April 30, 1940. S. COHN ET AL. 2,198,656

APPARATUS FOR RECTIFYING TRAVELING STRIPS

Filed Feb. 16, 1938 2 Sheets-Sheet 1

Fig. 1.

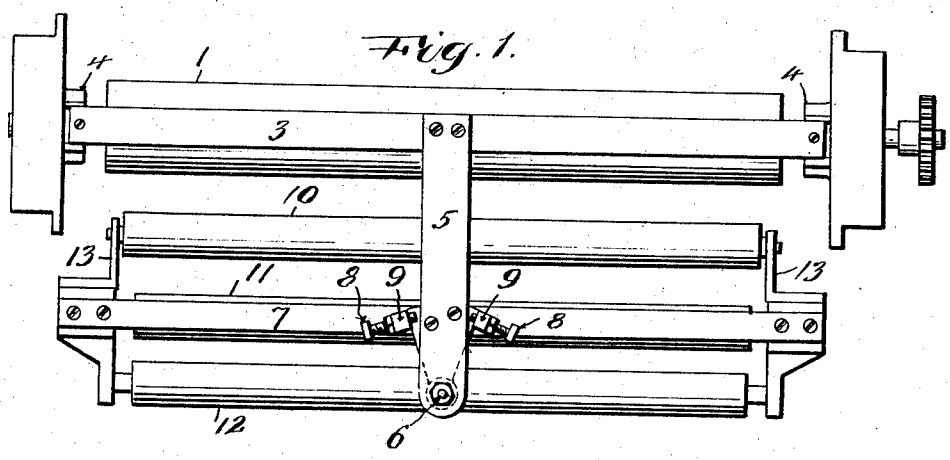


Fig. 2.

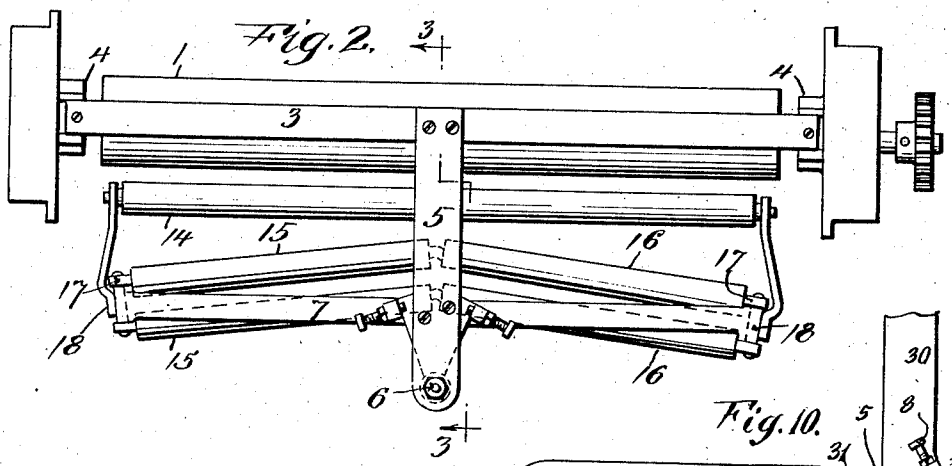


Fig. 10.

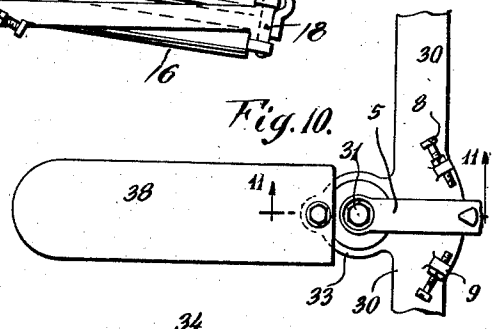


Fig. 3.

