(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 323 098 A2**

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **88312010.7**

(51) Int. Cl.⁴: **B65H 54/38**

(22) Date of filing: **19.12.88**

(30) Priority: **29.12.87 JP 201023/87**

(43) Date of publication of application:
05.07.89 Bulletin 89/27

(84) Designated Contracting States:
DE FR GB IT

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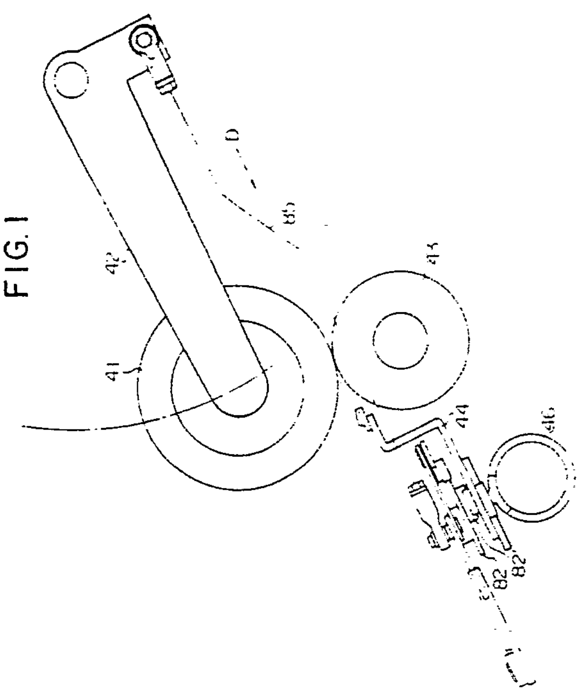
(54) **Axial disturbance device used in yarn take-up machine.**

(57) An axial disturbance device used in a yarn take-up machine which includes a traversing yarn guide (44) for winding a yarn on a yarn package (41) supported on a cradle arm (42), and a cam member (82) rotatable about a fixed axis, the traverse width of the traversing yarn guide (44) being changed by the rotation of the cam member (82) about the fixed axis; comprising: an axial disturbance link (84) rotatably supported on the cam member (82) and having a cam surface (89); a cam-member tilting rod (85) connected at its one end to the cradle arm (42) of the yarn package (41) and at its the other end to the axial disturbance link (84); a cam-member stopping link (87) rotatably supported on a fixed shaft (86) and engageable with the cam member (82), the stopping link (87) being connected with the cam-member tilting rod (85); an axial disturbance bar (92) disposed and movable in parallel relationship to the cam member (82); and an axial disturbance cam (91) rotatably supported on the axial disturbance bar (92) and engaged with the cam surface (89) of the axial disturbance link (84).

FIG. 1



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AXIAL DISTURBANCE DEVICE USED IN YARN TAKE-UP MACHINE

FIELD OF THE INVENTION

The present invention relates in general to an axial disturbance device, and in particular to an axial disturbance device used in a yarn take-up machine wherein a yarn being consecutively supplied at a constant speed is wound on the cheese package by the traversing yarn guide.

DESCRIPTION OF THE PRIOR ART

In yarn take-up machines and the like, a yarn being consecutively supplied at a constant speed is normally wound on a cheese package. The package is driven in contact with the surface of a friction roller which rotates at a high speed, and the yarn is reciprocated in the axial direction of the package by a traversing yarn guide which generally runs at a constant speed from the left to the right. In the winding of such a yarn, a so-called axial disturbance is normally made in order to prevent a so-called "the high of selvage".

The relation $\alpha = tT + 100t$ between the time t in which the axial disturbance is being made and the time T in which the traversing yarn guide is reciprocating with the maximum traverse width, is called an axial disturbance ratio, and if this becomes closer to 100 %, the occurrence of the high of selvage in the package is reduced, whereas if the α is increased, the yarn is subject to drop from the package. For this reason, the α needs to be determined properly. Consequently, a device is required in which while the yarn is being wound on the cheese package, an optimum axial disturbance ratio can be applied as the yarn layer on the cheese package increases.

Fig. 8 illustrates a conventional axial disturbance device which is used in a generally known yarn take-up machine. Since a winding method for winding a yarn on a package with the use of a traversing yarn guide is a generally well known method, the detailed description will be omitted as to the method.

In Fig. 8, reference numeral 1 designates a package which is supported at its opposite ends by a cradle arm 2 and is firmly engaged with a friction roller 3. A traversing yarn guide is designated by reference numeral 4, and a traverse drum with a groove for traversing motion by reference numeral 6. The traverse width of the traversing yarn guide 4 is changed as the yarn layer on the package 1 increases, by changing the tilt of a cam member (not shown) through a cam-member tilting rod 14 by an axial disturbance device T.

The axial disturbance device T comprises a generally y-shaped arm 17 which is freely rotatably supported on a shaft 18 fixed to the support structure (not shown) of the device. On one arm position 20 of the y-shaped arm 17 is freely rotatably supported a generally L-shaped arm 23 having two arm portions 21 and 22, and the arm portion 21 of the generally L-shaped arm 23 is connected at 25 with the aforesaid cam-member tilting rod 14 for tilting the cam member (not shown).

The other two arm portions 26 and 27 of the y-shaped arm 17 has cam rollers 28 and 29 mounted thereon, respectively, and in connection with the cam roller 28 there is provided an eccentric cam 30 which is supported on the support structure (not shown) and slowly rotated in accordance with a predetermined program by suitable drive means (not shown), and in connection with the cam roller 29, a plate cam 32 is provided through a bracket 31 in the aforesaid cradle arm 2. Also, on the other arm 22 of the generally L-shaped arm 23 is supported a cam roller 33 which is held in engagement with a 1/3 circular cam 34 fixed through the bracket 31 to the cradle arm 2. Reference numeral 35 denotes a spring provided between the shaft fixed to the support structure (not shown) and the shaft on the y-shaped arm 17. The spring 35 serves to urge the y-shaped arm 17 in the clockwise direction in Fig. 8.

The operation of the aforesaid conventional axial disturbance device will hereinafter be described. The width that the traversing yarn guide 4 reciprocates, i.e. the traverse width is decreased when the cam-member tilting rod 14 is moved away from the friction roller 3 in the direction indicated by the arrow R in Fig. 8 by the axial disturbance device T and is increased when the cam-member tilting rod 14 is moved in the opposite direction toward the friction roller 3.

