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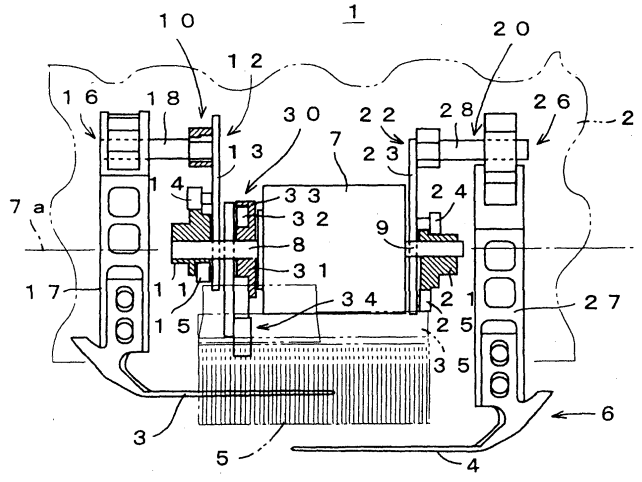
(54) CARRIAGE-MOUNTED UNIT OF WEFT KNITTING MACHINE

(57) The invention relates to a carriage-mounted unit of a weft knitting machine, capable of being made smaller in spite of being provided with many functions thereof. A pair of stitch pressers (3, 4) is driven by the rotating motion of a motor (7) through a one-side drive mechanism (10) and an other-side drive mechanism (20). The one-side drive mechanism (10) and the other-side drive mechanism (20) are provided with double-stepped cams (11) and (21) to reduce a load on the motor (7). A cam drive mechanism (30) advances and retracts a brush (5) as another member with respect to a needle bed gap (6) to avoid its interference with the pair of stitch presser (3, 4). Even if at least three of the stitch pressers (3, 4) as a pair of members and the brush (5) as another member are driven by the single motor (7) so that the respective members are advanced to and retracted from the needle bed gap (6) by the rotation of the motor (7), a groove cam plate traveling back and forth in a back-and-forth travel direction of a carriage (2) or the like is not provided in the unit, and therefore, the unit can be made smaller.

FIG. 1



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Description

Technical Field

[0001] The present invention relates to a carriage-mounted unit of a weft knitting machine, mounted on a carriage of the weft knitting machine and driving various members to move back and forth with respect to a needle bed gap.

Background Art

[0002] Conventionally, in a weft knitting machine, a large number of needle grooves are formed to accommodate knitting needles on a needle bed that linearly extends along a needle bed gap. A formation of a knitted fabric is carried out, for example, by causing a carriage to travel back and forth along the needle bed and causing a cam mechanism mounted on the carriage to advance and retract a knitting needle with respect to the needle bed gap. In the needle bed gap, a knitting yarn from a yarn feeding member that is brought by the carriage is fed to the front end of the knitting needle that has advanced from the needle bed. A stitch is formed by pulling the knitting needle into the needle bed. In the case of a knit, which is a basic stitch, when the knitting needle is retracted from the needle bed gap in order to form a new stitch, a stitch having been already formed surmounts the front end of the knitting needle, is separated from the knitting needle, and moves to the needle bed gap to become a part of the knitted fabric.

[0003] Many weft knitting machines are used in which at least a pair of front and back needle beds is opposed to each other with a needle bed gap interposed therebetween. It is possible to form various knitted fabrics by performing knitting using the front and the back needle beds. In the weft knitting machine provided with the front and the back needle beds, a stitch transfer operation is also performed in which a stitch is transferred between the front and the back needle beds.

In the stitch transfer operation, a stitch is transferred in such a manner that a knitting needle holding a stitch is advanced to the needle bed gap, and the stitch advanced to the needle bed gap following the front end of the knitting needle is received by the front end of a knitting needle that is advanced from an opposed needle bed to the needle bed gap.

[0004] At the time of a knit or a stitch transfer during formation of a knitted fabric in the needle bed gap of the weft knitting machine, a stitch sometimes moves slightly upward such that the stitch moves forward into the needle bed gap together with the front end of the knitting needle when the knitting needle is advanced to the needle bed gap. When a stitch moves slightly upward, phenomena called "stitch overlap" or "stitch drop" may occur. In order to prevent such phenomena, the carriage is provided with a mechanism that moves a member called a stitch presser back and forth with respect to the needle bed gap, the stitch presser pressing the upward movement of a stitch (see Japanese Examined Patent Publication JP-B2 2602156, for example).

[0005] JP-B2 2602156 has disclosed a knitted fabric presser of a weft knitting machine, driving three members in total with one motor via a groove cam plate that moves back and forth in the travel direction of a carriage, the three members consisting of a first and a second presser as a pair of members that is substantially in the shape of an L and that have a lateral line portion moving forward into the needle bed gap to press a stitch, and a brush as another member that opens a latch of a latch needle used as a knitting needle when the knitting needle is advanced to the needle bed gap. The motor is disposed such that an output shaft thereof is perpendicular to the back-and-forth travel direction of the carriage. A pinion gear attached to the output shaft drives a rack of the groove cam plate, to drive the groove cam plate back and forth. The L-shaped pressers have directionality, and thus the first presser and the second presser are switched according to the travel direction of the carriage. Basically, the brush has been always advanced to the needle bed gap. However, when the presser is advanced and retracted with respect to the needle bed gap, it is necessary to retract the brush in order to avoid interference with the locus of the presser.

[0006] Herein, the carriages are respectively provided on the front and the back needle beds, and are coupled by a bridge straddling the needle bed gap. There is also a configuration in which pressers in mutually different directions are mounted on the carriages on the front and the back needle beds, and each presser is driven by one motor (see Japanese Examined Patent Publication JP-B2 3-66415 (1991), for example). In JP-B2 3-66415, a crank arm and a rotating eccentric cam are provided on both ends of an output shaft of the motor and respectively drive the presser and the brush.

[0007] The brush is not necessary in a case where a compound needle in which a hook of a needle main portion is opened and closed with a slider by relatively moving the needle main portion and the slider is used as a knitting needle instead of a latch needle. However, instead of the function to advance and retract the brush, it is preferable to provide, for example, a function to retract a member such as a yarn guide from the needle bed gap when the presser is advanced and retracted, the yarn guide guiding a fed knitting yarn to the hook at the front end of the knitting needle when the front end of the knitting needle is advanced to the needle bed gap and receives the knitting yarn.

[0008] In the needle bed gap, a movable sinker that can be swung between knitting needles may be disposed. The movable sinker has a function to enable a stitch caught on the knitting needle to pass through a clear position for knock-over, by pressing and holding the stitch such that the stitch is not advanced to the needle bed gap together with the knitting needle when the knitting needle is advanced to the needle bed gap in order

to form a new stitch. The present applicant also has disclosed a weft knitting machine in which this sort of movable sinker is retracted from the needle bed gap when the stitch presser is advanced and retracted with respect to the needle bed gap (see Japanese Examined Patent Publication JP-B2 6-72347 (1994), for example). In JP-B2 6-72347, crank arms are provided on both ends of an output shaft of a motor, wherein one of the crank arms swingingly displaces the stitch presser via a link mechanism, and the other crank arm slidingly displaces a groove cam plate that swingingly displaces the movable sinker.

[0009] According to a configuration in which a pair of pressers and a brush are driven by one motor as in JP-B2 2602156, the number of motors can be made smaller than in a configuration in which a pair of presses is driven by two motors as in JP-B2 3-66415. Furthermore, for a knitted fabric that is formed substantially on only one of the front and the back needle beds, in a state where a unit that drives a pair of pressers is not mounted on the carriage traveling back and forth along that needle bed, the pressers cannot act in the same manner between the back and forth travel directions of the carriage.

