Aug. 10, 1937. D. FINLAYSON ET AL 2,089,198

MANUFACTURE OF ARTIFICIAL MATERIALS

Original Filed May 26, 1934

FIG. 1

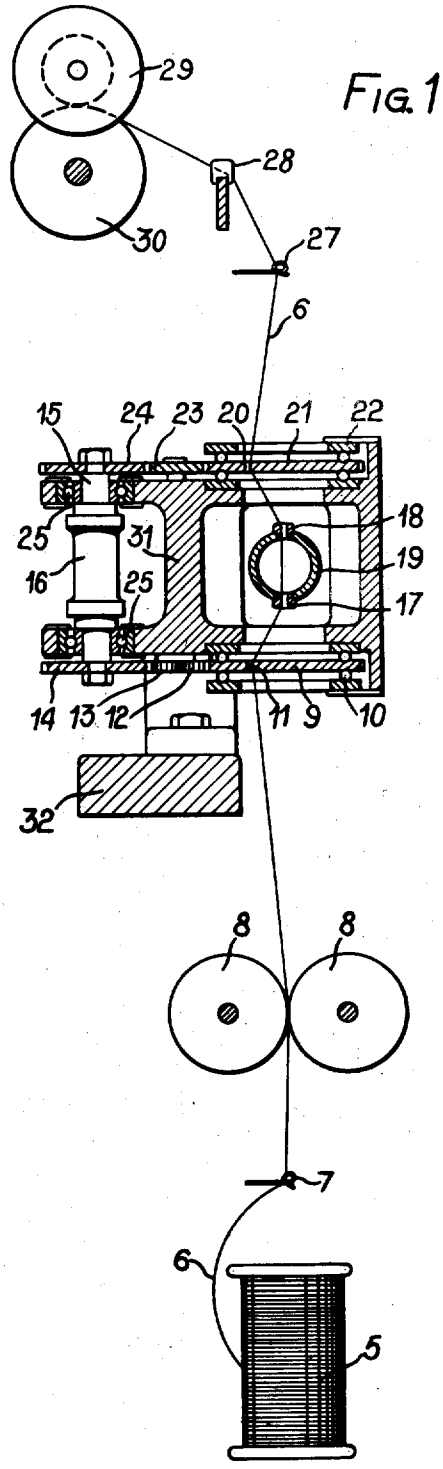


FIG. 2

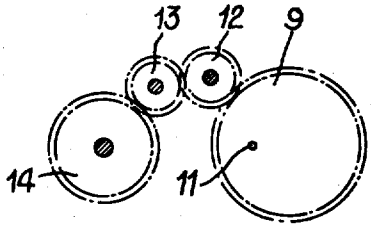
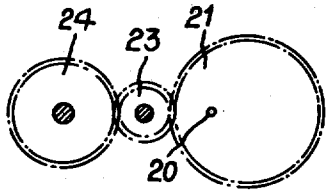


FIG. 3



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2,089,198

MANUFACTURE OF ARTIFICIAL MATERIALS

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Application May 26, 1934, Serial No. 727,609. Renewed March 11, 1937. In Great Britain June 2, 1933

17 Claims. (Cl. 117—21)

This invention relates to the production of textile materials and in particular to the production of filamentous yarns made of normally straight continuous or discontinuous filaments having modified characteristics and properties.

The chief objects in view are the avoidance of the straight, smooth structure characteristic of filaments, and its replacement by a structure resembling that found, for example, in fibres such as cotton or wool, so as to enable yarns and fabrics to be produced from filaments having the full-handling and springy properties of such natural fibre materials. These desirable properties are due in part to the natural serrations or crimps in the fibres of which there is no counterpart in filament structure. The invention enables a crimpiness to be imparted to filamentous yarns, whether continuous filaments or discontinuous (staple) filaments, or both are contained in the yarns, similar to that of natural fibre, in a simple operation.

According to the invention a yarn is crimped by setting twist therein while the yarn is travelling, and subsequently removing twist from the yarn. Conveniently, the twist may be set in the yarn while it is travelling in the course of the operation in which the twist to be set is imparted or removed. By treating the yarn while it is travelling, substantial uniformity of treatment along the length of the yarn is ensured, each part of the yarn being submitted to the same treatment under the same conditions. The degree to which the yarn or bundle is twisted depends upon its thickness and/or the degree of crimpiness to be obtained.

