Dec. 1, 1964 J. H. HAM, JR., ETAL 3,159,324

CONTROL MECHANISM

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FIG. 1

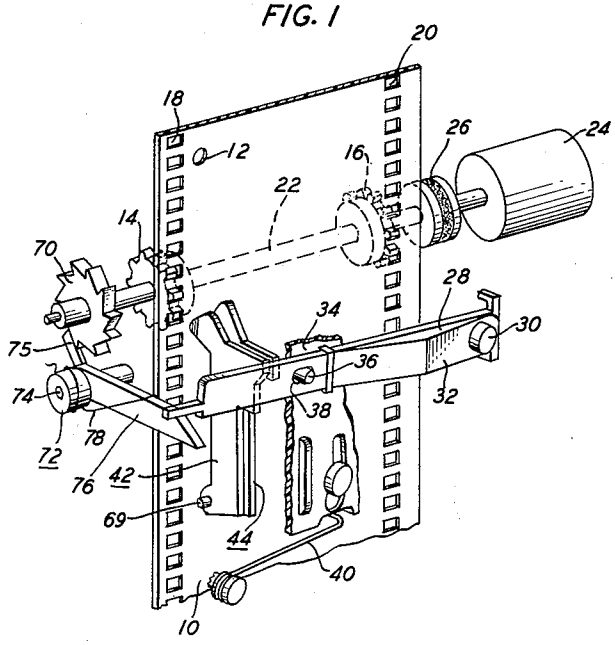

FIG. 2

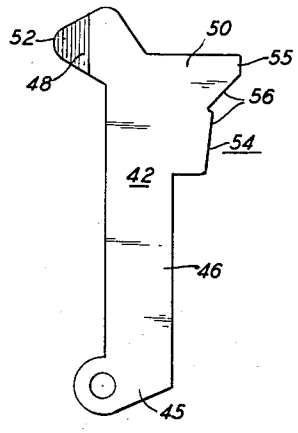

FIG. 3

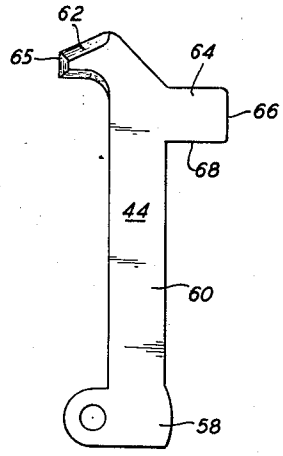

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FIG. 6

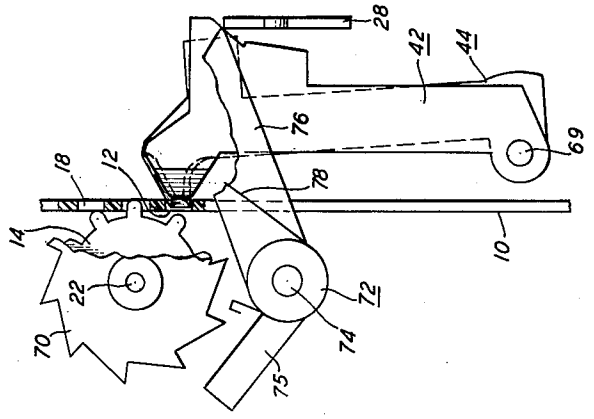


FIG. 5

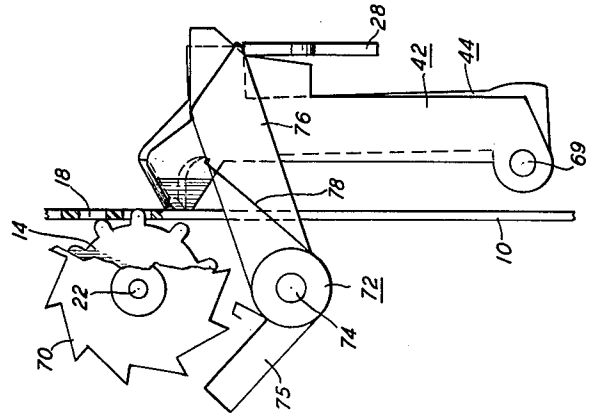
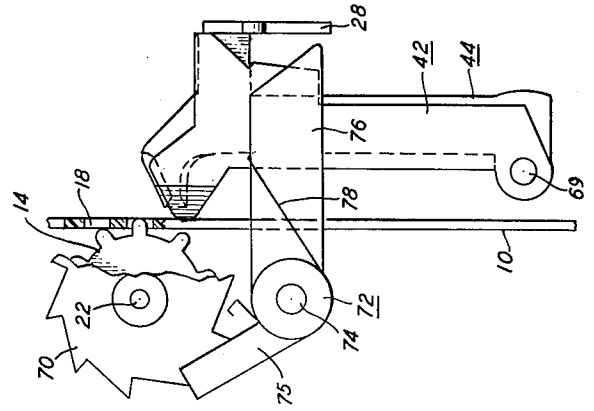


