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P. J. FRICKERT

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METHOD OF MAKING A TEXTILE MAT

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2 Sheets-Sheet 1

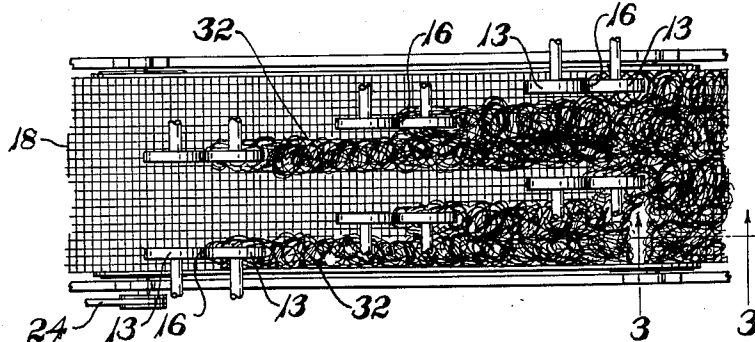
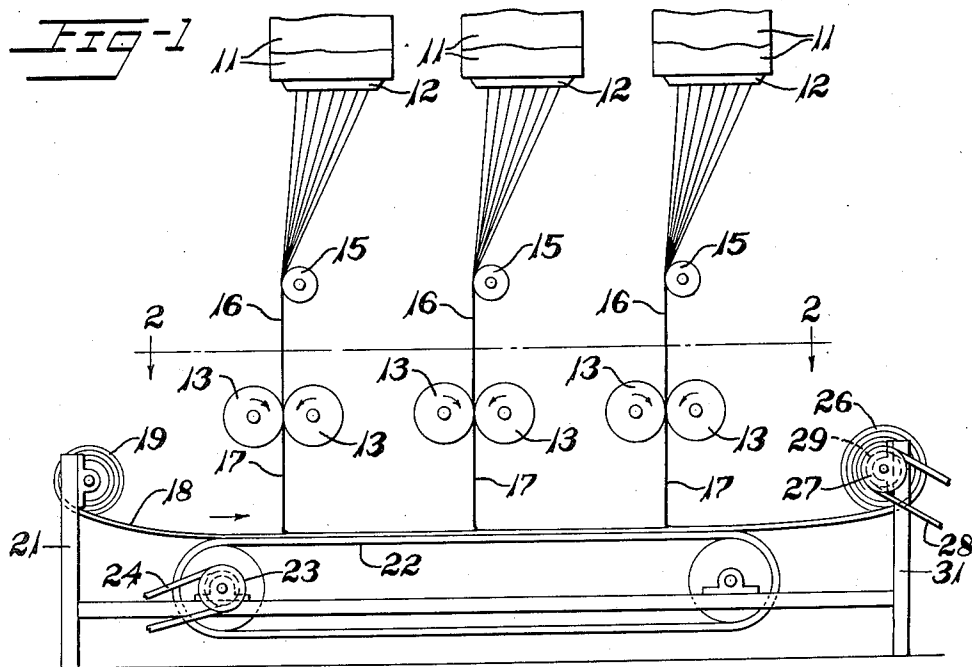


FIG-2

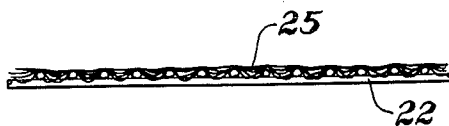


FIG-3

INVENTOR.
PHILIP J. FRICKERT
BY
Stachin & Overman
ATTYS.

