



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
22.07.2009 Bulletin 2009/30

(51) Int Cl.:
D03D 49/70 (2006.01) D03J 1/08 (2006.01)

(21) Application number: **09000360.9**

(22) Date of filing: **13.01.2009**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK TR
Designated Extension States:
AL BA RS

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(30) Priority: **18.01.2008 JP 2008009233**

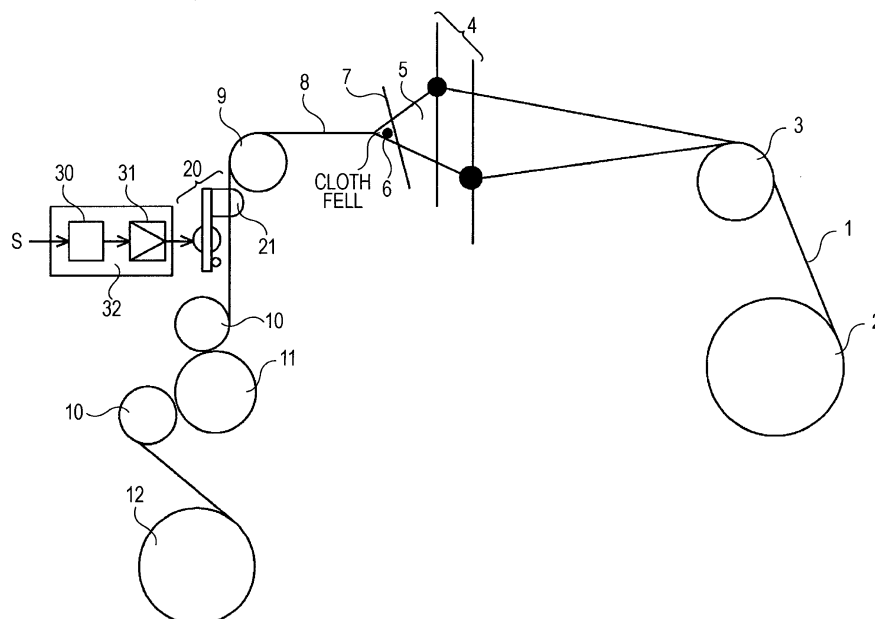
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(54) **Retraction device and retraction method of electric heat cutter for loom**

(57) A retraction device of an electric heat cutter (21) for a loom is provided. The loom includes the at least one electric heat cutter (21). The electric heat cutter (21) is arranged at a predetermined cutting position and cuts a woven cloth (8) or a weft (6) woven into the woven cloth (8). The retraction device includes position changing means (20) including a displacement member (22) and an actuator (23), the displacement member (22) provided

so as to be advanced to or retracted from the cutting position and changing relative positions of the electric heat cutter (21) and the woven cloth (8), the actuator (23) serving as driving means for driving the displacement member (22); and a control device (32) configured to control driving of the displacement member (22) using the actuator (23) in response to a stop operation of the loom so that the electric heat cutter (21) is separated from the woven cloth (8) when the loom is stopped.

FIG. 1



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a retraction device and a retraction method of an electric heat cutter for looms, in particular, a loom such as a water jet loom which performs weaving using chemical fiber as at least a weft and which includes an electric heat cutter device for cutting a woven cloth or a weft woven into the woven cloth during weaving.

2. Description of the Related Art

[0002] In some cases, during weaving, an electric heat cutter may be used in order to separate a selvage portion from a texture portion of a woven cloth, or to divide a woven cloth into two pieces. The electric heat cutter is fixed to a loom at a position between a selvage portion and a texture portion of a woven cloth produced by weaving, or when a loom is for a double-width loom, the electric heat cutter is fixed to the loom at an intermediate position of a woven cloth so as to intersect with the woven cloth. The electric heat cutter is fed by electricity during weaving, becomes red hot, and contacts a woven cloth, thereby cutting the woven cloth with heat.

[0003] Also, the electric heat cutter may be occasionally fixed to a loom so as to intersect with a weft woven into a woven cloth at a position between a weaving end and a catch-code thread in order to cut an end of an inserted weft. The electric heat cutter is fed by electricity during weaving, becomes red hot, and cuts with heat a weft woven into a woven cloth at a position near the woven cloth.

[0004] Feeding of the electric heat cutter is generally stopped when the loom is stopped. The electric heat cutter, however, has remaining heat even after the feeding is stopped. A certain position of a woven cloth is continuously heated with the remaining heat of the electric heat cutter after the loom is stopped. Hence, the position is excessively heated, and the appearance of the woven cloth is degraded. A defect may partly appear in the product of a woven cloth, and this may deteriorate the quality of the woven cloth. In the worst case, for example, a part of the woven cloth may be burned.

