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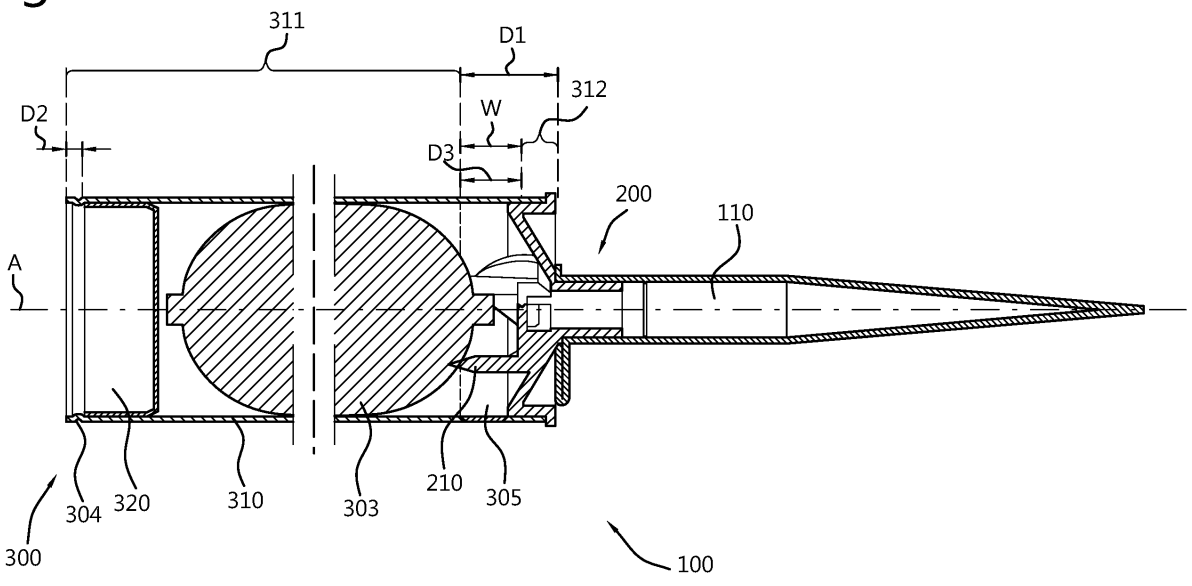
(54) CARTRIDGE CAP AND CARTRIDGE ASSEMBLY

(57) The present invention relates to a cartridge cap mountable on a distal end of a cartridge body for use with an extrusion gun. The cap comprises a dispensing outlet extending in a longitudinal direction around a longitudinal axis of the outlet. The cap further comprises a cap body extending radially outward from said outlet. Moreover, a plurality of rods extend in the longitudinal direction from an inner surface of the cap body. At least one rod of the plurality of rods is adapted to pierce a flexible bag when the flexible bag is pressed against the at least one rod. Furthermore, the tips of at least two of the plurality of rods have different sharpness. The present invention further relates to a cartridge assembly comprising such a cartridge cap.

Fig. 1



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Description

Field of the invention

[0001] The present invention relates to a disposable cartridge for use with an extrusion gun comprising a hollow tubular body and a piston displaceable provided in the tubular body along a cartridge wall. The present invention further relates to a cartridge assembly comprising a cartridge as described above and a flexible bag provided in the tubular body containing contents to be expelled from the cartridge using the extrusion gun.

Background art

[0002] Any discussion of the prior art throughout the specification should in no way be considered an admission that such prior art is widely known or forms part of the common general knowledge in the field.

[0003] Construction materials, such as caulk, sealant, grout or adhesive, are often supplied in cartridges having a plastic body. Typically, a cartridge cap is attached to the cartridge, and is required to be manually cut open to be able to expel the contents of the flexible bag through and out of the cap.

[0004] However, in a professional setting, it is known to supply cartridge bags separately. The practice of manually opening and/or installing the cartridge bags in the interior of a tubular body of the cartridge is not widespread due to the many challenges in safely and effectively using the cartridge bags, also known as foil packs, tubular bags, foil bags or film tube bags, especially in a home environment or by non-professional users and/or do-it-yourselfers (DIYers). For example, cutting open the cartridge bags too wide may pose risks of leakage and cartridge contamination. Cutting open the cartridge bags too narrow may pose risks of having an inefficient and ineffective product, causing problems relating to the extrusion process (e.g. flow) of the product being too slow or requiring an excessive amount of force.

[0005] Furthermore, cartridge caps provided with means for opening the cartridge bag are known. For example, EP 1065153 A1 describes a cover part that can be moved into a position, in which the piercing mandrel penetrates the tubular film bag. However, several problems arise from using such a cover part. For instance, moving the cover part into the position may be challenging, especially by non-professional users in a home environment. Furthermore, the cover part as described does not fit conventional or universal extruding guns. Furthermore, the cover part does not ensure an effective opening of the cartridge bag.

[0006] Further difficulties may be encountered in ensuring disposal and recycling of these cartridges when (nearly) empty or expired. The cartridges end up in the household/office plastic packaging garbage, and this stands in the way of a recycling process that is sustainable for the future. The leftover contents in the disposed cartridge is one problem in the recycling process. Most of the disposed cartridges still contain bits of fastening materials, and they can obstruct the machines in the recycling process.

[0007] The present inventors have been able to solve many of the problems associated with conventional construction fastening products and have been able to develop a tubular cartridge for use with an extrusion gun (or other mechanism) that can overcome many of the above problems. US Patent No. 6,234,348 discloses an extruding mechanism for a tubular bag and a method of extruding the contents of a tubular bag, by which a sealing material or the like is extruded and discharged from the tubular bag with an extruding gun.

[0008] An object of the present invention may be to provide a cartridge cap for use with a cartridge for use with an extrusion gun, that overcomes the above mentioned disadvantages associated with current products.

[0009] It may be another object of the invention to provide a cartridge cap that that allows the user to ensure efficient and effective opening of a cartridge bag in an associated cartridge without additional tools, e.g. a knife or scissors, and without opening the cartridge.

[0010] It may be another object of the invention to provide a cartridge cap that prevents clogging of the flow passage through the cap.

[0011] It may be yet another object of the invention to provide a cartridge assembly for use with an extruding gun comprising a cartridge cap and an associated cartridge that allow for safe and reliable extrusion of a construction fastening material from a cartridge bag comprised in a tubular body of the cartridge.

[0012] These and other objects may be accomplished by the invention described in the following text and figures.

Summary of the invention

[0013] In a first aspect, which can occur in combination with the other aspects and embodiments of the invention which are described herein, the present invention relates to a cartridge cap mountable on a distal end of a cartridge body for use with an extrusion gun apparatus, e.g. a standard extrusion gun for cartridges. The cap comprises a dispensing outlet, e.g. a hollow cylindrical tube, extending in a longitudinal direction around a longitudinal axis of the outlet. The cap further comprises a cap body extending radially outward from said outlet.

[0014] Moreover, a plurality of rods extend in the longitudinal direction from an inner surface of the cap body, i.e. a surface of the cap body to be directed toward the inner space of a cartridge when mounted on a cartridge. At least one rod of the plurality of rods, i.e. a piercing rod, is adapted to pierce a flexible bag when the flexible bag is pressed against the at least one rod, for example by displacement of a piston of a cartridge. Furthermore, the tips of at least two of the plurality of rods have different sharpness and/or at least two of the plurality of rods ex-

tend to different longitudinal positions in the longitudinal direction, i.e. at least one rod will protrude further into the cartridge body compared to at least another rod when the cartridge cap is mounted on the distal end of the cartridge body. For example, when the at least two of the plurality of rods extend from the same initial longitudinal position, than the at least two of the plurality of rods will have different lengths.

[0015] Sharpness can be measured as a radius of curvature, e. g., using scanning electron microscopy, SEM. In embodiments, the tip of a piercing rod has a radius of curvature less than about 50 nanometers. The radius of curvature can be equal to or less than about 50, 40, 30, 20, 10, 5, or 3 nanometers; and/or equal to or greater than about 3, 5, 10, 20, 30, or 40 nanometers. Additionally or alternatively, sharpness can be measured as a force required by a piercing rod to pierce open the flexible bag can be equal to or less than about 90, 80, 60, 40, 20, 10, 5 or 4 N. Said force may be measured by one or more force sensors. Additionally or alternatively, sharpness can be measured as a bevel angle, e.g., using a laser Goniometer. The bevel angle can be equal to or less than about 50, 40, 30, 20, 10 or 5 mm.

[0016] Advantageously, when a the flexible bag is pressed against the plurality of rods, the presence of a blunt rod, i.e. rod with a less sharp tip, will improve the pressure distribution and thereby improve the cutting tension, e.g. an asymmetrical cutting tension may be provided on the flexible bag improving the cutting. Thus, the cartridge cap can allow a more convenient cartridge for the DIY-ers. For example, the DIY-ers no longer have to cut a tube or a bag, which is safer and one operation less, and the DIY-ers stay in their comfort zone by using the cartridge with an extrusion apparatus, such as their cartridge gun.

[0017] In embodiments, the plurality of rods may consists of piercing rods and blunt rods, each type having tips with different sharpness. In further embodiment, the plurality of rods may consist of an even number of piercing rods, for example two, and an uneven number of blunt rods, for example one.

[0018] In a first embodiment, which can occur in combination with the other aspects and embodiments of the invention which are described herein, the plurality of rods are arranged symmetrically around the longitudinal axis.

[0019] In a second embodiment, which can occur in combination with the other aspects and embodiments of the invention which are described herein, two wings extend in opposite directions from at least one rod of the plurality of rods, preferably each of the plurality of rods are provided with wings extending in opposite directions. In a preferred embodiment, said wings extend in an angular direction around the longitudinal axis. Advantageously, when a the flexible bag is pressed/moved towards the plurality of rods, the two wings may enlarge an opening that is pierced by a rod in the flexible bag.

[0020] In a third embodiment, which can occur in combination with the other aspects and embodiments of the invention which are described herein, a bridge extends radially inward from the plurality of rods and connects multiple rods of the plurality of rods. In other words, the cap comprises an element closing of part of the outlet as seen in the longitudinal direction. Advantageously, the bridge prevents larger elements, such as the metal clip of the flexible bag, to clog the outlet of the cap.

[0021] In another embodiment, which can occur in combination with the other aspects and embodiments of the invention which are described herein, an annular wall extends in the longitudinal direction, wherein the cap body extends radially inward from said annular wall to the outlet. The cap body may be substantially arranged in the space defined by the annular wall. In a further embodiment, which can occur in combination with the other aspects and embodiments of the invention which are described herein, means for mounting of the cap to the distal end of the cartridge body are provided on an outer surface of the annular wall. The mounting means may comprise outer rings provided on an outer surface of the annular wall and/or a flange extending radially outward from said annular wall.

[0022] In embodiments, which can occur in combination with the other aspects and embodiments of the invention which are described herein, the outer surface of the outlet is provided with an screw thread, i.e. a ridge wrapped around the outlet in the form of a helix. Advantageously, a nozzle may be easily attached to the outlet of the cap.

[0023] In a further aspect, which can occur in combination with the other aspects and embodiments of the invention which are described herein, the present invention relates to a cartridge assembly comprising a cartridge containing a hollow tubular body configured to receive a flexible bag containing contents to be expelled from the cartridge, wherein the body comprises a cartridge wall extending in a longitudinal direction. The cartridge further containing a piston provided in the body at the proximal end, the piston being sealably displaceable along a cartridge wall in the longitudinal direction.

[0024] Furthermore, the cartridge assembly comprises a flexible bag containing contents to be expelled from the cartridge provided in the tubular body, and a cartridge cap, preferably as described above, sealably connected to the proximal portion of the cartridge, wherein the cartridge is configured to allow expulsion of the contents through an dispensing outlet of the cartridge cap by displacement of the piston. The contents of the flexible bag may contain at least one of the group containing caulk, sealant, grout and adhesive. In a preferred embodiment, the flexible bag contains silicon.

[0025] According to an embodiment, the present invention relates to the cartridge assembly as described above, wherein the tubular body is adapted such that a main part thereof, substantially made of a sustainable material, e.g. a paper-based material, is easily removable from the cartridge cap, for example the tubular body may be adapted to be divided into a proximal portion and a

distal portion, wherein the proximal portion is substantially made of a paper-based material. The tubular body may further comprise means to separate the distal portion and the proximal portion from each other.

[0026] According to a further embodiment, the present invention relates to the cartridge assembly as described above, wherein the separation means comprises a tear strip extending in a peripheral direction and releasably connecting the proximal portion and the distal portion.

