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(72) Inventor: **Almkvist, Jonas**
SE-952 51 KALIX (SE)

(74) Representative: **Kransell & Wennborg KB**
P.O. Box 27834
115 93 Stockholm (SE)

(71) Applicant: **BillerudKorsnäs AB**
169 27 Solna (SE)

Remarks:
Amended claims in accordance with Rule 137(2) EPC.

(54) **Sack with discontinuous longitudinal seam**

(57) There is provided a sack having an inner ply and an outer ply, wherein: the outer ply forms a longitudinally extending overlapping region comprising an inner and an outer layer; a first end portion of the outer ply forms the inner layer and a second end portion of the outer ply forms the outer layer; an inside of the outer layer is glued

to an outside of the inner layer to form a discontinuous longitudinal seam; and an inside of the first end portion is glued to the inner ply, such that air may pass out from an interspace between the inner and the outer ply through channels in the discontinuous longitudinal seam.

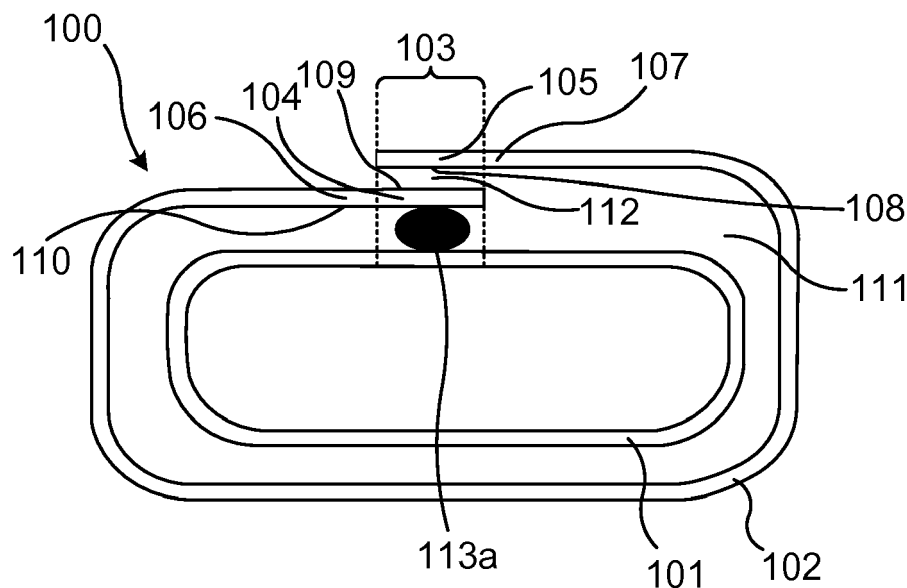


Fig. 1a

Description**TECHNICAL FIELD**

[0001] The present disclosure relates to sacks. In particular, it relates to a sack for a hydraulic binder, such as cement.

BACKGROUND

[0002] During filling and storage of a powdery material, such as cement, paper sacks are required to meet high standards.

[0003] Firstly, the paper sacks need to hold a considerable material weight, i.e. have high tensile strength. For this purpose, Kraft paper is a suitable sack wall material. The sacks typically have two or more walls, i.e. layers of paper material, to further strengthen the sack construction. A wall layer of a sack is often referred to as a ply. Production of ply material (i.e. sack paper) is for example disclosed in WO 99/02772.

[0004] Secondly, a material such as cement is sensitive to moisture contamination during storage. Hence, cement sacks often require protection against atmospheric water vapor penetration through the sack plies. Such protection is often achieved by a moisture barrier incorporated as an intermediate layer in the sack, i.e. between two plies of the paper material. The moisture barrier is typically a plastic film ("free film"), e.g. of polyethylene (PE), that is impermeable to water. The free film may also improve resistance to grease and prevent contamination by microorganisms.

[0005] Thirdly, the paper sack should vent air during filling. In detail, the air that accompanies the powdered material shall efficiently vent from the sack as the filling machines that deliver the material run at high throughput rates. Often, the venting capability of the sack is the actual limiting factor for the filling rate. Efficient venting also prevents that air is trapped in the sack and causes under-weight packs, sack rupture and problems when sacks are stacked for transportation.

