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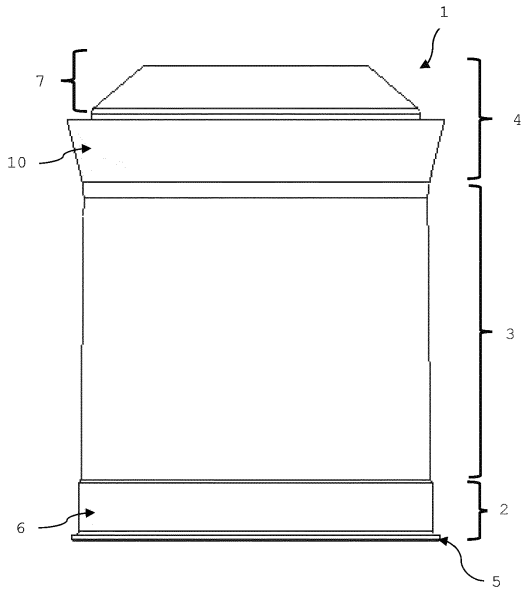
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(54) PISTON FOR A PACKAGING CONTAINER, PACKAGING CONTAINER AND METHOD OF MAKING THEREOF

(57) The present invention is directed to a piston for sliding along the longitudinal axis within and in contact with an internal wall of a pressurized packaging container, the piston comprising a cylindrical middle portion, a base portion at the first end of a middle portion, the base portion and the middle portion being in fluid connection with each other, a top portion at the second end of the middle portion, the top portion and the middle portion being in fluid connection with each other, wherein the base portion comprises a circumferential base collar and a mechanically enforced area connecting the circumferential collar with the middle portion, the middle portion has a smaller average wall thickness with respect to the mechanically enforced area of the base portion, and the top portion or the middle portion have a circumferential top sealing collar oriented outwards of the piston for separating two chambers within a packaging container.

Fig. 1A



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Description

Field of the invention

[0001] The present invention is directed to the piston for a packaging container, a packaging container, and a method of making a packaging container.

Background of the invention

[0002] Packaging containers with pistons are typically used for sensitive products. The containers allow for an adequate protection of the product while simultaneously allowing for easy dispensing by the user of the container.

[0003] One challenge for packaging containers comprising pistons is their manufacturing and the associated quality control. Pistons are fed on an assembly line to be inserted into the packaging container. This requires certain mechanical stability of the piston while still allowing for gas-tight sealing of the two resulting compartments in the pressurized packaging container.

[0004] Several versions of pistons and packaging containers are known from the prior art. DE19717080 and EP0732276 disclose pistons and packaging containers. However, the pistons lack the mechanically enforced area at the bottom part of the piston. Hence, the pistons run a risk of premature breakage and undesired deformations during manufacturing.

[0005] Thus, there still is a need for developing pistons and packaging containers with improved mechanical stability while being elastic and providing for gas-tight sealings in the packaging containers when pressurized. Such an improvement in pistons would allow for easier manufacturing, lower rejects, and lower manufacturing costs.

Summary of the invention

[0006] Therefore, the first object of the present invention is a piston for sliding along the longitudinal axis within and in contact with an internal wall of a packaging container, the piston comprising

- a cylindrical middle portion,
- a base portion at the first end of a middle portion, the base portion and the middle portion being in fluid connection with each other,
- a top portion at the second end of the middle portion, the top portion and the middle portion being in fluid connection with each other,
  wherein
- the base portion comprises a circumferential base collar and a mechanically enforced area connecting the circumferential collar with the middle portion,
- the middle portion has a smaller average wall thickness with respect to the mechanically enforced area of the base portion, and
- the top portion or the middle portion have a circumferential top sealing collar oriented outwards of the piston for separating two chambers within a packaging container.

[0007] The second object of the present invention is a packaging container having a cylindrical main body and a tapered neck part, the tapered neck part having a valve plate for accommodating a valve, the packaging container comprising

- a piston as defined above within the cylindrical main body for sliding along the longitudinal axis within and in contact with the internal wall of the packaging container,
- a gas space underneath the piston created within the cylindrical main body and facing the bottom of the packaging container,
- a product space above the piston created within the cylindrical main body and facing the valve plate,
- and a valve.

