PRESSURE ROLL BEAM IN A LONGITUDINAL SHEET CUTTER

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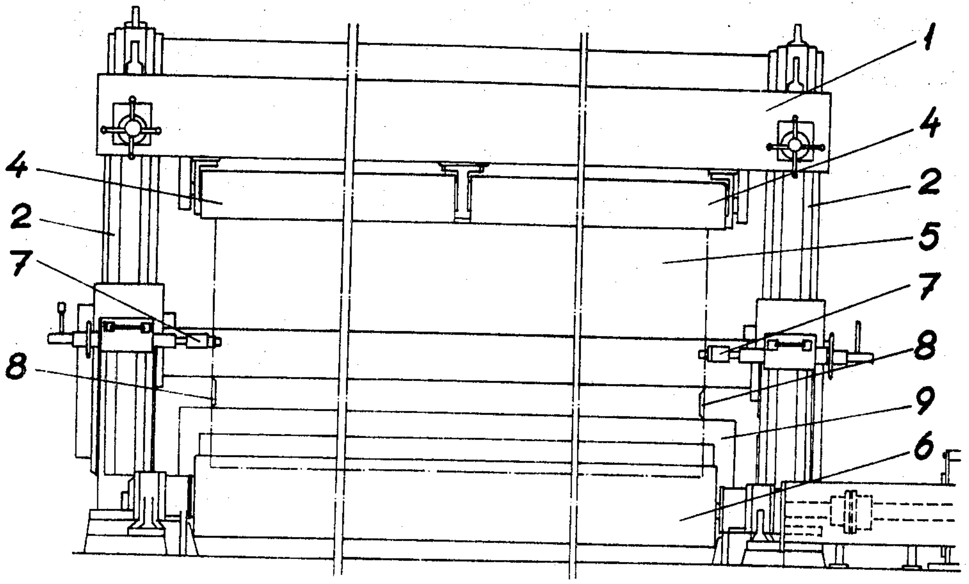

FIG. 1
PRIOR ART

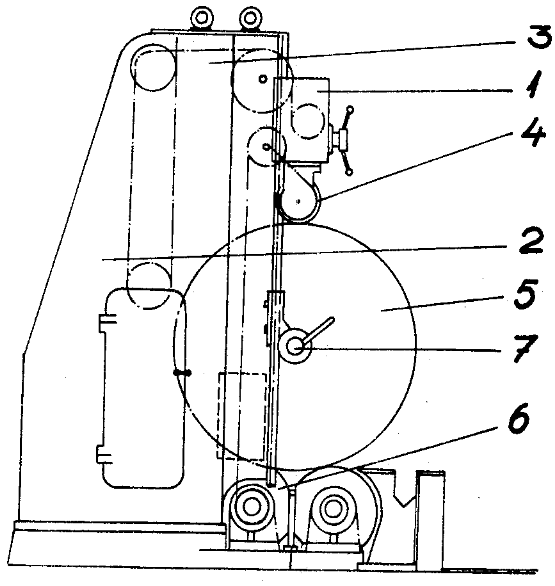

FIG. 2
PRIOR ART

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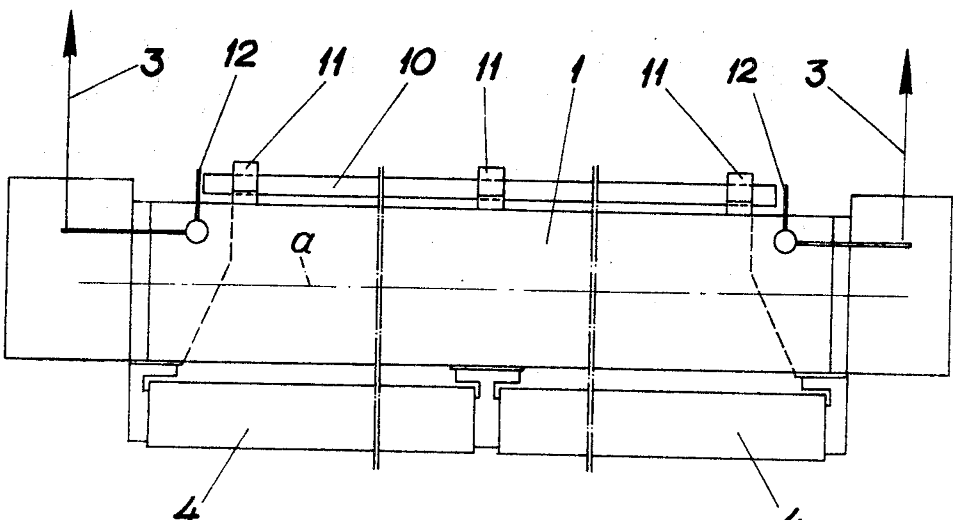

