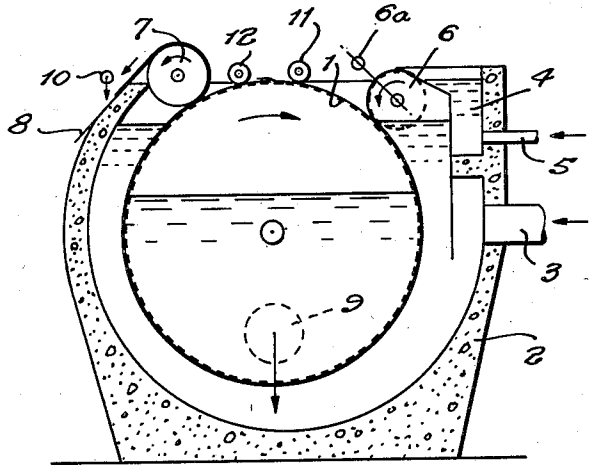
Dec. 19, 1950 K. L. ELLILA 2,534,760

FILTERING APPARATUS

Filed Sept. 19, 1946

FIG. 1.



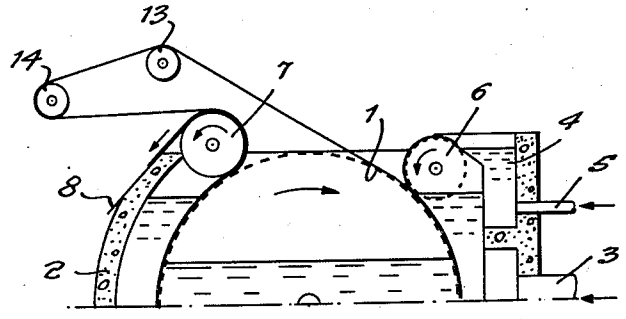


FIG. 2.

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FILTERING APPARATUS

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7 Claims. (Cl. 210—199)

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This invention relates to a filtering apparatus in which the liquid to be filtered is strained through the wall of a cylinder perforated or equipped with slits, rotating horizontally and immersed in a vat filled with the liquid in question, and possibly through a wire gauze and/or felt on the like fastened to the cylinder or rotating with the same, and also thru a layer of pulp or the like on the exterior side of the aforementioned, into the drum wherefrom the filtered liquid is removed.

The layer of pulp, conveniently produced by means of special equipment from chemical pulp or wood pulp or the like suspensions, is passed in felt-like layer form according to a special method over the surface of the straining drum to function as the actual filtering layer and is removed saturated with the impurities of the liquid to be eventually used for other purposes by means of a roller or the like on the other side of the drum.

In the hitherto known corresponding apparatus the filtering medium also consists of a layer of pulp created on an endless wire gauze belt by means of a special collecting roller and rotates with the wire gauze guided by guide rollers around the straining drum, and in which apparatus the liquid to be filtered passes the layer of pulp and gauze in the same direction as in producing the layer of pulp by the collecting rollers. It is already known, that in producing a layer of pulp from pulp suspensions on a wire gauze, a part of the fibres follow the liquid passing the gauge while other fibres stick in an upright position to the meshes on the gauze. It is evident that the fibres closest to the wire also take a more or less upright position in relation to the gauze. On the other hand the surface fibres settle more or less flatly along the surface of the layer of pulp. When gauze covered with such a layer of pulp then passes in the same position to the initial straining drum where filtering takes place and where considerably greater amounts of liquid pass through the gauze and layer of pulp, a part of the fibres sticking to the gauze are bound to detach themselves and follow the filtered liquid, which is not desirable.

According to this invention the above mentioned disadvantage is obviated in that the filtering layer to be formed from the chemical or wood pulp or the like suspension is produced by means of a special collecting roller or on the surface of an endless wire gauze running over two or more guide rollers, and then passed from these

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to the initial straining drum either directly or indirectly in such a way that the exterior surface of the thus formed pulp layer is caused to lie against the surface of the straining drum or the wire gauze and/or felt or the like positioned on the drum or endless wire gauze thus forming the interior surface of the pulp layer.

