

RESERVE COPY

AMENDED SPECIFICATION

Reprinted as amended in accordance with the Decision of the Superintending Examiner acting for the Comptroller General dated the sixteenth day of June, 1969, under Section 14 of the Patents Act, 1949.

PATENT SPECIFICATION

NO DRAWINGS

Inventors: MARIO NAVA and WALTER RUFFINI

Date of filing Complete Specification: 10 April, 1958.

Date of Application (No. 1247/57): 12 Jan., 1957.

Complete Specification Published: 8 Nov., 1961.



Index at acceptance:—120(3), G3 H1 (B:D)

International Classification:—D 02 d. D 06 h

COMPLETE SPECIFICATION

Improvements in and relating to methods for making Modified False Twist Crimped Bulked Yarns

We, IMPERIAL CHEMICAL INDUSTRIES LIMITED, a British Company, of Imperial Chemical House, Millbank, London, S.W.1, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a modified false-twist crimped bulked yarn and its manufacture.

Bulked filament yarn may be made in many ways. For example, it is known to make bulked filament yarn by twisting a filament yarn, setting the twist in the filaments, e.g. by heating, and then untwisting the yarn. By this process the individual filaments which are originally substantially straight become deformed and this imparts the bulk to the yarn. Such yarns can be called twist crimped bulked yarns. Commercially the twisting and untwisting is now most commonly done on the run by false twisting and twist crimped bulked yarns made using a false twisting step are hereinafter described as "false twist bulked yarns".

In comparison with wool and cotton yarns, false twist bulked yarns shrink to an excessive degree when subjected to hot wet conditions, e.g. hot water or steam. When making garments or fabrics from these bulked yarns it is common practice to knit or weave them to much larger dimensions and with much looser stitches than are required in the finished article. The garment or article is then caused to shrink to a controlled degree, e.g. by scouring at 60°C. This shrinkage of the bulked yarn is necessary to obtain the degree of bulk required

to give to the garment or fabric good textile characteristics. To obtain a shrunken garment or fabric in which the yarn has the optimum textile characteristics and which has the correct final dimensions needs considerable care. If the garment or fabric is shrunk insufficiently the necessary bulk will not be obtained in the yarn while if it is over shrunk a garment or fabric with a harsh consolidated handle will be obtained. Thus the process is one which must be controlled carefully. After the scouring process the garment or fabric is usually heat set by means of a heat treatment to confer on it dimensional stability during subsequent use.

When making garments or fabrics from cotton or wool the process is much simpler and less liable to error. As the garments or fabrics do not shrink greatly, e.g. 5%, they are knitted or woven to a size very near to the final size required. They are usually given a scouring treatment to ensure that all parts of the garment or fabric are subjected to uniform conditions and shrunk evenly. A heat setting process is not usually required.

Most of the machinery used for knitting and weaving was originally intended for use with wool and cotton yarns. While it is possible with some machinery to make the large allowances needed when knitting or weaving garments or fabrics from false twist bulked yarns, it is an added complication in the manufacturing process and one which can easily lead to errors. Furthermore, when using circular knitting machines some restriction is placed on the type of product which can be made, because the size of garment or fabric which can be knitted is limited by the size of

the machine. With false twist bulked yarn the knitted product may not be big enough to allow for the high shrinkage which takes place in the scouring process and still arrive at the required finished dimensions.

A disadvantage of bulked yarn made by the false twist process is that singles yarn is not free from torque and tend to snarl and twist which results in difficulty in processing and leads to objectionable characteristics in fabrics produced from them. Because of this they are commonly used only in the form of doubled yarn. A further disadvantage of these yarns is that when quite low tensions are applied to them, e.g. by extending them by hand, the strains imposed during the false twisting and heating steps used in their manufacture seem to be released and they contract so much as 50% of their original length. In this condition the yarn has a high degree of elasticity and as such is very sensitive to tension variations, such as may occur either in knitting or weaving operations and this clearly makes the production of regular and even knitted and woven structures very difficult.

