June 25, 1957 I. L. FIFE 2,797,091

WEB SHIFTING APPARATUS

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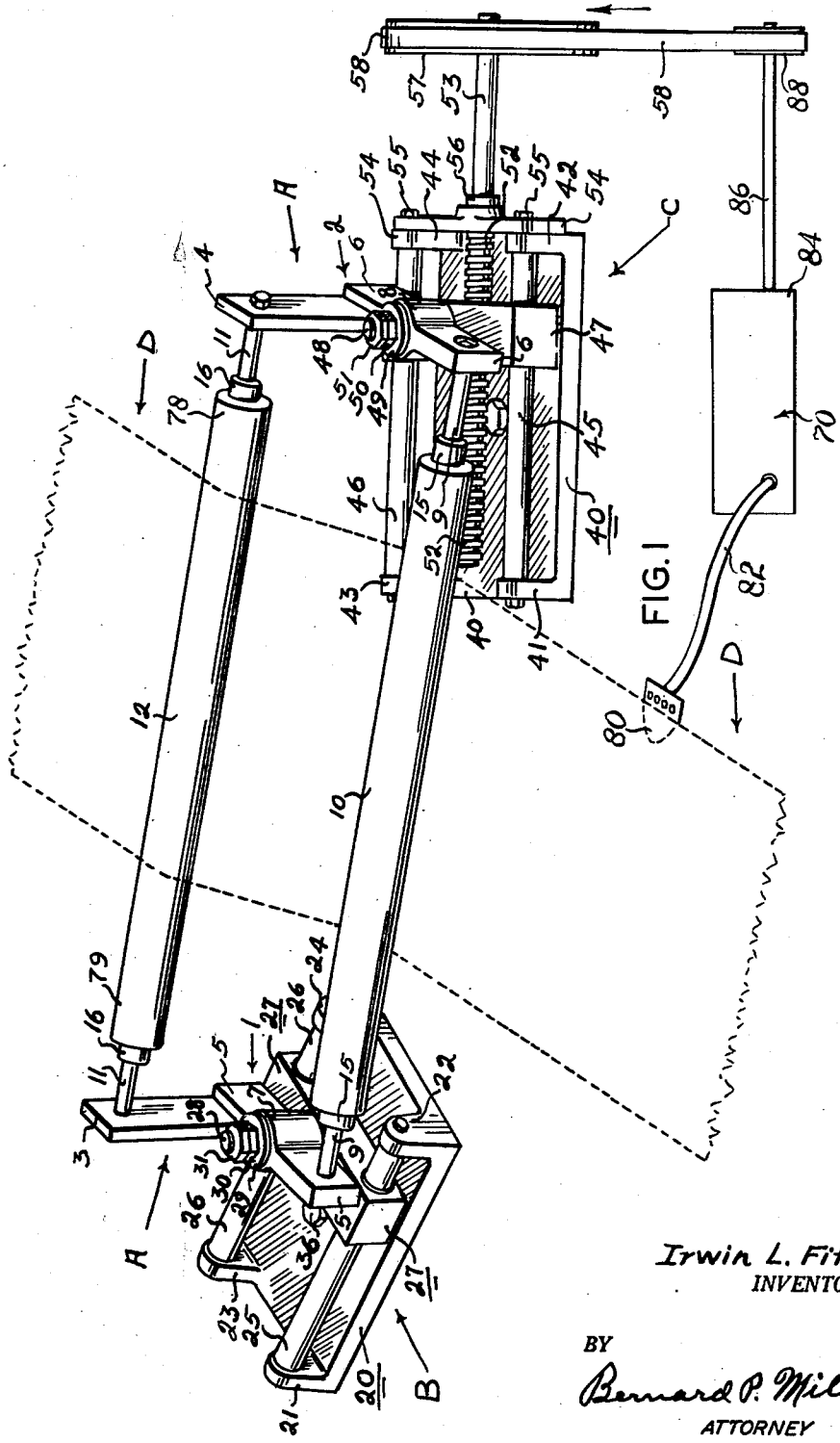

