

EUROPEAN PATENT APPLICATION

Application number: 82306180.9

Int. Cl.³: **B 65 H 71/00**
B 65 H 61/00

Date of filing: 19.11.82

Priority: 27.11.81 US 325215

Date of publication of application:
 08.06.83 Bulletin 83/23

Designated Contracting States:
 AT BE CH DE FR GB IT LI LU NL SE

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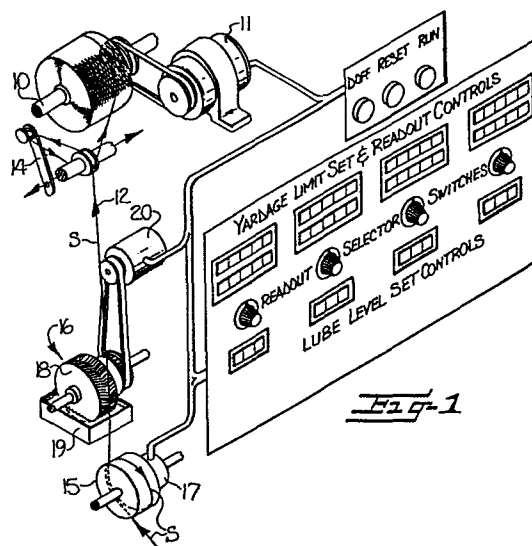
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Apparatus and method for lubricating strand material.

The invention relates to an apparatus and method for applying material, such as lubricant, to a strand (S), such as textile yarn or thread, as the strand is advanced at variable velocities. The strand (S) is engaged by a device (15) which generates a signal indicative of strand velocity. The strand (S) is also engaged by an applicator (16) which applies the material to the strand, the amounts of material applied being controllably varied in response to the strand velocity signalled by the device (15).



APPARATUS AND METHOD FOR LUBRICATING
STRAND MATERIAL

Field and Background of Invention

This invention relates to applying materials to strand material, such as lubricating textile yarn, as the strand material is advanced in an indeterminate
5 length and along a predetermined path.

Many processes of handling strand materials in indeterminate lengths, such as textile yarns, are involved with the strand materials being treated by application of some material, such as a lubricant.
10 Heretofore, many arrangements have been proposed for winders and other apparatus by which materials such as lubricants are applied to strand materials.

In many such apparatus, the strand materials being advanced in indeterminate lengths and along
15 predetermined paths are advanced at varying strand velocities. Such variation in strand velocity has, in many instances, been a source of unevenness in the application of lubricants or the like. By way of example only, strands drawn in engagement with solid bodies of
20 lubricants such as wax and the like may take on from the solid body varying quantities of lubricant depending upon tension and speed of the yarn. Where an alternative form of lubricant application is used, such as spraying, dripping or transfer from a lubricant roll, the
25 variations in lubricant application which can easily result from variations in strand velocity and tension

may be compounded by other factors. The same or similar problems exist in similar dyeing, coating, and other processes and apparatus.

In general, uniformity of material application is of significance as any following process must otherwise accomodate undesirable variations. Thus, as a general matter, improved uniformity of lubrication or the like is desirable and important. In some specific instances, a desired non-uniform profile of material application along the length of a strand may be desirable. In both the general and specific, control over application is critical.

Brief Description of Invention

In view of the above discussion, it is an object of the present invention to facilitate greater control over application of material such as lubricant to strand materials such as textile yarn advanced in indeterminate lengths and along predetermined paths. In realizing this object of the present invention, advancing strand material is engaged and a signal indicative of strand velocity is generated. Application of lubricant or the like is then controlled in response to the generated signal.

Yet a further object of the present invention is to provide for handling strand materials such as textile yarn in accordance with methods under which tension imposed on an engaged strand may be controllably varied. In accordance with the present invention, control over

tension imposed and over lubricant applied may be coordinated, in order to facilitate improved uniformity in lubrication.

Yet a further object of the present invention is
5 the provision of apparatus for lubricating strand material such as textile yarn as the strand material is advanced in an indeterminate length and along a predetermined path, and in which strand material advancing along the path is engaged for generating a
10 signal indicative of strand velocity and for transferring lubricant thereto from a lubricant roll. A control is provided which includes a drive for the lubricant roll which is responsive to the signaled strand velocity for controllably varying the amount of
15 lubricant applied to the strand material as a function of strand velocity and thereby obtaining a desired uniformity or a desired profile of lubrication.

Brief Description of Drawings

Some of the objects of the invention having been
20 stated, other objects will appear as the description proceeds, when taken in connection with the accompanying drawings, in which:

Figure 1 is a schematic representation of an apparatus in accordance with the present invention;

25 Figure 2 is an enlarged elevation view of a lubricant roll forming a portion of the apparatus of Figure 1; and

Figure 3 is an enlarged sectional view of the

surface of the roll of Figure 2.

Detailed Description of the Invention

While the present invention will be described more fully hereinafter with reference to the accompanying
5 drawings, in which a preferred embodiment of the present invention is shown, it is to be understood at the outset of the description which follows that persons of skill in the appropriate arts may modify the invention here described while still achieving the favorable results of
10 this invention. Accordingly, the description which follows is to be understood as being a broad, teaching disclosure directed to persons of skill in the appropriate arts, and not as limiting upon the present invention.

