United States Patent

Gruber

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[54] PARTICLE CLEANING APPARATUS

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[52] **U.S. Cl.** **209/133,** 209/250, 209/474

[51] **Int. Cl.** **B07b 3/00**

[58] **Field of Search**.....209/250, 21, 22, 28, 29, 133, 209/138, 486, 502, 134, 136, 474, 477, 140

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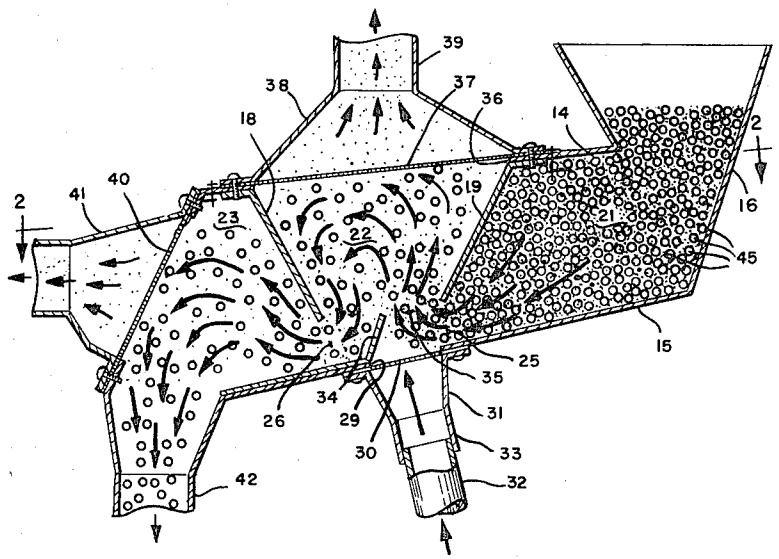
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[57] **ABSTRACT**

Particle cleaning means comprising a particle receiver, a first chamber having an input opening coupled to the particle receiver, a high velocity air stream directed into the first chamber adjacent the input opening for projecting particles into the first chamber for agitated movement under the influence of the air stream, a second chamber coupled to the first chamber through an opening spaced from the input opening, a baffle between the openings to force the particles in a circuitous path through the first chamber, a first suction means coupled to the first chamber and an opposed relation to the air stream and a discharge opening in the lower end of the second chamber, and second suction means coupled to the second chamber and an opposed relation to the second opening and the discharge opening.