FIG. 1

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WEB SHIFTING APPARATUS

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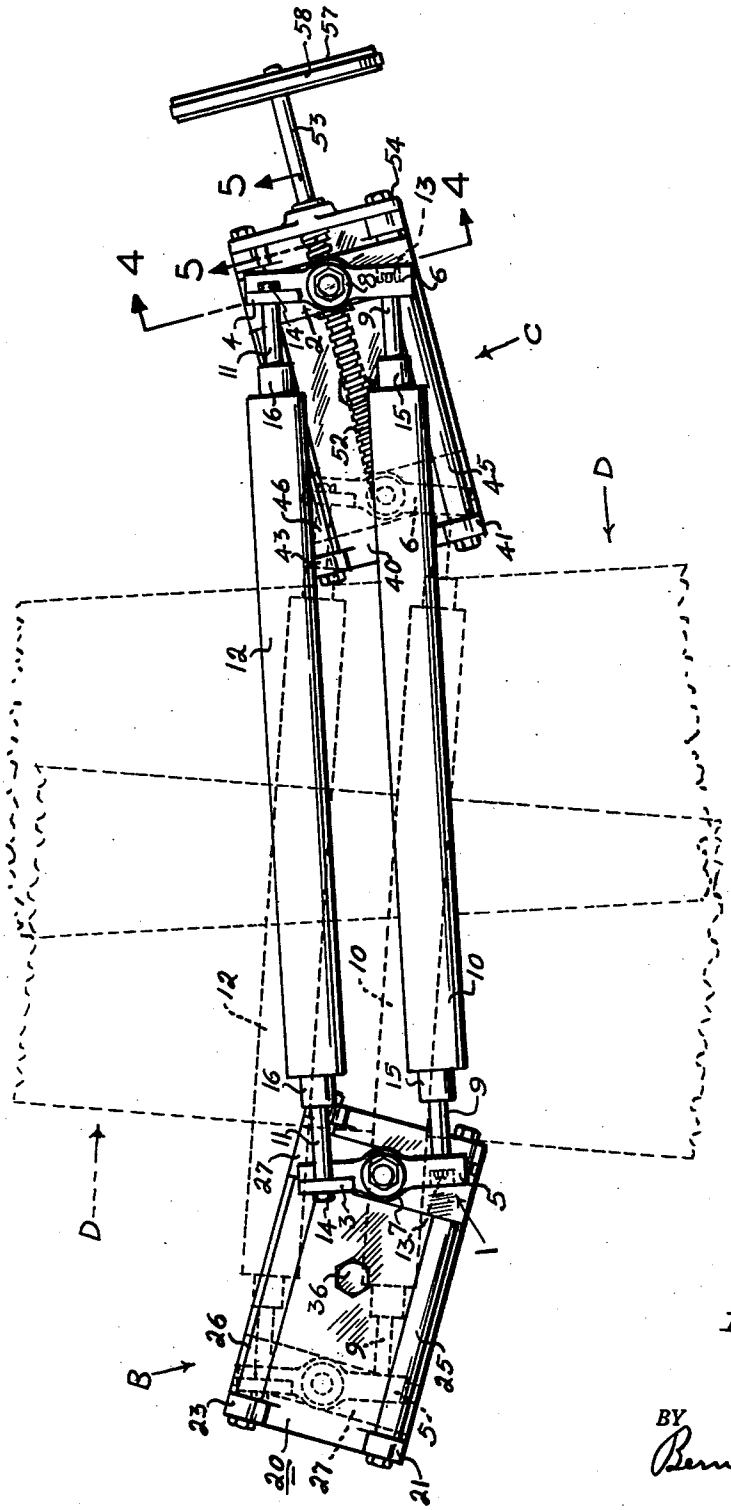

