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TREATMENT OF MATERIALS COMPOSED PARTLY OR WHOLLY OF WOOL OR SIMILAR FIBERS

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3 Claims. (Cl. 26—18.5)

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This invention relates to the treatment of materials composed partly or wholly of wool or similar fibres, all of which fibres will hereinafter be referred to as wool.

By means of my invention it is possible to decrease partly or completely the tendency of wool to felt or shrink.

The form of shrinkage referred to is that which is commonly described as felting and is accompanied by a progressive closing together and thickening of the material with an accompanying loss of area when alternate compression and relaxation is applied to the material under conditions similar to those which exist in household washing or in a laundering machine. It does not apply to a particular form of shrinkage commonly described as relaxation which is caused by the release of mechanical stresses when for the first time a material is immersed in water.

According to the process of the present invention wool either in the form of loose fibres, yarn or fabric is exposed to the action of sonic or ultrasonic vibrations whilst immersed in an aqueous liquid which is preferably water, for the purpose of rendering it substantially unshrinkable.

The sonic or ultrasonic vibrations may be generated in a standard manner, for example, by using a piezo-electric quartz crystal, a magneto strictive material (e. g. nickel), or by an electromagnetic method.

It is difficult to define exactly the intensity of sound vibrations necessary to achieve the effect, but a criterion which can be taken is the time necessary to denature a solution of egg albumen. Thus, if the vibrations are intense enough to coagulate at the iso-electric point a 0.1% solution of egg albumen in a period of less than five minutes, the solution being kept at below 50° C. by cooling, then the vibrations are intense enough to render wool substantially unshrinkable. Denaturation of egg albumen is judged to have taken place if the solution of albumen becomes cloudy; that is, if the protein precipitates out. The vibration intensity has to be considerable and vibrations which though intense enough to emulsify, say, benzene in water fairly rapidly but which do not denature an egg albumen solution rapidly, have usually very little effect on the felting properties of wool. It is difficult to specify frequency limits for the vibrations since as far as I have found, the only important factor is the intensity of the vibrations. Since the intensity of the vibrations is, however, a function of the displacement of the vibrating system and the frequency, it is clear that very high intensities cannot be obtained at low frequencies. In practice, we have never found it possible to generate vibrations of sufficient energy at below three kilocycles and we prefer to employ between eight and five hundred kilocycles. An upper limit for frequency is again determined by the methods of producing these vibrations and I have found it impossible to generate vibrations of the necessary intensity at about three thousand kilocycles.

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The following are examples of methods of producing vibrations of sufficient intensity:

(1) A piezo-electric oscillator as described in the examples below;

(2) A magneto striction oscillator as described by Newton Gaines, Physics, 1932, 3, 209, where the upper portion of the nickel rod oscillates in water; and

(3) An electro magnetic oscillator as described by Hillary W. St. Clair, Review of Scientific Instruments, 1941, page 250, again oscillating in water.

These oscillators, if constructed as described in these publications and run at full efficiency, render wool substantially unshrinkable in exactly the same method as the piezo-electric quartz crystal described in the examples.

The following examples illustrate how the process of the invention may be carried into effect:

1. A quartz crystal 60 mm. square was made the base of a rectangular vessel holding 500 ccs. of liquor and 600 watts of an electric current of the same frequency as the crystal (e. g. 250 kc.) was supplied by a standard transmitter and fed to the top and bottom plates of the crystal which was then in ultrasonic oscilaltion. It was convenient to silver the bottom plate and connect one lead to it and to feed the current to the top face by conduction of the water of the liquor. It is, of course, essential that there is no path for the water from the top face of the crystal to the bottom face, otherwise the high frequency current which is at a high voltage will be short circuited.

A piece of knitted all-wool fabric weighing 2 gms. was exposed in 50 ccs. of water to the ultrasonic vibrations running at 600 watts input for 30 minutes. After this treatment the fabric shrank 5% in area on being milled, whereas a control pattern shrank 28%.

2. 5 gms. of a woven fabric made up from a yarn containing 75% by weight of wool (64s quality) and 25% by weight of viscose rayon staple was treated in a device identical with that de-

scribed in Example 1 for 30 minutes in 100 ccs. of water. After this treatment the fabric shrank 3% in area on being milled, whereas an untreated pattern of the same fabric on milling for the same time shrank 32%.

3. 5 gms. of a knitted fabric made up from a yarn containing 50% by weight of wool and 50% by weight of staple fibre viscose rayon after a treatment identical with that described in Example 2, shrank 9% as opposed to an untreated sample which shrank 42%.

The advantage of the process of the present invention for rendering wool substantially unshrinkable over processes employing oxidising agents or other chemicals is that the wool is in no way degraded and its feel remains unaltered. Its wearing properties as judged by an abrasion resistance test are not at all or not appreciably reduced.

I claim:

1. A process for the treatment of wool for the purpose of rendering it substantially unshrinkable which comprises exposing the wool to the action of vibrations of a frequency of between 3 kilocycles per second and 3000 kilocycles per second, said vibrations having an intensity at least sufficient to coagulate a 0.1% solution of egg albumen at the iso-electric point and at a temperature below 50° F. in a period of less than five minutes, whilst immersed in an aqueous liquid, which is chemically inert to wool.

2. A process for the treatment of wool for the purpose of rendering it substantially unshrinkable which comprises exposing the wool to the action of vibrations of a frequency of between 3 kilocycles per second and 3000 kilocycles per second, said vibrations having an intensity at least sufficient to coagulate a 0.1% solution of egg albumen at the iso-electric point and at a temperature below 50° F. in a period of less than five minutes, whilst immersed in water.

3. A process for the treatment of wool for the purpose of rendering it substantially unshrinkable which comprises exposing the wool to the action of vibrations of a frequency of between 8 kilocycles per second and 500 kilocycles per second, said vibrations having an intensity at least sufficient to coagulate a 0.1% solution of egg albumen at the iso-electric point and at a temperature below 50° F. in a period of less than five minutes, whilst immersed in water.

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