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

(11) **EP 4 249 659 A1**

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
27.09.2023 Bulletin 2023/39

(21) Application number: **23159432.6**

(22) Date of filing: **01.03.2023**

(51) International Patent Classification (IPC):
D06B 1/14 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
D06B 1/145; D06B 1/148

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

(30) Priority: **23.03.2022 JP 2022047258**

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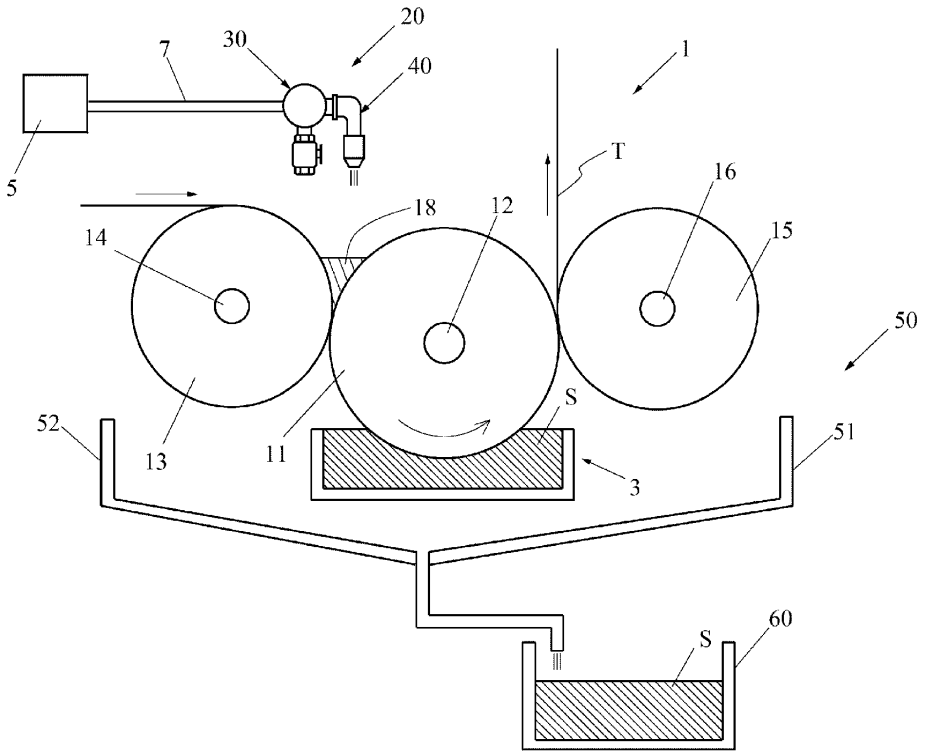
(54) WARP SIZING APPARATUS

(57) A warp sizing apparatus includes a first roll on which a warp sheet is to be wound, a second roll positioned around the first roll such that a path of the warp sheet is sandwiched between the first and the second rolls, and a sizing liquid supply device configured to supply a sizing liquid into the nip between the first and the second rolls. The sizing liquid supply device includes a sizing liquid supply pipe having a pipe part extending along an axis direction of the first roll. The pipe part has supply holes that penetrate through a peripheral wall of the pipe part and are formed at intervals in the axis direction. A lowest point in each of the supply holes, which penetrates through the peripheral wall to an inner peripheral surface of the pipe part, is above a lowest point in the inner peripheral surface.

FIG. 1



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Description

TECHNICAL FIELD

[0001] The present invention relates to a warp sizing apparatus including a first roll on which a warp sheet is to be wound, a second roll circumscribed around the first roll such that a path of the warp sheet is sandwiched between the first and the second rolls, and a size liquid supply device configured to supply a size liquid to a circumscribed position between the first and the second rolls, in which the size liquid supply device includes a size liquid supply pipe whose main body is a pipe part extending along an axis direction of the first roll, and the pipe part has a plurality of supply holes that penetrate through a peripheral wall of the pipe part and are formed at intervals in the axis direction.

BACKGROUND

[0002] For example, JP2013-2029A discloses a warp sizing apparatus for sizing a warp sheet. This warp sizing apparatus includes a drive roll (first roll) on which a warp sheet is wound, a first support roll (second roll) circumscribed around the first roll such that a path of the warp sheet is sandwiched between the first and the second rolls, and a size liquid supply device configured to supply a size liquid to a circumscribed position between the first and the second rolls from above. In this warp sizing apparatus, the size liquid is supplied from the size liquid supply device to the circumscribed position, and the warp sheet passes between the first and the second rolls, thereby the warp sheet sized while the extra size liquid is squeezed from the warp sheet.

[0003] CN111254609A discloses a size liquid supply device configured similarly to that warp sizing apparatus in terms of arrangement of the rolls. In addition, CN111254609A specifically discloses the size liquid supply device configured to supply a size liquid to the circumscribed position from above. This size liquid supply device has a size liquid supply pipe extending along an axis direction (width direction of this warp sizing apparatus) of the sizing roll (first roll). Both ends of the size liquid supply pipe are connected to a supply source of the size liquid, and the size liquid supply pipe has a plurality of supply holes that penetrate through a peripheral wall of the size liquid supply pipe and are formed at intervals in the axis direction. In this warp sizing apparatus, the size liquid is supplied from the supply source to the size liquid supply pipe and flows out from the supply holes to the circumscribed position.

[0004] In this warp sizing apparatus, each of the supply holes is formed such that it surrounds a lowest point on the peripheral wall of the size liquid supply pipe. That is, in the size liquid supply pipe, each of the supply holes is formed such that the direction in which it penetrates through the peripheral wall coincides with that in which the size liquid flows down from it. Therefore, the size liquid supplied to the size liquid supply pipe flows down when it reaches each of the supply holes.

