APPARATUS FOR THE WET TREATMENT OF CLOTHS

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ABSTRACT
Apparatus for the wet treatment of cloth in rope form wherein the treated cloth is drawn along by the treating liquor inside the treatment vessel which has substantially the shape of a right-angled triangle with unequal legs and rounded apexes and in which the liquid is pumped into the vessel through jet means housed in the vertical leg of said rightangled triangle, which leg has as an extension a cylindrical dome through which the cloth is introduced into the vessel.

22 Claims, 7 Drawing Figures
1 APPARATUS FOR THE WET TREATMENT OF CLOTHS

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

The present invention relates to an apparatus for the wet treatment of textiles, particularly for the dyeing of cloth in rope form in which said cloths, with their two ends joined together forming an unbroken unit, circulate in the treating liquor without any mechanical action whatsoever, the treating liquor itself driving the cloth in rope form through the apparatus.

Within the customary features of apparatus which wet treat cloths by this process of drawing the cloth along by the liquor itself, this invention offers several advantages in view of the special shape of the treatment vessel and the composition of the jet means with which it is equipped.

SUMMARY OF THE INVENTION

Essentially the apparatus according to the invention consists of an apparatus for the wet treatment of cloths in which the cloth is drawn along by the treating liquor, comprising a treatment vessel having a substantially cylindrical dome with a vertical axis and a tubular body of substantially right-angled triangle shape having unequal legs and rounded apexes, the longer leg being horizontal and the shorter leg being vertical, the axis of the dome being situated as an extension of the axis of said vertical leg. The tubular body of the treatment vessel consists of a large diameter tube for containing the major portion of the cloth to be treated and two lesser diameter tubes situated as extensions of the two ends of said large diameter tube and having between them the dome of the treatment vessel. The ratio between the diameter of the lesser diameter tubes and the large diameter tube lies between 1:2 and 1:4.

The large diameter tube, apart from having a larger volume, also is longer than the smaller diameter tubes and said large diameter tube runs along the whole of the horizontal base, part of the hypotenuse and part of the vertical side. The connection between the two tubular portions comprising the hypotenuse is made by means of a frustoconical tubular element, the cone angle of which lies between 20° and 30°.

As has been shown hereinbefore, the cloth in rope form inside the vessel is drawn along by the liquor itself, for which purpose the lesser diameter portion of the vertical side is provided with jet means for the treating liquor, in order to draw the cloth in rope form upwardly or downwardly with respect to the vertical side. As the cloth runs through the treatment vessel it passes through the vertically disposed dome which has a port centered in the bottom and a port in the side wall, both ports being joined by a semitubular member which, acting as a ramp, facilitates the circulation of the cloth as it passes from the hypotenuse to the vertical side. Likewise, in order to control the circulation of the cloth once this has passed through the jet means situated in the lesser diameter portion of the vertical side, there is a guide inclined towards one side and a suction area at the opposite side in order to initiate a folding of the cloth crosswise with respect to the tubular body.

As well as the treatment vessel hereinbefore referred to, the apparatus according to the invention comprises in combination a plurality of liquor suction means connected to said large diameter tube, with at least one aspiration means at each end of said tube, a delivery pump which receives the liquor from said suction areas and delivers it once again to the treatment vessel, a heat exchanger mounted between said pump and treatment vessel, a treating liquor inlet to the jet means, an inlet for the liquor from an external source and an outlet for the liquor to the outside. In order to control the pressure in the apparatus and particularly between the hypotenuse and the horizontal side of the vessel, there is a by-pass conduit, having a valve, between the frustoconical portion of the hypotenuse and the horizontal side.

In a preferred embodiment to control the pressure and flow in the treatment vessel, there is disposed a by-pass pipe, having a valve, between the suction and delivery conduits of the apparatus pump.

The triangular arrangement of the vessel of this apparatus with its horizontal side substantially longer than the vertical side affords notable advantages, among them, the low height of the ensemble which means ease of accessibility for loading the apparatus with the cloth to be treated and also the elimination of the need for premises with excessively high ceiling for their installation. Likewise the cloth only undergoes three changes of direction at the rounded apexes of the triangle, thereby avoiding friction with the apexes which could damage the cloth being treated.

