APPARATUS FOR UNFOLDING, SPREADING AND GUIDING A TRAVELLING KNITTED FABRIC

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ABSTRACT
An apparatus comprising endless belts disposed at the opposite edges of a travelling knitted fabric, respectively, and push members opposing and engageable with the working surfaces of the endless belts, respectively, to grip the knitted fabric therebetween, the push members being adapted to be brought close to or away from the endless belts individually. At least the endless belts are driven in the direction to unfold turned-up selvages of the fabric and to spread the fabric.

2 Claims, 10 Drawing Figures
APPARATUS FOR UNFOLDING, SPREADING AND GUIDING A TRAVELLING KNITTED FABRIC

The present invention relates to improvements in an apparatus for unfolding, spreading and guiding an elongated knitted fabric by correcting shrinkage, creasing, folding, deviation of the fabric and turned-up selvages while the fabric is delivered for rewinding, dyeing or some other treatment so as to ensure proper treatment of the travelling fabric.

Conventional apparatus of this type comprise rotary discs to be disposed at the opposite edges of a travelling knitted fabric on one face thereof and push plates to be disposed on the other face of the fabric in opposing relation to the rotary discs so as to position the knitted fabric between the grooved working surfaces of the rotary discs and the grooved working surfaces of the push plates, the rotary discs being rotatable in such direction as to force the opposing selvages of the travelling fabric outward, the push plates being adapted to be moved toward or away from the rotary discs by suitable means to be actuated by touch levers or like sensing means positioned beside the peripheries of the rotary discs. Thus, the push plates are movable toward or away from the rotary discs in accordance with the shifting of the selvages of the travelling fabric; when the push plates are brought closer to the rotary discs, the selvages of the fabric will be gripped therebetween and positively pulled outward for the spreading of the fabric, whereas when the push plates are brought away from the rotary discs, unrolling or unfolding of turned-up selvages alone will be performed by the rotary discs.

However, since the conventional apparatus unfolds and spreads the knitted fabric by the rotational motion of the circular arc portions of the rotary discs, the discs must have a greater diameter if it is attempted to increase the length effective to unfold turned-up selvages and spread the fabric, but the increase in the diameter of the rotary discs is restricted for structural reasons in practice. Thus there is an inevitable limitation on the effective length for unfolding and spreading of the fabric, making it impossible to achieve greatly improved selvage unfolding and fabric spreading effects.

Furthermore, inasmuch as the angle of entrance of the travelling fabric into the working area of the rotary disc with respect to the groove therein is small, turned-up selvages will engage in the meshing grooves in the grooved working surfaces of the rotary disc and the push plate, with the resulting drawback of markedly reducing the unrolling or unfolding effect due to such engagement.

A primary object of this invention is to provide an apparatus for unfolding, spreading and guiding a travelling knitted fabric having a greatly increased effective length for unfolding turned-up selvages of the knitted fabric and spreading the fabric with ease, free of troubles in its construction and operation and, therefore, with remarkably improved effectiveness.

Another object of this invention is to provide an apparatus for unfolding, spreading and guiding a travelling knitted fabric which permits the travelling fabric to be fed to the working area of the apparatus at an increased angle of entrance so that the selvages of the fabric can be prevented from engaging in the grooves or hollow spaces in the meshing working surfaces of an endless belt and a push member which include projections so as to eliminate any deterioration of the operation efficiency in unfolding selvages and spreading of the knitted fabric.

The apparatus for unfolding, spreading and guiding a travelling knitted fabric according to this invention comprises travelling endless belts disposed at the opposite edges of the travelling knitted fabric, respectively, on one face of the fabric and positioned transversely of the fabric, each of the endless belts having an engageable working surface including projections extending in the direction of travel of the endless belt, and push members opposing the endless belts, respectively, to be positioned at the side of the sensing face of the fabric transversely thereof, each of the push members having a working surface engageable with the working surface of the endless belt and including projections extending in the same direction as the projections of the endless belt so as to interpose the travelling fabric between the working surface of the endless belt and the working surface of the push member. At least the endless belts are driven in a direction to spread the fabric and to unfold turned-up selvages of the same. The apparatus further includes means for moving the push members toward or away from the endless belts, respectively, in accordance with the positions of the selvages in response to the operation of the endless belts disposed beside the peripheries of the endless belts, respectively.