The object of our invention is to provide a false twist crimped bulked singles yarn free from the aforementioned disadvantages with regard to knitting and weaving and which does not need to be shrunk in garment or fabric form to bring out the inherent crimp, i.e. a stabilised yarn.

According to the present invention we provide a process for making a modified false-twist-crimped bulked yarn which is free from torque in the singles form and which is in a stabilised condition wherein false-twist-crimped yarn which has been subjected to heat treatment during its production passes to a nip-roll system which grips the yarn and forwards it directly from the nip of the said nip roll system to wind-up means, the yarn being wound up at a lower rate than that of the forwarding nip-roll system and thus subjected to a controlled degree of relaxation between said nip-roll system and said wind-up means, and is then subjected in the said controlled relaxed condition to a heat setting treatment. Bulked yarn made by the process may be made of any synthetic filaments such as nylon, Perlon (Registered trade mark) or the like.

In a preferred modification of our invention the relaxing treatment is a continuation of one of the known processes for making false twist bulked yarn, wherein the yarn is fed from the false twisting machine to a wind-up mechanism which winds it on to a package at a linear speed which is a fixed amount less than the linear speed of the yarn from the false twisting machine. The yarn is then subjected to a heat setting treatment which preferably takes place while the yarn is still on the package. While any known heat setting method may be used we prefer to use treatment with steam. Steam ovens operating at 30—40 lb. gauge pressure

are commonly used by the trade and one of these serves very well for heat setting, in the process of our invention.

The apparatus used for operating the process of our invention comprises a yarn forwarding means in the form of a set of nip-rolls, which forward false twist bulked yarn to a wind-up device which winds the yarn onto a package at a linear speed which is a fixed amount less than the linear speed of the yarn coming from the yarn forwarding means and means for subjecting the yarn, or the package to a heat setting treatment. This apparatus may be separate from the machine on which the false twist bulked yarn is made, but in a preferred form of our invention the forwarding rolls and wind-up means are made part of the false twist machine. In this connection we have found that false twisting machines operating on the up-twisting principle are most suited to this modification.

The yarn forwarding means used in a simple form of our invention is the roll system of a false twisting machine which takes the yarn from the false twister.

In a particular form of our invention when the false twist bulked yarn is made on a false twisting machine operating on the up-twister principle, the roll system of the false twisting machine which takes the yarn from the false twister is a set of nip rolls and the wind-up means is positioned substantially vertically above the nip of the nip-roll system so that the yarn leaves the nip travelling in a substantially vertical path. To obtain the necessary grip of the yarn between the nip rolls it is preferred that one of the nip rollers has an attendant skewed idler roll and the nip rolls are positioned so that yarn enters one side of the nip, makes one or two more turns round the nip roll and its attendant idler roll and leaves from the other side of the nip. As with a false twisting machine operating on the up-twister principle the yarn comes to the nip in a substantially vertical direction, this means that the yarn can travel vertically to the nip rolls and vertically from them to the wind-up device.

The wind-up device may be any of those commonly used in the art. Conveniently it may consist of a yarn package support such as a tube, which is driven in a horizontal plane by frictional contact with a driven roll and onto which the yarn is laid by a traverse mechanism.

In making bulked yarn on a false twister the simplest way is to pass an untwisted yarn into the false twister but for ease of handling some twist is sometimes put into the yarn before it enters the false twister. For example, a 30 denier nylon yarn with 600 turns per metre of "Z" twist was made into a false twist bulked yarn using a false twister designed to impart 4,000 turns per metre. This false twist bulked yarn was relaxed by feeding it

70

75

80

85

90

95

100

105

110

115

120

125

130

5

10

15

20

25

30

35

40

45

50

55

60

tr
th
pc
fc

from the nip rolls of the false twisting machine to a traverse mechanism directly above, which laid the relaxed yarn on a tube driven by the roller. The relaxed yarn was then heat set by placing the yarn on the tube, in steam oven operating at 30—40 lb. pressure for one hour. As the final product still retained the "Z" twist originally imported, it was given a back twist of 560 turns per metre so that the yarn was left with a final low twist of 40 turns per metre "Z". The product was a bulky yarn which was elastic over a small extension and showed no tendency to snarl or twist, i.e. it was free from torque.

