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[54] **METHOD AND APPARATUS FOR THE TRANSFER OF A WET-LAID NONWOVEN TEXTILE WEB FROM A PERFORATED CONVEYOR SURFACE TO A SEIVE DRUM SURFACE**

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[51] **Int. Cl.** **F26b 3/06,** F26b 13/18, D21f 5/04

[58] **Field of Search** 162/207, 358, 359, 362, 162/117, 368, 369, 370, 317, 184, 185, 307, 362, 116, 114, 375, 306, 290; 34/115, 122; 117/119.8

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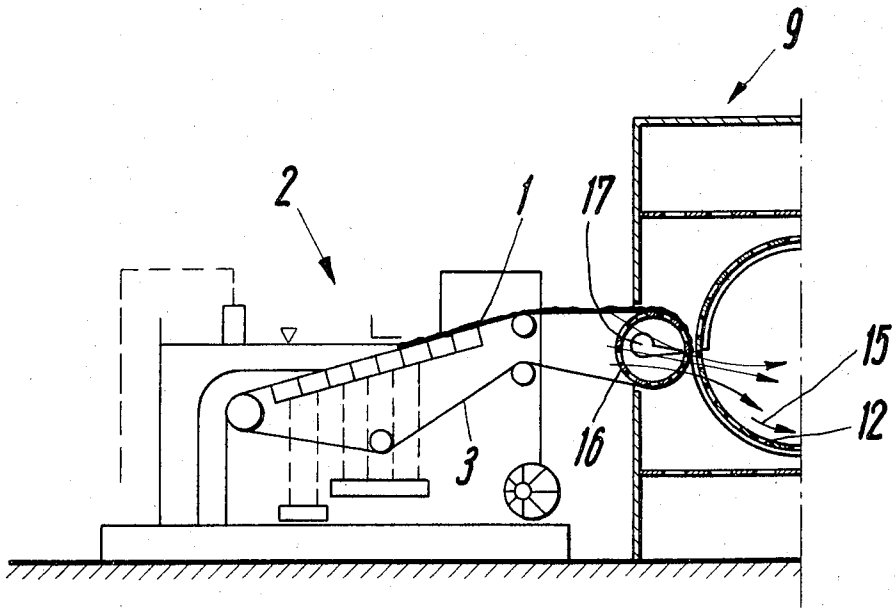
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[57] **ABSTRACT**

A fibrous web conveying system for transferring a newly formed web from a wet-laying unit to a seive drum dryer. The wet web is carried on a perforated conveying surface which comes into tangential contact with the curved surface of a perforated seive drum within the dryer, and web transfer is aided by air flowing through the perforated conveying surface into the seive drum by a suction draft. The perforated conveying surface can be a perforated hollow roller or an endless conveying belt such as a forming wire.

21 Claims, 7 Drawing Figures



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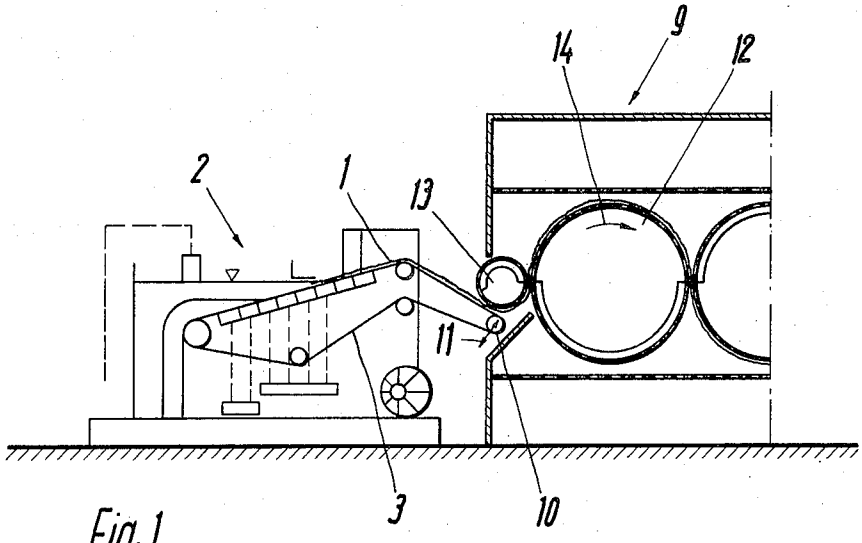


