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Eckrodt

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[54] **APPARATUS FOR WET TREATMENT OF STRANDS OF TEXTILE MATERIAL**

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[51] **Int. Cl.²** **D06B 3/28**

[58] **Field of Search** 68/177, 178, 184

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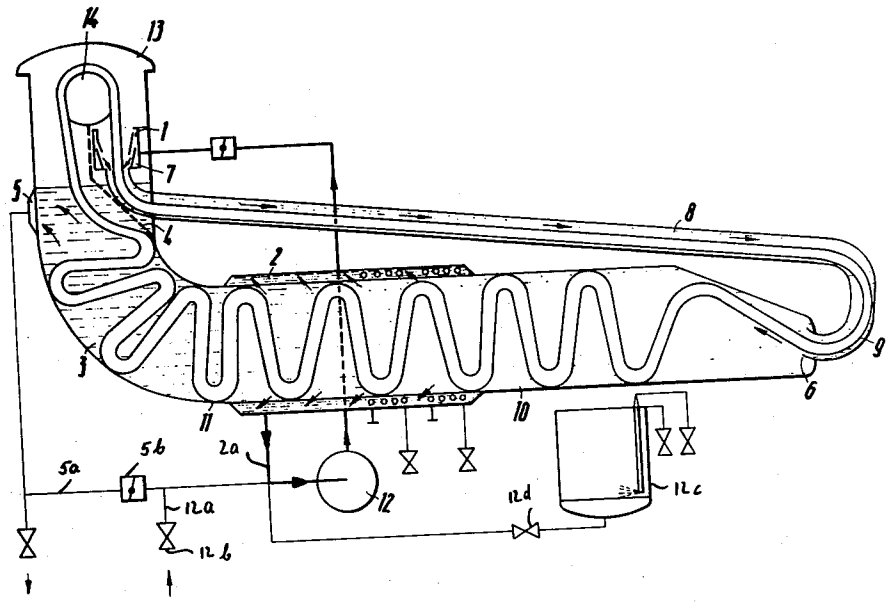
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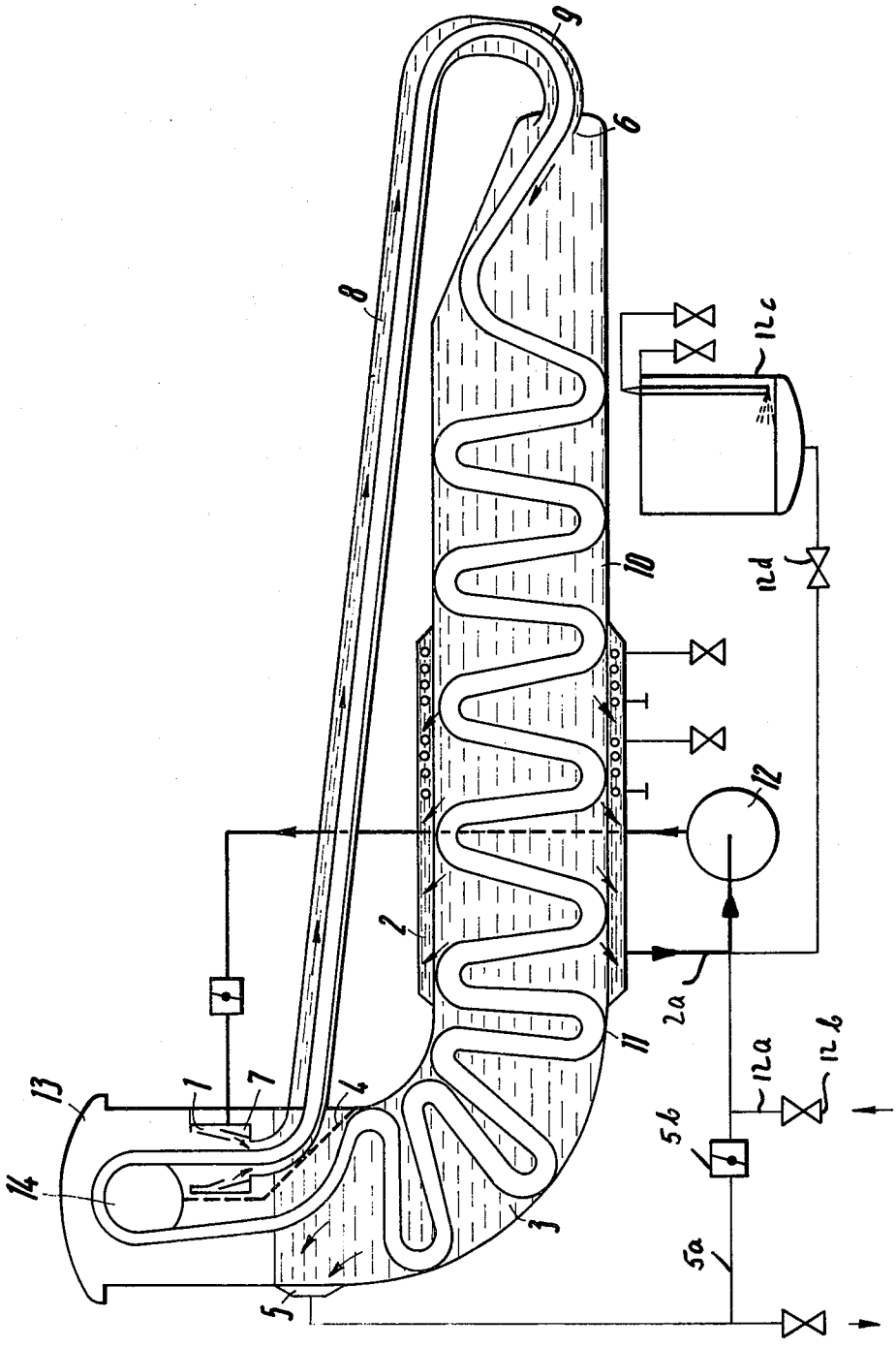
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[57] **ABSTRACT**

