



(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 158(3) EPC

(43) Date of publication:
01.10.2008 Bulletin 2008/40

(51) Int Cl.:
D04B 15/36 (2006.01)

(21) Application number: **06843766.4**

(86) International application number:
PCT/JP2006/326397

(22) Date of filing: **27.12.2006**

(87) International publication number:
WO 2007/074944 (05.07.2007 Gazette 2007/27)

(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 NL PL PT RO SE SI SK TR

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(30) Priority: **27.12.2005 JP 2005376633**

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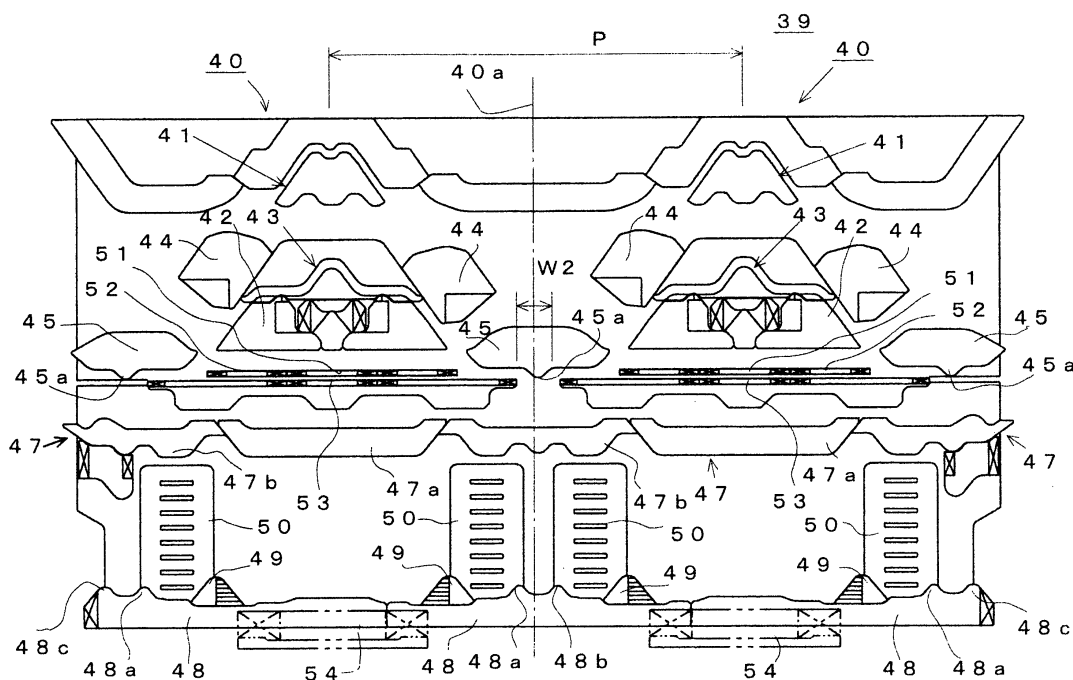
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(54) **NEEDLE SELECTING DEVICE FOR WEFT KNITTING MACHINE**

(57) A needle guide cam (45) acts on a butt for selecting of a select jack to push down the same forcibly to a B-position by its protrusion (45a). When a needle is selected by a first needle selecting actuator (50), a selector is pushed up to a position corresponding to an H-position of the select jack by a raising portion (48b) of a

selector guide cam for raising (48), thereby to push up the select jack to the H-position. The protrusion (45a) of the needle guide cam (45) and the two raising portions (48a, 48b) of the selector guide cam for raising (48) realize the function of a select jack clear cam of rising and setting type, thereby to eliminate the moving portions.

FIG. 1



Description

Technical Field

[0001] The present invention relates to a needle selecting device for a weft knitting machine, which selects knitting operation individually for plenty of knitting needles installed in a needle bed side by side.

Background Art

[0002] Conventionally, in weft knitting machines, knitting operations have been performed with knitting needles, that are slidably mounted in plenty of needle grooves of a needle bed and selected by needle selecting devices mounted in a carriage which performs reciprocating motion along with a longitudinal direction of the needle bed in order to drive needles by cam systems for knitting. A knit, a tuck, and a miss are standards for the knitting operation of the knitting needle. In the knit operation, a hook at a head of the knitting needle advances over an end of the needle bed into a knitting space called as tooth entrance, and a stitch loop currently held till then is made to clear from the hook. In the tuck operation, the hook also advances to the tooth entrance but not to exceed the limit for the stitch loop currently held till then is made to clear from the hook. In the miss operation, the hook does not advance to the tooth entrance. In the weft knitting machines provided with the front side needle bed and the back side needle bed, both needle beds confront each other so that the gap between the beds makes the tooth entrance, and transferring operation for stitch loops between both needle beds is also possible, and a cam system for loop transferring is also mounted in the carriage.

[0003] Fig. 4 shows a schematic structure of a knitting needle 1. The knitting needle 1 is of latch type, and the head end of a needle 2 moves into or from the tooth entrance, thereby to perform a knitting operation. At the head end of the needle 2, a hook 3 is provided for forming a stitch loop and a latch 4 is provided for opening and closing the hook 3. At the tail end, a needle jack 5 is connected. A loop transferring piece 6 for holding the stitch loop during transferring operation is also provided in the side of an interstitial segment of the needle 2. A butt for knitting 7 and a butt for loop transferring 8 are provided on the needle jack 5, that are driven at the time of operation of knitting, a stitch receiving and so forth. The tail end of the needle jack 5 is pressured from a select jack 9. Raising or clearing of the select jack 9 is controlled by nonexistence or existence of pressure to a butt for selecting 10. Pressure to the butt for selecting 10 is performed by a presser placed on a trajectory of the butt for selecting 10. The select jack 9 is pushed up toward the tooth entrance by an action of a selector 11. The selector 11 has a butt for clearing 12 to push down the selector 11 at the head end so that it may keep away from the tooth entrance, and a butt for raising 13 to push

up the selector 11 at the tail end toward the tooth entrance. Between the butt for clearing 12 and the butt for raising 13, a butt for needle selecting 14 is provided at a position as one of plural predetermined positions, for example, eight positions as illustrated. The position of the butt for needle selecting 14 is set up to differ one after another with the adjoining knitting needle 1.

[0004] Fig. 5 shows schematically a structure of a needle groove 15 for housing the knitting needle 1 shown in Fig. 4. Along a longitudinal direction of the needle bed 16, the carriage runs both ways, and needle plates 17 are installed upright in a fixed pitch on the needle bed 16. The needle groove 15 is formed between adjacent needle plates 17, and each knitting needle 1 is housed in the needle groove 15. The head side of the needle bed 16 confronts to the tooth entrance 18. In the tooth entrance 18, a movable sinker 19 moves forward and backward with the needle 2 of the knitting needle 1. The movable sinker 19 is biased to advance into the tooth entrance 18 by a spring 19a, and acts pushing down knitting fabric composed by the knitting needle 1 to the lower side of the tooth entrance 18.

[0005] In the Fig. 5, the select jack 10 and the selector 11 are at base positions that are most separated from the tooth entrance 18 respectively, and the selector 11 is floating in the needle groove 15 so that needle selection is possible. When the butt for raising 13 of the selector 11 is pushed up toward the tooth entrance 18, the select jack 9 will also be pushed up toward the tooth entrance 18. However, even when the butt for clearing 12 of the selector 11 is pushed down away from the tooth entrance 18, the select jack 9 maintains the pushed up position by sliding resistance in the needle groove 15. A hollow 11a is provided on the lower portion of the selector 11, and a gap is formed between a penetrate member 15a and the hollow 11a in the needle groove 15. When the butt for needle selecting 14 of the selector 11 is pressed, the tail end portion of the selector 11 sinks in the needle groove 15 until the hollow 11a contacts the penetrate member 15a and pushing up to the butt for raising 13 stops acting. The selector 11 can be returned to a state in which the lower part 11b floats in the needle groove 15 and the needle selection is possible, by pushing up the lower part 11b, in the state even when the selector 11 is sinking in the needle groove 15.

[0006] Fig. 6 shows an example of cam systems 20, which are mounted in the carriage to select the knitting needles 1 of Fig. 4 and to perform knitting and transferring operation selectively. Two couples of cam systems 20 are mounted in one carriage, for example. One couple of cam systems 20 includes a transfer cam for both sending and receiving 21, a fixed needle raising cam 22, a movable needle raising cam 23, stitch cams 24, needle guide cams 25, select jack clearing cams 26, selector guide cams for clearing 27, selector guide cams for raising 28, and selector raising cams 29. Selecting needle actuators 30, a tuck presser 31, half pressers 32, a fixed presser 33, and a selector floating cam 34 are also in-

cluded in one couple of cam system 20. Hereinafter, the cam systems are divided into right and left by a center line 20a of the carriage, and each cam shall be determined to belong either to the right-hand side cam system 20 or the left-hand side cam system 20. However, one part of function of needle selecting for forward side cam system 20 is also shared by backward side cam system 20.

