July 1, 1969 T. HINDLE ET AL 3,452,908

GUIDING MEANS FOR PAPER-MACHINE FELTS AND OTHER CONTINUOUS MOVING WEBS OR BANDS

Filed May 18, 1964 Sheet 1 of 4

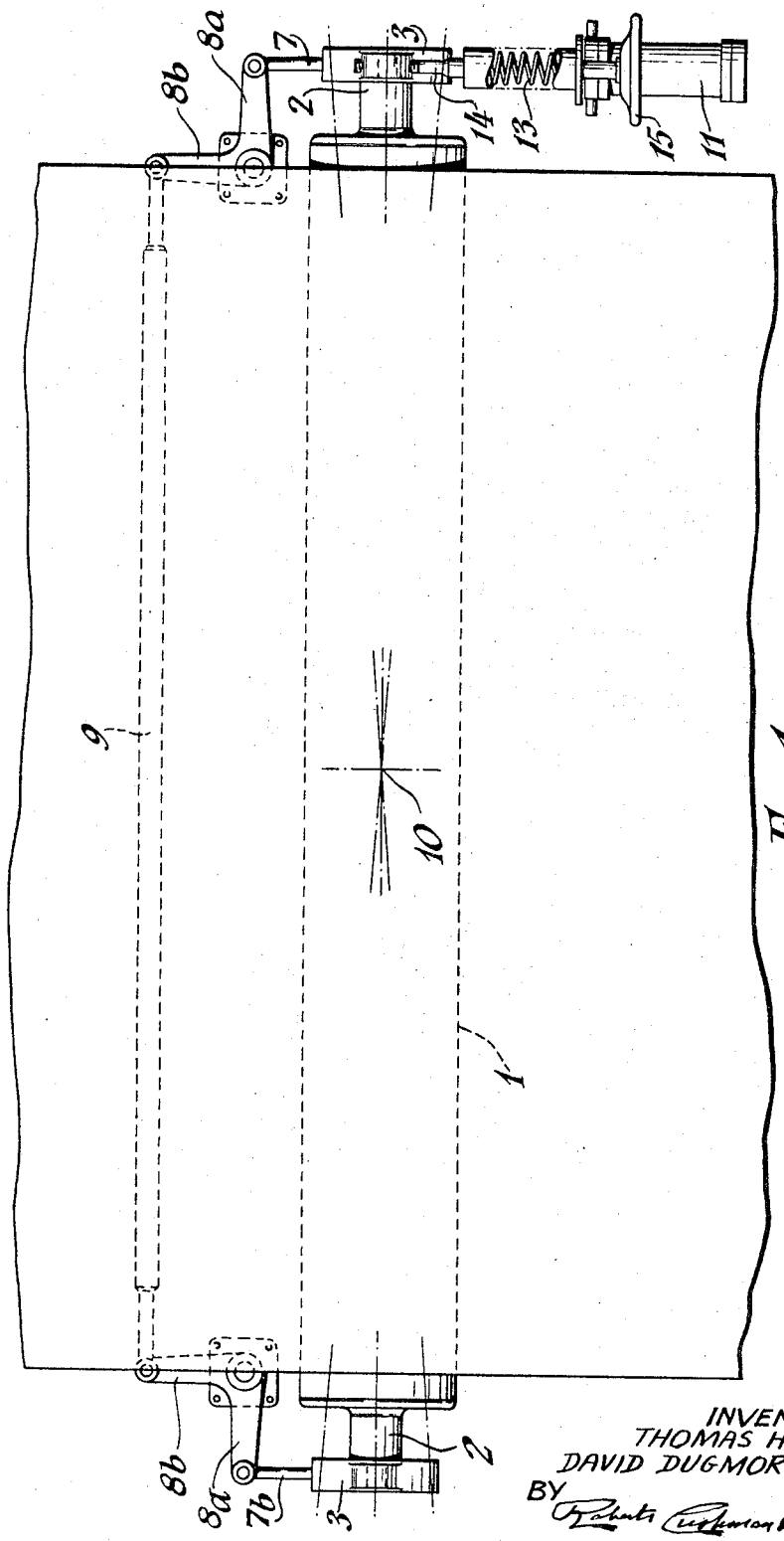

Fig. 1.