For optimal operation of the apparatus, the treatment vessel is substantially full with the treatment liquor and cloth circulating therethrough.

The general arrangement of the apparatus and the advantages it offers have been cited, but the invention is not limited to this general arrangement but also includes the composition of the jet means which comprise at least one drawing jet having an external cylindrical sleeve, an internal tubular wall and an intermediate tubular wall, said last two tubular walls being coaxial with said external cylindrical sleeve. Said internal tubular wall surrounds a central chamber through which the cloth in rope form circulates. Said intermediate wall is provided with at least one orifice and is spaced from said internal tubular wall, forming therebetween a jet chamber, said intermediate wall being composed of a larger diameter cylindrical section and a cylindrical section of smaller diameter than the former section, both said sections being joined by a frustoconical portion, the diameter of said smaller diameter section being the same as the diameter of said internal tubular wall. Said jet chamber has at least one treating liquid outlet orifice directed downwardly and convergingly towards the common axis of the tubular walls and external cylindrical sleeve, in one embodiment of the invention, whilst in a further preferred embodiment the outlet direction of the liquor from the jet chamber is the reverse, that is, directed upwardly and convergingly said common axis.

In a further embodiment, said jet means comprise a braking jet followed by a drawing jet, both jets being arranged in opposite facing positions and having a common external cylindrical sleeve, each jet having also an internal tubular wall and an intermediate tubular wall, said walls being coaxial with the external cylindrical sleeve, the interior space of the internal tubular wall forming a central chamber through which the cloth in rope form circulates. The intermediate wall is spaced apart from the internal tubular wall, forming therewith a jet chamber, the intermediate wall having at least one
orifice and being composed of a large cylindrical portion and a smaller portion, also cylindrical and having a lesser diameter than said larger portion, said portions being joined one to the other by a frustoconical portion, the diameter of said lesser diameter portion matching the diameter of said internal wall. Said jet chamber has at least one treating liquid outlet orifice directed convergently towards the common axis of the tubular walls and the external cylindrical sleeve, said liquor outlet being directed upwardly in the braking jet and downwardly in the drawing jet in one embodiment and downwardly in the braking jet and upwardly in the drawing jet in a further preferred embodiment.

In one embodiment, the intermediate cylindrical wall of each jet has a plurality of orifices and is spaced apart from the external sleeve, forming therewith a distribution chamber for the liquid towards the jet chamber. This jet chamber has a plurality of radial diffuser walls adjacent the treating liquid outlet.

In this preferred embodiment of this invention, the end of the internal tubular wall matching in diameter with the lesser diameter portion of the intermediate wall is spaced apart from the frustoconical portion of said intermediate wall and this space forms an annular orifice which is precisely the jet chamber liquid outlet orifice.

In a further embodiment of the invention, the internal tubular wall is extended to the frustoconical portion of the intermediate wall where it joins with the lesser diameter portion of said wall, and in this embodiment the internal tubular wall has a plurality of orifices disposed peripherally around said internal tubular wall, said orifices forming the jet chamber liquid outlet orifice.

A further feature of the invention is that the central chamber of the jet has a widened end region with a diameter equal to the diameter of the larger diameter portion of the intermediate wall.

In the preferred embodiment of this invention referred to hereinbefore, the braking and drawing jets have their common external sleeve fixed and are arranged in opposite directions in such a way that the free ends of the larger diameter portions of the respective intermediate walls are mated and in contact with the other, said walls having coupling means to fix the two jets together, the ensemble of the intermediate walls, in turn connected to the respective internal tubular walls, forming an ensemble demountable from the external common sleeve which remains fixed to the treatment vessel.

