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(71) Applicant: **Hisaka Works, Ltd.**
Osaka-shi, Osaka 530-0057 (JP)

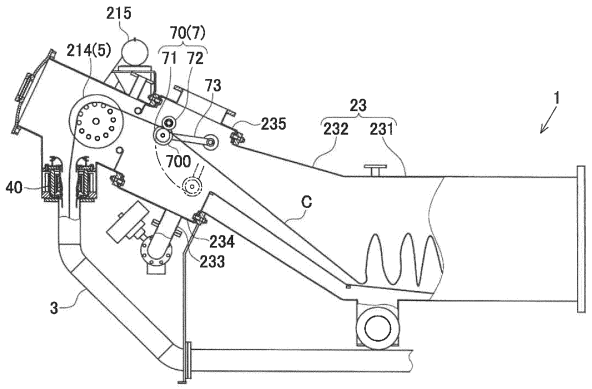
(72) Inventors:
- **TAKAHASHI, Masashi**
  Osaka-shi, Osaka 578-0973 (JP)
- **SHIRAISHI, Kenji**
  Osaka-shi, Osaka 578-0973 (JP)

(74) Representative: **Kraus & Lederer PartGmbB**
Thomas-Wimmer-Ring 15
80539 München (DE)

(54) **LIQUID-FLOW-TYPE FABRIC TREATMENT APPARATUS**

(57) A liquid-current-type woven fabric treatment apparatus for washing woven fabric with washing liquid after treatment using treating liquid according to this invention includes a treatment tank including a first end, a second end that is arranged on a side opposite to the first end, and a body part that is arranged between the first end and the second end and configured to retain the treating liquid; a transfer tube connecting the first end and the second end to form a circulation path through which the woven fabric is circulated together with the body part; a washing liquid supply system configured to supply the washing liquid; and a washing liquid supply system configured to supply the washing liquid, wherein a direction changer is arranged in the first end part, and is configured to change a movement direction of the woven fabric so as to pass the woven fabric through the transfer tube, and the treatment tank includes a press device arranged between a retention part for retaining the treating liquid and the direction changer, and configured to separate the treating liquid that is included in the woven fabric from the woven fabric by pressing the woven fabric moving to be circulated.

FIG.2



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Description

Cross-Reference to related Application

[0001] The present application claims priority to Japanese Patent Application No. 2021-091073, the contents of which are incorporated herein by reference.

Technical Field

[0002] The present invention relates to a liquid-current-type woven fabric treatment apparatus for washing woven fabric with washing liquid after treatment such as dyeing with treating liquid.

Background technology

[0003] A liquid-current-type woven fabric treatment apparatus for dyeing woven fabric is known in the art (see Patent Document 1). In a case in which woven fabric is dyed by the liquid-current-type woven fabric treatment apparatus, after a treating liquid containing dye, etc. added to water is first prepared, the woven fabric is impregnated with the treating liquid and placed at a high temperature for a certain time so that the dye is fixed on the woven fabric. After dye is fixed on the woven fabric, the woven fabric is washed with washing liquid to remove the remaining treating liquid from the woven fabric.

Prior Art

Patent Document

[0004] Patent Document 1: Japanese Patent Laid-Open Publication No. JP 2009-249797

Summary of the Invention

Problems to be Solved by the Invention

[0005] In such washing operation, the aforementioned liquid-current-type woven fabric treatment apparatus sometimes repeatedly discharges the treating liquid in the apparatus and supplies unused washing liquid. Specifically, after discharging a certain amount of the treating liquid in the apparatus, unused washing liquid is supplied to circulate through the woven fabric for a certain time so that the residual treating liquid in the woven fabric is mixed with the supplied unused washing liquid to dilute the residual treating liquid in the woven fabric, and the discharge of a certain amount of the treating liquid in the apparatus starts again to repeat the procedure on some occasions.

[0006] However, because water absorbency of the woven fabric itself can prevent the discharge of the treating liquid, and can reduce discharge efficiency of the treating liquid, a large amount of unused washing liquid is required to repeatedly discharge the treating liquid and supply unused washing liquid in order to sufficiently dilute the remaining treating liquid in the apparatus.

[0007] The present invention is intended to provide a liquid-current-type woven fabric treatment apparatus capable of saving washing liquid used for washing after treatment. Means for Solving the Problems

[0008] A liquid-current-type woven fabric treatment apparatus according to the present invention is a liquid-current-type woven fabric treatment apparatus for washing woven fabric with washing liquid after treatment using treating liquid, the liquid-current-type woven fabric treatment apparatus including a tubular treatment tank including a first end, a second end that is arranged on a side opposite to the first end, and a body part that is arranged between the first end and the second end and configured to retain the treating liquid; a transfer tube connecting the first end and the second end to form a circulation path through which the woven fabric is circulated together with the body part; a treating liquid supply system configured to supply the treating liquid to the treatment tank; and a washing liquid supply system configured to supply the washing liquid to the treatment tank, wherein a direction changer is arranged in the first end part, and is configured to change a movement direction of the woven fabric so as to pass the woven fabric through the transfer tube, and the treatment tank includes a press device arranged between a retention part for retaining the treating liquid and the direction changer, and configured to separate the treating liquid that is included in the woven fabric from the woven fabric by pressing the woven fabric moving to be circulated.

[0009] In addition, in the aforementioned liquid-current-type woven fabric treatment apparatus, the washing liquid supply system can include an unused washing liquid supplier that is arranged on a downstream side in a direction of the circulating movement relative to the press device on the circulation path, and is configured to supply unused washing liquid.

