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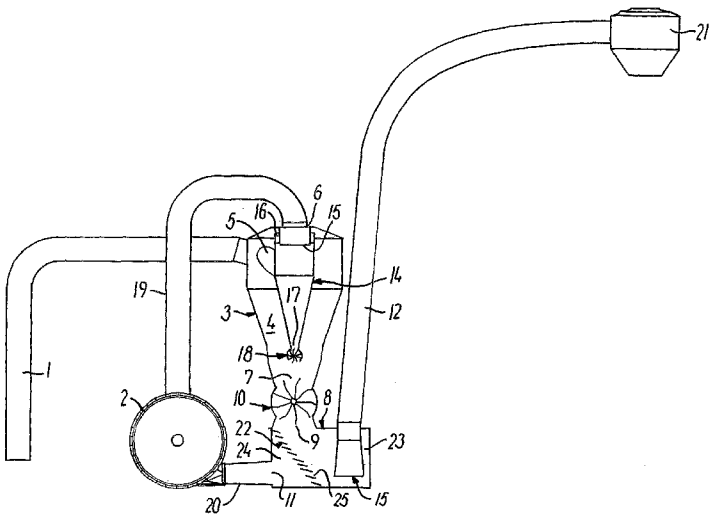
(54) **Title:** A PNEUMATIC TRANSPORT APPARATUS



(57) **Abstract:** A pneumatic transport apparatus for transporting granulate material comprises a suction pipe (1), a blower (2) with an inlet side and an outlet side, a cyclone separator (3) with a separation chamber (4), which has a separation chamber inlet (5), a separation chamber air outlet (6) and a lower granulate outlet (7). A collecting chamber (8) is provided below the lower granulate outlet (7) and has a granulate inlet (9) connected with the lower granulate outlet (7) through a rotary air lock (10), and a collecting chamber air inlet (11). An outlet pipe (12) is extending substantially vertical from the collecting chamber (8). A second separator (14) is placed inside the separation chamber (4), having a second separator air outlet (15) connected to the first separator air outlet (6), a second separator inlet (16), and a lower dust outlet (17) provided with a second rotary air lock (18). The inlet side of the blower (2) is connected with the separation chamber air outlet (6), and the outlet side of the blower (2) is connected with the collecting chamber air inlet (11).

WO 2007/051466 A1

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

A pneumatic transport apparatus

The present invention relates to a pneumatic transport apparatus for transporting granulate material, comprising a suction pipe, a blower with an inlet side and an outlet side, a separator with a separation chamber having a separation chamber inlet, a separation chamber air outlet and a lower granulate outlet, a collecting chamber below the lower granulate outlet, said collecting chamber having a granulate inlet connected with the lower granulate outlet through an air lock, and a collecting chamber air inlet, the inlet side of the blower being connected with the separation chamber air outlet, the outlet side of the blower being connected with the collecting chamber air inlet, and an outlet pipe connected with the collecting chamber.

Pneumatic transport apparatuses of this art are e.g. used in agriculture for transporting grain, or in plastic or plastic recycling industry for transporting granulated plastics material.

US-A-2 946 626 discloses a pneumatic transport apparatus of the above mentioned art, in which a suction pipe is connected to the bottom of a hopper containing granulate or pulverulent material for transporting said material into a separator, from the bottom of which the pulverulent material is carried to a collecting chamber by means of an actuator in the form of a rotary valve air lock. The collecting chamber comprises two opposite axial air inlets and a tangential outlet, to the latter of which a horizontal outlet pipe is connected. Inside the separation chamber a second separator in the form of a filter is provided. Material caught in the filter is removed through clean-out doors in the wall of the separator.

US-A-4 572 726 discloses a pneumatic transport apparatus for particulate material such as grain, comprising a separator with a separation chamber having an upper cylindrical portion and a lower frustoconical portion. Below the separator a collector including an air lock (not shown) is provided, said collector having a horizontal outlet duct or pipe. Inside the cylindrical part of the separation chamber a second separator in the form of a filter body is provided, said filter body com-

prising a cylindrical, vertical wall with an opening covered by a first filter plate, the bottom of the filter body being open but covered by a second filter plate considerably coarser than the first filter plate.