Although the yarn referred to above contained an initial twist this is not in any way essential but merely serves to illustrate one way in which the modified false-twist-crimped bulked yarn of our invention can be made.

WHAT WE CLAIM IS:—

1. A process for making a modified false-twist-crimped bulked yarn which is free from torque in the singles form and which is in a stabilised condition wherein a false-twist-crimped yarn which has been subjected to heat-treatment during its production passes to a nip-roll system which grips the yarn and forwards it directly from the nip of said nip-roll system to wind-up means, the yarn being wound up at a lower rate than that of the forwarding nip-roll system and thus subjected to a controlled degree of relaxation between said nip-roll system and said wind-up means, and is then subjected in the said controlled relaxed condition to a heat-setting treatment.

2. A process according to claim 1, wherein the false-twist-crimped yarn is produced on an up-twister and is fed in a substantially vertical direction from the nip of the nip-roll system.

3. A process according to claim 1 or claim 2, wherein the relaxed yarn is wound up and subjected to said heat-setting treatment while the yarn is on the package.

4. A process according to any one of the preceding claims, wherein the heat-setting treatment carried out with steam.

5. A process for making a modified false-

twist-crimped bulked yarn which is free from torque in the singles form and which is in a stabilised condition, substantially as hereinbefore described.

6. A modified false-twist-crimped bulked yarn which is free from torque in the singles form and is in a stabilised condition made from a synthetic filamentary material such as nylon, Perlon (Registered Trade Mark) or the like.

7. Apparatus for modifying a false-twist-crimped bulked yarn comprising yarn forwarding means, wind-up means and heat treatment means, said yarn forwarding means having a set of nip rolls arranged in operation to forward the false-twist-crimped yarn directly from the nip to the wind-up means which are adapted to wind the yarn on to a package at a linear speed which is a fixed amount less than the linear speed of the yarn coming from the yarn forwarding means, said heat treatment means being arranged for subjecting the yarn on the package to a heat setting treatment.

8. Apparatus according to claim 7, wherein the wind-up means is located above the yarn forwarding means so that in operation yarn is forwarded upwards from the nip to the wind-up means in a substantially vertical direction.

9. Apparatus according to claim 8, wherein one of the nip rollers has an attendant skewed idler roller and the nip rolls are positioned so that the yarn enters one side of the nip, makes one or more turns round one of the nip rolls and its attendant idler roll and leaves the other side of the nip to go to the wind-up device.

10. Apparatus according to any one of the claims 7 to 9, wherein the wind-up means comprises a traverse mechanism which lays the yarn on a package such as a tube, rotating in a horizontal plane and driven by frictional contact with a driving roll.

11. Apparatus for making a modified false-twist-crimped bulked yarn, substantially as hereinbefore described.

ALFRED O. BALL, *Agent for the Applicants.*

PROVISIONAL SPECIFICATION

Improvements in and relating to methods of Treating Synthetic Yarns and to Yarns obtained thereby

We, IMPERIAL CHEMICAL INDUSTRIES LIMITED, a British Company, of Imperial Chemical House, Millbank, London, S.W.1, do hereby declare this invention to be described in the following statement:—

This invention has reference to methods of treating synthetic yarns and to yarns obtained thereby, and has for its object to provide improvements in such methods whereby the performance of the method is simplified and made

more exact and reliable, and cheaper and better results are obtained.

The final products aimed at by this invention is an elastic or crimped single yarn in a shrunk, stabilised condition, which can be used in the manufacture of various articles, of which stockings may be considered as one example.

