United States Patent [19]

Fleissner

[11] **3,742,737**

[45] **July 3, 1973**

[54] **DEVICE FOR THE TENSION-FREE WET TREATMENT OF TEXTILE MATERIAL LENGTHS**

[75] Inventor: **Heinz Fleissner**, Egelsbach, Germany

[73] Assignee: Vepa AG, Basel, Switzerland

[22] Filed: **May 4, 1971**

[21] Appl. No.: **140,029**

[30] **Foreign Application Priority Data**

May 4, 1970 Germany ..... P 20 21 699.3
Mar. 19, 1971 Germany ..... P 21 13 473.6

[52] **U.S. Cl.** ..... **68/177**, 68/DIG. 5, 68/22 R, 68/208

[51] **Int. Cl.** **B05c 3/134**

[58] **Field of Search** ..... 68/158, 177, 178, 68/179, DIG 5, 22 R, 208; 226/44; 242/75.3; 8/151

[56] **References Cited**

UNITED STATES PATENTS

3,374,646	3/1968	Fleissner	68/177 X
2,663,177	12/1953	Hanhart	68/177 X
3,555,857	1/1971	Fleissner	68/22 R

FOREIGN PATENTS OR APPLICATIONS

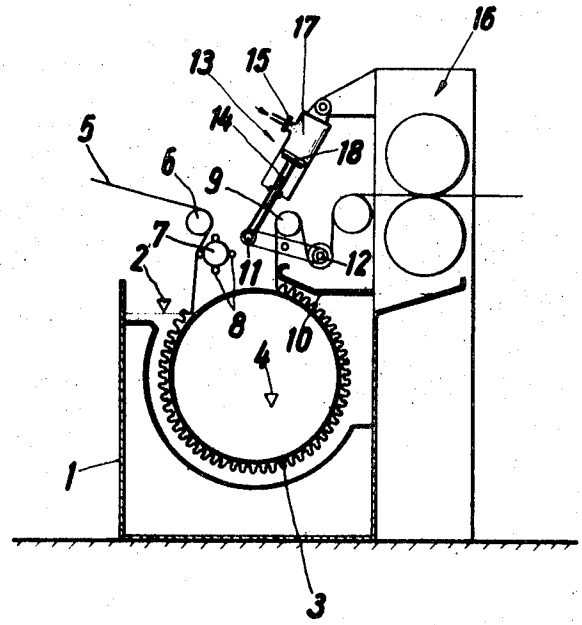
671,970	5/1952	Great Britain	68/177
1,206,510	8/1959	France	68/158
723,037	12/1965	Canada	242/75.3

Primary Examiner—William I. Price
Assistant Examiner—Philip B. Coe
Attorney—Craig, Antonelli & Hill

[57] **ABSTRACT**

A device for effecting tension-free wet treatment of textile material lengths (e.g., sheets, webs or the like continuous material) which comprises a wash bowl containing a predetermined level of processing liquor, a rotating perforated drum at least partially immersed in the processing processing liquor, and guide means for feeding the textile material as wave-like plaits onto the perforated drum and for removing the plaits from the drum. The guide means includes a beating device for forming the textile material into the wave-like plaits on the perforated drum. This device contacts the textile material above the level of liquor in the bowl, and the drum rotates at a speed which is lower than the speed at which the textile material is fed into the bowl onto the drum.

