June 16, 1959 L. F. McCAFFREY 2,890,609

ENTRY STICKER GUIDE FOR ROLLING MILLS

Filed Jan. 23, 1956 4 Sheets-Sheet 1

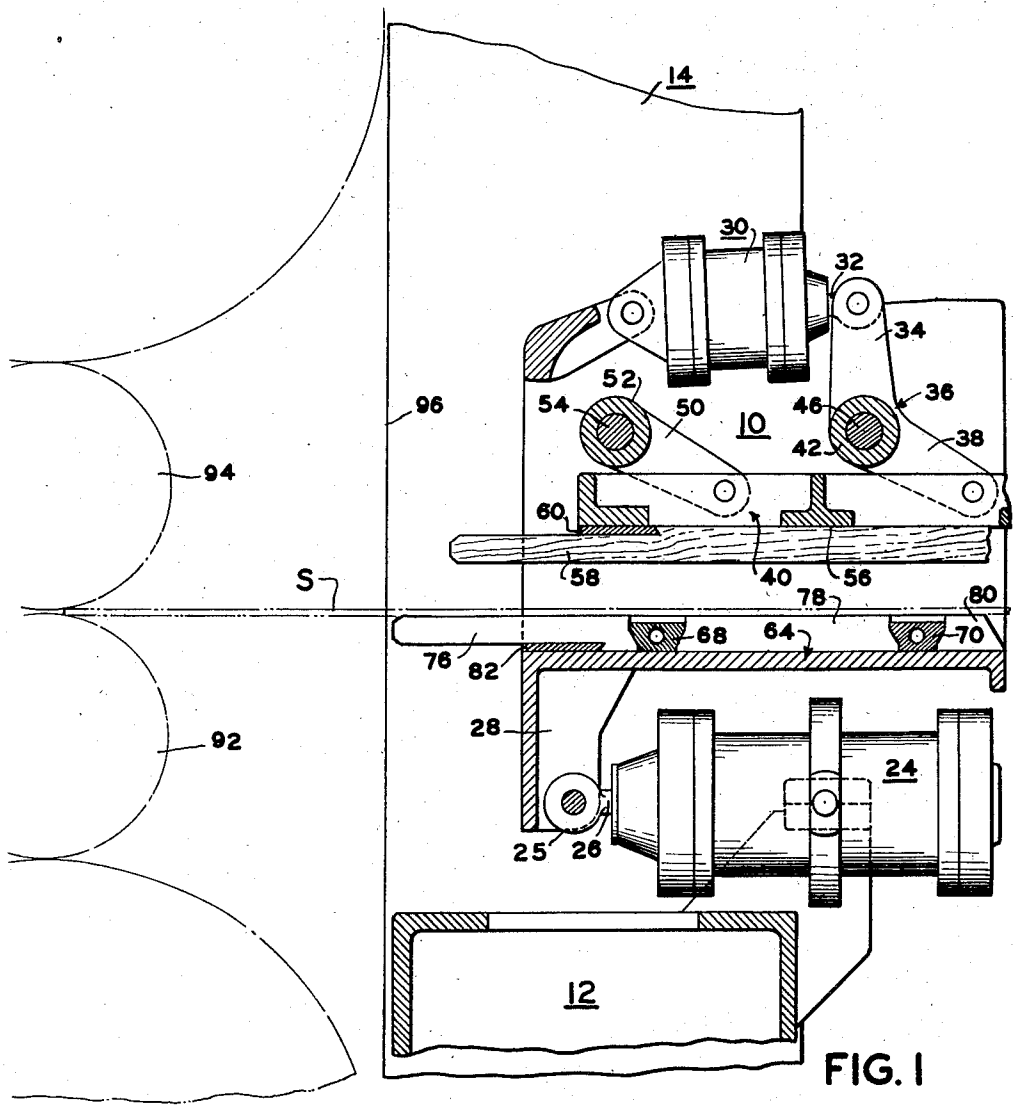