FIG. 4



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CONTROL MECHANISM

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8 Claims. (Cl. 226—53)

This pertains to control mechanisms and particularly to control mechanisms responsive to deviations in the surface of a web.

An object of this invention is to provide a novel control mechanism that is responsive to deviations, such as perforations or protrusions, in the surface of a web moving relative to the control mechanism.

This and other objects of this invention are achieved in an illustrative embodiment thereof wherein the control mechanism comprises means for sensing the deviations in the surface of the web, the sensing means consisting of a pair of adjacent members which ride on the surface of the web. The sensing members have a first position relative to one another wherein neither member engages a deviation in the surface of the web and a second position relative to one another wherein one of the members engages a deviation in the surface of the web. A first of the members includes a deflecting surface, and the second of the members includes an arresting surface intersecting the deflecting surface of the first member. The arresting surface extends beyond the deflecting surface when the members are in their first relative position and extends short of the deflecting surface when the members are in their second relative position.

A control member, which is movable along a generally planar path between a first and a second position, is biased toward the deflecting surface of the first sensing member, and when it is in engagement with the deflecting surface, it biases the first sensing member into engagement with the web. The control member is also biased toward its first position, the path of travel of the control member as it moves from its second to its first position being intersectable by the arresting surface of the second sensing member. The control member when in engagement with the arresting surface biases the second sensing member into engagement with the web.

Thus when the sensing members are in their first relative position, the control member in moving from its second to its first position is arrested by the arresting surface of the second sensing member, and when the sensing members move to their second relative position responsive to a deviation in the web, the control member is no longer arrested by the arresting surface of the second member and thereby moves to its first position.

Means are provided for moving the web, and means responsive to the position of the control member enable and disable the moving means. The enabling and disabling means enables the moving means when the control member is intermediate its first and second position and disables the moving means when the control member is in its first position.

A complete understanding of the invention and of these and other features and advantages thereof may be gained from consideration of the following detailed description taken in conjunction with the accompanying drawing wherein one embodiment of the invention is illustrated. It is to be expressly understood, however, that the drawing is for the purposes of illustration and description and is not to be construed as defining the limits of the invention.

In the drawing:

FIG. 1 is a schematic perspective view of the control mechanism of this invention operating in conjunction with a web having perforations therein;

FIG. 2 is a side view of the deflecting member of the control mechanism;

FIG. 3 is a side view of the arresting member of the control mechanism; and

FIGS. 4, 5 and 6 are side views of the control mechanism showing the sequence of operation thereof.

Referring now to the drawing and FIG. 1 in particular, the control mechanism of this invention is employed in conjunction with a web 10 having deviations, such as perforations 12, in the surface thereof. The perforations 12 may be formed in the web 10 purposely as a form of coding or the perforations may be due to imperfections in the web. The web 10 is moved relative to the control mechanism by such means as a pair of spaced sprocket wheels 14 and 16 which are positioned to the rear of the web and respectively mesh with a pair of spaced columns of sprocket holes 18 and 20 in the web, the sprocket wheels being fixedly mounted on a shaft 22 and being rotated in a counterclockwise direction by means such as a motor 24 coupled to the shaft by a slip clutch 26.