[0005] To address these problems, Japanese Unexamined Patent Application Publication No. 50-157659 discloses a device in which a water outlet tube is provided to directly face a woven cloth near an electric heat cutter, water is discharged from the water outlet tube at start-up of a loom or during an operation of the loom, thereby preventing the temperature of the woven cloth from increasing due to heat applied from the electric heat cutter. Water is also discharged from the water outlet tube when the loom is stopped, thereby preventing the temperature of the woven cloth from increasing due to remaining heat

of the electric heat cutter which is no longer fed by electricity.

[0006] With the configuration disclosed in the above publication, since the cooling with the discharged water relies upon thermal change, the cooling timing delays for the immediate mechanical stop of the loom. Continuous contact between the woven cloth and the electric heat cutter usually results in the woven cloth being affected by the remaining heat of the electric heat cutter. In addition, immediate cooling may deteriorate the electric heat cutter. Further, piping for the water outlet tube and a device for controlling the water discharge have to be additionally provided, resulting in the device increasing in size.

SUMMARY OF THE INVENTION

[0007] In light of such situations, in the above-described loom, an object of the present invention is to prevent a woven cloth from being excessively burned with remaining heat of an electric heat cutter when the loom is stopped.

[0008] According to an aspect of the present invention, a retraction device of an electric heat cutter for a loom is provided. The loom includes the at least one electric heat cutter. The electric heat cutter is arranged at a predetermined cutting position and cuts a woven cloth or a weft woven into the woven cloth. The retraction device includes position changing means including a displacement member and an actuator, the displacement member provided so as to be advanced to or retracted from the cutting position and changing relative positions of the electric heat cutter and the woven cloth, the actuator serving as driving means for driving the displacement member; and a control device configured to control driving of the displacement member using the actuator in response to a stop operation of the loom so that the electric heat cutter is separated from the woven cloth when the loom is stopped.

[0009] The "predetermined cutting position" in this aspect intends, in a width direction of a woven cloth, a position at which a woven cloth or a weft woven into the woven cloth is cut, such as a position between a selvage portion and a texture portion of a woven cloth; an intermediate position of a woven cloth for a double-width loom; and a position between a weaving end and a catch-code thread. In a direction intersecting with the woven cloth surface, the "predetermined position" in this aspect intends a position at which the electric heat cutter can cut a woven cloth or a weft woven into the woven cloth in an intersection manner.

[0010] Also, the electric heat cutter may be supported by the displacement member, and the control device may control an operation of the actuator to drive the displacement member such that the electric heat cutter is displaced between two positions of the cutting position and a retracted position retracted from the cutting position in a direction intersecting with a woven cloth surface.

[0011] The above-mentioned "retracted position" intends a position at which the electric heat cutter is separated from the woven cloth in the direction intersecting with the woven cloth surface.

[0012] In addition, the above-mentioned "displacement member" intends a member which is mounted to the actuator and is displaced. For example, the displacement member may be a lever provided separately from a rotary shaft or a rod of the actuator and mounted to the rotary shaft or the rod. When the actuator is linear drive type such as an air cylinder, a rod of the air cylinder may function as the displacement member.

[0013] Further, the position changing means may include a spring member coupled to the displacement member and applying an urging force to the displacement member in a direction in which the electric heat cutter is moved toward the woven cloth. The control device may control the operation of the actuator such that the displacement member is driven against the urging force in response to the stop operation of the loom.

[0014] According to another aspect of the present invention, a retraction method of an electric heat cutter for a loom is provided. The loom includes the at least one electric heat cutter, the electric heat cutter arranged at a predetermined cutting position and cutting a woven cloth or a weft woven into the woven cloth. The retraction method includes the steps of displacing at least one of the electric heat cutter and the woven cloth with respect to the cutting position in response to a stop operation of the loom such that the electric heat cutter is separated from the woven cloth when the loom is stopped; maintaining the separated state while the loom is stopped; and recovering either or both of the electric heat cutter and the woven cloth, which have been displaced with respect to the cutting position, to the cutting position in response to a re-starting operation of the loom.

[0015] With the retraction device and the retraction method of the electric heat cutter for the loom according to the aspects of the present invention, the at least one of the electric heat cutter and the woven cloth is displaced with respect to the cutting position in response to the stop operation of the loom such that the electric heat cutter is separated from the woven cloth when the loom is stopped, and the separated state is maintained while the loom is stopped. Accordingly, the woven cloth can be prevented from being excessively burned with remaining heat of the electric heat cutter. Therefore, the appearance of a woven cloth can be prevented from being degraded, the quality of a woven cloth can be prevented from being deteriorated as a result of a defect partly appearing in the product of a woven cloth, and a woven cloth or a weft can be prevented from being burned.

[0016] Also, since the electric heat cutter is supported by the displacement member, the device can be simple and lightweight as compared with the conventional technique disclosed in the above publication. The electric heat cutter can be separated from the woven cloth immediately in response to the stop operation of the loom

with small energy consumption.

