Jan. 10, 1939. W. H. PORTER ET AL 2,143,574

YARN AND FABRIC

Filed Dec. 15, 1937

Typical Fibers Shown are Between 1000 and 5000 Square Microns in Cross Section.

Fig. 1.

Fig. 1a

Typical Cuprammonium Artificial Staple Fiber

Fig. 2.

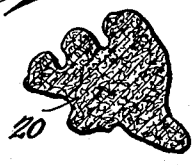


Fig. 2a

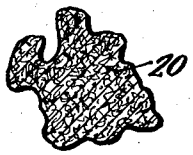
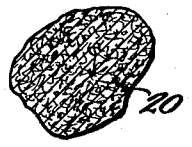


Fig. 3.

Fig. 3a



Typical Viscose Artificial Staple Fiber

Fig. 4.

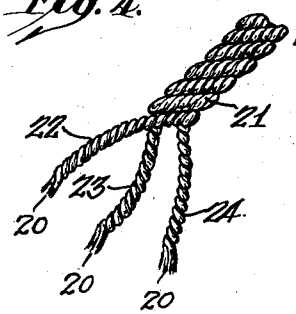


Fig. 5.

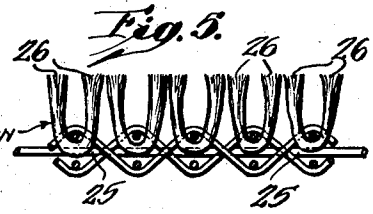
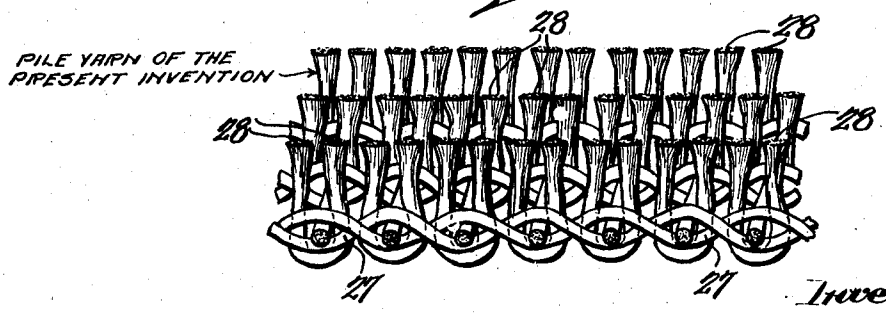


Fig. 6.



Inventors
William H. Porter
and Thomas H. Barker 2nd
by Stull Jackson and Son
Attorneys.

Witnesses:
Elmer W. Hacker
Walter Blum.

Patented Jan. 10, 1939

2,143,574

UNITED STATES PATENT OFFICE

2,143,574

YARN AND FABRIC

William H. Porter, Moylan-Rose Valley, and Thomas H. Barker, 2d, Philadelphia, Pa.; said Barker, 2d, assignor to said Porter

Application December 15, 1937, Serial No. 180,026

23 Claims. (Cl. 117—52)

The invention relates to pile fabrics, to pile yarn for pile fabrics and to artificial staple fiber for such pile yarn. The present application is a continuation in part of our application Serial No. 131,786, filed March 19, 1937, for Fiber, yarn and fabric.

A purpose of the invention is to produce artificial staple fiber of average filament cross section between 1000 and 5000 square microns (millionths of a meter) and of column-like cross section for making pile yarn for pile fabrics.

A further purpose is to produce pile yarn for pile fabrics containing artificial staple fiber of average filament cross section between 1000 and 5000 square microns and having desirable properties both for floor coverings and upholstery fabrics.

A further purpose is to produce artificial staple fiber having an average filament cross section between 1000 and 5000 square microns and having a minimum cross-sectional dimension at least 40% (preferably at least 60% and most desirably at least 80%) of the maximum cross-sectional dimension, so that the fiber can function as a column in a pile fabric, with adequate stiffness and resilience and without the exaggerated tendency to curl or cork-screw which exists when the minimum cross-sectional dimension is much less than the maximum.

