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(54) **A FLASH DRYER FOR DRYING A PRODUCT AND A METHOD FOR DRYING A PRODUCT IN A FLASH DRYER**

SCHNELLTROCKNER ZUM TROCKNEN EINES PRODUKTS UND VERFAHREN ZUM TROCKNEN EINES PRODUKTS IN EINEM SCHNELLTROCKNER

SÉCHEUR ÉCLAIR POUR LE SÉCHAGE D'UN PRODUIT ET PROCÉDÉ DE SÉCHAGE D'UN PRODUIT DANS UN SÉCHEUR ÉCLAIR

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Description

Technical field

[0001] The invention relates to a flash dryer for drying a product and a method for drying a product in a flash dryer or an agitated fluid bed dryer.

Background art

[0002] A flash dryer is used for continuous drying of a filter cake, fibrous materials, paste, sludge or similar materials. The flash dryer uses a rotary disintegrator, mill or impeller rotor for disintegration of the material and provides a change of the structure of the material from the paste or fibrous structure to a more particle shaped structure which is more suitable during the drying. Apertures are provided for supply of hot drying gas and for removal of the spent drying gas and removal of the dried material.

[0003] EP 1 719 963 A2 discloses an apparatus for continuous drying of a product. The apparatus comprises a feeding device, which conveys the product into a rotating disintegrator. In the lower part of the apparatus the drying gasses are being introduced and passed upwards through the slot and into the disintegrator housing. The drying chamber has a conical shape with the point towards the outlet for the drying gasses. The product, because of the rotation of the disintegrator, is being pressed by the wall of the cone away from the the outlet for the drying air with a resulting accelerating force which is greater than the force of gravity. The dried material and the spent drying air are discharged through the product outlet in the upper part of the drying chamber.

[0004] A problem with this type of conventional flash dryers is that the rotating disc in the bottom of the chamber may deform due to the heat from the air introduced via the air inlets. This will in turn lead to an undesired engagement between the disc and the inner wall of the chamber thereby decreasing the life time of the disc.

[0005] Another problem is that the product tends to accumulate between the rotating disc and the bottom portion of the chamber. In general, accumulation of material, in particular of waste materials build-up, at the bottom of a flash dryer is cumbersome to handle as removal of this material generally requires the processing line to be shut down during maintenance, which may entail disassembling the flash dryer and long waiting times in order for the dryer to cool to temperatures which permit operator access to the drying chamber.

[0006] Other dryers are also known for instance from CN 102 628 641 B, KR 2016 0024655 A and CN 102 183 134 B.

Summary of the invention

[0007] It is an object of the present invention to provide an improvement of the flash dryers according to prior art.

A particular object is to provide an improved flash dryer which allows for a more secure and effective drying process of a product.

[0008] According to a first aspect, these and other objects, and/or advantages that will be apparent from the following description of embodiments, are achieved, in full or at least in part, by a flash dryer for drying a product. The flash dryer comprises a chamber having a product inlet and a product outlet, the product inlet being located in a lower section of the chamber and the product outlet in a upper section of the chamber, a disc having a domed shape and being fixedly arranged in the lower section of the chamber below the product inlet, such that a gap is created between an outer edge of the disc and an inner wall of the chamber, wherein a thickness of the disc is decreasing radially from a mid-section of the disc towards the outer edge of the disc, a primary air inlet arranged below the chamber and arranged to provide air into the chamber via the gap, a drive unit arranged below the chamber having a drive shaft extending through a hole in the mid-section of the disc into the lower section of the chamber, a plurality of rotatable disintegrator elements connected to the drive shaft in the lower section of the chamber above the disc, and a rotatable shovel arm connected to the drive shaft in the lower section of the chamber above the disc and below the plurality of disintegrator elements. The shovel arm is adapted to distribute the product in the lower section of the chamber.

[0009] This is advantageous in that the new and inventive shape of the disc eliminates the need to rotate the disc in order to force the product towards the gap and the air flowing therefrom. In turn, the risk of the disc engaging with the inner wall of the chamber due to heat expansion is also eliminated, which will prolong the life time of the disc and the chamber.

[0010] The specially designed shovel arm will help distributing the product in the lower portion of the chamber and push the same towards gap and the air flowing therefrom. The shovel arm is preferably shaped to correspond with the upper surface of the disc, i.e. it may have an inclined or curved shape towards the disc.

[0011] Another advantage is that the product will no longer be able to accumulate between the disc and the bottom portion of the chamber as with the conventional flash dryers due to rotation of the disc.

[0012] The flash dryer may further comprise a secondary air inlet arranged in the lower section of the chamber above the plurality of disintegrator elements.

[0013] The secondary air inlet may comprise a plurality of inner air inlets providing air into the chamber, the inner air inlets being arranged along a periphery of the chamber.

[0014] The disc may comprise protrusions along its outer periphery adapted to direct air from the primary air inlet to enter the chamber via the gap in a substantially vertical direction.

[0015] The outer edge of the disc may be at least partly rounded.

[0016] The plurality of disintegrator elements may be vertically aligned with the location of the product inlet.

[0017] Each one of the plurality of disintegrator elements may comprise a grinding edge thereof such that the product is disintegrated and/or grinded between the grinding edge and the inner wall of the chamber.

[0018] The shovel arm may comprise a plurality of recesses in a bottom section thereof, allowing parts of product located on the disc to escape therethrough.

[0019] The shovel arm may comprise a wing portion attached to an outer edge thereof, the wing portion being vertically aligned with the product outlet such that the product fed into the chamber is cut into pieces when the shovel arm is rotating therein.

[0020] The shovel arm may be arranged in the lower section of the chamber to vertically correspond with the location of the product inlet.