The control mechanism is positioned forward of the web 10 and includes a control member 28 that is pivotally mounted on a pin 30 extending through an aperture in one end of the control member. The control member 28 is biased toward the web 10 by means such as a spring member 32 having one end thereof secured to the pin 30 and the other end thereof secured to the control member. In addition, the control member 28 is movable along a generally planar path between an upper and a lower portion by means such as a plunger 34 that is positioned intermediate the web 10 and the control member and has a stud 36 that extends into an aperture 38 in the control member. The bias of the spring member 32 maintains the control member 28 positioned over the stud 36, and upward or downward movement of the plunger 34 causes corresponding movement of the control member, or conversely, upward or downward movement of the control member causes corresponding movement of the plunger. The control member 28 and plunger 34 are biased toward an upward position by means such as a spring member 40 acting on the plunger.

The control mechanism further comprises a means for sensing the perforation 12 in the web 10 consisting of a deflecting member 42 and an arresting member 44 positioned intermediate the web and the control member 28. As shown in FIG. 2, the deflecting member 42 includes a mounting portion 45 at the lower end thereof and a stem portion 46 intermediate the lower and upper ends thereof. The upper end of the deflecting member 42 has a sensing portion 48 that extends toward the web 10 and a cam portion 50 that extends toward the control member 28. The sensing portion 48 tapers to a rounded point that includes a web engaging surface 52 while the cam portion 50 includes a deflecting surface 54 that comprises a forward surface 55 and an inclined surface 56 in series with one another.

Similarly, as shown in FIG. 3, the arresting member 44 includes a mounting portion 58 at the lower end thereof and a stem portion 60 intermediate the lower and upper ends thereof. The upper end of the arresting member 44 has a sensing portion 62 that extends toward the web 10 and a cam portion 64 that extends toward the control member 28. The sensing portion 62 tapers to a blunt point that includes a web engaging surface 65 while the cam portion 64 includes a forward surface 66 that extends generally parallel to the path of movement of the control member 28 and an arresting surface 68 that extends generally perpendicular to the path of movement of the control member.

Turning now to FIGS. 1, 2, and 3, the deflecting member 42 and arresting member 44 are pivotally mounted adjacent to one another on a pin 69 that extends through apertures in the mounting portion 45 and 58 respectively thereof. The deflecting and arresting members 42 and 44 are so located with respect to the control member 28 that when the control member is in its upward position, it is in juxtaposition with the forward surface 55 of the deflecting member and the forward surface 66 of the arresting member, and when the control member is in its downward position, it is in juxtaposition with the inclined surface 56 of the deflecting member and the stem portion 60 and the arresting member.

Furthermore, the deflecting and arresting members 42 and 44 are so located with respect to the web 10 that as the web moves relative to the deflecting and arresting members an unperforated longitudinal portion of the web moves past the sensing portion 48 of the deflecting member and a perforated longitudinal portion of the web moves past the sensing portion 62 of the arresting member. Hence, when the deflecting and arresting members 42 and 44 are biased toward the web 10, the deflecting member is located in a single position, that is, with the sensing portion 48 thereof in engagement with the surface of the web. The deflecting surface 54 of the deflecting member 42 is thereby positioned a constant distance from the surface of the web 10. The arresting member 44, on the other hand, is located in either one of two positions, that is, with the sensing portion 62 thereof in engagement with the surface of the web 10 or with the sensing portion 62 thereof extending into a perforation 12 in the web.

The apertures in the mounting portions 45 and 58 of the deflecting member 42 and arresting member 44 are located so that the axis about which the members rotate is to the rear of the cam portions 50 and 64 respectively thereof. Thus, an upward force exerted against the arresting surface 68 of the arresting member 44 produces a clockwise turning moment that rotates the member toward the web 10. However, the deflecting and arresting members 42 and 44 are designed so that the centers of gravity thereof are forward of their respective axis of rotation. This produces a clockwise turning moment that tends to rotate the members toward the control member 28.

The distance between the web engaging surface 52 and the forward surface 55 of the deflecting member 42 is a little greater than the distance between the web engaging surface 65 and the forward surface 66 of the arresting member 44. In addition, the arresting surface 68 of the arresting member 44 is so located with respect to the inclined surface 56 of the deflecting member 42 that it intersects and extends beyond the inclined surface when the deflecting and arresting members are in engagement with the surface of the web, but the arresting surface extends short of the inclined surface when the arresting member moves into a perforation 12 in the web.

