, 11), and
- removing the pod (10, 11) from the beverage preparation machine,
- preferably disposing the pod (10, 11) without separating any components of the pod (10, 11), wherein the pod (10, 11) is compostable and the step of disposing the pod (10, 11) includes composting the pod (10, 11) as a whole.

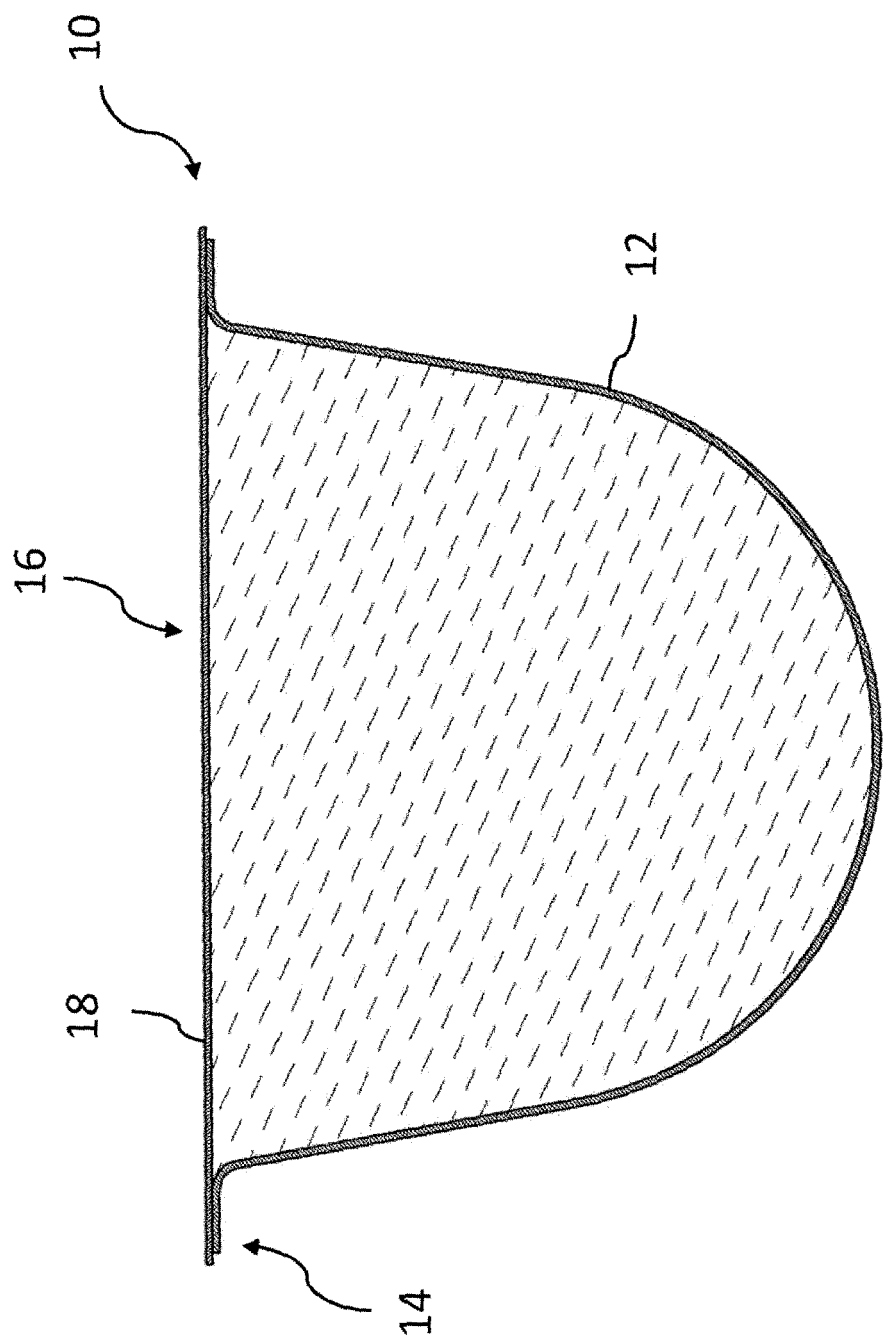


FIG. 1

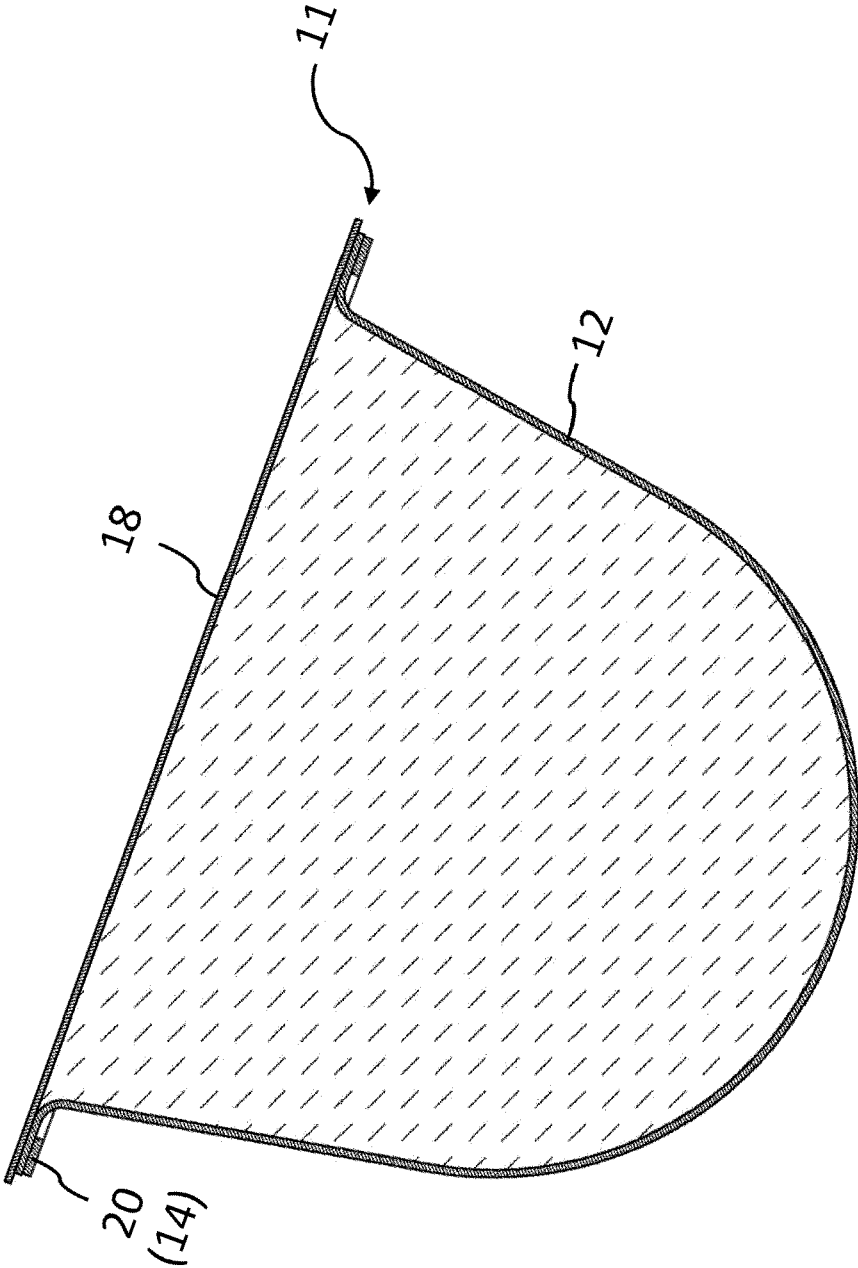


FIG. 2

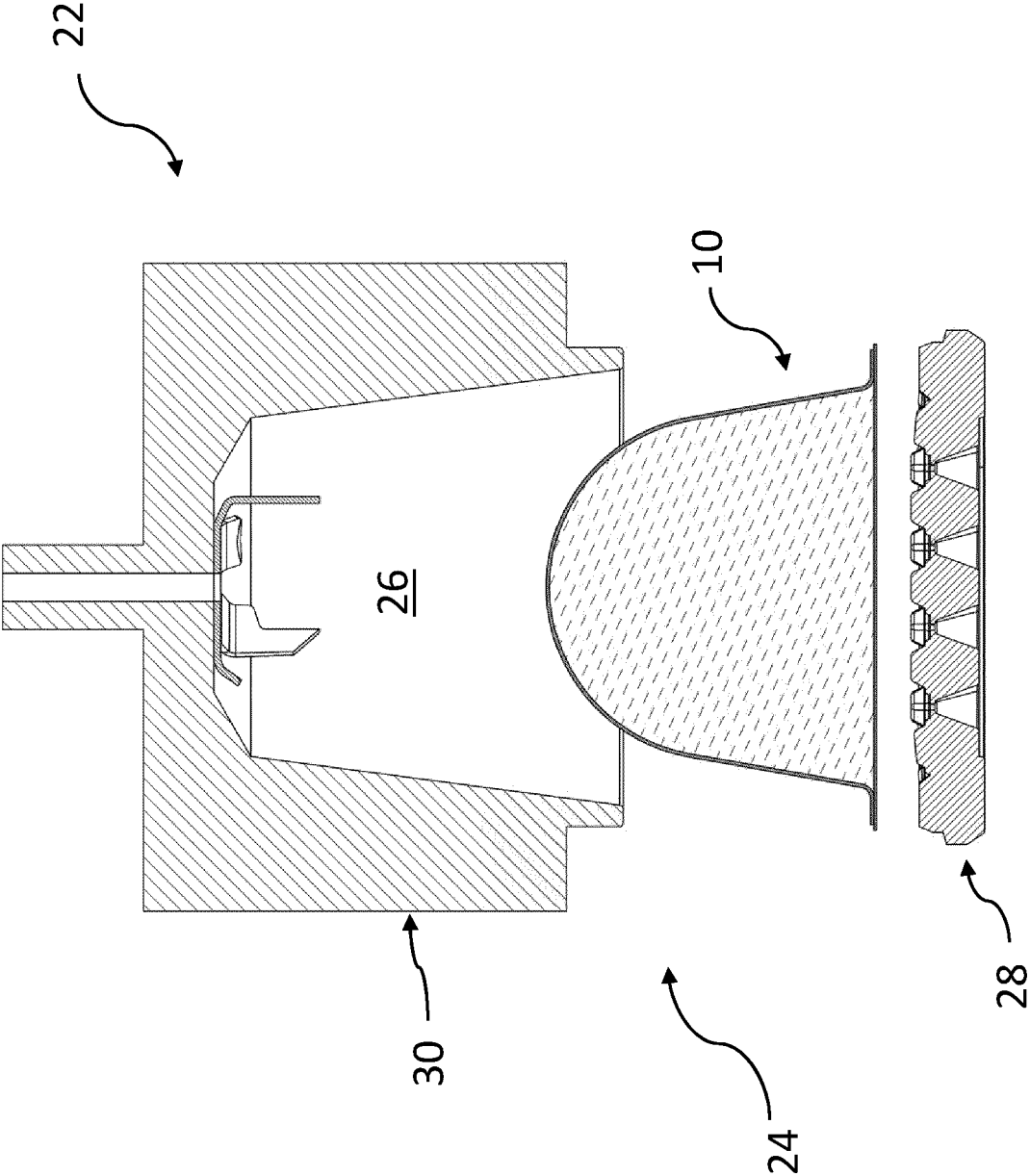


FIG. 3

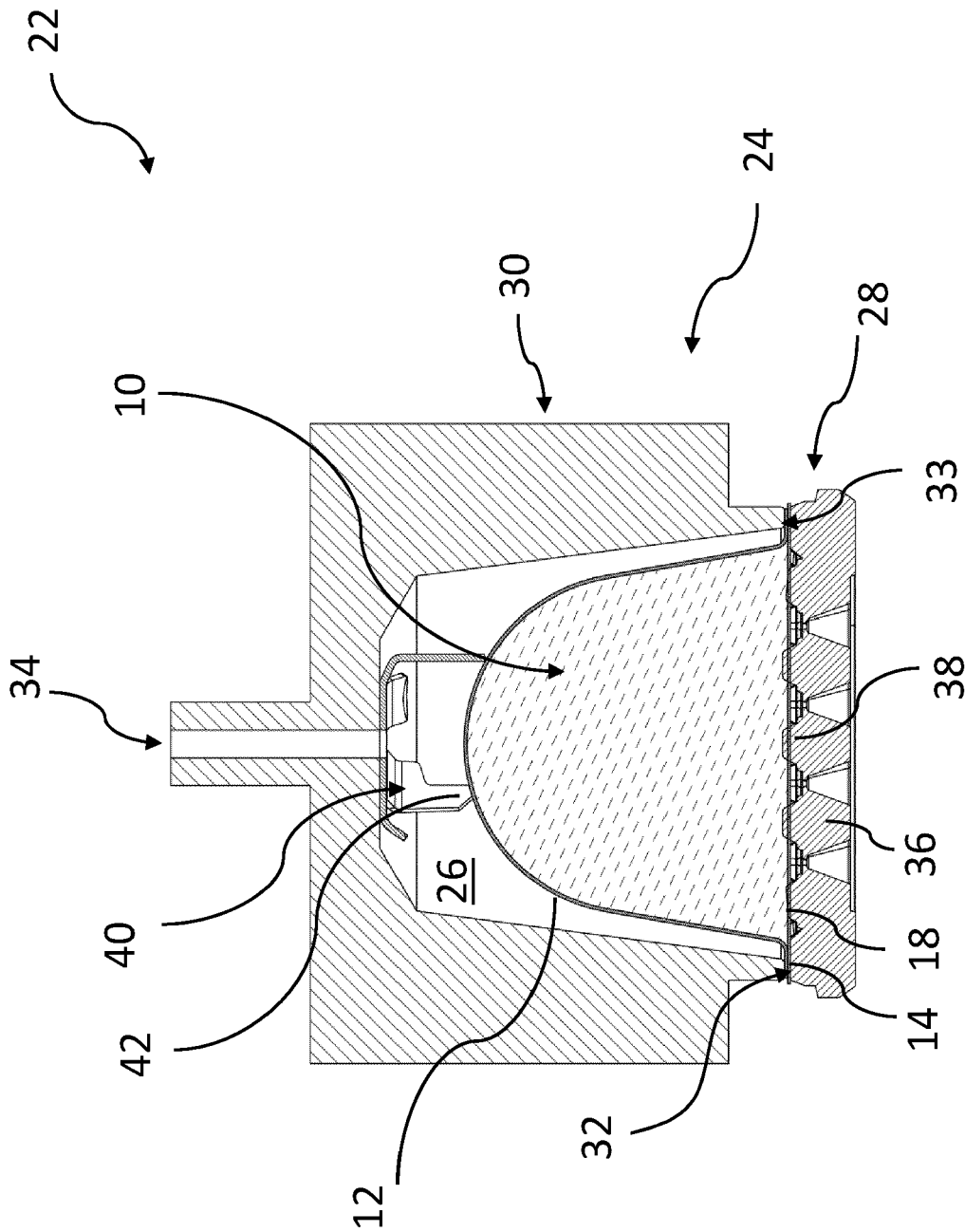


