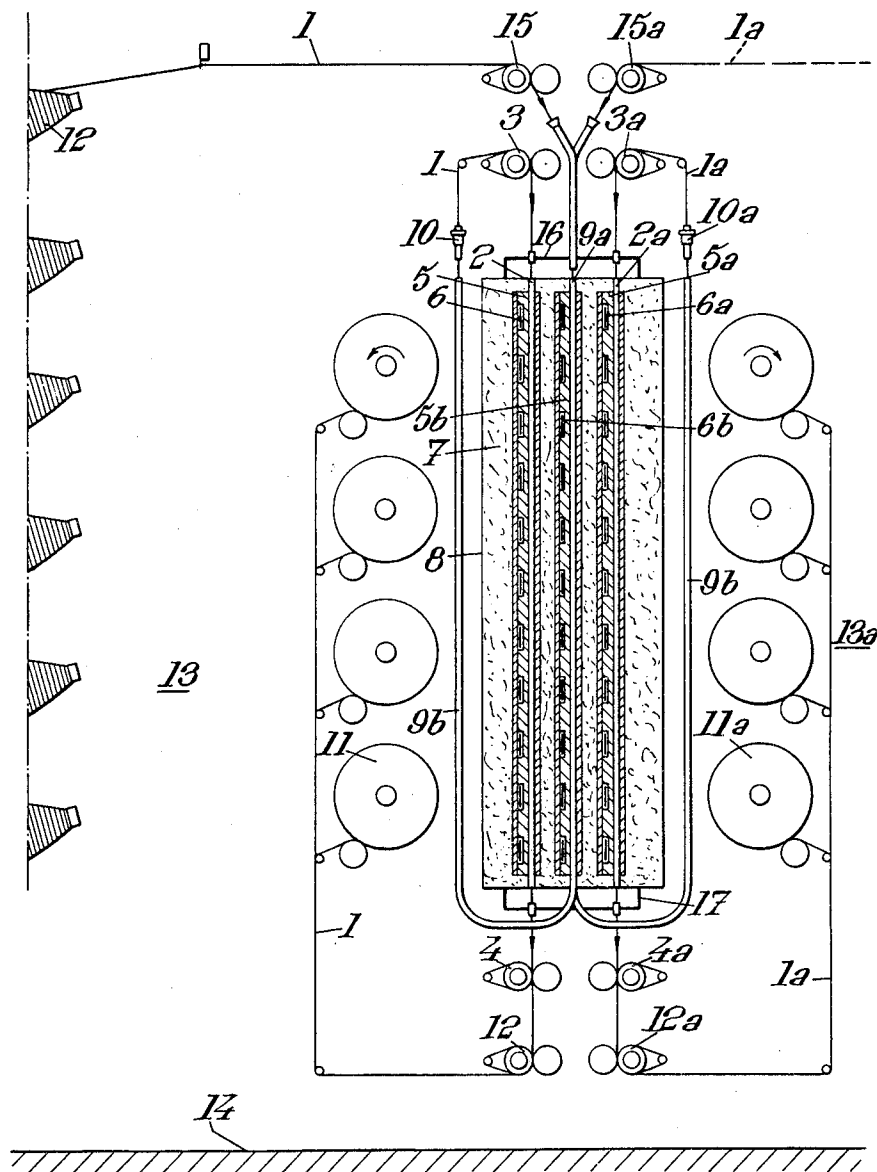


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PROCESS AND MACHINE FOR THE TEXTURIZATION OF THERMOPLASTIC
YARN, AND THE YARN THUS OBTAINED
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PROCESS AND MACHINE FOR THE TEXTURIZATION OF THERMOPLASTIC YARN, AND THE YARN THUS OBTAINED

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4 Claims

ABSTRACT OF THE DISCLOSURE

Each yarn to be textured descends, due, at least partly, to the weight of the yarn, down a vertical heating path. The yarn is fed into the top of the heating path at a speed which can exceed by 20% and possibly even by 60% the speed at which the yarn is fed out at the bottom of the heating path.

The present invention relates to processes and machines for the texturization of thermoplastic yarn and to the yarn obtained by these processes and machines. This invention is more particularly, but not exclusively, concerned with processes and machines of this type which permit textile yarn crimped by false twist to be obtained, whose elasticity with respect to its crimp is reduced.

It has already been proposed to treat thermoplastic yarn according to a conventional false twist process and then, to heat the yarn again to subject it to a second setting under controlled tension, so as to decrease its elasticity while preserving the maximum of its crimp.

