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

(11) EP 2 033 921 A1

(12) EUROPEAN PATENT APPLICATION

published in accordance with Art. 153(4) EPC

(43) Date of publication:
11.03.2009 Bulletin 2009/11

(21) Application number: **07744903.1**

(22) Date of filing: **07.06.2007**

(51) Int Cl.:
B65H 69/06 *(2006.01)* ***D04B 15/56*** *(2006.01)*
D01H 15/00 *(2006.01)*

(86) International application number:
PCT/JP2007/061576

(87) International publication number:
WO 2007/142310 (13.12.2007 Gazette 2007/50)

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC MT NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK RS

(30) Priority: **09.06.2006 JP 2006161671**

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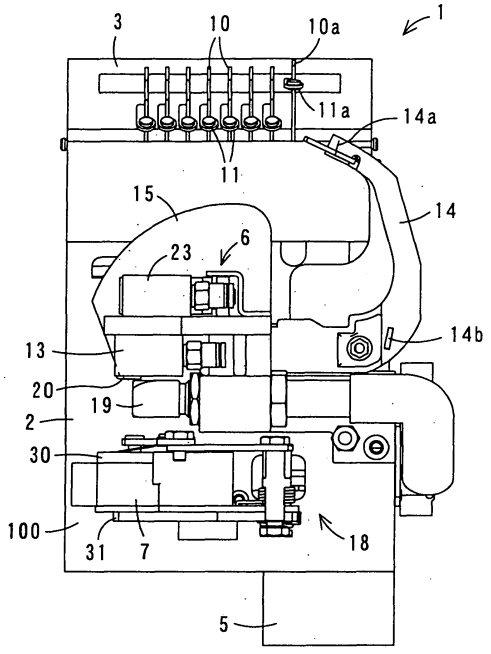
(54) SPLICER DEVICE

(57) The invention relates to a splicer apparatus capable of being downsized and preventing an operation failure caused by fibrous dust. A yarn (12a) selected by a yarn selecting portion (3) among yarns (12), held by a yarn holder (13) is put in a groove (7a) of a splicing nozzle (7) by a yarn guide lever (14) and pieced into a currently used yarn (12b). Then, the currently used yarn (12b) is cut by a cutter (30) and switched over to another yarn. A yarn lint produced is sucked by a suction portion (19). A base (2) has a partition wall (100). First and second motors (4, 5) which drive the yarn guide lever (14) and the cutter (30), respectively, are disposed on the partition wall (100) on an opposite side of the yarn holder (13), the yarn guide lever (14), the splicing nozzle (7), the suction portion (19) and the cutter (30).

FIG. 1



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Description

Technical Field

[0001] The present invention relates to a splicer apparatus that intertwines ends of different yarns.

Background Art

[0002] Conventionally, when forming a knitted fabric or woven fabric, it has been necessary to piece ends of different yarns into each other. Piecing is performed using, for example, a knotter that forms a knot, or a splicer in which twisted fibers at ends of yarns are once untwisted and then intertwined so as to be entangled with each other to form a joint. In a case where a knotter is used for piecing, a knot is formed at ends of different yarns, and thus the knot exists at the piecing portion. The knot portion has a larger diameter and is hooked at, for example, a portion inside an apparatus that forms a knitted fabric or woven fabric, and thus it is difficult to perform a smooth operation. In a case where a splicer is used for piecing, an increase in the diameter of the piecing portion can be suppressed. Thus, it is easy to smoothly continue a knitting or weaving operation.

[0003] A splicer is used for piecing at, for example, a winder for winding a yarn to form a cone that is to be attached to a weaving machine or the like. Examples of a splicer include an apparatus in which, in a state where ends of yarns that are to be pieced into each other are aligned in the same direction, the ends are intertwined to form a piecing portion so that the piecing portion laterally protrudes from the linearly joined yarns, that is, a T-shaped piecing portion is formed (see Japanese Unexamined Patent Publication JP-A 2004-27463, for example) and an apparatus in which, in a state where ends of yarns are arranged to oppose each other, the ends are intertwined to form a piecing portion so that the piecing portion covers the circumferential portions of the linearly joined yarns, that is, an I-shaped piecing portion is formed (see Japanese Unexamined Patent Publication JP-A 2004-131276, for example).

[0004] A knitted fabric is basically formed with one knitting yarn, and thus in a case where the knitting yarn is pieced into another yarn, a quality or color change that cannot be realized with one yarn can be provided. In a knitting machine, a plurality of yarns can be alternatively used, but in a case where portions that use the same yarn are positioned away from each other in a knitted fabric that is being formed, a crossing yarn is formed. In a case where yarns are switched with piecing, no crossing yarn is formed. Furthermore, even though a plurality of yarns can be used in the knitting machine, yarns can be fed only at a narrow region, and thus the number of yarns that can be used is limited. In a case where piecing is necessary in the knitting machine, for example, a knotter that forms a knot is used. In a case where a knotter is used, the knot portion has a larger yarn diameter, and thus a smooth operation of the apparatus is hampered. Accordingly, a process has to be performed so that the knot does not appear on the surface of the knitted fabric. It is expected that piecing with a splicer makes it easy to perform the process at the piecing portion. However, a splicer that is included in a conventional winder and the like is large and cannot be disposed at a yarn feed path in a knitting machine or the like.

[0005] Neither JP-A 2004-27463 nor JP-A 2004-131276 has disclosed the arrangement of constituent elements or a specific structure for downsizing the apparatus. With a splicer that is used in a knitting machine, for example, in a case where colors are switched, the I-shaped piecing portion becomes a portion that has an intermediate color. The T-shaped piecing portion has a portion that protrudes outward from the front and rear yarns, and thus the colors of the front and rear yarns can be switched without a portion having an intermediate color. In the knitting machine, piercing is performed at a pattern interface portion where colors are switched, and control also can be performed so that the piecing portion is hidden on a back side or the like of the knitted fabric. Accordingly, for a knitting machine or the like, the splicer that forms the T-shaped piecing portion is preferable. JP-A 2004-27463 has disclosed the details of a mechanism at a head portion for piecing. For installation in a knitting machine or the like, a yarn that is to be used for piecing has to be automatically inserted into the head. JP-A 2004-27463 has not disclosed a yarn insertion mechanism that can automatically insert a yarn into the head.

[0006] Neither JP-A 2004-27463 nor JP-A 2004-131276 has disclosed a configuration for preventing an operation failure caused by fibrous dust or the like.

Disclosure of Invention

[0007] It is an object of the invention to provide a splicer apparatus that can be downsized and can prevent an operation failure caused by fibrous dust.

[0008] The invention is directed to a splicer apparatus in which, in a state where at least one yarn of a plurality of yarns is currently used, the currently used yarn can be pieced into at least one different yarn, comprising:

a holder portion that holds tip end portions of yarns that are not currently used among the plurality of yarns;

a selecting portion that selects a yarn that is to be used for piecing, from among the yarns that are held by the holder portion;

a head that performs piecing by joining the yarn selected by the selecting portion and the currently used yarn, using a flow of compressed fluid in a groove that is formed from an inlet positioned on an opposite side of the holder portion to an outlet positioned on a side of the holder portion;

a yarn guide lever that catches the yarn selected by the selecting portion and guides the yarn to the inlet

of the groove of the head;
a first driving portion that drives the yarn guide lever;
a suction portion that sucks a yarn at a position near the outlet of the groove of the head;
a cutter that cuts the currently used yarn and the selected yarn that are pieced into each other, at a position near the outlet of the groove of the head;
a second driving portion that drives the cutter in conjunction with the yarn guide lever; and
a base that has a partition wall, and supports the holder portion, the selecting portion, the head, the yarn guide lever, the first driving portion, the suction portion, the cutter, and the second driving portion so that at least the holder portion, the head, the yarn guide lever, the cutter, and the suction portion are arranged on a first side of the partition wall and at least the first and the second driving portions are arranged on a second side of the partition wall.

[0009] In the invention, it is preferable that the splicer apparatus further comprises:

a supply control electromagnetic valve that is disposed on the second side of the partition wall and controls supply and supply stop of compressed fluid to the head; and
a suction control electromagnetic valve that is disposed on the second side of the partition wall and control suction and suction stop of a yarn performed by the suction portion.

[0010] In the invention, it is preferable that the holder portion is driven with compressed fluid, and
the splicer apparatus further comprises a holder portion control electromagnetic valve that is disposed on the second side of the partition wall and that controls supply and supply stop of compressed fluid to the holder portion.

[0011] In the invention, it is preferable that the splicer apparatus further comprises a yarn clamp that is driven by the second driving portion, and that blocks a portion of the groove on a side of the inlet and clamps the selected yarn and the currently used yarn in a state where the selected yarn and the currently used yarn are put in the groove.

[0012] In the invention, it is preferable that the splicer apparatus further comprises a yarn guide that guides the currently used yarn and in which a guide face that guides the currently used yarn is formed at a position closer to the selecting portion than the groove of the head and located out of the groove of the head in a groove depth direction.

[0013] In the invention, it is preferable that the base has the partition wall extending in a direction connecting a side on which the plurality of yarns are fed and a side on which the yarns are used,
the selecting portion is disposed closer to the yarn feeding side than the partition wall, and supported by an end portion of the base on the yarn feeding side,
the first driving portion and the second driving portion are supported by the base, at positions closer to the yarn using side than the selecting portion, on the second side of the partition wall, and
the holder portion, the suction portion, the cutter, and the head are supported by the base on the first side of the partition wall so that the holder portion, the suction portion, the cutter, and the head are arranged in this order from the yarn feeding side to the.yarn using side.

[0014] In the invention, it is preferable that the first driving portion is a motor that has an output shaft, and
the yarn guide lever is disposed so that the yarn guide lever can be angularly displaced within a predetermined angular range about an angular displacement axis that is parallel to the output shaft of the motor.

[0015] In the invention, it is preferable that the second driving portion is a motor, and
the cutter and the yarn clamp are driven by the motor via a cam mechanism.

Brief description of Drawings

[0016] Other and further objects, features, and advantages of the invention will be more explicit from the following detailed description taken with reference to the drawings wherein:

Fig. 1 is a front view showing a splicer apparatus 1 according to one embodiment of the invention;
Fig. 2 is a left side view showing the splicer apparatus 1;
Fig. 3 is a perspective view showing the splicer apparatus 1 from a front side;
Fig. 4 is a perspective view showing the splicer apparatus 1 from the front side;
Fig. 5 is a perspective view showing the splicer apparatus 1 from a back side;
Fig. 6 is a plan view of a cutter 30 and a yarn clamp 31;
Fig. 7 is a perspective view of the cutter 30 and the yarn clamp 31;
Fig. 8 is a perspective view showing the splicer apparatus 1 from below;
Fig. 9 is a block diagram showing an electrical configuration necessary for controlling a piecing operation in the splicer apparatus 1;
Fig. 10 is a front view schematically showing the splicer apparatus in a state where the selected yarn 12a for piecing is selected;
Fig. 11 is a left side view schematically showing the splicer apparatus 1 in a state of Fig. 8;
Fig. 12 is a front view schematically showing the splicer apparatus in a state where the selected yarn 12a is caught on a tip end 14a of a yarn guide lever 14;
Fig. 13 is a front view schematically showing the splicer apparatus 1 in a state where the selected yarn 12a is guided by the tip end 14a of the yarn

guide lever 14 to an inlet of the splicing nozzle 7;

Fig. 14 is a side view schematically showing the configuration near the splicing nozzle 7 in a state where the yarns 12a and 12b that are being pieced into each other are put in the groove 7a of the splicing nozzle 7;

Fig. 15 is a side view schematically showing the configuration near the splicing nozzle 7 in a state where the yarn clamp 31 and the cutter 30 are caused to act on each other;

Fig. 16 is a flowchart showing the procedure of a piecing operation including the states shown in Figs. 10 to 15;

Fig. 17 is a view for illustrating a knitting yarn position 200 and a piecing yarn position 201;

Fig. 18 is an enlarged plan view showing a portion near a yarn guide 20; and

Fig. 19 shows the configuration in which the splicer apparatus 1 is attached to a weft knitting machine 60 and piecing is performed using knitting yarns 61 as the yarns 12.

Best Mode for Carrying out the Invention

[0017] Now referring to the drawings, preferred embodiments of the invention will be described in detail.

[0018] Fig. 1 is a front view showing a splicer apparatus 1 according to one embodiment of the invention. Fig. 2 is a left side view showing the splicer apparatus. Figs. 3 and 4 are perspective views showing the splicer apparatus 1 from a front side. Fig. 5 is a perspective view showing the splicer apparatus 1 from a back side. Figs. 1 to 3 and 5 show a state close to the start of the piecing operation. Fig. 4 shows a state close to the end of the piecing operation. The splicer apparatus 1 includes a cover that suppresses scattering of fibrous dust formed during piecing, a cleaning mechanism, and the like, but these constituent elements are not shown in Figs. 1 to 5.

[0019] The splicer apparatus 1 is an apparatus in which, in a state where ends of different yarns are overlaid in the same direction, with an action of compressed fluid applied to the overlaid portion, the twisted yarns are once untwisted and then intertwined so as to be entangled with each other. In the splicer apparatus 1, a partition wall 100 of a base 2 supports a yarn selecting portion 3, a first motor 4 functioning as a first driving portion, a second motor 5 functioning as a second driving portion, an air mechanism portion 6, and a splicing nozzle 7. The base 2 has the partition wall 100 in the shape of a plate that extends in the upper, lower, left, and right directions and that is vertically disposed. The partition wall 100 supports to-be-supported members 3 to 7 at an appropriate positional relationship in terms of space. The yarn selecting portion 3 is disposed above the partition wall 100. The air mechanism portion 6 and the splicing nozzle 7 are arranged on the front side, which is a first side, of the partition wall 100. The first and the second motors 4 and 5 are arranged on the back side, which is a second side, of the partition wall 100.

