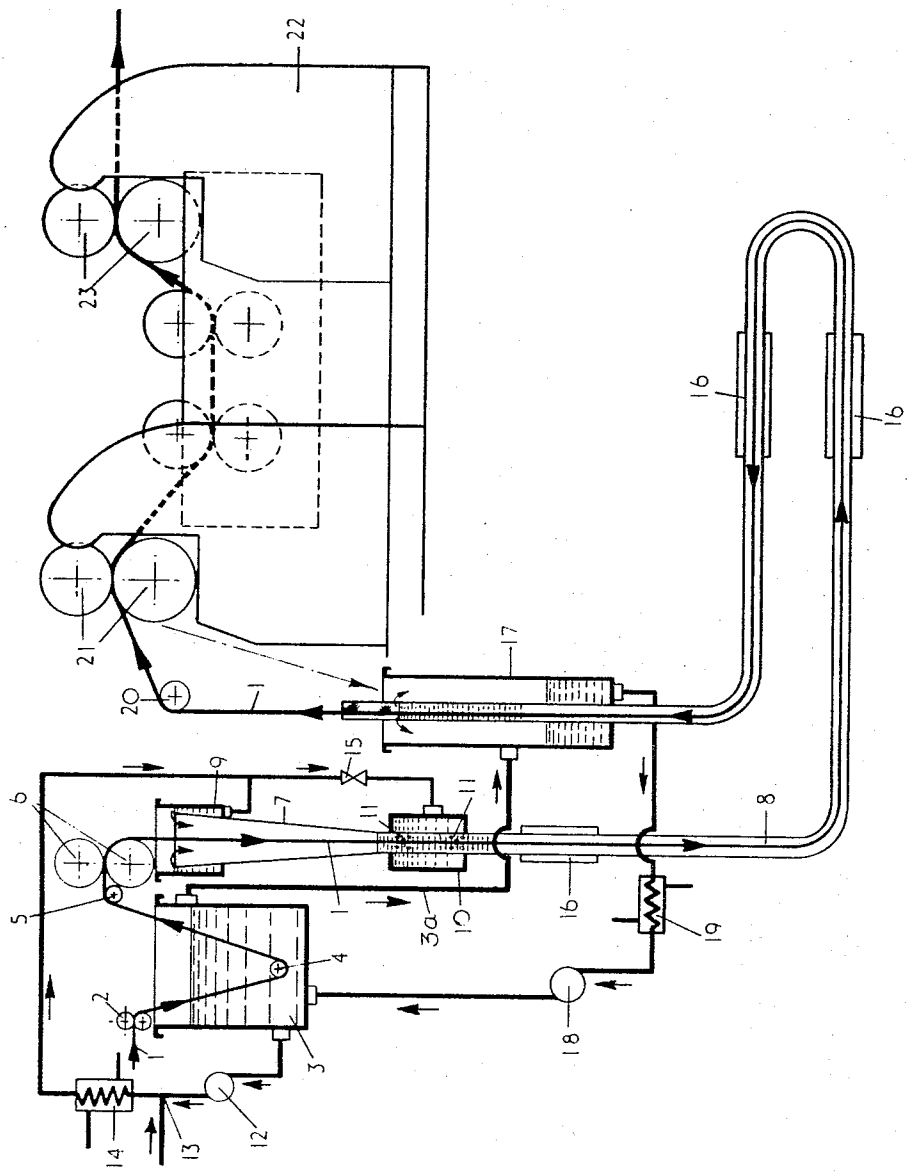
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APPARATUS FOR TREATING TEXTILE MATERIALS

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APPARATUS FOR TREATING TEXTILE MATERIALS

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ABSTRACT OF THE DISCLOSURE

The invention relates to an apparatus for treating textile materials whose nature is such that they tend to part easily on the application of a relatively low tensile stress. In particular the materials contemplated include wool, cotton or synthetics, loose stock, synthetic tows, or spun fibres. The material being treated is covered solely by the influence of a flow of treating liquor throughout the treatment zone, the treating liquor being with advantage a dye and this dye on being exhausted on passing through the treatment zone is replenished by a fresh portion of fresh dye liquor before being re-circulated from the treatment zone. One of the main features of the invention is that substantially no tensile stress is applied whatsoever to the material and no moving parts are incorporated within the treatment zone.