FIG. 2

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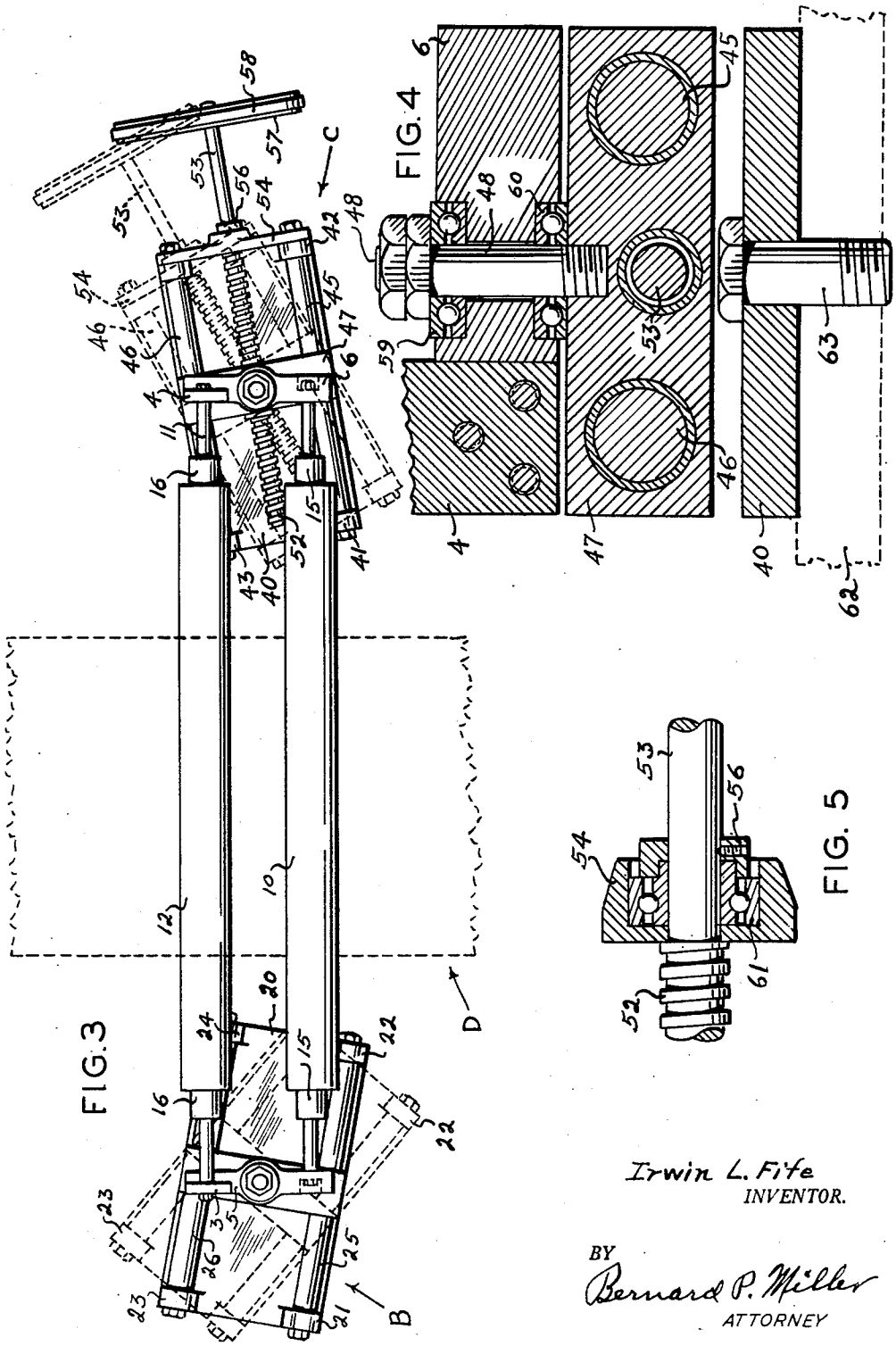

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WEB SHIFTING APPARATUS

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12 Claims. (Cl. 271—2.6)

The present invention relates to apparatus for shifting traveling webs or ribbons of sheet material such as paper, cloth and the like. This application is a continuation-in-part of applicant's co-pending application Serial No. 158,797, filed April 28, 1950, and entitled "Web Shifting Apparatus," now abandoned.

In the web guiding or rolling art, various types of mechanisms have heretofore been provided for longitudinally shifting the unwind shafts of web carrying rolls, so that the traveling web may be evenly rolled upon other rolls, or so that it will travel in a comparatively straight path through other mechanism such as slitting or trimming equipment.