Fig. 9 schematically illustrates the relative position assumed by the components of the conventional breaking device at the beginning of winding. In this situation, the cam roller 33 of the generally L-shaped arm 23 is engaged with the proximal side of the 1/3 circular cam 34, the generally L-shaped arm 23 is rotated about the shaft 24 in the clockwise direction, and the cam-member tilting rod 14 is moved toward the friction roller 3. At this point in time, the traverse width is the maximum width. As the yarn layer of the package 1 increases, the cradle arm 2 is rotated in the anticlockwise direction and raised. This upward movement of the cradle arm 2 causes the cam roller 33 to move along the cam surface of the 1/3 circular cam 34 from the proximal side of the cam 34 to the distal side of the cam 34. Consequently, the generally L-shaped arm 23 is rotated anticlockwise about the shaft 24, the cam-member tilting rod 14 is moved away from the friction roller 3, and thus the traverse width is gradually reduced. The gradual reduction in this traverse width is indicated by the gradients of two two-dot chain lines M and M′ shown in Fig. 2. (Since the device of the present invention and the conventional device are similar in respect of the package profile, Fig. 2 which shows the traversing condition of the present invention can be utilized). Thereafter, the fulcrum 24 of the generally L-shaped arm 23 is oscillated laterally with a short cycle by the rotation of the eccentric cam 30, and therefore the cam-member tilting rod 14 is also oscillated according to the eccentric amount of the eccentric cam 30. Consequently, the axial disturbance motion is made within a predetermined width L (Fig. 2). The locus of the axial disturbance motion is indicated by the zigzag line N between the aforesaid two chain lines M and M′ shown in Fig. 2. Fig. 3 schematically illustrates on enlarged scale the locus of the axial disturbance motion, and the straight line portion Nf of the left side of the zigzag line N is a portion wherein the traversing motion is made with the maximum width, while the trough portion Nc is a portion wherein the axial disturbance motion is made. The ratio of the Nf portion and the Nc portion may be changed by changing the program of the motion of the eccentric cam. In the conventional device, without changing the program of the motion of the eccentric cam 30, the axial disturbance ratio is made small at the beginning of winding and gradually increased as the yarn layer on the package increases, and after a predetermined time the axial disturbance ratio is maintained an increased constant value.

More particularly, in the device shown in Figs. 8 through 11, the aforesaid plate cam 32 fixed to the cradle arm 2 is brought into engagement with the cam roller 29 of the y-shaped arm 17 at the beginning of winding in order that the clockwise rotation of the y-shaped arm 17 caused by the rotation of the eccentric cam 30, i.e., the rotation in the direction in which the traverse width is increased is prevented at a predetermined position, thereby reducing the eccentric amount to dL at the time of the beginning of winding (Fig. 3).

Consequently, within the range of angle wherein the clockwise rotation is prevented by the plate cam 32 (Figs. 9 and 10), the eccentric amount of the y-shaped arm 17 becomes less than L (Fig. 3) regardless of the operation of the eccentric cam 30. If the yarn layer on the package 1 increases and the plate cam 32 is disengaged from the cam roller 29 by the rotation of the cradle arm 2 (when the condition in Fig. 10 is transferred to the condition in Fig. 11), a yarn is wound with the selvage amount of the eccentric amount L and with the axial disturbance ratio corresponding to the program of the motion of the eccentric cam 30, by the y-shaped arm 17 and L-shaped arm 23 in cooperation with the the cam roller 28, eccentric cam 30, cam roller 33 and the 1/3 circular cam 34.

However, the conventional axial disturbance device has its disadvantages in that the device is structurally complicated, costly and difficult to assemble, since the mechanism is extremely complicated.

Accordingly, it is the object of the present invention to provide an improved axial disturbance device which is relatively structurally simple.

SUMMARY OF THE INVENTION

The foregoing object is accomplished in accordance with the present invention by providing an axial disturbance device used in a yarn take-up machine which includes a traversing yarn guide for winding a yarn on a yarn package supported on a cradle arm, and a cam member rotatable about a fixed axis, the traverse width of the traversing yarn guide being changed by the rotation of the cam member about the fixed axis; comprising: an axial disturbance link rotatably supported on the cam member and having a cam surface; a cam-member tilting rod connected at its one end to the cradle arm of the yarn package and at its the other end to the axial disturbance link; a cam-member stopping link rotatably supported on a fixed shaft and engageable with the cam member, the stopping link being connected with the cam-member tilting rod; an axial disturbance bar disposed and movable in parallel relationship to the cam member; and an axial disturbance cam rotatably supported on the axial disturbance bar and engaged with the cam surface of the axial disturbance link.

The axial disturbance device may further comprise means for urging the axial disturbance link into engagement with the axial disturbance cam, and means for urging the axial disturbance cam into engagement with the axial disturbance link.

The axial disturbance bar may be movable between first, second and third positions, the cam-member stopping link being engaged with the cam member while the axial disturbance bar is moved from the first position to the second position, and the cam-member stopping link being disengaged from the cam member while the axial disturbance bar is moved from the second position to the third position.

BRIEF DESCRIPTION OF THE DRAWINGS

The drawbacks of a conventional axial disturbance device and the features and advantages of an axial disturbance device according to the present invention will be more clearly understood from the following description taken in conjunction with the accompanying drawings:

Figure 1 is a side view showing an axial disturbance device according to the present invention which is employed in a generally known yarn take-up machine:

Figure 2 schematically illustrates the change in the axial disturbance amount of the yarn package:

Figure 3 is an enlarged view showing the change in the axial disturbance amount of the yarn package:

Figure 4 is a top plan view of the axial disturbance device according to the present invention, the device being shown in the position it assumes at the beginning of winding;

Figure 5 is an enlarged view of the axial disturbance link and the axial disturbance bar shown in Figure 4, the link and bar being shown in the position wherein the axial disturbance operation is not made;

Figure 6 is a view similar to Figure 4 showing the relative positions assumed by the components of the device at the time the diameter of the yarn package is ϕB shown in Figure 2;

Figure 7 is a view similar to Figure 6 showing the relative positions assumed by the components of the device at the time the diameter of the yarn package is more than the ϕB;

Figure 8 is a side view of a conventional axial disturbance device which is used in a generally known yarn take-up machine;

Figure 9 is a schematic view showing the relative positions assumed by the components of the conventional breaking device at the beginning of winding;

Figure 10 is a view similar to Figure 9 showing the positions assumed by the components of the conventional breaking device at a particular stage in the winding operation; and

Figure 11 is a view similar to Figure 10 showing the positions assumed by the components of the conventional breaking device at a further particular stage in the winding operation.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring more particularly to the drawings where the showings are for the purpose of illustrating a preferred embodiment of the invention only and not for the purpose of limiting same, Fig. 1 shows the invention incorporated in an axial disturbance device.

