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METHOD FOR REMOVING FALSE TWIST AND LONGITUDINAL
FOLDS FROM CONTINUOUS FILAMENT CRIMPED TOW
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Fig. 2

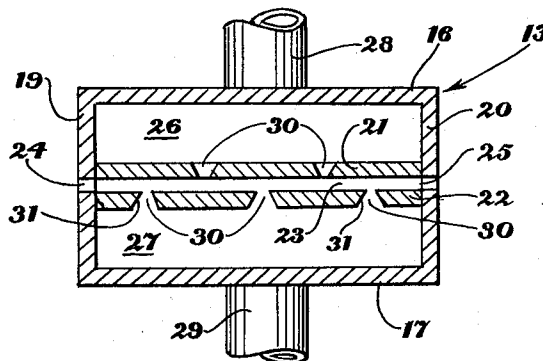
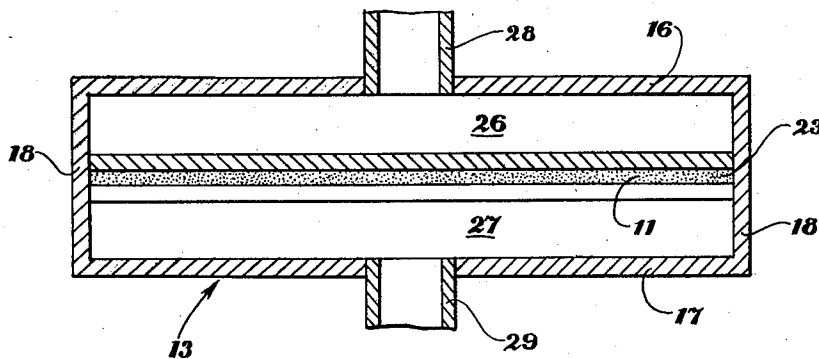


Fig. 3

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METHOD FOR REMOVING FALSE TWIST AND LONGITUDINAL FOLDS FROM CONTINUOUS FILAMENT CRIMPED TOW

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11 Claims. (Cl. 19—66)

The present invention relates to an unwinding apparatus, and more particularly to an improvement in the method of unwinding so as to remove false twist and longitudinal folds from a continuous filament crimped tow which is to be used in the manufacture of cigarette filters.

The term "tow" is used to designate a strand of yarn composed of a large number of continuous filaments. A single tow usually consists of from 500 to 5,000,000 single filaments which range in size from a fraction of a denier to 30 denier per filament. The tow may be wound on a core to form a package, commonly termed a "ball warp," or it may be laid loosely in a carton. However, the most advantageous method of packaging is to form the tow into a bale in which the tow is arranged in overlying layers; in each layer the tow is arranged in a zigzag fashion so that it may be quickly and easily withdrawn from the bale. The bale is compressed to form a compact structure. Such an arrangement permits easy withdrawal or removal of the tow from the bale. To facilitate the starting of said removal, the free end of the tow in the bale is provided with a tag or other designation so that it may be quickly and easily located by the tow user. Whatever the type of put-up selected by the tow producer, there is generally a certain amount of false twist in the tow. This twist is introduced by the guides which convey the tow to the package or bale. Since no parts of the tow packaging equipment rotate about the axis of the tow, the twist must be "false," that is first in one direction and then in another. Also, the "false" twist usually is not uniform along the length of the tow.

Another defect which is found in the tow is what is known as "folded edges." This is a condition where there are one or more longitudinal folds in the tow ribbon, commonly both edges may be folded toward the center and over one face of the tow.

In processing the tow prior to wrapping it in cigarette paper to form a filter rod, the main objects are to separate the individual filaments and form a uniform wide band to permit uniform application of a plasticizer or bonding medium. The two defects listed above, namely, false twist and longitudinal folds, hinder the achievement of these results. In the past, numerous combinations of mechanical guides have been used to keep the tow in the form of a flat ribbon. These guides have taken the form of either thin slots, convex guides, flat guides, concave guides, and various combinations thereof, but the results have never been satisfactory. It has been found that if the tow passes across the first guide in other than ribbon form, there is little chance that the false twist or folded condition can be removed. Previously, the best results have been obtained by locating the first guide fifteen feet more or less, vertically above the yarn package. This arrangement is difficult to thread up, delays production, and in many cases the plant construction does not permit this arrangement.