[0006] During the filling process, the only way for air to escape from the interior of the sack has, in many sack constructions, been through the walls of the sack. Kraft paper of high porosity has often been used in the walls to facilitate air permeability. However, an increased porosity of the paper often results in a decrease in the overall strength. In particular, the strength may be significantly reduced if holes must be made in the paper material to achieve sufficient air permeability. Furthermore, the use of a free film may reduce deaeration during filling, since most such films are impermeable to air. Therefore, the free film layers have been provided with slits or openings to facilitate deaeration.

SUMMARY

[0007] The object of the present disclosure is to provide a sack concept that has improved air ventilation during filling.

[0008] The present disclosure provides a sack having an inner ply and an outer ply, wherein:

the outer ply forms a longitudinally extending overlapping region comprising an inner and an outer layer;
 a first end portion of the outer ply forms the inner layer and a second end portion of the outer ply forms the outer layer;
 an inside of the outer layer is glued to an outside of the inner layer to form a discontinuous longitudinal seam; and
 an inside of the first end portion is glued to the inner ply,
 such that air may pass out from an interspace between the inner and the outer ply through channels in the discontinuous longitudinal seam.

[0009] The present disclosure further provides a use of the above sack for packaging a powdery or granularly material.

[0010] The present disclosure also provides a method of filling the above sack, comprising the step of filling the sack with a powdery or granularly material.

[0011] The air ventilation through the longitudinal seam is thus enabled by tubing the outer ply with a discontinuous longitudinal seam of glue instead of the continuous seam found in prior art sacks. The gaps in the discontinuous seam form air-ventilation channels that are activated (opened) by the overpressure formed inside the sack during filling. This construction is greatly improved when the outer ply is glued to the inner ply at the discontinuous longitudinal seam.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The invention is now described, by way of example, with reference to the accompanying drawings, in which:

Fig 1 shows schematic cross section views of three embodiments of a sack according to the present disclosure.

Fig 2 is a schematic side view of an embodiment of a non-filled sack according to the present disclosure.

Fig 3 shows a schematic longitudinal section view of an overlapping region of a sack according to the present disclosure.

Fig 4 shows the results of measurements of the normalized air flow (y axis ($\text{Nm}^3/\text{dm}^2\cdot\text{h}$)) at different pressure drops (x axis (mbar)) for six different sacks according to the present disclosure and one reference sack. Figure 4 further shows lines representing typical normalized air flows for filling with mixed mortar ($0.55 \text{ Nm}^3/\text{dm}^2\cdot\text{h}$), cement ($0.80 \text{ Nm}^3/\text{dm}^2\cdot\text{h}$) and finely ground powder ($1.20 \text{ Nm}^3/\text{dm}^2\cdot\text{h}$).

DETAILED DESCRIPTION

[0013] With reference to the figures, there is provided a sack 100, 200 as a first aspect of the present disclosure.

[0014] The sack 100, 200 comprises an inner ply 101 and an outer ply 102, 202. The outer ply 102, 202 forms a longitudinally extending overlapping region 103, 203. The overlapping region comprises an inner layer 104 and an outer layer 105. A first end portion 106 of the outer ply 102 forms the inner layer 104 and a second end portion 107 of the outer ply 102 forms the outer layer 105. An inside 108 of the outer layer 105 is glued 221 to an outside 109 of the inner layer 104 to form a discontinuous longitudinal seam 220. An inside 110 of the first end portion 106 is glued 113a, 113b, 113c to the inner ply 101. Thus, air may pass out from an interspace 111 between the inner 101 and the outer 102 ply through channels 112, 212 in the discontinuous longitudinal seam 220.

[0015] The sack 100, 200 comprises two ends, a top end 231 and a bottom end 232. The bottom end 232 is normally closed by folding and gluing, also before filling of the sack 100, 200. Foldings and gluing patterns for closing an end of a sack are well known in the field. The top end 231 may be open or partly closed before filling such that the sack may then be filled. Accordingly, the top end 231 may comprise a valve opening for spout filling. The sack of the present disclosure may thus be a valve sack.

[0016] "Longitudinally extending" refers to extending in the longitudinal direction of the sack 100, 200, which is the direction from the bottom end 232 to the top end 231 of the sack 100, 200. The longitudinal seam 220 is thus extending between the ends 231, 232 of the sack 100, 200.

[0017] As mentioned above, the inside 110 of the first end portion 106 is glued 113a, 113b, 113c to the inner ply 101. The specific parts of the inside 110 of the first end portion 106 that are glued to the inner ply 101 may be completely within the overlapping region 103 as shown in figure 1a, partly within the overlapping region 103 as shown in figure 1b or outside the overlapping region 103 as shown in figure 1c. It is preferred that the specific parts in question are partly or completely within the overlapping region 103.