A further feature of this invention consists of the free end region of the lesser diameter portion of the intermediate wall of the braking jet being flared outwardly to fit said external sleeve at the point of connection with the dome, said flared portion having a member suitable as a handle for said coupled ensemble of the intermediate walls of the two jets in order to be able to remove it from said fixed external sleeve, said handle element being reachable from the upper opening of the dome when the cover of the latter is open and, at the same time, the lesser diameter free end of the intermediate wall of the drawing jet has an annular flange external to said intermediate wall, said flange serving to support and fix said ensemble on a wall comprised between the inclined guide situated at the jet means exit and the external cylindrical sleeve.

As a result of the foregoing features, the coupled ensemble of the intermediate walls of the two jets, apart from being removable from the external fixed sleeve, is demountable in two independent units composed of the intermediate wall and the internal tubular wall of each jet, whereby this demountability allows one or both independent units to be changed with a variation of the diameter of the central chamber of both jets according to the requirements of the cloth in rope form to be treated.

As has been seen hereinbefore, the free end of the larger diameter portion of the intermediate wall of both jets has an external flange, the respective external flanges of the braking jet and the drawing jet being mated to achieve coupling of the flanges, one of the flanges having, also, an O-ring joint in contact in turn with the external common sleeve, in order to seal the distribution chambers of both jets one from the other.

The advantages offered by the invention to the jet means are evident. Among these I should mention in the first place the easy interchange of jets in view of the aforementioned demountability; secondly, the prevention of swirling movements in the jet chamber because of the diffuser walls with which it is fitted; thirdly, the proximity of the two braking and drawing jets prevents harmful deformations of the cloth.

BRIEF DESCRIPTION OF THE DRAWINGS

These features and advantages of the apparatus according to the invention will be demonstrated in the following description of certain embodiments taken in conjunction with the attached drawings in which:

FIG. 1 is a side elevational view of an apparatus embodying the invention;

FIG. 2 is a front elevational view of the apparatus of FIG. 1;

FIG. 3 is a sectional side elevational view of the apparatus of FIG. 1 on the line III—III of FIG. 2;

FIG. 4 is a fragmentary sectional side view on the line IV—IV of FIG. 2;

FIG. 5 is a fragmentary sectional view on the line V—V of FIG. 1;

FIG. 6 is a fragmentary sectional view on the line V—V of FIG. 1 of an alternative embodiment of the jet means; and

FIG. 7 is a side elevational view of an alternative embodiment of the apparatus.

DETAILED DESCRIPTION OF THE INVENTION

The apparatus according to the invention (FIGS. 1 and 3) comprises a treatment vessel 1 substantially in the form of a right-angled triangle having a large diameter tube 2 and two tubes 3 and 4 of lesser diameter. Between these latter tubes 3 and 4 there is the dome 5 which is cylindrical in shape and has its vertical axis forming a prolongation of the axis of tube 4. The right-angled triangle formed by the vessel 1 has its horizontal base 6 forming part of the large diameter tube of said vessel 1, said base being longer than the vertical side which has a portion 7 of the same diameter as the base and a further portion of lesser diameter coinciding with the tube 4. The portions 7 and 4 are connected together by means of the frustoconical portion 8. The hypotenuse of this right-angled triangle has the large diameter portion 9 and a portion of lesser diameter, coinciding with tube 3, as well as the frustoconical portion 10 connecting portion 9 to portion 3. The cone angle
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of portion 10 is 24°. This triangle has the vertex 11 formed by the intersection of the two sides rounded off, and the vertex 12 formed by the base 6 and the hypotenuse is also rounded off. Likewise, the tubes 3 and 4 of lesser diameter which should join at the apex are joined at the rounded apex 13 interrupted by the dome 5. The ratio of the diameters of tubes 3 and 4 to tube 2 is 1:2.5.

The treatment vessel 1 is thus formed by the plurality of tubes described above and forms a continuous vessel wherein it is possible to set up a closed circuit for circulation of the treating liquid and the cloth to be treated. The vessel 1 also has liquid suction chambers 14, 15 and 16 having respective suction pipes 17, 18 and 19 and valves 20, 21 and 22 regulating the aspirated liquid. As well as the aforementioned pipes, there is a by-pass conduit 23 with valve 24 interconnecting the frusto-conical portion 10 with the portion 11 (rounded vertex), in order to regulate the pressure between these two parts of the vessel 1.

