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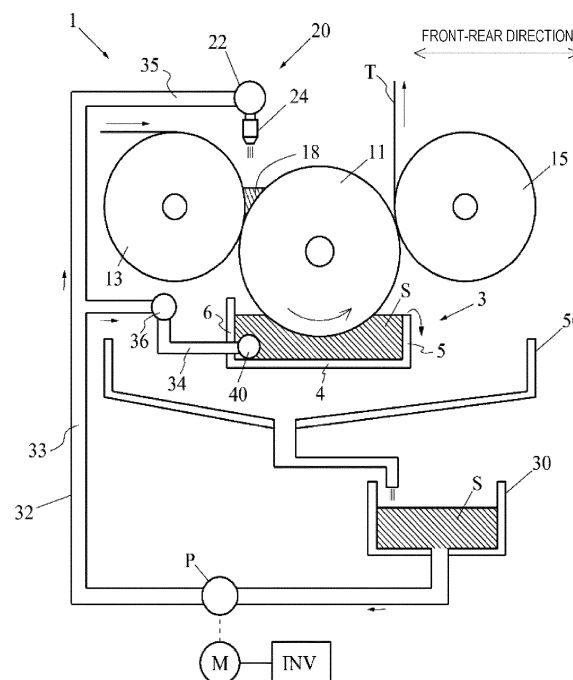
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(54) **WARP SIZING APPARATUS**

(57) A warp sizing apparatus (1) including: a sizing tank (3); a sizing roll (11) on which a warp sheet (T) can be wound; a squeeze roll (13) circumscribed around the sizing roll such to create a wedge area between the rolls; a sizing liquid supply device (20) for supplying the sizing liquid (S) to said circumscribed position of the sizing roll and the squeeze roll; and a supply pipe (32) in which the sizing liquid (S) delivered from a pump (P) is supplied to the sizing tank and the sizing liquid supply device (20).

The supply pipe (32) includes a main pipe (33) with one end connected to the pump (P), and a first branch pipe (34) and a second branch pipe (35) branched from the main pipe (33), the first branch pipe (34) is connected to the sizing tank (3), and the second branch pipe (35) is connected to the sizing liquid supply device (20). The first branch pipe (34) is provided with a flow regulating valve (36).

FIGURE



Description

TECHNICAL FIELD

[0001] The present invention relates to a warp sizing apparatus including: a sizing tank in which a sizing liquid is stored; a sizing roll on which a warp sheet is wound; a squeeze roll circumscribed around the sizing roll to sandwich a path of the warp sheet; a sizing liquid supply device configured to supply the sizing liquid to a circumscribed position of the sizing roll and the squeeze roll; and a supply pipe in which the sizing liquid delivered from a pump is supplied to the sizing tank and the sizing liquid supply device, in which the supply pipe includes a main pipe with one end connected to the pump, and a first branch pipe and a second branch pipe branched from the main pipe, the first branch pipe is connected to the sizing tank, and the second branch pipe is connected to the sizing liquid supply device.

BACKGROUND ART

[0002] Patent Literature 1 discloses a warp sizing apparatus including a sizing tank in which a sizing liquid is stored, and a sizing roll on which a warp sheet is wound. In addition, the warp sizing apparatus is provided with squeeze rolls circumscribed around the sizing roll on front and rear sides of the sizing roll, respectively. Further, the warp sizing apparatus is provided with a sizing liquid supply device that supplies the sizing liquid to a circumscribed position of the sizing roll and the squeeze roll on the rear side. In the warp sizing apparatus, the sizing liquid is supplied from the sizing liquid supply device to form a sizing liquid pool on the circumscribed position, the warp sheet passes through the sizing liquid pool, and the sizing is performed on the warp sheet while the extra sizing liquid is squeezed from the warp sheet.

[0003] A pump for delivering the sizing liquid is connected to the sizing tank and the sizing liquid supply device through a supply pipe. The supply pipe includes a main pipe with one end connected to the pump, and a first branch pipe and a second branch pipe branched from the main pipe. The first branch pipe is connected to the sizing tank, and the second branch pipe is connected to the sizing liquid supply device. Further, the sizing liquid delivered from the pump branches from the main pipe flows into the first branch pipe and the second branch pipe and is supplied to the sizing tank and the sizing liquid supply device.

