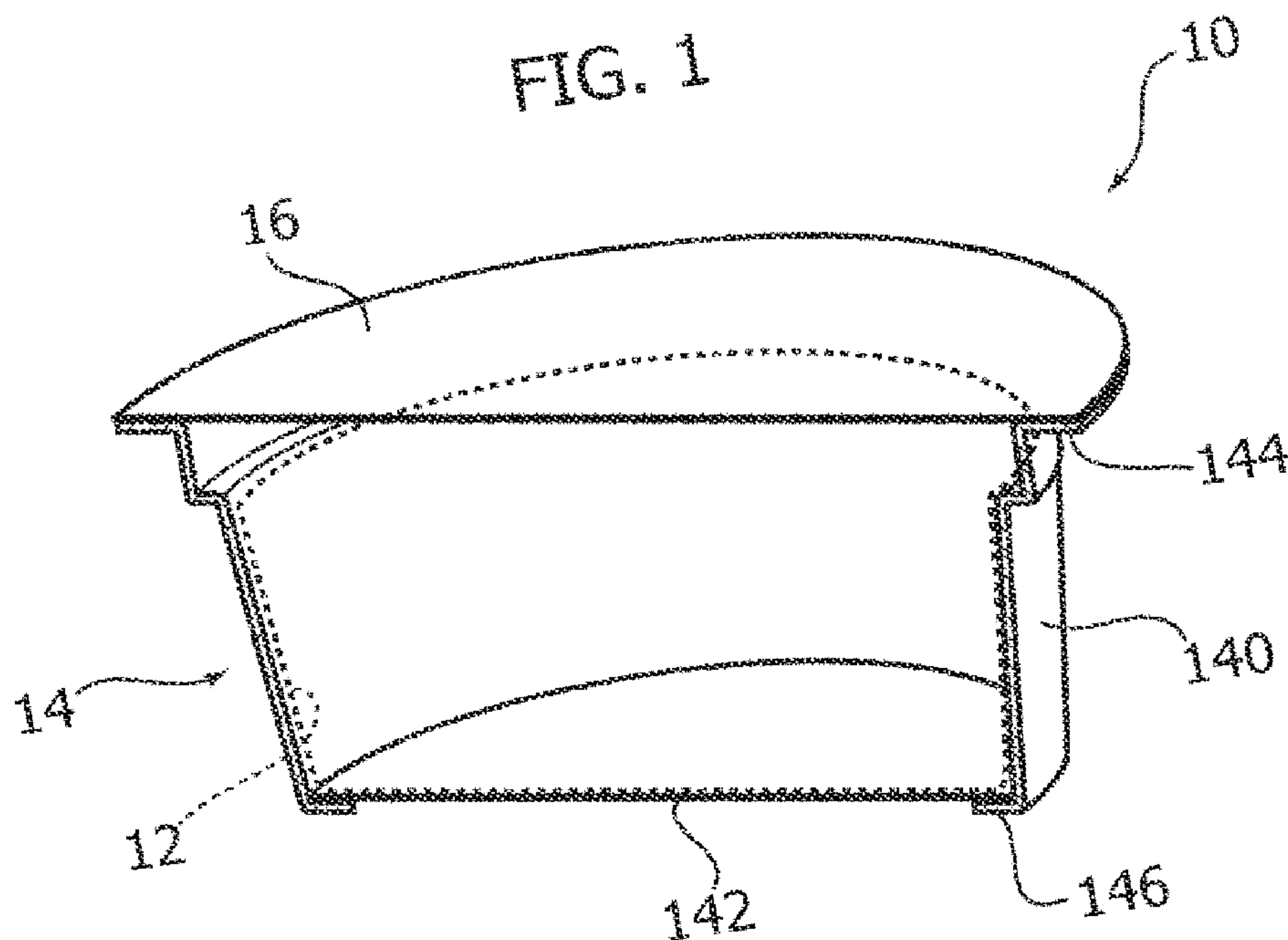




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(54) Title: CARTRIDGE FOR THE PREPARATION OF LIQUID PRODUCTS



