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SELECTOR

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FIG. 1.

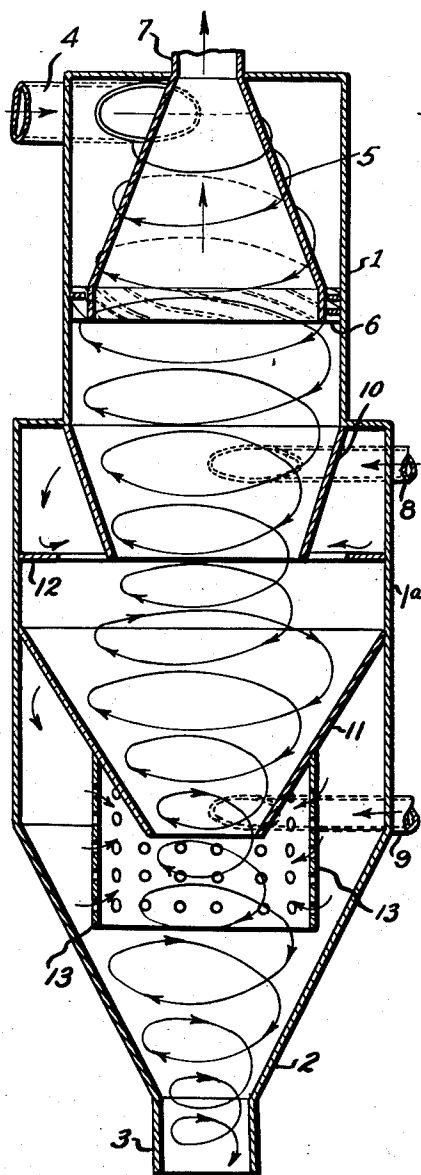
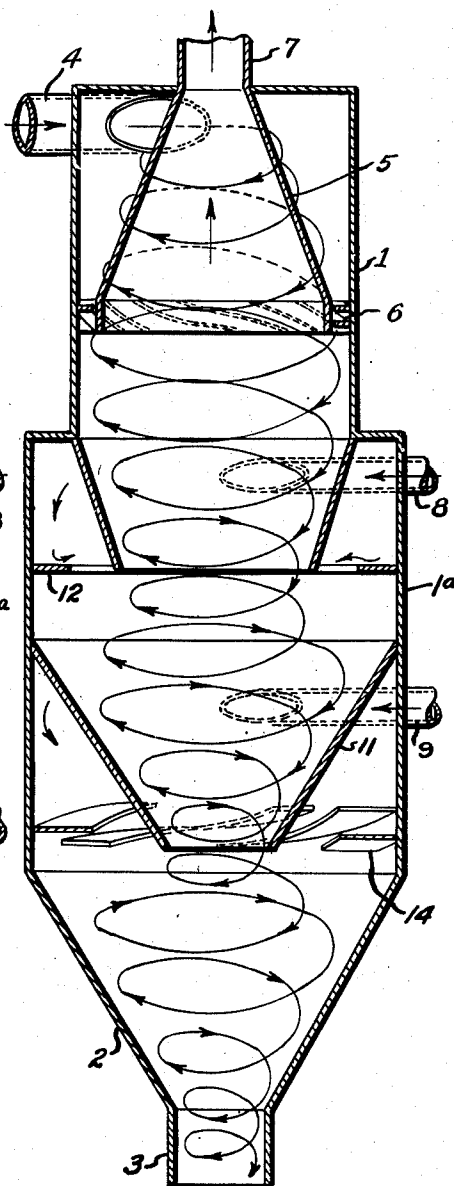


FIG. 2.



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SELECTOR

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5 Claims. (Cl. 209—144)

The present invention relates to apparatus intended for the separation and classification of solid particles held in suspension in a gaseous fluid, and more particularly to apparatus of the cyclone type, i. e. comprising a cylindrical body in which a current of fluid under pressure charged with solid particles is introduced tangentially, the body being connected at its upper end to suction means creating an upward suction current and being continued at its lower end by a conical portion provided with an outlet aperture for dust. In such apparatus the current of fluid admitted tangentially has a downward whirling movement imparted to it, which causes separation and classification of the solid particles increasing more and more as the current moves downwards. The coarser particles are flung against the wall of the cylindrical body and slide down the lower cone to the outlet at the bottom, while the finer particles remaining in the vicinity of the axis of the cylindrical body are carried away by the rising suction current.

It has already been proposed to provide apparatus of this kind with one or more inlets for secondary air under pressure connected tangentially to the cylindrical body opposite conical deflectors, for the purpose of ensuring what may be called a rinsing of the solid particles, that is separating from the coarse or medium particles the fine particles which might otherwise remain imprisoned between the latter. Now it has been found that the whirling movement impressed on the currents of secondary air so introduced tangentially into the cylindrical body, in combination with the whirling movement of the principal descending current, may give rise in some zones to an insufficient acceleration or too great an acceleration of the solid particles in suspension in this current and that very sensitive regulation in certain cases becomes difficult.

