MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963 A
We, AIR INDUSTRIE, of 19, Avenue Dubonnet, 92401 Courbevoie, France hereby apply for the grant of a Patent of Addition for an invention entitled:

PROCESS AND INSTALLATION FOR REMOVING DUST FROM PARTICLES

which is described in the accompanying complete specification.

We request that the Patent may be granted as a Patent of Addition to Patent Application No. 40868/78 in our name.

We request that the term of the Patent of Addition be the same as that of the patent for the main invention, or so much of the term of the patent for the main invention as is unexpired.

This application is a Convention application and is based on the application numbered 79 25260 or similar protection made in France on 10th October 1979.

Our address for service is: Edwd. Waters & Sons, Patent Attorneys, 50 Queen Street, Melbourne, Victoria, Australia.

LODGED AT SUB-OFFICE 9 OCT 1980
Melbourne

DATED this 8th day of October 1980.

AIR INDUSTRIE
by Wayne McMaster
Registered Patent Attorney

To:
The Commissioner of Patents.
COMMONWEALTH OF AUSTRALIA
Patents Act 1952-1969

DECLARATION IN SUPPORT OF A CONVENTION APPLICATION FOR A PATENT OR PATENT OF ADDITION

In support of the Convention Application made by AIR INDUSTRIE

(hereinafter referred to as the applicant) for a Patent of Addition for an invention entitled: PROCESS AND INSTALLATION FOR REMOVING DUST FROM PARTICLES

I, JEAN VIEL

of 19, Avenue Dubonnet, 92401 Courbevoie, France

do solemnly and sincerely declare as follows:

1. I am authorised by the applicant for the patent of Addition to make this declaration on its behalf.

2. The basic application as defined by Section 141 of the Act was made in France on the 10th day of October 1979, by AIR INDUSTRIE

3. ALBERT REBOURS, of 9, rue du Bray, 78400 Chatou, France

is the actual inventor of the invention and the facts upon which the applicant is entitled to make the application are as follow:

The applicant is the assignee of the said ALBERT REBOURS

4. The basic application referred to in paragraph 2 of this Declaration was the first application made in a Convention country in respect of the invention the subject of the application.

DECLARED at Courbevoie, France this 2nd day of October 1980.

AIR INDUSTRIE

(5) Signature

TO THE COMMISSIONER OF PATENTS,

Directeur du Centre d'Essais et de Développement Industriels
1. A process for removing the dust from particles, with a view to obtaining selective separation between particles and much finer dust clinging to these particles, consisting in creating at least one jet of particles charged with fine dust in a fluidized bed of these particles, formed in a fluidization chamber, and in directing this jet against an obstacle at a speed sufficient for fine dust, under the effect of the impact, to be loosened from the particles, the fluidization of the particles being achieved by means of a rising current of fluidizing and separating gas, characterized in that, by causing said chamber to vibrate, the particles of the fluidized bed are further subjected to sustained vibrations, said rising stream carrying upwards only the fine dust of a grain size less than a given threshold, thus effecting said selective separation between the fine dust and the largest particles from which the dust has thus been removed.
Complete Specification for the invention entitled:

PROCESS AND INSTALLATION FOR REMOVING DUST FROM PARTICLES

The following statement is a full description of this invention, including the best method of performing it known to us.
The present application relates first of all to improvements made to the process covered by the patent application 40868/78. Generally, it is a question of a process for removing dust from particles, with a view to obtaining selective separation between particles and much finer dust clinging to these particles, consisting in creating at least one jet of particles charged with fine dust in a fluidized bed of these particles, formed in a fluidization chamber, and in directing this jet against an obstacle at a sufficient speed for the fine dust, under the effect of the impact, to be loosened from the particles, the fluidization of the particles being achieved by a rising stream of fluidizing and separating gas.

Certain essential applications of such a process have been defined in the patent application 40868/78, particularly page 2, lines 4 to 22.

The aim of the present invention, which may have the same applications, is principally to increase further the efficiency of the separation obtained with the arrangements of the principal application, and particularly to obtain the completest possible separation and with good selectivity in difficult cases of application, i.e. when the very fine particles adhere strongly to the largest particles.

For this, a process in accordance with the present invention of the type generally defined at the beginning is characterized in that, by vibrating said chamber, the particles of the fluidized bed are further subjected to sustained vibrations, said rising stream taking upwards only the fine dust of a grain size less than a given threshold, thus achieving said selective separation between the fine dust and the largest particles from which the dust has thus been removed.

