June 2, 1953 R. WINKLER ET AL 2,640,660

DEVICE FOR LATERALLY ADJUSTING WEBS

Filed June 2, 1951 4 Sheets-Sheet 1

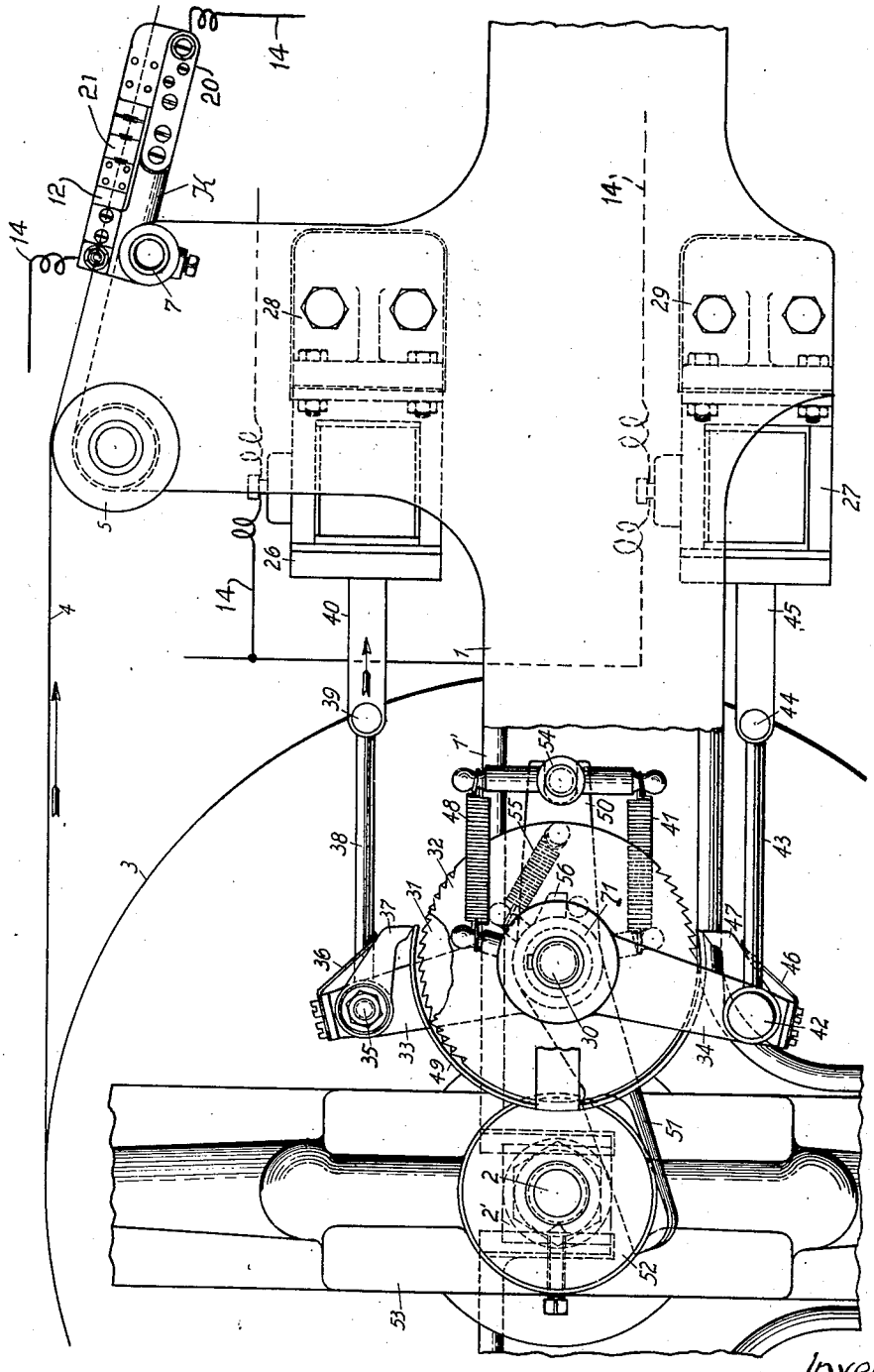


Fig. 1.

