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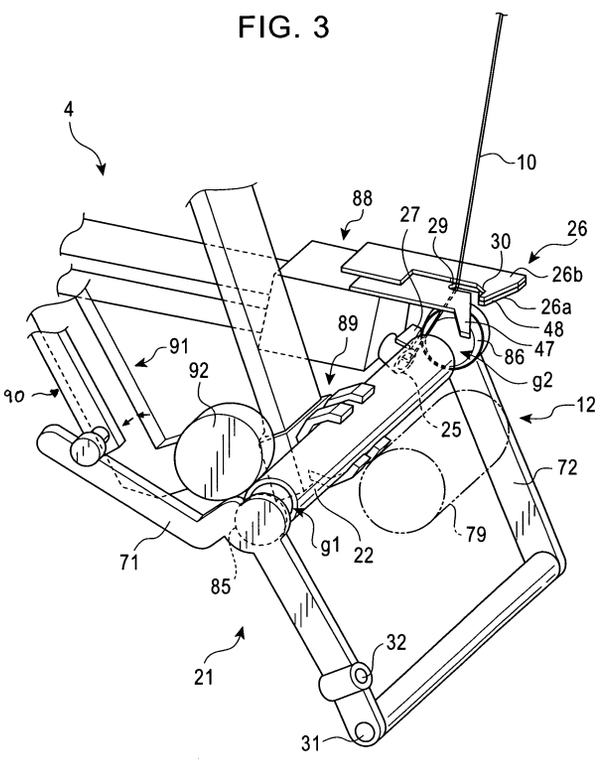
(54) Method for winding a thread reserve on an empty bobbin and spinning machine comprising a device for carrying out said method

(57) The present invention provides a bunch winding method of catching a spun yarn end of a continuously fed spun yarn 10 and executing bunch winding on an empty bobbin 22, in which the bunch winding is unlikely to fail. A chucker 89 holds the empty bobbin 22 so that a gap (g2) is formed between one end of the empty bobbin 22 and a bobbin holder 86. In this state, a suction pipe 88 in which the end of the continuously fed spun yarn 10 sucked and caught is used to guide the spun yarn 10 to an interior of the gap (g2). Then, in this state, a cradle operating arm 90 allows the empty bobbin 22 to be sandwiched between bobbin holders 85, 86 to sandwich the spun yarn 10 between one end of the empty bobbin 22 and the bobbin holder 86 to nip the spun yarn 10. In this state, the empty bobbin 22 is rotated to form a straight winding on the empty bobbin 22.

FIG. 3



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Description

Field of the Invention

[0001] The present invention relates to a bunch winding method of executing bunch winding on an empty bobbin in an initial stage in which a package is formed by winding a yarn around an empty bobbin. The present invention also relates to a spinning machine comprising a device that executes such bunch winding.

Background of the Invention

[0002] The Examined Japanese Utility Model Application Publication (Jikko-Hei) No. 6-38043 (p.2, right column, line 42~) discloses an example of a bunch winding method such as the one described above. With this method, as shown in Figures 4 and 5 of the Examined Japanese Utility Model Application Publication (Jikko-Hei) No. 6-38043, a notch-like hook is formed in an outer peripheral edge of one of bobbin holders that sandwich the ends of a cylindrical bobbin (paper tube) between them. A yarn handling member or the like is used to bias the yarn toward one end of the empty bobbin. Then, in this state, the empty bobbin is rotated to lock the yarn in the hook to nip a yarn end. Subsequently, bunch winding is executed.

[0003] However, when the yarn end is simply locked in the hook as disclosed in the Examined Japanese Utility Model Application Publication (Jikko-Hei) No. 6-38043, it is undeniable that the locking force of the hook is weak. Accordingly, a part of the yarn end which is outside its part locked in the hook is swung as the empty bobbin rotates. A centrifugal force thus acts on the yarn to cause it to slip out of the hook. As a result, the bunch winding fails. Such a failure has often occurred.

[0004] The present invention is provided in view of these circumstances. It is an object of the present invention to provide a bunch winding method which executes appropriate bunch winding to reduce the number of failures. It is another object of the present invention to provide a spinning machine comprising a bunch winding device having a reduced rate at which such a failure occurs.

Summary of the Invention

[0005] A description has been given of the problems to be solved by the present invention. Now, the description will be given of means for solving the problems and the effects of the means.

[0006] A first aspect of the present invention provides a bunch winding method such as the one described below. An empty bobbin is held so that a gap is formed between, at least one end of the empty bobbin and one of the bobbin holders. In this state, sucking and catching means for sucking and catching a continuously fed spun yarn end is used to guide the spun yarn to an interior of the gap. The bobbin holders are allowed to sandwich the empty bobbin between the bobbin holders to sandwich the spun yarn between one end of the empty bobbin and one of the bobbin holders to nip the spun yarn. In this state, the empty bobbin is rotated to form a bunch winding at a predetermined position of the empty bobbin.

[0007] The spun yarn can be strongly nipped at one end of the empty bobbin by employing a method of forming a gap between one end of the empty bobbin and one of the bobbin holders, and guiding the spun yarn to the interior of the gap to sandwich it between one end of the empty bobbin and one of the bobbin holders in an axial direction. This serves to avoid a failure in which the spun yarn is insufficiently fixed and thus slips off during bunch winding as in the case of the prior art. Moreover, although the spun yarn is continuously fed from the upstream side, the above configuration can use the sucking and catching means to suck and collect the spun yarn without slacking it. Consequently, the spun yarn can be appropriately guided to the interior of the gap.

[0008] According to the bunch winding method, a bunch guide that regulates a yarn path of the continuously fed spun yarn preferably guides the spun yarn to the interior of the gap between a catching section of the sucking and catching means and the bunch guide.

[0009] Thus, the bunch guide can steadily and reliably guide the continuously fed yarn to the interior of the gap.

[0010] A second aspect of the present invention provides a spinning machine configured as described below. The spinning machine comprises a bunch winding device that executes bunch winding on an empty bobbin supported by bobbin holders as a bobbin support section. The bunch winding device comprises operating means for operating the bobbin holders so that a gap is formed between one end of the empty bobbin and one of the bobbin holders, and sucking and catching means for catching a continuously spun yarn end to guide the spun yarn to an interior of the gap. The operating means operates the bobbin holders to eliminate the gap while the spun yarn is being guided by the sucking and catching means to the interior of the gap, to sandwich the spun yarn between one end of the empty bobbin and one of the bobbin holders to nip the spun yarn. In this state, the empty bobbin is rotated to form a bunch winding at a predetermined position of the empty bobbin.

