

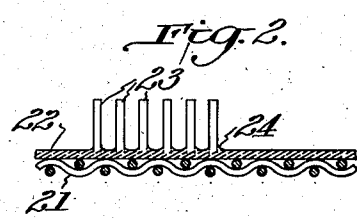
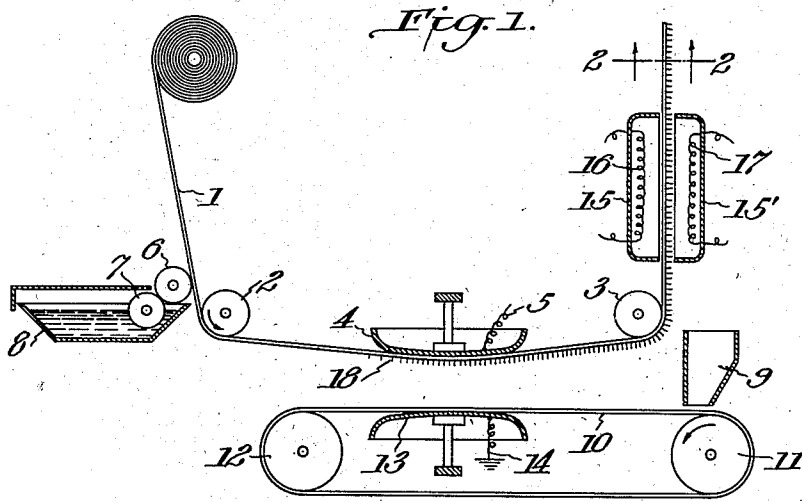
July 20, 1937.

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2,087,260

HOMOGENEOUS PILED SURFACE

Filed April 18, 1935



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UNITED STATES PATENT OFFICE

2,087,260

HOMOGENEOUS PILED SURFACE

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Application April 18, 1935, Serial No. 17,126

13 Claims. (Cl. 91-68)

This invention relates to piles and piled surfaces and their manufacture, and is directed particularly to a pile comprising attenuated elements and an indurated binding substance with which they are combined into a homogeneous structure, and to a method of making the same.

The invention is especially valuable when it is included in the method of piling surfaces comprising: coating the surface to be piled with adhesive, placing the coated surface in an electric field, and supplying fibers or other pile forming elements to the region of the electric field, that they may be oriented and deposited on the adhesive covered surface by the action of the electric field.

The principal object of the invention is to form a pile of attenuated particles, such as rayon fibers or "flocks", wherein one end of each fiber is incorporated into an indurated material and makes a homogeneous structure with it.

Another object of the invention is to incorporate one end of each of a group of fibers into an induratable binding material to form a pile by the use of a solvent common to fibers and binding material.

Another object of the invention is to so control the softening action of a solvent included in an induratable binding material on the fibers to be attached thereto in the forming of a pile that one end of each fiber will be amalgamated with the binding material to make a common substance with it.

A specific object of the invention is to make a pile of cellulose derivative fibers by fastening one end of each fiber into the pile structure with an adhesive, including a volatile solvent for the cellulose derivative, such as acetone, and then driving out the solvent and indurating the adhesive.

A further specific object is the production of a pile of attenuated elements upon a surface by coating the surface with an adhesive including a solvent for the elements, orienting the elements and projecting them endwise with an electric field into the adhesive, holding them in oriented position until the solvent has softened the imbedded ends of the elements and incorporated them into the adhesive to make a homogeneous structure with it, and then indurating the adhesive.

The products obtained from a realization of the above objects and such other objects as will be pointed out in the following exposition are characterized by the strong attachment between the individual fibers or elements and the common

binding material. When very fine fibers, such as rayon flocks, are projected endwise, for instance under the influence of an electric field, into an adhesive, they do not penetrate deeply, as a rule, and are not always wetted sufficiently by an ordinary adhesive to produce a strong bond between adhesive and fiber. The result is a pile with an appreciable number of elements which will become dislodged when the pile is brushed or given other rigorous handling. An adhesive with a constituent that is a solvent for the fibers, on the other hand, definitely wets, and partially dissolves, each fiber that contacts it for any length of time, and the result is a blending or incorporating of fibers and adhesive into a homogeneous whole. Upon evaporation of the solvent or solvents and induration of the adhesive a very strongly bonded pile results.

In the following description of the invention reference is had to the appended drawing in which:

Fig. 1 is a diagrammatic view, in side elevation, of apparatus useful in practicing the method of the invention; and

Fig. 2 is a fragmentary cross-sectional view of the product made with the apparatus shown in Fig. 1 taken on line 2-2 of that figure.

In Fig. 1, numeral 1 identifies a sheet material, for example, a sheet of closely woven cloth, a surface of which is to be piled. Sheet 1 is moved over rolls 2 and 3 in the direction indicated and in doing so passes under electrode 4 which is insulated from ground and maintained at a high potential with respect to ground by connecting it to a source (not shown) of high voltage, preferably unidirectional, current by conductor 5. A suitable adhesive is applied to the under surface of sheet 1 by rolls 6 and 7 in the manner readily appreciated by those familiar with the coating art. The adhesive is held in container 8, which has a close fitting top, except for the projecting area of roll 6, to minimize the losses of solvent by evaporation.

The attenuated elements, such as textile fibers, used in building the pile are distributed by means 9 upon belt 10 moving over rolls 11 and 12. Belt 10 may be of metal and held at ground potential, or it may be of semi-conducting or insulating material, in which case it is passed over an electrode 13, grounded at 14. In either case a strong electric field that terminates on electrode 4 exists adjacent the top of belt 10; and this electric field, which can be considered as existing between electrodes 4 and 13, lifts the fibers from the surface of belt 10 and de-

posits them on the coated surface of sheet 1 in oriented position perpendicular to that surface. Sheet 1 moves at a rate which permits the pile to form with the desired density. After deposition the piled surface is moved through a heating chamber 15, 15' containing electrical heating elements 16 and 17 wherein the solvents are driven from the adhesive, to be collected for reuse if economically advisable, and the adhesive hardened to the desired degree.

