Jan. 9, 1951

C. S. FRANCIS, JR
COATED SHEET MATERIAL AND PROCESS
FOR MAKING THE SAME
Filed Aug. 14, 1948

2,537,126

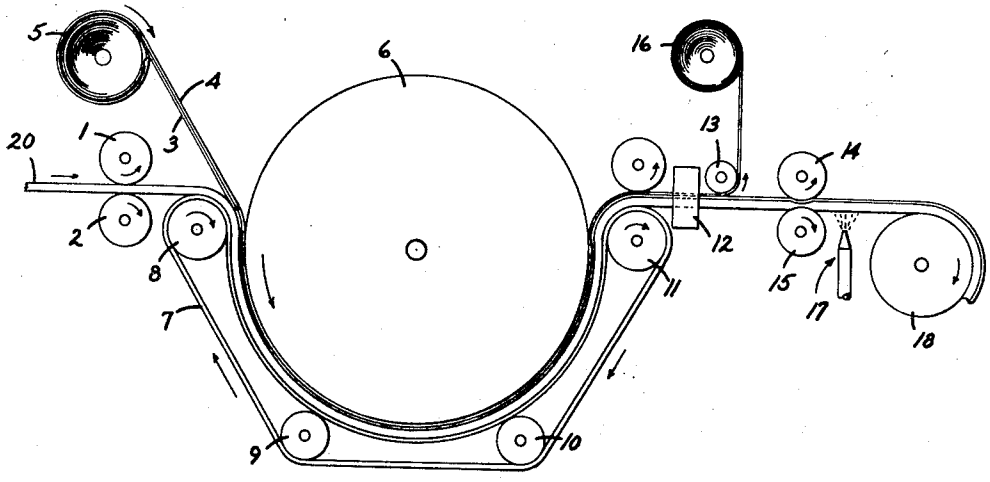

Fig. 1

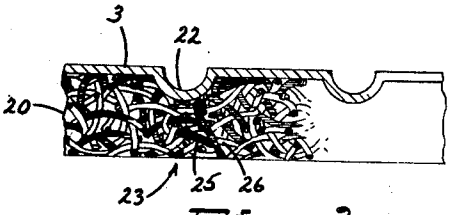

Fig. 3

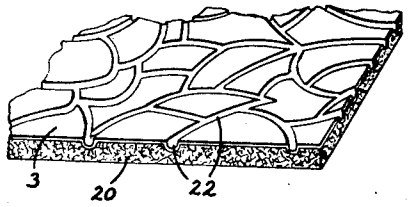

Fig. 2

INVENTOR.
CARLETON S. FRANCIS, JR.
BY
Thomas R. Malley

Patented Jan. 9, 1951 2,537,126

UNITED STATES PATENT OFFICE

2,537,126

COATED SHEET MATERIAL AND PROCESS FOR MAKING THE SAME

Carleton S. Francis, Jr., West Harwich, Mass., assignor to American Viscose Corporation, Wilmington, Del., a corporation of Delaware

Application August 14, 1948, Serial No. 44,284

10 Claims. (Cl. 154—106)

1

This invention relates in general to coated sheet materials and to processes of making coated sheet materials. More particularly, this invention relates to coated sheet materials on which may be formed a depressed design, coated sheet materials having a depressed design, and to processes of making said coated sheet materials.

Coated sheet materials heretofore produced are of several types. In one type the material comprises a backing or base supporting layer of a woven fabric such as flannel to one side of which a multiplicity of coatings of nitro cellulose lacquer have been applied. This coated product may be smooth or may be embossed to provide a suitable decorative grain or other design. The coatings are normally applied to the backing fabric as a solution of nitro cellulose in a volatile organic solvent. The manufacture of this type of artificial leather requires numerous coating operations in order to cover the nap fibers which would otherwise protrude through the coating. Since the nitro cellulose solution is applied directly to the fabric, some penetration of the nitro cellulose into the fabric takes place which is wasteful of the coating composition and tends to unduly stiffen the product. This procedure also requires the use of expensive solvent recovery equipment in order to operate economically.

In another type of coated sheet material, the coating is applied to a backing or base supporting layer by calendering. The coating material in paste-like form is applied to a calendering roll and from the roll the paste-like material is applied directly to the fabric. The coating material is forced into the interstices in the fabric requiring an excess amount of coating material and resulting in a relatively heavy coating on the fabric.

In a further type of coated sheet material, the backing or base supporting layer is of felt. The coating solution is applied directly to the felt and after drying, the coating is given a decorative effect by pressing or stamping selected areas of the coating. This product has all the disadvantages of the first mentioned type of product and in addition it is found that as the felt layer or backing has some resilience, the embossing effect does not remain permanently but gradually disappears as the felt expands in the areas which have been pressed or stamped. It has been found to be impossible with such felt backings, to produce a very fine grain surface effect such as a linen effect because the coating will not retain shallow fine depressed designs.