The apparatus has, as external members to the treatment vessel 1, the pump 25 having its drive motor 26. The pipes 17, 18 and 19 run together into the common pipe 27 which, connected to filter 31, feeds the liquid flow therefrom to the pump 25 which delivers said liquid flow to the heat exchanger 29 through delivery conduit 28. Conduit 30 runs from heat exchanger 29 to tube 4 containing the jet means to be described hereinafter. This device is completed by means (not shown) for filling the vessel 1 with liquid or emptying the liquid therefrom. Base means 32 support the vessel 1 with a small clearance above floor level.

As stated hereinbefore, the main object of the present invention is to provide for the treatment of cloth in a form in liquid in such a way that the cloth and liquid circulate within the treatment vessel without any other motive power than the circulation of the liquid therein. Prior to treatment, the vessel is filled with treating liquid and then the cloth is introduced into the vessel 1 by means of a loading device A (seen in FIG. 7 but not shown in the embodiment of FIG. 1) mounted externally to the dome 5 and which feeds the cloth T in rope form into the vessel along the direction of the axis of the dome 5. Once the pump 25 is started, the liquid will circulate according to the direction indicated by the arrows, drawing the cloth T in rope form along therewith. At the exit of the jet means housed in tube 4, the operation of which will be described hereinafter, there is a guide ramp 33 which in combination with the suction occurring in the chamber 15 through pipe 18 starts the folding of the cloth T in a transverse direction at the same time as the cloth continues to feed through large diameter tube 2 of the vessel 1. When the cloth T has travelled through the tubular sections of the two sides and hypotenuse of the vessel 1, the end portion of the cloth T in rope form which had been first fed into the apparatus reaches the dome 5. This end is taken up and attached by conventional means to the other free end of said cloth, thereby forming a closed loop of said cloth T in rope form which is now ready for treatment in the vessel 1. Apart from the cover 34 and the ports 35 and 36 (FIG. 4) corresponding to tubes 3 and 4, the dome 5 also houses a semi-segment member 37 disposed in form of a ramp between ports 35 and 36 and which facilitates the circulation of the cloth T through this part of the vessel 1.

An accessory to the vessel 1 is the roller 38 which drives a yardage counter (not shown) whereby the circulation speed of the cloth T through the vessel may be measured and thus be controlled by operation of the required valves.

A preferred embodiment of the jet means is illustrated in FIGS. 4 and 5 and a further embodiment is illustrated in FIG. 6. Said jet means is situated in the lesser diameter tube 4 of the vertical side of the triangle. Said means comprises a braking jet 39 and a flaring jet 40. These jets are arranged to operate in opposite directions and have a common external sleeve which also forms the external casing of the tube 4. Each jet also has an intermediate tubular wall 41 with a larger diameter section 42 and short, lesser diameter section 43 joined together by the frusto-conical section 44. Section 43 of the braking jet 39 is flared out at its free end to the same diameter as the port 36 of dome 5 to which it is fitted. Section 43 of the drawing jet 40 has an annular flange 45 at its free end resting on wall 46 which joins the sleeve 4 to the extension 47 of the frusto-conical portion 8. Both jets also have an internal wall 48 having a portion 49 of the same diameter as section 43 of the intermediate wall 41 and a frusto-conical portion 50 joining said portion 49 to wall 41. Each jet has its liquid inlet conduit 51 having a valve 51a. Conduit 30 (FIG. 2) distributes the liquid pumped by pump 25 to said conduits 51. The space between the intermediate wall 41 and the internal tubular wall 48 forms the jet chamber 52. The internal space enclosed by tubular wall 48 forms the central chamber 53 through which the cloth T circulates.