Referring now also to FIG. 4, as a result of the above relationships, when the control member 28 is in its upward position, it rests on the forward surface 55 of the deflecting member 42 and biases the web engaging surface 52 of the deflecting member into engagement with the web 10. The arresting member 44, due to the clockwise turning moment exerted by its center of gravity, has its forward surface 66 in engagement with the control member 28, and consequently, its web engaging surface 65 is slightly spaced from the web 10. Thus in this position of the control member 28, the control mechanism is essentially disengaged and does not respond to perforation 12 in the web 10.

However, when the plunger 34 is depressed, and the control member 28 is thereby moved downward, the control member under the bias of the spring member 32 moves along the forward surface 55 and inclined surface 56 of the deflecting member 42 onto the forward surface 66 of the arresting member 44 and then rearwardly along the

arresting surface 68 of the arresting member back into engagement with the inclined surface 56 of the deflecting member. Thereafter, when the plunger 34 is released and the spring member 40 moves the plunger and thereby the control member 28 upward, the control member moves along the inclined surface 56 of the deflecting member 42 into engagement with the arresting surface 68 of the arresting member 44, whereupon, as shown in FIG. 5, the movement of the control member 28 is halted.

The bias of the spring member 32 presses the control member 28 rearwardly against the inclined surface 56 of the deflecting member 42 and thereby presses the web engaging surface 52 of the deflecting member into engagement with the web 10. In addition, the bias of the spring member 40 presses the control member upwardly against the arresting surface 68 of the arresting member 44. As set forth above, due to the position of the axis of rotation of the arresting member 44 with respect to the cam portion 64 thereof, this upward force produces a counterclockwise turning moment that presses the web engaging surface 65 into engagement with the web 10.

Thereafter, when, as shown in FIG. 6, a perforation 12 in the web 10 moves before the sensing portion 62 of the arresting member 44, the sensing portion moves into the perforation and the arresting member pivots rearwardly. The arresting surface 68 of the arresting member 44 moves to a position wherein it extends short of the inclined surface 56 of the deflecting member 42, and hence the arresting surface no longer impedes the movement of the control member 28. The control member 28 under the bias of the spring member 40 acting upon the plunger 34, therefore moves forward along the inclined surface 56 to its upward position shown in FIG. 4.

As previously stated, the control member 28 in its upward position engages the forward surface 55 of the deflecting member 42 and under the bias of the spring member 32 presses the web engaging surface 52 of the deflecting member against the web 10. Since the distance between the web engaging surface 52 and the forward surface 55 of the deflecting member 42 is greater than the distance between the web engaging surface 65 and the forward surface 66 of the arresting member 44, the control member 28 does not bear against the arresting member. Thus the only forces acting on the arresting member 44 are the clockwise turning moment exerted by the center of gravity of the arresting member and the clockwise turning moment generated by the engagement of the bottom edge of the perforations 12 in the web 10 with the bottom edge of the sensing portion 62 of the arresting member. These forces combine to rotate the arresting member 44 forwardly into engagement with the control member 28, removing the sensing portion 62 of the arresting member from the perforation 12. The control mechanism is once more disengaged and to reengage the control mechanism the plunger 34 is depressed to again move the control member 28 to the position shown in FIG. 5, wherein it is situated beneath the arresting surface 68 of the arresting member 44.

It is seen from the foregoing description that the control member 28 changes its position responsive to the perforations 12 in the web 10. This change in position of the control member 28 is employed to actuate electrical or mechanical devices to achieve particular functions. In the apparatus shown in the drawing, the movement of the control member 28 is employed to control the movement of the web 10. A ratchet wheel 70 is fixedly mounted on the shaft 22, and a pawl 72, pivotally mounted on a pin 74, has a rearwardly extending arm 75 that extends into juxtaposition with the teeth on the ratchet wheel and a forwardly extending arm 76 that extends into juxtaposition with the free end of the control member 28. The free end of the control member 28 is reduced in cross section so that it may be bent to adjust the relationship between the control member and the pawl 72. A spring member 78 biases the pawl 72 in a clockwise

direction, tending to move the rearwardly extending arm 75 into engagement with the ratchet wheel 70.

When the control member 28 is in its upward position, shown in FIG. 4, it is disengaged from the pawl 72, the free end of the control member overlying the forwardly extending arm 76 of the pawl. The pawl 72 under the bias of the spring member 78 is therefore positioned with the rearwardly extending arm 75 thereof in engagement with the ratchet wheel 70. The pawl 72 prevents the ratchet wheel 70 and thereby the shaft 22 from rotating in a counterclockwise direction, and consequently the web 10 is held stationary, the torque generated by the motor 24 being dissipated in the slip clutch 26.

