Feb. 7, 1939. G. S. RADFORD 2,146,314

THREAD

Filed July 20, 1937

Fig. 1.

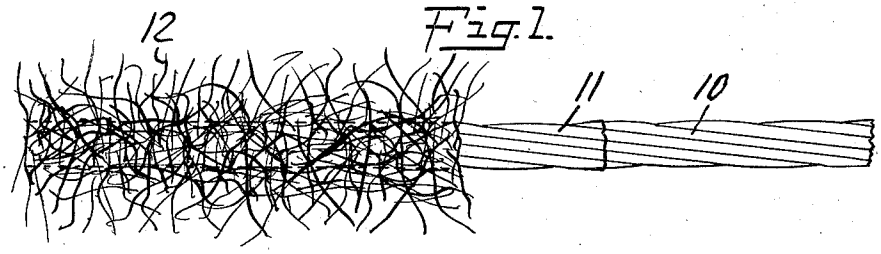


Fig. 2.

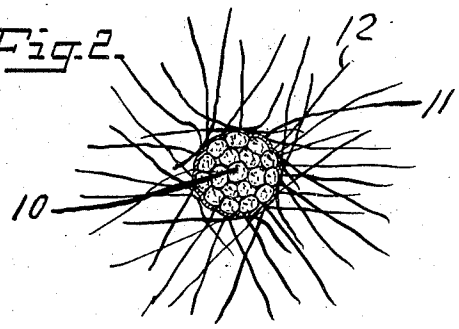


Fig. 6.

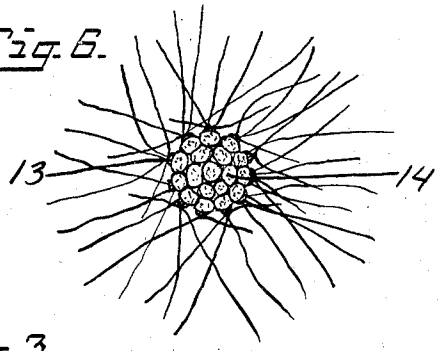


Fig. 3.

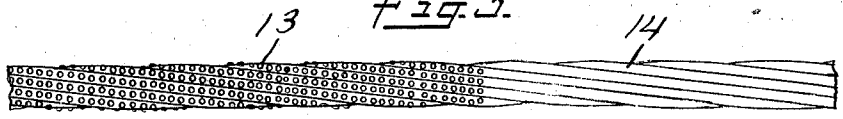


Fig. 4.

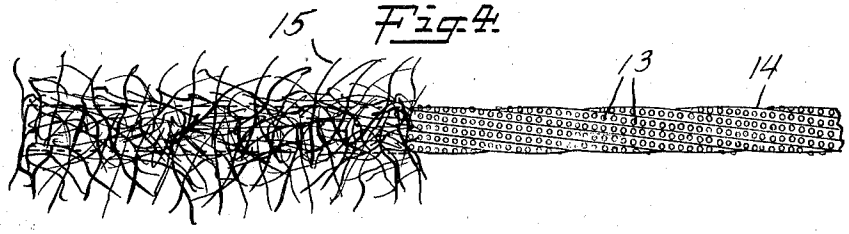


Fig. 5.

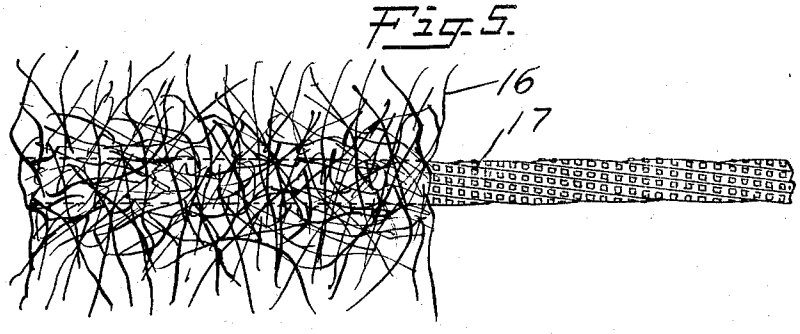
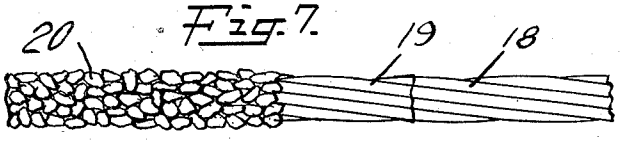


Fig. 7.



