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(54) Title: FABRIC WITH ODOR RECEIVING LAYER

(57) Abstract: A tufted fabric that incorporates an odor-receiving layer to remove unwanted odors from the final product in which the fabric is incorporated, particularly in floor covering articles. In an alternative embodiment, the present invention is a needle-punched fabric that incorporates an odor-receiving layer.
FABRIC WITH ODOR RECEIVING LAYER

BACKGROUND OF THE INVENTION:
The present invention relates to tufted and needle-punched fabrics, and, more particularly, to tufted and needle-punched fabrics having odor-receiving capabilities.

Conventional tufted and needle-punched floor coverings are desirable for use in a variety of facilities because of the inherent sound deadening features of these floor coverings, as well as the attractive appearance and ease of maintenance for such floor coverings. However, tufted and needle-punched floor coverings, both residential and commercial, act as receptacles for odors. In addition to odors from normal dust and dirt, these floor coverings are highly susceptible to acquiring odors emitted from humans and pets, as well as odors acquired from spills, smoke, mold and mildew.

Although cleaning products exist to combat these malodors in floor coverings, these products are typically only effective at masking or removing odors already present in the floor coverings, and are not effective at preventing the odors. Further, these products are typically applied to the surface of the floor coverings so that odor that has seeped below the surface of the floor covering is difficult for the cleaning products to address.

Accordingly, there exists a need for an improved odor-receiving fabric that can be incorporated into floor coverings.

SUMMARY OF THE INVENTION:
The following presents a simplified summary of the invention in order to provide a basic understanding of some aspects of the invention. This summary is not an extensive overview of the invention. It is not intended to identify key or critical elements of the invention or to delineate the scope of the invention. Its sole purpose
is to present some concepts of the invention in a simplified form as a prelude to the more detailed description that is presented later.

According to its major aspects and briefly stated, the present invention is a tufted fabric that incorporates an odor-receiving layer to remove unwanted odors from the final product in which the fabric is incorporated. In an alternative embodiment, the present invention is a needle-punched fabric that incorporates an odor-receiving layer.

A feature of the present invention is the use of a fabric that is formed with an odor-receiving layer. Items such as broadloom carpet, tile carpet, area rugs, and mats can sometimes develop smell that is offensive to the human nose caused by moisture or contaminants such as food, soil, and pet debris. Typically, these items do not have odor-receiving capabilities. Therefore, the use of a fabric that incorporates an odor-receiving layer is advantageous, thus rendering more pleasant and desirable the products into which the fabric is incorporated and the environment into which the products are placed.

Other features and advantages of the present invention will be apparent to those skilled in the art from a careful reading of the Detailed Description of the Preferred Embodiments presented below and accompanied by the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS:
In the drawings:

FIG. 1 is a cutaway side view of a fabric according to an embodiment of the present invention;

FIG. 2 is a schematic view of a process for making the fabric according to an embodiment of the present invention;
FIG. 3 is a cutaway side view of a fabric according to a first alternative embodiment of the present invention; and

FIG. 4 is a schematic view of a process for making the fabric according to a first alternative embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS:
Figure 1 illustrates an embodiment of a fabric 10 according the present invention. The fabric 10 includes a top layer of pile 12. "Pile" is a fabric effect formed by introducing tufts, loops, or other erect yarns on all or part of a fabric surface. As shown, the pile layer 12 is tufted through a primary backing 14 that is attached to layer of odor-receiving material 16.

Although there exist a variety of methods for making the fabric 10 of the present invention, FIG. 1 illustrates a method in which the odor-receiving layer 16 is fed into a tufting machine 20 below the primary backing layer 14. However, the odor-receiving layer 16 can alternatively be fed above the primary backing layer 14. Additionally, the odor-receiving layer 16 and the primary backing 14 can be bonded together in a separate process, such as by hot-roll calendaring wherein the layers are passed between heated calendar rolls, before the tufting process.

Although the type of tufting illustrated in FIG. 1 is cut-pile tufting, the tufting of the pile layer 12 can also be loop-pile tufting, or a combination of cut-pile tufting and loop-pile tufting. Preferably, the yarn that forms the pile layer 12 is made of a material such as nylon, polyester, acrylic, cotton, wool, rayon, polypropylene, or any combination thereof. However, the present invention contemplates the use of other suitable materials in addition to these listed. The fibers used to form the yarn of the pile layer 12 can be either monofilament or multifilament fibers. Further, the fibers can have a range of about 0.1 dpf (denier per filament) to about 100 dpf, and, preferably, from about 1 to about 50 dpf. Finally, the fiber used in the pile yarn can be colored by atmospheric dyeing, batik, chain dyeing, cross dyeing, high-temperature dyeing, ingrain, jet dyeing, muff dyeing, pad dyeing, piece dyeing,
printing, reserve dyeing, short-liquor dyeing, skein dyeing, solution dyeing, solvent dyeing, stock dyeing, thermal fixation, union dyeing, yarn dyeing, space dyeing, pressure dyeing, and any combination thereof, or the yarn may be natural in color.

