United States Patent

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[54] **STRAINING APPARATUS**
6 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** **209/240,** 209/306, 209/379; 210/456
[51] **Int. Cl.** **B07b 1/00**
[50] **Field of Search** ..... 209/270, 273, 300, 303, 304—306, 379; 210/413—415, 456, 453; 209/240; 210/405

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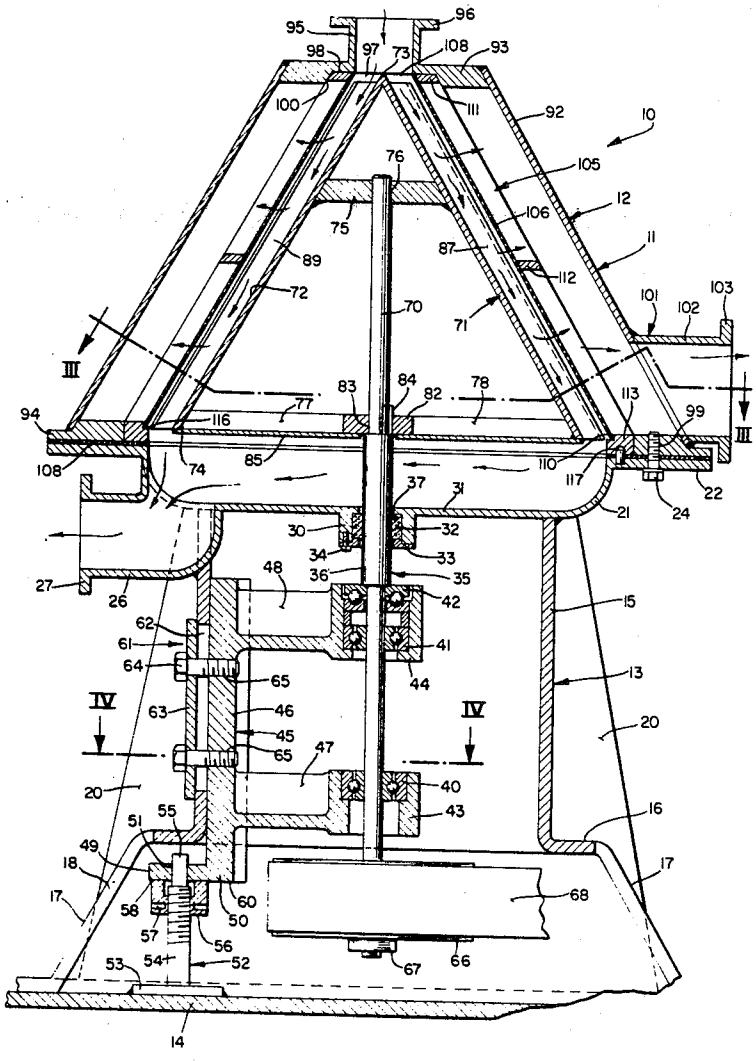
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ABSTRACT: A straining apparatus is provided, having a housing with a screen disposed therein, a rotatable member disposed within the screen, and pulsing foils attached to the rotatable member and extending outwardly toward the screen. An inlet is provided for a liquid suspension of fibrous material, for directing the suspension outwardly of the rotatable member, but inwardly of the screen, such that the pulsing pressure exerted by the foils attached to the rotatable member will force fibrous material of a particular size, to pass through predetermined holes in the screen, to yield accepted stock which is then carried off from the apparatus through a duct opening through the housing. Stock which is not of sufficient size to pass through the screen is collected at one end of the screen and is carried off as rejected stock, to be processed further, prior to undergoing another straining operation. A particularly novel type of screen and rotatable member are provided, for maximizing the efficiency of the apparatus, and for obtaining desirable flow variations of the suspension across the screen.

