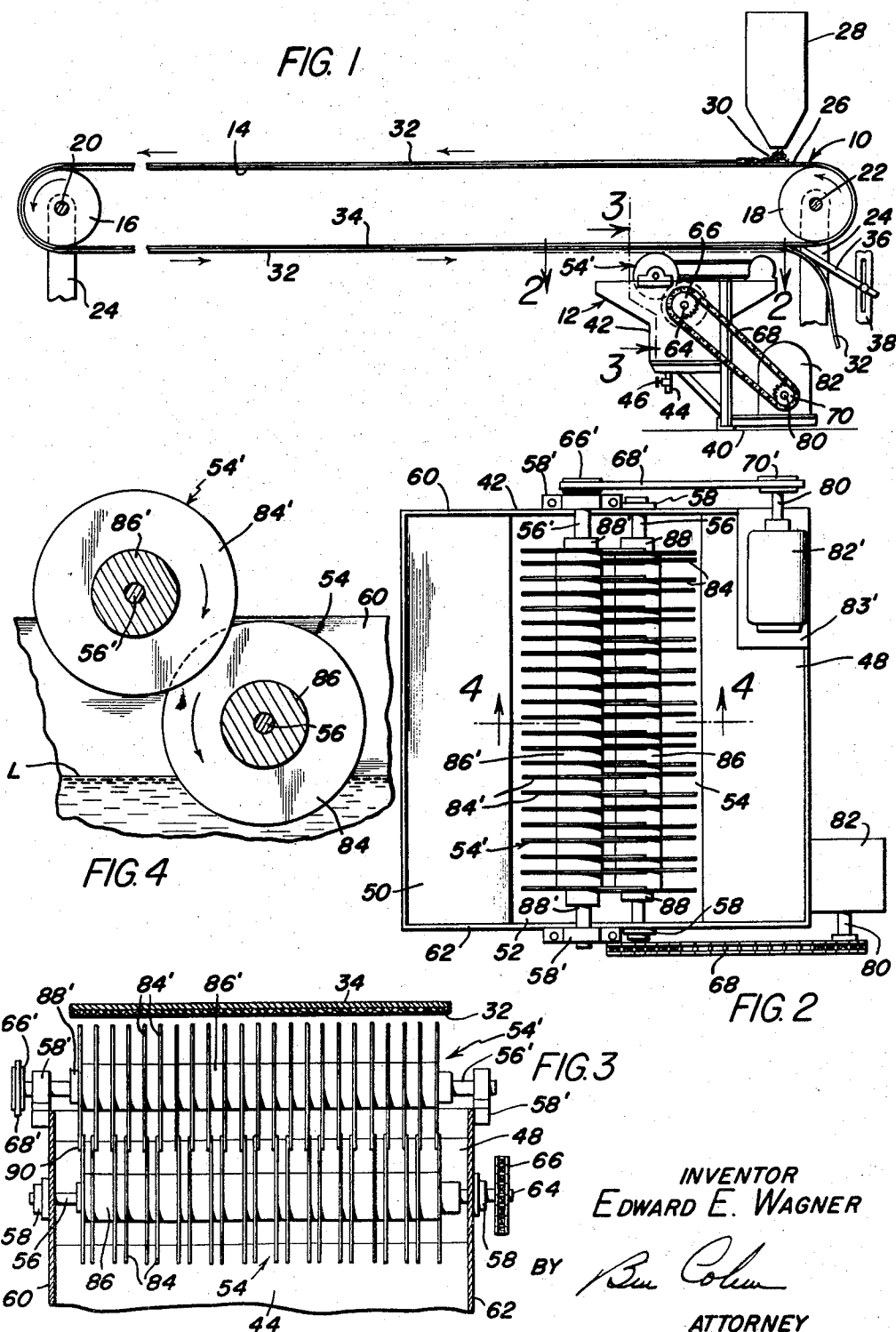


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LIQUID TREATMENT APPARATUS FOR
CONTINUOUS WEB PRODUCTS
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LIQUID TREATMENT APPARATUS FOR CONTINUOUS WEB PRODUCTS

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This invention relates generally to forming a continuous web of material from a slurry wherein the web of material being produced must be dehumidified or treated with a liquid additive.

This invention has general application for treating various continuous web products, being adaptable, for example, with "Fourdrinier" type apparatus used for forming a continuous web from pulp in the paper making art.

A primary object of the invention is to provide liquid treatment apparatus which may be readily controlled, is easily maintained and highly efficient and satisfactory for the purpose intended.

Another object of this invention is to provide liquid treatment apparatus including means for distributing a predetermined amount of treatment liquid to a continuous web of a slurry-formed material or the like, the means being substantially self cleaning and readily repaired and replaced.

