Aug. 7, 1956 J. F. NICHOLL 2,757,436

PUFFED FABRICS

Filed March 31, 1955

Fig. 1

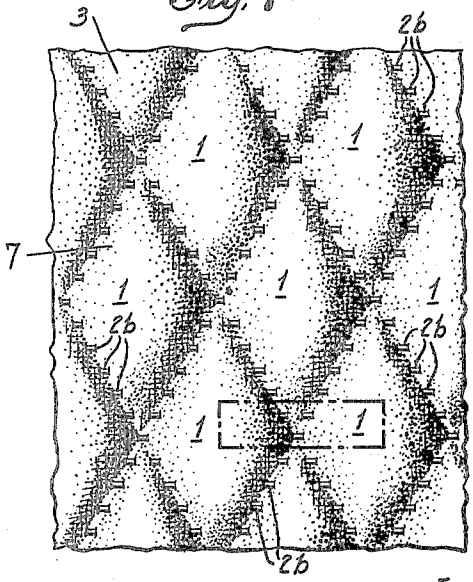
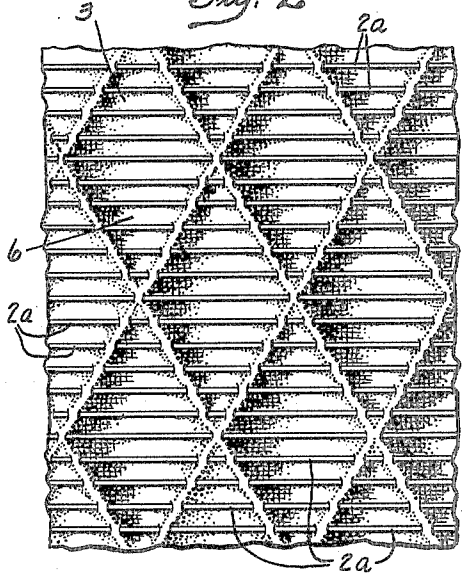


Fig. 2



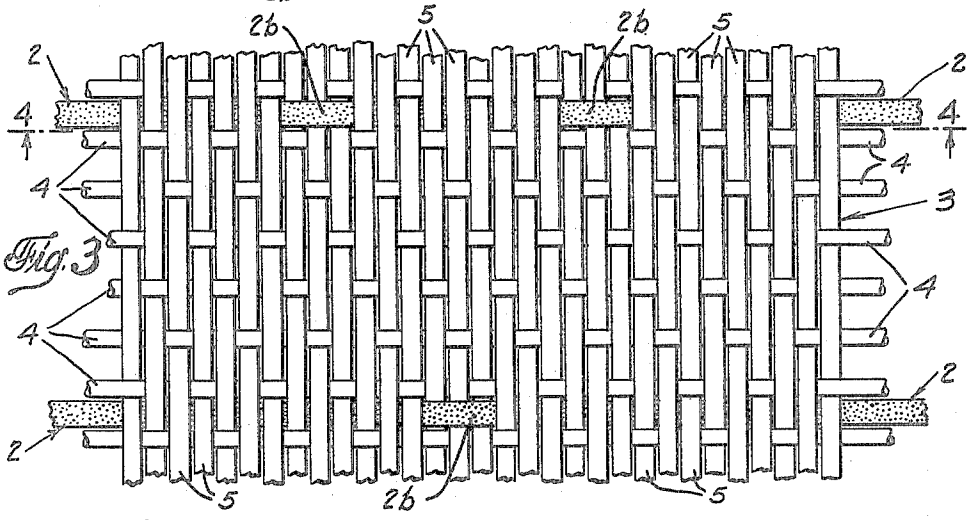


Fig. 3

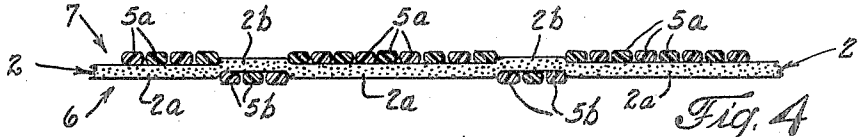


Fig. 4

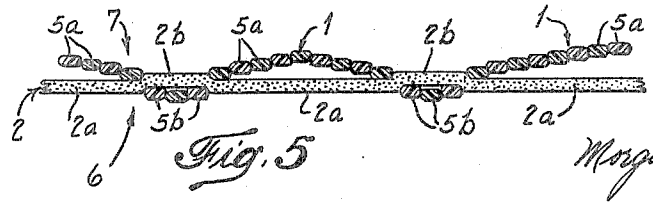


Fig. 5

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PUFFED FABRICS

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6 Claims. (Cl. 28—78)