[0020] The yarn selecting portion 3 is disposed at the uppermost portion of the base 2, and has a plurality of yarn selecting plates 10. Each of the yarn selecting plates 10 is an independently provided solenoid, and can be rotationally displaced. The drawings show a state in which the yarn selecting plate 10 at the right end shown in Fig. 1 is selected and a ring 11 on the tip end has been pulled by the yarn selecting plate 10 backward in Fig. 1. Rings 11 can be pulled backward in a similar manner also by the other yarn selecting plates 10. A yarn 12 is inserted into each of the rings 11. A portion near the tip end of the yarn 12 is held by a yarn holder 13. The yarn holder 13, which is a holder portion, is included in the air mechanism portion 6, and opened and closed by an air pressure or the like. In a closed state, the yarn holder 13 can simultaneously hold the tip ends of a plurality of yarns 12. In order to facilitate understanding, the character 'a' is added to the numerals of a selected yarn selecting plate, a ring of the yarn selecting plate, and a yarn passing through the ring. As shown in the drawings, for example, when one yarn selecting plate 10a is selected, the yarn 12a passing through the ring 11a is pulled backward in Fig. 1. The other yarns 12 are continuously on standby. The tip end of a currently used yarn 12b (the character 'b' is added to the numeral in order to facilitate understanding) is not held by the yarn holder 13, and is pulled downward in the splicer apparatus 1.

[0021] A tip end 14a of a yarn guide lever 14 that is angularly displaced by being driven by the first motor 4 can catch the selected yarn 12a. A side protrusion 14b is disposed at a middle portion of the yarn guide lever 14, and can catch the currently used yarn 12b during angular displacement. A separator 15 is disposed between the yarn guide lever 14 and the yarn holder 13. The yarn holder 13, the yarn guide lever 14, and the separator 15 are arranged on the front side of the partition wall 100. The yarn holder 13, the separator 15, and the yarn guide lever 14 are arranged in that order from the front side to the back side. The currently used yarn 12b is guided downward through an area between the separator 15 and the yarn guide lever 14. The standby yarn 12 is inserted through the ring 11 at the tip end of the yarn selecting plate 10, passes through an area on the front side of the separator 15, and is held by the yarn holder 13.

[0022] The yarn guide lever 14 is angularly displaced about a horizontal axis perpendicular to the section of the diagram in Fig. 1. The yarn guide lever 14 is angularly displaced by the first motor 4. With respect to the first motor 4, at least a motor main unit is disposed on the back side of the partition wall 100. The motor main unit refers to a portion excluding an output shaft. The first motor 4 is attached to the base 2 so that the output shaft is perpendicular to the section of the diagram in Fig. 1. The output shaft of the first motor 4 can directly drive the yarn guide lever 14, or can drive the yarn guide lever 14 via a speed change mechanism or the like. The output

shaft of the first motor 4 and the yarn guide lever 14 are connected via an opening formed through the partition wall 100. The yarn guide lever 14 is driven so as to rotate forward and in reverse within a constant angular range. The first motor 4 switches the rotational direction according to switching of the direction in which the yarn guide lever 14 is to be angularly displaced.

[0023] The splicing nozzle 7 is a head portion for piecing, and is disposed below the yarn holder 13 on the front side of the partition wall 100. In the splicing nozzle 7, a groove 7a in the shape of a straight line vertically extending from the inlet to the outlet is formed. The currently used yarn 12b and the selected yarn 12a are put in the groove 7a and exposed to the flow of compressed fluid inside the groove 7a, and thus piecing is performed. The groove 7a vertically extends, and has the inlet on the lower side, which is the opposite side of the yarn holder 13, and the outlet on the upper side, which is on the side of the yarn holder 13. As the compressed fluid used in the splicing nozzle 7, the compressed air used in the air mechanism portion 6 is utilized.

[0024] With respect to the second motor 5, at least a motor main unit is disposed on the back side of the partition wall 100. The second motor 5 is attached to the base 2. The second motor 5 is attached so that the output shaft is positioned upward in Fig. 1. The output shaft of the second motor 5 drives a piecing mechanism 18. The piecing mechanism 18 includes constituent elements that perform processes related to piecing at positions near the inlet and near the outlet of the groove 7a of the splicing nozzle 7.

[0025] The tip end of a suction portion 19 is open near the outlet of the groove 7a. The suction portion 19 can suck yarn pieces and the like together with the surrounding air. The suction portion 19 is included in the air mechanism portion 6. A suction force generated by a negative pressure formed around a negative pressure forming nozzle that blows out compressed air is guided to the suction portion 19, and the suction portion 19 sucks yarn pieces and the like. Furthermore, a yarn guide 20 that guides a currently used yarn is disposed near the outlet of the splicing nozzle 7.

[0026] In the yarn guide 20, a guide face 20a that guides a currently used yarn is formed at a'position closer to the .yarn selecting portion 3 than the groove 7a of the splicing nozzle 7 and located out of the groove 7a in the groove depth direction. More specifically, the yarn guide 20 is formed at a position close to the lower end portion of the separator 15 and to the end portion of the suction portion 19 in the opposite direction of the suction direction. The yarn guide 20 is formed between the partition wall 100 and the separator 15, and has a V-shaped groove. The V-shaped groove is constituted by two guide faces that define a narrower space therebetween in the suction direction of the suction portion 19. The guide faces protrude in the opposite direction of the suction direction of the suction portion 19 from the suction portion 19 and the groove 7a of the splicing nozzle 7. Moreover, a straight line connecting the guide faces and a yarn guiding portion 202 that guides a currently used yarn discharged from the splicer apparatus 1 is out of the groove 7a of the splicing nozzle 7.

[0027] Furthermore, a yarn presser 23 is disposed closer to the yarn selecting portion 3 than the yarn holder 13, above the yarn holder 13. The yarn presser 23 is included in the air mechanism portion 6, and can press a yarn 12 in a similar manner to that of the yarn holder 13. The yarn holder 13 and the yarn presser 23 are realize as air cylinders and driven with compressed air.

[0028] A first electromagnetic valve unit 130 that includes a supply control electromagnetic valve and a suction control electromagnetic valve as a unit is'disposed on the back side of the partition wall 100, and is fixed to the base 2. The supply control electromagnetic valve controls supply and supply stop of compressed air to the splicing nozzle 7, and controls execution and stop of a piecing operation on the yarns 12 performed by the splicing nozzle 7. The suction control electromagnetic valve controls supply and supply stop of compressed air for generating a suction force to the negative pressure forming nozzle, and controls suction and suction stop of the suction portion 19. A tube that guides compressed air to the splicing nozzle 7, the negative pressure forming nozzle, a tube that is connected to the negative pressure forming nozzle, and the like are not shown in the drawings. Moreover, a second electromagnetic valve unit 131 that includes a yarn holder control electromagnetic valve and a yarn presser control electromagnetic valve as a unit is disposed on the back side of the partition wall 100, and is fixed to the base 2. The yarn holder control electromagnetic valve controls supply and supply stop of compressed air to the yarn holder 13, and controls execution and stop of a holding operation on the yarns 12 performed by the yarn holder 13. The yarn presser control electromagnetic valve controls supply and supply stop of compressed air to the yarn presser 23, and controls execution and stop of a pressing operation on the yarns 12 performed by the yarn presser 23.

[0029] Fig. 6 is a plan view showing the configuration of a cutter 30 and a yarn clamp 31. Fig. 7 is a perspective view showing the configuration of the cutter 30 and the yarn clamp 31. Fig. 8 is a perspective view showing the splicer apparatus 1 from below. In order to facilitate understanding, Figs. 6 and 7 show only a partial configuration of the splicer apparatus 1. The cutter 30 is disposed near the outlet of the groove 7a of the splicing nozzle 7. The yarn clamp 31 is disposed near the inlet of the groove 7a of the splicing nozzle 7. The cutter 30 and the yarn clamp 31 are included in the piecing mechanism 18, and driven by the second motor 5.

[0030] A cam 36 is attached to an output shaft 5a of the second motor 5. The cam 36 is disposed on the back side of the partition wall 100. The cutter 30 has a fixed blade 30b and a movable blade 30a. A cutter operation mechanism 110 realized as a link mechanism is disposed on the front side of the partition wall 100, and supported

by link support shafts 35 and 45 fixed to the base 2. The movable blade 30a is fixed to one link of the cutter operation mechanism 110, and a cam driven link 111 disposed so as to pass through an opening of the partition wall 100 is fixed to another link. A follower 112 that is in contact with a cam face of the cam 36 is disposed on the cam driven link 111. A cam mechanism includes the cam 36 and the cam driven link 111. Furthermore, a follower contact spring 113 is provided that applies a spring force to either the cutter operation mechanism 110 or the cam driven link 111 thereby bringing the follower 112 into contact with the cam face of the cam 36. Accordingly, when the cam 36 is driven by the second motor 5, the movable blade 30a of the cutter 30 is driven via the cutter operation mechanism 110 to be displaced with respect to the fixed blade 30b.

[0031] The yarn clamp 31 includes a fixed portion 31a and a movable portion 31b. The fixed portion 31a is disposed at one of two divided protruding portions of the splicing nozzle 7 with the groove 7a interposed therebetween. The movable portion 31b is supported by the link support shaft 35 on the first side in an angularly displaceable manner, and is angularly displaced following the angular displacement of the movable blade 30a of the cutter 30 via a kick spring 40. The movable portion 31b is formed so as to be movable between the two protruding portions of the splicing nozzle 7. The movable portion 31b is configured so as to be movable by angular displacement between a contact position at which the movable portion 31b is in contact with the fixed portion 31a after passing through a portion'near the inlet of the groove 7a and an away position at which the movable portion 31b is away from the fixed portion 31a. When the movable portion 31b moves to the contact position, yarns accommodated in the groove 7a of the splicing nozzle 7 can be held and clamped. In this manner, in a state where the selected yarn 12a and the currently used yarn 12b are put in the groove 7a, the yarn clamp 31 blocks the inlet of the groove 7a and clamps the selected yarn 12a and the currently used yarn 12b using the fixed portion 31a and the movable portion 31b. In this manner, yarns arranged in the groove 7a of the splicing nozzle 7 are held from the direction perpendicular to the axes, and thus the yarns can be powerfully clamped.

[0032] In the splicer apparatus 1, the yarn presser 23, the yarn holder 13, the suction portion 19, the yarn guide 20, the cutter 30, the splicing nozzle 7, and the yarn clamp 31 are arranged in this order from above to below on the front side of the partition wall 100.

[0033] Fig. 9 is a block diagram showing an electrical configuration necessary for controlling a piecing operation in the splicer apparatus 1. A control portion 50 receives an instruction to perform piecing and an instruction specifying a selected yarn that is to be switched into a currently used yarn. Furthermore, the control portion 50 selectively electrically drives a solenoid for rotationally displacing a yarn selecting plate of the yarn selecting portion 3 corresponding to the selected yarn. Furthermore, the control portion 50 electrically opens and closes the electromagnetic valves of the first and the second electromagnetic valve units 130 and 131, thereby individually performing supply and supply stop of compressed air and individually controlling drive of the yarn holder 13, the yarn presser 23, the splicing nozzle 7, and the suction portion 19.

[0034] As the first and the second motors 4 and 5, for example, stepping motors are used. The angular position and the rotational direction can be adjusted with the number of drive pulses generated or the like. When controlling the first motor 4, the control portion 50 angularly displaces the yarn guide lever 14 between an origin position and an operation position, in response to signals from a lever origin sensor 135 that detects the origin position of the yarn guide lever and an operation position sensor 136 that detects the operation position. The origin position of the yarn guide lever 14 refers to a position at which the yarn guide lever 14 has been withdrawn from the yarns 12. The operation position refers to a position at which the yarn guide lever 14 can cause the selected yarn 12a to be put in the groove 7a. When controlling the second motor 5, the control portion 50 performs control so that pulses are applied in the number to realize angular displacement to a predetermined angular position in relative to an origin position of the cam 36, in response to a signal from a cam origin sensor 137 that selects the origin position of the cam 36. The origin position of the cam 36 refers to a position at which the cam 36 causes the cutter 30 to open the blades 30a and 30b and causes the yarn clamp 31 to open the inlet of the groove 7a. The first and the second motors 4 and 5 are driven forward and in reverse so as to correspond to a constant angular range.

[0035] Fig. 10 is a front view schematically showing the splicer apparatus 1 in a state where the selected yarn 12a for piecing is selected. Fig. 11 is a left side view schematically showing the splicer apparatus 1 in the state of Fig. 10. Fig. 12 is a front view schematically showing the splicer apparatus in a state where the selected yarn 12a is caught on the tip end 14a of the yarn guide lever 14. Fig. 13 is a front view schematically showing the splicer apparatus 1 in a state where the selected yarn 12a. is guided by the tip end 14a of the yarn guide lever 14 to the inlet of the splicing nozzle 7. Fig. 14 is a side view schematically showing the configuration near the splicing nozzle 7 in a state where the yarns 12a and 12b that are being pieced'into each other are put in the groove 7a of the splicing nozzle 7. Fig. 15 is a side view schematically showing the configuration near the splicing nozzle 7 in a state where the yarn clamp 31 and the cutter 30 are caused to act on each other. Fig. 16 is a flowchart showing the procedure of a piecing operation including the states shown in Figs. 10 to 15.

[0036] A piecing operation is executed under control of the control portion 50, and is started when a change of the yarns 12 becomes necessary. In step s1, the yarns 12 have been respectively inserted into the rings 11 at

the tip ends of the plurality of yarn selecting plates 10. At least one yarn 12b of these yarns is currently used. The ends of the other yarns 12 are held by the yarn holder 13. The ends of the standby yarns 12 are held by the yarn holder 13 on the front side of the separator 15. The currently used yarn 12b is separated from the standby yarns 12 so that the currently used yarn 12b passes through an area on the back side of the separator 15 and extends downward. The state of each constituent element is as follows. The yarn presser 23 is in an off state in which a yarn is not pressed. The yarn holder 13 is in an on state in which the ends of the standby yarns 12 are held. The suction portion 19 is in an off state in which a yarn is not sucked. The cutter 30 is in an off state in which the two blades 30a and 30b are open. The yarn clamp 31 is in a state in which the inlet of the splicing nozzle 7 is not blocked. That is to say, the cam 36 is at the origin position. The splicing nozzle 7 is in an off state in which a flow of compressed fluid for piecing is not formed. The yarn holder 13 holds the yarns 12 so that the tip ends of the yarns 12 protrude downward from the yarn holder 13. The tip ends of the yarns 12 protruding downward from the yarn holder 13 can be sucked by the suction portion 19, by turning the suction portion 19 on. The yarn guide lever 14 is at the origin position.

