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(54) Benævnelse: DYNAMISK SEPARATOR TIL PULVERFORMIGE MATERIALER OG FREMGANGSMÅDE TIL TILSVARENDE SEPARATION

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This invention relates to the classification of powders of varied granulometry, in a dynamic separator with a gaseous stream passing through it, generally of air.

The classification of powders or grains in two granulometric fractions can occur in suspension in air, by means of dynamic separators. In order to separate the particles according to their size, these separators use the forces created by the movement of the air and by the separating rotating devices.

The most recent generation of separators is commonly designated as “third generation”. From a raw product of a same granulometry, these separators enable more fine particles to be extracted in a chosen granulometric interval than the equipment of previous generations.

They are provided with one or more rotors with vertical axes, provided on the periphery with fixed selection blades, generally radial. These rotors, or selection cage, are also designated by the term “squirrel cage”. The materials to separate are powders, often of mineral origin, such as cement, lime or limestone, whose granulometric spectrum can range from a few microns to several millimetres.

The functioning principles of this family of separators are described in the documents USP 4,551,241 and EP 0 023 320, among others.

In third generation equipment, such as that illustrated in section in Figure 1, particle separation takes place in a restricted annular space, called “selection chamber” 3, delimited on the outside by the fixed louvers 5 for guiding the selection air 4, and on the inside by the blades of the selection rotor 6. The rotor 6 is integral with a vertical shaft 8 that makes it rotate.

The material to select is generally supplied by gravity, through several inlet chutes for material 1, distributed at the upper part of the selection chamber 3. The material exiting the chutes then falls onto an annular distribution plate 2, which centrifuges it in order to disperse it uniformly in the selection chamber 3. Separators also exist in which the material to select is brought into the selection chamber, in suspension in the air 4, through guiding louvers 5.
Each particle entering the selection chamber 3 is subjected to the resultant of the force of gravity, that of the centrifugal force initiated by the rotation of the turbine 6 and that of the resistance force of the selection air 4 introduced through the louvers 5. The lightest particles, called fine particles, penetrate the interior of the selection chamber 7, where they are carried by the air towards the outlet duct 9. The heaviest particles, called rejects, fall by gravity into the rejects chamber 10, whence they are evacuated, by gravity, through the outlet orifice 11.

The quality of the separation is quantified by parameters derived from a curve called the Tromp curve, which enables, for a given granulometric range, the quantities of fine particles trapped in the rejects to be known.

The cut point is the size at which any particle smaller than this size is classified among the fine particles, and any particle larger than this size is classified among the rejects. The desired cut point is obtained by varying the speed of rotation of the selection rotor. In fact, an increase of this speed of rotation increases the component of the centrifugal force, and therefore enables smaller particles to counterbalance the force of the air stream with the centrifugal force, thereby having the time to fall by gravity into the rejects chamber 10. This therefore reduces the cut diameter.

According to industrial experience acquired on third generation separators, the separation quality evolves in a non-linear manner, the other way round from the concentration criterion in the selection chamber, this criterion measuring the ratio between the quantity of material supplying the chamber and the air stream passing through it. In other words, when the mass of particles per cubic metre of air increases, the separation quality reduces. Consequently, any increase in the cut quality is only possible through a notable reduction of this concentration. For a given material delivery rate, this reduction necessitates an increase of the quantity of air passing through the separator, and therefore of the volume of the selection chamber, which increases the size of the separator and its energy consumption, often compromising the profitability of the investment with regard to the commercial value of the product to select. Thus, by conception, a third generation separator only has two adjustment parameters, which are the speed of rotation of the rotor, and, in a range generally restricted to +/- 10% of its nominal value, the delivery rate of the ventilation air stream.
The document EP 0 250 747 discloses a separator having a first separation space, from which the fine particles leave directly towards the outlet. The rejects are directed to a second separation space situated below, which improves the separation quality of the coarse rejects by removing more fine particles from them. However, this solution does not allow a reduction of the required air delivery rate, but on the contrary makes it necessary to increase it in order to supply the two separation spaces. It does not therefore allow any significant improvement of the cut quality for a given mass flow of particles/volume of air ratio.

The document EP 0 492 062, which is considered as the nearest state of the art, discloses a separator according to the preamble of Claim 1, with two concentric separation spaces, aiming to enable the production of at least three streams of material of different sizes with an improved separation quality, but nevertheless insufficient. Such a solution does not allow a reduction of the quantity of air.

