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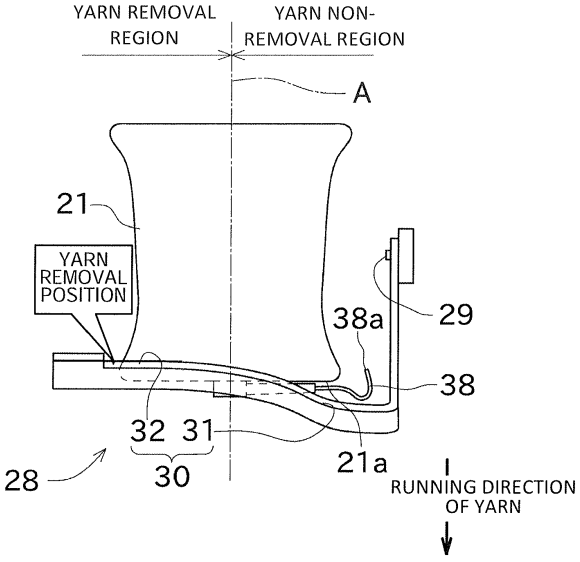
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(54) Yarn accumulating device, yarn winding unit including the same, and yarn winding machine including the same

(57) A yarn removal lever 28 includes a contacting surface 30 arranged movable between a standby position and a yarn removal position and adapted to be capable of making contact with a spun yarn 10. The yarn removal lever 28 is adapted to remove the spun yarn 10 from a yarn hooking member 22 by moving the contacting surface 30 to the yarn removal position. The contacting surface 30 includes a first portion 31 and a second portion 32 located downstream of the first portion 31 in a moving direction of the contacting surface 30. Under a state in which the contacting surface 30 has been moved to the yarn removal position, at least a portion of the first portion 31 is located downstream of a downstream end 21a of a yarn accumulating roller 21 in a running direction of the spun yarn 10.

FIG. 8



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a shape of a yarn removal member adapted to remove a yarn from a yarn hooking member in a yarn accumulating device adapted to accumulate the yarn by winding the yarn around a yarn accumulating roller by the rotating yarn hooking member.

2. Description of the Related Art

[0002] In some cases, a yarn winding machine such as a fine spinning machine includes a yarn accumulating device adapted to temporarily accumulate a yarn to be wound. Japanese Patent Application Laid-open No. 2013-67891 (Patent Document 1) describes such a yarn accumulating device. The yarn accumulating device described in Patent Document 1 includes a yarn accumulating roller adapted to accumulate a yarn by winding the yarn around a peripheral surface thereof. The yarn accumulating device includes a yarn hooking member for winding the yarn around the yarn accumulating roller. The yarn hooking member is formed into a shape on which the yarn can be hooked. Since the yarn hooking member with the yarn hooked thereon is integrally rotated with the yarn accumulating roller, the yarn is wound around the yarn accumulating roller.

[0003] A yarn removal lever adapted to remove the yarn from the yarn hooking member is arranged in proximity to the yarn accumulating device described in Patent Document 1. The yarn removal lever in Patent Document 1 is arranged to be capable of vertically swinging between an elevated position and a lowered position with a swing shaft as a center. The yarn removal lever is arranged to not make contact with a yarn path when located at the lowered position. By moving the yarn removal lever to the elevated position, the yarn hooked on the yarn hooking member is pushed upward by the yarn removal lever, and thus the yarn can be removed from the yarn hooking member.

SUMMARY OF THE INVENTION

[0004] In the configuration as described above, when a position to which the yarn is pushed upward by the yarn removal lever is excessively low, the yarn cannot be removed. When the position to which the yarn is pushed upward is excessively high, behavior of the yarn becomes unstable, and thus eventually the yarn cannot be removed from the yarn hooking member in some cases.

[0005] An object of the present invention is to provide a configuration of a yarn removal lever that enables the yarn to be reliably removed from the yarn hooking member.

[0006] According to an aspect of the present invention, a yarn accumulating device includes a yarn accumulating roller, a yarn hooking member, and a yarn removal member. The yarn accumulating roller is arranged to rotate under a state in which a yarn is wound around a peripheral surface thereof. The yarn hooking member is arranged capable of integrally rotating with the yarn accumulating roller and adapted to guide the yarn. The yarn removal member has a contacting surface arranged movable between a standby position and a yarn removal position and adapted to be capable of making contact with the yarn, and is adapted to remove the yarn from the yarn hooking member by moving the contacting surface to the yarn removal position. The contacting surface includes a first portion and a second portion. In a direction in which the contacting surface moves from the standby position towards the yarn removal position, the first portion is located upstream of the second portion. Under a state in which the contacting surface has been moved to the yarn removal position, at least a portion of the first portion is located downstream of the yarn accumulating roller in a running direction of the yarn.

[0007] Since the first portion and the second portion located at different positions in the direction in which the contacting surface moves are arranged at the contacting surface of the yarn removal member, a height to which the yarn is pushed upward can be differed in accordance with a position where the yarn makes contact with the contacting surface. Accordingly, reliable yarn removal becomes possible. By arranging the first portion to be located downstream of the yarn accumulating roller in the running direction of the yarn, the yarn pushed upward by the first portion can be prevented from being wound around the yarn accumulating roller.

[0008] In the yarn accumulating device, the first portion and the second portion are preferably smoothly continuous at the contacting surface of the yarn removal member.

[0009] Accordingly, the yarn that has made contact with the first portion can be smoothly moved to the second portion. Thus, when the yarn is moved from the first portion towards the second portion on the contacting surface, behavior of the yarn can be prevented from becoming unstable.

[0010] In the yarn accumulating device, the first portion is arranged with respect to a yarn non-removal region where the yarn cannot be removed from the yarn hooking member, and the second portion is arranged with respect to a yarn removal region where the yarn can be removed from the yarn hooking member.

[0011] As described above, by arranging the first portion with respect to the yarn non-removal region, a position to which the yarn is pushed upward can be set low in a region where the yarn cannot be removed. Accordingly, the yarn can be prevented from being unnecessarily moved a long distance and thus becoming unstable, and a defect such as an entanglement of the yarn can be prevented. By arranging the second portion with re-

spect to the yarn removal region, the position to which the yarn is pushed upward can be set high in a region where the yarn can be removed. Accordingly, the yarn can be reliably removed from the yarn hooking member.

[0012] In the yarn accumulating device, the contacting surface is arranged to not make contact with the yarn when located at the standby position. The contacting surface is adapted to make contact with the yarn by being moved from the standby position to the yarn removal position.

[0013] By arranging the contacting surface to not make contact with the yarn at the standby position, the yarn removal member does not influence running of the yarn. The contacting surface can push the yarn upward by being moved from the standby position to the yarn removal position.

[0014] In the yarn accumulating device, in the direction in which the contacting surface moves from the standby position towards the yarn removal position, a distance between an upstream end of the first portion and a downstream end of the second portion is preferably at least 10 mm and at most 20 mm.

[0015] By setting a large distance between the first portion and the second portion in the moving direction of the contacting surface, reliability of yarn removal can be improved. However, if the distance between the first portion and the second portion is excessively large, when moving the yarn from the first portion to the second portion, the yarn cannot be smoothly moved. The distance between the first portion and the second portion in the moving direction of the contacting surface is thus preferably within the above-described range.

[0016] According to another aspect of the present invention, a yarn winding unit includes the above-described yarn accumulating device, a draft device adapted to supply a fiber bundle, a spinning device adapted to apply twists to the fiber bundle and to produce a spun yarn, and a winding device adapted to wind the spun yarn. The yarn accumulating device is adapted to temporarily accumulate the spun yarn between the spinning device and the winding device.

[0017] Accordingly, the yarn accumulating device functions as a kind of a buffer, and a defect (such as a yarn slackening) in a case in which a spinning speed by the spinning device and a winding speed by the winding device do not correspond to each other for some reason can be resolved. Thus, in the winding device, the spun yarn can be stably wound.

[0018] According to further another aspect of the present invention, a yarn winding machine includes a plurality of the yarn winding units and a service carrier arranged to travel among the plurality of the yarn winding units. The service carrier includes a drive source adapted to move the contacting surface between the standby position and the yarn removal position.

[0019] By providing the drive source to the service carrier, an individual drive source is not required to be provided to each of the yarn winding units. Accordingly, the yarn winding machine can be configured at low cost.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020]

FIG. 1 is a front view illustrating an overall structure of a fine spinning machine according to an embodiment of the present invention;
FIG. 2 is a side view illustrating a spinning unit and a yarn joining carrier;
FIG. 3 is a perspective view illustrating a portion around a yarn accumulating device;
FIG. 4A is a front view illustrating the yarn accumulating device;
FIG. 4B is a side view illustrating the yarn accumulating device;
FIG. 5A is a front view illustrating a state in which a flyer is located in a yarn removal region;
FIG. 5B is a front view illustrating a state in which a spun yarn has been removed from the flyer by being pushed upward;
FIG. 6A is a front view illustrating a state in which the flyer is located in a yarn non-removal region;
FIG. 6B is a front view illustrating a state in which the spun yarn cannot be removed from the flyer even when pushed upward;
FIGS. 7A-7D are each a view illustrating a state in which the spun yarn is moved on a contacting surface of a yarn removal lever;
FIG. 8 is a plan view illustrating the yarn accumulating device;
FIG. 9 is a front view illustrating a shape of the yarn removal lever;
FIG. 10 is a side view illustrating yarn joining operation performed by the yarn joining carrier;
FIG. 11A is a plan view illustrating the yarn accumulating device of a comparative example; and
FIG. 11B is a front view illustrating a state in which the yarn is pushed upward in the yarn accumulating device of the comparative example.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0021] Next, a fine spinning machine (a yarn winding machine) according to an embodiment of the present invention will be described with reference to the accompanying drawings. A fine spinning machine 1 serving as the yarn winding machine illustrated in FIG. 1 includes a large number of spinning units (yarn winding units) 2 arranged side by side and a yarn joining carrier (a service carrier) 3. In the present specification, FIG. 4A and FIG. 4B, FIG. 5A and FIG. 5B, FIG. 6A and FIG. 6B, FIGS. 7A-7D, and FIG. 11A and FIG. 11B may be respectively referred to as simply FIG. 4, FIG. 5, FIG. 6, FIG. 7, and FIG. 11.

