March 16, 1971 R. C. SEANOR ET AL 3,570,054

AUTOMATICALLY ADJUSTABLE END GUIDES FOR CALENDER ROLLS

Filed Dec. 31, 1968 2 Sheets-Sheet 1

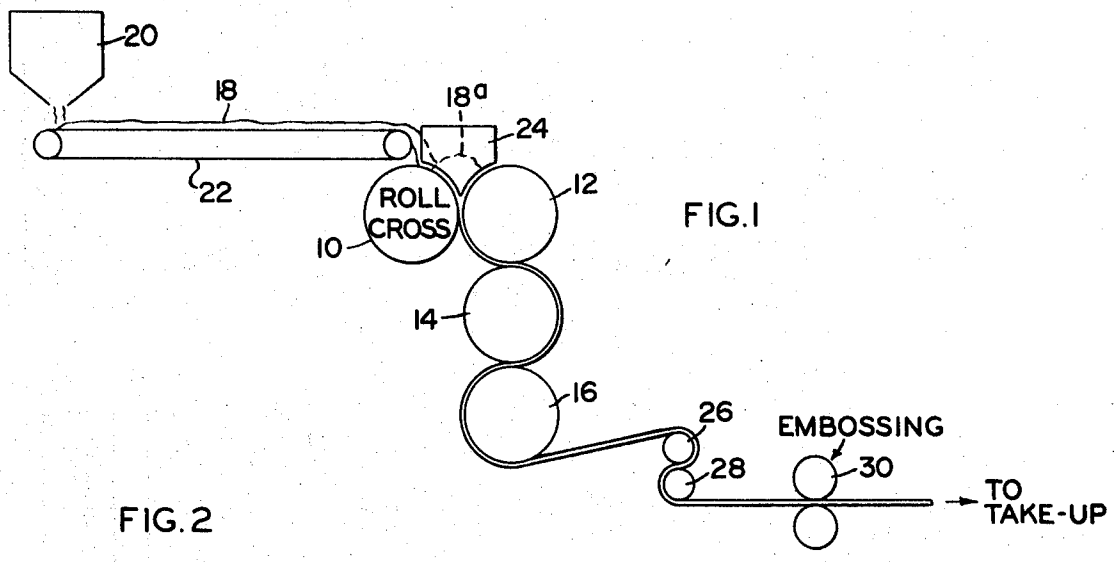

FIG. 1

FIG. 2

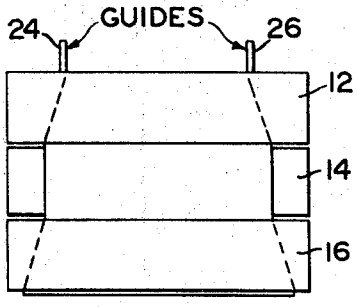

FIG. 3

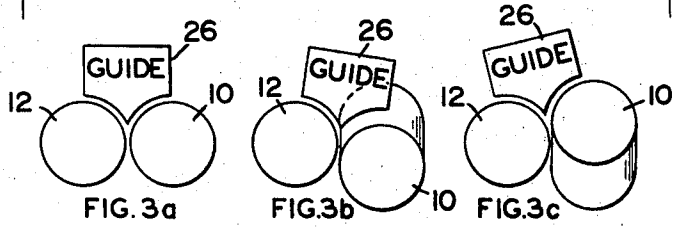

FIG. 3a FIG. 3b FIG. 3c

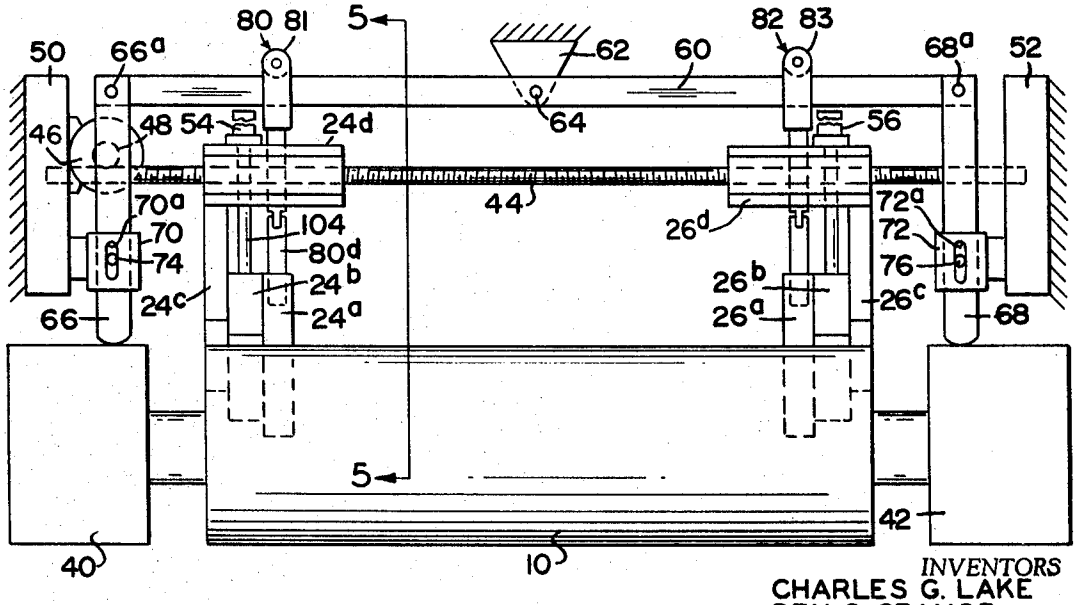

FIG. 4

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FIG. 5

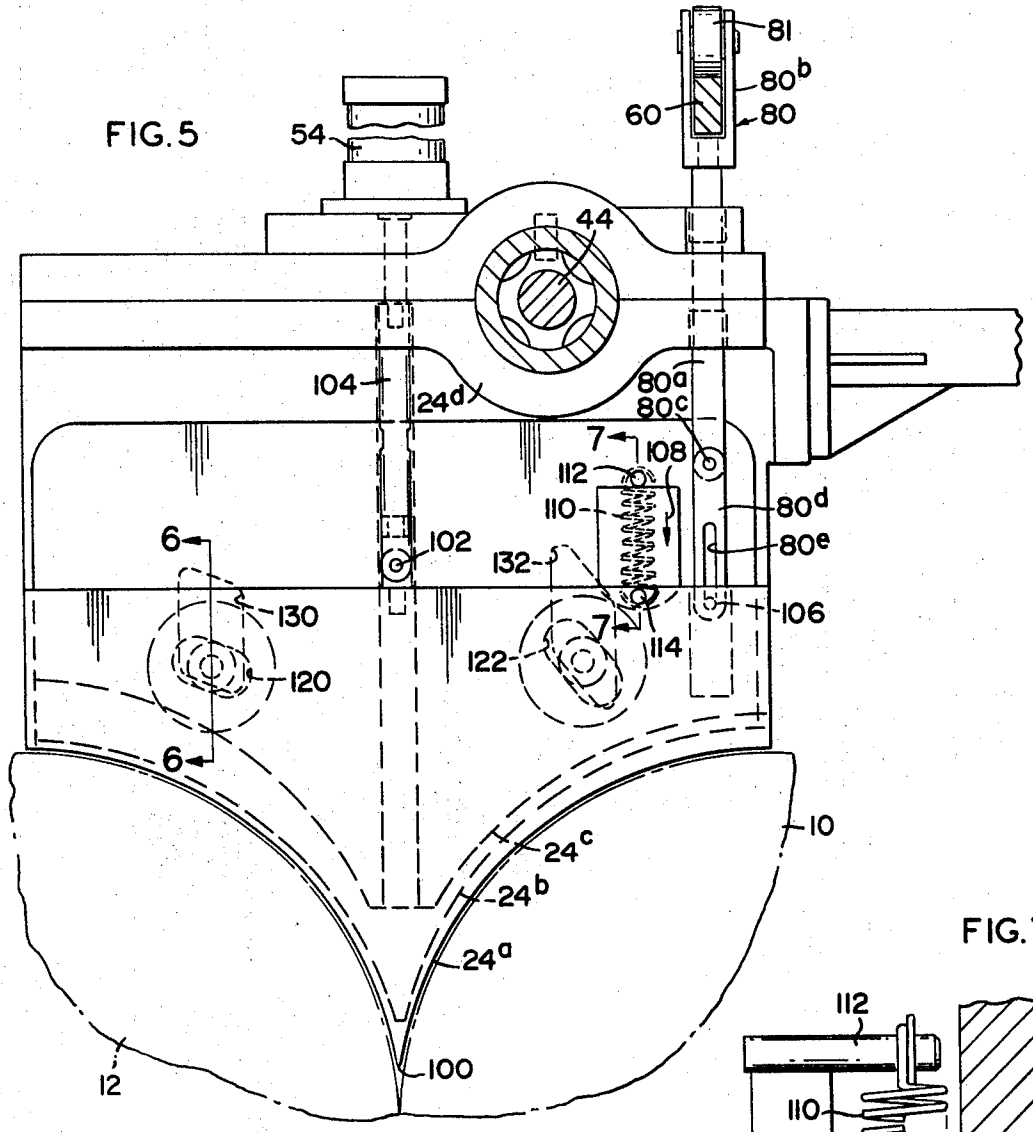


FIG. 6

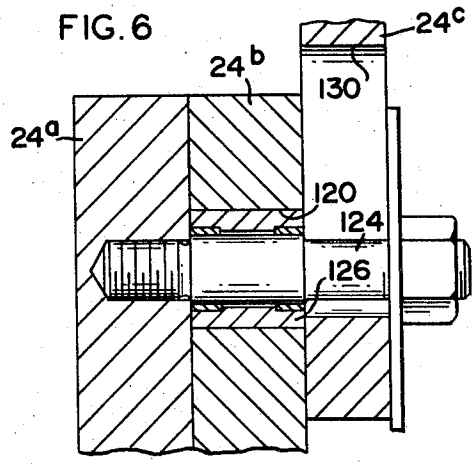
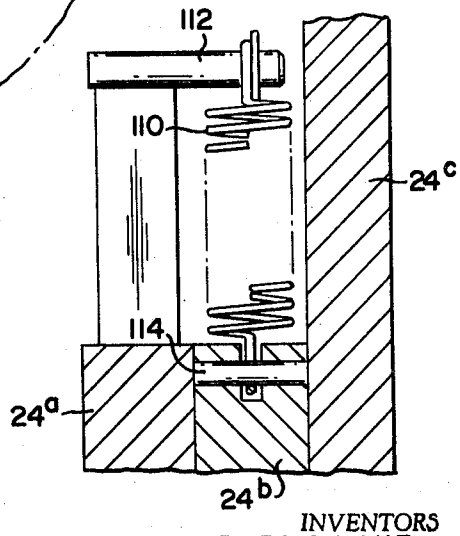


FIG. 7



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AUTOMATICALLY ADJUSTABLE END GUIDES FOR CALENDER ROLLS

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U.S. Cl. 18—2 12 Claims

ABSTRACT OF THE DISCLOSURE