FIG. 1

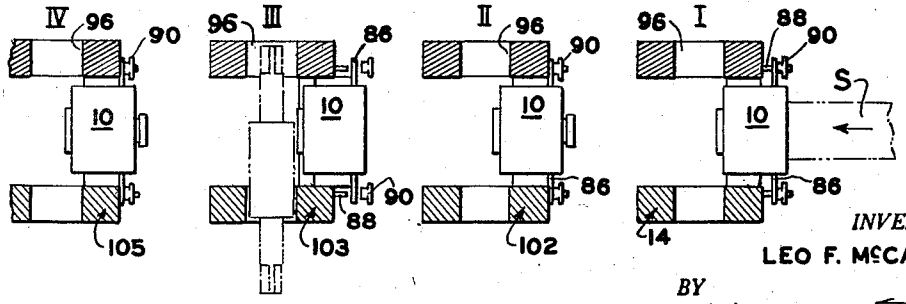


FIG. 7

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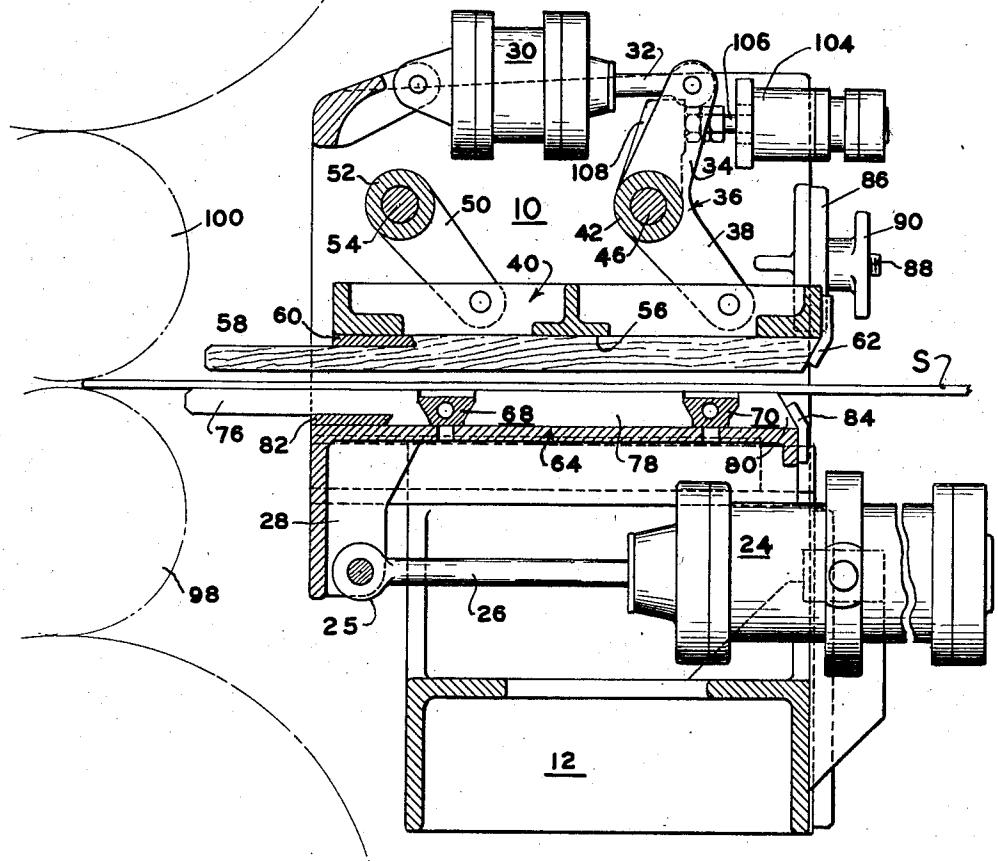


