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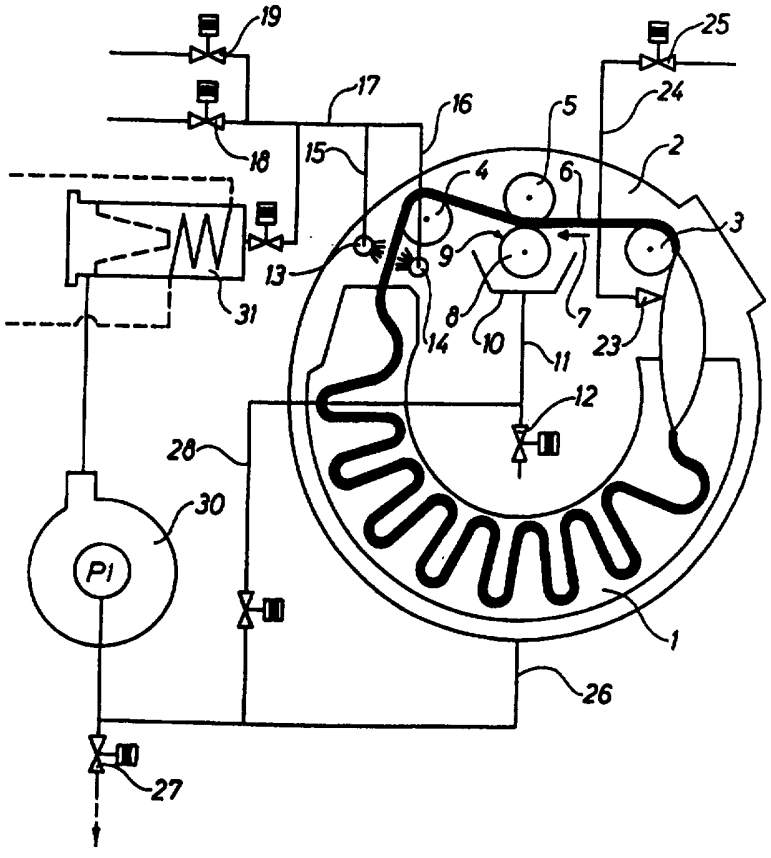
(54) Title: A METHOD AND A PLANT FOR RINSING A DYED LENGTH OF FABRIC

(57) Abstract

A method of continuously rinsing a length of dyed fabric implies that the length of fabric is subjected alternately to a feeding of water and removal of water during a cycle being repeated. By the feeding of water, water is only sprayed thereon in such an amount that the length of fabric is soaked. During a stay period where the water absorbs dye and chemicals from the fibres of the fabric, the length of fabric is then carried to a water-expelling device (9) in which the dirty water is pressed out of the length of fabric. A plant for carrying out the method comprises a plurality of driving rollers (3, 4) for advancing the length of fabric (6) and a U-shaped advancing path (1) in which the length of fabric (6) is carried downwards along one leg of the U and upwards again along the other leg of the U. This plant comprises a plurality of co-operating rollers (5, 8) for pressing water out of the length of fabric (6) and a plurality of spray nozzles (13, 14) for spraying water onto the length of fabric after the pressing out of water. The endless length of fabric (6) is straightened so as to substantially flatly abut the driving rollers (3, 4) by means of air blowing means (23) blowing air inwards through the side of the stocking-shaped length of fabric (6).



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Title: A method and a plant for rinsing a dyed length of fabric.

Technical Field

The invention relates to a method of continuously rinsing a dyed endless, round-knitted or stocking-shaped length of fabric, whereby the length of fabric is continuously advanced in a circumferential direction and alternately subjected to a feeding of water and removal of water during a cycle being repeated, said feeding of water being carried out by way of a spraying thereon and only in such an amount that the length of fabric is soaked, and whereby the length of fabric after a stay period involving an absorption in the water of dye and chemicals from the fibres of the fabric is advanced to a water expelling device where the dirty water is pressed out of the length of fabric. The invention relates furthermore to a plant for carrying out the method.

Background Art

Plants are known for dyeing knitwear. These are known under various names, viz. Haspelkufer, Jet-dying apparatuses, Jet-kufer, and Overflow--apparatuses depending on the way in which the article is transported and impregnated.