[0018] Accordingly, in one embodiment of the first aspect, an inside of the inner layer 104 of the overlapping region 103 is glued 113a to the inner ply 101.

[0019] In one embodiment, the inside of the inner layer 104 of the overlapping region 103 is glued 113a, 113b to the inner ply 101 at the channels 112, 212. In such an embodiment, at least some of the parts of the inner layer 104 that are glued 113a, 113b to the inner ply 101 on the inside faces the channels 112 at the outside 109 (see figure 3). Such a gluing pattern may facilitate air venting as it allows channels 112 of a bigger cross-section to form.

[0020] Accordingly, the inside of the inner layer 104 may be glued to the inner ply 101 by a discontinuous glue string. However, in alternative embodiment, the inside of the inner layer 104 may be glued to the inner ply 101 by a continuous glue string.

[0021] The outer ply 102 may for example be coated with a barrier, such as a moisture barrier. Accordingly, the sack of the first aspect may lack a plastic film arranged between the outer 102 and the inner 101 ply. Such as plastic film, which is also referred to as a "free film", is often used in prior art sacks to provide a moisture barrier.

[0022] Various moisture barrier coatings that may be applied to sack paper are known to the skilled person. The barrier coating may have one or more components. The coat weight of the barrier coating layer may for example be $5\text{--}25 \text{ g/m}^2$. When the barrier coating is applied, the water vapor transmission rate (WVTR, ISO 2528) of the outer ply 102 is normally less than $1350 \text{ g/m}^2\cdot 24\text{h}$ and preferably less than $1250 \text{ g/m}^2\cdot 24\text{h}$. For example, the WVTR of the multilayered paper material of the present disclosure may be $750\text{--}1150 \text{ g/m}^2\cdot 24\text{h}$. However, the sack concept of the present disclosure may also be used with higher water vapor transmission rates, such as $2500\text{--}3500 \text{ g/m}^2\cdot 24\text{h}$.

[0023] The air permeability of the outer ply 102 is normally very low when moisture barrier coating is applied, but that is no problem as air may escape through the channels 112, 212 in the discontinuous seam 220.

[0024] The inner ply 101 is preferably porous to allow air penetration. The air resistance according to Gurley (ISO 5636/5) is a measurement of the time (s) taken for 100 ml of air to pass through a specified area of a paper sheet. Short time means highly porous paper.

[0025] The Gurley porosity (ISO 5636/ 5) of the inner ply 101 is preferably less than 15 s. For example, it may be less than 10 s, such as 2-8 s, such as 3-7 s.

[0026] The grammage of the inner ply 101 is for example $50\text{--}140 \text{ g/m}^2$. Preferably, it is $50\text{--}130 \text{ g/m}^2$, such as $60\text{--}120 \text{ g/m}^2$, such as $60\text{--}110 \text{ g/m}^2$, such as $70\text{--}110 \text{ g/m}^2$.

[0027] The grammage of the outer ply 102, which may comprise the barrier coating, is for example 50-150 g/m². Preferably, it is 50-140 g/m², such as 60-130 g/m², such as 60-120 g/m², such as 70-120 g/m².

[0028] The tensile strength is the maximum force that a paper will withstand before breaking. In the standard test ISO 1924/3 for measuring the parameter, a stripe of 15 mm width and 100 mm length is used with a constant rate of elongation.

The tensile strength is one parameter in the measurement of the tensile energy absorption (TEA). In the same test, the tensile strength, the stretch and the TEA value are obtained.

[0029] TEA is sometimes considered to be the paper property that best represents the relevant strength of the paper sack wall. This is supported by the correlation between TEA and drop tests. By dropping a sack the filling goods will move when reaching the floor. This movement means a strain on the sack wall. To withstand the strain, the TEA should be high, which means that a combination of high tensile strength and good stretch in the paper will then absorb the energy.

[0030] If the index of a paper property is needed, it should be calculated by dividing the actual value with the grammage for the paper in question.

[0031] Crêping of the paper improves stretchability in the machine direction (MD) and thereby the TEA index. Accordingly, the inner ply 101 and/or the outer ply 102 of the present disclosure may be creped.