3 Claims, 2 Drawing Figures



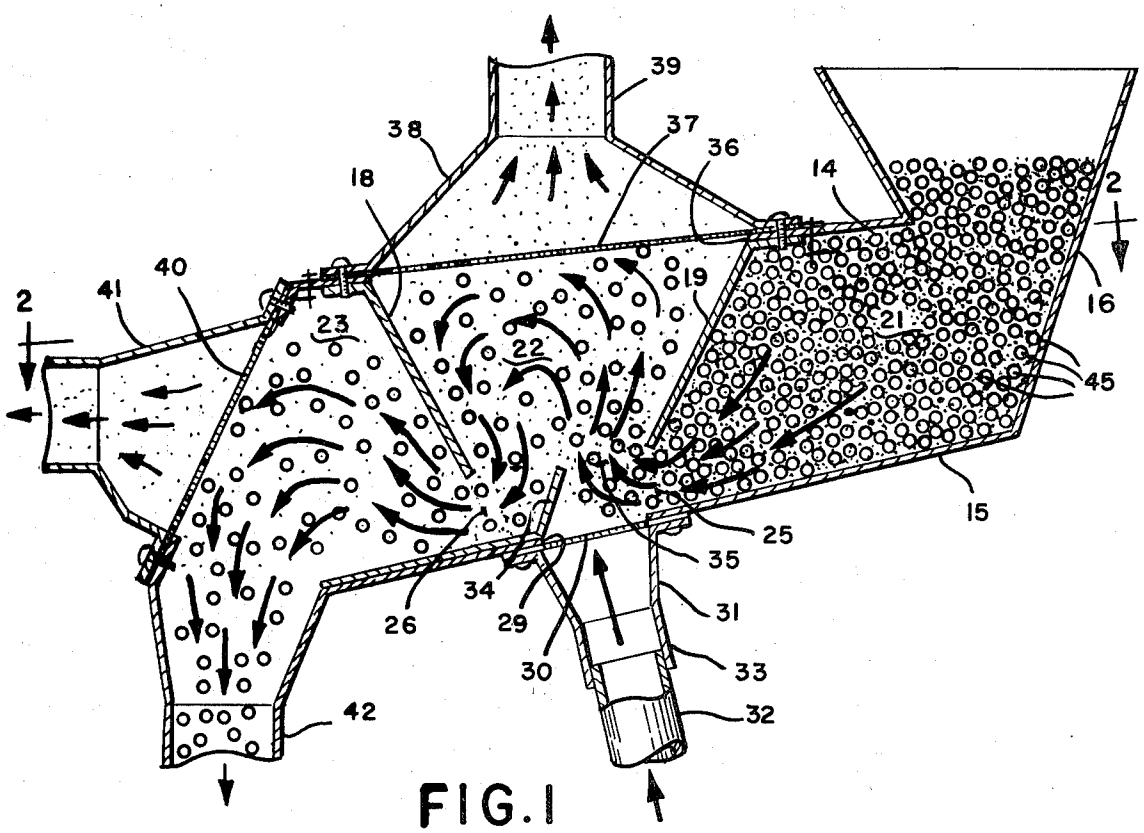


FIG. 1

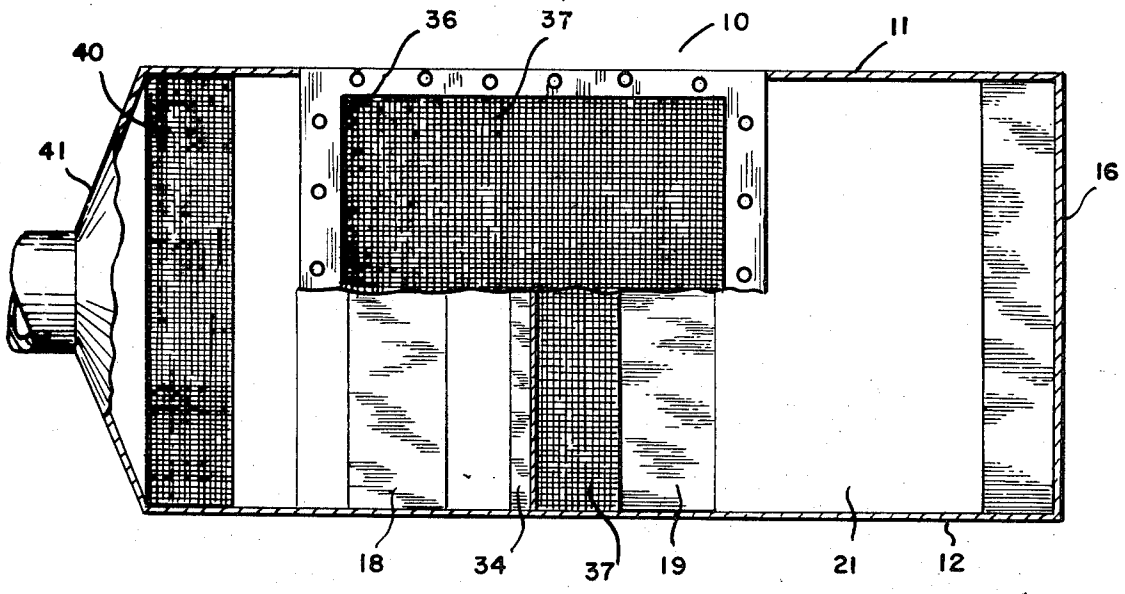


FIG. 2

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PARTICLE CLEANING APPARATUS

BRIEF SUMMARY OF THE INVENTION

The separation of dust and other foreign matter from particulate material has long been a problem in the food industry and particularly where such particles are to be ground or subdivided into smaller particles or powder. Prior art attempts to solve this problem generally include the separation of the lighter dust particles from the granular material by agitating the particles on an inclined wire mesh through which an air stream may be projected to carry the dust particles away. Such prior art apparatus is not wholly satisfactory because they tended to remove only the free or more loosely held dust particles. In addition, certain prior art devices employed expensive vibrating apparatus for oscillating the wire mesh in order to agitate the particles being cleaned.

