

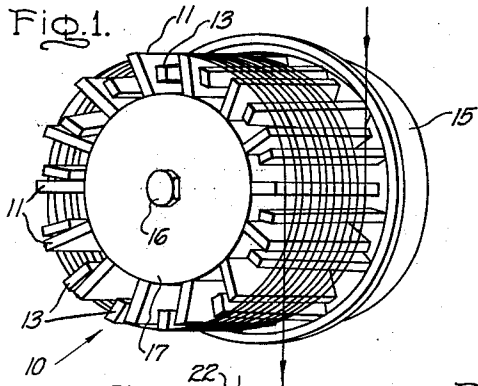
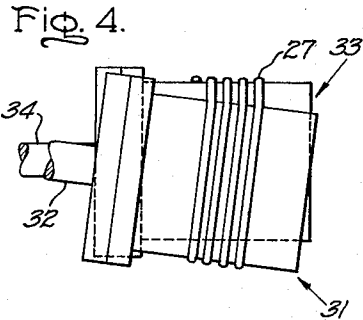
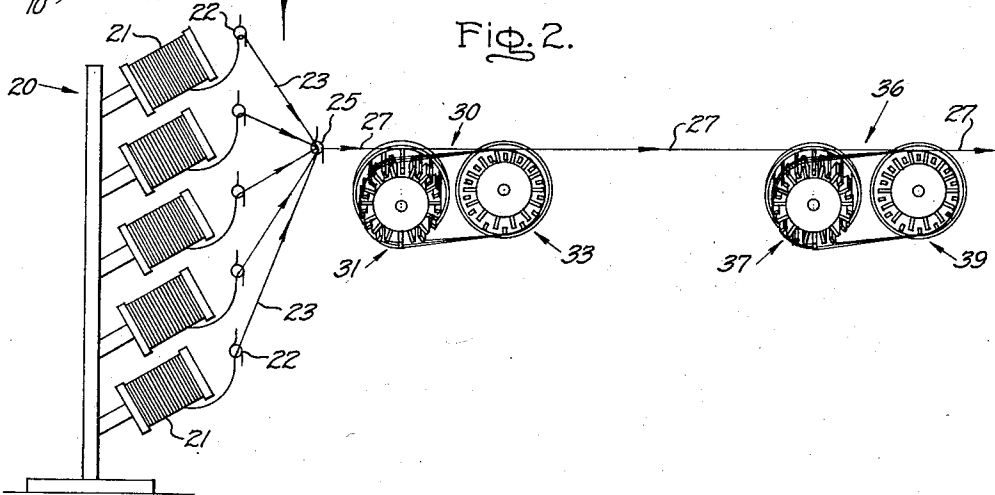
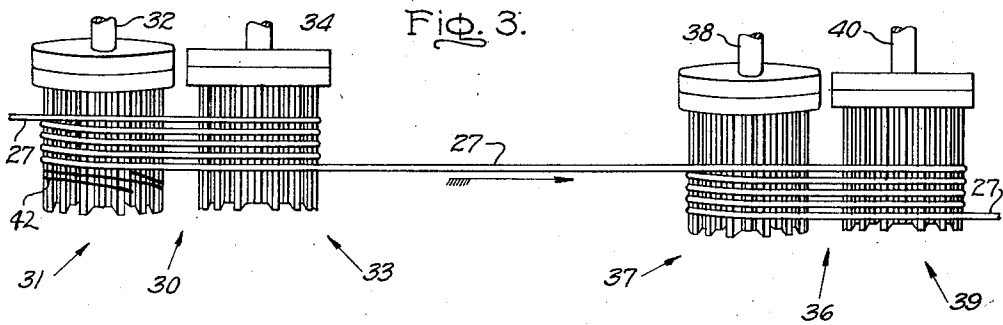
March 29, 1960

R. W. STANLEY

2,930,103

TOW STRETCHING APPARATUS

Filed Aug. 24, 1954



Inventor:
Richard W. Stanley,
by *Thomas A. Mayner*
His Attorney.

1

2,930,103

TOW STRETCHING APPARATUS

Richard W. Stanley, Rocky River, Ohio, assignor to Industrial Rayon Corporation, Cleveland, Ohio, a corporation of Delaware

Application August 24, 1954, Serial No. 451,787

1 Claim. (Cl. 28—71.3)

This invention relates to an apparatus for handling strands, bundles or ropes of textile fibers, particularly for drawing or stretching tows and the like of continuous filament lengths. More particularly, this invention relates to an inherently self-cleaning, drawing or stretching apparatus that is adapted to automatically rid itself of stray filaments and the like which have become separated on the apparatus for the bundle of textile fibers being handled.

