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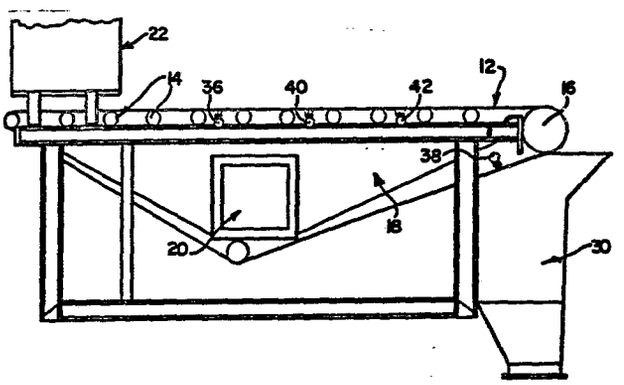
(54) **An apparatus and a method for separating one solid component from another solid component in suspension in liquid.**

(57) Undersize and oversize particles are separated by means of a continuous screen cloth (12) that has a horizontal operative separating region. Material is fed onto the cloth from a feedbox at one end of the operative separating region. There are three rows of sprays (36, 40 and 42) located at spaced positions underneath the cloth in the operative separating region. These sprays dislodge oversize particles that block the apertures of the cloth and fluidise the material, allowing undersize particles to pass through the apertures.



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METHOD OF AND AN APPARATUS FOR SEPARATING A FIRST SOLID COMPONENT FROM A SECOND SOLID COMPONENT IN A SUSPENSION IN LIQUID

This invention relates to a method of and an apparatus for separating a first solid component from a mixture thereof with a liquid and a second solid component, the first and second solid components being in suspension in the liquid.

Accordingly, the invention provides a method of separating a first solid component from a mixture thereof with a liquid and a second solid component which is of smaller average particle size than the first solid component which includes

feeding the liquid and solid components onto an endless cloth which has apertures of a suitable size to permit the passage therethrough of the second solid component and to impede the passage therethrough of the first solid component;

displacing the cloth with the liquid and solid component thereon along a substantially horizontal path, through an operative separating region;

allowing some of the liquid and solid component to pass through the cloth under the action of gravity;

spraying a fluidising liquid from below the cloth, in the operative separating region, against and through the cloth;

causing larger particles that are blocking apertures in the cloth to be dislodged by the fluidising liquid and causing fluidising of material on the cloth by means of the fluidising liquid;

allowing further liquid and solid component to pass through the cloth;

collecting liquid and other material that has passed through the cloth before and after being sprayed with the fluidising liquid; and

removing from the cloth material remaining thereon

downstream of the operative separating region and collecting such material.

Further, the invention provides a separator for separating a first solid component from a mixture thereof with a liquid and a second solid component which is of smaller average particle size than the first solid component, which includes

an endless cloth, a portion of which is substantially horizontally disposed and which defines an operative separating region, the cloth having apertures which are of a suitable size to permit the second component to pass through and to impede the passage therethrough of the first component;

a drive means for displacing the cloth;

a feed means located at an upstream end of the operative separating region above the cloth, for feeding the liquid and the solid component onto an upstream end portion of the operative separating region;

a material dislodging and fluidising spray means for spraying a fluidising liquid from below, and in the operative separating region, against and through the cloth to dislodge larger particles that are blocking apertures in the cloth from the apertures and to fluidise material on the cloth, thereby to permit further second component particles to pass through the cloth;

a second component collecting means for collecting liquid and material that has passed through the cloth in the operative separating region; and

a first component removal and collecting means for removing material remaining on the cloth downstream of the operative separating region for collecting it.

The fluidising liquid may be sprayed against the cloth, downstream of where the material is being fed onto the cloth and where the cloth is still in an

operative separating region.

The material may pass through the cloth under the action only of gravity without utilising an artificially created vacuum. The second component collecting means, in the form of a trough, is then located below the cloth in the operative separating region. The mixture may then be fed onto a downstream portion of the operative separating region by means of a feed box located above the cloth. Jets may then be provided below the cloth in another part of the operative separating region to spray fluidising liquid, which may be water, against the cloth.