In order to eliminate false twist and longitudinal folds, the present invention withdraws the tow from the package or bale and subjects the tow to the action of a banding

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jet. The tow is then conveyed by suitable guides to the processing apparatus. The banding jet is equally effective with tow packages in a bale or box. With tow wound on the ball warp, the jet is of less value because it is customary to withdraw the tow under tension which limits the banding action of the jets. Thus, banding jets remove false twist and folded edges before the tow enters the main processing zone. In the preferred process or method for forming filter rods, the tow is withdrawn from a bale package and passed through a banding jet. Since the end of the tow is, in effect, hanging free, see Fig. 1, the banding jet or guide can "back out" false twist and can also open folded edges. This is accomplished by banding the tow. The banding is a means and not a goal in this instance, as the width of the tow band and its uniformity are of little importance at this stage of the process. No arrangement of mechanical guides has been found which performs in like manner. Of necessity, mechanical guides create friction which puts the tow under tension and presses the crossover or fold upon itself to make it still more difficult to remove.

The present invention has as its principal object, the provision of a new and improved method of removing false twist and longitudinal folds in continuous filament crimped tow.

A further object of the invention is the provision of a method of removing said twist and folds from the tow while the latter is being withdrawn from the tow package or bale under low tension.

Another object of the present invention is the arrangement of the banding jet which is positioned immediately above or adjacent the center of the bale or tow package.

To these and other ends the invention resides in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawings:

Fig. 1 is a general arrangement of the apparatus for carrying out the method of the present invention;

Fig. 2 is a longitudinal sectional view through a banding jet, and taken substantially on line 2—2, Fig. 1; and

Fig. 3 is a transverse sectional view through a banding jet, and taken substantially on line 3—3 of Fig. 1.

Fig. 1 of the drawings shows apparatus for carrying out the method of the present invention. The tow 11 which is to be supplied to form the cigarette filter rod is packaged in a compressed bale 12. The tow is withdrawn from the bale and is passed through the banding jet, generally indicated by the numeral 13, which is positioned vertically about 2 feet above and centered over the bale 12, as shown in Fig. 1. From the jet 13 the tow is directed tangentially to a stainless steel roller or cylinder 14, which is about eight inches in diameter and twelve inches long over which the tow is passed as a banded tow 15. Thus the tow can be said to move as a continuous running length along a path formed by its longitudinal axis and extending from the package to a point spaced from the package, the path passing through a banding zone intermediate the package and the point.

The banding jet 13 is in the form of a hollow boxlike member formed with a top 16 and a bottom 17, opposite end walls 18, a back 19 and a front 20. The interior of the box is provided with a pair of spaced parallel wall members 21 and 22, which form a thin slot or passage 23 through which the tow is passed. It will be apparent from Fig. 1 that the slot 23 is vertically arranged and is positioned below the roller 14 so as to deliver the tow from the slot tangentially to the roller or cylinder 14. The back wall 19 and the front wall 20 are provided with apertures 24 and 25, respectively, which are equal in size and in alignment with the slot 23, as best shown in Fig. 3. The space between the wall

member 21 and the top 16, and the space between the wall member 22 and the bottom 17, provide plenum chambers 26 and 27, respectively. These plenum chambers are connected by pipes 28 and 29, respectively, to a suitable source, not shown, of air under pressure. The banding jet, per se, does not form a part of the present invention. In order to supply air to the tow moving through the slot 23, the walls 21 and 22 are formed with a plurality of orifices or jets 30, the sides or walls 31 of which are tapered toward the slot 23, as clearly illustrated in Fig. 3.

As the tow is withdrawn from the bale 12, the tow may contain a false twist, such as shown at 35, Fig. 1. This twist may be in either direction. Also, the tow may contain one or more longitudinal folds, such as shown at 36, Fig. 1. It will be apparent from Fig. 1 that the tow between the jet 13 and the bale 12 is hanging free, with the result that the tow is fed and enters the banding jet under low tension and in such a way that the streams of air issuing from the jets or orifices 30 of the banding jet 13 effect a uniform opening and separating action on the tow to remove the longitudinal folds 36. Also, as the tow hangs free between the jet and the bale 12, the false twist will be "backed out" so that when it leaves the banding jet it is free of both false twist and longitudinal folds, the advantages of which are deemed apparent.

While this method is primarily intended for use in opening the cellulose acetate tow used in the manufacture of cigarette filters, its use is not limited. It may be used advantageously with any tow composed of a number of parallel continuous filaments wherein subsequent processing can best be accomplished if the tow is in the form of a wide thin ribbon of uniform proportions. Other examples of use include tow entering a Pacific converter for direct conversion to staple roving and tow being formed into non-woven ribbons, filter mats, insulation batts, padding, and the like.

While one embodiment of the invention has been disclosed, it is to be understood that the inventive idea may be carried out in a number of ways. Therefore, this application is not to be limited to the precise details described but is intended to cover all variations and modifications thereof which fall within the scope of the appended claims.

