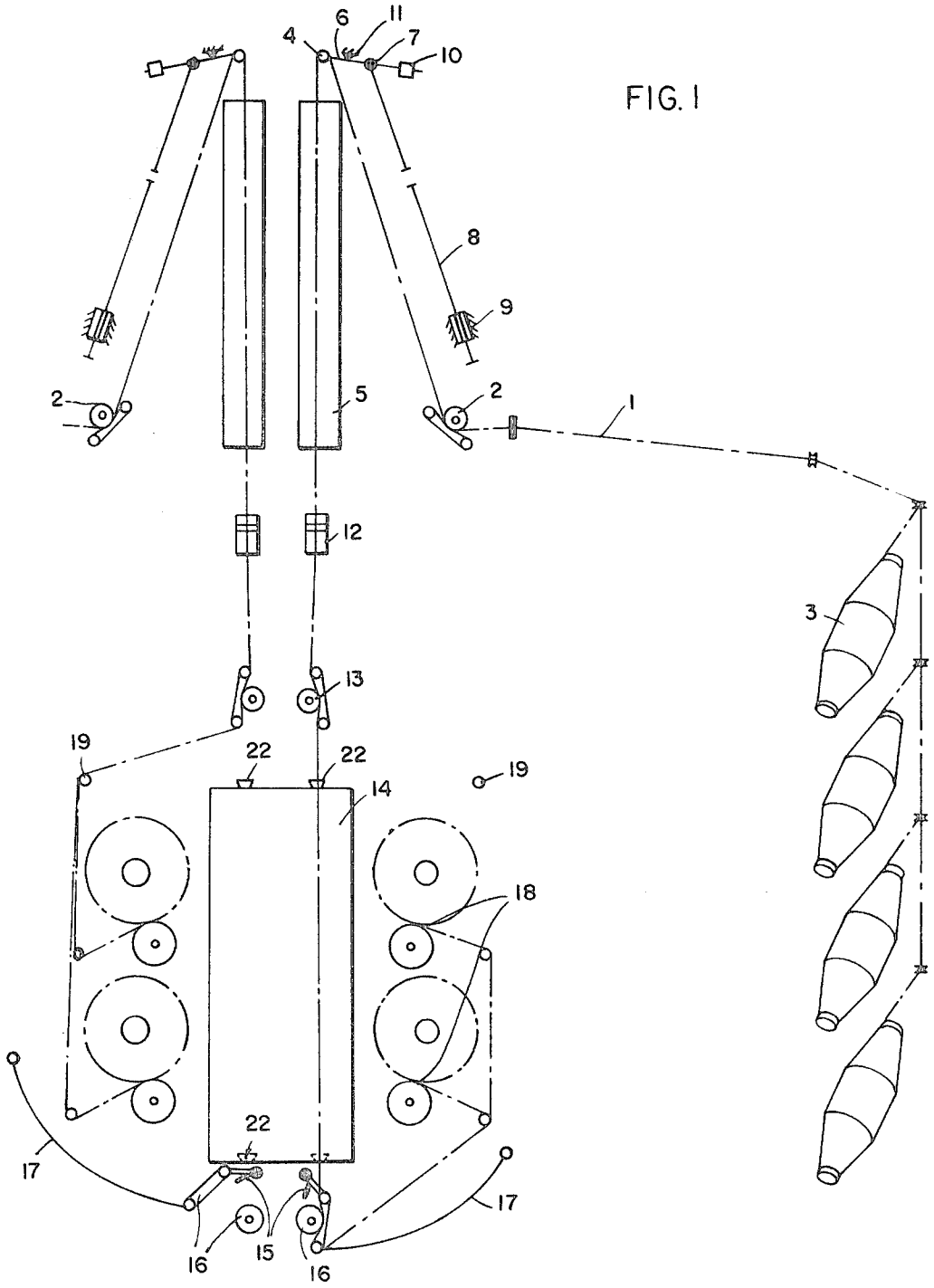
Oct. 12, 1971 H. KUBLER ET AL 3,611,692

FALSE TWIST CRIMPING APPARATUS

Filed July 18, 1969 2 Sheets-Sheet 1

FIG. 1



INVENTORS:
HERMANN KUBLER
HEINZ TREPTOW

BY: Johnston, Root, O'Keeffe, Keil, Thompson & Shurtleff
ATT'YS

