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(54) **INEXPENSIVE UNIVERSAL COMPATIBLE AIRTIGHT CAPSULE**

DICHTE UNIVERSALKOMPATIBLE KAPSEL

CAPSULE HERMETIQUE ET DE COMPATIBILITE UNIVERSAL

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**EP 2 995 577 B1**

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## Description

### Field of invention

**[0001]** The subject of the invention is a capsule for coffee that is compatible with numerous dispensing machines, or coffee machines.

### Prior art

**[0002]** It is well known that manufacturers of capsules are always searching for new forms of capsules that can provide the highest degree of compatibility with the largest number of coffee machines on the market.

**[0003]** A further trend is to make capsules that are as inexpensive as possible.

**[0004]** Of course, the yield in terms of product dispensed, taking into account the two aspects mentioned above, should be excellent or should improve upon the performance of the original capsules that are specially built for each dispenser.

**[0005]** We should add that the demands on, as well as the performance of, a generic coffee capsule are very different when they are filled with coffee powder and when they contain soluble products rather than leaf products.

**[0006]** In fact, the performance for the three above-mentioned possibilities is equally different because the needs of the product are different.

**[0007]** Therefore, today there is no single capsule for all the above-mentioned products, coffee powder, soluble products and leaf products, which can adapt to the numerous machines on the market.

**[0008]** In fact, such capsules need to effectively dissolve the soluble product, without any undissolved part being released or remaining inside the capsule and therefore not giving the desired results.

**[0009]** In the case of coffee powder, however, the main point is that there should be no release of residue into the cup, and also it is desirable to create an intense and persistent cream.

**[0010]** For leaf products, lastly, it is equally important that no fragment of the product is released, and also that the agitation of the product and the persistent flow is in contact with the material and that it extracts all the flavour and all the substances that can be dissolved.

**[0011]** Obviously all the above requirements are difficult to obtain with identically structured capsules, since each capsule needs a particular type of filter.

**[0012]** In fact, the filters employed in these sectors are specifically recommended for the various types of product contained within the capsule, in particular:

- filter paper for the coffee powder and the leaf products;
- micro-perforated film or aluminium composite for soluble products;

**[0013]** Of course various manufacturers, for reasons of diversification, tend to employ the above-mentioned filters also in a different way. There are other manufacturers who prefer to use their own filter as a moulded and perforated disc, as a replacement for an alternative to the cheap filters described above; however it is obvious that such a filter cannot be unique since, depending on the coffee, soluble material, and leaves, it must have different characteristics, and this involves the development of several very expensive moulds. An example of said filter is shown in document WO201108002 and WO2012122329.

**[0014]** Ultimately the decision taken by these producers to have their own filter is a solution that is much more expensive both in terms of the creation of more moulds (capsule and filter/s), as well as in terms of constructing the capping machine and the results are not always better .

**[0015]** All the aforesaid filters, however, need to be adequately supported and maintained in a manner spaced from the bottom, in order to let the brew percolate to the bottom of the capsule and collect at the outlet to be conveyed into the cup.

**[0016]** This support is also needed because the filter, being a very thin film, should not break under the effect of the pressure of the flow going in.

**[0017]** If, in fact, it breaks open in a manner that is not anticipated, part or the entire product contained within the capsule would be released directly into the cup. Or else it might clog the machine rendering it useless, obstructing the flow of the fluid.

**[0018]** With the aim of keeping costs down, some manufacturers have made a single body capsule, so the capsule is an auto-protected variety, and so there is no need to confine it in a protective atmosphere within a sealed bag.

**[0019]** However, this single body, since the product cannot come out when it is closed, needs to be broken by a breaking device, preferably a needle/needles or a blade, which comes out before any infusion, approaches the single body of the capsule and creates a break in the continuity, creating an outlet opening.

**[0020]** Preferably, said breaking devices are part of the dispensing machine itself and are moved up against the capsule by an appropriate actuator.

**[0021]** Due to the differing configurations of each machine, and the capsules prepared specifically for it, said opening devices need to penetrate inside the capsule in a measured way

**[0022]** In fact, depending on the combination of dispensing machine and relative opening devices with the capsules, the input of said opening devices takes place only at an exact position, namely for the exact distance that is sufficient to open the outer casing of the capsule at the outlet, but not so far that it reaches the filter inside.

**[0023]** For this reason, said filter must be set at a suitable height from the bottom, so as not to be affected by the opening devices.

**[0024]** It is, in fact, evident that the use of any capsule other than the one specifically made for a specific machine can lead to the filter being broken by the opening devices with the subsequent release through the filter of the product contained within the capsule into the underlying cup or the blocking of the dispensing machine itself.

**[0025]** For this reason, there cannot be capsules that are compatible with the original ones that could equally well be used in a variety of dispensing machines.

**[0026]** A further drawback of these dispensers is the fact that said filter perforators need to be periodically replaced, due to the fact that, after having pierced the outer casing of the outlet of the capsule, they encounter the structural elements for supporting the filter above, they become less sharp.

**[0027]** Said support of the overlying filter is made necessary so as not to leave the film of the filter without adequate support, risking it breaking due to the pressure of the incoming flow.

**[0028]** Taking into account all the competing requirements, and all of the problems in using a capsule that has not specifically been designed for use with the relative dispensing machine, we can understand the difficulty of simultaneously overcoming all the above-mentioned drawbacks.

**[0029]** In the following discussion the generic term coffee capsule means a capsule suitable for containing also other products, and not just coffee powder, like soluble products and leaf products, etc.

#### Presentation of the invention - Problems and Purposes

**[0030]** The main object of this invention is to make available a coffee capsule that overcomes one or more of the drawbacks set out above.

**[0031]** A further object of this invention is to make available a capsule which can be used in machines which have devices for creating an opening on the bottom for the products to come out, with varying diameters, positions and heights from the bottom.

**[0032]** Another object of this invention is to make available a capsule whose opening devices do not in any way affect the filter.

**[0033]** An even further object of this invention is to make available a capsule whose filter is suitable for the various products contained inside the capsule.

**[0034]** One more object of this invention is to make available a capsule that guarantees the opening devices have a long life and any maintenance is deferred.

**[0035]** An important object of this invention is to make this compatible capsule adaptable to the numerous existing solutions on the market, by improving the range of products that can be used without any additional costs to obtain them.

**[0036]** A further object of this invention is to make available a capsule that has minimal stagnation areas for the infusion before it comes out.

**[0037]** A clear object of this invention is to make avail-

able a capsule that provides, right from the first supply (and especially of Italian coffee, namely coffee delivered in 30-40 seconds), a high outlet temperature.

**[0038]** A different object of this invention is to make available a capsule whose flow is guided towards the outlet to prevent uncontrolled spurts at the outlet.

**[0039]** An important object of this invention is to make available a capsule whose filter supports are evenly distributed on the bottom.

**[0040]** An equally important object of this invention is to make available a capsule where said filter supports do not clog up or obstruct, or in any case significantly limit, the area where the infusion flows through the filter.

**[0041]** A significant object of this invention is to make available a capsule whose filter has a fair degree of resistance to the passage of the flow, in order to increase the time the water stays in contact with the product inside the capsule before it passes through said filter.

**[0042]** An essential object of this invention is to make available a capsule whose filter, even in tough conditions of use, like in the delivery of a long "American" coffee which lasts about 60-80 seconds with delivery pressures of 19 bar, will not yield or fracture, letting the product inside the capsule pass through it.

**[0043]** A desirable object of this invention is to make available a capsule where the material that the filter is made of is a material suitable for use with food that is highly inert even at the high temperatures to which it is subjected.

