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(54) **A machine for dyeing fabric in rope form**

Vorrichtung zum Färben von strangförmigem Textilgut

Installation pour teindre un tissu en boyau

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## Description

The present invention relates to a machine for dyeing fabric gathered into a rope and sewn into a loop.

More precisely, the invention relates to a machine according to the pre-characterising part of claim 1, which is known from DE-A-3 613 364.

DE-A-3 613 364 shows a machine having a tank for holding the dye bath, a nozzle for soaking the fabric and entraining it hydraulically and a tube downstream of the dyeing nozzle for transporting the rope hydraulically. The rope of fabric collects in an orderly series of folds at the outlet of the dyeing tube and is raised by a single motor driven roller at the end of the machine opposite to the outlet of the dyeing tube. Said machine includes a stationary guiding element located upstream of the lifting roller and urging the rope of fabric in a direction such that the rope passes around a larger angular portion of the lifting roller.

A problem of the machine according to DE-A-3 613 364 is that various types of fabric have been found to be unsuitable for dyeing in rope form in this kind of machines, because of their tendency to form permanent creases. In fact, in this known machine it is possible that some creases form always in the same position in the fabric as it passes repeatedly on the lifting roller, in the nozzle and in the dyeing tube. At the end of the dyeing process, some types of fabric - especially delicate or light fabrics - may be permanently damaged by marks produced by the creases.

The problem of the tendency of the material to crease during a dyeing process in rope form has already been confronted by FR-A-2 193 333. This document shows a dyeing machine provided with an air nozzle which swells the fabric upstream of a lifting roller. The air nozzle forms the fabric into a sort of balloon in order to prevent the creases from always forming in the same position in the fabric. The flow of air is directed from inside to outside of the loop of rope and to maintain the rope in frictional contact with the lifting roller, the machine is provided with a second roller which is biased by a spring toward the lifting roller.

The machine according to FR-A-2 193 333 does not overcome the problem of damages to delicate fabrics. In fact, while the air nozzle is effective in preventing the creases to form always in the same position, the entraining of the rope is effected by compressing the rope between two rollers. Such compression of the rope could still produce damages of delicate fabrics.

The object of the present invention is to provide a dyeing machine which can dye in rope form also types of fabrics which, because of their tendency to crease, could not be treated by conventional machines for dyeing ropes.

According to the present invention, this object is achieved by a dyeing machine according to claim 1.

The machine according to the invention includes means for directing a flow of air onto the rope from the

outside to the inside of the loop of rope. The air flow inflates the rope of fabric so that it opens out and closes up continually, thus changing the position of the creases and preventing them from forming permanent marks.

Moreover, the air generates a transverse force on the rope of fabric which causes it to pass around a larger angular portion of the roller so that positive entrainment is maintained without slippage, without compressing the rope between a pair of rollers.

Another characteristic of the invention is that, when the machine is operating, the fabric in the folding chamber is still above the level of the bath so that the machine can operate with low bath ratios (about 1:5). In these conditions, moreover, the rope of fabric is drained as it returns to the entrainment roller and is thus lighter and opens out more easily under the effect of the air so as to optimise the essential movement of the creases.

Further characteristics and advantages of the present invention will become clear in the course of the detailed description which follows with reference to the appended drawings, provided purely by way of non-limiting example, in which:

Figure 1 is a schematic, longitudinal section of a dyeing machine according to the present invention,

Figure 2 is a section taken on the line II-II of Figure 1, and

Figure 3 is a view taken on the arrow III of Figure 1.

With reference to Figure 1, a dyeing machine, indicated 1, includes a tank 2 containing the dye bath 4. In the upper portion of the tank 2 is a soaking, dyeing and hydraulic entrainment nozzle 8 which is supplied with the dye bath 4 by means of a circulation pump 10 and a pipe 12, and through which the rope 14 passes. Next to the nozzle 8 is a tube 6 for transporting the rope hydraulically to a folding chamber 16.