A container has an elongated substantially horizontal portion and a substantially upright portion at one end of said horizontal portion. A tube having a cross section considerably smaller than said container portions and communicating at one end with said upright portion below the upper end of the latter, extends to the other end of a generally horizontal portion of the container. A funnel structure is provided in the region of the upper end of the upright container portion for guiding a strand of textile material from the container into the tube. Liquid is circulated through the container funnel structure and tube so that the liquid flows from the upright container portion rapidly through said tube to the other end of the horizontal container portion to thereby move the strands of textile through the apparatus.

11 Claims, 1 Drawing Figure




9
6
8
12c
10
12d
12
2
2a
11
12a
12b
13
1
7
4
5b
14
3
5a
5

APPARATUS FOR WET TREATMENT OF STRANDS OF TEXTILE MATERIAL

BACKGROUND OF THE INVENTION

The invention relates to apparatus for wet treatment and particularly for dyeing of textile material. It has been proposed formerly to move an endless strand of the textile material in a container filled with dye liquid and to utilize circulation of the dye liquid for the moving of the textile strand. Problems have been encountered as the dye solution has not always been applied most effectively to the textile material.

SUMMARY OF THE INVENTION

It is an object of the invention to provide apparatus of the indicated type which overcomes the problems formerly encountered.

This is achieved mainly by combining a generally L-shaped container, as defined hereinafter, with a tube of narrower cross section than the container; means in an upper end part of the container for guiding a strand of textile material into the tube; and means for circulating liquid through the container and tube so that the liquid flows from the upper end of the container rapidly through the narrow tube and thereby moves a straight portion of the strand of textile fabric through the tube and into the wider container. Additional means such as a winch is preferably provided for additionally moving the strand; for removing spent dye liquid from the strand; and for thereby providing for intensive treatment of the strand with unspent dye liquid in the tube.

