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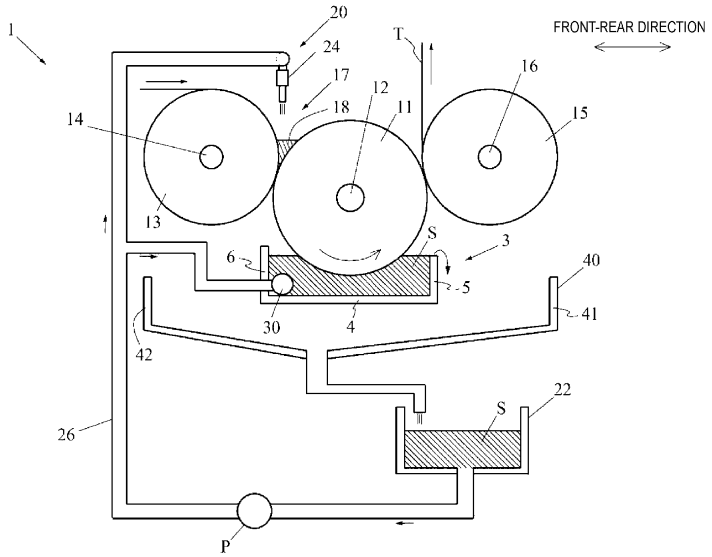
# (54) WARP SIZING APPARATUS

(57) Warp sizing apparatus (1) comprising a sizing tank (3) configured to store a sizing liquid (S); a recovery tank (22) configured to recover the sizing liquid (S); a sizing roll (11) onto which a warp sheet (T) is wound; a first squeeze roll (13) provided on an upstream side with respect to an advancing direction of the warp sheet (T); a second squeeze roll (15) provided on a downstream side with respect to the advancing direction of the warp sheet (T); and a sizing liquid supply device (20) configured to supply the sizing liquid (S) so as to form a sizing liquid pool (18) in a wedge-shaped area (17) formed above a contact position of the sizing roll (11) and the first squeeze roll (13), wherein the sizing roll (11) and/or the second squeeze roll (13) can be immersed in the sizing liquid (S), whereby the warp sizing apparatus (1) further comprises a sizing liquid receiving part (51, 60) for receiving the sizing liquid (S) flowing from the sizing liquid pool (18) and said sizing liquid receiving part (51, 60) is provided on at least one of the side walls (7) of the sizing tank (3).

*FIG.1*

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## Description

### TECHNICAL FIELD

**[0001]** The present invention relates to a warp sizing apparatus including a sizing tank having a bottom plate, front and rear end walls and left and right sidewalls and configured to store a sizing liquid; a recovery unit including a recovery tank configured to recover a sizing liquid used for sizing; a sizing roll onto which a warp sheet is wound; a first squeeze roll provided on a rear side with respect to the sizing roll so as to contact an outer circumference of 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 contact an outer circumference of the sizing roll on a downstream side with respect to the advancing direction; and a sizing liquid supply device configured to supply the sizing liquid so as to form a sizing liquid pool in a wedge-shaped area formed above a contact position of the sizing roll and the first squeeze roll, wherein the sizing tank is provided so that the sizing roll and/or the second squeeze roll can be immersed in the sizing liquid in the tank and the rear end wall is located behind the contact position of the sizing roll and the first squeeze roll in a front-rear direction.

### 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) onto which a warp sheet is wound and which is 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 the sizing liquid so as to form a sizing liquid pool in a wedge-shaped area formed above a contact 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. In addition, the warp sizing apparatus includes a recovery unit configured to recover the sizing liquid used for sizing. The sizing liquid used for sizing flows down to the recovery unit and is recovered. Note that, in the warp sizing apparatus of PTL 1, the recovery unit includes a recovery path through which the sizing liquid flows down and a recovery tank configured to recover the sizing liquid.

### CITATION LIST

### PATENT LITERATURE

**[0004]** PTL 1: JP2003-096657A

**[0005]** In the meantime, when the warp sheet passes through the sizing liquid, as described above, foreign matters such as fluff and cotton fly of the warp and oil component adhering to the warp are mixed in the sizing liquid. For this reason, a general warp sizing apparatus is configured to discharge the foreign matters together with an old sizing liquid by causing the old sizing liquid to overflow by continuously supplying a new sizing liquid into the sizing tank and the wedge-shaped area, so as to remove the foreign matters mixed in the sizing liquid.

**[0006]** In addition, the sizing liquid overflowing from the sizing tank to an outside of the tank directly flows down to the recovery unit and is recovered, as described above. Further, the sizing liquid overflowing from the sizing liquid pool formed in the wedge-shaped area is also recovered by the recovery unit. However, not all of the sizing liquid overflowing from the sizing liquid pool directly flows down to the recovery unit, and a part of the sizing liquid may also flow down into the sizing tank.

**[0007]** Specifically, the wedge-shaped area described above is present above the contact position of the sizing roll immersed in the sizing tank and the squeeze roll. Therefore, a sidewall of the sizing tank is located outside the wedge-shaped area (sizing roll, squeeze roll) in a width direction. In addition, the recovery unit is present in a range that includes the sizing tank, as seen from above. Note that, the sizing liquid pool is located above the sizing tank, and the sizing liquid overflows violently from the sizing liquid pool and flows down to the outside. However, not all of the sizing liquid that flows down reaches the outside of the sizing tank, and in some cases, the sizing liquid may collide with a wall or the like of a constitutional part of the warp sizing apparatus on the outside and rebound and a part thereof may flow down into the sizing tank.

**[0008]** When the sizing liquid from the sizing liquid pool flows down into the sizing tank, not only the foreign matters mixed resulting from direct immersion of the warp sheet but also the foreign matters in the sizing liquid flowing down from the sizing liquid pool are mixed in the sizing liquid in the tank. As a result, an amount of the foreign matters mixed in the sizing liquid in the sizing tank increases, and the foreign matters may not be discharged as expected by the supply of the new sizing liquid as described above. If a state in which the foreign matters are not discharged as expected continues, a state of the sizing liquid in the tank is deteriorated, which may adversely affect the sizing to the warp sheet.

### SUMMARY

**[0009]** Therefore, an object of the present invention is to provide a warp sizing apparatus capable of suppress-

ing deterioration in state of a sizing liquid in a sizing tank.

**[0010]** 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 warp sizing apparatus includes a receiving part that is present at least in a range, which is a partial range from the sidewall in a width direction and includes a presence range of the sizing liquid pool in the front-rear direction, between the sizing roll and both or one of the sidewalls of the sizing tank in the width direction.

**[0011]** In addition, in the present invention, the receiving part may be configured as a separate member from the sizing tank and the recovery unit. Further, the receiving part may be provided to be present up to an outside of the sizing tank in the width direction. Further, the receiving part may be configured to have an inclined surface for causing an overflowed sizing liquid overflowing from the sizing liquid pool to flow from an upper position toward a lower position, a guiding surface for directing a flow of the overflowed sizing liquid toward an outside of the sizing tank, and a restriction surface for restricting the overflowed sizing liquid flowing on the inclined surface from flowing down into the sizing tank.

**[0012]** According to the warp sizing apparatus of the present invention, the warp sizing apparatus includes the receiving part that is present at least in the above-described range between the wedge-shaped area and the sidewall of the sizing tank in the width direction. Thereby, since the sizing liquid that flows down from the sizing liquid pool is received by the receiving part, it is difficult for the sizing liquid that flows down to enter the sizing tank. Therefore, an amount of foreign matters mixed in the sizing liquid in the sizing tank is reduced, as compared to the related art, and the problem that the foreign matters mixed in the sizing liquid in the tank are not discharged as expected is less likely to occur. As a result, it is possible to suppress a state of the sizing liquid in the sizing tank from being deteriorated.

