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R. H. BARNARD
NONWOVEN FILM COATED FABRIC

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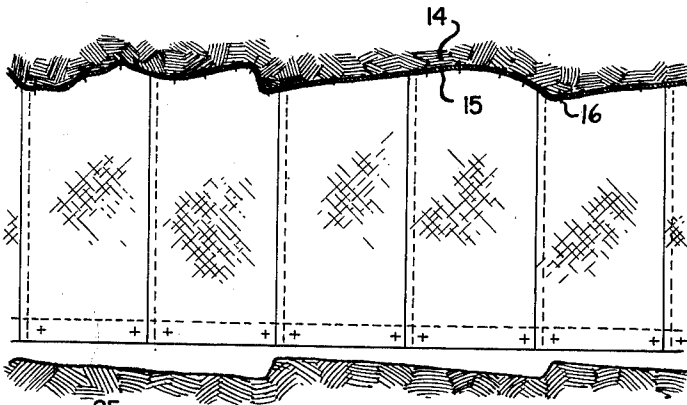


FIG. 6

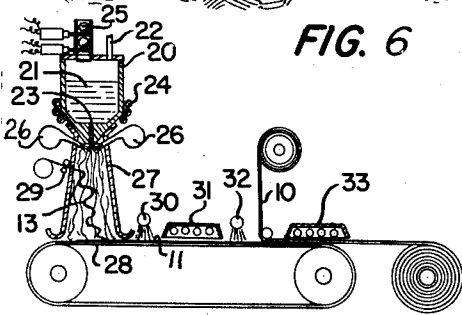


FIG. 5

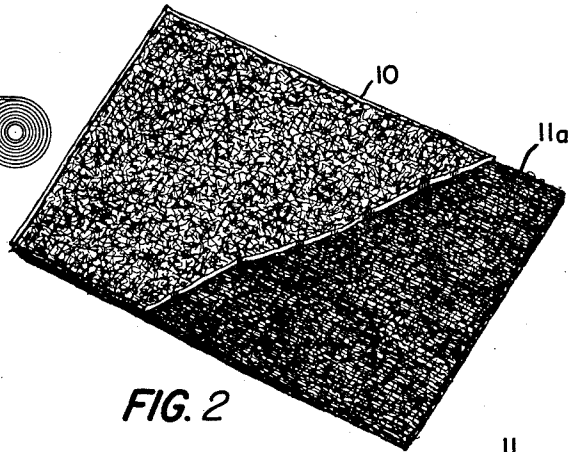


FIG. 2

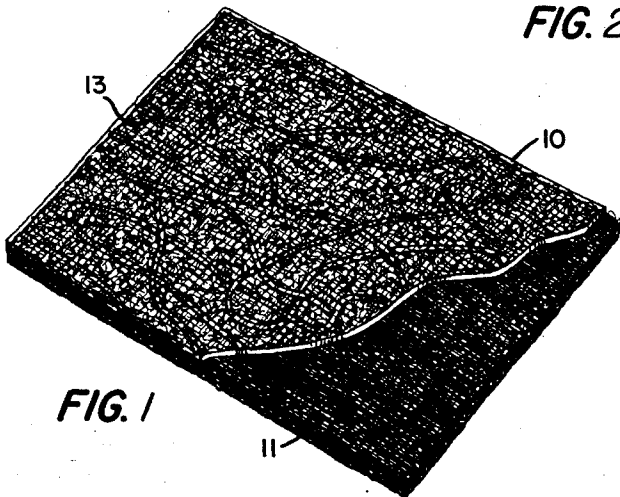


FIG. 1

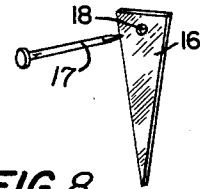


FIG. 8

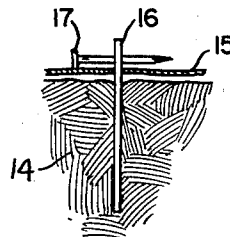


FIG. 7

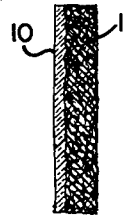


FIG. 3

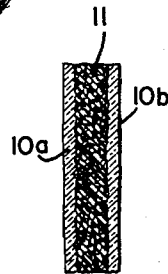


FIG. 4

INVENTOR
RANDOLPH H. BARNARD
By *Toulmin & Toulmin*
ATTORNEYS

UNITED STATES PATENT OFFICE

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NONWOVEN FILM COATED FABRIC

Randolph H. Barnard, Waterville, Ohio, assignor,
by mesne assignments, to Reconstruction
Finance Corporation, Cleveland, Ohio, a cor-
poration of the United States

Application January 30, 1950, Serial No. 141,283

4 Claims. (Cl. 154—50)

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This invention relates to unsupported films, and particularly to fabrics for use as reinforcements for unsupported films.

