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(54) **Reinforced sack**

(57) There is provided a single- or multiple-ply sack comprising a wall portion (48), a first end and a second end, wherein at least the first end is closed by folding and optionally gluing to form a first substantially rectangular end portion (45) having a first and a second short side (46a,46b), wherein the sack is reinforced by patches ((41a, 41b) covering edges defined by the short sides of each rectangular end portion (45), said patches only covering a part of the wall portion (48).

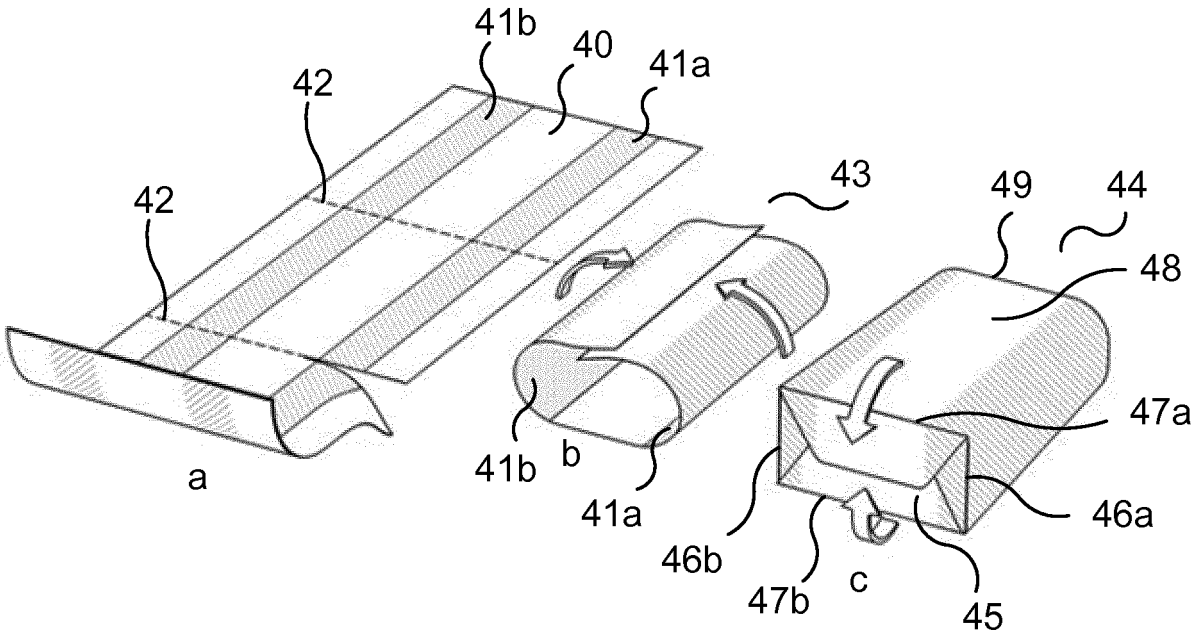

Fig. 4

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Description

TECHNICAL FIELD

[0001] The present disclosure relates to sacks and the production thereof. In particular, it relates to paper sacks for powdery or granularly material for the construction industry.

BACKGROUND

[0002] Paper sacks are used for holding a powdery or granularly material, such as cement, building materials, powdered goods for the construction industry, ready-mix building materials, chemicals, minerals or garden fertilizers. Paper sacks may also be used for holding food, animal feed or pet food. Some examples are sugar, flour, rice, potatoes, or seeds.

[0003] Of course, it is important that the filled sacks do not break/burst easily. Therefore, the paper sacks often have multiple plies. Each ply is normally composed of a paper with relatively high tensile strength.

[0004] During filling, storing and handling, the sacks are normally required to meet high standards. Firstly, the sacks need to hold a considerable material weight. Secondly, a material such as cement is sensitive moisture contamination during storage. Hence, the sacks normally require a protection against water and atmospheric vapor penetration. This may be achieved by applying a moisture barrier coating on one or more of the plies and/or incorporating a film as an intermediate layer in the sack, e.g. between the inner and outer plies of a two-ply paper sack. The moisture barrier is typically a plastic film, e.g. of polyethylene (PE), that is impermeable to water. The coating or film may also improve resistance to grease and prevent contamination by microorganisms.

[0005] The sacks are often filled with powdery material through a valve. During the filling process, during which the material is delivered at high speed by filling machines that run at high throughput rates, the air that accompanies the powdered material must vent from the sack. This limits the rate at which the bags can be filled. Air trapped in the sack might also lead to under-weight packs, bag rupture and problems when bags are stacked for transportation. During the filling process, the only way for air to escape from the interior of the bag is in most bag designs through the walls of the sack. Therefore, paper of high porosity is often used in the manufacture of sacks to provide the air permeability. If the air permeability of sack walls is further improved, filling pressure and filling speed may be increased. However, an increased porosity normally results in a decrease in the overall strength of the paper. Therefore, the selection of a paper material is often a compromise between tensile strength and porosity. One type of paper frequently selected for paper bags is Kraft paper.

[0006] Paper sacks for cement or similar materials are often produced from reels of paper (each reel providing the paper of one ply) at the site of a sack converter. The layered paper plies are then folded into a flattened tube. In the tubing, an overlap is formed and glue is provided at the overlapping portions such that a longitudinal seam is formed. The continuous tube is then divided into tube sections corresponding to individual sacks. At least one end of each tube section is then closed by folding and gluing in a well-known manner. Extra paper material may be glued to the folded end so as to strengthen the sack construction and provide further protection as well as a printing surface. One end of the sack may be left open for later filling. However, many times both ends are closed, but one end is adapted to receive a filling spout of a filling machine so as to allow automatic filling of the sack. Such sacks are called valve sacks. The sacks, which are still flat, are then stacked, normally on a pallet, and transported to the filling site, which may be the site where the sack content, such as cement, is also produced. During the filling of valve sacks, air is vented through the walls of the sacks or through a specific venting mechanism providing in the sacks. The filled sacks are then transported and handled in various stages, during which the sack should resists various types of impacts and protect the contents against moisture and possible grease and air, as discussed above.

