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[54] **APPARATUS FOR THE MANUFACTURE OF CONTINUOUS FILAMENT NONWOVEN WEB**

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Related U.S. Application Data

[62] Division of Ser. No. 320,843, Jan. 4, 1973, Pat. No. 3,853,651.

[30] **Foreign Application Priority Data**

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[51] **Int. Cl.**^{2} **B65H 33/02**

[58] **Field of Search** .... 156/433, 494, 167, 180, 156/148; 28/1 SM

[56] **References Cited**

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[57] **ABSTRACT**

The process and apparatus for manufacturing spunbonded nonwoven fabrics is disclosed, wherein continuous filaments of organic polymers are extruded, stretched to orient same, and then arranged in fabric form on a moving conveyor. The filaments are arranged or distributed on the moving conveyor by impact from a deflector surface, wherein at least that portion of the deflector surface wherein the filaments are at their maximum width is vibrated.

The spunbonded nonwoven fabrics produced are more homogeneous than similar fabrics produced without vibrating the deflector surface. The fabrics are suitable for conventional uses of spunbonded nonwoven fabrics, such as apparel backing, padding and the like.

10 Claims, 4 Drawing Figures

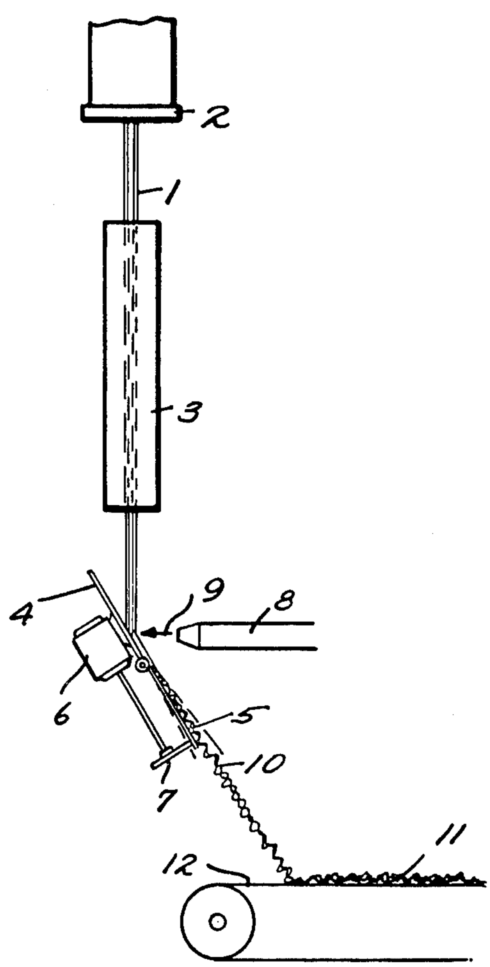


Fig. 1.

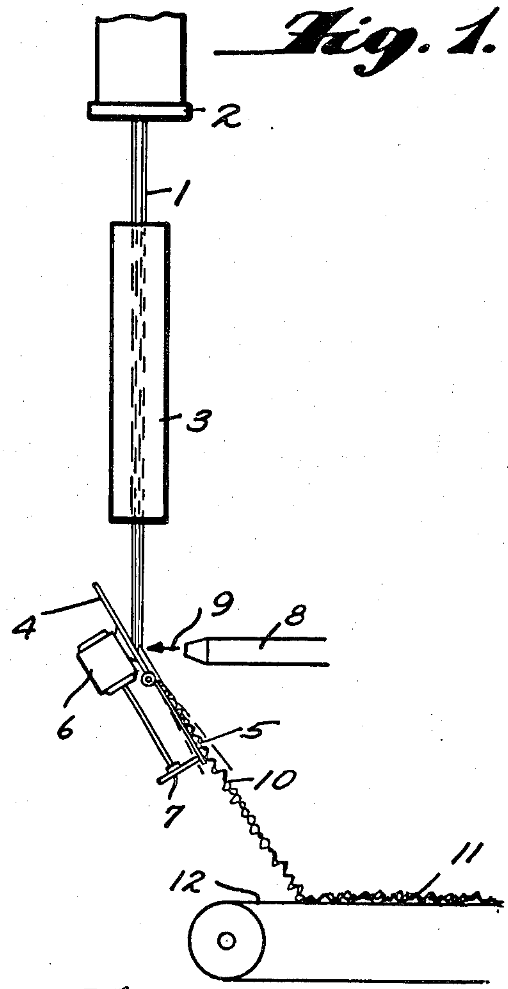


Fig. 2.