If endeavours are made to overcome this drawback by arranging the inlets for secondary air in a radial disposition or at a certain angle to the direction of the principal whirling current, difficulty is involved in obtaining a uniform distribution of the rinsing air over the whole of the internal periphery of the cylindrical body.

The invention is directed to an improvement applied to classifiers of the kind indicated with the object of obviating the above disadvantage and of ensuring a greater efficaciousness of the rinsing produced by the current or currents of secondary air.

The improvement according to the invention consists in disposing below at least one of the

secondary air inlets an annular substantially horizontal deflector which has the effect of accelerating the centrifugal action by confining the air to a fairly narrow channel. In this stage of the rinsing it is then possible to extract extremely fine dust because of the acceleration of the centrifugal effect. The other secondary air inlet or inlets may have no particular device for this purpose or they may have either an annular deflector similar to the above-mentioned deflector, or a device adapted to subdivide the current of secondary air and placed opposite the air inlet under consideration below the conical deflector. Such a device may be for example a cylinder of perforated sheet metal, a ring of vanes or the like. With the latter devices the second current of rinsing air is admitted with the maximum of centrifugal effect and can carry out the extraction of coarser particles than otherwise due to the fact that it traverses the surface of material perpendicularly.

The combination of these two arrangements makes it possible according to the quantity of air distributed between the rinsing systems operating in different manners to obtain maximum sensitiveness of operation and a greater certainty in the grading of the particles.

In the accompanying drawing

Figure 1 shows by way of example a form of construction of an improved cyclone dust classifier according to the invention in axial vertical section.

Figure 2 is a similar section showing a ring of vanes as referred to above in association with a secondary air inlet means.

Referring to the drawing 1 is the cylindrical body of the cyclone comprising a part 1a of larger diameter in the rinsing zone and a lower conical extension 2 provided with a discharge aperture 3 for the coarse and medium particles. An inlet duct 4 for the fluid charged with the materials to be separated and classified is connected tangentially to the cylindrical body 1. In this latter is disposed in a known manner an inverted truncated cone 5 of which the base is attached to the wall of the body 1 by a ring of vanes 6 and of which the top is in communication by a duct 7 with the inlet of a fan (not shown). 8 and 9 denote two inlets for secondary air connected tangentially to the portion 1a of the classified body; opposite these inlets are disposed in the known manner conical deflectors 10 and 11 respectively.

Below the secondary air inlet 8 there is an annular horizontal deflector 12 and below the

air inlet 8 in contact with the conical deflector 11 is disposed a cylinder of perforated sheet metal 13, preferably attached to the conical deflector 11. Between the lower end of the perforated cylinder 13 and the cone 2 below it sufficient space is left to permit the escape of any dust which may have lodged in the space between the cone 11, the wall 1a and the cylinder 13 when the apparatus is operated on the closed circuit principle. The perforated cylinder 13 may be replaced by any equivalent device, for example by rings of vanes 14 in Figure 2.

As will be clear from the above explanations, the current of fluid under pressure charged with solid particles descends with whirling motion in the body 1—1a. The centrifugal force drives the coarser particles towards the periphery, while the rising current of fluid due to upward suction traverses the apparatus axially and carries with it the finer particles which have remained at the inner part of the descending whirling current. The secondary air entering by the duct 8 is confined by the horizontal deflector 12 and the conical deflector 10 to a fairly narrow annular channel and on emerging therefrom is rotating in the opposite direction to the descending whirling current on which it acts tangentially. The secondary air entering by the duct 9 is distributed over the perforated cylinder 13, which breaks up the rotation and ensures a fairly uniform distribution of the air in the form of a plurality of jets directed inwards. The vane arrangement 14 in Fig. 2 has a similar effect. These jets traverse the descending whirling current perpendicularly to the motion of the latter. In this way an efficacious rinsing of the particles is ensured.

The construction shown may be modified in various ways. Thus, the apparatus may comprise only a single inlet for rinsing air, or it may comprise more than two. If there is more than one secondary air inlet, the several inlets may be provided with horizontal annular deflectors only or with perforated cylinders only or with rings of vanes only.

It may be necessary to deal in particular with mixtures of pulverulent materials in which the very fine or very light particles are in a large proportion, and it may be desired to extract all these particles in a single operation without carrying away the coarser or heavier elements. In this case it will be preferable in the above example of construction to combine with the secondary air inlet 9 not a perforated cylinder 13, but an annular horizontal deflector disposed below this air inlet, just as the deflector 12 is disposed below the secondary air inlet 8.

If instead of two secondary air inlets there are more than two, such an annular horizontal deflector can be disposed below each of them.