[0005] Since both ends of the size liquid supply pipe are connected to the supply source as described above, the size liquid supplied from the supply source flows toward the supply hole farthest from both ends while some of the size liquid flows down from the supply holes closer to both ends sequentially. As a result, the farther one of the supply holes is from both ends, the less the size liquid reaches it and flows down from it to the circumscribed position. If the circumscribed position far from both ends of the size liquid supply pipe is supplied with a small amount of the size liquid and is short of the size liquid, part of the warp sheet passing through the circumscribed position far from both ends may be insufficiently sized.

[0006] Therefore, an object of the present invention is to provide a warp sizing apparatus configured to size a warp sheet in whole reliably by equalizing the volume of a size liquid flowing out of each supply hole.

SUMMARY

[0007] The present invention presupposes the above-described warp sizing apparatus. The pipe part of the size liquid supply device is formed such that a lowest point in each of the supply holes, which penetrates through the peripheral wall to an inner peripheral surface of the pipe part, is above a lowest point in the inner peripheral surface.

[0008] In addition, the size liquid supply pipe may have a discharge structure configured to discharge the size liquid from the pipe part, and the discharge structure may have a discharge hole that surrounds the lowest point in the inner peripheral surface and penetrates through the peripheral wall and a switching part configured to switch the discharge hole between an open state and a closed state. Further, the discharge structure may be configured to discharge the size liquid at a position outside the first roll in the axis direction.

[0009] In the warp sizing apparatus according to the present invention, the size liquid supply pipe in the size liquid supply device is configured such that the lowest point in each of the supply holes is above the lowest point in the inner peripheral surface. As a result, since the size liquid supplied from the supply source to the pipe part is retained in the pipe part (until the liquid level reaches the lowest point in each of the supply holes), it does not flow out even when it reaches each of the supply holes in the axis direction. The size liquid flows down from each of the supply holes when the liquid level exceeds the lowest point in each of the supply holes. Therefore, the size liquid flows down substantially simultaneously from each of the supply holes, and the outflow of the size liquid from each of the supply holes is equalized. Since the size liquid is supplied to the circumscribed position substantially uniformly in the axis direction, the warp sheet in whole can be sufficiently sized.

[0010] In addition, if the size liquid supply pipe having

the discharge structure that includes the discharge hole surrounding the lowest point in the inner peripheral surface of the pipe part and the switching part configured to switch the discharge hole between the open and the closed states, it becomes possible to discharge the size liquid in the pipe part outside easily after the warp sizing apparatus is stopped. Specifically, since the size liquid supply pipe stores the size liquid in the pipe part, it is preferable that the size liquid in the pipe part be discharged outside to prevent the size liquid from being solidified if the warp sizing apparatus is stopped (particularly, over a long period of time). The size liquid supply pipe 30, which has the discharge structure 35 including the discharge hole 36 and the switching part 38 as described above, enables easy discharge of the size liquid S from the pipe unit 31 when the switching part 38 is switched. Further, if the discharge structure is configured to discharge the size liquid at a position outside the sizing roll in the width direction, it becomes possible to collect the size liquid discharged from the pipe part more easily.

BRIEF DESCRIPTION OF DRAWINGS

[0011] Exemplary embodiments of the present disclosure will be described in detail based on the following figures, wherein:

FIG. 1 is a side view of a warp sizing apparatus according to an embodiment of the present invention;
FIG. 2 is a front view of the warp sizing apparatus;
FIG. 3 is a cross-sectional view of a size liquid supply pipe taken along a line A-A shown in FIG. 2 according to an embodiment of the present invention; and
FIG. 4 is a cross-sectional view of the size liquid supply pipe taken along a line B-B shown in FIG. 2.

DESCRIPTION OF EMBODIMENTS

[0012] In the following, a warp sizing apparatus according to an embodiment of the present invention will be described with reference to FIGS. 1 to 4.

[0013] A warp sizing apparatus 1 includes a sizing tank 3 in which a size liquid S is stored, a sizing roll 11 on which a warp sheet T is to be wound and that is immersed in the size liquid S, and a first squeeze roll 13 and a second squeeze roll 15 that are circumscribed around the sizing roll 11. The warp sizing apparatus 1 further includes a size liquid supply device 20 configured to supply the size liquid S from above to a circumscribed position between the sizing roll 11 and the first squeeze roll 13. Note that, in the present embodiment, the sizing roll 11 corresponds to the first roll, and the first squeeze roll 13 corresponds to the second roll.

[0014] The sizing roll 11 is a roll on which the warp sheet T is to be wound and is rotatably supported on a frame (not shown) of the warp sizing apparatus 1 by support shafts 12 attached to both ends of the sizing roll 11. Lower part of the sizing roll 11 is immersed in the size liquid S stored in the sizing tank 3.

[0015] Note that, the warp sizing apparatus 1 includes a drive mechanism (not shown) configured to rotationally drive the sizing roll 11. Therefore, the sizing roll 11 is rotationally driven actively to advance the warp sheet T. The warp sheet T is immersed in and is impregnated with the size liquid S with the warp sheet T being wound on and being guided by the sizing roll 11.

[0016] The second squeeze roll 15 is a roll configured to squeeze the size liquid S from the warp sheet T impregnated therewith and is installed in front of the sizing roll 11. In addition, the second squeeze roll 15 is rotatably supported on the frame by support shafts 16 attached to both ends of the second squeeze roll 15 such that an axis direction of the second squeeze roll 15 coincides with that of the sizing roll 11 (width direction of the warp sizing apparatus 1). Note that, the second squeeze roll 15 is supported on the frame by the intermediacy of a pressing mechanism (not shown) and is pressed against and is circumscribed around the sizing roll 11. Therefore, the second squeeze roll 15 passively rotate as the sizing roll 11 actively rotates.