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THREAD

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6 Claims. (Cl. 28—1)

This invention relates to threads or yarns suitable for use in the manufacture of fabrics by ordinary textile operations, such as weaving, knitting, braiding, etc., and for similar purposes. More particularly, the invention is concerned with a novel thread or yarn characterized by having textile quality and of composite structure, the thread having physical characteristics which vary in accordance with the nature of its component elements and with their mode of assembly.

The thread or yarn of the invention consists of a flexible core, which is preferably made of fibrous material, an outer sheath or veneer of material selected because of its visual and textile characteristics and ordinarily of a fibrous nature, and an adhesive securing the elements of the sheath to the core, the adhesive being flexible and so applied as not to impair the flexibility of the core to a detrimental degree. The core largely determines what may be referred to as the invisible qualities of the final product, such as its tensile strength, working characteristics, etc., while the sheath or veneer determines its visual and tactile qualities and is made of a material or mixture of materials chosen with that purpose in mind. In order that the veneer may accomplish its purpose, it is ordinarily applied in such manner and in such quantity as to mask and conceal the core, although in some instances, less than complete concealment may be effected. The adhesive serves as a means for securing the elements of the sheath to the core so that the latter may act as a carrier, and the elements, which are ordinarily individual fibres, are affixed by the adhesive in completely random arrangement but may be thereafter rearranged in a suitable finishing process.

Since the core of the new thread or yarn acts as the vehicle or support for the decorative sheath, it will be apparent that the invention affords wide opportunity for the use in the production of threads of materials which lack the physical characteristics required to permit strands to be made therefrom, as by spinning. Accordingly, the invention makes possible the production of threads which have the desirable appearance, feel, or both, of materials which have not heretofore been available in thread form for use in textile manufacture, and it also makes possible the production of threads largely made up of fibres of a spinnable material which are themselves unfit for spinning because of their short length. Thus, for example, the sheath may be made of kapok or like vegetable fibres which cannot be spun, or it may be made of short fibres of wool, cotton, silk, and the like, which have heretofore been discarded as waste because of their short length. Similarly, the sheath may be made of abrasive material, leather, tinsel, mother-of-pearl, cork, etc., and similar materials in finely divided condition, or it may be composed of the barbs of feathers, shredded paper, etc. These and similar materials, when affixed to a flexible fibrous core in accordance with the principles of the invention, result in the production of threads or yarns which may be employed for ordinary textile uses in the production of fabrics having novel characteristics.

For a better understanding of the invention, reference may be made to the accompanying drawing, in which—

Figure 1 is a view in side elevation on a greatly magnified scale of one form of thread of the invention;

Figure 2 is a transverse sectional view of the thread shown in Figure 1;

Figure 3 is a view in side elevation on a greatly magnified scale of a core used in another form of the invention, the sheath being omitted;

Figures 4 and 5, respectively, are side elevational views, respectively, of different forms of thread of the invention in which the core illustrated in Figure 3 is employed;

Figure 6 is a sectional view of the thread shown in Figure 5; and

Figure 7 is a side elevational view on a greatly magnified scale of a form of the invention in which the sheath is of a non-fibrous material.

Referring to the drawing, the thread shown in Figure 1 comprises a core 10 which is flexible and ordinarily fibrous in nature. Thus, the core may consist, for example, of spun fibres of cotton, wool, natural or artificial silk, or mixtures thereof, etc., or it may consist of indefinitely long filaments of natural or artificial silk. For some purposes, particularly when the final product is to be of extremely small size, the core may consist of a single artificial silk filament possibly of larger diameter than that of ordinary artificial silk filaments now produced commercially.