[0037] In step s2, the control portion 50 causes the yarn selecting portion 3 to select at least one yarn 12a, as shown in Figs. 10 and 11. As clearly shown particularly in Fig. 11, the selected yarn 12a is moved to a position where the selected yarn 12a can be caught on the tip end 14a, the position being on a movement line in the angular displacement of the yarn.guide lever 14. The side protrusion 14b of the yarn guide lever 14 is disposed at a position where the side protrusion 14b can catch the currently used yarn 12b.

[0038] In step s3, the control portion 50 controls the first motor 4 so that the angular displacement of the yarn guide lever 14 is started from the origin position toward the operation position. When the tip end 14a of the yarn guide lever 14 catches the yarn 12a selected by the yarn selecting portion 3 during the angular displacement, the selected yarn 12a can be laterally pushed out as shown in Fig. 12. The end of the selected yarn 12a is held by the yarn holder 13 together with the ends of the other yarns on standby, but the other yarns are not shown in the drawings. During the angular displacement of the yarn guide lever 14, the currently used yarn 12b is caught on the side protrusion 14b. The currently used yarn 12b passes through the area on the back side of the separator 15 before being caught on the side protrusion 14b. After being caught on the side protrusion 14b, the currently used yarn 12b moves over the side edge of the separator 15 to the front side of the separator 15 due to the angular displacement of the yarn guide lever 14 and is placed in the yarn presser 23 that is open in the off state, as shown in Figs. 12 and 13. The standby yarns 12 are also placed in the yarn presser 23 as shown in Fig. 10. In a case where a yarn 12c, which is positioned on the right side of the currently used yarn 12b, is selected, the side protrusion 14b is not used, and the selected yarn 12c brings the currently used yarn 12b. The yarns 12 and 12b can be temporarily held by the yarn presser 23, by turning the yarn presser 23 on.

[0039] In step s4, the yarn guide lever 14 reaches the operation position, and the control portion 50 ends the angular displacement of the yarn guide lever 14. The tip end 14a of the yarn guide lever 14 guides the selected yarn 12a to the inlet of the splicing nozzle 7 in the lower portion. The selected yarn 12a is put in the groove 7a for piecing disposed in the splicing nozzle 7. The end of the selected yarn 12a is held by the yarn holder 13 above the splicing nozzle 7. The currently used yarn 12b moves over the side edge of the separator 15, is inserted into the yarn presser 23 that is open in the off state, and extends to the ring 11 of the yarn selecting plate 10b.

[0040] In step s5, the control portion 50 controls the suction control electromagnetic valve so that the suction portion 19 is turned on, and simultaneously controls the yarn presser control electromagnetic valve so that the yarn presser 23 is turned on. Since the suction portion 19 is on, as shown in Fig. 13, the tip ends of the selected yarn 12a as well as the yarns 12 held by the yarn holder 13, and protruding downward from the yarn holder 13 are sucked by the suction portion 19. Furthermore, the currently used yarn 12b is pressed by the yarn presser 23.

[0041] In step s6, the control portion 50 controls the second motor 5 so that the angular displacement of the cam 36 is started from the origin position. Accordingly, the movable portion 31b of the yarn clamp 31 is angularly displaced, and thus the yarn clamp 31 is turned on. In the on state, the inlet of the groove 7a of the splicing nozzle 7 is blocked, and the selected yarn 12a and the currently used yarn 12b that are both put in the groove 7a are clamped simultaneously by the movable portion 31b in cooperation with the fixed portion 31a. Furthermore, in a case where the angular displacement of the cam 36 is started from the origin position, the cutter 30 is turned on. In the on state, the selected yarn 12a and the currently used yarn 12b are cut at a position near the outlet of the groove 7a. In this manner, in step s6, the operation is performed to change the state in Fig. 14 into the state in Fig. 15.

[0042] Next, in step s7, the control portion 50 controls the supply control electromagnetic valve so that supply of compressed air to the groove 7a of the splicing nozzle is started, and thus piecing is started. A compressed air nozzle is disposed at the groove 7a. of the splicing nozzle 7, an air flow in the direction from the inlet to the outlet is formed, and the twisted yarns 12a and 12b are once untwisted and then intertwined in the air flow so that the yarns 12a and 12b are pieced into each other by splicing. In step s8, the control portion 50 controls the yarn holder control electromagnetic valve so that the yarn holder 13 is turned off, and thus holding of the yarns 12 is cancelled. The end portion of the selected yarn 12a is released from the yarn holder 13, and is sucked by the suction portion

19 as a yarn lint. Since the yarn presser 23 is turned on in step s6, the currently used yarn 12b as well as the standby yarns 12 are pressed by the yarn presser 23. For example, in a case where a suction force of the suction portion 19 is sufficient, the yarn holder 13 can be turned off even without the yarn presser 23.

[0043] In step s9, the control portion 50 controls the supply control electromagnetic valve so that supply of compressed air to the groove 7a of the splicing nozzle 7 is ended and thus piecing is ended. In step s10, the control portion 50 controls the yarn holder control electromagnetic valve so that the yarn holder 13 is turned on, and thus a portion near the ends of the standby yarns 12 are held. The currently used yarn 12b is held by the yarn holder 13 at an upper.portion with respect to a point where the currently used yarn 12b is cut with the cutter 30 in step s6, and the currently used yarn 12b is put on standby. In step s11, the control portion 50 controls the second motor 5 so that the cam 36 is angularly displaced to the origin position in the opposite direction of the angular displacement direction in step s6. The yarn clamp 31 is turned off, and thus the pieced yarns are released, and the inlet of the groove 7a of the splicing nozzle 7 is opened. Furthermore, the cutter 30 is turned off, and thus the blades are open.

[0044] Next, in step s12, the control portion 50 controls the suction control electromagnetic valve and the yarn presser control electromagnetic valve so that the suction portion 19 and the yarn presser 23 are simultaneously turned off. Suction of the yarns 12 performed by the suction portion 19 is stopped, and holding of the yarns 12 performed by the yarn presser 23 is stopped. In step s13, the control portion 50 rotates the first motor 4 in the opposite direction of that in step s3, to return the yarn guide lever 14 to the origin position, and thus the piecing operation ends.

[0045] Fig. 17 is a view for illustrating a knitting yarn position 200 and a piecing yarn position 201. Fig. 18 is an enlarged plan view showing a portion near the yarn guide 20. As shown in Fig. 18, the groove 7a of the splicing nozzle 7 defines a V-shaped space 7b that is recessed in the shape of a V and a piecing space 7c that is continued to the deepest region of the V-shaped space 7b. The piecing space 7c is swollen compared with the deepest region of the V-shaped space 7b.

[0046] As shown.in Fig. 18, the guide face 20a of the yarn guide 20 is away from the piecing space 7c by a predetermined first set distance D1 or more in the opposite direction of the suction direction of the suction portion 19. Accordingly, a currently used yarn during knitting is guided to the yarn guide 20 and guided to the yarn guiding portion 202 that guides a currently used yarn discharged from the splicer apparatus 1. With application of tension, the yarn is tensed as shown in Fig. 17, and the currently used yarn is removed from the piecing space 7c and positioned in the V-shaped space 7b. Accordingly, the yarn can be smoothly sent out because the yarn passes through the region wider than the piecing space 7c.

[0047] Furthermore, as shown in Fig. 13, the tip end 14a of the yarn guide lever 14 disposed at the operation position is away from the piecing space 7c by a predetermined second set distance D2 or more in the suction direction of the suction portion 19. Accordingly, the currently used yarn during piecing is guided by the tip end 14a of the yarn guide lever 14 and is disposed in the piecing space 7c. In a similar manner, a selected yarn is also guided by the tip end 14a of the yarn guide lever 14 and is disposed in the piecing space 7c.

[0048] As described above, yarns can be guided with a simple structure. Moreover, the yarn guide 20 is continued to the separator 15, and thus the yarn guide 20 can be disposed near the suction portion 19, and interference with the splicing nozzle 7 and the yarn guide lever 14 can be prevented.

[0049] Fig. 19 shows the configuration in which the splicer apparatus 1 is attached to a weft knitting machine 60 and piecing is performed using knitting yarns 61 as the yarns 12. The splicer apparatus 1 also can be attached to other apparatuses such as a weaving machine or a winder. The weft knitting machine 60 has been proposed, for example, in Japanese Patent Application No. 2004-303761. Although not shown in the drawing, cones that can respectively feed a plurality of types of yarns with different colors or qualities are mounted on the upper portion of the weft knitting machine 60. In the weft knitting machine 60, a cam mechanism that is mounted on a carriage 63 traveling along a needle bed 62 selectively drives knitting needles that are arranged on the needle bed 62, and thus a fabric is knitted. In order to feed the knitting yarn 61 to the knitting needles, the carriage 63 brings a yarn feeder 64. In the weft knitting machine 60, the knitting yarns 61 can be switched by selectively using a plurality of yarn feeders 64, but the number of the yarn feeders 64 that can be used is limited, and thus the number of the knitting yarns 61 that can be switched is also limited. In a case where the knitting yarns 61 can be switched with the splicer apparatus 1, a plurality of fed knitting yarns 61 can be switched with only one yarn feeder 64. Thus, the number of the knitting yarns 61 used in a fabric that is being knitted can be significantly increased.

[0050] The length of the knitting yarn 61 knitted into a fabric that is being knitted can be obtained in advance by calculation under the condition that a change in a tensile force of the knitting yarn 61 is small. It is preferable that a sudden change in a tensile force is avoided also in order to improve the quality of a fabric that is being knitted, and thus a feeding device 65 that feeds a knitting yarn in a fixed amount is disposed. In a case where the timing of switching the knitting yarns 61 in the splicer apparatus 1 is adjusted to match the position for switching the knitting yarns 61 in the knitted fabric, a piecing portion at which the types of the knitting yarns 61 are switched is knitted into the knitted fabric near a portion where the knitting yarns are switched. A knitting process also can be performed so that the piecing portion does not appear on the surface of the knitted fabric.

[0051] As described above, in the splicer apparatus 1 that is attached to a side portion of the weft knitting machine. 60, the base 2 supports the yarn selecting portion 3 at the uppermost portion and the first motor 4 and the second motor 5 below the yarn selecting portion 3 when the side on which the plurality of knitting yarns 61 are fed is taken as the upper side and the side on which the knitting yarn 61 are used is taken as the lower side. Thus, the selected knitting yarn 61 can be pieced into the currently used knitting yarn on the lower side. The first motor 4 drives the yarn guide lever 14 for angular displacement about a horizontal axis, and thus the selected knitting yarn 61 can be caught on the yarn guide lever 14 on the upper side and guided downward. The second motor 5 includes an output shaft oriented downward, and thus drive for piecing can be performed on the lower side. The suction portion 19 is disposed near the outlet of the groove 7a of the splicing nozzle 7, and thus a yarn lint formed by piecing can be sucked and removed.

[0052] The base 2 supports the first motor 4, the second motor 5, and the splicing nozzle 7 that is positioned below the suction portion 19 so that the outlet of the splicing nozzle 7 is positioned on the upper side and the inlet is positioned on the lower side. Thus, a portion from which the knitting yarn 61 that is used is pulled out downward corresponds to the inlet of the splicing nozzle 7. Accordingly, after piecing from the currently used knitting yarn 61 into the selected knitting yarn ends, the currently used knitting yarn 61 can be immediately switched into the selected knitting yarn.

[0053] It should be noted that the arrangement, of the constituent elements can be, for example, upside down, that is, yarns can be fed from the lower side to the upper side because the operation of the splicer apparatus 1 is not affected so much by the influence of gravity.

[0054] In the splicer apparatus 1, in a state where at least one yarn 12b of a plurality of yarns 12 is currently used, the currently used yarn 12b can be pieced into at least one different yarn 12a. For example, two yarns 12a can be selected and piecing can be performed with three yarns, that is, the two yarns 12a and the currently used yarn 12b. The yarn holder 13 holds the tip end sides of yarns 12 that are not currently used among the plurality of yarns 12. The yarn selecting portion 3 selects a yarn 12a that is to be used for piecing, from among the yarns 12 that are held by the yarn holder 13. Thus, piecing can be performed by freely selecting a yarn 12a from among the plurality of yarns 12. The splicing nozzle 7 performs piecing by joining the yarn 12a selected by the yarn selecting portion 3 and the currently used yarn 12b, using a flow of compressed fluid in the groove 7a. Thus, the currently used yarn 12b and the selected yarn 12a are continuously joined at the inlet of the splicing nozzle 7.

[0055] The yarn 12a selected by the yarn selecting portion 3 is caught on the tip end 14a of the yarn guide lever 14, and guided to the inlet of the groove 7a so as to be placed in the groove 7a. Furthermore, the currently used yarn 12b is also caught on the yarn guide lever 14 that is moving for guiding, and guided to the groove 7a so as to be placed in the groove 7a together with the selected yarn 12a. The yarn guide lever 14 is driven by the first motor 4. The suction portion 19 sucks the yarn 12 at a position near the outlet of the groove 7a. In a state where the selected yarn 12a and the currently used yarn 12b are put in the groove 7a, the yarn clamp 31 blocks the inlet of the groove 7a during piecing. Thus, leakage of the compressed fluid through the inlet can be prevented, and piecing can be effectively performed. Furthermore, the yarn clamp 31 clamps the currently used yarn 12b and the yarn 12a selected by the yarn selecting portion 3 at a position near the inlet of the groove 7a during piecing performed by the splicing nozzle 7, and cancels the clamping after the piecing ends. Thus, a tensile force applied to the yarns can be prevented from acting on the piecing portion that is formed in the groove 7a during the piecing.