SUMMARY

[0007] The inventors have noted that in drop tests, the point of breakage of filled sacks is in almost every case around the edges defined by the short sides of the approximately rectangular end portions of the sacks (see figure 1).

[0008] Accordingly, the inventors realized that sacks can be made more resistant to breakage by reinforcing the area around the four edges defined by the short sides of the rectangular end portions. In a drop test experiment described in more detail below, the inventors found that a two-ply paper sack on average survived about 10 drops in a drop tester without breakage, while a three-ply paper sack on average survived about 30 drops. A two-ply sack reinforced with the same material as used for the plies also survived about 30 drops on average, even tough the material consumption for the reinforcements was only 34 % of that for the third ply. Consequently, the present disclosure may provide for a significant reduction in material consumption.

[0009] The inventors have further realized that the reinforcement material, which only covers a part of the sack walls through which air is vented during filling, can have lower air permeability than the ply material while the sacks still

efficiently vents air during filling. Accordingly, the invention opens for the use of new materials in the sack that are stronger and less porous than the traditional ply materials. It is thus contemplated that a reinforced two-ply sack can be made more impact resistant than a three-ply sack without impairing the air venting capability. The reinforcement of the present disclosure is also beneficial as the edges in question are more exposed to contact than other parts of the sack, in particular when the filled sacks are stacked.

[0010] There is thus provided a single- or multiple-ply sack comprising a wall portion, a first end and a second end, wherein at least the first end is closed by folding and optionally gluing to form a first substantially rectangular end portion having a first and a second short side, wherein the sack is reinforced by patches covering the edges defined by the short sides of each rectangular end portion. The patches only cover a part of the wall portion.

[0011] There is also provided a method of manufacturing folded sacks according to any one of the preceding claims. The method comprises the steps of:

i) providing a first ply corresponding to an outer ply of the sacks;
ii) arranging reinforcement material on the first ply such that the reinforcement material cover edges defined by short edges of at least one substantially rectangular end portion of the folded sacks;
iii) optionally arranging another ply corresponding to an inner ply of the sacks over the reinforcement patches;
iv) forming tube sections corresponding to individual sacks from the layered material; and
v) folding and optionally gluing at least one end of the tube sections to form the folded sacks.

[0012] Generally, all terms used in the claims are to be interpreted according to their ordinary meaning in the technical field, unless explicitly defined otherwise herein. All references to "a/an/the element, apparatus, component, means, step, etc." are to be interpreted openly as referring to at least one instance of the element, apparatus, component, means, step, etc., unless explicitly stated otherwise. The steps of any method disclosed herein do not have to be performed in the exact order disclosed, unless explicitly stated.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013]

Fig 1 illustrates how sacks often break/burst such that the contents leak.

Fig 2 shows a flattened configuration of a sack according to the present disclosure, in which parts of the wall portion has been folded inwardly. It also shows that the sack has a rectangular bottom portion in the flattened configuration after as well as filling.

Fig 3 shows another flattened configuration of a sack according to the present disclosure. It also shows that the sack has a rectangular bottom portion after filling.

Figure 4 shows a single-ply sack according to the present disclosure having longitudinal reinforcement strips as well as the layered material from which is it formed.

Figure 5 shows a single-ply sack according to the present disclosure having cross-directional reinforcement strips as well as the layered material from which is it formed.

Figure 6 shows a single-ply sack according to the present disclosure having discrete patches covering the edges defined by the short sides of the rectangular end portions of the sack. The figure also shows the layered material from which the sack is formed.

Figure 7 shows a simplified representation of the first stage of a method of conversion of paper material to single-ply sacks having longitudinal reinforcement strips. The arrow shows the machine direction, which corresponds to the longitudinal direction of the sacks.

Figure 8 shows a simplified representation of the first stage of a method of conversion of paper material to two-ply sacks having longitudinal reinforcement strips. The arrow shows the machine direction, which corresponds to the longitudinal direction of the sacks.

DETAILED DESCRIPTION

[0014] As a first aspect of the present disclosure, there is provided a sack. The sack may be a single-ply sack or a multiple-ply sack, e.g. a sack comprising two, three or four plies. The sack comprises a wall portion, a first end and a second end, wherein at least the first end is closed by folding and optionally gluing to form a first substantially rectangular end portion having a first and a second short side. Thus, in addition to the wall portion, the sack comprises a closed end portion. The other end may also be closed by folding and optionally gluing, which is normally the case with "valve sacks". That means that in one embodiment, the second end is closed by folding and optionally gluing to form a second substantially rectangular end portion having a first and a second short side. The other end may alternatively be left open. Such as sack is often referred to as an "open mouth sack".

[0015] As mentioned above, the gluing is optional. Another technique for fixing the folding pattern at the end(s), such as sewing, may also be employed.

[0016] As mentioned above, at least one end portion of the sack is rectangular. However, the section from which the end portion is formed may have a hexagonal shape when the sack is in a flattened configuration before filling (see figure 3). The section from which the end portion is formed may also have the rectangular shape already in the flattened configuration (see figure 2).

[0017] The sack is reinforced by patches covering edges defined by the short sides of each rectangular end portion. Thereby, the most critical parts of the sack are strengthened. The patches are thus covering part of the wall portion of the sack and part or all of the closed end portion(s). This means that part of the wall portion is left uncovered by the patches. Normally, the patches cover less than 60 % of the wall portion, such as less than 50 % of the wall portion, such as less than 40 % of the wall portion, such as less than 30 % of the wall portion. The partial coverage of the patches may also be expressed as the relation between the total area of the patches and a ply of the sack. For example, the total area of the patches may be 5-60 %, such as 10-50 %, such as 20-40 %, such as 25-40 % of the area of a ply of the sack.

[0018] Preferably, the reinforcement patches cover any point in the end portion(s) or wall portion within 1 or 2 cm of the edges in question.

[0019] The material of the patches can be any type of flexible sheet material. Preferable, the patches are composed of paper. However, in some embodiments, the patches may be composed of other woven or non-woven fibrous sheet material, such as a material comprising plastic and/or textile fibers. The tensile strength of the patch material (in case of paper in the machine direction) is preferably at least 3 kN/m, such as at least 4, 5, 6 or 8 kN/m, according to Tappi 494.

