

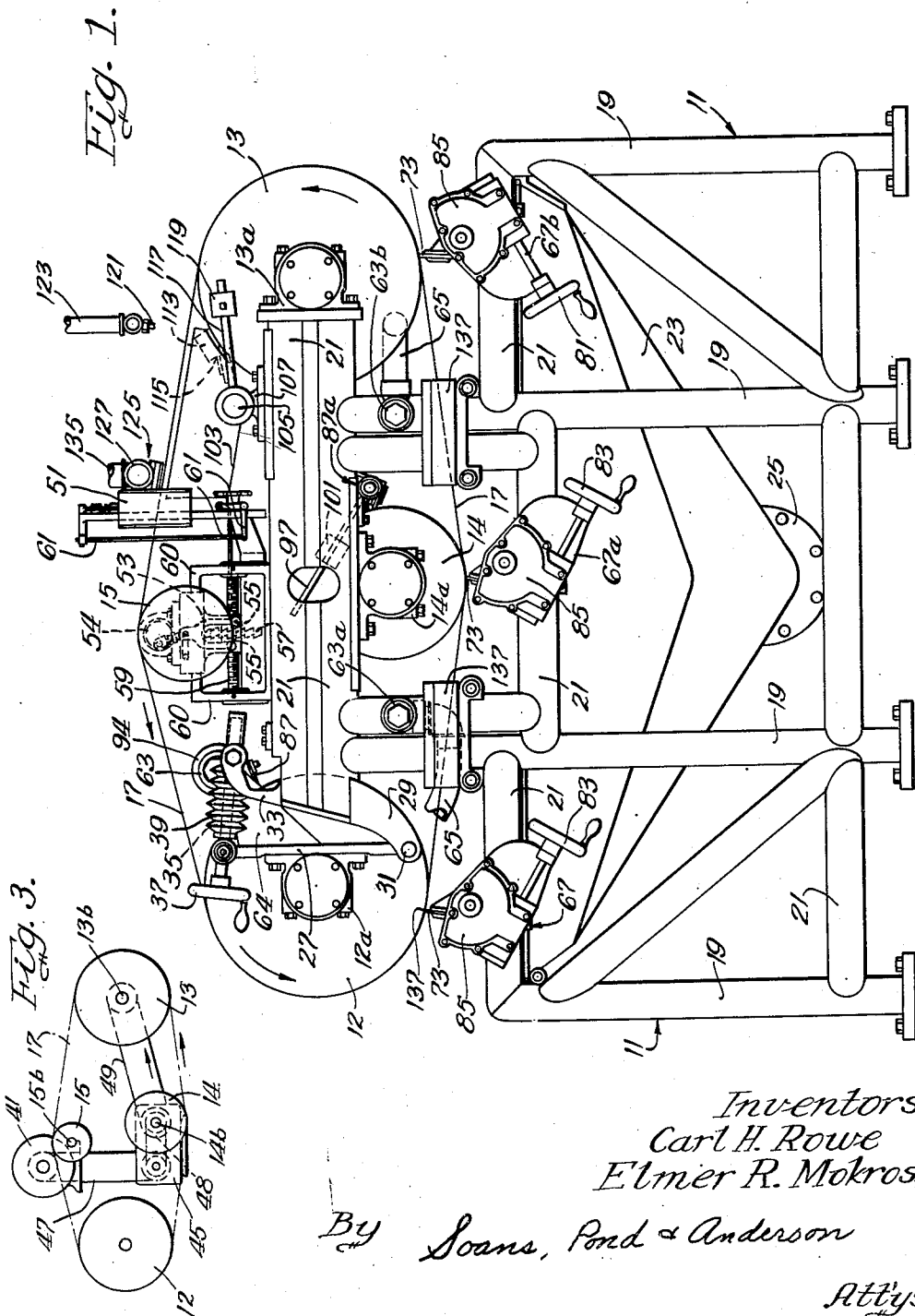
March 17, 1953

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METHOD AND APPARATUS FOR THE CONTINUOUS
SCREENING OF FLUIDS

2,631,733

Filed Oct. 9, 1947

3 Sheets-Sheet 1