When, however, the control member 28 is moved to its lower position, the free end thereof is deflected to a position beneath the forwardly extending arm 76 of the pawl 72 and when the control member moves upward to its arrested position, shown in FIG. 5, wherein it is in engagement with the arresting surface 68 of the arresting member 44, the free end of the control member pivots the pawl in a counterclockwise direction, moving the rearwardly extending arm 75 out of engagement with the ratchet wheel 70. The shaft 22 is no longer immobilized, and the motor 24 acting through the slip clutch 26 rotates the shaft in a counterclockwise direction whereby the sprocket wheels 14 and 16 respectively meshing with the sprocket holes 18 and 20 in the web 10 move the web upward.

When, as shown in FIG. 6, a perforation 12 in the web 10 moves before the arresting member 44, the arresting member moves into the perforation, and the control member 28 moves to its upward position. As the control member 28 moves upward, it is deflected forward by the inclined surface 56 of the deflecting member 42, and at the same time the free end of the control member further pivots the pawl 72 in a counterclockwise direction. These two occurrences combine to move the free end of the control member 28 beyond the end of the forwardly extending arm 76 of the pawl 72. The spring member 78 is thereby permitted to pivot the pawl in a clockwise direction and move the rearwardly extending arm 75 thereof into engagement with the ratchet wheel 70 to arrest the rotation of the shaft 22. The rotation of the sprocket wheels 14 and 16 is thereby arrested and the movement of the web 10 is halted.

Between the time that the arresting member 44 moves into a perforation 12 in the web 10 and the time that the movement of the web is halted, the web continues to move a small distance upward. The perforation 12 therefore moves above the arresting member 44 and the arresting member itself pivots forwardly into engagement with the control member 28. Consequently, when the control member 28 is again moved to its downward position, whereby it is moved beneath the forwardly extending arm 76 of the pawl 72, and it is permitted to move upward, it is again arrested by its engagement with the arresting surface 68 of the arresting member 44. The pawl 72 is again pivoted to move the rearwardly extending arm 75 thereof out of engagement with the ratchet wheel 70, and the motor 24 is again able to rotate the sprocket wheels 14 and 16 to reinstitute the upward movement of the web 10.

Although the control mechanism has been described as operating in conjunction with a web 10 having deviations in the form of perforations 12, the control mechanism functions in essentially the same manner when employed in conjunction with a web having deviations in the form of protrusions. The only change that is made is that the deflecting member 42 and arresting member 44 are so located with respect to the web 10 that a longitudinal portion of the web having no protrusions therein moves past the arresting member while the longitudinal portion of the web having protrusions therein moves past the deflecting member.

What is claimed is:

1. A mechanism for controlling the longitudinal movement of a web, the web including an unperforated longitudinal portion and a perforatable longitudinal portion, the perforatable portion being perforated to arrest the movement of the web, the mechanism comprising:

a deflecting member for riding on the unperforated longitudinal portion, the deflecting member including a deflecting surface spaced a constant distance from the surface of the web;

an arresting member for riding on the perforatable longitudinal portion, the arresting member being movable between a first position wherein it rests on the web and a second position wherein it extends into a perforation in the web, the arresting member having an arresting surface intersecting and extending beyond the deflecting surface of the deflecting member when the arresting member is in its first position and extending short of the deflecting surface when the arresting member is in its second position;

a control member movable along a generally planar path between a first and a second position, the control member being biased toward its first position and toward the deflecting surface of the deflecting member, the control member biasing the deflecting member against the web, the path of travel of the control member as it moves from its second to its first position being intersectable by the arresting surface of the arresting member, and the control member when in engagement with the arresting surface, biasing the arresting member into engagement with the web, whereby when the arresting member is in its first position, the control member in moving from its second to its first position is arrested by the arresting surface of the arresting member, and when the arresting member is moved to its second position responsive to a perforation in the web the control member is permitted to move to its first position;

means for moving the web; and

means responsive to the position of the control member for enabling and disabling the moving means, the enabling-disabling means enabling the moving means when the control member is arrested by the arresting surface and disabling the moving means when the control member is in its first position.