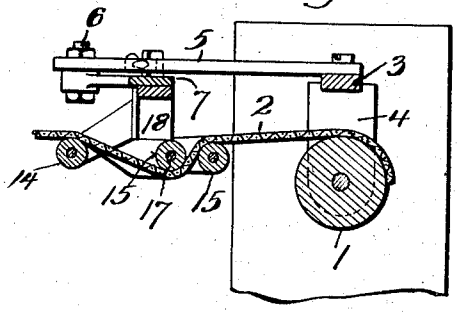
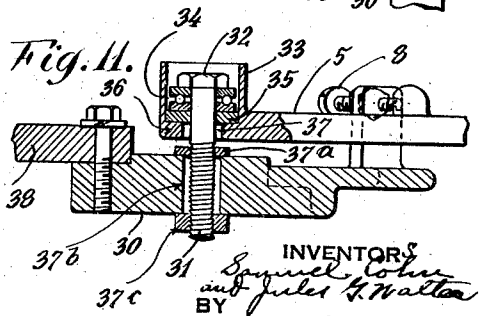


Fig. 11.



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APPARATUS FOR RECTIFYING TRAVELING STRIPS

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Fig. 4.

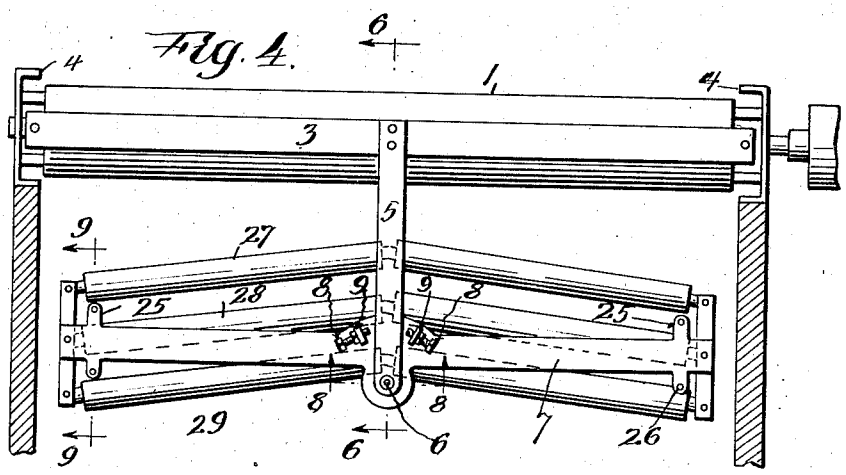


Fig. 5.

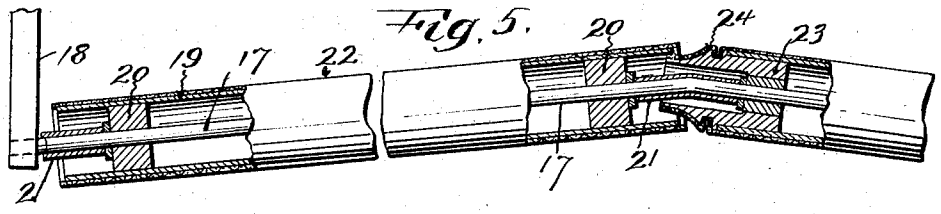
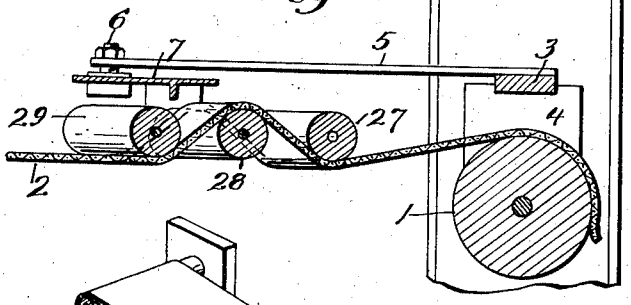


Fig. 6.



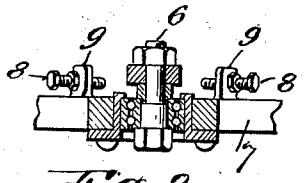


Fig. 8.

Fig. 7.

