



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
14.07.2010 Bulletin 2010/28

(51) Int Cl.:
D03D 39/22 (2006.01) D03D 49/04 (2006.01)
D03J 1/22 (2006.01)

(21) Application number: **10150106.2**

(22) Date of filing: **05.01.2010**

(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 SM TR
Designated Extension States:
AL BA RS

(72) Inventors:
• **Sakai, Yosuke**
Kariya-shi Aichi 448-8671 (JP)
• **Iwano, Yoshimi**
Kariya-shi Aichi 448-8671 (JP)
• **Murakami, Yasutaka**
Kariya-shi Aichi 448-8671 (JP)

(30) Priority: **09.01.2009 JP 2009004089**

(71) Applicant: **Kabushiki Kaisha Toyota Jidoshokki**
Kariya-shi,
Aichi 448-8671 (JP)

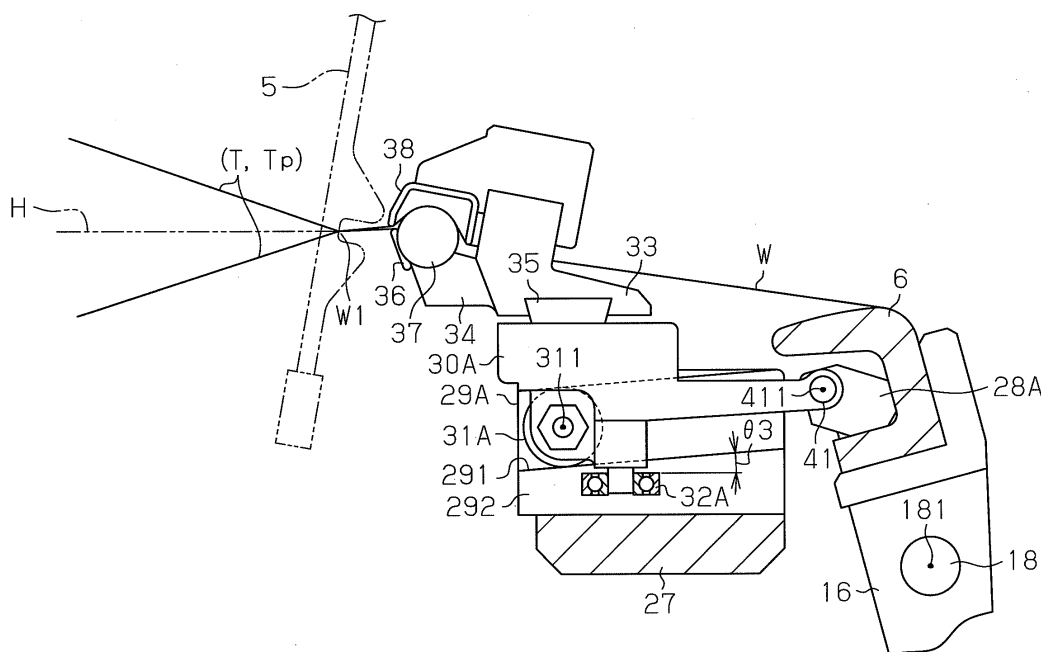
(74) Representative: **TBK-Patent**
Bavariaring 4-6
80336 München (DE)

(54) **Pile formation apparatus for pile fabric loom**

(57) A pile formation apparatus for a pile fabric loom changes a cloth fell position of a cloth. The pile formation apparatus includes a terry motion member, a movable body, a guide, and a roller. The terry motion member generates a terry motion by pivoting back and forth. The movable body supports a fell plate and is directly connected to the terry motion member in a relatively pivotal

manner. The guide includes a guide portion which guides and moves the movable body toward the front or rear of the loom. The roller is attached to the movable body. The guide portion has a form that displaces the movable body in a direction opposite to a height displacement of the fell plate when the movable body is pivoted about a center axis of the roller.

Fig.2



Description**BACKGROUND OF THE INVENTION**

[0001] The present invention relates to a pile formation apparatus for a pile fabric loom that changes a cloth fell position of a cloth to form a pile.

[0002] Japanese Laid-Open Patent Publication No. 7-90751 describes an example of a pile formation apparatus. Referring to Fig. 9, in the pile formation apparatus of Japanese Laid-Open Patent Publication No. 7-90751, a movable body 30 supports a fell plate 36. A guide 29 guides the movable body 30 through two front and rear rollers 31A1 and 31A2. The two rollers 31A1 and 31A2 roll along a guide surface 290 of the guide 29. The guide surface 290 extends parallel to a warp line H. An attachment piece 28 is fixed to an expansion bar 6. A link 39 connects the attachment piece 28 and the movable body 30. A support lever 16, which supports the expansion bar 6, is pivotal about a pivot shaft 18. Pivoting of the support lever 16 moves the expansion bar 6 and the movable body 30 toward the front or rear. This also moves a cloth fell W1 of a cloth W toward the front or rear. Further, a fell plate 36, which is supported by and moved integrally with the movable body 30, moves toward the front or rear.

[0003] The fell plate 36 supports the cloth W from below near the cloth fell W1. The fell plate 36 transmits to the position at which the link 39 and movable body 30 are connected the load produced when a reed 5 performs beating. Further, the fell plate 36 transmits to the position at which the link 39 and movable body 30 are connected the load produced from inertial force of a member (the expansion bar 6 and the support lever 16) that generates terry motions or the load produced from the tensile force of the cloth W. A connection pin 40 connects the link 39 and the movable body 30. The connection pin 40 must be lubricated to increase its durability. However, it is difficult to ensure space for lubrication.

[0004] This lubrication problem may be solved by the structure shown in Figs. 10A and 10B. In this structure, a connection pin 41 connects the movable body 30 and the attachment piece 28, and the movable body 30 includes only one roller, which rolls along the guide surface 290. More specifically, the movable body 30 is directly connected to the member that generates terry motions. Further, among the two front and rear rollers 31A1 and 31A2, which are described above, only the rear roller 31A1 is used. Fig. 10A shows the position of the expansion bar 6 during a fast pick, and Fig. 10B shows the position of the expansion bar 6 during a loose pick.

[0005] However, when the support lever 16 pivots, the connection pin 41 moves along an arcuate path about the pivot shaft 18 of the support lever 16. This displaces the connection pin 41 in the vertical direction. As a result, when the guide surface 290 is a plane parallel to the warp line H, as the roller 31A1 rolls along the guide surface 290, the movable body 30 pivots about the axis of the roller 31A1. Such pivoting of the movable body 30 displaces the fell plate 36 in the vertical direction.

[0006] Displacement of the fell plate 36, which supports the portion near the cloth fell W1 from below, in the vertical direction displaces the cloth fell W1 in the vertical direction. Displacement of the cloth fell W1 in the vertical direction displaces a shed for a warp T in the vertical direction. In a jet loom, which ejects air from a weft nozzle to interlace weft with warp, when the shed of a warp T is displaced in the vertical direction, the jetted weft is apt to contact the warp T. This may result in improper weft inserting.

SUMMARY OF THE INVENTION

[0007] It is an object of the present invention to suppress vertical displacement of a fell plate when a movable body is directly connected to a member that generates terry motions.

[0008] One aspect of the present invention is a pile formation apparatus for a pile fabric loom that changes a cloth fell position of a cloth to form a pile. The pile formation apparatus includes a terry motion member, which generates a terry motion by pivoting back and forth about a center axis of a first pivot shaft. A movable body supports a fell plate and is directly connected to the terry motion member in a relatively pivotal manner about a center axis of a second pivot shaft. A guide includes a guide portion which guides the movable body so that the movable body moves toward the front or rear of the loom. A roller attached to the movable body rolls along the guide portion. The movable body is pivotal about a center axis of the roller. The guide portion has a form that displaces the movable body in a direction opposite to a height displacement of the fell plate when the movable body is pivoted about the center axis of the roller.

[0009] Other aspects and advantages of the present 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 cross-sectional side view of a pile fabric loom according to a first embodiment of the present invention;
 Fig. 2 is an enlarged partial view of Fig. 1 during a fast pick;
 Fig. 3 is an enlarged partial view of Fig. 1 during a loose pick;
 Fig. 4 is a rear partial view of the pile fabric loom shown in Fig. 1;
 Fig. 5 is a coordinate diagram illustrating how to obtain angle θ_3 ;
 Fig. 6 is a coordinate diagram illustrating how to obtain angle θ_3 ;
 Fig. 7 is a coordinate diagram illustrating how to obtain angle θ_3 ;
 Fig. 8 is an enlarged partial cross-sectional side view showing a second embodiment;
 Fig. 9 is a cross-sectional side view showing a pile fabric loom of the prior art; and
 Figs. 10A and 10B are cross-sectional side views showing the pile fabric loom when a guide surface is horizontal.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0011] A first embodiment of the present invention will now be discussed with reference to Figs. 1 to 7.

