(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 231 441 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
14.08.2002 Bulletin 2002/33

(51) Int Cl.[7]: **F26B 17/14**

(21) Application number: **02075539.3**

(22) Date of filing: **11.02.2002**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE TR
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **12.02.2001 NL 1017343**

(71) Applicant: **Holding Dinnissen B.V.**
5971 DK Grubbenvorst (NL)

(72) Inventor: **Maes, Mathieu Antoon Karel**
5971 DK Grubbenvorst (NL)

(74) Representative: **Dorna, Peter et al**
Algemeen Octrooibureau
Postbus 645
5600 AP Eindhoven (NL)

(54) A device suitable for drying bulk goods

(57) A device (1) suitable for drying bulk goods, which device is provided with at least one chamber (4) comprising a bottom (3a-3h). The bottom is provided with a number of parallel tubes (6) extending along central axes (7). The tubes (6) are provided with air passages (37) present in the walls (35) thereof. The tubes provided with air passages are tiltable about central axes (7) extending through the tubes (6).

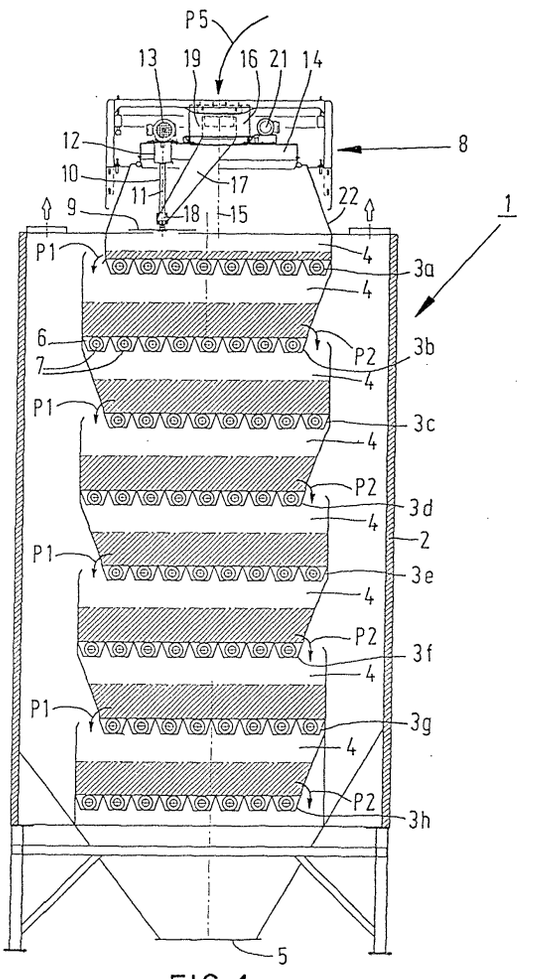

FIG. 1

EP 1 231 441 A1

Description

[0001] The invention relates to a device suitable for drying bulk goods, which device is provided with at least one chamber comprising a bottom, which bottom is provided with a number of parallel tubes extending along central axes, which are provided with air passages present in the walls thereof, which bottom is furthermore provided with means for releasing and closing openings present in the bottom.

[0002] With such a device as known from British patent No 24.432, a number of chambers are disposed one above another, each chamber being provided with a bottom. Each bottom is provided with a number of horizontally extending tubes and plate-shaped elements disposed between said tubes. Present between the plate-shaped elements are openings, which are located under the tubes in a first position, in which the openings are closed. When the plates are moved, the openings will be positioned beside the tubes, seen in horizontal direction, with the bulk goods present on the plates falling through the openings. Because a plate is in its entirety moved under a tube, all the bulk goods present on a plate will be pushed into the openings by the tubes.

[0003] The tubes are provided with air passages for supplying a gaseous fluid by means of which the bulk goods are dried, such as air, to the bulk goods.

[0004] The gaseous fluid will mainly reach the bulk goods that are located closest to the tubes. The bulk goods that are located centrally between the tubes will hardly be reached by the gaseous fluid.

[0005] The object of the invention is to provide a device in which the bulk goods can be provided with a gaseous fluid over substantially the entire bottom.

[0006] This objective is accomplished with a device according to the invention in that the tubes provided with air passages are tiltable about central axes extending through the tubes between a first position, in which the openings are closed, to a second position, in which the openings are released, and vice versa.