Fig. 1

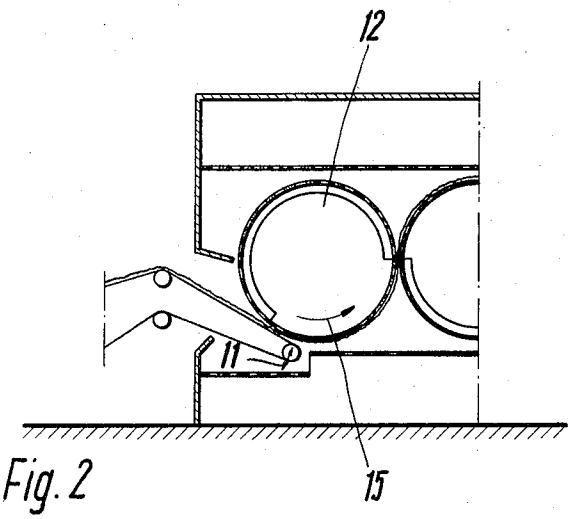


Fig. 2

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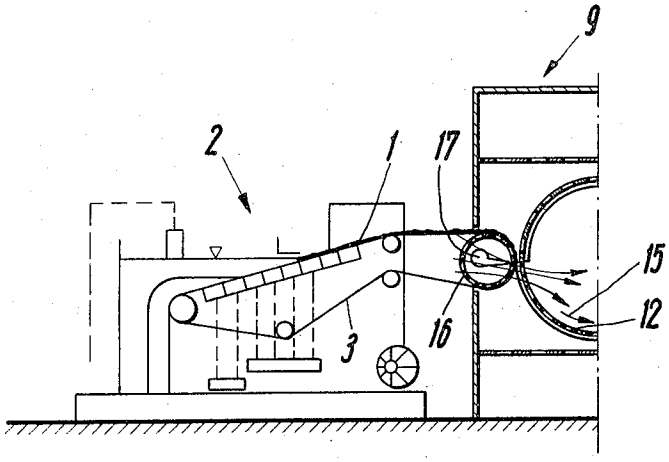


Fig. 3

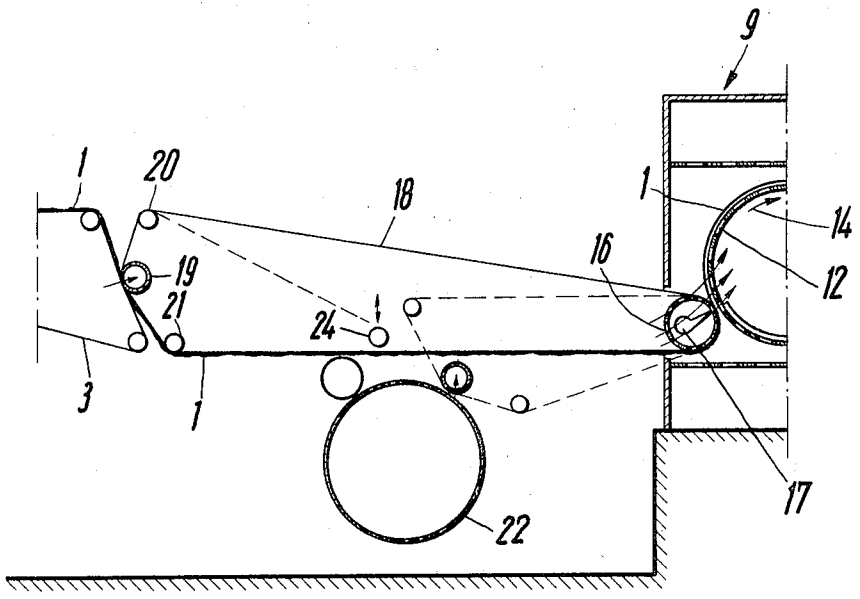


Fig. 4

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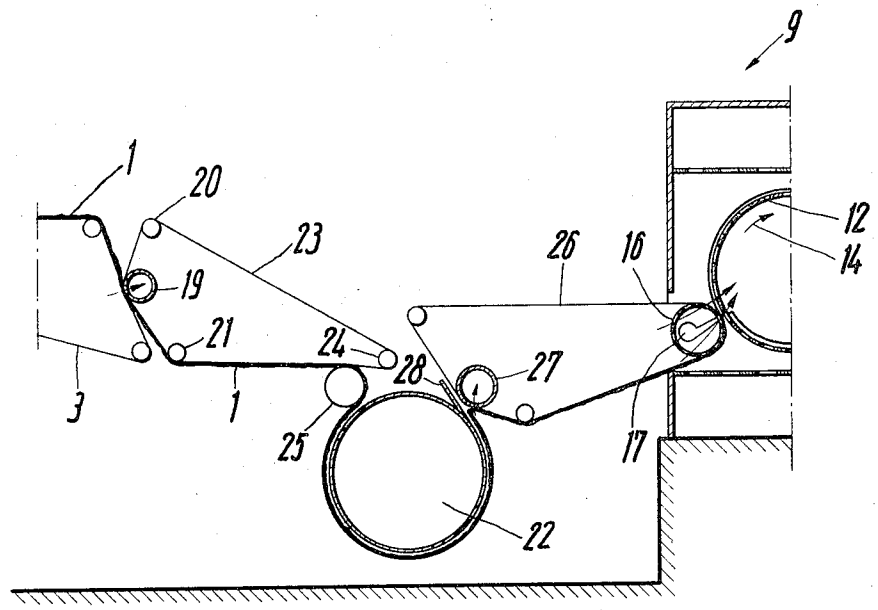