2. A control mechanism as in claim 1 wherein the enabling-disabling means comprises:

a ratchet wheel fixedly coupled to the moving means; and

a pawl having a first end thereof extending into juxtaposition with the teeth of the ratchet wheel and a second end thereof extending into juxtaposition with the control member, the pawl being biased into a blocking position wherein the first end thereof engages the teeth on the ratchet wheel and the second end thereof extends into the path of travel of the control member, the control member in moving from its second to its arrested position deflecting the pawl from the blocking position and the control member in moving from its arrested position to its first position permitting the pawl to return to its blocking position.

3. A mechanism for controlling the longitudinal movement of a web having deviations in the surface thereof, the mechanism comprising:

means for sensing the deviations in the surface, the sensing means comprising a pair of adjacent members which ride on the surface of the web, the members having a first position relative to one another wherein neither member engages a deviation in the surface and a second position relative to one another wherein one of the members engages a deviation in the surface, a first of the members including a deflecting surface and the second of the members including an arresting surface intersecting and extending beyond the deflecting surface when the members are in their first rela-

tive position and extending short of the deflecting surface when the members are in their second relative position;

a control member movable along a generally planar path between a first and a second position, the control member being biased toward the deflecting surface of the first sensing member and when in engagement with the deflecting surface biasing the first sensing member into engagement with the web, the control member also being biased toward its first position, the path of travel of the control member as it moves from its second to its first position being intersectable by the arresting surface of the second sensing member, and the control member when in engagement with the arresting surface biasing the second sensing member into engagement with the web, whereby when the sensing members are in their first relative position, the control member in moving from its second to its first position is arrested by the arresting surface of the second sensing member, and when the sensing members move to their second relative position responsive to a deviation in the web, the control member is no longer arrested by the arresting surface of the second member and thereby moves to its first position;

means for moving the web; and

means responsive to the position of the control member for enabling and disabling the moving means, the enabling-disabling means enabling the moving means when the control member is arrested by the arresting surface of the second sensing member and disabling the moving means when the control member is in its first position.

4. A control mechanism actuated responsive to deviations in the surface of a web moving relative thereto, the mechanism comprising:

means for sensing the deviations in the surface of the web, the sensing means comprising a pair of adjacent members which ride on the surface of the web, the members having a first position relative to one another wherein neither member engages a deviation in the surface and a second position relative to one another wherein one of the members engages a deviation in the surface, a first of the members including a deflecting surface and the second of the members including an arresting surface intersecting and extending beyond the deflecting surface when the members are in their first relative position and extending short of the deflecting surface when the members are in their second relative position; and

a control member movable along a generally planar path between a first and a second position, the control member being biased toward the deflecting surface of the first sensing member and when in engagement with the deflecting surface biasing the first sensing member into engagement with the web, the control member also being biased toward its first position, the path of travel of the control member as it moves from its second to its first position being intersectable by the arresting surface of the second sensing member, and the control member when in engagement with the arresting surface biasing the second sensing member into engagement with the web, whereby when the sensing members are in their first relative position, the control member in moving from its second to its first position is arrested by the arresting surface of the second sensing member, and when the sensing members move into their second relative position responsive to a deviation in the web, the control member is no longer arrested by the arresting surface of the second member and thereby moves to its first position.

5. A control mechanism as in claim 4 wherein the sensing members are positioned intermediate the control member and the web.

6. A control mechanism as in claim 4 wherein each sensing member includes a sensing portion that extends toward the web and a cam portion that extends toward the control member, each sensing portion having a surface in juxtaposition with the web and each cam portion having a surface in juxtaposition with the control member, the farthest distance between the web juxtaposed surface and the control member juxtaposed surface of the first sensing member being greater than the farthest distance between the web juxtaposed surface and the control member juxtaposed surface of the second sensing member.

7. A control mechanism as in claim 4 wherein the sensing members are pivotally mounted and the centers of gravity of the members are so located with respect to their axes of rotation that they tend to rotate toward the control member.

8. A control mechanism as in claim 7 wherein the point of engagement of the control member with the arresting surface of the second sensing member is situated with respect to the axis of rotation of the second sensing member so as to create a turning moment that biases the second sensing member toward the web.

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