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(71) Applicant: **Sahene Engineering v/Henning Rasmussen**
4420 Regstrup (DK)

(72) Inventor: **Sahene Engineering v/Henning Rasmussen**
4420 Regstrup (DK)

(54) Apparatus for continuous drying of a filter cake, fibrous materials, paste, sludge, fibres, and similar materials

(57) The apparatus embodies a feeding device (1), which conveys the paste/fibrous feeding material into a rotating disintegrator (4). In the under part of the apparatus the drying gasses (6) are being introduced and passed upwards through the slot (8) and into the disintegrator housing (4). The drying chamber has a conical shape with the point towards the outlet for the drying gasses (14), where the symmetrical rotating layer of powder (16), because of the rotation of the disintegrator (4), is being pressed by the wall of the cone (12) away from the the outlet for the drying air (14) with a resulting accelerating force (13) which is greater than the force of gravity. The symmetrical rotating layer of powder (16) is being held in position during the stay in the drying/floating zone (5). The finally dried material and the spent drying air is being discharged through the product outlet (17) and (18) in the upper part of the drying chamber.

A step 2 air volume (9), which has a for the particles moderate temperature, is being blown from the ring chamber (10) through slots or nozzles (11) into the drying/floating zone and can for this reason gently after dry the symmetrical rotating layer of powder (16) as in a fluid bed.

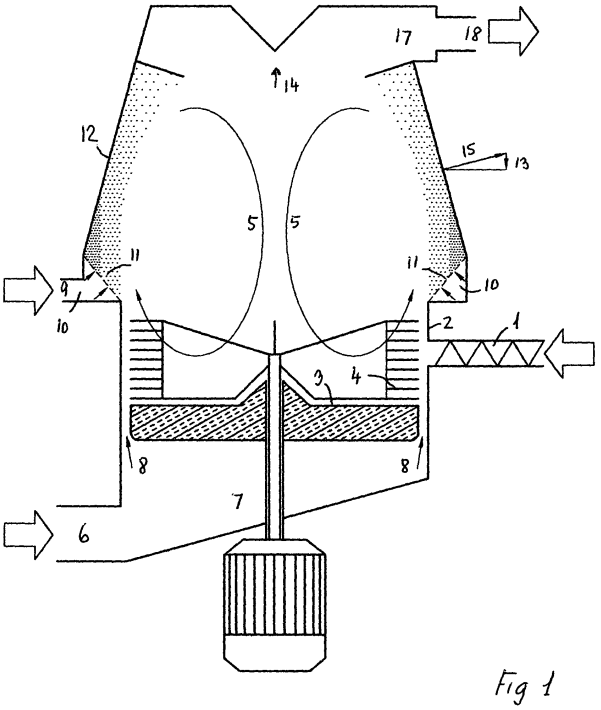

Fig 1

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Description

[0001] The invention is concerned with an apparatus for continuous drying of a filter cake, fibrous materials, paste, sludge or similar materials and of a nature that uses a rotary disintegrator, mill or impeller rotor for disintegration of the material and hence a change of the structure of the material from the paste/fibrous structure which it is very difficulty to treat efficiently in a drying apparatus to a more particle shaped structure which is more suitable during the drying.

[0002] Drying apparatuses of this type are already commonly known as f. inst. Described in DK 149.538B and in patent applications nos. 318/69 of 21. Jan. 1969 and 0098/91 of 21. Jan 1991.

[0003] The purpose with the invention is to stabilize the particle movements in the drying chamber and improve the drying process so that the particles will be gentler and more efficiently dried compared to the commonly known technique. The purpose is also in special cases to dry particles in gases, which are desired to be encapsulated in the dried particles.

[0004] These purposes will be obtained by, in the drying chamber for the particles, to apply a powerful accelerating force which is axial oriented and directed opposite the direction of the outgoing drying air in order to hold the particles in position during the stay in the drying/floating zone. In the same zone a step 2 air volume is blown tangentially with the drying chamber wall into the drying chamber and with a velocity which supports the rotation of the particles. The step 2 air volume is normal dry and has a for the particles moderate temperature.

[0005] A force opposing the direction of outgoing air much greater than the force of gravitation, is obtained by applying the particles a fierce axial rotation in the drying chamber by means of a disintegrator or an impeller together with step 2 air tangentially blown into the drying/floating zone and by a conical design of the drying chamber with the point of the cone pointing towards the outlet for the drying air.

