July 19, 1955 E. R. FREDERICK 2,713,547

SIMULATED DOWN FILLER AND METHOD OF MAKING THE SAME

Filed Aug. 8, 1952

2 Sheets-Sheet 1

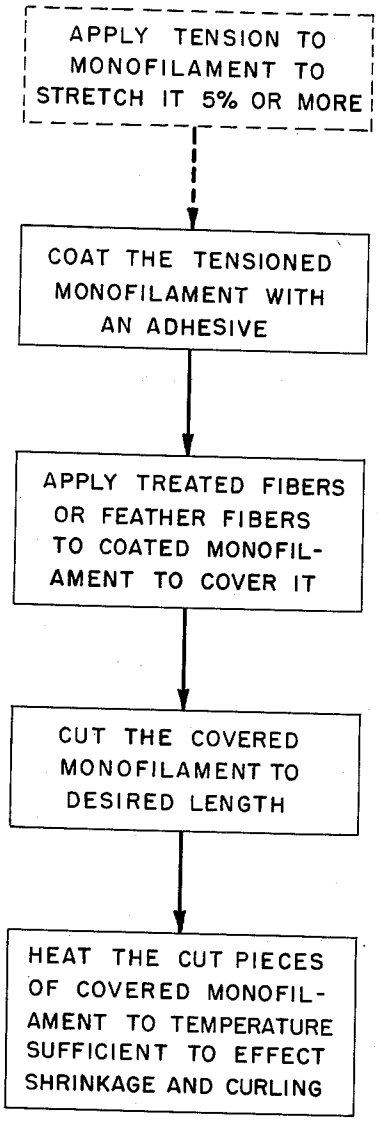


Fig. 1

Fig. 4

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Fig. 2

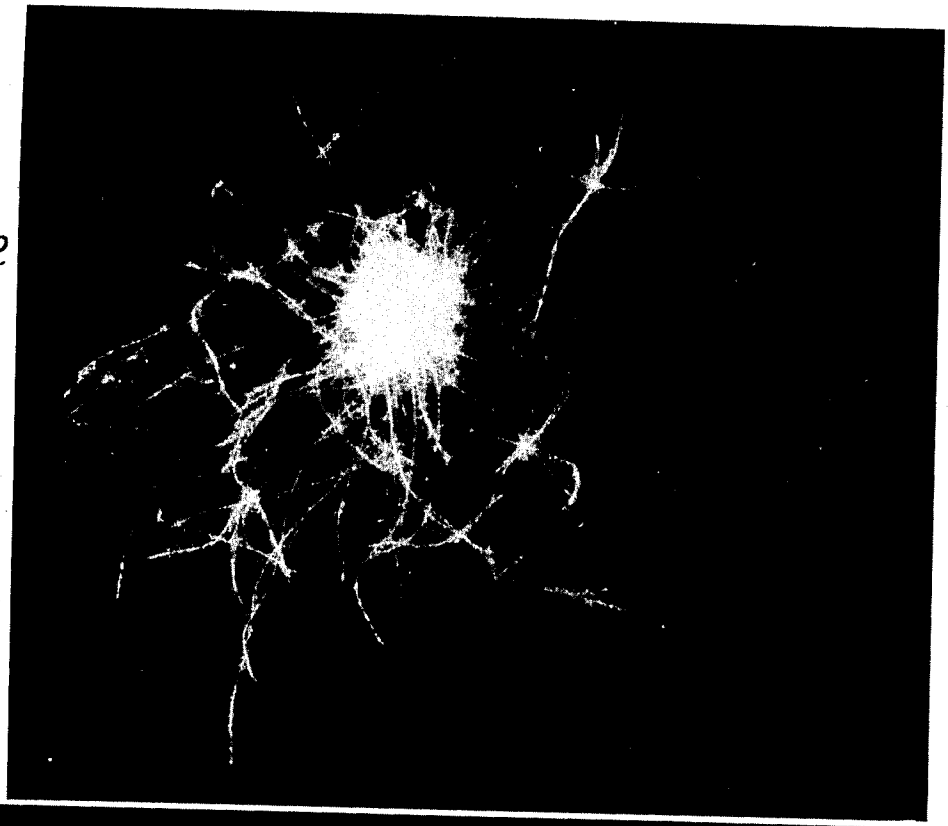




Fig. 3

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2,713,547

SIMULATED DOWN FILLER AND METHOD OF MAKING THE SAME

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Application August 8, 1952, Serial No. 303,327