They are, however, identical in one respect. They are all very cost-intensive when it comes to the succeeding rinsing process.

The rinsing is traditionally performed in two different ways, viz. either by way of

1. Overflow rinsing or
2. Stepwise rinsing or balanced rinsing.

By the overflow rinsing the apparatus is continuously fed with pure water

for a predetermined period. The article is kept moving. Impurities or hydrolysed dye is admixed the water and removed at an overflow. The water consumption is very high as the efficiency is very low especially at the end of the process where the concentrations in the fabric and the bath approach one another.Therefore this method is replaced more and more by stepwise rinsing.

By the stepwise rinsing the bath is drained periodically followed by a refilling with clean water. Then the fabric is moved in the bath until an almost balanced concentration has been obtained, whereafter the bath is again drained etc. This procedure is continued until the fabric is sufficiently clean. This method is, however, also very water-consuming. The latter is due to the fact that the textile retains a very large amount of the liquid at the draining of the bath. In connection with pure cotton it is a question of approximately 300% of the weight of the fabric.

At a so-called dye ratio of 1/10 (the weight of the fabric/total amount of liquid), the dilution per change of bath is thus 3/10 and the water consumption 700 l per 100 kg of fabric. The use of 6 rinsing baths is not uncommon. The resulting theoretical dilution is 0.0007 at a water consumption of 4,200 l per. 100 kg. The necessary time involved is also extensive, viz. about 20 min/per change of bath. In connection with overflow rinsing, the water consumption is typically 50 to 100% higher, whereas the necessary time is less.

Accordingly, attempts have been made at using other methods, and the result is that today many dye-works prefer to remove the material from the dye apparatuses and to carry out the washing on particular apparatuses, where the article is carried in counterflow to the rinsing water through a plurality of chambers, and where it is possible to carry out a pressing out of excess water between each chamber. The apparatuses structured for round-knitted articles are particularly advantageous as the article is inflated

with air before the pressing procedure in such a manner that folds and pleats are smoothed out. It is, however, difficult to reload the article, and an expensive separate machine is required for the washing out procedure.

German Offenlegungsschrift No. 29 11 138 discloses a method of rinsing an endless length of fabric and of the type mentioned above. The length of fabric has, however, a tendency to fold, and the feeding of water is only carried out by way of spraying thereon from one side while the length of fabric passes a roller.

Brief Description of the Invention

The object of the present invention is to provide a method, whereby the pressing out of water and the feeding of water are carried out uniformly over the entire length of fabric in such a manner that the rinsing, if desired, can be carried out relatively quickly in the same plant as the one including the dyeing of the fabric.

The latter is obtained by the endless length of fabric being straightened so as to substantially flatly abut driving rollers by means of air blowing means blowing air inwards through the side of the stocking-shaped length of fabric.

By the feeding of water, such as by way of spraying, clean water is fed in such an amount that the water content in the fabric amounts to approximately 300% when the fabric is cotton. During the subsequent stay period, an admixing is caused by diffusion and optionally a mechanical effect to such an extent that the concentration differences are compensated for before the articles reaches the water expelling device, where the excess amount of water is reduced to a water content in the articles of approximately 100%. Then the process is repeated. The degree of change is 1/3 and the water consumption amounts to 200 l per passage per 100

kg of fabric provided the operation is run without a waste of water.The passing period is usually approximately 3 min. After 7 passages, the degree of dilution is 0.0004 and the water consumption 1400 l. Cold or hot water can be used according to requirements.

As the length of fabric is round-knitted or stocking-shaped, it is straightened so as to substantially flatly abut driving rollers by means of air blowing means blowing air inwards through the side of the stocking--shaped length of fabric in such a manner that folds and pleats are smoothed out.

A plant for carrying out the method according to the invention comprises a plurality of driving rollers for continuously advancing the length of fabric and defining a substantially U-shaped advancing path for the length of fabric, said U-shaped advancing path extending below the driving rollers in such a manner that the length of fabric is carried downwards from the top through one leg of the U and around along the connecting portion and upwards again along the other leg of the U, where said plant comprises a plurality of co-operating rollers for pressing water out of the length of fabric and a plurality of spraying nozzles for spraying water on said length of fabric after the expelling of water. This plant is according to the invention preferably provided with air nozzles for abutting one side of the length of fabric and blowing in air through said side and into the interior of the length of fabric in such a manner that folds and pleats are smoothed out and it is possible to press the water out in a uniform manner during the passing of the length of fabric of the pressing out rollers.