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DEVICE FOR LATERALLY ADJUSTING WEBS

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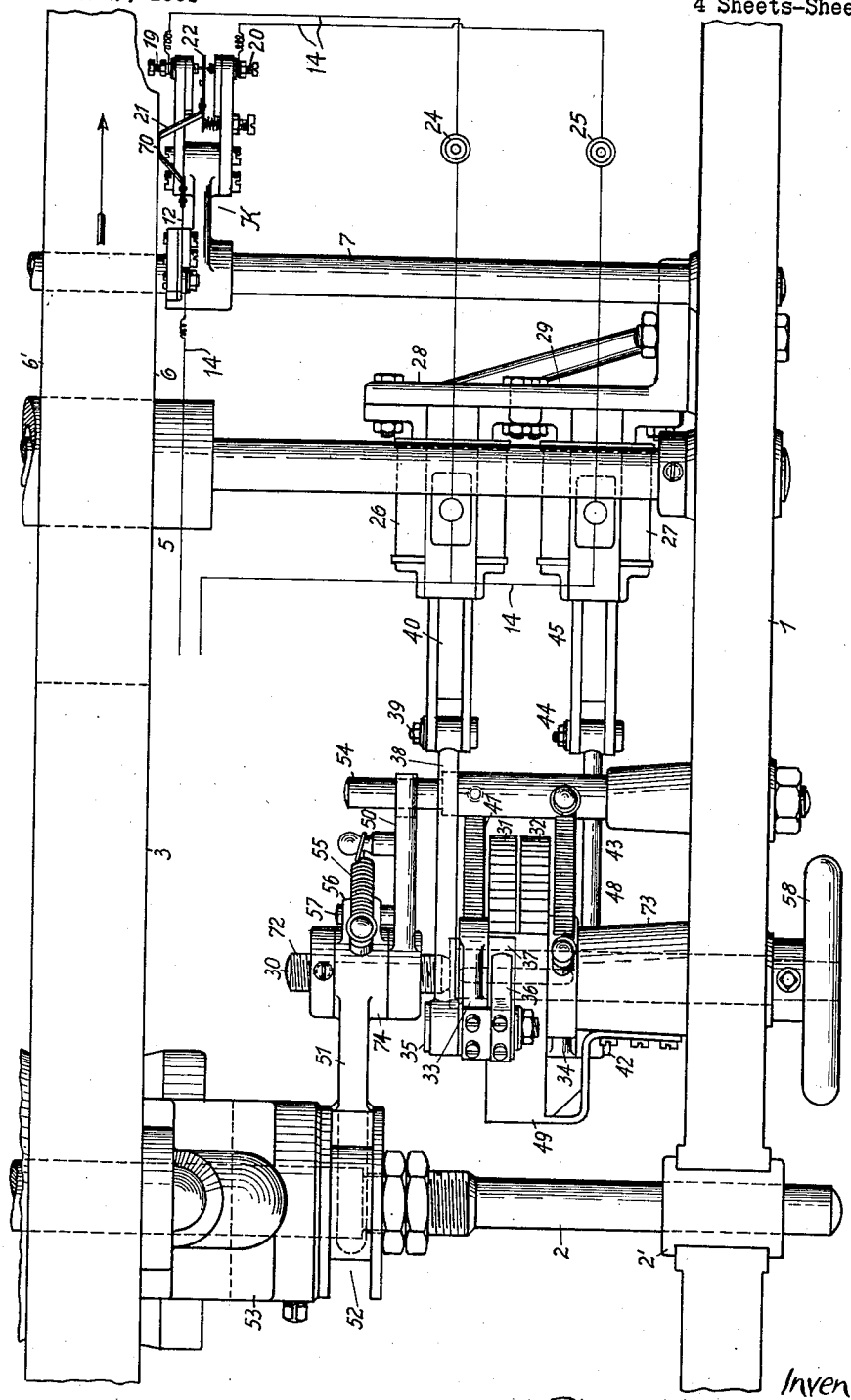


Fig. 2.