The rope of fabric 14 moves in the sense indicated by the arrow A. At the outlet of the transportation tube 6, the fabric is deposited in the folding chamber 16 in an orderly manner by a folding device constituted by a curved tube portion 6A which is rotatable about the axis of the tube 6. The portion 6A is connected to a compressed-air linear actuator (not shown) which causes the portion 6A to pivot to and fro about its axis of rotation so that the the entire width of the folding chamber is filled.

The chamber 16 has a quadrangular cross-section the width of which increases in the direction in which the fabric 14 moves. The base wall 18 of the folding chamber 16 is covered internally with self-lubricating material (for example teflon) to facilitate the sliding of the fabric 14. The side walls 20 of the chamber 16 are perforated so that the dye bath can drain out when the machine is operating with the dye-bath level below the base wall 18 of the chamber 16.

A motor-driven roller, indicated 22, lifts the fabric 14 from the folding chamber 16 and sends it to the nozzle 8.

A fan 24 disposed inside the loop defined by the rope of fabric 14 draws air into the tank 2 and sends it into an air duct 26. The duct 26 extends outwardly of the loop of fabric 14, passes over the motor-driven roller 22 and ends in a diffusor 28 which lies between the outlet of the folding chamber 16 and the motor-driven roller 22 in a vertical plane parallel to the axis of rotation of the roller 22.

The air blown out of the diffusor 28 opens out and inflates the rope of fabric and generates a force which moves it continually so as to achieve the main object of the invention.

As can be seen in Figure 1, the level of the dye bath 4 is below the base wall 18 of the folding chamber 16 and the fabric 14 thus extends completely out of the dye bath 4. The fabric 14 is thus dyed exclusively as a result of its contact with the bath in the dyeing tube 16. Except for the blowing circuit, the same machine can operate with a higher dye-bath level so that the fabric is partially or fully immersed.

It can be seen from Figure 2 that the machine 1 is constituted by a single tank 2 in which two entrainment and blowing circuits are arranged side by side and have a single terminal diffusor 28. The end of the pipe 12 for supplying the bath has a manifold 30 for supplying the bath to the two dyeing nozzles 8.

The two fans 24 are operated by a single shaft 32 driven by a variable-speed motor which enables the flow-rates and output pressures of the fans to be adjusted so that the effect of the air can be adjusted according to the characteristics of the fabric.

As can be seen in Figure 1 in particular, a tube 34 extends from the air duct 26 immediately downstream of the outlet of the fan 24 and its free end has a nozzle 36 for directing a flow of air into the region between the rope 14 and the surface of the lifting roller 22. The machine 1 has a nozzle 36 for each rope of fabric 14. Each of the tubes 34 has a valve 38 for shutting off and adjusting the air flow directed to the nozzle 36. The air-flows produced by the nozzles 36 create a cushion of air between the fabric 14 and the lifting roller 22 thus achieving a much more delicate, pneumatic entrainment of the rope 14 and avoiding the otherwise inevitable mechanical action on the fabric when it is entrained in direct contact with the roller.

## Claims

1. A machine for dyeing fabric gathered into a rope and sewn into a loop, including:
  - a tank (2) for holding the dye bath (4),
  - a nozzle (8) for soaking the fabric and entraining it hydraulically, the rope (14) being dyed in

the nozzle through which the fabric (14) being treated and a flow of dye bath (4) are intended to pass,

- a tube (6) downstream of the dyeing nozzle (8) for transporting the rope hydraulically,
- a folding chamber (16) in which the rope of fabric (14) collects in an orderly series of folds at the outlet of the dyeing tube (6),
- a motor-driven roller (22) for lifting the rope of fabric (14) which is supplied to the dyeing tube (6), and
- means to urge the rope of fabric in a direction such that the rope passes around a larger angular portion of the roller (22),

characterised in that said means provide a flow of air onto the rope of fabric (14) upstream of the lifting roller (22), the flow of air being directed from the outside to the inside of the loop of rope, so as to urge the rope of fabric in a direction such that the rope (14) passes around a larger angular portion of the lifting roller (22).