[0010] However, JP-B2 2602156, the pair of pressers is driven via the groove cam plate. Groove cams for swingingly displacing the vertical line portions of the respective L-shaped pressers with respect to the needle bed gap in an advancing-and-retracting movement direction perpendicular to the back-and-forth travel direction of the carriage are formed on the groove cam plate. In order to drive the presser, it is necessary to displace the groove cam plate by at least the length of the groove cam. Accordingly, in order to attach the groove cam plate, a sufficient space is necessary that is equal to or larger than the length obtained by adding the gap between the vertical line portions of the pair of pressers and the movement strokes of the groove cams, in a width direction that is the back-and-forth travel direction of the carriage.

[0011] In a case where the pressers are driven using the crank arms or the like as in JP-B2 3-66415 and JP-B2 6-72347, it is not necessary to secure a space as in the case where the groove cam plate that moves in the travel direction of the carriage is used. However, it is difficult for the crank arms to drive only one of the pair of pressers and to put the other presser on standby.

[0012] A cam mechanism and the like that are mounted on the carriage and drive a knitting needle are made more smaller and more lighter. When the carriage is made smaller and lighter, a drive mechanism that causes the carriage to travel back and forth can be made smaller and less energy-consuming. However, when a carriage-mounted unit is large, the carriage cannot be made smaller and lighter.

Disclosure of Invention

[0013] It is an object of the invention to provide a carriage-mounted unit of a weft knitting machine, capable of being made smaller in spite of being provided with many functions thereof.

[0014] The invention is directed to a carriage-mounted unit of a weft knitting machine, mounted on a carriage that travels back and forth along a needle bed of the weft knitting machine, comprising: at least three members that act independently of a knitting needle by being advanced and retracted with respect to a needle bed gap in which the knitting needle is advanced and retracted from the needle bed to form a knitted fabric, the three members including a pair of members that can be switched according to a travel direction of the carriage; and a motor disposed such that an output shaft thereof projects on both sides in an axial direction, and the axial direction is parallel to a back-and-forth travel direction of the carriage, the carriage-mounted unit being capable of controlling an advancing-and-retracting movement of the pair of members with respect to the needle bed gap such that when one of the pair of members acts on the needle bed gap, another of the pair of members is on standby without acting on the needle bed gap, by rotating an output shaft of a single motor forward or in reverse,
the carriage-mounted unit comprising:

a one-side drive mechanism that is disposed on one side of the output shaft of the motor, and swingingly displaces one of the pair of members such that the one of the pair of members is advanced to the needle bed gap by forward rotation of the motor and is retracted from the needle bed gap by reverse rotation of the motor;
an other-side drive mechanism that is disposed on the other side of the output shaft of the motor, and swingingly displaces the other of the pair of members such that the other of the pair of members is advanced to the needle bed gap by reverse rotation of the motor and is retracted from the needle bed gap by forward rotation of the motor; and
an other-member drive mechanism that is disposed adjacent to either one of the one-side drive mechanism and the other-side drive mechanism, and retracts another member, which is different from the pair of members, from the needle bed gap in order to avoid interference when the pair of members is advanced and retracted with respect to the needle bed gap.

[0015] Furthermore, in the invention, it is preferable that each of the one-side drive mechanism and the other-side drive mechanism comprises:

a rotating cam that is substantially formed into a shape of a plate, in which an outer peripheral face in a radial direction thereof functions as cam faces and the cam faces are formed on two steps in the axial direction;
a pair of rollers that follows the cam faces on the steps of the rotating cam while being kept in contact

therewith, and are arranged with a constant gap therebetween; and
a link mechanism that supports a member driven by each drive mechanism so as to allow swinging displacement back and forth with respect to the needle bed gap, and moves in conjunction with the rollers.

[0016] Furthermore, in the invention, it is preferable that the cam faces on two steps of the rotating cam have non-action faces on which the rotation centers of the respective rollers of the pair of rollers and the rotation center of the rotating cam are arranged on the same straight line and the distance between the rotation center of each roller and the rotation center of the rotating cam does not change, and action faces on which the distance changes.
[0017] Furthermore, in the invention, it is preferable that the pair of members is stitch presses that are inserted from above the needle bed gap and used for pressing a knitted fabric.
[0018] Furthermore, in the invention, it is preferable that the other member is any one of:

a brush that opens a latch when a latch needle is used as a knitting needle;
a yarn guide that is disposed next to a knitting needle on the needle bed, and guides a knitting yarn fed in the needle bed gap to a hook at a front end of the knitting needle by moving a front end of the yarn guide forward into the needle bed gap; and
a movable sinker that is disposed between knitting needles, and has a knitting yarn holding portion that is formed on the side of the needle bed gap and holds a stitch caught on the knitting needle when the knitting needle is advanced to the needle bed gap.

Brief Description of Drawings

[0019] 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.

Fig. 1 is a front view showing a schematic configuration of a drive unit according to an embodiment of the invention;
Figs. 2A to 2C are a left side view, a front cross-sectional view and a right side view of a double-stepped cam in Fig. 1.
Figs. 3A and 3B are right side views showing non-action faces and action faces of the double-stepped cam in Figs. 2A to 2C.
Fig. 4 is a partial left side view of a one-side drive mechanism in Fig. 1.
Fig. 5 is a partial left side view of an other-side drive mechanism in Fig. 1.
Fig. 6 is a partial left side view of a link mechanism in Fig. 1.
Fig. 7 is a partial left side view of a drive mechanism on a cum side in Fig. 1.
Fig. 8 is a left side view of respective components which view shows a state in which an output shaft on one side and an output shaft on the other side are rotated from the state shown in Figs. 4 to 7, and a stitch presser is pulled upward.
Fig. 9 is, following Fig. 8, a left side view of respective components which view shows a state in which the stitch presser has been retracted.

Best Mode for Carrying out the Invention

[0020] Now referring to the drawings, preferred embodiments of the invention are described below.
[0021] Fig. 1 shows the schematic configuration of a drive unit 1 as an embodiment of the invention. The drive unit 1 is mounted on a carriage 2 that travels back and forth along a needle bed of a weft knitting machine, and functions as a carriage-mounted unit of the weft knitting machine. The carriage 2 selectively drives a knitting needle to advance and retract the knitting needle from the needle bed in order to form a knitted fabric. The drive unit 1 is provided with at least three members that advance and retract independently of the knitting needle, the three members including a pair of members that can be switched according to the travel direction of the carriage 2. More specifically, a pair of stitch pressers 3 and 4, namely one stitch presser 3 and the other stitch presser 4 can be switched according to the movement of the carriage 2 to the left and right in Fig. 1. In a case where a latch needle is used as the knitting needle, a brush 5 that opens a latch is also used as a third member. The three members, that is, the pair of stitch pressers 3 and 4 and the brush 5 are advanced and retracted with respect to a needle bed gap 6 in which the knitting needle is advanced and retracted to form a knitted fabric, and act to supplement formation of the knitted fabric.
[0022] The drive unit 1 is a carriage-mounted unit of a weft knitting machine, capable of driving the members with a single motor 7. The motor 7 includes output shafts that respectively project on both sides in the direction of a motor axis 7a as an output shaft 8 on one side and an output shaft 9 on the other side. The motor 7 is disposed such that the direction of the motor axis 7a is parallel to the back-and-forth travel direction of the carriage 2. The output shaft 8 on one side of the motor 7 is provided with a one-side drive mechanism 10 that converts rotating motion to swing motion for driving such that the one stitch presser 3 is advanced to the needle bed gap 6 by rotation of the motor 7 in one direction. The output shaft 9 on the other side of the motor 7 is provided with an other-side drive mechanism 20 that converts rotating motion to swing motion for driving such that the other stitch presser 4 is advanced to the needle bed gap 6 by rotation of the motor 7 in the other direction. A cam drive mechanism 30 is disposed adjacent to either one of the one-side drive mechanism 10 and the other-side drive mechanism 20 (the one-side drive mechanism 10 in Fig. 1), as another-

member drive mechanism, with which the brush 5 as another member that is different from the pair of stitch pressers 3 and 4 is advanced and retracted with respect to the needle bed gap 6 by rotating motion of the motor 7 so as to avoid interference with the pair of stitch pressers 3 and 4. When the single motor 7 is used for driving the at least three members, that is, the stitch pressers 3 and 4 as a pair of members and the brush 5 as another member such that the members are advanced and retracted with respect to the needle bed gap 6 by rotation of the motor 7, a groove cam plate or the like that moves back and forth in the back-and-forth travel direction of the carriage 2 is not included, and thus the carriage-mounted unit can be made smaller in spite of being provided with many functions thereof.