[0011] The spun yarn can be strongly nipped at the end of the empty bobbin by employing a method of using the operating means to form a gap between one end of the empty bobbin and one of the bobbin holders, and guide the spun yarn to the interior of the gap and further using the operating means eliminate the gap to sandwich the spun yarn between one end of the empty bobbin and one of the bobbin holders in an axial direction. This serves to avoid a failure in which the spun yarn is insufficiently fixed and thus slips off during bunch winding as in the case of the prior art. Moreover, although

the spun yarn is continuously fed from the upstream side, the above configuration can use the sucking and catching means to suck and collect the spun yarn without slacking it. Consequently, the spun yarn can be appropriately guided to the interior of the gap.

[0012] In the spinning machine, the bunch winding device comprises a bunch guide that regulates a yarn path of the continuously fed spun yarn, and the bunch guide is placed, in a direction along the yarn path, at a position where the gap is sandwiched between the bunch guide and a yarn catching section of the sucking and catching means.

[0013] Thus, the bunch guide can steadily and reliably guide the continuously fed spun yarn to the interior of the gap.

[0014] In the spinning machine, the bunch guide has a bunch feeding surface along which the spun yarn is guided and fed to a position slightly closer to a center of the empty bobbin than the end of the empty bobbin when the empty bobbin is rotated for bunch winding.

[0015] Thus, during bunch winding, the spun yarn is naturally guided along the bunch feeding surface. As a result, a bunch winding can be formed at an appropriate position slightly closer to the center of the empty bobbin than one end of the empty bobbin.

[0016] In the spinning machine, the bunch guide is attached to the sucking and catching means.

[0017] This makes it possible to realize a simple configuration that steadily guides the continuously fed spun yarn.

[0018] In the spinning machine, the sucking and catching means is provided with a yarn cutting blade.

[0019] Thus, an extra spun yarn end can be cut near an area in which the spun yarn is sandwiched between the empty bobbin and the bobbin holder. This makes it possible to avoid a trouble such that during bunch winding, an extra spun yarn is freely swung and entangled with other members.

Brief Description of the Drawings

[0020]

Figure 1 is a vertical side view of a spinning machine according to an embodiment of the present invention.

Figure 2 is an enlarged view of a tip portion of a suction pipe as viewed from the direction of arrow A in Figure 1.

Figure 3 is a perspective view of a bunch winding device showing that the yarn end of a spun yarn has been guided to the gap between one end of an empty bobbin and one of bobbin holders.

Figure 4 is a perspective view showing that in the state shown in Figure 3, the gap is eliminated to sandwich the yarn between one end of the empty bobbin and one of the bobbin holders.

Figure 5 is a perspective view showing that the empty bobbin is rotated to form a bunch winding.

Figure 6 is a view showing that while a bunch winding is being formed, the spun yarn is fed to a position slightly closer to the center of the empty bobbin than ends of the empty bobbin.

Figure 7 is an enlarged view of an essential part of the present invention showing a bunch winding portion of a package.

Detailed Description of the Preferred Embodiments

[0021] A preferred embodiment of the present invention will be described below with reference to the accompanying drawings. Figure 1 is a vertical side view of a spinning machine according to an embodiment of the present invention. Figure 2 is an enlarged view of a tip portion of a suction pipe as viewed from the direction of arrow A in Figure 1. Figure 3 is a perspective view of a bunch winding device showing that a yarn end has been guided to the gap between one end of an emoty bobbin and one of bobbin holders.

[0022] Figure 1 shows a spinning machine 1 comprising a spinning unit 2. As shown in Figure 1, the spinning unit 2 is mainly composed of a draft device 7, a spinning member 9, a yarn feeding device 11, and a winding device 12. The draft device 7 is provided in an upper part of a main body of the spinning machine 1.

[0023] The spinning member 9 spins a fiber bundle 8 fed by the draft device 7. The yarn feeding device 11 feeds a spun yarn 10 downward which is discharged by the spinning member 9. The winding device 12 then winds the spun yarn 10 to form a package 45.

[0024] As shown in Figure 1, the draft device 7 draws a sliver 13 to form the fiber bundle 8. The draft device 7 is composed of four rollers including a back roller 14, a third roller 15, a middle roller 17 around which an apron belt 16 is extended, and a front roller 18.

[0025] Further, the yarn feeding device 11 is composed of a delivery roller 39 supported on the main body of the spinning machine 1 and a nip roller 40 that freely contacts with and separates from the delivery roller 39. The spun yarn 10 discharged from the spinning member 9 is fed to the winding device 12 by rotatively driving the delivery roller 39 with the spun yarn 10 sandwiched between the delivery roller 39 and the nip roller 40.

[0026] The winding device 12, including a bobbin support section, mainly comprises a first arm 71 and a second arm 72 which rotatably support a cylindrical bobbin 22 serving as a core material of a package 45 and a driving drum 79 that rotatively drives the empty bobbin 22, as shown in Figure 3. The first arm 71 and the second arm 72 constitute a cradle that holds the empty bobbin 22. The empty bobbin 22 includes a cylindrical cheese-winding bobbin and a truncated cone-shaped cone-winding bobbin having a larger diameter side and a smaller diameter side. The present invention is applicable to either case.

[0027] As shown in Figure 3, lower ends of the two

arms 71, 72 are pivoted to the spinning machine 1 via a first hinge 31. The arms 71, 72 can be rotatively moved so as to be laid down toward the front of the spinning machine 1 (the left of Figures 1 and 3). Urging springs (not shown in the drawings) are elastically attached to the arms 71, 72 to exert an urging force on the arms 71, 72, and the urging forces acts in a direction in which the arms 71, 72 stand up.

[0028] Bobbin holders 85, 86 holding the ends of a cylindrical bobbin 22 are rotatably provided at the tips of the arms 71, 72, respectively, and opposite each other. Accordingly, while the empty bobbin 22 is held between the bobbin holders 85, 86, when the empty bobbin 22 is contacted with the driving drum 79 and in this state, the driving drum 79 is rotatively driven, the spun yarn 10 can be wound by rotating the empty bobbin 22. At this time, both bobbin holders 85, 86 rotate integrally with the empty bobbin 22.

[0029] As shown in Figure 3, a lower end of the first arm 71 is pivoted via a second hinge 32. The lower end of the first arm 71 can be rotatively moved so as to be laid down in a direction in which the lower end moves away from the second arm 72, which is opposite the first arm 71. Thus rotatively moving the first arm 71 enables a full package 45 (shown by a chain line in Figure 1) to be removed from the winding device 12 and enables the empty bobbin 22 to be installed on the winding device 12. A return spring (not shown in the drawings) is elastically attached to the first arm 71 to exert an urging force on the first arm 71, and the urging force acts in a direction in which the first arm 71 nears the second arm 72.