In Fig. 1, reference numeral 41 designates a yarn package on which a yarn being consecutively supplied at a constant speed is wound. The yarn package 41 is supported at its opposite ends by a cradle arm 42 and driven in contact with the surface of a friction roller 43 which rotates at a high speed, and the yarn is reciprocated in the axial direction of the yarn package 41 by a traversing yarn guide 44. A traverse drum is designated by reference numeral 46, a cam member by 82, a guide groove for traversing motion by 82′, and a cam-member tilting rod by 85.

Fig. 4 is a view which serves to explain the mechanism of the axial disturbance device according to the present invention, and the device is shown in the position it assumes at the beginning of winding. The aforesaid cam member 82 is freely rotatably supported on a fixed shaft 81, and formed with the axially elongaged guide groove 82′ substantially parallel to the yarn package 41. In the guide groove 82′ is received the proximal portion of the traversing yarn guide 44 (Fig. 1), and the traverse width of the traversing yarn guide 44 is changed by the tilt of the cam member 82. The cam member 82 is connected at its one end with the cradle arm 42 (Fig. 1) through an axial disturbance link 84 and the cam-member tilting rod 85. The axial disturbance link 84 is freely rotatably supported on a shaft 83 fixed to one end of the cam member 82, and rotated about the shaft 83 by the movement of the cam-member tilting rod 85.

On the other hand, on a fulcrum shaft 86 fixed to the frame of the yarn traversing unit (including the aforesaid traversing yarn guide 44), there is freely rotatably supported a cam-member stopping link 87 which is connected through a link 88 with the cam-member tilting rod 85. The axial disturbance link 84 has a cam surface 89 which is always held in engagement with the cam surface 96 of an axial disturbance cam 91, with the use of a spring 90. The axial disturbance cam 91 is supported on a shaft 93 mounted in an axial disturbance bar 92. The axial disturbance cam 91 is pulled in the anticlockwise direction by a spring 94, and the cam surface 96 is held substantially perpendicularly to the shaft of a scroll cam (not shown) by the step 95.

At the beginning of winding, the traverse width is set to a predetermined traverse width (between A-A′ of Fig. 2) at the position at which the cam member 82 contacts with the stopper 97 of the cam-member stopping link 87.

It is assumed that the home position H of the left side of the axial disturbance bar 92 is a position where the cam surface 96 of the axial disturbance cam 91 and the cam surface 89 of the axial disturbance link 84 are contacted with each other and furthermore the axial disturbance cam 91 can be rotated about the shaft 93 in the clockwise direction against the spring 94.

When the axial disturbance bar 92 moves to the right from the home position H, the movement of the axial disturbance link 84 is limited by the axial disturbance cam 91 until the shaft 93 is moved to the position $93'$, as shown in Fig. 5, and thereafter the axial disturbance is made while the shaft 93 moves from the position $93'$ to the position $93''$ (Fig. 4). That is, the movement of the shaft 93 from the position 93 to the position $93'$ becomes the Nf portion of Fig. 3, while the movement of the shaft 93 from the position $93'$ to the position $93''$ becomes the Nc portion. As previously indicated, the axial disturbance needs not to be adjusted purposely, and can be made with a constant cycle.

As the yarn layer on the package 41 increases gradually, the cradle arm 42 is rotated upwardly in the clockwise direction in Fig. 1 and the cam-member tilting rod 85 is moved in the direction D shown in Figs. 1 and 4. That is, the cam-member tilting rod 85 is lowered in the direction D in Fig. 4. This movement of the cam-member tilting rod 85 causes the axial disturbance link 84 to be lowered along the cam surface 96 of the axial disturbance cam 91, and the cam member 82 to rotate downward about the fixed shaft 81 in the clockwise direction (i.e. the right end is lowered in Fig. 4). Furthermore, the cam-member stopping link 87 is also lowered through the link 88 and rotated downward about the shaft 86 in the clockwise direction by the cam-member tilting rod 85. When this occurring, the stopper 97 of the cam-member stopping link 87 is lowered at a speed of a ratio (distance between shafts 86 and 97) (distance between shafts 86 and 98). The stopper 97 and the cam member 82 are engaged with each other until the position shown in Fig. 6, for limiting the anticlockwise rotation of the cam member 82 about the fixed shaft 81 and thus limiting the maximum traverse width. The stopper 97 is disengaged from the cam member 82 at the position lower than the position of Fig. 6, and the relative positions assumed by the stopper 97 and the cam member 82 become as shown in Fig. 7. That is, the relative position shown from Fig. 4 to 6 corresponds to the condition until the diameter of the yarn package 41 becomes ϕB of Fig. 2, and the maximum traverse width changes along the AC line shown in Fig. 2 (i.e. the M'' line). In the condition of Fig. 7 (in the position larger than the ϕB), there is no limitation by the stopper 97, and the axial disturbance operation is made between the lines M and M'.

In Figs. 4 through 7, the two-dot chain line $91''$ indicates the position that the axial disturbance cam 91 assumes when the shaft 93 is moved to the position $93''$, and the two-dot chain line $84'$ indicates the position that the axial disturbance link 44 assumes when the cam 91 is moved to the position $91''$.

The operation of the axial disturbance device according to the present invention will hereinafter be described.

As shown in Fig. 2, when the yarn being supplied at a constant speed is wound on the winding core 51 while it is reciprocated in the axial direction of the yarn package 41 by the traversing yarn guide 44, the cam surface for traversing is tilted and thus the traverse width is gradually decreased as the yarn layer on the yarn package increases, and the gradient of the traverse width is shown by the line M. Furthermore, the axial disturbance is made as shown by the zigzag line N between the lines M and M', with the use of the axial disturbance bar and the like. Also, with aid of the cam-member stopping link 87, the maximum traverse width is limited from the beginning of winding to the ϕB, as shown by the line AC, and the amount of axial disturbance is also small as shown by dL. As clearly shown in Fig. 3, the maximum traverse width is limited from the beginning of winding to the ϕB, and changed along the line M''. The axial disturbance consists of the flat portion Nf of the line N defined by the lines M'' and N, and the zigzag portion Nc of the line N. If the maximum traverse width is not limited and the axial disturbance is made between the lines M and M', the line N becomes as shown by broken lines and the ratio of Nf and Nc becomes constant. However, since the maximum traverse width is limited until a predetermined position and changes along the line M'', the Nf portion is gradually reduced and the ratio of the Nf and Nc portions changes gradually and becomes constant after the ϕB. Thus, by the combination of the axial disturbance operation and the limitation to the maximum traverse width, the axial disturbance ratio can be adjusted to a desired value, and furthermore, this can be achieved in accordance with the present invention by a device which is relatively structurally simple.

