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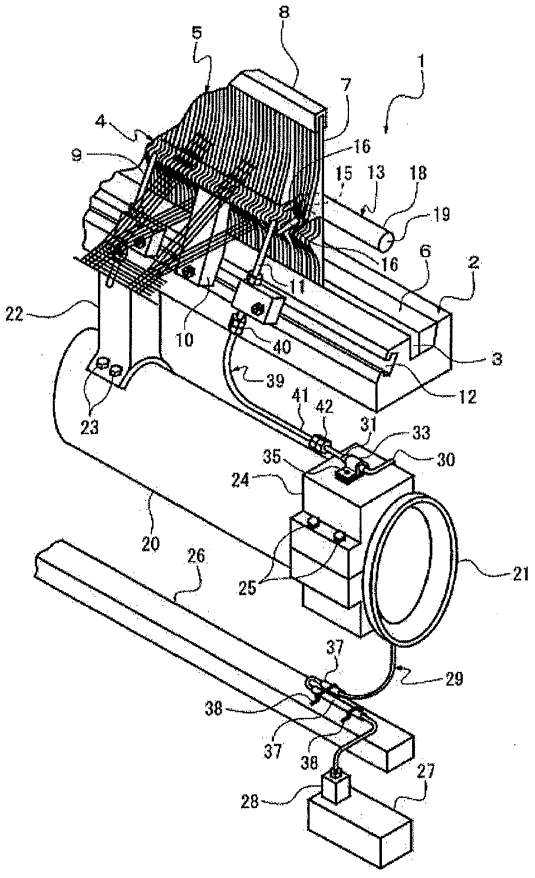
(54) **Weft yarn tension applying apparatus in air jet loom**

(57) A weft yarn tension applying apparatus (1) in an air jet loom includes a stretch nozzle (11), a valve (28) and an air supply tube. The stretch nozzle (11) is mounted movable in a weft insertion direction at a position on a downstream side of the sub-nozzle (9) of the slay (2) so as to be directed perpendicular to the weft yarn guide passage. The valve (28) is connected to an air tank (27) and provided in a part of the frame. The air supply tube connects the stretch nozzle (11) with the valve (28). The air supply tube includes a first air supply tube (29) connected to the valve (28) and a second air supply tube (39) connected to the stretch nozzle (11). An end of the first air supply tube (29) is fixed to the rocking shaft (20), an end of the second air supply tube (39) is connected to the end of the first air supply tube (29) through a connector (42).

FIG. 1



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Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a weft yarn tension applying apparatus in an air jet loom that applies tension to an inserted weft yarn.

[0002] Japanese Patent Application Publication No. 2000-170057 discloses a weft yarn tension applying apparatus in an air jet loom. The weft yarn tension applying apparatus includes a stretch nozzle that is fastened to the front surface of the slay of the air jet loom in such a manner that the stretch nozzle is adjustably positioned along weft insertion direction. The injection port of the stretch nozzle is directed perpendicular to the passage for weft insertion so that air is injected by the stretch nozzle across the passage. A weft yarn capturing tube is provided behind the reed of the air jet loom. The weft yarn capturing tube is supported to the upper frame of the reed through a hooking member.

[0003] The weft yarn capturing tube includes an inlet opened in the direction across the arrangement of the dents, an air blowing tube part arranged parallel to the arrangement of the dents and opened in the downstream direction of weft insertion and a bent part between the inlet and the air blowing tube part. An insertion projection is fixed to the inlet of the weft yarn capturing tube. The weft yarn capturing tube is movable to make the insertion projection to be inserted into a space between any two adjacent dents thereby to expand the space, so that the inlet of the weft yarn capturing tube faces the expanded space. The weft yarn capturing tube may be mounted to the reed at any position along the weft insertion direction. The stretch nozzle is connected to output port of an electromagnetic three-way valve through an air supply tube. Input port of the electromagnetic three-way valve is connected to a compressed air source through another air supply tube.

[0004] As disclosed in the above Publication, when the weaving width of the loom is changed, the mounting position of the stretch nozzle is changed through adjustment according to the changed weaving width of the loom. The air supply tube connecting between the stretch nozzle and the electromagnetic three-way valve is formed of a single tube. In the adjustment of the stretch nozzle, only the mounting position of the stretch nozzle is adjusted.

[0005] The air supply tube is formed appropriately to a length that is great enough for the connection between the electromagnetic three-way valve and the stretch nozzle adjusted to the position for the minimum weaving width of the loom. If the stretch nozzle is adjusted to the maximum weaving-width position, a large slack occurs in the air supply tube. If the air jet loom is operated with such large slack in the air supply tube, the air supply tube is swung largely due to the rocking motion of the slay and the connecting parts between the stretch nozzle and the electromagnetic three-way valve is subjected to repeated bending.