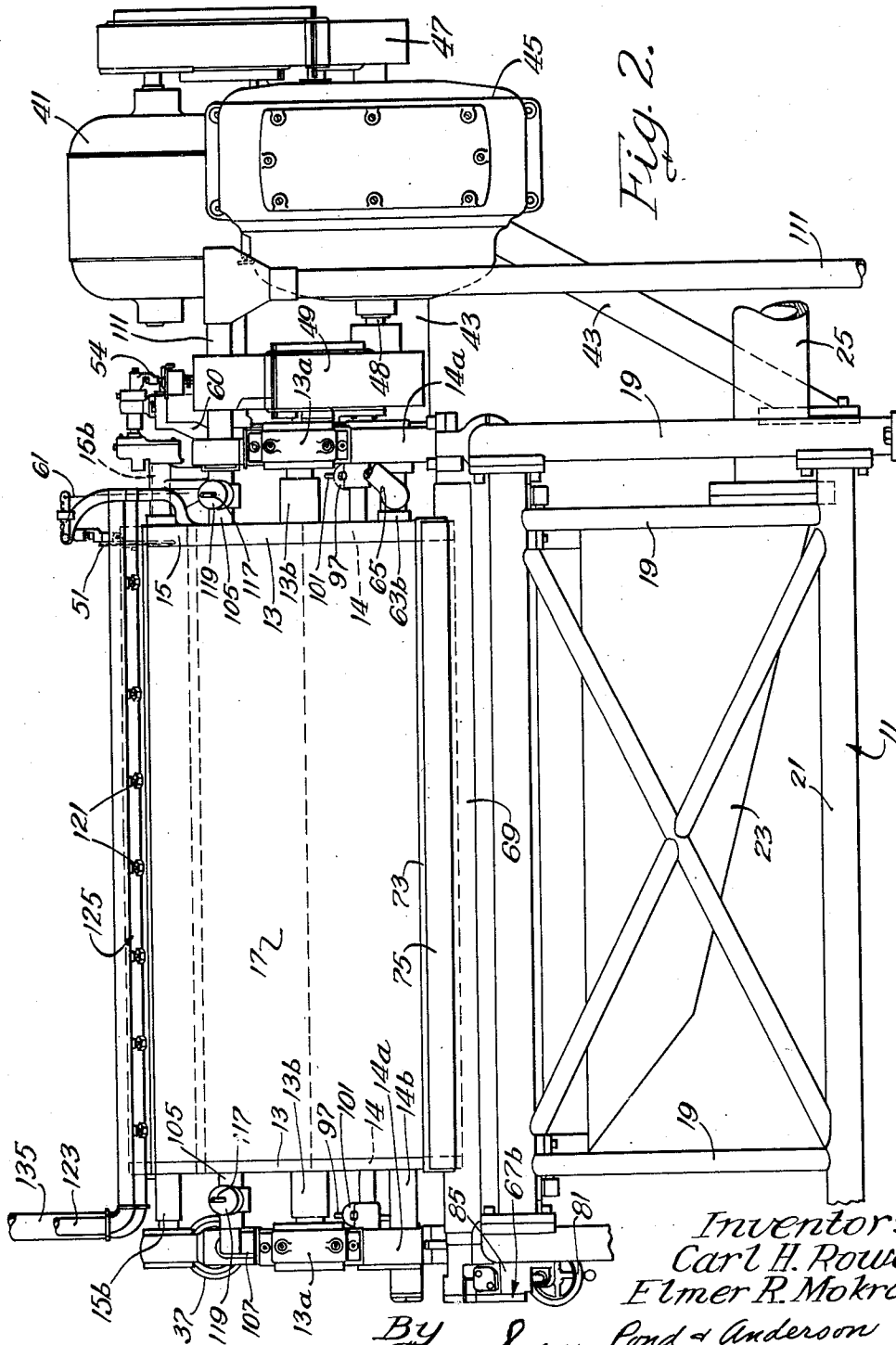
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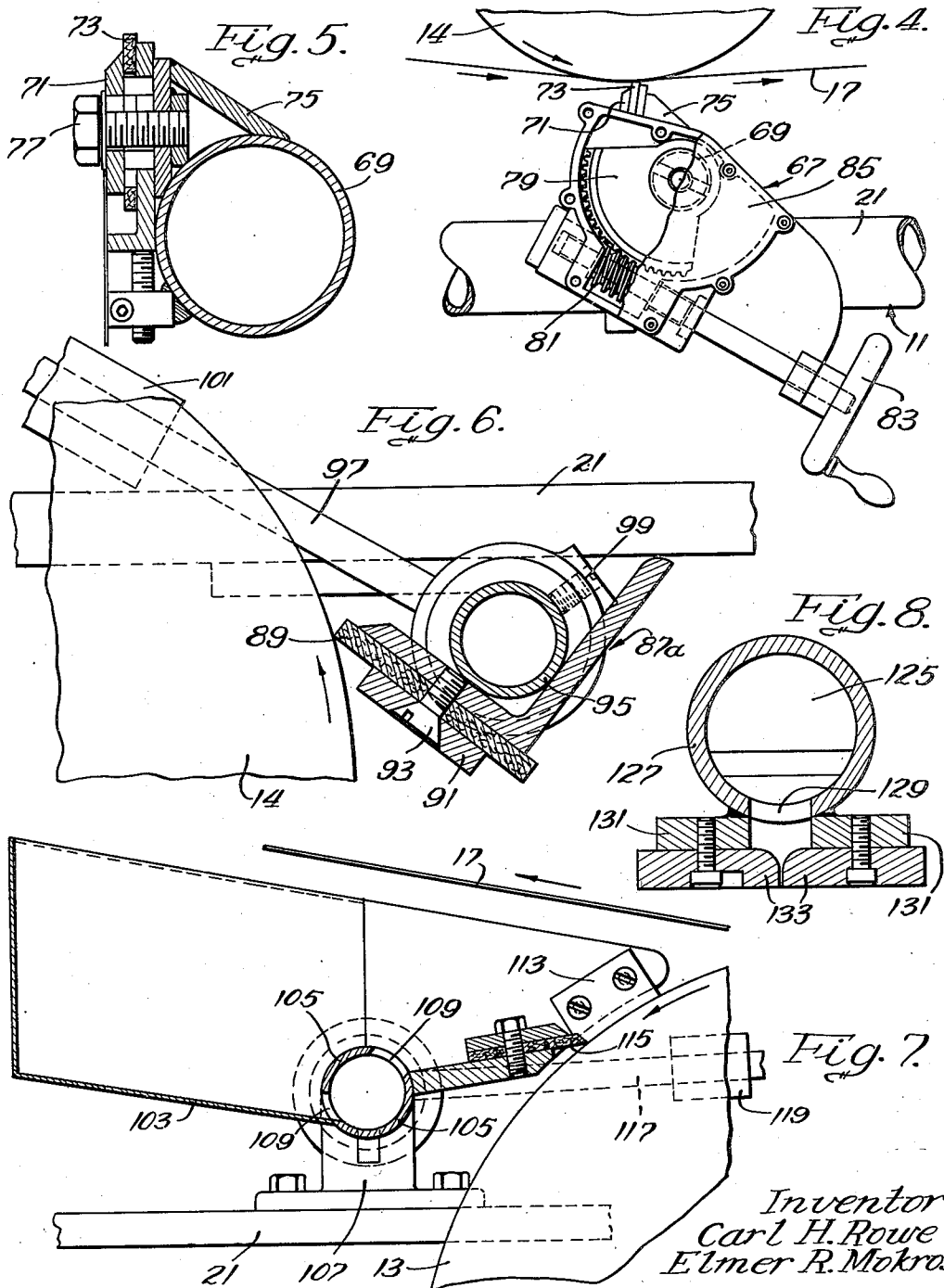
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UNITED STATES PATENT OFFICE