[0007] The transfer cam for both sending and receiving 21 acts on the butt for loop transferring 8 of the needle jack 5 shown in Fig. 4, and the fixed needle raising cam 22, the movable needle raising cam 23, and the stitch cams 24 act on the butt for knitting 7 of the needle jack 5. The stitch cam 24 is also called as a stitch density setting cam, and movable to adjust quantity for drawing the knitting needle 1 from the tooth entrance 18. The transfer cam for sending and receiving 21 and the movable needle raising cam 23 are switched so that it may appear interchangeably from a bottom board of the carriage. The select jack clear cam 26 presses the butt for selecting 10 of the select jack 9 from the tooth entrance 18 side so that pushes down it compulsorily to a B-position which is a base position. The selector guide cam for clearing 27 pushes down the butt for clearing 12 of the selector 11 by the clearing portions 27a and 27b protruded toward the needle selecting actuator 30, and guides it so that the selector 11 may fall in a base position until it reaches the position of the needle selecting actuator 30. The selected selector 11 can push up the select jack 9 to an H-position which is the mid-position by the raising portion 28a protruded from the selector guide cam for raising 28 to the tooth entrance 18 side, and can push up the select jack 9 by the selector raising cam 29 to an A-position which is an advancing position.

[0008] The needle selecting by each needle selecting actuator 30 is performed by not sinking the butt for needle selecting 14 of the selector 11 in the needle groove 15. Once the selector 11 falls into a non-selecting state and sinks in the needle groove 15, the selector 11 stops receiving the actions of the selector guide cam for raising 28, the selector raising cam 29 and the needle selecting actuator 30. When the lower part 11b of the tail end side of the selector 11 moves to a position where the selector floating cam 34 exists, the selector 11 in the state of sinking in the needle groove 15 will float, and will come to receive the actions of the selector guide cam for raising 28, the selector raising cam 29, and the needle selecting actuator 30.

[0009] Fig. 7A shows a transition state of a position in the needle is selected at the time of carriage going leftward which corresponds to the cam system 20 as the right-hand side in Fig. 6, and Fig. 7B shows a needle selecting state by the selector 11. It is assumed that the case where the cam system 20 shown in right-hand side of Fig. 6 becomes the backward side, that is, the case where the carriage mounting the cam system 20 runs to the left. The needle selection of the knitting needle 1 for knitting or loop transferring operation to be made by the

right-hand side cam system 20, is performed by two stages of needle selecting actuators 30 with right part of the left-hand side cam system 20 and left part of the right-hand side cam system 20. Even if the select jack 9 in whichever position of A, H, and B, the knitting needle 1 which received an action from the left-hand side cam system 20, receives needle selecting by the needle selecting actuator 30 on the right part of the left-hand side cam system 20, after being compulsorily cleared to the B-position by the select jack clear cam 25 on the right part of the left-hand side cam system 20. In the first stage of this needle selecting actuator 30, the needle is selected when setting the select jack 9 as the A- or H-position after two stages of needle selection, but the needle is not selected when setting it as the B-position, and then the selector 11 is sunk in the needle groove 15.

[0010] In addition, the selector 11 is pushed down to a position corresponding to the B-position of the select jack 9 by the clearing portion 27a of the selector guide cam for clearing 27 placed in the left-hand side cam system 20, and then receives needle selecting. If needle selecting of the knitting needle 1 is performed, since the selector 11 will be pushed up to a position corresponding to the H-position from a position corresponding to the B-position of the select jack 9 by the raising portion 28a of the selector guide cam for raising 28, the select jack 9 is also pushed up to the H-position. Since the selector 11 by which needle selecting is not performed maintains a position corresponding to the B-position of the select jack 9 and passes the raising portion 28a and the selector raising cam 29, the select jack 9 also maintains the B-position.

[0011] The selector 11 pushed up to a position corresponding to the H-position of the select jack 9 by the raising portion 28a is pushed down to a position corresponding to the B-position of the select jack 9 by the clearing portion 27b of the selector guide cam 27 placed in the middle of the right-hand side and left-hand side cam systems 20. The select jack 9 pushed up to the H-position by the raising portion 28a maintains the H-position.

[0012] If needle selecting of the selector 11 is performed by the needle selecting actuator 30 on the left part of the right-hand side cam system 20, the selector 11 will be pushed up to a position corresponding to the A-position of the select jack 9 in response to an action of the selector raising cam 29, and the select jack 9 will also be pushed up to the A-position. If needle selecting of the selector 11 is not performed in the needle selecting actuator 30 on the left part of the right-hand side cam system 20, the selector 11 will pass the selector raising cam 29 in a position corresponding to the B-position of the select jack 9, and the select jack 9 will maintain the H-position. That is, in the second stage of the needle selecting actuator 30, the needle is selected when setting the select jack 9 as the A-position, the needle is not selected when setting the select jack 9 as the H-position, and then the selector 11 is sunk in the needle groove 15.

The selector 11 sunk in the needle groove 15 will float in the needle groove 15, if the selector clearing cam 34 pushes up the lower part 11b of the tail end side of the selector 11 from the bottom side of the needle groove 15.

[0013] As shown in Fig. 6, the tuck presser 31, the half presser 32 and the fixed presser 33 are placed along trajectories which the butt for selecting 10 of the select jack 9 passes in the H-position and the B-position. If one of these pressers presses the butt for selecting 10, the select jack 9 will sink in the needle groove 15, and the tail end side of the needle jack 5 will also be depressed in the needle groove 15, the butt for knitting operation 7 stops receiving actions of the fixed needle raising cam 22 and the movable needle raising cam 23. The tuck presser 31 and the half presser 32 are changeover types, and can change over operation of the tuck or the loop receive for the knitting needle 1 selected to the H-position. Assuming the disposing pitch between the cam systems 20 is P, a fixed presser 33 is placed out of the range W1 within which a pair of the select jack clear cam 26.

[0014] In addition, the select jack clear cam 26 on the left part of the right-hand side cam system 20 is in a setting state and does not protrude from a bottom board of the carriage, in order to give passage to the butt for selecting 10 of the select jack 9 including in the selected needle. Furthermore, the selector raising cam 29 on the right part of the left-hand side cam system 20 is also in the setting state. That is, as for the select jack clear cam 26 and the selector raising cam 29, a state of either rising or setting is changed over according to a running direction of the carriage. A drive to change over of either rising or setting is performed, for example, by using a motor mounted on the carriage, or is performed by using magnet adsorption described in paragraph [0002] in Japanese Patent Application Laid-open No. H05-156553. However, in the Japanese Patent Application Laid-open No. H05-156553, not a latch needle such as the knitting needle 1 but a compound needle which opens and closes the hook of the needle body with a slider which performs sliding movement displacement relatively for the needle body is used.

[0015] In the conventional cam system 20 as shown in Fig. 6, a pair of the select jack clear cam 26 is placed on the down side of the needle guide cam 25 so that positioning of three positions of A, H, and B may be performed after the select jack 9 is reset to the B-position which is a base position. The select jack clear cam 26 belong to the backward system, however, needs to change into the setting state so as not to affect the trajectory along which the butt for selecting 10 of the select jack 9 belong to the needle selected in the H-position or the A-position gets through.

[0016] At the same time, it results in an upswing of a cost to manufacture the needle selecting device and in increase of time and effort of handling or maintenance that such a moving portion as the select jack clear cam 26 of a rising and setting type is provided.

Disclosure of Invention

[0017] It is an object of the present invention to provide a needle selecting device for weft knitting machine in which it is unnecessary to equip a moving portion such as the select jack clear cam of the rising and setting type.

