PATENT SPECIFICATION (11) 1255702

1255702

DRAWINGS ATTACHED

(21) Application No. 1566/69 (22) Filed 10 Jan. 1969

(31) Convention Application No. 150 788 (32) Filed 7 May 1968 in

(33) France (FR)

(45) Complete Specification published 1 Dec. 1971

(51) International Classification B 07 b 1/46

(52) Index at acceptance B2H 32E 32F 32H 9

(54) IMPROVEMENTS IN OR RELATING TO APPARATUS AND METHODS FOR THE SEPARATION OF GRANULAR MATERIALS

(71) We, BUREAU DE RECHERCHES GEOLOGIQUES ET MINIERES, of 8, Rue Leonard de Vinci, Paris, France, a French State Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to an apparatus for, and a process of, separating into granules of different sizes a mixture of crushed or naturally granular, pulverulent or clay-like products, in suspension in a liquid.

According to one aspect thereof, the present invention provides an apparatus for separating into granules of different sizes a mixture of crushed or naturally granular, pulverulent or clay-like products, in suspension in a liquid, said apparatus comprising a screening cloth mounted within an adjustably inclinable frame, a first channel for feeding the mixture onto the upper surface of the cloth, a second channel for the recovery of the products screened through the cloth, a third channel downstream of the cloth for the products rejected by the cloth, and a resilient layer of a porous cellular material on which said cloth rests.

According to another aspect thereof, the present invention provides a process of separating into granules of different sizes a mixture of crushed or naturally granular, pulverulent or clay-like products, in suspension in a liquid, said method comprising the use of a screening cloth mounted within an adjustably inclinable frame and resting on a resilient layer of a porous cellular material, feeding the mixture onto the upper surface of the cloth through a first channel, recovering the products screened through the cloth and through the cellular material by means of a second channel, and allowing the products rejected by the cloth to flow through a third channel downstream of the cloth.

Deflector means may be provided for distributing the suspension over the cloth. Conveniently, at least one initial coarse screening grid may be provided above the cloth, and a further resilient layer of a porous cellular material may be provided between the screening grid and the cloth.

One or more spray nozzles may be provided above the cloth for spraying a liquid onto the whole or a part of the cloth during the separation of the granules.

During the process of the invention, the cloth may be unwound from a lower roll and may be wound onto an upper roll.

In order that the invention may readily be carried into practice, various embodiments will now be described in detail, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a schematic view of the apparatus in section, illustrating the principle of the invention;

Fig. 2 is a plan view of the apparatus shown in Fig. 1;

Fig. 3 is a schematic view in section showing further details of the apparatus of Figs. 1 and 2;

Fig. 4 is a schematic view of a modification of the apparatus shown in Figs. 1 and 2;

Fig. 5 is a schematic view of a further modification of the apparatus shown in Figs. 1 and 2;

Fig. 6 is a schematic view in section, showing a modification of details shown in Fig. 3;

Fig. 7 is a schematic view in section showing a further modification of details shown in Fig. 6;

Fig. 8 is a schematic view in section showing a feature additional to the details shown in Fig. 7;

Fig. 9 is a schematic view in section showing an additional feature for the apparatus shown in any one of Figs. 1 to 8;

Fig. 10 is a schematic view in section of a container for feeding the apparatus;

Fig. 11 is a schematic plan view of the container of Fig. 10; and

Fig. 12 is a partial schematic view in section showing an arrangement of spray nozzles for the apparatus shown in any one of Figs. 1 to 11.

[*Price 25p*]

Fig. 1 shows a section taken on the lines A—A of the sifter apparatus shown in plan in Fig. 2. With reference to Figs. 1 and 2, a screening cloth 1 is shown simply stretched in an inclined frame 2 of the apparatus. The pulp to be processed is fed by a feed channel 3 and falls on to the upper portion of the cloth. The liquid, carrying particles of smaller dimensions than the openings of the cloth mesh, passes through the cloth and is recovered by the channel 4, whilst the portion rejected by the sifter slides over the cloth and is recovered by the channel 5.