[0030] As shown in Figure 1, the spinning machine 1 according to the present embodiment has a bunch winding device 4. The bunch winding device 4 has a casing 80 comprising a suction pipe 88, a chucker 89, a cradle operating arm 90, and a bunch winding driving arm 91. The suction pipe (sucking and catching means) 88 can be freely laid or raised and expanded or contracted to catch a yarn end continuously discharged from the spinning member 9 while sucking it and guide it to the winding device 12. The chucker 89 is rotatively movable to supply the empty bobbin 22 to the winding device 12. The cradle operating arm 90 (operating means) is rotatively movable to operate the tip of the first arm 71 of the winding device 12. Moreover, the bunch winding driving arm 91 is rotatively movable to allow bunch winding to be executed to start winding the spun yarn 10 around the empty bobbin 22.

[0031] A suction port (catching section) 25 is formed below the tip of the suction pipe 88 to suck the spun yarn 10. Sucker means (not shown in the drawings) cause a suction force to be generated in the suction port 25. Further, a bunch guide 26 is provided above the tip of the suction pipe 88 to guide the spun yarn 10 during bunch winding. Moreover, a cutter (yarn cutting blade) 27 is fixed above and near the suction port 25 to cut an extra spun yarn end located closer to a leading end of the spun yarn 10 than a part of the spun yarn 10 which is required for bunch winding.

[0032] Figure 2 shows the tip portion of the suction pipe 88 as viewed from the direction of arrow A in Figure 1. Figure 3 is a perspective view showing that the suction pipe 88 has been lowered. As shown in Figures 2 and 3, the bunch guide 26 is projected from the tip of the suction pipe 88.

[0033] The bunch guide 26 is composed of thin plate-like members 26a, 26b overlapping each other. As shown in Figure 2, the lower first plate-like member 26a forms a guide groove 29 and an oblique guide surface 47 used to feed the spun yarn 10 to the interior of the guide groove 29. The upper second plate-like member 26b has a hook-like projection 30 that can close an open side of the guide groove 29 and a second guide surface 48 used to feed the spun yarn 10 into the guide groove 29 similarly to the first guide surface 47.

[0034] The first plate-like member 26a is attached to the tip portion of the suction pipe 88 via a well-known slide mechanism such as a cam or a pneumatic cylinder. The first plate-like member 26a is movable in a longitudinal direction (lateral direction of Figure 2) of the suction pipe 88 in accordance with a predetermined stroke. As a result, the first plate-like member 26a can be switched between a groove open state shown by a solid line in Figure 2 and a groove closed state in which the projection 30 closes the guide groove 29.

[0035] Now, a description will be given of a bunch winding operation performed by the bunch winding device 4. Figure 3 is a perspective view showing that the yarn end of the spun yarn has been guided to the gap between one end of the empty bobbin and one of the bobbin holders. Figure 4 is a perspective view showing that in the state shown in Figure 3, the gap is eliminated to sandwich the spun yarn between one end of the empty bobbin and one of the bobbin holders.

[0036] Figure 5 is a perspective view showing that the empty bobbin is rotated to form a bunch winding. Figure 6 is a view showing that while a bunch winding is being formed, the spun yarn is fed to a position slightly closer to the center of the empty bobbin than the ends of the empty bobbin.

[0037] Upon receiving a bobbin request signal from a control section of the spinning machine 1, the bunch winding device 4 expands the suction pipe 88 while rotatively moving it obliquely upward. The bunch winding device 4 thus moves the suction port 25 to an area located directly downstream of the delivery roller 39 and nip roller 40 of the yarn feeding device 11 (as shown by the chain line in Figure 1; reference numeral 88'). At this time, both rollers 39, 40 of the yarn feeding device 11 nip the yarn end of the spun yarn 10 spun by the spinning member 9 and feed it further downstream. As a result, the yarn end of the spun yarn 10 is sucked and caught in the suction port 25 of the suction pipe 88.

[0038] As shown by reference numeral 88' in Figure 1, when the yarn end fed by the yarn feeding device 11 is caught in the suction pipe 88, the suction pipe 88 is

positioned so as to substantially stand up so that its suction port 25 is directly opposite the yarn feeding device 11. Accordingly, the bunch guide 26 is slightly withdrawn to the front of the spinning machine 1 (left of Figure 1).

[0039] Consequently, the bunch guide 26 from interfering with the bunch guide 26 when the yarn end is caught in the suction port 25.

[0040] At almost the same time, the bunch winding device 4 rotatively moves the cradle operating arm 90 to push the first arm 71 of the winding device 12 (see Figure 3). The bunch winding device 4 thus tilts the first arm 71 so as to lay it down toward the front of the spinning machine 1. On this occasion, the second arm 72 of the winding device 12 follows the first arm 71 and is tilted toward the front of the spinning machine 1. Moreover, the operating arm 90 pushes the first arm 71 so as to separate it from the second arm 72.

[0041] Then, the chucker 89 is allowed to nip the empty bobbin 22 (stocked inside the casing 80 of the bunch winding device 4 as shown in Figure 1) and then advance. Thus, the empty bobbin 22 supported by the chucker 89 is positioned between the two arms 71, 72 of the winding device 12, as shown in Figure 3.

[0042] At this time, the cradle operating arm 90 tilts the first arm 71 of the winding device 12 away from the second arm 72. Consequently, the distance between the both arms 71, 72 (distance between the bobbin holders 85, 86) is longer than the axial length of the empty bobbin 22. Therefore, the chucker 89 holds both ends of the empty bobbin 22 so that axial gaps (g1), (g2) are formed between the ends of the empty bobbin 22 and the arms 71, 72 of the winding device 12.

[0043] The bunch winding driving arm 91 also moves so that its movement is slightly later than that of the chucker 89. The bunch winding driving arm 91 thus places the driving roller 92, located at its tip, in proximity to the empty bobbin 22 held by the chucker 89, as shown in Figure 3. In this state, the driving roller 92 has not been rotatively driven yet.

[0044] Then, while the yarn end of the spun yarn 10 spun from the spinning member 9 is being sucked into the suction port 25, the suction pipe 88 located at the position shown by the chain line in Figure 1 is contracted and withdrawn downward and further rotatively moved. The spun yarn 10 is thus guided to the vicinity of one end of the empty bobbin 22 supported by the chucker 89, as shown in Figure 3. Then, the suction pipe 88 is stopped with its suction port 25 located at the position shown in Figure 3, that is, immediately below the gap (g2), formed between the empty bobbin 22 and the bobbin holder 86 of the second arm 72.