**[0044]** An important object of this invention is to make available a capsule where the material the filter is made of is a material which has a tensile strength higher than that of the usual filter paper with the same grammage.

#### Explanation of the invention

**[0045]** All the above-mentioned objects are achieved by an airtight capsule made as a single body, comprising a tubular body whose upper opening is closed by a closing partition and on the lowermost part there is a bottom, in the center of which, on a step protruding outwards with respect to the bottom floor, is an opening zone suited to being opened by the opening devices of the dispensing machine, where there is a non-woven fabric filter on the inside of the capsule near the bottom, whose grammage is between 40 and 200 gr/sq.m and whose thickness is between 0.1 and 0.9 mm, where said filter is distanced from the bottom by a series of evenly distanced spacers.

**[0046]** Specifically the capsule consists of a body, made as a single piece, with the central exposed part of the bottom protruding over a step facing the outside of the capsule and comprising a permeable membrane spaced from the bottom of the capsule supported by the spacing devices where said membrane is made of non-woven fabric material, preferably polypropylene, whose grammage is between 40 and 200 gr / sq.m and the thickness of which is between 0.1 and 0.9 mm.

### Advantageous features of the invention

**[0047]** Advantageously, said capsule is formed in a single moulding process, making it inexpensive to make, also and above all by thermoforming, and then employing a material that ensures excellent impermeability to oxygen and making it unnecessary to bag it within container outside the capsule.

**[0048]** Advantageously said capsule is compatible with numerous dispensers, since the distance between the opening area and the position of the filter in the part above it, the opening area, is sufficient for the opening devices not to affect said filter, and preferably has a distance of 0.2 to 3 cm and even more preferably from 0.25 to 2 cm and optimally from 0.3 to 1 cm.

**[0049]** Suitably, said opening area has a diameter (inside the step) not less than 4 mm, and preferably 5 mm, in such a way that each blade, as an opening device of the various dispensing machines, can penetrate inside up to the step present on the bottom, breaking the opening area, without encountering any obstacle.

**[0050]** Advantageously, said opening area has an inner diameter not exceeding 15 mm, and preferably 10 mm, and even more preferably 7 mm, so that the free area above, and which is not supported by the spacers of the filter with respect to the bottom, is not excessively extended so that it breaks the non-woven fabric filter in the thicknesses and grammage of the invention under the pressure of the flow of the infusion.

**[0051]** Advantageously, the area above, between the opening and the filter, is free from any structural element and/or filter support, thereby preventing the blade, as an opening device of the various dispensing machines, from losing its sharpness and its capacity to cut or break the opening area over time and with use.

**[0052]** Advantageously on the bottom of the capsule, on the inner side, there are spacers to keep the filter some distance off the bottom and to allow the fluid to reach the outlet opening; preferably said spacers are distributed in a uniform manner on the bottom, so that you do not create an unsupported area with a diameter not exceeding 15 mm, and preferably 10 mm, and even more preferably 7 mm, so that the unsupported area of the filter is overly extended and ruptures the non-woven cloth filter in thicknesses and grammages of the invention under the effect of the pressure of the infusion flow ; and preferably said spacers protrude from the bottom of the capsule by not more than 1 cm and preferably not more than 5 mm, and even more preferably not more than 2.5 mm so as not to create a stagnation area greater than 1/5, and preferably greater than 1/10, the volume of the capsule body, in order to avoid lowering the temperature, especially for the first cups of Italian coffee, and have the least amount of product released, even when using the capsule with a horizontal arrangement.

**[0053]** Advantageously, said spacers do not significantly block the passage area of the filter, against which it rests, in particular they obstruct from 1/5 to 1/10 of the

surface of this filter, thereby avoiding obtaining a filter surface that is too small, with consequent excessive strain on the free surfaces of the filter. In fact, even if this excessive stress can be rectified by a thicker filter or a filter with a high tensile strength, however, the increase of the above-mentioned characteristics lead to a deterioration of the permeability reducing the flow over a surface that is already limited and obstructed by the presence of said spacers. So, said non-woven fabric with said spacers that will not obstruct more than 1/5 to 1/10 of the passage area of the filter achieves the aim of not excessively stressing the free parts of said filter.

**[0054]** Advantageously, said non-woven fabric filter also has a significant resistance to the passage of the flow (in the thicknesses and grammages used in this invention), and this resistance is important for having, at least at the start of the dispensing, a permanence of the water with the product in the capsule, and for avoiding a fast, direct and unopposed output of the flow from input to output, which would result in a watered down product, with a non-woven fabric which has a permeability of between 250 and 150 l/min (ISO9273) or between 2000 and 1400 l/sqm (Glatfelter) such resistance can be obtained

**[0055]** It is clear that it is important that said non-woven fabric filter is as far as possible a product that can come into contact with foodstuff, and that it is as inert as possible, both because of the long permanence in contact before use and when being used at extremely high temperatures and pressures, 100° and 19 bar, these are the features especially of non-woven polypropylene.

**[0056]** Advantageously, said non-woven fabric filter with a density of between 50 g/dm<sup>3</sup> and 300 g/dm<sup>3</sup> manages to avoid any release of solid particulate in the brew, especially for the usual grinding grades of coffee.

**[0057]** It is very important that especially at high temperatures, and with the dispensing pressures of machines that can reach up to 19 bar, the filter does not tear and that it can resist the entire delivery period of long American coffee, therefore, the thickness of the non-woven fabric must be between 40 and 200 g/sqm and preferably between 50 and 150 gr/sqm and even more preferably between 60 and 120 gr/sqm.

**[0058]** Advantageously, said opening area has a tapered thickness from 20 to 70%, and preferably from 30 to 50%, compared to the thickness of the tubular body or the bottom of the capsule, allowing an easy opening of the opening area by the opening devices operated by the dispenser, preventing them from wearing out and the relative blade from becoming dull.

**[0059]** Advantageously, said non-woven fabric filter is sealed at least on the peripheral edge and/or on the protruding top of the spacers, however, it can remain resting on the circular crown inside the body of the capsule, close to the bottom, pushed by the pressure of the material inside the capsule, preventing the material from escaping between the body and the circumferential edge of the filter itself.

**[0060]** Advantageously, said non-woven fabric filter has a breaking load at least 5 times greater than the breaking load of the paper filter with the same grammage, thereby facilitating resistance to the pressure of the flow especially in the opening area; therefore to obtain a filter suitable for purpose, it could be possible to use a very thin filter, to make the non-woven fabric filter compatible with any coffee powder, leaf products and soluble products, a thickness comparable to or higher than that of the paper filter has been used.

**[0061]** In particular, the permissible weight for the non-woven fabric filters goes from 40 to 200 gr/sqm and preferably from 50 to 150 gr/sqm and even more preferably from 60 to 120 gr/sqm; with thicknesses between 0.1 and 0.9 mm and preferably between 0.2 and 0.8 mm, and even more preferably between 0.4 and 0.7 mm. Advantageously, said non-woven fabric filter keeps its mechanical resistance unchanged both dry and wet, preventing it from tearing when being used.

**[0062]** Advantageously, said non-woven fabric filter has a porosity 2 to 10 times lower than the porosity of filter paper with the same thickness, therefore able to use a thicker non-woven fabric filter without introducing any significant resistance to the passage of the infusion, and for that reason thicknesses of 0.1 to 0.9 mm and a grammage of 40-200 g/sqm can be used.