[0032] In embodiments of the present disclosure, the tensile energy absorption index (ISO 1924-3) of the inner ply 101 and/ or the outer ply 102 may for example be at least 1.8 J/g, such as at least 2 J/g, such as at least 2.2 J/g, in both the machine direction (MD) and the cross direction (CD). Further, tensile index of the inner ply 101 and/or the outer ply 102 may for example be at least 50 kNm/kg (ISO 1924/3), such as at least 60 kNm/kg, in the machine direction (MD) and at least 35 kNm/kg, such as at least 38 kNm/kg, in the cross direction (CD).

[0033] To further facilitate the formation of channels 112, 212, the expandability of the outer ply 102 may be higher than the expandability of the inner ply 101. This may also be expressed as that the tensile stiffness (ISO 1924-3) of the inner ply 101 is higher than the tensile stiffness of the outer ply 102.

[0034] The above strength properties may for example be obtained by selecting a bleached and/ or unbleached Kraft sack paper for the inner ply 101 and/or outer ply 102. Such Kraft sack papers are for example marketed by BillerudKorsnäs AB under the name QuickFill®.

[0035] In one embodiment, the discontinuous seam 220 comprises at least one glued portion 221 and at least one non-glued portion having a length in the longitudinal direction of at least 10 mm, such as at least 15 mm. For example, the discontinuous seam 220 may comprise at least two, such as at least three or four, glued portions 221 separated by non-glued portion(s). Further, the discontinuous seam 220 may comprise at least two, such as at least three or four, non-glued portions separated by glued portion(s) 221. A glued portion 221 may have a length in the longitudinal direction of 5-100 mm, such as 10-50 mm. A non-glued portion may have a length in the longitudinal direction of at least 5 mm, such as at least 10 mm, such as 10-100 mm, such as 15-100 mm, such as 15-80 mm.

[0036] In one embodiment, the discontinuous seam 220 may comprise at least one non-glued portion having a length in the longitudinal direction of at least 40 mm, such as at least 50 mm.

[0037] Sacks are normally filled from the bottom to the top. Accordingly, it maybe beneficial to provide at least one non-glued portion close to the top end 231 of the sack 100, 200. In one embodiment, the discontinuous seam 220 therefore comprises an upper half and a lower half, wherein the upper half is closer to the top end 231 and comprises at least one of the non-glued portions, such as a non-glued portion having a length in the longitudinal direction of at least 40 mm.

[0038] The sack 100, 200 of the present disclosure maybe designed to allow "top deaeration" in addition to the "longitudinal deaeration" through the channels 112, 212 in the discontinuous longitudinal seam 220. In contrast to deaeration relying on pores in the outer ply, "top deaeration" and "longitudinal deaeration" are both compatible with a moisture barrier-coated outer ply 102, 202.

[0039] In one embodiment of the sack 100, 200, the top end 231 is thus formed by folding and optionally gluing the plies 101, 102 such that a portion of the top end 231 is not sealed. In such an embodiment, the folding and optional gluing is such that air may escape through the non-sealed portion during filling of the sack 100, 200.

[0040] The width of the overlapping region 103, 203 may for example be 0.3-7 cm, such as 0.5-5 cm. A width of 1-3 cm is preferred as it is enough overlap to provide a reliable seam and is compatible with most converting process. If the width is above 3 cm, it may be difficult to open the channels 112, 212 during filling. Further, the paper consumption increases with a wider overlap.

[0041] The width of the glued portions 221 of the discontinuous longitudinal seam 220 may for example be 0.5-1.5 cm. On each side of the glued portions the distance to the end of the overlapping region may be 0.2-1 cm, such as 0.3-0.7 cm. Accordingly, the width of the overlapping region may be 0.9-3.5 cm and preferably 1.1-2.9 cm when the width of the glued portions 221 of the discontinuous longitudinal seam 220 is 0.5-1.5 cm.

[0042] The sack of the first aspect may for example be filled, e.g. with goods having a fineness (measured according to ASTM C204-11) above 4000 cm²/g, such as above 5000 cm²/g. An example of such fine goods is high blaine cement.

[0043] As a second aspect of the present disclosure, there is provided a use of a sack according to the first aspect for packaging a powdery or granularly material. Examples of powdery or granularly material are hydraulic binders including

cement and other building materials such as powdered goods for the construction industry and ready-mix building materials. Further examples are chemicals, minerals, garden fertilizers or animal feed.

