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(54) **Deaeration device, particularly for filling machines, dosage machines and the like**

(57) A deaeration device particularly for filling machines, dosage machines and the like, comprising at least one chamber (2) for deaerating granular and/or powdery products to be packaged in a bag, which is delimited by at least one internal surface which is closed hermetically by at least one closure device (6, 7), the internal surface (3) comprising at least one porous partition (8) which is adapted to extract gas with vacuum generation means and being made of a substantially deformable and/or flexible material, so as to reduce gradually the volume delimited by the internal surface (3) during the extraction of the gas.

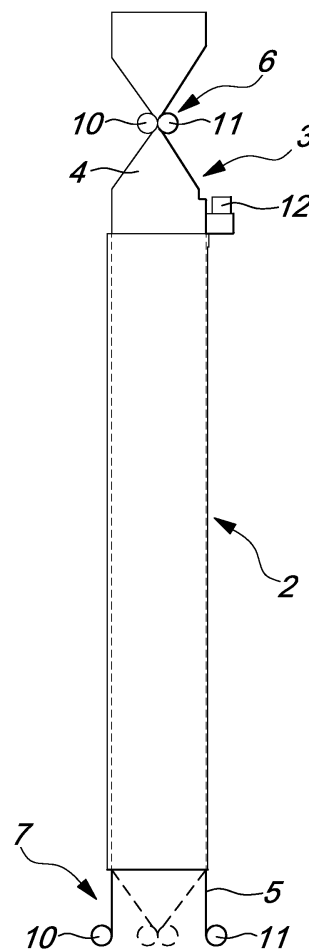


Fig. 2

Description

[0001] The present invention relates to a deaeration device particularly for filling machines, dosage machines and the like.

[0002] Modern filling machines which package granular and/or powdery products of any kind have, in their operating cycle, an important step for extracting air from said products (deaerating them), so that they can be introduced in appropriate rigid or flexible containers (for example bags) in the best conditions of preservation and with the smallest possible space occupation.

[0003] Currently there are various product deaeration techniques, for example by means of screw-feeder systems which extract the air while the product passes through them before it is packaged into the container or by means of appropriately provided suction probes, which are substantially inserted into the product when it is already entirely within the container.

[0004] However, currently widespread deaeration techniques have at least two drawbacks.

[0005] First of all, the time required to achieve the intended deaeration is currently definitely too long, and this is usually due to the rapid reduction in pressure which occurs within the product and is determined by the action of the vacuum-producing device, typically a pump: this sudden reduction makes subsequent extraction of the air (or other gas) from the product more expensive, consequently requiring long time intervals. This of course affects the degree of deaeration that is actually provided, which is rarely the degree needed by production requirements.

[0006] Secondly, typically in the field of deaeration techniques performed before the product is introduced in the container, it is observed that the products tend to reaerate during their insertion into the container.

[0007] The aim of the present invention is to obviate the above mentioned drawbacks, by providing a deaeration device particularly for filling machines, dosage machines and the like which allows to extract air or other gas from granular and/or powdery products much faster and more effectively than currently used techniques.

[0008] Within this aim, an object of the present invention is to provide a deaeration device particularly for filling machines, dosage machines and the like which allows to perform optimum compaction of the product so as to incorporate the smallest amount of air during insertion in the container.

[0009] Another object of the present invention is to provide a device which is simple, relatively easy to provide in practice, safe in use, effective in operation, and has a relatively low cost.

[0010] This aim and these and other objects which will become better apparent hereinafter are achieved by the present deaeration device particularly for filling machines, dosage machines and the like, characterized in that it comprises at least one chamber for deaerating granular and/or powdery products to be packaged in a

bag, which is delimited by at least one internal surface which is closed hermetically by at least one closure device, said internal surface comprising at least one porous partition which is adapted to extract gas with vacuum generation means and being made of a substantially deformable and/or flexible material, so as to reduce gradually the volume delimited by said internal surface during the extraction of said gas.

[0011] Further characteristics and advantages of the invention will become better apparent from the following detailed description of a preferred but not exclusive embodiment of a deaeration device particularly for filling machines, dosage machines and the like, according to the invention, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a front view of the deaeration device according to the invention;

Figure 2 is a side elevation view of the device;

Figure 3 is a plan view of the deaeration device.