The present invention relates to novel thermoplastic woven fabrics having puffed portions to provide ornamental patterns thereon. My fabrics are advantageously useful as upholstery fabrics, particularly automobile upholstery.

Objects and advantages of the invention will be set forth in part hereinafter and in part will be obvious herefrom, or may be learned by practice with the invention, the same being realized and attained by means of the compositions, combinations and improvements pointed out in the appended claims.

The invention consists in the novel parts, constructions, arrangements, compositions, combinations and improvements herein shown and described.

An object of my invention is to provide novel fabrics having puff portions to form attractive patterns, said patterns retaining their original appearance in use for a much longer period of time than is now possible with the presently known puffed fabrics.

A further object of my invention is to provide a novel puffed fabric wherein all of the filaments comprising said fabric possess substantially identical physical properties after the formation of the puffs in said fabric.

Woven fabrics having puffed portions are not new. The utilization of filaments having high shrinkage characteristics with filaments having lower shrinkage characteristics, in order to produce puffed fabrics, is also known. In some of the known puffed fabrics, the heat shrinkable filaments have been employed as warp or weft filaments of the main body of the fabric with the balance of the filaments being of the relatively non-shrinkable type. When such fabrics are subjected to a shrinking operation, the shrinkable filaments shrink to a greater extent than the non-shrinkable fibers to form the desired puffs. In another modification, both the warp and weft filaments are of the relatively non-shrinkable type to form the main body of the fabric, said main body having incorporated thereon shrinkers which on shrinking cause the formation of puffs.

Heretofore, the filaments used were of such a nature that the differential in shrinkage characteristics of the shrinkable and non-shrinkable filaments was maintained after the formation of the puffs. Disadvantageously, the shrinkable filaments would shrink even further when the fabric was in use so that the structure and appearance of the puffs were changed, resulting in a modification in the appearance of the pattern formed by the puffs.

In order to provide a puffed fabric wherein the appearance of the pattern remains unchanged in use, I have discovered the present invention. My invention in general relates to the formation of puffed fabrics by the utilization of a combination of two types of thermoplastic filaments, one type of filaments being referred to as the "heat shrinkable filament" and the other type of filaments being designated as the "less shrinkable filament." It is preferred that the shrinkable filaments, which on shrinking form the desired puffs, have initially higher

shrinkage characteristics than the less shrinkable filaments, but after the initial shrinking, possess substantially the same shrinkage characteristics as the less shrinkable filaments. Any thermoplastic filaments which have the foregoing characteristics may be used in producing my fabrics in accordance with the present invention. By using a combination of filaments which form puffed fabrics and possess the same shrinkage characteristics after formation thereof, the appearance of a pattern formed by said puffs remains unchanged when the fabric is in use, for if any shrinking does occur, all of the filaments comprising the fabric will shrink at the same rate.

Preferably, the thermoplastic materials not only possess the shrinkage characteristics as described above, but also are sufficiently similar in composition so as to possess the same structural strength, resistance to wear, resistance to corrosion, resistance to chemical action, etc. By using filaments of the type described, after the formation of the desired puffs, all of the filaments possess substantially identical physical properties, resulting in uniform wear, tear, shrinkage, etc., of the puffed fabrics so that the appearance of the patterns formed by the puffs is maintained while the fabric is in use for a much longer period of time than is attainable by the heretofore used puffed fabrics.