[0010] In addition, in the aforementioned liquid-current-type woven fabric treatment apparatus, the press device can include a pair of rollers configured to pinch the woven fabric from both sides of the woven fabric in a direction intersecting the direction of the circulating movement.

[0011] In addition, in the aforementioned liquid-current-type woven fabric treatment apparatus, at least one of the pair of rollers can be configured to move toward and away from another roller.

[0012] In addition, in the aforementioned liquid-current-type woven fabric treatment apparatus, the at least one of the pair of rollers, which is movable, can be supported by an arm that is pivotably supported by the body part.

[0013] In addition, in the aforementioned liquid-current-type woven fabric treatment apparatus, the pair of rollers can have flange parts that are arranged on ends of a roller.

[0014] In addition, in the aforementioned liquid-cur-

rent-type woven fabric treatment apparatus, the press device can be a roller that is configured to press the woven fabric by moving in one direction intersecting the direction of the circulating movement.

Brief Description of the Drawings

[0015]

[FIG. 1] FIG. 1 is a schematic diagram showing a liquid-current-type woven fabric treatment apparatus according to this embodiment.
[FIG. 2] FIG. 2 is an enlarged view showing essential parts of the aforementioned liquid-current-type woven fabric treatment apparatus.
[FIG. 3] FIG. 3 is an enlarged view showing essential parts of a liquid-current-type woven fabric treatment apparatus according to a modified embodiment.

Modes for Carrying Out the Invention

[0016] The following description describes a liquid-current-type woven fabric treatment apparatus according to one embodiment of the present invention with reference to FIGS. 1 and 2. A liquid-current-type woven fabric treatment apparatus 1 (hereinafter referred to simply as a "woven fabric treatment apparatus 1") is a woven fabric treatment apparatus for washing woven fabric C with washing liquid after treatment using treating liquid. The woven fabric treatment apparatus 1 according to this embodiment is a so-called dyeing machine configured to dye woven fabric with dyeing liquid as treatment using treating liquid. In addition to dyeing or instead of dyeing, pretreatment such as scouring and bleaching, and post-processing such as finishing treatment (for example, flame repelling treatment) may be performed. Although this woven fabric treatment apparatus 1 washes woven fabric with unused washing liquid of water as washing using washing liquid, the woven fabric treatment apparatus can wash woven fabric with washing liquid containing a cleaning agent dissolved in water. A liquid other than water may be used depending on types of treatment.

[0017] The woven fabric treatment apparatus 1 includes a treatment tank 2 including a first end 21, a second end 22 that is arranged on a side opposite to the first end 21, and a body part 23 that is arranged between the first end 21 and the second end 22 and configured to retain the treating liquid as shown in FIG. 1. The woven fabric treatment apparatus 1 includes a transfer tube 3 connecting the first end 21 and the second end 22 to form a circulation path R through which the woven fabric C is circulated together with the body part 23, and a washing liquid supply system 4 configured to supply the washing liquid to the treatment tank. In this embodiment, a direction of circulating movement of the woven fabric C is a counterclockwise direction in FIG. 1. Also, the woven fabric treatment apparatus 1 includes a treating liquid supply system 8 configured to supply the treating liquid to the treatment tank 2. The treatment tank 2 includes a press device 7 arranged between a retention part 6 for retaining the treating liquid and a direction changer 5, and configured to separate the treating liquid that is included in the woven fabric C from the woven fabric C by pressing the moving woven fabric C to be circulated.

[0018] The treatment tank 2 is a horizontally elongated tank (tubular tank) that can be watertightly closed. In the woven fabric treatment apparatus 1 according to this embodiment, the first end 21, the main body 23 and the second end 22 are connected in series in the treatment tank 2 so that an internal space of the treatment tank is integrally formed. Hereinafter, an edge on the first end 21 side (left side edge in FIG. 1) in the horizontal direction is referred to as one end, and an edge on the second end 22 side (right side edge in FIG. 1) is referred to as another end.

[0019] The main body 23 has a cylindrical body part 231 slightly inclined downward from another end toward one end, and a tapered part 232 tapered from the body part 231 toward the first end 21. The tapered part 232 is connected to one end of the body part 231 with being inclined upward from from the body part 231 toward one end. The body part 23 is not necessarily partially tapered, and a cylindrical body having the same diameter as the body part 231 may be connected to one end of the body part 231.

[0020] Also, the main body 23 has a drain 233 that opens downward. In the woven fabric treatment apparatus 1 according to this embodiment, the main body 23 (specifically, the tapered part 232) includes a lower protrusion 234 protruding downward, and the drain 233 is formed in the lower protrusion 234. In addition, in the woven fabric treatment apparatus 1 according to the embodiment, the main body 23 (specifically, the tapered part 232) includes an upper protrusion 235.

[0021] The first end 21 is a part to which an end on the one end side of the transfer tube 3 is connected, and a part for receiving the woven fabric C fed from the treatment tank 2 to the transfer tube 3. Specifically, the first end 21 includes a cylindrical first end body 211 continuously extending from the tapered part 232, and a connection part 212 extending downward from a lower part of the first end body 211 and connected to the transfer tube 3.

[0022] The direction changer 5 is arranged in the first end part 21, and is configured to change a movement direction of the woven fabric C so as to pass the woven fabric C through the transfer tube 3. The direction changer 5 is a member for transporting and guiding the woven fabric C.