[0022] Each of the spinning units 2 includes a draft device 7, a spinning device 9, a yarn accumulating device

12, and a winding device 13 arranged in this order from upstream towards downstream. When wordings of "upstream" and "downstream" are simply used in the present specification, upstream and downstream in a running direction of a fiber bundle and a yarn at the time of spinning are respectively meant. Each spinning unit 2 is adapted to spin a fiber bundle 8, which is fed from the draft device 7, by the spinning device 9 to produce a spun yarn 10, and to wind the spun yarn 10 around a bobbin 48 by the winding device 13 to form a package 45.

[0023] The draft device 7 is adapted to produce the fiber bundle 8 by stretching a sliver 15. As illustrated in FIG. 2, the draft device 7 includes four pairs of rollers, which are a pair of back rollers 16, a pair of third rollers 17, a pair of middle rollers 19, and a pair of front rollers 20 arranged in this order from upstream. An apron belt 18 is provided to each roller of the pair of middle rollers 19.

[0024] The spinning device 9 is arranged immediately downstream of the front rollers 20. The fiber bundle 8 from the draft device 7 is fed to the spinning device 9. The spinning device 9 is adapted to apply twists to the fiber bundle 8 fed from the draft device 7 to produce the spun yarn 10. In the present embodiment, a pneumatic spinning device adapted to apply twists to the fiber bundle 8 by use of whirling airflow is used.

[0025] The winding device 13 is arranged downstream of the spinning device 9. The winding device 13 includes a cradle arm 71 supported swingably about a support shaft 73. The cradle arm 71 can support in a rotatable manner, a bobbin 48 around which the spun yarn 10 is wound.

[0026] The winding device 13 includes a winding drum 72 and a traverse device 75. The winding drum 72 is driven while being in contact with an outer peripheral surface of the bobbin 48 or an outer peripheral surface of the package 45. The traverse device 75 includes a traverse guide 76 capable of engaging with the spun yarn 10. The winding device 13 is adapted to drive the winding drum 72 by an electric motor (not illustrated) while reciprocating the traverse guide 76 by a drive device (not illustrated). Accordingly, the winding device 13 rotates the package 45 in contact with the winding drum 72 and winds the spun yarn 10 while traversing the spun yarn 10.

[0027] The yarn accumulating device 12 is arranged between the spinning device 9 and the winding device 13. As illustrated in FIG. 2, the yarn accumulating device 12 includes a yarn accumulating roller 21 and an electric motor 25 adapted to rotationally drive the yarn accumulating roller 21.

[0028] The yarn accumulating roller 21 is a roller-shaped member adapted to be rotationally driven under a state in which the spun yarn 10 is wound around an outer peripheral surface thereof. Accordingly, the running spun yarn 10 can be temporarily accumulated by being wound around the outer peripheral surface of the yarn accumulating roller 21. The yarn accumulating device 12 can function as a kind of a buffer by temporarily accumulating the spun yarn 10. Accordingly, a defect (for example, a slackening in the spun yarn 10) in a case in which a spinning speed in the spinning device 9 and a winding speed in the winding device 13 do not correspond to each other for some reason can be resolved.

[0029] A yarn clearer (a yarn quality measuring device) 52 is provided at a position between the spinning device 9 and the yarn accumulating device 12. The spun yarn 10 spun from the spinning device 9 passes the yarn clearer 52 before being wound by the yarn accumulating device 12. The yarn clearer 52 is adapted to monitor the running spun yarn 10 by an optical sensor (not illustrated), and to transmit a yarn defect detection signal to a unit controller (not illustrated) when detecting a yarn defect (a portion of the spun yarn 10 having an abnormality in thickness or the like) in the spun yarn 10. The yarn clearer 52 may be provided with a capacitance sensor and may detect a presence and/or an absence of a foreign substance in the spun yarn 10 as a yarn defect.

[0030] The yarn joining carrier 3 is capable of travelling in a direction in which the spinning units 2 are arranged (a left-right direction in FIG. 1). As illustrated in FIGS. 1 and 2, the yarn joining carrier 3 includes a splicer (a yarn joining device) 43 and a yarn catching members 44, 46. After a yarn cut or a yarn breakage has occurred in a spinning unit 2, the yarn joining carrier 3 travels to such a spinning unit 2. The yarn joining carrier 3 then sucks and catches yarn ends of the disconnected spun yarn 10 by the yarn catching members 44, 46 and guides the caught yarn ends to the splicer 43. The splicer 43 joins the guided yarn ends together (yarn joining operation). A state in which the yarn joining operation is being performed by the splicer 43 is illustrated in FIG. 10.

[0031] Next, a configuration of the yarn accumulating device 12 will be described in more detail with reference to FIGS. 2, 3, 4, and the like. As illustrated in FIGS. 2 and 3, the yarn accumulating device 12 includes a yarn hooking member 22, a downstream guide 26, a yarn removal lever (a yarn removal member) 28 in addition to the above-described yarn accumulating roller 21.

[0032] The yarn hooking member 22 is arranged at a downstream end 21a of the yarn accumulating roller 21. Since the spun yarn 10 runs while being wound around the yarn accumulating roller 21 in the yarn accumulating device 12, to be exact, the spun yarn 10 runs in a spiral manner. In the present specification, a wording of a "running direction of the spun yarn 10" used in a description relating to the yarn accumulating device 12 refers to a direction in which an element parallel to an axial line of the yarn accumulating roller 21 faces, among the running direction of the spun yarn 10 running in a spiral manner. In FIG. 4B, for example, the "running direction of the spun yarn 10" is leftward (a direction indicated by a thick arrow).

[0033] The yarn hooking member 22 includes a flyer shaft 33 and a flyer 38.

[0034] The flyer shaft 33 is arranged to be capable of relatively rotating with respect to the yarn accumulating roller 21 about a rotational axis of the yarn accumulating

roller 21 with a base-end portion as a center. A predetermined resistance torque is applied between the flyer shaft 33 and the rotational axis of the yarn accumulating roller 21. Thus, as long as a force that surpasses the resistance torque is not applied to the flyer shaft 33, the yarn hooking member 22 is integrally rotated with the yarn accumulating roller 21.

[0035] The flyer 38 is fixed at a tip end of the flyer shaft 33. The flyer 38 is formed into a shape by which the spun yarn 10 can be guided (hooked). More specifically, the flyer 38 is formed into a hook shape. As illustrated in FIG. 4A, when seen in a direction of the rotational axis of the yarn accumulating roller 21, a tip end 38a of the hook-shaped flyer 38 faces downstream in a rotational direction of the yarn accumulating roller 21.

[0036] As illustrated in FIG. 4B, when seen in a direction perpendicular to the rotational axis of the yarn accumulating roller 21, the tip end 38a of the hook-shaped flyer 38 faces upstream in the running direction of the spun yarn 10. In the present embodiment, the tip end 38a of the flyer 38 is located upstream of the downstream end 21a of the yarn accumulating roller 21.

[0037] By the flyer 38 formed in this manner, the running spun yarn 10 can be guided. Since the yarn hooking member 22 is integrally rotated with the yarn accumulating roller 21 under a state in which the spun yarn 10 has been guided to the flyer 38, the spun yarn 10 can be wound around the yarn accumulating roller 21.

[0038] When the force that surpasses the resistance torque is applied to the yarn hooking member 22, the yarn hooking member 22 is relatively rotated with respect to the yarn accumulating roller 21. Accordingly, since the flyer 38 guiding the spun yarn 10 is relatively rotated with respect to the yarn accumulating roller 21, the spun yarn 10 can be drawn from the downstream end 21a of the yarn accumulating roller 21.

[0039] The downstream guide 26 is arranged slightly downstream of the yarn accumulating roller 21. The downstream guide 26 is adapted to regulate a trajectory of the spun yarn 10 swung by the rotating flyer 38. Accordingly, the downstream guide 26 guides the spun yarn 10 while stabilizing a running path of the spun yarn 10 located downstream.

[0040] As illustrated in FIG. 3, the yarn removal lever 28 is formed as a substantially L-shaped member having an elongated contacting surface 30 arranged in a substantially horizontal direction. The yarn removal lever 28 of the present embodiment has a shape formed by cutting a metal plate member into a predetermined shape and appropriately folding the cut metal plate member. The contacting surface 30 is formed of an end surface portion of the metal plate member, and the contacting surface 30 is constant in width.

[0041] A base portion of the yarn removal lever 28 is supported by a swing shaft 29. By swinging with the swing shaft 29 as a center, the yarn removal lever 28 can move the contacting surface 30 between a standby position indicated by a solid line in FIG. 4 and a yarn removal position indicated by a chain line in FIG. 4. A direction in which the contacting surface 30 is moved from the standby position towards the yarn removal position is referred to as a "moving direction" of the contacting surface 30 (see FIG. 4).

[0042] As illustrated in FIG. 4B, the contacting surface 30 is arranged in proximity to the downstream end 21a of the yarn accumulating roller 21. When the contacting surface 30 is located at the standby position, the yarn removal lever 28 is in a state of not being in contact with a yarn path of the spun yarn 10. By swinging the yarn removal lever 28 from this state and moving the contacting surface 30 to the yarn removal position, the spun yarn 10 can be removed from the flyer 38. A state in which the spun yarn 10 is removed from the flyer 38 will be described later.

