

July 17, 1934.

W. A. DICKIE ET AL

1,966,440

TEXTILE MATERIAL AND METHOD OF MAKING THE SAME

Filed July 14, 1931

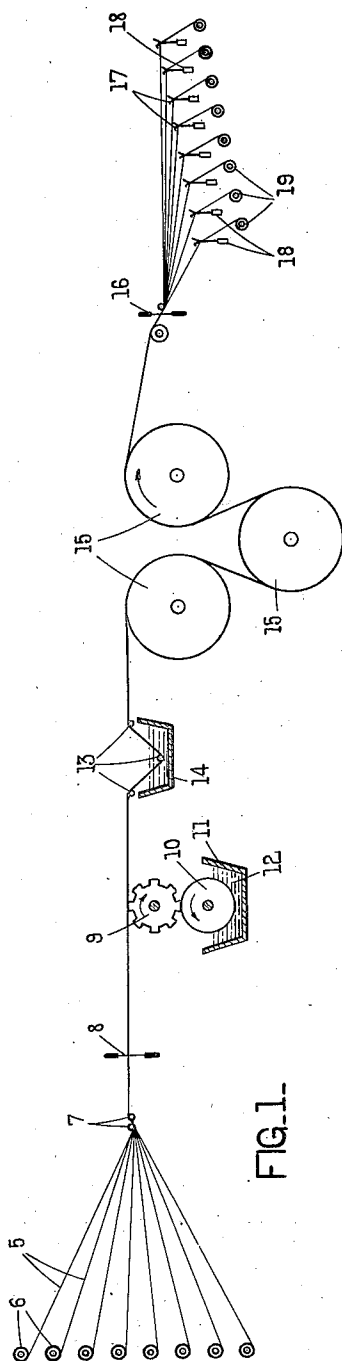


FIG. 1.

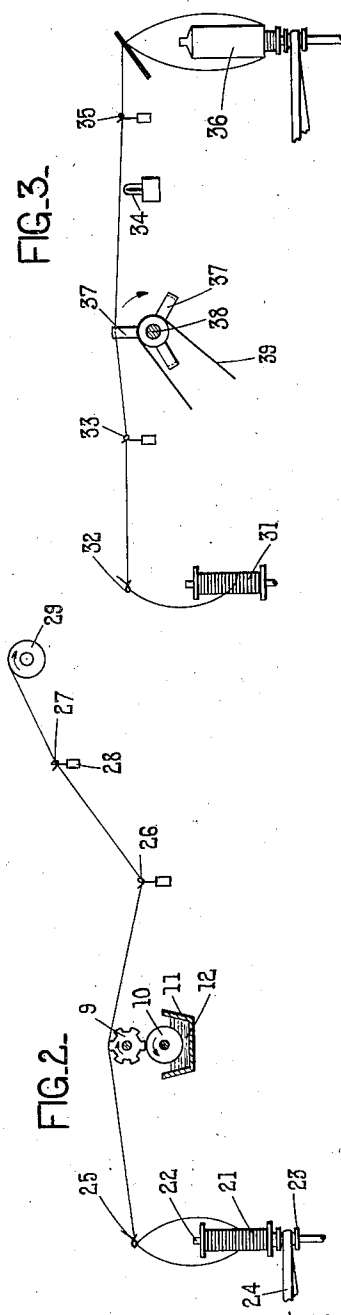


FIG. 2.

FIG. 3.

Inventors
William A. Dickie
Robert W. Moncrieff
by
J. Seltzer and ~~Brufman~~
Attorneys

UNITED STATES PATENT OFFICE

1,966,440

TEXTILE MATERIAL AND METHOD OF
MAKING THE SAME

William Alexander Dickie and Robert Wighton
Moncrieff, Spondon, near Derby, England, as-
signors to Celanese Corporation of America, a
corporation of Delaware

Application July 14, 1931, Serial No. 550,716
In Great Britain September 10, 1930

13 Claims. (Cl. 28—1)

This invention relates to the manufacture of crêpe threads and fabrics made of or containing cellulose acetate or other organic esters of cellulose.

5 U. S. application S. No. 535,287, filed 5th May, 1931 describes a method of producing fabrics exhibiting crêpe effects by incorporating therein highly twisted threads containing filaments of cellulose acetate or other organic derivatives of
10 cellulose, said filaments being provided with a coating or outer layer of cellulose, and according to one method described in that specification threads containing filaments of organic esters of cellulose may be treated by means of a saponi-
15 fying agent, so that the surface layer of the filaments is converted into cellulose, producing the desired result. After weaving, the fabrics are treated with an aqueous scouring bath, where-
20 upon valuable crêpe effects are produced. It appears probable that the scouring treatment causes swelling of the cellulose layer of the crêpe thread filaments, and that the crêpe threads in conse-
25 quence of the high twist are constrained to shrink in length and so give rise to the desired results.