According to the invention the water spraying nozzles may particularly advantageously be arranged after the last driving roller before the length of fabric is advanced to the U-shaped advancing path therebelow with the result that water is not pressed out of the length of fabric until a suitable balancing of the concentration has entered the water, which must occur

during the passage through the U-shaped advancing path.

Brief Description of the Drawing

The invention is explained in greater detail below with reference to the accompanying drawing showing a diagrammatic view of a plant for carrying out the method according to the invention.

Description of Preferred Embodiments of the Invention

The plant shown in the drawing comprises a lower U-shaped, closed channel 1, the two legs of which communicate upwardly with a closed upper housing 2. This upper housing 2 is provided with two driving rollers 3 and 4 as well as an guide roller 5 ensuring that an endless length of fabric 6 is ensured a sufficiently long abutment over the driving rollers 3 and 4 during their movement in the direction indicated by means of an arrow 7. The guide roller 5 is associated with a displaceable roller 8, which by means not shown in greater detail is adapted to be manually or pneumatically or in another suitable manner pressed against said guide roller 5 during the rinsing process in such a manner that said guide roller and the displaceable roller 8 together operate as a water-expelling device designated the general reference numeral 9. At least one of the rollers forming part of the water--expelling device should be driven. The pressing of the displaceable roller 8 against the guide roller 5 may, if desired, be carried out by means of an adjustable force.

A water-collecting vessel 10 is provided below the water-expelling device 9 formed by means of the guide roller 5 and the displaceable roller 8. said water-collecting vessel 10 carrying the water away through a pipe 11 and a valve 12.

Water-spraying nozzles 13 and 14 are provided immediately adjacent the

driving roller 4 on the side where the length of fabric 6 passes away from said driving roller 4 during its advancing movement, said water-spraying nozzles 13 and 14 being provided with water through respective pipes 15 and 16 from a pipe 17 and a valve 18 for cold water and a valve 19 for hot water. These water-spraying nozzles 13 and 14 are adapted to spray water out on their respective side of the endless length of fabric 6. The amount of water being sprayed can be adjusted by means of devices not shown in greater detail.

A pivotally journalled so-called plaiting plate can be provided immediately after the last driving roller 4, said plate turning about an axis of rotation in a known manner and thereby allowing the length of fabric to be arranged with the shown sinuous shape while passing downwards into the U-shaped channel 1.

In front of the first driving roller 3, the length of fabric 6 passes an air nozzle 23 being provided with air through a pipe 24 and a valve 25. In use of the plant, the opening of the air nozzle 23 abuts one side of the length of fabric 6 and ensures thereby a spraying in of air into the interior of the length of fabric and consequently a smoothing out of folds and pleats. As a result the length of fabric flatly abuts the succeeding rollers.

An outlet is provided at the lowermost level of the U-shaped channel, and water optionally dripping off can be drained off through said outlet via a pipe 26 and a valve 27 with the result that no water remains in the U-shaped channel during use of the plant.

The plant shown can be used for dyeing endless lengths of fabric by means of suitable means not shown in greater detail for the sake of clarity. After completion of the dyeing process and after the dye bath has been emptied out of the U-shaped channel 1 through the pipe 26 and the valve 27, the rinsing process can be started.The latter is carried out by a con-

tinued advancing of the length of fabric and activation of the pressing-out device 9. When the length of fabric passes the pressing-out device 9, the amount of excess water is reduced to a water content in the articles of approximately 100%. When the rinsing process is started water is allowed to be fed to the spray nozzles 13 and 14. During the passage of these nozzles, clean water is sprayed in such an amount that the water content in the length of fabric is approximately 300%. During the stay in the lower U-shaped channel 1, a diffusion and mechanical effect on the length of fabric involve such an admixing in the water that the concentration differences are compensated for before the length of fabric again passes upwards along the U-shaped channel 1 and past the pressing-out device 9, where the process is repeated.