US-A-4 599 016 discloses a pneumatic transport apparatus with a cyclonic separator comprising a separation chamber with a lower frusto-conical part and an upper cylindrical part. The frusto-conical part has a lower granulate outlet connected with a valve and duct means in the form of an airsealed rotary valve moving the granulate material into flexible duct extending horizontally from the airsealed rotary valve. In the cylindrical part of the separation chamber a second cyclonic separator is provided. Material separated from an air stream in the second separator is collected inside said second separator and is deposited on the bottom thereof. The bottom comprises a hinged bottom plate provided with a counter weight allowing the bottom to remain closed during operation, but to swing open when the blower is turned off. Thus the second separator is emptied only when the pneumatic transport apparatus is turned off.

US-A-5 163 786 discloses a pneumatic transport apparatus with a cyclonic separator having at its bottom a rotary air lock conveying valve with a horizontal outlet. Inside the separator a cylindrical filter is provided. When the blower is stopped material collected by the filter will fall downwardly and collect on top of a fixed baffle for clean out via an access door in the separator.

The pneumatic transport apparatus disclosed in US-A-4 599 016 and US-A-5 163 786 are both mobile units provided with wheeled carrier frames for hitching to a towing vehicle.

Pneumatic transport apparatuses of the above art are provided with the separators for by-passing the granulate material around the blower in order to avoid damage to the blower and/or the granulate material.

As it appears from the above prior art it is usual practice to provide a second separator inside the first or main separator. A second separator may be connected in the duct or pipe leading from the first separator to the blower (cf. the above mentioned US-A-4 572 726), but

it is often placed inside the first separator to provide a more compact apparatus. The reason for providing the second separator is that the granulate material often comprises more and less coarse particles, the finer of which may not be separated from the air stream by the first separator. Still these finer particles may course abrasion damages to the blower, and thus they are unwanted in the air stream passing through the blower.

Another kind of pneumatic transport apparatus is disclosed in DE-A-38 13 551, which discloses an apparatus for steep-inclined conveying of construction material in underground operation e.g. coal mining. The apparatus comprises means for pneumatic transporting pulverulent material into a so-called sender. Said means comprises a screw conveyor conveying pulverulent material from a container into a house with a sieve at the bottom and an outlet pipe extending vertically through the ceiling. By blowing air from beneath the sieve the material in the housing is fluidised and blown out through the outlet pipe and into the sender. The latter comprise a hopper with a frusto-conical bottom and an air lock closing a bottom outlet for carrying material into a horizontal pneumatic transport line.

It is an object of the present invention to provide a pneumatic transport apparatus of the art mentioned by way of introduction, which is more efficient that the known apparatuses.

It is another object of the present invention to provide a pneumatic transport apparatus comprising a second internal separator that may be operated in a continuous or quasi-continuous mode.

The former object is obtained by a pneumatic transport apparatus, in which an entrance end of the outlet pipe is placed inside the collecting chamber, said outlet pipe extending upwardly from said entrance end at an angle of maximum 45° from vertical. Preferably the outlet pipe in the collecting chamber extends upwardly from its entrance end at an angle of maximum 30° from vertical, and more preferably the outlet pipe extends substantially vertically in the collecting chamber. Compared to a similar apparatus having a horizontal outlet from the collecting chamber a surprising capacity increase of 35% has been obtained

with an apparatus according to invention.

In a preferred embodiment a perforated wall is provided in the collecting chamber dividing the collecting chamber in an air compartment and a granulate compartment, the collecting chamber air inlet being placed in the air compartment, and the granulate inlet and the outlet pipe being placed in the granulate compartment. The perforated wall is preferably slanted to direct material from the granulate inlet downwardly and laterally towards the entrance end of the outlet pipe. This provision facilitates the emptying of the collecting chamber.

The latter object is obtained by a pneumatic transport apparatus, wherein a second separator is placed inside the separation chamber, the second separator having a second separator air outlet connected to the first separator air outlet, a second separator inlet in the separation chamber, and a lower dust outlet provided with a second air lock. By providing the second separator with an air lock, like the first separator, it is possible to run the apparatus in continuous mode in the respect that the second separator is emptied during operation of the apparatus.

The material separated from the air stream by the second separator may be brought together with the main part of the granulate material, which is separated from the air stream by the first separator.

Thus in a preferred embodiment the second air lock opens into the separation chamber. Thus the material separated from the air stream by the second separator is recycled to the main part of the granulate material inside the separation chamber.

In another embodiment the second air lock opens into the collecting chamber.

In preferred embodiments the air lock or one or both air locks, as the case may be, is a rotary valve air lock, which, as it appears from the above discussion of prior art, is a well-known type of air lock suited for the purpose.

