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(54) METHOD FOR MANUFACTURING SOFT, RESISTANT AND BULKY NONWOVEN AND NONWOVEN THUS OBTAINED

VERFAHREN ZUR HERSTELLUNG EINES WEICHEN, BELASTBAREN UND VOLUMINÖSEN
VLIESSTOFFS UND DER SO ERHALTENE VLIESTOFF

PROCÉDÉ DE FABRICATION D'UN NON-TISSÉ DOUX, RÉSISTANT ET GONFLANT ET LE NON-
TISSÉ AINSI OBTENU

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to a method for manufacturing a nonwoven of the spunbonded type in-line and off-line and a nonwoven obtainable by said method. Particularly, the invention relates to a nonwoven provided with such improved tactile, resistant and bulky characteristics that make it suitable for use in the field of surface cleaning, personal hygiene, and formation of garments.

BACKGROUND OF THE INVENTION

[0002] A nonwoven is widely used as a replacement for traditional textile products in numerous sectors, for example in the field of surface cleaning and protection, or in the production of garments. Compared to conventional fabrics, the nonwovens have the advantage of lower production costs, outstanding mechanical properties and a high biocompatibility with skin.

[0003] Among the nonwovens, those of the spunbonded type are formed either by synthetic (polymer) or natural material filaments which are laid on a mat in the form of a layer after being solidified when just coming out from the spinneret and subsequently attenuated at a prefixed distance from the spinneret by the application of forced air substantially at ambient temperature. The material forming said fibres is conventionally subjected to a stretching or elongation force causing the formation of continuous filaments.

[0004] The thus obtained structure can be consolidated by dynamic treatments such as bonding by stitches or by weft (calendering), or by jets of water (hydro-entanglement). Other bonding methods known in the field are mechanical needling, thermobonding, chemical bonding.

[0005] Generally, the spunbonding methods provide the extrusion of thermoplastic polymers through spinnerets such as to form a plurality of continuous filaments. These filaments, which are first solidified and then elongated, typically by means of a highspeed fluid, are random laid on a collecting surface such as a conveyor belt and form a non-consolidated ply. Subsequently, the filaments are bonded to provide the final ply having cohesion and strength characteristics.

[0006] The bonding step can be obtained by directly applying heat and pressure to the non-consolidated ply by means of heated calenders.

[0007] Particularly, after the non-consolidated ply has been laid down, it is carried on said conveyor belt to the calenders where it leaves the belt and is taken by two calender rolls to be heated and crushed. Thereby, the polymer ply is only carried until reaching the calenders and both rollers of the same calenders also act as the supports/conveyors as well as consolidators for the ply.

[0008] The product resulting from said method is normally in the form of a very thin ply, in the range of 0,18-0,3 mm weighing 15-17 g/m², compact, of threadlike appearance, and provided by slightly embossed patterns defined by the gaps between the cohesion points of the calender design.

[0009] Such a product, though showing good cohesion properties, is not very suitable for use in the hygiene sector, and however in those sectors requiring particular performance in terms of softness and thickness.

[0010] In addition, the cohesion is not sufficient when the product is used for instance in the cleaning field or as garments so that the product easily tends to wear out and, further, tends to cause an undesirable "pilling" effect particularly when the cohesion is carried out by hydroentangled technology, i.e. formation of fine loops onto the surface of the final product which engage with the roughness of for instance hands during using.

[0011] Therefore, the object of the present invention is to provide a nonwoven which is provided with improved softness and bulky properties compared to known products though still retaining optimum cohesion properties and avoiding the pilling effect.

[0012] This object is achieved by a method for manufacturing a nonwoven and a nonwoven thus obtained, such as claimed in the independent claims annexed below.

SUMMARY OF THE INVENTION

[0013] A first object of the present invention is to provide a method for manufacturing a nonwoven of the spunbonded type.

[0014] A second object is to provide a nonwoven obtained by said method, wherein the end product is particularly advantageous in terms of softness, bulky, and cohesion.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] Further characteristics and the advantages of this invention will be better understood from the following detailed description of some embodiments thereof, which are provided by way of non-limiting examples wherein:

- Figure 1 is a schematic view of a cross-section of a filament in accordance with a first embodiment of the invention;
- Figure 2 is a schematic view of a cross-section of a filament in accordance with a second embodiment of the invention;
- Figure 3 is a schematic view of a cross-section of a filament in accordance with a third variant embodiment of the invention;
- Figure 4 is a schematic view of a cross-section of a filament in accordance with a four embodiment of the invention;
- Figure 5 is a schematic view of a cross-section of a filament in accordance with a fifth embodiment of the invention;

invention;

- Figure 6 is a perspective view of a cross-section of a filament in accordance with a sixth embodiment of the invention;
- Figure 7 is a schematic view of a cross-section of a filament in accordance with a seventh embodiment of the invention;
- Figure 8 is a schematic view of a cross-section of a filament in accordance with an eighth embodiment of the invention;
- Figure 9 is a schematic view of a cross-section of a filament in accordance with a ninth embodiment of the invention;
- Figure 10 is a schematic view of a cross-section of a filament in accordance with a tenth embodiment of the invention;
- Figure 11 is a schematic view of a cross-section of a filament in accordance with an eleventh embodiment of the invention;
- Figure 12 is a schematic view of a manufacturing process according to the invention;
- Figure 13 is a schematic view of a manufacturing process in accordance with a first variant embodiment of the invention;
- Figure 14a is a schematic view of a manufacturing process in accordance with a second variant embodiment of the invention;
- Figure 14b is a schematic view of a manufacturing process in accordance with a third variant embodiment of the invention;
- Figure 15a is a schematic view of a manufacturing process in accordance with a fourth variant embodiment of the invention;
- Figure 15b is a schematic view of a manufacturing process in accordance with a fifth variant embodiment of the invention;
- Figure 16a is a perspective view of the support for the nonwoven filaments of the invention;
- Figure 16b is a perspective view of a variant of the support for the nonwoven filaments of the invention;
- Figure 17 is a schematic view of a manufacturing process in accordance with a sixth variant embodiment of the invention;
- Figure 18 is a schematic view of a manufacturing process in accordance with a seventh variant embodiment of the invention;
- Figure 19 is a schematic view of a manufacturing process in accordance with an eighth variant embodiment of the invention;
- Figure 20 is a schematic view of a manufacturing process in accordance with a ninth variant embodiment of the invention;
- Figure 21 is an enlarged perspective view of a particular of a roll of the calender according to the invention;
- Figure 22 is an enlarged sectional side view along the line XXI-XXI of figure 21.

DETAILED DESCRIPTION OF THE INVENTION

[0016] As stated above, the scope of the present invention is to provide a particular kind of nonwoven designed in order to improve the bulky and softness characteristics while, at the same time, to improve the its cohesion.

[0017] The idea upon which the invention is based is therefore to modify the structure of nonwoven in order to achieve the desired results. With this aim in mind, it has been proposed to modify the structure of the basic elements composing the nonwoven structure, i.e. the spunbonded filaments.

[0018] Several experiments have been carried out to verify if changing in the shape of the single filaments could bring to any advantages. In particular, the typical rounded cross-section of the filaments has been modified.

[0019] Surprisingly, it has been found that filaments having a lobed cross-section produced by suitable spunbonded spinnerets and entangled in order to form a mono or multi layered nonwoven can provide all the desired effects of improving softness, bulkiness and resistance.

[0020] In particular, spunbond filaments according to the present invention can be provided by means of conventional spunbond technologies and apparatuses wherein the corresponding spinnerets are modified in order to have orifices with holes presenting lobed shapes.

[0021] It is to be noticed that with the term "lobed filaments" it is intended a cross-section of a spunbond filaments whose external perimeter is not constant in its direction but changes. In other words, the external perimeter of the cross-section is provided with grooves alternated by protrusions or lobes.

[0022] For instance, as represented in the drawings, protrusions or lobes can have a rounded shape (figures 1 and 3) or angular shape (figure 2). Moreover, they can be symmetric or asymmetric.

[0023] In addition, they can reproduce substantially the shape of letters, such as "T", "Y", "I", "Z", "E", "S", "C", numbers like "3", signs like ">" or symbols like stars (figures 2, 4-11).

[0024] The main feature all the particular cross-sections of the spunbond filaments should have is to allow the definition of spaces and, at the same time, to allow a sort of connection between filaments when they are entangled to form a web of nonwoven. In fact, from one side the protrusions of a filament can randomly engage the grooves of another filament to create a connection and from the other side protrusion can randomly create spaces between cores of the filaments.

[0025] Accordingly, when the filaments are entangled, the nonwoven web of mono or multi layers shows an improved cohesion due to the above engagements and, at the same time, an improved volume due to the above spaces which consequently corresponds to an improved softness.

[0026] It is also to be noticed that the spaces so created

can be advantageously filled up with for instance lotions, detergents, creams depending on the particular use the operator intends to do. Alternatively, said spaces can act as absorbent spaces when the nonwoven is used to absorb liquids in an improved manner with respect to the known nonwovens.

[0027] Furthermore, it has also surprisingly been observed that if the above lobed spunbond filaments are used in a method for manufacturing a spunbonded nonwoven as described later, the softness, bulkiness and cohesion can be further implemented.

[0028] In view of the above, with reference to figure 12, the first object of the present invention is a method for manufacturing spunbonded nonwoven comprising the step of:

- a) extruding continuous thread filaments or microfilaments through spinnerets to produce spunbonded continuous filaments having a lobed cross-section,
- b) laying at least one layer (T_1) of spunbonded lobed filaments or microfilaments on a suitable three dimensional support S, said support S having a surface with ribs in contact with said filaments or microfilaments, and
- c) effecting a pre-consolidation of said layer T_1 by passing the layer T_1 , supported by said three dimensional support S, between two rollers (2, 3), one of the rollers (2, 3) facing the layer T_1 , wherein the ribs of said surface of said support S have a height between 0.3 and 5 mm, said ribs being distributed to cover less than 14% of said surface, and
- wherein said roller (3) facing the layer T_1 is provided with a metal outer surface and is subject to heating.

[0029] Preferably, step c) takes place by means of said thickening means which comprises two rollers 2, 3, for instance of a conventional compactor or embosser, and a support S having said particular surface, in contact with said filaments, provided with the above described ribs.

[0030] Moreover, the height of the ribs can preferably be from 0.5 to 3, more preferably from 0.8 to 1 mm, the contact surface of the free heads of the ribs can preferably be from 0.70 to 0.20 mm², more preferably about 0.50 mm² and the distribution of the ribs can preferably be so that to cover 10-5%, more preferably 9-7% on said surface.

[0031] By the term "continuous thread filaments" is meant herein continuous filaments substantially endless consisting of one or more polymer components, either synthetic or natural, optionally splittable into two continuous individual microfilaments. Polymer filaments splittable into microfilaments are splittable bi-component lobed polymer filaments.

[0032] Step c) of treatment to obtain an increased thickness of the nonwoven layer may be called, in other words, "thickening", thereby meaning an operating step allowing to turn the filaments of a spunbonded nonwoven

laid on a support in the form of a thin, threadlike, and non-consolidated ply into a non-consolidated or poorly consolidated ply (pre-consolidation) of a cotton wool-like, thick, and soft appearance.

[0033] As stated above, it has been surprisingly found that if the thickening step is carried out on a rib-operated, i.e. embossed, and however not smooth surface, using lobed spunbonded filaments the resulting ply gains unexpected properties of softness, thickness and cohesion or resistance which are considerably increased compared to any other nonwoven ply of the spunbonded or carded type produced without said combination of method and filaments.

[0034] On the basis of this result, different variant embodiments of a nonwoven of the spunbonded type, both single-layer and multi-layer, have been provided.

[0035] For the production of a single layer (figure 12), the manufacturing steps generally comprise feeding the nonwoven layer T_1 in the form of filaments by means of a spinneret 1 (extruder) coupled to a conventional suction fan A, a hydro-entangling station 5, a drying station 6 and a rewinding station 4 of the hydro-entangled layer on a roller.

[0036] Particularly, step b) of laying a single layer comprises, such as schematically represented in Figure 12, extruding the nonwoven layer T_1 in the form of continuous lobed filaments by means of a spinneret 1 (extruder) having suitable orifices to produce the above described lobed cross-sections and laying said filaments on a suitable support S by means of a conventional suction fan A.

[0037] Step c) of thickening is preferably carried out by passing the layer T_1 , supported by support S, between two rollers 2 and 3 of a conventional compactor or embosser C.