FIG. 4

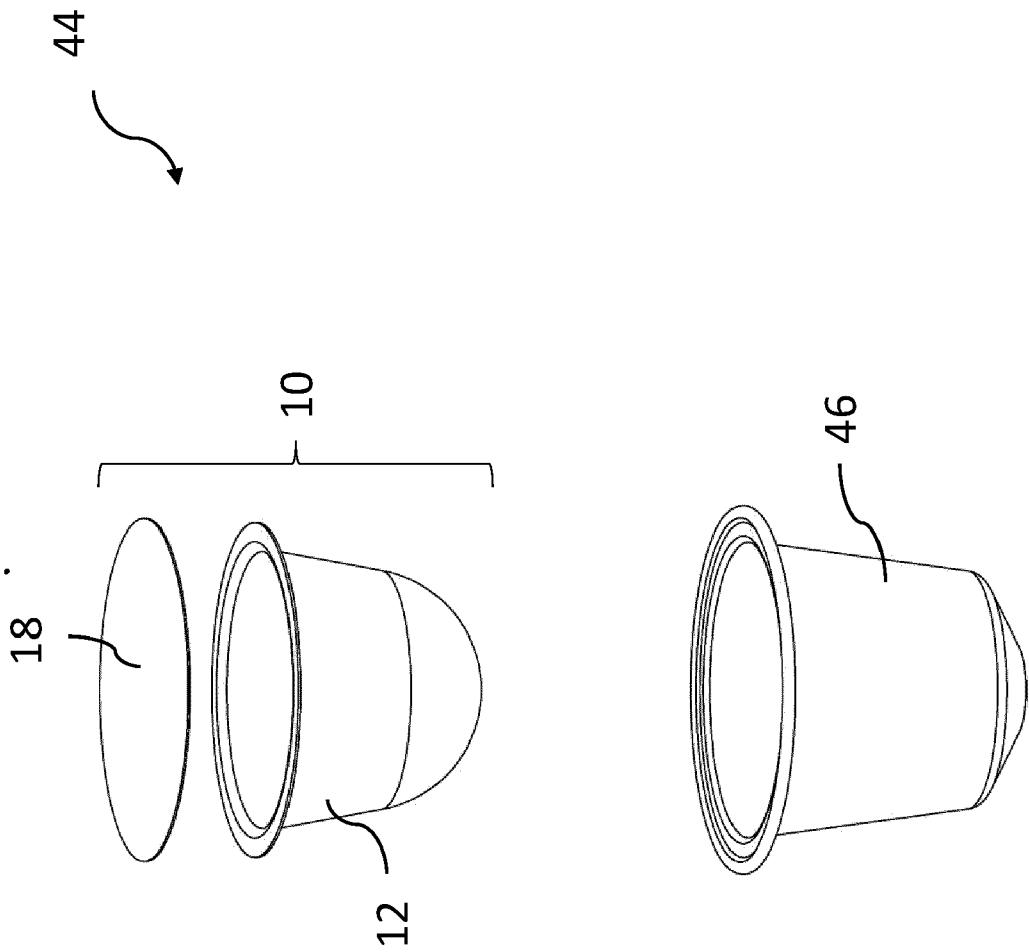


FIG. 5

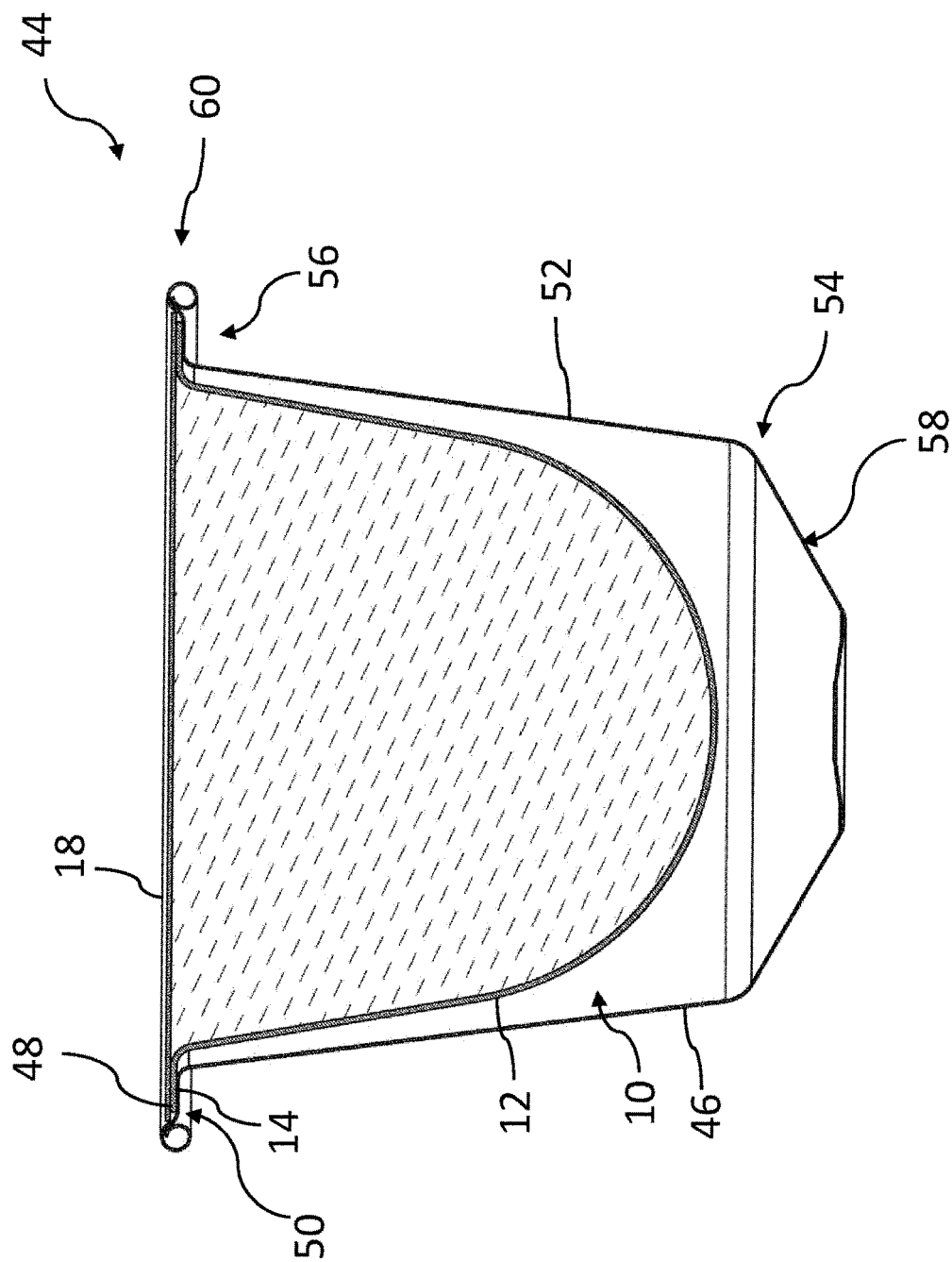


FIG. 6

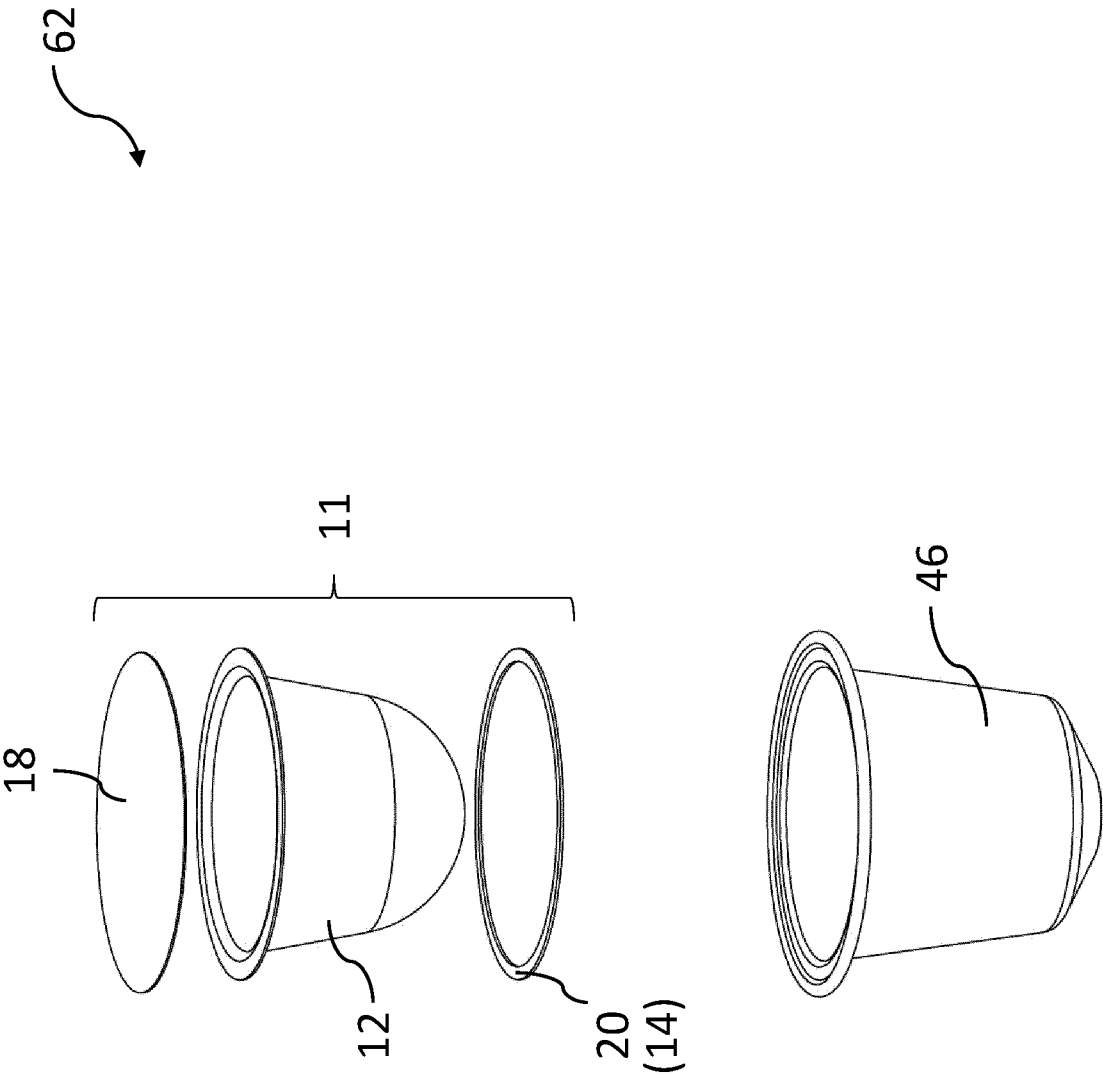


FIG. 7

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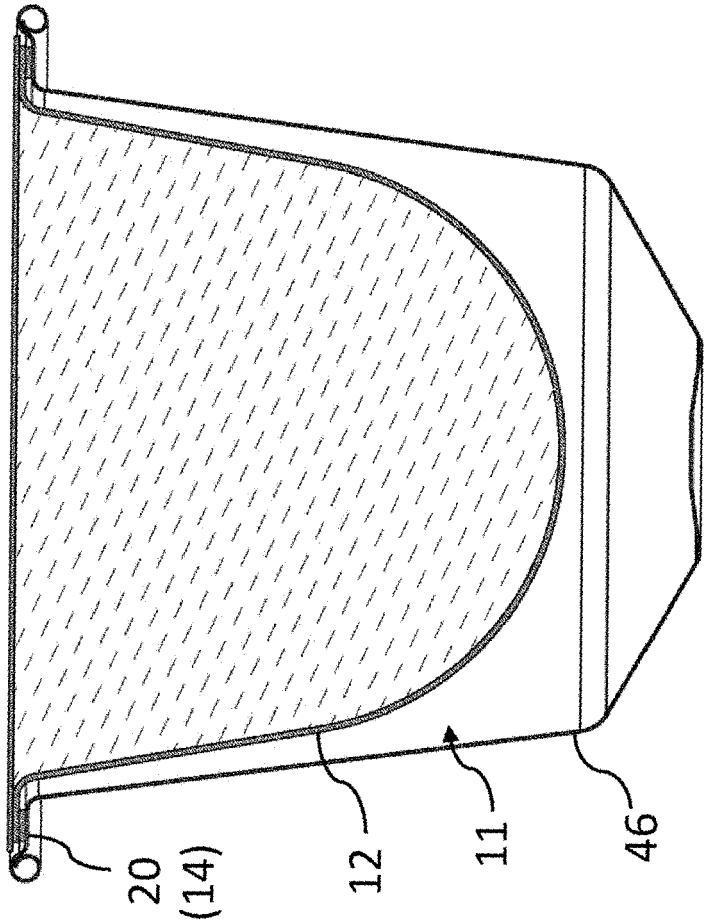