9 Claims, 2 Drawing Figures



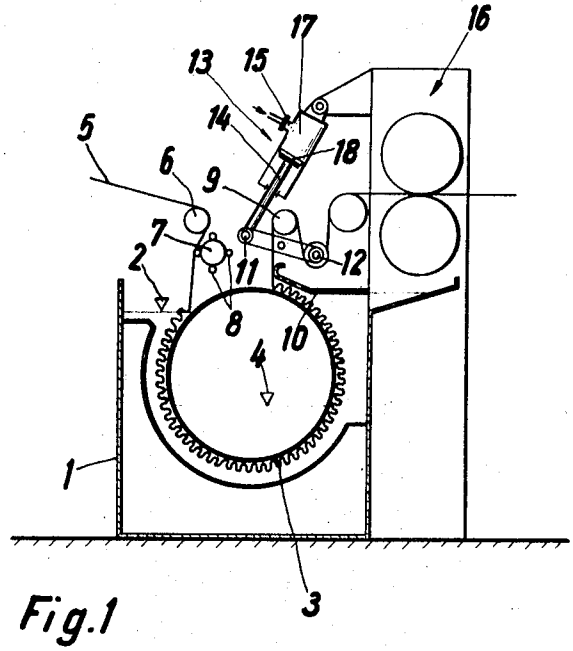


Fig.1

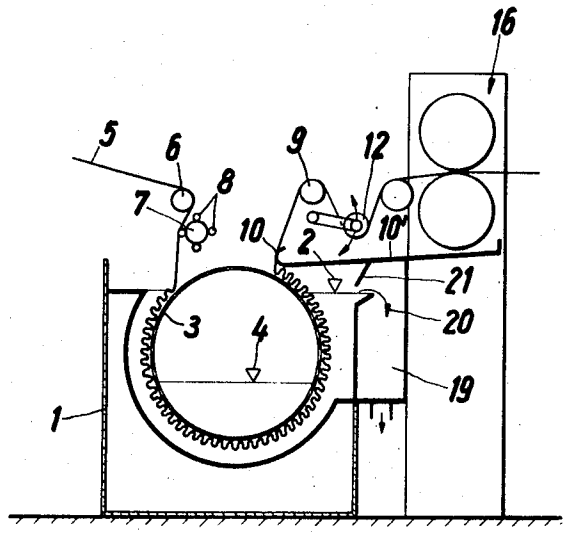


Fig.2

Inventor:

DR. HEINZ FLEISSNER

By Craig, Antonelli & Hill
ATTORNEYS

DEVICE FOR THE TENSION-FREE WET TREATMENT OF TEXTILE MATERIAL LENGTHS

The present invention relates to a device for effecting a tension-free wet treatment of textile material lengths such as woven fabrics, knitted fabrics, and non-wovens of natural and/or synthetic fibers, and more particularly to such a device wherein means are provided for directing the textile material to be treated in the form of waves over a perforated drum partially submerged in a process liquor in a wash bowl.

Depending on the characteristics which the processed knitted goods or fibrous webs are to have, fibers may be added to, or employed in the weaving of the textile material, which shrink under the influence of heat. However, the tendency of these types of textile materials to shrink is due not only to the added shrinking fibers but is also due to their structure, i.e., the way in which the individual fibers are incorporated or made into the fabric. In order to obtain the required voluminosity and textile feel of the finished goods the textile materials have to be completely shrunk both in width and length. It has been previously suggested to effect this shrinking process by using perforated drums through which a hot treatment medium flows from the outside to the inside. This type of washing device has been found to be very satisfactory indeed. The textile material is thus intensively penetrated by the treatment medium; all fibers come into close contact with the medium and any residual shrinkage of the material is eliminated.

With this process, it is absolutely necessary that the textile material be exposed to the processing liquor while resting on the rotating drum in such a condition that it may freely shrink both in width and length.

German patent application Ser. No. P 20 21 699.3 suggests that the use of a device which ensures the obtainment of an appropriate widthwise material overfeed. This device consists of two rows of pleating disks which are mounted at a certain distance from each other and which serve to bring the material length into wave-like form before entering a treatment bowl. According to the degree of shrinkage, the material may also be fed into the bowl at a speed that is higher than the speed at which the perforated drum transports the material forward. This speed difference can be varied as desired.