The primary backing layer 14 can be formed from any known construction including a knit construction, a woven construction, a non-woven construction, or the like. Further, the material of the backing layer 14 can be made of a synthetic material, a natural material, a man-made material using natural constituents or a blend of any of the foregoing. By way of example only and not limitation, it is contemplated that exemplary materials useful for the backing layer 14 are polyester, polypropylene, nylon, acrylic, cotton, rayon, or a combination thereof. However, the material of the backing layer 14 can be any other suitable material and is not limited to these listed materials.

The odor-receiving layer 16 will contain an odor receiving agent 17 for attracting and holding odors. The odor receiving agent 17 can be an odor absorbing agent, and/or an odor adsorbing agent. Odor absorbing agents receive the odor and trap the odor inside the agent. Odor adsorbing agents receive the odor and hold the odor on the exterior of the agent. The odor adsorbing agent has the added advantage that odor can be released and the agent refreshed for additional use if the agent is subjected to heat.

The odor receiving agent 17 of the odor receiving layer 16 is preferably a particulate odor receiving agent 17 such as activated carbon or charcoal, zeolite compounds, or the like. Particulate odor receiving agents provide a greater surface area for receiving the odorous material. Carbonaceous materials that can be converted into an activated carbon or charcoal for the present invention include materials such as coal (bituminous), coconut shells, coke, peat, petroleum fractions, wood chips (saw dust) or the like. Other less common materials that can be used for forming activated carbon or charcoal include automobile tires, cherry stones, coffee grounds, corn cobs, plastic waste, sewage sludge, straw, water lilies, or the like. Performance of the activated carbon or charcoal is typically improved with greater pore size and
surface area. Generally, the smaller the particulate size, the better the odor receiving capability of the odor receiving agent. One material that is contemplated for use is an activated carbon charcoal product marketed under the trade designation GARFIL™ by Purification Products, Ltd. of Great Britain. In one embodiment, the odor receiving agent 17 in the form of activated charcoal has a 100 X 150 mesh screened particle size. In another embodiment, the activated charcoal has a 50 X 100 mesh screen particle size.

Preferably, the odor receiving agent 17 of the odor receiving layer 16 can be secured in position by an adhesive or binder 18. It is contemplated that the adhesive or binder 18 securing the odor receiving agent 17 in place can be a thermoplastic film or melttable fabric. In one embodiment, the adhesive or binder 18 is a film of heat activatable thermoplastic adhesive. According to one contemplated practice using a film or melttable substrate adhesive, the odor receiving agent 17, such as activated charcoal, can be disposed within the adhesive film or melttable fabric, as illustrated in FIG. 1. For example, the odor receiving layer 16 can be a nonwoven fibrous material including an adhesive binding agent such as a thermoplastic adhesive in which particles of activated carbon or charcoal are dispersed. In such a construction, the binding agent is preferably a so called "soft binder" having a relatively low glass transition temperature as described in U.S. patent 5,678,247, the teachings of which are incorporated by reference.

Figures 3 and 4 illustrate an alternative embodiment of the present invention. The only distinction between the embodiment illustrated in FIGS. 1 and 2 and the alternative embodiment is that the fabric 10' is needle-punched rather than tufted. Similar to the method for making the tufted fabric, an odor receiving layer 16' is fed into a needle-punching loom 30 below a non-woven web 32. Through the needle-punching process, the non-woven web 32 and the odor receiving layer 16' are integrated together resulting in the completed needle-punched fabric 10. At this stage of the process, the needle-punched fabric can then go through hot roll calendaring in order to better bond the non-woven web 32 to the odor receiving layer 16' together. However, this additional step is not necessary to achieve the needle-
punched fabric 10'. Also similar to the tufted fabric 10, the finally formed needlepunched fabric 10' can be incorporated into products such as broadloom carpet, tile carpet, area rugs, and mats.

As discussed, a particular feature of the present invention is a fabric including an odor-receiving layer. Items such as broadloom carpet, tile carpet, area rugs, and mats can sometimes develop smell that is offensive to the human nose caused by moisture or contaminants such as food, soil, and pet debris. Typically, these items do not have odor-receiving capabilities. Therefore, the use of a fabric that incorporates an odor-receiving layer is advantageous, thus rendering more pleasant and desirable the products into which the fabric is incorporated and the environment into which the products are placed.

It is also contemplated that the fabric may be treated with so called "anti-microbial agents" also known as "microbe-inhibiting agents" to inhibit microbe and/or fungal growth. Such anti-microbial agents are typically based on metallic systems such as copper, silver and the like which impede or prevent the growth of microorganisms. Exemplary anti-microbial agents are identified in U.S. Patent 6,196,156 to Denesuk et al. the teachings of which are incorporated by reference in their entirety as if fully set forth herein.

