Dec. 17, 1963 A. J. HAUG 3,114,309

CENTRIFUGAL THICKENER FOR PAPER PULP

Filed Jan. 24, 1962 5 Sheets-Sheet 1

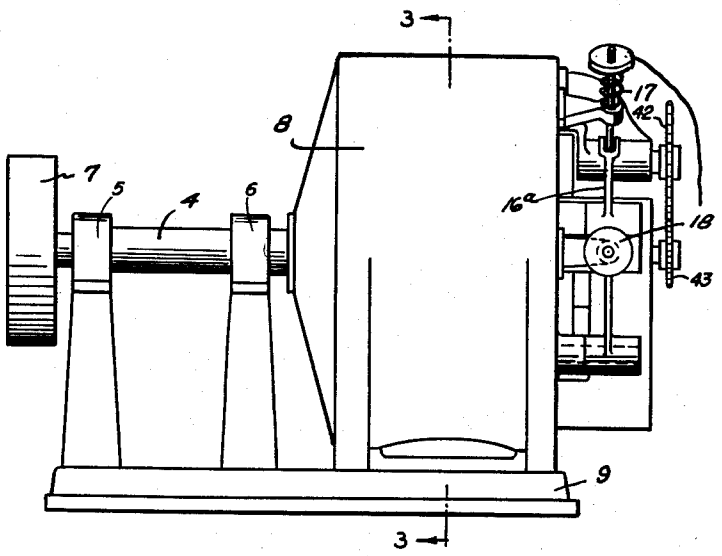


FIG. 1

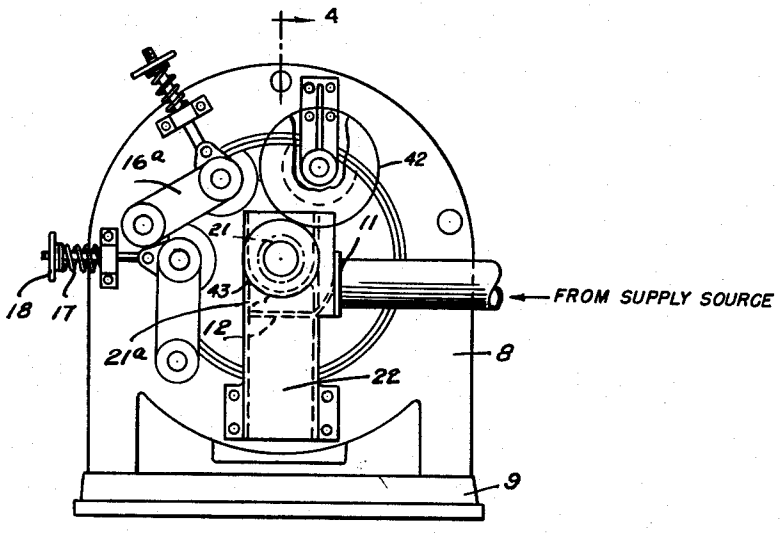


FIG. 2

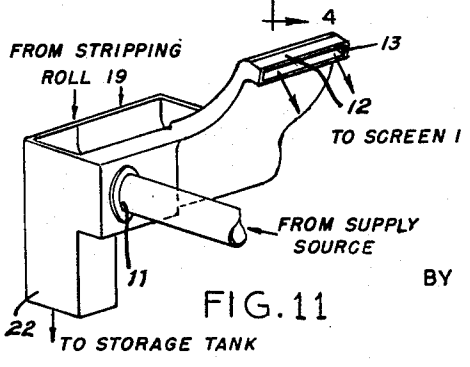


FIG. 11

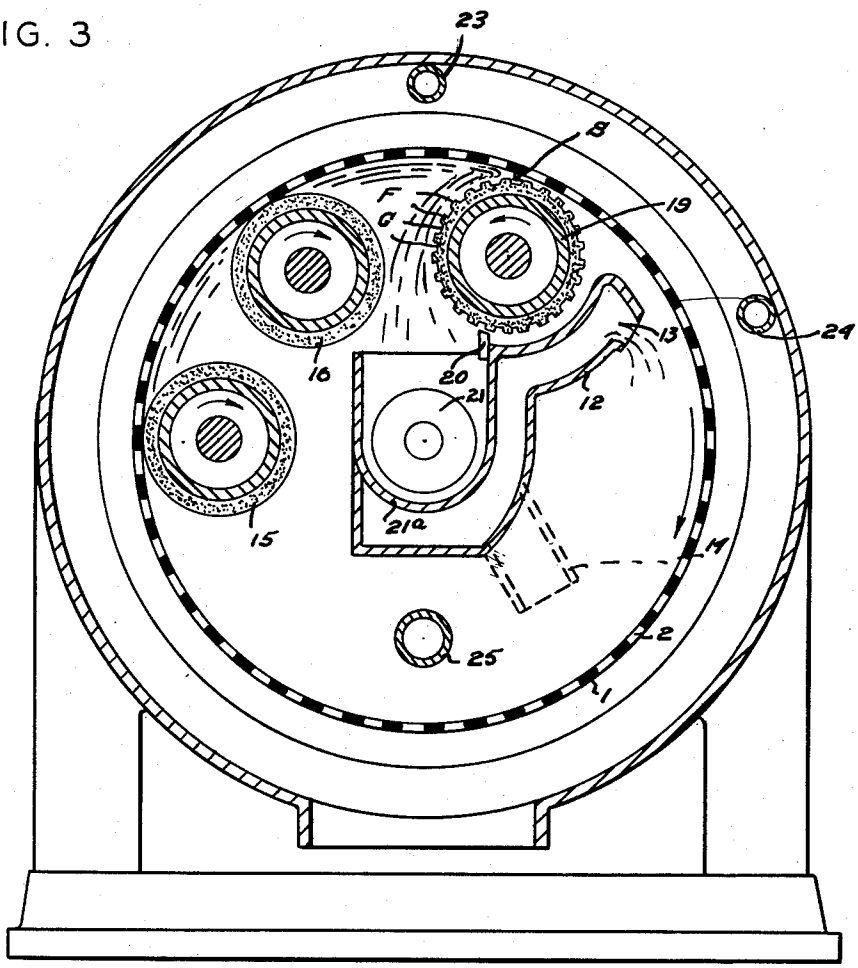
INVENTOR
Anton J. Haug
BY
Thomas H. Hamilton
ATTORNEY