[0012] Fig. 1 is a side view showing the entire loom. The right side as viewed in Fig. 1 is the front side of the loom, and the left side as viewed Fig. 1 is the rear side of the loom.

[0013] When a feed motor (not shown) is actuated, a ground warp T is fed out of a ground weave warp beam 1. The ground warp T travels along a back roller 2 and a tension roller 3 and extends to a heddle 4 and a reed 5. A cloth W travels along an expansion bar 6, a surface roller 7, and guide rollers 8 and 9 and is wound around a cloth roller 10. When a feed motor (not shown) is actuated, a pile warp Tp is fed out of a pile warp beam 11. The pile warp Tp travels along a tension roller 12 and extends through the heddle 4 and the reed 5.

[0014] A support lever 14, which is pivotal about a pivot shaft 141, is arranged at the rear of the loom. The support lever 14 supports the tension roller 12. An intermediate lever 13, which is pivotal about a pivot shaft 131, is arranged at the middle of the loom. A rod 15 connects the support lever 14 to the intermediate lever 13. Support levers 16, which are pivotal about a pivot shaft 18, are arranged at the front of the loom. The support lever 16 serves as a terry motion member. The pivot shaft 18 serves as a first pivot shaft. The support levers 16 support the expansion bar 6.

[0015] The left and right support levers 16 support the two ends of the expansion bar 6. As shown in Fig. 1, the support lever 16 is connected to the intermediate lever 13 by a rod 17. A drive shaft 19 is arranged above the intermediate lever 13. A terry motion cam 20 and a worm wheel 21 are fixed to the drive shaft 19. The worm wheel 21 is meshed with a drive worm 221 of a servo motor 22. The servo motor 22 generates rotation in one direction, and the terry motion cam 20 rotates in one direction. The actuation of the servo motor 22 is controlled based on a pile weaving pattern.

[0016] A pivot shaft 231, which is located directly above the drive shaft 19, pivotally supports a cam lever 23. A pivot shaft 241 is located beside the cam lever 23. The pivot shaft 241 pivotally supports a displacement direction changing lever 24. A link 25 connects the displacement direction changing lever 24 and the cam lever 23. A rod 26 connects the displacement direction changing lever 24 and the intermediate lever 13. Pivotal displacement of the cam lever 23 resulting from rotation of the terry motion cam 20 is transmitted to the expansion bar 6 via the link 25, the displacement direction changing lever 24, the rod 26, the intermediate lever 13, the rod 17, and the support lever 16. The transmission of the displacement pivots the expansion bar 6 about the pivot shaft 18. Further, pivotal displacement of the cam lever 23 is transmitted to the tension roller 12 via the intermediate lever 13, the rod 15, and the support lever 14. The transmission of the displacement pivots the support levers 14 and 16 in the same direction, and the tension roller 12 and the expansion bar 6 are displaced in the same direction by the same amount. This displaces the path of the pile warp Tp and the path of the cloth W, which in turn displaces a cloth fell W1.

[0017] A support bar 27 extends in the widthwise direction of the loom between the reed 5 and the expansion bar 6. The support bar 27 extends horizontally.

[0018] As shown in Fig. 4, a guide 29A is arranged on the support bar 27. The guide 29A is arranged at a first side (right side as viewed in Fig. 4) of the expansion bar 6. The guide 29A includes a guide surface 291 and a guide surface 292.

[0019] As shown in Fig. 2, a movable body 30A is supported by a roller 31A on the guide 29A so as to be movable in forward and rearward directions. The roller 31A and a roller 32A are attached to the movable body 30A. The roller 31A rolls on the guide surface 291, and the roller 32A rolls on the guide surface 292. A plurality of rollers 31A may be arranged along a center axis 311.

[0020] The expansion bar 6 is a hollow body including an opening facing toward the reed 5 and having a channel-shaped cross-section. An attachment piece 28A is attached to the hollow portion of the expansion bar 6. A connection pin 41, which serves as a second pivot shaft, connects the movable body 30A to the attachment piece 28A so that the movable body 30A and attachment piece 28A are pivotal relative to each other. That is, the movable body 30A and the attachment piece 28A are directly connected to each other in a relatively pivotal manner.

[0021] As shown in Fig. 4, the attachment piece 28A, the guide 29A, the movable body 30A, and the rollers 31A and 32A are arranged on a first side (right side as viewed in Fig. 4) of the expansion bar 6. An attachment piece 28B, a guide 29B, a movable body 30B, and rollers 31B and 32B are arranged on a second side (left side as viewed in Fig. 4) of the

expansion bar 6 in symmetry with the attachment piece 28A, the guide 29A, the movable body 30A, and the rollers 31A and 32A. Fig. 4 only shows the two guides 29A and 29B, the movable bodies 30A and 30B, and the guides 29B and 30B that are arranged at the left and right sides. However, other identical guides and movable bodies may also be arranged between the left and right sides.

[0022] A temple bar 35 is arranged on the movable bodies 30A and 30B. The two ends of the temple bar 35 each hold support brackets 33 and 34. A fell plate 36 is arranged between the distal portions of the left and right support brackets 34. The fell plate 36 supports the cloth W from below near the cloth fell W1.

[0023] As shown in Fig. 2, the support bracket 33 (the right support bracket 33 as viewed in Fig. 4) supports a temple 37 and a temple cover 38. The left support bracket 33, as viewed in Fig. 4, also supports the temple 37 and the temple cover 38. The left and right temples 37 prevent cloth contraction of the cloth W in the widthwise direction near the cloth fell W1.

[0024] During a fast pick, the expansion bar 6 is arranged at the position shown in Fig. 2. During a loose pick, the expansion bar 6 is arranged at the position shown in Fig. 3. The terry motions of the expansion bar 6 are transmitted via the connection pin 41 to the movable bodies 30A and 30B. The terry motions of the expansion bar 6 moves the movable bodies 30A and 30B toward the front and rear. The guides 29A and 29B guide the forward and rearward movements of the movable bodies 30A and 30B with the rollers 31A, 31B, 32A, and 32B. Accordingly, the fell plate 36 and the temple 37, which are supported on the movable bodies 30A and 30B, move integrally with the cloth W.

[0025] A downward load resulting from the cloth tensile force is applied to the fell plate 36 and the temple 37. This urges the movable bodies 30A and 30B downward. Accordingly, the rollers 31A and 31B contact and roll along the guide surface 291, which serves as a guide portion. Further, the rollers 32A and 32B contact and roll along the guide surface 292.

[0026] The temple bar 35 and the fell plate 36 connect the movable bodies 30A and 30B. Displacement of the movable bodies 30A and 30B in the widthwise direction is restricted by contact of the rollers 32A and 32B with the guide surface 291.

[0027] The guides 29A and 29B, the movable bodies 30A and 30B, and the rollers 31A and 31B are arranged symmetrically at the left and right sides in the widthwise direction. Thus, only the guide 29A and the movable body 30A will be described hereinafter.

[0028] As shown in Figs. 2 and 3, the center axis 411 of the connection pin 41 is located rearward from the center axis 181 of the pivot shaft 18. The guide surface 291 is a sloped surface that intersects the warp line H which extends horizontally from the front toward the rear of the loom, incline at angle $\theta 3$ relative to the warp line H. The guide surface 291 has a rising gradient that rises from the rear side (left side as viewed in Fig. 2) of the loom to the front side (right side as viewed in Fig. 2) of the loom.

[0029] The procedures for determining the angle $\theta 3$ will now be discussed with reference to Figs. 5 to 7.

[0030] Fig. 5 shows a coordinate system, which includes an X axis in the horizontal direction and a Y axis in the vertical direction. In Fig. 5, the dotted lines indicate the positions of the left roller 31A (F), the connection pin 41 (F), and the fell plate 36 (F) during a fast pick. The origin G of the coordinate system (X, Y) conforms to the center axis 311 of the roller 31A (F), which is located at the fast pick position.

[0031] In Fig. 5, the dotted lines indicate the positions of the right roller 31A (L), the connection pin 41 (L), and the fell plate 36 (L) during a loose pick when the guide surface 291 is a horizontal plane. The connection pin 41 (L) indicates the movement position of the connection pin 41 when the support lever 16 is pivoted about the center axis 181 of the pivot shaft 18 from the rear toward the front of the loom. The roller 31A (L) indicates the movement position of the roller 31A when the pivoting of the support lever 16 moves the roller 31A (F) in the horizontal direction. The fell plate 36 (L) indicates the movement position of the fell plate 36 when the pivoting of the support lever 16 moves the fell plate 36 (F).

[0032] The coordinates of the center axis 411 of the connection pin 41 (F) are represented by (X1, X2). The coordinates of the center axis 411 of the connection pin 41 (L) are represented by (X2, Y2). The movement amount of the connection pin 41 in the X axis direction when the support lever 16 pivots is represented by K. The movement amount of the connection pin 41 in the Y axis direction when the support lever 16 pivots is represented by α . In this case, the coordinates (X2, Y2) of the center axis 411 of the connection pin 41 (L) is also represented by (X1+K, Y1+ α).