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METHOD AND APPARATUS FOR THE
CONTINUOUS SCREENING OF FLUIDS

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Application October 9, 1947, Serial No. 778,800

9 Claims. (Cl. 210—198)

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The present invention relates generally to an improved method and apparatus for continuously screening suspended particles from fluid and semi-fluid materials, and in particular to an improved method and apparatus for continuously screening oversized materials from viscous suspensions such as the suspensions used in coating paper and the like.

In the manufacture of coated paper, in order to obtain a finished sheet having the requisite bright, smooth surface, it has been found necessary to coat the surface of the base sheet with viscous coating mixtures having certain highly specialized characteristics. As one step in production of satisfactory coating mixtures for this purpose, it has been found desirable to screen the mixture prior to its application to the paper sheet, and the provision of efficient screening apparatus for this purpose has presented a serious problem to the art. These coating mixtures usually comprise a mixture of an adhesive, china clay, and a bright mineral, such as calcium carbonate or satin white. The coating mixtures in current use have a viscosity of the order of several hundred centipoises. In the screening operation, in addition to removing all foreign material such as grit, dirt, fibers, etc., all particles which are over a certain critical size should be removed. Usually it is considered necessary to remove all particles having a cross-sectional dimension greater than about .003 inch, and it is desirable to remove those having a cross-sectional dimension over .001 inch. If this is done, the surface of the finished paper can be formed free from surface defects and with the requisite over-all smoothness.

Heretofore, the usual method for screening such coatings has been to pass them through either a cartridge type filter or through a vibrating screen. Neither method is wholly satisfactory or wholly effective because the viscous character of the coating material being screened so reduces the rate of flow of the material that the screening mechanisms become uneconomically large if complete screening of the smaller size particles is to be effected. The flow rates and capacities of the present screening equipment can be increased by either reducing the solids content of the coating material, which is undesirable, or by increasing the size of the openings in the filter or screen, but this is also undesirable. If the solids content of the coating is greatly reduced, a poor-surfaced paper results, which has neither the desired opacity and printability nor a bright appearance. When the

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screen capacity is increased by enlarging the openings above the established critical sizes, objectionable materials inherent in the coatings are allowed to pass through the screen with similar impairment of the coated surface.

The principal object of the present invention, therefore, is to provide an improved, economically practical apparatus and method which will effect rapid and efficient screening of fine particles from fluid or semi-fluid materials of this character. A particular object is to provide apparatus adapted for the continuous screening of paper coatings wherein particles having a maximum cross-sectional dimension of .003 inch or less can be screened from the coating mixtures at very high rates of flow. Other objects and advantages of the invention will be clear upon reference to the following description and the accompanying drawings of one embodiment of the invention.