[0017] Further, since the position changing means includes the spring member applying the urging force in the direction in which the electric heat cutter is moved toward the woven cloth. Accordingly, the actuator can be in a non-operation state when the relative positions of the electric heat cutter and the woven cloth are intersect with each other, thereby reducing the energy consumption of the actuator.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018]

Fig. 1 is a side view showing an embodiment of a fluid jet loom including a retraction device of an electric heat cutter for a loom;

Fig. 2 is a side view showing a first embodiment of position changing means of the retraction device of the electric heat cutter for the loom; and

Fig. 3 is a side view showing a second embodiment of position changing means of the retraction device of the electric heat cutter for the loom.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0019] Embodiments of the present invention are described below with reference to the attached drawings.

[0020] Figs. 1 to 3 illustrate an embodiment of the present invention. A loom including a retraction device of an electric heat cutter to which the illustrated present invention is applied is a water jet loom.

[0021] Fig. 1 illustrates the overall configuration of the loom along a path of warps. Warps 1 are wound around a let-off beam 2. The warps 1 travel along a tension roller 3 and become a substantially parallel state, form a shed 5 by healds 4, intersect with a weft 6 in front of a cloth fell, and produce a woven cloth 8 through a beating-up motion with a reed 7. Then, the woven cloth 8 changes its direction by a breast beam 9, is wound around the outer periphery of a take-up roller 11 with guide rollers 10, and is successively taken up by a cloth beam 12. The loom is driven by a motor (not shown). The motor is connected to a loom control device (not shown). The loom control device controls driving of the motor.

[0022] According to a first embodiment of the present invention with reference to Fig. 2, an electric heat cutter 21 and a retraction device of the electric heat cutter 21 for the loom are provided at positions in which the woven cloth 8 is vertically arranged between the breast beam 9 and the guide rollers 10. The electric heat cutter 21 cuts the woven cloth 8. The retraction device includes position changing means 20 for moving the electric heat cutter 21.

[0023] The position changing means 20 includes a support lever 33 rotatably connected to an actuator 23 and serving as a displacement member 22, a spring 24 serving as a spring member, a stopper 28, and a control device 32.

[0024] The actuator 23 is an actuator which is rotationally driven in the illustrated embodiment. The support lever 33 is mounted to a rotary shaft (output shaft) of the actuator 23. The actuator 23 drives the support lever 33 rotationally around the rotary shaft as its rotation center. The actuator 23 is mounted to a loom frame (not shown) via a stay 26. The rotary shaft of the actuator 23 is provided substantially parallel to a woven cloth surface of the woven cloth 8 and substantially perpendicularly to a moving direction of the woven cloth 8. Also, the actuator 23 is connected to the control device 32. The control device 32 controls driving of the actuator 23.

[0025] The support lever 33 serving as the displacement member 22 is mounted to the rotary shaft of the actuator 23 at an intermediate portion of the support lever 33. The electric heat cutter 21 is mounted to a tip end of the support lever 33. The electric heat cutter 21 is mounted so as to be directed toward the woven cloth 8 in a rotation direction, such that the electric heat cutter 21 intersects with the woven cloth 8 produced by weaving.

[0026] The spring 24 serving as the spring member is a compression spring. An end of the spring 24 is coupled to an end portion of the support lever 33 at a side opposite to a side provided with the electric heat cutter 21 with respect to the rotary shaft. Another end of the spring 24 is coupled to the loom frame (not shown). That is, the spring 24 is mounted so as to apply an urging force to the support lever 33 in a direction in which the electric heat cutter 21 is moved toward the woven cloth 8.

[0027] The stopper 28 is provided so as to contact an end portion of the support lever 33 opposite to the end portion to which the electric heat cutter 21 is mounted. The stopper 28 is supported by the loom frame (not shown) via a stay or the like so that displacement of the support lever 33 caused by the urging force of the spring 24 is regulated and the electric heat cutter 21 is retained at a cutting position.

[0028] The control device 32 includes a control unit 30 and a drive unit 31. The control device 32 is connected to the loom control device (not shown). The loom control device outputs a drive instruction signal S, which becomes high level in response to a stop operation of the loom, to the control unit 30 of the control device 32. When the drive instruction signal S at high level is input from the loom control device to the control unit 30, the control unit 30 controls the drive unit 31 to drive the actuator 23, so that the electric heat cutter 21 is displaced from the cutting position in a direction away from the woven cloth 8 against the urging force applied from the spring 24, via the support lever 33 mounted to the rotary shaft of the actuator 23.