[0006] As a result, the air supply tube tends to be damaged by direct contact with the rocking shaft that drives the slay and the repeated bending of the connecting parts. In order to protect the air supply tube from such damage, after changing the position of the stretch nozzle through adjustment, a work person needs to by binding the air supply tube appropriately so as to prevent direct contact of the air supply tube with the rocking shaft by eliminating the slack in the tube.

[0007] The present invention is directed to providing a weft yarn tension applying apparatus that facilitates its setting subsequent to the position changing of the stretch nozzle due to a change in the weaving width.

SUMMARY OF THE INVENTION

[0008] In accordance with the present invention, a weft yarn tension applying apparatus in an air jet loom including a frame, a rocking shaft supported by the frame, a slay being swingable by a reciprocating motion of the rocking shaft, a reed mounted to the slay and forming a weft yarn guide passage and a sub-nozzle for weft insertion mounted to the slay includes a stretch nozzle, a valve and an air supply tube. The stretch nozzle is mounted movable in a weft insertion direction at a position on a downstream side of the sub-nozzle of the slay so as to be directed perpendicular to the weft yarn guide passage. The valve is connected to an air tank and provided in a part of the frame. The air supply tube connects the stretch nozzle with the valve. The air supply tube includes a first air supply tube connected to the valve and a second air supply tube connected to the stretch nozzle. An end of the first air supply tube is fixed to the rocking shaft, an end of the second air supply tube is connected to the end of the first air supply tube through a connector.

[0009] Other aspects and advantages of the invention will become apparent from the following description, taken in conjunction with the accompanying drawings, illustrating by way of example the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The invention together with objects and advantages thereof, may best be understood by reference to the following description of the presently preferred embodiments together with the accompanying drawings in which:

Fig. 1 is a perspective view showing a weft yarn tension applying apparatus in an air jet loom according to a preferred embodiment of the present invention;

Fig. 2 is a fragmentary enlarged front view showing a positional relation between a stretch nozzle and a weft yarn capturing tube of the weft yarn tension applying apparatus of Fig. 1;

Fig. 3 is a fragmentary enlarged rear view showing

an end of a rocking shaft of the weft yarn tension applying apparatus of Fig. 1;

Fig. 4 is a front view showing the weft yarn tension applying apparatus of Fig. 1 when the weaving width of the loom is the minimum; and

Fig. 5 is a front view showing the weft yarn tension applying apparatus of Fig. 1 when the weaving width of the loom is the maximum.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0011] The following will describe a weft yarn tension applying apparatus according to a preferred embodiment of the present invention with reference to Figs. 1 through 5. Referring to Fig. 1 showing a part of an air jet loom in which the weft yarn tension applying apparatus is used, the weft yarn tension applying apparatus is designated generally by numeral 1. Specifically, Fig. 1 shows a part of the air jet loom adjacent to arrival end of the shed of the air jet loam. In the drawing, numeral 2 designates a slay having formed therein a mounting groove extending in the weaving width direction and numeral 5 designates a reed having formed therein a weft yarn guide passage 4 of the air jet loom, respectively. The reed 5 is mounted at the bottom thereof in the mounting groove 3 of the slay 2 fixed by an elongate wedge 6. The reed 5 is formed of a plurality of dents 7 arranged in an array and the top ends of the dents 7 are supported by the upper frame 8.

[0012] The slay 2 has formed therein on the front side thereof a mounting groove 12 having a T-shape in cross-section and extending in the weaving width direction and a sub-nozzle 9, a weft yarn detector 10 and a stretch nozzle 11 that forms a part of the weft yarn tension applying apparatus 1 are movably mounted in the mounting groove 12 of the slay 2 at predetermined positions. A weft yarn capturing tube 13 that forms a part of the weft yarn tension applying apparatus 1 is mounted to the slay 2 on the back side of the reed 5.

[0013] As shown in Figs. 1 and 2, the weft yarn capturing tube 13 is formed of a tube bent into an L-shape. The weft yarn capturing tube 13 of the L-shape includes a short part 14 having at the end thereof an inlet 15 and a pair of projections 16 and a long part 18 having at the end thereof an outlet 19. The short part 14 of the weft yarn capturing tube 13 is provided extending substantially perpendicular to the reed 5. The projections 16 of the weft yarn capturing tube 13 are provided on the top and the bottom of the inlet 15. The projections 16 are insertable into a space between any two adjacent dents 7 so as to expand the space, thereby allowing the inlet 15 of the weft yarn capturing tube 13 to enter into the weft yarn guide passage 4 of the reed 5. The stretch nozzle 11 has at the end thereof an injection hole 17 that is provided so as to face the inlet 15. In other words, the stretch nozzle 11 is mounted movable in a weft insertion direction at a position on a downstream side of the sub-nozzle 9 of the slay 2 so as to be directed perpendicular to the weft yarn guide passage 4.