2. A machine according to Claim 1, characterised in that it includes a fan (24) disposed inside the loop defined by the rope of fabric (14) being treated, the fan (24) being connected to an air duct (26) which extends outwardly of the loop, and ends in a diffusor (28) which blows inwardly of the loop.
3. A machine according to Claim 2, characterised in that the diffusor (28) on the air duct (26) lies substantially in a vertical plane parallel to the axis of rotation of the motor-driven roller (22).
4. A machine according to Claim 1, characterised in that it includes means for adjusting the level of the dye bath in the tank (2) to enable the machine to operate with the fabric completely above the level of the dye bath so that treatment takes place exclusively by means of the nozzle (8), or with the fabric partially or fully immersed.
5. A machine according to Claim 1, characterised in that the tube (6) carries at its outlet end of the rope (14) a folding device comprising a curved tube portion (6A) which is rotatable on the end of the tube (6) and is connected to a linear actuator which causes the curved portion (6A) to pivot to and fro about its axis of rotation.
6. A machine according to Claim 2, characterised in that a tube (34) extends from the air duct (26) and carries a nozzle (36) for sending a flow of air into

the region between the rope of fabric (14) and the surface of the lifting roller (22).

7. A machine according to Claim 6, characterised in that a valve (38) is interposed in the tube (34) for shutting off and adjusting the air flow sent to the nozzle (36).

### Patentansprüche

1. Vorrichtung zum Färben von zu einem Strang zusammengefaßtem und zu einer Schleife vernähtem Textilgut, mit:

- einem Tank (2) zur Aufnahme des Färbebad (4),
- einem Mündungsstück (8) zum Durchströmen und hydraulischen Einziehen des Textilgutes, wobei der Strang (14) in dem Mündungsstück gefärbt wird, durch welches vorgesehen ist, daß das behandelte Textilgut (14) sowie ein Strom von Färbebad (4) durchlaufen,
- einem Rohr (6) stromabwärts der Färbedüse (8), um den Strang hydraulisch zu transportieren,
- eine Faltkammer (16), in der sich der Strang von Textilgut (14) am Auslaß des Färberohres (6) in einer geordneten Folge von Falten sammelt,
- eine von einem Motor angetriebene Rolle (22), um den dem Färberohr (6) zugeführten Strang von Textilgut (14) hochzuheben, und
- eine Einrichtung, um den Strang von Textilgut in solch eine Richtung zu treiben, daß der Strang einen größeren Umschlingungswinkel auf der Rolle (22) einnimmt;

dadurch gekennzeichnet, daß diese Einrichtung stromaufwärts der Heberolle (22) einen Luftstrom auf den Strang von Textilgut (14) richtet, wobei der Luftstrom von der Außenseite zur Innenseite der Schleife des Textilstranges gerichtet ist, um den Strang von Textilgut in solch eine Richtung zu lenken, daß der Strang (14) auf der Heberolle (22) einen größeren Umschlingungswinkel einnimmt.

2. Vorrichtung gemäß Anspruch 1, dadurch gekennzeichnet, daß sie einen Ventilator (24) enthält, der innerhalb der von dem behandelten Strang von Textilgut (14) beschriebenen Schleife angeordnet ist, wobei der Ventilator (24) mit einem Luftkanal (26) verbunden ist, der sich nach außerhalb der Schleife

erstreckt und der in einem Diffusor (28) endet, der nach innerhalb der Schleife bläst.

3. Vorrichtung gemäß Anspruch 2, dadurch gekennzeichnet, daß der Diffusor (28) am Luftkanal (26) im wesentlichen in einer zur Rotationsachse der motorgetriebenen Rolle (22) parallelen vertikalen Ebene liegt.

4. Vorrichtung gemäß Anspruch 1, dadurch gekennzeichnet, daß sie eine Einrichtung zur Einstellung des Standes des Färbebad im Tank (2) enthält, um einen Betrieb der Maschine mit dem Textilgut völlig oberhalb des Spiegels des Färbebad, so daß die Behandlung ausschließlich mittels der Düse (8) erfolgt, oder mit teilweise oder vollkommen eingetauchtem Textilgut zu ermöglichen.