This application relates to co-pending application, Serial No. 99,545, filed June 16, 1949, assigned to the same assignee as the present application.

Unsupported films, such as many of the sheet plastic materials sold under various trade names such as "Pliofilm," "Velon," and others are used for various and sundry purposes. However, the unsupported films have little tear resistance and puncture resistance, so that a slight tear or puncture of the film causes a serious damage to the film sheet which renders it practically useless.

It is therefore an object of this invention to provide a thin reinforcing mat of nonwoven fabric to which the unsupported film is suitably bonded to increase the utility of the film by increasing the strength of the film, and increasing tear resistance and puncture resistance of the film.

It is a further object of the invention to provide an unsupported film with a nonwoven fabric reinforcement which will not eliminate the transparency of the unsupported film.

It is still another object of the invention to provide a fluid-impervious film on a nonwoven fabric base for use as brattice cloth in mines, and other comparable services.

It is another object of the invention to provide a fluid-impervious film with a reinforcing nonwoven fabric that contains random laid reinforcing threads in the fabric.

It is still another object of the invention to provide a reinforced unsupported film, which composite product will be fireproof, or fire-resistant, depending upon the nature of the film.

It is still another object of the invention to provide an unsupported film with a fabric reinforcement at a low and economical cost.

Further objects and advantages will become apparent from the drawings and the following description.

In the drawings:

Figure 1 is a perspective elevational view of a product incorporating features of this invention;

Figure 2 is a perspective elevational view of a modified form of a product made according to this invention;

Figure 3 is a cross-sectional view of the product shown in Figure 1;

Figure 4 is a cross-sectional view similar to Figure 3, but illustrating a slightly modified form of product;

Figure 5 is a diagrammatic illustration of ap-

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paratus for producing the product of this invention;

Figure 6 is a diagrammatic cross-sectional view of a mine illustrating the use of the product of this invention as brattice cloth;

Figure 7 is a cross-sectional view illustrating a method of attachment of the brattice cloth to the wall of a mine; and

Figure 8 is a perspective elevational view of a spad and nail used in Figure 7.

In Figure 1 there is illustrated a product incorporating the subject of this invention, the product consisting of a normally unsupported film 10 that is supported on and carried by a nonwoven fabric 11 having reinforcing threads 15 extending at random throughout the nonwoven fabric 11.

The nonwoven fabric 11 preferably consists of glass fibers or filaments that are laid down to form a thin mat, which can be termed a nonwoven fabric, the fibers or filaments constituting the mat having diameters on the order of .00023" to .00028". Of course, other fiber or filament diameters can be used depending upon the nature and strength desired in the mat, or nonwoven fabric strip. The mat 11 may be of any suitable thickness, but thicknesses of from 20 mils to 30 mils have been found sufficient for all practical purposes to give good tear resistance and puncture resistance to an unsupported film carried upon one or both surfaces of the mat 11, or nonwoven fabric strip.

The film 10 is produced in the form of a sheet of any suitable flexible fluid-impervious material, this sheet having a thickness on the order of 2 mils to 5 mils. However, other thicknesses of sheets or films can be used, depending upon the nature of use to which the product will be placed and the strength desired in the body of the film.

The mat 11 preferably is made of glass fibers or filaments reinforced with glass threads. It is preferable that the film 10 shall be either fireproof or fire-resistant, thus obtaining a product highly resistant against fire hazard. However, other films may be used if desired. Films made from phenol-furfural compounds, vinyl chloride acetate resins and vinylidene chloride resins are particularly suitable for the product of this invention for their burning rate is exceedingly low, being classified as "nil."

The film 10 is bonded to the mat 11 either by the bonding material that holds the fibers of the mat together or by a separately applied adhesive. Also, when the film 10 is of a heat softening material, the film 10 can be bonded to the mat 11 by heating the film slightly to

soften it and applying a slight pressure to the film to cause it to adhere to the mat 11.

Since the mat 11 is relatively thin, as heretofore stated, and is made of transparent fibers or filaments, such as glass filaments, the mat will be relatively transparent so that a transparent film applied to the mat will retain in the composite product a substantial degree of transparency. This can be aided, of course, by the use of clear bonding agents for binding the glass filaments together and for bonding the transparent film upon the mat or nonwoven fabric 11.

The glass threads 13 that are laid at random through the body of the mat or nonwoven fabric 11 impart a substantial degree of tensile strength to the mat in the direction of its length as well as in the direction of its width. Also, the mat 11 being bonded to the film 10 imparts to the film the added tensile strength of the mat, and adds to the film tear resistance and puncture resistance that the film alone does not have. It is thus possible to use the film-covered nonwoven fabric for rough applications to which the unsupported film 10 itself is not adapted.