Especially with knitted goods, it is advisable to subject the knitted textile material to a heat treatment without any tension at all. Also, it may be necessary to let the material dwell in the treatment bowl for a relatively long period in order to prolong the reaction time of the processing medium. This is especially important with a solvent process which is carried out at very high speeds while, chemically, the solvent requires a certain period for reacting with the fibrous material. Lengthwise overfeeding of the material to be treated is therefore necessary not only for allowing the material to shrink freely, but also for ensuring the appropriate dwell time of the material to be obtained in the treatment bath.

Advantageously, the textile treating device of the present invention provides a perforated drum and wash bowl having means which supplement or replace the previously suggested devices for the lengthwise overfeeding of the material to be processed. These means must in any case ensure the uniform wave-like plaiting of the material onto the perforated drum as well as the uniform release of the material from the drum; for this purpose the speeds of the feeding and delivering or discharging means must always be the same.

Thus, this invention contemplates a device for effecting tension-free wet treatment of textile material lengths (e.g., sheets, webs or the like continuous materials) which comprises wash bowl means containing a predetermined level of processing liquor, a rotating perforated drum at least partially immersed in said processing liquor, and guide means for feeding the textile material as wave-like plaits onto the perforated drum and for removing the plaits from the drum, the guide means including beating means for forming the textile material into the wave-like plaits on the perforated drum, the beating means contacting the textile material above the level of liquor in the bowl means, and the drum rotating at a speed which is lower than the speed at which the textile material is fed into the bowl means and onto the drum.

More particularly, this invention is directed to a device comprising a wash bowl, a rotating perforated drum accomodated in the wash bowl and at least partially immersed in the processing liquor to allow flow of the liquor from the outside to the inside of the drum and means for overfeeding the textile material as wave-like plaits onto the drum, said means including material deflecting devices for feeding and delivering the material to or from the drum, said deflecting devices being installed above the liquor level and parallel to the drum axis and being rotated at the same speed as the drum.

The present invention is further characterized in that the first deflecting device at the feed end of the machine is mounted at a certain distance above the liquor level in the bowl; between this deflecting device and the liquor level a beating device is provided which extends over the entire width of the material length hanging vertically down from the first deflecting device and which puts the material in waves or pleats onto the surface of the perforated drum; the speed of the drum being slower than the speed at which the material is fed into the bowl. The beating device comprises a driven roller which is mounted parallel to the axis of the first deflecting device (which is a guide roller) and is equipped with beating elements which extend over the entire width of the roller; the axis of the beating device is preferably shifted sideways from the axis of the first deflecting device, towards the axis of the perforated drum so that the material length is passed between the deflecting device and the beating device.

In accordance with this invention, the second deflecting device at the discharge end of the machine is mounted at a certain distance above the liquor level and a "nose," i.e., a projection in the form of a bent metal sheet plate, is provided between the deflecting device and the liquor level, close to the surface of the perforated drum. This nose is more suitable than a rotating roller for the purposes of this invention because unlike a driven roller it eliminates the danger of lap formation in the textile material.

There is not any substantial friction between the projection plate and the textile material because the liquor adhering to the textile material when the material is released from the perforated drum prevents the production of any meaningful frictional force. The projection is especially advantageous for the above described shrinking bowl because it eliminates any danger of lap

formation which could come into being because the discharge speed of the material is higher than the rotating speed of the perforated drum.

The device of this invention, including the wash bowl which is preferably used for the shrinking and tension-free processing of textile materials, can be further equipped with a dancing roller which follows the second deflecting device at the discharge end of the bowl and is swivelable or pivotal around a support axis. The dancing roller serves for controlling the rotating speed of the perforated drum and the weight which it exerts upon the material guided around it can be adjusted by means of an assembly of levers. In a shrinking bowl with a high degree of material overfeeding, the lever assembly is preferably regulated by a fixed pressure cylinder having a piston therein which is biased by the weight of the roller via a piston rod, as well as by the pressure of the material.