13 Claims. (Cl. 117—4)

This invention relates to simulated down fillers and a method of making the same, and is an improvement on the invention described and claimed in my pending application Serial No. 276,985, filed March 17, 1952.

In said pending application disclosure is made of a method including "spiralizing" a wire or monofilament, coating the tensioned wire or monofilament with an adhesive, blowing a feather product against the coated tensioned wire or monofilament to cover the latter, then cutting the covered wire or monofilament and relieving its tension so that a feather-covered helix or spiral of controlled length and diameter is obtained. As there disclosed, a plurality of such helices or spirals may be employed advantageously as filler elements in various fabric and other constructions, since they provide a high bulk to weight ratio, are good heat insulators, offer considerable resistance to lateral compression while permitting flexing and lengthwise expansion and contraction, and have other desirable characteristics.

In accordance with this invention, a feather-covered monofilament of any desired length is provided but the monofilament lacks a regular spiral or helical form, having instead an irregularly curled, twisted form as will be explained. The irregularity of the curly form is such that probably no two sections or fragments of the covered monofilament are identical. When the described covered monofilament is cut into short lengths and batts are formed therefrom, such batts have high filling power and can be substituted advantageously for the waterfowl feather-and-down mixture now in common use for sleeping bags, etc. The invention also provides an extremely simple and inexpensive procedure for making the described covered monofilaments.

For an explanation of the term "filling power," reference may be made to the report entitled "A proposed method for measuring the filling power of down and feathers" by Henry A. Sinski, publication No. TD 103037, The Office of Technical Services, U. S. Department of Commerce, and to the article by N. B. Edelman in Textile Research Journal, vol. 17, p. 199 (1947) entitled "Investigation of methods for determining the filling power of feathers."

In the accompanying drawings forming a part of this specification,

Fig. 1 is a flow sheet or diagram of the method;

Fig. 2 is an enlarged reproduction of a goose down particle;

Fig. 3 is an enlarged reproduction of a fragment of a feather-covered monofilament made in accordance with this invention, the enlargement being the same as Fig. 2; and

Fig. 4 is a full size elevation of a polyethylene monofilament after being shrunk about 80%.

In practicing the invention, the monofilament selected is preferably polyethylene, preferably of about .010 in. diameter. This monofilament has a specific gravity of only 0.92–0.93 and has the valuable characteristic of shrinking, thickening, and curling or twisting when exposed to moderate heat (about 250° F.). It also has low water absorption, remarkable chemical inertness, high dielectric strength and unusual low temperature

flexibility. Usually monofilaments as they come on the market have been stretched, and therefore a pre-tensioning is not necessary; but if the monofilament has not been stretched, the first step is to apply tension in any usual manner to stretch it 5% or more. The stretched monofilament, still under tension, is then run around a roller dipping in a bath of adhesive (not shown) to apply a coating of adhesive to the monofilament. For the adhesive I prefer to employ "Pliobond 20," which is said to be a butadiene-acrylonitrile rubber type adhesive, made by the Goodyear Tire & Rubber Co. This adhesive forms a positive bond so strong that chicken feathers and feather fibers attached to the monofilament by the adhesive may be pulled apart before the bonds will yield. "Pliobond 20" is extremely tacky, is vuncanizable, dries satisfactorily under the conditions obtaining, and is not brittle at low temperatures (−65° F.), nor does it disintegrate or flow at +120° F. While this adhesive as at present marketed has an objectionable odor, perhaps due to a volatile ketone, the odor disappears in time; if desired, deodorants or aeration may be used to shorten the period during which the odor is noticeable.