The present invention is not designed to supplant such mechanism for shifting the rolls of web material. Instead, it is designed as a means for shifting the web itself, as it proceeds in its travel.

In many operations where web material is handled, the web must travel considerable distances before it is finally re-rolled, or other disposition of the web is finally provided for, and during its travel, one or more mechanical operations on the web may take place. For instance, a printing or a slitting operation may be performed on the roll many feet or yards from the roll of source, or the unwind roll. It is therefore imperative that the traveling web be properly guided at or adjacent the operational points in the web's travel. In cases wherein the operation on the web takes place at a point remote from the unwind roll, the position of the web at the place of operation cannot be accurately controlled by the shifting of the unwind roll.

In operations wherein a web is compelled to travel a lengthy path, there are several contingencies which might cause the web to deviate from a perfectly straight line of travel. A slackening of the web's tautness might well cause it to shift laterally. Such slackening might be caused from bearing wear in the web supporting roll shafts, or in web material stretch. A slight variation in web thickness on either side of its longitudinal center line might well cause the web to creep towards the thicker or tighter side of the web.

The mechanism of the present invention generally contemplates a web guiding apparatus that will properly shift the traveling web at or adjacent any point in its travel, where accurate alignment is crucial or necessary. In most cases, this crucial point or points usually lies remote from the unwind roll. The present mechanism is not only designed to shift the traveling web laterally, but is also designed to alter the direction of travel of the web axis or edge, so that its tendency to creep in a given direction will be combatted or controlled.

The principal object of the present invention is to provide apparatus for mounting the shaft of a web guiding roller or rollers in such a manner that the camber of such roller is altered or canted simultaneously with the longitudinal movement of the roller shaft, and in such a manner that this swinging movement of the shaft

in a horizontal plane takes place in direct proportion to the longitudinal movement of the shaft.

The result is that the shaft is brought into a static position of perfect alignment with a feeler station. When such a condition is once obtained, then the shaft remains static so far as any shifting movement is concerned, and the web is then traveling in a desired direction and at the required lateral position. The shaft position remains static until some mis-alignment of the web is caused by a force outside of the shift control mechanism. Such outside mis-aligning forces may include those mentioned hereinabove, as well as a change in speed of travel; or mis-guiding at a point ahead of the "feeler" station.

Another object of the invention is to provide a roller shaft mounting mechanism for the purpose described which is positive in action and simple in construction.

An additional object is to provide a roller shaft mounting and shifting mechanism which will not frequently use up and run out of its shifting capacity. The cambering action of the present mechanism prevents the shifting capacity from eventually being completely consumed.

A further object is to provide a mechanism of this class which is simple to install, and when once installed requires no frequent or current adjustment.

Other objects will be apparent from the following description when taken in conjunction with the accompanying sheets of drawings, wherein:

In the drawings:

Figure 1 is a perspective view of the roller shaft mounting mechanism, a traveling web being shown in dotted lines.

Figure 2 is a plan view, the solid lines showing the rollers shifted longitudinally to the right hand end of their permitted travel, and the dotted lines showing the rollers as they would appear when at the left hand end of such travel.

Figure 3 is a top view showing the rollers in their intermediate position, the dotted lines illustrating the possible variation in the positioning of the camber controlling guide units.

Figure 4 is a vertical sectional view taken substantially along the line 4—4 of Fig. 2, and

Figure 5 is a fragmentary vertical section taken substantially along the line 5—5 of Fig. 2.

Referring to the drawings in detail, reference character A indicates, as a whole, a guide or feeder roll carrying frame. The character B indicates, as a whole, a mounting unit for one end of the frame A. Character C indicates, as a whole, a combination mounting and moving unit for the other end of the frame A, reference character D indicates a traveling sheet, ribbon, or web which is to be guided in its travel by the mechanism of the present invention.

The roll carrying frame A consists substantially of two substantially identical L-shaped brackets **1** and **2** (Fig. 1) comprising vertical post portions **3** and **4** extending upwardly from horizontal sill portions or bearing members **5** and **6**, respectively. The two bearings **5** and **6** are provided with central enlargements or hubs **7** and **8** respectively, which are vertically bored to receive pivot pins as will be hereinafter set forth. The forward or front end portions of the bearings **5** and **6** are perforated in horizontal alignment to receive and retain the opposite ends of a horizontally disposed roller shaft **9** having a cylindrical guide roller **10** rotatably mounted thereon.