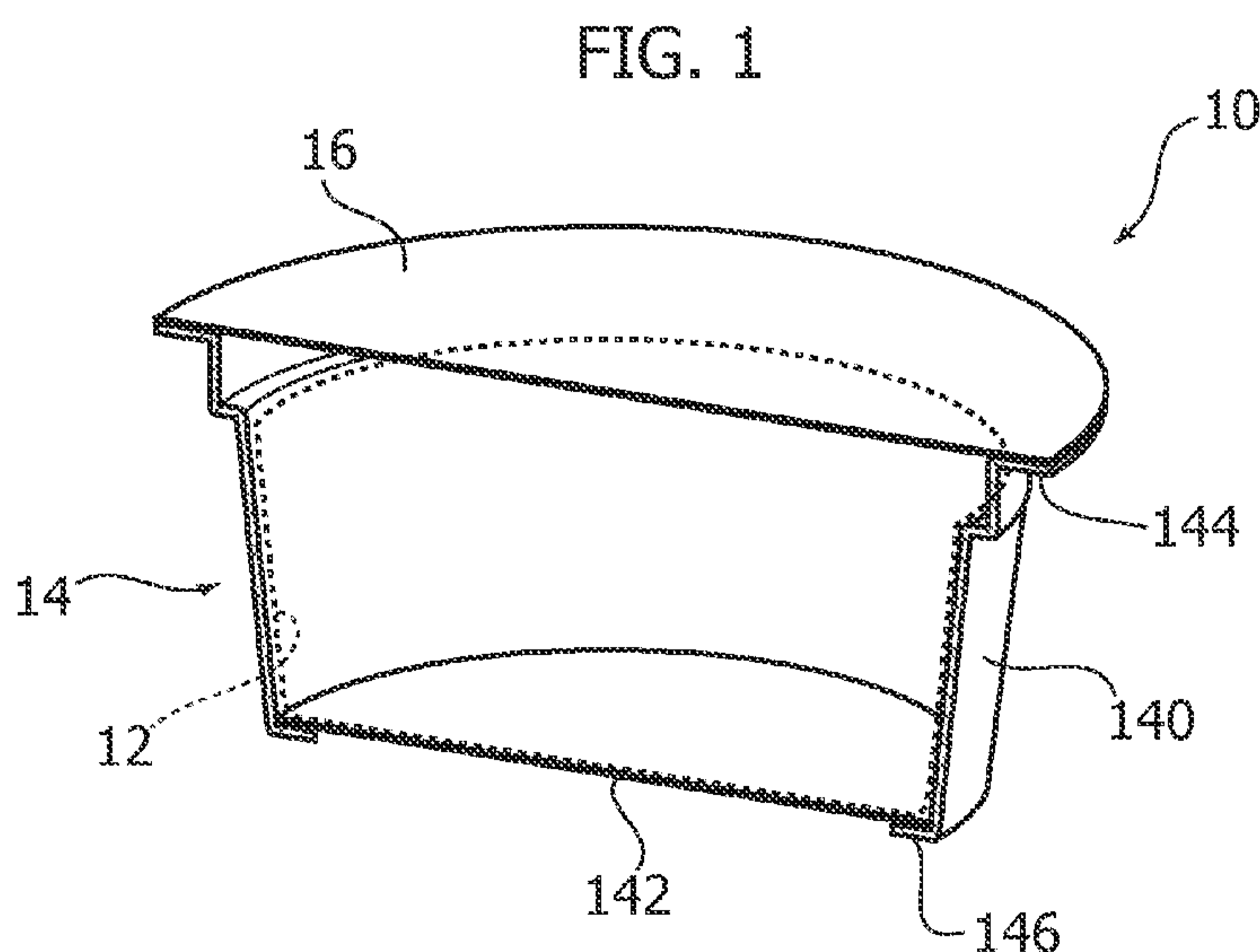
(57) **Abrégé/Abstract:**

A cartridge (10) containing a dose (12) of at least one substance such as ground coffee that can be used in the preparation of a liquid product, for example, using liquid and/or steam introduced into the cartridge (10), comprises a side wall (140), a bottom wall (142), through which said liquid product is able to flow from the cartridge (10), and a wall (16) for closing the cartridge (10) at the end opposite to said bottom wall (142). The side wall (140), the bottom wall (142), and the closing wall (16) comprise a material compostable after use of the cartridge. Either the bottom wall (142) or the closing wall (16) or both disintegrates/disintegrate during composting more rapidly than said side wall (140). In addition or as an alternative, either the bottom wall (142) or the closing wall (16) or both of them is/are connected to the side wall (140) by a bond resolvable during composting. In this way, during composting, the spent dose (12) is no longer withheld within the cartridge (10), thus accelerating disintegration and hence composting of the side wall (140).

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(54) **Title:** CARTRIDGE FOR THE PREPARATION OF LIQUID PRODUCTS

(57) **Abstract:** A cartridge (10) containing a dose (12) of at least one substance such as ground coffee that can be used in the preparation of a liquid product, for example, using liquid and/or steam introduced into the cartridge (10), comprises a side wall (140), a bottom wall (142), through which said liquid product is able to flow from the cartridge (10), and a wall (16) for closing the cartridge (10) at the end opposite to said bottom wall (142). The side wall (140), the bottom wall (142), and the closing wall (16) comprise a material compostable after use of the cartridge. Either the bottom wall (142) or the closing wall (16) or both disintegrates/disintegrate during composting more rapidly than said side wall (140). In addition or as an alternative, either the bottom wall (142) or the closing wall (16) or both of them is/are connected to the side wall (140) by a bond resolvable during composting. In this way, during composting, the spent dose (12) is no longer withheld within the cartridge (10), thus accelerating disintegration and hence composting of the side wall (140).

"Cartridge for the preparation of liquid products"

Technical field

5 The present disclosure relates to cartridges for the preparation of liquid products.

One or more embodiments may refer to cartridges for the preparation of beverages, such as coffee or tea.

Technological background

10 Cartridges (also known as "capsules" or "pods") for preparing liquid products, such as beverages, by introducing into the cartridge liquid (possibly under pressure and/or at high temperature) and/or steam constitute a technological sector that is extremely
15 rich and articulated, as documented, for example, by FR-A-757 358, FR-A-2 373 999 (corresponding to which is US-A-4 136 202), FR-A-2 556 323, GB-A-938 617, GB-A-2 023 086, CH-A-406 561, US-A-3 403 617, US-A-3 470 812, US-A-3 607 297 (corresponding to which is
20 FR-A-1 537 031), WO-A-86/02 537, EP-A-0 199 953, EP-A-0 211 511, EP-A-0 242 556, EP-A-0 468 078, EP-A-0 469 162, EP-A-0 507 905, WO 2010/106516 A1, and EP-A-2 218 653.

A fair share of the solutions described in the
25 documents referred to above primarily regards the preparation of liquid products constituted by beverages such as coffee, tea, chocolate, broth, soups, or various infusions. As regards the preparation of coffee, known from the prior-art documents (e.g., from
30 EP-A-0 507 905, already mentioned above), are solutions designed to enable preparation of espresso coffee.

Documents, such as for example WO2010/077066 A1, exemplify the possibility of using compostable materials for obtaining at least part of these
35 cartridges.

For instance, WO2010/077066 A1 describes a cartridge comprising a bottom wall having a layered structure with at least one layer of a first compostable material that can undergo softening and/or melting at a temperature comprised between 70°C and 120°C, and at least one layer of a second compostable material that does not undergo significant softening and/or melting at that temperature. The aforesaid layers of compostable material are coupled together to form a composite material.

The characteristics that a material must possess so that it can be defined as "compostable", according to a definition commonly adopted also at a patent level (see, for example, in addition to WO2010/077066 A1 referred to above, also documents such as EP-B-0 497 838, EP-B-0 561 982, EP-B-0 788 733, EP-B-0 723 572, EP-B-0 868 275, EP-B-0 971 818, and EP-B-1 842 944), are currently established by the European Norm EN 13432 "Requirements for packaging recoverable through composting and biodegradation - Test scheme and evaluation criteria for the final acceptance of packaging", recently adopted also in Italy as UNI EN 13432. According to this norm, the characteristics that a compostable material must present are listed below.