In making crimped yarn, the usual process is to double and twist two threads together, one thread having a "Z" crimp and the other



from the nip rolls of the false twisting machine to a traverse mechanism directly above, which laid the relaxed yarn on a tube driven by the roller. The relaxed yarn was then heat set by placing the yarn on the tube, in steam oven operating at 30—40 lb. pressure for one hour. As the final product still retained the "Z" twist originally imported, it was given a back twist of 560 turns per metre so that the yarn was left with a final low twist of 40 turns per metre "Z". The product was a bulky yarn which was elastic over a small extension and showed no tendency to snarl or twist, i.e. it was free from torque.

Although the yarn referred to above contained an initial twist this is not in any way essential but merely serves to illustrate one way in which the modified false-twist-crimped bulked yarn of our invention can be made.

WHAT WE CLAIM IS:—

1. A process for making a modified false-twist-crimped bulked yarn which is free from torque in the singles form and which is in a stabilised condition wherein a false-twist-crimped yarn which has been subjected to heat-treatment during its production passes to a nip-roll system which grips the yarn and forwards it directly from the nip of said nip-roll system to wind-up means, the yarn being wound up at a lower rate than that of the forwarding nip-roll system and thus subjected to a controlled degree of relaxation between said nip-roll system and said wind-up means, and is then subjected in the said controlled relaxed condition to a heat-setting treatment.

2. A process according to claim 1, wherein the false-twist-crimped yarn is produced on an up-twister and is fed in a substantially vertical direction from the nip of the nip-roll system.

3. A process according to claim 1 or claim 2, wherein the relaxed yarn is wound up and subjected to said heat-setting treatment while the yarn is on the package.

4. A process according to any one of the preceding claims, wherein the heat-setting treatment carried out with steam.

5. A process for making a modified false-

twist-crimped bulked yarn which is free from torque in the singles form and which is in a stabilised condition, substantially as hereinbefore described.

6. A modified false-twist-crimped bulked yarn which is free from torque in the singles form and is in a stabilised condition made from a synthetic filamentary material such as nylon, Perlon (Registered Trade Mark) or the like.

7. Apparatus for modifying a false-twist-crimped bulked yarn comprising yarn forwarding means, wind-up means and heat treatment means, said yarn forwarding means having a set of nip rolls arranged in operation to forward the false-twist-crimped yarn directly from the nip to the wind-up means which are adapted to wind the yarn on to a package at a linear speed which is a fixed amount less than the linear speed of the yarn coming from the yarn forwarding means, said heat treatment means being arranged for subjecting the yarn on the package to a heat setting treatment.

8. Apparatus according to claim 7, wherein the wind-up means is located above the yarn forwarding means so that in operation yarn is forwarded upwards from the nip to the wind-up means in a substantially vertical direction.

9. Apparatus according to claim 8, wherein one of the nip rollers has an attendant skewed idler roller and the nip rolls are positioned so that the yarn enters one side of the nip, makes one or more turns round one of the nip rolls and its attendant idler roll and leaves the other side of the nip to go to the wind-up device.

10. Apparatus according to any one of the claims 7 to 9, wherein the wind-up means comprises a traverse mechanism which lays the yarn on a package such as a tube, rotating in a horizontal plane and driven by frictional contact with a driving roll.

11. Apparatus for making a modified false-twist-crimped bulked yarn, substantially as hereinbefore described.

ALFRED O. BALL,
Agent for the Applicants.

PROVISIONAL SPECIFICATION

Improvements in and relating to methods of Treating Synthetic Yarns and to Yarns obtained thereby

95 We, IMPERIAL CHEMICAL INDUSTRIES LIMITED, a British Company, of Imperial Chemical House, Millbank, London, S.W.1, do hereby declare this invention to be described in the following statement:—

100 This invention has reference to methods of treating synthetic yarns and to yarns obtained thereby, and has for its object to provide improvements in such methods whereby the performance of the method is simplified and made

more exact and reliable, and cheaper and better results are obtained.

The final products aimed at by this invention is an elastic or crimped single yarn in a shrunk, stabilised condition, which can be used in the manufacture of various articles, of which stockings may be considered as one example.