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FIG. 7

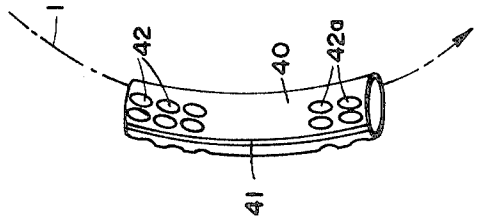


FIG. 6

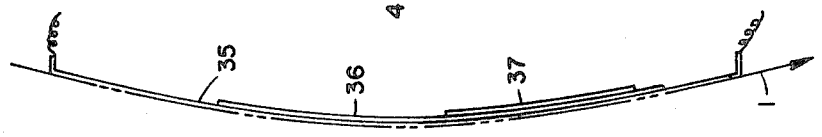


FIG. 5

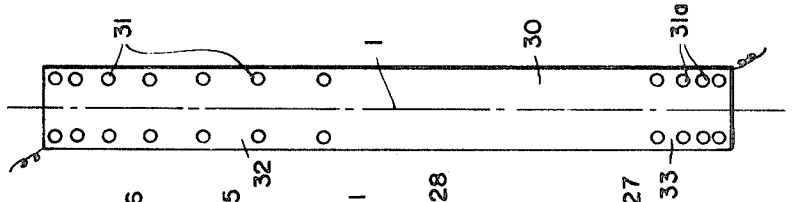


FIG. 3

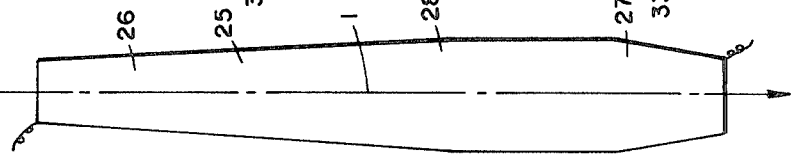
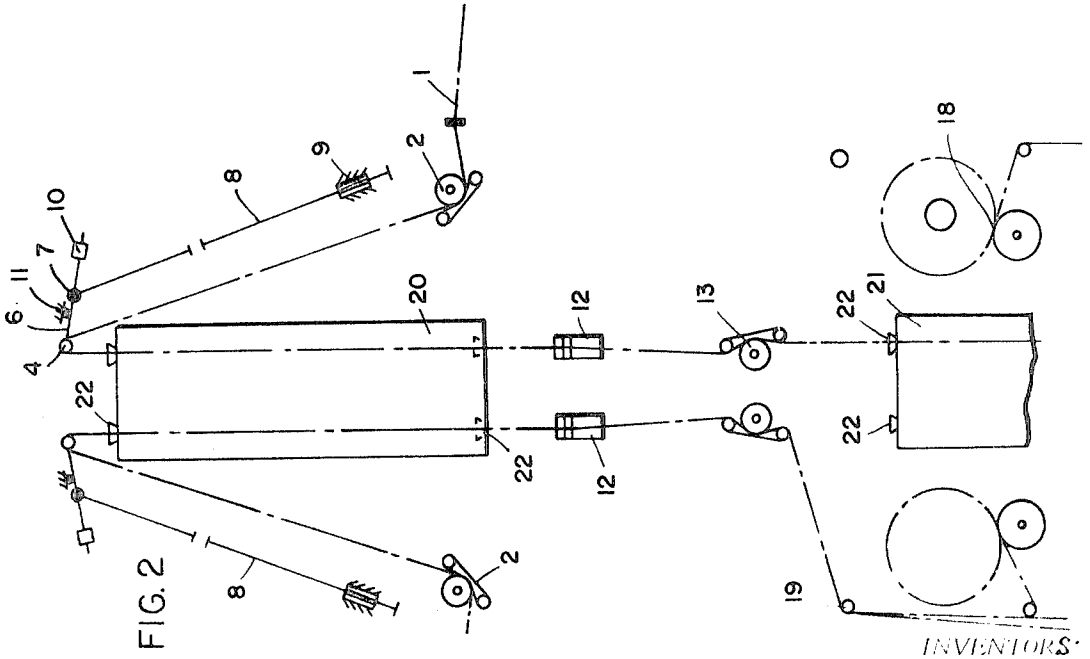


