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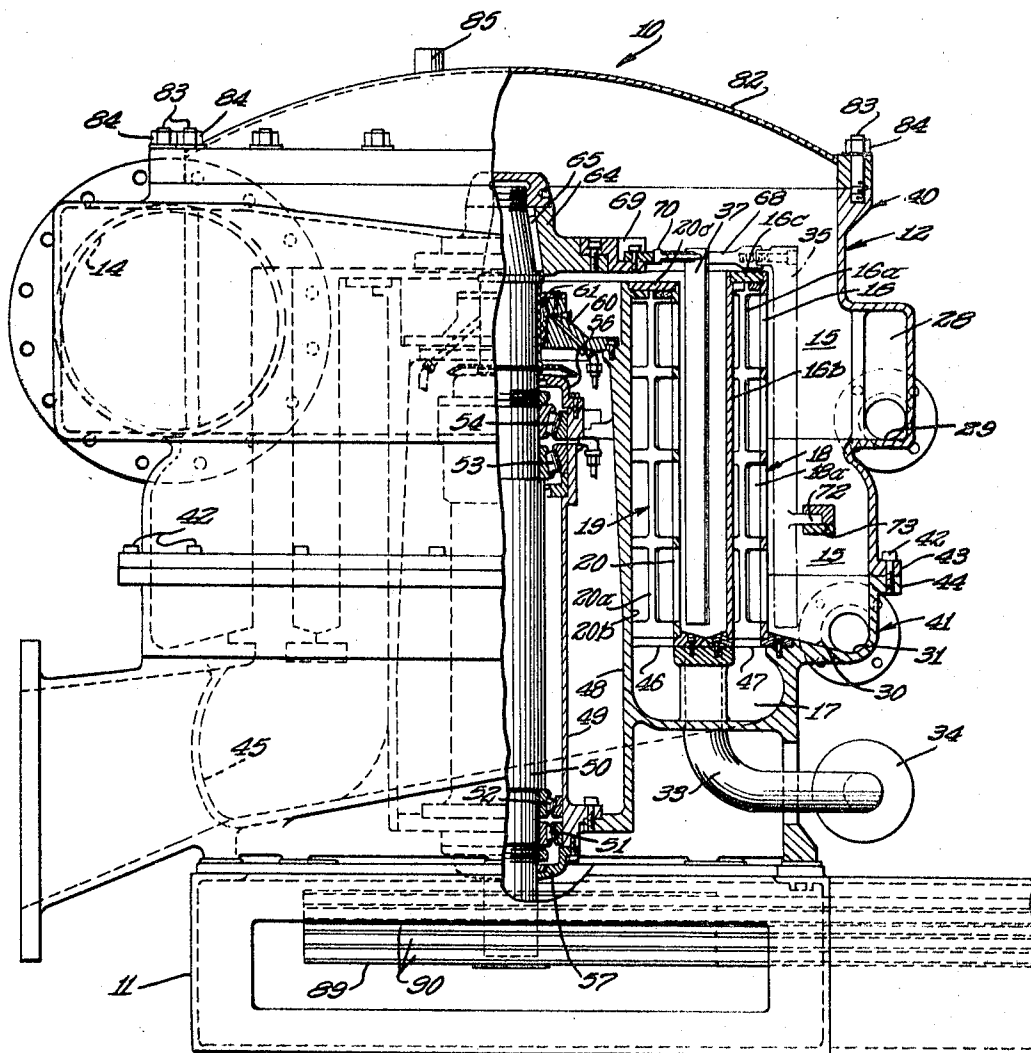
3,456,793