**[0013]** In addition, when the receiving part is configured as a separate member from the sizing tank and the recovery unit, the receiving part can be applied in a form of being later attached to the warp sizing apparatus installed already. Further, when the receiving part is provided to be present up to the outside of the sizing tank in the width direction, the sizing liquid received by the receiving part can be more effectively guided to the outside of the sizing tank.

**[0014]** Further, when the receiving part is configured to have the inclined surface, the guiding surface and the restriction surface as described above, the sizing liquid received by the receiving part can be effectively restricted from flowing down into the sizing tank. Therefore, it is possible to more effectively suppress deterioration in state of the sizing liquid in the sizing tank.

## BRIEF DESCRIPTION OF DRAWINGS

**[0015]**

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

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

FIG. 3 is a front view of FIG. 2.

FIG. 4 is a side view of FIG. 2.

FIG. 5 is a plan view of a warp sizing apparatus according to another embodiment of the present invention.

FIG. 6 is a front view of FIG. 5.

## DESCRIPTION OF EMBODIMENTS

**[0016]** Hereinafter, one embodiment of a warp sizing apparatus to which the present invention is applied will be described with reference to FIGS. 1 to 4.

**[0017]** A warp sizing apparatus 1 includes a sizing tank 3 in which a sizing liquid S is stored, a sizing roll 11 onto which a warp sheet T is wound and which is 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 contact 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.

**[0018]** 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 7 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 7 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).

**[0019]** In addition, the end wall (rear end wall) 6 on the rear side 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.

**[0020]** The sizing roll 11 is a roll on which the warp sheet T is wound, and is rotatably supported with respect to a frame (not shown) of the warp sizing apparatus 1 by support shafts 12 and 12 attached to both ends of the sizing roll. Note that, the sizing roll 11 is provided so that it is present within a presence 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 thereof is located lower than an upper edge of the end wall (front end wall) 5 on a front side in a vertical direction. Thereby, the sizing roll 11 is in a state where a lower portion thereof is im-

mersed in the sizing liquid S in a state where the sizing liquid S is stored in the sizing tank 3.

**[0021]** 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 sizing roll 11, and is immersed in the sizing liquid S and is impregnated with the sizing liquid S during the process.

**[0022]** 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. The second squeeze roll 15 is rotatably supported with respect to the frame by support shafts 16 and 16 attached to both ends thereof 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 with respect to the frame via a pressing mechanism (not shown), and is provided to contact to outer circumference in a state of being pressed against 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.

**[0023]** Further, as for arrangement of the second squeeze roll 15 in the vertical direction, in the present embodiment, a shaft center thereof is located slightly higher than a shaft center of the sizing roll 11. Therefore, a contact position of the second squeeze roll 15 with respect to the sizing roll 11 is located slightly above the support shaft 12 in the vertical direction of the sizing roll 11, on an outer peripheral surface of the sizing roll 11.

**[0024]** 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.

**[0025]** 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.

**[0026]** These are specifically described. The first squeeze roll 13 is rotatably supported with respect to the frame by support shafts 14 and 14 attached to both ends thereof 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 with respect to 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 sizing roll 11, and is configured to rotate as the sizing roll 11 is rotationally driven.

**[0027]** Further, in the present embodiment, the first squeeze roll 13 is provided at a position where a position of a shaft center thereof substantially coincides with a position of the shaft 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, a contact position of the first squeeze roll 13 with respect to the sizing roll 11 is substantially the same as the contact position of the second squeeze roll 15 with respect to the sizing roll 11 in the vertical direction, on the outer peripheral surface of the sizing roll 11. In addition, the contact position of the sizing roll 11 and the first squeeze roll 13 is located slightly ahead of the rear end wall 6 of the sizing tank 3 with respect to the front-rear direction.

**[0028]** Note that, the first squeeze roll 13 is circumscribed around the sizing roll 11 in this way, so that a wedge-shaped area 17, which is a wedge-shaped gap, 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 wedge-shaped area 17 is provided above the wedge-shaped area 17.

**[0029]** The supply nozzle 24 is provided in plural so as to be arranged at predetermined intervals in the width direction within the presence range of the sizing roll 11 in the width direction. The sizing liquid S is supplied from above to the wedge-shaped area 17 via each supply nozzle 24, so that a sizing liquid pool 18 in which the sizing liquid S is retained is formed in the wedge-shaped area 17.

**[0030]** In addition, the warp sheet T is guided in a 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. 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.

**[0031]** Note that, each supply nozzle 24 is a part of the sizing liquid supply device 20 configured to supply, from above, the sizing liquid S to the wedge-shaped area 17, 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.

**[0032]** 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 box 40 for receiving and causing the overflowed sizing liquid S to flow into the supply tank 22, below the sizing tank 3.

**[0033]** The recovery box 40 is formed in a housing shape opening upward, like the sizing tank 3, an interval between a front wall 41 and a rear wall 42 thereof is larger than a dimension of the sizing tank 3 in the short side direction (the front-rear direction), and an interval between left and right lateral walls 43 and 43 thereof is larger than a dimension of the sizing tank 3 in the long side direction (the width direction). In addition, each lateral wall 43 has a size facing the sizing roll 11 and the first squeeze roll 13, when seen in the width direction.

**[0034]** In addition, the sizing liquid S of the sizing liquid pool 18 in above-described wedge-shaped area 17 is also overflowed to both sides of the sizing roll 11 and the first squeeze roll 13 by the supply of the sizing liquid S from the supply nozzles 24, and the overflowed sizing liquid S is also received by the recovery box 40. The warp sizing apparatus 1 is configured so that the sizing liquid S received by the recovery box 40 flows to the above-described supply tank 22 and is recovered. Therefore, in the present embodiment, the supply tank 22 for recovering the sizing liquid S used for sizing corresponds to the recovery tank referred to in the present invention, and a combination of the supply tank 22 and the recovery box 40 corresponds to the recovery unit referred to in the present invention.

**[0035]** In the warp sizing apparatus 1 as described above, in the present invention, the warp sizing apparatus is configured to have a receiving part that is present at least in a range, which is a partial range from the sidewall in the width direction and includes a presence range of the sizing liquid pool in the front-rear direction, between the sizing roll and both or one of the sidewalls of the sizing tank in the width direction, for the purpose of suppressing deterioration in state of the sizing liquid in the sizing tank. The warp sizing apparatus 1 of the present embodiment is configured to have a receiving member 50 configured as a separate member from the sizing tank 3 and the recovery unit (recovery box 40), and the receiving member 50 is configured to have the receiving part. In addition, the present embodiment is an example where the receiving member 50 is each provided on both sides of the sizing roll 11 in the width direction.

**[0036]** One embodiment (the present embodiment) of the warp sizing apparatus 1 of the present invention is described in detail, as follows. However, since each configuration of both the receiving members 50 and the peripheries of the receiving members 50 is the same on both sides of the sizing roll 11 in the width direction, only one thereof is described below.

**[0037]** The receiving member 50 includes a guiding member 51 as a receiving part configured to receive the sizing liquid S overflowing from the sizing liquid pool 18 and to cause the sizing liquid S to flow to an outside of the sizing tank 3, and an attaching member 52 for attaching the guiding member 51. In addition, the guiding member 51 includes a flow part 51a configured to receive and cause the sizing liquid S overflowing from the sizing liquid pool 18 to flow, and a restriction part 51b configured to restrict a flow of the sizing liquid S flowing on the flow part 51a.