[0008] The third object of the present invention is a method of making a packaging container as defined above comprising the steps of:

a) producing the main body of the packaging in cylindrical shape with a constant diameter over the entire height of the packaging with an integrated bottom,

b) inserting the piston as defined above into the cylindrical main body so that it is movable along the longitudinal axis within and in contact with the internal wall of the cylindrical main body, thereby separating a space facing the bottom of the cylindrical main body and the top of the cylindrical main body from each other and providing a sealing between the two spaces,

c) forming the tapered neck at the end of the cylindrical main body opposite to the bottom of the cylindrical main body,

d) inserting a valve plate and a valve into the tapered neck and closing the tapered neck to form a gas-tight packaging allowing for the storage of pressurized gas.

Brief description of the figures

[0009]

Fig. 1A depicts a side view of the piston.

Fig. 1B depicts a perspective view of the piston.

Fig. 2 depicts a cut section of the piston.

Fig. 3 depicts a cut section of the piston.

Fig. 4 depicts a cut section of the packaging container.

Detailed description of the invention

[0010] Inventors of the present invention have unexpectedly found out that the piston, packaging container, and method of making according to the independent claims of the present invention provide for a packaging with less manufacturing rejects, higher speed of manufacturing, and lower cost in production.

[0011] In the following, the invention set out in the claims is described in detail with reference to the figures.

[0012] The present invention is directed to a piston (1, 11, 21, 31) for sliding along the longitudinal axis within and in contact with an internal wall of a packaging container (41), the piston (1, 11, 21, 31) comprising

- a cylindrical middle portion (3),
- a base portion (2) at the first end of a middle portion (3), the base portion (2) and the middle portion (3) being in fluid connection with each other,
- a top portion (4) at the second end of the middle portion (3), the top portion (4) and the middle portion (3) being in fluid connection with each other,

wherein

- the base portion (2) comprises a circumferential base collar (5) and a mechanically enforced area (6) connecting the circumferential collar (5) with the middle portion (3),
- the middle portion (3) has a smaller average wall thickness with respect to the mechanically enforced area (6) of the base portion (2), and
- the top portion (4) or the middle portion (3) have a circumferential top sealing collar (10) oriented outwards of the piston (1, 11, 21, 31) for separating two chambers within a packaging container (41).

[0013] The side view of the piston (1, 11, 21, 31) is shown in Fig. 1 A, whereas Fig. 1B shows a perspective view of the piston (1, 11, 21, 31).

[0014] The mechanically enforced area (6) of the base portion (2) has the function of securing the cylindrical shape of the piston (1, 11, 21, 31), especially during storage and manufacturing.

[0015] For use in certain packaging containers, it is preferred that the top portion (4) of the piston (1, 11, 21, 31) comprises:

- a top wall (7) having one or more indentations (8) oriented towards the base portion (2) of the piston for fitting the valve plate (44) of a packaging container (41),
- a connecting portion (9) for connecting the top wall (7) with the middle portion (3).

[0016] It is further preferred that circumferential top sealing collar (10) of the piston (1, 11, 21, 31) he extends from the middle portion (3) and reaches into the top portion (4) of the piston (1, 11, 21, 31), thereby creating a gap between the circumferential top sealing collar (10) and the connecting portion (9). This configuration ensures best sealing properties in the packaging container (41) between the gas space (46) and the product space (47).

[0017] It is preferred from the viewpoint of manufacturing that the top sealing collar (10) is made of the same material as the piston (1, 11, 21, 31). Alternatively, the top sealing collar (10) may be configured as a sealing lip made of a different material as the piston (1, 11, 21, 31) to further increase air-tight sealing.

[0018] It is preferred that the wall thickness of the top sealing collar (10) is lower than the wall thickness of the middle portion (3) of the piston (1, 11, 21, 31). This allows for a certain elasticity of the top sealing collar (10).

