(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 412 820 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
12.12.2018 Bulletin 2018/50

(21) Application number: **16914812.9**

(22) Date of filing: **19.10.2016**

(51) Int Cl.:
D06B 23/02 *(2006.01)*

(86) International application number:
PCT/CN2016/102628

(87) International publication number:
WO 2018/040249 (08.03.2018 Gazette 2018/10)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

(30) Priority: **02.09.2016 CN 201610800486**

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(54) UNDERSURFACE FABRIC DRIVING MECHANISM FOR CONTINUOUS OPEN-WIDTH WASHING DEVICE

(57) Under liquid fabric transportation mechanism on a continuous open width washing range involves the technical areas of the continuous open width washing machines. It solves the fabric elongation caused by the under liquid fabric transportation where fabric is not being transported sufficiently due to the insufficient friction between the under liquid driven drums and the fabric being transported under liquid. Such mechanism includes the driven drum and its driven rotor inside the drum; the said driven drum includes an external drum with perforated holes on its surface, the driven rotor is installed inside the external drum which is having the paddling profiles on its circumference. The rotation speed of the driven rotor is higher than the rotation speed of the external drum which created a suction effect which keeps the fabric on to the surface of the external drum. As a result, the friction between the under liquid fabric and driven drum can be maximized, the transportation of the fabric under liquid becomes stable, a lower running tension, and a better washing criteria can be achieved.

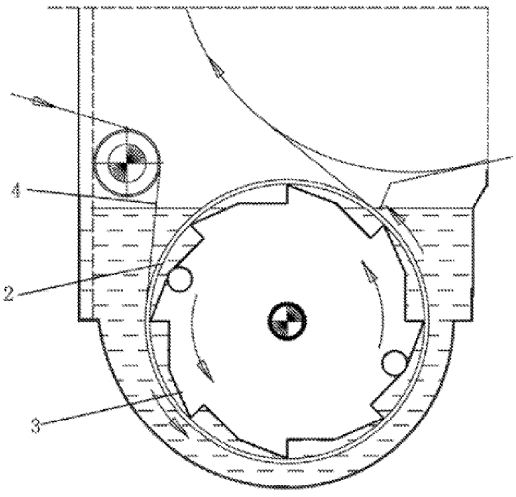

Fig.2

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Description

BACKGROUND

Technical Field

[0001] This invention relates to the technical areas of a continuous open width fabric washing range, specifically involves the improvement of transportation mechanism for under liquid fabric transportation.

Related art

[0002] On a continuous open width fabric washing range, fabric will run through the washing compartments from going down into water and lifting up from water many times continuously driven by drums and rollers. The effectiveness of washing is the most important factor for a washing range but the satiability of fabric running condition is also playing a very important role here. If the fabric running condition is not stable, it will cause fabric elongation, uneven shrinkage and uneven washing. In order to achieve stable running condition, a steady and controllable fabric running tension is the most important factor.

[0003] As the minimum fabric running tension is bringing the benefit of least elongation, the best shrinkage, and even washing; fabric running tension has become one of the most critical issues on the design of continuous washing ranges. Basically, the fabric running tension is controlled by the synchronization of all driven drums and rollers on the continuous washing range. In principle, if all the driven drums and rollers are perfectly synchronized, zero tension could be achieved. In fact, it is not the case as fabric will be going down into water for under liquid washing and lifting up from water for water spraying on fabric's top surface. So, the fabric is actually transported by many drums and rollers in different diameters, some of them are installed under water and some of them are installed above water. The fabric is transported by driven drums and roller through the pulling force which is equal to the frictional force generated by the surface friction, the roller surface area, and the fabric running tension.

[0004] Assuming that the fabric width is the same, and at the same fabric running tension, the maximum frictional force is found on the driven top drum where fabric is wrapping the top section of drum with maximum nominal weight with its own fabric weight. And the least frictional force is always observed at the driven lower drum under liquid as fabric is only wrapping the lower section of the drum where minimum nominal weight is found due to the fact that the fabric is only floating under liquid as its fabric weight is neglected.

[0005] As a result, maximizing the frictional force on the lower drum under liquid is the solution of stabilizing the fabric running condition, realizing the better synchronization, and finally the solution to achieve lower fabric running tension.

DISCLOSURE OF THE INVENTION

[0006] As per descriptions above, the target of this invention is to solve the existing problems such as fabric elongation, uneven shrinkage, uneven washing on the continuous open width fabric washing range; which caused by the under liquid fabric transportation where fabric is not being transported sufficiently due to the insufficient friction between the under liquid driven drums and the fabric being transported under liquid.

