March 24, 1970 A. BARRIQUAND 3,501,931

APPARATUS FOR THE LIQUID TREATMENT OF A CIRCULATING BAND OF MATERIAL IN A BATH

Filed Nov. 6, 1967 2 Sheets-Sheet 1

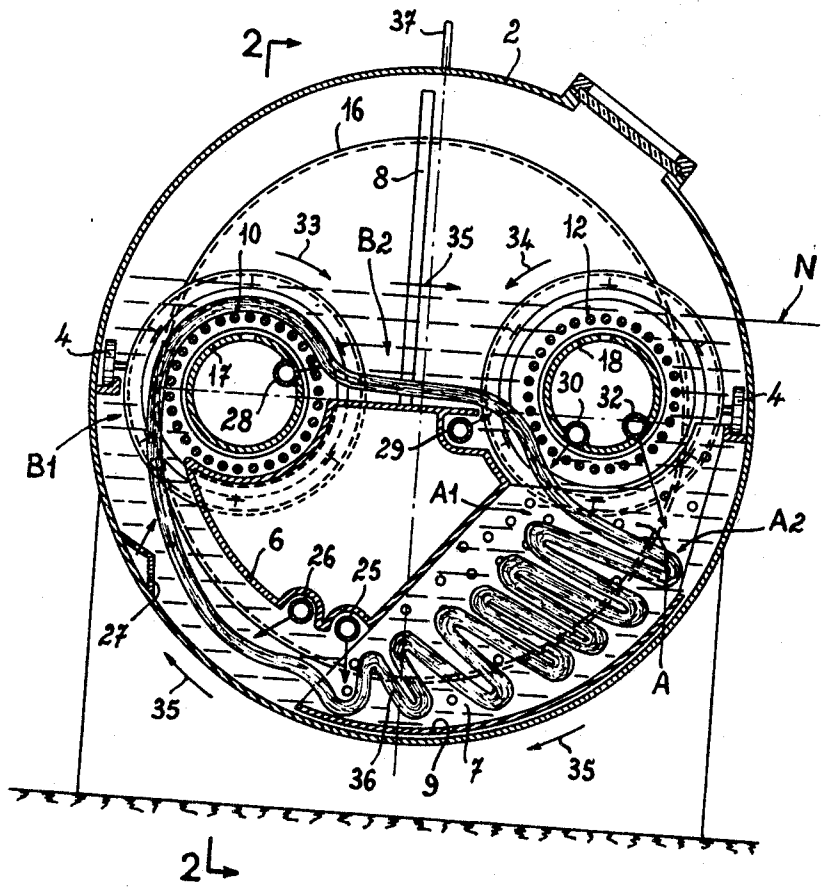

FIG. 1

March 24, 1970 A. BARRIQUAND 3,501,931

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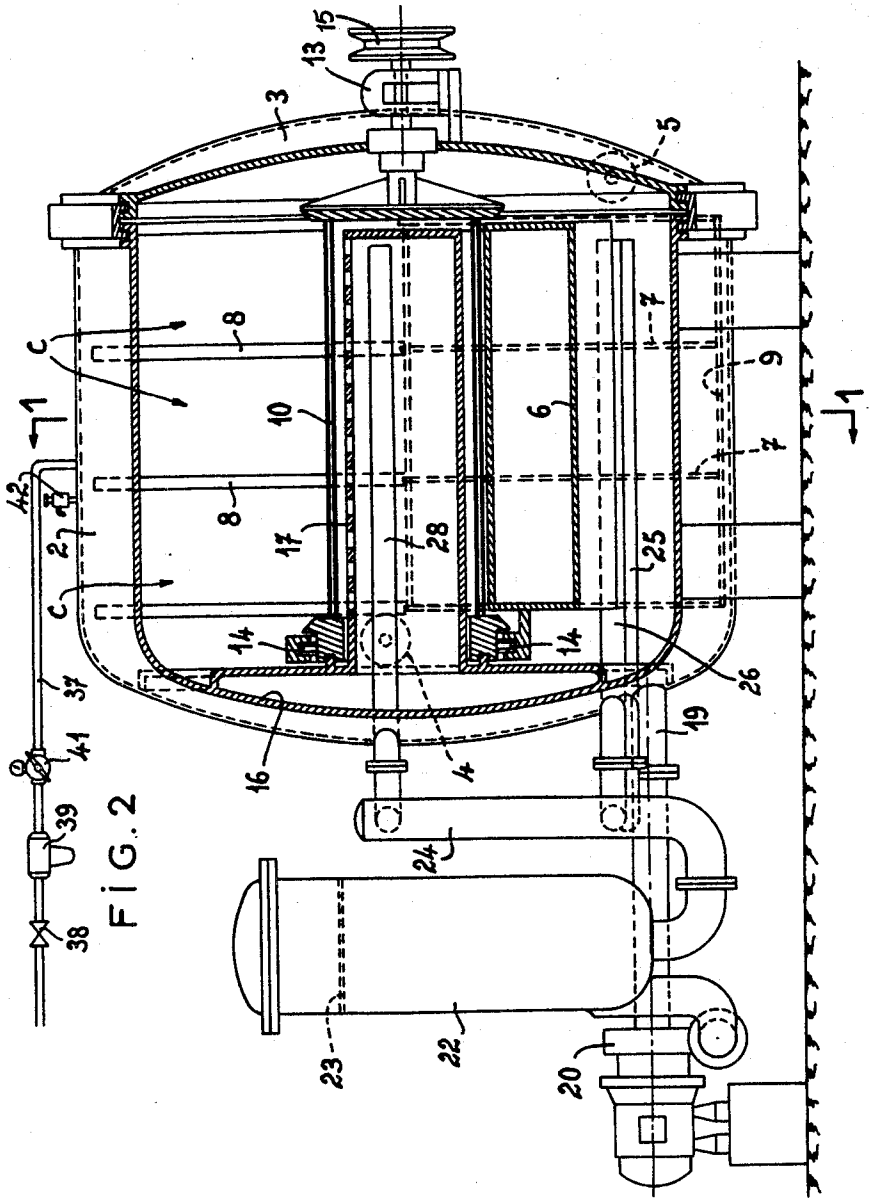

FIG. 2

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APPARATUS FOR THE LIQUID TREATMENT OF A CIRCULATING BAND OF MATERIAL IN A BATH

André Barriquand, Roanne, France, assignor to Etablissements Barriquand Freres, Roanne, France

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ABSTRACT OF THE DISCLOSURE

Apparatus for the wet treatment of textiles in which the material is circulated as an endless band in a liquid bath by means of rotating perforated cylinders and injection nozzles which cause liquid to impinge on and impregnate the material and at the same time cause the liquid in the bath to circulate and carry the material with it in proximity with the rotating cylinders.

The invention relates to a machine for the damp treatment of fabrics particularly, but not exclusively, at high temperatures.

In machines at present available, material to be treated is arranged in tubular fashion and set in motion by a sprinkler, then extracted from the bath and mangled by passage around a return roller in an atmosphere of steam at high pressure before being re-immersed in the bath. A disadvantage of this is that creases are formed which are very difficult to subsequently eliminate.

An object of the present invention is to obviate or mitigate this disadvantage.

