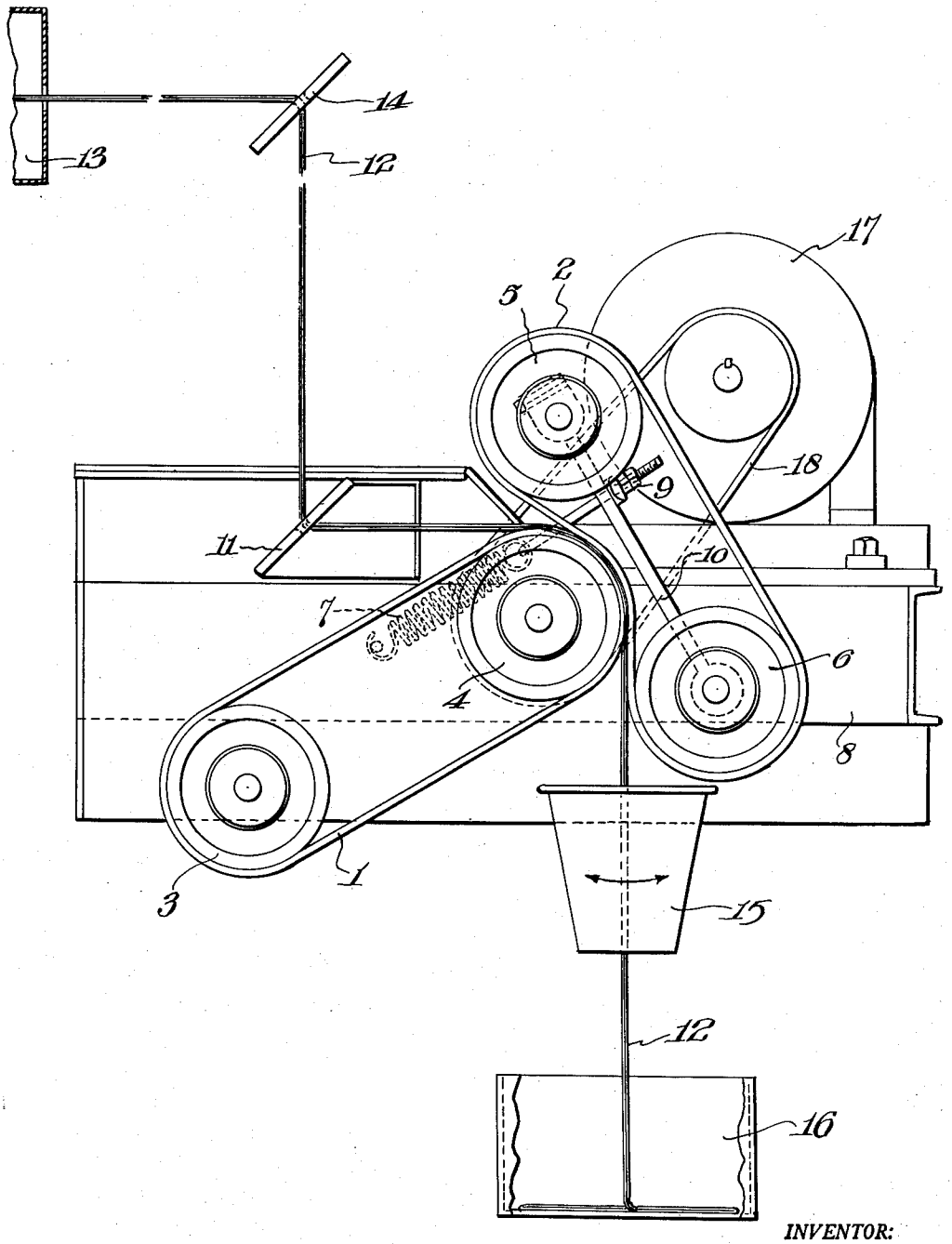
Oct. 30, 1962 H. R. VALERIUS, JR 3,061,164

T-BELT PIDDLER

Filed Aug. 15, 1958



INVENTOR:
Harold R. Valerius, Jr.
BY
C. N. Mortenson
ATTORNEY.