[0033] In Fig. 5, R1 represents the length of a straight line T1 connecting the center axis 311 of the roller 31A (F) and the center axis 411 of the connection pin 41 (F). Here, R2 represents the length of a straight line T2 connecting a vertex 361 of the fell plate 36 (L) with the origin G. Angle $\theta 2$ represents the gradient angle of the straight line T2 relative to the Y axis. Further, T3 represents a straight line connecting the vertex 361 of the fell plate 36 (L) with the center axis 311 of the roller 31A (L), and h represents the height of the warp line H from the origin G.

[0034] The roller 31A (Lg), the connection pin 41 (Lg), and the fell plate 36 (Lg) in Fig. 6 show the positions of the roller 31A (L), the connection pin 41 (L), and the fell plate 36 (L) in Fig. 5 moved in the X axis direction by distance (-K). In this case, the center axis 311 of the roller 31A (L) conforms to the origin G. The straight line T3(-K) shows the position of the straight line T3 in Fig. 5 moved in the X axis direction by distance (-K).

[0035] Further, β represents the distance between the center axis 411 of the connection pin 41 (F) and the center axis 411 of the connection pin 41 (Lg) in the X axis direction. The coordinates of the center axis 411 of the connection pin 41 (Lg) are represented by (X1- β , Y2).

[0036] Additionally, δ represents the distance between the vertex 361 of the fell plate 36 (Lg) and the warp line H, that is, the movement amount of the fell plate 36 (Lg) when moved in the Y axis direction to the fell plate 36 (L θ_0). In other words, δ represents the descending amount of the fell plate 36 when the pivoting of the support lever 16 moves the roller 31A (F) to the position of the roller 31A (L).

[0037] In Fig. 6, the roller 31A (L θ_0) and the fell plate 36 (L θ_0) represent the positions of the roller 31A (Lg) and the fell plate 36 (Lg) pivoted by angle θ_0 about the center axis 411 of the connection pin 41 (Lg) so that the vertex 361 of the fell plate 36 (Lg) lies on the warp line H. In other words, to raise the vertex 361 of the fell plate 36 (Lg) to the height of the warp line H, the center axis 311 of the roller 31A (Lg) is raised to the position of the center axis 311 of the roller 31A (L θ_0). The distance between the center axis 311 of the roller 31A (Lg) and the center axis 311 of the roller 31A (L θ_0) is represented by $(\alpha-6)$.

[0038] The straight line T4 represents the position of the straight line T3 (-K) pivoted by angle θ_0 about the center axis 411 of the connection pin 41 (Lg). Angle θ_1 represents the angle formed between the straight line T4 and the straight line T3 (-K).

[0039] In Fig. 7, the roller 31A (L θ_0 K) and the fell plate 36 (L θ_0 K) represent the positions of the roller 31A (L θ_0) and the fell plate 36 (L θ_0) of Fig. 6 moved by distance K in the X axis direction. In this case, the vertex 361 of the fell plate 36 (L θ_0 K) lies on the warp line H.

[0040] In Fig. 7, the dotted lines represent the guide surface 291, and the straight line T5 represents a straight line connecting the center axis 311 of the roller 31A (F) and the center axis 311 of the roller 31A (L θ_0 K). The guide surface 291 is parallel to the straight line T5. The angle formed between the guide surface 291 and the X axis and the angle formed between the straight line T5 and the X axis are the same and are both angle θ_3 . The angle θ_3 shown in Fig. 7 is the same as the angle θ_3 shown in Fig. 2. Thus, when the center axis 311 of the roller 31A (L) is pivoted by angle θ_0 about the center axis 411 of the connection pin 41 (L) and moved onto the straight line T5, the descending amount of the vertex 361 of the fell plate 36 approaches zero.

[0041] Equation (1) expresses the angle θ_3 , which is shown in Figs. 2 and 7.

$$\theta_3 = \tan^{-1}[(\alpha-\delta)/(K+\beta)] \quad \dots (1)$$

[0042] Equation (2) expresses δ .

$$\delta = h-R2 \times \cos(\theta_1+\theta_2) \quad \dots (2)$$

[0043] Equation (3) expresses β .

$$\beta = X1-[R1^2-(Y1+\alpha)^2]^{1/2} \quad \dots (3)$$

[0044] Equation (4) expresses θ_1 .

$$\theta_1 = 2 \times \sin^{-1}[(\alpha^2+\beta^2)/2]^{1/2}/R1] \quad \dots (4)$$

[0045] Equation (5) expresses R1.

$$R1 = (X1^2+Y1^2)^{1/2} \quad \dots (5)$$

[0046] Accordingly, θ_3 of equation (1) is obtained with R2, X1, Y1, α , h, K.

[0047] When the guide surface 291 is horizontal and the pivoting of the support lever 16 moves the connection pin 41 in the X axis direction by distance K, the fell plate 36 is descended by δ . However, by setting the angle θ_3 , which is

calculated from equation (1) using $R2$, $X1$, $Y1$, α , h , K , as the gradient angle of the guide surface 291, the descending amount δ of the fell plate 36 approaches zero.

[0048] The first embodiment has the advantages described below.

(1) The guide surface 291 has a rising gradient that rises from the rear side the front side of the loom. Thus, the descending amount δ of the fell plate 36 is close to zero. Thus, the guide surface 291 displaces the movable body 30A in a direction opposite to the height displacement of the fell plate 36 resulting from the pivoting of the movable body 30A about the center axis 311 of the roller 31A. This suppresses height displacement of the fell plate 36 when the movable body 30A is moved.

(2) When the connection position (i.e., the center axis 411 of the connection pin 41) of the movable body 30A and the attachment piece 28A, which serves as a terry motion member, is located rearward from the pivoting center (i.e., the center axis 181 of the pivot shaft 18) of the terry motion member (6, 16, 28A) in the loom, the center axis 411 of the connection pin 41 ascends when the support lever 16 is shifting from the fast pick position to the loose pick position. Thus, when the guide surface 291 is horizontal, the fell plate 36 continues to descend when the support lever 16 is shifting from the fast pick position to the loose pick position, that is, when the roller 31A is moving horizontally from the rear to the front of the loom.

[0049] However, the guide surface 291 is a plane having a rising gradient. Thus, the amount the fell plate 36 is lifted as the roller 31A climbs the guide surface 291 is approximately proportional to the descending amount of the fell plate 36 when the guide surface 291 is horizontal and the roller 31A moves horizontally. That is, the amount the fell plate 36 is lifted as the roller 31A climbs the guide surface 291 approximately cancels the descending amount of the fell plate 36 when the roller 31A moves horizontally.

[0050] Accordingly, when the connection position of the movable body 30A and the terry motion member is located rearward from the pivoting center of the terry motion member in the loom, the rising gradient of the guide surface 291 is optimal for the form of a guide that guides the roller 31A.

[0051] Particularly, the planar guide surface 291 has a convenient form when used as a guide for guiding the roller 31A.

[0052] It should be apparent to those skilled in the art that the present invention may be embodied in many other specific forms without departing from the spirit or scope of the invention. Particularly, it should be understood that the present invention may be embodied in the following forms.

[0053] As shown in Fig. 8, a guide surface 293, which serves as the guide for the roller 31A, may be curved. The guide surface 293 is curved bulging upward. In the illustrated example, when the roller 31A is located at the vertex of the guide surface 293, the center axis 411 of the connection pin 41 is located at the same position as the center axis 181 of the pivot shaft 18 with respect to forward-rearward direction of the loom. The vertical displacement of the fell plate 36 resulting from the pivoting of the movable body 30A is not a monotonous ascending or descending. It is thus preferable that the curved form of the guide surface 293 be set to correspond to the vertical displacement of the fell plate 36 resulting from the pivoting of the movable body 30A.

[0054] During a fast pick, the center axis 411 of the connection pin 41 is located rearward from the center axis 181 of the pivot shaft 18 in the loom. During a loose pick, the center axis 411 of the connection pin 41 is located frontward from the center axis 181 of the pivot shaft 18 in the loom. When the support lever 16 is moving from the fast pick position to the loose pick position, the center axis 411 of the connection pin 41 ascends and then descends. Thus, if the guide surface 293 is horizontal, when the support lever 16 moves from the fast pick position to the loose pick position, that is, when the roller 31A moves horizontally from the rear toward the front of the loom, the fell plate 36 descends and then ascends.

