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(54) **Machine for the discontinuous dyeing of fabric products**

(57) A machine for the discontinuous dyeing of fabric products in rope form comprises an autoclave (5) which contains a bath (10) for the treatment of the fabric and a unit for the introduction into the bath of dyes and any auxiliary chemical products contained in at least one tank

(1). The introduction unit provides a recirculation duct (9) between two points on the bath (10) in which a mixing pump (4) is fitted, and provides for the introduction of the products coming from at least one tank (1) into the recirculation duct (9).

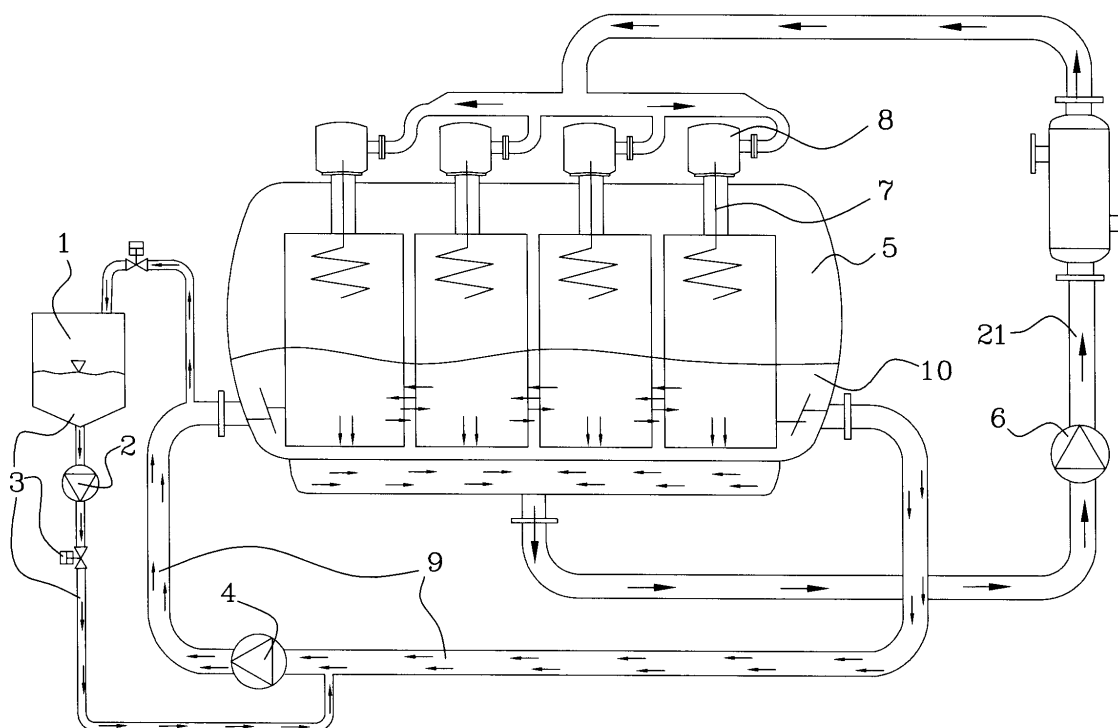


FIG 1

Description

[0001] The present invention concerns machines for the treatment of fabric products and in particular the so-called machines for discontinuous dyeing (or exhaustion dyeing) of fabrics in rope form.

[0002] With reference to the attached Fig. 3, a known machine for discontinuous dyeing of fabric products in rope form comprises a dyeing autoclave 5 which contains, in substantially static manner, both the fabric 7 to be treated and the bath 10 necessary for the treatment. The "static" bath necessary for the treatment is aspirated and introduced into the autoclave by a main pump 6 fitted in a movement duct 21.

[0003] By means of a movement unit, including for example a powered roller 22 and a nozzle for injecting the treatment bath, the fabric 7 is introduced into the autoclave, descending along the fabric transport channel 24, into the basket 25 for containing the fabric itself. The basket 25, being perforated, effects the separation of the bath 10 from the fabric 7 and makes the bath available again for being aspirated by the pump 6.

[0004] The main pump 6 effects the introduction of the treatment bath, containing the auxiliary chemical dyeing products and the dyes, through the injection nozzle 8 and onto the fabric, and is responsible for moving the bath. The movement of the bath and the movement of the fabric are in fact indispensable for achieving the process of dyeing which must be performed as uniformly as possible in order to obtain a qualitatively acceptable product.

[0005] The dyeing machine also requires, upstream of the pump 6, a unit for the introduction of the dyes and any auxiliary chemical products, which are mixed into the bath coming from the autoclave and aspirated by the main pump.

