

April 20, 1948.

M. P. KULP ET AL
ARTIFICIAL FILAMENT
Filed May 13, 1943

2,439,813

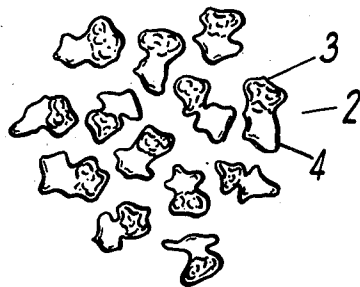


Fig-1-

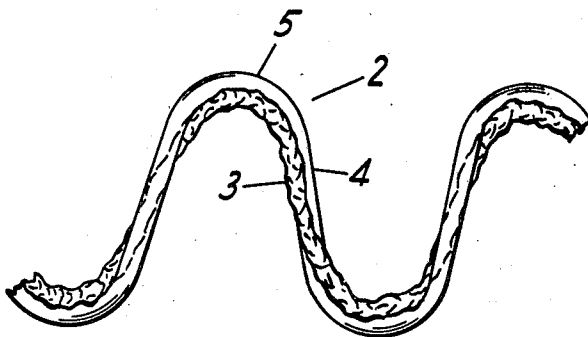


Fig-2-

BY

INVENTORS.
MAURICE R KULP
WAYNE A. Sisson
Carl A. Costello
ATTORNEY.

UNITED STATES PATENT OFFICE

2,439,813

ARTIFICIAL FILAMENT

Maurice P. Kulp, Linwood, Pa., and Wayne A. Sisson, Silverside, Del., assignors to American Viscose Corporation, Wilmington, Del., a corporation of Delaware

Application May 13, 1943, Serial No. 486,772

5 Claims. (Cl. 28—82)

1

This invention relates to artificial filaments of composite character and is particularly concerned with composite regenerated cellulose filaments having any desired crimpiness and the combination of reasonable strength and good retentivity. The process hereinafter described is claimed in my copending divisional application Serial No. 625,646, filed October 30, 1945.

In the application of Kulp et al., Serial No. 486,774, filed on even date herewith which has since been issued as Patent No. 2,386,173, dated October 2, 1945, there are disclosed various forms of spinnerets for producing composite filaments, the components of which are joined by intermingled portions of the materials making up the adjoining components.

In accordance with the present invention, it has been found possible, by extruding two cellulosic spinning solutions through the spinnerets of the type shown in the patent cited above into a regenerating medium, to produce, by the conversion of the composite liquid stream to a plastic condition during passage thereof through the regenerating medium, composite filaments of regenerated cellulose, the components of which are joined by intermingled portions of the materials making up the adjoining components having improved strengths both wet and dry and having also any desired degree of crimpiness which is of substantially permanent character. The customary methods of collection subject the filaments to sufficient tension while the filaments are still sufficiently plastic to be responsive to that tension and the wound mass, whether on a bobbin, twister spindle, or in the form of a cake formed within a spinning bucket, maintains the filaments under tension until they are sufficiently set up to maintain their smooth and straight uncrimped condition. It has been found that advantage can be taken of the stretching that can be performed upon the filaments as they proceed from the spinneret in the spinning machine, provided precaution be taken to relax the filaments either immediately or reasonably soon thereafter and to maintain them in relaxed condition until set. In this way, they do not have an opportunity to become set up in the stretched condition which is inherently free of crimp.

The stretch may be obtained by the use of any of the known systems to produce it, such as the passage of the filaments over a series of two or more rolls, each succeeding roll being driven at a higher peripheral speed than that immediately preceding it. Another particularly advantageous system is the passage of the filaments through a

2

generally helical path over a thread-storing, thread-advancing device of such a form that the individual convolutions of the helices become progressively larger. The filaments as they are being stretched, may be passed through a plasticizing bath or may be subjected to a plasticizing liquid, such as hot water, hot acids, and the like by spraying, immersion, etc.

The amount of stretch may vary from that which will increase the original filament length by 20% up to the maximum that it will take just before rupturing. In order to obtain the maximum strength as well as the maximum crimpiness, higher proportions of stretch which are within 25% and preferably within 5 to 15% of the maximum stretch (in terms of elongation) permissible without rupture are preferred. The actual stretching that can be performed upon the filaments in terms of percentage elongation depends upon the viscoses, the spinning conditions, the baths, and the denier of the composite filament prior to stretching. As an example of the dependency on denier, when the filaments are of a size up to 5½ denier per filament, a 65%–70% stretch is about all that can be imparted to them, whereas individual filaments having 15 to 25 denier size may go as high as 160% stretch.

