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(54) Glass textile fabric

(57) Provided is a woven, glass textile fabric comprised of glass sliver in the weft or cross direction and air texturized glass yarn in the machine direction having a titer of from 20 to 80 tex. The resulting fabric is aesthetically pleasing in appearance, strong, yet lightweight. The fabric finds excellent applicability as a wall covering.

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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a new glass textile fabric which is aesthetically pleasing, exhibits high strength, yet is extremely lightweight. The fabric is a woven glass textile fabric which finds particular applicability as a fabric for walls.

Description of the Related Art

[0002] Looms have been used for many decades in order to produce glass fabrics. This is also true for the production of fabrics woven with glass fiber yarns. Glass fabrics woven with a pattern are also known. For example, see U.S. Patent No. 6,267,151, issued to Andre Moll of Vitrulan Textilglas GmbH.

[0003] In the Moll patent, a method is described for producing a patterned glass fabric, especially suitable for wallpaper or similar materials having a fabric woven with glass fiber yams. The glass fiber yam has a titer between 130 tex and 150 tex, and preferably between 139 and 142 tex, which is used for the warp. A glass fiber yarn with a titer between 190 tex and 400 tex, and preferably of 215 tex, is used as the filling in the fabric. The yarn is generally processed on a pattern controlled Jacquard loom.

[0004] One of the difficulties with a glass fabric which is woven, and particularly glass fabrics intended for use as wallpaper fabrics, is the importance of aesthetics, as well as strength, while being lightweight. Certainly patterned fabrics can add to the aesthetics of a wall fabric, but problems have arisen in intending to achieve high strength, as the fabric has generally been a bit heavier, and does not provide the soft touch or voluminous look desired of the fabric.

[0005] Accordingly, it is an object of the present invention to provide one with a new and improved glass textile fabric which is aesthetically pleasing, has good strength, but is also lightweight in nature to provide the soft touch and look desired.

[0006] Another object of the present invention is to provide a wall fabric exhibiting good strength, but which is also lightweight and aesthetically pleasing in nature.

[0007] These and other objects of the present invention will become apparent to the skilled artisan upon a review of the following disclosure and the drawings attached hereto.

SUMMARY OF THE INVENTION

[0008] The present invention provides a glass textile fabric which is aesthetically pleasing, exhibits high strength, yet is lightweight, thereby providing a soft touch and feel. The textile is a woven glass fabric and finds distinct applicability as a wall fabric.

[0009] The fabric is woven with a 20 to 80 tex yam in the machine direction or warp, and a sliver is used as the weft or cross direction. For among other factors, it has been found that when the sliver in the cross direction is employed together with the fine, but strong, air texturized yarn, a strong, yet lightweight product having excellent aesthetics is achieved. The product is quite light and provides the soft look, voluminous touch and feel desired for wall fabrics. The economics of the fabric are also advantageous.

BRIEF DESCRIPTION OF THE FIGURES OF THE DRAWING

[0010] The above and other objects, features, and advantages of the present invention will become more apparent in light of the following detailed description in conjunction with the drawings, in which like reference numerals identify similar or identical elements, and in which:

FIG. 1 depicts a conventional process and set up for preparing sliver;
FIG. 2 depicts a process for preparing sliver in more detail using the drum attenuation method;
FIG. 3 depicts a process for applying a standard chemical treatment, in a preferred method in a continuous process using a rotating screen;
FIG. 4 shows a process for applying chemical dispersions, in a preferred method, in a continuous process using a rotating screen.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0011] Sliver, which can be characterized as a staple fiber strand or a discontinuous fiber yarn, is used in the weft of the fabric of the present invention. The manufacture of sliver is well known, and is described, for example, in Fiber Glass, by J. Gilbert Mohr and William P. Rowe, 1978, Van Nostrand Reinhold Company, which is hereby incorporated by reference in its entirety. The production of sliver using the so-called "drum attenuation" method is also described and referenced in U.S. Patent No. 4,863,502, which is also hereby incorporated by reference in its entirety. The sliver can be, and is preferably manufactured from C-glass or E-glass pellets. Such chemical glass or electronic glass compositions are well known.

[0012] Conventional production units for sliver are also known to the industry. Such production units have been developed, for example, by Schuller GmbH. FIG. 1 illustrates one such unit.

