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Remarks:
Amended claims in accordance with Rule 137(2) EPC.

(54) **Control method for synchronized fabric circulation in conveyor drive fabric dyeing machine**

(57) Disclosed is a control method for synchronized fabric circulation in a conveyer drive fabric dyeing machine. During a dyeing process of fabric (3), the fabric (3) is driven by a fabric guide (4) to move in a circulating manner and the time period for a cycle of circulation is set in consistency with the time period that a conveyor (2) moving from a rear end to a front end so as to achieve synchronization that makes the circulation smooth. The control method is performed with a computer or a PLC control unit (91) that is supplied with fabric length data (911) or fabric weight data (912) and fabric unit weight data (913) and, based on such data, performs an automatic operation of computation and supply of a signal to speed controllers of the fabric guide motor (40) and the conveyor motor (20) to set the speeds thereof at a predetermined ratio with respect to each other for synchronized operations.

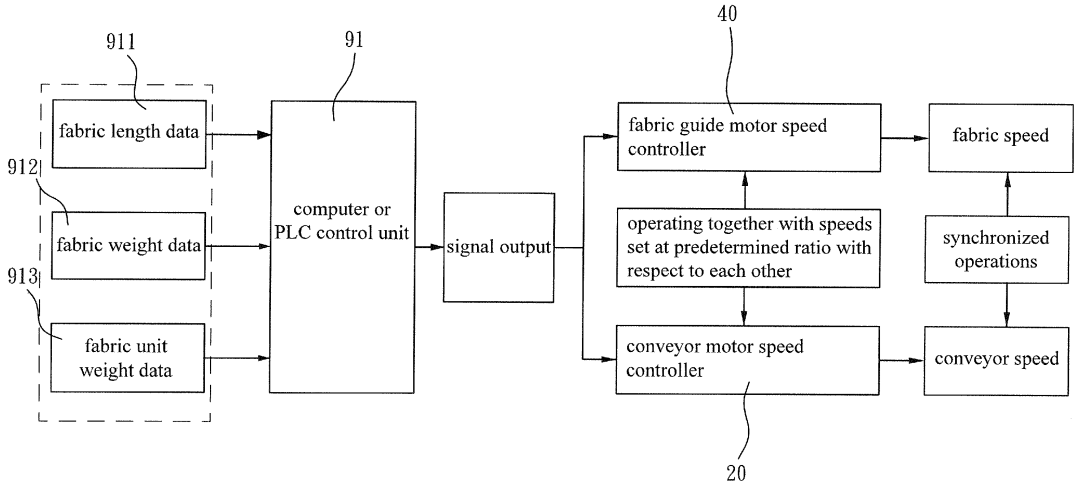

FIG. 2

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Description

(a) Technical Field of the Invention

[0001] The present invention generally relates to a conveyor drive fabric dyeing machine that is used to dye rope-like fabric, and more particularly to a control method for achieving operation synchronization of fabric and a fabric guide and a conveyor.

(b) Description of the Prior Art

[0002] FIG. 1 shows a structure of a conveyor drive fabric dyeing machine, which comprises a machine body 1 in which a dyeing tube 12, a fabric guide 4, and a conveyor 2 are arranged. The fabric guide 4 is driven to rotate by a fabric guide motor (not shown). The conveyor 2 is driven and operated by a conveyor motor (not shown).

[0003] The principle of operation is as follows. Fabric 3 moves around the fabric guide 4 and passes through a nozzle 5 to enter the dyeing tube 12 and then falls onto the conveyor 2 to complete a cycle of circulation. Dye liquid L is pressurized by a pump 7 to flow through a heat exchanger 8 (for heating or cooling) to enter the nozzle 5 for generating a jetting or overflowing hydraulic power that drives the fabric 3 into the dyeing tube 12. The fabric 3 that exits the dyeing tube 12 is allowed to fall back to the conveyor 2 and the conveyor 2 conveys the fabric 3 forward to pass through an idler 41 and the fabric guide 4 to repeatedly proceed with the above-described circulation cycle. In such a circulation cycle, a control box 9 controls the operation and dye and chemical agents are supplied from a service tank 11 and pressurized by the pump 7 to feed into a dye liquid circulation loop of the dyeing machine. During the circulation, the dye liquid Land the fabric 3 undergo a process of heating, temperature holding, and cooling achieved with the heat exchanger 8 to have the dye absorbed by the fabric thereby achieving a dyeing effect of scouring, coloring, color fixing, and water rinsing.

