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(71) Applicant: **LAFARGE**
75116 Paris (FR)

(72) Inventors:
- **Sen, Indrajit**
  London Ontario N6B 3R7 (CA)
- **Shah, Bipin**
  Nairobi (KE)

(74) Representative: **Keschmann, Marc et al**
Haffner und Keschmann
Patentanwälte GmbH
Schottengasse 3a
1014 Wien (AT)

(54) Woven bag for granular materials

(57) A bag (10) for a granular material (12), comprising: a body (20) defining a volume and formed of a woven polymer material, the body (20) comprising a laminated layer arranged along at least an outer surface (22) of the body (20) located on the opposite side of the volume, the body (20) presenting end portions (30) disposed at opposed extremities (24) thereof, one of the end portions (30) forming a structure (34) presenting an inner surface (37) and arranged to accommodate an outer mating surface (44) of a valve (40), the valve (40) presenting an inner filling surface (42) opposed to the outer mating surface (44), the valve (40) being made of a non-woven fabric (46) and presenting a first position wherein the valve (40) is opened and forms a passageway (36) delimited by the inner filling surface (42) allowing for filling the volume with the granular material (12), and a second position wherein the valve (40) and the passageway (36) are closed in order to seal the bag (10), the valve (40) moving from the first position to the second position upon the granular material (12) within the body (20) abutting against the structure (34).

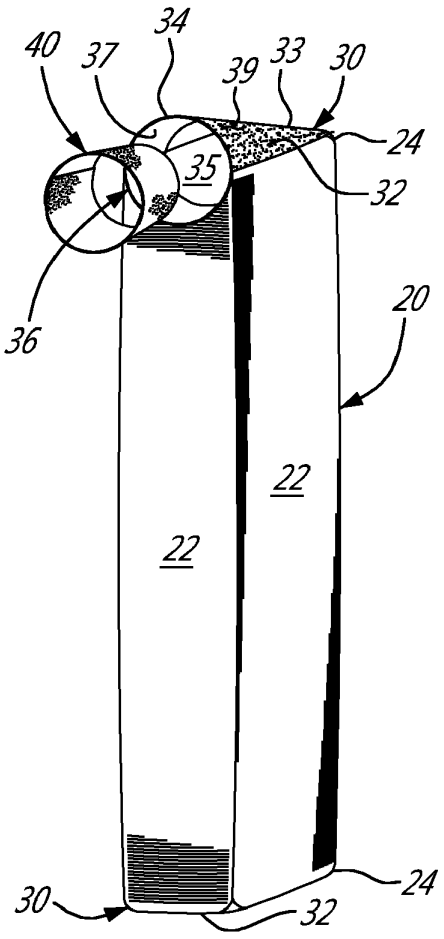

Fig. 2B

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Description

[0001] The application relates generally to bags and, more particularly, to woven bags to be filled with granular materials such as cement.

[0002] Bags for storing and transporting granular materials are made from a wide variety of materials. Consider bags used to store and transport dried cement powder, for example. Such bags can be made from relatively thick paper products, which have the advantage of being made from a relatively inexpensive source material. However, paper bags can tolerate moisture for only a relatively limited period of time before degrading or exposing their contents to water, which can make such contents unfit for sale and for use.

[0003] In addition, paper bags can become damaged from handling during production through to distribution to the end customer.

[0004] To compensate for such drawbacks, some bag manufacturers produce bags made from plastics. Plastic bags generally resist water better than paper ones but are comparatively more expensive to produce.

[0005] Plastic bags are relatively strong and lightweight, particularly when compared to bags made from paper products. As the bag is filled with the cement powder, it expands. This stretches the plastic of the bag and enlarges its pores. These pores allow air to escape from within the bag, thereby regulating the internal bag pressure during the filling. If these pores are larger in size than the grains of the cement powder, the cement powder may leak from the bag. In order to prevent such leakage, most plastic bags comprise at least one laminated layer. The laminated layer limits the size of the pores of the expanded bag, and reduces the seepage of the cement powder through these pores. The laminated layer generally covers the entire outer surface of the bag on all sides, as well as its interior surface. In order to allow air to escape from within the laminated bag while it is being filed, some surfaces of the bag have micro or nano perforations.

[0006] In addition, some plastic bags have bottom patches applied on the outer opposed extremities of the bags. The bottom patches reinforce these extremities of the bags against rubbing, and each bottom patch comprises a laminated layer on each of its sides. However, the application of different laminated layers on the body of the plastic bags and on their bottom patches over their entire surfaces increases the amount of steps for the manufacturing of the bag and therefore the cost of producing a bag significantly.

[0007] Irrespective of the material from which the bag is made, most bags have a valve which is used to fill the bag when it is open, and which seals the bag when it is closed. The valves, whether made from plastic or paper products, do not always form a perfect seal.

[0008] As such, cement powder may seep or leak through the valves as they are being filled and sealed, which can create insalubrious work environments, and cause losses due to wasted material.

[0009] The present invention aims to resolve all or some of these drawbacks mentioned above.