[0056] The cutter 30 cuts the currently used yarn 12b and the selected yarn 12a that'are pieced into each other, at a position near the outlet of the groove 7a. Thus, the length of the formed piecing portion can be limited. The second motor 5 that drives the cutter 30 and the yarn clamp 31 is disposed separately from the first motor 4 that drives the yarn guide lever 14, and thus the cutter 30 and the yarn clamp 31 can be controlled independently of the yarn guide lever 14. Thus, the control can be flexibly performed, for example, in such a manner that in a case where delicate yarns are used, the yarn guide lever 14 is angularly displaced at a low speed and the other mechanisms are operated at a normal speed.

[0057] The base 2 supports the constituent elements including the yarn holder 13, the yarn selecting portion 3, the splicing nozzle 7, the yarn guide lever 14, the first motor 4, the suction portion 19, the cutter 30, and the second motor 5 so that the positional relationship between the constituent elements is maintained. Accordingly, the constituent elements can be arranged so that the required space is reduced, the constituent elements can be compactly supported, and thus the apparatus can be downsized. Furthermore, the base 2 has the partition wall 100, and thus it is possible to suppress scattering of fibrous dust to the back side of the partition wall 100 on which the first and the second motors 4 and 5 and the first and the second electromagnetic valve units 130 and 131 are arranged, the fibrous dust being formed by piecing on the front side of the partition wall 100 on which the yarn holder 13, the splicing nozzle 7, the yarn guide lever 14, the cutter 30, the suction portion 19, the yarn guide 20, and the like are arranged. Accordingly, it is possible to prevent an operation failure caused by fibrous dust entering the first and the second motors 4 and 5 and the first and the second electromagnetic valve units 130 and 131. In this manner, a preferable splicer apparatus 1 can be realized. Moreover, the splicer apparatus 1 that includes electromagnetic valves can be realized.

[0058] Furthermore, the output shaft of the first motor 4 and the angular displacement axis of the yarn guide

lever 14 are parallel, and thus a space required by the first motor 4 to drive the yarn guide lever 14 can be reduced. The yarn guide lever can be angularly displaced within a predetermined angular range, a space required by the yarn guide lever to be angularly displaced can be limited within a predetermined angular range, and thus a space required by the yarn guide lever to be disposed can be reduced. Furthermore, the cutter 30 and the yarn clamp 31 are driven by the second motor 5 via the cam mechanism. Thus, the cutter 30 and the yarn clamp 31 can be driven so as to be operated in synchronization with each other.

[0059] The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description and all changes which come within the meaning and a range of equivalency of the claims are therefore intended to be embraced therein.

Industrial Applicability

[0060] According to the invention, the splicer apparatus can perform piecing into a currently used yarn by freely selecting a yarn from among yarns that are not currently used. The head performs piecing by joining the selected yarn and the currently used yarn, using a flow of compressed fluid in a groove that is formed from an inlet to an outlet. Thus, in the groove, twisted ends of the yarns are once untwisted and then intertwined to form a piecing portion, and the currently used yarn and the selected yarn are continuously joined at the inlet of the head. The first driving portion that drives the yarn guide lever and the second driving portion that drives the cutter are arranged separately from each other, and thus the yarn guide lever and the cutter can be controlled independently of each other, and the control can be flexibly performed. The base supports the holder portion, the selecting portion, the head, the yarn guide lever, the first driving portion, the suction portion, the cutter, and the second driving portion so that the positional relationship between the constituent elements is maintained. Accordingly, the constituent elements can be arranged so that the required space is reduced, and thus the apparatus can be downsized. Furthermore, the base has the partition wall, and thus it is possible to suppress scattering of fibrous dust to the second side of the partition wall on which the first and the second driving portions are arranged, the fibrous dust being formed by piecing on the first side of the partition wall on which the holder portion, the head, the yarn guide lever, the cutter, and the suction portion are arranged.

Accordingly, it is possible to prevent an operation failure caused by fibrous dust entering the first and the second driving portions.

[0061] According to the invention, the supply control electromagnetic valve that controls supply and supply stop of compressed fluid to the head and the suction control electromagnetic valve that controls suction and suction stop of a yarn performed by the suction portion are included. The supply control electromagnetic valve and the suction control electromagnetic valve are arranged on the second side of the partition wall. Thus, it is possible to prevent an operation failure caused by fibrous dust entering the supply control electromagnetic valve and the suction control electromagnetic valve. Accordingly, a preferable splicer apparatus that includes the supply control electromagnetic valve and the suction control electromagnetic valve can be realized.

[0062] According to the invention, the holder portion control electromagnetic valve controls supply and supply stop of compressed fluid to the holder portion. The holder portion control electromagnetic valve for controlling the holder portion is disposed on the second side of the partition wall. Thus, it is possible to prevent an operation failure caused by fibrous dust entering the holder portion control electromagnetic valve. Accordingly, a preferable splicer apparatus that drives the holder portion with compressed fluid and that includes the holder portion control electromagnetic valve for controlling the holder portion can be realized.

[0063] According to the invention, the yarn clamp is driven by the second driving portion so that, in state where the selected yarn and the currently used yarn are put in the groove of the head, the yarn clamp blocks the inlet of the groove of the head. Thus, the compressed fluid for piecing in the groove of the head can be prevented from leaking through the inlet, and piecing can be effectively performed. Furthermore, the yarn clamp can clamp the selected yarn and the currently used yarn, and thus the yarns can be firmly held in a state where the selected yarn and the currently used yarn are put in the groove of the head, and a piecing failure can be prevented.

[0064] According to the invention, the guide face of the yarn guide is disposed at a position located out of the groove of the head in a groove depth direction.

Accordingly, tension is applied to the currently used yarn so that the yarn is tensed, and thus a state in which the yarn is kept put in the groove of the head can be prevented. Thus, a smooth knitting operation can be realized. Furthermore, the yarn guide can be fixed to the base, and thus the structure can be simplified. Since the yarn guide does not have to be driven, the structure of the splicer apparatus can be simplified. Moreover, a hole through which a motive power from a driving source for driving the yarn guide is transmitted does not have to be formed in the base. Thus, it is possible to prevent an operation failure of the driving portions by preventing fibrous dust and the like from entering the back side of the base.

[0065] According to the invention, the base has the partition wall that extends in a direction connecting a side on which the plurality of yarns are fed and a side on which

the yarns are used. The selecting portion is disposed at the end portion of the base on the yarn feeding side. The holder portion, the suction portion, the cutter, the head, and the first and the second driving portions are arranged between the selecting portion and the yarn using side. The yarn selected by the selecting portion is pieced into the currently used yarn in a portion between the selecting portion and the yarn using side. Furthermore, the holder portion, the suction portion, the cutter, and the head are arranged in this order from the yarn feeding side to the yarn using side. The head is disposed so that the outlet of the groove is positioned on the yarn feeding side and the inlet of the groove is positioned on the yarn using side. Thus, after piecing from the currently used yarn into the selected yarn ends, the currently used yarn can be immediately switched into the selected yarn, and an unnecessary portion of the selected yarn that has been cut with the cutter can be sucked by the suction portion.

[0066] According to the invention, the output shaft of the motor functioning as the first driving portion and the angular displacement axis of the yarn guide lever are parallel. Thus, in a case where the output shaft of the motor directly drives the yarn guide lever or drives the yarn guide lever via a transmission mechanism such as a gear, the required space can be reduced. The yarn guide lever can be angularly displaced within a predetermined angular range, a space required by the yarn guide lever to be angularly displaced can be limited within a predetermined angular range, and thus a space required by the yarn guide lever to be disposed can be reduced.

[0067] According to the invention, the cutter and the yarn clamp are driven by the motor functioning as the second driving portion via a cam mechanism. Thus, the cutter and the yarn clamp can be driven so as to be operated in synchronization with each other.

Claims

1. A splicer apparatus in which, in a state where at least one yarn of a plurality of yarns is currently used, the currently used yarn can be pieced into at least one different yarn, comprising:

a holder portion that holds tip end portions of yarns that are not currently used among the plurality of yarns;
a selecting portion that selects a yarn that is to be used for piecing, from among the yarns that are held by the holder portion;
a head that performs piecing by joining the yarn selected by the selecting portion and the currently used yarn, using a flow of compressed fluid in a groove that is formed from an inlet positioned on an opposite side of the holder portion to an outlet positioned on a side of the holder portion;
a yarn guide lever that catches the yarn selected by the selecting portion and guides the yarn to the inlet of the groove of the head;
a first driving portion that drives the yarn guide lever;
a suction portion that sucks a yarn at a position near the outlet of the groove of the head;
a cutter that cuts the currently used yarn and the selected yarn that are pieced into each other, at a position near the outlet of the groove of the head;
a second driving portion that drives the cutter in conjunction with the yarn guide lever; and
a base that has a partition wall, and supports the holder portion, the selecting portion, the head, the yarn guide lever, the first driving portion, the suction portion, the cutter, and the second driving portion so that at least the holder portion, the head, the yarn guide lever, the cutter, and the suction portion are arranged on a first side of the partition wall and at least the first and the second driving portions are arranged on a second side of the partition wall.

2. The splicer apparatus of claim 1, further comprising:

a supply control electromagnetic valve that is disposed on the second side of the partition wall and controls supply and supply stop of compressed fluid to the head; and
a suction control electromagnetic valve that is disposed on the second side of the partition wall and controls suction and suction stop of a yarn performed by the suction portion.

3. The splicer apparatus of claim 1 or 2, wherein the holder portion is driven with compressed fluid, and the splicer apparatus further comprises a holder portion control electromagnetic valve that is disposed on the second side of the partition wall and that controls supply and supply stop of compressed fluid to the holder portion.

4. The splicer apparatus of any one of claims 1 to 3, further comprising a yarn clamp that is driven by the second driving portion, and that blocks a portion of the groove on a side of the inlet and clamps the selected yarn and the currently used yarn in a state where the selected yarn and the currently used yarn are put in the groove.

5. The splicer apparatus of any one of claims 1 to 4, further comprising a yarn guide that guides the currently used yarn and in which a guide face that guides the currently used yarn is formed at a position closer to the selecting portion than the groove of the head and located out of the groove of the head in a groove depth direction.

6. The splicer apparatus of any one of claims 1 to 5, wherein the base has the partition wall extending in a direction connecting a side on which the plurality of yarns are fed and a side on which the yarns are used,
the selecting portion is disposed closer to the yarn feeding side than the partition wall, and supported by an end portion of the base on the yarn feeding side,
the first driving portion and the second driving portion are supported by the base, at positions closer to the yarn using side than the selecting portion, on the second side of the partition wall, and
the holder portion, the suction portion, the cutter, and the head are supported by the base on the first side of the partition wall so that the holder portion, the suction portion, the cutter, and the head are arranged in this order from the yarn feeding side to the yarn using side.

7. The splicer apparatus of any one of claims 1 to 6, wherein the first driving portion is a motor that has an output shaft, and
the yarn guide lever is disposed so that the yarn guide lever can be angularly displaced within a predetermined angular range about an angular displacement axis that is parallel to the output shaft of the motor.

8. The splicer apparatus of claim 4, wherein the second driving portion is a motor, and
the cutter and the yarn clamp are driven by the motor via a cam mechanism.