In the drawings:

Fig. 1 is a side elevational view of a continuous belt screen, in accordance with the invention;

Fig. 2 is an end elevational view of the apparatus illustrated in Fig. 1;

Fig. 3 is a diagrammatic, elevational view of the drive arrangement employed in the apparatus illustrated;

Fig. 4 is a side elevational view, partially in section, of a belt wipe adapted for use with the apparatus of Fig. 1;

Fig. 5 is an enlarged, cross-sectional view of the wiping blade and supporting tube which is a part of the belt wipe illustrated in Fig. 4;

Fig. 6 is a sectional view of a roll wipe adapted to remove materials from the belt rolls in the apparatus illustrated;

Fig. 7 is a sectional view of the rejection pan of the apparatus of the present invention; and

Fig. 8 is a sectional view of the air jet manifold which is provided for continuously cleaning the screen in the apparatus illustrated.

Generally stated, the screening process of the invention includes providing a pool of unscreened material at the nip formed between an arcuate surface and a screen having the desired dimensions while producing relative movement between the screen and the surface so as to cause the material being screened to pass through the screen. Means for wiping the surface of the screen may be provided along the line of contact of the screen and the surface to facilitate the removal of the screened material. This means may comprise a doctor blade or a wipe.

Various cleaning and recycling means may also be incorporated into the apparatus, so that close control of the size and purity of the screened particles can be maintained at all times. It will be apparent that various structures can be used to accomplish the method of the invention. These include: the continuous belt screen and roll combination, illustrated in the drawings, a vibrating screen and a stationary or rotating surface, a stationary screen and a reciprocating, rotating, or rocking surface, or a reciprocating screen and a reciprocating, rotating, or rocking surface.

The embodiment of the invention illustrated in the drawings, is especially adapted to the screening of paper coatings and like viscous materials which must be delivered in large volumes. For convenience, the usable material which passes through the screen will be hereinafter termed the "accepted" material, and the oversize material which does not pass through the screen will be termed the "rejected" material.

The apparatus generally includes a frame 11, a plurality of rolls 12, 13, 14, and 15 which are supported on the frame 11 for rotatable movement, an endless screen 17 disposed about the rolls as a belt, means for rotating the rolls at predetermined speeds, and means for introducing a pool of the material to be screened into one or more of the nips formed between the rolls 12, 13, and 14 and the screen 17. Means are also provided for removing accepted material from the screen 17 and for conducting away the rejected material. To overcome any tendency of the material being screened to clog the screen openings during operation, means are provided for continuously cleaning the screen 17.

The main frame 11 comprises a plurality of vertically extending supporting columns 19 which are connected by suitable horizontally extending members 21. The various elements of the frame 11 may, as illustrated, be fabricated from pipe members or they may be of any convenient structural shape. A pan 23, conveniently fabricated from sheet metal, is supported in the frame 11 under the apparatus, and serves to catch the accepted material which passes through the screen 17. The pan 23 slopes downwardly to a low point at one side of the apparatus, where it is connected to a suitable conduit 25 which is adapted to conduct the screened coatings to the coating rolls or press. In the apparatus illustrated, there is no provision for a cabinet or outer shell around the apparatus, but it will be understood that when certain types of materials are being screened a shell should be provided to prevent the material from splashing onto surrounding working spaces. The provision of a cabinet or shell also makes possible the maintenance of a high humidity about the screen so that the material being screened will not dry out.

The rolls 12, 13, and 14 are horizontally disposed and extend transversely across the frame 11. The rolls are journaled for rotatable movement into bearings 12a, 13a, and 14a, respectively, on the main frame 11. In the apparatus illustrated, three active screening rolls are shown, rolls 12, 13, and 14; the number of active screening rolls is limited only by the length of the screen belt 17, and additional rolls may be used to increase the capacity of the apparatus.

The screen 17 is a continuous, woven, wire belt which is disposed about the rolls, and is adapted to travel with them. The screen 17 may be of any desired mesh, having regard to the dimensions of

the particles to be screened, but it should be so fabricated that the bond between the butt ends of the screening wire used is smooth, so as to offer no projections which will interfere with the operation of the apparatus. Good screening has been obtained on a commercial embodiment of the apparatus with only a very small amount of screen wrap on its associated roll. However, the more wrap that can be obtained the better the screening action. While the apparatus herein illustrated employs a flexible wire screen to effect the size separation other equivalent screening mediums can be used, as for example a plastic screen, a perforated sheet, a cloth screen, or the like.

In the removal of particles which have cross-sectional dimensions over .003 inch, we prefer to use 160 mesh screen which has wires .00225 inch in diameter and screen openings .004 inch by .004 inch.

In the apparatus illustrated, the screen 17 is driven by the drive roll 13, which is the righthand screening roll in Fig. 1. The screening roll 12 on the lefthand end of the apparatus (Fig. 1) serves as a take-up roll 12, in order that the tension of the screen can be adjusted. To accomplish this function, the bearings 12a for the take-up roll 12 are supported upon vertically extending members 27, which are pivoted to brackets 29 on the main frame 11 by horizontally disposed, transversely extending, pins 31. The other ends of the pivoted members 27 are connected to brackets 33 on the main frame 11 by threaded members 35 which are operable, upon rotation, to move the bearings 12a and their associated roll 12 inwardly or outwardly in relation to the main frame 11. The threaded members 35 are provided with a hand wheel 37 for adjustment, and are protected from splashing liquid by a conventional rubber bellows 39.