**[0038]** More specifically, as for the guiding member 51, the flow part 51a has a thin plate shape, and is formed so as to form a substantially rectangular shape, as seen in a plate thickness direction. Specifically, the flow part 51a has a shape where one of two corners on one end-side in a long side direction of an end surface is chamfered. In other words, the flow part 51a includes a portion (chamfered portion) 51a2 on which the chamfering has been performed and a rectangular portion 51a1 excluding the chamfered portion 51a2, in the long side direction. For reference, the rectangular portion 51a1 of the flow part 51a has a shape where a portion on the chamfered portion 51a2-side in the long side direction is slightly bent in the plate thickness direction.

**[0039]** In addition, the restriction part 51b has a plate shape having the same plate thickness as the flow part 51a, and has a shape continuous with chamfered one of both end edges parallel to the long side direction of the flow part 51a. However, the restriction part 51b is present over an entire presence range of the one end edge of the flow part 51a, and is formed to be orthogonal to an end surface of the flow part 51a. Therefore, the restriction part 51b includes a portion continuous with the rectangular portion 51a1 of the flow part 51a, and an inclined portion 51b1 formed to be continuous with the chamfered portion 51a2 in a form of forming an angle (the same angle as the chamfering) with respect to the portion.

**[0040]** Further, as for the attaching member 52, the attaching member 52 is a plate-shaped member, and has a through-hole penetrating in a plate thickness direction, in which a screw member for attaching is inserted, on one end-side thereof. Note that, in the present embodiment, a part to which the receiving member 50 (attaching member 52) is attached is the lateral wall 43 of the recovery box 40. In the receiving member 50, the guiding member 51 described above is joined to the attaching member 52 by welding or the like.

**[0041]** As for the joining of the guiding member 51 and the attaching member 52, the guiding member 51 and the attaching member 52 are joined in such a state that an end surface of the flow part 51a and an end surface of the attaching member 52 are orthogonal to each other. Further, the joining is performed in such a form that the end surface of the flow part 51a of the guiding member 51 is inclined with respect to the vertical direction (inclined in a lower direction from a rear side toward a front side) in a state (attached state) where the attaching member 52 is attached to the lateral wall 43 of the recovery box 40, as described later. Note that, in the present embod-

iment, the guiding member 51 and the attaching member 52 are joined in such a form that the other end edge of the flow part 51a of the guiding member 51 (an end edge opposite to the one end edge) and an end edge on the other end-side of the attaching member 52 are matched with each other. Therefore, the end edge on the other end-side of the attaching member 52 is formed to follow the end surface of the flow part 51a that is in an inclined state in the attached state, as seen in the plate thickness direction of the attaching member 52 (FIG. 4).

**[0042]** The receiving member 50 configured as described above is in a state of being attached to the lateral wall 43 of the recovery box 40 by screwing the screw member inserted in the through-hole of the attaching member 52 into a female screw hole formed in the lateral wall 43 of the recovery box 40. Note that, as for an attaching position of the receiving member 50, in the vertical direction, the receiving member 50 is attached so that a lower end of the guiding member 51 (flow part 51a) provided inclined as described above is located slightly above an upper edge of the sidewall 7 of the sizing tank 3.

**[0043]** Further, in the front-rear direction, the receiving member 50 is provided so that the flow part 51a of the guiding member 51 is present between the support shaft 12 configured to support the sizing roll 11 and the support shaft 14 configured to support the first squeeze roll 13 in the attached state. In other words, the flow part 51a of the guiding member 51 of the receiving member 50 has such a dimension in the long side direction that it can be present between both the support shafts 12 and 14 in the front-rear direction in the state inclined as described above. Therefore, the receiving member 50 is provided in such a form that a presence range of the flow part 51a includes a presence range of the sizing liquid pool 18 in the front-rear direction. Further, in the state where the receiving member 50 is provided as described above, the receiving member 50 and the sizing liquid pool 18 have a positional relationship where a presence range of the rectangular portion 51a1 of the flow part 51a includes the presence range of the sizing liquid pool 18 in the front-rear direction.

**[0044]** Further, a dimension in the short side direction of the rectangular portion 51a1 of the flow part 51a is larger than an interval between the lateral wall 43 of the recovery box 40 and the sidewall 7 of the sizing tank 3 facing in the width direction, and is slightly smaller than an interval between the lateral wall 43 of the box 40 and the sizing roll 11 (first squeeze roll 13). Therefore, the receiving member 50 in the attached state is present in such a form that a part of the end surface of the flow part 51a overlaps the sizing tank 3 in the width direction in the presence range of the sizing liquid pool 18 in the front-rear direction.

**[0045]** Note that, since the flow part 51a is chamfered on one end-side in the long side direction, as described above, the flow part has a shape where the dimension in the short side direction gradually decreases at the chamfered portion 51a2. In addition, the chamfering at the flow part 51a is performed in such a form that the flow part 51a is cut out from the one end edge to a position on a slightly more outer side (the lateral wall 43-side of the recovery box 40) than the sidewall 7 of the sizing tank 3 in the width direction in the attached state of the receiving member 50. Therefore, the inclined portion 51b1, which is continuous with the chamfered portion 51a2, of the restriction part 51b continuous with the flow part 51a is present in such a form that a tip end portion thereof is located outside the sizing tank 3 in the width direction.

**[0046]** According to the warp sizing apparatus 1 of the present embodiment configured as described above, the sizing liquid S is supplied from the supply nozzles 24 to the sizing liquid pool 18 in the wedge-shaped area 17, so that the sizing liquid S in the sizing liquid pool 18 overflows to both sides of the sizing roll 11 and the first squeeze roll 13. However, the receiving member 50 is provided as described above, so that the receiving member 50 receives the overflowed sizing liquid S and guides the same to the outside of the sizing tank 3 in the width direction. Therefore, it is possible to prevent the sizing liquid S overflowing from the sizing liquid pool 18 from falling down into the sizing tank 3 (from being mixed in the sizing liquid in the sizing tank 3). In addition, since some of the sizing liquid S overflowing from the sizing liquid pool 18 collides with the lateral wall 43 of the recovery box 40 and rebounds to the sizing tank 3-side but the sizing liquid S is also received by the receiving member 50, the sizing liquid is prevented from entering the sizing tank 3.

**[0047]** The operations of the receiving member 50 are more specifically described. The flow part 51a of the guiding member 51 of the receiving member 50 is present in such a form that a part of the end surface of the flow part 51a overlaps the sizing tank 3 in the width direction in the presence range of the sizing liquid pool 18 in the front-rear direction, as described above. Therefore, the sizing liquid S falling down from above is received by the flow part 51a. In addition, since the guiding member 51 has the restriction part 51b facing toward the lateral wall 43-side of the recovery box 40, in addition to the flow part 51a, the sizing liquid S rebounding from the lateral wall 43 as described above is also more effectively received.

**[0048]** Since the guiding member 51 is provided in an inclined state, as described above, the received sizing liquid S is caused to flow down along the end surface of the flow part 51a. Note that, the restriction part 51b is formed to be orthogonal to the end surface of the flow part 51a on which the sizing liquid S flows. Therefore, since the overflowing of the sizing liquid S flowing on the flow part 51a toward the sizing tank 3 is restricted by the restriction part 51b, the flowing sizing liquid S does not flow into the sizing tank 3.