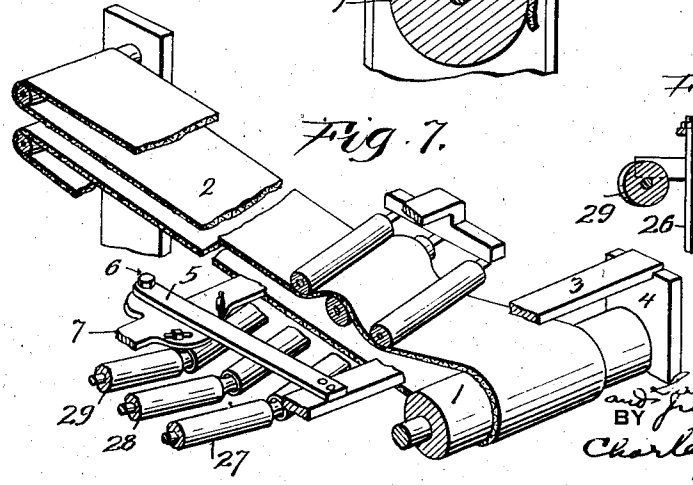
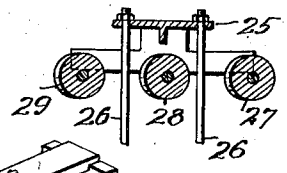


Fig. 9.



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UNITED STATES PATENT OFFICE

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APPARATUS FOR RECTIFYING TRAVELING STRIPS

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Application February 16, 1938, Serial No. 190,830

13 Claims. (Cl. 271—2.6)

The present application is a continuation in part of our application Serial No. 691,522, filed September 29, 1933, and also it is a continuation in part of our co-pending application Serial No. 108,318, filed October 30, 1936.

Our present invention relates to an apparatus for rectifying a traveling strip, the purpose of which is to maintain a traveling strip of material, such as fabric, in a given path, and to restore the fabric to that path if it develops a lead to one side or the other of the intended line of travel. The invention is useful in various types of machines, such as in the drying apparatus shown in the parent applications, where a strip of fabric is guided in a straight or tortuous path over a series of rollers. It is a well known fact that where a strip of material is traveling over rollers, no matter how perfect the rollers may be made, or how perfect the fabric may be constructed, there is a tendency for the fabric to shift sidewise from its intended path, and where the strip of material is in the nature of a fabric it cannot be maintained in a straight path by simply having side guides.

Where the traveling strip consists of knitted fabric it is difficult to maintain the strip in a definite and predetermined path of travel because of the elastic quality or characteristic of the fabric, and while different kinds of materials may be handled with the present device, it is an important feature of the invention that it is capable of handling strips of knitted fabric, and especially knitted, tubular fabric. The present device is very inexpensive to manufacture so that a number of rectifiers may be placed adjacent a number of fabric propelling rollers to guide and rectify the fabric adjacent each such roller.

The rectifier itself requires no outside driving force but is controlled and actuated by the strip of fabric itself in such manner that whenever the fabric develops a tendency to lead to either side of the intended or predetermined course the rectifier acts to produce a counterlead in the fabric sufficient to restore it to the intended path, as soon as the tendency to lead off from this path develops, and by a gentle action which will not produce wrinkles in the fabric nor place the fabric under undue strain or tension. On the contrary, the present device not only acts to rectify the strip of fabric, but to smooth out or remove any wrinkles which may exist in the fabric as it approaches the rectifier.

We have shown the invention in different forms, in one of which the rollers with which the strip of fabric has a rolling engagement extend at substantially right angles to the path of travel of the fabric, whereas in another form of the invention the rollers are composed of sections which lie at angles or in convergent relation to each other and in this form of the invention we have shown the roller sections of each pair mounted on shafts which are bent or formed in convergent shape so that the roller sections have a fixed angle in relation to each other.

Another object of the invention is to pivot the roller supporting means of the rectifier in an eccentric relation so that a slight deflection of the fabric from its intended course will cause the rectifier to act quickly to produce the counterlead necessary to restore the fabric to the intended course. Preferably, the rectifier has at least three rollers with which the fabric engages in order to produce a slight tautness in the fabric while it is passing the rectifier, in order to make the action of the rectifier very sensitive. Where knitted fabric is being propelled through a machine, it is desirable that the fabric be maintained in a very loose condition and the present device is effective even under these conditions.