[0023] In the woven fabric treatment apparatus 1 according to this embodiment, a reel 214 is arranged as the direction changer 5 in the first end 21. Specifically, the reel 214 is arranged in the first end body 211. The reel 214 includes a plurality of multiple bar-like members that are configured to contact the moving woven fabric C to be circulated, and are spaced at a fixed interval in

a circumferential direction, and rotates about an axis orthogonal to the travel direction of the woven fabric C in the treatment tank 2 (leftward/rightward direction in FIG. 1) and an upward/downward direction. The reel 214 is rotatably driven by an electric motor 215, for example, as shown in FIG. 2.

[0024] The first end body 211 includes an opening/closing door 213 on one end. The opening/closing door 213 can be changed between an arrangement in which one end of the treatment tank 2 is opened (opened arrangement) and an arrangement in which one end is watertightly closed (closed arrangement).

[0025] The second end 22 is a part to which an end of the another end side of the transfer tube 3 is connected, and a part for receiving the woven fabric C fed from the transfer tube 3 to the treatment tank 2. This second end 22 closes another end of the treatment tank 2.

[0026] The transfer tube 3 connects (couples) the first end 21 and the second end 22 to form the circulation path R through which the woven fabric C can be circulated together with the treatment tank 2. Specifically, the transfer tube 3 is a roughly U-shaped pipe including a main tube part 30 that extends under the treatment tank 2 in a horizontal direction, a first vertical part 31 that extends from one end of the main tube part 30 to the connection part 212, and a second vertical part 32 that extends upward from another end of the main tube part 30 to the second end 22.

[0027] The washing liquid supply system 4 includes a new liquid supplier 40 that is arranged on a downstream side in a direction of the circulating movement of the woven fabric C relative to the press device 7 in the circulation path R on the circulation path, and is configured to supply unused washing liquid. The new liquid supplier 40 is, for example, a nozzle arranged in the connection part 212. The nozzle is configured to spray the washing liquid diagonally downward toward a center in the connection part 212 at a high speed. In the woven fabric treatment apparatus 1 according to this embodiment, the nozzle sprays the washing liquid from the entire circumference surrounding the center of the connection part 212 toward a center of a lower end of the connection part 212 at high speed.

[0028] The press device 7 includes a pair of rollers 70 configured to pinch the woven fabric C from both sides of the woven fabric C in a direction intersecting the direction of the circulating movement as shown in FIG. 2, for example. In other words, the press device 7 is a so-called mangle type roller device. In the woven fabric treatment apparatus 1 according to this embodiment, the press device 7 presses the woven fabric C during the woven fabric is washed with the washing liquid after treatment using the treating liquid. The press device 7, for example, is arranged in a substantially center position between the retention part 6 of the processing fluid and the direction changer 5.

[0029] In the woven fabric treatment apparatus 1 of this embodiment, the pair of rollers 70 are arranged side by side in a direction orthogonal to the direction of the circulating movement of the woven fabric C. Each of the pair of rollers 70 is configured to rotate about a rotation axis extending a direction intersecting the direction of the circulating movement of the woven fabric C, more specifically extending a direction intersecting both a direction intersecting the direction of the circulating movement and the direction of the circulating movement. The pair of rollers 70 include flange parts 700 on ends of a roller (ends in a direction intersecting the direction of the circulating movement). One roller 71 of the pair of rollers 70 is arranged on a lower side of the woven fabric C and another roller 72 is arranged on an upper side of the woven fabric C. The flange parts 700 in this embodiment are circular flange shaped parts arranged on both the ends of one roller 71.

[0030] At least one roller 71 of the pair of rollers 70 is configured to move toward and away from another roller 72. In the woven fabric treatment apparatus 1 according to this embodiment, the pair of rollers 70 are arranged at separated positions away from each other during treatment using the treating liquid, and at adjacent positions to each other during washing using the washing liquid. Specifically, one roller 71 (for example, one roller 71 arranged on the lower side) is configured to move toward and away from another roller 72. Both rollers 71 and 72 can be configured to move toward and away from each other.

[0031] The movable roller 71 of the pair of rollers 70 is a follower roller. The movable roller 71 is pivotably supported by the body part 23. More specifically, the movable roller 71 is supported by a movable arm 73 as shown in FIG. 2. The roller 71 moves between lower and upper positions along an arc centering a pivot axis extending in a direction intersecting the direction of the circulating movement of the woven fabric C, for example. At least a part of the roller 71 (for example, a lower half of the roller 71) can be arranged in the lower protrusion 234.

[0032] For example, an air cylinder 74 is used to move the roller 71 (see FIG. 1). A longitudinal direction of the air cylinder 74 is parallel to an extension direction of the main body 23 (tapered part 232 in this embodiment). The air cylinder 74 is arranged beside the main body 23 at a deviated position in a depth direction of the main body 23. The air cylinder 74 is connected to the movable roller 71 by a link 75 having one end connected to the air cylinder 74 and another end connected to the arm 73, for example.

[0033] One end of the link 75 is connected to a free end of the air cylinder 74 by a rotational shaft. Another end of the link 75 is connected to the arm 73 by a rotational shaft. Parts including the one end of the link 75 is located outside the body part 23 and beside the body part 23. The rotational shaft connecting the arm 73 to the link 75 extends in the horizontal direction, and penetrates the main body 23. The rotational shaft extends parallel to the rotation axis of the another roller 72. The rotational shaft is constructed of a single rod, for example. Specifically,

the rod extends in the horizontal direction from a position aligned with one end of the movable roller 71 to a position aligned with another end of the movable roller 71.