The disclosure relates to automatically adjustable end guides for calender rolls, and is particularly adapted for end guide adjustment for rolls which may be adapted to change relative position because of roll crossing techniques. The automatic guide adjustment is achieved by use of a slave bar associated with adjustable journals carrying the calender rolls. The slave bar is connected through appropriate linkage to the guides which are adjustably mounted to follow the slave bar and maintain close spaced proximity with respect to the rolls without actually touching the rolls to cause scoring. The specifics of the adjustable mounting include a spring loading to urge each guide to a predetermined position, and sliding adjustability on at least two points within the surface of the guide on a radius with respect to one of the rolls.

Heretofore it has been known that there have been material guides associated with calender rolls to prevent the spread of material laterally of the rolls as it is squeezed in through the bite thereof. These guides when dealing with rubber and metal rolls can actually contact the rolls occasionally without serious problems, since scoring of the rolls does not harm the rubber since the final rolled material is not the finished rubber product. Also, these prior art guides have not been confronted with the problem of roll crossing which changes the angular relationship between the rolls because such techniques were not necessary or had not been developed. However, with the advent of roll crossing, and the rolling of plastics, and particularly very thin plastics, into final sheet form through such calender rolls, the guides can no longer touch the rolls in all instances, and must conform to such changes of angle as occur with roll crossing.