FIG. 8

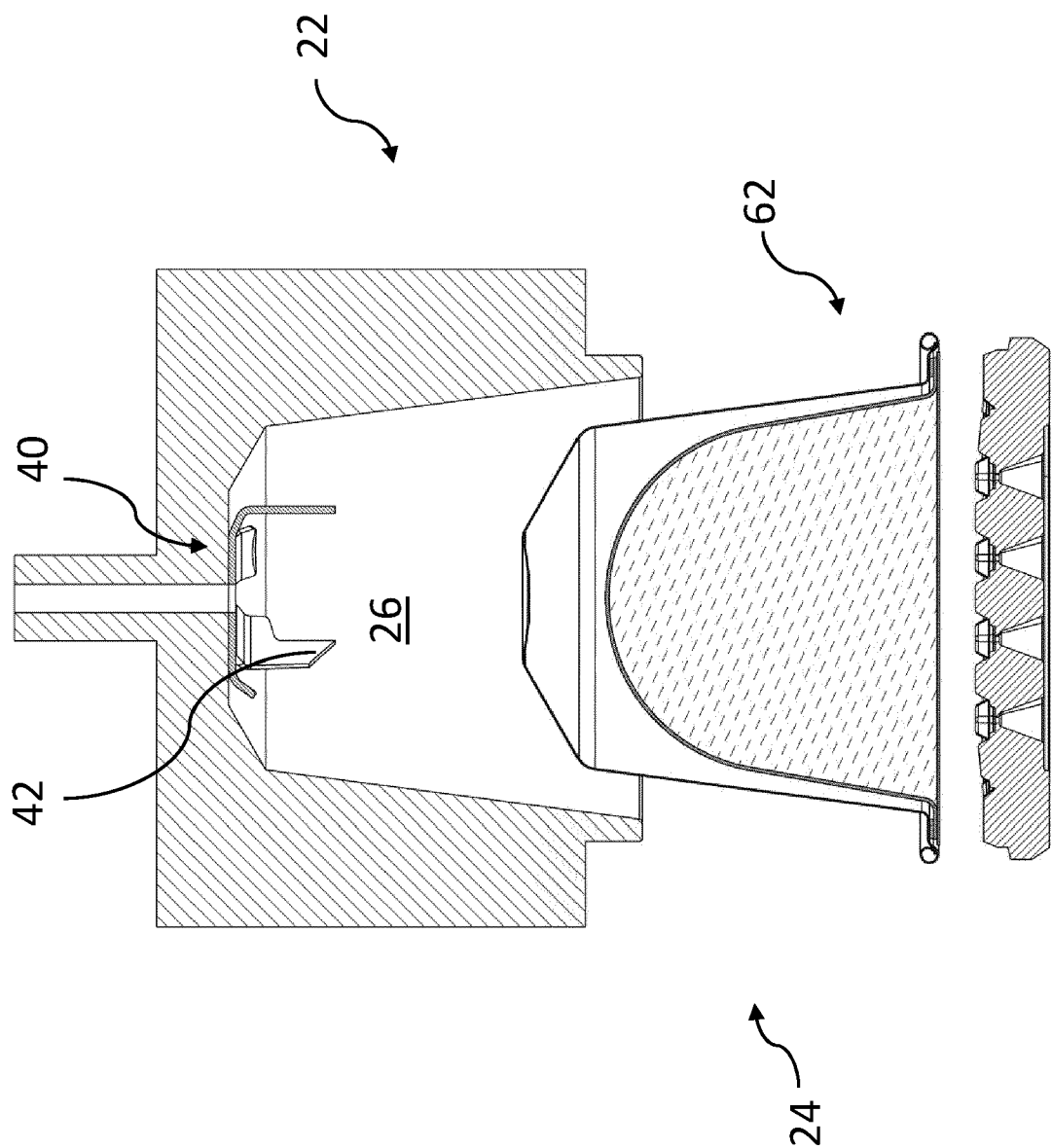


FIG. 9

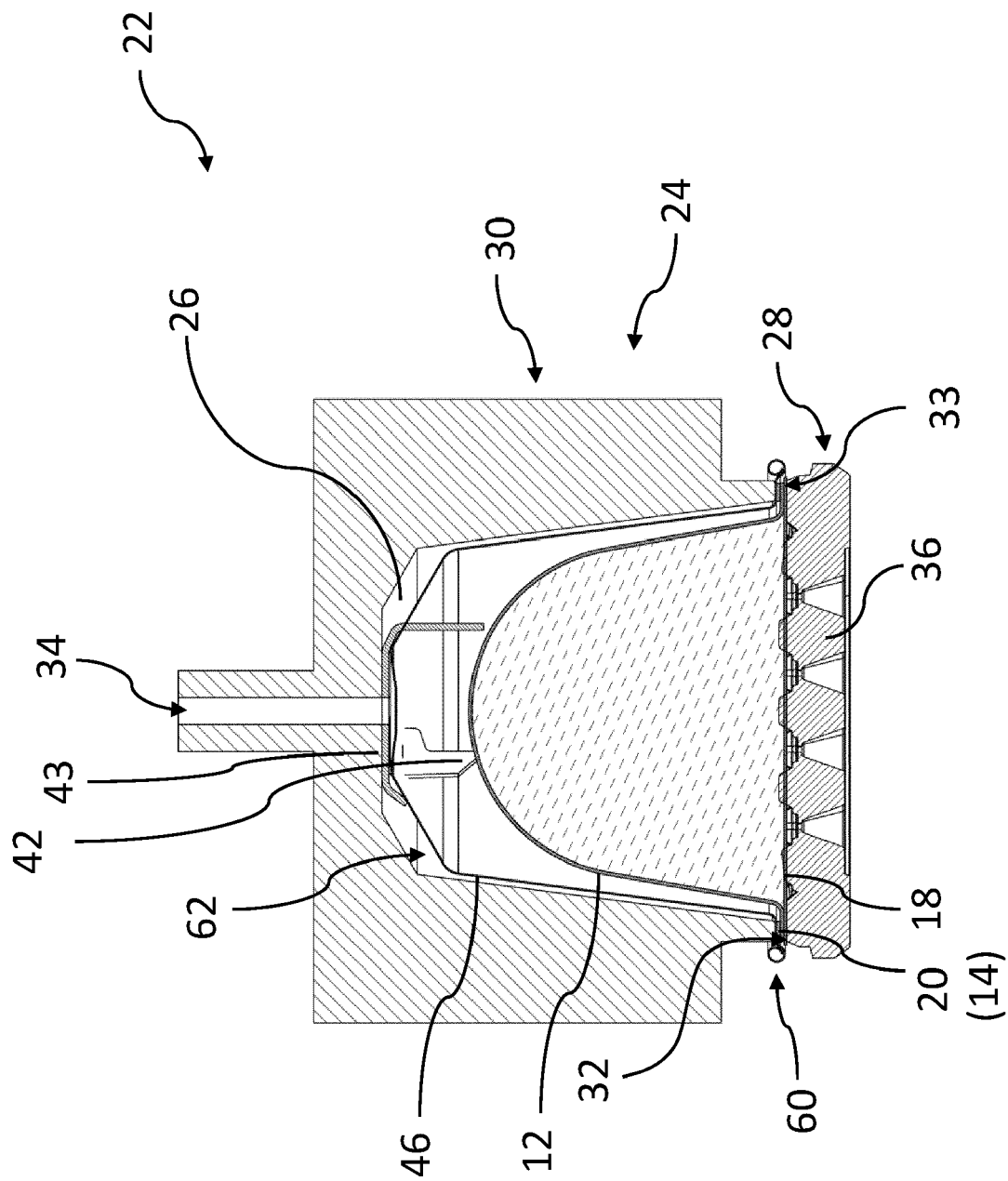


FIG. 10

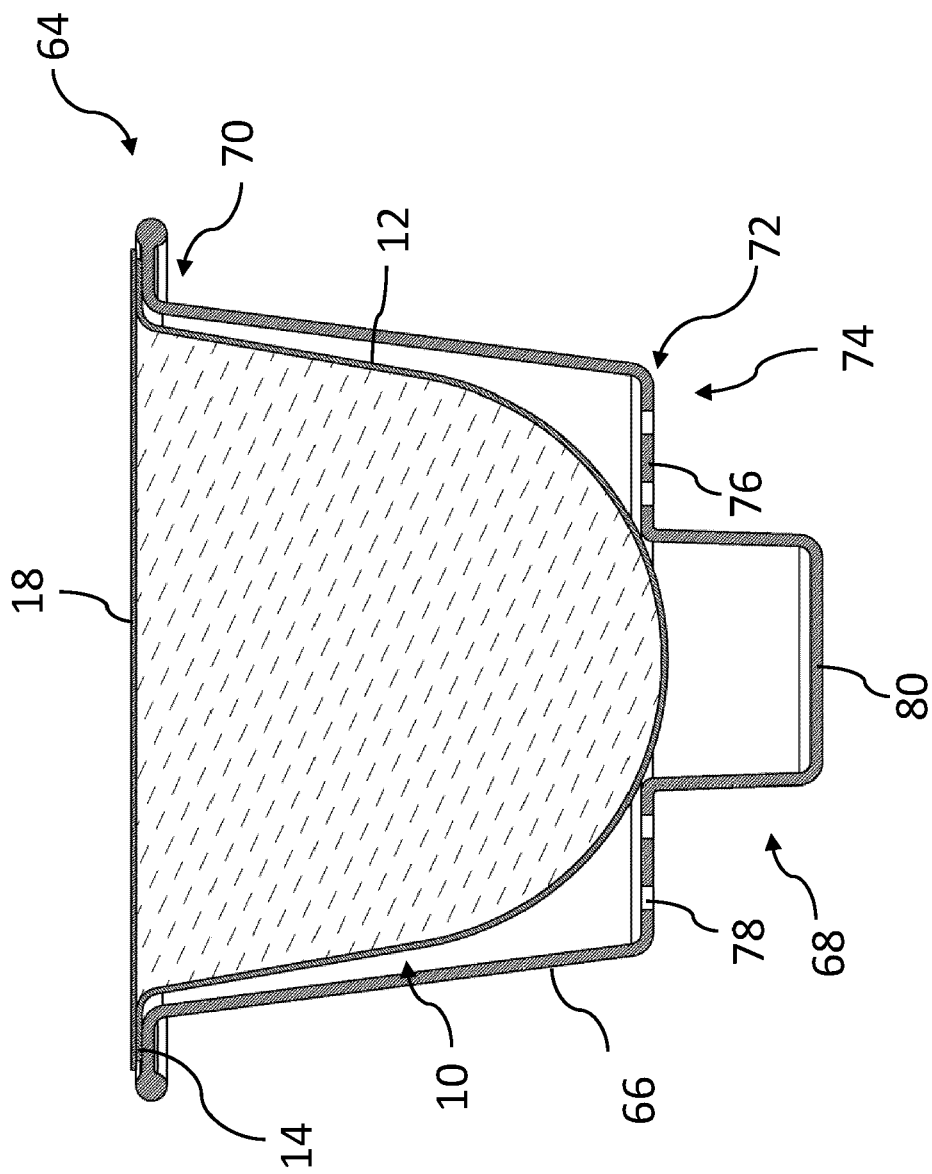


FIG. 11