Fig. 5

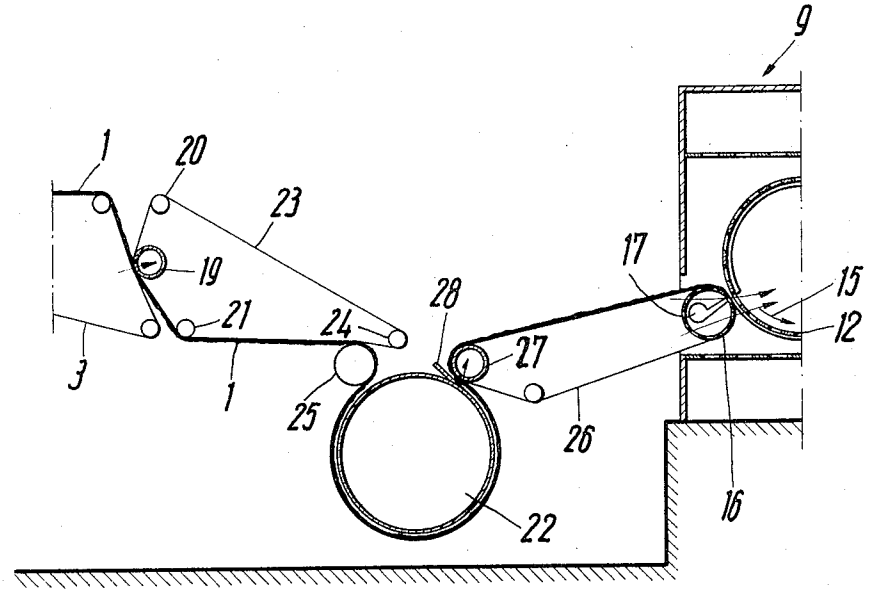


Fig. 6

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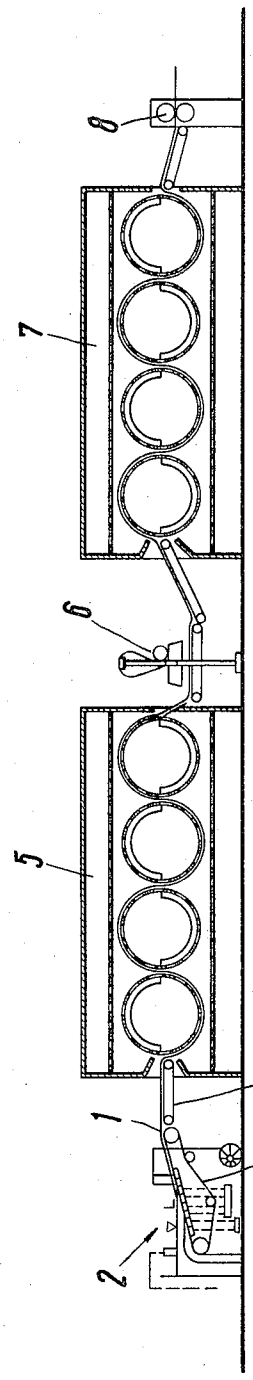


Fig. 7

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METHOD AND APPARATUS FOR THE TRANSFER OF A WET-LAID NONWOVEN TEXTILE WEB FROM A PERFORATED CONVEYOR SURFACE TO A SEIVE DRUM SURFACE

BACKGROUND OF THE INVENTION

The present invention relates to a wet-lay process for the production of nonwoven materials with textile properties, wherein the fibers are united into a web by means of a wet-web laying unit. The web is subsequently dried and bounded.

The wet-lay process which essentially resembles the process used for the production of paper has been found more advantageous than the dry-lay process because in the former case, the fibers are all mixed up at random whereas with the dry-lay process they are oriented in one direction by the carding machine used for the web formation. The structure of a web, which has been produced on a wet-lay process, is therefore more fabric-like than that of a web in which the fibers are oriented in one direction. Another advantage of the wet-lay process is that the web has a greater tensile strength and also a smaller quantity of bonding agent, which has been already added in the web laying machine is necessary in order to obtain the required strength of the web.