[0021] The chamber may comprise protrusions arranged at a distance from each other along a periphery of the inner wall of the cylinder.

[0022] Each one of the protrusions may comprise an exchangeable cutting edge.

[0023] The flash dryer may further comprise a product conveyer connected to the product inlet.

[0024] According to a second aspect, the objects are achieved in full, or at least in part, by a method for drying a product in a flash dryer. The method comprises introducing the product into a chamber of the flash dryer via a product inlet located in a lower section of the chamber onto a disc having a domed shape and being fixedly arranged in the lower section of the chamber below the product inlet, wherein a thickness of the disc is decreasing radially from a mid-section of the disc towards the outer edge of the disc, rotating a shovel arm in the lower section of the chamber above the disc to distribute the product in the lower section of the chamber, rotating a plurality of rotatable disintegrator elements in the lower section of the chamber above the disc and the shovel arm to disintegrate the product, providing air into the chamber from a primary air inlet arranged below the chamber via a gap between an outer edge of the disc and an inner wall of the chamber to lift and dry the product, providing air into the chamber from a secondary air inlet arranged in the lower section of the chamber above the plurality of disintegrator elements to rotate and dry the product, and exiting the product via a product outlet in an upper section of the chamber.

[0025] It should be noted that the different embodiments of the flash dryer that is described above are exemplifying only. The embodiments may be combined with each other in any suitable way depending on the requirements established for the flash dryer.

[0026] It should be further noted that the different steps of the method described above may be conducted in any suitable order.

[0027] Effects and features of the second aspect of the present invention are largely analogous to those described above in connection with the first aspect the

inventive concept. Embodiments mentioned in relation to the first aspect of the present invention are largely compatible with the further aspects of the invention.

[0028] Generally, all terms used in the claims are to be interpreted according to their ordinary meaning in the technical field, unless explicitly defined otherwise herein. All references to "a/an/the [element, device, component, means, step, etc.]" are to be interpreted openly as referring to at least one instance of said element, device, component, means, step, etc., unless explicitly stated otherwise.

[0029] As used herein, the term "comprising" and variations of that term are not intended to exclude other additives, components, integers or steps.

Brief description of the drawings

[0030] The above objects, as well as additional objects, features and advantages of the present invention, will be more fully appreciated by reference to the following illustrative and non-limiting detailed description of preferred embodiments of the present invention, when taken in conjunction with the accompanying drawings, wherein:

Fig. 1 illustrates a perspective view of an exemplary embodiment of a flash dryer according to a first aspect of the invention.

Fig. 2 illustrates a cross-section of the flash dryer in Fig. 1.

Fig. 3 illustrates a perspective view of an exemplary embodiment of a disc located in a chamber of the flash dryer.

Detailed description of preferred embodiments of the invention

[0031] Fig. 1 and 2 illustrate an exemplary embodiment of a flash dryer 1 for drying a product 2. The flash dryer 1 comprises a chamber 3 having a product inlet 4 and a product outlet 5. The product inlet 4 is located in a lower section of the chamber 3 and the product outlet 5 is located in an upper section of the chamber 3.

[0032] A domed shaped disc 6 is fixedly arranged in a bottom 7 of the chamber 3 below the product inlet 4. The disc 6 has a diameter that is slightly smaller than an inner diameter of an inner wall 8 in the lower section of the chamber 3, such that a gap 9 is created between an outer edge 10 of the disc 6 and the inner wall 8 of the chamber 3. As the disc 6 is has a domed shape, a thickness of the disc 6 is decreasing radially from a mid-section 11 of the disc 6 towards the outer edge 10 of the disc 6. The outer edge 10 of the disc 6 is preferably at least partly rounded for manufacturing purposes and structural strength. The rounded shape of the outer edge 10 of the disc 6 makes it possible to avoid welded corner joints which highly contributes to an increase structural strength of the disc 6. The radius of the rounded outer edge is preferably 50

mm or more. Naturally, the exact size and shape of the disc 6 may be varied. The disc 6 can have a domed shape or for example straight upper surfaces where the thickness of the disc 6 is decreasing radially from a mid-section 11 of the disc 6 towards the outer edge 10 of the disc 6. In this specific embodiment, the disc 5 has a domed shape with a diameter of approximately 3200 mm, maximum height - at the mid-section 11 - of approximately 600 mm, and a minimum height - at the outer edge 10 - of approximately 300 mm.

[0033] A primary air inlet 12 is arranged below the chamber 3 and arranged to provide air into the chamber 3 via the gap 9. The disc 6 comprises protrusions 25 along its outer periphery. The protrusions 25 are illustrated in Fig. 3 and are formed to direct air from the primary air inlet 12 to enter the chamber 3 via the gap 9 in a substantially vertical direction.

[0034] The flash dryer 1 further comprises a drive unit 13 arranged below the chamber 3 which has a drive shaft 14 extending through a hole 15 in the mid-section 11 of the disc 6 into the lower section of the chamber 3.

[0035] A rotatable shovel arm 16 is connected to the drive shaft 14 directly above the disc 6 in the lower section of the chamber 3. The shovel arm 16 rotates above the disc 6 and is used to push the product 2 towards the gap 9 and the air flowing into the chamber 3 therefrom. In a bottom section 17 of the shovel arm 16 is provided a plurality of recesses 18 allowing parts of product 2 located on the disc to escape therethrough. The recesses 18 is used minimize the torque of the shovel arm 16 when distributing the product 2 present on the disc 6. More specifically, the shovel arm 16 comprises a first portion 19 which is flat and extends horizontally from the drive shaft 14 towards the inner wall 8 of the chamber 3, a second portion 20, comprising the recesses 18, which also is flat and extends perpendicular from the first portion 19 vertically in a downward direction towards the disc 6, and a wing portion 21 attached to the first portion 19 at an outer edge 22 thereof. The second portion is preferably shaped to correspond with the shape of the domed shaped of the disc 6 thereby nearly engaging with the disc 6. The wing portion 21 is vertically aligned with the product outlet 5 such that the product 2 fed into the chamber 3 can be cut into pieces by means of the wing portion 21.