[0012] In the exemplary embodiment that follows, individual characteristics may actually be interchanged with other different characteristics that exist in other exemplary embodiments.

[0013] Moreover, it is noted that anything found to be already known during the patenting process is understood not to be claimed and to be the subject of a disclaimer.

[0014] With reference to Figure 1, the reference numeral 1 generally designates a deaeration device particularly for filling machines, dosage machines and the like according to the invention.

[0015] The device described hereinafter is absolutely general in its application, with any kind and size of granular and/or powdery product, and in association with filling machines having different characteristics. The device can also be used in combination with other known types of deaeration means, such as screw feeders, probes, and others.

[0016] The device according to the invention advantageously comprises at least one chamber for deaerating granular and/or powdery products to be packaged in bags, which is generally designated by the reference numeral 2 and is provided with at least one internal surface, generally designated by the reference numeral 3. The internal surface 3 is closed hermetically, at mutually opposite ends 4, 5, by at least two respective closure devices, constituted for example by valves and generally designated by the reference numerals 6 and 7.

[0017] Conveniently, the internal surface 3 of the deaeration chamber 2 integrates and comprises at least one porous partition 8, which is rigid or flexible and by means of which it is possible to extract gas (air, protective gas or others) with adapted vacuum generation means, for example a volumetric pump or others, which are not shown for the sake of simplicity in the figures but are of a substantially traditional type.

[0018] The internal surface 3 is conveniently made of a substantially deformable, flexible and impermeable material, for example of the type of rubber and/or the like, having suitable physical and mechanical characteristics; preferably but not exclusively, said material can also be of the elastically deformable type. In this manner, it is possible to reduce progressively the volume of the chamber 2 as the gas that lies inside it, embedded within the product, is extracted. This is achieved easily and effectively by way of the deformability of the internal surface 3, which progressively reduces the volume that is delimited as the pressure inside it decreases.

[0019] In greater detail, the deaeration chamber 2, which is supported preferably by fixed parts of the filling machine, has a vertically elongated tubular shape and a transverse cross-section of any shape which is adapted for the type of container (in Figure 3, for example, it is substantially rectangular); the deaeration chamber 2 is further affected, along at least one side, by at least one window 9, which is for example rectangular and at which the porous partition 8 is arranged.

[0020] The internal surface 3 also has a substantially tubular elongated shape, which for example tapers at the ends 4 and 5, and a transverse cross-section of any shape which is adapted for the type of container in the inactive condition.

[0021] The porous partition 8 can lie substantially along the entire length of the internal surface 3, as shown in Figure 1. The internal surface 3 can also be provided with a plurality of porous partitions 8, which are arranged on different sides, so as to increase the total surface through which it is possible to extract gas from the deaeration chamber 2. This is particularly important because differently from traditional deaeration devices, for example probes, here it is possible to extract gas from a much larger surface of the product, and this characteristic reduces considerably the operating times and therefore the energy expenditure.

[0022] By virtue of the gradual reduction in volume during extraction of the gas, which is achieved by way of the flexibility and deformability of the internal surface, two fundamental advantages are achieved.

[0023] The first advantage is that the pressure inside the deaeration chamber 2 decreases much more slowly than in traditional devices: this increases considerably the efficiency of the vacuum generation device (which would have to perform more work to extract air which is at a very low pressure) and reduces the total time required to extract from the product the quantity of gas that is deemed optimum for proper packaging.

[0024] The second advantage is that the product is compacted very effectively within the deaeration chamber 2, since the shape of the internal surface 3 adheres perfectly thereto by virtue of its deformability. In this manner, at the end of the gas extraction step, a sort of aggregate is obtained which is constituted by the particles of the granular and/or powdery product, which during the transfer (fall) from the deaeration chamber to the con-

tainer breaks up into agglomerates and reabsorbs a very small amount of gas.

[0025] Merely by way of example, each of the valves 6, 7 comprises at least one pair of rollers 10, 11, which can move transversely with respect to the internal surface 3, from a closure position (Figure 2, solid line), in which they are mutually adjacent, clamping between them hermetically the internal surface 3 at the ends 4 and 5, to an open position (Figure 2, broken line), in which they are conveniently spaced with respect to each other so as to allow respectively to fill the volume delimited by the internal surface 3 from above with granular and/or powdery products and empty from below the agglomerate of products after gas extraction.

