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PROCESS AND APPARATUS FOR THE WET-TREATMENT OF LOOSE FIBROUS MATERIAL

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U.S. Cl. 8—156 21 Claims

ABSTRACT OF THE DISCLOSURE

The present disclosure relates to a process and apparatus for the wet-treatment of loose fibrous material, particularly to a method and apparatus for scouring raw wool. The apparatus of the present disclosure comprises a liquid container containing a treatment bath, means for introducing the fibrous stock into the liquid container, a first conveying element disposed in the liquid container at the inlet, said first conveying element being partially immersed in the treatment bath, a second conveying element disposed in the liquid container at the outlet and partially immersed in the treatment bath, said second conveying element being perforated to permit the treatment liquid to flow from the treatment bath to the inside of said second conveying element, means for returning the treatment liquid drawn into the perforated conveying element to the liquid container at the inlet, thereby producing in the liquid container a flow in the direction of material passage and means for removing the material being treated from the liquid container.

BACKGROUND OF THE INVENTION

The present invention relates to a process and apparatus for the wet-treatment of loose fibrous material, particularly to a process and apparatus for scouring raw wool. The apparatus of the present invention comprises a liquid container in which conveying elements are disposed, the treatment liquid flowing through at least one of said elements, said container containing a floating distance which is provided between the conveying elements.

The well known raw wool scouring machines consist essentially of about five treatment bowls. The first one serves for wetting the wool and generally contains only sodium carbonate or another wetting agent, but no detergent. The following two to three bowls serve for scouring the wool. Here the dirt is washed out of the wool and in addition, the wool is degreased. The last bowl serves for rinsing purposes. Between the individual bowls squeezer means are arranged to dehydrate the wool when it is conveyed from one bowl to the next bowl.

In the well known raw wool scouring bowls the wool is generally transported through the bowls by means of rakes. This incorporates the disadvantage that tails of wool are formed on the rakes which result in wool fiber breakage when the wool is opened up. Apart from the tail formation, a pronounced felting of the wool is encountered in well known rake leviathans due to the turbulence of the scouring liquor produced by the rake movements.

In order to obtain a more gentle transportation of the wool it has already been suggested to use sieve drums subjected to a suction draft, said sieve drums being partially immersed in the treatment liquid. The liquid drawn in by the sieve drum is discharged out of the drum at its face and is returned into the treatment bowl underneath a perforated intermediate bottom. With these devices the top-to-noil ratio is improved in an amount up to about 3% as compared with the well known rake leviathans.

SUMMARY OF THE INVENTION

An object of the present invention is to avoid the prior art disadvantages in the wet-treatment of loose fibrous stock.

Another object of the present invention is to provide an improved process and apparatus for the wet-treatment of loose fibrous stock, particularly for scouring raw wool wherein the wool is conveyed in the treatment bath in a gentle manner and providing at the same time a good dirt separation from the wool and a rapid settling of said dirt.

A further object of the present invention is to provide an improved process and apparatus for the wet-treatment of loose fibrous stock wherein optimum contact of the material being treated with the treatment liquid is ensured while at the same time producing a flow of the treatment liquid in the direction of material passage.

Other objects and further scope of applicability of the present invention will become apparent from the detailed description given hereinafter; it should be understood, however, that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

Pursuant to the present invention, it has been found that the above-mentioned disadvantages may be eliminated and a much improved process and apparatus for the wet-treatment of loose fibrous stock may be obtained by providing a liquid container which is subdivided by means of a perforated intermediate bottom into an upper trough-like treatment zone and a lower dirt sediment zone. At the inlet of the treatment zone a conveying element, for example a paddle roller, a suction drum or a conveyor belt, which partially immerses in the treatment liquid is arranged for immersing the fibrous material. At the discharge end of the treatment zone a discharge element, for example a conveyor belt, a suction drum or a sieve roller is arranged. The treatment liquid flows through the discharge element from the outside to the inside thereof and the liquid which is discharged by the discharge element is returned to the inlet of the liquid container. By returning the liquid which is discharged at the end of the liquid container to the inlet of said container, a flow from the inlet to the discharge end of said container is produced in the treatment zone which enables the loose fibrous material, particularly raw wool, to float freely in the treatment liquid. Thus the dirt particles adhering to the wool are soaked and can detach from the wool and settle down into the dirt sediment zone. Since there is no liquid motion in the dirt sediment zone, settling of the dirt at the bottom of the container is readily facilitated. The scouring effect is particularly good at the discharge element since at this point the fibrous material is intensely penetrated by the treatment liquid. Because of the liquid penetration from the outside to the inside of the discharge element, a uniform fleece is formed at the discharge element thereby permitting a uniform squeezing of the material, for example wool.