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Fig.5

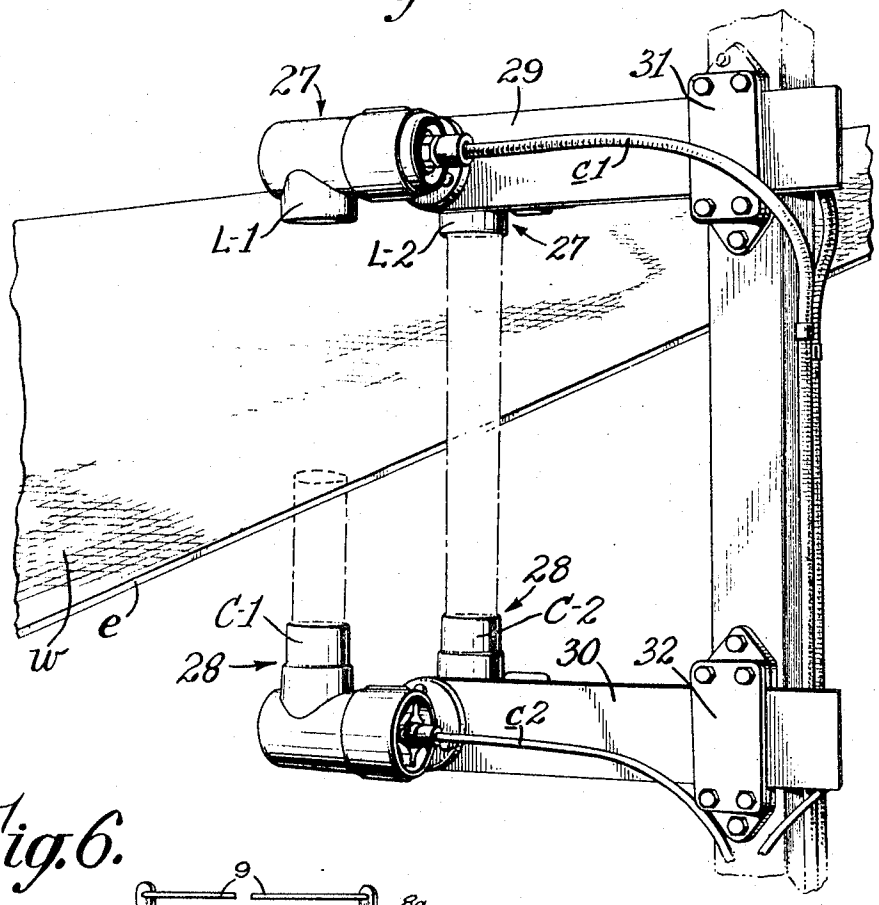

Fig.6.

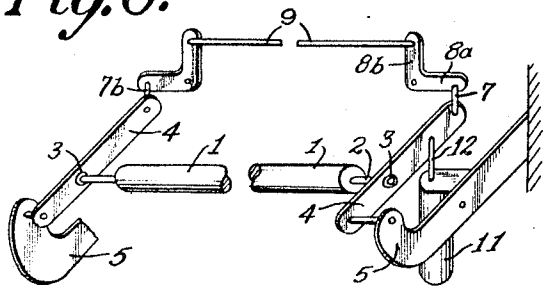

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Fig. 2.

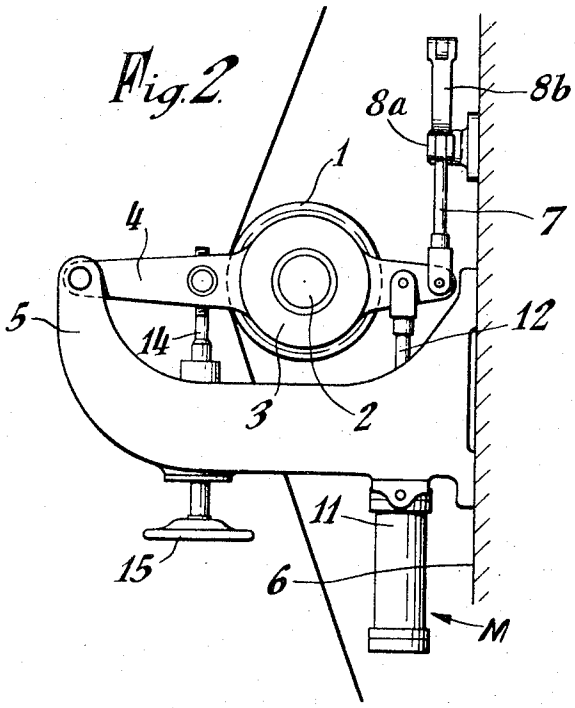


Fig. 3.

