Oct. 13, 1970 M. WENGER 3,533,543

DEVICE FOR MAINTAINING A PREDETERMINED TENSION IN A WEB OR WRAP GUIDED OVER ROLLERS

Filed Nov. 16, 1967 3 Sheets-Sheet 1

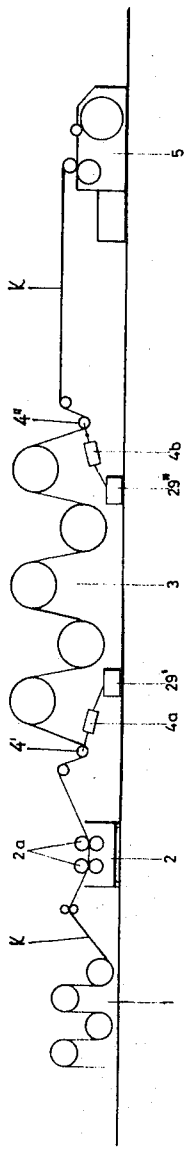

Fig. 1

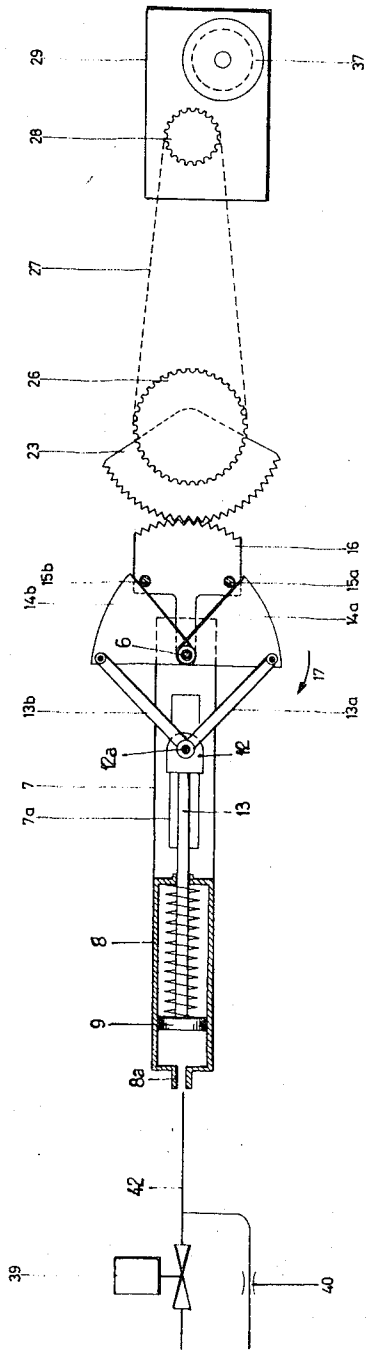

Fig. 2

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Filed Nov. 16, 1967 3 Sheets-Sheet 2