DUAL PRESSURE STOCK SCREEN

Filed Oct. 3, 1966

2 Sheets-Sheet 1

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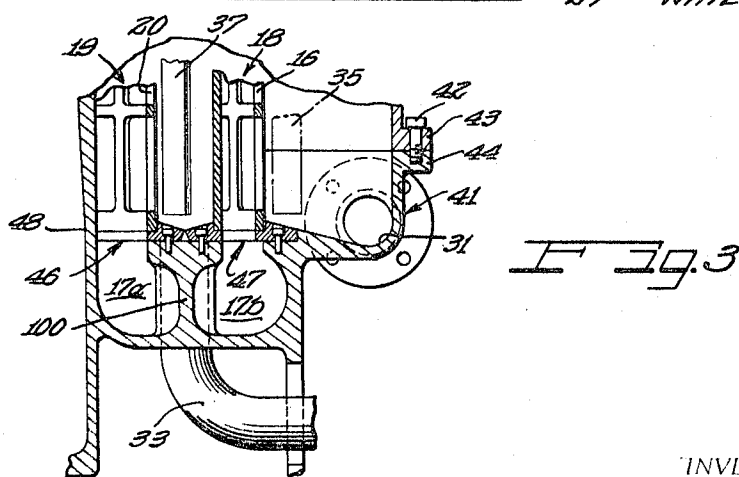
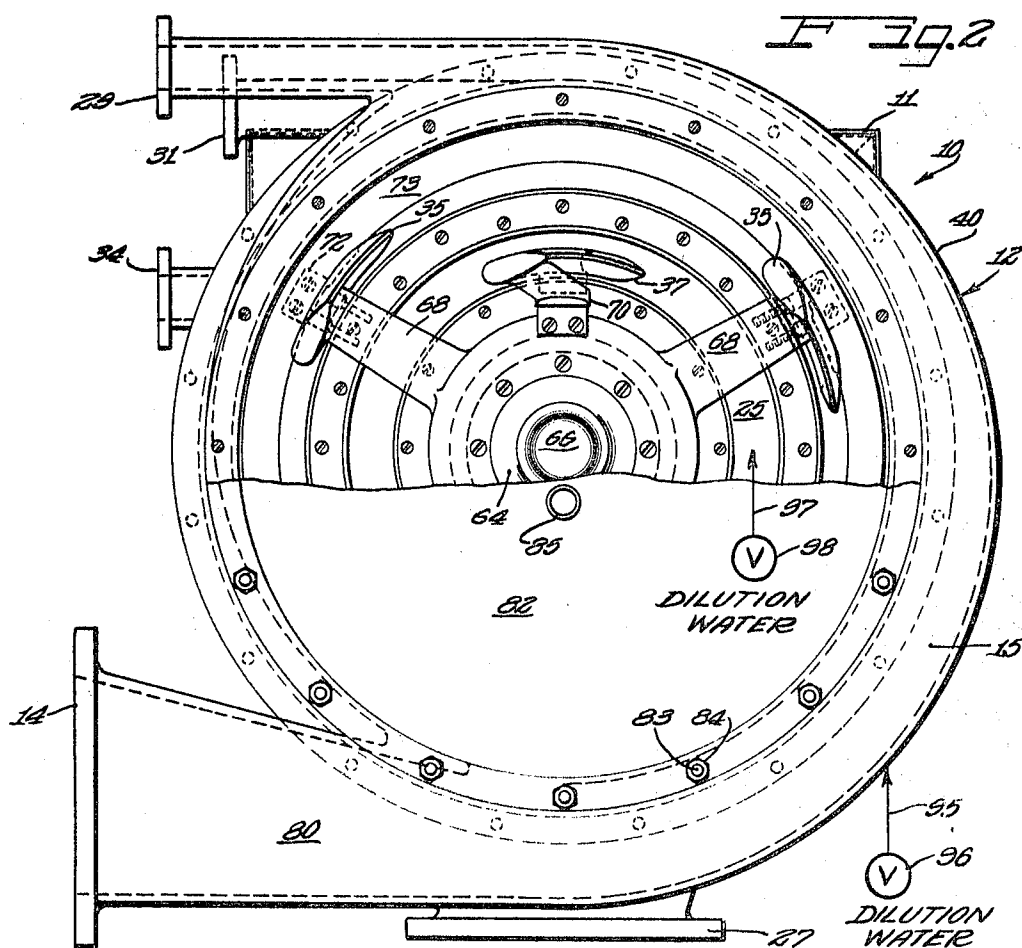
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DUAL PRESSURE STOCK SCREEN

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2 Claims

ABSTRACT OF THE DISCLOSURE

A screening mechanism for screening paper stock having a pair of concentric screen assemblies in parallel relationship screening stock radially inwardly therebetween where at least the outer screen assembly is in direct contact with the stock inlet.