[0006] These products must be introduced into the bath uniformly diluted to avoid localised concentrations which would lead to a qualitatively unacceptable dyeing result, for example non-uniform dyeing or with localised defects.

[0007] These products cannot be introduced directly into the bath containing the fabric, because inside the autoclave the fabric is in contact with the bath in static form and therefore there is a strong risk of locally increasing the concentration of the bath and obtaining a localised non-uniformity.

[0008] In the known machine shown in Fig. 3, the introduction unit normally includes one or more tanks 30, 31, for the products, and a device for introducing the products into the water circuit, which is made up for example by a pump 2 or a Venturi pipe. Accessory components are also provided for feedback-governed control, flow rate measurement etc., so as to make the introduction of the products homogeneous and regular. These components are not illustrated or described in detail because they are not essential for the purposes of the present invention.

[0009] The introduction point for these products corre-

sponds normally to the intake or to the outlet of the main pump 6.

[0010] According to the machine described, the products are introduced in proximity to the intake duct of the main pump 6 and mixed with the bath which the pump aspirates from the autoclave.

[0011] This known solution entails the introduction of the products in very small quantities to avoid an excessive rise in the concentration of the portion of the bath withdrawn from the autoclave which is passing through at that moment and which will come into contact with a portion of fabric.

[0012] According to another known solution (not shown), before being introduced in proximity to the intake of the main pump, the products are diluted in advance in an auxiliary (external) tank which receives a fraction of the bath coming from the outlet of the main pump. In this way the proportions of bath are increased, because a greater quantity of bath is required, corresponding to what must be kept in recirculation in the auxiliary tank. Furthermore, the dilution obtained is limited, corresponding to the volume of bath contained in the auxiliary tank.

[0013] The increase in the proportion of bath entails an increase in processing costs, owing to the greater quantity of chemical products used, which are proportional to the quantity of water fed into the machine. The energy costs are also increased, because a larger quantity of bath must be heated, in addition to the costs of treatment of the waste water. This solution therefore entails an increase in the overall costs of treatment.

[0014] Furthermore, the introduction of the chemical products into the intake of the main circulating pump for the bath can cause imbalances and not guarantee a constant feed of the bath through the injection nozzle, with consequent traction problems for the fabric and therefore problems of fabric circulation.

[0015] The aim of the present invention is to overcome the disadvantages and limitations, set out above in the prior art, by creating a machine for discontinuous dyeing of fabric products in rope form which allows an improved (or rather higher) dilution ratio for the chemical products and dye, with consequent improvement in the quality of the fabric product obtained, and with a reduction in cost due to the overcoming of the limitations of the known art.

[0016] The machine according to the invention enables the time required for the introduction of the products to be reduced, allows lower proportions of bath to be used, with consequent reduction in processing and energy costs, and makes the action of drawing the fabric through the action of the bath injection nozzle more stable and constant.

[0017] The invention achieves these aims by means of a machine for the discontinuous dyeing of fabric products according to claim 1. Further advantageous characteristics form the subject of the dependent claims.

[0018] According to the invention, the machine provides an additional pump capable of moving the treatment bath contained in the autoclave, into the intake duct

(or the outlet duct in a variant embodiment of the invention) of this pump, products being introduced coming from the auxiliary tank(s) for the purpose of mixing them with the treatment bath contained in the autoclave. In this way, localised raising of the concentration of the bath is avoided and the maximum dilution possible is achieved before the bath, aspirated by the main pump, comes into contact with the fabric itself.

[0019] The invention will now be described with reference to its preferred, but not limiting, embodiments, shown by reference to the attached drawings, in which:

- Fig. 1 is the schematic plan view of the system which provides for introduction into the intake of the pump for mixing the machine's bath, and for recirculation via a takeoff on the pump's outlet;
- Fig. 2 is the schematic plan view of the system which provides for introduction into the outlet of the pump for mixing the machine's bath, and for recirculation again via a takeoff on the pump's outlet, but upstream of the introduction point;
- Fig. 3, already described, schematically shows a conventional machine.

[0020] In Figures 1 and 3, for ease of comparison, equal or substantially equivalent parts, both of the known machines and of the invention, are distinguished by the same reference numbers. In Figure 2, the numbers corresponding to parts in Fig. 1 have been increased by 100.

[0021] With reference to Fig. 1, besides the principal components already described with reference to Fig. 3, the machine according to the invention provides for a system of introducing products which is composed of a unit made up of one or more tanks, indicated generically by the reference number 1, of a pump 2 for introducing products, and of a control system for the quantity introduced per unit of time, indicated comprehensively by the reference number 3.