[0023] The one-side drive mechanism 10 is provided with a double-stepped cam 11, and the other-side drive mechanism 20 is provided with a double-stepped cam 21. Cam faces are formed on two steps of the outer periphery of the double-stepped cams 11 and 21. The cam faces are held between rollers 14 and 15; 24 and 25 that are provided upright with a constant gap therebetween on bases 13 and 23 of followers 12 and 22, and thus the followers 12 and 22 follow the double-stepped cams 11 and 21. Since the cam faces are formed on two steps, the rollers 14 and 24 are in contact with the double-stepped cams 11 and 21 at positions farther from the bases 13 and 23 than the rollers 15 and 25. When the double-stepped cams 11 and 21 are respectively driven to rotate by the output shaft 8 on one side and the output shaft 9 on the other side of the motor 7, the followers 12 and 22 are displaced, and link mechanisms 16 and 26 are respectively driven via the base plates 13 and 23. The link mechanisms 16 and 26 include holders 17 and 27 to which the stitch pressers 3 and 4 are attached and link shafts 18 and 28, and displace the stitch pressers 3 and 4 according to swinging displacement of the bases 13 and 23.

[0024] When the stitch pressers 3 and 4 are advanced and retracted with respect to the needle bed gap 6, the stitch pressers may interfere with the brush 5. Thus, the cam drive mechanism 30 retracts the brush 5. The cam drive mechanism 30 uses a rotating cam 31 to drive a follower 32. A cam groove 33 is formed on the side face of the rotating cam 31, and the follower 32 is engaged with the rotating cam 31 inside the cam groove 33. When the rotating cam 31 is rotated by the output shaft 8 on one side, the follower 32 is displaced by being guided along the cam groove 33 and drives a link mechanism 34. The link mechanism 34 drives a holder 35 to which the brush 5 is attached.

[0025] Figs. 2A to 2C show the configuration of the double-stepped cam 11 used in the one-side drive mechanism 10 shown in Fig. 1. The double-stepped cam 21 used in the other-side drive mechanism 20 has basically the same configuration. Fig. 2A is a left side view thereof. Fig. 2B is a front cross-sectional view thereof. Fig. 2C is a right side view thereof. The outer periphery of the double-stepped cam 11 has a fixed portion 40 fixed to the motor shaft and the like, and cam faces 41 and 42 on at least two steps. A shaft hole 43 passes through from the fixed portion 40 whose outer peripheral face is not a cam face to a portion on which the cam faces 41 and 42 on two steps are formed.

[0026] As shown in Fig. 1, the rollers 14 and 15 respectively act on the cam faces 41 and 42 of the double-stepped cam 11. The gap between the rollers 14 and 15 is constant. The rollers 14 and 15 are in contact with the cam faces 41 and 42, not on both sides as in a groove cam but rather on only one side on the periphery. Thus, when the double-stepped cam 41 rotates in one direction, the rollers 14 and 15 only have to rotate in one direction, and thus the load due to frictional resistance can be reduced. Furthermore, the cam faces 41 and 42 are the outermost peripheral faces. Thus, the diameter can be made smaller than in a case where a base portion of a groove cam exists up to the outer side in the radial direction of the groove cam as in the case of a rotating cam whose side face has the groove cam. Accordingly, moment of inertia can be reduced, and load can be reduced.

[0027] Figs. 3A and 3B show the shape of the cam faces 41 and 42 of the double-stepped cam 11 in Figs. 2A to 2C.

The gap between the pair of rollers 14 and 15 is constant. The cam faces 41 and 42 are formed such that when the rollers 14 and 15 are in contact therewith, the rotation centers of the rollers 14 and 15 and the rotation center of the double-stepped cam 11 are arranged on the same straight line. Furthermore, the cam faces 41 and 42 are provided with non-action faces 41a and 42a as shown in Fig. 3A and action faces 41b and 42b as shown in Fig. 3B.

[0028] As shown in Fig. 3A, in a state where the pair of rollers 14 and 15 is at the positions indicated as 14a and 15a, the output shaft 8 on one side functioning as the rotation center of the double-stepped cam 11 is rotated forward in a clockwise direction. The pair of rollers 14 and 15 relatively moves with respect to the double-stepped cam 11 to the positions indicated as 14b and 15b, while being kept in contact with the cam faces 41 and 42 of the double-stepped cam 11. During this movement, the rollers 14 and 15 are respectively in contact with the cam faces 41 and 42 in the range of the non-action faces 41a and 42a. In the range where the rollers 14 and 15 are respectively in contact with the non-action faces 41a and 42a, the distance between the rotation center of each of the rollers 14 and 15 and the axis of the output shaft 8 on one side is constant without any change. Thus, in the range where the rollers 14 and 15 are in contact with the non-action faces 41a and 42a, even when the output shaft 8 on one side is angularly displaced to relatively move the rollers 14 and 15 with respect to the double-stepped cam 11 in the range between the positions at 14a and 15a and the positions at 14b and 15b, the follower 12 does not move up and down and only the double-stepped cam 11 is angularly displaced in the one-side drive mechanism 10 in Fig. 1.

[0029] As shown in Fig. 3B, in a state where the pair of rollers 14 and 15 is at the positions indicated as 14b and 15b, when the output shaft 8 on one side is further rotated forward, the rollers 14 and 15 relatively move with respect to the double-stepped cam 11 to the positions indicated as 14c and 15c. During this movement, the rollers 14 and 15 are respectively in contact with the cam faces 41 and 42 in the zone of the action faces 41b and 42b. In the zone where the rollers 14 and 15 are respectively in contact with the action faces 41b and 42b, the distance between the rotation center of each of the rollers 14 and 15 and the axis of the output shaft 8 on one side changes. Thus, in the zone where the rollers 14 and 15 are in contact with the action faces 41b and 42b, when the output shaft 8 on one side is angularly displaced to relatively move the rollers 14 and 15 with respect to the double-stepped cam 11 in the zone between the positions at 14b and 15b and the positions at 14c and 15c, the follower 12 moves up and down in the one-side drive mechanism 10 in Fig. 1.

[0030] The double-stepped cam 21 shown in Fig. 1 has the same configuration as the double-stepped cam 11 shown in Figs. 3A and 3B, in that action faces and non-action faces are provided. However, the double-stepped cams 11 and 21 are fixed to the output shaft 8 on one side and the output shaft 9 on the other side at mutually different angles such that the rollers 24 and 25 of the follower 22 are in contact with the action faces of the double-stepped cam 21 while the rollers 14 and 15 of the follower 12 are in contact with the non-action faces 41a and 42a of the double-stepped cam 11. The rollers 24 and 25 of the follower 22 are in contact with the non-action faces of the double-stepped cam 21, while the rollers 14 and 15 of the follower 12 are in contact with the action faces 41b and 42b of the double-stepped cam 11. Thus, switching can be performed such that the other stitch presser 4 is moved up and down while the one stitch presser 3 is on standby with forward rotation of the motor 7 and such that the other stitch presser is on standby while the one stitch presser 3 is moved up and down with further forward rotation of the motor 7.