A further purpose is to produce an artificial pile yarn for floor covering such as rugs and carpets which has the desirable properties of high resilience, resistance to crushing, resistance to wear, ability to shed dirt, and ease in cleaning by ordinary household cleaning procedure.

A further purpose is to produce artificial pile yarn for floor coverings which is equal in its general properties to carpet wool, and superior to wool in being mothproof.

A further purpose is to obtain unusual effects in pile fabrics by using an artificial pile yarn which has high brilliancy, simulating washed American Oriential rugs, or by applying cross dyeing to blended yarn.

A further purpose is to cheapen the production of house furnishing fabrics such as floor coverings and upholstery fabrics by employing pile yarn which is cheaper in the first instance, which is readily obtainable at the point of manufacture and therefore need not be stocked in large quantities with heavy investment and risk of large inventory losses, which is very economical in use because initially clean, and which is economical in processing because of ease of manufacture and uniformity in blend.

A further purpose is to produce upholstery fabrics such as plush, velvet, tapestry and upholstery cloth, using a pile yarn containing artificial staple fiber of between 1000 and 5000 square microns average cross section, capable of functioning as a column, having high wear resistance, high resistance to crushing, good cleanability, being moth-proof and exhibiting unusual dyeing effects.

Further purposes appear in the specification and in the claims.

In so far as the drawing shows particular cross sectional contours, or a particular yarn or a particular weave of floor covering or of upholstery fabric, they are intended to be conventional.

Figures 1, 1*a*, 2, 2*a*, 3 and 3*a* illustrate cross sections of typical artificial staple fibers which may be employed in the yarns and fabrics of the present invention.

Figure 4 illustrates in perspective a yarn embodying the present invention.

Figure 5 is a longitudinal section of a floor covering embodying features of the invention.

Figure 6 is a longitudinal sectional perspective of an upholstery fabric embodying features of the invention.

In the drawing like numerals refer to like parts.

The prior art practice has been to make the pile yarn of pile fabrics intended for floor coverings almost entirely of "carpet wool" because no other fiber has been found which is satisfactory as a substitute. Of all textile fabrics, carpets are probably subjected to the roughest usage, The only wool suitable for the major constituents of the pile yarn in floor coverings are those obtained from China, India, South America, Southeastern Europe and parts of Great Britain, which are characterized by stiffness and coarse texture, possess the necessary resilience to resist crushing and have the required wear resisting properties. Since, under the climatic conditions in North America, wool does not develop the necessary coarseness and stiffness, carpet wool is not produced in the United States and foreign carpet wool for floor coverings is admitted free of duty.

The American rug or carpet manufacturer must maintain a high inventory (about three months' supply) and inventory losses with fluctuations in market are very heavy. In addition, the required investments in inventory and foreign shipments are extremely heavy. The above factors, plus the definitely limited world supply of carpet wool, make the market for this material

extremely unstable and unsatisfactory from the standpoint of the manufacturer of floor coverings.

The increase in automobile production has caused great expansion in the demand for upholstery fabrics. Many of such fabrics are subjected to almost as much abuse as floor coverings. In the upholstery fabric field, the difficulties due to fluctuation in the market for raw materials, heavy investment and limited supply, are comparable with those of the floor covering field. Examples of upholstery fabrics are plush, velvet, tapestry, upholstery cloth.

The present inventors have discovered a raw material for pile yarn for pile fabrics, such as floor coverings and upholstery fabrics, which may be manufactured in indefinite quantities in any part of the world, is cheaper than carpet wool, and has certain definite advantages over carpet wool, especially over the cheaper grades of carpet wool. The raw material of the present invention is an artificial staple fiber having properties especially suiting it to the pile yarn of pile fabrics.

