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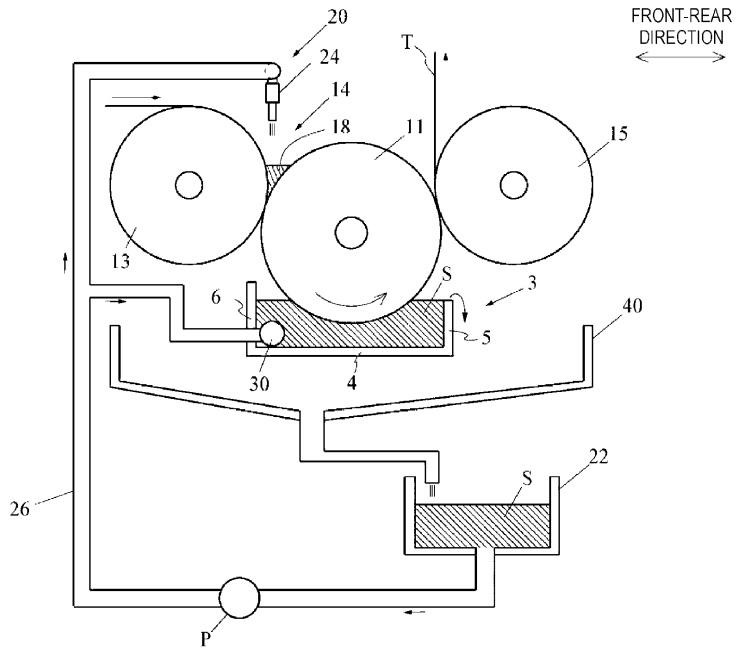
(54) WARP SIZING APPARATUS

(57) The present invention relates to a warp sizing apparatus (1) including a sizing tank (3); a sizing roll (11) having a warp sheet wound thereon and immersed into a sizing liquid (S) in the sizing tank; a first squeeze roll (13) positioned around the sizing roll (11) on an upstream side with respect to an advancing direction of the warp sheet; a second squeeze roll (15) positioned around the sizing roll (11) on a downstream side with respect to the advancing direction; and a sizing liquid supply device (20) configured to supply, from above, the sizing liquid to a predetermined position of the sizing roll (11) and the first squeeze roll (13). The sizing tank (3) is formed to have a dimension in an upstream-downstream direction equal to or smaller than a distance between a center axis of the first squeeze roll (13) and a center axis of the second squeeze roll (15).

FIG.1



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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 having a warp sheet wound thereon and immersed into the sizing liquid in the sizing tank; a first squeeze roll provided on a rear side with respect to the sizing roll so as to be circumscribed around the sizing roll on an upstream side with respect to an advancing direction of the warp sheet; a second squeeze roll provided on a front side with respect to the sizing roll so as to be circumscribed around the sizing roll on a downstream side with respect to the advancing direction; and a sizing liquid supply device configured to supply, from above, the sizing liquid to a circumscribed position of the sizing roll and the first squeeze roll.

BACKGROUND ART

[0002] For example, PTL 1 discloses a warp sizing apparatus as described above. The warp sizing apparatus disclosed in PTL 1 includes a sizing tank in which a sizing liquid is stored and a first roll (sizing roll) having a warp sheet wound thereon and immersed into the sizing liquid in the sizing tank. In addition, second and third rolls circumscribed around the sizing roll are respectively provided on front and rear sides of the sizing roll. Further, the warp sizing apparatus includes a sizing liquid supply device configured to supply, from above, the sizing liquid to a circumscribed position of the second roll on the rear side and the sizing roll.

[0003] In addition, the second and third rolls are provided so as to be pressed against the sizing roll, respectively. Thereby, a warp sheet that has passed through the sizing liquid supplied by the sizing liquid supply device or the sizing liquid in the sizing tank passes between each roll and the sizing roll, so that extra sizing liquid is squeezed from the warp sheet. Therefore, the second and third rolls are so-called squeeze rolls.

[0004] Note that, on a liquid surface of the sizing liquid in the sizing tank, foreign matters such as fluff and cotton fly of the warp, oil adhering to the warp, and air bubbles caused due to rotation of the sizing roll are floating. For this reason, in a general warp sizing apparatus, in order to remove foreign matters floating on the liquid surface, a new sizing liquid is continuously supplied into the sizing tank so that the foreign matters on the liquid surface are caused to overflow to an outside of the tank, together with the old sizing liquid in the sizing tank.

