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APPARATUS FOR THICKENING LIQUID SLURRY STOCK

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2 Sheets-Sheet 1

Fig-1

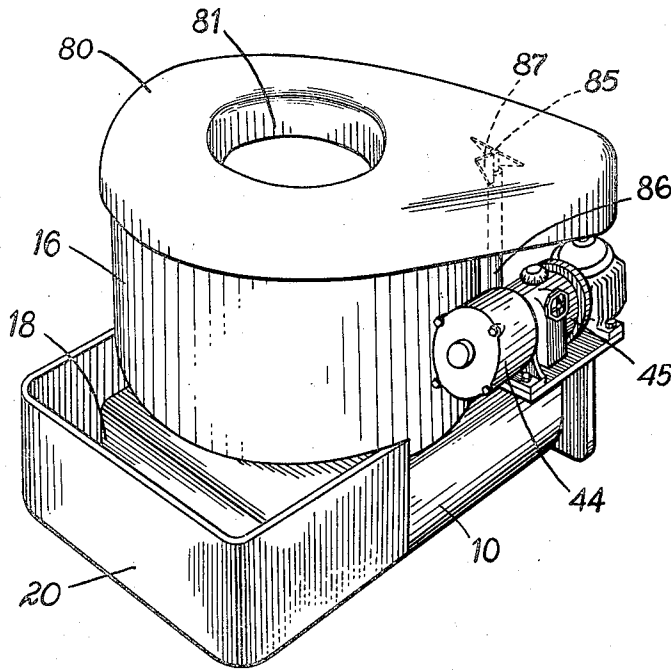
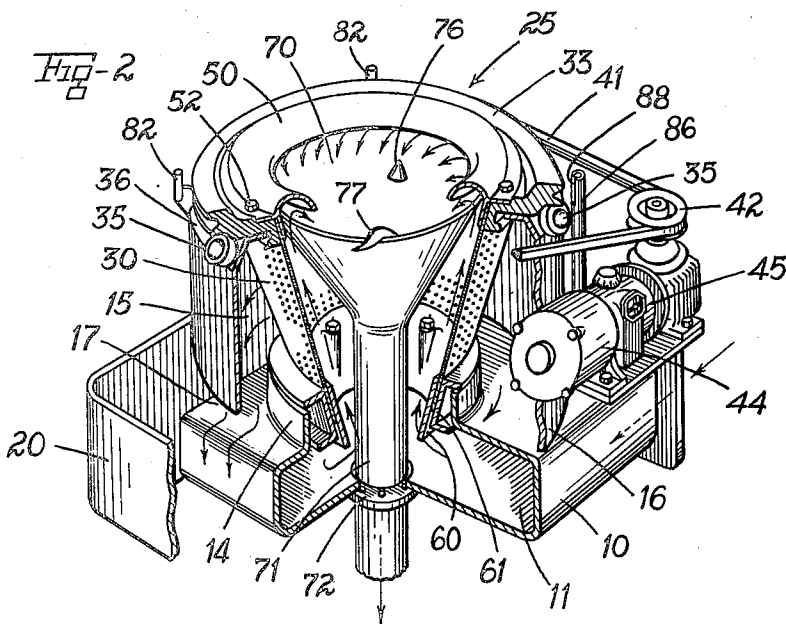


Fig-2



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# UNITED STATES PATENT OFFICE

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## APPARATUS FOR THICKENING LIQUID SLURRY STOCK

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This invention relates to apparatus for the removal of water or other liquids from liquid slurry stock such as paper making stock, industrial wastes and the like.

One of the principal objects of the invention is to provide centrifugal apparatus for removing liquid from stock which is of simple, lightweight and compact construction, which continuously unloads the thickened stock from which the liquid has been removed, and which has high operating capacity with relatively low power requirements for economical operation.

It is also an object of the invention to provide centrifugal apparatus for removing liquid from liquid slurry stock wherein the percentage of liquid removed from the stock, and hence the consistency of the thickened stock, may be readily predetermined and controlled by simple regulation of the speed of rotation of the driven unit therein.

Another object is to provide such centrifugal liquid-removing apparatus wherein a rotating frusto-conical perforate screen member is arranged to receive stock for thickening at the smaller end thereof for travel upwardly therein and to discharge the liquid therefrom outwardly through the perforations therein, and wherein the thickened material is discharged inwardly from the upper end of the screen member into a stationary funnel member for gravity flow from the apparatus.