As mentioned above, the degree of change is 1/3, and provided the operation is run without a waste of water the water consumption amounts to 200 l per passage per 100 kg of article. The passing usually takes approximately 3 min, and after passing 7 times the degree of dilution is 0.00004 and the water consumption so far is 1400 l. Cold or hot water can be used according to requirements by an adjustment of the valves 18 and 19.

The invention has been described with reference to a preferred embodiment. Many modifications can be carried out without thereby deviating from the scope of the invention. The displaceable roller 8 can for instance be adapted to co-operate with one of the driving rollers 3 and 4 instead of with the guide roller 5 so as to form a water-expelling device. It is also possible to increase the water-expelling effect by using a row of co-operating squeezing rollers instead of using only one displaceable roller 8, whereby the length of fabric is more thoroughly processed. The expelling device can be adapted so as not to function during the dyeing process. If desired, it can, however, also be coupled so as to start an expelling during the dyeing process in order to ensure an improved distribution of dye. Then the dye liquid pressed out can be carried through a pipe 28, a valve 29, a

pump 30, and a heat exchanger 31 and back to the dye bath.

The invention has been described in connection with a plant for continuously rinsing an endless length of fabric. It can, however, also be incorporated in a plant for continuously treating long coherent lengths of fabric in plants where the length of fabric is carried by means of driving rollers from one dye bath to the next dye bath in a row of dye baths.

Claims.

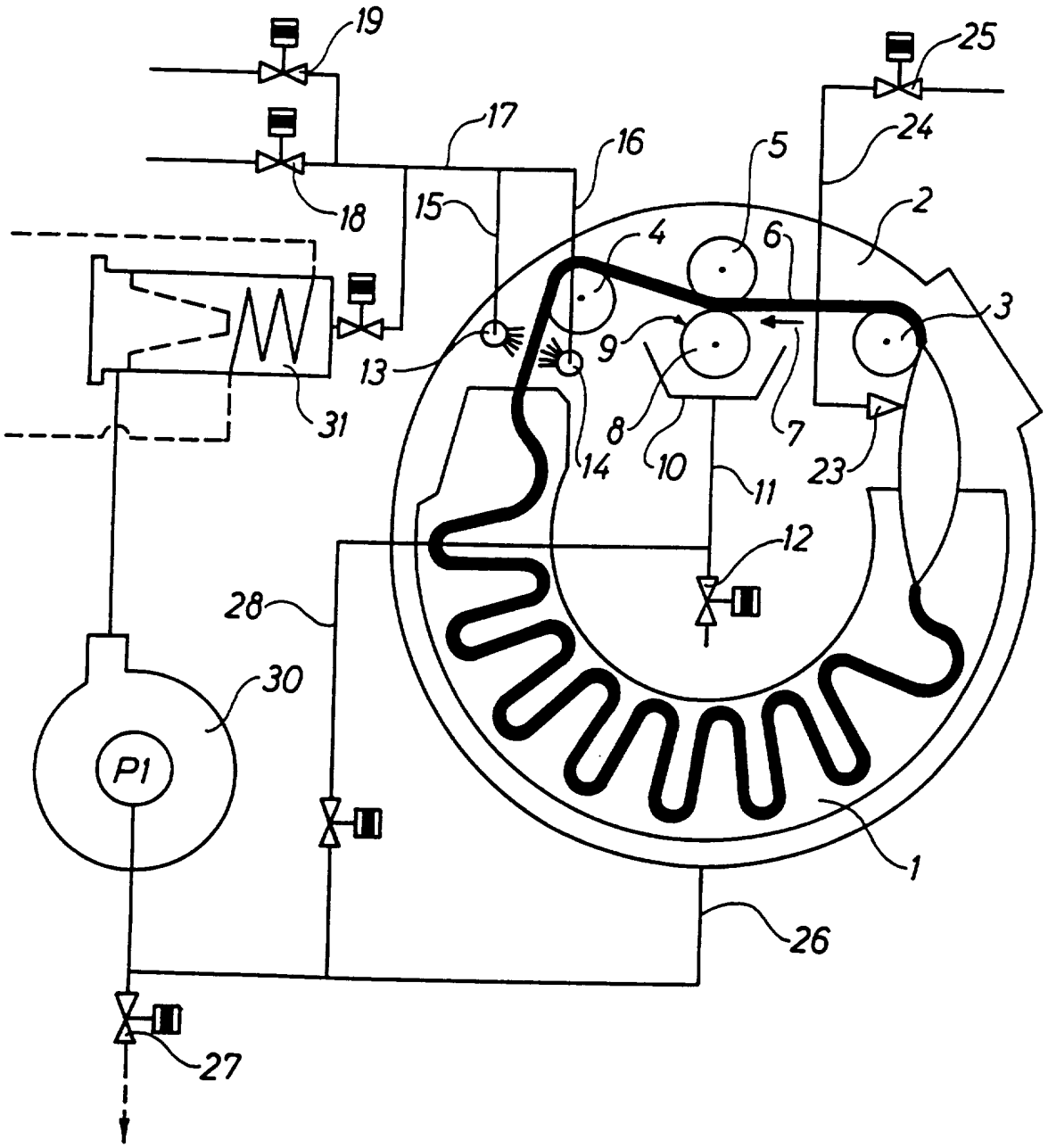
1. A method of continuously rinsing a dyed endless, round-knitted or stocking-shaped length of fabric (6), whereby the length of fabric (6) is continuously advanced in a circumferential direction and alternately subjected to a feeding of water and removal of water during a cycle being repeated, said feeding of water being carried out by way of a spraying thereon and only in such an amount that the length of fabric is soaked, and whereby the length of fabric after a stay period involving an absorption in the water of dye and chemicals from the fibres of the fabric is advanced to a water-expelling device (9), where the dirty water is pressed out of the length of fabric, c h a r a c t e r i s e d in that the endless length of fabric (6) is straightened so as to substantially flatly abut the driving rollers (3, 4) by means of air blowing means (23) blowing air inwards through the side of the stocking-shaped length of fabric (6).