It is an object of the invention to provide a new and improved particle cleaning device.

Another objection of the invention is to provide a particle cleaning device which more effectively removes dust and foreign matter.

Yet a further object of the invention is to provide a particle cleaning device which produces violent particle agitation and promotes separation of dust and foreign material from the product.

A further object of the invention is to provide an efficient and economical particle cleaning device wherein oscillation producing means is not required.

These and other objects and advantages of the invention will become more apparent from the detailed description thereof taken with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a side elevational view of the particle cleaning device according to the instant invention; and

FIG. 2 is a view taken along lines 2—2 of FIG. 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The particle cleaning device **10** according to the invention is shown in the drawing to include a housing having a pair of generally vertical side walls **11** and **12** and generally inclined the top and bottom walls **14** and **15** respectively. The walls **11** and **12**, **14** and **15** may be joined in any suitable manner, such as by welding, and may be shaped as shown in FIGS. **1** and **2** to form a particle receiving hopper **16** at the elevated end of the assembly as shown in FIG. **1**. A pair of baffle walls **18** and **19** are suitably affixed in spaced relation on, and extend generally downwardly from, the upper wall **14** and between the side walls **11** and **12**. The baffle walls **18** and **19** are generally convergent at their lower ends and serve to divide the housing into a particle receiving chamber **21** coupled to the lower end of the hopper **16**, a first chamber **22** and a second chamber **23**.

Baffle wall **19** forms an oblique angle with the top wall **14** and its terminal end is spaced from the lower wall **15** to form an elongate, generally rectangular opening **25** between the receiving chamber **21** and the first chamber **22**. Baffle wall **18** is disposed at a relatively larger angle with the upper wall **14** and its terminal end is also spaced from the lower wall **15** to form

a generally rectangular opening **26** between the chambers **22** and **23**.

An elongate opening **28** is formed in the lower wall **15** and opens into the first chamber **22** just inwardly of the intake opening **25**. A screen **30** covers the opening **28** and is held in position by an elongate hood **31** suitably affixed over the opening **28** and generally coextensive therewith. A conduit **32** is connected to a couplind **33** formed on the hood **31** and to a high pressure source of any suitable gas, such as air (not shown).

A third baffle wall **34** is suitably affixed to and extends upwardly from the lower wall **15** adjacent the opening **29** and between the side walls **11** and **12**. The baffle wall **34** is inclined toward the opening **29** and terminates thereabove and at a point spaced generally horizontally from the lower end of baffle wall **19**. This forms a generally rectangular gap **35** between the ends of baffle walls **19** and **34** and disposed generally vertically above the gas input opening **29**.

A generally rectangular opening **36** is formed in the top wall **14** and is generally coextensive with the upper end of the chamber **22**. A fine screen **37** covers the opening **36** and is held in position by a generally conical hood **38** which is suitably secured to the top wall **14** and is generally coextensive with the opening **36**. The upper end of the hood **38** terminates in a conduit **39** which is connected to a suitable suction device such as a vacuum pump (not shown) through a filter (not shown). It can thus be seen that the chamber **22** is generally trapezoidal in vertical section parallel to the plane of FIG. **1** with its large base defined by the screen **37** and its small base defined by the lower ends of the baffle walls **18** and **19**.

