Aug. 2, 1932. E. H. WARD ET AL 1,869,531

METHOD OF MAKING CEMENTED PILE FABRICS

Filed Aug. 27, 1930

Fig. 1.

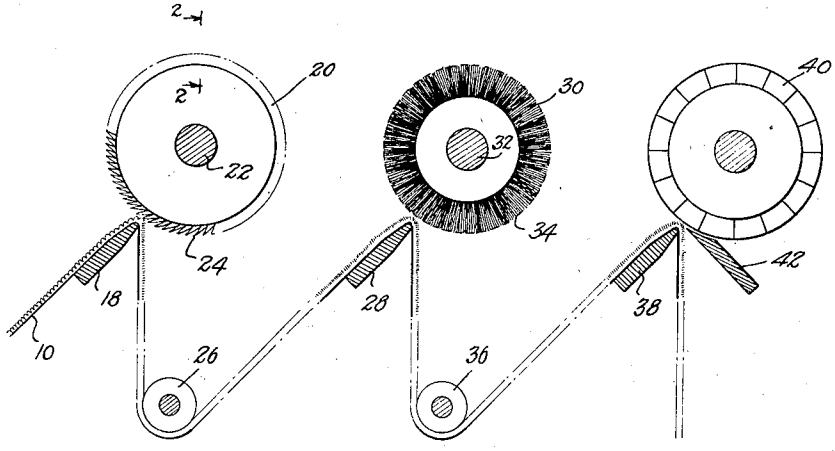
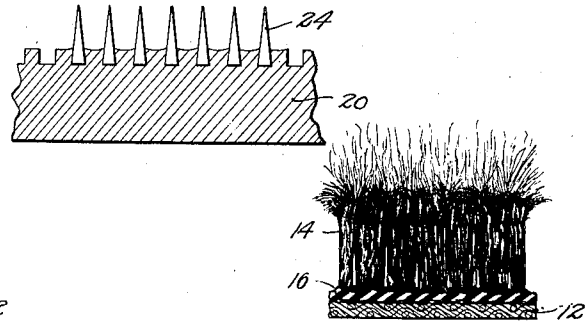


Fig. 2.



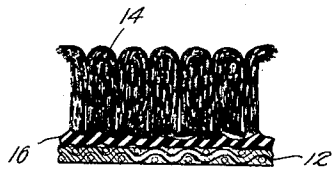


Fig. 3.

Fig. 4.

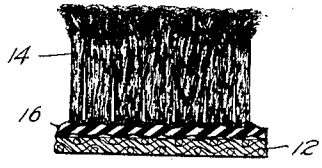


Fig. 5.

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UNITED STATES PATENT OFFICE

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METHOD OF MAKING CEMENTED PILE FABRICS

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The present invention relates to the production of cemented pile fabric material and more particularly to improvements in the making and finishing of cemented pile fabric of that form in which a series of loops are cemented to a backing material and finished by cutting or opening the loops to produce the pile finish.

Heretofore a cemented pile fabric has been made by inserted a batt of goat hair, or similar fibres unadapted for spinning into the spaces between separators or spacing elements on the surface of a drum forming a series of loops or folds, a sufficient amount of material being employed so that the bases of the loops, or in other words, the upper exposed portions of the loops, lie in substantially a continuous surface. A vulcanizable cement material is then applied to the bases of the loops while they are held in place between the separators or spacing elements and a backing material is applied to the cemented base portions of the loops. While the material is held on the drum, the loops being rigidly held in place between the separators, the cement material is vulcanized to permanently attach the loops to the backing material. After the vulcanization step, the product is drawn off the drum, the loops being withdrawn from between the separators, and the product, comprising the loops cemented to the backing material, is finished by opening the loops. The opening of the loops has heretofore been accomplished by cutting off the tops or top portions of the loops, the material being then combed or tigered to remove the loose hair or fibres, and then steamed so that the pile or fibres will stand straight on end, or in other words, at right angles to the base of the material, the product being finally sheared to produce an even fibre height in the pile.

This method, which involves cutting off the tops of the loops down to a point necessary for opening or cutting the shortest or lowest loops in the pile, in order to assure that all the loops will be opened, results in the loss of a very considerable proportion of the total amount of pile element material used.