[0022] The system for introducing products feeds the products into the intake side of the mixing system for the bath contained in the dyeing autoclave 5. The mixing system for the bath consists of a mixing pump 4 and a system of pipework 9 with corresponding diverters.

[0023] The products introduced and diluted into the bath 10 are withdrawn, in dilute form, by the main circulating pump 6 for the movement duct 21, and brought into contact with the fabric 7 through the nozzles 8.

[0024] In the variant embodiment illustrated in Figure 2, the introduction system for products again consists of a unit made up of one or more tanks 101, of a pump for introducing the products 102 and of a control system for the quantity introduced per unit of time 103.

[0025] According to this variant the products are introduced into the bath's mixing system in proximity to the outlet of pump 104. The mixing system for the bath contained in the dyeing autoclave 105 consists of the mixing pump 104 and of a suitable system of pipework 109, with associated diverters.

[0026] The products introduced and diluted into the bath 110 are withdrawn, in dilute form, by the main circulating pump 106 and brought into contact with the fabric 7 through the nozzles 108.

[0027] With reference to both examples, the invention provides advantageously that a fraction of the bath in the recirculation duct (9; 109) is carried back to the tank (1; 101) in order to dilute the products. In particular, in the example shown in Fig. 1 the recirculation occurs via a takeoff on the outlet of the mixing pump for the bath (4), while in the example in Fig. 2, recirculation again occurs via a takeoff on the outlet of the pump (104), but upstream of the introduction point for products coming from the tank.

[0028] Although the invention has been illustrated with reference to preferred constructions, it is in general susceptible of other applications and modifications which are intended to be included in the protective scope, as will be evident to those skilled in the art.

Claims

1. A machine for the discontinuous dyeing of fabric products comprising:

- a dyeing autoclave (5; 105) into which is fed fabric in rope form (7) and which contains a bath (10; 110) for the treatment of said fabric;
- a movement duct (21; 121) equipped with a main pump (6; 106) which withdraws a fraction of said bath and reintroduces it into the autoclave in proximity to one or more nozzles (8; 108) in which it comes into contact with the fabric;
- a unit for the introduction into said bath of dyes and any auxiliary chemical products contained in at least one tank (1; 101) of said products, including an introduction device (2; 102);

characterised by providing a recirculation duct (9; 109) between two points on said bath (10; 110) in which a mixing pump (4; 104) is fitted, and **characterised in that** said products coming from at least one tank (1; 101) are fed into said recirculation duct (9; 109).

2. A machine according to claim 1, **characterised in that** said products are fed into the recirculation duct (9) upstream of said mixing pump (4).
3. A machine according to claim 1, **characterised in that** said products are fed into the recirculation duct (109) downstream of said mixing pump (104).
4. A machine according to any of the preceding claims, **characterised in that** a fraction of the bath present in the recirculation duct (9; 109) is withdrawn and

carried back to the at least one tank (1; 101) to dilute the products.

5. A machine according to claim 4, **characterised in that** said fraction of the bath is withdrawn into the recirculation duct (9) downstream of said mixing pump (4). 5
6. A machine according to claim 4, **characterised in that** said fraction of the bath is withdrawn into the recirculation duct (109) downstream of said mixing pump (104) but upstream of said introduction point for the products coming from at least one tank (101). 10
7. A machine according to one of the preceding claims, **characterised in that** the unit for the introduction into the said bath (10; 110) of dyes and of any auxiliary chemical products contained in at least one tank (1; 101) includes means (3; 103) for controlling the quantity of product(s) introduced. 15 20