The present device is very sensitive, so that it produces a counterlead promptly, but nevertheless the rectifier itself does not have excessive movement because of its sensitive action. In other words, with the present invention it is possible to prevent the rectifier from having an action which, for lack of a better term we call "hunting," or back and forth movement, carrying the fabric with it, or a movement in excess of that necessary to maintain the fabric in a straight line. In other words, when the present device moves to produce a counterlead in the fabric it will not have a tendency to go beyond the point where the fabric is brought back to normal position, and thus produce in itself an undesirable counterlead on the opposite side of the normal position or line of movement. Whereas in prior art devices the rectifiers have acted through the tension existing in the layer of fabric as a whole, the present device may function through a light tension of the fabric created within the limits of the rectifier itself and without any relation to any tension or lack of tension which may exist in a layer of fabric beyond the rectifier itself.

Another object of the invention is to provide a rectifier which may oscillate on an axis which is perpendicular to the plane of the fabric with the rectifier moving in a plane parallel with the plane of the fabric, but we also mount the rectifier so that it may oscillate to a limited extent in a ver-

tical plane. This not only increases the sensitiveness of the device but it also prevents the rectifier from producing a local distortional stress upon the fabric which is important where the fabric is of knitted construction. This particular feature is not shown in the parent applications but is new to the present case.

Other features and advantages will be set forth in the following detailed description of our invention.

In the drawings forming part of this application:

Figure 1 is a plan view of a rectifier embodying our invention in the form in which the fabric engaging rollers are at right angles to the path of travel of the fabric,

Figure 2 is a similar view of a modified form in which two of the fabric engaging rollers are composed of convergent sections,

Figure 3 is a sectional view taken on the line 3—3 of Figure 2, but showing a further modification,

Figure 4 is a plan view of a rectifier embodying our invention, in which all of the fabric engaging rollers are composed of convergent sections,

Figure 5 is a detailed elevation with parts broken away and showing the construction of one of the fabric engaging rollers shown in Figure 4,

Figure 6 is a sectional view taken on the line 6—6 of Figure 4,

Figure 7 is a broken perspective view of the rectifier and showing its relation to the fabric propelling rollers,

Figure 8 is a sectional view taken on the line 8—8 of Figure 4,

Figure 9 is a sectional view taken on the line 9—9 of Figure 4,

Figure 10 is a plan view of a portion of a rectifier which is adapted to have pivotal movement on a plurality of axes, and

Figure 11 is a sectional view on an enlarged scale, taken on the line 11—11 of Figure 10.

The rectifying devices are preferably placed at advantageous points in the travel of the fabric, preferably engaging the fabric in advance of each propelling roller 1. We will first describe the form of our invention shown in Figure 1.

The strip of material 2 being driven by and running over the roller 1 and other similar rollers, has a tendency to run off to one side or the other unless there is something to guide it and hold it centralized, and this tendency is especially great if the fabric is of soft texture such as knitted fabric. If there are superposed layers of fabric and especially if it is in moist condition, and where the fabric changes its direction as where it passes around the propelling rollers, it has been difficult to keep the fabric centralized on the rollers and to eliminate creases and wrinkles in the fabric.

There is shown a cross member 3 mounted in the uprights 4 of a frame such as the frame of a drying chamber; and within the drying chamber there is placed the driving roller 1. The cross piece 3 is preferably adjacent the propelling roller 1 and at its middle point it supports an arm 5 which extends forwardly of the propelling roller. At the end of this arm there is a pivot bolt 6 which forms a pivotal support for an oscillating frame 7 which is adapted to oscillate in a horizontal plane and to a limited extent around the bolt 6; and in order to allow this frame to move with the least resistance we prefer to provide ball bearings interposed around the bolt 6 and on which the frame 7 oscillates.