FIG. 4

FIG. 2



INVENTORS:
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BY: Johnston, Root, O'Keeffe, Keil, Thompson & Shurtleff
ATT'YS

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FALSE TWIST CRIMPING APPARATUS

Hermann Kubler, Remscheid-Lennep, and Heinz Treptow, Ennepetal-Milspe, Germany, assignors to Barmag Barmer Maschinenfabrik Aktiengesellschaft, Wuppertal, Germany

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Int. Cl. D02g 1/02; D02j 13/00; D01h 7/92
U.S. Cl. 57—34 14 Claims

ABSTRACT OF THE DISCLOSURE

False twist crimping device for yarns, including filamentary materials such as those made of artificial fibers, comprising false twist units, first and second yarn-heating devices preceding and following each unit, winding devices disposed after the false twist units and adjacent the second heating device with optional second heating device by-pass, and yarn delivery means arranged laterally adjacent to or on the machine.

It has repeatedly been proposed, in connection with the false twist crimping of thermoplastic yarns, to heat the yarn intensively before and/or during and/or after the twisting has occurred, for the purpose of fixing the crimp and for post-fixing treatment during reduction of the high crimping elongation produced in the yarn structure. See for example U.S. Pats. Nos. 3,091,912; 2,803,105 and 2,803,108. Initially these steps were effected only discontinuously, and the crimped yarn first of all obtained was subjected to a further heating operation, for example in a steam oven, in a separate working step. As a part of the effort to achieve more intensive production, attempts have been made to perform the various treatments in a single working step. There have been proposed, for the continuous carrying out of all these treatments, devices wherein the yarn travels through a heating zone before and after the false twister and is subsequently formed, as stretch-poor crimped yarn, into a lap or package form advantageous for further processing. The heating device used before the false twister has preferably been an electrical resistance heater over which the yarn travels in contact with a preferably convexly curved heating face. Such heating devices have found wide acceptance and the same devices have now also been employed for postfixing after the false twister, for continuous production of set yarn.

False twist units have recently been improved to such an extent that, in practice, they may quite readily be run at velocities of 500,000 r.p.m., thus permitting a considerable acceleration of the throughtravel in the yarn structures to be crimped. This has necessarily resulted in lengthening of the hitherto conventional heating zones before and after the false twister, so as to ensure the necessary degree of heating.

Such yarn twisting machines having a large number of closely juxtaposed processing sections have a considerable overall height, if yarn guiding is to be clear and neat. For this reason, they may be operated only with difficulty especially before and during starting up of the machine. For this reason, it has already been proposed to arrange the heating zones side by side, or to arrange them one behind the other before and after the false twister, at the same height (cf., U.S. Pat. No. 3,077,724), or to replace them by a single common heating device over which the yarn travels downwardly once before the false twist unit, and over which it passed, in the opposite direction, after the false twist unit.

DESCRIPTION OF THE INVENTION

More accurate examination of the achievable crimp quality has shown that, for the production of bulky, high quality crimped yarns which at the same time are not readily stretched, it is most important that the travelling yarn should be treated as gently as possible in the second heating zone after passing the false twister. The yarn should be subjected, to a heat-controlled, completely contact-free shrinking and fixing process before the winding proper. Any contact between the crimped yarn and the second heating means has a detrimental influence on the crimp quality. On the other hand, the yarn fed in from the delivery points may be heated in any desired manner, before the false twister, within the first heating zone, for example by means of contact heating, in order to set the twist.

It is therefore the primary object of the invention to make possible gentle, contact-free processing of the crimped yarn after the false twist unit in the second heating zone while, at the same time, constructing heating zone so that it takes up the smallest possible amount of space. A device for this purpose should be capable of being used selectively for the manufacture of highly elastic or relatively inelastic crimped yarns. In addition such a device should be clearly and neatly arranged, and simple to operate especially in comparison with known devices of the type described above.

Accordingly, the invention provides a false twist crimping device for synthetic yarns, the device comprising a first heating device; a false twist unit arranged after the first heating device in the path of yarn travel; yarn delivery means arranged after the false twist unit; a second heating device arranged after the yarn delivery means, adapted to heat the yarn substantially only by convection, and having enclosing walls defining an internal chamber; a multiplicity of yarn inlets in an end wall of the second heating device; a multiplicity of yarn outlets provided in an opposite end wall of the second heating device; and means for guiding a multiplicity of crimped yarns simultaneously through the internal chamber without contacting one another and in spaced relationship to the side walls of the second heating device.

