July 28, 1931. B. H. FOSTER ET AL 1,816,574

PILE OR TUFTED SHEET FIBROUS MATERIAL

Filed March 7, 1929

Fig. 1.

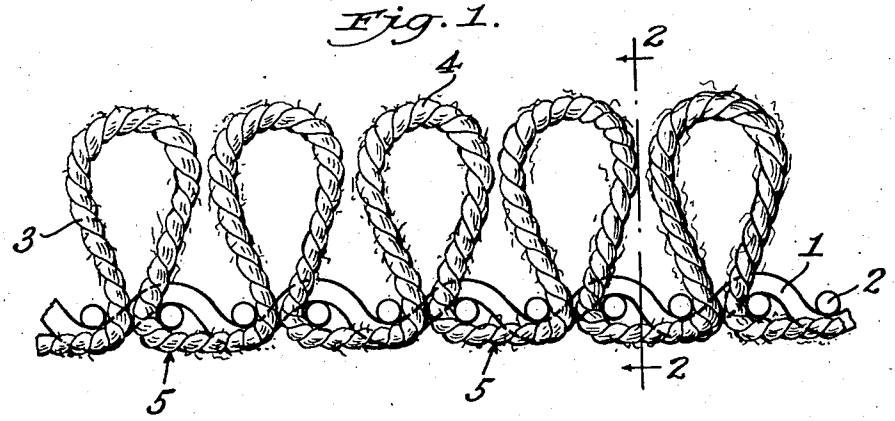


Fig. 3.

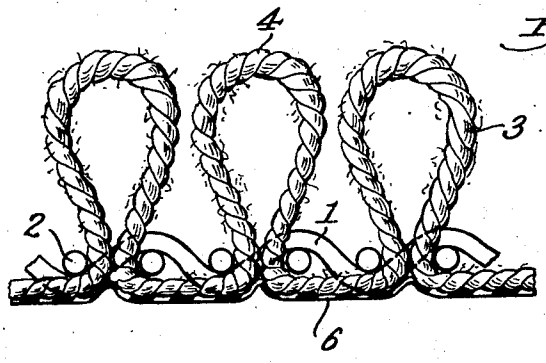


Fig. 2.

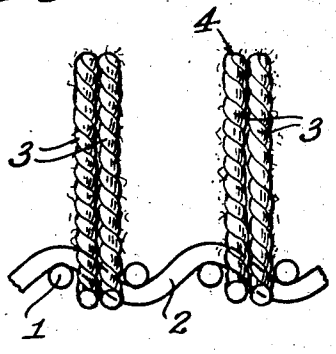
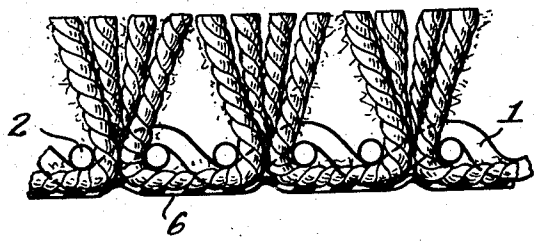


Fig. 4.



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UNITED STATES PATENT OFFICE

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PILE OR TUFTED SHEET FIBROUS MATERIAL

Application filed March 7, 1929. Serial No. 345,040.

This application is a continuation in part of our copending application Serial No. 247,768, filed Jan. 19, 1928.

This invention relates to a pile or tufted sheet fibrous material, and more particularly to a material suitable for use as carpet, rugs, upholstery and draperies.

Various tufted or pile fabrics are on the market for use as carpets, rugs, etc., but these materials are expensive by reason of their method of manufacture and the means employed to secure the tufts or pile against displacement. Ordinarily the tufts or pile are introduced into the fabric and secured against displacement by the weaving process, and this involves the use of expensive machinery and additional fibrous material, and the resulting base fabric including an anchorage for the tufts or pile is several times thicker than the plain fabric would be and hence its flexibility is greatly reduced. This lack of flexibility is objectionable for many uses.

An object of the present invention is to provide an improved and inexpensive tufted or pile sheet fibrous material.

Another object is to provide a tufted or pile sheet material in which the tufts or pile are secured against displacement by means of rubber, without substantial decrease in the flexibility or other usual characteristics of the material, and with economy in the use of fibrous material in the base fabric.

Another object is to provide a tufted or pile sheet material having a base of minimum thickness.

For a complete disclosure of the nature and objects of the invention, reference is made to the accompanying specification and drawings, in which latter:

Fig. 1 is an enlarged sectional view showing one application of the tufting material to a fabric base;

Fig. 2 is a cross section on the line 2—2 of Fig. 1;

Fig. 3 is a view similar to Fig. 1 after the application of a rubber anchorage to the base and tufting; and

Fig. 4 is a cross section of a completed pile fabric.