United States Patent Office 3,061,164 Patented Oct. 30, 1962

3,061,164

T-BELT PIDDLER

Harold Rickert Valerius, Jr., Seaford, Del., assignor to E. I. du Pont de Nemours and Company, Wilmington, Del., a corporation of Delaware

Filed Aug. 15, 1958, Ser. No. 756,270
4 Claims. (Cl. 226—172)

This invention relates to apparatus for delivering a running length of yarn or tow composed of a plurality of yarns. It relates in particular to a means for handling running lengths of yarn at high speeds for delivery onto conveyor belts or for forming them into large packages from which the lengths are readily removed and rewound.

In the handling of yarns on the run difficulty is usually encountered in static generation, yarn breakage, wrap formation, tension variation and the like. When a large number of yarn ends are being run simultaneously these difficulties are especially serious and must be avoided. The avoidance is particularly important when processing a tow composed of a large number of filaments or yarn ends. These difficulties interfere with the operation of yarn forwarding devices, but are especially hard to overcome in the case of yarn delivering devices. By a yarn forwarding device is meant a device which mechanically forwards yarn to another apparatus which is itself supplied with pulling means to keep the yarn in motion. If the yarn or tow is disengaged from such a device, it will still remain in motion.

In contrast, a yarn delivering device must pull the yarn or tow from a source, and deliver it, assisted only by gravity, upon a conveyor, shipping carton or the like. This is much more difficult than mere yarn forwarding, for gravity alone is available to free filaments which may be caught by the device; if the filaments are not freed, of course, a heavy wrap will immediately form. This is especially important in delivery mechanisms used for the high strength synthetic fibers, where even a few filaments trapped around the forwarding rolls will support a heavy tow, drawing the tow back into the mechanism. This tendency is aggravated by the presence of broken filaments produced by prior processing, and by the tendency to generate static electricity during handling, which causes loose filaments to stand out widely, to be caught on every minor projection or roughness. High speed operation multiplies these difficulties because wraps form quickly and grow to dangerous proportions before an operator can shut down the equipment.

An object of this invention is to provide an apparatus for pulling a traveling yarn and delivering it to a position at which a package is to be laid down or at which additional processing steps such as washing or drying are to be performed. Another object is the provision of apparatus which will throw the yarn or tow into a container onto a moving belt. A still further object is the provision of apparatus for reflecting wrap-free consolidated discharge of a tow into a random pattern on a belt conveyor or into a random package. Other objects will appear hereinafter.

The accomplishment of these objectives can be seen by reference to the FIGURE and to the discussion below which are given for illustrative purposes only.

The figure shows the thread line, the discharge apparatus and the mechanism for placing the tow in a can.

The objects of this invention are attained by running the yarn end or plurality of yarn ends preferably through a guide and then to a nip formed by two endless belts running in close proximity. The belts preferably run at substantially the same speed and this is accomplished by driving a pulley of only one belt and by spring loading the assembly holding the rollers of the second belt to insure driving contact of the first belt with the second belt. The two belts contact each other in a rudimentary T-fashion such that the entrance to the nip between the belts is in substantially a horizontal direction and such that the exit from the nip is in substantially a vertical direction forming an included angle of about 90° during which the yarn is in contact with the belt representing the stem of the T. By this provision the centrifugal force of the driven pulley throws the yarn, as it exits from the nip, against the other belt, where it rides until the centrifugal force of the lower idler roller on this belt throws the yarn off in a vertical direction to a traverse guide. This traverse guide moves in two directions at right angles to each other with a straight line motion in each direction. Below this guide is a container which is provided to receive the yarn or tow.

In the figure there are two endless belts designated 1 and 2 which are mounted to be in close proximity and from a nip of finite length during a part of their respective travel. Belt 1 is mounted on rollers 3 and 4, being driven by roller 4. Belt 2 is mounted on rollers 5 and 6, neither of which is driven. Belt 2 is mounted so that it may be pivoted about the axis of roller 6. This roller is attached to frame 8 which likewise serves to fix the positions of rollers 3 and 4. As shown in the figure the driven roller 4 together with the idler rollers 3 and 6 are firmly mounted on plate 8; and idler roller 5 is connected to roller 6 through the pivotable mounting 10. Rollers 3, 4, 5, and 6 are journalled in adequate bearings for sustained high speed operations. Also mounted on frame 8 is motor 17 which drives roller 4 through belt 18. Roller 5 pivots about the axle of roller 6 through bar 10, but the pivot point may be placed elsewhere if desired. Rollers 3 and 4 may be mounted in slots on frame 8 to provide for movement toward or away from belt 2.

