(19) Europäisches Patentamt
European Patent Office
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(11) **EP 3 744 656 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
02.12.2020 Bulletin 2020/49

(51) Int Cl.:
B65D 51/28 *(2006.01)*

(21) Application number: **20176918.9**

(22) Date of filing: **27.05.2020**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **31.05.2019 IT 201900007782**

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(54) DISPENSING CAP FOR DISPENSING A SUBSTANCE IN A CONTAINER AND VIAL PROVIDED WITH SUCH DISPENSING CAP

(57) Dispensing cap (7) configured for being coupled to the mouth (3) of a container (2) storing a first substance (4) and for housing inside therein a capsule (5) storing a second substance (6); the cap (7) comprising: a base (8) for coupling to the container (2); a roof (9) movable between a raised rest position and a lowered dispensing position; side walls (10) connecting the base (8) and the roof (9) configured in such a way that during the lowering of the roof (9) they do not penetrate inside the cap (7) but are laterally folded on themselves; wherein the cap (7) further comprises at least one device configured for blocking the roof (9) in the lowered position or for preventing the raising of the roof (9) from the lowered position beyond a prefixed height.

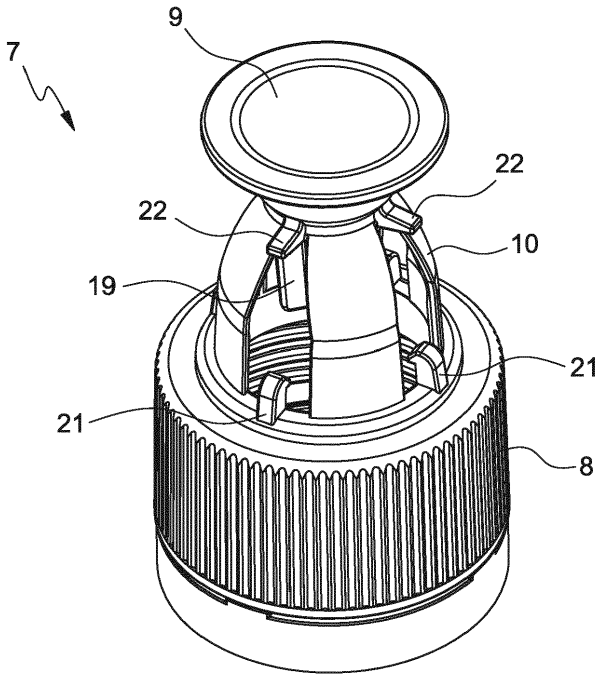

FIG. 5

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Description

Cross-Reference to Related Applications

[0001] This Patent Application claims priority from Italian Patent Application No. 102019000007782 filed on May 31, 2019.

Technical field

[0002] The present invention relates to a dispensing cap for dispensing a substance in a container and to a vial comprising such a dispensing cap. In particular, the present invention relates to a cap suitable for being fixed to the mouth of a container and shaped in such a way as to house inside therein a capsule for storing a first substance. Furthermore, the cap is configured in such a way as to deform under the action of a user for breaking the capsule and controlling the dispensing of the first substance into the container where a second substance is stored which, mixed with the first one, forms a desired solution.

Prior art

[0003] Different types of vials, usually defined as single-dose, are currently known and greatly widespread on the market, consisting of a container storing a first substance and a cap, or closure, inside which a second substance is stored. This configuration allows the two substances to be kept separate until the user wishes to mix them.

[0004] These types of vials are widespread in many application fields which range from the purely pharmacological to the food and sports fields. In general, such vials are in fact usable whenever there is the need to have a pre-established mixture in a short time and to be able to keep the components making up such mixture separate for a long time.

[0005] The need to mix the two components in a practical and fast way just before and at the place of use derives from the fact that the therapeutic properties of the mixed solution rapidly decline over time. Usually the substance stored in the cap is in turn housed inside the capsule so as to be protected from external agents, such as for example humidity. Generally, the substance stored in the capsule placed inside the cap is of the soluble type, in the form of powder or tablet, while the substance stored in the container closed by the cap is usually liquid.

[0006] The dispensing caps are therefore provided with a base portion, usually sleeve-shaped, for coupling with the neck of the container and an upper portion configured for realizing a seat for housing the capsule. In particular, the capsule, which has a substantially dome shape, is blocked in such a way that the flat base thereof faces the mouth of the container, so that the breakage of the lower membrane causes the powder to enter by gravity into the container, while the dome is contained between the walls and the roof of the cap.

