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(54) **PROCESS AND APPARATUS FOR FILLING A BAG WITH POWDERED OR GRANULAR MATERIAL**

VERFAHREN UND VORRICHTUNG ZUM FÜLLEN EINES BEUTELS MIT PULVERFÖRMIGEM ODER KÖRNIEM MATERIAL

PROCEDE ET APPAREIL DE REMPLISSAGE DE SAC EN MATERIAU EN POUDRE OU GRANULAIRE

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Description

[0001] The present invention relates to a process for filling a bag with a measured quantity of powdered or granular material, for example powdered cement.

[0002] It has long been known to fill a bag with powdered material such as cement by dispensing measured quantities of the material into the bag from a hopper.

[0003] However, using a conventional filling process, the packing density of the powdered material within a filled bag is typically very low, which has a number of disadvantages. Firstly, the loosely packed material within the bag will make the bag difficult to manipulate. Secondly, when the bag is opened, for example by hitting the bag with the blade of a shovel, a large amount of the powdered material may be dispersed into the surrounding atmosphere, thereby giving rise to a potential health hazard. Thirdly, a loosely packed bag, if sealed, will be more likely to burst when subjected to external pressure, for example when the bag is stored in a stack.

[0004] We have now devised a process for filling a bag with powdered material which overcomes the limitations of existing processes.

[0005] According to a first aspect of the present invention, there is provided a process for filling a bag with a powdered or granular material wherein a measured quantity of said material is subjected to a vacuum to compact the material prior to its being dispensed into the bag and once the bag has been filled with said material, said process further comprises fully sealing the mouth of the bag, and is *characterised by* compressing and/or vibrating the sealed bag to cause air within the bag to collect adjacent a point, forming a puncture hole in the bag at the point and then subjecting the bag to a vacuum and/or compressing the bag to remove air from the interior of the bag through the puncture hole.

[0006] It will be appreciated that by increasing the density of the powdered or granular material, the volume of air within the filled bag will be minimised.

[0007] Preferably the material is compacted within a chamber and is dispensed by positioning the chamber within the bag, such that the base of the chamber extends substantially to the base of the bag, and then releasing the compacted material from the base of the chamber whilst simultaneously separating the base of the chamber from the base of the bag.

[0008] The compacted material will thus remain relatively undisturbed as it is dispensed and therefore will maintain its high packing density.

[0009] Preferably, having been evacuated to compact the powdered or granular material, the top of the chamber is pressurised to encourage the release of the compacted material into the bag.

[0010] The chamber may be positioned within the bag by lowering the chamber into bag and/or by raising bag to envelop the chamber.

[0011] The base of the chamber may be separated from the base of the bag by raising the chamber and/or

by lowering bag.

[0012] Once filled, the volume of air within the bag may be further reduced by inserting a suction device into the material contained in the bag, via the mouth of the bag, and applying suction via the suction device.

[0013] The volume of air within the bag may be further reduced by fully sealing the mouth of the bag, forming a small puncture hole in the side of the bag and then compressing the bag and/or subjecting the bag to a vacuum, to expel air from the interior of the bag through the puncture hole.

[0014] Once the bag has been compressed and/or subjected to a vacuum, the puncture hole is preferably closed, for example by a weld or by applying an adhesive patch to the bag to cover the hole.

[0015] Prior to forming the small puncture hole, the fully sealed bag may be vibrated and/or compressed to cause air within the bag to collect adjacent the point at which the puncture hole is to be formed.

[0016] In accordance with this invention as seen from a second aspect there is provided apparatus for filling a bag with powdered or granular material in accordance with the process of the first aspect.

[0017] DE-A-4107495 discloses a method and apparatus for filling a bag with powdered material, wherein a quantity of the material is subject to a vacuum in a form chamber to compact the material prior to being dispensed into a bag.

[0018] Embodiments of the present invention will now be described by way of examples only and with reference to the accompanying drawing which is a schematic illustration of an in-line bag packing process in accordance with the present invention.

