Dec. 4, 1945. G. S. RADFORD 2,390,386

NAPPED FABRIC AND METHOD

Filed June 29, 1943

Fig. 1

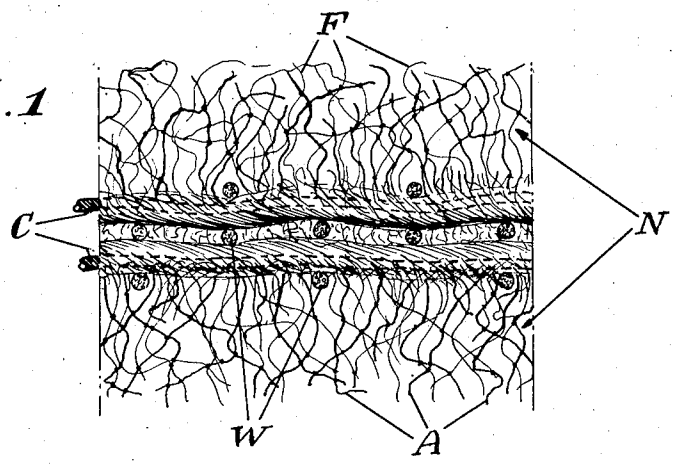


Fig. 2

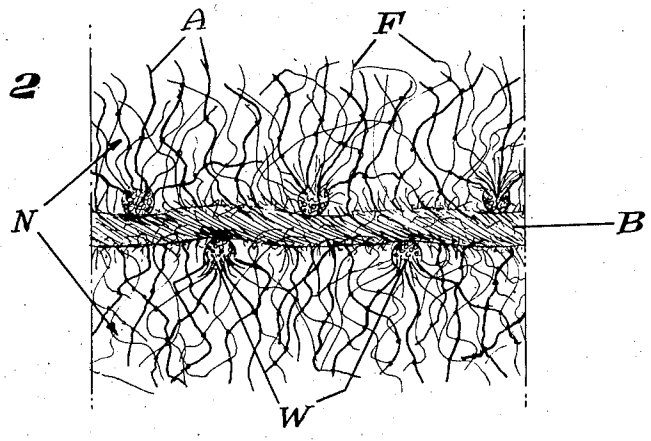
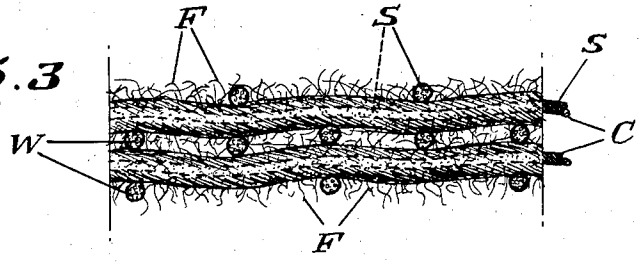


Fig. 3



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NAPPED FABRIC AND METHOD

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14 Claims. (Cl. 28—73)

This invention relates to novel, non-shedding napped fabrics, particularly household blankets, and to novel yarns and methods for use in making such fabrics. The invention has for its object to provide such a fabric in which the tendency of fibres to loosen and separate themselves from the structure is minimized, or even practically eliminated. The application is a continuation in part of my prior application, Serial No. 406,165, filed August 9, 1941.

The invention finds principal application in the manufacture of blankets and will, therefore, be described with particular reference thereto.

The blankets to which the invention is applicable may be of wool, rayon, cotton, silk, nylon, or other fibres, or their mixtures. The yarns of which the blanket is woven may be all of the conventional twisted construction or they may include yarns of the composite type called "core yarns," consisting of a small, hard-twisted core having a wrapping of random mixed, loosely tangled fibres, such, for example, as disclosed in Amory Patent No. 2,208,533, dated July 16, 1940. After weaving, the blanket structure is subjected to napping, which raises the surface fibres of the twisted yarns or of the wrapping of the core yarns, or both, to form the nap.

The tendency of such blankets to shed their nap fibres is familiar and has constituted a troublesome problem in the art. This has been particularly so where the nap contained rayon or nylon fibres which, by reason of their smoothness, readily work themselves loose. By means of the present invention the anchorage of the nap fibres to the basic woven structure of the blanket is increased and the tendency of the blankets to shed is substantially reduced.