Unlike the conventional apparatus referred to above, the present apparatus provides an increased effective length for the unfolding of turned-up selvages and spreading of the fabric by elongating the length of the travelable endless belt, namely by readily employable means to greatly improve the effect of the unfolding and spreading operation. Furthermore, the endless belt and the push member which are disposed transversely of the knitted fabric permit the fabric to advance into the working area at an increased angle of entrance, whereby the selvages of the fabric are prevented from engaging in the grooves or spaces in the engageable working surfaces of the endless belt and the push member, this serving to eliminate any reduction in the unfolding and spreading operation efficiency.

For a better understanding of this invention, a detailed description will be given below with reference to the accompanying drawings, in which:

FIG. 1 is a front view schematically showing an apparatus of this invention for unfolding, spreading and guiding a travelling knitted fabric during operation;

FIG. 2 is a front view showing the apparatus at one selvage only;

FIG. 3 is a plan view of the same;

FIG. 4 is a fragmentary view in section taken along the line II—II in FIG. 3;

FIG. 5 is a view in section taken along the line III—III in FIG. 3;

FIG. 6 is a view in section taken along the line IV—IV in FIG. 3;

FIG. 7 is a plan view showing another embodiment of the apparatus of this invention for unfolding, spreading and guiding a travelling knitted fabric;

FIG. 8 is a view in section taken along the line V—V in FIG. 7;

FIGS. 9 and 10 are views in section schematically showing other examples of the opposing endless belt and push member which may be used.

The unfolding, spreading and guiding apparatus shown in FIGS. 1 to 6 includes travelable endless belt assemblies disposed at the opposite edges of a travel-
ling knitted fabric N, each of the belt assemblies comprising an endless belt 2 formed on its front and rear faces with grooves and projections 1 extending in the direction of travel, a drive roller 3 and a guide roller 5 for supporting the endless belt 2 thereon, and smaller guide rollers 4 and 4 positioned along the path of travel of the endless belt 2. All the rollers are formed with grooves and projections in their surfaces. The endless belt assemblies 6 are positioned on one face of the knitted fabric N transversely thereof. Spaced apart by a small distance from the endless belt assemblies 6 and positioned at the side of the other face of the knitted fabric N are push members 8 formed, in their surfaces, with grooves and projections 7 extending in the same direction as those of the endless belts 2, the push members being positioned transversely of the fabric N. Thus the knitted fabric N is interposed between the grooved working faces of the endless belt assemblies 6 and the grooved working faces of the push members 8, with the result that when the push members 8 are brought close to or pressed against the endless belt assemblies 6, the grooves and projections 1 and 7 mesh with each other to a small or great extent in gripping engagement with the knitted fabric N so as to positively spread the fabric and unfold or unroll the turned-up selvages of the fabric.

Disposed beside the periphery of the endless belt assembly 6 is means for sensing the selvage of the knitted fabric comprising a touch lever 9. Through the action of the touch lever 9, operating means to be described later brings the push member 8 toward or away from the endless belt assembly 6 in accordance with the position of the selvage of the fabric N. The endless belt 2 is driven in speed-variable fashion in a direction to unfold and spread the fabric as indicated by the arrows in FIG. 3, by means of the drive roller 3 which is in turn driven by a rotary shaft 14 through a bevel gear 15. The rotary shaft 14 is fixedly attached to a gear 13 meshing with a gear 11 on a torque motor 10. These transmission means are all housed in a gear box 12 which is secured near a sub-bracket 16.