The apparatus is driven by an electric motor 41, which is supported on a bracket 43 on the main frame 11. The motor 41 is connected to a chain drive, variable speed reducing unit 45 by means of a chain belt 47 (Fig. 3). The output shaft 48 of the reducing unit 45 is operatively connected to the drive roll shaft extension 13b by a suitable chain belt 49. Drive roll 13 is adapted to be driven at a rate which will move the screen over a range of from about 60 to 180 linear feet per minute. The take-up roll 12 rotates freely in its bearings 12a, and is driven by the screen belt 17.

The roll 14 on the lower run of the belt is termed the "intermediate roll," and its shaft 14b is adapted to be driven directly from the output shaft 48 of the reducing unit 45, which provides power for the drive roll 13. The intermediate roll 14 may be driven at either the same peripheral speed as the screen belt 17, or as in the illustrated apparatus, it may be driven at a higher peripheral speed with resultant increase in the capacity of the apparatus. In the illustrated apparatus the relative speeds of the intermediate and drive rolls may be in any desired ratio, the range of peripheral speed for the intermediate roll being from 100 to 300 feet per minute for drive roll speeds within the range of 60 to 180 feet per minute as specified above.

The guide roll 15 engages the upper run of the screen belt 17, and this roll is similar to the conventional felt guide rolls which are used on papermaking machines. The function of the guide roll 15 is to prevent side-play of the screen belt 17; and to accomplish this, it co-acts a palm and escapement control mechanism similar to that used in the conventional felt guide.

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This mechanism includes a counter-weighted palm 51 which is biased into contact with one edge of the moving screen belt 17. A bifurcated reciprocating member 53, driven from the roll shaft 15b by a pitman 54, is provided with a pawl 55 on each of its arms, and these pawls are adapted to act individually upon a ratchet wheel 57. The ratchet wheel 57 is rotatably supported on a threaded member 59 (Fig. 1) located on the frame 11 by means of a support bracket 60. Movement of the palm 51 is transmitted to the bifurcated member 53 by a rod linkage 61 so as to cause one of the pawls 55, depending upon the movement of the screen 17, to engage one side of the ratchet wheel 57. One side of the ratchet wheel 57 has teeth which effect clockwise movement, and the other side has teeth which effect counter-clockwise movement. The rotation of the ratchet wheel 57 on the threaded member 59 in response to movement of one of the pawls 55, thus effects slideable, longitudinal movement of the bearing on one end of the guide roll 15 relative to the frame 11 and this, in turn, re-aligns the screen belt 17 and disengages the pawl and ratchet wheel.

For delivering the coating material to the screen, distributing manifolds 63, 63a, and 63b, are provided adjacent the nips formed between the belt screen 17 and the surfaces of the take-up roll 12, the intermediate roll 14, and the drive roll 13. The manifolds furnish a constant supply of material to the screening nips. The manifolds comprise horizontally extending pipelines which are drilled with suitable holes and which are supported in fixed relationship to their associated roll, or they may comprise slotted troughs which are shaped to provide the required flow of material. The manifolds 63a and 63b are supported at each end on the frame 11 and the manifold 63 is supported on a pair of brackets 64 which are attached to the vertically extending members 27 which form a part of the take-up roll supporting and positioning means. The manifolds are supplied with material through suitable pipelines 65, and the flow of material is regulated by means of valves (not shown) so that the material being screened does not run over the edges of the screen 17 into the pan 23 which receives the accepted coating materials.

Screen or belt wipes 67, 67a, and 67b (Figs. 4 and 5) are provided adjacent each of the screening rolls, as illustrated in Fig. 1, for removing continuously accepted material from the screen. These wipes are each supported from the main frame 11 by a transversely extending rod or tube member 69. Each of the rods or tubes 69 is journaled into suitable bearings on the frame 11 for rotatable movement. A clamping arrangement 71 which is adapted to hold a wiping blade 73 made from rubber or any material which does not introduce excessive wear, is connected by web sections 75 to each of the tubes 69. The clamping arrangement is provided with a series of clamping bolts 77 so that the wiping blade 73 is easily removable. A quadrant gear 79 is attached to one end of each of the tubes 69 and this is actuated by a worm 81, controlled by a hand wheel 83. Each of the worms 81 and its associated hand wheel 83 is attached to the main frame 11, by means of a housing 85 so that rotation of the hand wheel 83 moves the quadrant 79 which in turn rotates the attached tube 69 in its bearings and thus forces the wiping blade 73 against the screen

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17 (Fig. 4). Each of the screen wipes is positioned adjacent one of the screening rolls 12, 13, and 14, so that the blades 73 engage the screen belt 17 along the line of contact of the screen belt 17 and the surface of the adjacent roll, thereby permitting maximum pressure to be applied to the screen 17 without possibility of injury to the screen.