Dec. 17, 1963 A. J. HAUG 3,114,309

CENTRIFUGAL THICKENER FOR PAPER PULP

Filed Jan. 24, 1962 5 Sheets-Sheet 2

FIG. 3



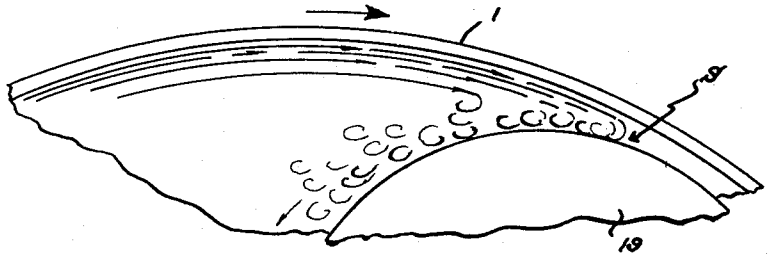


FIG. 5

INVENTOR
Anton J. Haug
BY
Memmon F. Hamilton
ATTORNEY

Dec. 17, 1963 A. J. HAUG 3,114,309

CENTRIFUGAL THICKENER FOR PAPER PULP

Filed Jan. 24, 1962 5 Sheets-Sheet 3

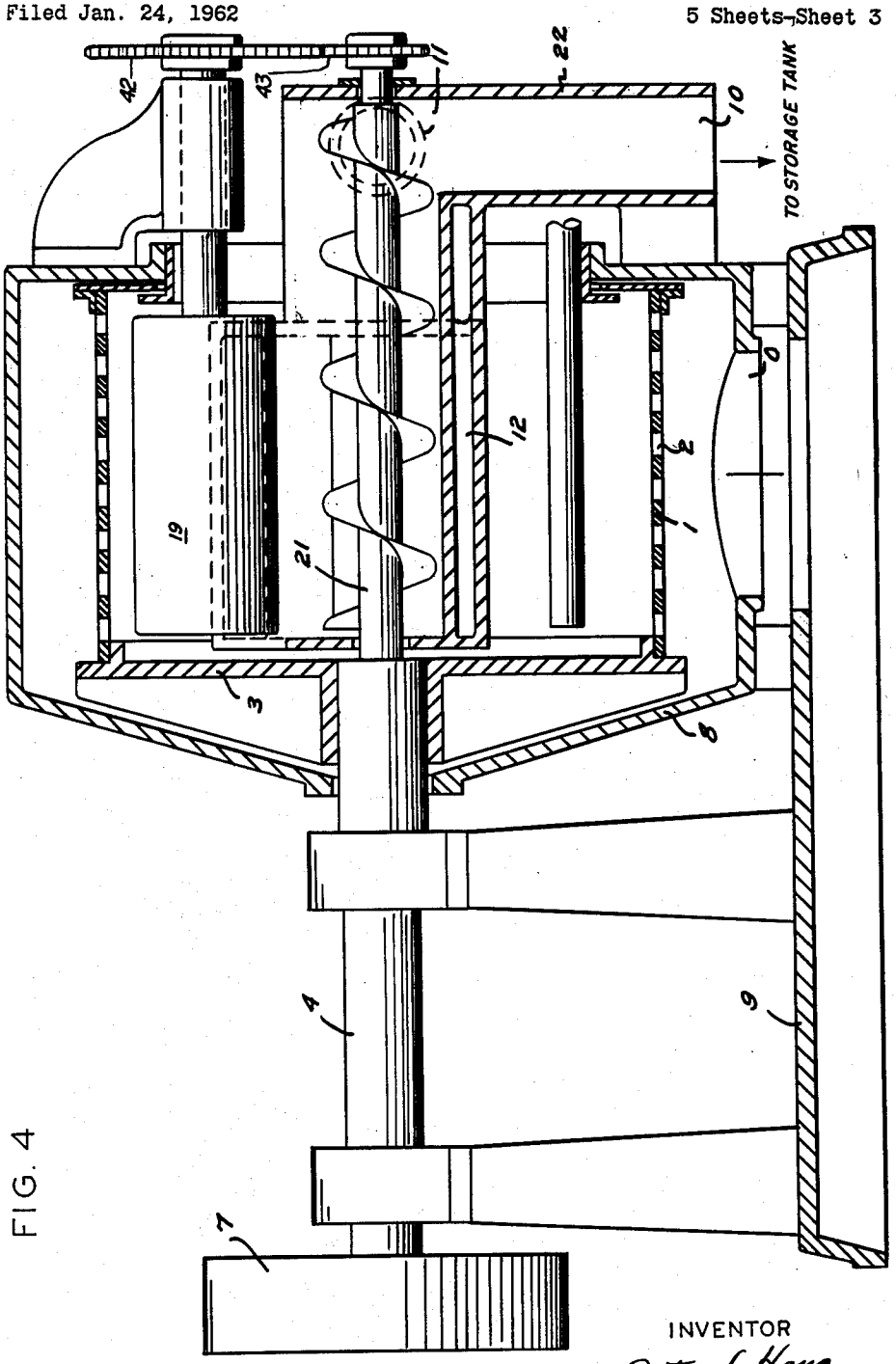


FIG. 4

INVENTOR
Anton J. Haug

BY
Munn & Hamilton

ATTORNEY

Dec. 17, 1963 A. J. HAUG 3,114,309

CENTRIFUGAL THICKENER FOR PAPER PULP

Filed Jan. 24, 1962 5 Sheets-Sheet 4

FIG. 6

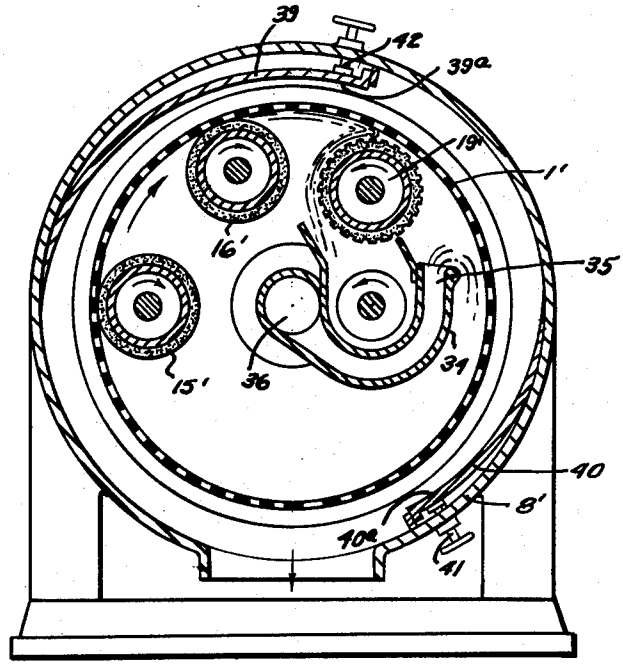
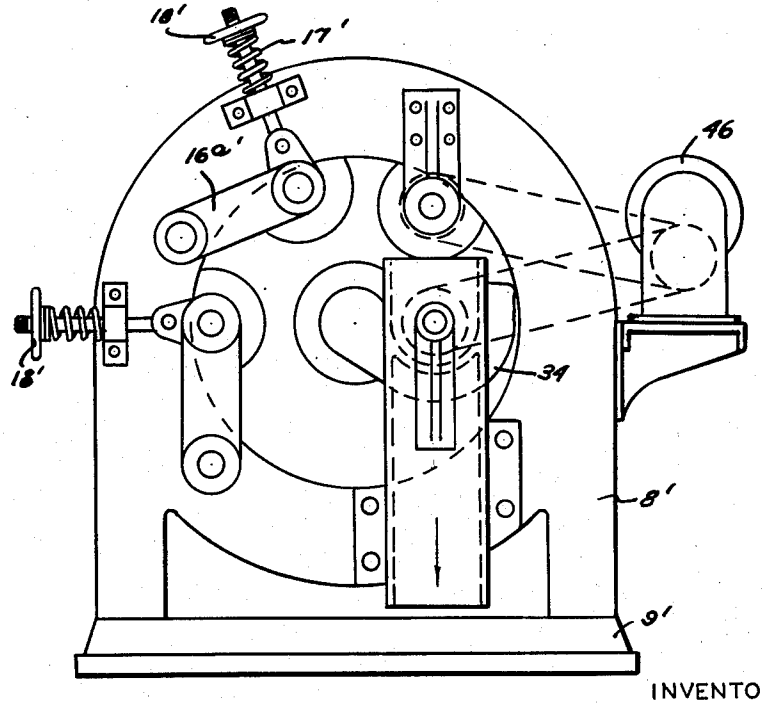