[0017] The warp sheet T wound on the sizing roll 11 passes between the sizing roll 11 and the second squeeze roll 15 and is then pulled out. When passing between the sizing roll 11 and the second squeeze roll 15, the size liquid S extra is squeezed from the warp sheet T impregnated with the size liquid S.

[0018] The first squeeze roll 13 is installed behind the sizing roll 11. The first squeeze roll 13 is rotatably supported on the frame by support shafts 14 attached to both ends of the first squeeze roll 13 such that an axis direction of first squeeze roll 13 coincides with the width direction. The first squeeze roll 13 is rotatably supported on the frame by the intermediacy of the pressing mechanism and is pressed against and is circumscribed around the sizing roll 11. Therefore, the first squeeze roll 13 is passively rotate as the sizing roll 11 actively rotates. Note that, since the first squeeze roll 13 is circumscribed around the sizing roll 11 as described above, a wedge-shaped region, or a wedge-shaped gap, is formed between the sizing roll 11 and the first squeeze roll 13 (above the circumscribed position).

[0019] Further, the size liquid supply device 20 configured to supply the size liquid S to the wedge-shaped gap is installed above the wedge-shaped region. The size liquid supply device 20 includes a size liquid supply pipe 30 that extends along the axis direction of the sizing roll 11 and has a plurality of supply holes 32 formed at intervals in the axis direction, and nozzle units 40, each of which is provided for corresponding one of the supply holes 32 and is attached to the size liquid supply pipe 30.

[0020] Specifically, the size liquid supply pipe 30 has, as a main body, a pipe part 31 having a pipe body and closures (not shown) configured to close both ends of the pipe body. The pipe part 31 is longer than the width of the sizing roll 11. The size liquid supply pipe 30 is installed above the wedge-shaped region such that an

axis direction of the pipe part 31 is parallel to the width direction. That is, the pipe part 31 extends along the axis direction of the sizing roll 11. Note that, as for a front-rear direction of the warp sizing apparatus 1, the size liquid supply pipe 30 is installed in a position slightly closer to the first squeeze roll 13 than to the circumscribed position as seen from the width direction. In addition, as for the width direction, the size liquid supply pipe 30 is installed such that the center of the pipe part 31 substantially coincides with that of the sizing roll 11. Therefore, the size liquid supply pipe 30 extends over the sizing roll 11 in the width direction.

[0021] Note that, the size liquid supply pipe 30 is attached by brackets or the like (not shown). A supply pipe 7 is connected to one end of the pipe part 31 of the size liquid supply pipe 30, and the size liquid S is supplied from a supply source 5 via the supply pipe 7.

[0022] In addition, the size liquid supply pipe 30 has a plurality of supply holes 32 that penetrate through a peripheral wall to an outer peripheral surface 31a of the pipe part 31 and are formed at intervals in the width direction. Further, the size liquid supply pipe 30 has cylindrical attachment portions 33, each of which protrudes radially from the outer peripheral surface 31a around corresponding one of the supply holes 32. The inside of the pipe part 31 and that of the attachment portions 33 are connected by the supply holes 32.

[0023] Each of the nozzle unit 40 is attached to corresponding one of the attachment portions 33 of the size liquid supply pipe 30. Each of the nozzle units 40 includes an elbow 41 attached to the attachment portion 33 and a nozzle 42 attached to the elbow 41. In the warp sizing apparatus 1, the size liquid S is supplied from the supply source 5 to the pipe part 31 of the size liquid supply pipe 30 and is jetted from a tip of the nozzles 42 to the wedge-shaped region. Therefore, a size liquid pool 18 in which the size liquid S is retained is formed in the wedge-shaped region.

[0024] The warp sheet T is wound on and is guided by the first squeeze roll 13, passes between the sizing roll 11 and the first squeeze roll 13, and is then wound onto the sizing roll 11. Then, the warp sheet T passes through the size liquid pool 18 formed between the first squeeze roll 13 and the sizing roll 11, and the size liquid S is impregnated in the warp sheet T. When the warp sheet T that has been impregnated with the size liquid S passes between the sizing roll 11 and the first squeeze roll 13, the size liquid S extra is squeezed from the warp sheet T.

[0025] The warp sizing apparatus 1 further includes a collection box 50 configured to receive the size liquid S overflowing the sizing tank 3 as the size liquid S is supplied to the sizing tank 3. The collection box 50 is installed below the sizing tank 3 and has a box shape whose upper part is opened. In the collection box 50, the length between a front wall 51 and a rear wall 52 is longer than that of the sizing tank 3 in the front-rear direction, and the length between a left wall 53 and a right wall 54 is longer than that of the sizing tank 3 in the width direction. The size liquid S overflowing the sizing tank 3 toward the sizing roll 11 and the first squeeze roll 13 as the size liquid S is supplied to the size liquid pool 18 in the wedge-shaped region is received by the collection box 50. Note that, the size liquid S received by the collection box 50 flows into and is collected in a collection tank 60.

[0026] In the warp sizing apparatus 1 according to the present invention, the size liquid supply pipe is configured such that the lowest point in each of the supply holes, which penetrate through the peripheral wall to the inner peripheral surface, is above the lowest point in the inner peripheral surface. In the present embodiment, each of the supply holes 32 is formed on a front side of the pipe part 31 (faces in a direction from the first squeeze roll 13 to the sizing roll 11).