[0007] With the device according to the invention, the entire bottom is preferably provided with tubes. This makes it possible to provide the entire layer of bulk goods with air in a uniform manner. It is also possible, of course, to pass another gaseous fluid through the passages.

[0008] The cross-sectional configuration of the tubes is selected so that the tubes close the openings in the first position, whilst in the second, tilted position openings are present between the tubes, through which the bulk goods can fall.

[0009] One embodiment of the device according to the invention is characterized in that the cross-sectional area of an air passages space in the tube decreases from the first end.

[0010] As a result of the fact that the cross-sectional area of the air passage space decreases from the first end it is ensured that practically the same amount of space will flow from the air passages near the second end of the tube remote from the first end as near the first end. In this manner uniform drying of the bulk goods is guaranteed.

[0011] The invention will be explained in more detail hereinafter with reference to the drawings, in which:

Figure 1 is a cross-sectional view of a device according to the invention;
Figure 2 is a sectional view along the central axis of a tube of the device as shown in Figure 1;
Figure 3 is view in the direction indicated by the arrows III-III of the tube that is shown in Figure 2; and
Figure 4 is a few in the direction indicated by the arrows IV-IV of the tube that is shown in Figure 2.

[0012] In the figures, like parts are indicated by the same reference numerals.

[0013] Figure 1 shows a device 1 according to the invention, which comprises a vertically extending cylinder 2, in which substantially horizontally extending bottoms 3a-3h are present. Chambers 4 are present between the bottoms 3a-3h and above the uppermost bottom 3a. Present below the lowermost bottom 3h is a discharge funnel 5. Each bottom 3a-3h includes a number of horizontally extending tubes 6, which are tiltable in the directions indicated by the arrows P1, P2 about axes 7 extending through said tubes 6. The tubes 6 of successive bottoms 3a-3h are alternately rotatable in directions indicated by arrows P1, P2.

[0014] The device 1 furthermore comprises a bulk goods supplying device 8, which includes an horizontally extending plate 9. The plate is circular in shape and extends transversely to a central axis 10. The plate 9 is rotatable about the central axis 10. To this end, the plate 9 is provided with a rod 11 extending along the central axis 10, which is mounted in bearings in a bearing block 12 on a side of the plate 9 remote from the bottom 3a and which is rotatably connected to a motor 13. The bearing block 12 is mounted in a frame 14, which is rotatably mounted, about an axis of rotation 15, in a bearing block 16. The central axis 11 and the axis of rotation 15 extend parallel to each other in spaced-apart relationship. The bulk goods supplying device 8 furthermore includes a supply pipe 17, which opens above the plate 9 with a first end 18 and which is connected to the frame 14 near the axis of rotation 15 with a second end 19 remote from the first end 18. A supply pipe or feed hopper (not shown), via which the bulk goods are introduced into the second end 19, is disposed above said second end 19.

[0015] Figure 2 is a sectional view along the central axis 7 of a tube 6, which tube 6 is provided, near a first end 30 thereof, with a stationary propeller 31 and a diffuser 32 disposed some distance away therefrom. The first end 30 is connected to an air supplying device (not shown), by means of which area is carried to the propeller 31 in a direction indicated by the arrow P10.

[0016] A plate 33 is disposed inside the tube 6, which plate includes an acute angle with the central axis 7. The plate 33 is connected to a wall portion 35 of the tubes 6 near a second end 34 remote from the first end 30. Near the first end 30, the plate 33 is connected to a wall portion 36 extending parallel to the first wall portion 35.

[0017] The first wall portion 35 is provided with a number of air passages 37 which are regularly distributed over the surface of the wall portion 35.

[0018] Air that is blown into the tube 6 by the propeller 31 lands in the air passage space 38 bounded by the first wall portion 35 and the plate 33, from where the air is blown in the direction indicated by arrows P11, towards and through the bulk goods present on the first wall portion 35, via the air passages 35.

[0019] As a result of the presence of the plate 33, the cross-sectional area of the air passage space 38 decreases from the first end 30 to the second end 34. In this manner it is ensured that substantially the same amount of the air is passed through the air passages 37 located near the second end 34 as through the air passages 37 located near the first end 30.