The document DD 241 869 discloses a separator with two concentric separation spaces, with rotors turning in opposite directions to each other in order to provoke a more significant speed difference and to increase the delivery rate of material treated for a constant size. Such a solution nevertheless does not allow an improvement of the separation quality.

This invention proposes a solution enabling at least a part of the abovementioned drawbacks to be avoided, and relates to a separator in which the internal arrangement of the classification components enables the separation to be fractioned, which results in a substantial reduction of the final concentration levels, without increasing the required volume of air.

Compared with a third generation separator, this results, either in a gain in the quantity of fine particles produced, or a reduction in the required quantity of air for the same quantity of fine particles, or even a compromise between the two.

To that effect, it proposes a dynamic separator for pulverulent materials, such as cement, limestone or raw materials according to Claim 1, including a primary rotor, mobile in rotation about a vertical axis, provided with primary selection blades arranged at its periphery so as to sweep, during the rotation of the primary rotor, a hollow circular cylinder, a secondary rotor provided with secondary selection blades arranged at its periphery, part of said secondary selection blades being located within said cylinder so as to form a secondary selection chamber between said primary selection blades and said secondary selection blades, and guiding louvers located outside said cylinder so as to form a primary selection chamber between said primary guiding louvers and said primary selection blades. This dynamic separator is particular in that said secondary selection blades and said guiding
louvers protrude below said cylinder so as to form, under said cylinder between said guiding louvers and said secondary selection blades, a reject selection chamber for subjecting to an additional separation operation the rejects coming from the primary and secondary selection chambers. In this manner, the secondary selection chamber recovers an air discharged of part of the rejects, and therefore with a lower concentration of material. For a given air delivery rate, this allows improved performance in terms of separation quality. Furthermore, the reject selection chamber allows the creation of a second stream of fine particles, and an improvement of the overall production delivery rate of fine particles.

According to other characteristics:
- the secondary rotor can comprise a diaphragm arranged substantially at the level of the lower end of the selection blades of said primary rotor so as to restrict the movements of air between a lower portion located under said diaphragm and an upper portion located above said diaphragm of the secondary rotor; this arrangement allows the relative stream of air to be regulated between that passing through the two primary and secondary selection chambers and that passing through the reject selection chamber; this makes it possible to avoid having a majority of air passing through the reject selection chamber, which would reduce the overall performance by reducing the selection operation of the primary and secondary selection chambers.
- said guiding louvers can be inclined by rotation about their vertical axis, so as to direct the incoming air stream and to impart a tangential velocity to same; this allows the load to be reduced on the drive shafts of the primary and secondary rotors,
- the height of the selection blades of the primary rotor can range from half to three quarters of the height of the selection blades of the secondary rotor; such a proportion allows particularly advantageous results to be obtained,
- at least one of the rotors can be provided with means capable of making its speed of rotation adjustable, which makes it possible to regulate the cut points of each selection chamber until an optimum result is obtained,
- said separator can comprise a distribution plate arranged above the primary and secondary rotors, capable of distributing the stream of incoming material under the action of the centrifugal force,
- said separator can comprise an outlet for the fine particles located above the secondary rotor,
- said separator can comprise an outlet for the fine particles located below the secondary rotor.

The invention also relates to a dynamic separation method according to Claim 9 by means of a separator according to the invention powered by a selection gas, for example, selection air. This method is particular in that the angular speed of the primary rotor is lower than that of the secondary rotor.
According to other characteristics:

- the supply of fresh material can occur by gravity and can be dispersed under the action of the centrifugal force by means of a distribution plate located above the selection rotors,
- the supply of pulverulent material can occur in suspension in the selection gas through the guiding louvers at the level of the primary and secondary selection chambers, a pulverulent-material-free gas being introduced through a distribution duct surrounding the guiding louvers at the level of the reject selection chamber,
- said selection gas can be a hot gas, so that the pulverulent materials dry during their passing through said separator.

This invention will be better understood on reading the detailed description that follows, made with reference to the attached figures, in which:

- Figure 1 illustrates, in section, a third generation separator of the state of the art.
- Figure 2 illustrates, in section, a separator according to a first embodiment of the invention,
- Figure 3 illustrates, in section, a separator according to a second embodiment of the invention,
- Figure 4 illustrates one of the possible arrangements of the aeraulics classification diagram for a separator supplied with material by gravity means in accordance with Figure 2,
- Figure 5 illustrates one of the possible arrangements of the aeraulics classification diagram for a separator supplied with material by pneumatic means in accordance with Figure 3.

