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DRAWTWISTER WITH SLIP COUPLING

2 Sheets-Sheet 1

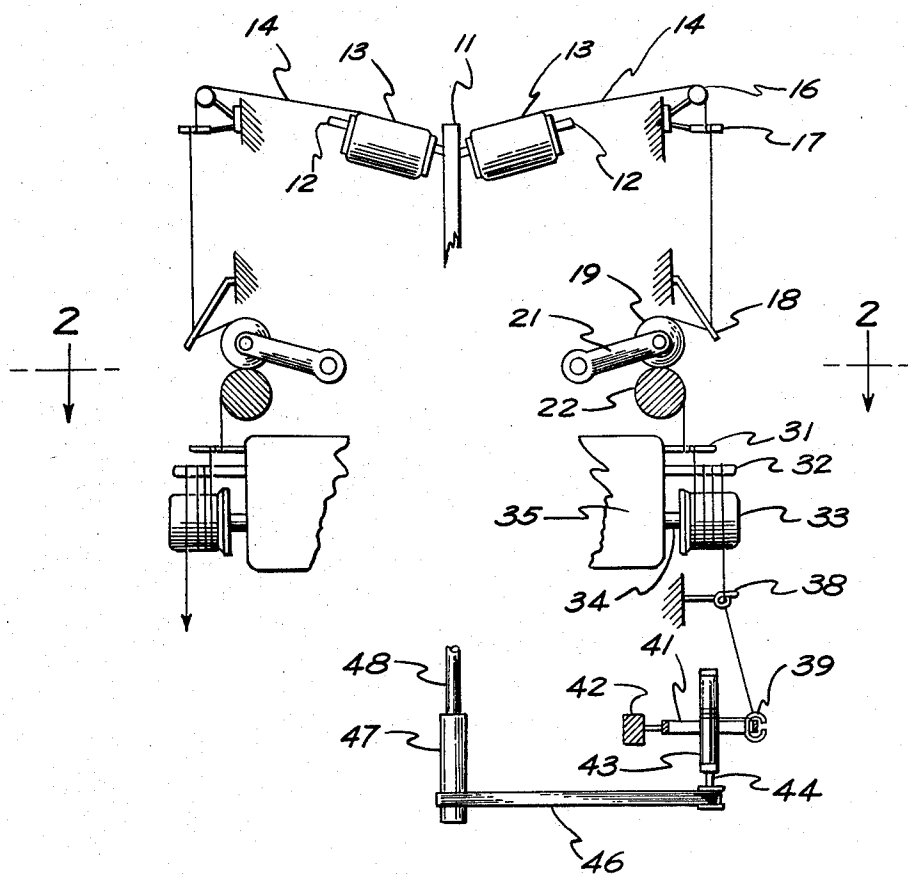


FIG. 1.