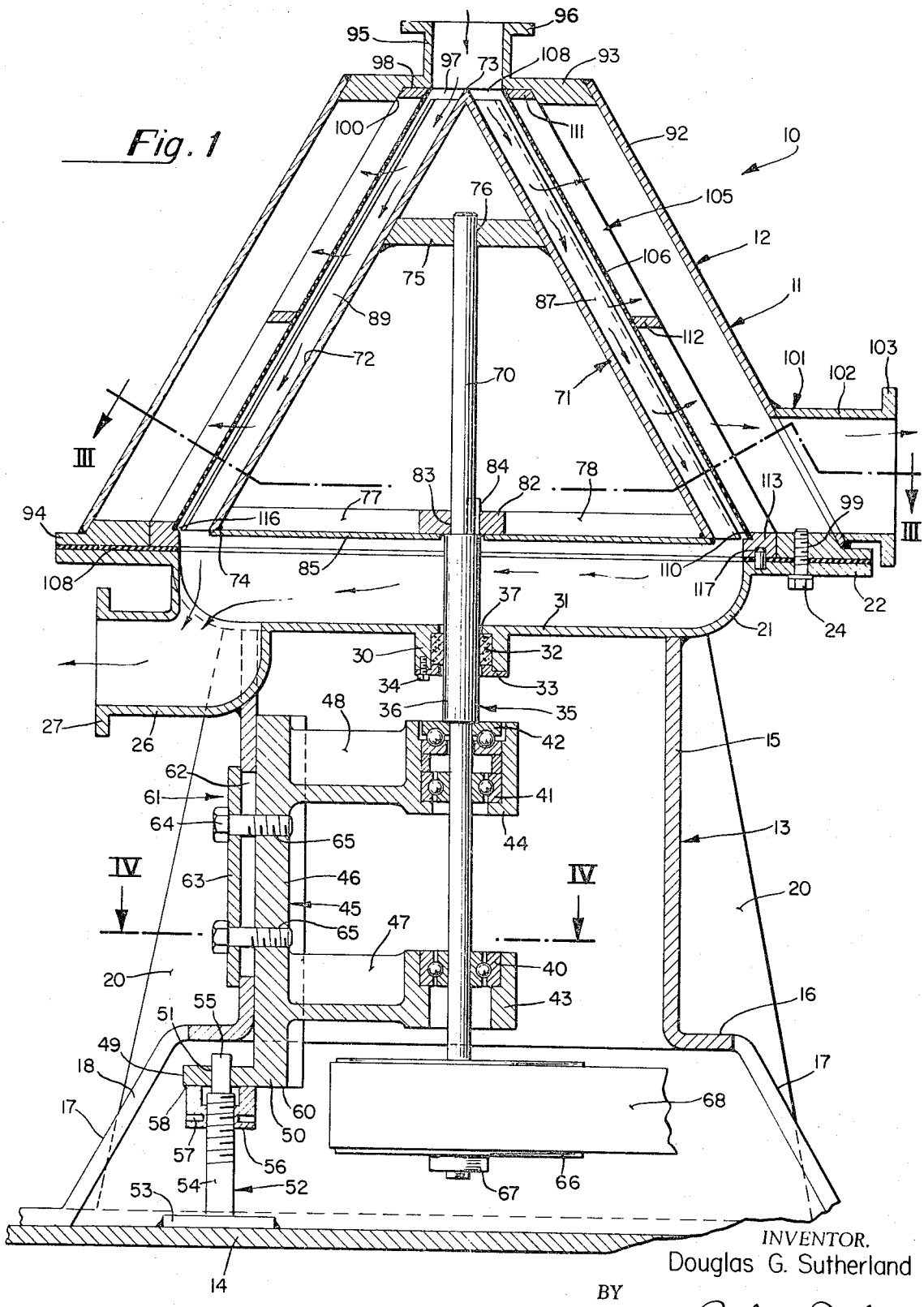


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Fig. 1



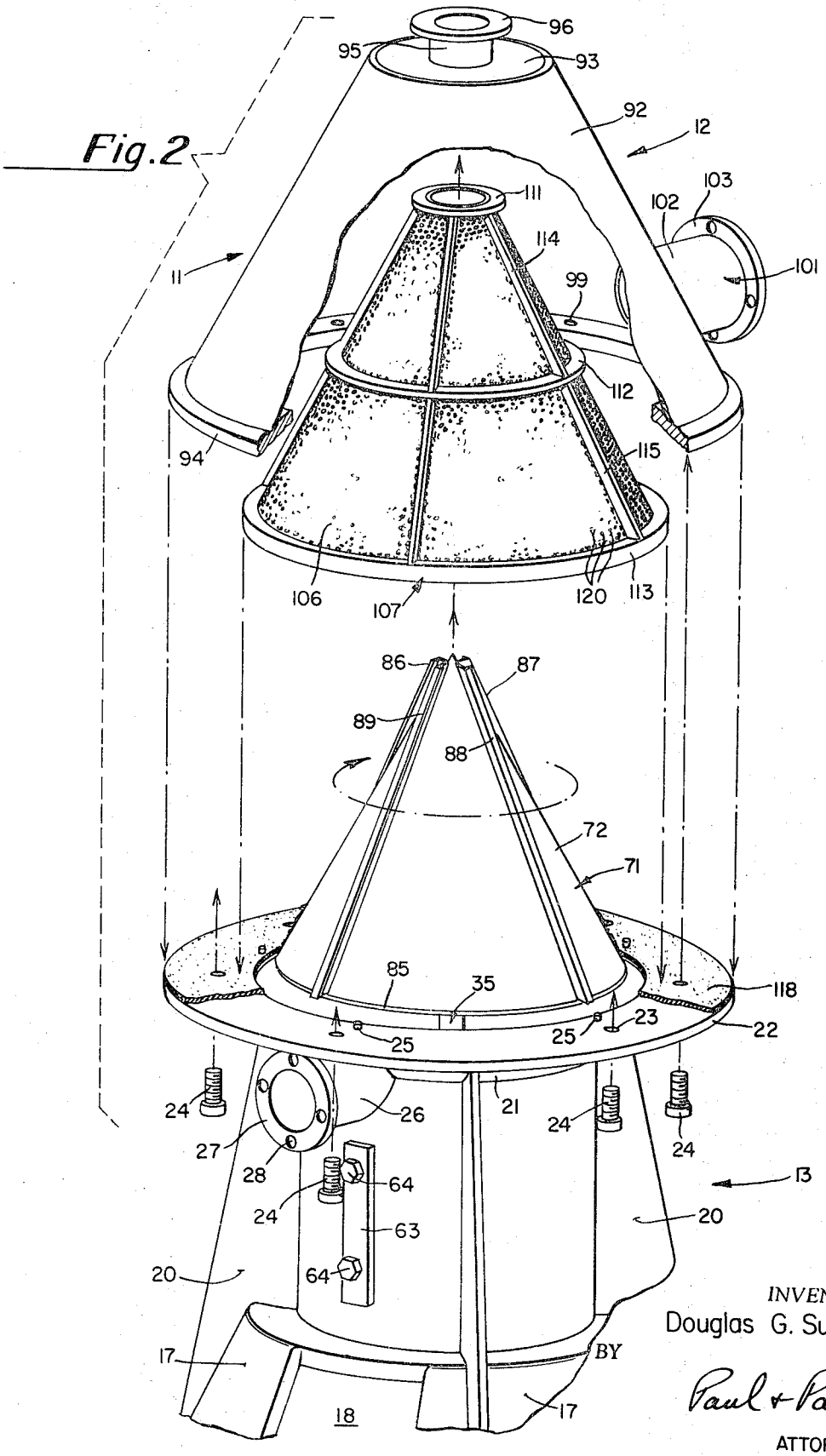
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Fig. 2