CITATION LIST

PATENT LITERATURE

[0005] PTL 1: JP2003-096657A

[0006] In the meantime, in the warp sizing apparatus of PTL 1, the sizing tank has a dimension in a front-rear direction greater than an existence range of the sizing roll and the two squeeze rolls in the front-rear direction. Therefore, the sizing tank has a large size as a whole and a large amount of the sizing liquid is stored therein. For this reason, in the warp sizing apparatus, a used amount of the sizing liquid is large, so that the cost for sizing increases.

[0007] Further, when the sizing tank is so large, an area of the liquid surface of the stored sizing liquid is also inevitably large. In this case, it takes time for the sizing liquid near the liquid surface on which the foreign matters are floating to be replaced by the supply and overflow of the sizing liquid as described above. In contrast, the foreign matters on the liquid surface are continuously generated during an operation of the warp sizing apparatus. Therefore, in some cases, the foreign matters may increase to such an extent that the foreign matters adversely affect the sizing to the warp sheet.

SUMMARY

[0008] Therefore, an object of the present invention is to provide a warp sizing apparatus capable of reducing a used amount of a sizing liquid to save the cost for sizing and preventing deterioration in state of the sizing liquid in a sizing tank due to an increase in foreign matters on a liquid surface, as much as possible.

[0009] In order to achieve the above object, the present invention has a preamble of the warp sizing apparatus as described above, and is characterized in that the sizing tank is formed to have a dimension in a front-rear direction equal to or smaller than an interval between an axis center of the first squeeze roll and an axis center of the second squeeze roll in the front-rear direction.

[0010] According to the warp sizing apparatus of the present invention, the sizing tank is configured to have a dimension in the front-rear direction equal to or smaller than the interval between the axis centers of the two squeeze rolls in the front-rear direction. That is, the sizing tank is configured to have such a small size that only the sizing roll can be immersed. Thereby, an amount of the sizing liquid that is stored in the sizing tank becomes also small. Therefore, according to the warp sizing apparatus of the present invention, the used amount of the sizing liquid can be suppressed, as compared to the warp sizing apparatus having a large-sized sizing tank as in PTL 1, so that the cost for sizing can be reduced.

[0011] In addition, when the sizing tank is configured to have such a small size, an area of a liquid surface of the stored sizing liquid is also inevitably small. Thereby, a time consumed until the sizing liquid near the liquid surface on which the foreign matters are floating is replaced by the supply and overflow of the sizing liquid as described above becomes shorter, as compared to a case where a size of the sizing tank is large. As a result, it is possible to prevent the increase in foreign matters on the liquid surface as much as possible, and to prevent

a state of the sizing liquid in the sizing tank from being deteriorated as much as possible.

BRIEF DESCRIPTION OF DRAWINGS

[0012]

FIG. 1 is a side view of a warp sizing apparatus according to one embodiment of the present invention.
FIG. 2 is a plan view of FIG. 1.

DESCRIPTION OF EMBODIMENTS

[0013] Hereinafter, one embodiment of a warp sizing apparatus to which the present invention is applied will be described with reference to FIGS. 1 and 2.

[0014] A warp sizing apparatus 1 includes a sizing tank 3 in which a sizing liquid S is stored, a sizing roll 11 having a warp sheet T wound thereon and immersed in the sizing liquid S, and a first squeeze roll 13 and a second squeeze roll 15 circumscribed around the sizing roll 11. The warp sizing apparatus 1 also includes a sizing liquid supply device 20 configured to supply, from above, the sizing liquid S to a circumscribed position of the sizing roll 11 and the first squeeze roll 13. The respective constitutional elements of the warp sizing apparatus 1 are described in detail, as follows.

[0015] The sizing tank 3 has a substantially rectangular shape, as seen from above, and is formed by a bottom plate 4 forming a bottom surface, and front and rear end walls 5 and 6 and left and right sidewalls 7 and 8 erected from four end edges of the bottom plate 4, respectively. Note that, a long side direction of the bottom surface forming a rectangular shape is a width direction of the sizing tank 3 (a direction in which the sidewalls 7 and 8 face each other), and a short side direction is a front-rear direction (a direction in which the end walls 5 and 6 face each other).