[0026] Finally, the deaeration chamber 2 comprises advantageously at least one connector 12, which is suitable to connect the porous partition 8 to the vacuum generation device in order to extract the gas.

[0027] The fall of the product, at the end of gas extraction, is very short, since the deaeration chamber 2 can be advantageously inserted directly within the container: as a consequence of this, by way of injection means, a small amount of air is introduced which separates the agglomerated product from the internal surface 3, thus depositing said product within the container. Depending on the type of machine in which the present device is installed, furthermore, the deaeration chamber 2 can be raised again or the container (for example the bag) can be lowered. The amount of air that is injected further allows to clean the internal surface 3 of product residues.

[0028] The operation of the device according to the invention is therefore fully intuitive from the above description.

[0029] It has thus been shown that the invention achieves the proposed aim and objects.

[0030] Another important advantage that is observed is constituted by the fact that the mouth of the bag or the rim of the container in which the agglomerate of products is inserted remains substantially clean, since said agglomerate breaks up to a very limited extent: this is highly beneficial for the heat-sealing of the mouth of the bag.

[0031] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims.

[0032] All the details may be replaced with other technically equivalent ones.

[0033] In practice, the materials used, as well as the shapes and dimensions, may be any according to requirements without thereby abandoning the scope of the protection of the appended claims.

[0034] The disclosures in Italian Patent Application No. BO2006A000061 from which this application claims priority are incorporated herein by reference.

[0035] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the

interpretation of each element identified by way of example by such reference signs.

Claims

1. A deaeration device particularly for filling machines, dosage machines and the like, **characterized in that** it comprises at least one chamber (2) for deaerating granular and/or powdery products to be packaged in a bag, which is delimited by at least one internal surface which is closed hermetically by at least one closure device (6, 7), said internal surface (3) comprising at least one porous partition (8) which is adapted to extract gas with vacuum generation means and being made of a substantially deformable and/or flexible material, so as to reduce gradually the volume delimited by said internal surface (3) during the extraction of said gas.
2. The device according to claim 1, **characterized in that** said internal surface (3) is made of a substantially elastically deformable and/or flexible material.
3. The device according to claims 1 and 2, **characterized in that** said internal surface (3) is suitable, during gas extraction, to slowly decrease the pressure inside said deaeration chamber (2), so as to increase the efficiency of said vacuum generation means and reduce the total time for extracting from the product the quantity of gas which is optimum for proper packaging.
4. The device according to one or more of the preceding claims, **characterized in that** said internal surface (3) is adapted to compact the granular and/or powdery product, adhering to it during gas extraction, so as to obtain a sort of aggregate, which is constituted by the particles of the granular and/or powdery product, which during transfer from said deaeration chamber (2) to the container breaks up into agglomerates and therefore reabsorbs a limited amount of gas.
5. The device according to one or more of the preceding claims, **characterized in that** said porous partition (8) is substantially rigid.
6. The device according to one or more of the preceding claims, **characterized in that** said porous partition (8) is substantially flexible.
7. The device according to one or more of the preceding claims, **characterized in that** said porous partition (8) lies substantially along the entire length of said internal surface (3).
8. The device according to claims 1 and 2, **characterized in that** said deaeration chamber (2) has a vertically elongated tubular shape and a transverse cross-section of any shape suitable for the container of the product and is further affected, along at least one side, by at least one window (9), at which said porous partition (8) of said internal surface (3) is arranged, said window being adapted for the extraction of the gas with said vacuum generation means.
9. The device according to one or more of the preceding claims, **characterized in that** said internal surface (3) has a vertically elongated substantially tubular shape and a transverse cross-section which has any shape and is suitable for the container of the product.
10. The device according to one or more of the preceding claims, **characterized in that** it comprises a pair of said closure devices (6, 7), one at the base and one at the top of said deaeration chamber (2).
11. The device according to one or more of the preceding claims, **characterized in that** each one of said closure devices (6, 7) is constituted by a valve which comprises at least one pair of rollers (10, 11), which can move transversely to said internal surface (3) from a closure position, in which they are mutually adjacent and clamp between them hermetically said internal surface (3), to an open position, in which they are conveniently mutually spaced so as to allow respectively, from above, the filling of said internal surface (3) with granular and/or powdery products, and, from below, the emptying of said internal surface (3) after gas extraction.
12. The device according to one or more of the preceding claims, **characterized in that** said deaeration chamber (2) comprises at least one connector (12) which is adapted to connect said porous partition (8) to said vacuum generation means.
13. The device according to one or more of the preceding claims, **characterized in that** it comprises air injection means which are adapted to introduce a preset amount of the air between the product and said internal surface (3) at the end of gas extraction, so as to separate said internal surface (3) from the product and allow the deposition by gravity of said product into the packaging container.
14. The device according to one or more of the preceding claims, **characterized in that** said injection means are adapted to clean, by introducing a preset amount of the air, said internal surface (3) of residues of product after said product has fallen into the container.