[0043] Since the yarn removal lever 28 is urged by a spring member (not illustrated), the contacting surface 30 is held at the standby position.

[0044] In the present embodiment, the yarn removal lever 28 is driven by a drive source (an air pressure cylinder 49 in the present embodiment) provided to the yarn joining carrier 3. As illustrated in Fig. 10, since the yarn joining carrier 3 advances a rod of the air pressure cylinder 49, the air pressure cylinder 49 pushes the yarn removal lever 28. Accordingly, the yarn removal lever 28 is swung, and the contacting surface 30 is moved from the standby position to the yarn removal position. Consequently, the spun yarn 10 can be removed from the flyer 38.

[0045] When the yarn joining carrier 3 causes the rod of the air pressure cylinder 49 to recede, the yarn removal lever 28 is swung to an original position by the urging force of the spring member, and the contacting surface 30 is returned to the standby position. Accordingly, the spun yarn 10 is guided to the flyer 38 again.

[0046] With the above-described configuration, since the yarn joining carrier 3 can appropriately control swing of the yarn removal lever 28 at the time of the yarn joining operation, the spun yarn 10 can be removed from the flyer 38 at any timing, and guiding of the spun yarn 10 by the flyer 38 can be started at any timing. Accordingly, the yarn joining carrier 3 can appropriately perform the yarn joining operation. Since control of the yarn removal lever 28 at the time of the yarn joining operation is publicly known as described in Patent Document 1, for example, detailed description is omitted.

[0047] In the present embodiment, as described above, the yarn joining carrier 3 includes the drive source (the air pressure cylinder 49) that swings the yarn removal lever 28. A drive source that swings the yarn removal lever 28 is thus not provided to each spinning unit 2. Accordingly, the spinning unit 2 can be configured at a low cost, and cost for the overall fine spinning machine 1 can be reduced.

[0048] Next, the state in which the spun yarn 10 is removed from the flyer 38 by the yarn removal lever 28 will be described.

[0049] When the yarn removal lever 28 is swung in the direction (the moving direction) in which the contacting surface 30 is moved from the standby position to the yarn removal position, the contacting surface 30 makes contact with the spun yarn 10 located downstream of the flyer 38 (the spun yarn 10 between the flyer 38 and the downstream guide 26). By further swinging the yarn removal lever 28 under the state in which the spun yarn 10 is being made in contact with the contacting surface 30, the spun yarn 10 can be moved towards the yarn removal position (an upper side in FIG. 4) by the contacting surface 30. In the following description, in consideration of understandability, moving the spun yarn 10 towards the yarn removal position may be simply described as "pushing the spun yarn 10 upward" (however, this wording is for convenience sake in the description, and there is no intention to limit a direction of moving the spun yarn 10 to an upper direction).

[0050] For example, in FIG. 5A, the tip end 38a of the flyer 38 is facing the yarn removal position (an upper side in a case of FIG. 5A) when seen in a direction of a rotational axis of the yarn hooking member 22. Thus, by swinging the yarn removal lever 28 to move the contacting surface 30 to the yarn removal position from this state and pushing the spun yarn 10 by the contacting surface 30, the spun yarn 10 can be removed from the flyer 38 (a state in FIG. 5B). In such a manner, when the tip end 38a of the flyer 38 is facing the yarn removal position (an upper side in a case of FIG. 5B), by swinging the yarn removal lever 28 and pushing the spun yarn 10 upward by the contacting surface 30, the spun yarn 10 can be removed from the flyer 38.

[0051] However, since the yarn hooking member 22 is rotating with the yarn accumulating roller 21, the flyer 38 is not always located at a position in FIG. 5. The tip end 38a of the flyer 38 thus faces various directions. For example, in FIG. 6A, the tip end 38a of the flyer 38 is facing the standby position (a lower side in a case of FIG. 6A) when seen in the rotational axis direction of the yarn hooking member 22. Under this state, even if the spun yarn 10 is pushed upward by the contacting surface 30, the spun yarn 10 cannot be removed from the flyer 38 (a state in FIG. 6B). For example, in FIG. 6B, in spite of pushing the spun yarn 10 upward by the contacting surface 30, the spun yarn 10 is still hooked on the flyer 38.

[0052] As illustrated in FIGS. 5 and 6, a plane that passes the rotational axis of the yarn hooking member 22 and is parallel to the moving direction of the contacting surface 30 (upward directions in FIGS. 5 and 6) is assumed to be a boundary plane A. Out of two regions partitioned by the boundary plane A when seen in the rotational axis direction of the yarn hooking member 22, one region is referred to as a yarn removal region, and one region is referred to as a yarn non-removal region. The yarn removal region is a region where the tip end 38a of the flyer 38 faces the yarn removal position (downstream in the moving direction of the contacting surface 30, that is the upper sides in FIGS. 5 and 6). The yarn non-removal region is a region where the tip end 38a of the flyer 38 faces the standby position (upstream in the moving direction of the contacting surface 30, that is the lower sides in FIGS. 5 and 6).

[0053] When the flyer 38 is located in the yarn removal region, the spun yarn 10 can be removed from the flyer 38 by being pushed upward by the contacting surface 30 (FIG. 5).

[0054] When the flyer 38 is located in the yarn non-removal region, the spun yarn 10 cannot be removed from the flyer 38 even if the spun yarn 10 is pushed upward by the contacting surface 30 (FIG. 6). However, as described above, since the yarn hooking member 22 is rotating with the yarn accumulating roller 21, the flyer 38 is always moving. Thus, wherever the flyer 38 is located, when the spun yarn 10 is pushed upward by the contacting surface 30, the spun yarn 10 can be eventually removed from the flyer 38. This state will be described with reference to FIG. 7.

[0055] As illustrated in FIG. 7A, when the spun yarn 10 is pushed upward by the contacting surface 30, in a case in which the flyer 38 is located in the yarn non-removal region, the spun yarn 10 is not removed from the flyer 38. In this case, the flyer 38 is sequentially moved as illustrated in FIGS. 7B and 7C accompanying rotation of the yarn hooking member 22 while guiding the spun yarn 10.

[0056] At this time, the spun yarn 10 is pulled towards the yarn removal region (a left side in FIG. 7) by the moving flyer 38. Consequently, as illustrated in FIGS. 7B, 7C, and 7D, the spun yarn 10 is moved from a first portion 31 towards a second portion 32 on the contacting surface 30.

[0057] Subsequently, the flyer 38 enters the yarn removal region while guiding the spun yarn 10 (FIG. 7D). Since the flyer 38 enters the yarn removal region, and thus the tip end 38a of the flyer 38 faces the yarn removal position (an upper side of FIG. 7), the spun yarn 10 is removed from the flyer 38 (FIG. 7D). As described above, even if the flyer 38 is located in the yarn non-removal region when the spun yarn 10 is pushed upward by the contacting surface 30, the spun yarn 10 can be eventually removed from the flyer 38.

[0058] Next, a characteristic configuration of the present embodiment will be described.

[0059] As illustrated in FIG. 5 and the like, out of the contacting surface 30, a portion with respect to the yarn non-removal region is referred to as the first portion 31, and a portion with respect to the yarn removal region is referred to as the second portion 32.

[0060] The second portion 32 is located downstream of the first portion 31 in the moving direction of the contacting surface 30 (a position close to the yarn removal position and close to an upper side in FIG. 5). Conversely, the first portion 31 is located upstream of the second portion 32 in the moving direction of the contacting surface 30 (a position close to the standby position and close to a lower side in FIG. 5).

[0061] Thus, when the contact surface 30 is moved to the yarn removal position, the second portion 32 can move the spun yarn 10 to a position higher than the first portion 31 can. "High" and "low" indicate a height in a case in which downstream (the upper sides in FIGS. 5 and 6) in the moving direction (the upper directions in FIGS. 5 and 6) of the contacting surface 30 is an upper side when seen in the rotational axis direction of the yarn accumulating roller 21 (this wording is for convenience sake in the description and there is no intention to limit the moving direction of the contacting surface 30 to an upper direction).

[0062] With the above-described configuration, a height to which the spun yarn 10 is pushed upward by the contacting surface 30 can be differed between when the flyer 38 is located in the yarn removal region and when the flyer 38 is located in the yarn non-removal region.

[0063] When the flyer 38 is located in the yarn removal region, the spun yarn 10 can be pushed upward to a relatively high position by the second portion 32 (see FIG. 5B). Accordingly, the spun yarn 10 can be reliably removed from the flyer 38.

[0064] When the flyer 38 is located in the yarn non-removal region, even if the spun yarn 10 is pushed upward to a high position, the spun yarn 10 cannot be removed from the flyer 38. If the spun yarn 10 is pushed upward to an excessively high position when the flyer 38 is located in the yarn non-removal region, behavior of the spun yarn 10 becomes unstable, causing a defect in which the spun yarn 10 is entangled with the yarn hooking member 22, for example.

[0065] As described above, the first portion 31 is located at a position lower than the second portion 32. Thus, when the flyer 38 is located in the yarn non-removal region, the spun yarn 10 is pushed upward merely to a relatively low position by the first portion 31 (see FIG. 6B). Accordingly, the spun yarn 10 is not pushed upward to an unnecessarily high position. Consequently, the behavior of the spun yarn 10 can be prevented from becoming unstable, and the defect in which the spun yarn 10 is entangled with the yarn hooking member 22, for example, can be prevented from occurring.

[0066] As illustrated in FIGS. 3, 4 and the like, the first portion 31 and the second portion 32 are smoothly continuous at the contacting surface 30 of the present embodiment. In other words, as a whole, the contacting surface 30 is formed in a curved-surface-shape (a curved shape) not to have an edge.

