Aug. 27, 1940. N. AHLMANN 2,212,819

APPARATUS FOR SEPARATING POWDERED MATERIALS

Filed June 18, 1938

Fig. 1.

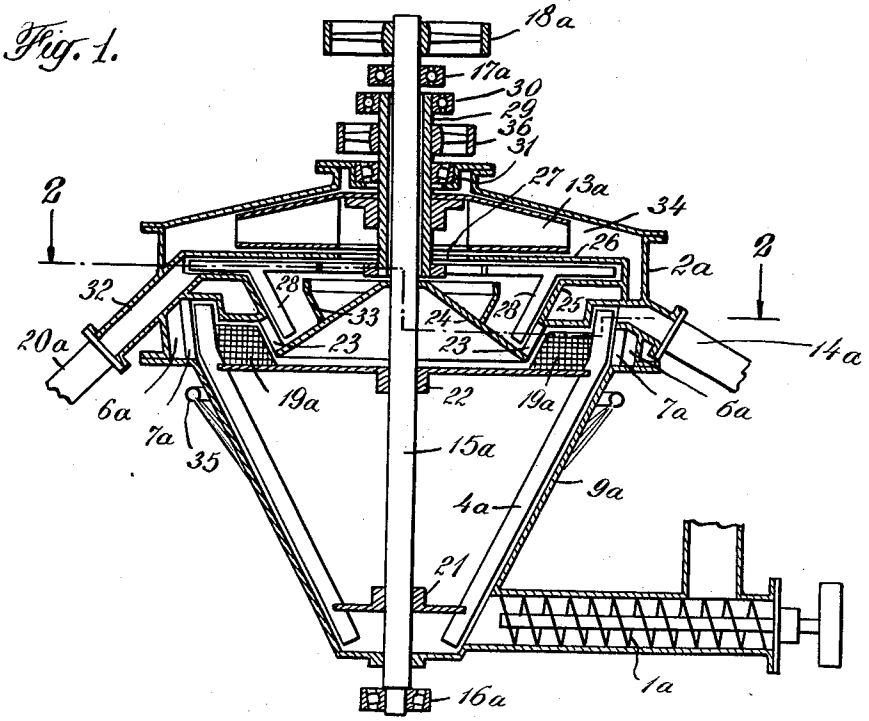
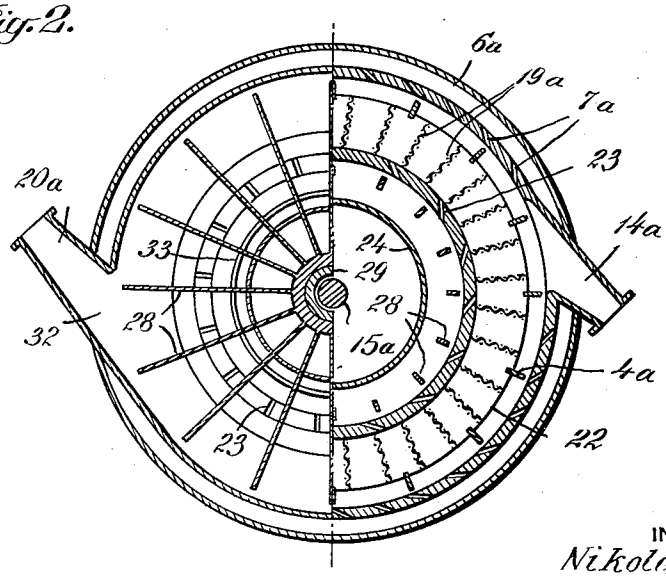


Fig. 2.



INVENTOR
Nikolai Ahlmann
BY
Dennie, Davis, Travers & Edmonds
ATTORNEYS

Patented Aug. 27, 1940 2,212,819

UNITED STATES PATENT OFFICE

2,212,819

APPARATUS FOR SEPARATING POWDERED MATERIALS

Nikolai Ahlmann, Copenhagen, Denmark, assignor to F. L. Smidth & Co., New York, N. Y., a corporation of New Jersey

Application June 18, 1938, Serial No. 214,500
In Great Britain July 1, 1937

1 Claim. (Cl. 209—144)

This invention relates to apparatus for separating powdered materials from one another.