[0036] A plurality of rotatable disintegrator elements 23 is connected to the drive shaft 14 directly above the shovel arm 16 in the lower section of the chamber 3. The disintegrator elements 23 are vertically aligned with the location of the product inlet 4. Each one of the disintegrator elements 23 comprises a grinding edge 24 which is used to grind and/or disintegrate the product 2 towards the inner wall 8 of the chamber 3. The grinding edge 24 is replaceable and can be turn over in any suitable position. The shape, extent and number of disintegrator elements 23 may naturally be varied in any suitable way. They can be mounted in different angles in relation to each other, they can be displaced at a specific distance from each other, and they can be mounted in a cross or to overlap.

By the different mounting possibilities of the disintegrator elements 23 to the drive shaft 14 any desired type of disintegration and/or grinding results can be achieved. In this specific embodiment, the disintegrator elements 23 extends more or less from the drive shaft 14 towards the inner wall 8 of the chamber 3 in a tapering manner with the grinding edge 24 provided on the outermost edge thereof.

[0037] A secondary air inlet 26 is arranged in the lower section of the chamber 3 above the disintegrator elements 23. The secondary air inlet 26 comprises an outer air inlet 27 and a plurality of inner air inlets 28 providing air into the chamber 3. The inner air inlets 28 are arranged along the entire periphery of the chamber 3 in a substantially tangential direction to create circular flow along the inner wall 8 of the chamber 3.

[0038] The lower section of the chamber 3 comprises protrusions 29 arranged at a distance from each other along the entire periphery of the inner wall 8 of the chamber 3. Each one of the protrusions 29 comprises an exchangeable cutting edge. The protrusions 29 are vertically aligned with the disintegrator element 23 such that the product 2 can be grinded and/or disintegrated between the grinding edges 24 of the disintegrator elements 23 and the cutting edges of the protrusions 29. The exchangeable cutting edge of the protrusion 29 can be placed in different positions in order to adjust the distance between themselves and the grinding edges 24 of the disintegrator elements 23.

[0039] A product conveyer (not shown), preferably a screw product conveyer, is connected to the product inlet 4 and used to transport the product 2 to the chamber 3 of the flash dryer 1. A pump (not shown) could also be used to input the product 2 to the chamber 3 of the flash dryer 1 via the product inlet 4.

[0040] An exemplary method for drying the product 2 in the flash dryer 1 will now be described in greater detail.

[0041] When the flash dryer 1 is used, the product 2 to be disintegrated and dried is fed into the chamber 3 via the product inlet 4 by means of the product conveyer. The product 2 entering the chamber 3 is cut into pieces by means of the wing portion 21 of the rotating shovel arm 16 and is thereafter disintegrated by means of the rotating disintegrator elements 23 when falling towards the disc 6 in the bottom 7 of the chamber 3 by means of gravity. The product 2 is further grinded and/or disintegrated between the grinding edges 24 of the disintegrator elements 23 and the cutting edges of the protrusions 29.

[0042] When the product 2 reaches the domed shaped disc 6, it will, in cooperation with the second portion 20 of the shovel arm 23, force the product 2 towards the gap 9 between the outer edge 10 of the disc 6 and the inner wall 8 of the chamber 3. Air from the primary air inlet 12 flowing into the chamber 3 via the gap 9 will thereafter lift the product 2 up from the lower section of the chamber 3 towards the upper section thereof. Simultaneously, air from the secondary air inlet 26 is flowing into the chamber 3 to rotate the product 2 therein.

[0043] The disintegrated and dried product 2 will finally exit the chamber 3 via the product outlet 5 in the upper section of the chamber 3. Larger pieces of the product 2 will fall down towards the disc 6 in the bottom 7 of the chamber 3 by means of gravity, through the disintegrator elements 23 once again, and reiterate the process described above.

[0044] As stated above, it is important to understand that the different method steps may be conducted in any suitable order and that the detailed description of the method presented above is of exemplary nature only.

[0045] The skilled person realizes that a number of modifications of the embodiments described herein are possible without departing from the scope of the invention, which is defined in the appended claims.

[0046] For instance, the flash dryer 1 can be equipped with a CIP-system comprising pop-in-pop-out (PIPO) nozzles which are activated by means of pressure in order to clean the inner surfaces of the flash dryer 1 that are in contact with the product 2 inside the chamber 3.

[0047] The disc 6 can be filled with an insulating material, preferably a non-inflammable, such as vermiculite, in order to increase the isolating properties of the disc 6 and limit the heat transfer in a downward direction of the flash dryer 1..

[0048] The disc 6 can be placed in the bottom 7 of the chamber 8 or in fact constitute the bottom 7 of the chamber 3.

Claims

1. A flash dryer (1) for drying a product (2), comprising:

a chamber (3) having a product inlet (4) and a product outlet (5), the product inlet (4) being located in a lower section of the chamber (3) and the product outlet (5) in an upper section of the chamber (3),

a disc (6) having a domed shape and being fixedly arranged in the lower section of the chamber (3) below the product inlet (4), such that a gap (9) is created between an outer edge (10) of the disc (6) and an inner wall (8) of the chamber (3), wherein a thickness of the disc (6) is decreasing radially from a mid-section (11) of the disc (6) towards the outer edge (10) of the disc (6),

a primary air inlet (12) arranged below the chamber (3) and arranged to provide air into the chamber (3) via the gap (9),

a drive unit (13) arranged below the chamber (3) having a drive shaft (14) extending through a hole (15) in the mid-section (11) of the disc (6) into the lower section of the chamber (3),

a plurality of rotatable disintegrator elements (23) connected to the drive shaft (14) in the lower section of the chamber (3) above the disc (6),

and

a rotatable shovel arm (16) connected to the drive shaft (14) in the lower section of the chamber (3) above the disc (6) and below the plurality of disintegrator elements (23), the shovel arm (16) being adapted to distribute the product (2) in the lower section of the chamber (3).