Particularly useful in producing puffed fabrics in accordance with my invention are the saran type filaments. For example, highly attractive and uniform puffed fabrics may be produced by utilizing "Saran" vinylidene chloride-vinyl chloride copolymers wherein the vinyl chloride is generally in the range of 18–30% as the shrinkable filaments, and saran copolymers wherein vinyl chloride is in a lesser amount, generally in the range of 4–15%, preferably 8–12%, as the less shrinkable filaments.

The foregoing combination of saran copolymers not only possesses the desired shrinkage characteristics but also possesses the same structural strengths, resistance to wear, resistance to corrosion, and resistance to chemical action, etc.

Although my invention includes puffed fabrics wherein the shrinkable filaments form the weft or warp filaments of a fabric, the preferred puffed fabrics are those wherein the main body of the fabric is woven from thermoplastic filaments of the less shrinkable type, and wherein the puffs are formed by the incorporation of the heat shrinkable filaments in the form of floats or shrinkers. Examples of such preferred fabrics are those disclosed in co-pending application Serial No. 498,306, filed March 31, 1955, by Douglas D. McCord, Harold P. Faris and Bernard R. Koenig. The puffed fabrics disclosed in the referred to application relate to thermoplastic woven fabrics having incorporated thereon thermoplastic, heat shrinkable shrinkers floated predominantly on the back of the main body of said fabric, said shrinkers intersecting said main body so as to define the borders of the puffs formed by the shrinking of said shrinkers. By the term "floated" as used hereinabove and hereinafter, is meant that the shrinkers are not interwoven with the main body of the fabric but instead pass over or under a plurality of threads of the main body.

Any suitable heat treating method may be used in effectuating the initial shrinkage necessary to shrink the shrinkable filaments. Where the puffs are formed by the use of heat shrinkable shrinkers floated predominantly on the back of the main body of the fabric, the shrinkers are preferably shrunk in accordance with the method disclosed in co-pending application Serial No. 498,286, filed March 31, 1955, by Douglas D. McCord, Thomas R. Holbrook and Charles A. Rudolph. In this method, the fabric is passed around a plurality of internally heated dry drums, so the back of the fabric always con-

tacts the hot surface, causing the formation of the desired puffs.

In order to describe my invention by specific example, reference is now made to the drawings. The particular mechanical structure of the puffed fabric illustrated in the drawing is not part of the present invention. The present invention is concerned with the use of particular thermoplastic materials in forming the main body and shrinkers of a puffed fabric, one type of said fabric being illustrated in the drawings.

Fig. 1 is a view of the face of a puffed fabric produced by the incorporation of heat shrinkable floats or shrinkers having higher initial shrinkage characteristics than the main body of the fabric, but having the same shrinkage characteristics after the initial shrinking operation.

Fig. 2 is a view of the back of the puffed fabric of Fig. 1.

Fig. 3 is a greatly enlarged schematic view of the area enclosed by dot and dash lines, as shown in Fig. 1, but before the fabric has been subjected to the shrinking operation.

Fig. 4 is a section along the line 4—4 of Fig. 3.

Fig. 5 is similar to Fig. 4, but indicating the configuration of the fabric after the shrinking operation has taken place.

In the puffed fabric illustrated in the drawings, puffs **1**, which give a diamond pattern seen pictorially in Fig. 1, are produced by incorporating heat shrinkable shrinkers **2** on the main body **3** and subjecting the fabric to a heat shrinking operation. The main body **3** comprises woven weft or filler threads **4** and warp threads **5**, said threads **4** and **5** being yarns or filaments of a "saran" copolymer having about 11% vinyl chloride. The shrinkers **2**, consisting of yarns or filaments of a "saran" copolymer having about 20% vinyl chloride, are woven in a weft direction and are floated predominantly at the back **6** of main body **3** to form shrinker portions **2***a* and slightly over the face **7** to form shrinker portions **2***b*.

