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

UNTERGRUNDGEWEBEANTRIEBSMECHANISMUS FÜR VORRICHTUNG ZUM  
KONTINUIERLICHEN BREITWASCHEN

MÉCANISME D'ENTRAÎNEMENT DE TISSU SOUS-JACENT POUR DISPOSITIF DE LAVAGE  
CONTINU AU LARGE

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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.

[0006] It is remarked that Korean Patent Application KR 2012 0022321 discloses a mechanism for cleaning a fabric by beating a fabric. Said document discloses inside a guide drum with perforations a turbo drum with indentations and protrusions. The rotation of the turbo drum cause strong vortex and vibrations transmitted to the fabric on the guide drum through the perforations of the guide drum, for effectively removing foreign substances attached to the surface of the fabric. Strong vortex and vibrations are transmitted to the fabric through the perforations in the guide drum, which effectively removes foreign substances attached to the surface of the fabric, so that the cleaning effect is large, and the vibration effect is also caused by the contraction of the fabric to reduce the effect. The cleaning effect, due to the vibrations, is said to be large, and the vibration effect is also caused by the contraction of the fabric to reduce the effects on the fabric.

[0007] United States Patent US 3 864 948 discloses a suction drum washer comprising an outer tank, an inner tank having openings at both ends thereof and accommodated in the outer tank, a hollow suction drum having numerous holes in the outer periphery thereof and mounted rotatably in the inner tank, and a cylindrical body having helical fins on the outer periphery thereof and rotatably mounted in the suction drum. The helical fins are formed symmetrically in respect to the center of the cylindrical body.

### DISCLOSURE OF THE INVENTION

[0008] 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.

[0009] In order to tackle to technical problems raises by this invention, the technical solution being used is: the under liquid fabric transportation mechanism suitable for 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 circumferential drum surface with support side plates and bushings on both ends, the bushings can be rotated on rotor shafts installed on the washing compartment; the external circumferential drum surface is punched with perforations on its surface for passing through of circulating liquid; the driven rotor has the rotor shafts which are mounted on rotorside plates of the rotor, both rotor shafts are installed with mechanical seals, one of the rotor shaft is extended outside the washing compartment for driving motor installation; the rotor is located inside and coaxial with the perforated external circumferential drum sur-

face, wherein the driven rotor has paddling profiles on its circumference causing during rotation of the driven rotor a spinning of liquid inside the drum and relatively steady liquid outside the circumferential drum surface for creating, as per Bernoulli's principle, a pressure difference between the volumes inside and outside the perforated external circumferential drum surface, thereby creating a lower pressure inside the perforated external circumferential drum surface, for increasing by suction the surface friction between the lower part of the perforated external circumferential drum surface and the fabric.

**[0010]** The under liquid fabric transportation mechanism, its characteristic is that; the bushing is mounted with a chain sprocket, and the chain sprocket is driven by chain links which is connected to a driving mechanism.

**[0011]** The under liquid fabric transportation mechanism, its characteristic is that; the rotor shafts are installed in the bearing housings mounted on both sides of the washing compartment, there are mechanical seal between the bushing and the rotor shafts.

**[0012]** The said under liquid fabric transportation mechanism, its characteristic is that; there are ball bearings installed between the shafts and the bearing housings.

**[0013]** 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

### [0014]

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

**[0015]** The implementation (with explanations of the descriptions on the drawing) is described as follow.

**[0016]** 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.

**[0017]** The structure of the driven drum 2 includes the external circumferential drum surface 21, the external drums are connected to bushings 23 which supported by the side plates 22. The external circumferential drum surface 21 is punched with perforations 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 driving mechanism 26.

**[0018]** The driven rotor 3 installed inside the external circumferential drum surface 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 rotor shafts 33, the rotor shafts 33 are connected to bushings 23 and one of the rotor shafts 33 is extended outside the washing compartment for driving 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 circumferential drum surface 21, the paddling profiles 311 will push the liquid away from external circumferential drum surface 21 and create a relatively low pressure inside the driven drum 2, while liquid outside the external circumferential drum surface 21 is passing through the perforations 211 going inside the external circumferential drum surface 21, the fabric 4 will be hold on the surface of the external circumferential drum surface 21 caused by the suction effect above, and the fabric running tension can be reduced.