* Biodegradability, i.e., the metabolic conversion of the compostable material into carbon dioxide. This property is measured with a standard testing method, namely prEN 14046 (also published as ISO 14855: biodegradability under controlled composting conditions). The level of acceptance is 90% biodegradability (with respect to cellulose) to be achieved in less than 6 months.

* Disintegrability, i.e., the fragmentation and loss of visibility in the final compost (absence of visual contamination). Measured with a composting test

on a pilot scale (prEN 14045). Samples of the test material are composted together with organic waste for 3 months. At the end, the compost is sifted with a 2-mm sieve. The mass of residue of the test material with a size greater than 2 mm must be less than 10% of the initial mass.

* Absence of adverse effects on the composting process, verified with a composting test on a pilot scale.

* Low levels of heavy metals (below predefined maximum values) and absence of adverse effects on the quality of the compost (e.g., reduction of the agronomic value and presence of ecotoxicological effects on plant growth). A plant-growth test (test OECD 208, modified) is carried out on samples of compost where degradation of the test material has occurred. No difference must be observed as compared to a control compost.

* Other chemico-physical parameters that must not change after degradation of the material under study: pH; saline content; volatile solids; N; P; Mg; K.

It will be appreciated that a biodegradable material is not necessarily compostable because it must also disintegrate during a composting cycle. On the other hand, a material that breaks up during a composting cycle into microscopic pieces that are not then, however, totally biodegradable is not compostable. UNI EN 13432 is a harmonized norm; i.e., it has been published in the Official Journal of the European Union and is adopted in Europe at a national level and envisages presumption of compliance with the European Directive No. 94/62 EC, on packages and package waste.

Capsules or cartridges for the preparation of coffee (or tea or other liquid products such as

beverages) that are compostable according to the norm UNI EN 13432 can be disposed of in organic recycling (composting), for example envisaging that the spent capsules undergo a process of disintegration within a pre-set time (3 months).

Object and summary

It has, however, been found that the above cartridges, albeit constituted by materials in themselves compostable and with maximum wall thickness equal to or less than the maximum compostable thickness for the material used, may present as whole as not compostable in the terms outlined above.

One or more embodiments have the purpose of overcoming the aforesaid drawbacks.

According to one or more embodiments, the above object is achieved thanks to a cartridge having the characteristics recalled in Claim 1.

Advantageous developments of the invention form the subject of the dependent claims.

The claims form an integral part of the technical teaching provided herein in relation to embodiments.

In one or more embodiments, at least one between the bottom wall and the closing wall of the cartridge can be disintegrated by composting more rapidly than the side wall.

In one or more embodiments, at least one between the bottom wall and the closing wall of the cartridge is connected to the side wall by a bond resolvable during composting.

In one or more embodiments, the solutions referred to above may be implemented individually, i.e., either one or the other.

In one or more embodiments, the solutions referred to above may be implemented in combination with one another, using both of them.

Brief description of the drawings

One or more embodiments will now be described, purely by way of non-limiting example, with reference to the annexed drawings, wherein:

- 5 - Figure 1 is a perspective cut-away view of a cartridge according to the embodiment; and
- Figures 2 and 3 are ideal views in radial cross section that exemplify possible modalities of operation of embodiments.

10 Detailed description

In the ensuing description, various specific details are illustrated aimed at providing an in-depth understanding of examples of embodiments. The embodiments may be obtained without one or more of the

15 specific details, or with other methods, components, materials, etc. In other cases, known structures, materials, or operations are not illustrated or described in detail so that the various aspects of the embodiments will not be obscured.

20 Reference to "an embodiment" or "one embodiment" in the framework of the present description is intended to indicate that a particular configuration, structure, or characteristic described in relation to the embodiment is comprised in at least one embodiment.

25 Hence, phrases such as "in an embodiment" or "in one embodiment" that may be present in various points of the present description do not necessarily refer to one and the same embodiment. Furthermore, particular conformations, structures, or characteristics may be

30 combined in any adequate way in one or more embodiments.

The references used herein are provided merely for convenience and hence do not define the sphere of protection or the scope of the embodiments.

35 In the figures, the reference number 10 designates

as a whole a cartridge (or pod or capsule, these terms being here used as equivalent to one another) for preparing a liquid product by introducing liquid and/or steam into the cartridge.

5 In various embodiments, the liquid product in question may be constituted by a beverage such as coffee (for instance, espresso coffee) or tea, for example obtained by introducing into the cartridge liquid and/or steam under pressure and at a high
10 temperature (i.e., hot).

 In any case, the repeated reference, in the framework of the present detailed description, to the preparation of a particular beverage is in no way to be understood as limiting the scope of the embodiments,
15 which is altogether general.

 The cartridge 10 contains a dose 12 of at least one substance that is able to form the aforesaid product via the aforesaid liquid and/or steam.

 In various embodiments, the dose 12 may be
20 constituted by ground coffee, or by another precursor of a liquid product such as, for example, a beverage, tea, chocolate either in powdered or granular form, products for preparing broths, soups, drinks, and infusions of various nature. This list is to be
25 understood as purely having the nature of example and is in no way binding.

 In one or more embodiments, in the structure of the cartridge 10, which is shaped as a whole substantially like a tray or small cup inside which the
30 dose 12 is present, there may be distinguished:

 - a body 14, comprising a side wall 140 and a bottom wall 142 that closes the body 14 at one end of the side wall 140; and

 - a closing foil (seal 16) that closes the
35 cartridge 10 at the opposite end with respect to the

bottom wall 142.

For instance, the material of the foil 16 may be suited to being connected in a fluid-tight way, for example by heat-sealing, to the side wall 140 of the
5 body 14 of the cartridge, for instance at a flange 144 that surrounds the mouth part of the aforesaid body 140.

Likewise, the material of the bottom wall 142 may be suited to being connected in a fluid-tight way, for
10 example by heat-sealing, to the side wall 140 of the body 14 of the cartridge, for instance at a flange 146 that extends towards the inside of the bottom part of the body 140.