In making crimped yarn, the usual process is to double and twist two threads together, one thread having a "Z" crimp and the other



an "S" crimp, the twists in opposite directions thus supporting one another and balancing the torque. This doubling had been found necessary as a single thread crimped in a "Z" or "S" direction will possess a torque which will produce a fabric, when knitting up, which is distorted and tends to twist in a "Z" or "S" direction according to the torque in the yarn used.

It will, however, be understood that if a single thread yarn can be made possessing the crimp, but without the torque, it will be a great advantage as it will be half the thickness of a double yarn and much finer fabric can be made from it than from a double yarn.

The present invention provides a method of treating synthetic threads to produce crimped yarns wherein the thread is first twisted in one direction, is fixed or stabilised by heat and subsequently twisted in the opposite direction, the number of turns in each direction being equal or approximately so, the yarn then being allowed to relax under controlled conditions in a continuous operation on a machine on which the relaxed yarn is wound into a package, the relaxed yarn being heat stabilised a second time and again twisted if necessary as many times as desired.

In carrying out the invention in one way, a synthetic thread of Nylon, Perlon or the like of 30 denier in parallel condition is "S" or "Z" twisted a number of turns, say 3000 per metre and is stabilised by heat treatment at 100°C. The yarn is then twisted in the opposite direction at from 3,400 to 3,800 per metre, whereby the yarn is given, in this instance, from 400 to 800 turns in the opposite direction.

The yarn is now wound into a cheese or other package and is mounted on a machine from which it is taken upwards to a pair of nip rollers arranged substantially side-by-side but with the driving roller slightly below the driven roller. These rollers are so arranged that their point of nip is in a vertical line of the travel of the yarn, which is thus brought into the nip behind the front roller and is passed as many times as may be necessary round the front roller and over guide fingers to prevent fouling of the turns and finally leaves the nip in a direction which is substantially vertical, but if not vertical is not inclined toward the front roller round which it has been wound.

Above the nip rollers is a tube or the like horizontally mounted on which the yarn is laid in a well known way by a traverse mechanism, and this tube is rotated more slowly than is the front roller of the nip rollers so that the yarn is overfed and allowed to relax between the nip rollers and the package above. One of the reasons why the yarn leaving the nip rollers must not be inclined toward the front roller of the nip rollers is to ensure that the relaxed yarn will not be caught on the front roller it has just left, another reason is to reduce as much as possible the danger of generating static electricity.

The relaxed yarn is subjected to a second fixing or stabilising operation at a temperature higher than that formerly used and, say at 130°C. and is then twisted in the same direction as the first twisting at, say, 400—800 turns per metre or approximately equal to the difference between the number of turns in the first and second twisting. A yarn treated in this way can be elongated but is stable and does not possess a torque.

In applying the method in another way and when dealing with a 30 denier Nylon yarn in a parallel state, the yarn is given, say, 600 turns per metre of "Z" twist by a normal twisting method as in an up-twisting machine from a cheese, and from this cheese the yarn is passed through a false twisting operation crimping 4000 turns per metre "S" twist at a temperature of 290°F. and then is relaxed as already described, which operation can be done on the false twisting machine modified to effect the relaxing. The yarn is then stabilised in the relaxed state by steam pressure of 30 lbs. per square inch for one hour, and after leaving for 24 hours the operation of heating and leaving is repeated. The yarn is then wound into cheeses on bobbins in an "S" direction and is given a back twist of 520 or 560 turns per metre so that the final twist in the yarn is from 40 to 80 turns per metre "Z" twist.

It is to be understood that the figures given herein are by way of example and that other twists and temperatures and periods of treatment may be used according to requirements.

For the Applicants,
BARLOW, GILLET & PERCIVAL,
 Chartered Patent Agents,
 6, St. Ann's Passage, King Street,
 Manchester, 2.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1969.
 Published by the Patent Office, 25 Southampton Buildings, London, W.C.2, from which copies may be obtained.



881,729

L
Cde
w
ar
fo
bytw
tu
wa
fil
tir
an
th
su
thca
Co
no
tw
usi
scrfal
de
e.g
me
coi
mi
stri
Th
to
60
net

[P]