**[0063]** We should add that even if hypothetically non-woven fabric could have already been used as a filter for some time, it was always believed in the sector that non-woven fabric was not suitable for such use. In fact, experience had shown that non-woven fabric did not give good results with dispensing machines, either breaking often, or not having adequate resistance to stress or letting through particulates or excessively blocking the flow due to the high resistance inserted, but especially from a quality point of view. Therefore all the fruitless attempts led industry experts to abandon this product as a filter for coffee capsules. So, even if in the literature of all the materials that could have suitable features to work as a filter also filter paper with the addition of synthetic fibers, or even just synthetic fibers, was mentioned, the facts of its use have demonstrated the impossibility of this material being employed for the coffee capsules, so a capsule for coffee with a non-woven fabric filter was never placed on the market. Only now after many tests and experiments, and in contrast to the industry philosophy, we have seen that it is possible the use non-woven fabric as a filter, but only in a narrow range of thicknesses and weights. So, only a non-woven fabric filter with the above-mentioned features of grammage and thickness, which is the object of this invention, has finally led to non-woven fabric being used as a filter for coffee capsules with the technical results shown and providing excellent quality.

#### Brief description of the drawings

**[0064]** The technical characteristics of the invention, according to the aforesaid aims, are clearly noted in the

claims reported below, and its advantages will become more readily apparent in the detailed description that follows, made with reference to the accompanying drawings, which illustrate a preferred embodiment, purely exemplary and not limiting, in which:

fig. 1 shows a perspective top view of the capsule that is the object of the invention, illustrating the bottom from the inside of the capsule itself;

fig. 2 shows a perspective view from the bottom of the capsule that is the object of the invention, illustrating the bottom visible from the outside of the capsule;

fig. 3 shows a plan view of the capsule that is the object of the invention seen from the bottom;

fig. 4 shows a plan view of the capsule that is the object of the invention seen from above;

fig. 5 shows a section along the plane A-A of fig. 3 of the capsule of the invention;

fig. 6 shows an enlargement of fig. 5 with the positioning of the non-woven fabric filter in proximity to the bottom resting on the spacers;

fig. 7 and 8 show two different perspectives views of a section along a vertical plane passing through the main axis of the capsule of the invention;

figs. 9, 10, 11 and 12 corresponding respectively to figs. 1, 2, 3 and 4 show an alternative embodiment of the capsule, with particular regard to the arrangement of the spacers of the filter from the bottom of the capsule, to the presence of a central spacer that surrounds the cavity in the inner part of the step on which the partition is, while on the outside said step is partially surrounded by some stiffening ribs of the bottom of the capsule.

#### Detailed Description

**[0065]** The capsule 1 of the invention is made with a single mold and in this way it has the important characteristic of self protection, so it does not need to be confined within another bag for commercialisation.

**[0066]** Naturally, the tubular body 2 of the capsule 1 is always open at the top so that the coffee powder and other material can be put inside, and then it is hermetically sealed by an aluminium composite film sealed on the upper edges 3 of the tubular body 2.

**[0067]** The lower part of the tubular body 2 of the capsule 1 is closed by a bottom 4.

**[0068]** To be self-protected but also compatible with all the machines which have the blade for opening the central outflow, the septum 5 must have a very exposed position, over a step 6 which protrudes from the bottom 4.

**[0069]** In this way both the machines which have an opening from very small blades, as well as machines which have an opening from very noticeable blades are able to cut and open this closing septum 5 creating the necessary opening for dispensing the products.

**[0070]** Now the fact that said septum 5 is a very ex-

posed central part and distanced from the bottom 4, arranged over a step 6, related to the fact that the capsule 1 is to be molded in a single mold, it follows that centrally on the inner side of the the step the part is empty, like a cavity 7, and in particular said cavity 7 is devoid of any support for the inner filter 8, in part above this empty cavity 7.

**[0071]** However, without an adequate central support, normal permeable filters are not adequately supported and under the thrust of pressure they break: these normal filters are paper filters, the micro-perforated or aluminium.

**[0072]** If necessary, we might consider increasing the thickness of the material of the above mentioned filters, but without any satisfactory outcome (they continue to yield after a certain time, due to the increasing pressure, and due to the temperature that changes their technical characteristics, and also because of the lowering of the wet breaking load), it also excessively increases the over-pressure worsening the product yield in the cup.

**[0073]** Only an internal filter 8 consisting of a non-woven fabric membrane are can achieve a positive result.

**[0074]** Such a membrane of non-woven fabric is suitably sealed on a step 9 on the body side 2 near the bottom 4.

**[0075]** If necessary, or alternatively, said internal filter 8 is sealed onto the upper protruding part 10 of the spacers 11 which rise from the bottom 4.

**[0076]** However it is possible to ensure the retention of the product inside the capsule, even if the filter is simply resting on the circular crown (step 9) thanks to the pressure of the product above.

**[0077]** So, this internal filter 8 is distanced from the bottom 4 of the capsule 1 by means of said spacers 11, which are stretches of radial ribs spaced apart and converging towards the center of the bottom.

**[0078]** Said radial ribs emerge from the bottom part 4 and are an integral part of it since the body of the capsule 1 is made as a single mold.

**[0079]** A very important aspect is that the cavity 7 is free of any structural part or the filter support 8, this allows you to make the inexpensive capsule 1 with a single mold and to avoid jamming or breaking the opening blades operated by the dispensing machine or that they lose their sharpness over time, since they do not encounter solid and raised elements numerous times, for opening the opening zone.

**[0080]** Moreover, still within the above-mentioned purposes, the area of opening 5 is tapered with respect to the thickness of the edge or the bottom, preferably by a value of 20 to 70% and preferably with a value of 30 to 50%. Even with the minimum values of the thickness of the exposed opening area 5, the air-tightness of the capsule 1 is always ensured, so it does not need to be placed within a bag, in an inert atmosphere, for the sales packing, in order to be able to provide the characteristic of self-protection.

By way of example, the values of the technical characteristics for the various materials used as a filter are set out:

Filter paper 27 gr / sq.m

5 Thickness 0.1mm; Longitudinal tensile strength (ISO1924) 15 N/15mm; Transversal tensile strength (Tensile strength in the cross direction) 6 N /15mm; Tensile strength wet 4 N / 15mm; Porosity (Glatfelter) 536 l / sqm.

10 Filter paper 38 gr / sqm

Thickness 0.17mm; Tensile strength longitudinal (ISO1924) 23 N/15mm; Transverse tensile strength 17 N / 15mm; Tensile strength wet 7.7 N / 15mm; Porosity (Glatfelter) 882 l / sqm.

15 Filter paper 60 gr / sqm

Thickness 0.16mm; Tensile strength longitudinal (ISO1924) 30 N/15mm; Transverse tensile strength 23 N/15mm; Tensile strength wet 7.0 N/15mm; Filtration time (WS008) 882 l/sqm.

20 Non-woven fabric 40 gr/sqm (polypropylene)

Thickness 0.37mm; Tensile strength longitudinal and transverse (Tensile strength in machine direction and cross direction) (ISO9073) 65N;

25 Tensile strength longitudinal and transverse wet: dry idem; Permeability (ISO 9273) 220 l/min approximately (Glatfelter) 1800 l/sqm

Non-woven fabric 50 gr/sqm (polypropylene)

30 Thickness 0.44mm; Tensile strength longitudinal and transverse (ISO9073) 77N; Tensile strength longitudinal and transverse wet: dry idem; Permeability (ISO 9273) 210 l/min approximately (Glatfelter) 1750 l/mqs

Non-woven fabric 60 gr/sqm (polypropylene)

35 Thickness 0.45mm; Tensile strength longitudinal and transverse (ISO9073) 105N;

Tensile strength longitudinal and transverse wet: dry idem; Permeability (ISO 9273) 200 l/min approximately (Glatfelter) 1666 l/sqm

Non-woven fabric 100 gr / sqm (polypropylene)

40 Thickness 0.57mm; Tensile strength longitudinal and transverse (ISO9073.3) 180N; Tensile strength longitudinal and transverse wet: dry ditto; Permeability (ISO 9273) 200 l / min; Elongation at break longitudinal / transverse (elongation in machine direction and cross direction) (ISO9073.3) 70% / 80%; longitudinal/transversal tear (tearing strength in machine direction and cross direction)

(ISO9073.4) 75N/70N, permeability (ISO9273) 220 l/min.