The several steps recommended in electrically depositing fibers are disclosed in detail in U. S. patent applications Serial No. 692,201, of A. F. Meston filed October 4, 1933, and Serial No. 699,456, of H. F. Wintermute filed Nov. 23, 1933.

Fig. 2 shows a portion of the product of the invention in which fabric 21 corresponds to sheet 1 of Fig. 1. A layer of binding material 22 is attached to the surface of cloth 21, and imbedded in or joined with the binding material are fibers 23. Binding material 22 had been applied to cloth 21 as a viscous adhesive composition and throughout the layer of adhesive a substance had been distributed which had a solvent or softening effect upon fibers 23. The solvent softened or partially dissolved the ends of the fibers projecting into or contacting the adhesive and brought about an intimate association of the materials comprising fibers and adhesive as shown at 24, with the result that upon driving out the solvent and indurating the adhesive the fibers were autogenously welded to the binding material in what may be termed a homogeneous whole.

I have obtained very satisfactory results with a solvent common to both binding material and fibers. For example, in depositing cellulose acetate rayon fibers, I have used acetone in an adhesive composition comprising cellulose acetate, a relatively high boiling point solvent, such as ethylene glycol mono-methyl ether ("Cello-solve") and a plasticizer. Deposition with this combination under conditions which controlled the evaporation of the acetone and the surface penetrativeness of the adhesive have produced piles with very strongly attached fibers. The deposition apparatus is preferably enclosed in a chamber when a highly volatile solvent, such as acetone, is used and it has been found advisable to control the gaseous contents of the chamber as to temperature and other vapor pressure conditions and to guard against possible explosive mixtures. The preferred viscosity and surface setting characteristics of the adhesive are readily discernible through trial and observation.

Other cellulose derivatives, such as the esters and ethers of cellulose, as well as other fibrous substances capable of being dissolved or softened by an ingredient of the adhesive composition, may be used in place of cellulose acetate.

While the invention has been particularly described for the purpose of illustration in connection with the production of a product including a fabric backing, other backings, such as sheets of preformed indurated material, may be used, or the fibers may be deposited on a layer of adhesive on a temporary backing, being later removed from the temporary backing and used as such or applied to a permanent backing.

It will be appreciated by those familiar with the characteristics of adhesives and textile and other fibers that many embodiments of my invention are possible. What I wish to emphasize as the broad conception of the invention is the

breaking down of the surface of the fiber where it contacts the binding material so that the definite interface which ordinarily separates two such substances is, to an appreciable degree, eliminated and the fiber becomes integrally united with the binding material.

I claim:

1. A method of making pile-surfaced material which comprises depositing attenuated fibers of a cellulosic derivative in a layer of an adhesive composition including a substance having a solvent action on said cellulosic derivative, and indurating the adhesive layer.

2. A method of making pile-surfaced material which comprises depositing attenuated fibers of a cellulose ester in a layer of an adhesive composition including a substance having a solvent action on said cellulose ester, and indurating the adhesive layer.

3. A method of making pile-surfaced material which comprises depositing attenuated fibers of cellulose acetate in a layer of an adhesive composition including a substance having a solvent action on said cellulose acetate, and indurating the adhesive layer.

4. A method of making pile-surfaced material which comprises depositing attenuated fibers of a cellulosic derivative in a layer of an adhesive composition including a similar cellulosic derivative and a substance having a solvent action on said cellulosic derivative, and indurating the adhesive layer.

5. A method of making pile-surfaced material which comprises depositing attenuated fibers of a cellulosic derivative in a layer of an adhesive composition including cellulose acetate and a substance having a solvent action on said cellulosic derivative, and indurating the adhesive layer.

6. A method of making pile-surfaced material which comprises forming a layer of an adhesive composition comprising a cellulosic derivative, a volatile solvent therefor, a high boiling solvent, and a plasticizer, depositing thereon attenuated fibers of a similar cellulosic derivative and indurating the adhesive layer by removing the volatile solvent.

7. A method of making a pile-surfaced material which comprises forming a layer of an adhesive composition comprising cellulose acetate, acetone ethylene glycol mono-methyl ether and a plasticizer, depositing thereon attenuated fibers of cellulose acetate and indurating the adhesive layer by removing the acetone.

8. A pile-surfaced sheet material comprising a layer of indurated adhesive substance and a pile consisting of attenuated fibers embedded at one end in said layer and physically homogeneous therewith.

9. A pile-surfaced sheet material comprising a layer of indurated adhesive substance and a pile consisting of attenuated fibers embedded at one end in said layer and physically and chemically homogeneous therewith.

10. A pile-surfaced sheet material comprising a layer of indurated cellulosic substance and a pile consisting of attenuated fibers of a cellulose derivative embedded at one end in said layer and physically homogeneous therewith.

11. A pile-surfaced sheet material comprising a layer of indurated plastic composition including cellulose acetate and a pile consisting of attenuated fibers of cellulose acetate embedded at one end in said layer and physically homogeneous therewith.

12. A pile-surfaced sheet material comprising a backing, a layer of indurated adhesive substance thereon and a pile consisting of attenuated fibers embedded at one end in said layer and physically homogeneous therewith.

a backing, a layer of indurated plastic composition including cellulose acetate thereon and a pile consisting of attenuated fibers of cellulose acetate embedded at one end in said layer and physically homogeneous therewith.

5 13. A pile-surfaced sheet material comprising

LOUIS P. MILLER. 5