**[0049]** Further, the restriction part 51b of the guiding member 51 has the inclined portion 51b1 forming an angle with respect to the flowing direction of the sizing liquid S and provided at the position of the chamfered portion 51a2, which is a lower end side of the flow part 51a with

respect to the long side direction, and the tip end portion of the inclined portion 51b1 is configured to be located outside the sizing tank 3 in the width direction. Thereby, the sizing liquid S flowing on the flow part 51a collides with the inclined portion 51b1 and is thus guided to the outside (recovery box 40) of the sizing tank 3. Therefore, the sizing liquid S received by the flow part 51a is caused to flow down along the end surface of the flow part 51a, and is guided to the restriction part 51b and is caused to flow to the recovery box 40.

**[0050]** From the above, in the receiving member 50 configured in this way, the end surface of the flow part 51a functions as an inclined surface for causing the sizing liquid S from the sizing liquid pool 18 to flow from an upper position toward a lower position. In addition, an inner end surface of the restriction part 51b of the guiding member 51 functions as a restriction surface for restricting the sizing liquid S flowing on the inclined surface (end surface of the flow part 51a) from flowing down into the sizing tank 3. Further, an inner end surface of the inclined portion 51b1 of the restriction part 51b of the guiding member 51 functions as a guiding surface for directing the flow of the sizing liquid S toward the outside of the sizing tank 3.

**[0051]** In this way, according to the warp sizing apparatus 1 of the present embodiment, the sizing liquid S overflowing from the sizing liquid pool 18 formed in the wedge-shaped area 17 is received by the receiving member 50 and is guided to the outside of the sizing tank 3. Therefore, foreign matters such as fluff and cotton fly of warp mixed in the sizing liquid S is prevented from being mixed in the sizing liquid in the sizing tank 3 as much as possible. Thereby, since an amount of foreign matters mixed in the sizing liquid S in the sizing tank 3 is reduced, as compared to the related art, a problem that the foreign matters mixed in the sizing liquid S in the sizing tank 3 are not discharged as expected is less likely to occur. As a result, it is possible to suppress a state of the sizing liquid in the sizing tank 3 from being deteriorated.

**[0052]** Further, when the receiving member 50 is configured as a separate member from the sizing tank 3 and the recovery box 40, like the receiving member 50 of the present embodiment, the receiving member 50 can be applied in a form of being later attached to the warp sizing apparatus installed already.

**[0053]** 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 receiving part, in the above embodiment, the warp sizing apparatus 1 includes the receiving member 50 attached to the lateral wall 43 of the recovery box 40, and the guiding member 51 of the receiving member 50 is provided as the receiving part. However, in the present invention, the receiving part may be provided to be present at least in a range, which is a partial range from the sidewall 4 of the sizing tank 3 in the width direction and includes the presence range of the sizing liquid pool 18 in the front-rear direction, and is not limited to being configured in the form of the guiding member 51 of the above embodiment.

**[0054]** For example, the receiving part may be a receiving member 60 configured as shown in FIGS. 5 and 6. Specifically, the receiving member 60 is mainly configured by a plate-shaped part 61 having a plate shape and a rectangular end surface. However, the receiving member 60 has sidewall parts 62 formed to be erected from both side edges that are long sides of the plate-shaped part 61. Note that, the plate-shaped part 61 of the receiving member 60 has a dimension in a short side direction larger than the size of the presence range of the sizing liquid pool 18 in the front-rear direction. The receiving member 60 is provided at a position where the short side direction of the plate-shaped part 61 is matched with the front-rear direction and the presence range of the plate-shaped part 61 includes the presence range of the sizing liquid pool 18 in the front-rear direction. For reference, the receiving member 60 is provided at such a position via an attaching member or the like (not shown).

**[0055]** In addition, the receiving member 60 is provided in an inclined state so that an end edge on one end-side, which is the sizing roll 11-side in the long side direction of the plate-shaped part 61, is located above an end edge on the other end-side that is the lateral wall 43-side (an outer side in the width direction) of the recovery box 40. Further, the receiving member 60 has such a size that the plate-shaped part 61 can be present over a range from an inside to an outside of the sizing tank 3 in the long side direction of the plate-shaped part 61, as seen from above in the provided state.

**[0056]** According to the receiving member 60 configured in this way, the sizing liquid S from the sizing liquid pool 18 is received by the plate-shaped part 61, and the received sizing liquid S flows on an end surface of the plate-shaped part 61 toward the end edge on the other end-side and flows down to the outside of the sizing tank 3. Note that, the sizing liquid S flowing on the end surface of the plate-shaped part 61 is restricted from flowing down from the side edge of the plate-shaped part 61 into the sizing tank 3 by the sidewall parts 62. Therefore, the end surface of the plate-shaped part 61 of the receiving member 60 functions as an inclined surface for causing the sizing liquid S from the sizing liquid pool 18 to flow from the upper position toward the lower position, and as a guiding surface for directing the flow of the sizing liquid S toward the outside of the sizing tank 3. Further, an inner surface of the sidewall part 62 functions as a restriction surface for restricting the sizing liquid S flowing on the inclined surface (end surface of the plate-shaped part

61) from flowing down into the sizing tank 3.

**[0057]** Note that, as a receiving part, the guiding member 51 of the receiving member 50 of the above embodiment and the receiving member 60 are configured to have a restriction surface for restricting the sizing liquid S flowing on the inclined surface from flowing down into the sizing tank 3. However, the receiving part of the present invention is not limited to those having such a restriction surface. For example, when the plate-shaped part 61 of the receiving member 60 is configured so that a size in the front-rear direction is such a size that the sizing liquid S received by the plate-shaped part 61 does not flow down from both the side edges during the process of flowing on the end surface, the restriction surface can be omitted. Further, the restriction surface can be omitted when a plate material provided in the same manner as the plate-shaped part 61 of the receiving member 60 is formed so that an end surface thereof is an arc surface forming an arc between both the side edges.

**[0058]** (2) In addition, as for the receiving part, in the above embodiment, the guiding member 51 as the receiving part is configured as a separate member from the recovery box 40 and the sizing tank 3, and the guiding member 51 is attached to the lateral wall 43 of the recovery box 40 by the attaching member 52. However, in the present invention, even when the receiving part is configured as the above-described separate member, the attaching position is not limited to the lateral wall 43 of the recovery box 40, and may also be the sidewall 7 of the sizing tank 3.

**[0059]** In addition, as for the attaching of the receiving part, in the above embodiment, the attaching is performed via the attaching member 52. However, instead of this, the receiving part may also be directly fixed to the recovery box 40 or the sizing tank 3 by welding or the like.

**[0060]** Further, the receiving part is not limited to being configured as a separate member from the recovery box 40 and the sizing tank 3, as described above, and for example, the sizing tank 3 itself may be configured to have a part corresponding to the receiving part. Specifically, the sizing tank 3 is configured to have a plate-shaped part that is a part formed integrally with the sidewall 7 and protrudes from the upper edge portion of the sidewall 7 toward the inside and oblique upper of the sizing tank 3 (toward the sizing roll 11-side). In addition, the plate-shaped part is formed over a range including the presence range of the sizing liquid pool 18 in the front-rear direction. This makes it possible to cause the plate-shaped part to function as a receiving part. Note that, in this case, the receiving part is present only in a range overlapping the sizing tank 3 in the width direction. In this way, with respect to the presence range in the width direction, the receiving part of the present invention is not limited to that that is present up to the outside of the sizing tank 3 as in the above embodiment, and may be any part as long as it is present in a partial range from the sidewall 7 of the sizing tank 3.