[0020] The ply material is preferably paper, such as Kraft paper. The Gurley porosity value of the paper may be less than 25 Gurley seconds, such as less than 20, 17, 15 or 12 Gurley seconds, acoording to Tappi 460 (a lower Gurley seconds value means a higher porosity). The tensile strength of the ply material (in case of paper both in the machine and the cross direction) is preferably at least 2 kN/m, such as at least 3, 4 or 5 kN/m, according to Tappi 494. The grammage of the ply material may be 30-160 g/m^2, preferably 50-130 g/m^2.

[0021] The reinforcement patches may be composed of a material having a higher tensile strength than the material of the plies. For example, the tensile strength (measured according to Tappi 494) of the reinforcement patches may be at least 10 % higher, such as at least 20 %, 30 % or 50 % higher, than the tensile strength of the strongest ply (sometimes the plies of a multiple-ply sack have different tensile strengths).

[0022] Higher tensile strength often means lower porosity. Therefore, the Gurley porosity value of the reinforcement patches may be higher than the Gurley porosity value of the plies. For example, the Gurley porosity value of the patches may be at least 10 Gurley seconds higher than the Gurley porosity of the least porous ply of the sack.

[0023] The stretch value (%) of the reinforcement patches measured according to ISO 1924/3 may be approximately the same as the stretch value of the ply or plies. For example, the stretch value of the reinforcement patches may be within one percentage unit of the stretch value of the ply or plies.

[0024] The sack is typically a "25 kg sack" or a "50 kg sack", which are the sack sizes most frequently used in the field. The skilled person is thus well aware of the dimensions of a 25 or 50 kg sack. However, the sack may also be dimensioned for any weight in the range of 10-100 kg.

[0025] The volume of the sack may for example be in the range of 10-60 liters. The volume of a "25 kg sack" is typically about 17.4 liters. The volume of a "50 kg sack" is typically about 35 liters.

[0026] The sack may for example be a valve sack or an open mouth sack.

[0027] In an embodiment, the patches comprise a first and a second strip, wherein each strip extends from the first to the second end in the longitudinal direction of the sack. The first strip covers the first short side of the first rectangular end portion and the second strip covers the second short side of the first rectangular end portion (see figure 4). This means that the strips are arranged opposite to each other in the filled sack. If the wall portion of a filled sack is considered comprising two opposite wide sides and two opposite narrow sides, the two strips of the present embodiment will normally cover the narrow sides. When the second end is closed by folding and optionally gluing to form a second substantially rectangular end portion having a first and a second short side, the first strip will normally cover the first short side of the second rectangular end portion and the second strip will normally cover the second short side of the second rectangular

end portion. This means that the first strip may cover and extend between the first short side of the first end portion and the first short side of the second end portion, while the second strip may cover and extend between the second short side of the first end portion and the second short side of the second end portion.

[0028] The provision of such strips extending in the longitudinal direction is beneficial from a manufacturing perspective (see figures 7 and 8) as it requires comparatively small modifications of existing sack converting machinery and allows for high conversion speeds.

[0029] In another embodiment, the patches comprise a first single strip covering both short sides of the first substantially rectangular end portion (see figure 5). When the second end is closed by folding and optionally gluing to form a second substantially rectangular end portion having a first and a second short side, the patches may comprise a second single strip covering both short sides of the second substantially rectangular end portion. This means that the strips extend in the cross direction.

[0030] Strips in the cross direction are less preferred from a manufacturing perspective. However, the reinforcing effect is found to be comparable to that of the longitudinal strips.

[0031] The reinforcement strips of the present disclosure may for example have a width of 100-200 mm, such as 115-170 mm.

[0032] In an alternative embodiment, the reinforcement patches comprise four patches covering one short side of an end portion each (see e.g. figure 6).

[0033] In case of a single-ply sack, the reinforcement patches are preferably arranged on the inside of the ply. Such patches are preferably glued to the inside of the ply. However, they may also be attached by means of sewing.

[0034] In case of a two-ply sack, the reinforcement patches are preferably arranged between the outer ply and the inner ply. In case of a three-ply sack, the reinforcement patches are preferably arranged between the outer ply and the middle ply or between the middle ply and the inner ply.

[0035] When the sack is a multiple ply-sack and the longitudinal strips discussed above are provided between two plies, the closing of the end(s) may be sufficient for keeping the strips in position. Thus, such an embodiment requires no extra gluing compared to a conventional multiple-ply sack.

[0036] In another embodiment, the reinforcement patches are arranged on the inside of the innermost ply of a multiple ply sack.

[0037] It is thus often preferred, e.g. for aesthetic reasons, that the patches are not arranged on the outside of the sack. However, in one embodiment of the present disclosure, the outside of each closed rectangular end portion is covered with a patch that extends over the short sides of the end portion to form the reinforcement patches. In such an embodiment, the reinforcement patches are thus arranged on the outside of the sack. A drawback of such an embodiment is that the sack may be difficult to produce in existing machinery without substantial modifications.

[0038] As a second aspect of the present disclosure, there is provided a method of manufacturing folded sacks according to the first aspect. The method comprises the steps of:

i) providing a first ply corresponding to an outer ply of the sacks;
ii) arranging reinforcement material on the first ply such that the reinforcement material cover edges defined by short edges of substantially rectangular end portions of the folded sacks;
iii) optionally arranging another ply corresponding to an inner ply of the sacks over the reinforcement patches;
iv) forming tube sections corresponding to individual sacks from the layered material;
v) folding and optionally gluing at least one end of the tube sections to form the folded sacks.

[0039] Step i) may for example comprise unwinding a first reel of ply material to provide the first ply and step iii) may for example comprise unwinding a second reel of ply material to arrange the second ply.

[0040] In one embodiment, step ii) comprises arranging two continuous reinforcement strips extending in the machine direction over the first ply. For example, the step may comprise unwinding two reels of reinforcement material to form the two continuous reinforcement strips.

