Nov. 11, 1941. J. F. FERM 2,262,638

STRIP GUIDING APPARATUS

Filed Jan. 30, 1941 2 Sheets-Sheet 1

Fig. 1.

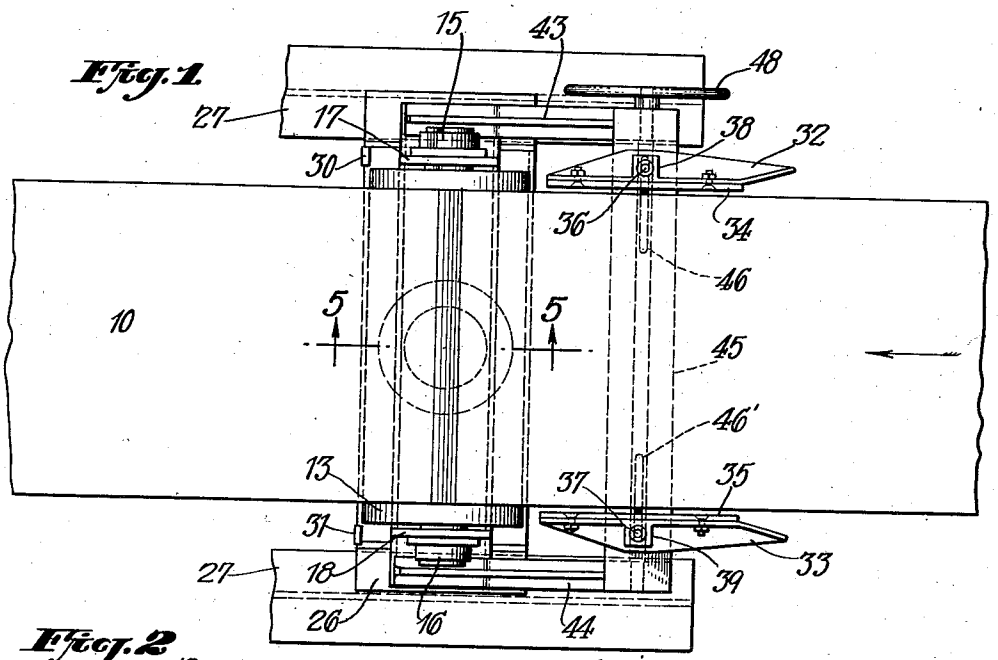


Fig. 2.

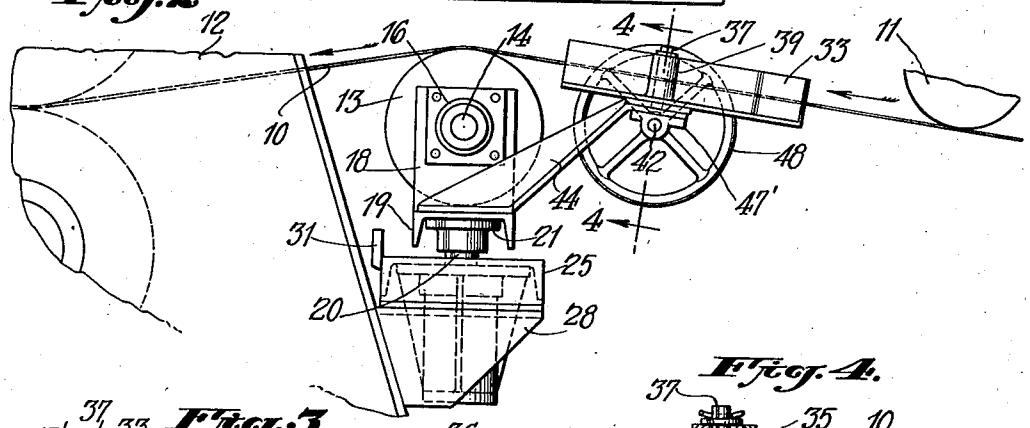


Fig. 3.