The artificial staple fiber of the present invention is manufactured from the raw material now used in making rayon, with suitable change in the spinneret orifice, speed of extrusion and solution concentration. While the artificial staple fiber may be made by any one of a number of processes, including processes which may be developed in the future, the experiments up to the present time indicate that the cuprammonium and viscose processes are preferable. Cellulose ether or nitrocellulose may be used. Cellulose esters such as cellulose acetate are not particularly recommended because of their peculiar dyeing characteristics and present high relative cost.

A very important feature of the present invention is the use of an average filament cross section ranging between 1000 and 5000 square microns (millionths of a meter). The preferable average filament cross section is 1000 to 2200 square microns, and the best average cross section is 1450 to 1800 square microns. In determining the average filament cross section, at least 100 cross sections selected by an approved sampling method should be measured and an average taken. For a discussion of testing filament fineness, see American Society for Testing Materials, Tentative Methods of Test for Fineness of Wool, D419—35T.

The present inventors have discovered that artificial filaments of average filament cross section between 1000 and 5000 square microns, when cut into staple fiber and spun into thread, have unexpected desirable properties for pile yarn.

Since the pile must act structurally as a series of columns to support the load applied to it, the fiber cross section must be that of a column, with the maximum and minimum cross-sectional dimensions at a given point not very different from one another. In general the minimum cross-sectional dimension at a point should be at least 40% (preferably at least 60% and most desirably at least 80%) of the maximum cross-sectional dimension at that point.

If the minimum cross-sectional dimension is very much less than the maximum, as in fibers whose cross sections are 10 x 70 microns or 10 x 200 microns, stiffness and resilience are lacking, and a marked tendency to curl or cork-screw exists, rendering such fibers unsuitable for use as a major constituent of a pile. In order for the fiber to possess resilience (not be mushy), it must have, in all directions from its longitudinal axis, elements in compression on one side of the column and in tension on the other side, at a sufficient distance from the axis to exert a powerful tendency to straighten the column, once it has deformed under load.

Desirable fibers according to the present invention might have maximum and minimum cross-sectional dimensions of 50 x 40 microns, 40 x 45 microns, 45 x 40 microns, 60 x 45 microns, etc.

Where the fiber minimum cross-sectional dimension is much less than the maximum, the fiber not only curls laterally, but, when the fiber is twisted into yarn, the effect of the twist is to produce a cork-screw configuration about the axis of the individual fiber (as distinguished from the axis of the yarn), likely to cause dust pick-up. A fiber whose maximum and minimum cross-sectional dimensions are close together as explained above may be twisted even into a hard twist yarn without exhibiting much tendency to form cork-screws about the individual fiber axes.

Manufacturers of pile yarn for upholstery fabrics are familiar with the use of rayon staple fiber of the heretofore conventional average cross section of about 380 square microns, which has been specified in automobile upholstery fabrics, for example, to limits of less than 33%. Such prior art rayon, when crushed, packs, does not resiliently regain its shape, and is not comparable with wool or mohair in wearing qualities. Due to its packing and to the property of ready adherence to dirt which it possesses, it has been found that a fabric having such prior art rayon as a major constituent of its pile yarn, cannot be cleaned by ordinary household methods like the vacuum cleaner, sweeping and beating. The feel of this prior art artificial staple fiber is "mushy" from the standpoint of the manufacturer of floor coverings and upholstery fabrics.

The artificial staple fiber employed in the present invention, ranging in average cross section between 1000 and 5000 square microns (preferably between 1000 and 2200 square microns and most desirably between 1450 and 1800 square microns), and of column-like cross section, has distinctly different properties from the prior art artificial staple fiber. The artificial staple fiber of the present invention is comparable in resilience with carpet wool. In feel it is stiff and firm, and quite similar to carpet wool or to mohair. If compressed it regains its shape to a degree closely approaching carpet wool of comparable fiber diameter. This insures absence of packing, permitting cleaning of a pile fabric manufactured from pile yarn containing as a major constitutent the artificial staple fiber of the present invention, by ordinary household methods, such as the vacuum cleaner, sweeping and beating.

