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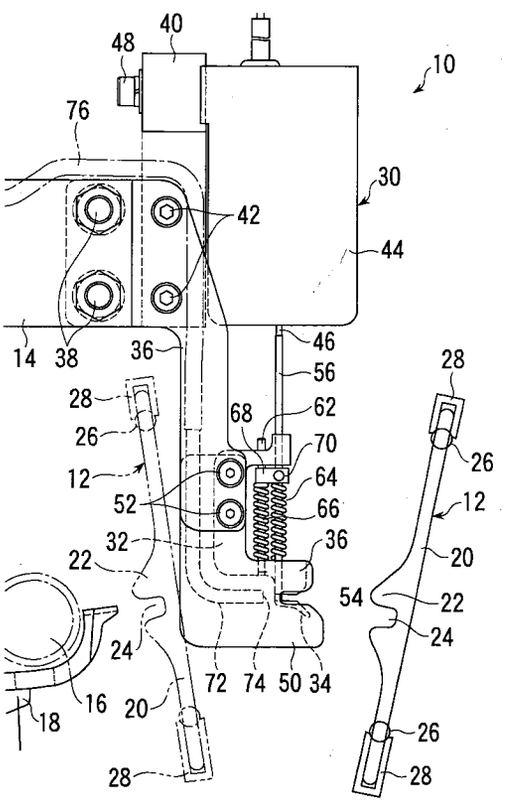
(54) Weft holding device in fluid jet loom

(57) The weft holding device (10) in a fluid jet loom comprises: a pair of holding members (32, 34) having weft holding portions (58, 60) for receiving the weft (80) which moves together with a reed (12) between the most forward position and the most backward position of the reed (12) and to be moved selectively and relatively in the directions to contact each other and part from each other; and an engaging member which engages the weft (80) received in the weft holding portions (58, 60) and positions the weft (80) relative to both holding members (32, 34).

FIG. 1



EP 1 413 659 A1

Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a weft holding device in a fluid jet loom, and more particularly, to a weft holding device disposed on a non-weft-inserting side.

Description of Prior Art

[0002] As a weft holding device in a fluid jet loom, techniques described in patent documents 1 and 2 are known.

[0003] Both prior arts described in patent documents 1 and 2 have a mechanism such as a so-called hinge in which one of a pair of weft holding members angularly rotates about a rotation shaft.

[0004] In both prior arts, the length of a weft holding portion, especially the length of a portion capable of holding exceeds a swinging range of a reed (between the most forward position and the most backward position of the reed).

[Patent Document 1]
Japanese Patent Appln. Public Disclosure No. 10-130999
[Patent Document 2]
Japanese Patent Appln. Public Disclosure No. 2000-199152

[0005] In such prior arts, an axis of a support point which is the axis of a rotation shaft being out of a swinging range of a reed, the distance from the axis of the support point of a pair of holding members to a weft holding position is-long. For this reason, in both prior arts, if the swinging range of the holding members is small, it becomes difficult to receive the weft between the holding members, while if the swinging range of the holding members is large, a difference in time from when a command to hold is outputted until when the weft is actually held is great, which results in bad responsiveness of the weft holding device.

[0006] Also, in both prior arts, since the weft is only sandwiched by a pair of the holding members, the weft tends to come off the holding members at the time of swinging motion of the reed, particularly when the reed moves ahead of the weft holding members.

[0007] An object of the present invention is to provide a high responsiveness to a command to hold and to catch hold of the weft surely.

SUMMARY OF THE INVENTION

[0008] The weft holding device according to the present invention is one to be attached to a member different from a reed sley of a fluid jet loom, and comprises: a pair of holding members which have a weft holding portion for receiving and holding a weft, which moves together with a reed, between the most forward position and the most backward position of the reed, the weft holding portion having a length in the moving direction of a warp shorter than the length of a swinging locus of the reed, and which are moved selectively and relatively by a drive unit in the directions to approach each other or part from each other; and an engaging member for engaging the weft received in the weft holding portion and positioning the weft relative to both holding members.

[0009] Since the length of the holding member in the moving direction of the warp is shorter than the length of the moving locus of the reed, even in case of a linear movement or an angular rotational movement of holding member, a difference in time from when a command to hold is outputted until when the weft is actually caught hold of becomes small, thereby improving responsiveness.

[0010] Also, in case of a weft holding device wherein holding members receive the end portion on a non-inserting side of the weft inserted into a warp shed as the reed advances, and holding the weft with both holding members moved linearly by the drive unit, the weft can be surely received in the weft holding portion even if the moving range of the holding members is smaller than a device for holding a weft wherein both holding members are angularly rotated to catch hold of the weft. Therefore, a difference in time from when the command to hold is outputted until when the weft is actually caught hold of becomes small, thereby improving the responsiveness.

[0011] The tension of the weft after insertion usually gets smaller toward the non-weft-inserting side, but the weft is beaten as it is to cause a flaw in a cloth. If, however, the weft holding portions are positioned within the swinging range of the reed, both holding members, besides being linearly moved, catch hold of the weft extending immediately after the weft insertion instantaneously and can keep the tension of the weft. Therefore, after the weft is caught hold of by the holding members, the reed is further advanced, by which the part of the weft on the non-inserting side is stretched and beaten by the reed. As a result, the tension on both end portions of the weft becomes equal, thereby preventing generation of a flaw in a cloth.

[0012] The weft received in the weft holding portion is engaged with an engaging member and positioned relative to both holding members. Therefore, the weft is surely held by the holding members, and is prevented from coming out of the holding members with the advance of the reed.

[0013] Also, at this time, a certain tension can be applied to the weft, and by further adjusting the position of the engaging member forward or backward, the applied tension can be adjusted.

[0014] The length of the weft holding portion in the

moving direction of the warp can be made smaller than the length of the swinging locus of the reed. Thus, the holding members can be made small, thereby improving the responsiveness.