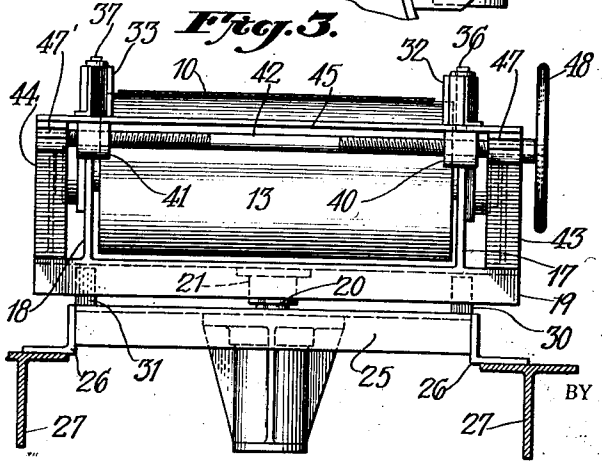
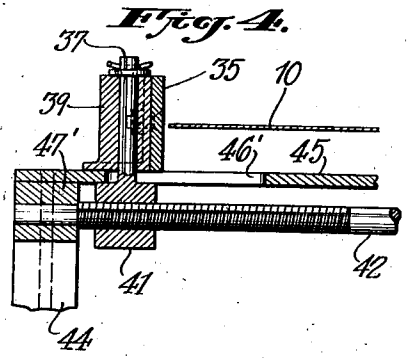


Fig. 4.



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Filed Jan. 30, 1941 2 Sheets-Sheet 2

Fig. 6.

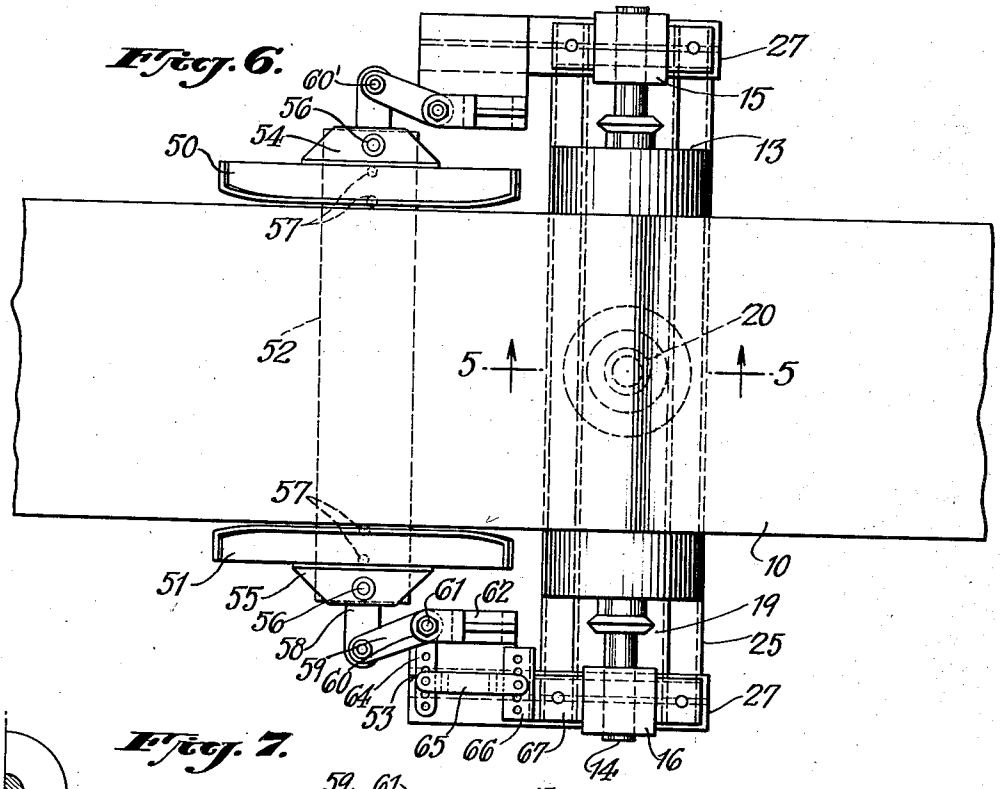


Fig. 7.