5. Vorrichtung gemäß Anspruch 1, dadurch gekennzeichnet, daß das Rohr (6) an seinem Auslaßende des Stranges (14) eine Falteinrichtung trägt, welche ein gekrümmtes Rohrstück (6A) aufweist, welches am Ende des Rohres (6) drehbar ist und mit einem linearen Betätigungsorgan verbunden ist, welches bewirkt, daß das gekrümmte Rohrstück (6A) um seine Rotationsachse vor und zurück schwenkt.

6. Vorrichtung gemäß Anspruch 2, dadurch gekennzeichnet, daß ein Rohr (34) von dem Luftkanal (26) ausgeht und eine Düse (36) trägt, um einen Luftstrom in den Bereich zwischen dem Strang von Textilgut (14) und der Oberfläche der Heberolle (22) einzubringen.

7. Vorrichtung gemäß Anspruch 6, dadurch gekennzeichnet, daß ein Ventil (38) in dem Rohr (34) eingesetzt ist, um den zu der Düse (36) geschickten Luftstrom abzuschalten und einzustellen.

### Revendications

1. Machine pour teindre un tissu collecté en une corde et cousu en une boucle, comprenant :

- une cuve (2) pour contenir le bain de teinture (4),
- une buse (8) pour imprégner le tissu et l'entraîner de manière hydraulique, la corde (14) étant teinte dans la buse à travers laquelle le tissu (14) en cours de traitement et un écoulement de bain de teinture (4) doivent passer,
- un tube (6) en aval de la buse de teinture (8) pour transporter la corde hydrauliquement,
- une chambre de pliage (16) dans laquelle la

corde de tissu (14) est collectée dans une série ordonnée de plis au niveau de la sortie du tube de teinture (6),

- un rouleau (22) entraîné par un moteur pour lever la corde de tissu (14) qui est fournie au tube de teinture (6) et des moyens pour pousser en force la corde de tissu dans un sens tel que la corde passe autour d'une partie angulaire plus large du rouleau de levage (22),

caractérisé en ce que lesdits moyens dirigent un écoulement d'air sur la corde de tissu (14) en amont du rouleau de levage (22), l'écoulement d'air étant dirigé depuis l'extérieur vers l'intérieur de la boucle de corde de manière à pousser en force la corde de tissu dans un sens tel que la corde (14) passe autour d'une partie angulaire plus large du rouleau de levage (22).

2. Machine selon la revendication 1, caractérisée en ce qu'elle comprend un ventilateur (24) placé à l'intérieur de la boucle définie par la corde de tissu (24) traité, le ventilateur (24) étant relié à une conduite d'air (26) qui s'étend vers l'extérieur de la boucle, et se termine dans un diffuseur (28) qui souffle vers l'intérieur de la boucle.

3. Machine selon la revendication 2, caractérisée en ce que le diffuseur (28) sur la conduite d'air (26) se situe sensiblement dans un plan vertical parallèle à l'axe de rotation du rouleau entraîné par un moteur (22).

4. Machine selon la revendication 1, caractérisée en ce qu'elle comprend des moyens pour régler le niveau du bain de teinture dans la cuve (2) pour permettre à la machine de fonctionner avec le tissu complètement au-dessus du niveau du bain de teinture de sorte que le traitement s'effectue exclusivement au moyen de la buse (8), ou avec le tissu partiellement ou totalement immergé.

5. Machine selon la revendication 1, caractérisée en ce que le tube (6) supporte au niveau de son extrémité de sortie de la corde (14) un dispositif de pliage comprenant une partie de tube incurvée (6A) qui peut tourner sur l'extrémité du tube (6) et est reliée à un dispositif d'actionnement linéaire qui provoque le pivotement de la partie incurvée (6A) selon un mouvement de va-et-vient autour de son axe de rotation.

6. Machine selon la revendication 2, caractérisée en ce qu'un tube (34) s'étend à partir de la conduite d'air (26) et supporte une buse (36) pour envoyer un écoulement d'air dans la zone comprise entre la corde de tissu (14) et la surface du rouleau de le-

vage (22).

