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(54) **OVERFLOW DYEING SYSTEM FOR AIRFLOW ATOMIZATION DYEING MACHINE AND WATER-USING METHOD THEREOF**

(57) The invention relates to an overflow dyeing system of atomized airflow dyeing machine and a method for wet processing thereof, wherein a filter I is coordinate-ly configured between the main pump and the heat exchanger; an overflow nozzle is connected on the output tube of the heat exchanger through an overflow nozzle connection tube valve and placed above the airflow nozzle; an auxiliary pump is added on the tube of the main pump; a connection valve I and a connection valve II are

respectively configured on the tubes of both ends of the auxiliary pump. The invention effectively saves electricity and provides solutions to the dyeing limitation of airflow dyeing machines. This invention has both the airflow dyeing system and the overflow dyeing system, which prevent polyester fabric wrinkling while being dyed in high-temperature air flow at 130°C and reduce electricity consumption by air blower during the process of airflow dyeing at high temperature. This invention saves energy and enlarges the application of dyeing machine.

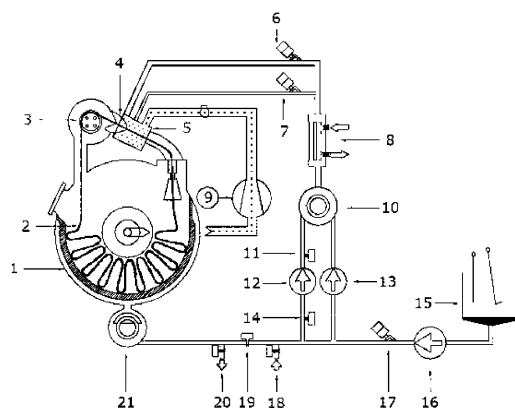


FIG. 1

Description

Field of the Invention

[0001] The invention relates to an overflow dyeing system of atomized airflow dyeing machine and method for wet processing thereof.

Background of the Invention

[0002] In prior art of airflow dyeing machines, greige fabric is transmitted by air flow through guide roller while preprocessing and dyeing. Liquor ratio is quite low, generally 1:3-4 for pure cotton greige fabric and 1:2-4 for polyester fabric, thus saving water consumption and dye-stuff and reducing wastewater discharging volume. So far, these dyeing machines are environment-friendly for preprocessing and dyeing greige fabric. However, an airflow dyeing machine uses air from an air blower as major drives to transmit greige fabric; the air blower has big power and consumes large amounts of electricity. Especially, when the dyeing temperature is at 130°C, the actual electricity consumption is over twice of the consumption at normal temperature and pressure below 100°C; in addition, while dyeing polyester fabric or T/C greige fabric at 130°C, the dyed fabric has fish-skin wrinkles which cannot be flattened even through after-finishing, high-temperature tentering and finalizing. Therefore, dyeing with airflow dyeing machines at high temperature and high pressure around 130°C has certain influences on the quality of polyester fabric or T/C greige fabric, and airflow dyeing machines have lots of inadequacies, like big power consumption.

Summary of the Invention

[0003] The object of the invention is to provide in view of the problems in the prior art a technical program of an overflow dyeing system of atomized airflow dyeing machine and method for wet processing thereof.

[0004] The invention effectively saves electricity and provides solutions to the dyeing limitation of airflow dyeing machines. Take a single-tube dyeing machine as an example, this system has added an overflow nozzle at the front end of the original airflow nozzle as well as an auxiliary pump with the same power of the main pump; a filter I has also been added between the main pump, auxiliary pump and the heat exchanger. In this way, the air blower does not have to be turned on; instead two pumps are started at the same time to form an overflow dyeing system for the airflow dyeing machine. Both the airflow dyeing and overflow dyeing systems of the airflow dyeing machine as per technological requirements are controlled via PLC program. During airflow dyeing operation, the greige fabric in the dyeing machine is transmitted by the air from air blower and guide roller and continuously contacts and circulates in the dye liquor in the vessel that is pumped by the main pump, atomized by