[0044] In a preferred embodiment of the second aspect, the use is for packaging cement or finely powdered goods, such as carbon black. The cement may for example be high blaine cement, wherein the fineness (measured according to ASTM C204-11) is above 4000 cm²/g, such as above 5000 cm²/g. Likewise, the fineness of the finely powdered goods may be above 4000 cm²/g, such as above 5000 cm²/g, such as above 6000 cm²/g. The sack of the first aspect enables filling of such a fine material with a satisfactory filling rate.

[0045] As a third aspect of the present disclosure, there is provided a method of filling a sack according to the first aspect, comprising the step of filling the sack with a powdery or granularly material. Examples of powdery or granularly materials are given above in connection with the second aspect.

EXAMPLES

[0046] Tests were carried out with paper sacks having an inner and an out paper ply. The inner-ply of the sacks was highly porous (Gurley 3-6 seconds). Further, the sacks lacked a free film. Instead, the outer ply of the sacks was coated with a moisture barrier. Such a barrier considerably limited the air penetrability. The outer ply of the sacks formed a longitudinally extending overlapping region having a width of 20 mm. In the overlapping region, two ends of the outer ply were glued to each other by a longitudinal discontinuous seam. The gluing pattern of the discontinuous seam differed between the tested sacks, as shown in the table below. For each sack, the longitudinal seam was glued 50mm from both sides of the tuber in order to have a robust construction. In between, there were non-glued and glued regions in an iterative pattern. Further, a sack having a continuous longitudinal seam was included as a reference. The bottom ends of the sacks were completely closed by folding and gluing in a conventional manner. In contrast, the top ends were not completely closed to allow top deaeration during filling.

Sack no	Length of each non-glued region (mm)	Length of each glued region (mm)
1	25	50
2	20	20
3	30	30
4	40	40
5	40	20
6	70 mm, below the valve, only one non-glued area	Everything except the 70 mm opening
Reference	-	The whole length was glued

[0047] The air permeability was measured in a Haver Airflow Tester® (Mega Gurley) that measures the air-flow in m³/h at different pressure drops. These results were normalized to the sack sizes and specifically the area of the sacks that normally allows air-ventilation according to following formula: [Sack width*Sack length*2]. The results of the measurements are shown in figure 4, which also indicates desired normalized flow rates for filling with mixed mortar, cement and finely ground powder, respectively.

[0048] Figure 4 shows that for the normalized flow rate associated with filling with mixed mortar (0.55 Nm³/dm²*h), the pressure drop was lower for all sacks with a discontinuous seam (sacks 1-6) than for the reference sack with a continuous seam. For the normalized flow rate associated with filling with cement (0.80 Nm³/dm²*h), the pressure drop was at least 30 % lower for all sacks with a discontinuous seam (sacks 1-6) than for the reference sack. A lower pressure drop means that a shorter filling time is obtainable.

[0049] Figure 4 further shows that the normalized flow rate associated with filling with finely ground powder (1.20 Nm³/dm²*h) cannot be reached at a pressure drop of 100 mbar for the reference sack, while for all the sacks with a discontinuous seam (sacks 1-6), a pressure drop below 100 mbar was sufficient.

[0050] Figure 4 also shows a ~50-90% improvement in deaeration at 100 mbar for the sacks with a discontinuous seam compared to the reference sack.

[0051] Finally, figure 4 shows that sacks 1 and 2 had the best deaeration values at 50 mbar overpressure. The other sacks showed progressive behaviors with improved deaeration when the overpressure increased above 50 mbar. The best result at 100mbar was obtained for sack 5 and, which had 118% better deaeration compared to the reference sack.

Claims

1. A sack having an inner ply and an outer ply, wherein:

the outer ply forms a longitudinally extending overlapping region comprising an inner and an outer layer;
 a first end portion of the outer ply forms the inner layer and a second end portion of the outer ply forms the outer layer;
 an inside of the outer layer is glued to an outside of the inner layer to form a discontinuous longitudinal seam; and
 an inside of the first end portion is glued to the inner ply,
 such that air may pass out from an interspace between the inner and the outer ply through channels in the discontinuous longitudinal seam.

2. The sack of claim 1, wherein the outer ply is coated with a barrier, such as a moisture barrier.

3. The sack of claim 1 or 2, wherein the inner ply is porous to allow air penetration.

4. The sack according to claim 3, wherein the Gurley porosity (ISO 5636/5) of the inner ply is less than 15 s, such as less than 10 s, such as 2-8 s, such as 3-7 s.