Experimental carpets have been made having a large area of the pile consisting of carpet wool and another large area of the pile consisting of 75% of the artificial staple fiber of the present invention and 25% of carpet wool. The two areas of the pile have been so closely similar that experienced wool graders could not tell them apart by feel, resilience or stiffness.

Experiments made upon pile fabrics using the artificial staple fiber of the present invention as a major constituent of the pile yarn, indicate wear resistance practically equal to that of the best natural fibers or blends thereof as usual in floor coverings or upholstery pile fabrics, thus

offering the possibility of manufacturing floor coverings and upholstery fabrics using a pile yarn consisting entirely of the staple fiber of the present invention or of the staple fiber of the present invention blended with some other natural or artificial fiber.

In making up the pile yarn in accordance with the present invention, rayon is extruded in such a manner as to produce an average cross section in the finished filament of between 1000 and 5000 square microns, both inclusive. The preferred average filament cross section is between 1000 and 2200 square microns, best results being obtained with an average filament cross section between 1450 and 1800 square microns. The filament cross section should be close enough to general roundness (without considering the cross-sectional contour in detail) so that the minimum cross sectional dimension is at least 40% (preferably at least 60% and most desirable at least 80%) of the maximum cross-sectional dimension at a given point. Figures 1 to 3a inclusive show at **20** fiber suitable for use in the pile yarns and pile fabrics of the present invention.

The extruded filament is cut into staple fiber of suitable length, ranging for example from ½ to 10 inches in the ordinary case, although in exceptional cases being as long as 12 or even 14 inches. Of course the cutting into lengths for staple fiber is in itself well known. For convenient spinning in blended yarn the length of the artificial staple fiber should be comparable with that of the natural or artificial fiber with which the blending is being accomplished. The preferred length of fiber is 4 to 5 inches, especially when blending with carpet wool on the woolen system of spinning.

The only raw material which is necessarily used in making the pile yarn of the present invention is the artificial staple fiber just described. Any conventional spinning procedure may be adopted in preparing a multiple filament pile yarn from the artificial staple fiber of the present invention. The number of filaments in a thread cross section is of course variable, in ordinary practice perhaps 50 to 100 being a usual figure for the pile yarn of the present invention.

In the preliminary steps to spinning, economies may be effected as compared with the spinning of carpet wool because the artificial staple fiber when manufactured is free from dirt and therefore little or no loss is involved in processing. When spun on the woolen system, the artificial staple fiber of the present invention, alone or blended as explained below, is prepared by picking, is lubricated in accordance with the usual practice for wool, is carded to produce roving ends, and is spun on woolen mules or woolen spinning frames, using any suitable number of twists (for example 1 to 75 to an inch, 5 to 50 being usual practice), and using any desired number of plies. Figure 4 shows pile yarn **21** consisting of a suitable number of plies **22, 23** and **24**.

Any other spinning system may be used, for example the cotton, worsted, flax, silk, or jute system may be employed without substantial modification, instead of the woolen system.

The pile yarn may comprise 100% of the artificial staple fiber of the present invention. At the other extreme, as little as 20% of the artificial staple fiber of the present invention may be used with suitable blending fiber as later explained. If less than 20% of the artificial staple fiber of the present invention is employed, the characteristic properties of the pile yarn due to the artificial staple fiber of the present invention are materially reduced.

A house-furnishing fabric in accordance with the present invention is a floor covering fabric or an upholstery fabric or the like. This term is intended to apply to such fabrics, whether used in buildings, automobiles, airplanes, etc. The term house-furnishing fabric applies to rugs, carpets, furniture coverings, interior fittings, hangings, curtains, cushions and the like. House-furnishing pile fabrics are subject to special conditions not only in respect to the loads placed on the piles and the resilience required, but also in respect to the infrequency of washing and the necessity of cleaning by sweeping, brushing, beating, and the vacuum cleaner.