FIG. 7



INVENTOR
Anton J. Haug
BY
Merwin H. Hamilton
ATTORNEY

Dec. 17, 1963 A. J. HAUG 3,114,309

CENTRIFUGAL THICKENER FOR PAPER PULP

Filed Jan. 24, 1962 5 Sheets-Sheet 5

FIG. 8

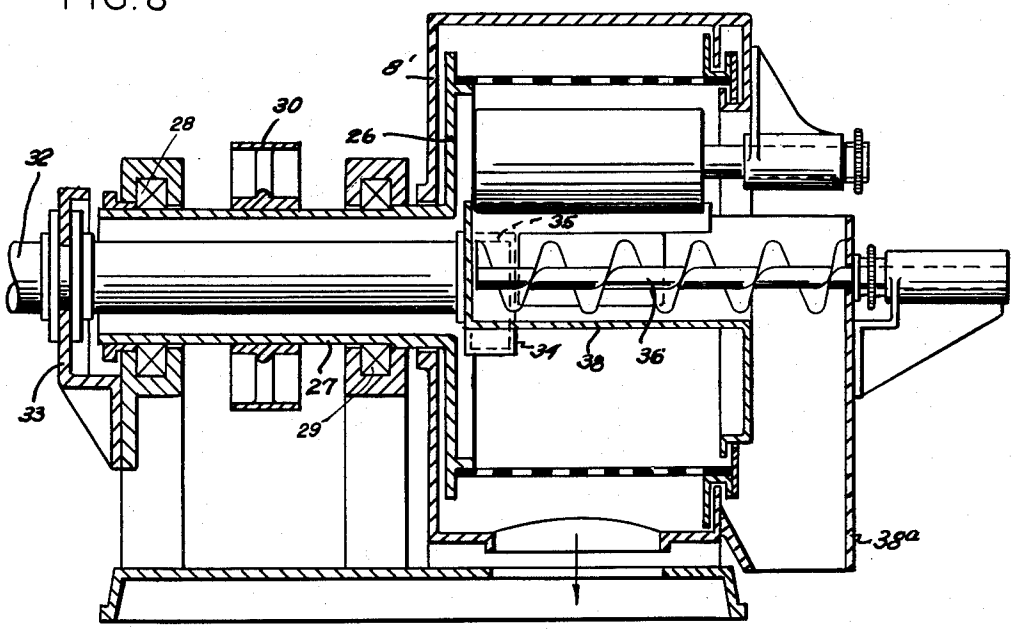
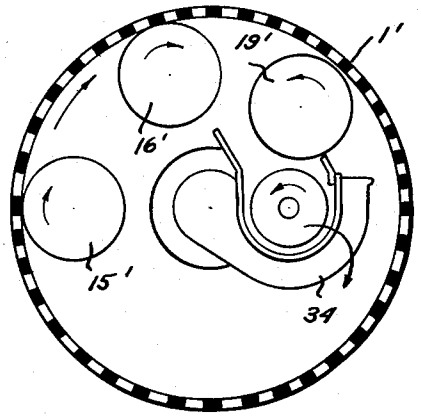


FIG. 10



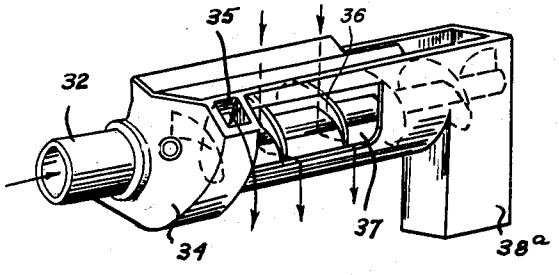


FIG. 9

INVENTOR

BY Antonius J. Haug

Thomas H. Hamilton

ATTORNEY

United States Patent Office 3,114,309 Patented Dec. 17, 1963

3,114,309

CENTRIFUGAL THICKENER FOR PAPER PULP

Anton J. Haug, Nashua, N.H., assignor to Canadian Ingersoll-Rand Company Ltd., Montreal, Quebec, Canada, a corporation of Canada

Filed Jan. 24, 1962, Ser. No. 168,492
12 Claims. (Cl. 100—37)

This invention relates to a method and machine for processing fluid mixtures of fibrous material and more particularly the invention is concerned with removing liquid material from a dilute paper stock to obtain a desired pulp consistency. In a typical operation, the liquid pulp may occur with a low consistency of from one to two percent and a common requirement is the removal of water in sufficient amounts to bring the stock up to a consistency range of from ten to fifteen percent, and in some cases to a twenty to thirty percent consistency range.

Removal of water is commonly carried out in the art by the use of revolving screen drums and various problems have been encountered in obtaining a satisfactory rate of water removal at relatively high operating speeds. A chief difficulty arises from the fact that the paper stock usually contains very fine fibre fragments and slimy or gelatinous material which tends to clog the small drain apertures used in conventional revolving screen drums. Clogging will, after a time, interrupt continuous operation and as a result the efficiency of the dewatering operation is materially lowered.

Various arrangements have been proposed for combining, with the revolving screen drum, means for scraping away or otherwise removing the slimy or gelatinous material which tends to collect on the inside of the screen. It has been found, however, that machines of the prior art, even with these scraper devices, are unsatisfactory and are only practical when operated at very low drum speeds. Thus the problem of meeting more recent requirements of high speed operation and consequent reduction in operating costs has remained unsolved.

It is an object of the present invention to improve methods and apparatus for removing water from dilute paper stock so as to provide a means of continuously carrying out a dewatering operation at relatively high drum speeds. Another specific object is to deal with the problem of removing slimy or gelatinous material from the drain openings of a revolving drum so that the openings may be continuously cleared and maintained in proper operating condition while, at the same time, providing for satisfactory water displacement.

Having in mind the particular tendency for slimy or gelatinous material to concentrate and collect on the inner peripheral surface of the drum, I have conceived of a method of first centrifuging a layer of the dilute paper stock in a screen drum so that a large part of the fluid component is almost immediately expelled by centrifugal force, and thereafter the fibrous material and the slimy gelatinous material are compressed and caused to adhere to one another in a relative cohesive layer which can be separated from the screen drum.

In order to remove this cohesive layer of fibres and gelatinous material, I have further devised a method and means by which a moving layer of matted fibres and gelatinous material is turned over upon itself and simultaneously stripped away from the inner periphery of the drum to clear the drain openings. In carrying out the method of the invention, I employ a special stripping roll means in combination with a screen or foraminous drum. Dilute paper stock is fed in a controlled manner along one particular section of the drum to almost instantly form a thin layer of centrifuged fibres and gelatinous material.

At an opposite side of the drum, I provide press rolls which are resiliently held against the inner surface of the drum. By means of this arrangement the centrifuged layer of fibres passes along a substantial path of travel before passing between the drum and the press rolls. These press rolls are mounted rotatably on their central shafts and revolve by contact with the drum or they may, in some cases, be driven separately. In addition, the rolls are spring-loaded to exert a definite pressure so that they may exercise a pronounced squeezing or compressing of the centrifuged layer at points of rolling contact.