The upper end portions of the two vertical posts **3** and **4** are perforated in horizontal alignment to receive and retain the opposite ends of a roller shaft **11** which has a cylindrical guide roller **12** rotatably mounted thereon. The roller shafts **9** and **11** are held in stationary position by suitable nuts **13** and **14** (Fig. 2). The rollers **10** and **12** are held against longitudinal movement upon

the shafts 9 and 11 by suitable set collars 15 and 16, respectively. The web D is passed over the roller 12 and under the roller 10, and theoretically is held taut in its travel past the rollers. The web travels over the rollers 10 and 11 in the above manner for maintaining or getting "wrap" between the rolls and the web. The term "wrap" in the industry is understood to mean the web causing the roll to rotate.

The left hand bracket 1 is movably supported by the mounting unit B which consists substantially of a flat bottomed base plate 20 having upstanding corner ears 21—22, and 23—24. The two ears 21 and 22 are perforated in horizontal alignment to respectively receive the left and right hand ends of a stationary guide rod 25, and the two ears 23 and 24 are similarly perforated to receive the ends of a similar guide rod 26 which lies parallel to the rod 25. The plate 20 is adapted to be anchored to a suitable foundation (not shown) by a vertical stud 36 and its angle of repose is selective.

Slidably mounted upon the two rods 25 and 26 is a horizontally disposed beam or follower 27 which has its front and rear ends perforated to receive the guide rods. Intermediate its ends, the follower 27 is equipped with an upstanding vertical spindle 28 (Fig. 1) which passes through the vertical bore in the hub enlargement 7 of the bearing 5, and the spindle 28 projects above the hub 7 a sufficient distance to receive an annular wear plate 29, a nut 30 and a lock nut 31.

The hub 7 is such that the bearing 5 may pivot about the spindle 28 at the same time the follower 27 is moving along the two guide rods 25 and 26.

The right hand bracket structure 2 of the frame A is similarly movably supported by the combination mounting and moving unit C, which unit C consists substantially of a flat bottomed base plate 40 similar to the base plate 20 of the unit B. The base plate 40 has upstanding corner ears 41—42 and 43—44, and the ears of each pair are perforated in horizontal alignment to receive the opposite ends of two parallel horizontal guide rods 45 and 46. The guide rods 45 and 46 are similar in construction and position to the guide rods 25 and 26 of the unit B, and slidably support the laterally bored ends of a horizontal beam or follower 47. The follower 47 has a centrally located upstanding spindle 48 which extends upwardly through the vertical bore in the hub or flange 8 of the bearing 6 of the L-shaped bracket 2 of the frame A. The spindle 48 pivotally supports the bearing 6, and projects thereabove a sufficient distance to receive an annular wear plate 49, a nut 50, and a lock nut 51.

The follower 47 of the unit C is similar to the follower 27 of the unit B, except that the follower 47 has a centrally located horizontal bore (Fig. 4) which is threaded to receive the abutment threads 52 of a screw shaft 53.

The right hand end of the base plate 40 is equipped with a horizontal end plate 54 which is rigidly held in place by suitable studs 55. The end plate 54 is centrally perforated to journal the unthreaded portion of the screw shaft 53, and the shaft 53 is held against longitudinal movement with relation to the end plate 54 by a suitable set collar 56.

The screw shaft 53 extends beyond the end plate 54, and its outer end is provided with a suitable drive pulley 57 adapted to be driven to rotation in either direction by an endless belt 58 in a manner to be hereinafter set forth.

As best illustrated in Fig. 4, the vertical spindle 48 of the follower 47 is journalled in conventional frictionless ball bearings 59 and 60, and the bearings 59 and 60 also act as thrust bearings to support the weight of the frame A. The bearing 5 of the frame bracket 1 is equipped with similar frictionless bearings (not shown).