[0007] In order to tackle to technical problems raises by this invention, the technical solution being used is: the under liquid fabric transportation mechanism on the continuous open width washing range, its characteristic is that such mechanism includes a driven rotor being installed inside the driven drum in the washing compartment; the said driven drum includes an external drum with support side plates and bushings on both ends, the two sets of bushings can be rotated on the rotor shafts installed on the washing compartment; the said external drum is punched with perforated holes on its surface for passing through of circulating liquid; the said drive rotor is having driven shafts which mounted on the side plated of the rotor, both shafts are installed with mechanical seals, one driven shaft is extended outside the washing compartment for driven motor installation; the said driven rotor is having the paddling profiles on its circumference.

[0008] The said under liquid fabric transportation mechanism, its characteristic is that; the said bushing is mounted with chain sprocket, and the chain sprocket is driven by chain links which connected to the driven mechanism.

[0009] The said under liquid fabric transportation mechanism, its characteristic is that; the driven shaft are installed in the bearing housings mounted on both sides of the washing compartment, there are mechanical seal between the bushing and the driven shaft.

[0010] The said under liquid fabric transportation mechanism, its characteristic is that; there are ball bearings installed between the shafts and the bearing housings.

[0011] The effect of this invention is: to achieve the minimum fabric running tension for least elongation and best shrinkage, the solution is to design a mechanism which increases the surface friction between the lower perforated drum surface and the fabric. On this design, the Bernoulli's principle is implied. The new design named "Cyclone Rotor" will be rotated at variable speed inside the lower perforated drum which causes the spinning of water inside the drum. As per the Bernoulli's principle, the high speed spinning water is creating a lower pressure inside the perforated drum while the water outside the drum is relatively steady. And such pressure difference inside and outside the drum has created a suction effect while the fabric is transporting by this drum. As the suction effect has implied the same as increasing

the friction between the drum and the fabric, the same frictional force can be maintained even with the less fabric running tension. As the pulling force for transporting the fabric on the lower perforated drum is secured, the lower fabric running tension along with the smoother fabric running condition is achieved.

Descriptions of Drawings

[0012]

Drawing 1: An illustration on this invention;

Drawing 2: The A-A section of drawing 1;

Drawing 3: A 3-D illustration on this invention.

Models for carrying the invention

[0013] The implementation (with explanations of the descriptions on the drawing) is described as follow.

[0014] As per drawing 1, 2, & 3, the under liquid fabric transportation mechanism on the continuous open width washing range, including the under liquid driven drum 2 and its driven rotor 3 are installed inside the washing compartment 1. The main function of the driven drum 2 is to transport the fabric 4 which the fabric 4 will be washed after passing through the washing compartment 1; the driven rotor 3 inside the driven drum 2 will be rotated in relatively higher speed inside the driven drum 2 which creates a lower pressure inside the perforated drum while the water is relatively steady outside the drum. Such pressure difference between the volumes inside and outside the perforated drum has created a suction effect while the fabric is transported by the drum. As a result, the friction between the perforated drum and the fabric is increased by such suction effect.

[0015] The structure of the driven drum 2 includes the external drum 21, the eternal drums are connected to bushings 23 which supported by the side plates 22. The external drum 21 is punched with perforated holes 211 on its surface for passing through of circulating liquid. In order to synchronize the linear speed of the driven drum 2, and the upper drum above the liquid surface inside the washing compartment 1, the bushings 23 are mounted with chain sprocket 24. And the chain sprocket 24 is linked with chain links 25 which connected to the driven mechanism 26.

[0016] The driven rotor 3 installed inside the external drum 21, which is a co-axial system with the rotor body 31, the rotor body 31 is connected by rotor side plates 32 which connected to the driven shafts 33, the driven shafts 33 are connected to bushings 23 and one of the driven shafts 33 is extended outside the washing compartment for driven motor 5 installation; the rotor body 31 is having the paddling profiles 311 on its circumference. There is running fit between the rotor body 31 and the external drum 21, the paddling profiles 311 will push the liquid away from external drum 21 and create a relatively low pressure inside the driven drum 2, while liquid outside the external drum 2 is passing through the perforated holes 211 going inside the external drum 2, the fabric 4 will be hold on the surface of the external drum 2 caused by the suction effect above, and the fabric running tension can be reduced.

[0017] In order to avoid leakage for liquid from the driven shafts 33 when the liquid level in washing compartment 1 is higher than driven shafts 33, mechanical seals 11 are used on the driven shafts 33 on the connection to the washing compartment 1. Lip seals 12 are used between the driven shafts 33 and the mechanical seals 11. Bearings 13 are also used in this driven shafts and mechanical seals 11 assembly.

Claims

1. Under liquid fabric transportation mechanism on a continuous open width washing range, wherein such mechanism includes a drive rotor being installed inside a driven drum in a washing compartment; the said driven drum includes an external drum with support side plates and bushings on both ends, the two sets of bushings can be rotated on rotor shafts installed on the washing compartment; the said external drum is punched with perforated holes on its surface for passing through of circulating liquid; the said drive rotor is having driven shafts which are mounted on the side plated of the rotor, both shafts are installed with mechanical seals, one driven shaft is extended outside the washing compartment for driven motor installation; the said drive rotor has paddling profiles on its circumference.