The separator according to the invention is illustrated by Figure 2, in one of the possible configurations. It comprises a primary rotor 6 driven by a primary shaft 19 and a secondary rotor 14 coaxial with the primary rotor 6, and driven by a secondary shaft 8. The selection blades of the primary rotor 6 define a cylinder, which they sweep during the rotation of the rotor. The annular volume formed by the space between the guiding louvers 5 and the selection blades of the primary rotor 6 forms the primary selection chamber 3. The contiguous annular space delimited by the selection blades of the primary rotor 6 and of the secondary rotor 14, constitutes the secondary selection chamber 7, the secondary selection blades being arranged at least in part within the cylinder described above. They are arranged at a distance nearer to the axis than the selection blades of the primary rotor 6, and describe a cylinder having a smaller radius within the cylinder corresponding to the selection blades of the primary rotor 6.

A sealing gasket 18 makes it possible to prevent the air situated in the secondary selection chamber 7 from passing directly into the outlet duct 9 without passing through the selection blades of the secondary rotor 14.
Conforming to the invention, the primary rotor 6 rotates at a slower speed than the secondary rotor 14, and this speed can, depending on the applications, be fixed or variable in the aim of an optimising adjustment. The selection air 4 enters the separator through the guiding louvers 5 at a radial speed in the direction of the axis of rotation of the rotors. Due to the rotation of the primary rotor 6, the selection air 4 adopts a tangential speed in addition to its radial speed. An appropriate inclination of the guiding louvers 5 allows the initiation of this tangential speed. As a result, the particles in suspension in the selection air 4 are carried by the stream of air towards the interior of the primary rotor 6, and according to a rotational movement inducing a centrifugal force. Now, the centrifugal force exerted on a particle increases in proportion to its volume, therefore substantially as the cube of its size, while its resistance to the air stream increases in proportion to its surface area, therefore substantially as the square of its size. Thus, the smaller particles will go more towards the interior of the rotor, and the larger particles, more sensitive to the centrifugal force, will stay longer in the annular space formed by the selection chamber, and will more often end up falling into the reject chamber 10.

The low speed of the primary rotor 6, due to the weaker centrifugal force, subjects the particles passing through the primary rotor 6 to a coarse cut point. The result is elimination by gravity of a first quantity of rejects, which is thus subtracted from the initial quantity of material in suspension in the air 4. The selection air 4 arrives in the secondary selection chamber 7 with a smaller quantity of material, and the selection task therefore takes place with a less concentrated product. The speed of rotation of the secondary rotor 14 being higher, the centrifugal force increases, and the cut size is smaller, allowing a stream of fine particles 20, sufficiently fine due to the lower cut, and of very good quality due to the lower concentration of particles in the secondary selection chamber 7, to be directed towards the outlet duct 9.

Furthermore, according to the invention, the height of the selection blades of the primary rotor 6 ranges from half to three quarters of the height of the selection blades of the secondary rotor 14. This results, at the level of the lower end of the secondary rotor 14, in the creation of a reject selection chamber 12, which collects the rejects from the primary 3, and the secondary 7, selection chambers. The rejects arriving in this enclosed space are once more selected, in an even weaker concentration, resulting from the respective elimination of fine fractions in the primary 3, and secondary 7, selection chambers. This reject selection chamber 12 functions with the speed of rotation of the secondary rotor 14, and therefore with a cut point identical to that of the secondary selection chamber 7. The cut quality here is also very good, due to the weak concentration of material. The reject selection chamber 12 therefore allows a second stream of fine particles, which come to join the first stream of fine particles described above, to be directed towards the outlet duct 9.

The secondary rotor 14 is partitioned, at its lower end, by a diaphragm 15, compensating for the slightest loss of charge suffered by the fraction in the air passing though the reject selection chamber 12.
compared with the fraction that passes through both the primary and secondary rotors. Without this
diaphragm 15, the majority of the incoming air would pass through the reject selection chamber 12,
where separation would be very well done, but little air would pass through the primary and secondary
chambers, where the separation would therefore be much inferior. The diaphragm 15 therefore allows
the distribution of the stream of selection air 4 to be regulated between the high end and the low end of
the secondary rotor 14. This diaphragm 15 cuts the secondary rotor 14 into two parts, in the direction of
its height. The upper part 13 receives the fine particles coming from the primary 3, and secondary 7,
selection chambers, while the lower part 16 receives the residual fine particles captured in the reject
selection chamber 12.