The general object of the present invention is to meet the needs of the art by providing material guides for calender rolls which automatically adjust to the configuration and positioning of the rolls without actually contacting the rolls and regardless of roll crossing between the rolls.

A further object of the invention is to provide material guides connected in a slaved relationship to the journal housings supporting calender rolls whereby movement of such journal housings to effect roll crossing of such rolls automatically adjusts the guides to such configuration of the rolls as to provide automatic material guidance without scoring the rolls.

The aforesaid objects of the invention and other objects which will become apparent as the description proceeds are achieved by providing an automatically adjusting guide mechanism for calender rolls which includes at least one pair of parallel calender rolls, a stock guide comprising two laterally spaced forms contoured to fit into the bite between the rolls in close spaced relation to the rolls, but usually out of engagement therewith, means to adjust the laterally spaced relation of the forms, and slave link means connected to the journal means and to the forms to automatically adjust the forms for any change of angular relation between the calender rolls.

For better understanding of the invention, reference should be had to the accompanying drawings wherein:

FIG. 1 is a schematic illustration of the material feed and position of the guide with respect to a plurality of rolls arranged in a conventional rolling configuration;

FIG. 2 is a schematic front elevation of the rolls of FIG. 2 showing how the material is spread when it is flattened as it passes from roll to roll;

FIG. 3 is a schematic illustration showing how the guide must be tilted to conform to the roll crossing configuration between the rolls;

FIG. 4 is a front elevational view of the guide associated with the calender rolls, and comprising a preferred embodiment of the invention;

FIG. 5 is a greatly enlarged partial cross-sectional view of one of the guides of FIG. 4 taken on line 5—5 thereof;

FIG. 6 is an enlarged cross-sectional view of one of the guide pins associated with the guide taken on line 6—6 of FIG. 5; and

FIG. 7 is a cross-sectional view of the spring loading associated with the guide taken on line 7—7 of FIG. 5.

NATURE OF THE PROBLEM

FIGS. 1 and 2 illustrate the general arrangement of a typical calender roll assembly with which the guide of the invention might be associated. Specifically, the calender is made up of four rolls numbered 10–16, where roll 10 is set up to have roll crossing features, and rolls 12, 14 and 16 may have any suitable or desired positioning means provided therefor. Material 18 is fed from a hopper 20 onto a conveyor 22, to then fall down into a mass 18*a* at the bite between rolls 10 and 12. Material is contained in the bite by appropriate material end guides 24 and 26, as best seen in FIG. 2 of the drawings. FIG. 2 also illustrates how the material 18 is spread as it passes from roll to roll so as to be spread to a thin web as it comes off the bottom of roll 16. A pair of tensioning rolls 26 and 28 provide proper tension on the web off the bottom of roll 16, and the web may then pass between a pair of embossing rolls 30 to the takeup, as is standard in the art.

The necessity for the adjustable guides of the invention is most clearly illustrated with respect to FIG. 3 of the drawings, which shows rolls 10 and 12 with guide 24 in the usual position without any roll adjustment in FIG. 3*a*. In FIG. 3*b*, roll 10 has been crossed by lowering the end illustrated as coming out of the paper and raising the opposite end which causes guide 26 to slant or cock to the right as illustrated. The contouring situation is illustrated in FIG. 3*c* where roll 10 has been raised at the end considered as coming out of the paper and lowered at the opposite end so as to cock guide 26 to the left if it is to conform to the configuration of the cocked roll surfaces. Naturally, when one guide cocks one way, the guide on the opposite end is going to cock the other way because of the difference in relationship of the rolls when roll crossing of roll 10 occurs.

The actual structural features of the invention are shown in FIGS. 4–7. Specifically, with reference to FIG. 4, roll 10 is mounted on each end by a journal box 40 and 42. As is usual in the art, the journal boxes 40 and 42 are oppositely moveable vertically limited amounts both up and down to provide desired roll crossing characteristics. For example, in the typical situation where roll 10 might be 36 inches in diameter, and 10 feet long, the journal boxes 40 and 42 might move from a center line position 1½ inches up and down to give a 3 inch total roll crossing characteristic when the journal boxes are moved in opposite directions.