[0004] In addition, in the warp sizing apparatus according to Patent Literature 1, a flow adjustment valve as a flow regulating valve is provided in the second branch pipe connected to the sizing liquid supply device for a purpose of adjusting a ratio of a flow rate of the sizing liquid supplied to a sizing tank side and a flow rate of the sizing liquid supplied to a sizing liquid supply device side. Note that in the configuration, since the flow adjustment valve adjusts the flow rate in a direction of throttling (re-

ducing) the flow rate, the flow rate of the sizing liquid flowing through the second branch pipe is smaller than that when the flow adjustment valve is not provided.

CITATION LIST

PATENT LITERATURE

[0005] Patent Literature 1: JP2003-96657A

[0006] In the meantime, in the warp sizing apparatus as described above, since the warp sheet is first immersed in the sizing liquid at the sizing liquid pool on the circumscribed position, that is, the warp sheet not penetrated by the sizing liquid first passes through (is immersed by) the sizing liquid pool on the circumscribed position, a consumption amount of the sizing liquid is larger in the sizing liquid pool than in the sizing tank in which the sizing liquid is immersed downstream of the sizing liquid pool. Therefore, to maintain a state in which a sufficient amount of the sizing liquid is stored in the sizing liquid pool, an amount of the sizing liquid supplied to the sizing liquid supply device needs to be set to a sufficient amount (a larger amount) with respect to the consumption amount.

[0007] Note that in the warp sizing apparatus, the sizing liquid supply device is provided at a position higher than the sizing tank. Therefore, the supply of the sizing liquid to the sizing liquid supply device is performed in a form of pushing up the sizing liquid to a higher position than that of the supply of the sizing liquid to the sizing tank. Therefore, the sizing liquid delivered from the pump to the main pipe in the supply pipe is divided and flows to the first branch pipe on the sizing tank side and the second branch pipe on the sizing liquid supply device side at a branching portion of the pipe, and the flow of the sizing liquid is difficult to flow to the second branch pipe side than to the first branch pipe side. In addition, in the warp sizing apparatus according to Patent Literature 1, since the flow adjustment valve is provided in the second branch pipe as described above, the sizing liquid is more difficult to flow to the second branch pipe side.

[0008] Therefore, to supply a sufficient amount of the sizing liquid to the sizing liquid supply device as described above (to make an amount of the sizing liquid flowing in the second branch pipe sufficient) in the warp sizing apparatus according to Patent Literature 1, an amount (a delivery amount) of the sizing liquid to be delivered to the supply pipe (the main pipe) needs to be extremely large. Therefore, in such a warp sizing apparatus, it is necessary to adopt a large-capacity pump, and there is a problem that the running cost is high as a device cost increases.

SUMMARY

[0009] Accordingly, an object of the present invention is to provide a configuration of a warp sizing apparatus capable of supplying an appropriate amount of a sizing

liquid to a sizing liquid supply device side while reducing a device cost and a running cost.

[0010] To achieve the object, the preamble of the present invention of a warp sizing apparatus including: a sizing tank in which a sizing liquid is stored; a sizing roll on which a warp sheet is wound; a squeeze roll circumscribed around the sizing roll to sandwich a path of the warp sheet; a sizing liquid supply device configured to supply the sizing liquid to a circumscribed position of the sizing roll and the squeeze roll; and a supply pipe in which the sizing liquid delivered from a pump is supplied to the sizing tank and the sizing liquid supply device, in which the supply pipe includes a main pipe with one end connected to the pump, and a first branch pipe and a second branch pipe branched from the main pipe, the first branch pipe is connected to the sizing tank, and the second branch pipe is connected to the sizing liquid supply device. In addition, in the warp sizing apparatus, the first branch pipe is provided with a flow regulating valve. Further, in the present invention, the pump may be a pump capable of adjusting a delivery amount of the sizing liquid.

