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(54) **DEVICE, SYSTEM AND METHOD FOR FILLING PACKAGES WITH SOLID FOOD PRODUCT**

(57) A device (1) for filling at least one package (10) with a first volume of solid food product is provided. The device (1) comprises a pump (4) operatively connected to a product tank (2) containing the solid food product, at least one fill head (8) operatively connected to the pump (4); a valve (7) configured to selectively connect the pump (4) to the product tank (2) or to the fill head (8); and a control unit (9) configured to control the valve (7) to connect the pump (4) to the product tank (2) or to the fill head (8), and to control the pump (4) to supply the first volume of solid food product to the fill head (8), wherein the control unit (9) is further configured to control the pump (4) to draw from the product tank (2) a larger volume of solid food than the first volume and to output an excess volume back to the product tank (2).

A system (20) and method (100) for filling at least one package (10) with solid food product is also provided.

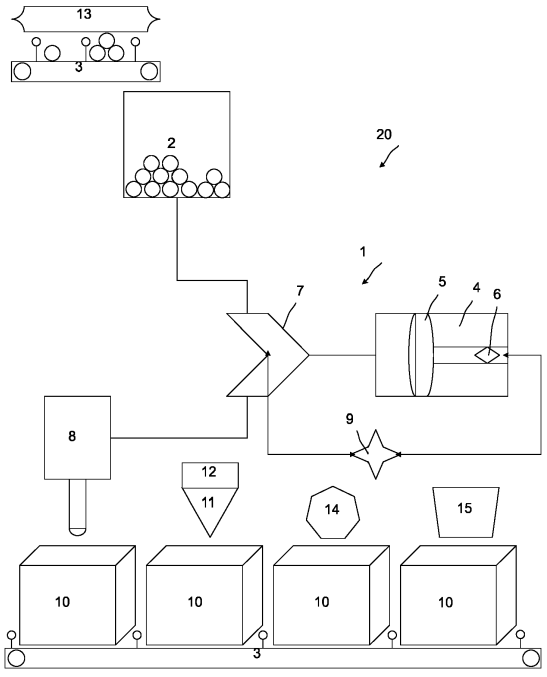

Fig. 3

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Description

Technical Field

[0001] The invention relates to a device, system and method for filling packages. More specifically, the present invention refers to a device, system and method for filling packages with food particles.

Background Art

[0002] Today there are several known techniques for filling packages with liquid food product, such as soups, purees, juices and sauces. Liquids or substances having sufficiently low viscosity may be moved from a product tank to a package using standard pumps, in combination with standard volume measurements in order to control the amount of product being filled.

[0003] However, filling packages with food products in the form of food particles such as mushrooms, fruit, peas, or beans is normally made in two steps; first, the solid part of the food product (i.e. the actual mushrooms/fruits/etc.) are filled, before a second step of filling with brine or syrup or similar is performed. Especially the first part has proven to be very difficult to automate due to air pockets occupying an unknown amount of volume between individual food particles. Solid food products are today often filled in volumetric pocket fillers, or manual filling is performed. Even for automatic filling processes, manual adjustment after filling is often necessary. Weight fillers can also be used for some types of solid food, giving better filling accuracy. To some extent prior art systems may successfully fill packages with food particles. However, such machines cannot be used to accurately fill particles or pieces of food being sticky, irregularly shaped, to some extent fragile, spongy, or wet, without requiring manual adjustment after filling.

Summary

[0004] It is an object of the invention to at least partly overcome one or more of the above-identified limitations of the prior art. In particular, it is an object to provide a device, method and system for filling packages with solid food product in an improved, and more accurate manner.

[0005] The food particles, such as sliced mushrooms, are preferably transported on a conveyor into a filling tank. Advantageously, the mushrooms shall contain as little water/moisture as possible when arriving to the filler. According to some emboidments described herein, from the filling tank the mushrooms are sucked into a piston pump controlled by a servomotor. When filling up the piston pump from the tank, the stroke of the piston is about 40-80% longer, such as 50% longer than required for the desired filling volume. A retract stroke to the nominal, or desired, filling volume is made before switching the piston pump connection from the tank to the filling nozzle. The retract stroke is compressing the product in the piston and pressing out the air between the food particles. The profile and acceleration of the piston movement can be controlled in order to accurately control the filling process. During filling, i.e. when the piston pump discharges the desired filling volume to the filling nozzle, the piston pump may be emptied through a filling head that can cut food particles when closed if neccesary. Brine/liquid can be added into the package using another filler.

[0006] According to a first aspect of the invention, the above and other objects of the invention are achieved, in full or at least in part, by a device for filling at least one package with a first volume of solid food product. The device comprises a pump operatively connected to a product tank containing the solid food product, at least one fill head operatively connected to the pump; a valve configured to selectively connect the pump to the product tank or to the fill head; and a control unit configured to control the valve to connect the pump to the product tank or to the fill head, and to control the pump to supply the first volume of solid food product to the fill head, wherein the control unit is further configured to control the pump to draw from the product tank a larger volume of solid food product than the first volume and to output the excess volume back towards the product tank.