[0041] In case of a multiple ply sack, which means that the arranging of step iii) is carried out, no application of glue to attach the strips may be necessary during or between steps i), ii) and iii). However, in case of a single-ply sack, which means that the arranging of step iii) is not carried out, application of glue to adhere the strips to the first ply is normally required.

[0042] In the method, the reinforcement material may for example cover 5-60 %, such as 10-50 %, such as 20-40 %, such as 25-40 % of the area of the first ply.

[0043] The features of the first aspect apply to the second aspect *mutatis mutandis*.

[0044] The invention is now described, by way of example, with reference to accompanying drawings 4-8.

[0045] Figure 4a shows the layered material corresponding to three reinforced single-ply sacks. A first paper ply 40 is provided. A first 41a and a second 41b reinforcement strip extending in the machine/longitudinal direction are arranged on the first paper ply 40. Glue is preferably applied between the paper ply 40 and the reinforcement strips 41a, 41b.

Perforations 42 are provided in the layered material. The continuous stretch of layered material can be torn apart along the perforations 42 to form sections corresponding to individual sacks. Figure 4b shows a tube section 43 corresponding to an individual sack. The reinforcements 41a, 41b are now located on the inside of the tube section 43. In figure 4c, one end of the tube section has been closed by folding and gluing to form a sack 44, which comprises a first rectangular end portion 45 having a first 46a and a second 46b short side and two long sides 47a, 47b. The sack 44 also comprises a tubular wall portion 48. The other end 49 of the sack 44 may be closed before or after filling to form a second rectangular end portion. Figure 4c further shows that the first reinforcement strip 41a covers the first short side 46a of the first rectangular end portion 45 from the inside. It would also cover a first short side of a second rectangular end portion after closing of the other end 49. Likewise, the second reinforcement strip 41b covers the second short side 46b of the first rectangular end portion 45 and would cover a second short side of the second rectangular end portion. However, the longitudinal strips 41a, 41b cover only a small part of the tubular wall portion 48.

[0046] Figure 5a shows the layered material corresponding to three reinforced single-ply sacks according to another embodiment. A first paper ply 50 is provided. Perforations 52 are provided in the ply material. The continuous ply 50 can be torn apart along the perforations 52 to form sections corresponding to individual sacks. A first 51a and a second 51b reinforcement strip extending in the cross direction are arranged on each section. In figure 4, the length of the reinforcement strips 51a, 51b are equal to the width of the ply 50. However, the reinforcement strips 51a, 51b may also be shorter as long as they cover both short sides of the rectangular end portions(s) of the folded sack 54 (see below). Glue is preferably applied between the paper ply 50 and the reinforcement strips 51a, 51b. Figure 5b shows a tube section 53 corresponding to an individual sack. The reinforcements 51a, 51b are now located on the inside of the tube section 53. In figure 5c, one end of the tube section has been closed by folding and gluing to form a sack 54, which comprises a first rectangular end portion 55 having a first 56a and a second 56b short side and two long sides 57a, 57b. The sack 54 also comprises a tubular wall portion 58. The other end 59 of the sack 54 may be closed before or after filling to form a second rectangular end portion. Figure 5c further shows that the first reinforcement strip 51a covers the first 56a and the second 56b short side of the first rectangular end portion 55 from the inside. The second reinforcement strip 51b would cover the short sides of a second rectangular end portion after closing of the other end 59. However, the cross-directional strips 51a, 51b cover only a small part of the tubular wall portion 58.

[0047] Figure 6a shows the layered material corresponding to three reinforced single-ply sacks according to yet another embodiment. A first paper ply 60 is provided. Perforations 62 are provided in the ply material. The continuous ply 60 can be torn apart along the perforations 62 to form sections corresponding to individual sacks. A first 61a, a second 61b, a third 61c and a fourth 61d reinforcement patch are arranged on each section. Glue is preferably applied between the paper ply 60 and the reinforcement patches 61a-d. Figure 6b shows a tube section 63 corresponding to an individual sack. The reinforcements 61a-d are now located on the inside of the tube section 63. In figure 6c, one end of the tube section has been closed by folding and gluing to form a sack 64, which comprises a first rectangular end portion 65 having a first 66a and a second 66b short side and two long sides 67a, 67b. The sack 64 also comprises a tubular wall portion 68. The other end 69 of the sack 64 may be closed before or after filling to form a second rectangular end portion.

[0048] The first reinforcement patch 61a is arranged to cover the first short side 66a of the first rectangular end portion 65 from the inside. The second 61a reinforcement patch is arranged to cover the second short side 66b of the first rectangular end portion 65 from the inside. After closing of the other end 69, the third 61c and the fourth 61d reinforcement patch would cover the short sides the second rectangular end portion from the inside. However, the patches 61a-d cover only a small part of the tubular wall portion 68.

[0049] A benefit of the sack of figure 6 is that it consumes less reinforcement material than the sacks of figures 4 and 5.

[0050] In figures 4-6, the perforations 42, 52, 62 are present already before tubing of the layered material. However, in large scale production of sacks according to the present disclosure, the perforations are preferably made after tubing.

[0051] Figure 7 illustrates the first stage in a conversion method forming single-ply sacks according to the present disclosure reinforced with longitudinal reinforcement strips 72a, 72b. A paper ply 70 is unwound from a wide paper reel 71 to provide the outer ply of the sacks and glue is applied 74 to the upper side of the ply 70. The upper side corresponds to the inside in the sacks. Paper strips 72a, 72b are unwound from narrow paper reels 73a, 73b and positioned on the glue such that they adhere to the ply 70. The layered material is than formed into a tube 75, in which the paper strips 72a, 72b are opposite to each other.

[0052] Figure 8 illustrates the first stage in a conversion method forming two-ply sacks according to the present disclosure reinforced with longitudinal reinforcement strips 82a, 82b. A first paper ply 80 is unwound from a first wide paper reel 81 to provide the outer ply of the sacks. Paper strips 82a, 82b are unwound from narrow paper reels 83a, 83b and positioned on the ply 80. A second paper ply 84 is unwound from a second wide paper reel 85 to provide the inner ply of the sacks. No gluing of may be necessary as the in resulting sacks, the reinforcement strips 82a, 82b will be fixed in position between the plies 80, 84 by the closing (involving folding and gluing) of the ends of the sacks. The layered material is than formed into a tube 86, in which the paper strips 82a, 82b are opposite to each other.