In one or more embodiments, the bottom wall 142
15 may also be made of a single piece with the side wall 140.

In this connection, it will be appreciated that characteristics here exemplified with reference to either the sealing foil 16 or the bottom wall 142 may
20 be applied to the other, with the sealing foil 16 and the bottom wall 142 that may be either the same as or different from one another.

In one or more embodiments as exemplified herein, the bottom wall 142 is plane or substantially plane. In
25 one or more embodiments, the bottom wall 142 may also present a vaulted shape, for example concave with the concavity facing the outside or the inside of the cartridge 10. Also in this case, the choice of the above shape is not imperative.

In one or more embodiments, as exemplified in the annexed figures, the body 14 may present a tray-like conformation diverging from the bottom wall 142 towards the end closed by the sealing foil 16. In one or more
30 embodiments, this divergent conformation may, for example, be a frustoconical conformation. This
35

conformation is not on the other hand imperative in so far as the cartridge 10 may present as a whole different shapes, for example a prismatic shape, or the shape of a truncated pyramid, etc.

5 Consequently, it will be appreciated that the perspective view of Figure 1 is a cut-away view, in which half of the cartridge 10 is visible, and it is assumed that the non-visible half is specularly symmetrical to the visible half.

10 In various embodiments, the sequence of use of the cartridge 10 may be substantially the same as the sequence of use of the cartridge described in EP-A-0 507 905 or WO2012/077066 A1 already referred to above, which renders any repetition of the
15 corresponding description superfluous.

In brief, and according to criteria in themselves known:

- in an initial step, the cartridge 10 is laid on an array of bottom tips, which may have a hollow
20 structure, substantially resembling a syringe needle, with one or more openings that enable off-flow of the liquid product prepared using the cartridge 10;

- when the cartridge 10 is laid on the aforesaid bottom tips, its bottom 142 (whether plane or concave,
25 with concavity facing the outside or the inside of the cartridge) rests on the aforesaid tips, with the top foil 16 exposed to another array of tips that are designed to perforate it; the latter tips can hence advance towards the foil 16 (under the action of
30 respective motor means and/or as a result of a movement imparted on the cartridge) and penetrate into the sealing foil 16, perforating it, so that the cartridge 10 is opened on its upper side;

- in the case where the bottom 142 has not already
35 been previously perforated, the machine for preparing

liquid products (e.g., a coffee brewer, which is also of a known type) may be activated, thus causing water at a temperature in the region of 90-100°C and at a pressure in the region of 8-10 atm or higher to flow
5 through the holes formed in the top foil 16 (e.g., via a pump);

- the hot water under pressure that flows into the cartridge 10 can perform a dual function: in the first place, the hot water starts to penetrate into the dose
10 12 starting off the process (which may be referred to, perhaps in a not altogether proper way, as "infusion") that leads to preparation of the beverage; in the second place, the pressure that is set up within the cartridge 10 causes the bottom 142 to undergo
15 deformation and be pushed against the tips on which the bottom wall 142 itself rests;

- in an initial step, penetration of the tips into the bottom wall 142 may be only partial, with the tips that start only to deform the bottom 142 of the
20 cartridge 10, creating dimples therein; in a subsequent step, the bottom tips 100 start to penetrate the bottom wall 142 of the cartridge 10 so that the cavities provided in these tips (as has already been said, in various embodiments these are hollow tips, which
25 resemble syringe needles) enter in communication with the internal volume of the cartridge 10 so that the infusion of coffee starts to come out of the cartridge 10 and to flow out through the bottom tips;

- the mechanism of perforation of the bottom wall
30 142 of the cartridge 10 may then proceed until practically each of the bottom tips has perforated the bottom wall 142 of the cartridge 10, penetrating into the cartridge 10 itself, so that the axial cavity of each tip provides an out-flow path for delivery of the
35 infusion of coffee;

- the above condition is maintained up to completion of preparation of the beverage; at this point, the pump that sends the hot water under pressure into the cartridge 10 is deactivated, the top tips (if
5 this has not already happened previously) move away from the foil 16, which they had previously perforated, and the spent cartridge 10 can be taken out of the machine and replaced by a new cartridge in order to proceed to preparation of a new liquid product (e.g.,
10 coffee).

The sequence of use just described is evidently provided by way of example, and admits of different variants.

For example, in various embodiments, the
15 perforation of the bottom wall 142, instead of occurring following upon introduction of the liquid and/or steam into the cartridge 10, may also occur in "cold" conditions following upon an action of perforation of the bottom 142 of the cartridge 10 by
20 the tips of the bottom 142 of the cartridge 10 laid on the bottom tips (before, together with, or after perforation of the sealing foil 16) even before the liquid and/or steam starts flowing into the cartridge 10.

25 Whatever the specific solution of use adopted (i.e., for example, irrespective of whether the bottom wall 142 and/or the closing wall 16 are perforated in the process of use described above or else present already previously with an openwork structure, for
30 example, perforated or porous), at the end of preparation and dispensing of the liquid product, the cartridge 10 presents as a body that is as a whole closed, which encloses and withholds inside it the dose 12, with the dose that comes right up against the inner
35 surface of the side wall 140.

In one or more embodiments that can be used according to the method just exemplified, a compostable cartridge 10 may comprise:

- 5 - a side wall 140 made of a material (e.g., plastic) that is compostable according to UNI EN 13432;
- a bottom wall 142 made of a material compostable according to UNI EN 13432; and
- a top wall or sealing foil 16 made of a material compostable according to UNI EN 13432.

10 Distinct reference to a compostable material according to UNI EN 13432 for the side wall 140, the bottom wall 142, and the top wall or sealing foil 16 aims at highlighting the fact that these materials may be either the same as or different from one another:
15 for instance (this being just one of the possible examples), in one or more embodiments, the bottom wall 142 could be made of a single piece with the wall 140.