The above-mentioned vibrations contribute, concurrently with the impact of the jet(s) of particles on a fixed obstacle or on other jets, in causing repeated impacts of the particles against
each other and against the dividing walls of the enclosure or of the passage which they occupy (fluidization chamber), and it has been discovered that that contributed greatly to overcoming the clinging forces between the very fine particles and the largest particles to which they adhere.

Furthermore, there is obtained through these vibrations a more rapid removal effect of the particles of the fluidized bed in the jet(s) of particles which are created therein, which increases the efficiency of these jets and also makes the dust removal more rapid. Because the particles are subjected to much more complex movements than those to which the single rising stream of fluidizing gas would subject them, they are projected into the jets also more rapidly. In other words, the induction created by the jets of particles is much better used when the particles are subjected to vibrations.

The invention then allows an excellent cooperation to be obtained between, on the one hand, the effects proper to the impacts resulting from the creation of the jets in the fluidized bed and to their impact on an obstacle and, on the other hand, the effects proper to the vibrating of the particles.

The result is a great efficiency in the separation in the fluidized bed and the possibility of increasing the flow rates of treated material.

Of course, the fine particles carried upwards will be able to be separated from the fluidizing gas, before this latter has been discharged outside, by any known means, for example by a filter with filtering pockets. As for the largest particles, they will be able to be removed from the fluidized bed by overflow and by simple gravity, also in a known way.

It is also evident that the present invention may be combined with the other advantageous arrangements of the principal parent application. Particularly, it may be advisable to create the jets of particles in the fluidized bed by simply injecting therein jets of compressed air (or other gas), directed towards each other.
The present application also relates to the means for implementing the above-described process, i.e. to an installation for removing the dust from particles, formed essentially by a fluidization chamber comprising a duct for introducing particles from which the dust is to be removed, a duct for removing the particles from which the dust has been removed, connected on the side opposite the preceding one, and a permeable dividing wall forming a bottom, separating an upper part of the chamber, forming a fluidization space defined moreover by lateral walls, from a lower part forming blowing box and able to be placed in communication with a duct for compressed fluidization and separation gas, the input of a pipe being furthermore in communication with the upper part of said space for discharging upwards the fine particles separated from the largest ones in the bed and carried along by the rising current of fluidization gas, the outlet of this pipe being possibly connected to a separator of the filter kind or similar, means being furthermore provided on the lateral walls of the fluidization space for generating jets of particles directed against each other.

In accordance with the invention, such an installation is characterized in that it comprises means for vibrating the particles in said fluidization space, adapted to subject to sustained vibrations said permeable dividing wall and possibly said lateral walls of the fluidization space, means being furthermore provided for adjusting the speed of the rising stream of fluidizing gas.

Advantageously, said vibrating means comprise a resilient suspension of the fluidization chamber and, connected thereto, at least one shaft pivoting at an adjustable speed, carrying at least one eccentric mass, also with adjustable eccentricity.

Thus the frequency and the amplitude of the vibrations may be conveniently adjusted. The stiffness of the suspension and this frequency are as a rule chosen so as to obtain the maximum amplitude.

Even with a resilient suspension supporting the chamber and acting therefore vertically, there is obtained, with this vibratory system, horizontal vibrations, although of a smaller amplitude than the vertical vibrations, which contributes to increasing the number of impacts between particles.

It may further be provided that said means comprise at
least two parallel pivotable shafts each carrying at least one eccentric mass, and means for adjusting the angular offset of the masses, which provides an additional adjusting facility.

One embodiment of the invention will now be described by way of non-limiting example with reference to the figures of the accompanying drawings in which:

Figure 1 is a schematical and partial representation in axial section of an installation in accordance with the invention, for implementing the process; and

Figure 2 is a cross-sectional view along line II-II of Figure 1.

The installation shown in the figures is for example intended for removing the dust from particles of alumina whose grain size (particles and fine dust) varies from 1 to 100 μ, and this so as to obtain removal of all the particles less than 30 μ.

This installation comprises a fluidization chamber 1 provided with a duct 2 for introducing particles from which the dust is to be removed, fed by a hopper 3, and a duct for discharging the particles from which the dust has been removed, so the largest particles, 4, which discharge duct is connected on the side opposite the inlet duct 2. Chamber 1 is limited by a permeable dividing wall forming a bottom 6, which bottom forms the lower wall of what was called above an upper part of the chamber, forming a fluidization space 7 defined furthermore by lateral walls 8a and 8b.

Below this permeable dividing wall 6 is located what was called above a lower part forming blowing box, shown at 9 and being able to be placed in communication with a fluidizing and separating compressed air duct 10, itself able to be fed by an adjustable output fan.