EXAMPLE

[0053] To examine the effect of the reinforcements of the present disclosure, drop tests were carried out according to the Constant Drop Height Method ISO 7965/1. In the test, the drop was 1.2 m for all sacks, which were filled with cement and closed at both ends. The drop tests were carried out in a controlled atmosphere of 23 °C and a relative humidity of 50 % (according to ISO 6599/1). Each sack was dropped until broken and the number of drops before breakage was counted. Breakage was defined as leakage of cement. 10 sacks of each type were tested and an average number was calculated.

[0054] The dimensions of the closed sacks were 400x450x100 mm, which corresponds to a volume of 17.4 liters and 25 kg cement.

[0055] Both single- and multiple-ply sacks were tested. In the single-ply sacks, the ply material was BillerudKorsnäs' sack paper QuickFill® (white) having a grammage of 120 g/m^2. In the multiple-ply sacks, the ply material was Billerud-Korsnäs' sack paper QuickFill® (white) having a grammage of 80 g/m^2.

[0056] The tests included sacks reinforced with longitudinal reinforcement strips (see e.g. figure 4). The width of each strip was 140 mm and the total area of the reinforcement strips corresponded to 34.1% of a ply. The material of the reinforcement strips was in all cases BillerudKorsnäs' sack paper QuickFill® (brown) having a grammage of 80 g/m^2.

[0057] The results of the drop tests are shown in the table below.

	Single-ply	Single-ply reinforced	Two-ply	Two-ply reinforced	Three-ply
Drops (avergage)	3.7	16.7	10.1	30.6	29.8

[0058] As seen in the table, the reinforcement of the single-ply sack resulted in an almost five-fold increase in the number of drops. The reinforced two-ply sack performed slightly better than the three-ply sack. The effect of the reinforcements was better than what the inventors expected.

Claims

1. A single- or multiple-ply sack comprising a wall portion, a first end and a second end, wherein at least the first end is closed by folding and optionally gluing to form a first substantially rectangular end portion having a first and a second short side, wherein the sack is reinforced by patches covering edges defined by the short sides of each rectangular end portion, said patches only covering a part of the wall portion.

2. The sack according to claim 1, wherein said patches cover less than 60 % of the wall portion, such as less than 50 % of the wall portion, such as less than 40 % of the wall portion, such as less than 30 % of the wall portion.

3. The sack according to claim 1 or 2, wherein said patches comprises a first and a second strip, each strip extending from the first to the second end in the longitudinal direction of the sack, wherein said first strip covers the first short side of the first rectangular end portion and the second strip covers the second short side of the first rectangular end portion.

4. The sack according to claim 3, wherein the second end is closed by folding and optionally gluing to form a second substantially rectangular end portion having a first and a second short side, wherein said first strip covers the first short side of the second rectangular end portion and the second strip covers the second short side of the second rectangular end portion.

5. The sack according to claim 1 or 2, wherein said patches comprise a first single strip covering both short sides of the first substantially rectangular end portion.

6. The sack according to claim 5, wherein the second end is closed by folding and optionally gluing to form a second substantially rectangular end portion having a first and a second short side and said patches comprise a second single strip covering both short sides of the second substantially rectangular end portion.

7. A single ply sack according to any one of the preceding claims, wherein the patches are arranged on the inside of the ply.

8. A multiple-ply sack according to any one of the preceding claims, wherein the patches are arranged between two plies of the sack.

9. The sack according to any one of the preceding claims, wherein the ply/plies are composed of Kraft paper.

10. The sack according to any one of the preceding claims, wherein the patches are composed of a material having a higher tensile strength and/or a lower air permeability than the material of the plies.

11. The sack according to any one of the preceding claims, wherein the total area of the patches is 5-50 %, such as 10-40 %, such as 15-35 % of the area of a ply of the sack.

12. A method of manufacturing folded sacks according to any one of the preceding claims comprising the steps of:

i) providing a first ply corresponding to an outer ply of the sacks;
ii) arranging reinforcement material on the first ply such that the reinforcement material cover edges defined by short edges of at least one substantially rectangular end portion of the folded sacks;
iii) optionally arranging another ply corresponding to an inner ply of the sacks over the reinforcement patches;
iv) forming tube sections corresponding to individual sacks from the layered material; and
v) folding and optionally gluing at least one end of the tube sections to form the folded sacks.

13. The method of claim 12, wherein glue is provided on the first ply where the reinforcement material is arranged.

14. The method of claim 12 or 13, wherein step ii) comprises arranging two continuous reinforcement strips extending in the machine direction over the first ply.

15. The method of claim 14, wherein another ply is arranged according to step iii) and no glue is provided during step i), ii) or iii) or between these steps.