According to a preferred practice of my invention, I include in some or all of the napped yarns of the blanket thermosensitive or solvent-sensitive textile fibres which, after weaving, and preferably after napping, are activated and rendered adhesive and then allowed to set so as to hold and more firmly anchor the nap of the blanket in position and prevent appreciable shedding. Such potentially adhesive fibres may be made of a thermosensitive or solvent-sensitive substance such as cellulose acetate, cellulose formate, ethyl cellulose, cellulose propionate, or other esters or ethers of cellulose, vinyl polymers, or other resins; or they may be of fibres of other substances which are coated with such a potentially adhesive substance. Other fibres of the napped yarns may be of a non-thermosensitive, non-solvent-sensitive nature, or relatively so, such as wool, silk, viscose or cuprammonium rayon, cotton, etc.

In cases where the napped yarns are of the core type, at least some of the potentially adhesive fibres are preferably included in the wrapping of fibres although, within the purview of the invention, they may be confined to the core. When conventional type twisted yarns are used which incorporate the potentially adhesive fibres, such proportion of these fibres as is near the surface of the yarns prior to napping will be raised into the nap, together with non-potentially adhesive fibres, by the napping treatment.

Where the napped yarns are of the conventional twisted type and also, preferably, where they are core yarns, activation of the potentially adhesive fibres takes place after the yarns have been napped. In the case of the core yarns, however, the potentially adhesive fibres may be activated between the weaving and the napping operations, as, with this type of yarn, there is less tendency for the bonds produced by the activated fibres to be broken by the napping operation, or, in the alternative, to interfere with the production of a properly lofted nap, than in the case of the conventional type of yarn.

Activation after napping is preferably accomplished by heat, with or without the aid of solvents, in the absence of sufficient pressure to crush down the nap. The heat may be applied directly as by hot air, but I prefer to apply it indirectly either by the use of infra-red or other suitable form of radiant energy, as by induction heating which may be effected by placing the blanket in, or passing it through, a high frequency electric field. Activation before napping may be effected by heat aided by pressure, as by passing the fabric between heated rollers.

Preferably, although not necessarily, post-napping activation is so conducted that the potentially adhesive substance is softened and rendered tacky but is not melted down to the extent that the potentially adhesive fibres lose their integrity or fibre form, as may be accomplished by properly controlling the heating according to the softening and melting points of the particular adhesive used. These softened, tacky fibres, then, to a large extent bond themselves to other fibres, with which they are in contact, and provide an integrated nap structure. Upon setting of the softened fibres, the upstanding nap has the form of a three-dimensional open network of intermingled fibres, many of which are bonded together at their points of mutual crossing. The effect is to increase greatly the extent of anchor-

age and stability of the fibres of the nap and also to increase the resilience and stiffness of the nap.

Figs. 1 and 2 of the accompanying drawing are illustrative of effects produced by the preferred practice of the invention as just described wherein the activation of the potentially adhesive fibres takes place after napping and is not carried out to the extent of completely melting down the fibres. Fig. 1 of the drawing is a filling-wise, fragmentary cross-section view, on an exaggerated scale corresponding roughly to a 15x photomicrograph, of a napped blanket produced according to this process wherein the napped yarns are filling yarns of the composite core and wrap type, and Fig. 2 is a corresponding view of another napped blanket produced by this process in which the napped yarns are warp and filling yarns of the conventional twisted type.

In each of the said figures, the warps are shown at W. The relatively dark line fibres A of the nap N are the potentially adhesive fibres and the relatively light line fibres F of the nap are other, non-potentially adhesive fibres. In the blanket represented by Fig. 1, the potentially adhesive fibres A were included in the wrap of fibres about the core C of the composite filling yarn, said wrap having been elevated to form the nap N by the napping operation. In the blanket represented by Fig. 2, the potentially adhesive fibres A in the nap were initially included in the twisted body B of the warp and filling yarns close to the surface and have been elevated into the upstanding lofty nap, together with other fibres at the surface of the yarns, by the napping operation.

In both figures the potentially adhesive fibres have, by virtue of the activation treatment and subsequent setting, welded themselves, so to speak, to other fibres F and A of the nap at their mutual points of crossing, these bonds being indicated by dots in the figures.

