March 15, 1938. D. FINLAYSON ET AL 2,111,211

APPARATUS FOR THE TREATMENT OF TEXTILE MATERIALS

Filed Oct. 20, 1936

FIG. 1

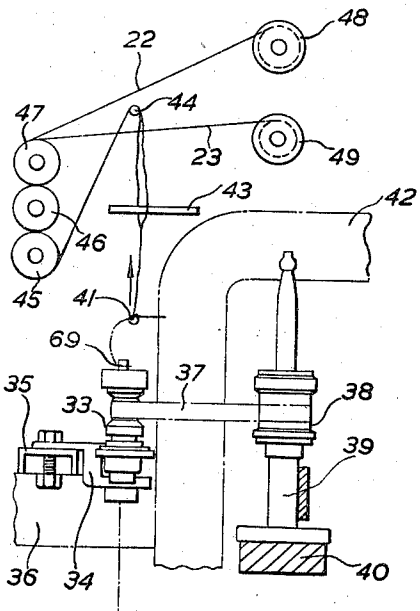


FIG. 2

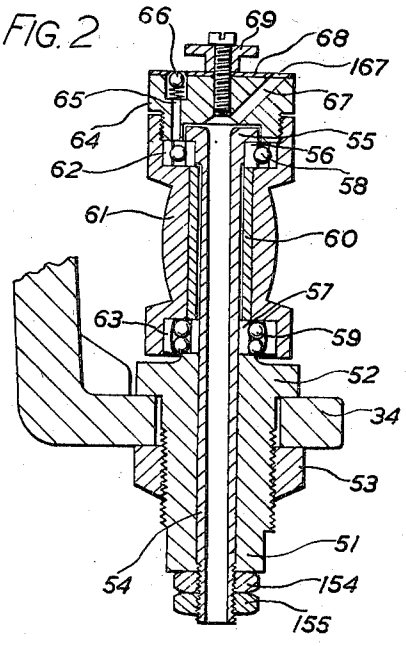


FIG. 13 FIG. 14 FIG. 5

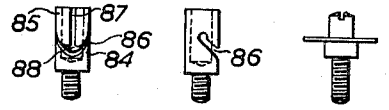


FIG. 15

FIG. 6

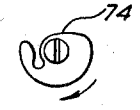


FIG. 3 FIG. 9 FIG. 7 FIG. 11

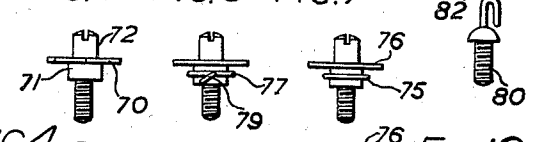


FIG. 4

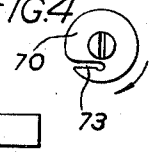






FIG. 12

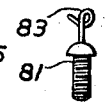


FIG. 10 FIG. 8

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APPARATUS FOR THE TREATMENT OF TEXTILE MATERIALS

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14 Claims. (Cl. 117—1)

This invention relates to a process and apparatus for the treatment of filamentous threads made of substantially straight continuous or discontinuous filaments with a view to imparting a crimped or like effect to said threads. U. S. application S. No. 727,609 filed 26th May 1936 and British Patent No. 442,073 describe methods of crimping such threads in which a temporary twist is given to the thread by means, inter alia, of a false twisting device, the twist so imparted being set in the thread and then automatically removed, leaving the thread in a crimped condition. The present invention provides a new process and apparatus for crimping such threads, said apparatus including a new form of false twisting device.

The false twisting device of the invention comprises a rotatable member provided with means for engaging a thread or yarn passing through two points substantially in line with the axis of rotation of said member and on different sides of said member, and causing said yarn to undergo several sharp changes in direction between said points. Preferably the rotatable member is hollow and the yarn passes through it on its way from one of said points to the other. The means which cause the yarn to turn sharply in the course of its travel comprise trapping means which, by frictional engagement with the yarn, exert a torque thereon and induce and/or maintain a degree of twist in the yarn on one or both sides of the false twisting device. The trapping action should be sufficiently firm to exert the necessary torque but not so firm as to prevent the longitudinal passage of the yarn through the device or to strain the yarn by twisting it excessively. Thus, the yarn may be led up a stationary guide tube or hollow spindle surrounded by a wharl on which the rotating member is mounted, and may enter an angular passage in said member leading it outwards, the yarn then returning from the end of the oblique passage back to the middle of the rotating member, where there may be a trapping device rotating with the member and causing the yarn to turn through one or more further sharp angles.