Brief description of the drawings

[0027] The invention will be explained in more detail below with reference to drawings in which illustrative embodiments thereof are shown. They are intended exclusively for illustrative purposes and not to restrict the inventive concept, which is defined by the appended claims.

Figure 1 shows a cross-sectional view of a cartridge assembly cartridge cap according to the present invention;

Figure 2 shows a perspective view of a cartridge of the cartridge assembly shown in Figure 1;

Figures 3A and 3B show respectively a cross-sectional view and a perspective view of a cartridge cap of the cartridge assembly shown in Figure 1;

Figures 4A and 4B show respectively cross-sectional views of a cartridge cap of a cartridge assembly according to the present invention;

Figure 5 shows a perspective view of a cartridge of the cartridge assembly shown in Figures 4A and 4B;

Figures 6A and 6B show respectively perspective views of a piston of a cartridge of the cartridge assembly shown in Figures 4A and 4B;

Figures 7A, 7b, 7C and 7D show respectively cross-sectional views of the piston of Figures 6A and 6B; and

Figures 8A, 8B and 8C show respectively cross-sectional views of a cartridge cap of the cartridge assembly shown in Figures 4A and 4B.

Detailed description of the drawings

[0028] In the following, it should be noted that the term 'comprising' encompasses the terms 'consisting essentially of and 'consisting of. Where the term 'comprising' is used, the listed steps or options need not be exhaustive and further steps or features may be included. As used herein, the indefinite article 'a' or 'an' and its corresponding definite article 'the' means at least one, or one or more, unless specified otherwise.

[0029] It should be further noted that the term 'sealably' is used to describe an interaction between two surfaces creating a 'seal', which refers to making a tight, possibly airtight, enclosure. Thus, when two objects are 'sealably connected', a surface of the object is enclosed and tightly fastened or secured by a surface of a second object. When the first object is 'sealably displaceable' in the second object, the surface of the first object is enclosed in the surface of the second object, where the first object may be slidably displaced inside the second object while being tightly enclosed. Furthermore, the terms 'flexible bag' and 'cartridge bag' will be used interchangeably herein.

[0030] Fig. 1 shows a cartridge assembly 100 configured for use with an extrusion gun or other extrusion apparatuses, such as a standard cartridge gun. The cartridge assembly 100 comprises a cartridge 300 and a cartridge cap 200. The cartridge 300 comprises a tubular body 310 extending in a longitudinal direction. The tubular body 310 is generally hollow having two open ends: a proximal end and a distal end. A longitudinal axis A extends in the longitudinal direction from the open proximal end of the cartridge 300 through the distal end of the tubular body 310 and through the cartridge cap 200. The cartridge cap 200 is sealably connected to the cartridge 300, particularly to the tubular body 310, more particularly at the distal end of the tubular body 310. Thus, an outer surface of the cartridge cap 200 that is sealably connected to the cartridge 300 has a general shape that is similar to the inner shape of the tubular body 310.

[0031] The tubular body 310 may have an inner shape and an outer shape that are similar or different. For example, the outer shape may be one of a circle cylinder, triangle cylinder, square cylinder, pentagon cylinder, hexagon cylinder, octagon cylinder or other cylindrical shapes, and the inner shape may be one of a circle cylinder, triangle cylinder, square cylinder, pentagon cylinder, hexagon cylinder, octagon cylinder or other cylindrical shapes, wherein the inner shape and the outer shape are similar or different.

[0032] A nozzle 110 may be attached to an end of the cartridge cap 200. Here, the longitudinal axis A further extends through the nozzle 110. Alternatively, the nozzle 110 and the cartridge cap 200 may be formed as a single element. This may reduce the cost of manufacturing and may have a further advantage of increasing the length of the tube.

[0033] In the embodiment shown in Fig. 1, a piston 320 is provided between the proximal end of the tubular body 310 and the cartridge bag 303. Thus, by moving the piston 320 towards the cartridge bag 303, the pressure exerted through the piston 320 onto the cartridge bag 303 can deform the cartridge bag 303. In other words, the piston 320 may press the cartridge bag 303 onto cartridge cap 200. Contents of the cartridge bag 303 are provided for extraction from the cartridge bag 303. The piston 320 may be provided for applying pressure on one end (proximal end) of the cartridge bag 303 and allowing the extraction of the contents of the cartridge bag 303 from another end (distal end) of the cartridge bag 303, preferably the distal end of the cartridge bag 303 is or has been opened. The contents of the cartridge bag 303 may be extracted through the cartridge cap 200.

[0034] The distal end of the cartridge bag 303 is typi-

cally sealed/closed with a sealing/closing means, such as fastening (e.g. a metal/plastic clamp), tying (e.g. with a metal wire/strip, plastic wire/strip, fibre string, ...) or adhering (e.g., glue, heat, ...), which is opened prior to use or during use of the cartridge bag 303. This prevents spillage/leakage of the contents of the cartridge bag 303, and allows for better storage and transportation of the cartridge assembly 100 or cartridge 300. Moreover, sealing the cartridge bag 303 allows for improving the shelf-life of the cartridge bag 303 (resp. the cartridge 300 and the cartridge assembly 100). The proximal end of the cartridge bag 303 may be sealed/closed with a sealing/closing means similar to or different from the sealing/closing means of the distal end.

[0035] The cartridge cap 200 may comprise means to pierce open the cartridge bag 303. As previously described, a piston 320 may be provided to press the cartridge bag 303 onto the cartridge cap 200, thus allowing the cartridge bag 303 to be pierced and/or opened after a suitable force is applied onto/by the piston 320. Other means may be used to press the cartridge bag 303 onto the cap, thus allowing the piercing/opening means to pierce/open the cartridge bag 303 after a suitable pressure is applied at the piercing/opening means.

[0036] To provide a suitable force onto/by the piston 320, it may be pushed through the tubular body 310 by means of an extrusion apparatus, such as an extrusion gun, which may be manual, motorised or air-powered. Other extrusion means may also be used, such as manually pushing an object, such as a plunger, of suitable dimensions (i.e., diameter and length) into the tubular body 310 to able to reach the piston and of suitable structural strength to exert enough force onto the piston 320 to displace it.

[0037] The cartridge assembly 100 may further comprise a nozzle 110 configured to be attached to one end of the cartridge cap 200, particularly to a dispensing outlet 202 comprised in the cartridge cap 200, e.g. a cylindrical tube 202. The nozzle 110 may comprise a cylindrical conduit and a conical conduit extending along the longitudinal axis A, the cylindrical conduit having an open proximal end, wherein the proximal end of the cylindrical conduit in the nozzle 110 is connected to the cartridge cap 200. The conical conduit has a distal end that may be closed or open. The conical conduit of the nozzle 110 may be cylindrical or triangular. Furthermore, an exterior of the nozzle 110 may have a cylindrical-shape or a triangular spear-shape. Furthermore, any shape of the exterior of the nozzle 110 and the conical conduit of the nozzle 100 may be combined.

[0038] The cartridge cap 200 may comprise a cap body 201 (as shown in Figs. 3A, 4B and 8C) extending radially outward from the dispensing outlet 202 comprised in the cartridge cap 200, preferably extending along the longitudinal axis A. The cap body 201 may be configured to allow contents of a cartridge bag 303 in the cartridge 300 to be extracted there through. An advantage of the cap body 201 is to improve flow of material there through. The cap body 201 may be conical having a wide end (i.e., proximal end) and a narrow end (i.e.. distal end), wherein the wide end is provided in the tubular body 310 facing the cartridge bag 303 when the cartridge cap 200 is sealably connected to the cartridge 300. The narrow end of the cap body 201, preferably of the conical tube 201, may be sticking-out of the distal end of the tubular body 310.

[0039] The nozzle 110 may be a plastic nozzle, a metal nozzle or a paper/cardboard nozzle. The plastic and paper/cardboard nozzles may be provided with a closed distal end of the nozzle 110. The plastic and paper/cardboard nozzles may comprise at least one cutting line configured to be cut by the user. The at least one cutting line may be provided at an angle with respect to the longitudinal axis A between 0 and 60 degrees, preferably at 45 degrees. The paper/cardboard nozzle may be pre-cut or manufactured with an open distal end of the nozzle 110 with an angle from any of the previously disclosed angles. The metal nozzle has an open distal end of the nozzle 110, the open end having an angle from any of the previously disclosed angles.

[0040] Once the proximal end 311 is separated from the distal end 312 of the tubular body 310, the proximal end 311 may also be separated from the cartridge bag 303 and the cartridge cap 200. Furthermore, the proximal end 311 may be separated from the piston 320.

[0041] To inform the user regarding proper disposal of the cartridge, instructions in the form of written instructions or illustrations may be provided on the tubular body 310. The instructions are preferably printed on the outer surface of the tubular body 310. Providing disposal instructions on a surface of the cartridge 300 may be advantageous because such instructions will be visible when the cartridge 300 or cartridge assembly 100 is purchased or removed from the extrusion apparatus.

[0042] The cartridge 300 will now be described in more detail with reference to Figs. 1 and 2. The cartridge 300 described herein includes a number of improvements that may provide enhanced performance. The cartridge 300 may comprise an improved tubular body 310 and improved means of disposal. Each of these improvements will be described in more detail below. Moreover, it will be appreciated that the features described below may be incorporated in a cartridge assembly 100 alone, or in combination with other features of the cartridge cap 200 and/or the cartridge assembly 100 to provide a further improved product.

[0043] The tubular body 310 comprised in the cartridge 300 may be manufactured from a paper-based material, such as cardboard or paperboard. In this respect, the term cardboard means a material based on cellulose fibers or cellulose or groundwood pulp or recovered paper or combinations thereof which usually, but not necessarily, includes a plurality of layers of paper or board of different thickness and/or different material. These layers are frequently pressed with one another without the use of adhesive. One or both sides of the cardboard may be coated or painted in this respect. An example of paper-

board or cardboard is kraft paper. The grammage of paperboard or cardboard amounts to between 80 and 600 g/m2. Preferred grammage amounts to between 80 and 500 g/m2, between 80 and 400 g/m2, between 80 and 300 g/m2, between 80 and 200 g/m2, between 80 and 150 g/m2, between 80 and 120 g/m2, and between 80 and 100 g/m2, as well as ranges between several combinations of the above-disclosed upper bounds (100, 120, 150, 200, 300, 400, 500, 600 g/m2), with the invention not being restricted to any of these weight ranges.

[0044] The tubular body 310 is configured to be divided into a proximal portion 311 and a distal portion 312. The tubular body 310 may comprise a separation means configured to separate the proximal portion 311 and the distal portion from each other. The separation means may be provided between the proximal portion and the distal portion. Thus, the proximal portion 311 and the distal portion 312 may be defined with respect to the separation means 305. The separation means 305 may comprise a tear line and/or a tear strip provided between the proximal portion 311 and the distal portion 312 along a circumferential direction. In some embodiments, the separation means 305 may be additionally provided in the longitudinal or axial direction of the tubular body 310. One advantage of a longitudinal separation means 305 is to improve the separation of the proximal portion 311 and the distal portion from each other. Another advantage is to improve the removal of the proximal portion 311 of the tubular body 310 from any other part of the cartridge 300.

[0045] The tear line may comprise perforations. Alternatively or additionally, the tear line may comprise a string or fibre which allows the tear line to be embedded in the tubular body 310. Examples are a punch line, tear punch line and so on.

[0046] The tear strip may comprise a corrugated zipper or rip-up perforation. Alternatively or additionally, the tear strip may comprise of a polyethylene strip which allows the tear strip to be embedded in the tubular body 310. Other examples of a tear strip may be a tear tape, tear-off ribbon, and so on. To improve the use of the separation means 305, an edge of the tear line or tear strip may be provided as a gripping means, for example the edge of the tear line or tear strip may be sticking out of the tubular body 310 or may be configured to be bent to provide a gripping means, e.g. a flap (as shown in Figs. 4A and 4B). Alternatively or additionally, the edge of the tear line or tear strip may be gripped through a premade opening in the tubular body 310 or an opening made by pushing or bending the edge of the tear line or tear strip inwardly (e.g. pressing on the tubular body 310) such that the edge of the tear line or tear strip may be sticking to the inside of the tubular body 310 (e.g., a perforated or punched part may be pushed into the tubular body 310 forming a flap on the inside of the tubular body 310).

[0047] Fig. 2 shows a perspective view of a cartridge of the cartridge assembly according to the present invention A distance D1 can be defined between the distal end of the tubular body 310 and the separation means 305 (e.g. tear line), preferably the distal end of the separation means 305 (e.g., tear strip). The distance D1 is measured in the longitudinal direction, wherein D1 may be between 1 - 6 cm. Preferred distances are between 2 - 6 cm, between 3 - 6 cm, between 4 - 6 cm, between 5 - 6 cm, between 1 - 5 cm, between 1 - 4 cm, between 1 - 3 cm, between 1 - 2 cm, with the invention not being restricted to any of these distance ranges.

