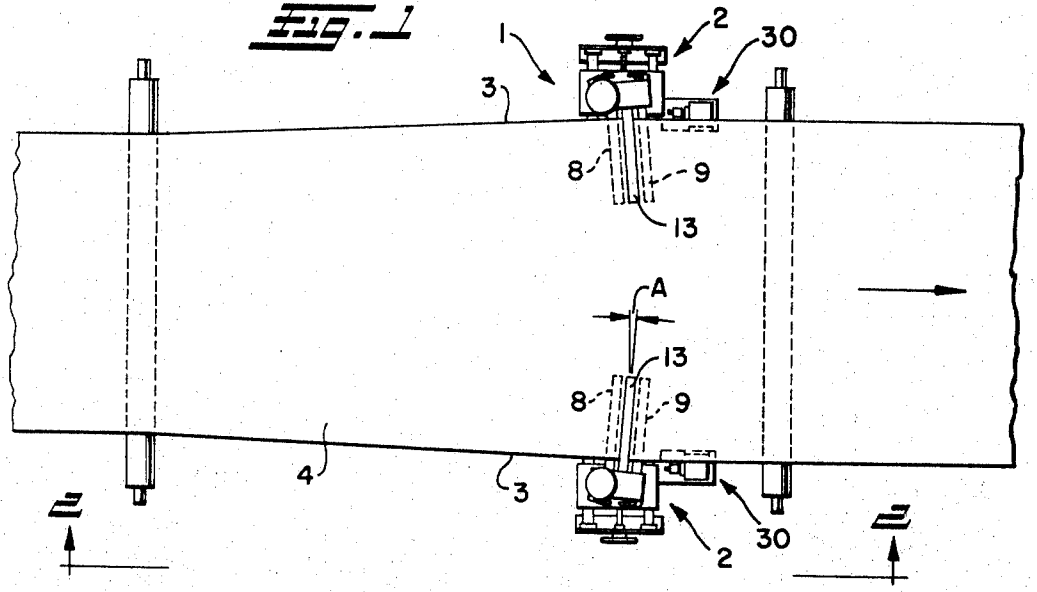
Dec. 10, 1968 A. V. ALEXEFF 3,414,954

ADJUSTABLE WEB SPREADING AND GUIDING APPARATUS

Filed Sept. 1, 1966 2 Sheets-Sheet 1

Fig. 1



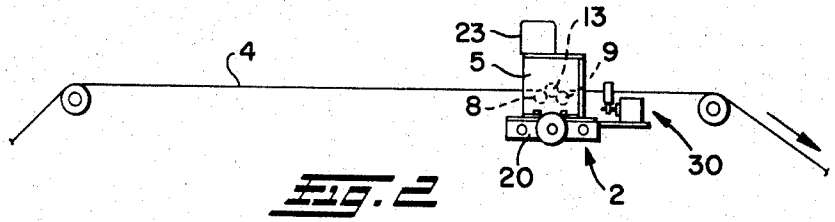


Fig. 2

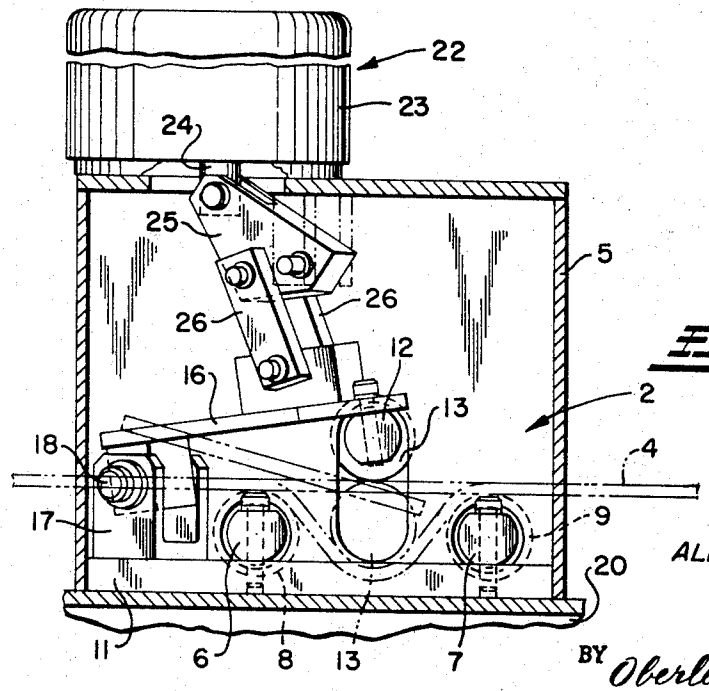


Fig. 4

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ADJUSTABLE WEB SPREADING AND GUIDING APPARATUS

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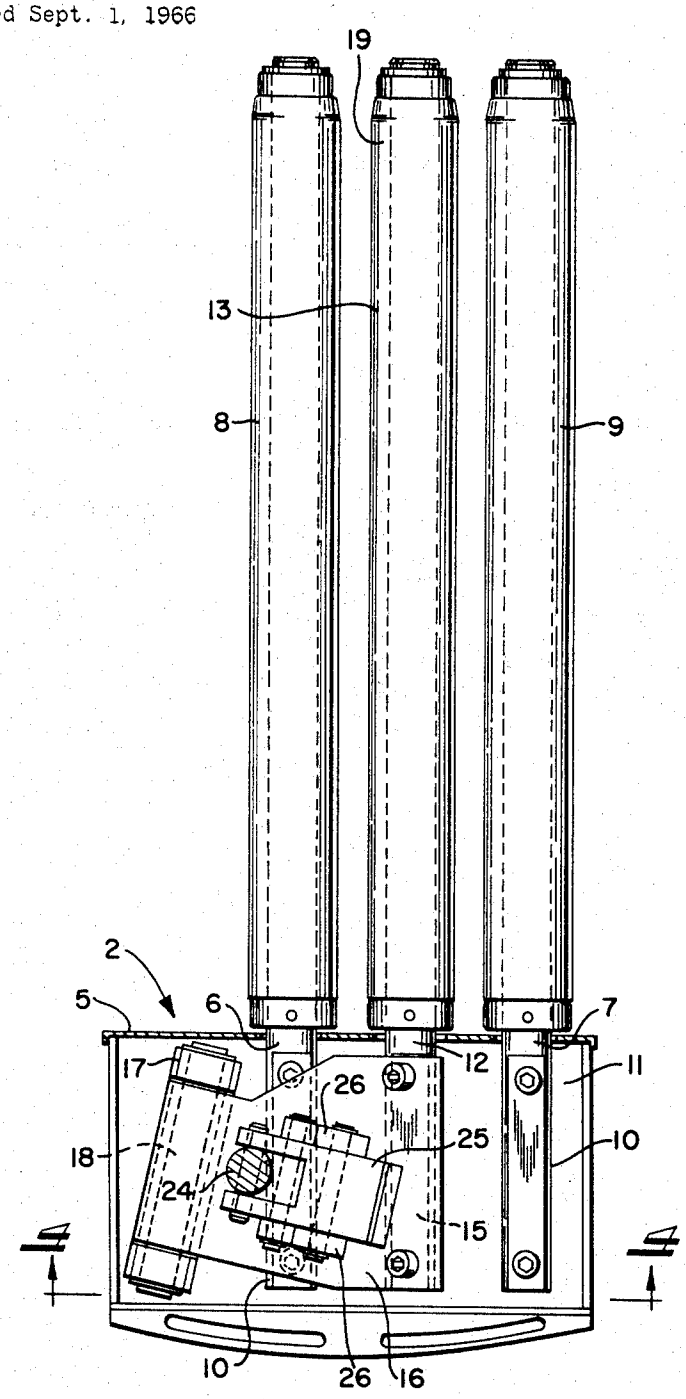

Fig. 3

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ADJUSTABLE WEB SPREADING AND GUIDING APPARATUS

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ABSTRACT OF THE DISCLOSURE

Web spreading and guiding apparatus including plural guide rolls adjacent each edge of the web material, one of said guide rolls adjacent each edge being supported by a shaft whose outer end is fixed to a pivotally mounted support plate at such an angle with respect to the pivotal axis of the support plate that an extension of the pivotal axis intersects the inner end of such one guide roll so that pivotal movement of the support plate will cause the one guide roll to pivot about its inner end in a perpendicular direction toward and away from the web.