[0007] The capsule is usually made of aluminum sheets with reinforcement layers of plastic material wherein the flat base of the capsule, the one placed on the mouth of the container, suitably has a lower thickness than the rest of the capsule for facilitating the breakage thereof. Alternatively, it is currently possible to make the capsule entirely of plastic material.

[0008] The upper portion of the cap, i.e. the portion placed beyond the neck of the container and which houses the capsule, in turn comprises side walls and a roof. By acting manually on the roof, usually by pressing with one or both thumbs, the latter is lowered controlling the breaking of the capsule and the dispensing in the container of the substance contained therein.

[0009] The capsule breakage mechanics can occur in various ways. One typology provides that the side walls of the cap or the roof itself possibly provided with a punch, break through the capsule piercing it from part to part. Another typology provides that the side walls penetrate inside the cap, not piercing the capsule but compressing it until causing the breaking thereof only inferiorly. Both such two solutions currently in use are not entirely optimal from a hygienic point of view. In fact, in both cases there is a sort of contamination from the outside towards the internal environment of the cap kept isolated until the cap itself is moved.

[0010] Specifically, in the first embodiment described, the outer walls of the cap, per se exposed to the external environment, come into direct contact with the substance to be dispensed, inevitably contaminating it. In the second case, the contamination does not take place directly, i.e. with direct contact of exposed walls and substance to be dispensed, but indirectly since the walls, which penetrate in any case inside the cap, cause the breaking only of the lower part of the capsule, leaving the upper face intact. The Applicant analyzed such problem in the past and, as described in WO2015125123, has developed a new and inventive solution which provides for the presence of side walls of the cap which, starting from an extended configuration, are configured for folding back on themselves outside of the cap creating, with the cap compressed, a substantially flower-shaped configuration where each petal is nothing more than a side wall of the cap folded laterally towards the outside.

[0011] Subsequently, the Applicant further improved the cap described in WO2015125123 in order to facilitate the actuation thereof. In fact, starting from the structure described in WO2015125123, analyses conducted on the force necessary for breaking the capsule for the dispensing highlighted two force peaks that are required of the user, wherein the first one, with higher absolute value, is that required for controlling the beginning of the folding step of the side walls; the second peak corresponds to the breaking step of the capsule where, obviously, once opened, no longer offering resistance, the powder comes out. In particular, the first force peak is necessary for yielding the side walls, which at rest have a substantially

vertical curved continuous profile, at a point of union which joins the lower portion, connected to the base of the cap and substantially vertical, and the upper portion connected to the roof of the cap and slightly inclined or curved towards the roof. The solution proposed by the Applicant for facilitating the actuation of the cap according to WO2015125123 is described in EP3279110.

[0012] Therefore, according to EP3279110 the side walls of the cap comprise a lower portion connected to the base and an upper portion connected to the roof wherein, even in the raised roof position, the lower portion of the side walls is inclined towards the outside of the cap and the upper portion of the side walls is inclined towards the inside of the cap. In this way, at the point of union of the upper and lower portions of the side walls, which preferably has a reduced thickness with respect to the rest of the side walls, there is an angle β lower than 180° facing towards the inside of the cap.

[0013] In this way, the force required for the first lowering steps of the cap is minimal, in particular lower than in the case wherein the lower portion is substantially vertical as in the prior art. In fact, the resistance offered to the lowering of the already inclined lower portion is much lower than the configuration wherein a vertical force acts on a component which is also vertical in order to fold it laterally. In other words, according to EP3279110, the force required for the first lowering steps of the cap is further lower as the upper portion is already inclined to fold over the lower portion outside the cap.

[0014] Starting from the solutions proposed in WO2015125123 and EP3279110, the Applicant has now developed a further improvement in order to improve the dispensing step of the substance stored in the capsule in the container. As described above, the actuation of the cap requires the lowering of the roof which, due to the external folding of the side walls, moves from a raised position to a lowered position. In this last position the capsule is in such a state of compression that it breaks (in particular the lower base facing the mouth of the container) causing the first substance to fall into the container. To generate such a break, the cap can internally be provided with a punch for crushing the dome portion of the capsule. Once the capsule has been broken, before drinking the final solution, the user must shake the vial to allow the correct mixing of the substance and to control the fall of any part of the first substance which, although the capsule has been opened, has remained trapped in the capsule. Usually in order to carry out such shaking of the vial, the user interrupts his/her action on the cap roof which, due to the elastic return of the side walls, tends to raise. While not returning to the initial position, such small raising of the cap leaves some portions of the capsule no longer in a collapsed condition and therefore some areas can be formed, for example folded parts of the dome of the capsule, wherein the substance is trapped. Such trapped substance does not penetrate the container even during the user's shaking action, making the final solution at least in part lacking of the first substance.