[0014] The long part 18 of the weft yarn capturing tube 13 is disposed parallel to the reed 5 and the outlet 19 of the weft yarn capturing tube 13 at the rear end of the long part 18 is opened in weft flying direction. In such arrangement of the stretch nozzle 11 and the weft yarn capturing tube 13, compressed air injected from the injection hole 17 of the stretch nozzle 11 flows across the weft yarn guide passage 4 and enters into the inlet 15. The air is then flowed through the short part 14 and the long part 18 of the weft yarn capturing tube 13 and flowed out through the outlet 19.

[0015] A rocking shaft 20 is provided below the slay 2 and between left and right frames 43 (only right frame being shown in Figs. 4 and 5) of the air jet loom and rotatably supported by the frames 43. The rocking shaft 20 is connected to a drive shaft (not shown) through a coupling 21 to be reciprocated by the drive shaft. A plurality of arms 22 (only one arm being shown in the drawing) is fixedly mounted at the bottom end thereof to the rocking shaft 20 by bolts 23. The slay 2 is supported by and fixed to the arms 22 at the upper end thereof by bolts (not shown). Thus, the slay 2 is swingable by the reciprocating motion of the rocking shaft 20. A mounting block 24 is fixed to the end of the rocking shaft 20 by bolts 25.

[0016] A stay 26 is fixedly disposed below the rocking shaft 20 and between the left and the right frames 43 of the air jet loom. An air tank 27 for the stretch nozzle 11 is provided at a position adjacent to the right frame 43 of the air jet loom and connected to a valve 28 that is controllably opened and closed. According to the preferred embodiment, the valve 28 is directly mounted to the air tank 27. Alternatively, the valve 28 may be separated from the air tank 27 and directly mounted to the right or left frame 43 or to a bracket (not shown) which is fixed to the right or the left frames 43 and connected to the air tank 27 through a tube (not shown).

[0017] The first air supply tube 29 is connected to the valve 28. The first air supply tube 29 has an end 30 that is held by a clamp 33 through a protection tube 31 on the upper surface of the mounting block 24. The clamp 33 is fixed by the bolts 25 to the mounting block 24 that is movable integrally with the rocking shaft 20 by a screw 35. In other words, the end 30 of the first air supply tube 29 is fixed to the rocking shaft 20. A part of the first air supply tube 29 that is positioned below the end 30 thereof is fixed to the rear surface of the mounting block 24 by a clamp 34 and a screw 36 through a protection tube 32 thereby to be prevented from swinging freely. A part of the first air supply tube 29 that is adjacent to the valve 28 is fixed to the stay 26 by clamps 38 through protection tubes 37 and has a predetermined slack that permits free reciprocal swinging with the rocking shaft 20. The protection tubes 31, 32 and 37 serve as a protection member to protect the first air supply tube 29 against damage due to direct contact with the clamps 33, 34 and 38.

[0018] The second air supply tube 39 is connected at one end thereof to the stretch nozzle 11 through a connector 40. The other end 41 of the second air supply tube 39 is connected to the first air supply tube 29 through a connector 42. The second air supply tube 39 is formed with a length that corresponds to the sum of a length between the connecting point of the stretch nozzle 11 provided on the slay 2 and the connecting point of the first air supply tube 29 and a length for a predetermined slack that allows free reciprocal swinging with the slay 2. The weft yarn tension applying apparatus 1 of the preferred embodiment includes the air tank 27 configured to supply compressed air to the stretch nozzle 11, the valve 28, the first air supply tube 29, the second air supply tube 39 and the connectors 40 and 42. The first air supply tube 29 and the second air supply tube 39 cooperate to serve as an air supply tube configured to supply compressed air from the air tank 27 to the stretch nozzle 11. Each of the first and the second air supply tubes 29, 39 is a flexible tube. Thus, the first and the second air supply tubes 29, 39 have a flexibility and a predetermined slack that permits free reciprocal swinging with the rocking shaft 20 and free reciprocal swinging with the slay 2 and, therefore, the first and the second air supply tubes 29, 39 are protected against damage.

[0019] The following will describe the operation of the weft yarn tension applying apparatus 1. During the operation of the air jet loom, a weft yarn (not shown) is inserted into a warp shed by a weft insertion nozzle (not shown) and assisted in flying through the shed by a sub-nozzle 9. When the inserted weft yarn reaches a position on the opposite side from the weft insertion nozzle, the valve 28 is opened and compressed air in the air tank 27 is supplied through the first and the second air supply tubes 29 and 39 to the stretch nozzle 11 and air is injected from the injection hole 17 of the stretch nozzle 11 in the direction perpendicular to the weft yarn guide passage 4.

[0020] Part of the weft yarn in the weft yarn guide passage 4 is blown into the weft yarn capturing tube 13 through the inlet 15 thereof by air jet and guided through the short part 14 and the long part 18 of the weft yarn capturing tube 13. The weft yarn is thus kept in a state where the weft yarn is bent at a substantial right angle at a point from the weft yarn guide passage 4 to the short part 14 and also at a point from the short part 14 to the long part 18 in the weft yarn capturing tube 13. Because the end of the inserted weft yarn is held by the dent 7, the stretch nozzle 11 and the weft yarn capturing tube 13 during the beating of the reed 5, the weft yarn is woven into the fabric while being tensioned.