[0067] As illustrated in FIG. 7, when the flyer 38 is located in the yarn non-removal region, the spun yarn 10 is pushed upward by the first portion 31. The spun yarn 10 is moved towards the second portion 32 (the left side in FIG. 7) on the contacting surface 30 by being pulled by the rotating flyer 38. In the present embodiment, since the first portion 31 and the second portion 32 are smoothly continuous at the contacting surface 30, the spun yarn 10 can be smoothly moved towards the second portion 32 on the contacting surface 30. Thus, behavior of the spun yarn 10 can be prevented from becoming unstable when moving on the contacting surface 30. Accordingly, when the flyer 38 enters the yarn removal region, the spun yarn 10 can be reliably removed from the flyer 38 (FIG. 7D).

[0068] In the present embodiment, as illustrated in FIG. 8, under a state in which the contacting surface 30 has been moved to the yarn removal position, at least a portion of the second portion 32 is positioned upstream of the tip end 38a of the flyer 38 in the running direction of the spun yarn 10.

[0069] As described above, the flyer 38 is formed into the hook shape to be capable of hooking the spun yarn 10 thereon, and the tip end 38a of the flyer 38 faces upstream in the running direction of the spun yarn 10 (see FIGS. 4A and 8). Thus, in order to remove the spun yarn 10 from the flyer 38, the spun yarn 10 is required to be moved to a position upstream of the tip end 38a of the flyer 38 in the running direction of the spun yarn 10.

[0070] In the present embodiment, as described above, when the contacting surface 30 is moved to the yarn removal position, at least a portion of the second portion 32 is located upstream of the tip end 38a of the flyer 38 in the running direction of the spun yarn 10. Accordingly, the spun yarn 10 that has been pushed upward by the second portion 32 can be moved to a position upstream of the tip end 38a of the flyer 38 in the running direction of the spun yarn 10. Consequently, the spun yarn 10 can be reliably removed from the flyer 38.

[0071] In the present embodiment, as illustrated in FIG. 8, under the state in which the contacting surface 30 has been moved to the yarn removal position, at least a portion of the first portion 31 is located at a position downstream of the downstream end 21a of the yarn accumulating roller 21 in the running direction of the spun yarn 10.

[0072] A comparative example is illustrated in FIG. 11 to describe an effect thereof. As illustrated in FIG. 11A, in the comparative example, under the state in which the contacting surface 30 has been moved to the yarn removal position, all region of the first portion 31 is located upstream of the downstream end 21a of the yarn accumulating roller 21 in the running direction of the spun yarn 10.

[0073] In the comparative example in FIG. 11, when the spun yarn 10 is pushed upward by the first portion 31, the spun yarn 10 between the first portion 31 and the flyer 38 passes a position where the spun yarn 10 overlaps with an outer peripheral surface of the yarn accumulating roller 21 in a radial direction. Thus, under this state, the spun yarn 10 is wound around the yarn accumulating roller 21 by the rotating yarn hooking member 22 (a state illustrated in FIG. 11B) . In the comparative example of FIG. 11, since the spun yarn 10 is wound around the yarn accumulating roller 21 in some cases when the spun yarn 10 is pushed upward by the first portion 31, the spun yarn 10 may not be able to be removed from the flyer 38.

[0074] In the present embodiment, under the state in which the contacting surface 30 has been moved to the yarn removal position, at least a portion of the first portion 31 is located downstream of the downstream end 21a of the yarn accumulating roller 21 in the running direction of the spun yarn 10. Thus, in the present embodiment, when the spun yarn 10 is pushed upward by the first portion 31, the spun yarn 10 between the first portion 31 and the flyer 38 does not overlap with the yarn accumulating roller 21 in the radial direction. Accordingly, in the present embodiment, even if the yarn hooking member 22 is rotated under the state in which the spun yarn 10 is pushed upward by the first portion 31, the spun yarn 10 is not wound around the yarn accumulating roller 21 (see FIG. 7).

[0075] With the configuration of the present embodiment, the spun yarn 10 pushed upward by the contacting surface 30 can be prevented from being wound around the yarn accumulating roller 21. Accordingly, since a case in which the spun yarn 10 cannot be removed from the flyer 38 does not occur, the spun yarn 10 can be reliably removed from the flyer 38.

[0076] Since the spun yarn 10 is immediately removed from the flyer 38 when the spun yarn 10 is pushed upward by the second portion 32, the spun yarn 10 is not wound around the yarn accumulating roller 21. Thus, there is no problem even if the second portion 32 is located upstream of the downstream end 21a of the yarn accumulating roller 21 in the running direction of the spun yarn 10. In the present embodiment, as illustrated in FIG. 8, under the state in which the contacting surface 30 has been moved to the yarn removal position, all region of the second portion 32 is located upstream of the downstream end 21a of the yarn accumulating roller 21 in the running direction of the spun yarn 10.

[0077] As described above, in the present embodiment, by devising a shape of the yarn removal lever 28, reliability of yarn removal can be improved. Conversely, even if processing accuracy of the yarn removal lever 28 or driving accuracy of a configuration (the air pressure cylinder 49) for driving the yarn removal lever 28 is low, the reliability of the yarn removal can be sufficiently secured. With the configuration of the present embodiment, accuracy of the yarn removal lever 28 and the air pressure cylinder 49 is not required as much as before. Accordingly, the yarn removal lever 28 and/or the air pressure cylinder 49 can be configured at low cost, and cost for the overall fine spinning machine 1 can be reduced.

[0078] Next, a shape of the contacting surface 30 will be described in more detail.

[0079] As illustrated in FIG. 9, a distance between an upstream end of the first portion 31 and a downstream end of the second portion 32 in the moving direction of the contacting surface 30 (an upper direction in FIG. 9) is referred to as a distance L.

[0080] Since the present invention has a technical concept to improve reliability of removal of the spun yarn 10 from the flyer 38 by providing the second portion 32 to be higher than the first portion 31, an effect of the invention is not sufficiently achieved if the distance L is excessively small.

[0081] On the other hand, as described with reference to FIG. 7, when the spun yarn 10 is pushed upward by the first portion 31, the spun yarn 10 is moved from the first portion 31 towards the second portion 32 on the contacting surface 30 in some cases. From a viewpoint of smoothly moving the spun yarn 10 from the first portion 31 towards the second portion 32, the distance L should not be excessively large.

[0082] The distance L is preferably not excessively small nor excessively large. Based on consideration of the inventor of the present invention, the distance L is preferably at least 10 mm and at most 20 mm, and is preferably 15 mm in particular. In the present embodiment, thus, the distance L is 15 mm.

[0083] As described above, the yarn accumulating device 12 of the present embodiment includes the yarn accumulating roller 21, the yarn hooking member 22, and the yarn removal lever 28. The yarn accumulating roller 21 is rotated under the state in which the spun yarn 10 is wound around the peripheral surface thereof. The yarn hooking member 22 is capable of integrally rotating with the yarn accumulating roller 21, and includes the flyer 38 capable of guiding the spun yarn 10. The yarn removal lever 28 has the contacting surface 30 capable of making contact with the spun yarn 10. The yarn removal lever 28 is capable of moving the contacting surface 30 between the standby position and the yarn removal position and removes the spun yarn 10 from the yarn hooking member 22 by moving the contacting surface 30 to the yarn removal position. The contacting surface 30 includes the first portion 31 and the second portion 32. The first portion 31 is located upstream of the second portion 32 in the moving direction of the contacting surface 30. Under the state in which the contacting surface 30 has been moved to the yarn removal position, at least a portion of the first portion 31 is located downstream of the downstream end 21a of the yarn accumulating roller 21 in the running direction of the spun yarn 10.

[0084] The first portion 31 and the second portion 32 are located at different positions in the moving direction of the contacting surface 30, and are arranged at the contacting surface 30 of the yarn removal lever 28. Height to which the spun yarn 10 is pushed upward thus can be differed according to a position where the spun yarn 10 makes contact with the contacting surface 30. Accordingly, reliable yarn removal becomes possible. Furthermore, as described above, by arranging at least a portion of the first portion 31 to be located downstream of the downstream end 21a of the yarn accumulating roller 21, the spun yarn 10 pushed upward by the first portion 31 can be prevented from being wound around the yarn accumulating roller 21 again.

[0085] In the yarn accumulating device 12 of the present embodiment, the first portion 31 and the second portion 32 are smoothly continuous at the contacting sur-

face 30 of the yarn removal lever 28.

[0086] Accordingly, the spun yarn 10 that has made contact with the first portion 31 can be smoothly moved to the second portion 32. Thus, when the spun yarn 10 is moved from the first portion 31 towards the second portion 32 on the contacting surface 30, behavior of the spun yarn 10 can be prevented from becoming unstable.

[0087] In the yarn accumulating device 12 of the present embodiment, the first portion 31 is arranged with respect to the yarn non-removal region where the spun yarn 10 cannot be removed from the yarn hooking member 22, and the second portion 32 is arranged with respect to the yarn removal region where the spun yarn 10 can be removed from the yarn hooking member 22.

[0088] As described above, by arranging the first portion 31 with respect to the yarn non-removal region, a position to which the spun yarn 10 is pushed upward can be set low in the region where the spun yarn 10 cannot be removed. Accordingly, the spun yarn 10 can be prevented from being unnecessarily moved a large distance and thus becoming unstable, and a defect such as an entanglement of the spun yarn 10 can be prevented. By arranging the second portion 32 with respect to the yarn removal region, the position to which the spun yarn 10 is pushed upward can be set high in the region where the spun yarn 10 can be removed. Accordingly, the spun yarn 10 can be reliably removed from the yarn hooking member 22.

[0089] In the yarn accumulating device 12 of the present embodiment, the contacting surface 30 is arranged to not make contact with the spun yarn 10 when located at the standby position. The contacting surface 30 makes contact with the spun yarn 10 by being moved from the standby position to the yarn removal position.

