United States Patent [19]

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[11] **3,713,960**

[45] **Jan. 30, 1973**

[54] **ANTISTATIC TUFTED PRODUCT**

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[22] Filed: **Oct. 30, 1969**

[21] Appl. No.: **872,657**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 765,267, Oct. 4, 1968.

[52] **U.S. Cl.** **161/66,** 57/157, 161/67, 161/88, 161/175, 317/2

[51] **Int. Cl.**.....**H05f 3/00**

[58] **Field of Search**.....161/62–67, 175, 161/213, 173, 88; 57/157 AS; 317/2

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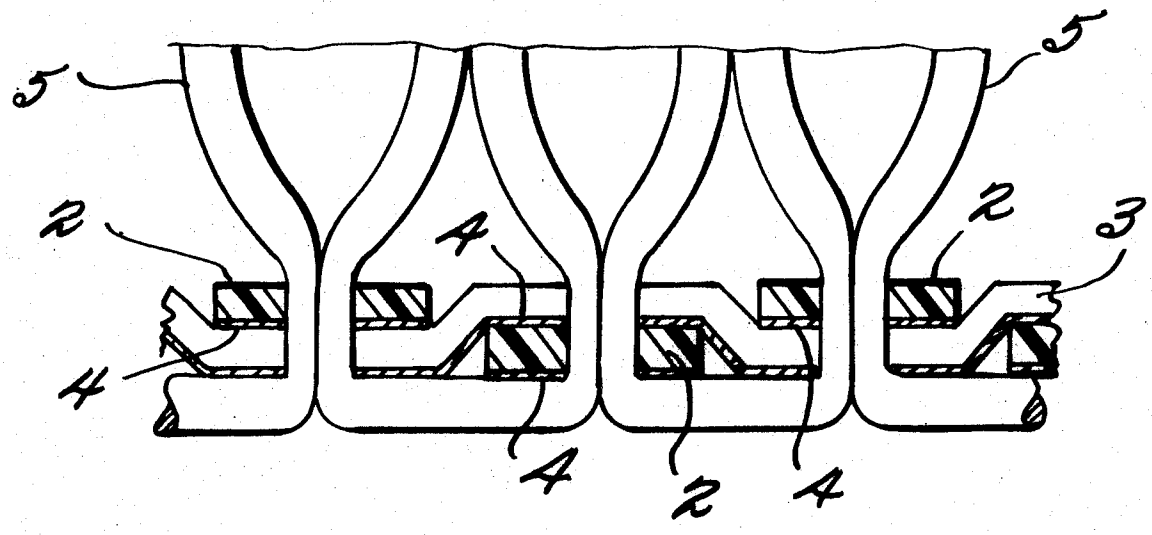
[57] **ABSTRACT**

A tufted pile product having antistatic properties including a pile yarn tufted through a backing formed of a non-electrically conductive textile material bonded to an electrically conductive foil.