It has now been found that an enhanced crêpe effect may be produced by means of crêpe threads of cellulose acetate or other organic esters of cellulose which have been saponified at intervals along their length. The saponification is prefer-
30 ably carried out merely superficially, so as not to convert the treated parts of the filaments entirely into cellulose.

It seems probable that the improved effect thus obtained is due to the saponified and unsaponi-
35 fied parts of the threads reacting differently to the shrinking treatment employed to bring out the crêpe effect, more shrinking taking place in the saponified parts than the others, with consequent sharp distortion of the surface of the fabric
40 by the increased local shrinkage.

If desired, swelling of the saponified and/or the unsaponified parts of the threads may be resorted to, in conjunction with the shrinking treatment, to bring out the crêpe effects on the fabric.

45 The saponification of the threads may be carried out while the threads have little or no twist, or they may have received a portion of the crêpe twist before saponification to the extent of, say, 20-30 turns per inch or more, and may afterwards
50 be twisted to a higher degree, for example 60, 70, or 80 or more turns per inch.

Any suitable saponifying agent may be employed, for example, sodium carbonate, potassium silicate, trisodium phosphate and other alkali
55 salts or weak acids, and particularly the hydrox-

ides of sodium and potassium. The saponifying agent may be employed in the form of solution, or alternatively in the form of a paste, and there may be incorporated with such saponifying solu-
tion or paste, thickening agents, for example gum tragacanth, gum tragasol, dextrin, British gum, etc., and/or swelling agents for the cellulose ester, for example thiocyanates and ethyl and methyl alcohol, and if desired, any further modi-
fying substances. Care must be taken of course
65 that no substance is introduced into the solution or paste which is incompatible with the saponifying agent.

By suitably adjusting the conditions of treat-
ment, for example, temperature, concentration
70 of saponifying agent, and concentration of any swelling agents and/or buffer salts or modifying agents, such as soap, sodium acetate, or borax, which may be used, the material may be saponi-
75 fied to any desired extent, for example to the extent of 3, 5, 10 or even 20 per cent. or more, as measured by loss of weight.

Numerous methods may be adopted to apply the saponifying material at intervals to the threads; some suitable methods are described in U. S. application S. No. 415,803 filed 21st Decem-
80 ber 1929, according to which threads are intermittently saponified for the purpose of rendering the threads capable of receiving differential dyeing effects. Thus, travelling threads may
85 receive the saponifying material from wicks or other absorbent devices, or from rollers, rods, or the like, intermittent application being effected either by bringing the applying means into con-
90 tact with the threads or by causing the threads to be displaced into or out of contact with the applying means. According to a further method, saponifying material may be applied by means
95 of a corrugated or fluted roller, the thread passing over or round the said roller, which applies the saponifying liquid or paste at points corresponding to the raised portions of the roller. A
100 furnisher roller may be used to supply the fluted roller, the furnisher roller dipping into a trough containing the saponifying material, which is thereby conveyed and fed to the fluted roller.

After treatment with the saponifying material the threads may be passed through a bath of very dilute acid, e. g. hydrochloric or acetic acid, in
105 order to neutralize the residual saponifying alkali, and to control the saponifying action. By the elimination of the alkali before it is converted into carbonate by atmospheric action, a smooth and more satisfactory yarn results. After their
110 saponification, and after passing through an acid

bath, if used, the threads are preferably dried relatively quickly, as for example by passing them over one or more heated drying drums, over a heated plate, or through a heated atmosphere.

5 A fairly high temperature, say 65–85° C. is preferably used for drying, so as to accelerate the saponification. After drying, the threads may be collected by winding on to bobbins or the like, which, when full, are transferred to a suitable
10 twisting machine by means of which a high degree of twist is imparted to the threads, it being preferred to carry out the twisting as a separate operation.

The intermittent saponification may take place
15 continuously with the production of the threads, as described in U. S. application S. No. 415,803, in which case it is not essential to make special provision for drying, especially when the threads are collected by cap-spinning. The treatment
20 may also be carried out in the course of bobbin-to-bobbin or other winding or twisting and winding operations subsequent to the production of the threads. Spun yarns may be similarly treated.