The present invention relates generally, as indicated, to adjustable web spreading and guiding apparatus and, more particularly, to certain improvements in such apparatus for accurately maintaining the edge alignment of web material and particularly tire fabric material by stretching the material adjacent the edges thereof as required.

Web material which is being rapidly processed has a tendency to wander, thus necessitating the use of guiding equipment for maintaining the web material on guide rolls. Moreover, oftentimes the width of the web material will vary considerably due to shrinkage or other reasons, and accordingly it is desirable to stretch the web material while it is being guided to provide more uniform material width.

Various types of web guiding and stretching apparatus have been devised which operate satisfactorily for most purposes, but in general they are much more complex and costly than necessary. For example, it has been found that only one of the rolls of the guiding apparatus need be adjustable to vary the angle of wrap of the web on the rolls, rather than two or more as is customary. Moreover, the additional stretching of the web which may be obtained by bodily shifting the rolls transversely with respect to the web is minor in comparison to the stretching which is obtained by changing the wrap angle and hardly worth the additional cost of the relatively complex mounting for the rollers which is required to effect such transverse movement.

With the foregoing in mind, it is a principal object of this invention to provide a web spreading and guiding apparatus in which only one of the rolls is angularly adjustable in a perpendicular direction toward and away from the web for increasing and decreasing the angle of wrap of the web against a plurality of rolls as necessitated by the amount of lateral movement of the web that is required.

Another object is to provide such a spreading and guiding apparatus in which all of the rolls are mounted against movement in a transverse direction parallel to the general plane of the web guided thereby.

A further object is to provide such a spreading and guiding apparatus with novel means for angularly adjustably mounting one of the rolls in such a manner that the innermost end of the roll which is nearest the center line of the web remains substantially stationary during vertical movement of the outer end toward and away from the adjacent web edge.

Other objects and advantages of the present invention will become apparent as the following description proceeds.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawing setting forth in detail a certain illustrative embodiment of the invention, this being indicative, however, of but one of the various ways in which the principles of the invention may be employed.

In such annexed drawing:

FIG. 1 is a top plan view of a preferred form of adjustable web spreading and guiding apparatus in accordance with the present invention shown in use guiding a web of fabric material or the like;

FIG. 2 is a side elevation view of the apparatus of FIG. 1 is seen from the plane of the line 2—2 thereof;

FIG. 3 is an enlarged top plan view of one set of spreading and guide rolls for the apparatus of FIG. 1 with parts of the support stand broken away to show the mountings for the rolls; and

FIG. 4 is a vertical section taken on the plane of the line 4—4, FIG. 3.

Referring now in detail to the drawing and first especially to FIGS. 1 and 2, a preferred form of web spreading and guiding apparatus in accordance with this invention is generally indicated at **1** and comprises a roll assembly **2** disposed adjacent each edge **3** of a web material **4** being processed. Although the apparatus **1** may be used for guiding all types of fabrics, strands, textiles, foils, and film, it is particularly designed for guiding tire fabric material.

Each roll assembly **2** may be of identical construction, including a support stand **5** located adjacent each web edge **3** and having a pair of laterally spaced cantilevered shafts **6** and **7** projecting inwardly from the support stand **5** toward the center line of the web material **4**, with guide rolls **8** and **9** journalled on the shafts **6** and **7** for supporting one side of the web **4**. The outer ends **10** of the shafts **6** and **7** may be bolted or otherwise firmly secured to the base plate **11** of the support stand **5**.