[0048] In embodiments, the separation means is a tear strip 305 having a width W which is measured in a longitudinal direction parallel to the longitudinal axis A. The width W may be between 0.01 and 5 cm. Preferred widths are between 0.01 and 2.5 cm, between 0.01 and 2 cm, between 0.01 and 1.5 cm, between 0.01 and 1 cm, and between 0.01 and 0.5 cm, as well as ranges between several combinations of the above-disclosed upper bounds (0.5, 1, 1.5, 2, 2.5, 3, 5 cm), with the invention not being restricted to any of these width ranges.

[0049] In embodiments, the separation means is a tear line having another width which is measured in the longitudinal direction. Said width may be between 0.1 and 10 mm. Preferred widths are between 0.1 and 8 mm, between 0.1 and 6 mm, between 0.1 and 4 mm, between 0.1 and 2 mm, between 0.1 and 1 mm, and between 0.1 and 0.5 mm as well as ranges between several combinations of the above-disclosed upper bounds (0.5, 1, 2, 4, 6, 8, 10 mm), with the invention not being restricted to any of these width ranges. Additionally or alternatively, perforations in the tear line may have a burst strength or TPI (teeth per inch or ties per inch) from 3-4 TPI 5-6 TPI, 7-10 TPI, 11-14 TPI or 15-18 TPI. Higher values of TPI provide higher resistance. The perforations may further have a cut (gap) / tie size of 0.5 - 2 mm, preferably 0.5 - 1.5 mm or 0.5 - 1 mm or ranges between several combinations of the above-disclosed upper bounds (1, 1.5, 2 mm), with the invention not being restricted to any of these width ranges. The perforations may further have a tooth size of 0.8 - 12 mm, preferably 0.8 - 10 mm, 0.8 - 8 mm, 0.8 - 6 mm, 0.8 - 4 mm, 0.8 - 2 mm, 0.8 - 1.5 mm or ranges between several combinations of the above-disclosed upper bounds (1.5, 2, 4, 6, 8, 10 mm), with the invention not being restricted to any of these width ranges.

[0050] Note that a length of the distal portion 312 of the tubular body 310 may be defined as the difference between the distance D1 and a width of any one or combination of widths of the tear strip and the tear line, for e.g. D1-W, wherein said length is measured in the longitudinal direction.

[0051] It must be noted that higher grammage of the tubular body 310 may increase the rigidity and/or stiffness of the body and/or increase tear strength of the tubular body 310 at the separation means 305. Larger width W of the tear strip 305 may increase the rigidity and/or stiffness of the tear strip. Thus, a combination of suitable grammage of the tubular body 310 and suitable width of the tear strip 305 may be desired. For example, a higher grammage with a larger width, such as 600 g/m2 for the

tubular body 310 in combination with 3 cm for the tear strip 305, or a lower grammage with a smaller width, such as 80 g/m2 for the tubular body 310 in combination with 0.25 cm for the tear strip 305, or other combinations such as 400 g/m2 for the tubular body 310 in combination with 2 cm for the tear strip 305 or 200 g/m2 for the tubular body 310 in combination with 1 cm for the tear strip 305, with the invention not being restricted to any of these combinations of grammage of the tubular body 310 and width of the tear strip 305. Furthermore, the composition of the separation means 305 may additionally or alternatively influence its rigidity and/or stiffness. Thus, a combination of suitable grammage of the tubular body 310 and suitable composition of the separation means 305 may be desired. For example, a combination of a tear line and a tear strip may be suitable for a tubular body 310 having grammage of 300 g/m2 or more.

[0052] The piston 320 is provided at the proximal end of the tubular body 310 and is sealably displaceable along the longitudinal axis A from the proximal end towards the distal end of the tubular body 310. Thus, an outer surface of the piston 320 has a general shape that is similar to the inner shape of the tubular body 310. The piston 320 may be a hollow tube with two closed ends, an outer surface of both ends having a flat surface, preferably the outer surface of a distal end of the piston 320, which may be provided facing the proximal end of the cartridge bag 303 may be flat and the outer surface of a proximal end, which may be facing the proximal end of the tubular body 310 when the piston 320 is provided inside the tubular body 310, has grooves and/or protrusions, preferably in a shape complementary to a shape of an extrusion plate (e.g. of a plunger). Alternatively, the piston 320 may be a generally hollow tube with the proximal end being open or closed and the distal end being closed or open. In other words, the open end of the piston 320 is configured to allow the extrusion plate to fit into the open end of the piston 320. The outer surface of the proximal end of the piston 320 may have grooves and/or protrusions, preferably in a shape complementary to a shape of the extrusion plate. Additionally or alternatively, the outer surface of the proximal and/or distal end of the piston 320 may have a flat surface. In preferred embodiments, the distal end of the piston 320 may has a shape complementary to the shape of the proximal end of the cartridge bag 303. This can allow the piston 320 to push on the cartridge bag 303 ore effectively.

[0053] In embodiments, the piston 320 the piston 320 may be cylindrical with rounded edges. The rounded edges allow the piston to move smoothly in the tubular body 310 without getting stuck in the tubular body 310, causing the tubular body 310 to tear. In addition, the rounded edges ensure that the cartridge bag 303 can be emptied more effectively, and that the waste is reduced to a minimum. More details are provided below with reference to Figs. 6A, 6B, 7A, 7B, 7C and 7D.

[0054] An indentation 304 may be provided near or at the proximal end of the tubular body 310, preferably between the proximal end of the tubular body 310 and the piston 320. The indentation 304 provides a means of stopping/blocking the piston 320 from exiting the tubular body 310. The indentation 304 may be formed in a continuous line along the peripheral or circumferential direction. Alternatively, the indentation 304 may be formed in points along the same direction. A distance D2 can be defined between the proximal end of the tubular body 310 and the indentation 304. The distance D2 is measured in the longitudinal direction, wherein D2 may be up to 1 cm. Preferred distances are up to 1 cm, up to 0.9 cm, up to 0.8 cm, up to 0.7 cm, up to 0.6 cm, up to 0.5 cm, up to 0.4 cm, up to 0.3 cm, up to 0.2 cm, between 0.2 and 1 cm, between 0.3 and 1 cm, between 0.4 and 1 cm, between 0.5 and 1 cm, between 0.6 and 1 cm, between 0.7 and 1 cm, between 0.8 and 1 cm, between 0.9 and 1 cm, as well as ranges between several combinations of the above-disclosed lower/upper bounds, with the invention not being restricted to any of these distance ranges.

[0055] The cartridge 300 may comprise indication marks formed on an outer surface of the tubular body 310 as previously described. The indication marks indicate the steps to divide the tubular body into the proximal portion 311 and the distal portion 312, or indicate the location of the means to separate the distal portion and the proximal portion from each other.

[0056] The cartridge 300 may comprise a cartridge bag 303 in the tubular body 310. The cartridge bag 303 may be obtained by manufacturing so-called "sausages". The cartridge bag 303 may have an external diameter between 10 to 100 mm. Preferred diameters are between 10 and 20 mm, between 10 and 30 mm between 10 and 40 mm, between 10 and 50 mm, between 10 and 60 mm between 10 and 70 mm, between 10 and 80 mm, between 10 and 90 mm, between 20 to 100 mm, between 30 to 100 mm, between 40 to 100 mm, between 50 to 100 mm, between 60 to 100 mm, between 70 to 100 mm, between 80 to 100 mm, between 90 to 100 mm, as well as ranges between several combinations of the above-disclosed lower/upper bounds, with the invention not being restricted to any of these diameter ranges. The cartridge bag 303 may have a length in the longitudinal direction between 10 to 60 cm. Preferred lengths are between 10 and 20 cm, between 10 and 30 cm between 10 and 40 cm, between 10 and 45 cm, between 10 and 50 cm, between 10 and 55 cm, between 20 to 60 cm, between 30 to 60 cm, between 40 to 60 cm, between 45 to 60 cm, between 50 to 60 cm, between 55 to 60 cm, as well as ranges between several combinations of the above-disclosed lower/upper bounds with the invention not being restricted to any of these length ranges. The cartridge bag 303 may have a volume between 7.85 and 4712 mL. Other volume ranges of the cartridge bag 303 may be derived by multiplying pi with a length from the above-disclosed length ranges and with the square of half of a diameter from the above-disclosed diameters.

[0057] A length of the tubular body 310 in the longitu-

dinal direction may be an addition of the above-disclosed sizes of the proximal portion 311 and the distal portion 312. In other words, the length of the tubular body 310 may range from about 150.1 mm to about 280 mm. Other ranges may be derived from the addition of any value in the ranges provided above for the proximal portion 311 (i.e., 150-250 mm, 175-200 mm, 190 mm, and so on) with any value in the ranges provided above for the distal portion 312 (i.e., 0.1-30 mm, 10-20 mm, 15 mm and so on). Furthermore, the tubular body 310, proximal portion 311 and distal portion 312 may have an internal diameter equal to or larger than any of the above-disclosed external diameter ranges of the cartridge bag 303. Different combinations of dimensions of cartridge 300 or the tubular body 310 (i.e., length, internal diameter, volume) and cartridge bag 303 (length, external diameter, volume) may considered, such that the cartridge 300 or the tubular body 310 accommodates the cartridge bag 303 (i.e., the dimensions of the cartridge bag 303 may smaller than or equal to the dimensions of the cartridge 300 or the tubular body 310, or the cartridge bag 303 having larger dimensions than the cartridge 300 or tubular body 310 may be deformed to fit in the cartridge 300 or the tubular body 310).

[0058] The cartridge 300 may comprise a cartridge bag 303 in the tubular body 310. The cartridge bag 303 may accommodate a paste-like material/content, such as caulk (e.g. rigid silicone, latex or acrylic substances), sealant (e.g. soft silicone or spackle putty), grout (e.g. cement) or adhesive (e.g. grab adhesive or cyanoacrylate),or any other material known in the art. The paste-like material/content in the cartridge bag 303 are provided for extraction from the cartridge bag 303.

[0059] The cartridge bag 303 may be provided in a material, such as metal, preferably aluminium foil, or Biaxially-oriented Polyethylene Terephthalate (BoPET), preferably Mylar® or Melinex® polyester film, or any other material known in the art suitable for contents of the cartridge bag 303 and/or suitable for use with the piston 320. The piston 320 may be provided in a material suitable for use with the cartridge bag 303 and/or the contents thereof. Example materials of the piston 320 are steel, aluminium, soft leather, impregnated leather, nitrile rubber, nylon, polyethylene, poly plastic, Polytetrafluoroethylene (PTFE), such as Teflon®, or thermoplastic polyester elastomers, such as Hytrel®, or any other material known in the art. For instance, a highly viscous content of the cartridge bag 303 (e.g. cold urethane or two-part epoxy) may require a piston 320 provided in a material with low friction properties (e.g. Teflon®) to reduce the force applied by a user and improve the extrusion of said content. The piston 320 may formed by moulding, 3D printing, milling, sewing or other means known in the art.

[0060] A distance D3 can be defined between the widest end or proximal end of the cap body 201 and the separation means 305 (e.g. tear line), preferably the proximal end of the separation means 305 (e.g., tear strip). The distance D3 is measured in the longitudinal direction, wherein D3 may be up to 4 cm. Preferred distances are up to 3.5 cm, up to 3 cm, up to 2.5 cm, up to 2 cm, up to 1.5 cm, up to 1 cm, and up to 0.5 cm, as well as ranges between several combinations of the above-disclosed upper bounds (0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4 cm), with the invention not being restricted to any of these distance ranges. In view of the above, the distance D3 may be equal to the width W of the tear strip as shown in Fig. 1.

[0061] The cartridge cap will now be described in more detail with reference to Figs. 3A-3B. The cartridge cap 200 described herein includes a number of improvements that may provide enhanced performance. The cartridge cap 200 may comprise improved pierce opening means and improved conical tube. Each of these improvements will be described in more detail below. Moreover, it will be appreciated that the features described below may be incorporated in a cartridge assembly 100 alone, or in combination with other features to provide a further improved product.

[0062] As shown in Fig. 3B, the cartridge cap 200 comprises means to pierce and/or open a cartridge bag 300 in a cartridge 300. Said piercing/opening means comprises a plurality of rods 210 extending in the longitudinal direction A from an inner surface 220 of the cap body 201, e.g. extending outwardly from the inner surface 220 of the cap body 201. At least one of the plurality of rods 210 may have a shape of a circle cylinder, triangle cylinder, square cylinder, pentagon cylinder, hexagon cylinder, octagon cylinder or other cylindrical shapes.