[0015] The weft holding portion may be located, as viewed from the running direction of the weft, at the height position of the weft swinging locus connecting the weft running paths respectively at the most forward position and at the most backward position. By doing' so, the weft can be surely received by the weft holding portion and more surely held.

[0016] The drive unit includes a drive source which relatively moves the pair of holding members in one of the directions to approach each other and to part from each other, a spring which relatively moves the pair of holding members in the other of the directions to approach each other and to part from each other, and adjusting means for adjusting the energizing force of the spring may be included. By doing so, since the holding force can be set at an appropriate value by adjusting the energizing force of the spring, applying excessive tension to the weft can be prevented. Further, the energizing force may be adjusted by replacing the springs.

[0017] The weft holding device can further include a blow nozzle for jetting a pressure fluid toward the weft held by the pair of holding members. Thus, the weft can be surely discharged from the holding members by the pressure fluid jetted from the blow nozzle, thereby preventing tangling of the weft with the weft holding device.

[0018] The weft holding device can further include a weft anti-tangling member disposed near the weft holding portion in the running direction of the weft. As a result, a guide port for the weft into the weft holding portion is formed by the weft anti-tangling member, so that the weft can be surely guided to the holding member when the reed swings, thereby preventing the weft from tangling with the holding member. Also, even if the weft anti-tangling member is disposed near the non-weft-introducing side of the holding member, entanglement of the weft with the holding member is prevented.

[0019] The weft anti-tangling member may be a plate-like member disposed opposite to both sides of the jet nozzle of the blow nozzle. Since thereby the weft anti-tangling member regulates diffusion of jetting of the pressure fluid to be jetted from the blow nozzle, even if the pressure fluid of the blow nozzle has a low pressure, the pressure fluid acts on the weft in a state strong enough to blow off the weft, so that the fluid compression equipment of the blow nozzle can be made small.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020]

Fig. 1 is a side view of the first embodiment of the weft holding device according to the present invention.

Fig. 2 is an enlarged view of the weft holding device shown in Fig. 1

Fig. 3 is an enlarged front view of the weft holding device shown in Fig. 1.

Fig. 4 is a plan view of the weft holding device shown in Fig. 1.

Fig. 5 is a typical front view of the second embodiment of the weft holding device according to the present invention.

Fig. 6 is a typical side view of the weft holding device shown in Fig. 5.

PREFERRED EMBODIMENT OF THE INVENTION

[0021] Referring to Figs. 1 - 4, a weft holding device 10 is disposed on the non-weft-inserting side of an air jet loom and is used for holding a weft 80 (see Fig. 4) to be inserted and advanced from a reed 12 toward a cloth fell.

[0022] The weft holding device 10 is disposed nearer the non-weft-inserting side than the reed 12 which beats the inserted weft 80, and removably assembled by a support arm 14 into a member different from a reed sley (not shown), for example, a temple base 18 which rotatably supports a temple 16. However, the position and state of assembly of the weft holding device 10 is optional.

[0023] The reed 12 has a plurality of strip-like dents 20 at intervals in the direction of the weaving width. Each dent 20 has, near the longitudinal center, a convex portion 22 projected toward the cloth fell, and at the center of the convex portion 22, a concave portion 24 opening toward the cloth fell side. The reed 12 having the dents 20 arranged in parallel in its thickness direction forms a groove formed by the concave portions 24 of the dents 20 as a running path of the weft 80.

[0024] The reed 12 has a coiled fine line 26 disposed at each end portion of the reed 20, with the end portions of each dent 20 inserted into adjoining turn portions of the fine lines 26 to keep the adjoining dents 20 at certain intervals and prevents relative displacement of the dents 20 by upper and lower caps 28. The reed 12 is attached to a reed sley (not shown) by the lower cap 28.

[0025] The weft holding device 10 holds the weft 80 to be advanced together with the reed 12 accompanying the forward motion of the reed 12 with a pair of holding members 32, 34 to be moved selectively so as to approach and part from the drive unit 30, and assembles a pair of plate-like support members 36 arranged in front of and behind the holding members 32, 34 in the weaving width direction (running direction of the weft) into the support arm 14 by a plurality of screw members 38.

[0026] Both support members 36 are shaped like an inverted L-letter, and the holding members 32, 34 are removably attached to the support arm 14 at the upper portions at an interval in the direction of the weaving width (weft running direction) in the upper portion so as to be located there between in the weaving width direction, and furthermore, a bracket 40 is removably assem-

bled into the upper portion by a plurality of screw members 42.

[0027] The drive unit 30 uses an electric actuator such as a solenoid, a motor or the like as a drive source 44, and removably assembles the drive source 44 into the bracket 40 with a plurality of screw members 48 such that its movable pin 46 projects downward. Consequently, the drive source 44 as well as the drive unit 30 is firmly assembled through the bracket 40, the support member 36 and the support arm 14 into the temple base 18 so as to adjust the position, and removably.

[0028] As the drive source 44, it is possible to use a one-way excitation type solenoid which incorporates a coil spring. An excitation command (drive command) to this solenoid is supplied from a control unit (not shown) to a drive circuit (not shown). By this, excitation current (drive current) is supplied to the drive circuit to excite (drive) the drive source 44.

[0029] The movable pin 46 of the solenoid is applied downward force by the built-in coil spring of the drive source 44 when the solenoid is not excited (not driven), while it is sucked upward against the spring force of the built-in coil spring when the solenoid is excited.

[0030] A plate-like weft anti-tangling member 50 is removably attached to the lower end portion of each support member 36 by a plurality of spring members 52. Both weft anti-tangling members 50 are L-shaped as viewed in the direction of the weaving width and assembled into the support member 36 at the upper end portion.