2. The under liquid fabric transportation mechanism on a continuous open width washing range according to claim 1, the said under liquid fabric transportation mechanism characterized that the said bushing is mounted with a chain sprocket, and the chain sprocket is driven by chain links which are connected to the driven mechanism.

3. The under liquid fabric transportation mechanism on a continuous open width washing range according to claim 1, the said under liquid fabric transportation mechanism **characterized in that** the driven shaft are installed in bearing housings mounted on both sides of the washing compartment, and there are mechanical seals between the bushing and the driven shaft.

4. The under liquid fabric transportation mechanism on the continuous open width washing range according to claim 3, the said under liquid fabric transportation mechanism **characterized in that** there are ball bearings installed between the shafts and the bear-

ing housings.

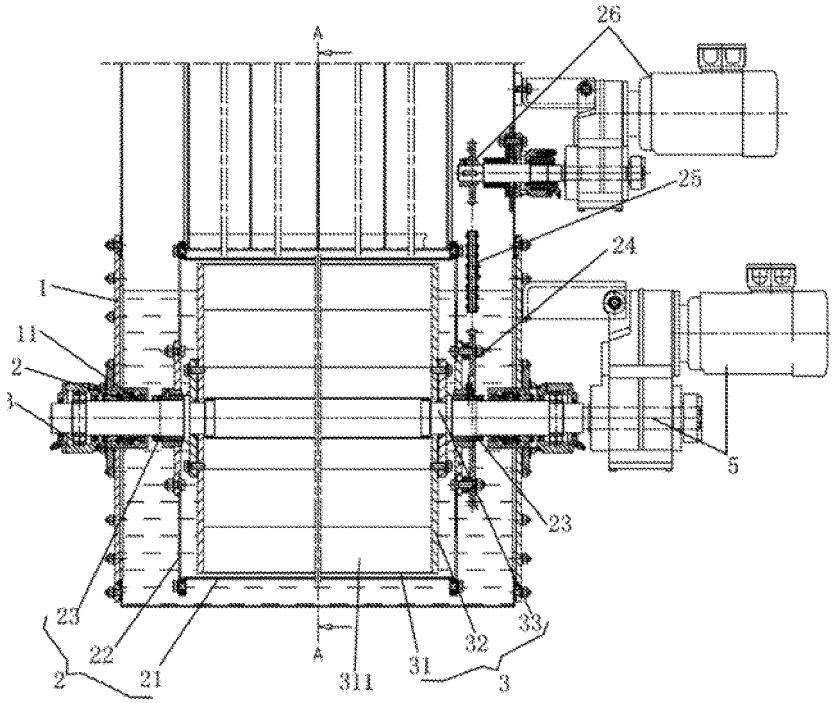

Fig.1

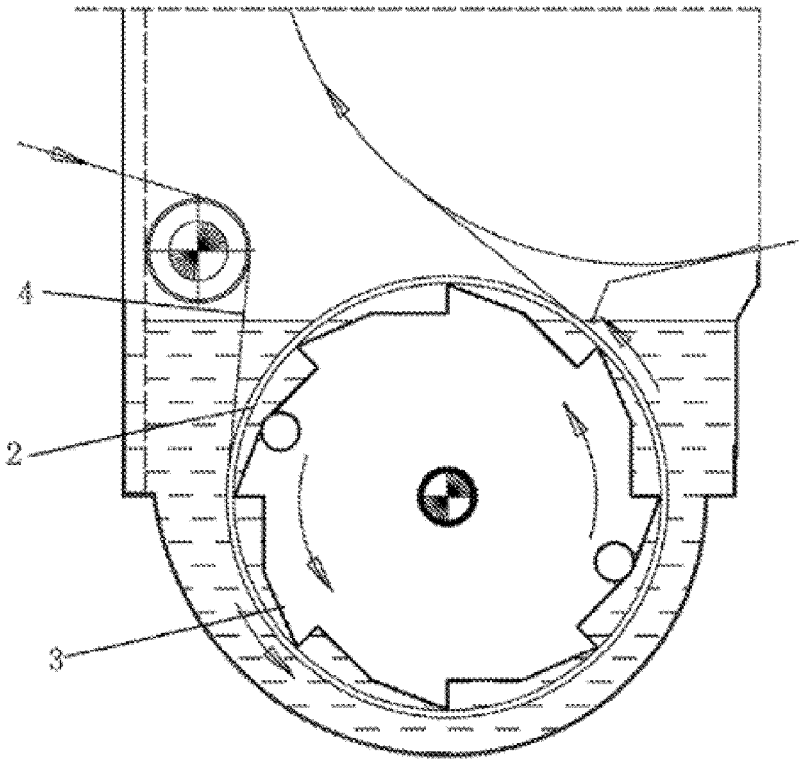

Fig.2

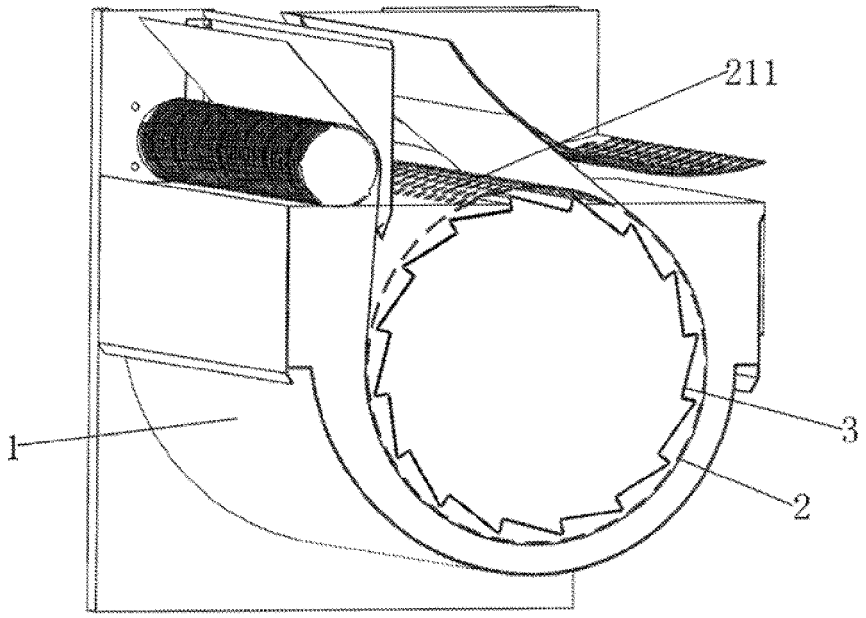

Fig.3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2016/102628

A. CLASSIFICATION OF SUBJECT MATTER

D06B 23/08 (2006.01) i

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)

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)

CNKI, CNPAT, WPI, EPODOC, ISI WEB OF KNOWLEDGE: 转鼓, 转筒, 滚筒, 转子, 辊, 内筒, 外筒, 同心, 共轴, 桨, 叶片, 同圆心, 孔, 水洗, 洗水, 平幅水洗, 第二, 双, 内, 外, 负压, 抽吸, second, double, inside, outside, tumbling box, drum, roller, tumbler, negative pressure, vacuum, sucking, suction, pump

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 101328681 A (ZHANG, Qi) 24 December 2008 (24.12.2008), description, page 2, lines 6-20, embodiment, and figures 1-4	1-4
X	CN 201729984 U (JIANGYIN JINTIAN MACHINERY CO., LTD.) 02 February 2011 (02.02.2011), description, embodiment, and figures 1 and 2	1-4