[0029] It is to be noted that, in the illustrated embodiment, a retaining member 25 is provided at a position at which the retaining member 25 can contact the support lever 33 at a position nearer to the woven cloth surface than the stopper 28. The retaining member 25 holds the position of the support lever 33 such that the position of the electric heat cutter 21 is at a retracted position with

respect to the woven cloth 8. In the above-described embodiment, the electric heat cutter 21 cuts the woven cloth 8. However, depending of the type of a woven cloth 8, it is not necessary to cut a woven cloth 8. In such situation, the retaining member 25 is used.

[0030] The retaining member 25 is detachably attached to a stay 27 mounted to the loom frame (not shown). The retaining member 25 is provided at a position at which the retaining member 25 contacts an end surface of the support lever 33 facing the woven cloth surface so that the electric heat cutter 21 is separated from the woven cloth 8. The retaining member 25 is, for example, a setscrew. A screw hole is made in the stay 27 in a direction perpendicular to the paper plane of Fig. 2, and the retaining member 25 is screwed into the screw hole to protrude from the stay 27. Accordingly, the retaining member 25 holds the support lever 33 such that relative positions of the electric heat cutter 21 and the woven cloth 8 achieve the retracted position. Alternatively, the retaining member 25 may be a pin. In this case, a through hole may be made in the stay 27 in the direction perpendicular to the paper plane of Fig. 2, and the retaining member 25 may be fitted into the through hole to protrude from the stay 27.

[0031] During an operation of the loom, the loom control device (not shown) outputs the drive instruction signal S at low level (OFF) to the control device 32. The control unit 30 of the control device 32 controls the drive unit 31 in response to an input signal from the loom control device. The drive unit 31 controls the actuator 23 to a non-operation state. Accordingly, the support lever 33 is rotated toward the woven cloth 8 with the urging force of the spring 24, and is regulated at the cutting position by the stopper 28. Thus, the electric heat cutter 21 cuts the woven cloth 8 in a warp-extending direction as weaving progresses while the electric heat cutter 21 is red hot.

[0032] When the loom is stopped, the loom control device outputs the drive instruction signal S (loom stop signal), which becomes high level in response to the stop operation of the loom, to the control device 32. The control unit 30 of the control device 32 controls the drive unit 31 on the basis of the drive instruction signal S at high level input from the loom control device. The drive unit 31 drives the actuator 23. The rotary shaft of the actuator 23 is rotated by a predetermined amount against the urging force of the spring 24. At this time, the support lever 33 mounted to the rotary shaft of the actuator 23 is rotated, and hence the electric heat cutter 21, which is mounted to the tip end of the support lever 33 to face the woven cloth 8 in the rotation direction, is moved. Thus, the electric heat cutter 21 is separated from the woven cloth 8.

[0033] While the relative positions of the electric heat cutter 21 and the woven cloth 8 are separated, or while the electric heat cutter 21 is held at the retracted position, the woven cloth 8 is not excessively heated although the electric heat cutter 21 is maintained red hot. Alternatively, while the electric heat cutter 21 is held at the retracted

position, the heating of the electric heat cutter 21 may be stopped under the control of the loom control device. In the case where the heating of the electric heat cutter 21 is stopped, the heating of the electric heat cutter 21 may be resumed before the operation of the loom is resumed under the control of the loom control device.

[0034] When the operation of the loom is resumed, the loom control device changes the drive instruction signal S to low level (OFF). The control unit 30 of the control device 32 controls the drive unit 31 on the basis of the drive instruction signal S at low level (OFF) from the loom control device. The drive unit 31 controls the actuator 23 to a non-operation state. At this time, the support lever 33 mounted to the rotary shaft of the actuator 23 is rotated toward the woven cloth 8 with the urging force of the spring 24. The support lever 33 is regulated at the cutting position by the stopper 28.

[0035] At this time, the electric heat cutter 21, which is mounted to the tip end of the support lever 33 to face the woven cloth 8 in the rotation direction, is moved to the position at which the electric heat cutter 21 intersects with the woven cloth 8. Accordingly, the cutting of the woven cloth 8 with the electric heat cutter 21 is resumed.

[0036] While the electric heat cutter 21 is moved away from the woven cloth 8 to the retracted position, the woven cloth 8 may be moved by a displacement member 22 so as to be separated from the electric heat cutter 21.

[0037] In particular, according to a second embodiment of the present invention with reference to Fig. 3, the electric heat cutter 21 is not mounted to the tip end of the displacement member 22, but is fixed to the loom frame (not shown) via a stay or the like at a position at which the electric heat cutter 21 intersects with the woven cloth 8 produced by weaving.