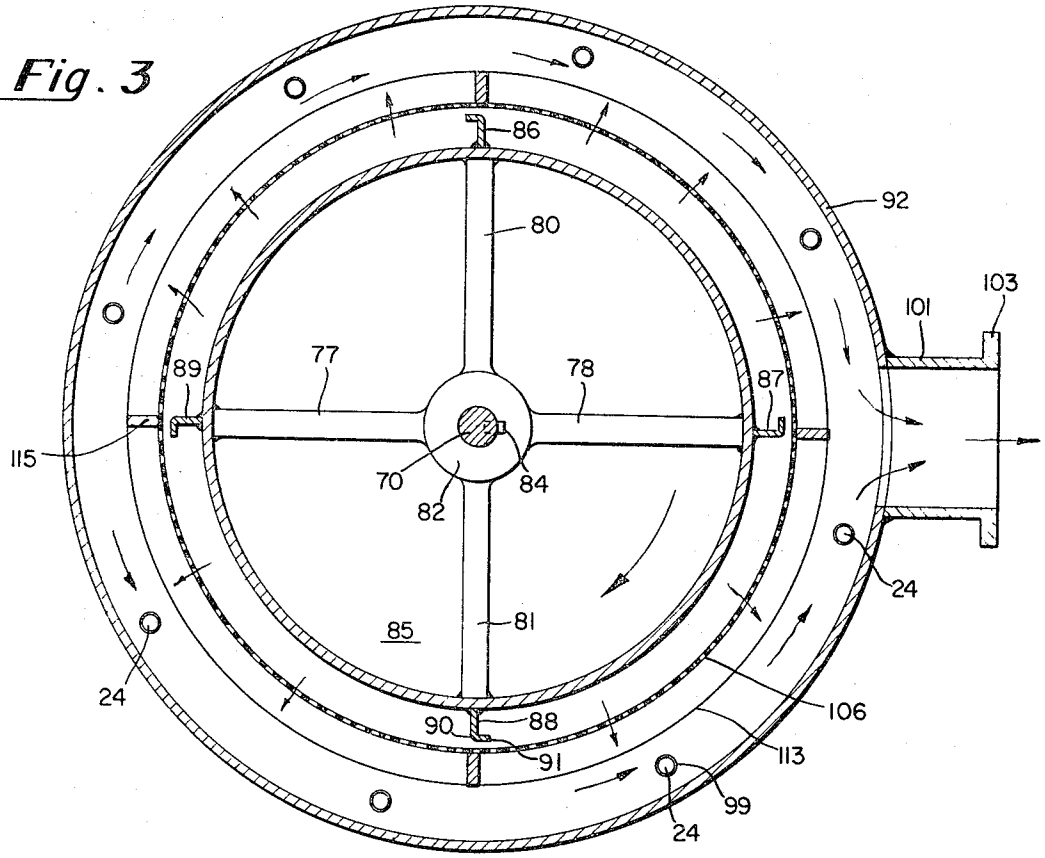


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Fig. 3



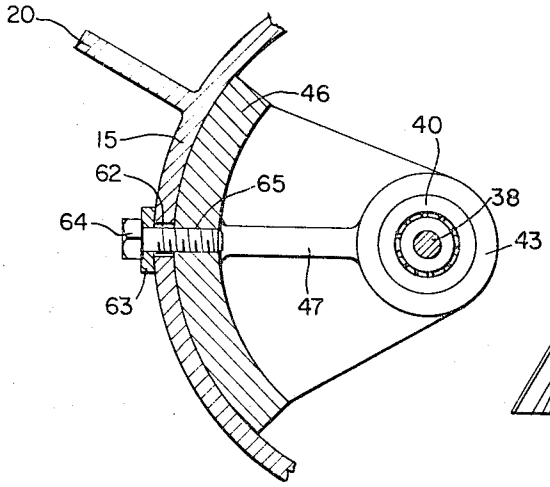


Fig. 4

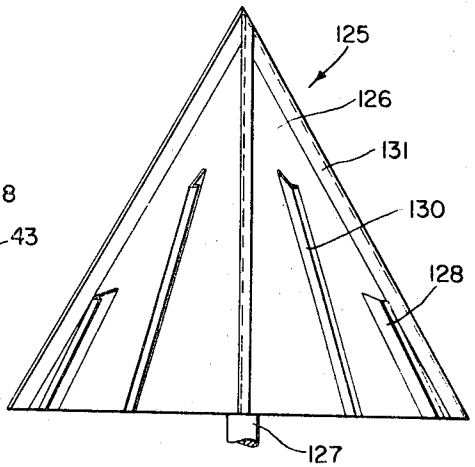


Fig. 5

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STRAINING APPARATUS

BACKGROUND OF THE INVENTION

Prior art types of straining apparatus generally use vertical screen baskets, such that the fibrous material in a liquid suspension enters the top of the baskets and flows downwardly. The accepted stock generally passes horizontally through the screen, and the rejects flow downwardly and are thus carried off from the bottom of the screen baskets. Prior art devices usually provide some means for preventing the screen perforations from plugging, generally in a form of foils which are rotated within the screen basket, to provide periodic pressure pulsations, often at a rate of 1,000 times per minute. Also, the foils of prior art devices may be slanted forward in a direction of rotation in order to provide a downward thrust of the rejected particles, in addition to the pulsation. The rejected particles or oversize materials are thus driven toward a reject port.

As the rejects gradually move downwardly, the percentage of rejects at the screen surface increases, providing increased opportunity for the oversize material to pass through the screen perforations and enter the accepted stock stream. Furthermore, accumulation of rejected material at the bottom of the vertical screen basket may interfere with the downward flow of the stock suspension through the screen basket. In these prior art devices, the flow through the screen is generally horizontal, with approximately 70 percent to 85 percent of the material being accepted and 15 percent to 30 percent being rejected on a weight basis. This substantially large rate of flow through the screen perforations in a horizontal direction is detrimental, in that it nullifys the effect of gravity which would otherwise facilitate the removal of rejected material away from a screen surface. Moreover, the heavy flow through the screen perforations often insures that a fine layer of oversize particles will adhere to the screen, near the bottom of the screen basket.