This invention is concerned with an apparatus for the continuous treatment of textile materials with a liquid and is particularly concerned with treating textile materials such as slivers of wool, cotton or synthetics, loose stock, synthetic tows, spun fibre in warp or hank, or fabrics of any type.

The treatments with which the apparatus is particularly concerned is the dyeing of materials but it will be readily appreciated from the following description how the apparatus may be applied to other processes such as bleaching and so on.

In previously proposed methods for the continuous dyeing of sliver material, disadvantages have arisen in that the number of dyes which may be applied to the material is restricted. Other methods usually employed such as the pad steam method requires special dyes. The present invention employs conventional and cheaper dyestuffs whilst maintaining a superior degree of fastness and also special dyestuff auxiliaries are eliminated. Further, with the treatment of such materials as wool slivers the material must be handled with great care to prevent damage. The present invention seeks to provide an apparatus for continuously treating textile material in which the aforesaid disadvantages are obviated or mitigated.

According to the present invention there is provided apparatus for continuously treating textile material with a treating liquor comprising a vessel having no moving parts and defining a treatment zone through which the material is passed, means for inducing a flow of liquor through the vessel whereby the material is carried through the treatment zone entirely by the liquor moving at a constant velocity relative to the speed of the material under conditions in which substantially no tensile stress is applied to the material being treated, means for heating the liquor during its passage through the treatment zone, means for receiving the exhausted liquor after its passage through the treatment zone, recirculating it to be proportionately mixed with a supply of fresh liquor and passing the mixed liquor to the treatment zone.

Preferably, the vessel is in the form of a substantially U-shaped tube open at both ends.

An embodiment of the invention will now be described, by way of example, with reference to the accompanying drawing which shows diagrammatically one form of apparatus for the colour dyeing of textile slivers.

Referring to the drawing, a continuous sliver indicated generally by the reference numeral 1, is fed from a supply (not shown) through a pair of feed rolls 2 before passing into a bath 3 containing a supply of exhausted dye liquor, the passage through the bath 3 serving to provide the sliver with a preliminary impregnation prior to the actual dyeing process. The sliver 1 passes round a guide roller 4 in the bath 3 before travelling upwardly over a second guide roller 5 and into the nip of a pair of variable speed squeeze rollers 6. The sliver 1 then travels downwardly into the bell-shaped end 7 of one leg of a substantially U-shaped vessel or tube 8 lagged with electrical tape or other heating media (not shown, but of any suitable known form) to increase the temperature and to compensate for heat losses. The open end of the bell is surrounded by an auxiliary dye tank 9 the level of which is maintained such that a small amount of dye liquor spills over the open end of the bell to act as a lubricant for the continuous sliver 1 being fed into the tube 8. Below the tank 9 and subsequent to the termination of the bell shaped portion of the tube 8, the tube is surrounded by a main tank 10 into which the main supply of the dye liquor is fed, the liquor passing into the tube 8 through holes 11 in the walls.

The dye liquor is fed to the tanks 9 and 10 by a variable capacity dye feed pump 12 which pumps a proportion of exhausted dye liquor from the bath 3 and mixes it with a predetermined quantity of fresh dye liquor fed into the circuit at 13. The mixture is then passed through a heat exchanger 14 to heat the dye liquor before feeding it to the tanks 9 and 10 as required under the control of valve 15.

When the dye liquor passes into the tube 8 through the holes 11 the liquor envelopes the sliver 1 and carries it down the tube under the influence of the dye liquor flow, the continuous flow being maintained due to the pressure differential created by effective liquor height in the outlet leg of the U being shorter than that is the inlet leg. Although the sliver 1 is indicated in the drawing by a straight line, in practice the sliver fills the tube from side to side in a wave form.

At intervals the U-tube 8 is surrounded by auxiliary heaters 16 which maintain the temperature of the liquor passing through the tube at the required temperature whereby the dyeing process is facilitated.

As the liquor travels up the outlet leg of the U-tube it overflows over the open end into a collecting tank 17 from where the exhausted liquor is pumped by a circulating pump 18 after passing through a heat exchanger 19 in which the exhausted dye liquor is cooled before being pumped back into the bath 3. Any overflow from the bath 3 passes through flow line 3*a* by gravity into tank 17. The dyed sliver on leaving the U-tube 8 passes over a guide roller 20 to squeeze rollers 21 after which it passes into a wash bath 22 of known form, out of the bath through a further set of squeeze rollers 23 and thence to any subsequent treatment as may be required.