For this purpose, and this is the principal object of this invention, it is appropriate to limit as much as possible the tension exerted on the yarn during the operation of heating, in particular the second operation of heating.

The process according to the invention consists above all in making the yarn of thermoplastic material travel along the heating path of its texturization treatment while limiting the tension exerted on this yarn and while using its own weight to ensure, or at least to assist in ensuring, its progression along this path, this heating path extending preferably vertically from top to bottom.

The machine according to the invention comprises, in a manner known in itself, for each yarn to be treated, at least one substantially vertical passage adapted to be heated, and this machine is characterized in that it comprises, in addition, means for making this yarn descend through this passage under a controlled tension, preferably adjustable, these means being advantageously constituted, for each passage, by two yarn feed rollers, one upstream and the other downstream of the passage, the upstream feed roller being such that it drives the yarn faster than the downstream feed roller, this difference of speed being able to exceed 20% and even, possibly, 60%.

The single figure of the accompanying drawing shows, schematically in section, the essential elements of a texturization machine established according to one advantageous embodiment of the invention.

It has already been proposed to subject yarn, previously crimped by false twist, to a second heating to set the yarn a second time under a controlled tension, in order to eliminate its elasticity while preserving a maximum volume of this yarn. The second setting was intended to take place under a tension as low as possible, in order to reduce to the minimum the decrimping of the yarn.

To make this yarn advance along its second heating path, it was necessary to subject it to a certain traction from which a corresponding tension resulted which, not only was intended to ensure the progression of the yarn along its heating path, but, in addition, was intended to

oppose the effects that its own weight exerted generally in the opposite direction during its progression along this same path.

In known machines in which there was a yarn feed roller at each end of the heating path, insofar as the yarn was given, by the upstream feed roller, a speed greater than the speed that it was given by the downstream feed roller, this difference of speed (overfeeding), for the reasons mentioned above, never exceeded about 20%.

To increase this difference of speed and to make it exceed possibly 60%, in particular for a 70 denier polyamide yarn which has previously undergone crimping by false twist, in order better to preserve the crimp of the yarn while eliminating its elasticity, the crimped yarn, according to the invention, is made to travel along a second heating path (reheating) while using its own weight to ensure, or at least to assist in ensuring, its progression along this path, which permits a corresponding reduction of the tension exerted on the yarn to obtain its progression along this path.

In order to take advantage of this effect to the maximum, it is appropriate to arrange the path in such a manner that it extends vertically from top to bottom.

In particular, the yarn can be made to reach, along its heating path, a speed in the neighbourhood of or equal to the speed that it would reach towards the middle of the heating path of it travelled through this path in free fall.

In the machine according to the invention, there is consequently provided, for each yarn 1, 1a to be treated, at least one vertical passage 2, 2a, adapted to be heated and in which the yarn is made to descend while making it pass at the two ends of this passage through yarn feed rollers respectively upstream 3, 3a and downstream 4, 4a, the upstream feed roller being able to drive the yarn more than 20% and, possibly, more than 60% faster than the downstream feed roller.

It is appropriate to arrange that the yarn 1 or 1a issues from the upstream feed roller 3 or 3a and enters into the downstream feed roller 4 or 4a rigorously in the axis of the vertical heating tube 2, 2a.

The traction that is exerted on the yarn by its own weight is then directed in the same direction as the traction that it is necessary to apply to the yarn to make it travel along the heating passage 2, 2a.

If it were desired to make the yarn progress through its heating passage in a conventional machine in which the yarn travels through this passage for example from bottom to top, the traction that its own weight exerts on the yarn in the region where it is rendered malleable along its heating path, would be exerted in the opposite direction to the direction of its progression and it would be necessary to apply a traction to this yarn tending to uncrimp it which would be at least twice as great as the traction that its own weight exerts on it, in order to obtain finally the same progression of the yarn along its heating path that has been obtained according to this invention, as indicated previously, by not exerting on the yarn any exterior traction on the soft portion of the yarn along the heating path.

It will be noted that the advantage of an arrangement according to this invention is greater as the heating path is longer, which is remarkable since, if it is wished to increase the output of a texturization machine, it is necessary to increase the lengths of the heating paths of the yarns.

The machine has, preferably, a heating block common to a plurality of separate yarns.

This block comprises, for an entire series of heating tubes 2, 2a, aligned one behind another in a common plane, a metallic mass 5 or 5a, in the form of a vertical plate, through the entire height of which these tubes pass;

these plates are electrically heated, for example by resistances 6, 6a which extend in the plates transversely, preferably perpendicularly, to the tubes.