[0004] The conveyor 2 and the fabric guide 4 are respectively driven by the conveyor motor (not shown) and the fabric guide motor (not shown) to operate, while the fabric is driven by the fabric guide 4 to move. During the process of circulation, the time period that the fabric needs for each cycle of circulation must be identical to the time period that the conveyor takes to move from a rear end to a front end. In other words, the two must be operated in a synchronous manner, otherwise fabric entangling or jamming may result. Practically, the length or weight of fabric for each dyeing batch would be different so that the adjustment for synchronization is generally time consuming and difficult and often times, poor machine operation or low operation efficiency result.

SUMMARY OF THE INVENTION

[0005] An object of the present invention is to overcome the problem of unsmooth conveyance of fabric resulting from operation speeds of fabric driven by fabric guide and a conveyor of a dyeing machine being hard to be in synchronization with each other during a circulation cycle.

[0006] To overcome such a problem, a computer or a programmable logic controller (PLC) control unit is included to automatically operate for computation and supply of a signal, based on data of fabric length or fabric weight and data of fabric unit weight fed to the computer or control unit, to a speed controller (such as an inverter) of a fabric guide motor and a speed controller (such as an inverter) of a conveyor motor so as to make the fabric guide motor and the conveyor motor rotate together with speeds that are of a predetermined ratio with respect to each other so that the speeds of the fabric and the conveyor are synchronized with each other and the circulation of the fabric can be performed smoothly.

[0007] An advantage of the present invention is that it is not necessary to fix the length of fabric to be dyed and, regardless the length and weight of the fabric, the computer or PLC control unit performs automatic computation and controls the fabric guide and the conveyor and the fabric to achieve operation synchronization so as to make the circulation and conveyance of the fabric smooth and the operation of the machine is automatized, simplified, capable of greatly increasing production performance.

[0008] The foregoing objectives and summary provide only a brief introduction to the present invention. To fully appreciate these and other objects of the present invention as well as the invention itself, all of which will become apparent to those skilled in the art, the following detailed description of the invention and the claims should be read in conjunction with the accompanying drawings. Throughout the specification and drawings identical reference numerals refer to identical or similar parts.

[0009] Many other advantages and features of the present invention will become manifest to those versed in the art upon making reference to the detailed description and the accompanying sheets of drawings in which a preferred structural embodiment incorporating the principles of the present invention is shown by way of illustrative example.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010]

FIG. 1 is a schematic view illustrating a conveyor drive fabric dyeing machine.

FIG. 2 is a schematic view illustrating a control method according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0011] The following descriptions are exemplary em-

bodiments only, and are not intended to limit the scope, applicability or configuration of the invention in any way. Rather, the following description provides a convenient illustration for implementing exemplary embodiments of the invention. Various changes to the described embodiments may be made in the function and arrangement of the elements described without departing from the scope of the invention as set forth in the appended claims.

[0012] The present invention provides a control method that is applicable to a fabric dyeing machine shown in FIG. 1. The fabric dyeing machine comprises a machine body 1 in which a dyeing tube 12, a fabric guide 4, and a conveyor 2 are arranged. The fabric guide 4 is driven to rotate by a fabric guide motor (not shown). The conveyor 2 is driven and operated by a conveyor motor (not shown). Fabric 3 moves around the fabric guide 4 and passes through a nozzle 5 to enter the dyeing tube 12 and then falls onto the conveyor 2 to be conveyed forward so as to complete a cycle of circulation. Dye liquid L is pressurized by a pump 7 to flow through a heat exchanger 8 (for heating or cooling) to enter the nozzle 5 for generating a jetting or overflowing hydraulic power that drives the fabric 3 into the dyeing tube 12. The fabric 3 that exits the dyeing tube 12 is allowed to fall back to the conveyor 2 and the conveyor 2 conveys the fabric 3 forward to pass through an idler 41 and the fabric guide 4 to repeat the above-described circulation cycle. In such a circulation process, a control box 9 controls the operation. The control box 9 comprises a computer or a programmable logic controller (PLC) control unit 91 mounted therein. Dye and chemical agents are supplied from a service tank 11 and pressurized by the pump 7 to feed into a dye liquid circulation loop of the dyeing machine. During the circulation, the dye liquid Land the fabric 3 undergo a process of heating, temperature holding, and cooling achieved with the heat exchanger 8 to have the dye absorbed by the fabric thereby achieving a dyeing effect of scouring, coloring, color fixing, and water rinsing.