Depending on the fibrous material used, for example on the type of wool being treated, and depending on the required capacity, a certain flow speed through the treatment bowl (liquid container) is required for a proper transportation of the wool in the treatment liquid. In order to render it possible to change the flow in the treatment zone and thus to adapt it to the desired conditions, it is suggested to vary the liquid quantity which is removed from the discharge element and to control the liquid flow for the transportation of the fibrous material in the treatment zone by means of the amount of liquid

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CERTIFICATE OF CORRECTION

Patent No. 3,509,587 Dated May 5, 1970

Inventor(x) Irving Fins

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, line 33, "a" should read --as--.

Column 3, line 56, "as" should read --are--.

Column 4, line 48, (Claim 1) "itured" should read --inturned--;

line 49, "tio" should read --tion--;

line 57, after "outer" the word --upper-- should be inserted.

SIGNED AND
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(SEAL)
Attest:

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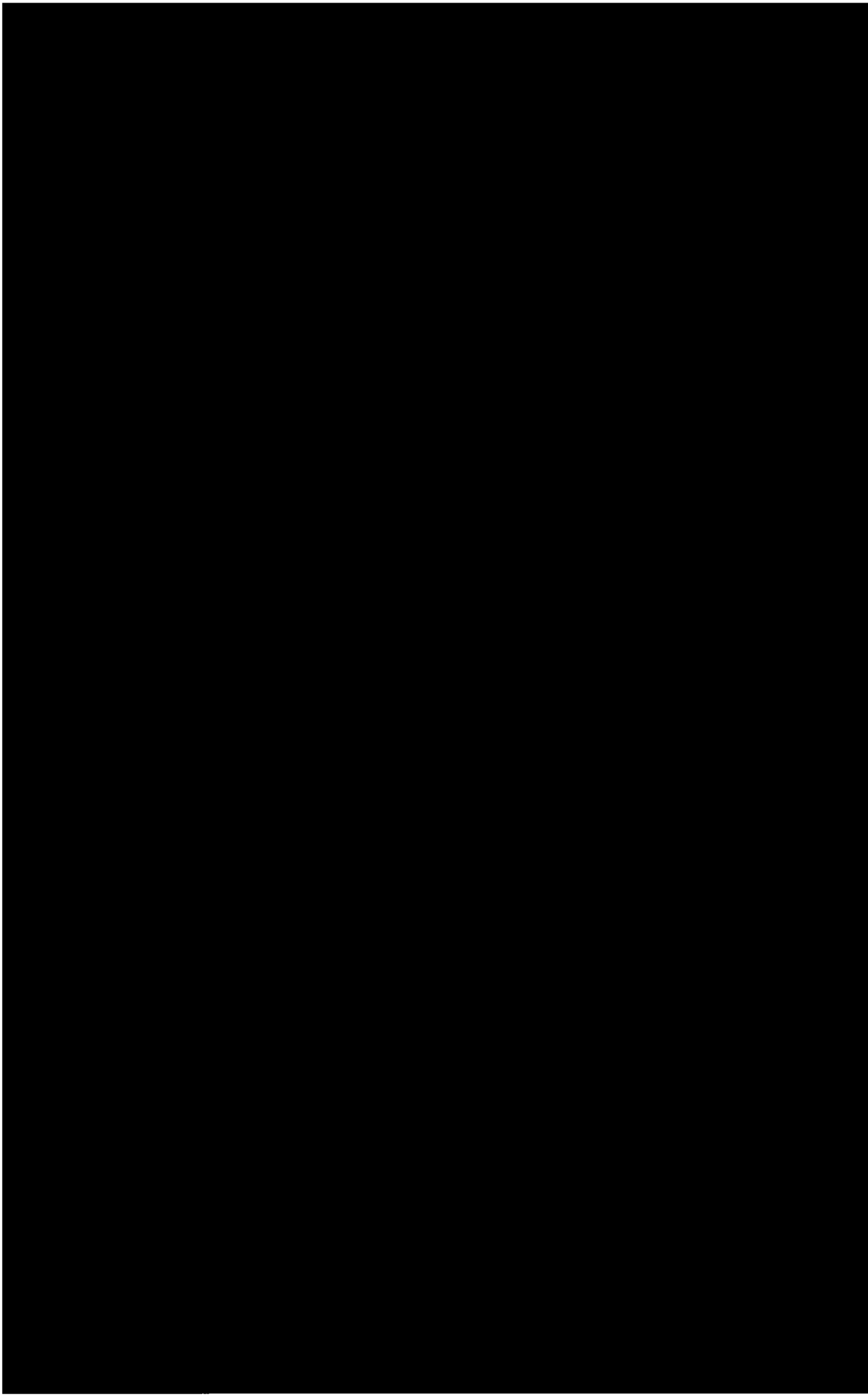