the heat exchanger and sprayed out by the airflow nozzle and circulate to finish the process of preprocessing, dyeing and washing, etc. During overflow dyeing operation, the air blower stops working; the greige fabric in the dyeing machine is transmitted by the guide roller and sufficient flow rate and flow generated by the main pump and auxiliary pump and continuously contacts and circulates in the dye liquor in the vessel that is pumped by two pumps and flows through the heat exchanger and overflow nozzle, etc. to finish the dyeing and washing process. Generally, the overflow nozzle has a water flow five times bigger than the airflow nozzle. This invention has both the airflow dyeing system and the overflow dyeing system, which have prevented polyester fabric wrinkling while being dyed in high-temperature air flow at 130°C and reduced electricity consumption by air blower during the process of airflow dyeing at high temperature. This invention saves energy and enlarges the application of dyeing machine.

Brief description of the Drawings

[0005] FIG. 1 is a structural diagram of the invention.

Detailed Description of the preferred Embodiment

[0006] Referring now to the drawings, the invention is further described as:

[0007] An overflow dyeing system of atomized airflow dyeing machine, comprising a vessel 1, a greige fabric 2, a guide roller 3, an airflow nozzle 5, an airflow nozzle connection tube valve 7, a heat exchanger 8, an air blower 9, a main pump 13, a feeding vat 15, a charge pump 16, a feeding valve 17, a water inlet valve 18, a drain valve 20, a connection valve III 19, and a filter II 21. A filter I 10 is coordinately configured between the main pump 13 and the heat exchanger 8. An overflow nozzle 4 is connected on the output tube of the heat exchanger 8 through an overflow nozzle connection tube valve 6 and placed above the airflow nozzle 5. An auxiliary pump 12 is added on the tube of the main pump 13; a connection valve I 11 and a connection valve II 14 are respectively configured on the tubes of both ends of the auxiliary pump 12. A connection valve III 19 is configured between the water inlet valve 18 and the drain valve 20. The auxiliary pump 12 and the main pump 13 are of the same model.

[0008] A method for wet processing of overflow dyeing system of atomized dyeing machine to process a jacquard greige fabric cross-woven with polyester and modified polyester, comprising the processing steps of:

[0009] 1) Degreasing preprocessing: adding water and dyes and circulating the greige fabric at the temperature of 60°C; directly rising the temperature to 90°C and holding for 30~40min; directly dropping the temperature to 70°C; finishing preprocessing and draining water; and then continuously adding 60°C hot water and washing for 15min.

[0010] 2) Alkali deweighting: adding water and dyes

and circulating the greige fabric at the temperature of 60°C; directly rising the temperature to 90°C and holding for 40~60min; directly dropping the temperature to 60°C; finishing alkali deweighting and draining water; and then continuously adding 60°C hot water and washing for 15min; washing with neutralization water for 5min and fresh water for 5min.

[0011] 3) Dyeing polyester with disperse dyes: adding water and dyes and circulating the greige fabric at the temperature of 60°C; rising the temperature to 130°C at a rate of 1~2°C/min and holding for 40~60min; directly dropping the temperature to below 80°C; finishing polyester dyeing and draining water; and then adding 60°C hot water, circulating the greige fabric, and draining water after 10min washing.

[0012] 4) Dyeing modified polyester with cationic dyes: adding water and dyes and circulating the greige fabric at the temperature of 70°C; rising the temperature to 85°C at a rate of 1°C/min, then to 98°C at a rate of 2°C/min and holding for 40~60min; dropping the temperature to 80°C; finishing dyeing and draining water; and then adding 60°C hot water and washing for 10min.

[0013] 5) Restoring and cleaning: adding water and dyes and circulating the greige fabric at the temperature of 60°C; directly rising the temperature to 80°C and holding for 10min; and then continuously adding 60°C hot water and washing for 15min.