[0038] It should be noted that by the term compactor or embosser is meant herein a device known per se, such as described below, which has only the function of changing the surface of a nonwoven ply to obtain a slight consolidation (pre-consolidation) and in addition, in the case of embosser, such as to form patterns, writings or drawings in relief. In other words, the compactor would have a pre-consolidation function, actually weak, whereas the embosser would have a pre-consolidation and ornamental function, thereby increasing the thickness of the ply. On the contrary, the conventional calender, though being provided with a similar general structure, has the basic function to consolidate, and bond the fibres or filaments composing the nonwoven while minimizing or at most maintaining the ply thickness being laid down.

[0039] Preferably, roller 2 of the compactor generally has a thermoplastic smooth rubber surface for the layer T_1 to be pressed thereon, which layer is supported by support S, by means of roller 3. Roller 3 is normally made of smooth metal materials. Moreover, roller 3 is heated to the polymer filaments melting temperature. Accordingly, due to the use of lobed spunbonded filaments, mechanical action of both rollers, the heating of the filaments and the three-dimensional support S (mat interposed be-

tween both cylinders) the thickening of the nonwoven layer T_1 or, in other words, a "volumizing effect", a "flimsy effect" is thus obtained. In the case where an ornamental appearance is also desired, the embosser may be used, where the support S has deeper, more marked ribs and respective grooves, i.e. the ornamental matrix, such as to obtain the desired ornamental effect.

[0040] On the other hand, roller 3 in a conventional calender is engraved, i.e. it has ribs in the form of dots or dashes evenly alternating with grooves. In particular, the ribs have a height comprised between 0.4 and 0.6 mm, a free head with a contact surface for the filaments of 0.88 mm² and a distribution so that to cover 19-23% of the surface of the roller. It is to be noticed that said combination of features is just responsible of a firm consolidation of the nonwoven ply.

[0041] As already explained above, these ribs in the calender act by forming melting points. Moreover, in the calender, the nonwoven ply is not supported by any support. On the contrary, either in the compactor device or in the embosser, ribs on rollers are not provided or provided so that to create the above described effects typical of conventional embossers or compactors. On the other hand, there is provided a support S having a three-dimensional surface which gives considerable thickness, softness, and the above mentioned cotton wool-like appearance. These effects are further improved by means of the use of the above described lobed spunbonded filaments.

[0042] In addition, as already stated the use of the lobed filaments improves considerably the cohesion between filaments so that the whole nonwoven results much more resistant to wearing and is free from the peeling effect.

[0043] Support S can be a single continuous support stretching beneath all the nonwoven working stations and is advantageously provided with a surface in contact with the filaments, which is provided by ribs alternating with grooves. Non-limiting examples of said support S can be those represented in Figures 16a and 16b where the contact surface with said filaments has a section with crimps or steps according to what has been described in the international patent application PCT/IT2004/000220 in the name of the same applicant. Alternatively, the ribs can be either dots or dashes. Furthermore, said ribs can be of any other known conventional type such as truncated pyramid with substantially squared base or truncated cone with oval or circular base, the last one being the preferred shape.

[0044] Accordingly, as described above, when the spunbonded filaments are passed between two rollers 2 and 3 while being supported by a support S such as that described above, the resulting ply acquires softness, smoothness and thickness similar to cotton wool.

[0045] Moreover, the effect described above can be created by employing lobed continuous spunbonded filaments on a support surface having ribs of substantially any shape, which filaments can be passed between the

rollers of a compactor or embosser according to conventional procedures together with for instance carded fibres. In any case, the support S should be sufficiently solid to withstand the operating pressure of rollers 2 and 3 and withstand the fibre melting temperature.

[0046] Therefore, the support S described above can be a conveyor belt or tape made of any type of plastic material which is normally used in the field. Preferably, the support S is a metal sheet or a hard heat-resistant plastic sheet. Preferably, support S can further consist of a punched sheet through which the air can be sucked in order to maintain the filaments adherent to said sheet while they are being worked.

[0047] This support S can alternatively be a closed conveyor belt (not shown) limited to the level of rollers 2 and 3 of compactor or embosser C. Thereby, the filaments can be laid on a conventional support which carries said filaments to said conveyor belt such as to deliver the filaments thereto and allow the thickening treatment to be carried out in the advantageous conditions described above.

[0048] Following the passage of ply T_1 of lobed continuous spunbonded nonwoven supported by support S through the compactor C, the ply T_1 passes underneath the hydro-entangling machine 5 to be consolidated (step c)) in accordance with widely established methods. Subsequently, the ply T_1 is conventionally dried in dryer 6 (figure 12).

[0049] In addition, such as shown in figure 12, the fabric ply T_1 can be wound around a winding roller 4, also of the conventional type.

[0050] Particularly, the single- or multi-layer nonwoven can be of the hydroentangled type based on splittable bi-component continuous filaments. The nonwoven filaments generally consist of only one component; however, for personal care products they may also be manufactured in the bi-component form, through the joint extrusion of different polymers according to known technologies. It is to be noticed that in any case the bi-component filaments have to be produced in order to maintain a lobed profile even when split.

[0051] In addition, the multi-layer composite nonwovens can contain one or more nonwoven layers, associated to a layer of cellulose fibres: in such cases, the final composite advantageously combines the mechanical properties of the nonwoven with the absorbent properties of the cellulose fibres.

[0052] The above bi-component filament technology is described in the patent application PCT/IT2004/000220 in the name of the same applicant and fully incorporated herein by reference.

Production of splittable synthetic polymer filaments

[0053] For the production of a single layer, reference is made to what is illustrated in Figure 12, where the difference from the method described above is that the spinneret 1 employed is herein a device, known per se,

which is capable of manufacturing polymer filaments splittable into lobed microfilaments.

[0054] For the details of each step, reference should be made to the description below, with reference to Figures 13, 14 and 15 in which the steps with similar names are identical to those outlined above.

[0055] The method for manufacturing a nonwoven, according to this first variant embodiment of the invention, comprises the manufacturing steps a) to c) such as described above, in which the filaments laid in step b) comprise splittable bi-component lobed polymer filaments which split into mono-component lobed microfilaments by entangling to one other during the consolidation step by hydro-entanglement.

[0056] According to a variant embodiment of the invention, such as illustrated in Figure 13, the method provides a further step of laying at least one layer of absorbent material fibres T_3 on said at least one layer T_1 subsequent to the thickening step c), therefore the hydro-entanglement step takes place such as to obtain a nonwoven in which the bi-component polymer filaments split into mono-component micro-filaments entangle with one another and with the fibres of the absorbent material.

[0057] Generally, said method provides feeding the nonwoven first layer T_1 through a suitable spinneret 7, one or more stations 8 for laying the cellulose pulp 80, hydro-entanglement 10, drying 11 and rewinding on a roller 12.

[0058] On the other hand, the manufacture of a three-layer composite in accordance with the invention (Figure 14a where the same reference numbers as those from Figure 13 designate similar operating equipment or stations) generally provides feeding the first nonwoven layer T_1 through a suitable spinneret 7 according to the above description, one or more stations 8 for laying the cellulose pulp 80, laying a second nonwoven layer T_2 similar to the nonwoven layer T_1 through a suitable spinneret 9, hydro-entanglement 10, drying 11 and rewinding on a roller 12.

[0059] Referring to a multi-layer product, it is widely known that splittable bi-component lobed filaments may be produced through extrusion by spinnerets of polymer materials so as to form continuous filaments. These filaments, on output from the spinnerets, are hit by a jet of compressed air that causes the elongation and the electrostatic charging thereof such to cause a mutual repulsion causing them to fall randomly onto a conveyor belt.

[0060] With reference to Figure 14a, a method for the production of multi-layer nonwoven fabric comprising outer layers made with splittable filaments according to the abovementioned technology will be now described. In any case, the subject method comprises the following steps:

- a) extruding continuous thread filaments or microfilaments through spinnerets to produce spunbonded continuous filaments having a lobed cross-section,
- b) laying at least one layer T_1 of continuous splittable

bi-component lobed polymer filaments on a suitable support S;

c) treating said layer T_1 such as to obtain an increase in the thickness thereof as disclosed above;

d) laying on said at least one first layer T_1 at least one layer T_3 of absorbent material fibres 80;

e) laying at least one second layer T_2 of splittable bi-component lobed polymer filaments on said at least one layer of absorbent material fibres T_3 ;

f) treating said layer T_2 such as to obtain an increase in the thickness thereof as disclosed above;

g) consolidating said layers T_1 , T_2 and T_3 by hydro-entanglement.

[0061] Preferably, step c) and step f) take place by said layer T_1 and said layers T_1 , T_2 and T_3 , passing between two rollers, respectively, onto a support having a contact surface to said filaments being provided with ribs alternating with grooves as specified above.

[0062] As stated above, the hydro-entanglement of the laid filaments layers takes place such as to obtain a multi-layer nonwoven wherein the bi-component lobed polymer filaments are split into single mono-component micro-filaments entangling with one another and with the fibres of the absorbent material.

[0063] Particularly, splittable bi-component synthetic lobed filaments can be formed by separately extruding individual polymers in a molten state in the form of threads 70, 90 exiting from orifices, of capillary dimensions, of a spinneret 7, 9 and linking them beneath the spinneret. The polymers at the molten state are linked in a single fibre combined by extrusion of the individual polymer threads in such directions to cause the contact thereof and the adhesion thereof, such as described in patent US 6,627,025 herein incorporated by reference. A suction fan A positioned underneath the spinneret has the function of sucking and conveying the individual threads of extruded polymer in order to favour the bonding thereof into a single filament.

[0064] The synthetic filament is composed of two threads of a single polymer (bi-component), be they homopolymers, copolymers or blends thereof. The polymers may be selected from polyesters, polyamides, polyolefins, polyurethane, polyester modified with additives, polypropylene, polyethylene, polypropylene terephthalate, polybutylene terephthalate.

[0065] Preferably, such polymers may be selected such that in the filaments adjacent polymers cannot blend or in any case have poor affinity in order to favour the subsequent separation thereof. Alternatively, the polymers may be additized with lubricants that prevent the adhesion thereof. In addition, as the longitudinal, axial portion of the fibre usually has a greater force of cohesion than the peripheral portion, it may be advantageous to spin bi-component filaments so as to leave an axial hole or in any case a weakened axial portion.

[0066] As shown in figure 14a, once a layer of splittable bi-component lobed polymer filaments has been laid

through the special spinneret 7 onto a conveyor belt S such as to create a first layer of spun-bonded nonwoven T_1 , one layer of absorbent material T_3 such as cellulose pulp is laid on said layer of nonwoven.

[0067] Subsequently, a second layer T_2 of nonwoven substantially identical to that prepared previously is laid on the layer of cellulose pulp T_3 , such as illustrated in Figure 14a at the station identified with reference number 9.

[0068] At this point, the fibres are subject to hydro-entangling at the hydro-entangling station 10. This treatment, widely known per se, advantageously enables to split the polymer filaments that compose the nonwoven outer layers nonwoven in micro-filaments and to entangle them with one another and with the cellulose pulp fibres.

[0069] Preferably, the hydro-entangling is made not only on side S_1 of the support S on which the filaments are laid but also on side S_2 , opposite side S_1 , through special through holes (not shown in the figures) and suitable equipment positioned on said side S_2 (not shown).

[0070] Figures 12 to 14 also schematically represent a conventional filtering device 20 for the water originating from the hydro-entangling machines positioned after the cellulose pulp laying step. Said device has the function of recovering the water of the hydro-entangling machine and filtering it of any cellulose pulp fibres besides filtering the chemical components that are contained in the fibres and may be released in the course of hydro-entanglement.

[0071] In accordance with a further variant embodiment of the invention, Figure 14b illustrates a support S' , identical to that described above, on which the second layer T_2 of nonwoven filaments is laid. As will be seen, said S' is at a different level from support S on which the first layer T_1 is laid. Thereby, the second layer T_2 can be separately subjected to thickening (embossing). Thickening only layer T_2 is advantageous in that two substantially even layers can be obtained.

[0072] Subsequently to the thickening treatment, the layer T_2 is carried and laid on the layer of absorbent material fibres T_3 , by support S' or by a conventional conveyor belt, such as described above, and the three layers are subjected together to hydro-entanglement.

[0073] The drying step in the dryer 11 and the final winding on roller 12 take place as described above.

[0074] A further advantage also in relation to the technology that employs splittable polymer filaments lies in the fact that a greater density of individual micro-filaments per each filament is obtained. In other words the filament divides into a number of components at equal initial dimension, i.e. the micro-filaments that are obtained are at least 10 times finer, preferably up to 100 times finer.

[0075] Regardless of the type of traditional spunbonded or splittable filament used in the case one wishes to pre-entangle the nonwoven before bonding it into the form of a multi-layer composite (Figures 15a and 15b), the steps are as follows: laying the first layer T_1 by means

of the spinneret 13 or a carding machine, pre-hydro-entangling through equipment 14, drying through equipment 15, laying cellulose pulp T_3 through equipment 16, laying the second layer T_2 through spinneret 17 or carding machine, hydro-entangling with hydro-entangling machine 18, drying through equipment 19 and rewinding onto a roller 21.