[0021] Referring to Fig. 4 showing the weft yarn tension applying apparatus 1 when the weaving width of the loom is the minimum, a second air supply tube 39A with an appropriate length for the stretch nozzle 11 positioned for the minimum weaving width is selected and the selected second air supply tube 39A is connected at one end thereof to the bottom of the stretch nozzle 11 and at the other end thereof to the end 30 of the first air supply tube 29 through the connectors 40 and 42, respectively. The second air supply tube 39A has a predetermined slack that allows free reciprocal swinging with the slay 2 in such a way that the second air supply tube 39A is not largely swung and, therefore, the second air supply tube 39A is protected against damage due to direct contact with any part. Initial setting of the first air supply tube 29 as installed during the assembling of the air jet loom need not be changed. The second air supply tube 39A may only be connected to the first air supply tube 29 through the connector 42 at a position above the end of the rocking shaft 20 and, therefore, the installation of the weft yarn tension applying apparatus 1 may be performed easily.

[0022] Referring to Fig. 5 showing the weft yarn tension applying apparatus when the weaving width of the loom is the maximum, the stretch nozzle 11 is set at a position closer to the frame 43 than in the case of Fig. 4 and the distance between the bottom end of the stretch nozzle 11 and the end 30 of the first air supply tube 29 is shorter, accordingly. The second air supply tube 39B has a length that is shorter than the second air supply tube 39A (refer to Fig. 4) that is used for the minimum weaving width of the loom.

[0023] As in the case of Fig. 4, initial setting of the first air supply tube 29 as installed during the assembling of the air jet loom need not be changed. The installation of the weft yarn tension applying apparatus 1 may be completed by connecting the second air supply tube 39B to the bottom end of the stretch nozzle 11 through the connector 40 and connecting the end 41 of the second air supply tube 39B to the end 30 of the first air supply tube 29 through the connecter 42 after the stretch nozzle 11 has been mounted to the slay 2 at the desired position. Therefore, the relocation of the weft yarn tension applying apparatus 1 according to a change of the weaving width of the loom is easily accomplished.

[0024] Since the length of the second air supply tube 39B for the maximum weaving width of the loom is shorter than the length of the second air supply tube 39A for the minimum weaving width of the loom, the pressure loss of compressed air supplied to the second air supply tube 39B is smaller than in the case of the second air supply tube 39A, so that difference occurs in the pressure waveforms of the air injected from the stretch nozzle 11 connected to the second air supply tubes 39A and 39B. To solve the problem due to such pressure waveform difference between the second air supply tubes 39A and 39B, the opening and closing timing of the valve 28 may be adjusted and changed according to the lengths of the second air supply tubes 39A and 39B so as to lessen the pressure waveform difference between the second air supply tubes 39A and 39B. Since the lengths of the second air supply tubes 39A and 39B for the minimum and the maximum weaving widths of the loom are different from each other, the pressure waveforms of the second air supply tubes 39A and 39B are different from each other and responsiveness of the second air supply tubes

39A and 39B when performing injection of compressed air is constantly maintained in best conditions.

[0025] According to the preferred embodiment of the present invention, the adjustment of the weft yarn tension applying apparatus 1 to be made when the width of the loom is changed is performed only by selecting a second air supply tube 39 having an appropriate length, connecting the selected second air supply tube 39 at one end thereof to the stretch nozzle 11 through the connector 40 and then connecting the first air supply tube 29 with the second air supply tube 39 through the connector 42 after the stretch nozzle 11 has been mounted to the slay 2 at the desired position. Work person may perform the connecting between the first air supply tube 29 and the second air supply tube 39 while viewing from above the rocking shaft 20 to which the end 30 of the first air supply tube 29 is fixed, so that the connection may be made extremely easy. The length of the second air supply tube 39 for used may be shortened with an increase of the weaving width of the loom. Thus, the pressure loss of the compressed air is decreased, which contributes to reduction in energy consumption. The second air supply tube 39 with an appropriate length for the stretch nozzle 11 which is positioned for the selected weaving width and moved in a weft insertion direction may be easily mounted. Thus, a special work such as adjustment of unnecessary slack occurring in the second air supply tube 39 is not required, thereby facilitating setting of the stretch nozzle 11. The first air supply tube 29 fixed to the rocking shaft 20 may be shared. The second air supply tube 39 for the maximum weaving width of the loom which is connected to the stretch nozzle 11 and has an appropriate length without an unnecessary slack may be used. Therefore, the pressure loss of the compressed air is minimized, which contributes to reduction in consumption of compressed air.

[0026] The present invention is not limited to the preferred embodiment described above, but it may be practiced in various alternative embodiments, as exemplified below.

(1) The first air supply tube 29 and the second air supply tube 39 may be formed of the combining a flexible tube and a rigid tube.