Any conventional spinning system in which the filaments are subjected to the stretching while in a partially regenerated condition may be employed for carrying out the invention. For the making of continuous filaments or continuous filament yarns, the filaments immediately after leaving the last stretching godet or thread-storing, thread-advancing device may fall of their own weight upon a traveling belt by which they may be delivered in a relaxed condition to subsequent processing operations. In falling upon the belt, they may be guided to follow a definite pattern to economize space; for example, they may be caused to zig-zag back and forth across the width of a relatively slowly moving belt. For the making of staple fibers, the final continuous filaments made in the manner just described may be cut to the desired lengths. Alternatively, for the making of staple fiber, the continuous filaments after leaving the stretching stage of the spinning operation may be cut to staple prior to being wet-processed. The cutting to staple may occur at any of the customary stages heretofore suggested in the art. For example, the filaments after leaving the stretching stage may proceed immediately to a cutting device from which the cut fibers may be allowed to fall into the first of a series of wet processing baths in which they

3

are free to relax. The first of these baths, when cutting occurs immediately after stretching, may advantageously be a wet-opening bath of hot or cold water or of an acid, or even a bath similar in constitution to the coagulating bath used in spinning the filaments.

Any of the acid coagulating baths which have heretofore been used for the production of regular regenerated cellulose yarns of normal strength or of high tenacity yarns may be used. Bath immersions ranging from 6 inches to 72 inches, preferably the longer immersions especially where high speeds of travel are involved, may be used. The usual coagulating bath temperatures and conditions are satisfactory, bath temperatures of 40 to 50° C. being preferable.

The degree of crimp in the final filaments can be varied to any desired extent merely by suitably selecting the original viscose solutions of which the filaments are to be composed. By associating a viscose solution which under the conditions to be used in the production of the composite filaments exhibits a high degree of shrinkage after stretching with another viscose which under the same conditions exhibits a low degree of shrinkage, the final product will be characterized by an extremely high degree of crimp. Similarly by selecting and associating viscoses which under the conditions of spinning show lesser differences between their shrinkage characteristics after stretching, a correspondingly less degree of crimp is observed in the final composite filaments.

Besides taking advantage of variation in the viscoses, it is possible to vary the final crimp in the product by properly selecting the coagulating bath. For example, the selection of a coagulating bath which favors the shrinkage of one of the components and disfavors the shrinkage of the other viscose component of the final composite filament will produce a product having a higher degree of crimp than the use of a bath which favors the shrinkage of both or disfavors such shrinkage. When a normal strength viscose solution is spun with a high tenacity viscose solution, either a normal strength coagulating bath or a high tenacity bath may be used with the production of a satisfactory crimp. However, it is generally possible to vary the constitution of such baths so that a compromise bath may be obtained whose use will produce a higher degree of crimp than is obtainable with either of the standard bath types. No general rule can be laid down which will enable one in all cases to determine without actual tests what precise variation in the constitution of the bath will produce a given degree of crimp, but one who has had previous experience and knows the general shrinkage characteristics of particular viscose solutions in particular baths can, by following the general rules set forth herein, ordinarily predict what bath is the most suitable for any particular double-component spinning system. One helpful rule is that in general, the smaller the denier per filament, the greater the crimp. That is, for a given crimp, spinning materials having greater differences in shrinkage under the particular bath and other conditions of spinning must be used when spinning larger filaments.

In accordance with the stretch-spinning procedures of the present invention, crimp composite filaments of regenerated cellulose components are obtained which have dry strengths of 1.5 to 2.2 or more grams per denier and wet strengths of 0.6 to 1.2 or more grams per denier. It has not been possible heretofore to produce regenerated

4

cellulose filaments with strengths of this order combined with a degree of crimpiness and crimp retentivity that characterizes the present filaments.

Referring to Figures 1 and 2 of the drawing showing crimped filaments of the invention, reference character 2 indicates a filament generally and reference characters 3 and 4 indicate the component portions of the filament which are constituted of different materials. In Figure 2 of the drawing in which the crimp of the filament is shown, reference character 5 indicates one bend of the crimp. Reference character 4 indicates the portion of the filament that is made of the material having the lesser tendency to shrink or less elastic recovery and reference character 3 indicates the portion of the filament that is made of the material having the greater shrinkage tendency or greater elastic recovery. The portion 4 being, in effect, shrunk less than portion 3, portion 4 is of greater length and forms the outside of the bends of the crimp and portion 3 forms the inside of the bends of the crimp. It is to be understood that the crimp is actually of a three-dimensional character (that is, the crimps extend or lie at random in three dimensions) and that Figure 2 shows the filament in a single plane.