[0034] Specifically, telescopic movement of the air cylinder 74 is transmitted to the roller 71 through the arm 73 and the link 75 to move the roller 71 so that a push force of the air cylinder is transmitted to the roller 71 to push the roller 71 toward the woven fabric C. The air cylinder 74 is driven through a control console (not shown) of the woven fabric treatment apparatus 1, and can be driven by an operation on a switch or automatic control. An air pressure supplied to the air cylinder 74 is adjusted by a mechanism that includes a pressure reducing valve.

[0035] In the woven fabric treatment apparatus 1 according to this embodiment, the drain 233 of the main body 23 is arranged under a movement area of the arm 73. As a result, waste liquid squeezed by the pair of rollers 70 (residual treating liquid separated from the woven fabric C) can be immediately drained to the outside of the main body 23.

[0036] The movable roller 72 of the pair of rollers 70 is a roller that is fixed to the main body 23 and can be driven or be rotated following the movement of the woven fabric. The roller 72 can be driven by electric motor power, specifically the roller 72 is driven through a belt or chain that transmits the rotational force from the electric motor, example. For example, the electric motor is driven through the control console of the woven fabric treatment apparatus 1, and a rotation speed and torque of the electric motor can be changed an operation on a switch or automatic control. In the woven fabric treatment apparatus 1 according to this embodiment, the pair of rollers 70 are rotated at a speed synchronized with a speed of the circulating movement of the woven fabric C thereby reducing damage on the woven fabric C caused by washing. At least a part of the roller 72 (for example, an upper half of the roller 72) can be arranged in the upper protrusion 235.

[0037] In the above-mentioned woven fabric treatment apparatus 1, the woven fabric C circulating in a circular rope-like shape is pressed (squeezed) by the stationary roller 72, which can be driven or be rotated following the movement of the woven fabric, and the movable roller 71, which is a follower roller, so that residual treating liquid adhered to surfaces of woven fabric C and residual treating liquid absorbed in the woven fabric C are separated from the woven fabric C and are then drained to the outside of the apparatus through the drain 233, which is opened downward in the main body 23. After that, the woven fabric C from which the treating liquid is separated by squeezing is supplied with only the unused washing liquid, and washed with water. In the woven fabric treatment apparatus 1 according to this embodiment, because the drain 233 is arranged in the lower protrusion 234 of the main body 23 (specifically, the tapered part 232), the waste liquid separated from the woven fabric C can be temporarily retained in the lower protrusion 234 and be prevented from mixing with other liquid in the treatment tank 2.

[0038] Here, in liquid-current-type woven fabric treatment apparatuses, difficulties for achieving improvement of washing efficiency arise in the following mechanisms. Specifically, because a shape of the woven fabric to be washed (after treatment using the treating liquid) is not stationary when placed in the liquid-current-type woven fabric treatment apparatus, it is difficult to achieve "improvement of washing efficiency by using a mechanism that applies air pressure to dyed woven fabric after dyeing", which can be achieved by yarn dyeing machines. Also, because the liquid-current-type woven fabric treatment apparatus has a structure that holds the woven in the circulation path including the treatment tank and the transfer tube dissimilar to product dyeing machines, which has a structure that holds a dyed product in a cylindrical inner tank, it is difficult to achieve "improvement of washing efficiency bu using a mechanism that uniformly applies a centrifugal force to the dyed product", which can be achieved by the product dyeing machines.

[0039] Contrary to this, according to the woven fabric treatment apparatus 1 of this embodiment, because the treating liquid is separated from the woven fabric C by pressing the woven fabric C by using the press device 7 after the woven fabric is treated (for example, dyed), it is possible to reduce an amount of washing liquid used for washing, i.e., an amount of washing liquid used to removing the treating liquid included in the woven fabric C (for example, unused washing liquid used for washing the woven fabric with water). Consequently, it is possible to improve washing efficiency.

[0040] In the woven fabric treatment apparatus 1 according to this embodiment, because the moving woven fabric C to be circulated is pressed by the press device 7 so that an amount of treating liquid that is included in the woven fabric is reduced, and then is washed with unused washing liquid, it is possible to efficiently wash the woven fabric C.

[0041] Also, in the woven fabric treatment apparatus 1 according to this embodiment, because the pair of rollers 70 nip the woven fabric C while rotating, damage on the woven fabric C can be reduced as compared to a structure that includes fixed member rubbing against the woven fabric C. Specifically, even if thickness of the woven fabric C is uneven (for example, a sewed part is formed in the woven fabric C (the woven fabric C is partially doubled and sewed)), because the roller 71, which can correspondingly move together with the arm (for example, the arm moved by the air cylinder) 73, is not fixed but gently presses the woven fabric C, it is possible to prevent that a strong force is applied to the part of the woven fabric C that is thicker.

[0042] Also, in this embodiment of woven fabric treatment apparatus 1, because the pair of rollers 70 can be arranged at separated positions away from each other during treatment using the treating liquid so that the pair of rollers 70 move to distant positions away from the cir-

culation path R to prevent interference with the woven fabric C, the woven fabric C can be smoothly circulated.

[0043] In the woven fabric treatment apparatus 1 according to this embodiment, because the movable roller 71 is supported by the arm 73, it is possible to simplify a structure relating to the roller 71 as compared to a structure that moves the pair of rollers 70 parallel to each other, for example. Also, because a through hole through which the shaft for pivotably supporting the arm 73 passes is formed in the main body 23 so that a mechanism for moving the arm 73 (air cylinder, etc.) can be arranged outside the main body 23, it is possible to simplify a mechanism of the press device 7 for pressing the woven fabric C inside the main body 23.