[0019] It is further preferred from the viewpoint of sliding within the packaging that the top wall (7) of the piston (1, 11, 21, 31) has a convex or trapezoid shape. The top wall (7) preferably further has one or more indentation(s) (8) for fitting the valve plate (44) of a packaging container (41).

[0020] It is further preferred that the top sealing collar (10) of the piston (1, 11, 21, 31) ends at the level of or below the top wall (7).

[0021] It is further preferred that the mechanically enforced area (6) of the piston (1, 11, 21, 31) has a higher wall thickness by 10% or more, preferably by 20% or more, more preferably by 25% or more, still more preferably by 30% or more, with respect to the average wall thickness of the middle portion (3) of the piston (1, 11, 21, 31).

[0022] It is further preferred that piston (1, 11, 21, 31) comprises one or more ribs (25, 35) on the inside of the piston (1, 11, 21, 31) for improving the mechanical stability of the piston (1, 11, 21, 31) and for preventing locking or blocking of the one or more pistons (1, 11, 21, 31) when stacked onto each other. Such stacking may occur during storage, transport, and manufacturing by feeding the pistons (1, 11, 21, 31) into a manufacturing line. The ribs (25, 35) thereby prevent locking or blocking of the base portion (2) of a piston (1, 11, 21, 31) into the top

portion (4) of another piston (1, 11, 21, 31). This allows for easy manufacturing without blocking assembly lines by locked or blocked pistons, resulting in packaging containers having less quality issues. The ribs (25, 35) are illustrated in the cut sections of Fig. 2 and 3.

[0023] In one aspect of the present invention, the piston (1, 21, 31) comprises one or more ribs (25) on the inside of the piston (1, 11, 21, 31) extending from the base portion (2) into the middle portion (3). This version of the piston is easy to manufacture, has improved mechanical stability, and prevents locking or blocking of the pistons when stacked onto each other, as explained above.

[0024] In another aspect of the present invention, the piston (1, 31) comprises one or more ribs (35) on the inside of the piston (1, 11, 21, 31) extending from the base portion (2) into the top portion (4), and preferably ending at or before the top wall (7) of the top portion (4). This version of the piston has the highest mechanical stability while still allowing for a certain degree of elasticity at the top sealing collar (10) and base sealing collar (5). It also prevents locking or blocking of the pistons (1, 11, 21, 31) when stacked, as explained above.

[0025] The top sealing collar (10) of the piston (1, 11, 21, 31) provides for gas-tight sealing in radial direction toward the side wall of the packaging container (41). Hence, the ribs (25, 35) prevent locking or blocking of the piston (1, 11, 21, 31) when stacked onto each other, but do not impair the elasticity and function of the top sealing collar (10).

[0026] It is further preferred that the piston (1, 11, 21, 31) is a metal or plastic component, preferably an elastic plastic component, more preferably an elastic plastic component made of polyethylene (PE), polypropylene (PP), polyethylene terephthalate (PET), or mixtures thereof.

[0027] It is further preferred from the viewpoint of material savings and minimizing the size of the packaging container that the piston (1, 11, 21, 31) has a hollow body. Thus, it is preferred that the piston (1, 11, 21, 31) has an open bottom at the bottom portion (4) thereby creating a gas space in a packaging container (41).

[0028] Another object of the present invention is a packaging container (41) having a cylindrical main body (42) and a tapered neck part (43), the tapered neck part (43) having a valve plate (44) for accommodating a valve (45), the packaging container (41) comprising

- a piston (1, 11, 21, 31) as defined above within the cylindrical main body (42) for sliding along the longitudinal axis within and in contact with the internal wall of the packaging container (41),
- a gas space (46) underneath the piston (1, 11, 21, 31) created within the cylindrical main body (42) and facing the bottom of the packaging container (41),
- a product space (47) above the piston (1, 11, 21, 31) created within the cylindrical main body (42) and facing the valve plate (44),
- and a valve (45).

[0029] This packaging container is depicted in Fig. 4.