While it is generally preferable that the unitary filaments comprise equal portions of the different types of material, various proportions of the different types of spinning solutions may be used by adjusting the pumps to control the proportionate amounts of the different types of spinning material that are delivered to form a single filament.

The individual filaments of this invention have a unitary structure having a cross-section at all points of the filament length which comprises two or more substantially distinct areas each of which has a different composition or state of physical aggregation than that of the others and at least one of which is eccentrically disposed with respect to the filament cross-section. The components of the composite fibers exhibit therein differences in shrinkage, swelling, extensibilities, strength, orientations, dye absorptions, chemical reactivity, crenulation, and they show different skin thickness which is readily observable when they are stained with certain dyes.

The crimped filament takes the form of a regular or irregular helical coil which may reverse itself in direction at more or less frequent intervals of regular or irregular occurrence, the eccentric components of the filament following a helical path about the longitudinal axis of the filaments, which path may reverse itself at more or less frequent irregular or regular intervals. Thus, a three-dimensional crimp with the crimps out of phase is present in the composite filaments.

The individual composite filaments produced in accordance with this invention in their state of normalcy are characterized by a stabilized condition having an inherent distortion which imparts a permanently recoverable crimp. The only condition under which it loses its crimp, and in this case the loss is temporary, is that prevailing when the crimped filament is wetted and caused to dry while under a tension. It can be repeatedly wet and dried without an appreciable loss in crimpiness as long as it is permitted to dry in a relaxed condition. If dried under tension, the crimp can be recovered merely by wetting and drying while relaxed.

Not completely satisfactory tests have been devised to evaluate the degree of permanency of a

5

crimp. However, the crimped composite filaments of this invention have been found to possess a "crimp retentivity" ranging from about 60% up to a value approaching 100% when tested in accordance with the procedure outlined in the Hardy et al. Patent 2,287,099, issued June 23, 1942. Individual filaments when subjected to that test, not merely after a single immersion but after as many as 20 or more immersions, have been found to show crimp retentivities as high as substantially 100% and relatively few of the filaments made in accordance with this invention have been found to have crimp retentivities as low as 60%. The crimp retentivity test as outlined in Patent 2,287,099 is performed in water at 60° C. It has been found that for the composite filaments of this invention, crimp retentivity is fully as high when cold or boiling water is used in the test. In addition, the composite filaments of the present invention show a corresponding excellence (that is from about 60 to 100%) when measured by the "crimp recovery from stretch" test outlined in the above mentioned Patent 2,287,099. When these tests were applied to filaments having an extensibility of less than 10% under the conditions of test, a stretch of 95% of the extensibility was employed.

Thus, the composite filaments and staple fibers of the present invention do not appreciably lose their crimp during the ordinary fabrication processes or during the ordinary conditions of wear in either of which temperatures ranging from the neighborhood of the freezing point and the boiling point of water are encountered. Fabricated products made from these filaments and fibers thus have properties which may be made to approach those of natural wool in some respects.

In the following examples which are illustrative of the invention, one of the devices for producing a composite filament shown and described in the Kulp et al. Patent 2,386,173 referred to hereinabove was used.

Example 1

Two different types of viscose solutions were spun in composite association into a spinning bath containing 10% sulfuric acid, 1% zinc sulfate and 20% sodium sulfate at a temperature of 45° C. One of the types of viscose solution was made from wood pulp using 32% carbon disulfide based on the air dry weight of the pulp and contained 8% cellulose and 6½% sodium hydroxide. This viscose was aged for 48 hours and had a common salt (NaCl) point of 4.8. The other type of viscose solution was made from wood pulp using 32% carbon disulfide based on the air dry weight of the pulp and contained 8% cellulose and 6½% sodium hydroxide. This viscose was aged for 100 hours and had a common salt point of 1.9. The freshly spun filaments were stretched between godets by 55% and were then allowed to completely relax. After wet-processing and finally drying in the relaxed condition, the resulting filaments which were of 5.5 denier comprised cellulose regenerated from both types of viscose solution and had 13 crimps per inch.