[0010] To this end, the present invention relates to a bag for a granular material, comprising: a body defining a volume and formed of a woven polymer material, the body comprising a laminated layer arranged along at least an outer surface of the body located on the opposite side of the volume, the body presenting end portions disposed at opposed extremities thereof, one of the end portions forming a structure presenting an inner surface arranged to accommodate an outer mating surface of a valve, the valve presenting an inner filling surface opposed to the outer mating surface, the valve being made of a non-woven fabric and presenting a first position wherein the valve is opened and forms a passageway delimited by the inner filling surface allowing for filling the volume with the granular material, and a second position wherein the valve and hence the passageway are closed in order to seal the bag, the valve moving from the first position to the second position upon the granular material within the body abutting against the structure.

[0011] Non-woven fabric is an engineering fabric, manufactured by putting small fibers together in the form of a sheet and then binding them either through thermal bonding, mechanically bonding, with an adhesive, or by interlocking them with serrated needles such that the inter-fiber friction results in a strong fabric.

[0012] The use of a non-woven fabric to make the valve improves the capacity of the valve to crumple or collapse inward onto itself with less pressure and more completely, thereby providing an improved seal to the bag.

[0013] This results in less leakage from the bag while being filled and when being sealed, which improves the sanitation of the work environment and results in less wasted granular material.

[0014] According to one aspect of the invention, the non-woven fabric is a polymer fabric.

[0015] According to one aspect of the invention, the polymer fabric is polypropylene.

[0016] According to one aspect of the invention, the non-woven fabric is a spun bonded non-woven fabric.

[0017] The spun bonded non-woven fabric valve can crumple or collapse upon itself more easily and completely, thereby providing a greater seal to the bag.

[0018] According to one aspect of the invention, the valve has a polymer laminated layer applied on only the outer mating surface.

[0019] The bag is therefore comparatively less costly to produce because it has a laminated layer on only one surface of the valve.

[0020] According to one aspect of the invention, the polymer laminated layer is made of polypropylene or polyethylene.

[0021] According to one aspect of the invention, bottom patches formed of the woven polymer material are disposed on each end portion, each bottom patch having an application surface engaged with a corresponding end

surface of the end portions and an exposed bottom surface.

[0022] Such bottom patches reinforce the end of the bag and improve its durability.

[0023] According to one aspect of the invention, each bottom patch has a polymer laminated layer applied to only the application surface.

[0024] The bag is therefore comparatively less costly to produce because it has a laminated layer on only one surface of each bottom patch.

[0025] According to one aspect of the invention, the woven polymer material of the body includes a fabric made of woven polypropylene flat tapes.

[0026] According to one aspect of the invention,the outer surface of the body comprises a printing ink.

[0027] Also the subject of the present invention includes a method for making a bag for a granular material as described above, comprising the following steps: providing a valve made of a non-woven fabric; applying a polymer laminated layer to only an outer mating surface of the valve; and applying the valve within a structure of the bag.

[0028] According to one implementation of the method, the method comprises a step of providing a bottom patch to each one of opposed end portions of the bag, each bottom patch having an application surface and an exposed bottom surface.

[0029] Such bottom patches reinforce the end of the bag and improve its durability.

[0030] According to one implementation of the method, of the step of providing the bottom patch includes applying a polymer laminated layer to only the application surface of each bottom patch.

[0031] The bag is therefore comparatively less costly to produce because it has a laminated layer on only one surface of each bottom patch.

[0032] According to one implementation of the method, the polymer laminated layer is made of polypropylene or polyethylene.

[0033] In another aspect, there is provided a bag for a granular material, comprising: a body defining a volume and formed of a woven polymer material, the body comprising a laminated layer arranged along at least an outer surface of the body located on the opposite side of the volume, the body presenting end portions disposed at opposed extremities thereof, each end portion having an exposed end surface, bottom patches formed of the woven polymer material and disposed on the end surface of each end portion, each bottom patch having an application surface engaged with a corresponding end surface and an exposed bottom surface, each bottom patch having a laminated layer made in polymer applied to only the application surface; one of the end portions forming a structure presenting an inner surface arranged to accommodate an outer mating surface of a valve, the valve presenting an inner filling surface opposed to the outer mating surface, the valve presenting a first position wherein the valve is opened and forms a passageway delimited by the inner filling surface allowing for filling the volume with the granular material, and a second position wherein the valve and hence the passageway are closed in order to seal the bag, the valve moving from the first position to the second position upon the granular material within the body abutting against the structure.

[0034] The bottom patches reinforce the end of the bag and improve its durability. The bag is also comparatively less costly to produce because it has a laminated layer on only one surface of each bottom patch.

[0035] Reference is now made to the accompanying figures in which:

Fig. 1A is a perspective view of a bag filled with a granular material, according to an embodiment of the present disclosure;

Fig. 1B is another perspective view of the bag of Fig. 1A, with an interior portion exposed to show the bag being filled with the granular material;

Fig. 2A is a view of the bag of Fig. 1A, shown empty and flattened;

Fig. 2B is another perspective view of the bag of Fig. 1A, a valve as a part of the bag being shown apart therefrom;

Fig. 2C is an enlarged perspective view of the valve of Fig. 2B; and

Fig. 3 is a block diagram of a method for making a bag for a granular material.