In the separator according to the invention, the selection air 4, charged with fine particles, exits at the
upper part of the secondary rotor 14, through the outlet duct 9. A circular sealing gasket 17 prevents
any suction, by the air exiting through the duct 9, of particles supplied by the chutes 1. An arrangement,
ot illustrated in a figure, can exist wherein this air exits through a duct placed at the base of the
secondary rotor 14.

Example 1: Class 32.5 cement, 85% passing at 32 μm.

The separator is supplied with 100 t/h of material to separate, at a rate of 2.5 kg/m³ of air.

This stream penetrates the primary selection chamber 3. 51.5 t/h of primary fine particles, cut at 80 μm,
pass through the blades of the primary rotor 6 and reach the secondary chamber. The remaining 48.5 t/h
fall directly into the reject selection chamber 12. The primary fine particles therefore penetrate the
secondary selection chamber 7 at a reduced concentration of 1.29 kg/m³, which allows 24.1 t/h to be
obtained, passing through the blades of the secondary rotor 14, cut at 28 μm, which can leave the
separator through the duct 9 as a finished product. The secondary rejects represent 27.4 t/h and are
added to the 48.5 t/h of primary rejects to give a delivery rate of 75.9 t/h, which enter the reject
selection chamber 12 at a concentration of 1.9 kg/m³. This concentration allows 13 t/h of fine particles,
cut at 28 μm, to be recovered, which are added to the 24.1 t/h, which allows a production of 37.1 t/h to
be reached, which exit as a finished product through the duct 9.

An installation according to the state of the art, also supplied with such a product at 100 t/h at a
concentration of 2.5 kg/m³, allows a production of 33.75 t/h of fine particles cut at 32 μm to be reached.
A production increase of approximately 10% is therefore observed, at the same time obtaining a finer
product with the separator according to the invention.

Example 2: Class 52.5 cement with 93% passing at 32 μm.

The separator is supplied with 100 t/h of material to separate, at a rate of 2.5 kg/m³.
This stream penetrates the primary selection chamber 3, 51.5 t/h of primary fine particles, cut at 80 μm, pass through the blades of the primary rotor 6 and reach the secondary chamber. The remaining 48.5 t/h fall directly into the reject selection chamber 12. The primary fine particles therefore penetrate the secondary selection chamber 7 at a reduced concentration of 1.29 kg/m³, which allows 19.9 t/h to be obtained, passing through the blades of the secondary rotor 14, cut at 22 μm, which can leave the separator through the duct 9 as a finished product. The secondary rejects represent 31.6 t/h and are added to the 48.5 t/h of primary rejects to give a rate of 80.1 t/h, which enter the reject selection chamber 12 at a concentration of 2.0 kg/m³. This concentration allows 11.6 t/h of fine particles, cut at 22 μm, to be recovered, which are added to the 19.9 t/h, which allows a production of 31.5 t/h to be reached, which exit as a finished product through the duct 9.

An installation according to the state of the art, also supplied with such a product at 100 t/h at a concentration of 2.5 kg/m³, allows a production of 27.4 t/h of fine particles cut at 23 μm to be reached. A production increase of approximately 15% is therefore observed, at the same time obtaining a finer product with the separator according to the invention.

The material to select is supplied by gravity through the inlet chutes of material 1, distributed around the circumference of the primary selection chamber 3. The number of these chutes depends on the size of the separator and on the delivery rate to process; it is generally more than or equal to two, in order to ensure a distribution as homogeneous as possible.