[0018] The invention is directed to a needle selecting device for a weft knitting machine, mounted in a carriage which performs both-way run along with a longitudinal direction of a needle bed, positioning and changing over each select jack which controls rising or setting state for a driving butt of each knitting needle, the driving butt receives an action of a cam system for knitting so as to go up to a tooth entrance side one after another by three positions of a base position of non selection, a mid-position in selection by a first needle selecting actuator, and an advancing position in selection by a second needle selecting actuator, the needle selecting device for the weft knitting machine comprising:

a needle guide cam provided with a protrusion for acting on a butt for selecting provided with the select jack and for guiding the select jack to the base position between the first needle selecting actuator and the second needle selecting actuator;

a selector guide cam for clearing provided with a first clearing portion and a second clearing portion, wherein the first clearing portion guides a selector to the base position where a needle receives selection by the first needle selecting actuator, and the second clearing portion guides the selector to the base position where the needle receives selection by the second needle selecting actuator; and

a selector guide cam for raising provided with a first raising portion and a second raising portion, wherein the first raising portion guides only the selector selected by the first needle selecting actuator to the mid-position between the first needle selecting actuator and the protrusion of the needle guide cam, the second raising portion guides only the selector selected by the first needle selecting actuator to the mid-position between the protrusion of the needle guide cam and the second clearing portion of the selector guide cam for clearing.

[0019] Furthermore, the invention is characterized in that:

the needle selecting actuator, the clearing portion of the selector guide cam for clearing and raising portion of the selector guide cam for raising positioned at one end of the cam system for knitting mounted in the carriage, are operated respectively as said first needle selecting actuator, said first clearing portion, and said first raising portion, when said end becomes backward; and are operated respectively as said second needle selecting actuator, said second clearing portion, and said second raising portion, when

said end becomes forward.

[0020] Furthermore, the invention is characterized in that:

a presser for pressing said butt for selecting in the setting state when said select jack is positioned in said base position, being made to start from said second clearing portion of said selector guide cam for clearing.

[0021] Furthermore, the invention is characterized in that:

stitch cams are placed within the pressing range of said presser.

[0022] According to the present invention, if the needle selecting of the selector is performed by the first needle selecting actuator, since it can raise by the second raising portion of the selector guide cam for raising to the mid-position even if the selector is also cleared to the base position when the select jack is guided to the base position by the protrusion of the needle guide cam, the select jack cleared to the base position by the protrusion can be raised to the mid-position. Furthermore, since the selector which acts as in non-needle selected state by the first needle selecting actuator is not raised by the second raising portion of the selector guide cam for raising, it can maintain the select jack at the base position to which it is cleared by the protrusion. The guidance to the selector by the first raising portion of the selector guide cam for raising does not affect positioning. When a running direction of the carriage is reversed, functions of the first raising portion and the second raising portion will be switched on the selector guide cam for raising. In case the two raising portions are fixed, backward side raising portion can be reflected by the result of the first needle selecting actuator according to the running direction of the carriage, the function of the select jack clearing cam of an rising and setting type is brought to realization with a fixed type protrusion and the first and the second raising portions of the selector guide cam for raising placed between the first and the second needle selecting actuators. Since a moving portion such as the select jack clear cam of the rising and setting type can become unnecessary, improvement in cost reduction and the stability of operation can be achieved.

[0023] Furthermore, according to the present invention, the needle selecting actuator at the end of the cam system for knitting mounted in the carriage, the clearing portion of the selector guide cam for clearing, and the raising portion of the selector guide cam for raising can be operated respectively as the first needle selecting actuator, the first clearing portion, and the first raising portion, when the end becomes the backward side. Moreover, since the needle selecting actuator at the end of the cam system for knitting, the clearing portion of the selec-

tor guide cam for clearing, and the raising portion of the selector guide cam for raising are operated respectively as the second needle selecting actuator, the second clearing portion, and the second raising portion when the running direction of the carriage is reversed and the end becomes the forward side, the width required for the end of the carriage can also be reduced.

[0024] Furthermore, according to the present invention, a result of needle selecting by the first needle selecting actuator reflects to the selection by the second raising portion of the selector guide cam for raising. Since the first needle selecting actuator is set to non-selected state when the select jack sets to the base position, the position of the select jack can maintain the base position at the second raising portion. Since the presser which acts on the butt for selecting of the select jack is made to start from the second clearing portion of the selector guide cam for clearing which follows the second raising portion, the width necessary only for the needle selecting portion is decreased, so that the width of the knitting portion can be expanded than conventional method, and stabilization of knitting can be achieved or the width of the knitting portion as equivalent to conventional method can achieve a miniaturization of the carriage.

[0025] Furthermore, according to the present invention, since the stitch cam is placed within the limits for the presser to press the butt for selecting into the setting state when the select jack is positioned at base position, the butt for knitting of the knitting needle can be made to pass the stitch cam without interfering in the knitting operation.

Brief Description of Drawing

[0026]

Fig. 1 is a plan view showing a schematic construction of a cam system 40 including a needle selecting device 39 for a weft knitting machine as one embodiment of the present invention.

Fig. 2A is a figure showing a transition state of a position in needle selecting at the time of carriage going leftward for the cam system 40 on the right-hand side of Fig. 1.

Fig. 2B is a figure showing a needle selecting state by a selector 11 corresponding to Fig. 2A.

Fig. 3A is a figure showing a transition state of a position in needle selecting at the time of carriage going leftward about the cam system 40 on the right-hand side of Fig. 1.

Fig. 3B is a figure showing a transition state of a position in needle selecting at the time of carriage going rightward about the cam system 40 on the right-hand side of Fig. 1.

Fig. 4 is a side view showing a schematic construction of the conventional knitting needle 1.

Fig. 5 is a side cross-sectional view showing schematically a construction of the needle groove 15

housing the knitting needle 1 shown in Fig. 4.

Fig. 6 is a plan view showing a schematic construction of the conventional cam system 20.

Fig. 7A is a figure showing a transition state of a position in needle selecting at the time of carriage going leftward for the cam system 20 on the right-hand side of Fig. 6.

Fig. 7B is a figure showing a needle selecting state by a selector 11 corresponding to Fig. 7A.

Best Mode for Carrying Out the Invention

[0027] Fig. 1 shows a schematic construction of a cam system 40 including a needle selecting device 39 for weft knitting machine as one embodiment of the present invention. This cam system 40 has similar function for the knitting needle 1 shown in Fig. 4 about knitting and loop transferring operation to the cam system 20 shown in Fig. 6. Two couples of cam systems 40 are mounted in one carriage as like as the cam system 20, for example. One couple of the cam systems 40 is divided by a center line 40a, and includes a transfer cam for both sending and receiving 41, a fixed needle raising cam 42, a movable needle raising cam 43, stitch cams 44, needle guide cams 45, a selector guide cam for clearing 47, selector guide cams for raising 48, selector raising cams 49, needle selecting actuators 50, a tuck presser 51, half pressers 52, a fixed presser 53, and a selector floating cam 54. The transfer cam for both sending and receiving 41 and the movable needle raising cam 43 which is provided in the tooth entrance side of central portion are of change-over type and changed over by turns so that one protrudes from a bottom board of the carriage but the other does not protrude. The stitch cams 44 are movable cam so that the backward side stitch cam 44 works to adjust stitch density which is a drawing quantity determined by pulling backward the knitting needle 1 from tooth entrance. Although any movable part equivalent to the select jack clear cam 25 of the rising and setting type as shown in Fig. 6 is not included, the same function is realized by a protrusion 45a protruded from the central portion on a downside of needle guide cam 45.

[0028] As the needle selecting device 39 for weft knitting machine, for example, at the time of going leftward of the carriage, for the right-hand side cam system 40, the needle selecting actuator 50 on the right part of the left-hand side cam system 40 functions as a first needle actuator, and the needle selecting actuator 50 on the left part of the right-hand side cam system 40 functions as a second needle selecting actuator. Furthermore, at the time of going rightward of the carriage, the needle selecting actuator 50 on the right part of the right-hand side cam system 40 functions as the second needle selecting actuator. The same needle selecting actuator 50 functions as the first needle actuator at the time of going leftward before reversal direction from going rightward. Although such an operation of the needle selecting actuator 50 is the same as that of the cam system 20 of Fig. 6,

the needle guide cam 45 which has the protrusion 45a, and the selector guide cam for raising 48 which has the two raising portions 48a and 48b differ from the needle guide cam 25 and the selector guide cam for raising 28 of Fig. 6, in the needle selecting device 39 for weft knitting machine.