[0007] The flow of product into and out of the pump is advantageous in that it makes the product more homogeneous, meaning that air is pushed out so that volumetric measurements become more standardised and the product is easier to handle.

[0008] The pump may be a reciprocating pump.

[0009] The reciprocating pump is advantageous in that it may easily be scaled depending on the first volume to be filled.

[0010] The pump may comprise a piston.

[0011] The piston is advantageous in that it increases the efficiency of the pump.

[0012] The device may comprise a motor for actuating the piston, such as a servo motor.

[0013] The motor is advantageous in that it allows for an increased speed of the piston and automatic control. This is especially true when using the control unit for controlling movement of the piston according to a software profile adapted for filling of specific food particles. In this way, potentially any solid product which has a corresponding software profile for the movement of the piston stored in the control unit or some external memory accessible by the control unit can be filled accurately into a container described earlier. The software profile has the function of controlling the motion of the motor and thus the piston.

[0014] The excess volume of solid food product drawn from the product tank may be between 40-80% of the first volume to be filled.

[0015] This interval is advantageous in that it has been found by the inventors of this application to maximise the air pushed out while maintaining a high speed and efficiency.

[0016] The first volume to be filled may correspond to the volume of solid food product to be filled in only one package.

[0017] This volume is advantageous in that it allows for a simpler fill head and a simpler operative connection between the fill heads and the tank, resulting a simpler valve.

[0018] According to a second aspect, a system for filling at least one package with solid food product is provided. The system comprises a device according to the first aspect; a product tank containing the solid food product; at least one nozzle for pouring liquid into the at least one package; and a sealer for sealing the at least one package. Optionally, the system also comprises a heater for retorting the at least one package.

[0019] The system is advantageous in that it allows for an efficient cooperation of different components and produces a complete, retorted package of food ready to be consumed.

[0020] The system may comprise at least one liquid tank operatively connected to the at least one nozzle.

[0021] The liquid tank is advantageous in that it supplies the nozzle(s) in a simple and effective manner.

[0022] The system may comprise a conveyor belt for stocking the product tank with solid food product.

[0023] The conveyor belt is advantageous in that it may transport any solid food product in a fast manner.

[0024] According to a third aspect, a method for filling at least one package with solid food product is provided. The method comprises the steps of inputting into a pump a larger volume of solid food product than a first volume to be filled; returning the excess volume to a product tank; and supplying a fill head with the first volume of solid food product to be filled.

[0025] The flow of product into and out of the pump is advantageous in that it makes the product more homogeneous, meaning that air is pushed out so that volumetric measurements become more standardised and the product is easier to handle.

[0026] The method may comprise a step of stocking the product tank with solid food product.

[0027] The method may comprise a step of pouring liquid into the at least one package.

[0028] The method may comprise a step of sealing the at least one package.

[0029] The method may comprise a step of retorting the at least one package.

[0030] Still other objectives, features, aspects and advantages of the invention will appear from the following detailed description as well as from the drawings.

Brief Description of the Drawings

[0031] Embodiments of the invention will now be described, by way of example, with reference to the accompanying schematic drawings, in which

Fig. 1 is a schematic view of a device for filling at least one package with solid food product according to an embodiment;

Fig. 2 is a schematic view of a device for filling at least two packages with solid food product according to another embodiment;

Fig. 3 is a schematic view of a system for filling at least one package with solid food product according to an embodiment; and

Fig. 4 is a schematic illustration of a method for filling at least one package with solid food product according to one embodiment.

Detailed Description

[0032] With reference to Fig. 1 a device 1 for filling at least one package 10 with a first volume of solid food product, i.e. food particles, is illustrated. The package 10 may be a cardboard box, a metal can, a plastic bottle or any other suitable packaging for food. In the most preferred embodiment, the package 10 is a retortable carton package designed for shelf-stable products traditionally filled in cans, glass jars or pouches - foods like vegetables, beans, tomatoes, pet food, soups and sauces. Such carton package is commercially available and known as Tetra Pecart®.

[0033] For the device 1 of Fig.1, the food particles may for example comprise mushrooms, pieces of fruit, or pieces of meat. The solid food is heterogeneous and comprises chunks or particles of product with air pockets in between. The solid food product may have some amount of liquid, for example between 0-20%, as long as the result is heterogeneous. The solid food product is usually packaged in brine or another type of liquid, such as syrup, which is added to the at least one package 10 at a later stage as discussed below with reference to Fig. 3.

[0034] The device 1 comprises a pump 4 operatively connected to a product tank 2 containing the solid food product, i.e. the solid part of the food product. The pump 4 may be a reciprocating pump capable of drawing the solid food product from the product tank 2. An advantage of a reciprocating pump is that it is very convenient to scale to variations in the filling volume of solid food product. The scaling may e.g. be slave scaling. In this way, one device 1 may be used for any number of filling volumes or package volumes. A skilled person will realise that the volume of the package 10 is not necessarily the same or even proportional to the filling volume.

[0035] The pump 4 preferably pumps at a speed and acceleration that is fast and efficient, but without causing any damage to the product. The pump 4 is preferably operated automatically.

[0036] The purpose of the pump 4 is to draw solid food product from the product tank 2, and to later deliver the drawn solid food product to the package 10. The fill volume, i.e. the volume of solid food product being delivered to the package 10, is from now on denoted a first volume.