[0013] As shown in FIG. 2, the technical solution of the present invention is that the control box 9 is provided with the computer or the PLC control unit 91 built therein in such a way that the compute or PLC control unit 91 is electrically connected to a speed controller of a fabric guide motor 40 and a speed controller of a conveyor motor 20. The computer or PLC control unit 91 are fed with fabric length data 911 or fabric weight data 912 and fabric unit weight data 913, based on which an automatic operation is performed by the computer or the PLC control to compute and supply a signal to the speed controller (such as an inverter) of the fabric guide motor 40 and the speed controller (such as an inverter) of the conveyor motor 20 so as to make the fabric guide motor 40 and the conveyor motor 20 rotate together with speeds that are of a predetermined ratio with respect to each other so that the fabric 3 is driven by the fabric guide 4 to move in a manner of being in synchronization with the operation of the conveyor 2.

[0014] 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 methods differing from the type described above.

[0015] While certain novel features of this invention have been shown and described and are pointed out in the annexed claim, it is not intended to be limited to the details above, since it will be understood that various omissions, modifications, substitutions and changes in the forms and details of the device illustrated and in its operation can be made by those skilled in the art without departing in any way from the spirit of the present invention.

Claims

1. A control method for synchronized fabric circulation in a conveyer drive fabric dyeing machine, wherein during a dyeing process of fabric (3), a computer or a programmable logic controller (PLC) control unit (91) is electrically connected with a fabric guide motor (40) and a conveyor motor (20) of the fabric dyeing machine, the computer or PLC control unit (91) being supplied with fabric length data (911) or fabric weight data (912) and fabric unit weight data (913) and, based on such data, performing an automatic operation of computation and supply of a signal to a speed controller of the fabric guide motor (40) and a speed controller of the conveyor motor (20) to make the fabric guide motor (40) and the conveyor motor (20) rotate together with speeds that are of a predetermined ratio with respect to each other so that the fabric (3) and the fabric guide (4) and the conveyor (2) are set in operations in synchronization with each other.

Amended claims in accordance with Rule 137(2) EPC.

1. A control method for dyeing machine provided with a driven reel and a driven conveyor for circulating fabric in the dyeing machine, wherein during a dyeing process of fabric (3), a computer or a programmable logic controller (PLC) control unit (91) is electrically connected with a reel motor (40) and a conveyor motor (20) of the fabric dyeing machine, **characterized in that** the computer or PLC control unit (91) is supplied with fabric length data (911) or, alternatively, fabric weight data (912) and fabric unit weight data (913), and, based on such data, performs an automatic operation of computation and supplies a signal to a speed controller of the reel motor (40) and a speed controller of the conveyor motor (20) to make the reel motor (40) and the conveyor motor (20) rotate respectively at speeds that are of a predetermined ratio with respect to each other so that the fabric (3) is driven by the reel (4) to move at a speed

that is in synchronization with a speed of the conveyor (2).