For floor coverings, from 20% to 100% of the artificial staple fiber of the present invention may be blended with from 80% to 0% of animal, vegetable or synthetic fibers.

For best results said other fibers should be of a stiffness and hardness of feel comparable with that of carpet wool in case they be used in quantities greater than 15%. For floor coverings, it is preferred to blend the artificial staple fiber of the present invention with from 80% to 0% of a natural fiber of coarse texture such as carpet wool, mohair or other equivalent natural coarse fiber. In floor coverings as much as 10% or even 15% of fine fiber having a cross sectional area of less than 400 square microns, such as fine mohair, fine wool, prior art fine (380 square micron) rayon or the equivalent may be blended with the artificial staple fiber of the present invention and the stiff animal, vegetable or synthetic fiber, the fine mohair, fine wool or prior art fine rayon imparting spinnability to the blended fiber. More than this quantity of fine fiber serves to substantially increase the dirt pick-up by the yarn and fabric.

More than 15% of fiber finer than 400 square microns cross section and of whatever nature may be used in a blend for a floor covering pile yarn where there is no objection to substantially increasing the dirt pick-up by the yarn and fabric, as for example cheap floor coverings made from a blend containing animal, vegetable or synthetic shoddy.

In the preferred pile yarn of the present invention for floor coverings, from 50% to 100% of 1000 to 5000 square micron (preferably 1000 to 2200 square micron and best 1450 to 1800 square micron) artificial staple fiber of column-like cross section, from 50% to 0% of stiff animal, vegetable or synthetic fiber and from 15% to 0% of fine mohair, fine wool, prior art fine rayon or the equivalent will be employed. A pile yarn which for many purposes is equally good for floor coverings can be made from 100% of the artificial staple fiber of the present invention and a pile yarn which is substantially more spinnable can be made from 85% to 90% of the artificial staple fiber of the present invention and 10% to 15% of fine mohair, fine wool, prior art fine rayon or the equivalent.

In floor coverings, more than 10% or 15% of prior art fine fiber having a cross sectional area of 400 square microns or less, such as fine (380 square micron) rayon or other comparable vegetable fiber causes the fabric to pick up dirt excessively and renders it difficult or impossible to clean by ordinary household methods.

A floor covering fabric is shown in Figure 5, of any suitable weave, having a backing **25** and

tufts of pile yarn 26 embodying the features of the present invention.

For upholstery fabrics, from 20% to 100% of the artificial staple fiber of the present invention may be blended with from 80% to 0% of other animal, vegetable or synthetic fibers.

For best results said other fibers should be of a stiffness and hardness of feel comparable with mohair and/or other animal fibers of a comparable nature in case they be used in quantities greater than 33%. For upholstery fabrics, it is preferred to blend the artificial staple fiber of the present invention with from 80% to 0% of a natural fiber of coarse texture such as mohair or other equivalent natural coarse fiber. In upholstery fabrics as much as 33% of fine fiber having a cross sectional area of 400 square microns or less, such as fine mohair, fine wool, prior art fine (380 square micron) rayon or the equivalent may be blended with the artificial staple fiber of the present invention and the stiff animal, vegetable or synthetic fiber, the fine mohair, fine wool, or prior art fine rayon imparting spinnability to the blended fiber. More than this quantity of fine fiber serves to substantially increase the dirt pick-up by the yarn and fabric.

More than 33% of fiber finer than 400 square microns cross section and of whatever nature may be used in a blend for an upholstery fabric pile yarn where there is no objection to substantially increasing the dirt pick-up by the yarn and fabric, as for example cheap upholstery fabrics made from a blend containing animal, vegetable or synthetic fiber.