[0037] Another function of the pump 4 is to temporarily store the solid food product as the amount of product to

be filled is measured. Thus, the pump 4 is made from a material suitable for containing solid food product periodically, such as a plastic, glass or metal and shaped e.g. substantially like a ball, box, cylinder, or tube.

[0038] The pump 4 is configured to accommodate a volume of solid food product being larger than the first volume, i.e. the volume to be filled in the package 10. When drawing the solid food product into the pump 4, a larger volume of solid food product than the first volume enters the pump 4. The excess volume, i.e. the difference between the drawn volume and the first volume, is then discharged from the pump 4 back towards the product tank 2.

[0039] The excess volume is consequently the difference between the input/drawn volume and the first volume to be filled. Outputting the excess volume back towards the product tank 2 does not necessarily mean that the product will reach the product tank 2. The excess volume of the output product may instead e.g. be lodged in connection tubes.

[0040] This process compresses the solid food product to primarily discharge air from air pockets, to achieve a more homogeneous and compact solid food product. This means that by drawing extra volume and then outputting the extra volume, while the resulting volume of product is the same as without the extra steps, the resulting content actually fills the volume efficiently and may be used as a fair measurement.

[0041] In one embodiment, the drawn volume is between 40-60% larger than the first volume to be filled. In another embodiment, the drawn volume is about 50% larger than the first volume to be filled.

[0042] The device 1 further comprises at least one fill head 8 operatively connected to the pump 4. The fill head 8 is configured to dispense the solid food product supplied by the pump 4 into the at least one package 10. The fill head 8 may e.g. be a nozzle, a funnel, or a pipe opening.

[0043] The fill head 8 preferably ensures that all solid food product supplied by the pump 4 is filled into the at least one package 10, either by using a feedback system such as sensors or simply by designing the fill head 8 such that spillage and loss is prevented.

[0044] The device 1 further comprises a valve 7 configured to selectively connect the pump 4 to the product tank 2 or to the fill head 8. The valve 7 is preferably a passive component that does not impact the flow. The valve 7 may for example be a branched pipe with a mechanical switch or a set of plugs that block different pathways depending on their positions. The valve 7 may allow flow into or out of one or more than one pump 4.

[0045] The valve 7 preferably connects the pump 4 to the product tank 2 to allow for flow of solid food product between the product tank 2 and the pump 4 while the product is drawn into the pump 4 and while the excess volume of product is output back towards the product tank 2 as described previously. This process typically takes around half of a second for modern filling operations.

[0046] Note that the valve 7 allows for flow of product from the product tank 2 to the pump 4 and from the pump 4 to the product tank 2. In different embodiments, the valve 7 may be arranged to allow both directions of flow at the same time or to switch between allowing the two directions at different times.

[0047] Once the excess volume of product is output from the pump 4, the valve 7 preferably switches to connect the pump 4 to the fill head 8 to allow for flow between the pump 4 and the fill head 8. This allows for the correct amount of solid food product contained in the pump 4 to be filled into the package 10 by the fill head 8. This process usually takes around half of a second for a modern filling operation.

[0048] In the embodiment shown in Fig. 1, the pump 4 comprises a piston 5 for controlling the flow of solid food product between the product tank 2 and the pump 4.

[0049] During a stroke, the piston 5 will initially drive the flow of solid food product into the pump 4, and by changing direction thus pushing the piston 5 forward, the product is output from the pump 4, either towards the product tank 2 or to the fill head 8.

[0050] The piston 5 is preferably moved at a speed and acceleration that is fast and efficient, but without damaging the product.

[0051] The device 1 may further comprise a motor 6 for driving the piston 5. The motor 6 may be integrated into the piston 5 or arranged in conjunction with it and may be arranged to actuate one or more than one piston 5. The motor 6 may be controlled by hand or automatically. The motor 6 may e.g. be a step motor or an electrical motor and is preferably a servomotor.

[0052] The device 1 also comprises a control unit 9 configured to control the valve 7 to connect the pump 4 to the product tank 2, to control the pump 4 to draw from the product tank 2 a larger volume of solid food product than the first volume to be filled, and then output the excess volume back towards the product tank 2, to control the valve 7 to connect the pump 4 to the fill head 8, and to control the pump 4 to supply the first volume of solid food product to the fill head 8.

[0053] The control unit 9 may further be configured to control the operation of one or more pistons 5 and/or one or more motors 6 in order for the pistons 5 to cooperate with the pumps 4.

[0054] The control unit 9 may further be configured to control the operation of one or more fill heads 8 in order to activate the filling of the solid food product, to monitor and react to the feedback system, and/or to control the processing means as discussed previously.

[0055] The control unit 9 may be implemented as one or more processors (CPU) or programmable logic controllers (PLC). It may be a single unit or divided into several parts. One control unit 9 may be configured to control the operation of any number of valves 7, pumps 4, pistons 5, motors 6 and/or fill heads 8.

[0056] The control unit 9 may be fully automatic using

feedback systems to control the device 1 in the most efficient manner. The control unit 9 may have semi-manual control of variations such as package volume control using a user interface such as a control panel.