[0014] When the dyeing machine circulates normally, the air blower 9 starts blowing; the dyeing machine transmits one end of the greige fabric 2 through the guide roller 3, the overflow nozzle 4 and the airflow nozzle 5 into the vessel 1; as the greige fabric 2 is totally transmitted into the vessel, the head end and the tail end of the greige fabric 2 are connected to be like a rope, which keeps circulating and transmitting under the effect of the guide roller 3 and the force of air flow generated by the air blower 9; at the same time, the drain valve 20, auxiliary pump 12, connection valve I 11, connection valve II 14 and overflow nozzle connection tube valve 6 close while the connection valve III 19, water inlet valve 18 and main pump 13 open. Water runs through the heat exchanger 8 and airflow nozzle 5, continuously contacts the transmitting greige fabric 2, flows inside the vessel and downwards to the bottom of the vessel, goes through the filter II 21 and connection valve III 19, and at last returns back to the main pump 13 for water circulation. When the vessel has a certain water level, the water inlet valve 18 closes. Water keeps flowing and circulation inside the system.

[0015] When temperature rising or dropping is needed during the processing steps, steam or cooling water goes into the heat exchanger 8 and indirectly contacts the water inside the vessel 1, thus rising or dropping the temperature of the water inside the vessel 1. Through the process, the main pump 13 supplies power for water circulation inside the vessel.

[0016] When feeding is needed during the processing steps, additives or dyes are diluted in the feeding vat 15

in advance. The charge pump 16 starts while feeding. The feeding valve 17 opens. Dyes are fed evenly.

[0017] When continuous washing is needed during the processing steps, the drain valve 20 and water inlet valve 18 open; at the same time the connection valve III 19, auxiliary pump 12, connection valve I 11, connection valve II 14 and overflow nozzle connection tube valve 6 close. Fresh water is sucked in by the main pump 13, goes through the filter I 10 to the heat exchanger 8, and continuously washes the transmitting greige fabric 2 via the airflow nozzle 5.

[0018] While dyeing at 130°C as described in step 3), the main pump 13, auxiliary pump 12, connection valve I 11, connection valve II 14, connection valve III 19, water inlet valve 18 and overflow nozzle connection tube valve 6 open; the air blower 9, airflow nozzle connection tube valve 7 and drain valve 20 close. The greige fabric circulates inside the vessel 1 under the effect of the overflow nozzle 4.

[0019] The invention effectively saves electricity and provides solutions to the dyeing limitation of airflow dyeing machines. Take a single-tube dyeing machine as an example, this system has added an overflow nozzle 4 at the front end of the original airflow nozzle as well as an auxiliary pump 12 with the same power of the main pump 13; a filter I 10 has also been added between the main pump 13, auxiliary pump 12 and the heat exchanger 8. In this way, the air blower 9 does not have to be turned on; instead two pumps are started at the same time to form an overflow dyeing system for the airflow dyeing machine. Both the airflow dyeing and overflow dyeing systems of the airflow dyeing machine as per technological requirements are controlled via PLC program. During airflow dyeing operation, the greige fabric 2 in the dyeing machine is transmitted by the air from air blower 9 and guide roller 3 and continuously contacts and circulates in the dye liquor in the vessel 1 that is pumped by the main pump 13, atomized by the heat exchanger 8 and sprayed out by the airflow nozzle 5 and circulate to finish the process of preprocessing, dyeing and washing, etc. During overflow dyeing operation, the air blower 9 stops working; the greige fabric 2 in the dyeing machine is transmitted by the guide roller 3 and sufficient flow rate and flow generated by the main pump 13 and auxiliary pump 12 and continuously contacts and circulates in the dye liquor in the vessel 1 that is pumped by two pumps and flows through the heat exchanger 8 and overflow nozzle 4, etc. to finish the dyeing and washing process. Generally, the overflow nozzle 4 has a water flow five times bigger than the airflow nozzle 5. This invention has both the airflow dyeing system and the overflow dyeing system, which have prevented polyester fabric wrinkling while being dyed in high-temperature air flow at 130°C and reduced electricity consumption by air blower during the process of airflow dyeing at high temperature. This invention saves energy and enlarges the application of dyeing machine.