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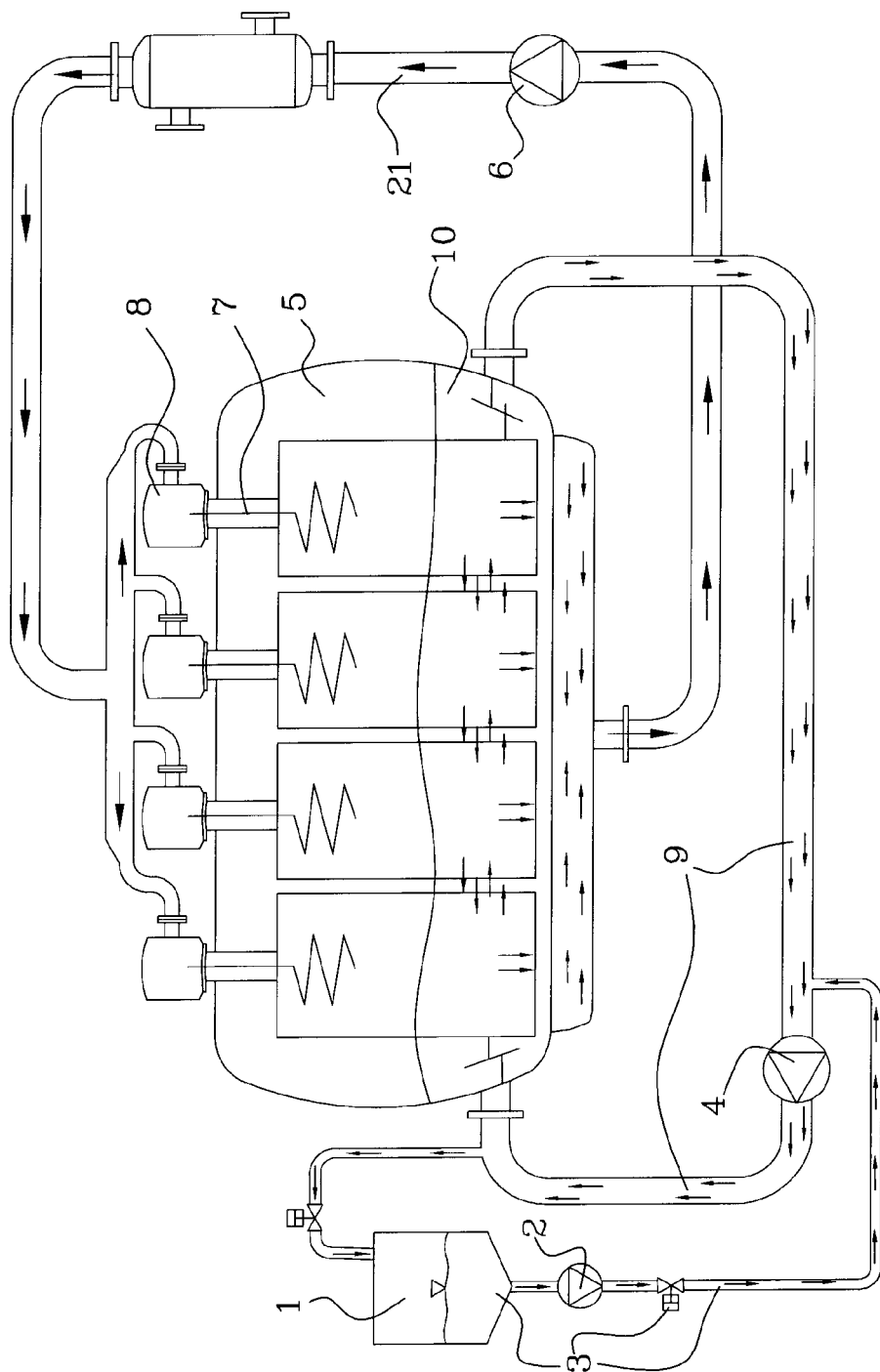