The pile fabric material which is produced by this method has a high durability, due to the resilience of the rubber cement material by which the pile elements are attached to the base and the characteristics of the fibre material employed; these fibres, which are unadapted for spinning or weaving, have a low coefficient of friction, so that the wear produced by the rubbing of the fibres against each other is extremely low. It has been found, however, that carpets and rugs made by this method are peculiarly subject to "shadowing" or "mottling" which takes place to a very considerable extent when the product made as above described is walked upon, and the "shadowing", after it is once produced in the material, cannot be eliminated by any simple means, as by brushing, for example, although it may be completely removed by steaming and brushing in a manner well known to those skilled in the art.

The product made by the above method has also the peculiar characteristic that when a carpet or rug of this character is walked upon a snap or sudden yielding effect is produced. This effect is apparently due, at least in part, to the high degree of elasticity of the fibres employed, and to the fact that these fibres stand on end in the rubber cement material on the backing, so that when the material is walked on the upright fibres support a considerable weight before being deflected from the upright position. Thus when the pressure of the foot is applied to the surface of the fibres, they yield suddenly when the excessive load is applied producing the characteristic snap. The snap produced by the sudden yielding is not objectionable except as being noticeably different from the effect produced in treading upon the usual woven carpet, and would, therefore, preferably be obviated. In the product made by the method of our invention, hereinafter described, both the mottling or shadowing effect and the snapping or yielding effect produced when a carpet or rug of this material is walked on, are entirely overcome.

One of the main objects of the present invention is, therefore, to provide an improved method which will overcome the deficiencies

and undesirable features of the method heretofore used for the production of cemented pile fabric.

Another object of the invention is to provide an improved method of making cemented pile fabrics by which shadowing or mottling effect may be entirely eliminated.

Another object of the invention is to provide a method for the making of cemented pile fabric by which wastage of pile element material may be reduced to a negligible amount.

Another object of the invention is to provide a new and improved method for the making of cemented pile fabric by means of which the amount of pile element material employed may be reduced to a fraction of the amount heretofore used as a minimum for the making of a pile fabric product of a definite pile height.

A further object of the invention is to provide a method for the making of cemented pile fabric by which the number of operations required in the production of the material may be greatly reduced for a given output.

A further object of the invention is to improve the method heretofore used for the making of cemented pile fabrics, by which the cost of the product may be greatly reduced and whereby the minimum cost for the production of a suitable pile fabric material may be reduced to such an extent as to permit competing with the cheapest carpets and fabrics on the market, but without a corresponding reduction in the quality and wearing properties of the product.

With these and other objects in view, the invention comprises the various features hereinafter more fully described and particularly defined in the claims.

In the former method, above referred to, for the production of cemented pile fabrics, the loops are generally cemented to the fabric backing by means of a rubber dispersion in water, although latex, or rubber dissolved in a non-aqueous solvent, might be employed. In the use of an aqueous dispersion of rubber for this purpose, the water employed in the dispersion is vaporized during the vulcanization process and produces a "kinking" or wave in the fibres, by which a portion of the fibres is set in the curved form, particularly at the portion of the loops which has been doubled on itself in being inserted between the separators or spacing elements, in the manner above described.

In this former method substantially all of the "kinked" or upper curved portion of the loops is cut off and discarded, although in the steaming operation, by which the fibres are straightened, any remaining portions of the fibres which are kinked or curved will be straightened. The fibres after being steamed are finally sheared as above explained, to produce a product in which the pile elements are of an even height.

It has been found as the result of extended experiments that a greatly improved product, subject to production in greater diversity of grades, may be produced by the method hereinafter fully described, and that the product may be made with fewer operations than have heretofore been necessary. The product may be made moreover at a greatly reduced cost of production over the method heretofore used.

Our invention involves the discovery that that the mottling or shadowing effect produced in cemented pile fabric products as heretofore made takes place because of the fact that the appearance of the pile element material, as observed by looking at the ends of the fibres, is materially different from its appearance in looking at the sides or side portions of the fibre elements. Doubtless this effect is due more or less to the different reflecting power of the ends or cross sections of the fibres from that of side portions of the fibre elements. Obviously also, the color or shade of the cross-sections of the fibres may be different from that of exterior portions of the fibre elements and may also produce a difference in the appearance of the surface of a pile fabric product, depending upon whether the surface comprises mainly cross sections of of the fibres or the side portions of the fibres.

We have discovered that by having the surface of the pile fabric material composed predominantly of the side portions of fibre elements arranged in different or multiple directions, there is substantially no mottling effect produced when the material is walked on. This result is due apparently to the fact that by having mainly the side portions of the fibres in the surface of the pile, instead of mainly the fibre ends or cut ends of the fibres, the reflectitng power thereof is substantially the same in all directions, and the character of the surface is not altered by depressing or bending the fibres in a portion of the pile mass.