[0063] At least one of the plurality of rods 210 is adapted to pierce the cartridge bag 303 in the cartridge 300 when the cartridge bag 303 is pressed towards the cartridge cap 200. Several means of pressing the cartridge bag 303 onto the cartridge cap 200 having been previously described. The plurality of rods 210 can pierce the cartridge bag 303 after a suitable force is applied onto the cartridge bag 303. The suitable force may be equivalent to a force resulting from the plurality of rods 210 onto the cartridge bag 303.

[0064] The tips of at least two of the plurality of rods 210 have different sharpness. The plurality of rods 210 may consist of piercing and blunt rods having tips with different sharpness. The blunt rod(s) may have a blunt end 211 and the piecing rod(s) may have a sharp end 212, such as a moil point end or a conical end. Thus, an imbalanced pressure on the cartridge bag 303 is caused by the plurality of rods 210. In other words, there may be more pressure at the at least one sharp-ended rod 212, thereby allowing it to pierce the cartridge bag 303 more efficiently. Subsequently, the blunt-ended rod 211 may also open the cartridge bag 303.

[0065] In the embodiment of Fig. 3B, the plurality of rods 210 are arranged around the longitudinal axis A, preferably the plurality of rods 210 may be arranged symmetrically around the longitudinal axis A. In other words, the plurality of rods 210 are arranged on the inner surface 220 of the cap body 201 between the wide end and the

narrow end of the cap body 201 or between the proximal end and the distal end of the cap body 201, preferably halfway between the two ends of the cap body 201. The plurality of rods 210 may be equally spaced from the longitudinal axis A. In other words, the plurality of rods 210 may be arranged circumferentially, preferably at an equal radial distance from the longitudinal axis A. The plurality of rods 210 may be equally spaced apart. In other words, the plurality of rods 210 may be arranged at an equal circumferential distance from each other.

[0066] In the embodiments of Figs. 3A-3B, it is shown that the plurality of rods 210 are extending in a longitudinal direction parallel to the longitudinal axis A, allowing the plurality of rods 210 to have a more effective angle of contact with the cartridge bag 303.

[0067] The cartridge cap may further comprise a bridge 205 mounted on the inner surface 220 of the cap body 201. In this respect, the term bridge means a structure mounted at a certain distance in the longitudinal direction over an opening, particularly the narrow end or distal end of the cap body 201. The bridge 205 may extend radially inward from the plurality of rods 210 and connect each of the plurality of rods 210. The bridge 205 may further extend in the longitudinal direction to a distance less than a size of the plurality of rods 210 in the longitudinal direction to allow the effective functioning of the plurality of rods 210 in piercing/opening the cartridge bag 303 without diminishing the functionality of the plurality of rods 210. When the cartridge bag 303, having a sealed end as previously described, is pressed onto the cartridge cap 200, the bridge is configured to block the sealed end of the cartridge bag 303 to clog the cap body 201, particularly the narrow end or distal end of the cap body 201.

[0068] The bridge 205 may be mounted on a plurality of points on the inner surface 220 of the cap body 201, preferably from where the plurality of rods 210 are extending. In the embodiment of Fig. 3B, it is shown that the bridge 205 radially extends from the longitudinal axis A to each of the plurality of rods 210 or vice versa connecting the plurality of rods 210.

[0069] In the embodiments of Figs. 3A-3B, the plurality of rods 210 may each comprise one or more side walls or wings 203. The one or more side walls or wings 203 may extend from each of the plurality of rods 210 outwardly (i.e., in a circumferential direction from each of the plurality of rods 210). The one or more side walls or wings 203 are configured to enlarge the piercing/opening formed in the cartridge bag 303 by the plurality of rods 210 when the cartridge bag 303 is pressed onto the cartridge cap 200.

[0070] Fig. 3B shows two side walls or wings 203 extending from sides of each of the plurality of rods 210 in opposite directions. In another example, the plurality of rods 210 may each have a side wall extending from another side of the plurality of rods 210 in an outwardly radial direction (i.e. in the direction from the longitudinal axis A to the widest end or proximal end of the cap body 201). The plurality of rods 210 may comprise the combination of the three side walls or wings 203 as described herein. The three side walls or wings 203 may be extending from different sides of each of the plurality of rods 210, wherein a first side wall is orthogonal to a second and third side wall, wherein the second and third walls extend in opposite directions.

[0071] The one or more side walls or wings 203 may extend towards the inner surface of the cap body 201. The one or more side walls or wings 203 may have a uniform thickness along the direction of extension. Alternatively, the thickness may increase or decrease along the extension direction of the one or more side walls or wings 203 (i.e., away from a rod).

[0072] Additionally or alternatively to a uniform or non-uniform thickness of the one or more side walls or wings 203, the one or more side walls or wings 203 may extend from each of the plurality of rods 210 outwardly having a uniform height (i.e., the height being measured in a direction in which the plurality of rods 210 extend, such as the longitudinal direction). Alternatively, the height may non-uniform, preferably decreasing along the extension direction of the one or more side walls or wings 203 (i.e., away from a rod).

[0073] The one or more side walls or wings 203 may extend circumferentially. Fig. 3B further shows that the two side walls or wings 203 extend around the longitudinal axis A. Thus, it is understood that one side wall of one rod of the plurality of rods 210 may extend radially in towards another side wall of another rod of the plurality of rods 210. It is preferred that the one side wall of one rod of the plurality of rods 210 may not intersect or meet another side wall of another rod of the plurality of rods 210. In other words, there may be an opening between the one side wall of one rod of the plurality of rods 210 and another side wall of another rod of the plurality of rods 210. This allows contents of the cartridge bag 303 to be extracted through the cap body 201 without any severe blocking by the one or more side walls or wings 203.

[0074] In the embodiments of Figs. 3A-3B, it is shown that the cartridge cap 200 comprises a dispensing outlet 202 extending in a longitudinal direction around the longitudinal axis A, e.g. a cylindrical tube extending from the narrow end or distal end of the cap body 201 along the longitudinal axis A. A proximal end of the dispensing outlet 202 may be connected to the narrow end or distal end of the cap body 201. The length of the dispensing outlet 202 in the longitudinal direction is a suitable length for a nozzle 110 to be connected thereto. Examples of a nozzle 110 have been previously described. The dispensing outlet 202 may comprise an outer surface having an outer thread 213 provided for sealably connecting the nozzle 110 thereto, e.g. a screw thread. In other words, the cylindrical conduit of the nozzle 110 may comprise an inner surface having an inner thread that is complementary to the outer thread of the dispensing outlet 202 of the cartridge cap 200.

[0075] In the embodiments of Figs. 3A-3B, it is shown

that the cap body 201 is surrounded by an annular wall comprised in the cartridge cap 200. The annular wall may refer to the outer surface of the cartridge cap 200. The annular wall may extend in the longitudinal direction, wherein the cap body 201 extends radially inward from said annular wall to the outlet 202. The annular wall may have a general shape that is similar to the inner shape of the tubular body 310, as previously described. Furthermore, means for mounting of the cartridge cap 200 to the distal end of the cartridge body or tubular body 310 are provided on an outer surface of the annular wall. The annular wall or the mounting means may comprise outer rings 206 provided on an outer surface of the annular wall. The outer rings may be provided for sealably connecting the cartridge cap 200 to the cartridge 300. The outer rings 206 may be formed as circumferential channels or annular grooves. The outer rings 206 can allow the cartridge cap 200 to be pressure-fit itself into the cartridge 300 or tubular body 310, preferably to the distal portion 312, to prevent the cartridge cap 200 from falling out or falling off the cartridge 300 or tubular body 310.

[0076] Note that the dispensing outlet 202 of the cartridge cap 200 may be referred to as a neck of the cartridge cap 200, and the cap body 201 of the cartridge cap 200 may be referred to as a shoulder of the cartridge cap 200. For example, the nozzle 110 may be generally secured to the neck of the cartridge cap 200 by way of complementary screw threads on the neck and in the nozzle 110. For another example, the cartridge cap 200 may be generally secured to the tubular body 310 by way of outer ridges, outer threads and/or outer rings 206 in the annular wall of the shoulder of the cartridge cap 200.

[0077] Alternatively or additionally to the outer rings 206, the annular wall may comprise a flange 207 extending radially outward from said annular wall. Preferably the mounting means may comprise the flange 207. The flange 207 may have a diameter equal to or larger than a diameter of the annular wall. Note that the diameter of the annular wall is equal to or larger than a diameter of the widest end or proximal end of the cap body 201. The flange 207 is configured to limit/prevent the cartridge cap 200 from entering the tubular body 310 to/by a specific distance. Thus, the flange 207 allows for a correct positioning of the cartridge cap 200 when being sealably connected to the cartridge 300 or the tubular body 310, preferably to eh distal portion 312. Said specific distance can be measured as the difference between a distance defined between the widest end or proximal end of the cap body 201 and a separation means 305 in the tubular body 310 of the cartridge 300 (distance D3 as described above) and another distance defined between a proximal end of the tubular body 310 and the separation means 305 (distance D1 as described above).. The specific distance may be equal to or less than a length of a distal region 312 of the tubular body 310. The length of the distal region 312 of the tubular body 310 is described further in detail below.

[0078] The flange 207 may comprise a protrusion at a circumferential end of flange 207, wherein the protrusion forms an elbow with a distal portion of the elbow extending in the longitudinal direction. The flange 207 may further comprise ribs, threads and/or ridges. The elbow is configured to sealably connect the cartridge cap 200 to the tubular body 310 of the cartridge 300 such that the elbow encloses a portion of the tubular body 310. Said connection may be snap-on connection, a threaded connection, a connection by means of ribs and/or a connection by means of ridges, where the threads, ribs and/or ridges in the flange 207 are preferably complementary to the outer ridges, outer threads and/or outer rings 206 in the annular wall of the shoulder of the cartridge cap 200. The protrusion may be an annular protrusion and may refer to another annular wall formed around the outer surface of the cap body 201. Thus, the annular wall surrounding the cap body 201 and the annular protrusion may allow part of the distal portion 312 of the tubular body 310 to be sealably connected therein between. This would further improve the connection between the cartridge cap 200 and the cartridge 300.

[0079] Figs. 4A and 4B show respectively cross-sectional views of a cartridge cap of a cartridge assembly according to the present invention. The cartridge 300 and cartridge assembly 100 of Figs. 4A and 4B correspond in many aspects and/or features to the cartridge 300 and cartridge assembly 100 of Fig. 1. In the embodiment of Fig. 4A, the length in the longitudinal direction of the cartridge 300 is 237 mm and the length of the distal region 312 is 10 mm. Furthermore, the width W in the longitudinal direction of the tear strip 305 is 20.5 mm. It can be derived that the distance D1 is 30.5 mm, which is the sum of the length of the distal region 312 and the width W of the tear strip 305. Furthermore, the internal diameter of the cartridge 300 (and respectively the proximal region 311, distal region 312 and/or tearing means 305) is 48 mm. The cartridge bag 303 shown in Fig. 4B may have an external diameter equal to or less than the internal diameter of the cartridge 303 of 48 mm shown in Fig. 4A. Other dimensions (i.e., lengths, widths, diameters, ...) may be considered as described above.

[0080] In Fig. 4B, the cartridge 300, preferably the tubular body 310 comprises means 304 to prevent the displacement of the piston 320 through the open proximal end of the tubular body 310. Said prevention means 304 may be an indentation as described above and/or a protrusion at a circumferential end of the proximal portion 311, wherein the protrusion forms a shoulder with the proximal portion 311 extending inwardly (i.e., to the interior of the tubular body 310) in the radial direction.

[0081] As described above, the cartridge cap 200 may comprise a cap body 201. Preferably, the widest end or proximal end of the cap body 201 is provided at the interior of the cartridge wall (i.e., inner surface of the tubular body 310). This allows for better flow of material through the cap body 210 while reducing material that is blocked by the cartridge cap 200, for example by the annular wall of the cartridge cap 200 or the outer surface of the car-

tridge cap 200. In some embodiments, the distal portion 312 may comprise inner rings complementary to the outer rings 206 of the cartridge cap 200. The inner rings maybe formed as annular protrusions that are complementary to the annular grooves or the circumferential channels of the outer rings 206.

[0082] Fig. 5 shows perspective view of a cartridge cap of the cartridge assembly of Figs. 4A and 4B. The cartridge 300 and cartridge assembly 100 of Fig. 5 correspond in many aspects and/or features to the cartridge 300 and cartridge assembly 100 of Fig. 2, further including a cartridge cap 200 as described above, preferably further including a nozzle as described above. The nozzle 110 may comprise a gripping means, such as a latch to allow the user to more easily connect the nozzle 110 to the cartridge cap 200.