[0006] The particles will due to the rotation be pressed by means of the wall of the cone towards the wide end of the cone where the particles are being gently after dried by means of the step 2 air volumes.

[0007] If the drying chamber was cylindrical or conical with the wide end pointing towards the outlet for the drying air the force of gravity would influence the particles only. Consequently the particles will jump up and down which will result in an uneven drying of the particles.

[0008] The invention is further explained in the following with reference to the drawing where

[0009] Figure 1 shows the drying chamber according to the invention with impeller rotor or disintegrator together with the placement of the rotating powder layer in the drying chamber and

[0010] Figure 2 shows the drying chamber in a closed cycle drying air stream according to the invention with powder outlet in the side of the vessel.

[0011] Figure 1 shows a cut in the drying chamber. The paste like material, which must be dried, is being fed into the drying chamber by means of a charging apparatus, f. inst. a screw conveyor 1, to the predominant surface of revolution disintegrator housing 2 delineated by the bottom 3, where the paste is being disintegrated by the rotating disintegrator 4 which essentially has a vertical rotation, at the same time the just introduced material is being mixed with the semi-dried material, which is being fed into the disintegrator housing by the air stream 5. The air stream 5 is being created, as in a ventilator, by means of an impeller or disintegrator 4, which is rotating and thereby is blowing air away and also sucks air.

[0012] The under part of the disintegrator housing 7, is being fed with drying gas and this is passing up through the slot 8, which is rotationally symmetrical, and into the disintegrator housing and by contact with the material being dried in the disintegrator housing a pre-drying of this material is being implemented.

[0013] A step 2 drying air is being fed through the ring formed chamber 10 with a, for the particles in the drying/floating zone 5, moderate temperature. The step 2 air volume is being blown rotationally symmetrical and tangential into the drying chamber cylinder 12 through the slots 11.

[0014] A centrifugal power 13 much greater than the force of gravity and oppositely directed to the drying air outlet 14, is being achieved by applying the symmetrically rotating layer of powder 16 a severe and axial rotation in the floating zone in the drying chamber 5 by means of a disintegrator or impeller system 4, together with the support by step 2 air 9 tangentially blown into the floating zone and by designing the drying chamber 12 conically with the point towards the outlet for the drying air 14. Because of the effect of the rotation the particles will by means of the wall of the cone 12 by means of an accelerating force 15 be pressed towards the wide part of the cone and by a resulting accelerating force 13.

[0015] The accelerating force 13 holds the particles in position during the stay in the floating zone until the particles are sufficiently dried to escape through the outlet 14 from the drying chamber together with the drying air. The symmetrical and rotating layer of powder 16 is being after dried as in a fluid bed by means of the step 2 air volume 9, which is normally dry and has a for the particles moderate temperature.

[0016] The finally dried material is being removed together with the now cooled down drying air through the product point of discharge.

[0017] The invention concerning drying of particles in an environment of gasses, which are wanted to be encapsulated in the dried particles, is being explained further with reference to figure 2.

[0018] There are certain materials such as f. inst. sludge, which contains gasses, which it is desirable to preserve in the dried powder.

[0019] An arrangement of the drying chamber 1 as shown in figure 1 with a closed cycle for the drying air,

where the fines powder is being filtrated in a filtration room 3 and where the drying air is being cooled and dewatered in a condenser 5 afterwards being blown by means of the fan 6 into the drying chamber 2 passing through a filter 7 and passing through an indirect heating source 8. The particles are being discharged through an outlet device 10 as round solid balls. Inside the balls are small pockets, which contains the gasses, which originally were in the material 1 or from gasses, which were fed into the drying gasses. From the filter 3 the fines powder is being conveyed back to the feeding device for the material to be dried and is being mixed with the paste like material. The step 2 air volume, as shown in figure 1, is being regulated for volume and temperature by means of the dampers 9.