2. The flash dryer (1) according to claim 1, further comprising a secondary air inlet (26) arranged in the lower section of the chamber (3) above the plurality of disintegrator elements (23).
3. The flash dryer (1) according to claim 2, wherein the secondary air inlet (26) comprises a plurality of inner air inlets (28) providing air into the chamber (3), the inner air inlets (28) being arranged along a periphery of the chamber (3).
4. The flash dryer (1) according to any one of the preceding claims, wherein the disc (6) comprises protrusions (25) along its outer periphery adapted to direct air from the primary air inlet (12) to enter the chamber (3) via the gap (9) in a substantially vertical direction.
5. The flash dryer (1) according to any one of the preceding claims, wherein the outer edge (10) of the disc (6) is at least partly rounded.
6. The flash dryer (1) according to any one of the preceding claims, wherein the plurality of disintegrator elements (23) are vertically aligned with the location of the product inlet (4).
7. The flash dryer (1) according to any one of the preceding claims, wherein each one of the plurality of disintegrator elements (23) comprises a grinding edge (24) thereof such that the product (3) is grinded and/or disintegrated between the grinding edge (24) and the inner wall (8) of the chamber (3).
8. The flash dryer (1) according to any one of the preceding claims, wherein the shovel arm (16) comprises a plurality of recesses (18) in a bottom section (17) thereof, allowing parts of product (2) located on the disc (6) to escape therethrough.
9. The flash dryer (1) according to any one of the preceding claims, wherein the shovel arm (16) comprises a wing portion (21) attached to an outer edge (22) thereof, the wing portion (21) being vertically aligned with the product inlet (4) such that the product (2) fed into the chamber (3) is cut into pieces.
10. The flash dryer (1) according to any one of the preceding claims, wherein the shovel arm (16) is arranged in the lower section of the chamber (3) to vertically correspond with the location of the product

inlet (4).

11. The flash dryer (1) according to any one of the preceding claims, wherein the chamber (3) comprises protrusions (29) arranged at a distance from each other along a periphery of the inner wall (8) of the chamber (3). 5
12. The flash dryer (1) according to claim 11, wherein each one of the protrusions (29) comprises an exchangeable cutting edge. 10
13. The flash dryer (1) according to any one of the preceding claims, further comprising a product conveyor connected to the product inlet (4). 15
14. A method for drying a product (2) in a flash dryer (1), comprising:

introducing the product (2) into a chamber (3) of the flash dryer (1) via a product inlet (4) located in a lower section of the chamber (3) onto a disc (6) having a domed shape and being fixedly arranged in the lower section of the chamber (3) below the product inlet (4), wherein a thickness of the disc (6) is decreasing radially from a mid-section (11) of the disc (6) towards the outer edge (10) of the disc (6), 20

rotating a shovel arm (16) in the lower section of the chamber (3) above the disc (6) to distribute the product (2) in the lower section of the chamber (3), 25

rotating a plurality of rotatable disintegrator elements (23) in the lower section of the chamber (3) above the disc (6) and the shovel arm (16) to disintegrate the product (2), 30

providing air into the chamber from a primary air inlet arranged below the chamber via a gap between an outer edge of the disc and an inner wall of the chamber to lift and dry the product, providing air into the chamber (3) from a secondary air inlet (26) arranged in the lower section of the chamber (3) above the plurality of disintegrator elements (23) to rotate and dry the product (2), and 40

exiting the product (2) via a product outlet (5) in an upper section of the chamber (3). 45

Patentansprüche 50

1. Schnelltrockner (1) zum Trocknen eines Produkts (2), der Folgendes aufweist:

eine Kammer (3), die einen Produkteinlass (4) und einen Produktauslass (5) aufweist, wobei sich der Produkteinlass (4) in einem unteren Bereich der Kammer (3) befindet und sich der 55

Produktauslass (5) in einem oberen Bereich der Kammer (3) befindet,

eine Scheibe (6), die eine kuppelförmige Form aufweist und derart unbeweglich in dem unteren Bereich der Kammer (3) unter dem Produkteinlass (4) angeordnet ist, dass ein Spalt (9) zwischen dem Außenrand (10) der Scheibe (6) und einer Innenwand (8) der Kammer (3) gebildet wird, wobei eine Stärke der Scheibe (6) radial von einem Mittenbereich (11) der Scheibe (6) zum Außenrand (10) der Scheibe (6) hin abnimmt,

einen primären Lufteinlass (12), der unter der Kammer (3) angeordnet ist und dazu angeordnet ist, über den Spalt (9) Luft in die Kammer (3) zuzuführen, eine Antriebseinheit (13), die unter der Kammer (3) angeordnet ist und eine Antriebswelle (14) aufweist, die sich durch ein Loch (15) in dem Mittenbereich (11) der Scheibe (6) in den unteren Bereich der Kammer (3) erstreckt, eine Vielzahl an drehbaren Zerkleinerungselementen (23), die mit der Antriebswelle (14) in den unteren Bereich der Kammer (3) über der Scheibe (6) verbunden sind, und einen drehbaren Schaufelarm (16), der mit der Antriebswelle (14) in dem unteren Bereich der Kammer (3) über der Scheibe (6) und unter der Vielzahl an Zerkleinerungselementen (23) verbunden ist, wobei der Schaufelarm (16) dazu ausgelegt ist, das Produkt (2) in dem unteren Bereich der Kammer (3) zu verteilen.