The push member 8 in the form of a plate is bent, at its opposite ends, away from the endless belt assembly 6 to facilitate the passage of the selvage of the travelling knitted fabric N. The push member 8 is pivoted at its base portion to a diaphragm body 17 which is fixed to one end of a U-shaped arm 18 having the other end fixed to the sub-bracket 16. The aforementioned operating means for the push member 8 comprises a diaphragm 19 within a diaphragm body 17 and a push rod 20 secured to and supported by the center of the diaphragm 19, the front end of the push rod 20 being in contact with the rear face of the push member 8. Disposed behind the diaphragm 19 is a stationary plate 21, the center of which is provided on its rear face with an air supply nozzle 22 communicating with the space between the diaphragm 19 and the plate 21. A spring 23 extends between the push member 8 and the diaphragm body 17 to urge the push member 8 away from the endless belt assembly 6, namely toward the diaphragm body 17.

Compressed air supplied to the space between the stationary plate 21 and diaphragm 19 through the air supply nozzle 22 inflates the diaphragm 19 toward the push member 8 to move the push rod 20 against the action of the spring 23, with the result that the front end of the push rod pushes the push member 8 toward the endless belt assembly 6 and meshes the projections and grooves 7 of the push member 8 with the projections and grooves 1 of the endless belt assembly 6 to grip the selvage of the travelling fabric N.

One air supply tube 25 of an air valve 24 provided on the gear box 12 communicates with the air supply nozzle 22 for the diaphragm 19 by way of an air hose 26, and the other air supply tube 27 of the air valve 24 communicates with a suitable air compressor (not shown). Disposed between the air supply tubes 25 and 27 is an aperture lever 28, to a pivot 29 of which is secured the base portion of the aforementioned touch lever 9. The distal end of the touch lever 9 extends into a slot 31 formed in a plate 30 disposed behind the push member 8, the touch lever 9 being movable outward or inward within the range defined by the slot 31. Although not shown, the touch lever 9 is so constructed as to be usually movable slightly inward from the normal position of the travelling fabric N under the action of a spring or gravity, so that when the selvage of the travelling fabric N moves inward and tends to retract from between the endless belt assembly 6 and push member 8, the touch lever 9 is moved inward to turn the pivot 29, which in turn moves the aperture lever 28, bringing an aperture 32 of the lever into register with the holes of the air supply tubes 25 and 27 to open the air valve 24. As a result, the air from the air compressor is supplied through the air hose 26 and air supply nozzle 22 to the diaphragm 19, causing the endless belt assembly 6 and the push member 8 to grip the selvage of the fabric to positively unfold or unroll the selvage and spread and guide the fabric. Further, if the selvage is displaced outward to move in between the endless belt assembly 6 and the push member 8 to excess, the selvage pushes the touch lever 9 outward to bring the aperture 32 of the lever 28 out of register with the holes of the air supply tubes 25 and 27 to close the air valve 24, whereupon the compressed air is discharged from the air valve through its opening 33. Accordingly, the inflated diaphragm 19 is restored to the original state to retract the push rod 20, permitting the spring 23 to force the push member 8 away from the endless belt assembly 6 to free the travelling fabric from the gripping engagement. Unrolling of the turned-up selvage only is thereafter conducted by the endless belt 6.

The selvage-unfolding and fabric spreading and guiding apparatus of the foregoing construction embodying this invention assures an effective unfolding and spreading of the travelling knitted fabric N through readily applicable means of an elongated endless belt, unlike the conventional apparatus incorporating rotary discs, so that remarkably improved results can be achieved in unrolling the turned-up selvages and spreading of the fabric. Furthermore, the endless belt assemblies 6 and the push members 8, being disposed transversely of the knitted fabric N, enable the travelling fabric N to advance into the working area at a great angle of entrance, without permitting the selvages of the fabric to engage in the meshing grooves in the working faces of the endless belt assemblies 6 and push members 8, the present apparatus thus being free of the drawback encountered with conventional apparatus including rotary discs to overcome the deterioration of operation efficiency.

FIGS. 7 and 8 show a partially modified embodiment of the apparatus for spreading and guiding travelling
knitted fabric and unfolding the turned-up selvages of the fabric according to this invention.