5. The sack of any one of claims 1-4, wherein no plastic film ("free film") is provided between the inner and the outer ply.

6. The sack of any one of claims 1-5, wherein the discontinuous seam comprises at least one glued portion and at least one non-glued portion having a length in the longitudinal direction of at least 10 mm, such as at least 15 mm.

7. The sack of claim 6, wherein the discontinuous seam comprises at least two, such as at least three, separated non-glued portions, each having a length in the longitudinal direction of at least 10 mm, such as at least 15 mm.

8. The sack of claim 6, wherein the discontinuous seam comprises at least one non-glued portion having a length in the longitudinal direction of at least 40 mm, such as at least 50 mm.

9. The sack of any one of the preceding claims, wherein the sack comprises a top end through which it is filled and the discontinuous seam comprises an upper half and a lower half, wherein the upper half is closer to the top end and comprises at least one non-glued portion.

10. The sack of any one of the preceding claims, wherein the sack comprises a top end formed by folding and gluing the plies, wherein a portion of the top end is not sealed by gluing such that air may escape through the non-sealed portion during filling of the sack.

11. The sack of any one of the preceding claims, wherein the width of the overlapping region is 0.3-7 cm, such as 0.5-5 cm, such as 1-5 cm, such as 1.5-3 cm, such as 1-3 cm.

12. Use of a sack according to any one of the preceding claims for packaging 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.

13. Use of a sack according to claim 12 for packaging cement.

14. Method of filling a sack according to any one of claims 1-11, comprising the step of filling the sack with a powdery or granularly material.

15. Method according to claim 14, wherein the fineness (measured according to ASTM C204-11) of the powdery material is above 4000 cm²/g, such as above 5000 cm²/g.

Amended claims in accordance with Rule 137(2) EPC.

1. A sack (100, 200) having an inner ply (101) and an outer ply (102, 202), wherein:

the outer ply (102, 202) forms a longitudinally extending overlapping region (103, 203) comprising an inner (104) and an outer (105) layer;

a first end portion (106) of the outer ply (102, 202) forms the inner layer (104) and a second end portion (107) of the outer ply (102, 202) forms the outer layer (105);

an inside (108) of the outer layer (105) is glued (221) to an outside (109) of the inner layer (104) to form a discontinuous longitudinal seam (220); and

an inside (110) of the first end portion (106) is glued (113a, 113b, 113c) to the inner ply (101), such that air may pass out from an interspace (111) between the inner (101) and the outer (102, 202) ply through channels (112, 212) in the discontinuous longitudinal seam (220),

wherein the outer ply (102, 202) is coated with a barrier, such as a moisture barrier, and the inner ply (101) is porous to allow air penetration.

2. The sack according to claim 1, wherein the Gurley porosity (ISO 5636/5) of the inner ply (101) is less than 15 s, such as less than 10 s, such as 2-8 s, such as 3-7 s.

3. The sack of any one of claims 1-2, wherein no plastic film ("free film") is provided between the inner (101) and the outer (102) ply.

4. The sack of any one of claims 1-3, wherein the discontinuous seam (220) comprises at least one glued portion (221) and at least one non-glued portion having a length in the longitudinal direction of at least 10 mm, such as at least 15 mm.

5. The sack of claim 4, wherein the discontinuous seam (220) comprises at least two, such as at least three, separated non-glued portions, each having a length in the longitudinal direction of at least 10 mm, such as at least 15 mm.

6. The sack of claim 4, wherein the discontinuous seam (220) comprises at least one non-glued portion having a length in the longitudinal direction of at least 40 mm, such as at least 50 mm.

7. The sack of any one of the preceding claims, wherein the sack comprises a top end (231) through which it is filled and the discontinuous seam (220) comprises an upper half and a lower half, wherein the upper half is closer to the top end (231) and comprises at least one non-glued portion.

8. The sack of any one of the preceding claims, wherein the sack comprises a top end (231) formed by folding and gluing the plies, wherein a portion of the top end (231) is not sealed by gluing such that air may escape through the non-sealed portion during filling of the sack.