[0038] A woven cloth displacement lever 34 serving as a displacement member 22 is mounted to the rotary shaft of the actuator 23 at an intermediate portion of the woven cloth displacement lever 34. A spring 24 is mounted to the woven cloth displacement lever 34 at a position opposite to the electric heat cutter 21 with respect to the rotation center of the woven cloth displacement lever 34 at a side opposite to a side facing the woven cloth surface. The spring 24 is a compression spring. An end of the spring 24 is coupled to the woven cloth displacement lever 34, and another end of the spring 24 is coupled to the loom frame (not shown). The spring 24 is mounted to the woven cloth displacement lever 34 so as to apply an urging force to the woven cloth displacement lever 34 such that a portion of the woven cloth displacement lever 34 at the side near the electric heat cutter 21 with respect to the rotation center of the woven cloth displacement lever 34 and facing the woven cloth surface is moved away from the woven cloth 8.

[0039] In addition, a stopper 28 is provided at a position at which the stopper 28 can contact a portion of the woven cloth displacement lever 34 at the side opposite to the electric heat cutter 21 with respect to the rotation center of the woven cloth displacement lever 34 and facing the

woven cloth. The stopper 28 is supported by the loom frame (not shown) via a stay or the like so as to regulate rotation of the woven cloth displacement lever 34 with the urging force of the spring 24.

[0040] During an operation of the loom, the loom control device (not shown) outputs a drive instruction signal S at low level (OFF) to the control device 32. The control unit 30 of the control device 32 controls the drive unit 31 in response to an input signal from the loom control device. The drive unit 31 controls the actuator 23 to a non-operation state. Accordingly, an end portion of the woven cloth displacement lever 34 near the electric heat cutter 21 is rotated in a direction away from the woven cloth 8 with the urging force of the spring 24, and is regulated at a position at which the woven cloth displacement lever 34 is separated from the woven cloth 8 by the stopper 28. Thus, the electric heat cutter 21 cuts the woven cloth 8 in a warp-extending direction as weaving progresses while the electric heat cutter 21 is red hot.

[0041] When the loom is stopped, the loom control device outputs the drive instruction signal S (loom stop signal), which becomes high level in response to the stop operation of the loom, to the control device 32. The control unit 30 of the control device 32 controls the drive unit 31 on the basis of the drive instruction signal S at high level input from the loom control device. The drive unit 31 drives the actuator 23. The rotary shaft of the actuator 23 is rotated by a predetermined amount against the urging force of the spring 24. At this time, the woven cloth displacement lever 34 mounted to the rotary shaft of the actuator 23 is rotated, and hence the woven cloth displacement lever 34 pushes the woven cloth surface of the woven cloth 8, thereby the electric heat cutter 21 being separated from the woven cloth 8.

[0042] When the operation of the loom is resumed, the loom control device changes the drive instruction signal S to low level (OFF). The control unit 30 of the control device 32 controls the drive unit 31 on the basis of the drive instruction signal S at low level (OFF) from the loom control device. The drive unit 31 controls the actuator 23 to a non-operation state. At this time, the woven cloth displacement lever 34 mounted to the rotary shaft of the actuator 23 is rotated away from the woven cloth 8 with the urging force of the spring 24. The woven cloth displacement lever 34 is regulated at a position at which the woven cloth displacement lever 34 is separated from the woven cloth 8.

[0043] At this time, since the electric heat cutter 21 mounted to the loom frame (not shown) via the stay (not shown) intersects with the woven cloth 8, the cutting of the woven cloth 8 by the electric heat cutter 21 is resumed.

[0044] The present invention is not limited to the above-described embodiments. In the embodiments, while either the electric heat cutter 21 or the woven cloth 8 is moved, both the electric heat cutter 21 and the woven cloth 8 may be moved.

[0045] Also, in the embodiments, the rotation of the

displacement member 22 uses the urging force of the spring 24 so that the relative positions of the electric heat cutter 21 and the woven cloth 8 are moved toward the positions for the operation of the loom. However, instead of using the spring 24, the displacement member 22 may be actively rotated toward the positions for the operation of the loom by operating an actuator.

[0046] Alternatively, the rotation of the displacement member 22 may use the urging force of the spring 24 so that the relative positions of the electric heat cutter 21 and the woven cloth 8 are changed to the positions for the stop operation of the loom, and the displacement member 22 may be rotated toward the position during the operation of the loom by operating an actuator.

[0047] Further, the position changing means 20 which changes the relative positions of the electric heat cutter 21 and the woven cloth surface of the woven cloth 8, and the electric heat cutter 21 may be provided at positions in which the woven cloth 8 is horizontally arranged between the cloth fell and the breast beam 9, or at positions in which the woven cloth 8 is obliquely arranged between the guide rollers 10 and the cloth beam 12. Also, in the embodiments, while the position changing means 20 which changes the relative positions of the electric heat cutter 21 and the woven cloth 8, and the electric heat cutter 21 are provided on the front surface of the woven cloth 8, these components may be provided at positions facing the back surface of the woven cloth 8.