[0031] Both weft anti-tangling members 50 are spaced apart in the direction of the weaving width, interposing the holding members 32, 34, and each has a U-shaped guide port 54 opening toward the non-cloth-fell side (the upstream side in the moving direction of the warp) at the front end portion so as to receive the front end portion of the weft 80 which is advanced together with the reed 12. The interval between the upper and lower parts of the portion from the guide port 54 toward the non-cloth-fell side (the front end side) is made larger toward the non-cloth-fell side so as to surely receive the end portion of the weft 80 which is advanced together with the reed 12.

[0032] The holding member 32 is shaped like a bracket with a one-side open rectangular or a U-like shape opening toward the non-cloth-fell side and acts as a fixed side holding member attached immovably to the support member 36.

[0033] On the other hand, the holding member 34 is immovably attached to the lower end portion of a movable shaft 56 which is independent from the holding member 34 and which extends vertically through the holding member 32, and acts as a holding member on the movable side. The movable shaft 56 abuts at its upper end face on the lower end face of the movable pin 46. The holding member 34 is located below the holding member 32 at an interval. Either one of the holding members 32 and 34 or both may be made movable.

[0034] The movable shaft 56, on which the weft 80 advancing with the reed 12 abuts, acts as an engaging member for preventing the weft 80 from advancing further. The axis of the movable shaft 56 coincides with the axis of the movable pin 46.

[0035] The weft holding portion is formed by the horizontal lower end face 58 and the horizontal upper end face 60 of the holding member 32, and opens toward the non-cloth-fell side. The height positions of the weft holding portions 58, 60 are the height position of the guide port 54 (See Fig. 2).

[0036] A position nearer the non-cloth-fell side than the weft holding portions 58, 60 is adapted to be a weft inlet, the distance between the upper and lower parts of which is made larger toward the non-cloth-fell side so as to surely receive the end portion of the weft advancing together with the reed 12.

[0037] The length L (the distance from the position of the movable shaft 56 to the front end portion of the non-cloth-fell side of the weft holding members 58, 60) of the weft holding members 58, 60 in the swinging direction of the reed 12 is shorter than the length (the distance between the most forward position and the most backward position) of the swinging locus (actually, the swinging locus of the weft running path accompanying the swinging of the reed 12) of the reed 12 in the moving direction of the warp.

[0038] A guide shaft 62 for the holding member 34 and the movable shaft 56 penetrates the holding member 32 not to move up and down in a state of extending vertically parallel with the movable shaft 56.

[0039] The holding springs 64 and 66 to apply the weft holding force to the holding members 32, 34 are compression coil spring in the illustration, and each of them is within a one-side open rectangular or U-shaped area formed by the holding member 32 and disposed around the movable shaft 56 and the guide shaft 62.

[0040] The movable shaft 56 and the guide shaft 62 penetrate a spring force adjusting member 68 so as to move vertically and are connected by the spring force adjusting member 68 and an adjusting screw 70. The spring force adjusting member 68 is disposed above the holding springs 64 and 66 so as to adjust the energizing force of the holding springs 64 and 66, and assembled by the adjusting screw 70 into the movable shaft 56 so as to be able to change the attached position.

[0041] The holding springs 64 and 66 constantly apply the upward the force to the spring force adjusting member 68. However, the spring force of the holding springs 64 and 66 is smaller than the spring force of the built-in coil spring of the drive source 44.

[0042] As a result, when the drive source 44 is not driven, the holding member 34 is applied the downward spring force by the built-in coil spring and can be changed by changing the position assembling the spring force adjusting member 68 into the movable shaft 56.

[0043] A blow nozzle 72 for removing the weft from the weft holding device 10 is disposed between both

weft anti-tangling members 50 and on the cloth fell side of the weft holding portions 58, 60 so as to jet a pressure fluid like the compressed air from a nozzle 74 horizontally relative to the weft holding members 58, 60 toward the non-cloth-fell side. The blow nozzle 72 is air-tightly connected to a hose 76 extending over the support arm 14.

[0044] A stretch nozzle 78 for sucking the end portion of the inserted weft 80 is disposed, as shown in Fig. 4, on the non-weft-insert side of the holding members 32, 34 so as to form an air flow to suck the end of the weft 80. The height position of the weft 80 is kept approximately at the height positions of the weft holding portions 58, 60, because the end portion of the weft 80 is sucked by the stretch nozzle 78.

[0045] The above-mentioned weft holding device 10 acts as follows.

[0046] Firstly, with the drive source 44 not driven, weft insertion is started. When the drive source 44 is not driven, the movable pin 46, by the spring force of the built-in coil spring of the drive source 44, presses down the movable shaft 56 and the movable-side holding member 34 against the spring force of the holding springs 64, 66, whereby the weft holding portions 58, 60 are spaced apart so as to receive the weft 80.

[0047] Then, with the stretch nozzle 78 driven, the reed 12 is advanced from the most backward position as shown in the upper part of Fig. 4 toward the most forward position as shown in the lower part of Fig. 4. By this, the inserted weft 80 is advanced together with the reed 12 to be introduced between the weft holding portions 58 and 60, while the front end portion on the non-insert side is sucked into a stretch nozzle 78.

[0048] At this time, since the guide port 54 and the vertical distance of the position of each non-cloth-fell side of the weft holding portions 58, 60 become larger toward the non-cloth-fell side positions, the weft 80 is surely received by the guide port 54 and the weft holding portions 58, 60. However, the weft 80, abutting on the movable shaft 56, is prevented from advancing further.

[0049] Then, after the weft 80 is engaged with the movable shaft 56, the drive source 44 is driven. Since the movable pin 46 is raised by this, the movable shaft 56 and the weft holding member 34 are raised by the spring force of the holding springs 64, 66, and the weft 80 is held by the weft holding members 58, 60. At this time, since the weft 80 abuts on the movable shaft 56, the weft 80, positioned relative to both holding members 32, 34, is surely held by the holding members 32, 34.