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2 Sheets-Sheet 2

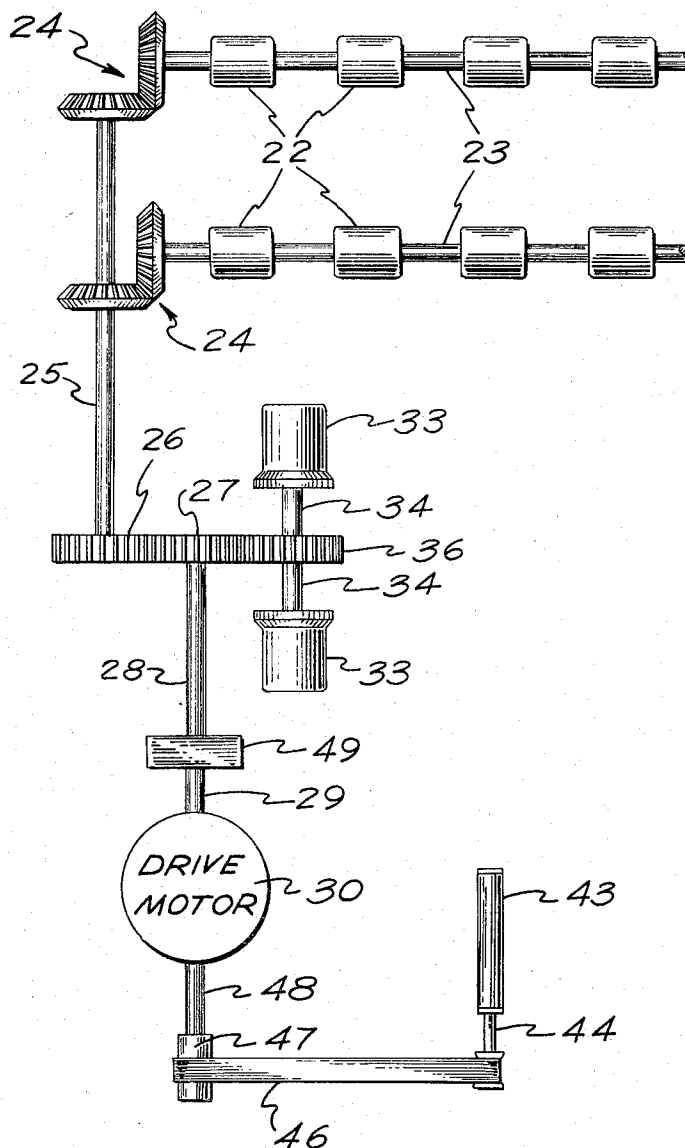


FIG. 2.

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DRAWTWISTER WITH SLIP COUPLING

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4 Claims. (Cl. 57-92)

This invention relates to an improvement in textile machinery and more particularly to an improvement in a drawtwister of the type employed to stretch and twist filamentary material formed from such synthetic compositions as nylon or the like. The improvement of this invention is particularly applicable to a drawtwister of the type manufactured by the Whitin Machine Works of Whitinsville, Massachusetts.

In present day textile practice, the processing of filamentary material, particularly continuous filaments formed from synthetic material such as nylon, frequently includes an operation which is known as drawtwisting. In such an operation, continuous multifilamentary or monofilamentary yarn or thread is drawn or drafted to orient the molecules in the filaments and impart tensile strength thereto. Subsequent to this drawing operation, the filaments are twisted and then packaged in the drawn and twisted form on a suitable holder such as a bobbin or spool. One such type of drawtwisting machinery in widespread commercial use today is a drawtwister manufactured by the Whitin Machine Works of Whitinsville, Massachusetts.

In the drawtwister referred to above, driving means are provided for driving cooperating draw and feed rolls which form the yarn drawing means of the drawtwister. By means which include a belt or tape, the driving means is also directly connected to rotatable spindles with which ring twister assemblies are operatively associated. These spindles accommodate the wind-up bobbins on which the drawn and twisted threads are wound during the operation of the drawtwister.

In such a drawtwister, the driving means generally comprises an electric motor, and in starting the drawtwister the motor reaches full speed in a relatively short period of time. As the feed and draw rolls have been directly coupled to the motor, these rolls are consequently brought up to speed simultaneously with the motor, while the tape, which connects the motor with the spindles, slips somewhat and the spindles do not come up to full speed with the rolls. As a result of this spindle lag in coming up to speed, tension on the thread is reduced and the thread is overfed to the spindles by the feed and draw rolls. This thread overfeed results in knots and entanglements in the thread, and ultimately thread breakage. The operator is, therefore, required to deactivate the drawtwister components associated with the broken thread and once again lace-up the thread through the machine. This additional operation not only reduces the output of the machine, but is time consuming and imposes a considerable burden on the operator.

Further difficulty is often encountered in such a drawtwister during a shut-down of the machine. As the drive motor slows down and the spindle speed is reduced, the yarn balloon slackens reducing tension on the thread. The feed and draw rolls, therefore, tend to overfeed producing knots or entanglements in the thread which are known in the trade as "filament loops." The pres-

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ence of these "filament loops," of course, gives a thread end product of low quality.

Accordingly, a primary object of this invention is to provide a new and novel improvement on textile machinery such as drawtwisters and the like.

Another object of this invention is to provide a new and novel driving arrangement for a drawtwister which virtually eliminates breaking of thread or yarn during start-up of the drawtwister at normal speeds and at much higher than normal speeds.