FIG 1

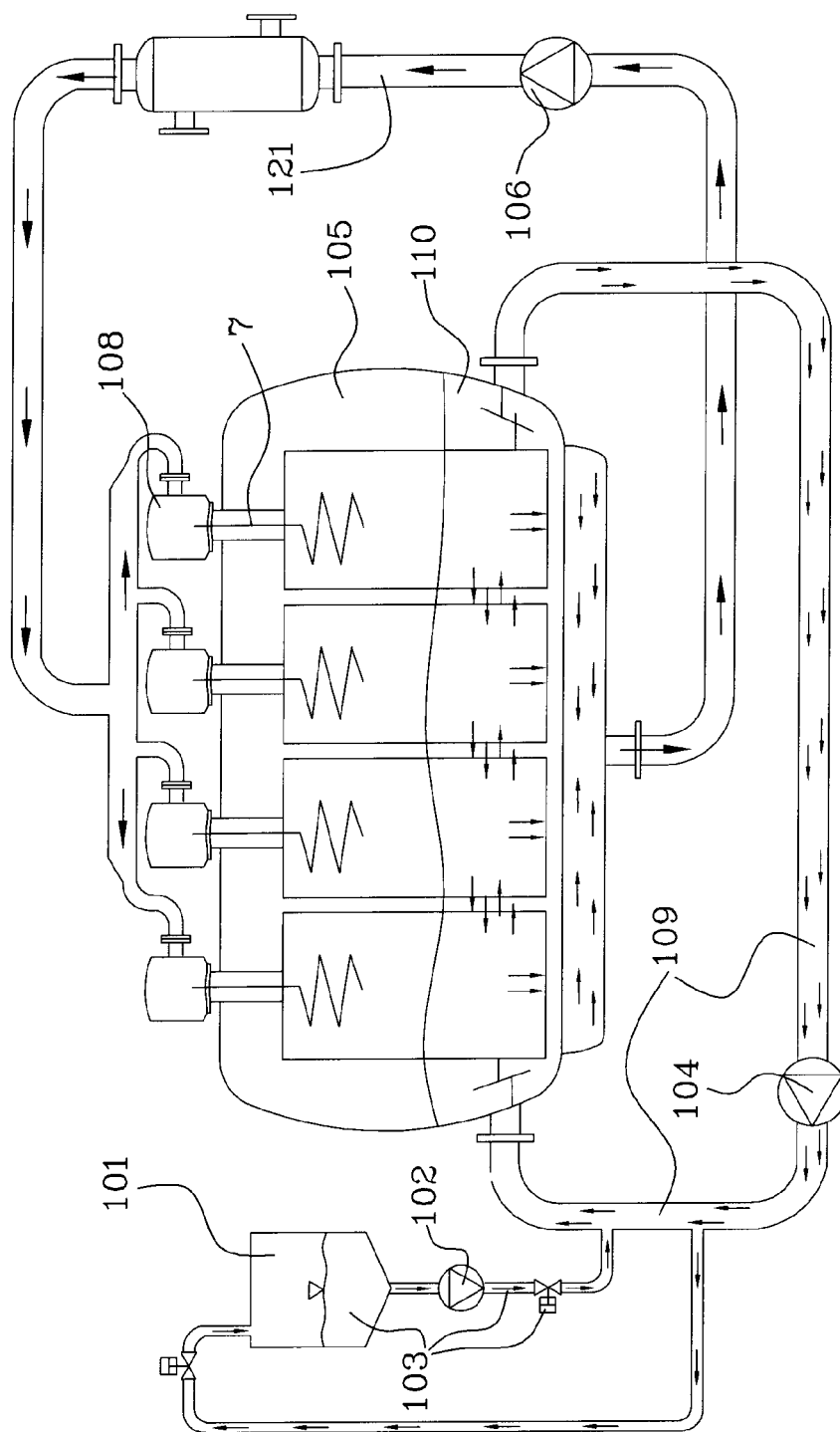
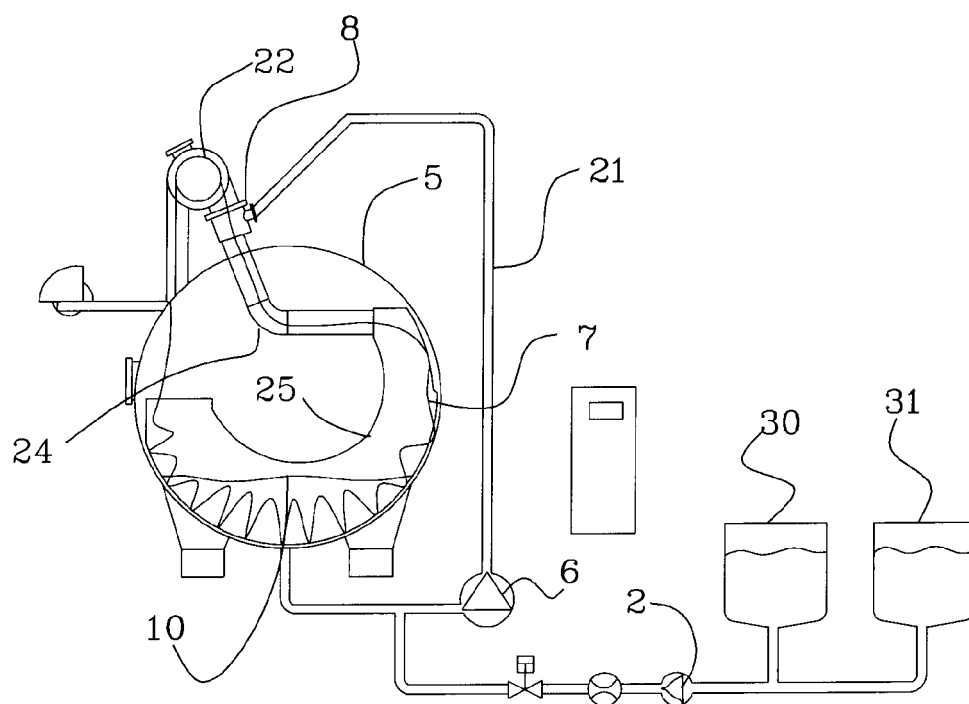


FIG. 2

FIG 3





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 11 3037

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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 7 November 2007	Examiner Bichi, Marco
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 07 11 3037

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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