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(54) **CAPSULE WITH STRUCTURE FOR CONTAINING AND RELEASING A PRODUCT**

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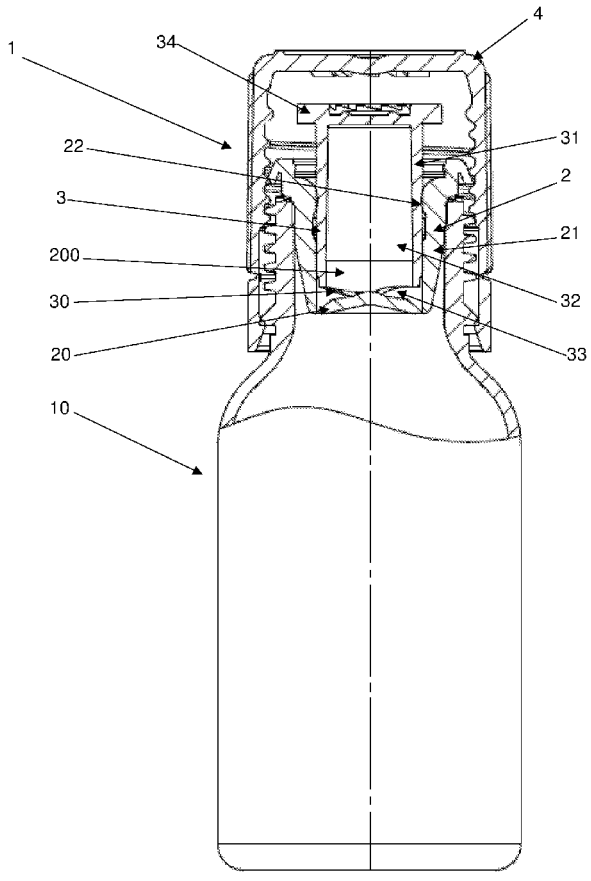
(57) **ABSTRACT**

A closure capsule for closing a container, comprising: —a support (**2**) for a first product, said support (**2**) being applicable to a container and comprising a frangible bottom (**20**); —a cutter (**3**) comprising a drum (**31**) having at a first end (**33**), a cutting edge (**30**) to be positioned opposite the frangible bottom (**20**); said drum (**31**) forming or contributing to forming a concavity (**32**) which extends starting from said first end (**33**). The capsule (**1**) assumes at least a first and a second configuration. In the first configuration the frangible bottom (**20**) is intact and at least said frangible bottom (**20**) and said concavity (**32**) form in combination a chamber (**200**) adapted to contain the first product. In the second configuration said frangible bottom (**20**) is open to allow a mixing of the first product with a product present in the container (**10**). At least a part of the cutter (**3**) is defined at least by: —a matrix (**41**) made of a plastic material; —particles (**42**) absorbing humidity dispersed within the matrix (**41**); —a surface coating (**43**) that acts as a barrier to the passage of humidity, said surface coating (**43**) surrounding the matrix (**41**) made of plastic material.