As described above, when material is fed onto the feed area of the cloth, a certain portion of the second component passes through the cloth and first component particles block the apertures. Fluidising liquid sprayed from below dislodges these first component particles and fluidises material on the cloth, thereby permitting more of the second component particles to pass through the cloth. First component particles again block the apertures, trapping second component particles remaining above the first component particles that are blocking the apertures. The process can be repeated, with more of the second component particles passing through the cloth.

If the fluidising spray is vertically upwards, with the cloth extending horizontally, then the particles tend to move at right angles to the cloth and abrasion wear of the cloth is reduced. As the passage of particles through the cloth is lubricated by fluid, wear of the cloth is also reduced thereby.

The cloth may be of any suitable material. Thus, it may be of stainless steel strands, stainless steel strands that are coated with a synthetic rubber or plastics material or it may be of a synthetic monofilament fabric. The cloth may also be of a woven

material and it may be of a single, double or triple layer fabric. The cloth is also referred to in the art as a screen, and the term "cloth" includes screens and the like.

It will be appreciated that the first solid component and the second solid component may be particles of different size, shape or configuration although they are of the same material. Thus, coarse particles may be removed from a slurry after a milling operation. Instead, they may be different materials. In particular, the first solid component may be wood chips and the second solid component may be a gold-bearing chemical composition. It will also be appreciated that the first solid component that is retained on the cloth is subsequently removed by any suitable process which may be a mechanical process.

The invention is now described, by way of an example, with reference to the accompanying drawing which shows schematically a separator for removing coarse particles from a slurry after a milling operation, that is in accordance with the invention.

Referring to the drawing, a separator is shown therein, designated generally by reference numeral 10. The separator 10 has an endless cloth 12 which is supported on a number of support rollers 14 to define a horizontal separating region and also passes over a number of other rollers, including a drive roller 16. Beneath the support rollers 14 there is a collecting trough 18 which has an outlet 20. Material that is to be separated is fed onto the cloth by means of a feedbox 22. The feedbox 22 has a floor that has a number of apertures that are distributed over substantially the entire floor. The floor is spaced few centimetres from the cloth 12, and extends over about one quarter of the operative separating region. Thus, the feedbox 22 feeds material to be separated, in

a distributed manner, across the width of the cloth 12 on to the upstream quarter of the operative separating region. Instead the feedbox 22 may have an overflow weir.

The cloth 12 is made from stainless steel strands that are covered with polyurethane. The cloth has apertures of a suitable size depending on the application for which it is intended. For the particular application in question i.e. for removing coarse particles from a slurry after a milling operation, the cloth has apertures of 180 micrometres. Thus, when the material to be separated is fed onto the cloth 12 by means of the feedbox 22, some of the smaller particle fraction passes through the cloth under the action of gravity to be collected in the trough 18 and larger particles block the apertures of the cloth 12. A short distance downstream of the feedbox 22, a row of sprays 36 is located below the cloth 12 to spray water against and through the cloth 12 from below.

As described above, water sprayed from below by the sprays 36 dislodges first component particles and fluidizes material on the cloth 12. As the cloth 12 moves to an adjacent downstream position, more second component material passes through the cloth 12 and is collected in the trough 18. Again, first component particles block the apertures trapping the remaining second particles on the cloth 12. A further short distance downstream of the sprays 36, a further row of sprays 40 is provided below the cloth.

The process described above is repeated with more of the second component particles passing though the cloth 12, and being collected in the trough 18. A final row of sprays 42 is located a short distance upstream of the roller 16 to provide a final dislodging and fluidisation with resulting further separation.

The number of rows of sprays 36, 40 and 42 depends upon the application and the sharpness of separation required.

Particles remaining on the cloth 12 fall off, or are washed off by sprays 38, to be collected in a trough 30.

The cloth 12 is driven at a speed of between 5 and 30 metres per minute with a feed rate of dry solids of about 0.6 tons per hour with the percentage of solids in the feed being in the region of 40%. Water to dislodge and fluidise the particles supplied at a rate of between 1 and 10 cubic metres an hour.