Roll wipes 87 and 87a are provided on the upwardly moving side of the take-up roll 12 and the intermediate roll 14 (Fig. 1). Each of the roll wipes is of the edge type and comprises a wiping blade 89 which is fabricated from rubber or the like, and which is held in place by a clamping member 91 and a plurality of machine screws 93. The clamping member 91 of the roll wipe 87 is rigidly attached to the manifold 63 by means of a pair of clamping rings 94. The clamping member 91 of the roll wipe 87a is attached to a tube 95 which is journaled into suitable bearings (not shown) on the frame 11, as illustrated in Fig. 6, in the same manner as the tubes 69 which support the screen wipes 67. Counterweight arms 97 are attached to the tube 95 for the roll wipe 87a by means of set screws 99 (Fig. 6). The counterweight arms 97 are provided with a weight 101, which may be adjustably secured to the arm 97. By varying the position of the weights 101, the pressure of the blade 89 on the surface of the roll 14 may be increased and the cleaning action facilitated. The roll wipe 87 is held in fixed relation to the roll 12 by the manifold 63.

A save-all pan 103 is supported on the frame 11 in a position adjacent the point where the screen belt 17 moves away from the drive roll 13 (Fig. 7), at which point the screen belt 17 is washed, as will be hereinafter described. The save-all pan 103 is fabricated from sheet metal, and is supported from a transversely extending tube member 105 which is journaled for rotatable movement in pedestal bearings 107 at each side of the main frame 11. The tube 105 is provided with a plurality of slots 109 on each of its sides within the pan, so as to allow material flowing into the pan 103 to run out the end of the tube 105 into a disposal pipe 111. On the forward edge of the pan 103, end wipes 113 are provided for retaining material from flowing lengthwise of the roll 13, and these co-act with a doctor blade 115 which effects removal of material from the roll 13. The entire pan assembly is counter-weighted in a suitable manner such as by the arms 117 and weights 119, illustrated.

A plurality of water jets 121 are provided for washing and cleaning the screen 17. These extend transversely across the belt screen 17 in a position adjacent the location of the doctor blade 115. The water jets 121 are supplied from a suitable pipeline 123. At the upper end of the save-all pan 103, an air doctor 125 is provided, which effects the drying of the screen 17 after it is washed free of adhering materials by the water jets 121. This air doctor 125 prevents dilution of the coating materials being screened by wash water which might otherwise adhere to the screen 17. The air doctor 125 comprises a transversely extending tube member 127 in which is milled a longitudinally extending slot 129 (Fig. 8). Longitudinal stiffening members 131 are attached to the tube 127 adjacent the slot in the tube, and these are provided with orifice plates 133 which are adjustably bolted to the stiffening members 131 so that the intensity of the air blast

may be varied. The tube 127 is connected to a suitable source of pressure air by a conduit 135.

In one commercial embodiment of the invention adapted to screen paper coatings, a 160 mesh screen, as before described, having a width of 50 inches is disposed about three active screening rolls, a drive roll, a take-up roll, and an intermediate roll. The take-up roll and the drive roll are 18 inches in diameter and the intermediate roll is 12 inches in diameter.

During operation, the drive roll 13 is rotated at between about 13 and 38 R. P. M., by the motor 41. The coating material which is to be screened is pumped through the manifolds 63, 63a, and 63b. The coating first flows onto the take-up roll 12, where it rotates with the roll until it is forced through the screen 17 by the pressure exerted at the nip formed between the roll surface and the screen 17. The rejected or oversized materials follow around the roll 12 and are wiped off by the roll wipe 87 provided below the take-up roll manifold. The accepted material is removed from the belt 17 by the belt wipe 67 as at 137, and falls into the pan 23 from which it is continuously withdrawn through the conduit 25.

The rejected material from the take-up roll 12 falls back to the screen 17 and joins the unscreened material which flows onto the screen 17 from the press roll manifold 63a. The accepted material on the screen 17 at this point is forced through the screen 17 by the pressure exerted by the belt screen 17 at the roll 14, and is removed by the screen wipe 67a. The rejected material follows the roll 14 around until it is scraped from the roll by the edge wipe illustrated at 87a. The accepted material falls into the pan 23 and flows out through the conduit 25.

The rejected material from the roll 14 also falls back onto the screen 17, where it joins the unscreened material flowing onto the belt from the manifold at 63b. This material is screened at the nip between the screen belt and the drive roll 13, and the accepted material is removed from the belt by the belt wipe 67b and falls into the pan 23. The rejected material from all three rolls then follows around the drive roll 13 until it is removed by the doctor blade 115, aided by the spaced water jets 121. The cleaned screen 17 then passes through the air jet cleaner 125, which removes any water that may adhere to the screen. If the screen belt 17 develops side-movement at any time it is automatically re-aligned by means of the palm and escapement mechanism of the guide roll 15.

The installation and the renewal of the screen belts of the apparatus is facilitated by the inclusion of a pair of removable spacer blocks 137 in the frame 11 of the machine. The blocks 137 are located on one side of the frame in a position adjacent the lower run of the screen belt 17. When it is desired to remove or install a screen belt, the blocks 137 are removed and the screen belt is pulled outwardly over the ends of the rolls, and a new screen is inserted in its place.