2. Schnelltrockner (1) nach Anspruch 1, der ferner einen sekundären Lufteinlass (26) aufweist, der in dem unteren Bereich der Kammer (3) über der Vielzahl an Zerkleinerungselementen (23) angeordnet ist.

3. Schnelltrockner (1) nach Anspruch 2, wobei der sekundäre Lufteinlass (26) eine Vielzahl an inneren Lufteinlässen (28) aufweist, die Luft in die Kammer (3) zuführen, wobei die inneren Lufteinlässe (28) entlang eines Umfangs der Kammer (3) angeordnet sind.

4. Schnelltrockner (1) nach einem der vorhergehenden Ansprüche, wobei die Scheibe (6) Vorsprünge (25) entlang ihres Außenumfangs aufweist, die dazu ausgelegt sind, Luft vom primären Lufteinlass (12) über den Spalt (9) in einer im Wesentlichen vertikalen Richtung in die Kammer (3) zu leiten. 50

5. Schnelltrockner (1) nach einem der vorhergehenden Ansprüche, wobei der Außenrand (10) der Scheibe (6) mindestens teilweise abgerundet ist.

6. Schnelltrockner (1) nach einem der vorhergehenden Ansprüche, wobei die Vielzahl an Zerkleinerungs-

- elementen (23) vertikal mit der Position des Produkteinlasses (4) ausgerichtet ist.
7. Schnellrockner (1) nach einem der vorhergehenden Ansprüche, wobei jedes der Vielzahl an Zerkleinerungselementen (23) einen Zerreibungsrand (24) daran aufweist, derart, dass das Produkt (3) zwischen dem Zerreibungsrand (24) und der Innenwand (8) der Kammer (3) zerrieben und/oder zerkleinert wird. 5 10
8. Schnellrockner (1) nach einem der vorhergehenden Ansprüche, wobei der Schaufelarm (16) eine Vielzahl an Aussparungen (18) in einem Bodenbereich (17) davon aufweist, die gestatten, dass Produktstücke (2), die sich auf der Scheibe (6) befinden, hindurch fallen können. 15
9. Schnellrockner (1) nach einem der vorhergehenden Ansprüche, wobei der Schaufelarm (16) einen Flügelabschnitt (21) aufweist, der an einem Außenrand (22) davon angebracht ist, wobei der Flügelabschnitt (21) derart vertikal mit dem Produkteinlass (4) ausgerichtet ist, dass das Produkt (2), das in die Kammer (3) geführt wird, in Stücke zerschnitten wird. 20 25
10. Schnellrockner (1) nach einem der vorhergehenden Ansprüche, wobei der Schaufelarm (16) im unteren Bereich der Kammer (3) vertikal entsprechend der Position des Produkteinlasses (4) angeordnet ist. 30
11. Schnellrockner (1) nach einem der vorhergehenden Ansprüche, wobei die Kammer (3) Vorsprünge (29) aufweist, die in einem Abstand voneinander entlang eines Umfangs der Innenwand (8) der Kammer (3) angeordnet sind. 35
12. Schnellrockner (1) nach Anspruch 11, wobei jeder der Vorsprünge (29) eine austauschbare Schneidkante aufweist. 40
13. Schnellrockner (1) nach einem der vorhergehenden Ansprüche, der ferner ein Produktförderband aufweist, das mit dem Produkteinlass (4) verbunden ist. 45
14. Verfahren zum Trocknen eines Produkts (2) in einem Schnellrockner (1), das Folgendes umfasst:
- Einführen des Produkts (2) in eine Kammer (3) des Schnellrockners (1) über einen Produkteinlass (4), der sich in einem unteren Bereich der Kammer (3) befindet, auf eine Scheibe (6), die eine kuppelförmige Form aufweist und unbeweglich in dem unteren Bereich der Kammer (3) unter dem Produkteinlass (4) angeordnet ist, wobei eine Stärke der Scheibe (6) radial von einem Mittenbereich (11) der Scheibe (6) zum Außenrand (10) der Scheibe (6) hin ab-

nimmt,
Drehen eines Schaufelarms (16) in dem unteren Bereich der Kammer (3) über der Scheibe (6), um das Produkt (2) in dem unteren Bereich der Kammer (3) zu verteilen,
Drehen einer Vielzahl an drehbaren Zerkleinerungselementen (23) in dem unteren Bereich der Kammer (3) über der Scheibe (6) und dem Schaufelarm (16), um das Produkt (2) zu zerkleinern,
Zuführen von Luft in die Kammer von einem primären Lufteinlass, der unter der Kammer angeordnet ist, über einen Spalt zwischen einem Außenrand der Scheibe und einer Innenwand der Kammer, um das Produkt anzuheben und zu trocknen,
Zuführen von Luft in die Kammer (3) von einem sekundären Lufteinlass (26), der in dem unteren Bereich der Kammer (3) über der Vielzahl an Zerkleinerungselementen (23) angeordnet ist, um das Produkt (2) zu drehen und zu trocknen, und
Ausgeben des Produkts (2) über einen Produktauslass (5) in einem oberen Bereich der Kammer (3).