After passing around the adhesive roller, the tensioned filament lies in a horizontal line and passes through a feather-applying chamber like the one disclosed in my aforesaid pending application Serial No. 276,985, where feathers and feather fibers are blown against the adhesive-coated filament, causing the filament to be completely covered. Due to the nature of feathers and the way they are handled in the machine, the feathers are orientated, their quills being foremost or in advance of the barbs as the feathers travel with the air currents. Thus, the quills usually strike the filament and become attached thereto by the adhesive, the quills usually arranging themselves at approximately right angles to the filament. The air stream, of course, helps to dry the adhesive to make a reasonably firm bond before the covered filament passes out of the machine.

The feathers used are preferably straight chicken feathers not over 3 in. long or commercial "curled" (i. e., crushed) chicken feathers or feather fibers, or mixtures of these in any proportions. These feathers or fibers are preferably washed or dry cleaned and then coated with an elastomer, a wax or a resin, as disclosed in my pending application Serial No. 276,985; or the feather product may be chemically treated as disclosed in my pending application Serial No. 287,427, filed May 12, 1952, or in the Frederick and Janowski application Serial No. 343,806, filed March 20, 1953. Chicken feathers or chicken feather products are prefered because of the large quantity available; other land fowl feathers and feathers products may, however, be used. Waterfowl feathers and down are disclaimed.

After the covering, the filament is cut or chopped into convenient lengths, which may be as much as ten inches or as little as one inch or even less. These feather-covered fragments are then subjected to heat, conveniently heated air currents in a closed thermostatically controlled chamber with the temperature about 250° F. High temperatures are avoided to prevent undesirable changes in the feathers. This heating effects a 30–40% reduction in length due to shrinkage, which, of course, brings the feather fibers closer together. If the pre-stretching mentioned above has taken place, the shrinkage will approach or equal 40% or even more. As a pronounced twisting and curling also takes place (see Fig. 4), the fragments have their feather barbs or fibers extending outwardly in all directions, generally like waterfowl down. Fig. 4 also shows how a filament (originally 0.010 in. diam.) thickens as it shrinks in length. In this instance, the shrinkage was about 80% due to exposure to a temperature of 300° F. for about ten minutes. Fig. 3 reproduces

on an enlarged scale a covered filament fragment made as described. Fig. 2 shows on the same scale a goose down particle, for comparison.

The filling power of the described product is high, about 4.3 to 4.5 in case untreated feathers are used. With treated feathers, the filling power may reach 5.3 to 5.9; hence masses or batts formed from the product may be used as substitutes for the standard down-feather mixture now used in Army sleeping bags.

While polyethylene monofilament has been particularly described because of its perfect adaptability to the method of the invention, other heat-shrinkable filaments may be used, provided the degree of heat necessary for effecting the shrinking does not impair the bond or damage the feathers. For instance, "vinyon H" monofilament, which is a vinyl chloride-vinyl acetate resinous filament of about 87% vinyl chloride content may be used, or "vinyon N" thread (an acrylonitrile-vinyl chloride resinous thread of about 60% vinyl chloride content) may be employed as the core. The properties of various "vinyon N" yarns are described in "Industrial and Engineering Chemistry," vol. 40, No. 9, p. 1724 (September 1948). Among the patents relating to "vinyon H" are Rugeley et al. Nos. 2,161,766 and 2,344,002; while the Shriver et al. Patent No. 2,420,330 and the Rugeley et al. Patent No. 2,420,565 relate to "vinyon N."

What I claim is:

1. A method of making simulated down fillers which comprises applying an adhesive coating to a heat-shrinkable resinous filamentous member, applying a land fowl feather product of substantial bulk to the coated member to substantially completely cover the same with the feather product adhesively bonded firmly thereto and sticking out therefrom in all directions, cutting the covered member to the desired lengths, and heat-shrinking the cut lengths at least 30% while maintaining the feather product covering unimpaired.

