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WASHING ARRANGEMENT FOR FIBROUS MATERIALS

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FIG. 1.

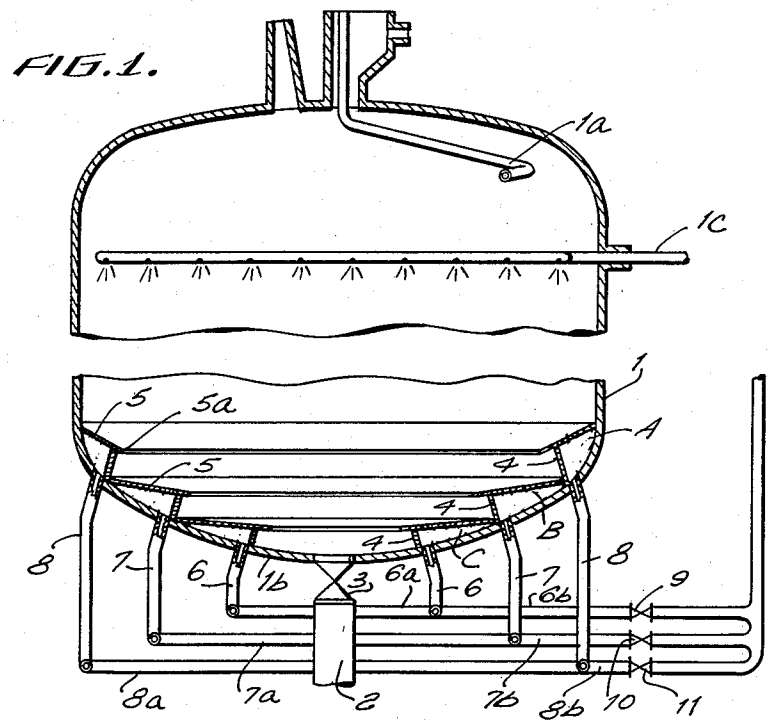


FIG. 2.

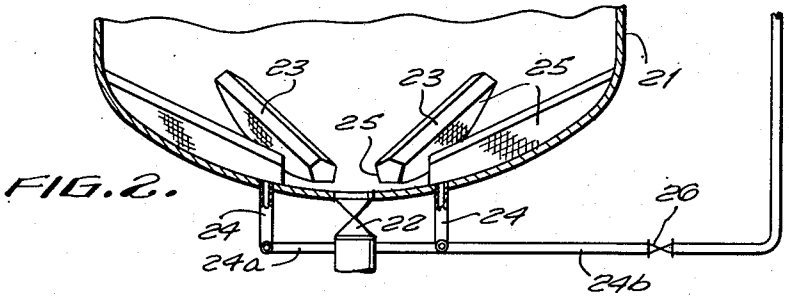
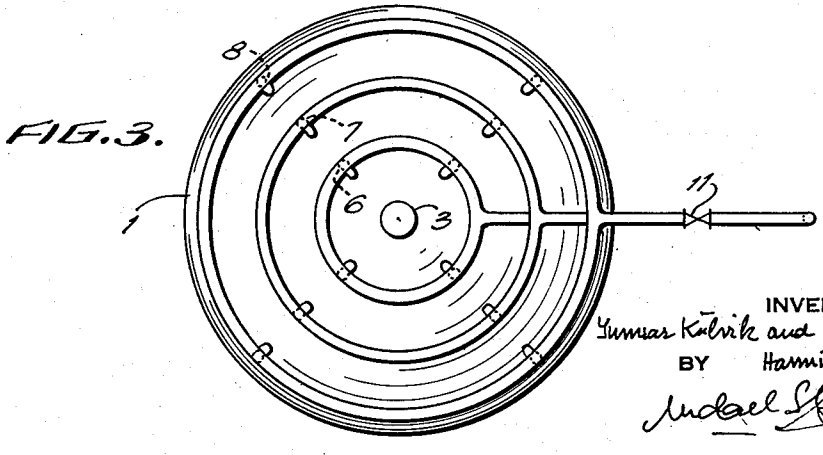


FIG. 3.



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WASHING ARRANGEMENT FOR FIBROUS MATERIALS

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6 Claims. (Cl. 68—181)

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The present invention relates to an arrangement for washing fibrous material, such as pulp.

In washing fibrous materials such as chemical pulp it has heretofore been customary to use washing tanks or containers with screen bottoms. During the washing process washing liquid is delivered to the tank through the top thereof and displaces, while flowing downwards, the heavier liquor which is withdrawn from the bottom of the tank through the screen bottom. Tanks of the kind described have, however, the disadvantage that during the washing process there is formed upon the screen surface a compact layer of materials which hinders liquid flow. Two main factors produce this effect, firstly, the weight of the material to be treated exerts a pressure which mainly is downwardly directed but has a smaller lateral component due to soft consistency of the material. Secondly the liquid flow causes a pressure as well as a suction effect which reduce the size of passages through the material.