to FIGURE 3, a sieve roller **22** is provided as a discharge element which is connected with the collecting container **14** by means of a conduit **10** so that in this case also the treatment liquid flows through the sieve roller **22** due to the differential liquid level. Instead of using a sieve roller through which the liquid flows due to the difference in the liquid level, a suction roller can also be used in which one or several pumps are arranged for producing the suction draft.

In the embodiment of the present invention according to FIGURE 4, the bottom roller **19** of the squeeze rollers **15** is again perforated and used as a discharge element. In this design no installations whatsoever are required in the roller **19**. The liquid flows through the roller **19** solely due to the level difference between the treatment liquid in the treatment zone **3** and the treatment liquid in the collecting container **14**. To the collecting container **14** a pump **23** is correlated which returns the liquid to the inlet of the liquid container through a conduit **24**. According to the capacity of the pump **23** the level difference between collecting container **14** and treatment zone **3** and thus also the liquid quantity which flows through the roller **19** can be regulated.

The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention and all such modifications are intended to be included within the scope of the following claims.

It is claimed:

1. An apparatus for the wet-treatment of loose fibrous stock which comprises a liquid container containing a treatment bath, means for introducing the fibrous stock into the liquid container, a suction drum as a first conveying element disposed in the liquid container at the inlet, said first conveying element being partially immersed in the treatment bath, a second conveying element disposed in the liquid container at the outlet and partially immersed in the treatment bath, said second conveying element being perforated to permit the treatment liquid to flow from the treatment bath to the inside of said second conveying element, means for returning the treatment liquid drawn into the perforated conveying element to the liquid container at the inlet, thereby producing in the liquid container a flow in the direction of material passage and means for removing the fibrous stock from the liquid container.

2. The apparatus of claim **1**, wherein the conveyor belt is provided with a discharge roller at its discharge end, said discharge roller being a perforated roller provided with a suction means which draws the treatment liquid through the conveyor belt and into one side of the discharge roller and discharges it on the other side of said roller through the discharge end of the conveyor belt.

3. The apparatus of claim **2**, wherein the second conveying element comprises a perforated roller which acts as a bottom roller and cooperates with an upper roller to form a pair of squeeze rollers as the discharge element, said perforated roller containing a baffle means disposed in said rollers below the liquid level to interrupt the flow from the container into the roller, said baffle means supporting a swivel sheet which, by its position, varies the level difference between the liquid in the container and the liquid in the roller thereby controlling the quantity of liquid flowing through the roller.

4. The apparatus of claim **3**, wherein the perforated roller of the second conveying element is associated with a collecting container and a pump means is provided to pump the treatment liquid from said collecting container to the inlet of the liquid container.

5. The apparatus of claim **2**, wherein the second conveying element comprises a sieve roller disposed in front of outlet squeeze roller means, said second conveying element communicating with a collecting container outside of the liquid container by conduit means.

6. The apparatus of claim **1**, wherein the second conveying element comprises a perforated conveyor belt disposed in front of outlet squeeze roller means.

7. The apparatus of claim **6**, wherein a substantial portion of the conveyor belt obliquely extends out of the treatment bath in the direction of material passage thereby providing a conveying surface above the level of the treatment liquid.

8. The apparatus of claim **7**, wherein a suction box communicates with the interior of the conveyor belt below the surface of the treatment liquid and a collecting container is disposed below the squeeze roller means outside of the liquid container, said suction box being connected to the collecting container by conduit means.