[0076] The manufacturing method and plant may as well provide a dewatering step or station 22 associated to the drying step or station. The advantage of a pre-hydro-entangling step is that it allows to create a first layer of spunbonded lobed polymer bi-component filaments thanks to the greater density of the entangling of the micro-filaments of said filaments, favours the laying of filaments of absorbent material and prevents the partial loss thereof through spaces too wide, which are left by prior art technologies.

[0077] As mentioned previously, the step of laying fibres of absorbent material is preferably made with cellulose pulp fibres having a length that may vary from 0, i.e. cellulose powder, to 2.5 mm, preferably from 1 to 2 mm.

[0078] In addition, the process according to the invention may provide a drying step after the hydro-entangling step and, preferably also after the pre-hydro-entangling step.

[0079] A further step may consist in the elimination of the water contained in the fibres by means of a dewatering step. Particularly, said step consists in arranging a condenser 22 below support S and for example at dryer 15 to which an entirely conventional suction fan (not shown) is usually coupled up. The air sucked through the holes made on said support is conveyed into said condenser where it releases the water contained therein. Equipment of this type is described for example in patent application PCT/IT2004/000127 of the same applicant.

[0080] The method may also comprise an embossing step to make products with patterns of the multi-layer nonwoven. Particularly, the embossing may consist in a calendering treatment made by making the nonwoven being heated and pass under pressure between a pair of engraved rollers, in accordance with conventional techniques, or through a further step in a hydro-entangling machine. It should be noted that the term "embossing step" is not referred to a consolidation of the nonwoven as occurs according to the prior art mentioned previously but is simply enabling to make captions and/or three dimensional drawings in order to tailor or decorate the nonwoven through a "thermo-embossing" or "hydro-embossing" calender, in this case in the hydro-entangling process.

[0081] Preferably, the process comprises sucking the air at room temperature through the abovementioned through holes (not shown in the drawings) made in the support S for the fibres. In this way, the splittable lobed polymer filaments, laid at the molten state, are cooled and cured.

[0082] Still more preferably, said method may com-

prise one or more of the following final steps, known per se, in order to increase or add additional characteristics to the end product: colouring or finishing of a chemical nature as the anti-pilling treatment and the hydrophilic treatment, antistatic treatment, improvement of flame proof properties, substantially mechanical treatments such as napping, sanforizing, emerizing.

[0083] In addition, the nonwoven may be subject to a further process of multicolour printing using the equipment described in patent application PCT/IT2004/000127 in the name of the same applicant. In this case, a nonwoven sheet at the end of the process described above may be printed directly in-line following the steps of:

- providing equipment for nonwoven printing comprising a moving support for the transport of said nonwoven and at least one moving print organ;
- feeding said nonwoven sheet to said equipment;
- performing the printing on said nonwoven under the command and control of a command and control unit, in which said command and control unit is operatively connected with said support and at least one printing organ in order to detect electrical signals originating from said support and at least one print organ, transforming said signals into numerical values representative of the state of their angular speed and torsional moment, comparing said numerical values with ratios of preset numerical values of said angular speeds and torsional moments and sending signals to said support and at least one print organ in order to correct any variation of said values that fall outside said ratios.

[0084] Finally, the process in accordance with the present invention may comprise a step of winding the nonwoven onto a roller 21.

[0085] The method of the present invention enables to obtain various types of product:

A. single-layer fabric with basic weight of between 8 and 50 g/m². The manufacturing method is such as illustrated in Figure 12. The filament used may be either a synthetic bi-component lobed filament, splittable with a hydro-entangling machine or a normal lobed spunbonded fibre.

B. multi-layer fabric with single-layer hydro-entangling or three-layer hydro-entangling with or without pre-hydro-entanglement. For example, the product may be a three-layer, one of which is a central cellulose pulp layer and the outer layers with different combinations of the technologies illustrated above (20 to 200 g/m²).

[0086] In any case, regardless of the type of single-layer or multi-layer nonwoven, the tactile and visual characteristics of the individual ply which forms it and differ-

entiate it from any other ply comprise, weights being equal, a 3-5 times greater thickness, softness and smoothness similar to cotton and a cotton wool-like appearance, i.e. similar to a mellow and delicate flock, as well a degree of resistance to the wearing which is from 1,5 to 2 fold greater.

[0087] Particularly, and by way of non-limiting examples, exemplary fibres obtainable in accordance with the inventive method are described below.

Splittable bi-component spunbonded polymer synthetic filaments

[0088] Preferably, the splittable bi-component lobed polymer filaments are composed of micro-filaments of polymer such as those described above with reference to the manufacturing method. The micro-filaments may have a diameter of between 0.5 dTex and 0.9 dTex and the corresponding filaments may vary according to the number of micro-filaments that compose it but generally are of dimensions of between 1.7 dTex and 2.2 dTex.

[0089] As to a three-layer nonwoven having an inner layer of cellulose pulp fibres and two outer layers of polymer filaments consisting of two different splittable lobed polymer components such as polypropylene/polyethylene wherein 50% is fluff pulp and 50% is spunbonded, analytical tests have shown the following physical characteristics:

- weight in grams per square meter ranging between 20 and 200, preferably between 30 and 50;
- tensile strength in the machine direction expressed in Newton per 5 cm (N/5cm) between 70 and 150, preferably between 80 and 120, whereas in the cross-direction between 30 and 75, it is preferably between 35 and 65 for a 45-50 g/m² product; 50% fluff and 50% 2 continuous filament layers;
- elongation, calculated as a percentage of the length in a relaxed state, ranged between 35% and 85% in machine direction (MD), preferably between 45% and 75%, whereas it ranged between 70% and 130% in the cross-direction (CD), preferably between 80% and 110%;
- final content of the cellulose pulp fibre ranged between 30% and 75% of the total weight of the nonwoven; and
- power of absorption calculated as a percentage of total weight in relation to the weight of the dry nonwoven was between 600% and 800% (according to the percentage of pulp in the end product).

[0090] A non-limiting example of one embodiment of the process according to the present invention is described below.

EXAMPLE

[0091] Isotactic polypropylene polymer material has

been employed to carry out this example, having a melt flow rate of 40 g/10 min, such as established by ASTM D-1238, in the form of "chips". The polymer has been loaded in an extruder connected to a spinneret having an operating pressure of about 9646 kPa. The spinneret consists of capillaries having a diameter of 0,038 cm and a slot length of 0,152 cm. The molten isotactic polypropylene passes through the spinnerets at a speed of 0.6 g/min/hole and is extruded at a temperature of 227°C. The polymer is random laid on a perforated support having a fibre-collecting surface provided with truncated cone-shaped ribs of 0.9 mm height and alternating with specular grooves, a 0.5 mm² head pressure surface and a total pressure surface onto the nonwoven of 9-7%. Subsequently, the support is moved forward until reaching two rollers of an embosser where it is pinched between said rollers together with the non-consolidated polymer fibre ply carried thereonto. The pressure applied by the embosser, which normally ranges between 10 and 100N/mm, is about 45N/mm whereas the operating temperature, which normally ranges between 80 and 200°C, is 140°C the rotation and dragging speed of the ply, which varies between 20 and 600 m/min, is 300 m/min. At the calender outlet, the consolidated ply has a cotton wool-like appearance, is soft, has a weight in grams ranging between 8 and 20 g/m² and is up to five times thicker than a spunbonded nonwoven of the same weight in grams, which is usually no more than 0,18 mm thick, and has a cohesion of 1.5 fold greater. Now, the continuous ply is wound on a roll to be then carried to a subsequent manufacturing line or, in the case of in-line operation, to the hydro-entangling station to be subjected to the normal treating conditions. It should be noted, however, that the end product does not exhibit substantial modifications of the tactile, thickness and functional characteristics such as described above.

[0092] It should be appreciated by what has been stated above that the present patent application provides a method for manufacturing a particularly soft, smooth, thick and resistant nonwoven, as well as a nonwoven obtainable by said method.

[0093] Furthermore, those of ordinary skill in the art may carry out a number of modifications both to the method and the nonwoven, all being within the scope of protection of the claims appended herein.

[0094] Referring to Figure 17 wherein the same reference numbers as the reference numbers in Figure 14a designate the same working stations, there is schematically represented a manufacturing line or a method for manufacturing a three-layer carded fibres/cellulose pulp/lobed spunbonded mixed nonwoven.

[0095] Compared to the method described in Figure 14a, this method is different in that the first spinneret 7 for laying the first nonwoven layer T₁ is replaced with a conventional carding machine 23.

[0096] It should be noted that, also in this case, all the variants discussed above are valid, i.e. the nonwoven layers can be previously hydro-entangled, the second

nonwoven layer T₂ can be laid and passed through the compactor or embosser on a different level from any previous laying of fibres and the above-mentioned supplementary machining operations such as moulding and decoration (thermo-embossing) may be provided.

[0097] Furthermore, in the mixed multi-layer nonwoven, either the first laid layer, such as illustrated in Figure 17, or the second layer can be the carded layer.

[0098] In addition, in Figure 18 there is illustrated a manufacturing method in which a roller 24 of spunbonded lobed filaments, treated only by a compactor or embosser such as discussed above, is subjected to machining in a different line, in accordance with what has been already discussed above. Particularly, the nonwoven ply T is unwound from roller 24 and subjected for example to hydro-entangling by equipment 5, similarly to what has been described above, then it is dried and finally wound again on a roller 4'.

[0099] Similarly to what has been illustrated in Figures 13 and 14a, figures 19 and 20 represent identical methods, wherein, again, a roller 24 of spunbonded lobed filaments replaces the spinnerets and the carding machines for laying said fibres, respectively; the other machining operation remaining unchanged. In both latter cases, the variant embodiments described above may be also adopted, such as employing two rollers carrying the same fabric of the type spunbonded/spunbonded, spunbonded/staple fibres treated by compactor or embosser.

[0100] With reference to figure 21, a further embodiment of the invention consists in performing the method disclosed above wherein, in particular, said at least one surface is the surface of one of the rollers of the compactor or embosser. The provision of the surface with ribs on one of said rollers allows to avoid the support S disclosed above without altering the result to be obtained, i.e. increasing the thickness and softness of the nonwoven layer so that to look like a cotton wool-like.

[0101] In detail, the compactor C comprises two rollers (only one is represented in figure 21) similar to the rollers of a conventional compactor or embosser, wherein the surface 200 of one roller 201 is provided with ribs 202 having an height comprised between 0.3 and 5 mm, a free head with a contact surface for the fibres or micro-filaments having an extension of less than 0.80 mm², said ribs being distributed so that to cover less than 14% of said at least one surface. The ribs can be of the same type as disclosed above with reference to the ribs of the support S and the same preferred range are to be considered herein included, too.

[0102] In particular, said ribs 202 can have a preferred shape substantially in the form of a frustum of cone with a grater circular base attached to the surface 201, as can be better seen in figure 22.

[0103] In addition to the attached claims the present invention includes the following embodiments, which may be used and combined, whenever appropriate, with any one of the attached claims and/or any other embod-

iment.

[0104] Embodiment 1: The ribs of the three-dimensional support S have a height between 0.8 and 1 mm, and each rib has a free head with a contact surface, said contact surface of the free heads being between 0.70 and 0.20 mm², preferably about 0.50 mm², and a distribution of said ribs covering from 10 to 5% of said surface, preferably 7 to 9% thereof.

[0105] Embodiment 2: The three-dimensional support (S) comprises ribs (202) having the shape of truncated pyramid with substantially squared base or frustum cone with oval or circular base.

[0106] Embodiment 3: The three-dimensional support (S) is a conveyor belt or a tape made of a hard heat-resistant plastic material or a metal sheet.

[0107] Embodiment 4: The three-dimensional support (S) is drilled such as to allow for the air to be sucked through the thickness thereof.

[0108] Embodiment 5: The roller (2) of the compactor or embosser is provided with a thermoplastic smooth rubber outer surface and the roller (3) facing the layer T₁ is subject to heating at the melting temperature of said filaments or microfilaments.

[0109] Embodiment 6: The laying of the continuous filaments on the support S takes place by means of a suction fan (A).

[0110] Embodiment 7: The lobed filaments laid to form layer T₁ are made of material such as PES, PP, PLA, viscose, lyocell, tencell.

[0111] Embodiment 8: The polymers used for forming splittable bi-component lobed filaments are selected among polyesters, polyamides, polyolefins, polyurethane, polyester modified with additives, polypropylene, polyethylene, polypropylene terephthalate, and polybutylene terephthalate.

[0112] Embodiment 9: A drying step is provided after the hydro-entangling step.

[0113] Embodiment 10: A step of winding the nonwoven on a roller is provided after said drying step.