[0057] The control unit 9 is preferably configured to accurately control the motion profile of the piston 5; in terms of speed and acceleration, as well as in terms of defining the end positions of the piston 5 (i.e. the end position corresponding to the larger volume, and the intermediate position corresponding to the first volume to be filled). As the piston 5 is preferably driven by a servomotor, the control unit 9 is communicating with the servomotor to follow a software profile adapted to each type of food particles being filled. Such control will improve the filling operation, in terms of accuracy and speed.

[0058] Fig. 2 shows another embodiment of the device 1, where two devices 1 are arranged with certain shared components in order to increase efficiency. The skilled person will realise that any number of devices 1 may be arranged with any number of shared components.

[0059] Fig. 2 shows two pumps 4, each comprising a piston 5. While not shown, two or more pumps 4 may be arranged to share the same piston 5. Only one of the pistons 5 is provided with a motor 6, which in this embodiment is configured to actuate both pistons 5.

[0060] Two fill heads 8 are shown, each filling one respective package 10. One fill head 8 may e.g. be arranged with several nozzles or openings, each being configured to fill one package 10.

[0061] In one embodiment, the first volume to be filled corresponds 7to the volume of solid food product to be filled in only one package 10. In this case, it is preferred to use one fill head 8 per package 10 to be filled.

[0062] It is preferred that the first volume to be filled output by each pump 4 does not change between the pump 4 and the corresponding packages 10 to be filled. To this end, it is beneficial to keep the number of pumps 4 and fill heads 8 the same while scaling the system 20. Each fill head 8 may then be configured to fill exactly one volume to be filled into any number of packages 10, using known methods to ensure that each package 10 receives the same amount of solid food product.

[0063] Fig. 2 further shows two valves 7, each being connected to one respective pump 4 and one respective fill head 8. Each of the valves 7 is however connected to the same product tank 2 (not shown). The skilled person will realise that more than one valve 7 may share any two or more connections.

[0064] It is however preferred that the valves 7 maintain a direct connection between a pump 4 and a corresponding fill head 8 to ensure that the first volume to be filled output by each pump 4 does not change as discussed above.

[0065] One control unit 9 is shown in Fig. 2 to control two valves 7, and one motor 6. While all of these components may be controlled by one control unit 9 each, the skilled person will realise that it may be more efficient to have one control unit 9 controlling all components as needed.

[0066] Fig. 3 shows a system 20 for filling at least one package 10 with solid food product. The system 20 comprises a device 1 for filling at least one package 10 with a first volume of solid food product similar to the device 1 of Fig. 1 and will thus not be described further.

[0067] The system 20 comprises a product tank 2 containing the solid food product. The product tank 2 is connected to the pump 4 via a valve 7 as described previously. The product tank 2 may be any tank suitable for storing solid food product, made from a material suitable for containing solid food product, such as a plastic, glass or metal and shaped e.g. substantially like a ball, box, cylinder, or tube.

[0068] The product tank 2 may be any size, such as 0.1-5 litres, 5-10 litres, 10-20 litres and 20-100 litres. No matter the size, it may eventually need to be restocked. Stocking may be done by hand or automatically. If automatically, any device suitable for transportation of solid food product may be used such as screws, vibration funnels or a conveyor belt 3.

[0069] It may be beneficial to process the solid food product before being stocked into the product tank 2. For example, a dryer 13 may be arranged in conjunction with a device suitable for transportation to dry the product as it is being stocked. Other processing stations 11-15 are also possible. Other examples of processing include shaping, mashing, cutting or coating.

[0070] However, a dryer 13 is not necessary for the described system 20. The conveyor or any other type of transportation should in such embodiments ensure that the food particles are thoroughly drained when arriving to the filler device 1. When a conveyor is used, it may have holes to drain the food product.

[0071] After the at least one package 10 is filled, further processing may be beneficial. The embodiment of Fig. 3 shows a conveyor belt 3 with packages 10 being processed in a specific order at different processing stations 11-15. The different processing stations 11-15 may be processed in any order and any station may be skipped. Any number of packages 10 may be processed at a time by each processing stations 11-15 and any number of processing stations 11-15 may process the same package 10 at the same time.

[0072] The different processing stations 11-15 may be parts of different machines or integrated into one machine. The packages 10 may be transported in some manner, e.g. by hand or by conveyor belt 3, between the different processing stations 11-15. Additionally or alternatively the different processing stations 11-15 may be transported to the package 10; additionally or alternatively the different processing stations 11-15 may be arranged to process the package 10 without any need for transportation.

[0073] A nozzle 11 may be used for pouring liquid into at least one package 10. The liquid may e.g. be brine or a syrup. The nozzle 11 may be any opening suitable for delivering liquid to a package 10, similar to how the fill

head 8 delivers solid food product.

[0074] The nozzle 11 may be operatively connected to at least one liquid tank 12. The liquid tank 12 may be any tank suitable for storing liquid, made from a material suitable for containing liquid, such as a plastic, glass or metal and shaped e.g. substantially like a ball, box, cylinder, or tube. Different liquid tanks 12 may comprise different liquids. The liquid tank 12 may be integrated with the nozzle 11 or not. One liquid tank 12 may be centrally connected to any number of nozzles 11, additionally or alternatively each nozzle 11 may have its own liquid tank 12.