From the foregoing description, it will be seen that an improved, simple axial disturbance device is afforded by the present design.

While a certain representative embodiment and details have been shown for the purpose of illustrating the invention, it will be apparent to those skilled in this art that various changes and modifications may be made therein without departing from the scope of the invention.

Claims

1. An axial disturbance device used in a yarn take-up machine which includes a traversing yarn guide (44) for winding a yarn on a yarn package (41) supported on a cradle arm (42), and a cam member (82) rotatable about a fixed axis, the traverse width of said traversing yarn guide (44) being changed by the rotation of said cam member (82) about said fixed axis; comprising:
an axial disturbance link (84) rotatably supported on said cam member (82) and having a cam surface (89);
a cam-member tilting rod (85) connected at its one end to said cradle arm (42) of said yarn package (41) and at its the other end to said axial disturbance link (84);
a cam-member stopping link (87) rotatably supported on a fixed shaft (86) and engageable with said cam member (82), the stopping link (87) being connected with said cam-member tilting rod (85);
an axial disturbance bar (92) disposed and movable in parallel relationship to said cam member (82); and
an axial disturbance cam (91) rotatably supported on said axial disturbance bar (92) and engaged with said cam surface (89) of said axial disturbance link (84).

2. An axial disturbance device as set forth in claim 1, which further comprises means (90) for urging said axial disturbance link (84) into engagement with said axial disturbance cam (91), and means (94) for urging said axial disturbance cam (91) into engagement with said axial disturbance link (84).

3. An axial disturbance device as set forth in claim 1, wherein said axial disturbance bar (92) is movable between first, second and third positions (93, 93′, 93″), said cam-member stopping link (87) being engaged with said cam member (82) while said axial disturbance bar (92) is moved from said first position to said second position, and said cam-member stopping link (87) being disengaged from said cam member (82) while said axial disturbance bar (92) is moved from said second position to said third position.

4. An axial disturbance device as set forth in claim 2, wherein said axial disturbance bar (92) is movable between first, second and third positions (93, 93′, 93″), said cam-member stopping link (87) being engaged with said cam member (82) while said axial disturbance bar (92) is moved from said first position to said second position, and said cam-member stopping link (87) being disengaged from said cam member (82) while said axial disturbance bar (92) is moved from said second position to said third position.