According to the invention the material is immersed throughout the treatment in a treatment bath and caused to treatment in a treatment bath and caused to circulate in the bath by producing movement of the bath itself, by means of fixed injection nozzles which also serve to effect impregnation of the fabric by the velocity effect they cause in the bath, recirculation of the bath being carried out by squirrel cage rotors rotated at the speed of the bath by non-slipping engagement with the material and in which suction nozzles are located.

The machine according to the invention comprises a cylindrical vat having a horizontal axis, injection nozzles fed by a pump circulating the bath through at least two perforated cylinders turning at a linear speed substantially equal to that of the pieces of textile being treated thereby ensuring on the one hand, by the velocity effect caused by the nozzles within the bath, the penetration of the bath to the core of the pieces being treated, and on the other hand the carrying forward and the spreading out of the pieces in endless bands of which one part, moving relatively rapidly, is spread out in the bath, while the remainder, folded generally sinusoidally, moves forward slowly in a deposit zone located in the lower part of the vat.

Preferably, the vat is provided with a support having a suitable profile and a horizontal axis, which defines the lower part of the vat and has an annular passage which channels circulation of the material in the bath, the support having one inclined face which forms the upper boundary of the deposit zone wherein the folded material is prevented from rising directly to the surface of the bath.

Preferably also, the perforated cylinders of the machine are squirrel cage rotors rotated at the speed of the material, one being disposed horizontally at the entrance to the deposit zone and on whose lower sector the material is held due to the suction of the bath into its interior, and then released alternately by two nozzles angularly displaced within the interior of the rotor, the first of which nozzles operates intermittently.