5 Claims, 3 Drawing Figures



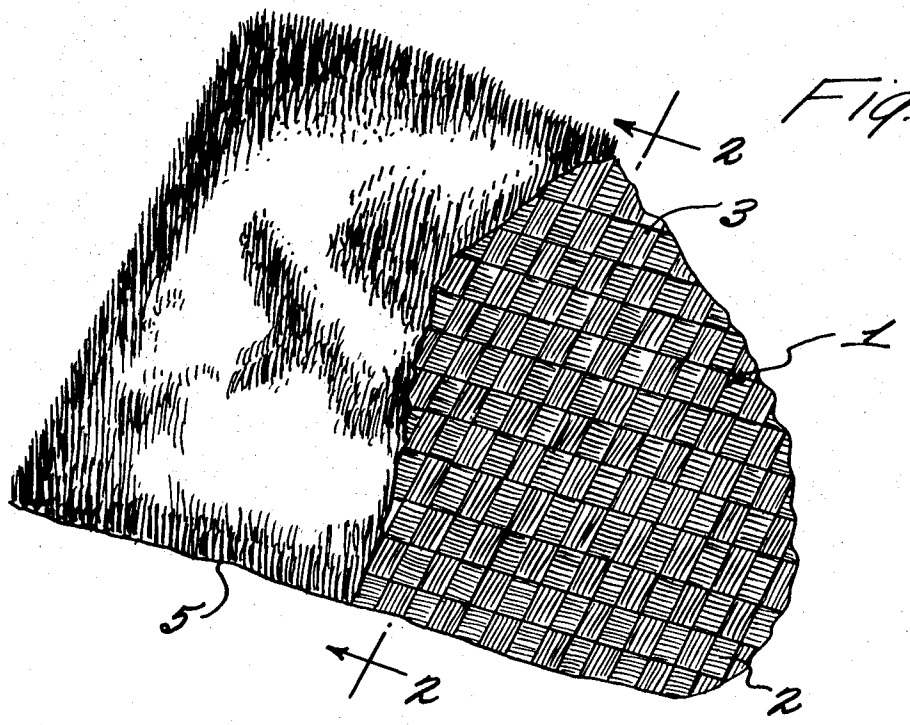


Fig. 1

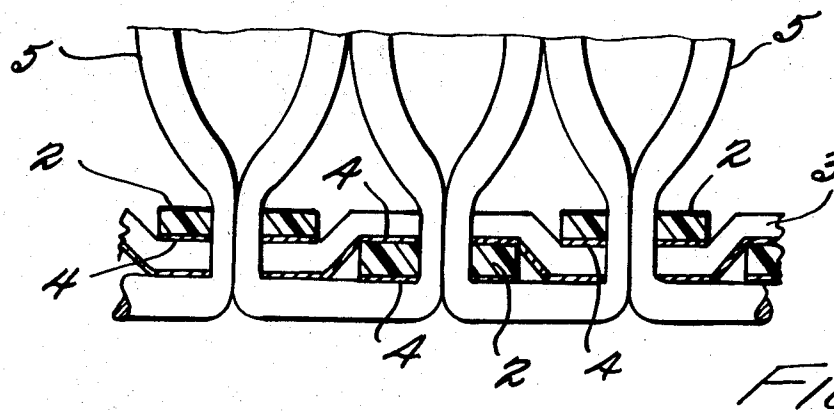
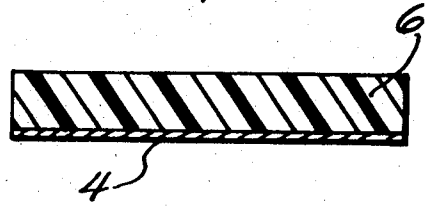


Fig. 2

Fig. 3



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ANTISTATIC TUFTED PRODUCT

This application is a continuation-in-part of Ser. No. 765,267, filed Oct. 4, 1968.

The present invention is concerned with a tufted product, e.g. carpeting, carpet tile, wall-covering or the like, having improved antistatic properties.

It is well known that products having a pile surface of nylon, wool or other fibers tend to generate and/or accumulate undesirable amounts of static electricity in use causing shocks, sparking and the like. Numerous techniques have been used to overcome this problem of static generation and/or accumulation but most of these suffer from one disadvantage or another. For example, pile surfaces are coated with antistatic agents but while such coatings can be effective for a time, they tend to wear off or come off during cleaning. The antistatic coating can also undesirably affect the appearance and/or feel of the product and increase its apparent soiling rate.

Another approach to the problem is to include conductive metal fibers or wires in the pile yarn but this may undesirably affect the appearance of the product and it adds considerably to the cost thereof. Additionally, conductive metal fibers or wires dull cutting knives used in the manufacture and/or installation of the product. A further disadvantage is that special types of conductive backsizings may be required in order for this alternative to be fully effective.

The purpose of the present invention is to obviate prior art difficulties in obtaining antistatic effects in a tufted product. Other objects will also be apparent.