The invention will be further explained below by way of example with reference to the accompanying schematic drawings, on which

Fig. 1 shows partly in section a pneumatic transport apparatus

in a preferred embodiment of the invention;

Fig. 2 shows a sectioned perspective view of the separator of the apparatus in Fig. 1;

Fig. 3 shows partly in section a variant of the apparatus in Fig, 1; and

Fig. 4 shows the variant of Fig. 3 in different section.

Figs. 1 and 2 show a preferred embodiment of a pneumatic transport apparatus for transporting granulate material. The apparatus comprises a suction pipe 1, a blower 2 with an inlet side and an outlet side, and a cyclone separator 3 with a separation chamber 4, which has a tangential separation chamber inlet 5, a separation chamber air outlet 6 and a lower granulate outlet 7. Below the lower granulate outlet 7, a collecting chamber 8 is provided, which has a granulate inlet 9 connected with the lower granulate outlet 7 through a first rotary air lock 10. The collecting chamber 8 has a collecting chamber air inlet 11. An outlet pipe 12 of the apparatus has an entrance end 13 placed inside the collecting chamber, whereby a part of the outlet pipe 12 extends vertically in the collecting chamber 8.

A second separator 14 is placed inside the separation chamber 4, said second separator having a second separator air outlet 15 connected to the first separator air outlet 6, a second separator inlet 16 in the separation chamber 4, and a lower dust outlet 17 provided with a second rotary air lock 18.

The inlet side of the blower 2 is connected with the separation chamber air outlet 6 through a conduit 19, and the outlet side of the blower 2 is connected with the collecting chamber air inlet 11 through a conduit 20.

The outlet end of the outlet pipe 12 is in a manner known per se (e.g. cf. US-A-5 163 786) provided with an outlet cyclone 21.

The collecting chamber 8 is by means of a slanted perforated wall 22 divided into two compartments arranged in a side-by-side relationship. Thus a granulate compartment 23 comprises the granulate inlet 9 and the entrance end 13 of the outlet pipe 12, while an air compartment 24 comprises the collection chamber air inlet 11. The perfo-

rated wall 22 is provided by mutually overlapping, but spaced slats 25. Granulate material, such as grain, entering through the granulate inlet 9 may fall onto the slats of the perforated wall 22 and will slide down the wall 22 towards the entrance end 13 of the outlet pipe 12, whereas air entering the collection chamber 8 through the air inlet 11 may penetrate the wall 22. The granulate material will however not penetrate into the air compartment 24.

As shown more detailed in Fig. 2 the first rotary air lock 10 comprises a rotor with radial vanes 26 the tips 27 of which are flexible and bend rearwards relative to the direction of rotation 28 in order to provide for good air tightening without impeding the rotation. The rotor is driven by a motor (not shown).

The second rotary air lock 18 is generally of a similar construction, but it is much smaller than the first rotary air lock 10 as the second separator 14 separates a much smaller amount of material than the first rotary air lock, e.g. only 0,1% the amount. The rotor of the second rotary air lock 18 is driven through a shaft 29 and a transmission (not shown) by the same motor as the rotor of the first rotary air lock 10.

In the inlet 16 of the second separator 14 curved guide vanes 30 are provided to give inflowing air a swirl inside the second separator 14.

The apparatus works as follows:

When the blower 2 is activated air is sucked into the suction pipe 1. If its end is inserted e.g. into a heap of grain, this will be sucked together with the air through the suction pipe 1 and into the separation chamber 4 of the first separator 3. A well-known flow pattern will develop in the separation chamber 4 with a swirl of air and grain descending along the curved outer wall of the separation chamber 4. The grain is slowed down due to friction, and finally falls to the lower granulate outlet 7 at the bottom of the separation chamber, whereas the air rises in the centre of the separation chamber around the second separator 14. The air enters through the inlet 16 of the latter, whereby a swirl of air and any dust, which has not been separated in the separation chamber 4, is established inside the second separator 14. Due to the swirl the

dust falls to the second lower granulate outlet 17 at the bottom of the second separator 14, from where it is transported by means of the second rotary air lock 18 back into the separation chamber 4 to be united with the grain at the lower granulate outlet 7. Thus the second separator 14 is continuously emptied from dust. The grain and the dust are transported down into the collecting chamber 8 by rotation of the rotor of the first rotary air lock 10.