[0050] The timing to start driving the drive source 44 is set beforehand together with the timing of weft insertion, the timing to start warp shed motion, the timing to start the reed beating motion and the like, on the basis of the rotation angle of the main shaft of the loom.

[0051] In the weft holding device 10, since the motion of the holding member 34 at the time of holding the weft 80 is a linear motion, the weft 80 can be surely received into the weft holding portions 58, 60, even if the range of moving of the holding member 34 is small in comparison with a device in which a holding member is angularly rotated to hold the weft. As a result, a difference in time from when a command to hold is outputted until the weft 80 is actually held becomes smaller, thereby improving the responsiveness.

[0052] Since the weft holding portions 58, 60 are located at the height position of the weft swinging locus of the weft running path connecting the most forward position and the most backward position of the reed 12, as viewed from the weft running direction, the weft 80 is more surely received in the weft holding portions to be held more surely.

[0053] Then, the reed 12 is further advanced, and the weft 80 is beaten against the cloth fell. Due to such a further advance of the reed 12, further tension is applied to the weft 80. At this time, since the weft 80 is surely held by the holding members 32, 34, the weft 80 is prevented from coming off, accompanying the advance of the reed 12, from the holding members 32, 34.

[0054] Also, as the energizing force by the holding springs 64, 66 is adjusted, a constant tension is applied to the holding member 34.

[0055] Also, the weft 80 abuts the weft anti-tangling member 50 while abutting the movable shaft 56 to be prevented from advancing further, so that the weft 80 is prevented from tangling with the vicinity of the weft holding portions 58, 60.

[0056] Furthermore, since the weft holding portions 58, 60 are located within the swinging range of the reed 12 and the holding members 32, 34 are linearly moved, the weft stretched immediately after the weft insertion can be instantaneously held, and the tension of the weft 80 can be maintained. As a result, after the weft 80 is held by the holding members 32, 34, the reed 12 is further advanced, so that the portion of the non-weft-insert side of the weft 80 is extended and beaten. Thereby, the tensions at both ends of the weft 80 become equal, thereby preventing generation of a defect in cloth.

[0057] Thereafter, the drive source 44 is stopped, the holding of the weft 80 by the holding members 32, 34 is released, the reed 12 begins to withdraw, and the next weft insertion is started. At this time, by the swinging motion of the reed, the weft 80 is removed from the holding members 32, 34, and before the next weft arrives, the pressure fluid is jetted from the nozzle 74 of the blow nozzle 72 to the weft holding portions 58, 60.

[0058] The pressure fluid from the nozzle 74 is jetted substantially horizontally from the cloth fell side to the non-cloth-fell side relative to the weft holding portions 58, 60, and passes the weft holding portions 58, 60. Thereby, the weft holding portions 58, 60, the weft 80 and dust tangling in both weft anti-tangling members 50 are removed from the weft holding device 10.

[0059] Also, since diffusion of jetting of the pressure fluid from the nozzle 74 is restricted by the plate-like weft anti-tangling members 50 arranged to face each other on both sides of the nozzle 74, even if the pressure of

the pressure fluid from the blow nozzle 72 is low, the pressure fluid acts on the weft 80 strongly enough to blow off the weft 80, so that a fluid compressor of the blow nozzle 72 can be made small.

[0060] According to the weft holding device 10, the drive unit 30 includes: the drive source 44 for linearly move the holding members 32 and 34 relatively in one of the direction to approach each other and the direction to part from each other; holding springs 64 and 66 for linearly moving the holding members 32 and 34 relatively in the other of the direction to approach each other and the direction to part from each other; the spring force adjusting member 68 for adjusting the energizing force of the holding springs 64 and 66, and the adjusting screw 70, so that, by adjusting the force of the holding springs 64, 66, the energizing force to hold the weft can be adjusted to a proper value, thereby preventing the weft 80 from being applied an excessive tension.

[0061] Also, it is possible to provide the drive source 44, for example, out of the swinging range of the reed and also in front of and behind the weft holding device 10, to move the movable pin 46 horizontally, to move horizontally the movable shaft 56 abutted by the movable pin 46 and to connect the movable shaft 56 with the holding member 34 through a mechanism for converting the horizontal motion of the movable shaft 56 into an angular rotation of the holding member 34.

[0062] Referring to Figs. 5 and 6, a weft holding device 90 differs from the weft holding device 10 shown in Fig. 1 in that the former uses a stick-like weft anti-tangling member 92. The weft anti-tangling member 92 is disposed in front of and behind the weft holding portions 58, 60 in the running direction of the weft 80 so as to extend upward and downward.

[0063] The weft holding device 90 disposes the weft holding portions 58, 60 and the weft anti-tangling member 92 between the reed 12 and the stretch nozzle 78. The weft holding device 90 is attached to the loom through a bracket not shown, like the weft holding device 10 shown in Fig. 1.

[0064] In the embodiments shown in Figs. 5 and 6, one end portions of the holding springs 64, 66 are attached to a bracket 94, but the spring force may be made adjustable like the holding springs 64, 66 of the weft holding device 10.

[0065] In the embodiment shown in Fig. 6, as shown by a dashed line, the weft anti-tangling member 92 may be disposed near the non-weft-introducing side of the holding members 32, 34. It also prevents the weft 80 from tangling with the holding members 32, 34.

[0066] Also, it is possible to provide a holding spring not in the holding member which is driving in the foregoing embodiment but in the other holding member.

[0067] The timing to drive the drive source 44 and the jet timing of the blow nozzle 72 can be freely controlled by a command from an operation panel and the like not shown.

[0068] The present invention is not limited to the foregoing embodiments but can be variously modified without departing from its spirit.