The invention is of the greatest importance in connection with continuous filament yarns, or staple fibre yarns formed from continuous filaments, since, by means of the invention, the normally straight filaments or fibres comprising the yarn or bundle have crimps impressed in their structure and resemble in this respect naturally crimpy fibres, such as cotton or wool. A yarn or bundle containing such crimped filaments or fibres thus attains a handle and springy character comparable with that of yarn made from naturally crimpy fibres, and fabrics made therefrom are characterized by enhanced voluminosity, handling properties, and covering power.

The invention can be applied for the purpose of imparting crimp to a bundle of smooth continuous filaments, in which case the resultant bundle may be used as a continuous filament yarn containing any desired twist appropriate to the use to which it is to be put, or may be transformed by cutting or otherwise into a spun fibre yarn. If the bundle is to be cut into staple fibres, it should preferably contain little or no twist after the crimping operation, so that the fibres can be easily separated in readiness for the subsequent spinning operation.

Again, the process according to the invention may be used to crimp a spun yarn i. e. a yarn containing fibres cut or otherwise formed into comparatively short lengths from continuous filaments. In crimping such a yarn sufficient twist should be retained after setting the crimp to maintain coherence of the yarn.

The crimping operation may conveniently be carried out during a bobbin-to-bobbin or other back-winding operation, in which case the crimping twist which is to be set in the yarn may either be a true twist imparted to the yarn in a previous operation, or may be imparted to the yarn immediately before being set, and in the same back-winding operation. Similarly, the removal of twist after setting may be effected in the same operation, or in a separate operation. Thus, twisting, setting and untwisting may be effected in a single operation, the twist imparted being a true but temporary twist.

A very convenient alternative method of imparting a temporary twist consists of imparting a false twist to the yarn, i. e. twist of temporary duration over a length of the yarn, which, though it may be relatively short, is sufficient to enable the distortion imposed on the filaments or fibres by the twist to be set. On removal of the false twist the distortions imposed upon the filaments or fibres provide the desired crimps in the bundle or yarn which may then be wound or reeled into packages prior to use. In other words, twisting and untwisting the filaments or fibres is achieved in one operation with sufficient interval between the two stages for the setting of the crimps in the filaments or fibres to be achieved. In this manner the final twist in the bundle or yarn may be exactly the same as the first twist contained therein. Thus, if a substantially twistless bundle is treated, e. g. a bundle of continuous filaments, the operation can be completed with the bundle in the same substantially untwisted condition, while if a twisted discontinuous fibre yarn is treated, the false twist merely adds temporarily to the true twist already in the yarn, and on removal of the false twist the yarn contains the same amount of true twist as before the operation commenced.

For the purpose of setting twist in the yarn,

whether the twist is a true twist or a false twist, any convenient setting medium may be employed. Thus, the twisted yarn may be passed through a chamber to which a gaseous setting medium is supplied, e. g. steam, hot air, or, especially where the yarns contain organic derivatives of cellulose, solvent vapours. Or a liquid setting medium may be employed, e. g. a solvent or softener for the material of the filaments, such as dilute acetone for yarns of cellulose acetate or other cellulose derivative yarns. Again, heat may be employed where the yarns consist of thermoplastic materials. Alternatively, setting may be effected by wetting the yarn prior to its reaching the false-twisting device and drying the yarn while the false twist is being inserted in such a manner that the steam or other vapour thus generated serves to set the twist in the yarn. Drying may conveniently be accomplished by heating the twisting device internally or externally or both by means such as a steam jacket or an electric heating element. The drying may be further assisted by ballooning of the yarn proceeding to or from the twist inserting device.

As explained above, the process according to the invention may be used to crimp bundles of continuous filaments prior to forming the filaments into staple fibres. Conveniently a large number of associated crimped bundles are cut simultaneously into staple fibres, the length of which are predetermined in accordance with the purpose for which they are to be used. Thus, fibres for the production of yarns having characteristics similar to those of cotton yarns may be from 1 to 2½" in length, while fibres for the production of yarns having worsted yarn characteristics may be from 2½ to 12" or more in length.