The plates 5, 5a, surrounded by a heat insulator 7, are enclosed with this heat insulator in a casing 8.

Needless to say, such a machine can be used to treat yarn previously crimped in a conventional false twist machine.

Better still, in order to eliminate an additional step, the machine can be arranged so that it effects in a single passage of the yarn its crimping by false twist and, then, its second setting by a reheating operation.

The principle according to the invention of the progression of the yarn along its heating path by its own weight, as described above for the second heating path 2 or 2a (reheating), is advantageously taken advantage of for the first false twist heating path 9 as well, by disposing this path 9 vertically and by making the yarn travel along this path from top to bottom.

For this purpose, according to the invention, the false twist heating path 9a and a cooling path 9b are advantageously constituted by a single tube in the form of a U of which only the branch 9a passes through a heated metallic plate 5b in which extend, perpendicularly to the branches 9a of the tubes, electric resistances 6b.

In order to use the same common heating block for the treatment of separate yarns 1 and 1a, fed laterally from one side or from the other to this block and leaving it on the same side,

Advantageously as many U-shaped tubes are used as there are yarns 1 and 1a to be treated.

These tubes are aligned one behind the other,

They are alternately staggered out of this alignment, on one side and on the other, in a manner to bring one of the branches 9a of each tube at least approximately into a common vertical plane,

And these branches 9a of the tubes are made to pass through a common metallic heating plate 5b, the heat insulator 7 and the casing 8, whereas the remainder of each U-shaped conduit remains free, passing around a part of the bottom of the casing 8 and passing upwardly laterally at the exterior of this casing with its cooling branch 9b.

Upstream of the heating branches 9a of the U-shaped tubes are provided yarn feed rollers 15 and 15a and, downstream of the cooling branches 9b of the same tubes, false twist spindles 10 or 10a.

The yarn 1 or 1a, after having passed successively through the feed rollers 15 or 15a, the tubes 9a-9b and the spindles 10 or 10a, is then seized by other yarn feed rollers of adjustable speed with respect to the speed of the feed rollers 15 and 15a to permit adjustment of the tension of the yarn in the U-shaped tube; these feed rollers are, for example, the feed rollers 3 and 3a which have already been mentioned above and through which the yarn 1 or 1a is then directed into the reheating tubes 2 and 2a respectively, to lose a part of its elasticity.

It will be noted that the invention is applicable to texturization machines in general, for example to a machine which effects a texturization by false twist without reheating, provided that the yarn, before arriving at the false twist spindle, descends along an at least approximately vertical heating path in order to use its own weight to the advantage of its progression along this path.

It will also be noted that if the traction exerted on the yarn in the cooling branch 9b of the tube by its weight is directed in the opposite direction to the direction of the progression of the yarn which moves upwardly in this tube, it is practically without importance, since the yarn, already cooled and continuing to cool in the branch 9b of the tube, will be less and less sensitive to the tension progressively as it moves upward in this branch 9b, which tension, at the same time, increases during this same upward movement with the weight of the yarn itself which hangs vertically.

If appropriate, there can be provided, between the feed rollers 4 and 4a and the take-up packages 11 and 11a for the yarns, other feed rollers 12 and 12a whose speed is adjustable with respect to the speed of the feed rollers 4 and 4a and which possibly permit the stretching of the yarns which have just been set, in order, in particular, to increase their inflation capacity before take-up and to obtain very soft take-up packages 11 or 11a, for example for sending them for dyeing.

The machine, according to the invention, can be very small with respect to its output.

The yarn take-up packages 11 and 11a are distributed along its entire height, on each side of the common heating block, which permits these take-up packages to be given large dimensions, each package being able to take up 4 to 5 kilograms of yarn; hence the productivity can be increased and the amount of labour reduced.

Advantageously, there are added to the machine external supplies in which are disposed the cops 12 and 12a of the yarns intended to be textured, while providing a corridor 13, 13a between the supplies and each side of the machine for the passage of the operators.

These cops 12 or 12a can be coupled in pairs, so as to ensure a continuous supply to each yarn path.