Whatever the choice of materials for the body (e.g., for the side wall 140 and, possibly the bottom
20 wall 142) it is possible to resort to compostable materials (according to a term sometimes used in the sector, a "biomaterial"), such as, for example: polymers extracted from biomass (for instance, polysaccharides such as cellulose-starch, lipids,
25 proteins); synthetic polymers (e.g., polylactic acid - PLA - deriving from fermentation of starch); polymers produced by genetically modified micro-organisms or bacteria (e.g., polyhydroxyalkanoates - PHA); and polymers from fossil monomers (e.g., polybutylsuccinate
30 - PBS); also belonging in this category are mixtures of the above (the so-called "compounds") with or without the introduction of additives, such as nanoparticles (e.g., talcum, Cloisite).

As has already been said, the bottom wall 142 may
35 be made of a material that is the same as or different

from the material that constitutes the top wall 16.

In the application considered here, where (for example, in the preparation of a beverage such as coffee or espresso coffee) the liquid and/or steam
5 introduced into the cartridge may be at temperatures of around 100°C and at pressures even higher than 10 atm, compostable materials such as the ones recalled above can undergo softening or melting, a circumstance that can basically be put down to the fact that they are
10 materials of natural origin.

Operating, for example, according to the criteria exemplified in WO2012/077066 A1 it is possible to proceed so as to prevent the bottom wall, for example, when it is perforated during the process of preparation
15 of the liquid product, from tearing in a random way or else from obstructing, on account of a marked creep at high temperatures, the orifices provided in the means such as needles or tips that perform the aforesaid operation of perforation, or else again assuming, as a
20 result of a great elongation at yield, the shape of a sock that envelops the aforesaid perforating tips, in effect obstructing outflow of the beverage.

For instance, the bottom wall 142 and/or the top closing wall 16 may comprise a single layer of paper or
25 a single layer of plastic or a mono-material laminate or a multi-material laminate.

In various embodiments, the cartridge 10 as a whole may constitute a packaging formed by materials recoverable by composting and biodegradation, for
30 example in accordance with the norm UNI EN 13432:2002 and/or subsequent modifications and integrations.

It may, however, occur that the cartridge, albeit constituted by materials in themselves compostable and with maximum thickness of the wall equal to or smaller
35 than the maximum compostable thickness for the material

used, may present as a whole as not compostable in the terms outlined above.

Albeit without wishing to be tied down to any specific theory in this regard, there is reason to think that this negative aspect can be put down to the fact that, even after use (preparation and dispensing of the liquid product, for instance, with possible perforation of the bottom wall 142 and of the sealing foil 16 according to the process of use exemplified previously), the cartridge 10 remains a closed object, which encloses and withholds inside it the precursor of the product (e.g., ground coffee) rendering slower the microbial action on which composting is based, in so far as this action is exerted on just one side of the product (e.g., only on the outer side of the side wall 140).

One or more embodiments aim at overcoming this drawback by providing the cartridge 10, after it has performed its function of enclosing and withholding the dose 12 of precursor of the product (e.g., the ground coffee) inside it before and during the operations of preparation of the liquid product, in such a way that it is able to "open up", thus causing the dose 12 to be no longer withheld within it and enabling an acceleration and completion of disintegration, and hence composting, also, for example, of the side wall 140, in the times required by the reference standard in so far as the microbial action can take place on both sides of the side wall.

In this regard, it may be noted that, during the treatment period, the composting process envisages, for the staff managing the plant in which the cycle is executed, implementation of some operations of movement of the organic mass undergoing the composting cycle according to approximately fixed schedules. This

action, which is of a prevalently mechanical nature, aims at turning over the mass of the reacting compost to oxygenate it. This mechanical action is consequently applied also to the cartridges, which, being contained
5 in the bulk of the organic mass, can react under this action according to pre-set modalities of disaggregation determined by the design of the capsule itself (i.e., the bottom and/or the lid tend to undergo delamination and/or to tear with greater ease than the
10 rest). In such a scenario, cartridges that, during the composting cycle, are able to open up to facilitate mixing with the rest of the organic mass may lead to an improvement in the rapidity of disintegration and thus represent an aid to the staff managing the plant in
15 obtaining a homogeneous end product according to the final desired requisites.

In one or more embodiments, such a behaviour can be achieved in different ways, which may possibly be combined with one another.

20 For instance, in one or more embodiments, at least one between the top wall 16 and the bottom wall 142 (and preferably both of them), can be initially connected to the side wall 140 (e.g., welded thereon, as exemplified in Figure 1) so as to withhold the dose
25 12 within the cartridge 10 during the step of conservation, dispensing, and discharging of the cartridge from the dispensing machine.

At the same time, however, it is necessary to proceed in such a way that the conditions to which the
30 cartridge is subjected during dispensing weaken the bond (e.g., the weld) between the bottom wall 142 and/or top wall 16 and the side wall 140, thus favouring detachment (delamination or peeling) thereof.

This occurs possibly in a step not following
35 immediately upon the dispensing step in order to enable

discharge of the cartridge from the machine for preparing the beverage, without exit of the dose 12, for example spent coffee, but causing the top wall 16 and/or the bottom wall 142 to detach (i.e., peel away) from the side wall 140, for example in the initial step of the composting process, as represented schematically in Figure 2.

The aim of the foregoing is to favour exit of the spent dose 12 from the cartridge 10 and thus enable acceleration and completion of disintegration, and hence of composting of the cartridge 10 in accordance with the reference standards since, for example, the microbial action can take place on both sides of the side wall 140.

In addition or as an alternative, in one or more embodiments, the top wall 16 and/or the bottom wall 142 of the cartridge 10 may be made so as to have a higher rate of disintegration than the side wall 140, this being a result that may also be facilitated by the possible presence of holes formed during dispensing of the liquid product.

Also in this case, the faster rate of disintegration, and hence of composting, of the top wall 16 and/or of the bottom wall 142 can cause the spent dose 12 to be no longer withheld within the cartridge, as represented schematically in Figure 3.

Also here it is possible to achieve acceleration and completion of disintegration, and hence of composting, of the cartridge 10 in accordance with the reference standards, since, for example, the microbial action can take place on both sides of the side wall 140.