[0013] Generally, as shown in FIG. 1, a hopper, located on top of the sliver unit, contains the glass pellets. A pellet feeder draws the required pellet volume, time and weight controlled, and distributes it evenly into a glass

fiber bushing. The bushing is comprised of an electrically heated trough made of precious metal. It is embedded in a set of heat resistant bricks and assembled on a frame. On the bottom of the trough, the bushing has numerous nozzle-like outlets called "tips" from which glass fibers are drawn. The bushing is temperature response power controlled.

[0014] In the bushing the solid glass pellets are transformed into liquid glass. This glass penetrating through the outlets forms glass beads which in turn generate liquid glass fiber filaments. The fibers are vaporized with fiber forming promoter fluid and are wound onto a spinning drum. The glass drops are accelerated, broken from the filaments and disposed to the basement for recycling. Finally, the spinning drum attenuates the fibers to the desired diameter. The fibers adhere to the drum surface for less than one drum rotation and are then removed with a scraper blade. Good adhesion action firmly keeps the fibers on the drum surface. They are then released at the scraper blade edge.

[0015] The fibers are whirl-vortexed in a funnel, twisted (closed), removed and continuously wound on bobbins. Should fibers break, the fiber drawing process automatically restarts. Glass drops and heavy fibers are separated from the standard glass fibers and collected for recycling.

[0016] It is preferred that the dwelling time in the funnel is significantly abbreviated, for it has been discovered that especially evenness and uniform appearance are improved. thickness variation reduced and tensile increased by approximately 20% when the dwelling time in the funnel is significantly abbreviated. It is important to keep the drum speed-draw-off speed ratio as small a possible.

[0017] FIG. 2 of the Drawing provides more detail as to this preferred method of preparing sliver, using the so-called drum attenuation method. As shown in FIG. 2, filaments 4 are drawn from the ends of glass rods or from nozzles of a trough 2 containing fluid glass with the help of a rotating drawing surface 3. The filaments 4 are drawn parallel, next to each other, and attenuated to thin filaments, which are then lifted from the circumference of the rotating drawing surface before the completion of one wrap around, dispersed into fibers and fed into an enclosed space 7. This space is oriented rotation symmetrical and axis parallel to the drawing surface. In the enclosed space, a fiber whirl 9 is formed which is drawn off on one side as a fiber.

[0018] More specifically, with the help of a rotating drawing surface 3 in the form of a drum, large numbers of parallel, side by side glass filaments 4 are continuously drawn from the spinning nozzles 1 of a melting trough 2, or from the heat softened ends of glass rods. These contact the drawing surface external to the free fall line at 5, are drawn off and attenuated to a smaller diameter than at their formation with the help of this drawing surface. Prior to the completion of a single wrap around of the drawing surface 5 the filaments 4 are lifted by a suitable lifting device 6, for instance a stripper of thin sheet metal, or by counter directed blast streams, and fed into an enclosed space 7 such as a so-called spinning funnel, which is oriented parallel to the rotating drawing surface 3. A co-rotating air cushion is formed around the drawing surface 3 by the high rotation velocity. It assists during the drawing of the filaments 4 and is also lifted by the removal device 6 and fed into the enclosure 7 along with the suspended fibers 8. As a result, an air fiber-vortex 9 is created which forms the fibers in the circulating whirl to a fiber web or a roving. It is then continuously drawn off through a tubular nozzle 10 by means of a drawing and spooling device 11. The strength of the web is determined by the number of fibers and/or the removal rate. The side of the enclosure 7 opposite the nozzle 10 is open and allows the rotational wind or the air cushion in the funnel to escape.

[0019] The rotating drawing surface 3 is surrounded over a large portion of its circumference at a distance by a mantle 12 which serves as a protective device. In addition, it assures that no contaminants are pulled to the drawing surface by the resultant rotational wind and that the air cushion surrounding the drum is safely guided to the removal location 13.

[0020] If defects occur at the removal location 13, then a preceding removal device 14 is activated which removes the accumulating filaments from the drawing surface 3 until the defects at 13 have been corrected.

[0021] At the beginning of the process described above, and also when the filaments break during the production process, a glass droplet 15 is formed at the spinning location 1. It pulls a new filament 4 behind itself during the free fall. The filament is conducted to the drawing surface 3 by an oblique guide surface 16 underneath the drum. The filament is caught by the drawing surface and is carried along by it. At the same time it is separated from the droplet 15.