[0019] Referring to the drawing, a hopper 2 is shown, from which powdered material is fed by a screw 4 to a weighing chamber 6. Once the desired weight of material has accumulated in the weighing chamber, the material is discharged into a conditioning chamber 8, within which the material is compacted by evacuating air from the chamber.

[0020] The compacted material is then released from the base of the conditioning chamber 8 into a plastics bag 10 which is positioned such that it envelops the conditioning chamber, with the base of the chamber extending substantially to the base of the bag. As the compacted material is being released, the plastics bag 10 is gradually lowered away from the conditioning chamber 8, thereby minimising any disturbance which might loosen the compacted material. To assist in the release of material from the conditioning chamber, a pressure differential is preferably established by re-introducing air into the top of the chamber.

[0021] The filled bag is then transported to a passing station where the mouth of the bag is held open as its contents are subjected to a low frequency jog, for example by repeatedly raising and dropping the bag or by subjecting the bag to a series of blows.

[0022] The filled bag may pass through a series of pos-

sing stations according to the rate at which filled bags are delivered from the conditioning chamber and the level of deaeration required.

[0023] A suction device (not shown) is then inserted into the material contained in the bag, via the mouth of the bag, and suction applied via the suction device to further compact the material. The apparatus is preferably arranged such that, between successive suction operations, air is blown through the suction device to dislodge any residual material therefrom, which might otherwise reduce the suction capability of the device.

[0024] In a process not covered by the claims the bag is then partially sealed by forming a series of welds 12 across its mouth and then compressed between a pair of opposed plates 14 to expel excess air from its interior through the partially sealed mouth. A pair of opposed rollers 16 run across the top of the bag 10 as it is compressed to expel any remaining air from the ullage region of the bag.

[0025] Excess air may also or otherwise be expelled from the interior of the partially sealed bag by subjecting the bag to a vacuum, for example by placing the partially sealed bag in a vacuum chamber which is then evacuated.

[0026] A second series of welds 18 is finally formed across the top of the bag 10, in parallel with the first series of welds 12, with the two series of welds being staggered to provide a series of convoluted channels which allow further air to escape from the bag, for example if the bag is compressed within a stack, but which also inhibit the release of the powdered or granular material from, or the ingress of moisture into, the bag.

[0027] In an alternative process which is covered by the claims, the mouth of the bag is fully sealed and the bag transported on its side along a vibrating conveyor belt, causing any remaining air to accumulate against the upper surface of the bag.

[0028] The fully sealed bag may also or otherwise be compressed, before the uppermost side of the bag is punctured and the bag compressed and/or subjected to a vacuum, e.g. within a vacuum chamber, to expel the accumulated air.

[0029] Finally, the puncture hole is sealed by a weld or by applying an adhesive patch over the hole.

[0030] The processes thus described result in a tightly packed bag of powdered material which contains a minimal volume of air.

Claims

1. A process for filling a bag (10) with a powdered or granular material wherein a measured quantity of said material is subjected to a vacuum to compact the material prior to its being dispensed into the bag (10) and once the bag (10) has been filled with said material, said process further comprises fully sealing the mouth of the bag (10), and

is characterised by compressing and/or vibrating the sealed bag (10) to cause air within the bag (10) to collect adjacent a point, forming a puncture hole in the bag (10) at the point and then subjecting the bag (10) to a vacuum and/or compressing the bag (10) to remove air from the interior of the bag through the puncture hole.

2. A process as claimed in Claim 1, wherein the powdered or granular material is compacted within a chamber (8) and is dispensed by positioning the chamber (8) within the bag (10), such that the base of the chamber extends substantially to the base of the bag, and then releasing the compacted material from the base of the chamber whilst simultaneously separating the base of the chamber from the base of the bag.

3. A process as claimed in Claim 2, wherein, once the chamber (8) has been evacuated to compact the powdered or granular material, the top of the chamber is then pressurised to encourage the release of the compacted material into the bag (10).

