

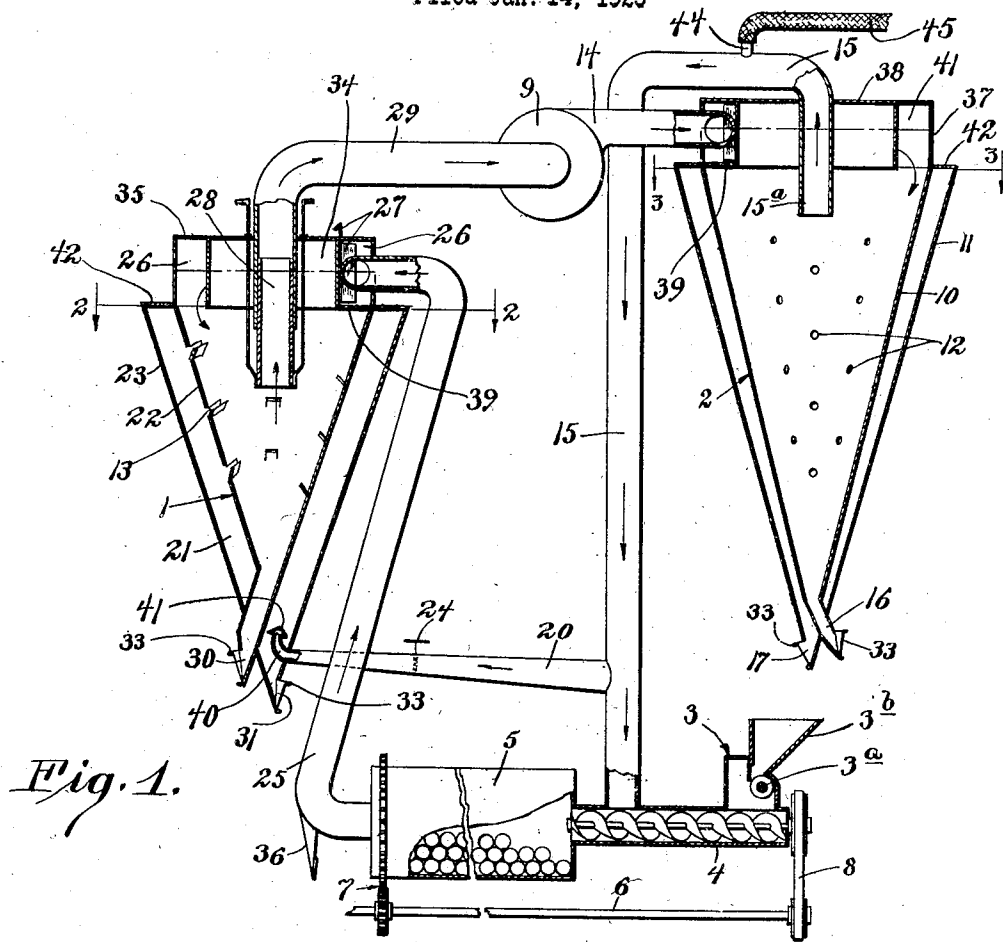
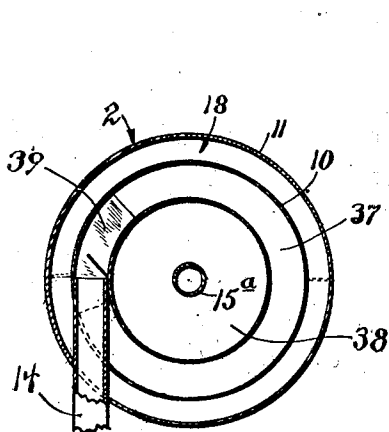
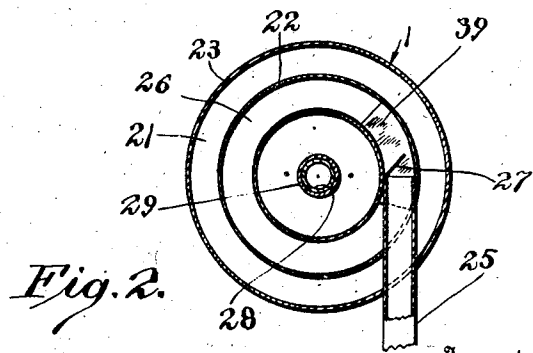
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VACUUM AIR SEPARATOR

Filed Jan. 14, 1925



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UNITED STATES PATENT OFFICE.

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VACUUM AIR SEPARATOR.

Application filed January 14, 1925. Serial No. 2,340.