Applied to the surface of the core is a continuous film 11 of an adhesive, and this film is extremely thin and the adhesive forming it is preferably applied in such manner that there is no substantial penetration of the core by the adhesive. The adhesive employed may be of various kinds, but since the final product is to have textile quality, the adhesive is one which remains flexible indefinitely and its flexibility is not less than that of the core so that it will not stiffen

the latter. The adhesive I prefer to use is a synthetic resin or mixture of such resins, and it may be of the type which is softened by means of a solvent and sets on evaporation of the latter, or one which is softened by heat and sets upon cooling. Since the new threads may be employed in the production of fabrics used for articles of clothing, etc., the type of adhesive chosen will depend to some extent on the ultimate use of the thread. Thus, in the production of threads to be woven into fabrics used for clothing, the adhesive must be one capable of withstanding the agents used in laundering and dry cleaning operations, and suitable synthetic resin adhesives for this purpose are available. When the adhesive is applied, as illustrated in Figure 1, to produce a continuous film, the flexibility of the adhesive after setting is an important factor in its selection, and in some cases, it may be necessary to employ an adhesive which contains a plasticizing agent.

The core is enclosed within a sheath of decorative material, illustrated as being fibrous in nature, with the individual fibres 12 bound to the core by the adhesive at one or more points and in completely random arrangement. The fibres are ordinarily employed in such amount as to mask and conceal the core effectively, and, accordingly, the final product derives its tensile strength mainly from the core and its visual and tactile qualities are imparted to it by the sheath. The amount of adhesive employed is the least amount necessary to bind the fibres securely in place and the adhesive may be applied to the core in various ways, as, for example, by passing the core between a pair of rolls carrying an extremely thin coating of the adhesive. After the core has received the film of adhesive, the sheath may be applied in various ways, as, for example, by being blown against the coated core, or by passing the coated core through a chamber in which the sheath material is maintained in suspension. After the application of the sheath material, it may be desirable, in some instances, to lay the fibres more snugly against the core, as by burnishing, after which, if desired, the ends of the fibres may be raised, for example, by a brushing or carding operation.

In another form of the invention, illustrated in Figures 3 to 6, inclusive, the adhesive is not in the form of a continuous film on the core, but covers spaced areas 13 thereon, these areas being relatively close together and of so small size that there may be from ten to four hundred dots of adhesive per lineal inch of the core. The application of the adhesive in this manner may be readily accomplished by the use of rolls having dots or lines engraved thereon and similar in many respects to those employed in half-tone work.

If an engraved roller is used, it may be desirable to use the roller as a means for applying dots of adhesive to a roller having a resilient surface, the latter roller being then employed to apply the adhesive to the core. When such an arrangement is used, the second roller, which may have a rubber surface, removes the adhesive from the engraved roller in such manner as to keep the latter clean, and clogging is thereby prevented.

When the core is passed between the rolls, one of which carries the small lines or dots of adhesive, similar fine lines or dots are applied to the surface of the core at a close and uniform spacing. When the core is a spun strand made up of individual fibres 14, the adhesive, even though forming lines on the roller, may be limited to the high spots of the fibres of the core, in which case, the core carries small dots of adhesive. After the application of the adhesive, the fibrous material forming the sheath is applied to the core, and the individual fibres 15 are bound in random arrangement by the spaced dots. The fibres may contact with one or more such dots and thus be bound at one or more points. When a thread or yarn is made with the adhesive applied in interrupted fashion as illustrated, the size and spacing of the adhesively coated areas may be such that the elements of the sheath overlie and conceal the uncoated areas on the core between adjacent coated areas.

In the case of a thread or yarn of the invention in which the sheath is affixed by a discontinuous or interrupted layer of adhesive, the adhesive has less effect on the flexibility of the core, and, accordingly, while it is preferable to employ a flexible adhesive, the adhesive used may be much less flexible than that required when it is applied in a continuous film.

The thread or yarn illustrated in Figure 5 is of the same general construction as that shown in Figure 4, except that the fibres 16 of which the sheath is made are of greater staple length. Accordingly, the dots 17 of adhesive may be somewhat farther apart in the latter case than in the former, since the long fibres will span the spaces between adjacent dots so that they are likely to be bound at more than one place and will also conceal the uncoated areas between the dots.

In the production of the thread having a sheath and core of fibrous material, it may be desirable in some instances to apply the sheath to the core while the latter is in loosely twisted condition, after which, the twist of the core is increased. This causes the fibres of the sheath to be wound into the core somewhat, so that the sheath is held both by the adhesive and by the fibres of the core.