[0020] As is clearly shown in Figures 3 and 4, the first wall portion 35 has a width B1 greater than the width B2 of the second wall portion 36. The wall portions 35, 36 are interconnected by means of the wall portions 39, 36, which, as a result of the difference in width between the wall portions 35, 36, include an acute angle with the first wall portion 35.

[0021] As a result of this configuration of the tubes 6, a flat bottom will be present in each chamber 3a-3h in the closed position as shown in Figure 1.

[0022] The operation of the device 1 will now be explained in more detail with reference to the figures.

[0023] As already indicated above, bulk goods are carried into the end 19 of the supply pipe 17 in the direction indicated by the arrow P5 via a supply pipe or a feed hopper. At the same time, the frame 14 is rotated about the axis of rotation 15, in the direction indicated by the arrow P4, by means of a motor 21. The supply pipe 17 and the plate 9 are rotated about the axis of rotation 15 together with the frame 14. At the same time the plate 9 is also rotated about the central axis 10, in the direction indicated by the arrow P3, by means of the motor 13. The bulk goods that fall through this supply pipe 17 onto the plate 9 via the first end 18 is flung off the plate 9 in the direction of the outer walls 22 of the chamber 4 as a result of the rotation of the plate 9 in the direction indicated by the arrow P3. The bulk goods present on the bottoms of the chamber will be dried in an even manner by the air that is supplied via the air passages a 37.

[0024] As soon as the bulk goods are to be moved from one chamber to a chamber disposed thereunder, the tubes 6 will be tilted through an angle of, preferably, 90° in the direction indicated by the arrows P1 or P2. In that case the tubes 6 take up a width in horizontal direction which equals the distance B3 between the first wall portion 35 and the second wall portion 36. Thus an opening which equals B1-B3 has been formed between the tubes 6. As a result of the tilting of the first wall portions 35, the bulk goods present thereon will slide off the first wall portions 35 and fall through the openings present between the tubes 6 into a chamber disposed thereunder.

[0025] The bulk goods will successively land on the bottoms 3c-3h and eventually leave the device 1 via the funnel 5.

[0026] It is also possible to make the first wall portion 35 slightly curved instead of flat.

[0027] Furthermore it is possible for the surfaces 36, 39, 40 to have a circular or other shape.

Claims

1. A device suitable for drying bulk goods, which device is provided with at least one chamber comprising a bottom, which bottom is provided with a number of parallel tubes extending along central axes, which are provided with air passages present in the walls thereof, which bottom is furthermore provided with means for releasing and closing openings present in the bottom, **characterized in that** the tubes provided with air passages are tiltable about central axes extending through the tubes between a first position, in which the openings are closed, to a second position, in which the openings are released, and vice versa.

2. A device according to claim 1, **characterised in that** at least a first end of at least one tube is connected to an air supplying device.

3. A device according to claim 2, **characterised in that** the cross-sectional area of an air passage space in the tube decreases from said first end.

4. A device according to claim 3, **characterised in that** a plate is disposed inside the tube, which plate reduces the air passages space on a side remote from the air passages and which includes an acute angle with the central axis.

5. A device according to any one of the preceding claims, **characterised in that** propellers are disposed inside the tubes near the first ends.

6. A device according to any one of the preceding claims, **characterised in that** diffusers are disposed inside the tubes near the first ends.

7. A device according to claims 5 and 6, **characterised in that** the propellers are disposed nearer to the first end of the tubes than the diffusers.

8. A device according to any one of the preceding claims, **characterised in that** the tubes have a cross-sectional configuration such that wall portions of the tubes facing towards the chamber form a substantially continuous surface in a position of the tubes in which the openings are closed, whilst the openings are present between the tubes in a position of the tubes in which the openings are released.

9. A device according to claim 8, **characterised in that** the cross-section of a tube comprises two wall portions extending parallel to each other, wherein a first wall portion has a greater width than the second wall portion and wherein said wall portions are interconnected by third and fourth wall portions.