The movement of the piston which varies because of the force exerted upon the dancing roller by the material is preferably throttled at the pressure cylinder. This throttling can be especially important or necessary if the individual material waves on the perforated drum are very long and the material length is transferred to the second deflecting device or discharge means at the discharge end of the machine at an intermittent speed. The throttling of the movement of the piston thus eliminates any danger of a constant upward and downward movement of the pivotal dancing roller.

It is generally known that a processing bowl of the above described type is conventionally equipped with a valve means through which waste water (i.e., used processing medium) flows off; the volume of the waste water corresponds exactly to the volume of fresh water used as processing medium which is simultaneously supplied to the bowl. This drain valve means which is in most cases designed as a simple overflow is always situated at the material feed end of the textile treating machine while fresh water supply is effected at the discharge end. This arrangement is used in order to permit the application of the well-know counter-current principle. According to this principle the processing medium is supplied into a multi-bowl washing machine, for example, at the material discharge end, from where it then flows in opposite direction to the material to be treated towards the first bowl of the machine where it finally flows off as waste water.

Especially with a wash bowl which is to be suited for the tension-free treatment of material lengths it is disadvantageous to have the overflow situated at the feed end of the machine, and this is mainly because the formation of material waves on the drum which is somewhat problematic, would thereby be even more complicated. According to the present invention it is therefore suggested to locate the overflow behind the wash bowl, when viewed in the direction of material passage, i.e., on the material discharge side of the bowl.

This layout of the wash bowl is very advantageous indeed, not only because it facilitates the release of the material from the perforated drum in that the water flows in the same direction as the material which is to be released from the drum, but also because the waste water which flows back into the bowl from the subsequent squeezing unit can be directly drained through the overflow. As a consequence, the dirty water which has been squeezed off the material is not mixed with the liquor in the bowl but flows off through the overflow which, in accordance with the invention, is fitted at the discharge end of the machine; thus there is no need for any additional drain opening.

The projection which contacts the textile material as it is removed from the drum is preferably mounted at a downward angle from a housing wall to the perforated drum so that it can serve as a drain channel for the waste water which is squeezed off the material by the squeezing unit. When the bottom of this projection is designed to be liquid-permeable, the waste water which is collected in the nose flows through the perforation holes, directly into the overflow.

It is also of advantage to supplement the bottom section of the projection plate by another metal sheet plate which is inclined towards the liquor level in the bowl; this plate eliminates any danger of the water creeping upwards towards the housing wall and permits the control of the volume of washing liquor which flows off through the overflow.

The invention will be further understood by reference to the following detailed description of its embodiments and to the accompanying drawings in which;

FIG. 1 shows a device in accordance with this invention including a wash bowl and a subsequent squeezing unit; and

FIG. 2 shows a different embodiment of the wash bowl of the invention.

In FIG. 1, a perforated drum wash bowl comprises a housing 1 which is filled with a washing or shrinkproofing liquor up to a liquor level designated by reference numeral 2. A perforated drum 3 is mounted in the bowl transversely to a passage for the textile material to be treated. The liquor level 4 inside the drum is lower than level 2 outside the drum. This difference of liquor levels is maintained in a conventional manner by pump means installed at one front side of the perforated drum.

Due to the difference of liquor levels, in the housing and the drum, the processing liquor automatically flows through the textile material 5 to be treated which lies on the perforated drum in the form of plaited waves. It will also be appreciated that the washing unit can also be equipped with an axially fitted pump which produces a suction draft inside the perforated drum 3 and that under certain circumstances the material length 5 can also be put onto the drum 3 without any folds or waves.

Overfeeding of the textile material 5 onto the perforated drum is essentially effected by setting the speed of the perforated drum lower than the speed at which the material is fed into the bowl and onto the drum. However, since the accurate formation of the individual plaited waves or folds of material on the perforated drum is necessary, a beating device 7 is installed between a deflecting roller 6 which is mounted at a predetermined distance from the perforated drum 3 and the liquor level 2. The axis of the beating device is parallel to the axes of the perforated drum and the deflector roller and is also shifted or positioned sideways, towards the axis of the drum. Due to its high rotating speed the beating device with the beating elements 8 extending radially outward from its surface effects a rhythmical movement to the material length which hangs down from the deflector roller 6; the formation of uniform waves of material on the drum surface is thus guaranteed.