Such an application is illustrated in Figure 6, wherein the fabric-reinforced film is used as brattice cloth to seal off the walls of a mine against air leakage. In an application of this kind, the resistance of the glass fibers of the mat to deterioration from moisture and heat renders the product of this invention particularly useful as brattice cloth, the plastic film 10 providing the desired degree of fluid imperviousness to prevent air leakage from the mine chambers or in air ducts formed by the use of the brattice cloth.

In Figure 6 the brattice cloth usage of the product of this invention illustrates the application of the cloth to the roof 14 of a mine chamber, the brattice cloth 15 being attached to the roof by means of spads 16 and nails 17 threaded through the cloth 15 and a hole 18 provided in the spad 16. These spads 16 are driven into the wall of the mines at suitable intervals to support the brattice cloth 15.

In Figure 4 there is illustrated a slightly modified form of product in which the mat 11 is provided with films 10a and 10b on each side of the mat 11.

In Figure 2 there is illustrated a modified form of product wherein the mat 11a is formed of felted glass fibers or filaments in the same manner as the mat 11 shown in Figure 1, but the reinforcing threads 13 have been omitted.

In Figure 5 there is illustrated diagrammatically an apparatus for producing the products illustrated in Figure 1 and 2.

The apparatus of Figure 5 includes a heating chamber 20 that contains a body of molten glass 21. Gaseous pressure is applied to the molten glass 21 through a conduit 22 to cause the glass to move through small orifices 23 provided in the bottom wall of the chamber 20. A heating coil 24 is provided around the chamber 20 to maintain the glass in a molten condition. Glass balls 25 are fed at regular intervals into the chamber 20 to maintain a supply of molten glass therein.

At each side of the small orifices 23, which extend in a row longitudinally of the heating chamber 20 there is provided a high pressure blast of gas directed angularly inwardly toward the streams of molten glass discharging through the orifices 23 to grasp the streams at the convergence of the blasts of gas issuing from the nozzle chambers 26 to cause the glass to be drawn into fine filaments or fibers, as is well known in the art.

The glass fibers or filaments are conducted through a collecting hood 27 for collection upon an endless belt 28 provided beneath the hood 27.

Glass threads 13 are fed into the hood 27 such as by the feeding rolls 29 for random displacement of the threads 13 within the body of the mat formed on the collecting belt 28 as the glass fibers and the threads fall to the collecting belt.

As the mat moves from beneath the collecting hood on the belt 28 a binding agent is sprayed upon the mat through a conduit 30, and the product then passes beneath a heating hood 31 to dry the binding agent. Subsequently, another adhesive may be sprayed on the bonding mat through a spray conduit 32 before the unsupported film 10 is placed on the surface of the mat. After the film 10 is placed on the surface of the mat 11, it may be conducted under a heating hood 33 to set the adhesive and bond the film 10 to the mat 11.

It will be understood that the apparatus shown in Figure 5 is merely illustrative of one method of producing the products shown in Figures 1 and 2 and that other suitable apparatus can be used, and the bonding of the film 10 to the mat 11 can be accomplished in various ways.

While the product described herein is a preferable form of the invention, yet the product can be modified without departing from the spirit of the invention, and such modifications are intended to be included within the scope of the appended claims.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. As a new product of manufacture, a non-woven fabric substitute consisting of a thin non-woven semi-transparent mat of staple glass fiber forming a structural supporting base and a flexible fluid impervious film of lesser thickness bonded on one side thereof.

2. As a new product of manufacture, a non-woven fabric substitute, consisting of a thin non-woven semi-transparent mat of inter-entangled staple glass fiber having a thickness on the order of twenty mils to thirty mils bonded together forming a structural supporting base and a sheet of flexible fluid impervious film having a thickness on the order of two mils to five mils bonded on one side thereof.

3. As a new product of manufacture, a non-woven fabric substitute consisting of a thin non-woven semi-transparent mat of inter-entangled staple glass fiber bonded together forming a structural supporting base, a continuous length thread random laid in the body of said mat, and a sheet of a flexible fluid impervious film of lesser thickness than said mat bonded on one side of said mat.

4. As a new product of manufacture, a non-woven fabric substitute consisting of a thin non-woven semi-transparent open-mesh mat of inter-entangled staple glass fiber having a thickness on the order of twenty mils to thirty mils bonded together forming a structural supporting base, a continuous length thread random laid within the body of said mat, and a sheet of a flexible fluid impervious film having a thickness on the order of two mils to five mils bonded on one side of said mat.

RANDOLPH H. BARNARD.

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