[0055] However, the guide surface 293, which is curved, shifts from a rising gradient to a falling gradient. Thus, the amount the fell plate 36 is lifted as the roller 31A climbs the guide surface 293 is approximately proportional to the descending amount of the fell plate 36 when the guide surface 293 is horizontal and the roller 31A moves horizontally. Further, the amount the fell plate 36 is lifted as the roller 31A climbs the guide surface 293 is approximately proportional to the ascending amount of the fell plate 36 when the guide surface 293 is horizontal and the roller 31A moves horizontally. Thus, the amount the fell plate 36 is lifted as the roller 31A climbs the guide surface 293 approximately cancels the descending amount of the fell plate 36 when the roller 31A moves horizontally. Further, the amount the fell plate 36 is lowered as the roller 31A climbs the guide surface 293 approximately cancels the ascending amount of the fell plate 36 when the roller 31A moves horizontally. The curved guide surface 293 is preferable for more accurately suppressing displacement of the fell plate 36 resulting from movement of the movable body 30A.

[0056] A guide surface may be formed from a plane having a rising gradient and a plane having a falling gradient, with the boundary of the two planes being located in correspondence with the portion at which the center axis 411 of the connection pin 41 and the center axis 181 of the pivot shaft 18 are located at the same position with respect to the forward-rearward direction of the loom.

[0057] The rising gradient of the guide surface 291 in the first embodiment may be set in correspondence with the vertical displacement of the fell plate 36 resulting from the pivoting of the movable body 30A.

[0058] In the first embodiment, when the roller 31A moves from the fast pick position to a predetermined position (e.g., intermediate position), which is located between the fast pick position and the loose pick position, the movement amount of the roller 31A in the X axis direction may be used as K when obtaining the angle θ_3 .

[0059] The present examples and embodiments are to be considered as illustrative and not restrictive, and the invention is not to be limited to the details given herein, but may be modified within the scope and equivalence of the appended claims.

[0060] A pile formation apparatus for a pile fabric loom changes a cloth fell position of a cloth. The pile formation apparatus includes a terry motion member, a movable body, a guide, and a roller. The terry motion member generates a terry motion by pivoting back and forth. The movable body supports a fell plate and is directly connected to the terry motion member in a relatively pivotal manner. The guide includes a guide portion which guides and moves the movable body toward the front or rear of the loom. The roller is attached to the movable body. The guide portion has a form that displaces the movable body in a direction opposite to a height displacement of the fell plate when the movable body is pivoted about a center axis of the roller.

Claims

1. A pile formation apparatus for a pile fabric loom that changes a cloth fell position of a cloth to form a pile, the pile formation apparatus including:

a terry motion member (16) which generates a terry motion by pivoting back and forth about a center axis (181) of a first pivot shaft (18);

a movable body (30A) which supports a fell plate (36) and which is directly connected to the terry motion member (16) in a relatively pivotal manner about a center axis (411) of a second pivot shaft (41);

a guide (29A) including a guide portion (291, 293) which guides the movable body (30A) so that the movable body (30A) moves toward the front or rear of the loom;

a roller (31A, 31 B) attached to the movable body (30A), which rolls along the guide portion (291, 293), the movable body (30A) being pivotal about a center axis (311) of the roller (31A, 31 B), the pile formation apparatus being **characterized in that:**

the guide portion (291, 293) has a form that displaces the movable body (30A) in a direction opposite to a height displacement of the fell plate (36) when the movable body (30A) is pivoted about the center axis (311) of the roller (31A, 31 B).

2. The pile formation apparatus according to claim 1, being **characterized in that** the guide portion (291, 293) is a guide surface (291, 293) having a rising gradient that rises from the rear toward the front of the loom.

3. The pile formation apparatus according to claim 1, being **characterized in that:**

the guide portion (291, 293) is a guide surface (291, 293) inclined relative to a warp line (H), which extends from the front toward the rear of the loom; and

when the center axis (411) of the second pivot shaft (41) is located rearward from the center axis (181) of the first pivot shaft (18) in the loom, the roller (31A, 31 B) rolls along the guide surface (291, 293) having a rising gradient that rises from the rear toward the front of the loom relative to the warp line (H).

4. The pile formation apparatus according to claim 1, being **characterized in that:**

the guide portion (293) is a guide surface (293) inclined relative to a warp line (H), which extends from the front toward the rear of the loom; and

when the center axis (411) of the second pivot shaft (41) is located frontward from the center axis (181) of the first pivot shaft (18) in the loom, the roller (31A, 31 B) rolls along the guide surface (293) having a falling gradient that falls from the rear toward the front of the loom relative to the warp line (H).

5. The pile formation apparatus according to claim 1, being **characterized in that** the guide portion (291) is a planar guide surface (291).

6. The pile formation apparatus according to claim 1, being **characterized in that the** guide portion (293) is a curved guide surface (293).