A web which has been produced on the wet-lay process usually has a moisture content of about 200 to 300 percent, when leaving the web laying machine, based on the bone-dry weight of the fibers. This moisture content is obtained by means of gravity dehydration and by suction pumps which are arranged underneath the perforated conveyor of the web laying machine.

Subsequent drying of the web was, up to now, effected on calender dryers, i.e., by means of contact. However, a web which has been dried on this type of cylinder dryer has a paper-like appearance because the surfaces are ironed, which means that the requirement of a textile appearance of the produced web is not met. It was therefore tried to dry a wet web by means of tensionless operating nozzle-type dryers in which the compressed air is applied to both sides of the material. This type of dryer, however, is not suited for processing thin webs because the webs are not strong enough and the fibers are blown apart. It is also possible to apply the drying air to the surface of the web only, but in this case the energy consumption required for obtaining the minimum drying effect is very high.

SUMMARY OF THE INVENTION

An object of the present invention is to avoid the prior art disadvantages in the treatment of nonwoven materials.

Another object of the present invention is to provide an improved process and apparatus wherein it is not only possible to dry the material economically but also to subject the web to various other processing steps before it is entirely dry.

Other objects and further scope of applicability of the present invention will become apparent from the detailed description given hereinafter; it should be understood, however, that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

The process and apparatus according to the invention comprises drying a web by means of a gaseous treatment medium which is drawn through the material. Here it is of advantage to pre-dry the web down to a residual moisture content of less than 150 percent, i.e., preferably between 30 and 80 percent, to apply preparations by printing or spraying or to impregnate the web with the same and finally to dry the web while simultaneously heat-setting the preparations disposed thereon.

It was unexpectedly found that not only very thin webs can be economically dried utilizing the suction principle but also very thick and wet webs. Since the wet webs are discharged from the web laying machine can have moisture contents of up to about 300 percent, it had been feared that the use of the suction principle, i.e., the suction drum principle, would not be applicable because it would be impossible to draw the hot air through very thick and very wet webs. Furthermore, it has also been feared that the web, especially a thin web, would be torn in two when being transferred from one drum to the next. However, experiments have shown that these fears were unfounded and that a very good drying effect could be obtained by drawing hot air through a thin web. It is, of course, still possible to predry the fiber web on heated cylinders before subjecting it to the final drying process in a perforated drum dryer. A web which has been dried in such a combination of drying aggregates can produce satisfactory results in the web as far as its textile properties are concerned, but it is more advantageous to dry it on perforated drum dryers only.

The subdivision of the drying process into a predrying and a final drying stage is of advantage because the web can be subjected to various other processing steps while it is still easily wettable. For example, it is known to add a bonding agent or the like to the web by adding the agent to the treatment liquor or the fiber deposit. It is impossible to dye or print the web or to apply it to the material in any other way. It is advantageous to interrupt the drying process and to add or apply to the web with little surface tension any agents which improve the final quality of the material.

Depending on the required degree of residual moisture content, pre-drying can be effected in a dryer comprising one or several perforated drums. It is known that, apart from having a greater drying effect, which is due to the use of several drums, the multi-drum dryers offer the additional advantage that the material is reversed at each point of passage from one drum to the next and therefore the hot air is applied alternately to both sides of the web. This kind of drying process can also be made use of for drying a thin, unbonded fiber web without any danger of the web being torn apart while being transferred from one drum to the next. The final drying can be conducted at a temperature of about 180°C to 230°C.

Immediately after the drying process, the dry fiber web can be squeezed or possibly embossed with a pair of cooled rollers so that the cloth-like web can be provided with surface patterns. The webs generally consist of pure synthetic fibers or synthetic/natural fiber blends to which the bonding agent is subsequently added. It is also possible to add bonding, melting or dis-

solving fibers to the fiber composite while the web is being formed.

The apparatus necessary for carrying out the process according to the present invention comprises a wet web laying unit with a subsequent perforated drum or sieve drum dryer or pre-dryer which is preferably a perforated drum dryer, an application unit and a final dryer which is also preferably a perforated drum dryer. Depending on the respective requirements, the final dryer, which can also serve as a bonding or heat-setting unit, can be followed by a pair of cooled squeeze rollers by means of which the web surface can be changed in any desired way. One problem with the drying of web webs by means of perforated drum dryers consists in the transfer of the very thin fiber web from the endless perforated conveyor to the drums. Since the web is very susceptible to tension there is the danger of its being torn apart. This problem can be solved by arranging the endless perforated conveyor of the wet web laying machine in such a way that it is reversed immediately in front of the first drum of the perforated drum dryer. It is especially advantageous if the deflector or reversing roller of the endless perforated conveyor is arranged to be swivellable toward the perforated or sieve drum of the dryer so that the perforated conveyor can be set to any required distance from the drum jacket. Just as with the other already suggested devices consisting of a perforated drum dryer and a preceding tentering frame, the distance between the perforated conveyor and the drum jacket is preferably equal to the thickness of the web so that the web is transferred either immediately onto the perforated drum or at least constantly supported by an intermediate transfer element.