**[0019]** In order to avoid leakage for liquid from the rotor shafts 33 when the liquid level in washing compartment 1 is higher than rotor shafts 33, mechanical seals 11 are used on the rotor shafts 33 on the connection to the washing compartment 1. Lip seals 12 are used between the rotor shafts 33 and the mechanical seals 11. Bearings 13 are also used in this rotor shafts and mechanical seals

11 assembly.

## Claims

1. Under liquid fabric transportation mechanism suitable for a continuous open width washing range, wherein the under liquid fabric transportation mechanism includes a driven rotor (3) being installed inside a driven drum (2) in a washing compartment (1); the driven drum (2) includes an external circumferential drum surface (21) and support side plates (22) and bushings (23) on both ends, the bushings (23) can be rotated on rotor shafts (33) installed on the washing compartment; the external circumferential drum surface (21) is punched with perforations on its surface for passing through of circulating liquid; the driven rotor (3) has the rotor shafts (33) which are mounted on rotor side plates (32) of the driven rotor, both rotor shafts (33) are installed with mechanical seals (11), one of the rotor shafts (33) is extended outside the washing compartment for driving motor (5) installation for driving the driven rotor (3); the driven rotor (3) is inside and coaxial with the perforated external circumferential drum surface (21) wherein the driven rotor (3) comprises a rotor body (31), having paddling profiles (311) on its circumference causing during rotation of the driven rotor (3) a spinning of liquid inside the drum and relatively steady liquid outside the circumferential drum surface (21) for creating, as per Bernoulli's principle, a pressure difference between the volumes inside and outside the perforated external circumferential drum surface (21) thereby creating a lower pressure inside the perforated external circumferential drum surface (21), for increasing by suction the surface friction between the lower part of the perforated external circumferential drum surface (21) and the fabric .
2. The under liquid fabric transportation mechanism suitable for a continuous open width washing range according to claim 1, the under liquid fabric transportation mechanism characterized that the bushing (23) is mounted with a chain sprocket (24), and the chain sprocket (24) is driven by chain links (2) which are connected to a driving mechanism (26).
3. The under liquid fabric transportation mechanism suitable for a continuous open width washing range according to claim 1, the under liquid fabric transportation mechanism **characterized in that** the rotor shafts (31) are installed in bearing housings mounted on both sides of the washing compartment (1), and there are mechanical seals between the bushings (23) and the rotor shafts (31).
4. The under liquid fabric transportation mechanism

suitable for the continuous open width washing range according to claim 3, the under liquid fabric transportation mechanism **characterized in that** there are ball bearings installed between the rotor shafts and the bearing housings.

5. A continuous open width washing range comprising an under liquid fabric transportation mechanism as claimed in any of the preceding claims.