[0045] The suction pipe 88 is laid down as it is lowered and rotatively moved from the position (88') shown by the chain line in Figure 1. With this rotative movement, the bunch guide 26, projected upward from the tip of the suction pipe 88, gradually advances into the yarn path of the spun yarn 10, which extends between the yarn feeding device 11 and the suction port 25. The spun yarn 10 is constantly sucked into the suction port 25 while the suction pipe 88 is being lowered and rotatively moved. As a result, in spite of the continuous feeding of the spun yarn 10 by the yarn feeding device 11, an appropriate tension is applied to the spun yarn 10 between the suction port 25 and the yarn feeding device 11. Accordingly, owing to the advancement of the bunch guide 26 into the yarn path and the guiding action of the two guide surfaces 47, 48 of the bunch guide 26, the spun yarn 10 caught in the suction pipe 88 is naturally fed to the guide groove 29 in the bunch guide 26, shown in Figure 3. The yarn path of the spun yarn 10 is thus regulated.

[0046] The guide groove 29 is formed almost immediately above the suction port 25 of the suction pipe 88 (see Figure 2). Further, the guide groove 29 is formed so as to lie immediately above the gap (g2) when the suction pipe 88 assumes a posture shown in Figure 3. Specifically, the bunch guide 26 is located, in a direction along the yarn path, at a position where the gap (g2) is sandwiched between the bunch guide 26 and the suction port 25 of the suction pipe 88. Consequently, the spun yarn 10 is guided between the suction port 25 and the guide groove 29 so as to pass through the interior of the gap (g2) between the empty bobbin 22 and the second arm 72.

[0047] Then, as shown in Figure 4, the bunch winding device 4 moves the cradle operating arm 90 closer to the second arm 72. The bunch winding device 4 thus allows the empty bobbin 22 to be sandwiched between the two arms 71, 72 (between the bobbin holders 85, 86). This eliminates the gap (g2) between the empty bobbin 22 and the bobbin holder 86 (together with the opposite gap (g1)) to sandwich the spun yarn 10 between one end of the empty bobbin 22 and the bobbin holder 86 of the second arm 72. At almost the same time, the gripping of the empty bobbin 22 by the chucker 89 is canceled. In this case, when the spun yarn 10 is sandwiched, the spun yarn 10 is still continuously fed from the upstream side. Consequently, the spun yarn 10 is slacked. However, appropriate slack eliminating means (not shown in the drawings) may be used to absorb this slack.

[0048] Immediately after this, as shown in Figure 5, the bunch winding device 4 slidably moves the first plate-like member 26a of the bunch guide 26 to close the groove as previously described. The bunch winding device 4 thus uses the projection 30 of the first plate-like member 26a to close the guide groove 29 in the first plate-like member 26a. Moreover, the bunch winding driving arm 91 is moved to contact the driving roller 92, located at its tip, with a peripheral surface of the empty bobbin 22. Further, the driving roller 92 is rotatively driven to rotate the empty bobbin 22.

[0049] When the empty bobbin 22 rotates in the direction of a thick arrow in Figure 5, it exerts a force acting toward the right end of the sheet of Figure 5 on a part of the spun yarn 10 which is above the empty bobbin 22. The spun yarn 10 is thus prone to slip out of the

guide groove 29 but this is inhibited by the projection 30. At this time, owing to the guide action of an oblique bunch feeding surface 49 (see Figure 2) formed on the second plate-like member 26b of the bunch guide 26, the spun yarn 10 is fed toward the axial center of the empty bobbin 22 by a short distance as shown by an arrow in Figure 6. This axial feeding executes straight winding on the spun yarn 10 to form a bunch winding portion 50 at a position slightly closer to the center of the empty bobbin 22 than one end of the empty bobbin 22 as shown in Figure 7.

[0050] When the empty bobbin 22 has been rotated a predetermined number of times to form a bunch winding portion 50 with several windings, the bunch winding is completed. The extra spun yarn 10 at the suction port 25 is naturally fed to the cutter 27 as the empty bobbin 22 is rotated. The extra spun yarn 10 is then cut and sucked into the suction port 25 for disposal.

[0051] In the state shown in Figure 5, once the bunch winding is completed, the first plate-like member 26a of the bunch guide 26 is immediately slidably moved to a withdrawn side to open the groove. Moreover, the suction pipe 88 is rotatively moved upward to return to the position shown by a solid line in Figure 1. The chucker 89, the bunch winding driving arm 91, and the driving roller 92 are also withdrawn upward as shown in Figure 1. As the suction pipe 88 elevates, the spun yarn 10 naturally slips out of the guide groove 29 in the bunch guide 26. Further, at almost the same time, the cradle operating arm 90 is elevated and withdrawn to cancel the tilting of the first arm 71 toward the front of the spinning machine 1. The empty bobbin 22 sandwiched between the arms 71, 72 is thus contacted with the driving drum 79 being rotatively driven. The empty bobbin 22 is thus rotatively driven to start winding the spun yarn 10 around the empty bobbin 22. During the winding, a well-known traverse device (not shown in the drawings) traverses the spun yarn 10.

[0052] The rotative motions of the chucker 89, cradle operating arm 90, bunch winding driving arm 91, and suction pipe 88 are sequentially carried out in order of, for example, Figures 1, 3, 4, 5, and 1 by using an electric motor (not shown in the drawings) to drive a cam shaft (not shown in the drawings) supported by the casing 80 of the bunch winding device 4.

[0053] As described above, the spinning machine 1 according to the present embodiment executes bunch winding using the following method.

(a) The chucker 89 holds the empty bobbin 22 so that a gap (g2) is formed between one end of the empty bobbin 22 and the bobbin holder 86. (b) In this state, the suction pipe 88 is used to suck the yarn end of the spun yarn 10 continuously fed by the spinning member 9. The spun yarn 10 is thus guided to the interior of the gap (g2). (c) The empty bobbin 22 is sandwiched by the bobbin holder 86 so as to sandwich the spun yarn 10 between one end of the empty bobbin 22 and the bobbin holder 86. (d) In this state, the empty bobbin 22 is rotated to form a bunch winding portion 50 on the empty bobbin 22.