**[0061]** Further, in the warp sizing apparatus of the above embodiment, the guiding member 51 as the receiving part is each provided on both sides of the sizing roll 11 in the width direction. However, the warp sizing apparatus according to the present invention is not limited to the configuration where the receiving parts are provided on both sides of the sizing roll 11, and the receiving part may also be provided only on one side of the sizing roll 11 in the width direction. However, in this case, a configuration for preventing the overflowing is preferably adopted so as to prevent the sizing liquid S from the sizing liquid pool 18 from overflowing from the other side of the sizing roll 11 on which the receiving part is not provided. For example, the warp sizing apparatus may be configured to include a cover member having a size that includes the presence range of the sizing liquid pool 18, when seen in the width direction, and the cover member may be provided to cover the other side of the sizing liquid pool 18.

**[0062]** (3) As for the recovery unit for recovering the sizing liquid used for sizing, in the warp sizing apparatus 1 of the above embodiment, the sizing liquid S from the sizing liquid pool 18 is caused to flow to the recovery box 40 via the receiving member 50, and the sizing liquid S is caused to flow into the supply tank 22 for recovery. That is, in the above embodiment, the recovery unit is configured by a combination of the supply tank 22 as a recovery tank in which the sizing liquid S is retained and the recovery box 40 configured to function as a recovery path for causing the sizing liquid S to flow toward the recovery tank. However, in the present invention, the recovery unit may be configured only by the recovery tank, without the recovery path. In this case, the recovery tank (recovery unit) has a size larger than the sizing tank 3 in the width direction and in the front-rear direction and is provided at a position where the presence range thereof includes the sizing tank 3, as seen from above, and the sizing liquid S overflowing from the sizing tank 3 directly flows down to the recovery tank.

**[0063]** (4) As for the warp sizing apparatus that is the preamble, in the above embodiment, the warp sizing apparatus 1 is configured in such a form that the sizing roll 11 is immersed in the sizing liquid S in the sizing tank 3 and the first and second squeeze rolls 13 and 15 are circumscribed around the sizing roll 11 so as 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.

**[0064]** For example, the warp sizing apparatus may also be configured so that the second squeeze roll is also immersed in the sizing liquid S in the sizing tank, in addition to the sizing roll. Note that, in this case, the sizing tank is sized 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 so that only the second squeeze roll is immersed in the sizing liquid S in the sizing tank. However, even in this case, in the present invention, the sizing tank is not sized to include only the second squeeze roll in the front-rear di-

rection, and is sized so that the rear end wall is located behind the contact position of the sizing roll and the first squeeze roll.

**[0065]** Further, in the warp sizing apparatus 1 of the above embodiment, the two squeeze rolls 13 and 15 located before and after the sizing roll 11 are provided so that the shaft centers thereof are located slightly above the shaft center of the sizing roll 11 in the vertical direction. However, in the warp sizing apparatus to which the present invention is applied, each squeeze roll may also be provided so that the shaft center thereof is located substantially the same position as or slightly below the shaft center of the sizing roll in the vertical direction. Further, the warp sizing apparatus is not limited to the configuration where the two squeeze rolls are provided symmetrically with respect to the sizing roll in the front-rear direction, and the two squeeze rolls may also be provided asymmetrically with respect to the sizing roll.

**[0066]** Further, in the warp sizing apparatus 1 of the above embodiment, the device for supplying the sizing liquid S to the supply nozzles 24 and the sizing tank 3 (supply unit 30) is a common device (sizing liquid supply device 20). However, the warp sizing apparatus may also be configured so that a device for supplying the sizing liquid S to the sizing tank (supply unit) is provided separately from a device for supplying the sizing liquid S to the supply nozzles.

**[0067]** 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

**[0068]**

1: warp sizing apparatus
3: sizing tank
4: bottom plate
5: front end wall
6: rear end wall
7: sidewall
11: sizing roll
12: support shaft
13: first squeeze roll
14: support shaft
15: second squeeze roll
16: support shaft
17: wedge-shaped area
18: sizing liquid pool
20: sizing liquid supply device
22: supply tank
24: supply nozzle
26: pipeline
30: supply unit
40: recovery box
41: front wall
42: rear wall
43: lateral wall
50: receiving member
51: guiding member
51a: flow part
51a1: rectangular portion
51a2: chamfered portion
51b: restriction part
51b1: inclined portion
52: attaching member
60: receiving member
61: plate-shaped part
62: sidewall part
S: sizing liquid
T: warp sheet

## Claims

1. A warp sizing apparatus (1) comprising a sizing tank (3) having a bottom plate, front and rear end walls (5 and 6) and left and right sidewalls (7) and configured to store a sizing liquid (S); a recovery unit comprising a recovery tank (22) configured to recover a sizing liquid used for sizing; a sizing roll (11) onto which a warp sheet (T) is wound; a first squeeze roll (13) provided on a rear side with respect to the sizing roll (11) so as to contact an outer circumference of the sizing roll on an upstream side with respect to an advancing direction of the warp sheet (T); a second squeeze roll (15) provided on a front side with respect to the sizing roll (11) so as to contact an outer circumference of the sizing roll on a downstream side with respect to the advancing direction; and a sizing liquid supply device (20) configured to supply the sizing liquid (S) so as to form a sizing liquid pool (18) in a wedge-shaped area (17) formed above a contact position of the sizing roll (11) and the first squeeze roll (13), wherein the sizing tank (3) is provided so that the sizing roll (11) and/or the second squeeze roll (15) can be immersed in the sizing liquid (S) in the tank and the rear end wall (6) is located behind the contact position in a front-rear direction,
**characterized in that**
the warp sizing apparatus (1) further comprises a receiving part (51; 60) that is present at least in a range, which is a partial range from the sidewall in a width direction and includes a presence range of the sizing liquid pool (18) in the front-rear direction, between the sizing roll (11) and both or one of the sidewalls (7) of the sizing tank (3) in the width direction.

2. The warp sizing apparatus according to Claim 1, wherein the receiving part (51; 60) is configured as a separate member from the sizing tank (3) and the recovery unit.

3. The warp sizing apparatus according to Claim 2, wherein the receiving part (51; 60) is provided to be

present up to an outside of the sizing tank (3) in the width direction.

**4.** The warp sizing apparatus according to any one of Claims 1 to 3, wherein the receiving part (51; 60) is configured to have an inclined surface for causing an overflowed sizing liquid (S) overflowing from the sizing liquid pool (18) to flow from an upper position toward a lower position, a guiding surface for directing a flow of the overflowed sizing liquid (S) toward an outside of the sizing tank (3), and a restriction surface for restricting the overflowed sizing liquid (S) flowing on the inclined surface from flowing down into the sizing tank (3).