In close proximity to the press rolls, I locate a counter rotation stripping roll which cooperates with the drum to form a restricted passageway. It is pointed out the compressed fibrous material is in a relatively thin layer form in which the fibres and slimy gelatinous material, as earlier noted, are caused to adhere to one another in a cohesive mass. This cohesive layer of fibres and gelatinous material passes directly from the press rolls into the restricted passageway comprised by the drum and a stripping roll member. The counter rotation stripping roll is spaced from the drum a distance less than the thickness of the fibrous layer and as the stripping roll rotates against the travel of the layer it firmly engages the fibres. As a result of these conditions, the layer of fibres approaching the restricted passageway first tends to pile up in front of the stripping roll and is further compressed momentarily in this restricted passageway. At the same time, however, the stripping roll operates to turn the fibres back upon themselves and a peeling action is initiated by which the layer of fibres is continuously stripped away from the drum. This operation is carried on in a continuous manner so that successive portions of the compressed layers are continuously stripped away from the drum carrying with it the troublesome slimy or gelatinous material which otherwise would collect in the drain openings. Thus it becomes possible to maintain the drain openings in a satisfactorily cleared condition even when the drum is revolving at relatively high operating speeds.

These and other objects and novel features will be more fully understood and appreciated from the following description of preferred embodiments of the invention selected for purposes of illustration and shown in the accompanying drawings, in which:

FIGURE 1 is a side elevational view of a screen drum apparatus which I may employ in carrying out the method of the invention;

FIGURE 2 is an end elevational view of the machine shown in FIGURE 1;

FIGURE 3 is a cross section taken on the line 3—3 of FIGURE 1;

FIGURE 4 is a cross section taken approximately on the line 4—4 of FIGURE 2;

FIGURE 5 is a fragmentary view of a screen drum and roll indicating diagrammatically a compressed layer of fibres entering a restricted passageway and being stripped away from the screen member;

FIGURE 6 is a central vertical cross section of another form of screen drum apparatus of the invention;

FIGURE 7 is an end elevational view of the drum arrangement shown in FIGURE 6;

FIGURE 8 is a cross sectional view taken along the axis of rotation of the screen drum structure shown in FIGURES 6 and 7;

FIGURE 9 is a detail perspective view of the conveyor mechanism shown in FIGURE 8;

FIGURE 10 is a diagrammatic view illustrating rotative travel of the various roll members shown in FIGURES 6 to 9 inclusive, and

FIGURE 11 is a detail perspective view of feed inlet means.

Referring more in detail to the drawings, attention is directed to the form of invention illustrated in FIGURES 1 to 5, incl. This form is especially designed for handling of relatively large volumes of paper stock where a concentration or thickening of the pulp is required to bring it up to consistencies of from ten to fifteen percent. In this form of machine the dilute paper stock is fed into the machine across the entire length of the inner surface of the revolving screen drum.

Number 1 (FIGS. 3–5) denotes the screen drum which is formed with drain openings 2 (FIGS. 3, 4). One end of the drum 1 is fastened to a head 3 (FIG. 4) which is secured to shaft 4 (FIGS. 1 and 4) carried in bearings 5 and 6 and driven by conventional means as pully 7. The drum 1 is contained in a casing 8 (FIGS. 1, 2 and 4) which rests on a bed plate 9.

The dilute paper stock to be thickened or dewatered is fed through an inlet pipe 11 (FIGS. 3, 11) from some suitable supply source and the pipe 11 connects through inlet trough 21*b* (FIGS. 3, 11) with a conduit 12 (FIGS. 2–4 and 11) which has a rectangular opening 13 (FIGS 2, 3) from which the stock may flow against one side of the inner peripheral surface of the drum 1. There may also be used, when desired, a discharge opening 14 (FIG. 3) for handling fluids which contain very heavy particles.

Press rolls 15 and 16 (FIG. 3) are carried in pivotal arms as 16*a* and 16*b* (FIGS. 1 and 2) and are arranged to be resiliently forced against the inner drum surface by means of springs 17 (FIGS. 1 and 2) and hand wheels 18. Preferably, the rolls 15 and 16 are provided with a rubber covering with a small circular groove formed therein. These rolls 15 and 16 are positioned at an opposite side of the revolving drum 1 from the feed inlet 11 and it will be observed that by means of this arrangement the rolls 15 and 16 do not come into rolling contact with a centrifuged layer of fibres until the layer has moved through a large part of a revolution of the drum 1.

There is thus provided an opportunity for most of the free water in the stock to be displaced through the screen 1 by centrifugal force. The rolls 15 and 16 (FIG. 4) then can exert a second force for squeezing out water held in the fibres themselves. The compressive action of the rolls 15 and 16 also operates to force the fibres against small quantities of slime or gelatinous material occurring on the inside of the drum 1 so that the fibres and gelatinous material stick to one another in closely matted relationship. This is important in removing the layer of fibres as noted below.

In accordance with the invention, the matted layer of fibres and gelatinous material, as it leaves the press rolls 15 and 16, is almost immediately brought into a small restricted passageway S (FIGS. 4 and 5), one side of which is comprised by the screen drum 1 and the other side of which is formed by a special counter rotating fibre stripping roll 19. The roll 19 (FIGS. 3–5), in addition to being mounted for rotation in a direction opposite to that of the screen drum 1, by gears 43 and 44 (FIGS. 1, 2 and 4), is also located in close proximity to the screen drum 1 as shown in FIGURES 3 and 5. Also the surface of the roll 19 is formed with fibre engaging surfaces F (FIGURE 3) which are defined by a series of closely spaced grooves G. The grooves G may be of either an axial or helical form and may extend throughout the length of the roll 19.