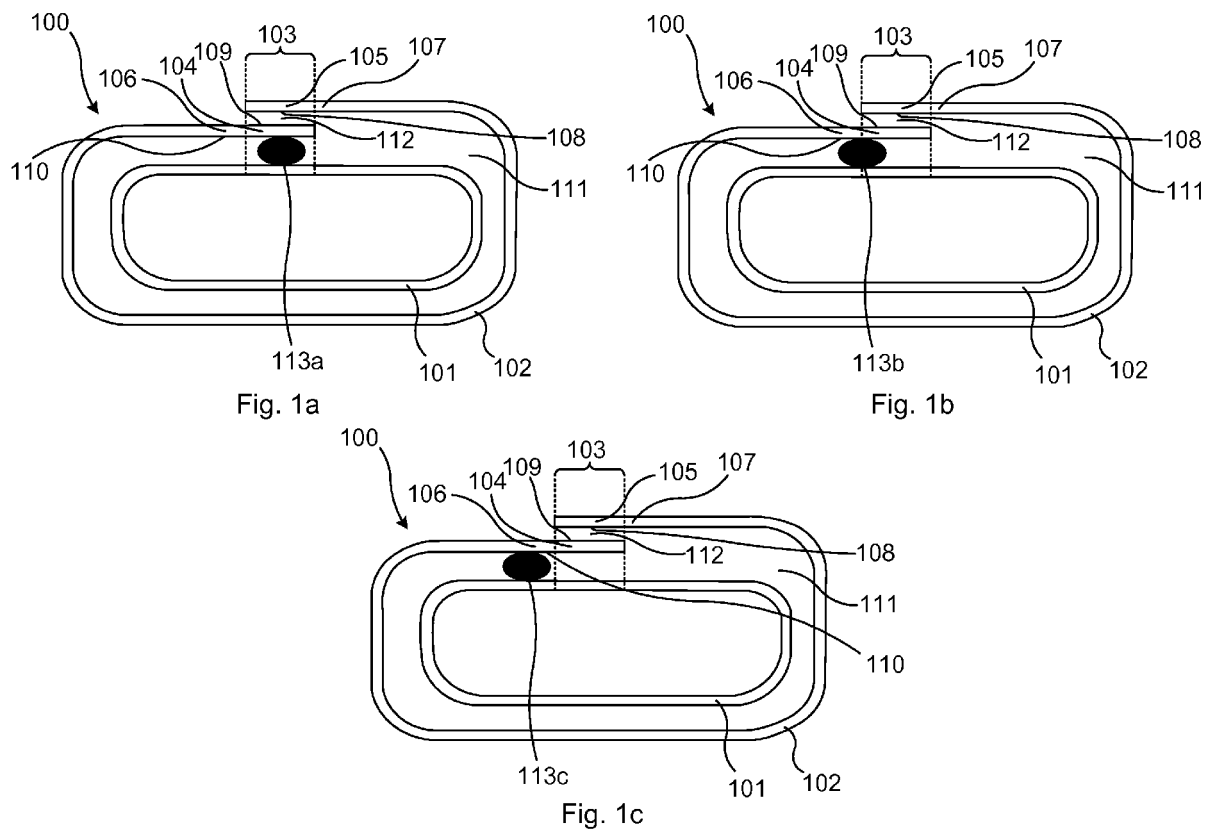
9. The sack of any one of the preceding claims, wherein the width of the overlapping region (103, 203) is 0.3-7 cm, such as 0.5-5 cm, such as 1-5 cm, such as 1.5-3 cm, such as 1-3 cm.

10. Use of a sack (100, 200) according to any one of the preceding claims for packaging 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.

11. Use of a sack (100, 200) according to claim 10 for packaging cement.

12. Method of filling a sack (100, 200) according to any one of claims 1-9, comprising the step of filling the sack with a powdery or granularly material.

13. Method according to claim 12, wherein the fineness (measured according to ASTM C204-11) of the powdery material is above 4000 cm²/g, such as above 5000 cm²/g.