Broadly speaking, the objects of the invention are realized by providing a tufted product comprising a primary backing material, e.g. a self-supporting film or more preferably a woven or nonwoven fabric, having a tufted surface of pile yarn which would normally tend to accumulate and/or generate static electricity and electrically conductive material, preferably but not necessarily aluminum foil, attached to the primary backing material, the pile yarn being tufted through the primary backing material and the electrically conductive material attached thereto so that there is intimate contact between the pile yarn and the conductive material. The electrically conductive material may be be grounded by itself, or directly to an external ground or to or through means constituting a part of the tufted product, e.g. a conductive back sizing and/or cushion joined, if necessary, to an external ground.

The success of the invention is based on the finding that the more surface area of the pile yarn of a tufted product which is in direct and intimate contact with a conductor, linked to or itself forming a ground, the less the generation and/or accumulation of static charge. Antistatic performance is improved by any close contact between the pile and conductor, and it is important only to provide the degree of contact necessary to reduce static electricity generated and/or accumulated below the point where it is noticeable when the product is used. The invention provides a convenient way for obtaining the desired contact between the pile yarn and the conductor by tufting the yarn through the primary backing material and the conductor.

The tufted product of the invention may be made in a variety of ways. Conventional forms of primary backing materials may be used provided the conductor is applied before tufting to at least part of one surface

thereof, usually the back side. Primary backing fabrics for tufted carpets conventionally comprise either woven jute or woven or nonwoven polypropylene or similar plastic material, or films thereof, all of which are themselves generally poor conductors. A particularly useful type of primary backing fabric is shown in U.S. Pat. No. 3,110,905 wherein the backing fabric is woven from strips of polypropylene or like synthetic plastic material which are rectangular in cross section. Other primary backing fabrics, woven or nonwoven, are made from more conventional types of fibers, filaments or yarns which are essentially round in cross section. As noted above, the conventionally known primary backing materials are not generally conductive but by applying a conductor over at least part of the back of these fabrics before tufting, according to the invention, the pile yarn after tufting will necessarily be in substantial contact with the conductor and thereby provide a way for avoiding the generation and/or accumulation of static charges.

The conductor may be applied to the back side of the primary backing fabric in any convenient fashion depending on the nature of the backing fabric and the conductor employed. Advantageously, the conductor is a conductive metal foil, e.g. aluminum foil, which can be heat sealed or adhesively, dielectrically or otherwise bonded to the primary backing fabric. One way of making a primary backing fabric from polypropylene ro similar synthetic plastic involves forming a film of the plastic; drawing the film, usually while hot, to orient; cooling; and then slitting the film into appropriate widths after which the resulting strips of plastic are woven to form the primary backing fabric: for example, the structure shown in U.S. Pat. No. 3,110,905. The sequence of drawing and slitting as set forth above may be reversed but both of these methods can be readily adapted to use the present invention. Specifically, the conductive metal may be bonded to the film after it has been drawn and oriented (if orientation is necessary). This may be done before or after slitting the film. The result is, in essence, a bicomponent yarn comprising a strip of polypropylene or similar plastic laminated to the foil. This yarn can then be woven into a primary backing fabric as, for example, in the case of U.S. Pat. No. 3,110,905, care being taken to minimize twisting or turning of the yarn so that the foil is essentially entirely on the back side of the primary backing fabric. Both warp and filling may include the foil or it may be preferred to use the foil in either the warp or filling alone. In addition to its effect on static charge generation or accumulation, use of the foil as described has the following advantages:

1. The heat-conducting properties of foil tend to provide even temperature distribution over the entire area where the product is used; and

2. chemical adhesion of polypropylene and similar plastic materials to conventional back sizing, secondary backing fabric and their adhesives, and cushioning materials is easier to obtain with aluminum foil than with exposed polypropylene or other conventional plastics used in primary backing fabrics. Such improved chemical adhesion has the further advantage of minimizing fraying of cut edges of the tufted product and improves bond to cushioning materials or the like as in the case of one-piece carpeting;

3. in order to minimize pile yarn costs, it is desirable to minimize the thickness of the primary backing material and the foil, being very thin, permits this to be accomplished.