[0027] Specifically, each of the supply holes 32 is formed such that its axis is substantially parallel to a horizontal direction and passes through the center of the pipe part 31 in an upper-lower direction. In addition, the inner diameter of each of the supply holes 32 is smaller than that of the pipe part 31.

[0028] Therefore, in the size liquid supply pipe 30, each of the supply holes 32 is above a lower end of the inner peripheral surface 31b of the peripheral wall of the pipe part 31. That is, as shown in FIG. 3, the lowest point (first position P1) in each of the supply holes 32, which penetrate through the peripheral wall to the inner peripheral surface 31b of the pipe part 31, is above the lowest point (second position P2) in the inner peripheral surface 31b.

[0029] According to the warp sizing apparatus 1 of the present embodiment, the size liquid S supplied from the supply source 5 to the pipe part 31 of the size liquid supply pipe 30 is retained in the pipe part 31 until the liquid level of the size liquid S reaches the first position P1 and flows through the attachment portions 33 via the supply holes 32 to the nozzles 42 at the tip of the nozzle units 40 when the liquid level exceeds the first position P1. Since the axis of the pipe part 31 is parallel to the width direction (horizontal direction) as described above, the liquid level in the pipe part 31, which fluctuates as the size liquid S is supplied to the pipe part 31, remains substantially uniform in the width direction. Therefore, the size liquid S flows down substantially simultaneously from each of the supply holes 32, and the outflow of the size liquid S from each of the supply holes 32 is equalized. Since the size liquid S is supplied to the circumscribed position substantially uniformly in the axis direction, the warp sheet T in whole can be sufficiently sized.

[0030] In addition, the size liquid supply pipe 30 of the warp sizing apparatus 1 according to the present embodiment has a discharge structure 35 configured to discharge the size liquid S from the pipe part 31 (see FIG. 4). The discharge structure 35 includes a discharge hole 36 penetrating through the peripheral wall of the pipe part 31, a discharge part 37 protruding radially from a periphery of the discharge hole 36, and a switching part 38 configured to switch the discharge hole 36 between an open state, in which the discharge hole 36 is connected

to outside, and a closed state, in which the discharge hole 36 is disconnected from outside.

[0031] As for the discharge structure 35, the discharge hole 36 is formed at a lower side of the pipe part 31, and its axis is parallel to the upper-lower direction. Specifically, the axis of the discharge hole 36 passes substantially through the lowest point (second position P2) in the inner peripheral surface 31b of the pipe part 31 as seen from the upper-lower direction. That is, the discharge hole 36 surrounds the lowest point (second position P2) in the inner peripheral surface 31b of the pipe part 31. As for the width direction, the discharge hole 36 is formed in the pipe part 31 between the sizing roll 11 and one of the left and the right walls 53 of the collection box 50.

[0032] The discharge part 37 having a cylindrical shape is formed in the size liquid supply pipe 30 such that it protrudes radially (downward) from the periphery of the discharge hole 36 of the outer peripheral surface 31a of the pipe part 31. The switching part 38 is attached to the tip of the discharge part 37. Note that, the switching part 38 is a ball valve in the present embodiment. Its inlet communicates with the discharge part 37 and its outlet 38a is directly below the discharge part 37. Therefore, the outlet 38a of the switching part 38 is also between one of the left and the right walls 53 of the collection box 50 and the sizing roll 11 in the width direction. That is, the outlet 38a does not overlap with the sizing roll 11 in the width direction.

[0033] Since the size liquid supply pipe 30 has the discharge structure 35, the discharge hole 36 can be switched between the open and the closed state by switching the switching part 38 in order to switch the discharge. Therefore, after the warp sizing apparatus 1 is stopped, the size liquid S in the pipe part 31 can be easily discharged.

[0034] Specifically, if the size liquid supply pipe 30 stores the size liquid S in the pipe part 31, it is preferable that the size liquid S in the pipe part 31 be discharged to prevent the size liquid S from being solidified if the warp sizing apparatus 1 is stopped (particularly, over a long period of time). The size liquid supply pipe 30, which has the discharge structure 35 including the discharge hole 36 and the switching part 38 as described above, enables easy discharge of the size liquid S from the pipe unit 31 when the switching part 38 is switched. In addition, since the discharge structure 35 is configured to discharge the size liquid S at a position outside the sizing roll 11 in the width direction, it is possible to collect the size liquid S discharged from the pipe part 31 more easily.

[0035] In the above, a warp sizing apparatus according to an embodiment (hereinafter, referred to as the "above embodiment") has been described. However, the present invention is not limited thereto, and other embodiments (modified embodiments) to be described in the following can be conceivable.

[0036] (1) As for the size liquid supply pipe, the present invention requires that the lowest point in each of the supply holes is above the lowest point in the inner peripheral surface of the pipe part. In addition, in the above embodiment, each of the supply holes 32 penetrating through the front side of the peripheral wall of the pipe part 31 is formed such that its axis is substantially parallel to the horizontal direction and passes through the center of the pipe part 31 in the upper-lower direction, and the inner diameter of each of the supply holes 32 is smaller than that of the pipe part 31. Therefore, the size liquid supply pipe 30 of the above embodiment satisfies the requirements. However, the supply hole is not limited to the above embodiment as long as the size liquid supply pipe 30 of the warp sizing apparatus satisfies the requirements.

[0037] For example, in the size liquid supply pipe, each of the supply holes may be formed such that its axis is off the center of the pipe part in the upper-lower direction. In addition, each of the supply holes may be formed such that its axis inclines from the horizontal direction. Further, the supply holes may be formed on a rear side of the pipe part.