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Fig. 3

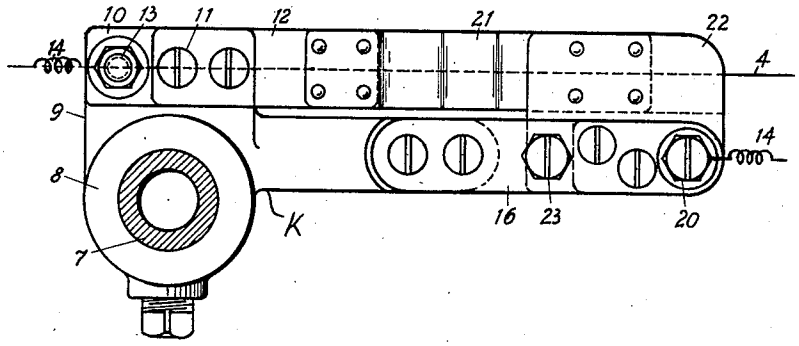
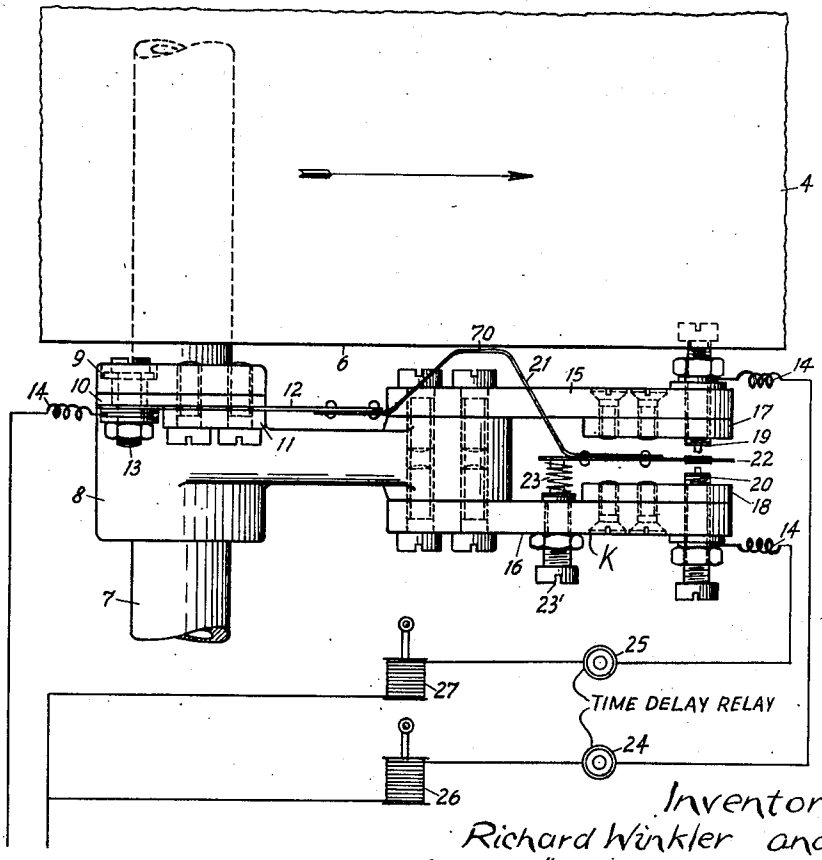