On the basis of experiences gathered in combining perforated drum layers and tentering frames for processing fabrics, it is desirable to provide that the endless perforated conveyor be tangent to the bottom section of the first perforated drum so that the web is fed immediately onto the upward moving drum jacket. In another embodiment of the present invention, a transfer drum can be provided which is tangent both to the endless perforated conveyor and the perforated drum and the web, which is taken off the perforated conveyor by this transfer drum, is fed immediately onto the upward moving drum jacket. With this type of device it can be especially advantageous if the web is penetrated by cold air before coming into contact with the drums of the dryer. This can be obtained in a very effective way if the transfer drum is subject to a suction draft, is insulated towards the processing air in the dryer and draws in cold ambient air.

As has already been mentioned, it is known to guide the web over heated cylinders. The thus produced web, however, has a paper-like final appearance. For the production of webs with textile properties the present invention suggests the use of perforated drums which are subject to a suction draft as drying aggregates. This drying method ensures not only the production of webs with the desired properties, i.e., a full and soft handle, but also a more rapid and thus more economical drying than is obtained by means of the conventional contact drying aggregates. With contact drying processes it is known to transfer the web from the web laying machine to the dryer by transporting it from the endless perforated conveyor of the web layer onto an endless belt which is generally made or felt. The transfer element is usually a suction pipe around which the tensioned felt belt is guided by deflector rollers. At the transfer point the felt belt runs in the same direction as the perforated conveyor of the web layer so that the undisturbed transfer from conveyor to belt is safeguaded. From the felt belt the web is transferred to a deflector roller which then tranfers it to the heated cylinder on which the contact drying takes place. In this case the transfer of the web to the heated cylinder is hindered because a water film on the web eliminates any excessive friction or clinging of the web to the deflector rollers.

In order to ensure the undisturbed transfer of the web onto the first perforated drum of the dryer, it is suggested, according to the present invention to guide the endless perforated conveyor of the wet web laying machine to this first perforated drum and to reverse it by means of a deflector roller immediately in front of the drum. The endless perforated conveyor can thus be tangent to the first peforated drum and the web can be immediately transferred onto the jacekt of the drum which moves upward in the same direction. This transferring method which can possible be facilitated by another intermediate perforated drum ensures the safe transfer of the web from the wet web layer to the perforated drum dryer.

For the rapid drying of paper-like webs, i.e., webs which are guided around heated contact cylinders or webs with special properties, e.g., crepe paper, it is suggested according to the present invention to install a cylinder for contact drying between the web layer and the perforated drum dryer. In this case, too, the main problem is the transfer of the web from one drying aggregate to the next. Therefore, it is the task of the present invention to solve the problem of web transfer without any tension or pressure for the new drying method by means of contact and convection heat. This tension and pressure free transfer is obtained by means of another endless conveyor which is installed, in addition to the heated cylinder, between the web layer and the perforated drum dryer. The additional conveyor, which effects the web transfer, is guided by the deflector roller near the first perforated drum and by at least one other drum which is adjoined to the cylinder. It is of advantage to design this roller as a suction pipe, the suction slit of which is preferably situated at the point where the web is discharged from the cylinder. The endless conveyor can move either in the same direction or in the opposite direction to the cylinder, depending on the way in which the web is to be transferred onto the belt or the subsequent perforated drum. Also, a scrape can be adjoined to the suction pipe which takes the web off the cylinder. This is advantageous for the production of special types of paper such as crepe paper.

It is an essential feature of the present invention that the deflector roller which is mounted very near to the perforated drum is designed as a perforated hollow body rather than a solid roller. The use of such a perforated hollow roller ensures that the web is more easily released from the felt belt than it would be with a normal roller, without perforations. This is due to the air current flowing through the roller, which air current is produced by the fan of the first perforated drying drum. The air current flows against the reverse side of the web to be transferred to the perforated drum so that this air current alone compensates for any possibly existing friction between the web and the belt. As a conse-

quence, the web is transferred to the drum without any detrimental tension or pressure acting upon it.