15 Referring now more particularly to the accompanying figures, an apparatus in accordance with the present invention is there somewhat schematically illustrated. In the form shown, the apparatus operates in conjunction with a winder of a type having a package
20 winding spindle 10 and a package drive means 11 for advancing strand materials along a predetermined path 12. The package drive means, in the form illustrated, is an electrical motor rotating the package winding spindle. As is conventional in such winders, a traverse
25 motion compensator 14 is provided in order to maintain certain desired characteristics for the package being formed at the package winding location.

As is known to persons familiar with such

apparatus for handling strand materials, a strand S such as a textile yarn is advanced in indeterminate length and along a predetermined, defined path by the operation of the package winding spindle and drive 10, 11. In accordance with the present invention, the strand S is trained about and engages a means, generally indicated at 15, for generating a signal indicative of strand velocity. Preferably, the means 15 includes an especially configured sheave which engages the strand material, in particular a textile yarn, in such a way that the strand is gripped and its movement along the predetermined path is quite accurately reflected by rotation of the sheave. By appropriate means such as a rotational encoder of known type, an accurate signal indicative of strand velocity is generated by rotation of the means 15. Further, inasmuch as the sheave forming a portion of the means 15 is fixed to a shaft for rotation therewith and is in gripping engagement with the strand S , an appropriate controllable brake generally indicated at 17 and housed within the means 15, such as a magnetic brake of a known type (such as shown in White United States Patent 3,797,775) is coupled to the shaft to form a portion of the means. Thus, the velocity signaling means comprises means for adjustably varying tension imposed on the engaged strand material S .

The strand S , moving along the predetermined path of travel, passes adjacent an applicator means generally

indicated at 16. The applicator means 16, in the specific form shown and in accordance with the present invention, is capable of applying controllably variable amounts of lubricant to strand material advancing along the path. In the form illustrated, the applicator means 5 16 comprises a lubrication roll 18 mounted adjacent the strand path for rotation and for engaging strand material and transferring lubricant thereto. The roll 18 is mounted to rotate through a reservoir 19 in which a 10 body of liquid lubricant is maintained. Preferably, the surface of the roll 18 has a chevron pattern of grooves applied thereto (Figures 2 and 3), so as to distribute lubricant over the surface of the roll and enhance the uniformity of application. The chevron pattern has been 15 found to be an important element of the specific arrangement shown.

The lubricant roll 18 is driven in rotation by an appropriate drive means such as the illustrated electrical motor 20, which forms a portion of a control 20 means. The control means is operatively connected to the velocity signalling means 15 and to the applicator means for responding to signals indicative of strand velocity by controllably varying the amount of lubricant applied to strand material advancing along the path. In the form 25 illustrated, the control means comprises electrical signal processing means for receiving signals generated by the rotational encoder mentioned hereinabove. The electrical signal processing means is capable of

processing encoder signals over time in order to determine velocity and, by appropriate processing of such signals, to derive a drive signal to be applied to the drive means 20 so as to apply lubricant in a desired
5 uniformity or in a desired profile. AS will be appreciated by persons of appropriate skill in the applicable arts, the applicator means 16 may take other forms such as an aspirator, may apply a material or materials other than lubricants, and/or may apply
10 material from a liquid, solid or gas source. In accordance with this invention, critical elements are that strand velocity varies and that application rates are controllably varied with velocity.

As will be appreciated by persons of appropriate
15 skill in the applicable arts of processing electrical signals, and particularly digital signals, information derived from the velocity signaling means 15 is further adapted to a determination of the length of strand material. The present invention contemplates that the
20 control means may comprise length limit means (such as suggested, for example, in Warshaw United States Patent 3,172,779 or Weller United States Patent 3,293,760 or Mutziger United States Patent 3,564,219) and may be operatively connected to the package drive 11 for
25 controllably interrupting continued advancement of strand material along the predetermined path as may be desired. Thus, the functions of the apparatus as described to the present point may include monitoring

and controlling lubricant application through the parameters described above, controlling strand tension through the operations described above, and terminating winding upon selected package sizes being reached. As
5 will be appreciated by persons skilled in the arts of electrical controls, and particularly digital controls, central processing units are available which have the capability of monitoring a plurality of thread lines or a number of individual strands of material being
10 processed at substantially the same time on one or more apparatus. Thus, the present invention specifically contemplates the provision of multiple channel control arrangements. Where such arrangements are employed, a multiple station winding machine may be operated under
15 the control of a single control means, while means for engaging each of a plurality of strands and for applying lubricant to each of the plurality of engaged strands are provided.

In operation, and as briefly described above,
20 strand material such as textile yarn is advanced in an indeterminate length and along a predetermined path. The material is engaged while advancing along the path and while a signal indicative of strand velocity is generated. Controllably variable amounts of lubricant
25 are applied to the strand material as the material advances along the path, and the amounts of lubricant applied are varied in response to the signals indicative of strand velocity. By such variation, a uniform

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application of lubricant along the length of the strand material is achieved. Alternatively, the possibility exists of controlling a profile by which the quantity of lubricant applied might vary in a controlled
5 predetermined manner along the length of strand material, should that be deemed desirable.