Fig. 4



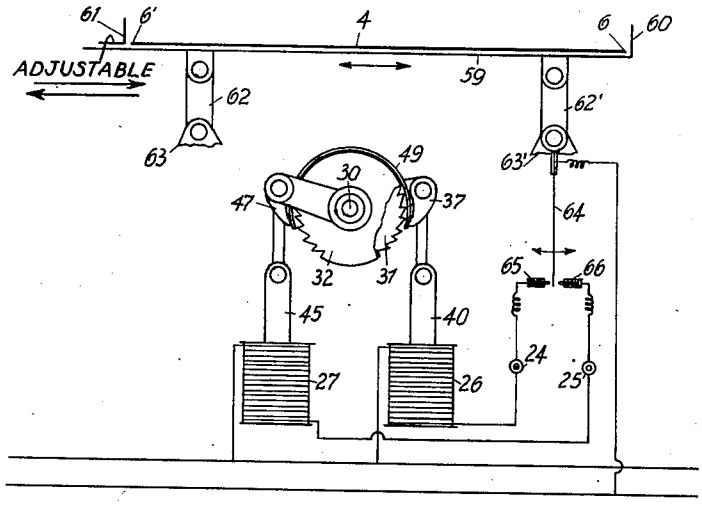
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DEVICE FOR LATERALLY ADJUSTING WEBS

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Fig. 5



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UNITED STATES PATENT OFFICE

2,640,660

DEVICE FOR LATERALLY ADJUSTING WEBS

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Application June 2, 1951, Serial No. 229,568
In Germany November 2, 1949

12 Claims. (Cl. 242—76)

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This invention relates to a device for the continuous automatic straightening of a web of paper or other material fed from a carrying roll, and relates, more particularly, to a device for accurately straightening the web during the operation of a machine while the web is travelling from its carrying roll to the web treating stations in the machine.

This lateral straightening, which is of great importance for uniformity and dependability, is generally effected by an axial displacement of the roll to one side or the other to counteract the lateral deflection of the web.

One object of the present invention is to provide a device with which it is unnecessary to effect a troublesome adjustment with every variation in width of the roll but which remains ready for operation with webs of different widths, either without any adjustment whatever or with only a very simple adjustment that can be conveniently and quickly effected.

Another object of the present invention is to provide a device having a single feeling member actuated by deflection of one edge of the web in either direction, movement in one direction being effected by the web itself and movement in the other direction being effected by spring or like means, in order to complete one or other of two separate electric circuits, whereby actuating means partly electrical and partly mechanical are controlled in such manner as to shift the web roller in one direction or the other to compensate for the deflection of the web.

Two embodiments of the invention are hereinafter described with reference to the accompanying drawings.

One of these embodiments is characterized by a device arranged in proximity to one of the two longitudinal edges of the web so that deflection of the web in either direction actuates this feeler member and such actuation, on reaching certain limits established by suitable adjustment, actuates certain contact means to close one or other of two electric circuits whereby electric and mechanical actuating means are operated to compensate for the deflection of the web by shifting the roll in the direction opposite to the direction of deflection.

The second embodiment comprises a cross bar arranged beneath the web, this cross bar having side edges adjustable in relation to each other and to the width of the web, the cross bar actuating a single contact member extending between two spaced contacts.

With the above and other objects in view, the present invention consists in the novel construction and arrangement of parts as hereinafter described, illustrated in the drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form and arrangement may be made without departing from the spirit of the invention or sacrificing any of the advantages thereof.

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In the drawings—

Fig. 1 is a side view showing the complete device, according to the embodiment of the invention.

Fig. 2 is a plan view thereof.

Fig. 3 is a detail side view of the feeler member with contact device for engaging one edge of the web.

Fig. 4 is a plan view of the device shown at Fig. 3, and

Fig. 5 is a diagrammatic front view showing a second embodiment of the device with feeler members at both edges of the web.

Referring to Figs. 1 and 2 of the drawings, the frames 1, 1' of the complete machine are broken away so as to show only the parts carrying the device according to the present invention, and in Fig. 1 the front part of the frame 1 is partly broken away to give an unobstructed side view of certain portions of the device, and Fig. 2 shows only the side frame part at one side of the machine.

Bearings 2' for the support of the shaft 2 of the roll 3 are mounted in guides in the side frames 1, 1' and these guides are open at the top.