Claims

1. A weft holding device (10) in a fluid jet loom, to be attached to a member different from a reed sley of the fluid jet loom, comprising:

   a pair of holding members (32, 34) each having a weft holding portion (58, 60) for receiving the weft which moves together with a reed (12) and holding the weft (80), said weft holding portion (58, 60) being positioned between the most forward position and the most backward position of said reed (12), said weft holding portion (58, 60) having a length in the warp moving direction shorter than the length of the swinging locus of said reed (12), and said pair of holding members (32, 34) being moved by a drive unit (30) selectively and relatively in their contacting and parting directions; and
   an engaging member for engaging the weft (80) received in said weft holding portion (58, 60) and positioning relative to both holding members (32, 34).

2. The weft holding device (10) according to claim 1, wherein the length of said weft holding portion (58, 60) in the warp moving direction is smaller than the length of the swinging locus of the reed (12).

3. The weft holding device (10) according to claim 1 or 2, wherein said weft holding portion (58, 60) is located at the height position of the weft swinging locus connecting the weft (80) running path of said reed (12) in said most forward position and said most backward position in view of the running direction of said weft (80).

4. The weft holding device (10) according to any one of claims 1 through 3, wherein said drive unit (30) includes a drive source for moving said pair of holding members (32, 34) relatively in either one of the direction to approach each other and the direction to part from each other, and a spring for relatively moving said pair of holding members (32, 34) in the other of the direction to approach each other and the direction to part from each other.

5. The weft holding device (10) according to any one of claims 1 through 4, further comprising a blow nozzle for jetting a pressure fluid toward the weft (80) held by said pair of holding members (32, 34).

6. The weft holding device (10) according to any one of claims 1 through 5, further comprising a weft anti-

tangling member disposed in the vicinity of said weft holding portion (58, 60) in the running direction of said weft (80).

7. The weft holding device (10) according to any one of claims 1 through 5, further comprising a weft anti-tangling member disposed in the vicinity of the non-weft-introducing side of said weft holding portion (58, 60).