The guides 24 and 26 are indicated generally by these numerals in FIG. 4, but actually each guide comprises a face plate indicated by suffix *a*, a backing plate indicated by suffix *b*, and a carrying plate indicated by suffix *c*, re-

spectively. The carrying plate indicated by suffix *c* is connected to an appropriate housing indicated by suffix *d*. The housings **24***d* are respectively threadably engaged on a screw shaft **44**, which has reversed threading on both halves thereof, as clearly indicated in FIG. 4, so that driving of the screw **44** by an appropriate motor **46** connected through its screw drive shaft **48** will affect simultaneous inward and outward movement of the housings. The motor **46** is mounted to a frame member **50**. A corresponding frame member **52** is mounted at the other side of the calender roll **10**.

Each of the backing plates designated by suffix *b* is connected through a plunger to a respective pressure cylinder, indicated by numerals **54** and **56** respectively, which cylinders are mounted to their respective housings indicated by suffix *d*. The cylinders **54** and **56** control the vertical relationship of backing plates indicated by suffix *b*, respectively. Thus, the cylinders **54** and **56** may be actuated to move the backing plates **24***b* and **26***b* and the guide or facing plates **24***a* and **26***a*, respectively, upwardly away from the rolls **10** and **12** when the guides **24** and **26** are not to be used. The carrying plates indicated by suffix *c* are fixedly mounted to the housings.

As a critical part of the invention, a slave bar **60** is pivotally mounted at about its center to a fixed frame **62** by pin **64**. The bar **60** is connected at opposite ends to links **66** and **68**, respectively through appropriate pivotal pins **66***a* and **68***a*. Each of the links **66** and **68** is slidably received through sleeves **70** and **72**, which are mounted in fixed relationship to frames **50** and **52**, respectively. The links **66** and **68** are limited in their relative sliding movement with respect to the sleeves **70** and **72** by appropriate slots **70***a* and **72***a* in the sleeves and a pin **74** and **76** carried in fixed relationship by each of the links **66** and **68**, respectively. Hence, it should be quite clearly understood that as journal boxes **40** and **42** move vertically, and one always moves in the opposite direction of the other, the bar **60** will pivot around pin **64** causing a slave relationship of bar **60** to follow in exact parallel relationship to the surface of roll **10**. This parallel relationship is then translated to the face plates **24** designated by suffix *a* through a roller link arrangement indicated generally by numeral **80** and **82** connected to each respective face plate. Essentially, each roller link **80** and **82** contains a roller **81** and **83** which simply rolls on top of the bar **60** and is connected through appropriate linkage **80***a*, **80***b*, **80***c*, and **80***d* to the respective face plate, all as is quite clearly shown in FIG. 5 of the drawings.

The details of the material guide construction in total combination is more clearly shown with respect to FIG. 5 of the drawings. Specifically, the configuration of the face plate **24***a* is quite clearly shown as coming down to a sharp peak **100** as close as possible to the bite between the rolls **10** and **12**. The configuration of backing plate **24***b* is shown in dotted lines, as is the configuration of the guide support housing **24***c*. The backing plate **24***b* is pivotally mounted by a horizontally positioned pin **102** secured to the backing plate and to the linkage **104** connecting from pressure cylinder **54**. The linkage **104** is slidable through housing **24***d*. This allows the entire backing plate to be pivotal in a vertical plane around pin **102**, the function of which will be more fully understood as the description proceeds. The linkage **80** and its relationship to slave bar **60** is also clearly shown in FIG. 5. The linkage **80***a* connecting from the roller carrier **80***b* at the top has a pivot pin **80***c* pivotally mounting a bottom link **80***d* in position as is quite clearly shown. The link **80***d* has an elongated slot **80***e* which cooperatively receives a pin **106** which is fixedly mounted to the face plate **24***a*. Hence, it should be understood that the pin **106** engaging the bottom end of slot **80***e* limits the maximum downward movement of face plate **24***a*. The face plate **24***a* is normally urged in a downward direction, or in the direction of an arrow **108** by a suitable spring **110**. The spring **110** has one end thereof hooked over a pin **112** directly mounted to face plate **24***a*, and the other end mounted over a pin **114** mounted directly to the backing plate **24***b*. This configuration is most clearly shown in FIG. 7 of the drawings, which shows the downwardly urging action effected by spring **110** on plate **24***a* in its relationship between the facing plate **24***a* and backing plate **24***b*.