[0011] According to the warp sizing apparatus of the present invention, since the first branch pipe connected to the sizing tank is provided with the flow regulating valve, a flow rate of the sizing liquid to a sizing tank side is adjusted in a direction in which the flow rate of the sizing liquid is throttled (reduced) in the warp sizing apparatus. In the supply pipe branched as described above, the flow rate of the sizing liquid to the sizing liquid supply device side is increased (compared to a case where the first branch pipe is not throttled) by throttling the first branch pipe on the sizing tank side. Therefore, according to the warp sizing apparatus of the present invention, there is no need to adopt a large-capacity pump to supply a sufficient amount of the sizing liquid to the sizing liquid supply device (make an amount of the sizing liquid flowing the second branch pipe sufficient), and a device cost and a running cost are reduced.

[0012] Further, in the warp sizing apparatus, if the pump is a pump capable of adjusting the delivery amount of the sizing liquid, it is possible to increase the flow rate of the sizing liquid to the sizing tank side while maintaining a state of supplying a sufficient amount of the sizing liquid to the sizing liquid supply device side as described above. Specifically, in the warp sizing apparatus, depending on an operation condition, an environmental condition, and the like, it may be requested to increase the flow rate of the sizing liquid to the sizing tank side. In such a case, if the pump supplies a certain amount of the sizing liquid, it is possible to cope with the request by reducing a throttle amount of the flow regulating valve provided in the first branch pipe. However, when the flow rate of the sizing liquid to the sizing tank side is increased in this way, the flow rate of the sizing liquid to the sizing liquid supply device decreases accordingly. In contrast, if the pump can adjust the delivery amount of the sizing liquid, by increasing the delivery amount of the sizing liquid from

the pump according to the request, it is possible to increase the flow rate of the sizing liquid to the sizing tank side without decreasing the flow rate of the sizing liquid to the sizing liquid supply device side as much as possible.

BRIEF DESCRIPTION OF DRAWINGS

[0013] FIGURE is a side view of a warp sizing apparatus according to an embodiment of the present invention.

DESCRIPTION OF EMBODIMENTS

[0014] Hereinafter, an embodiment (an example) of a warp sizing apparatus to which the present invention is applied will be described with reference to FIGURE.

[0015] The warp sizing apparatus 1 includes a sizing tank 3 that stores a sizing liquid S, a sizing roll 11 that is immersed in the sizing liquid S when a warp sheet T is wound thereon, and a first squeeze roll 13 and a second squeeze roll 15 circumscribed around the sizing roll 11. However, the sizing roll 11, the first squeeze roll 13, and the second squeeze roll 15 are rolls having substantially the same dimensions in axis line directions thereof. The warp sizing apparatus 1 further includes a sizing liquid supply device 20 that supplies, from above, the sizing liquid S to a circumscribed position of the sizing roll 11 and the first squeeze roll 13.

[0016] The sizing roll 11 is a roll on which the warp sheet T is wound. The sizing roll 11 is rotatably supported with respect to a frame (not shown) of the warp sizing apparatus 1 by support shafts on both ends of the sizing roll. In addition, the sizing roll 11 is provided such that a lower part thereof is in a state of being immersed in the sizing liquid S stored in the sizing tank 3.

[0017] Note that the warp sizing apparatus 1 includes a drive mechanism (not shown) configured to rotationally drive the sizing roll 11. Thereby, the sizing roll 11 is rotationally driven positively in conformity with advancing of the warp sheet T. The warp sheet T is guided in a form of being wound onto the sizing roll 11, and is immersed in the sizing liquid S and is impregnated with the sizing liquid S during such guiding.

[0018] The second squeeze roll 15 is a roll for squeezing the sizing liquid S impregnated in the warp sheet T, and is provided in arrangement of being located on a front side with respect to the sizing roll 11. In addition, the second squeeze roll 15 is rotatably supported with respect to the frame by support shafts on both ends of the second squeeze roll, in a direction in which the axis line direction of the second squeeze roll is made to coincide with the axis line direction of the sizing roll 11 (a width direction of the warp sizing apparatus 1). Note that the second squeeze roll 15 is supported with respect to the frame via a pressing mechanism (not shown), and is provided to be circumscribed in a state of being pressed against the sizing roll 11. Therefore, the second squeeze

roll 15 is adapted to rotate as the sizing roll 11 is rotationally driven as described above.

[0019] The warp sheet T wound on the sizing roll 11 as described above passes between the sizing roll 11 and the second squeeze roll 15 circumscribed as described above, and is then pulled out toward an outside. Further, when passing between the sizing roll 11 and the second squeeze roll 15 in this way, the extra sizing liquid S is squeezed from the warp sheet T impregnated with the sizing liquid S as described above.