[0075] A sealer 14 may be used for sealing the at least one package 10. The sealer 14 may use e.g. adhesives, pressure, fastening means, heat or electricity to seal the package 10. The package 10 may need to be folded before being sealed 170, which may be done by the sealer 14 or another processing station.

[0076] A heater 15 may be used for retorting the at least one package 10. The heater 15 may heat the package 10 to between 100-130°C.

[0077] The control unit 9 of the device 1 for filling at least one package 10 may further be used to control any number of components of the system 20, such as the different processing stations 11-15 and/or the conveyor belt(s) 3. A feedback system may be implemented on a systematic level to allow for the control unit 9 to automatically control the system 20.

[0078] The system 20 may further comprise a user interface (not shown) to allow a user to interface with the control unit 9, and in turn the system 20. The user interface may e.g. be configured to allow a user to vary the first volume of solid food product or the excess volume/stroke length, to adjust the speed of filling operations, or to stop or resume filling operations.

[0079] Fig. 4 shows a method 100 for filling at least one package 10 with solid food product. The method 100 may comprise any number of steps that may be taken in any order or skipped partially or entirely. Each step will thusly be described individually.

[0080] A stocking step 110 comprises stocking the product tank 2 with solid food product. This step 110 may be performed by hand or by any device suitable for transportation of solid food product such as a conveyor belt 3. This step 110 may be performed continually or periodically.

[0081] An inputting step 120 comprises inputting into a pump 4 a larger volume of solid food product than a first volume to be filled. This step 120 may be performed by the pump 4, driven by means of a piston 5.

[0082] A returning step 130 comprises returning the excess volume to the product tank 2. This step 130 may be performed by the pump 4. As explained above, the excess volume is the difference between the input volume and the first volume to be filled. Returning the excess volume to a product tank 2 does not mean that the product returned will reach the product tank 2. The returned product may instead e.g. be lodged in connection tubes.

[0083] A supplying step 140 comprises supplying a fill head 8 with the first volume of solid food product to be filled. This step 140 may be performed using any operative connection between the pump 4 and the fill head 8 such as a tube and may be driven e.g. by the pump 4.

[0084] A filling step 150 comprises filling the at least one package 10 with solid food product. This step 150 may be performed by the fill head 8. Any number of packages 10 may be filled 150 by one fill head 8. In this case, the fill head 8 may need to ensure that each package 10 is filled 150 with the correct amount of solid food product.

[0085] Note that the correct amount to be filled in each package 10 is not the first volume to be filled, the first volume to be filled is the total sum of the volume filled in all packages 10 by the fill head 8 in this step 150.

[0086] A pouring step 160 comprises pouring liquid into the at least one package 10. This step 160 may be performed by a nozzle 11, the liquid being supplied by a liquid tank 12 as discussed previously. The resulting mixture of solid food product and liquid is the food product sold to customers, such as mushrooms or chick peas in brine or fruit in a sugar solution.

[0087] A sealing step 170 comprises sealing the at least one package 10. This step 170 may be performed by a sealer 14 using e.g. adhesives, pressure, fastening means, heat or electricity. The package 10 may need to be folded before being sealed 170, which is to be regarded as being a part of this step 170.

[0088] A retorting step 180 comprises retorting the at least one package 10. This step 180 may be performed by a heater 15 by heating the package 10 after it is sealed 170, the increased heat and pressure that results sterilising the package 10 and its contents.

[0089] From the description above follows that, although various embodiments of the invention have been described and shown, the invention is not restricted thereto, but may also be embodied in other ways within the scope of the subject-matter defined in the following claims.

Claims

1. A device (1) for filling at least one package (10) with a first volume of solid food product, the device (1) comprising:

   a pump (4) operatively connected to a product tank (2) containing the solid food product,
   at least one fill head (8) operatively connected to the pump (4);
   a valve (7) configured to selectively connect the pump (4) to the product tank (2) or to the fill head (8); and
   a control unit (9) configured to control the valve (7) to connect the pump (4) to the product tank (2) or to the fill head (8), and to control the pump (4) to supply the first volume of solid food product to the fill head (8),

characterized in that
the control unit (9) is further configured to control the pump (4) to draw from the product tank (2) a larger volume of solid food product than the first volume and to output an excess volume back to the product tank (2),

2. The device (1) according to claim 1, wherein the pump (4) is a reciprocating pump.

3. The device (1) according to claim 1 or 2, wherein the pump (4) comprises a piston (5).

4. The device (1) according to claim 3, further comprising a servomotor (6) for actuating the piston (5).

5. The device (1) according to claim 4, wherein the control unit (9) is further configured to regulate the movement and/or the speed of the piston (5) in relation to a software profile adapted for filling of specific food particles.

6. The device (1) according to any one of the preceding claims, wherein the excess volume of solid food product drawn from the product tank (2) is between 40-60% of the first volume to be filled.

7. The device (1) according to any one of the preceding claims, wherein the first volume to be filled corresponds to the volume of solid food product to be filled in one package (10).