The prior art also utilizes generally conical-shaped or non-vertical screen baskets, but not in apparatus having a high percentage of accepted stock in the incoming stock suspension, all of which will eventually pass through the screen. Thus, those apparatuses which use conical-shaped screens do not direct all incoming stock across the screens, and therefore do not experience the problems of reject particle buildup adjacent to the lower end of the screens.

SUMMARY OF THE INVENTION

The present invention seeks to obviate the above and other undesirable features and weaknesses of the prior art, in providing conical-shaped screens, wherein all of the incoming stock is directed into closely adjacent relation to the screen as it is carried thereby, in order to yield a high flow of accepted stock through the screens, but wherein the disposition of the screen facilitates a gravity dropoff of rejected particles from the screen surface, assisted by the flow of the incoming stock suspension, in order to eliminate rejected particle buildup at the lower end of the screen surface.

Accordingly, it is a primary object of this invention to provide a straining apparatus for liquid suspensions, wherein means are associated with a screen for straining the stock suspension and facilitating the automatic removal of rejected stock therefrom, and wherein means are provided for directing all incoming stock suspension across and in closely adjacent relationship to the screen.

It is a further object of this invention to accomplish the above object, wherein the automatic removal of rejected stock from the screen is facilitated by gravity such that the rejected stock falls onto the upper surface of a rotating cone.

It is yet another object of this invention to accomplish the above objects, wherein the screen is a conical-shaped member having perforations therein of a preselected size, in order to permit the passage therethrough of fibrous stock particles of a desired size, and wherein the cone is disposed radially inwardly of the screen, and has a vertical axis, with pulsing means carried by the rotatable cone for creating a high pressure area at their forward tips when rotated, forcing accepted stock through the screen perforations, and for creating a draft at their rearward ends when rotated to facilitate removal of rejected stock from the screen's surface.

It is a further object of this invention to provide a straining apparatus for separating accepted stock from rejected stock of incoming suspensions of fibrous material in a liquid, wherein the incoming stock suspension is passed through a channel defined by a generally conical surface and a concentrically disposed generally conical screen, with means being provided for forcing accepted stock through screen perforations under pressure, and wherein the slopes of the conical surface and conical screen are selected for either increasing, decreasing, or maintaining uniform the velocity of downward flow of stock suspension as the flow progresses through the channel.

It is a further object of this invention to provide a novel straining device, utilizing a conical screen and a rotatable cone disposed therein, the cone having foils emanating therefrom toward the inner surface of the conical screen, wherein stock suspension is delivered between the cone and the screen and fibrous particles of a selected size are forced through the screen under pressure by means of rotating the cone and foils, and wherein means are provided for adjusting the gap between the outermost portions of the foils and the inner surface of the screen, by effecting a single adjustment.

It is another object of this invention to provide a novel stock straining device, utilizing a conical screen and a cone having a solid surface disposed for rotation inside the screen, with foils emanating from the cone surface toward the screen, for providing a pulsing effect and forcing accepted fibers through perforations in the screen upon rotation of the cone, wherein means are provided for regulating the pulsing action at various sections of the screen by varying the length and number of foils.

It is a further object of this invention to provide an apparatus as set forth in all of the objects above, wherein the apparatus is readily disassembled for replacement of a screen, or cone, or both.

Other objects and advantages of this invention will become apparent upon reference to the brief description of the FIGS., the detail description of the preferred embodiments, and the appended claims.

In the drawings:

FIG. 1 is a vertical sectional view taken generally along the vertical axis of the apparatus of this invention, wherein there is illustrated a relationship of most of the components of the apparatus of this invention in their assembled condition.

FIG. 2 is a top perspective view, partially exploded, of the apparatus of FIG. 1, wherein the manner of assembly of the apparatus is clearly illustrated.

FIG. 3 is a transverse sectional view through the upper housing portion of the apparatus of this invention taken generally along the line III–III of FIG. 1, wherein the channel defined between the screen and cone of this invention is clearly illustrated.

FIG. 4 is an enlarged fragmentary transverse sectional view of a portion of the cone adjustment mechanism of this invention, taken generally along the line IV–IV of FIG. 1, wherein there is particularly illustrated the adjustment locking feature of this invention.

FIG. 5 is a front elevational view of another embodiment of a cone of this invention, wherein a large number of foils of various lengths are provided, for achieving a special pulsing effect.

Referring now to the drawings in detail, reference is first made to FIG. 1, wherein there is illustrated the apparatus of this invention, generally designated by the numeral 10, including a housing 11 having an upper housing portion 12 and a lower housing portion 13.

The lower housing portion 13 is adapted to be disposed on a floor or baseplate 14 or the like, and includes a generally cylindrical wall portion 15, terminating in an out-turned

peripheral flange 16, having a plurality of leg extensions 17. A plurality of access openings 18 are provided between the legs 17, for a purpose later to be described. A plurality of reinforcing struts 20 are secured to the floor or baseplate 14, to the legs 17, to the cylindrical wall portion 15, and terminate at their upper end in an upwardly opening bowl portion 21.

The bowl portion 21 of the lower housing portion 13 is provided with a radial peripheral flange 22, for securing the upper housing portion 12 thereto. A plurality of clearance holes 23 are provided in the flange 22, to facilitate insertion of screws 24 or other suitable fastening members therethrough. Additionally, locating pins 25 are disposed in press-fit relation in the flange 22, extending upwardly therefrom, for being located in mating bores of the screening member later to be described. An outlet duct 26 is provided, in communication with the interior of the bowl portion 21, and terminates in an outwardly directed flange 27 having a plurality of mounting holes 28 therein. An annular ringlike portion 30 extends downwardly from the base 31 of the bowl portion 21, and has a packing gland 32 disposed therein, retained in place by a cap 33 secured to the ringlike portion 30 by suitable fasteners 34. A shaft 35 is carried, in vertical disposition within the lower housing portion 13, having an enlarged diameter portion 36 extending through the gland 32, and consequently through a hole 37 in the bottom 31 of the bowl portion 21.