2. A method as claimed in claim 1, c h a r a c t e r i s e d in that the feeding of water is carried out by a spraying from both sides on the straightened length of fabric.

3. A plant for carrying out he method as claimed in claim 1, said plant comprising a plurality of driving rollers (3, 4) for continuously advancing the length of fabric (6) and defining a substantially U-shaped advancing path (1) for the length of fabric, said U-shaped advancing path (1) extending below the driving rollers (3, 4) so that the length of fabric (6) is carried from the top and downwards through one leg of the U and around along the connecting portion and upwards again along the other leg of the U, where said plant comprises a plurality of co-operating rollers (5, 8) for pressing water out of the length of fabric (6) and a plurality of spraying nozzles (13, 14) for spraying water on said length of fabric (6) after the expelling of water, c h a r a c t e r i s e d in that air nozzles (23) are provided at the passing of the length of fabric (6) from the U-shaped path

(1) upwardly to the first driving roller (3), said air nozzles abutting one side of the length of fabric and blowing in air through said side into the interior of the length of fabric (6).

4. A plant as claimed in claim 3, c h a r a c t e r i s e d in that the water-spraying nozzles (13, 14) are arranged on both sides of the length of fabric (6) after the last driving roller (4) before the advancing of the length of fabric (6) to the U-shaped advancing path (1) therebelow.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INTERNATIONAL SEARCH REPORT

International application No.
PCT/DK 95/00396

A. CLASSIFICATION OF SUBJECT MATTER

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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

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IPC6: D06B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0016350 A1 (BRÜCKNER APPARATEBAU GMBH), 1 October 1980 (01.10.80), figures 1-2 --	1-4
Y	DE 3200373 C2 (BRÜCKNER-APPARATEBAU GMBH), 26 Sept 1985 (26.09.85), column 5, line 27 - line 53, figure 6 --	1-4
A	EP 0264677 A1 (BRÜCKNER APPARTEBAU GMBH), 27 April 1988 (27.04.88), figure 1 --	1-4
A	EP 0320701 A1 (BRÜCKNER APPARATEBAU GMBH), 21 June 1989 (21.06.89), figure 4 --	1-4

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT

Information on patent family members

05/02/96

International application No.
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