In case the suction draft produced by the fan of the first perforated drum should not be sufficient for the release of the web from the endless belt which is possibly made of felt, it is suggested, according to the present invention, to arrange a blowing element within the hollow roller which blowing element points towards the section where the web is released from the endless belt. This type of hollow roller can be provided as the conveying element between the dryer and the drying cylinder as well as for the endless perforated conveyor of the web laying unit. It is of great advantage for both machine types.

DESCRIPTION OF THE DRAWINGS

The present invention will become more fully understood from the detailed description given hereinbelow and the accompanying drawings which are given by way of illustration only and thus are not limitative of the present invention and wherein,

FIG. **1** shows the section of a wet web laying machine with an adjoining perforated drum dryer, where the web is transferred from the web layer to the dryer;

FIG. **2** shows a device which is similar to that shown in FIG. **1**;

FIG. **3** shows a similar arrangement as FIG. **1**;

FIGS. **4** to **6** show a dryer for contact and convection drying which is installed behind a wet web laying machine. The different ciphers designate the different methods of transporting the web; and

FIG. **7** shows a complete production range for drying and bonding wet-lay webs.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A web, generally indicated as **1**, which is delivered from the web laying machine, is to be transferred from an endless perforated conveyor **3** to a subsequent perforated drum dryer **9**. For this purpose, the perforated conveyor is arranged near the dryer and in its reversing section it is provided with a reversing roller **10** which is movable in relation to the web layer **2** and the dryer **9**, i.e., towards the dryer **9**. This movability of the reversing end of the endless perforated conveyor **3** is indicated by the double headed arrow **11**.

Depending on the respective requirements, there can be a transfer element, e.g., a perforated roller **13**, as shown in FIG. **1**, arranged between the first perforated drum **12** and the transfer point. This transfer element can also be omitted as shown in FIG. **2**. In the device according to FIG. **1**, the web is directly taken off the transfer element by the perforated or sieve drum which is tangent to the transfer element and then adheres to the drum surface because of the fresh air flowing from the outside to the inside of the drum. From the perforated roller **13**, the web is then transferred to the positively rotating perforated or sieve drum **12**, rotating in direction **14**.

FIG. **2** shows another embodiment wherein the endless perforated conveyor **3** is tangent to the first perforated drum **12**, and the web is immediately transferred onto the negatively rotating drum **12** for further processing. Drum **12** rotates in direction **15**.

According to the embodiment of FIG. **3**, the transfer and deflector roller which is arranged immediately in front of the dryer is designed as a perforated hollow reversing roller **16**. This perforated hollow roller can have the same dimensions as the intake drum which is usually arranged at this point, so that the standard construction of the dryer does not have to be changed in order to adapt the dryer to the processing of wet-lay webs. Since the roller **16** is perforated, the air flows from the outside of the dryer **9** or possibly also from the processing chamber (see the arrows) through the perforated hollow roller towards the perforated drum **12** which is subject to a suction draft because of the action of a fan (not shown). The air which is drawn through the perforated hollow roller causes the web to be released from the endless perforated conveyor **3** without any other force being necessary. This air current is reinforced by a blowing unit **17** which is installed inside the hollow roller, the blow pipe of which points towards the point where the web **1** is released from the hollow roller **16**.

FIGS. **4** and **6** show a drying device for either pure convection drying or a combination of convection and contact drying. According to FIG. **4**, the conveyors are guided in such a way that the web **1** is transferred from the endless perforated conveyor **3** of the web lay shown in FIGS. **1** and **3** to another endless conveyor **18** by means of a suction pipe **19**. The endless conveyor **18** which is guided by deflector rollers **20** and **21** and by the perforated hollow roller **16** transports the web directly to the perforated drum **12** which, according to the arrow **14**, rotates in the upward direction and leads the web over its upper section.

Underneath and possibly also above the tensioned carrier stringer of the endless conveyor **18**, there is disposed a cylinder **22**, the jacket of which is heated. FIG. **5** shows another conveyor guidance system other than that shown in FIG. **4**. According to FIG. **5** the web **1** arriving from the web layer is transferred to a second endless conveyor **23**. This conveyor **23** is guided by the deflector rollers **20** and **21** and by a third roller **24** which is either swivellable (see FIG. **4**) or fixed at a certain distance from the cylinder **22** (see FIG. **5**). From this conveyor **23** the web is transferred to the contact dryer **22** via a deflector roller **25**. From the contact dryer **22** it is then transferred to the endless conveyor **26** leading to the dryer **9**, either in the way shown in FIG. **5** or in the way shown in FIG. **6**.