Revendications

1. Sécheur éclair (1) pour le séchage d'un produit (2), comprenant :
- une chambre (3) comportant une entrée de produit (4) et une sortie de produit (5), l'entrée de produit (4) se trouvant dans une section inférieure de la chambre (3) et la sortie de produit (5) dans une section supérieure de la chambre (3), un disque (6) présentant une forme de dôme et agencé fixement dans la section inférieure de la chambre (3) sous l'entrée de produit (4), de manière à créer un espace (9) entre un bord extérieur (10) du disque (6) et une paroi intérieure (8) de la chambre (3), dans lequel une épaisseur du disque (6) diminue radialement à partir d'une section centrale (11) du disque (6) vers le bord extérieur (10) du disque (6), une entrée d'air primaire (12) agencée sous la chambre (3) et conçue pour fournir de l'air dans la chambre (3) par le biais de l'espace (9), une unité d'entraînement (13) agencée sous la chambre (3), laquelle comporte un arbre d'entraînement (14) s'étendant à travers un orifice (15) dans la section centrale (11) du disque (6) dans la section inférieure de la chambre (3), une pluralité d'éléments de désintégrateur rotatifs (23) reliés à l'arbre d'entraînement (14) dans la section inférieure de la chambre (3) au-dessus du disque (6), et

- un bras de pelle rotatif (16) relié à l'arbre d'entraînement (14) dans la section inférieure de la chambre (3) au-dessus du disque (6) et sous la pluralité d'éléments de désintégrateur (23), le bras de pelle (16) étant adapté pour distribuer le produit (2) dans la section inférieure de la chambre (3).
2. Sécheur éclair (1) selon la revendication 1, comprenant en outre une entrée d'air secondaire (26) agencée dans la section inférieure de la chambre (3) au-dessus de la pluralité d'éléments de désintégrateur (23).
 3. Sécheur éclair (1) selon la revendication 2, dans lequel l'entrée d'air secondaire (26) comprend une pluralité d'entrées d'air internes (28) fournissant de l'air dans la chambre (3), les entrées d'air internes (28) étant agencées le long d'une périphérie de la chambre (3).
 4. Sécheur éclair (1) selon l'une quelconque des revendications précédentes, dans lequel le disque (6) comprend des saillies (25) le long de sa périphérie extérieure, lesquelles sont adaptées pour guider de l'air à partir de l'entrée d'air primaire (12) pour l'introduire dans la chambre (3) par le biais de l'espace (9) dans une direction substantiellement verticale.
 5. Sécheur éclair (1) selon l'une quelconque des revendications précédentes, dans lequel le bord extérieur (10) du disque (6) est au moins partiellement arrondi.
 6. Sécheur éclair (1) selon l'une quelconque des revendications précédentes, dans lequel la pluralité d'éléments de désintégrateur (23) sont alignés verticalement avec l'emplacement de l'entrée de produit (4).
 7. Sécheur éclair (1) selon l'une quelconque des revendications précédentes, dans lequel chacun parmi la pluralité d'éléments de désintégrateur (23) comprend un bord de meulage (24), de sorte que le produit (3) est broyé et/ou désintégré entre le bord de meulage (24) et la paroi intérieure (8) de la chambre (3).
 8. Sécheur éclair (1) selon l'une quelconque des revendications précédentes, dans lequel le bras de pelle (16) comprend une pluralité de cavités (18) dans une section basse (17) de celui-ci, permettant à des parties de produit (2) situées sur le disque (6) de s'échapper à travers celles-ci.
 9. Sécheur éclair (1) selon l'une quelconque des revendications précédentes, dans lequel le bras de pelle (16) comprend une partie d'aile (21) fixée à un bord extérieur (22) de celui-ci, la partie d'aile (21) étant alignée verticalement avec l'entrée de produit (4) de telle façon que le produit (2) alimenté dans la chambre (3) est découpé en morceaux.
 10. Sécheur éclair (1) selon l'une quelconque des revendications précédentes, dans lequel le bras de pelle (16) est agencé dans la section inférieure de la chambre (3) pour correspondre verticalement à l'emplacement de l'entrée de produit (4).
 11. Sécheur éclair (1) selon l'une quelconque des revendications précédentes, dans lequel la chambre (3) comprend des saillies (29) agencées à une distance les unes par rapport aux autres le long d'une périphérie de la paroi intérieure (8) de la chambre (3).
 12. Sécheur éclair (1) selon la revendication 11, dans lequel chacune des saillies (29) comprend un bord de coupe remplaçable.
 13. Sécheur éclair (1) selon l'une quelconque des revendications précédentes, comprenant en outre un convoyeur de produit relié à l'entrée de produit (4).
 14. Procédé de séchage d'un produit (2) dans un sécheur éclair (1), comprenant :
 - l'introduction du produit (2) dans une chambre (3) du sécheur éclair (1) par une entrée de produit (4) située dans une section inférieure de la chambre (3) sur un disque (6) présentant une forme de dôme et agencé fixement dans la section inférieure de la chambre (3) sous l'entrée de produit (4), dans lequel une épaisseur du disque (6) diminue radialement à partir d'une section centrale (11) du disque (6) vers le bord extérieur (10) du disque (6),
 - la mise en rotation d'un bras de pelle (16) dans la section inférieure de la chambre (3) au-dessus du disque (6) pour distribuer le produit (2) dans la section inférieure de la chambre (3),
 - la mise en rotation d'une pluralité d'éléments de désintégrateur rotatifs (23) dans la section inférieure de la chambre (3) au-dessus du disque (6) et du bras de pelle (16) pour désintégrer le produit (2),
 - l'apport d'air dans la chambre à partir d'une entrée d'air primaire agencée sous la chambre par le biais d'un espace entre un bord extérieur du disque et une paroi intérieure de la chambre pour soulever et sécher le produit,
 - l'apport d'air dans la chambre (3) à partir d'une entrée d'air secondaire (26) agencée dans la section inférieure de la chambre (3) au-dessus de la pluralité d'éléments de désintégrateur (23) pour mettre en rotation et sécher le produit (2), et
 - le retrait du produit (2) par une sortie de produit

(5) dans une section supérieure de la chambre
(3).