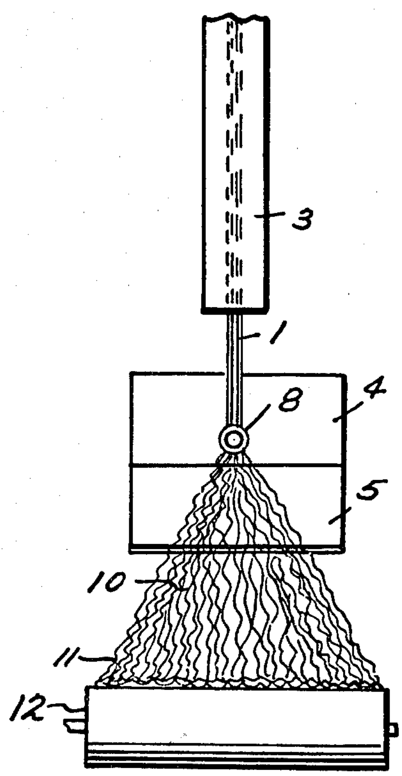


Fig. 3.

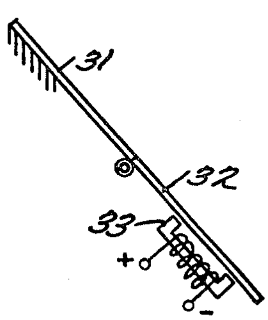
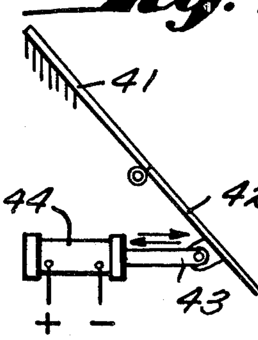


Fig. 4.



APPARATUS FOR THE MANUFACTURE OF CONTINUOUS FILAMENT NONWOVEN WEB

This is a division, of application Ser. No. 320,843 filed Jan. 4, 1973 now U.S. Pat. No. 3,853,651.

BACKGROUND OF THE INVENTION

Spunbonded nonwoven textile fabrics are nonwoven textile fabrics substantially made of continuous filaments generally randomly disposed throughout the fabric.

The manufacture of spunbonded nonwoven textile fabrics generally consists of extruding through a spinneret a melted, or even dissolved, fiber-forming organic polymer. Depending upon the nature of the particular polymer involved, the extruded filaments are generally next oriented by stretching the extruded fiber bundle, generally by pneumatically stretching the filaments with one or several compressed air jets. Then, the filament bundle is deposited in a predetermined manner on a moving conveyor, with the speed and the method of feeding the conveyor being regulated to control the desired thickness and width of the nonwoven fabric, and also to increase the regularity or homogeneous nature, thereof. After being deposited on the moving conveyor, the spunbonded fabric is often subjected to a calendaring step, generally a relatively light calendaring step, preferably with the application of heat, to increase the cohesiveness of the final product. Generally this calendaring step causes some of the basic filaments to be bound to one another, markedly increasing the unity of the nonwoven fabric product.

As mentioned above, after the textile filaments have been extruded and stretched, the filaments are deposited on a moving receiving conveyor. The distribution of the filaments on the conveyor is normally accomplished with the use of deflector surfaces. The bundle of filaments is directed upon and impinges the deflector surface at a certain angle and then, after impingement, moves in a tangential direction along and off of the deflector surface. The deflector surfaces are in the form of flat or curved surfaces, preferably curved surfaces of revolution, which can be either concave or convex in relation to the direction of travel of the filaments.

It is known to utilize fixed, flat deflectors to produce relatively regular textile fabrics, and this involves a relatively simple design. However, the width of the distributed fibers, as well as their strength, is often less than desired. The art prefers to use deflectors which produce a greater filament spread, as such use permits a decrease in the number of filament extrusion or spinning positions for a given width of final fabric produced. To achieve a sufficient filament spread, the art has used deflectors with complex surfaces, or movable deflectors, either flat or curved, which lead to greater filament spreads. However, these moveable deflectors are mechanically relatively complicated, expensive, difficult to precisely regulate, and relatively untrustworthy.