As the matted layer of fibres (FIGS. 3 and 5) moves at relatively high speed into the restricted passageway S, a piling up of material tends to occur and relatively large compressive forces are momentarily concentrated on the piled-up material with the result that a still further displacement of water is caused to take place. Simultaneously, the fibre engaging surfaces F and grooves G which are turning in an opposite direction, engage firmly in the matted layer of fibres, and by a combined rolling and peeling action, strip the layer away from the drum surface and divert the direction of flow of the turned-over fibres along a reversely directed path of travel.

As the stripping action takes place, I find that the fibres pull away any gelatinous material collecting on the drum surface and in the drain openings 11, and thus these drain openings 11 are constantly cleared so that efficient draining is possible during each revolution of the drum 1.

The fibrous layer thus turned over upon itself is then caused to drop downwardly as shown in FIGURE 3 onto a screw conveyor 21 (FIGS. 3 and 4) which is preferably an extension of shaft 4 and which is surrounded at its underside by a tubular trough 21*a* (FIGS. 2 and 3) having at one end thereof a discharge spout 22 (FIGS. 3, 4 and 11) through which is a discharge passageway 10 (FIGURE 4).

I may also provide a scraper element 20 (FIGURE 3) which is adjustably mounted on the member 12 as shown in a position to remove from the stripper roll 19 any thickened fibrous material which has not already dropped onto the conveyor 21. Conventional shower pipes 23 and 24 (FIG. 3) may, in addition, be employed to keep the outside of the drum 1 clean. The pipes 23 and 24″ may be supplied with steam, air, or water and, in addition, I may provide a pipe 25 (FIG. 3) to perform a washing operation on the fibrous layer where this is desirable. The bottom of the casing 8 is formed with an opening 0 (FIG. 4) for draining away water passing through screen 1.

In FIGURES 6–10, I have illustrated another form of the invention which is particularly designed to provide higher ranges of consistencies in the neighborhood of from twenty to thirty percent. As shown in FIGURE 8 a screen drum 1′ is carried by a drum 1′ head 26 which has a hollow journal 27 and which rests in bearings 28 and 29 in a casing 8′. The drum is driven by conventional means such as a pulley 30.

Pulp stock is fed into the machine through an inlet plate 32 (FIGS. 8 and 9) which is held in bracket 33 (FIG. 8) and pipe 32 communicates with a conduit 34 (FIGS. 6–9) having an outlet 35 as shown in FIGURE 9. The dilute paper stock is pumped into the conduit 34 and flows over the edge of opening 35 into one end of the screen drum 1′ in a restricted stream. This stream of dilute stocks goes through the same process of being formed into a layer, then pressed by rolls 15′, 16′ and then stripped away by a stripping roll 19′.

The dewatered or thickened stock drops into conveyor 36 (FIGS. 6, 8) which moves it over to the opening 37 (FIG. 9) in the conveyor trough 38 (FIG. 8) and drops it again against the screen drum surface at an advanced location. This cycle is repeated several times until the stock reaches the section of the trough 38 behind the opening 37 and is conveyed through the spout 38*a* (FIGS. 8 and 9). Conveyor 36 is driven from a motorized reducer 45 (FIG. 7) or other convenient means. This motorized reducer 45 also drives roll 19.

I have still further devised an improved means for maintaining the outside of the screen drum 1 clean consisting of two tank wall components 39 and 40 (FIGURE 6). These tank wall components 39 and 40 extend substantially over the whole width of the casing 18 and are formed to provide inwardly converging surfaces 39*a* and 40*a* which terminate abruptly as best shown in FIGURE 6. By means of this arrangement there is continuously induced a turbulence and splashing of drained water against the surface of the drum 1 which tends to wash away any slimy or gelatinous material which tends to collect on the outer surface of the drum 1. Furthermore, a suction effect is induced at the points of termination of the components 39 and 40 which aids in carrying out dewatering. The members 39 and 40 are adjustably secured to the casing 8′ and may be moved in or out radially by means of the screw studs 41 and 42 (FIG. 6) to control the amount of blacksplash.

The method and apparatus as now disclosed is found to provide very high efficiency under relatively high drum speeds of, for example, 500 r.p.m., and the operation may be carried out continuously without troublesome operation since the clogging of the drum opening S by slimy gelatinous material is prevented. It is understood that changes and modifications within the scope of the appended claims may be resorted to and that features of FIGURES 6–10 may also be incorporated in the machine shown in FIGURES 1–5. Likewise it is intended that the structures disclosed may be assembled and operated in either vertically disposed or horizontally disposed positions and various other fluid mixtures may be desired to be procesed.

I claim:

1. In a thickening machine for dilute fibrous paper stock in which machine is included:

(*a*) a casing,

(*b*) a discharge outlet,

(*c*) a revolving screen drum having drain openings mounted therein,

the combination of:

(1) means for feeding the paper stock onto one side of the revolving screen drum whereby the paper stock is subjected to centrifugal forces for removing a portion of the fluid component in the stock,

(2) press roll means mounted at an opposite side of the revolving screen drum for engaging and compressing the centrifuged material during one point in its path of travel thereby to displace another portion of the fluid component from the fibers, and

(3) stripping roll means presenting substantially rigid longitudinally extending projections having rolling and peeling edges disposed adjacent to the revolving screen drum to form a restricted passageway and to engage the compressed material as it enters the restricted passageway.

(4) said stripping roll means being rotatable in a direction opposite to the direction of rotation of the revolving screen drum to peel away the compressed material from the revolving screen drum and to maintain the drain openings continuously cleared of fibrous material.