FIG.1

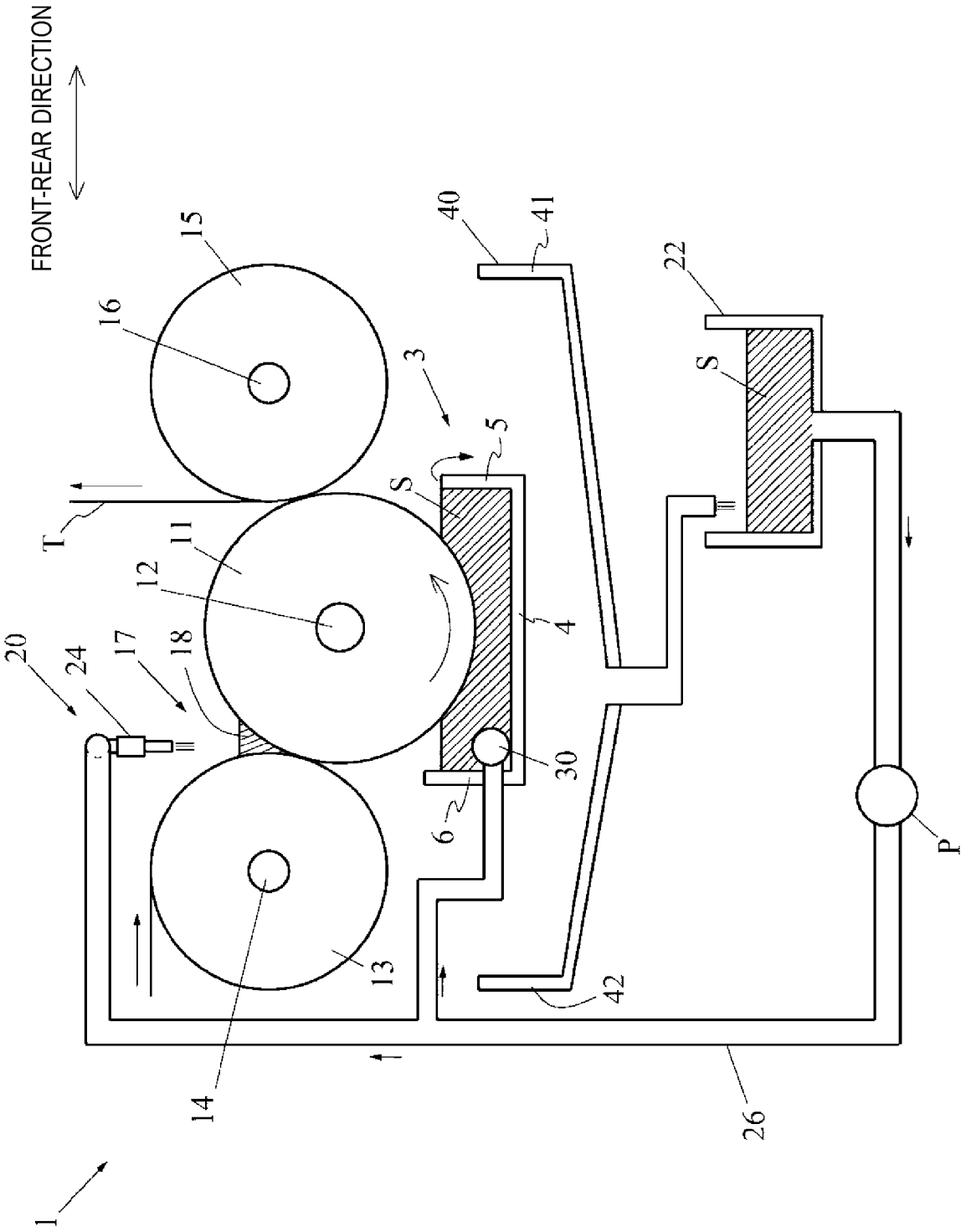
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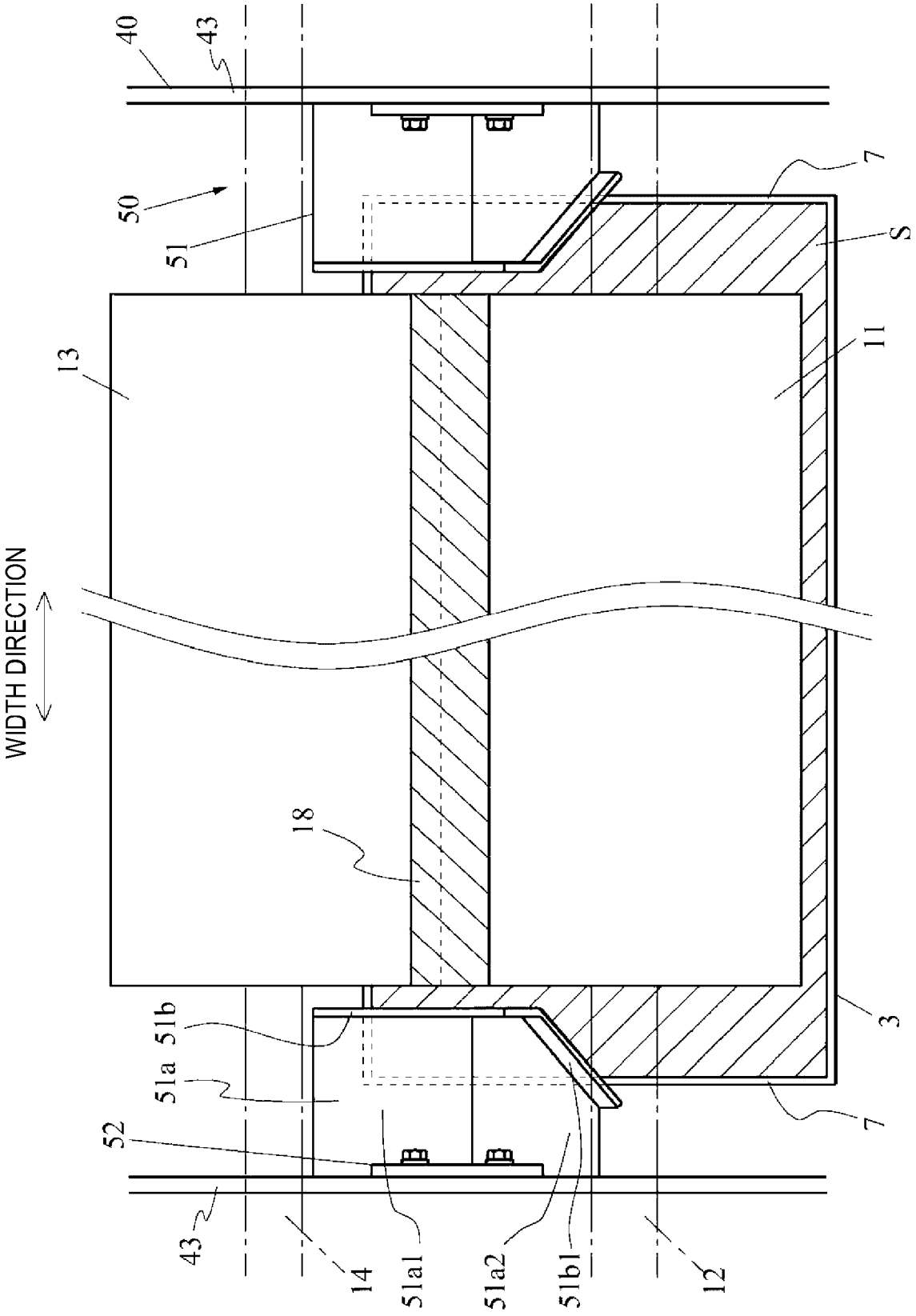
FIG.2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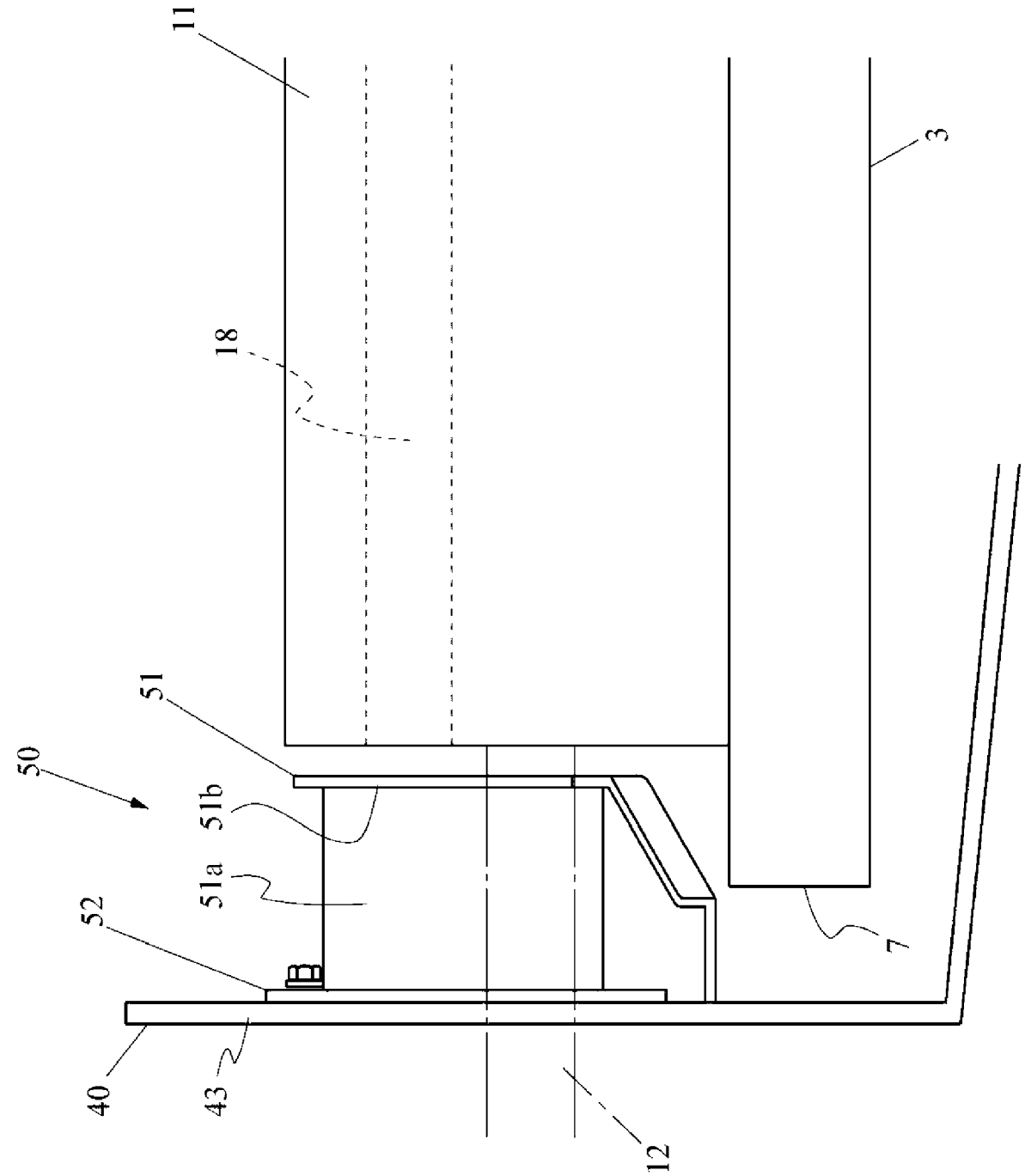