[0031] Figs. 4, 5, and 6 show an example of a drive state of the one-side drive mechanism 10, the other-side drive mechanism 20, and the stitch pressers 3 and 4 in Fig. 1. As shown in Fig. 6, in this drive state, the one stitch presser 3 does not act, and the other stitch presser 4 acts. Such a state is set as a reference state. As shown in Figs. 4 and 5, this reference state is prescribed as a state in which a proximity sensor 50 detects a detection piece 51 attached to the output shaft 8 on one side and a proximity sensor 55 detects a detection piece 56 attached to the output shaft 9 on the other side. As shown in Fig. 4, the follower 12 is positioned with respect to the double-stepped cam 11 such that the lower roller 15 is closest to the output shaft 8 on one side and the upper roller 14 is farthest from the output shaft 8 on one side. Movement of the follower 12 to this position is transmitted via the base 13 from a link member 52 to the holder 17, and thus the stitch presser 3 is positioned on the upper side in Fig. 6. As shown in Fig. 5, the follower 22 is positioned with respect to the double-stepped cam 21 such that the upper roller 24 is closest to the output shaft 9 on the other side and the lower roller 25 is farthest from the output shaft 9 on the other side. Movement of the follower 22 to this position is transmitted via the base 23 from a link member 57 to the holder 27, and thus the stitch presser 4 is positioned on the lower side in Fig. 6.

[0032] As shown in Fig. 6, cam plates 60 and 65 are respectively used in order to realize three-dimensional loci of the stitch pressers 3 and 4. Cam grooves 61 and 66 are respectively formed on the cam plates 60 and 65, and followers 62 and 67 extended from the holders 17 and 27 are respectively engaged with the cam grooves 61 and 66. Herein, the upper end portions of the cam grooves 61 and 66 have different shapes as indicated by the solid line and the broken line.

[0033] Fig. 7 shows a state of the cam drive mechanism 30 corresponding to Figs. 4 to 6. The follower 32 guided along the cam groove 33 of the rotating cam 31 is positioned closer to the output shaft 8 on one side. At this position, the brush 5 has been moved downward with the link mechanism 34.

[0034] Fig. 8 shows a state in which the output shaft 8 on one side and the output shaft 9 on the other side are rotated from the state shown in Figs. 4 to 7, and the stitch presser 4 is pulled upward. Since the stitch presser 4 passes through the narrow needle bed gap, the brush 5 is pulled upward and retracted in order to avoid interference.

[0035] Fig. 9 shows a state in which the stitch presser 4 has been retracted. In Fig. 9, the stitch presser 3 has been also retracted. When both stitch pressers 3 and 4 are retracted to the same position, the stitch pressers interfere with each other. Thus, the upper end portions of the cam grooves 61 and 66 have different shapes as described above, and thus the stitch pressers 3 and 4 are retracted to slightly different positions. The retraction of the brush 5 is cancelled, and the brush 5 returns to the lower position. It is possible to advance the stitch presser 3 to the needle bed gap 6 and to retract the brush 5 during this time, by further rotating the motor 7.

[0036] As described above, the one-side drive mechanism 10 and the other-side drive mechanism 20 have the double-stepped cams 11 and 21 that function as rotating cams having the cam faces 41 and 42 on two steps in the axial direction formed on the outer periphery in the radial direction, and the pairs of rollers 14 and 15; 24 and 25 that respectively follow the cam faces 41 and 42 on the steps of the rotating cams while being kept in contact therewith and that are arranged with a constant gap between the rollers. Thus, the diameter of the rotating cams is made smaller, and inertial load is reduced. Further, the pairs of rollers 14 and 15; 24 and 25 are respectively brought into contact with the cam faces 41 and 42 on the outer periphery from both sides. Thus, the load at the time when the rollers follow the cam faces 41 and 42 is

also reduced. Accordingly, power necessary for the motor 7 can be reduced, and thus the motor 7 can be made smaller.

[0037] As described above, the one-side drive unit and the other-side drive unit include a link mechanism that supports one of a pair of members such that the member can be swingingly displaced back and forth with respect to the needle bed gap 6. A part of the link mechanism is swingingly displaced by rotation of the motor 7 forward or in reverse, and the swinging displacement is converted to swinging displacement of the one of the pair of members supported by the link mechanism. Thus, the units can be made smaller.

[0038] It should be noted that not only the brush 5 but also other members such as a yarn guide or a movable sinker can be used as the third member. Herein, the yarn guide and the movable sinker are provided on the side of the needle bed, and act on the needle bed gap 6 by being guided along a groove cam of a cam plate mounted on the carriage 2. When the stitch pressers 3 and 4 are advanced and retracted with respect to the needle bed gap 6, the cam plate may be slidingly displaced to retract this sort of yarn guide and movable sinker. The configuration for slidingly displacing the cam plate may be, for example, the configuration disclosed in JP-B2 6-72347.

[0039] 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 the range of equivalency of the claims are therefore intended to be embraced therein.

Industrial Applicability

[0040] According to the invention, a carriage-mounted unit of a weft knitting machine comprising at least three members that are advanced and retracted with respect to a needle bed gap, the three members including a pair of members that can be switched according to the travel direction of the carriage, and capable of driving the members with a single motor, can be realized without including a groove cam plate or the like that moves back and forth in the back-and-forth travel direction of the carriage. Thus, the carriage-mounted unit can be made smaller in spite of being provided with many functions thereof.

[0041] Furthermore, according to the invention, a one-side drive unit and an other-side drive unit rotate an output shaft of the motor forward or in reverse, thereby swingingly displacing either one of a pair of members supported on link mechanisms. Thus, the units can be made smaller. Furthermore, the outer peripheral face of a rotating cam functions as cam faces. Thus, the diameter of the rotating cam is made smaller, and inertial load is reduced. Further, the pair of rollers is brought into contact with the cam faces on the outer periphery from both sides. Thus, the load at the time when the rollers follow the cam faces is also reduced. Accordingly, power necessary for the motor can be reduced, and thus the motor can be made smaller.

[0042] Furthermore, according to the invention, the cam faces on two steps of the rotating cam have non-action faces on which the rotation centers of the respective rollers of the pair of rollers and the rotation center of the rotating cam are arranged on the same straight line and the distance between the rotation center of each roller and the rotation center of the rotating cam does not change, and action faces on which the distance changes. It is possible to not drive the member when the pair of rollers is in contact with the non-action faces, and to drive the member when the pair of rollers is in contact with the action faces. It is possible to alternately drive the pair of members, according to a configuration in which the pair of rollers of the other-side drive mechanism is in contact with the non-action faces while the pair of rollers of the one-side drive mechanism is in contact with the action faces, and the pair of rollers of the one-side drive mechanism is in contact with the non-action faces while the pair of rollers of the other-side drive mechanism is in contact with the action faces.

[0043] Furthermore, according to the invention, the carriage-mounted unit provided with the pair of stitch pressers and the brush can be made smaller and lighter.

[0044] Furthermore, according to the invention, the carriage-mounted unit that can cause a member such as a brush, a yarn guide, or a movable sinker together with members such as a pair of stitch pressers, to act by moving back and forth with respect to the needle bed gap can be made smaller and lighter.