The actual relative movement of the face plate **24***a* relative to the backing plate **24***b* is controlled by guide slots indicated by dotted lines **120** and **122** formed in the backing plate **24***b*. Guidance through these slots is best seen in FIG. 6, and is achieved by a pin **124** connected in threadable relationship to face plate **24***a* and carrying a cam follower **126** in locked relationship thereon. The slots **120** and **122**, which are quite visible in FIG. 5, are at different angles. The slots are formed so as to be perpendicular to a radius from the axis of the roll **12** through the center line of the respective slots **120** and **122**. In this way, it is quite clear that face plate **24***a* can only move in a direction substantially tangential to the surface of roll **12**, and that in effect any part of the surface of face plate **24***a* will only move in a direction tangential to such surface. In order to allow vertical movement of the backing plate **24***b* as controlled by its appropriate actuating cylinder **54**, elongated slots **130** and **132** respectively are cut into the supporting plate **24***c*, again as is clearly shown in FIG. 6.

Thus, it should be quite clear that with the backing plate **24***b* pivotally mounted by pin **102**, and the face plate **24***a* being relatively movable with respect to the backing plate **24***b* by means of the slots **120** and **122**, and with the face plate **24***a* normally being urged in a direction of arrow **108** by spring **110**, and limited in such downward movement by pin **106** engaging the bottom end of slot **80***e*, and with the actual bottom end of slot **80***e* being controlled by its direct linkage connection to slave bar **60**, face plate **24***a*, which actually forms the material guide, will react in direct relationship to the movement of slave bar **60**, and automatically reposition face plate **24***a* upon any movement of roll **10** to conform to the exact configuration in the bite between such rolls **10** and **12**.

As is usual in this type of guide, the face plate **24***a* will be made of some suitable material, preferably other than metal, for example wood, aluminum, Teflon coated material, or the like. Any person skilled in this art would know the most suitable material with which the face plate should be made to incorporate the best action with the type of material being passed through the calender rolls. Normally, the support plate **24***c* is of cast iron, and the backing plate **24***b* is of steel.

The apparatus is not limited to use with a 4-roll inverted L calender, as the guide plates could be mounted between two vertically spaced rolls or between any pair of rolls forming a roll nip and horizontally and/or vertically offset from each other. Thus, the roll guides may move horizontally in some assemblies.

The cylinders **54** and **56** can move the guides up so that the bite at the top roll **12** can be opened by such roll being raised up to 3 inches. The end guides may bear upon the rolls if desired.

Hence, it should be understood that the objects of the invention have been achieved by providing an adjustable facing plate which is connected in direct relation to the slave bar so that it follows movement of the journal housing supporting the roll which is provided with roll crossing features. The movement of the guide in any direction is automatic to compensate for any crossing regardless of the relationship of the stock guides because of the slave roller tie relationship. Hence, a smaller vertical movement of the guide face plate occurs when the guides are nearer the center of the roll than the ends of the roll.

In accordance with the patent statutes only one best known embodiment of the invention has been illustrated and described in detail. It is to be understood that the invention is not limited thereto or thereby, but that the inventive scope is defined in the appended claims.

What is claimed is:

1. An automatically adjustable guide mechanism for calender rolls, comprising:
a frame;
a pair of calender rolls arranged to form a bite;
journal means carried by the frame and rotatably supporting each roll;
means to adjust the journal means supporting one roll to change the relationship of the bite between the rolls;
a slave bar operatively associated with the adjustable journal means which remains parallel to the axis of such roll during any movements thereof;
at least one guide member pivotally connected to the slave bar to follow the movements thereof;
a backing plate associated with each form; and
means connecting each said guide member to its respective backing plate, the means including cam means guiding said guide member so that at least two points thereon are moved substantially tangentially with respect to the surface of the other roll.