FIG. 1

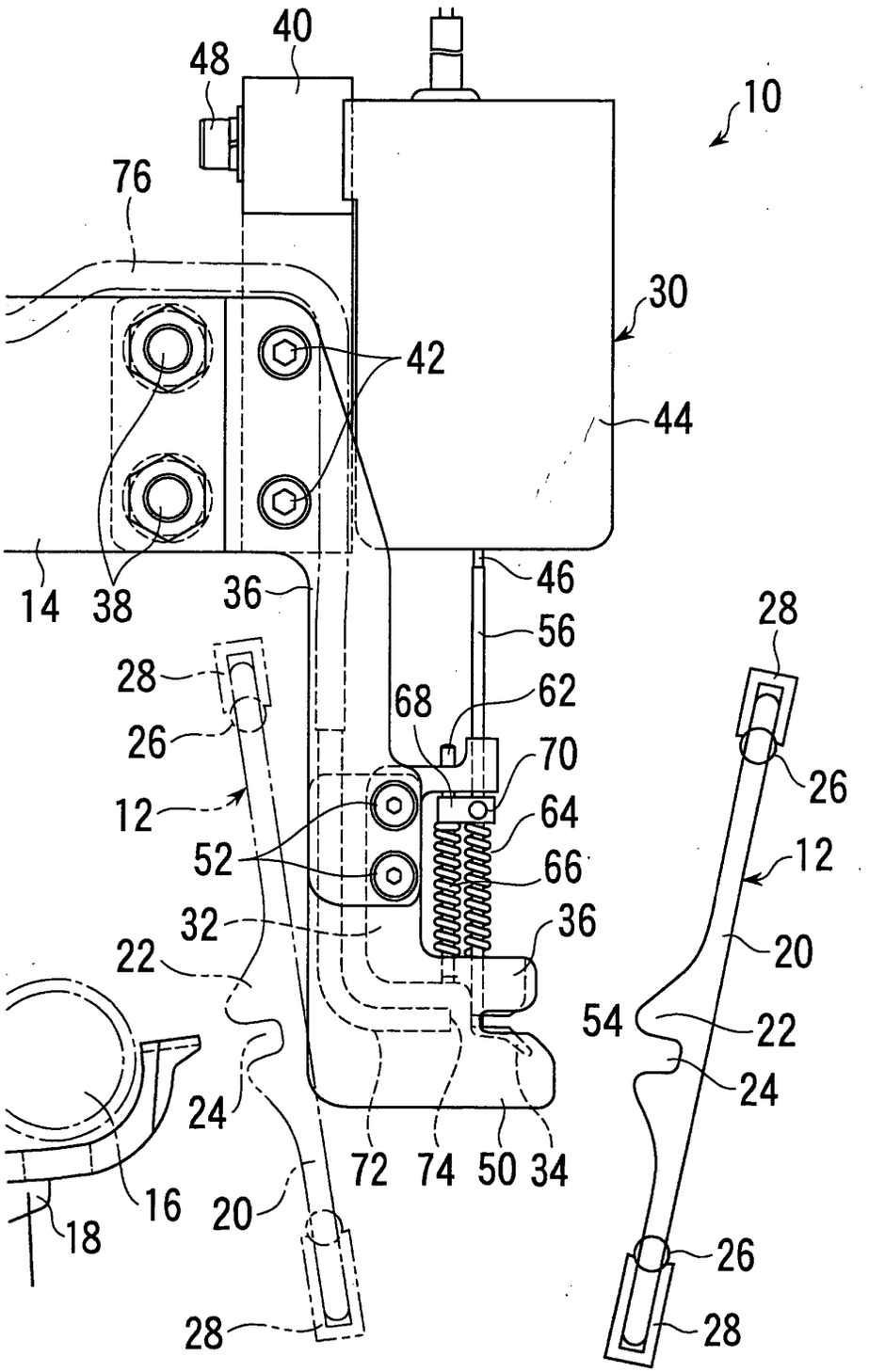

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FIG. 2

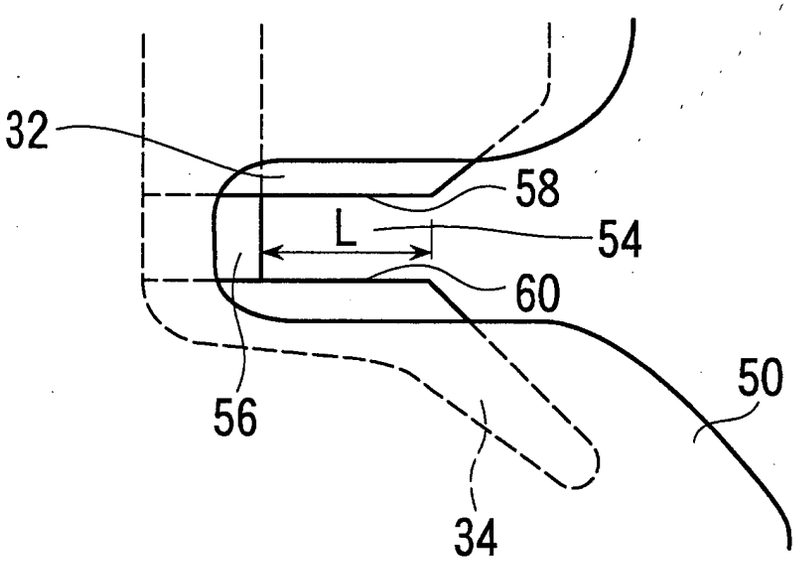
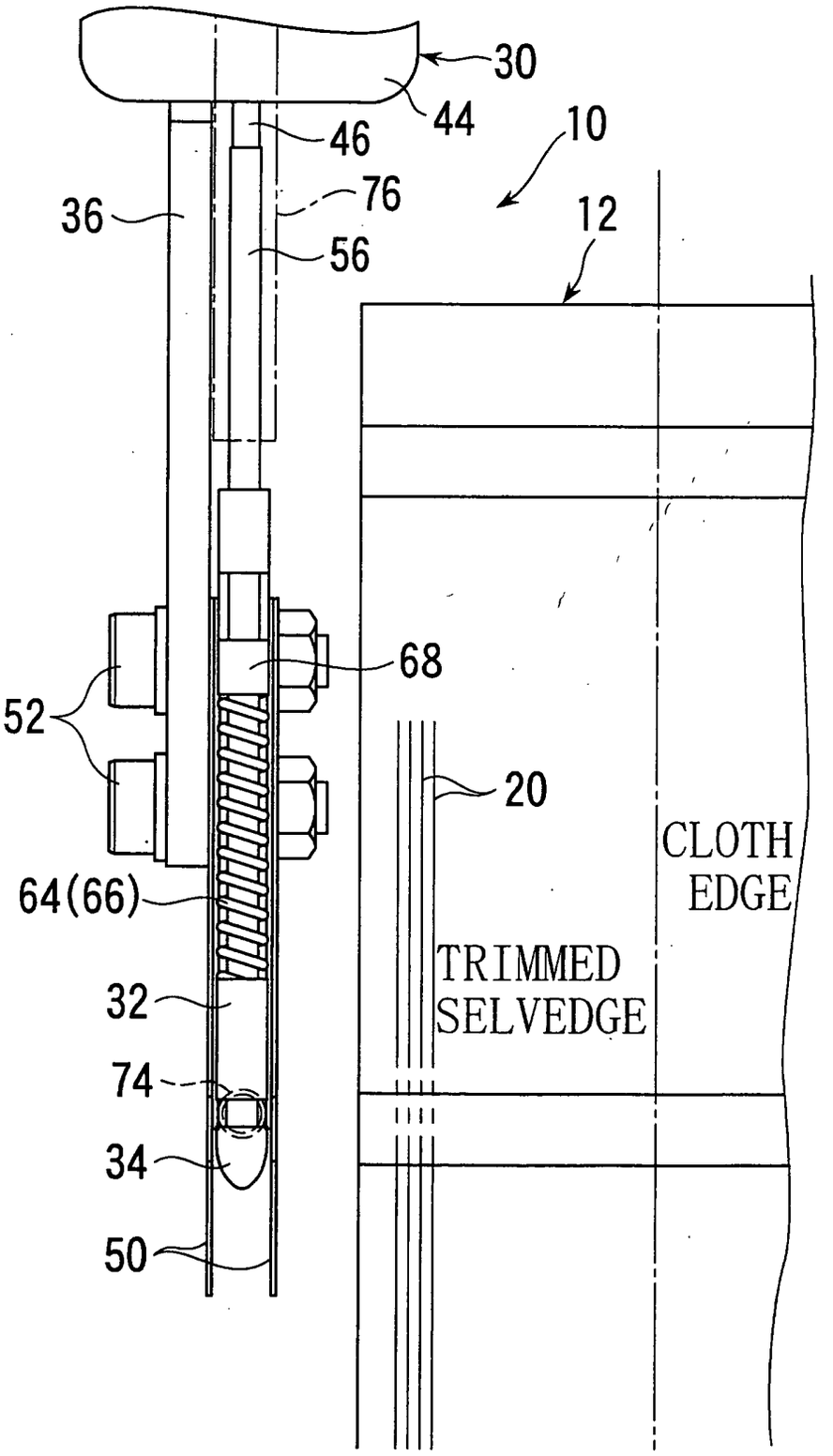