The expression "a multiplicity" is to be understood in the context of the present invention to mean a number considerably greater than two. Thus, for example, the filaments from fifteen or more juxtaposed false twist units can be guided through a single yarn-heating chamber. It is also possible to bring together the filaments of two oppositely arranged rows consisting respectively of fifteen or more false twist units in each case and to guide them, while keeping an adequately large spacing between them so as to avoid mutual contact, separately through a single heating chamber.

The use of a common heating box or chamber for a plurality of yarns, instead of the hitherto conventional narrow heating tubes for at most two filaments results in a considerable improvement in the prevention of undesirable contact both between the yarns themselves and also between the yarns and the walls of the heating devices. At the same time there results an arrangement which is compact as regards the heating devices, but which nevertheless provides a large amount of space for the individual yarns.

Preferably the heating device connected before the false twist unit is an electrical resistance heater through or over which the filaments can travel, individually or in groups, and which preferably has either a varying cross section or a varying heating output along the filament travel path.

Embodiments of and the special advantages afforded by a resistance heater are described in detail in our French Pat. No. 1,516,505, corresponding to the U.S. application

Ser. No. 621,566, filed Mar. 8, 1967, issued as U.S. Pat. No. 3,506,804 on Apr. 14, 1970.

In a further preferred embodiment of the device according to the invention, the first heating device is adapted to heat the yarn substantially only by convection and has enclosing walls defining an internal chamber, means for simultaneously guiding a multiplicity, as herein defined, of filaments, through the chamber, and a multiplicity of yarn inlet and outlet apertures.

The expression "heating substantially only by convection" is, in the present context intended to indicate that the heat transfer between the walls and the yarns is effected not by contact, only to a negligibly small degree by radiation and mainly by convection, i.e., by means of a gaseous medium contained within the heating box.

The heating of the heating box may be effected directly or indirectly, for example by means of electrical resistance elements.

Although the ratio of the lengths of the heating zones before and after the false twist unit may vary within wide limits, depending on the temperatures employed, it has been found to be expedient, in the case of substantially uniform temperatures in the two heating sections, that the second heating zone through which the yarn travels after the false twist unit should be from 60% to 80% of the length of the first heating section preceding the false twist unit.

The introduction of the individual filaments into the yarn inlet or outlet apertures of the heating box may for example be effected by an arrangement whereby the heating box is hinged and is re-closed after introduction of the yarns. In the case of extremely long heating boxes however, e.g., where more than 20 or 30 filaments are being simultaneously guided, this solution cannot be employed or can be employed only with the accompaniment of very considerable spatial difficulties.

Preferably, therefore, the yarn inlet and yarn outlet apertures in the horizontal walls of the heating box are in the form of funnels whose largest diameter is greater than the smallest diameter through which a threading weight secured to the filament would be able to pass without any great hindrance. Preferably the weight is of spherical shape. The advantage of this special design is discussed in greater detail in the further description of the apparatus.

The embodiments so far described with regard to their individual structural elements and the mode of cooperation between the elements, provide highly satisfactory operation of the machine, and guarantee excellent crimping under appropriate processing conditions.

The use of convection heating within the free space of an essentially closed heating box or chamber makes it possible to heat a multiplicity of filaments completely uniformly. This is achieved without forced circulation of the air circulating in the box, and the filaments travel contact-free through it without any kind of mechanical stressing. Uniformity of heating is further assisted by the rapid travel of the filaments which entrain the hot air and set up not inconsiderable vortices.

The regulation and operational expenditure for convection heating of this kind, in which a multiplicity of filaments is simultaneously heated, is extremely small as compared with conventional individual or double filament heating systems, since only a fraction of the control devices is required. For example 30 or more filaments can be heated simultaneously and in common, and the heating thereof regulated in common. Conventional individual or double filament heating tubes rapidly become soiled, and production stoppages can reach an extremely high level due to lengthy cleaning processes which are necessary. By using heating box or chamber according to the invention such stoppages may be reduced to a minimum. Naturally, complete freedom from maintenance is unattainable, due to unavoidable fiber fly deposits, and for this reason either individual parts of the heating box or the heating box as a whole are preferably hinged, so that the necessary cleaning work in the interior can be carried out conveniently and comfortably.