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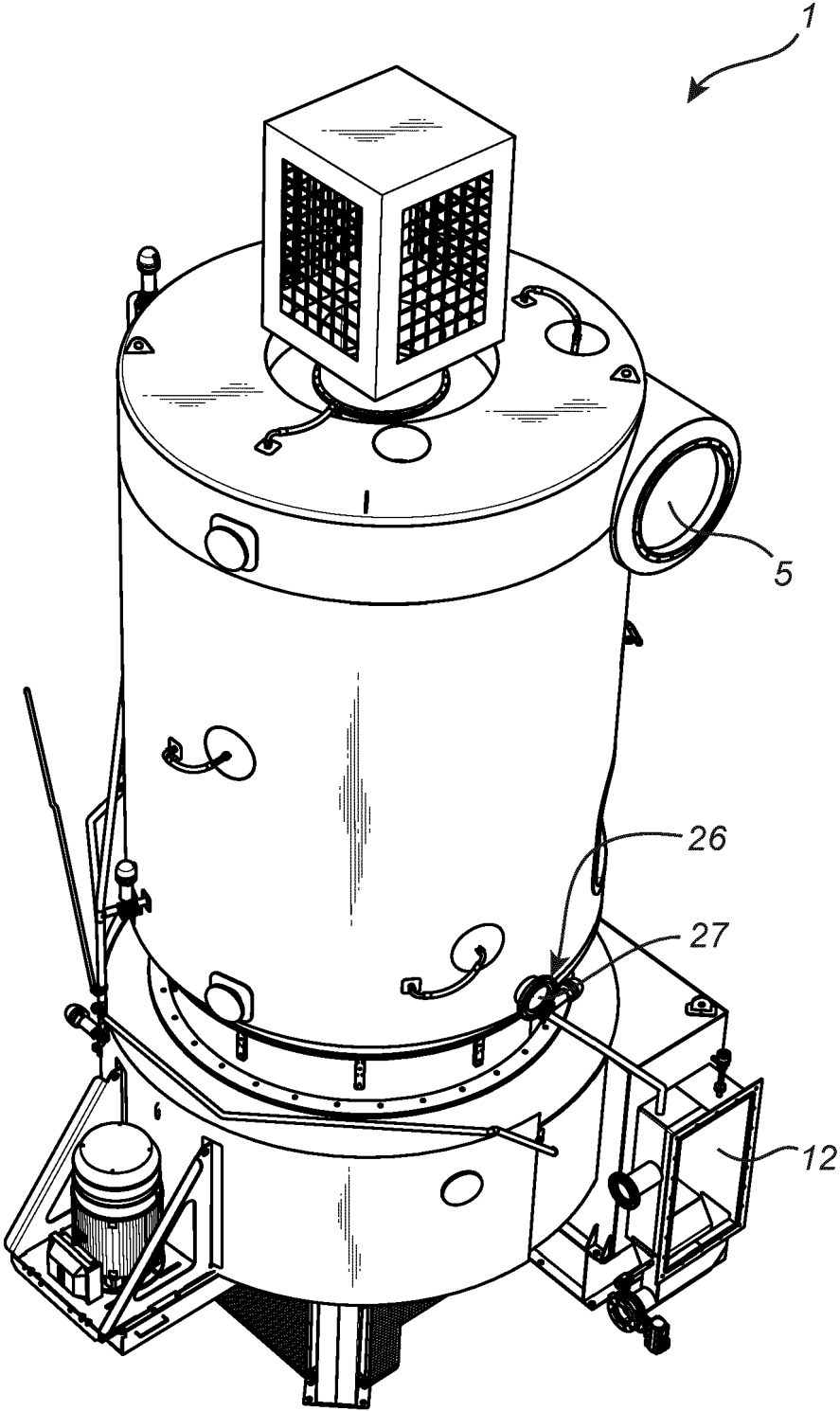