Claims

1. Apparatus for continous drying of filter cake, paste, fibrous materials, sludge, fibres and similar materials and of a nature figure 1, which incorporates a feeding device f. inst. A screw conveyor (1), which feeds the paste/fibrous feed product to a rotating disintegrator (4) which has an essentially vertical axis of rotation in a main form predominantly surface of revolution Housing (2) delineated by the bottom (3), which from below is supplied with drying gasses (6), which passes upwards through the slot (8) and into the disintegrator housing (4), being **characterized in that**, the drying chamber (12)is designed as a cone with the point towards the outlet (14), where the symmetrical rotating layer of powder (16) because of rotation of disintegrator or impeller system (4) is being pressed by the wall of the cone (12) away from the outlet (14) with a resulting accelerating force (13) which is greater than the force of gravity and the symmetrical rotating layer of powder (16) thus being held in position during the stay in the drying/floating zone (5).

2. Apparatus according to claim 1, being **characterized in that** a step 2 air volume (9), which has a for the particles moderate temperature, is being blown from the ring chamber (10) through slots or nozzles (11) into the drying/floating zone and hence can gently after dry the symmetrical rotating layer of powder (16) as in a fluid bed.

3. Apparatus according to claim 1, which with an arrangement of the drying chamber (1) figure 2 in a closed cycle for the drying air, when the fines powder is being filtrated in a filter room (3) and the drying air is being cooled and dewatered in a condenser (5), afterwards being pumped by a fan (6) into the drying chamber (2) through a filter (7) and through an indirect heating device (8). From the filter (3) the fines powder is being conveyed back to the feeding device and mixed with the paste like material. The step 2 air volume, as shown in figure 1, is being regulated for volume and temperature by means of the dampers (9). Being **characterized in that** the particles which are being discharged from the air lock (10), are solid and have small pockets which contain the gasses which were in the feed material (1) or gasses which have been fed into the drying gasses.