FIG. 1

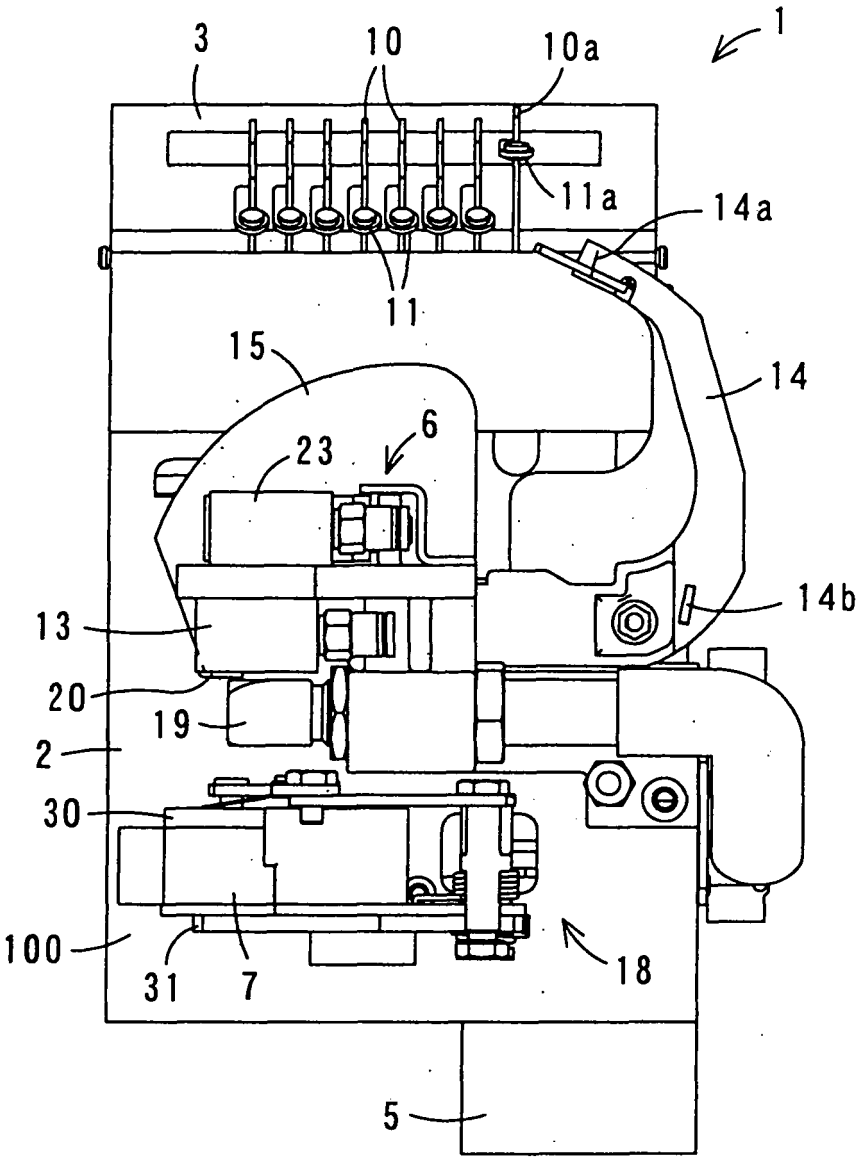

FIG. 2

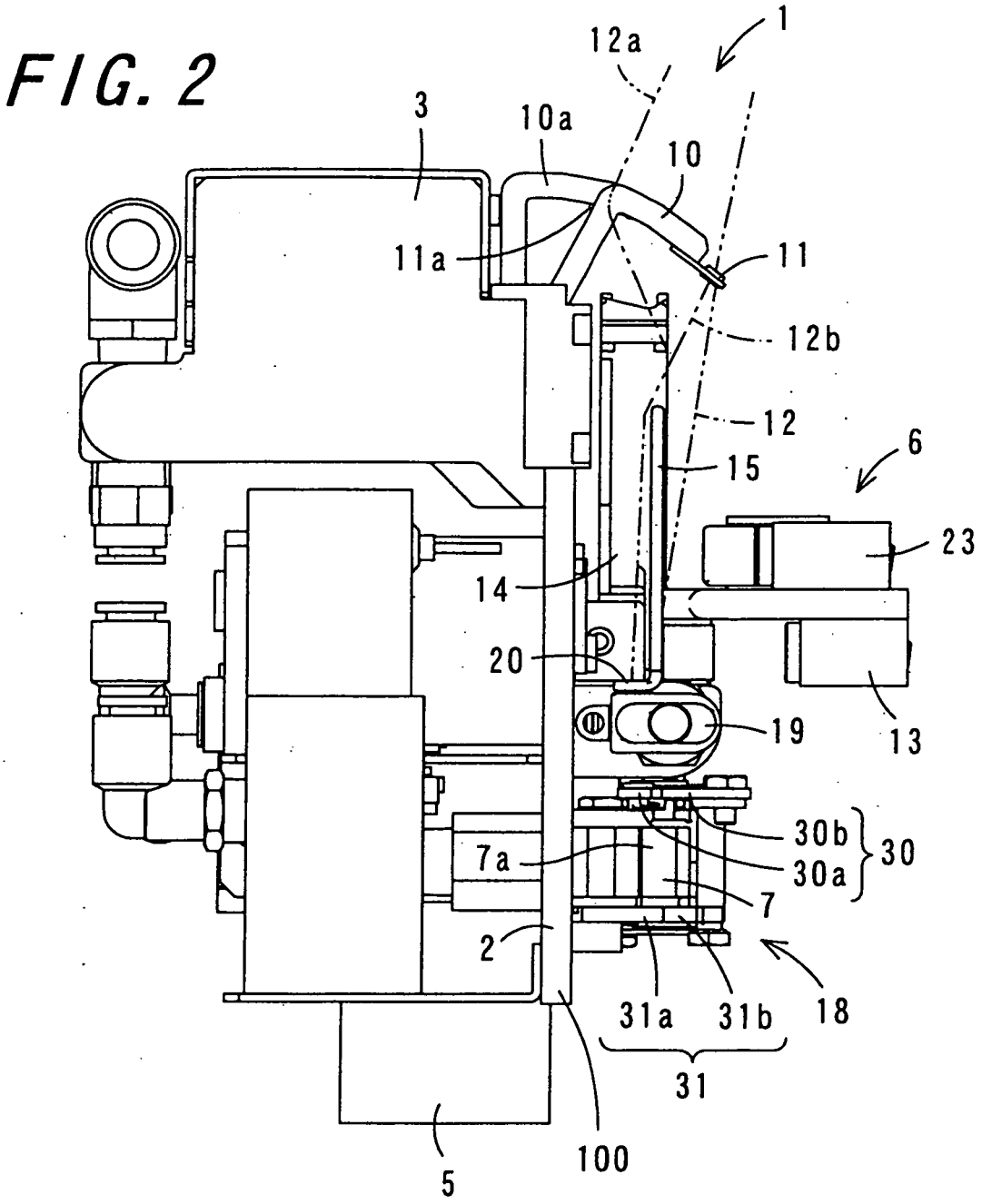
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FIG. 3

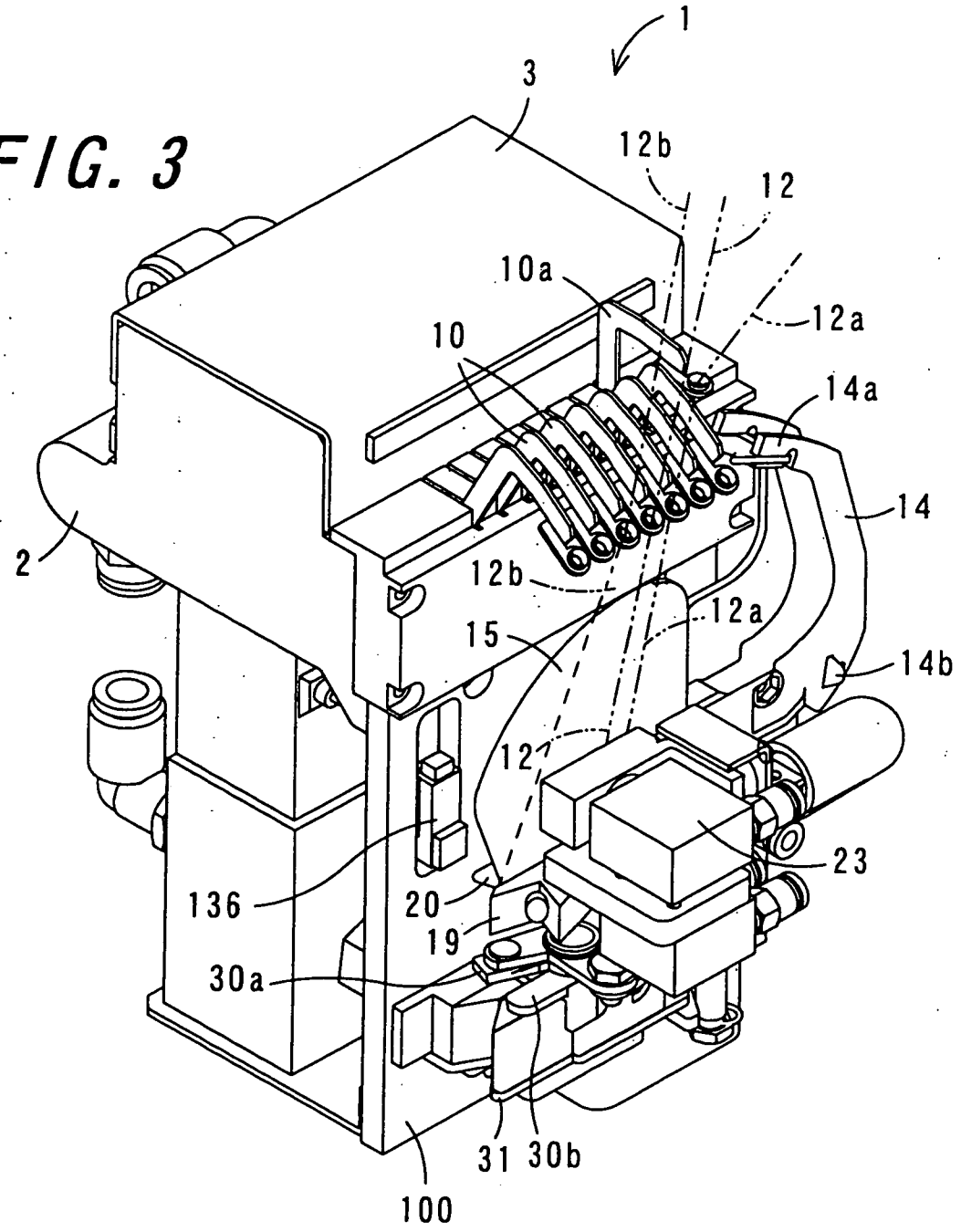
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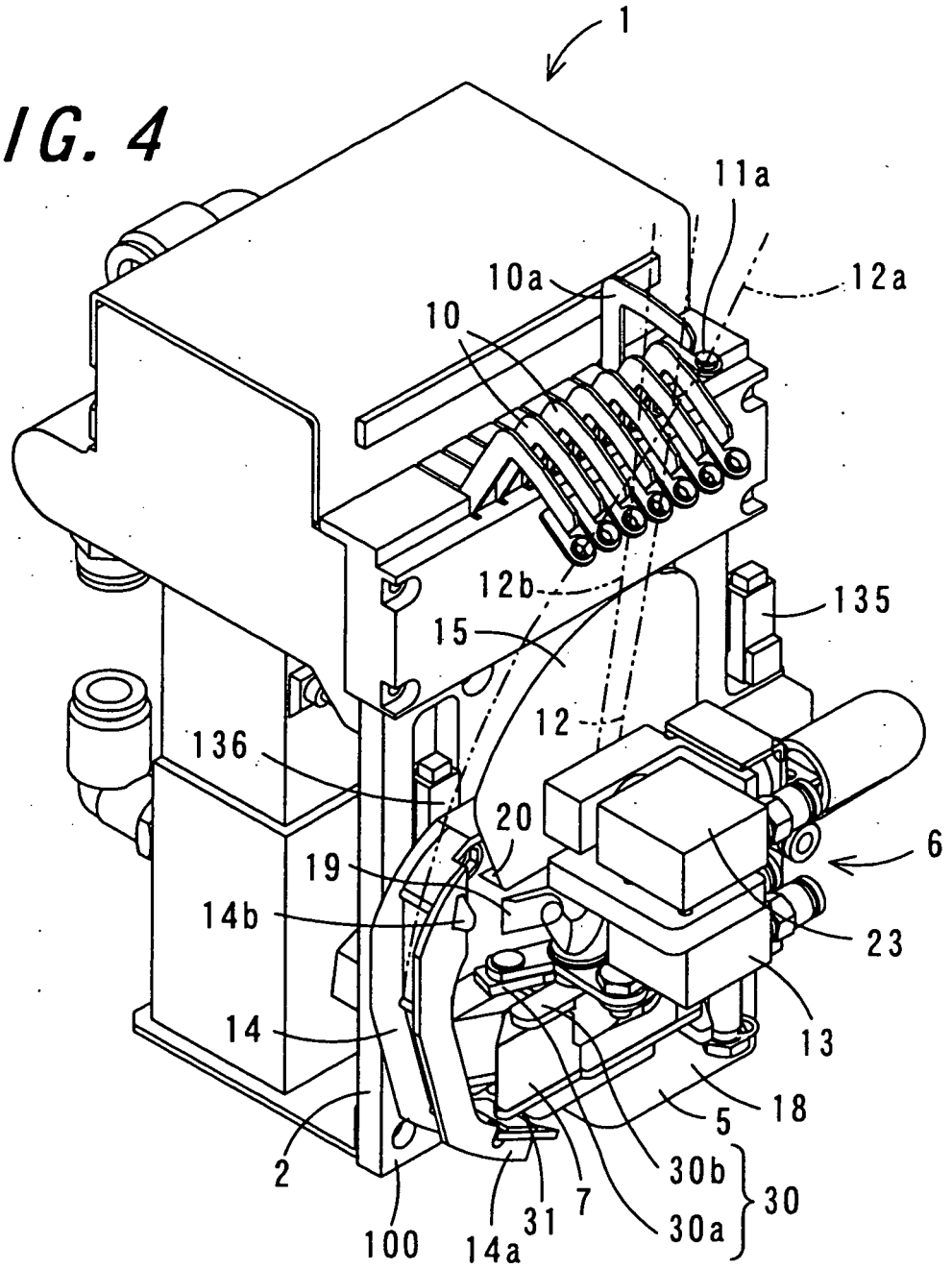
FIG. 4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30a
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14a