5

10

15

20

25

30

35

40

45

50

55

Fig.1

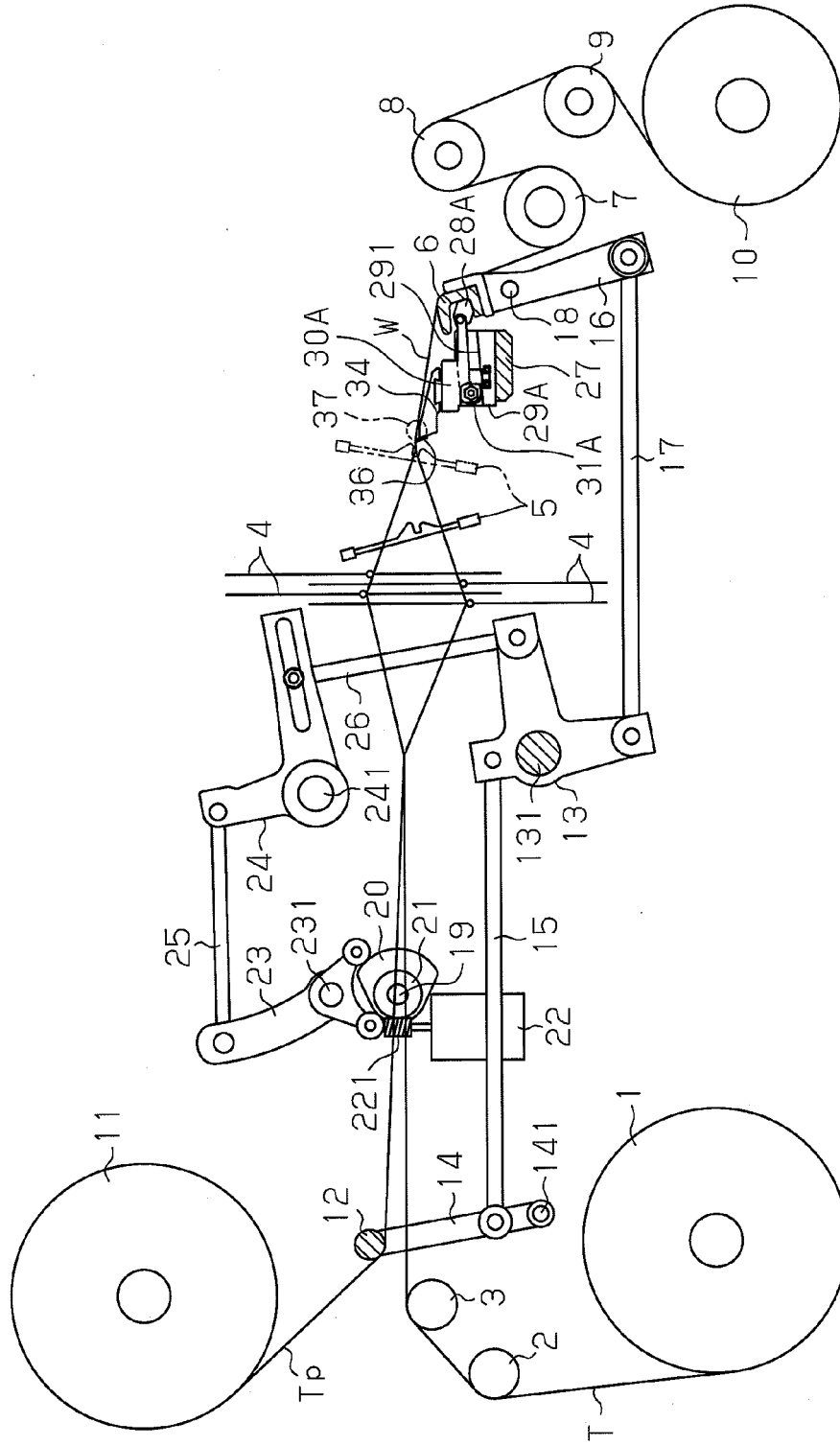


Fig.2

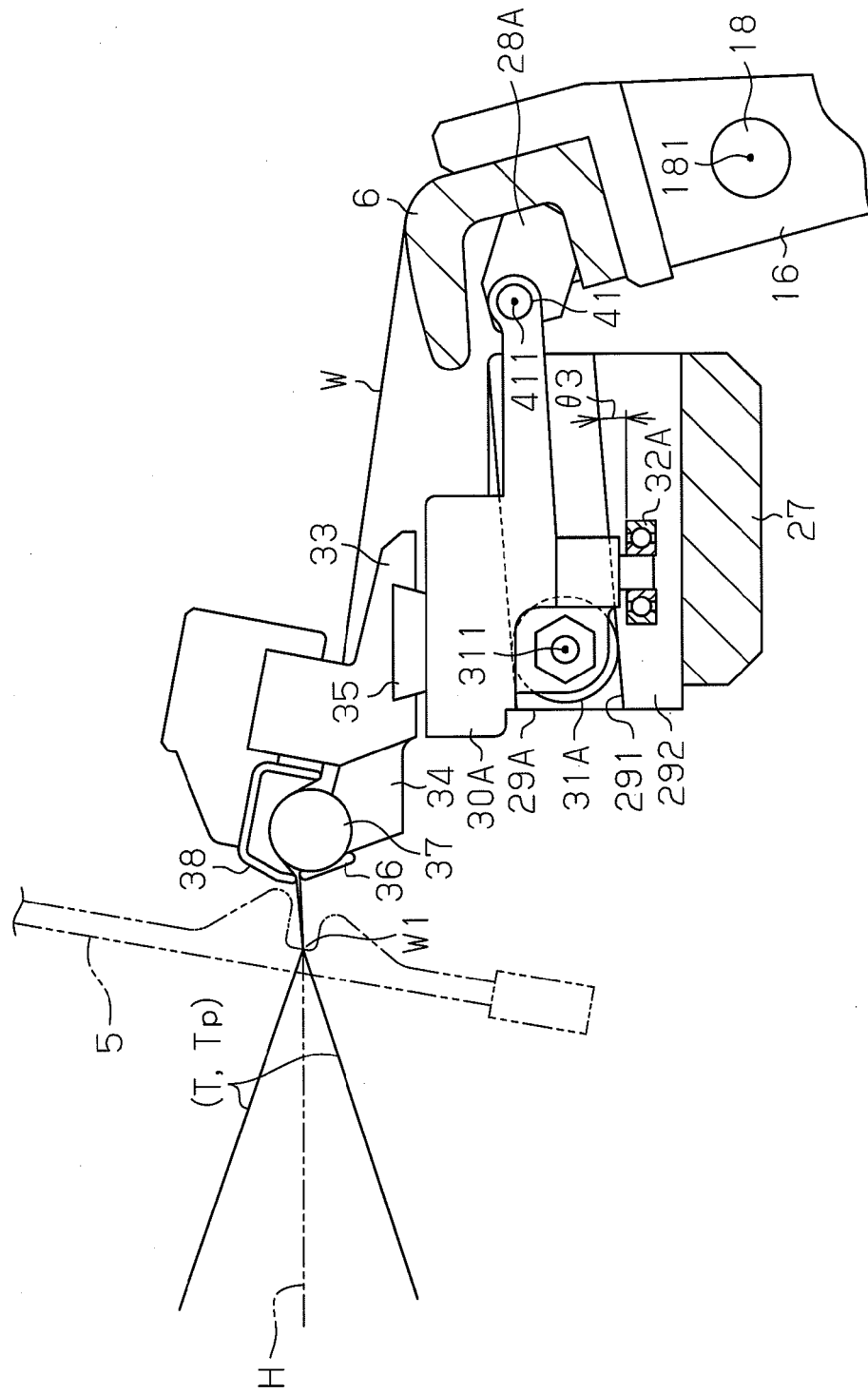