[0036] Figs. 1A and 1B illustrate a bag 10 for receiving, storing, and transporting a granular material 12. The bag 10 can be filled with the granular material 12 when it is vertically oriented, as shown in Fig. 1B. An insertable filling spout 14 is placed through an open end of a flattened and/or empty bag 10. The granular material 12 is fed into the bag 10 via the spout 14, causing the bag 10 to fill and expand. As the bag 10 expands, it changes from a flattened shape to the filled-out shape shown in Fig. 1B. The spout 14 stops feeding the granular material 12 when the bag 10 is considered to be sufficiently filled. The bag 10 can be of any size, and can take shapes other than the rectangular shape shown in the figures. The bag 10 shown in Figs. 1A and 1B is intended to be stored and transported on the sides having the greatest surface area, and it will be appreciated that the bag 10 can be stored and transported on different sides.

[0037] The granular material 12 can be any material composed of grains, particles, or seeds, of any grain size. Some non-limitative examples of a granular material 12 include: cement powder, chemicals, animal feed, plastic granules, and flowable materials in their dried state. The granular material 12 can include materials having a very fine grain size, such as powders, or materials having a

larger grain size, such as plant seeds. Therefore, and although the granular material 12 is most often disclosed herein as being a cement powder, it will be appreciated that the granular material 12 can be other materials as well, or a mixture of these materials.

[0038] Fig. 2A shows a bag 10 in an empty, flattened state (i.e. not filled with the granular material 12). The bag 10 is often manufactured in this state, and empty bags 10 are stacked one on top of the other along their sides having the greatest surface area. This facilitates storage and transportation of empty bags 10. Referring to Figs. 2A and 2B, the bag 10 comprises a body 20. The body 20 comprises end portions 30 located at opposed extremities 24 of the body 20. One of the end portions 30 forms a structure 34 which receives a valve 40. These are now discussed.

[0039] The body 20 is the main part of the bag 10 and provides structure to the bag 10. It extends along a length and width so as to define a maximum internal volume which can be filled, partially or completely, with the granular material 12. The body 20 is also enclosed, meaning that it forms with its end portions 30 the volume to retain and store the granular material 12. The volume may vary in magnitude depending on whether the valve 40 is opened or closed. It most instances, but not necessarily all, the body 20 is a tubular fabric. The body 20 may similarly be an elongated object.

[0040] The body 20 is made up of a woven polymer material. The woven polymer material is a fabric formed by weaving together separate polymer yarns, tapes, or threads. This creates a mesh-like pattern on an outer surface 22 of the body 20 located on the opposite side of the volume, i.e. the surface not intended to be in contact with the granular material 12 and which can be viewed when looking upon the bag 10. If desired, the outer surface 22 can act as a substrate onto which printing inks can be applied in order to provide information about the contents of the bag 10. The polymer material used in the weave can be any suitable polymer, depending on the intended use of the bag 10. For example, if the bag 10 requires improved moisture resistance, a polymer exhibiting strong water repellency can be used. Similarly, if the bag 10 must be able to withstand high temperature environments, a polymer with a higher melting point can be used. Some examples of polymer materials from which the body 20 can be made include polypropylene (PP) and polyethylene (PE) of all grades and densities. A bag 10 having a body 20 made up of woven polypropylene flat tapes is commonly referred to as a woven polypropylene (WPP) bag 10.

[0041] The woven polymer body 20 is relatively strong and lightweight, particularly when compared to bags having paper bodies. In order to prevent leakage through its pores, a laminated layer made up of a suitable polymer laminated sheet is applied at least on the outer surface 22 of the body 20. The laminated layer closes or limits the size of the pores of the expanded body 20, and reduces the seepage of the granular material 12 through these pores. The outer surface 22 may be perforated with perforations, whose size can vary. For example, the perforations can each have diameters measured in microns or nanometers. The perforations allow air to escape from the volume of the body 20 as the bag 10 is being filled with the granular material 12. The laminated layer generally covers the entire outer surface 22 of the body 20 on all sides of the body 20, but may also cover only a selection of the outer surface 22. If desired, a laminated layer may also be applied to the inner surface of the body 20 opposite the volume.

[0042] The body 20 shown in the figures only has two end portions 30, but it will be appreciated that bodies 20 having different shapes may have more end portions 30, and such bags 10 are also within the scope of the present disclosure. The end portions 30 are also made of a woven polymer material, such as woven polypropylene flat tapes or PE. The end portions 30 are substantially planar when the bag 10 is stacked, flattened and empty, as shown in Fig. 2A. In such a flattened configuration, the end portions 30 are folded inwards to minimise the volume occupied by the bag 10 during storage and transport. The end portions 30 each include an exposed end surface 32. One of the end portions 30 has a structure 34, i.e. presenting a tubular shape, into which the valve 40 is introduced, and through which the body 20 can be filled with the granular material 12 via the filling spout 14, which presents a complementary shape to the structure 34.

[0043] The exposed end surfaces 32 also form, in an interchangeable manner, the upper and lower surfaces of the filled bag 10 when it is in a vertical orientation. The exposed end surfaces 32 therefore more generally correspond to the distal ends of the bag 10.