[0044] Also, In the woven fabric treatment apparatus 1 according to this embodiment, when the woven fabric C is sandwiched between the pair of rollers 70, the flange part 700 of one roller 71 can prevent the woven fabric to from disengaging from the pair of rollers 70 in a width direction (longitudinal direction of the pair of rollers 70).

[0045] The woven fabric treatment apparatus according to the present invention is not limited to the aforementioned embodiment, and needless to say various modification can be made without departing from the spirit of the present invention. For example, a component in one embodiment can be added to another embodiment, and some of components in one embodiment can be replaced with compositions in another embodiment. Also, some of components in one embodiment can be removed.

[0046] Although it has been illustratively described that the press device 7 presses the woven fabric C during the woven fabric is washed with the washing liquid after treatment using the treating liquid in the woven fabric treatment apparatus 1 according to the aforementioned embodiment, the press device 7 presses the woven fabric C before the start of the washing using the washing liquid after treatment using the treating liquid. Even in this configuration, an amount of washing liquid used for washing can be reduced by pressing the woven fabric C by using the press device 7 to separate the treating liquid from the woven fabric before washing.

[0047] Although it has been illustratively described that the press device 7 includes the pair of rollers 70 in the aforementioned embodiment, the press device can include a fixed bar and a roller configured to sandwich the woven fabric C from both sides of the woven fabric, or a pair of bars configured to sandwich the woven fabric C from both sides of the woven fabric.

[0048] Although it has been illustratively described that the movable roller 71 of the pair of rollers 70 is moved along an arc by the arm 73 in the aforementioned embodiment, the movable roller can be moved by a different member from the arm 73, for example, can be slid (be slide, e.g., in a direction orthogonal to the direction of the circulating movement).

[0049] Although it has been illustratively described that one roller 71 is the movable roller and another roller 72 is the stationary roller in the pair of rollers 70, both the rollers 71 and 72 can be movable rollers relative to the main body 23 or both the rollers 71 and 72 can be stationary rollers.

[0050] Although it has been illustratively described that the pair of rollers 70 are aligned in a direction orthogonal to the direction of the circulating movement of the woven fabric C, the rollers 71 and 72 can be arranged at deviated positions from each other in the direction of the circulating movement so that the woven fabric C is meandered in an S shape by the pair of rollers 70 in this case.

[0051] The movable roller 71 can be moved by a driver other than the air cylinder 74. The configuration that supports the roller 71 is not limited to the aforementioned configuration. For example, the pivot shaft connecting the arm 73 to the link 75 can be constructed of a plurality of rods. Specifically, the pivot shaft can be constructed of two rods, and the two rods do not necessarily extend from a position aligned with one end of the movable roller 71 to a position aligned with another end of the movable roller 71 in this case.

[0052] The press device 7 may be constructed of one roller 71. For example, as shown in FIG. 3, the press device 7 may be a roller 71 configured to press the woven fabric C by moving in one direction intersecting the direction of the circulating movement of the woven fabric C. In this case, it is possible to further simplify a configuration of the press device 7.

[0053] The treatment tank 2 can have a different shape from the aforementioned shape. For example, at least one of the lower protrusion 234 and the upper protrusion 235 can be omitted in the treatment tank 2. The treatment tank 2 does not necessarily include the drain 233.

[0054] A liquid-current-type woven fabric treatment apparatus according to the present invention is a liquid-current-type woven fabric treatment apparatus for washing woven fabric with washing liquid after treatment using treating liquid, the liquid-current-type woven fabric treatment apparatus including a tubular treatment tank including a first end, a second end that is arranged on a side opposite to the first end, and a body part that is arranged between the first end and the second end and configured to retain the treating liquid; a transfer tube connecting the first end and the second end to form a circulation path through which the woven fabric is circulated together with the body part; a treating liquid supply system configured to supply the treating liquid to the treatment tank; and a washing liquid supply system configured to supply the washing liquid to the treatment tank, wherein a direction changer is arranged in the first end part, and is configured to change a movement direction of the woven fabric so as to pass the woven fabric through the transfer tube, and the treatment tank includes a press device arranged between a retention part for retaining the treating liquid and the direction changer, and configured to separate the treating liquid that is included in the woven fabric from the woven fabric by pressing the woven fabric moving to be circulated.

[0055] According to this structure, an amount of washing liquid can be reduced by pressing the woven fabric by using the press device to separate the treating liquid from the woven fabric after the woven fabric is treated.

[0056] In addition, in the aforementioned liquid-current-type woven fabric treatment apparatus, the washing liquid supply system can include an unused washing liquid supplier that is arranged on a downstream side in a direction of the circulating movement relative to the press device on the circulation path, and is configured to supply unused washing liquid.

[0057] According to this structure, because the woven fabric moving to be circulated is pressed by the press device, and then is washed with unused washing liquid, it is possible to efficiently wash the woven fabric.

[0058] In addition, in the aforementioned liquid-current-type woven fabric treatment apparatus, the press device can include a pair of rollers configured to pinch the woven fabric from both sides of the woven fabric in a direction orthogonal to the direction of the circulating movement.

[0059] According to this configuration, because the pair of rollers nip the woven fabric while rotating, damage on woven fabric can be reduced.

[0060] In addition, in the aforementioned liquid-current-type woven fabric treatment apparatus, at least one of the pair of rollers can be configured to move toward and away from another roller.

[0061] According to this configuration, because the pair of rollers can be arranged at separated positions away from each other during treatment using the treating liquid to prevent interference with the woven fabric, the woven fabric can be smoothly circulated.

[0062] In addition, in the aforementioned liquid-current-type woven fabric treatment apparatus, the at least one of the pair of rollers, which is movable, can be supported by an arm that is pivotably supported by the body part.