[0038] In the present invention, the pipe part of the size liquid supply pipe is not limited to one having a circular cross-sectional shape as in the above embodiment. For example, the pipe part may have an elliptical or polygonal cross-sectional shape.

[0039] (2) As for the size liquid supply device, the size liquid supply device 20 of the above embodiment is configured such that the pipe part 31 of the size liquid supply pipe 30 has the attachment portions 33, each of which radially protrudes from corresponding one of the supply holes 32, the nozzle unit 40 is attached to each of the attachment portions 32, and the size liquid S is supplied from the nozzle units 40. However, in the present invention, the size liquid supply device may be configured to supply the size liquid S directly from the size liquid supply pipe (pipe part) without the nozzle units. In this case, the size liquid supply device (size liquid supply pipe) may have no cylindrical portion protruding radially such as the attachment portion 33 of the above embodiment. In this case, the size liquid is supplied directly from the supply holes formed in the pipe part.

[0040] (3) As for the discharge structure, in the above embodiment, the size liquid supply pipe 30 has the discharge structure 35 that is configured to discharge the size liquid S in the pipe part 31 and includes the discharge hole 36, the discharge part 37, and the switching part 38. In addition, the discharge structure 35 is formed such that the discharge hole 36 is between one of the left and the right walls 53 of the collection box 50 and the sizing roll 11 in the width direction, and the size liquid S is discharged directly below the discharge hole 36. However, even if the size liquid supply pipe has a discharge structure, the discharge structure is not limited to the above embodiment.

[0041] For example, the discharge structure may be configured to discharge the size liquid S between the sizing roll 11 and the other of the left and the right walls 54 of the collection box 50 in the width direction. In ad-

dition, the discharge structure is not limited to one configured to discharge the size liquid S at a position outside the sizing roll 11 in the width direction and may be configured to discharge the size liquid S at a position within the sizing roll 11 in the width direction. Further, in the size liquid supply pipe, a plurality of the discharge structures may be provided in the width direction.

[0042] In the discharge structure, the switching part configured to switch the discharge hole between the open and the closed states is not limited to the ball valve as in the above embodiment and may be a cover detachably attached to the discharge portion. In addition, the discharge structure is not limited to one including the discharge hole 36 penetrating through the peripheral wall of the pipe part 31 as in the above embodiment. For example, the size liquid supply pipe may be configured such that the closures provided at both ends of the pipe body of the pipe part is detachable from the pipe body. Note that, in the warp sizing apparatus of the present invention, it is not essential that the size liquid supply pipe has a structure configured to discharge the size liquid in the pipe part.

[0043] (4) As for the warp sizing apparatus presupposed, in the above embodiment, the warp sizing apparatus 1 is configured such that the sizing roll 11 is immersed in the size liquid S in the sizing tank 3 and the first squeeze roll 13 and the second squeeze roll 15 are circumscribed around the sizing roll 11 to sandwich the path of the warp sheet T between the sizing roll 11 and the first squeeze 13 and between the sizing roll 11 and the second squeeze roll 15. However, the warp sizing apparatus according to the present invention is not limited thereto.

[0044] For example, the warp sizing apparatus may be configured such that the second squeeze roll is immersed in the size liquid S in the sizing tank similarly to the sizing roll. In this case, the sizing tank should be larger to accommodate the sizing roll and the second squeeze roll in the front-rear direction. In addition, the warp sizing apparatus may be configured such that only the second squeeze roll is immersed in the size liquid S stored in the sizing tank.

[0045] The present invention is not limited to the above embodiment, and a variety of modification can be made within the gist of the present invention.

Claims

1. A warp sizing apparatus (1) comprising:

a first roll (11) on which a warp sheet (T) is to be wound;
a second roll (13) circumscribed around the first roll (11) such that a path of the warp sheet (T) is sandwiched between the first roll (11) and the second roll (13); and
a size liquid supply device (20) configured to supply a size liquid (S) to a circumscribed position between the first roll (11) and the second roll (13), wherein
the size liquid supply device (20) includes a size liquid supply pipe (30) whose main body is a pipe part (31) extending along an axis direction of the first roll (11),
the pipe part (31) has a plurality of supply holes (32) that penetrate through a peripheral wall of the pipe part (31) and are formed at intervals in the axis direction, and
a lowest point (P1) in each of the supply holes (32), which penetrates through the peripheral wall to an inner peripheral surface (31b) of the pipe part (31), is above a lowest point (P2) in the inner peripheral surface (31b).

2. The warp sizing apparatus according to claim 1, wherein

the size liquid supply pipe (30) has a discharge structure (35) configured to discharge the size liquid (S) from the pipe part (31), and
the discharge structure (35) has:

a discharge hole (36) that surrounds the lowest point (P2) in the inner peripheral surface (31b) and penetrates through the peripheral wall; and
a switching part (38) configured to switch the discharge hole (36) between an open state and a closed state.

3. The warp sizing apparatus according to claim 2, wherein
the discharge structure (35) is configured to discharge the size liquid (S) at a position outside the first roll (11) in the axis direction.