[0114] Embodiment 11: A drying step is provided after said pre-hydro-entanglement step.

[0115] Embodiment 12: A dewatering step is provided, either simultaneous or subsequent to said drying step.

[0116] Embodiment 13: An embossing step is provided before the winding step.

[0117] Embodiment 14: The embossing is carried out by calendering or hydro-entanglement.

[0118] Embodiment 15: Air is sucked at a temperature either equal to or lower than room temperature through the polymer filaments in order to cool and harden them.

[0119] Embodiment 16: A step of multicolour printing of the nonwoven is provided.

[0120] Embodiment 17: Split filaments are humidified before being hydro-entangled.

[0121] Embodiment 18: The three-dimensional support (S) has a surface comprising sections with a substantially perpendicular profile to the vertical laying flow of the filaments alternating with sections with a profile

biased of 10°-50° relative to said vertical flow.

[0122] Embodiment 19 discusses a method for manufacturing single-layer or bilayer lobed spunbonded nonwoven comprising the steps of:

- i) providing at least one layer (T₁, T₂) of lobed spunbonded nonwoven which has been subjected to swelling treatment by passing the layer T₁ through means of thickening which comprises two rollers (2, 3) and at least one surface provided with ribs having a height comprised between 0.3 and 5 mm, a free head with a contact surface for the filaments or microfilaments having an extension of less than 0,80 mm², said ribs being distributed to cover less than 14% of said at least one surface;
- ii) consolidating said layer through hydro-entanglement.

[0123] In embodiment 20 the step i) above comprises providing at least one layer of fibres (T₃) of absorbent material.

[0124] In embodiment 21 the step i) above further comprises providing at least one second layer (T₂) of lobed spunbonded nonwoven or nonwoven carded of staple fibres, which has been subjected to swelling treatment.

Claims

1. A method for manufacturing spunbonded or spunbonded/carded nonwoven, comprising the following sequential steps;
 - a) extruding continuous thread filaments or microfilaments through spinnerets to produce spunbonded continuous filaments having a lobed cross-section,
 - b) laying at least one layer (T₁) of spunbonded lobed filaments or microfilaments on a suitable three dimensional support S, said support S having a surface with ribs in contact with said filaments or microfilaments, and
 - c) effecting a pre-consolidation of said layer T₁ by passing the layer T₁, supported by said three dimensional support S, between two rollers (2, 3), one of the rollers (3) facing the layer T₁, wherein the ribs of said surface of said support S have a height between 0.3 and 5 mm, said ribs being distributed to cover less than 14% of said surface, and wherein said roller (3) facing the layer T₁ is provided with a metal outer surface and is subject to heating.
2. The method according to claim 1, wherein said support (S) has sectional crimps, steps, dots or line dashes or similar sections suitable to give three dimensionality to the filaments or microfilaments.

3. The method according to claim 1 or 2, wherein step b) comprises preparing at least one layer (T_1) of bi-component lobed polymer filaments that are splittable into microfilaments and entangled to one another through hydro-entangling and laying said layer on said support (S). 5
4. The method according to any claim 1 to 3, further comprising a step of laying at least one layer (T_3) of absorbent material fibres on said nonwoven layer (T_1) subsequent to said step c). 10
5. The method according to claim 4, further comprising a step of laying at least one further layer (T_2) of spunbonded lobed filaments or microfilaments or carded staple fibres on said at least one layer (T_3) of fibres of absorbent material. 15
6. The method according to claim 5, further comprising, subsequent to said step of laying said at least one further layer (T_2), a step of treating said at least one further layer (T_2) to obtain an increase in the thickness thereof, said step being performed by means of said thickening means which comprises two rollers (2, 3) and a support (S) having the surface with ribs in contact with said filaments. 20 25
7. The method according to any claim 3 to 6, wherein said step b) is carried out by separate extrusion of at least two polymer components from a suitable spinneret (1,7,9,13,17) beneath of which said two polymer components are linked such as to form one single splittable bi-component lobed filament. 30
8. The method according to any claim 4 to 7, wherein said laying of absorbent material is carried out with cellulose pulp fibres. 35
9. The method according to any claim 1 to 8, further comprising, after step c), a step of consolidating said layer (T_1) and/or said layer (T_2) by means of a treatment to obtain an increase in the thickness thereof. 40
10. The method according to claim 9, wherein said step of consolidating takes place through hydro-entanglement. 45
11. The method according to any claim 1 to 10, further comprising a step of pre-hydro-entanglement after said step of preparing at least one layer (T_1) of filaments. 50
12. The method according to any claim 5 to 11, wherein said at least one second nonwoven layer (T_2) is laid on a support (S') which is identical to said support (S) but placed on a different level. 55
13. A mono- or multi-layer spunbonded or spunbond-

ed/carded nonwoven produced according to one of the claims 1 - 12, comprising;

- a) continuous thread filaments or microfilaments of spunbonded continuous filaments having a lobed cross-section,
- b) at least one layer (T_1) of spunbonded lobed filaments or microfilaments formed on a suitable three dimensional support S, said support S having a surface with ribs to contact with said filaments or microfilaments, and
- c) said layer T_1 by passing the layer T_1 being preconsolidated by passing it supported by said three dimensional support S, between two rollers (2, 3), one of the rollers (3) facing the layer T_1 , the roller (3) facing the layer being heated,

wherein the layer T_1 is preconsolidated with the surface of said support S by ribs having a height between 0.3 and 5 mm, said ribs being distributed to cover less than 14% of said surface.

14. The nonwoven according to claim 13, comprising at least one layer (T_1 , T_2) having a thickness ranging from 0,54 mm to 0,9 mm, cotton wool-like appearance and soft and smooth to the touch.
15. The nonwoven according to claim 13, wherein said at least one layer (T_1 , T_2) is a lobed spunbonded layer.

Patentansprüche

1. Verfahren zur Herstellung von Spunbonded-Vliesstoff oder kardiertem Spunbonded-Vliesstoff mit den folgenden aufeinanderfolgenden Schritten:
 - a) Extrudieren von Endlosfaden-Filamenten oder Endlos-Mikrofilamenten durch Spinndüsen, um Spunbonded-Endlosfilamente zu erzeugen, die einen gelappten Querschnitt haben,
 - b) Anordnen mindestens einer Schicht (T_1) gelappter Spunbonded-Filamente oder Spunbonded-Mikrofilamente auf einem geeigneten dreidimensionalen Träger (S), wobei der Träger (S) eine Oberfläche mit Rippen in Kontakt mit den Filamenten oder Mikrofilamenten hat, und
 - c) Durchführen einer Vorverfestigung der Schicht (T_1) durch Hindurchführen der von dem dreidimensionalen Träger (S) getragenen Schicht (T_1) zwischen zwei Walzen (2,3), wobei eine der Walzen (3) gegenüber der Schicht (T_1) angeordnet ist,

wobei die Rippen der Oberfläche des Trägers (S) eine Höhe zwischen 0,3mm und 5mm haben und so verteilt sind, dass sie weniger als 14% der Oberflä-

- che bedecken, und
wobei die gegenüber der Schicht (T_1) angeordnete Walze (3) mit einer metallischen Außenfläche versehen ist und einer Erhitzung unterzogen wird.
2. Verfahren nach Anspruch 1, wobei der Träger (S) abschnittsweise wellenförmige, stufige, punkt- oder linienförmige Strukturen oder ähnlich geformte Abschnitte hat, um den Filamenten oder Mikrofilamenten Dreidimensionalität zu verleihen.
 3. Verfahren nach Anspruch 1 oder 2, wobei der Schritt b) aufweist: Herstellung mindestens einer Schicht (T_1) zweikomponentiger gelappter Polymer-Filamente, die in Mikrofilamente spaltbar sind und durch ein Wasserstrahl-Verschlingungsverfahren miteinander verschlungen sind, und Anordnen der Schicht auf dem Träger (S).
 4. Verfahren nach einem der Ansprüche 1 bis 3, wobei nach dem Schritt c) ferner ein Schritt durchgeführt wird, in welchem mindestens eine Schicht (T_3), die Fasern eines absorbierenden Materials aufweist, auf der Vlieschicht (T_1) angeordnet wird.
 5. Verfahren nach Anspruch 4, ferner mit einem Schritt, in welchem mindestens eine weitere Schicht (T_2) gelappter Spunbonded-Filamente oder Spunbonded-Mikrofilamente oder kardierter Zellstofffasern auf der mindestens einen Schicht (T_3), die Fasern eines absorbierenden Materials aufweist, angeordnet wird.
 6. Verfahren nach Anspruch 5, wobei nach dem Schritt des Anordnens der mindestens einen weiteren Schicht (T_2) ferner ein Schritt durchgeführt wird, in welchem die mindestens eine weitere Schicht (T_2) behandelt wird, um eine Vergrößerung ihrer Dicke zu erzielen, wobei dieser Schritt mit Hilfe der Dickenvergrößerungsmittel durchgeführt wird, die zwei Walzen (2,3) und einen Träger (S) aufweist, der eine Oberfläche mit Rippen in Kontakt mit den Filamenten hat.
 7. Verfahren nach einem der Ansprüche 3 bis 6, wobei der Schritt b) durch separiertes Extrudieren von mindestens zwei Polymerkomponenten aus einer geeigneten Spinn Düse (1,7,9,13,17) durchgeführt wird, unterhalb welcher die zwei Polymerkomponenten verbunden werden, derart, um ein einziges spaltbares zweikomponentiges gelapptes Filament zu bilden.
 8. Verfahren nach einem der Ansprüche 4 bis 7, wobei das Anordnen eines absorbierenden Materials mit Zellulosepulpe-Fasern durchgeführt wird.
 9. Verfahren nach einem der Ansprüche 1 bis 8, wobei nach dem Schritt c) ferner ein Schritt durchgeführt wird, in welchem die Schicht (T_1) und/oder die Schicht (T_2) durch eine Behandlung verfestigt wird, um eine Vergrößerung ihrer Dicke zu erzielen.
 10. Verfahren nach Anspruch 9, wobei der Verfestigungsschritt mittels eines Wasser-Verschlingungsverfahrens durchgeführt wird.
 11. Verfahren nach einem der Ansprüche 1 bis 10, ferner mit einem Schritt eines vorausgehenden Wasser-Verschlingungsverfahrens nach dem Schritt des Herstellens mindestens einer Filamentschicht (T_1).
 12. Verfahren nach einem der Ansprüche 5 bis 11, wobei die mindestens eine zweite Vliesstoffschicht (T_2) auf einem Träger (S') angeordnet wird, der mit dem Träger (S) identisch ist, aber auf einer anderen Höhe angeordnet ist.
 13. Einschichtiger oder mehrschichtiger Spunbonded-Vliesstoff oder kardierter Spunbonded-Vliesstoff, der nach einem der Ansprüche 1 bis 12 hergestellt ist und aufweist:
 - a) Endlosfaden-Filamente oder Endlos-Mikrofilamente von Spunbonded-Endlosfilamenten eines gelappten Querschnitts,
 - b) mindestens eine auf einem geeigneten dreidimensionalen Träger (S) gebildete Schicht (T_1) gelappter Spunbonded-Filamente oder Spunbonded-Mikrofilamente, wobei der Träger (S) eine Oberfläche mit Rippen hat, um die Filamente oder Mikrofilamente zu kontaktieren, und
 - c) wobei die Schicht (T_1) vorverfestigt worden ist, dadurch, dass die Schicht (T_1), getragen von dem dreidimensionalen Träger (S), zwischen zwei Walzen (2,3) hindurchgeführt wird, wobei eine der Walzen (3) gegenüber der Schicht (T_1) angeordnet ist und einer Erhitzung unterzogen wird,
 wobei die Schicht (T_1) mit Hilfe von Rippen der Oberfläche des Trägers (S) vorverfestigt worden ist, wobei die Rippen eine Höhe zwischen 0,3mm und 5mm haben und derart verteilt sind, dass sie weniger als 14% der Oberfläche bedecken.
 14. Vliesstoff nach Anspruch 13, der mindestens eine Schicht (T_1, T_2) einer Dicke zwischen 0,54mm und 0,9mm aufweist, ein baumwollartiges Aussehen hat und sich weich und glatt anfühlt.
 15. Vliesstoff nach Anspruch 13, wobei die mindestens eine Schicht (T_1, T_2) eine gelappte Spunbonded-Schicht ist.