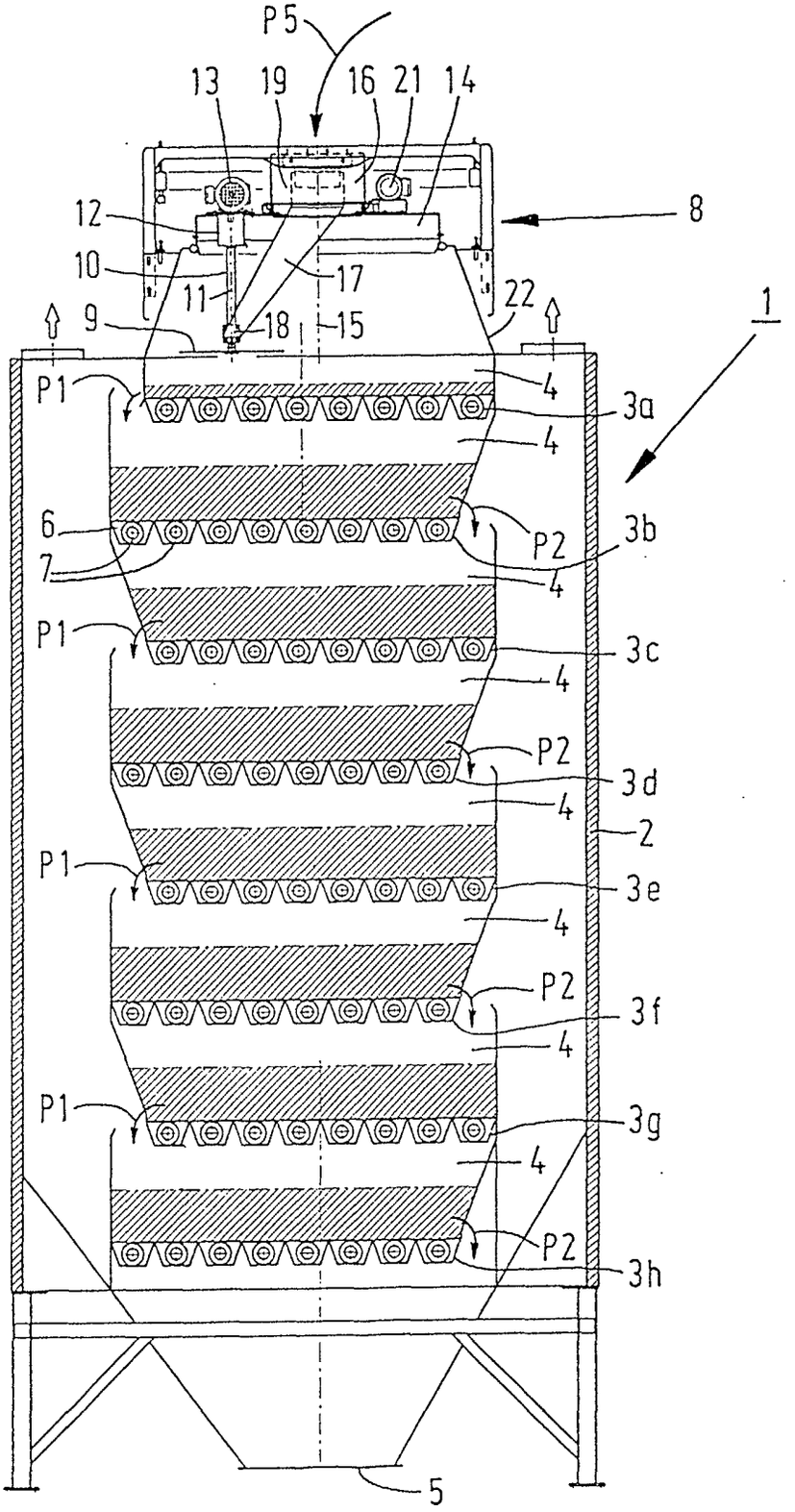
P5
13
19
16
21
14
12
8
10
11
17
22
1
9
18
15
P1
4
3a
6
7
P2
3b
3c
3d
2
3e
3f
3g
3h
5