In the drawings and specifications there has been set forth a preferred embodiment of the invention and, although specific terms are used, the description
10 thus given uses terminology in a generic and descriptive sense only and not for purposes of limitation.

CLAIMS:

1. An apparatus for applying material such as lubricant to strand material/^(S) such as textile yarn as the strand material is advanced along a predetermined path (12), the apparatus comprising:
5 ⁽¹⁵⁾ means/^(S)for engaging strand material/^(S)advancing along the path and for generating a signal indicative of strand velocity,
 ⁽¹⁶⁾ material applying means/⁽¹⁶⁾disposed adjacent the path for applying controllably variable amounts of material
10 such as lubricant to strand material/^(S) advancing therealong, and
 control means operatively connected to said
 ⁽¹⁵⁾ velocity signaling means/⁽¹⁵⁾and to said material applying
 ⁽¹⁶⁾ means/⁽¹⁶⁾for responding to signals indicative of strand
15 velocity and for controllably varying the amounts of material such as lubricant applied to strand material moving along the path in response to such signals indicative of strand velocity.
2. An apparatus according to Claim 1 wherein said
 ⁽¹⁵⁾ velocity signaling means/⁽¹⁷⁾comprises means/⁽¹⁷⁾for imposing tension on the engaged strand material (S).
3. An apparatus according to one of Claim 1 or Claim
2 wherein said material applying means/⁽¹⁶⁾ comprises
 ⁽¹⁸⁾ lubrication roll means/⁽¹⁸⁾mounted adjacent the path ^(S)for
rotation and for engaging strand material/^(S) and

5 transferring lubricant thereto, and further wherein said control means comprises drive means⁽²⁰⁾ / operatively connected to said roll means⁽¹⁸⁾ / for driving said roll means in rotation at a speed correlated to indicated strand velocity.

4. An apparatus according to Claim 3 further comprising lubricant reservoir means⁽¹⁹⁾ / mounted adjacent said roll means⁽¹⁸⁾ / for retaining a body of lubricant through which said roll means rotates.

5. An apparatus according to Claim 3 wherein said roll means⁽¹⁸⁾ / has a chevron pattern of grooves in a circumferential face thereof for enhancing lubrication application.

6. An apparatus according to one of Claim 1 or Claim 2 further comprising package drive means⁽¹¹⁾ / for advancing strand material^(S) / along the predetermined path, and further wherein said control means is operatively⁽¹¹⁾ connected to said package drive means⁽¹¹⁾ / for controllably interrupting continued advancement⁽¹²⁾ of the strand material along the predetermined path / upon occurrence of a predetermined event.

7. An apparatus according to Claim 6 wherein said control means is responsive to signals indicative of strand velocity for determining length of strand material and further wherein said control means 5 comprises length limit means for interrupting continued advancement of strand material along the path upon advancement of a predetermined length of material.

8. An applicator⁽¹⁶⁾ for applying material to a strand (S) moving adjacent the applicator and comprising roll means (18) mounted for rotation and having a chevron grooved circumferential face adapted for engaging strand material, drive means⁽²⁰⁾ operatively connected with said roll means for driving said roll means in rotation, and means⁽¹⁹⁾ for applying material to said face for transfer thereby to strand material engaged by said roll means.
9. A method of applying material such as lubricant to strand material^(S) such as textile yarn as the strand material is advanced in an indeterminate length and along a predetermined path⁽¹²⁾, the method comprising the steps of: engaging strand material^(S) advancing along the path⁽¹²⁾ while generating⁽¹⁵⁾ a signal indicative of the velocity of movement of the strand along the path, applying⁽¹⁶⁾ controllably variable amounts of material such as lubricant to the strand material as the strand material advances along the path, and varying the amounts of material applied in response to the signals indicative of strand velocity.
10. A method according to Claim 9 further comprising the step of imposing an adjustably varied tension⁽¹⁷⁾ on the engaged advancing strand material.
11. A method according to one of Claim 9 or Claim 10 wherein the applying of material comprises engaging the strand material with an applicator roll⁽¹⁸⁾ mounted adjacent the path⁽¹²⁾ for rotation and transferring material⁽²⁰⁾ therefrom, and further comprises driving the roll in

rotation at a speed correlated to indicated strand velocity.

12. A method according to Claim 11 further comprising rotating the roll⁽¹⁸⁾ through a reservoir⁽¹⁹⁾ mounted adjacent the roll for retaining a body of material such as lubricant to be applied.

13. A method according to one of Claim 9 or Claim 10 further comprising controllably interrupting continued advancement of the strand material along the predetermined path upon occurrence of a predetermined
5 condition.

14. A method according to Claim 13 further comprising detecting the advancement of a predetermined length of advancing strand material as being the occurrence of a predetermined condition and interrupting continued
5 advancement of strand material along the path in response to such detecting.