[0016] In addition, the rear end wall 6 of the sizing tank 3 is provided with a supply unit 30 connected to a supply source of the sizing liquid S, which will be described later. The sizing liquid S is supplied into the sizing tank 3 via the supply unit 30, so that the sizing liquid S is stored in the tank. Further, the sizing tank 3 of the present embodiment is formed so that a height position of an upper edge of the rear end wall 6 where the supply unit 30 is provided is higher than a height position of an upper edge of the front end wall 5.

[0017] The sizing roll 11 is constituted by a roll portion 11a on which the warp sheet T is wound, and shaft portions 11b and 11b provided at both ends of the roll portion 11a. The sizing roll 11 is rotatably supported on both the shaft portions 11b and 11b by a frame (not shown) of the warp sizing apparatus 1. Note that, the sizing roll 11 is provided so that the roll portion 11a is located within an existence range of the sizing tank 3 as seen from above and an axis line direction thereof coincides with the width direction. In addition, the sizing roll 11 is provided so that a lower end of the roll portion 11a is located lower than an upper edge of the front end wall 5 in a vertical direction. Thereby, the sizing roll 11 is in a state where the lower portion of the roll portion 11a is immersed in the sizing liquid S in a state where the sizing liquid S is stored in the sizing tank 3.

[0018] Note that, the warp sizing apparatus 1 is provided with a drive mechanism (not shown) for rotationally driving the sizing roll 11, and the sizing roll 11 is actively rotationally driven in accordance with a progress of the warp sheet T. The warp sheet T is guided in a form of being wound onto the roll portion 11a of the sizing roll 11, and is immersed in the sizing liquid S and is impregnated with the sizing liquid S in a process of passing through the roll portion 11a.

[0019] Further, the second squeeze roll 15 for squeezing the impregnated sizing liquid S in the sizing tank 3 from the warp sheet T is provided in arrangement of being located on a front side with respect to the sizing roll 11. Like the sizing roll 11, the second squeeze roll 15 is constituted by a roll portion 15a and shaft portions 15b and 15b provided at both ends of the roll portion 15a.

[0020] The second squeeze roll 15 is rotatably supported on the shaft portions 15b and 15b by the frame in a direction in which an axis line direction thereof is made to coincide with the axis line direction of the sizing roll 11. Note that, the second squeeze roll 15 is supported by the frame via a pressing mechanism (not shown), and is provided so that the roll portion 15a is circumscribed in a state of being pressed against the roll portion 11a of the sizing roll 11. Therefore, the second squeeze roll 15 is configured to rotate as the sizing roll 11 is rotationally driven as described above.

[0021] Further, as for arrangement of the second squeeze roll 15 in the vertical direction, in the present embodiment, an axis center thereof is located slightly higher than an axis center of the sizing roll 11. Therefore, the circumscribed position of the second squeeze roll 15 with respect to the sizing roll 11 is located slightly above the shaft portion 11b in the vertical direction, on an outer peripheral surface of the roll portion 11a of the sizing roll 11.

[0022] Further, 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. 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.

[0023] Further, on an upstream side of the sizing roll 11, a supply nozzle 24 for supplying the sizing liquid S so as to impregnate the warp sheet T with the sizing liquid S on the upstream side, and the first squeeze roll 13 for squeezing the sizing liquid S supplied by the supply nozzle 24 are provided.

[0024] These are specifically described. The first squeeze roll 13 is constituted by a roll portion 13a and

shaft portions 13b and 13b provided at both ends of the roll portion 13a, like the second squeeze roll 15. The first squeeze roll 13 is rotatably supported on the shaft portions 13b and 13b by the frame in a direction in which an axis line direction thereof is made to coincide with the axis line direction of the sizing roll 11. Note that, the first squeeze roll 13 is also rotatably supported by the frame via the pressing mechanism, like the second squeeze roll 15. Therefore, the first squeeze roll 13 is also circumscribed in a state of being pressed against the roll portion 11a of the sizing roll 11, and is configured to rotate as the sizing roll 11 is rotationally driven.

[0025] Further, in the present embodiment, the first squeeze roll 13 is provided at a position where a position of an axis center thereof substantially coincides with a position of the axis center of the second squeeze roll 15 in the vertical direction. That is, the first squeeze roll 13 is provided symmetrically with respect to the sizing roll 11 in the front-rear direction. Therefore, the circumscribed position of the first squeeze roll 13 with respect to the sizing roll 11 is substantially the same as the circumscribed position of the second squeeze roll 15 with respect to the sizing roll 11, on the outer peripheral surface of the roll portion 11a of the sizing roll 11.