The operation of continuous screening apparatus in accordance with the invention is typified by extremely high rates of flow and unusually accurate particle size separation. In a particular run of the commercial embodiment of the invention which has been described, the screen was operated at 120 linear feet per minute and the intermediate roll was operated at a peripheral speed of about 200 feet per minute. A typical paper coating being screened had a viscosity of about 100 to 200 centipoises and had a solids con-

tent of about 63 percent. During the run the coating mixture was screened at a rate of 85 gal. per minute and about 90 percent of the oversized material (cross sectional dimensions over .003 inch) was removed from the coating mixture, and only 0.4 percent of the acceptable material flowed out with the rejected or over-sized material.

The over-all capacity of the apparatus can be greatly increased if the intermediate roll 14 is operated at a peripheral speed that is greater than the linear speed of the screen belt 17, as before described. The difference between the speeds may be relatively large, provided the proportion of the oversized material is not excessive and the character of the material being screened is not such as to cause undue wear on the screen. A plurality of intermediate rolls may also be provided when it is desired to greatly increase the capacity of the existing apparatus, or when space requirements render it impractical to add more separate units of equipment.

The apparatus and method of the invention provide for the economical and efficient screening of liquid materials, and especially viscous materials, containing particles of differing cross sectional dimensions. The positive force which is applied to the material when it is engaged in the nip between the roll surface and the screen makes possible the rapid and efficient screening of viscous fluids such as paper coatings, and even permits the screening of pasty, semi-fluids such as paint pigments, printer's ink, toothpaste, and the like.

The arrangement of the rolls is not extremely critical, but we have found that the particular arrangement illustrated, which subjects the larger portion of the rejected material to more than one screening operation, is very effective for screening paper coatings. The rescreening of a major portion of the rejected material at subsequent nips maintains the percentage of acceptable coating material flowing out with the finally rejected material at a minimum.

The features of our invention that are believed to be new are expressly set forth in the appended claims.

We claim:

1. In apparatus for screening fluid materials, a roll, a wire belt screen supported for movement in contact with a portion of said roll, said screen contacting said roll along a line which extends across the entire width of said screen, means for moving said belt screen at a predetermined linear speed, means for tensioning said belt screen, means for rotating said roll, means for introducing the material to be screened into the nip formed between the surface of said roll and said belt screen, whereby the movement of said belt screen and said roll forces acceptable material of a size determined by the openings of said screen through said belt screen, a first wiping blade extending across said belt screen for removing acceptable material from said belt screen, said first wiping blade being in contact with said belt screen in a region where said belt screen is disposed about said roll, and a second wiping blade disposed in contact with the surface of said roll for removing material adhering to said roll.

2. In apparatus for screening fluid materials, a roll, a flexible wire belt screen supported for movement in contact with a portion of said roll, said screen contacting said roll along a line which extends across the entire width of said screen,

means for moving said belt screen at a predetermined linear speed, means for tensioning said belt screen, means for driving said roll at a peripheral speed at least as great as the linear speed of said belt screen, means for introducing the material to be screened into the nip formed between the surface of said roll and said belt screen, whereby the movement of said belt screen and said roll forces acceptable material of a size determined by the openings of said screen through said belt screen, a first wiping blade extending across said belt screen for removing acceptable material from said belt screen, said first wiping blade being in contact with said belt screen in a region where said belt screen is disposed about said roll, and a second wiping blade disposed in contact with the surface of said roll for removing material adhering to said roll, and means for cleaning the belt screen after each contact with said roll including a jet of fluid which is directed through the openings of said belt screen.

3. Apparatus for screening fluid materials comprising a frame, a plurality of horizontally extending, transversely disposed rolls rotatably supported on said frame, a flexible, endless screen disposed about said rolls as a belt, driving means, means connecting at least one of said rolls to said driving means for effecting movement of said screen, means for tensioning said screen about said rolls, means for forming a pool of the material being screened in the nip formed between said screen and the surface of one of said rolls, a first wiping blade for removing material which passes through said screen, and means for removing the material retained on said one roll upon each revolution thereof, including a second wiping blade engaged against said roll in such a position that the material removed from said roll falls back upon said screen and is carried between said screen and another of said rolls.

4. Apparatus for screening fluid materials comprising a frame, a plurality of horizontally extending, transversely disposed, generally parallel rolls rotatably supported on said frame, a flexible endless screen disposed about said rolls as a belt, having an upper and a lower run, rotatable means for driving at least one of said rolls, and one of said rolls being adjustable so as to tension said screen, means for forming a pool of the material being screened in the nip formed between said screen and the surface of at least one of said rolls, at least one transversely extending wiping blade contacting the lower run of said screen for removing material which passes through said screen, another wiping blade which engages the surface of the one of the plurality of rolls adjacent the beginning of the upper run of said belt screen, the material removed by said last mentioned wiping blade being the over-sized portion of the material being screened, and means for conducting said over-sized portion away from said last mentioned wiping blade.