In a further development of the device according to the invention, the two heating devices are adapted to be regulated and used independently of one another device, and a guide means is arranged above each of the winding-on devices to deflect the crimped yarns and by-pass the second heating device.

If, as indicated at the outset, the device is to be converted from one producing double set relatively inelastic yarn to one producing highly elastic yarn which is set only once, the second heating device is shut down and guide means are employed which make it possible to guide crimped yarn directly to the winding-on device.

In order to achieve a package shape and package size of maximum uniformity, it is expedient, where both highly elastic and relatively inelastic yarn are to be produced, to make the yarn travel path lengths between the last delivery mechanism before a winding-on device and the winding-on device itself equal to one another within 35% in every case, and preferably to make them substantially uniform.

The yarn-delivery, linear velocity imparted by the delivery mechanism arranged directly before the second heating device is preferably substantially equal to the linear winding-on velocity at which the crimped yarn is deposited on the winding-on device, and the yarn delivery velocity of the yarn delivery mechanism directly following the second heating device is substantially lower.

In this way, the crimped yarn is able to shrink unhindered during the thermal treatment in the second heating zone, and at the same time the volume of the package does not become excessively large. The yarn wound under tension becomes bulky once again when it is doffed, i.e., it assumes that shape which it possessed on leaving the second heating device. Depending on the adjustment of the percentage of yarn lag in the delivery mechanism after the second heating section, the yarn character required in each specific case may be predetermined in known manner.

If it is desired to achieve an especially high degree of shrinkage and, at the same time, to ensure that the winding-on of the filaments is such as to form an adequately firm package, then the yarn delivery velocity of the delivery mechanism arranged directly before the second heating device is preferably higher than the winding-on velocity at which the crimped yarn is deposited on the winding-on device, whereas the yarn delivery velocity of the yarn delivery mechanism directly after the second heating device is lower than the linear winding-on velocity.

Finally, there may be a travel-over device which is displaceably and/or pivotally arranged before the first heating device to provide vertical adjustment by means of a guided manipulating means and serving to position the filament or filaments travelling to it at overhead level from a yarn-supply creel or the like. At the lower end of the second heating device there may be a baffle plate, adapted to be pivoted into the path of travel of the yarn, inclined at approximately 45° relative to the yarn travel direction and serving as a yarn introduction aid.

Details, in particular of the travel-over device, assisting introduction may be ascertained from our German Utility Model No. 1,958,183.

DESCRIPTION OF THE DRAWINGS

Two preferred embodiments of the invention are shown diagrammatically in the drawings, wherein:

FIG. 1 is an elevational view of a false twist crimping machine having the two heating zones of which only the zone following the false twist unit is designed as a convection heating box or chamber;

FIG. 2 is an elevational view of a similar machine in which the heating zone preceding the false twist unit is also a convection heating box or chamber;

FIG. 3 is a front elevation of an electrical resistance-heated, yarn-heating plate of varying transverse cross section;

FIG. 4 is a side elevation of the yarn-heating plate of FIG. 3;

FIG. 5 is a front elevation of another embodiment of a yarn-heating plate of varying transverse cross section;

FIG. 6 is a side elevation of still another embodiment of a yarn-heating plate of varying transverse cross section; and

FIG. 7 is a perspective view of a tubular form yarn-heating element.

The right-hand half of FIG. 1 and FIG. 2 shows the yarn travel during the manufacture of a relatively inelastic yarn which passes through both heating zones, whereas the left-hand half shows the yarn travel with second heating zone by-pass during the manufacture of a highly elastic yarn.

DESCRIPTION OF ILLUSTRATED EMBODIMENTS

The structure of the machine will now be described further by way of a description of the yarn travel.

Filaments **1** are doffed, from supply bobbins or cops **3** by endless band and drive roller delivery mechanisms **2**, and pass over the so-called service passage above the level of the heads of machine operators. The cops **3** are, in part, reserve cops. They may be doffed individually or simultaneously in groups and travel over a corresponding number of guide points and travel-over rollers **4** into a heating device **5**. Each travel-over roller **4** is rotatably mounted on a two-armed lever **6** connected by a pivot **7** to a vertically displaceable manipulating means **8**. The manipulating means **8** (shown shortened in broken lines) extends sufficiently far into the service passage for it to be readily and conveniently actuated by an operator. The lower end of the manipulating means **8** is displaceably mounted in a stationary fixture **9**. The free arm of the lever **6** carries a small counterweight **10** which may be replaced by any means of storing potential energy. In the upper inoperative position of the manipulating means **8**, the lever arm **6** bears against a stationary stop **11**.