From the above, it will be appreciated that until now it has not been possible to obtain in a simple manner elementary spunbonded fabrics which are strong, regular, and have the desired width.

U.S. Pat. No. 2,736,676 discloses a process for producing sheets or mats made of strands, yarns, or slivers of various materials, especially glass strands. The glass strands are extruded, stretched, and then impinged on

a deflector surface. The patent discloses that the deflector surface may be either flat or curved, and may be fixed or moveable. The angle of impingement is disclosed as being between 0° and 90°. The patent discloses, with relation to FIG. 7 thereof, the use of two air jets, mounted on opposite sides of the point of impact, to laterally sweep the strand from the deflector surface, by alternate operation. The patent also discloses, with relation to FIGS. **8** and **9** thereof, the use of an air jet operating behind the point of impact to aid in throwing the deflected strand a further distance from the point of impact to a receiving conveyor. Another effect of the use of these air jets is to spiral the filaments, so that the filaments are deposited on the receiving conveyor in the form of loops. The process of this patent, however, still suffers the defects of prior processes mentioned above, namely inadequate width and poor homogeneity of the resulting product.

U.S. patent application Ser. No. 247,874 of Marchadier and Togny, assigned to the common assignee, filed Apr. 26, 1972, discloses the use of a fluid jet device operating upon the point of impact of the filaments on the deflector surface from a location in front of the point of impact in relation to the direction of the deflected filaments, and in the same plane as the axis of the filaments before and after impact with the deflector surface.

SUMMARY OF THE INVENTION

The process of the present invention involves the use of a vibrating deflector surface upon which the polymeric filament is impinged, to produce in a simple way a spunbonded nonwoven textile fabric having an improved spread or width and improved homogeneity. At least one bundle of filaments is extruded and stretched by conventional methods. Then the filaments are distributed upon a moving receiving conveyor by means of a deflector surface, with at least that portion of the deflector surface at the point where the filaments have their maximum width being vibrated. Fluid jets may be associated with the deflector surface if desired.

DESCRIPTION OF THE INVENTION

Spunbonded nonwoven textile fabrics are manufactured by extruding filaments of a fiber-forming polymer, orienting the extruded filaments by stretching, and then distributing the filaments on a receiving conveyor by impinging the filaments on a smooth deflector surface. The process of the present invention involves vibrating at least that portion of the smooth deflector surface where the bundle of filaments has the maximum spread or width. This area of the deflector surface is that portion which is nearest the moving receiving conveyor. The filaments may impact the smooth deflector surface on a fixed portion of the deflector surface or on a vibrating portion of the deflector surface, as long as the filaments are subjected to the vibration step at the aforesaid point of maximum width on the vibrator surface.

Various types of filaments may be used in the present process of manufacturing spunbonded nonwoven textile fabrics. The filaments may be made of fiber-forming inorganic polymers, such as glass, although preferably the filaments are made of a fiber-forming organic polymer. Any of the conventional textile fiber-forming organic polymers may be used, such as cellulose acetate, nylon or other polyamide, rayon, acrylic, modacrylic and the like. However, the present process is particularly useful in the production of polyester spunbonded nonwoven fabrics. Preferably, the polyester is a polyalkylene terephthalate. When the term "polyalkylene terephthalate" is used in the present specification, it is to be understood to apply to polymeric linear terephthalate esters formed by reacting a glycol of the series

$$HO(CH_2)_nOH$$

wherein n is an integer of **2** to **10**, inclusive, with terephthalic acid or a lower alkyl ester of terephthalic acid, wherein the alkyl group contains 1 – 4 carbon atoms, such as, for example, dimethyl terephthalate. The preparation of polyalkylene terephthalates is disclosed in U.S. Pat. No. 2,465,319 to Whinfield and Dickson, the disclosure of which is hereby incorporated by reference. The most widely used and commercially attractive polyalkylene terephthalate material is polyethylene terephthalate, which is the most preferred polymer in the practice of the process of the present invention. Polyethylene terephthalate is generally produced by an ester interchange between ethylene glycol and dimethyl terephthalate to form bis-2-hydroxy ethyl terephthalate monomer, which is polymerized under reduced pressure and elevated temperature to polyethylene terephthalate. The fiber-forming polymers are extruded into continuous textile filaments, generally of about 4 to 70 dtex.