According to FIG. **5**, the conveyor **26** moves in the opposite direction to the contact dryer **22** so that the web is guided on the bottom stringer of the conveyor **26** and transferred onto the jacket surface of the perforated drum **12**. In the device according to FIG. **6**, the contact dryer **22** and the conveyor **26** move in the same direction so that the web is guided onto the upper stringer of the conveyor **26** and then transferred onto the bottom section of the perforated drum **12** by means of the perforated hollow roller **16**. The conveyors **18**, **23** and **26** can be easily exchanged and although the deflector rollers remain at their places when they are not operating they are no hindrances to material flow.

The web adheres tightly to the contact dryer **22** so that it is rather difficult to take the web off the jacket of the cylinder. Apart from the suction pipe **27**, FIGS. **5** and **6** show a scraper **28** which is installed at the point of release and which takes the web off the cylinder by constantly touching the jacket surface with its knife edge and continuously moving to and fro. In this way the special structure of crepe paper, for example, can be produced.

FIG. 7 shows a device in which the web is dried and heat-set on the perforated drums subject to a suction draft. The web which has been formed in the web laying machine 2 is transferred to the pre-dryer 5 by means of endless conveyors 3 and 4. The pre-dryer 5 consists of several perforated drums subjected to a suction draft, which are arranged in line, one behind the other, and over which the web is guided alternately on the top and the bottom drum sections. The pre-dryer 5 is followed by a unit 6 in which the fiber web can be subjected to a series of different processes.

It is advantageous to subject a web which is not completely dry to these processes because the dyestuffs or bonding agent preparations contain liquids which make a second drying process necessary. In any event, fibers which are not completely dry are more easily wettable with these preparations. Therefore, the web need not be completely dry and in the final dryer 7 following the unit 6, the web can be bonded and the applied dyestuffs simultaneously heat-set. The final dryer 7 is followed by a squeezing unit 8 comprising a pair of cooled rollers, by means of which unit the web can be provided with the required surface properties.

The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications as would be apprent to one skilled in the art are intended to be included.

What is claimed is:

1. A method for the wet-lay production of nonwoven textile materials which comprises uniting textile fibers into a wet web on a wet web laying unit, said web having a moisture content of up to about **300%**, conveying said wet web from said web laying unit on an endless perforated conveyor means, transferring the wet web from said perforated conveyor means to a sieve drum dryer containing at least one sieve drum means having a conveying surface subjected to a suction draft, said wet web being transferred to the conveying surface of a first sieve drum means due to the suction draft applied to said sieve drum means in said drier by positioning one end of the conveyor means closely adjacent and tangent to the conveying surface of said first sieve drum means and by reversing the direction of travel of the conveyor means on which said web is being conveyed immediately in front of the conveying surface of said first sieve drum means, and drying the wet web in said sieve drum dryer to the desired moisture content by conveying said wet web on the conveying surface of said sieve drum means and by drawing a heated gaseous treatment medium through the web and through said conveying surface by said suction draft.

2. The method of claim **1,** wherein the heated treatment medium is hot air.

3. The method of claim **1,** wherein the conveying surface of the first sieve drum means is travelling in substantially the same direction as the web at the time of transfer.

4. The method of claim **1,** wherein the wet web is first predried down to a residual moisture content of between 30 and 80 percent in said sieve drum dryer, the predried web is then treated with heat-settable liquid preparations, and the treated web is finally dried while these preparations are simultaneously heat-set on the web in another sieve drum dryer.

5. The method of claim **4** wherein the predrying and final drying of the web is effected by conveying the web on the surface of at least one sieve drum means subjected to a suction draft and wherein the treatment medium is drawn through the web, alternately from both sides of the web, thereby penetrating the web a plurality of times.

6. The method of claim **4,** wherein after final drying, the dry fiber web is embossed between a pair of opposing cooled rollers.

7. The method of claim **4,** wherein the final drying is effected at a temperature of about 180°C to 230°C.

8. An apparatus for the wet-lay production of nonwoven textile materials which comprises a wet laying unit, at least one endless perforated conveyor means having a conveying surface for conveying a wet web formed of textile fibers from within said unit to a sieve drum dryer containing at least one sieve drum means having a curved conveying surface subjected to a suction draft for drawing a heated gaseous treatment medium into said sieve drum means, said sieve drum means being rotatably mounted within said dryer, one end of said conveyor means extending into close proximity of and being tangent to the curved conveying surface of a first sieve drum means in the sieve drum dryer, said conveyor means including a reversing roller means positioned at said one end for reversing the direction of travel of said conveying surface immediately in front of the curved conveying surface of said first sieve drum means to effect transfer of said web to said sieve drum means by said suction draft, the curved conveying surface of said first sieve drum means travelling substantially in the same direction as the web during transfer of the web from said conveyor means.