We have found, furthermore, that instead of cutting off the tops of the loops, as has been the practice heretofore, we may open the loops by the use of a series of moving non-cutting projections such as spikes or pins suitably arranged upon a roll, similar, for example, to a garnetting roll, the roll being operated so that the pins or spikes engage the loops substantially in the plane of the loops. In carrying out our method, therefore, a roll of this character may be placed transversely across a traveling strip of the looped product, so as to open the loops progressively as the material is passed into engagement with the spikes or non-cutting projections of the roll.

The loops of the product are opened by a breaking of the loops, instead of by cutting

off the tops of the loops, as was the practice heretofore. Moreover, opening of the loops by the new method occurs promiscuously at different points in the loops, thus obtaining different fibre lengths attached to the backing.

It will thus be apparent that in contradistinction to the character of the product obtained by the method heretofore used, in which the fibres in the pile were of substantially the same length, the new method of opening the loops results in a pile fabric product having fibres of greatly varying length in the pile. In the pile product obtained by the novel mode of opening the loops, the shorter fibre or fibre portion produced will, in general, be straight and will serve to reinforce the pile density in proximity to the base or backing material of the product, whereas the longer fibres or fibre portions formed in opening the loops will have a crimped or kinked upper portion. These longer fibres having the "kinked" portion naturally distribute themselves in various directions in the pile, or extend in one or another direction in the pile surface, depending upon the "set" of the kinked or curved portions and also to some extent upon the direction in which these fibres are released when the corresponding loops are broken open. Whatever may be the explanation of the effect produced, it is observed that the product of this method of opening the loops does not produce thes snap or sudden yielding effect which results when the material as heretofore made is stepped on, and has a soft velvet "feel" to the foot when walked on; the product does not exhibit moreover, a mottling or shadowing effect when in use, even when subjected to the most extreme conditions for producing such effects.

With the above explanation of the features of our invention, the new and improved method will now be described in its preferred form in connection with the accompanying drawing, in which:

Fig. 1 is a view in elevation of one form of apparatus for opening the loops and for carrying out the finishing operations for the production of the improved cemented pile fabric product;

Fig. 2 is a sectional view in elevation taken on the section line 2—2 of Fig. 1, illustrating a section of the preferred form of mounting of the pins or non-cutting projections for opening the loops;

Fig. 3 is an enlarged detail view showing the form of product operated upon in which the series of loops 14 attached to the backing material 12 are to be opened;

Fig. 4 is a sectional view showing the appearance of the product after the loops have been opened by our novel method; and,

Fig. 5 is a sectional view illustrating the appearance of the final product obtained by carrying out the method of our invention.

Referring more particularly to the drawing, the looped product to be treated 10, which consists of a base fabric material, or a backing element, 12 having a series of upstanding loops 14 cemented to the backing by means of vulcanized rubber cement 16, as illustrated more particularly in Fig. 3 of the drawing, is passed over a support 18 of suitable form into contact with a series of non-cutting projections for breaking open the loops. These projections or pins are preferably mounted on a roll 20, which may be revolved at a high rate of speed in bearings on the shaft 22 in a manner so that the pins or non-cutting projections move progressively into contact with the loops.

The pin-bearing roll comprises preferably a steel roll of suitable size upon which are mounted a series of non-cutting projections, such as spikes or tapered pins 24, which are inserted into the body of the roll in any suitable manner. These pins may be mounted, for example, by the use of Garnett wire, or a steel ribbon having the pins or projections thereon, which is inserted into a spiral groove cut on the surface of the roll. To obtain the desired form of pins, Garnett wire may be wound on the roll in the groove under suitable tension and may be fastened in place by being suitably swaged or "calked in" in a manner well known to those skilled in the art.

The roll 20 containing the non-cutting projections may be run at any suitable speed, depending on the character and size of the loops operated upon, and also upon the dimensions of the roll and the size of the pins 24. The speed at which the roll should be operated may be readily determined by experiment, it being understood that the roll is preferably operated between the minimum speed which causes suitable opening of the pile loops 14, and the maximum practical speed for rolls of this type.

It will be understood that in the operation of the roll 20, to open the loops, the opening may be brought about progressively, as by passing the material 10 several times into contact with the pins or projections 24. In the operation of the roll, the higher speeds are more advantageous for the initial run or runs, for opening the loops, the operation at the lower speeds being dependent on a breaking action, although at higher speeds the inertia of the fibres apparently assists in producing the desired opening of the loops, which takes place by means of the rounded unsharpened pins or projections without cutting action.