This embodiment differs from the foregoing embodiment only in the construction of the push member. A push member 80 is in the form of a movable endless belt assembly, similar to the endless belt assembly 6 already described, which comprises an endless belt 82 formed in its front and rear faces with projections and grooves 81 extending in the direction of travel and passed around a drive roller 83, a large guide roller 85 and small guide rollers 84. The push member 80 is disposed transversely of the knitted fabric N to position the fabric between the grooved working surface of the endless belt assembly 6 and the grooved working face of the push member 80. The endless belt 82 of the push member 80 is driven by a drive roller 83 independently of the endless belt assembly 6 in a direction opposite to that of the travel of the assembly 6, the drive roller 83 being rotatable by a torsion motor 87 equipped with a speed change means 86. The guide rollers 84, 84 and 85 are supported by a link 88 and coupled to a link mechanism 89 disposed in the rear of the push member 80. The link mechanism 89 is pivoted at its base ends to a frame as indicated at 90 and is in contact at its rear portion with the front end of the push rod 20 of the operating means already described, the arrangement being such that when pushed by the push rod 20, the mechanism 89 pivotally moves about the pivots 90 against the action of the spring 23 to push the guide rollers 84, 84 and 85, consequently forcing the push member 80 toward the endless belt assembly 6.

The drive roller 83 and guide roller 85 are supported on upper and lower frames 91, which are formed at the supporting portions with slots 92 extending in the direction of advance or retraction of the push member 80. These slots therefore permit the forward and backward movement of the push member 80.

The apparatus of this invention having the modified construction described above achieves the same effects and has the same advantages as the first embodiment. In addition, since the push member 80 is driven in the selvage-unrolling and fabric-spreadig direction with respect to the knitted fabric N as is the case with the endless belt assembly 6, the fabric N will be subjected to a positive selvage-unfolding and fabric-spreadig operation on its opposite faces, hence producing a highly improved effect. Although the selvage of the knitted fabric may roll or turn up only over one side, the finished state of a knitted fabric does not indicate on which side the fabric will roll up. In this respect, the endless belt assembly 6 and the push member 80 which are adapted to be driven at a variable speed individually have the advantage in that on whichever side the selvage may roll up, the travelling body positioned on the rolled-up side can be driven at a suitably higher speed than the other travelling body on the opposite side, this making it sure that the fabric can be unfolded and spread completely. Thus the knitted fabric to be treated can be fed to the apparatus either with face up or down as desired for trouble-free operation.

The present invention is not limited to the principal modes of embodiment which are given above for illustrative purposes only. Further the engageable working surfaces of the endless belts may be provided by opposing groups of a plurality of round belts disposed in parallel as seen in FIG. 9. Alternatively, a plurality of round belts and a strip of belt may be used in opposing arrangement as shown in FIG. 10. Thus various other modifications of this invention, apparent to one skilled in the art, will be included within the scope of this invention insofar as they do not depart from the disclosure of the appended claims.

What is claimed is:

1. An apparatus for unfolding, spreading and guiding a travelling knitted fabric comprising travelling endless belts disposed on the opposite edges of the travelling knitted fabric respectively on one face of the fabric and positioned transversely of the fabric, each of the travelling endless belts having an engageable working surface including projections extending in the direction of travel of the endless belt, push members opposing the travelling endless belts respectively positioned at the side of the other face of the fabric and transversely thereof, each of the push members comprising an endless belt having a working surface engageable with the working surface of the associated travelling endless belt and including projections extending in the same direction as the projections of the travelling endless belt so as to interpose the travelling fabric between the working surface of the travelling endless belt and the working surface of the endless belt push member, means for driving the travelling endless belts and the endless belts serving as push members at variable speeds individually whereby the endless belt member of each pair of opposed such members at each edge of the fabric at the side thereof wherein the selvage is turned-up may be driven at a higher speed than the opposing endless belt member in directions to spread the fabric and to unfold turned-up selvages of the same, selvage sensing means disposed adjacent the travelling endless belts, and means for moving each of the endless belt push members toward or away from the associated travelling endless belt in accordance with the position of the selvages in response to the operation of said selvage sensing means.

2. The apparatus for unfolding, spreading and guiding a travelling knitted fabric as set forth in claim 1 wherein the means for moving each of the push members toward or away from the associated endless belt comprises a push rod, a diaphragm within a diaphragm body, the front end of the push rod being in indirect contact with a rear portion of the associated push member, and the push rod being fixed to said diaphragm.