Fig. 3

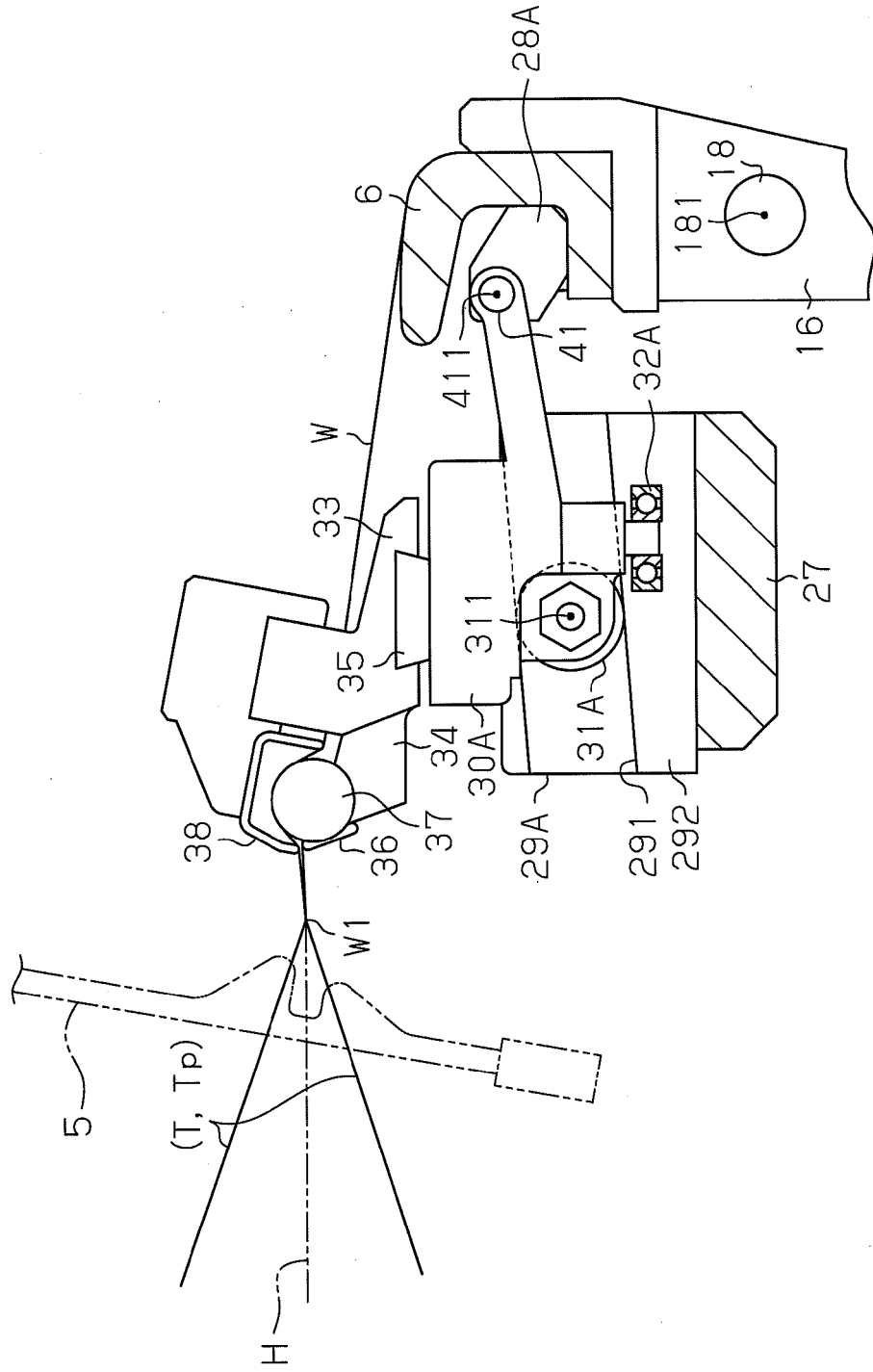


Fig. 4

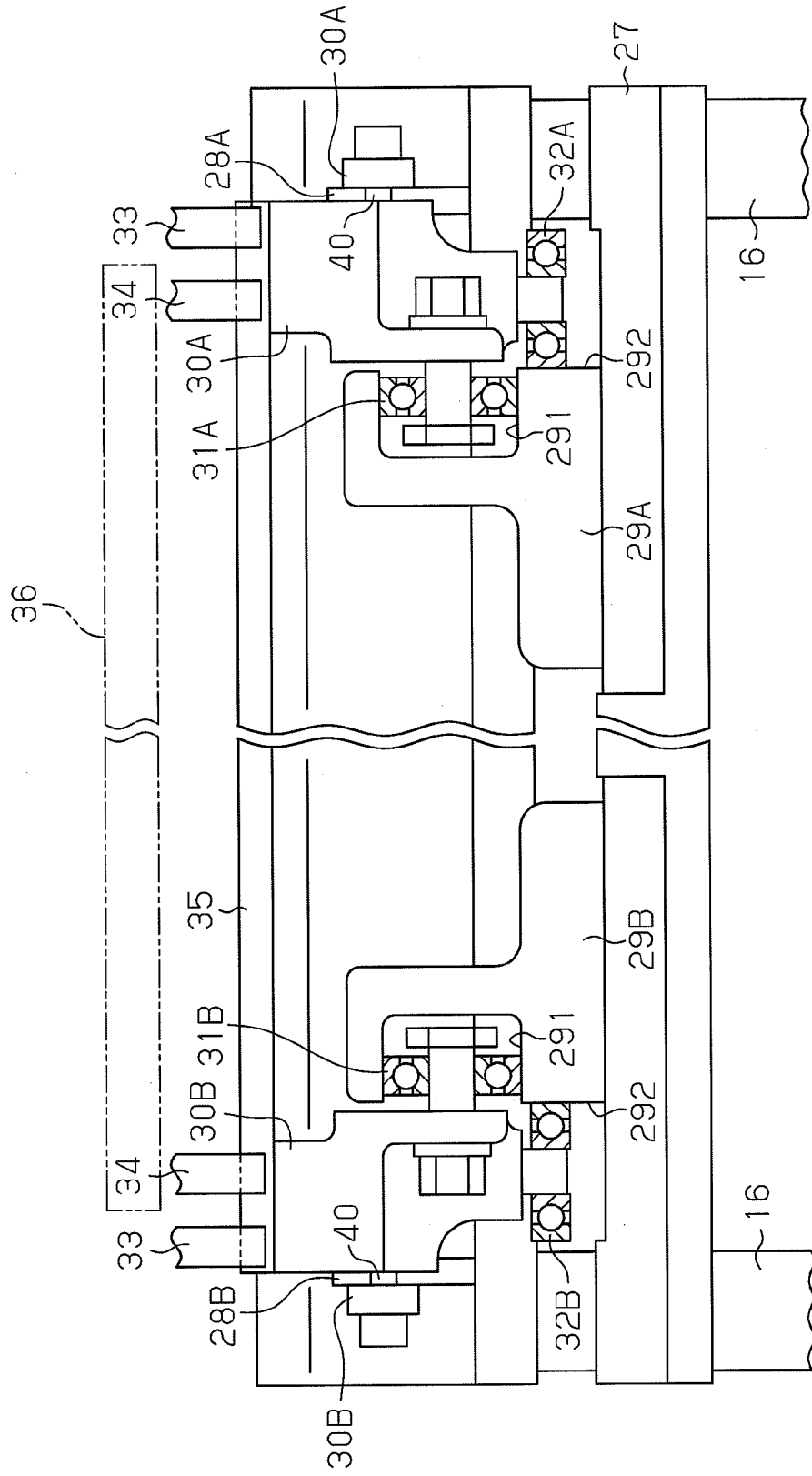


Fig. 5