Belt 2 may sometimes be held against belt 1 by weights for slow speed operation, but, for high speed work, positive means such as spring 7, pressure cylinders or any of the various spring loading systems are preferred; thus, spring 7 acts through bolt 9 on plate 10 which interconnects the axles of rollers 5 and 6. Roller 4 can be driven through a pulley or gear arrangement at the appropriate speed from a suitable source of power. The yarn end or tow or rope 12 is fed from a source (not shown) through guide 11 and thence through the nip of the belts. Usually the tow emerges from the drying oven at 13 and proceeds via guides 14 and 11 through the nip of the belts and is delivered into traversing guide 15 which is an oscillating funnel or boot. Under guide 15 is a can or container 16 in which the tow 12 is deposited. The lay-down of the tow is uniform and dependable and easy backwinding is obtained. Upon filling a can which can be of any desired capacity, the tow is severed and the can is removed either manually or mechanically and an empty container is again placed under guide 15.

At the feed end of the oven which is the opposite end of the oven to that shown in the figure, there is mounted another belt feeder of the kind described which serves to feed the drawn and crimped wet tow onto a moving belt (not shown) which proceeds through the drying oven to the exit end of the oven where the tow is removed. This apparatus of this invention is, therefore, equally useful for handling wet or dry tow in the drawn crimped state and it is equally useful for handling undrawn or uncrimped tow.

It is essential that the coacting belts be wider than the width of the filament bundle processed but not much wider. About two inches on either side of the filament bundle is all that is necessary. Much more than this tends to cause static charges to accumulate and renders the apparatus too bulky and unwieldy for high speeds. When the tow bundle or rope exceeds the belt width, there is a tendency for filaments to catch on minor rough spots produced by belt manufacturing operations or by wear on the edge of the belt, thus initiating a wrap. Even if a wrap does not form, filaments protruding beyond the belts are not forwarded as rapidly as the bulk of the tow which lies within the nip of the belts; the slower-moving yarn often tangles with the remainder of the tow and diverts it from the traversing guide **15**. Therefore it is essential that the belts be somewhat wider than the tow bundle being processed, preferably about 4" wider. It is also desirable to have the belts of substantially equal width to reduce adverse effects of static charges which might otherwise be induced by the high speed yarn travel. It is also essential that both belts be substantially the same width for high speed travel.

The belts used in the apparatus of this invention can be knit cotton endless tubing, rubber impregnated cotton belts, leather belts, rubber belts, etc. Usually the belt should be a minimum of 6" wide and from 3/32 to 1/4" thick. For heavy denier tow, wider belts must be used; for example, a 600,000 denier tow should have a 16" belt. The choice of belt materials and dimensions will, of course, depend in part on the material being processed, the speed, the finishes being used and other like considerations. The drive and idler rollers may be of any desired diameter but for most purposes a diameter of about 6" is satisfactory. This diameter reduces rotative speeds but gives sufficiently high centrifugal force so that the yarn does not wrap. In the preferred embodiment all the drive and idler rollers are of the same diameter and width.

As indicated, the belts are run at the same surface speed. This eliminates excessive belt wear. While there are a number of ways to get equal surface speeds, it is preferred to have one belt drive the other. However, both belts may be driven independently.

Such mounting permits the determination of the arrangement best suited for the prevailing conditions. It is not essential that the line running through the axes of rollers **3** and **4** be perpendicular to the line running through the axes of rollers **5** and **6**. The angle between these lines when measured on the entrance side of the nip can be considerably less than 90°, with the minimum angle being determined by the geometrical considerations imposed by the diameters of rollers **4** and **5** and the distance of separation of rollers **5** and **6**. It is usually not desirable to have this angle between these lines much greater than 90° because of the increasing possibility that the yarn, tow or rope will be likely to follow the surface of belt **1** rather than belt **2**. Further, it is usually desirable to have the section of belt **2** from the point where it leaves contact with belt **1** to the point where it contacts roller **6** substantially vertical.