In the manufacture of the sheet material forming the subject matter of the present invention, any suitable fibrous base material may be used which possesses the required strength, flexibility and penetrability for the particular form of sheet material to be made. In the present instance there is disclosed a fabric base formed with warp threads 1 and weft threads 2. Any suitable machine may be used to introduce the strands, cords, yarns, rovings, or other elements 3 which are to form the tufts or pile in the completed fabric. These strands or elements may be introduced by rows of needles carrying the strands, which are punched through the fabric and withdrawn to form extended loops 4 on one side of the fabric, after which the fabric is moved slightly and the needles again enter the fabric to form a row of loops 4 closely adjacent to the first row, the operation being continued until the entire fabric is closely covered on one side with extended loops 4 which are to form the tufts or pile of the finished fabric, while on the opposite side the connecting loops 5 are closely drawn in against the fabric. The needles for forming the loops may carry any desired number of strands, and in the present instance two of such strands are shown in each loop.

In the next step, the back of the fabric base, that is, the side on which the connecting loops 5 are formed, is covered with a relatively thin film or anchoring coating 6 of rubber to secure the loops 5 to the base. Ordinary thin solutions of rubber in organic solvents are not suitable for the purpose for the reason that only a very small amount of rubber can be put into solution and therefore a sufficient thickness of rubber cannot be obtained by a single coating. Moreover, the thin solution tends to strike through the base material, while if a thick dough is used it will not penetrate the loops 5 sufficiently to properly anchor them to the base. A further objection is that the deposit of rubber laid down from the cement is relatively tacky and it tends in the case of a floor cov-

ering to adhere to the floor. Calendered sheet rubber is not suitable for an anchorage because of the expense and the difficulty of securing a good anchorage to the base and loops 5 unless cement is used, which latter further adds to the expense. Unvulcanized rubber latex of ordinary concentration and consistency is not entirely satisfactory for use to form the anchorage since it also tends to strike into the fabric and thereby stiffen it. For the best results it is preferred not to use unvulcanized rubber of any character by reason of the effects of temperature changes upon it. We have found that the most suitable material for the purpose is a concentrated and thickened latex containing a powerful vulcanizing combination which will vulcanize at ordinary or slightly elevated temperatures. It has also been found that the most suitable latex to use is one which has been concentrated preferably by a process which eliminates a fairly large proportion of the water soluble constituents, such as a creaming or centrifuging process. If a creaming process be used, a creaming agent such as a pectin body or an alginate is added in small quantity to the latex and the latter allowed to stand for a time. The rubber particles of the latex thereupon concentrate in a top layer while the water and water solubles form a lower layer. These water solubles may then be drawn off and the concentrated creamed latex recovered.

It is preferred to subject this creamed latex to a second creaming operation to further concentrate and purify it, this being accomplished by diluting it with water, adding a further amount of creaming agent, and again allowing it to stand. By this second operation, a concentrated latex may be obtained containing 50–55% rubber solids and from which the non-rubber water soluble elements have been largely removed.

The creamed latex may be compounded with 3 parts sulphur, 1 part zinc oxide, 1 part glue, 1 part sulphonated stabilizing material, and 1 part of zinc dimethylaminodithiocarbamate, these proportions being based on 100 parts of rubber. The sulphonated stabilizing agent may be such as that obtained by the condensation of an aromatic hydrocarbon with an aliphatic alcohol in the presence of sulphuric acid, the commercial product known as Nekal being illustrative of such products. The accelerator zinc dimethylaminodithiocarbamate may be replaced by any other suitable accelerator, such as tetramethylthiurammonosulphide or tetramethylthiuramdisulphide. Compounds such as that given will vulcanize at room temperature in two or three months or in a shorter time at a slightly elevated temperature. The compound may be otherwise varied, such as by the addition of suitable coloring material, fillers, anti-cracking agents or anti-oxidants. For instance, there may be added to the mix from 1 to 5 parts of the anti-oxidant obtained by condensing acetaldehyde and aniline in strongly acid solution.

The compounded and vulcanizable latex as above prepared is then applied to the back of the fabric over the loops 5, any suitable method being used, such as brushing, spreading or spraying. The material is then dried and allowed to vulcanize at ordinary temperature, or the temperature may be moderately raised to hasten either or both of these steps. If a pile fabric is to be made, the tops of the loops 4 may be cut in any usual manner.

It has been found that a suitable thickness of the dried and vulcanized rubber composition is such as to approximate in weight not more than 10 ozs. to the square yard, but 3 to 6 ozs. have been found to be sufficient in most cases, the object being merely to apply a film of sufficient thickness to properly anchor the tufts or pile.