The false twisting device according to the present invention may be employed for the crimping of yarns or bundles of continuous filaments, or of staple fibres, especially staple fibres made from straight continuous filaments, by imparting twist to the yarn, setting the twist so imparted and then removing some or all the twist. Over the portion of the length of the yarn in which a temporary twist is induced or maintained a twist setting operation is carried out, and subsequently by reason of the nature of the false twisting device, the twist so imparted runs out of the yarn again, leaving in it, however, the crimps formed by setting it while it was twisted.

The twist setting operation may be carried out by means of a device such as is described in British Patent No. 440,653 in which the yarn is caused to pass through a chamber having an offset member, in which chamber and offset member a setting agent is applied to the yarn. Any convenient setting medium may be employed, for example steam or hot air or, especially when the yarns contain organic derivatives of cellulose, solvent vapours for the substance of the yarn. The invention is of especial advantage in crimping yarns containing organic derivatives of cellulose, whether by means of solvent vapours or by means of other setting agents.

A convenient general arrangement in which the false twisting device according to the present invention may be employed comprises a source of supply of yarn, from which the yarn is drawn through a tensioning device and over a roller from which it proceeds through a chamber and an offset member provided in connection therewith of the kind described in British Patent No. 440,653. Emerging from the offset member the yarn passes through the false twisting device of the present invention to a balloon guide and is positively drawn from the balloon guide by means of three debit rollers which feed the yarn to a take-up bobbin. The take-up bobbin is rotated at a lower speed than the peripheral speed of the debit rollers so that the yarn may contract as it is wound on the bobbin. It is of considerable advantage to treat two or more yarns together since in this way a higher degree of crimp can be imparted. The individual yarns can be drawn together at an early stage, e. g. before passing through the tensioning device, and separated after the false twisting step, e. g. between the balloon guide and the debit rollers.

Apparatus according to the invention is illustrated in the accompanying drawing wherein:

Fig. 1 shows in elevation a lay-out of a complete apparatus for crimping two yarns simultaneously;

Fig. 2 is a sectional elevation of a false twisting device;

Fig. 3 is an elevation and Fig. 4 a plan of a trapping device comprising a slotted disc;

Fig. 5 is an elevation and Fig. 6 a plan of a similar form of trapping device in which the disc is cut away;

Fig. 7 is an elevation and Fig. 8 a plan of a trapping device comprising a disc and a floating ring of wire;

Fig. 9 is an elevation and Fig. 10 a plan of a somewhat similar trapping device in which the wire ring is discontinuous;

Figs. 11 and 12 are elevations of two forms of trapping device comprising wire loops, and

Figs. 13, 14, and 15 show a slotted cylindrical type of trapping device in front elevation, side elevation and plan respectively.

Referring to Fig. 1, 20 and 21 are bobbins from which two substantially twistless yarns of straight continuous filaments 22 and 23 are drawn through guides 24 and 25, the latter bringing the two yarns together, through a further guide 26, then through a gate tensioning device 27 and over a roller 28 to a steam chamber. The steam chamber comprises a main steam pipe 29 adapted to supply a row of false twisting devices having for each false twisting device a nipple 30 through which the yarn enters and an offset member 31 provided with a nipple 32 through which the thread passes out of the chamber. The change of direction caused by the offset position of the tensioning device is of advantage but is not essential. Wet steam is supplied to the pipe 29. Other fluids suitable for setting the twist could be used as described above but steam is preferred. The yarn leaving the steam chamber is drawn through the middle of the false twisting device 33, to be described in detail below, and so receives a false twist which extends backwards to or beyond the steam chamber. On leaving the false twisting device the two yarns, which have followed the same path from the guide 25, pass through the balloon guide 41 and are then separated by a bar 43 as described in U. S. application S. No. 83,273 filed June 3, 1936. This bar serves not only to separate the two yarns but also to remove any slight residual false twist which might otherwise persist along portions of the yarn. Each yarn then passes over the guide 44 and part way round each of the rollers 45, 46, and 47, which are rotated at constant speed, in turn. The yarn 22 is then collected on the bobbin 48 and the yarn 23 on the bobbin 49, these bobbins running at a constant speed, lower than the rollers 45, 46, and 47 to allow of slight contraction of the yarn. The bobbins may be driven by friction driving means not shown.