Assuming that the height of the corridor 13 or 13a, between the ground 14 and the yarn 1 or 1a passing above this corridor between the exterior supplies of the machine, is about 2.20 meters (a distance which it can hardly exceed if it is desired to leave the path travelled by the yarn within easy reach of the operator), the path of the treatment between the first feed roller 15 or 15a, through which the yarn passes before passing through the tube 9a, 9b, the false twist spindle 10 or 10a, the second feed roller 3 or 3a, the second tube 2 or 2a, the third feed roller 4 or 4a, to arrive finally at the fourth feed roller 12 or 12a, is of the order of 5 meters, hence much greater than in most of the traditional machines, which, with long setting paths, permits full use to be made of the false twist spindles 10 and 10a rotating at very high speed.

Furthermore, there can be added to the machine suction or blowing ramps 16 and 17 which cover, on the casing 8 of the heating block, the inlet and outlet orifices of the tubes 2, 2a and 9a and which the yarns, entering or leaving these tubes, pass through via small orifices provided for this purpose; these ramps 16 and 17 can function either both in suction or one in suction and the other in blowing, so as to eliminate any textile oil vapour released by the yarns in the heating tubes 2, 2a and 9a.

The branches 9a of the U-shaped tubes can comprise orifices, not shown, in the region in which they pass through the ramp 17, and it can be arranged that the hot air circulates between the ramps 16 and 17 more or less in closed circuit, in order to decrease the energy consumption of the heating block, this air being purified by filtering of all dirt, and in particular, of all textile oil vapour, between its suction into one of the ramps and its reinjection into the other.

The union of three heat insulated metallic blocks 5, 5a and 5b, enclosed in the same casing 8, permits a considerable economy of electricity since the heat losses are analogous to the losses with a single metallic block.

Although the present invention has been described with specific reference to one particular embodiment, it is clear that the invention should not be limited to that embodiment, since various modifications and changes are possible without departing from the spirit or scope of the invention.

What I claim is:

1. Machine for the texturization of a plurality of thermoplastic yarns, comprising:

a plurality of U-shaped tubes each having two vertical branches joined together at their bottom, one branch of each U-shaped tube being aligned in a vertical plane common to all said one branches, and

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the other branches of said U-shaped tubes being staggered out of said plane, alternately on one side and on the other side of said plane, each said one branch forming a heating path for a yarn,

a common heating block for said heating paths comprising a vertically oriented metallic plate having electric heating elements, said metallic plate and its heating elements being disposed in a heat insulator disposed in a casing,

each said one branch passing vertically through the entire height of said metallic plate and through said casing, whereas the remainder of each said U-shaped tube passes around a part of the bottom and passes upward laterally of said block at the exterior of said casing of said block, each said other branch forming a cooling path for said yarn downstream of the heating path formed by each said one branch, first feed means, disposed upstream of said heating paths, for feeding said yarns into the top of said heating paths, and

second feed means, disposed downstream of said heating paths, and downstream of said cooling paths, for feeding said yarns out of the bottom of said heating paths, said first feed means being adapted to feed said yarns into the top of said heating paths at a speed from 20% to 60% greater than the speed at which said second feed means feed said yarns out of the bottom of said heating paths, whereby said yarns descend down said heating paths under a controlled, limited tension.

2. Machine according to claim 1, wherein said heating block contains, in addition to said heated, vertically oriented, metallic plate through the entire height of which passes each said one branch of said U-shaped tubes, two other vertically oriented metallic plates, disposed one on each side of said first-mentioned metallic plate, and separately heated by separate heating means including electric heating elements, said two other metallic plates having rectilinear tubes passing through their entire

height, each of said rectilinear tubes opening on the upper face and on the lower face of said heating block, in the interval between two neighbouring U-shaped tubes, feed means being provided for feeding said yarn successively downward through said one branch of a U-shaped tube, upward through said other branch of said U-shaped tube, and downward through said rectilinear tube, said one branches and said rectilinear tubes forming heating paths for said yarn and said other branches forming cooling paths for said yarn.

3. Machine according to claim 2 including, for each yarn, a false twist spindle through which the yarn passes after passing upward through said cooling path and before passing downward through said rectilinear tube forming said heating path, said machine also including, for making each yarn travel first through said one branch of a U-shaped tube, then, successively, through said other branch of said U-shaped tube, through a false twist spindle, and through a rectilinear tube, at least three yarn feed rollers adapted to give the yarn different respective speeds, the first of said feed rollers being located upstream of said one branch, the second of said feed rollers being located downstream of said false twist spindle and upstream of said rectilinear tube, and the third of said feed rollers being located downstream of said rectilinear tube.

4. Machine according to claim 1, wherein at least one of said two feed means is adjustable in respect of its feeding speed.

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