The shrinking operation is effectuated in any desired manner. For example, the main body, including the attached shrinkers, may be passed through a hot liquid bath at a suitable shrinking temperature, generally in the range of 220° to 280° F. and preferably about 245° F. Alternatively, the fabric may be passed around a plurality of internally heated drums wherein the back of the fabric is caused to contact heated surfaces of said drums causing the shrinker portions **2***a* to shrink. By heating the fabric in this manner, the shrinker portions **2***a* shrink from their position shown in Fig. 4 to that of Fig. 5, which, in turn, causes the warp threads **5***a* over said portions **2***a* to be pulled together, whereupon the body portion of the fabric adjacent said shrinker portions rises above the front face of the fabric to form the desired puffs. The body portion of the main body of the fabric adjacent the shrinkers is caused to rise on the shrinking of the shrinkers due to the frictional grip exerted by the shrinkers where they intersect the main body and the adherence of the shrinkers to the main body at said intersecting portions due to the slight fusing during the heat shrinking operation. Also, by floating the shrinkers over a number of warp threads **5***b*, the warp threads **5***a* do not rise tangentially from the front face **7** but at an angle which enhances the formation of sharp and accentuated puffs.

The puffed fabrics produced in accordance with the present invention are particularly useful as automobile upholstery fabrics, not only because of their durability, strength, attractive three-dimensional appearance, etc., but also because of their desirable "breathing properties" which further enhance such use. By "breathing properties" is meant that the fabrics are sufficiently porous to permit the passage of air therethrough to provide adequate ventilation. Thus, my fabrics may readily be used as seat covers without causing discomfort to anyone coming in contact therewith.

The term "filaments" as used herein includes monofilaments, twisted multifilament strands, yarn spun from filament staple, etc.

The invention in its broader aspects is not limited to the specific compositions, combinations and improvements described, but departures may be made therefrom within the scope of the accompanying claims without departing from the principles of the invention and without sacrificing its chief advantages.

What I claim is:

1. A woven thermoplastic fabric having puffs constituting an ornamental pattern therein comprising thermoplastic filaments and heat shrunken thermoplastic shrinker filaments, said puffs having been formed by the shrinking of said shrinker filaments, said heat shrunken shrinker filaments possessing substantially the same shrinkage characteristics as the first mentioned thermoplastic filaments, and having been heat shrunken from heat shrinkable filaments which prior to shrinkage possess a higher initial heat shrinkability than the first mentioned thermoplastic filaments whereby to form the puffs upon initial shrinkage of the heat shrunken filaments.

2. A woven thermoplastic fabric in accordance with claim 1 wherein the first mentioned thermoplastic filaments and the heat shrunken thermoplastic filaments have substantially the same physical properties.

3. A woven thermoplastic fabric having puffed portions constituting an ornamental pattern therein, said fabric comprising a main body presenting such puffed portions, and having warp and weft thermoplastic filaments of given heat shrinkability and heat shrunken thermoplastic filaments defining the puffed portions and maintaining their puffed configurations, said second mentioned thermoplastic filaments having substantially the same heat shrinkability as the first mentioned warp and weft thermoplastic filaments but which in the fabric prior to shrinkage have higher initial heat shrinkability than the warp and weft thermoplastic filaments whereby to form the puffed portions upon initial shrinkage of the second mentioned thermoplastic filaments.

4. A woven thermoplastic fabric having puffs constituting an ornamental pattern therein comprising thermoplastic filaments and heat shrunken thermoplastic shrinker filaments, said puffs having been formed by the shrinking of said shrinker filaments, the first mentioned thermoplastic filaments and the heat shrunken thermoplastic shrinker filaments being of a vinylidene chloride-vinyl chloride copolymer containing vinyl chloride in a minor amount, the amount of vinyl chloride being greater in said heat shrunken thermoplastic shrinker filaments than the first mentioned thermoplastic filaments.

5. A woven thermoplastic fabric in accordance with claim 4 wherein the amount of vinyl chloride in the heat shrunken thermoplastic shrinker filaments is in the range of about 18 to 30% by weight of the copolymer and the amount of vinyl chloride in the first mentioned thermoplastic filaments is in the range of about 4 to 15% by weight of the copolymer.

6. A woven thermoplastic fabric in accordance with claim 5 wherein the amount of vinyl chloride in the heat shrunken thermoplastic shrinker filaments is about 20% by weight of the copolymer and the amount of vinyl chloride in the first mentioned thermoplastic filaments is about 11% of the copolymer.

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