Crimped continuous filaments may, however, be directly transformed into fibrous sliver or spun yarn in a single operation, e. g. in the manner described in U. S. Patents Nos. 1,959,142 and 1,956,600 or in British Patent No. 410,805. Where crimping is effected on spun yarn itself, similar methods to those described above (i. e. cutting continuous filaments into spinnable fibres or direct transformation of continuous filament yarns into spun yarn) may be employed for the production of the spun yarn.

The process according to the invention may be applied to any type of filamentary yarn, for example, yarn of cellulose acetate or other organic derivative of cellulose, e. g. other cellulose esters, such as cellulose formate, propionate and butyrate, and cellulose ethers, such as ethyl and benzyl cellulose, yarn of reconstituted cellulose such as viscose, nitrocellulose and cuprammonium artificial silk and natural silk. It may likewise be applied to yarns consisting of a mixture of filaments of two or more of the above types.

The filaments contained in the basic yarn may be of a lustrous character or they may be pigmented and of subdued lustre or even delustred as by subjecting cellulose acetate or other cellulose derivative yarn to hot aqueous liquors or liquors containing thiocyanates or solvents for the cellulose derivative so as to resemble more closely the finer qualities of natural staple fibres.

By way of example the invention will now be described in greater detail with reference to the accompanying drawing in which:—

Figure 1 is a part sectional side elevation of an apparatus for carrying out the invention, and

Figures 2 and 3 show details of gearing employed in the apparatus illustrated in Figure 1.

In the drawing, 5 is a yarn package from which a yarn 6 is drawn through a guide 7 in line with the axis of the package. The yarn 6 is drawn through the guide 7 by means of nip rollers 8 from which it proceeds to a false twisting device. The false twisting device comprises a disc 9 mounted in ball bearings 10 and having a hole removed from the centre thereof at 11. The disc 9 is rotated by means of gears 12, 13, 14, the gear 14 being mounted on and secured to a spindle 15 having a driving whorl 16. The gears 12, 13, 14 and the disc 9 are shown in plan view in Figure 2.

The yarn 6 then passes through two orifices 17, 18 in a pipe 19 through which is passed steam or other setting medium adapted to set in the yarn the twist imparted by the false twisting device. On emerging from the orifices 18 the yarn passes through a hole 20 in a further disc 21 mounted in ball bearings 22 and driven by gears 23, 24 from the spindle 15. The spindle 15 is mounted at the top and bottom in ball bearings at 25. The gears 23, 24 and the disc 21 are shown in plan view in Figure 3, and it will be seen that the discs 9 and 21 rotate in opposite directions, the disc 9 being driven through two idle gears 12, 13, while the disc 21 is driven through one idle gear 23. Since the discs 9 and 21 rotate in opposite directions they impart to the yarn between them the same kind of false twist, so that the length of yarn between the orifices 17 and 18 in the pipe 19 is amply twisted.

On emerging from the hole 20 the yarn 6 proceeds through a guide 27 and thence to the traversing guide 28 of a winding device by means of which it is wound up on a bobbin 29 driven by a driving roller 30. If the yarn 6 at this stage is still slightly soft or plastic, it is preferably slackly wound on bobbin 29 in order to avoid subjecting the yarn to tension which might diminish or even destroy the crimp in the yarn. The spindle 15 and the false twisting discs 9 and 21 are mounted in a frame 31 carried on a spindle rail 32.

Since the rotating plates 9 and 21 are only capable of inserting false twist in the yarns 6, the yarn proceeds through the guide 27 without any substantial twist, or with substantially the same twist as it had when it left the guide 7. Nevertheless, in the course of its travel it has had a high degree of twist imparted to it, and while possessing that degree of twist has been set by the steam or other conditioning agent in the pipe 19. As a result, on the removal of the twist the filaments or fibres of the yarn retain the crimpiness due to the twist in the manner desired according to the invention. The rate of delivery of the yarn 6 to the false twisting device together with the rate of rotation of the discs 9 and 21 determine the number of turns of false twist imparted to the yarn. Thus if the yarn 6 is passed quickly through the false twisting device a relatively small amount of false twist is inserted in the yarn and a correspondingly small number of crimps is impressed. Alternatively, if the yarn 6 is passed through the false twisting device slowly a correspondingly greater number of crimps is impressed in the yarn for any given rate of rotation of the discs 9 and 21. Similarly, for any given rate of passage of the yarn 6 through the false twisting device the rate of rotation of the discs 9 and 21 may be varied in accordance with the number of crimps it is

desired to impress in the yarn. Generally, the smaller the diameter of the yarn the more crimps are required and vice versa.