The swing of the rectifier is limited by adjustable screws 8 which are threaded into the ears 9 on the member 7 and which strike the bar 5. The oscillating frame carries the traction rollers which automatically maintain the fabric centralized, and in Figure 1 these rollers are constructed as follows: In Figure 1 we have shown three rollers 10, 11, 12 which are preferably covered with rubber, velvet or similar material, and the pintles of these rollers are all journaled in brackets 13 at opposite ends; which brackets are mounted upon the swinging frame member 7. The rollers are shown as being parallel to each other and so positioned that the fabric travels under one of these rollers over the middle one; and thence under the end one as it approaches the propelling roller 1. Normally, the swinging frame 7 lies in a position so that the several rollers 10, 11, 12 are at right angles to the intended path of travel of the fabric and in subsequent description we will set forth the operation of the device.

In the construction shown in Figure 2 the arrangement is modified and in this construction the roller 14 which is nearer the propelling roller 1 is shown as a straight roller whereas the two rollers in front of it are convergent; that is to say, these rollers are composed of sections which converge in relation to each other. Each of these rollers consists of a section 15 on the left side of the frame 7 and a section 16 on the right side of the frame. The two sections of each roller are shown on an angular shaft 17 which is secured at its ends to the brackets 18 which are mounted on the oscillating frame 7. The sections of the rollers are shown as composed of thin, cylindrical rollers 19 having plugs 20 disposed inside the tubular member and adjacent the opposite ends thereof; and these plugs have their bearings on the shafts 17. The sleeves 21 serve as spacers to maintain the roller sections in proper position on the shaft.

The cylinders 19 are preferably covered with a fabric 22 which may be velvet, rubber or plush, in order to have sufficient traction for the fabric to revolve the several rollers which are in fact idlers. Preferably one of the roller sections, for instance, the section 16 on the right of Figure 5, has a plug 23 in the end of the cylinder 19 which plug projects beyond the end of the cylinder and into the open end of the cylinder of the companion roller section. This plug is shaped as shown at 24 to provide a member for the traveling fabric to rest against and to prevent the fabric from piling up against the edge of either roller section when it shifts from side to side of the central line. The straight roller 14 may precede the convergent rollers as shown in Fig. 3.

Preferably, the two convergent roller sections of each roller are constructed alike so that the above description applies to each of them. Of course it will be understood that two rollers may be used or more than three rollers, in the rectifier, but we have found that three rollers in each rectifier will perform all of the functions desired.

We have shown extensions or ears 25 on the frame 7 with rods 26 connected thereto and extending downwardly between adjacent roller sections to prevent either edge of the traveling fabric from becoming entangled with the ends of the rectifier rollers.

In the construction shown in Figure 4 all three

rollers 27, 28, 29 on the rectifier are constructed of convergent sections corresponding with the rollers 15, 16 in Figure 2 and the sections of all of these rollers are disposed parallel to each other. In other words, instead of a straight roller like the roller 14 in Figure 2, the three rollers are all constructed alike.

Operation

The strip of fabric just before it approaches one of the propelling rollers 1 passes under the first roller of the rectifier, in the form shown in Figure 1, the first roller 15, 16 of the form shown in Figure 2, or the first roller 29 of the form shown in Figure 4. The fabric then passes partly over the second roller, then partly around the third roller of the rectifier, from which it passes directly onto the propelling roller 1. The traction of the fabric on the several rollers of the rectifying device causes the latter rollers to revolve as they are in the nature of idlers. Where the rollers are shown in Figures 2 and 4 they will, because of their formation in convergent sections, cause any creases or wrinkles in the fabric to be worked off from the middle line of the fabric in opposite directions to the edges of the fabric, so that when the fabric reaches the propelling rollers 1 these wrinkles or creases will have been smoothed out and caused to pass off the side edges of the fabric. The bolt 6 which is the pivotal point of the frame 7 is preferably in the median line of the correct path of travel of the fabric, or in line with the middle of the fabric propelling roller 1.