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P. J. FRICKERT

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2 Sheets-Sheet 2

Fig-4

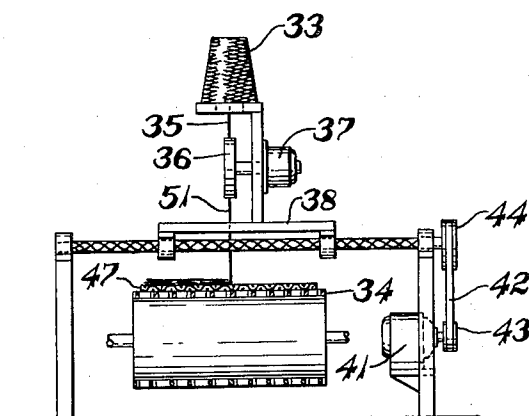
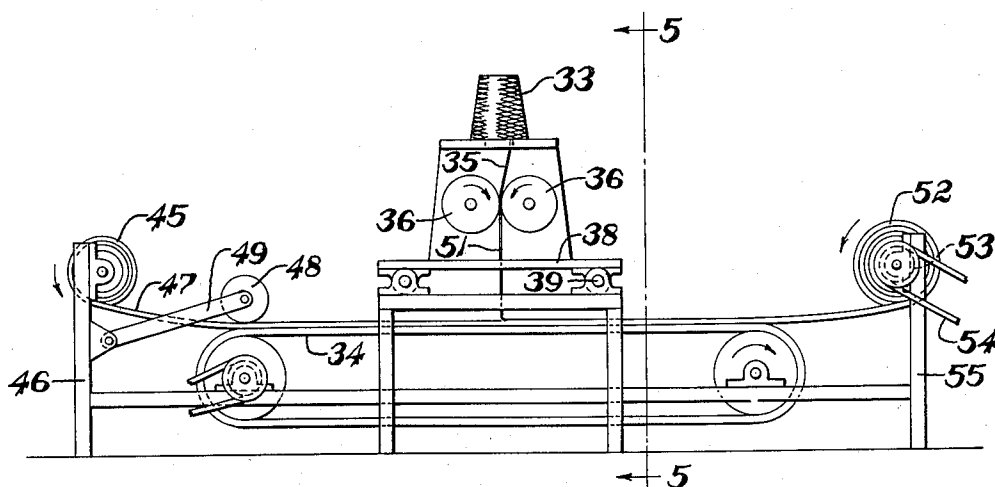


Fig-5

INVENTOR.

PHILIP J. FRICKERT

BY

John Sherman

ATTYS.

1

2,900,700

METHOD OF MAKING A TEXTILE MAT

Philip J. Frickert, Anderson, S.C., assignor to Owens-Corning Fiberglass Corporation, a corporation of Delaware

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7 Claims. (Cl. 28—73)

This invention relates to textile mats and particularly to mats comprising one or more materials combined to give an integral product having unusual properties.

It is an object of this invention to provide an integral mat product.

It is a further object to provide a reinforced plastic mat having high strength and greatly improved physical properties.

It is also an object to provide methods and apparatus for combining textile products into a mat which has exceptionally good properties.

Other objects will be apparent from the description which follows. According to this invention, an improved mat is obtained by directing a driven strand or filament into a base material comprising a fabric or other woven product such as a woven screen or the like or into a non-woven fabric or weftless fabric or into a mat of oriented or haphazardly arranged fibers. The driven strand as used herein may be a single filament such as a resinous filament or the like or it may comprise a bundle of filaments which may or may not be twisted together. The strand may be any textile strand comprising one or more filaments of either organic or inorganic compositions. The driven strand forms loops in the interstices of the fabric or other base material, which loops interlock the strand with the fabric or base material to produce an integral mat.

The invention will be better understood by reference to the drawings, in which:

Figure 1 is an elevational view of one form of the apparatus used in carrying out the invention;

Figure 2 is a plan view on line 2—2 of Figure 1;

Figure 3 is an enlarged cross sectional view on line 3—3 of Figure 2 showing the mat product upon the conveyor belt;

Figure 4 is a view in elevation of another form of apparatus; and

Figure 5 is a cross sectional view on line 5—5 of Figure 4.

In Figure 1 the apparatus comprises feeders 11 having a plurality of orifices in the tip sections 12. Molten glass flows through the orifices in the tip section 12 in the form of streams, which streams are attenuated due to the pulling action of pulling wheels 13, 13. Fibers 14, 14 are gathered together on gathering wheel 15 to form a strand 16 which passes between the rubber treaded pulling wheels 13, 13, as shown. The driven strand 17 is directed in a substantially straight path toward the loosely woven fabric 18 which is slowly advanced through the target area below the multiple sets of pulling wheels 13, 13. Fabric 18 is supplied in the form of a roll 19 mounted on the frame 21. The loosely woven fabric is advanced upon conveyor belt 22, which belt is driven by sheave 23 and drive belt 24 in conjunction with a power source not shown.