9. The apparatus of claim **8,** wherein the sieve drum dryer is a predryer, which is followed by an applicating means and a final dryer containing at least one sieve drum means subjected to a suction draft.

10. The apparatus of claim **9,** wherein the final dryer is followed by a squeezing unit consisting of two opposing, cooled squeeze rollers.

11. The apparatus of claim **8,** wherein the reversing roller means is a hollow, perforated reversing roller disposed tangent to the side portion of the first sieve drum means, thus facilitating the transfer of the web from the conveyor means to an upward moving curved conveying surface of the first sieve drum means.

12. The apparatus of claim **8,** wherein means are provided for mounting said reversing roller means to be swivellable toward and away from the first sieve drum means of the sieve drum dryer.

13. The apparatus of claim **8,** wherein the the reversing roller means is arranged adjacent to said sieve drum dryer whereby said reversing roller means is supplied with fresh air from outside of said sieve drum dryer.

14. The apparatus of claim **8,** wherein said sieve drum dryer includes a housing in which said first sieve drum means is rotatably disposed, said housing having an inlet through which the web enters the sieve drum dryer, and said reversing roller means at the end portion of the endless perforated conveyor means includes a hollow, perforated reversing roller, said reversing roller being positioned in the inlet of said housing whereby fresh air is drawn through said hollow perforated roller towards the first sieve drum means in said sieve drum dryer.

15. The apparatus of claim 14, wherein the hollow, perforated reversing roller contains a blowing element which is pointed in the direction of that portion of the hollow roller from which the web is released from the hollow roller.

16. The apparatus of claim 14, wherein the perforated hollow roller is designed as a reversing roller for an intermediate endless conveyor means which takes the web off a conveyor means of the web web laying unit and transports it to the sieve drum dryer.

17. The apparatus of claim 8, wherein the endless conveyor means includes a belt made of felt.

18. The apparatus of claim 8, wherein the reversing roller means is a hollow, perforated reversing roller disposed tangent to the bottom side portion of the first sieve drum means, thus facilitating the transfer of the web from the conveyor means to a downwardly moving curved conveying surface of the first sieve drum means; said at least one perforated conveyor means including an endless conveyor means of said wet laying unit on which the wet web is formed and two other endless conveyor means for transporting the web to said sieve drum dryer; and a heated cylinder positioned between said two other endless conveyor means for contacting said web.

19. The apparatus of claim 8, wherein the at least one endless perforated conveyor means includes an endless perforated conveyor means within said wet laying unit on which the wet web of textile fibers is formed and at least one other endless perforated conveyor means, said other conveyor means transporting said web from the conveyor means of the wet web laying unit to the sieve drum dryer and a suction roller disposed at the point of transfer of the wet web from the conveyor means of the wet laying unit to the other conveyor means.

20. An apparatus for the wet-lay production of nonwoven textile materials which comprises a wet laying unit, at least one endless perforated conveyor means having a conveying surface for conveying a wet web formed of textile fibers from within said unit to a sieve drum dryer containing at least one sieve drum means having a curved conveying surface subjected to a suction draft for drawing a heated gaseous treatment medium into said sieve drum means, said sieve drum means being rotatably mounted within said sieve drum dryer, one end of said conveyor means extending into close proximity to a first sieve drum means in the sieve drum dryer, a perforated transfer drum subjected to a suction draft tangentially disposed between the one end of said endless perforated conveyor means and the first perforated sieve drum of the sieve drum dryer, the curved conveying surface of said first sieve drum means travelling in the same direction as said web at the time of transfer.

21. An apparatus for the wet-lay production of nonwoven textile materials which comprises a wet laying unit, at least one endless perforated conveyor means having a conveying surface for conveying a wet web formed of textile fibers from within said unit to a sieve drum dryer containing at least one sieve drum means having a curved conveying surface subjected to a suction draft for drawing a heated gaseous treatment medium into said sieve drum means, said sieve drum means being rotatably mounted within said dryer, one end of said conveyor means extending into close proximity of and being tangent to the curved conveying surface of a first sieve drum means in the sieve drum layer, said conveyor means including a reversing roller means positioned at said one end for reversing the direction of travel of said conveying surface immediately in front of the curved conveying surface of said first sieve drum means to effect transfer of said web to said sieve drum means by said suction draft, the curved conveying surface of said first sieve drum means travelling substantially in the same direction as the web during transfer of the web from said conveyor means, said at least one perforated conveyor means also including an endless conveyor means of said wet laying unit on which the wet web is formed and two other endless conveyor means for transporting the web to said sieve drum dryer; and a heated cylinder positioned between said two other endless conveyor means for contacting said web.

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