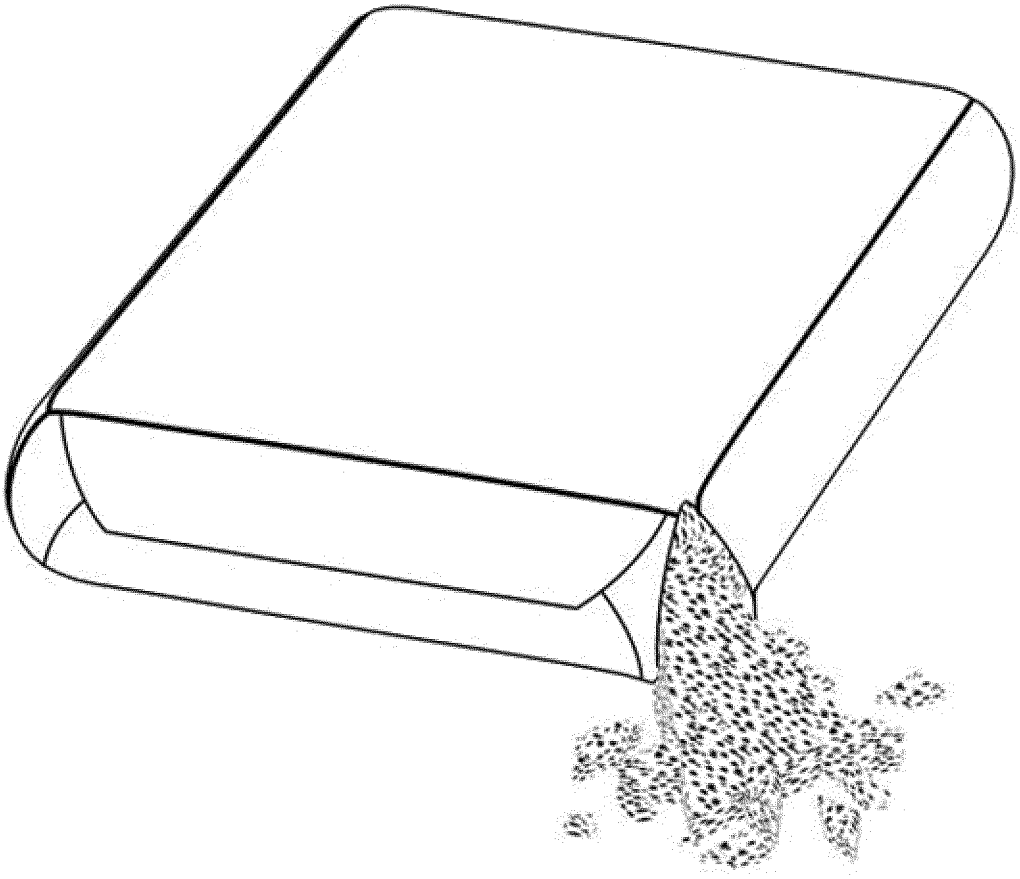


Fig. 1

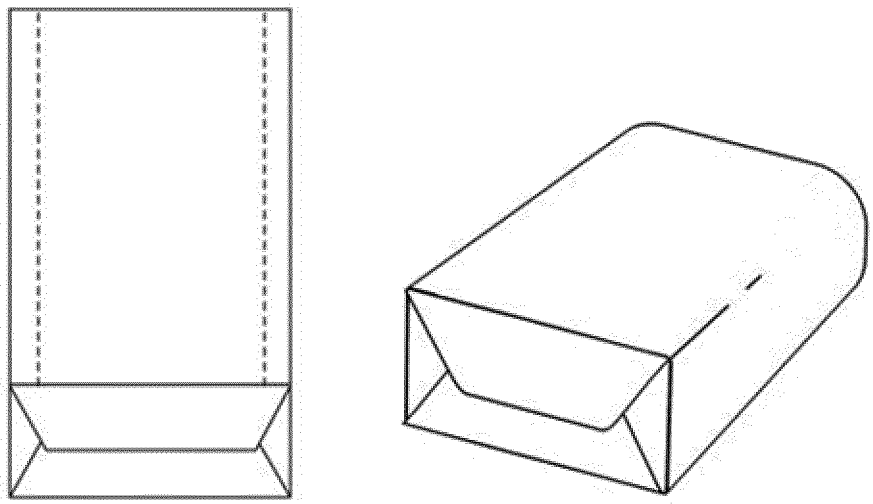


Fig. 2

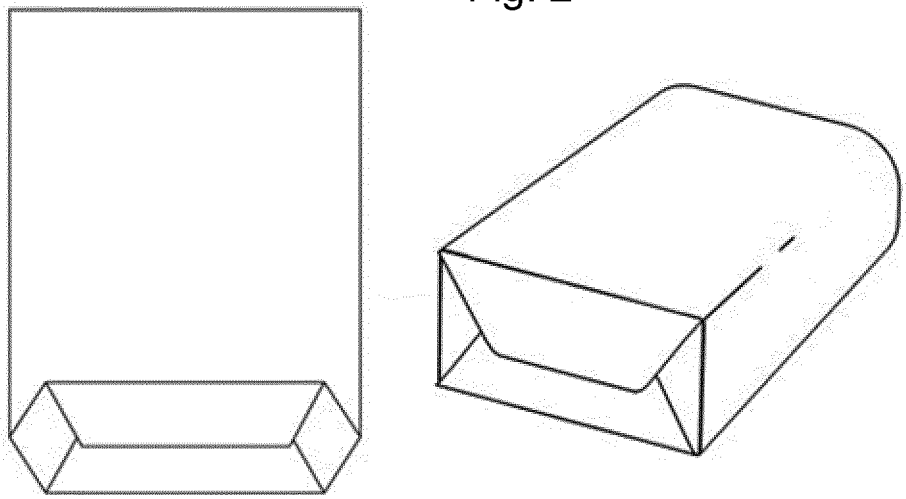