Objects of the invention are the provision of a washing tank in which the above described disadvantages are overcome; provision of an apparatus in which the washing process is rapidly carried out so that the number of washing tanks necessary to produce a continuous washing process can be appreciably reduced; provision of an apparatus in which the material to be treated can be evenly and thoroughly washed; provision of a washing tank in which the chiefly downwardly directed pressure in the treated material due to its own weight is prevented from forming a compact layer of materials hindering liquid flow.

With these objects in view, the present invention mainly consists in an arrangement for washing fibrous material and comprises in combination, a substantially vertically arranged tank having a wall formed with an inlet for material to be washed at the upper end of said tank and an outlet for washed material at the lower end of the tank; at least one screening chamber device including at least one inclined supporting plate member secured to the inner surface of the wall and projecting from the same downwardly into the interior of the tank, the inclined supporting plate member having the highest point thereof located adjacent to the wall of the tank, the plate member being adapted to support material to be washed, inclined screen means extending between the underside of the supporting plate member and the inner surface of the wall so as to form a screening chamber bounded by the supporting plate member, the inner surface of the

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wall, and the screen means, the screen means having at least one outer face outside the chamber and at least one inner face inside the chamber, the outer face of the inclined screen member facing downwardly; and outlet means for a washing liquid located on the tank communicating with the screening chamber.

According to one embodiment of the present invention annular downwardly inclined supporting plates project from the inner surface of the tank into the interior of the same and form together with downwardly inclined annular screen members a plurality of annular screening chamber devices which are provided with outlet means for a washing liquid.

According to another embodiment of the present invention a plurality of radially extending screening chamber devices are located on the bottom wall of the tank, each of the screening chamber devices having on top a downwardly inclined supporting plate and including two lateral downwardly inclined screen members, the plate and the screen members forming radially extending screening chambers communicating with outlet means for the washing liquid.

The invention will be best understood from the following descriptions of specific embodiments when read in connection with the accompanying drawings, in which:

Fig. 1 is a vertical sectional view of a washing tank according to a preferred embodiment of the present invention;

Fig. 2 is a fragmentary vertical sectional view of another embodiment of the present invention; and

Fig. 3 is a bottom view of the arrangement shown in Fig. 1.

Referring now to Figs. 1 and 3, in an upright washing tank 1 an inlet 1a for fibrous material to be washed is located in the upper part of the tank, and an outlet 2 for the washed material is arranged in the center of the bottom 1b of the tank, and controlled by a valve 3. Washing water is supplied through the water inlet 1c.

A plurality of annular screening chamber devices A, B, C are provided, each screening chamber device including a downwardly inclined annular supporting plate member 5 having the shape of truncated cones whose highest point is located adjacent to the wall of the tank. A screen means, namely the inclined annular screen member 4 extends between the under side of the supporting plate member 5 and the inner surface of the tank so as to form a screening chamber. Each screening chamber communicates with outlet means 6,

7, 8, respectively, which end in annular pipes 6a, 7a, and 8a, respectively, communicating with outlet pipes 6b, 7b, and 8b. Closing valves 9, 10 and 11 are arranged in the outlet pipes 6b, 7b and 8b. As clearly shown in the drawing each annular screening member 4 has an inner face located in the screening chamber and an outer face which faces downwardly. The inclined annular screen members 4 are protected from the pressure of the material by the supporting plate members 5 which may have projecting edge portions 5a. The outer faces of the screen members 4 define with the vertical an angle which is at least as great as the angle formed between the vertical and the resultant of the horizontal and vertical components of the pressure in the treated material whereby any pressure due to the weight of the material on the screen surfaces is prevented.

The washing process as effected with the above described washing tank is similar to that on employing diffusers of the known type. However, if so desired, at the end of the washing process when the boundary layer between the liquid to be displaced and the washing liquid has reached the uppermost annular screening chamber, it is advantageous to shut off the outlets from the uppermost compartment thereby avoiding unnecessary dilution of the liquid to be displaced. The same measure can be repeated when the boundary layer reaches the next lower screening chamber device and so on.

In the embodiment shown in Fig. 2 the screen members are arranged so as to form the side walls 25 of radially arranged screening chamber devices 23. According to this embodiment each screening chamber device has a downwardly and laterally inclined supporting top plate 23. From the underside of each supporting top plate extend screen means, namely two screen members 25 which, together with the surface of the tank bottom and with the top plate 23, form a screening chamber communicating with outlets 24. Outlets 24 communicate through an annular pipe 24a with an outlet pipe which is controlled by a valve 26. It will be understood that each of the elements described above may also find a useful application in other types of washing tanks for fibrous material differing from the types described above.

The invention is not intended to be limited to the detail shown since various modifications may be made without departing from the spirit of the present invention.

What is claimed as new and desired to be secured by Letters Patent is:

1. An arrangement for washing a fibrous material, comprising, in combination, a substantially vertically arranged elongated tank having a wall formed with an inlet for material to be washed at the upper end of said tank and an outlet for washed material at the lower end of said tank; at least one screening chamber device including at least one inclined supporting plate member secured to the inner surface of said wall and projecting from the same downwardly into the interior of said tank, said inclined supporting plate member having the highest point thereof located adjacent to said wall of said tank, said plate member being adapted to support material to be washed, inclined screen means extending between the underside of said supporting plate member and said inner surface of said wall so as to form a screening chamber bounded by said supporting plate member, said inner surface of said wall, and said screen means, said screen means having at least one outer face outside said chamber and at least one inner face inside said chamber, said outer face of said inclined screen member facing downwardly; and outlet means for a washing liquid located on said tank communicating with said screening chamber.