The false twisting device comprises a base member carrying a fixed hollow spindle on which is rotatably mounted a wharl carrying a device for trapping the yarn which is drawn up through the interior of the spindle. A hollow rotating spindle could be used but would be less stable. The base member 51 is flanged at 52 and held in position on the bracket 34 by a nut 53. The bracket 34 is bolted to a rail 35 attached to the frame 36 of the machine. Through the middle of the base member passes the hollow spindle 54 having a flange 55 on the periphery of which is the inner race 56 of a ball bearing 58. At 57 is provided the inner race of a second ball bearing 59 which is of the self-aligning type. An annular distance piece 60 separates the two ball races and a nut 154 and lock-nut 155 fix the spindle 54 in position.

Surrounding the spindle 54 is a wharl 61 which carries the outer ball races 62 and 63 of the ball bearings 58 and 59. Screwed into the upper portion of the wharl is a cap 64 provided with a lubricating passage 65 closed by a ball and spring valve 66, and an oblique passage 67 communicating with the interior of the hollow spindle 54. The dimensions of the lubricating passage and of the oblique passage are such that the cap 64 is not substantially out of balance about its axis of rotation. The cap 64 is provided with a cover plate 68 which may be of different material from the body of the cap and through which is an oblique passage 167 continuous with the passage 67. A trapping device 69 for the yarn, which is described in further detail below, is screwed on to the cap 64. The wharl 61 is driven by means of a band or tape 37 from a pulley 38 mounted on another spindle 39 journalled in a stationary rail 40.

The yarns pass up the middle of the spindle 54 through the slots 67 and 167 which are so inclined as to impart a rapid change of direction to the yarns, and which are carefully rounded at the edges to avoid damaging the yarns, and then through the trapping device 69 which causes the yarns to undergo further sharp changes of direction.

The trapping device may be of any suitable form. Figures 3 and 4 show a form of trapping device consisting essentially of a disc or plate 70 provided with a boss 71 and a stud 72 which serves to screw the device on to the cap 64. The disc 70 is provided with an eccentric non-radial slot 73 extending from the periphery, which serves to trap the yarn emerging from the inclined passage 67 of the cap 64 and cause it to pass through the desired sharp angles on its way to the balloon guide 41.

Figures 5 and 6 illustrate a similar form of trapping device wherein the disc is cut away at 74 to facilitate threading up.

In the trapping device of Figures 7 and 8 a floating wire ring 75 is provided below the disc 76 and the thread is trapped between this ring and the disc, turning round one sharp angle as it enters and leaves the ring and round another sharp angle as it passes round the edge of the disc.

The trapping device of Figures 9 and 10 differs from that of Figures 7 and 8 in that the wire ring 77 is broken at 78, one end of the wire being drawn back on itself to form a hook 79 through which the yarn is caused to pass.

The trapping devices of Figures 11 and 12 consist essentially of studs 80 and 81 provided with wire loops made, for example, from piano wire, the loop 82 being U-shaped and 83 being of the pigtail type. The form illustrated in Figure 11 is particularly suitable. The yarn emerging from the oblique slot in the cap is caused to pass through the U after being wrapped, if desired, round one arm thereof. Instead of being mounted on a screw the wire may be sweated into a hole in the middle of the cap 64.

Figures 13 to 15 show a trapping device comprising a hollow stud 84 screwed into the cap 64 of the false twisting device, the hollow part of the stud being open at the top 85 and cut half through by the oblique upward sloping saw-cut 86. The wall of the stud is also slotted vertically at 87 from its upper edge to the middle or lowest part 88 of the oblique saw-cut 86. When this form of trapping device is used the yarn emerging from the oblique slot 67 in the false twisting device is slipped into the vertical slot and is trapped in one side or the other of the oblique slot.

When a single yarn is treated instead of two simultaneously the bar 43 and the duplication of the guides and bobbins is of course unnecessary.

It will be seen that in passing through the

false twisting device the yarn is caused to go through a configuration comprising several sharp angles, and this configuration is caused to rotate rapidly with the wharl. The rotation tends to twist the yarn below the false twisting device and applies a torque to the yarn which can only be resisted when a sufficient twist has been built up. It is the building up and maintenance of this twist within the treating chamber and offset member that is the purpose of the false twisting device.

Having described our invention, what we desire to secure by Letters Patent is:—

1. A false twisting device particularly suitable for use in crimping threads, said device comprising a hollow spindle, means for holding said spindle stationary in a vertical position, a wharl mounted for rapid rotation on said spindle, a cap secured to the upper portion of said wharl and adapted to rotate therewith, said cap having an oblique passage extending through it and communicating with the interior of the spindle, and a trapping device, said device comprising a U-shaped hook vertically mounted on said cap so as to rotate coaxially therewith, said hook being adapted to engage a thread drawn through the hollow spindle and the oblique passage to a point in line with the axis of the spindle and to cooperate with said cap to cause said thread to undergo several sharp changes in direction during its passage towards said point, and simultaneously to rotate about said axis.