[0090] By arranging the contacting surface 30 to not make contact with the spun yarn 10 at the standby position, the yarn removal lever 28 does not influence running of the spun yarn 10. By moving the contacting surface 30 from the standby position to the yarn removal position, the spun yarn 10 can be pushed upward by the contacting surface 30.

[0091] In the yarn accumulating device 12 of the present embodiment, the distance L between the upstream end of the first portion 31 and the downstream end of the second portion 32 in the moving direction of the contacting surface 30 is 15 mm.

[0092] The spinning unit 2 of the present embodiment includes the yarn accumulating device 12, the draft device 7 that supplies the fiber bundle 8, the spinning device 9 that applies twists to the fiber bundle 8 and to produce the spun yarn 10, and the winding device 13 that winds the spun yarn 10. The yarn accumulating device 12 temporarily accumulates the spun yarn 10 between the spinning device 9 and the winding device 13.

[0093] The fine spinning machine 1 of the present embodiment includes a plurality of the spinning units 2 and the yarn joining carrier 3 that travels among the plurality of the spinning units 2. The yarn joining carrier 3 includes the drive source (the air pressure cylinder 49) that moves the contacting surface 30 between the standby position and the yarn removal position.

[0094] The preferred embodiment of the present invention has been described, but the above-described configuration may be modified as follows, for example.

[0095] In the above-described embodiment, since the yarn removal lever 28 is formed of a metal plate member, the width of the contacting surface 30 is constant. However, the yarn removal lever 28 may be formed by an appropriate member without being limited to the metal plate member. In this case, the width of the contacting surface 30 is not required to be constant.

[0096] A shape of a yarn removal member (the yarn removal lever 28) is not limited to a shape illustrated in the drawings. In the yarn removal member of the present invention, in particular, a feature in which the contacting surface 30 that makes contact with the spun yarn 10 includes the first portion 31 and the second portion 32 that is located higher than the first portion 31 is essential, and shapes of the other portions are not limited and may be appropriately modified.

[0097] In the above-described embodiment, the yarn removal lever 28 is swung with the swing shaft 29 as a center. The contacting surface 30 is thus moved in an arc shape. However, the moving direction of the contacting surface 30 is not limited thereto, and the contacting surface 30 may be moved in a linear manner, for example.

[0098] As illustrated in FIG. 4A, in the above-described embodiment, the yarn accumulating roller 21 is driven and rotated in a clockwise direction when seen from downstream, but may be driven and rotated in a counterclockwise direction. However, in this case, a direction in which the tip end 38a of the flyer 38 faces is opposite to a direction of the tip end 38 illustrated in FIG. 4A. Thus, in this case, the shape of the yarn removal lever 28 is also opposite to a shape of the yarn removal lever 28 illustrated in FIG. 4A in a left-right direction.

[0099] The configuration of the spinning unit 2 may be appropriately modified. For example, a pair of delivery rollers adapted to transport the spun yarn 10 by being rotationally driven with the spun yarn 10 therebetween may be provided between the spinning device 9 and the yarn accumulating device 12.

[0100] In the above described embodiment, the drive source (the air pressure cylinder 49) that moves the contacting surface 30 of the yarn removal lever 28 is provided to the yarn joining carrier (the service carrier) 3, but the drive source may be provided to each spinning unit 2 in place of or in addition to such a configuration.

[0101] In the above-described embodiment, a service carrier to which the drive source is provided is the yarn joining carrier 3. However, the drive source may be provided to another type of service carrier that travels among a plurality of yarn winding units. For example, in place of or in addition to the yarn joining carrier 3 of the above-described embodiment, a doffing carrier may be provided

to a yarn winding machine, and the drive source may be provided to the doffing carrier. The doffing carrier is a service carrier adapted, when a package 45 is completed in the winding device 13 of a certain yarn winding unit, to remove the package 45 from the winding device 13 and to supply a new (empty) bobbin 48 to the winding device 13.

[0102] A yarn accumulating device of the present invention may be applied to another type of textile machine in which a yarn is required to be temporarily accumulated, without limited to a spinning unit.

[0103] A "yarn" accumulated by the yarn accumulating device of the present invention is not limited to a spun yarn in particular and widely includes a thread such as a rove, for example.

[0104] The yarn joining carrier 3 and/or the doffing carrier may be arranged in plurality in accordance with the number of the spinning units 2.

Claims

1. A yarn accumulating device (12) comprising:

a yarn accumulating roller (21) arranged to rotate under a state in which a running yarn (10) is wound around a peripheral surface thereof;
a yarn hooking member (22) arranged capable of integrally rotating with the yarn accumulating roller (21) and adapted to guide the yarn (10); and
a yarn removal member (28) having a contacting surface (30), the contacting surface (30) being arranged movable between a standby position and a yarn removal position and being adapted to be capable of making contact with the yarn (10), the yarn removable member (28) being adapted to remove the yarn (10) from the yarn hooking member (22) by moving the contacting surface (30) to the yarn removal position,
wherein the contacting surface (30) includes a first portion (31) and a second portion (32),
in a direction in which the contacting surface (30) moves from the standby position towards the yarn removal position, the first portion (31) is located upstream of the second portion (32), and under a state in which the contacting surface (30) has been moved to the yarn removal position, at least a portion of the first portion (31) is located downstream of the yarn accumulating roller (21) in a running direction of the yarn (10).

2. The yarn accumulating device (12) according to claim 1, wherein the first portion (31) and the second portion (32) are smoothly continuous at the contacting surface (30) of the yarn removal member (28).

3. The yarn accumulating device (12) according to claim 1 or claim 2,
wherein the first portion (31) is arranged with respect to a yarn non-removal region where the yarn (10) cannot be removed from the yarn hooking member (22), and
the second portion (32) is arranged with respect to a yarn removal region where the yarn (10) can be removed from the yarn hooking member (22).

4. The yarn accumulating device (12) according to any one of claim 1 through claim 3, wherein the contacting surface (30) is arranged to not make contact with the yarn (10) when located at the standby position, and
the contacting surface (30) is adapted to make contact with the yarn (10) by being moved from the standby position to the yarn removal position.

5. The yarn accumulating device (12) according to any one of claim 1 through claim 4, wherein in the direction in which the contacting surface (30) moves from the standby position towards the yarn removal position, a distance (L) between an upstream end of the first portion (31) and a downstream end of the second portion (32) is at least 10 mm and at most 20 mm.

6. A yarn winding unit (2) comprising:

the yarn accumulating device (12) according to any one of claim 1 through claim 5;
a draft device (7) adapted to supply a fiber bundle (8);
a spinning device (9) adapted to apply twists to the fiber bundle (8) and to produce a spun yarn (10); and
a winding device (13) adapted to wind the spun yarn (10),
wherein the yarn accumulating device (12) is adapted to temporarily accumulate the spun yarn (10) between the spinning device (9) and the winding device (13).

7. A yarn winding machine (1) comprising:

a plurality of the yarn winding units (2) according to claim 6; and
a service carrier (3) arranged to travel among the plurality of the yarn winding units (2), the service carrier (3) including a drive source (49) adapted to move the contacting surface (30) between the standby position and the yarn removal position.