[0030] It is preferred that the packaging container (41) has a hole at the bottom for allowing the introduction of pressurized gas. It is further preferred that the hole is closed with a plastic or rubber stopper, once the pressurized gas has been introduced.

[0031] It is preferred that the piston (1, 11, 21, 31) within the packaging container (41) has an elastic body allowing for a sliding movement along the longitudinal axis of the cylindrical main body (42), thereby separating the gas space (46) and the product space (47) from each other and providing a sealing between the gas space (46) and the product space (47).

[0032] It is further preferred that the gas space (46) of the packaging container (41) comprises one or more pressurized gas(es), preferably pressurized air, pressurized carbon dioxide, liquefied petroleum gases, or mixtures thereof.

[0033] The function of the pressurized gas is to eject the product from the product space (47), once the user operates the valve (45). This operation lifts the piston (1, 11, 21, 31) in the direction of the tapered neck part (43) of the packaging container (41), thereby providing a continuous pressure onto the product allowing for another ejection of the product when the user operates the valve (45) again.

[0034] It is, therefore, further preferred that the product space (47) of the packaging container (41) comprises one or more cosmetic product(s), preferably one or more liquid cosmetic product(s), more preferably one or more hair dye product(s), one or more oxidizing cosmetic product(s), one or more permanent waving product(s), or one or more hair care or skin care product(s).

[0035] Another object of the present invention is a method of making a pressurized packaging container (41) as defined above comprising the steps of:

a) producing the main body (42) of the packaging in cylindrical shape with a constant diameter over the entire height of the packaging with an integrated bottom,

b) inserting the piston (1, 11, 21, 31) as defined above into the cylindrical main body (42) so that it is movable along the longitudinal axis within and in contact with the internal wall of the cylindrical main body (42), thereby separating a space facing the bottom (46) of the cylindrical main body (42) and the top (47) of the cylindrical main body (42) from each other and providing a sealing between the two spaces,

c) forming the tapered neck (43) at the end of the cylindrical main body (42) opposite to the bottom of

the cylindrical main body (42),

d) inserting a valve plate (44) and a valve (45) into the tapered neck (43) and closing the tapered neck (43) to form a gas-tight packaging allowing for the storage of pressurized gas.

[0036] As an additional preferred step e), a product is filled into the packaging container after or prior to step d).

[0037] As an additional preferred step f), a hole is introduced in the bottom of the cylindrical main body (42) of the packaging container (41).

[0038] It is preferred to execute step f) prior to inserting the product into the product space (47).

[0039] As an additional preferred step g), pressurized gas (46) is filled through the hole into the gas space of the packaging container (41), and the hole is closed in a gas-tight manner with a plastic or rubber stopper.

[0040] It is preferred to execute step g) after inserting the product into the product space (47).

Claims

1. A piston (1, 11, 21, 31) for sliding along the longitudinal axis within and in contact with an internal wall of a packaging container (41), the piston (1, 11, 21, 31) comprising

- a cylindrical middle portion (3),
- a base portion (2) at the first end of a middle portion (3), the base portion (2) and the middle portion (3) being in fluid connection with each other,
- a top portion (4) at the second end of the middle portion (3), the top portion (4) and the middle portion (3) being in fluid connection with each other,

wherein

- the base portion (2) comprises a circumferential base collar (5) and a mechanically enforced area (6) connecting the circumferential collar (5) with the middle portion (3),
- the middle portion (3) has a smaller average wall thickness with respect to the mechanically enforced area (6) of the base portion (2), and
- the top portion (4) or the middle portion (3) have a circumferential top sealing collar (10) oriented outwards of the piston (1, 11, 21, 31) for separating two chambers within a packaging container (41).

2. The piston (1, 11, 21, 31) according to claim 1 **characterized in that** the top portion (4) comprises:

- a top wall (7) having one or more indentations (8) oriented towards the base portion (2) of the piston for fitting the valve plate (44) of a packaging container (41),
- a connecting portion (9) for connecting the top wall (7) with the middle portion (3).