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**[0081]** From the values presented above you can see that the non-woven fabric filter has a tensile strength that makes its use possible, in combination with the capsule of the invention, and in particular above the opening area, without which this filter might break as a result of the pressure of the flow, even if beneath it there is no structural support element; and outside the opening area, taking into account the presence and distribution of the spac-

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ers.

**[0082]** Also, from the values presented above we can see that such resistance is maintained even during the permeation of the infusion, since the wet laceration is not affected by how wet the filter is, thereby avoiding having to increase the thickness to take into account the drawback of a lower wet breaking load.

**[0083]** Finally, being able to guarantee a porosity lower by 2 to 10 times compared to the porosity of filter paper with the same thickness, we can deduce from the permeability data reported above, the use of a non-woven fabric filter even with a grammage from 4 to 10 times greater than filter paper does not introduce any drawbacks.

**[0084]** The specifications of filters consisting of a micro-perforated material or aluminium film are not shown since PET-PP and aluminium materials have a null or insignificant permeability value and therefore to function as a filter they need to be perforated or torn to let the infusion pass through (in particular for soluble products). The presence of such micro-holes, because of their size and density, directly influences the tear resistance and the breaking load. When there are soluble products a non-woven fabric filter is able to effectively dissolve these soluble products even during the passage through the filter itself, while preventing parts not fully diluted and dissolved getting beyond this filter.

**[0085]** Currently, however, these aspects of complete dilution and the prevention of the release of undissolved soluble products, for those capsules that use a micro-perforated or aluminum composite film must be resolved with a persistent presence of the steam flow within the capsule, and/or a substantial turbulent motion and non-linear flow between input and output.

**[0086]** These expedients, with a non-woven fabric filter, when there are soluble products, becomes of secondary importance, thus ensuring an excellent result for a single capsule, equipped with a single filter for any product, coffee powder, leaf product or soluble products.

## Claims

1. Universal air-tight compatible coffee capsule, made as a single body, comprising a tubular body (2) whose top opening is closed on the top edges (3) by a closure septum and on the lower part there is a capsule bottom (4) and at the centre of the bottom (4) there is, over a step (6) projecting outwards with respect to the bottom (4), an opening area (5) that is opened by the opening devices of the dispensing machine, **characterised in that** there is a non-woven fabric filter (8) inside the capsule (1) close to the bottom (4), whose grammage is between 40 and 200 gr/sqm and the thickness of which is between 0.1 and 0.9 mm, where said filter is distanced from the bottom by a series of evenly spaced spacers.

2. Universal air-tight compatible capsule, according to claim 1 **characterised by** the fact that said capsule (1) is made in a single mold.

5 3. Universal air-tight compatible capsule, according to claim 1 **characterised by** the fact that said capsule (1) is compatible with numerous dispensers since the distance between the opening zone (5) and the position of the filter (8) in the part above it is sufficient for the opening devices not to affect said filter (8), and preferably distant by 0.2 to 3 cm, and even more preferably from 0.25 to 2 cm and optimally from 0.3 to 1 cm.

10 4. Universal air-tight compatible capsule, according to claim 1, **characterised by** the fact that the opening area of said capsule (1) has a diameter, inside the step (6), of not less than 4mm, and preferably 5mm.

20 5. Universal air-tight compatible capsule, according to claim 1, **characterised by** the fact that the opening area of said capsule (1) has a diameter, inside the step (6), no greater than 15 mm, preferably 10 mm, and even more preferably 7 mm.

25 6. Universal air-tight compatible capsule, according to claim 1, **characterised by** the fact that the region above between the opening and the filter, defined as a cavity (7), is free from any structural element and/or the filter support (8).

30 7. Universal air-tight compatible capsule, according to claim 1, **characterised by** the fact that on the bottom (4) of the capsule (1) on the inner side there are spacers (11) able to keep the filter (8) distant from the bottom (4) and allow the dispensed fluid to reach the outlet opening (5), where preferably said spacers protrude from the bottom of the capsule by not more than 1 cm and preferably not more than 5 mm, and even more preferably not more than 2.5 mm, so as not to create a stagnation area greater than 1/5, and preferably greater than 1 / 10, of the volume of the body of the capsule.

35 8. Universal air-tight compatible capsule, according to claim 1, **characterised by** the fact that the on the bottom (4) of the capsule (1) on the inner side said spacers (11) are capable of keeping the filter (8) at a distance from the bottom (4) blocking an area of passage between 1/5 and 1/10 of the surface of the filter.

40 9. Universal air-tight compatible capsule, according to claim 1 **characterised by** the fact that said opening zone (5) is a tapered thickness from 20 to 70%, and preferably from 30 to 50%, with respect to the thickness of the tubular body (2) or the bottom (4) of the capsule (1).

10. Universal air-tight compatible capsule, according to claim 1 **characterised by** the fact that said non-woven fabric filter (8) is sealed on at least one perimeter edge (9) and/or on the top protruding section (10) of the spacers (11).
11. Universal air-tight compatible capsule, according to claim 1 **characterised by** the fact that said non-woven fabric filter (8) has a grammage from 40 to 200 gr / sqm and preferably from 50 to 150 gr / sqm and even more preferably from 60 to 120 gr / sqm.
12. Universal air-tight compatible capsule, according to claim 1 **characterised by** the fact that said non-woven fabric filter (8) has a thickness between 0.1 and 0.9 mm and preferably between 0.2 and 0.8 mm, and even more preferably between 0.4 and 0.7 mm.
13. Universal air-tight compatible capsule, according to claim 1 **characterised by** the fact that said non-woven fabric filter (8) has a breaking load that is at least 5 times greater than the breaking load of the filter paper with the same grammage.
14. Universal air-tight compatible capsule, according to claim 1 **characterised by** the fact that said non-woven fabric filter (8) has a permeability between 250 and 150 l/min (ISO9273) or between 2000 and 1400 l/sqm (Glatfelter).
15. Universal air-tight compatible capsule, according to claim 1 **characterised by** the fact that said non-woven fabric filter (8) has a density between 50 g/dmc and 300 g/dmc

#### Patentansprüche

1. Universelle luftdichte, kompatible Kaffee kapsel, die als ein Einzelkörper gebildet ist und einen rohrförmigen Körper (2) aufweist, dessen obere Öffnung an den oberen Kanten (3) durch ein Verschlussseptum geschlossen ist, am unteren Teil einen Kapselboden (4) aufweist und in der Mitte des Bodens (4) einen, gegenüber dem Boden (4) nach außen vorstehenden Absatz (6) und einen von den Öffnungsvorrichtungen der Abgabevorrichtung geöffneten Öffnungsbereich (5) aufweist, der **dadurch gekennzeichnet ist, dass** innerhalb der Kapsel (1) nahe dem Boden (4) ein Vliesstofffilter (8) vorhanden ist, dessen Flächengewicht zwischen 40 und 200 g / qm liegt und dessen Dicke zwischen 0,1 und 0,9 mm liegt, wobei der Filter von unten durch eine Reihe von gleichmäßig verteilten Abstandshaltern beabstandet ist.
2. Universelle luftdichte kompatible Kapsel nach Anspruch 1, **dadurch gekennzeichnet, dass** die Kap-

sel (1) aus einer einzigen Form hergestellt ist.