Fig. 3

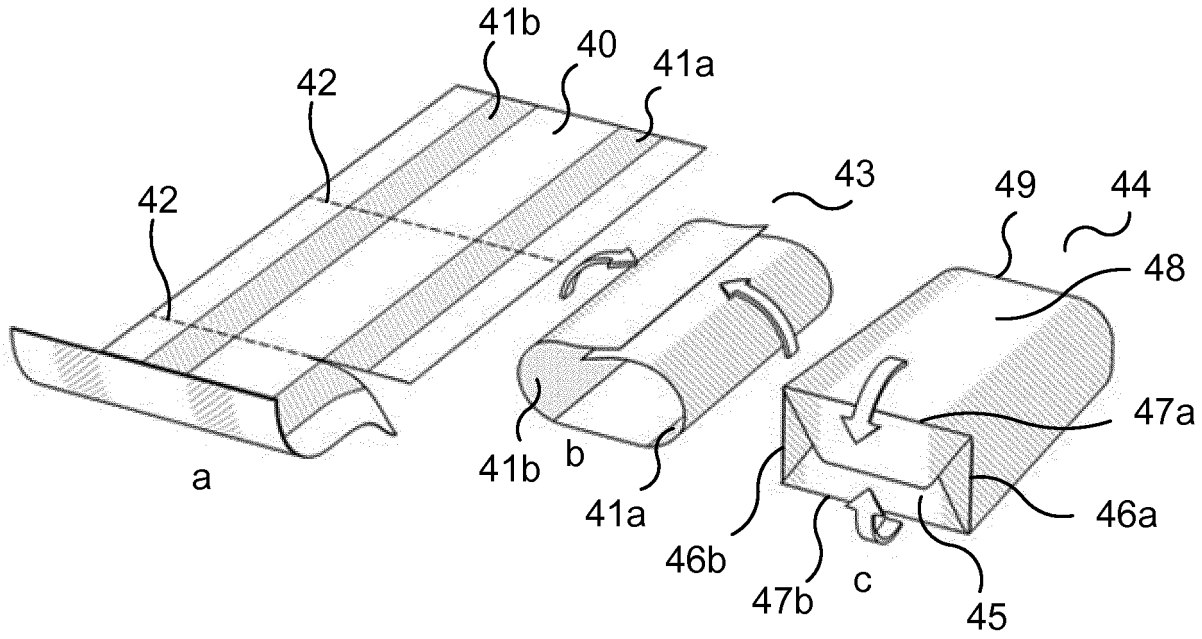


Fig. 4

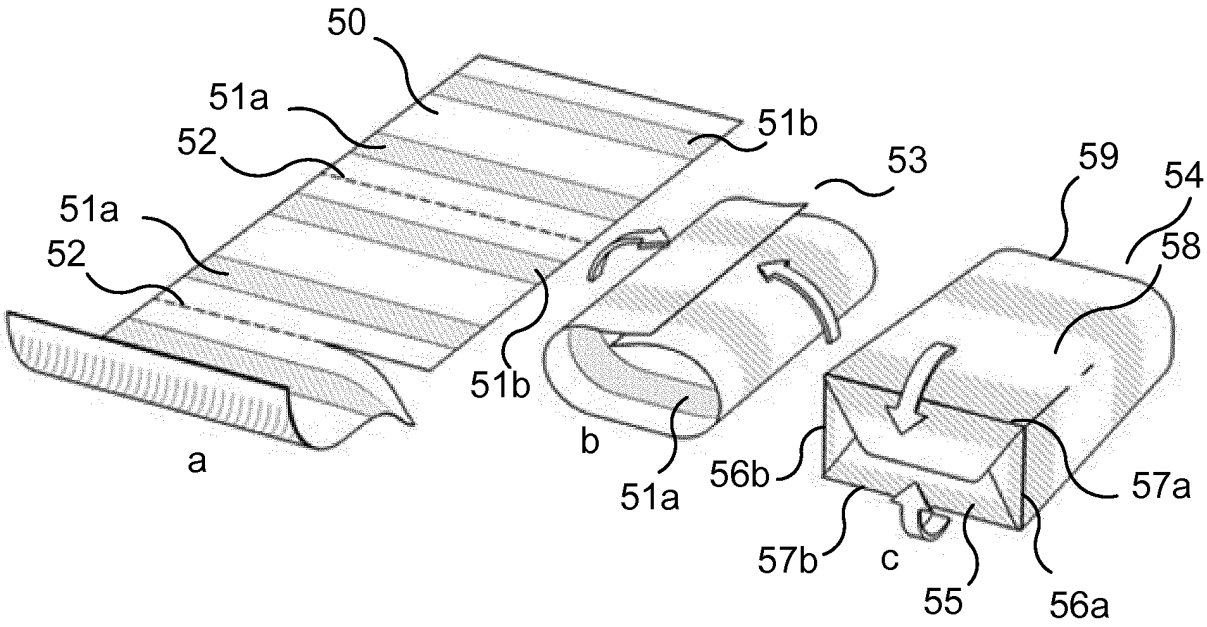
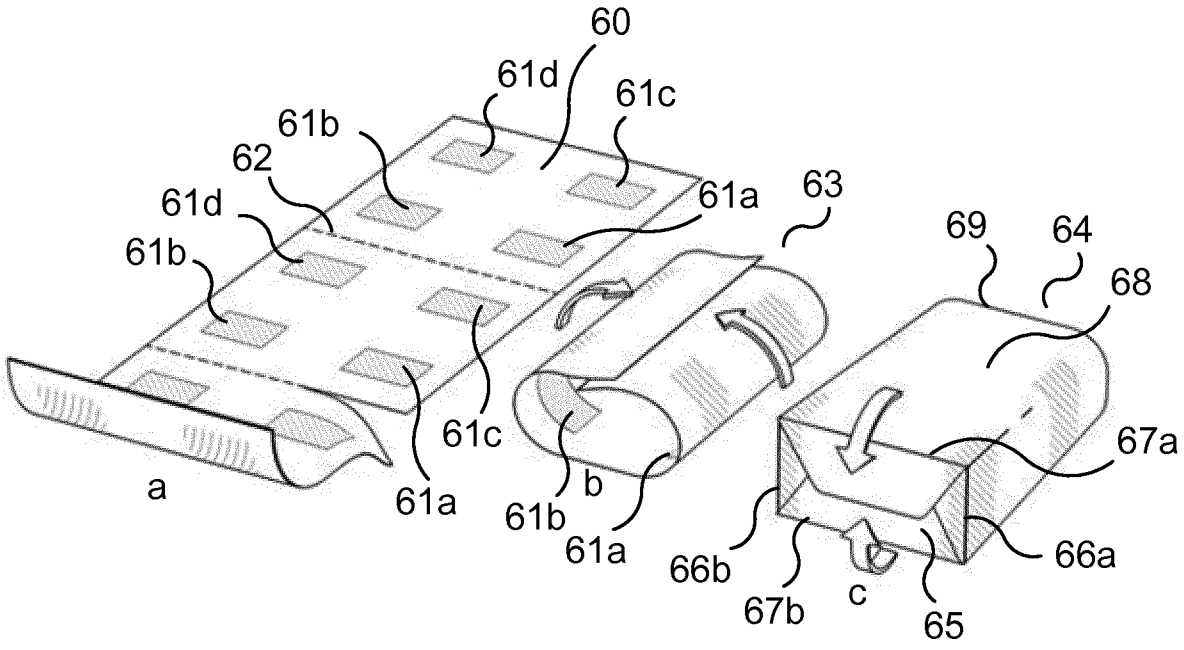