As one alternative to the above, a conductive layer may be deposited on any of the conventional types of primary backing fabrics by applying a conductive material in latex or solution form followed by drying prior to tufting. This may be accomplished by immersing the primary backing fabric in the latex or solution of conductive material or by roller coating, spraying, etc. This alternative is also helpful to prevent or reduce the tendency of primary backing fabrics to fray at cut edges. The conductive material thus applied also adheres chemically better to conventional back sizings, secondary backing fabric adhesives and/or cushioning materials in the case of one-piece carpeting than to exposed polypropylene or similar plastic material.

The invention is illustrated in the accompanying drawing wherein

FIG. 1 is a perspective view of a tufted carpet prepared according to the invention while

FIG. 2 is a vertical sectional view along the line 2—2 of FIG. 1 and

FIG. 3 is another vertical sectional through a typical warp or fill for use in making the present primary backing fabric.

As illustrated, the primary backing fabric (1) comprises strips of polypropylene or the like woven as warp (2) and filling (3) in the manner of, for example, U.S. Pat. No. 3,110,905. Heat sealed or otherwise bonded to the underside of the strips 2 and 3 is a thin aluminum foil 4 or like conductor. Typically, the foil may be 0.0002 inch to 0.0005 inch thick, dead soft, clean aluminum, surface treated or plain. It is desirable to use the thinnest foil practical so that hand of the finished product is minimally affected and foil cost is minimized. Conductive foils other than aluminum foil may be used and, while the conductor is shown applied to both warp and fill in the drawing, it will be appreciated that the conductor may be attached to the underside of only the warp or filling as desired.

The pile surface of the product is represented in the drawing by the numeral 5, it being noted that in keeping with the invention the pile yarn is tufted through the primary backing after the foil 4 has been applied to the backing so as to provide the desired areas or points of contact between the pile yarn and foil. A ground, not shown, may also be connected to the conductive component and, if desired, the product may include other conventional components, e.g. a secondary backing fabric attached to the backside of the tufted product. Either a conventional or a conductive back sizing may also be applied to the product as desired.

FIG. 3 shows, in vertical section, the yarn used as filling and/or warp to prepare the tufted product described above, the numeral 6 representing the polypropylene or other plastic material constituting the strip and 4 being the foil or other conductive layer.

It will be appreciated from the foregoing that various modifications may be made in the invention as described above. For instance, while the foregoing description shows application of the conductive foil to the back of the primary backing fabric, there may be circumstances which will permit application of the foil or the conductive material to the top of the fabric although the back is usually preferred. As an illustration, the material to which the pile of a flocked fabric is anchored may be a conductive substance with the same desirable antistatic results. Alternatively the pile yarn may be tufted through and, therefore, in direct and intimate contact with, a conductive screen used as a primary backing fabric. A further embodiment of the invention contemplates the use of a plastic film coated with aluminum foil or other conductive material or combined with a woven or nonwoven fabric, in the manner of U.S. Pat. No. 3,075,865, made of conductive fibers for use as a primary backing material to achieve the desired anti-static results. Hence the scope of the invention is defined in the following claims wherein:

I claim:

1. A tufted product having antistatic properties comprising a woven primary backing material woven of yarn which comprises a bonded laminate having an upper layer and a lower layer bonded together, the upper layer being of non-electrically conductive textile material and constituting the upper surface of said backing material, and the lower layer being electrically conductive metal foil constituting the other surface of said laminate, pile yarn projecting from the upper surface of non-conductive material, the pile yarn, consisting of non-metallic fibers which would otherwise tend to accumulate or generate static electricity, and being tufted through said laminate including said electrically conductive foil so that said yarn is in direct contact with said conductive foil sufficient to render said product antistatic.

2. The tufted product of claim 1 wherein the yarns are yarns of rectangular cross section.

3. The tufted product of claim 1 wherein the foil is aluminum foil.

4. The tufted product of claim 1 wherein the conductive layer serves as its own ground.

5. The tufted product of claim 1 including means for connecting the conductive portion to an external ground.

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