The shaft 35 includes a lower reduced diameter portion 38 which is carried in suitable radial bearings 40 and 41, and a thrust bearing 42. The upper end of the thrust bearing 42 is engaged by the shoulder formed by the enlarged diameter portion 36 of the shaft 35, and provides a seating means therefor. The bearings 40, 41 and 42 are carried as illustrated in FIG. 1, in suitable mounting bosses 43 and 44 which are part of an adjustable member 45 carried inwardly of the cylindrical wall 15 of the lower housing portion 13 for vertical adjustment therein. The bosses 43 and 44 are connected to an arcuate wall portion 46 of the member 45 by means of connection members 47 and 48, integral therewith. The wall portion 50 has an out-turned lower end 49 which is provided with a vertical bore 51 therein.

An adjustment member 52, is provided, including a base portion 53 which is welded or otherwise secured to the baseplate or floor portion 14, and a threaded portion 54, having an unthreaded stud 55 at its upper end, rotatably received within the bore 51 of the projection 50. An annular collar 56 is threaded about the threaded portion 54 of the adjustment member 52, and has a plurality of blind holes 57 therein, for receiving a tool to enable rotation of the collar 56 about the threaded portion 54 of the adjustment member 52, and resulting in a consequent raising or lowering of the member 45, by engagement of an upper surface 58 of the collar 56 against a lowermost surface 60 of the projection 50.

A locking means 61 is provided, comprising a vertically disposed slotted hole 62 in the cylindrical wall portion 15 of the lower housing portion 13, with a plate 63 being provided, having screw fasteners 64 extending therethrough and suitably engaged in tapped holes 65 of the arcuate wall portion 46 of the member 45.

The lowermost end of the shaft portion 38 is provided with a pulley 66 keyed or otherwise secured to the shaft portion 38, and retained in a desired vertical position along the shaft portion 38 by means of an adjustable thrust collar 67 disposed at the lowermost end of the shaft portion 38. A pulley belt 68 is disposed around the pulley 66, which, when driven, provides rotation to the shaft 35 in the desired direction, as indicated by the arrow in FIG. 3.

The shaft 35 is provided with an upper portion 70 of reduced diameter, upon which is mounted a cone 71. The cone 71 comprises a surface member 72 which is completely continuous and preferably has a smooth outer surface. The cone 71 is disposed with its smaller diameter or apex 73 directed upward, and with its larger diameter or bottom portion 74 directed downward. A plate 75 is welded or otherwise secured inwardly of the cone 71, near an upper portion thereof, and is provided with a bore 76 therein for receiving the uppermost end of the reduced diameter shaft portion 70 of the shaft 35, and for providing lateral support for the cone 71. Driving means such as a key or the like (not shown) may be provided between the shaft portion 70 and the supporting plate 75, if desired.

Lower supporting means comprising four bars 77, 78, 80 and 81 are provided, welded or otherwise secured to the inner surface at the lowermost end 74 of the cone 71, these supporting bars 77, 78, 80 and 81 extending radially inwardly and terminating in a boss 82 having a bore 83 therein. The shaft portion 70 of the shaft 35 is received within the bore 83, and positively drives the cone 71 through a key 84, as is illustrated in FIG. 1. The boss 82 sits on a shoulder formed by the uppermost end of the enlarged diameter portion 37 of the shaft 35. A plate 85 is disposed over the enlarged end 74 of the cone 71 to preclude entry of rejected stock material inwardly of the cone 71.

A plurality of foils 86, 87, 88 and 89 which act as pulsing members are welded or otherwise secured to the outer surface 72 of the cone 71, and emanate radially outwardly therefrom.

The foils 86 through 89 may be of generally L-shaped configuration or of angle iron construction, and are so arranged on the cone 71 that the rounded portion at the bend becomes the leading edge, when the cone is rotated in the direction shown in FIG. 3, the leading edge 90 of each of the foils being in a high-pressure zone during rotation of the cone 71, and a trailing edge 91 of each of the foils being in reduced pressure zone during rotation of the cone in the direction shown. It is to be noted that any desired number of foils 86 through 89 may be provided, depending upon the desired number of pulsing actions, and that four such foils are illustrated for exemplary purposes only.

The upper housing portion 12 of the housing 11 includes a generally conical-shaped sidewall member 92, an upper plate 93, and a lower annular ring 94. The plate 93 and ring 94 may be welded or otherwise secured to the conical sidewall member 92, as desired. The annular ring 94 is provided with a plurality of tapped holes 99.

The upper plate 93 is provided with an inlet port 95 for receiving a suspension delivered to the apparatus 10, the port 95 being provided with a peripheral flange 96 to facilitate the attachment thereto of piping or other desired delivery means (not shown).

A circular recess 97 is provided on the under surface of the plate 93, concentric with the apex 73 and longitudinal axis (not shown) of the cone 71, the recess 97 being defined by a flat surface portion 98 and a sloped annular sidewall 100.

An outlet port 101 for accepted stock is provided, extending radially outwardly from the sidewall 92 of the upper housing portion 12, comprising a tubular portion 102 welded or otherwise secured to the sidewall 92, and a peripheral flange portion 105 adapted for connection to other piping (not shown). The outlet port 101 communicates with the interior of the upper housing 12.