At the material discharge side of the perforated drum 3, immediately above the drum and at a distance from the deflector roller 9, there is a projection 10 in the form of a bent metal sheet plate. This projection eliminates any danger of the material lapping around a rotating roller which might be used in some cases; this danger exists especially when high draw-off speeds are employed.

The wash bowl is also equipped or associated with a dancing roller 12 for controlling the running speed of the perforated drum 3. This dancing roller is positioned behind the deflector roller 9 at the discharge end of the machine and is pivotally mounted about an axis 11. Depending on the inclination of the dancing roller, i.e., depending on the load which is exerted upon the roller by the textile material length 5, the roller 12 will move either up or down; this up or downward movement in turn influences the controlling action of a gear (not shown) for controlling the speed of the drum. In previous devices of this type the weight of the dancing roller 12 was compensated by a counter-weight. This counter-weight compensation has been found disadvantageous for any device in which the material is overfed onto the perforated drum because the dancing roller reacted too quickly to a change in the load. According to the invention the counter-weight is replaced by a pneumatic pressure cylinder 13 which in turn may also be replaced by a hydraulic piston-cylinder assembly. With the embodiment of the invention shown in FIG. 1, the piston rod 14 of the piston assembly is connected to a rocking hinge 11 of the lever assembly for roller 12; whereas the cylinder 15 is fastened or secured to the squeezing unit 16 which follows the wash bowl 3 in the treating cycle. Depending on the pressure which prevails in the space 17 above the piston 18, the piston will move to a certain position in the cylinder 15, and this position is dependent on the weight of the dancing roller 12 and the load which is put upon the dancing roller by the material length 5. If this load is increased, the roller will go up while the piston will go down. Downward movement of the piston, however, will be damped or throttled to a certain degree because of the increase in volume of the air or other fluid in the piston chamber 14. The same applies to the downward movement of the dancing roller 12. If necessary an additional throttling of the movement of the piston may be provided by appropriate means.

FIG. 2 shows that the projection 10 is formed of a metal sheet plate 10' which is inclined downwardly from the housing wall towards the perforated drum 3. The waste water which has been squeezed off or out of the textile material by the squeezing unit 16 can thus be collected in the metal sheet plate 10' and guided towards the bowl. In addition, the metal sheet plate 10' can be designed to be liquid-permeable, e.g., perforated, so that the waste water can flow directly into the overflow zone or passage 19 underneath the plate 10'.

A certain amount of waste water which corresponds to the amount of fresh water supplied at a certain location in the bowl flows off through the overflow zone 19. It is of advantage to install the overflow zone close to the squeezing unit 16, i.e., at the discharge end of the machine so that the liquor flow towards the overflow zone 19 (as shown by the arrows 20) does not affect the passage of the material 5 which is to be treated without any tension and so that the waste water squeezed off by the squeezing unit 16 can be directly drained through the overflow zone 19.

The volume of waste water returned is determined by the inclined metal sheet plate 21 which is mounted underneath the plate 10' and inclined towards the liquor level in the bowl. This plate 21 also prevents the washing liquor from creeping up at the bottom side of the metal sheet plate 10'.

While the novel embodiments of the invention have been described, it will be understood that various omissions, modifications and changes in these embodiments may be made by one skilled in the art without departing from the spirit and scope of the invention.