Usually this section of belt **2** will be inclined slightly from the vertical away from belt **1**. Where it is desired to have the path of the yarn exactly vertical this angle will be determined by the difference in the thickness of the yarn bundle in the compressed state as it leaves the nip of the belts and the thickness of the yarn bundle in the uncompressed state as it leaves belt **2**. By this means, the usually desired condition of a straight downward path for the rope or tow is obtained. In case a path other than vertically downward is desired, such may be obtained by inclining the surface of belt **2** from the point where it leaves belt **1** to the point were it contacts roller **6** at the desired angle, or by rotating the entire assembly about roll **4** as an axis. The latter method is usually more desirable in case an angle of discharge greater than 10 degrees from the vertical is to be obtained. It is usually not desirable to have this line deviate from the vertical toward belt **1**. In some instances it may be desirable to run the yarn or tow on the belt surface of either idler roller **3** or idler roller **5** as guides for the incoming yarn, tow or rope to the nip.

The apparatus of this invention operates very satisfactory at yarn speeds of 1200 yds./min. and above, although speeds of 100 to 400 yds./min. are often used. The upper limit on operating speed depends in part on the yarn finish used; thus, sticky or gummy finishes require a lower maximum operating speed.

The apparatus of this invention may be used for low denier yarns, for example, 680 denier yarns or smaller. It has particular utility in the high speed packaging or delivery of heavy denier tow such as 600,000 denier and above. Surprisingly, the desired delivery is not attained if belt **1** is removed and only roller **4** is employed.

The apparatus of this invention is useful in handling running yarn ends or tows of any material, synthetic or natural. It is particularly useful in staple production. The rectangular shaped packages formed in the cans are readily transferred either within a given area or to a point removed or they are converted into staple for further processing.

This application is a continuation-in-part of our copending application Ser. No. 301,456, filed July 29, 1952, now abandoned.

It will be apparent that may widely different embodiments of this invention may be made without departing from the spirit and scope thereof, and therefore it is not intended to be limited except as indicated in the appended claims.

I claim:

1. Apparatus for conveying and packaging continuous filament yarn or tow which consists essentially of two endless belts of about equal width, both of which are wider than the yarn or tow and adapted to travel at substantially the same speed and contacting each other in substantially T-fashion to form a nip between the said belts, the entrance end of which is in a substantially horizontal position and the exit of which is in a substantially vertical downward position, means for guiding continuous lengths of yarn or tow to the entrance end of nip, means for operating the belts at surface speeds from 100 to 1200 y.p.m., means for collecting the yarn or tow in continuous lengths as it passes vertically downward at the same speed from the exit end of the nip and a funnel-shaped guide through which the yarn passes as it leaves the nip in a vertical direction.

2. The apparatus of claim 1 which includes a spring for maintaining substantially constant pressure between one belt and the other.

3. Apparatus for conveying and packaging continuous filament yarn or tow which consists essentially of an endless belt mounted on two rollers, one of which is driven; a second endless belt of about equal width and wider than the yarn or tow mounted on two rollers, said belts being positioned to contact each other substantially in T-fashion to from a nip between the said belts, the entrance end to the nip being in a substantially horizontal direction and the exit end being in a substantially vertical downward direction, means for guiding continuous lengths of yarn or tow to the entrance end of the nip, means for operating the belts at surface speeds from 100 to 1200

y.p.m., means for collecting the yarn or tow in continuous lengths as it passes vertically downward at the same speed from the exit end of the nip and an oscillating funnel below the exit of the said nip.

4. The apparatus of claim 3 which includes a spring for furnishing uniform tension between the two belts.

References Cited in the file of this patent

UNITED STATES PATENTS

965,561	Butler	July 26, 1910
2,433,035	Ersted	Dec. 23, 1947
2,685,362	Larsen	Aug. 3, 1954
2,805,765	Saum et al.	Sept. 10, 1957

FOREIGN PATENTS

136,007	Great Britain	Dec. 11, 1919