FIG. 2

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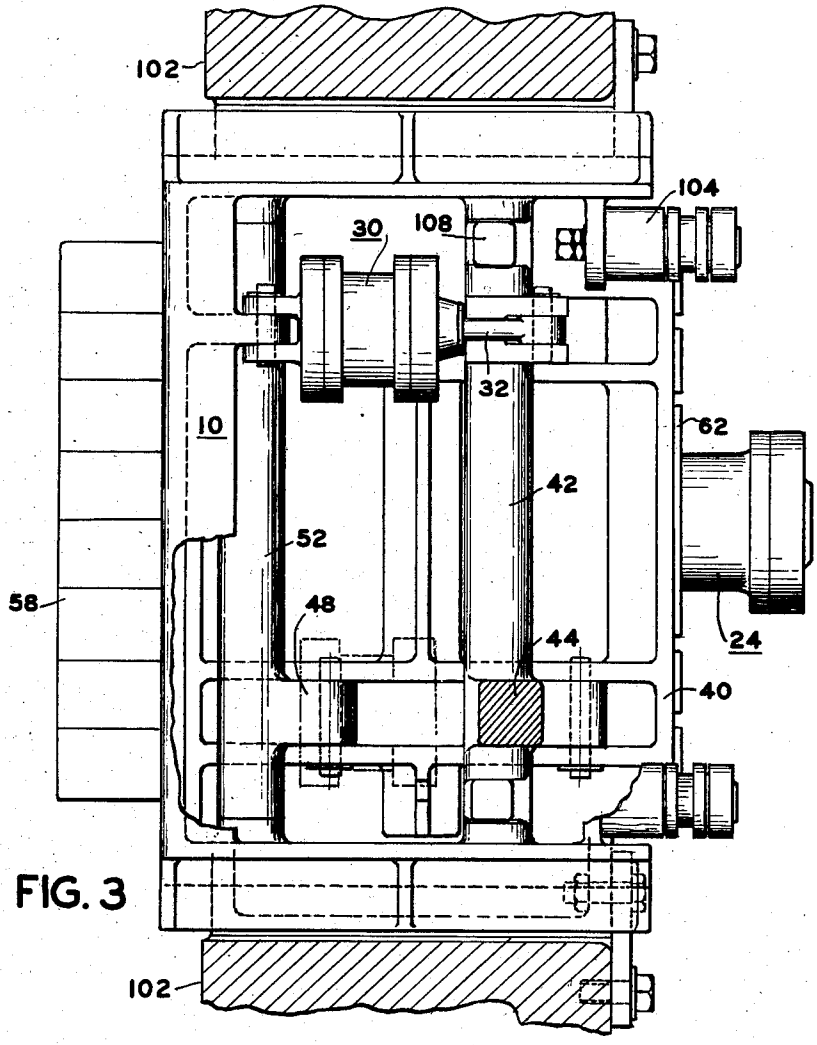