8. A system (20) for filling at least one package (10) with solid food product, the system (20) comprising:

a device (1) according to any one of the previous claims;
a product tank (2) containing the solid food product;
at least one nozzle (11) for pouring liquid into the at least one package (10); and
a sealer (14) for sealing the at least one package (10).

9. The system (20) according to claim 8, further comprising at least one liquid tank (12) operatively connected to the at least one nozzle (11).

10. The system (20) according to claim 8 or 9, further comprising a conveyor belt (3) for stocking the product tank (2) with solid food product.

11. A method (100) for filling at least one package (10) with a first volume of a solid food product, the method (100) comprising the steps of:

controlling a pump (4) to draw from a product tank (2) a volume of solid food product larger than the first volume;
controlling the pump (4) to return (130) the excess volume to the product tank (2); connecting the pump (4) to a fill head (8) and
controlling the pump (4) to supply (140) the fill head (8) with the first volume of solid food product to be filled.

12. The method (100) according to claim 11, further comprising regulating the movement and/or the speed of a piston (5) in the pump (5) in relation to a software profile adapted for filling of specific food particles.

13. The method (100) according to claim 11 or 12, further comprising a step of filling (150) the at least one package (10) with the solid food product.

14. The method (100) according to any of the claims 11-13, further comprising a step of stocking (110) the product tank (2) with the solid food product.

15. The method (100) according to any one of the claims 11-14, further comprising a step of pouring (160) liquid into the at least one package (10).

16. The method (100) according to any one of the claims 11-15, further comprising a step of sealing (170) the at least one package (10).

17. The method (100) according to any one of the claims 11-16, further comprising a step of retorting (180) the at least one package (10).