[0083] Figs. 6A and 6B show respectively perspective views of a piston of a cartridge of the cartridge assembly shown in Figures 4A and 4B. As described above, the outer surface of the piston 320 has a general shape that is similar to the inner shape of the tubular body 310. In Figs. 6A and 6B, the piston 320 has cylindrical with rounded edges, which similar to the cylindrical inner shape of the tubular body 310 shown in Fig. 5. This ensures that the piston 320 can be sealably displaceable along the longitudinal axis A, preferably through the tubular body 310.

[0084] The piston 320 may have rounded edges 323 (shown in more detail in Figs. 7C and 7D). Said rounded edges may be provided circumferentially or on the peripheral of the distal end and/or proximal end of the piston 320. Said rounded edges ensure that the piston 320 can tilt in the tubular body 310 due to uneven angular pushing motion of an extrusion plate (e.g. of a plunger of an extrusion gun). This prevents clogging of the piston 320 in the tubular body 310 and ensures that the piston can be sealably displaced to the distal portion 312 of the tubular body 310.

[0085] In embodiments, the piston 320 may have ribs 322 at the proximal end of the piston 320. The ribs 322 may be provided around the longitudinal axis and/or with said rounded edges 323. The ribs 322 allow for effective demoulding of pistons 320 formed by moulding (such as injection or rotational moulding). Alternatively or additionally, the piston 320 may be formed of two parts, a proximal part comprising the proximal end and a distal part comprising the distal end. Said parts may be combined by attaching/joining means, such as solvent bonding, vibration welding, induction welding, sewing or other types of attaching/joining means. Advantageously, the ribs 322 require less material to be formed while still providing a necessary structural support to the piston 320.

[0086] In Figs. 6A and 6B, the piston 320 comprises an opening 321 configured for accommodating the proximal end of the cartridge bag, preferably the proximal end of the cartridge bag being sealed/closed with a sealing/closing means. The opening 321 may be formed along the longitudinal axis A (i.e. in the center of the piston 320) or along a longitudinal direction parallel to the longitudinal axis. The opening 321 may be a depression or a hollowed out area in/at the distal end of the piston 320, or the opening 321 may be formed through the distal end to the proximal end of the piston 320 (e.g., a cylindrical or conical hole through the piston 320 in the longitudinal direction). The opening 321 is provided for accommodating the proximal end of the cartridge bag 303, preferably the proximal end of the cartridge bag 303 being sealed/closed with a sealing/closing means. For example, a metal clamp for sealing/closing the proximal end of the cartridge bag may be accommodated/fit into said opening 321. Advantageously, the piston 320 ensures that the cartridge bag 303 is properly positioned in the tubular body 310 (e.g. centered at the longitudinal axis A), and is properly displaced through the interior of the tubular body 310 (e.g. along the longitudinal axis A).

[0087] The following embodiments will be described with reference to Figs. 7A, 7B, 7C and 7D, which show respectively cross-sectional views of the piston 320 of Figs. 6A and 6B.

[0088] In the embodiment of Fig. 7A, the opening 321 has a diameter of about 23 mm or less. Other diameters of the opening 321 may be about 50 mm or less, 40 mm or less, 30 mm or less, and 10 mm or less. Fig. 7A shows the piston 320 having an external diameter of 46 mm. The piston 320 may have an external diameter equal to or less than any of the above-disclosed external diameter ranges of the cartridge bag 303 and/or the tubular body 310.

[0089] In the embodiment of Fig. 7B, there are 14 ribs 322 equally spaced at an angle of about 25.71 degrees or less between two consecutive ribs. Other numbers of ribs 322 may be between 3 and 24, preferably between 8 and 24, between 12 and 24 or between 16 and 24. Other angles between two consecutive ribs may be between 15 and 120 degrees. Preferred angles can be derived by dividing 360 degrees by a number of ribs from the above-disclosed umber of ribs.

[0090] In the embodiment of Fig. 7C, the piston 320 has a length along the longitudinal axis A of about 18 mm or less. Other lengths of the piston 320 may be about 50 mm or less, 40 mm or less, 30 mm or less, and 20 mm or less. The distal end of the piston 320 may be flat, where the edges of the distal end of the piston 320 form 90 degrees with the longitudinal axis or 180 degrees between two opposite edges (with respect to the longitudinal axis A) of the distal end of the piston 320, or the distal end of the piston 320 may be concave, for example the edges of the distal end form 80 degrees with the longitudinal axis or 160 degrees between two opposite edges (with respect to the longitudinal axis A). Other angles between said opposite edges of the distal end of the piston 320 may be between 120 and 180 degrees, between 130 and 180 degrees, between 140 and 180 degrees, between 160 and 180 degrees, and between 170 and 180 degrees.

[0091] Fig. 7C shows the opening 321 being conical

and having a cone angle or opening angle of 4 degrees, wherein the angle is facing in direction from the proximal end to the distal end of the piston 320, preferably in the longitudinal direction. Other cone angles may be 60 degrees or less, 50 degrees or less, 40 degrees or less, 30 degrees or less, 20 degrees or less, 10 degrees or less, and 5 degrees or less, as well as any other cone angle derived from an external diameter (or respective radius) of the above-disclosed external diameter ranges of the piston 320 and from a length from the above-disclosed lengths of the piston 320. The edges 323 of the piston 320 may be rounded, wherein the rounded edge may be representative of part of a circle having a radius of about 6 mm or more. Other radii may be 2 mm or more, 4 mm or more, 8 mm or more, 10 mm or more and 12 mm or more.

[0092] In the embodiment of Fig. 7D, the piston 320 comprises a proximal part and distal part. The distal part of the piston 320 may have a length of about 12 mm or less. Other lengths may be about 40 mm or less, 30 mm or less, 20 mm or less, 10 mm or less, etc.. The proximal part of the piston 320 may have a length of about 6 mm or less. Other lengths may be about 40 mm or less, 30 mm or less, 20 mm or less, 10 mm or less, etc. Both lengths of the proximal and distal parts of the piston 320 may be derived from the above-disclosed lengths of the piston 320 being the sum of said both lengths.

[0093] Figs. 7B and 7D show that each of the ribs 322 comprises one or more ribs. Fig. 7B shows the one or more ribs in each of the ribs 322 being parallel. Fig. 7D shows the one or more ribs in each of the ribs 322 having an angle between them of 3 degrees or less. Other angles may be 20 degrees or less, 15 degrees or less, 10 degrees or less, 8 degrees or less, 6 degrees or less and 4 degrees or less.

[0094] The following embodiments will be described with reference to Figs. 8A, 8B and 8C, which show respectively cross-sectional views of a cartridge cap of the cartridge assembly shown in Figs. 4A and 4B.

[0095] In the embodiment of Fig. 8A, the widest end or proximal end of the cap body 201 has a diameter of about 42 mm. The widest end or proximal end of the cap body 201 may have a diameter equal to or less than the internal diameter of the tubular body 310 and/or the external diameter of the cartridge bag 303, i.e., any of the ranges disclosed above between 10 to 100 mm. Furthermore, a narrow end or distal end of the cap body 201 may have a diameter in the range of about 5-20 mm. Preferred ranges may be 5-15 mm, 5-12 mm, 5-10 mm, 7-15 mm, 7-12 mm, 7-10mm and so on.

[0096] Fig. 8A shows the cartridge cap 200 comprising the flange 207 having a diameter of about 50 mm. The flange 207 may have a diameter equal to or larger than the internal diameter of the tubular body 310 (i.e., any of the ranges disclosed above between 10 to 100 mm), preferably equal to or larger than an external diameter of the tubular body 310. The cartridge cap 200 may comprise a bridge 205 mounted on the inner surface 220 of the cartridge cap 200 as disclosed above. In Fig. 8A, the bridge 205 radially extending from the longitudinal axis A to a plurality of parts of the inner surface 220 or vice versa. Each of said extension may have a width in a radial direction in the range of about 1-10 mm, preferably about 1-8 mm, 1-6 mm, 1-4mm, and more preferably is about 2.3 mm.

[0097] Fig. 8A shows that the plurality of rods 210 are arranged on the inner surface 220 of the cap body 201 on the inner surface 220 of the cap body 201 at a distance between any two farthest rods of the plurality of rods in the radial direction is about 11.70 mm. Said distance between the two farthest rods may be derived as double the distance between any of the plurality of rods 210 and the longitudinal axis A, e.g. when the plurality of rods 210 are equally spaced from the longitudinal axis A. The plurality of rods 210 may be arranged between the wide end (i.e., proximal end) and the narrow end (i.e., distal end) of the cap body 201 (i.e. having a distance from the longitudinal axis A larger than half a diameter from any of the above ranges of the narrow end or distal of the cap body 201 and smaller than half a diameter from any of the above ranges of the wider end or proximal end of the cap body 201), preferably halfway between the two ends of the cap body 201.

[0098] In the embodiment of Fig. 8B, it is shown that the cartridge cap 200 comprises a dispensing outlet 202 extending in a longitudinal direction around the longitudinal axis A, e.g. a longitudinal tube extending from the narrow end or distal end of the cap body 201 along the longitudinal axis A. The length of the dispensing outlet 202 in the longitudinal direction is shown to be 14 mm. Said length may be in the range of 5-20 mm, 5-15 mm, 5-10 mm, 7-20 mm, 7-15 mm, 12-20 mm, and so on. A distance between a distal end of the dispensing outlet 202 (i.e., to which a nozzle may be connected) and an outer surface of the bridge 205 (i.e., facing away from the inner surface 220 of the cap body 201) is 22 mm. Said distance may be in a range of 10-40 mm, 10-30 mm, 10-25 mm, 10-20 mm, 10-15 mm, 15-40 mm, 15-30 mm, 15-25 mm, 15-20 mm, and so on.

[0099] Fig. 8B shows a plurality of rods 210 one of which has a sharp end 212 having a bevel angle of about 34 degrees. The bevel angle of a sharp end 212 may be equal to or less than about 50, 40, 30, 20, 10 or 5 degrees. Another rod of the plurality of rods 210 has a blunt end 211 having a bevel angle of about 80 degrees. The bevel angle of a blunt end 211 may be equal to or greater than about 51, 60, 70, 75, 80, 85 or 90 degrees. The plurality of rods 210 may extend in the longitudinal direction having a generally cylindrical or conical shape. In other words, the plurality of rods 210 may have a cone angle equal to or less than about 10, 9, 8, 7,6, 5, 4, 3, 2 or 1 degrees, where 0 degrees corresponds to a cylindrical rod. The cone angle in this embodiment is formed at the tip of the plurality of rods 210, preferably in the direction of the longitudinal direction (i.e. in the direction from the widest end (i.e., proximal end) to the narrow end (i.e.,

distal end) of the cap body 201.

[0100] Fig. 8B shows the annular wall of the cartridge cap 200 having a diameter of 46 mm. The annular wall may have a diameter equal to or less than the internal diameter of the tubular body 310 and/or the external diameter of the cartridge bag 303, i.e., any of the ranges disclosed above between 10 to 100 mm. The cartridge cap 200 may further comprise outer rings 206, wherein the diameter of the cartridge cap 200 including the outer rings 206 is 47 mm. In other words, the outer rings 206 may have an protruding distance (i.e., being radially protruding from the annular wall) of about 1mm or less, preferably 4 mm or less, 3 mm or less, 2 mm or less, 1.5 mm or less, 0.5 mm or less, and so on.

[0101] In the embodiment of Fig. 8C, the dispensing outlet 202 has a conical shape with a cone angle of about 3 degrees or less, the cone angle facing a direction from the cap body 201 to the dispensing outlet 202, preferably the direction being the longitudinal direction. Said cone angle of the dispensing outlet 202 may be in the range of about 10 mm or less, 8 mm or less, 6 mm or less, 4 mm or less, 3 mm or less, 2 mm or less, and so on, where 0 degrees corresponds to a dispensing outlet 202 with parallel walls. Fig. 8C shows the cap body 201 having an angle between an outer surface or inner surface 220 and the annular wall or longitudinal axis A of about 61.4 degrees or less. Said angle may be about 90, 80, 70, 65, 60, 55, 50 and so on. Furthermore, the annular wall is shown to have a conical shape having a cone angle of 3 degrees or less, the cone angle facing in a direction from the cap body 201 to the dispensing outlet 202, preferably the direction being the longitudinal direction. The annular wall may have a cone angle equal to or less than about 10, 9, 8, 7,6 , 5, 4, 3, 2 or 1 degrees.