3. Universelle luftdichte kompatible Kapsel nach Anspruch 1, **dadurch gekennzeichnet, dass** die Kapsel (1) mit zahlreichen Maschinen kompatibel ist, da der Abstand zwischen der Öffnungszone (5) und der Position des Filters (8) im oberen Teil ausreichend ist, damit die Öffnungsvorrichtungen den Filter (8) nicht beeinträchtigen und vorzugsweise zwischen 0,2 und 3 cm und noch bevorzugter zwischen 0,25 und 2 cm und optimal zwischen 0,3 und 1 cm liegt.
4. Universelle luftdichte kompatible Kapsel nach Anspruch 1, **dadurch gekennzeichnet, dass** die Öffnungsfläche der Kapsel (1) innerhalb des Absatzes (6) einen Durchmesser von nicht weniger als 4 mm und vorzugsweise 5 mm aufweist.
5. Universelle luftdichte kompatible Kapsel nach Anspruch 1, **dadurch gekennzeichnet, dass** die Öffnungsfläche der Kapsel (1) innerhalb des Absatzes (6) einen Durchmesser von nicht mehr als 15 mm, vorzugsweise 10 mm, und noch bevorzugter 7 mm aufweist.
6. Universelle luftdichte kompatible Kapsel nach Anspruch 1, **dadurch gekennzeichnet, dass** der zwischen Öffnung und Filter, als Hohlraum (7) definierte Bereich, frei von jeglichem Strukturelement und / oder dem Filterträger (8) ist.
7. Universelle luftdichte, kompatible Kapsel nach Anspruch 1, **dadurch gekennzeichnet, dass** am Boden (4) der Kapsel (1) auf der Innenseite Abstandshalter (11) vorhanden sind, die den Filter (8) von dem Boden (4) fern halten können und es der ausgegebenen Flüssigkeit erlauben, die Austrittsöffnung (5) zu erreichen, wobei vorzugsweise die Abstandshalter von dem Boden der Kapsel um nicht mehr als 1 cm und vorzugsweise nicht mehr als 5 mm und noch bevorzugter nicht mehr als 2,5 mm vorstehen, um keine Stagnationsfläche größer als 1/5 und vorzugsweise nicht größer als 1/10 des Volumens des Körpers der Kapsel zu erzeugen.
8. Universelle luftdichte kompatible Kapsel nach Anspruch 1, **dadurch gekennzeichnet, dass** auf dem Boden (4) der Kapsel (1) auf der Innenseite die Abstandshalter (11) in der Lage sind, den Filter (8) in einem Abstand von der Unterseite (4) zu halten, der einen Durchgangsbereich zwischen 1/5 und 1/10 der Oberfläche des Filters blockiert.
9. Universelle luftdichte kompatible Kapsel nach Anspruch 1, **dadurch gekennzeichnet, dass** die Öffnungszone (5) eine spitz zulaufende Dicke von 20 bis 70 % und vorzugsweise von 30 bis 50 %, bezogen auf die Dicke des rohrförmigen Körpers (2) oder dem



- Boden (4) der Kapsel (1) aufweist.
10. Universelle luftdichte kompatible Kapsel nach Anspruch 1, **dadurch gekennzeichnet, dass** der Vliesstofffilter (8) an mindestens einer Umfangskante (9) und / oder am oberen vorstehenden Abschnitt (10) der Abstandshalter (11) abgedichtet ist.
  11. Universelle luftdichte kompatible Kapsel nach Anspruch 1, **dadurch gekennzeichnet, dass** der Vliesstofffilter (8) ein Flächengewicht zwischen 40 und 200 g / qm und vorzugsweise zwischen 50 und 150 g / qm und noch bevorzugter zwischen 60 und 120 g / qm aufweist.
  12. Universelle luftdichte kompatible Kapsel nach Anspruch 1, **dadurch gekennzeichnet, dass** der Vliesstofffilter (8) eine Dicke zwischen 0,1 und 0,9 mm und vorzugsweise zwischen 0,2 und 0,8 mm und noch bevorzugter zwischen 0,4 und 0,7 mm aufweist.
  13. Universelle luftdichte kompatible Kapsel nach Anspruch 1, **dadurch gekennzeichnet, dass** der Vliesstofffilter (8) eine Bruchlast aufweist, die mindestens 5-mal größer ist als die Bruchlast des Filterpapiers mit dem gleichen Flächengewicht.
  14. Universelle luftdichte kompatible Kapsel nach Anspruch 1, **dadurch gekennzeichnet, dass** der Vliesstofffilter (8) eine Permeabilität zwischen 250 und 150 l / min (ISO9273) oder zwischen 2000 und 1400 l / qm (Glatfelter) aufweist.
  15. Universelle luftdichte kompatible Kapsel nach Anspruch 1, **dadurch gekennzeichnet, dass** der Vliesstofffilter (8) eine Dichte zwischen 50 g / dmc und 300 g / dmc aufweist.

## Revendications

1. Capsule pour café compatible et universelle de type hermétique réalisée dans un seul corps, comprenant un corps tubulaire (2) dont l'ouverture supérieure est fermée sur les bords supérieurs (3) par une cloison et pourvue d'un fond au niveau inférieur (4), et au centre du fond (4) elle est disposée sur un gradin (6) saillant à l'extérieur par rapport au fond (4) une zone d'ouverture (5) capable d'être ouverte par les dispositifs d'ouverture de la machine en usage, **caractérisée par le fait qu'il y ait un filtre (8) en tissu non tissu à l'intérieur de la capsule (1) à proximité du fond (4), dont le grammage est compris entre 40 et 200 gr/mq et dont l'épaisseur est comprise entre 0,1 et 0,9 mm, ledit filtre étant séparé du fond par une série d'entretoises espacées de manière homogène.**

2. Capsule économique compatible et universelle selon la revendication 1 **caractérisée par le fait que** ladite capsule (1) est réalisée en un seul moule.
3. Capsule économique compatible et universelle selon la revendication 1 **caractérisée par le fait que** ladite capsule (1) est compatible avec de nombreux distributeurs parce que la distance entre la zone d'ouverture (5) et le niveau du filtre (8) dans la partie située au-dessus étant suffisante pour que les dispositifs d'ouverture ne puissent encocher ledit filtre (8) et préférablement distant de 0,2 à 3 cm et mieux de 0,25 à 2 cm et mieux encore de 0,3 à 1 cm.
4. Capsule économique compatible et universelle selon la revendication 1 **caractérisée par le fait que** la zone d'ouverture de ladite capsule (1) possède un diamètre, intérieur au gradin (6), non inférieur à 4 mm et préférablement à 5 mm.
5. Capsule économique compatible et universelle selon la revendication 1 **caractérisée par le fait que** la zone d'ouverture de ladite capsule (1) possède un diamètre, intérieur au gradin (6), non supérieur à 15 mm, préférablement à 10 mm et mieux encore à 7 mm.
6. Capsule économique compatible et universelle selon la revendication 1 **caractérisée par le fait que** la zone du dessus entre l'ouverture et le filtre, définie cavité (7) est libre de tout élément structurel et/ou de support du filtre (8).
7. Capsule économique compatible et universelle selon la revendication 1 **caractérisée par le fait que** sur le fond (4) de la capsule (1) sur le côté intérieur sont présentes des entretoises (11) en mesure de maintenir à distance le filtre (8) du fond (4) et de consentir que le fluide puisse rejoindre l'ouverture (5) de l'écoulement, préférablement lesdites entretoises sortent du fond de la capsule, pas plus d'1 cm et préférablement pas plus de 5 mm et mieux encore pas plus de 2,5 mm de manière à ne pas créer une zone de stagnation supérieure à 1/5 et préférablement supérieure à 1/10 du volume du corps de la capsule.
8. Capsule économique compatible et universelle selon la revendication 1 **caractérisée par le fait que** sur le fond (4) de la capsule (1) sur le côté intérieur, lesdites entretoises (11) en mesure de maintenir à distance le filtre (8) du fond (4) obstruent une aire de passage comprise entre 1/5 et 1/10 de la superficie du filtre.
9. Capsule économique compatible et universelle selon la revendication 1 **caractérisée par le fait que** ladite zone d'ouverture (5) est d'épaisseur amincie

de 20 à 70 %, et préférablement de 30 à 50 % par rapport à l'épaisseur du corps tubulaire (2) ou du fond (4) de la capsule (1).