FIG.1

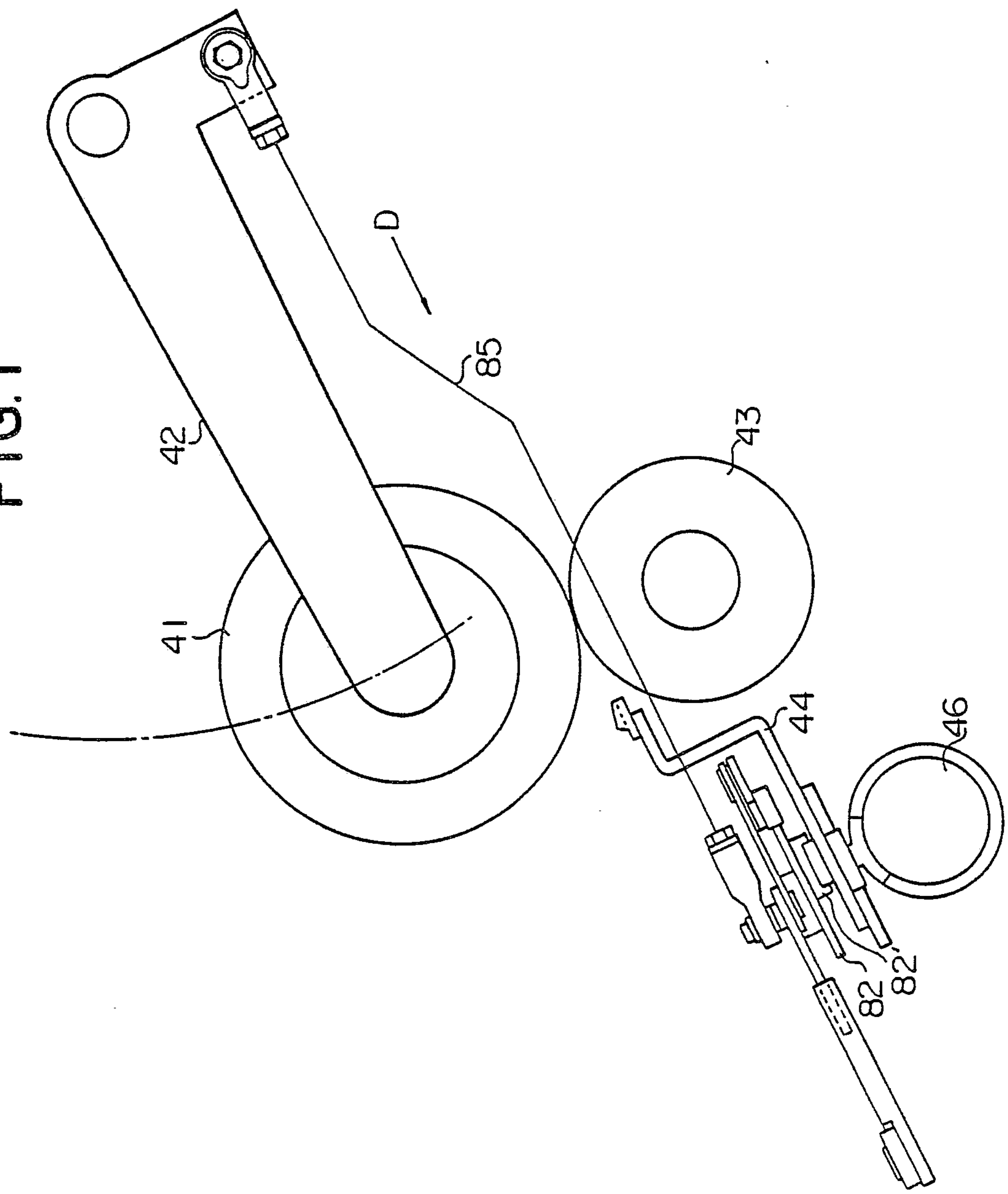
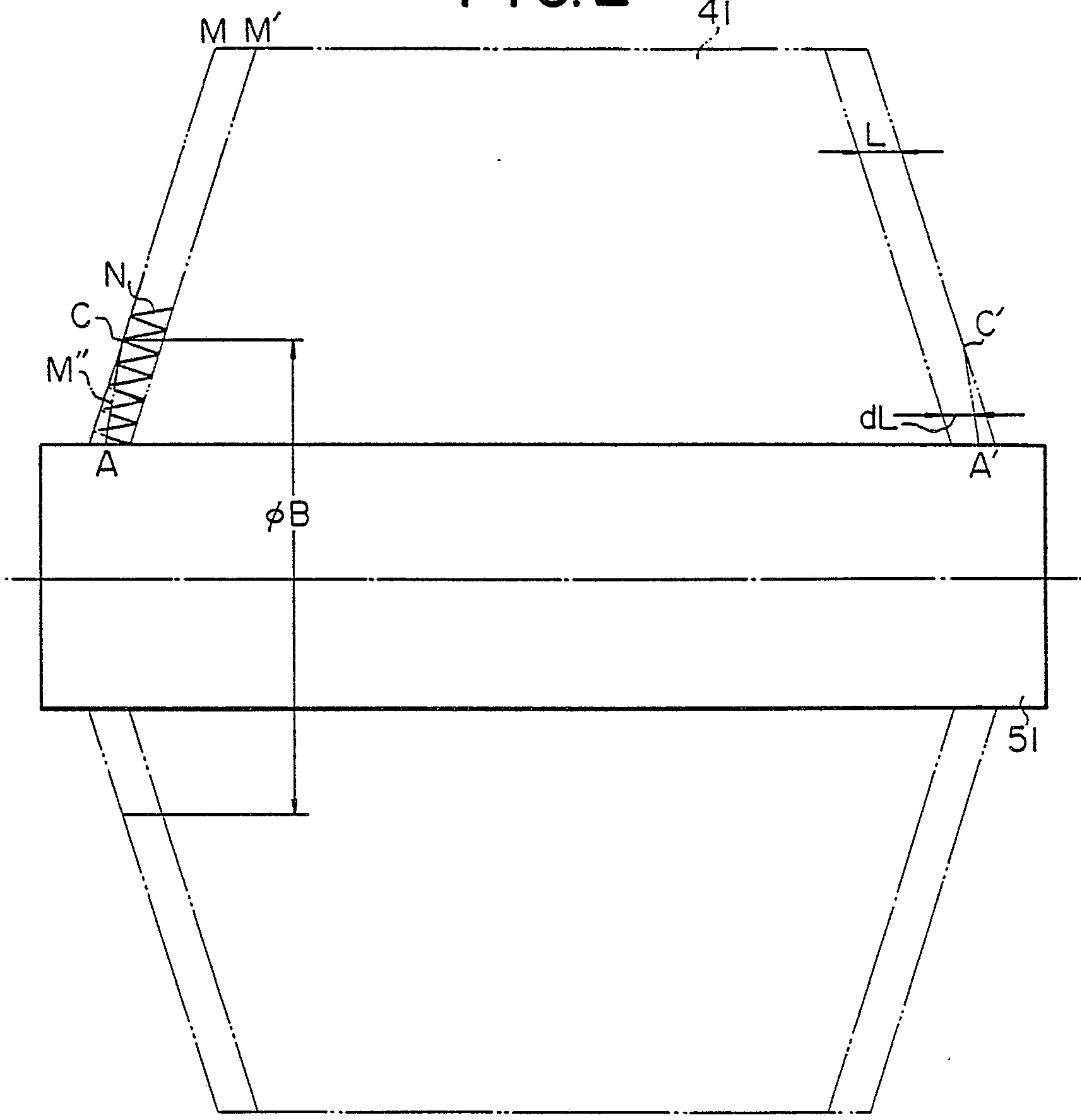