[0054] Further, the bunch winding device 4 according to the present embodiment comprises the cradle operating arm 90 that operates the winding device 12 so as to form a gap (g2) between one end of the empty bobbin 22 and the bobbin holder 86, and the suction pipe 88 through which the spun yarn 10 continuously spun by the spinning member 9 has its yarn end caught and is then guided to the interior of the gap (g2). While the spun yarn 10 is passing through the gap (g2), the cradle operating arm 90 operates the winding device 12 to eliminate the gap (g2). This makes it possible to sandwich the spun yarn 10 between one end of the empty bobbin 22 and the bobbin holder 86. Then, with the spun yarn 10 sandwiched between one end of the empty bobbin 22 and the bobbin holder 86, the empty bobbin 22 is rotated to form a bunch winding portion 50 on the empty bobbin 22.

[0055] Thus, the spun yarn 10 can be strongly nipped at the end of the empty bobbin 22 by employing a method of forming a gap (g2) between one end of the empty bobbin 22 and the bobbin holder 86 and guiding the spun yarn 10 to the interior of the gap (g2) to sandwich it between the empty bobbin 22 and the bobbin holder 86 in an axial direction. This prevents the spun yarn 10 from being insufficiently fixed and thus cut during bunch winding as in the prior art. Moreover, the spun yarn 10 is continuously spun on the upstream side and is constantly fed even while the spun yarn 10 is being guided for the bunch winding. However, the suction pipe 88 is used to suck and collect the spun yarn 10 to prevent the spun yarn 10 from slacking. As a result, the spun yarn 10 can be appropriately guided to the interior of the gap (g2).

[0056] Further, in the present embodiment, the bunch winding device 4 comprises the bunch guide 26. The spun yarn 10 is guided to the interior of the gap (g2) between the suction port 25 of the suction pipe 88 and the guide groove 29 in the bunch guide 26. Therefore, the bunch guide 26 can steadily feed the constantly fed spun yarn 10 to reliably feed it to the interior of the gap (g2).

[0057] Further, in the present embodiment, the bunch guide 26 has the bunch feeding surface 49. The bunch feeding surface 49 is adapted so that the spun yarn 10 is guided and fed to the position slightly closer to the center of the empty bobbin than one end of the empty bobbin 22 when the empty bobbin 22 is rotated for bunch winding.

[0058] Moreover, the bunch guide 26 is attached to the suction pipe 88. This provides a simple configuration for steadily guiding the spun yarn 10. Moreover, the cutter 27 is attached to the suction pipe 88. Accordingly, the extra spun yarn end can be cut near the area in

which the spun yarn 10 is sandwiched between the empty bobbin 22 and the bobbin holder 86. This makes it possible to avoid a trouble such that during bunch winding, the extra spun yarn is freely swung and entangled with other members.

[0059] In the present embodiment, the spinning machine 1 illustrated comprises only one spinning unit 2. However, of course, the bunch winding method according to the present invention is also applicable to a spinning machine 1 in which a large number of spinning units 2 are arranged.

Claims

1. A bunch winding method of catching a continuously fed spun yarn end to execute bunch winding on an empty bobbin, the method being **characterized by** comprising holding the empty bobbin so as to form a gap between one end of the empty bobbin and one of bobbin holders, and in this state, guiding the spun yarn to an interior of the gap by sucking and catching means for sucking and catching a continuously fed spun yarn end, and allowing the bobbin holders to sandwich the empty bobbin to sandwich the spun yarn between one end of the empty bobbin and one of the bobbin holders to nip the spun yarn, and in this state, rotating the empty bobbin to form a bunch winding at a predetermined position of the empty bobbin.

2. A bunch winding method according to Claim 1, **characterized in that** a bunch guide that regulates a yarn path of the continuously fed spun yarn guides the spun yarn to the interior of the gap between a catching section of the sucking and catching means and the bunch guide.

3. A spinning machine comprising a bunch winding device that executes bunch winding on an empty bobbin supported by a bobbin support section, the spinning machine being **characterized in that** the bunch winding device comprises operating means for operating the bobbin support section so that a gap is formed between one end of the empty bobbin and one of bobbin holders, and sucking and catching means for catching a continuously spun yarn end to guide the spun yarn to an interior of the gap, and the operating means operates the bobbin support section to eliminate the gap while the spun yarn is being guided by the sucking and catching means to the interior of the gap, to sandwich the spun yarn between one end of the empty bobbin and one of the bobbin holders to nip the spun yarn, and in this state, rotates the empty bobbin to form a bunch winding at a predetermined position of the empty bobbin.

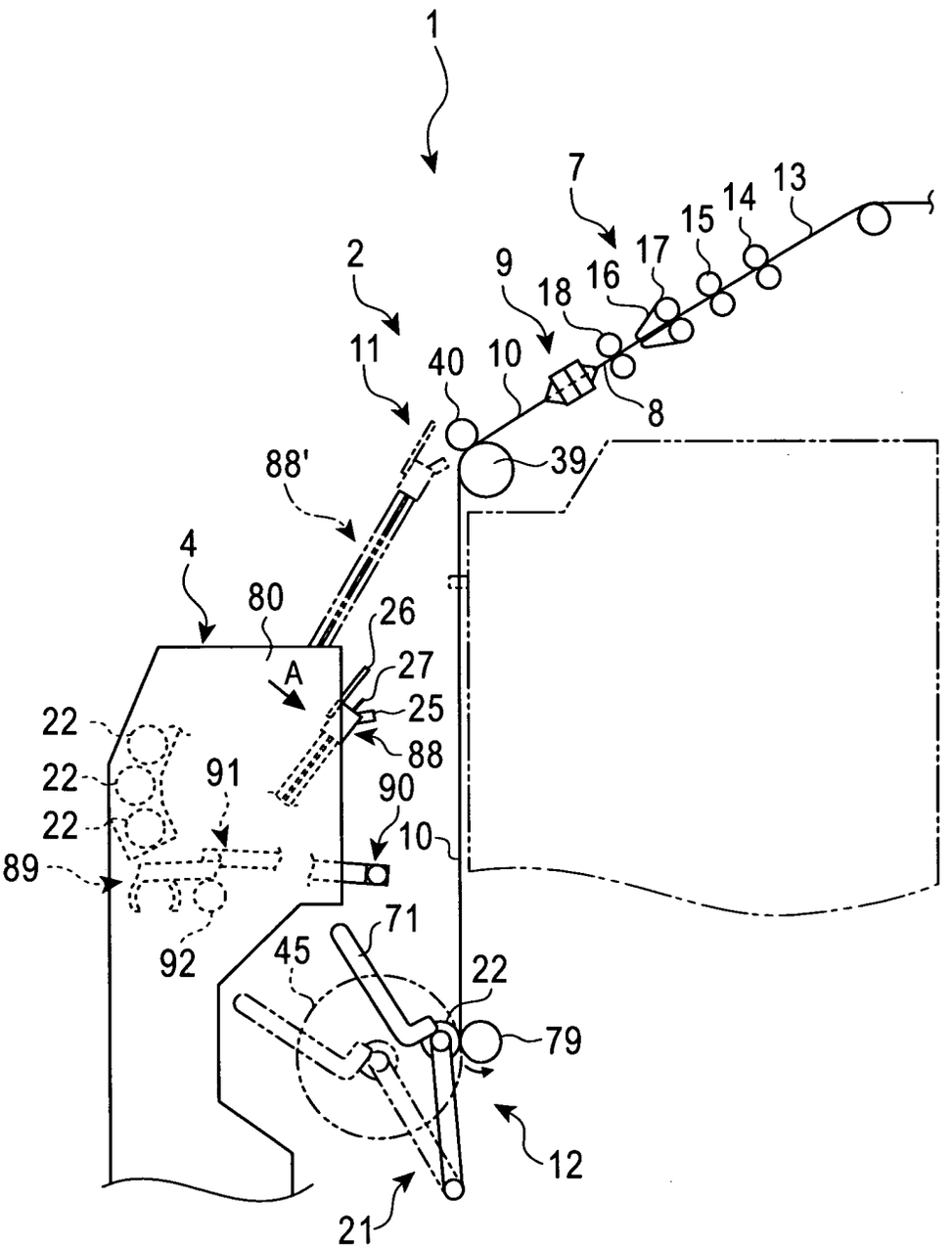
4. A spinning machine according to Claim 3, **characterized in that** the bunch winding device comprises a bunch guide that regulates a yarn path of the continuously fed spun yarn, and the bunch guide is placed, in a direction along the yarn path, at a position where the gap is sandwiched between the bunch guide and a yarn catching section of the sucking and catching means.