[0026] Note that, the first squeeze roll 13 is circumscribed around the sizing roll 11 in this way, so that a wedge-shaped gap 14 is formed between the sizing roll 11 and the first squeeze roll 13. The supply nozzle 24 configured to supply the sizing liquid S toward the gap 14 is provided above the gap 14.

[0027] The supply nozzle 24 is provided in plural so as to be arranged at predetermined intervals in the width direction within the existence range of the roll portion 11a in the axis line direction of the sizing roll 11. The sizing liquid S is supplied from above to the gap 14 via each supply nozzle 24, so that a sizing liquid pool 18 in which the sizing liquid S is retained is formed in the gap 14.

[0028] In addition, the warp sheet T is guided in a form of being wound onto the roll portion 13a of 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. By passing through the sizing liquid pool 18 formed between the two rolls, the warp sheet T is in a state of being impregnated with the sizing liquid S. When the warp sheet T impregnated with the sizing liquid S passes between the sizing roll 11 and the first squeeze roll 13, the extra sizing liquid S is squeezed from the warp sheet T.

[0029] Note that, each supply nozzle 24 is a part of the sizing liquid supply device configured to supply, from above, the sizing liquid S to the gap 14 as described above, and the warp sizing apparatus 1 includes such sizing liquid supply device 20. In addition to the supply nozzles 24 described above, the sizing liquid supply device 20 includes a supply tank 22, which is a supply source of the sizing liquid S that is supplied to the supply nozzles 24. In the sizing liquid supply device 20, the supply tank 22 and each supply nozzle 24 are connected to each other by a pipeline 26, a pump P is provided in the pipeline 26, and the sizing liquid S is supplied to each nozzle 24 by the pump P. Further, in the present embodiment, the pipeline 26 is branched and also connected to the supply unit 30, and the sizing liquid supply device 20 is configured to supply the sizing liquid S even to the sizing tank 3.

[0030] Further, in the warp sizing apparatus 1, the sizing liquid S is supplied to the sizing tank 3, so that the stored sizing liquid S overflows to an outside of the tank. Therefore, the warp sizing apparatus 1 is provided with a recovery tank 40 for recovering the overflowed sizing liquid S, below the sizing tank 3.

[0031] The recovery tank 40 is formed in a housing shape opening upward, like the sizing tank 3, an interval between front and rear end walls 41 and 42 is greater than a dimension of the sizing tank 3 in the short side direction (the front-rear direction), and an interval between left and right sidewalls 43 and 44 is greater than a dimension of the sizing tank 3 in the long side direction (the width direction). In addition, the sizing liquid S of the sizing liquid pool 18 in the gap 14 is also overflowed to both the roll portion 11a of the sizing roll 11 and the roll portion 13a of the first squeeze roll 13 by the supply of the sizing liquid S from the supply nozzles 24. The overflowed sizing liquid S is also recovered by the recovery tank 40. Further, the warp sizing apparatus 1 is configured so that the sizing liquid S recovered in the recovery tank 40 is sent to the above-described supply tank 22.

[0032] In the warp sizing apparatus 1 as described above, in the present invention, the sizing tank is of a small size so that the sizing roll is immersed, for the purpose of suppressing a used amount of the sizing liquid S, and the like.

[0033] Specifically, in the present invention, the sizing tank is configured such that the dimension in the short side direction is equal to or smaller than the interval between the axis centers of the two squeeze rolls 13 and 15 in the front-rear direction. In addition, in the present embodiment, the dimension of the sizing tank 3 in the short side direction is slightly greater than an outer diameter of the roll portion 11a of the sizing roll 11.

[0034] According to the warp sizing apparatus 1 of the present embodiment, the amount of the sizing liquid S stored in the sizing tank 3 is smaller, as compared to the conventional warp sizing apparatus provided with a large sizing tank. This makes it possible to suppress the used amount of the sizing liquid S and to reduce the cost for sizing.