[0102] Fig. 8C shows the outer rings 206 having a width or thickness in the longitudinal direction of 1 mm or less. The outer rings 206 may have a width or thickness equal to or less than about 10, 9, 8, 7, 6, 5, 4, 3, 2 or 1 mm. Furthermore, the outer rings 206 may be protruding radially at an angle with the widest end or proximal end of the cap body 201 of 10, 9, 8, 7, 6, 5, 4, 3, 2, 1 degrees or less, preferably an angle of 2 degrees. Furthermore, the outer rings 206 may be protruding in the longitudinal direction forming an angle with the widest end or proximal end of the cap body 201 of 110, 109, 108, 107, 106, 105, 104, 103, 102, 101 degrees or more, preferably an angle of 118 degrees.

[0103] Fig. 8C shows the cartridge cap 200 having a flange 207 having a width in the longitudinal direction of about 2 mm or less. The flange 207 may have a width equal to or less than 10, 9, 8, 7, 6, 5, 4, 3, 2 or 1 mm. The annular wall may have a width in the longitudinal direction equal to or less than about 20, 18, 16, 14, 12, 10, 8, 6 or 4 mmm preferably is about 10 mm. The cap body 201 may have a tube thickness (i.e. a distance between the exterior and interior surfaces) equal to or less than about 6, 5, 4, 3, 2, 1 mm, preferably is about 2 mm. The one or more side walls or wings 203 extending from the plurality of rods 210 may have a distance in the longitudinal direction between a point farthest away from the inner surface 220 of the cap body 201 and the narrow end (i.e. distal end) of the cap body 201 or a proximal end of the dispensing outlet 202, which may be connected to the narrow end or distal end of the cap body 201, equal to or less than about 30, 25, 20, 18, 16, 14, 12, 10, 8 or 6 mm, preferably is about 16 mm.

[0104] It will be appreciated that aspects of the present invention include embodiments in which the features described above are provided alone or in combination with other features described here. For example, the cartridge 300 described above can be provided in a cartridge assembly 100, the assembly 100 having a cartridge cap 200 assembly that sealably connects to the cartridge 300 as described herein. In such assemblies, the cartridge cap 200 comprises a cap body 201 configured to allow contents of the cartridge bag 303 to be extracted there through. The cartridge 300 can be employed in cartridge assemblies with different caps.

[0105] Moreover, the cartridge cap 200 described above may be provided in a cartridge assembly 100, the assembly 100 having a cartridge 300 comprising a cartridge bag 303 as described herein. In such assemblies, the cartridge cap 200 is configured to open the cartridge bag 303 in the cartridge 300 when the cartridge bag 303 is pressed towards the cartridge cap 200. The cartridge cap 200 can be employed in cartridge assemblies with different cartridges and cartridge bags.

[0106] While the invention has been described with reference to exemplary or preferred embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope of the invention. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from the essential scope thereof. Therefore, it is intended that the invention not be limited to the particular or preferred embodiments or preferred features disclosed, but that the invention will include all embodiments falling within the scope of the appended claims.

Claims

1. Cartridge cap (201) mountable on a distal end of a cartridge body (310) for use with an extrusion gun, said cap comprising a dispensing outlet (202) extending in a longitudinal direction around a longitudinal axis (A) and a cap body (201) extending radially outward from said outlet (202),
said cap comprises a plurality of rods (210) extending in the longitudinal direction (A) from an inner surface (220) of the cap body (201), wherein at least one piercing rod of the plurality of rods (210) is adapted to pierce a flexible bag when the flexible bag is pressed against the at least one rod,

characterised in, that the tips of at least two of the plurality of rods (210) have different sharpness, that at least two of the plurality of rods (210) extend to different longitudinal positions in the longitudinal direction, or the combination thereof.

2. The cap according to claim 1, wherein the plurality of rods (210) consists of piercing and blunt rods having tips with different sharpness.

3. The cap according to claim 1 or claim 2, wherein the plurality of rods (210) are arranged symmetrically around the longitudinal axis (A).

4. The cap according to any preceding claim, said cap further comprising two wings (203) extending in opposite directions from at least one rod of the plurality of rods (210).

5. The cap according to claim 4, said wings (203) extending in an angular direction around the longitudinal direction (A).

6. The cap according to any preceding claim, said cap further comprising a bridge (205) extending radially inward from and connecting each of the plurality of rods (210).

7. The cap according to any preceding claims, said cap further comprising an annular wall extending in the longitudinal direction, wherein the cap body (201) extends radially inward from said annular wall to the outlet (202), preferably the cap body (201) is substantially arranged in the space defined by the annular wall.

8. The cap according to claim 7, wherein means for mounting of the cap to the distal end of the cartridge body are provided on an outer surface of the annular wall.

9. The cap according to claim 7, wherein the mounting means comprise outer rings (206) provided on an outer surface of the annular wall; or
wherein the mounting means comprise a flange (207) extending radially outward from said annular wall.

10. The cap according to any preceding claims, wherein an outer surface of the outlet (202) is provided with an screw thread (213).

11. A cartridge assembly comprising:

a cartridge containing:

a hollow tubular body (310) configured to receive a flexible bag (303) containing contents to be expelled from the cartridge, wherein the body (310) comprises a cartridge wall extending in a longitudinal direction (A); and
a piston (302) provided in the body at the proximal end, the piston being sealably displaceable along a cartridge wall in the longitudinal direction (A),

a flexible bag (303) containing contents to be expelled from the cartridge provided in the tubular body; and
a cartridge cap (200), preferably according to any one of the preceding claims, sealably connected to the proximal portion (111), wherein the cartridge is configured to allow expulsion of the contents through an dispensing outlet of the cartridge cap by displacement of the piston (302),
wherein the cartridge cap (200) further comprises a plurality of rods extending in the longitudinal direction (A) from an inner surface (212) of the cap, wherein at least one piercing rod of the plurality of rods is adapted to pierce the flexible bag when the flexible bag is pressed against the at least one rod by displacement of the piston (302), and wherein the tips of at least two of the plurality of rods have different sharpness.

12. The cartridge assembly according to claim 11, wherein the contents of the flexible bag contains at least one of the group containing caulk, sealant, grout and adhesive, preferably the flexible bag contains silicon.

13. The cartridge assembly according to claim 12, wherein the tubular body is adapted to be divided into a proximal portion (311) and a distal portion (312), wherein the proximal portion (311) is substantially made of a paper-based material.

14. The cartridge assembly according to any one of claims 11-13, wherein the tubular body comprises means to separate the distal portion and the proximal portion from each other.

15. The cartridge assembly according to claim 14, wherein the separation means comprises a tear strip (302) extending in a peripheral direction and releasably connecting the proximal portion (311) and the distal portion (312).