[0044] The structure 34 is defined by an opening 35 in one of the distal extremities of the selected end portion 30, and is made when the bag 10 is manufactured by not sealing the inner surfaces of the distal extremities of the selected end portion 30 together. The structure 34 can extend along any suitable length, and take a cylindrical or other suitable shape. The structure 34 is therefore a hollow enclosure with a single opening 35, and defines an inner surface 37.

[0045] The bag 10 also includes a valve 40, as shown in Figs. 2B and 2C. The valve 40 is shown as separate from the end portion 30 for the purposes of illustration, but it is appreciated that the valve 40 can be any conduit which is located within, and enclosed by, the structure 34. It allows the bag 10 to be filled with the granular material 12, and to be sealed once it has been filled.

[0046] The valve 40 typically has a circular cross-section, but can also have any other suitable cross-section which provides the above-described functionality.

[0047] The valve 40 presents an outer mating surface 44 and an inner filling surface 42 opposed to the outer mating surface. The inner surface 37 of the structure 34 is arranged to accommodate the outer mating surface 44 of the valve 40. The valve 40 presents a first position wherein the valve 40 is opened and forms a passageway

36 delimited by the inner filling surface 42 allowing for filling the volume with the granular material 12, and a second position wherein the valve 40 and hence the passageway 36 are closed in order to seal the bag 10.

[0048] The valve 40 is made of a non-woven fabric 46, as shown in Fig. 2B. A non-woven fabric is material made from fibers which are bonded or similarly attached together through various processes (e.g. chemical, mechanical, heat, and solvent treatment). Non-woven fabrics are not made by weaving or knitting. They can be considered to be sheet or web structures which are formed by entangling fiber or filaments, or by perforating films, mechanically, thermally, chemically, or with solvents. The non-woven fabric 46 disclosed herein may have a circular cross-section, formed by rolling a sheet or web of non-woven fabric material into a generally tubular shape.

[0049] Non-woven fabrics can have many material properties, including at least increased softness versus paper and woven polymer fabrics. Such increased softness can be useful for the valve 40 because it allows the valve 40 to easily crumple or collapse inward onto itself with less pressure and more completely, thereby providing an improved seal to the bag 10. This results in less leakage from the bag 10 while being filled or sealed, which improves the sanitation of the work environment and results in less wasted granular material 12.

[0050] The non-woven fabric 46 may be a polymer fabric, such as PP, PE, polyester, or a polyamide. When discussing polymer materials and polymer fabrics within the present disclosure, it will be appreciated that such materials and fabrics may include suitable additives to enhance the material properties of the material or fabric. Some examples of additives includes Masterbatch for coloring the polymer, PE for adding elasticity, and calcium carbonate and recycled polymers (e.g. PP) as filler.

[0051] The non-woven fabric 46 may also be a spun bonded non-woven fabric. Most non-woven fabrics are produced in three stages: web formation, bonding and finishing treatments. Manufacturing of such fabrics begins by arranging polymer fibers or filaments, which are extruded from polymer granules, into a sheet or web. The formation of the sheet or web can be achieved by any of the following techniques: drylaid, spunlaid or spun bonded, and wetlaid.

[0052] Spun bonded non-woven fabrics can be produced as follows. Granules of the desired polymer are vacuum-fed to a dosing station placed on top of an extruder. The extruder melts and homogenizes the polymer granules, and the melted polymer is subsequently sent through a filter and a spin pump. A curtain of polymer filaments is formed in a spin pack. The filaments are air cooled, and stretched out. For non-woven fabrics, instead of a further stretching process, the polymer filaments are swirled and deposited on a wire mesh belt in a random, non-woven pattern, thus forming a web. This web is transferred to a bonding calendar that uses heat and pressure to set such physical properties as tensile strength and elongation of the final product. After cooling, the fabric can be wound.

[0053] It has been observed that such spun bonded non-woven fabrics are soft and comfortable to the touch compared to paper and woven polymer fabrics. As mentioned above, the spun bonded non-woven fabric valve 40 can thus crumple or collapse upon itself more easily and completely, thereby providing a greater seal to the bag 10. Furthermore, and depending on how it is manufactured, the non-woven fabric 46 may have a porosity that is high enough to allow for the passage of air through the valve 40, but still low enough to prevent passage of even the smallest particles of the granular material 12.

[0054] The valve 40 can be selectively laminated. More particularly, a polymer laminated layer can be applied on only the outer mating surface 44 of the valve 40. In such a configuration, a laminated layer is not applied to inner filling surface 42 of the valve 40, or to any of its other parts.

[0055] The filling and sealing of the bag 10 typically occur as follows. The body 20 is vertically oriented as the volume is being filled with the granular material 12 via the filling spout 14, which is inserted through passageway 36 of the valve 40 and the opening 35 of the structure 34. The filling spout 14 fills the body 20 with the granular material 12 until it has reached a certain level within the body 20. Air is evacuated from the body 20 via perforations in the body 20 while the volume is being filled. Once filled to the desired level, the bag 10 is released and falls onto its large or narrow side on a conveyor, thereby assuming a horizontal orientation.