The filaments may be extruded at extrusion rates which are conventional in the textile field. However, it is preferred that the impinging fibers be travelling at a speed of about 50 to 130 meters per second at the time of impact with the deflector surface, and the extrusion rate may be accordingly adjusted.

After extrusion, the filaments are generally stretched by an amount sufficient to orient the polymer molecules in the filament. Generally, the stretching will be within the range of about 200 to about 400%, based on the unstretched length of the filaments. Preferably, the filaments are stretched by pneumatic means, but other means may be utilized, such as those disclosed in the aforesaid U.S. Pat. No. 2,736,676, the disclosure of which is hereby incorporated by reference.

After being stretched, the filaments are directed at the deflector surface, and impinged on the surface, generally at the aforesaid speed of about 50 to 130 meters per second. While the angle of impingement may be from slightly more than 0° up to slightly less than 90°, e.g. 1° to 89°, it is preferred that the angle of impingement be from 10° to 80°, more preferably 20° to 60°.

The deflector surface may be flat or curved, and if a curved surface is used, it is preferred that the curved surface be a surface of revolution. The curved surface may be either concave or convex, and may be either stationary or moveable, as known to the art. Any of the known deflectors, such as those disclosed in the aforesaid U.S. Pat. No. 2,736,676, may be used in the practice of this invention. It is important that the deflector present a smooth surface in order to prevent any restraint of the filaments and to prevent any filament impingement that might disturb the regularity of the deflected filaments. In normal operation, the nature of the deflector material has no significant influence upon the formation of the spunbonded nonwoven fabric. However, it is clear that the material of which the deflector surface is made must have sufficient strength and resistance to abrasion so that the impingement of the filaments and the fluid jet will not deterioriate the surface. Among suitable materials for the deflector sur-

face may be mentioned soft steel, bronze, glass, ceramics, and the like.

A fluid jet may be directed to the point of impact of the filaments with the deflector surface. This fluid jet is conveniently formed by passing the fluid, preferably a gas, and most preferably compressed air, under pressure, through a nozzle. The use of a fluid jet generally allows greater filament speeds to be obtained. In the case of compressed air, the air is suitably under a pressure of between about 1 to about 4 bars. The nozzle preferably has a circular cross-section of a diameter of 0.5 to 5 millimeters, preferably 1 – 3 millimeters, although the nozzle cross-section can be of shapes other than circular. For instance, the nozzle may be in the form of a rectangular or eliptical slot, having its major axis in the vertical plane defined by the axis of the impinging filaments and the average axis of the deflected filaments. In any event, the nozzle cross-sectional area is preferably no larger or smaller than that of the circular nozzle mentioned above. It should be understood that the fluid pressure and nozzle areas mentioned above are not limiting, but are decidely preferred, as it has been observed that lower pressures or greater cross-sectional areas produces an insufficient deflected filament spread, whereas higher pressures or smaller cross-sectional areas generally adversely affect the homogeneous nature of the resultant nonwoven fabric product.

Particularly good results are obtained when the fluid jet acts in a manner which does not destroy the symmetry of the impacting bundle of filaments. This is accomplished by having the fluid jet substantially in the vertical plane which contains the axis of the impacting filaments and the average axis of the deflected filaments. The deflected filaments will be on diverging paths, so that some of the deflected filaments will be in a different vertical plane than other of the deflected filaments. Therefore, an average axis must be considered. In addition, the deflected filaments may be subjected to a sweeping action, e.g. such as that caused by movement of the deflector surface, and this also must be considered when determining the average axis of the deflected filaments. The velocity of the fluid jet should not be so great as to destroy the filament bundle symmetry.

Preferably, but not necessarily, the fluid jet is a gas, which generally is chemically inert with respect to the filament. It is, however, possible to use a gas or other fluid which does react with the filaments, if such action is desired. Compressed air is conveniently used as the inert gas, as being efficient and economical, but other gases may also be used, such as nitrogen, carbon dioxide, helium and the like, and liquids, such as water, while not preferred, can be used as well.

The distance from the end of the fluid jet nozzle to the point of impact of the filaments on the deflector surface will vary according to the type of fluid, fluid pressure, nozzle size, diameter and number of filaments, and desired width of the fabric product. Generally, the nozzle will be located a few centimeters from the point of impact, but this distance can be as great as a few decimeters. Generally, the distance will be no greater than 5 decimeters and no less than about 2 centimeters, but preferably the distance is between 2 and 5 centimeters.