It is preferred, as before stated, to use for the rubber anchorage a vulcanizable natural rubber latex which has been concentrated by a creaming process, since by the removal of water soluble ingredients from the latex the resulting deposit of rubber is non-hygroscopic, and by reason of the thickened and concentrated condition of the latex a sufficient thickness of rubber may be secured by a single application and this deposit of rubber while substantially superficial is yet firmly bonded to the loops 5 and adjacent side of the base. The concentrated latex does not penetrate the fabric to an extent sufficient to cause any material decrease in the flexibility of the fabric. However, good results may also be obtained by the use of latex concentrated in other ways, such as by the use of heat or centrifuging. Moreover, it is not essential to use a concentrated latex, but instead an ordinary latex which has been thickened by the addition of compounding ingredients may be used, or it may be both thickened and concentrated, and for some purposes a latex containing no vulcanizing ingredients may be used. It is also within the scope of the invention to use any artificial water dispersion of rubber, either unvulcanizable, vulcanizable or vulcanized, if so conditioned that it does not substantially penetrate the base. Any suitable method of introducing the tufted or pile material through the base to its lower side may be used as long as the portion of the pile material projecting through the lower side of the base is secured to the latter against displacement by the hereindescribed rubber anchorage. The invention also is not limited to the use of woven fabric as the base material, since it is obvious that a knitted or felted material

may be used as long as it has sufficient penetrability to permit the introduction of the tufted or pile elements and has the desired flexibility.

It will be seen that by our invention a tufted or pile sheet fibrous material may be produced by the use of very simple apparatus and few operations, thereby obviating the use of expensive and complicated weaving apparatus for anchoring the tufts or piles and also economizing in the use of the fibrous material for making the base. The anchoring film of rubber is so thin that it does not appreciably increase the thickness of the base fabric, while by the previous weaving methods for anchoring the tufts or pile, the base fabric is increased in thickness several times. Moreover, by reason of the thinness of the rubber anchorage of the base fabric and the fact that the rubber does not substantially penetrate the fabric, the finished material is very flexible. The finished product can be made very cheaply as compared with the previous tufted or pile fabrics, and by reason of its thinness and flexibility is available for use in a greatly enlarged field.

When the phrase, "water dispersion of rubber" is used in the claims, it is meant to include either natural or artificial latex whether made from crude rubber or reclaimed rubber.

Having thus described our invention, what we claim and desire to protect by Letters Patent is:

1. As a new article of manufacture, a sheet of material comprising a base of fibrous material, a multiplicity of strands of fibrous material extending from one side of said base and also passing through said base to its opposite side, and anchoring means for said strands on said opposite side of the base, comprising a deposit in situ from a thickened water dispersion of rubber, said deposit being relatively thin and superficial, whereby flexibility of the base is unimpaired.

2. As a new article of manufacture, a flexible sheet of material comprising a base of fibrous material, a multiplicity of strands of fibrous material extending from one side of the base, each strand having a loop disposed on the opposite side of the base secured against displacement by a thin anchoring coating on said loops and on said opposite side of the base comprising a dried in situ deposit from a thickened aqueous dispersion of rubber.

3. As a new article of manufacture, a sheet of material comprising a base of fibrous material, a multiplicity of strands of fibrous material, each strand having a medial portion adjacent one side of the base and free end portions extending separately through the base and projecting from the opposite side to form a pile, each strand being looped in the base and secured against displacement by an anchoring film of the dried in situ deposit from a thickened water dispersion of rubber secured to said medial strand portions and adjacent side of the base, said film being substantially thin and superficial, whereby flexibility of the article is unimpaired.

4. As a new article of manufacture, a sheet of material comprising a woven fabric base, a multiplicity of textile elements extending from one side of the base, each having a loop engaging the opposite side of the base and secured against displacement by a layer of vulcanized rubber composition free from water solubles, united to the woven fabric base and anchoring the looped portions of the textile elements, the thickness of the vulcanized rubber composition being such as to approximate in weight not more than 10 ozs. to the square yard.

5. As a new article of manufacture, a sheet of material comprising a base of textile material, a multiplicity of strands of fibrous material, each strand having a medial portion adjacent one side of the base and free end portions extending separately through the base and projecting from the opposite side to form a pile, each strand being secured against displacement by an anchoring film securing said medial strand portions to the adjacent side of the base, said film comprising a vulcanized deposit from thickened rubber latex and an anti-oxidant, said film being substantially thin and superficial whereby flexibility of the article is unimpaired.

6. As a new article of manufacture, a base formed of plain square woven fabric, a multiplicity of strands of fibrous material, each strand having a medial portion in contact with one side of the base and free end portions extending separately through the base and projecting from the opposite side to form a pile, each strand being secured against displacement by an anchoring film securing said medial strand portions to the adjacent side of the base, said film being substantially superficial and comprising the vulcanized deposit in situ from thickened rubber latex, the flexibility of the rubber coated article being not substantially less than that of the uncoated pile fabric and its thickness being not substantially greater than that of the fabric and projecting pile.

7. As a new article of manufacture, a flexible sheet material comprising a base of fibrous material, a multiplicity of strands of fibrous materials extending from one side of said base and also passing through said base to its opposite side, and a single anchoring means for securing said strands against displacement on said opposite side of the base comprising a deposit in situ from a water dispersion of rubber of a concentra-