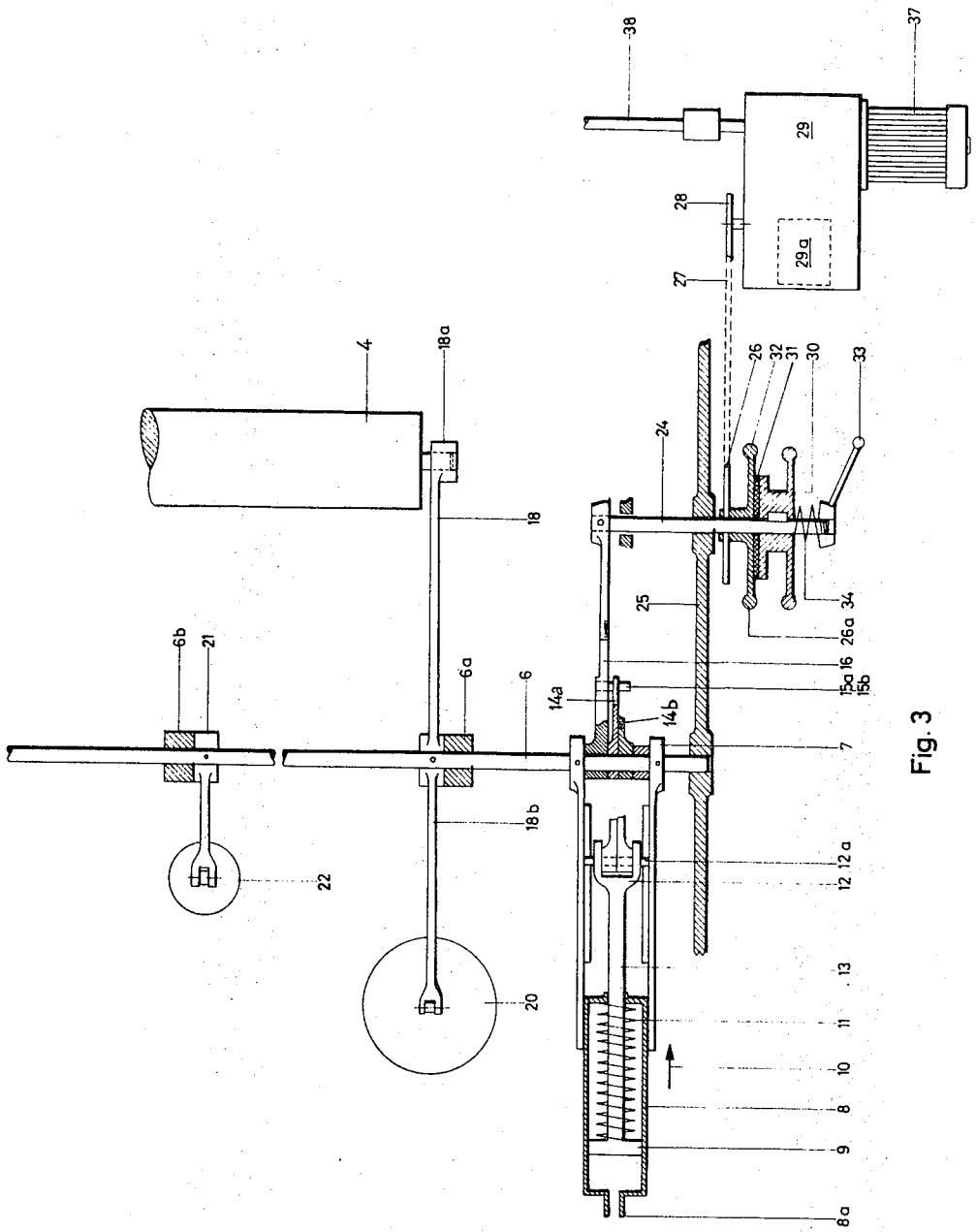

Fig. 3

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Oct. 13, 1970 M. WENGER 3,533,543
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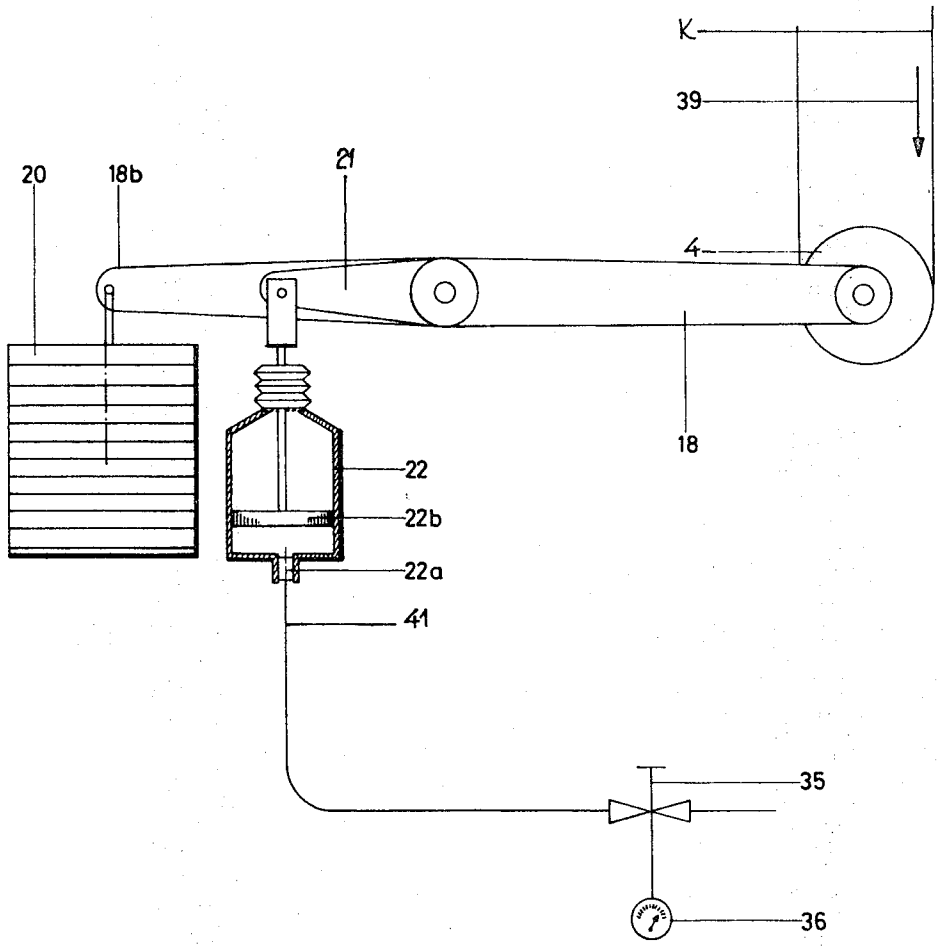