At the upper part of the installation there is provided a pipe 11 in communication with the top of the fluidization space 7. The other end of this pipe 11 is connected to a dust separator 12, for example with filtering pockets, the filtered air leaving at 13, and the separated particles falling into a hopper 14 provided with a drain valve 15.

In accordance with the invention there are further provided means for vibrating the particles in the fluidization space 7.
These means have been shown very schematically in the form of vibrators 16. These may advantageously be shafts rotatably mounted on bearings of the frame 17 of the installation, these shafts being driven by electric motors and carrying one or more eccentric masses.

As mentioned above, an adjustment may be provided for the angular offset of the masses carried by different shafts for creating vibrations having several components.

In any case, the vibrating means used are adapted to subject the chassis 17, the fluidization space 7, the permeable dividing wall 6, the side walls 8a and 8b and the blowing box 9 to vibrations whose principal component is directed vertically. To this end, a resilient system, formed for example by helical springs 18, is placed between supports 19 of the frame and bearing pieces 20 placed on the ground. Such a system allows not only vertical vibration but also the appearance of horizontal vibratory components.

Finally, there is shown at 21 (Figure 2) two compressed-air blowing nozzles disposed opposite one another and in the same direction, on the two opposite lateral walls 8a and 8b of the fluidization space 7.

The role of these nozzles is to induce in the fluidization bed of particles from which the dust has to be removed jets of particles directed against each other so as to subject the particles to impacts adapted to dislodge therefrom the finest dust which adheres thereto. For example four pairs of opposite nozzles 21 may be provided, as is shown in Figure 1.

These impacts to which the particles from which the dust has to be removed are subjected combine very efficiently with the vibratory movements to which they are also subjected because of the vibrating of space 7, and thus an excellent efficiency in the removal of dust may be obtained. By way of example, with particles of alumina having the grain size indicated above, all the dust of dimensions less than 30 μ may be conveniently eliminated. It should be noted that it is impossible to reach this result with conventional installations of the industrial vibrating screen type, in which a very rapid clogging up of the screen may furthermore be noted.

Then, the fine dust 22 loosened from the largest particles is carried along in the upper pipe 11 by the stream of fluidizing
air, and it is separated from this air in the dust separator 12. As for the largest particles, they remain or fall back into the fluidized bed, and by natural flow pass through the fluidization space 7 from the inlet duct 2 to the outlet duct 4 which thus supplies large particles 23 from which the dust has been removed.
THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A process for removing the dust from particles, with a view to obtaining selective separation between particles and much finer dust clinging to these particles, consisting in creating at least one jet of particles charged with fine dust in a fluidized bed of these particles, formed in a fluidization chamber, and in directing this jet against an obstacle at a speed sufficient for the fine dust, under the effect of the impact, to be loosened from the particles, the fluidization of the particles being achieved by means of a rising current of fluidizing and separating gas, characterized in that, by causing said chamber to vibrate, the particles of the fluidized bed are further subjected to sustained vibrations, said rising stream carrying upwards only the fine dust of a grain size less than a given threshold, thus effecting said selective separation between the fine dust and the largest particles from which the dust has thus been removed.

2. An installation for implementing the process of claim 1, formed essentially by a fluidization chamber comprising an inlet duct for particles from which the dust has to be removed, an outlet duct for the particles from which the dust has been removed, connected on the side opposite the preceding one, and a permeable dividing wall forming a bottom, separating an upper part of the chamber, forming a fluidization space defined moreover by lateral walls, from a lower part forming a blowing box and able to be placed in communication with a duct for compressed fluidizing and separating gas, the inlet of a pipe being furthermore in communication with the upper part of said space, for removing upwards the fine particles separated from the largest particles in the bed and carried along by the rising stream of fluidizing gas, the output of this pipe being possibly connected to a separator of the filter kind or similar, means being further provided on the lateral walls of the fluidization space for generating jets of particles directed against each other, characterized in that it comprises means for vibrating the particles in said fluidization space, adapted to subject to sustained vibrations said permeable dividing wall and possibly said lateral walls of the fluidization space.

3. The installation according to claim 2, characterized in
that said vibrating means comprise a resilient suspension of the fluidization chamber and, connected thereto, at least one shaft pivoting at an adjustable speed, carrying at least one eccentric mass, also with adjustable eccentricity.

4. The installation according to claim 3, characterized in that said means comprise at least two parallel pivoting shafts each carrying at least one eccentric mass, and means for adjusting the angular offset of the masses.

DATED this 3rd day of October 1980.

AIR INDUSTRIE

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Fig. 2.