Textile fibers, including tows of continuous filament textile fibers made from polymeric materials of artificial or synthetic origin, may often advantageously be treated by being stretched or drawn under various conditions. By this means, the artificial or synthetic fibers can be permanently extended, depending on the particular fiber being stretched, to as much as several times their original extruded length. As a result, the long chain molecules in the fiber are thus physically aligned or oriented. Among the desirable results which may thereby be accomplished, the tensile strength of such fibers is generally improved and further extensibility is usually brought within reasonably low limits.

Sometimes, for purposes of stretching fibers, it is preferable to handle them in the form of a tow, or a composite strand, rope, bundle or the like. A stretch-drawing operation may be performed on running tows of continuous lengths of artificial or synthetic textile fibers by passing them through a given stretch path. The degree or extent of stretching imposed upon the fibers depends upon the relative rates or speeds at which they are fed to and withdrawn from the stretch path, that is, the amount by which the speed of the fiber fed to the stretch path exceeds the speed of the fiber withdrawn therefrom.

The stretch-drawing operation may conveniently be performed with a group, or a plurality of groups, of stretch-rolls or drums and the like which substantially grip and advance the tow which they are handling through a stretch path. A desired amount of stretch is thus imparted to the fibers. In many instances, however, filaments escaping from the tow or the like tend to entwine and entangle themselves about stretch-rolls and the like. Generally, the apparatus usually employed for stretch-drawing operations does not have the facility to be automatically self-cleaning of entwined filaments which have escaped from a tow or a like bundle of textile fibers being handled.

In general, the usually employed stretch-roll assemblies exert a substantial grip by compression or frictional contact on a tow or the like in order to tension and securely maintain it against longitudinal displacement or slippage. Interference with proper stretching otherwise might be experienced. The stretch-roll assembly may be of a type, for example, which is adapted to handle the tow in a compressive bight or through a serpentine frictional path between multiple opposed rollers. Or, certain types of thread-advancing, thread-storage devices such as canted rollers, or interdigitating devices may

2

also be employed to feed or withdraw a tow in a stretch path.

Synthetic or artificial fiber tows and the like of continuous filament lengths are generally more difficult to handle because of their smooth and relatively slippery surfaces and also due to their propensity to charge with static electricity causing the filaments to become repellant to one another. When such tows are subjected to a substantial gripping in the form of compressive or frictional tensioning contact being exerted by stretch-roll assemblies, they tend to spread and separate beyond desired dimensions. The effect may be abetted by the influence of static electricity in the fibers. In such instances, broken filaments, which may occur in the tow, tend upon separation to escape and to wrap and entwine themselves as fugitive wraps or laps about the individual rolls of stretch-roll assemblies. The presence of static electrical charges in broken or tramp filaments which have escaped from the tow may also serve to intensify this fugitive wrapping tendency.

In some instances, filament breaks in a tow are also traceable to spinning or to the handling of the filaments prior to stretching. In addition, filament breaks may occur during the stretching operations. Undesirable fugitive wrapping and entanglement may not only interfere with the practice of good stretching operations, but eventually may lead to severe mechanical damage to stretch-roll assemblies, or it may cause significant damage to the tow. The wrap-up and entanglement of fugitive wraps may develop so rapidly that machine inertia may sometimes be sufficient to cause damage.

It would be desirable and advantageous for stretch-roll or drum assemblies to be automatically self-cleaning of fugitive wraps that have separated and escaped from the tow. The present invention advantageously provides for a stretch-roll or drawing assembly that is automatically self-cleaning and that is adapted to rid itself of fugitive wraps or laps which may form during handling of a tow or the like. Advantageously, unitary thread-advancing, thread-storage devices, such as are described by Walter F. Knebusch in U.S. Patent No. 2,210,914 and which possess self-cleaning characteristics, can be employed. They are employed in pairs, as a double roller device, to form a composite tow-advancing reel or snubbing instrument for a stretch-roll or tow-drawing assembly.