For upholstery fabric the preferred pile yarn of the present invention will contain 50% to 100% of 1000 to 5000 square micron (preferably 1000 to 2200 square micron and best 1450 to 1800 square micron) artificial staple fiber, from 50% to 0% of stiff animal, vegetable or synthetic fiber and from 33% to 0% of fine mohair, fine wool, prior art fine rayon or the equivalent. A pile yarn which for many purposes is equally good for upholstery fabrics can be made from 100% of the artificial staple fiber of the present invention and a pile yarn which is slightly more spinnable can be made from 67% of the artificial staple fiber of the present invention and 33% of fine mohair, fine wool, prior art fine rayon or the equivalent. Any desired amount of the fine fiber less than 33% may be used in pile yarn for upholstery fabrics.

For upholstery fabrics more than 33% of prior art fine (380 square micron or finer) rayon causes the fabric to pick up dirt and renders it difficult or impossible to clean by ordinary methods.

An upholstery fabric is shown in Figure 6, of any suitable weave, having a backing 27 and tufts of pile yarn 28 embodying the features of the present invention.

The pile yarn of the present invention, when consisting of 100% of the artificial staple fiber of the present invention, or of the artificial staple fiber of the present invention blended with prior art fine rayon, may be dyed with standard rayon dyes. It will be understood of course that the artificial staple fiber as initially produced may be either lustrous or delustered, with or without delustering subsequent to extrusion. A lustrous staple fiber is desirable in many cases, producing brilliant effects in floor coverings which are not obtainable with the ordinary carpet wools. Where the yarn is blended, with carpet wool for example, the yarn can be dyed uniformly throughout by the use of dyes suited to the various components, or special color effects can be obtained by cross dyeing. For example, through cross dyeing, the artificial staple fiber may be given one color and the natural animal fiber may be given a distinctly different color, or the artificial staple fiber may take on one shade and the carpet wool another shade.

A special advantage exists by virtue of the fact that the artificial staple fiber can be dyed before extrusion, thus eliminating steps in the process, and cheapening the product.

By the product of the present invention, it is possible to simulate the effect of a washed American Oriental rug. This is a high luster fabric produced from carpet wool by chemically washing the fabric. In the prior art this has involved added expense for dyeing in order to withstand the chemical washing, required better construction of the fabric, and represented an actual loss in weight of wool of about 10% dissolved by the washing chemicals. The artificial staple fiber of the present invention may be produced with a luster and may be dyed prior to extrusion so that no loss is involved in obtaining the high luster effect of a washed American Oriental rug.

No deviation need be made from the usual weaving practice in the present invention. The pile yarn of the present invention may be used in any type of pile fabric, whether the pile be cut, uncut or partially cut. It will of course be understood that the yarn of the present invention is intended for the pile, and not intended for the warp, filler or stuffer.

There are two distinct fields of utility for the fabric of the present invention. The first is in floor coverings, such as carpets and rugs, for example of the Axminster, Wilton and other conventional types. For this use, resilience of the pile yarn is a very important requirement to insure that the pile will not pack. If the pile packs the floor covering takes on a worn appearance, dark spots result and the rug or carpet shows irregular areas. Of equal seriousness, where the pile yarn packs it cannot be cleaned by ordinary household methods such as vacuum cleaning, sweeping or beating. The pile yarn of the present invention has resilience substantially equal to that of carpet wool pile yarns of the prior art. The feel of the pile yarn of the present invention, especially when the cross section is about 1600 square microns, very closely approaches the feel of carpet wool.

The features of the invention may be used conjointly with the features of the invention of Charles Henry Masland, 2d, claimed in a copending application, Serial No. 147,883, filed June 12, 1937.

As to wear resistance, tests made at the United States Testing Laboratories using the Bureau of Standards method indicate that the pile yarn of the present invention has properties as favorable as those of carpet wool. Whereas the wool "control" resisted 140,000 cycles of wear, a floor covering otherwise identical but having a pile consisting of 80% of the artificial staple fiber of the present invention (1380 square micron average filament cross section) blended with 20% of carpet wool resisted 148,000 cycles. The pile yarn of the present invention possesses the advantage over carpet wool of being mothproof.