[0022] The filaments 4 are in actuality not only drawn off and attenuated by the drawing surface 3 but are also drawn off and attenuated by the air cushion created by this surface, whereas both can be effective for the individual filament during its path. A filament can therefore arrive at the drawing surface, then become immersed in the air cushion, be deposited again at the drawing surface, etc. or the other way around. The filaments are frequently broken into longer and shorter pieces by this, so that at 3, longer and shorter filament pieces or fibers can be present.

[0023] The resulting sliver product can then be used in preparing the glass textile fabric of the present invention. Preferably, the glass sliver has a titer in the range of from about 180 to about 220 tex, more preferably in the range of from about 190 to 210 tex, and most preferably about 200 tex. In a most preferred embodiment, the glass textile fabric of the present invention is comprised of glass sliver with a titer of about 200 tex as the weft, a glass yarn in the machine direction with a titer in the range of from about 30 to 40 tex, and most preferably

about 34 tex.

[0024] The glass yarn used in the machine direction, or warp of the textile fabric of the present Invention, is a 20 to 80 tex, air texturized yarn, more preferably a yarn with a titer between about 30 and 50 tex, particularly for those fabrics woven on a Jacquard style loom, and from about 60 to 80 tex in other fabrics. The yarn can be air texturized by using any conventional process for glass fibers. Suitable machines are available, such as the air texturizing machines from Dietze and Schell Corporation, Greenville, South Carolina. Air texturizing machines DS60 and DS60D are examples of suitable machines useful in texturizing glass yarns using various jet streams of air to accomplish the texturizing. The machine can be supplied with glass yarn in various feedstock forms such as from flexible bobbins, spin cables and direct rovings.

[0025] This glass yarn used as the warp is a very fine yarn which has been air-texturized. The fineness of the glass yarn, and its texturized state, combined with the use of the sliver in the cross direction, helps to give the final product its lightweight and voluminous look, feel and touch. The final textile, despite its lightweight characteristics, also exhibits good strength characteristics. It has been found that this unique combination of characteristics yields many practical advantages from the perspective of the user/customer. The wall fabric is easier to hang in outer and inner corners, on a pillar and in tough angles. The fabric also allows one to smooth out wrinkles and bubbles easily. The glass fabric textile of the present invention is also easier to paint, as it is easier to spread the paint out over the surface, and there is less roll resistance. The fabric consumes less paint and glue, and thereby is more economical. Because of the fabric's strength characteristics, the flexible fabric can stand extra handling, and allows for several adjustments during hanging of the wallpaper without any serious consequences. It has also been observed that the fabric provides almost invisible joints, and thus is more aesthetically pleasing in this respect, as well as in its overall look, feel and touch. The fabric also looses less fibers, which provides less fibers in the air during hanging, making handling of the textile fabric more environmentally friendly for the person handling the fabric as well as the environment in general. The lightweight characteristic of the fabric also, as well as the strength characteristics, allows for less raw material consumption. Overall, the strength, flexibility and lightweight nature of the fabric, as well as its voluminous look, feel and touch, provide for a very desirable product.

[0026] The sliver and air-texturized yam are combined into the final textile product using any conventional loom, e.g., a Dobby loom, Jacquard loom, a weaving machine such as a Dornier weaving machine. Woven-in patterns are possible, if desired.

[0027] Once the textile product has been woven, it can be treated in conventional fashion to provide the final characteristics of the product. Chemical treatments of glass fabrics are known to finalize/adjust such characteristics as strength, volume, stability and opacity of the final textile product.

[0028] FIG. 3 depicts a process for applying a normal chemical treatment to a glass fabric of the present invention, preferably, the glass fabric is a woven product from fiberglass yarn. The weave is typically a simple pattern, of up to eight shafts. The weave is produced, for example, on Dornier weaving machines, Reapiers or Air-Jets, in typically two or three meter widths for collecting on roll beams of typically 1,500-6,000 meters of untreated woven fiberglass fabric. Preferred yarns in accordance with the present invention include, for the warp direction, continuous C-glass or E-glass of 20 to 80 tex, more preferably from about 30 to 50 tex or 60 to 80 tex, which has been air-texturized. For the weft or cross direction, the sliver as described above is used.

[0029] In the process of the present invention, the glass fabric 21, preferred in roll form, is fed to an impregnation bath, typically through rollers 23 and conventional conveyance means, to contact a bath 22 of, for example, a soft touch chemical mixture, or alternatively, for example, a pick up roll may convey the same mixture to at least one of the glass fabric surfaces. A preferred coating mixture consists of those components set out in Table 1 below.