[0063] According to this configuration, it is possible to simplify a structure relating to the movable roller.

[0064] In addition, in the aforementioned liquid-current-type woven fabric treatment apparatus, the pair of rollers can have flange parts that are arranged on ends of a roller.

[0065] According to this configuration, the woven fabric is unlikely to disengage from the pair of rollers when the woven fabric is sandwiched between the pair of rollers.

[0066] In addition, in the aforementioned liquid-current-type woven fabric treatment apparatus, the press device can be a roller that is configured to press the woven fabric by moving in one direction intersecting the direction of the circulating movement.

[0067] According to this configuration, it is possible to further simplify a configuration of the press device 7. Description of Reference Numerals

[0068] 1 ... Liquid-Current-Type Woven Fabric Treatment Apparatus (Woven Fabric Treatment Apparatus), 2 ... Treatment Tank, 3 ... Transfer Tube, 4 ... Washing Liquid Supply System, 5 ... Direction Changer, 6 ... Retention Part, 7 ... Press Device, 8 ... Washing Liquid Supply System, 21 ... First End Part, 22 ... Second End Part, 23 ... Main Body, 30 ... Main Tube Part, 31 ... First Vertical Part, 32 ... Second Vertical Part, 40 ... New Liquid Supplier, 70, 71, 72... Roller, 73 ... Arm, 74 ... Air Cylinder, 75 ... Link, 211 ... First End Body, 212 ... Connection Part, 213 ... Opening/Closing Door, 214 ... Reel, 215 ... Electric Motor, 231 ... Body Part, 232 ... Tapered Part, 233 ... Drain, 234 ... Lower Protrusion, 235 ... Upper Protrusion, 700 ... Flange Part, C ... Woven Fabric, R ... Circulation Path

Claims

1. A liquid-current-type woven fabric treatment apparatus for washing woven fabric with washing liquid after treatment using treating liquid, the liquid-current-type woven fabric treatment apparatus comprising:

   a tubular treatment tank including a first end, a second end that is arranged on a side opposite to the first end, and a body part that is arranged between the first end and the second end and configured to retain the treating liquid;
   a transfer tube connecting the first end and the second end to form a circulation path through which the woven fabric is circulated together with the body part;
   a treating liquid supply system configured to supply the treating liquid to the treatment tank; and
   a washing liquid supply system configured to supply the washing liquid to the treatment tank, wherein
   a direction changer is arranged in the first end part, and is configured to change a movement direction of the woven fabric so as to pass the woven fabric through the transfer tube, and
   the treatment tank includes a press device arranged between a retention part for retaining the treating liquid and the direction changer, and configured to separate the treating liquid that is included in the woven fabric from the woven fabric by pressing the woven fabric moving to be circulated.

2. The liquid-current-type woven fabric treatment apparatus according to claim 1, wherein the washing liquid supply system includes an unused washing liquid supplier that is arranged on a downstream side in a direction of the circulating movement relative to the press device on the circulation path, and is configured to supply unused washing liquid.

3. The liquid-current-type woven fabric treatment ap-

paratus according to claim 1 or 2, wherein the press device includes a pair of rollers configured to pinch the woven fabric from both sides of the woven fabric in a direction intersecting the direction of the circulating movement.

4. The liquid-current-type woven fabric treatment apparatus according to claim 3, wherein at least one of the pair of rollers is configured to move toward and away from another roller.

5. The liquid-current-type woven fabric treatment apparatus according to claim 4, wherein the at least one of the pair of rollers, which is movable, is supported by an arm that is pivotably supported by the body part.

6. The liquid-current-type woven fabric treatment apparatus according to any of claims 3 to 5, wherein the pair of rollers have flange parts that are arranged on ends of a roller.

7. The liquid-current-type woven fabric treatment apparatus according to claim 1 or 2, wherein the press device is a roller that is configured to press the woven fabric by moving in one direction intersecting the direction of the circulating movement.