In the embodiment illustrated in FIG. 5, the intermediate wall 41 is spaced from the sleeve 4 forming therebetween the distribution chamber 54 for the liquid towards the jet chamber 52. Wall 41 of the drawing jet 40 has at the free end of the larger diameter section 42 an annular flange 55 which may be fitted to the annular flange 56 of wall 41 of the braking jet 39. With the two jets disposed in opposite directions, the flanges 55 and 56 are joined one to the other and separate the respective distribution chambers 54 of both jets, said separation being sealed by an O-ring 57 in contact with the sleeve 4. The wall 41 has a plurality of orifices 41a which permit fluid communication between chamber 52 and chamber 54. In turn, the free end of the internal wall 49 is spaced from the frusto-conical section 44 of the intermediate wall 41 thereby forming an annular liquid outlet orifice 58 in each of the jet chambers 52 of the two jets. The outlet corresponding to the braking jet directs the liquid upwardly and in convergence towards the common axis of the tubular walls 41 and 48 which, in turn, are coaxial with the outer sleeve 4. The liquid outlet in the drawing jet 40 is directed downwardly and convergently towards said axis. To guide the liquid and avoid excessive turbulence in the jet chamber 52, each jet has a plurality of diffuser walls 59 disposed across the space between walls 41 and 48.

The ensemble comprising the tubular walls 41 and 48 of the jets 39 and 40 joined by flanges 55 and 56 forms a unit which may be separated from the external sleeve 4 and which, in operation, rests with flange 45 at the end of wall 43 on wall 46. In order to remove this ensemble from the sleeve 4, the flared end of wall 43 of jet 39 has a handle 60 which may be reached inside dome 5 when the lid 34 has been removed therefrom. The ease of replacing the above described ensemble
with a further ensemble of different internal diameter, that is, with the central chamber 53 having a greater or lesser diameter according to the characteristics of the cloth to be treated will be understood. The possibility of dismantling this assembly at the flanges 55 and 56 also allows only one of the jets to be changed once the ensemble has been removed from the vessel by means of the handle 60, whereby an ensemble having a braking jet 39 with central chamber 53 of a different diameter from that of the drawing jet 40 attached thereto may be obtained.

FIG. 6 illustrates an embodiment in which the intermediate tubular wall 41 is in contact with the sleeve 4, whereby the distribution chamber 54 is omitted. A further alternative included in this embodiment is that the internal tubular wall 48 extends as far as the frustoconical section 44 of the intermediate wall 41 where it joins with section 43 of said wall. In this alternative, the orifice of the jet chamber 52 is formed by a plurality of orifices 61 disposed peripherally around this extended portion 49 of the tubular wall 48, the treatment liquor flowing through said orifices and converging towards the axis of the ensemble. In this alternative embodiment, the ensemble of the two jets may also be removed from sleeve 4 by means of handle 60.

Having now described the component members of the apparatus, the mode of operation is obvious. Once the cloth T has been fed into the treatment vessel 1 and forms a closed loop therein, as described hereinbefore, the pump 25 is set running and drives the treatment liquor through the delivery conduit 28 to the heat exchanger 29 where it is heated to the preset temperature. The liquor continues along conduit 30 and the current is divided, before entering the jets means housed in tube 4, between the two conduits 51 controlled by respective valves 51a and enters the two jets 39 and 40. Since the object is to draw the cloth downwardly, it is obvious that the effect of the braking jet 40 must be greater than the effect of the braking jet 39, which is achieved by regulating the flow of liquor entering each of said jets by way of valves 51a. The braking jet, apart from keeping the cloth under a certain degree of tension as it passes through the jets, controls the circulation speed of said cloth as measured by the yardage counter driven by roller 38.