In passing into contact with the pins or non-cutting projections over the support 18, the material is preferably given an abrupt change in direction, as illustrated in the drawing, in order to spread open the loops and to give greater opportunity for the pins

or projections to pass into and through the loops, so as to cause the rupturing or breaking thereof. After the loops have been opened in the manner described, the product is preferably passed over a roll 26, serving as a guide in drawing off the material from the support 18 and also to direct the material over a suitable support 28 and into contact with a brush 30. This brush is preferably mounted to revolve on a shaft 32, the brush having a series of steel wires 34 or other suitable brushing elements which serve to comb out or to rake out the loose fibre ends or unattached fibres in the product. The brush serves also to comb out the material so as to free or open out the fibres, and to spread the kinked fibre ends in multiple directions in the pile surface of the product.

After the brushing operation, in which the material is given a sharp bend or twist in passing over the support 28, the material may be drawn off on the roll 36 at a suitable angle and preferably passes from thence to a suitable shearing device, for example, over the support or cloth-rest 38 and into contact with the revolver 40 and the blade 42, which cooperate to cut off the loose ends of the pile fabric product.

By the use of this method, the cutting operation which was formerly employed for cutting off the tops of the loops is entirely eliminated, being replaced by a tigering or loop breaking operation, as described, which does not involve the discarding of pile element material. Furthermore, the final cutting operation by means of the shearing device 40, 42, as above described, results in removing only the extremely long fibre ends, thus causing a loss of only a very small percent of the weight of the pile element material used, whereas in the method formerly employed, by removing the entire tops of the loops, the subsequent final cutting operation, employed after the steaming operation, removed a very considerable amount of material in addition to that already removed, resulting in a substantial loss in this finishing operation.

It has been found, furthermore, that whereas by the method formerly employed in the finishing operation, involving cutting off the tops of the loops, brushing or tigering, steaming and finally shearing, or the variations of this method by repeating certain of the steps, the product obtained had substantially the same pile density throughout the pile, the product obtained by the use of our improved method has a pile density which increases from the surface of the pile to the base fabric. This result is attained by having the fibres promiscuously opened, which results in a variety of fibre lengths. Our method permits, therefore, the use of a very much smaller amount of pile element material than has heretofore been employed to obtain a suitably covered base fabric without giving the appearance of a scanty or thin pile.

By the use of this method, furthermore, the cost of production of a suitable pile fabric product is greatly reduced and a product may be made moreover with a greatly reduced minimum limit in the amount of pile element material employed to obtain a product of suitable appearance, as expressed, for example, in terms of pounds of pile element material per square yard of backing. The material, moreover, does not have the objectionable feature of snapping when walked on, and shadowing or mottling is entirely eliminated by the use of our invention.

It is to be understood that while this invention has been described in connection with the use of a batt of fibres, such as goat hair, it is also applicable to other pile element material, such as yarns or other spun fibre elements cemented to a backing material.

It is also to be understood that various changes or modifications may be made in the method and apparatus above described in carrying out our invention, as will be apparent to those skilled in the art, without departing from the spirit or scope of our invention; and we do not desire, therefore, to be limited to the specific embodiment of the invention described. The loop-opening operation by means of the spiked roll as described, may, for example, be repeated any number of times, as may be desired, and the speed of operation may also be varied in the various runs as may be found desirable. Furthermore, the brushing and final cutting operations may each be repeated or varied in any desired manner as may be found preferable under the conditions of operation.

By the use of the term "promiscuously opening the loops" or the equivalent, as employed in the claims, is meant the operation of opening the loops in the manner herein explained, or its equivalent, and does not include a cutting operation in which a part of the material is cut off or discarded. Obviously the term is intended to include a cutting operation in which the fibre loops are merely cut without cutting off or discarding a portion of the fibres. It will be obvious, however, that the material may, if desired, be subjected to a shearing or cutting operation after the loops have been opened, as above described.

Having thus described our invention, what we claim as new is:

1. In a method of making cemented pile fabrics in which loops of pile element material are cemented to a backing, the step comprising opening the loops promiscuously to provide pile fibres of different lengths attached to the backing.

2. In a method of making cemented pile fabrics in which a series of loops are cemented to a backing by means of a cement, the step

comprising promiscuously opening the loops to obtain pile fibres of different lengths attached to the backing and extending in multiple directions, thereby avoiding mottling in the finished product.