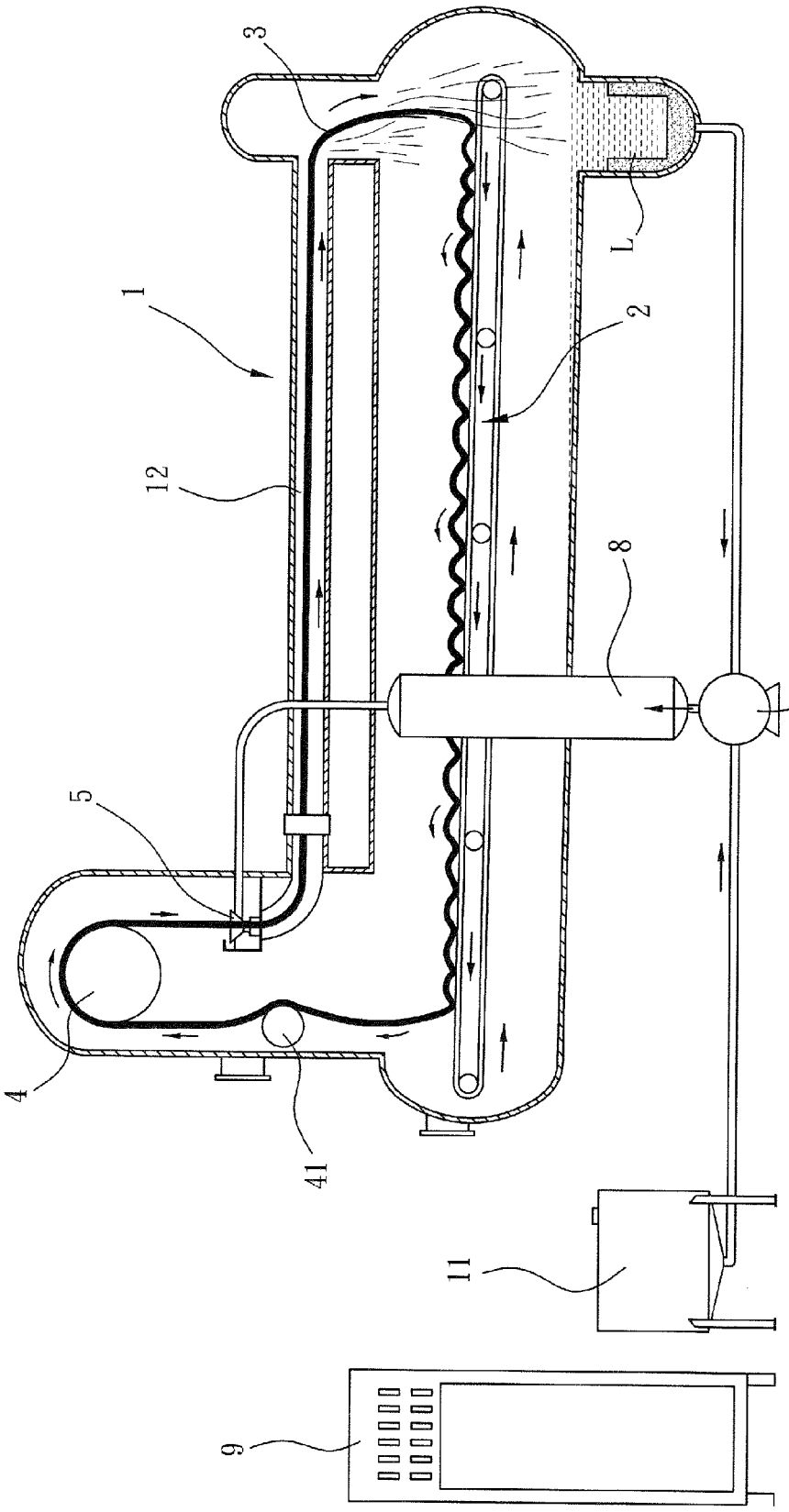

FIG. 1

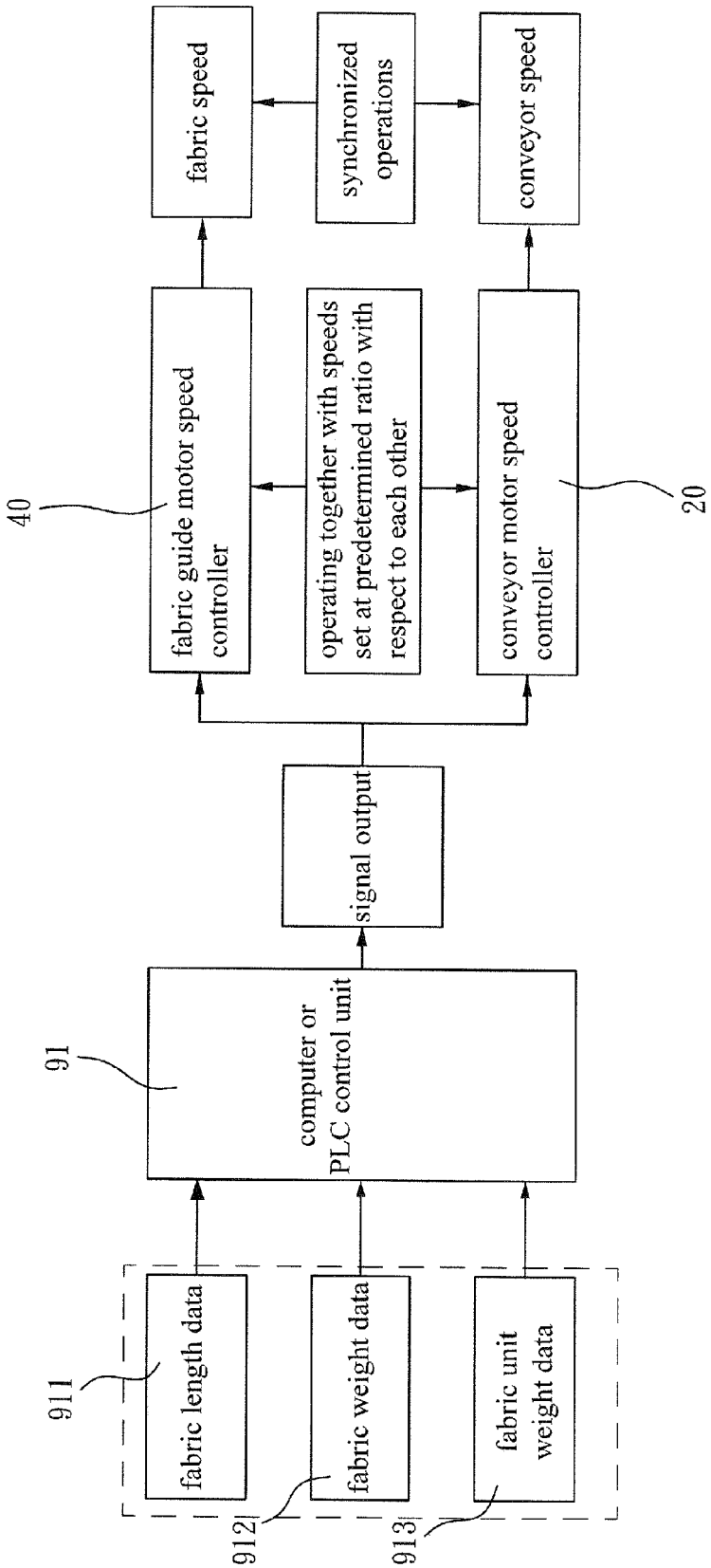
fabric length data
fabric weight data
fabric unit weight data
911
912
913
computer or PLC control unit
91
signal output
fabric guide motor speed controller
operating together with speeds set at predetermined ratio with respect to each other
conveyor motor speed controller
40
20
fabric speed
synchronized operations
conveyor speed

FIG. 2

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EUROPEAN SEARCH REPORT

Application Number
EP 14 19 5552

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 20 2014 104073 U1 (CHANG CHI LUNG [TW]) 9 September 2014 (2014-09-09) * paragraphs [0010], [0011] * -----	1	INV. D06B3/28 D06B3/36
X	DE 20 2014 104532 U1 (CHANG CHI LUNG [TW]) 7 October 2014 (2014-10-07) * paragraphs [0005], [0010] * -----	1	
X	EP 1 865 097 A1 (L A I P S R L [IT]) 12 December 2007 (2007-12-12) * paragraphs [0010], [0024]; claim 15 * -----	1	

TECHNICAL FIELDS SEARCHED (IPC)

D06B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	30 April 2015	Bichi, Marco

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
O : non-written disclosure
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T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
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L : document cited for other reasons

& : member of the same patent family, corresponding document

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 14 19 5552

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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30-04-2015

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 202014104073 U1	09-09-2014	NONE	
DE 202014104532 U1	07-10-2014	NONE	
EP 1865097 A1	12-12-2007	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82