Fig. 5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b
61a
66b
67b
c
65

Fig. 6

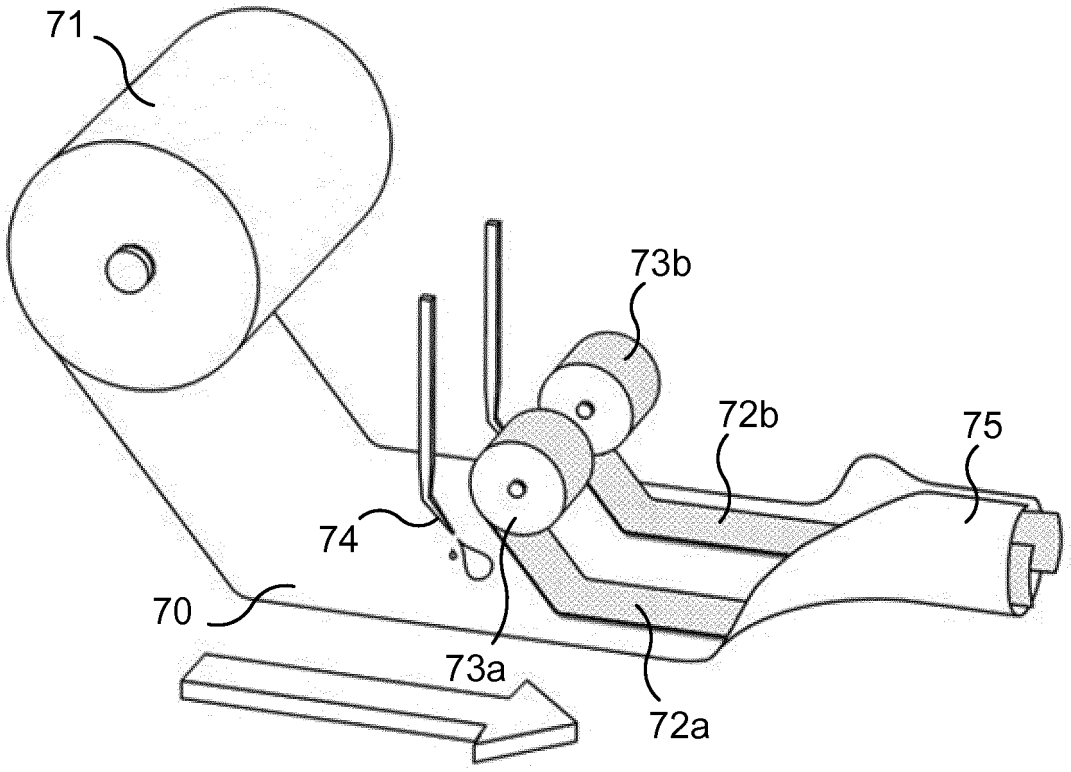

Fig. 7

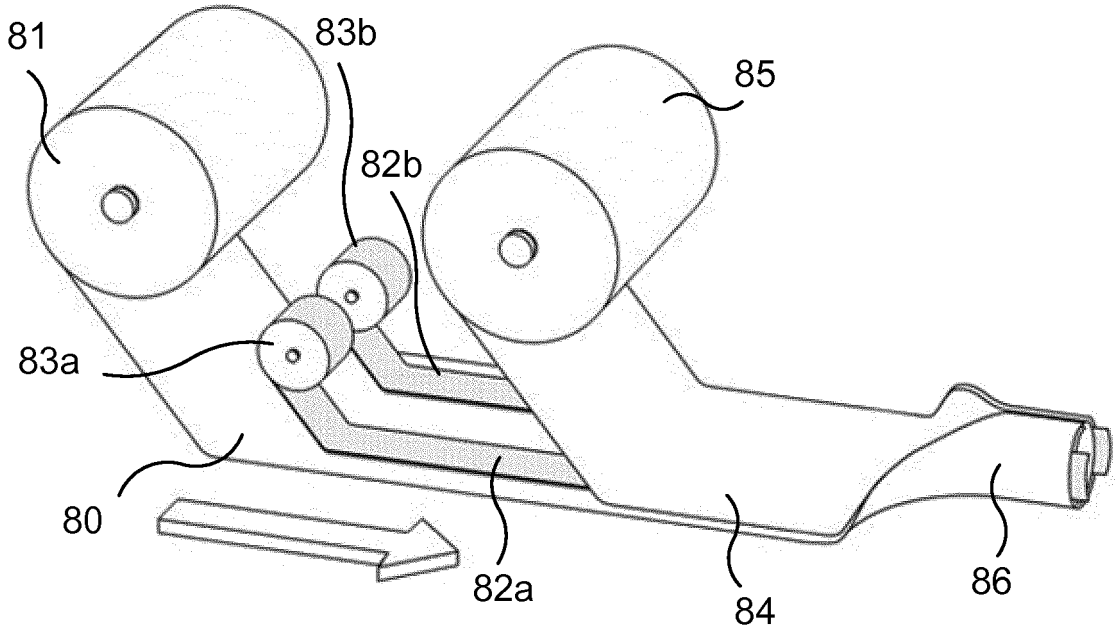

Fig. 8

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EUROPEAN SEARCH REPORT

Application Number
EP 13 18 8301

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	BE 512 903 A (BISCHOF UND KLEIN PAPIERVERARBEITUNGSWERK) 5 March 1954 (1954-03-05) * page 3, line 22 - page 4, line 38; figures 1-6 * -----	1-15	INV. B65D33/02 B31B19/90
X	US 2 854 186 A (WILLIAMS RUSSELL J) 30 September 1958 (1958-09-30) * column 5, line 18 - line 59; figures 7-10 * -----	1,2,5-9, 12,13	
X	US 2 869 772 A (WILLIAMS RUSSELL J) 20 January 1959 (1959-01-20) * column 1, line 55 - column 4, line 54; figures 1-6 * -----	1,2,12, 13	
			TECHNICAL FIELDS SEARCHED (IPC) B65D B31B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	24 March 2014	Derrien, Yannick

CATEGORY OF CITED DOCUMENTS

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24-03-2014

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