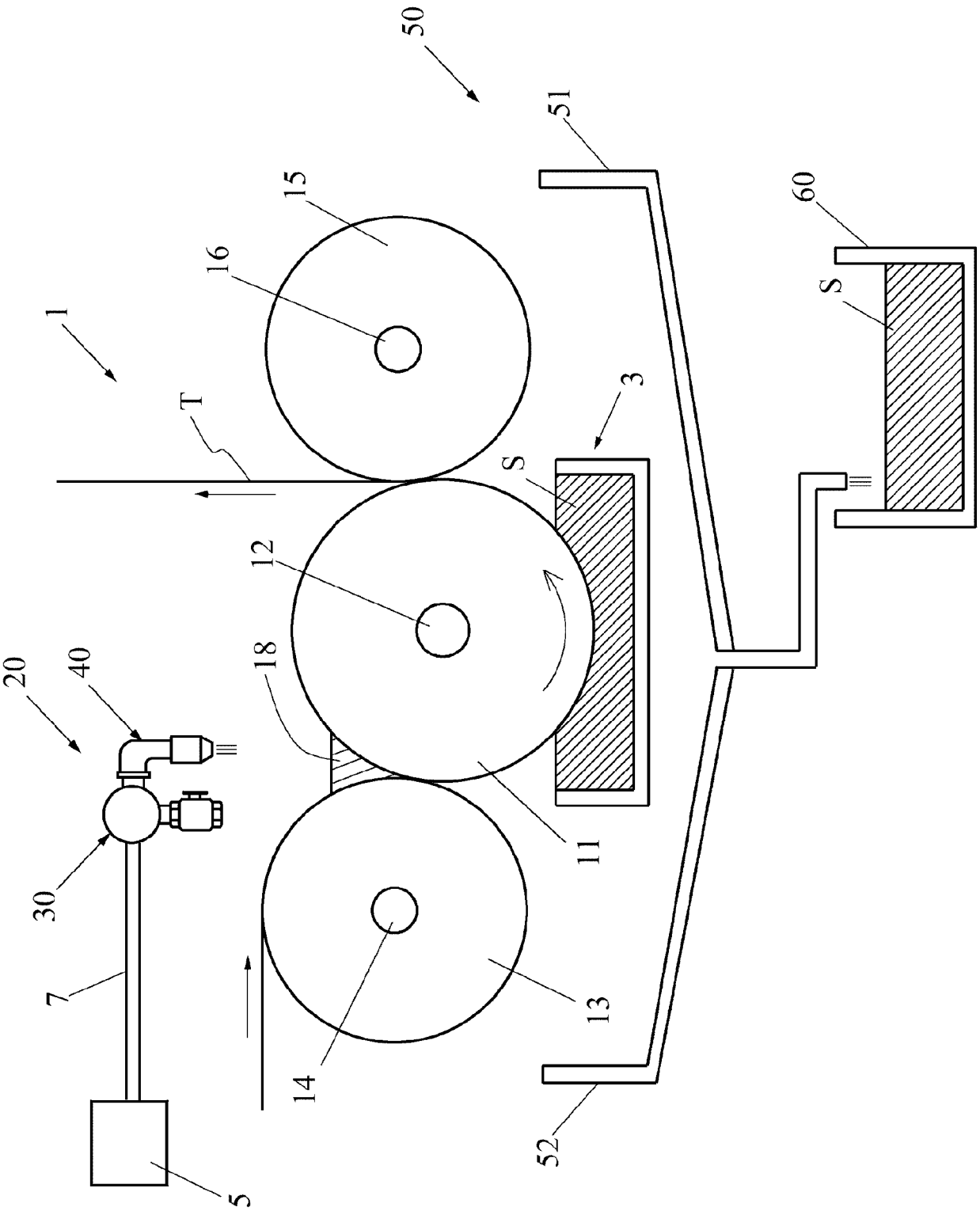
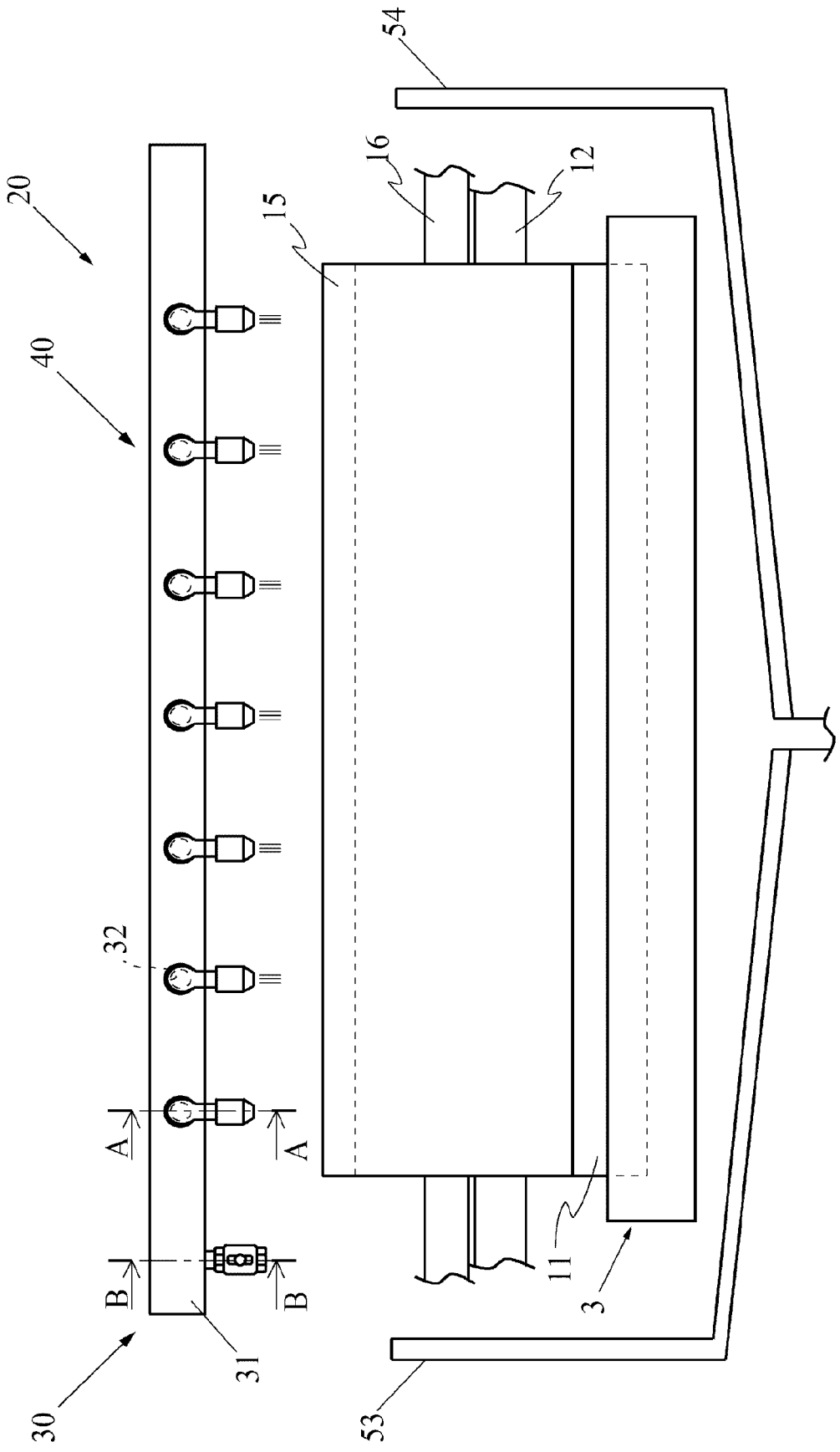