2. A method of making simulated down fillers which comprises stretching a heat-shrinkable resinous monofilament at least 5%, applying an adhesive coating to the monofilament, applying a land fowl feather product of substantial bulk to the coated monofilament to substantially completely cover the same with the feather product adhesively bonded firmly thereto and sticking out therefrom in all directions, cutting the covered monofilament to the desired length, and heat-shrinking the cut lengths of covered monofilament at least 30% while maintaining the feather product covering unimpaired.

3. A simulated down filler element which consists of a core that is a heat-shrunk and curled section of a resinous monofilament, and a land fowl feather product of substantial bulk adhesively bonded to said core and substantially completely covering the same and sticking out therefrom in all directions.

4. A simulated down filler element which consists of a polyethylene core that has been curled and shrunk to a substantial extent by heat alone, and a land fowl feather product of substantial bulk adhesively bonded to said core and substantially completely covering the same and sticking out therefrom in all directions.

5. A simulated down filler element which consists of a polyethylene monofilament core heat-treated to shrink it at least 30% and curl it, and a land fowl feather product of substantial bulk adhesively bonded to said core prior to the shrinking and substantially completely covering the same and sticking out therefrom in all directions.

6. A simulated down filler element which consists of a polyethylene monofilament of about 0.010 in. initial diameter having chicken feathers and feather fibers secured thereto by a butadiene-acrylonitrile adhesive, said monofilament being heat-shrunk at least 30% to impart thereto a twisted or curly shape to bring the feather fibers closer together and sticking out therefrom in all directions.

7. A simulated down filler element which consists of a vinyl chloride-vinyl acetate resinous monofilament heat-treated to shrink it at least 30% and curl it, and a land fowl feather product of substantial bulk adhesively bonded to said core prior to the shrinking and substantially completely covering the same and sticking out therefrom in all directions.

8. A simulated down filler element which consists of an acrylonitrile-vinyl chloride resinous thread heat-treated to shrink it at least 30% and curl it, and a land fowl feather product of substantial bulk adhesively bonded to said core prior to shrinking and substantially completely covering the same and sticking out therefrom in all directions.

9. A simulated down filler element which consists of a cut segment of a resinous monofilament core which has been stretched 5% or more; and a land fowl feather product of substantial bulk adhesively bonded to the core and substantially completely covering the same; the resinous core being heat-shrunk at least 30% to have a twisted or curly form so that the feather product sticks out therefrom in all directions.

10. A simulated down filler element which consists of a cut segment of a polyethylene monofilament core which has been initially stretched 5% or more; and a chicken feather product of substantial bulk adhesively bonded to the core and substantially completely covering the same; the resinous core being heat-shrunk at least 30% to have a twisted or curly form so that the chicken feather product sticks out therefrom in all directions.

11. A simulated down filler element which consists of a cut segment of a stretched vinyl chloride-vinyl acetate monofilament of about 87% vinyl chloride content and forming a core which has been stretched 5% or more; and a chicken feather product of substantial bulk adhesively bonded to the core and substantially completely covering the same; the resinous core being heat-shrunk at least 30% to have a twisted or curly form so that the chicken feather product sticks out therefrom in all directions.

12. A simulated down filler element which consists of a cut segment of a stretched acrylonitrile-vinyl chloride monofilament of about 60% vinyl chloride content and forming a core which has been stretched 5% or more; and a chicken feather product of substantial bulk adhesively bonded to the core and substantially completely covering the same; the resinous core being heat-shrunk at least 30% to have a twisted or curly form so that the chicken feather product sticks out therefrom in all directions.

13. A simulated down filler element which consists of a cut segment of a resinous monofilament core which has been stretched 5% or more, an adhesive coating on said core; and a bulky covering composed of chicken feathers having their quills mostly attached to the core by said adhesive coating, with the quills mostly at approximately right angles to the core; the resinous core being heat-shrunk at least 30% to have a twisted or curly form so that the chicken feather covering sticks out therefrom in all directions.

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