2. A guide mechanism according to claim 1 where a pressure means operatively engages said guide member to force it toward said rolls.

3. A guide mechanism as in claim 1 and comprising means pivotally positioning said slave bar intermediate its ends for pivotal movement parallel to movement of said one roll, said guide member having an end adjacent the roll bite complementary in shape thereto, and said guide member being positioned for movement in a vertical plane.

4. An automatically adjusting guide mechanism for calender rolls which includes:
at least one pair of calender rolls arranged in side by side relation to form a bite, adjustable journal means to adjust the side by side relation of the rolls, a stock guide comprising two laterally spaced forms contoured to fit into the bite between the rolls at closed spaced relation to the rolls, but out of engagement therewith, means to adjust the laterally spaced relation of the forms, and slave link means connected to the journal means and to the forms to automatically adjust the forms to the bite between the rolls for any change of relation between the rolls.

5. A guide mechanism as in claim 1 where the slave link means includes:
a slave bar pivotally secured intermediate its ends to a frame means and positioned above said rolls, means pivotally supporting each of said forms for movement in vertical planes defined by said forms, and
support means for each of said forms connecting between corresponding ends of a said form and said slave bar to tilt said forms on said pivotal means in opposite directions with adjustment in position of said journal means.

6. A guide mechanism according to claim 1 where only one of the rolls is adjustable to change the side by side relation of the rolls, and the slave link means includes:
a slave bar operatively connected to said adjustable rolls which bar is substantially the length of said roll and moves therewith so as to remain in substantially parallel relation to the surface thereof.
connecting link means pivotally connecting each form operatively to the slave bar, and
fixed cam guide means slidably received by each form to provide controlled tilting movement of the form on a radius from the axis of the other roll upon movement of the connecting link means.

7. A mechanism according to claim 1 which includes a separate backing plate pivotally connected to each connecting link means and each carrying a separate cam guide means associated with a respective form, and spring means between each backing plate and its respective form normally urging such form toward the bite of the rolls.

8. A guide mechanism according to claim 1 where each backing plate is adjustable laterally with respect to the bite of the rolls, and includes means connected between each respective backing plate and its form to normally resiliently urge the form toward the bite of the rolls.

9. A mechanism according to claim 1 where the slave bar comprises:
a bar about the length of said one roll arranged in spaced parallel relation to the axis of the other roll and pivotally connected to the frame at about the midpoint of the length thereof,
actuator bars slidably mounted to the frame and one pivotally connected to each end of the long bar with the other end of each actuator bar riding on a respective journal means at each end of said one roll.

10. In a calender roll assembly having a pair of calender rolls arranged to form a bite for compressing and forming material fed thereto into a web, a frame, and adjustable journal means supporting the rolls and mounted to be selectively movable relative to the frame to at least provide roll crossing adjustment, an end guide assembly for the material fed to the bite, comprising:
a pair of supports mounted in laterally adjustable relation to the frame;
a stock guide backing plate carried by each support;
a stock guide face plate mounted on each backing plate for movement in a vertical plane tangentially to the surface of one of the rolls;
a slave bar extending parallel to one of the rolls and pivotally connected to the journal means to maintain the bar in parallel relation to the roll when the roll is tilted; and
link means connecting the slave bar to each of the guide face plates to effect movement of the face plates according to the movement of the slave bar.

11. The end guide assembly according to claim 10 further including means to effect vertical movement of the backing plates relative to the supports.

12. The end guide assembly according to claim 10 wherein the facing plates are mounted on their respective backing plates by means of at least two cams, the cams being received in slots in the backing plates.

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U.S. Cl. X.R.

18—9; 100—173

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,570,054 Dated March 16, 1971

Inventor(s) Rex C. Seanor et al.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 11, "disclosure" should read -- inventi --. Column 4, line 51, "L" should read -- ell --. Column line 38, "closed" should read -- close --.

Signed and sealed this 13th day of July 1971.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

WILLIAM E. SCHUYLER, JR
Commissioner of Patents