3. The piston (1, 11, 21, 31) according to any of the claims 1 and/or 2 **characterized in that** the circumferential top sealing collar (10) extends from the middle portion (3) and reaches into the top portion (4) of the piston (1, 11, 21, 31), thereby creating a gap between the circumferential top sealing collar (10) and the connecting portion (9).

5. The piston (1, 11, 21, 31) according to any of the preceding claims **characterized in that** the top sealing collar (10) ends at the level of or below the top wall (7).

6. The piston (1, 11, 21, 31) according to any of the preceding claims **characterized in that** the top wall (7) has a convex or trapezoid shape.

7. The piston (1, 11, 21, 31) according to any of the preceding claims **characterized in that** the mechanically enforced area (6) has a higher wall thickness by 10% or more, preferably by 20% or more, more preferably by 25% or more, still more preferably by 30% or more, with respect to the average wall thickness of the middle portion (3).

8. The piston (1, 11, 21, 31) according to any of the preceding claims **characterized in that** the piston (1, 11, 21, 31) comprises one or more ribs (25, 35) on the inside of the piston (1, 11, 21, 31) for preventing locking or blocking of one or more pistons (1, 11, 21, 31) when stacked onto each other.

9. The piston (1, 21, 31) according to claim 8 **characterized in that** the one or more ribs (25) on the inside of the piston (1, 21, 31) extend from the base portion (2) into the middle portion (3).

10. The piston (1, 31) according to claim 8 **characterized in that** the one or more ribs (35) on the inside of the piston (1, 31) extend from the base portion (2) into the top portion (4), and preferably end at or before the top wall (7) of the top portion (4).

11. The piston (1, 11, 21, 31) according to any of the preceding claims **characterized in that** the piston (1, 11, 21, 31) is a metal or plastic component, preferably an elastic plastic component, more preferably an elastic plastic component made of polyethylene (PE), polypropylene (PP), polyethylene terephthalate (PET), or mixtures thereof.

12. The piston (1, 11, 21, 31) according to any of the

preceding claims **characterized in that** the piston (1, 11, 21, 31) has a hollow body.

13. A packaging container (41) having a cylindrical main body (42) and a tapered neck part (43), the tapered neck part (43) having a valve plate (44) for accommodating a valve (45), the packaging container (41) comprising

- a piston (1, 11, 21, 31) according to any of the claims 1 to 12 within the cylindrical main body (42) for sliding along the longitudinal axis within and in contact with the internal wall of the packaging container (41),
- a gas space (46) underneath the piston (1, 11, 21, 31) created within the cylindrical main body (42) and facing the bottom of the packaging container (41),
- a product space (47) above the piston (1, 11, 21, 31) created within the cylindrical main body (42) and facing the valve plate (44),
- and a valve (45).

14. The packaging container (41) according to claim 13 **characterized in that** the piston (1, 11, 21, 31) has an elastic body allowing for a sliding movement along the longitudinal axis of the cylindrical main body (42), thereby separating the gas space (46) and the product space (47) from each other and providing a sealing between the gas space (46) and the product space (47).

15. The packaging container (41) according to any of the claims 13 and/or 14 **characterized in that** the gas space (46) comprises one or more pressurized gas(es), preferably pressurized air, pressurized carbon dioxide, liquefied petroleum gases, or mixtures thereof.