FIG. 3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74
34
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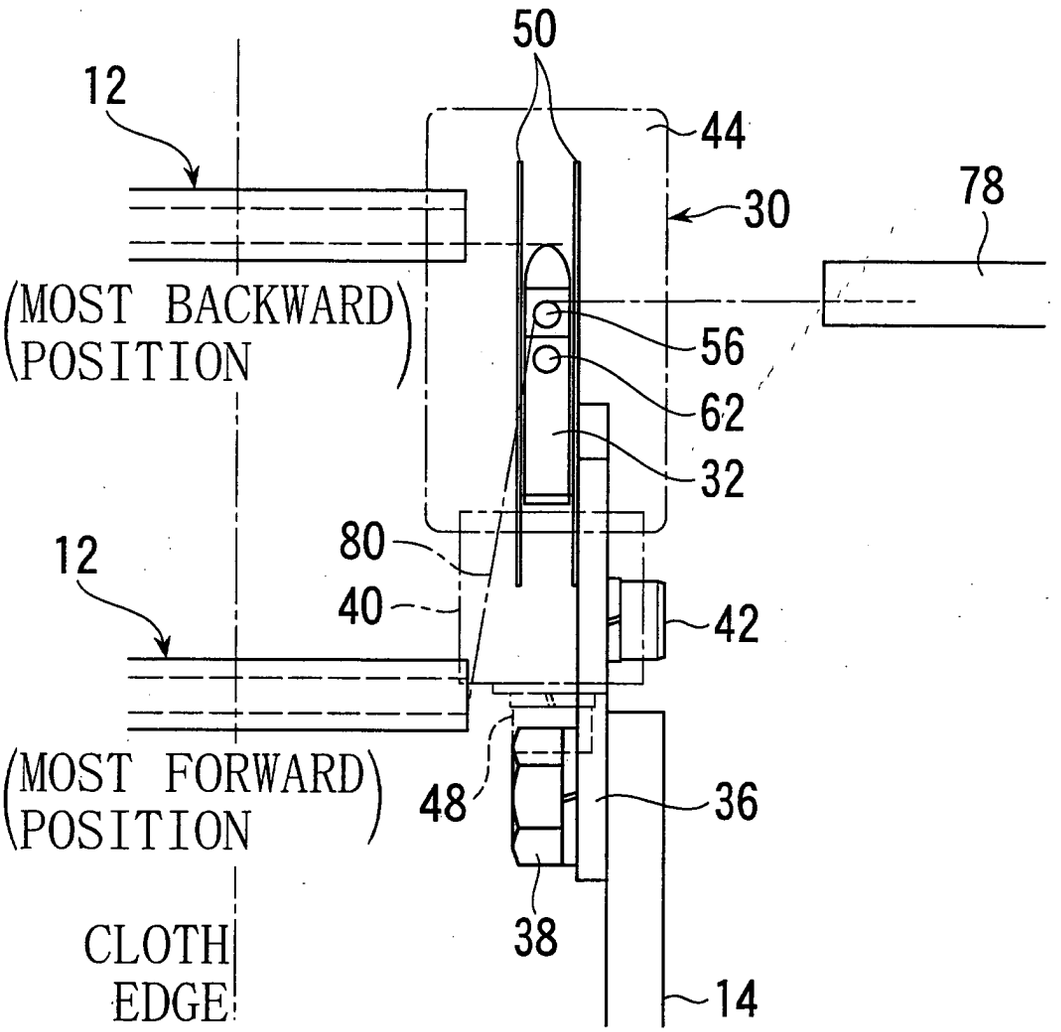
FIG. 4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30
78
(MOST BACKWARD POSITION)
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62
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12
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42
(MOST FORWARD POSITION)
48
36
38
CLOTH EDGE
14