A further object of this invention is to provide liquid treatment apparatus especially adapted for use beneath a continuous moving web product, the apparatus comprising upper and lower rotor assemblies including axially spaced disk elements, the disk elements of the respective rotor assemblies being interdigitated as cooperating pairs and rotated at different speeds, the lower disk elements serving to pick up liquid by surface tension on the sides thereof, and the upper disk elements transferring the liquid from the lower disk elements and centrifugally discharging the liquid toward an overhead moving web of the material being treated.

More particular objects of the invention will become apparent from the reading of the following description of the preferred embodiment, the appended claims and the accompanying drawing, in which:

Figure 1 is a fragmentary side elevation view showing the liquid treatment apparatus in relation to equipment for forming a continuous web product;

Figure 2 is an enlarged horizontal plan view taken substantially on line 2—2 of Figure 1;

Figure 3 is an enlarged fragmentary vertical section taken substantially on line 3—3 of Figure 1; and

Figure 4 is a further enlarged vertical section taken substantially on line 4—4 of Figure 2, showing the manner in which liquid is distributed by the apparatus.

Referring to the drawing in detail, indicated generally at 10 in Figure 1 is apparatus for forming a continuous web product to be treated by liquid additive by means of liquid treatment apparatus indicated generally at 12.

The web forming apparatus comprises an endless belt 14 of a relatively thin flexible metal, for example, journaled at opposite ends over suitable support rollers 16 and 18, the axes of rotation of which being parallel. The rollers 16 and 18 respectively incorporate longitudinal support shafts 20 and 22 suitably supported at opposite ends in vertically extending supports 24.

Overlying the upper run 26 of the belt 14 is a downwardly opening supply hopper 28 which will contain a

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slurry of material to be deposited as indicated at 30 on the upper surface of the upper run 26, the rate of discharge from the hopper being controlled in any suitable manner. The material 30 will form a continuous web 32 and adhere to the belt to be exposed at the under side of the bottom run 34 of the belt. The continuous web material may be treated by heat, for example, as it moves with the belt and may require rehumidification before it is removed from the belt, or it may be desirable to treat the continuous web material with a liquid additive, for example, for the purpose of providing a particular flavor to the product.

The liquid treatment apparatus 12 operates in a manner to be subsequently described in detail, and after the continuous web material 32 has been treated by the apparatus 12 it is stripped from the bottom run 34 of the endless belt 14 by means of a suitable transverse stripper blade 36 vertically, pivotally adjustable in a suitable support 38.

The apparatus 12 comprises a support base 40 including an upwardly opening tank 42 which will contain the treatment liquid. The tank 42 incorporates a discharge pipe 44 controlled by a valve 46 to facilitate the draining and cleaning of the tank. The tank 42 extends transversely beneath the bottom run 34 of the continuous belt including converging transverse end portions 48 and 50, see Figure 2, draining into a central section 52.

Indicated generally at 54 is a liquid-pickup rotor extending transversely of the central section 52 of the tank and functioning in a manner to subsequently become apparent. The rotor 54 includes a suitable support shaft 56 journaled at opposite ends in aligned suitably sealed bearings 58 on the sidewalls 60 and 62 of the tank 42. One end of the shaft 56, as indicated at 64, has keyed thereon a driven gear 66 over which is entrained an endless drive chain 68, the opposite end of the chain being entrained over a driving gear 70. The gear 70 is mounted on a drive shaft 80 projecting laterally from suitable variable speed power unit 82 carried on the support base 40. Mounted on the shaft 56 of the rotor are a plurality of longitudinally and equidistantly spaced pairs of relatively thin disk elements 84 and clamping nuts 88. The pairs of elements 84 are separated by spacer elements 86. As seen in Figure 4, approximately one quarter of the disk elements 84 will be immersed in liquid additive L, and the rotor 54 will be rotated at a suitable speed by the power unit 82 through the medium of the drive chain 68 whereby a portion of the liquid additive remains on the sides of the disk elements 84 as the disk elements are rotated in a counter clockwise direction, for example. Although the disk elements 84 are illustrated as being rotated counterclockwise, the rotor will function to pick up the liquid additive if rotated in a clockwise direction, the liquid additive being sufficiently thick and having sufficient surface tension to permit such function. Excess liquid additive will drain back into the tank 42.

Indicated generally at 54' is a liquid distributing rotor. The rotor 54' includes a support shaft 56' disposed in parallel relationship above the shaft 56 of the rotor 54 at approximately 45°. Opposite ends of the shafts 56' are journaled in suitable bearings 58' mounted on the sidewalls 60 and 62. Suitably keyed on one end of the shaft 56' is a driven pulley 66' over which is entrained a flexible endless drive belt 68', the other end of which being entrained over a drive pulley 70' secured on a laterally extending drive shaft 80' of motor unit 82'. The motor unit 82' is carried on a suitable support plate 83' mounted on the upper edge of the tank 42. The rotor 54' comprises a plurality of longitudinally and equidistantly spaced disk elements 84' retained in spaced relationship by means of suitable spacer elements 86' and clamp nuts 88'.