FIG. 1

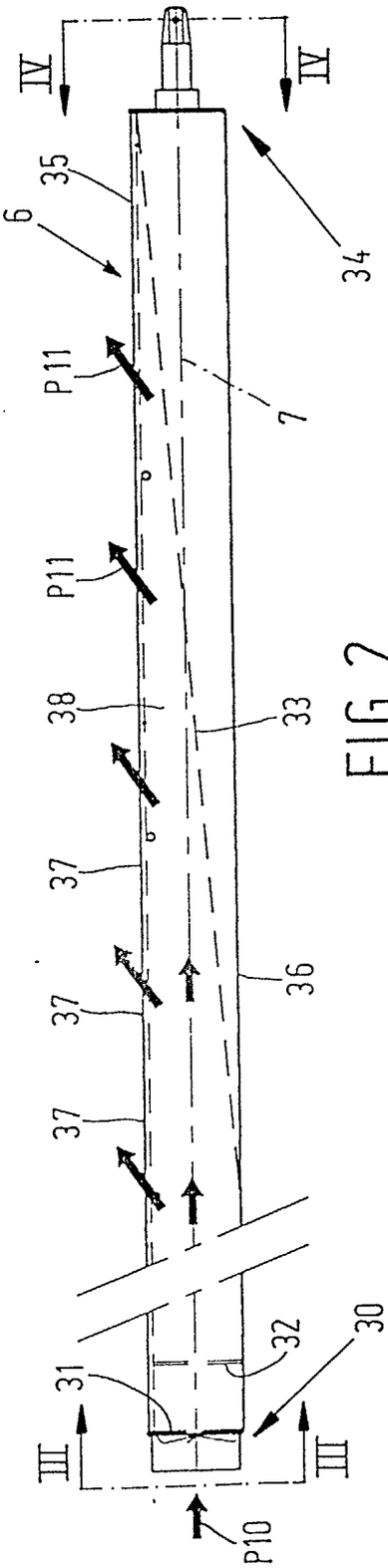

FIG. 2

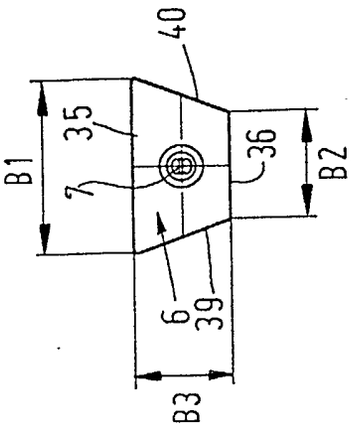

FIG. 4

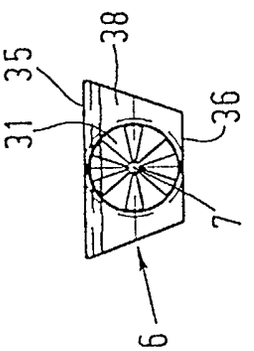

FIG. 3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 07 5539

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
D,A	GB 24432 A A.D. 1911 (BERRY) 28 November 1912 (1912-11-28) * the whole document *	1,2	F26B17/14
A	FR 2 563 327 A (BERTIN & CIE) 25 October 1985 (1985-10-25) * figure 3 *	1,2,9	
A	GB 111 112 A (WESTERBEEK ET AL) 6 February 1919 (1919-02-06) * the whole document *	1,8	
A	EP 0 498 725 A (SATIG SOCIETE ANONYME) 12 August 1992 (1992-08-12) * the whole document *	3,4	
A	GB 155 625 A (WATZE SPOELSTRA) 30 December 1920 (1920-12-30)		
A	DE 43 38 898 A (KNOLL ANLAGENBAU GMBH) 18 May 1995 (1995-05-18)		TECHNICAL FIELDS SEARCHED (Int.Cl.7)
A	FR 2 201 696 A (DUPUIS STE EXPLOIT) 26 April 1974 (1974-04-26)		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	14 May 2002	Silvis, H

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

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 02 07 5539

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

14-05-2002

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB L24432 A		NONE	
FR 2563327 A	25-10-1985	FR 2563327 A1	25-10-1985
GB 111112 A		NONE	
EP 0498725 A	12-08-1992	FR 2672377 A1	07-08-1992
		CS 9200322 A3	14-10-1992
		EP 0498725 A1	12-08-1992
		HU 67337 A2	28-03-1995
		PL 293396 A1	19-10-1992
GB 155625 A	30-12-1920	NONE	
DE 4338898 A	18-05-1995	DE 4338898 A1	18-05-1995
		WO 9514200 A1	26-05-1995
FR 2201696 A	26-04-1974	FR 2201696 A5	26-04-1974

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82