The fabric in flat form, whether of single thickness or a flattened tube, will travel in a horizontal or substantially horizontal plane, and will reach the rectifier from some previous roller or guiding means and the several rollers of the rectifier will be revolved by the action of the fabric. The function of the rectifier is to keep the traveling strip of fabric centralized in relation to the propelling roller 1. If while the fabric is traveling through the rectifier it, for any reason, develops a tendency to lead toward the right as viewed in Figures 1, 2 or 4, the fabric will travel on the rectifier rollers toward the right, and when this takes place there will be more fabric engaging the rectifier rollers or roller sections to the right of the pivotal points 6 and this will cause the rectifier to turn diagonally toward the left in these views or to swing anticlockwise and the rectifier will thereupon immediately develop a left lead in the traveling fabric. This left lead will overcome the previously developed right lead of the fabric, or in other words, the rectifier will immediately and automatically equalize the fabric by leading it back toward the correct path of travel.

When this counterlead develops and starts to bring the fabric back to its correct position, the rectifier will also move from its original position back to its central position so that by the time the fabric has been corrected in relation to the propelling roller 1 the rectifier itself will have been brought back to the neutral or straight position at right angles to the correct line of travel of the fabric as indicated in Figures 1, 2 and 4. The lateral lead caused by the rectifier is therefore brought to an end when the fabric has been brought back to its correct path. The rectifying action is not sudden but it takes place gradually as is necessary with a wide, soft fabric. If the pivotal screw 6 is arranged directly over the frame 7 the rectifying action will be much slower and more gradual. Whereas if this pivotal point is arranged ahead of the frame 7 as shown in Figures 1, 2 and 4, there is a greater swing to the rectifier and therefore the rectifying action is quicker.

If the fabric at the rectifier tends to develop a left lead, the opposite action will take place to that described above, and the rectifier will provide a right hand counterlead and bring the fabric back to its correct position. The rectifier operates on substantially the full width of the fabric rather than locally, and instead of creating wrinkles in the strip it irons and smooths them out. The several rollers of the rectifier may create only a light tension in the fabric where it is passing through the rectifier; in other words only enough tension will be created to cause the rectifier to operate in the manner described above.

In the forms of our invention described above, the rectifier swings on the pivots 6 in a plane which is horizontal or which is parallel to the plane of the fabric. In Figures 10 and 11 we have shown a modified construction wherein the rectifier may oscillate in the same horizontal plane as described above, but which on occasion may also oscillate slightly in a vertical plane. In this construction the oscillating frame 30 corresponds with the oscillating frames 7 and its horizontal rocking motions are limited by the same kind of stop screws 8 as described above. In this form, however, while the oscillating frame is pivoted on the screw 31 to permit it to move in a horizontal plane the same as the oscillating frames described above, it may also rock upon the screw in a vertical plane. For this purpose the screw 31 is attached to the bracket 5 corresponding with the brackets in the previous description and the upper end of this screw has a nut or head 32 which is disposed in a cup or housing 33 formed on the support 5 and the upper end of the housing may be open or covered. Under the head 32 of this screw or bolt there is arranged a ball bearing 34 which is shown as smaller in diameter than the opening in the cup 33. This ball bearing device is shown as resting on a washer 35 which may be of soft material, and the washer itself seats on the bottom wall 36 of the cup. The bolt 31 passes through the ball bearing, through the washer 35 and also through an enlarged aperture 37 in the bottom wall of the cup and thence through the nut 37^a; thence freely through an aperture 37^b in the member 30 and through the nut 37^c. The nuts 37^a and 37^c attach the bolt 31 to the member 30 and the latter with the bolt may swing on the ball bearing. Preferably, we provide a counterweight 38 which is shown as bolted to the oscillating frame 30 and disposed on the opposite side of the pivot bolt 31 so that this counterweight serves to counterbalance the portion of the rocking frame which is on the opposite side of the bolt 31, thereby tending to keep the frame in a horizontal position under normal conditions.