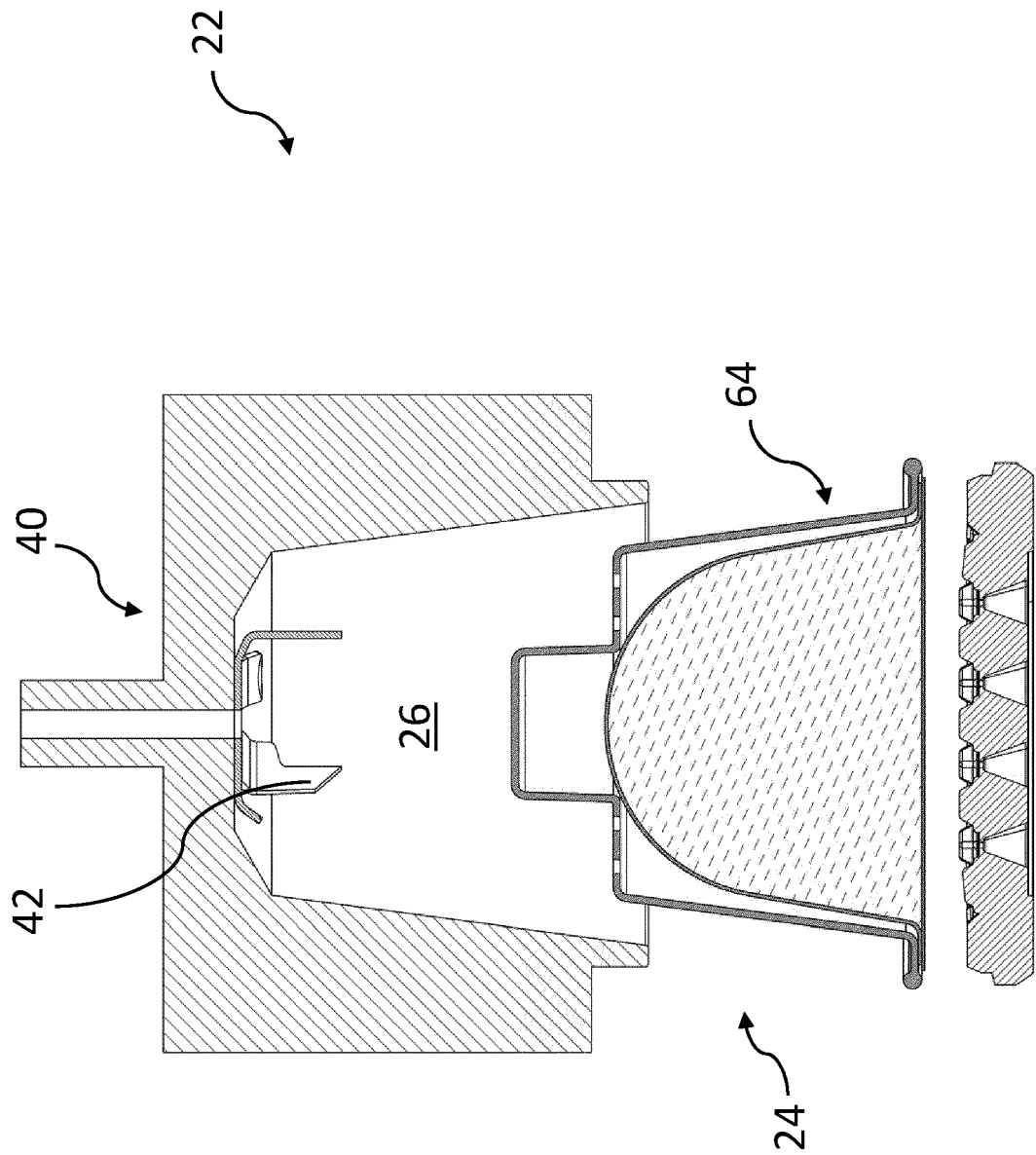


FIG. 12

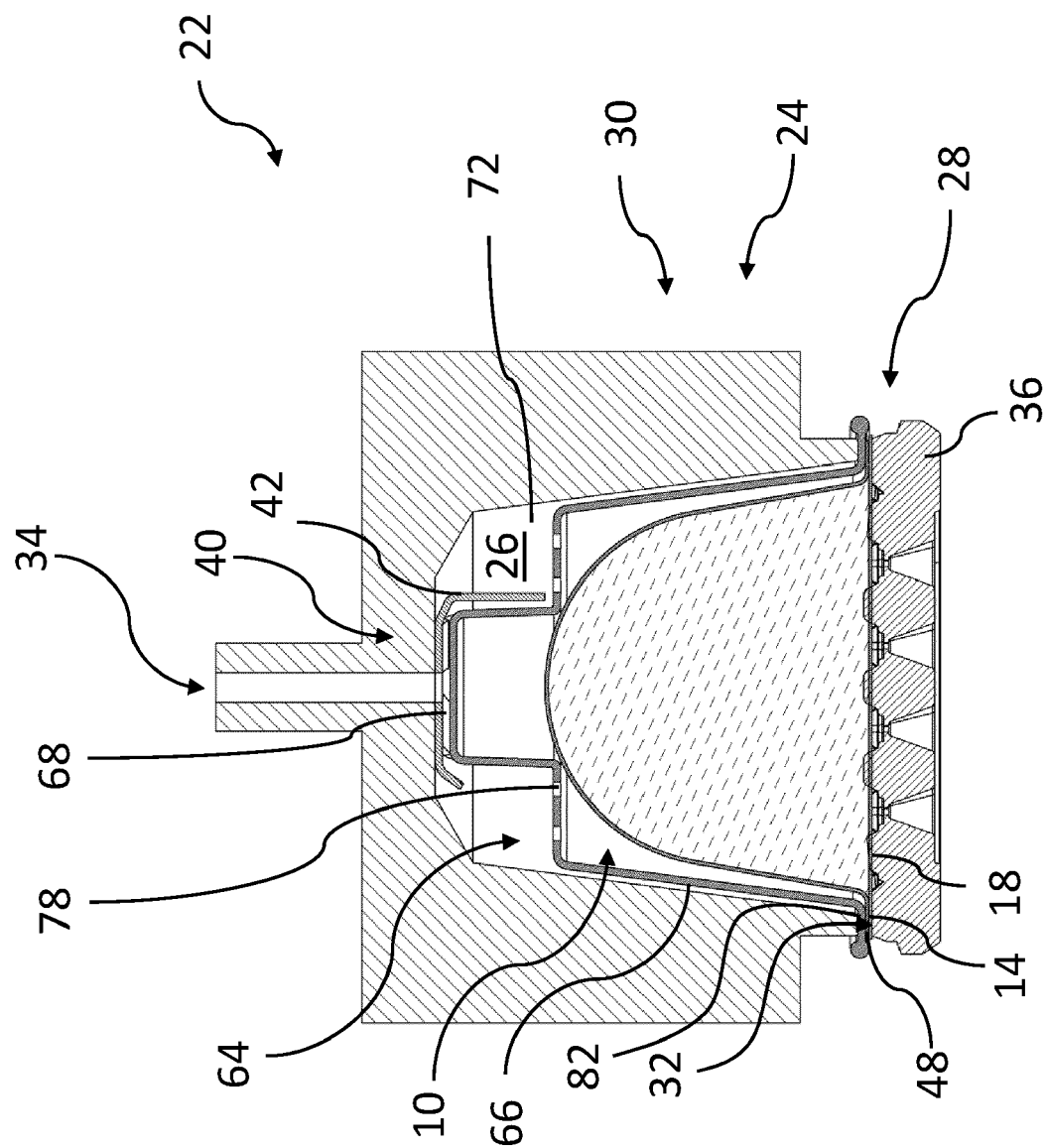
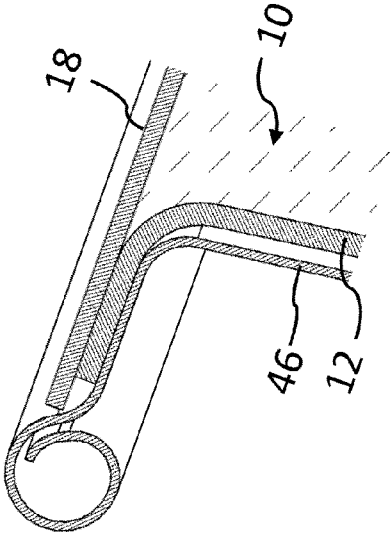
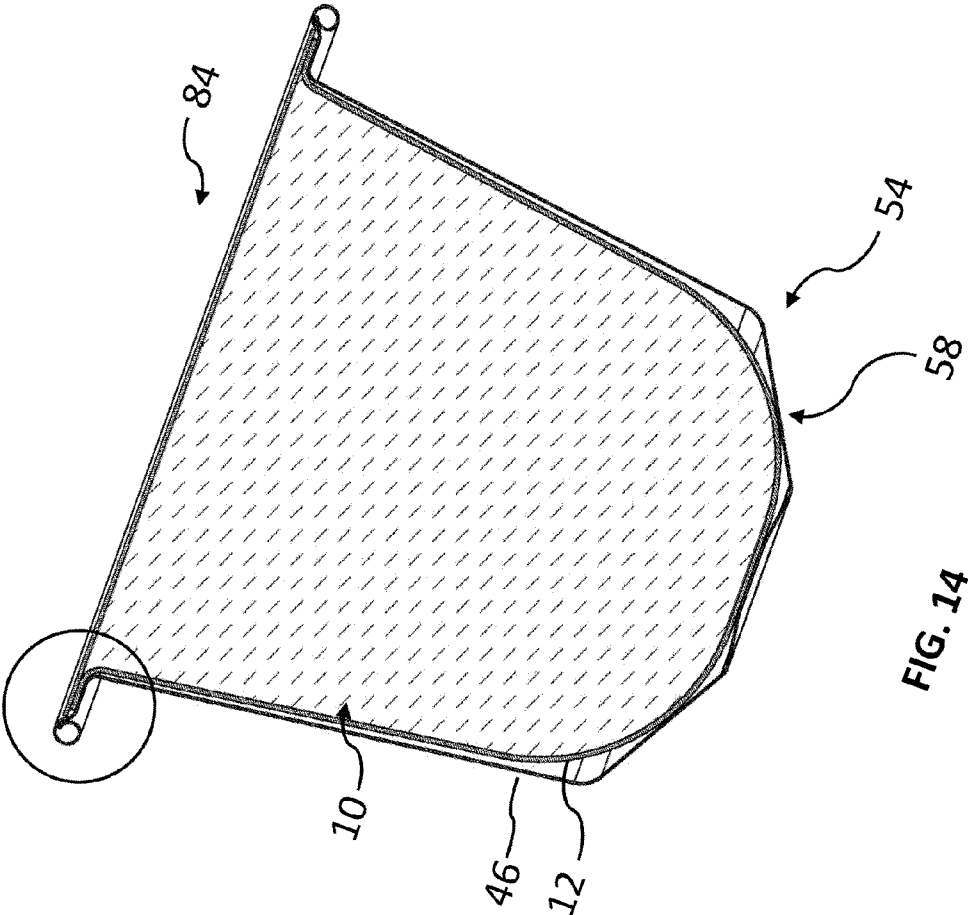