A distribution plate 2, driven by the primary rotor 6, then distributes this material throughout the annular space corresponding to the upper part of the primary selection chamber 3. The material dispersed in this way falls into the primary selection chamber 3, where each of the grains is subjected to the triple effect of the centrifugal force generated by the rotation of the primary rotor 6, the opposing thrust of the selection air 4 and gravity. A large proportion of grains of a size larger than the primary cut point defined by the speed of rotation of the primary rotor 6 therefore falls into the reject selection chamber 12, while the larger proportion of grains of a size smaller than or equal to the primary cut point is carried into the secondary selection chamber 7. The result, according to the invention, is a notable reduction of the concentration of material in this chamber, induced by the subtraction of a fraction of the coarsest elements during the primary selection. The secondary rotor 14 rotating at a higher speed than that of the primary rotor 6, while increasing the centrifugal force, induces a cut point of a size smaller than that created by the primary rotor 6. This results in the elimination of a second quantity of rejects, which fall in turn into the reject selection chamber 12. The secondary rotor 14 is provided with a device for varying speed, which allows the final cut point to be adjusted according to the desired granulometric curve of the finished product. In the reject selection chamber 12, the collection of rejects is subjected to a third selection, in the aim of extracting from it the residual fine particles that were trapped in the rejects during the two preceding selections. The blades of the secondary rotor 14 extend
into the reject selection chamber 12 and are active there in cooperation with the guiding louvers. The blades can be rectilinear, and can move with the rotation of the secondary rotor 14 with the same diameter in this area as at the level of the secondary selection chamber 7. But they can also be located further away from the axis of the rotors, or nearer, depending on the design requirements of the separator, these blades also being capable of being blades independent of those that are active at the level of the secondary selection chamber 7, but fixed to the same secondary rotor 14. The concentration levels in the two selection chambers 7 and 12 being substantially lower than the initial concentration in the chamber 3, the recovery rates of fine particles are higher than those of a third generation separator having an equivalent delivery rate of selection air 4 and a rotor rotating at the same speed as the secondary rotor 14 of the separator according to the invention (see the examples above).

According to a variant of the invention, the separator can be without a reject selection chamber 12. It is then possible to benefit from the advantage of the lower concentration in the secondary selection chamber 7. However, the results obtained for a given concentration of material are generally less good, due to the fact that advantage is not taken of the third chamber to recover an additional stream of fine particles.

The separator according to the invention can be supplied according to the gravity mode common to third generation separators, from inlet chutes of material 1 supplying a distribution plate 2. In this configuration, Figure 4 presents an example of an aerulic diagram wherein the air 20 charged with fine particles is introduced into a filter enabling separation of these fine particles, and their recovery 25, below the hopper of the filter, while the purified air 21 is extracted by a fan.

The invention discloses another variant, illustrated by Figures 3 and 5. In this variant, the supply of the material 1 to select occurs in suspension in the primary fraction 4a of the selection air 4, fraction that exclusively supplies the selection chambers 3 and 7. The balance of the selection air 4, constituting the secondary fraction 4b penetrating the reject selection chamber 12, is free of material in suspension, thus preventing the concentration levels in this area from increasing. The separation of the airs at the level of the rotors occurs according to the principle illustrated by Figure 5, where the secondary fraction 4b of the air arrives through an air distribution duct 24, which distributes it through the lower part of the guiding louvers 5. In the example of Figure 5, the secondary fraction 4b of the air is derived from the recirculation 22 of a fraction of the purified air 21. A point of introduction 23 enables, if necessary, the temperature of the secondary fraction 4b of the air to be controlled by introducing an air or a gas at a fixed temperature through the point of introduction 23.

The separator according to the invention allows adjustment of the ratio of the speeds of the primary and secondary rotors, so as to minimise the concentration levels in the selection chambers at a constant air delivery rate.
Whatever the configuration of the supply of material, the selection of air 4 can be replaced by a hot combustion gas, allowing the material to dry during the classification phases.

The two most frequent problems posed by the majority of third generation separators are the difficulty of balancing the supply streams between the inlet chutes of material 1, in cases where this occurs by gravity, and the angular orientation, in the vertical plane, of the fine particles outlet duct 9.

For the problem of the supply by gravity of the inlet of material 1, the separator proposes a single supply point of fresh material 1, preferably placed axially, and undertakes to optimise this distribution by the distribution plate 2, in a manner transparent to the installer.

With regard to the orientation of the outlet duct 9, this latter can be oriented in a standard manner, in a vertical plane, from 15 degrees to 15 degrees, between 45 and 90 degrees, depending on the installer’s need.

For the inlet of air 4 to the separator in the supply by gravity mode, the installer has the choice between an annular inlet, from below, or a cyclonic lateral inlet.

This flexibility greatly facilitates the installation of the separator, in particular in existing workshops, where high installation constraints can exist.