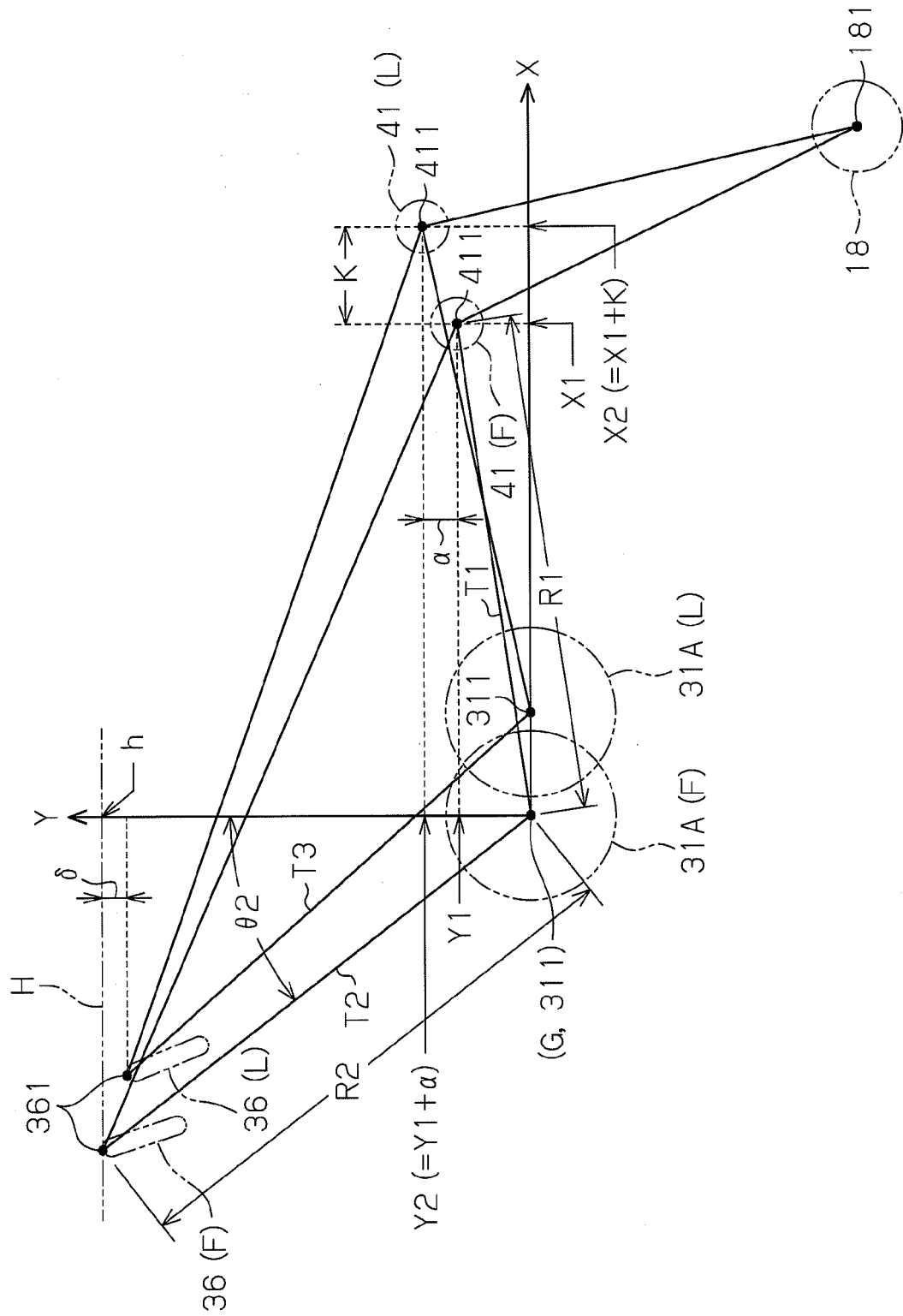


Fig. 6

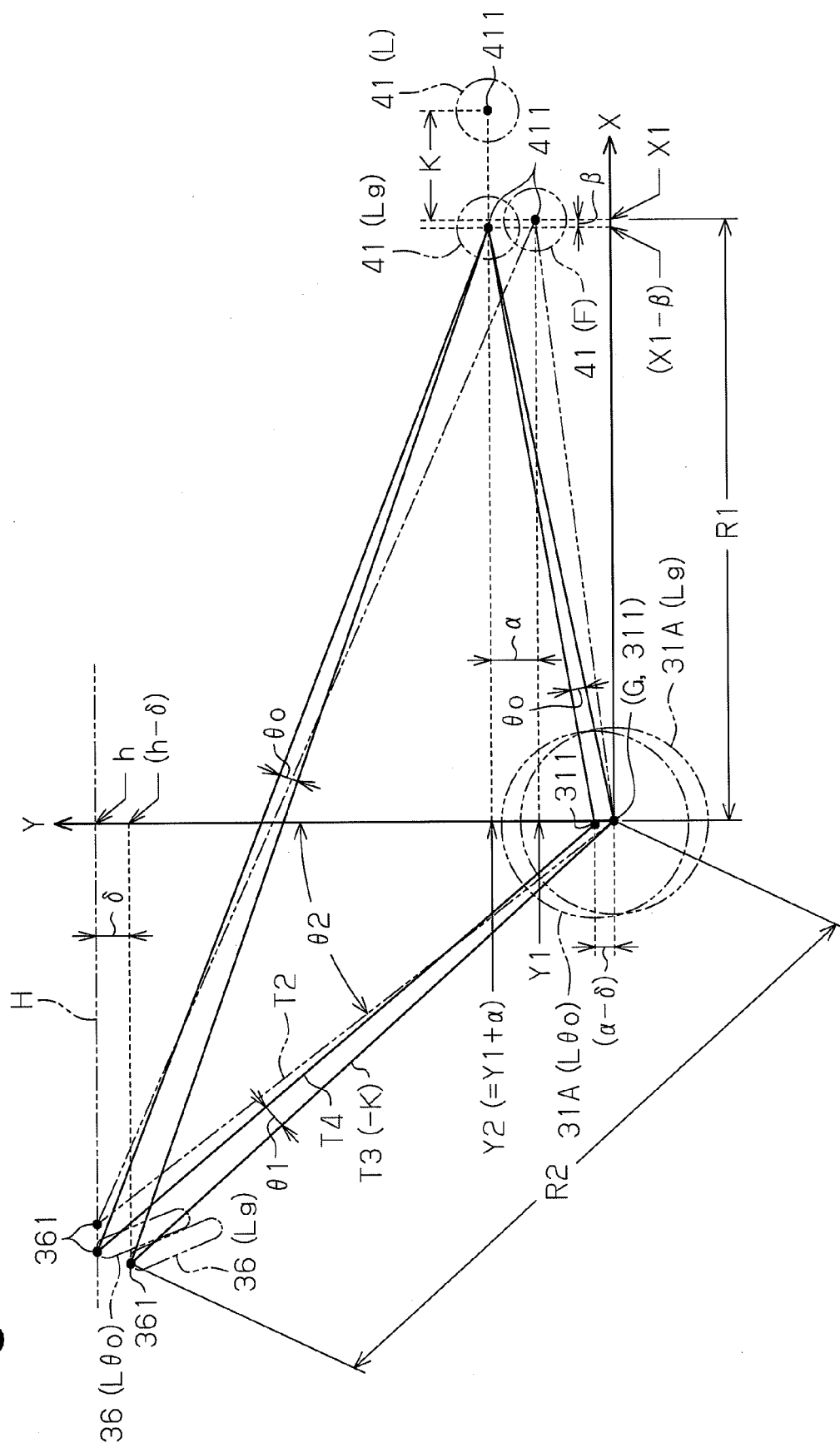
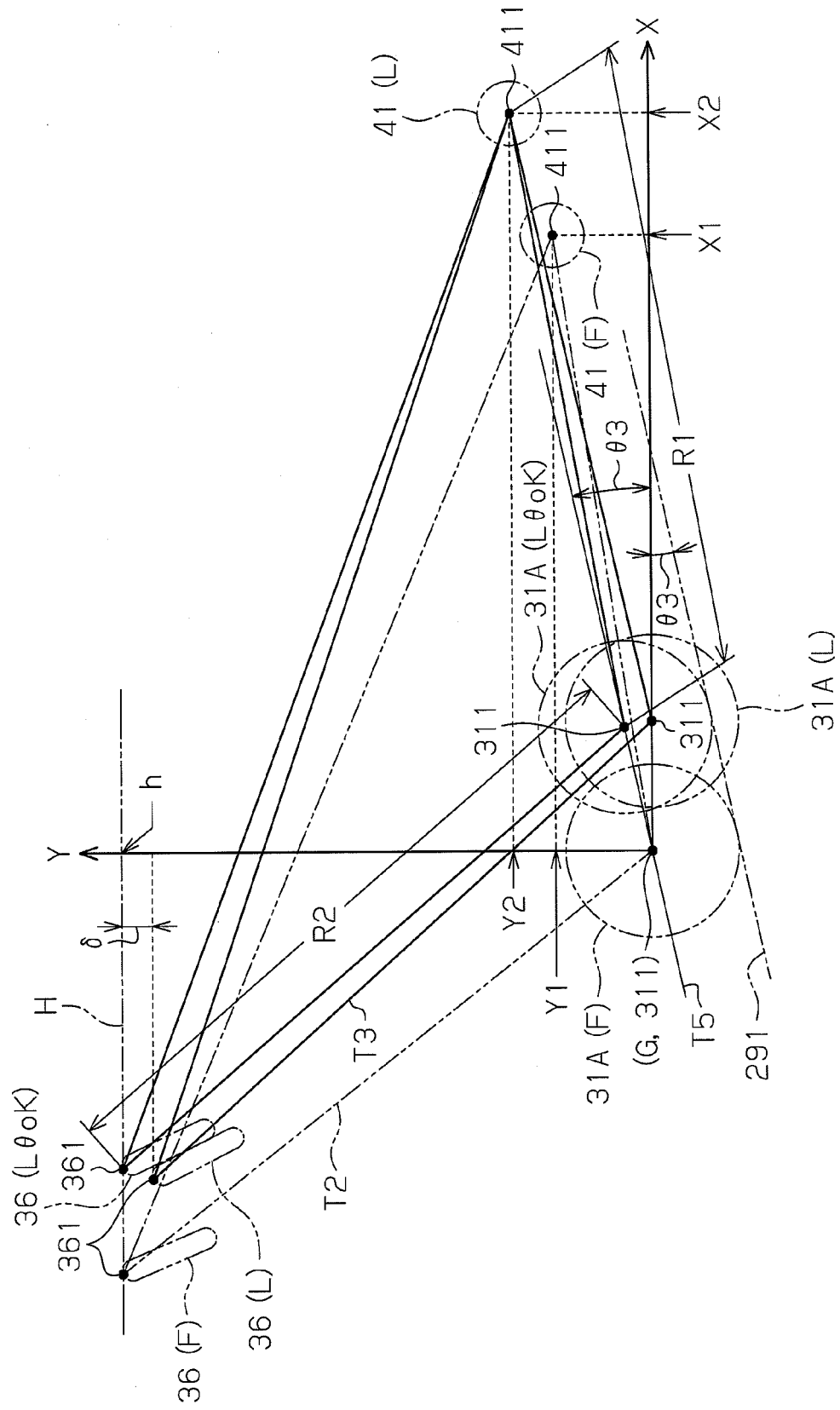