The web 4 unwinds from the roll 3 with the operation of the machine and runs in the direction of the arrows as shown at Figs. 1, 2 and 4 toward the operating stations of the machine, being supported by suitable guide rolls in the usual well-known manner. A suitable guide roll 5 is so arranged that the web 4 remains under tension in spite of variations in the diameter of the roll 3 from which the web is fed and a feeler device K is carried on a cross member 7 in proximity to one of the two longitudinal edges 6, 6' of the web 3, the member 7 being carried by the two side frame parts 1, 1' and the feeler K being capable of longitudinal adjustment on the member 7 and of swinging motion for angular adjustment thereon.

Referring to Figs. 3 and 4 showing details of the said feeler device K, the hub part 8, which serves for the mounting of the device on the cross bar 7, has an upwardly extending projection 9 upon which a very thin leaf spring 12 is secured between two plates 10 and 11 of insulating material. The right-hand end of the leaf spring

12 projects beyond both insulating plates 10, 11 and its other end extends only beyond the plate 11 and rests upon the plate 10 and is connected with a screw 13 which is insulated from the part 8 and serves for the connection of an electric lead wire 14, so that only the screw 13 and the leaf spring 12 are electrically connected. On the right-hand end of the part 8, two side rails 15, 16 of insulating material are provided and the free ends of these rails are provided on their inner sides with metal plates 17, 18, respectively, and mounted in these plates are contact screws 19, 20 to which electric lead wires 14 are connected. As clearly shown at Fig. 4, the end of the leaf spring 12 which extends beyond the plates 10, 11 and beyond the projection 9 of part 8, has a rail member 21 secured thereon and this rail preferably consists of a steel or hard metal plate which thus forms an extension of the spring 12 and is bent to such a shape that the surface of a bent portion extends beyond the outer surface of the projection 9 while its free end is located between the said plates 17, 18 and in parallel relation thereto. A thin metal plate 22 is secured to the rail part 21 and extends between the screws 19 and 20. Under the action of the leaf spring 12 and of a sensitive coil spring 23, the pressure of which can be readily adjusted by means of a set screw 23', the rail 21 exerts a very slight pressure against the longitudinal edge 6 of the web 4 and, as long as this web is correctly positioned in a transverse direction, the feeler is maintained in such a position that the plate 22 does not come in contact with either of the contact screws 19, 20. A deflection of the web 4 in a direction upwardly with respect to Fig. 4 causes the plate 22 to make contact with the contact screw 19 while a deflection of the web in the opposite direction causes the said plate to make contact with the screw 20, so that one or other of two electric circuits is closed through one or other of the screws 19, 20. Each of these two circuits includes one of two time delay relays 24, 25 and includes one of two electromagnets 26, 27, which serve as part of the electric actuating means for the displacement of the roll 3 in order to compensate for the deflection of the web 4.

Referring again to Figs. 1 and 2, the electromagnets 26, 27 are carried on brackets 28, 29 secured on the side frame 1. Mounted in the frame 1 is a screw-threaded spindle 30 having two ratchet wheels 31, 32 secured thereon and having their ratchet teeth facing in opposite directions. On the outer side of each of these wheels 31, 32 rocker arms 33, 34 are mounted, the rocker arm 33 having a pin 35 carrying a pawl 37 acted upon by a spring 36 and adapted to engage the teeth at the upper periphery of the wheel 31. A connecting rod 38 links the arm 33 to a pin 39 on the iron core 40 of the electromagnet 26. When the electromagnet 26 is energized, the attraction of its iron core 40 imparts a feeding motion to the rocker arm 33 and a partial rotation of the wheel 31 and of the screw-threaded spindle 30 connected therewith. The swinging motion of the arm 33 takes place against the action of a tension spring 41 connected to the hub of the said wheel 31 so that the arm is returned to its initial position when the circuit is interrupted and the iron core 40 is thus also pulled out of the magnet coil. In the same manner, the rocker arm 34 is actuated by the electromagnet 27 when current has been supplied thereto, the said arm 34 being connected by means of a pin 42 with a rod 43 and pin 44 with the iron core 45 of the magnet 27. The arm 34 has a pawl 47 with a spring 46 and the lower periphery of the wheel 32 is engaged by the pawl 47 and the rocker arm 34 is returned to its initial position by the tension of a spring 48 when the current to the electromagnet 27 is interrupted.