5. A spinning machine according to Claim 4, **characterized in that** the bunch guide has a bunch feeding surface along which the spun yarn is guided and fed to a position slightly closer to a center of the empty bobbin than one end of the empty bobbin when the empty bobbin is rotated for bunch winding.

6. A spinning machine according to Claim 4 or Claim 5, **characterized in that** the bunch guide is attached to the sucking and catching means.

7. A spinning machine according to any one of Claims 3 to 6, **characterized in that** the sucking and catching means is provided with a yarn cutting blade.

FIG. 1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22
79
12
21

FIG. 2

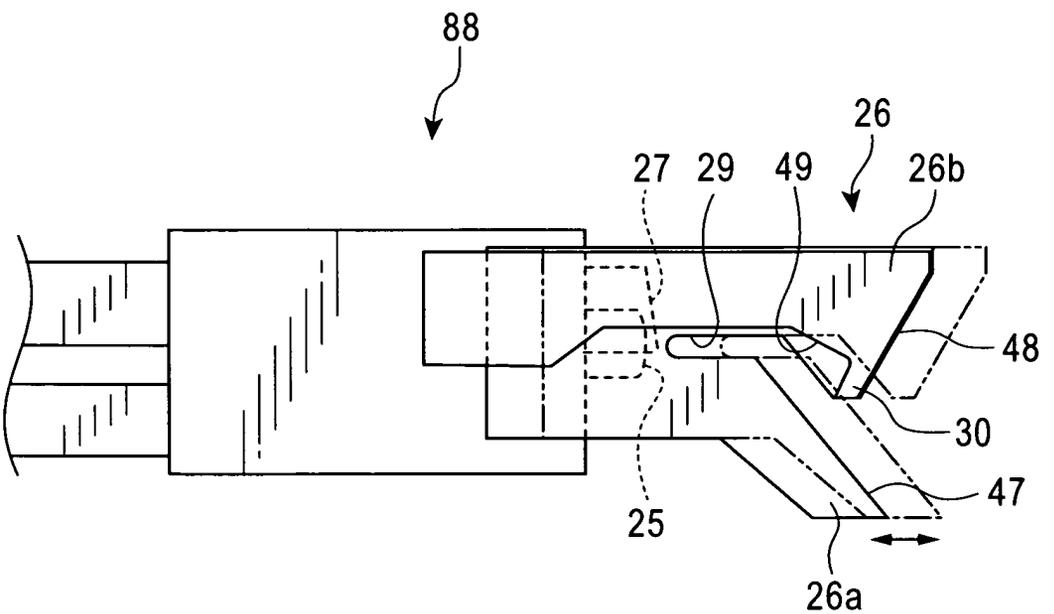
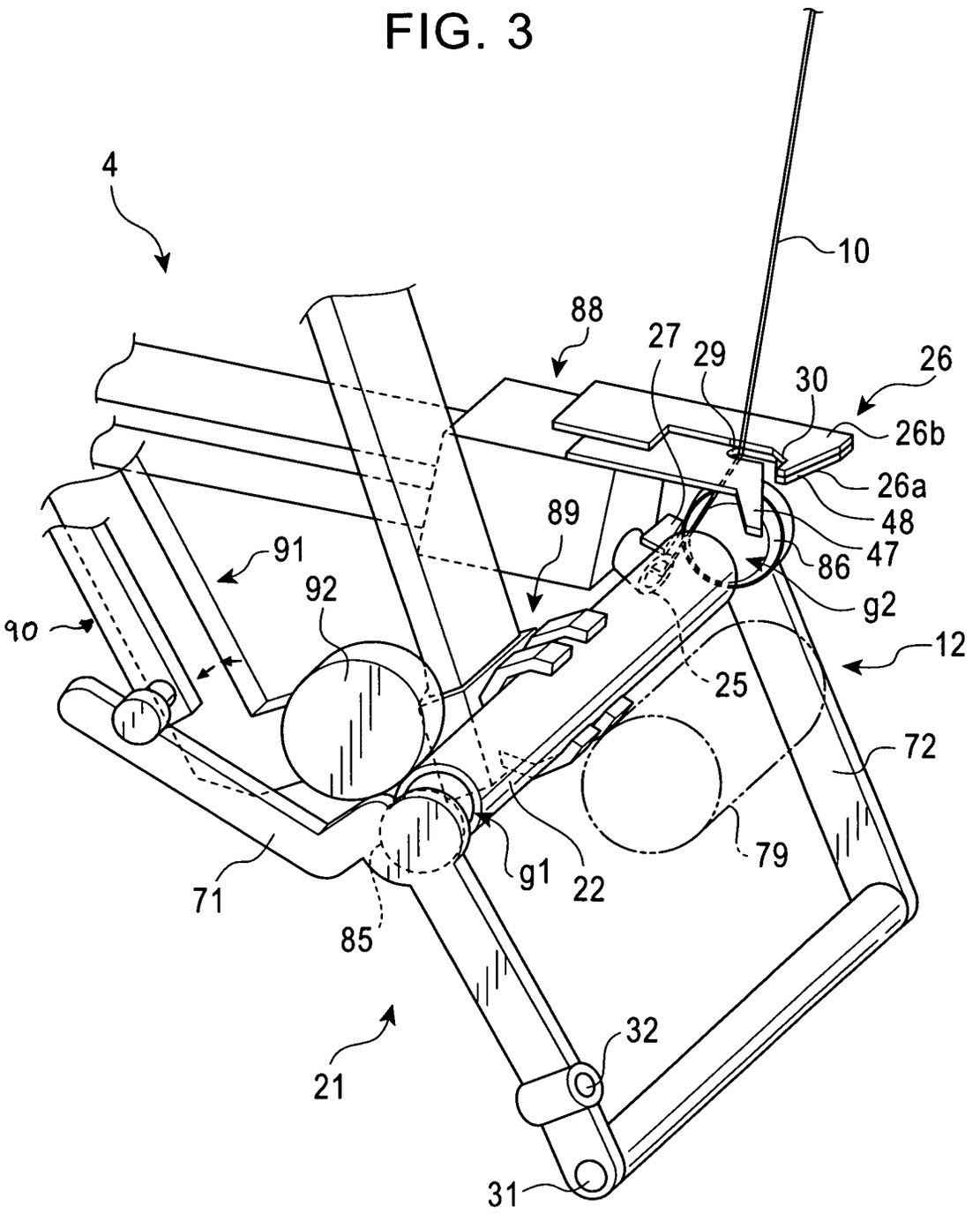