Claims

1. An overflow dyeing system of atomized airflow dyeing machine, comprising a vessel, a greige fabric, a guide roller, an airflow nozzle, an airflow nozzle connection tube valve, a heat exchanger, an air blower, a main pump, a feeding vat, a charge pump, a feeding valve, a water inlet valve, a drain valve, a connection valve III, and a filter II, which are configured coordinately, wherein a filter I is coordinately configured between the main pump and the heat exchanger; an overflow nozzle is connected on the output tube of the heat exchanger through an overflow nozzle connection tube valve and placed above the airflow nozzle; an auxiliary pump is added on the tube of the main pump; a connection valve I and a connection valve II are respectively configured on the tubes of both ends of the auxiliary pump. 5
2. The overflow dyeing system of atomized airflow dyeing machine as recited in claim 1, wherein the connection valve III is configured between the water inlet valve and the drain valve. 10
3. The overflow dyeing system of atomized airflow dyeing machine as recited in claim 1, wherein the auxiliary pump and the main pump are of the same model. 15
4. A method for wet processing of overflow dyeing system of atomized dyeing machine as recited in claim 1, wherein a jacquard greige fabric cross-woven with polyester and modified polyester is processed by the processing steps of: 1) Degreasing preprocessing: adding water and dyes and circulating the greige fabric at the temperature of 60°C; directly rising the temperature to 90°C and holding for 30~40min; directly dropping the temperature to 70°C; finishing preprocessing and draining water; and then continuously adding 60°C hot water and washing for 15min; 2) Alkali dewighting: adding water and dyes and circulating the greige fabric at the temperature of 60°C; directly rising the temperature to 90°C and holding for 40~60min; directly dropping the temperature to 60°C; finishing alkali dewighting and draining water; and then continuously adding 60°C hot water and washing for 15min; washing with neutralization water for 5min and fresh water for 5min; 3) Dyeing polyester with disperse dyes: adding water and dyes and circulating the greige fabric at the temperature of 60°C; rising the temperature to 130°C at a rate of 1~2°C/min and holding for 40~60min; directly dropping the temperature to below 80°C; finishing polyester dyeing and draining water; and then adding 60°C hot water, circulating the greige fabric, and draining water after 10min washing; 4) Dyeing modified polyester with cationic dyes: adding water and dyes and circulating the greige fabric at the temperature of 70°C; rising the temperature to 85°C at a rate of 1°C/min, then to 98°C at a rate of 2°C/min and holding for 40~60min; dropping the temperature to 80°C; finishing dyeing and draining water; and then adding 60°C hot water and washing for 10min; 5) Restoring and cleaning: adding water and dyes and circulating the greige fabric at the temperature of 60 °C; directly rising the temperature to 80°C and holding for 10min; and then continuously adding 60°C hot water and washing for 15min; when the dyeing machine circulates normally, the air blower starts blowing; the dyeing machine transmits one end of the greige fabric through the guide roller, the overflow nozzle and the airflow nozzle into the vessel; as the greige fabric is totally transmitted into the vessel, the head end and the tail end of the greige fabric are connected to be like a rope, which keeps circulating and transmitting under the effect of the guide roller and the force of air flow generated by the air blower; at the same time, the drain valve, auxiliary pump, connection valve I, connection valve II and overflow nozzle connection tube valve close while the connection valve III, water inlet valve and main pump open. Water runs through the heat exchanger and airflow nozzle, continuously contacts the transmitting greige fabric, flows inside the vessel and downwards to the bottom of the vessel, goes through the filter II and connection valve III, and at last returns back to the main pump for water circulation. When the vessel has a certain water level, the water inlet valve closes. Water keeps flowing and circulation inside the system; when temperature rising or dropping is needed during the processing steps, steam or cooling water goes into the heat exchanger and indirectly contacts the water inside the vessel, thus rising or dropping the temperature of the water inside the vessel. Through the process, the main pump supplies power for water circulation inside the vessel; when feeding is needed during the processing steps, additives or dyes are diluted in the feeding vat in advance. The charge pump starts while feeding. The feeding valve opens. Dyes are fed evenly; when continuous washing is needed during the processing steps, the drain valve and water inlet valve open; at the same time the connection valve III, auxiliary pump, connection valve I, connection valve II and overflow nozzle connection tube valve close. Fresh water is sucked in by the main pump, goes through the filter I to the heat exchanger, and continuously washes the transmitting greige fabric via the airflow nozzle. 20 25 30 35 40 45 50
5. The method for wet processing of overflow dyeing system of atomized airflow dyeing machine as recited in claim 4, wherein while dyeing at 130°C as described in step 3), the main pump, auxiliary pump, connection valve I, connection valve II, connection valve III, water inlet valve and overflow nozzle con- 55