In order to prevent the possibility of the pawls 37, 47 locking themselves in their feed positions, a guard 49 is secured to the bearing hub of the frame 1 and extends around a part of the periphery of both ratchet wheels 31, 32 and extends so far towards the points of engagement of the pawls 37, 47 that when the rocker arms 33, 34 are swung back into their initial positions, the pawls are supported upon the guards and are thus raised from the teeth of the ratchet wheels.

A lateral deflection of the web 4 upwardly with respect to Fig. 2 causes a corresponding motion of the rail 21 in the feeler device K, thus making contact between the metal plate 22 and the contact screw 19 so that the circuit which is thus closed actuates the relay 24 and the electromagnet 26 thus causing partial rotation of the rocker arm 33 to actuate the gear 31 and screw-threaded spindle 30. As long as the circuit remains closed due to the deflection of the web, it will be interrupted and again closed at given time intervals determined by the relay 24 which thus causes repeating feed movement of the rocker arm 33. Due to the partial clock-wise rotation (Fig. 1) of the threaded spindle 30, the arm 50 which is guided on the said spindle and the arm 51 which engages the said thread are moved in the direction opposite to the direction of the deflection of the web. The lever 51 engages a groove 52 in a part 53 which serves as a stop for the roll 3, and said part 53 is secured to the roll shaft 2 so that the latter is moved with the roll 3 and the web 4 running therefrom. The web 4 is accordingly displaced in the direction opposite to the direction of the deflection and when the web has been returned to its correct position, the rail 21 and plate 22 move to their normal position to break the contact and the feeding motion of the rocker arm 31 is interrupted.

In the same manner, a deflection of the web 4 downwardly with respect to Fig. 2 causes movement of the rail 21 in the feeler K in the same direction and brings about a contact between the metal plate 22 and the contact screw 20 which thus closes the second circuit. This circuit actuates through the time relay 25 the electromagnet 27, the iron core 45 of which moves the rocker arm 34 through the connecting rod 43 and pawl 47 thus imparting movement to the feed gear 33 and turning the spindle 30 in a counter-clockwise direction (Fig. 2) so that the arms 50, 51 together with roll 3 and web 4 are displaced to compensate for the deflection of the web.

The arm 50 which is engaged by the screw thread of the spindle 30 has at its free end a slot engaging a fixed pin 54 secured to the side frame 1. The arms 50 and 51 are connected to each other by a spring 55 which holds the arm 51 and a stop projection 56 against a pin 57 secured to the arm 50 so that the upward motion of the arm 51 is limited. This arrangement facilitates the introduction of the arm 51 into the groove 52 of the roll part 53 when a new roll of material is mounted in the machine and prevents injury to the arm 51. The spindle 30 is provided with a hand wheel 58 for the initial adjustment of the lever 51 upon the introduction of a new

roll of material into the machine and for the subsequent adjustment of the roll itself in an axial direction. This adjustment is effected in such a manner that the feeler rail 21 is moved by the edge 6 of the web 4 into the position in which its metal plate 22 does not contact either of the two contact screws 19 and 20.

Since the edge 6 of the web is located at the same place regardless of the width of the webs, the feeler member K does not require readjustment when a new roll is placed in the machine even if the width of the web differs from the width of the roll previously handled by the machine.

In the initial adjustment of the feeler member K, the hub of the arm 50 should be located in approximately the longitudinal center of the threaded part of the spindle 30 when the web is in its correct lateral position so that the spindle is free to turn in either direction.

By a proper shaping and dimensioning of the feeler member comprising the parts 12, 21 and 22, and by the relative length of the parts between the plates 10 and 11 and the points of contact with the web and the total length from said plates to the points of contact with the screws 19, 20, the feeler may be designed to give the desired sensitiveness since the movement between the screws 19 and 20 may be considerably in excess of the deflection at the point of contact between the web and the plate 21. In the embodiment shown on the drawings, the feeler has approximately twice the deflection between contact screws 19 and 20 as it has at the point of contact with the web. This ratio of 2 to 1 can, however, be readily increased to 3 to 1 or more when greater sensitivity is desired.