## Patentansprüche

1. Gewebefördermechanismus unter Flüssigkeit passend für eine Linie zum kontinuierlichen Breitwaschen, wobei der Gewebefördermechanismus unter Flüssigkeit einen angetriebenen Rotor (3) umfasst, der innerhalb einer angetriebenen Trommel (2) in einer Waschkammer (1) eingebaut ist; die angetriebene Trommel (2) eine äußerliche Umfangstrommeloberfläche (21) und Unterstütsungsseitenplatten (22) und Laubbuchsen (23) an beiden Enden umfasst, die Laubbuchsen (23) auf an der Waschkammer angeordneten Rotorwellen (33) gedreht werden können; die äußerliche Umfangstrommeloberfläche (21) mit Durchlochungen auf ihrer Oberfläche zur Durchströmung einer Umlaufflüssigkeit gestanzt ist; der angetriebene Rotor die Rotorwellen (33) aufweist, die auf Rotorseitenflächen (32) des angetriebenen Rotors montiert sind, beide Rotorwellen (33) mit mechanischen Dichtungen (11) aufgestellt sind, eine der Rotorwellen (33) außerhalb der Waschkammer (1) verlängert ist, damit eine Antriebsmotoranlage (5) den angetriebenen Rotor (3) antreibt ; der angetriebene Rotor (3) innen und gleichachsig mit der äußerlichen durchlöcherten Umfangstrommeloberfläche (21) ist, wobei der angetriebene Rotor (3) einen Rotorkörper (31) umfasst, Schaufelprofile auf seinem Umfang aufweist, die während der Drehung des angetriebenen Rotor (3) ein Schleudern von Flüssigkeit innerhalb der Trommel und eine relativ stabile Flüssigkeit außerhalb der äußerlichen Umfangstrommeloberfläche (21) verursachen, damit ein Druckunterschied gemäß der Bernoulli-Regel zwischen den Volumen innerhalb und außerhalb der äußerlichen durchlöcherten Umfangstrommeloberfläche (21) geschaffen wird, sodass die Oberflächenreibung zwischen dem unteren Teil der äußerlichen durchlöcherten Umfangstrommeloberfläche (21) und der Gewebe durch Absaugung erhöht wird.
2. Gewebefördermechanismus unter Flüssigkeit passend für eine Linie zum kontinuierlichen Breitwaschen nach Anspruch 1, wobei der Gewebefördermechanismus unter Flüssigkeit **dadurch gekennzeichnet ist, dass** die Laubbuchse (23) mit einem Kettenrad (24) montiert ist, und das Kettenrad (24) durch Kettenverbindungen (2) angetrieben ist, die

mit einem Antriebmechanismus (26) verbunden sind.

3. Gewebefördermechanismus unter Flüssigkeit passend für eine Linie zum kontinuierlichen Breitwaschen nach Anspruch 1, wobei der Gewebefördermechanismus unter Flüssigkeit **dadurch gekennzeichnet ist, dass** die Rotorwellen (31) in Lagergehäusen aufgestellt sind, die an beiden Seiten der Waschkammer (1) montiert sind, und es mechanische Dichtungen zwischen den Laufbuchsen (23) und den Rotorwellen (31) gibt.
4. Gewebefördermechanismus unter Flüssigkeit passend für eine Linie zum kontinuierlichen Breitwaschen nach Anspruch 3, wobei der Gewebefördermechanismus unter Flüssigkeit **dadurch gekennzeichnet ist, dass** Kugellager zwischen den Rotorwellen und den Lagergehäusen aufgestellt sind.
5. Linie zum kontinuierlichen Breitwaschen umfassend einen Gewebefördermechanismus unter Flüssigkeit nach einem der vorhergehenden Ansprüche.

#### Revendications

1. Mécanisme de transport de tissus sous liquide apte pour une ligne de lavage continue au large, dans lequel le mécanisme de transport de tissu sous liquide comporte un rotor entraîné (3) installé à l'intérieur d'un tambour entraîné (2) dans un compartiment de lavage (1) ; le tambour entraîné (2) comporte une surface de tambour circonférentielle extérieure (21) et des plaques latérales d'appui (22) et des manchons (23) aux deux extrémités, les manchons (23) peuvent tourner sur des arbres rotoriques (33) installés sur le compartiment de lavage ; la surface de tambour circonférentielle extérieure (21) est poinçonnée avec des perforations sur sa surface afin d'y faire passer un liquide en circulation ; le rotor entraîné (3) présente les arbres rotoriques (33) qui sont montés sur des plaques latérales rotoriques (32) du rotor entraîné, les deux arbres rotoriques (33) sont installés avec des joints mécaniques (11), l'un des arbres rotoriques (33) s'étend en dehors du compartiment de lavage pour qu'une installation motrice d'entraînement (5) entraîne le rotor entraîné (3) ; le rotor entraîné (3) se trouve à l'intérieur et est coaxial avec la surface de tambour circonférentielle extérieure (21), le rotor entraîné (3) comprenant un corps rotorique (31), présentant des profilés formant aubes sur sa circonférence lesquels causent, pendant la rotation du rotor entraîné (3), une rotation de liquide à l'intérieur du tambour et un liquide relativement régulier à l'extérieur de la surface de tambour circonférentielle (21) afin de créer, selon la règle de Bernoulli, une différence de pression entre les vo-