The vibrating deflector results in a better entanglement of the filaments and improved distribution of the filaments in the fabric, with the result that more regular, homogeneous fabric can be produced. The deflector, as mentioned above, may be either fixed or moveable, and may be of a plane form or curved. The deflector can be made of any rigid material, including stratified materials, which have a coefficient of surface friction compatible with the extruded material. Generally, metals are preferred materials for the vibrating deflector. If desired, the deflector surface may be coated with a film of an elastomer or the like, or of a product having a paper-like characteristic.

The deflector surface, or portion thereof, may be vibrated or actuated by various known means, including mechanical, electromagnetic, magnetic, pneumatic, or by resonance. The vibration can also be accomplished by the incident fluid directed upon the point of impact of the filaments with the deflector surface, if such fluid is used.

At least a portion of the deflector surface will be vibrated at a frequency of about 1.67 – 1000 vibrations per second, preferably about 8 – 50 vibrations per second. The amplitude of the vibrations varies according to the dimensions of the vibrating deflector surface, but will generally be within the range of about 5 – 30% of the vibrating deflector surface portion length. That is, for a vibrating part which is 100 mm in length, the amplitude of the vibrations are generally within the range of 5 – 30 mm at the deflector extremity.

Obviously, several units each comprising a deflector surface and associated vibrating means can be mounted side by side to treat a plurality of filament bundles, with each group of filaments so treated on each unit forming a portion of the final fabric. This approach permits the ready production of extremely wide spunbonded nonwoven fabrics. Using this approach, care must be taken to avoid the disturbance of one deflected group of filaments by another group at the time of depositing the filaments on the conveyor. It is preferred to displace the deflected group of filaments so that they contact the conveyor in a stepwise manner. This is readily done by displacing the deflectors so that the planes of the deflected filaments leaving the deflector surface are parallel, and the points of impact are aligned along a straight line which is parallel to the plane of the receiving conveyor. This insures that the distance travelled by each group of filaments between the point of impact and the conveyor surface is the same.

After the filaments are deposited on the receiving conveyor, in the general form of the spunbonded nonwoven textile fabric, the deposited filaments are subjected to conventional treatments to improve the cohesiveness of the nonwoven fabric product. Generally the use of needlepunching or a relatively light calendaring step is preferred, although other approaches, such as use of an adhesive, can also be utilized. For polyalkylene terephthalate filaments, a calendaring step using a nip pressure of 20 – 50 kilograms per centimeter and a temperature of 140° – 250°C is preferred. For needlepunching, the fabric is preferably needlepunched at a penetration density of about 5 – 500 penetrations per square centimeter, although it will be appreciated that even greater penetration densities may be used if desired. Preferably, the penetration density will be in the range of 20 – 100 penetrations per square centimeter.

The weight of the spunbonded nonwoven fabric produced, for a given fabric width, can be controlled by varying the speed of the receiving conveyor and/or the extrusion rate of the filaments. In the case of polyethylene terephthalate, the fabric weight will generally be in the range of 10 to 2000 g/m^2, preferably 10 to 500 grams per square meter, most preferably 80 to 120 grams per square meter.

The distance between the point of impact of the filament bundle on the deflector surface and the receiving conveyor can be conveniently regulated by shifting the conveyor. The weight of the resulting fabric can be varied by changing the speed of the receiving conveyor and/or by changing the rate of filament extrusion. The use of the vibrating deflector allows lightweight fabrics to be produced having a high degree of regularity. As mentioned, if very wide fabrics are desired, several units, each consisting of at least one drawplate, a stretching nozzle, and a vibrating deflector, can be mounted in a side-by-side relationship, with each bundle of filaments thus forming a portion of the final fabric.

Because of the equipment simplicity and adaptability, the vibrating deflector can be used on any conventional apparatus for manufacturing spunbonded nonwoven fabrics. The spunbonded fabric may be either of a natural color or may be colored in the bulk. The fabric may be used as such or printed, impregnated with pulverized or liquid adhesives or other products or needlepunched in one or several layers. The spunbonded fabric may be made of heat-bondable material or of material which is not heat-bondable. The heat bonds may be developed on appropriate filaments by thermal treatment. The spunbonded nonwoven fabric produced by the apparatus and process of the present invention may be used in application where prior spunbonded nonwoven textile fabrics have been used, such as apparel backing, padding for garments and furniture and the like, for filters, sound and thermal installation, and in housing and in public works and buildings.