An additional object is to provide such apparatus wherein the rotating screen member includes an inwardly turned discharge lip overhanging the discharge funnel to provide a trough for temporarily retaining the thickened stock and temporarily retarding the discharge thereof in accordance with the speed of rotation of the screen member to control the final consistency of the resulting thickened stock.

A further object is to provide such centrifugal apparatus which has relatively few moving parts and bearing points for easy operation with minimum wear, which is effectively self-cleaning and which also is constructed for quick disassembly to facilitate maintenance thereof.

Other objects and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

In the drawings—

Fig. 1 is a perspective view showing centrifugal liquid-removing apparatus in accordance with the invention;

Fig. 2 is a perspective view of the apparatus

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with the cover removed and a portion at the front broken away to show the internal construction and arrangement;

Fig. 3 is a vertical section through the apparatus of Fig. 1;

Fig. 4 is a detail view in perspective showing the member which forms the lower end of the rotating screen unit of the apparatus;

Fig. 5 is an exploded fragmentary view in perspective showing the lower end of the discharge funnel and the supporting collar therefor;

Fig. 6 is an enlarged sectional view showing a fragment of the perforate screen member;

Fig. 7 is a fragmentary plan view of the top of the discharge funnel showing one of the plows for aiding discharge of thickened stock from the screen into the funnel; and

Fig. 8 is a diagrammatic view in vertical section illustrating the operation of the apparatus.

The present invention has particular relation to apparatus for thickening or condensing liquid slurry stock by mechanical removal of water or other liquid therefrom, there being many occasions for such liquid-removing operations in many branches of industry. As one example, great quantities of water are used in the paper industry as a vehicle for transporting the fibers used in paper manufacture from one stage of the paper making process to another, and some of these process steps commonly require dilution to consistencies as low as 0.5% followed by other process steps requiring substantially higher consistencies, for example from 4 to 10%. Thus in a mill operating at a production capacity of 100 tons of paper per 24 hours, the flow of stock at 0.5% consistency would be at a rate of 3300 gallons per minute as compared with 425 gallons per minute at 4%. It will be readily apparent that in order to fulfill these operating conditions, enormous quantities of water must be removed quickly and economically from the stock and without removing any substantial amount of the usable fiber with the water, this water ordinarily being returned to the system at another point, for example for initial dilution of the stock.

Another field in which quick and effective removal of large quantities of liquid from liquid slurry stocks is desirable is in the treatment of industrial wastes from mills and factories to prevent stream pollution. The waste water from many types of mills includes suspended solids which it is desirable to prevent from reaching the streams into which these mills discharge, either because they tend to pollute the streams or because they are of substantial value if they can be

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recovered economically from the waste water. For example, packing houses and other plants handling meat and meat products, tanneries, mills handling metal products, and many other types of industries have appreciable percentages of solids in their waste water which should be removed before the water is finally discharged to promote economical operation and adequate prevention of stream pollution.

The present invention provides a simple and compact centrifugal apparatus for quickly and easily thickening liquid slurry stocks by separation of water therefrom, and this apparatus is well suited for use in thickening paper stock as well as for other liquid-removing operations. Referring to the drawings, which illustrate a preferred embodiment of the present invention, the lower part 10 of the casing forms an inlet chamber 11 for the stock to be thickened, which enters through an inlet passage 12. The upper wall of casing member 10 is provided with an opening 13 from which a cylindrical collar 14 extends upwardly into a chamber 15 formed by an annular upper part 16 of the casing mounted on the lower casing member 10. The casing member 16 is relieved at the front of the machine to form an outlet 17 from chamber 15 into a trough 18 formed between the front wall 20 of the casing and the member 10, gravity drainage being provided from trough 18 to a suitable pipe or other receptacle as indicated by arrow 22.

A generally frusto-conical screen unit 25 is mounted for rotation within the outer chamber 15 with the smaller end thereof lowermost and extending through the opening 13 into the inlet chamber 11 to receive therefrom the stock to be thickened. The screen unit 25 includes a frusto-conical main section 30 formed of perforate material having perforations of suitable size to prevent the passage of the suspended solids in a given stock to be thickened, and for use with paper making stock, the screen section 30 is preferably formed of a perforate rubber sheet material sold under the trade name "Multipore" rubber. This material is obtainable commercially in sheets of sufficient thickness and rigidity to hold a desired shape, and it has multiple minute perforations extending therethrough substantially perpendicularly to the surfaces of the sheet. It is understood to be produced by successively flowing a film of latex on to a supporting layer of cloth and then subjecting the cloth to a blast of air from below to blow out holes in the film through the spaces between adjacent threads in the cloth, these steps being repeated until a sheet of desired thickness is formed. The supporting cloth is removed from the finished sheet to leave a pattern of holes therein corresponding directly to the pattern of the mesh in the cloth, and such sheets are available commercially in different grades having respectively 1100, 3200 and 6400 perforations per square inch, the perforations ranging from 0.004 to 0.014 inch in diameter.