FIG. 3

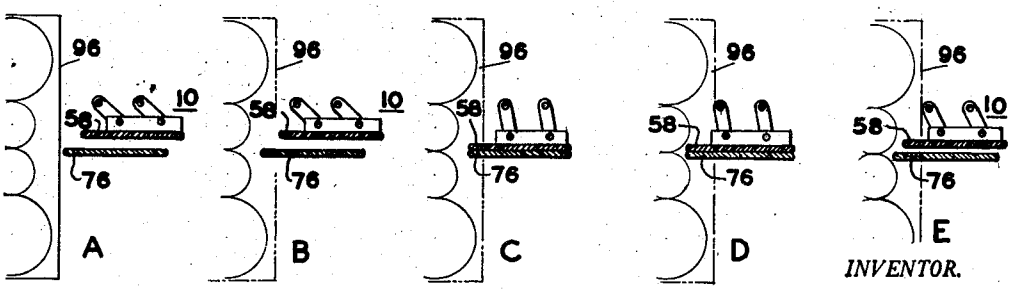


FIG. 8

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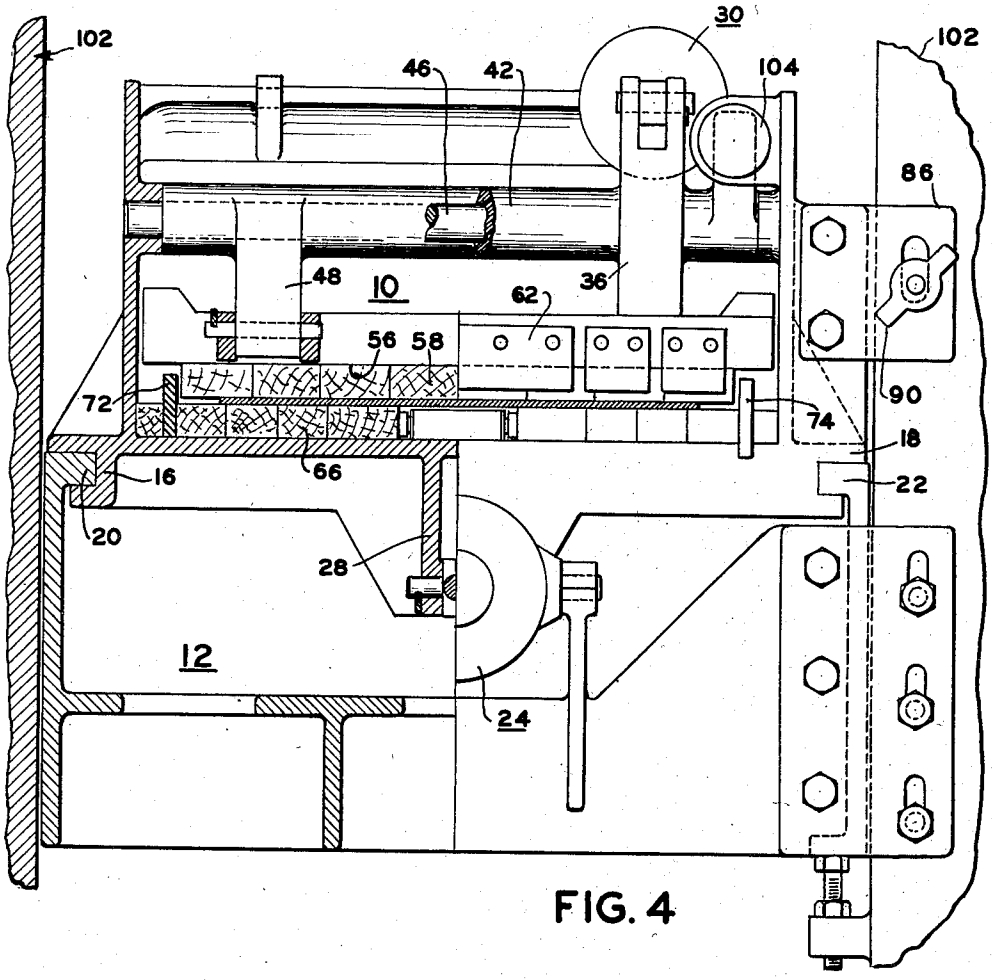


FIG. 4

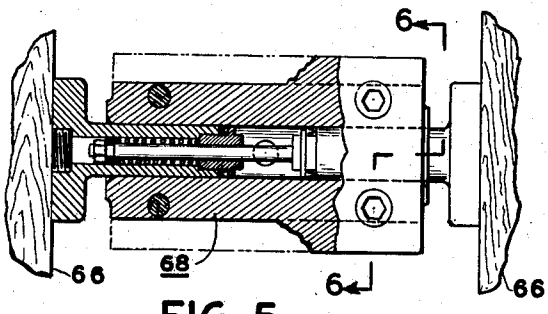


FIG. 5

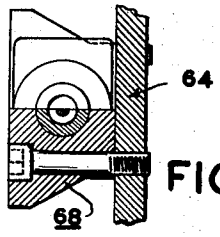


FIG. 6

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ENTRY STICKER GUIDE FOR ROLLING MILLS

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Application January 23, 1956, Serial No. 560,656
1 Claim. (Cl. 80—51)

This invention relates, in general, to apparatus for guiding strip between work rolls of rolling mill stands. In particular the invention relates to apparatus for sticking the forward end of a strip of metal between the work rolls of a rolling mill stand, and thereafter for guiding the strip between the work rolls of subsequent rolling mill stands arranged in tandem.