5. Apparatus of the class described comprising a flexible, endless screen, means including a pair of spaced-apart, transversely extending, generally parallel rolls for supporting said screen as a belt, one of said support rolls being adjustable so as to adjust the tension in said belt screen, at least one intermediate roll, means for supporting said intermediate roll in contact with said belt screen, means for driving one of said support rolls to effect linear movement of said

screen, means for driving said intermediate roll with a surface speed at least equal to the linear speed of said screen, material inlets adjacent the nips formed between said screen and said supporting rolls and said intermediate roll, a first wiping blade engaged against said screen at a position on each of said rolls for removing the material which passes through said screen from the surface of said screen, means for collecting the material passing through said screen, and a second wiping blade engaged against the surface of one of said rolls and means for conducting the material collected by said second wiping blade away from the apparatus.

6. Apparatus of the class described comprising a flexible, endless screen, means including a pair of spaced-apart, horizontally disposed, transversely extending, generally parallel rolls for supporting said screen as a belt, one of said support rolls being adjustable so as to adjust the tension in said screen, at least one intermediate roll, means for supporting said intermediate roll in contact with said screen, means for driving one of said support rolls to effect linear movement of said screen, means for driving said intermediate roll with a surface speed greater than the linear speed of said screen, material inlets adjacent the nips formed between said screen and said supporting rolls and said intermediate roll, wiping means engaged against said screen at each of said rolls for removing accepted material from said belt screen, said wiping means being located over the area of contact between said rolls and said screen, means for collecting said accepted material, and means for continuously wiping the surfaces of said supporting rolls and said intermediate roll whereby material retained by said screen is removed from said apparatus.

7. Apparatus of the class described comprising a flexible, endless screen, means including a pair of spaced-apart, horizontally disposed, transversely extending, generally parallel rolls for supporting said screen as a belt, one of said support rolls being adjustable so as to adjust the tension in said screen, at least one press roll, means for rotatably supporting said press roll in contact with said screen, means for driving one of said support rolls to effect linear movement of said screen, means for driving said intermediate roll with a peripheral speed greater than the linear speed of said screen, material inlets adjacent the nips formed between said screen and said supporting rolls and said intermediate roll, wiping blades engaged against said screen at a position on each of said rolls for removing accepted material from said screen, means for collecting said accepted material, means for continuously wiping the surfaces of said supporting rolls and said intermediate roll whereby said material retained by said screen is removed from said apparatus, and means for cleaning said screen after each cycle of said apparatus including washing means extending transversely across said screen and drying means which includes an air blast directed on said screen at a point spaced from said washing means.

8. Apparatus for screening fluid materials comprising a frame, a pair of horizontally extending, transversely disposed, generally parallel rolls rotatably supported on said frame, a flexible endless screen disposed about said rolls as a belt having an upper and a lower run, rotatable means for driving at least one of said rolls, and one of said rolls being adjustable to tension said screen into driving engagement with said pair of

rolls, means for forming a pool of the material being screened in the nips formed between said screen and the surfaces of said rolls whereby said material will be moved between said screen and said roll surfaces, a pair of wiping blades contacting said screen, one of said blades being disposed adjacent each of said rolls for removing material which passes through said screen from the surface of said screen, and a second pair of wiping blades, each of said second pair of wiping blades engaging the surfaces of one of said rolls, and means associated with the wiping blade engaged against the surface of the roll which is adjacent the beginning of the upper run of said screen, for removing from the apparatus the material wiped from that roll, the wiping blade associated with the other of said rolls being positioned to deposit the material removed from the surface of that roll upon the lower run of said belt so that the material passes through the nip between said screen and the other of said rolls.

9. Apparatus for screening fluid materials comprising a frame, a pair of horizontally extending, transversely disposed, generally parallel rolls rotatably supported on said frame, a flexible endless screen disposed about said rolls as a belt having an upper and a lower run, rotatable means for driving at least one of said rolls, and one of said rolls being adjustable to tension said screen into driving engagement with said pair of rolls, means for forming a pool of the material being screened in the nips formed between said screen and the surfaces of said rolls whereby said material will be moved between said screen and said roll surfaces, a pair of wiping blades contacting said screen, one of said blades being disposed adjacent each of said rolls for removing material which passes through said screen from the surface of said screen, and a second pair of wiping blades, each of said second pair of wiping blades engaging the surfaces of one of said rolls, means associated with the wiping blade engaged

against the surface of the roll which is adjacent the beginning of the upper run of said screen for removing from the apparatus the material wiped from that roll, the wiping blade associated with the other of said rolls being positioned to deposit the material removed from the surface of that roll upon the lower run of said belt so that the material passes through the nip between said screen and the other of said rolls, and means for cleaning said screen after each cycle of said apparatus, said cleaning means being located along the upper run of said screen and including a washing means which extends transversely across said screen and drying means which includes an air blast directed against said screen at a point spaced from said washing means.

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