This invention relates generally to apparatus for screening of particles from liquids such as paper making stock and the like. Specifically, the present invention is directed to a dual pressure stock screen which includes a pair of cylindrical screen members through which the stock passes radially inwardly therethrough.

The invention has special relation to screening apparatus embodying a pair of vertically extending cylindrical screen assemblies which are in fluid communication with a common stock receiving chamber to deliver stock of desired consistency to the output of the screening apparatus.

Heretofore, screening apparatus of the cylindrical screen type has incorporated one or more screens through which the stock is forced through the screen in a direction radially outwardly of the screen. It has been found that centrifugal forces due to the direction of flow through the screen cause undesirable particles to pass through the screen. Therefore, the screening apparatus of the present invention provides a pair of cylindrical screen assemblies through which the stock passes in a direction radially inwardly of the screen thereby eliminating the effects of centrifugal force on the particles.

It is a primary object of the present invention to provide a screening apparatus of the above type which will effectively and efficiently screen fibrous material suspended in liquid and which is particularly useful in screening paper stock of dirt particles, bark, slivers and other undesirable material.

Another object of the present invention is to provide a screening apparatus for separating fibrous material and delivering the desired constituent of the material at an outlet of the apparatus and for delivering undesired constituents of material of different characteristics to different outlets of the apparatus.

Another object of the present invention is to provide a screening apparatus which will prevent unwanted particles to be carried along with the desired particles due to centrifugal force.

Yet another object of the present invention is to provide a screening apparatus of the character described which provides means for supporting a perforated screen against the pressures of incoming material.

A feature object of the present invention is to provide a screening apparatus which incorporates a pair of rotating foil members each of which are positioned radially outwardly of a corresponding annular screen assembly.

These and other objects and features will be more fully realized and understood from the following detailed description when taken in conjunction with the accompanying drawings in which like reference numerals throughout the various views of the drawings are intended to designate similar elements or components and wherein:

FIGURE 1 is an elevational view which is partly

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broken away in vertical section to show the screening apparatus constructed in accordance with this invention;

FIGURE 2 is a plan view of the apparatus shown in FIGURE 1, with a portion of the top cover broken away; and

FIGURE 3 is an elevational sectional view showing an alternate arrangement of the stock receiving channel of FIGURE 1.

Referring to the drawings, which illustrates a preferred embodiment of the invention, the screening apparatus shown in FIGURES 1 and 2 is designated generally by a reference numeral 10. The screening apparatus 10 includes a base 11 supporting a main body 12 of substantially cylindrical configuration. An inlet 14 is provided near the upper portion of the body 12 for receiving a supply of fibrous material suspended in liquid such as paper stock. The material is delivered to a chamber 15 within the housing 12 whereupon the desired constituent of the material passes through a screen member 16 and is collected by an outlet receiving chamber 17. The annular screen member 16, an annular reinforcing grid member 16a, a back-up wall 16b, and a top ring 16c, which is positioned over the grid member 16a and extended between the screen 16 and the back-up wall 16b, are constructed so as to form a first screen assembly 18 which has a stock receiving chamber 18a which is in fluid communication with the outlet chamber 17. A second screen assembly 19 is positioned radially inwardly of the screen assembly 18 and substantially concentric therewith. The screen assembly 19 is constructed of a screen 20, a reinforcing grid member 20a, a back-up wall 20b, and a top ring 20c. The back-up wall 20b also forms a part of the supporting structure of within the main body 12.

The reinforcing members 16a and 20a serves to support the screens 16 and 20 against the pressure exerted thereon by the incoming material. Material which is delivered to the screening apparatus 10 will fill the chamber 15 and flow over the cylindrical screen assembly 18 to fill a chamber 25 located between the screen assemblies 18 and 19. Therefore, the material which is carried over into chamber 25, will pass through the screen 20 and is collected in the outlet chamber 17, also, the material which is supplied to the chamber 15 will pass through the screen 16 and is collected in the outlet chamber 17. The desired constituent of material which is collected in the receiving chamber 17 is then delivered to a main outlet 27.

Therefore, according to the new and improved screening arrangement of the above invention, the desired constituent of pulp which is delivered to the main outlet 27 is screened by passing the material through screens in a direction radially inwardly of the screening apparatus. This feature eliminates the effect of centrifugal force on the particles being screened, thereby giving a more uniform consistency of the desired constituent of the material.