[0029] The needle guide cam 45 acts on the butt for selecting 10 of the select jack 9 of Fig. 4, as well as the needle guide cam 25 of Fig. 6, and if it is the A-position which is an advancing position, it will be compulsorily pushed down to the tail end side till the H-position which is the mid-position. The selector 11 is pushed down to a position corresponding to the B-position of the select jack 9 by the clearing portion 47a of the selector guide cam for clearing 47. That is, in the first needle actuator, the needle is selected in the state where the select jack 9 is at the H-position or the B-position. The protrusion 45a of the needle guide cam 45 acts on the butt for selecting 10 of the select jack 9, and compulsorily pushes it down to the B-position. However, a second raising portion 48b of the selector guide cam for raising 48 is provided between the protrusion 45a and the second needle selecting actuator, the selector 11 which is in the needle selecting state by the first needle actuator is pushed up from a position corresponding to the B-position of the select jack 9 to a position corresponding to the H-position. Thus, the select jack 9 is also pushed up to the H-position.

[0030] In addition, the first raising portion 48a of the selector guide cam for raising 48 is provided between the first needle actuator and the protrusion 45a of the needle guide cam 45, and pushes up the selector 11, which is in the needle selecting state by the first needle actuator and at a position corresponding to the B-position of the select jack 9, to a position corresponding to the H-position of the select jack 9. Even if the selector 11 is pushed up to the position corresponding to the H-position of the select jack 9 and the select jack 9 is pushed up to the H-position, the pushing up function of the first raising portion 48a becomes invalid since the select jack 9 is again pushed down to a position corresponding to the B-position of the select jack 9 by the protrusion 45a of the needle guide cam 45. However, the first raising portion 48a at the time of going leftward of the carriage functions as the second raising portion at the time of going rightward of the carriage, and performs an effective action to push up the selector 11 which is pushed down to a position corresponding to the B-position of the select jack 9 by the protrusion 45a of the needle guide cam 45, till a position corresponding to the H-position of the select jack 9. That is, even if the action as the first raising portion 48a is invalid, the action as the second raising portion becomes effective after a running direction of the carriage is reversed, and an effective function can be realized by the fixed type protrusion 45a without providing a select jack clear cam of an rising and setting type in the needle guide cam 45.

[0031] The selector raising cam 49 acts on the butt for raising 13 of the selector 11 in the state where the needle

is selected by the second needle selecting actuator 50, and pushes up the selector 11 to a position corresponding to the A-position of the select jack 9. When the selector 11 is pushed up to a position corresponding to the A-position of the select jack 9, the select jack 9 will also be pushed up to the A-position.

[0032] The tuck presser 51 and the half presser 52, and the fixed presser 53 are placed along trajectories which the butt for selecting 10 of the select jack 9 passes through in the H-position and the B-position among three positions, A, H, and B. When one of these pressers presses the butt for selecting 10, the select jack 9 will sink in the needle groove 15 of Fig. 5. Since the head side of the select jack 9 presses the tail end side of the needle jack 5 from the upper portion, the tail end side of the needle jack 5 also sinks in the needle groove 15, so that the butt for knitting 7 stops receiving an action of the fixed needle raising cam 42 and the movable needle raising cam 43. The tuck presser 51 and the half pressers 52 are changeover types, and can change over operation of the tuck or the stitch receiving with the knitting needle 1 selected to the H-position.

[0033] The butt for clearing 12 and the butt for raising 13 of the selector 11 are guided so that they may be pinched by the selector guide cam for clearing 47 and the selector guide cam for raising 48. However, hollow shape corresponding to protrusion shape of the selector raising cam 49 is provided in the selector guide cam for clearing 47 which faces a portion in which the selector raising cam 49 is provided. In addition, the selector raising cam 49 is of a rising and setting type as well as the selector raising cam 29 of Fig. 6.

[0034] The needle selecting actuator 50 presses the butt for needle selecting 14 provided in the selector 11 of the knitting needle 1 which is not selected, and decreases a protrusion amount of the butt for raising 13 from the needle groove 15. When the protrusion amount of the butt for raising 13 becomes reduced, the selector 11 will cease to receive the action of the selector guide cam for raising 48 and the selector raising cam 49.

[0035] The end of the fixed presser 53 of each cam system 40 can be placed to near protrusion 45a of the needle guide cam 45. However, it is necessary to leave a path along which the butt for selecting 10 of the select jack 9 pass through to the H-position or the A-position. That is, in the needle selecting device 39 for weft knitting machine, the width W2 of a portion in which the fixed presser 53 cannot be placed, is able to be limited within an area near the protrusion 45a of the needle guide cam 45 among needle selecting portions. As compared with the width W1 of Fig. 6, the width W2 of Fig. 1 can be made small enough. Therefore, if the disposing pitch P of the cam system 40 is made the same as the disposing pitch P of the cam system 20 of Fig. 6, the range of the stitch cam 44 can be made large, and the stability of yarn feeding in the knitting operation of the knitting needle 1 etc. can be improved.

[0036] Figs. 2A and 2B correspond to Figs. 7A and 7B,

Fig. 2A shows a transition state of a position in needle selecting at the time of carriage going leftward for the cam system 40 on the right-hand side of Fig. 1, and Fig. 2B shows a needle selecting state of the selector 11. As mentioned above, if a position of the select jack 9 is the A-position as an advancing position at the time of knitting by the cam system 40 of left-hand side which runs ahead, the select jack 9t will be pushed down compulsorily to the H-position as the mid-position by a portion on the left-hand side of the needle guide cam 45 placed on an intermediate space. The selector 11 is pushed down to a position corresponding to the B-position of the select jack 9 by the clearing portion 47a formed on the selector guide cam for clearing 47 placed in the left-hand side cam system 40, and receives needle selection by the needle selecting actuator 50 at the right part of the cam system 40 on the left-hand side used as the first needle selecting actuator. If the position of the select jack 9 is the H-position or the B-position at preceding time, the select jack 9 does not receive change of a position. The selector 11 which received needle selection by the first needle actuator is pushed up to a position corresponding to the H-position of the select jack 9 by the first raising portion 48a of the selector guide cam for raising 48. Since the butt for needle selecting 14 of the selector 11 shown in Fig. 5 is sunk in the needle groove 15 and the butt for raising 13 is also sunk in the needle groove 15 without receiving the needle selection, the butt for raising 13 does not receive the pushing up action of the first raising portion 48a and keeps a position corresponding to the B-position of the select jack 9. The select jack 9 at the H-position is compulsorily pushed down to the B-position by the protrusion 45a of the needle guide cam 45. The selector 11 is also pushed down to a position corresponding to the B-position of the select jack 9.

[0037] When the selector 11 reaches a position of the second raising portion 48b of the selector guide cam for raising 48, the second raising portion 48b pushes up the selector 11 which is selected by the first needle selecting actuator from a position corresponding to the B-position of the select jack 9 to a position corresponding to the H-position of the select jack 9. The selector 11 in the non-selecting state does not receive the action of the raising portion 48b, and keeps a position corresponding to the B-position of the select jack 9. The selector 11 pushed up to a position corresponding to the H-position of the select jack 9 is pushed down to a position corresponding to the B-position of the select jack 9 by the second clearing portion 47b of the selector guide cam for clearing 47 after pushing up the select jack 9 to the H-position, and receives the needle selection by the needle selecting actuator 50 on the left part of the cam system 40 of the right-hand side used as the second needle selecting actuator. At this needle selecting actuator 50, the needle selection is performed when making the knitting needle 1 into the A-position, and the select jack 9 is also pushed up to the A-position since the butt for raising 13 of the selector 11 will be pushed up to a position corresponding

to the A-position of the select jack 9 by the action of the selector raising cam 49 if the needle is selected. When the cam system 40 shown in the right-hand side of Fig. 1 becomes the preceding side, the left-hand side cam system 40 operates as well as the above-mentioned cam system 40 in the right-hand side.

[0038] As mentioned above, in the needle selecting device 39 for weft knitting machine mounted in the carriage which performs the both-way run along with a longitudinal direction of the needle bed 16, the select jack 9 for controlling either rising state or setting state to determine whether the butt for knitting 7 as a driving butt of each knitting needle 1 receives the action of the cam system 40 for knitting or not, is changed over with three positions of the B-position which is base position, the H-position which is mid-position and the A-position which is advancing position by two steps of selections to the selector 11 by the first and second needle selecting actuators 50. In the needle selecting device 39, the needle guide cam 45, the selector guide cam for clearing 47, and the selector guide cam for raising 48 are included. The needle guide cam 45 is provided with the protrusion 45a between the first needle selecting actuator 50 and the second needle selecting actuator 50, and the cam acts on the butt for selecting 10 of the select jack 9 as the butt for needle selecting, moves the select jack 9 of the A-position to the H-position until it reaches the first needle selecting actuator 50. By such a needle guide cam 45, the knitting needle 1 in the A-position can also be cleared to the B-position.