It is further contemplated that other chemical surface treatments may also be utilized either alone or in combination with one another and/or in combination with anti-microbial agents to impart desired physical performance properties. By way of example only and not limitation, such chemical surface treatments may include the application of fire retardant agents, UV inhibiting agents, water resisting agents, stain resisting agents, coloring agents, fragrances, anti-static agents or the like. For example, it is contemplated that a fluorochemical treatment such as SCOTCHGUARD® or the like available from Minnesota Mining and Manufacturing Company can be applied to the outer surface of the fabric either alone or in combination with other surface chemical treatments to inhibit stains and to repel water. It is also contemplated that a so called "soil release agent" may be applied
either alone or in combination with other surface chemical treatments to aid in the
cleanability of the fabric during a cleaning operation. One such soil release agent is
believed to be commercially available under the trade designation VISA® by Milliken
Chemical having a place of business in Spartanburg, South Carolina. Such soil
release agents may also impart the added features of improving initial staining
resistance and reducing moisture wicking which may be beneficial in some
instances.

Finally, there are many alternative embodiments and modifications of the present
invention that are intended to be included within the spirit and scope of the following
claims.
CLAIMS

1. A fabric, comprising:
   a layer of pile that is tufted through a primary backing layer; and
   an odor receiving layer that is attached to said primary backing layer, wherein
   said odor receiving layer comprises a plurality of odor receiving particles selected
   from the group consisting of activated carbon, activated charcoal, zeolite compound,
   and any combination thereof, held in place by a bonding adhesive.

2. The fabric as recited in claim 1, wherein said pile layer is formed from a
   material that is selected from the group consisting of nylon, polyester, acrylic, cotton,
   wool, rayon, polypropylene, and any combination thereof.

3. The fabric as recited in claim 1, wherein said primary backing layer is
   formed from a material that is selected from the group consisting of polyester,
   polypropylene, nylon, acrylic, cotton, rayon, and any combination thereof.

4. The fabric as recited in claim 1, wherein said activated charcoal has a 100
   X 150 mesh screened particle size.

5. The fabric as recited in claim 1, wherein said activated charcoal has a 50 X
   100 mesh screen particle size.

6. The fabric as recited in claim 1, wherein said bonding adhesive is a
   thermoplastic film.

7. The fabric as recited in claim 1, wherein said bonding adhesive is
   contained within melttable fabric.

8. The fabric as recited in claim 1, wherein said pile layer is formed from a
   plurality of fiber, and wherein said plurality of fibers have a range of about 0.1 dpf to
   about 100 dpf.
9. The fabric as recited in claim 8, wherein said plurality of fibers have a range from about 1 to about 50 dpf.

10. The fabric as recited in claim 1, wherein said pile layer is colored from at least one of the group consisting of: atmospheric dyeing, batik, chain dyeing, cross dyeing, high-temperature dyeing, ingrain, jet dyeing, muff dyeing, pad dyeing, piece dyeing, printing, reserve dyeing, short-liquor dyeing, skein dyeing, solution dyeing, solvent dyeing, stock dyeing, thermal fixation, union dyeing, yarn dyeing, space dyeing, pressure dyeing, and any combination thereof.

11. The fabric as recited in claim 1, wherein said pile layer is formed from at least one of the group consisting of: cut-pile tufting, loop-pile tufting, and a combination of cut-pile tufting and loop-pile tufting.

12. The fabric as recited in claim 1, wherein said primary backing layer is formed from at least one of the group consisting of: a knit construction, a woven construction, a non-woven construction, and any combination thereof.

13. A fabric, comprising:

   a layer of pile;

   an odor receiving layer that is attached to said pile layer, wherein said odor receiving layer comprises a plurality of odor receiving particles selected from the group consisting of activated carbon, activated charcoal, zeolite compound, and any combination thereof, held in place by a bonding adhesive; and

   a primary backing layer that is attached to said odor receiving layer.

14. The fabric as recited in claim 13, wherein said pile layer is formed from a material that is selected from the group consisting of nylon, polyester, acrylic, cotton, wool, rayon, polypropylene, and any combination thereof.
15. The fabric as recited in claim 13, wherein said primary backing layer is formed from a material that is selected from the group consisting of polyester, polypropylene, nylon, acrylic, cotton, rayon, and any combination thereof.

16. The fabric as recited in claim 13, wherein said activated charcoal has a 100 X 150 mesh screened particle size.

17. The fabric as recited in claim 13, wherein said activated charcoal has a 50 X 100 mesh screen particle size.

18. The fabric as recited in claim 13, wherein said bonding adhesive is a thermoplastic film.

19. The fabric as recited in claim 13, wherein said bonding adhesive is contained within meltable fabric.

20. The fabric as recited in claim 13, wherein said pile layer is formed from a plurality of fiber, and wherein said plurality of fibers have a range of about 0.1 dpf to about 100 dpf.