Once the cloth T is set moving by the drawing jet 40, it leaves the jets means housed in tube 4 and is guided by the guide ramp 33 in the frustoconical portion 8 of the vessel 1, which portion 8 combines its effect with the suction of the liquid through pipe 18 to initiate the horizontal folding of said cloth which continues to advance through the large diameter tube 2 of vessel 1 where it moves along in folded condition in contrast with the substantially rectilinear disposition it has when moving through the lesser diameter tubes. The cloth thus moves along the whole of the horizontal base and large diameter portion of the hypotenuse until it reaches the frustoconical portion 10 where it begins to unfold and enter the narrow diameter tube 3 in a generally rectilinear disposition and thus pass through the dome 5 guided by ramp 37. At the exit of the dome 5 it comes under the braking effect of the jet 39 and the cycle starts again. The pipes 17, 18 and 19 supply the flow of liquid to the pump 25 which, in turn, drives it to the jets 39 and 40. The speed of the cloth to be treated may also be adjusted, with the flow of the circulating liquid, by means of these pipes and their valves 20, 21 and 22. In this way an uninterrupted flow of the cloth T in rope form and in a closed loop is achieved around the whole of the vessel, whereby the liquid is caused to penetrate perfectly and evenly in the cloth. The heat exchanger 29 provides the preset treating temperature and conduit 23 provides for adjustment of any pressure differential which might be caused inside the vessel 1 between the portions connected thereby.

In the embodiment illustrated in FIG. 7, the jets work in the opposite direction to the afore described embodiment, that is, the jet 39 is the drawing jet and the jet 40 is the braking jet. Therefore the cloth and the treatment liquor in the vessel also circulate in the opposite direction to that hereinbefore described. The cloth in rope form is drawn upwardly towards the tube 4 and enters the dome 5, continues through lesser diameter tube 3 of the hypotenuse and enters the frustoconical portion thereof where it begins to fold in zig-zag form with the aid of suction through 17; it continues along portion 12 and the horizontal base 6 where the greater portion of the rope is stored and continues along portions 7 and 8 of the vertical side to close the circuit.

A further alternative included in the embodiment of FIG. 7 is that the pressure and treatment liquor flow in the apparatus is controlled by means of conduit 23a which connects the delivery conduit 28 of the pump 25 with its suction conduit 27. This by-pass pipe 23a has a valve 24a controlling the flow therethrough, whereby a secondary, adjustable circulation current can be established: pump 25, delivery conduit 28, by-pass conduit 23a, suction conduit 27 and pump 25, the flow through this secondary circuit being subtracted from that which would circulate through the vessel if the said circuit did not exist or valve 24a were completely closed.

Obviously, both the embodiment of FIGS. 1 and 3 and the embodiment of FIG. 7 can operate with circulation in the opposite direction to that shown in said Figures. To do so it is sufficient to invert the function of the respective jets, which is done by adjusting the respective inlet flow control valves 51a for each jet so that the inlet flow to the jet required to do the drawing is greater than the inlet flow to the jet required to produce the braking effect.

What I claim is:
1. Apparatus for the wet treatment of cloths having the cloth in rope form drawn along by a treating liquor, said apparatus comprising:
   1. a treatment vessel comprising:
      a. a tubular body of substantially right-angled triangular shape with unequal legs and rounded apexes, the longer of said legs being horizontal and the shorter being vertical, said tubular body further comprising a large diameter tubular portion adapted to contain the major portion of the cloth being treated at one time and two lesser diameter tubular portions forming extensions respectively of the two ends of said large diameter tubular portion and being located respectively in the shorter of said legs and in the hypotenuse of said right-angled triangular shape; and
      b. a substantially cylindrical dome connecting said two lesser diameter tubular portions, the axis of said dome being vertical and an extension of the axis of said shorter leg;
   2. a liquid circulation pump;
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3. A heat exchanger in fluid communication with said pump;
4. A jet means housed in said treatment vessel in the lesser diameter portion of said shorter leg, said jet means including at least one jet comprising:
   a. An external cylindrical sleeve,
   b. An internal tubular wall, and
   c. An intermediate tubular wall, said internal wall, said intermediate wall, and said external cylindrical sleeve being coaxial; said internal tubular wall defining a central chamber through which the cloth in rope form circulates when the apparatus is in use; said intermediate wall having at least one orifice and being spaced apart from said internal tubular wall, forming therebetween a jet chamber; said intermediate wall being composed of a first cylindrical section and a second cylindrical section of smaller diameter than said first cylindrical section; said first and second cylindrical sections being joined by a frustoconical section; the diameter of said second cylindrical section being the same as the diameter of said internal tubular wall; and said jet chamber having at least one treating liquor outlet aperture; and
5. Means for establishing fluid communication between said heat exchanger and said jet means.