[0020] The first squeeze roll 13 is provided in arrangement of being located on a rear side with respect to the sizing roll 11. The first squeeze roll 13 is also rotatably supported with respect to the frame by support shafts on both ends of the first squeeze roll, in a direction in which the axis line direction of the first squeeze roll is made to coincide with the width direction. In addition, the first squeeze roll 13 is also rotatably supported with respect to the frame via the pressing mechanism and is circumscribed in a state of being pressed against the sizing roll 11, like the second squeeze roll 15. Therefore, the first squeeze roll 13 is also adapted to rotate as the sizing roll 11 is rotationally driven.

[0021] Note that the sizing tank 3 is a housing with an open upper surface and is formed by a bottom plate 4, front and rear end walls 5 and 6, and left and right side walls (not shown). In addition, the sizing tank 3 is provided such that the front end wall 5 is located slightly in front of a circumscribed position of the sizing roll 11 and the second squeeze roll 15 in a front-rear direction of the warp sizing apparatus 1. Further, the sizing tank 3 has such a size in the front-rear direction that the rear end wall 6 is located behind the circumscribed position of the sizing roll 11 and the first squeeze roll 13. A supply unit 40 for supplying the sizing liquid S into the sizing tank 3 is provided in the sizing tank 3.

[0022] Further, in the warp sizing apparatus 1, the first squeeze roll 13 is circumscribed around the sizing roll 11 as described above, and a wedge-shaped region, which is a wedge-shaped gap, is formed between the sizing roll 11 and the first squeeze roll 13 (above the circumscribed position). In addition, the sizing liquid supply device 20 for supplying the sizing liquid S toward the wedge-shaped region is provided above the wedge-shaped region. The sizing liquid supply device 20 includes a sizing liquid pipe 22 extending along the axis line direction of the sizing roll 11 and a nozzle 24 attached to the sizing liquid pipe 22.

[0023] In addition, the warp sizing apparatus 1 is provided with a supply tank 30, which is a supply source of the sizing liquid S, and a pump P connected to the supply tank 30 and delivering the sizing liquid S in the supply tank 30. In addition, the supply unit 40 in the sizing tank 3 and the sizing liquid pipe 22 in the sizing liquid supply device 20 are connected to the pump P via a supply pipe 32. Thereby, the sizing liquid S delivered from the pump P is supplied to the sizing tank 3, the sizing liquid S is stored in the sizing tank 3, and is supplied to the wedge-

shaped region to form a sizing liquid pool 18 in the wedge-shaped region.

[0024] Note that the supply pipe 32 includes a main pipe 33 with one end connected to the pump P, and a first branch pipe 34 and a second branch pipe 35 branched from the main pipe 33. Further, the first branch pipe 34 and the second branch pipe 35 have substantially the same pipe diameters. In addition, the supply pipe 32 is connected to the supply unit 40 in the sizing tank 3 via the first branch pipe 34, and is connected to the sizing liquid pipe 22 in the sizing liquid supply device 20 via the second branch pipe 35.

[0025] In addition, in the warp sizing apparatus 1, the warp sheet T is guided in the form of being wound onto the first squeeze roll 13, passes between the sizing roll 11 and the first squeeze roll 13 circumscribed as described above, and is then wound on the sizing roll 11 as described above. Further, the warp sheet T is impregnated with the sizing liquid S by passing through the sizing liquid pool 18 when passing between the sizing roll 11 and the first squeeze roll 13 in this way. Then, when the warp sheet T impregnated with the sizing liquid S in this way passes between the sizing roll 11 and the first squeeze roll 13, the extra sizing liquid S is squeezed from the warp sheet T.

[0026] Note that the warp sizing apparatus 1 includes a collection box 50 that receives the sizing liquid S overflowing from the sizing tank 3 as the sizing liquid S is supplied as described above. The sizing liquid S overflowing to both sides of the sizing roll 11 and the first squeeze roll 13 as the sizing liquid S is supplied to the sizing liquid pool 18 in the wedge-shaped region is also received by the collection box 50. Then, in the warp sizing apparatus, the sizing liquid S received in the collection box 50 flows to the supply tank 30 and is collected.