Fig. 1A

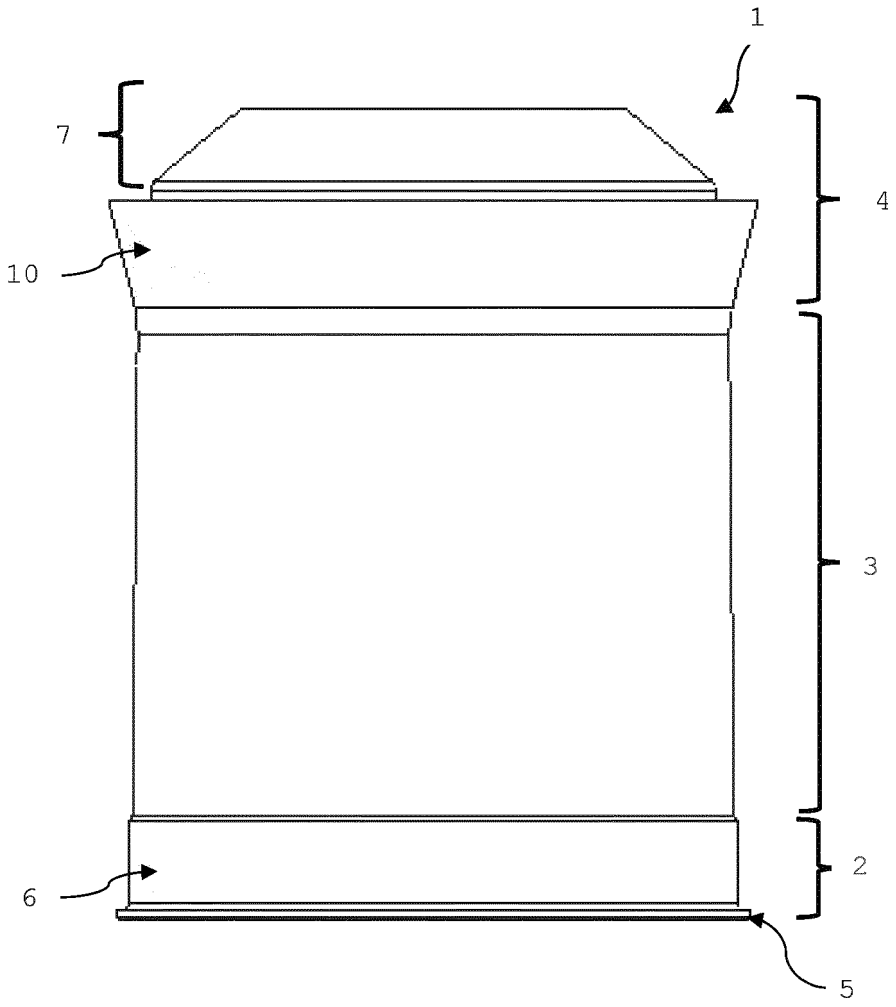


Fig. 1B

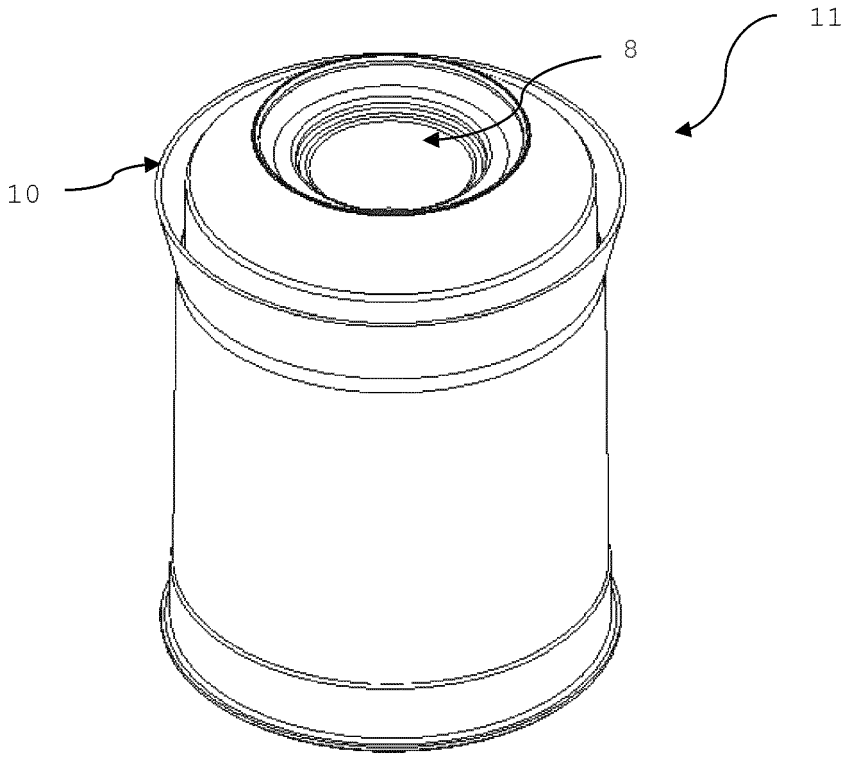


Fig. 2

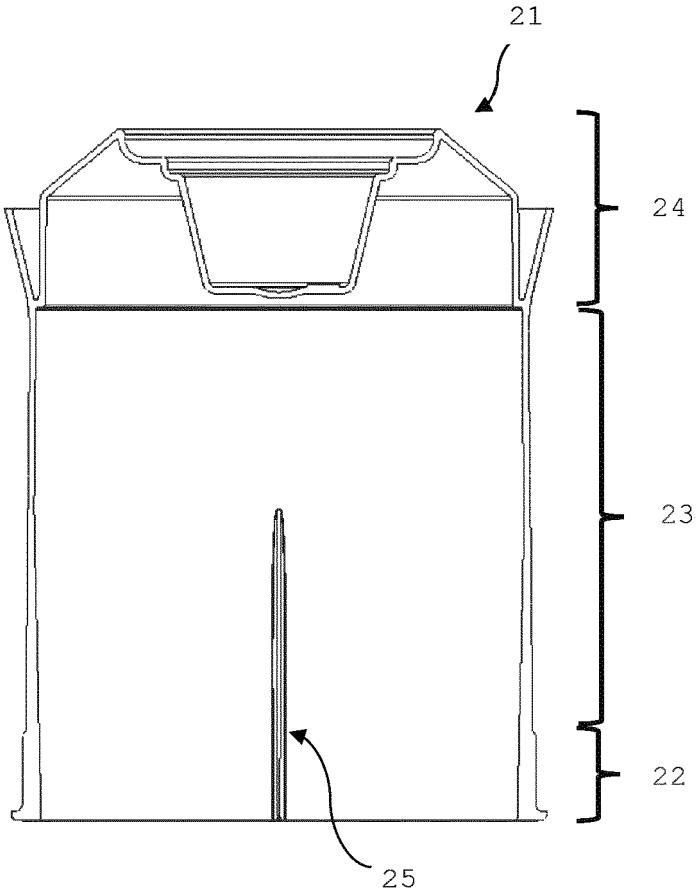


Fig. 3

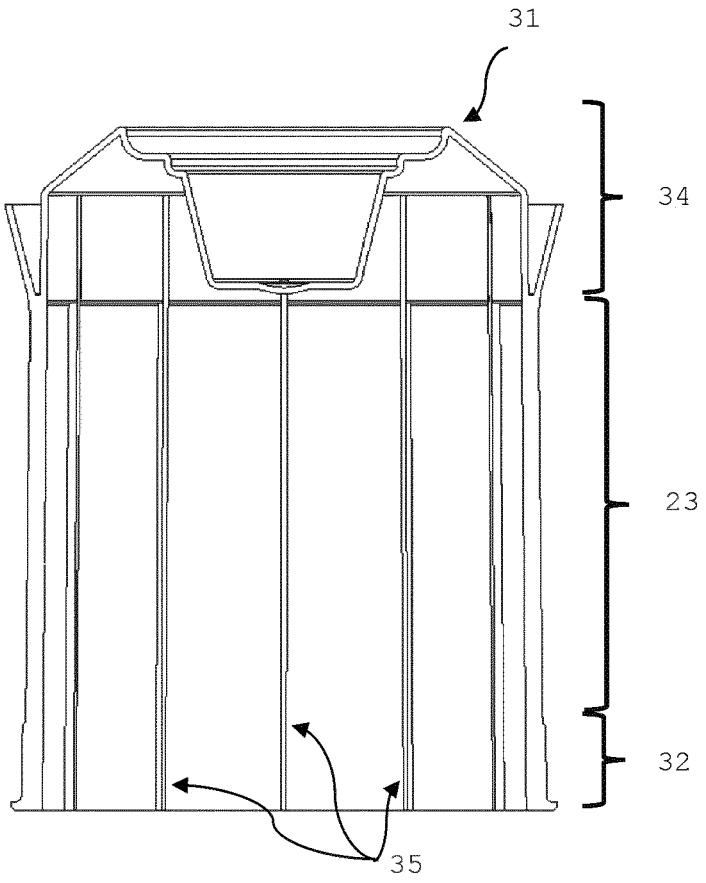