2. Apparatus for the wet treatment of cloths, according to claim 1, wherein said jet chamber having at least one treating liquor aperture is directed downwardly and convergently towards the common axis of said tubular walls and said external cylindrical sleeve.

3. Apparatus for the wet treatment of cloths, according to claim 1, wherein said liquor aperture is directed upwardly and convergently towards the common axis of said tubular walls and said external cylindrical sleeve.

4. Apparatus for the wet treatment of cloths, according to claim 1, wherein said jet means comprises two of said jets disposed in said shorter leg in oppositely facing directions and having a common external cylindrical sleeve, the treating liquor outlet aperture in the jet chamber in each of said jets being directed convergently towards the common axis of said tubular walls and said external cylindrical sleeve.

5. Apparatus for the wet treatment of cloths, according to claim 4, wherein said treating liquor outlet aperture is upwardly directed in one jet and downwardly directed in the other jet.

6. Apparatus for the wet treatment of cloths, according to claim 4, wherein the free ends of the larger diameter sections of the respective intermediate walls are mated and in contact, said intermediate walls having coupling means to hold the two jets together, the coupled ensemble of the intermediate walls, connected in turn to their respective internal tubular walls, forming an ensemble demountable from said common external sleeve which remains fixed to said treatment vessel.

7. Apparatus for the wet treatment of cloths, according to claim 6, wherein said dome has a cover which may be removed, the free end portion of the second cylindrical section of the intermediate wall of one of said jets is flared outwardly to fit said external sleeve, said flared portion having a member suitable for a handle for said coupled ensemble of the intermediate walls of the jets in order to remove said ensemble from said external sleeve, said handle member being reachable from the upper opening of said dome when the cover thereof is open, the lesser diameter free end of the intermediate wall of the other of said jets having an annular flange external to said wall which supports and holds said ensemble in said shorter leg.

8. Apparatus for the wet treatment of cloths, according to claim 6, wherein said coupled ensemble formed by the intermediate walls of the two jets, apart from being demountable from the fixed sleeve, is demountable in two independent units constituted by the intermediate wall and the interior tubular wall of each jet, said demountability allowing one or both of the independent units to be changed, with variation of the diameter of the central chamber of the jets according to the requirements of the cloth in rope form to be treated.

9. Apparatus for the wet treatment of cloths, according to claim 6, wherein the intermediate wall of both jets has at the free end of its larger diameter an external flange, said external flange of one of said jets mating with the external flange of the other of said jets for coupling purposes, at least one of said flanges having an O-ring joint in contact with said common external sleeve to seal the distribution chambers of both jets from each other.

10. Apparatus for the wet treatment of cloths, according to claim 1, wherein the intermediate tubular wall has a plurality of orifices and is spaced apart from the external sleeve, forming therebetween a liquid distribution chamber towards the jet chamber.

11. Apparatus for the wet treatment of cloths, according to claim 1, wherein said jet chamber has a plurality of diffuser walls situated adjacent said treating liquor outlet aperture.

12. Apparatus for the wet treatment of cloths, according to claim 1, wherein the end of the interior tubular wall having the same diameter as the second cylindrical section of said intermediate wall is spaced apart from said frustoconical section of said intermediate wall, forming thereby an annular orifice constituting the jet chamber treating liquor outlet aperture.

13. Apparatus for the wet treatment of cloths, according to claim 1, wherein the internal tubular wall extends to the frustoconical section of the intermediate wall at the point where said frustoconical section joins said second cylindrical section, said internal tubular wall having a plurality of orifices disposed peripherally therearound, said orifices constituting the jet chamber treating liquor outlet aperture.