It will be obvious from the above that the rocking frame 30 in this construction can oscillate in a horizontal plane around the bolt 31 so that the rollers of the rectifier will perform the same functions as the rollers in the construction described above. If, however, there is a tendency for the fabric to move out of its true horizontal position, and of course any movement resulting from this tendency will be slight, then there will be no undesirable drag or distortional action on the fabric because the frame 30 in addition to its os-

cillation on a horizontal plane may tilt in a vertical plane. This is permitted because the bolt 31 which supports the rocking frame can tilt to a limited extent within the aperture 37 which is larger than the diameter of the bolt and in this action the bolt will simply rock upon the washer 35 and the ball bearing device 34 may rock with the head 32 of the bolt. We prefer to use the form of joint shown herein because the mere weight of the oscillating frame will tend to bring it back to the horizontal position shown in Figure 11 and yet permit the frame to rock in a vertical plane in the manner just described, to permit the equalizer to adjust its position to accord with any variation in the plane of the fabric. This accelerates rectification and makes the device more sensitive. This feature of our invention is new to the present case.

Having described our invention, what we claim is:

1. A rectifier for a traveling strip, including a frame having means with which a traveling strip has a tractional engagement, a support for said frame, a pivot pin for connecting said frame with said support adjacent the median line of travel of the strip, said pin adapted to permit said frame to oscillate in a plane parallel with the path of the strip, said pin being mounted to rock on said support to permit said frame to oscillate in a plane vertical to the plane of the strip, said rectifier being adapted to produce a counter lead in the strip of fabric when swung on its pivot for the purpose of rectifying the travel of said strip.

2. In a machine for propelling a fabric strip, a horizontal propeller roll for propelling the strip and a rectifier through which said strip is drawn horizontally, said rectifier comprising a plurality of successive rollers separated enough to prevent pinching of the strip between them and so maintaining free surface contact between the fabric and each roller, said rollers being sufficiently closely spaced so that said strip passes over one of said rollers and under the next and maintains said free surface contact with a substantial area of each of said rollers, a frame rotatably carrying said rollers, and means freely pivoting said frame around an axis located ahead of said rollers with reference to the travel of said strip and passing perpendicularly through the median line of said strip, whereby when in operation, as said strip assumes an off center position with respect to said median line said free surface contact of said fabric acts on the sides of the rollers toward which the fabric has shifted to automatically turn that side of the rectifier in the direction of travel of the fabric so that the areas of said rollers in contact with said strip all cooperate in urging the fabric uniformly back toward the center and so uniformly rectify the travel of the strip according to the amount of deflection.

3. Apparatus according to claim 2 in which there are three successive cooperating rolls on the rectifier frame.

4. Apparatus according to claim 2 in which said pivot is located above said rollers, whereby the tension of the fabric tends to lift said rollers and thus reduce pressure at said pivot which facilitates the pivoting action.

5. Apparatus according to claim 2 in which said frame is attached to said pivot with sufficient clearance around the pivot to enable said frame to rotate somewhat in a vertical plane, whereby said pivot permits universal rotation in both a horizontal and in vertical planes.

6. In a machine for propelling a fabric strip, a horizontal propeller roll for propelling the strip and a rectifier through which said strip is drawn horizontally by the propeller roll, said rectifier comprising three rollers located in close proximity to each other but not close enough to pinch the strip between them, so that said strip passes alternately over and under successive rollers, thereby maintaining contact with a substantial area of each of said rollers, said rollers being mounted in a frame which is freely pivoted at a pivot located ahead of said rollers with reference to the travel of said strip, the axis of said pivot passing perpendicularly through the median line of said strip, whereby when in operation, as said strip assumes an off center position with respect to said median line the side of the rectifier to which the fabric has shifted is automatically pulled in the direction the strip is traveling, which shifts the frame so that the areas of said rollers in contact with the strip all urge the fabric uniformly back toward the center and so rectify the travel of the strip.