FIG. 2



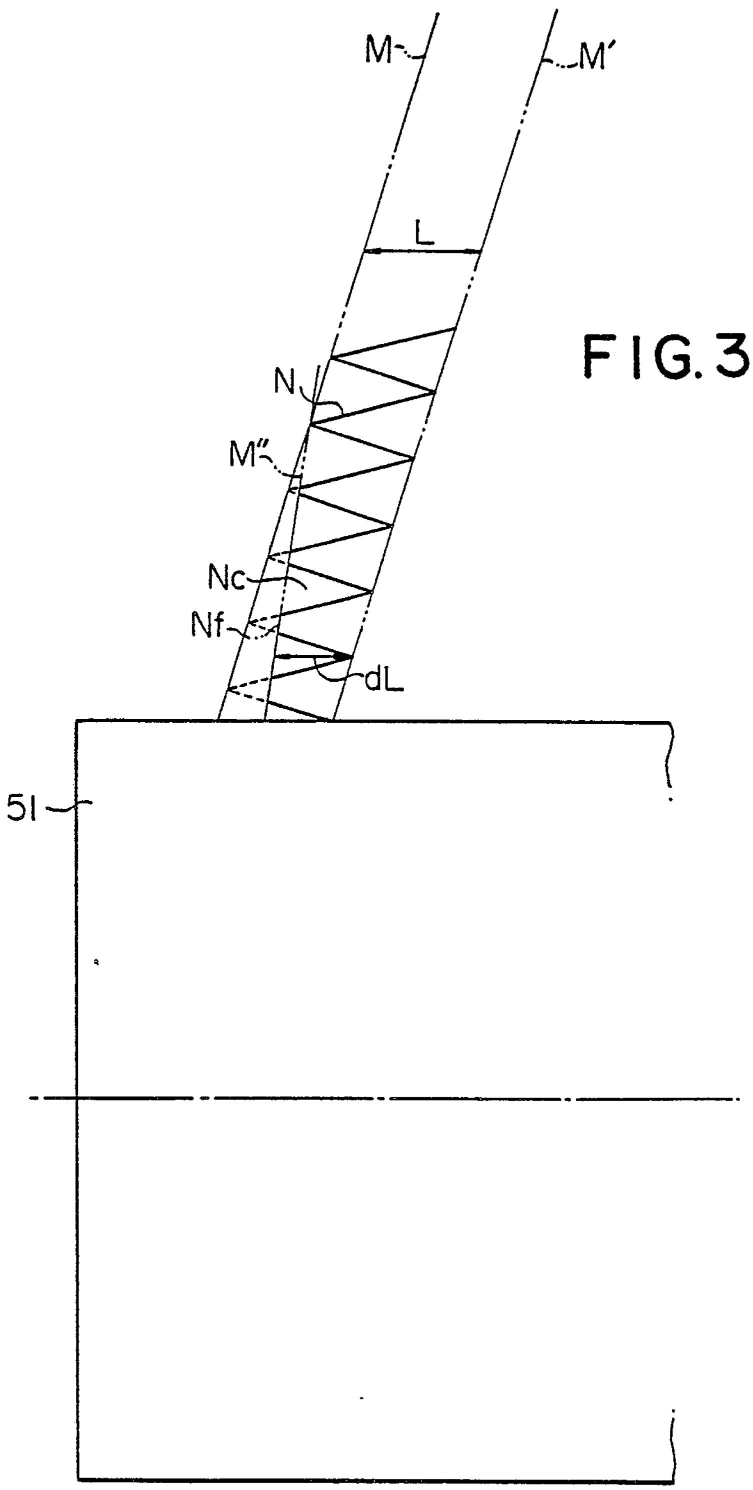


FIG. 3

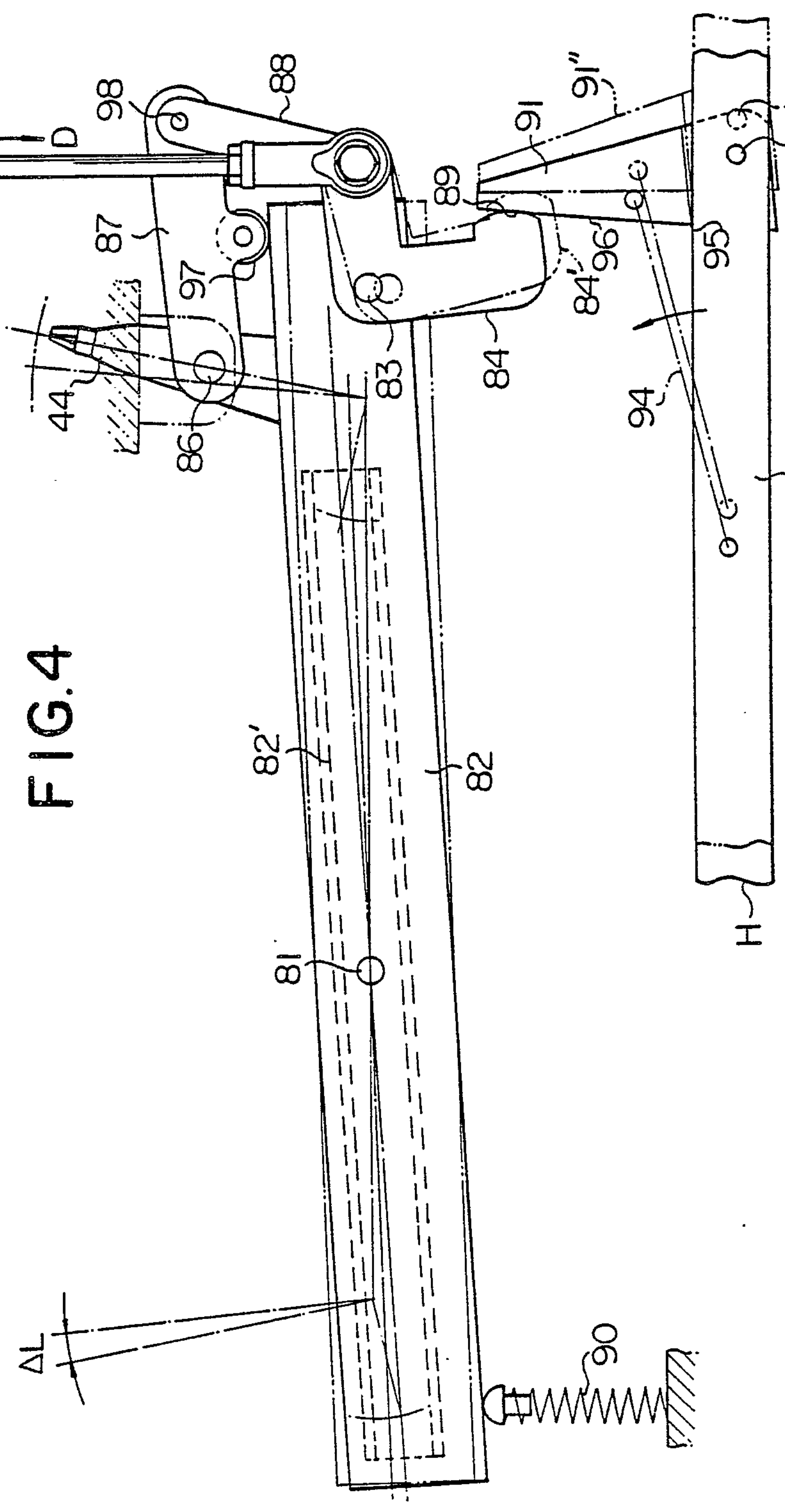

85
D
98
88
87
97
89
91
91''
93''
93
95
96'
84'
84
83
44
86
94
92
82'
82
H
81
ΔL
90

FIG.4

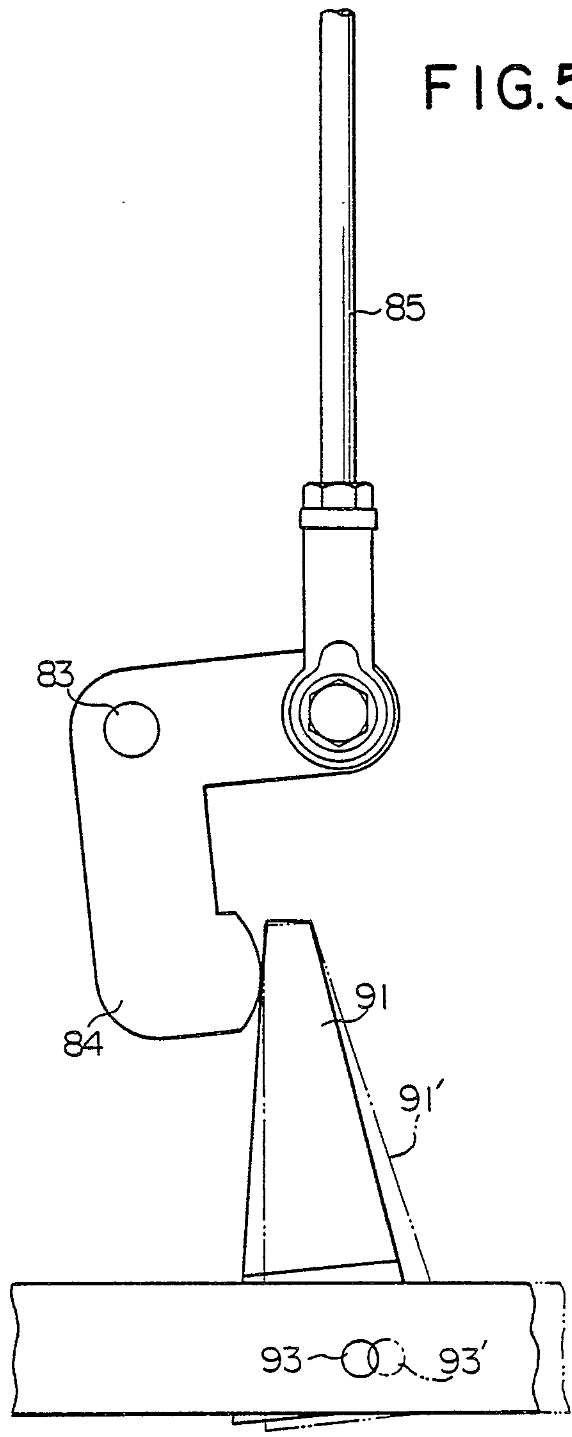


FIG.5
85
83
91
84
91'
93
93'