When it is desired to separate the materials in a powdered mixture, the mixture is often suspended in air and delivered to a centrifugal separator in which the heavier particles move outwards under the action of centrifugal force, and the lighter particles are carried by an air current towards the axis of rotation of the separator.

The essential idea underlying the present invention is the avoidance of the necessity for moving the coarser particles from the middle to the outside of the separator, with a consequent saving of work and increase in efficiency. According to the invention the powder mixture is moved in a thin layer in a helical path along the inner surface of a wall of a container, internally circular in cross-section, and air is blown in a number of jets through the layer to carry the fine powder particles towards the axis. The heavier particles, under the influence of centrifugal force, remain on the wall and are discharged separately from the fine particles. The powder mixture is not suspended in air before the separation takes place although some air may be entrained and travel with it, and the coarser particles remain on or close to the wall of the separator throughout. Naturally the coarse and fine particles cannot be completely separated from one another in a single treatment, but excellent results are obtained if some 30 or more air nozzles are provided around the wall.

The powder mixture may advantageously be whirled around the wall mechanically and it may be caused to move upwards in a container with a vertical axis. The container and the means for causing the powder mixture to whirl around its inner wall may be constructed in substantially the same way as in the cooler described in my copending application, Serial No. 79,837, filed May 15, 1936, that is to say, the container may increase in diameter upwards and the material may be whirled around, moving helically upwards, by means of vanes rotating at high speed.

In order that the invention may be clearly understood and readily carried into effect a pneumatic separator constructed in accordance with the invention will now be described by way of example with reference to the accompanying drawing, in which:

Figure 1 is a vertical section through the pneumatic separator; and

Figure 2 is a horizontal cross-section on the line 2—2 of Figure 1.

The container has a cylindrical part 2*a* and a conical part 9*a*. The powder mixture is supplied at the bottom of the container by worm 1*a*. The mixture is set into rotation by a system of vanes 4*a* carried by a shaft 15*a* through spiders 21 and 22 and is moved upwards as a result of the reaction of the wall 9*a*. The shaft 15*a* is mounted in bearings 16*a* and 17*a* and rotated by a pulley 18*a*. At the top of the conical part 9*a* there is a steeper part of the wall lying within the cylindrical part 2*a* and provided with slots 7*a* through which air passes from an annular chamber 6*a*. The coarse particles move upwards over this part of the wall and are discharged through a tangential discharge outlet 14*a*, and the fine particles are carried inwards by the air past perforated vanes 19*a*, rotating with the vanes 4*a* and through tangential slots 23 into a cyclone. This cyclone is bounded by conical walls 24 and 25 and a top plate 26 which is provided with a central discharge opening 27. Vanes 28 secured to a hollow shaft 29 rotate along the conical wall 25. The shaft 29 surrounds the shaft 15*a* and is carried in bearings 30 and 31 and driven independently of the shaft 15*a* by a pulley 36. The fine particles separated in the cyclone are flung out through a tangential discharge outlet 32 and pass through a pipe 20*a*. A wall 33 is provided inside the cyclone to force the air to remain on the periphery of the cyclone.

The clean air that passes through the outlet 27 is driven by a fan 13*a* in a space 34 to the annular chamber 6*a*.

The perforated vanes 19*a* referred to above control the speed of rotation of the air and prevent the formation of a vortex. The speed of the air is maintained such that coarse particles carried inwardly by the air can move outwardly again under the influence of centrifugal force.

Some materials, and in particular cement from a cement mill, need to be cooled as well as separated. For cooling purposes a pipe 35 is arranged around the part 9*a* of the container and sprays water on the outside of the container. Thus the apparatus illustrated acts as a cooler, separator, cyclone and fan, and as it lifts the material it may also render an elevator unnecessary.

I claim:

A pneumatic separator comprising a container having a vertical axis and having a wall which is internally circular in cross section, means at the bottom of the container for feeding a powder

mixture in bulk form to the interior of the container, a rotatable structure within the container having elements moving close to the inner surface of the container for mechanically imparting to the material a whirling motion to bring it into a semi-liquid state and to move it upwardly in a thin layer along said inner surface and to tend to keep the particles near such surface by centrifugal force, means for passing air transversely through the layer while it is moving upwardly over a portion of said inner surface, a discharge outlet at the inner surface of the container wall for the heavier particles, and a discharge outlet for the air and fine particles picked up by it.

NIKOLAI AHLMANN.