This perforate rubber sheet has several advantageous features when used with paper making stock. Its inherent slipperiness when wet facilitates sliding travel of thickened stock along its surface, and this effect is further aided by the smoothness of its surface as compared, for example, with the surface of wire mesh or of sheet metal in which holes have been punched. Moreover, since the holes in the sheet are of such exceedingly small dimensions, there is minimum tendency for useful paper fibers to be trapped therein or to pass therethrough. In addition,

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since the holes are of substantially uniform and approximately cylindrical configuration when the sheet is flat, they assume a generally frusto-conical shape when the sheet is formed into a cylinder or cone, as shown at 31 in Fig. 6, and since the larger end of each of these holes is at the outer surface of the cone, any fiber or other particle sufficiently small to enter the smaller, inner end of one of these holes will readily pass therethrough without clogging.

The perforate section 30 of the screen unit 25 is suspended from a supporting ring 33, which is mounted for rotation with respect to the upper casing member 16 by a plurality of bearing units 35 secured to the inwardly tapered upper end portion 36 of casing part 16, there being three of these bearing units disposed around the circumference of the casing part 36 at substantially 120° from each other. For minimum vibration and noise in operation, each of the bearing units 35 may advantageously comprise a wheel having a tapered rubber tire 37 and journaled in a suitable bearing such as a ball or roller bearing secured to the casing portion 36, and the supporting ring 33 is formed with a tapered surface portion 38 arranged to ride on tires 37. The supporting ring 33 also includes a V-belt sheave portion 40 which receives a V-belt 41 driven by pulley 42, which is in turn driven by motor 44 through a variable speed transmission unit 45.

The upper end of the screen section 30 is clamped between the inner surface of supporting ring 33 and a downwardly extending frusto-conical portion 49 of a curved lip member 50, which includes an outwardly projecting flange portion 51 bolted to ring 33 at 52. The lip member 50 extends inwardly from the upper periphery of the screen and is curved in such manner as to form an inverted trough 55 surrounding the upper end of the screen. The lower end of screen section 30 is similarly clamped between a pair of inner and outer frusto-conical members 60 and 61 which extend into the collar 14 and opening 13 from inlet chamber 11. The part 60 is provided with clamp bosses 62 (Fig. 4) to receive the right angled clamp bolts 63 which extend outwardly below the part 61, and the part 61 is provided with upper and lower flanges 65 and 66 which extend outwardly therefrom to serve as flinger rings or deflectors for preventing the stock from traveling up the outer surface of the screen unit from chamber 11.

A stationary cone or funnel member 70 is mounted within the screen unit 25 to receive the thickened stock therefrom. It includes a discharge pipe 71 which extends at its lower end through the bottom wall of the casing member 10 and is received within a supporting socket 72 bolted to casing member 10. As shown in Fig. 5, the lower end of pipe 71 is turned to a slight taper and is provided with a plurality of welded keys 73 for engagement in receiving slots 74 in the tapered inner surface 75 of socket member 72, thus supporting the funnel 70 in upright position and preventing rotation thereof with respect to the casing. To facilitate disassembly of the apparatus, the inner surface of funnel member 70 is shown as provided with a pair of orange peel sections 76 arranged with their pointed ends uppermost to serve as lift lugs to receive lifting hooks for hoisting the funnel member out of the machine when desired. A plurality of spiral plows 77 may be secured along the upper rim of funnel member 70 to facilitate discharge of the thickened stock into the funnel member during

operation of the device, the plows 77 being arranged with their outer ends pointed opposite to the direction of rotation of the screen unit 25.