Each heating device **5** (FIG. 1) comprises a heating plate over which the filaments travel in direct contact therewith. In one example, the heating plate is an electrical heating resistance element acting upon a multiplicity of filaments and has its width or thickness so profiled that its electrical resistance varies in a functionally suitable manner along the travel path of the yarn. Such a plate is described in greater detail in our French specification No. 1,516,505 and in our aforesaid U.S. application, as well as below.

Arranged below the heating device **5** are false twist units **12** corresponding in number to the number of filaments. The filaments **1** are withdrawn from the false twist unit **12** by delivery mechanisms **13**, and then travel through (FIG. 1) a contact-free operating heating device **14** which comprises a spacious, essentially closed heating box or chamber. The heat is transferred to the filaments substantially only by convection. A baffle plate **15** and a delivery mechanism **16** corresponding to each of the false twist units are provided beneath the heating device **14**. The endless band thereof and the baffle plate are adapted to be pivoted individually or in groups by means of a hand lever **17**. From the delivery mechanism **16**, the yarn **1** then travels to one of the winding-on devices **18**.

The manipulating means **8** is put into its lower, arresting position to position a filament **1** after the filament **1** has been laid over the roller **4**. The manipulating means **8** is once again pushed into upper inoperative position. When the lever arm **6** contacts the stop **11**, it rotates slightly about the point **7** in a counterclockwise direction. At the same time, the filament **1** comes into direct contact with the heating plate **5**.

After pulling the filament **1** through the false twister **12** and introducing it into the delivery mechanism **13**, a perforated metal ball is secured to a free filament end and allowed to fall through the first yarn inlet passage **22** in the upper wall of the heating box **14**. The ball is guided by the funnel **22** through the yarn outlet passage in the lower wall and the heating box and strikes the baffle plate **15**, which at this stage is in the position shown on the left-hand side of FIGS. 1 and 2. The inclination of the baffle plate **15** relative to the yarn travel path has the effect that the metal ball, with the yarn end knotted thereto, falls forwardly into the service passage. On introduction of the yarn **1** into the delivery mechanism **16**, by actuation of the hand lever **17**, the baffle plate **15** is pivoted out of the yarn travel path into the position shown on the right-hand of FIGS. 1 and 2.

The crimping of the yarn **1** may be effected in a manner such as the following, for example. Twist travelling backwards in the yarn **1** from the false twist unit **12** is fixed or set by the heating device **5**. After twist has once again been imparted to the yarn below the false twist unit **12**, the twisted yarn is guided from the delivery mechanism **13** into the yarn-contact-free heating device **14** in which post-setting, preferably accompanied by simultaneous tension relief, then takes place. The post-setting eliminates torsion stresses set up in the yarn **1** due to the preceding twisting, so that the yarn reaching the bobbin of the winding-on device **18** is a so-called "set" or "dead" yarn.

It has been found in practice that, by heating the yarn **1** with the aid of contact heating means **5** during the first heating step and by contact-free heating during passage through the heating box **14**, a yarn is obtained which is of extremely high quality.

FIGS. 3–6 illustrate embodiments of yarn-heating plates which may be used as the yarn-heating means **5** in FIG. 1. Each of these embodiments comprises a longitudinally bowed heating element or plate of relatively high resistance, which elements are heated upon passage of electrical current therethrough. The surface temperature along the entire length of the heating elements is made more uniform or may be varied within predetermined limits by variation of the transverse cross section of the heating elements. The transverse cross section variations can be obtained by a change in width and/or thickness of the resistor element, or by machining, e.g., drilling holes at predetermined places in the heating plate.