The driven strand 17 from each of the sets of pulling wheels impinges upon the loosely woven fabric 18 and forms interlocking loops in the interstices of the loosely

2

woven fabric as is shown in the enlarged view of the product and conveyor belt in Figure 3. The mat product 25 comprises the loosely woven fabric with interlocking loops of strand disposed in the openings in the fabric, the interlocking loops being in no definite pattern but rather being formed when the driven strand is directed toward the slowly advancing fabric to form random loops, swirls and folds resulting in an integral product requiring no binder.

The product is formed into a roll 26 by the action of take-up spindle 29, which is turned by sheave 27 and driving belt 28. Take-up spindle 29 is mounted upon frame member 31 as seen in Figure 1. The apparatus shown in Figures 1 and 2 is capable of producing an all glass product or a product comprising fibrous glass strand and another filamentary material which may be any inorganic or organic material including metal, thermoplastic and thermosetting resins or the like. The base material may be a fabric of resinous filaments, threads, yarns or the like.

The multiple sets of pulling wheels 13, 13 are shown disposed above the conveyor belt 22 in such a manner that the strand from each of the sets of pulling wheels forms a pattern 32 upon the loosely woven fabric 18. These patterns overlap to provide a mat having the desired width. More than one strand may be directed through each of the pairs of pulling wheels. By so doing, a fibrous glass strand and a resinous filament may be introduced simultaneously into the base material. Instead of using multiple wheels as is shown in Figures 1 and 2, the pulling wheels may be oscillated to provide a cyclic sweeping action of the driven strand to provide a wide mat.

One method of traversing the driven strand is shown in Figures 4 and 5. In Figure 4 the package of strand 33 is traversed across the conveyor belt 34. The strand 35 is removed from package 33 by the action of pulling rolls 36, 36. The pulling rolls are driven by an electric motor 37 and a timing belt or each of the wheels is provided with its own motor. The pulling rolls and package of strand are mounted upon a frame 38 which is free to traverse back and forth across the width of the conveyor belt 34 due to the action of Yankee screw 39. The Yankee screw arrangement is driven by electric motor 41 through power transmitting belt 42 and sheaves 43 and 44.

The base member which is either a woven or non-woven fabric or a mat of haphazardly arranged fibers or the like is supplied in one or more rolls 45 mounted upon frame member 46. The base material 47 as it is unwound from roll 45 passes below the idler roll 48 which is mounted upon pivotable arms 49 and thence over conveyor belt 34. The driven strand 51 from pulling rolls 36, 36 is directed downwardly in a substantially straight path toward the base material 47 which is upon conveyor belt 34. The driven strand forms interlocking loops with the base material. The pattern which the strand assumes after coming in contact with the base material is in the form of loops, swirls, and folds. The strand folds and loops and then folds upon itself and in addition fills the interstices of the base material. When the base material is a fabric, the product is as shown in the enlarged view of Figure 3. A roll of product 52 is formed on take-up spindle 53 which is driven by the sheave and driving belt 54. The take-up spindle is mounted upon the frame member 55.

The speeds at which the driven strand are directed toward the base material may vary widely depending upon several factors including the distance at which the driving means is spaced from the base material and the nature of the strand or filament being driven. Generally if the

driving means is positioned immediately adjacent to the base material, the driving speed need not be as great as when the driving means is positioned some distance away from the base material. When a fibrous glass strand is being directed toward the base material, linear speeds of from 5,000 to 10,000 feet per minute or more may be used.

The driven strand may travel at speeds of up to 10,000 feet per minute or more when the apparatus shown in Figures 1 and 2 is used. The speeds at which the strand is driven when using the apparatus of Figures 4 and 5 will be less and probably at speeds of about 5,000 feet per minute.