In a preferred embodiment of the invention, the container constitutes a wide tube of cylindrical cross section, and has the form of a lying L at its side, the substantially horizontal part of the L being longer than its upright part. It is further preferred that these parts are interconnected by a curved portion of the container so that the side view of the container may best be described as one-half of a U, lying on one of its legs and having the curved container portion leading to a relatively short upright container portion. The latter portion has an upper end region, generally kept empty of dye liquid and constituting a dome, wherein a winch is provided to promote the movement of the textile strand through the container and tube. The tube is narrower than the container, for relatively rapid flow of the circulating dye liquid. Preferably, the tube is connected with the container opposite the upright container portion by a curved tube portion for guiding the textile strands into the container.

Below the aforementioned winch the preferred form of the invention provides a funnel structure for guiding the strand of textile material from the winch into the tube, this structure being advantageously surrounded by guide wall means for guiding a liquid. A dye liquid circulating pump withdraws dye liquid from the upright container portion and discharges liquid mixed with new dye material into the guide means in the upright container portion for radial inward flow of the circulated liquid into the aforementioned funnel. Other guide wall means may also be provided at or adjacent this funnel, as will be explained. The aforementioned withdrawal of dye liquid is effected at or near the top of the upright container portion, where the dye liquid is spent by extended contact with textile material, or in a cylindrical jacket around the generally horizontal container portion, or at both locations.

Other characteristics of the invention will become apparent from the more detailed description of a preferred embodiment thereof which follows.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

The single FIGURE of the drawing is a side view, generally in vertical central section, through a preferred embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A container **10** of cylindrical cross section is provided for receiving and accumulating therein an endless textile strand **11** in contact with dye liquid which fills the container **10** up to the vicinity of a liquid withdrawing outlet **5.** This outlet is provided in an upright portion of the container **10** which rises from one end of a generally horizontal and generally longer section of the container **10.** The generally horizontal and upright portions of the container **10** are interconnected by a curved section **3.**

A dome-shaped top closure **13** is provided at the top end of the upright container portion, subject to removal of the closure **13,** for placing the textile strand **11** in the container **10.** A winch **14** is disposed between the closure **13** and the liquid outlet **5,** and an adjacent portion of strand **11** is placed over the winch **14,** wherefrom another portion of the strand enters a conical funnel **1.** At the lower and restricted end of this funnel **1** a straight connecting tube **8** of a cross section considerably smaller than the container extends from the upright container **10** portion to the opposite end **6** of the generally horizontal container portion. The tube **8** preferably is inclined downwardly from the funnel **1** to the container end **6.**

A circulating pump **12** withdraws dye liquid from outlet **5** through a pipe **5*a*** and a check valve **5*b***, or from a jacket **2** around and communicating with the horizontal container portion, through a pipe **2*a***. The circulating pump **12** returns circulated dye liquid comingled if necessary with new liquid from a pipe **12*a*** and a valve **12*b*** and/or new dyestuff from container **12*c*** and a valve **12*d***, to a ring-shaped inlet section defined by guide wall means **7** around the funnel **1,** for radial inward flow of the liquid into the funnel **1.** A stream of this liquid then engages the textile strand **11** and flows rapidly with it, propelling it from the funnel **1** into and through the connecting tube **8.** If and when the winch **14** is rotated by a motor (not shown) this promotes the motion of the strand **11** from the upright container portion and into the funnel **1,** and additionally serves to wring spent dye liquid from the strand **11.** In the funnel **1** the liquid stream circulated by the pump **12** and containing fresh dye material receives the strand **11** which then is moved with the aid of this liquid stream in a straight line through the pipe **8** and a curved end section **9** thereof back into the other end **6** of the container **10,** in a relatively rapid motion compared with the motion of the strand and liquid in the wider con-

tainer **10.** The motion of the strand **11** in the tube **8** is further promoted gravitationally by the inclined arrangement of this tube **8.** Successive portions of the strand then accumulate in the wide container **10** as indicated by zig-zag forms of the strand **11.**

The dye treatment of textile material in the new apparatus can be applied at temperatures of about **180°C.**

Advantageously, the apparatus according to the invention causes the textile strand **11** in effect to float in and through the container **10;** to remove spent dye liquid from the textile strand **11** with the aid of the winch **14,** which also serves to assist the hydraulic and gravitational propulsion of the strand **11;** and to have the strand **11** wetted with fresh and intensively acting dye liquid from the sources **12***a*, 12*c* in the funnel structure **1, 7** the tube **8.** In the latter tube **8,** in which the dye liquid moves rapidly and faster than the strand **11,** an intensive dyeing is performed. In the container **10,** this is followed by continued, less intensive treatment, as folded portions of the strand **11** are accumulated in the dye liquid to float in and with this liquid in a relatively slow motion from the region of one end **6** of the container to the region of the outlet **5,** while the dye liquid gradually becomes spent.