[0035] Further, foreign matters such as fluff of the warp and air bubbles caused due to rotation of the sizing roll 11 are floating near the liquid surface of the sizing liquid S in the sizing tank 3. However, the sizing tank 3 is configured to have such a small size, so that an area of the liquid surface of the stored sizing liquid S is also inevitably small. Thereby, the sizing liquid S near the liquid surface on which the foreign matters are floating is replaced in a

short time by the supply and overflow of the sizing liquid S as described above. As a result, it is possible to prevent the increase in foreign matters near the liquid surface as much as possible, and to prevent a state of the sizing liquid S in the sizing tank 3 from being deteriorated as much as possible.

[0036] In the above, one embodiment (hereinafter, referred to as 'above embodiment') 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 above embodiment, and can also be implemented by other embodiments (modified embodiments) as described below.

(1) As for the sizing tank, the sizing tank 3 of the above embodiment is formed so that the dimension in the short side direction (the front-rear direction) is slightly greater than the outer diameter of the roll portion 11a of the sizing roll 11. However, in the present invention, the sizing tank is not limited to one formed to have the dimension in the front-rear direction as in the embodiment, and may also be formed so that the dimension in the front-rear direction is equal to or smaller than the interval between the axis centers of the two squeeze rolls 13 and 15 in the front-rear direction.

[0037] However, the smaller the dimension in the front-rear direction is, the narrower the range of the sizing roll 11 that can be immersed in the sizing liquid S is. Therefore, the dimension is set to such a size that the warp sheet T is impregnated with the sizing liquid S to a desired degree, considering a thread type of the warp, a feeding speed of the warp, and the like. In addition, the dimension is, of course, set to such a size that the end walls 5 and 6 are located at positions in the front-rear direction where the front and rear end walls 5 and 6 do not interfere with the squeeze rolls 13 and 15.

[0038] (2) As for the positional relationship of the squeeze rolls with respect to the sizing roll, in the above embodiment, the two squeeze rolls 13 and 15 located before and after the sizing roll 11 are provided so that their axis centers are located slightly above the axis center of the sizing roll 11 in the vertical direction. However, in the present invention, each squeeze roll may also be provided so that its axis center is located at substantially the same position as or slightly below the axis center of the sizing roll 11 in the vertical direction. Further, in the above embodiment, the two squeeze rolls 13 and 15 are provided symmetrically with respect to the sizing roll 11 in the front-rear direction, but may also be provided asymmetrically with respect to the sizing roll 11.

[0039] (3) As for the sizing liquid supply device, in the above embodiment, the sizing liquid supply device 20 configured to supply the sizing liquid S to the supply nozzles 24 via the pipeline 26 is configured to branch the pipeline 26 and to supply the sizing liquid S even to the supply unit 30 (sizing tank 3). However, in the present invention, the sizing liquid supply device may be configured to supply, from above, the sizing liquid to the circumscribed position of the sizing roll and the first squeeze roll. Therefore, the warp sizing apparatus of the preamble of the present invention may also be configured so that a device for supplying the sizing liquid to the sizing tank (supply unit) is provided separately from the sizing liquid supply device.

[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
7:	left sidewall
8:	right sidewall
11:	sizing roll
11a:	roll portion
11b:	shaft portion
13:	first squeeze roll
13a:	roll portion
13b:	shaft portion
14:	gap
15:	second squeeze roll
15a:	roll portion
15b:	shaft portion
18:	sizing liquid pool
20:	sizing liquid supply device
22:	supply tank
24:	supply nozzle
26:	pipeline
30:	supply unit
40:	recovery tank
S:	sizing liquid
T:	warp sheet

Claims

1. A warp sizing apparatus (1) comprising a sizing tank (3) in which a sizing liquid (S) is stored; a sizing roll (11) having a warp sheet (T) wound thereon and immersed into the sizing liquid in the sizing tank; a first squeeze roll (13) provided on a rear side with respect to the sizing roll (11) so as to be circumscribed around the sizing roll on an upstream side with respect to an advancing direction of the warp sheet; a second squeeze roll (15) provided on a front side with respect to the sizing roll (11) so as to be circumscribed around the sizing roll on a downstream side with respect to the advancing direction; and a sizing

liquid supply device (20) configured to supply, from above, the sizing liquid to a circumscribed position of the sizing roll (11) and the first squeeze roll (13), **characterized in that**
the sizing tank (3) is formed to have a dimension in a front-rear direction equal to or smaller than an interval between an axis center of the first squeeze roll (13) and an axis center of the second squeeze roll (15) in the front-rear direction.