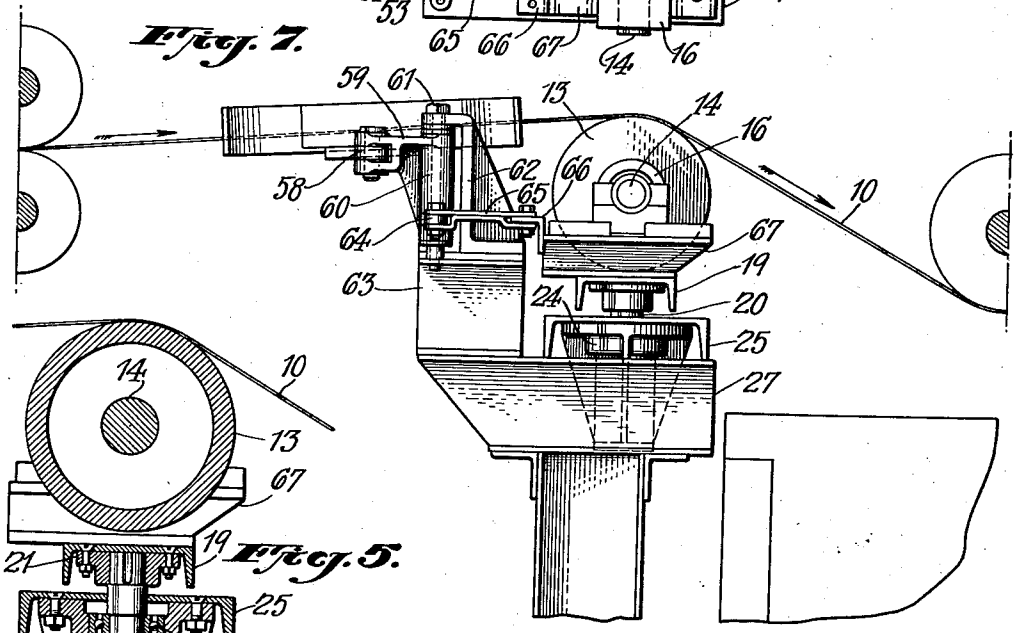


Fig. 5.

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Patented Nov. 11, 1941 2,262,638

UNITED STATES PATENT OFFICE

2,262,638

STRIP GUIDING APPARATUS

John F. Ferm, Midland, Pa., assignor to Crucible Steel Company of America, New York, N. Y., a corporation of New Jersey

Application January 30, 1941, Serial No. 376,660

8 Claims. (Cl. 271—2.6)

This invention relates to apparatus for automatically guiding traveling continuous strip material, and is particularly adapted for controlling the position of rapidly moving metal strip during its passage from one machine or process to another in steel mills.

The invention involves the use of a roller, or equivalent means, over the surface of which the traveling strip passes, such roller being mounted in a manner permitting variation of the angular position of its axis in respect to the normal path of travel of the strip, and a pair of contact members one adjacent each side of the moving strip, these being constructed and arranged for edgewise engagement of the strip therewith whenever the strip deviates with a sideways drift from its normal path. These contact members are attached to or interconnected with mounting means for the roller in a manner whereby engagement of the strip with the contact means causes said angular position of the roller axis to be varied in a direction and to an extent whereby the roller then acts to guide the strip back to its desired normal position of travel.

According to preferred examples of the invention, the roller mounting means is supported pivotally at its mid portion, and the above mentioned contact members are secured at opposite ends of such mounting means, and arranged for contacting with the strip at a position somewhat in advance of the position of the roller, whereby the strip, when it deviates from its normal path, frictionally engages one or the other of the contact members, thus tending to urge such member along with the strip and at the same time displacing the contact member laterally somewhat. The combined effect of such frictional engagement and lateral displacement, serves to promptly and effectively turn the roller mounting means on its pivot to the extent necessary for the roller to guide the strip back to its normal path. The contact members preferably extend for a considerable distance longitudinally of the edges of the strip, and are preferably pivotally mounted, for example, adjacent their mid portions so as to insure uniform smooth contact with a considerable edge surface area on the strip even when deflected to an angle from its normal path, and even though the strip may be of thin flexible material.

Various further and more specific objects, features and advantages of the invention will more clearly appear from the detailed description given below taken in connection with the accompanying drawings which form a part of this specification and illustrate merely by way of example certain preferred forms of the invention. The invention consists in such novel features, arrangements and combinations of parts as may be hereinafter disclosed and claimed.

In the drawings, Figs. 1, 2 and 3 respectively are plan, side and end views showing a preferred form of the apparatus;

Fig. 4 is a sectional view partly broken away and taken substantially along the line 4—4 of Fig. 2;

Fig. 5 is a sectional view taken substantially along the line 5—5 of Fig. 6; and

Figs. 6 and 7 respectively are plan and side views of an alternative form of the invention.