A further object of this invention is to provide such a driving arrangement which virtually eliminates the formation of "filament loops" in the thread or yarn processed in the drawtwister which commonly occur during shut-down of the drawtwister.

This invention further contemplates the provision of a new and novel improvement in the driving arrangement for a drawtwister of the type manufactured by the Whitin Machine Works of Whitinsville, Massachusetts, which enables the production of drawn and twisted thread composed of synthetic material such as nylon having a relatively high quality and uniformity and which minimizes the possibility of thread breakage during starting up of the drawtwister.

Still another object of this invention is to provide a new and novel combination of a slip coupling and a textile drawtwister for improving the quality of processed thread, which enables the drawtwister to be operated more efficiently at normal and above normal speeds, and which is relatively inexpensive in construction.

A still further object of this invention is to provide a new and novel driving arrangement for a drawtwister which permits the use of substantially increased spindle speeds without affecting the quality of the yarn.

Other objects and advantages of the invention will become apparent from the following description taken in connection with the accompanying drawings.

Generally, the novel contribution to the art provided by this invention for accomplishing the above objects is an improvement on a drawtwister of the type manufactured by the Whitin Machine Works of Whitinsville, Massachusetts. The drawtwister is provided with means for drawing and means for twisting filamentary material which is composed of filaments or a filament such as those formed from a synthetic material such as nylon. In accordance with the novel construction of the invention, frictional coupling means such as a slip coupling, which may be of any suitable type, for example, a friction, magnetic, centrifugal coupling or the like, is employed to drivably connect the drawtwister driving means with the drawing means, with the twisting means directly connected in driving engagement with the driving means, as in the existing equipment. By means of the slip coupling, a relatively short interval of slip occurs in the driving connection between the drawing means and the driving means on both start-up and shut-down of the drawtwister to eliminate thread start-up breaks and the formation of filament loops during shut-down.

The novel features which are believed to be characteristic of the invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and method of operation, may be best understood by reference to the following description taken in conjunction with the accompanying drawing in which:

Figure 1 is a partial diagrammatic view of the drawtwister with which this invention is incorporated; and

Figure 2 is a diagrammatic view taken substantially along line 2-2 of Figure 1 including the driving mechanism.

Referring now to the drawing, there is shown in Figures

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1 and 2 a drawtwister of which this invention represents an improvement. This drawtwister is shown diagrammatically and in part in the figures for the purpose of clarity and is preferably of the type manufactured by the Whitin Machine Works, Whitinsville, Massachusetts. As is well known, the drawtwister of Figure 1 is employed to draw and twist filamentary material such as multifilamentary or monofilamentary thread or yarn for molecular orientation of the filaments and to provide a twisted end product.

In the particular drawtwister referred to above, a bracket or support 11 is positioned centrally of the machine and is arranged to support laterally extending arms 12, which accommodate thread packages such as wound "spin" bobbins 13 or the like. It will be noted that the support 11 is arranged to support bobbins 13 on opposite sides of the drawtwister in order to increase its capacity. As is well known, such a drawtwister may be used to drawtwist filaments composed of a synthetic material such as nylon and it is with reference to the drawtwisting of nylon that the invention will be described hereinafter.

For the purposes of simplicity and brevity, the operation of one side of the drawtwister only will be described hereinafter, but it should be understood that duplicate components are positioned on each side of the drawtwister. Furthermore, it should be understood that on each side of the drawtwister a plurality of spin bobbins 13 are arranged in spaced relation longitudinally of the machine and correspond in number to the number of individual strands or threads to be processed.

In the operation of the drawtwister of Figures 1 and 2, a thread 14, which has been initially packaged on the spin bobbin 13, is unwound from the bobbin and carried through a snub guide 16 and a snubber 17 in a downward direction as shown. The direction of the thread is then changed by means of a traverse guide 18 so that the thread moves from the traverse guide 18 upwardly behind a top or cot roll 19 mounted for pivotal movement by means of an arm 21. By means of the pivotal arm 21, the top roll 19 may be moved into engagement with a feed roll 22 so that the thread 14 may be held therebetween as it advances through the drawtwister.