This invention is particularly intended for the classification of powders, such as those produced in industrial crushing installations of all capacities, and over a wide range of fineness, which can range from a few microns to several mm.

Although the invention has been described according to a particular embodiment, it is not at all limited to it, and variants can be brought to it, as well as combinations of the variants described, while still remaining within the scope of the claims, without for all that straying from the scope of the invention.
PATENTKRAV

1. Dynamisk separator til pulverformige materialer, såsom cement, kalk eller råmaterialer, hvilken separator omfatter en primer rotor (6), mobil i rotation om en vertikal akse, forsynet med primære udvælgelsesblade, der er placeret i periferien heraf for således at feje, under rotation af den primære rotor (6), en hul cirkelformet cylinder, en sekundær rotor (14) forsynet med sekundære udvælgelsesblade, placeret i periferien heraf, hvor en del af de sekundære udvælgelsesblade er placeret inde i cylinderen for således at danne et sekundært udvælgelseskammer (7) mellem de primære udvælgelsesblade og den sekundære udvælgelse af blader, og styrelameller (5) placeret uden for cylinderen for således at danne et primært udvælgelseskammer (3) mellem styrelamellerne (5) og de primære udvælgelsesblade, hvor de sekundære udvælgelsesblade og styrelamellerne (5) rager frem under cylinderen for således at danne, under cylinderen mellem styrelamellerne (5) og de sekundære udvælgelsesblade, et afvisningsudvælgelseskammer (12) for at underkaste, for en supplerende separation, de afvisninger, der kommer fra de primære (3) og sekundære (7) udvælgelseskamre.

2. Dynamisk separator ifølge det foregående krav, hvor den sekundære rotor (14) indbefatter en membran (15) arrangeret i alt væsentligt ved niveauet for den nedre ende af udvælgelsesbladene for den primære rotor (6) for således at begrænse luftbevægelser mellem en nedre del (16) placeret under membranen og en øvre del (13) placeret over den sekundære rotors (14) membran.

3. Dynamisk separator ifølge et hvilket som helst af de foregående krav, hvor styrelamellerne (5) hældes ved rotation omkring deres vertikale akse for således at lede den indgående luftstrøm og bibringes denne en tangential hastighed.

4. Dynamisk separator ifølge et hvilket som helst af de foregående krav, hvor højden på den primære rotors (6) udvælgelsesblade er i intervallet fra halvdelen til tre fjerdedele af højden på udvælgelsesbladene for den sekundære rotor (14).

5. Dynamisk separator ifølge et hvilket som helst af de foregående krav, hvor mindst én af rotorerne (6, 14) er forsynet med et middel, for eksempel en frekvensomformer, der er i stand til at gøre dens hastighed justerbar.
6. Dynamisk separator ifølge et hvilket som helst af de foregående krav, hvilken separator omfatter en fordelingsplade (2) placeret over den primære (6) og sekundære (14) rotor, hvilken fordelingsplade er i stand til at fordele strømmen af indgående materiale (1) under påvirkning af centrifugalkraft.

7. Dynamisk separator ifølge et hvilket som helst af de foregående krav, hvilken dynamisk separator omfatter en udgang (9) til finpartiklerne placeret over den sekundære rotor (14).

8. Dynamisk separator ifølge et hvilket som helst af de foregående krav, hvilken dynamisk separator omfatter en udgang til finpartiklerne placeret under den sekundære rotor (14).


10. Fremgangsmåde ifølge det foregående krav, hvor tilførslen af pulverformigt materiale (1) sker ved tyngdekraft og dispergeres under påvirkning af centrifugalkraft ved hjælp af en fordelingsplade (2) placeret over udvælgelsesrotorerne.

11. Fremgangsmåde ifølge krav 9, hvor tilførslen af pulverformigt materiale (1) sker i suspension i udvælgelsesgassen (4) gennem styrelamellerne (5) ved niveauet for den primære udvælgelse (3) og sekundære (7) kamre, hvor en pulvormaterialefri gas introduceres via en fordelingskanal (24), der omgiver styrelamellerne (5) ved niveauet for afvisningsudvælgelseskammeret (12).

12. Fremgangsmåde ifølge et af kravene 9 til 11, hvor udvælgelsesgassen (4) er en varm gas, således at de pulverformige materialer (1) tørres under deres passage gennem separatoren.