4. A process as claimed in Claim 2 or Claim 3, wherein the chamber (8) is positioned within the bag by lowering the chamber into bag (10).

5. A process as claimed in Claim 2 or Claim 3, wherein the chamber (8) is positioned within the bag (10) by raising the bag to envelop the chamber.

6. A process as claimed in any of Claims 2 to 5, wherein the base of the chamber is separated from the base of the bag by raising the chamber (8).

7. A process as claimed in any of Claims 2 to 5, wherein the base of the chamber is separated from the base of the bag by lowering the bag (10).

8. A process as claimed in any preceding claim, wherein, once the bag (10) has been compressed and/or subjected to a vacuum, the puncture hole is then closed.

9. A process as claimed in Claim 8, wherein the puncture hole is closed by a weld.

10. A process as claimed in Claim 8, wherein the puncture hole is closed by applying an adhesive patch to the bag to cover the hole.

11. An apparatus arranged to fill a bag (10) with a powdered or granular material according to the process of any preceding claim.

Patentansprüche

1. Verfahren zum Füllen eines Beutels, einer Tüte oder eines Sacks (10) mit einem pulverisierten oder körnigen Material, wobei eine abgemessene Menge des Materials einem Unterdruck ausgesetzt wird, um das Material zu verdichten, bevor es in den Beutel, die Tüte oder den Sack (10) ausgegeben wird, und wenn der Beutel, die Tüte oder der Sack mit dem Material gefüllt ist, das Verfahren weiter es aufweist, vollständig die Mündung des Beutels, der Tüte oder des Sacks (10) zu verschließen, und das **dadurch gekennzeichnet ist, dass** der verschlossene Beutel, die verschlossene Tüte oder der verschlossene Sack (10) zusammengedrückt und/oder in Schwingungen versetzt wird, um zu bewirken, dass sich Luft innerhalb des Beutels, der Tüte oder des Sacks (10) in der Nähe einer Stelle sammelt, dass ein Durchstechungsloch in der Beutel, die Tüte oder dem Sack (10) an der Stelle ausgebildet wird und dann der Beutel, die Tüte oder der Sack (10) einem Unterdruck ausgesetzt wird und/oder der Beutel, die Tüte oder der Sack (10) zusammengedrückt wird, um Luft aus dem Innern des Beutels, der Tüte oder des Sacks durch das Durchstechungsloch zu entfernen.
2. Verfahren nach Anspruch 1, bei dem das pulverisierte oder körnige Material innerhalb einer Kammer (8) verdichtet wird und durch Positionieren der Kammer (8) innerhalb des Beutels, der Tüte oder des Sacks (10) ausgegeben wird, so dass sich die Basis der Kammer im Wesentlichen zur Basis des Beutels, der Tüte oder des Sacks erstreckt und dann das verdichtete Material von der Basis der Kammer freigegeben wird, während gleichzeitig die Basis der Kammer von der Basis des Beutels, der Tüte oder des Sacks getrennt wird.
3. Verfahren nach Anspruch 2, bei dem, wenn die Kammer 8 evakuiert worden ist, um das pulverförmige oder körnige Material zu verdichten, die Oberseite der Kammer dann unter Druck gesetzt wird, um das Freigeben des verdichteten Materials in den Beutel, die Tüte oder den Sack (10) zu unterstützen.
4. Verfahren nach Anspruch 2 oder Anspruch 3, bei dem die Kammer (8) innerhalb des Beutels, der Tüte oder des Sacks positioniert wird, indem die Kammer in den Beutel, die Tüte oder den Sack (10) abgesenkt wird.
5. Verfahren nach Anspruch 2 oder Anspruch 3, bei dem die Kammer (8) innerhalb des Beutels, der Tüte oder des Sacks (10) positioniert wird, indem der Beutel, die Tüte oder der Sack angehoben wird, um die Kammer zu umschließen.
6. Verfahren nach einem der Ansprüche 2 bis 5, bei

dem die Basis der Kammer von der Basis des Beutels, der Tüte oder des Sacks getrennt wird, indem die Kammer (8) angehoben wird.