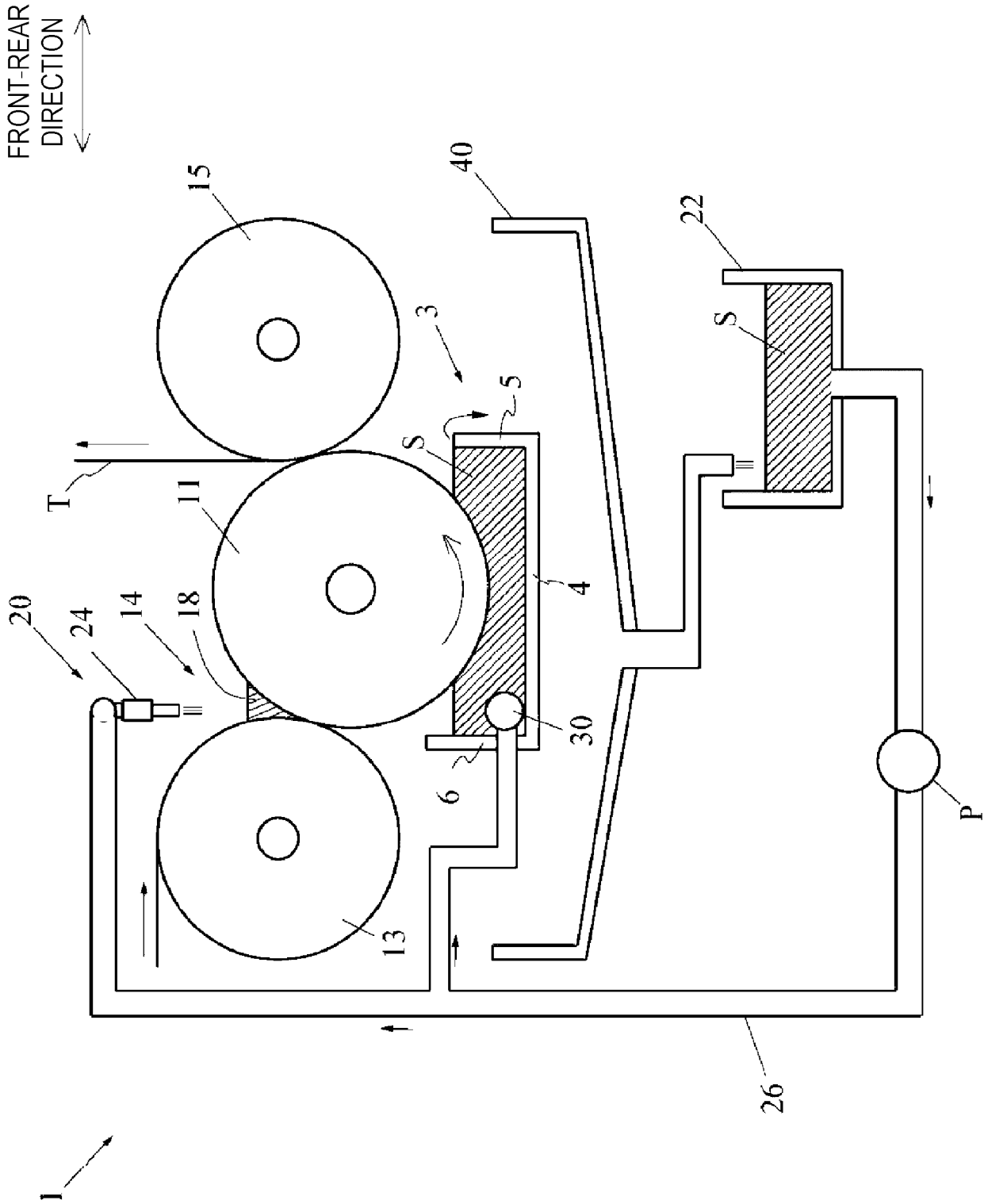
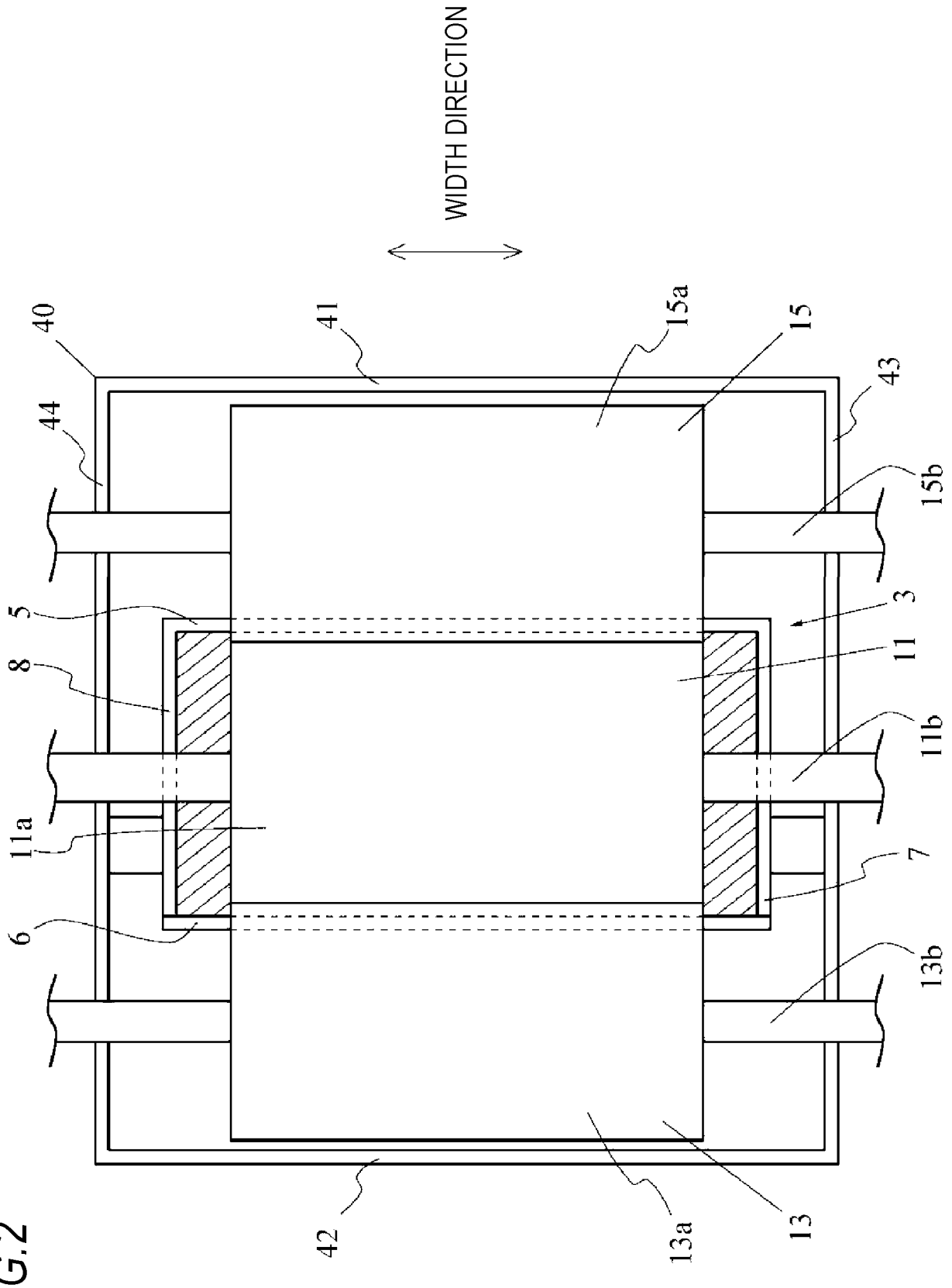


FIG.1

FIG.2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EUROPEAN SEARCH REPORT

Application Number
EP 22 15 8530

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	IT UA20 164 038 A1 (T M T MANENTI S R L) 1 December 2017 (2017-12-01) * page 1, first and second paragraphs; page 5, first paragraph - page 7, first paragraph; page 7, third paragraph - page 9, last paragraph; claims; figures *	1	INV. D06B1/14
A	DE 36 38 357 A1 (SIEVERS KLAUS [DE]) 10 March 1988 (1988-03-10) * column 2, lines 39-43; column 4, lines 33-45; claims; figures *	1	
A	EP 3 299 503 A1 (KARL MAYER ROTAL SRL [IT]) 28 March 2018 (2018-03-28) * paragraphs [0001] - [0003], [0023] - [0035]; claims; figures *	1	
			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	20 July 2022	Clivio, Eugenio

CATEGORY OF CITED DOCUMENTS

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20-07-2022

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REFERENCES CITED IN THE DESCRIPTION

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