FIG. 3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29
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26
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26a
48
47
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g2
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71
g1
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85
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32
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FIG. 4

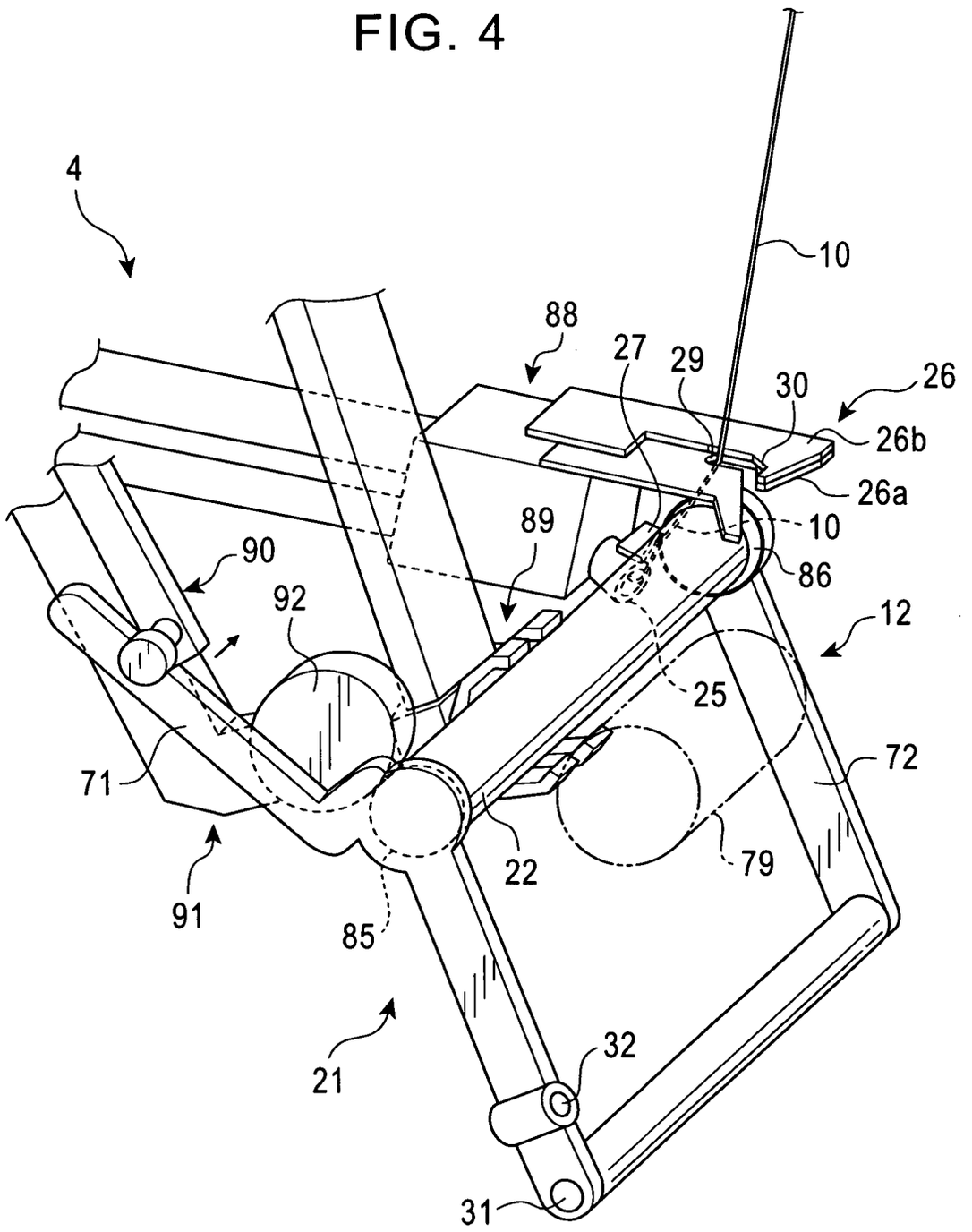
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FIG. 5

