

PATENT SPECIFICATION

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(54) IMPROVEMENTS IN OR RELATING TO CONTINUOUS FILTRATION APPARATUS

(71) We, FOONG WENG HING and FOONG WENG CHEW, both Malaysian citizens, of 81/83 Kuala Kangsar Road, Ipoh, Perak, Malaysia, 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 continuous filtration apparatus, and is particularly concerned with a continuous filtration apparatus for recovering or extracting from suspension in a fluid solids or particles, in particular very small jelly-like particles which are discharged during industrial processes, which easily clog a filter.

According to this invention there is provided a continuous filtration apparatus comprising a drum having an axis about which it is rotatable, two guide rollers disposed adjacent to and externally of the drum parallel to said axis, an idler roller, an endless filter band which extends around the idler roller and is guided by means of said guide rollers around part of the drum, the band passing directly from the drum to one of the guide rollers, supply means for introducing a fluid to be filtered to a surface of the filter band so that, in use of the apparatus, the fluid is carried between the band and said part of the drum with the fluid in contact with the external surface of the drum, means for rotating the drum, and cleaning means for removing solids from the filter band said cleaning means being situated directly between the idler roller and said one of the guide rollers from which one guide roller the filter band passes directly to the idler roller.

In an embodiment of the invention which is particularly suited to the filtering of fluids having a very high viscosity, said supply means for introducing the fluid comprises means to supply the fluid to the filter band between the idler roller and the other of the guide rollers, both of which are preferably

grooved parallel to their axes along their lengths and arranged to press the filter band against the drum, to be carried by the filter band past said other of the guide rollers to between the filter band and said part of the drum, where the filtrate passes through the filter band.

In a preferred embodiment of this invention, said drum is perforated and said band extends around the idler roller and is guided by means of said guide rollers around the drum in such manner that it obstructs the perforations of the drum over a part of the circumference thereof, there being a further roller which has a soft impermeable surface and which is disposed within the drum in such manner that its surface obstructs those perforations of the drum which are not obstructed by the filter band, and said supply means includes means for introducing into the drum a fluid to be filtered, so that the fluid passes through those perforations of the drum not obstructed by said further roller, to said surface of the band.

Preferably the guide rollers are arranged to press the filter band against the drum, and preferably at least said one of the guide rollers is grooved parallel to its axis along its length.

The apparatus preferably further includes two endless belts, and two pulleys disposed on the side of the idler roller remote from the drum, the belts being arranged to pass each around a respective pulley and over a respective edge of the filter band, being guided therewith around the drum and serving to seal the edges of the filter band to the drum. To this end the drum preferably includes grooves in which the belts run.

Advantageously said means for rotating the drum comprises a motor and reduction gear train arranged to drive at least said one of the guide rollers.

Preferably the means for cleaning the filter band comprises an air or water pressure head or a vacuum head which

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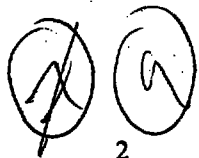
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extends the entire width of the filter band, although any other suitable means may be provided.

5 The apparatus may further include means, for example a scraper, disposed between the guide rollers adjacent to the drum for removing from the drum solids which may have adhered thereto.

10 The invention will be further understood from the following description by way of example of an embodiment thereof with reference to the drawing accompanying the Provisional Specification, which schematically shows a sectional view of a continuous filter apparatus.

15 Referring to the drawing, the apparatus shown therein includes a drum 1 the curved surface of which is perforated over its entire area except at portions of its curved surface adjacent the two ends of the drum. The drum 1 is in operation of the apparatus rotated about its axis 2 in the direction indicated by an arrow 3. Similar arrows indicate the directions of movement of other parts of the apparatus.

25 Disposed within the drum 1 with its axis 4 parallel to the axis 2 of the drum 1 is a roller 5 which has a soft impermeable surface 6 which extends the entire length of the perforated section of the drum 1. The roller 5 is positioned so that its surface 6 is compressed against the drum 1 and obstructs the perforations of the drum 1 over a part of the circumference thereof.

30 A filter band 7 whose width is substantially equal to the length of the drum 1 is guided around the drum 1, in such manner that it covers all of the unobstructed perforations of the drum 1, by two guide rollers 8 and 9 which have the same length as the drum 1. The filter band 7 is kept taut by an idler roller 10 which is situated at some distance from the guide rollers 8 and 9 and around which the filter band 7 passes. Close to each edge of the filter band 7 there is disposed a respective one of two endless belts 11 which are tensioned by idler pulleys 12 around which they pass. From the idler pulleys 12 the belts 11 extend towards the idler roller 10, in the region of which they lie radially outwardly of the filter band 7 adjacent to its edges, from where they are guided by means of the guide rollers 8 and 9 with the filter band 7 around the drum 1, where they run in grooves adjacent the ends of the drum 1 and serve to press the edges of the filter band 7 hard against the surface of the drum 1 to ensure a good seal therebetween.

60 The guide rollers 8 and 9 are for example rubber rollers and are positioned so that they press against the drum 1 within the part of the circumference thereof over which the perforations are obstructed by the surface 6 of the roller 5. The guide rollers are pre-

ferably grooved as shown for the guide roller 8, but may instead be smooth as shown for the guide roller 9. The degree of pressure of the guide rollers 8 and 9, the hardness of these rollers, and the size of any grooves thereon determine the degree of dryness of the filtered material.

The guide roller 8 is in operation driven in the direction shown by a motor and reduction gear chain (not shown). The frictional coupling between this driven roller and the filter band 7 and the belts 11 causes the latter to move in the directions shown, with consequent rotation of the drum 1, the rollers 5, 9 and 10, and the pulleys 12. Throughout such rotation it will be seen that the belts 11 and the rollers 5, 8, and 9 together ensure a continuous seal of the edges of the filter band 7 and the points where the filter band joins and leaves the drum 1 to the drum 1.