FIG. 1

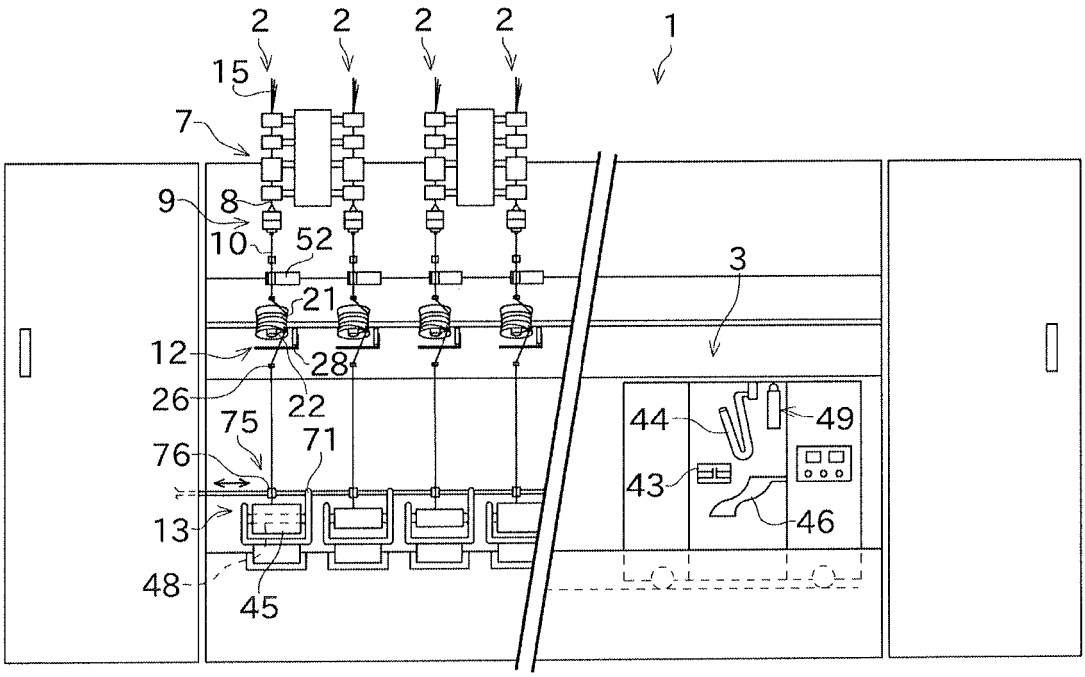


FIG. 2

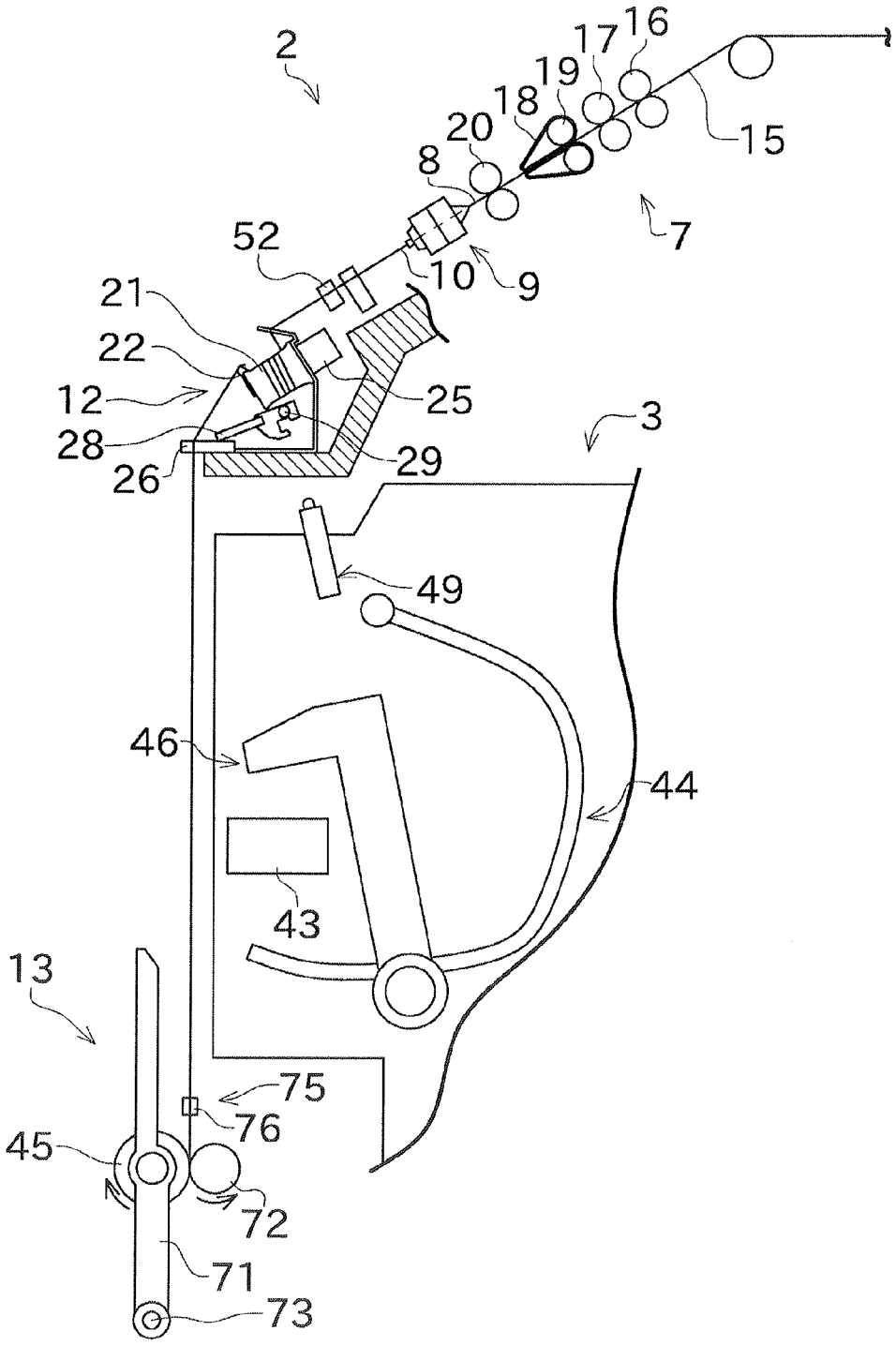

2
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10
9
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FIG. 3