[0039] The selector guide cam for clearing 47 has a first clearing portion 47a and a second clearing portion 47b. The first clearing portion 47a pushes down the selector 11 to a position corresponding to the B-position of the select jack 9 so as to receive the needle selection at the first needle selecting actuator 50. The second clearing portion 47b pushes down the selector 11 to a position corresponding to the B-position of the select jack 9 so as to receive the needle selection at the second needle selecting actuator 50.

[0040] The selector guide cam for raising 48 includes a first raising portion 48a for displacing the selector 11, which is at a position corresponding to the B-position of the select jack 9 in the needle selecting state by the first needle selecting actuator 50, to a position corresponding to the H-position of the select jack 9 until it reaches the protrusion 45a of the needle guide cam 45, and a second raising portion 48b for displacing the selector 11, which is in the selected state displaced to a position corresponding to the B-position of the select jack 9 by the protrusion 45a of the needle guide cam 45, to a position corresponding to the H-position of the select jack 9 until it reaches the second needle selecting actuator 50. If the needle selecting state is selected by the first needle actuator 50, even if the select jack 9 is lowered to the B-position by the protrusion 45a of the needle guide cam 45, since the selector 11 can be made to advance to a position corresponding to the H-position of the select jack 9 by the

second raising portion 48b of the selector guide cam for raising 48, the select jack 9 is able to be positioned to the H-position for the select jack 9 if the needle is not selected at the second needle selecting actuator 50. If the needle is selected by the second needle selecting actuator, the selector 11 can be further pushed up to a position corresponding to the A-position of the select jack 9, and the select jack 9 can also be pushed up to the A-position.

[0041] In this embodiment, the function of the select jack clear cam 26 of the rising and setting type as shown in Fig. 6 is realizable by the fixed type protrusion 45a of the needle guide cam 45 placed between the first and second needle selecting actuators 50, and by the two raising portions 48a and 48b of the selector guide cam for raising 48, and the width W2 required for the needle selecting portion can be decreased. Furthermore, since the moving portion such as the select jack clear cam 26 of the rising and setting type shown in Fig. 6 can be eliminated, improvement in cost reduction or stability of operation can be achieved.

[0042] Fig. 3A shows a transition state of the cam system 40 on the right-hand side of Fig. 1, which precedes at the time of carriage going leftward, and Fig. 3B shows a transition state of needle selecting at the time of carriage going rightward. As shown in Fig. 3B, in the cam system 40 which goes ahead at the time of carriage going rightward, the needle selecting actuator in the right part functions as the second needle selecting actuator, the right-hand side selector raising cam 49 rises, and the selector 11 which is in the needle selecting state, is pushed up to a position corresponding to the A-position of the select jack 9. As shown in Fig. 3A, at the time of going leftward before inverting a running direction of the carriage from leftward to rightward, the selector raising cam 49 of this right-hand side will be in the setting state, and the needle selecting actuator 50 will function also as the first needle actuator.

[0043] In addition, such a construction in the needle groove 15 as shown in Fig. 5, at the time of preceding leftward, is able to go out of the carriage in a state where the select jack 9 is selected, floating and pushed down to the B-position by the protrusion 45a of the needle guide cam 45, for example, when the knitting operation is interrupted in order to perform maintenance work etc, there is might be a possibility that the selector 11 might be sunk in the needle groove 15. Therefore, the raising portion 48c is provided in the selector guide cam for raising 48, and the operation going out of the carriage is performed after the selector 11 of the needle selecting state is pushed up to a position corresponding to the H-position of the select jack 9.

[0044] Thus, since the needle selecting actuator 50 of the end of the cam system 40 for knitting mounted in the carriage is operated as the first needle selecting actuator when the end becomes the backward side, and the needle selecting actuator 50 is operated as the second needle selecting actuator when the running direction of the

carriage is inverted and the end becomes the forward side, the width required for the end of the carriage can also be decreased.

[0045] In the cam system 20 shown in Fig. 6, the fixed presser 33 cannot be placed in the range of the width W1 including the space between outside heads of the select jack clear cam 26. The range for the stitch cam 24 being able to be placed in each cam system 20, corresponds to the space between both outside ends of the fixed presser 33. When the size of the width direction of the carriage is restricted and the disposing pitch P between the cam systems 20 is also fixed, a gap between the stitch cams 24 will become narrow if the width W1 by which the select jack clear cam 26 is placed becomes large within disposing pitch P between the cam systems 20. If the gap between the stitch cams 24 becomes narrow, a position which makes the hook 3 of the knitting needle 1 advance to the tooth entrance 18, and receives knitting yarn will become difficult to be stabilized. If the gap between the stitch cams 24 is made large, it will be necessary to enlarge the disposing pitch P of the cam system 20, the size of the width direction of the carriage will become large, and a miniaturization will become difficult. Furthermore, if the size of the width direction of the carriage becomes large, even when composing knitting fabric of the same knitting width, the carriage needs to run more distance than the sum of the knitting width and the width of the carriage, and the productivity also reduces.

[0046] In particular, if the width of the fixed presser 53 is made large, it will become easy to restrict the range between the stitch cams 24 within the limit of the fixed presser 53, and it will become possible to continue pressing the butt for selecting 10 of the select jack 9 by the fixed presser 53 at the time of the B-position is selected, so that the butt for knitting 7 of the needle jack 5 in the knitting needle 1 which received needle selection of the miss, is able to pass through the stitch cam 44 with no relation.

[0047] If the gap between the stitch cams 44 is made equivalent to the stitch cams 24 of Fig. 6, a decrement from the width W1 to the width W2 which the needle selecting portion requires, is able to reflect in disposing pitch P between the cam systems 40, so that the gap between the cam systems 40 can be narrowed, and a miniaturization of the carriage can also be achieved.

[0048] Although the two sets of the cam systems 40 are mounted in the carriage in the above explanation, one set or three or more sets can also be mounted. Furthermore, in the needle selecting actuator 50, although one knitting needle is selectable from eight adjoining knitting needles, the number of the selectable knitting needles can also be changed according to an placing pitch of the knitting needle, etc. Moreover, as the knitting needle, not only a latch needle but a compound needle etc. can also use.

Industrial Applicability

[0049] In a needle selecting device for weft knitting machine, moving portion such as a select jack clear cam of an rising and setting type can be eliminated.

Claims

1. A needle selecting device for a weft knitting machine, mounted in a carriage which performs both-way run along with a longitudinal direction of a needle bed, positioning and changing over each select jack which controls rising or setting state for a driving butt of each knitting needle, the driving butt receives an action of a cam system for knitting so as to go up to a tooth entrance side one after another by three positions of a base position of non selection, a mid-position in selection by a first needle selecting actuator, and an advancing position in selection by a second needle selecting actuator, the needle selecting device for the weft knitting machine comprising:

a needle guide cam provided with a protrusion for acting on a butt for selecting provided with the select jack and for guiding the select jack to the base position between the first needle selecting actuator and the second needle selecting actuator;

a selector guide cam for clearing provided with a first clearing portion and a second clearing portion, wherein the first clearing portion guides a selector to the base position where a needle receives selection by the first needle selecting actuator, and the second clearing portion guides the selector to the base position where the needle receives selection by the second needle selecting actuator; and

a selector guide cam for raising provided with a first raising portion and a second raising portion, wherein the first raising portion guides only the selector selected by the first needle selecting actuator to the mid-position between the first needle selecting actuator and the protrusion of the needle guide cam, the second raising portion guides only the selector selected by the first needle selecting actuator to the mid-position between the protrusion of the needle guide cam and the second clearing portion of the selector guide cam for clearing.