The advantage achieved by means of this invention is evident when the pulp band is placed directly on the surface of the straining drum or when only a wire gauze or felt or the like is used as an intermediate gauze, because the fibres lying flat in the pulp layer now lie against the actual filtering drum or metal gauze or the like, wherefore the passing of these fibres into the filtered liquid is effectively prevented. In addition to this the capacity of the filter is improved because the meshes of the gauze are and stay open, and a finer gauze can thus be used. The cleansing capacity of filtering apparatus can be perceptibly increased according to the invention not only by regulating the thickness and quality of the pulp and the peripheral speed of the drum but also by placing a removable and detachable felt or an endless felt or the like running over one or more auxiliary rollers either on top of the aforementioned wire gauze or directly on the straining drum, in which case the wire gauze can be omitted. In this way the eventual passing of pulp fibres into the filtered liquid is totally prevented.

The filtering apparatus can successfully be used for cleansing waste water in the wood-treating industry as also for cleansing chemically pre-treated water, especially when felt or the like is used as a foundation for the pulp layer.

The annexed schematic drawings illustrate in Fig. 1 in section an embodiment of the apparatus according to the invention. Fig. 2 illustrates another embodiment of the invention. In both figures the corresponding parts are designated with the same reference numbers.

In the drawing 1 designates the straining drum rotating in the direction shown by the arrow and immersed in a vat 2 containing the liquid to be filtered. The liquid is conducted into the vat through pipe 3. In the vat there is a trough 4 with inlet 5 for the pulp suspension, e. g. chemical pulp or wood pulp, from which trough the pulp is passed to a collecting roller 6, the rotating direction of which is indicated by the arrow. Roller 6 can be positioned in relation to the liquid level by means of the lever 6a. The roller 6 rests directly on the periphery of the straining drum wherefrom it derives its motion and de-

livers the pulp band collecting on its surface to the surface of the drum 1. Thus the exterior surface of the pulp band will lie against the mantle of the straining drum, and practically all the fibres coming against the mantle will lie flat along the surface of the straining drum and therefore will not pass through the mantle of the straining drum. On the other hand the upright fibres which lie against the surface of the roller 6 form now the exterior surface of the pulp band covering the straining drum and are pressed by the liquid tightly against the pulp band thus forming a most compact layer on the surface of the band.

Impurities stick to the surface of the pulp band and are removed on the opposite side of the drum together with the pulp band by means of roller 7 and separating knife 8. The impure pulp band separated from roller 7 can when necessary, be decomposed, e. g. by means of a spray pipe 10. With special equipment the impurities can even be separated from the pulp band used for filtering after which it is conducted in some suitable manner to trough 4 to be reused for the making of a new pulp band. The exterior layer of the pulp band mixed with impurities after the filtering operation will lie as an interior layer on roller 7. Through the effect of the collected impurities this interior layer of the pulp band adheres well to roller 7. The interior layer of the pulp band lying on the straining drum is generally relatively clean and does not adhere quite as well. By means of special devices it is possible to conduct only the exterior pulp layer lying on the straining drum over roller 7, while the interior layer can be split off and conducted back to collecting roller 6 or trough 4 to be used for the making of a new pulp band which in the described manner is conveyed to the straining drum.

The filtering power of the apparatus can still be made more effective, if necessary, by placing a wire gauze and/or felt or the like between the pulp band and the wall of straining drum 1. In this way the filtering layer will consist of three or more parts namely the uppermost, most compact layer formed by the pulp band, wherefore the exterior layer is, as mentioned, the most compact, the intermediate wire gauze and/or felt, and the undermost wire gauze or perforated mantle of the drum, on which the openings are larger than the meshes on the employed intermediate wire gauze.

In the embodiment illustrated in Fig. 1 the intermediate layer consists of a felt band of the same breadth as the side of the straining drum passing over roller 11 and somewhat longer than the circumference of the straining drum. When the one end of the band is fed under the pulp band, the straining drum on rotating will drag the band with it. When the end appears from under the pulp band on the other side of the drum, it is placed to overlap the other end of the band, so that the band functions as an endless one. When the band has to be removed e. g. for cleaning or washing, it is rolled up on roller 12.

In the embodiment illustrated in Fig. 2 an endless felt, wire band and/or gauze running around straining drum 1 and one or more guide rollers 13, 14 is used.