FIG. 13



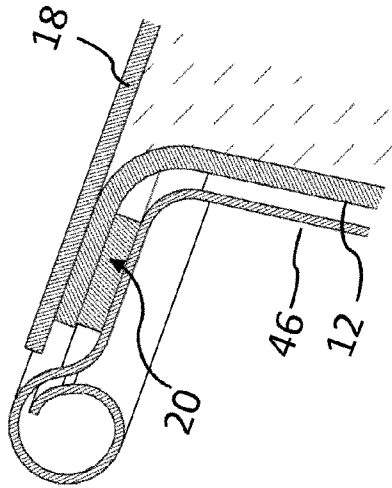
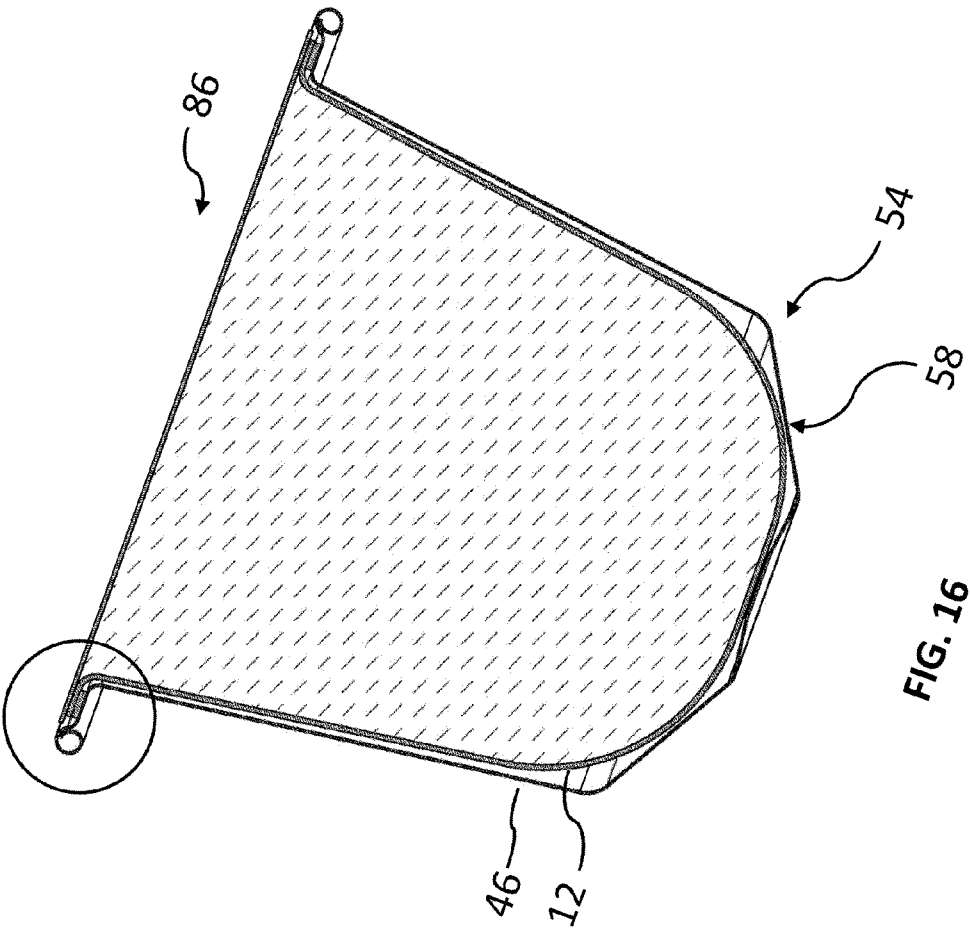