What I claim and desire to secure by Letters Patent of the United States is:

1. Method of removing false twist and longitudinal edge folds from a ribbon of crimped continuous filament tow being withdrawn from a tow package of a type from which tow may be separated in the absence of substantial tension, said method comprising the steps of so separating the tow from the package by pulling the tow away from the package continuously as a running length, continuously moving the separated tow under such absence of substantial tension along a path comprising the longitudinal axis of the tow extending between the package and a point spaced from the package, supporting the tow thus moved in a manner such that as it leaves the package it is free to turn and twist about its longitudinal axis, passing the tow moving along such path while in such free condition from the package through a banding zone, directing air jets broadside against the tow during movement of the tow through the banding zone thereby spreading the tow laterally to flatten it and remove false twist and edge folds, and after thus spreading, untwisting and unfolding the tow, continuing its movement to said point while maintaining it in its widened, flattened, untwisted and unfolded form.

2. Method as defined in claim 1 in which the tow is separated from a compressed bale in which the tow is arranged in overlying layers, each layer being arranged in a zigzag fashion for easy withdrawal of the tow from the bale.

3. Method as defined in claim 2 in which the tow is moved along a path extending upwardly from the bale.

4. Method of removing false twist and longitudinal edge folds from a ribbon of crimped continuous filament tow withdrawn from a tow package, said method comprising the steps of withdrawing the tow from the package continuously and without the application of substantial tension as a running length in an upward direction along a path comprising the longitudinal axis of the tow toward a supporting point spaced vertically from the package, allowing the moving tow being thus withdrawn to hang free in a manner whereby it may turn and twist about its longitudinal axis as it leaves the package, subject substantially only to such slight longitudinal tension as results from the weight of the tow hanging between the supporting point and the package, spreading the tow laterally and flattening it enroute from the package to the supporting point while the tow is (a) under such low tension, (b) thus supported for free turning movement, and (c) maintained substantially free of any mechanical friction between the package and the point, thereby effecting removal of false twist and edge folds from the tow, and moving the tow upwardly from the spreading point to the supporting point while in its widened, flattened, untwisted and unfolded form.

5. Method as defined in claim 4 wherein the tow is separated from a compressed bale in which the tow is arranged in overlying layers, each layer being arranged in zigzag fashion for easy withdrawal of the tow from the bale.

6. Method of removing false twist and longitudinal edge folds from a ribbon of crimped continuous filament tow being withdrawn from a tow package of a type from which tow may be separated in the substantial absence of tension, said method comprising the steps of so separating the tow from the package by pulling the tow from the package continuously as a running length along a path comprising the longitudinal axis of the tow extending between the package and a first point spaced vertically above the package, allowing the tow thus withdrawn to hang down relatively loosely and in a manner whereby it is free to turn and twist about its longitudinal axis as it leaves the package, directing a plurality of air jets substantially horizontally into broadside contact against the tow at an intermediate point in the movement of the latter above the tow package, thereby widening and flattening the tow during its movement from the package to the first point while the tow is supported for such free turning movement, thereby removing false twist and longitudinal edge folds from the tow, and after thus spreading, untwisting and unfolding the tow continuing its movement upward to said first point while maintaining the tow in its spread, untwisted and unfolded form.

7. Method as defined in claim 6 wherein the tow is separated from the top of a bale.

8. Method of removing false twist and longitudinal edge folds from a ribbon of crimped continuous filament tow being withdrawn from a tow package of a type from which tow may be separated in the absence of substantial tension, said method comprising the steps of so separating the tow from the package by pulling it away from the package continuously as a running length, continuously moving the separated tow under such absence of substantial tension along a path comprising the longitudinal axis of the tow extending between the package and a point spaced from the package, supporting the tow thus moved in a manner such that as it leaves the package it is free to turn and twist about its longitudinal axis, passing the tow moving along such path while in such free condition from the package through a banding zone, subjecting the tow to the action of a banding jet during movement of the tow through the banding zone thereby removing false twist and edge folds, and after thus untwisting and unfolding the tow, continuing its movement to said point

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while maintaining it in its untwisted and unfolded condition.

9. Method as defined in claim 8 in which the tow is separated from a compressed bale in which the tow is arranged in overlying layers, each layer being arranged in zigzag fashion for easy withdrawal of the tow from the bale. 5

10. Method as defined in claim 9 in which the tow is pulled upwardly away from the bale and moved to a point above the bale. 10

11. Method as defined in claim 10 in which the tow moving upwardly from the bale is passed through the banding zone while subject substantially only to such slight longitudinal tension as results from the weight of the tow hanging from the point to the bale. 15

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