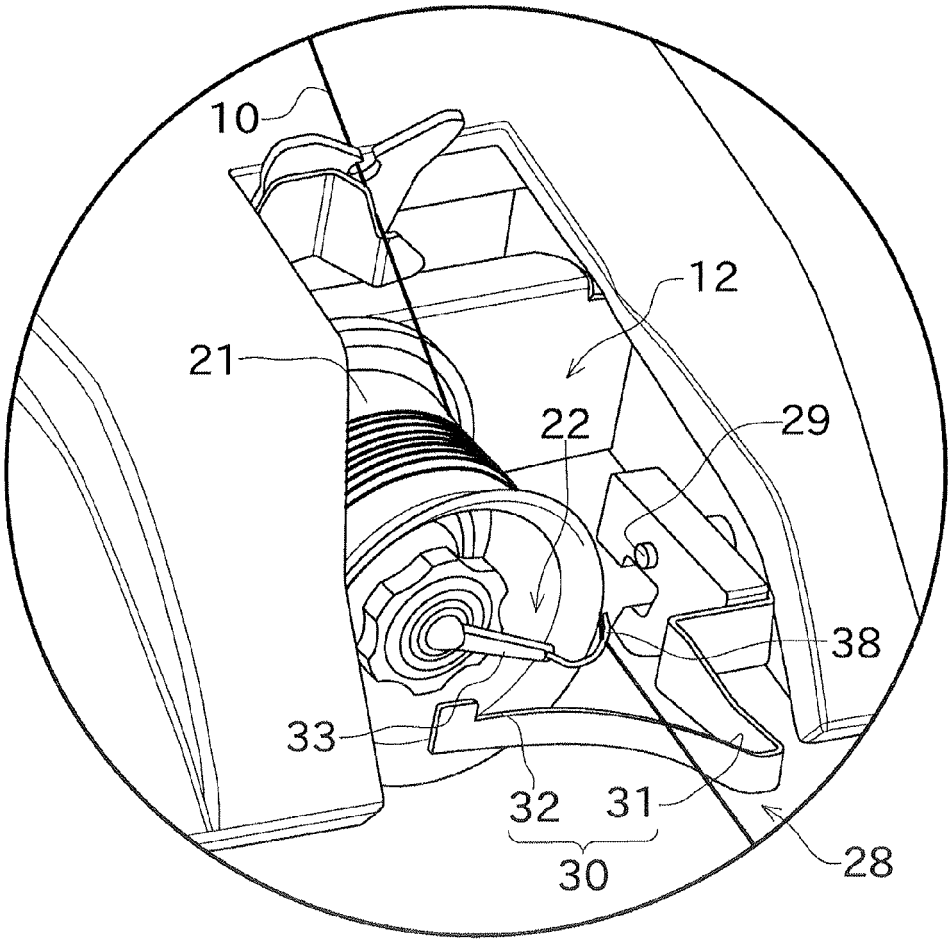


FIG. 4A

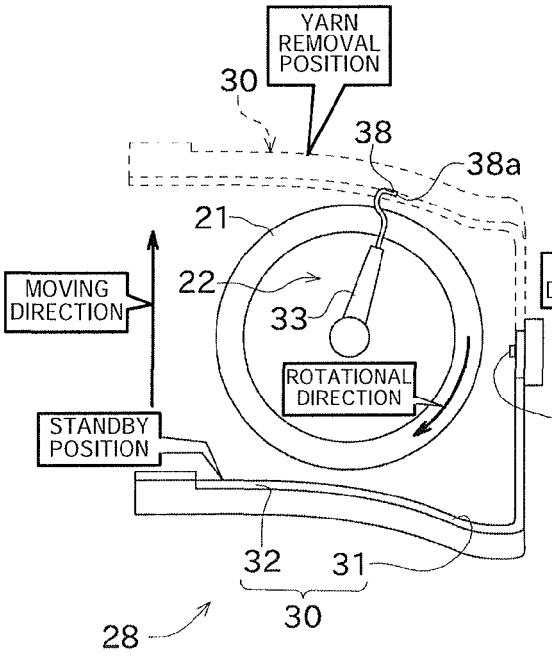

YARN REMOVAL POSITION
30
38
38a
21
22
33
MOVING DIRECTION
ROTATIONAL DIRECTION
STANDBY POSITION
29
32
31
30
28

FIG. 4B

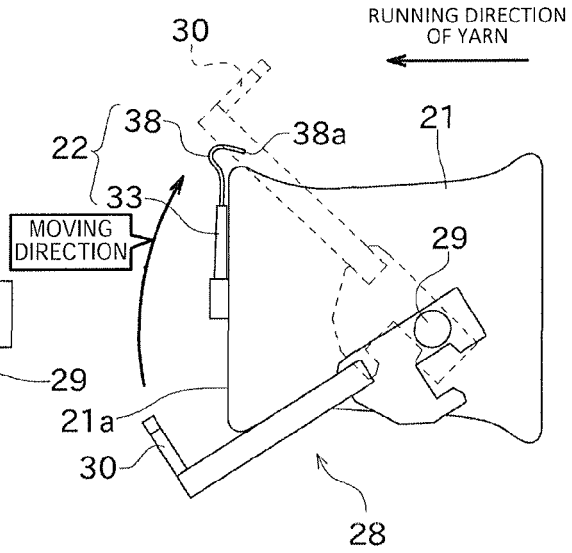

RUNNING DIRECTION OF YARN
30
38
38a
21
22
33
MOVING DIRECTION
29
21a
30
28

FIG. 5A

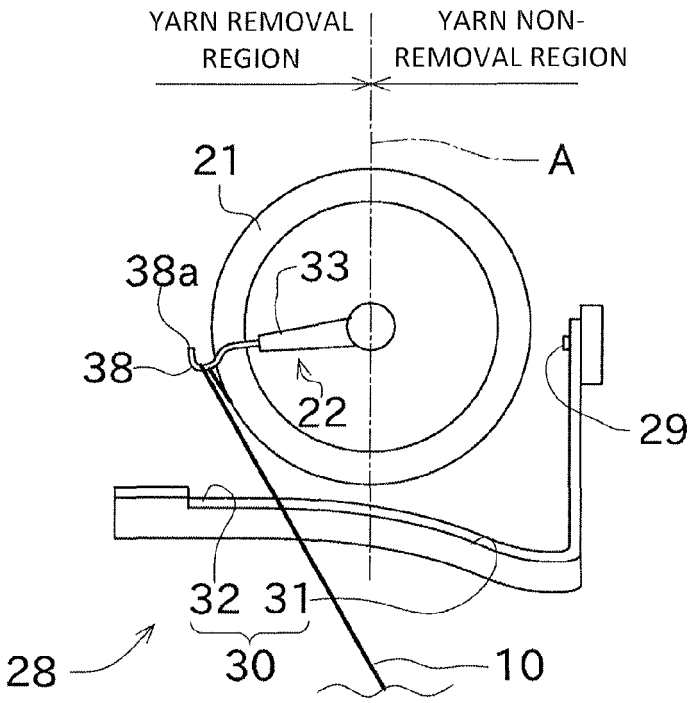

YARN REMOVAL REGION
YARN NON-REMOVAL REGION
A
21
38a
33
38
22
29
32
31
30
28
10

FIG. 5B

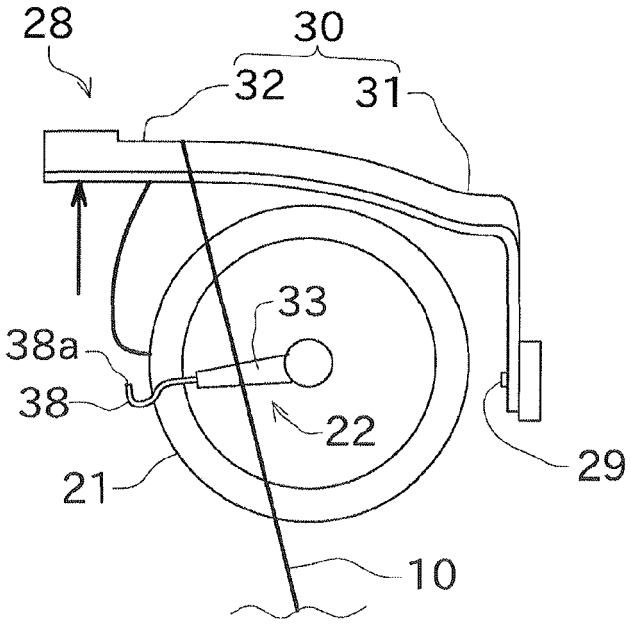

28
30
32
31
33
38a
38
22
29
21
10

FIG. 6A

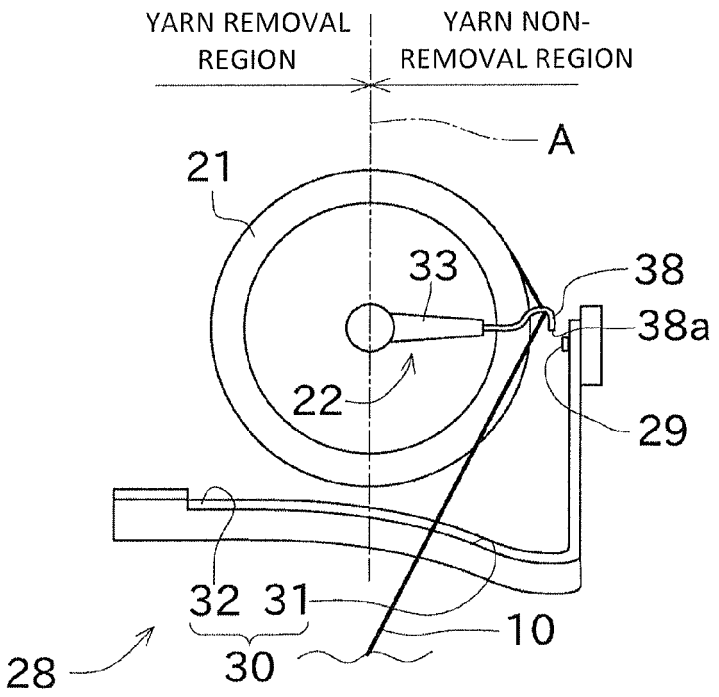

YARN REMOVAL REGION
YARN NON-REMOVAL REGION
A
21
33
38
38a
22
29
32
31
10
28
30

FIG. 6B

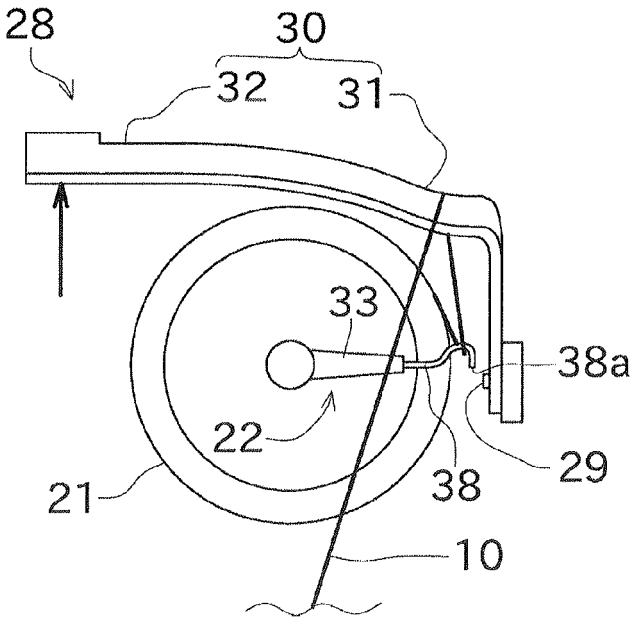

28
30
32
31
33
38a
22
29
21
38
10

FIG. 7A

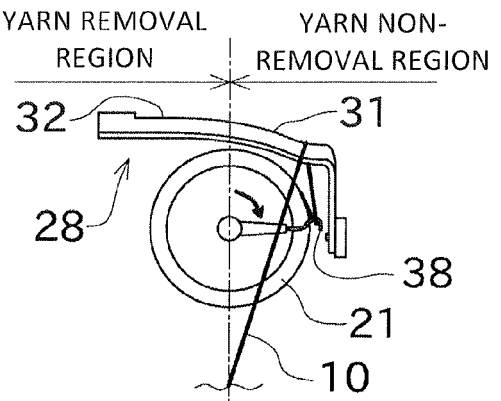


FIG. 7B

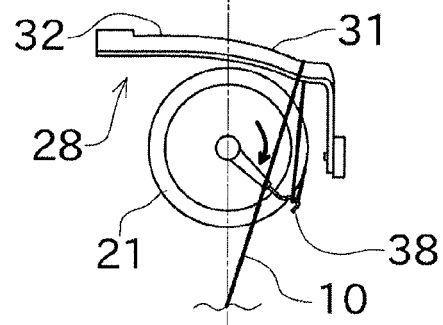


FIG. 7C

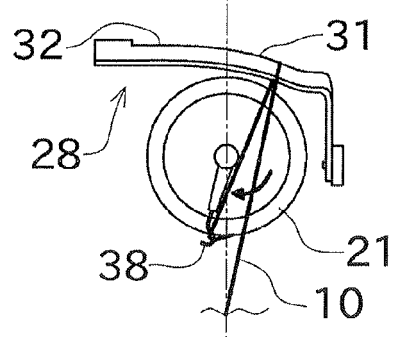


FIG. 7D

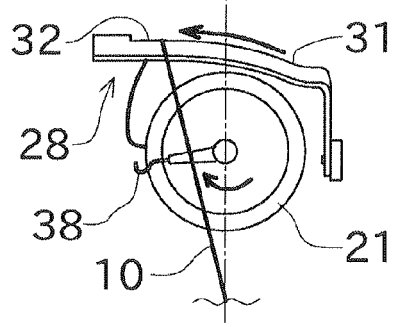


FIG. 8

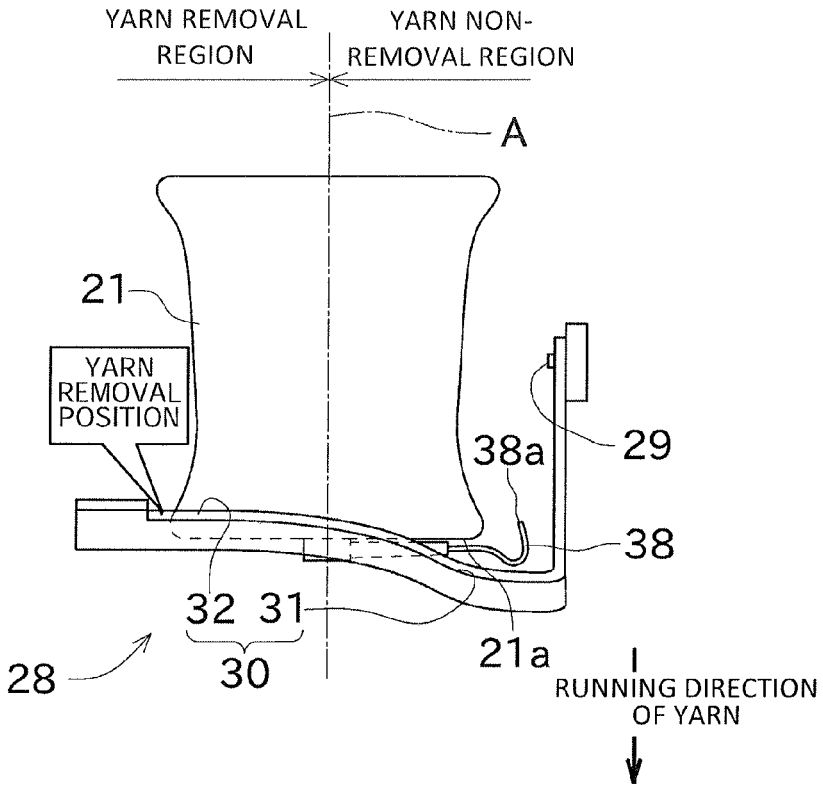

YARN REMOVAL REGION
YARN NON-REMOVAL REGION
A
21
YARN REMOVAL POSITION
38a
29
38
32 31
30
28
21a
RUNNING DIRECTION OF YARN