7. In a machine for propelling a fabric strip, a horizontal propeller roll for propelling the strip, and a rectifier through which said strip is drawn horizontally by the propeller roll, said rectifier comprising a frame pivotally mounted at the median plane of the traveling strip for free pivotal movement in a horizontal plane, a set of rollers mounted in said frame on each side of said median plane, each set comprising a plurality of parallel rollers, the rollers on one side of the median plane being disposed in divergent relation to the median line of the strip and to the rollers on the other side of the median plane, the rollers of each set being located in close proximity to each other but not close enough to pinch the strip between them, so that said strip passes alternately over and under successive rollers, thereby maintaining contact with a substantial area of each of the rollers, whereby in operation, each set of rollers imposes a lateral spreading thrust on the fabric on each side of the median plane, and unequal tensions on the fabric on the two sides of the median plane pull forward the side of said roller frame subjected to the greatest tension, thereby urging the fabric uniformly toward the center and so rectifying the travel of the strip.

8. In a machine for propelling a fabric strip, a horizontal propeller roll for propelling the strip for free pivoted movement in a horizontal plane, and a rectifier through which said strip is drawn horizontally by the propeller roll, said rectifier comprising a frame pivotally mounted at the median plane of the traveling strip, a set of rollers mounted in said frame on each side of said median plane, a pair of said rollers in each set being parallel, and the pair in one set diverging from the pair in the other set to form a double V having the apices at said median plane, the rollers of each pair being located in close proximity to each other but not close enough to pinch the strip between them, so that said strip passes alternately over and under the successive rollers, thereby maintaining contact with a substantial area of the rollers, whereby in operation, each set of rollers imposes a lateral spreading thrust on the fabric on each side of the median plane, and unequal tensions on the fabric on the two sides of the median plane pull forward the side of said roller frame subjected to the greatest tension, thereby urging the fabric uniformly toward the center and so rectifying the travel of the strip.

9. In a machine for propelling a fabric strip, a horizontal propeller roll for propelling the strip, and a rectifier through which said strip is drawn horizontally by the propeller roll, said rectifier comprising a frame pivotally mounted at the median plane of the traveling strip for free pivotal movement in a horizontal plane, a set of three parallel rollers mounted in said frame on each side of said median plane, the rollers on one side of the median plane being disposed in divergent relation to the median plane and to the rollers on the other side of the median plane, the rollers of each set being located in close proximity to each other but not close enough to pinch the strip between them, so that said strip passes alternately over and under successive rollers, thereby maintaining contact with a substantial area of each of the rollers, whereby in operation, each set of rollers imposes a lateral spreading thrust on the fabric on each side of the medan plane and unequal tensions on the fabric on the two sides of the median plane pull forward the side of said roller frame subjected to the greatest tension, thereby urging the fabric uniformly toward the center and so rectifying the travel of the strip.

10. Apparatus according to claim 9 in which the six rollers comprised in the two sets of rollers on opposite sides of the median plane, are mounted for rotation on three V-shaped rods fixed in the frame with their apices at the median plane, a roller of one set being mounted on one arm of each V rod and a roller of the other set being mounted on the other arm of each V rod.

11. Apparatus as set forth in claim 9 in which the six rollers comprised in the two sets of rollers on opposite sides of the median plane are mounted for rotation on three V-shaped rods fixed in the frame with their apices at the median plane, a roller of one set being mounted on one arm of each V-rod and a roller of the other set being mounted on the other arm of each V-rod, said roller frame being attached to said pivot with sufficient clearance around the pivot to enable said frame to rotate somewhat in a vertical plane, whereby said pivot permits universal rotation in a horizontal plane and in vertical planes.

12. A rectifier for a traveling fabric strip, including a frame supporting a plurality of rollers with which the traveling strip has tractional engagement, said frame being suspended over said strip by a pivot located ahead of said rollers and adjacent the median line of path of the strip, said pivot including a pin having a head supported by a yieldable washer permitting said frame to oscillate both in a plane parallel to the plane of the fabric and in a plane perpendicular thereto, said rectifier producing a counter lead in the strip of fabric when swung on its mounting for the purpose of rectifying the travel of said strip.

13. A rectifier as set forth in claim 12 wherein said roller frame is pivoted eccentrically of the front and back dimension of said frame and has a counterweight on the shorter arm of said pivoted frame to counterbalance the weight thereof.

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