25 After saponification and twisting the threads are woven into fabric, which is then subjected to an aqueous or other scouring treatment which causes the saponified portions of the filaments to swell while shrinking lengthwise, so producing a
30 crêpe effect on the fabric. Further, if desired, the scouring bath may be of such a nature as to cause not only the cellulose layers but also the unsaponified portions of the filaments themselves to swell. To this end the scouring bath may include swelling agents for the filaments them-
35 selves, as for example any of the swelling agents applicable to organic esters of cellulose as referred to in U. S. application S. No. 501,461 filed 10th December 1930. It will be appreciated of
40 course that the swelling agent should be selected in any particular case according to the nature of the filaments; for example in the case of saponified filaments of cellulose acetate, swelling of both the filament itself and the coating may
45 be accomplished by means of aqueous solutions of thiocyanates.

In order that the finished fabrics may exhibit the desired crêpe effect in the maximum degree it is preferred to effect the final drying in the ab-
50 sence of any substantial tension.

The crêpe threads according to the invention may contain, in addition to filaments or fibres of cellulose acetate or other organic esters of cellulose, filaments or fibres of other materials,
55 such as silk, cotton, wool, natural silk, or other forms of artificial silk.

This invention will now be described in greater detail with reference to the accompanying drawing, but it is to be understood that this description is given by way of example only and is in no
60 respect limitative.

Fig. 1 shows one form of apparatus for the purpose of the invention, and Figs. 2 and 3 show two other forms of apparatus.

65 In Fig. 1, twisted or untwisted threads 5 made of or containing filaments or fibres of cellulose acetate are taken from a number of bobbins 6, and led under and over glass spacing rods 7, to a spacing reed 8, and thence parallel to each other
70 to a fluted roller 9, supplied with a suitable saponifying liquid or paste by means of a dip roller 10, adapted to run in contact with the fluted roller 9 and to dip into a trough 11 of the liquid or paste 12. The dip roller should consist of or be
75 covered with a material which is not attacked by

the saponifying liquid, for example copper, or rubber, and if desired strips of rubber or like material may be placed round the ends of the roller to act as a resilient spacing strip between it and the fluted roller, so that a controlled
80 amount of liquid is supplied. Any suitable saponifying liquid or paste may be used for the purpose, for example, an aqueous or alcoholic solution containing from 1–5 per cent. of caustic soda or more, for example, up to 30 per cent. The
85 threads are treated at frequently occurring intervals with the saponifying liquid by which parts of the filaments at the treated points become converted, more or less superficially, into cellulose. After saponifying, the threads are conducted by
90 guide rods 13 through a bath 14 of very dilute hydrochloric or acetic acid and are then passed round a number of heated drums at a temperature of about 70° C., whereby the threads are
95 dried and the saponification is completed. The threads are then passed through a further reed 16, and through traversing guides 17 mounted on traverse bars 18 to a number of bobbins 19 and wound thereon, the bobbins being subsequently
100 taken to twisting devices by which a high degree of twist is imparted to the threads.

According to another method, shown in Fig. 2, untwisted or already twisted threads may be taken individually from one or a number of
105 twisting devices, each comprising a bobbin 21 mounted on a spindle 22 driven by a whorl 23 and belt 24. Other twisting devices, for example of the kind described in U. S. Patent No. 1,784,581, may be used. On leaving the top guide 25 of
110 the twisting device, each thread is led over a fluted roller 9 supplied with saponifying agent as above described with reference to Fig. 1, through a stationary guide 26 and a traversing
115 guide 27 mounted on a traversing bar 28 to a take up bobbin 29 on which it is collected. The twisting device imparts to the thread a degree of twist of, say, 20–30 turns per inch, prior to the intermittent saponification of the thread. Alternatively, an untwisted thread or one slightly twisted
120 or twisted to say 20–30 turns per inch may be drawn off a package without twisting, and intermittently saponified.

As shown in Fig. 3 such methods as described in U. S. application S. No. 415,803 may be used, according to which the travelling threads coming
125 from bobbins 31 pass through guides 32, 33 over a wick 34 from which they receive the saponifying material, before passing through a guide 35 to a twisting and winding device such as the cap-spinning device 36. Intermittent contact be-
130 tween the threads and the supplying means is obtained by displacing the thread into and out of contact with the applying device intermittently. To effect the intermittent contact, arms
135 37 mounted on a rotatable shaft 38 driven by a belt or chain 39 engage the thread and lift it from its normal path between guides 33 and 35 and out of contact with wick 34. The period of contact between the thread and the wick 34
140 may be varied by varying the number of, or length of, the arms 37 or by varying the speed of rotation of the shaft 38 relative to the speed of travel of the thread. As shown in dotted lines in the drawing, the arms 37 may be slotted at their
145 extremities so as to engage the thread. By this method, or with the aid of fluted rollers as described above, the threads may be treated continuously with their production, in which case, especially when the threads are collected on cap-spinning devices, special drying of the threads
150

may generally be dispensed with, since drying takes place as the threads balloon round the cap.