Description of the invention

[0015] Starting from such prior art, an object of the present invention is to provide a dispensing cap for dispensing a substance in a container which, starting from the cap structure described in WO2015125123 and EP3279110, better guarantees the complete dispensing of the first substance in the container.

[0016] In particular, the present invention is applicable to a vial comprising:

- a container for storing a first substance provided with a mouth;
- a breakable capsule for storing a second substance;
- a cap coupled to the container at the mouth and housing the capsule inside therein.

[0017] In particular, the cap comprises:

- a base coupled to the container;
- a roof movable between a raised rest position, wherein the capsule is kept intact inside the cap, and a lowered position, wherein the opening of the capsule and the dispensing of the second substance into the first substance are generated, and
- side walls connecting the base and the roof.

[0018] In particular, the side walls are configured in such a way that during the lowering of the roof they do not penetrate inside the cap but fold outwards and laterally on themselves.

[0019] Starting from this structure, according to the main aspect of the present invention, the cap comprises a device (i.e. technical means) configured for blocking the roof in the lowered position. In this way advantageously also in the case in which the user releases his/her manual action on the cap, the capsule remains in its maximum collapsed configuration so that potentially trapped parts of the first substance may not be formed.

[0020] According to a preferred embodiment of the present invention, an embodiment which will be described with reference to the accompanying figures, the technical means configured for blocking the roof in a lowered position comprise on one side hook-shaped elements projecting from the sleeve portion of the cap towards the roof and lip elements with radial extension (with respect to the axis of the cap) arranged radially at the roof. In particular, the hook-shaped elements and the lip elements are configured so that:

- during the lowering of the roof, the lip elements exceed the hook elements;
- once the hook elements have been exceeded by the lip elements (i.e. when the roof has reached its lowered position), the lip elements remain blocked in the hook elements, thus avoiding the raising of the

cap.

[0021] Such coupling is therefore of the non-reversible snatch or hook type.

[0022] Other improvements have been made by the Applicant to the cap structure described in WO2015125123 and in EP3279110, i.e. the particular geometry of the star-section punch, i.e. with a section defined by a plurality of radial radiuses or spokes. Furthermore, the outer surface of the cap, that of manual actuation of the cap, has been enlarged for facilitating the coupling with the user's thumb. In particular, the roof has an axial circular geometry with the axis of the circular base of the capsule wherein the radius of the roof is greater than that of the base of the capsule.

Brief Description Of The Drawings

[0023] Further features and advantages of the present invention will become apparent from the following description of a non-limiting embodiment example, with reference to the figures of the accompanying drawings, wherein:

- Figure 1 is a schematic side view of a vial according to the prior art before its use wherein the present invention can be implemented;
- Figure 2 is a schematic sectional view of the vial of Figure 1;
- Figure 3 is a schematic sectional view of the vial of Figure 1 after its use;
- Figure 4 is an enlarged view of the detail IV of Figure 1;
- Figures 5-7 are a perspective view, a sectional view and a bottom view, respectively, of a cap according to the present invention.

Description of an embodiment of the invention

[0024] In the figures, reference numeral 1 indicates an embodiment example of a dispensing cap according to the present invention and reference numeral 10 indicates a vial comprising such dispensing cap.

Figure 1 shows a side view of an embodiment example of a vial 1, for example of the disposable single-dose type, comprising:

- a container 2 in the form of a small bottle provided with a mouth 3 inside which a first liquid substance 4 is stored;
- a frangible capsule 5 inside which a second substance 6 is stored, soluble or mixable in the first 4, preferably the second substance 6 is in powder or in tablet form;
- a cap 7 coupled to the container 2 at the mouth 3 and housing the capsule 5 inside thereof.

[0025] As can be seen in Figure 2, the capsule 5 is dome-shaped 15 with a flat base 16 and the cap 7 is configured for containing and protecting the dome 15 leaving the flat base 16 facing and in abutment on the mouth 3 of the container 2.

[0026] In particular, as visible in the enlargement of Figure 4, at the abutment of the flat base 16 with the mouth 3 of the container 2, the cap comprises a flange 17 which is inserted in a raised edge 18 of the capsule 5.