DESCRIPTION OF THE DRAWINGS

The invention will be more readily understood with reference to the accompanying drawings, wherein:

FIG. **1** represents a schematic side view of the process of the present invention,

FIG. **2** represents a front view of a portion of the process depicted in FIG. **1**,

FIG. **3** represents another embodiment of the vibrating deflector surface, and

FIG. **4** represents yet another embodiment of the vibrating deflector surface.

In FIGS. **1** and **2**, filaments **1** are extruded through a spinneret **2** by a conventional extruder (not shown) and passed through a stretching compressed air nozzle **3**, wherein the filaments are stretched to orient same. The filaments discharged from the stretching compressed air nozzle **3** impact upon the fixed deflector surface portion **4.** A compressed air jet **9** formed by compressed air nozzle **8** is directed at the point of impact of the filaments **1** with the fixed deflector surface portion **4,** and this compressed air jet **9** assists in the spreading of the bundle of filaments. The filaments passing down the deflector surface pass over vibrating deflector surface portion **5,** wherein the vibration is obtained by means of a cam **7,** having a generally square configuration, driven by motor **6.** The filament bundle continues to open under the influence of the vibrations, with the filament bundle opening increased and the filaments somewhat undulated by the action of vibrating surface **5.** Thus, the plane filament bundle is transformed into a three-dimensional filament bundle **10** which is received in the form of spunbonded nonwoven fabric **11** on receiving conveyor **12.** The receiving conveyor **12** has a lower speed than the filament bundle **10.** The conveyor **12** may be subjected to a transversal displacement movement, as can the other equipment mentioned above.

FIG. **3** represents an alternative apparatus for vibrating the vibrating deflector surface portion. Vibrating deflector surface portion **32** abuts fixed deflecting surface portion **31.** The vibrating portion **32** is made of ferromagnetic material and is vibrated by means of electromagnetic means comprising an electromagnetic bar **33,** connected to an electrical circuit.

FIG. **4** represents yet another alternative embodiment for vibrating the vibrating deflector surface portion. The vibrating portion **42** abuts fixed vibrator surface portion **41.** Vibrating portion **42** is vibrated by means of bar **43** actuated by solenoid **44.**

EXAMPLES OF THE INVENTION

The invention will be understood more readily by reference to the following examples; however, these examples are intended to illustrate the invention and are not to be construed to limit the scope of the invention. In the following examples, the resistance to rupture was obtained by the procedure of AFNOR G07.001 of Aug. 1944. The extension values were obtained according to the procedures of AFNOR G07.001 of Aug. 1944 and the tear strengths were determined according to the procedure of AFNOR G07.001 of Aug. 1944.

EXAMPLE 1

Two parallel bundles of filaments, each bundle having 70 filaments of 8.8 dtex, of polyethylene terephthalate were extruded through two spinnerets at a rate of 20 kg/hour per spinneret. The distance between the axis of the two bundles of filaments discharged from the two spinnerets was 480 mm.

Each extruded bundle of filaments was then stretched 350% of its original length during passage through a compressed air nozzle and then passed through an apparatus formed by a rectilinear tube and a plate located at the extremity of the tube. The plate was a plane inclined surface cutting across the major axis of the tube at an angle of 10°. The filaments discharged from the surface of the plate were received on a fixed vibrating deflector.

The fixed vibrating deflector was a plane deflector having a fixed glass portion which was 150 mm in length and 100 mm in width. Between the fixed glass portion and the receiving apron of the moving conveyor, described hereinafter, and adjacent the fixed deflector surface, was a vibrating plane deflector portion of polished bluish steel which was 155 mm in length and 90 mm in width (the length of the vibrating deflector portion was parallel to the axis of the moving conveyor). The inclination of the deflector surface (the two portions thereof were located in the same plane) in relation to the rectilinear tube was 125° and in relation to the moving conveyor receiving apron was 80°. The vibrating deflector portion was actuated, or vibrated, by a motor driving a square cam having sides 57 mm long. The vibrating deflector portion was vibrated at 2000 vibrations per minute, corresponding to a vibrating frequency of 33.3 vibrations per second. The extremity of the vibrating portion (furtherest removed from the fixed portion) had an amplitude of ± **10** mm. The opposite extremity of the vibrating portion (closest

to the fixed portion) did not vibrate and was held in fixed abutting relationship to the fixed portion.