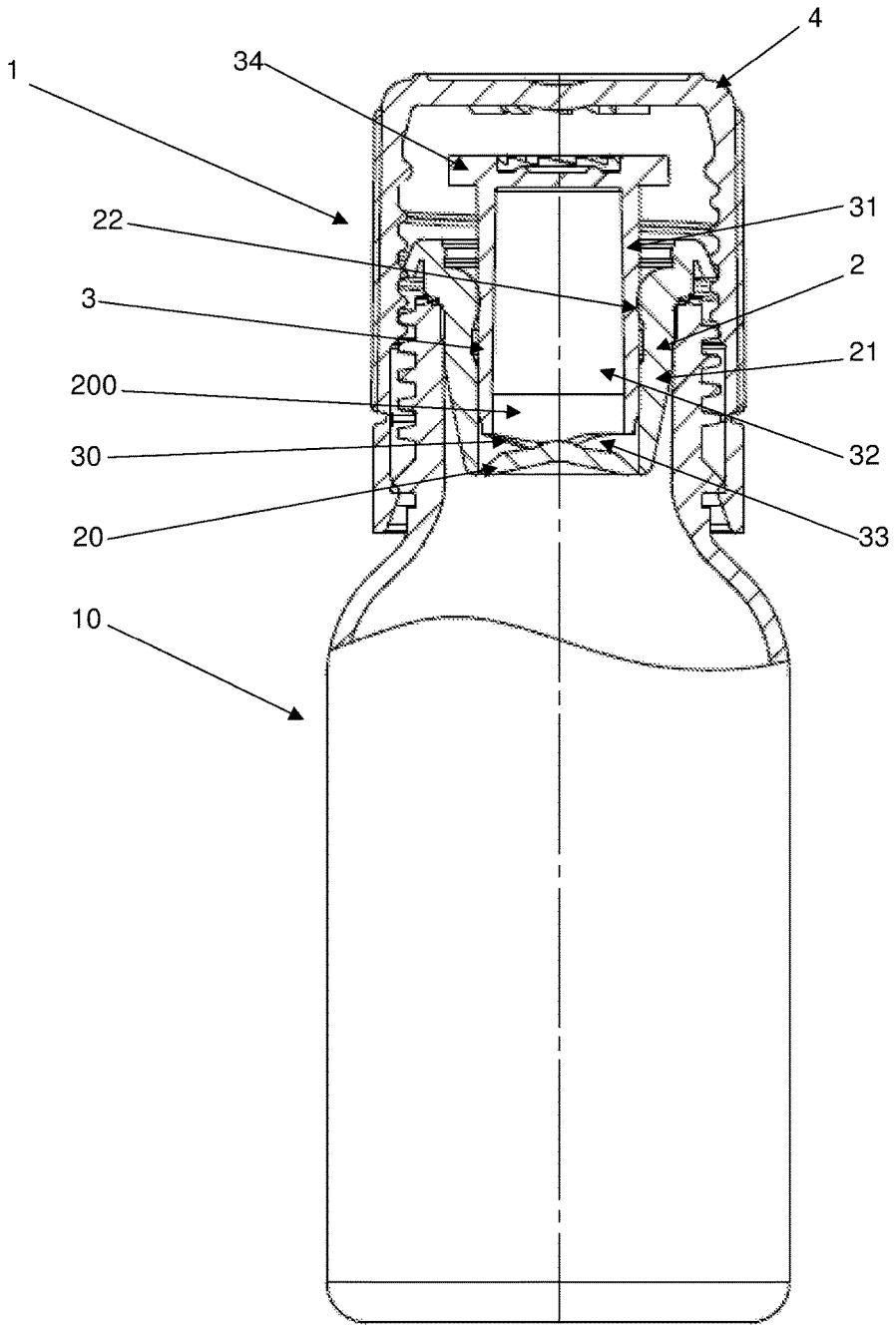


Fig. 1

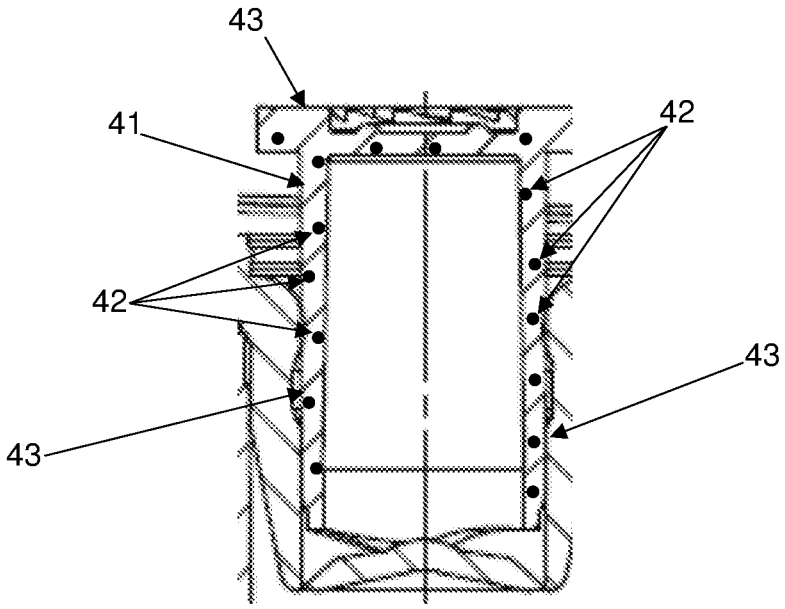


Fig. 2

CAPSULE WITH STRUCTURE FOR CONTAINING AND RELEASING A PRODUCT

TECHNICAL FIELD

[0001] The present invention relates to a capsule comprising a structure for containing and releasing a product.

[0002] Such capsules are typically applied to the mouth of a container and allow, as required, a product contained therein to be mixed with a different product present in the container. Such mixing is envisaged when the container is first opened.

BACKGROUND ART

[0003] Capsules are known that allow such mixing. For example, they are described in EP2704962.

[0004] In that case, the capsule comprises a support cup for supporting a granular product in which a cylindrical cutter is inserted equipped with an end cutting edge. Such cutting edge counterfaces a frangible bottom of the cup. Upon opening the container the cutting edge of the cutter comes into contact with the frangible bottom, causing the opening and the dropping of the product present in the cup into the container. In order to reduce the possibilities of the product present in the cup being altered by external humidity the polypropylene cutter has a concavity in which an absorbent material is placed. In fact, over time, particles of humidity can penetrate through pre-fracture lines of the capsule or more generally through the walls of the capsule. This problem is of deep concern due to the fact that the product placed in the capsule is usually powdered and is therefore particularly sensitive to humidity both due to physical reasons (the powder product could agglomerate) and due to chemical reasons (the properties of the powdered product could be altered).

[0005] A drawback of this construction solution is connected with the higher production and assembly costs. In fact, after the polypropylene cutter has been made a hollow cylinder of absorbent material with reduced dimensions must be shaped and introduced into the concavity of the cutter. This determines slower production as well as the inevitable risks connected with the defective insertion of the absorbent cylinder within the cutter.

DISCLOSURE OF THE INVENTION

[0006] In this context, the technical task underlying the present invention is to propose a capsule which obviates the drawbacks in the known art as described above.