FIG. 9

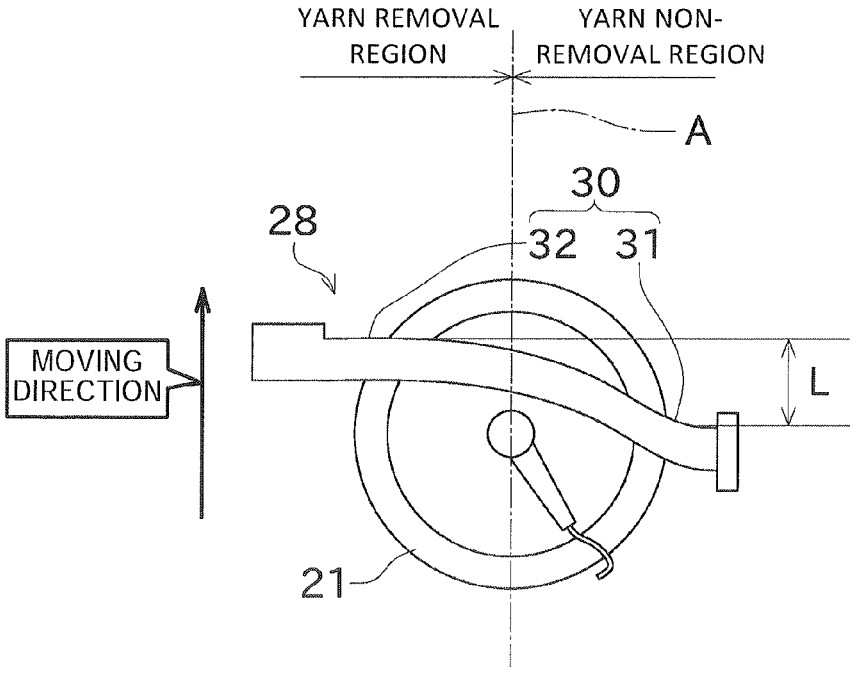
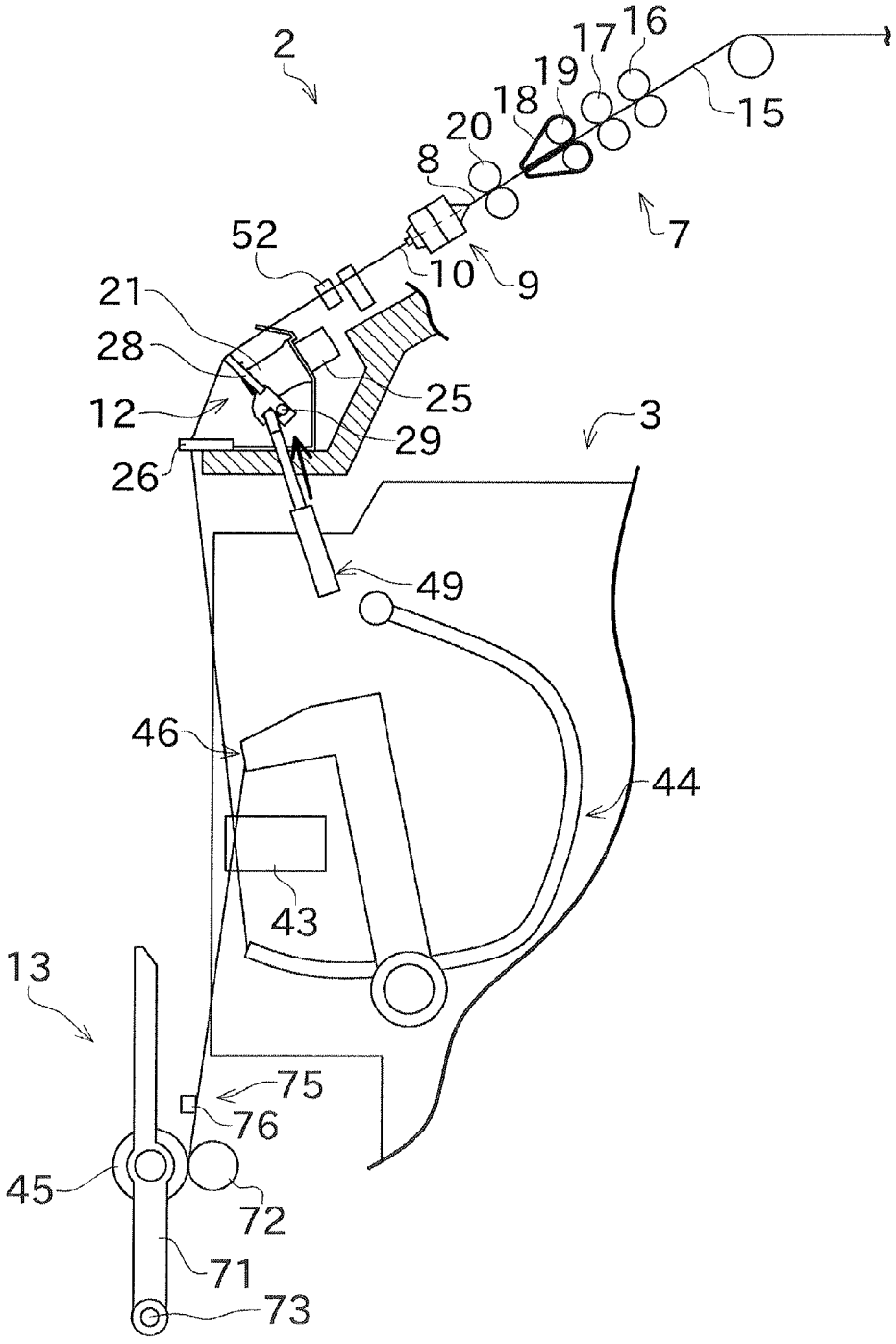

YARN REMOVAL REGION
YARN NON-REMOVAL REGION
A
30
28
32 31
MOVING DIRECTION
L
21

FIG. 10


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COMPARATIVE EXAMPLE

FIG. 11A

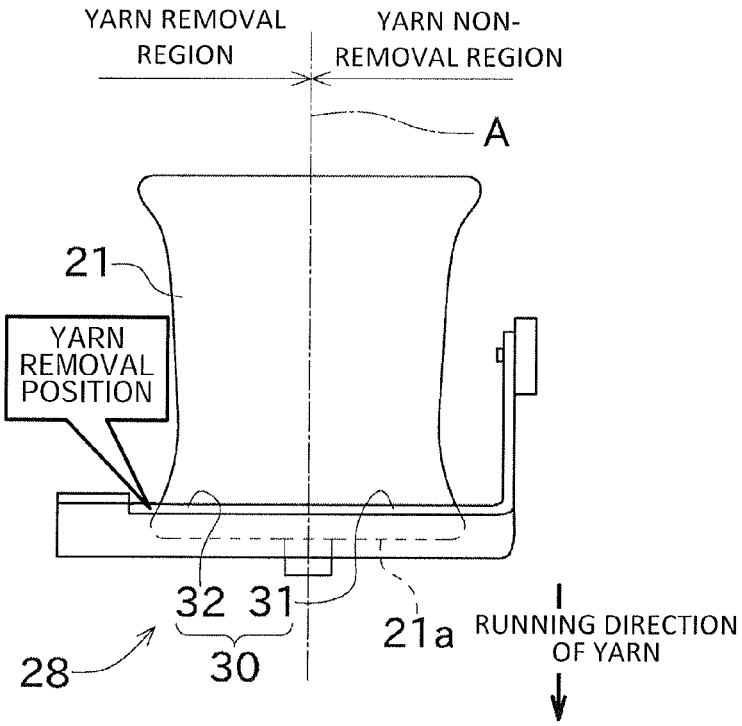
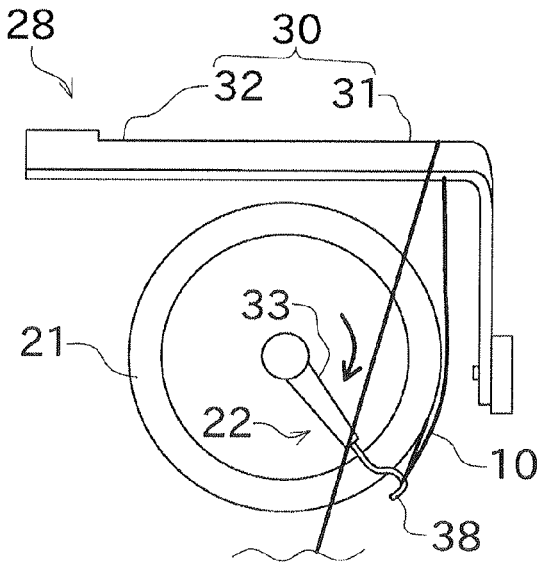


FIG. 11B



Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 15 15 3002

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 2 573 217 A2 (MURATA MACHINERY LTD [JP]) 27 March 2013 (2013-03-27) * paragraphs [0048], [0049]; figure 5 * -----	1-7	INV. B65H51/22
A	EP 2 213 773 A1 (MURATA MACHINERY LTD [JP]) 4 August 2010 (2010-08-04) * paragraph [0055]; figure 3 * -----	1-7	
A	EP 1 407 995 A2 (MURATA MACHINERY LTD [JP]) 14 April 2004 (2004-04-14) * paragraphs [0023] - [0027]; figures 4-6 * -----	1-7	

TECHNICAL FIELDS SEARCHED (IPC)

B65H
D01H
D03D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	24 June 2015	Pussemier, Bart

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 15 15 3002

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24-06-2015

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

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