The slope of the cloth is selected depending on the desired cloth mesh size, on the characteristics of the pulp, in particular on the shape of the granules of material being sifted; angular as in the case of quartz for example, round as in the case of garnets or flat as in the case of mica, and on the desired yield. Since the device enabling the frame or the apparatus to be inclined, may be of any desired type, it has not been shown.

Experience has shown that the yield of the apparatus is increased by disposing the sifting cloth 1 directly on an elastic porous layer or pad 8 (Fig. 3). As further described below, the layer or pad 8 may be supported by a grid such as 6 or by a wire gauze such as 7, so as to produce a close contact between the layer or pad 8 and the cloth 1.

In fact, in addition to the damper part played by the pad 8, the close contact it produces with the cloth makes it possible to overcome the effects of capillary action of the cloth which, according to the viscosity of the pulp, would tend to reject a portion of the pulp and, consequently, to create preferential passages for the pulp on the cloth.

Although such apparatus is already giving remarkable results with certain types of pulp, the yield thereof is improved by disposing the cloth 1 with the layer or pad 8 on a support formed by a bar grid 6 (Fig. 4).

The contact points between the bars and the cloth ensure a certain degree of relief, creating multiple slight waves assisting drainage. Moreover, since the formation of a centre area is avoided in which the pulp could form a pocket in the cloth, an improved yield of the apparatus is obtained, since the pulp no longer tends to accumulate in the centre area. Improved distribution of the pulp on the surface of the cloth also makes it possible to increase the delivery of substances to be processed. As a variation, it is also possible to rest the cloth 1 with the layer or pad 8 on a simple wire gauze 7 (Fig. 5) having a mesh aperture greater than that of the cloth 1 and stretched over the frame 2. For example, the wire gauze may have a mesh aperture of 1 mm. For the sake of clarity, the cloth 1 is shown above the gauze 7, but in fact the cloth 1 with the layer or pad 8 rests completely on the gauze 7.

In the event of relatively high feed, an extra layer 9, as shown in Fig. 6 of an elastic, porous material is added above the cloth and at the level of its upper portion. This layer avoids the direct impact of the flow of pulp onto the cloth which can then work normally at this place.

When the feed becomes even greater, it has been found that the presence of a grid 10 (Fig. 7), disposed directly on the cloth 1, and possibly on the layer 9 and the cloth 1, plays the simultaneous role of a means of protecting the cloth and regulating the discharge of the pulp which, by spreading over the entire surface of the cloth, again increases the yield of the apparatus.

In the event of the pulp containing large particles, a mesh or bar grid 11 (Fig. 8) is provided intended for initial screening. Contrary to the other members which are in contact with the cloth 1 the grid 11 is located with a certain clearance above the cloth, thus playing the simultaneous role of initial screen and protector.

However, even when the arrangement shown in Fig. 8 is adopted, non-uniform wear of the cloth will occur by reason of the appreciable differences between the quantities screened along the surface. In particular, since the area adjacent to the channel 3 (Fig. 1) is an area in which screening is most intense, this part of the cloth tends to wear or warp prematurely. Therefore, instead of changing the cloth, a feature which involves considerable loss of time, according to the invention, a roll of cloth 13 (Fig. 9) is located below the grid 10 in the frame which roll is unwound by winding the portion of cloth disposed between the layer 8 and the grid 10 on the roll 12 located above the grid 10. As required, the rolls 12 and 13 may be driven continuously automatically or otherwise. The cloth which is not worn out, but only warped, may then be renovated. This arrangement is of particular advantage when the feed becomes large and great screening precision is desired.

When this is the case, the flow of pulp is fed into a feed container 14, shown only schematically in Figs. 10 and 11. The generally tubular flow is circulated through a series of baffles, such as 15, and penetrates to the outlet of the container in the sealed frames 16 through a passage having a very elongated section, thus distributing the flow of pulp over substantially the entire width of the cloth.