(2) The weft yarn tension applying apparatus 1 does not necessarily need the weft yarn capturing tube such as 13. In this case, the weft yarn is held by being pressed against the dents 7 by compressed air injected from the stretch nozzle 11 or, alternatively, held and tensioned by being blown through a space between the expanded dents 7.

(3) The protection tubes 31,32 and 37 may be replaced by any protection member, such as a planar cover member.

[0027] A weft yarn tension applying apparatus in an air jet loom includes a stretch nozzle, a valve and an air supply tube. The stretch nozzle is mounted movable in a weft insertion direction at a position on a downstream side of the sub-nozzle of the slay so as to be directed perpendicular to the weft yarn guide passage. The valve is connected to an air tank and provided in a part of the frame. The air supply tube connects the stretch nozzle with the valve. The air supply tube includes a first air supply tube connected to the valve and a second air supply tube connected to the stretch nozzle. An end of the first air supply tube is fixed to the rocking shaft, an end of the second air supply tube is connected to the end of the first air supply tube through a connector.

Claims

1. A weft yarn tension applying apparatus (1) in an air jet loom including a frame (43), a rocking shaft (20) supported by the frame (43), a slay (2) being swingable by a reciprocating motion of the rocking shaft (20), a reed (5) mounted to the slay (2) and forming a weft yarn guide passage (4) and a sub-nozzle (9) for weft insertion mounted to the slay (2), the weft yarn tension applying apparatus (1) comprising:

   a stretch nozzle (11) mounted movable in a weft insertion direction at a position on a downstream side of the sub-nozzle (9) of the slay (2) so as to be directed perpendicular to the weft yarn guide passage (4);
   a valve (28) connected to an air tank (27), the valve (28) provided in a part of the frame (43); and
   an air supply tube connecting the stretch nozzle (11) with the valve (28),
   characterized in that the air supply tube includes a first air supply tube (29) connected to the valve (28) and a second air supply tube (39) connected to the stretch nozzle (11), an end (30) of the first air supply tube (29) is fixed to the rocking shaft (20), an end (41) of the second air supply tube (39) is connected to the end (30) of the first air supply tube (29) through a connector (42).

2. The weft yarn tension applying apparatus (1) according to claim 1, **characterized in that** each of the first air supply tube (29) and the second air supply tube (39) is a flexible tube.

3. The weft yarn tension applying apparatus (1) according to claim 1 or 2, **characterized in that** the end (30) of the first air supply tube (29) is fixed to the rocking shaft (20) by a clamp (34) through a protection member (32).

4. The weft yarn tension applying apparatus (1) accord-

ing to any one of claims 1 through 3, **characterized in that** opening and closing timing of the valve (28) is changed according to length of the second air supply tube (39) when the mounting position of the stretch nozzle (11) is changed.

FIG. 1

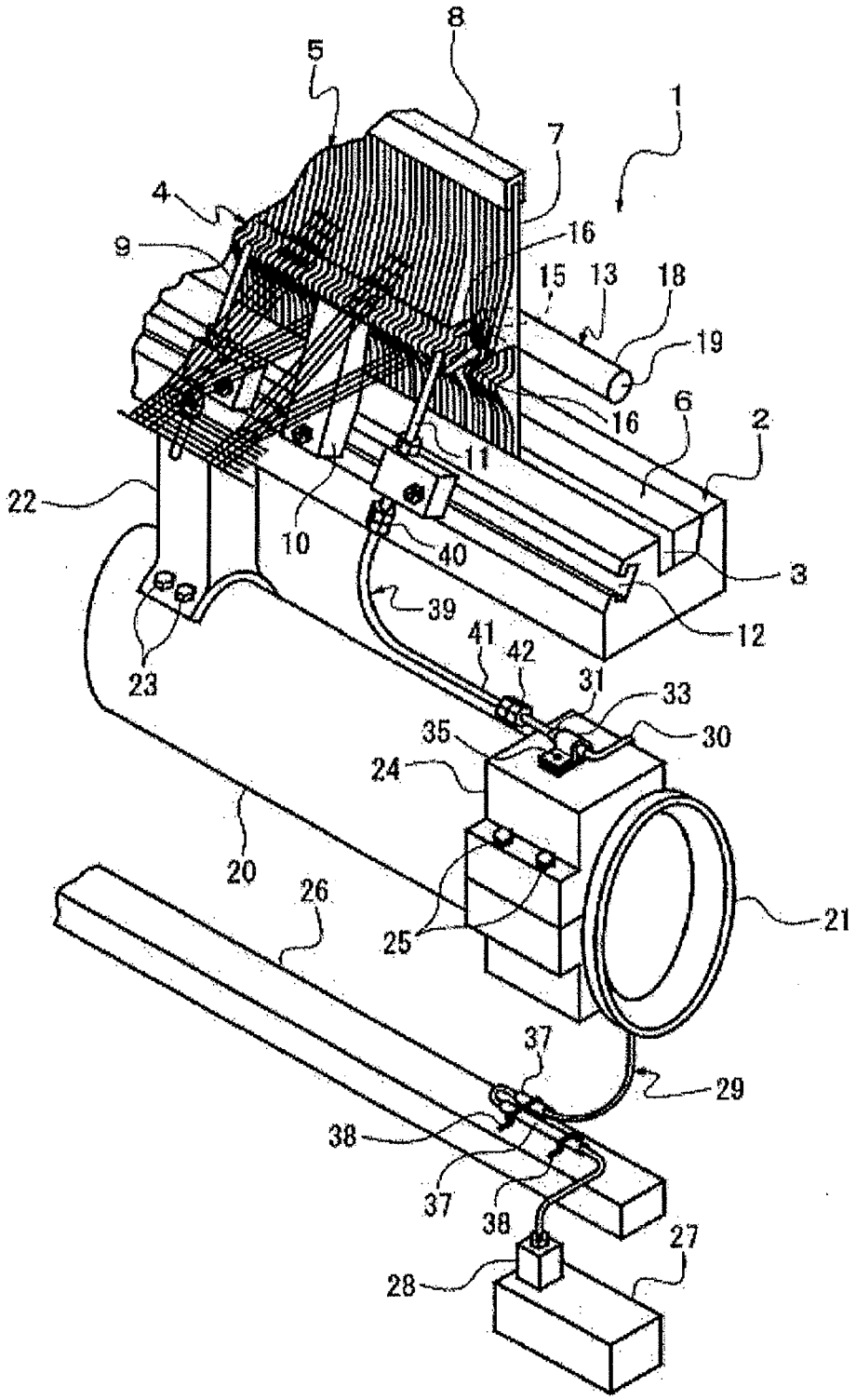
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FIG. 2