Preferably also the second squirrel cage rotor is disposed in the proximity of the support and at the exit of the channel for the passage of the material at the base of the vat, the second rotor combining with the other rotor to assist the movement of the material in the bath.

One embodiment of the invention is shown, by way of example only, in the accompanying drawings, in which:

FIG. 1 is a front elevation in vertical section along the line 1—1 in FIG. 2; and

FIG. 2 is a side elevation in section along the line 2—2 in FIG. 1.

The machine consists of a vat autoclave 2 having a horizontal axis, closed by a cover 3 arranged for rapid closure.

The cover is integral with a carriage which is carried by internal wheels 4 and external wheels 5 and can be removed from the vat 2. Perforated dividing walls 7 and bars 8 forming a rack are secured radially on a support 6 of suitable profile having a horizontal axis and integral with the aforesaid carriage, the perforated walls 7 being connected at their base by a metal sheet 9 curved substantially to the same radius of curvature as the vat 2. These walls 7 and bars 8 define compartments C on the support 6, three in this case, in which the textile pieces to be treated are placed.

In the upper part of the carriage and substantially at the height of the horizontal diametral plane of the vat 2, two squirrel cage rotors 10 and 12 are disposed carried at one end by an external bearing 13 and at the other end by rollers 14. These rotors can be rotated in opposite directions by pulleys 15 carried on the ends of outwardly projecting axles.

The vat 2 further includes, opposite the cover 3 a suction chamber 16, into which enter two perforated pipes 17 and 18 arranged co-axially within the interior of the rotors 10 and 12.

The chamber 16 is connected by a duct 19 to a pump 20, delivering the bath thus aspirated into a heat exchanger 22, fitted with a fitter 23, and at whose outlet a collector 24 distributes the bath to injection nozzles 25 to 30 and 32 distributed in the vat 2 of the autoclave.

The machine operates as follows:

The cover 3 and its carriage, i.e. the whole rigid assembly consisting of the support 6, the dividing walls 7, the bars 8, the metal sheet 9 and the squirrel cage rotors 10 and 12 are removed from the vat by withdrawing the wheeled carriage. The textile pieces to be treated are then placed in each of the compartments C defined by the dividing walls 7 and the metal sheet 9, then one end of each piece is passed between two of the bars 8 of the rack, above the rotor 10 and below the rotor 12 in such a way as to pass completely around the special profile support 6 and then attached to the other end of the same piece, so that each piece forms a continuous loop.

The carriage is introduced into the autoclave 2 and the cover 3 hermetically sealed. The bath is then introduced into the vat up to the level N shown in FIG. 1, i.e. at least until the squirrel cage rotor 10, whose axis is slightly above the horizontal axis of the vat 2, is completely immersed.

The pump 20 is then activated and simultaneously the squirrel cage rotors 10 and 12 are set in rotation, one in the direction of the arrow 33 in FIG. 1 and the other in the direction of the arrow 34, at a peripheral speed substantially equal to the speed of displacement of the piece to be treated. The latter then moves in the direction of the arrows 35 in FIG. 1, not under the movement of the rotors 10 and 12 but under the action of the jets trained on it by the injection nozzles 25 to 32.

In effect, as FIG. 1 shows, the piece 36 to be treated, after its deposit in zone A where it is folded sinusoidally,

is subjected to the action of the jets of the nozzle **25** which holds in place the part of this piece treated in the deposit zone and only allows the part driven by the current caused by the injection nozzles **26** and **27** to disengage. These nozzles direct this part of the piece **36** against the squirrel cage rotor **12** to which it applies itself under the action of the suction current of the bath and whose movement it follows until the nozzle **28** located within the cylinder **10** releases it from the cylinder and directs it into the zone B2 of the machine towards the nozzle **29** partly lodged in a recess of the support **6**. The latter nozzle directs the part of the piece **36** against the squirrel cage rotor **12** under which it likewise applies itself under the action of the suction current of the bath until the nozzle **32**, alone or with the help of the nozzle **30** projects it downwardly. In fact the nozzle **30** operating intermittently projects the piece to be treated when moving, towards the edge A1 of the zone A, while, when it is not fed, the nozzle **32** only acts on the piece **36** and projects it towards the edge A2 thus bringing about the depositing in regular sinusoidal folds.

Due to the circular current caused by the nozzles and due to the direct action of the injection nozzles on the piece to be treated, each part of the latter is subjected to a relatively rapid movement in the place where it is spread out, i.e. in the zones B1 and B2 of the machine and then to a relatively slow movement in the zone A of the machine where it is deposited.