14. Apparatus for the wet treatment of cloths, according to claim 1, wherein the internal tubular wall of said jet has a cylindrical section of the same diameter as the second cylindrical section of said intermediate tubular wall and a frustoconical portion joining one end of said cylindrical section to the wall of the frustoconical section of said intermediate wall in order to provide an area of widening of the central chamber of each jet which is thus delimited by said intermediate wall in said widening area.

15. Apparatus for the wet treatment of cloths, according to claim 1, wherein the ratio between the diameter of the lesser diameter tubular portions and the diameter of the larger diameter tubular portion lies between 1:2 and 1:4.

16. Apparatus for the wet treatment of cloths, according to claim 1, wherein the connection between the large diameter tubular portion and the lesser diameter tubular portion in the hypotenuse of said right-
angled triangular shape is made by means of a frusto-
conical tubular element, the cone angle of which lies
between 20° and 30°, measured from the axis of the two
tubular portions.

17. Apparatus for the wet treatment of cloths, ac-
cording to claim 1, wherein said jet means are disposed
in such a way that they cause the cloth in rope form to
be drawn in a downward direction with respect to the
vertical side.

18. Apparatus for the wet treatment of cloths, ac-
cording to claim 1, wherein said jet means are disposed
in such a way that they cause the cloth in rope form to
be drawn in an upward direction with respect to the
vertical side.

19. Apparatus for the wet treatment of cloths, ac-
cording to claim 1, wherein said dome has a central
port in the bottom thereof and a port situated in the
side wall thereof, said two lesser diameter tubular por-
tions being connected to said ports, said ports being
joined by a semitubular member which, as a ramp, fa-
cilitates the circulation of the cloth through the interior
of the dome.

20. Apparatus for the wet treatment of cloths, ac-
cording to claim 1, wherein said shorter leg has, below
the jet means, a guide ramp inclined towards one side, the
being beyond this guide ramp a liquid suction
zone disposed on the opposite side in order to produce
a transverse folding of the cloth with respect to the tu-
bular body.

21. Apparatus for the wet treatment of cloths, ac-
cording to claim 1, wherein a by-pass conduit,
equipped with a valve, connects the apex between said
unequal legs with the hypotenuse of said substantially
right-angled triangular shape in order to control the
pressure existing in those portions of said treatment

vessel.

22. Apparatus for the wet treatment of cloths having
the cloth in rope form drawn along by a treating liquor,
said apparatus comprising:

1. a treatment vessel comprising:
   a. a tubular body of substantially right-angled tri-
      angular shape with unequal legs and rounded
      apexes, the longer of said legs being horizontal
      and the shorter being vertical, said tubular body
      further comprising a large diameter tubular por-
      tion adapted to contain the major portion of the
      cloth being treated at one time and two lesser di-
      ameter tubular portions forming extensions re-
      spectively of the two ends of said large diameter
      tubular portion and being located respectively in
      the shorter of said legs and in the hypotenuse of
      said right-angled triangular shape;
   b. a substantially cylindrical dome connecting said
      two lesser diameter tubular portions, the axis of
      said dome being vertical and an extension of the
      axis of said shorter leg; and
   c. a by-pass conduit, equipped with a valve, which
      connects the apex between said unequal legs with
      the hypotenuse of said substantially right-angled
      triangular shape in order to control the pressure
      existing in those portions of said treatment ves-
      sel;

2. a liquid circulation pump;

3. a heat exchanger in fluid communication with said
   pump;

4. a jet means housed in said tubular body of said
treatment vessel; and

5. means for establishing fluid communication be-
tween said heat exchanger and said jet means.
UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION


Inventor(s) Isidro Folch TRULLAS

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

Applicant's claims of Priority have been omitted.

(1) Spain Patent of Invention No. 386.502, filed December 16, 1970
(2) Spain Patent of Invention No. 392.431, filed on June 19, 1971

Signed and sealed this 21st day of May 1974.

(SEAL)
Attest:

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Attesting Officer Commissioner of Patents