Within the frame a series of spray nozzles 17 (Fig. 12) are arranged, above the cloth 1. They may be fed with compressed air, water, with a reactant or a processing solution. As required, they assist in completing the washing or increasing the through-put of the apparatus or in forcing the evacuation of the rejected material or assisting the unwarping action, it being possible to combine these various actions, according to the case.

The construction of such an apparatus has

made it possible to process a large number of products and, particularly, clay-like products containing, in addition to clay, large particles of quartz, silica and other coarse impurities extending in dimension from 0 to 10 mm, in a concentration which, for example, has been fixed between 50 and 250 g/l.

A single passage of such a product through such an apparatus as described above and fitted, as required, with a cloth of 81 microns, 104 microns or 124 microns, has made it possible to obtain screenings leading to the recovery, quasi quantitative, of clay and its separation from coarse fractions greater than the size of the screen aperture.

It is important to note that, since separation begins as soon as the apparatus is fed, said apparatus may be used both for industrial operations which are continuous or for prospecting campaigns which involve intermittent operation.

Although several embodiments of the present invention have been particularly described, it will be evident that numerous additions, substitutions or omissions could be made with regard to the various parts of the apparatus without departing from the object of the present invention as defined in the appended claims. For example, the frame supporting the screening system could be arched, or in two intersecting planes, or convex or concave, or in a plurality of parallel planes for the discharge of the pulp in a cascade. Thus, certain accessories such as the release container, may have different shapes or designs. Similarly, the nature of the material forming the frame of the screen, and the various metal parts of the apparatus may be adapted to different conditions of use, by utilising for example alloys resisting sea water corrosion if the prospecting is taking place at sea, or of light metal in cases where the apparatus is required to be portable.

WHAT WE CLAIM IS:—

1. An apparatus for separating into granules of different sizes a mixture of crushed or naturally granular, pulverulent or clay-like products, in suspension in a liquid, said apparatus comprising a screening cloth mounted within an adjustably inclinable frame, a first channel for feeding the mixture onto the upper surface of the cloth, a second channel for the recovery of the products screened through the cloth, a third channel downstream of the cloth for the products rejected by the cloth, and a resilient layer of a porous cellular material on which said cloth rests.

2. An apparatus as claimed in Claim 1, comprising a further support for the cloth, the further support having large cells or cavities, so that said cloth and said resilient layer rest on said further support.

3. An apparatus as claimed in Claim 1 or Claim 2, comprising deflector means for distributing the suspension over the cloth.

4. An apparatus as claimed in any one of Claims 1 to 3, comprising at least one initial coarse screening grid above the cloth.

5. An apparatus as claimed in Claim 5, comprising a further resilient layer of a porous cellular material between a said screening grid and said cloth.

6. An apparatus as claimed in any one of Claims 1 to 5, comprising one or more spray nozzles above said cloth.

7. An apparatus as claimed in any one of Claims 1 to 6, comprising a lower roll from which the said cloth may be unwound, and an upper roll on which the cloth may be wound.

8. A process of separating into granules of different sizes a mixture of crushed or naturally granular, pulverulent or clay-like products, in suspension in a liquid, said method comprising the use of a screening cloth mounted within an adjustably inclinable frame and resting on a resilient layer of a porous cellular material, feeding the mixture onto the upper surface of the cloth through a first channel, recovering the products screened through the cloth and through the cellular material by means of a second channel, and allowing the products rejected by the cloth to flow through a third channel downstream of the cloth.

9. A process as claimed in Claim 8, wherein a liquid is sprayed onto the whole or a part of the cloth during the separation of the granules.

10. A process as claimed in Claim 8 or Claim 9, wherein the cloth is unwound from a lower roll and is wound onto an upper roll.

11. A process as claimed in any one of Claims 8 to 10, wherein an initial coarse screening operation is performed before said mixture is screened by the cloth.

12. An apparatus as claimed in Claim 1, constructed substantially as described herein with reference to Figs. 1 and 2, or any one of Figs. 3 to 9, or any one of the said constructions modified as described herein with reference to Figs. 10 and 11 or Fig. 12 of the accompanying drawings.