Revendications

1. Procédé de fabrication de tissu non tissé filé-lié ou filé-lié/cardé, comprenant les étapes successives suivantes :

- a) d'extrusion de filaments ou microfilaments à fil continu à travers des filières afin de produire des filaments continus filés-liés présentant une section transversale lobée,
- b) d'agencement en couche d'au moins une couche (T_1) de filaments ou microfilaments lobés filés-liés sur un support tridimensionnel approprié (S), ledit support (S) présentant une surface avec nervures en contact avec lesdits filaments ou microfilaments, et
- c) d'exécution d'une consolidation préalable de ladite couche T_1 en faisant passer la couche T_1 , supportée par ledit support tridimensionnel (S) entre deux rouleaux (2, 3), l'un des rouleaux (3) faisant face à la couche T_1 ,

dans lequel les nervures de ladite surface dudit support (S) présentent une hauteur comprise entre 0,3 et 5 mm, lesdites nervures étant réparties de manière à recouvrir moins de 14 % de ladite surface, et

dans lequel ledit rouleau (3) faisant face à la couche T_1 comporte une surface externe métallique et est chauffé.

2. Procédé selon la revendication 1, dans lequel ledit support (S) comporte, sur sa section, des plis, échelons, points ou lignes en pointillés ou sections similaires appropriées afin de communiquer un caractère tridimensionnel aux filaments ou microfilaments.
3. Procédé selon la revendication 1 ou 2, dans lequel l'étape b) comprend la préparation d'au moins une couche (T_1) de filaments polymères lobés à deux composants qui peuvent être séparés en microfilaments et enchevêtrés les uns aux autres par enchevêtrement hydraulique, et l'agencement en couche de ladite couche sur ledit support (S).
4. Procédé selon l'une quelconque des revendications 1 à 3, comprenant en outre une étape d'agencement en couche d'au moins une première couche (T_3) de fibres de matériau absorbant sur ladite couche non-tissée (T_1) suite à ladite étape c).
5. Procédé selon la revendication 4, comprenant en outre une étape d'agencement d'au moins une autre couche (T_2) de filaments ou microfilaments lobés, filés-liés ou de fibres de base cardées sur ladite au moins une couche (T_3) de fibres de matériau absorbant.

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6. Procédé selon la revendication 5, comprenant en outre, après ladite étape d'agencement en couche de ladite au moins une autre couche (T_2), une étape de traitement de ladite au moins une autre couche (T_2) afin d'obtenir une augmentation sur son épaisseur, ladite étape étant mise en oeuvre au moyen dudit moyen d'épaississement qui comprend deux rouleaux (2, 3) et un support (S) dont la surface comporte les nervures en contact avec lesdits filaments.

7. Procédé selon l'une quelconque des revendications 3 à 6, dans lequel ladite étape b) est mise en oeuvre par extrusion séparée d'au moins deux composants polymères à partir d'une filière appropriée (1, 7, 9, 13, 17) au dessous de laquelle lesdits deux composants polymères sont liés de manière à former un simple filament lobé à deux composants pouvant être séparé.

8. Procédé selon l'une quelconque des revendications 4 à 7, dans lequel ledit agencement en couche de matériau absorbant est mis en oeuvre avec des fibres de pâte de cellulose.

9. Procédé selon l'une quelconque des revendications 1 à 8, comprenant en outre après l'étape c), une étape de consolidation de ladite couche (T_1) et/ou de ladite couche (T_2) au moyen d'un traitement destiné à obtenir une augmentation sur son épaisseur.

10. Procédé selon la revendication 9, dans lequel ladite étape de consolidation est assurée par enchevêtrement hydraulique.

11. Procédé selon l'une quelconque des revendications 1 à 10, comprenant en outre une étape d'enchevêtrement hydraulique préalable après ladite étape de préparation d'au moins une couche (T_1) de filaments.

12. Procédé selon l'une quelconque des revendications 5 à 11, dans lequel ladite au moins une seconde couche non-tissée (T_2) est déposée sur un support (S') qui est identique audit support (S) mais placé à un niveau différent.

13. Tissu non-tissé, filé-lié ou filé-lié/cardé mono ou multicouche, produit selon l'une des revendications 1 à 12, comprenant :

- a) des filaments ou microfilaments à fil continu de filaments continus filés-liés présentant une section transversale lobée,
- b) au moins une couche (T_1) de filaments ou microfilaments lobés filés-liés formée sur un support tridimensionnel (S) approprié, ledit support (S) présentant une surface avec nervures destinée à venir en contact avec lesdits fila-

ments ou microfilaments, et

c) ladite couche T_1 , en faisant passer la couche T_1 , préalablement consolidée par son passage, supportée par ledit support tridimensionnel (S), entre deux rouleaux (2, 3), l'un des rouleaux (3) faisant face à la couche T_1 , le rouleau (3) faisant face à la couche étant chauffé,

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dans lequel la couche T_1 est consolidée préalablement avec la surface dudit support (S) par des nervures présentant une hauteur comprise entre 0,3 et 5 mm, lesdites nervures étant réparties afin de recouvrir moins de 14% de ladite surface.

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14. Tissu non tissé selon la revendication 13, comprenant au moins une couche (T_1 , T_2) présentant une épaisseur comprise entre 0,54 mm et 0,9 mm, un aspect du type laine de coton et un touché doux et lisse.

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15. Tissu non tissé selon la revendication 13, dans lequel ladite au moins une couche (T_1 , T_2) est une couche filée-liée lobée.

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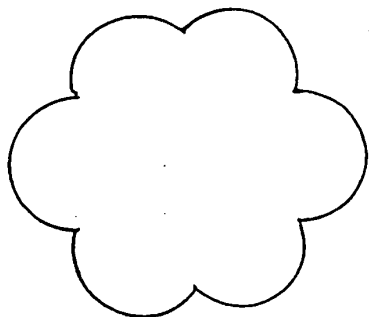