[0027] In the warp sizing apparatus 1 as described above, according to the present invention, the warp sizing apparatus 1 includes a flow regulating valve in the first branch pipe 34. In addition, the present embodiment is an example in which a pump capable of adjusting a delivery amount of the sizing liquid S to be delivered to the main pipe 33 is adopted as the pump P connected to the supply tank 30.

[0028] Specifically, the warp sizing apparatus 1 includes a flow adjustment valve 36 as the flow regulating valve in the first branch pipe 34. Note that the flow adjustment valve 36 is a flow regulating valve capable of electrically adjusting (throttling) a flow rate. The flow adjustment valve 36 is connected to a control device (not shown) provided in the warp sizing apparatus 1, and the flow rate (an opening degree of the valve) is adjusted by the control device. However, the flow regulating valve in the warp sizing apparatus according to the present invention may be another valve capable of adjusting the flow rate, such as a throttle valve configured to manually adjust the flow rate.

[0029] The pump P includes a motor M that is a dedicated motor serving as a drive source and whose rota-

tional speed can be changed by inverter control. Thereby, the pump P can change (adjust) the delivery amount of the sizing liquid S to be delivered by changing (adjusting) the rotational speed of the motor M. The warp sizing apparatus 1 further includes an inverter INV for controlling the rotational speed of the motor M. Further, in the warp sizing apparatus 1, the inverter INV is also connected to the control device, and an output frequency and the like of the inverter INV are controlled by the control device.

[0030] Further, in the warp sizing apparatus 1 according to the present embodiment configured in this way, the motor M of the pump P is driven to deliver a preset amount (an amount per unit time, a set amount) of the sizing liquid S. Thereby, the set amount of the sizing liquid S is delivered from the pump P to the main pipe 33 provided in the supply pipe 32. Note that the set amount is appropriately set in the control device in consideration of an operation condition, an environmental condition, and the like corresponding to a type of the warp to be sized.

[0031] Then, the sizing liquid S delivered to the main pipe 33 is divided and flows to the first branch pipe 34 (a sizing tank 3 side) and the second branch pipe 35 (a sizing liquid supply device 20 side). However, since the first branch pipe 34 is provided with the flow adjustment valve 36, and the flow rate of the sizing liquid S is in a state of being reduced by the flow adjustment valve 36, a flow rate of the sizing liquid S flowing toward the second branch pipe 35 is relatively higher than the flow rate of the sizing liquid S flowing toward the first branch pipe 34.

[0032] Therefore, according to the warp sizing apparatus 1, since a sufficient amount of the sizing liquid S flows to the second branch pipe 35 for supplying the sizing liquid S to the sizing liquid supply device 20 provided at a high position, there is no need to adopt a large-capacity pump to supply an appropriate amount of the sizing liquid S to the sizing liquid supply device 20 side, and a device cost and a running cost can be reduced.

[0033] Note that in the warp sizing apparatus, when there is a concern that an amount of the sizing liquid S stored in the sizing tank 3 is insufficient for a reason that a consumption amount of the sizing liquid S increases with a change in the operation condition, it is necessary to increase the amount of the sizing liquid S supplied to the sizing tank 3 side as a countermeasure. In this case, when the opening degree of the flow adjustment valve 36 is simply increased (a throttle amount is decreased), an amount of the sizing liquid S supplied to the sizing liquid supply device 20 side decreases.

[0034] In contrast, according to the warp sizing apparatus 1 of the present embodiment, since the pump P can adjust the delivery amount of the sizing liquid S, it is possible to increase the flow rate of the sizing liquid S to the sizing tank 3 side without decreasing the flow rate of the sizing liquid S to the sizing liquid supply device 20 side as much as possible by changing the delivery amount of the sizing liquid S by the pump P due to the change in the operation condition. Note that a change in the delivery amount is implemented by changing the set

amount set in the control device. Further, the change in the set amount may be implemented by, for example, setting "a current setting amount + n%".

[0035] In the above, an embodiment (hereinafter, referred to as "the example") of the warp sizing apparatus to which the present invention is applied has been described. However, the present invention is not limited to the configuration described in the example, and can also be implemented by other embodiments (modified embodiments) as described below.