FIG. 1

FIG. 2



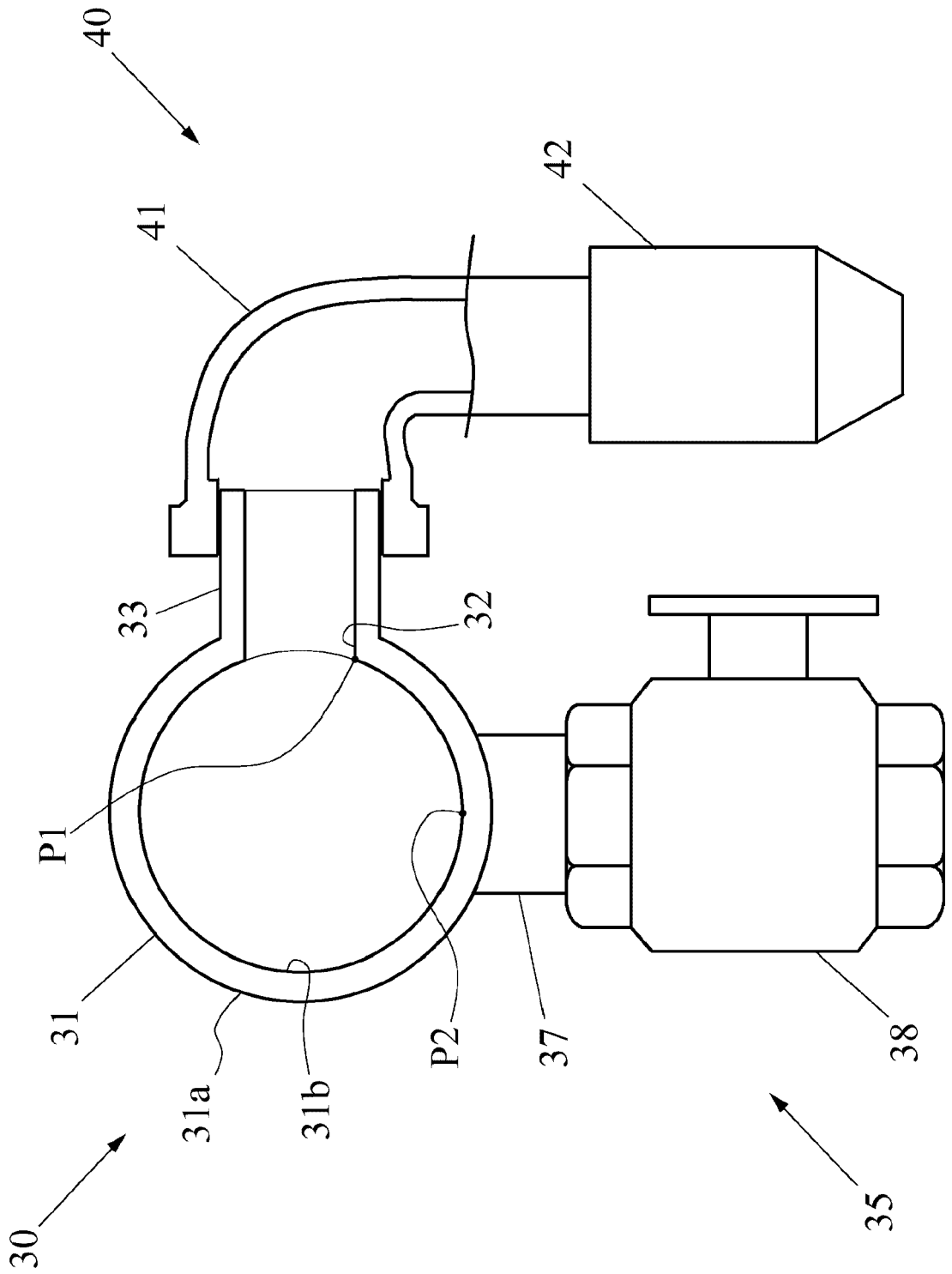


FIG. 3

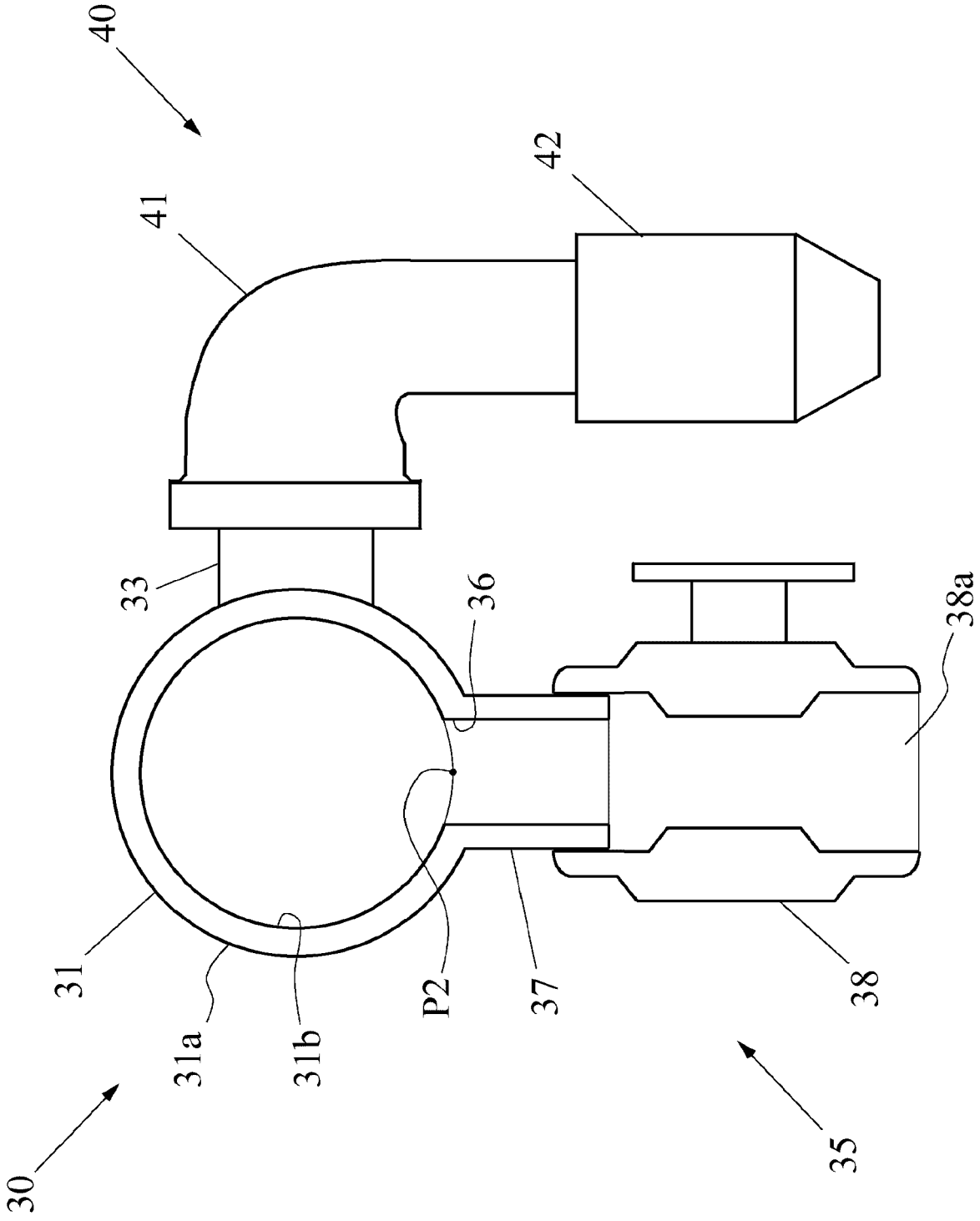


FIG. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 23 15 9432

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	IT UA20 164 038 A1 (T M T MANENTI S R L) 1 December 2017 (2017-12-01)	1	INV. D06B1/14
A	* page 1, line 9 - page 2, line 20; page 5, line 1 - page 12, line 6; claims; figures *	2,3	
Y	US 4 907 426 A (WOOD ROBERT F [US] ET AL) 13 March 1990 (1990-03-13)	1	
A	* column 7, line 31 - line 53; claims; figures *	2,3	
A	EP 3 792 286 A1 (BENNINGER AG MASCHF [CH]) 17 March 2021 (2021-03-17) * paragraphs [0001], [0002], [0066] - [0070]; claims; figure 1 *	1-3	
A	CN 112 695 473 A (SHANDONG BINZHOU LOFTEX IND CO LTD) 23 April 2021 (2021-04-23) * paragraphs [0020] - [0025]; claims; figures *	1-3	
A	CN 108 589 113 A (HUZHOU YONGBANG TEXTILE WEAVING CO LTD) 28 September 2018 (2018-09-28) * paragraphs [0009] - [0017]; claims; figures *	1-3	TECHNICAL FIELDS SEARCHED (IPC) D06B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	13 July 2023	Clivio, Eugenio

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 23 15 9432

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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13-07-2023

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
IT UA20164038 A1	01-12-2017		
US 4907426 A	13-03-1990	CA 1310173 C	17-11-1992
		US 4907426 A	13-03-1990
EP 3792286 A1	17-03-2021	EP 3792286 A1	17-03-2021
		EP 4031584 A1	27-07-2022
		US 2022332851 A1	20-10-2022
		WO 2021052805 A1	25-03-2021
CN 112695473 A	23-04-2021	NONE	
CN 108589113 A	28-09-2018	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2013002029 A **[0002]**
- CN 111254609 A **[0003]**