FIG. 5

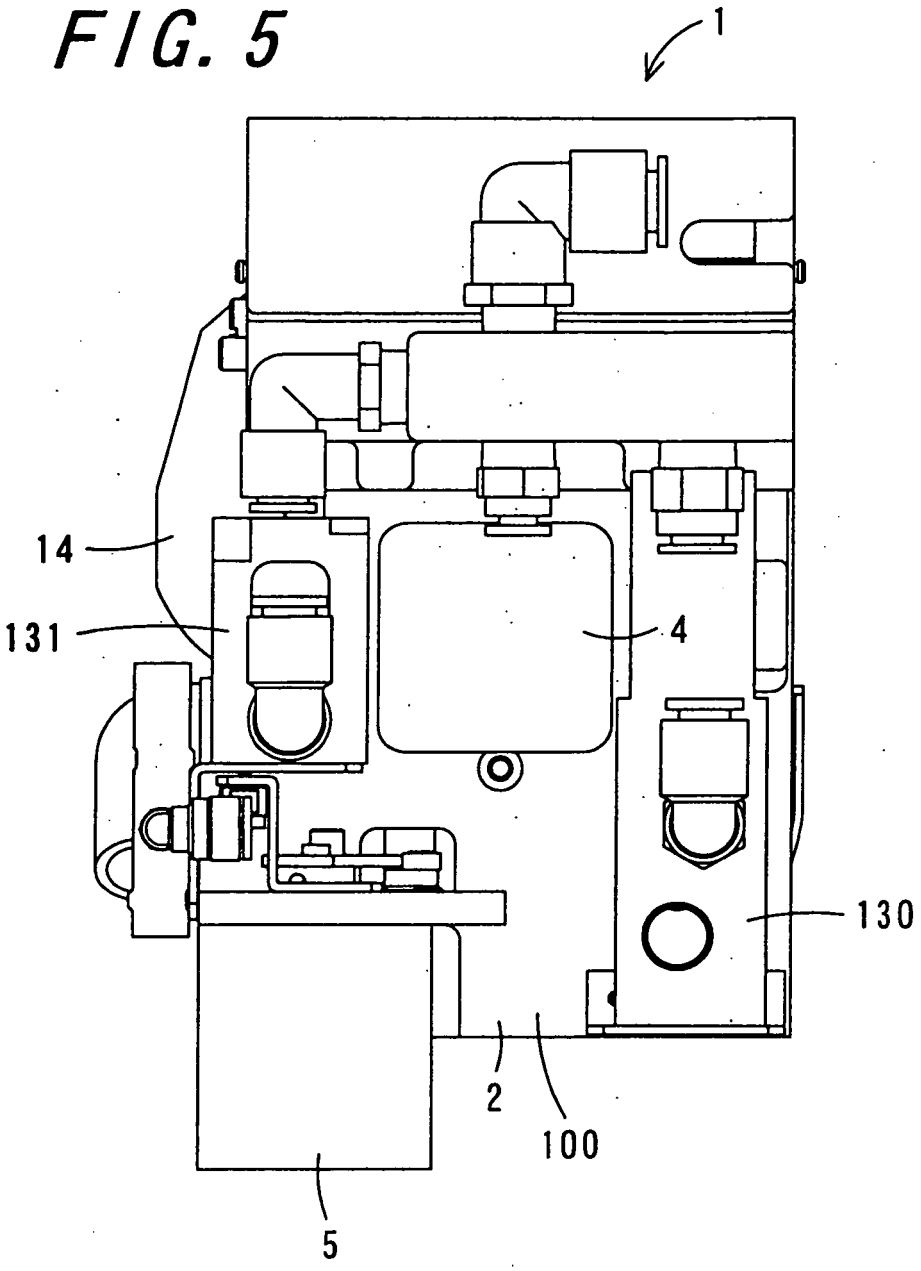


FIG. 6

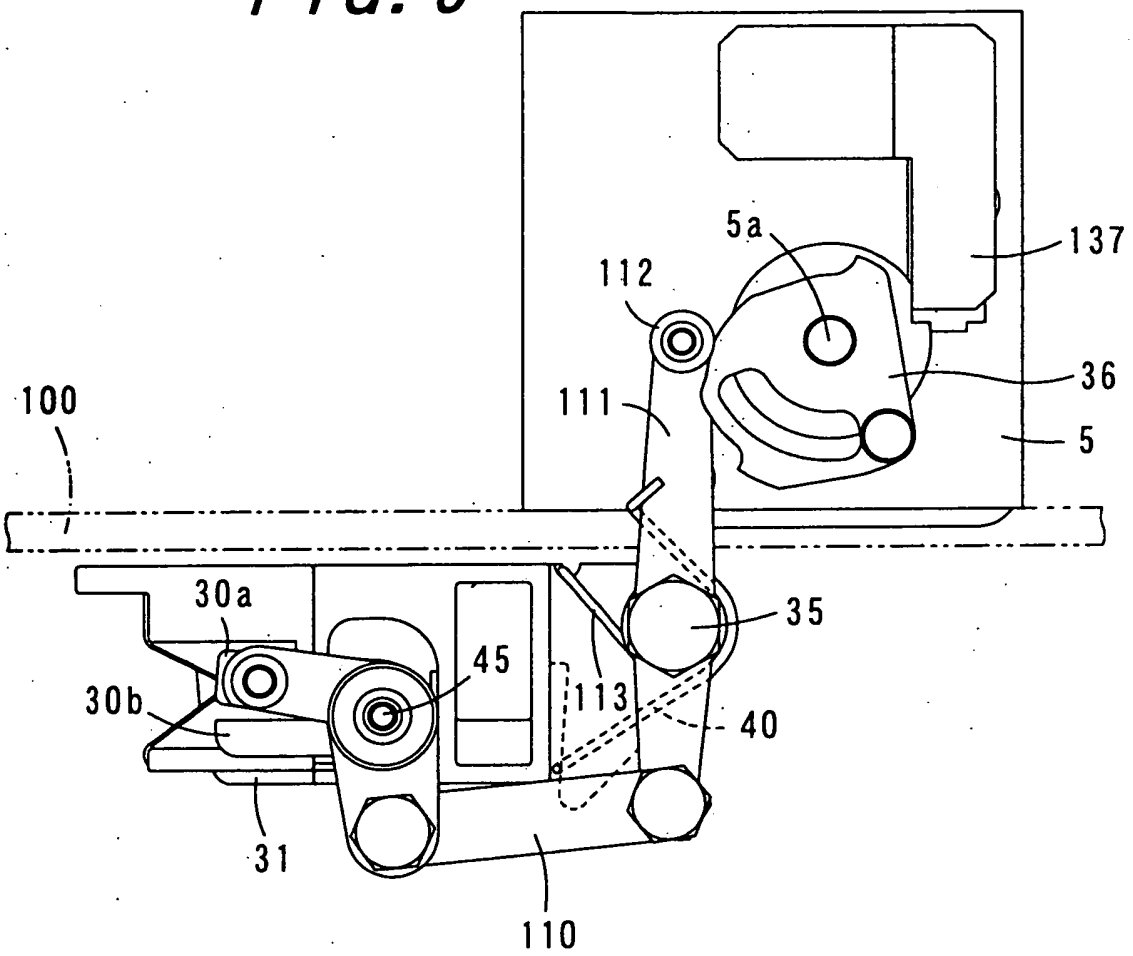


FIG. 7

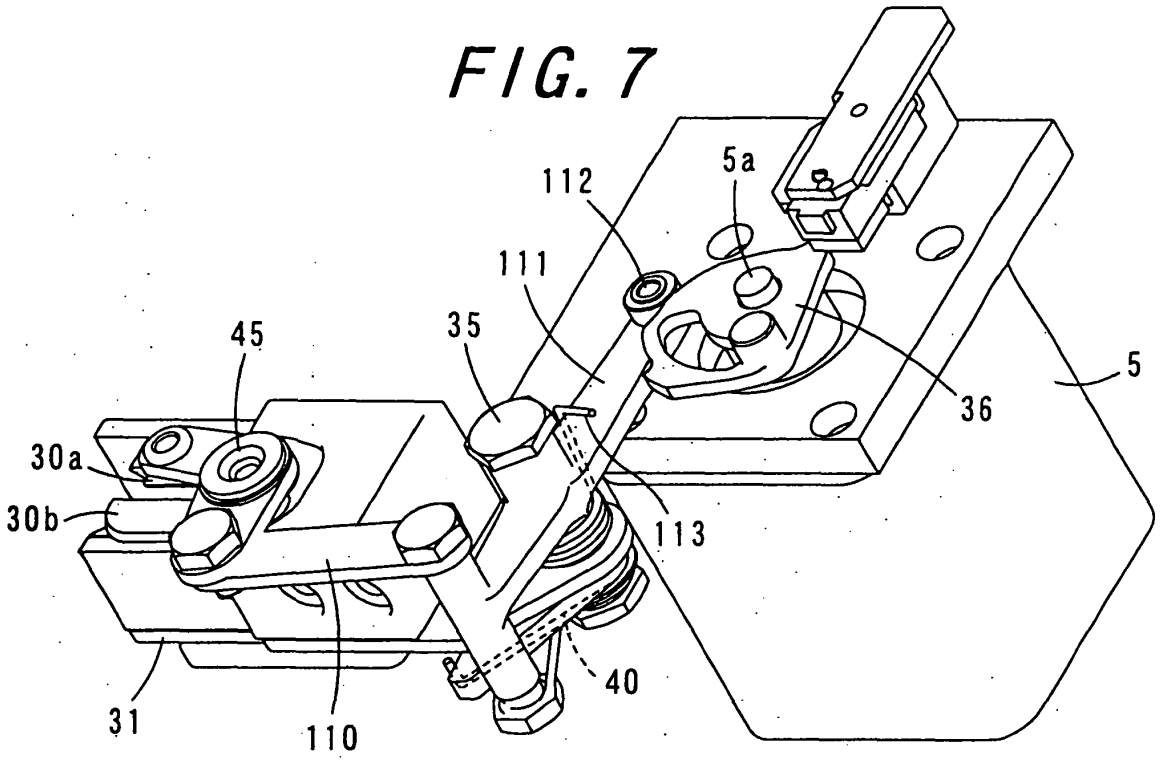


FIG. 8

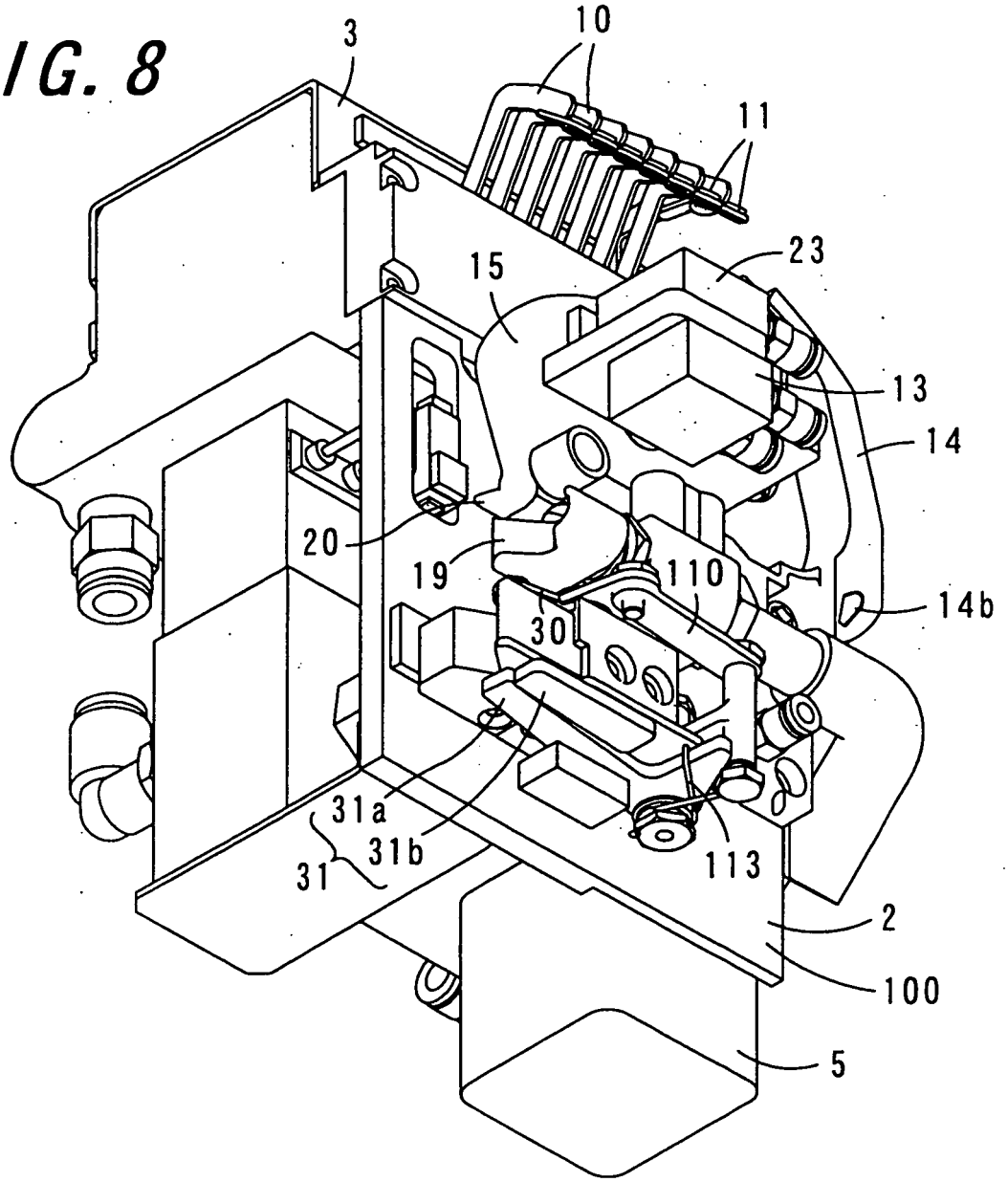
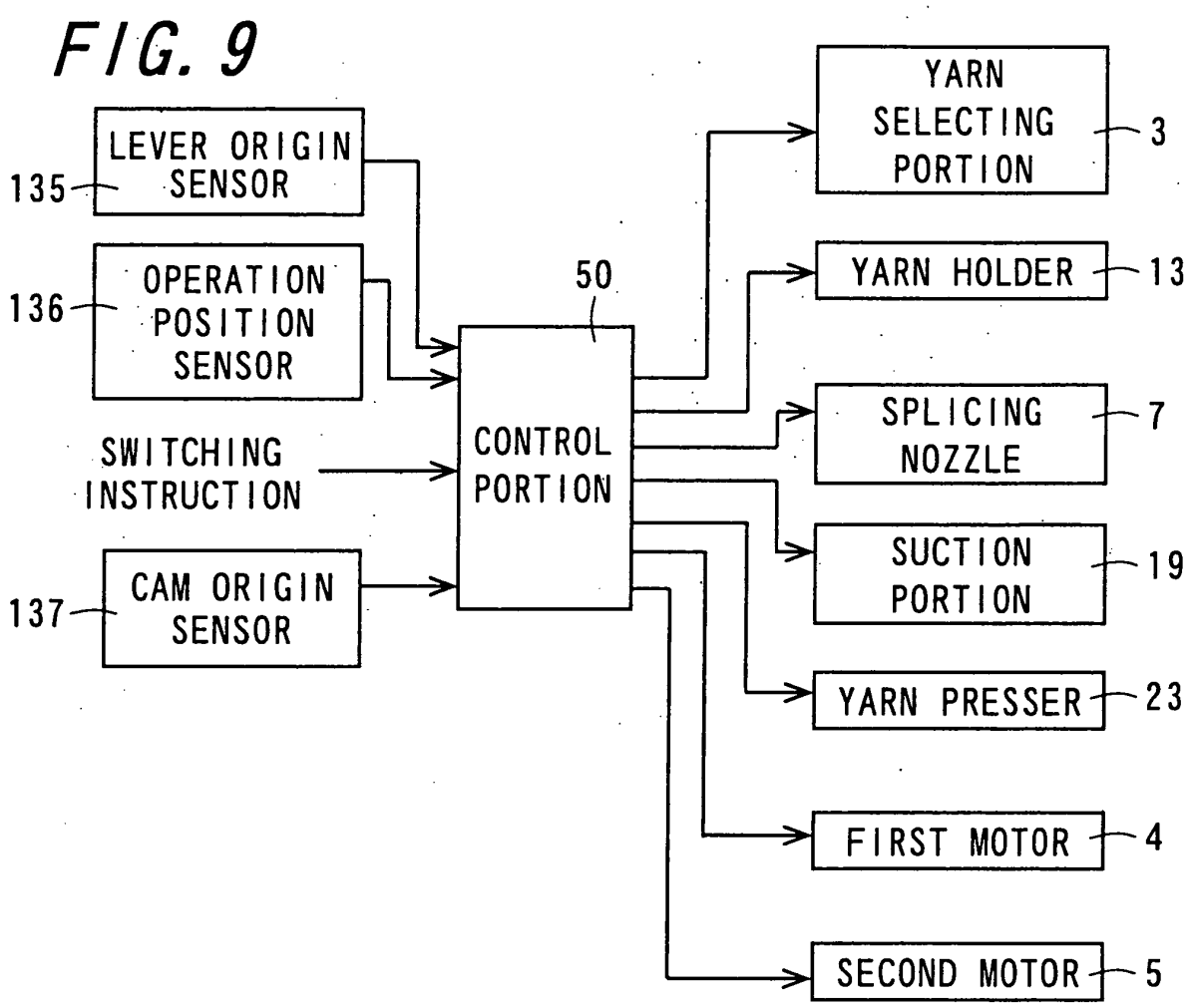