2. An arrangement for washing a fibrous material, comprising, in combination, a substantially vertically arranged elongated tank having a wall formed with an inlet for material to be washed at the upper end of said tank and an outlet for washed material at the lower end of said tank; at least one inclined supporting plate member secured to the inner surface of said wall and projecting from the same downwardly into the interior of said tank, said inclined supporting plate member having the highest point thereof located adjacent to said wall of said tank, said plate member being adapted to support material to be washed; at least one inclined screen member extending between the underside of said supporting plate member and said inner surface of said wall so as to form a chamber bounded by said supporting plate member, said inner surface of said wall, and said screen member, said screen member having an outer face outside said chamber and an inner face inside said chamber, said outer face of said inclined screen member facing downwardly; and outlet means for a washing liquid located on said tank communicating with the lowermost point of said chamber.

3. An arrangement for washing a fibrous material, comprising, in combination, a substantially vertically arranged elongated tank having a wall formed with an inlet for material to be washed at the upper end of said tank and an outlet for washed material at the lower end of said tank; at least one inclined annular supporting plate member secured to the inner surface of said wall and projecting from the same downwardly into the interior of said tank and having a free annular edge, said inclined supporting plate member having the highest point thereof located adjacent to said wall of said tank, said plate member being adapted to support material to be washed; at least one inclined annular screen member extending between the underside of said supporting plate member spaced from said annular free edge of the same, and said inner surface of said wall so as to form a chamber bounded by said supporting plate member, said inner surface of said wall, and said screen member, said screen member having an outer face outside said chamber and an inner face inside said chamber, said outer face of said inclined screen member facing downwardly; and outlet means for a washing liquid located on said tank communicating with said chamber.

4. An arrangement for washing a fibrous material, comprising, in combination, a substantially vertically arranged elongated tank having a wall formed with an inlet for material to be washed at the upper end of said tank and an outlet for washed material at the lower end of said tank; a plurality of inclined annular supporting plate members secured to the inner surface of said wall and projecting from the same downwardly into the interior of said tank and having a free annular edge, said inclined supporting plate members having the highest point thereof located adjacent to said wall of said tank, said plate members being adapted to support material to be washed; a plurality of inclined annular screen members, each screen member extending between the underside of one supporting plate member spaced from said annular free edge of the same, and said

inner surface of said wall so as to form a chamber bounded by said supporting plate member, said inner surface of said wall, and said screen member, each of said screen members having an outer face outside said chamber and an inner face inside said chamber, said outer faces of said inclined screen members facing downwardly; and outlet means for a washing liquid located on said tank communicating with the lowermost points of said chambers.

5. An arrangement for washing a fibrous material, comprising, in combination, a substantially vertically arranged elongated cylindrical tank formed with an inlet for material to be washed at the upper end thereof and having a bottom wall formed with an outlet for washed material in the center thereof; a plurality of elongated screening chamber devices located on said bottom wall of said tank extending radially with respect to said outlet, each of said screening chamber devices including an inclined elongated supporting plate member secured to and projecting downwardly from the cylindrical inner surface of said tank into the interior of said tank and having the highest point thereof located adjacent said cylindrical inner surface, said plate member being adapted to support material to be washed, and inclined screen means including two inclined screen members, each screen member extending between the underside of said plate member and the inner surface of said bottom wall adjacent to a longitudinal edge of said supporting plate member, said supporting plate members, said screen members and the inner surface of said bottom wall defining an elongated screening chamber in each of said screening chamber devices, each of said inclined screen members having an outer face located outside of the corresponding chamber and an inner face located inside said corresponding chamber, said screen members being inclined with said outer faces facing downwardly; and outlet means for a washing liquid in said bottom wall of said tank communicating with the lowermost portions of said elongated screening chambers.

6. Arrangement for washing material, comprising, in combination, a tank having an inlet for the material to be washed located in the upper part of said tank, and an outlet for washed material on the bottom of the same; at least one inclined supporting plate member having an upper and a lower edge and being secured to the inner surface of said tank projecting from the same inwardly and downwardly into the interior of said tank, said supporting plate member being adapted to support material to be washed; at least one screen member mounted in said tank extending downwardly from the underside of said supporting plate member between the same and said inner surface of said tank so as to form together with said inner surface of said tank and with said inclined supporting plate member a chamber bounded on one side by the inner face of said screen member, said screen member having an upper edge located on said underside of said supporting plate member and a lower edge located on said inner surface of said tank, and an outer face extending from said upper edge to said lower edge thereof and being inclined relative to a vertical passing through said upper edge thereof toward said upper edge of said supporting plate member so as to face downwardly; and outlet means for a washing liquid mounted on said tank and communicating with said chamber.

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