The heaviest undesired constituent of the material is separated by a plurality of actions but chiefly by centrifugal force and is collected in a receiving chamber 28 whereupon this undesired constituent of the material is delivered to an outlet 29. Still a further undesired constituent of the material, which is heavier than the desired constituent of material, is separated by gravitational means and falls to the bottom of chamber 15. The bottom of chamber 15 forms a trough 30. An outlet 31 communicates with the trough 30 for receiving the undesired material collected thereby. Another trough 33 is located at the bottom of chamber 25 for collecting the constituent of material unacceptable to the process and which is carried over the top of the screen assembly 18. An outlet 34 communicates with the trough 33 for receiving the undesired constituent of material collected thereby.

One or more rotatable foils 35 extend axially of the screen assembly 18 and radially outwardly thereof and immediately adjacent thereto as indicated by the dotted lines shown in FIGURE 1. In the preferred embodiment of the present invention the plurality of foils 35 are spaced equally apart around the periphery of the screen assembly 18. The foils 35 are rotated to clean the surface of the screen member 16 of materials which would otherwise clog the screen. Some of the undesired constituents of the material which are removed from the screen members 16 will fall to the bottom of the chamber 15 into trough 30 and be removed by outlet 31, and some of the undesired material will be carried in suspension over the top of the screen assembly 18 and ultimately collected within the trough 33 and removed by outlet 34.

In a similar fashion a plurality of equally spaced foils 37 extend axially and radially outwardly of the screen assembly 19 and immediately adjacent thereto as seen in FIGURE 1. The coils 37 are also rotated to remove undesired constituents of the material from the surface of the screen member 20 which would otherwise clog the screen. This undesired constituent of material is ultimately collected within the trough 33 and removed via outlet 34.

A better understanding of the detailed construction of the screening apparatus shown in FIGURES 1 and 2 can be had by reference to the following description.

The housing 12 consists of an upper portion 40 and a lower portion 41 which are fastened together by a plurality of bolts 42 engaging flanges 43 and 44 of the upper and lower portions 40 and 41 respectively. The receiving chamber 17, which communicates with the main outlet 27, is formed by an involute 45 which has the major diameter thereof at the outlet 27, a pair of openings 46 and 47 are provided in one side of the involute 45 in a plane perpendicular to the axis thereof and concentric therewith. The openings 46 and 47 are in direct communication with the space between the screen assemblies 18 and 19.

A support member 48 which also forms the back-up wall 20b of the screen assembly 19, is formed concentrically and integrally within the lower portion 41 and extends upwardly within the upper portion 40. Located concentrically within the support member 48 is a sleeve 49. A shaft 50 is journaled by bearings 51, 52, 53 and 54 which are carried within the sleeve 49. Retainer caps 56 and 57 are secured respectively to the upper and lower ends of the sleeve 49 for retaining the bearings 51, 52, 53 and 54 and the shaft 50 therein. A cover 60 is secured to the upper end of the support member 48, and a seal 61 is carried between the shaft 50 and the cover 60.

A hub 64 is removably connected to the upper end of the shaft 50 and is prevented from rotating relative to the shaft by a key 65. A contoured nut 66 threadably engages the shaft 50 to retain the hub 64 in place. One or more arms 68, indicated by dotted lines in FIGURE 1, extend outwardly from a ring 69 which is secured to the hub 64. Each of the arms 68 serves to carry one of the foils 35, as seen in FIGURE 1. Also connected to the ring 69 are one or more arms 70, and each of the arms 70 serves to carry one of the foils 37. It will be understood that each of the foils 35 or 37 may be fixedly connected to their associated arm or may be removably connected thereto.

The foils 35 have bosses 72 which engage a stiffener ring 73 located radially outwardly of the foils. The ring 73 is connected to all of the foils 35 and serves to prevent the foils 35 from flexing axially, which action would cause a gap between the foil 35 and the bottom portion of the screen member 16. The foil 37 are shown without a stiffener ring associated therewith since the foils 37 have relatively little flexure due to the short length of the support arms 70. However, it will be understood that such a stiffener ring may be incorporated with the foils 37.