FIG.3

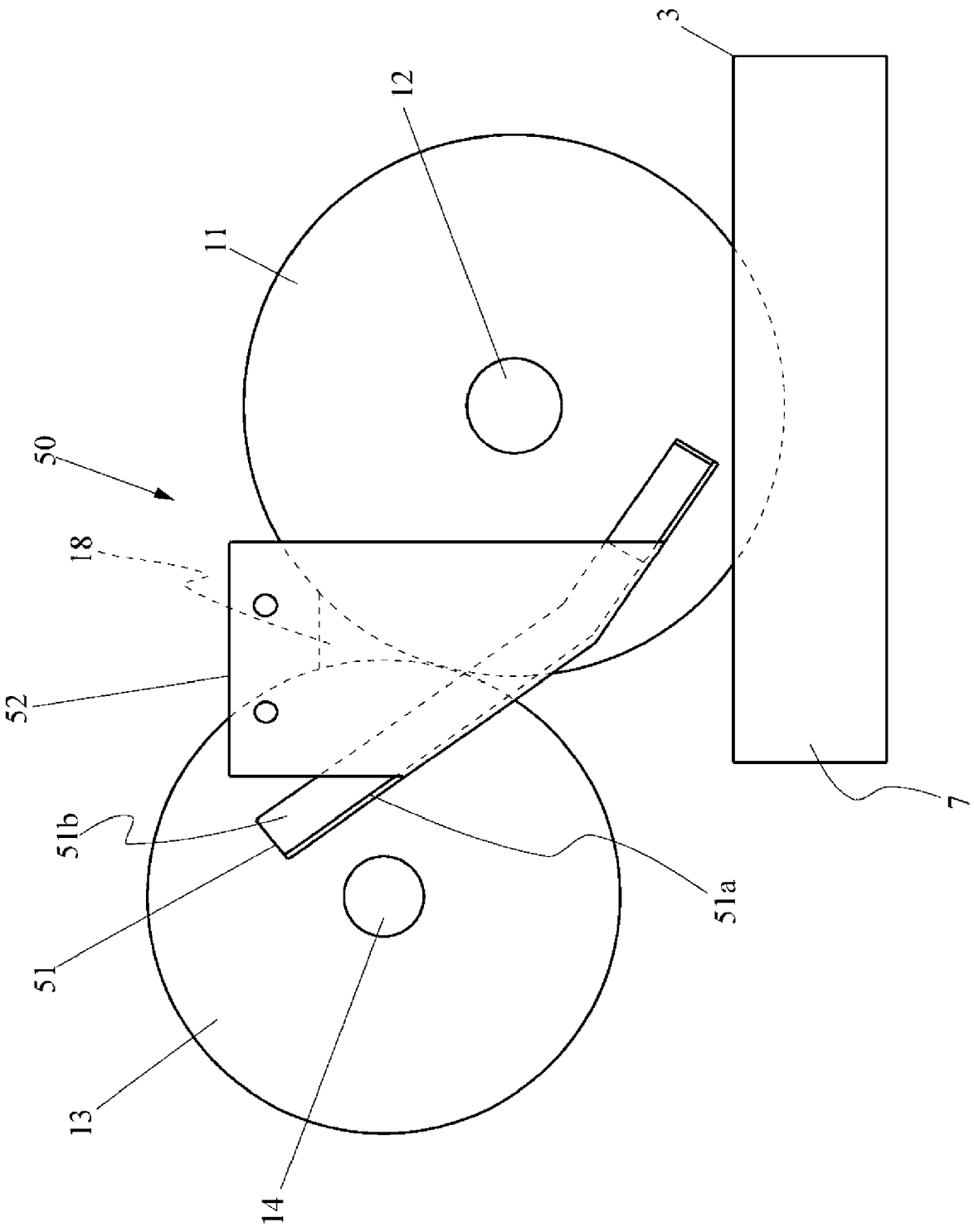


FIG.4

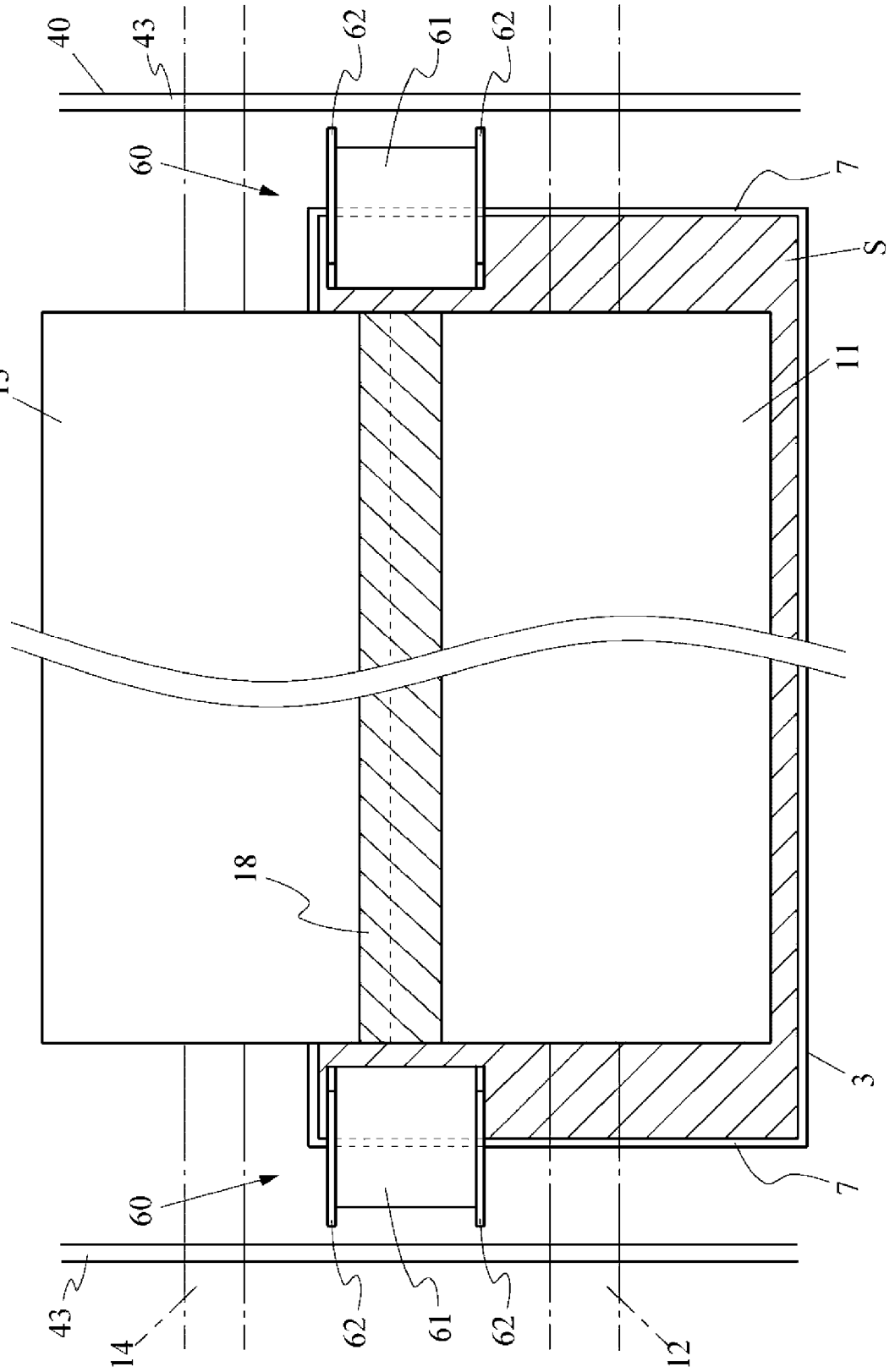


FIG.5

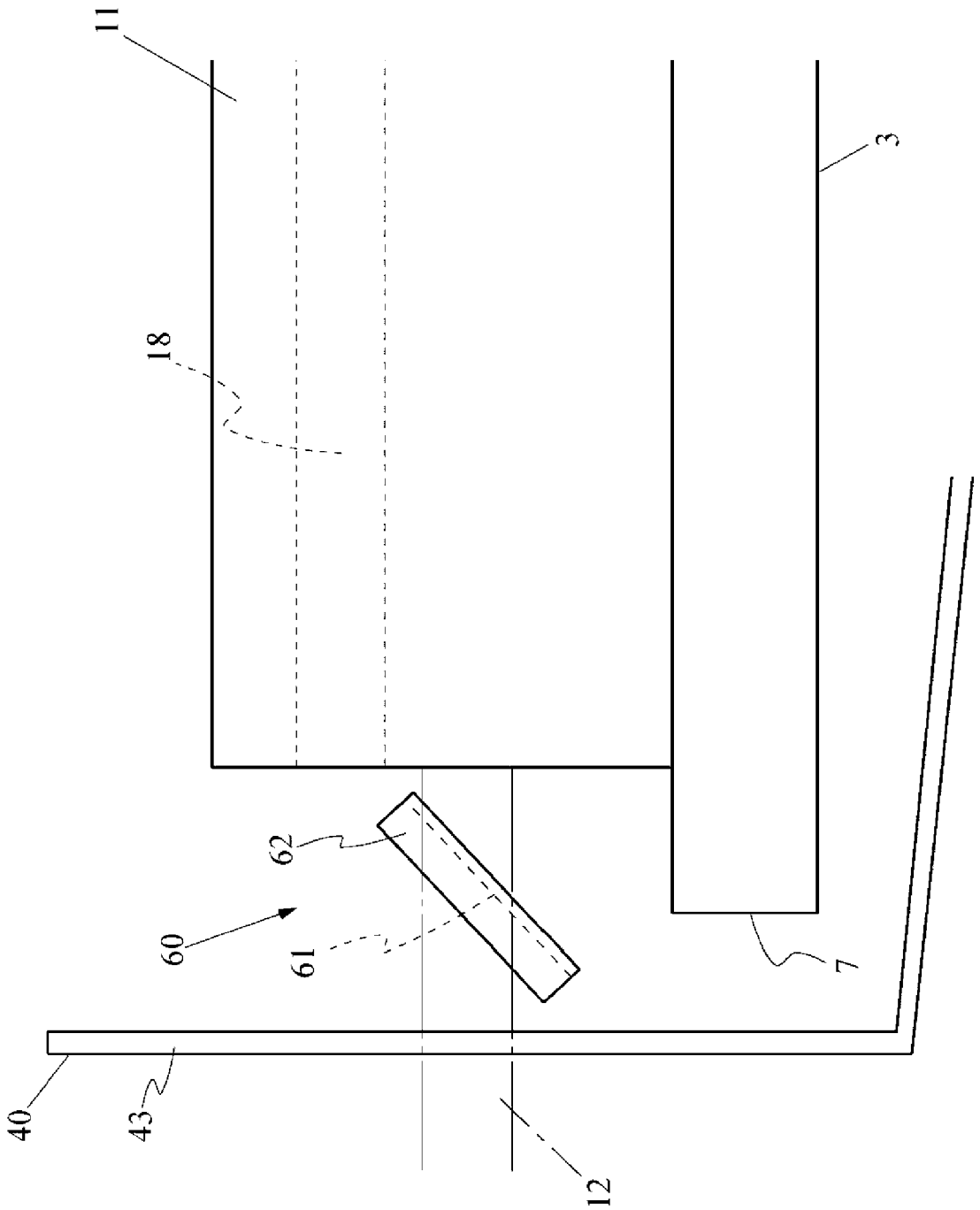


FIG.6

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# EUROPEAN SEARCH REPORT

Application Number
EP 22 16 3841

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| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
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The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| Munich | 11 August 2022 | Clivio, Eugenio |

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