FIG.1

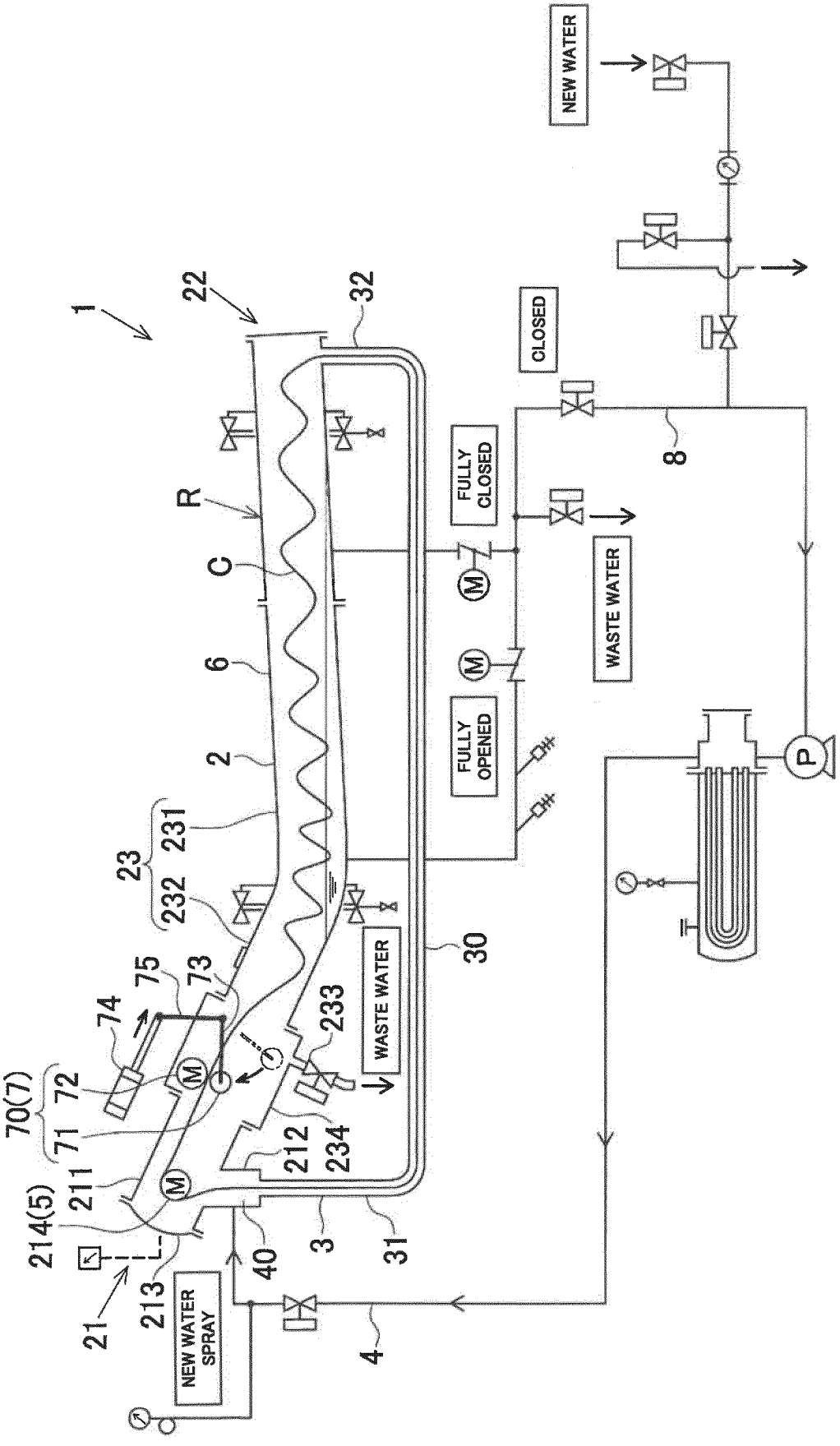

1
22
32
R
C
6
2
23
231
232
75
73
74
70(7)
72
71
211
214(5)
213
21
NEW WATER SPRAY
40
3
31
4
30
WASTE WATER
233
212
234
FULLY OPENED
FULLY CLOSED
CLOSED
NEW WATER
8
WASTE WATER
M
P

FIG.2

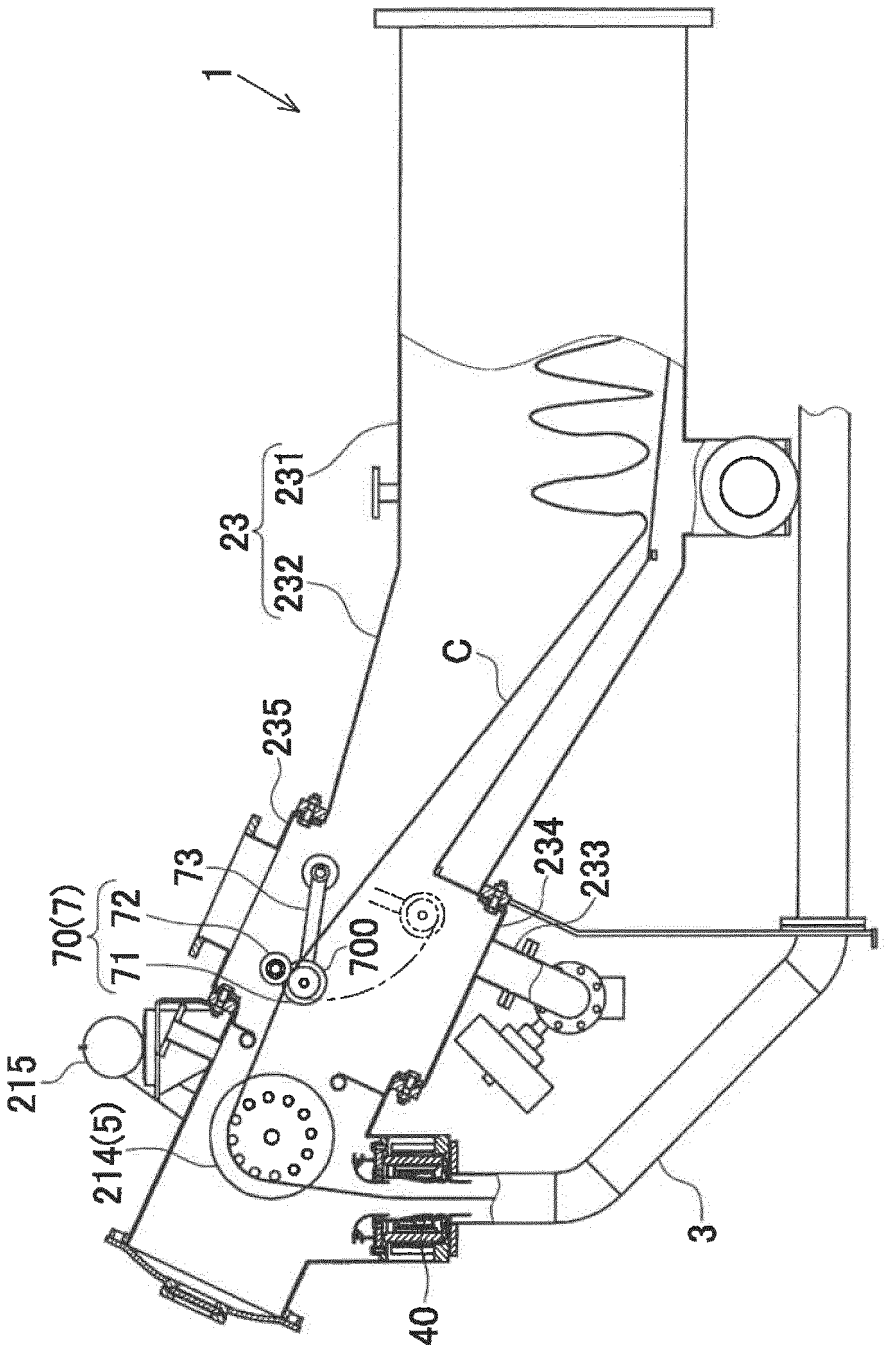
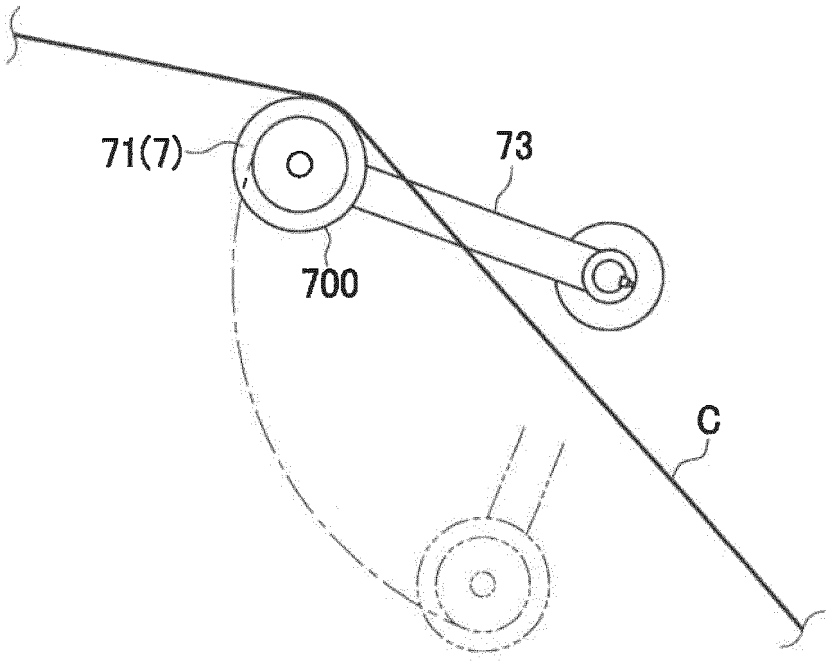