Claims

1. A carriage-mounted unit of a weft knitting machine, mounted on a carriage that travels back and forth along a needle bed of the weft knitting machine, comprising: at least three members that act independently of a knitting needle by being advanced and retracted with respect to a needle bed gap in which the knitting needle is advanced and retracted from the needle bed to form a knitted fabric, the three members including a pair of members that can be switched according to a travel direction of the carriage; and a motor disposed such that an output shaft thereof projects on both sides in an axial direction, and the axial direction is parallel to a back-and-forth travel direction of the carriage, the carriage-mounted unit being capable of controlling an advancing-and-retracting movement of the pair of members with respect to the needle bed gap such that when one of the pair of members acts on the needle bed gap, another of the pair of members is on standby without acting on the needle bed gap, by rotating an output shaft of a single motor forward or in reverse,

the carriage-mounted unit comprising:

a one-side drive mechanism that is disposed on one side of the output shaft of the motor, and swingingly displaces one of the pair of members such that the one of the pair of members is advanced to the needle bed gap by forward rotation of the motor and is retracted from the needle bed gap by reverse rotation of the motor;
an other-side drive mechanism that is disposed on the other side of the output shaft of the motor, and swingingly displaces the other of the pair of members such that the other of the pair of members is advanced to the needle bed gap by reverse rotation of the motor and is retracted from the needle bed gap by forward rotation of the motor; and
an other-member drive mechanism that is disposed adjacent to either one of the one-side drive mechanism and the other-side drive mechanism, and retracts another member, which is different from the pair of members, from the needle bed gap in order to avoid interference when the pair of members is advanced and retracted with respect to the needle bed gap.

2. The carriage-mounted unit of claim 1, wherein each of the one-side drive mechanism and the other-side drive mechanism comprises:

a rotating cam that is substantially formed into a shape of a plate, in which an outer peripheral face in a radial direction thereof functions as cam faces and the cam faces are formed on two steps in the axial direction;
a pair of rollers that follows the cam faces on the steps of the rotating cam while being kept in contact therewith, and are arranged with a constant gap therebetween; and
a link mechanism that supports a member driven by each drive mechanism so as to allow swinging displacement back and forth with respect to the needle bed gap, and moves in conjunction with the rollers.

3. The carriage-mounted unit of claim 2, wherein the cam faces on two steps of the rotating cam have non-action faces on which the rotation centers of the respective rollers of the pair of rollers and the rotation center of the rotating cam are arranged on the same straight line and the distance between the rotation center of each roller and the rotation center of the rotating cam does not change, and action faces on which the distance changes.

4. The carriage-mounted unit of any one of claims 1 to 3, wherein the pair of members is stitch presses that are inserted from above the needle bed gap and used for pressing a knitted fabric.

5. The carriage-mounted unit of any one of claims 1 to 4, wherein the other member is any one of:

a brush that opens a latch when a latch needle is used as a knitting needle;
a yarn guide that is disposed next to a knitting needle on the needle bed, and guides a knitting yarn fed in the needle bed gap to a hook at a front end of the knitting needle by moving a front end of the yarn guide forward into the needle bed gap; and
a movable sinker that is disposed between knitting needles, and has a knitting yarn holding portion that is formed on the side of the needle bed gap and holds a stitch caught on the knitting needle when the knitting needle is advanced to the needle bed gap.

FIG. 1

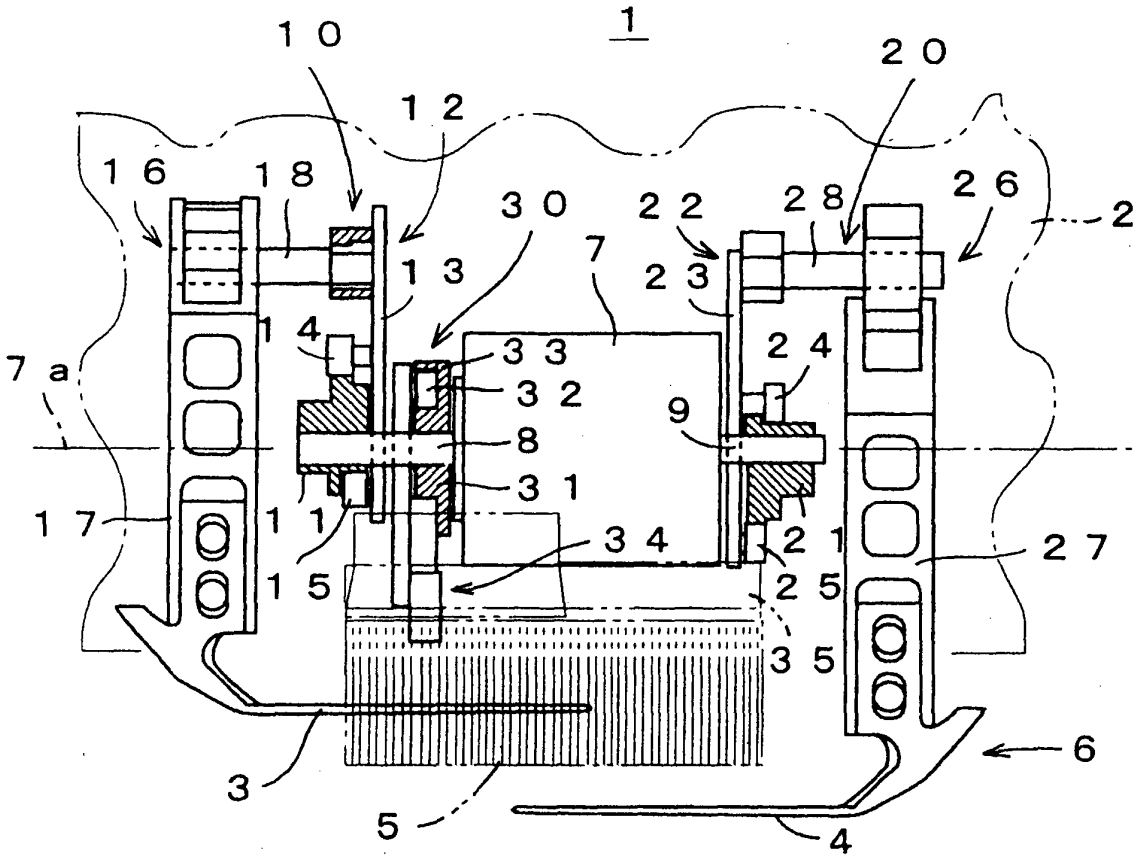
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FIG. 2A