FIG. 9


LEVER ORIGIN SENSOR
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OPERATION POSITION SENSOR
136
SWITCHING INSTRUCTION
CAM ORIGIN SENSOR
137
50
CONTROL PORTION
YARN SELECTING PORTION
3
YARN HOLDER
13
SPLICING NOZZLE
7
SUCTION PORTION
19
YARN PRESSER
23
FIRST MOTOR
4
SECOND MOTOR
5

FIG. 10

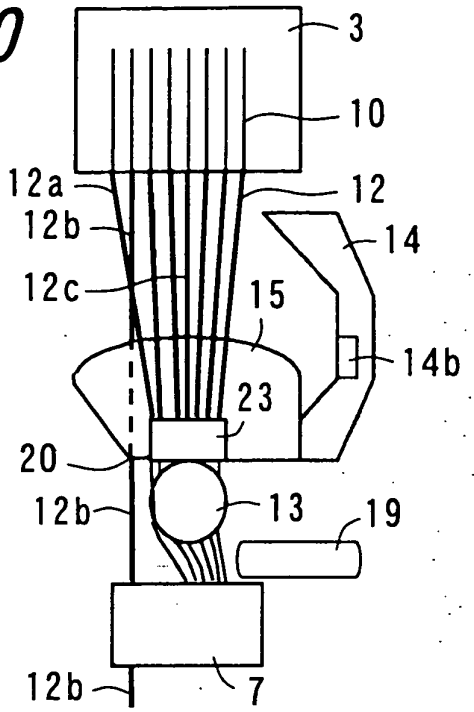

3
10
12a
12
12b
14
12c
15
14b
23
20
12b
13
19
12b
7

FIG. 11

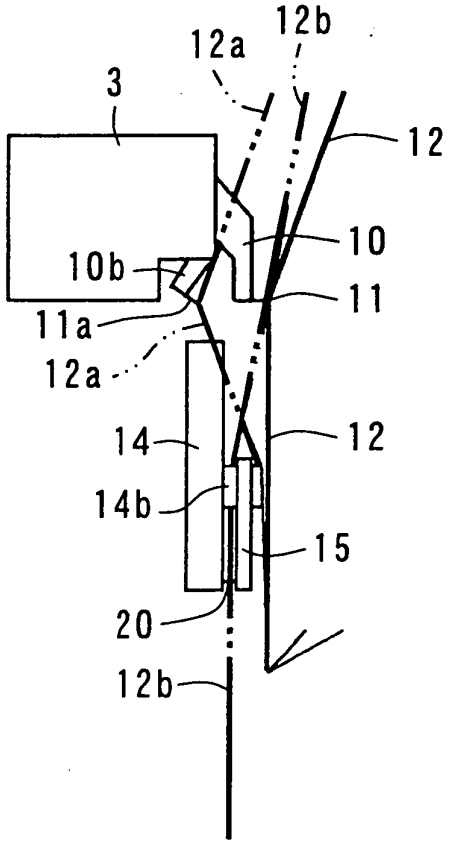

12b
12a
3
12
10
10b
11
11a
12a
14
12
14b
15
20
12b

FIG. 12

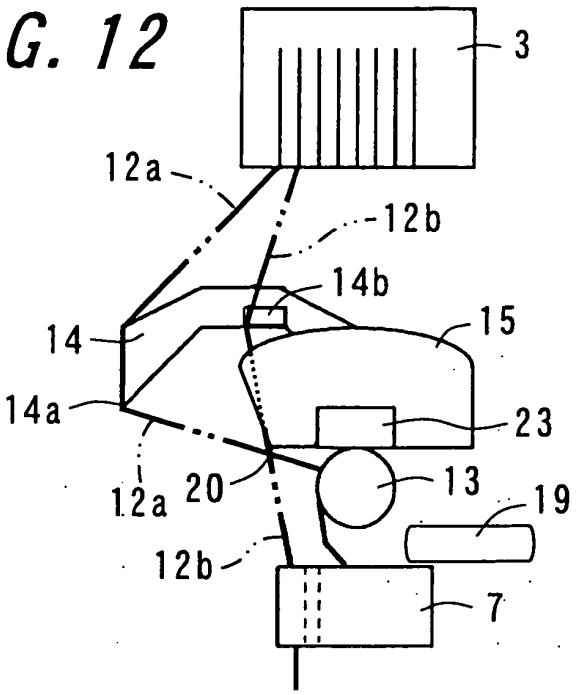

3
12a
12b
14b
14
15
14a
23
12a
20
13
19
12b
7

FIG. 13

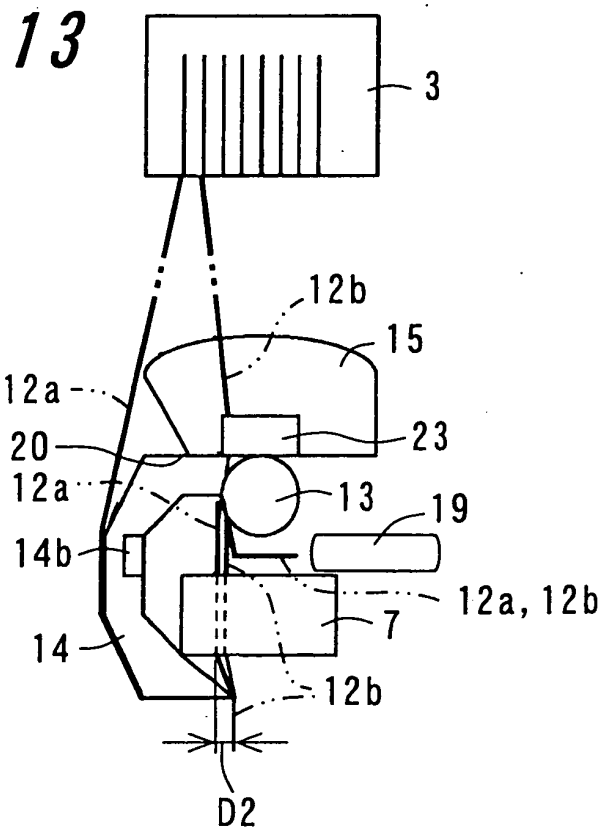

3
12b
15
12a
20
23
12a
13
19
14b
12a, 12b
7
14
12b
D2

FIG. 14

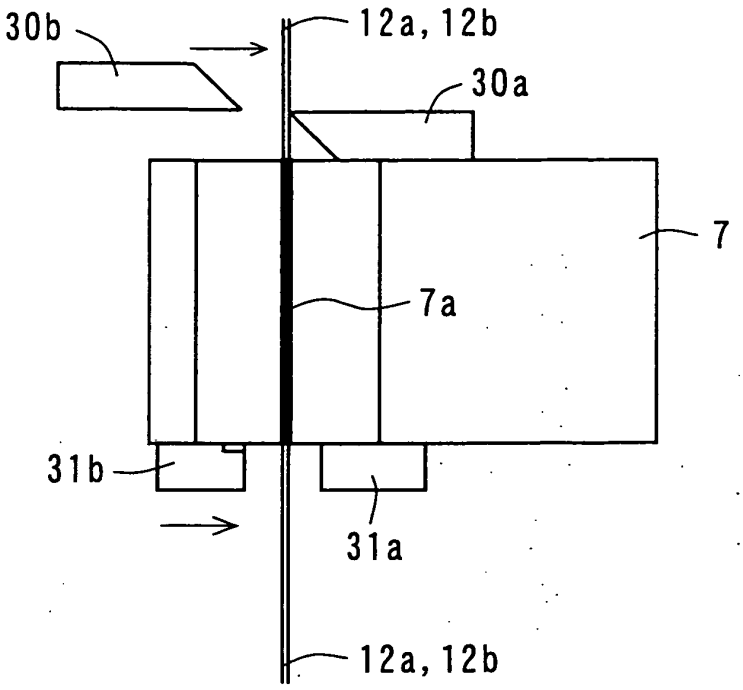

30b
12a, 12b
30a
7
7a
31b
31a
12a, 12b

FIG. 15

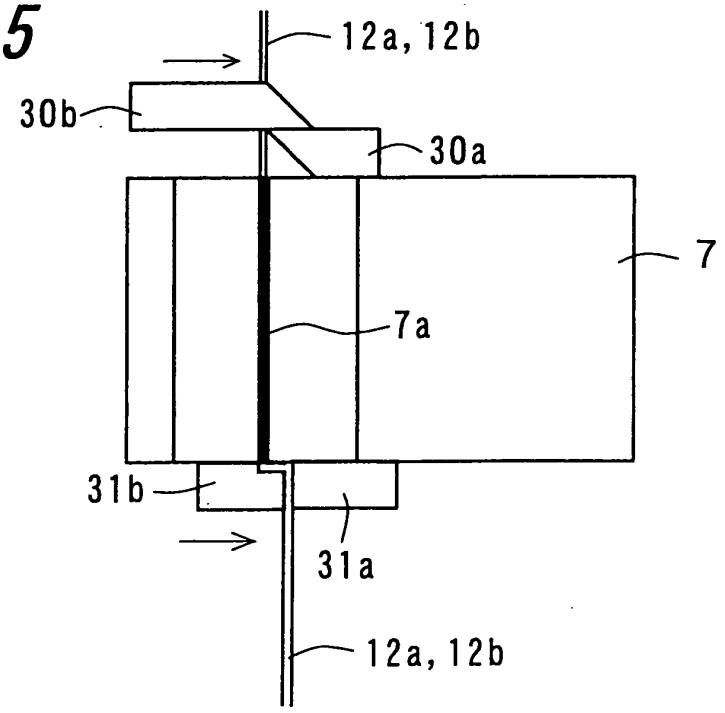

12a, 12b
30b
30a
7
7a
31b
31a
12a, 12b

FIG. 16

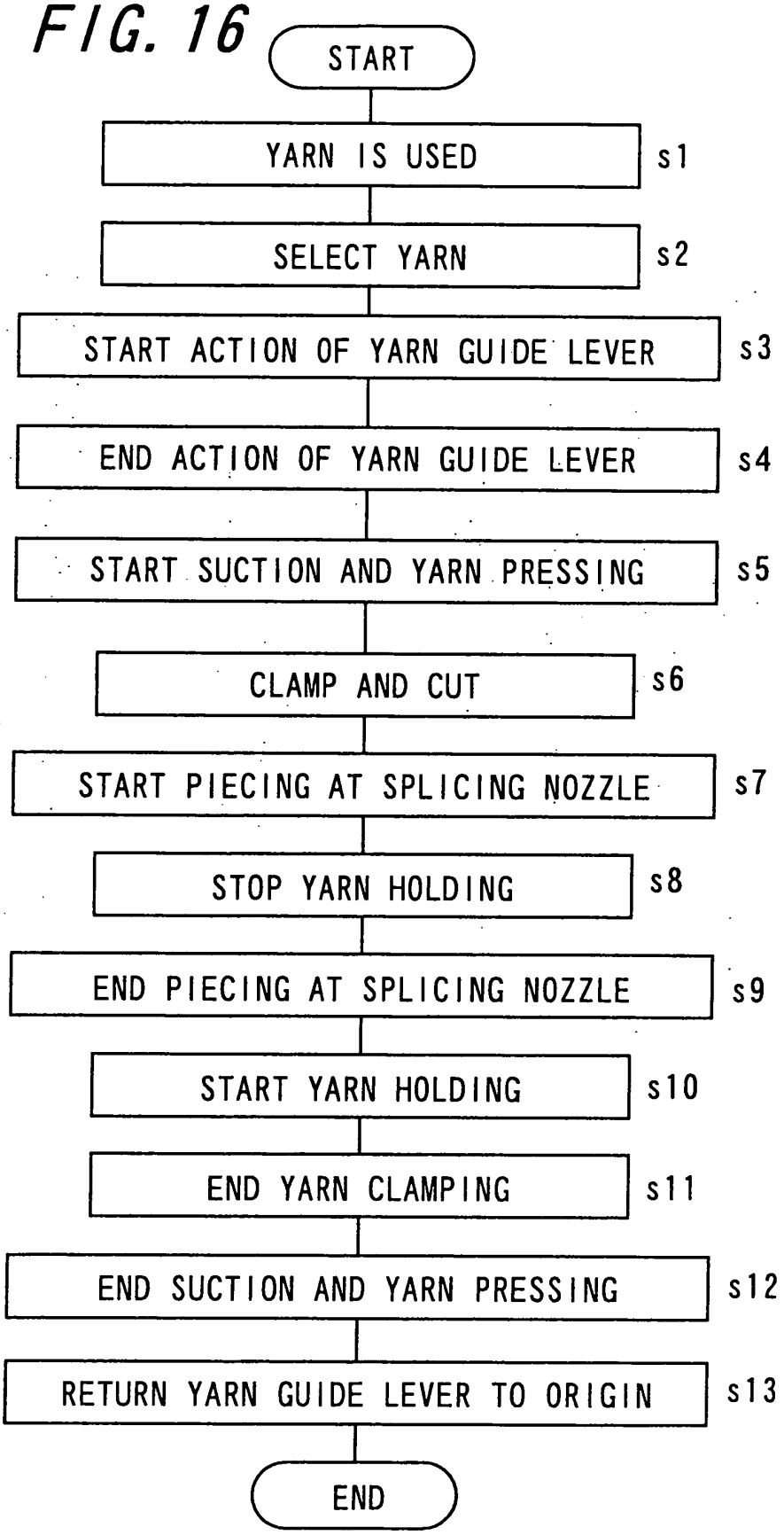

START
YARN IS USED
s1
SELECT YARN
s2
START ACTION OF YARN GUIDE LEVER
s3
END ACTION OF YARN GUIDE LEVER
s4
START SUCTION AND YARN PRESSING
s5
CLAMP AND CUT
s6
START PIECING AT SPLICING NOZZLE
s7
STOP YARN HOLDING
s8
END PIECING AT SPLICING NOZZLE
s9
START YARN HOLDING
s10
END YARN CLAMPING
s11
END SUCTION AND YARN PRESSING
s12
RETURN YARN GUIDE LEVER TO ORIGIN
s13
END

FIG. 17

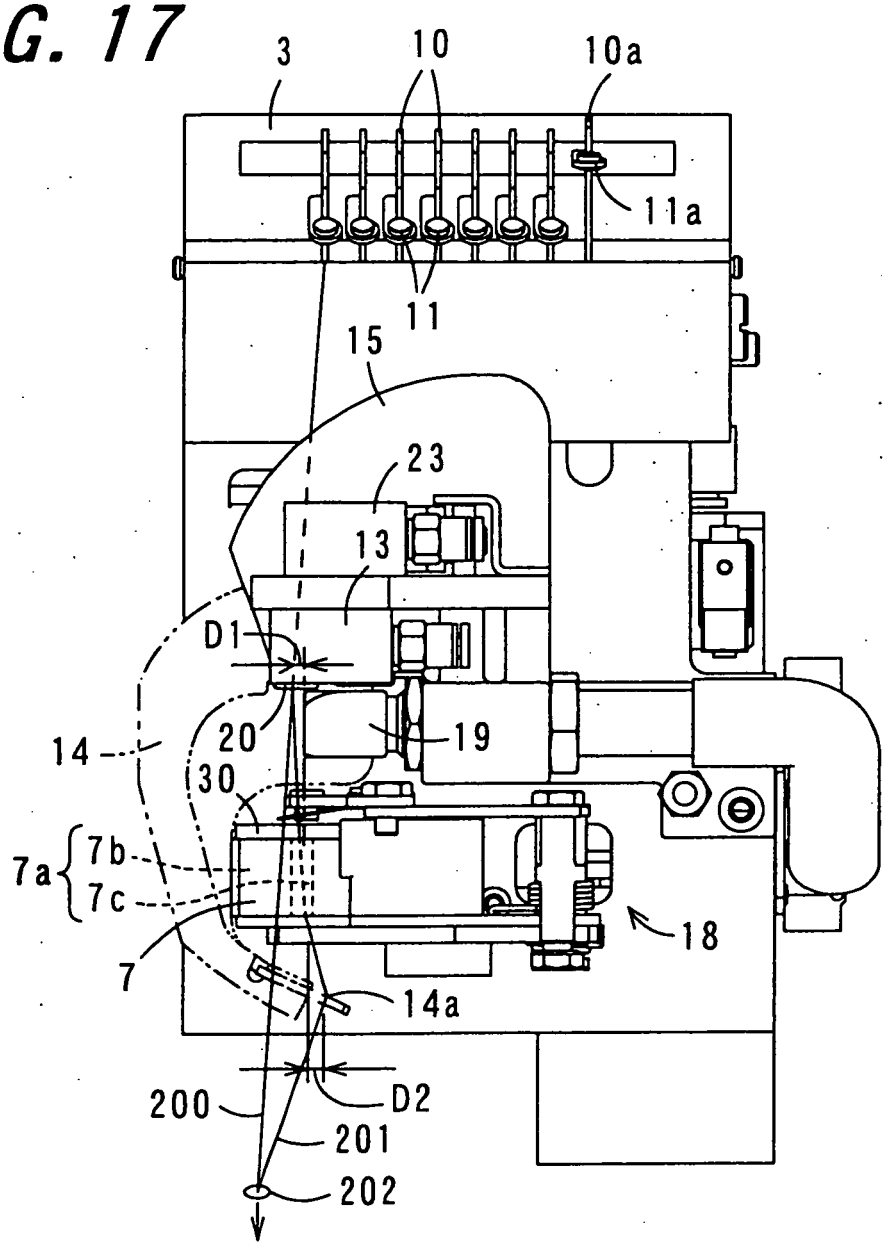

3
10
10a
11a
11