The other important application of the pile yarn of the present invention is to upholstery fabrics such as plushes, velvets, tapestry and upholstery cloth. In this field the resilience is per-

haps not quite so necessary as in floor coverings, but it is an important factor. The fiber of the present invention has the feel of mohair when the filament diameter is about 1400 square microns. In upholstery fabrics wear resistance and mothproofing are very important. The increased stiffness and the increased resistance to dirt accumulation characteristic of the fabric of the present invention are most unusual. The lustrous character of the yarn and the ability to obtain unusual dyeing effects are very valuable.

In the case of both floor coverings and upholstery fabrics, a distinct saving to the manufacturer will occur due to the initial cheapness of the staple fiber, the avoidance of the necessity for large capital investment and the avoidance of high inventory losses.

When reference is made herein to the column-like cross section of the fiber of the present invention, it is intended to indicate that the maximum and minimum cross-sectional dimensions are sufficiently near together to enable the structure to function as a column in a pile fabric. As a guide to this condition, it is recommended that the minimum cross-sectional dimension be at least 40% (preferably at least 60% and most desirably at least 80%) of the maximum cross-sectional dimension.

It will be evident that pile fabrics may be made by weaving, stitching, hooking, punching, flocking (blowing on an adhesive base) or any other suitable process.

Where percentages are referred to herein in connection with fiber blends, they are of course percentages by weight in the finished clean yarn.

Where reference is made herein to cross-sectional dimension, it is intended to refer to what would ordinarily be called the diameter in a truly circular cross section.

In view of our invention and disclosure, variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain all or part of the benefits of our invention without copying the exact embodiment described, and we, therefore, claim all such in so far as they fall within the reasonable spirit and scope of our invention.

Having thus described our invention what we claim as new and desire to secure by Letters Patent is:—

1. Pile yarn for pile fabrics consisting of staple fiber at least 20% of which is artificial staple fiber having a fiber length of ½ to 14 inches and an average filament cross section of 1000 to 5000 square microns, the minimum cross-sectional dimension being at least 40% of the maximum cross-sectional dimension.

2. Blended pile yarn for pile fabrics consisting of at least 50% of artificial staple fiber having an average filament cross section of 1000 to 5000 square microns, the minimum cross-sectional dimension being at least 40% of the maximum cross-sectional dimension, and a natural fiber.

3. Blended pile yarn for pile fabrics consisting of at least 50% of rayon artificial staple fiber having an average filament cross section of 1000 to 5000 square microns, the minimum cross-sectional dimension being at least 40% of the maximum cross-section dimension, a natural fiber of coarse texture and fine fiber to impart spinnability, the quantity of fine fiber being not sufficient to substantially increase the dirt pick-up by the yarn.

4. Pile yarn for pile fabrics consisting substantially entirely of artificial staple fiber of average filament cross section between 1000 and 5000 square microns, the minimum cross-sectional dimension being at least 40% of the maximum cross sectional dimension.

5. Pile yarn consisting of a blend of carpet wool and more than 20% of artificial staple fiber having an average filament cross section of 1000 to 2200 square microns, the minimum cross-sectional dimension being at least 40% of the maximum cross-sectional dimension.

6. House-furnishing fabric pile yarn containing at least 20% of artificial staple fiber having an average filament cross section of 1000 to 5000 square microns, the minimum cross-sectional dimension being at least 40% of the maximum cross-sectional dimension.

7. Floor-covering pile yarn containing at least 20% of artificial staple fiber, the yarn being substantially equal in feel, resilience, resistance to crushing and resistance to wear to pile yarn for floor coverings consisting entirely of carpet wool.

8. Upholstery fabric pile yarn at least 20% of which is staple fiber of average filament cross section from 1000 to 5000 square microns, the minimum cross-sectional dimension being at least 40% of the maximum cross-sectional dimension, having high wear resistance, high resistance to crushing and good cleanability.