In order to conceal the working parts of the apparatus and give a finished appearance thereto, there is provided a top cover 80 of generally pear-shaped configuration having a center aperture 81 to provide for visual observation of the interior of the apparatus, and this cover is readily removable when desired. A plurality of supporting pins 82 are secured to the casing part 16 by means of bracket members 83, and these pins are received in socket members 84 welded within the downwardly extending flange portion of the cover. The cover 80 is supported for swinging movement to a position exposing the screen by means of a rod 85 welded or otherwise secured to the under surface thereof and received within a tube 86 extending upwardly from the upper surface of casing part 16. The rod 85 is sufficient length to have a portion thereof remain within tube 86 when the cover 80 has been lifted sufficiently to effect disengagement of the pins 82 and sockets 84. In order to guide the cover into proper position for reengagement of these pins and sockets, a fin or key 87 is secured to the upper end of rod 85 and is arranged to be received in a slot 88 in the upper end of tube 86 when cover 80 is in such position that the pins 82 and sockets 84 are in proper relative alignment.

The action of this apparatus in operation is illustrated diagrammatically in Fig. 8. The stock to be thickened is supplied to the inlet passage 12 at a controlled rate sufficient to maintain the level thereof in chamber 11 above the lower end of the screen unit but below the upper end of collar 14, in order to prevent the stock from short circuiting the screen and passing directly to the outlet chamber 15 and discharge trough 18. As the frusto-conical screen rotates, frictional contact between its inner surface and the stock will cause the stock to travel up along the inner surface of the screen, due to the centrifugal force which is thus generated, and since the lower end portion of the screen unit formed by the conical member 60 is imperforate, the stock will accelerate in its upward travel until it reaches the perforate screen section 30. At this point, free discharge of water will begin, the water being discharged outwardly through the perforations 31 into the outlet chamber 15, whence it flows to the discharge trough 18.

The stock accordingly begins to thicken as soon as it reaches the perforate screen section 30, and the thickened material continues to advance up the inner surface of the screen following a more or less spiral path, while the lower end of the spinning screen continues to pick up fresh stock. As this action continues, the effective centrifugal force will increase as the stock moves further away from the axis of the screen, and also the fibers will be spread over a continually increasing area as they approach the upper end of the perforate screen section. As a result, discharge of the residual free water is facilitated, since the fibers are drawn increasingly apart and form a mat of constantly decreasing thickness which presents less resistance to the passage of the water therethrough than would be the case if the same fiber content were spread over a lesser area.

When the thickened stock reaches the upper end of the perforate screen section 30, it continues to travel upwardly along the flange 49 and into the trough 55, the lower end of flange

49 being beveled at 90 to facilitate this action. Since further upward travel of the stock is then prevented by the overhanging portion of lip 50, the stock collecting in trough 55 is caused to level off to form a layer having a substantially cylindrical inner surface as indicated at 95 in Fig. 8. With the stationary funnel member 70 arranged as shown with its upper rim extending outwardly and upwardly into the trough 55, the stock will accumulate in the trough until a balance column is forced inwardly above the rim of the funnel, and this stock is free to fall by gravity downwardly into the funnel and its discharge pipe 71. The plows 77 mounted as shown along the upper rim of the funnel facilitate this discharge by deflecting the accumulated stock inwardly over the rim of the funnel.

It will accordingly be seen that this apparatus is capable of continuous operation to reduce the water content of the stock supplied to its inlet passage 12, with the water being continuously removed by way of trough 18 and the thickened stock similarly continuously discharged inwardly and downwardly through the funnel 70 and pipe 71. In addition, the percentage of water removed, and hence the consistency of the thickened stock as discharged from pipe 71, may be readily controlled to a predetermined range by simple regulation of the speed of rotation of the screen unit 25. This result is due to two main factors. In the first place, increase in the speed of rotation of the screen will produce a corresponding increase in the centrifugal force effective on the stock as it travels up the inner surface of the perforate screen section. In addition, the centrifugal force effective on the stock accumulating in trough 55 will similarly increase, thus retarding the inward discharge of the thickened stock to funnel 70 and causing this accumulated stock to act as a dam retarding upward travel of the stock from the perforate section of the screen, with resulting increased drainage therefrom.