What is claimed is:

1. A device for effecting tension-free wet treatment of textile material lengths which comprises wash bowl means containing a predetermined level of processing liquor, a rotating perforated drum at least partially immersed in the processing liquor, first guide means for feeding the textile material as wave-like plaits onto the perforated drum and second guide means for removing the plaits from the drum, the first guide means including a deflecting roller for feeding the material to the drum and beating means for forming the textile material into the wave-like plaits on the perforated drum, said beating means comprising a driven rotating roller mounted parallel to the axis of the deflecting roller, said roller having radially extending beating elements that contact the textile material above the level of liquor in the bowl means and above the drum, and the axis of the beating roller being shifted sideways from the deflecting roller towards the axis of the drum, said textile material being guided through the space between these two rollers and the drum rotating at a speed which is lower than the speed at which the textile material is fed into the bowl means and onto the drum.

2. A device for effecting tension-free wet treatment of textile material lengths which comprises wash bowl means containing a pre-determined level of processing liquor, a rotating perforated drum at least partially immersed in the processing liquor, first guide means for feeding the textile material as wave-like plaits onto the perforated drum and second guide means for removing the plaits from the drum, said first guide means including beating means for forming the textile material into the wave-like plaits on the perforated drum, said beating means contacting the textile material above the level of liquor in the bowl means and above the drum, said second guide means including a deflecting roller mounted at the material discharge end of said bowl means and at a certain distance above the liquor level, and a projection close to the surface of the drum for guiding the textile material between the deflecting roller and the liquor level whereby said material is removed from the drum above said liquor level.

3. A device for effecting tension-free wet treatment of textile material lengths which comprises wash bowl means containing a pre-determined level of processing liquor, a rotating perforated drum at least partially immersed in the processing liquor, first guide means for feeding the textile material as wave-like plaits onto the perforated drum and second guide means for removing the plaits from the drum, said first guide means including beating means for forming the textile material into the wave-like plaits on the perforated drum, said beating means contacting the textile material above the level of the liquor in the bowl means and above the

drum and said second guide means including a material deflecting roller mounted above the liquor level and at the discharge end of the bowl means and control means for regulating the speed of the drum, said control means including a dancing roller that bears on the textile material, a lever assembly, and a piston in a fixed pressure cylinder, said dancing roller being positioned after said material defecting roller and being mounted on said lever assembly which is swivelable around a support axis, the drawing weight applied to the material length by said dancing roller being adjustable by said lever assembly which is engaged by said piston in the fixed pressure cylinder, said piston being acted on by the weight of the dancing roller via a piston rod and by the contact pressure of said material, said control means causing said drum to rotate at a speed which is lower than the speed at which the textile material is fed into the bowl means and onto the drum.

4. The device of claim **1**, in which said wash bowl means includes a wash bowl and pump means, operatively associated with said bowl and said drum, for causing flow of the processing liquor from the outside to the inside of the drum and said first guide means lengthwise overfeeding the textile material onto said drum, said deflecting roller being mounted at a predetermined distance above the liquor level and said beating means being located between the deflecting roller and the liquor level whereby the textile material from said first deflecting roller hangs vertically down across the entire width of the beating means during formation of said wave-like plaits.

5. The device of claim **2**, in which the projection is formed by a bent sheet metal plate.

6. The device of claim **3**, in which the movement of the piston produced by the changing load exerted upon the dancing roller by the textile material is throttled by the pressure cylinder.

7. The device of claim **2**, which further comprises an over-flow means for draining a certain volume of waste processing medium which corresponds to the volume of fresh processing medium supplied to the wash bowl means, said overflow means being situated behind the perforated drum in the direction of travel of the material through said device.

8. The device of claim **7**, in which the projection comprises a bent sheet metal plate that has a portion that is inclined downwardly to the perforated drum, said portion of the plate being situated above the overflow means and having a liquid-permeable bottom for allowing waste processing medium to fall into said overflow means.

9. The device of claim **8**, in which a substantially flat sheet metal plate is mounted underneath the bottom of the bent plate, said flat plate being inclined towards the liquor level and extending across the entire width of the bowl means.

* * * * *