Fig. 4

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3,533,543

DEVICE FOR MAINTAINING A PREDETERMINED TENSION IN A WEB OR WARP GUIDED OVER ROLLERS

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Int. Cl. B65h 25/04
U.S. Cl. 226—44 9 Claims

ABSTRACT OF THE DISCLOSURE

A device for maintaining a predetermined tension in a web or warp guided over rollers wherein the deflections of a compensating roller pivot a pendulum axle, and the angular movements of the latter act upon a regulating mechanism adapted to keep constant the tension of a web or warp guided about the compensating roller. When the warp or web comes to a stop and, for the whole duration of such standstill, a cylinder is aerated and, as a consequence thereof, a mechanism is operated that interrupts transmission of any controlling angular movements of the pendulum axle to the regulating mechanism.

BACKGROUND OF THE INVENTION

In many cases, the tension of a warp or of a web is of great importance. For example, in the operation of a loom, the warp tension may be decisive for the efficiency of the loom. Since the warp is previously sized, whereby, in the drying zone of the sizing machine, important variations of length either in the sense of an elongation or in the sense of a shrinking may occur, the meticulous maintaining of a constant warp tension is required. This, in turn, requires precise and reliable operating control means. Such control means are present in most of the machines and, according to their technical construction, they also operate more or less correctly.

For example, it is known, for the purpose of regulating the different drives of sizing machines, to make use of compensating rollers. These rollers, on the one hand, impart to the warp to be sized a determined tension and, on the other hand, compensate elongations or shrinkings of the warp. The tension is produced, for example, by compensating rollers that are loaded by weights, springs or also pneumatically. Elongations or shrinkings are, in some instances, only signalled by the compensating rollers and must then be corrected by hand. In other known constructions, more particularly in automatically operating machines, the deviations of the compensating roller as a result of an elongation or shrinking of the warp are used to regulate driving means electrically or mechanically in such a manner that the synchronism of the different drives is restored.

Upon a sudden stop of the machine and consequently of the driving means for the web or warp, the aforementioned elongation or shrinking of course holds on and so does the deflection of the compensating roller. Consequently, in automatic devices, the regulating means are also operated. Now, as is easily understood, the forces required to operate the regulating means when the warp or web stands still are substantially greater than the forces required when the web or warp is running, so that at the standstill, larger forces are acting over the compensating roller onto the web than are when the machine is in operation. As a consequence thereof, when the machine stands still and for the whole duration of such standstill,

a portion of the length of the web is maintained under a tension exceeding the desired tension.

Attempts have been made to overcome this disadvantage by the use of overrunning gears, of free motion gears, of clutches and the like mounted into the drives. However all these solutions are only partly effective since they do not actually remove the source of such overtensions.

SUMMARY OF THE INVENTION

Accordingly, it is a primary object of the present invention to overcome this last-mentioned drawback of prior art structures.

In order to implement this and still further objects of the invention which will become readily apparent as the description proceeds, the inventive device for maintaining a predetermined tension in a web or warp guided over rollers, of the type comprising at least a compensating roller the deflections of which out of a predetermined position control a regulating mechanism, is provided with means operated upon a stop of the treated web or warp to interrupt the control of the regulating mechanism by the web or warp as long as the latter stands still.