Various devices have been employed heretofore to guide steel strip through a rolling mill, and in particular a tandem rolling mill, and these guides essentially comprise a plurality of members arranged to maintain the position of the strip laterally and vertically with respect to the work rolls of the mill. To this purpose top and bottom platens of some form are employed in association with side members, the platens being adapted to provide some degree of pressure against the upper and lower surfaces of the strip as it passes through the mill, with the side members serving to provide lateral alignment of the strip. Inasmuch as these guides are usually permanently mounted on the mill stand housings it is necessary to separate the upper and lower platens to provide clearance when first threading a strip through the stands of a rolling mill, but otherwise the platens are in clamped engagement with the strip. In these prior art devices, in the clamped position the guide is subjected to wear due to the sliding of the steel between the upper and lower platens, and in the open position the platens do not sufficiently restrict the undulating movement of the strip between stands to provide good control of the strip.

It is a principal object of this invention, therefore, to provide an improved strip guide for rolling mills which is adjustable to reduce excessive wear of the platens, and yet maintains the strip in proper alignment between stands.

Other objects of the invention include the provision of a strip guide which serves to stick the leading end of the strip between the work rolls of the first stand of a rolling mill, and to provide back tension on the strip being fed into the first stand; the provision of a strip guide suitable for use as a so-called "entry sticker guide" i.e., a guide adapted to start strip between a pair of work rolls, or as an intermediate guide between stands of rolls; the provision of a strip guide which is adjustable to several positions, namely, closed, slightly open, and full open, whereby in the closed position the platens provide back tension on the strip being drawn therethrough, in the partially open position the platens properly guide the strip into the work rolls without subjecting the platens to abrading action of the strip, and in the full open position the strip is readily threaded between the platens into the work rolls of a mill stand; and the provision of a strip guide which is of simple construction and is trouble free in operation, which serves either as a so-called "entry sticker guide" or as an intermediate strip guide, and which is readily adjustable to enable the rolls of the mill to be removed and serviced without interference from the strip guides.

Other objectives of the invention will become apparent in the description of a preferred embodiment of the invention which is set forth hereinbelow.

Figure 1 is a side elevational view, partially sectioned, of a preferred embodiment of the invention in use as

an entry sticker guide mounted opposite the work rolls of the first stand of a four-high mill;

Figure 2 is a side elevational view, partially sectioned, showing the application of the embodiment as an intermediate strip guide between stands of a rolling mill;

Figure 3 is a top plan view of the embodiment of the invention shown in Figure 2;

Figure 4 is a rear elevational view, with parts broken out and with other parts partially sectioned, of the embodiment of the invention shown in Figure 2;

Figure 5 is an enlarged fragmentary detail view, partially sectioned, showing the quick release clamp means employed to secure wooden members to the top face of the lower platen of the embodiment of the invention shown in Figure 2;

Figure 6 is a sectional view taken on the line 6—6 of Figure 5;

Figure 7 is a schematic plan view layout of a four stand tandem mill employing preferred embodiments of the invention; and

Figure 8 is a schematic elevational representation of the strip guide employed in its various positions relative to a roll stand.

Reference is now made to Figure 1 wherein is shown a preferred embodiment of the invention employed as an entry sticker guide, i.e., apparatus for gripping the lead end of a strip and forcing it between the work rolls of a mill. This embodiment of the invention comprises a frame 10 slidingly mounted on a supporting base 12 which is rigidly secured to the housing of a first mill stand 14 or subsequent mill stand 102 (see also Figures 3 and 4). The lateral edges of the frame 10 are provided with rectangular ways 16 and 18 (see Figure 4) to receive therein track portions 20 and 22 of base 12 to guide the movement of the frame forwardly and rearwardly with respect to the mill stands 14 or 102.