[0030] Alternatively, to the rollers 23, double side rotary screens may be used to apply the chemicals to the glass fabric 21. The chemical mixture is supplied to the interior of the two rotating screens and applied to the glass fabric by contact with the rotating screens.

Table 1

Starch Binder	10-70% of dry substance
Latex Binder	20-80% of dry substance
Inorganic Cross-Linker	0-10% of dry substance
Pigments	10-30% of dry substance

[0031] All commercial available starch binders can be used. A starch binder derived from potatoes or com is preferred. The soft latex binders are preferably based on vinyl acetate. However, other types of latex binders can also be used. Inorganic cross-linkers are materials which may improve the effect of that mixture by stabilizing the chemical mixture upon application. Ammonium zirconium carbonate is preferred, but also other chemistries can be used.

[0032] The mixture is preferably water based, and has a dry substance percentage of between 5 and 20 weight percent, preferably between 10 and 20 weight percent in the chemical bath. Besides white pigments, colored pigments can also be added or used to create colored fabrics as well.

[0033] Following the impregnation, the fabric may be conveyed to a drying means 24, which in the preferred embodiment of FIG. 3 is depicted as steam heated cyl-

inders 25. After drying, the fabric is collected onto roll 26 and is usually cut into desired width. This first impregnation step adds additional volume, stability and opacity to the fabric.

[0034] In FIG. 4, dispersion 44 can also be added to improve tear strength of the fabric 42. Typically, 10-60g of the dispersion per square meter is sufficient to obtain an optimum adhesion strength combined with moderate tear forces. The wanted tear force can be adjusted by the amount of the applied dispersion. It also depends on the type and structure of the used fabrics. The optimum adhesion strength is necessary to obtain the same wear resistance and the same fire resistance as standard glass fiber wall covering.

[0035] Following the application of the dispersion 44 to the fabric surface at 41, the fabric may be conveyed to a drying means 46, which in the preferred embodiment of FIG. 4, is depicted as air dryers. Alternatively, heated cylinders can be used without any drawbacks. The fabric is then collected on roll 48.

[0036] Having described preferred embodiments of the invention, it is to be understood that the invention is not limited to those precise embodiments, and that various changes and modifications may be effected therein by one skilled in the art without departing from the scope or spirit of the invention as defined in the appended claims.

Claims

1. A glass textile fabric comprised of a glass sliver having a titer from 180 to 220 tex in the weft and a 20 to 80 tex, air texturized glass yarn in the machine direction.

2. The glass textile fabric of claim 1, wherein the glass sliver is comprised of C-glass.

3. The glass textile fabric of claim 1, when the glass sliver is comprised of E-glass.

4. The glass textile fabric of claim 1, wherein the glass fabric has been woven on a Jacquard loom.

5. The glass textile fabric of claim 1, wherein the titer of the air-textured yarn is from 30 to 40 tex.

6. The glass textile fabric of claim 1, wherein the titer of the glass sliver is from 190 to 210 tex.

7. The glass textile fabric of claim 1, wherein the titer of the glass sliver is about 200 tex.

8. The glass fabric of claim 5, wherein the titer of the air-texturized yarn is about 34 tex.

9. The glass fabric of claim 8, wherein the titer of the glass sliver is about 200 tex.

10. A glass textile fabric comprised of a glass sliver in the weft and a 30 to 50 tex, air texturized glass yarn in the machine direction.

11. The glass textile fabric of claim 10, wherein the glass sliver is comprised of C-glass.

12. The glass textile fabric of claim 10, when the glass sliver is comprised of E-glass.

13. The glass textile fabric of claim 10, wherein the glass fabric has been woven on a Jacquard loom.

14. The glass textile fabric of claim 10, wherein the titer of the air-textured yarn is from 30 to 40 tex.

15. The glass textile fabric of claim 10, wherein the titer of the glass sliver is from 180 to 220 tex.

16. The glass textile fabric of claim 10, wherein the titer of the glass sliver is from 190 to 210 tex.

17. The glass textile fabric of claim 10, wherein the titer of the glass sliver is about 200 tex.

18. The glass fabric of claim 14, wherein the titer of the air-texturized yarn is about 34 tex.

19. The glass fabric of claim 18, wherein the titer of the glass sliver is about 200 tex.

20. A glass textile fabric comprised of a glass sliver in the weft and a 20 to less than 60 tex, air texturized glass yarn in the machine direction.