A	CN 202688675 U (TAIZHOU COSMO ENGINEERING EQUIPMENT CO., LTD.) 23 January 2013 (23.01.2013), entire document	1-4
A	CN 101892567 A (JIANGYIN JINTIAN MACHINERY CO., LTD.) 24 November 2010 (24.11.2010), entire document	1-4
A	CN 202849790 U (JIANGSU REDFLAG PRINTING & DYEING MACHINERY CO., LTD.) 03 April 2013 (03.04.2013), entire document	1-4

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

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"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

"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

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
31 May 2017	13 June 2017
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 WANG, Li'na Telephone No. (86-10) 62084563

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2016/102628

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 103088575 A (JING, Xudong) 08 May 2013 (08.05.2013), entire document	1-4
A	CN 201729979 U (JIANGYIN JINTIAN MACHINERY CO., LTD.) 02 February 2011 (02.02.2011), entire document	1-4
A	SU 1134641 A1 (IVANOVSK NI EX K MASHINO) 15 January 1985 (15.01.1985), entire document	1-4
A	CN 104562494 A (ZHANG, Qi) 29 April 2015 (29.04.2015), entire document	1-4

Form PCT/ISA /210 (continuation of second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2016/102628

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 101328681 A	24 December 2008	CN 101328681 B	08 September 2010
CN 201729984 U	02 February 2011	None	
CN 202688675 U	23 January 2013	None	
CN 101892567 A	24 November 2010	CN 101892567 B	21 December 2011
CN 202849790 U	03 April 2013	None	
CN 103088575 A	08 May 2013	None	
CN 201729979 U	02 February 2011	None	
SU 1134641 A1	15 January 1985	None	
CN 104562494 A	29 April 2015	None	

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