A power cylinder 24 is mounted on the base 12 and the forward end 25 of the piston 26 of the cylinder is secured to a depending lug 28 integral with the frame 10. Standard means (not shown) are provided to energize this cylinder 24, whereby the piston 26 will force frame 10 forwardly or rearwardly with respect to the mill stand 14. A second power cylinder 30 is mounted on the upper portion of the frame 10, and the forward end of the piston 32 of this power cylinder is pivotally secured to the upper arm 34 of a bell crank 36. The bell crank 36 is pivotally secured to the frame 10, and the lower arm 38 of the bell crank is pivotally secured to the rearward portion of the upper platen 40. The bell crank 36 is integral with a sleeve 42 extending transversely across the frame 10 to carry near its opposite end an arm 44 which is a companion to bell crank arm 38 (see Figure 3), and the sleeve 42 is pivotally journaled on a cross shaft 46 having its end portions mounted in the frame 10. The forward portion of the upper platen 40 is pivotally secured to an pair of arms 48 and 50 integral with a sleeve 52, and sleeve 52 is pivotally journaled to a cross shaft 54 having its end portions mounted in the frame 10. Arms 38, 44, 48 and 50 are pivotally mounted in the same horizontal plane and are of equal length to form a parallelogram linkage which imparts vertical movement to the upper platen 40 while at the same time maintaining the platen in a horizontal position.

The lower face 56 of the upper platen 40 is lined with a plurality of elongated wooden slats or blocks 58 which are suitably secured thereto by means of holding plates 60, 62, or the like. (See Figures 2 and 4.) The lower platen 64 is likewise lined with a plurality of elongated wooden blocks 66 these blocks being held in place by a pair of quick release clamps 68 and 70 (see also Fig-

ures 5 and 6) which apply lateral pressure against the sides of the blocks forcing them into pressure contact with side guide plates 72 and 74. Filler blocks 76, 78, and 80 (see Figure 1) are also placed adjacent the quick release clamps and are held in place by means of the dovetail or V cross-sectioned configuration of quick release clamps 68 and 70 and holding plates 82 and 84.

The strip guide in operation as an entry sticker guide functions in the following manner (see Figure 1). The piston 26 of the cylinder 24 is retracted to shift the frame 10 to the position shown at (*b*) of Figure 8. This movement away from the mill stand 14 is delimited by a plate member 86 fastened to the side of the frame 10, a stud member 88 integral with the mill stand housing 14 and projecting outwardly therefrom to pass through an aperture in the plate member, and a nut 90 which is threadedly received on the outer end of the stud member (see stand I of Figure 7). By adjusting the nut 90 on the stud 88 the travel of the frame 10 is accordingly delimited.

With the nut 90 threaded on the stud 88, power cylinder 30 is then energized, by suitable means (not shown) to pivot said bell crank 36 from position (*b*) of Figure 8 in a clockwise direction thereby shifting the upper platen 40 downwardly into clamping position on the strip S, as shown in position C of Figure 8. With the platens 40 and 64 gripping the strip S therebetween, the power cylinder 24 is once more energized to shift the frame 10 forwardly toward the mill stand 14 and to stick the forward end of the strip between the work rolls 92 and 94 of the mill stand (see position *d* of Figure 8). The work rolls will then draw the strip therethrough, and in order to provide some back tension on the strip, the platens 40 and 64 are maintained in this clamped position. To clear the frame 10 from the window 96 of the mill stand housing 14 or 102, the nut 90 is removed from the stud 88 and the piston 26 is retracted within the cylinder 24 to shift the frame beyond the outer limit defined by the end of the stud (see Figure 1 and stand I of Figure 7).