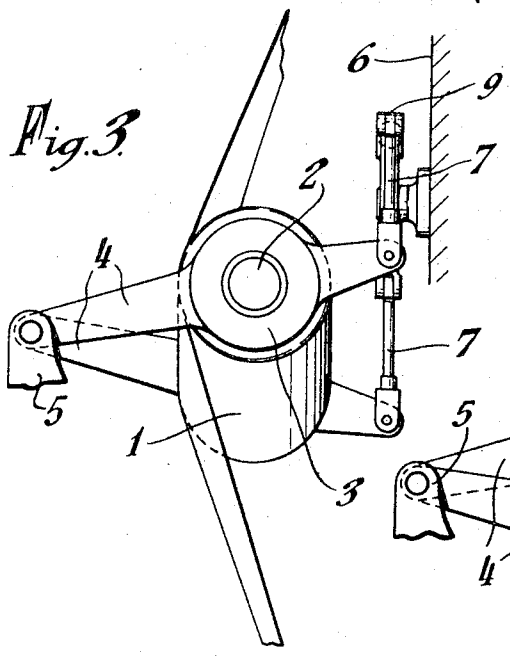
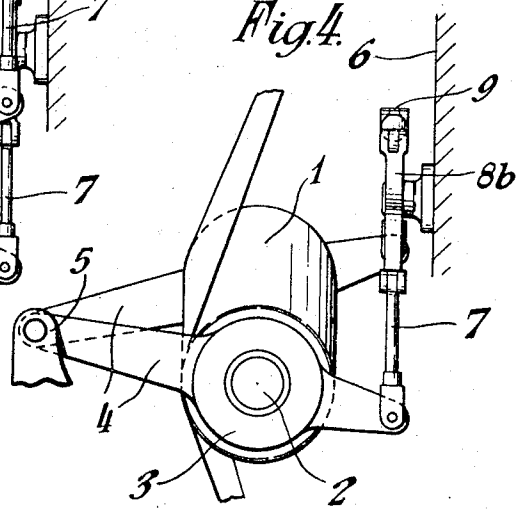


Fig. 4.



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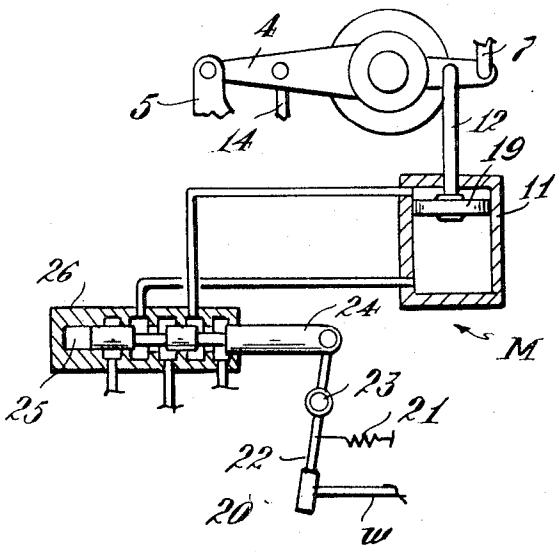