21. The glass textile fabric of claim 20, wherein the glass sliver is comprised of C-glass.

22. The glass textile fabric of claim 20, when the glass sliver is comprised of E-glass.

23. The glass textile fabric of claim 20, wherein the glass fabric has been woven on a Jacquard loom.

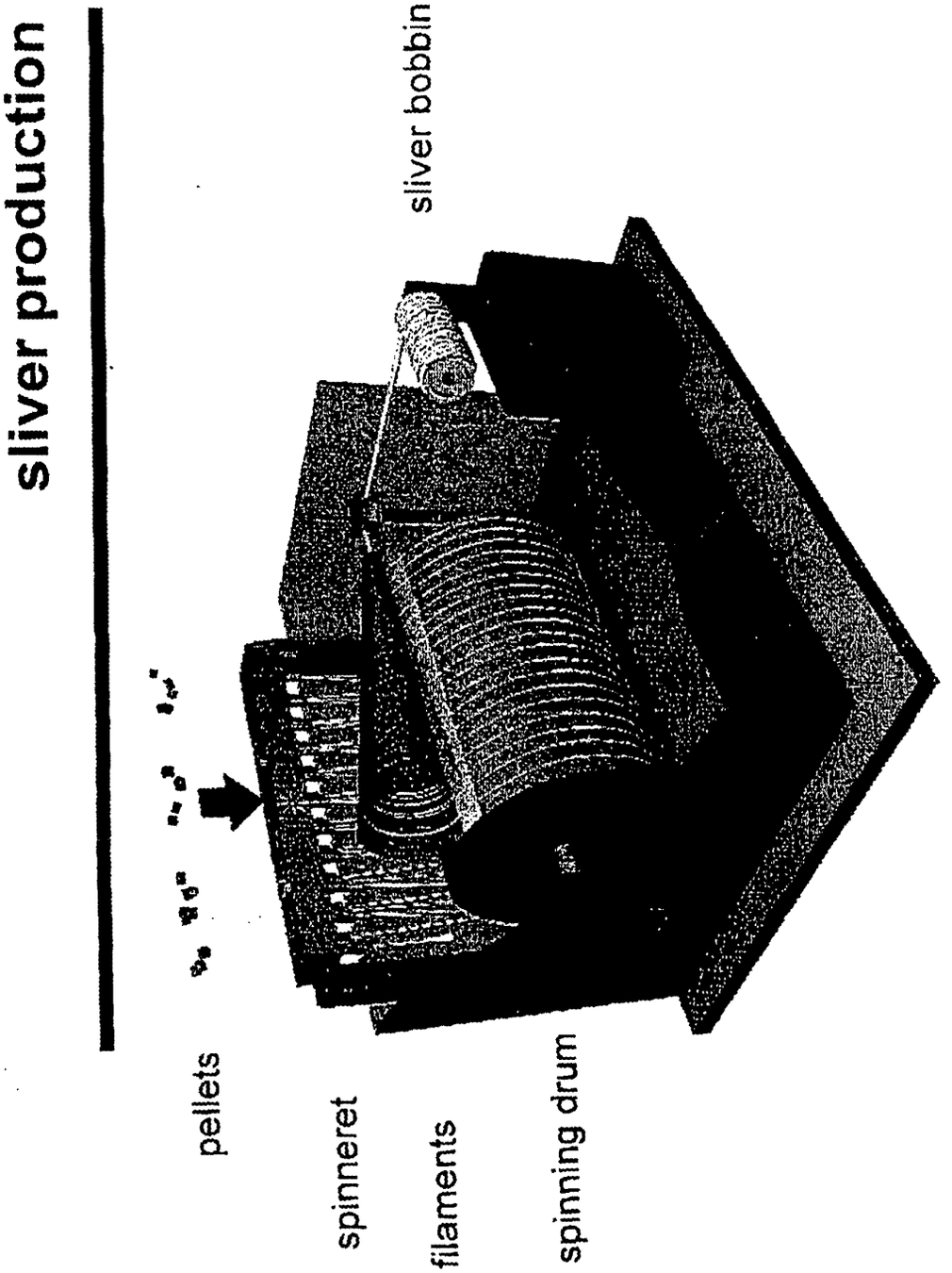
sliver production
pellets
spinneret
filaments
spinning drum
sliver bobbin