Example 2

Two different types of viscose solutions were spun in composite association into a spinning bath containing 10% sulfuric acid, 1% zinc sulfate and 20% sodium sulfate at a temperature of 45° C. One of the types of viscose solution was made from cotton pulp using 32% carbon disulfide based on the air dry weight of the pulp

6

and contained 8% cellulose and 6½% sodium hydroxide. This viscose was aged for 48 hours and had a common salt point of 4.8. The other type of viscose solution was made from wood pulp using 32% carbon disulfide based on the air dry weight of the pulp and contained 8% cellulose and 6½% sodium hydroxide. This viscose was aged for 100 hours and had a common salt point of 1.9. The freshly spun filaments were stretched 53% and were then allowed to completely relax after which they were subjected to the usual after-treating processes including drying in relaxed condition. The resulting filaments which were of 6.0 denier comprised cellulose regenerated from both types of viscose solution and had 16 crimps per inch.

Example 3

Two different types of viscose solutions were spun in composite association into a spinning bath containing 10% sulfuric acid, 1% zinc sulfate and 20% sodium sulfate at a temperature of 45° C. One of the types of viscose solution was made from wood pulp using 43% carbon disulfide based on the air dry weight of the pulp and contained 8% cellulose and 6½% sodium hydroxide. This viscose was aged for 66 hours and had a common salt point of 5.0. The other type of viscose solution was made from wood pulp using 32% carbon disulfide based on the air dry weight of the pulp and contained 8% cellulose and 6½% sodium hydroxide. This viscose was aged for 108 hours and had a common salt point of 2.0. The freshly spun filaments were stretched 55% and were then allowed to completely relax. They were then cut to staple fiber and wet-processed and dried in that form. The resulting fibers which were of 5.0 denier comprised cellulose regenerated from both types of viscose solution and had 20 crimps per inch.

Example 4

Two different types of viscose solutions were spun in composite association into a spinning bath containing 10% sulfuric acid, 1% zinc sulfate and 20% sodium sulfate at a temperature of 45° C. One of the types of viscose solution was made from wood pulp using 43% carbon disulfide based on the air dry weight of the pulp and contained 8% cellulose and 8% sodium hydroxide. This viscose was aged for 66 hours and had a common salt point of 5.0. The other type of viscose solution was made from wood pulp using 30% carbon disulfide based on the air dry weight of the pulp and contained 8% cellulose and 6½% sodium hydroxide. This viscose was aged for 108 hours and had a common salt point of 2.0. The freshly spun filaments were stretched 55% and were then allowed to completely relax and were finished in relaxed condition. The resulting filaments which were of 5.0 denier comprised cellulose regenerated from both types of viscose solution and had 22 crimps per inch.

Example 5

Two different types of viscose solutions were spun in composite association into a spinning bath containing 10% sulfuric acid, 1% zinc sulfate and 20% sodium sulfate at a temperature of 45° C. One of the types of viscose solution was made from cotton pulp using 43% carbon disulfide based on the air dry weight of the pulp and contained 8% cellulose and 8% sodium hydroxide. This viscose was aged for 72 hours and had a common salt point of 5.5. The other type of viscose solution was made from

7

wood pulp using 30% carbon disulfide based on the air dry weight of the pulp and contained 7½% cellulose and 6½% sodium hydroxide. This viscose was aged for 104 hours and had a common salt point of 2.2. The freshly spun filaments were stretched 60% and were then allowed to completely relax and were finished in relaxed condition. The resulting filaments which were of 4.5 denier comprised cellulose regenerated from both types of viscose solution and had 25 crimps per inch.

Example 6

Two different types of viscose solutions were spun in composite association into a spinning bath containing 10% sulfuric acid, 1% zinc sulfate and 20% sodium sulfate at a temperature of 45° C. One of the types of viscose solution was made from cotton pulp using 43% carbon disulfide based on the air dry weight of the pulp and contained 8% cellulose and 8% sodium hydroxide. This viscose was aged for 72 hours and had a common salt point of 5.5. The other type of viscose solution was made from wood pulp using 30% carbon disulfide based on the air dry weight of the pulp and contained 7½% cellulose and 6½% sodium hydroxide. This viscose was aged for 104 hours and had a common salt point of 2.2. The freshly spun filaments were stretched 28% and were then allowed to completely relax. They were wet-processed and finished in relaxed condition. The resulting filaments which were of 4.5 denier comprised cellulose regenerated from both types of viscose solution and had 7 crimps per inch.