By: SWANN ELT & COMPANY,
Chartered Patent Agents,
4 Dyers Buildings,
Holborn,
London, E.C.1.
Agents for the Applicants.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1971.
Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

made it possible to process a large number of products and, particularly, clay-like products containing, in addition to clay, large particles of quartz, silica and other coarse impurities extending in dimension from 0 to 10 mm, in a concentration which, for example, has been fixed between 50 and 250 g/l.

A single passage of such a product through such an apparatus as described above and fitted, as required, with a cloth of 81 microns, 104 microns or 124 microns, has made it possible to obtain screenings leading to the recovery, quasi quantitative, of clay and its separation from coarse fractions greater than the size of the screen aperture.

It is important to note that, since separation begins as soon as the apparatus is fed, said apparatus may be used both for industrial operations which are continuous or for prospecting campaigns which involve intermittent operation.

Although several embodiments of the present invention have been particularly described, it will be evident that numerous additions, substitutions or omissions could be made with regard to the various parts of the apparatus without departing from the object of the present invention as defined in the appended claims. For example, the frame supporting the screening system could be arched, or in two intersecting planes, or convex or concave, or in a plurality of parallel planes for the discharge of the pulp in a cascade. Thus, certain accessories such as the release container, may have different shapes or designs. Similarly, the nature of the material forming the frame of the screen, and the various metal parts of the apparatus may be adapted to different conditions of use, by utilising for example alloys resisting sea water corrosion if the prospecting is taking place at sea, or of light metal in cases where the apparatus is required to be portable.

WHAT WE CLAIM IS:—

1. An apparatus for separating into granules of different sizes a mixture of crushed or naturally granular, pulverulent or clay-like products, in suspension in a liquid, said apparatus comprising a screening cloth mounted within an adjustably inclinable frame, a first channel for feeding the mixture onto the upper surface of the cloth, a second channel for the recovery of the products screened through the cloth, a third channel downstream of the cloth for the products rejected by the cloth, and a resilient layer of a porous cellular material on which said cloth rests.

2. An apparatus as claimed in Claim 1, comprising a further support for the cloth, the further support having large cells or cavities, so that said cloth and said resilient layer rest on said further support.

3. An apparatus as claimed in Claim 1 or Claim 2, comprising deflector means for distributing the suspension over the cloth.

4. An apparatus as claimed in any one of Claims 1 to 3, comprising at least one initial coarse screening grid above the cloth.

5. An apparatus as claimed in Claim 5, comprising a further resilient layer of a porous cellular material between a said screening grid and said cloth.

6. An apparatus as claimed in any one of Claims 1 to 5, comprising one or more spray nozzles above said cloth.

7. An apparatus as claimed in any one of Claims 1 to 6, comprising a lower roll from which the said cloth may be unwound, and an upper roll on which the cloth may be wound.

8. A process of separating into granules of different sizes a mixture of crushed or naturally granular, pulverulent or clay-like products, in suspension in a liquid, said method comprising the use of a screening cloth mounted within an adjustably inclinable frame and resting on a resilient layer of a porous cellular material, feeding the mixture onto the upper surface of the cloth through a first channel, recovering the products screened through the cloth and through the cellular material by means of a second channel, and allowing the products rejected by the cloth to flow through a third channel downstream of the cloth.

9. A process as claimed in Claim 8, wherein a liquid is sprayed onto the whole or a part of the cloth during the separation of the granules.

10. A process as claimed in Claim 8 or Claim 9, wherein the cloth is unwound from a lower roll and is wound onto an upper roll.

11. A process as claimed in any one of Claims 8 to 10, wherein an initial coarse screening operation is performed before said mixture is screened by the cloth.

12. An apparatus as claimed in Claim 1, constructed substantially as described herein with reference to Figs. 1 and 2, or any one of Figs. 3 to 9, or any one of the said constructions modified as described herein with reference to Figs. 10 and 11 or Fig. 12 of the accompanying drawings.

By: SWANN ELT & COMPANY,
Chartered Patent Agents,
4 Dyers Buildings,
Holborn,
London, E.C.1.
Agents for the Applicants.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1971.
Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.