[0036] (1) As for the pump, the pump P according to the example includes the dedicated motor M as the drive source. However, in the present invention, the pump is not limited to the configuration of being driven by the motor in this way, and may be, for example, a pump including another drive unit such as an air-driven pump driven by compressed air.

[0037] Further, the pump P according to the example can adjust the delivery amount of the sizing liquid S. However, the pump according to the present invention may not be able to adjust the delivery amount of the sizing liquid S. That is, for example, in a warp sizing apparatus used in a situation where there is no need to change the operation condition, there is a case where there is no need to adjust the delivery amount of the sizing liquid S by the pump. Therefore, in this case, the pump may not be able to adjust the delivery amount of the sizing liquid S.

[0038] (2) As for the warp sizing apparatus that is the preamble, the warp sizing apparatus 1 according to the example is configured in such a form that the sizing roll 11 is immersed in the sizing liquid S in the sizing tank 3, and two rolls including the first and second squeeze rolls 13 and 15 are circumscribed around the sizing roll 11 to sandwich the path of the warp sheet T therebetween. However, the warp sizing apparatus to which the present invention is applied is not limited to such a configuration.

[0039] For example, the warp sizing apparatus may also be configured such that the second squeeze roll is also immersed in the sizing liquid S in the sizing tank, in addition to the sizing roll. However, in this case, the sizing tank is dimensioned to include the sizing roll and the second squeeze roll in the front-rear direction. In addition, the warp sizing apparatus may also be configured such that only the second squeeze roll is immersed in the sizing liquid S in the sizing tank.

[0040] The present invention is not limited to the above embodiment, and can be variously changed without departing from the gist of the present invention.

REFERENCE SIGNS LIST

[0041]

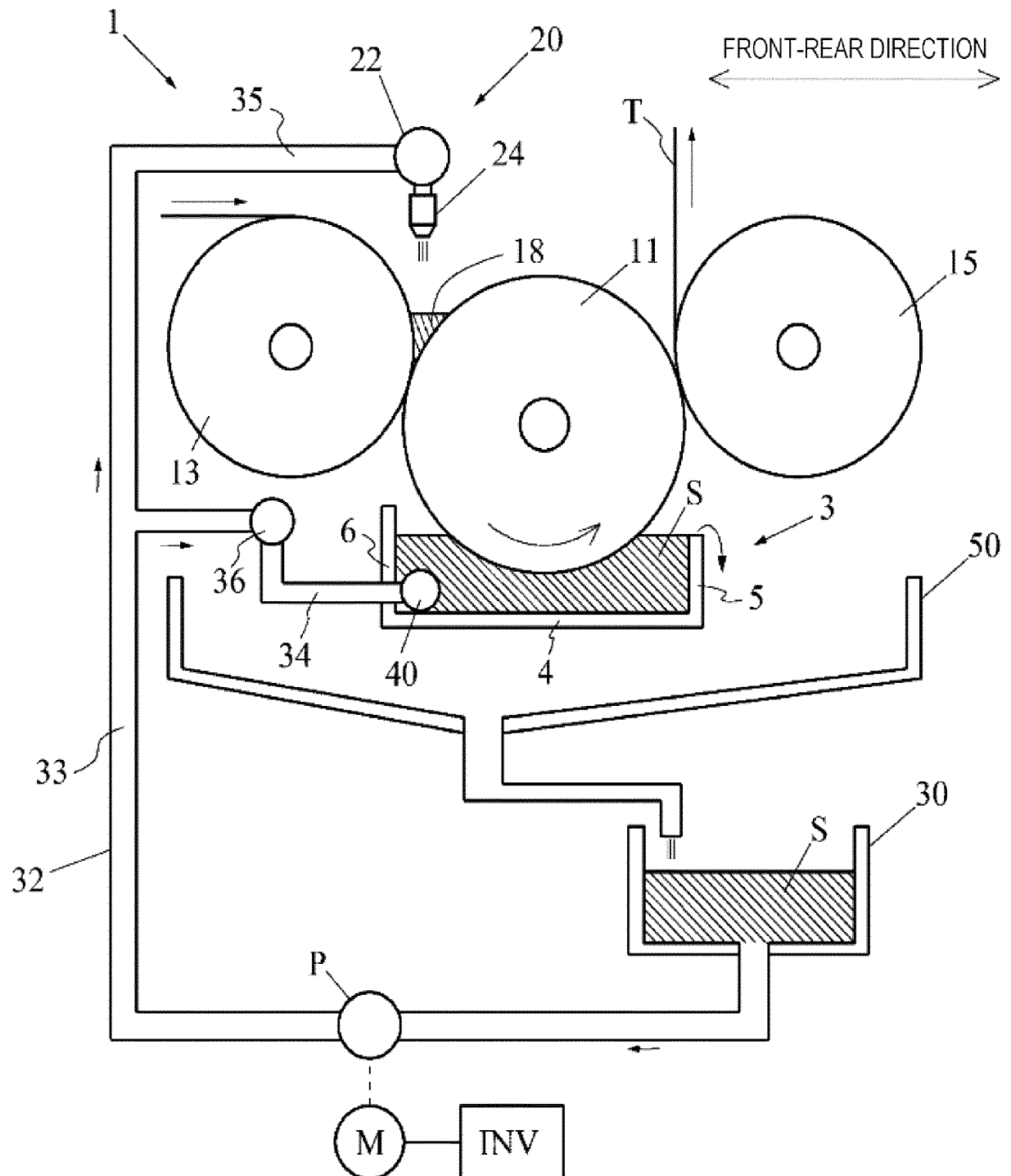
- 1: warp sizing apparatus
- 3: sizing tank
- 4: bottom plate
- 5: front end wall
- 6: rear end wall

