YARN FORWARDING APPARATUS

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Filed Mar. 21, 1967, Ser. No. 624,881

Ext. Cl. B65B 17/08

U.S. Cl. 226—186

2 Claims

ABSTRACT OF THE DISCLOSURE

Forwarding wheels for delivering continuous filament yarn or tow are made of sponge-like polyurethane rubber alone or with a woven textile circumferential cover made of continuous spun liquid absorbent filaments.

This invention relates to yarn forwarding apparatus for spun synthetic yarn of any of the thermoplastics including the rayons; more particularly, it relates to paired wheels capable of straight line ejection of the yarn from their bite or nip into a collecting means such as a can, bin, or wound onto a spool.

Continuous spun synthetic yarn in the form of strand or tow generally and desirably is collected in large quantities in containers such as cans or bins at usually high linear speeds. The advance and collection is desirably effected with little if any accompanying changes in tension created by the forwarding wheels on the strand resulting in subsequent undesirable improperly laid coils or wound variables. Where the strand or tow is collected in a can it is laid in similar coils, a variation in delivery of the tow will cause a change in diameters of the laid coils creating a possible under or overlapping; and where collected on tubes, a variation in the tension of the wound yarn may cause subsequent uneven withdrawal, creating a need for tension controlling devices. Where the yarn or tow is laid in a collecting can or bin continuous linear feed is of particular advantage since continuous duplicate coils of yarn, one laid on the other with coil upon coil provides for a steady and even withdrawal without interruption for the entire store.

It has been found that ordinary hard surfaced drawing wheels either of metal or of plastic tend to induce variations in tension in the forwarded yarns by possible slippage, an attraction of a rotating wheel surface to the yarn because of either the presence on either of moisture or of static electricity resulting in carrying the yarn with and about a wheel, or possibly becoming totally wound about it. Various surfaces have been tried on wheels to prevent the aforesaid possibilities from occurring but most have been found inadequate, they have not produced a constant unvarying linear ejection of the yarn or tow. A still further source of possible difficulty is where a conditioning oil is applied to the yarn prior to its collection. The addition of such a conditioning substance tends to add still another possible adhesive agent to one wheel surface or the other and, also, possibly introducing static to the surface of the wheels.

Advantageously this invention provides for an improvement in forwarding wheels enabling a better grasp of a traveling yarn, its nonslippage in a bite or nip, and a constant linear and independent let-off out of forwarding wheels. The applicant has found that forwarding wheels constructed of a sponge-like material made of rubber or of synthetic materials, spaced on axes to effect slight pressure against each other thus to form a linear holding surface under compression, obviates the difficulties outlined hereinbefore. The compression of the resilient wheels should provide for at least one half inch to about two inches or more of strand holding area to avoid any yarn or tow slippage therebetween. Yarn ejected from such a nip is forwarded in a continuous linear path and at a continuous similar rate.

The wheel surface of each wheel of rubber-like sponge material, desirably, is covered with a woven textile band of material. When forwarded yarn having been conditioned with a liquid, as oil, tends to cling longer to an unevenly wetted wheel but the covering equalizes wetness areas. The fibers of the band preferably should be continuous in length and of smooth surface such as continuously spun rayon, silk, and combinations of these with synthetic polymer materials. Such bands or ribbons also advantageously absorb and spread over their surfaces the conditioning liquid such as oil that has been previously applied to the tow. The continuous and equalizing wicking action permits the wheels to continue to operate for extended periods of time and providing the further advantage of protecting the rubber wheels themselves from wear. Of course the ribbons eventually may become occluded with foreign material so as to become somewhat ineffective, they can then be readily replaced with new ones. It is preferred that the ribbons be of woven material rather than knitted or of some construction since such a surface tends to provide a stable band not subject to linear or transverse change in dimensions.

The over and under construction of a weave also provides for a great many holding parts of the yarn. The sponge-like rubber or textile covered yarn forwarding wheels of this invention will now be more specifically described in the following specification and drawings, where:

FIGURE 1 represents a side view of a pair of yarn forwarding wheels of this invention;

FIGURE 2 is an enlarged side view detail of a forwarding wheel;

FIGURE 3 is a fragmentary forward view taken in section of one of the wheels;

FIGURE 4 is a fragmentary bottom plan showing the roll bite of the yarn in tow; and

FIGURE 5 is a view of the woven ribbon cover utilized on the wheels.

Where yarns in tow form are forwarded to a collecting can, laid on a platen, or coiled in a various desirable configuration in containers, their feed desirably must be constant, that is without interruption and linearly straight otherwise interfering, shortened loops, various forms of possible intertwining may take place resulting in uneven withdrawal and tangled areas which will not pass through guiding equipment, resulting in a broken tow. The forwarding wheels of this invention decrease such difficulties to a great extent being adapted to forward linearly and at a constant rate spun synthetic yarn in the form of tow or strands without tie-up to a collected means from which they are later withdrawn, trouble free, for further processing.