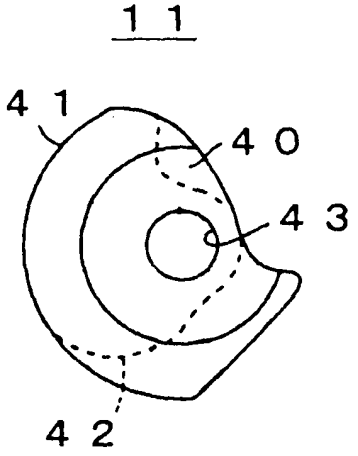


FIG. 2B

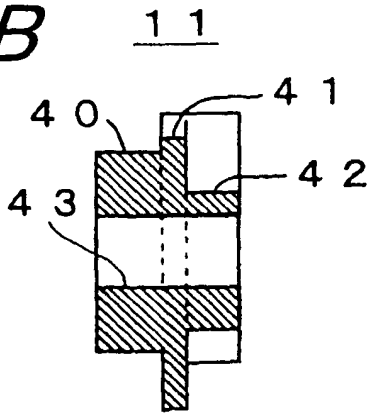


FIG. 2C

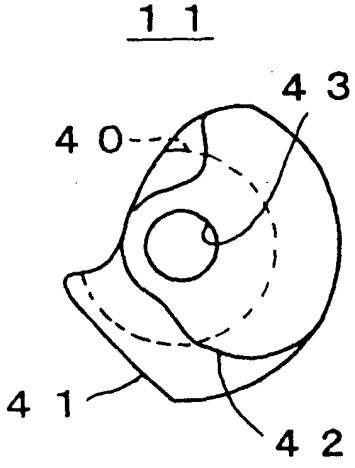
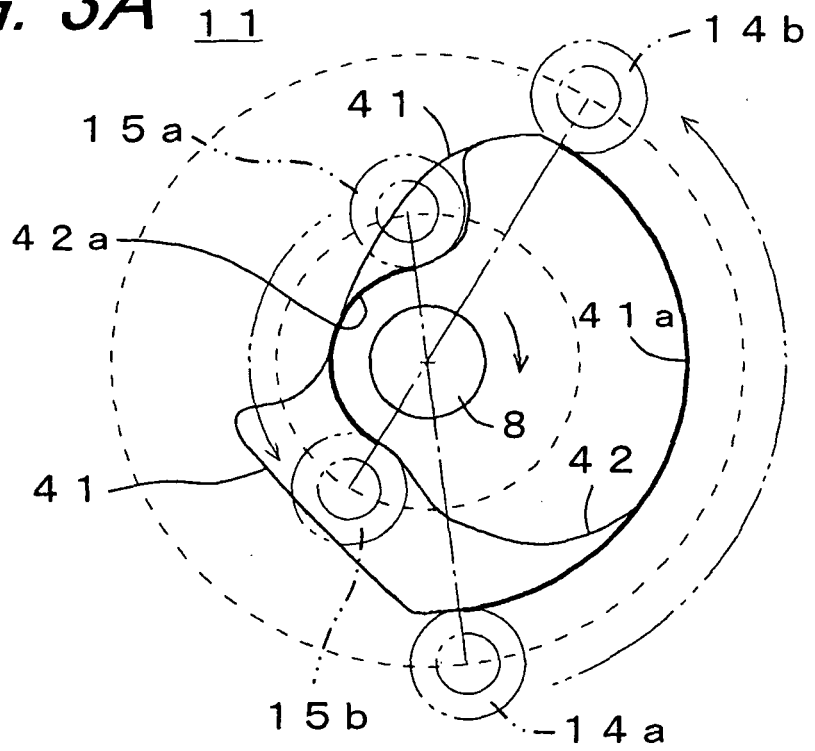


FIG. 3A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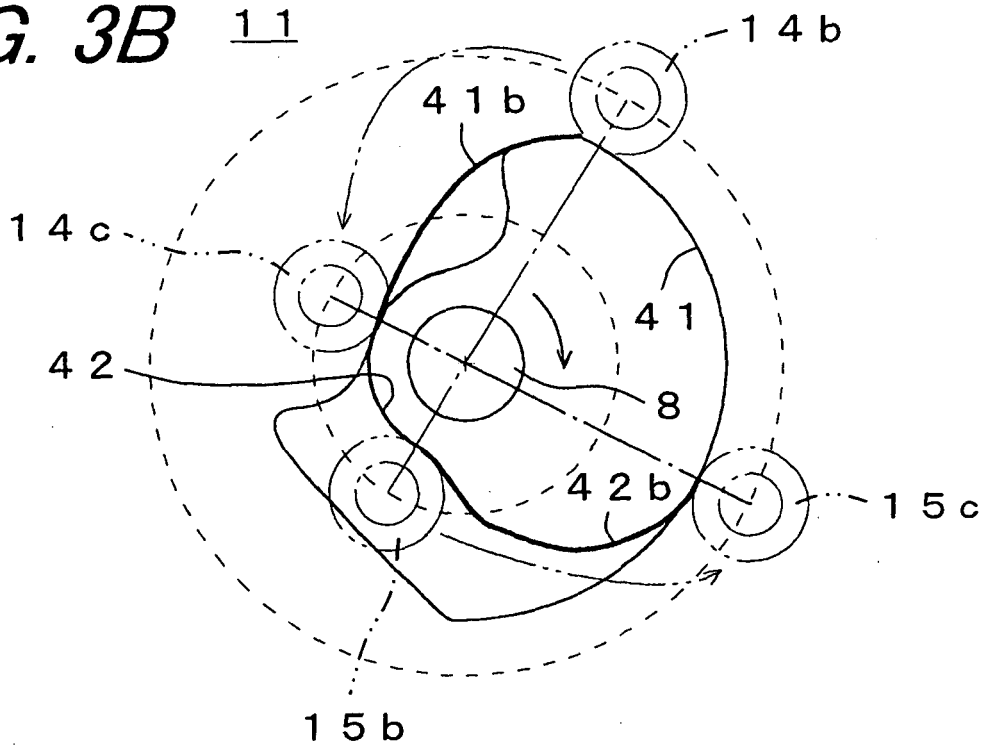
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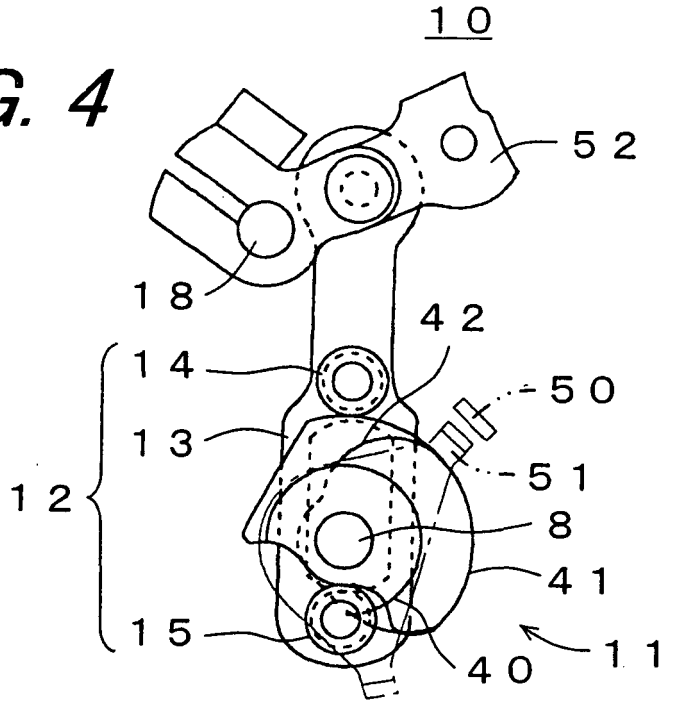
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FIG. 5

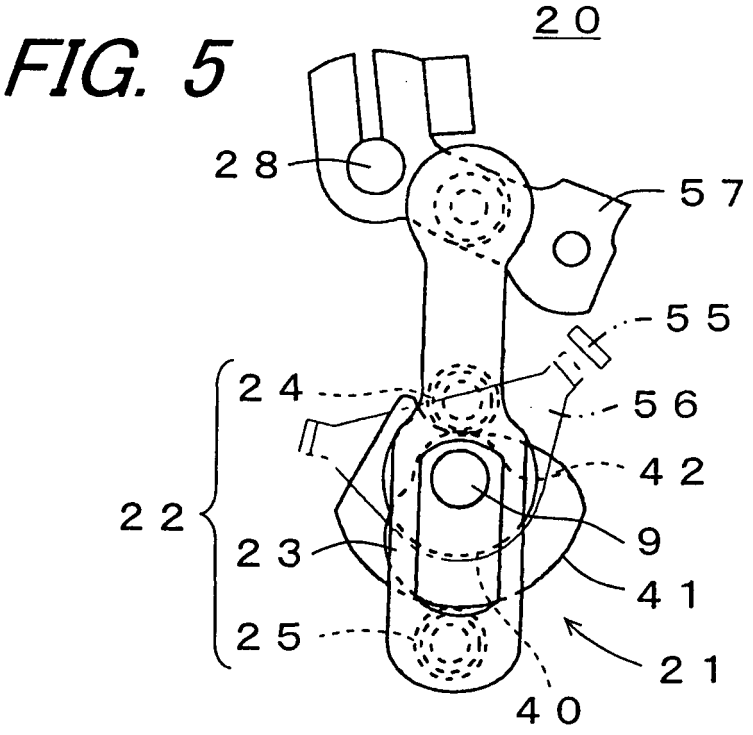
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FIG. 6