Various materials may be combined in the methods described above. For instance, the base material which may be a screen or fabric or the like may comprise glass, thermoplastic or thermosetting resin, resin-covered glass fibers or metal coated glass fibers. Likewise, the base material may comprise a fabric having glass warp and cotton weft threads or it may comprise any of the naturally occurring or man-made fibers. The driven strand may comprise glass, thermoplastic or thermosetting resin, resin-covered glass filaments, metal coated glass filaments, or any of the naturally occurring or man-made fibers. The material which is driven into the base material may either be a monofilament, a bundle of filaments, a strand comprising a plurality of filaments, or a thread, yarn or the like.

It is advantageous to form the strand and immediately direct it into the base material by the use of apparatus shown in Figures 1 and 2. This expedient makes it unnecessary to first form a package of strand or other filamentary material and then remove the strand or filamentary material from the package by some pulling device.

Multiple sets of pulling rolls and packages of strand may be mounted above the conveyor shown in Figure 4 if it is desirable to advance the base material at high speeds and yet maintain the desired thickness of looped strand upon the base material.

A mat comprising resinous filament base material and fibrous glass strand impinged upon and interlocked therewith is heated in an oven to cause the resin to flow forming a glass reinforced resin product. Such a mat is pressed between platens of a press to form glass reinforced resinous sheets.

It has been found that other pulling devices can be used instead of the pulling wheels shown. For instance, a scalloped, rubber-treaded wheel may be paired with a scalloped metal wheel. Likewise two scalloped metal wheels, each of which has a band of rubber stretched about its periphery in such a manner that the band contacts the crests of the scallops and bridges the troughs, may be used together. When these wheels mesh the bands of rubber are pushed downwardly into the trough of the scallop but the metal wheels do not actually contact one another except through the bands of rubber. Other pulling devices including single pulling wheels, tertiary wheel sets, air turbines, air blowers, liquid jets and the like may be used.

The products are used for reinforcing members for molded resin products or they are used alone as insulating blankets, spacers, covers or the like. The mats are laminated with resin to form structural panels, boards or

the like. Mats comprising resinous fibers and one or more other fibers are advantageously combined with a compatible resin to produce reinforced resin sheets or molded products. Novel decorative effects are possible since pigments can be included in the resinous components.

Obvious variations and modifications may be made within the spirit and scope of the following claims.

I claim:

1. Method of producing a mat comprising advancing a fibrous base material along an established path, advancing a bundle of filaments at sufficient speed with respect to the mass of the bundle to provide a driven bundle of filaments that forcibly impinges upon and interlocks with said fibrous base material to form an integral product, at least some of the fibers in said integral product being glass and others being a resinous material, and fusing the resinous material fibers.
2. The method of claim 1 wherein said fibrous base material comprises a resin.
3. The method of claim 1 wherein said fibrous base material comprises resin coated glass fiber screen.
4. The method of claim 1 wherein said fibrous base material comprises fabric having at least a glass warp.
5. The method of claim 1 wherein said fibrous base material comprises glass strand coated with a heat softenable material which is fusible to provide an integral product.
6. A method of producing a glass reinforced resinous sheet comprising advancing a fibrous base material along an established path, advancing a strand at sufficient speed with respect to the mass of the strand to provide a driven strand that forcibly impinges upon and interlocks with said fibrous base material to form an integral product, at least some of the fibers in said integral product being glass and others being a resinous material, fusing the resinous material fibers, and pressing the resultant product to form a reinforced resin sheet.
7. In combination with a process of attenuating filaments from a supply of molten glass and making a strand thereof, advancing a sheet of fibrous material along a defined path, said fibrous material comprising loosely arranged fibers at least some of which comprise glass coated with a heat softenable material, advancing an integral strand along a collision course with respect to said defined path of the sheet at sufficient velocity with respect to the mass of the strand to provide a driven strand that impinges upon said sheet of fibrous material and interlocks therewith to form an integral mat, and fusing the heat softenable material to form an integral product.

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