As shown best in Figure 2, the feed roll 22 is preferably formed as one of a plurality of substantially identical, longitudinally spaced feed rolls positioned on a feed roll shaft 23 (Figure 2) and preferably formed integral therewith. In the specific drawtwister illustrated, a pair of such feed roll shafts 23 are provided which are arranged on opposite sides of the drawtwister. As shown best in Figure 2, the feed roll shafts 23 are arranged to be driven through any suitable driving arrangement such as bevel gears designated generally by the numeral 24. The gears 24 are suitably driven by means such as a shaft 25 connected at one end to a pair of cooperating spur gears 26, 27. The spur gear 27 is mounted on one end of shaft 28 which is drivably connected in a manner to be explained hereinafter to the drive shaft 29 of a driving motor 30. It should be understood that the specific gearing arrangement shown is illustrative only and any desired gear drive arrangement may be used.

Referring now again to Figure 1, the thread 14 advancing from the feed roll 22 moves around a draw pin 31 and is wrapped or laced in a multiplicity of turns around a separator pin 32 and draw roll 33. The draw roll 33 is mounted on a rotatable shaft 34 which preferably extends within a housing 35 as shown in Figure 1. As can be seen, the draw roll shafts 34 on each side of the drawtwister are drivably connected in a direct manner to the drive motor 30 by any suitable means such as gear 36 positioned in meshing engagement with the spur gear 27.

As is well known, the draw rolls 33, the number of which corresponds to the number of feed rolls 22 on each side of the drawtwister, are rotated at a relatively higher

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speed than the feed rolls 22 in accordance with a predetermined draw ratio so as to impose a drawing or stretching action on the thread 14 at the draw pin 31 and thus orient the molecules in the thread filaments. It should be understood that the driving arrangement for the feed rolls 22 and draw rolls 33 has been somewhat simplified in the figures for the purpose of clarity, but it should be further understood that in the drawtwister illustrated, both the draw rolls and feed rolls are driven simultaneously by means of the main driving motor 30.

Subsequent to the above-described drawing operation, the thread 14 advances through a balloon guide 38 to a ring traveler 39 loosely mounted on a traveler ring 41. As is well known, each of the traveler rings 41, which are of a number corresponding to each pair of associated feed rolls 22 and draw rolls 33 on each side of the drawtwister, is arranged to be moved vertically in a reciprocating manner by means of a lay rail 42 to permit the thread 14 to be wound in a twisted manner on a wind-up bobbin 43 supported on a spindle 44. As is well known, the spindle 44 is suitably connected by means such as a belt or tape 46 to a driving drum 47 or the like. In order to rotate the drum 47, and consequently the spindle 44, the drum is preferably mounted on one end of a rotatable shaft 48 which may be an extension of the shaft of the driving motor 30. Thus, the nylon thread 14 after drawing is wound on the bobbin 43 in a twisted manner as it moves through the ring traveler 39 to build up a twisted thread package on the bobbin.

It can be seen from the above-described construction that the driving motor 30 is employed to drive both the drawtwister's drawing means and the twisting means. With this driving arrangement, it has been found that when starting up a drawtwister of this type, the driving motor 30 comes up to speed very rapidly, and when the motor is directly connected to the feed and draw rolls 22, 33, the rolls would come up to full speed with the motor in a relatively short interval of time. Unfortunately, when the thread 14 has been laced through the drawtwister components prior to the initial operation of the machine, this rapid start-up is accompanied by slip between the tape 46 and spindle 44. As a result of this slip, tension in thread 14 is reduced and knots, entanglements, or the like, are produced as the feed and draw rolls tend to overfeed. Not only are these entanglements objectionable from the standpoint of thread quality, but they often cause the thread to break. This, of course, means that this thread must be laced-up once again with an attendant decrease in productivity of the drawtwister as well as imposing additional work on the operator.

Further difficulty is also experienced in the drawtwister during shutdown of the motor. When the drawtwister operation is discontinued, the high inertia of the motor and the driven parts connected thereto creates a relatively long slow-down period. This extended slow-down period is a source of trouble in that the yarn balloon contracts with decrease in spindle speed and tension on the thread is reduced. As a result of this slackening of tension in the thread and the tendency of the rolls to overfeed, entanglements such as knots and the like known in the textile industry as "filament loops" occur, giving a thread of inferior quality. Means, therefore, have been provided in accordance with this invention for eliminating both the thread breaks which occur during start-up of the drawtwister and the "filament loops" which occur when the drawtwister is shut down.