The total-degree of twist imparted to the crêpe threads may be similar to that commonly employed in the case of crêpe threads of natural silk in the gum, for example a twist of from 50-75 turns per inch may be utilized. A degree of twist of about 60 turns per inch has been found to give highly satisfactory results. The yarns may, however, be of fine denier and twisted to a higher degree than usual in crêping, as described in U. S. application S. No. 523,931 filed 19th March 1931. If desired a highly twisted thread may be subsequently doubled with another thread or threads of the same or different twist, and of the same or different direction of twist, whereby still more varied effects can be obtained.

The highly twisted crêpe threads are then woven into fabrics in any suitable manner, for example the weft alone may be wholly or partially composed of such threads, or the warp also may contain them. It is found convenient in general, however, to employ threads at relatively low twist in the warp, and to employ as the weft both crêpe threads having a left-hand twist and crêpe threads having a right-hand twist, and prepared according to the invention. The threads having right-hand twist and those having left-hand twist may be incorporated in any convenient manner, for example pairs of weft threads of right-hand twist may alternate with pairs of threads of left-hand twist.

The woven fabrics are treated in aqueous scouring baths, containing suitable soaps, together with swelling agents, if desired, to bring about the shrinkage. After scouring, the fabrics are allowed to dry under substantially low tension.

In order to enhance the crêpe effects obtainable, the intermittently saponified threads may be coated with sizes, e. g. sizes such as are described in U. S. application S. Nos. 491,070 filed 24th October 1930, 514,898 and 514,899 filed 10th February 1931, 530,728 filed 16th April 1931, 527,358 filed 2nd April 1931 and 535,287 filed 5th May 1931, either before, during, or after twisting, and the subsequent scouring treatment may be such as to swell the sizing materials.

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

1. Crêpe threads containing filaments of an organic ester of cellulose, which filaments are highly twisted together and are saponified at intervals along their length.

2. Crêpe threads containing filaments of cellulose acetate, which filaments are highly twisted together and are saponified at intervals along their length.

3. Crêpe threads containing filaments of an organic ester of cellulose which filaments are highly twisted together and are superficially saponified at intervals along their length.

4. Method of manufacture of crêpe threads containing filaments of cellulose acetate or other organic ester of cellulose, said method comprising saponifying the filaments at intervals along the length of the thread, and subsequently twisting the thread to a high degree.

5. Method according to claim 4 comprising superficially saponifying the filaments at intervals along their length.

6. Method of manufacture of crêpe threads containing filaments of cellulose acetate or other organic ester of cellulose, said method comprising twisting the filaments, saponifying the filaments at intervals along their length and subsequently further twisting the filaments to a high degree.

7. Method of manufacture of crêpe threads containing filaments of cellulose acetate or other organic ester of cellulose, said method comprising saponifying the filaments at intervals along their length with a saponifying agent in which is incorporated a swelling agent for the cellulose ester and subsequently twisting the filaments to a high degree.

8. Method of manufacture of crêpe threads containing filaments of cellulose acetate or other organic ester of cellulose, said method comprising saponifying the filaments at intervals along their length, running said filaments through a neutralizing bath after saponification, and subsequently twisting the filaments to a high degree.

9. Method of manufacture of crêpe threads containing filaments of cellulose acetate or other organic ester of cellulose, said method comprising twisting the filaments, saponifying the filaments at intervals along their length, running said filaments through a neutralizing bath, and subsequently further twisting the filaments to a high degree.

10. Method of manufacture of crêpe threads containing filaments of cellulose acetate or other organic ester of cellulose, said method comprising saponifying the filaments at intervals along their length, running said filaments through a neutralizing bath containing dilute hydrochloric acid, and subsequently twisting the filaments to a high degree.

11. Method of manufacture of crêpe threads containing filaments of cellulose acetate or other organic ester of cellulose, said method comprising saponifying the filaments at intervals along their length, drying the filaments, and subsequently twisting the filaments to a high degree.

12. Method of manufacture of crêpe threads containing filaments of cellulose acetate or other organic ester of cellulose, said method comprising as a step continuous with their production saponifying the filaments at intervals along their length, and subsequently twisting the filaments to a high degree.

13. Method of manufacturing crêpe threads containing filaments of cellulose acetate or other organic esters of cellulose which comprises applying to the filaments a saponifying agent at intervals along their length, twisting the intermittently saponified filaments to a high degree and subsequently treating the same with a swelling agent.

WILLIAM ALEXANDER DICKIE.
ROBERT WIGHTON MONCRIEFF.