[0056] As the bag 10 shifts from a vertical position to a horizontal position, the granular material 12 within the bag 10 shifts as well. As the granular material 12 shifts horizontally, it eventually abuts against a segment of the structure 34 which faces into the body 20. This segment of the structure 34 abuts against the granular material 12. The horizontal shifting of the granular material 12 impacts this segment of the structure 34 and exerts a pressure thereagainst. This pressure, in turn, is applied against the valve 40 disposed within the structure 34. The pressure forces the valve 40 to close by crumpling or collapsing inward onto itself, thereby preventing the granular material 12 from leaking, thus sealing the bag 10.

[0057] Therefore, the valve 40 presents a first position wherein the valve 40 is opened and forms the passageway 36 delimited by the inner filling surface 42 allowing for filling the volume with the granular material 12, and a second position wherein the valve 40 and hence the passageway 36 are closed in order to seal the bag 10, the valve 40 moving from the first position to the second position upon the granular material 12 within the body 20 abutting against the structure 34.

[0058] As will be discussed in greater detail below, the valve 40 disclosed herein can close by crumpling or collapsing inward onto itself with less pressure and more completely, thereby providing an improved seal to the bag 10.

[0059] The length of the valve 40 will largely depend on the size of the bag 10 and/or end portions 30. It has been observed that a shorter valve 40 will collapse upon itself more readily, thereby providing a quicker and more complete seal. A shorter valve 40 also allows the filling spout 14 to penetrate more deeply into the structure 34, thereby reducing the likelihood of residual granular material 12 remaining in the valve 40 and/or structure 34 when the valve 40 is closed. One possible range of lengths for the valve 40 includes 130 mm to 150 mm, and other ranges are within the scope of the present disclosure. Furthermore, a shorter valve 40 can also help ensure that the pressure created by the granular material 12 within the bag 10 when it transitions to a horizontal orientation and the second position hits squarely on the mouth of the valve 40 and helps to seal it up.

[0060] In yet another aspect of the invention, and referring to Figs. 2A and 2B, the bag 10 may have the body 20 as described above, and bottom patches 33 formed of the woven polymer material and disposed on the end surface 32 of each end portion 30. Each bottom patch 33 has an exposed bottom surface 39, and an opposed and inner application surface (not shown) which is bonded or otherwise attached to the corresponding end surface 32. Each bottom patch 33 has a polymer laminated layer applied to only the application surface. Such a bag 10 also may have a valve 40 disposed within a structure 34, as detailed above.

[0061] The bottom patches 33 reinforce the end surfaces 32 of the bag 10. The bottom patches 33 are typically pieces of woven polymer fabric which are sized to match the dimensions of the end surfaces 32 to which they are applied. They are applied to the end surfaces 32 using any suitable thermal or chemical bonding technique.

[0062] A polymer laminated layer may be applied to the inner application surface of each bottom patch 33. This helps to seal the pores of the end surfaces 32, to heat weld the bottom patch 33 to the end surfaces 32, and to improve the durability of the ends of the bag 10. The polymer laminated layer, which can be a polymer laminated sheet, is applied to the application surface only of each bottom patch 33, and not to the exposed bottom surface 39 or other parts of the bottom patches 33. The application of the polymer laminated layer to only the application surface of the woven polymer bottom patches 33 can be done by bonding or adhering the polymer laminated layer thereto, and eliminates the need for laminated layer to be applied on the outer exposed bottom surface 39 of the bottom patches 33, without compromising the strength and durability of the bag 10.

[0063] It can thus be appreciated that the bottom patches 33, as well as the valve 40, can selectively comprise a laminated layer on only one of their surfaces. The types of polymer used for this "single-sided" lamination can vary. For example, the polymer laminate layer can be a laminated sheet of PP or PE applied through controlled hot air to the application surfaces of the bottom patches 33, and to the outer mating surface 44 of the valve 40. When applied to only the application surfaces of the bottom patches 33, the polymer laminate layer facilitates the heat welding of the bottom patches 33 to the end surfaces 32 of the bag 10.

[0064] It has been observed that important savings can be achieved when manufacturing bags 10 having selective lamination, without significantly affecting the structural integrity, strength, or durability of the bags 10. Cost savings during production of the bags 10 are typically measured as savings per number of bags produced. Over large bag production runs, the cost savings are significant.

[0065] According to yet another aspect, and referring to Fig. 3, there is provided a method 100 for making a bag 10 for a granular material 12. The method 100 comprises a first step i of providing a valve 40 made of a nonwoven fabric 46 so as to fill the bag 10 with the granular material 12, shown as 102 in Fig. 3. The method 100 also includes a second step ii of applying a polymer laminated layer to only an outer mating surface 44 of the valve 40, shown as 104 in Fig. 3. The method 100 also includes a third step iii of applying the valve 40 within a structure 34 of the bag 10, shown as 106 in Fig. 3.

[0066] The method 100 can also comprise a step of providing a bottom patch 33 to each one of opposed end portions 30 of the bag 10, each bottom patch 33 having an application surface and an exposed bottom surface 39.

[0067] The method 100 can also comprise a step of applying a polymer laminated layer to only the application surface of each bottom patch 33. The polymer laminated layer can be a laminated sheet made of polypropylene or polyethylene.

[0068] The above description is meant to be exemplary only, and one skilled in the art will recognize that changes may be made to the embodiments described without departing from the scope of the invention disclosed. Still other modifications which fall within the scope of the present invention will be apparent to those skilled in the art, in light of a review of this disclosure, and such modifications are intended to fall within the appended claims.