At any desired position between the driven guide roller 8 and the roller 10 there is provided a material collector, which for example comprises a scraper 13 which extends the entire width of the filter band 7 and a trough 14 of corresponding length, and a filter band cleaner, which for example comprises an air pressure head or preferably a vacuum head 15 having an elongate slot 16 therein which extends the entire width of the filter band 7.

In operation, a liquid to be filtered is pumped through a hollow shaft at one end of the drum 1 so that it is contained within the drum 1, the continuous seal mentioned above withstanding the pressure of the liquid. The filtrate passes through the perforations in the drum 1 and through the filter band 7 and is collected by means not shown externally of the drum 1, and solids and particles suspended in the liquid are collected on the inner surface of the filter band 7. The solids and particles are thus conveyed by the filter band past the roller 8, the grooves or teeth of which facilitate the trapping and discharge of the solids and particles rather than allowing them to be squeezed back into the drum 1, to the material collector where the solids such as the particles are scraped from the filter band 7 by means of the scraper 13 and are collected in the trough 14, which may be in the form of a conveyor belt. The fine jelly-like particles which still clog the pores of the filter band 7 are subsequently sucked from the filter band 7 by means of the vacuum head 15 (or are blown from the filter band 7 if the filter band cleaner includes an air pressure head) and are collected by means not shown.

It will thus be seen that the continuous filter apparatus enables a continuous filtering process to be carried out with simultaneous collection of the filtered

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material and cleaning of the filter band.

Although this is not shown in the drawing, the apparatus may include a further scraper, which for example may be similar to the scraper 13 and may likewise have a trough similar to the trough 14 associated with it, disposed adjacent to the drum 1 between the guide rollers 8 and 9 and arranged to remove from the drum 1 any solids which may have adhered thereto.

WHAT WE CLAIM IS:—

1. A continuous filtration apparatus comprising a drum having an axis about which it is rotatable, two guide rollers disposed adjacent to and externally of the drum parallel to said axis, an idler roller, an endless filter band which extends around the idler roller and is guided by means of said guide rollers around part of the drum, the band passing directly from the drum to one of the guide rollers, supply means for introducing a fluid to be filtered to a surface of the filter band so that, in use of the apparatus, the fluid is carried between the band and said part of the drum, with the fluid in contact with the external surface of the drum, means for rotating the drum, and cleaning means for removing solids from the filter band said cleaning means being situated directly between the idler roller and said one of the guide rollers from which one guide roller the filter band passes directly to the idler roller.

2. Apparatus as claimed in Claim 1 wherein said supply means for introducing the fluid comprises means to supply the fluid to the filter band between the idler roller and the other of the guide rollers to be carried by the filter band past said other of the guide rollers to between the filter band and said part of the drum.

3. Apparatus as claimed in Claim 1 or Claim 2 wherein the guide rollers are grooved parallel to their axes along their lengths and arranged to press the filter band against the drum.

4. Apparatus according to Claim 1 wherein said drum is perforated and said band extends around the idler roller and is guided by means of said guide rollers around the drum in such manner that it obstructs the perforations of the drum over a part of the circumference thereof, there being a further roller which has a soft

impermeable surface and which is disposed within the drum in such manner that its surface obstructs those perforations of the drum which are not obstructed by the filter band, and said supply means includes means for introducing into the drum a fluid to be filtered, so that the fluid passes through those perforations of the drum not obstructed by said further roller to said surface of the band.

5. Apparatus as claimed in Claim 4 wherein the guide rollers are arranged to press the filter band against the drum.

6. Apparatus as claimed in Claim 4 or Claim 5 wherein at least said one of the guide rollers is grooved parallel to its axis along its length.

7. Apparatus as claimed in any of the preceding claims and including two endless belts, and two pulleys disposed on the side of the idler roller remote from the drum, the belts being arranged to pass each around a respective pulley and over a respective edge of the filter band, being guided therewith around the drum and serving to seal the edges of the filter band to the drum.

8. Apparatus as claimed in Claim 7 wherein the drum includes grooves in which the belts run.

9. Apparatus as claimed in any of the preceding claims wherein said means for rotating the drum comprises a motor and reduction gear train arranged to drive at least said one of the guide rollers.

10. Apparatus as claimed in any of the preceding claims wherein the means for cleaning the filter band comprises an air or water pressure head or a vacuum head which extends the entire width of the filter band.

11. Apparatus as claimed in any of the preceding claims and including means disposed between the guide rollers adjacent to the drum for removing from the drum solids which may have adhered thereto.

12. A continuous filter apparatus substantially as herein described with reference to the drawing accompanying the Provisional Specification.

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2. Apparatus as claimed in Claim 1 wherein said supply means for introducing the fluid comprises means to supply the fluid to the filter band between the idler roller and the other of the guide rollers to be carried by the filter band past said other of the guide rollers to between the filter band and said part of the drum.

3. Apparatus as claimed in Claim 1 or Claim 2 wherein the guide rollers are grooved parallel to their axes along their lengths and arranged to press the filter band against the drum.

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impermeable surface and which is disposed within the drum in such manner that its surface obstructs those perforations of the drum which are not obstructed by the filter band, and said supply means includes means for introducing into the drum a fluid to be filtered, so that the fluid passes through those perforations of the drum not obstructed by said further roller to said surface of the band.

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10. Apparatus as claimed in any of the preceding claims wherein the means for cleaning the filter band comprises an air or water pressure head or a vacuum head which extends the entire width of the filter band.

11. Apparatus as claimed in any of the preceding claims and including means disposed between the guide rollers adjacent to the drum for removing from the drum solids which may have adhered thereto.

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