[0007] In particular, an object of the present invention is to provide a capsule that allows the deterioration of a product contained therein to be prevented.

[0008] The stated technical task and specified objects are substantially achieved by a capsule comprising the technical features disclosed in one or more of the appended claims.

BRIEF DESCRIPTION OF DRAWINGS

[0009] Further characteristics and advantages of the present invention will become more apparent from the following indicative, and hence non-limiting, description of a preferred, but not exclusive, embodiment of a capsule illustrated in the appended drawings, in which:

[0010] FIG. **1** is a sectional view of a capsule according to the present invention applied to a container;

[0011] FIG. **2** shows a component of FIG. **1**, highlighting further details.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

[0012] In the appended figures, reference number **1** denotes a closure capsule for closing a container.

[0013] The capsule **1** comprises a support **2** for a first product. The support **2** can be applied to a container, in particular to a mouth of a container. As shown by way of example in the appended figures, the support **2** is a cup **21**. Appropriately, the support **2** comprises a frangible bottom **20**.

[0014] The capsule **1** comprises a cutter **3**. It comprises a drum **31** having at a first end **33** a cutting edge **30** to be positioned opposite the frangible bottom **20**. The drum **31** extends starting from a base **34**. The drum **31** extends like a cylindrical tube at one end of which is the cutting edge **30**.

[0015] The drum **31** forms (or however contributes to forming) a concavity **32** that extends starting from said first end **33**.

[0016] The capsule **1** assumes at least a first and a second configuration. In the first configuration the frangible bottom **20** is intact and at least said frangible bottom **20** and said concavity **32** form in combination a chamber **200** adapted to contain the first product. Preferably, but not necessarily, the first product is granular or powdery. The frangible bottom **20** in the first configuration comprises a pre-incision that facilitates the opening of the frangible bottom **20** following the thrust exerted by the cutter **3**.