Example 7

Two different types of viscose solutions were spun in composite association into a spinning bath containing 10% sulfuric acid, 1% zinc sulfate and 20% sodium sulfate at a temperature of 45° C. One of the types of viscose solution was made from cotton pulp using 43% carbon disulfide based on the air dry weight of the pulp and contained 8% cellulose and 8% sodium hydroxide. This viscose was aged for 72 hours and had a common salt point of 5.5. The other type of viscose solution was made from wood pulp using 30% carbon disulfide based on the air dry weight of the pulp and contained 7½% cellulose and 6½% sodium hydroxide. This viscose was aged for 104 hours and had a common salt point of 2.2. The freshly spun filaments were stretched 48% and were then allowed to completely relax. They were finished in the relaxed condition. The resulting filaments which were of 4.5 denier comprised cellulose regenerated from both types of viscose solution and had 15.5 crimps per inch.

Example 8

Two different types of viscose solutions were spun in composite association into a spinning bath containing 11% sulfuric acid, 5% zinc sulfate and 20% sodium sulfate at a temperature of 45° C. One of the types of viscose solution was made from cotton pulp using 43% carbon disulfide based on the air dry weight of the pulp and contained 8% cellulose and 8% sodium hydroxide. This viscose was aged for 72 hours and had a common salt point of 5.5. The other type of viscose solution was made from wood pulp using 30% carbon disulfide based on the air dry weight of the pulp and contained 7½% cellulose and 6½% sodium hydroxide. This viscose was aged for 104 hours and had a common salt point of

8

2.2. The freshly spun filaments were stretched 70% and were then allowed to completely relax and were finished in relaxed condition. The resulting filaments which were of 3.5 denier comprised cellulose regenerated from both types of viscose solution and had 35 crimps per inch.

Example 9

Two different types of viscose solutions were spun in composite association into a spinning bath containing 12% sulfuric acid, 5% zinc sulfate and 20% sodium sulfate at a temperature of 45° C. One of the types of viscose solution was made from cotton pulp using 43% carbon disulfide based on the air dry weight of the pulp and contained 8% cellulose and 8% sodium hydroxide. This viscose was aged for 72 hours and had a common salt point of 5.5. The other type of viscose solution was made from wood pulp using 30% carbon disulfide based on the air dry weight of the pulp and contained 7½% cellulose and 6½% sodium hydroxide. This viscose was aged for 104 hours and had a common salt point of 2.2. The filaments proceeded from the spinneret over a plurality of godets between the last two of which they were stretched by 70%. They proceeded directly from the last stretching godet into an aqueous bath where they were allowed to relax and the filament bundles were free to open. The resulting filaments were of 2 denier and had 50 crimps per inch.

Example 10

Two different types of viscose solutions were spun in composite association into a spinning bath containing 8% sulfuric acid, 1% zinc sulfate, 16% sodium sulfate and 5% glucose at a temperature of 45° C. One of the types of viscose solution was made from cotton pulp using 43% carbon disulfide based on the air dry weight of the pulp and contained 8% cellulose and 8% sodium hydroxide. This viscose was aged for 72 hours and had a common salt point of 5.5. The other type of viscose solution was made from wood pulp using 30% carbon disulfide based on the air dry weight of the pulp and contained 7½% cellulose and 6½% sodium hydroxide. This viscose was aged for 104 hours and had a common salt point of 2.2. The freshly spun filaments were stretched 60% and were then allowed to completely relax and were finished in relaxed condition. The resulting filaments which were of 4.5 denier comprised cellulose regenerated from both types of viscose solution and had 20 crimps per inch.

Example 11

Two different types of viscose solutions were spun in composite association into a spinning bath containing 6% sulfuric acid and 18% sodium sulfate at a temperature of 45° C. One of the types of viscose solution was made from cotton pulp using 43% carbon disulfide based on the air dry weight of the pulp and contained 8% cellulose and 8% sodium hydroxide. This viscose was aged for 72 hours and had a common salt point of 6. The other type of viscose solution was made from wood pulp using 30% carbon disulfide based on the air dry weight of the pulp and contained 7½% cellulose and 6½% sodium hydroxide. This viscose was aged for 104 hours and had a common salt point of 3. The freshly spun filaments were stretched 62% and were then allowed to completely relax and were finished in relaxed condition. The resulting filaments which were of 10

9

denier comprised cellulose regenerated from both types of viscose solution and had 6 crimps per inch.

It is to be understood that changes and variations may be made without departing from the spirit and scope of the invention as defined by the appended claims.