FIG. 5

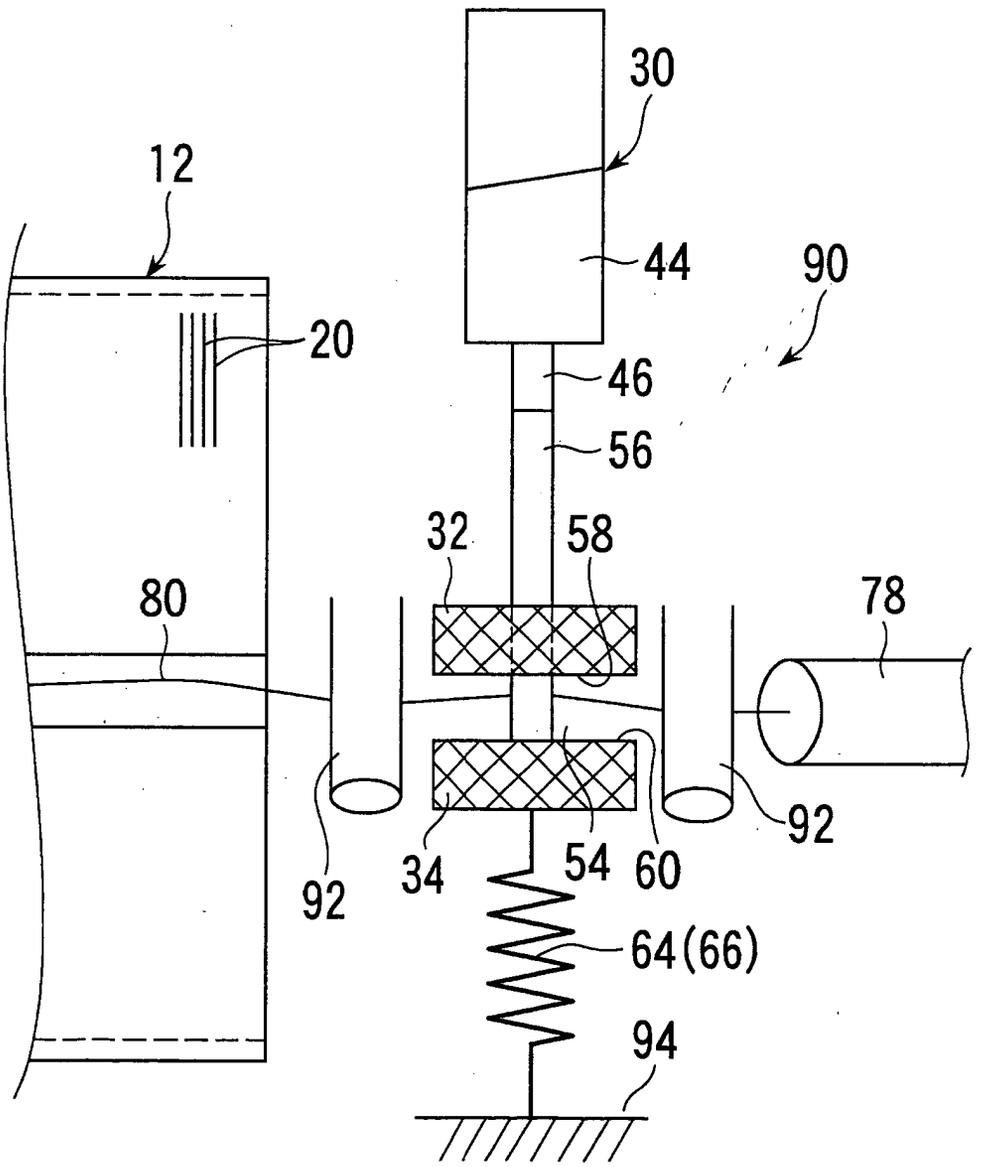
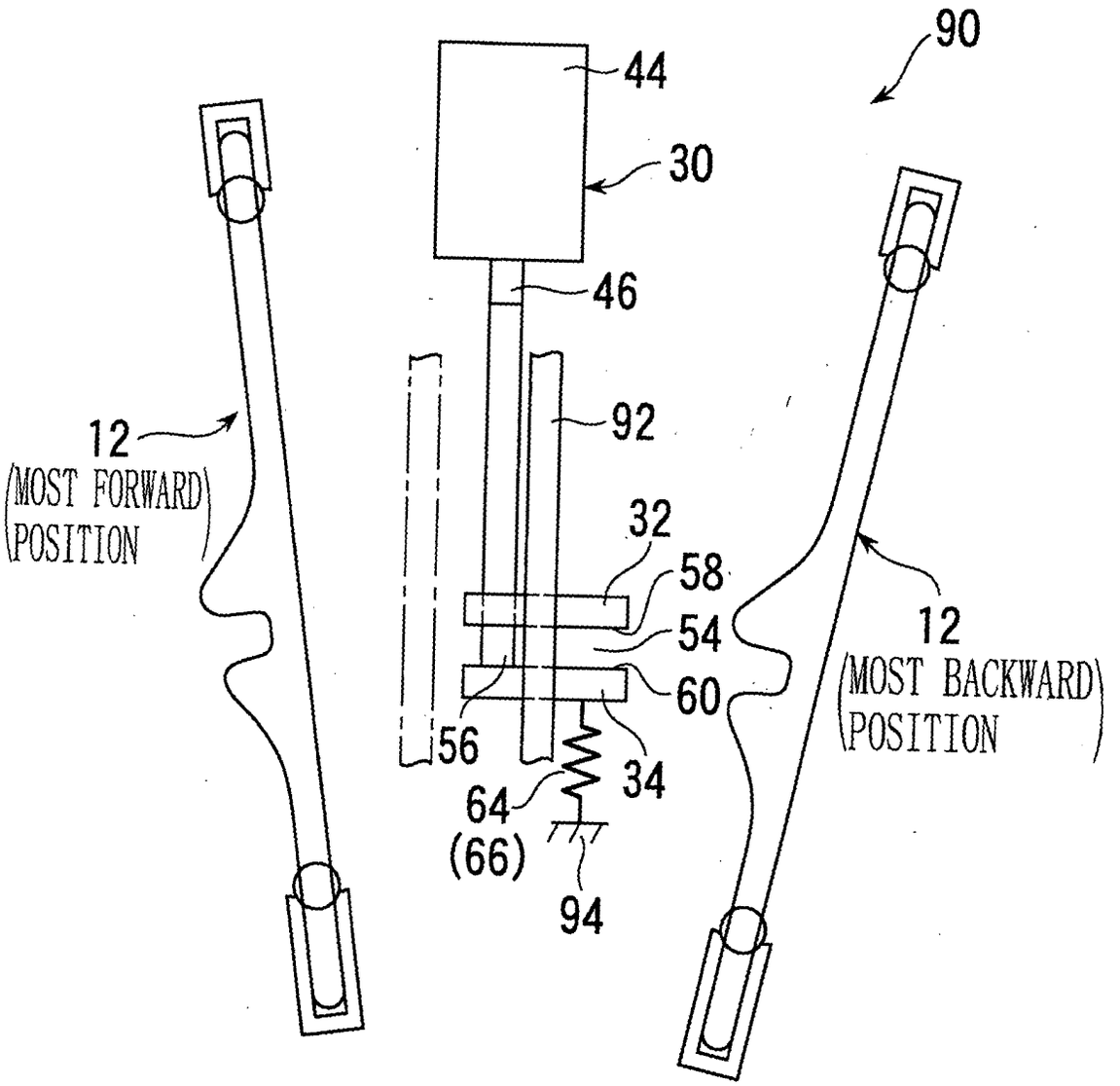


FIG. 6


90
44
30
46
92
12
(MOST FORWARD)
POSITION
32
58
54
60
12
(MOST BACKWARD)
POSITION
56
34
64
(66)
94

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EUROPEAN SEARCH REPORT

Application Number
EP 03 02 2690

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D03D
D02J

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	28 January 2004	Louter, P

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