This invention relates to separators for the separation of light powdered material, such as talcum or the like, from the heavier portions of the same material, although it is not intended that this invention should be limited to the separation of such a material as talcum, as the principles of this invention may be applied to separators for handling other finely ground material in any case where it is desired to separate the fine from the coarse, and the principles of this invention are adaptable for separating materials as to specific gravity, that is, ores ground and containing a number of different materials may be separated by the apparatus provided herein and separated as to specific gravity, the heavier portions probably lead compounds composing one fraction, and light gangues, clays and the like forming a second fraction and the materials of intermediate specific gravity forming the third.

An object of this invention is to produce a vacuum separator operating upon the stage principle for the separation of light or finely divided material from a heavy or coarse material.

An object of this invention is to provide a separator operating on the two stage rotary separation principle employing a rotary air draught for separating a light from a heavy material in a two stage operation employing a centrifugal air draught in each separator.

Other objects and advantages of this invention will be apparent from the following detailed description of a preferred embodiment thereof as illustrated in the accompanying drawings.

In the drawings:

Fig. 1 is a diagrammatic elevation of a separator assemblage embodying this invention.

Fig. 2 is a top plan view taken substantially on the line 2—2 of Fig. 1.

Fig. 3 is a top plan view taken substantially on the line 3—3 of Fig. 1.

The preferred embodiment of this invention illustrated in the drawings embodies a plurality of separating units 1 and 2 connected in series so that the separation is obtained in a stepped or stage manner as the material is carried through the separating units 1 to 2 on a current of air or similar gas.

The material which it is desired to grind or pulverize and separate is placed on a

feed trough 3, which trough 3 is illustrated as of the mechanical hopper type, embodying a roller 3^a and a funnel 3^b so that the feed trough 3 will be air tight and not permit air to be forced outward or drawn inward at this point, and carried through the screw conveyor 4 into a grinding mill 5, which mill 5 is preferably of the ball type. As illustrated in Fig. 1, it is preferable that the grinding mill 5 and the screw conveyor 4 be driven from a common shaft 6 by means of the gears 7 and a belt or chain drive 8, the shaft 6 being connected to any suitable source of power (not shown).

A blower 9 for creating a vacuum in the unit 1 preferably of the centrifugal type produces a current of air or gas sucked from the separating unit 1 and blown to the unit 2 into a chamber 38 provided above the inner cone 10, which inner cone 10 is spaced from an outer cone 11. The inner cone 10 being perforated in any desired manner as illustrated at 12, or as illustrated in the separator 1 or slotted as shown at 13. The current of air blown into the separator 2 from the lead 14 from the blower 9 maintains a centrifugal action within the inner cone 10 of the separator and passes outward from the separator through the spout 15^a of the discharge pipe 15. As the current of gas leaves the separator unit 2 at the center of the largest or approximately the largest section of the unit 2 it carries practically none of the ground material with it. The ground material is separated within this unit by means of centrifugal action alone; the heavier fraction of the ground material is thrown outward through the perforations 12 into the outer cone 11 and the lighter fraction separates into the lower end of the cone 10 as the same drops from the influence of the centrifugal air current and the two fractions are drawn from the spouts 16 and 17 of the inner cone 10 and outer cone 11, respectively. The space between the inner cone 10 and outer cone 11 is a dead air space. The air leaving through the discharge pipe 15 is led back into the screw conveyor 4 and hence into the grinding mill 5 and carries through the grinding mill 5 the material which is ground to approximately the correct size for separation. A transverse lead 20 from the pipe 15 leads into the space 21 provided between the inner cone 22 and the outer cone 23 of the

separator 1 so as to provide an air draft at this point. This air draft being led into the space 21 separates from the material thrown out through the perforations 13 of the cone 22 the lighter material and allows the heavier material to fall to the apex of the cone 23, from where this heavier material is withdrawn through the spout 31 and may be returned to the mill 5 to be reground to the correct degree of subdivision.

This transverse lead 20 is provided with an upwardly extending section 40 and a diffusion cap 41 to diffuse the current of air into all parts of the space 21. A damper or valve control 24 is provided in the lead 20 to regulate the flow of air therethrough.

The air leaving the grinding mill 5 is carried through the lead 25 to the upper or cylindrical portion 26 of the separator 1. A damper or swing valve 27 is provided in this cylindrical chamber between the upper cylindrical portions of the separating cones 22 and 23 to regulate the flow of air and ground material into the separator 1. The material from the pipe 25 is delivered in the inner cone 22 of the unit 1 and the air from the lead 20 is blown upward through the perforations 13 and carries with it the lighter material upward into the adjustable spout 28 and hence through the lead pipe 29 through the centrifugal blower 9 into the separator 2.

The adjustable spout 28 is preferably of similar construction to that illustrated in the patent granted to E. M. Davids, and myself, No. 1,309,879, issued July 15, 1919.