9. A pile fabric whose pile contains in excess of 20% of artificial staple fiber of average filament cross section of 1000 to 5000 square microns, the minimum cross-sectional dimension being at least 40% of the maximum cross-sectional dimension.

10. A pile fabric whose pile contains artificial staple fiber of average filament cross section of 1000 to 5000 square microns, the minimum cross-sectional dimension being at least 40% of the maximum cross-sectional dimension, said artificial staple fiber being blended with another fiber.

11. A pile fabric whose pile contains artificial staple fiber of average filament cross section of 1000 to 5000 square microns, the minimum cross-sectional dimension being at least 40% of the maximum cross-sectional dimension, said artificial staple fiber being blended with a natural fiber of comparable coarse texture.

12. A pile fabric whose pile contains artificial staple fiber of average filament cross section of 1000 to 5000 square microns, the minimum cross-sectional dimension being at least 40% of the maximum cross-sectional dimension, said artificial staple fiber being blended with a natural fiber of comparable coarse texture and a fine fiber, the quantity of fine fiber being not sufficient to substantially increase the dirt pick-up by the fabric.

13. A pile fabric whose pile consists substantially entirely of artificial staple fiber of average filament cross section of 1000 to 5000 square microns, the minimum cross-sectional dimension being at least 40% of the maximum cross-sectional dimension.

14. A house furnishing pile fabric whose pile contains at least 20% of artificial staple fiber of average filament cross section of 1000 to 5000 square microns, the minimum cross-sectional dimention being at least 40% of the maximum cross-sectional dimension.

15. A floor covering whose pile contains at least 20% of artificial staple fiber of average filament cross section of 1000 to 5000 square microns, the minimum cross-sectional dimension being at least 40% of the maximum cross-sectional dimension, said floor covering having a

feel, resilience, resistance to crushing and resistance to wear substantially equal to that of a similar floor covering whose pile is entirely of carpet wool.

16. An upholstery fabric whose pile contains artificial staple fiber of average filament cross section of 1000 to 5000 square microns, the minimum cross-sectional dimension being at least 40% of the maximum cross-sectional dimension, having high wear resistance, high resistance to crushing and good cleanability.

17. A cross dyed blended pile yarn for pile fabrics, consisting of artificial staple fiber of average filament cross section of 1000 to 5000 square microns, the minimum cross-sectional dimension being at least 40% of the maximum cross-sectional dimension, and having one color effect, and another fiber having another color effect.

18. A floor covering whose pile comprises lustrous artificial staple fiber of average cross section of 1000 to 5000 square microns, the minimum cross-sectional dimension being at least 40% of the maximum cross-sectional dimension, and the effect simulating that of a washed American Oriental rug.

19. Pile yarn for pile fabrics consisting of staple fiber at least 20% of which is artificial staple fiber having an average filament cross section of 1000 to 2200 square microns, the minimum cross-sectional dimension being at least 40% of the maximum cross-sectional dimension.

20. Pile yarn for pile fabrics consisting of staple fiber at least 20% of which is artificial staple fiber having an average filament cross section of 1450 to 1800 square microns, the minimum cross-sectional dimension being at least 40% of the maximum cross-sectional dimension.

21. Pile yarn for pile fabrics consisting of staple fiber at least 20% of which is artificial staple fiber having an average filament cross section of 1450 to 1800 square microns, the minimum cross-sectional dimension being at least 60% of the maximum cross-sectional dimension.

22. The process of producing pile yarn for house-furnishing fabrics, which comprises spinning into yarn fiber at least 20% of which is artificial staple fiber of average filament cross section of 1000 to 5000 square microns, the minimum cross-sectional dimension being at least 40% of the maximum cross-sectional dimension.

23. The process of producing pile yarn for house-furnishing fabrics, which comprises blending artificial staple fiber of average filament cross section of 1000 to 5000 square microns with other fiber of comparable coarse texture and spinning the blended fiber into yarn.

WILLIAM H. PORTER.
THOMAS H. BARKER, 2D.