[0048] Also, the actuator 23 may be linearly moved. The electric heat cutter 21 may be mounted to a tip end of a rod (displacement member 22) of an actuator, and the electric heat cutter 21 may be linearly moved.

[0049] Also, the retraction device of the present invention may be applied to an electric heat cutter not only for cutting a woven cloth at a position between a selvage portion and a texture portion, and at an intermediate position of a woven cloth for a double-width loom, but also for cutting a weft provided between a weaving end and a catch-code thread and woven into a woven cloth.

Claims

1. A retraction device of an electric heat cutter (21) for a loom, the loom including the at least one electric heat cutter (21), the electric heat cutter (21) arranged at a predetermined cutting position and cutting a woven cloth (8) or a weft (6) woven into the woven cloth (8), the retraction device comprising:

position changing means (20) including a displacement member (22) and an actuator (23), the displacement member (22) provided so as to be advanced to or retracted from the cutting position and changing relative positions of the electric heat cutter (21) and the woven cloth (8), the actuator (23) serving as driving means for driving the displacement member (22); and

a control device (32) configured to control driving of the displacement member (22) using the actuator (23) in response to a stop operation of the loom so that the electric heat cutter (21) is separated from the woven cloth (8) when the loom is stopped.

2. The retraction device of the electric heat cutter (21) for the loom according to claim 1, wherein the electric heat cutter (21) is supported by the displacement member (22), and wherein the control device (32) controls an operation of the actuator (23) to drive the displacement member (22) such that the electric heat cutter (21) is displaced between two positions of the cutting position and a retracted position retracted from the cutting position in a direction intersecting with a woven cloth surface.
3. The retraction device of the electric heat cutter (21) for the loom according to claim 1 or 2, wherein the position changing means (20) includes a spring member (24) coupled to the displacement member (22) and applying an urging force to the displacement member (22) in a direction in which the electric heat cutter (21) is moved toward the woven cloth (8), and wherein the control device (32) controls the operation of the actuator (23) such that the displacement member (22) is driven against the urging force in response to the stop operation of the loom.
4. A retraction method of an electric heat cutter (21) for a loom, the loom including the at least one electric heat cutter (21), the electric heat cutter (21) arranged at a predetermined cutting position and cutting a woven cloth (8) or a weft (6) woven into the woven cloth (8), the retraction method comprising the steps of:

displacing at least one of the electric heat cutter (21) and the woven cloth (8) with respect to the cutting position in response to a stop operation of the loom such that the electric heat cutter (21) is separated from the woven cloth (8) when the loom is stopped; maintaining the separated state while the loom is stopped; and recovering either or both of the electric heat cutter (21) and the woven cloth (8), which have been displaced with respect to the cutting position, to the cutting position in response to a re-starting operation of the loom.