As best illustrated in Fig. 5, the end plate 54 is equipped with a suitable frictionless bearing 61 to properly journal the screw shaft 53. The base plate 40 of the unit C may be rigidly anchored in selective positions upon a suitable foundation 62 by a suitable stud bolt 63 (Fig. 4).

In installing the two units B and C upon their foundations, the two rollers 10 and 12 are first placed with their axis at right angles to the intended path of travel of the web D. The screw shaft 53 is then rotated to bring the two followers 27 and 47 to an approximately equal distance between the ends of their respective base plates. This position of the followers 27 and 47 is shown in solid lines in Fig. 3. The units B and C are then placed upon their foundations at a predetermined and equal obtuse angle with relation to the longitudinal axis of the roller shafts 9 and 11. The possible variation in this angle of disposition is illustrated by the dotted lines as depicted in Fig. 3. When the two base plates 20 and 40 are properly positioned, their respective studs 36 and 63 are tightened down to maintain them accordingly.

With the roller carrying mechanism thus installed, and with the taut web D traveling across the rollers 10 and 12, and with the feeler unit 70 in control of the direction of rotation of the drive pulley 57, the mechanism is in the proper operational condition. The "feeler" unit 70 shown generally schematically in Fig. 1 is similar to that described and depicted in applicant's prior Patent No. 2,562,062, issued July 24, 1951, and entitled "Automatic Web Guiding Apparatus." From Fig. 1 it will be apparent that the web D cooperates with a feeler or sensing member 80 disposed adjacent, or along side the edge of the web D which in turn provides communication through a conduit 82 with the power unit 84 having a variable rotatable shaft 86 upon which is mounted a fixed pulley 88 about which is disposed the endless belt 58. It will be apparent that irregularities of movement of the web D are sensed by the feeler member 80 to cause actuation of the power unit in turn directing rotation of the drive pulley 88 in either a right or left hand direction which in turn drives the pulley 57 and shaft 53 accordingly. It will be apparent that the feeler unit 70 is not limited to the structure of the above mentioned patent, but any suitable feeler unit capable of sensing irregularities in the web and controlling rotation of the shaft 53 will be sufficient. It will also be apparent that the details of the power or feeler unit form no part of the present invention.

Operation

Rotation of the pulley 57 and the screw shaft 53 in a clockwise direction (as shown by the arrow in Fig. 1) acts to move the two followers 27 and 47 in a right hand direction, possibly to the positions shown in solid lines in Figs. 1 and 2. Such traveling movement of the followers not only acts to move both the rollers 10 and 12 in a right hand direction, but also acts to swing or cant their right hand ends 78 rearwardly, and their left hand ends 79 forwardly (for purposes of clarity, reference characters 78 and 79 are only shown on the roller 12). This simultaneous longitudinal roller shaft movement and axial roller shaft shifting movement functions to more quickly and accurately correct or alter the travel path of the web than can possibly be accomplished alone by longitudinal roller shaft movement, and consequently, over correction is reduced upon each corrective movement caused by the feeler unit 70.

A slight movement of the screw shaft 53 causes a considerable alteration in the travel path of the web, and consequently there is little or no danger of the screw shaft thread capacity becoming all used up.

It is pointed out that a single guide roller and roller shaft could be mounted between the bearing members 5 and 6, and when so mounted, the above described roller shifting mechanism would move such roller which in turn would alter the path of travel of the web. However, two or more guide rollers are preferred.

The embodiment of the invention which is described hereinabove and which is shown in the accompanying drawings discloses a jack screw 52 as the means for shifting the follower 47. In cases in which a more rapid movement of the follower is desired, the follower could

be actuated by other suitable actuating mechanisms such as a conventional piston or other fluid actuated mechanisms (not shown).