By means of the invention the operation of a separator of the kind described is improved with an improvement in the cut size. There is thus an improvement in the separation of smaller particles into the undersize stream thus reducing the amount of smaller particles in the oversize stream.

CLAIMS

1. A method of separating a first solid component from a mixture thereof with a liquid and a second solid component which is of smaller average particle size than the first solid component which includes

feeding the liquid and solid components onto an endless cloth which has apertures of a suitable size to permit the passage therethrough of the second solid component and to impede the passage therethrough of the first solid component;

displacing the cloth with the liquid and solid component thereon along a substantially horizontal path, through an operative separating region;

allowing some of the liquid and solid component to pass through the cloth under the action of the gravity;

spraying a fluidising liquid from below the cloth, in the operative separating region, against the through the cloth;

causing larger particles that are blocking apertures in the cloth to be dislodged by the fluidising liquid and causing fluidising of material on the cloth by means of the fluidising liquid;

allowing further liquid and solid component to pass through the cloth;

collecting liquid and other material that has passed through the cloth before and after being sprayed with the fluidising liquid; and

removing from the cloth material remaining thereon downstream of the operative separating region and collecting such material.

2. The method claimed in Claim 1, in which the fluidising liquid is sprayed against and through the cloth in a substantially narrow band which extends across the cloth.

3. The method claimed in Claim 1, in which the fluidising liquid is sprayed against and through the

cloth, in the operative separating region, at a plurality of spaced positions, causing dislodging of blocking particles and fluidisation of the material a plurality of times.

4. The method claimed in Claim 1, in which the fluidising liquid is sprayed substantially vertically upwards and particles on the cloth are displaced substantially upwardly and downwardly.

5. The method claimed in Claim 1, in which the fluidising liquid is sprayed against the cloth, in the operative separating region, only from below.

6. The method claimed in Claim 1, in which material and liquid pass through the cloth, in the operative separating region, due to the action of gravity only.

7. The method claimed in Claim 1, in which the liquid and solid component are fed onto the cloth at an upstream portion of the operative separating region across substantially the entire width of the cloth and over a feed area that is substantially smaller than the area of the cloth in the operative separating region.

8. The method claimed in Claim 1, in which the fluidising liquid is sprayed against the cloth downstream of where the liquid and solid components are fed onto the cloth.

9. A separator for separating a first solid component from a mixture thereof with a liquid and a second solid component which is of smaller average particle size than the first solid component, which includes

an endless cloth, a portion of which is substantially horizontally disposed and which defines an operative separating region, the cloth having apertures which are of a suitable size to permit the second component to pass through and to impede the passage therethrough of the first component;

a drive means for displacing the cloth;

a feed means located at an upstream end of the operative separating region above the cloth, for feeding the liquid and the solid component onto an upstream end portion of the operative separating region;

a material dislodging and fluidising spray means for spraying a fluidising liquid from below, and in the operative separating region, against the through the cloth to dislodge larger particles that are blocking apertures in the cloth from the apertures and to fluidise material on the cloth, thereby to permit further second component particles to pass through the cloth;

a second component collecting means for collecting liquid and material that has passed through the cloth in the operative separating region; and

a first component removal and collecting means for removing material remaining on the cloth downstream of the operative separating region and for collecting it.

10. The separator claimed in Claim 9, in which the material dislodging the fluidising spray means includes a row of sprays that extends across the width of the cloth.

11. The separator claimed in Claim 10, which includes a plurality of spaced rows of sprays, all in the operative separating region.

12. The separator claimed in Claim 9, which has, in the operative separating region, a material dislodging the fluidising spray means located only below the cloth.

13. The separator claimed in Claim 9, in which the material dislodging and fluidising spray means is directed substantially perpendicularly with respect to the cloth in the operative separating region.

14. The separator claimed in Claim 9, which is

operable by gravity only, the second component collecting means comprising a trough located below the operative separating region.

15. The separator claimed in Claim 9, in which the material dislodging and fluidising spray means is located downstream of the feed means.

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