The stretch-roll or tow-drawing assembly in accordance with the present invention is comprised of a pair or more of individual, unitary, interdigitating, cantilever mounted thread-advancing reels positioned as a double-roller, thread-advancing, thread-storage device or composite reel. The axes of the paired reels are offset and askew, as double-rollers would be, to provide the necessary pitch for advancing a tow or the like without overlap through a generally helical path. The individual reels of each double-roller pair may effect a lesser thread-advancing pitch which has no conflicting influence upon the helical advance of the tow. The reels operate, however, to expel over their unobstructed ends any fugitive wraps or laps of tramp filaments which may have separated and escaped from the tow and wound about the reels. Such stretch-roll assemblies may advantageously be employed in a stretch-drawing apparatus or in like drawing mechanisms since they are adapted, due to their self-cleaning nature, to automatically rid themselves of fugitive wraps which may form on them. Consequent damage to the mechanism or tow, which might otherwise result without their removal, may thereby be avoided.

Further features and advantages will become apparent

in the following description and the accompanying drawing wherein:

Figure 1 is a perspective view of a thread-advancing, interdigitating, and self-cleaning reel forming the double-roller type tow-advancing, stretch-roll assembly in accordance with the present invention;

Figure 2 is a schematic representation of an embodiment of the present invention employed in a stretch-drawing operation of a tow of textile fibers;

Figure 3 is a plan view of the stretch-drawing mechanism of Figure 1; and

Figure 4 further illustrates the canted or skew tow-advancing relationship between a pair of interdigitating, thread-advancing reels.

There is shown in Figure 1 a unitary, thread-advancing, thread-storage reel which is employed as a component element of a double-roller, stretch-roll assembly in accordance with the present invention. Advantageously, the reel is based on the principles disclosed in U.S. Patent No. 2,210,914. The reel, indicated generally by the reference numeral 10, comprises two wholly rigid, cylindrical reel members 11 and 13, each having a plurality of spaced, longitudinally extending bars. The bar members of the members 11, 13 interdigitate when the reel is assembled. Each of the reel members, when mounted, rotates about a separate axis, the axis of reel member 13 being canted to an inclined position with reference to the axis of reel member 11 so that the axes of the reel members are in skew relation to each other. The reel member 11 is mounted to rotate concentrically on a drive shaft (not shown) while the member 13 is mounted so as to rotate eccentrically thereto. Upon rotation, the thread bearing periphery of the reel advances a thread or the like along the length of the reel through a generally helical path, as depicted in the drawing.

The reel is advantageously mounted in cantilever fashion from one end, so that its other end is unobstructed. A hub, or flange 15 is provided at one end of the reel for the support of the eccentric reel member's bars. A cap screw 16, fastened to the end of the drive shaft in the reel, is employed to press the hub 17 against shaft tightening seals (not shown) to frictionally bind the concentric reel member 11 to the reel shaft for rotation therewith.

Reels similar to that depicted in Figure 1 are advantageously utilized in stretch-drawing apparatus for tows and the like. As shown in Figure 2, a tow of textile fibers is stretched using a stretch-drawing mechanism comprised of two double-roller, stretch-roll assemblies. A tow 27 is formed through a guide 25 which gathers a plurality of ends, each numbered 23, of a continuous multiple-filament synthetic yarn, which may be comprised of polyamide, polyester, acrylic or the like extruded fibers. The individual ends of yarn 23 are withdrawn from a plurality of yarn supply packages 21 positioned in a creel 20. Each of the plurality of ends of yarn 23 is guided from one of the plurality of supply packages 21 in the creel 20 through one of a plurality of creel guides 22, associated with the packages and from which they are directed, to the gathering guide 25.

From the gathering guide 25 the tow 27 is first passed through a plurality of generally helical turns about the generally indicated double-roller, stretch-roll assembly 30. This assembly snubs the tow to exert a holding effect on it while it is being fed to the stretch path. The assembly 30 is comprised of a pair of interdigitating, thread-advancing, thread-storage reels 31 and 33 similar to the reel 10 of Figure 1. The reels are arranged offset and askew to each other similar to the arrangement of double-rollers forming a thread-advancing device. This arrangement is more particularly illustrated in Figure 4. The reels 31, 33 (in the feed assembly 30) are mounted in cantilever fashion on drive shafts 32 and 34 respectively. They are driven by the shafts at the same predetermined

speed by any suitable means (not shown) to feed the tow 27 at a desired rate and pitch into the stretch path.