Another, more specific operative advantage of the invention pertains to an arrangement in which the deflections of a compensating roller by means of an arm, pivot a shaft, the angular displacement of which controls the regulating mechanism in such manner that the pendulum axle of the compensating roller carries an arm supporting a tooth segment producing the control of the regulating mechanism. Means are provided for fixedly securing the tooth segment to the arm when the web is running and to release the tooth segment from the arm movements when the web stands still.

Thus, as long as the web is running, the regulating mechanism is controlled in the conventional manner by the deflections of the compensating roller, which are transmitted to the tooth segment over the said arm. As soon, however, as the web stops, the motion transmission from the compensating roller to the regulating mechanism by the tooth segment, now no longer moved with the arm, is interrupted.

BRIEF DESCRIPTION OF THE DRAWINGS

Other features and advantages of the invention will become apparent from the description now to follow, of a preferred embodiment thereof, given by way of example only, and in which reference will be made to the accompanying drawings in which:

FIG. 1 diagrammatically illustrates a sizing machine and the guiding of a warp through said machine;

FIGS. 2 and 3 illustrate, at enlarged scale and partly in section, the members serving to control a regulating mechanism by the deflections of a compensating roller, and

FIG. 4 shows the members serving to load a compensating roller in order to maintain a predetermined tension in a web guided over said roller.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the direction of running of the warp through the sizing machine, diagrammatically represented in FIG. 1, the warp K guided over rollers first passes through the warp beam structure **1**, then through the sizing trough **2**, further through the drum dryer **3** and finally reaches the beaming or winding-up device **5**. In a well known manner, there are thus produced two independent regulating paths for regulating the warp tension, one path being between the sizing trough **2** and the dryer **3** and the other path being between the latter and the winding-up device **5**.

In the first regulating path between the sizing trough **2** and the dryer **3**, the warp K is tensioned by a compensating roller **4'**. In the second regulating path between the dryer **3** and winding-up device **5**, the warp K is tensioned by a compensating roller **4''**. The associated mechanism is identical for each of the compensating rollers of a regulating path so that in the following only one of such mechanisms shall be explained in more detail.

As appears from FIGS. 3 and 4, the compensating roller **4** rotates in an eye **18***a* of an arm **18** of a twin lever **18, 18***b*, the pivoting axle of which coincides with the pendulum axle **6**, with which the lever **18, 18***b* is connected for rotation and which is rotatably arranged in bearings **6***a*, **6***b*. From the end of arm **18***b* of the twin lever, a counterweight **20** is suspended serving to precisely balance the compensating roller system. The loading of the compensating roller **4** is effected pneumatically by means of a cylinder **22**, the piston **22***b* of which is articulated by means of its piston rod to the free end of a lever **21** connected for rotation with the pendulum axle **6**. The loading of the piston **22***b* is effected through a connection **22***a* of cylinder **22** by means of a conduit **41**. The pressure may be adjusted by hand at a reduction valve **35** and may be checked on a manometer **36**. The desired tension of the warp K guided about the compensating roller **4** results from the load of the warp K depending on the pressure adjusted at the reduction valve **35** and transmitted by the piston **22***b*, the piston rod thereof, the lever **21**, the pendulum axle **6**, and the arm **18** in direction of arrow **39**.

The compensating rollers **4**, however, should not only serve to impart to the warp a determined tension, but in addition, they should maintain such tension independent of all shrinkings and elongations of the warp during the drying process. If, necessary, they should compensate such deviations from a desired tension by means of regulating members not only in operation of the machine but also, and particularly, at interruptions of such operation of the machine with the warp drawn-in.

The means serving to this and appear from FIGS. 2 and 3. At both sides of the machine a plate **7** is connected for rotation with each of the two pendulum axles **6**. Each of these plates **7** carries a pneumatical cylinder **8**. A piston **9** sliding in said cylinder **8** may be loaded in direction of arrow **10** by compressed air supplied through a conduit **42** (FIG. 2) connected to the cylinder. A spring **11** acting in the opposite direction onto the piston **9** holds the latter in a rest position near the connection **8***a'* when the conduit **42** is pressureless. The outer end of the piston rod **13** of piston **9** carries a head piece **12**, to which is secured a bolt **12***a* guided in longitudinal direction in a slot **7***a* of plate **7**. The head piece **12** serves in addition to secure links **13***a* and **13***b*, which are each secured to a segment **14***a* and **14***b* respectively, arranged for free rotation on the pendulum axle **6**. Both segments **14***a*, **14***b* form, as is best seen from FIG. 2, a scissors acting onto two bolts **15***a*, **15***b* projecting from a tooth segment **16**. The latter, as are the segments **14***a*, **14***b*, is arranged for free rotation on the pendulum axle **6**.