As will be readily seen from the drawing, the U-tube 8 has its lower portion deformed horizontally for the purpose of saving space. It will be understood that although a vessel in the form of a U-tube has been described in the above embodiment any other suitable form of vessel can be employed so long as a pressure differential created by any suitable means exists across the inlet and outlet ends of the vessel.

Further, the squeeze rollers 21 are variably geared in known manner and are controlled to receive the dyed sliver at a rate not greater than and preferably at the

same speed as that at which the sliver is carried through the U-tube 8 by the dye liquor. In this way the rollers 21 merely take up the material as it is fed from the outlet of the U-tube and do not apply any tension at all to the sliver.

In the embodiment described above, the pressure differential across the inlet and outlet ends of the U-tube is created by having the column of liquor in the inlet leg of a greater height than that in the outlet leg. It will be apparent therefore that the rate of flow of the liquor and hence the sliver to be treated can be controlled by the selection of a given difference in height of the liquid in the two legs. The rate of flow of the liquor is adjusted to ensure adequate penetration and treatment of the material by the dye liquor. It is important that the relative speeds of the material and liquor through the tube be kept substantially constant. If the liquor flows too fast relative to the material there is a tendency to tear wool slivers, whereas if the liquor speed is too slow the material tends to pack in the tube.

Although in the embodiment described above, the bulk of the dye liquor is fed into the U-tube 8 through the holes 11 whilst a small amount is fed over the top of the inlet leg of the U-tube for lubrication purposes, the whole of the liquor can if desired be fed over the top of the inlet leg.

By means of the process and apparatus of the present invention, material such as wool slivers, which cannot have tension applied to them, can be gently conveyed through a treatment zone and it is also though that the pressure existing towards the base of the U-tube assists in the penetration of the dye into the material.

What I claim is:

1. Apparatus for continuously treating fibrous textile material of low tensile strength with a treating liquor comprising a vessel having no moving parts and defining a treatment zone through which the material is passed, means for inducing a flow of liquor through the vessel whereby the material is carried through the treatment zone entirely by the liquor moving at a substantially constant velocity relative to the speed of the material under conditions in which substantially no tensile stress is applied to the material being treated, means for heating the liquor during its passage through the treatment zone, means for receiving the exhausted liquor after its passage through the treatment zone, means for recirculating the exhausted liquor to be proportionately mixed with a supply of fresh liquor and means for passing the mixed liquor to the treatment zone.

2. Apparatus as claimed in claim 1, in which the vessel is in the form of a U-tube through which the material is passed, dye liquor being fed to the inlet leg of the tube to maintain a greater column of liquor in the inlet leg than in the outlet leg thereby creating a pressure differential across the inlet and outlet legs to induce a liquor flow by which the material is carried through the tube.

3. Apparatus as claimed in claim 2, in which a proportion of the liquor is fed to the inlet leg of the U-tube through perforations therein, the remaining liquor being fed to the U-tube above the liquor-level in the inlet leg to act as a lubricant for the infeed of textile material to the U-tube.

4. Apparatus as claimed in claim 1 and further comprising cooling means for cooling the exhaust liquor, a bath into which the textile material is passed for a preliminary soaking prior to passing through the U-tube, and means for recirculating the exhaust liquor from the cooling means to the soaking bath.

References Cited

UNITED STATES PATENTS

813,478	2/1906	Zillessen	68—184
1,652,649	12/1927	Tice.	
2,203,678	6/1940	Dursteler.	
2,460,206	1/1949	Wentz	68—179 X
2,633,009	3/1953	Steverlynck	68—184
2,720,443	10/1955	Keggin	68—178 X
2,947,595	8/1960	Moelter	68—184 X
2,969,664	1/1961	Nasu et al.	68—178
3,058,327	10/1962	Hablutzel et al.	68—5
3,110,169	11/1963	Suggs	68—181 X

FOREIGN PATENTS

1,033,208	4/1953	France.
504,995	8/1930	Germany.
514,045	2/1955	Italy.
60,819	3/1948	Netherlands.
348,944	11/1960	Switzerland.
120,207	8/1958	USSR.
1,071,644	12/1959	Germany.

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