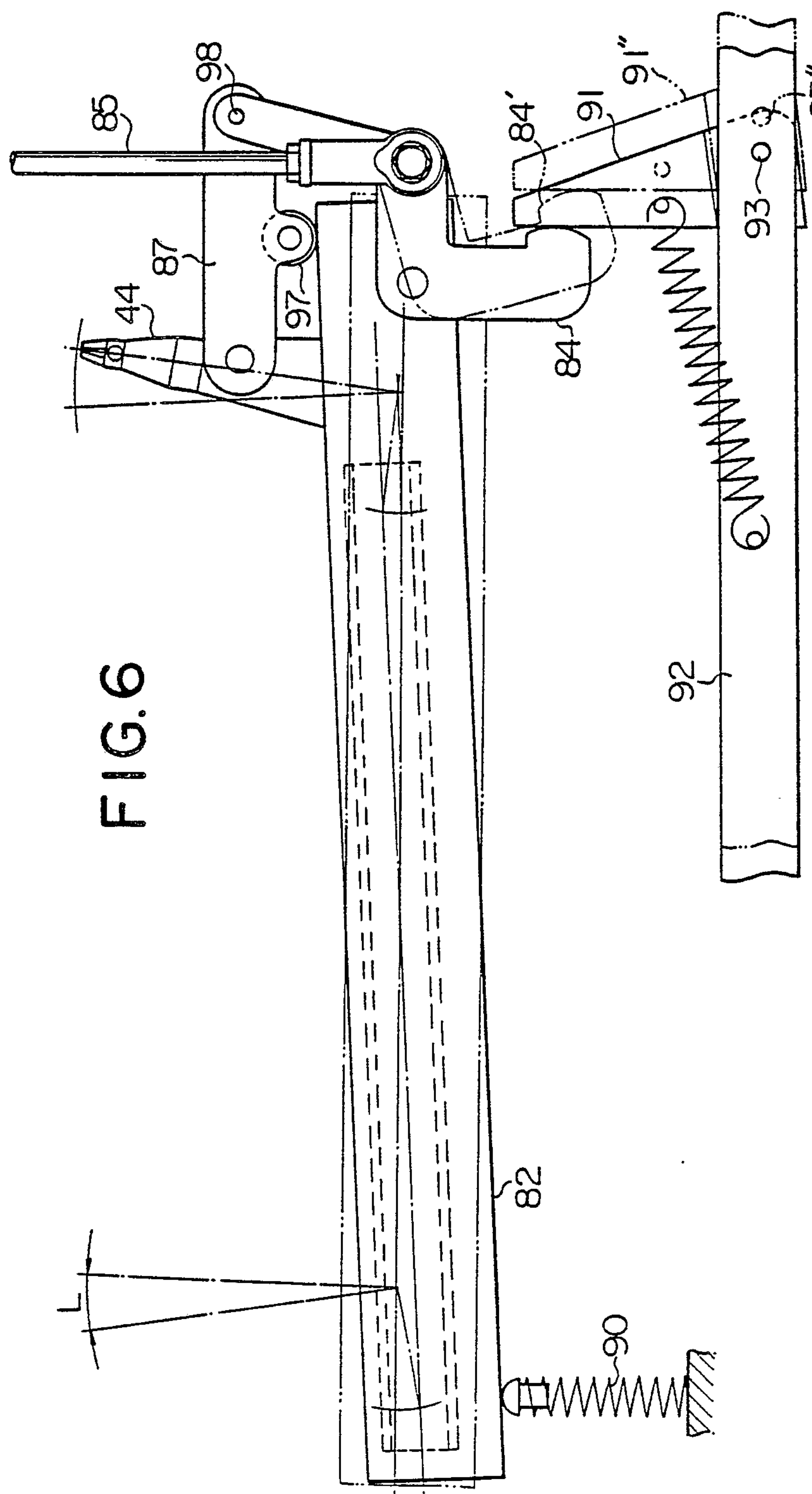


FIG.6

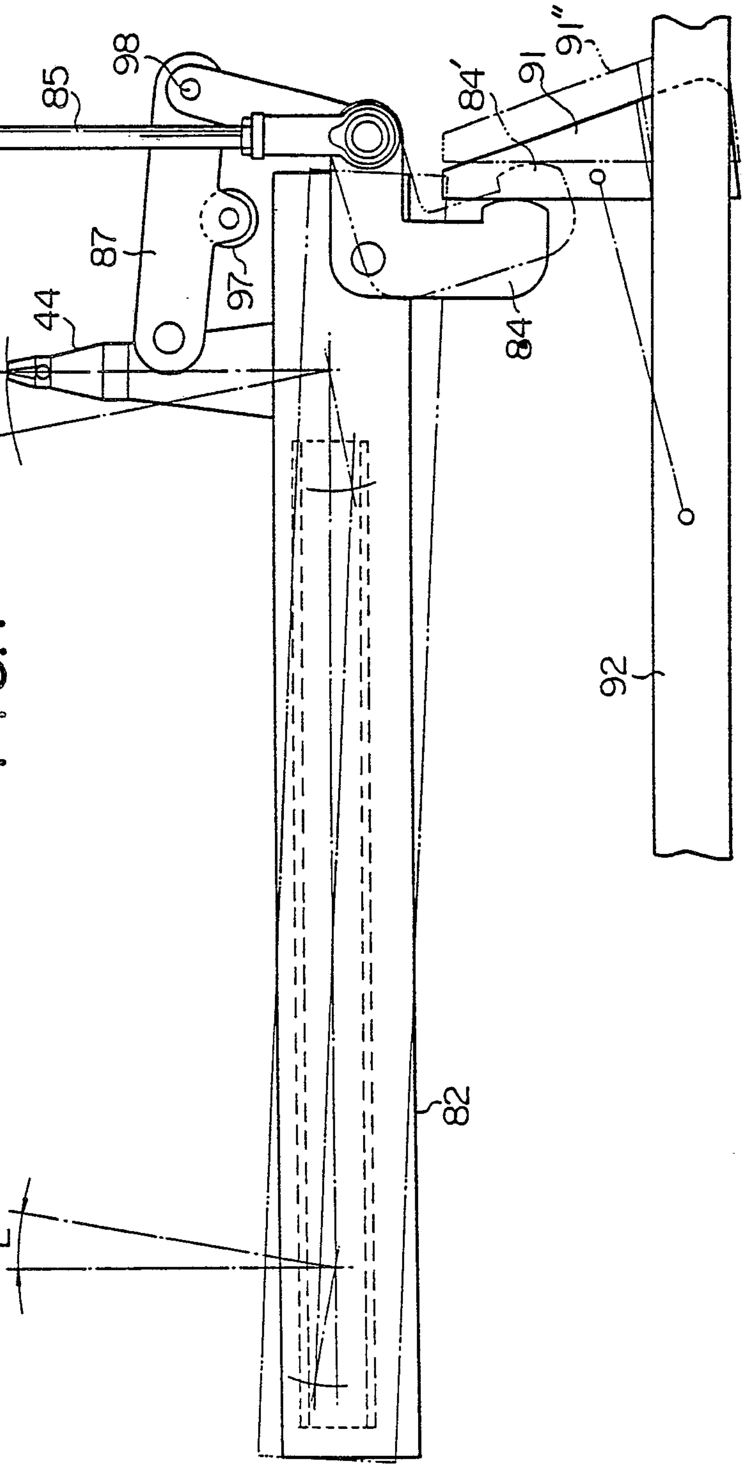


FIG.7

FIG. 8
PRIOR ART

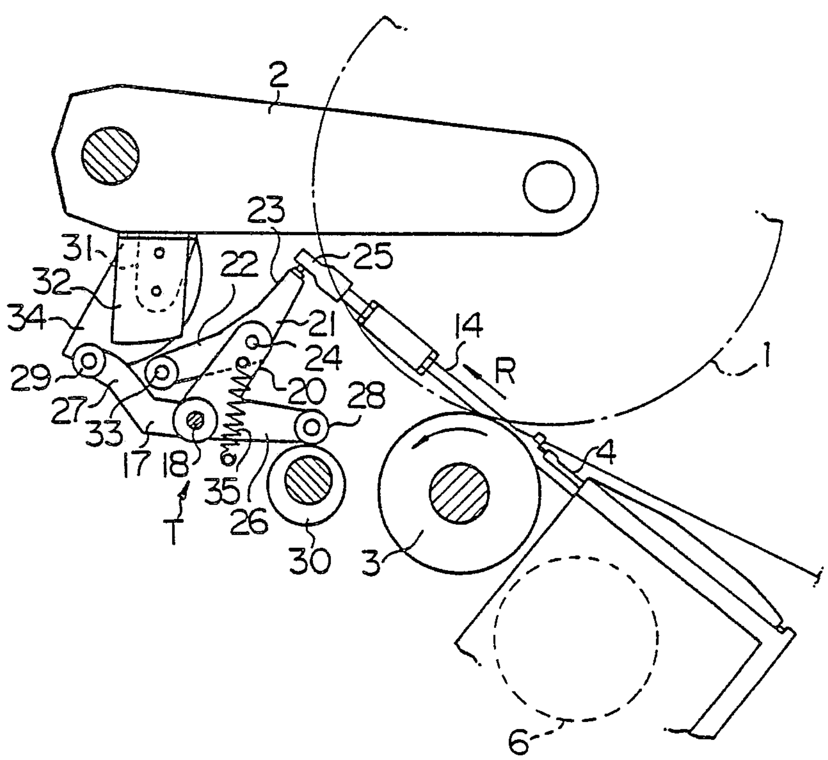