2. Apparatus for inserting a crimp in a thread, which comprises in combination with a false twisting device comprising a rotatable hollow member provided with means for engaging the thread passing through said member and through two points substantially in line with the axis of rotation of said member and on different sides of said member and causing said thread to undergo several sharp changes in direction between said points and simultaneously to rotate about said axis, means for exerting controllable tension on the thread drawn from a suitable source of supply, a chamber adapted to be continuously supplied with steam for setting the crimp in the thread, said chamber being disposed below the false twisting device and between it and the tensioning device and having inlet and outlet orifices for the thread, said orifices being substantially in line with the axis of rotation of the false twisting device, a balloon guide above the false twisting device and substantially in line with said axis, means for drawing a thread at a substantially constant rate from the source of supply through the tensioning device, the chamber, the false twisting device and the balloon guide in succession, and means for collecting the thread.

3. Apparatus for inserting crimp in a plurality of threads, which comprises in combination with a false twisting device comprising a rotatable hollow member provided with means for engaging the threads passing through said member and through two points substantially in line with the axis of rotation of said member and on different sides of said member and causing said threads to undergo several sharp changes in direction between said points and simultaneously to rotate about said axis, means for exerting controllable tension on threads drawn from a suitable source of supply, means for bringing together a plurality of threads drawn from said source and guiding said threads along a common path through said tensioning device, a chamber adapted to be continuously supplied with steam for setting the crimp in the threads, said chamber being disposed below the false twisting device and between it and the tensioning device and having inlet and outlet orifices for the thread, said orifices being substantially in line with the axis of rotation of the false twisting device, a balloon guide above the false twisting device and substantially in line with said axis, means for drawing the threads at a substantially constant rate from the source of supply through the tensioning device, the chamber, the false twisting device and the balloon guide in succession, means above the balloon guide for separating the individual threads, and means for collecting said threads separately.

4. Apparatus for inserting a crimp in a thread, which comprises in combination with a false twisting device comprising a rotatable hollow member provided with means for engaging the thread passing through said member and through two points substantially in line with the axis of rotation of said member and on different sides of said member and causing said thread to undergo several sharp changes in direction between said points and simultaneously to rotate about said axis, means for exerting controllable tension on the thread drawn from a suitable source of supply, a chamber adapted to be continuously supplied with steam for setting the crimp in the thread, said chamber being disposed below the false twisting device and between it and the tensioning device and having inlet and outlet orifices for the thread, said orifices being substantially in line with the axis of rotation of the false twisting device, a balloon guide above the false twisting device and substantially in line with said axis, means for drawing a thread at a substantially constant rate from the source of supply through the tensioning device, the chamber, the false twisting device and the balloon guide in succession, and means for collecting the thread at a lower rate than that at which the thread is drawn by said drawing means.

5. Apparatus for inserting crimp in a plurality of threads, which comprises in combination with a false twisting device comprising a rotatable hollow member provided with means for engaging the threads passing through said member and through two points substantially in line with the axis of rotation of said member and on different sides of said member and causing said threads to undergo several sharp changes in direction between said points and simultaneously to rotate about said axis, means for exerting controllable tension on threads drawn from a suitable source of supply, means for bringing together a plurality of threads drawn from said source and guiding said threads along a common path through said tensioning device, a chamber adapted to be continuously supplied with steam for setting the crimp in the threads, said chamber being disposed below the false twisting device and between it and the tensioning device and having inlet and outlet orifices for the thread, said orifices being substantially in line with the axis of rotation of the false twisting device, a balloon guide above the false twisting device and substantially in line with said axis, means for drawing the threads at a substantially constant rate from the source of supply through the tensioning device, the chamber, the false twisting device and the balloon guide in succession, means above the balloon guide for separating the individual threads, and means for collecting said

threads separately at a lower rate than that at which the threads are drawn by said drawing means.

6. Apparatus for inserting crimp in a thread, comprising, in the combination according to claim 2, a false twisting device having a hollow spindle, a rotatable member carried by said spindle, and adapted to rotate about an axis substantially coincident with that of the spindle, said member having an oblique passage extending through it and communicating with the interior of said spindle, and a trapping device mounted on said member so as to rotate therewith, said trapping device being adapted to co-operate with said member to engage the thread drawn through the hollow spindle and the oblique passage to a point in line with the axis of the spindle and to cause the thread to undergo several sharp changes in direction during its passage toward said point and simultaneously to rotate about said axis.