[0017] Also in the first configuration the cutter **3** advantageously extends into the cup **21**.

[0018] The support **2** comprises a surface **22** for guiding the cutter **3**. Such guide surface **22** directs the movement of the cutter **3** during the movement of the latter which determines the passage from the first to the second configuration.

[0019] In the second configuration said frangible bottom **20** is open to allow a mixing of the first product with a product present in the container **10**. In the second configuration the frangible bottom **20** is irreversibly open (it is no longer possible to re-close it sealingly). It has been opened by the cutter **3**.

[0020] Preferably, but not necessarily, the product present in the container **10** is liquid.

[0021] At least a part of the cutter **3** and/or of the drum **31** is defined at least by:

- **[0022]** a matrix **41** made of a plastic material;
- **[0023]** particles **42** absorbing humidity which are dispersed within the matrix **41** (FIG. **2** highlights the particles **42** indicating them schematically and out of scale);
- **[0024]** a surface coating **43** that acts as a barrier to the passage of humidity.

[0025] The particles **42** are therefore inserted into the cutter **3** and are not assembled thereto as an additional component.

[0026] Appropriately the surface coating **43** surrounds the matrix **41** made of plastic material.

[0027] Preferably the base **34** and at least a part of the drum **31** are defined at least:

- **[0028]** by the matrix **41** made of plastic material;
- **[0029]** by the particles **42** absorbing humidity dispersed within the matrix **41**;

[0030] by the surface coating **43** that acts as a barrier to the passage of humidity.

[0031] An example of the surface coating **43** is defined by styrene-acrylate resin or a hydroalcoholic solution with an inorganic base. For example, the coating **43** may be applied through plasma deposition or through spraying.

[0032] In a further solution the coating **43** could be applied through heat shrinking an additional film. On that point, the film could surround the cutter **3** adhering thereto by heating. In an additional solution the coating **43** could be applied by bi-injection. On this point, the coating **43** could be introduced into the mould forming the cutting by adhering to the matrix **41**.

[0033] Therefore, the surface coating **43** exerts a protection against humidity coming from outside. It constitutes a coating that is substantially impermeable to humidity. Any minimum quantity of humidity that could cross the surface coating **43** would be intercepted by the absorbent particles **42** that play an active role (unlike the coating **43** that exerts passive protection). The presence of the surface coating **43** is a prerequisite for the absorbent particles **42** since otherwise the absorbent particles **42** would become saturated straight away with external humidity impeding their correct operation. The absorbent particles **42** for example comprise zeolite and/or calcium oxide.

[0034] The matrix **41** made of plastic material confers structural rigidity to the cutter **3**.

[0035] The matrix **41** made of plastic material in which particles **42** are dispersed absorbing humidity preferably affects more than 80%, advantageously more than 90% of the thickness of the drum **31** of the cutter **3**.

[0036] In an exemplifying, but not limiting, solution discontinuities along the thickness of the drum **31** between the matrix **41** and said surface coating **43** may not be visible to the naked eye.

[0037] In the first configuration said matrix **41** made of plastic material is intended to come into contact at least in part with the first product. The matrix **41** directly delimits or contributes to delimiting the chamber **200**.

[0038] The surface coating **43** defines an outer surface of the drum **31**.

[0039] Preferably, the matrix **41** is in direct contact with the surface coating **43**. Advantageously also the support **2**, in particular the cup **21**, is at least in part covered by an additional surface coating that acts as a barrier to the passage of humidity. Appropriately the support **2**, in particular at least a part of the cup **21**, can comprise a matrix **41** made of plastic material in which the absorbent particles **42** are dispersed.

[0040] Appropriately the capsule **1** may comprise a lid **4** that protects the cutter **3** and the support **2**. The lid **4** may comprise an intactness band that is removed upon opening. The movement of the cutter **3**, which determines the passage of the capsule from the first to the second configuration, is induced by the thrust exerted by the lid **4**.