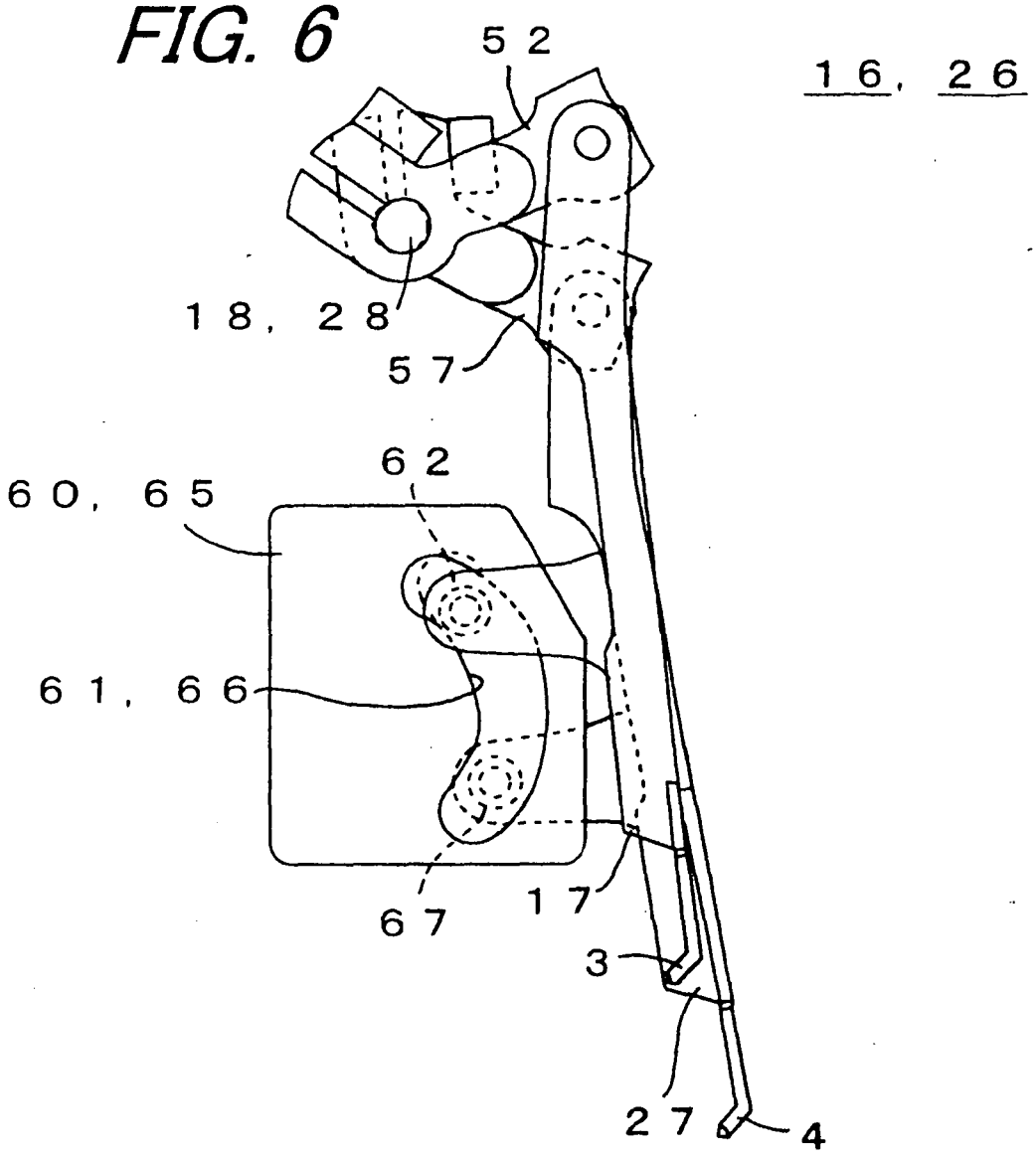

FIG. 7

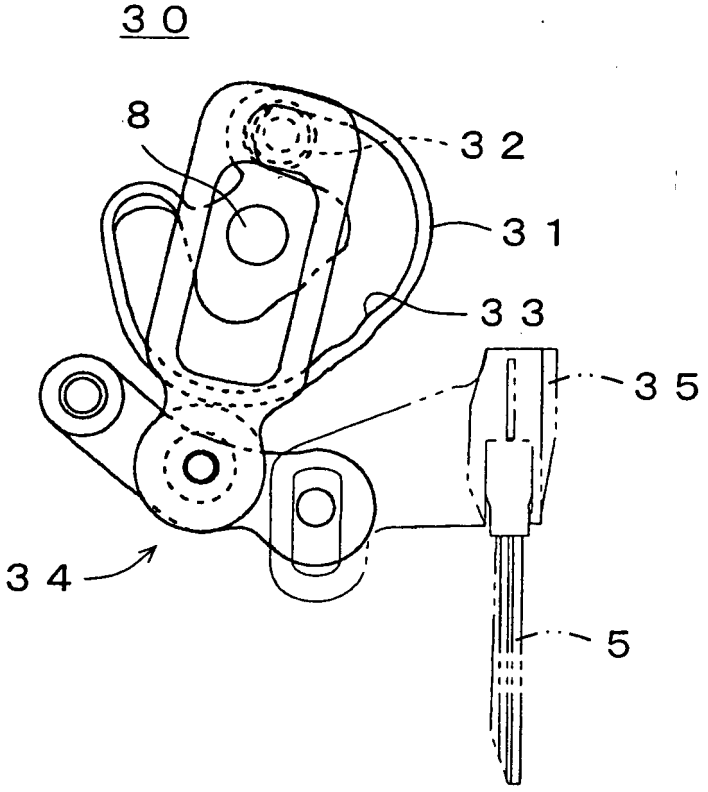

FIG. 8

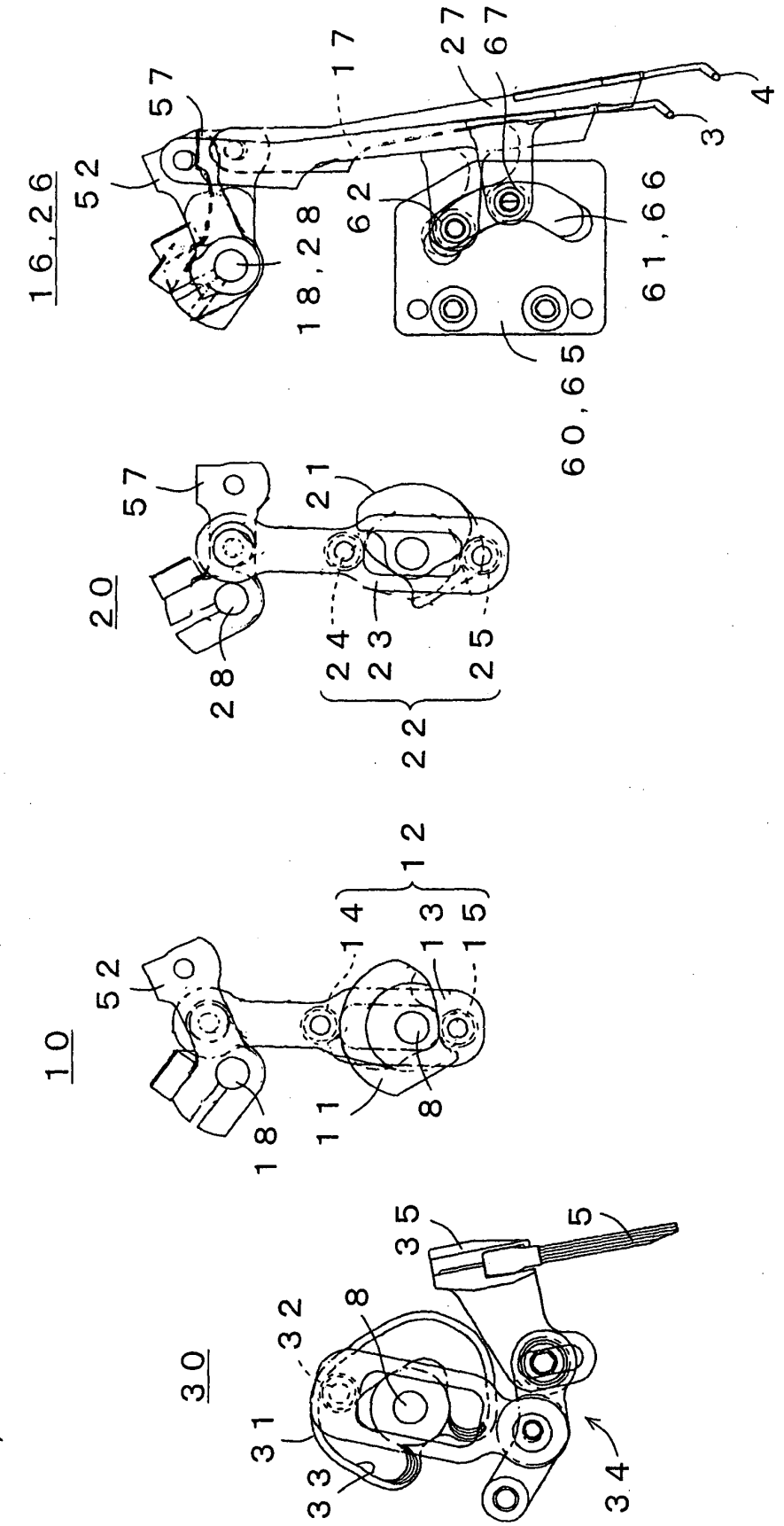
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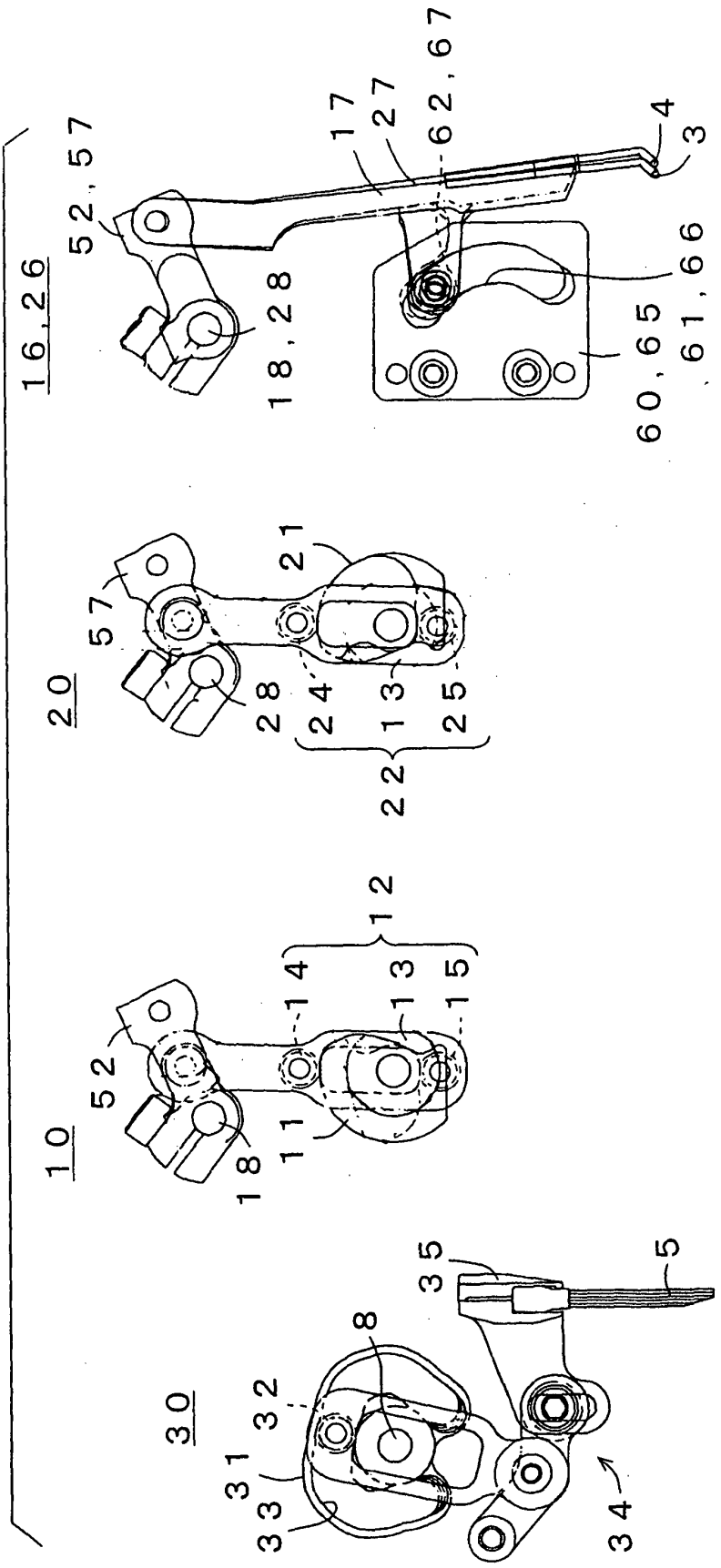
FIG. 9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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2006/322886

A. CLASSIFICATION OF SUBJECT MATTER
D04B15/06(2006.01)i, *D04B15/00*(2006.01)i, *D04B15/08*(2006.01)i, *D04B15/90*(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)
D04B15/00, 15/06-15/08, 15/90

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 1996-2006
Kokai Jitsuyo Shinan Koho 1971-2006 Toroku Jitsuyo Shinan Koho 1994-2006

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.
A	JP 2-58384 B2 (Kabushiki Kaisha Mitsuboshi Seisakusho), 07 December, 1990 (07.12.90), (Family: none)	1-5
A	JP 2602156 B2 (Shima Seiki Mfg., Ltd.), 29 January, 1997 (29.01.97), & US 5415016 A & EP 597548 A1 & DE 69323956 C	1-5
A	JP 3-66415 B2 (Shima Seiki Mfg., Ltd.), 17 October, 1991 (17.10.91), & GB 2233674 A	1-5
A	JP 6-72347 B2 (Shima Seiki Mfg., Ltd.), 14 September, 1994 (14.09.94), & DE 69113724 C	1-5

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 November, 2006 (30.11.06)	12 December, 2006 (12.12.06)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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Patent documents cited in the description

- JP 2602156 B **[0004] [0005] [0009] [0010]**
- JP 3066415 B **[0006] [0006] [0009] [0011]**
- JP 6072347 B **[0008] [0008] [0011] [0038]**