In the production of the yarns or threads of the type illustrated in Figures 1 to 6, inclusive, in which the sheath is made of fibrous material, various combinations of material may be employed for the sheath and core. Thus, for example, the core may be of cotton and the sheath of wool, in which event, the thread has the appearance and feel of wool and may have a suitable tensile strength, but is less costly than a thread made throughout of wool. Similarly, the core may be a cotton thread, and the sheath of fibres of natural or artificial silk. Still another combination includes a core of cotton, and a sheath of hair, fur, kapok and similar unspinnable vegetable fibres, shredded paper waste, shredded crepe waste, barbs of feathers, etc. In combinations of this type, the core is made of a material of low cost and of the desired strength, while the heath is made up of a material chosen because of the appearance and feel which it imparts to the final product. Accordingly, the core may be of any suitable fibrous material having the desired characteristics, such as cotton, wool, spun or filamentary natural or artificial silk, and the fibrous material of the sheath may be cotton, wool, natural or artificial silk, hair, fur, and the like.

The thread or yarn of the invention may also be prepared to achieve other objects, as, for example, to produce a thread having the appearance of one formed with low twist but the

action of one with a high twist. Thus, the core may be wool fibres of high twist, and the sheath may also be of wool fibres, but the fibres of the sheath may be so applied as to give the final thread an appearance similar to that of a wool thread of low twist, in which event the thread has the high twist action of the core and the low twist appearance of the sheath. Another example of a material of this character is one which includes a natural silk core of high twist and crepe action, and a sheath of silk fibres which are so applied as to give the thread the appearance of a thread of low twist. Similar results may be also obtained with artificial silk fibres in the core and sheath and various combinations of different materials will at once come to mind.

Another object attainable by the invention is that of making use of fibres which are of spinnable material but are themselves too short to be spun, and such short fibres, as, for example, wool waste, natural and artificial silk waste, and the like, may readily be employed in the sheath of the new thread. The sheath may also be made of combinations of materials, as, for example, of wool and silk fibres, either natural or artificial, in which event the final yarn has visual and tactile characteristics derived from both materials employed in the sheath.

Instead of employing material made up of individual fibres for the sheath, the latter may be formed of finely divided substances which are of a fibrous nature or otherwise, and in this way, various novel effects may be obtained. Thus, as illustrated in Figure 6, the core 18 may have a continuous film 19 of adhesive applied thereto and the sheath may be of finely divided materials 20, such as shredded leather, tinsel, cork, abrasives, mother-of-pearl, and the like. In the manufacture of a thread of this type, the sheath material is subdivided to a fineness suitable for producing the desired appearance and feel, and it is affixed by the use of either a continuous or discontinuous film of adhesive.

In some instances, it may be desired to produce a thread of ornamental appearance, such as one having knobs or tufts thereon, and this is easily accomplished in accordance with the present invention. For this purpose, beads of adhesive are applied to the core at spaced intervals, thus producing knobs, the adhesive chosen having a color and the dots thereof being disposed at the spacing required to give the desired effect. To produce a thread having tufts, the same procedure is followed except that tuft material is applied to the core and bound by the adhesive after the application of the latter in the form of dots.

In the final product of the invention, the ratio of the weights of the sheath and core may vary widely, as, for example, the weight of the sheath may be two or three times that of the core, and the sheath may be affixed to the core in a single application or it may be built up in a series of operations. Preferably, if the sheath material is applied in a series of stages, adhesive is applied in discontinuous arrangement prior to each application of sheath material.

The kind of adhesive employed and its mode of application depend to some extent on the relation of the diameter of the core to that of the final thread, since, if the diameter of the core is small relative to that of the thread, the core may be somewhat stiffer than is permissible when its diameter is large in relation to that of the thread. Accordingly, with a small diameter core, the adhesive need not be so flexible as with a large diameter core. Application of the adhesive to the core in a continuous film is, therefore, more satisfactory in connection with a small diameter core than with one of large diameter, and penetration of the core by the adhesive is not particularly important when the core diameter is small. With a core of relatively large diameter, the adhesive should be of high flexibility or else should be applied discontinuously.