FIG. 3

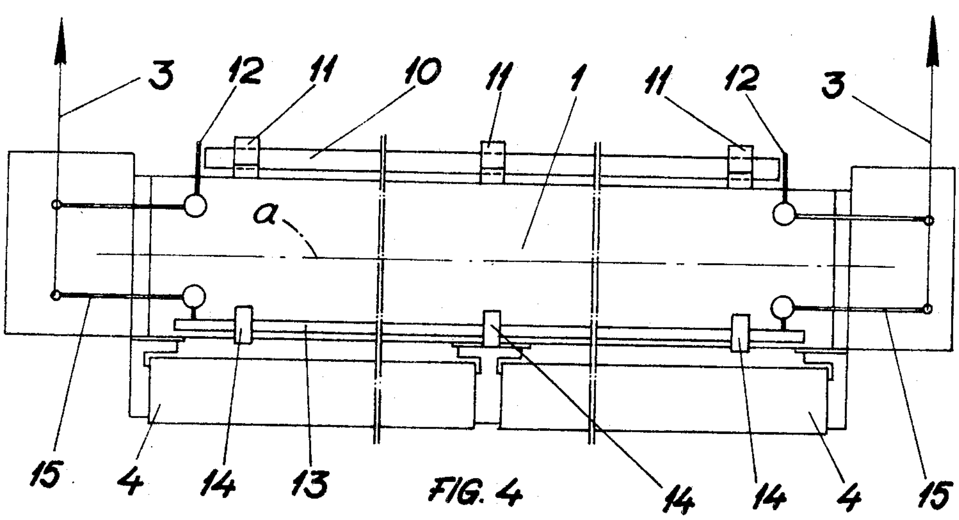

FIG. 4

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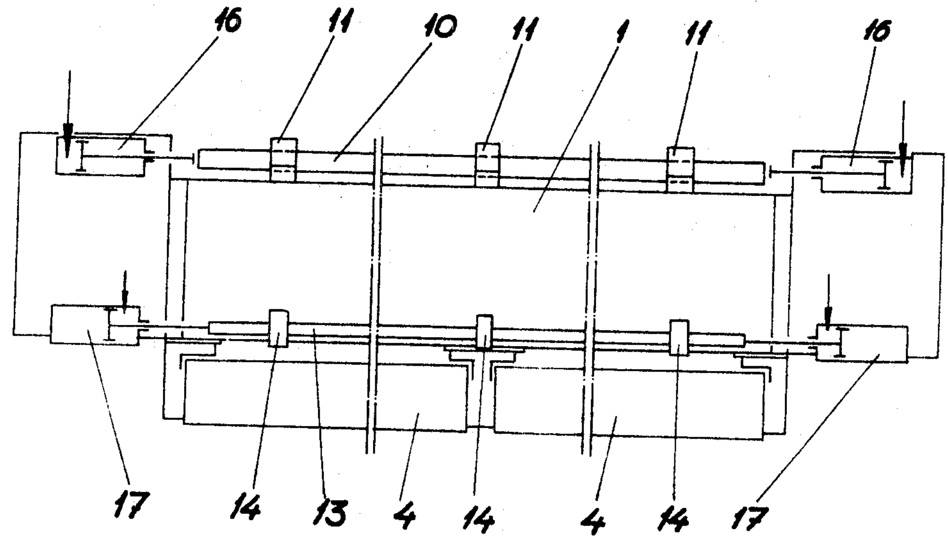