A screen member 105 is provided, comprising an annular conical-shaped screen 106 and a plurality of rigidifying means 107. The screen 106 has a small diameter upper end 108 and a large diameter lower end 110, thereby having a frustoconical configuration. The inner diameter of upper end 108 of the screen 106 is substantially equal to the inner diameter of the inlet port 95, to facilitate entry of a suspension inwardly of the screen 106. The screen rigidifying means 107 comprises three annular rings 111, 112, 113 connected by a plurality of upper and lower longitudinally extending struts 114 and 115 respectively. The upper two annular rings 111, and 112 are generally of the same thickness, the lower ring 113 being of a greater thickness, substantially the same as the thickness of the annular plate 94 of the upper housing portion 12. The screen 106 may be tack welded or otherwise secured to the rigidifying means 107 at various places along the rings 111, 112 and 113, as well as along the struts 114 and 115. The ring 111, as well as the upper portion 108 of the screen 106 is received within the

recess 97 of the upper plate 93 of the upper housing portion 12, with the ring 111 being clamped against the upper surface 98 of the recess 97, and with the sloped sidewalls 100 of the recess 97 insuring concentric positioning of the screen member 105 relative to the plate 93.

The ring 113 is provided with an annular notch 116 on the upper inner corner thereof, to receive the lower end 110 of the screen 106 therein. The ring 113 is disposed concentrically radially inwardly but adjacent the ring 94 of the upper housing portion 12, and is provided with a plurality of blind bores 117 for receiving those portions of the locating pins 25 which protrude above the upper surface of the flange 22 of the lower housing portion 13.

The screen member 105 is thus maintained in the desired concentric disposition inwardly of the upper housing portion 12 by the ring 94.

The upper housing portion 12 is connected to the lower housing portion 13 by means of the screw fasteners 24 which are suitably engaged in the tapped holes 99 in the ring 94. A gasket 118 is disposed between the ring 94 and the flange 22 to preclude undesirable leakage of fluid therebetween.

The screen 106 is generally of stainless steel construction, and comprises a relatively thin sheet member having numerous holes 120 therein. The holes 120 may be of any size which facilitate the passage therethrough of accepted stock having fibers therein of a desirable length, but such holes 120 are generally from 0.040 inches to 0.125 inches in diameter. Should the holes be 0.040 inches in diameter, they may be spaced apart 0.100 between centers, for example.

OPERATION

A suspension of fibrous particles or the like in a liquid, such as water, is delivered to the inlet port 95 of the upper housing portion 12, and passes downwardly into the channel defined between the screen 106 and the outer surface 72 of the cone 71, in the direction of the arrows indicated. The cone 71 is rotatably driven from the shaft 35 which in turn is driven trough the pulley 66 and pulley belt arrangement 68, responsive to a motor or the like (not shown) in order to provide clockwise rotation of the cone 71 as illustrated in FIG. 3.

The rotation of the cone 71, and consequently of the foils 86 through 89, provides a pulsing action on the screen 106, in forming a high pressure area preceding the leading edge 90 of each of the foils, during their rotation. The pressure thus formed in the vicinity of the leading edge 90 of each of the foils 86 through 89 forces fibrous stock material which is suspended in water through the holes 120 of the screen 106, should the fibrous material be sufficiently small to pass through the holes 120. That fibrous material which is not of a sufficiently small size to pass through the holes 120 of the screen 106 remains on the inner surface of the screen 106, and is drawn or "sucked" off the inner surface of the screen 106 by the reduced pressure zones which follow the trailing edges 91 of each of the foils 86 through 89. The conical configuration and disposition of the screen 106 also aids the removal of large fibrous particles from the screen 106 by facilitating a gravity drop or fall of particles away from the screen 106. Also, the incoming flow of the suspension is directed through a relatively narrow channel between the surface 72 of the cone 71 and the inner surface of the screen 106, such that the incoming flow itself enables a washing away of large fibrous particles from the screen 106. Thus, it is evident that the slope of the screen 106 prevents fibrous material, once it has been withdrawn from the screen 106 by the low-pressure zones following the trailing edges 91 of the foils 86 through 89, from once again adhering to the screen 106, these larger fibrous particles falling to the outer surface 72 of the cone 71. Such large particles are washed along the outer surface 72 of the cone 71 until they pass the lower end 74 and drop into the bowl-shaped portion 21 of the lower housing portion 13. Thus, while the pulsing action of the foils 86 through 89 on the screen 106 prevents a mat of fibrous material from forming on the screen, the particular relationship of the cone 71 and the screen 106 enables the removal of those large fibrous particles, which would otherwise tend to form a mat, from the channel between the cone 71 and the screen 106. Also, while there may be a tendency for enlarged particles to accumulate somewhat in the lower regions of the channel between the cone 71 and the screen 106, the present invention overcomes defects in vertical screen baskets in providing for the gravity descent of large particles toward the cone surface 72, thereby minimizing opportunities for undesirable material to pass through the screen 106.

The particular configuration of the screen 106 and cone 71 of this invention provided increased volume at lower portions of the channel between the screen 106 and cone 71, than at the upper portions of this channel, thereby offsetting the tendency toward greater density of undesirably large fibrous particles in lower regions of the channel, due to the progressively large volume of the channel with increased depth of travel through the channel. The particles passing through the screen 106 have a flow component which is actually an upflow or reversely directed, due to the particular screening construction. The accepted stock which has passed through the screen 106 then passes around the inner surface of the upper housing portion 92 and outwardly through the accepted stock outlet port 101, as illustrated by the arrows indicated in FIG. 3. Rejected stock material which falls off the outer surface 72 of the cone 71 and into the bowl-shaped portion 21 passes into the outlet port 26, for later refining, or the like.