Fig. 7

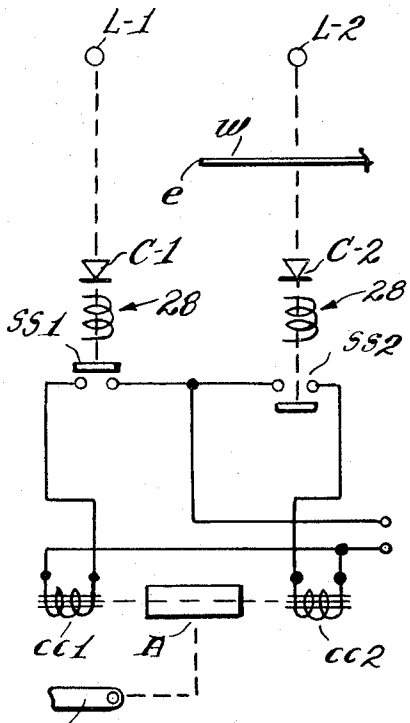

Fig. 8

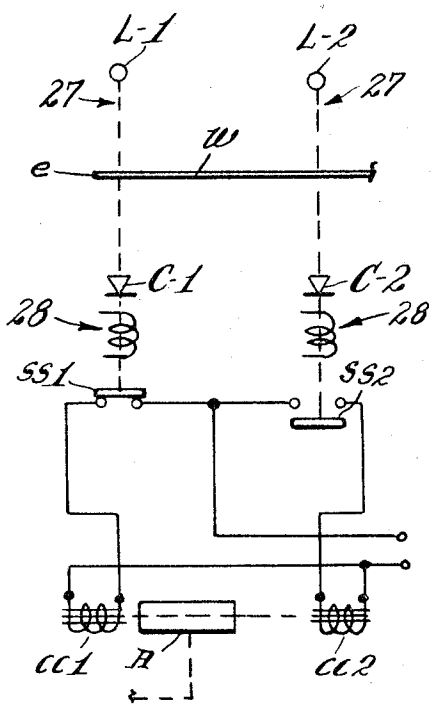

Fig. 9

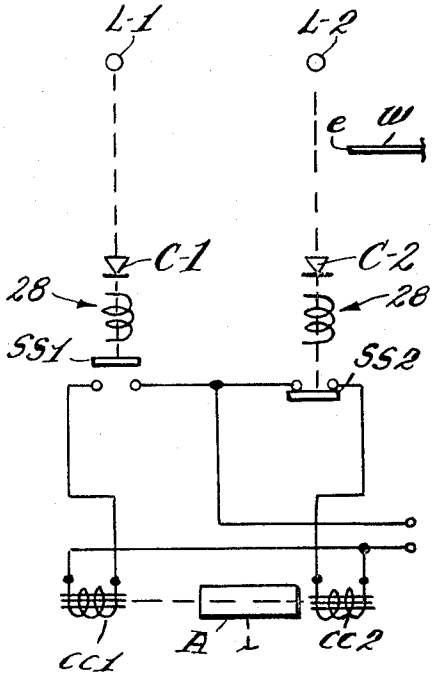

Fig. 10

United States Patent Office 3,452,908 Patented July 1, 1969

3,452,908

GUIDING MEANS FOR PAPER-MACHINE FELTS AND OTHER CONTINUOUS MOVING WEBS OR BANDS

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Int. Cl. B65h 25/26
U.S. Cl. 226—21 9 Claims

ABSTRACT OF THE DISCLOSURE

A guide roll over which a continuous web is drawn, bearings supporting the ends of the guide roll for movement in the plane of the run of the web moving over it, linkage connecting the bearings such that movement of one bearing in a forward direction results in an equal and opposite movement of the other bearing in a rearward direction with respect to the direction of movement of the web, and web edge sensing means operable in response to lateral movement of the web to effect compensating movement of the guide roll.

The invention relates to a guiding means of the type which includes a non-driven guide roller over which the felt or other band passes in contact therewith, and in which the mountings for said roller are adjustable for varying the inclination of the roller axis relatively to the direction of run of the felt, the adjustment being brought about automatically in response to means sensing an edge or edges of the felt and actuated by changes in the transverse location of such edge or edges. The shift imposed on the axis of the guide roller by said adjustment means is such as causes the roller to return the felt to its intended longitudinal path. Although such normal position of the felt may be centrally of the length of the guide roller, there are cases where it is desired to have the neutral position located to one side or the other of the center of the length of this guide roller, and one means of providing for this is shown in our United States Patent No. 3,043,153, dated July 10, 1966. The present improvements relate to guide means of the type above described both with and without a position shifting means such as is shown in the aforesaid patent 3,043,153.

As above stated the shifting of the axis of the guide roller relatively to the longitudinal run of the felt is subject to the control of a means sensing an edge or edges of the felt. This means may be a feeler member held lightly against one edge of the felt and adapted to follow any wandering of the felt or, more preferably, it may be a light beam or similar ray device adapted to be intercepted or not intercepted by the felt if it wanders out of the intended position. In all cases actuation of the sensing means by a wandering of the felt puts into operation a mechanical, electrical or fluid-pressure operated means for appropriately shifting the axis of the guide roller so as to cause the felt to return to its intended running track and, when the felt arrives at that position, thereby relieving the sensing means, further action of the means for shifting the guide roller is cut off and such roller returns to its normal position under the influence of a biasing means.