21. The fabric as recited in claim 20, wherein said plurality of fibers have a range from about 1 to about 50 dpf.

22. The fabric as recited in claim 13, wherein said pile layer is colored from at least one of the group consisting of: atmospheric dyeing, batik, chain dyeing, cross dyeing, high-temperature dyeing, ingrain, jet dyeing, muff dyeing, pad dyeing, piece dyeing, printing, reserve dyeing, short-liquor dyeing, skein dyeing, solution dyeing, solvent dyeing, stock dyeing, thermal fixation, union dyeing, yarn dyeing, space dyeing, pressure dyeing, and any combination thereof.
23. The fabric as recited in claim 13, wherein said pile layer is formed from at least one of the group consisting of: cut-pile tufting, loop-pile tufting, and a combination of cut-pile tufting and loop-pile tufting.

24. The fabric as recited in claim 13, wherein said primary backing layer is formed from at least one of the group consisting of: a knit construction, a woven construction, a non-woven construction, and any combination thereof.

25. A fabric, comprising:

   a non-woven web; and

   an odor receiving layer that is needle-punched to said non-woven web, wherein said odor receiving layer comprises a plurality of odor receiving particles selected from the group consisting of activated carbon, activated charcoal, zeolite compound, and any combination thereof, held in place by a bonding adhesive.

26. The fabric as recited in claim 25, wherein said activated charcoal has a 100 X 150 mesh screened particle size.

27. The fabric as recited in claim 25, wherein said activated charcoal has a 50 X 100 mesh screen particle size.

28. The fabric as recited in claim 25, wherein said bonding adhesive is a thermoplastic film.

29. The fabric as recited in claim 25, wherein said bonding adhesive is contained within meltable fabric.

30. A floor covering comprising:

   a layer of pile that is tufted through a primary backing layer; and

   an odor receiving layer that is attached to said primary backing layer, wherein said odor receiving layer comprises a textile layer having a plurality of odor receiving particles disposed therein.
31. The floor covering as recited in claim 30, wherein said pile layer is formed from a material that is selected from the group consisting of nylon, polyester, acrylic, cotton, wool, rayon, polypropylene, and any combination thereof.

32. The floor covering as recited in claim 30, wherein said primary backing layer is formed from a material that is selected from the group consisting of polyester, polypropylene, nylon, acrylic, cotton, rayon, and any combination thereof.

33. The floor covering as recited in claim 30, wherein said odor receiving particles are selected from the group consisting of activated carbon, activated charcoal, zeolite compound, and any combination thereof.

34. The floor covering as recited in claim 33, wherein said activated charcoal has a 100 X 150 mesh screened particle size.

35. The floor covering as recited in claim 33, wherein said activated charcoal has a 50 X 100 mesh screen particle size.

36. The floor covering as recited in claim 30, wherein said odor receiving particles are held in place by a bonding adhesive.

37. The floor covering as recited in claim 36, wherein said bonding adhesive is a thermoplastic film.

38. The floor covering as recited in claim 36, wherein said bonding adhesive is contained within meltable fabric.

39. The floor covering as recited in claim 30, wherein said pile layer is formed from a plurality of fiber, and wherein said plurality of fibers have a range of about 0.1 cdpf to about 100 dpf.
40. The floor covering as recited in claim 30, wherein said plurality of fibers have a range from about 1 to about 50 dpf.

41. The floor covering as recited in claim 30, wherein said pile layer is colored from at least one of the group consisting of: atmospheric dyeing, batik, chain dyeing, cross dyeing, high-temperature dyeing, ingrain, jet dyeing, muff dyeing, pad dyeing, piece dyeing, printing, reserve dyeing, short-liquor dyeing, skein dyeing, solution dyeing, solvent dyeing, stock dyeing, thermal fixation, union dyeing, yarn dyeing, space dyeing, pressure dyeing, and any combination thereof.

42. The floor covering as recited in claim 30, wherein said pile layer is formed from at least one of the group consisting of: cut-pile tufting, loop-pile tufting, and a combination of cut-pile tufting and loop-pile tufting.

43. The floor covering as recited in claim 30, wherein said primary backing layer is formed from at least one of the group consisting of: a knit construction, a woven construction, a non-woven construction, and any combination thereof.

44. The floor covering as recited in claim 30, wherein said floor covering has been treated with at least one chemical surface treatment.

45. The floor covering as recited in claim 44, wherein said chemical surface treatment is selected from the group consisting of: fire retardant agents, UV inhibiting agents, water resisting agents, stain resisting agents, coloring agents, anti-static agents, anti-microbial agents and any combination thereof.