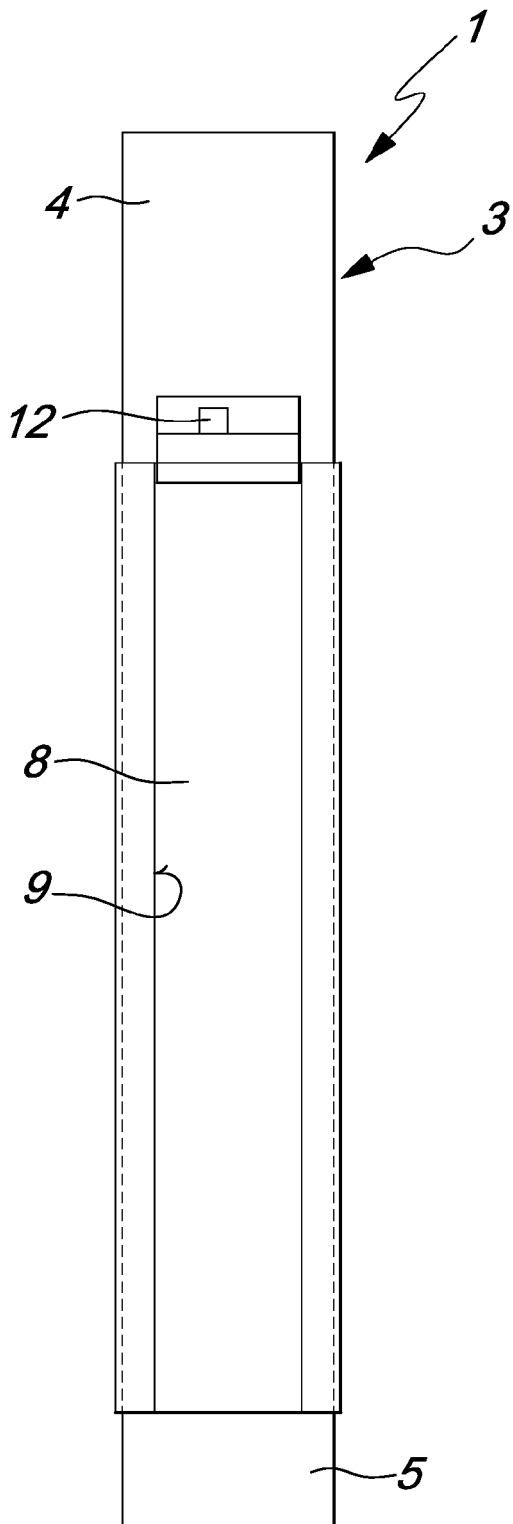


Fig. 1

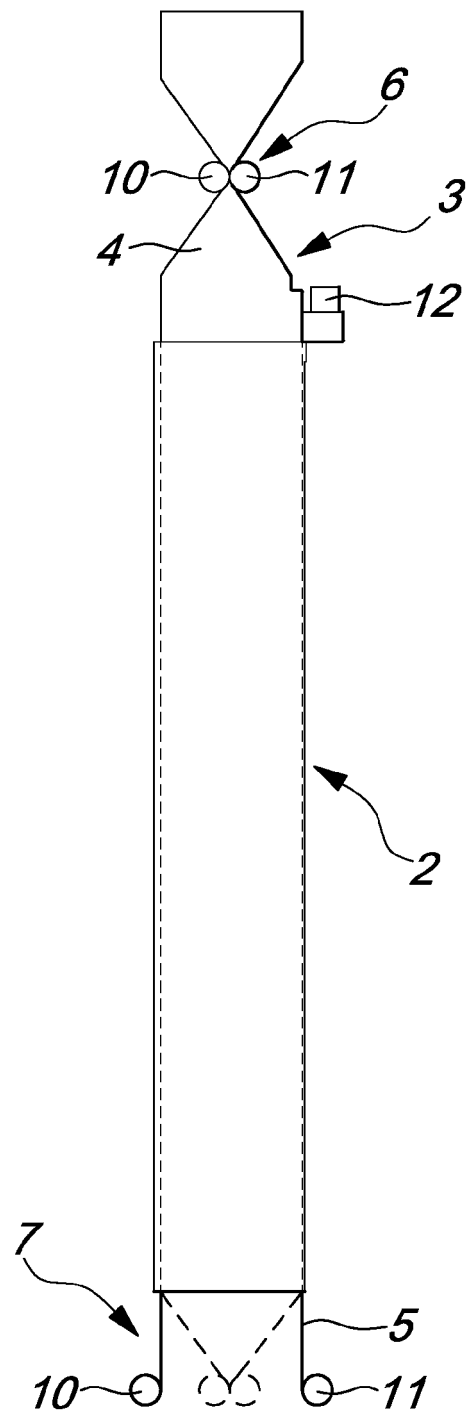


Fig. 2

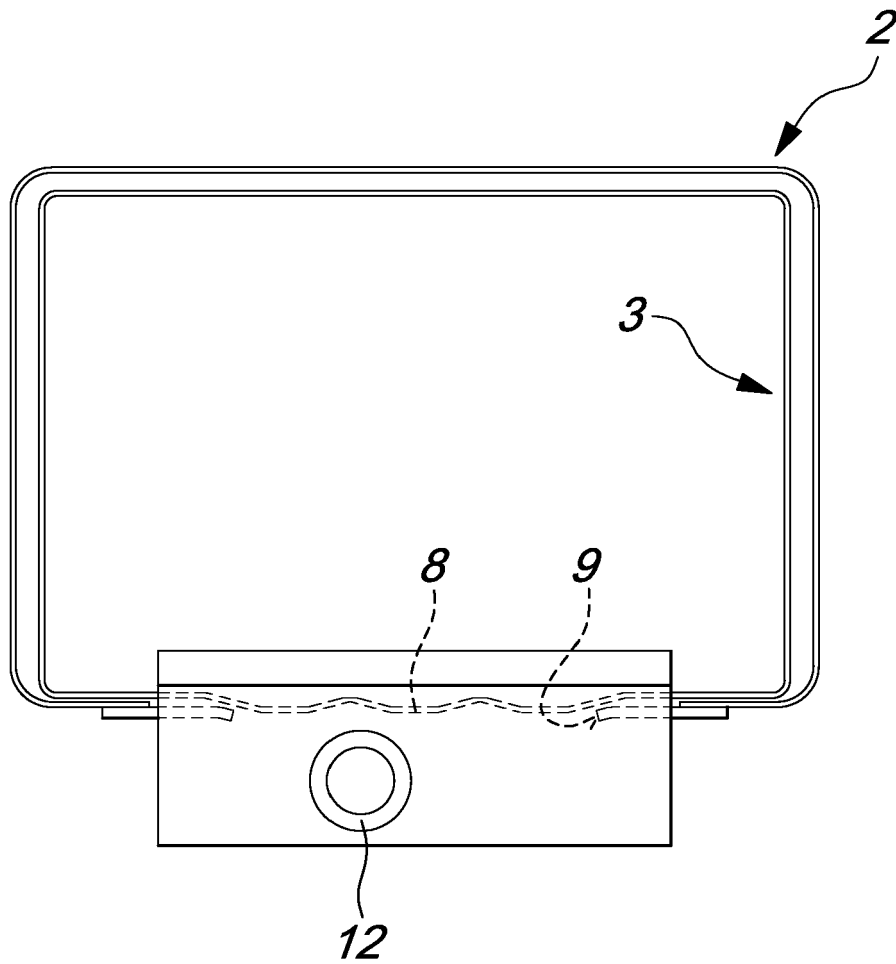


Fig. 3



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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Place of search Munich		Date of completion of the search 30 April 2007	Examiner Schelle, Joseph
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			

**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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