FIG.9
PRIOR ART

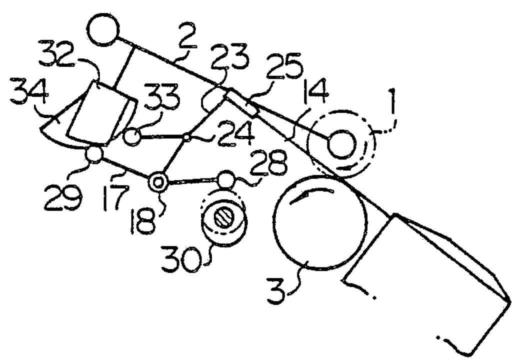


FIG.10
PRIOR ART

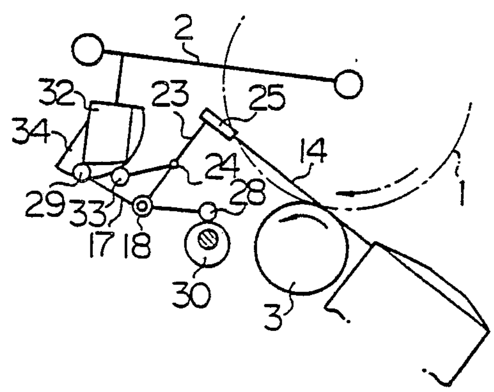


FIG.11
PRIOR ART