Fig.7

89.1

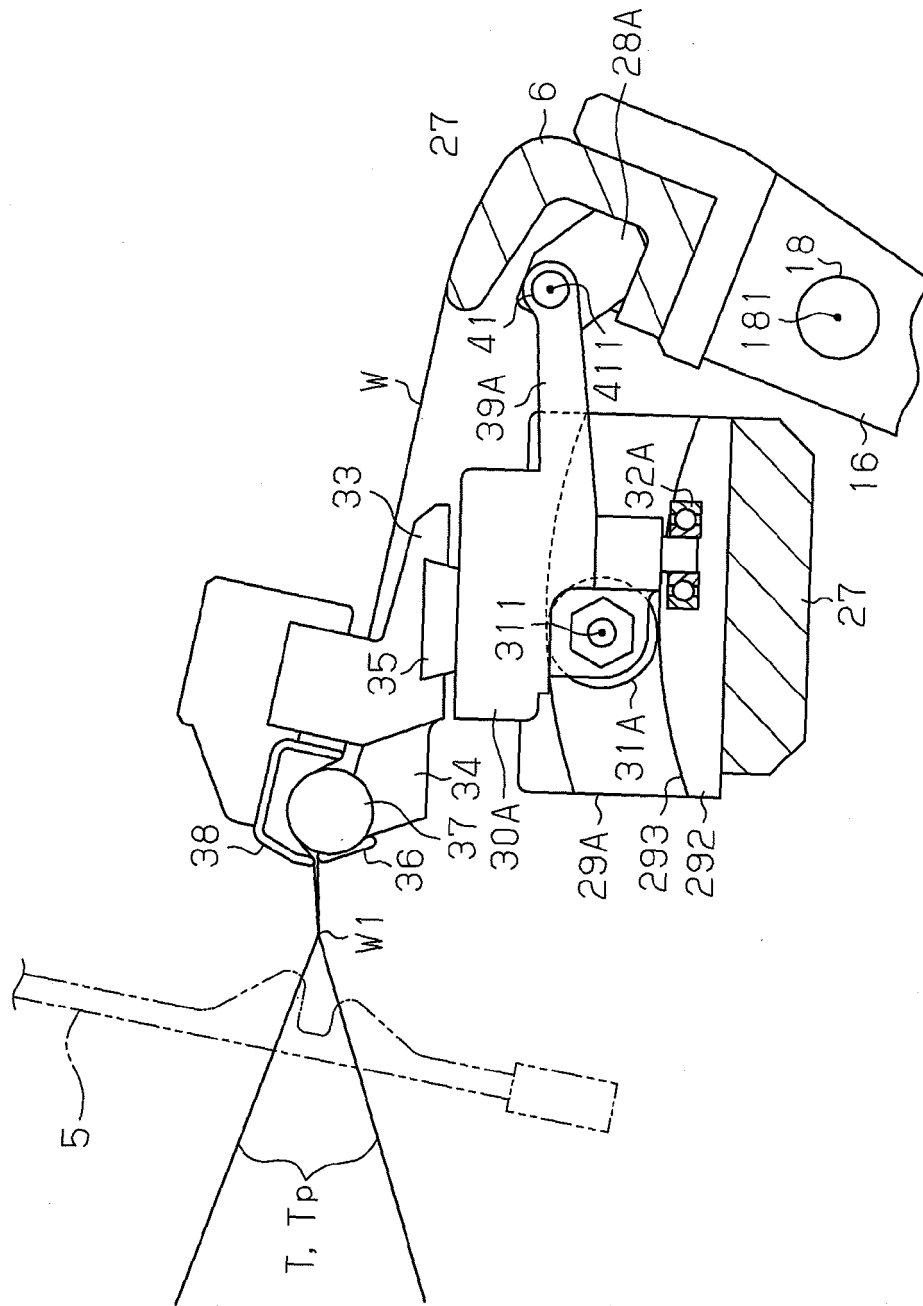


Fig. 9

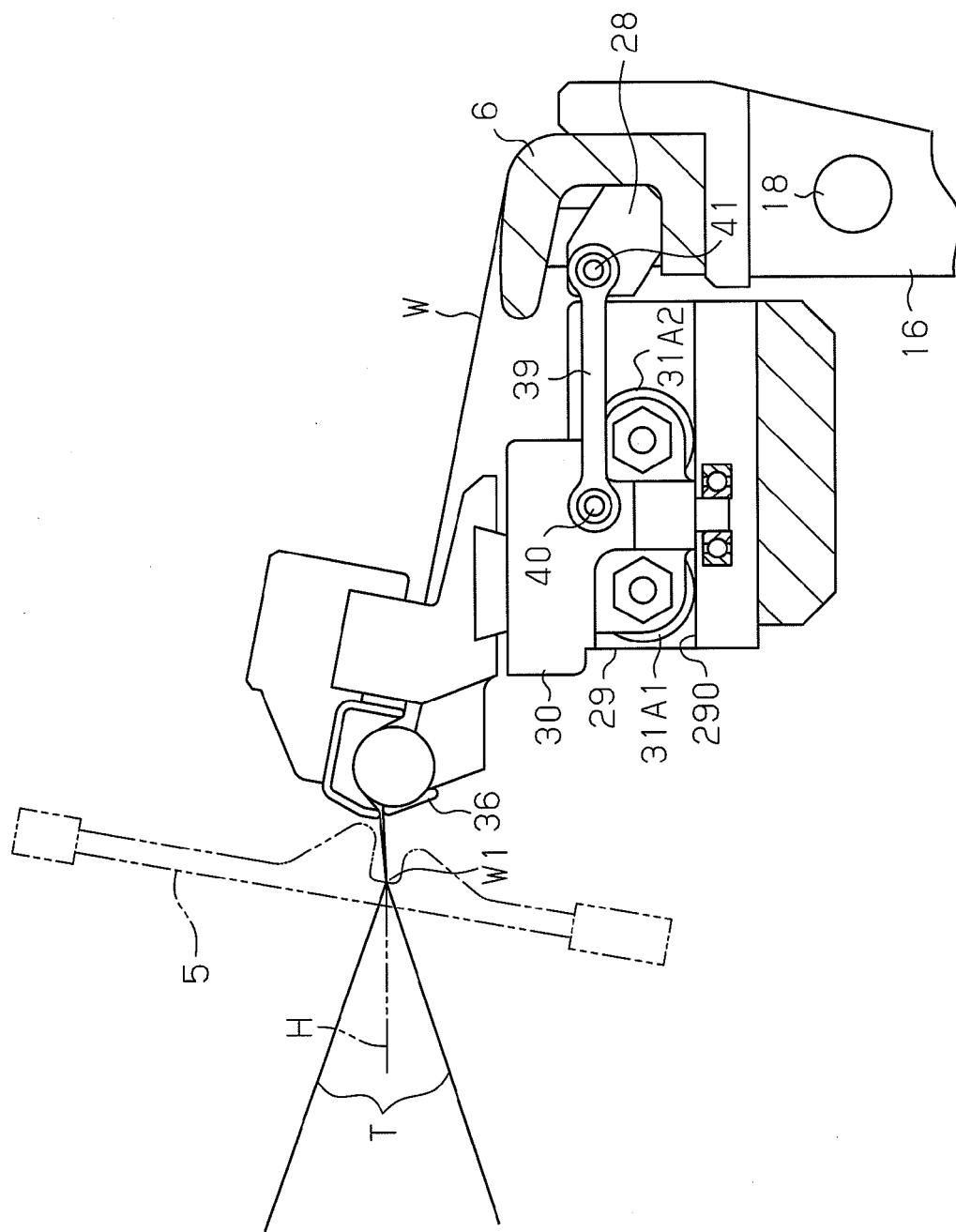


Fig.10A

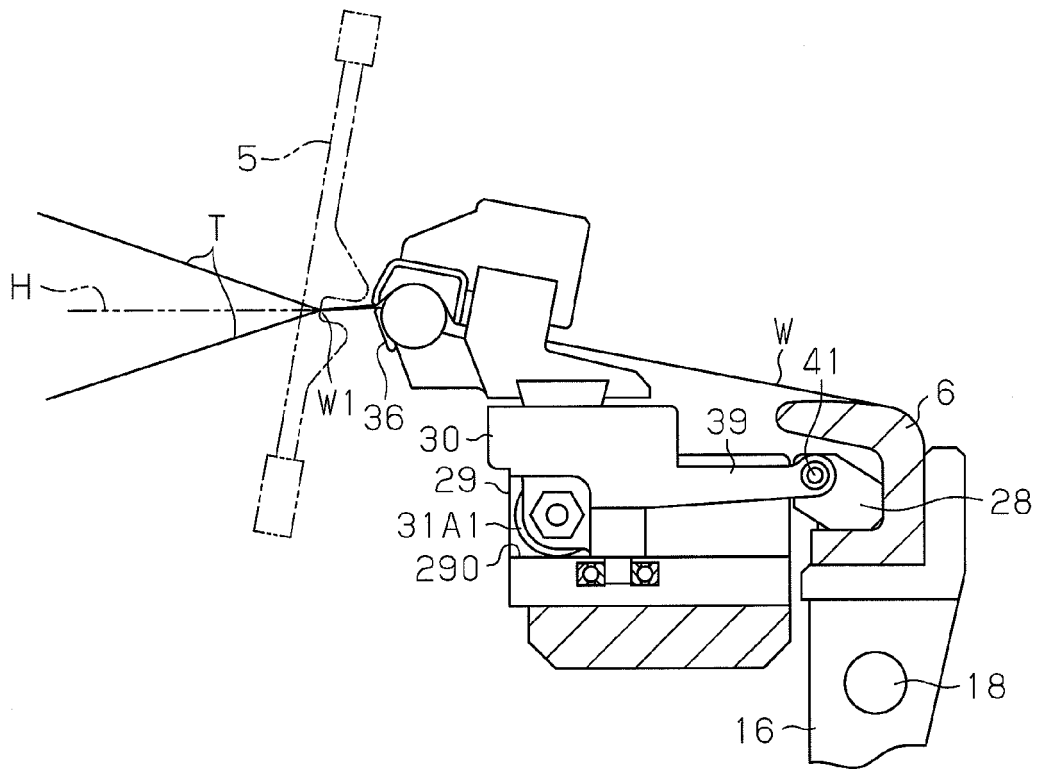
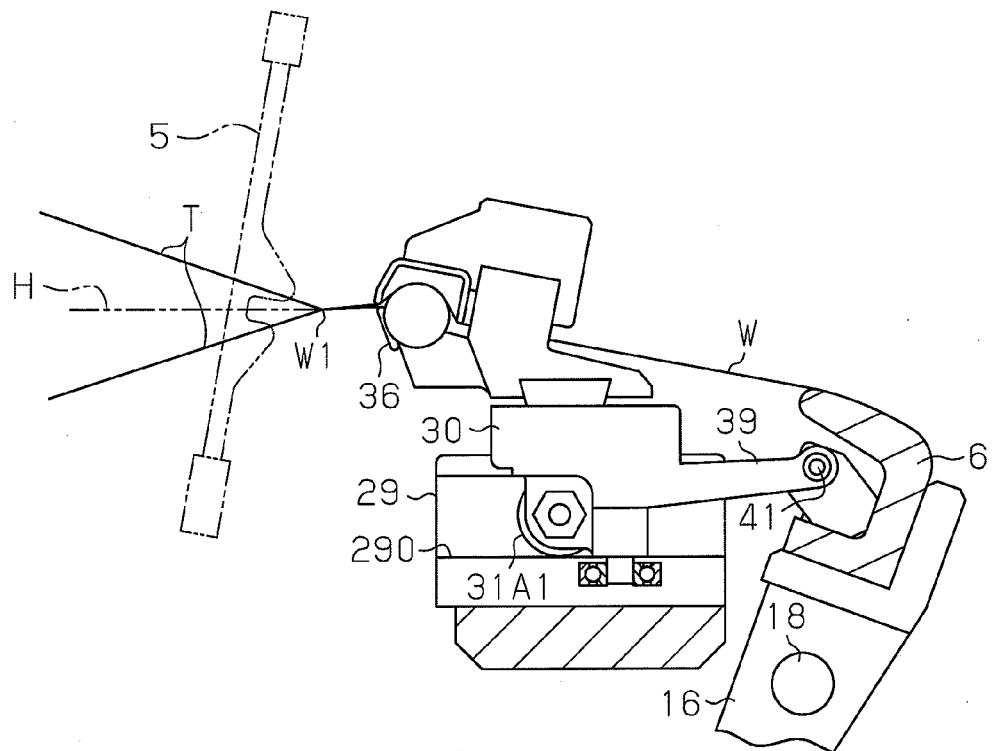


Fig.10B



REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 7090751 A [0002]