The filtered water in the straining drum is led away through an opening 9 in the end of the cylinder. The regulating valve of said opening can be adjusted by means e. g. of a float in the vat, not shown in the drawing. The float can also regulate the inflow through pipe 3.

Naturally the apparatus can be driven directly or over a suitable transmission by any known driving machine.

What I claim is:

1. The method of filtering comprising, in continuous sequence, the steps of building up a filter cake on a porous medium by passing a liquid suspension of filter material therethrough; transferring the filter cake in inverted form to continuous porous filter means so that the exterior surface of the filter cake on said porous medium becomes the interior surface of the cake on said filter means; passing the liquid to be filtered through said cake and filter means; removing the cake from the filter means; and moving the latter into position for another succession of operations.

2. The method of filtering comprising, in continuous sequence, the steps of building up a filter cake on a porous medium by passing a liquid suspension of filter material therethrough; transferring the filter cake in inverted form to continuous porous filter means so that the exterior surface of the filter cake on said porous medium becomes the interior surface of the cake on said filter means; passing the liquid to be filtered through said cake and filter means; removing the cake from the filter means; splitting the cake horizontally into a solid-contaminated disposable portion and a relatively uncontaminated reusable portion; and, simultaneously therewith, moving the filter means into position for another succession of operations.

3. A filtering apparatus comprising in combination movable continuous porous filter means; means for admitting the liquid to be filtered at one face and removing it at the other face of said filter means; a trough for receiving a slurry of a filter forming material, said trough being formed with an overflow; a porous endless transfer element movable across said overflow and movable with its top surface in substantial engagement with said filter means; means for imparting revolving movements in opposite directions to said transfer element and said filter means whereby the filter cake is formed on said transfer element from the material passing through said overflow and is transferred in inverted form to said filter means; and means for removing said filter cake from said filter means after filtering of liquid therethrough.

4. A filtering apparatus comprising in combination a filter tank; a drum revolvable therein; a substantially continuous porous filter surface provided on the circumference of said drum; a trough adapted to receive a slurry of filter material, said trough being formed with an overflow; a porous endless transfer element movable across said overflow and movable with its top surface in substantial engagement with said filter surface; means for imparting revolving movements in opposite directions to said transfer element and said drum whereby the filter cake formed on said transfer element from the material passing through said overflow is transferred in inverted form to said filter surface; means for removing said filter cake from said filter surface after a portion of one revolution of said drum; and means for withdrawing the filtered liquid from the interior of said drum.

5. A filtering apparatus, comprising in combination, movable endless porous filter means; means for applying the liquid to be filtered to one

face and for withdrawing it to the other face of said filter means; a movable endless porous transfer element; means for continuously passing a suspension of a filter material through said transfer element so as to continuously form a filter cake thereon, the said transfer element being in engagement with said filter means through said filter cake; means for imparting revolving movements in opposite directions to said filter means and transfer element so as to continuously transfer the said filter cake in inverted position to said filter means; and means for continuously removing said filter cake from said filter means after filtering of liquid therethrough.

6. A filtering apparatus, comprising in combination, movable endless porous filter means; means for applying the liquid to be filtered to one face and for withdrawing it to the other face of said filter means; a movable endless porous transfer element; means for continuously passing a suspension of a filter material through said transfer element so as to continuously form a filter cake thereon, the said transfer element being in engagement with said filter means through said filter cake; means for imparting revolving movements in opposite directions and at substantially equal speed to said filter means and transfer element so as to continuously transfer the said filter cake in inverted position to said filter means; and means for continuously removing said filter cake from said filter means after filtering of liquid therethrough.

7. A filtering apparatus, comprising in combination, movable endless porous filter means; means for applying the liquid to be filtered to

one face and for withdrawing it to the other face of said filter means; a movable endless porous transfer element; means for adjustably bringing said element in engagement with said filter means; means for continuously passing a suspension of a filter material through said transfer element so as to continuously form a filter cake thereon; means for imparting revolving movements in opposite directions to said filter means and transfer element so as to continously transfer the said filter cake in inverted position to said filter means; and means for continuously removing said filter cake from said filter means after filtering of liquid therethrough.

KARL LAURI ELLILÄ.

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