10. Capsule économique compatible et universelle selon la revendication 1 **caractérisée par le fait que** ledit filtre (8) en tissu non tissu est soudé au moins sur un bord (9) périmétrique et/ou sur la partie saillante (10) sommitale des entretoises (11). 5  
10
11. Capsule économique compatible et universelle selon la revendication 1 **caractérisée par le fait que** ledit filtre (8) en tissu non tissu présente un grammage de 40 à 200 gr/mq et préférablement de 50 à 150 gr/mq et mieux encore de 60 à 120 gr/mq. 15
12. Capsule économique compatible et universelle selon la revendication 1 **caractérisée par le fait que** ledit filtre (8) en tissu non tissu présente une épaisseur comprise entre 0,1 et 0,9 mm et préférablement entre 0,2 et 0,8 mm et mieux encore entre 0,4 et 0,7 mm. 20
13. Capsule économique compatible et universelle selon la revendication 1 **caractérisée par le fait que** ledit filtre (8) en tissu non tissu présente une charge de rupture supérieure d'au moins 5 fois par rapport à la charge de rupture du papier filtre à parité de grammage. 25  
30
14. Capsule économique compatible et universelle selon la revendication 1 **caractérisée par le fait que** ledit filtre (8) en tissu non tissu présente une perméabilité comprise entre 250 et 150 l/min (ISO9273) ou comprise entre 2000 et 1400 l/mqs (Glatfelter). 35
15. Capsule économique compatible et universelle selon la revendication 1 **caractérisée par le fait que** ledit filtre (8) en tissu non tissu présente une densité comprise entre 50 g/dmc et 300 g/dmc. 40

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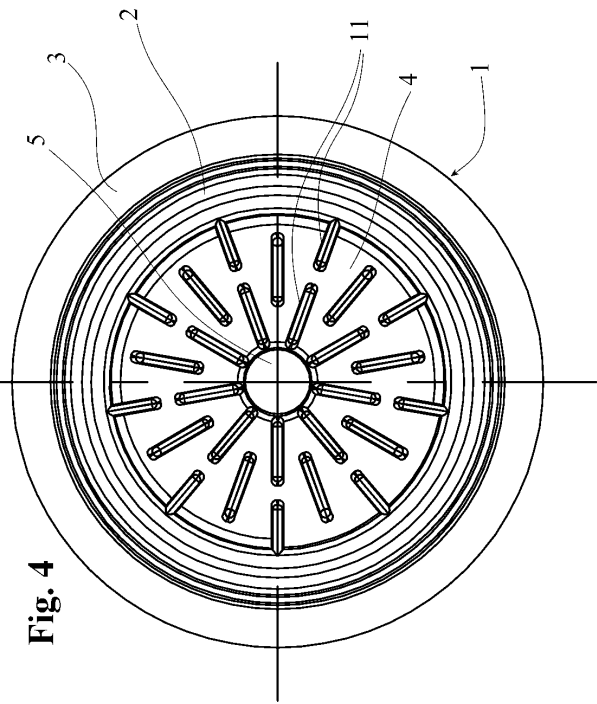
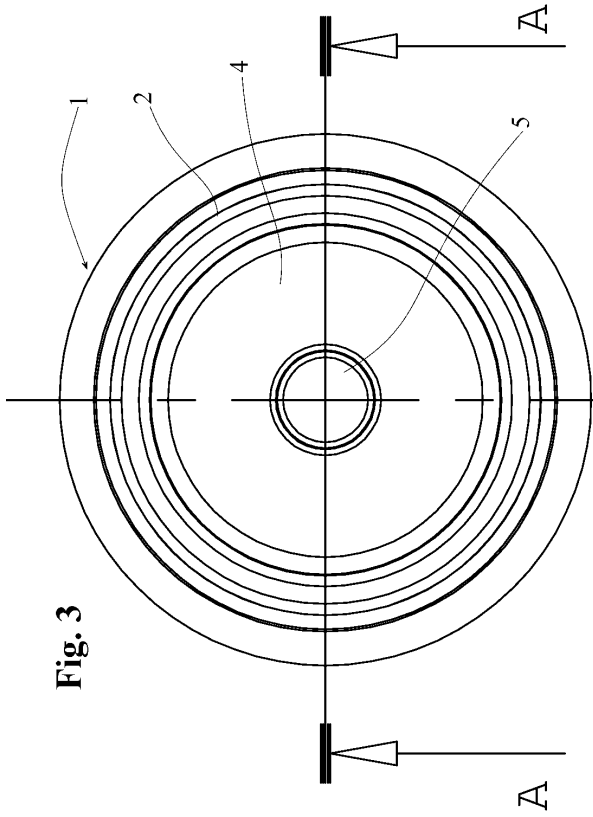
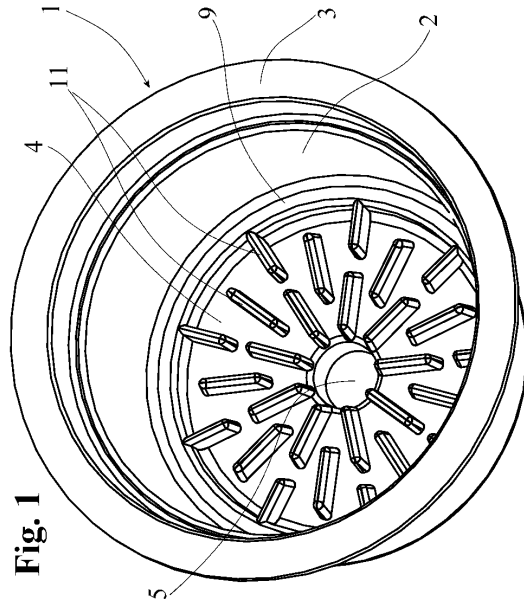
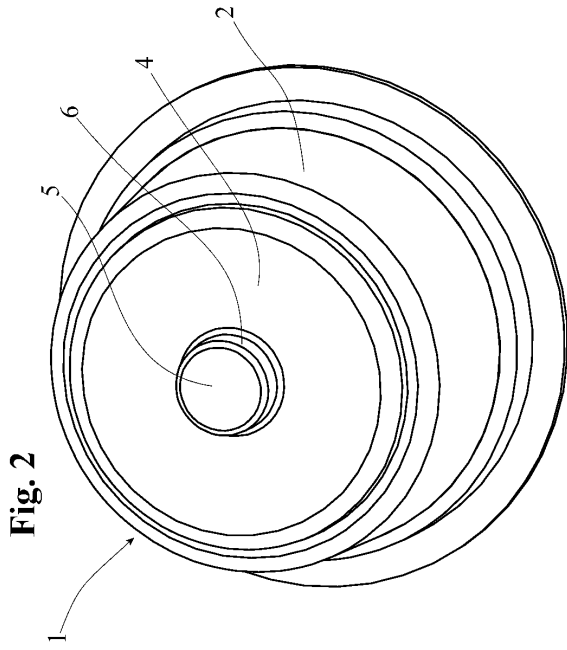