11: sizing roll	
13: first squeeze roll	
15: second squeeze roll	
18: sizing liquid pool	
20: sizing liquid supply device	5
22: sizing liquid pipe	
24: nozzle	
30: supply tank	
32: supply pipe	
33: main pipe	10
34: first branch pipe	
35: second branch pipe	
36: flow adjustment valve	
40: supply unit	
50: collection box	15
M: motor	
P: pump	
INV: inverter	
S: sizing liquid	
T: warp sheet	20

Claims

1. A warp sizing apparatus (1) comprising: 25
 - a sizing tank (3) in which a sizing liquid (S) is stored;
 - a sizing roll (11) on which a warp sheet (T) is wound; 30
 - a squeeze roll (13) circumscribed around the sizing roll (11) to sandwich a path of the warp sheet (T);
 - a sizing liquid supply device (20) configured to supply the sizing liquid (S) to a circumscribed position of the sizing roll (11) and the squeeze roll (13); and 35
 - a supply pipe (32) in which the sizing liquid (S) delivered from a pump (P) is supplied to the sizing tank (3) and the sizing liquid supply device (20), the supply pipe (32) including a main pipe (33) with one end connected to the pump (P), and a first branch pipe (34) and a second branch pipe (35) branched from the main pipe (33), the first branch pipe (34) being connected to the sizing tank (3), and the second branch pipe (35) being connected to the sizing liquid supply device (20), 40
 - wherein the first branch pipe (34) is provided with a flow regulating valve (36). 45 50
2. The warp sizing apparatus (1) according to claim 1, wherein 55
 - the pump (P) is a pump capable of adjusting a delivery amount of the sizing liquid (S).

FIGURE





EUROPEAN SEARCH REPORT

Application Number

EP 23 21 3089

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EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	CH 421 878 A (CILANDER AG [CH]) 15 October 1966 (1966-10-15)	1	INV. D06B1/14
A	* page 1, lines 1-11; page 2, line 22 - page 3, line 58; claims; figures *	2	
A,D	----- JP 2003 096657 A (TSUDAKOMA IND CO LTD) 3 April 2003 (2003-04-03) * paragraphs [0001] - [0004], [0009] - [0013], [0020] - [0025]; claims; figures *	1,2	
A	----- EP 1 302 583 A2 (TSUDAKOMA IND CO LTD [JP]) 16 April 2003 (2003-04-16) * paragraphs [0001], [0002], [0011] - [0015]; claims; figures *	1,2	

The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			D06B
Place of search		Date of completion of the search	Examiner
Munich		16 April 2024	Clivio, Eugenio
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

EP 23 21 3089

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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16-04-2024

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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