The air is sucked from the second separator 14 through the outlet 15 thereof, through the connected outlet 6 of the first separator 3 and through the pipe 19 into the blower 2. From the blower 2 the air is blown through pipe 20 into the air compartment 24 of the collecting chamber 8 and between the slats 25 of the perforated wall 22, whereby the air enters the granulate compartment 23. In the granulate compartment 23 the air enters the entrance end 13 of the outlet pipe carrying along the grain and dust, which has entered the granulate compartment 23 through the granulate inlet 9 below the first rotary air lock 10.

The entrance end 13 of the outlet pipe 12 is placed inside the collecting chamber 23 and thus it is placed below the granulate inlet 9. Thereby the grain is able to flow through the collecting chamber to surround the entrance end 13 to be blown or sucked into the outlet pipe 12. The entrance end 13 is positioned close to the bottom in order to be able to suck up as much grain as possible when emptying the collecting chamber. On the other hand the entrance end should not be that close to the bottom that the passage between the bottom and the entrance end becomes a restriction of the flow of grain into the outlet pipe. The distance of the entrance end 13 from the bottom may e.g. be one third of the diameter of the entrance end 13. The lower part of the outlet pipe 12 at the entrance end may, as seen in Figs. 1, 3 and 4, be slightly conical.

The air, grain and dust exit through the outlet cyclone 21 e.g. into a lorry not shown.

Figs. 3 and 4 show a variant of the apparatus described with reference to Figs. 1 and 2. Alike components are indicated by the same

reference numerals as in Figs. 1 and 2 and only the differences will be explained here. It should be understood that Figs. 3 and 4 differs in that the sections through the air lock are made in two different, parallel planes one behind the other.

In Fig. 3 it is shown that the second separator 14' is extended down to the level of a rotor 31 of a second rotary air lock 18'. Thus the dust separated in the second separator 14' is kept isolated from the grain in the separation chamber 4.

Fig. 4 shows a section behind the section of Fig. 3 whereby the rotor 32 of the first rotary air lock 10' is seen. A similar rotor (not shown) of the first rotary air lock 10' is found in front of the rotor 31 shown in Fig. 3.

The rotor 31 has a small axial extend compared to the combined axial length of the rotors 32. Further, as seen from Figs. 3 and 4, the compartments between the vanes of the rotor 31 are much smaller than the compartments between the vanes of the rotors 32. A common central shaft 33 drives all the rotors 31 and 32.

Another difference from the embodiment of Figs. 1 and 2 is that in the collecting chamber 8 a perforated slanting wall 22' is made of a perforated plate rather than from overlapping slats.

The apparatus shown in Figs. 3 and 4 operates largely like the apparatus shown in Figs. 1 and 2. However dust separated in the second separator 14' is transported directly to the granulate compartment 23 of the collecting chamber 8, where it is united with the grain separated in the separation chamber 4.

As indicated in Fig. 3 the apparatus may, and this applies to both embodiments, be provided on a mobile frame 34, which further may be provided with wheels 35 for the frame 34 to be towed by a vehicle, e.g. a tractor.

PATENT CLAIMS

1. A pneumatic transport apparatus for transporting granulate material, comprising a suction pipe, a blower with an inlet side and an outlet side, a separator with a separation chamber having a separation chamber inlet, a separation chamber air outlet and a lower granulate outlet, a collecting chamber below the lower granulate outlet, said collecting chamber having a granulate inlet connected with the lower granulate outlet through an air lock, and a collecting chamber air inlet, the inlet side of the blower being connected with the separation chamber air outlet, the outlet side of the blower being connected with the collecting chamber air inlet, and an outlet pipe having an entrance end placed inside the collecting chamber, said outlet pipe extending upwardly from said entrance end at an angle of maximum 45° from vertical.

2. A pneumatic transport apparatus according to claim 1, wherein the outlet pipe in the collecting chamber extends upwardly from its entrance end at an angle of maximum 30° from vertical.

3. A pneumatic transport apparatus according to claim 1 or 2, wherein the outlet pipe extends vertically in the collecting chamber.

4. A pneumatic transport apparatus according to claim 1, 2 or 3, wherein a perforated wall is provided in the collecting chamber dividing the collecting chamber in an air compartment and a granulate compartment, the collecting chamber air inlet being placed in the air compartment, and the granulate inlet and the outlet pipe being placed in the granulate compartment.

5. A pneumatic transport apparatus according to claim 4, wherein the perforated wall is slanted to direct material from the granulate inlet downwardly and laterally towards the entrance end of the outlet pipe.

6. A pneumatic transport apparatus according to any of the claims 1-5, wherein a second separator is placed inside the separation chamber, the second separator having a second separator air outlet connected to the first separator air outlet, a second separator inlet in the separation chamber, and a lower dust outlet provided with a second

air lock.