Angularly adjustably mounted on the support stand **5** between the guide rolls **8** and **9** for movement toward and away from the plane of their longitudinal axes is an intermediate cantilevered shift **12** on which is journalled an intermediate guide roll **13** for contacting the other side of the web **4**. Accordingly, as shown in FIG. 4, angular adjustment of the intermediate shaft **12** toward and away from the plane of the guide rolls **8** and **9** will increase and decrease the angle of wrap of the web material **4** when threaded between the pair of guide rolls **8**, **9** and intermediate guide roll **13**.

The mounting for the intermediate shaft **12** is best seen in FIGS. 3 and 4. The outer end **15** of the intermediate shaft **12** is suitably attached to a support arm **16** pivotally supported by a yoke **17** carried by the base plate **11**. An extension of the axis of the pivot pin **18** for the support arm **16** preferably intersects the inner end **19** of the intermediate guide roll **13**, whereby pivoting of the support arm **16** toward and away from the plane of the axes of the guide rolls **8**, **9** will cause a corresponding movement of the outer end **15** of the guide roll **13** but not the inner end **19**. Rather, the inner end **19** will remain substantially stationary, acting as a pivot about which the intermediate roll **13** is raised and lowered. Accordingly, engagement of the intermediate roll **13** with the web **4** will always be greatest at the fabric edge **3**, and such engagement will progressively diminish in the direction of the web center line due to the angular inclination of the intermediate roll **13** into the web **4**. This is an important feature, since the angle of wrap will be greatest at the fabric edge where

the stretching is needed most, especially when it is desired to improve the cord count.

Of course, increasing and decreasing the wrap angle will only change the location of the web edge **3** if the rolls **8**, **9** and **13** are canted in the direction of web flow as shown, since material always has a tendency to assume a position perpendicular to the roll faces. Thus, the cant angle actually controls the amount and speed of fabric movement in the transverse direction with its effectiveness depending on the angle of wrap or grip between the rolls and web material. In actual practice, a cant angle A of approximately 5° has been found suitable for most purposes, but it may be changed as desired simply by changing the angular position of the support stand **5** with respect to its base structure **20**, as is well known in the art.

Angular adjustment of the intermediate roll **13** is controlled by an actuator **22** mounted on the top of the support stand **5**. Such actuator **22** may be in the form of an air motor **23** including a reciprocable piston rod **24** having its free end operatively connected to the support arm **16** through a pivotally mounted bell crank **25** and pair of links **26**. An edge sensor **30** of conventional type located adjacent the web edge **3** controls in known manner the operation of the actuator **22**. Thus, should the web edge **3** pull inwardly from the edge sensor **30**, the actuator **22** will cause the intermediate guide rolls **13** to move angularly into further engagement with the web **4**, while movement of the web edge outwardly of the edge sensor **30** will have the reverse effect.

Although the extent of movement of the outer end **15** of the intermediate roll **13** may obviously be varied within rather wide limits depending upon the type of material being guided and the amount of stretching desired, a movement of the roll **13** sufficient to establish approximately a one inch interference between the web engaging profiles of the stationary rolls **8**, **9** and movable roll **13** has been found adequate to expand a sixty inch wide web of tire fabric material six to eight inches per side without any bodily shifting of the rolls **8**, **9** and **13** transversely of the web, as is often the present day practice. The location of the inner end **19** of the intermediate roll **13** with respect to the web material does not appear to be very critical; it may be completely out of contact with the web material or slightly contacting the same.

From the above discussion, it can now be seen that the web spreading and guiding apparatus of the present invention is of a simple and unique construction, and yet is very effective in accurately controlling the position of web material being processed, whether it be fabric, strands, textiles, foils, or film. Only one of the guide rolls is movable, and then only in an angular direction into and out of engagement with the web material for increasing and decreasing the angle of wrap of such material on the rolls. Moreover, while two stationary guide rolls are shown, it should be obvious that if the web material is sufficiently taut both of the stationary guide rolls could be eliminated or only one stationary roll need be included, disposed adjacent the angularly adjustable roll, without departing from the teachings of the present invention.