It is to be noted that the close proximity of the cone surface 72 to the screen 106 facilitates the direction of all incoming stock suspension across and in close adjacent relation to the screen 106 in order that a large percentage of acceptable size fibers will have an opportunity to pass through the holes 122 of the screen 106, and that only a minimum percentage of particles of the size preferred for accepted stock will pass through the channel between the cone 71 and the screen 106 to be lost, without being drawn through the cone 122 of the screen 106. Thus, substantially a fully effective screening operation is provided by this apparatus.

It will be noted that differences in fiber characteristics, screen plate perforations and consistency of the fibrous material being processed require different settings of the gap between the foils 86 through 89 and the inner surface of the screen 106. Such different settings are readily effected by insertion of a tool through one of the access openings 18, to engage one of the tool-receiving holes 57 of the collar 56, for rotating the collar 56 on the threaded member 54 and consequently raising or lowering the adjustment member 45 and shaft 35. Once the shaft 35 and its attached cone 71 are vertically positioned with the desired gap between the foils 86 through 89 and the inner surface of the screen 106, the adjustment member 56 may be clamped in position by tightening the screw fastener 64.

In the embodiment illustrated in the drawings, the conical surface 72 of the cone 71 is shown to have the same slope as the inner surface of the screen 106, particularly as viewed in section in FIG. 1. With such parallel slopes as illustrated, the resultant channel configuration will generally provide progressively decreasing velocity of downward flow of the stock suspension between the screen and the cone surface. This is due to the progressively increasing cross-sectional area of the channel formed between the cone surface 72 and the screen 106, with increased downward travel of the stock suspension through that channel. The cone 71 may be constructed such that its surface 72 is of greater slope than that of the screen 106, or the converse. For example, if the included angle between the surface 72 and the plate 85 of the cone 71 were greater than that illustrated in FIG. 1, with the slope of the screen 106 remaining constant, the rate of flow of the suspension would not decrease progressively as fast as it would with the parallel slopes illustrated, and in fact, at some determinable angle between the surface 72 and the plate 85 there would be uniform velocity of downward flow of the stock suspension

through the channel. At a very large angle between the conical surface **72** and the plate **85** relative to the slope of the screen **106**, the flow of stock suspension through the channel could progressively increase. The converse is also true, such that if the angle between the conical surface **72** and the base **85** was decreased, with the slope of the screen **106** remaining the same as illustrated in FIG. **1**, such that the cross-sectional area at the top of the channel was larger than that illustrated, with the cross-sectional area at the bottom of the channel remaining the same, the rate of flow of the stock suspension would be even more greatly progressively decreased during its traversal of the channel. Thus, the particular slopes selected for the cone **71** can control the difference in cross-sectional area between the top and the bottom of the channel and consequently control the flow between the top and the bottom of the channel as to whether the flow would be increased, decreased, or remain constant during its traversal of the channel. Also, it will be noted, that the same effect could be achieved by varying the slope of the screen **106** and maintaining the slope of the cone **71** constant, but the apparatus of this invention has been particularly designed for ready removal of the upper housing portion **12** from the lower housing portion **13**, and ready replacement of the cone **71** with one having a different slope, if desired. Also, this split formation of the housing **11** facilitates the removal of the upper housing portion **12** from the lower housing portion **13**, for cleaning or replacement of the screen **106**.

With particular reference to FIG. **5**, there is illustrated an alternative embodiment **125** for the cone of this invention, the cone **125** having a conical surface **126** and being carried by a shaft **127**, similar to the cone **71** of FIG. **1**, but having a plurality of foils **128**, **130** and **131** of varying lengths. By placing foils of varying lengths in a manner as illustrated, it will be apparent that a greater pulsing effect will be achieved along lower portions of a screen with which the cone **125** is used, due to the greater number of foils which will traverse a given screen portion at a lower end of the screen, than at an upper end. Normally, the flow rate of fluid through the channel between a screen and cone is less at the lower end of the screen, and consequently there may be a tendency for large fibrous particles to concentrate in the lower portion of the channel. The increased pulsing provided by the embodiment illustrated in FIG. **5** would thus insure that the pulsing rate may be increased at a lower end of the screen for directing accepted size particles through the screen holes at maximum screen efficiency. It will be noted that various configurations and numbers of foils, as well as dispositions thereof may be utilized, as desired, for varying the pulsing rate at different points along the screen as desired, depending upon the particular application for the apparatus of this invention.

The term "slope" utilized herein refers to the angle formed between a sidewall portion of either a cone or screen and a horizontal plane, as the cone or screen is viewed in longitudinal section through its geometric axis, as illustrated in FIG. **1**. The term "stock suspension" generally refers to fibrous suspensions in water, but can apply to any suspension or mixture of solid matter, fibrous or nonfibrous in a liquid. Suggested dimensions for the screens of this invention has been given above, as well as dimensions for spacing of holes **122** thereof. However, it should be noted that it is not desirable to have the holes **122** closer together than the maximum fiber length being strained, in that, should the holes be too close together, both ends of a given fiber could pass through different holes in a screen, and become entangled on an outer surface of the screen. It is also often desirable to construct the holes **122** to be undercut, or have larger diameters on the outer surface of the screen **106** than on the inner surface of the screen, in order to prevent clogging of the holes **122**.

The apparatus may be operated with the cone driven at any suitable speed which provides the desired pulsing rate, but in many instances speeds of rotation of 350 to 400 r.p.m.'s will be satisfactory.

The apparatus **10** of this invention is adapted for insertion anyplace in a stock line where it may be desirable to strain or screen the particles or fibrous suspensions.

While only preferred embodiments of the invention have been described herein, it is to be noted that various modifications may be made in the details of construction of the apparatus of this invention without departing from the spirit and scope of the invention as claimed.