FIG. 5

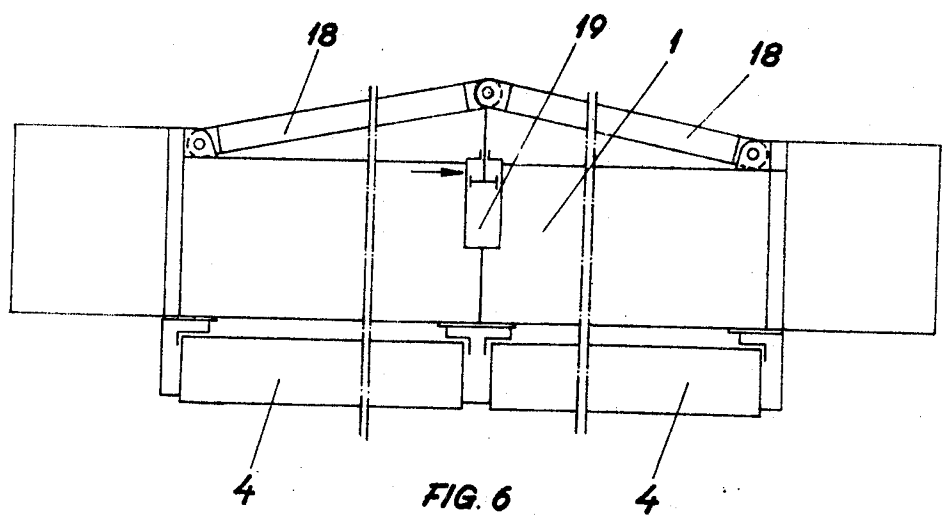

FIG. 6

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U.S. Cl. 242—66 7 Claims

ABSTRACT OF THE DISCLOSURE

A mechanical, hydraulic or pneumatic device acts upon the pressure roller beam of a longitudinal sheet cutter either above or below its neutral axis—or both above and below—to cancel at least partly the deflection of the pressure roll beam caused by its own weight, action above the neutral axis producing a longitudinal tensile stress in the beam, while action below the neutral axis produces longitudinal compression in the beam.

The present invention concerns a pressure roll beam in a longitudinal sheet cutter.

On the lower part of the pressure roll beam in a longitudinal sheet cutter pressure rolls are mounted, which serve to press down on the paper rolls which are being formed, so that the rolls will have an appropriate firmness. As the rolls increase in size, the load imposed by the pressure rolls on the paper rolls must be reduced because the weight of the paper rolls themselves continuously increases. The load of the pressure rolls is caused by the weight of the rolls themselves and by that of the pressure roll beam. The required relief of the load is accomplished by supporting the pressure roll beam at its ends by an appropriate force, which is increased as the diameter of the paper rolls increases. Since the pressure roll beam is supported by its ends, a downward deflection of this beam is caused by its own weight. This deflection increases with increasing support of the pressure roll beam at its ends, that is, with increasing relief of the load. The deflection of this beam is detrimental for the paper roll-forming process because the pressure rolls exert greater pressure on the paper rolls near the central line of the sheet cutter than on its sides. At the final stage of roll-forming, when the greatest amount of relief is applied (when the paper rolls have their greatest size) it frequently happens that the deflection of the beam reaches such magnitude that the pressure rolls farthest from the center have no contact at all with the paper rolls which are being formed. Owing to the deflection of the pressure roll beam, the firmness of the paper rolls cannot be sufficiently well controlled: the outermost paper rolls will be softer than those in the center. The harder rolling of the rolls in the center also implies that their diameter will be smaller than that of the rolls on the sides, and correspondingly also their peripheral velocity will be smaller than that of the outermost rolls, a circumstance which may cause wrinkling of the paper during the sheet cutting process.

