ABSTRACT

A pneumatic conveyance system for particulate material, particularly for reclaiming chemically bonded moulding sand from foundry moulds. The material is broken down and/or scrubbed during conveyance through the system which has a surface portion formed with peaks and depressions positioned in the path of flow of the material which break down and/or scrub the material as it strikes said surface portion.

7 Claims, 3 Drawing Figures
PNEUMATIC CONVEYANCE SYSTEM FOR PARTICULATE MATERIAL

The present invention relates to a pneumatic conveyance system for particulate material and more particularly to a sand reclamation plant for reclaiming chemically bonded moulding sand from used foundry moulds or cores.

In known sand reclamation plants, sand agglomerates comprising sand particles coated with binder are crushed and thereafter graded by various classifying units, any particles over a predetermined size being recirculated for further classification. A certain amount of scrubbing and further crushing of sand particles also occurs during conveyance through the plant after initial processing in a crusher device for example.

The pneumatic conveyance system of the present invention further increases breaking down and/or scrubbing of the sand agglomerates after initial crushing in a crusher device. However, it must be understood that the pneumatic conveyance system of the present invention can be used whenever particulate material of any nature is to be broken down and/or scrubbed.

Accordingly therefore, the present invention provides a pneumatic conveyance apparatus for particulate material including a conduit for receiving and conveying agglomerated particulate material, an internal surface portion being formed within the conduit and having peaks and depressions positioned in a path of flow of the material which, in use, break down and/or scrub said material striking the surface portion during conveyance of the material in the conduit.

Preferably, the surface portion forms at least a part of a conveyance wall of the system. The system may have a cyclone separator wherein the surface portion forms at least a part of an internal wall of the cyclone separator.

The surface portion may be arranged to deflect material through more or less than 90° and the system may be a sand reclamation plant.

The invention will now be further described, by way of example, with reference to the accompanying drawings, in which:

FIG. 1 is a diagrammatic side view of a sand reclamation plant,
FIG. 2 illustrates in side section a portion of the plant of FIG. 1, and
FIG. 3 illustrates the portion of the plant illustrated in FIG. 2 taken along line A—A in FIG. 2.

With reference to FIG. 1 the plant comprises a feed input 10 for agglomerates of material from used foundry cores or moulds, the agglomerates being from sand grain size up to lumps of approximately 4 inches cube. The feed input 10 has a screen 11 for separating the agglomerates. The finer particles passing through the screen 11 to a vibratory screen 12 for further separation whilst the larger lumps and particles pass along to an adjacent jaw crusher 13 to be broken down and likewise fed to the vibratory screen 12. Hard substances, as for example, tramp metal is allowed to pass between the jaw crusher 13 through the provision of a yieldable jaw when the pressure between the jaws exceeds a predetermined value. The hard material is conveyed along the top of the vibratory screen 12 and discharged into a suitable container 14. Suction conduit means 15, the inlet end of which is positioned through an opening in the screen 12, enables the screened particles to be sucked up to a cyclone separator 16 via the suction conduit means 15.

Referring more particularly now to FIG. 2, the suction conduit means 15 has a sharp right angled turn leading to the cyclone separator 16 the purpose of which will be later described. Disposed at the right-angled turn in the conduit means 15 is a surface in the form of a corrugated or ribbed plate 17 manufactured from a very hard material e.g., white iron. A similar corrugated or ribbed surface 18 is positioned with a trailing edge adjacent the inlet of the cyclone separator 16 and a leading edge positioned on the horizontal centre-line looking in plan view of the separator. At the top and centrally disposed in the separator 16 is a T-shaped conduit 19 having a slidably mounted tubular member 20 shown in its uppermost position. At the bottom of the separator, see FIG. 1, is a thick rubber valve 21 which is self-opening depending on the quantity of sand in the lower part of the separator 16. The sand particles are discharged through valve 21 on to a further vibratory screen 22 whereby the granular size particles pass through the screen to discharge outlet 23 and any larger size particles pass along the top of the screen and fall through a gap (not shown) therein into space 24 and from here the sand particles are drawn up the conduit 15 again for further processing.

A suction fan 25, which exhausts to atmosphere, is provided and associated with an air filter unit 26 and dust hopper 27, the latter having a conduit 28 which connects with T-shaped conduit 19 associated with separator 16.

In operation, the screened sand which constitutes the sand being reclaimed is pneumatically conveyed upwards in the conduit means 15 at a velocity for example, of approximately 6,000 ft./Min. At the right-angled turn in the conduit 15 a breaking down of the sand agglomerate into separate grains occurs together with a scrubbing action which removes any used binder from the sand grains by the high speed impact of the material on the corrugated or ribbed plate 17. Further breaking down and scrubbing takes place on entry into the cyclone separator 16 upon impact of the material on the ribbed member 18. Adjustment of the tubular member 20, which in FIG. 2 is shown in the raised position, enables the plant operator to classify the granular size particles from the dust and any foreign matter, for example, resin particles. With the tubular member 20 in the raised position the tendency would be for a substantial amount of the granular size particles together with dust and foreign matter to be drawn through the T-shaped conduit 19 and into the dust hopper 27. It will, of course, be appreciated that in lowering the tubular member 20 in the direction of the conical portion of the cyclone separator 16 wherein the air velocity is decreasing, the pneumatically conveyed material can be classified i.e., the granular size particles fall out of suspension whilst the "fines" are drawn into the dust hopper 27 and the dust is filtered off. The granular size particles discharged from outlet 23 via screen 22, valve 21 and cyclone separator 16 may be conveyed to a storage container for re-use in the manufacture of foundry cores or moulds wherein the sand is chemically bonded as for example in the Furam Process.

The pneumatic conveying system described above with reference to FIGS. 1 and 2 relates to a sand reclamation plant. However, the system can be used for the treatment of at least most particulate materials.
I claim:

1. A method of treating particulate material, said method comprising using suction means to receive and convey agglomerated particulate material, breaking down, in a separator means, the particulate material conveyed from the suction means, screening the particulate material after the latter has been broken down, and returning the non-screen material to the suction means, said receiving and conveying step including disposing an internal surface member, having peaks and depressions formed thereon, within the suction means, in the path of flow of the particulate material, so that the particulate material is broken down and scrubbed by collision with the internal surface member during conveyance through said suction means.

2. Apparatus for treating particulate material comprising suction means for receiving and conveying agglomerated particulate material, separator means for receiving and breaking down the particulate material conveyed thereto from said suction means, screening means for receiving and screening broken down particulate material conveyed thereto from said separator means and for returning non-screened material to said suction means, said suction means being provided with an internal surface member having peaks and depressions formed thereon and disposed within the path of flow of particulate material whereby the particulate material is broken down and scrubbed by collision with the internal surface member during conveyance through said suction means.

3. Apparatus as claimed in claim 2, wherein said separator means is provided with a surface portion having peaks and depressions formed on at least a part of an internal wall thereof and a suction fan operatively associated with said separator means.

4. The pneumatic conveyance apparatus of claim 2 wherein said suction means comprises a curved conduit portion.

5. The pneumatic conveyance apparatus of claim 4, wherein the internal surface member forms at least a part of the conveyance wall of the conduit portion.

6. The pneumatic conveyance apparatus of claim 2, wherein said internal surface member comprises a ribbed plate forming said peaks and depressions.

7. The pneumatic conveyance apparatus of claim 6, wherein said ribbed plate is formed of white iron.

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