2. In a machine according to claim 1 and having

(*a*) tank well means supported between the revolving screen drum and the casing to form converging surfaces for causing liquid drained through the revolving screen drum to splash against the outer surface of the revolving screen drum and exert a cleaning action.

3. A structure according to claim 2 in which the tank wall means has curved plates extending throughout the casing and being positionably secured to vary their spacing from the revolving screen drum.

4. A structure as defined in claim 2 in which the tank wall means terminates abruptly at points of greatest constriction to cooperate with the casing in exerting localized suction forces on the said revolving screen drum.

5. In a thickening machine for dilute fibrous paper stock in which machine is included:

(*a*) a casing,

(*b*) a discharge outlet,

(*c*) a revolving screen drum having drain openings mounted therein, and rotatable at velocities adapted to produce centrifugal forces on the paper stock,

the combination of:

(1) means for feeding the paper stock onto one side of the revolving screen drum whereby the paper stock is subjected to centrifugal forces for removing a portion of the fluid component in the stock,

(2) press roll means mounted at an opposite side of the revolving screen drum for engaging and compressing the centrifugal material during one point in its path of travel thereby to displace another portion of the fluid component from the fibers, and

(3) stripping roll means presenting substantially rigid lonigtudinally extending projections having rolling and peeling edges disposed adjacent to the revolving screen drum to form a restricted passageway and to engage the compressed material as it enters the restricted passageway,

(4) said stripping roll means being rotatable in a direction opposite to the direction of rotation of the revolving screen drum to peel away the compressed material from the revolving screen drum and to maintain the drain openings continuously cleared of fibrous material.

6. A pulp processing machine for thickening a dilute mixture of pulp fibers, gelatinous material and water, said machine comprising:

(*a*) a casing having a discharge outlet,

(*b*) a revolving drum mounted in the casing formed with drain openings and rotatable at velocities adapted to produce centrifugal forces on the paper stock,

(*c*) feed inlet means for introducing the fluid mixture into the revolving drum along one side thereof whereby a layer of pulp fibers and gelatinous material is formed on the inner surface of the revolving drum and centrifugally dewatered during a part of the revolution of the revolving drum,

(*d*) press roll means mounted in the revolving drum along a side opposite to the inlet means, said press roll means being arranged to resiliently engage and compress the layer of centrifuged pulp fibers and gelatinous material against the revolving drum thereby to displace water held by the fibers and to cause the fibers and gelatinous material to adhere to one another in matted relationship.

(*e*) a fiber stripping roll presenting a series of substantially rigid longitudinally extending projections having rolling and peeling edges, said stripping roll being mounted in closely spaced relation to the inner periphery of the revolving drum to form a restricted passageway which is located at a point between the press roll means and the said feed inlet means and which has a spacing from the revolving drum less than the thickness of the compressed layer whereby a piling up of material is caused to take place at the restricted passageway,

(*f*) means for rotating said stripping roll in a direction opposite to the rotative travel of the revolving drum, said stripping roll being formed with grooved fiber engaging surfaces which operate to strip the layer of fibers and gelatinous material away from the revolving drum thereby to clear the drain openings in the revolving drum,

(*g*) and conveyor means arranged to receive fibers from the stripping roll and to conduct the fibers to the said discharge outlet.

7. In a machine for thickening a dilute mixture of pulp fibers, gelatinous material and water, said machine including:

(*a*) a casing having a discharge outlet,

(*b*) a revolving drum mounted in the casing, formed with drain openings and rotatable at velocities adapted to produce centrifugal forces on the paper stock,

(*c*) and feed inlet means for continuously introducing a quantity of the fluid mixture into the revolving drum along one side thereof, the combination of:

(1) press roll means mounted in the revolving drum for compressing a layer of fibrous and gelatinous material against the inner surface of the revolving drum and removing water held by the fibers,

(2) stripping roll means presenting substantially rigid projections having rolling and peeling edges cooperating with the press roll means for stripping the compressed layer of fibers, together with portions of gelatinous material adhered thereto, away from the revolving drum and cleaning the said drain openings, said stripping roll means, being spaced away from the revolving drum a distance less than the thickness of of the compressed layer, and means for rotating said stripping roll means in a direction opposite to the direction of rotation of the revolving drum.

8. In a method of thickening a dilute paper stock which includes water, slimy and gelatinous material and pulp fibers, the steps which include:

(*a*) introducing the paper stock into a revolving screen drum,

(*b*) moving a mass of the said pulp fibers, slimy and gelatinous material and water along a circular path of travel in one direction and subjecting the mass to centrifugal forces to expel a part of the water in the mass through the revolving screen drum,

(*c*) applying rolling pressure to the partly dewatered mass as it continues along the said circular path of travel to remove another portion of the water and to cause the fibers and slimy and gelatinous material to adhere together in a compressed cylindrical layer which is held against the inner peripheral surface of the revolving screen drum by the said centrifugal forces,

(*d*) then conducting the compressed layer into a restricted roll nip passageway of a spacing less than the thickness of the compressed cylindrical layer to induce a continuous piling up of elongated wads of dewatered fibers all along the roll nip passageway,

(*e*) simultaneously engaging the piled up mass of dewatered fibers against a substantially rigid interrupted fiber engaging surface, and

(*f*) peeling the engaged fiber portions and adjacent adhering slimy and gelatinous material away from the surface of the revolving screen drum in a direction opposite to the said direction of rotation of the revolving screen drum and along a reverse path of rotation of limited arcuate travel by the combined rolling and peeling action of said interrupted fiber engaging surface.