No deflecting air jets were used in this example.

The filaments discharged from the vibrating portion surface were received on an inclined apron having an angle of 45° in relation to the horizontal, of a moving conveyor. A web of 1 meter in width was obtained from the two bundles of filaments, with the weight of the fabric varying with respect to the speed of the moving conveyor as follows:

Conveyor Speed m/min	9.6	6.7	3.35	2.20
Web Weight g/m²	100	100	200	300

The web was then needle punched on one face with needles 9 cm in length, each needle having 3 ridges with 3 sharp edges, each disposed in a helixical fashion. The needles penetrated 15 mm, and the needle punching density was 50 punches per square centimeter.

The needle punched web, having a weight of 200 g/m² had the following mechanical characteristics:

	Resistance to rupture	Extension	Tear Strength
Machine direction (along length of web)	34 kg	70%	11.7 kg
Cross-machine direction (along width of web)	36 kg	54%	13.5 kg

This example was repeated, except the vibrator was not used. The resulting web, again of a weight of 200 g/m² had the following characteristics:

	Resistance to rupture	Extension	Tear Strength
Machine direction (along length of web)	42 kg	60%	15 kg
Cross-machine direction (along width of web)	15 kg	33%	5 kg

It will be noted that a more isotropic web was obtained by use of the vibrating deflector according to the present invention.

The web obtained with the vibrating deflector could be used as coating backing, padding underfelt, and the like.

EXAMPLE 2

Example 1 was repeated, with the distance between the two extruded bundles of filaments being 720 mm. The fixed deflector was replaced by a plane deflector having a cyclically oscillating motion around a vertical axis parallel to the impinging filament bundle, oscillated at the rate of 60 round trips per minute about its axis with the total travel spanning an arc of 22°.

The vibrating deflector was composed of a glass non-vibrating deflector portion and a bluish steel vibrating deflector portion. The latter portion had a thickness of 0.2 mm. The dimensions of the fixed deflector portion were 150 mm in length and 100 mm in width, whereas the vibrating deflector portion was 150 mm in length and 90 mm in width. The length of the deflector on the average, or mid-point, position of oscillation was parallel to the axis of the receiving apron of the moving conveyor. The deflector made an angle of 125° with the vertical and was located 20 mm from the tube/plate apparatus. The distance from the lower edge of the deflector to the receiving apron was 45 cm. The distance from the point of impact of the filaments on the deflector to the receiving apron was 690 mm, with the filaments impacting the deflector at the center of the fixed portion thereof.

The vibrating portion of the deflector was actuated by electromagnetic means and had a vibration speed of 1000 vibrations per minute, corresponding to a vibration frequency of 16.6 cycles per second. The extremity of the vibrating portion had an amplitude of ± 12 mm.

The two bundles of deflected filaments were combined to produce a web of 1.4 meters in weight, whose weight varied with the speed of the receiving apron conveyor similar to Example 1.

A web having a weight of 200 g/m² was needlepunched as in Example 1, producing a needlepunched web having the following mechanical characteristics:

	Resistance to rupture	Extension
Machine direction (along length of web)	35 kg	72%
Cross-machine direction (along width of web)	37 kg	55%

The coefficient of irregularity of the cloth was 8.2%. This coefficient is determined from variation of weight (in grams per square meter) calculated from weighing 400 random samples of the web, having a size of 5 × 5 cm.

This example was repeated, except the vibrator was not used, resulting in a web which had the following physical characteristics.

	Resistance to rupture	Extension
Machine direction (along length of web)	29 kg	64%
Cross-machine direction (along width of web)	40 kg	59%

The coefficient of irregularity of this second web was 9.8%.

It will be appreciated from the above that the web produced utilizing the vibrating deflector surface was more isotropic and had improved resistance to rupture in the machine direction. The resulting web was suitable for use in manufacturing wall coatings.