3. In a method of making cemented pile fabrics in which loops of pile element material are cemented by means of a vulcanizable cement to a backing material and heated to produce vulcanization of the said cement and simultaneous setting of the loops, the steps comprising promiscuously opening the loops to obtain fibres of varying lengths extending in multiple directions and cutting the ends of the longer projecting fibres to produce the pile fabric product.

4. In a method of making cemented pile fabrics in which loops of pile element material are attached to a backing strip by means of cement, the step comprising passing the loops of the material into contact with rapidly moving non-cutting projections to open the loops, thus forming separate fibres attached to the backing.

5. In a method of making cemented pile fabrics in which loops of pile element material are attached to a backing material by means of cement, the step comprising passing the loops of the material into contact with rapidly rotating non-cutting projections so as to break open the loops without cutting off portions of the fibres.

6. In a method of making cemented pile fabrics in which loops of pile element material are cemented to a backing strip by means of a vulcanizable cement, and in which the cement is vulcanized to attach the loops to the backing material, the step comprising passing the looped material into contact with rapidly moving non-cutting projections on a roll rotating in proximity to the loops so that the said projections enter the loops so as to cause breaking thereof without cutting off portions of the fibres.

7. In a method of making cemented pile fabrics in which loops of pile element material are attached to a backing material by means of a vulcanizable cement and in which the cement material is vulcanized while the said loops are held in place in contact with the said backing, the step comprising breaking the said loops by means of a series of rapidly moving pins passed into contact with the loops of a moving strip of the said material, thus breaking open the loops to form separate fibres of varying lengths without cutting off portions of the fibres.

8. In a method of making cemented pile fabrics in which loops of pile element material are cemented to a backing strip by means of a vulcanizable cement and in which heat is applied to vulcanize the cement material while the loops are held in place so as to cause setting of the tops of the loops, the step comprising progressively moving the strips of loop material into contact with the non-cutting projections of a roll arranged transversely of the said moving strip so as to promiscuously open the said loops to form separate fibres of varying lengths.

9. In a method of making cemented pile fabrics in which loops of pile element material are cemented to a backing strip by means of a vulcanizable cement, and in which the cement material is vulcanized by means of heat while the loop material is rigidly held in place in contact with the said backing strip thus causing setting of the loops, the step comprising passing the said loops into contact with a rapidly revolving roll containing a series of pins projecting from the surface of the roll adapted to engage the loops in substantially the plane of the loops, thereby opening the loops promiscuously producing varying lengths of fibres attached to the said backing strip.

10. In a method of the kind described, the steps comprising forming a series of loops of pile element material cemented to a backing material, and breaking open the loops by means of engagement with a rapidly moving non-cutting element causing breaking of the loops mainly at portions between the tops and base portions of the loops so as to produce long and short fibres.

11. In a method of the kind described, the steps comprising forming a series of loops of pile element material, cementing the loops to a backing, setting in curved form the tops of the loops and opening the loops mainly below the curved top portions to form attached fibres having crimped ends.

12. In a method of the kind described, the steps comprising forming a series of loops of pile element material, cementing the loops to a backing by means of a vulcanizable cement, setting the loops in their curved form, by means of steam and heat, opening the loops promiscuously mainly below the set curved portions to form short fibres serving to increase the density of the pile mass adjacent the backing material and long fibres having crimped ends forming the upper portion of the pile mass.

13. In a method of the kind described, the steps comprising forming a series of loops cemented to a backing material, heating the loops in the presence of moisture to set the curved portions thereof, breaking the loops promiscuously to obtain long and short fibres of varying length, the long fibres containing the said set curved portions and forming a pile surface in which the side portions of the fibres are mainly exposed, thus forming a surface homogeneous in appearance.

14. A method for the production of cemented pile fabrics which comprises forming loops of pile element material, cementing the said loops to a backing material, heating the loops in the presence of moisture to

set the curved portions thereof and opening the loops promiscuously to provide pile fibres of varying lengths, the longer fibres of which comprise the said curved portions, thus forming a pile surface comprising the kinked or set curved portions of the fibres.

15. A method for the production of cemented pile fabrics which comprises forming loops of pile element material, cementing the said loops to a backing material, heating the loops in the presence of moisture to set the curved portions thereof, opening the loops promiscuously by means of a rapidly revolving roll carrying projections adapted to contact with and break the loops, thereby forming fibres of varying lengths.

In testimony whereof, we affix our signatures.

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