Fig. 6

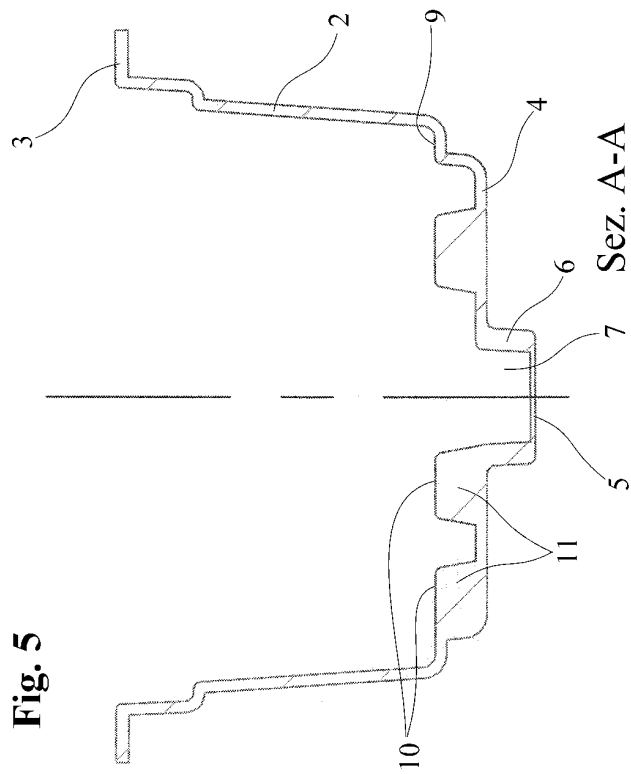
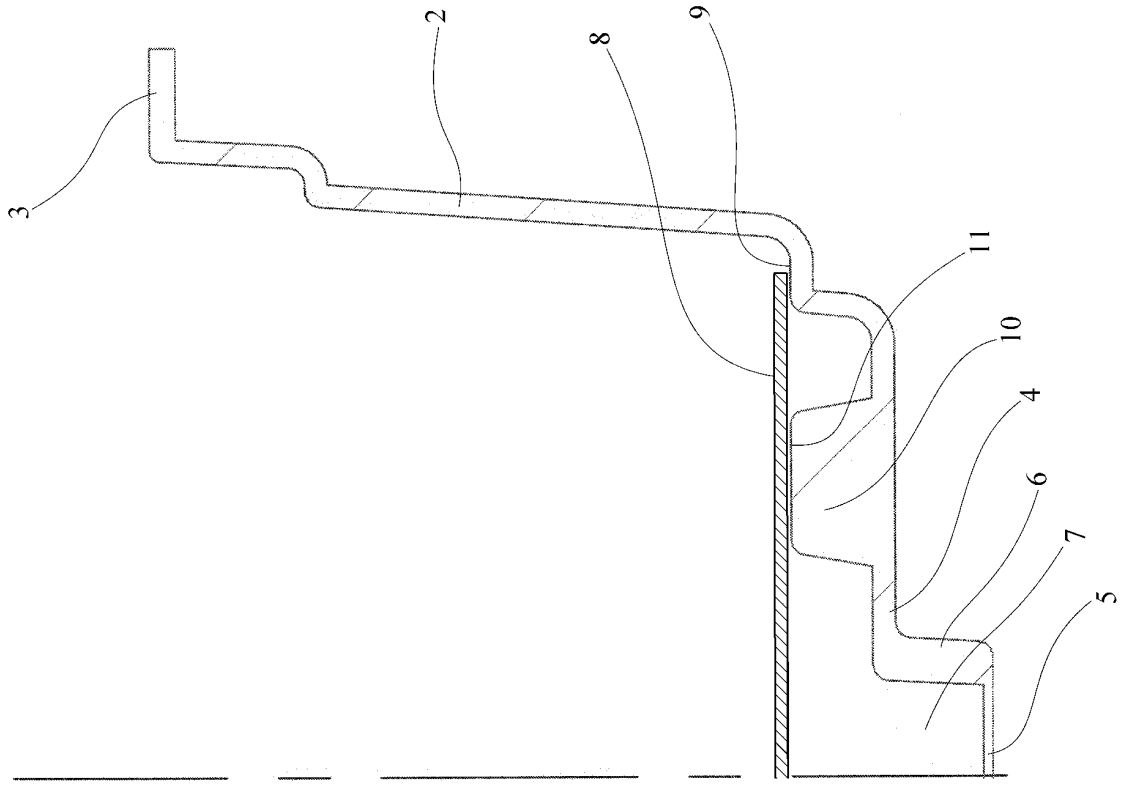
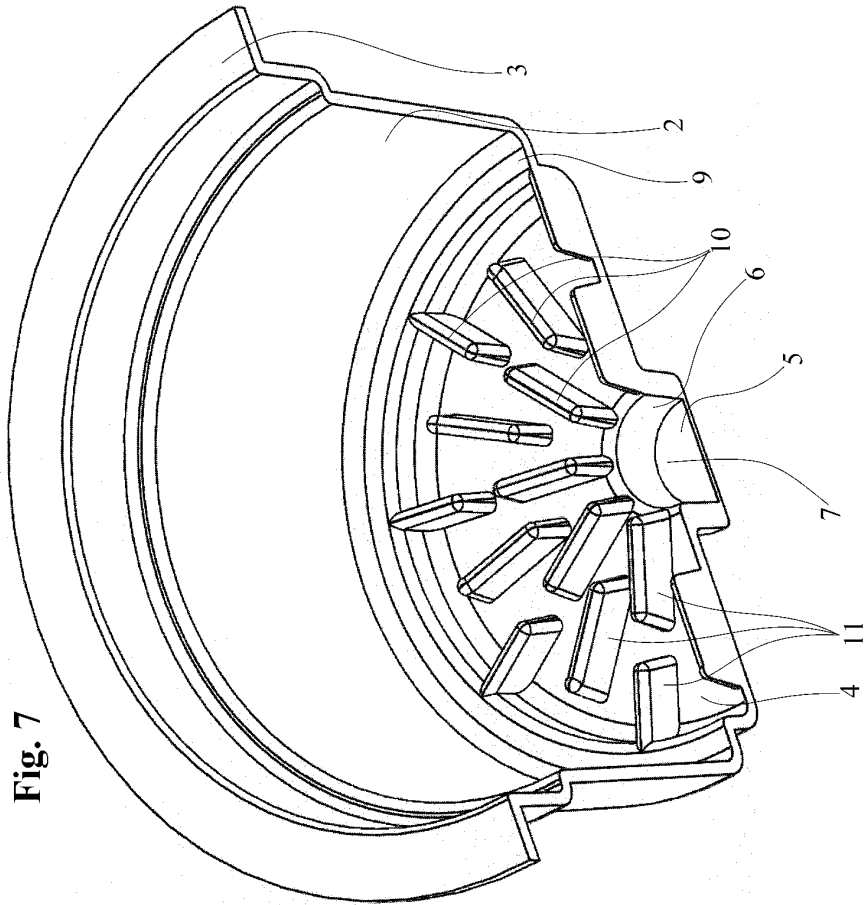
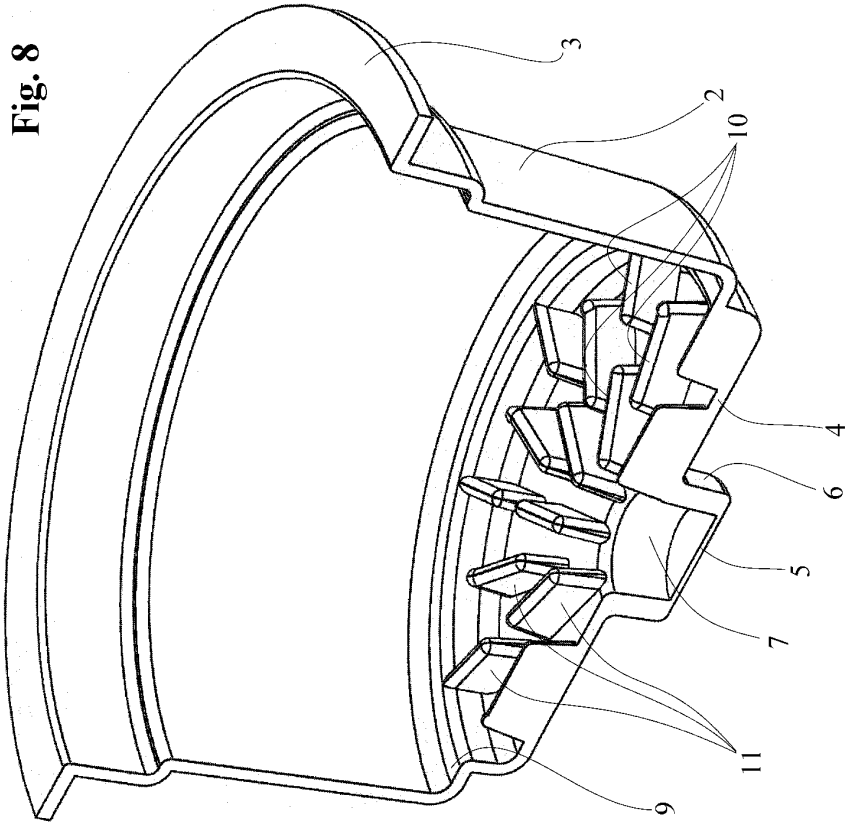
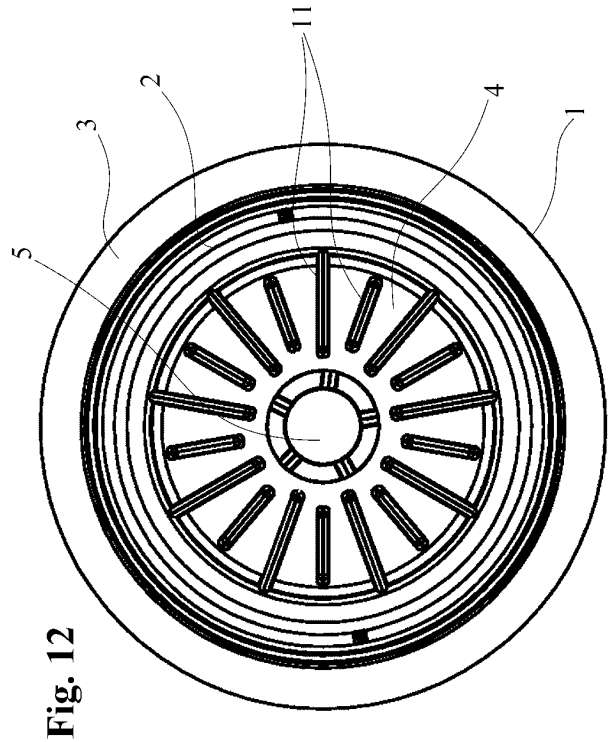
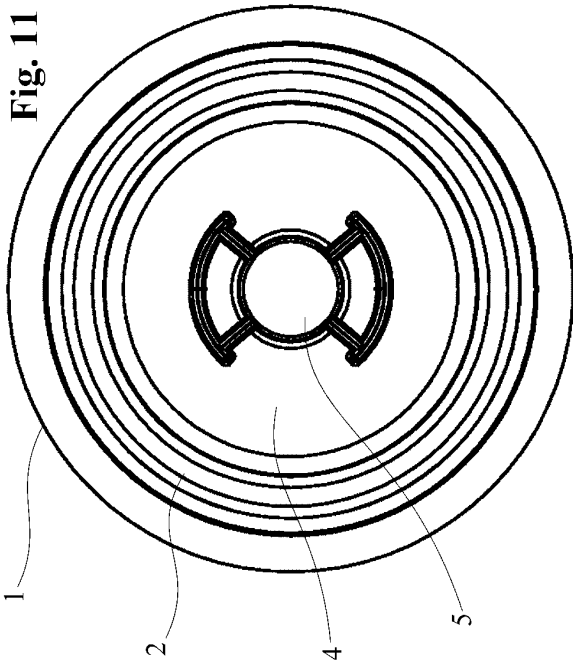