7. Apparatus for inserting crimp in a thread, comprising, in the combination according to claim 2, a false twisting device having a hollow spindle, a rotatable member carried by said spindle and adapted to rotate about an axis substantially coincident with that of the spindle, said member having an oblique passage extending through it and communicating with the interior of said spindle, and a trapping device mounted on said member so as to rotate therewith, said trapping device comprising a disc mounted on, but spaced apart from said rotatable member, said disc having an eccentric non-radial slot adapted to engage the thread coming from said oblique passage.

8. Apparatus for inserting crimp in a thread, comprising, in the combination according to claim 2, a false twisting device having a hollow spindle, a rotatable member carried by said spindle and adapted to rotate about an axis substantially coincident with that of the spindle, said member having an oblique passage extending through it and communicating with the interior of said spindle, and a trapping device mounted on said member so as to rotate therewith, said trapping device comprising a disc mounted on, but spaced apart from said rotatable member, so as to rotate co-axially therewith, and a floating ring disposed between said disc and the said rotatable member, said disc and said ring being adapted to engage the thread coming from said oblique passage.

9. Apparatus for inserting crimp in a thread, comprising, in the combination according to claim 2, a false twisting device having a hollow spindle, a rotatable member carried by said spindle and adapted to rotate about an axis substantially coincident with that of the spindle, said member having an oblique passage extending through it and communicating with the interior of said spindle, and a trapping device mounted on said member so as to rotate therewith, said trapping device comprising an inverted U-shaped hook, vertically mounted on said rotatable member so as to rotate co-axially therewith, said hook being adapted to engage the thread coming from said oblique passage.

10. Apparatus for inserting crimp in a thread, comprising, in the combination according to claim 2, a false twisting device having a hollow spindle, a rotatable member carried by said spindle and adapted to rotate about an axis substantially coincident with that of the spindle, said member having an oblique passage extending through it and communicating with the interior of said spindle, and a trapping device mounted on said member so as to rotate therewith, said trapping device comprising a hollow cylindrical stud mounted on said rotatable member so as to rotate co-axially therewith, said stud being open at the top, cut half through by an oblique upwardly sloping saw-cut, and slotted vertically from its upper edge to meet the oblique saw-cut, and being adapted to engage the thread coming from said oblique passage.

11. Process for false twisting a thread, comprising drawing said thread at a regular rate between two points, trapping the thread between said points without interrupting its travel so as to cause it to undergo several sharp changes in direction causing the thread to rotate about a line joining said points whereby twist extending in both directions beyond the region in which the thread is trapped is inserted in the thread, and winding up the thread at a lower rate than that at which it passes said points.

12. Process for crimping a thread, comprising drawing said thread at a regular rate between two points, trapping the thread between said points without interrupting its travel so as to cause it to undergo several sharp changes in direction causing the thread to rotate about a line joining said points whereby twist extending in both directions beyond the region in which the thread is trapped is inserted in the thread, subjecting the thread along a part of its path to which said twist extends and which lies behind the region in which the thread is trapped, to the action of a fluid adapted to increase the permanence of the deformations resulting from said twist, and winding up the thread at a lower rate than that at which it passes said points.

13. Process for false twisting threads, comprising drawing a plurality of threads together at a regular rate between two points, trapping the threads between said points without interrupting their travel so as to cause them to undergo several sharp changes in direction and causing the threads to rotate about a line joining said points whereby twist extending beyond the region in which the threads are trapped is inserted in the threads, subjecting the thread along a part of its path to which said twist extends and which lies behind the region in which the thread is trapped, to the action of a fluid adapted to increase the permanence of the deformations resulting from said twist, separating the individual threads and winding said threads separately at a speed less than that at which they are drawn past said points.

14. Process for crimping threads, comprising drawing a plurality of threads together at a regular rate between two points, trapping the threads between said points without interrupting their travel so as to cause them to undergo several sharp changes in direction and causing the threads to rotate about a line joining said points whereby twist extending beyond the region in which the threads are trapped is inserted in the threads, subjecting the threads along a part of their path to which said twist extends and which lies behind the region in which the threads are trapped, to the action of a fluid adapted to increase the permanence of the deformations resulting from said twist, separating the individual threads and winding said threads separately at a speed less than that at which they are drawn past said points.

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