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As most clearly seen in Figure 3, the disk elements 84 and 84' are disposed as adjacent overlapped pairs, there being approximately a 25% radial overlapping between the adjacent pairs. As indicated at 90, see Figure 3, the adjacent pairs of cooperating disk elements 84 and 84' are in spaced relationship. The upper disk elements 84' preferably rotated in a clockwise direction as indicated in Figure 4, but they may be rotated in a counterclockwise direction, and the liquid additive L will be circumferentially cast to the exposed under surface of the continuous web material 32. The variable speed motor unit 82 may be controlled for increasing or decreasing the amount of liquid additive to be transmitted to the distributing rotor and subsequently discharged. Considering Figure 4, rotation of the disk element 84 will pick up a film of the liquid additive on its exposed sides and carry the same toward a cooperating portion of the upper disk element 84'. The upper disk elements 84' will rotate at a greater speed than the lower disk elements and will receive the liquid additive therefrom and centrifugally cast it toward the endless web material 32.

The disk elements moving in the manner indicated for the purpose of discharging the liquid additive will be substantially self-cleaning and thus will keep maintenance and shut-down periods at a minimum. The upper or discharge rotor 54' is disposed in offset relationship from the lower rotor 54 facilitating the independent removal of the rotors, thus improving maintenance and repair of the apparatus.

The construction as shown embodies the invention in a preferred form, but it is intended that disclosure be illustrative rather than definitive, the invention being defined in the claims.

What is claimed as new is as follows:

1. Liquid treatment apparatus comprising a supply tank for a liquid additive, a liquid pick-up rotor assembly having axially spaced disks arranged to contact the liquid, a liquid distributing rotor assembly having spaced disks interdigitated with the disks of said pick-up rotor assembly and in laterally liquid film contacting relation therewith, and drive means for rotating said rotors, said distributing rotor being rotated at a speed to cast liquid centrifugally radially from the disks.

2. Liquid treatment apparatus as set forth in claim 1 in which the drive for said pick-up rotor assembly embodies a variable speed means for controlling the rate of liquid feed to said distributing rotor assembly.

3. Liquid treatment apparatus as set forth in claim 1 in which the axes of rotation of the rotor assemblies are parallel and that of the distributing rotor assembly is offset both horizontally and vertically upwardly from the axis of the pick-up rotor assembly.

4. Liquid treatment apparatus comprising a supply tank for a liquid additive, a liquid pick-up rotor assembly having axially spaced elements arranged to contact

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the liquid, a liquid distributing rotor assembly having spaced elements interdigitated with the elements of said pick-up rotor assembly, the overlapping surface areas comprising radially flat annular bands with the surface areas on one rotor assembly in liquid film contacting relation with the areas on the other rotor assembly, and drive means for rotating said rotors, said distributing rotor being rotated at a speed to cast liquid centrifugally radially from the disks.

5. Liquid treatment apparatus comprising a supply tank for a liquid, a liquid pick-up rotor assembly having a plurality of axially spaced disks arranged to dip into the liquid, a liquid distributing rotor assembly having a plurality of axially spaced disks, means for rotating each of the rotor assemblies, the rotors being arranged adjacent with the respective disks on the rotor assemblies overlapping for a substantial distance radially and arranged closely adjacent at the overlapping area for liquid film transfer from the pick-up rotor assembly to the distributing rotor assembly.

6. Liquid treatment apparatus comprising a supply tank for a liquid, a liquid pick-up rotor assembly having a plurality of axially spaced circular members arranged to dip into the liquid, a liquid distributing rotor assembly having a plurality of axially spaced circular members, means for rotating each of the rotor assemblies, the rotors being arranged adjacent with the respective members on the rotor assemblies overlapping for a substantial distance radially and having flat complemental surfaces arranged closely adjacent at the overlapping area for liquid film transfer from the pick-up rotor assembly to the distributing rotor assembly.

7. Liquid treatment apparatus comprising a supply tank for a liquid, a liquid pick-up rotor assembly having a plurality of axially spaced circular members arranged to dip into the liquid, a liquid distributing rotor assembly having a plurality of axially spaced circular members, means for rotating each of the rotor assemblies, the rotors being arranged adjacent with the respective members on the rotor assemblies overlapping for a substantial distance radially and having flat complemental surfaces arranged closely adjacent at the overlapping area for liquid film transfer from the pick-up rotor assembly to the distributing rotor assembly, the flat surfaces on each rotor being arranged in pairs with each pair on one rotor positioned between a complemental pair of flat surfaces on the other rotor.

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