As hitherto known, the guide roller has had one of its ends mounted in a fixed self-aligning bearing and the shifting of the axis of the roller has been effected at the other end by moving the bearing at that other end, for example by having that bearing suspended in a pendulous lever or mounted for sliding movement in horizontal guides. With such an arrangement the dead weight of

the guide roller is carried by the bearings and, where the felt run is horizontal or substantially horizontal, no interference with the guiding operation arises from the dead weight of the roll.

However, due to lack of space on a paper machine and some other machines, it is often desirable to apply a guide roll to a felt where it is running otherwise than horizontally, for example vertically or at an acute inclination to the horizontal. In order to obtain the necessary corrective movement of the felt the shifting movement of the guide roller must always be in a direction substantially identical with that of the run of the felt. However, with other-than-horizontal dispositions of the felt, the dead weight of the guide roll at its movable end presents a special problem, as it severely biases the shifting and centralising means.

The dead weight of the movable end of the guide roll may be counter-balanced by an additional spring provided for that particular purpose, but each application of such a means must be separately assessed and the spring then designed and adjusted to provide the desired counterbalance, as nearly as is physically possible. None the less, the counter-balance so obtained is not entirely satisfactory, especially as such spring, being continuously loaded, loses its initial resilience. A further drawback to these known arrangements is that the size of spring necessary to support one half of a wide guide roll, for example one having a face width of 300", is considerable and is particularly inconvenient in the restricted space available on a paper-machine or the like.

It is therefore the object of the present invention to provide improvements in guide means for felts and like bands which are free from the objections of those already known in that they may be used readily and conveniently with the felt or band in any disposition, whether horizontal, vertical or otherwise, and without the dead weight of the guide roll offering any difficulty in any of these dispositions.

According to this invention the guide roll is supported in end bearings both of which are movable in or substantially in the direction of the run of the felt and these bearings are interconnected by a compensating mechanism such that if one of them is shifted in one direction under the influence of a sensing means, the other is shifted to a corresponding extent in the opposite direction. This arrangement has the advantage that the extent of shift of the roller end is reduced relatively to that in the known arrangements where only one end is shiftable and, further, as the weight of one end of the roll is counter-balanced through the said compensating mechanism by the weight of the other end of the roll, its dead weight does not in any way interfere with or prejudice the operation of the guiding or centralising means, nor their adjustment.

In one mode of carrying out the invention, each end of the guide roll is mounted in a bearing which is carried by a pivoted lever, mounted on a fixed part of the machine, and such levers are connected to opposite ends of a linkage mechanism so that they have equal and opposite movements. Usually the linkage mechanism will comprise a pair of identical bell-crank levers mounted one at each side of the path of the felt but mutually reversed, a long link connecting corresponding arms of such levers to each other, and a short link connecting each other arm of the bell-crank to the corresponding bearing-supporting lever. In most cases one or both of the bearing-supporting levers will be provided with a biasing or setting means, preferably as in our United States Patent 3,043,153 for varying the neutral position of the felt.

With these arrangements, the equal and opposite movements of the bearings at opposite ends of the guide roll are brought about not only in response to the sensing

means which initiates a corrective slewing of the guide roller axis, but in response also to the centering or setting means determining the neutral position of the central axis of the felt relatively to the centre of the length of the guide roller.

Adjustable stops may be provided, with cushions of rubber or the like, to limit the movement of the bearing-supporting levers and to prevent the roll ends falling in the event of an accidental failure in the said compensating means.

The invention will now be described in conjunction with the accompanying drawings wherein:

FIG. 1 is a view in elevation of a fragmentary length of a vertically-running felt with the improved guide means applied thereto;

FIG. 2 is an end view looking to the right of FIG. 1, with the roller in its neutral position;

FIGS. 3 and 4 are views corresponding to FIG. 2 showing the roller in two shifted positions, one with the front end raised and the other with the rear end raised;

FIG. 5 is a perspective view illustrating one form of edge sensing means;

FIG. 6 is a perspective view of the improved guide means with the felt omitted;

FIG. 7 diagrammatically illustrates a web edge feeler, valve, and power-operable means in which the feeler, by engagement with an edge of the web, mechanically shifts the valve; and

FIGS. 8, 9 and 10 are wiring diagrams showing electrical means for shifting the valve mechanism of FIG. 6.