FIG.3



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2022/021441

A. CLASSIFICATION OF SUBJECT MATTER

D06B 3/10(2006.01)i; ***D06B 15/02***(2006.01)i
FI: D06B3/10 B; D06B15/02

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)

D06B1/00-23/30; D06C3/00-29/00; D06G1/00-5/00; D06H1/00-7/24; D06J1/00-1/12; D06P1/00-7/00

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

Published examined utility model applications of Japan 1922-1996
Published unexamined utility model applications of Japan 1971-2022
Registered utility model specifications of Japan 1996-2022
Published registered utility model applications of Japan 1994-2022

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	JP 2009-249797 A (SEIREN CO., LTD.) 29 October 2009 (2009-10-29) paragraphs [0006], [0012]-[0021], fig. 1	1-7
Y	JP 52-103581 A (TAKASE DYEING & PRINTING WORKS, LTD.) 30 August 1977 (1977-08-30) page 2, lower left column, lines 11-13, fig. 2	1-7
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 100901/1977 (Laid-open No. 32375/1979) (MITSUBISHI RAYON CO., LTD.) 02 March 1979 (1979-03-02), claims, page 5, lines 2, 3, fig. 2	1-7
Y	JP 50-154599 A (DAIDO MARUTA SENKO KK) 12 December 1975 (1975-12-12) page 3, lower left column, lines 4-13, fig. 1	1-7
Y	JP 62-78253 A (TSUDAKOMA IND. CO., LTD.) 10 April 1987 (1987-04-10) page 2, lower right column, line 14 to page 3, upper left column, line 11, fig. 1	4-7
Y	JP 2010-248673 A (AIKI RIOTECH CORP.) 04 November 2010 (2010-11-04) paragraph [0038], fig. 2	4-7

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

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"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
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
28 June 2022	**12 July 2022**
Name and mailing address of the ISA/JP **Japan Patent Office (ISA/JP)** **3-4-3 Kasumigaseki, Chiyoda-ku, Tokyo 100-8915** **Japan**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2022/021441

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2020-7647 A (HISAKA WORKS LTD.) 16 January 2020 (2020-01-16) entire text, all drawings	1-7

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2022/021441

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
JP 2009-249797 A	29 October 2009	(Family: none)	
JP 52-103581 A	30 August 1977	(Family: none)	
JP 54-32375 U1	02 March 1979	(Family: none)	
JP 50-154599 A	12 December 1975	(Family: none)	
JP 62-78253 A	10 April 1987	(Family: none)	
JP 2010-248673 A	04 November 2010	(Family: none)	
JP 2020-7647 A	16 January 2020	CN 110670278 A entire text, all drawings KR 10-2020-0004249 A	

Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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- JP 2021091073 A **[0001]**
- JP 2009249797 A **[0004]**