7. Verfahren nach einem der Ansprüche 2 bis 5, bei dem die Basis der Kammer von der Kammer des Beutels, der Tüte oder des Sacks getrennt wird, indem der Beutel, die Tüte oder der Sack (10) abgesenkt wird.
8. Verfahren nach einem vorangehenden Anspruch, bei dem, wenn der Beutel, die Tüte oder der Sack (10) zusammengedrückt und/oder einem Unterdruck ausgesetzt worden ist, das Durchstechungsloch dann geschlossen wird.
9. Verfahren nach Anspruch 8, bei dem das Durchstechungsloch durch eine Schweißung geschlossen wird.
10. Verfahren nach Anspruch 8, bei dem das Durchstechungsloch **dadurch** geschlossen wird, dass ein Klebemittelflicken auf den Beutel, die Tüte oder den Sack aufgebracht wird, um das Loch zu bedecken.
11. Vorrichtung, die dazu ausgebildet ist, einen Beutel, eine Tüte oder einen Sack (10) mit einem pulverisierten oder körnigen Material gemäß dem Verfahren nach einem vorangehenden Anspruch zu füllen.

Revendications

1. Procédé de remplissage d'un sac (10) avec un matériau pulvérulent ou granulaire, dans lequel une quantité mesurée dudit matériau est soumise à un vide destiné à compacter le matériau avant de le délivrer dans le sac (10) et, une fois le sac (10) rempli dudit matériau, ledit procédé comprenant en outre le scellage complet de l'ouverture du sac (10) et étant **caractérisé par** la compression et/ou par la vibration du sac scellé (10) pour amener l'air à l'intérieur du sac (10) à être collecté à proximité d'un point, par la formation d'un trou de perforation dans le sac (10) au niveau du point, puis par l'exposition du sac (10) à un vide et/ou par la compression du sac (10) afin d'éliminer l'air de l'intérieur du sac à travers le trou de perforation.
2. Procédé selon la revendication 1, dans lequel le matériau pulvérulent ou granulaire est compacté à l'intérieur d'une chambre (8) et délivré en plaçant la chambre (8) à l'intérieur du sac (10), de sorte que la base de la chambre s'étende substantiellement sur la base du sac, puis en libérant le matériau compacté depuis la base de la chambre, tout en séparant simultanément la base de la chambre de la base du sac.

3. Procédé selon la revendication 2, dans lequel, une fois que le vide a été généré dans la chambre (8) pour compacter le matériau pulvérulent ou granulaire, le haut de la chambre est ensuite soumis à une pression pour favoriser la libération du matériau compacté dans le sac (10). 5
4. Procédé selon la revendication 2 ou 3, dans lequel la chambre (8) est placée à l'intérieur du sac en abaissant la chambre dans le sac (10). 10
5. Procédé selon la revendication 2 ou 3, dans lequel la chambre (8) est placée à l'intérieur du sac (10) en relevant le sac de manière à envelopper la chambre. 15
6. Procédé selon l'une quelconque des revendications 2 à 5, dans lequel la base de la chambre est séparée de la base du sac en relevant la chambre (8).
7. Procédé selon l'une quelconque des revendications 2 à 5, dans lequel la base de la chambre est séparée de la base du sac en abaissant le sac (10). 20
8. Procédé selon l'une quelconque des revendications précédentes, dans lequel, une fois que le sac (10) a été comprimé et/ou soumis à un vide, on referme ensuite le trou de perforation. 25
9. Procédé selon la revendication 8, dans lequel le trou de perforation est refermé par une soudure. 30
10. Procédé selon la revendication 8, dans lequel le trou de perforation est refermé par application d'une pièce adhésive sur le sac pour recouvrir le trou. 35
11. Appareil aménagé pour remplir un sac (10) d'un matériau pulvérulent ou granulaire en appliquant le procédé selon l'une quelconque des revendications précédentes. 40

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