More specifically, the feed rolls 22 and the draw rolls 33 which formerly were connected directly to the driving motor 30, are drivably coupled by frictional means to the motor. By way of example, a slip coupling 49 which may be of any suitable type such as magnetic, centrifugal or similar slip coupling, is positioned as shown in Figure 2 in coupling relationship with the motor shaft 29 and the drive shaft 28. As is well known, slip couplings in gen-

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eral permit relative movement between the coupling parts when a predetermined transmitted torque level is attained.

As specifically illustrative of the practice of the invention, the energization of the drive motor 30 results in the motor coming up to full speed very rapidly, but due to the slip between the frictionally engagable components of the slip coupling 49, the feed rolls 22 and draw rolls 33 driven through shaft 28 and spur gear 27 come up to speed over a relatively long period of time maintaining tension on the thread until the spindles 44 have reached full speed. This relatively slow acceleration of the feed and draw rolls has been found to eliminate the breaking of the thread 14 which often occurred in previous constructions during start-up. By way of example, it has been found that the drive motor 30 and the spindles 44 connected thereto by means of tape 46, will generally reach full speed in approximately two seconds, whereas the feed and draw rolls 22, 33 come up to speed in approximately twenty seconds when the slip coupling 49 is employed.

Another novel feature of the invention occurs during shut-down of the drawtwister as through the novel utilization of the slip coupling 49, "filament loops" may also be virtually eliminated. When the motor 30 is de-energized, the feed rolls 22 and drive rolls 33, as a result of their relatively high frictional forces, stop very quickly, while the motor together with the directly connected spindle 44 and bobbin 43 continues to rotate for a relatively long period of time. This action, of course, is permitted by the slipping components in the coupling 49 and, consequently, tension in the thread is maintained with attendant elimination of filament loops.

Through the novel construction of this invention, a new and distinctive advance in the operation of a drawtwister of the type described above has been attained. Synthetic filamentary threads formed from nylon or the like may now be processed in such a drawtwister with no further concern for the annoying, inconvenient, and expensive sources of trouble such as start-up breaks and "filament loops." By only a relatively inexpensive addition to conventional machines these objects may be obtained. Higher spindle speeds may now be employed while permitting the production of thread of a higher quality and more uniform physical characteristics. Thus, not only is a more highly desirable end product obtained, but also a substantial increase in production on the machine results.

While there has been described what at present is considered to be the preferred embodiment of the invention,

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it will be understood by those skilled in the art that various changes and modifications may be made therein without departing from the invention and, therefore, it is the aim of the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

Having thus described the invention, what is claimed is:

1. In a drawtwister, the combination of, a feed roll on said drawtwister, a draw roll on said drawtwister operatively associated with said feed roll for drawing filamentary material, means for twisting said drawn filamentary material, driving means for said drawtwister, means for drivably connecting said driving means to said feed roll, draw roll, and said twisting means including a slip coupling for frictionally coupling said driving means to said feed and draw rolls.

2. A drawtwister in accordance with claim 1 including a plurality of said operatively associated feed and draw rolls and including twisting means operatively associated with each of said feed and draw rolls.

3. A drawtwister in accordance with claim 1 wherein said twisting means comprises a spindle for accommodating a bobbin, means for drivably connecting said spindle to said driving means, and a freely movable traveler ring for guiding the laying of said filamentary material on said bobbin in a twisted condition.

4. In a drawtwister, the combination of, a plurality of feed rolls on said drawtwister, a plurality of draw rolls on said drawtwister each operatively associated with one of said feed rolls for drawing a filamentary thread advancing therethrough, a drive motor, means for drivably connecting said feed and draw rolls to said motor including a slip coupling whereby slip occurs momentarily in said connecting means during start-up and shut-down of said drawtwister drive motor, twisting means on said drawtwister comprising a spindle for accommodating a bobbin, means for drivably connecting said spindle to said drive motor, and a freely movable traveler ring for guiding the laying of said filamentary material on said bobbin in a twisted condition.

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