FIG. 1

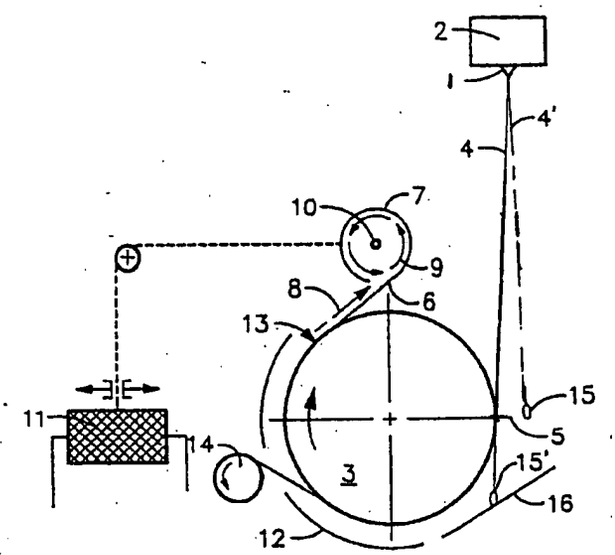

FIG. 2

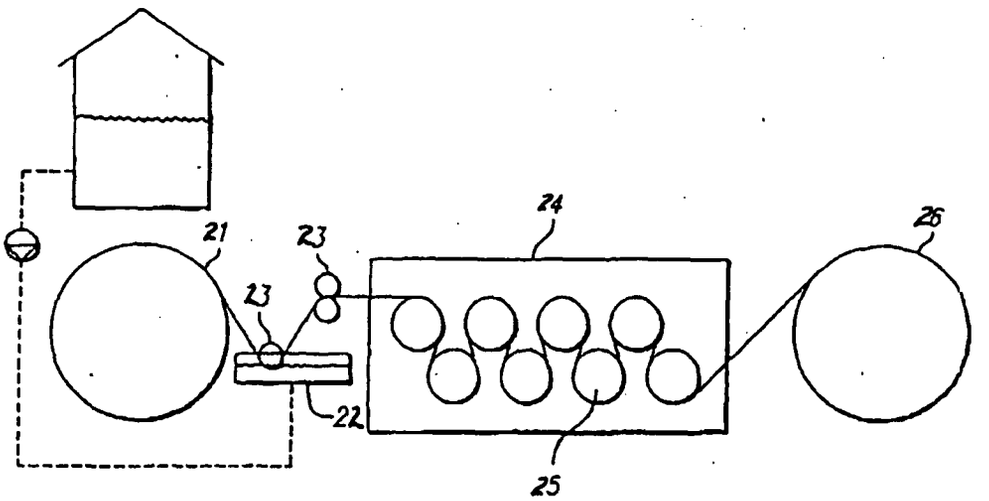

FIG. 3

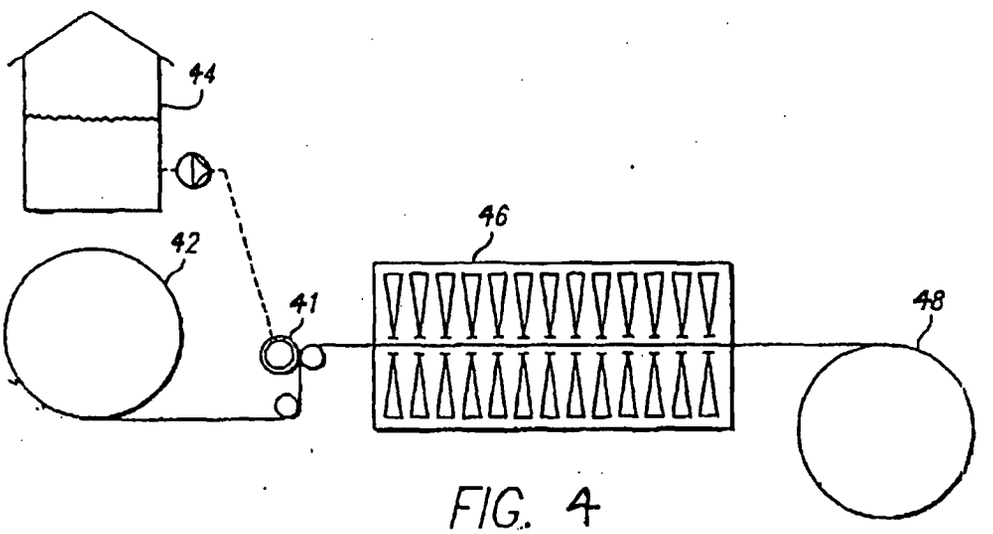

FIG. 4