The treatment is subject to regulation in several ways. For example dye liquid can be circulated to the pump **12** either from the outlet **5** and the pipe **5***a* or from the cylindrical jacket **2** and the pipe **2***a*, or from both, as shown.

The strand **11,** rising in folded condition through and from the curved container portion **3,** can be guided in suitably inclined orientation in the overlying area where the winch **14** lifts the strand **11** from the liquid in the upright portion of the container **10.** For this purpose an inclined guide wall **4** can be provided in this latter portion, as shown by dotted lines in the drawing.

It is also possible to keep the strand **11** fully submerged, or at least to keep it submerged to some extent, above the funnel and guide structure **1, 7** to make entirely sure that air will not be entrained with the circulated liquid and the strand **11** into the connecting tube **8.**

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of constructions differing from the type described above.

While the invention has been illustrated and described as embodied in an apparatus for wet treatment of textile strands, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.

1. Apparatus for wet treatment of a strand of textile material, comprising a substantially L-shaped tubular container having an elongated substantially horizontal portion having longitudinally spaced ends, and a substantially upright portion extending upwardly from and communicating with one of said ends, said horizontal portion being completely, and said upright portion being partially filled with a treating liquid, means for discharging spent treating liquid at least from said upright portion so as to establish a liquid level therein; a tube having a cross section considerably smaller than said container portions, said tube being located at one end thereof within said upright portion and communicating at the other end thereof with the other end of said horizontal portion, said tube being inclined toward said other end and extending between the ends thereof outside said container and at least partially below said liquid level and at the other end with the other end of said horizontal portion means for withdrawing the strand of textile material from underneath said liquid level and for removing spent treating liquid therefrom; means communicating with said tube and with said upright portion above said liquid level for guiding the strand from said withdrawing means into said tube; and means for introducing fresh treating liquid into said container in the region of said guiding means and through said tube so as to advance the strand through said tube into said horizontal portion of said container where the strand is accumulated until again withdrawn by said withdrawing means and to completely fill said tube to thereby treat the strand with fresh treating liquid while the strand is advancing through said tube and with partly spent treating liquid while the strand is in said horizontal portion of said container without contact with the ambient air.

2. Apparatus as defined in claim **1,** wherein said guiding means includes a funnel in the upright portion of said container and guide wall means around the funnel for guiding the fresh liquid radially inwardly into said funnel for flow through said funnel into said tube.

3. Apparatus as defined in claim **2,** wherein said upright container portion is shorter than said horizontal portion.

4. Apparatus as defined in claim **1,** wherein said container has a curved portion interconnecting said horizontal and upright container portions.

5. Apparatus as defined in claim **4,** wherein said tube has a curved portion connecting the tube with said other end of said horizontal container portion.

6. Apparatus as defined in claim **1,** including winch means in the region of said withdrawing means guiding means for additionally propelling said strand through the apparatus.

7. Apparatus as defined in claim **6,** wherein said winch means is so disposed as to remove dye liquid from said strand and then to feed said strand into said guiding means.

8. Apparatus as defined in claim **1,** wherein said guiding means comprises a funnel and a guide wall for guiding fresh liquid inwardly into said funnel.

9. Apparatus as defined in claim **1,** wherein said discharging means includes outlet means for withdrawing liquid from said upright portion of said container.

10. Apparatus as defined in claim **1,** wherein said discharging means includes a cylindrical sleeve surrounding part of said horizontal container portion and communicating therewith.

11. Apparatus as defined in claim **1,** including means for dyeing the textile strand.

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