Claims

1. A bag (10) for a granular material (12), comprising: a body (20) defining a volume and formed of a woven polymer material, the body (20) comprising a laminated layer arranged along at least an outer surface (22) of the body (20) located on the opposite side of the volume, the body (20) presenting end portions (30) disposed at opposed extremities (24) thereof, one of the end portions (30) forming a structure (34) presenting an inner surface (37) and arranged to accommodate an outer mating surface (44) of a valve (40), the valve (40) presenting an inner filling surface (42) opposed to the outer mating surface (44), the

valve (40) being made of a non-woven fabric (46) and presenting a first position wherein the valve (40) is opened and forms a passageway (36) delimited by the inner filling surface (42) allowing for filling the volume with the granular material (12), and a second position wherein the valve (40) and the passageway (36) are closed in order to seal the bag (10), the valve (40) moving from the first position to the second position upon the granular material (12) within the body (20) abutting against the structure (34).

2. The bag (10) according to claim 1, wherein the non-woven fabric (46) is a polymer fabric.

3. The bag (10) according to claim 2, wherein the polymer fabric is polypropylene.

4. The bag (10) according to any one claims 1 to 3, wherein the non-woven fabric (46) is a spun bonded non-woven fabric.

5. The bag (10) according to any one claims 1 to 4, wherein the valve (40) has a polymer laminated layer applied on only the outer mating surface (44).

6. The bag (10) according to claim 5, wherein the polymer laminated layer is made of polypropylene or polyethylene.

7. The bag (10) according to any one of claims 1 to 6, wherein bottom patches (33) formed of the woven polymer material are disposed on each end portion (30), each bottom patch (33) having an application surface engaged with a corresponding end surface (32) of the end portion (30) and an exposed bottom surface (39).

8. The bag (10) according to claim 7, wherein each bottom patch (33) has a polymer laminated layer applied to only the application surface.

9. The bag (10) according to any one claims 1 to 8, wherein the woven polymer material includes a fabric made of woven polypropylene flat tapes.

10. The bag (10) according to any one claims 1 to 9, wherein the outer surface (22) of the body (20) comprises a printing ink.

11. A method (100) for making a bag (10) for a granular material (12) according to any one claims 1 to 10, comprising the steps of:

- i- providing (102) a valve (40) made of a non-woven fabric (46);
- ii- applying (104) a polymer laminated layer to only an outer mating surface (44) of the valve (40); and
- iii- applying (106) the valve (40) within a structure (34) of the bag (10).

12. The method (100) according to claim 11, further comprising the step of providing a bottom patch (33) to each one of opposed end portions (30) of the bag (10), each bottom patch (33) having an application surface and an exposed bottom surface (39).

13. The method (100) according to claim 12, wherein providing the bottom patch (33) includes applying a polymer laminated layer to only the application surface of each bottom patch (33).

14. The method (100) according to any one claims 12 to 14, wherein the polymer laminated layer is made of polypropylene or polyethylene.