What we claim and desire to secure by Letters Patent is:—

1. Process for crimping yarns containing twist comprising setting twist in yarns while they are travelling, and subsequently removing twist from the yarns.

2. Process for crimping continuous filament yarns containing twist comprising setting twist in yarns while they are travelling, and subsequently removing such twist from the yarns.

3. Process for crimping artificial staple fibre yarns containing twist comprising setting twist in such yarns while they are travelling, and subsequently removing a part of such twist from the yarns.

4. Process for crimping yarns comprising twisting yarns, then setting the twist in the yarns continuously with the twisting operation, and subsequently removing twist from the yarns.

5. Process for crimping yarns comprising twisting yarns, setting the twist in the yarns, and subsequently removing twist from the yarns continuously with the twisting operation.

6. Process for crimping yarns comprising imparting false twist to a travelling yarn, and setting in the yarn the twist imparted by the false twisting.

7. Process for crimping yarns comprising steaming twisted yarns while they are travelling so as to set twist therein, and subsequently removing twist from the yarns.

8. Process for crimping yarns comprising imparting false twist to a travelling yarn, and steaming the travelling yarn to set the twist imparted by the false twisting.

9. Process for crimping yarns comprising applying to twisted yarns while they are travelling a solvent material for the substance thereof so as to set twist therein, and consequently removing twist from the yarns.

10. Process for crimping yarns comprising applying to twisted yarns while they are travelling the vapours of a solvent material for the substance thereof so as to set twist therein, and subsequently removing twist from the yarns.

11. Process for crimping yarns of cellulose acetate comprising applying to twisted yarns of cellulose acetate while they are travelling a material which has a solvent effect on cellulose acetate, so as to set twist in the yarns, and subsequently removing twist from the yarns.

12. Process for the production of crimped staple fibre yarns comprising setting twist in twisted continuous filament yarns while they are travelling, subsequently removing substantially all the twist from the yarns, transforming the continuous filaments into staple fibres and spinning such staple fibres into a staple fibre yarn.

13. Apparatus for crimping yarns comprising a twisting device for applying twist to a yarn, an untwisting device for removing twist from the yarn, means for delivering the yarn from said twisting device to said untwisting device, and means disposed between said devices for applying a setting agent to the twisted yarn.

14. Apparatus for crimping yarns comprising a false-twisting device adapted to impart a temporary twist to a travelling yarn, and means for applying a setting agent to the temporarily twisted yarn passing through said false-twisting device.

15. Apparatus for crimping yarns comprising a twisting device for applying twist to a yarn, an untwisting device for removing twist from the yarn, means for delivering the yarn from said twisting device to said untwisting device, and a steam chamber through which the yarn is caused to pass in travelling from said twisting device to said untwisting device whereby the twist is set in the yarn.

16. Apparatus for crimping yarns comprising a false twisting device adapted to impart a temporary twist to a travelling yarn, and a steam chamber through which the temporarily twisted travelling yarn is caused to pass in order to set the twist in the yarn.

17. Apparatus for crimping yarns comprising two false twisting devices adapted to impart temporary twist of the same kind to a travelling yarn, and a chamber between said devices for the application of a setting medium to the temporarily twisted yarn, substantially as described.

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FRANK HAPPEY.

CERTIFICATE OF CORRECTION.

Patent No. 2,089,198. August 10, 1937.

DONALD FINLAYSON, ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, first column, line 42, claim 9, for "consequently" read subsequently; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 5th day of October, A. D. 1937.

Henry Van Arsdale

(Seal) Acting Commissioner of Patents.

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