Fig. 1

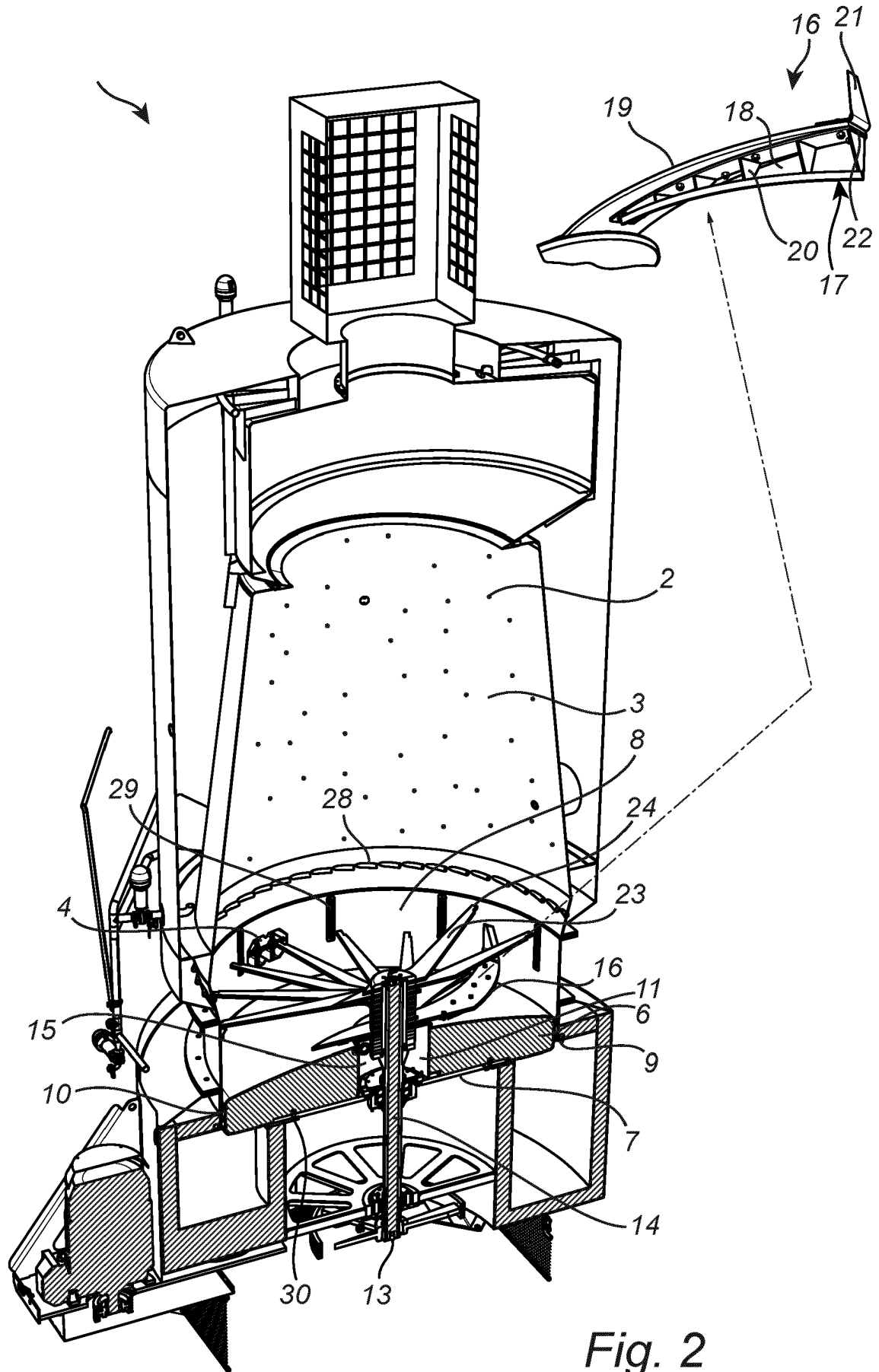


Fig. 2

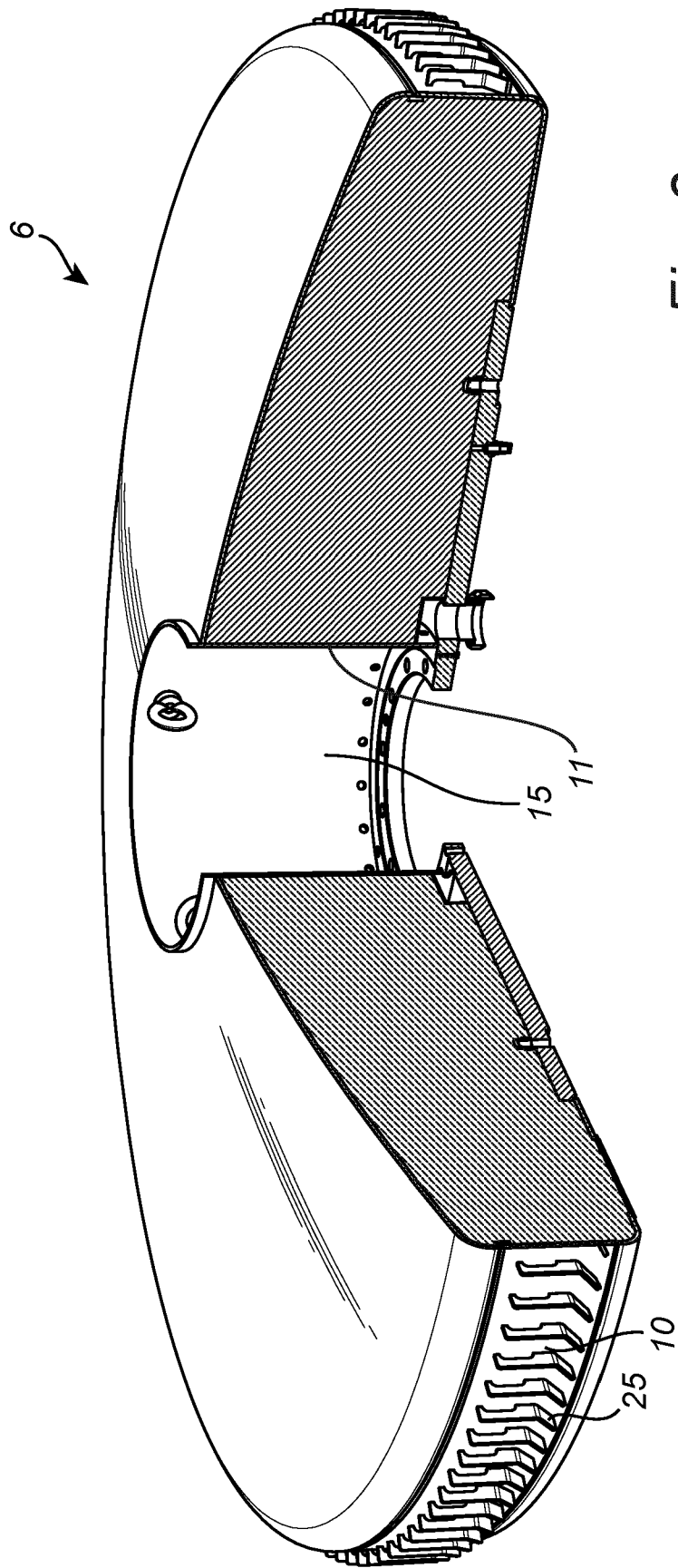


Fig. 3

REFERENCES CITED IN THE DESCRIPTION

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