For instance, in one or more embodiments, the top closing wall 16, the bottom wall 142, and the side wall 140 may be constituted as follows:

- closing wall 16 - material: compostable paper/cellulose, compostable polymer, for example PLA, in a single layer or in double-layered or triple-layered laminates; thickness: from 30 μm to 300 μm (30-
5 300 $\cdot 10^{-6}$ m), preferably between 70 and 100 μm (70-
100 $\cdot 10^{-6}$ m); disintegration time according to UNI EN
13 432: less than or equal to 5 weeks;

- bottom wall 142 - material: compostable paper/cellulose, compostable polymer, for example PLA,
10 in a single layer or in double-layered or triple-
layered laminates; thickness: from 30 μm to 300 μm (30-
300 $\cdot 10^{-6}$ m), preferably between 70 μm and 100 μm (70-
100 $\cdot 10^{-6}$ m); disintegration time according to UNI EN
13 432: less than or equal to 5 weeks;

- side wall 140 - material: compostable paper/cellulose, compostable polymer, for example PLA,
15 in a single layer or in double-layered or triple-
layered laminates; thickness: greater than 0.3 mm
(0.3 $\cdot 10^{-3}$ m); disintegration time according to UNI EN
20 13 432: longer than 5 weeks and less than 12 weeks.

The data provided above exemplify the possibility,
in one or more embodiments, of the bottom wall 142
and/or the closing wall 16 undergoing disintegration by
composting more rapidly than the side wall 140 in so
25 far as:

- they are thinner than the side wall 140; and/or
- they comprise a material that can be disintegrated by composting more rapidly than the material of the side wall 140.

30 In addition or as an alternative to the possible
solution exemplified above whereby at least one between
the bottom wall 142 and the closing wall 16 can be
disintegrated by composting more rapidly than the side
wall 140, in one or more embodiments the top wall 16
35 and the bottom wall 142 can be welded to the side wall

140 as follows:

- bonding of the top wall 16 on the side wall 140: heat-sealing or ultrasonic sealing; resistance to peeling/delamination prior to use: between 50N/150mm and 200N/150mm, measured along the axis of the cartridge subjected to tensile stress; decrease of resistance to peeling/delamination at 2 h from use (e.g., following upon hot preparation of beverage, with introduction of water/steam at approximately 95°C): at least 20%, preferably 50%;

- bonding of the bottom wall 142 on the side wall 140: heat-sealing or ultrasonic sealing; resistance to peeling/delamination, prior to use: between 50N/150mm and 200N/150mm, measured along the axis of the cartridge subjected to tensile stress; decrease of resistance to peeling/delamination at 2 h from use (e.g., following upon hot preparation of beverage, with introduction of water/steam at approximately 95°C): at least 20%, preferably 50%.

The aforesaid data regarding resistance to peeling/delamination refer to heat-sealing at a temperature of between 100°C and 180°C, preferably 140°C for a time interval of less than 10 s, preferably between 0.5 and 2 s, or else refer to ultrasonic sealing at a frequency preferably of between 10 and 50 kHz, preferably between 20 and 30 kHz, and a welding time of between 0.1 and 0.5 s, preferably between 0.2 and 0.3 s.

The result of the foregoing is that at least one between the bottom wall 142 and the closing wall 16 is connected to the side wall 140 by a bond resolvable during composting.

In this regard, it will be appreciated that the data given above exemplify the fact that, in one or more embodiments, following upon preparation of a

liquid product using liquid and/or steam introduced at high temperature into the cartridge 10, the aforesaid bond resolvable during composting is weakened, for example, by at least 20%, preferably 50%, by the
5 aforesaid liquid and/or steam introduced at a certain temperature into the cartridge 10.

The data provided above exemplify the possibility, in one or more embodiments, of the bottom wall 142 and/or the closing wall 16 being connected to the side
10 wall 140 with an adhesive bond that can peel off following upon composting.

At the same time, it is necessary for the bottom wall 142 and/or the closing wall 16 to be puncturable without being torn during preparation of the liquid
15 product, for example, coffee.

Without prejudice to the underlying principle, the details of construction and the embodiments may vary, even significantly, with respect to what has been illustrated herein purely by way of non-limiting
20 example, without thereby departing from the sphere of protection, which is defined in the annexed claims.

CLAIMS

1. A cartridge (10) with a filling (12) of at least one substance for use in preparing a liquid product, said cartridge including a side wall (140), a bottom wall (142) for said liquid product to flow from the cartridge (10), and a closure wall (16) of the cartridge (10) at the end opposed to said bottom wall (142), wherein said side wall (140), said bottom wall (142) and said closure wall (16) include a material compostable after use of the cartridge and wherein:

- at least one of said bottom wall (142) and said closure wall (16) is disintegrable in composting more rapidly than said side wall (140), and/or

- at least one of said bottom wall (142) and said closure wall (16) is connected to said side wall (140) by a bond releasable during composting.

2. The cartridge (10) of claim 1, for use in preparing a liquid product by means of liquid and/or steam introduced at a certain temperature into the cartridge (10), wherein said bond releasable during composting is a bond weakenable by said liquid and/or steam introduced at a certain temperature into the cartridge (10).

3. The cartridge (10) of claim 2, wherein said bond releasable during composting is a bond weakenable by at least 20%, and preferably by at least 50%, by said liquid and/or steam introduced at a certain temperature into the cartridge (10).

4. The cartridge (10) of any of claims 1 to 3, wherein both of said bottom wall (142) and said closure wall (16) are disintegrable in composting more rapidly than said side wall (140).

5. The cartridge (10) of any of the previous claims, wherein both of said bottom wall (142) and said

closure wall (16) are connected to said side wall (140) with a bond releasable during composting.

5 6. The cartridge (10) of any of the previous claims, wherein said at least one of said bottom wall (142) and said closure wall (16) disintegrable in composting more rapidly than said side wall (140):

- is thinner than said side wall (140), and/or
- includes a material disintegrable in composting more rapidly than the material of said side wall (140).

10 7. The cartridge (10) of any of the previous claims, wherein said at least one of said bottom wall (142) and said closure wall (16) is connected to said side wall (140) by a bond peelable during composting.