9. In a method of thickening a dilute fibrous mass which includes water, slimy and gelatinous material and pulp fibers, the steps which include:

(*a*) introducing the fibrous mass into a revolving screen drum having a multiplicity of drain openings,

(*b*) moving the mass of pulp fibers, slimy and gelatinous material and water along a circular path of travel in one direction and subjecting the mass to centrifugal forces to expel a part of the water in the mass through the drain openings of the revolving screen drum,

(*c*) applying rolling pressure to the partly dewatered mass as it continues along the said circular path of travel to remove another portion of the water and to cause the fibers and slimy and gelatinous material to adhere together in a compressed cylindrical layer which is held against the inner peripheral surface of the revolving screen drum by the said centrifugal forces,

(*d*) then conducting the compressed layer into a restricted roll-nip passageway of a spacing less than the thickness of the compressed cylindrical layer to induce a continuous piling up of elongated wads of dewatered fibers all along the roll-nip passageway,

(*e*) simultaneously engaging the piled up elongated mass of dewatered fibers at the inner peripheral portions thereof against a substantially rigid rotating fiber-engaging surface which moves in a direction opposite to the direction of rotation of said screen drum and forms one side of the roll nip passageway thereby to peel the engaged portions and adjacent adhering slimy and gelatinous material away from the surface of the revolving screen drum by the combined rolling and peeling action of said fiber engaging surface.

10. In a method of thickening a dilute fibrous mass which includes water, slimy and gelatinous material and pulp fibers, the steps which include:

(*a*) introducing the fibrous mass into a revolving screen drum having a multiplicity of drain openings,

(*b*) moving the mass of pulp fibers, slimy and gelatinous material and water along a circular path of travel in one direction and subjecting the mass to centrifugal forces to expel a part of the water in the mass through the drain openings of the revolving screen drum,

(*c*) applying rolling pressure to the partly dewatered mass as it continues along the said circular path of travel to remove another portion of the water and to cause the fibers and slimy and gelatinous material to adhere together in a compressed cylindrical layer which is held against the inner peripheral surface of the revolving screen drum by the said centrifugal forces,

(*d*) then conducting the compressed layer into a restricted roll-nip passageway of a spacing less than the thickness of the compressed cylindrical layer to induce a continuous piling up of elongated wads of dewatered fibers all along the roll-nip passageway,

(*e*) simultaneously engaging the piled up elongated mass of dewatered fibers at the inner peripheral portions thereof against a substantially rigid grooved fiber-engaging surface which forms one side of the roll nip passageway thereby to peel the engaged portions and adjacent adhering slimy and gelatinous material away from the surface of the revolving screen drum by the combined rolling and peeling action of said grooved fiber engaging surface, in a direction opposite to the said direction of rotation of the revolving screen drum and along a path of rotation of limited arcuate travel whereby the said drain openings in the revolving screen drum are continuously cleared of slimy and gelatinous material,

(*f*) collecting dewatered fibers at points where said engaged portions fall away from the fiber-engaging surface by forces of gravity,

(*g*) and then conveying the collected dewatered fibers through a discharge outlet in the said revolving screen drum.

11. In a method of thickening a dilute fibrous mass which includes water, slimy and gelatinous material and pulp fibers, the steps which include:

(*a*) introducing the fibrous mass into a revolving screen drum,

(*b*) moving the mass of pulp fibers, slimy and gelatinous material and water along a circular path of travel in one direction and subjecting the mass to centrifugal forces greater than about five pounds of centrifugal force per pound of paper stock to expel a part of the water in the mass through the revolving screen drum,

(*c*) applying rolling pressure to the partly dewatered mass as it continues along the said circular path of travel to remove another portion of the water and to cause the fibers and slimy and gelatinous material to adhere together in a compressed cylindrical layer which is held against the inner peripheral surface of the revolving screen drum by the said centrifugal forces,

(*d*) then conducting the compressed layer into a restricted roll-nip passageway whose outer side is defined by the revolving screen drum and whose inner side is defined by a substantially rigid interrupted

fiber engageable roll surface which is separated from the revolving screen drum by a spacing less than the thickness of the said compressed cylindrical layer thereby to induce a continuous piling up of elongated wads of fibers all along the roll-nip passageway,

(*e*) simultaneously engaging the piled-up elongated mass of dewatered fibers at inner peripheral portions thereof by rotating the fiber engageable roll surface in a direction opposite to the said circular path of travel of the layer to peel the engaged portions of fibers and adjacent adhering slimy and gelatinous material away from the surface of the revolving screen drum by the combined rolling and peeling action of said fiber engageable roll surface whereby the said drain openings in the revolving screen drum are continuously cleared of slimy and gelatinous material at those points along the surface of the revolving screen drum where the engaged portions are peeled away,

(*f*) collecting dewatered fibers as they fall away from

the fiber engageable roll surface by force of gravity,

(*g*) and conveying the collected fibers axially through the revolving screen drum to a discharge outlet.

12. The method according to claim 11 and the step of engaging the mass of fibers consists in continuously impressing fibers into successive concave areas of the said roll surface and then rolling the impressed fibers over upon themselves during rotative movement of the said roll surface.

References Cited in the file of this patent

UNITED STATES PATENTS

558,572	Schacke	Apr. 21, 1896
714,856	Birkholz	Dec. 2, 1902
2,282,887	Roberts	May 12, 1942
2,713,291	Cook	July 19, 1955

FOREIGN PATENTS

592,105	France	Apr. 23, 1925
1,090,963	Germany	Oct. 13, 1960