The air draught carries the ground material into the upper cylindrical chamber 26 and is forced to travel in a centrifugal path into the inner cone 22 of the unit 1 and traveling downward drops the heavier material into the apex of this cone 22 and being met with the air draught from the lead 20 traveling through the perforations 13 carries the finely divided portion of material through the spout 28 and lead 29 into the blower 9 as described.

The heavier material from the separator 1 is taken from the spouts 30 and 31 communicating with the inner and outer cones 22 and 23, respectively, and is returned to the feed trough 3 or the material from the spouts 30 and 31 being granular could be used in this condition if desired, particularly is this so in the separation of minerals as to their specific gravity.

The spouts 16, 17, 30 and 31 are provided with swing valves or gates 33 so that the material will discharge through the respective spouts.

In the units 1 and 2, the outer cones 23 and 11, respectively, terminate short of the cylindrical chambers 26 and 41, respectively, formed above the inner cones 22 and 16. The separating cylinder 34 is secured to the cover 35 of the inner cone 22 and the sepa-

rating cylinder 37 is secured to the cover 38 of the inner cone 10. The outer cones 23 and 11 are capped as illustrated at 42.

A spout 36 is illustrated as connected to the lower end of the lead 25 to withdraw the heavier material from the bottom of the said lead 25 that is carried from the grinding mill 5 and is of too great specific gravity to be carried upward with the draft of air into the separator 1. This spout is also provided with a gate or cover similar to the gate or cover 33.

A bleeder pipe 44 is secured in communication with the upper lead 15 leading from the interior of the separator unit 2, and is connected with a hose 45, which leads to a dust room (not shown). The bleeder 44 is for the purpose of maintaining the pressure in the lead 15 substantially atmospheric so that there will be a reduced pressure in the unit 1.

Deflecting plates 39 are positioned below each of the inlet leads 25 and 14 to prevent the air current from traveling directly downward, and to force the same to travel in a centrifugal path.

Having fully described a preferred embodiment of this invention, it is to be understood that it is not intended to limit this invention to the exact construction herein set forth, which may obviously be varied in detail without departing from the spirit of the appended claims.

I claim:

1. In an air separating system, the combination of a plurality of conical separating units connected in series, a grinding element within the circuit, a blower within the circuit, means for admitting gas to the upper zone of each separating unit, means for returning a portion of gas from the last unit to the lower end of the first unit, and means for returning a portion of gas from the last unit to the grinding element.

2. In a separator, the combination of a plurality of funnel shaped units connected in closed circulating series, a blower interposed between the said funnel shaped units in the said series, a cone surrounding one of said units and spaced therefrom, and means for taking gas from the other of said units and conducting the same into the space provided between the said outer cone and the other said unit.

3. In a separator, the combination of a centrifugal type separator unit comprising a pair of spaced concentric cones, a second centrifugal type separator unit comprising a pair of spaced concentric cones, a blower interposed between the said separator units, a conduit connecting the said blower with the first said unit for drawing gas from the inner cone of the first said unit and delivering the same to the inner cone of the second said unit, and means for conducting gas from the inner cone of the second said unit

into the space provided between the concentric cones of the first said unit.

4. In a separating system, the combination of a conical separating unit containing an inner conical member, a separate separating unit comprising concentric conical members, means for discharging gas from said first unit into the second unit, and means for discharging gas from said second unit into the space between inner and outer conical members of said first unit.

5. In a separating system, the combination of a separating unit comprising two spaced concentric conical members, perforations in the inner member, a second separating unit comprising two spaced concentric conical members, perforations in the inner member of said second unit, means for removing gas from the central compartment of the first unit and supplying said gas to the inner compartment of said second unit, means for discharging gas from the central compartment of said second unit and means for admitting such gas from said second unit into the space between concentric members of the first unit at the lower section thereof.

6. A separating system comprising two separate centrifugal type separating units,

said units comprising spaced, concentric, conical members, perforations in the inner member of each unit, means for removing gas from the central compartment of one unit and discharging said gas into the inner compartment of the second unit, and means for discharging a portion of the gas from the central compartment of the second unit into the space between the concentric members of the first unit.

7. A separating system comprising in combination, a conical separating unit comprising a pair of spaced concentric cones, a second separating unit comprising concentric, conical members, means for discharging gas from the central compartment of said first unit tangentially into the central compartment of the second unit, means for discharging a portion of the gas from the central compartment of the second unit into the space between concentric cones of the first unit, means for discharging a portion of the gas from the second unit into a mill, and means for discharging gas from the mill tangentially into the central compartment of said first unit.

Signed at Los Angeles, California, this 7th day of January, 1925.

LYCURGUS LINDSAY.