[0027] The capsule 5 is made of materials suitable for the prolonged storage of the second substance 4 and the flat base 16 is configured, as is known, for breaking whereas the dome portion 15 is only subject to deformation.

[0028] As described above, the cap 7 envelops the capsule 15 and keeps it in position with the base 16 facing the mouth 3 of the container 2. In particular, the cap 7 comprises a base portion 8 in the form of a sleeve for coupling to the neck of the container. In the accompanying figures, such coupling is of the threaded type but can also be made in other ways, for example snatch.

[0029] From the sleeve or base 8, a series of side walls 10 of the cap 7 branch off towards the outside of the container 2, in particular upwards with respect to the mouth 3, which flow into the roof 9 arranged above the capsule 5 and aligned with the mouth 3 of the container 2 along the relative vertical axis A. In fact, both the container 2 and the roof 9 have a circular section and shape for identifying the axis A passing through the relative center.

[0030] Such roof 9 is substantially flat in shape or with a small depression for facilitating the user while using the vial.

[0031] As with known dispensing caps, during use the user must act on the cap 9 by lowering it in such a way that a punch 19 arranged under the roof 9, or in the absence of a punch 19 the cap 7 itself, compress the capsule 5 up to making the base 16 thereof break and thus dispense the powder 6 into the liquid 4 placed in the container. Figure 3 schematically shows the configuration of lowered roof 9.

[0032] The roof 9 is therefore movable under the manual action of a user between a raised rest position, wherein it is in contact without compression against the capsule 5 or slightly spaced as visible in Figure 2, and a lowered working position wherein it progressively compresses the capsule 5 in a collapsed configuration.

[0033] As visible in Figure 3, as is known, the side walls 10 are configured in such a way that during the compression of the roof 9 against the capsule 5, they do not penetrate inside the cap 7 and they reach a configuration folded laterally on themselves.

[0034] As visible in Figure 1, the side walls are interspersed with each other by a series of openings or windows. Advantageously, such windows make the type of internal capsule 5 visible, which can be of a different color depending on the case, or make the indication of an expiry date better accessible and recognizable.

[0035] As visible in Figure 2 and in detail in Figure 4,

the side walls 10 of the cap 7 comprise a lower portion 11 connected to the base 8 and an upper portion 12 connected to the roof 9.

[0036] Figure 4 shows an enlarged section of the cap 7 in the condition of raised rest position of the roof 9. In such configuration, the lower portion 11 of the side walls 10 is inclined towards the outside of the cap. In other words, the lower portion 11 of the side walls 10 is inclined externally upwards, i.e. towards the roof 9, so that the attachment point 14 to the base 8 is arranged in an innermost position of the cap 7 with respect to the attachment point 13 with the relative upper portion 12.

[0037] Considering ideally the upper portion 12 as a connecting rod, the attachment point 14 to the base constitutes the lower hinge whereas the attachment point 13 to the upper portion 12 acts as the intermediate hinge. Figure 4 shows the angle α which the first portion 11 identifies with the vertical or parallel to the axis A.

[0038] In a completely similar manner, even if with opposite inclination, also the upper portion 12 of the side walls 10 is inclined towards the inside of the cap 7 until it connects to the roof 9 of the cap 7. Continuing the analogy described above, also the upper portion 12 creates a sort of connecting rod with the upper hinge 20 at the roof 9.

[0039] As visible in Figure 4, the intermediate hinge 13 is in an outermost position with respect to the lower hinge 14 and the upper hinge 20. Such configuration causes the side walls 10 to create a sort of bellows structure already partially folded even before starting to press on the roof 9 wherein therefore the lower 11 and upper 12 portions, or their ideal continuations, identify a lower angle β of 180° facing inside the cap 7. Such angle can be sharp-edged or provide a fitting.

[0040] The above described configuration of the particular inclinations of the upper 12 and lower 11 portions of the side walls 10 is achieved due to the fact that a first compression of the roof 9, or at least a partial lowering of the roof 9, is carried out with the cap 7 not assembled on the container 2 and in the absence of capsule 5 starting from a configuration of upper 12 and lower 11 portions substantially vertical or in any case aligned in the absence of intermediate angles.

[0041] Since the cap is made by molding of plastic material, the walls 10 deformed in advance folding back on themselves, maintain a configuration already partially folded which greatly reduces the force necessary to then proceed with the actual use of the vial 1.

[0042] Taking into account that such first preliminary lowering of the roof 9 with the cap 7 removed is performed automatically during the final production steps of the cap 7, the end user receives a cap 7 whose actuation is extremely facilitated.