Other modes of applying the principles of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims or the equivalent of such be employed.

I therefore, particularly point out and distinctly claim as my invention:

1. Web spreading and guiding apparatus comprising a pair of support stands, one adjacent each edge of an elongated strip of web material, a first shaft fixed to each of said support stands, a first guide roll journalled on each of said first shafts inwardly of said support stands for engaging one side of the web material adjacent the respective edges thereof, a second shaft for each such support stand laterally spaced from said first shaft and having a second guide roll journalled thereon for engaging the other side of the web material adjacent the respective edges, means mounting each of said second shafts on their respective support stands for angular adjustment with respect to their respective first shafts to vary the amount of interference between the web engaging profiles of said first and second rolls and thus the angle of wrap of such web material against said first and second rolls while substantially maintaining the location of said second shaft with respect to the center line of the web material, said mounting means for each of said second shafts effecting such angular adjustment by causing movement of the ends of said second shafts which are outward of the web material toward and away from such web material while maintaining the inner ends of said second shafts nearest the center line of the web material substantially stationary, said mounting means for each of said second shafts comprising a support plate, means mounting said support plate for pivotal movement, each of said second shafts being fixed to their associated support plates spaced from the pivotal axes of said support plates, each of said second shafts being disposed at an angle such that an extension of the pivotal axes of the respective support plates intersects the inner ends of said second guide rolls; pivot means for pivoting each of said support plates toward and away from the web material; and edge sensor means located adjacent each edge of the web material for actuating said pivot means in response to changes in the width of the web material.

2. The web spreading and guiding apparatus of claim **1** wherein said pivot means for each of said support plates includes a motor carried by each of said support stands, said motor having a piston rod projecting therefrom, a bell crank pivotally connected to said piston rod and also pivoted to said support stand, and a link connecting said bell crank to said support plate.

3. Apparatus for guiding the movement of web material comprising a pair of shafts each having a guide roll journalled thereon, and shaft mounting means mounting said shafts adjacent opposite edges of the web material for angular movement of said guide rolls in a perpendicular direction into and out of engagement with the web material for varying the angle of wrap of such web material against said guide rolls while substantially maintaining the relative locations of said shafts with respect to the center line of the web material, said mounting means for said shafts being operative to cause movement of the ends of said shafts which are outward of the web material in such perpendicular direction toward and away from such web material while maintaining the inner ends of said shafts nearest the center line of the web material substantially stationary, said inner ends of said shafts acting as a pivot about which said shafts are raised and lowered away and toward the web material, and means responsive to lateral movement of the web material to actuate said shaft mounting means for one or both of said shafts.

4. The apparatus of claim **3** wherein said mounting means for said shafts comprises a support plate for each shaft, means mounting said support plates for pivotal movement, said shafts being fixed to their respective support plates spaced from their pivotal axes and disposed at an angle such that an extension of their pivotal axes intersects the inner ends of said guide rolls, and pivot means are provided for pivoting said support plates toward and away from the web material.

5. The apparatus of claim **3** further comprising another shaft laterally spaced from each of said first-mentioned shafts adjacent opposite edges of the web material and having another guide roll journalled thereon for engaging the opposite side of the web material, said first-mentioned shafts when angularly adjusted in a perpendicular direction toward and away from the web material varying the amount of interference between the web en-

gaging profiles of the rolls adjacent opposite edges of the web material and thus the angle of wrap of such web material against said rolls.

6. The apparatus of claim **5** further comprising a third shaft laterally spaced from each of said another shafts with said first-mentioned shafts disposed between said third and another shafts adjacent opposite edges of the web material, a third guide roll journalled on each of said third shafts for engaging the opposite side of the web material, whereby angular adjustment of said first-mentioned shafts in a perpendicular direction toward and away from the web material varies the amount of interference between the web engaging profiles of all of said rolls adjacent opposite edges of the web material so as

to vary the angle of wrap of such web material thereagainst.

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U.S. Cl. X.R.

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