Referring to the drawings, a roll **1** is provided with end trunnions **2** which are mounted in self-aligning bearings **3**, these bearings being carried by pivoted levers **4** as shown more clearly in FIGS. 2, 3 and 4. One end of each lever **4** is pivotally mounted on the forward end of a fixed bracket **5**, the rear end of which is attached to the frame **6** of the machine and the other end of each lever **4** is pivotally attached by a link **7** to one arm **8a** of a bell-crank lever also pivotally mounted on the frame of the machine, the other arm **8b** of that lever being connected by a tension link **9** to the corresponding arm **8***b* of the bell-crank lever at the other end of the roll **1**.

The two bell-crank levers are set in opposite directions (see FIG. 1) so that a depression of the arm **8a** of one bell-crank results in an elevation of the corresponding arm **8a** of the other bell-crank. Accordingly, the axis of the guide roll **1** may be shifted about a theoretical pivot axis **10** between a position where one of the roll ends is higher than the other (compare FIGS. 3 and 4). A fluid operable motor M (FIG. 7) comprising a cylinder **11**, piston **19** and piston rod **12**, is employed to effect movement of the linkage and as illustrated (FIG. 2) the cylinder **11** is fixed to one of the brackets **5** and the rod **12** is pivotally connected to the lever **4** adjacent the connection of the link **7** thereto.

The sensing means for operating the guide mechanism may be of any known kind. Both mechanically and electrically operable sensing means are shown herein of the kind illustrated in Patent No. 3,043,153. The mechanical means (FIG. 7) comprises a shoe **20** at one end of an arm **22** yieldably held against an edge of the web by a light spring **21**. The arm is supported on a pivot **23** so that movement of the shoe in one direction will move the other end of the arm in the opposite direction. The opposite end of the arm is pivotally connected to the protruding end **24** of a spool slidable axially in a valve housing **26** to deliver fluid pressure alternately to one end or the other of the cylinder **11**.

The electrical sensing means is illustrated diagrammatically in FIGS. 5, 8, 9 and 10, wherein the plane of the web is labeled *w* and the components of the electrical means above and below the web are **27** and **28** respectively. Two pairs of components **27, 28** (FIG. 5) are supported adjacent an edge of the web on the frame member by suitable bracket arms **29, 30** secured in clamps **31, 32** bolted to the frame and adjustable therein laterally with respect to the edge of the web. Wiring c^1, c^2 connects the pairs of components **27, 28** to a suitable source of power. The components **27** (FIGS. 5, 8, 9 and 10) are lamps **L–1** and **L–2** and the components **28** are cells **C–1** and **C–2** embodied in circuits which contain, respectively, switches **SS1, SS2** adapted to supply current to coils **CC1, CC2**. An armature A is situated between the coils **CC1, CC2** and is movable by the coils in one direction or the other and this in turn, as will appear hereinafter, is connected to the aforementioned protruding end **24** of the valve spool **25** through which pressure fluid is supplied to the motor.

The pairs of components are so arranged that in operation when the edge *e* of the web *w* is running in a normally centralized position as shown in FIG. 8, neither of the switches **SS1, SS2** is closed. This is provided for by employing a cell **C–1** which, in response to illumination, opens the switch **SS1** and a cell **C–2** which, when non-illuminated, opens the switch **SS2**. As thus arranged, if the edge *e* of the moving web *w* moves laterally to the position shown in FIG. 9, interruption of the light to the cell **C–1** results in closing the switch **SS1**, leaving switch **SS2** open so as thereby to move the armature A to the left. Movement of the edge *e* of the web *w* laterally in the other direction to uncover both cells **C–1** and **C–2** (FIG. 10) results in the switch **SS1** remaining closed and the switch **SS2** opening so as thereby to move the armature A to the right.

The armature A is connected to the protruding end **24** of the valve spool **25**. As will be seen by reference to FIG. 7, when the valve spool is shifted to the left the piston is shifted to the right and vice versa. Correspondingly, when the piston rod **12** is moved to the right the end of the guide roll connected thereto is moved in a corresponding direction.