7. A pneumatic transport apparatus, according to claim 6, wherein the second air lock opens into the separation chamber.

8. A pneumatic transport apparatus according to claim 6, wherein the second air lock opens into the collecting chamber.

9. A pneumatic transport apparatus according to any of the claims 1-8, wherein at least one of said air locks is a rotary valve air lock.

10. A pneumatic transport apparatus according to any of claims 1-9, wherein the apparatus is provided on a mobile frame.

11. A pneumatic transport apparatus according to claim 10, wherein the mobile frame is provided with wheels.

12. A pneumatic transport apparatus for transporting granulate material, said apparatus comprising:

a suction pipe,

a blower with an inlet side and an outlet side,

a cyclone separator with a separation chamber having a separation chamber inlet, a separation chamber air outlet and a lower granulate outlet,

a collecting chamber below the lower granulate outlet, said collecting chamber having a granulate inlet connected with the lower granulate outlet through a rotary air lock, and a collecting chamber air inlet, and

an outlet pipe having an entrance end placed inside the collecting chamber, said outlet pipe extending at an angle of maximum 45° from vertically in the collecting chamber,

the inlet side of the blower being connected with the separation chamber air outlet, the outlet side of the blower being connected with the collecting chamber air inlet.

13. A pneumatic transport apparatus for transporting granulate material, said apparatus comprising:

a suction pipe,

a blower with an inlet side and an outlet side,

a cyclone separator with a separation chamber having a sepa-

ration chamber inlet, a separation chamber air outlet and a lower granulate outlet,

a collecting chamber below the lower granulate outlet, said collecting chamber having a granulate inlet connected with the lower granulate outlet through a rotary air lock, and a collecting chamber air inlet,

an outlet pipe extending from the collecting chamber, and

a second separator placed inside the separation chamber, said second separator having a second separator air outlet connected to the first separator air outlet, a second separator inlet in the separation chamber, and a lower dust outlet provided with a second rotary air lock,

the inlet side of the blower being connected with the separation chamber air outlet, the outlet side of the blower being connected with the collecting chamber air inlet.