The reels 31, 33 are arranged so that the tow 27 is supported by the concentric reel member of each. Thus, the bearing pressure is exerted directly on the reel shafts 32, 34. The eccentric reel members of the reels 31, 33 therefor face inwardly and serve essentially to advance, over the free end of the reel, fugitive wraps or laps of stray filaments and the like escaping from the tow 27. Thus positioned, the reels 31, 33 function, in effect, as double-roller devices for the purpose of advancing the tow 27. The second set 36, of thread-advancing reels 37, 39, is similarly positioned and arranged so that the substantial tension generated by stretch-drawing of the tow is borne by the concentric reel members. Such an arrangement better adapts the reels to withstand the substantial tensions encountered while snubbing a sizeable tow or the like during stretch-drawing operations. Separated tramp filaments which may escape from the tow 27 and form fugitive wraps or laps about the reels are expelled from the assembly by being advanced off the individual reels over their unobstructed ends before any serious entanglement can occur.

Figure 3 illustrates more clearly the advance of the tow 27 through a generally helical form about the reel pairs of the consecutive assemblies 30 and 36. The offset and canted relationship of the individual reels in each assembly effects the helical advance of the tow 27 in turns about the double reels having a sufficient pitch or degree of helical advance to provide sufficient center-to-center spacing and clearance for the tow and avoid overlap. As mentioned, the individual reels in each pair primarily function to remove fugitive wraps of tramp filaments separated from the tow. The paired reels arranged in double-roller fashion function as the composite snubbing instrument for the tow while advancing it about themselves through a generally helical path.

The reel 31 in the assembly 30 is also shown in Figure 3 as advancing a fugitive wrap 42 towards its unobstructed end. As mentioned, the filaments are automatically disposed from the assembly over the end of the reel before any serious entanglement can develop. The fugitive wraps are peripherally advanced along the thread bearing periphery of the reels away from the tow or the like from which they have separated and escaped.

In operation, the double-roller, stretch-roll assemblies 30 and 36 are laced up with the tow 27 in a conventional manner. The consecutive assemblies are rotatably driven so that the rotational speed of assembly 36 exceeds the rotational speed of assembly 30 by the amount required to impart the desired stretch to the fibers in the tow. During operation, a minimum of attention is paid to the stretch-roll assemblies since fugitive wraps of tramp filaments are automatically expelled from the assembly upon formation before any serious entanglement or wrap-up can occur which might damage either the apparatus or the tow, or both. The offset and askew relationship between the interdigitating members of the unitary thread-advancing reels in paired, double-roller relationship will maintain each of the reels substantially free and clean of wrapped-around accumulations of stray or broken tramp filaments and the like.

As many groups of stretch-roll assemblies as needed can be used. Each group, in accordance with the principles of the present invention, may contain more than two unitary, interdigitating, thread-advancing devices. For example, a tow or the like may be handled with triple-roller devices employed in accordance with the present invention for snubbing the tow while advancing it through a generally helical path. Such assemblies can be utilized in handling tow or the like in operations or treatments other than stretch-drawing. They may be employed wherever it is desirable to maintain the individual rolls or drums of tow handling assemblies free and clean

5

of possible wrap-up and entanglement with stray, tramp filaments and the like. Further, one or more assemblies in accordance with the present invention may be used together with conventional stretch-roll assemblies to make up complete stretch-drawing or like mechanisms wherein, for example, only the feed or other assembly for the tow or the like is desired to be self-cleaning.

Since certain changes and modifications may readily be made and entered into in the practice of this invention without substantially departing from its intended spirit or scope, it is to be fully understood that all of the foregoing specification and description be interpreted as being merely illustrative and in no sense limiting or restrictive of the invention, as more particularly pointed out and defined in the appended claim.

What is claimed is:

Apparatus for stretch-drawing tows and the like of textile fibers comprising; at least two cantilever supported, unitary, interdigitating, thread-advancing devices arranged offset and canted askew to each other to form a composite reel group for advancing a tow and the like in generally helical turns; each of said thread-advancing devices having interdigitating reel members arranged off-

6

set and canted askew to each other, one of said reel members being mounted concentric to the axis about which it rotates and the other being mounted offset and askew to the axis of said concentric reel member and a second similar arrangement spaced from said first composite reel group for drawing and helically advancing tow; each composite group being so positioned that the concentric reel member of each individual reel bears the tension of the tow being stretched.

References Cited in the file of this patent

UNITED STATES PATENTS

2,002,995	Hartmann et al.	May 28, 1935
2,074,022	Oppenlaender	Mar. 16, 1937
2,181,916	Somerdyke	Dec. 5, 1939
2,210,914	Knebusch	Aug. 13, 1940
2,423,182	Fields	July 1, 1947
2,440,226	Swank	Apr. 20, 1948

FOREIGN PATENTS

674,604	Great Britain	June 25, 1952
319,875	Italy	July 24, 1934