This apparatus is accordingly simple to operate as well as easy to maintain. Since the control of the apparatus is centered in the adjustment of the variable ratio transmission, even an inexperienced operator can readily understand it. Furthermore, samples of the thickened stock can be readily obtained through the opening in the top cover if desired, and the results of adjustment can thus be quickly observed. The simplicity of the moving parts of the application minimizes the possibility of breakdown in operation, and also if it is desired to disassemble the apparatus for any purpose, this can be quickly and easily done as described. Still another advantage of the invention is the relatively small size and compact arrangement of the apparatus, which minimizes the floor space required in a mill, and also its streamlined construction contributes both to its appearance and to the ease with which the apparatus can be kept clean and in good running order.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. Apparatus of the character described for thickening a liquid slurry stock by removing liquid therefrom comprising a frusto-conical per-

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forate screen member mounted with the larger end thereof uppermost, means for supplying stock to be thickened to the lower end of said screen member, means for rotating said screen member to cause said stock to travel upwardly along the inner surface thereof with accompanying discharge of liquid outwardly through the perforations therein, imperforate collecting means defining a chamber for receiving the thickened stock from said screen member, means mounting said collecting means in stationary position inwardly of the perforate surface of said screen member, and means forming a peripheral discharge lip extending inwardly from the upper end of said screen member, said lip being curved radially inwardly of said screen member and downwardly to a position located radially inwardly of the periphery of said collecting means to form an inverted trough partially overhanging said chamber for guiding said thickened stock from said screen member into said chamber.

2. Apparatus of the character described for thickening a liquid slurry stock by removing liquid therefrom comprising a frusto-conical perforate screen member mounted with the larger end thereof uppermost, means for supplying stock to be thickened to the lower end of said screen member, means for rotating said screen member to cause said stock to travel upwardly along the inner surface thereof with accompanying discharge of liquid outwardly through the perforations therein, imperforate collecting means defining a chamber for receiving the thickened stock from said screen member, means mounting said collecting means in stationary position inwardly of the perforate surface of said screen member, means forming a peripheral discharge lip extending inwardly from the upper end of said screen member, said lip being curved radially inwardly of said screen member and downwardly to a position located radially inwardly of the periphery of said collecting means to form an inverted trough partially overhanging said chamber for guiding said thickened stock from said screen member into said chamber, and means forming a discharge outlet extending downwardly from said chamber for continuous gravity discharge of said thickened stock therefrom.

3. Apparatus of the character described for thickening a liquid slurry stock by removing liquid therefrom comprising a frusto-conical perforate screen member mounted with the larger end thereof uppermost, means for supplying stock to be thickened to the lower end of said screen member, means for rotating said screen member to cause said stock to travel upwardly along the inner surface thereof with accompanying discharge of liquid outwardly through the perforations therein, imperforate collecting means defining a chamber for receiving the thickened stock from said screen member, means mounting said collecting means in stationary position inwardly of the perforate surface of said screen member, means forming a peripheral discharge lip extending inwardly from the upper end of said screen member, said lip being curved through approximately 180° and having the inner periphery thereof located radially inwardly of and below the upper end of said collecting means to effect positive guiding of said thickened stock from said screen member into said chamber.

4. Apparatus of the character described for thickening a liquid slurry stock by removing

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liquid therefrom comprising a frusto-conical perforate screen member mounted with the smaller end thereof lowermost, means forming a peripheral lip extending inwardly from the upper end of said screen member to provide an inverted trough, means for supplying stock to be thickened to the lower end of said screen member, means for rotating said screen member to cause said stock to travel upwardly along the inner surface thereof into said trough with accompanying discharge of liquid from said stock outwardly through the perforations in said screen member, a generally frusto-conical imperforate stationary member mounted within said screen member with the larger end thereof uppermost and arranged to extend upwardly and outwardly into said trough to receive the thickened stock inwardly and downwardly therefrom, said lip extending inwardly and downwardly from said screen member to a position located radially inwardly of and below the upper end of said stationary member to guide said thickened stock into said stationary member, and said lip forming means including an imperforate flange portion extending downwardly within said screen member from said trough to a position located below and approximately in vertical alignment with the outer periphery of said stationary member to prevent discharge of liquid from said stock after said stock reaches a distance from the axis of said screen member approximately equal to the maximum radius of said stationary member.