Referring now to the form of the invention shown in Figs. 1 to 4, the continuous strip of material which is to be guided, is indicated at 10. This strip may be advancing rapidly longitudinally in the direction indicated by the arrows, and may comprise for instance a steel strip on its way from a guide roller 11 for example, to a bridle stand such as indicated at 12. A roller 13 over which the strip passes, may be mounted upon a shaft 14 suitably journaled at each end as by bearings 15 and 16. These bearings may be supported respectively as upon steel plate members 17 and 18 upstanding from a channel-shaped cross beam member 19, the latter being pivotally supported at its mid portion by means which may be substantially as shown in Fig. 5. This pivotal support may include for example a shaft 20 secured to the under side of the beam 19 as by a flange member 21 and having its lower portion supported as shown by ball bearing assembles as at 22, 23. These bearings may be mounted in a suitable housing as at 24 secured to the under side of a stationary cross beam member 25. The beam 25 may be supported at its ends as by angle irons 26 resting upon side frames as at 27 of any desired machine (as indicated for example in Figs. 1, 3) or in case the apparatus is to be mounted adjacent the bridle stand as shown in Fig. 2, the ends of the beam 25 may be secured to plate-like bracket members as at 28, for example, welded to the frame of the bridle stand.

A pair of upstanding lugs as at 30, 31 may be welded to the ends of the beam member 25 for suitably engaging the beam member 19 to limit its pivotal movements in either direction, and to consequently limit the pivotal movements of the roller 13 about the axis of shaft 20.

As shown in Figs. 1 and 2, a pair of contact members 32, 33 having hardened steel liner strips

as at 34, 35 are mounted in positions adjacent each side of the strip for edgewise engagement of the strip therewith whenever the strip drifts abnormally to one side or the other. As shown, these contact members, together with the liner strips therefor, may extend a considerable distance along the edge surfaces of the strip and may also be pivoted on pins as at 36, 37, so that there will be a considerable area of uniform smooth frictional engagement between the vertical edge surfaces of the traveling strip and the liner strips, even though such edges may be quite thin or the strip 10 may be deflected to an angle somewhat from its normal path of travel. As shown, the rear surfaces of the contact members 32, 33 may be formed with apertured lugs as at 38, 39 for receiving the pivoting pins 36, 37 respectively. Also these pins may be mounted within or form a part of block members as at 40, 41, having respectively oppositely threaded apertures for receiving a correspondingly threaded shaft 42.

The contact members and associated parts may be supported from the ends of the cross beam 19 as by a pair of supporting brackets 43, 44 connected at their upper ends by a cross plate or bar 45 having slots as at 46, 46' for slidably receiving pins 36, 37 respectively. As shown in Figs. 3 and 4, the blocks 40, 41 may engage the lower surface of the cross plate 45, whereas the lugs 38, 39 may engage the upper surface thereof. The shaft 42 may be journaled in bearings as at 47, 47' carried respectively by the brackets 43, 44. Thus it will be apparent that an arrangement is provided by which, on turning a hand wheel 48 fixed upon shaft 42, one may adjust the spacing between the contact members 32, 33 as desired. Furthermore, it will be apparent that as one of these contact members is adjusted toward or away from the edge of the strip, the other contact member will be accurately adjusted by an equal amount in the opposite direction. Hence by a single hand wheel adjustment the spacing of the contact members may be suitably varied to correspond with strips of various widths and yet the adjustment is such that the desired center line along which the strip is to be guided will not be changed.