With these arrangements the rotation of the materials in suspension will be maintained at all levels in the apparatus, and at each stage of extraction (represented by a cone such as 10 or 11 in combination with a secondary air inlet such as 8 or 9) a quantity of fine or light particles will be extracted corresponding to the quantity and velocity of the secondary fluid introduced at each stage.

These fractional extractions can be regulated separately one from the other with the maximum possible range of separate regulation and the minimum risk of carrying away the heavier or denser particles.

What I claim is:

1. In a cyclone selector for solid particles, a cylindrical body having a tangential inlet through which a gaseous fluid containing the solid particles to be classified enters said body, and an upper outlet communicating with suction means and a lower outlet for discharging the largest particles, a secondary tangential inlet below said first named inlet, an inverted frustro-conical deflector having its upper and outer edge secured to said body below said first named inlet and above said secondary inlet and extending downwardly and inwardly past said secondary inlet to direct a blast of material entering there-through, said deflector having a free lower end forming a central passage for air and material, and an annular horizontal deflector attached to the wall of said body substantially opposite the free end of said frustro-conical deflector, and disposed to reduce the space between the narrow end of said frustro-conical deflector and said body whereby to increase the whirling speed of air entering through said secondary air inlet.

2. In a cyclone selector for solid particles, a cylindrical body having a tangential inlet through which a gaseous fluid containing the solid particles to be classified enters said body, and an upper outlet communicating with suction means and a lower outlet for discharging the largest particles, a secondary tangential inlet below said first named inlet, an inverted frustro-conical deflector having its upper and outer edge secured to said body below said first named inlet and above said secondary inlet and extending downwardly and inwardly past said secondary inlet to direct a blast of material entering there-through, said deflector having a free lower end forming a central passage for air and material, and means in association with the narrow end of said frustro-conical deflector for diminishing the whirling speed of air entering through said secondary inlet, said means comprising a perforated cylinder attached to the said frustro-conical deflector.

3. In a cyclone selector for solid particles, a cylindrical body having a tangential inlet through which a gaseous fluid containing the solid particles to be classified enters said body, and an upper outlet communicating with suction means and a lower outlet for discharging the largest particles, a secondary tangential inlet below said first named inlet, an inverted frustro-conical deflector having its upper and outer edge secured to said body below said first named inlet and above said secondary inlet and extending downwardly and inwardly past said secondary inlet to direct a blast of material entering there-through, said deflector having a free lower end forming a central passage for air and material, and means in association with the narrow end of said frustro-conical deflector for diminishing the whirling speed of air entering through said secondary inlet, said means comprising a ring of vanes located between said body and the narrow end of said frustro-conical deflector.

4. In a cyclone selector for solid particles, a cylindrical body having a tangential inlet through which a gaseous fluid containing the solid particles to be classified enters said body, and an upper outlet communicating with suction means and a lower outlet for discharging the largest particles, a secondary tangential inlet below said first named inlet, an inverted frustro-conical deflector having its upper and outer edge secured to said body below said first named inlet

and above said secondary inlet and extending downwardly and inwardly past said secondary inlet to direct a blast of material entering there-through, said deflector having a free lower end forming a central passage for air and material, 5 and an annular horizontal deflector attached to the wall of said body substantially opposite the free end of said frustro-conical deflector, and disposed to reduce the space between the narrow end of said frustro-conical deflector and said 10 body whereby to increase the whirling speed of air entering through said secondary air inlet, another secondary tangential air inlet located below the first, a frustro-conical deflector opposite said inlet to direct a whirling blast of air 15 entering therethrough, and means in association with the narrow end of said last mentioned frustro-conical deflector for diminishing the whirling speed of air entering through said last mentioned secondary inlet, said means comprising a perforated cylinder attached to said last 20 mentioned frustro-conical deflector.

5. In a cyclone selector for solid particles, a cylindrical body having a tangential inlet through which a gaseous fluid containing the 25 solid particles to be classified enters said body, and an upper outlet communicating with suction means and a lower outlet for discharging the

largest particles, a secondary tangential inlet below said first named inlet, an inverted frustro-conical deflector having its upper and outer edge secured to said body below said first named inlet and above said secondary inlet and extending downwardly and inwardly past said secondary inlet to direct a blast of material entering there-through, said deflector having a free lower end forming a central passage for air and material, 5 and an annular horizontal deflector attached to the wall of said body substantially opposite the free end of said frustro-conical deflector, and disposed to reduce the space between the narrow end of said frustro-conical deflector and said 10 body whereby to increase the whirling speed of air entering through said secondary air inlet, another secondary tangential air inlet located below the first, a frustro-conical deflector opposite said inlet to direct a whirling blast of air 15 entering therethrough, and means in association with the narrow end of said last mentioned frustro-conical deflector for diminishing the whirling speed of air entering through said last mentioned secondary inlet, said means comprising a ring of vanes located between said body and the narrow end of said last mentioned 20 frustro-conical deflector.

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