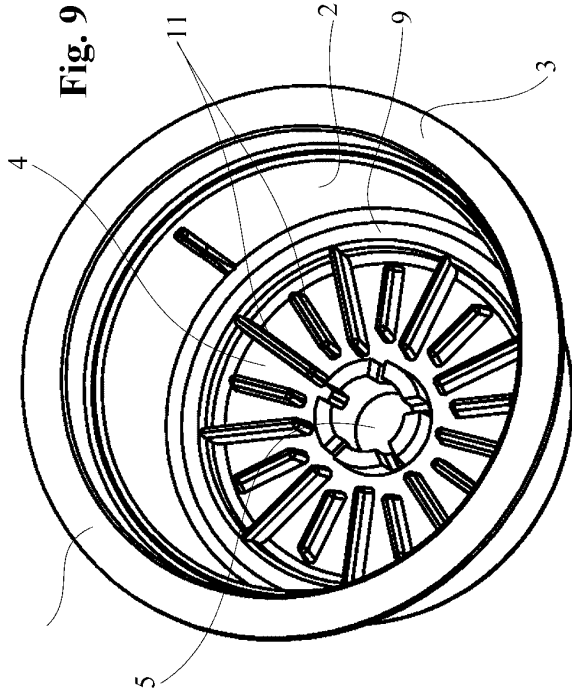
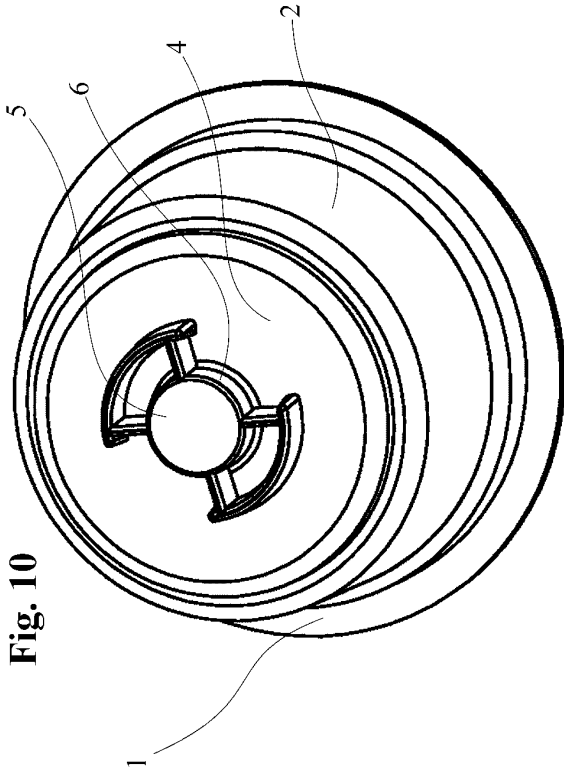


Fig. 5

Sez. A-A





**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

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