nection tube valve open; the air blower, airflow nozzle connection tube valve and drain valve close. The greige fabric circulates inside the vessel under the effect of the overflow nozzle.

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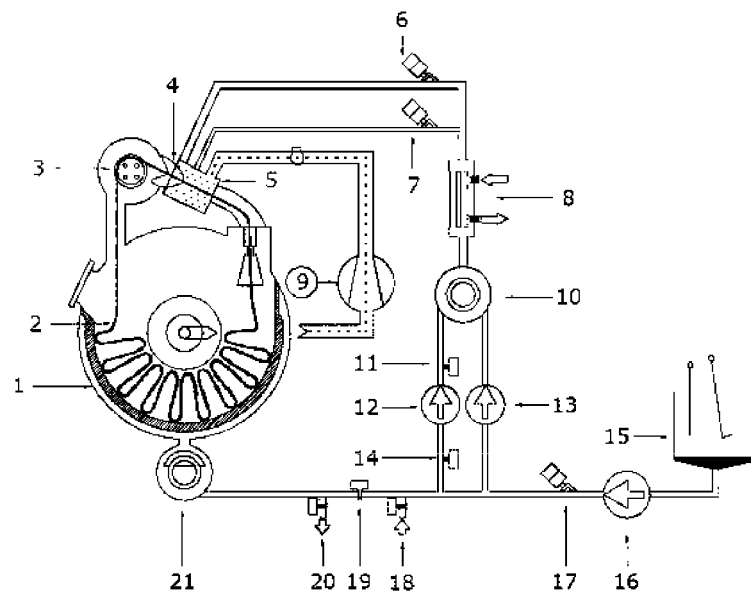


FIG. 1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2012/000225

A. CLASSIFICATION OF SUBJECT MATTER

See the extra sheet

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: D06B

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

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

CNABS,CNKI,VEN, dying, dye+, air+, overflow+, liquid w flow+, over w flow+, pump?, valve?

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN102212944A(ZHEJIANG YINHE PRINTING&DYEING CO LTD),12 Oct. 2011(12.10.2011), claims 1-5	1-5
PX	CN202116840U(ZHEJIANG YINHE PRINTING&DYEING CO LTD),18 Jan. 2012(18.01.2012), claims 1-3, description, paragraphs [0010]-[0021]	1-5
A	CN2527579Y(CHEN, Tingyong),25 Dec. 2002(25.12.2002), description, page 3 line 6 to page 4 line 10, figure 4	1-5
A	CN2220483Y(CHEN, Qingxiang),21 Feb. 1996(21.02.1996), the whole document	1-5
A	JP11323719A(ONOMORI TEKKOSHO KK),26 Nov. 1999(26.11.1999), the whole document	1-5
A	US5850651A(HISAKA SEISAKUSHO KK),22 Dec. 1998(22.12.1998), the whole document	1-5
A	JP2002339225A(TOU J L),27 Nov.2002(27.11.2002), the whole document	1-5

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 17 May 2012(17.05.2012)	Date of mailing of the international search report 31 May 2012(31.05.2012)
Name and mailing address of the ISA State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No. (86-10)62019451	Authorized officer SONG, Lin Telephone No. (86-10) 62084562

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2012/000225

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN102212944A	12.10.2011	None	
CN202116840U	18.01.2012	None	
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JP2002339225A	27.11.2002	None	

Form PCT/ISA/210 (patent family annex) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2012/000225

Continuation of : second sheet

A. CLASSIFICATION OF SUBJECT MATTER

D06B5/22(2006.01)i

D06B1/02(2006.01)i

D06B23/20(2006.01)i