lumes à l'intérieur et à l'extérieur de la surface de tambour circonférentielle extérieure (21), ce qui crée une plus basse pression à l'intérieur de la surface de tambour circonférentielle extérieure perforée (21) afin d'augmenter par succion la surface de friction entre la partie inférieure de la surface de tambour circonférentielle extérieure perforée (21) et le tissu.

2. Mécanisme de transport de tissus sous liquide apte pour une ligne de lavage continue au large selon la revendication 1, le mécanisme de transport de tissu sous liquide étant **caractérisé en ce que** le manchon (23) est monté avec un pignon à chaîne (24), et le pignon à chaîne (24) est entraîné par des liaisons à chaîne (2) qui sont raccordées à un mécanisme d'entraînement (26).
3. Mécanisme de transport de tissus sous liquide apte à une gamme de lavage au large en continu selon la revendication 1, le mécanisme de transport de tissu sous liquide étant **caractérisé en ce que** les arbres rotoriques (31) sont installés dans des logements à roulement montés des deux côtés du compartiment de lavage (1), et **en ce qu'il y a** des joints mécaniques entre les manchons (23) et les arbres rotoriques (31).
4. Mécanisme de transport de tissus sous liquide pour une ligne de lavage continue au large selon la revendication 3, le mécanisme de transport de tissu sous liquide étant **caractérisé en ce que** des roulements à billes sont installés entre les arbres rotoriques et les logements à roulements.
5. Ligne de lavage continue au large comprenant un mécanisme de transport de tissus sous liquide selon l'une quelconque des revendications précédentes.