As shown in the drawings a continuous source (not shown) of tow or yarn 10 is provided by a prior holding or drawing reel or gantry wheel 11 in a lower position of oppositely rotating and forwarding wheels 13, 14. The tow 10 is pulled under some tension and then freely forwarded into and collected within a can or bin (not shown) to an economical transferable package. Of course, where the yarn is to be collected on spools the rubber covered wheels through their bite can readily control the outgoing yarn's tension to form a desirable package. The forwarding pair of wheels 13, 14 are rectangular in cross section and they are of resilient material such as a sponge-like rubber except, of course, for the supporting central shaft portions 15, 16 and the supporting arbor thereabout 17, 18. The holding or drawing reel 11 and the forwarding wheels 13, 14 are of about equal diameters although not shown that way in the illustra-
tion, the equal diameters forward yarn without substantial pull therefor with minimum tension. The rubber-like material 20, 21 forming the outer substantial part of each wheel 13, 14 has a readily yielding resiliency permitting an instant change from its normally arcuate configuration into a straight line upon entering the bite. The length of the bite or nip formed by the wheels depends upon the relationship of the spacing of the axes of the wheels. Where wheels 13, 14 are of similar diameters they generally are positioned on spaced axes at a distance less than such diameters to give a desired strand line holding bite, and at a rate of travel equal to about that to the feed tow. When the wheel periphery emerges from the bite it assumes its normal cylindrical form with a snap and both wheels eject the yarn instantaneously, in a free condition, to drop linearly vertically into a collecting can. The yarn is generally laid therein in coils. It has been found that, as an example, with holding and feeding rolls having 6.0 inch diameters the forwarding reels each should have preferably a similar diameter and should be spaced apart on 5.90 to 5.95 centers to provide for a bite length of at least about 1/2 inch.

The yielding section of each wheel 13, 14 is generally supported or mounted in a metal arbor or glued to an arbor 17, 18, mounted securely to their respective shafts. The wheels 13, 14 are rotated at identical speeds through a gear arrangement 22. The wheels 13, 14 are made more effective for extended periods of operation through the utilization of a pliable textile covering 25 over its rubber-like portion 20, 21. The covering 25 is advantageous in that it prolongs the life of the rubber-like wheels, in eliminating static, and readily disseminating yarn attractive conditioning liquid mediums. Where oil is used it can accumulate or remain in local droplets when taken off the running yarn. Where a wheel surface is not of the type to cause oil or liquid dissemination or spread over larger areas it may serve as an adhesive agent to only one wheel or the other. Where oil is used, advantageously, a textile ribbon is applied as a surfacing of the wheels 13, 14 which prevents such a disturbing condition from arising. The woven ribbon is of pliable material being attached to flex with the rubber-like wheels and, being woven, it has both longitudinal and lateral stability. Being formed of continuous fibers the ribbon cover has oil disbursement and spreading powers because of its ability as a good wicking material. Such a covering can be a rayon material or could be silk, or the ribbon cover can be either of these two combined with other synthetic fibers so long as good wicking and distributing qualities are incorporated. Rayon is cited as an example since it has limited stretch and high liquid absorption characteristics. When woven it is stable in both directions and it readily absorbs water or oil in substantial quantities, this latter characteristic is advantageous in dampening static should it develop. The preferred structure of the wheel cover is an ordinary sample weave as shown in FIGURE 4.

The rubber sections 20, 21 of wheels 13, 14 as shown in FIGURE 2 should be of sufficient depth to readily provide a desired linear bite deflection resulting in a linear projection of yarn or tow, generally one of about 1/2 to 2 inches. The width of the wheels should be to adequately envelop the running strand or tow. Various soft rubbers and their synthetic duplicates have been tested and it has been found that polyurethane rubbers of sponge-like consistency are most advantageous. The recovery rate of polyurethane rubber from a deformed state is almost instantaneous, and its wearing characteristics have also proved to be longer than most others. Onto these polyurethane equipped wheels the bands of woven rayon textile ribbons 25 are firmly attached by sewing or use of glue. The resultant wheels upon coming out of a bite expunge the received tow 10 as if it were free of them. Whatever oil or other liquid utilized in the running yarn also is quickly absorbed and readily spread over both wheels making them continuously similar in surface characteristic and equal in performance for an extended period of time.

What is claimed is:

1. Yarn or tow forwarding wheels in nip relation, each comprising, a metal arbor, a pliable rubber-like ring of rectangular cross section on said arbor, and a woven textile covering forming the forwarding surface of said ring, the yarn in said covering is woven of continuous spun rayon filaments.

2. Yarn or tow forwarding wheels in nip relation, each comprising, a metal arbor, a pliable polyurethane ring of rectangular cross section on said arbor, and a woven ribbon-like textile band covering said ring, said covering being of continuous spun rayon filaments.

References Cited

UNITED STATES PATENTS


ALLEN N. KNOWLES, Primary Examiner.

U.S. Cl. X.R.

226—191, 193