From the foregoing, it will be apparent that the present invention contemplates a web guiding apparatus for shifting variable types of web material such as cloth, paper, plastics and the like by a cambering roller method of accurately positioning the moving web of material. The invention is particularly adaptable where accurate guiding cannot be accomplished by guiding from the unwind shaft or roller because of distance or other factors. The cambering roller apparatus actually cambers the moving web into a correct position automatically by its lateral movement by a slight canting of the rollers simultaneously which counteracts any inclination of the moving web to go off to the right or left of a given direction. It will be apparent that the apparatus is not limited to one roller, but may comprise a plurality of rollers and the cambering movement is a combined lateral shifting and swiveling of the rollers simultaneously to automatically regulate the alignment of the traveling web. Variable types of web guiding jobs may be accomplished by the cambering roller apparatus in that a single roller may be used where the web makes a right angle turn or in a directional exchange of one hundred eighty degrees in a moving web. Furthermore, multiple sets of double cambering guide rollers may be utilized in one web winding operation, such as for example, in a printing press where a web moving from the mill roll is directed by one set of cambering rollers in correct position into the press, and utilizing one or more cambering roller units for subsequent operations from the press and prior to the rewind of the web.

Changes may be made in the combination and arrangement of parts as heretofore set forth in the specification and shown in the drawings, it being understood that any modification in the precise embodiment of the invention may be made within the scope of the following claims without departing from the spirit of the invention.

I claim:

1. In a self-compensating mechanism for straightening traveling webs comprising in combination a roller over which the web travels and about which it is wrapped to effect a substantial frictional engagement therewith, said roller extending transversely to the direction of web travel, a base plate at each side of the web and disposed at a slanting angle to the direction of the web travel, a movable support member carried by each base plate and each support member journalling an end of said roller, and means responsive to mis-alignment of web travel to effect movement of the support members in a direction to provide a cambering movement of the roller to correct mis-alignment of the web.

2. In a self-regulating mechanism for straightening traveling webs comprising in combination a roller over which the web travels and about which it is wrapped to effect a substantial frictional engagement therewith, said roller extending transversely to the direction of web travel, a base plate at each side of the web and disposed at a slanting angle to the direction of the web travel, a movable support member carried by each base plate and each support member journalling an end of said roller, and means responsive to variations of web travel to effect movement of the support members in alternate right or left hand directions dependent upon the variation of web travel to provide a cambering movement of the roller to correctly position the travel of the web.

3. In a self-regulating mechanism for straightening traveling webs comprising in combination a roller over which the web travels and about which it is wrapped to effect a substantial frictional engagement therewith, said roller extending transversely to the direction of web travel, a base plate at each side of the web and disposed at a slanting angle to the direction of the web travel, a movable support member carried by each base plate and each support member journalling an end of said roller, a rotatable screw shaft extending through one of the support members to provide for movement of the support members, a feeler control member adjacent the edge of the traveling web and responsive to variations of web travel to provide for rotation of the screw shaft, said screw shaft upon rotation effecting movement of the support members for producing a cambering movement of the roller in a direction susbtantially transverse of the web travel to correct any variations of web travel.

4. In a self-compensating mechanism for straightening traveling webs comprising in combination a pair of rollers over which the web travels, said rollers extending transversely to the direction of the web travel, said web traveling over one roller and under another roller for maintaining wrap during its travel, a base plate supported at each side of the web and disposed at an angle to the direction of the web travel, a movable support member carried by each base plate for journalling the ends of the rollers, and means responsive to variations of web travel to effect movement of the support members in a direction to provide a cambering movement of the rollers for correctly positioning the travel of the web.

5. In an automatic web shifting apparatus for a traveling web comprising in combination a roller member extending transversely to the direction of the web travel, and a pair of support members disposed at opposite edges of the web for journalling the roller member, said support members disposed at an angle to the direction of the web travel, a pair of spaced rod members carried by each of the support members, an apertured follower slidably supported on each of the pairs of rods, an upstanding shaft carried by each of the followers, a bearing member journalled on each of the shafts and freely rotatable thereon, means provided in each of the bearing members for journalling the ends of the roller, a screw shaft provided in one of said support members and extending in threaded relation through an aperture in one of said followers, a reversible pulley unit carried on one end of the screw shaft and responsive to variations in web travel for alternate directions of rotation thereof, said screw shaft rotatable simultaneously with the pulley unit to cause movement of the follower units to accurately position the direction of the web travel.