5. Apparatus of the character described for thickening a liquid slurry stock by removing liquid therefrom comprising a casing including means forming an inlet chamber for receiving said stock to be thickened and an outlet chamber for the liquid removed from said stock, a frusto-conical perforate screen member, means mounting said screen member for rotation within said casing with the smaller end thereof lowermost and extending within said inlet chamber to receive stock therefrom, means forming a peripheral lip extending inwardly from the upper end of said screen member to provide an inverted trough along the upper end of said screen member, means for rotating said screen member to cause said stock to travel upwardly along the inner surface thereof to said trough with accompanying discharge of liquid therefrom outwardly through the perforations in said screen member, a generally frusto-conical imperforate stationary member mounted within said screen member with the larger end thereof uppermost and arranged to extend upwardly and outwardly into said trough to receive the thickened stock inwardly and downwardly therefrom, said lip being curved radially inwardly of said screen member and downwardly to a position located radially inwardly of and below the upper periphery of said stationary member to guide said thickened stock from said screen member into said stationary member, and means for regulating the speed of rotation of said screen member to vary the consistency of said thickened stock discharged into said stationary member.

6. Apparatus of the character described for thickening a liquid slurry stock by removing liquid therefrom comprising a casing including means forming an inlet chamber for receiving said stock to be thickened and an outlet chamber for the liquid removed from said stock, a frusto-conical perforate screen member, means mounting said screen member for rotation within said casing with the smaller end thereof

lowermost and extending within said inlet chamber to receive stock therefrom, means forming a peripheral lip extending inwardly from the upper end of said screen member to provide an inverted trough along the upper end of said screen member, means for rotating said screen member to cause said stock to travel upwardly along the inner surface thereof to said trough with accompanying discharge of liquid therefrom outwardly through the perforations in said screen member, and an imperforate funnel member mounted within said screen member with the larger end thereof uppermost and arranged to extend upwardly and outwardly into said trough to receive the thickened stock inwardly and downwardly therefrom, said lip being curved radially inwardly of said screen member and downwardly to a position located radially inwardly of and below the upper periphery of said stationary member to guide said thickened stock from said screen member into said stationary member, the lower end of said funnel member extending through said inlet chamber for gravity discharge of said thickened stock.

7. Apparatus of the character described for thickening a liquid slurry stock by removing liquid therefrom comprising a casing forming an inlet chamber for stock to be thickened, said casing having an opening in the upper wall thereof, a frusto-conical screen unit open at both ends thereof and including an imperforate section at the smaller end thereof and a perforate section adjacent said imperforate section, means mounting said screen unit for rotation above said casing with said smaller end thereof lowermost and with said imperforate end arranged to extend into said inlet chamber through said opening to receive stock therefrom, means for rotating said screen unit to cause said stock to travel upwardly from said inlet chamber along the inner surface of said screen unit and to effect centrifugal discharge of liquid therefrom through said perforate screen section above said casing while the resulting thickened stock continues to travel upwardly within said screen, an imperforate inverted trough member secured within the upper end of said screen unit to receive said thickened stock from said perforate screen section for discharge radially inwardly of said screen unit and downwardly, and an imperforate container supported within said screen unit with the upper periphery thereof located within said trough member to receive said stock discharged from said trough member.

8. Apparatus of the character described for thickening a liquid slurry stock by removing liquid therefrom comprising a casing forming an inlet chamber for stock to be thickened, means forming an outlet chamber above said inlet chamber, said casing having an opening in the upper wall thereof connecting said chambers, a collar extending upwardly from said upper casing wall and surrounding said opening to prevent backflow from said outlet chamber, a frusto-conical screen unit including an imperforate small end section and a perforate section adjacent said imperforate section, means mounting said screen unit for rotation with said perforate section located above said collar and with said imperforate section arranged to extend through said opening into said inlet chamber to receive stock therefrom, means for rotating said screen unit to cause said stock to travel upwardly from said inlet chamber along the inner surface of said imperforate screen section and to effect

centrifugal discharge of liquid from said stock through said perforate screen section into said outlet chamber while the resulting thickened stock continues to travel upwardly within said screen unit, said screen unit having an outwardly projecting flange thereon adjacent the lower end of said perforate section and above said collar to prevent flow of liquid from said outlet chamber through said opening to said inlet chamber, and means for effecting continuous controlled discharge of said thickened stock from the upper end of said screen unit.