[0041] Typically the capsule **1** is used in the pharmaceutical field. In that case it is important to prevent the deterioration of products due to humidity.

[0042] Furthermore, there are many pharmaceutical applications that envisage, prior to use, the mixing of a product contained in the capsule with a product contained in the container.

[0043] Therefore, during use, with reference to the solution illustrated in FIG. **1**, the user exerts a force on the lid **4**, which screwing onto the container **10**, brings the cutter **3** into rototranslation, which perforates the frangible bottom **20**. In different solutions, the lid **4** could move the cutter **3** in another way (still pushing it against the frangible bottom **20**).

[0044] With the opening of the frangible bottom **20**, the product present in the capsule falls into the container **10** obtaining the desired mixing.

[0045] The invention as it is conceived enables achieving multiple advantages. Above all it allows the production and assembly speed to be optimised. This also has a consequence on the reduction in production costs, allowing at the same time a high performance and effective capsule to be obtained.

[0046] The invention as it is conceived is susceptible to numerous modifications and variants, all falling within the scope of the inventive concept characterising it. Further, all the details can be replaced with other technically-equivalent elements. In practice, all the materials used, as well as the dimensions, can be any according to requirements.

1. A closure capsule for closing a container, comprising:

a support (**2**) for a first product, said support (**2**) being applicable to a container and comprising a frangible bottom (**20**);

a cutter (**3**) comprising a drum (**31**) having at a first end (**33**), a cutting edge (**30**) to be positioned opposite the frangible bottom (**20**); said drum (**31**) forming or contributing to forming a concavity (**32**) which extends starting from said first end (**33**);

the capsule (**1**) assuming at least a first and a second configuration; in the first configuration the frangible bottom (**20**) being intact and at least said frangible bottom (**20**) and said concavity (**32**) forming in combination a chamber (**200**) suitable to contain the first product; in the second configuration said frangible bottom (**20**) being open to allow the mixing of the first product with a product present in the container (**10**);

characterised in that at least a part of the cutter (**3**) is defined at least by:

a matrix (**41**) made of a plastic material;

particles (**42**) absorbing humidity which are dispersed within the matrix (**41**);

a surface coating (**43**) that acts as a barrier to the passage of humidity, said surface coating (**43**) surrounding the matrix (**41**) made of plastic material.

2. The capsule according to claim **1**, characterised in that the cutter (**3**) comprises a base (**34**) from which the drum (**31**) extends; the base (**34**) and at least a part of the drum (**31**) are defined at least:

by the matrix (**41**) made of plastic material;

by the particles (**42**) absorbing humidity which are dispersed within the matrix (**41**);

by the surface coating (**43**) that acts as a barrier to the passage of humidity.

3. The capsule according to claim **1**, characterised in that the matrix (**41**) made of plastic material confers structural rigidity to the cutter (**3**).

4. The capsule according to claim **1**, characterised in that said matrix (**41**) made of plastic material in which the particles (**42**) that absorb humidity are dispersed affects more than 90% of the thickness of the drum (**31**) of the cutter (**3**).

5. The capsule according to claim **1**, characterised in that in the first configuration said matrix (**41**) made of plastic

material directly delimits, at least in part, the chamber (**200**) and is intended to come into contact at least in part with the first product.

6. The capsule according to claim **1**, characterized in that said matrix (**41**) is in direct contact with said surface coating (**43**).

7. The capsule according to claim **1**, characterised in that said surface coating (**43**) defines an outer surface of the drum (**31**).

8. The capsule according to claim **1**, characterised in that said support (**2**) is a cup (**21**), at least a part of which is coated with an additional surface coating that acts as a barrier against the passage of humidity.

9. The capsule according to claim **1**, characterised in that said absorbent particles (**42**) comprise zeolite and/or calcium oxide.

10. The capsule according to claim **1**, characterised in that said surface coating (**43**) comprises a styrene-acrylate resin or a hydroalcoholic solution with an inorganic base.

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