FIGS. 3 and 4 show one embodiment of an electrical resistance heating plate or element **25** of varying transverse cross section. The longitudinally curved heating plate or element is heated by an electric current which passes directly through the element. It is tapered to provide widths which gradually increase at the upper, flaring end **26** and which gradually decrease at the lower, tapered end **27**. Such changes in the width dimension of the heating element or plate **25** provide areas of highest electrical resistance at the opposite longitudinal ends thereof, which electrical resistance gradually dimensions toward the midportion **28**. This configuration of the heating plate or element **25** provides a substantially uniform surface temperature throughout the length thereof and compensates for inherent resistance-heating characteristics in the plate **25** and for uneven heat losses to the atmosphere via radiation and convection from the heating plate **25**.

Change in cross section to vary the electrical resistance of the yarn-heating plate or element may also be provided by using a longitudinally bowed heating plate or element **30** as shown in FIG. 5. The electrical resistance of this plate, which has a uniform width and thickness, is achieved by drilling in the longitudinal edge portions thereof a plurality of holes **31** with progressively increasing spacing between said holes in the upper portion **32** and by drilling additional holes **31***a* in the lower portion **33**. The holes **31***a* are more closely spaced than the holes **31**, and the spacing therebetween gradually dimensions in the downward direction. This arrangement provides a sub-

stantially uniform temperature characteristic similar to that provided by the embodiment of FIGS. 3 and 4.

In still another embodiment, the change in transverse cross section is accomplished by changing the thickness dimension rather than the width dimension of the heating plate or element. In the embodiment of FIG. 6, the heating element is composed of a longitudinally bowed plate **35**, onto the underside of which is solidly joined in electrical conducting relationship a shorter heating plate **36**. The latter in turn has solidly joined therewith in electrical conducting relationship a still shorter heating plate **37**.

The yarn heating element of FIG. 7 is a longitudinally bowed, longitudinal split tube **40**. Yarn is inserted and withdrawn therefrom through the longitudinal slot **41**. The variations in transverse cross section are obtained by drilling or punching holes **42** and **42***a* in the respective end portions in a manner similar to the apertured heating plate shown in FIG. 5.

The embodiment shown in FIG. 2, is similar to that shown in FIG. 1 except that the heating device before the false twist unit **12** is replaced by a heating device having yarn-contact-free convection heating means **20** and is designed in the same manner as a heating box **21** after the false twist unit.

In both FIGS. 1 and 2, the right-hand yarn is shown as passing through the second heating device **14** whereas the left-hand yarn is shown as travelling over the deflecting guide means to by-pass the second heating device. In the latter case, the yarn is wound directly on the take-up spools after leaving the yarn delivery mechanism **13**.

It is thought that the invention and its numerous attendant advantages will be fully understood from the foregoing description, and it is obvious that numerous changes may be made in the form, construction and arrangement of the several parts without departing from the spirit or scope of the invention, or sacrificing any of its attendant advantages, the forms herein disclosed being preferred embodiments for the purpose of illustrating the invention.

The invention is hereby claimed as follows:

1. False twist crimping apparatus for crimping synthetic yarns comprising first yarn-heating means; a false twist unit following said first heating means in the path of yarn travel; yarn delivery means following the false twist unit; second yarn-heating means following said yarn delivery means and adapted to heat the yarn substantially only by convection; said second yarn-heating means having enclosing wall defining a substantially closed, convection-heating chamber; a multiplicity of yarn inlet passages provided in an end wall of the second heating means; a multiplicity of yarn outlet passages provided in an opposite end wall of said second heating device; and means for drawing a multiplicity of yarns simultaneously through said chamber via said passages without contacting one another and in spaced relationship to the walls of the second heating means.

2. Apparatus as claimed in claim **1**, wherein said first heating means is an electrical resistance heater element over which or through which the filaments travel individually or in groups in direct contact with a heated surface.

3. False twist crimping apparatus for crimping synthetic yarns comprising first yarn-heating means; a false twist unit following said first heating means in the path of yarn travel, said first heating means being an electrical resistance heater element over which or through which the filaments travel individually or in groups in direct contact with a heated surface, said heater element varying in transverse cross section along the yarn travel path across said surface; yarn delivery means following the false twist unit; second yarn-heating means following said yarn delivery means and adapted to heat the yarn substantially only by convection; said second yarn-heating means having enclosing walls defining a substantially closed, convection-heating chamber; a multiplicity of yarn inlet passages provided in an end wall of the second heating means; a multiplicity of yarn outlet passages provided in an opposite end wall of said second heating device; and means for drawing a multiplicity of yarns simultaneously through said chamber via said passages without contacting one another and in spaced relationship to the walls of the second heating means.