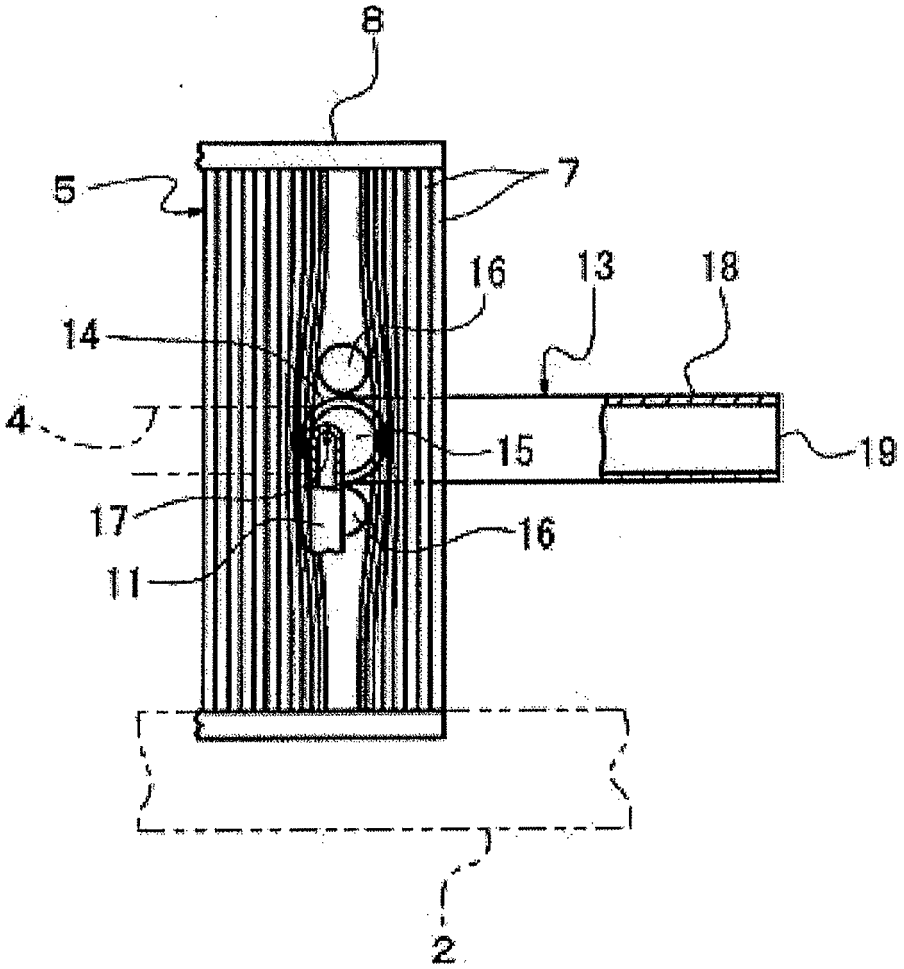

FIG. 3

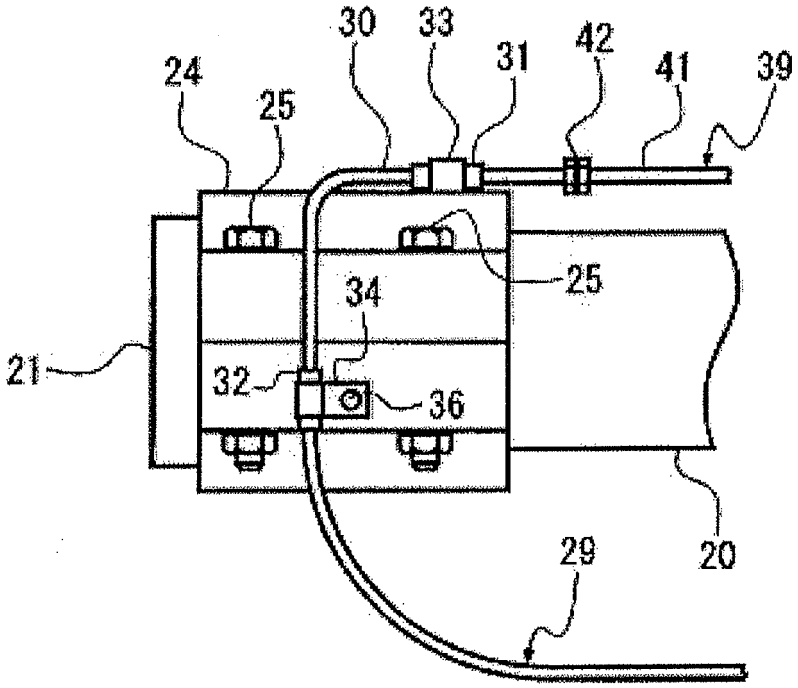

FIG. 4

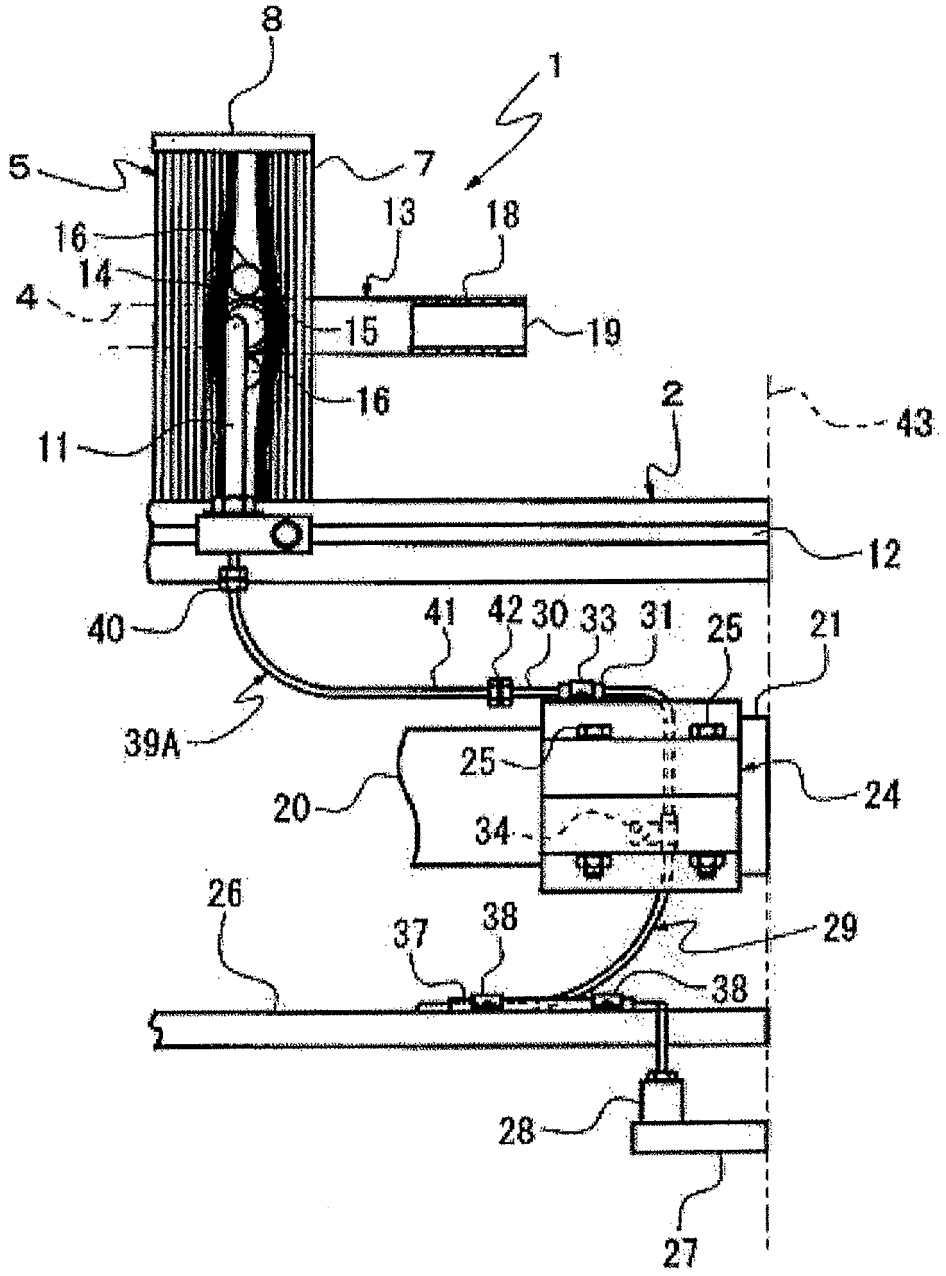
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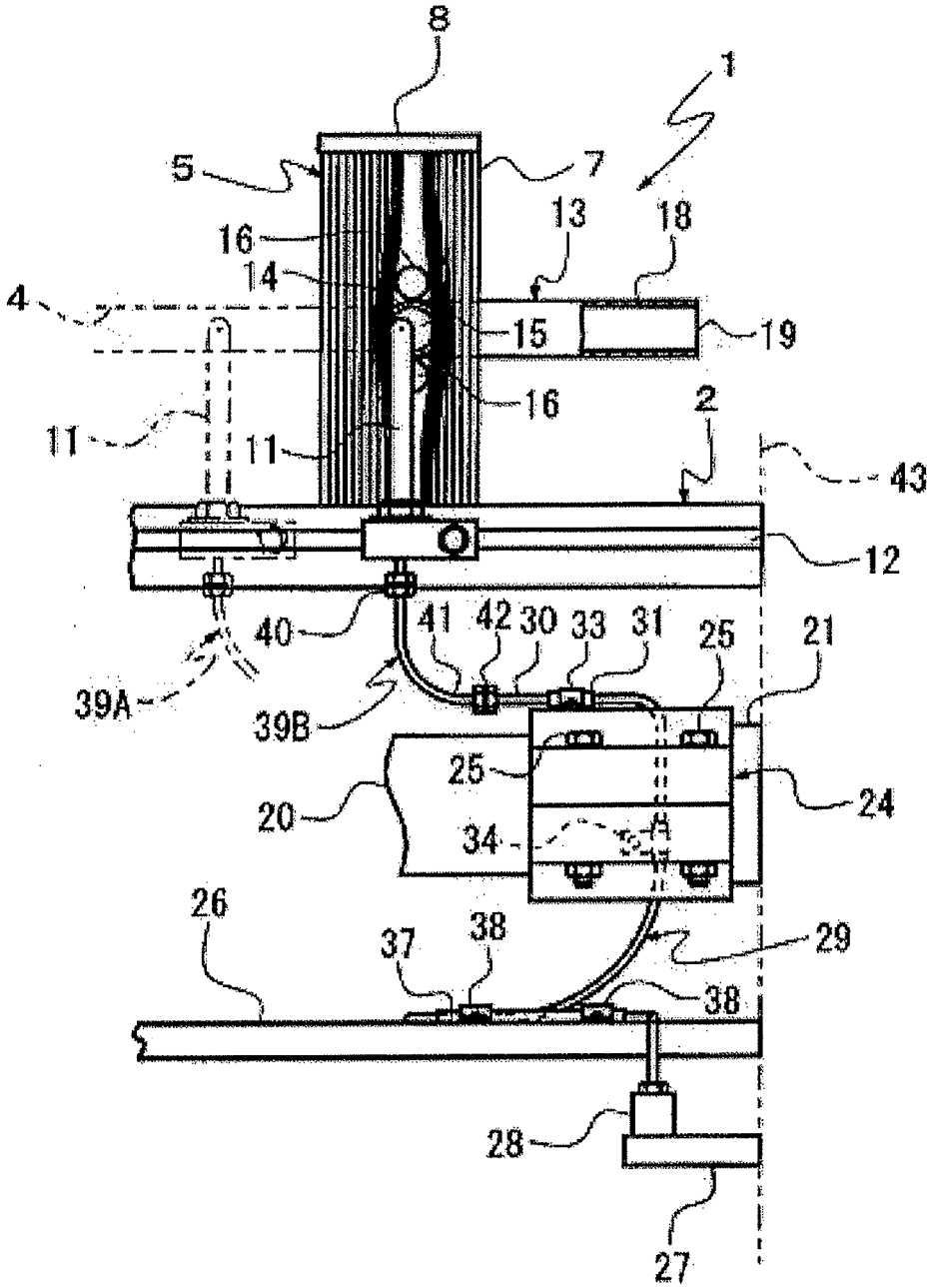
FIG. 5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EUROPEAN SEARCH REPORT

Application Number
EP 14 16 9563

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A	EP 0 619 391 A1 (PICANOL NV [BE]) 12 October 1994 (1994-10-12) * column 1, line 38 - column 4, line 15 * * figures 1, 2 * -----	1-4	
			TECHNICAL FIELDS SEARCHED (IPC) D03D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	23 September 2014	Hausding, Jan

CATEGORY OF CITED DOCUMENTS

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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23-09-2014

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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