The object of the present invention is to eliminate the above-mentioned difficulties encountered in the re-rolling of the cut paper in a longitudinal sheet cutter. The invention is accordingly characterized in that in order to cancel the deflection of the pressure roll beam caused by its proper weight, either entirely or in part, there has been provided to act on the part of the pressure roll beam above its neutral axis a mechanical, hydraulic or pneumatic device which produces in the part of the pressure roll beam above said neutral axis a longitudinal tensile stress and/or that there has been provided to act on the part of the pressure roll beam below its neutral axis a similar device which produces longitudinal compression in this part of the beam. Since with the aid of the invention the deflection due to the proper weight of the beam can be entirely or partly cancelled, it follows that the pressure rolls exert uniform pressure on the paper rolls over the entire width of the sheet cutter. The paper rolls produced will then have equal hardness and equal diameters both in the center of the sheet cutter and on its sides and consequently the peripheral velocity is also the same over the entire width, nor will there be any tendency of wrinkling. In one of the embodiments of the invention, the pressure roll beam may be supported by mechanical devices belonging to it. The mechanical devices may then consist of bell cranks attached to it, one arm of each bell crank engaging a rod which is parallel to the pressure roll beam and is carried in guide brackets attached to it, while the other arms are connected to the chains supporting the pressure roll beam. In another embodiment of the invention the mechanical device consists of hydraulic or pneumatic cylinders at the ends of the pressure roll beam, the piston rods of which engage a rod parallel to the beam and carried in guide brackets attached to it. The other details of the invention are more clearly illustrated by the subsequent description of the invention, with reference to the embodiments presented in the attached drawings.

In the drawings:

FIG. 1 shows a previously known longitudinal sheet cutter in frontal view, and FIG. 2 shows the same, viewed from one end. FIG. 3 shows a pressure roll beam according to one of the embodiments of the invention. FIG. 4 shows a pressure roll beam according to another embodiment of the invention. FIG. 5 shows a pressure roll beam according to a third embodiment of the invention. FIG. 6 shows a pressure roll beam according to a fourth embodiment of the invention.

The reference numeral **1** in FIGS. 1 and 2 indicates the pressure roll beam with which this invention is concerned. The pressure roll beam **1** moves in vertical direction along its guides on the bed pylons **2**, supported by chain **3**. On the lower part of the beam **1** the bearing housing for the pressure rolls **5**, **4**, have been mounted. The rolls formed by the paper after cutting, revolve, driven by the drive rolls **6**. The revolving paper rolls **5** are kept in their proper position by the center dowels **7**, which move vertically in guides on the pylons **2**. Cutting of the full-width paper web into strips of the widths specified by the customer takes place by means of rotating disk blades **8** on the cutting table **9**.

In a device shown in FIG. 3 there is above the pressure roll beam **1** a rod **10** extending parallel to said beam and which is carried in guide brackets **11** attached to the pressure roll beam **1**. The rod **10** is free to move in the brackets **11** in its longitudinal direction, but the rod **10** may be immovably fixed to the central bracket **11**. In the part of the pressure roll above its neutral axis *a*, close to its either end, bell cranks **12** pivoted on pivot pins fixed to the beam and turning in the vertical plane have been mounted. Their arms **12** pointing upward press against the rod **10** above the pressure roll beam because to the outward-pointing arms of the bell cranks there have been attached the chains **3** supporting the pressure roll beam with its accessory equipment. As a result of this arrangement the pressure roll beam exerts pressure, by virtue of its proper weight, through the vertical bell crank arms on the ends of the rod **10**, which in its turn causes a force to act on the pivot pins of the bell cranks **12** on the pressure roll beam, this force tending to draw these pivot points apart. The result is that a stress is set up in the pressure roll beam, which tends to compensate the deflection of the said beam. The proportion of the vertical and horizontal arms of the bell cranks **12** determines the magnitude of the deflection-compensating stresses produced in the pressure roll beam. The horizontal arm of each bell crank **12** is loaded by a force equalling half the total weight of the pressure roll beam.

In the device shown in FIG. 4 the upper part of the pressure roll beam **1** has been provided with attachments equivalent to those illustrated by FIG. 3, but in addition the part of the pressure roll beam below its neutral axis has been provided with a device serving to compensate for the deflection in the lower part of the beam. This device is equivalent in design to that in the upper part of the pressure roll beam. It comprises a rod **13** parallel to the said beam and carried in guiding brackets **14** fixed to this beam, and bell cranks **15** mounted on the beam and turnable in the vertical plane, the pivot points of which are located above the rod **13**. The arms of the bell cranks pointing downward engage the ends of the rod **13**, and their arms pointing outward have been attached to the chains supporting the pressure roll beam. Due to this arrangement, a tensile stress is produced in the rod **13** and a compressive stress in the lower part of the beam **1**, which is longitudinal with respect to the said beam and tends to compensate its deflection. The proportion of the vertical and horizontal arms of the bell cranks determines the magnitude of the deflection-compensating stresses produced in the pressure roll beam. The horizontal arms of the bell cranks **12** and **15** are subjected, by the chain **3**, at each end to the load of a combined force equalling half of the total weight of the pressure roll beam.