Referring to Fig. 5 of the drawings, the embodiment diagrammatically shown is provided with a bridge member or cross-bar 59 arranged transversely beneath the web 4 running from the roll to the operating stations of the machine. The parts 60 and 61 of the bridge 59 extend upwardly to engage said edges, the part 60 serving to guide the web edge 6 which is located in the same place regardless of the width of the web, while the part 61 is adjustable in the transverse direction so that it may be moved in accordance with the width of the web. The adjustment is effected in such a manner that the web 4 passes exactly between the two parts 60, 61, and the bridge 59 may swing upon two parallel links 62, 62' mounted on stationary supports 63, 63' of the machine frame. When the web is in the normal position, the parts are located as shown in Fig. 5 and in this position a contact rail 64 connected to the link 62' participates in the movement of the feeler device and in the position shown is located between two contact screws 65, 66.

In operation a deflection of the web 4 to the right causes a corresponding movement of part 59 in the same direction and thus deflects the rail 64 into contact with a screw 65 so that an electric current is caused to pass through the time relay 24 and through the electromagnet 26, thus operating the feed gear 31 through the medium of the pawl 37 so that the roll is shifted towards the left, the threaded spindle in this case having a left-hand thread.

In the same manner, a deflection of the web towards the left causes contact between the rail 64 and the contact screw 66, thus closing the second circuit through the time relay 25 and the electromagnet 27, so that the feeding of the gear

32 is effected by the pawl 47 and the roll is shifted toward the right.

Although the drawings and the above specification disclose the best modes in which we have contemplated embodying our invention, we desire to be in no way limited to the details of such disclosure, for in the further practical application of our invention many changes in form and construction may be made as circumstances require or experience suggests, without departing from the spirit of the invention within the scope of the appended claims.

What we claim is:

1. In a machine of the type described, a straightening device for a web, comprising a web-carrying roll, a feeler member engaging at least one edge of the web and adapted to be deflected in accordance with lateral deflection of the web in either direction, an electric circuit, means whereby lateral deflection of the said feeler member in one direction closes said circuit, a second electric circuit, means whereby deflection of the feeler member in the opposite direction closes said second circuit, a screw-threaded spindle, two ratchet wheels mounted co-axially with each other and with said spindle, two rocker arms both mounted for swinging movement about the axis of said wheels, and means actuated by either of said circuits to swing one of said arms and to impart step-by-step motion to said spindle to move the web-carrying roll to compensate for the deflection of the web in either direction.

2. A device according to claim 1, in which the straightening device for the web comprises a spring member whereby deflection of the web in either direction closes one of said electric circuits.

3. A device according to claim 1, in which the feeler member comprises a spring with a medial feeler portion resiliently engaging one longitudinal edge of the web whereby the spring member is bent in accordance with lateral deflection of the web in either direction, and an adjustable spring device for regulation of said spring member.

4. A device according to claim 1, comprising a cross-member located beneath the web and extending from edge to edge thereof, and feeler parts mounted on said cross-member for engagement with the two side edges of the web.

5. A device according to claim 1, in which the feeler member comprises a laterally movable cross-member located beneath the web and extending from edge to edge thereof, and relatively adjustable upwardly projecting feeler parts mounted on said cross-member for engagement with the opposite edges of the web.

6. A device according to claim 1, in which the feeler member comprises a cross-bar located beneath the web and extending from edge to edge thereof, a feeler part secured to the cross-bar and engaging one side edge of the web, a feeler part adjustably secured to the cross-bar and engaging the second side edge of the web, means for supporting the cross-bar for movement in a lateral direction with respect to the web, and a contact rail depending from the cross-bar, for closing said circuits.