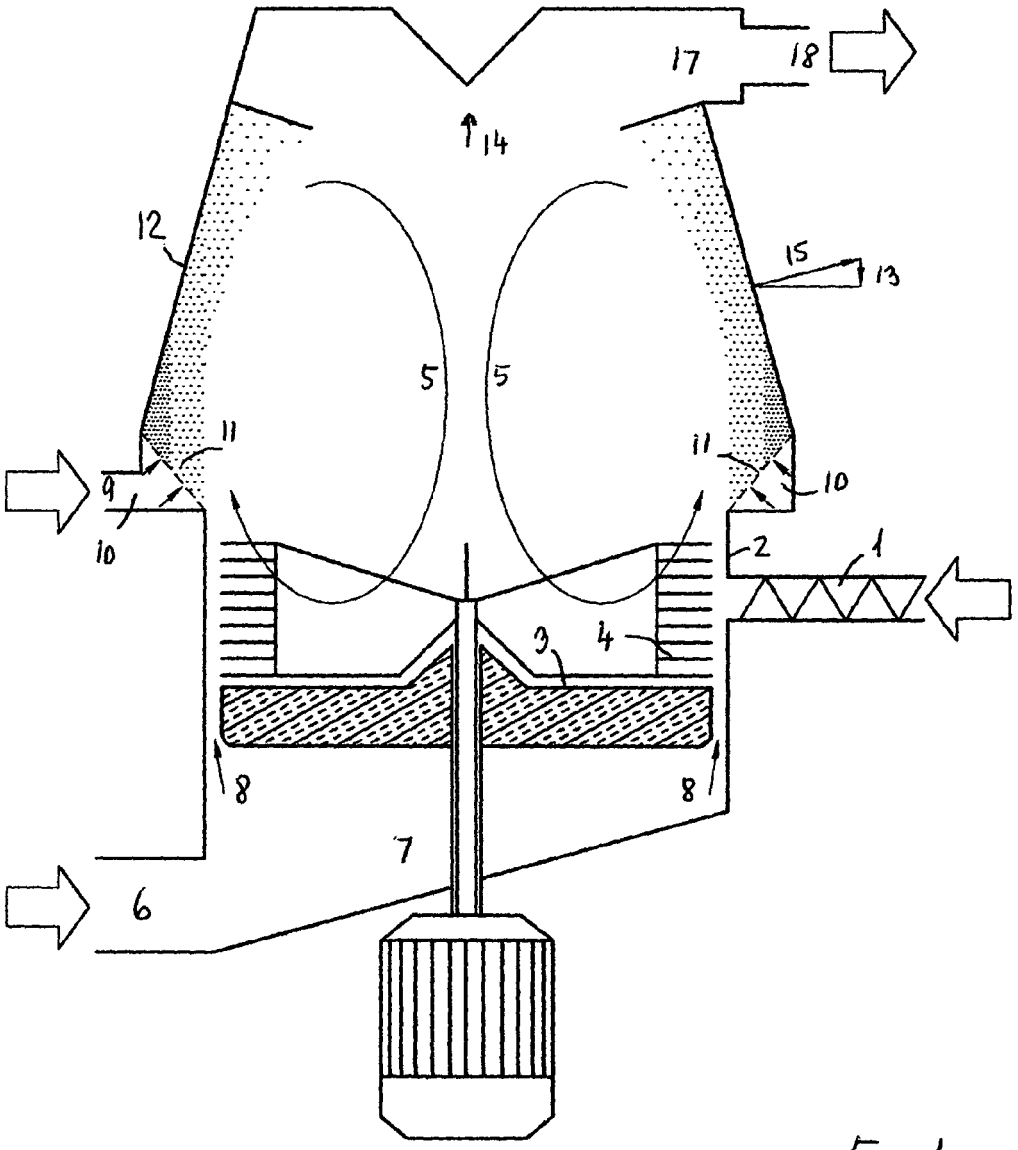

Fig 1

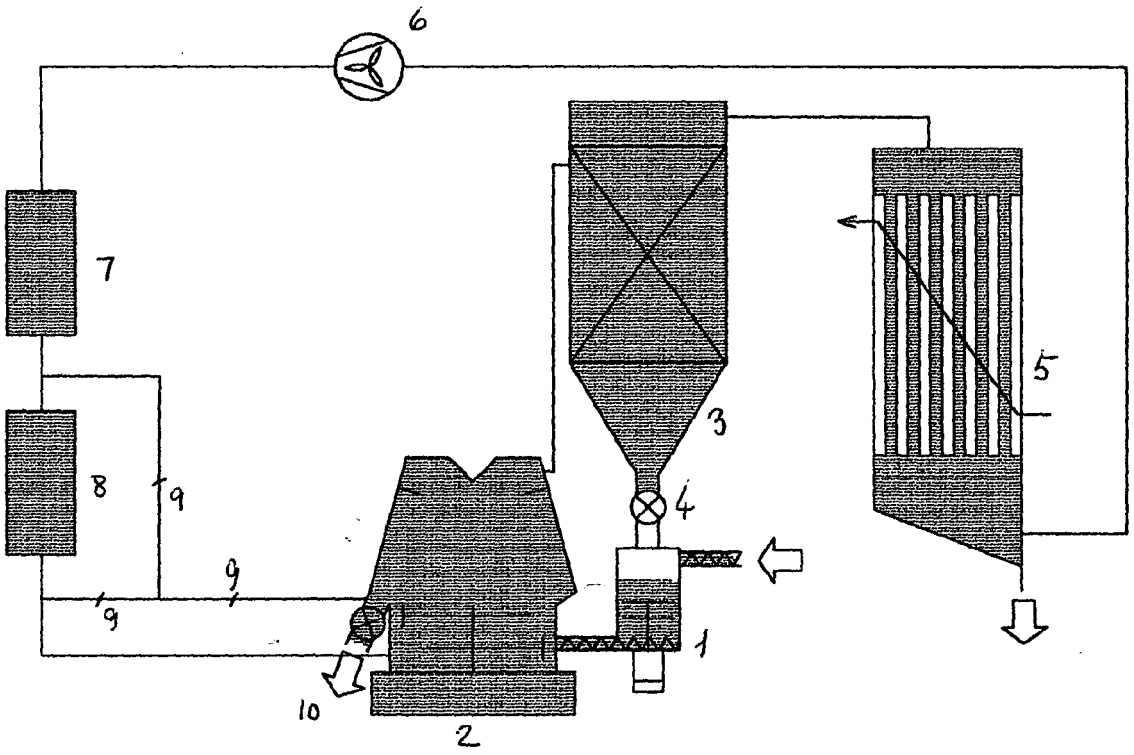

Fig 2

REFERENCES CITED IN THE DESCRIPTION

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- DK 31869 **[0002]**
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