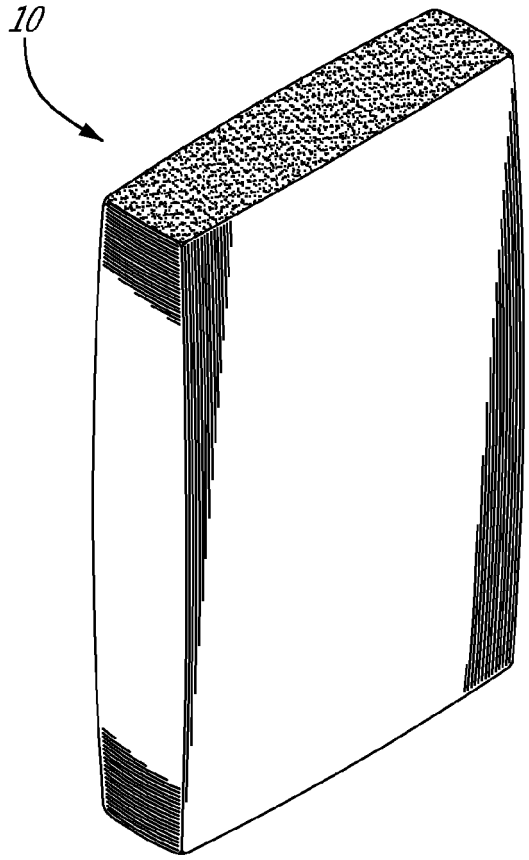

Fig. 1A

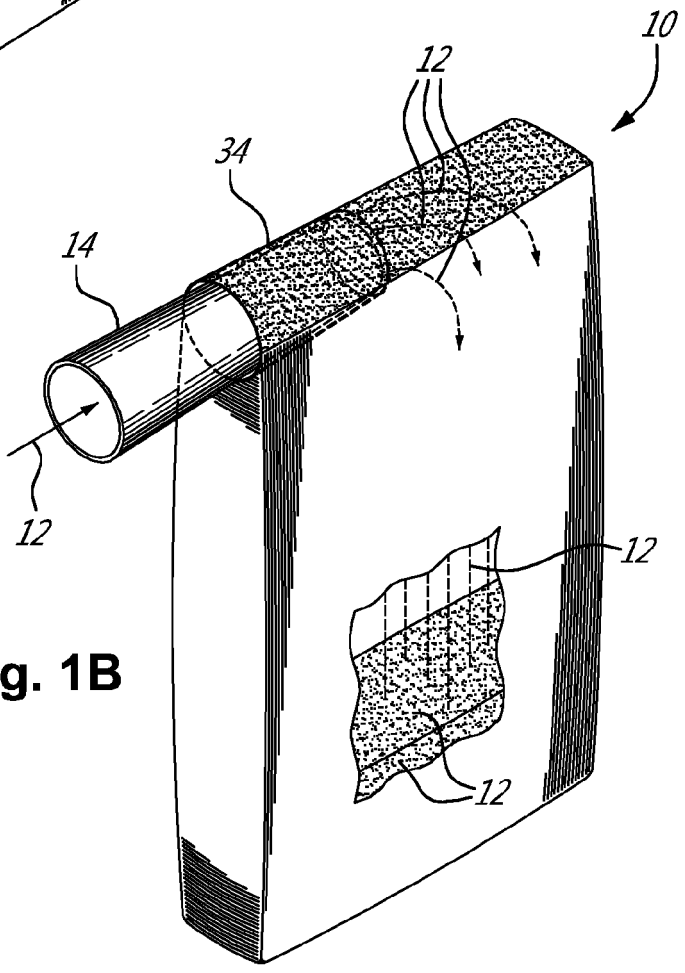

Fig. 1B

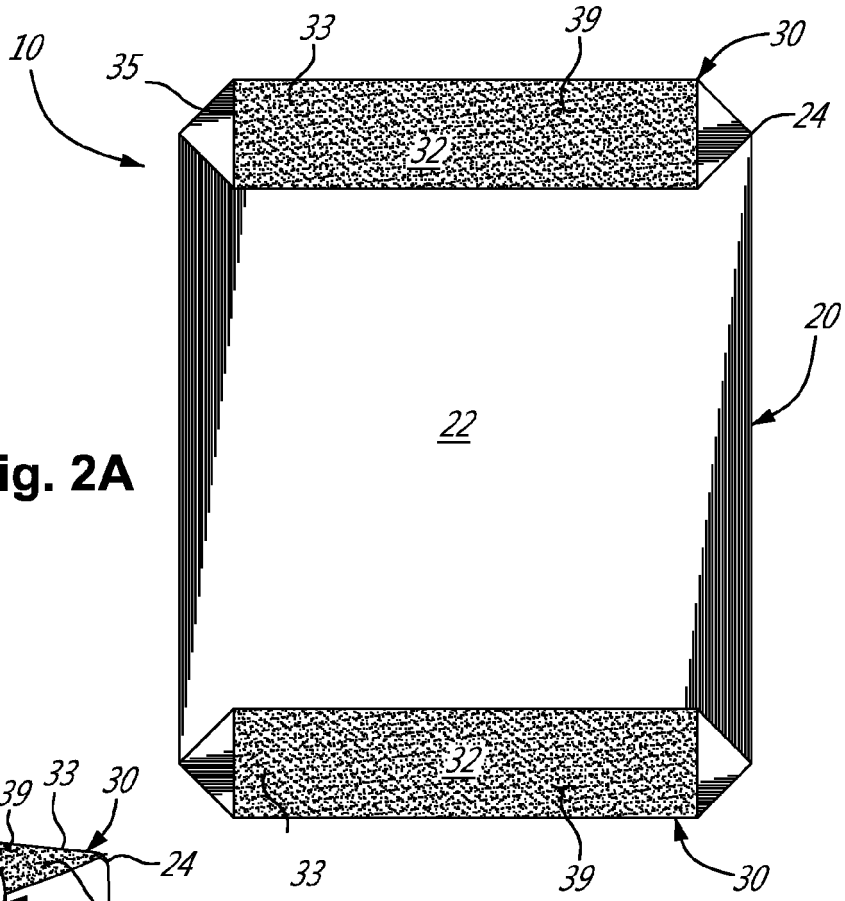

Fig. 2A

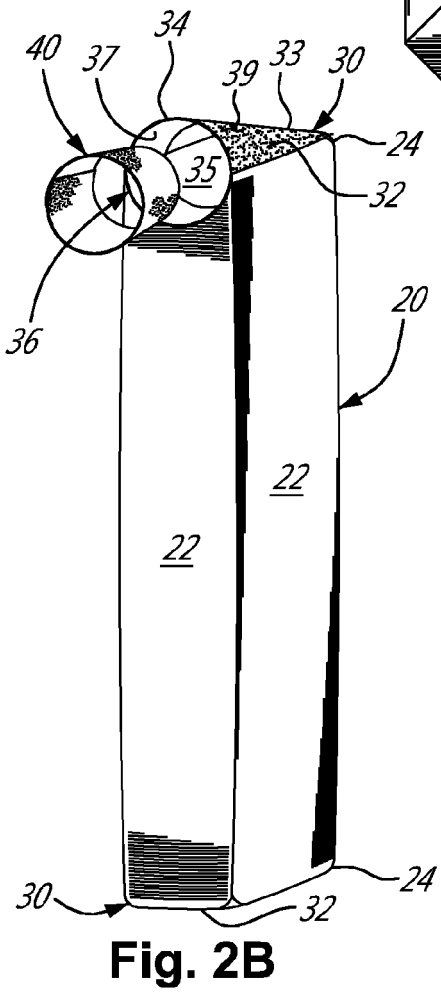

Fig. 2B

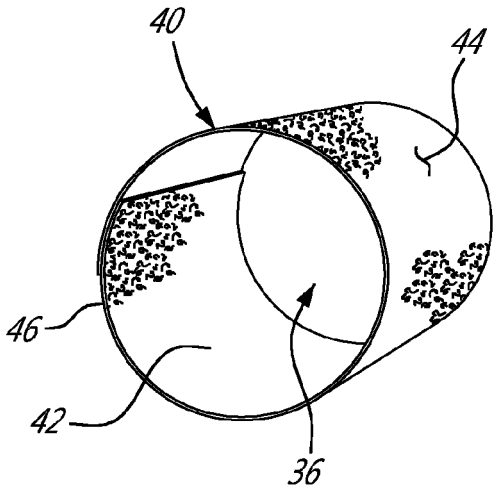

Fig. 2C

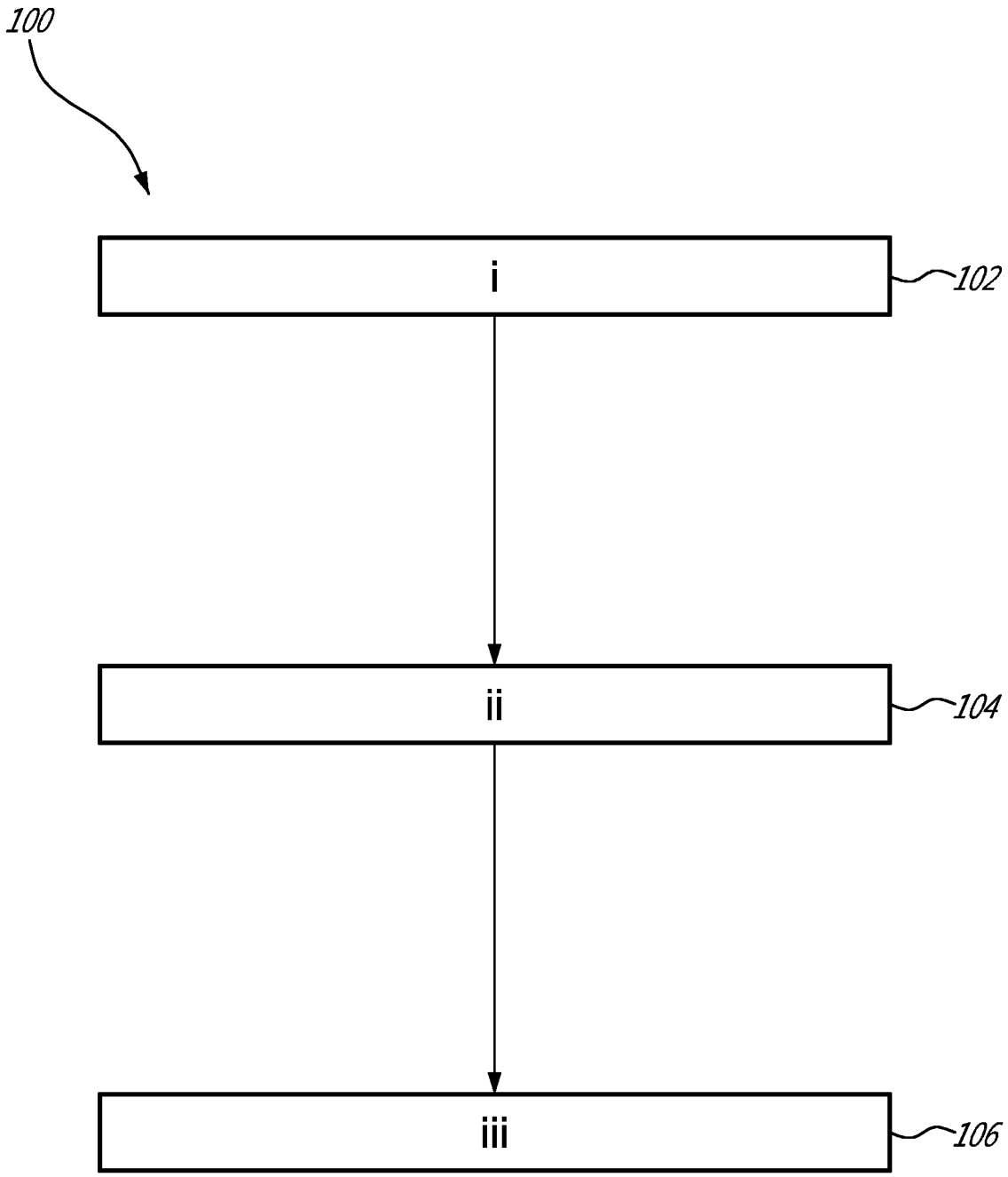

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 15 30 5343

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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	6 August 2015	Weyand, Tim

CATEGORY OF CITED DOCUMENTS

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