In the foregoing, I have described the adhesive as constituting one of the components of the product, but with cores of certain materials, such, for example, as cellulose acetate, the sheath can be bonded to the core without the use of adhesive by rendering the surface of the core tacky, by the application of heat or a solvent. The use of such expedients with a core of the type referred to is equivalent to using an adhesive, since the treated portions of the core, to which the fibres or elements of the sheath adhere, serve the same purpose as areas on the core coated with an extraneous adhesive.

In all forms of the invention, the final product is a thread which has textile quality. This quality may be defined as the sum of the characteristic properties of an ordinary textile thread or fabric which permit it to yield in continuing conformity to a moving curved surface. In a textile thread, the fibrous components, which are spun or twisted together, are held in assembled relation both by friction and a permanent set which has been imparted to them, and when such threads are employed in the production of a fabric by usual textile operations, such as weaving, knitting, braiding, etc., the component parts both of the threads and the fabric are not in continuous contact and slight relative localized movements between them are permitted. This limited freedom of movement of the threads and fabric, together with a large ratio of length to diameter in the textile fibres themselves, is the reason for the valuable flexibility and form-fitting quality (both dynamic and static) which make textile threads so well adapted for the purposes for which they are employed.

I am aware that products consisting of a core and a coating or sheath applied to the core have been made heretofore, an example of such a product being an insulated wire in which the core consists of a metal conductor and the sheath consists of fibres of insulating material, such as asbestos or the like affixed thereto. Similarly, it has been proposed to pass threads or yarns through a body of adhesive and to apply decorative material such as a metal powder thereto to form an outer coating. These products, however, differ substantially from that of the present invention because of the nature of the core employed, or because of the nature of the adhesive and of the amount and manner in which it is applied. The prior materials, as produced or proposed, have, accordingly, lacked those characteristics to which I have above referred to generally as textile quality, and are neither intended nor adapted for use in ordinary textile operations.

I claim:

1. A thread characterized by having textile quality and comprising a flexible core of fibrous material, a sheath of fibrous material on the core with the individual fibres affixed to the core in random arrangement, the core substantially determining the tensile strength of the thread and

the sheath giving the thread its visual and tactile characteristics, and an adhesive affixing the individual fibres to the core, the adhesive covering closely adjacent spaced areas on the core.

2. A thread characterized by having textile quality and comprising a flexible core, a sheath of decorative material on the core with the elements of the sheath affixed to the core in random arrangement, the core substantially determining the tensile strength of the thread and the sheath masking the core and giving the thread its visual and tactile characteristics, and adhesive covering spaced areas on the core and securing the elements of the sheath thereto.

3. A thread characterized by having textile quality and comprising a flexible core of fibrous material, a sheath of fibrous material on the core with the individual fibres affixed to the core in random arrangement, said individual fibres being unspinnable, the core substantially determining the tensile strength of the thread and the sheath giving it its visual and tactile characteristics, and adhesive binding the fibres to the core, the adhesive covering spaced areas on the core, said areas being so near together that the fibrous material masks the core.

4. A thread characterized by having textile quality and comprising a flexible core of fibrous material, a sheath of fibrous material on the core with the individual fibres affixed to the core in random arrangement, the fibrous material on the sheath being different from that making up the core, the core substantially determining the tensile strength of the thread and the sheath giving it its visual and tactile characteristics, and adhesive binding the fibres to the core, the adhesive covering spaced areas on the core so closely adjacent that the fibrous material masks the core.

5. A thread characterized by having textile quality and comprising a core of spun fibres, the core being flexible and substantially determining the tensile strength of the thread, a sheath of fibrous material on the core and giving the thread its visual and tactile characteristics, the individual fibres of the sheath being affixed to the core in random arrangement, and adhesive affixing the fibres to the core, said adhesive being flexible and retaining that characteristic indefinitely and covering spaced areas on the core, so closely adjacent that the fibrous material masks the core.

6. A thread characterized by having textile quality and comprising a flexible fibrous core substantially determining the tensile strength of the thread, a sheath of fibrous material on the core and giving the thread its visual and tactile characteristics, the individual fibres of the sheath being affixed to the core in random arrangement, and adhesive securing the fibres of the sheath in place, the adhesive covering closely adjacent spaced areas on the core and having the characteristic of being substantially unaffected by the agents employed in laundering and dry cleaning operations.

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