7. A device according to claim 1, in which the feeler member comprises a cross-bar located beneath the web and extending from edge to edge thereof, a feeler part secured to the cross-bar and engaging one side edge of the web, a feeler member adjustably secured to the cross-bar and en-

gaging the second side edge of the web, parallel links supporting the cross-bar for swinging movement with respect to the web, and a contact rail carried by the cross-bar member for closing said circuits.

8. A device for the lateral straightening of a web, comprising a web-carrying roll, two electro-magnets, an electric circuit for the actuation of each magnet, feeler means engaging at least one side edge of the web, contacts adapted to be closed by said feeler means to supply current to one of said circuits on deflection of the web in either direction, two rocker arms one of which is actuated by each electro-magnet, two ratchet wheels rotatable in opposite directions, and one of which is operated by each of the rocker arms, and means actuated by said ratchet wheels to impart axial step-by-step motion to the roll in the direction opposite to the direction of deflection of the web.

9. A device for the lateral straightening of a web, comprising a web-carrying roll, two electro-magnets, an electric circuit for the actuation of each magnet, a feeler engaging at least one side edge of the web, contacts adapted to be closed by said feeler on predetermined motion thereof to supply current to one of said circuits on deflection of the web in each direction, a relay whereby the iron core of each electro-magnet is alternately attracted and released while its circuit is closed, a screw-threaded spindle for imparting axial movements to the roll to compensate for the deflection of the web in either direction, two independently rotatable ratchet wheels for rotating the said spindle, two independently actuated rocker arms for imparting step-by-step motion to said ratchet wheels, and means connecting each iron core with one of said rocker arms to impart rocking movement thereto when the corresponding circuit is closed.

10. A device for the lateral straightening of a web, comprising a web-carrying roll, two electro-magnets, an electric circuit for the actuation of each magnet, a feeler device with a medial portion engaging one side edge of the web, contacts adapted to be engaged by the end portion of said feeler device to supply current to one of said circuits on deflection of the web in either direction, a time delay relay in each circuit whereby the iron core of each electro-magnet is alternately attracted and released while its circuit is closed, two independently actuated rocker arms mounted on a common axis and one actuated by each electro-magnet, two ratchet wheels both mounted on the same axis as said arms and rotated in opposite directions by said arms, a screw threaded spindle turned in one direction by each of said ratchet wheels, and an arm extending from and actuated by said spindle to move the said roll axially to compensate for the deflection of the web.

11. A device for the lateral straightening of a web, comprising a web-carrying roll, two electro-magnets, an electric circuit for the actuation of each magnet, a feeler member engaging at least one edge of the web, a contact device actuated by said feeler member to supply electric current to either of said circuits, a time delay relay included in each circuit to alternately make and break the circuit while it is closed by said contact device, a pair of independently rotating ratchet wheels, a pair of independently actuated rocker arms both mounted on the same axis as said wheels, a screw-threaded spindle adapted to be turned in one direction by each of said ratchet wheels, means connecting each electro-magnet with one of the rocker arms to impart rocking motion thereto to impart step-by-step motion to the ratchet wheel, and means whereby the screw threaded spindle transmits axial step-by-step movement to the roll in the proper direction to compensate for the deflection of the web.

12. A device for the lateral straightening of a web, comprising a web-carrying roll, two electro-magnets, two electric circuits, one for the actuation of each magnet, a feeler member engaging one side edge of the web, spaced contact devices engaged by said feeler member to supply electric current to either of said circuits, a time delay relay included in each circuit to alternately make and break the circuit while it is closed by one of said contact devices, two rocking pawl devices one actuated by each electro-magnet, two ratchet wheels one actuated by each pawl device, a screw-threaded spindle adapted to be turned in one direction by each of said ratchet wheels, stationary guard means preventing engagement of each pawl device with its ratchet wheel while its electric circuit is open, and means whereby a turning motion of the spindle transmits axial movement in either direction to the roll to compensate for the deflection of the web.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
477,352	Cottrell	June 21, 1892
1,882,578	Hardiman	Oct. 11, 1932
2,037,086	Nash	Apr. 14, 1936
2,078,669	King	Apr. 27, 1937