This invention has for its principal object, to

2

provide coated fibrous sheet material in which may be formed a depressed design and which will retain the design permanently, which is economical to produce and which is relatively free of coating material through the body of the fibrous material.

Another object of the invention is to provide coated fibrous sheet material having a depressed design which retains the design permanently, which is economical to produce and which is relatively free of coating material throughout the body of the fibrous material.

Another object of the invention is to provide an economical process for making coated fibrous sheet material in which a depressed design may be formed and which will retain the design permanently, and which is relatively free of coating material throughout the body of the fibrous material.

A further object of the invention is to provide an economical process for making coated fibrous sheet material having a depressed design which will retain the design permanently, and which will be relatively free of coating material through the body of the fibrous material.

Other objects and advantages of the invention will be apparent from the following description and the accompanying drawing.

In the drawing,

Figure 1 is a diagrammatical side elevational view of a form of apparatus suitable for carrying out a process and making products embodying this invention.

Figure 2 is a perspective view of a form of product embodying this invention.

Figure 3 is a cross-sectional view greatly enlarged of a form of product embodying this invention.

The present invention provides coated fibrous sheet material that is suitable to be used for upholstery, handbags, wall coverings, table coverings, apparel, luggage, and other purposes for which artificial leathers may be used. The coated sheet material comprises at least one layer of a fiber bonded web to at least one surface of which a thin continuous film of thermoplastic organic material is adhered or bonded. The fiber bonded web is characterized by some resilience and is compressible to less thickness.

The film bonded to the fiber bonded web may be given a decorative effect by pressing or stamping selected areas of the film by a shaped or engraved plate or roller. The pressed or stamped areas of the film are depressed and the areas of the film that have not been pressed or stamped

appear to be raised with respect to the other areas of the film and a decorative effect like embossing is produced. The regions of the fibrous web beneath the pressed or stamped areas of the film are compressed and are of greater density than the other regions of the fibrous web. The fibers in the fibrous web in the regions of greater density are bonded together and the increased density of these regions and the embossed effect is retained.

The fiber bonded web used in this invention comprises fibers such as cotton, wood pulp, wool, silk, hemp, flax, hair, fur, or regenerated cellulose, and a minor proportion, of the order of ten (10) to forty (40%) percent, of heat activatable fibers for instance fibers of thermoplastic materials or thermosetting materials in a thermoplastic state referred to herein generally as thermoplastic materials such as polyvinyl chloride, polyvinylidene chloride, copolymers of vinylidene chloride and vinyl chloride, polystyrene, copolymers of vinyl chloride and vinyl acetate, polymethyl methacrylate, copolymers of methyl methacrylate and vinyl chloride, polyvinyl butyral, polyvinyl acetal, polyethylene, polyamides, natural rubber, synthetic rubbers, phenol formaldehyde resins, cellulose acetate and the like. The different fibers are mixed together and are formed into a non-woven web either by depositing them from a current of air on a perforated surface or by carding, garneting, felting or by water laying as in the manufacture of paper.

To enable the fibrous web to be more easily handled during later operations, thermoplastic fibers in the web may be made adhesive by the application of heat to bond fibers in the web. This activation of the thermoplastic fibers is such that the potentially adhesive properties of those fibers is not substantially decreased.

The film of thermoplastic organic material used in this invention is of thermoplastic resin, thermoplastic cellulosic material, thermosetting resin in a thermoplastic state or mixtures of thermoplastic and thermosetting resins in a thermoplastic state. Such materials are referred to herein generally as thermoplastic materials and include, for example, polyvinyl chloride, copolymers of vinyl chloride and vinyl acetate, copolymers of vinylidene chloride and vinyl chloride, polyamides, natural rubber, cellulose acetate, butyl cellulose, urea-formaldehyde, and phenol-formaldehyde. The film while relatively thin, of the order of 1 to 8 mils, may be self-supporting or may be temporarily supported on a backing sheet such as smooth paper, cellophane, polished metal, or the like from which it may be readily stripped off.