The chamber **23** is defined by the baffle wall **18**, short sections of the upper and lower walls **14** and **15** and a screen **40** which forms an end wall of the housing. Screen **40** is held in position by a hood **41** suitably secured to the housing and generally coextensive with the screen **40**. Hood **41** is also connected to a suitable vacuum source (not shown) such as a vacuum pump and through a filter (not shown). A discharge opening is formed in the lower end of chamber **23** and is connected to a collecting conduit **42** which discharges cleaned product into a container (not shown) disposed therebelow.

In operation, the high pressure air source (not shown) will be actuated to deliver air at a high velocity through opening **29** and the vacuum sources will be activated to produce a suction through screens **37** and **40**. The material to be cleaned, such as spices, seasons, grain, cocoa or coffee beans, or any similar particulate material, will be charged through hopper **16** into the particle receiving chamber **24**. A quantity of the material will flow onto screen **25** whereby they will be displaced rapidly in an upward direction toward the screen **37**. It will be appreciated that the inclination of the baffle **34** will tend to direct the high velocity air stream upwardly and to the right as viewed in FIG. **1** and that the particles will tend to follow this path. The further movement of the particles **45** in the chamber **22** will generally follow a path defined by the wall **19**, the screen **37**, the wall **18** and downwardly through the opening **26**. The high velocity air stream flowing through the gap **35** between the ends of baffles **19** and **34** will prevent the particles **45** from falling back onto

the screen **29**. The particles **45** passing rapidly through the gap **26** will tend to flow generally upwardly and to the left and against the screen **40** and then fall downwardly through the discharge conduit **42**.

It will be appreciated from the foregoing that the high velocity air stream passing upwardly through the screen **30** and the gap **35** between the ends of the baffles **19** and **34** will tend to separate dust and other foreign matter from the particles **45** and carry these particles upwardly through screen **37** and to the filter (not shown) by the action of the vacuum. In addition, the air stream will cause the particles **45** to be displaced rapidly upward at a high velocity causing them to impinge one against another as well as against the screen **37** and the baffle walls **18** and **19** whereby dust and other foreign particles adhering to their surfaces will be dislodged and carried through the screen **37** under the action of the air stream and the vacuum. In addition, the rapid movement of the particles through the gap **16** into the chamber **23** and against screen **40** will cause a second cleaning action whereby any remaining particles of dust and other foreign material will be carried through the suction hood **41**.

It will be appreciated from the foregoing description that the configuration of the particle cleaning device according to the foregoing description provides a highly efficient and economical means for cleaning particulate material.

While only a single embodiment of the instant invention is shown and described, it is not intended to be limited thereby, but only by the scope of the appended claims.

I claim:

1. A particle cleaning device comprising an enclosure having top, bottom, and side walls forming a chamber,

an input opening formed in said side wall adjacent one end of said chamber for receiving the particles to be cleaned,

a second opening formed in said enclosure adjacent the other end of said chamber and spaced from the input opening for discharging the particles from said chamber,

said input and second opening being formed in said side walls adjacent the lower end of said enclosure,

baffle means disposed between said input and second openings and extending upwardly from the bottom wall of said enclosure the upper end of said baffle means being spaced from the top wall of said enclosure,

said chamber being inclined downwardly from said input opening to said second opening, said side walls diverging outwardly from their lower ends to their upper ends,

high pressure fluid input means coupled to said enclosure and opening into the lower end of said chamber adjacent to said input opening and between said input opening and said baffle means for projecting said particles upwardly at high velocity into said chamber for agitated movement around said baffle means and in a circuitous path between said input and second openings for discharging from said second opening,

and suction means opening into the top wall of said enclosure and in spaced relation to said high pressure input means and said input opening for removing from said chamber dust and foreign matter separated from said particles.

2. The particle cleaning device set forth in claim **1** and including a second enclosure forming a second chamber and having an opening coupled to the discharge opening for receiving said particles and suction means coupled to said second chamber in spaced relation to said discharge opening.

3. The particle cleaning device set forth in claim **2** and including means forming a storage chamber coupled to the input opening and adapted to receive the particles to be cleaned, said storage means being elevated relative to said input opening wherein said particles will flow by gravity into said first chamber.

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