The tooth segment **16** meshes with a pinion **23** mounted on a shaft **24** arranged for rotation in bearings **25**. The shaft **24** further carries a chain wheel **26** connected by means of a chain **27** and a further chain wheel **28** with a regulating mechanism **29***a* for a gear **29** which is of wellknown type and, for this reason, is not represented in more detail. By means of this gear connected with a motor **37**, the latter drives a shaft **38** and, over this shaft, drives the rollers in the sizing trough **2** and/or one or several drums of the dryer **3**. Since it is wellknown that the shrinkings or elongations of the warp in a sizing machine do not occur equally on the individual drums of the dryer, it is preferable to provide the latter with two or more drives whereby, to each of such drives, a compensating roller with associated adjusted mechanism in accordance with FIGS. 2 and 3 should be associated.

In the machine diagrammatically represented in FIG. 1, the arrangement is such that the compensating roller **4'** at the inlet of the dryer regulates a gear **29'** driving the squeezing rollers **2***a* of the sizing trough **2**. The compensating roller **4''**, on the other hand, about which the warp K is guided immediately behind the dryer **3**, regulates a gear **29''** driving one of the drums of the dryer **3**. The regulating mechanism **29***a* associated to each gear controls the rotational speed transmitted by the gear to the shaft **38**. This control is effected in such manner that a lowering of the associated compensating roller as a result of an elongation of the warp adjusts the regulating mechanism in such manner that the speed transmitted from the gear to the shaft **38** is reduced. In the embodiment of FIG. 1, thus a lowering of the compensating roller **4'** results in a reduction of the speed of the squeezing device **2***a* in trough **2** and a lowering of the compensating roller **4''** initiates a reduction of the speed of the drum of the dryer **3** driven by the gear **29''**, whereby the occurred elongation is successively compensated while the tension of the warp is maintained at a constant value.

As the machine according to FIG. 1 is set into operation, the supply of compressed air through conduit **42** to cylinder **8** is also initiated. The loaded piston **9** is displaced against the action of spring **11** in direction of arrow **10** into the operating position shown in FIG. 2 and closes, by means of its piston rod **13** and the links **13***a*, **13***b*, the scissors formed by the segments **14***a*, **14***b* until these segments abut the bolts **15***a*, **15***b* of the tooth segment **16**. Since during operation of the machine, the conduit **42** contains compressed air, the tooth segment **16** is thus fixedly secured by the segments **14***a*, **14***b* and pivots with the pendulum axle **6** in accordance with the deflections of the compensating roller resulting from elongations or shrinkings of the warp guided over said compensating roller. The extent and the direction of these deflections produce a corresponding pivoting movement of the tooth segment **16** and, consequently, of the pinion **23** of the chain wheel **26**, which drives the chain wheel **28**. This pivotal movement is used in wellknown manner to regulate the regulating mechanism of the gear **29**.

When due to any circumstance the sizing machine stops, the opening of a valve **39** aerates the conduit **42**. The piston **9** is displaced under the action of its spring **11** in a direction contrary to that of arrow **10** into its rest position and thereby pivots the two segments **14***a*, **14***b* in direction of arrow **17** away from the abutment at the bolts **15***a* **15***b* of tooth segment **16**. By this, the rigid connection of the tooth segment **16** through the plate **7** with the pendulum axle **6** within the limits of the opening of the scissors is released, i.e. the tooth segment **16** is no longer pivoted as a result of elongations and shrinkings, which, of course, also occur when the machine stands still. Consequently, such elongations and shrinkings no longer result in an adjustment of the regulating mechanism **29***a*. In other words, when the machine stands still, the control of the regulating mechanism by the compensating roller **4** is interrupted but not the maintaining of the predetermined tension by the means illustrated in FIG. 4. The compensating roller which remains freely movable and is solely maintained by the tension of the warp maintains the desired warp tension even when the machine stands still independent of elongations and shrinkings in contrast to the known devices in which, when the machine stands still, the regulating gear remains coupled with the compensating roller.