4. False twist crimping apparatus for crimping synthetic yarns comprising first yarn-heating means; a false twist unit following said first heating means in the path of yarn travel, said first heating means being an electrical resistance heater element over which or through which the filaments travel individually or in groups in direct contact with a heated surface, means to vary the heat output of said heating element in the direction of yarn travel across said surface; yarn delivery means following the false twist unit; second yarn-heating means following said yarn delivery means and adapted to heat the yarn substantially only by convection; said second yarn-heating means having enclosing walls defining a substantially closed, convection-heating chamber; a multiplicity of yarn inlet passages provided in an end wall of the second heating means; a multiplicity of yarn outlet passages provided in an opposite end wall of said second heating device; and means for drawing a multiplicity of yarns simultaneously through said chamber via said passages without contacting one another and in spaced relationship to the walls of the second heating means.

5. Apparatus as claimed in claim **1**, wherein said first heating means is adapted to heat the yarn substantially only by convection and has enclosing walls defining a substantially closed, convection heating chamber having means for simultaneously guiding a multiplicity of yarns through said chamber, and a multiplicity of yarn inlet and outlet passages in opposed end walls of said chamber.

6. Apparatus as claimed in claim **1**, wherein the length of said first heating means is 60% to 80% of the length of said second heating means.

7. Apparatus as claimed in claim **1**, wherein said yarn inlet and yarn outlet passages in at least one of said heating devices are funnel-shaped passages, the diameter of which is in each case great enough to permit passage therethrough of a threading weight secured to the yarn.

8. Apparatus as claimed in claim **1**, and means for independently operating and regulating said first and second heating means.

9. Apparatus as claimed in claim **1**, and further additional yarn delivery means following said second heating means to deliver yarns which have passed through the second heating means.

10. Apparatus as claimed in claim **1**, and further additional yarn delivery means following said second heating means to deliver yarns which have passed through the second heating means, and guide means arranged relative to the winding means and said second heating means to guide yarns to a winding means in a path by-passing said second heating means.

11. Apparatus as claimed in claim **1**, and further additional yarn delivery means following said second heating means to deliver yarns which have passed through the second heating means, and guide means arranged relative to the winding means and said second heating means to guide yarns to a winding means in a path by-passing said second heating means, said additional yarn delivery means being located to provide a length of yarn path between said additional yarn delivery means and its corresponding winding device differing from the length of yarn path between said yarn delivery means following said false twist unit to its corresponding winding means by not more than 35%.

12. Apparatus as claimed in claim **1**, and further additional yarn delivery means following said second heating means to deliver yarns which have passed through the second heating means, and guide means arranged relative to the winding means and said second heating means to guide yarns to a winding means in a path by-passing

said second heating means, said additional yarn delivery means being located to provide a length of yarn path between said additional yarn delivery means and its corresponding winding means substantially the same as the length of yarn path between said yarn delivery means following said false twist unit to its corresponding winding means.

13. Apparatus as claimed in claim 1, and further additional yarn delivery means following said second heating means to deliver yarns which have passed through the second heating means, wherein said yarn delivery mechanism following said false twist unit operates to deliver yarn at a velocity substantially equal to the linear winding-on velocity of a winding means for spooling the crimped yarn and said additional yarn delivery means operates to deliver yarn to said winding means at a substantially lower linear velocity.

14. Apparatus as claimed in claim 1, a yarn guide carried in a vertically adjustable manner by manipulating means before the first heating device and a baffle plate

arranged at the lower end of the second heating device, adapted to be pivoted into the yarn travel path and inclined at approximately 45° relative to the yarn travel direction so as to serve as a yarn positioning aid.

References Cited

UNITED STATES PATENTS

3,094,761	6/1963	Dudzik	57—34 X
3,165,881	1/1965	Moncuit et al.	57—34 X
3,383,850	5/1968	Ratti	57—34 X
3,443,371	5/1969	Ward	57—34 X
3,448,572	6/1969	Merower	57—34 X
3,472,011	10/1969	Scragg	57—34
3,486,320	12/1969	Mattingly et al.	57—34 X

FOREIGN PATENTS

453,934	6/1935	Great Britain	57—34
1,098,545	1/1968	Great Britain	57—34

DONALD E. WATKINS, Primary Examiner