Independent of the circular movement they create in the bath, the injection nozzles **25** to **32** produce a vibratory movement which ensures the penetration of the bath into the core of the material.

As FIG. 1 shows, the support **6** has a shape adapted for the separation of the deposited part of the piece, and for the canalisation thereof during its passage where it is spread out, while preventing the deposited part from rising to the surface of the bath.

During the circulating movement of the piece, the injection nozzles are fed by the pump **20** which sucks the bath from the interior of the rotors **10** and **12** in a very regular manner over the whole length of the vat **2** without causing braking of the material, or longitudinal currents which might displace the piece, and this is due to the rotation of the rotors **10** and **12** and to the presence of the perforated tubes **17** and **18** ensuring the regularization of the suction over the whole length of these cylinders.

In order to prevent any cavitation of the pump **20**, a cushion of compressed air is created in the upper part of the vat **2** above the level N of the bath. This cushion is furthermore maintained at a constant pressure whatever may be the particular phenomenon of distension of the bath. For this purpose the vat **2** is fed with compressed air by a pipe **37** passing into its upper part and including a valve **38**, a filler **39**, and a manopressure reducer **41** which allows the pressure of the air cushion to be regulated to the desired value. The vat **2** is also provided, in its upper part, with a release valve **42** adjusted to the same pressure as the pressure reducer **41**.

As is obvious, the invention is not limited to the sole embodiment which has been described above. On the contrary it includes all possible variations. Thus, for example, the heat exchanger **22** disposed outside the vat **2** could be replaced by a coil disposed within the vat.

I claim:

1. A machine for the wet treatment of pieces of fabric, said machine comprising a cylindrical vat containing a liquid bath and having a horizontal axis, at least two perforated rotatable cylinders in said vat, the pieces of fabric to be treated forming an endless band in said vat and passing in proximity to said cylinders, injection nozzles in said vat, pump means, and means connecting said pump means to said nozzles and said cylinders to circuate the liquid of the bath by withdrawing the liquid from the cylinders and discharging the liquid from the nozzles, said nozzles being positioned relative to the band of fabric to direct liquid thereagainst and advance the band in a given direction, and means for rotating said cylinders with a linear speed substantially equal to that of the speed of advancement of the band being treated, thereby insuring on the one hand, by the velocity effect caused by the nozzles within the bath, the penetration of the liquid into the pieces being treated, and on the other hand the carrying forward and the spreading out of the pieces in the endless band form such that one part, moving relatively rapidly, is spread out in the bath, while the remainder, which is folded, moves forward slowly in a deposit zone located in the lower part of the vat.

2. A machine according to claim **1** comprising a support in said vat having a particular profile and a horizontal axis, said support defining said deposit zone in the lower part of the vat, and having an annular passage which channels circulation of the band in the bath, said support having an inclined face which forms the upper boundary of the deposite zone and by which the folded piece is prevented from rising directly to the surface of the bath.

3. A machine according to claim **2** wherein one of said cylinders is a squirrel cage rotor disposed horizontally at the entrance to the deposit zone, the band of fabric being held against said rotor at the lower surface thereof by suction of the bath in the interior of the rotor, two of said nozzles being angularly displaced within the interior of said rotor to cause release of the band therefrom, the first of said two nozzles operating intermittently.

4. A machine according to claim **3** wherein the other of the cylinders is also a squirrel cage rotor disposed in proximity of said support and at the exit of the passage for the band.

5. A machine according to claim **1** wherein the means connecting the pump means and the nozzles comprises two perforated cylindrical pipes each disposed coaxially in a respective perforated cylinder, said pipes being connected to the pump by means of a suction chamber disposed at the base of the vat.

6. A machine according to claim **1** comprising dividing panels radially disposed in said vat in the deposit zone, and radial bars attached to said panels and forming a rack in the upper part of the vat where the spread out band passes at high speed.

7. A machine according to claim **6** comprising a removable cover for said vat, and a carriage secured to said cover, said cylinders, support, and panels being carried by said carriage.

8. A machine according to claim **6** comprising a cylindrical sector, having substantially the same radius of the cylindrical vat and defining the lower boundary of the deposit zone, connected to said support by the radial dividing panels.

9. A machine according to claim **1** comprising a heat exchanger in the means connecting the pump means and nozzles.

10. A machine according to claim **1** comprising means for feeding gas into the vat at the top thereof above the bath at constant and adjustable pressure and a release valve in said vat adjustable to the said pressure.

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