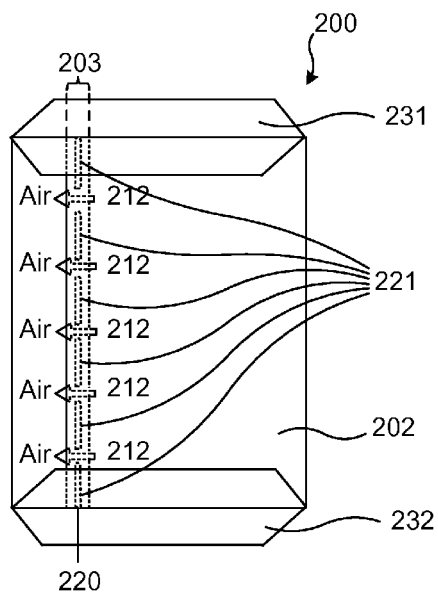


Fig. 2

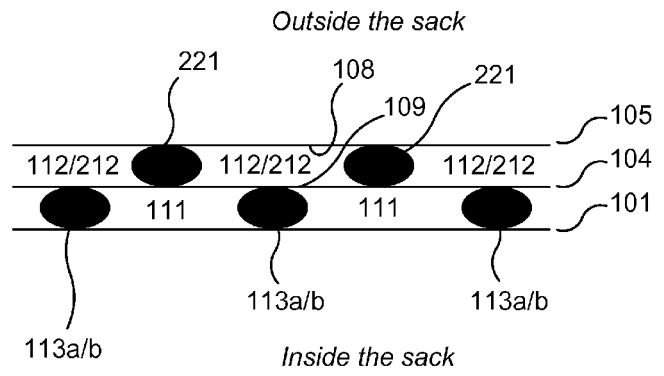


Fig. 3

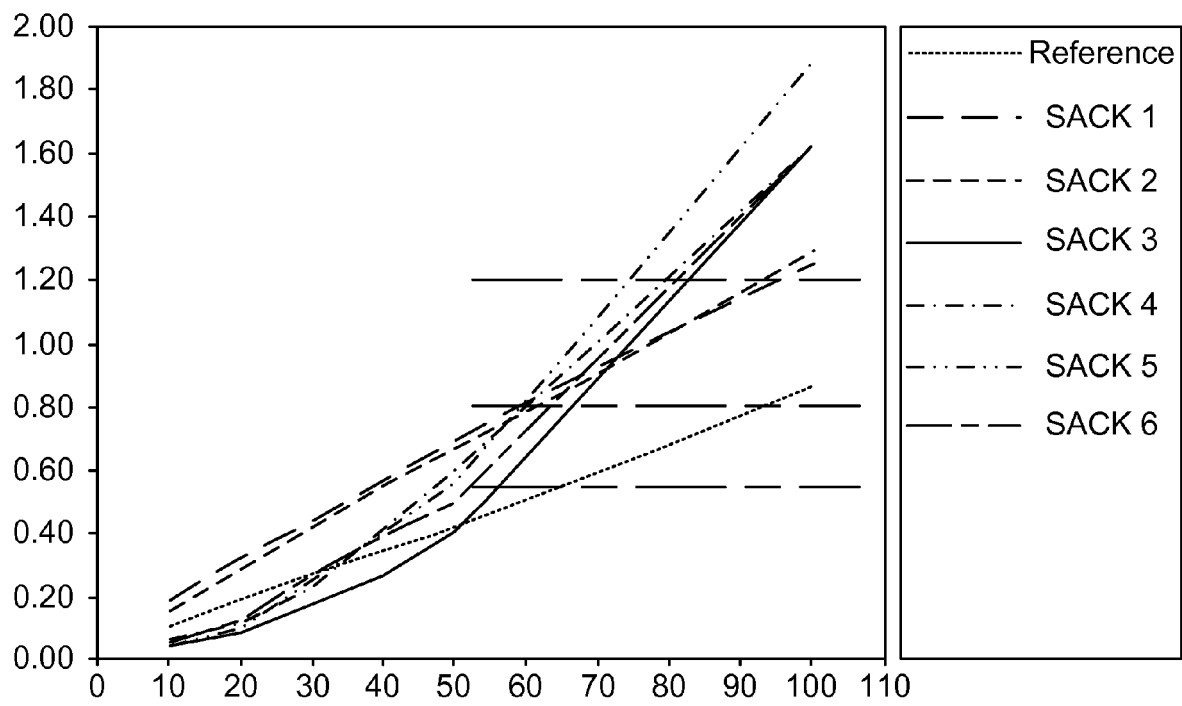


Fig. 4



EUROPEAN SEARCH REPORT

Application Number
EP 14 18 9053

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			TECHNICAL FIELDS SEARCHED (IPC)
			B65D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 7 May 2015	Examiner Derrien, Yannick
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03/02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 14 18 9053

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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Patent documents cited in the description

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