15
23
13
D1
20
19
14
30
7a
7b
7c
7
18
14a
200
D2
201
202

FIG. 18

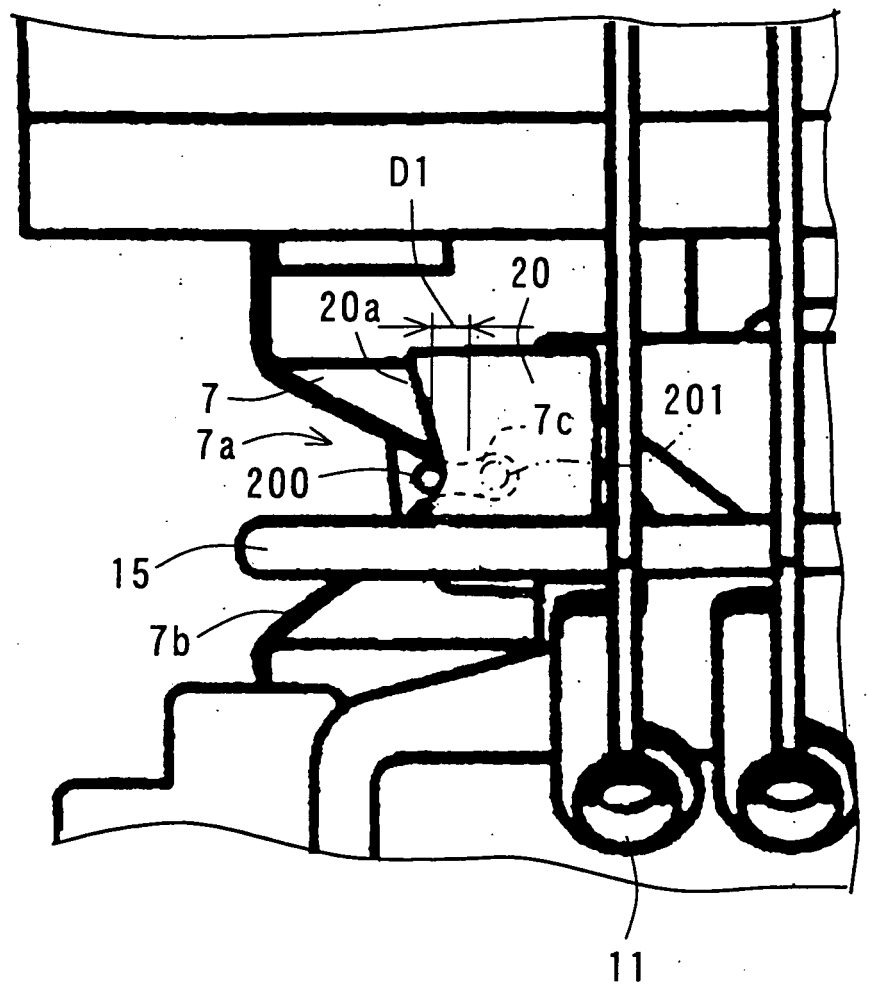
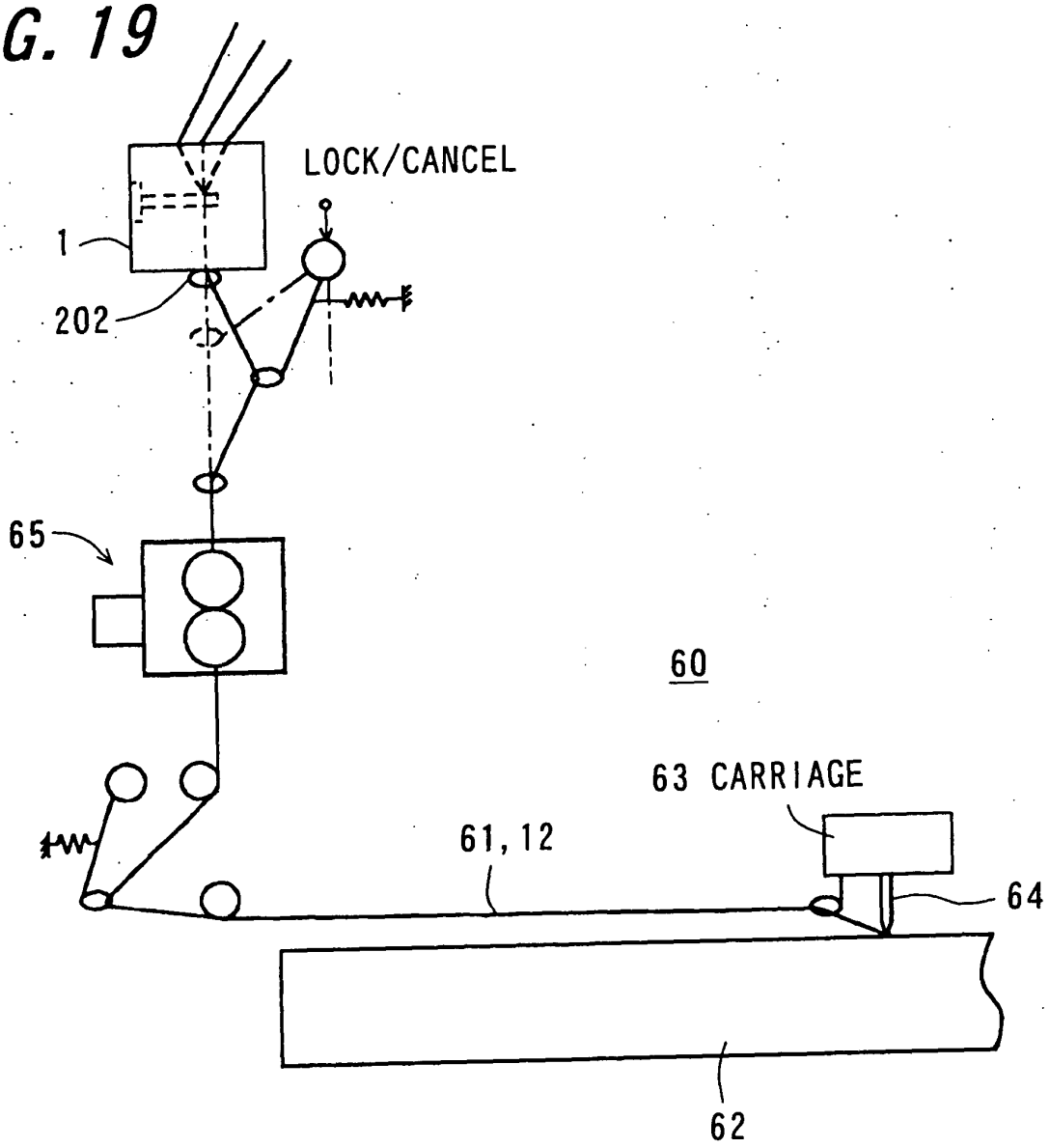


FIG. 19



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2007/061576

A. CLASSIFICATION OF SUBJECT MATTER
B65H69/06(2006.01)i, *D04B15/56*(2006.01)i, *D01H15/00*(2006.01)n

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B65H69/06, D04B15/56, D01H15/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2007
Kokai Jitsuyo Shinan Koho 1971-2007 Toroku Jitsuyo Shinan Koho 1994-2007

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2005-314104 A (Murata Machinery Ltd.), 10 November, 2005 (10.11.05), Par. Nos. [0032] to [0035], [0042] & EP 1584595 A1	1-8
Y	JP 2005-112550 A (Murata Machinery Ltd.), 28 April, 2005 (28.04.05), Par. No. [0039] & EP 1522517 A1	1-8
Y	JP 2004-27463 A (Murata Machinery Ltd.), 29 January, 2004 (29.01.04), Par. No. [0037] & CN 1456721 A	4,8

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Date of the actual completion of the international search	Date of mailing of the international search report
25 July, 2007 (25.07.07)	07 August, 2007 (07.08.07)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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- JP 2004027463 A **[0003] [0005] [0005] [0005] [0006]**
- JP 2004131276 A **[0003] [0005] [0006]**
- JP 2004303761 A **[0049]**