15 8. The cartridge (10) of any of the previous claims, wherein said at least one of said bottom wall (142) and said closure wall (16) is puncturable without breaking during preparation of said liquid product.

20 9. The cartridge (10) of any of the previous claims, wherein the bottom wall (142) is made one piece with the side wall (140).

FIG. 1

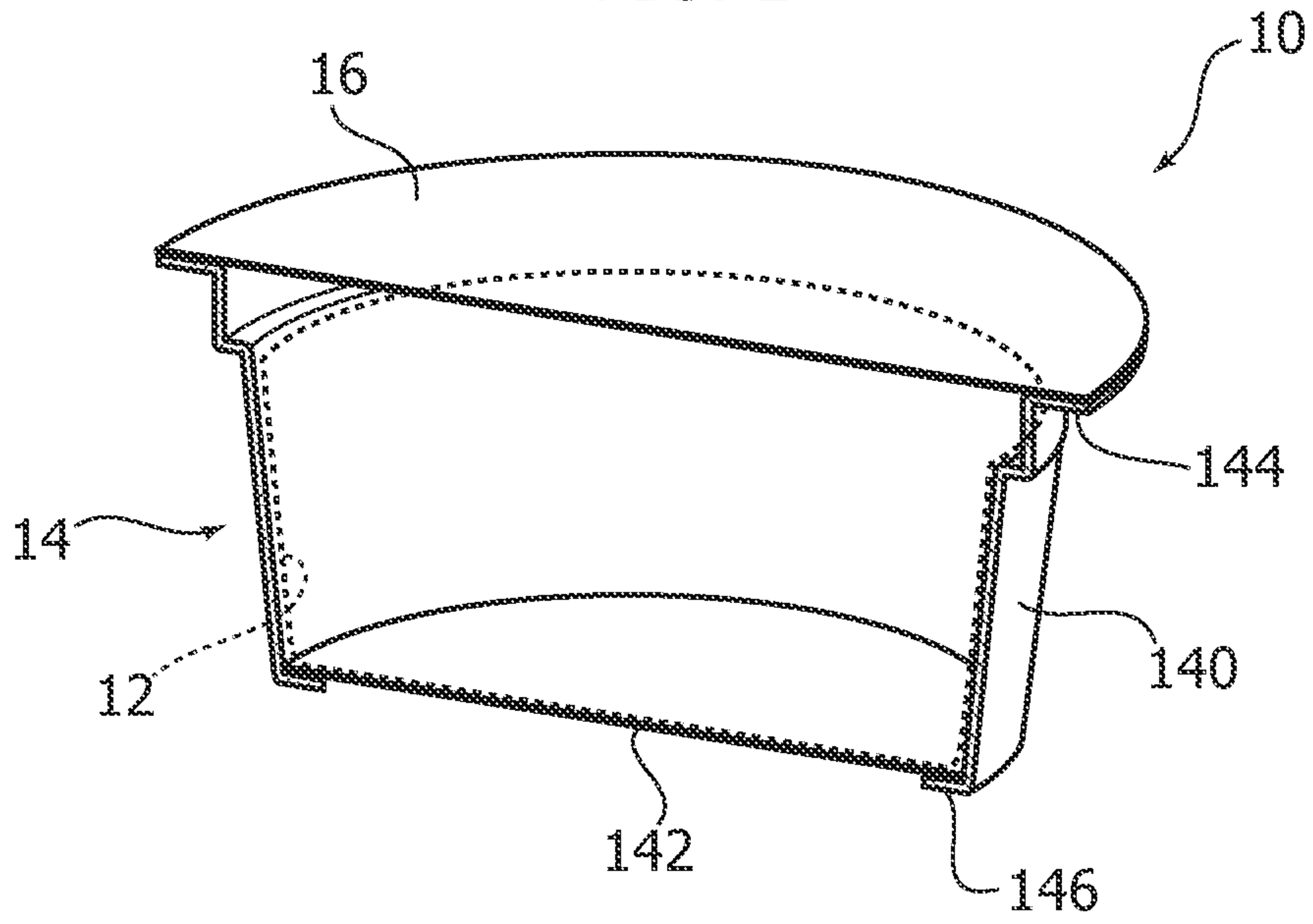


FIG. 2

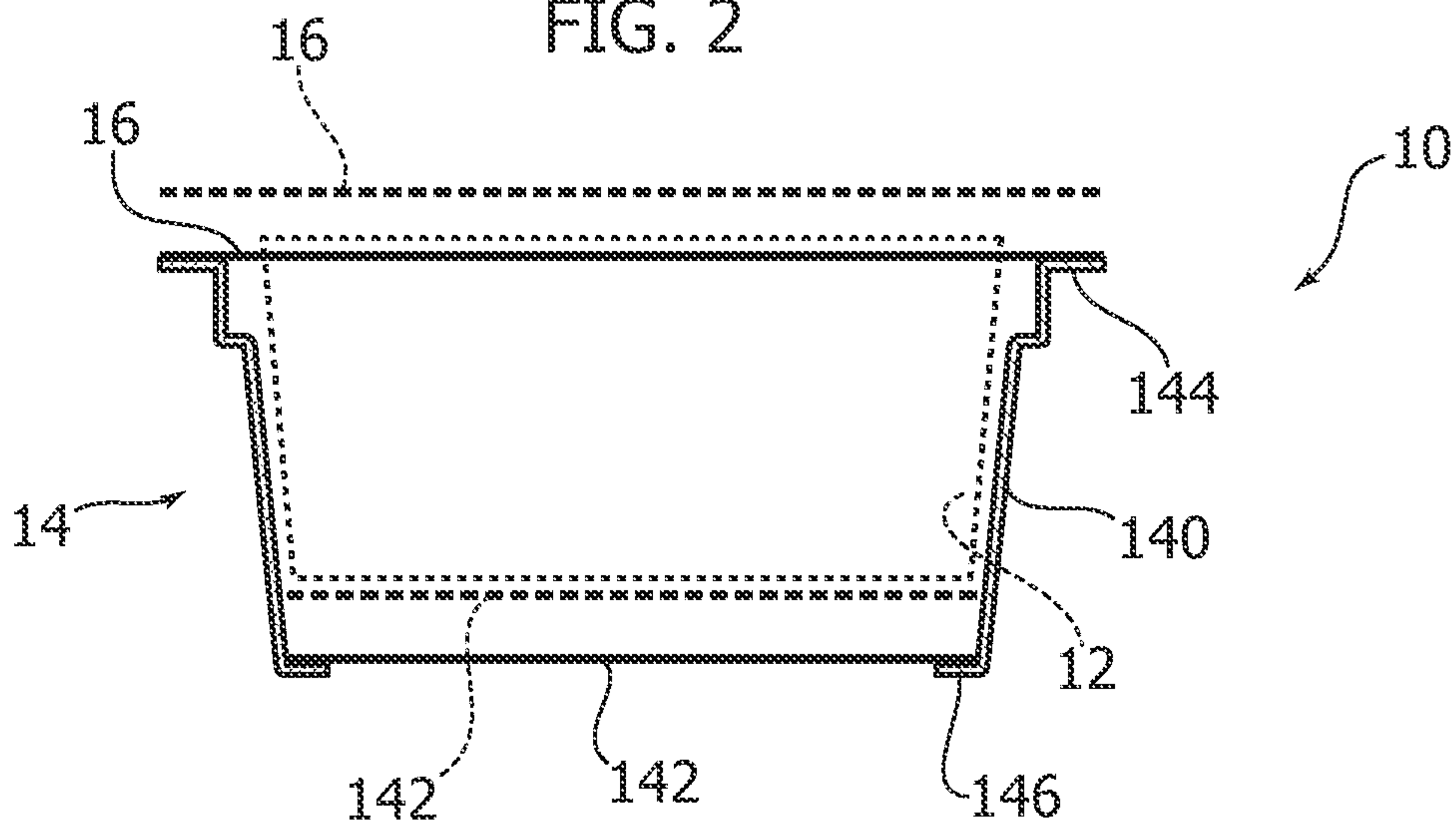


FIG. 3

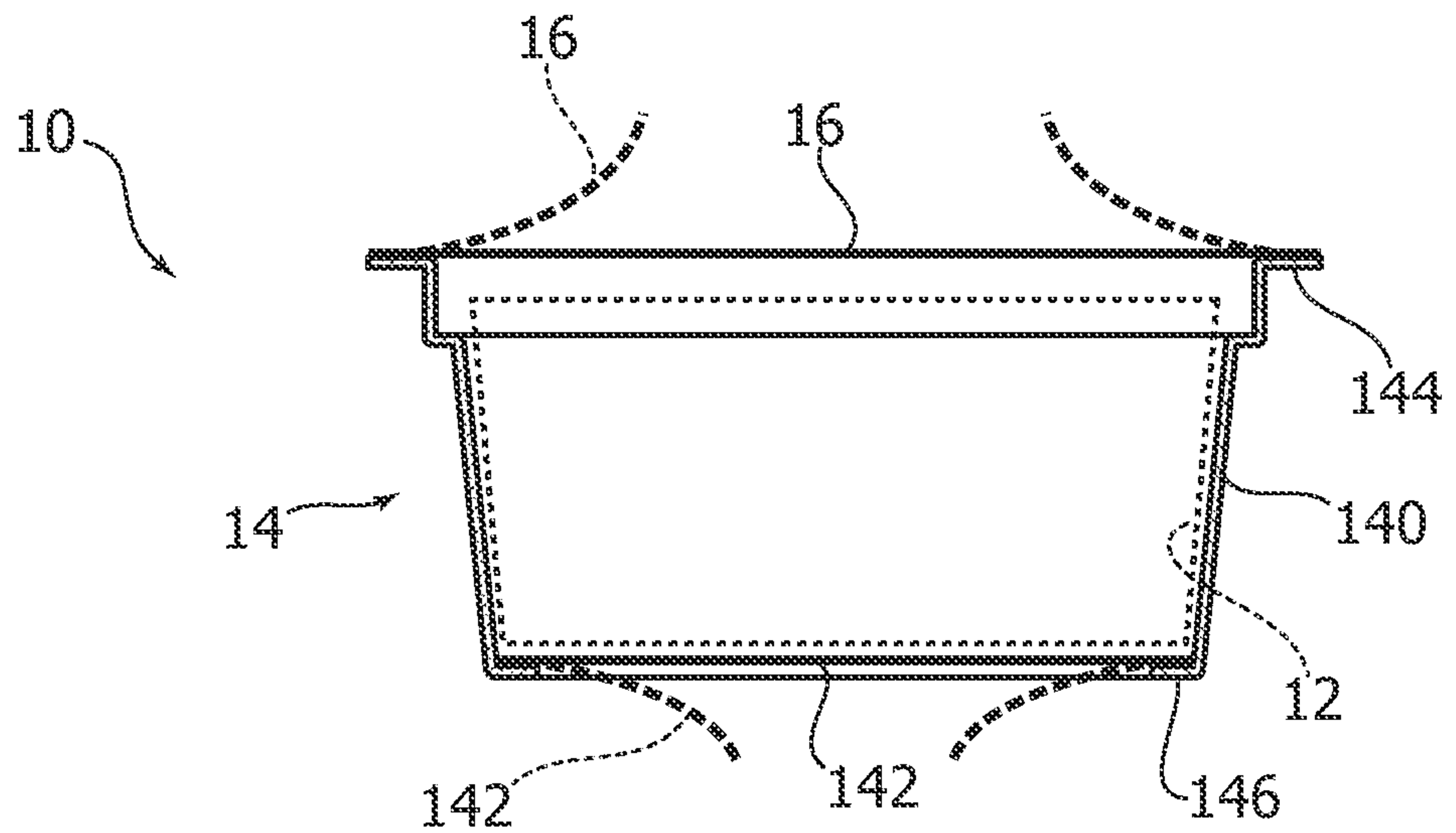


FIG. 1