As best seen in FIGURE 2, the top portion 40 of the housing 12 is provided with an inlet passage 80 which

forms an involute. The involute 80 has an opening on the inside arcuate portion thereof communicating with the interior of the housing 12 for delivering the material to be screened to the chambers 15 and 25.

A cover 82 is secured to the upper portion 40 of the housing 12 by a plurality of studs 83 and nuts 84. A threaded fitting 85 is provided on the cover 82 and may be connected to suitable piping means.

The lower end of the shaft 50 extends into a space within the base 11 and is connected to a multiple V-belt pulley 89. The pulley 89 is rotated by a plurality of belts 90 which are connected to a suitable power source.

Although the specific embodiment of the present invention shows single outlets 29, 31 and 34 for receiving undesired constituents of different character, it is not to be construed in the limiting sense. The housing 12 may have a plurality of outlets for receiving each different undesired constituent of material that is delivered to the outlet 29. That is, the housing 12 may have a plurality of outlets around the housing to receive the undesired constituent of material which is received by the outlet 31. Similarly, the housing 12 may have a plurality of outlets in communication with the chamber 25 for receiving the undesired constituents of material therefrom.

As seen in FIGURE 2, the housing 12 may be provided with water dilution means as indicated by arrow 95. The water dilution is introduced into the chamber 15 in a direction substantially tangential to the direction of rotation of the foils 35 and 37. The water dilution means indicated by arrow 95 is provided with a valve 96 for controlling the quantity of water which is to be added to the chamber 15. Water dilution means may be connected to the chamber 25 as indicated by the arrow 97. A valve 98 is connected to the water dilution means for controlling the quantity of water delivered to the chamber 25.

It will be noted that the rotating foils 35 and 37 at no time pass over the outlet openings of the housing 12. Also, the rotating foils 35 and 37 at no time pass over the inlet opening 14 of the housing 12. This will allow the inlet opening 14 to be moved upwardly as seen in FIGURE 1 if necessary. Furthermore, this feature decreases the amplitude of pulsations of the material delivered to the inlet 14.

Seen in FIGURE 3 is an alternate embodiment of the stock receiving chamber 17. Here the stock receiving chamber 17 is shown as being divided into two separate receiving chambers 17a and 17b by placing a wall 100 therebetween. By utilizing a receiving chamber of this configuration, it is possible to use screens having different size apertures. That is, the screens 16 may have one size aperture while the screen 20 may have a different size aperture. This feature would allow the screening apparatus of the present invention to separate to desired constituents simultaneously yet independently of one another.

It can be seen, therefore, that the preferred embodiment of the present invention provides means for separating the desired constituent of a material and delivering the desired constituent to a main outlet while at the same time, the undesired constituent of the material are delivered to one or more different outlets. Specifically, the invention shows an improved screening apparatus whereby the material to be screened passes through a pair of screen members in a direction radially inwardly, thereby eliminating the effects of centrifugal force which would otherwise cause unwanted particles to pass through the screens.

I claim as my invention:

1. In a screening apparatus of the character described for screening fibrous material in liquid suspensions to deliver the desired constituent of the materials from the apparatus and to remove the undesired constituent of material comprising

a housing having a central axis, an inlet and a multiplicity of outlets,

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a pair of screen assemblies disposed concentrically within the said housing in radially spaced apart relation to provide a first foil chamber between said first screen assembly and said housing and a second foil chamber between said first and second screen assemblies, each of said screen assemblies comprising wall means forming a screen chamber having a radially outwardly facing open side and a screen member across said open side,

means communicating said inlet with both said first and second foil chambers in parallel hydraulic circuitry,

means communicating said first foil chamber with one of said outlets,

means communicating both said screen chambers with another of said outlets,

first and second foil means rotatably mounted in said housing and disposed respectively within said first and second foil chambers and radially outwardly of their respective screen members, and

drive means for rotating said foil means, both said screen members being constructed and arranged so as to screen the same constituent of the fibrous material.

2. The screening apparatus as defined in claim 1 and a further comprising

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dilution means connected to said housing for adding dilution fluid to the fibrous material within said housing,

said dilution means directing the dilution fluid substantially tangentially to the first and second screen assemblies.

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209—306, 379; 210—415