In the device shown in FIG. 5 the pressure roll beam **1** has been provided with rods **10** and **13** carried in guiding brackets **11** and **14** exactly as in the device illustrated by FIG. 4. The difference between the devices is that the device of FIG. 5 includes hydraulic cylinders **16** and **17**, which replace the bell cranks **12** and **13** of the device shown in FIG. 4, and that the pressure roll beam **1** has been directly attached to the chains **3** at its ends. The said hydraulic cylinders **16** and **17** have been mounted on the pressure roll beam **1** on the extensions of the rods **10** and **13**, respectively, and the piston rods of the cylinders engage with the said rods **10** and **13**. The hydraulic cylinders have been arranged to load the rods as they were loaded in the preceding embodiments, that is, so that compression is provided in the upper rod **10** and tension in the lower rod **13**, by which stresses counteracting the deflection are set up in the pressure roll beam.

In the device shown in FIG. 6 there are two rods **18** mutually pivotally connected and pivoted at their ends on the upper ends of the pressure roll beam **1**. The common pivot point of the said rods engages the piston rod of a hydraulic cylinder **19** in order that the said rods might be subjected to such load that the rods **18**, which are positioned at an angle with respect to each other, tend to straighten out, whereby a stress counteracting the deflection of the beam **1** is produced in this beam.

In the devices shown in FIGS. 5 and 6 the pressure supplied to the hydraulic cylinder and the area of the pistons in the cylinders determine the magnitude of the deflection-compensating stresses produced in the pressure roll beam.

The invention is not restricted to the embodiments presented in the disclosure; it may be modified in a multitude of ways without leaving the coverage of the invention.

What is claimed is:

1. In a longitudinal sheet cutter, a pressure roll beam, at least one elongated pressure transmitting device carried by said pressure roll beam, said device extending substantially between opposite ends of the pressure roll beam, and means connected with said device and said pressure roll beam and actuating said device to produce a longitudinal tension in at least a part of the pressure roll beam.

2. In a cutter in accordance with claim **1**, comprising supporting chains, said means being mechanical means and being connected with said chains, said means being actuated by the weight of said pressure roll beam.

3. In a cutter in accordance with claim **1**, wherein said pressure transmitting device comprises an elongated rod and guiding brackets mounted upon said pressure roll beam and carrying said rod, and wherein said means comprise two bell cranks having pivots mounted in said pressure roll beam, said bell cranks being located adjacent opposite ends of said rod, each bell crank having an arm engaging a separate end of said rod and another arm connected to a separate supporting chain.

4. In a cutter in accordance with claim **3**, wherein the pivots of said bell cranks are located above the neutral axis of said pressure roll beam and below said rod, the first-mentioned arms of said bell cranks extending upwardly, said bell cranks producing a longitudinal tensile stress in the part of the pressure roll beam located above its neutral axis.

5. In a cutter in accordance with claim **3**, wherein the pivots of said bell cranks are located below the neutral axis of said pressure roll beam and above said rod, the first-mentioned arms of said bells cranks extending downwardly, said bell cranks producing a longitudinal compression in the part of the pressure roll beam located below its neutral axis.

6. In a cutter in accordance with caim **1**, wherein said pressure transmitting device comprises an elongated rod and guiding brackets mounted upon said pressure roll beam and carrying said rod, and wherein said means comprise two hydraulic cylinders mounted upon said pressure roll beam adjacent opposite ends thereof, said hydraulic cylinders having piston rods engaging opposite ends of said elongated rod.

7. In a cutter in accordance with claim **1**, wherein said pressure transmitting device comprises two rods having pivotally interconnected ends, the opposite ends of said rods being pivoted upon said pressure roll beam adjacent opposite ends thereof, said two rods extending at an obtuse angle to each other, and wherein said means comprise a hydraulic cylinder mounted upon said pressure roll beam and having a piston rod engaging the interconnected ends of said two rods.

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