6. In an automatic web straightening apparatus comprising in combination a pair of rollers over which the web travels, said rollers extending transversely to the direction of the web travel, said web traveling over one roller and under another roller for maintaining wrap during its travel, a base plate supported at each side of the web and disposed at an angle to the direction of the web travel, a movable support member carried by each base plate for journalling the ends of the rollers, a rotatable screw shaft extending through one of the support members to provide for sliding movement of the support rollers in a direction parallel to the angular disposition of the base plates, a feeler control member cooperating with the edge of the traveling web and responsive to variations in web travel to provide for rotation of the screw shaft, said screw shaft upon rotation effecting movement of the support members for producing a cambering movement of the rollers in a direction susbtantially transverse of the web travel to correct any variations of web travel.

7. In an automatic web straightening apparatus comprising a pair of rollers over which the web travels and about which it is wrapped to effect a substantial frictional engagement therewith, said rollers extending transversely to the direction of the web travel, a base plate supported adjacent each side of the web and disposed at an angle to the direction of the web travel, a slidable support member carried by each base plate for journalling the ends of the rollers, means cooperating with one of the support members to provide sliding movement of the support members in a direction parallel to the angular disposition of the base plates, and means cooperating with the edges of the

traveling web and responsive to variations of web travel for effecting actuation of the last mentioned means to cause movement of the support members whereby the rollers are canted in a direction relative to the web travel to provide for correct positioning of the web travel.

8. In a self-compensating mechanism for straightening traveling webs comprising in combination a pair of rollers over which the web travels and about which it is wrapped to effect a substantial frictional engagement therewith, said rollers extending transversely to the direction of the web travel, a base plate supported at each side of the web and disposed at an angle to the direction of the web travel, a movable support member carried by each base plate for journalling the ends of the rollers, and means responsive to variations of web travel to effect movement of the support members in a direction to provide a combined lateral shifting and swiveling action of the rollers for correctly positioning the travel of the web.

9. In an automatic web straightening apparatus comprising in combination a pair of rollers over which the web travels, said rollers extending transversely to the direction of the web travel, said web traveling over one roller and under another roller for maintaining wrap during its travel, a base plate supported at each side of the web and disposed at an angle to the direction of the web travel, a movable support member carried by each base plate for journalling the ends of the rollers, a rotable screw shaft extending through one of the support members to provide for sliding movement of the support members in a direction parallel to the angular disposition of the base plates, a feeler control member cooperating with the edge of the traveling web and responsive to variations in web travel to provide for rotation of the screw shaft, said screw shaft upon rotation effecting movement of the support members for producing a combined lateral shifting and swiveling of the rollers for correcting mis-alignments in web travel.

10. In an automatic regulating mechanism for straightening traveling webs comprising in combination a roller over which the web travels and about which it is wrapped in an amount sufficient to effect lateral movement of the web in response to lateral movement of the roller, said roller extending transversely to the direction of web travel, means disposed at each side of the web at an angle to the direction of web travel, means movably mounted on the first mentioned means for simultaneous lateral and swivel movement and journalling an end of said roller, and means responsive to lateral deviations of the web from a pre-determined path of travel for directing the movable means in said simultaneous lateral and swivel movement effecting a canting movement of the roller for correcting any misalignment of the web.

11. In a self-compensating mechanism for straightening traveling webs comprising in combination a roller over which the web travels and about which it is wrapped to effect a substantial frictional engagement therewith, said roller extending transversely to the direction of web travel, means disposed at each side of the web for journalling an end of said roller, means cooperating with the first mentioned means to provide for simultaneous lateral and swivel movement of said roller, means responsive to lateral deviations of the web from a pre-determined path of travel for directing the first mentioned means in said simultaneous lateral and swivel movement for effecting a canting movement of the roller.

12. In a self-compensating mechanism for straightening traveling webs comprising in combination a roller over which the web travels and about which it is wrapped to effect a substantial frictional engagement therewith, said roller extending transversely to the direction of web travel, means disposed at each side of the web for journalling an end of said roller, means cooperating with the first mentioned means to provide for simultaneous lateral and swivel movement of said roller, means responsive to lateral deviations of the web from a pre-determined path of travel for directing the first mentioned means in said simultaneous lateral and swivel movement in a horizontal plane for effecting a canting movement of the roller.

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