An embodiment of the invention (Figures 2, 3 and 4) is also employed as an intermediate guide between stands of rolls and for a better understanding of this application of the invention, reference is now specifically made to Figure 2. This embodiment of the invention is quite similar to the previously described embodiment, and for clarity and brevity of exposition, like parts are indicated by like numerals.

Power from the first stand of rolls 14 is sufficient to stick the leading end of the strip between the work rolls 98 and 100 of the stand 102 so that no traversing of the frame 10 is required. Accordingly, nut 90 is screwed down snug against plate 86 during normal operating conditions. However, when the frame 10 is to be shifted clear of the housing stand 102, as with the first discussed embodiment of the invention, nut 90 is removed from stud 88 and the frame is then shifted the full length of the stroke of the cylinder 24 (see stand III of Figure 7).

In threading the strip S into the work rolls 98 and 100 of the second stand 102, the piston 32 of cylinder 30 of Figure 1 is retracted to elevate the upper platen 40 into full open position. After the strip S is gripped by the work rolls of the second stand 102, cylinder 30 of the first stand guide is then re-energized to force the piston 32 outwardly and platen 40 downwardly into a strip gripping position with the lower platen 64, and the platens are maintained in this gripping position until the strip is threaded through all of the stands of the tandem mill.

To reduce friction between the strip S and the lower platens of the intermediate guides, means are provided to hold the upper platens 40 spaced above the lower platens an optimum distance which will reduce wear on the lower platen and yet provide good alignment of the strip passing therethrough. To this purpose, an additional power cylinder 104 is provided with the guides employed between mill stands. This cylinder 104 is mounted on the frame 10 and positioned so that its piston 106 makes contact with a lug 108 secured to the cross shaft sleeve 42. The pressure of the cylinder 104 is sufficient to overcome the pressure of cylinder 30, whereby bell crank 36 is counterrotated to incrementally elevate the upper platen 40 from the strip. By employing pressure and counter-pressure as provided by cylinders 30 and 104, a relatively fine adjustment can be made in the position of the upper platen with respect to the lower platen (see position *e* in Figure 8). This adjustment is very advantageous since, as aforesaid, to maintain the platens in a tightly clamped position on the strip when the mill has been brought up to speed results in excessive wear of the wooden blocks lining the platen faces, thereby requiring frequent replacement thereof. On the other hand, to shift the upper platen to the full open position necessary to thread the mill reduces the control and effect of the guide on the strip. It has been found, however, that to elevate the upper platen an incremental amount sufficient to reduce frictional wear of the platens by the strip, very good control can be maintained on the strip even though the upper platen is no longer in pressure engagement therewith.

It will be apparent, however, that friction of the strip against the wooden blocks 66 of the lower platen 64 has not been eliminated, and for this reason the quick release clamps 68 and 70 are provided, as discussed hereinabove, to enable quick replacement of the wooden blocks when they have become sufficiently worn to require their removal.

While only two embodiments of the invention are shown and described hereinabove, it is not intended that these embodiments be construed in a limiting sense. Other changes and modifications will occur to those skilled in the art following the teaching of the present invention which will be within the spirit and scope of the appended claim.

I claim:

In combination, an entry sticker guide for a rolling mill stand including a frame shiftably secured to said mill stand, first motor means to shift said frame to and from said mill stand along a horizontal path, a lower platen rigidly secured to the said frame, an upper platen shiftably secured to said frame, and bell crank means adapted to shift said upper platen to and from said lower platen while maintaining said platens parallel, the improvement comprising: second double acting motor means drivingly connected between said frame and said bell crank, said motor means when actuated to operate in one direction urges said upper platen through said bell crank into clamping engagement with said lower platen, and when actuated to operate in the opposite direction urges said upper platen through said bell crank away from said lower platen; and third motor means secured between said frame and said bell crank to oppose the effort of said second motor means on said bell crank to stabilize said upper platen at any predetermined position above said lower platen.

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