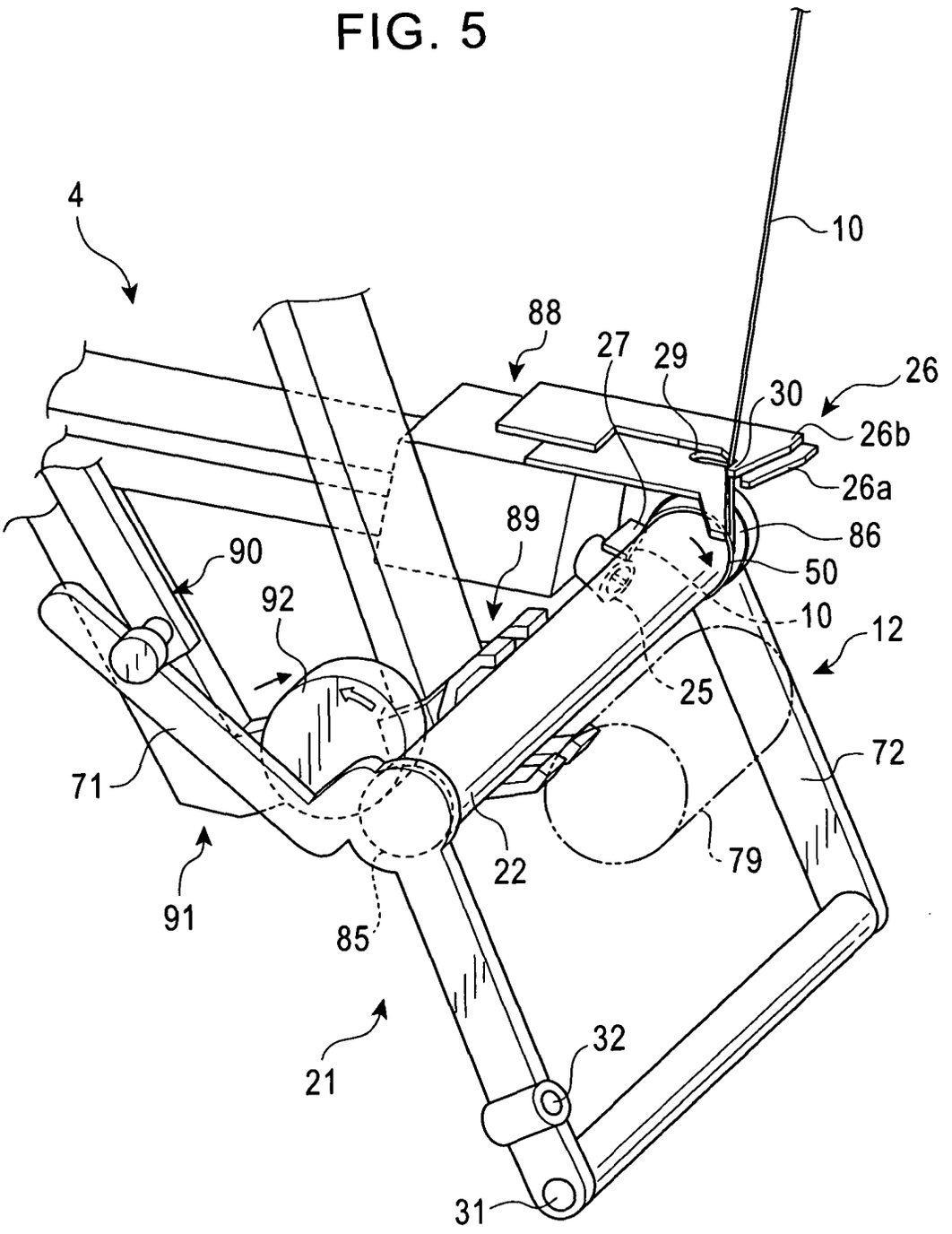
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FIG. 6

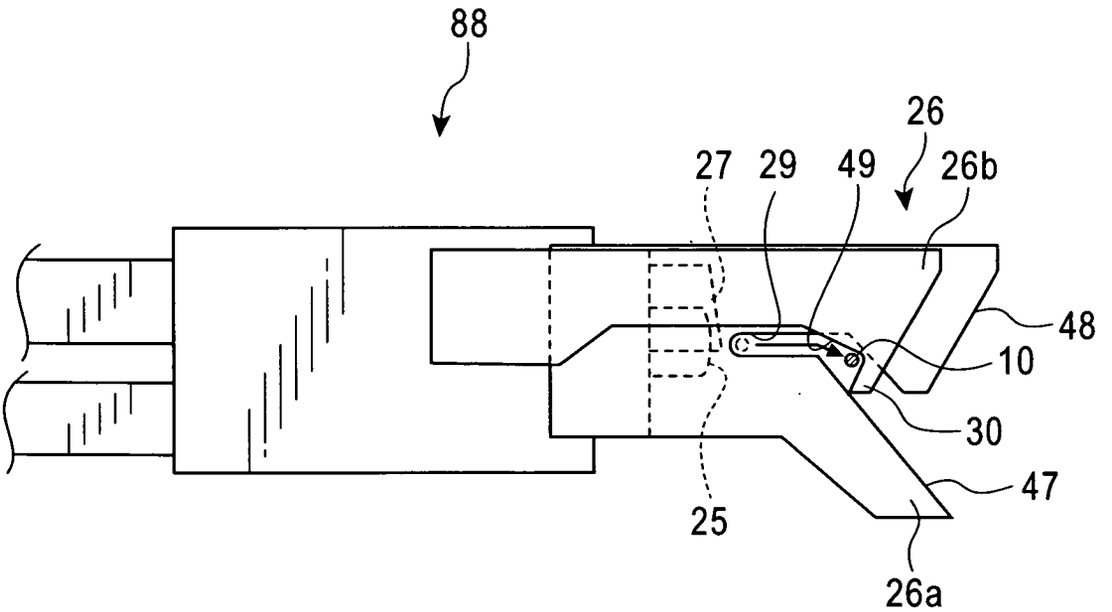
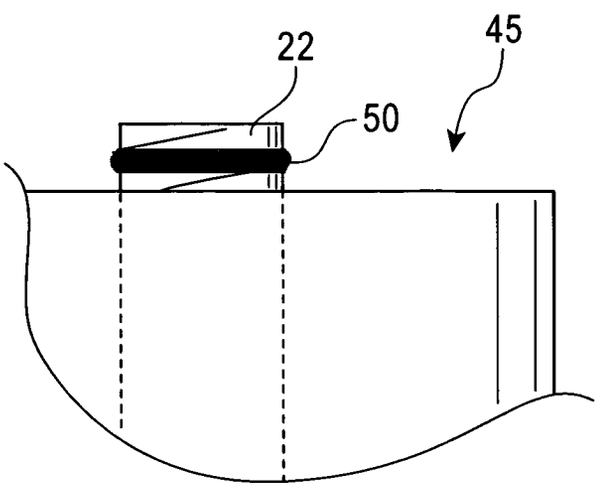


FIG. 7



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Application Number
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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	20 May 2005	Uhlig, R

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