Also, a setting means for determining the position of the centre axis of the felt may be of any of the forms set forth in our United States Patent 3,043,153. In the drawing a biasing spring **13** is shown, re-acting between the fixed bracket **5** and a collar on the screw **14**. By rotating the hand-wheel **15**, which is integral with the screw **14** the loading of the spring **13** may be varied to vary the neutral position of the logitudinal axis of the felt.

Other embodiments of the invention may be devised embodying the principle set out above and instead of a mechanical linkage being used as a compensating means a hydraulic or other fluid-operated means may be used. For example, double-acting hydraulic or pneumatic systems would be provided, controlled from common inlet and exhaust valves and arranged so that the loading of one system for displacement in one direction would always be accompanied by an equal loading of the other system for displacement in the opposite direction.

What we claim is:

1. Guiding means for a travelling web comprising a rotatable non-driven guide roll over an arcuate portion of which the web is led, means supporting the guide roll with its axis of rotation horizontal comprising a pair of transversely spaced bearings within which the ends of the guide roll are journaled, transversely spaced supports at one side of the axis of the guide roll to which the bearings are pivotally connected for pivotal movement about an axis spaced from and parallel to that of the guide roll, linkage connected to the bearings at the other side of the axis of the guide roll operable concomitantly to effect movement of the bearings in opposite directions relative to a pivot axis situated midway between said supports, said guide roll being axially constrained by said supports, and power-operable means connected to the linkage, responsive to lateral movement of an edge of the web to the left or right with respect to the direction of movement of the web to effect a compensating movement of the end of the guide roll at that edge rearwardly or forwardly in the direction of movement of the web.

2. Guiding means according to claim **1**, wherein said bearings are movable angularly in perpendicular planes at right angles to the axis of rotation of the guide roll.

3. Guiding means according to claim 1, wherein each bearing comprises a hub and radially extending, diametrically disposed arms, the extremities of the arms at one side being connected to said supports and the extremities of the arms at the other side being connected to said linkages, and said guide roll being pivotally journaled at its opposite ends in said hubs.

4. Guiding means according to claim 1, wherein the supports are transversely spaced horizontal arms, the bearings are supported between the arms for pivotal movement in perpendicular planes at right angles to the axis of the guide roll, for pivotal movement about an axis spaced forwardly of the axis of rotation of the guide roll, and the linkage is pivotally connected to the bearings on axes spaced rearwardly of the axis of the guide roll.

5. Guiding means according to claim 1, wherein said linkage comprises a pair of bell crank levers having first and second pairs of arms, the first pair of arms being disposed in opposite directions and being connected to the bearings, and the second pair of arms being disposed in the same direction, and a connecting rod connecting said second pair of arms to each other.

6. Guiding means according to claim 9, wherein said power-operable means comprises a fluid pressure operable cylinder containing a piston and piston rod to which pressure is adapted to be supplied to effect movement of the piston rod, and means connecting the piston rod to the linkage.

7. Guiding means according to claim 6, wherein a valve controls the flow of fluid pressure to said cylinder, and a feeler in engagement with an edge of the web operates to shift the valve in a direction to compensate for wandering of the edge of the web.

8. Guiding means according to claim 6, wherein a valve controls the flow of fluid pressure to said cylinder, and photoelectric means controls the operation of the valve, said photoelectric means comprising a pair of switches and an armature alternately responsive thereto, said photoelectric means being normally operable in response to movement of the web laterally in a direction to be intercepted by such movement to actuate one of the switches and by lateral movement in a direction to intercept neither of the photoelectric means to operate the other of the switches.

9. Guiding means for a substantially vertically travelling web comprising a non-driven guide roll over which said web is led, said guide roll having an arc of contact with the web, transversely spaced end bearings rotatably supporting the ends of the guide roll in a substantially neutral position with the axis of the guide roll substantially at right angles to the direction of the run of the web, means supporting the bearings for movement substantially in the direction of the run of the web, means mutually interconnecting the bearings such that any movement of either bearing in one direction of said run of the web in response to the action of sensing means effects equal movement of the other bearing in the opposite direction so as to counter-balance the weight of the one end of the guide roll against the other, sensing means responsive to lateral wandering of an edge of the web operable to effect said compensating movement of the bearings, and biasing means operably associated with the ends of the guide roll operable to restore the same to its neutral position in the absence of operation of said sensing means.

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WALTER STOLWEIN, *Primary Examiner.*

U.S. Cl. X.R.

74—241; 250—219