9. Apparatus of the character described for thickening a liquid slurry stock by removing liquid therefrom comprising a casing forming an inlet chamber for stock to be thickened, means forming an outlet chamber above said inlet chamber, said casing having an opening in the upper wall thereof connecting said chambers, a collar extending upwardly from said upper casing wall and surrounding said opening to prevent backflow from said outlet chamber, a frusto-conical screen unit including an imperforate small end section and a perforate section adjacent said imperforate section, means mounting said screen unit for rotation with said perforate section located above said collar and with said imperforate section arranged to extend through said opening into said inlet chamber to receive stock therefrom, means for rotating said screen unit to cause said stock to travel upwardly from said inlet chamber along the inner surface of said imperforate screen section and to effect centrifugal discharge of liquid from said stock through said perforate screen section into said outlet chamber while the resulting thickened stock continues to travel upwardly within said screen unit, said screen unit including an imperforate portion extending inwardly from the upper end thereof to form an inverted trough for receiving said thickened stock, and a stationary imperforate funnel member mounted within said screen unit with the upper end thereof extending upwardly and outwardly into said trough to receive said thickened stock therefrom and including a discharge pipe extending downwardly through said lower casing for continuous gravity discharge of said thickened stock, said upper imperforate portion of said screen unit extending from a position within said screen unit located below and approximately in vertical alignment with the upper periphery of said funnel to a position located radially inwardly of and below said upper periphery of said funnel to guide said thickened stock from said screen unit into said funnel while preventing discharge of liquid therefrom after said stock reaches a distance from the axis of said screen unit approximately equal to the maximum radius of said funnel.

10. Apparatus of the character described for thickening a liquid slurry stock by removing liquid therefrom comprising a frusto-conical perforate screen member mounted with the smaller end thereof lowermost, means forming a peripheral lip extending inwardly from the upper end of said screen member to provide an inverted trough, means for supplying stock to be thickened to the lower end of said screen member, means for rotating said screen member to cause said stock to travel upwardly along the inner surface of said screen member into said trough with accompanying discharge of liquid from said stock outwardly through the perforations in said screen member, a generally frusto-conical imperforate stationary member mounted

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within said screen member with the larger end thereof uppermost and arranged to extend upwardly and outwardly into said trough and means mounted along the upper rim of said stationary member for deflecting the thickened stock inwardly and downwardly from said trough into said stationary member.

11. Apparatus of the character described for thickening a liquid slurry stock by removing liquid therefrom comprising a frusto-conical screen member including a perforate section formed of rubber sheet material having multiple minute perforations extending therethrough, means mounting said screen member for rotation with the smaller end thereof lowermost, means for supplying stock to be thickened to said small end of said screen member, means for rotating said screen member to cause said stock to travel upwardly along the inner surface of said rubber section and to effect centrifugal discharge of liquid from said stock through said perforations, imperforate means defining a stationary chamber within said screen member for receiving the thickened stock therefrom, and means forming a peripheral discharge lip extending inwardly from the upper end of said screen member into overhanging relation with said stationary means, said lip being curved radially inwardly of said screen member and downwardly to a position located radially inwardly of the periphery of said chamber means to form an inverted trough partially overhanging said chamber for guiding said thickened stock from said screen member into said stationary chamber.

12. Apparatus of the character described for thickening a liquid slurry stock by removing liquid therefrom comprising a casing forming an inlet chamber for stock to be thickened, means forming an outlet chamber above said inlet chamber, said casing having an opening in the upper wall thereof connecting said chambers, a collar extending upwardly from said upper casing wall and surrounding said opening to prevent backflow from said outlet chamber, a frusto-conical screen unit including an imperforate small end section and a perforate section adjacent said imperforate section and formed of

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rubber sheet material having multiple minute perforations extending therethrough, means mounting said screen unit for rotation with said perforate section located above said collar and with said imperforate section arranged to extend through said opening into said inlet chamber to receive stock therefrom, means for rotating said screen unit to cause said stock to travel upwardly from said inlet chamber along the inner surface of said imperforate screen section and to effect centrifugal discharge of liquid from said stock through said perforate screen section into said outlet chamber while the resulting thickened stock continues to travel upwardly within said screen unit, said screen unit including an imperforate portion extending inwardly from the upper end thereof to form an inverted trough for receiving said thickened stock, and a stationary imperforate funnel member mounted within said screen unit with the upper end thereof extending upwardly and outwardly into said trough to receive said thickened stock therefrom and including a discharge pipe extending downwardly through said lower casing for continuous gravity discharge of said thickened stock, said upper imperforate portion of said screen unit extending from a position within said screen unit located below and approximately in vertical alignment with the upper periphery of said funnel to guide said thickened stock from said screen unit into said funnel while preventing discharge of liquid therefrom after said stock reaches a distance from the axis of said screen unit approximately equal to the maximum radius of said funnel.

JOSEPH BAXTER, JR.

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