[0043] Such preliminary compression not only brings the lower 11 and upper 12 portions already in a partially folded condition which facilitates the use of the vial, but also provides for carrying out a sort of yielding of the hinges 13, 14, 20 described above with consequent reduction of the effort required for performing the compression again.

[0044] In the example of Figure 4, the point 13 which joins the lower 11 and upper 12 portions, or intermediate hinge, has a reduced thickness with respect to the rest of the wall 10 and a V-shaped groove facing the inside of the cap 7 to further facilitate the folding.

[0045] Likewise, also the lower hinge 14, or attachment point of the lower portion 11 and of the base 8, and/or also the upper hinge 20, has a reduced section with respect to the side walls 10 which assist the folding.

[0046] Figures 5 and 6 show a perspective view and a sectional view, respectively, of a cap according to the present invention, i.e. a cap as described above which furthermore comprises at least one device or technical means configured for blocking the roof in the lowered position of Figure 3 or for limiting the raising thereof upon release of the user's manual action at a predetermined height in the vicinity of the maximum lowering position.

[0047] According to the example shown in these figures, the device configured for blocking the roof in the lowered position comprises a plurality of hook elements 21 substantially axially projecting from the sleeve 18 towards the roof 9 of the cap 7. At the circumferential position of the hook elements 21, at the roof 9 the cap 7 is provided with lip elements 22 having a substantially radial extension. During the lowering of the roof 9, the lip elements 22 exceed the hook elements 21 without any visible details of the geometry of the hooks themselves facing towards the capsule 5. However, once the hook elements 21 have been exceeded by the lip elements 22 (i.e. when the roof has reached its lowered position), the lip elements 22 remain blocked in the hook elements 21, thus avoiding the raising of the roof 9. Such coupling is therefore of the non-reversible snatch type. Figure 6 shows the axis A of the cap so as to highlight the dimensions in terms of radius of the roof 9. In fact, such roof 9 is larger than the open base of the dome where the base 16 of the capsule 5 is placed. Such large radius offers a large gripping portion for the user's thumb.

[0048] Finally, Figure 7 shows the particular shape of punch 19. Such punch is per se substantially cylindrical with a section comprising a plurality of lateral radiuses or spokes 23.

[0049] Finally, it is clear that modifications and variations can be made to the invention described herein without departing from the scope of the appended claims.

Claims

1. A dispensing cap (7) configured to be coupled to the mouth (3) of a container (2) storing a first substance (4) and for housing a capsule (5) storing a second substance (6); the cap (7) comprising:

   - a base (8) to be coupled to the container (2);
   - a roof (9) movable between a raised rest posi-

tion and a lowered dispensing position
- side walls (10) connecting the base (8) and the roof (9), configured so that during the lowering of the roof (9) they do not penetrate inside the cap (7) but are laterally folded on themselves;
characterized in that
the cap (7) moreover comprises at least a blocking device configured for blocking the roof (9) in the lowered position or for avoiding the raising of the roof (9) from the lowered position beyond a prefixed height.

2. Cap as claimed in Claim 1, wherein the blocking device configured for blocking the roof (9) in the lowered position or for avoiding the raising of the roof (9) from the lowered position beyond a prefixed height comprises shaped portions of the cap configured for realising an irreversible snatch coupling when the roof (9) is in the lowered position.

3. Cap as claimed in Claim 1 or 2, wherein the cap (7) comprises a sleeve (8) for coupling to the container (2), the blocking device configured for blocking the roof (9) in the lowered position or for avoiding the raising of the roof (9) from the lowered position beyond a prefixed height comprising:

- a plurality of hook elements (21) substantially axially projecting from the sleeve (8) towards the roof (9);
- a plurality of lip elements (22) substantially radially projecting from the roof (9);

wherein the hook elements (21) and the lip elements (22) are configured so that:

- during the lowering of the roof (9) the lip elements (22) exceed the hook elements (21);
- once the hook elements (21) have been exceeded by the lip elements (22), the lip elements (22) are blocked by the hook elements (21).

4. Cap as claimed in any one of the foregoing claims, wherein with respect to the axis of the cap (7) the roof (9) has a radius higher than the contact point of the sleeve (8) with the side walls (10).

5. Cap as claimed in any one of the foregoing claims, wherein the roof (9) is inferiorly provided with a punch (19) extending axially towards the capsule (5), the punch (19) having a substantially cylindrical shape along the axis (A) of the cap and a cross-section comprising a plurality of radiuses (23).