9. The apparatus of claim **1**, wherein the second conveying element comprises a perforated roller which acts as a bottom roller and cooperates with an upper roller to form a pair of squeeze rollers as the discharge element, said perforated roller being associated with a collecting container which is provided with a pump means which conveys the treatment liquid through conduit means back to the inlet of the liquid container.

10. An apparatus for the wet-treatment of loose fibrous stock which comprises a liquid container containing a treatment bath, a perforated intermediate bottom means which subdivides the liquid container into an upper trough-like treatment zone and a lower dirt sediment zone, inlet means for introducing the material to be treated into the liquid container, a paddle roller means disposed in the liquid container at the inlet, said paddle roller means partially immersed in the treatment bath, a perforated conveyor belt disposed at the outlet of the liquid container means, a substantial portion of the conveyor belt obliquely extending out of the treatment bath in the direction of material passage, thereby providing a conveying surface above the level of the treatment liquid, a suction box communicating with the interior surface of the conveyor belt below the surface of the treatment liquid, a collecting tank disposed outside of the liquid container, conduit means connecting the suction box to the collecting container, means for conveying the treatment liquid from the collecting container to the inlet of the liquid container and outlet squeeze roller means disposed above the collecting tank for removing the material from the liquid container.

11. The apparatus of claim **10**, wherein a perforated sheet is disposed at the inlet of the liquid container thereby ensuring that the treatment liquid which is conveyed from the collecting tank back to the liquid container is uniformly distributed over the entire working width of said liquid container.

12. The apparatus of claim **11**, wherein the liquid container has an oblique bottom.

13. The apparatus of claim **12**, wherein a worm conveyor and a sludge removal valve are located at the lowest portion of the liquid container.

14. An apparatus for the wet-treatment of loose fibrous stock which comprises a liquid container containing a treatment bath, a perforated intermediate bottom means which subdivides the liquid container into an upper trough-like treatment zone and a lower dirt sediment zone, inlet means for introducing the material to be treated into the liquid container, a perforated conveyor belt disposed in the liquid container at the inlet, a substantial portion of the conveyor belt obliquely extending into the treatment bath in the direction of material passage thereby providing a conveying surface beneath the level of the treatment liquid, a perforated roller disposed in the conveyor belt at its discharge end, said roller provided with a suction means which draws the treatment liquid through the conveyor belt, into one side of the discharge roller and discharges it out the other side of said roller through

he discharge end of the conveyor belt, a perforated roller isposed at the outlet of the liquid container, said perfoated roller acting as a bottom roller and cooperating vith an upper roller to form a pair of squeeze rollers as he discharge element, said perforated roller containing a neans for varying the level difference between the liquid n the container and the liquid in the perforated roller hereby controlling the quantity of liquid flowing through aid roller, a collecting container associated with the erforated roller and a pump means for conveying the reatment liquid from the collecting container to the inlet of the liquid container.

15. The apparatus of claim **14**, wherein a perforated sheet is disposed at the inlet of the liquid container thereby nsuring that the treatment liquid which is conveyed from he collecting tank back to the liquid container is uniformly distributed over the entire working width of said iquid container.

16. The apparatus of claim **15**, wherein the liquid container has an oblique bottom.

17. The apparatus of claim **16**, wherein a worm conveyor and a sludge removal valve are located at the lowest portion of the liquid container.

18. A method for the wet-treatment of loose fibrous stock which comprises introducing said material into a iquid bath containing a treatment liquid, conveying the naterial beneath the surface of the treatment liquid on he surface of a conveying element, floating the material or a distance on the surface of the treatment liquid, reoving the material from the treatment bath on the surface of a conveying element, removing a portion of the reatment liquid from the material and from the treatnent bath by means of a suction draft and returning said

treatment liquid to the inlet of the treatment bath thereby producing a liquid flow in the direction of material passage.

19. The method of claim **18**, wherein the material is subsequently squeezed to further remove the treatment liquid from the material.

20. The method of claim **18**, wherein the treatment liquid is partially removed from the material and from the treatment bath by means of the difference in liquid level in the conveying element and in the treatment bath.

21. The method of claim **18**, wherein the material conveyed beneath the surface of the treatment liquid is held to the surface of the conveying element by a suction draft which draws the treatment liquid through the material being treated on one side of the conveying element and discharges said liquid on the other side of the conveying element thereby discharging the material from said conveying element into the treatment bath.

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