As the machine again is set into operation, a throttle **40** connected into the pressure air supply to cylinder **8** insures that the reinstalled compressed air supply loads the piston **9** in a retarded manner so that the segments **14***a*, **14***b* close slowly and again secure the tooth segment **16**, whereby the throttle **40** is adjusted in such manner that the regulating mechanism **29***a* may adjust itself in accordance with the position of the compensating roller.

Since, as a matter of experience, in the drying process, webs or warps containing staple fibres tend to elongate,

while in contraction thereto, webs or warps containing endless filaments tend to shrink in the drying process, it is advantageous to make the compensating axle **6** adjustable so that, in accordance with the web or warp to be treated, substantially the whole possible stroke of the compensating roller may be used for control purposes.

To this end there is provided in the device shown in FIG. 3, a disk **30** mounted for rotation on shaft **24** by means of a wedge. This disk **30** carries a friction lining **31**. The chain wheel **26** is mounted for free rotation on shaft **24** and carries a disk **32**. By a handle **33** and by means of a spring **34** the disk **30** may be pressed with its friction lining **31** against disk **32** so as to transmit rotation of shaft **24** to the chain wheel **26**. When this connection is released, the relative position of the chain wheel **25** and the pinion **23** may be modified and consequently, the rotational speed of gear **29** for a determined position of pinion **23**. This possibility of adjustment is intended to be used in such manner that, with a web or warp which is expected to elongate only, the compensating roller may regulate the gear **29** through the regulating mechanism in one direction only but, in this direction, over the largest possible range. The frictional connection through the friction lining **31** in addition has the advantage of providing safety against faulty manipulation.

While in the preceding, a device for maintaining a predetermined tension has been particularly described with respect to a warp passing through a sizing machine, it will appear to those skilled in the art that the same device may be used everywhere where non-woven or woven webs are guided over rollers and over compensating rollers, whereby the deflections of the latter out of a predetermined position control a regulating mechanism.

The pneumatical operation of the scissors **14***a*, **14***b* as described may, of course, be replaced by hydraulic, mechanical or electrical actuation effecting an opening of the scissors when the machine stops and a slow closing of the scissors when the machine is set into operation.

What is claimed is:

1. In a device for maintaining a predetermined tension in a web or warp guided over rollers by means of at least a compensating roller, the deflections of which out of a predetermined position are transferred to a regulating mechanism to control the same, the improvement comprising means for interrupting the transfer of said deflections to said regulating mechanism when the web or warp stands still.

2. In a device for maintaining a predetermined tension in a web or warp guided over rollers by means of at least a compensating roller, the deflections of which out of a predetermined position are transferred to a regulating mechanism to control the same, the improvement comprising means for interrupting the control of the regulating mechanism by the web or warp when the latter stands still, said improvement further comprising an arm connected with a pendulum axle, a compensating roller means the deflections of which pivot said pendulum axle, a regulating mechanism regulated by the angular movement of said pendulum axle, a tool segment means for producing the control of the regulating mechanism carried by said arm connected with said pendulum axle, and wherein means are provided for securing said tooth segment means to said arm when the web is running and for releasing said securing when the web stands still.

3. The improvement defined in claim **2**, in which said securing means comprises a scissors means pivotable with said arm for fixing in closed position by means of abutments said tooth segment means and for allowing in its open position free angular movement of said arm with said scissors means with respect to said tooth segment means.

4. The improvement defined in claim **3**, in which said scissors means are actuated pneumatically by a pressure cylinder means holding said scissors means closed when it is under pressure and opening said scissors means when aerated, and wherein the control of a pressure air supply to said cylinder means is effected by a valve means adapted to aerate said cylinder means when the web stops.

5. The improvement defined in claim **3**, further comprising mechanical means adapted to hold said scissors means closed when the web is running.

6. The improvement defined in claim **3**, further comprising delaying means for delaying the closing of said scissors means.

7. The improvement defined in claim **6**, further comprising a throttle valve connected into a pressure air conduit to said cylinder means.

8. The improvement defined in claim **2**, wherein the rest position of the regulating mechanism with respect to the fixedly secured tooth segment means is adjustable.

9. The improvement defined in claim **8**, wherein the tooth segment means meshes with a pinion, the angular position of which with respect to its shaft is adjustable.

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