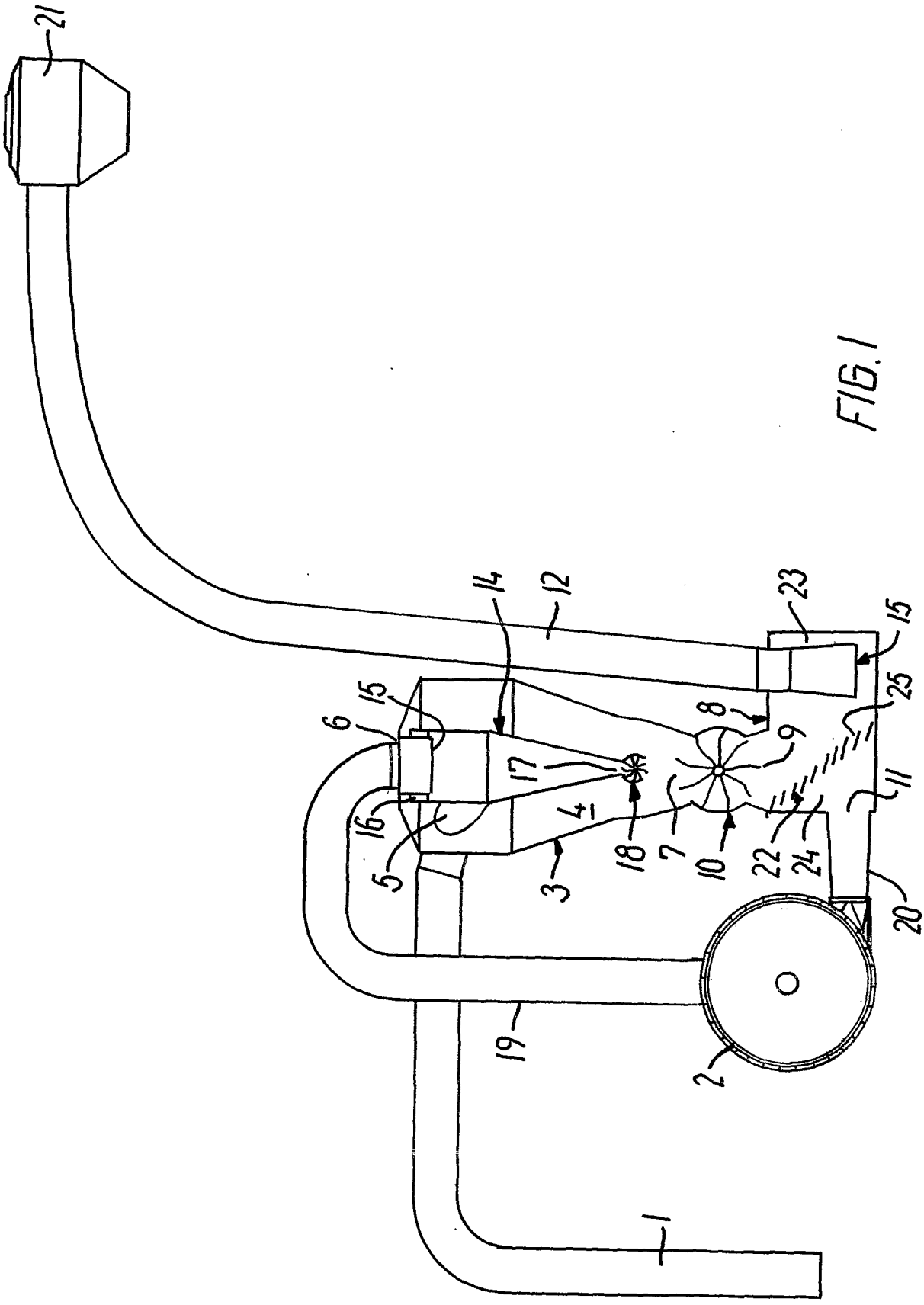


FIG. 1

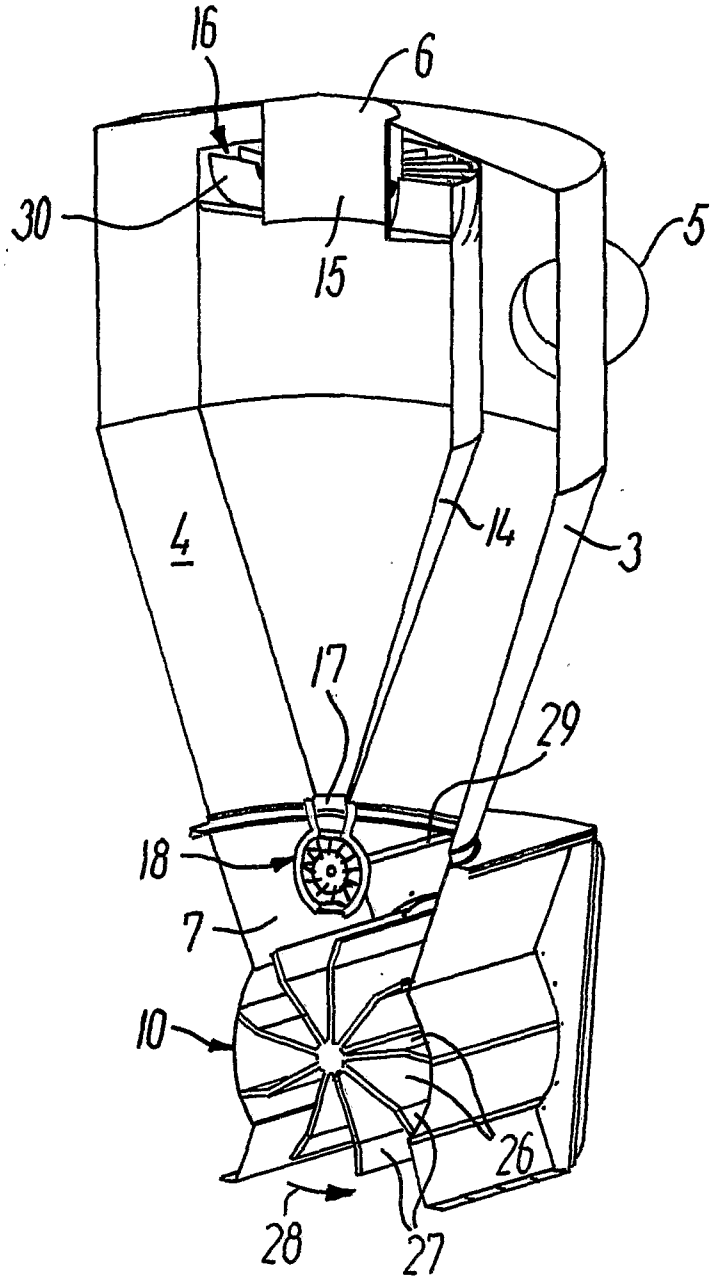


FIG. 2

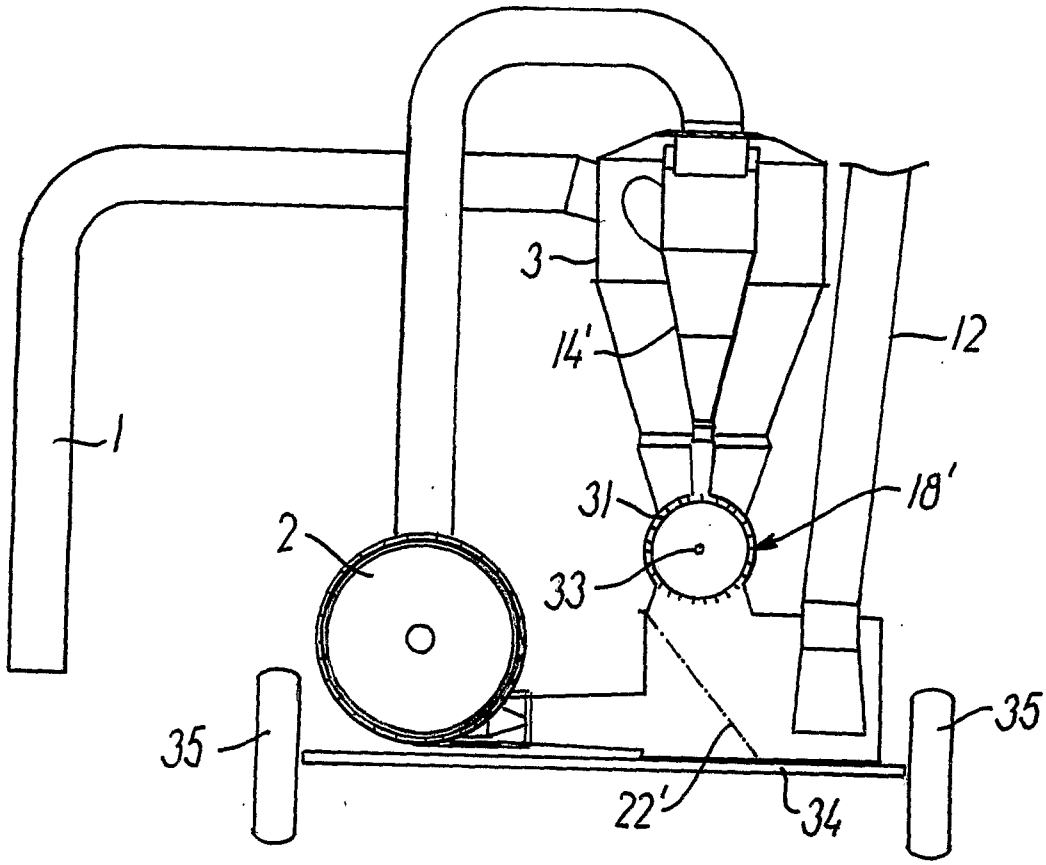


FIG. 3

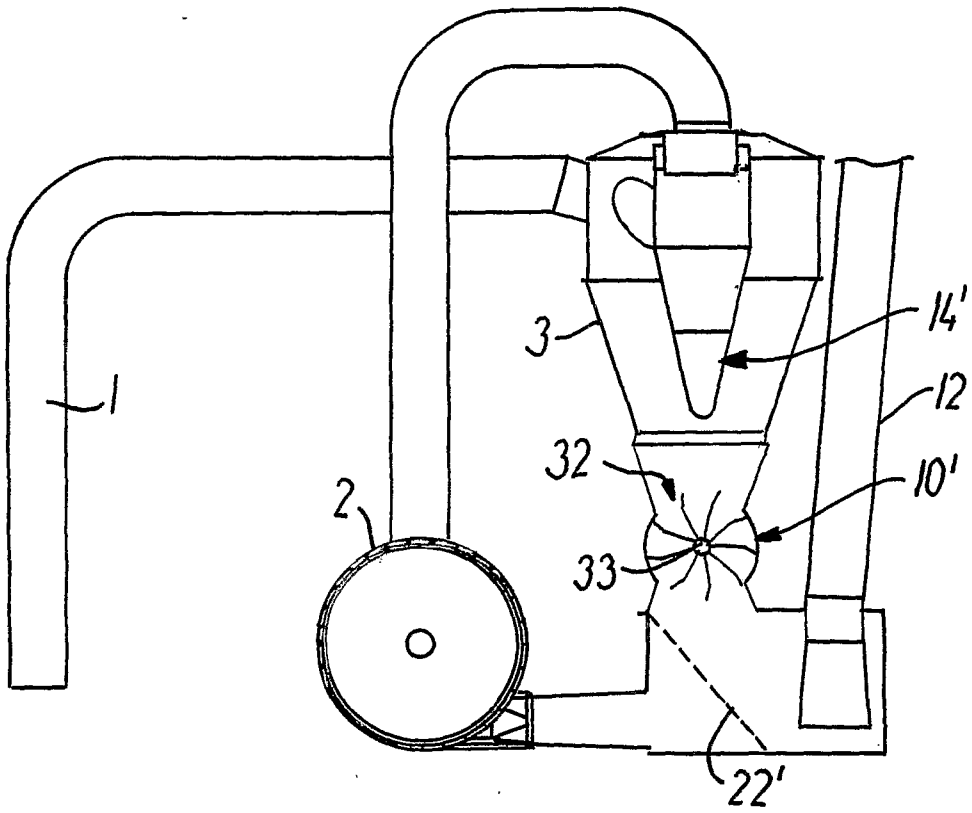


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
INV. B65G53/60 B65G53/52 B65G53/28 B65G53/46

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B65G B04C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	FR 1 056 672 A (SOCIETE DIEBOLD & CO) 1 March 1954 (1954-03-01) Whole Document	1-12
Y	FR 768 227 A (DIEBOLD & CO) 2 August 1934 (1934-08-02)	1-12
A	figures 1,7	13
Y	DE 25 08 847 A1 (TRYTHALL DESIGN AND DEVELOPMENT LTD) 9 September 1976 (1976-09-09) page 5, lines 25-30; figures 1-3	4,5
A	US 3 933 394 A (KLEIN ET AL) 20 January 1976 (1976-01-20) column 1, lines 5-20; figure 1 column 3, lines 1-5	4,5

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
23 August 2006	31/08/2006

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Garlati, T

INTERNATIONAL SEARCH REPORT