When the activating treatment is conducted to a greater extent than that of the preferred practice so that the potentially adhesive fibres are melted down, the blanket differs from those illustrated in the drawing in that, in place of the fibres A of the nap, there are many small globules of adhesive bonded to the non-potentially adhesive fibres F. The effect of these globules is to bond some of the fibres F together and to strengthen the anchorage of the nap in similar manner to the action of the fibres A in the embodiments of Figs. 1 and 2. In general, however, the improvement in anchorage and strengthening of the nap is not as marked when the potentially adhesive fibres are completely melted down as when they are merely softened according to the preferred practice, and, of course, complete melting down of these fibres reduces, pro tanto, the fibre content of the nap.

When the potentially adhesive fibres are included in the core only of yarns of the composite core and wrap type, I employ say a 50% mixture of potentially adhesive and non-potentially adhesive fibres in making the core. After activation, these fibres bond themselves to the inner portions of the wrapping fibres which lie against the core and thus improve the anchorage of the nap to the blanket.

It is contemplated and preferred that the potentially adhesive substance may include a suitable plasticizer and this may desirably be a fire-retardant plasticizer, such, for example, as tricresyl phosphate.

A blanket made in accordance with the foregoing description, in which the nap includes a substantial percentage of the fibres thereof, of cellulose acetate has been found in practice to represent a market improvement from the standpoint of non-shedding, and 5–20% (in terms of the entire blanket) is believed to be a suitable potentially adhesive fibre content for ordinary commercial practice though, as will be appreciated, the relative quantity of the adhesive fibres which can most advantageously be employed for obtaining the improved effects of the invention will vary considerably according to particular conditions.

As an alternative to the use of potentially adhesive fibres in the core of a core type yarn as above described, I may coat the core with a suitable potentially adhesive substance. This coating is applied to the core and allowed to set before the wrapping of fibres, which may or may not include potentially adhesive fibres, is formed about the core. Upon subsequent activation, which may precede or follow weaving or napping, those fibres which are in contact with the adhesive coating on the core become bonded thereto and the anchorage of the wrap fibres to the core is increased.

Also, in cases where core yarns are used to provide the nap fibres of the blanket, I may apply a potentially adhesive substance, either in the form of fibres or as a coating, to the other yarns of the blanket, then, after the blanket is woven, and either before or after napping, treat the blanket to activate the adhesive substance. Those wrapping fibres of the core yarns which are in contact with these other yarns then become bonded thereto.

In Fig. 3 of the drawing there is shown a blanket construction according to the invention, preliminary to napping, in which the filling yarns are core type yarns and are the yarns which are ultimately napped, and in which the cores of these yarns, and the warp threads, are coated with a potentially adhesive substance.

In this figure, which is a fillingwise fragmentary cross-section view on an exaggerated scale corresponding to that of Figs. 1 and 2, the the core C of the core type filling yarns and the warp threads W are coated with a potentially adhesive substance S. Many of the fibres F which form the wrap of the core yarns are in contact with the substance S on the cores C and the warps W. Upon activation of the adhesive, which may precede or follow napping, these fibres become bonded to the substance S and increase the anchorage of the wrap fibres as a whole to the structure.

It is to be understood that the term "potentially adhesive fibres" as used in the appended claims includes fibres which have a surface coat of a potentially adhesive substance as well as fibres which are formed entirely of such substance.

Having described my invention, what I wish to claim by Letters Patent is:

1. As a new article of manufacture, a non-shedding napped fabric, such as a household blanket, comprising on interwoven yarn structure including napped yarns providing the nap of raised fibres thereof, said napped yarns including in the raised nap fibres thereof potentially adhesive fibres bonded by the potentially adhesive substance thereof to contiguous fibres some of which are raised fibres of other, adjacent napped yarns, to increase the anchorage of said nap to said structure.

2. As a new article of manufacture, a non-shedding napped fabric, such as a household blanket, comprising an interwoven structure of warp yarns and composite filling yarns having a core and a napped wrapping of fibres, said composite filling yarns including potentially adhesive fibres bonded by the potentially adhesive substance thereof to contiguous fibres of said napped wrapping to increase the anchorage of said wrapping to said structure.