In certain practices of this invention, in general, the film either self-supporting or temporarily supported on a backing sheet is placed on the fibrous web. The film and the fibrous web are subjected to heat sufficient to make the film and thermoplastic fibers in the web tacky or adhesive without substantially altering their form. The film and the fibrous web are uniformly pressed together to adhere the film to the fibrous web and particularly to adhere or bond thermoplastic fibers in the web to the film without completely compressing the fibrous web. Because of the affinity between the material of the film and that of the thermoplastic fibers of the web when they are made adhesive by the application of heat, a secure bond is formed between them, and the film and the thermoplastic fibers form an integral structure. Where the film is supported on a backing sheet, the web and film may then be cooled and the backing sheet stripped off, or the fibrous web and the film may be cooled after subsequent operations and the backing sheet stripped off. Selected areas of the film are pressed or stamped with sufficient pressure to form depressed areas in the film and to compress or densify the fibrous material in the regions beneath the stamped or pressed areas of the film. The selected areas of the film may be pressed or stamped while the thermoplastic fibers in the fibrous web are adhesive or those fibers may be made adhesive directly after the stamping or pressing of the film. The fibrous web is then allowed to cool to set the thermoplastic fibers while the fibers in the web in the regions beneath the stamped areas of the web are compressed together to bond the fibers in the web and to the film while the fibers in those regions are compressed.

Referring to Figure 1 of the drawing the invention will be described in connection with a form of apparatus diagrammatically shown with which an embodiment of this invention may be carried out. Reference characters 1 and 2 indicate a pair of rollers between which a non-woven fibrous web 20 containing a minor proportion of thermoplastic fibers is fed from a card, garnet, or other fiber mixing and web forming device which is not shown. The rollers 1 and 2 may be heated to activate the thermoplastic fibers to cause some bonding to take place to enable the web to be more easily handled during subsequent operations. A film of thermoplastic material 3 on a temporary backing sheet 4 is drawn from a roll 5 and is applied to the web, and the web and the film on the backing sheet are passed around a portion of the heated drum 6. The web and the film are uniformly pressed against the drum with the backing sheet between the film and the drum by the continuous belt member 7 that passes over the guiding and tensioning rollers 8, 9, 10, and 11. Suitable means not shown are provided for rotating the drum and the rollers in the directions shown by the arrows. The heat of the drum 6 is sufficient to render the thermoplastic film and the thermoplastic fibers in the web tacky so that the film is bonded or adhered to the fibrous web by its own adhesiveness and that of the thermoplastic fibers in contact therewith and the film and thermoplastic fibers in contact therewith form an integral structure. The pressure of the belt is firm but is not sufficient to completely compress the fibrous web. The fibrous web, film, and backing sheet are withdrawn from the heated drum and sent through the cooling chamber 12 which renders the film non-tacky. The backing sheet is then stripped from the thermoplastic film by the stripping roller 13 and collected on the roll 16. The film and the fibrous web are thereafter directed between the roller 14 that has projecting portions thereon in the form of a design and the supporting roller 15, where selected areas of the film are pressed or stamped by the projecting portions of the roller 14 and the regions of the fibrous web beneath the areas of the film that have been pressed or stamped are compressed. The supporting roller 15 is heated to a temperature sufficient to cause the thermoplastic fibers or particles in the fibrous web to become tacky without softening the film. Directly after passing from the roller 14, the fibrous web is cooled by an air blast or the like shown at 17 which renders the adhesive fibers nonadhesive and sets the bonded fibers in the compressed re-

gions of the web. The coated web is afterwards collected on the roll 18.

If desired, selected areas of the thermoplastic film may be pressed or stamped through the backing sheet in which case the roller having the projecting portions is positioned in advance of the cooling chamber.

Figure 2 of the drawing shows a perspective view of the product embodying the present invention. Reference character 20 indicates the non-woven fibrous bonded web and 3 the film that has been adhered thereto. Reference character 22 indicates the depressed areas in the film that have been pressed or stamped and that make up the desired design or decorative effect.

In Figure 3 of the drawing, an enlarged cross-section of a product embodying the invention is shown. The fibers in the regions 23 of the fibrous material below the depressed regions 22 in the film are compressed or are more dense and the thermoplastic fibers 25 bind the film and the other fibers 26 and prevent the compressed regions from expanding due to their natural resilience which would otherwise flatten or remove the depressed regions in the film that make up the decorative effect. The thermoplastic fibers bonded to the film are integral with the film. The thermoplastic fibers bonded to the other fibers and the film strengthen the fibrous web and prevent delamination.

Instead of using a film as the coating material in practicing this invention, an organisol in the form of a plaste applied to a temporary backing sheet may be used instead. The organisol may comprise a powdered or finely divided thermoplastic resin such as one of the vinyl resins in a vehicle comprising a volatile or removable liquid that does not dissolve the resin and a minor proportion of a solvent for the resin. The organisol is applied to the temporary backing sheet in the form of a paste and dried so that the sheet may be handled. When the organisol is applied to the fibrous web and subjected to heat and pressure, the resin particles flow together forming a film which is adhered as a film to the fibrous web.