EXAMPLE 3

A web having a weight of 120 g/m² was made by extruding 6 parallel bundles of polyethylene terephthalate fibers, each bundle being formed of 60 filaments of 4.4dtex. Each bundle was extruded through a separate spinneret at the rate of 9.3 kilograms per hour per spinneret, and the centers of the spinnerets, were separated by a distance of 370 mm.

The filaments were stretched 350% of their original length by a compressed air nozzle and then discharged upon a fixed deflector associated with a compressed air jet. The compressed air jet was applied at the point of impact of the filaments on the deflector, at an angle of 35° with the impinging filament bundle. The air jet was formed by passing compressed air at a pressure of 3.5 bars through a nozzle having a circular port 3 mm in diameter, with the end of the nozzle located about 30 mm in front of the point of impact. The deflector was made with a glass fixed deflector portion having a length of 150 mm and a width of 100 mm and a vibrating deflector portion (made of stratified glass and polyester resin, with a glass surface) having a length of 150 mm and a width of 90 mm. The extremity of the vibrating deflector had an amplitude of ± 10 mm, and the vibrating portion was vibrated at a frequency of 16 cycles per second by electromagnetic means.

The filaments discharged from the vibrating deflector were passed to an incline apron at an angle of 45° and moving at a speed of 4 meters per minute, of a moving conveyor. The inclined apron was located 45 cm from the extremity of the vibrating deflector portion.

The resulting web was needlepunched similar to Example 1, and then had a width of 210 mm and a weight of 120 g/m² and the following characteristics:

	Resistance to rupture	Extension
Machine direction (along length of web)	26 kg	65%
Cross-machine direction (along width of web)	31 kg	54%

This web had an irregularity coefficient of 5.5%.

When this example was repeated, but without the use of the vibrator, a web of 120 g/m² was obtained which had an irregularity coefficient of 6.5% and the following physical characteristics.

	Resistance to rupture	Extension
Machine direction (along length of web)	18 kg	50%
Cross-machine direction (along width of web)	37 kg	42%

Thus, the use of the vibrating deflector surface increases the regularity of the resulting web. The resulting spunbonded nonwoven fabric product could be utilized in manufacturing light coating backing or interlining.

What is claimed is:

1. Apparatus for making spunbonded nonwoven fabrics, said apparatus comprising means for producing a plurality of filaments of an organic polymer, means for stretching said filaments to orient same, moving receiving means, and deflector surface means associated with said stretching means for distributing the stretched filaments on said moving receiving means by impacting said filaments on said deflector surface means, at least that portion of said deflector surface means wherein the plurality of filaments have their maximum width being vibrated in a substantially vertical plane at a frequency of 1.67 – 1000 vibrations per second at an amplitude of 5 – 30% of the length of the deflector surface means.

2. Apparatus according to claim 1, wherein only a portion of said deflector surface means is vibrated.

3. Apparatus according to claim 1, wherein the entire deflector surface means is vibrated.

4. Apparatus according to claim 1 including fluid jet means for directing a fluid jet at the point of impact of said filaments on said deflector surface means.

5. Apparatus according to claim 1 wherein said portion of said deflector surface means is vibrated at a frequency of 8 – 50 vibrations per second.

6. Apparatus according to claim 1, additionally including means to needlepunch the filaments received on said moving receiving means.

7. Process according to claim 1, additionally including means to calendar the filaments received on said moving receiving means.

8. Apparatus according to claim 1, wherein said deflector surface means includes a fixed portion of said deflector surface means, wherein the filaments are impacted, and another portion of the deflector surface means, wherein the filaments are vibrated.

9. In an apparatus for making spunbonded nonwoven textile fabrics that includes means for producing a plurality of filaments of a fiber forming polymer, means for stretching said filaments to orient the same, moving receiving means and deflector surface means associated with said stretching means for distributing the stretched filaments on said moving receiving means by impacting said filaments on said deflector surface means, the improvement comprising a deflector surface means wherein at least that portion of the deflector surface wherein the plurality of filaments have their maximum width is vibrated in a substantially vertical plane by vibrating means which induce a frequency of 1.67 to 1,000 vibrations per second at an amplitude of 5 to 30% of the length of the deflector's surface means.

10. Apparatus according to claim 9, wherein said deflector surface means includes a fixed portion of said deflector surface means, wherein the filaments are impacted, and a vibrating portion of the deflector means, wherein the vibrating portion of the deflector surface means is located on the end of the deflector surface nearest the moving receiving means.

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