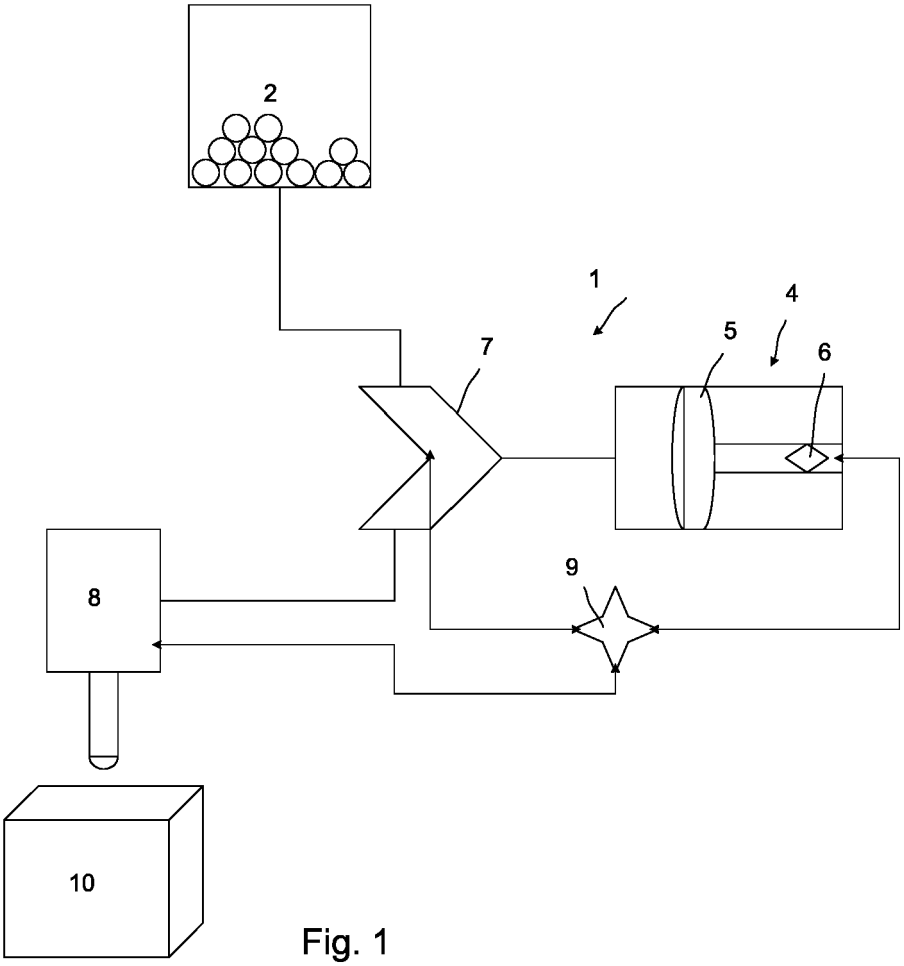

Fig. 1

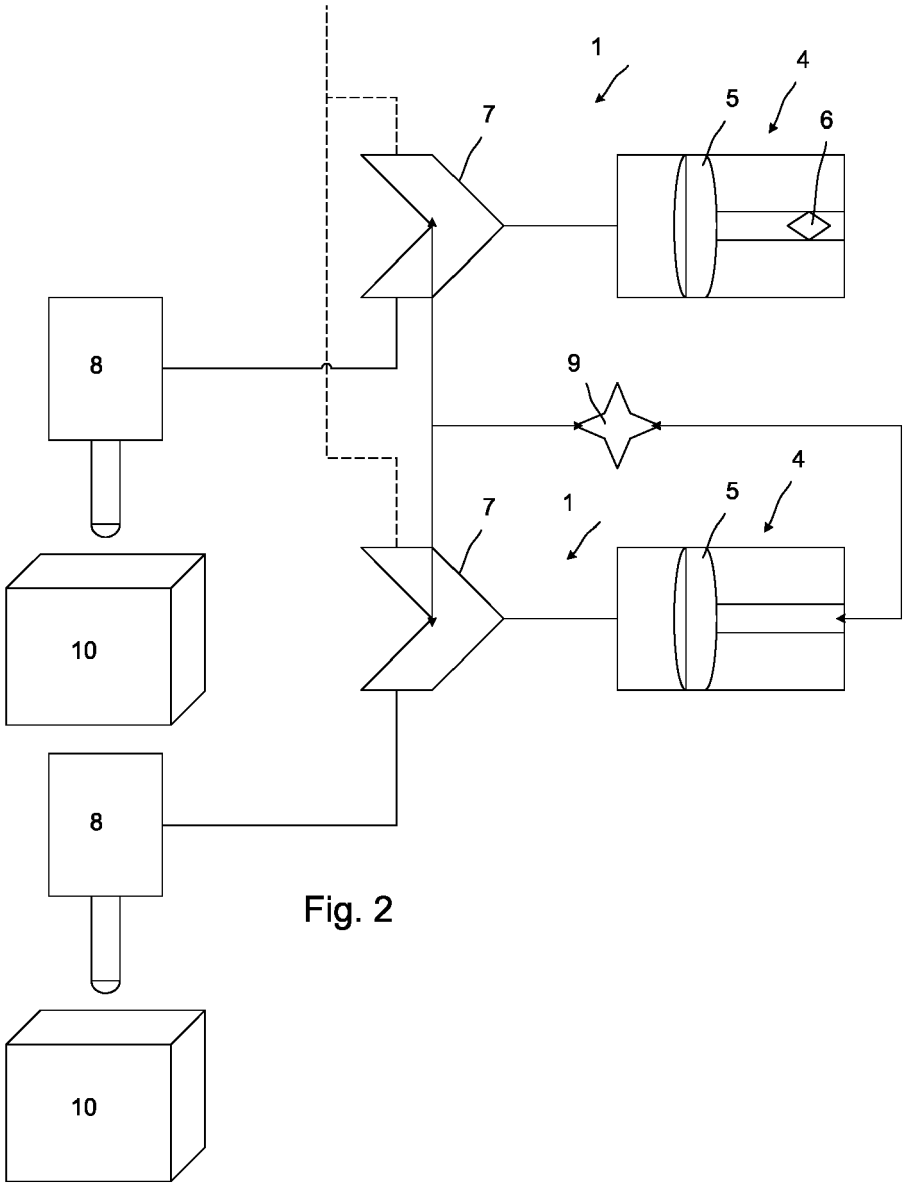

Fig. 2

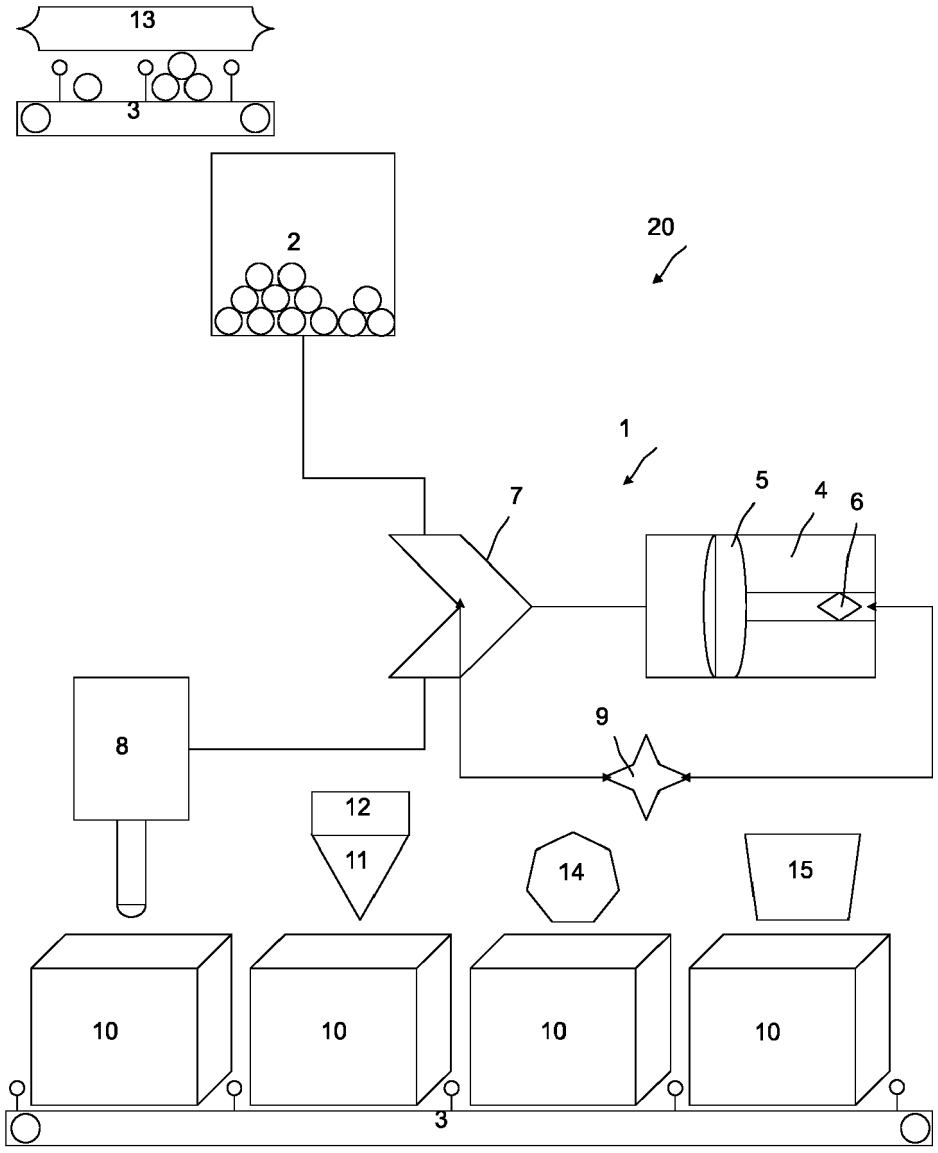

Fig. 3

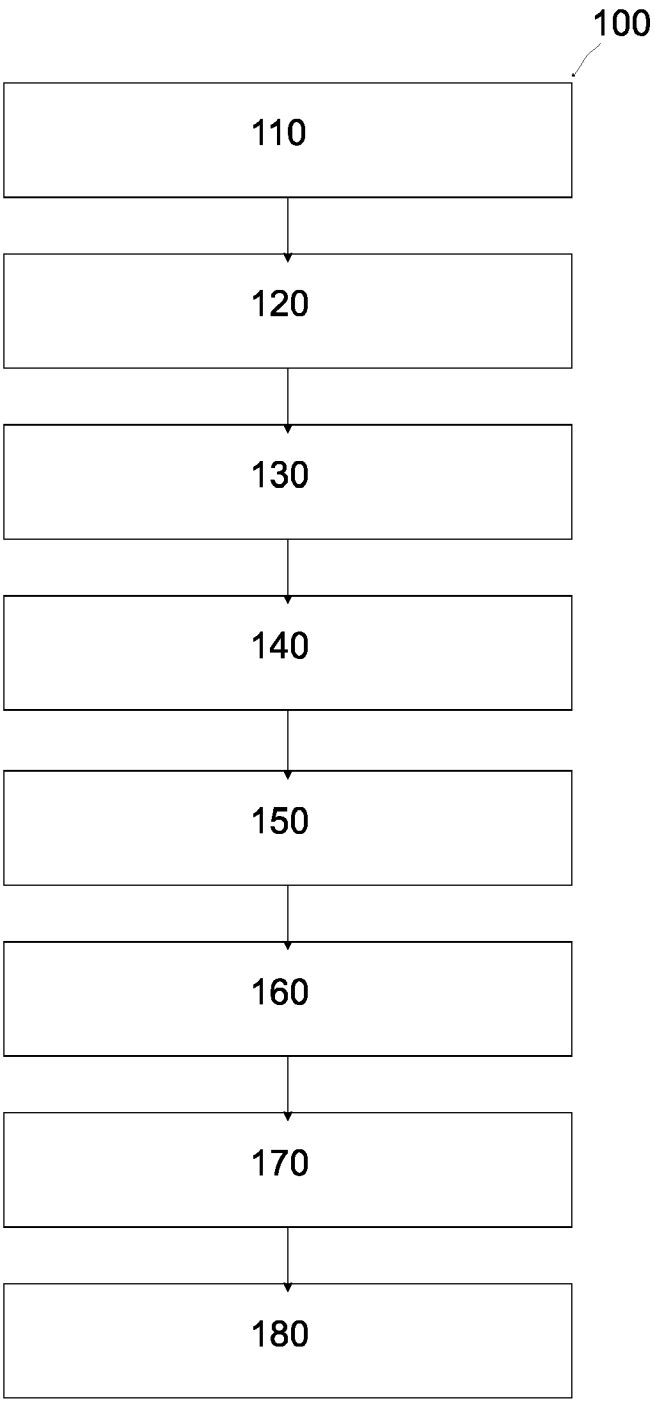

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 4 606 174 A (BERG RUNE [CH]) 19 August 1986 (1986-08-19) * This document discloses the preamble of claim 1: see figures and their description; tank 18 for solid contents, metering pump 17, valve arrangement 19. * -----	1-17	INV. B65B1/36 B65B25/00 B65B25/02
A	US 4 608 810 A (BORDINI GIORGIO [IT]) 2 September 1986 (1986-09-02) * This document discloses the preamble of claim 1: see figures and description thereof; tank 11 for solid contents, metering pump 10, valve arrangement 9 * -----	1-17	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	26 February 2020	Ngo Si Xuyen, G

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