International application No
PCT/DK2005/000706

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2 622 936 A (DIEBOLD PIERRE) 23 December 1952 (1952-12-23) figures 1,2	1-3,9-12
A	US 4 988 240 A (THOMPSON ET AL) 29 January 1991 (1991-01-29) figures 1,2	1-3,9-12
A	US 3 385 634 A (VIGYAZO GYORGY) 28 May 1968 (1968-05-28) figure 1	1-5,12
A	GB 834 052 A (ELISABETH CONSTANCE SCHMITT) 4 May 1960 (1960-05-04) figure 1	1-5,12
A	US 3 612 499 A (PAUL OELDE WEBER ET AL) 12 October 1971 (1971-10-12) figure 1	1-5,12
A	DE 236 371 C (MASCHINENFABRIK UND MÜHLENBAUANSTALT G. LUTHER AKT.-GES. BRAUNSCHWEIG) 4 July 1911 (1911-07-04) the whole document	6,8,13
A	DE 383 053 C (SIEMENS-SCHUCKERTWERKE G.M.B.H) 9 October 1923 (1923-10-09) page 1, lines 37-50; figure 2	13
Y	US 1 897 195 A (HOWDEN PETER) 14 February 1933 (1933-02-14)	6,7,9
A	page 2; figures 1,2	13
Y	US 4 834 586 A (DEPEW ET AL) 30 May 1989 (1989-05-30) column 3, line 28 - column 4, line 30; figures 1-6 column 5, lines 1-27,43-53	6,8
A	US 2 643 769 A (TANNER FRITZ) 30 June 1953 (1953-06-30) column 1, line 53 - column 3, line 8; figures 1-3	6,8,13
A	US 2 830 674 A (DOLF HANS R ET AL) 15 April 1958 (1958-04-15) column 3, lines 24-49; figure 3	6,7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/DK2005/000706

Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. [X] As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

[X] No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1, 2-5, 9-12

Claims 1-5, 9-12 directed to a pneumatic transport apparatus with an upwardly extending outlet pipe at an angle of maximum 45 degrees from the vertical according to claims 1-3 and 12.

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2. claims: 6-8, 13

Claims 6-8 and 13 directed to a pneumatic transport apparatus with a second separator according to claim 13.

INTERNATIONAL SEARCH REPORT

International application No
PCT/DK2005/000706

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