FIG.1

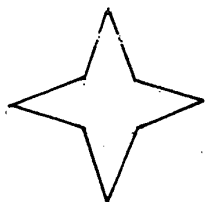


FIG.2

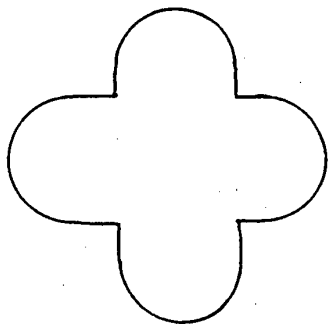


FIG.3



FIG.4

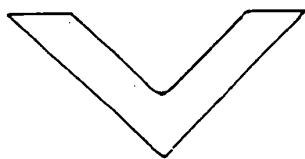


FIG.5



FIG.6

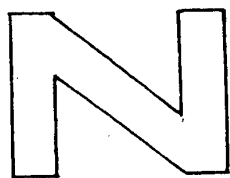


FIG.7

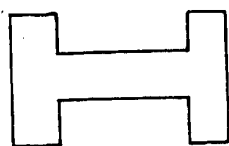


FIG.8

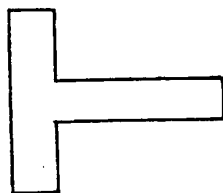


FIG.9

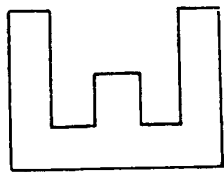


FIG.10

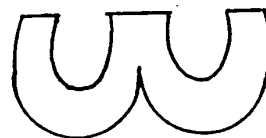