FIG. 17

FIG. 16

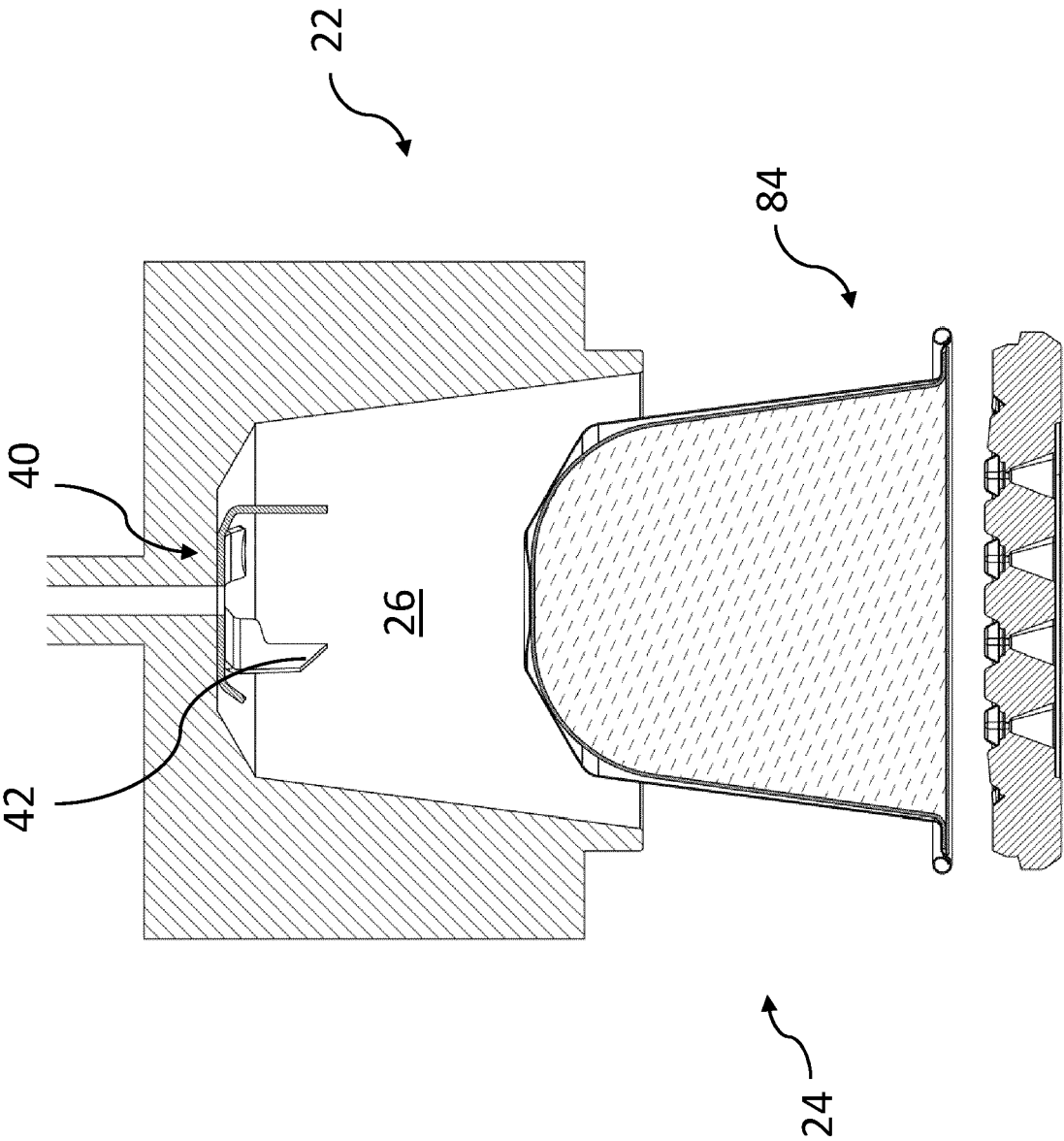


FIG. 18

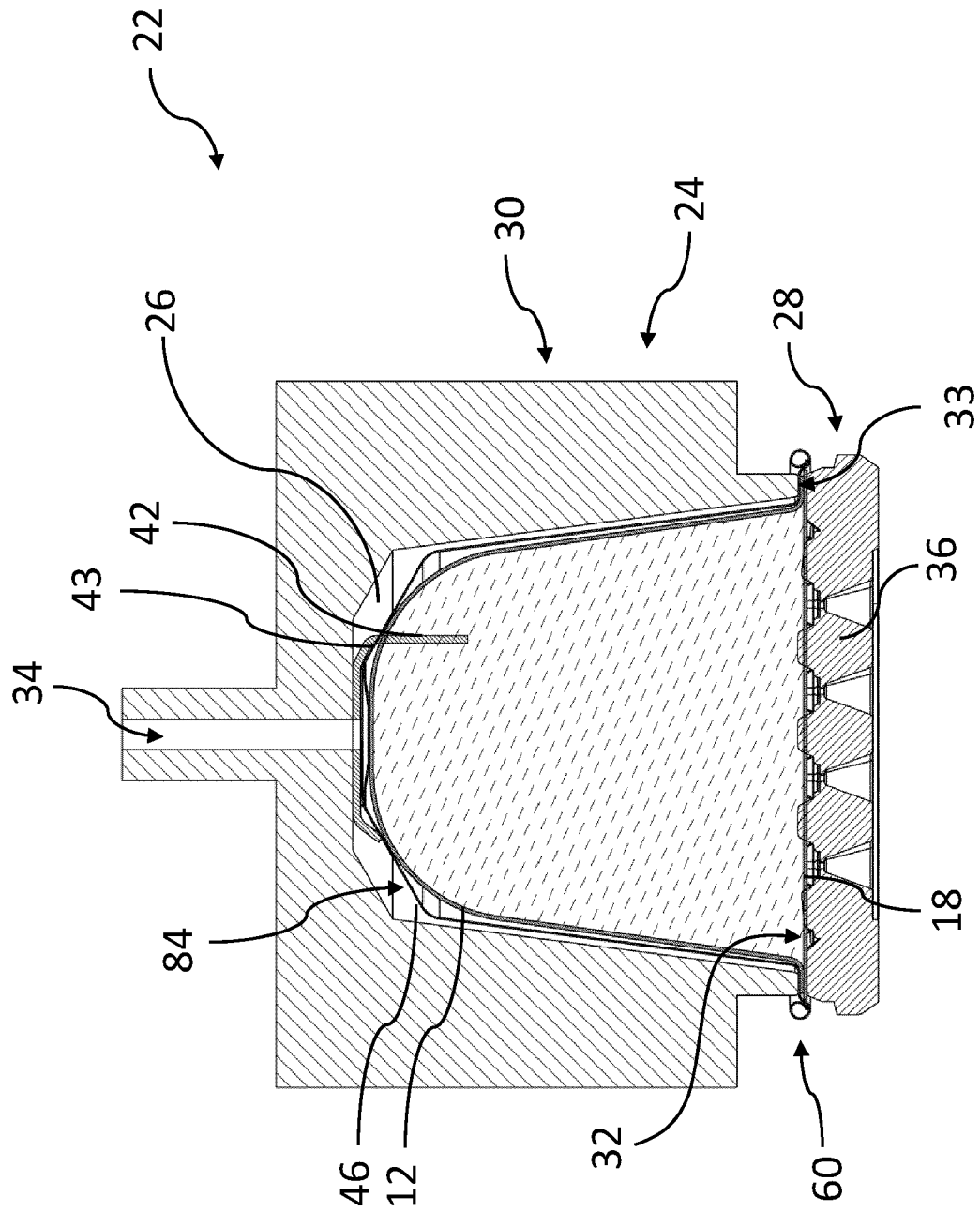


FIG. 19

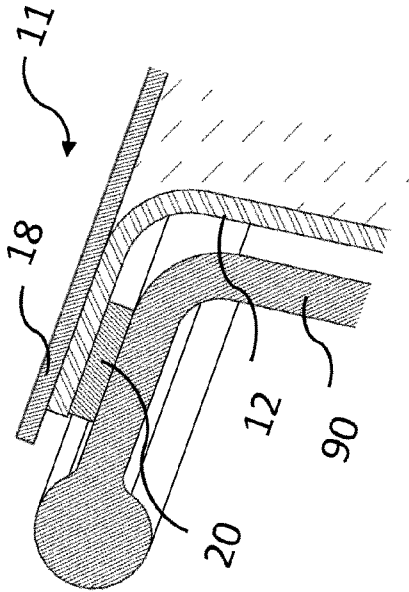
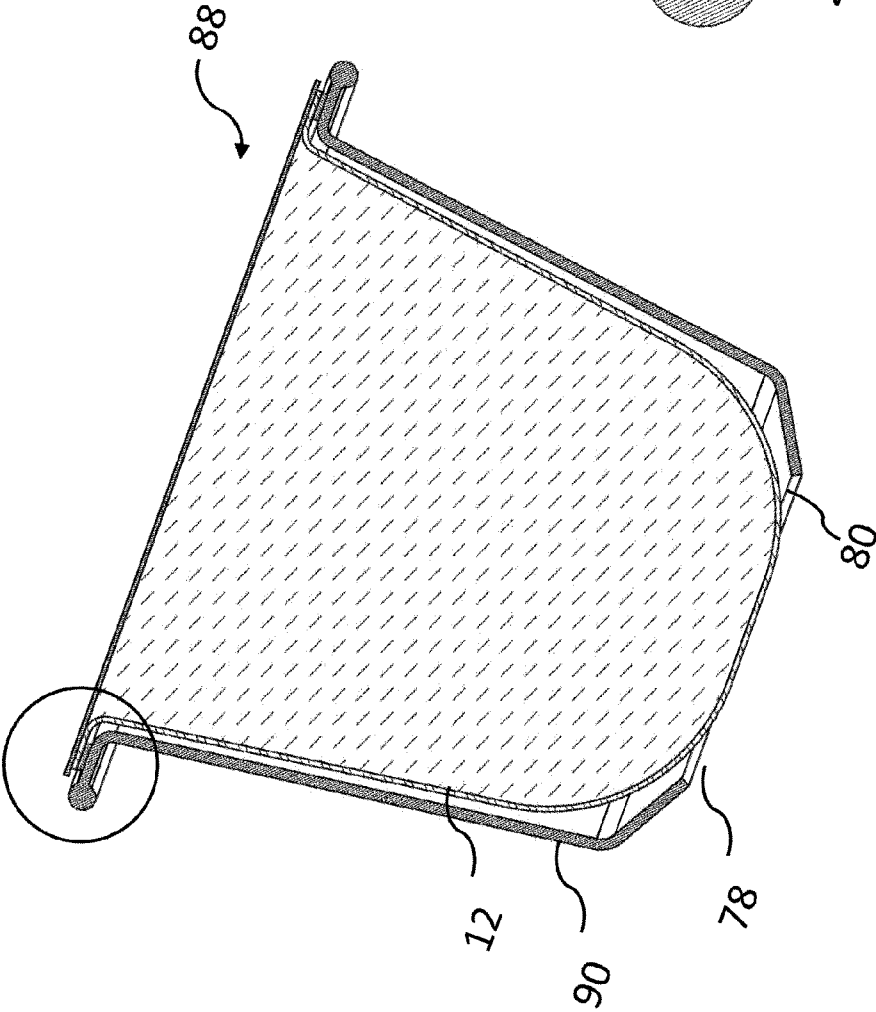