2. The needle selecting device for the weft knitting machine according to claim 1, wherein the needle selecting actuator, the clearing portion of the selector guide cam for clearing and raising portion of the selector guide cam for raising positioned at one end of the cam system for knitting mounted in the carriage, are operated respectively as said first needle select-

ing actuator, said first clearing portion, and said first raising portion, when said end becomes backward; and are operated respectively as said second needle selecting actuator, said second clearing portion, and said second raising portion, when said end becomes forward. 5

3. The needle selecting device for the weft knitting machine according to claim 1 or 2, wherein a presser for pressing said butt for selecting in the setting state when said select jack is positioned in said base position, being made to start from said second clearing portion of said selector guide cam for clearing. 10
4. The needle selecting device for the weft knitting machine according to claim 3, wherein stitch cams are placed within the pressing range of said presser. 15

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FIG. 1

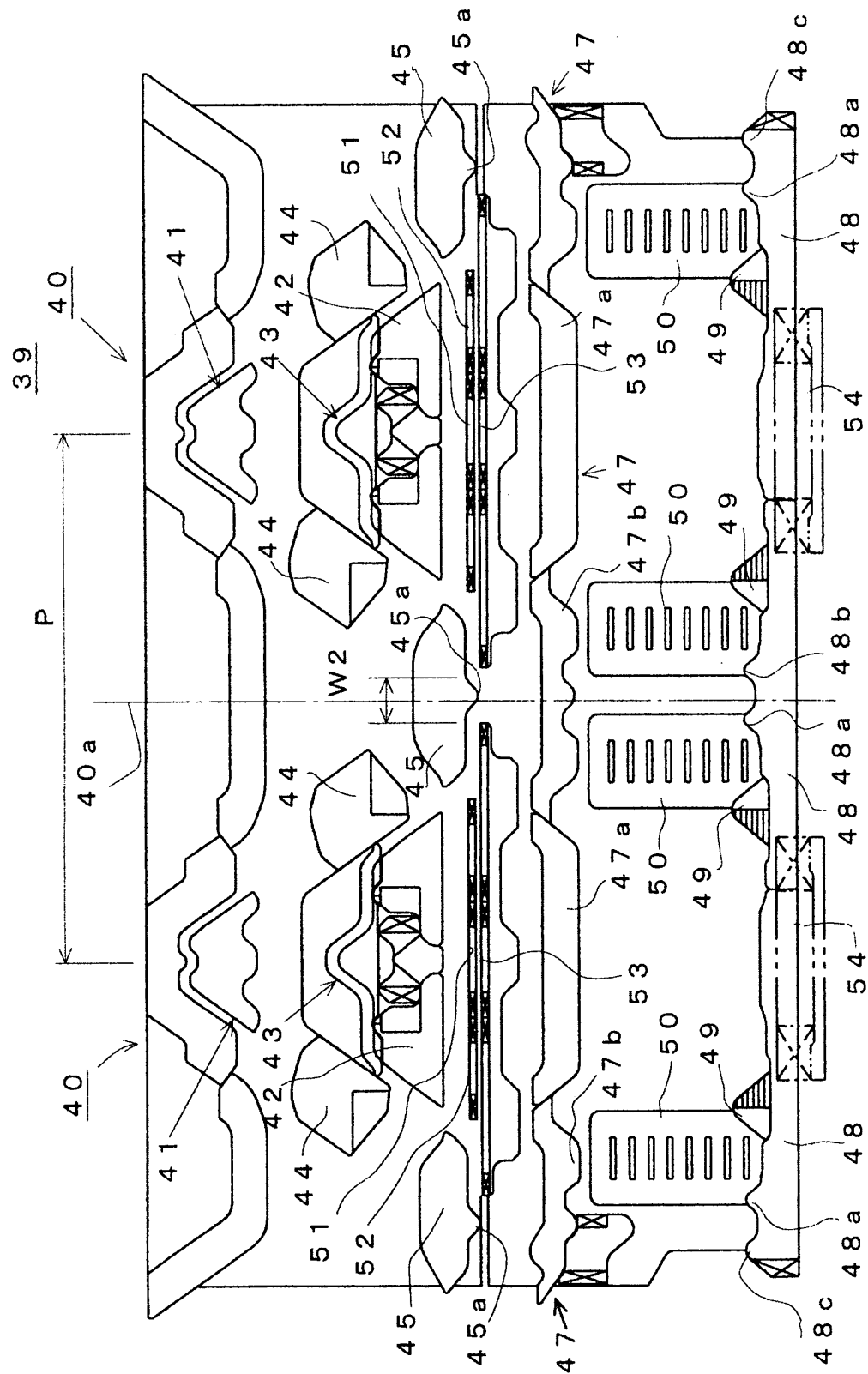


FIG. 2A

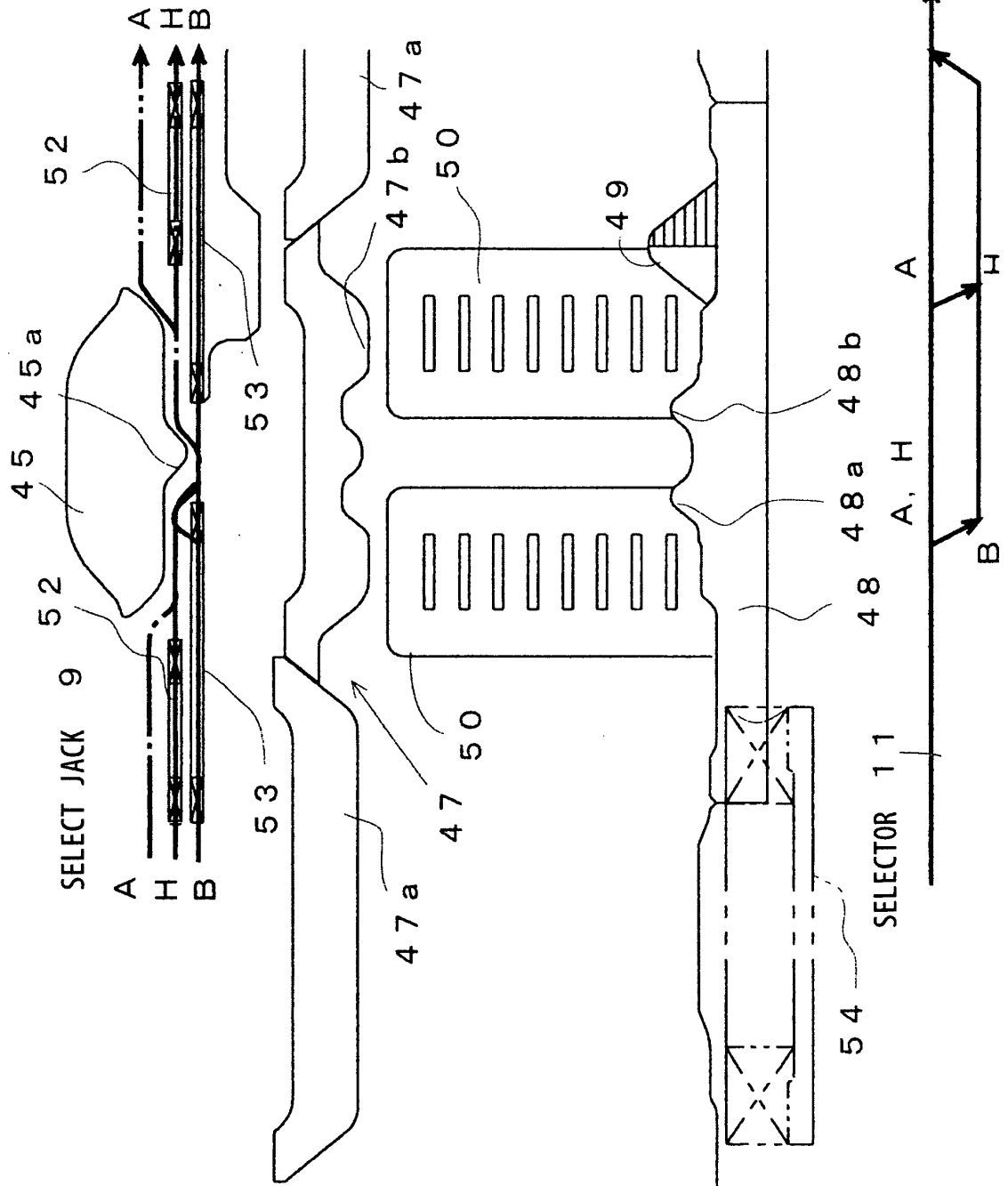


FIG. 2B

FIG. 3A

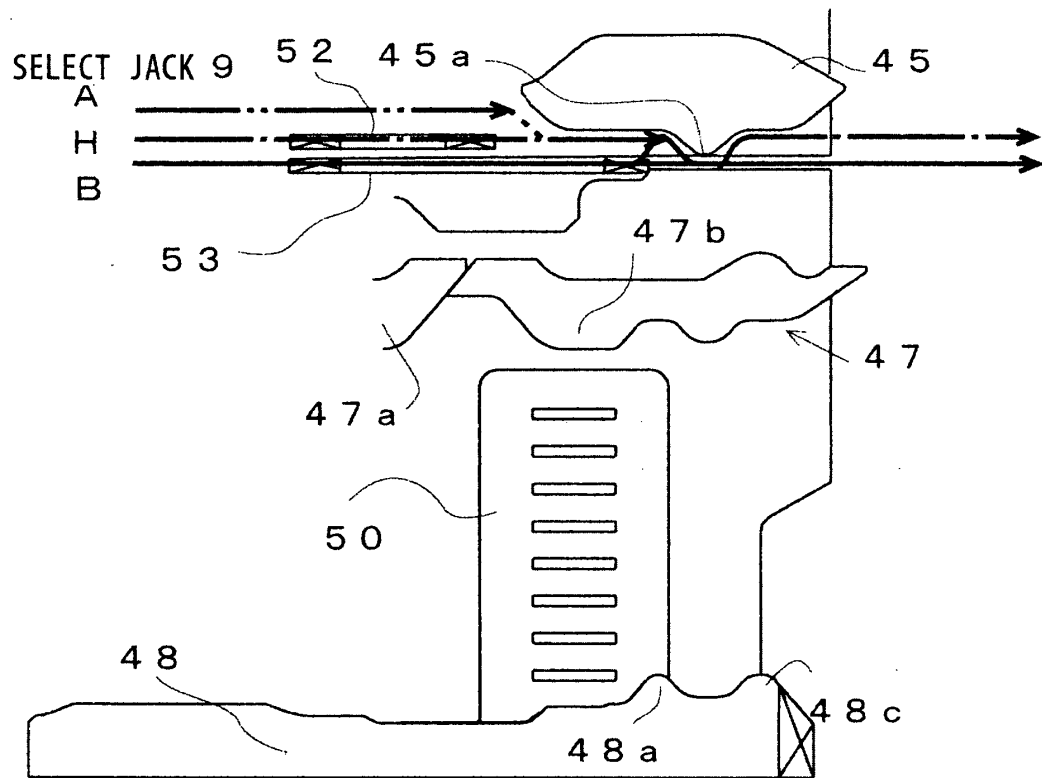


FIG. 3B

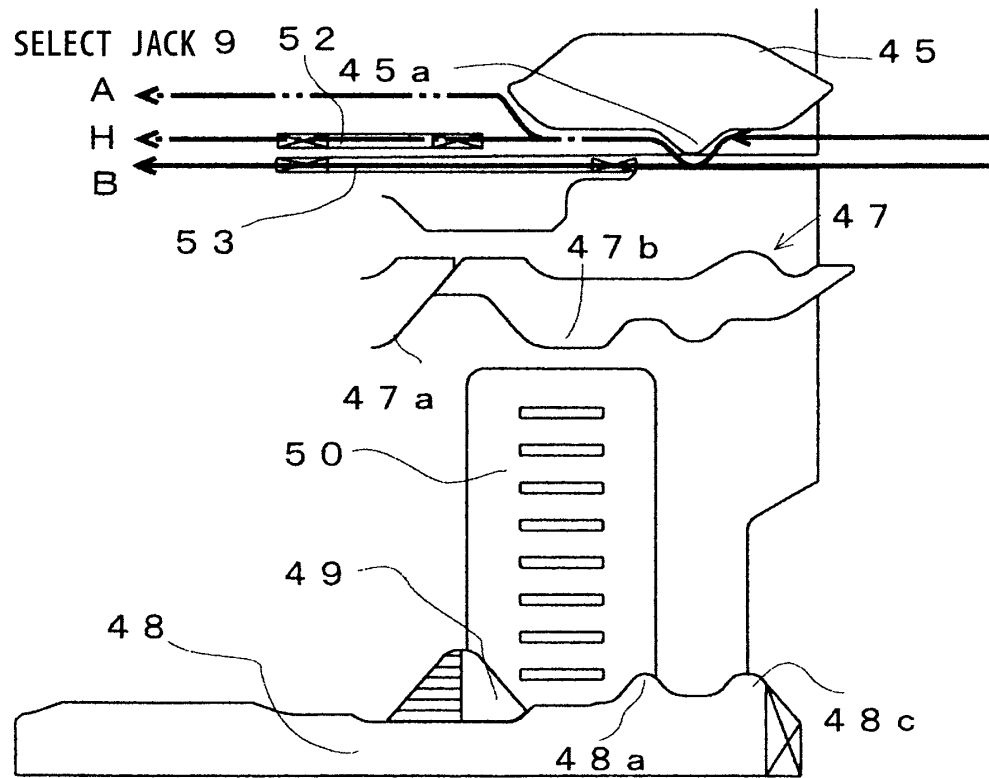


FIG. 4

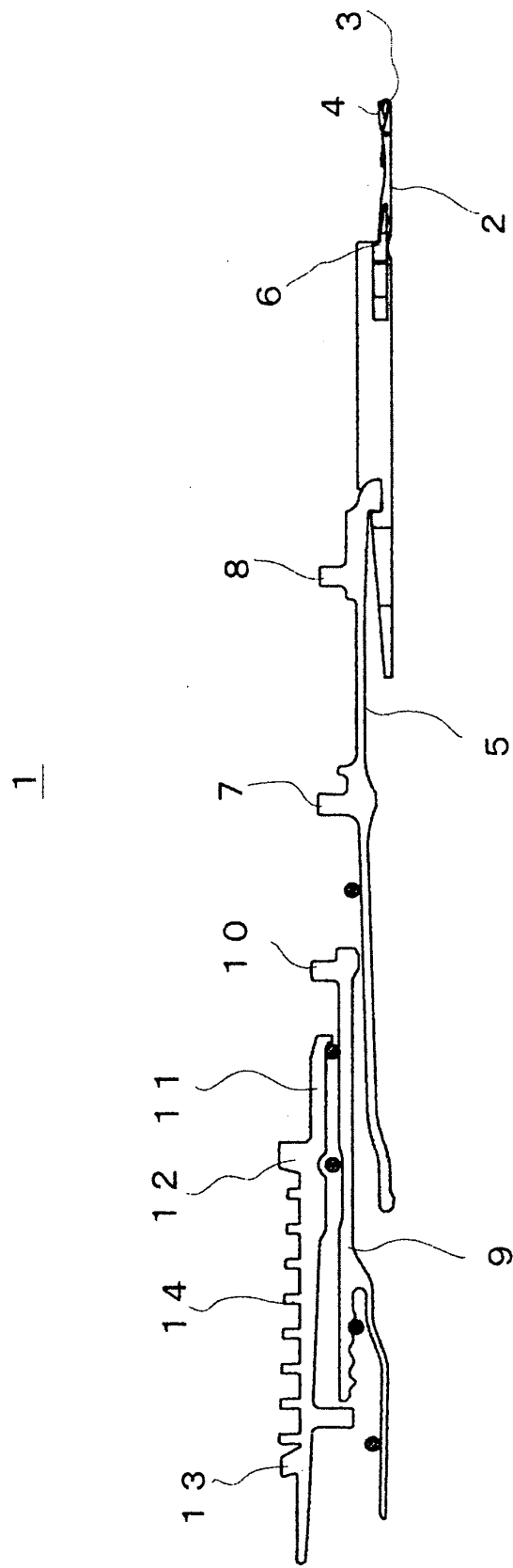


FIG. 5

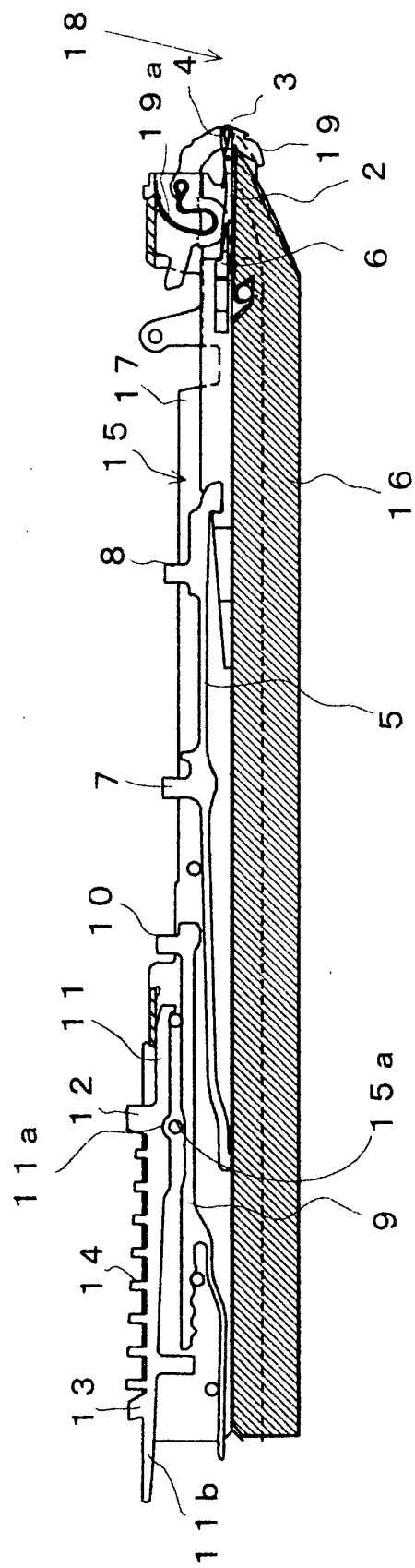


FIG. 6

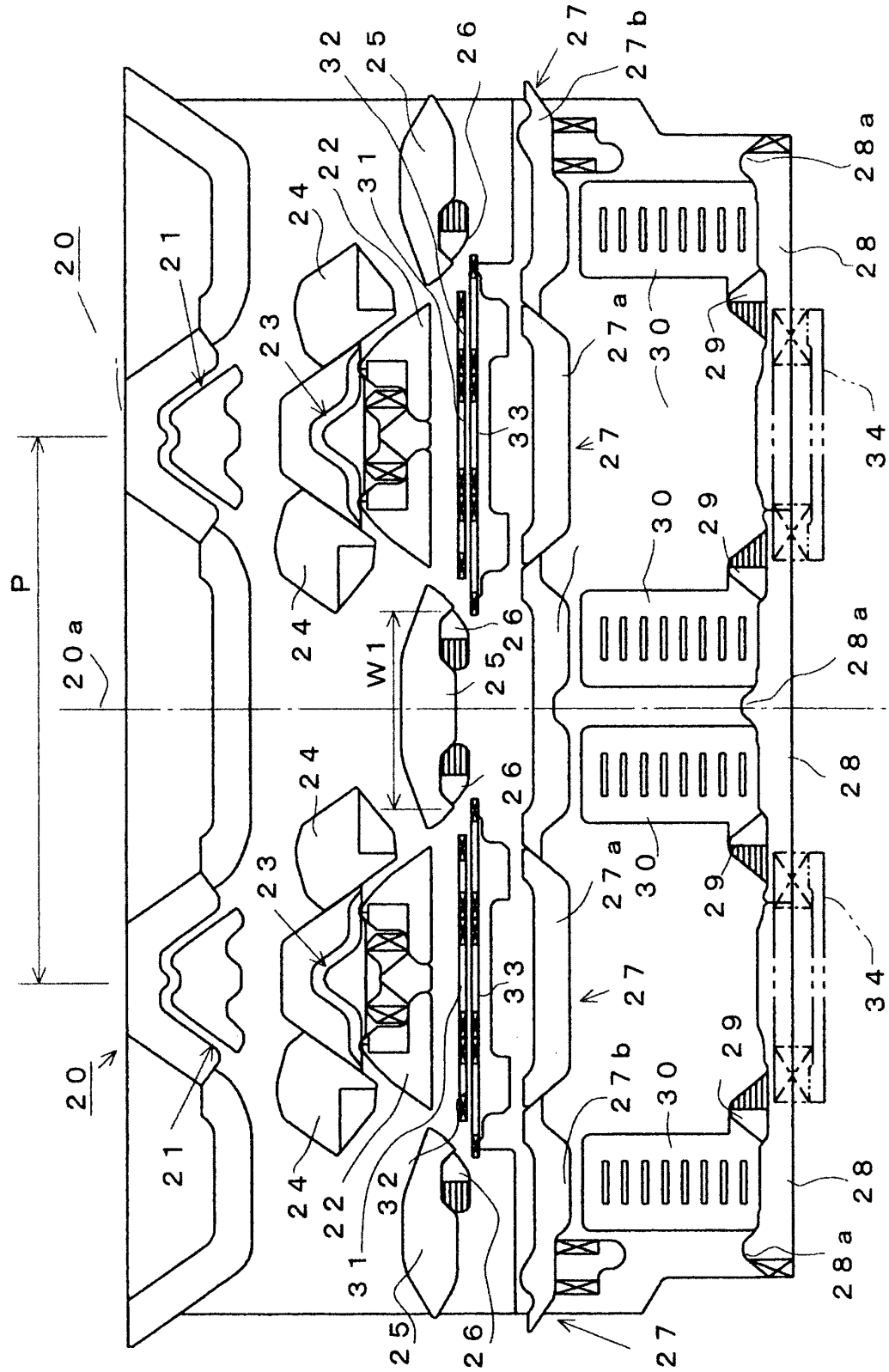


FIG. 7A

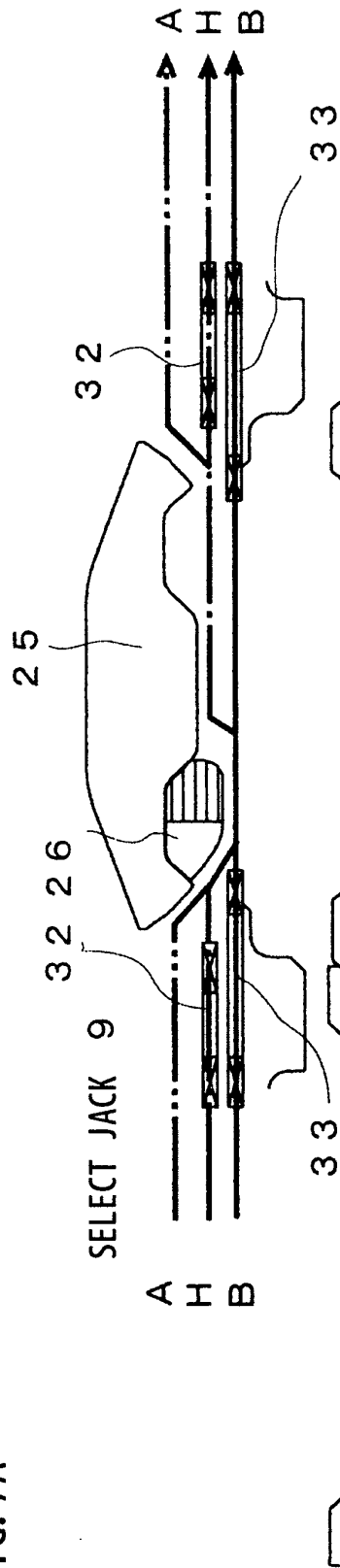
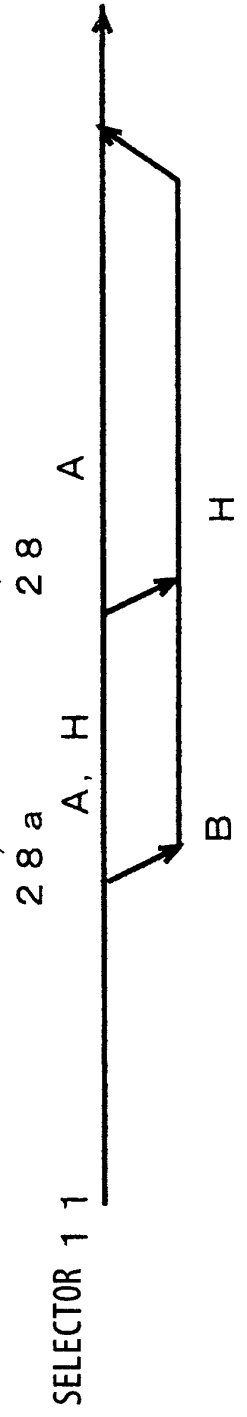


FIG. 7B



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2006/326397

A. CLASSIFICATION OF SUBJECT MATTER

D04B15/36(2006.01) i

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)

D04B15/36, 15/82

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.
A	JP 5-156553 A (Shima Seiki Mfg., Ltd.), 22 June, 1993 (22.06.93), (Family: none)	1-4
A	WO 1981/000869 A1 (Kabushiki Kaisha Shima Idea Center), 02 April, 1981 (02.04.81), & GB 2072713 A & CH 628969 A & ES 495435 A & ES 503574 A & IT 1128682 A & IT 8049747 A0	1-4
A	JP 3459514 B2 (Shima Seiki Mfg., Ltd.), 20 October, 2003 (20.10.03), & US 5802878 A1 & US 5819559 A1 & US 5694792 A1 & EP 748887 A1 & EP 1026299 A2 & CN 1138645 A & CN 1313417 A & CN 1182286 C	1-4

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"&" document member of the same patent family

Date of the actual completion of the international search
20 March, 2007 (20.03.07)Date of mailing of the international search report
03 April, 2007 (03.04.07)Name and mailing address of the ISA/
Japanese Patent Office

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REFERENCES CITED IN THE DESCRIPTION

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- JP H05156553 B [0014] [0014]