While preferred embodiments of this invention have been shown, it is to be understood that changes and variations may be made without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. The method of making coated fibrous sheet material comprising adhering a film of thermoplastic material to a surface of a compressible non-woven fibrous web having thermoplastic fibers therein by pressing the film and fibrous web together and compressing the fibrous web only a portion of the limit to which it could be compressed while subjecting the fibrous web and film to heat sufficient to render the film and the thermoplastic fibers in the fibrous web adhesive to adhere the film to the fibrous web without substantially altering the form of the film and thermoplastic fibers, bond fibers in the fibrous web and bond thermoplastic fibers to the film.

2. The method of making coated fibrous sheet material comprising adhering a film of thermoplastic material to a surface of a compressible non-woven fibrous web having a minor proportion of thermoplastic fibers therein by pressing the film and fibrous web together and compressing the fibrous web only a portion of the limit to which it could be compressed while subjecting the fibrous web and film to heat sufficient to render the film and the thermoplastic fibers in the fibrous web adhesive to adhere the film to the fibrous web without substantially altering the form of the film and thermoplastic fibers, bond fibers in the fibrous web and bond thermoplastic fibers to the film.

3. The method of making coated fibrous sheet material having a depressed design therein that will retain the design comprising depressing selected areas of a film that is adhered to a surface of a compressible non-woven fibrous web containing thermoplastic fibers and compressing the regions of the fibrous web beneath the selected areas of the film that are depressed, rendering the thermoplastic fibers in the regions of the fibrous web beneath the areas of the film that are depressed adhesive while these regions are compressed, and rendering the adhesive fibers in the regions of the fibrous web beneath the depressed areas of the film non-adhesive while these regions are compressed to bond fibers in these regions in the compressed state.

4. The method of making coated fibrous sheet material having a depressed design therein that will retain the design comprising depressing selected areas of a film that is adhered to a surface of a compressible non-woven fibrous web containing thermoplastic fibers and compressing the regions of the fibrous web beneath the selected areas of the film that are depressed while the thermoplastic fibers are in an adhesive state, and rendering the adhesive fibers in the regions of the fibrous web beneath the depressed areas of the film non-adhesive while these regions are compressed to bond fibers in these regions in the compressed state.

5. The method of making coated fibrous sheet material having a depressed design therein that will retain the design comprising depressing areas of a film that is adhered to a surface of a compressible non-woven fibrous web containing a minor proportion of thermoplastic fibers and compressing the regions of the fibrous web beneath the selected areas of the film that are depressed, heating the thermoplastic fibers in the regions of the fibrous web beneath the areas of the film that are depressed to render the thermoplastic fibers adhesive while these regions are compressed, and cooling the adhesive fibers to render these fibers non-adhesive while these regions are compressed to bond fibers in these regions in the compressed state.

6. The method of making coated fibrous sheet material having a depressed design therein that will retain the design comprising depressing through the temporary backing sheet selected areas of a film on a temporary backing sheet that is adhered to a surface of a compressible non-woven fibrous web containing a minor proportion of thermoplastic fibers and compressing the regions of the fibrous web beneath the selected areas of the film that are depressed, rendering the thermoplastic fibers in the regions of the fibrous web beneath the areas of the film that are depressed adhesive while these regions are compressed, and rendering the adhesive fibers in the regions of the fibrous web beneath the depressed areas of the film non-adhesive while these regions are compressed to bond fibers in these regions in the compressed state.

7. Coated fibrous sheet material that may have a design pressed therein and the design retained comprising a thermoplastic film adhered to a surface of a compressible resilient non-woven fibrous web containing a minor proportion of thermo-

plastic fibers bonded to the film and other fibers, said web being relatively free of coating material throughout the body of the web and compressed to only a portion of the limit to which it can be compressed.

8. Coated fibrous sheet material that may have a design pressed therein and the design retained comprising a thermoplastic film adhered to a surface of a compressible resilient non-woven fibrous web containing thermoplastic fibers bonded to the film and other fibers, said web being relatively free of coating material throughout the body of the web and compressed to only a portion of the limit to which it can be compressed.

9. A coated fibrous sheet material comprising a thermoplastic film having a depressed design therein adhered to a surface of a non-woven fibrous web containing a minor proportion of thermoplastic fibers bonded to the film and other fibers, said web being relatively free of coating material throughout the body of the web having regions beneath the depressed areas of the film comprising the design, compressed and of greater density than other portions of the web and with fibers bonded in the regions of greater density.

10. A coated fibrous sheet material comprising a thermoplastic film having a depressed design therein adhered to a surface of a non-woven fibrous web containing thermoplastic fibers bonded to the film and other fibers, said web being relatively free of coating material throughout the body of the web having regions beneath the depressed areas of the film comprising the design, compressed and of greater density than other portions of the web and with fibers bonded in the regions of greater density.

CARLETON S. FRANCIS, JR.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
440,055	Palmer	Nov. 4, 1890
1,972,923	Dreyfus et al.	Sept. 11, 1934