FIG. 21

FIG. 20

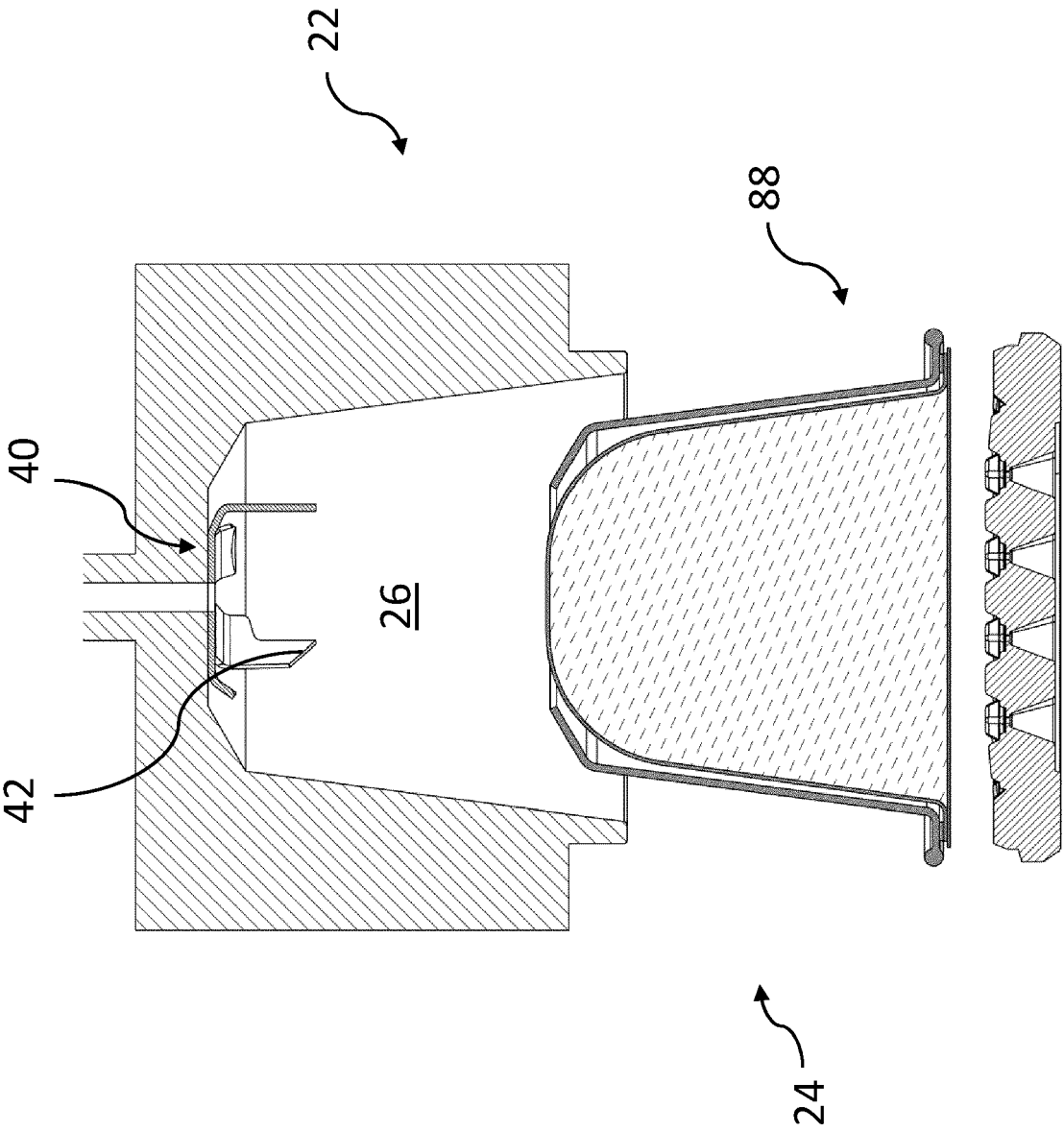


FIG. 22

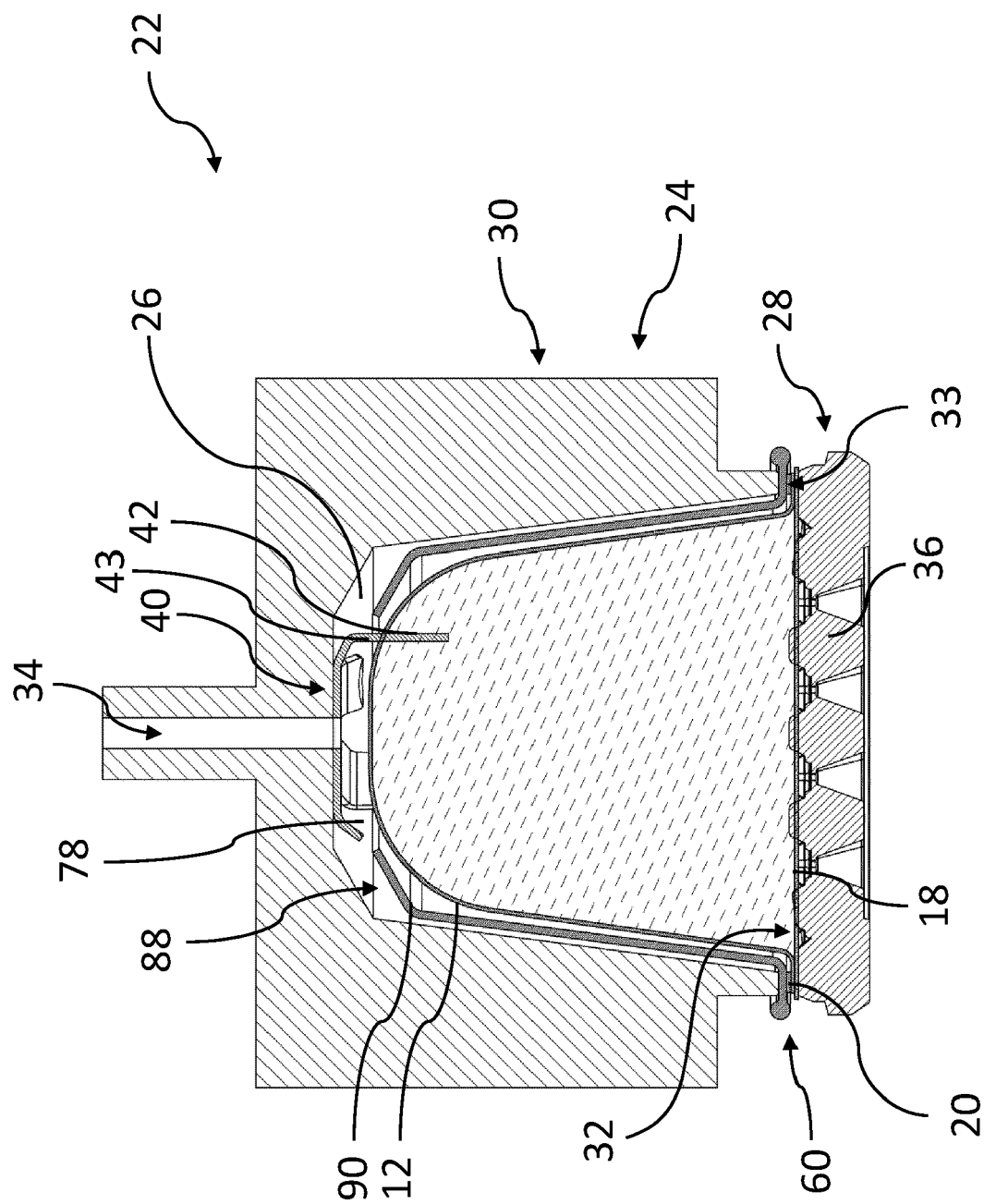


FIG. 23

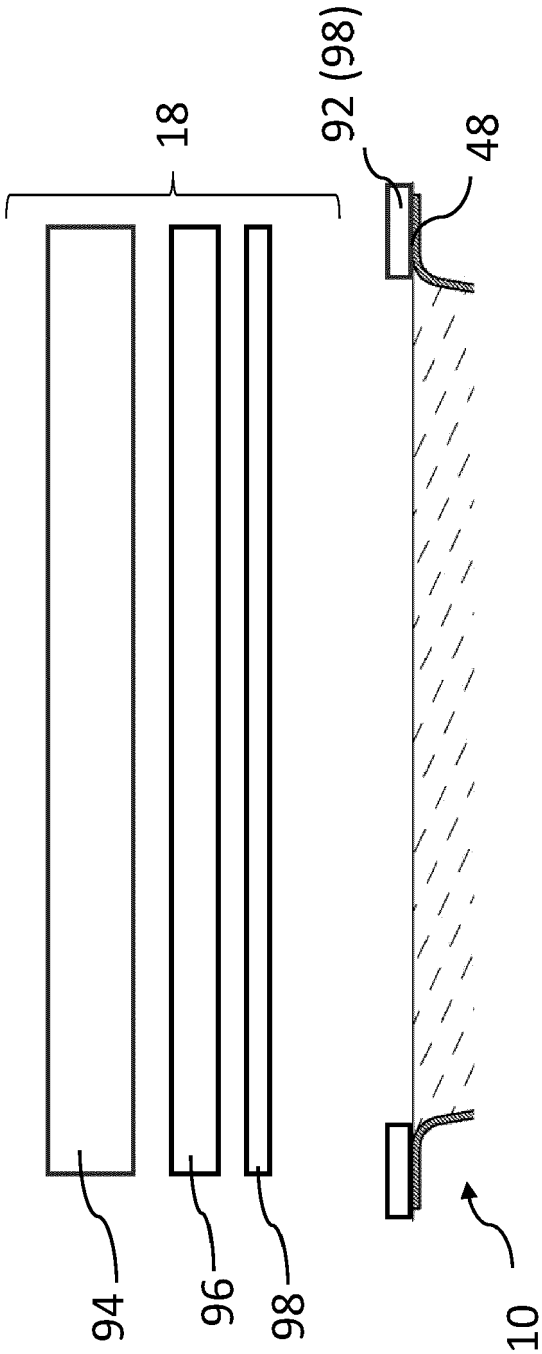


FIG. 24

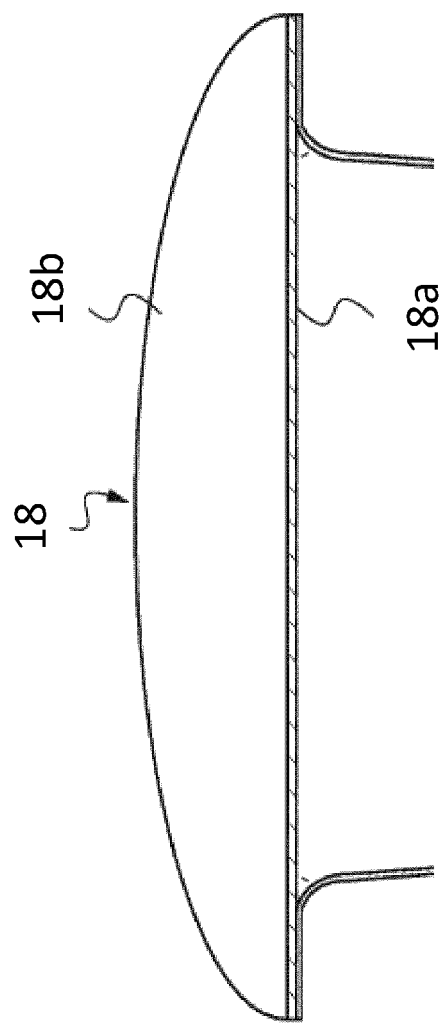


FIG. 25



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Application Number

EP 23 20 3951

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 19 July 2024	Examiner Brochado Garganta, M
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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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