FIG.11

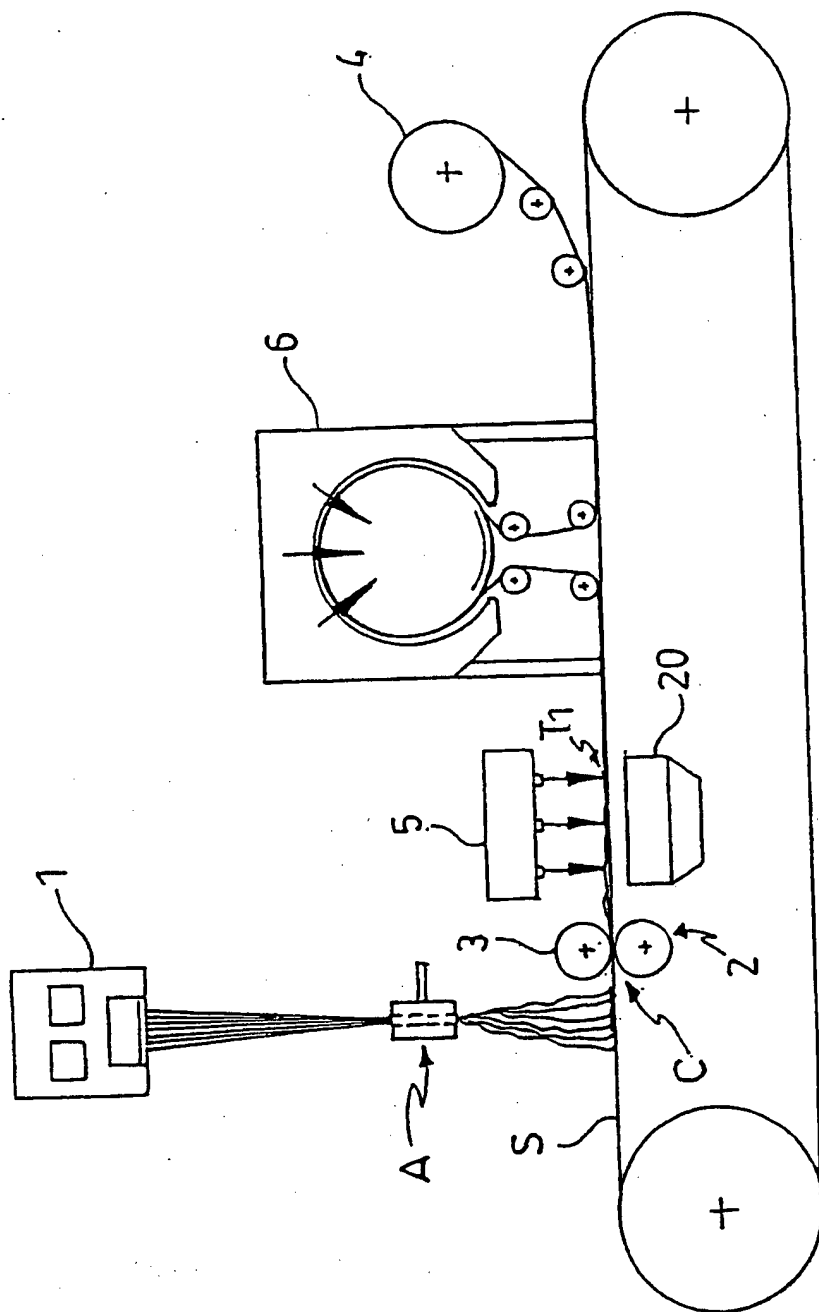


FIG. 12

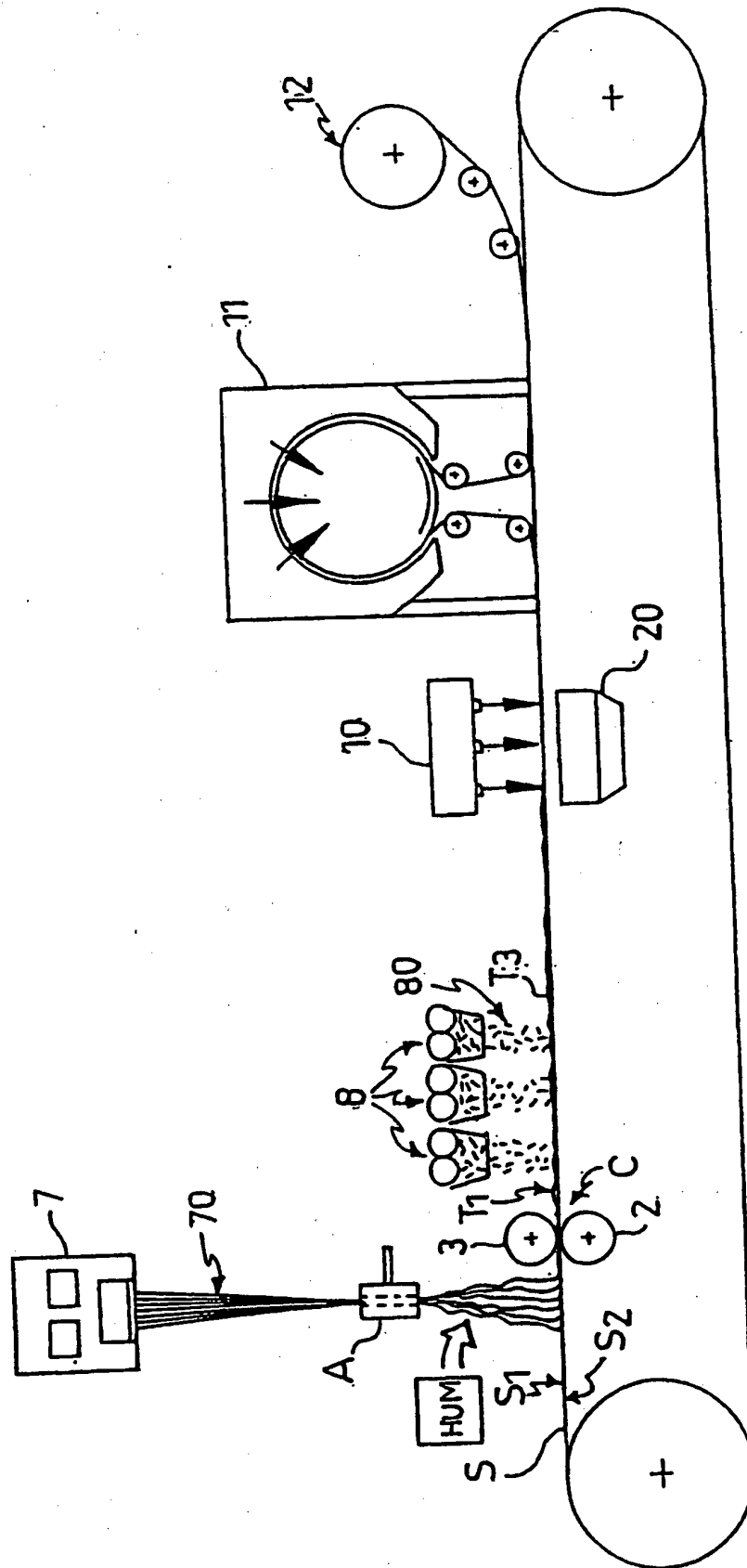


FIG.13

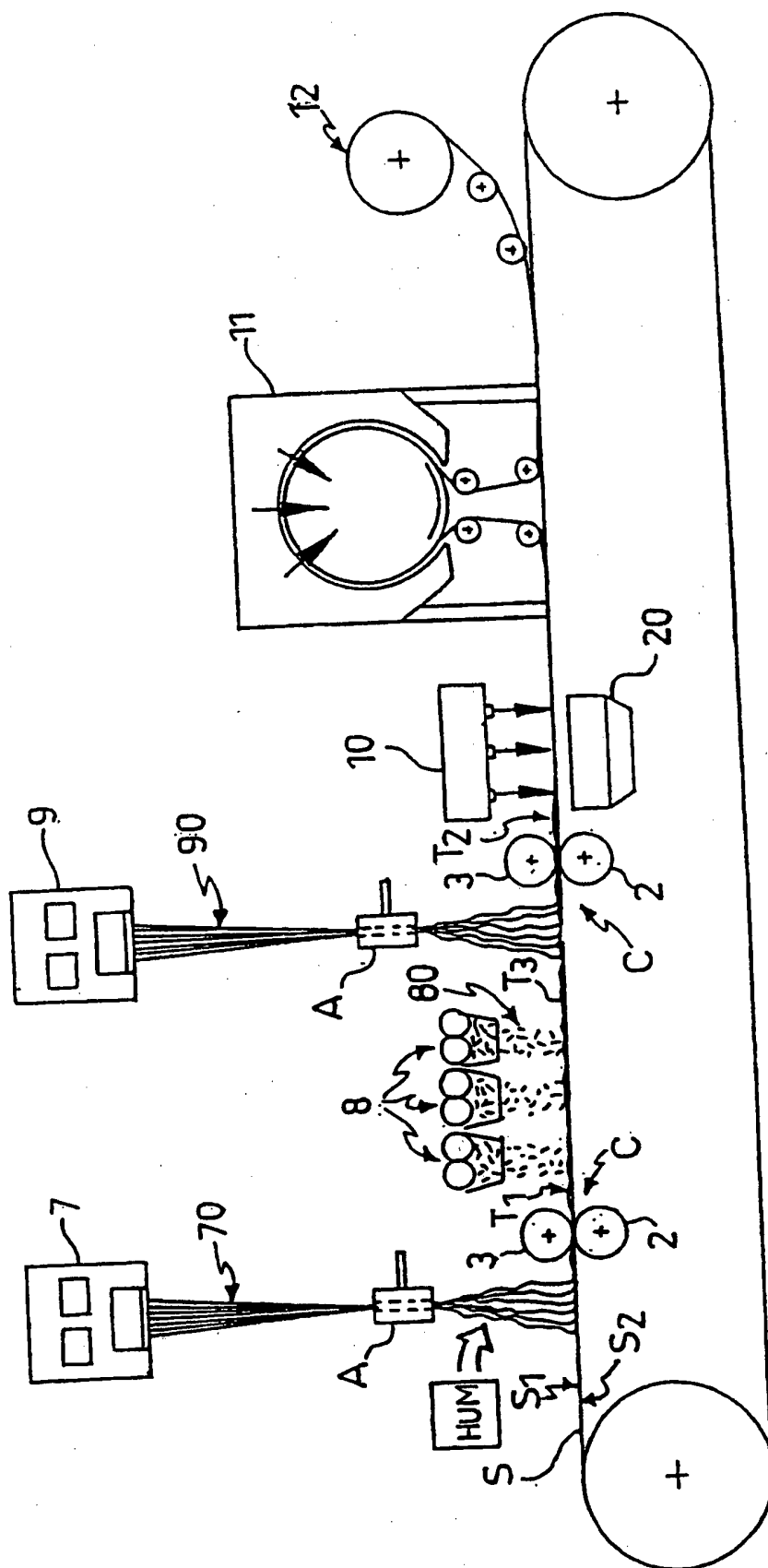


FIG.14a

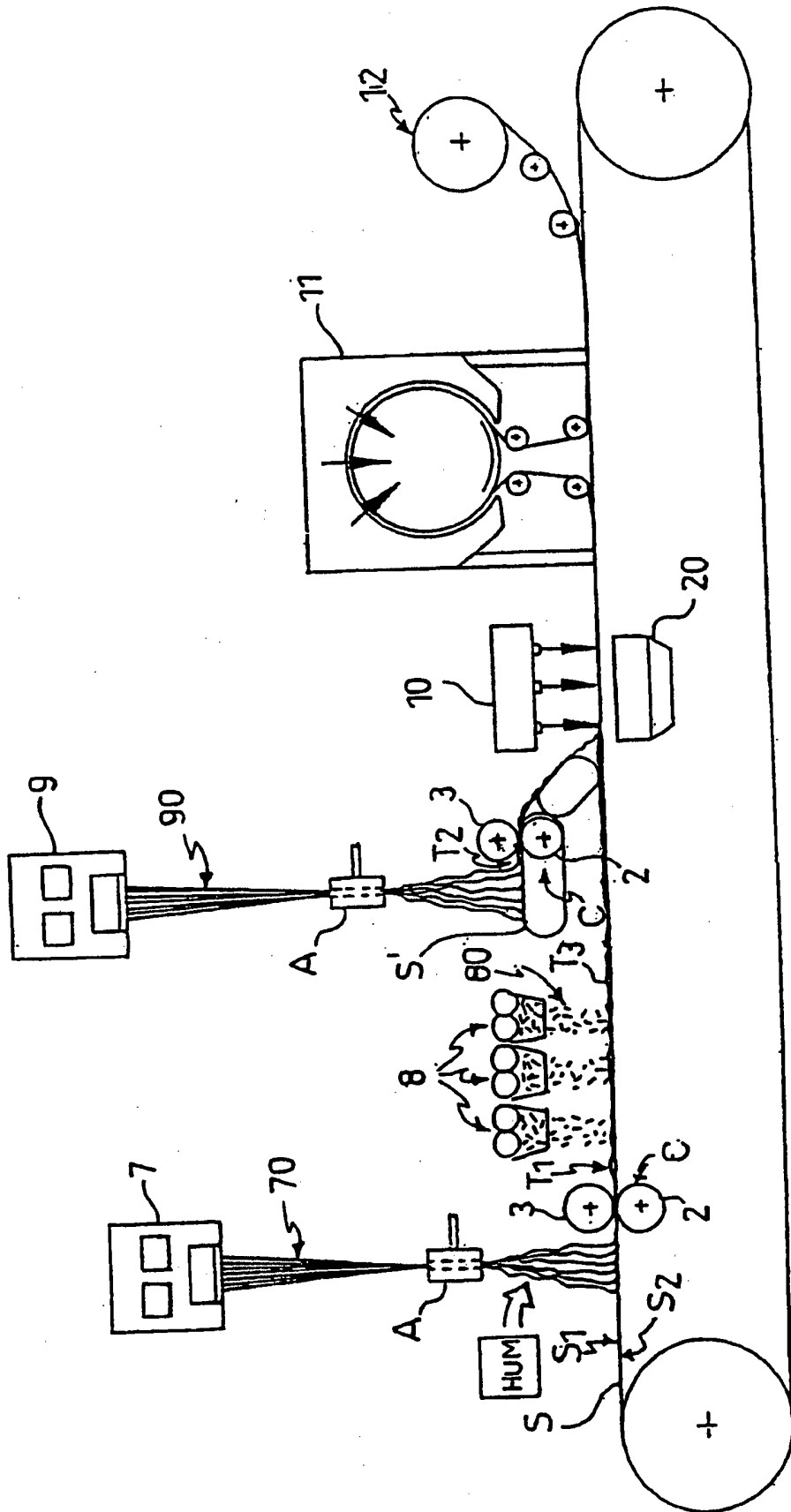


FIG.14b

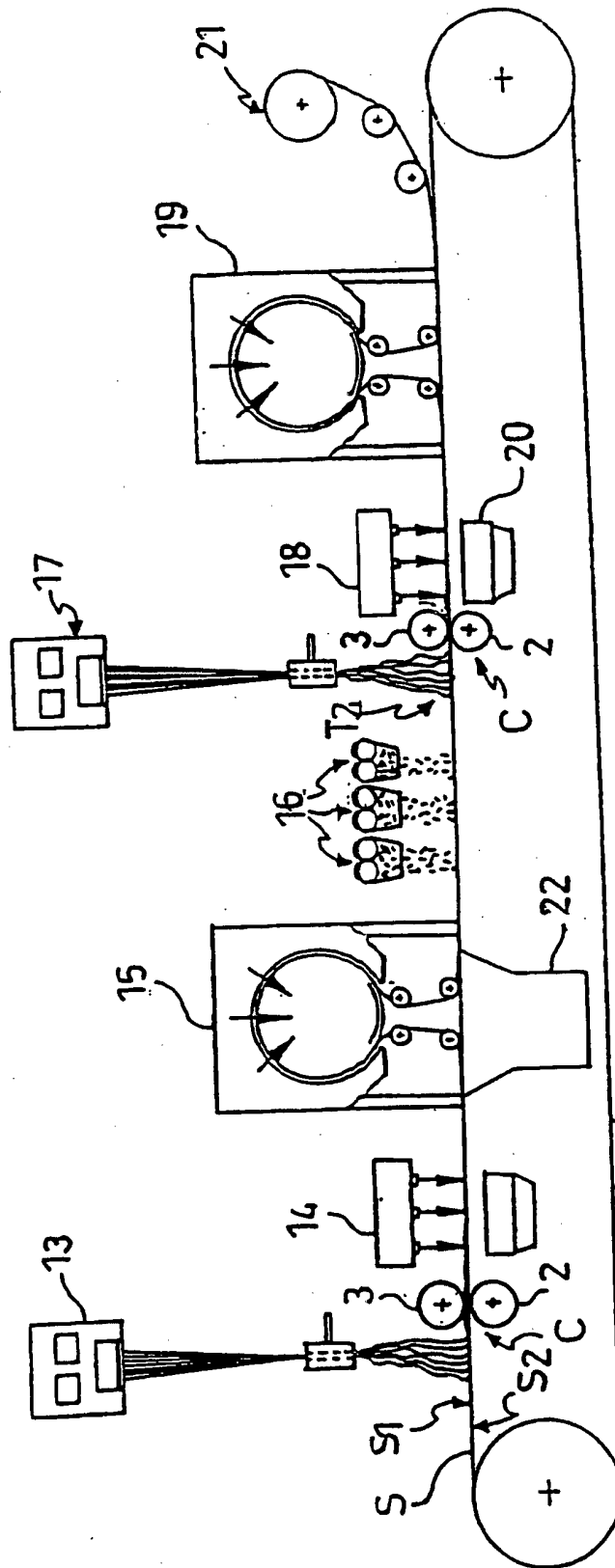


FIG. 15a

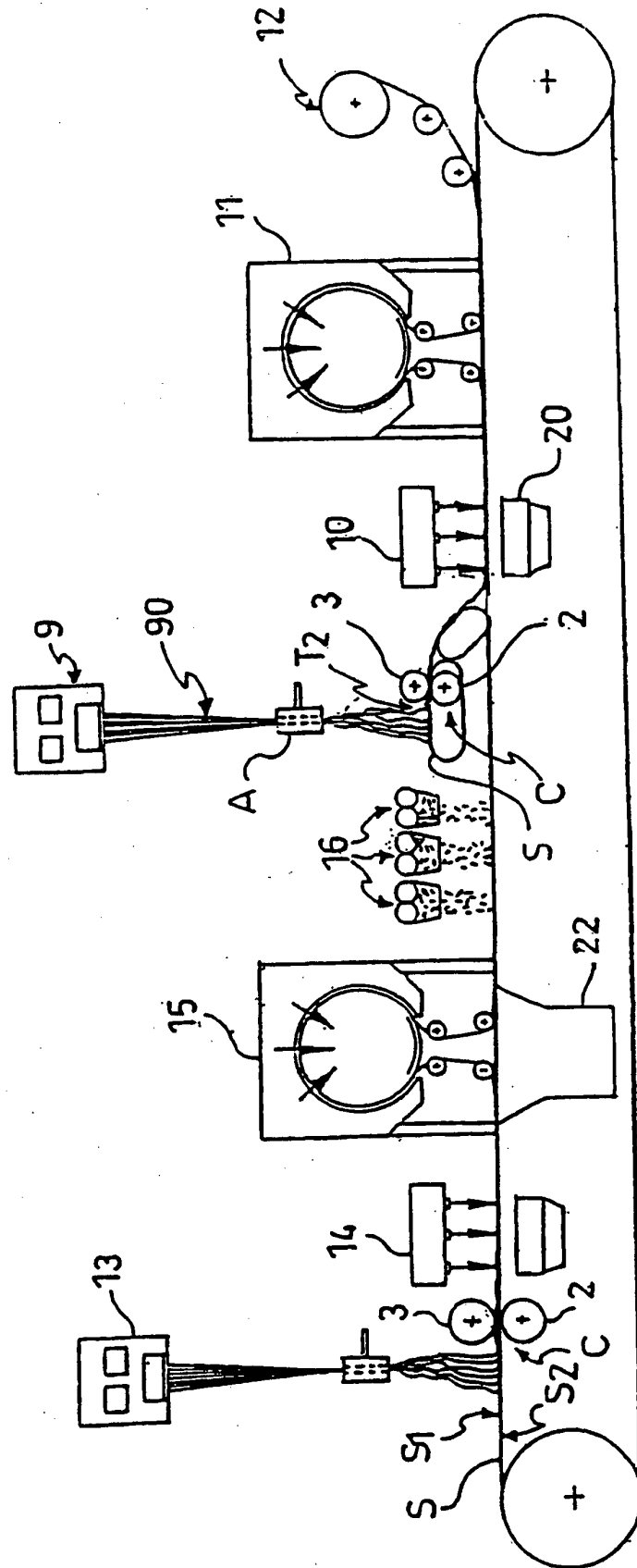


FIG. 15b

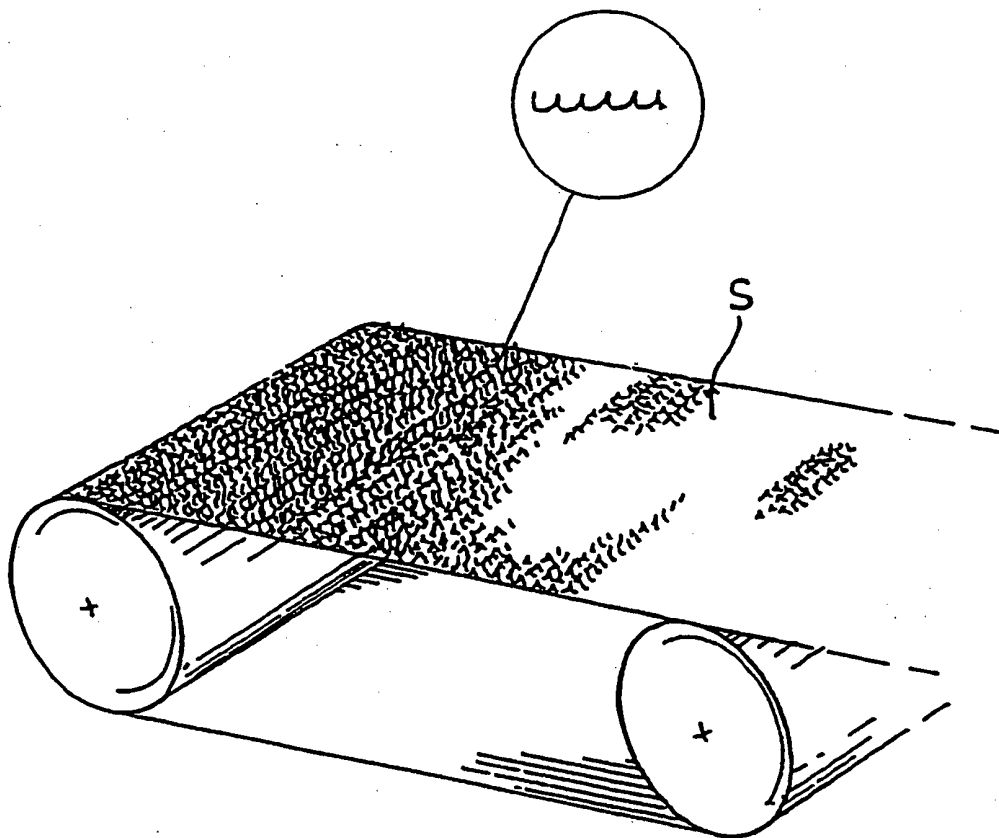


FIG. 16a

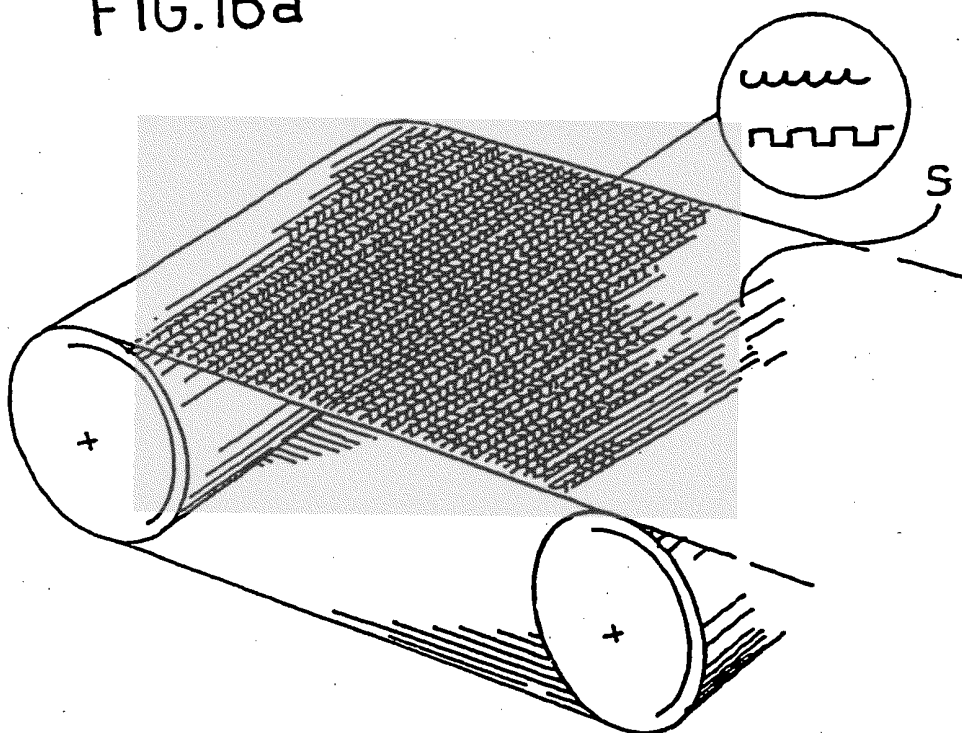