6. A vial (1) comprising:

- a container (2) for storing a first substance (4) provided with a mouth (3);
- a breakable capsule (5) for storing a second substance (6) ;
- a cap (7) coupled to the mouth (3) of the container (2) and housing the capsule (5);
wherein the cap (7) is realised as claimed in any one of the foregoing claims.

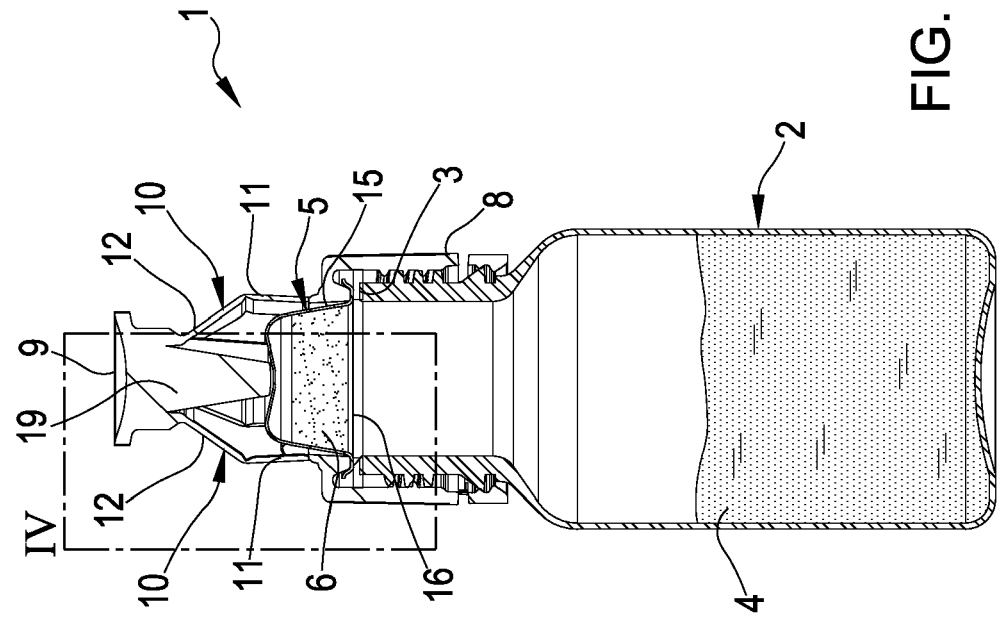

FIG. 2

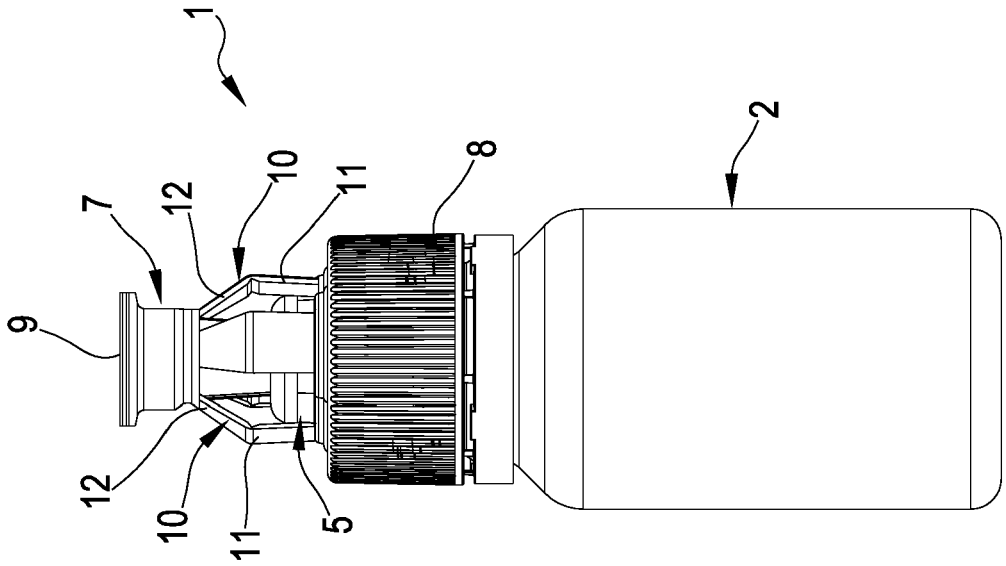

FIG. 1

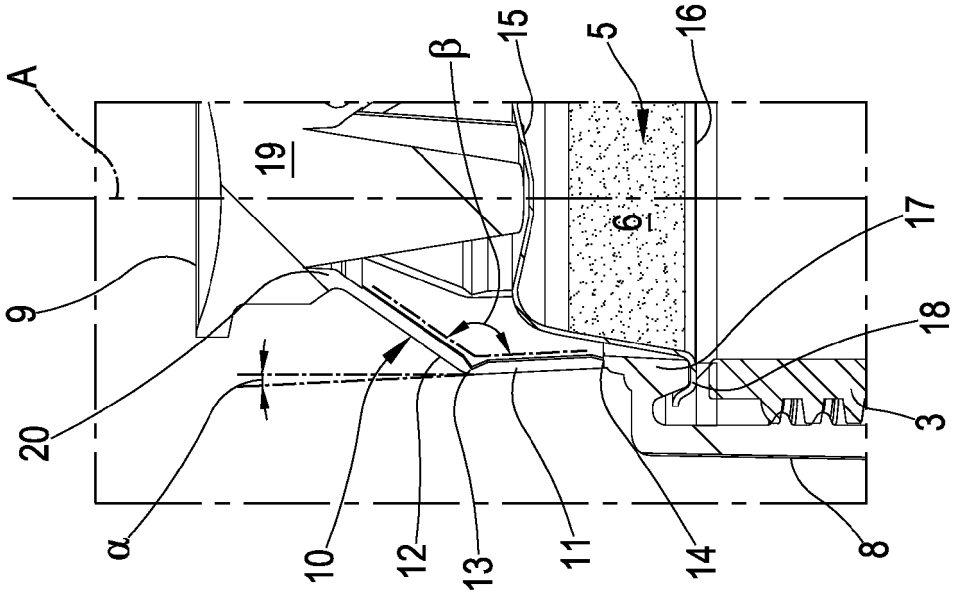
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FIG. 4

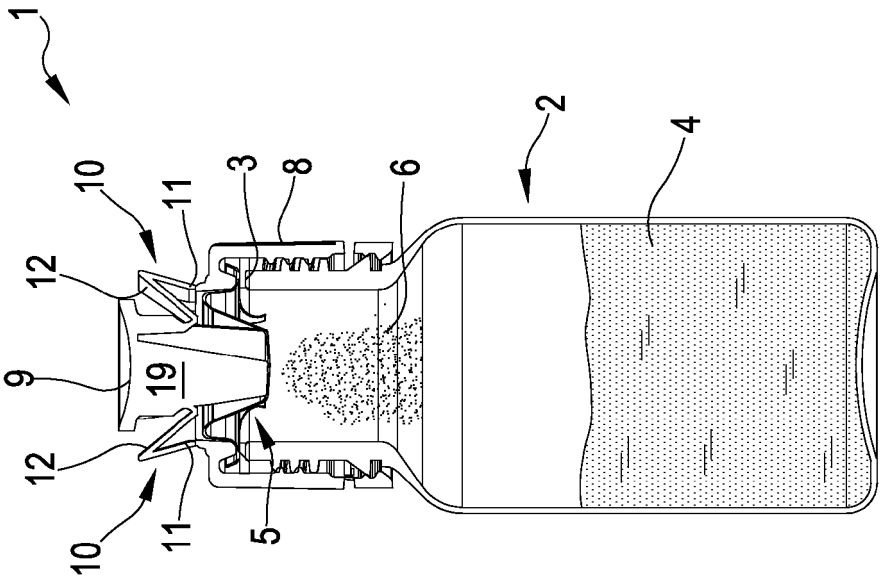
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FIG. 3