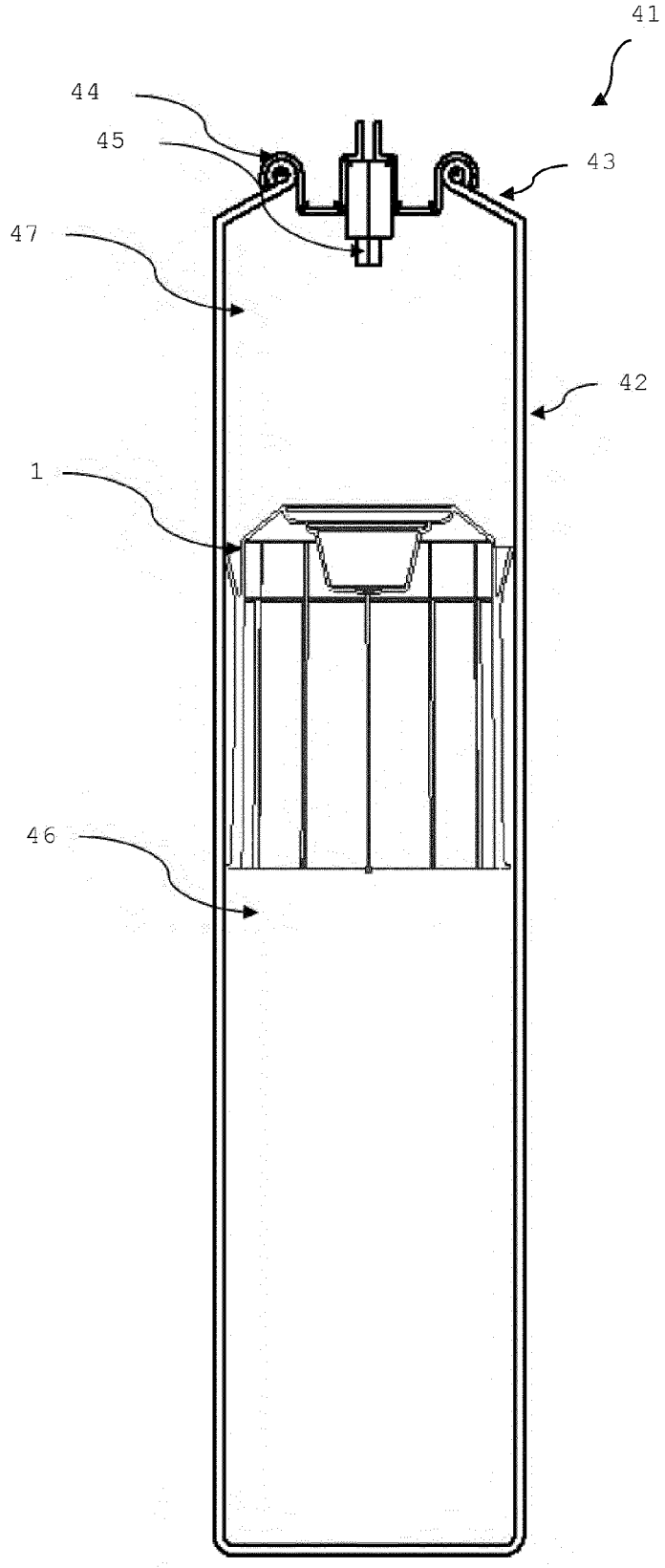


Fig. 4



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EUROPEAN SEARCH REPORT

Application Number
EP 23 15 5053

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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B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	14 July 2023	Lindner, Volker

CATEGORY OF CITED DOCUMENTS

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