3. As a new article of manufacture, a non-shedding napped fabric, such as a household blanket, comprising an interwoven structure of warp yarns and composite filling yarns having a core and a napped wrapping of fibres, said napped wrapping including potentially adhesive fibres bonded by the potentially adhesive substance thereof to contiguous fibres to increase the anchorage of said wrapping to said structure.

4. As a new article of manufacture, a non-shedding napped fabric, such as a household blanket, comprising an interwoven structure of warp yarns and composite filling yarns having a core and a napped wrapping of fibres, said warp yarns comprising at the surface thereof a potentially adhesive substance bonded to fibres of said napped wrappings of said composite filling yarns to increase the anchorage of said wrappings to said structure.

5. As a new article of manufacture, a non-shedding household blanket comprising an interwoven structure of warp yarns and filling core yarns, the core of said filling core yarns having a napped wrapping of fibres, a portion only of said napped wrapping fibres being potentially adhesive, said potentially adhesive fibres acting to bond other said fibres to said structure.

6. The process of making a non-shedding napped fabric such as a household blanket which comprises forming a yarn which includes a mixture of potentially adhesive fibres and relatively non-potentially adhesive fibres, weaving said yarn into a fabric structure, napping said fibre mixture of said yarn, and thereafter activating said potentially adhesive fibres thereby effecting a more permanent anchorage of said napped fibres in said structure.

7. The process of making a non-shedding napped fabric such as a household blanket which comprises forming a yarn which includes a mixture of potentially adhesive fibres and relatively non-potentially adhesive fibres, weaving said yarn into a fabric structure, napping said fibre mixture of said yarn to produce an upstanding nap of raised fibres thereof, and thereafter activating said potentially adhesive fibres while preserving said nap upstanding, thereby bonding together some of said upstanding nap fibres and effecting a more permanent anchorage of said napped fibres in said structure.

8. In a process of making a non-shedding napped fabric such as a household blanket the steps which comprise forming a warp yarn of twisted fibres which includes at the surface thereof a potentially adhesive substance, forming a composite filling yarn comprising a core of hard twisted fibres having a wrapping of loosely tangled fibres, weaving said warp and filling yarns into a fabric structure and thereafter activating said potentially adhesive substance thereby effecting a more permanent anchorage of said wrapping fibres in said structure.

9. The process of making a non-shedding napped fabric such as a household blanket which comprises forming a yarn which includes potentially adhesive fibres, weaving said yarn into a fabric structure, napping said structure, and thereafter activating said potentially adhesive fibres by irradiation thereby effecting a more permanent anchorage of said napped fibres in said structure.

10. The process of making a non-shedding napped fabric such as a household blanket which comprises forming a yarn which includes potentially adhesive fibres, weaving said yarn into a fabric structure, napping said structure, and thereafter activating said potentially adhesive fibres by heat electrically induced therein thereby effecting a more permanent anchorage of said napped fibres in said structure.

11. The process of making a non-shedding household blanket which consists in forming a filling core yarn of a core and a wrapping of fibres and including in said core potentially adhesive artificial fibres, weaving said filling core yarn with a warp, thereafter activating the said artificial fibres thereby effecting a more permanent union between said wrapping of fibres and said core yarn, and napping said wrapping of fibres.

12. The process of making a non-shedding household blanket which consists in forming a filling core yarn of a core and a wrapping of fibres and including in said wrapping a portion only thereof of potentially adhesive artificial fibres, weaving said filling with a warp, thereafter activating the said artificial fibres thereby effecting a more permanent union between the other of said wrapping fibres and said core, and napping said wrapping of fibres.

13. The process of making a non-shedding household blanket which consists in forming a filling core yarn of a core and a wrapping of fibres and including in said wrapping a portion only thereof of potentially adhesive artificial fibres, weaving said filling with a warp, napping said wrapping of fibres, and then activating the said potentially adhesive fibres by irradiation thereby effecting a more permanent union between the other of said wrapping fibres and said core.

14. The process of making a non-shedding household blanket which consists in forming a filling core yarn of a core and a wrapping of fibres and including in said core potentially adhesive artificial fibres, weaving said filling with a warp, napping said wrapping of fibres, and then activating the said potentially adhesive fibres by irradiation thereby effecting a more permanent union between said wrapping fibres and said core.

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