In operation, assuming for example the strip 10 drifts against contact member 33, this member will by reason of the frictional engagement, be urged in the direction of travel of the strip and at the same time displaced laterally outwardly of the strip. These frictional and lateral forces on the contact member will cause it to turn the roller mounting means clockwise (as viewed in Fig. 1) about the axis of shaft 20 by amounts varying in accordance with the force applied by the strip to the contact member 33. Accordingly the roller 13 will be similarly turned clockwise about said axis and thereby cause the strip 10 to be guided away from contact member 33 back toward its normal path of travel. In so doing, the strip will then soon engage contact member 32, which in turn will, because of the frictional and outward displacement forces thereon, act to turn the roller somewhat in a counter clockwise direction to thus restore the roller to its normal position at right angles to the path of the strip. If this engagement of the strip 10 against the contact member 32 should be excessive, or if the strip 10 should drift in the direction of contact member 32 beyond the normal path of travel of the strip, then it will be apparent that this contact will act to restore the strip to normal position in the same manner as, but opposite to the above described action of contact member 33. The spacing of the contact members 32 and 33 may be readily adjusted by trial in respect to the edges of the strip so that little or no tendency for hunting effects will occur. It may be particularly noted that the contact members 32, 33 are arranged to engage the strip at a position considerably in advance of the position of the roller, and this fact together with the positive contact afforded by the engagement of the vertical edges of the strip with the contact members, insures that the contact means will have sufficient leverage on the roller mounting means, to vary the position of the roller by the proper amount, even though the strip 10 may bear with considerable force against a sizable surface area of the roller 13.

As to the form of the invention shown in Figs. 6 and 7, parts corresponding substantially to those above described are identified by the same reference numerals. With this form of the invention, two contact members as at 50, 51 for frictionally engaging the edges of the strip when it drifts from its normal path, are mounted on a cross plate member 52 which in turn is connected by adjustable linkage means indicated generally at 53, to the roller mounting means. The contact members 50, 51 respectively, may be supported upon and secured to cross plate member 52 by clamping members as at 54, 55 adapted to be fixed by bolts as at 56 passing through one of a series of holes as at 57 in each end of the member 52. Thus the spacing of the contact members 50, 51 may be properly adjusted to accommodate traveling strips of various widths by selecting for use the proper holes 57. The plate member 52 may be formed at its ends with extended lugs as at 58, each having a pivot-pin connection with one arm as at 59 of knuckle members 60 or 60'. These members in turn may be pivotally supported on bolts as at 61 held in place by bracket members as at 62 upon a support as at 63. An outwardly extending arm as at 64 on the knuckle member 60 may be provided with a series of holes as shown for adjustable pivotal connection with a link as at 65, the other end of which link is adapted for adjustable pivotal connection with an angle iron member 66 likewise formed with a series of holes as shown and secured to a member 67 fixed to the end of the cross beam 19.

With the arrangement of Figs. 6 and 7 it will be apparent that when the strip 10 deviates to one side or the other, it will come into edgewise frictional engagement with one or the other of the contact members, and as with the form of the invention previously described, it will be noted that these contact members are pivotally retained by the bolts 56 so that smooth uniform engagement is assured along a considerable length of the edge surfaces of the strip. Such frictional engagement will serve to displace the contact member laterally outwardly of the strip 10 and also longitudinally in the direction of travel of the strip and thus move the knuckle member 60 in the proper direction angularly to push one end of the roller mounting means forward in the direction of movement of the strip. This in turn will cause the roller to assume a position such as to promptly guide the strip back to its normal path. In so doing, the strip will engage the other contact member, which acting through the same linkage, will serve to return, in due course, the roller 13 back to its normal position substantially at right angles to the path of travel of the strip.

With the adjustable linkage above described,

it will be apparent that the leverage by which the contact members act upon the roller mounting means, may be properly adjusted as determined by trial, to cause the roller to change its position by amounts, as compared with the deviation of the strip, such that the strip will be promptly guided back to normal, but without any substantial tendency for hunting effects to occur.

While the invention has been described in detail with respect to particular preferred examples, it will be understood by those skilled in the art after understanding the invention that various changes and modifications may be made without departing from the spirit and scope of the invention, and it is intended therefore in the appended claims to cover all such changes and modifications.

What is claimed as new and desired to be secured by Letters Patent is:

1. Apparatus for automatically guiding continuous strip material along a given longitudinal direction of travel, comprising; a roller extending transversely of the strip and contacting therewith, means mounting said roller for pivotal movement whereby the angular position of the axis of the roller may be altered in respect to the normal path of travel of the strip, contact members respectively extending along the strip for engagement with the strip edges when the strip deviates substantially from its normal path, laterally and longitudinally displaceable means mounting said contact members respectively on pivotal axes generally perpendicular to the strip, whereby the contacting surfaces of said members are free to become aligned with the strip edges in extensive frictional contact upon such engagement, to thereby advance said contact mounting means in said longitudinal direction, and means interconnecting the contact mounting means and the roller mounting means, whereby engagement of the strip with either contact member alters said angular position in a direction such that the roller tends to guide the strip toward its normal path.