FIG. 1

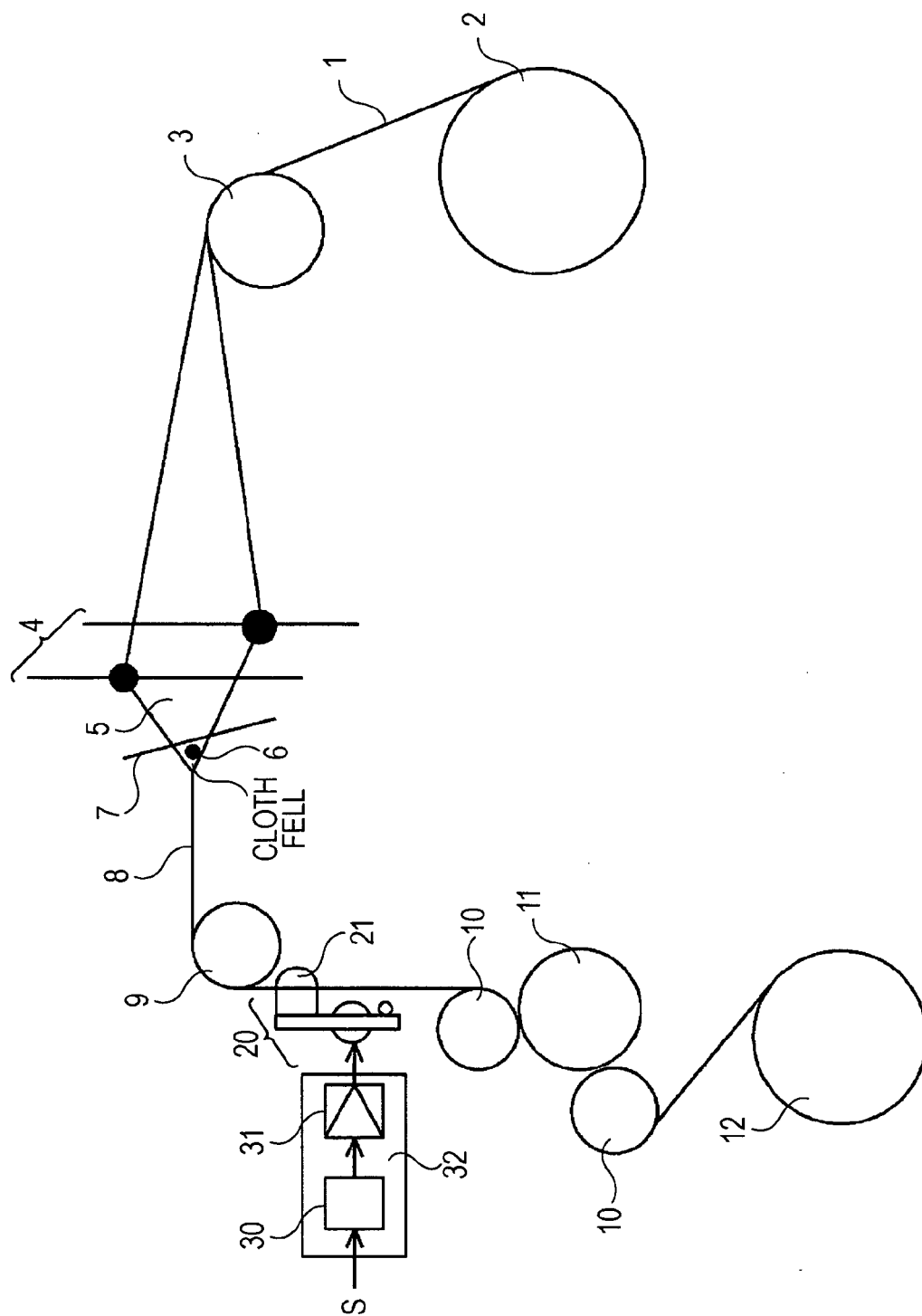


FIG. 2

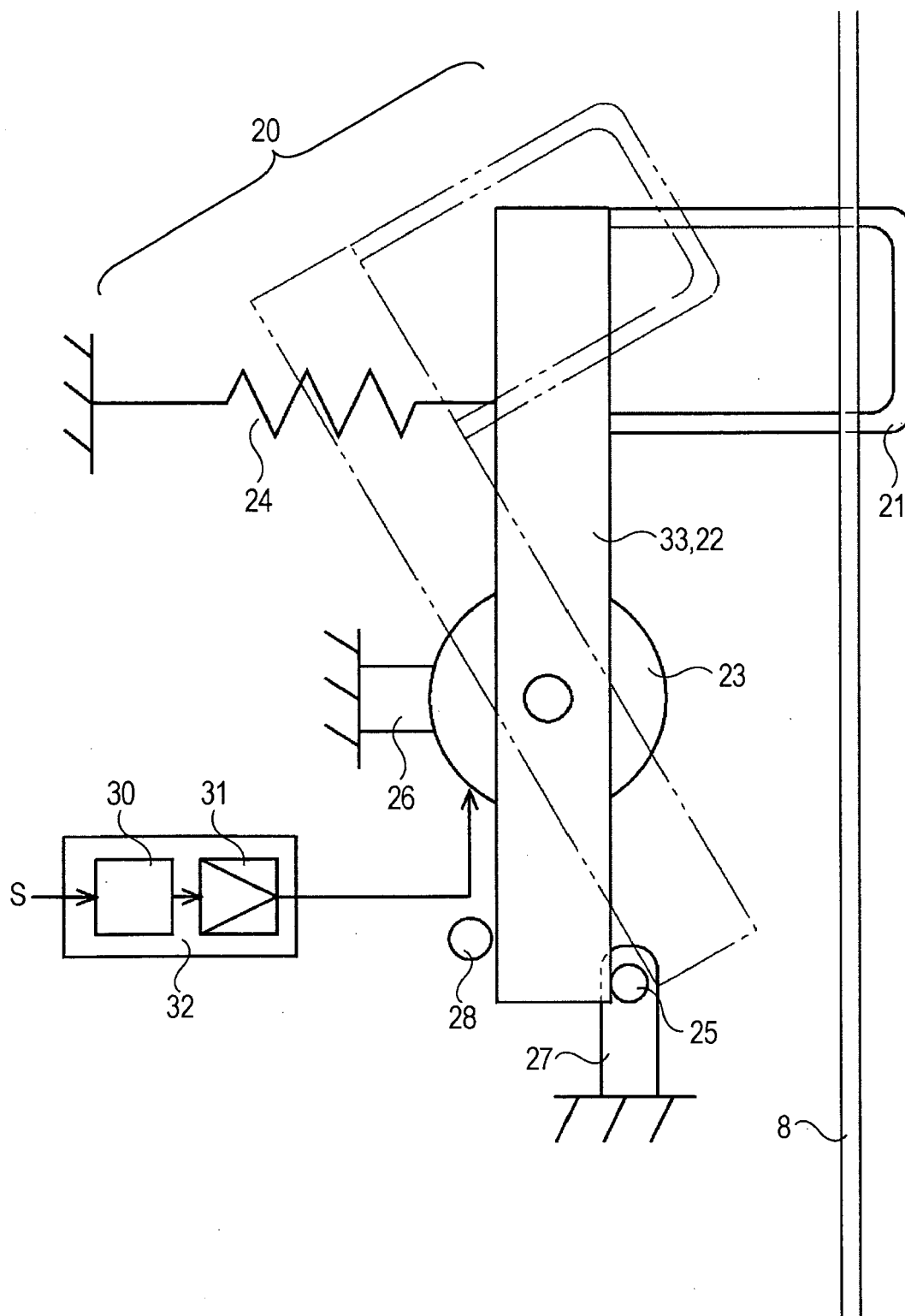
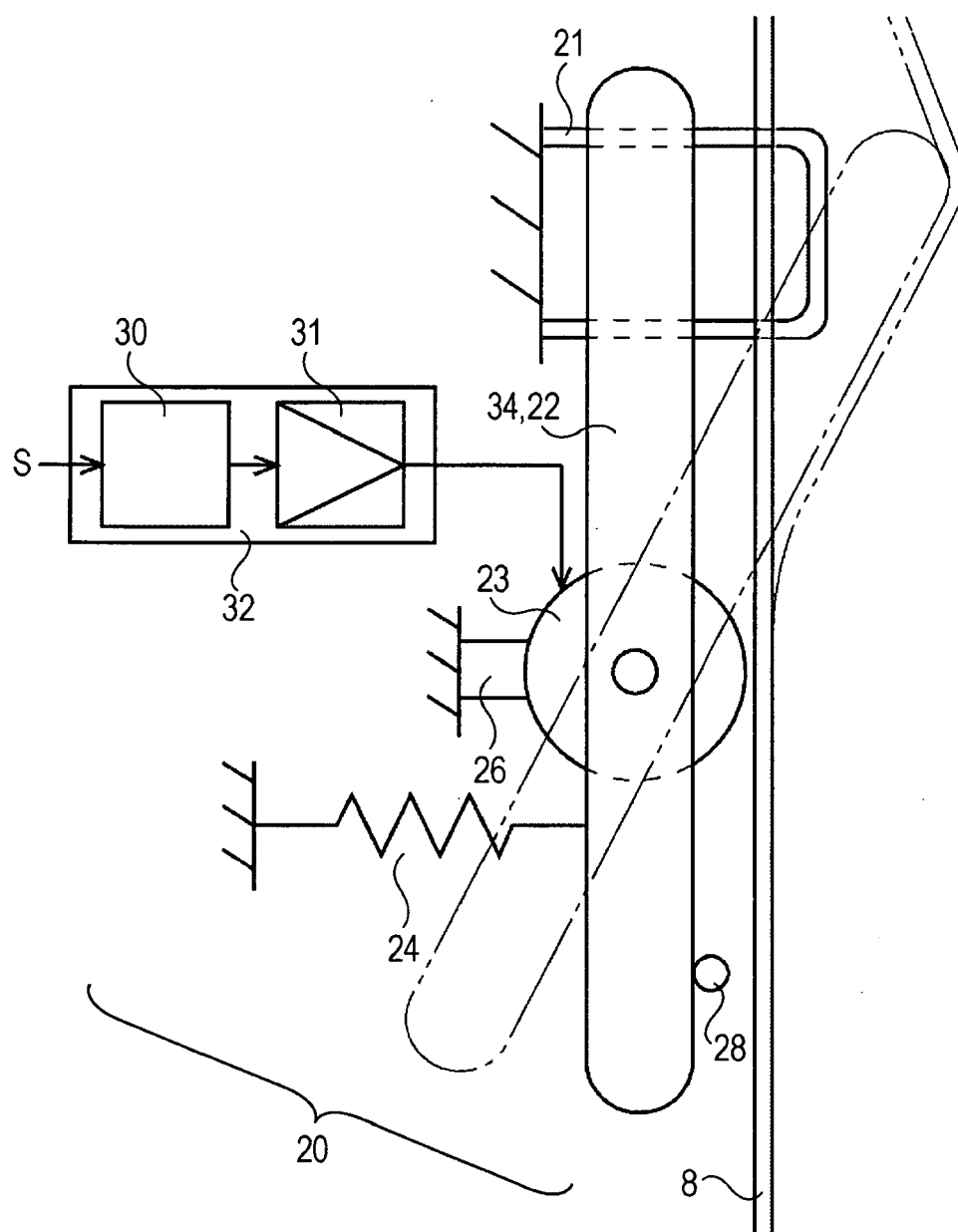


FIG. 3



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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