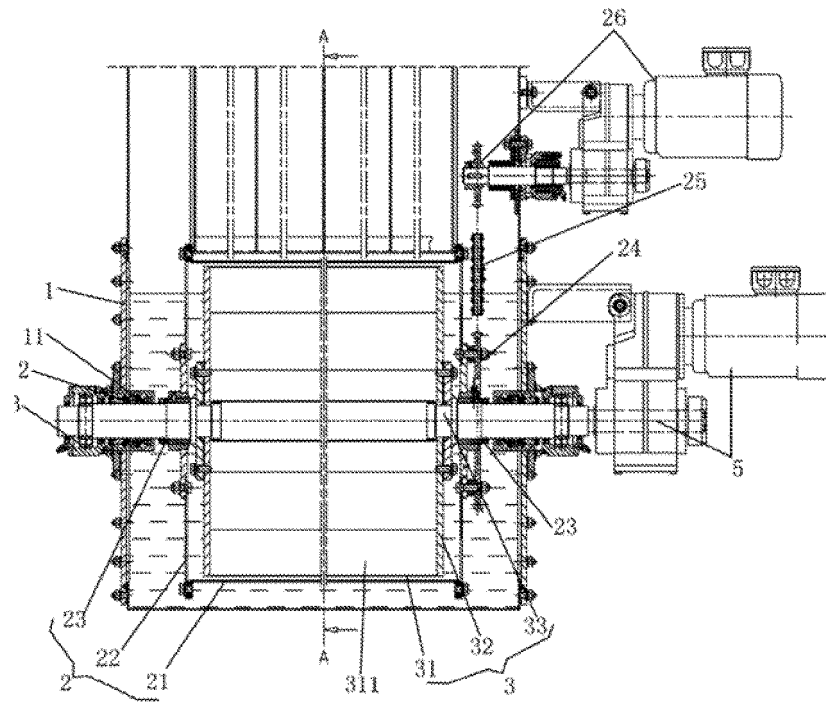


Fig.1

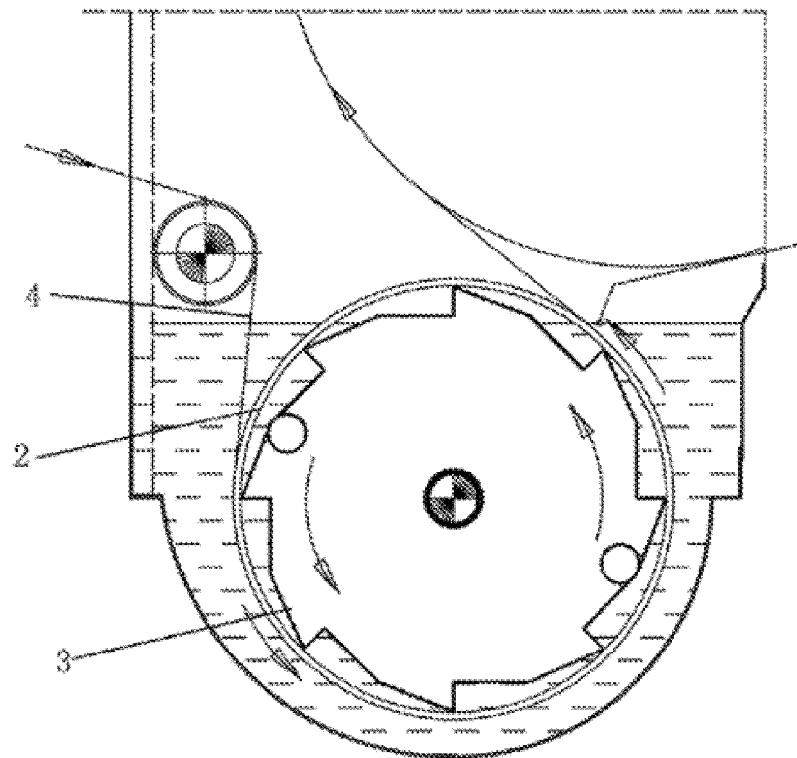


Fig.2

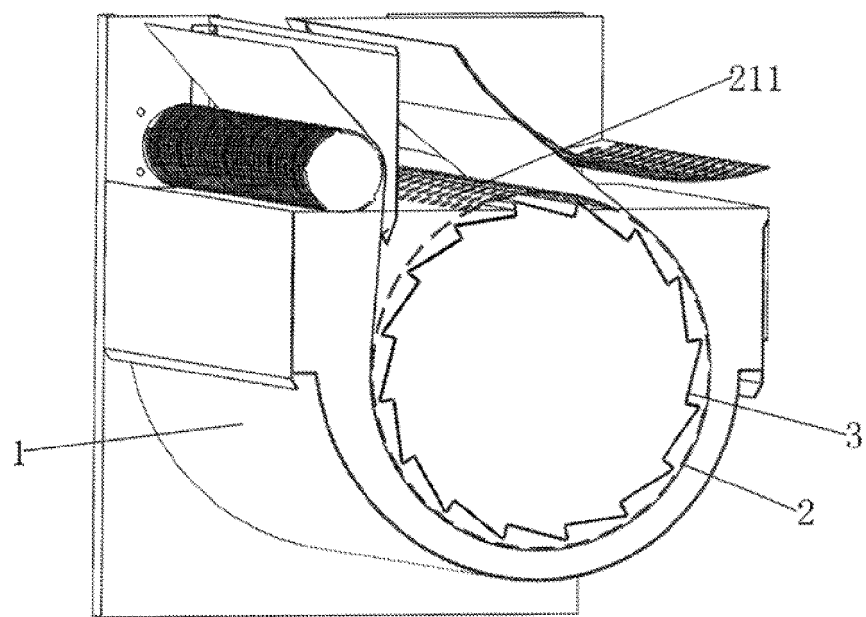


Fig.3

**REFERENCES CITED IN THE DESCRIPTION**

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