We claim:

1. An artificial filament having a plurality of crimps lying at random in three dimensions comprising two components of regenerated celluloses differently oriented as a result of stretching the composite filaments during spinning while in a partially regenerated condition to an extent within 5 to 15% of, but short of, the rupturing stretch, the components being joined side by side the entire length thereof by intermingled portions of the materials making up the adjoining components, each of said components having a portion of its peripheral surface disposed outside the periphery of the other component throughout the entire length of the filament, the components being formed from differing materials and having different skin thickness at said peripheral portions, said filament having a crimp retentivity as determined in water ranging from cold to boiling temperatures of about 60 to 100%, a dry strength of at least 1.5 grams per denier and a wet strength of at least 0.6 gram per denier.

2. An artificial filament having a plurality of crimps lying at random in three dimensions comprising two components of regenerated celluloses differently oriented as a result of stretching the composite filaments during spinning while in a partially regenerated condition by at least 20%, the components being joined side by side the entire length thereof by intermingled portions of the materials making up the adjoining components, one of the components being derived from a viscose made from cotton and the other being derived from a viscose made from wood pulp, each of said components having a portion of its peripheral surface disposed outside the periphery of the other component throughout the entire length of the filament, the components having different skin thickness at said peripheral portions, said filament having a dry strength of at least 1.5 grams per denier and a wet strength of at least 0.6 gram per denier.

3. An artificial filament having a plurality of crimps lying at random in three dimensions comprising two components of regenerated celluloses differently oriented as a result of stretching the composite filaments during spinning while in a partially regenerated condition by at least 20%, the components being joined side by side the entire length thereof by intermingled portions of the materials making up the adjoining components, one of the components being derived from a viscose having a higher carbon disulphide content than that from which the other is derived, each of said components having a portion of its peripheral surface disposed outside the periphery of the other component throughout the entire length of the filament, the components having different skin thickness at said peripheral portions, said filament having a dry strength of at least 1.5 grams per denier and a wet strength of at least 0.6 gram per denier.

4. An artificial filament having a plurality of crimps lying at random in three dimensions comprising two components of regenerated celluloses

10

differently oriented as a result of stretching the composite filaments during spinning while in a partially regenerated condition by at least 20%, the components being joined side by side the entire length thereof by intermingled portions of the materials making up the adjoining components, one of the components being derived from a viscose made from cotton and having a higher carbon disulphide content than the other viscose made of wood pulp, each of said components having a portion of its peripheral surface disposed outside the periphery of the other component throughout the entire length of the filament, the components having different skin thickness at said peripheral portion, said filament having a dry strength of at least 1.5 grams per denier and a wet strength of at least 0.6 gram per denier.

5. An artificial filament having a plurality of crimps lying at random in three dimensions comprising two components of regenerated celluloses differently oriented as a result of stretching the composite filaments during spinning while in a partially regenerated condition by at least 20%, the components being joined side by side the entire length thereof by intermingled portions of the materials making up the adjoining components, one of the components being derived from a viscose made from cotton and having a higher carbon disulphide and higher salt test than the other viscose made of wood pulp, each of said components having a portion of its peripheral surface disposed outside the periphery of the other component throughout the entire length of the filament, the components having different skin thickness at said peripheral portions, said filament having a dry strength of at least 1.5 grams per denier and a wet strength of at least 0.6 gram per denier.

MAURICE P. KULP.
WAYNE A. SISSON.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,611,001	Cross	Dec. 14, 1926
1,867,298	Zart	July 12, 1932
1,975,153	Jacquet	Oct. 2, 1934
1,993,847	Koch	Mar. 12, 1935
2,209,919	Herrmann	July 30, 1940
2,238,694	Graves	Apr. 15, 1941
2,310,785	Herrmann	Feb. 9, 1943
2,328,074	Hunter	Aug. 31, 1943
2,337,969	Bugge	Dec. 28, 1943
2,340,377	Graumann	Feb. 1, 1944

FOREIGN PATENTS

Number	Country	Date
51,307	Netherlands	Oct. 15, 1941
132,043	Japan	Oct. 11, 1939
769,593	France	June 11, 1934
797,779	France	Feb. 24, 1936
837,555	France	Nov. 12, 1938

OTHER REFERENCES

Cleaning and Dyeing of Celanese and Rayon, Foster, Copyright 1929.
Hand Book of Plastics, Siminds and Ellis, Copyright 1943.