I claim:

1. A straining apparatus for use in straining fibrous particles from suspensions of fibers in liquid, comprising a housing means, inlet means at an upper end thereof for facilitating entry of an incoming stock suspension to said housing means, first outlet means from said housing means for removal of accepted stock, second outlet means for said housing means for removal of rejected stock at a lower end of said housing means and means for separating the incoming stock suspension into accepted stock and rejected stock, said separating means including (1) frustoconically configured screen means for straining the stock suspension and facilitating automatic removal of rejected stock therefrom, (2) rotatable channel-forming means comprising a frustoconically configured surface member disposed within said screen and having a plurality of radial members on an outer surface thereof extending toward said screen means, said radial members comprising means for pulsing liquid suspension through the screen by providing pressure waves having forward elevated pressure zones forward of said radial members and rearward suction zones behind said radial members during rotation of said channel-forming means, wherein said screen means for facilitating automatic removal of rejected stock therefrom comprises means facilitating gravity fall of the rejected stock away from substantially all portions of said screen means, with said screen means having a substantially vertically disposed longitudinal axis, and with said screen means and surface member being mounted with their smaller ends uppermost, with said channel-forming means comprising means for directing all incoming stock suspensions across and in close adjacent relationship to said screen means, wherein said screen means comprises a substantially conical-shaped screen, wherein said surface member has a slope selected for progressively decreasing velocity of downward flow of stock suspension between said screen and said surface member.

2. The apparatus as defined in claim **1**, wherein said surface member slope is substantially equal to the slope of said screen.

3. A straining apparatus for use in straining fibrous particles from suspensions of fibers in liquid, comprising a housing means, inlet means at an upper end thereof for facilitating entry of an incoming stock suspension of said housing means, first outlet means from said housing means for removal of accepted stock, second outlet means for said housing means for removal of rejected stock at a lower end of said housing means and means for separating the incoming stock suspension into accepted stock and rejected stock, said separating means including, (1) frustoconically configured screen means for straining the stock suspension and facilitating automatic removal of rejected stock therefrom, (2) rotatable channel-forming means comprising a frustoconically configured surface member disposed within said screen and having a plurality of radial members on an outer surface thereof extending toward said screen means, said radial members comprising means for pulsing liquid suspension through the screen by providing pressure waves having forward elevated pressure zones forward of said radial members and rearward suction zones behind said radial members during rotation of said channel-forming means, wherein said screen means for facilitating automatic removal of rejected stock therefrom comprises means facilitating gravity fall of the rejected stock away from substantially all portions of said screen means, with said screen means having a substantially vertically disposed longitudinal axis, and with said screen means and surface member being mounted with their smaller ends uppermost, with said channel forming means comprising means for direct-

ing all incoming stock suspensions across and in close adjacent relationship to said screen means, wherein said screen means comprises a substantially conical-shaped screen, wherein said surface member and screen have slopes selected for progressively increasing the velocity of downward flow of stock suspension between said screen and said surface member.

4. A straining apparatus for use in straining fibrous particles from suspensions of fibers in liquid, comprising a housing means, inlet means at an upper end thereof for facilitating entry of an incoming stock suspension to said housing means, first outlet means from said housing means for removal of accepted stock, second outlet means for said housing means for removal of rejected stock at a lower end of said housing means and means for separating the incoming stock suspension into accepted stock and rejected stock, said separating means including, (1) frustoconically configured screen means for straining the stock suspension and facilitating automatic removal of rejected stock therefrom, (2) rotatable channel-forming means comprising a frustoconically configured surface member disposed within said screen and having a plurality of radial members on an outer surface thereof extending toward said screen means, said radial members comprising means for pulsing liquid suspension through the screen by providing pressure waves having forward elevated pressure zones forward of said radial members and rearward suction zones behind said radial members during rotation of said channel-forming means, wherein said screen means for facilitating automatic removal of rejected stock therefrom comprises means facilitating gravity fall of the rejected stock away from substantially all portions of said screen means, with said screen means having a substantially vertically disposed longitudinal axis, and with said screen means and surface member being mounted with their smaller ends uppermost, with said channel-forming means comprising means for directing all incoming stock suspensions across and in close adjacent relationship to said screen means, wherein said pulsing means comprise a plurality of foils, wherein each foil traverses substantially the entire outer surface of said surface member, between opposite ends thereof, wherein said pulsing members are arranged to provide means for effecting a plurality of different pulses per conical member revolution at various corresponding distances from one end of the screen along the surface thereof.

5. The apparatus as defined in claim 4, wherein said latter means comprise foils of varying lengths

6. A straining apparatus for use in straining fibrous particles from suspensions of fibers in liquid, comprising a housing means, inlet means at an upper end thereof for facilitating entry of an incoming stock suspension to said housing means, first outlet means from said housing means for removal of accepted stock, second outlet means for said housing means for removal of rejected stock at a lower end of said housing means and means for separating the incoming stock suspension into accepted stock and rejected stock, said separating means including, (1) frustoconically configured screen means for straining the stock suspension and facilitating automatic removal of rejected stock therefrom, (2) rotatable channel-forming means comprising a frustoconically configured surface member disposed within said screen and having a plurality of radial members on an outer surface thereof extending toward said screen means, said radial members comprising means for pulsing liquid suspension through the screen by providing pressure waves having forward elevated pressure zones forward of said radial members and rearward suction zones behind said radial members during rotation of said channel-forming means, wherein said screen means for facilitating automatic removal of rejected stock therefrom comprises means facilitating gravity fall of the rejected stock away from substantially all portions of said screen means, with said screen means having a substantially vertically disposed longitudinal axis, and said said screen means and surface member being mounted with their smaller ends uppermost, with said channel-forming means comprising means for directing all incoming stock suspensions across and in close adjacent relationship to said screen means, wherein said housing means includes an upper portion and a lower portion and said screen includes rigidifying members; said housing upper portion being telescopically engageable with said screen for clamping said screen between upper and lower housing portions; said conical-shaped surface member being removably connected to a vertically disposed shaft; said shaft being bearing-mounted within said lower portion of said housing