7. Machine selon la revendication 6, caractérisée en ce qu'une valve (38) est interposée dans le tube (34) pour arrêter et régler l'écoulement d'air envoyé dans la buse (36).

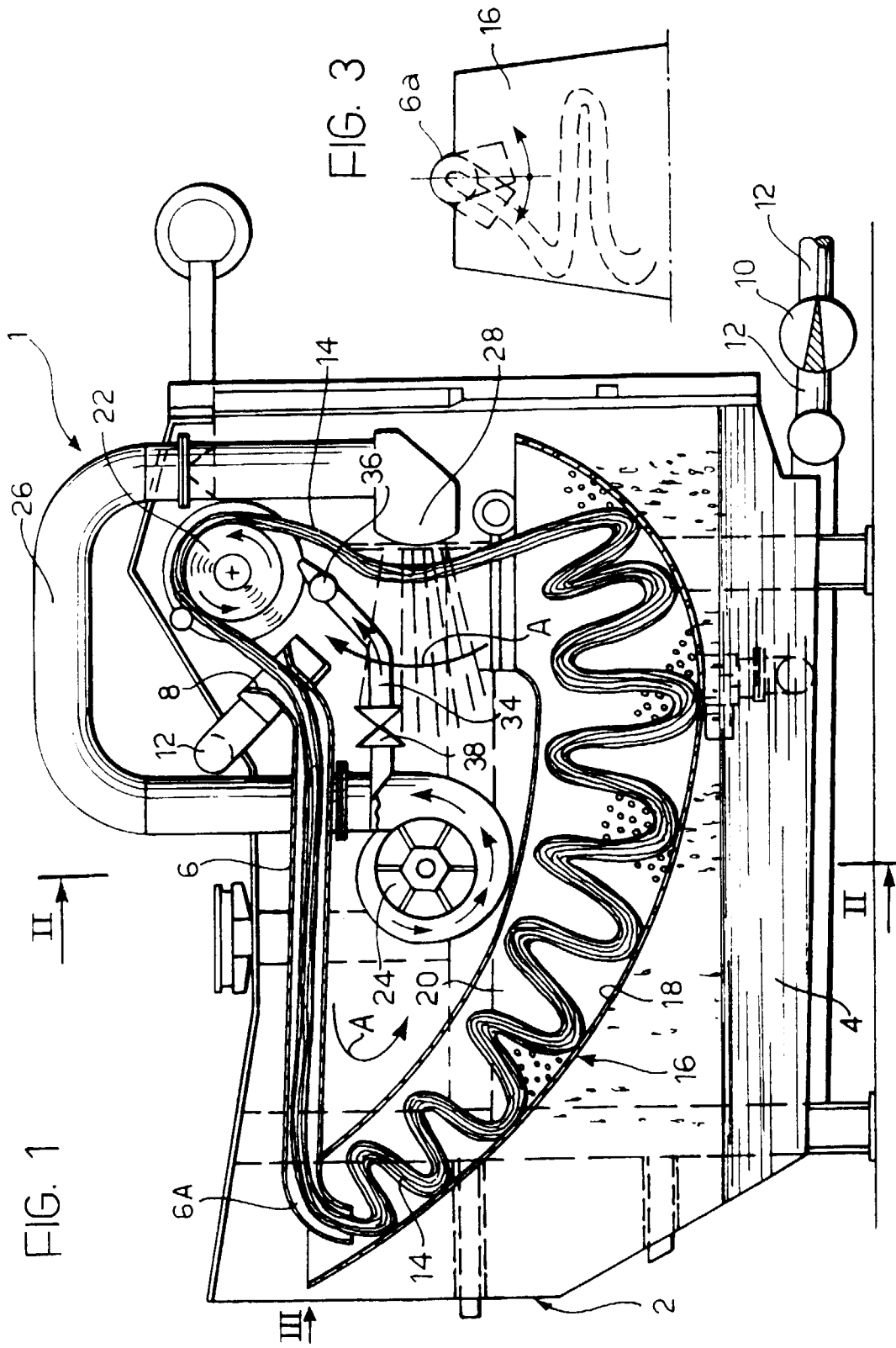


FIG. 2