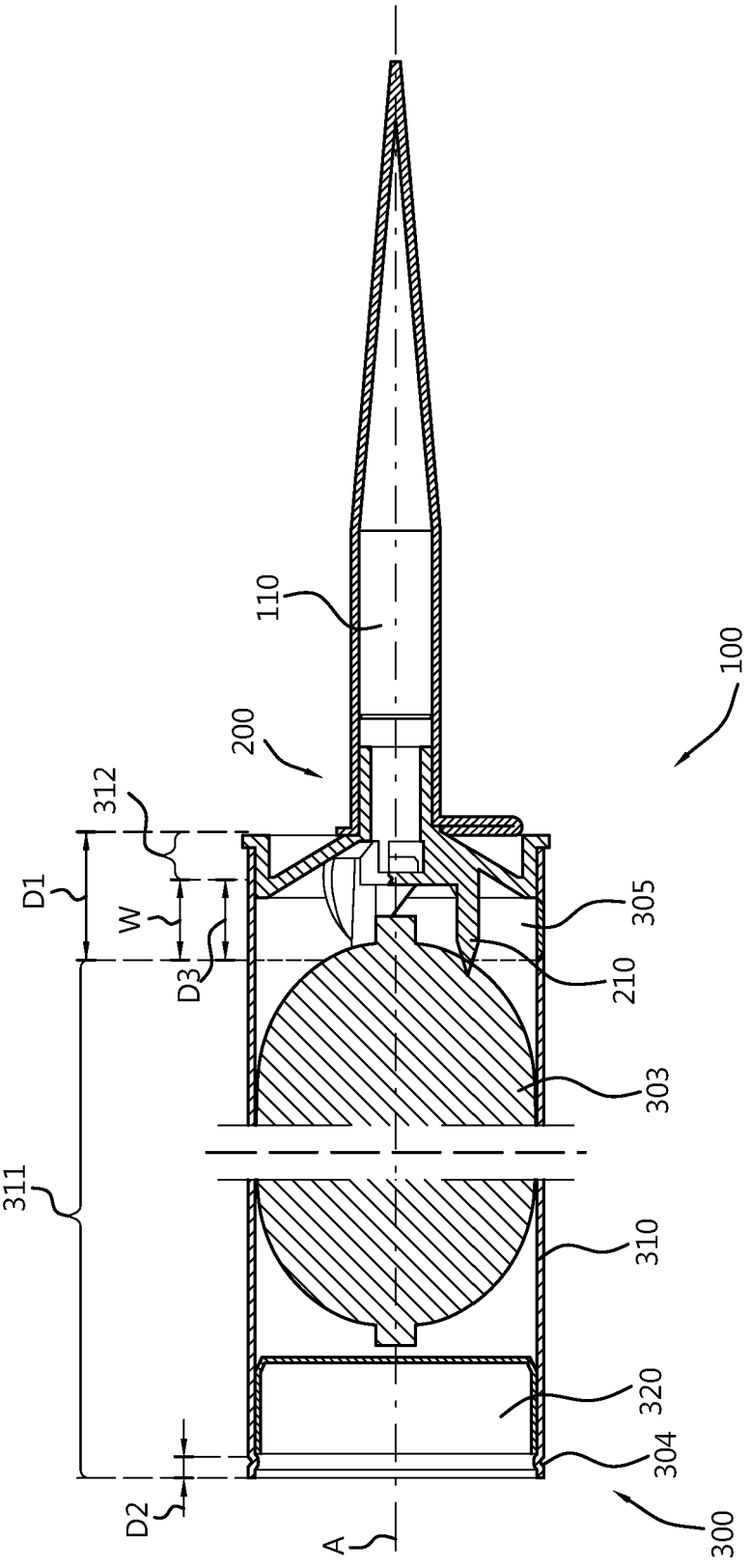


Fig. 1

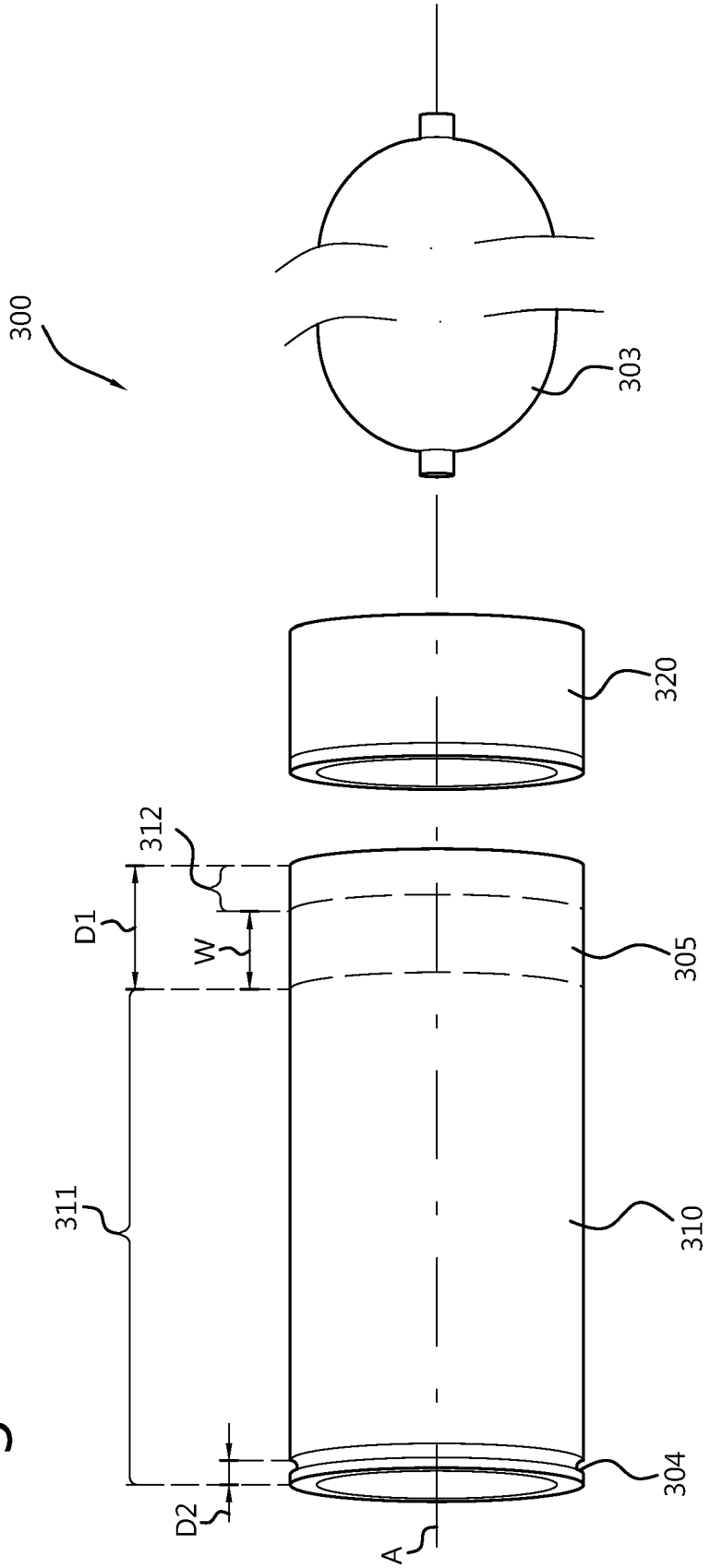


Fig. 2

Fig. 3A

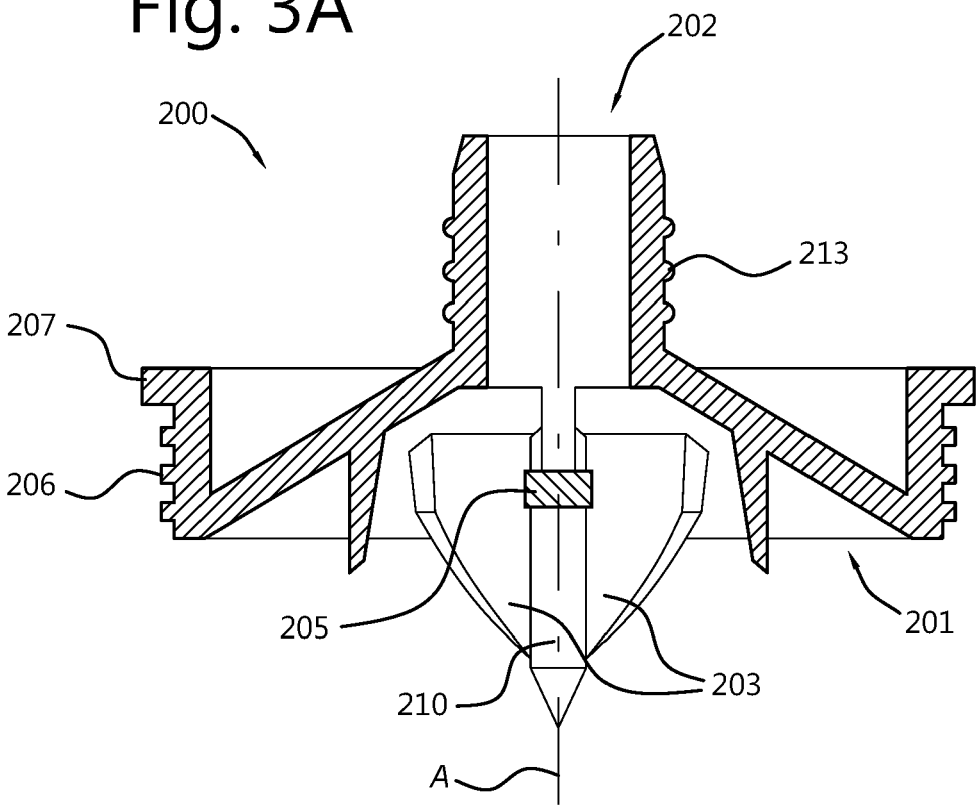


Fig. 3B

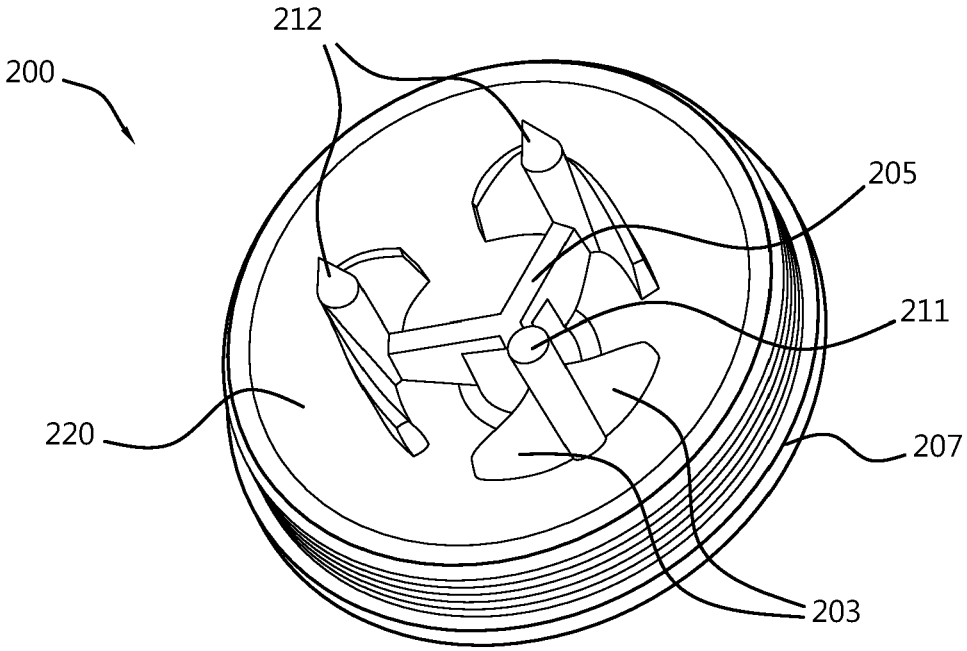


Fig. 4A

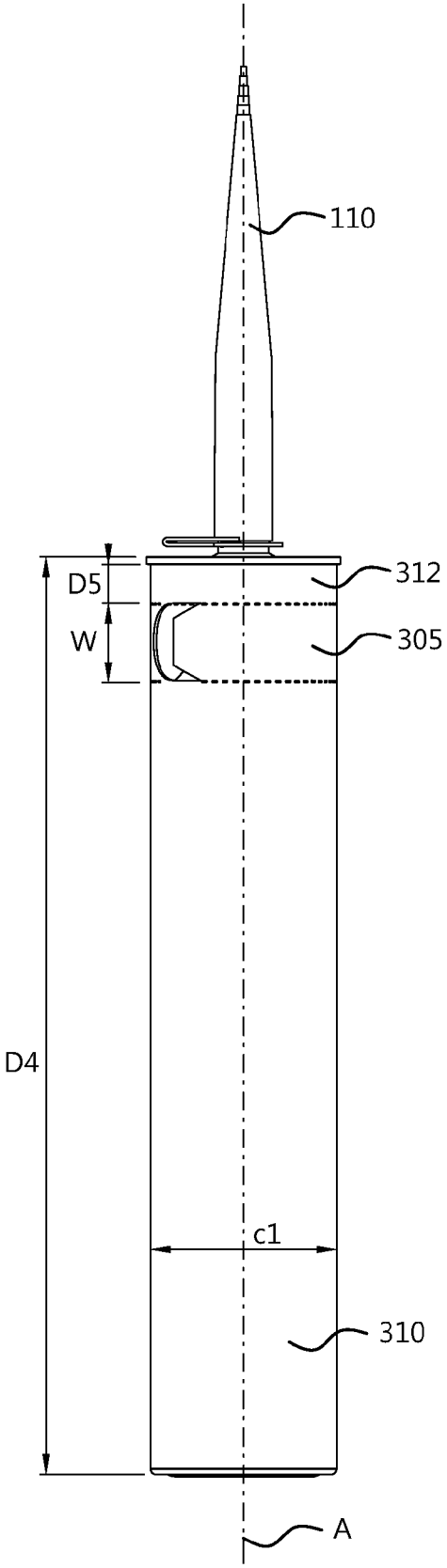


Fig. 4B

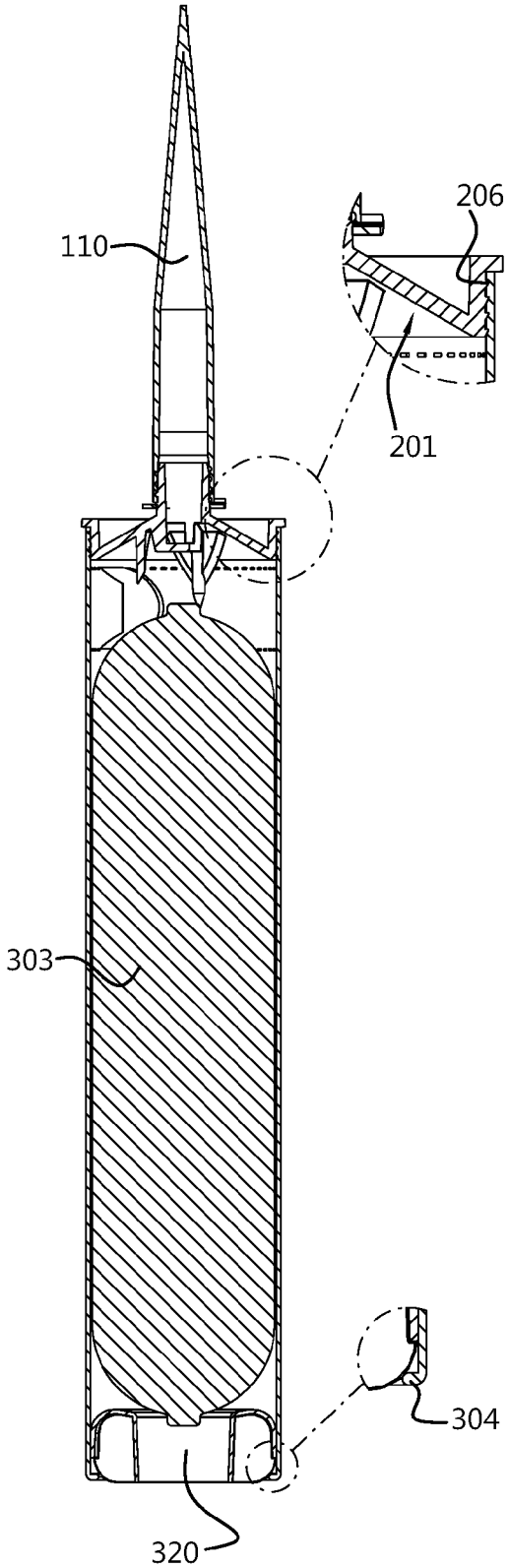


Fig. 5

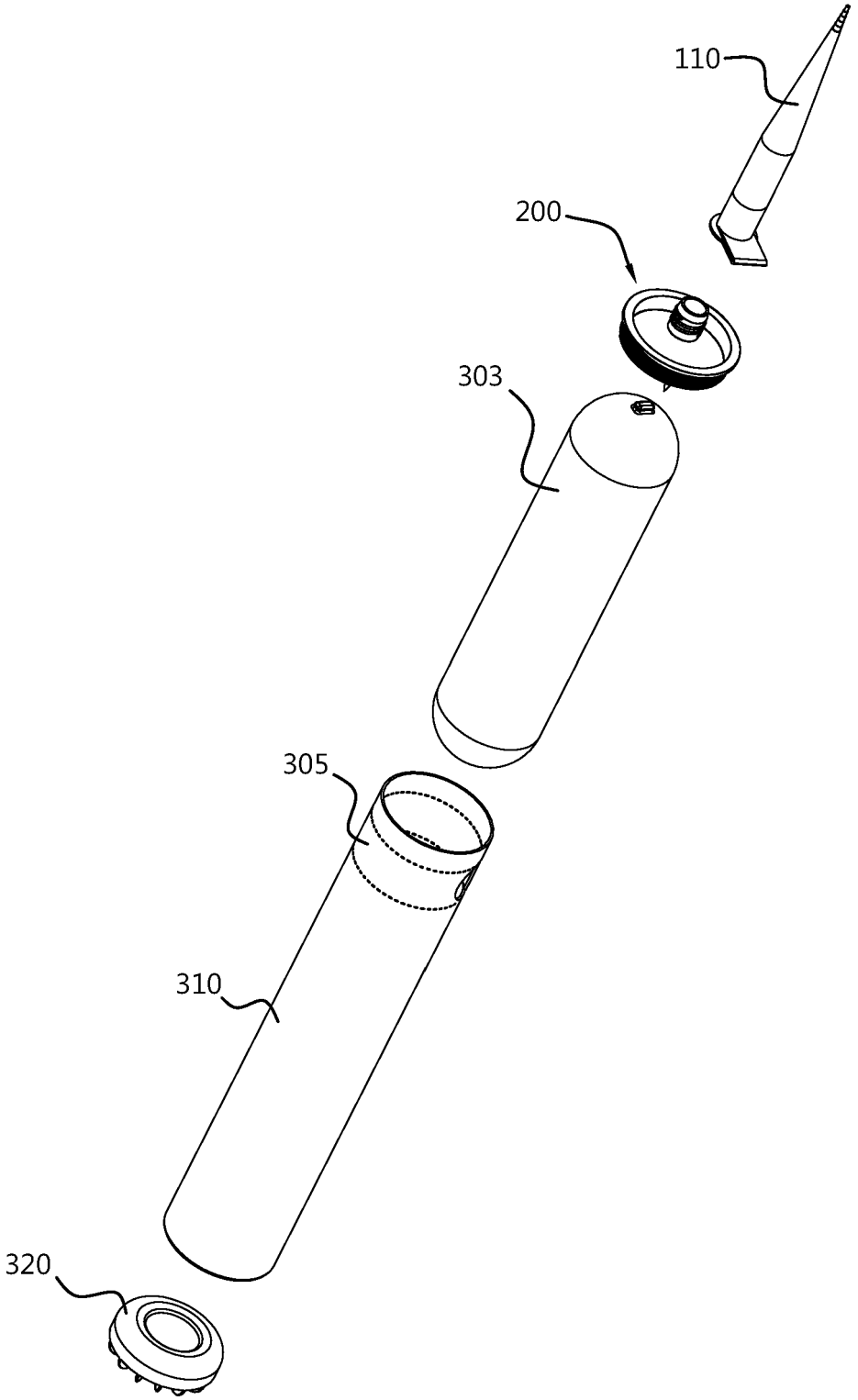


Fig. 6A

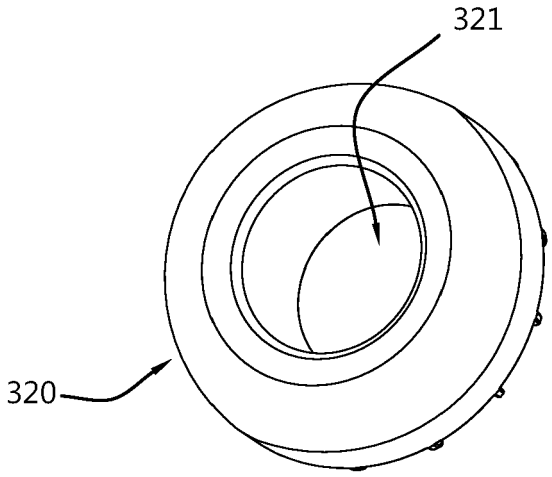


Fig. 6B

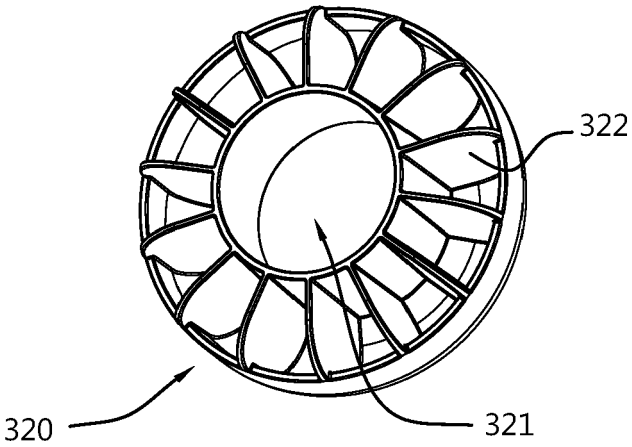


Fig. 7A

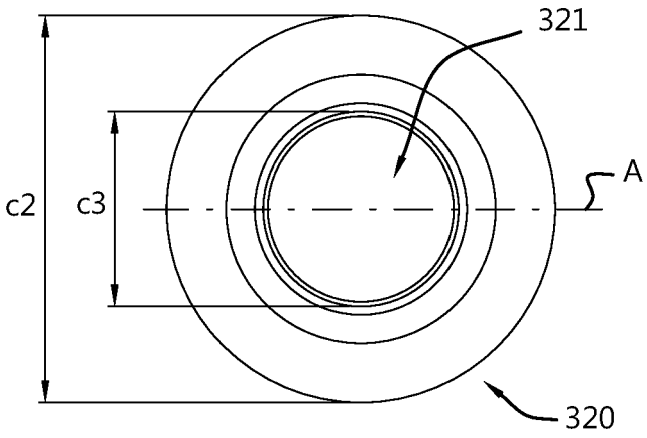


Fig. 7B

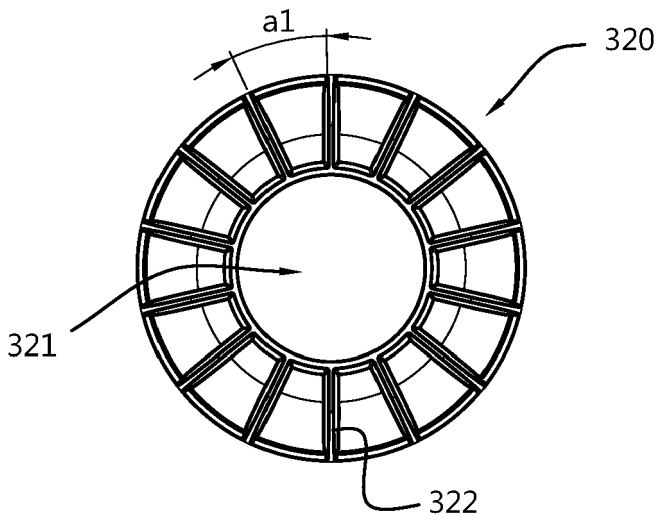


Fig. 7C

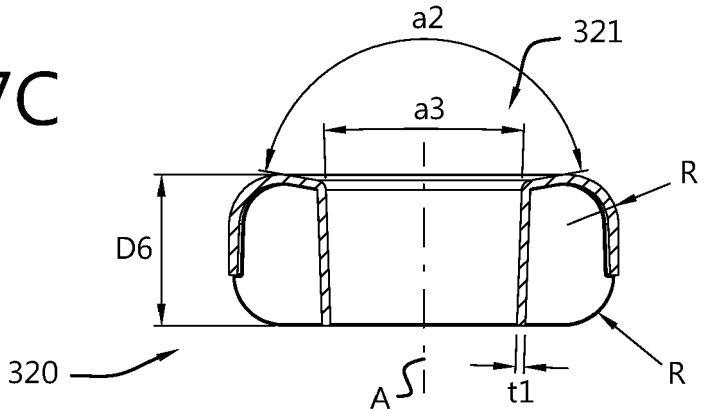


Fig. 7D

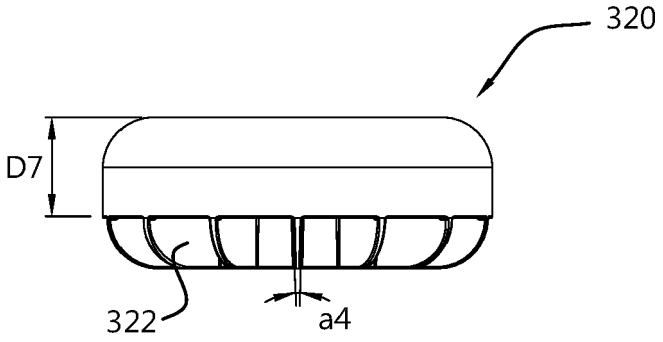


Fig. 8A

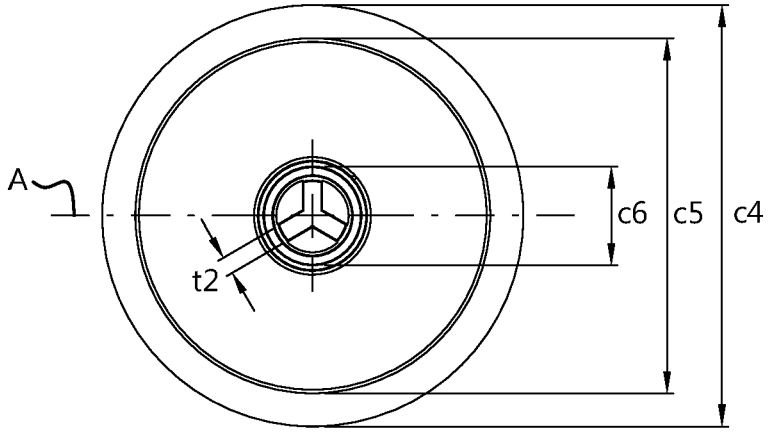


Fig. 8B

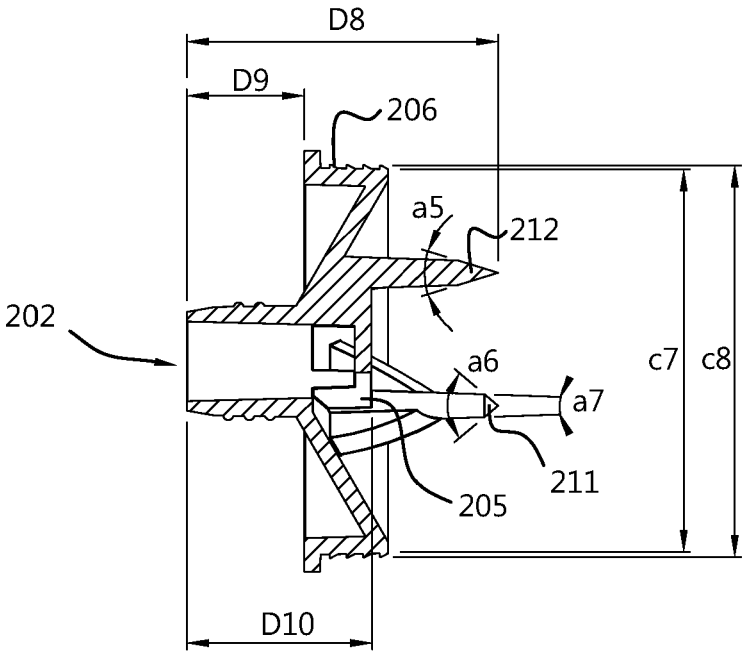
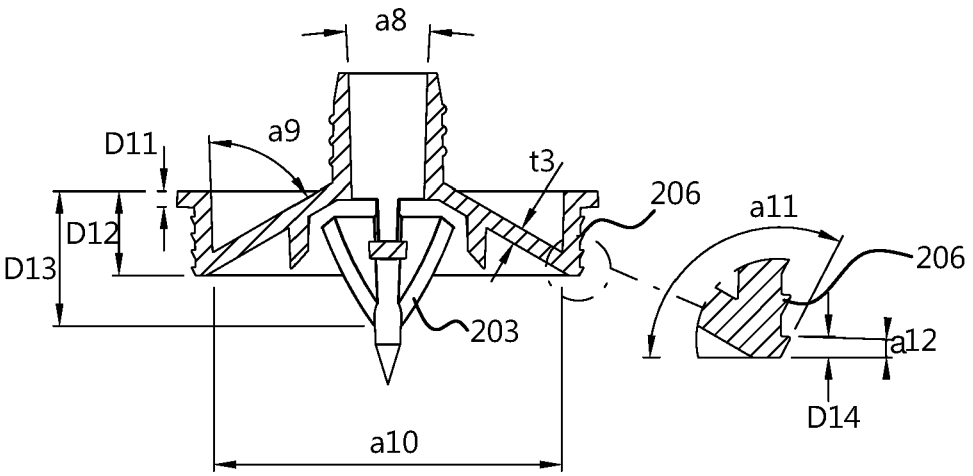


Fig. 8C



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EUROPEAN SEARCH REPORT

Application Number
EP 20 18 4786

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 00/76676 A1 (CREATECHNIC AG [CH]; WALCH ROGER [CH]; SEELHOFER FRITZ [CH]) 21 December 2000 (2000-12-21)	1,2,11, 12	INV. B65D25/48 B65D47/06
A	* paragraph [0007] - paragraph [0008]; figures 1-4 *	3-10, 13-15	B65D83/00 B05C17/005
A	US 2018/333742 A1 (LEE III GEORGE L [US]) 22 November 2018 (2018-11-22) * paragraph [0063] - paragraph [0069]; figures 4-6 *	1-15	
A	US 6 364 163 B1 (MUELLER JOHN J [US]) 2 April 2002 (2002-04-02) * column 7, line 35 - line 55; figures 1-3 *	1-15	

TECHNICAL FIELDS SEARCHED (IPC)

B65D
B05C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	15 December 2020	Derrien, Yannick

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15-12-2020

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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