FIG. 16b

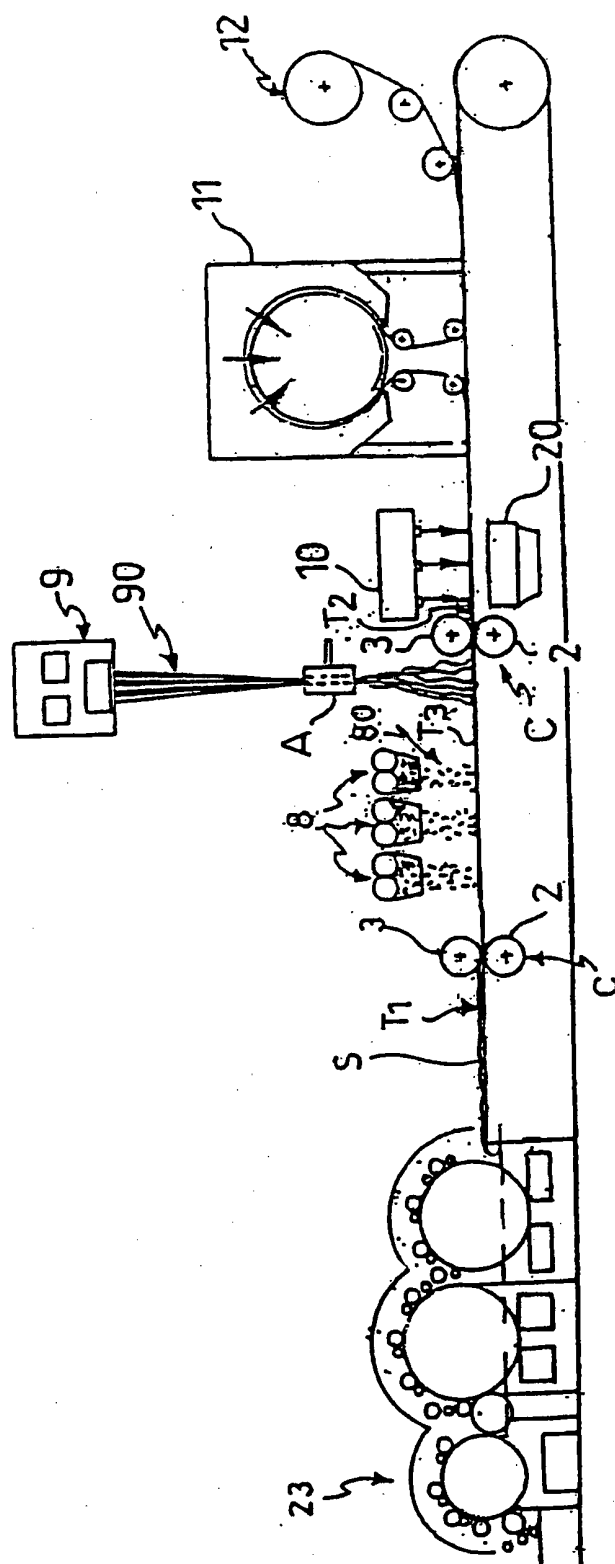


FIG.17

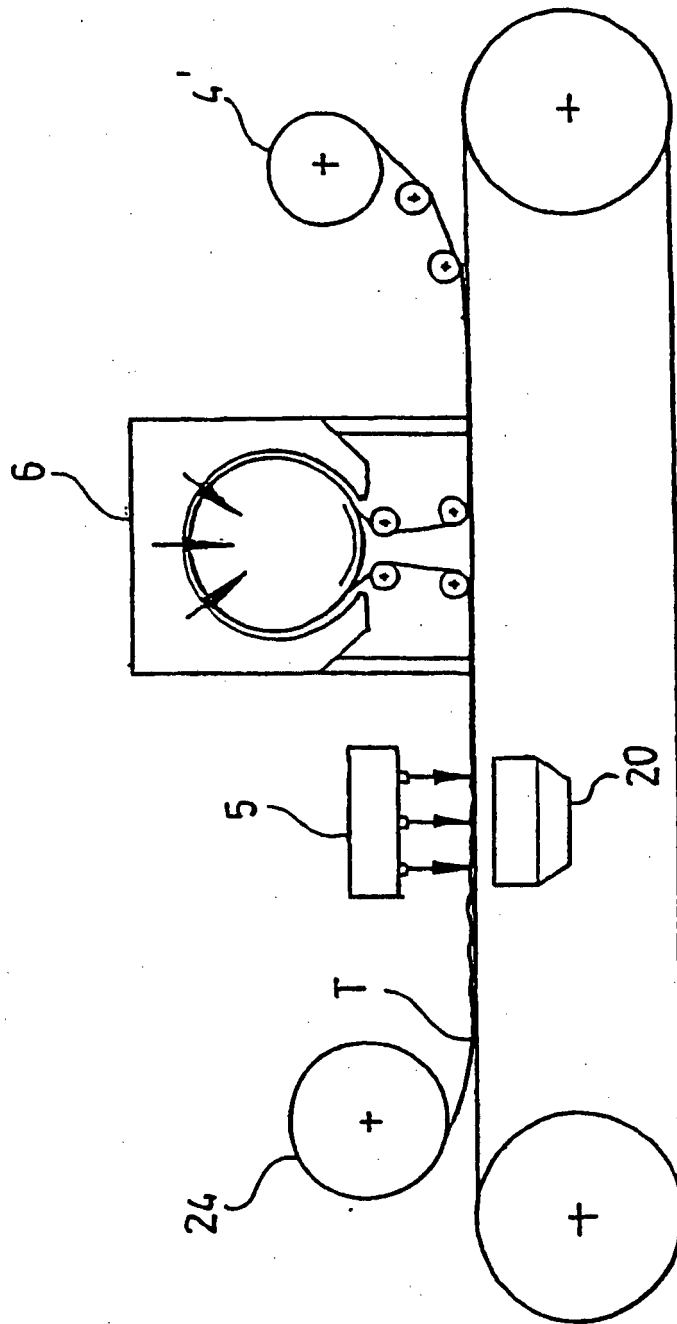


FIG. 18

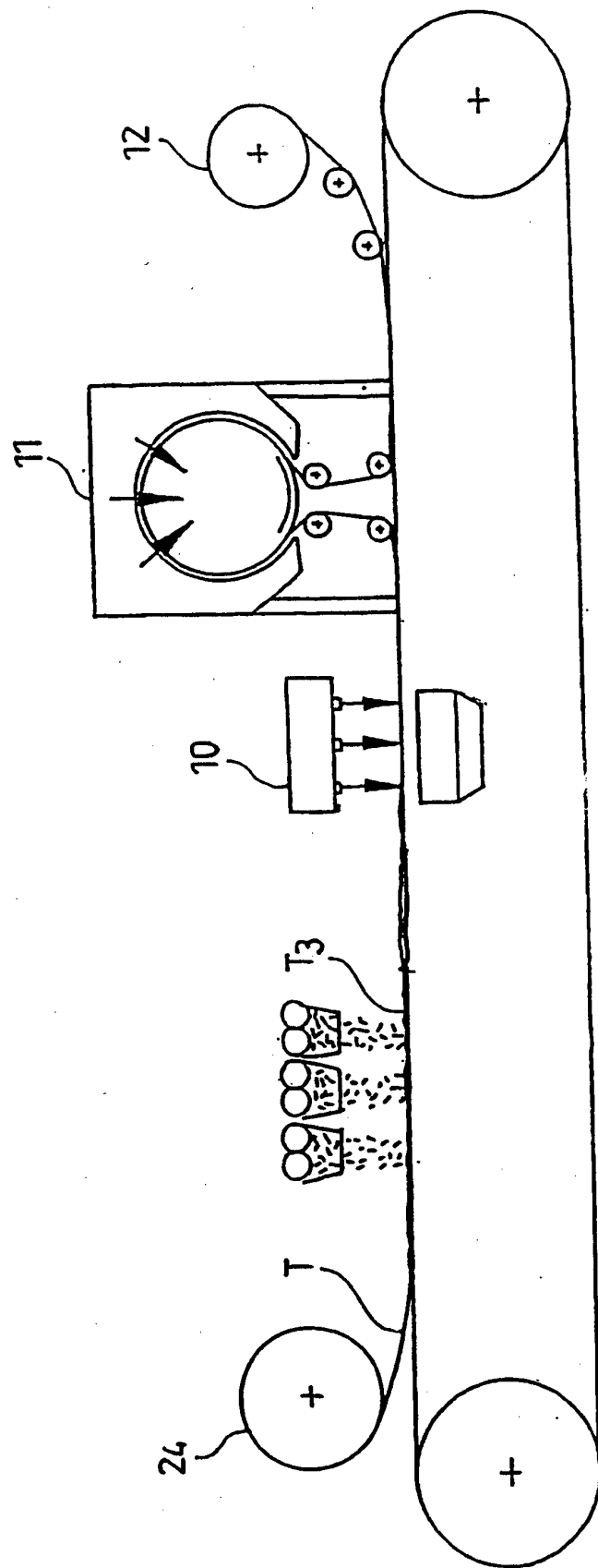


FIG.19

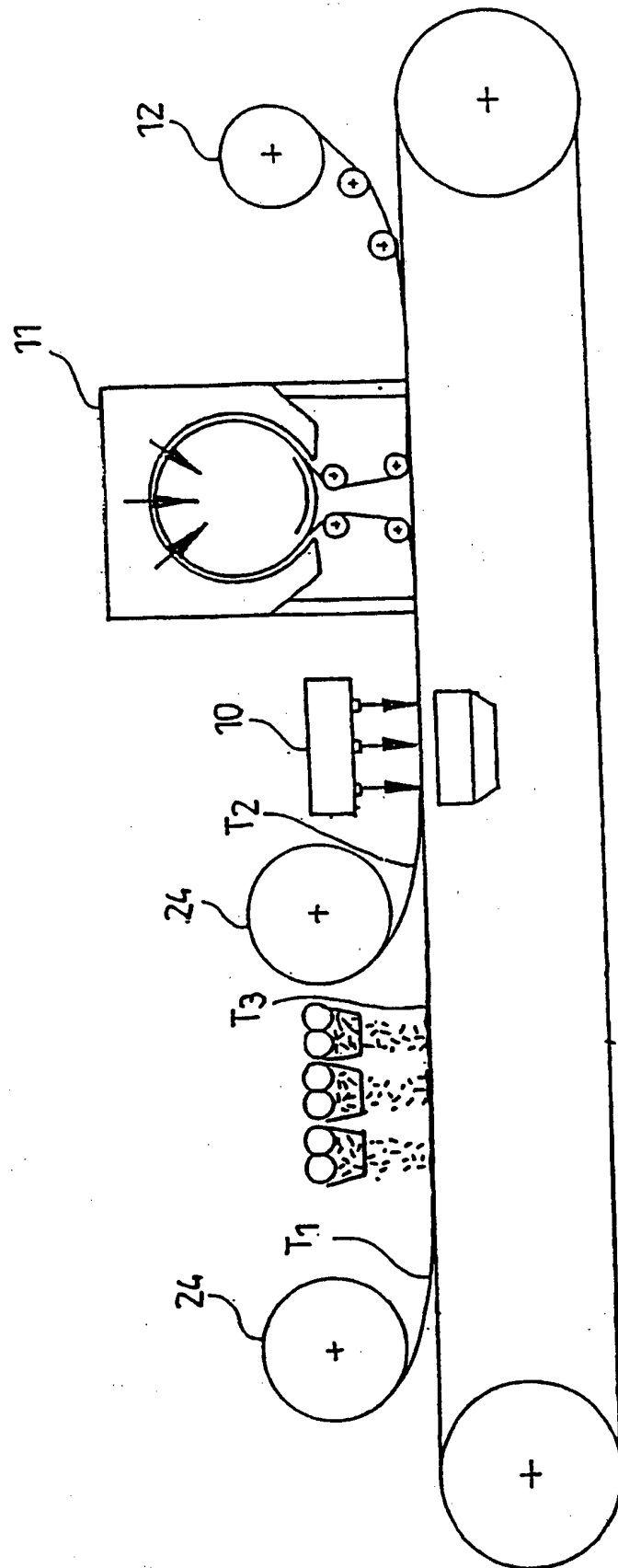
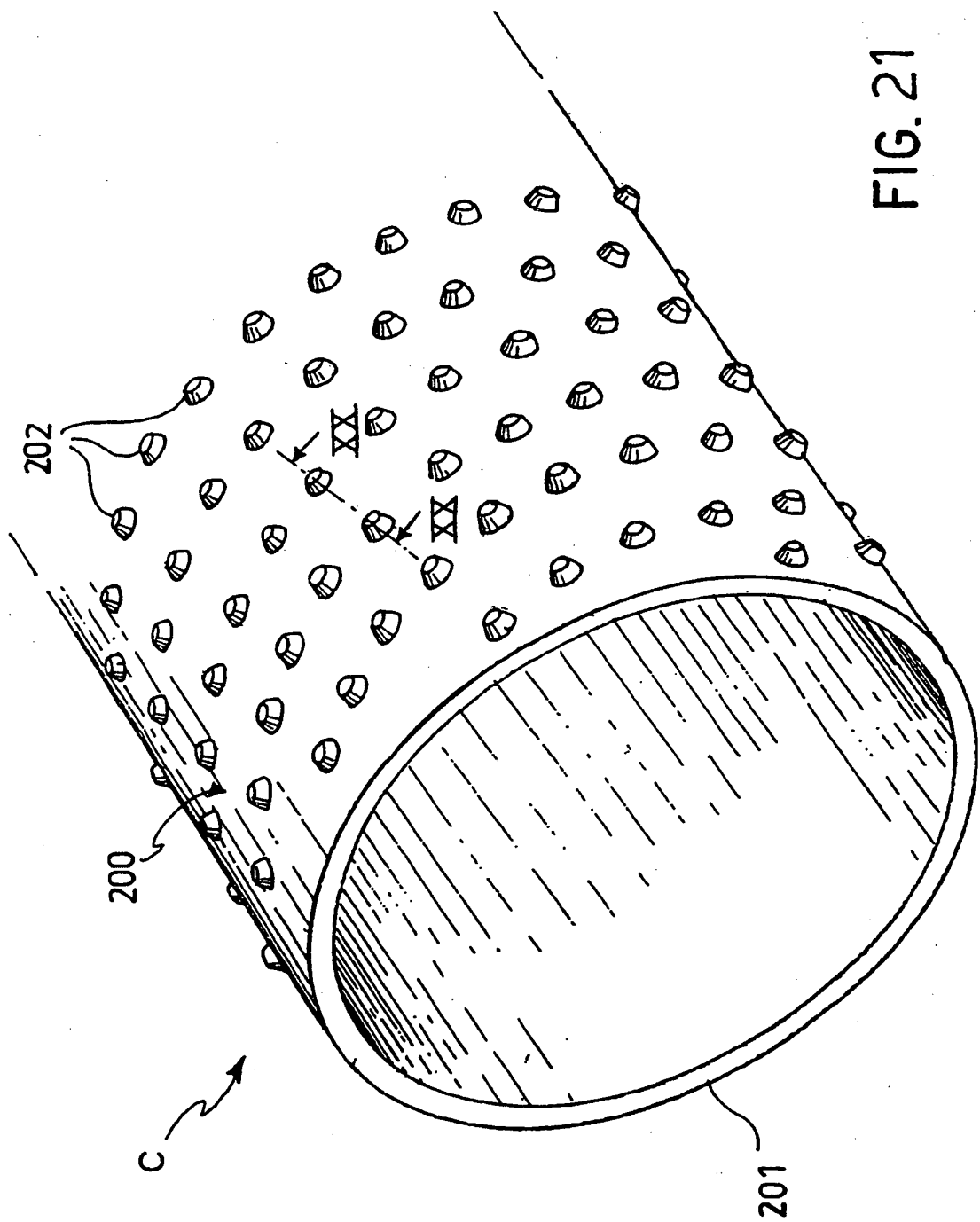


FIG. 20



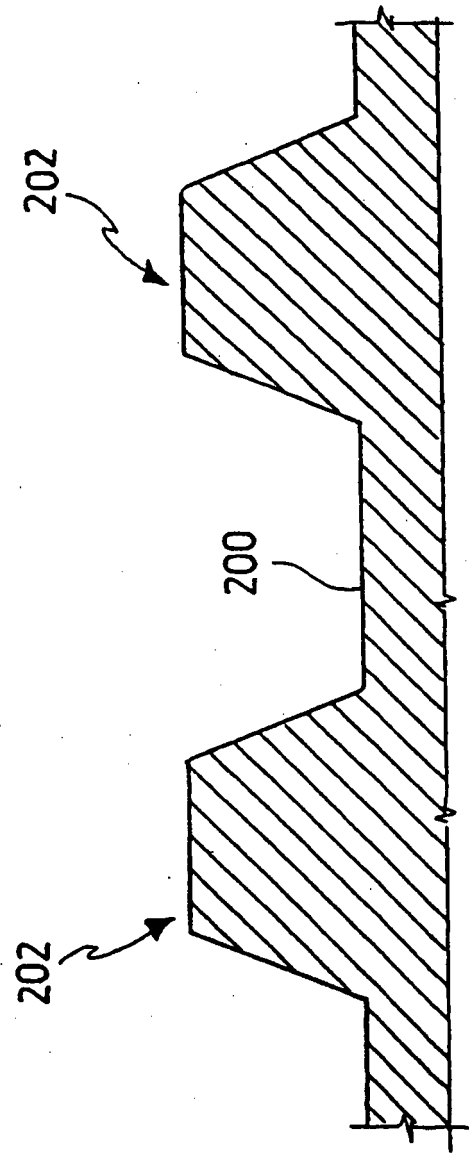


FIG. 22

REFERENCES CITED IN THE DESCRIPTION

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