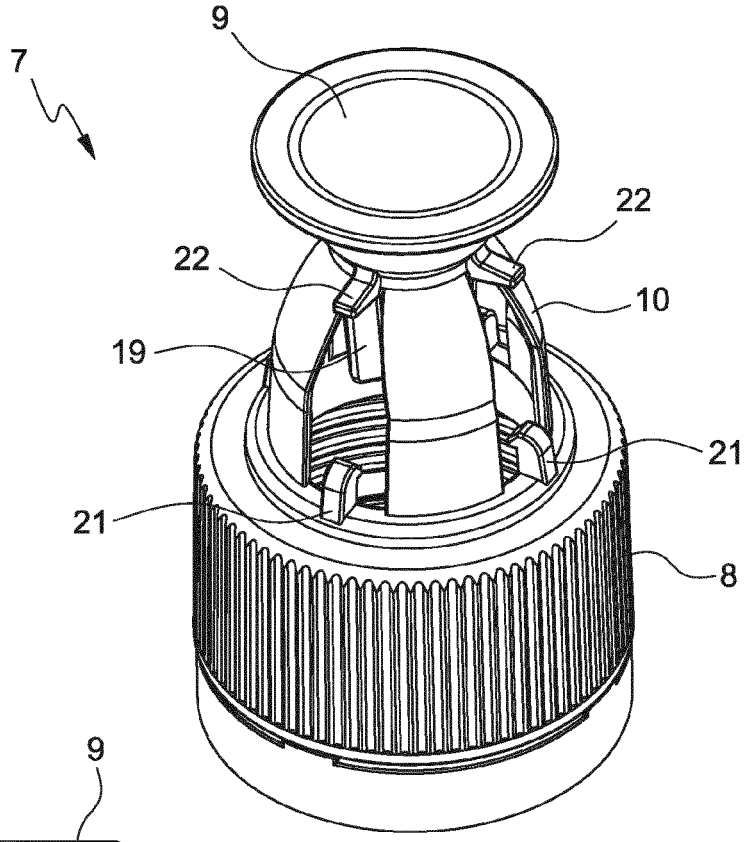

FIG. 5

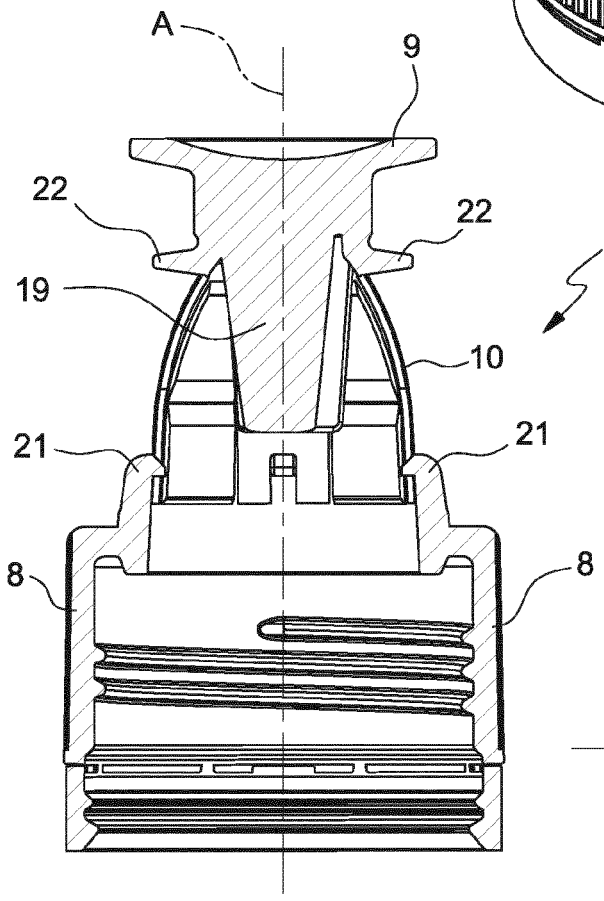

FIG. 6

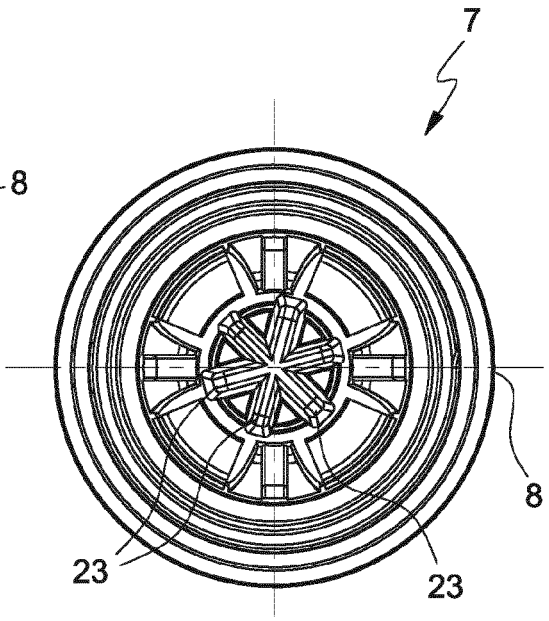

FIG. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 20 17 6918

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			TECHNICAL FIELDS SEARCHED (IPC) B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	16 June 2020	Le Bihan, Nicolas

CATEGORY OF CITED DOCUMENTS

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16-06-2020

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