2. Apparatus for automatically guiding continuous strip material along a given longitudinal direction of travel, comprising; a guide roller over the surface of which the strip passes, means mounting said roller and permitting variations of the angular position of its axis in respect to the normal path of the strip, laterally displaceable contact means constructed and arranged for edgewise engagement of the strip therewith when the strip deviates substantially from its normal path, adjustable linkage means interconnecting said mounting means and said contact means to then alter said angular position in a direction such that the roller tends to restore the strip to said normal path.

3. Apparatus for automatically guiding along a given longitudinal direction, a continuous metal strip which is rapidly traveling under substantial tension, comprising two contact members respectively extending along the strip edges, means at each of said members intermediate the ends thereof for pivoting same about axes extending generally perpendicular to the face of the strip, whereby the contacting surfaces of said members are free to become aligned with the strip edges in extensive frictional contact upon engagement with the strip during departure from its normal path, means mounting said pivoting means and so constructed and arranged as to be advanced in said longitudinal direction by such frictional contact, a guide roller over the surface of which the strip passes, and means associating said mounting means and roller for varying the angular position of the roller axis in respect to the normal path of the strip in a direction tending to restore the strip to its normal path upon such advancing movements of said mounting means.

4. Apparatus for automatically guiding along a given longitudinal direction, a continuous metal strip which is rapidly traveling under substantial tension, comprising two contact members respectively extending along the strip edges, mounting means movable in general directions longitudinally of the strip, for each of said members, and also so constructed and arranged as to permit said members to become aligned with the strip edges in extensive frictional contact upon engagement with the strip when the latter deviates at various angles from its normal path, and a guide roller adjustable in its angular relation to the strip by movements of said mounting means resulting from such frictional contact.

5. Apparatus for automatically guiding along a given longitudinal direction, a continuous metal strip which is rapidly traveling under substantial tension, comprising two contact members respectively extending along the strip edges, a guide roller for the strip, a supporting frame upon which said roller is journaled and upon which said contacts are mounted at positions in advance of the roller, and a pivotal support for said frame including a shaft surrounded by a bearing, the axis of said shaft extending in a plane passing through the mid-portion of the roller and generally perpendicular to the roller axis, said contacts being adapted for extensive frictional engagement with the tensioned strip during its deflection from its normal path to thereby turn said frame on its pivotal support and alter the angular position of the roller axis in respect to the normal path of the strip in directions tending to restore the strip to its normal path.

6. Apparatus for automatically guiding along a given longitudinal direction, a continuous metal strip which is rapidly traveling under substantial tension, comprising two contact members respectively extending along the strip edges, means mounting said members to permit movement thereof generally along the strip upon frictional engagement with the strip and also permitting generally transverse movement under sidewise impacts of the strip, a single guide roller adjacent to and under the control of said members and extending transversely of the strip, and means interconnecting said members and roller whereby said movements alter the angular position of the roller axis in respect to the normal path of the strip, in a direction such that the roller tends to restore the strip toward its normal path.

7. Apparatus for automatically guiding along a given longitudinal direction, a continuous metal strip which is rapidly traveling under substantial tension, comprising two contact members respectively extending along the strip edges, means mounting said members and having portions movable generally along the strip upon frictional engagement of the members with the strip and said portions also being movable generally transversely under impacts of the strip, a freely revolving guide roller journaled on said mounting means and contacting with the strip transversely thereof after its passage between said two con-

tact members, whereby said movements alter the angular position of the roller axis in respect to the normal path of the strip, in a direction such that the roller tends to restore the strip toward its normal path.

8. Apparatus for automatically guiding along a given longitudinal direction, a continuous metal strip which is rapidly traveling under substantial tension, comprising a guide roller over the surface of which the strip passes, a pivotal support for said roller having an axis adjacent the roller and generally perpendicular to the roller axis, a pair of contact members respectively extending along the strip edges and adjacent to but in advance of the roller, means mounting said contact members to permit movement thereof generally along the strip upon frictional engagement with the strip and also movement transversely under sidewise impacts of the strip, and means interconnecting said contact members and roller whereby said movements alter the angular position of the roller axis in respect to the normal path of the strip, in a direction such that the roller tends to restore the strip toward its normal path.

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