# United States Patent [19]

**Fleissner**

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[54] **PROCESS FOR SHRINKING NON-WOVEN WEBS**


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[73] Assignee: **VEPA AG,** Switzerland



[ * ] Notice: The portion of the term of this patent subsequent to Mar. 31, 1987, has been disclaimed.

[22] Filed: **Jan. 24, 1973**

[21] Appl. No.: **326,559**

**Related U.S. Application Data**

[63] Continuation of Ser. No. 850,549, Aug. 5, 1969, abandoned.

[30] **Foreign Application Priority Data**

Aug. 17, 1968 Germany ..... 1785165

[52] **U.S. Cl.** ..... **26/18.5;** 34/115; 68/DIG. 5

[51] **Int. Cl.** ..... **D06c 1/08;** D06c 27/00

[58] **Field of Search** ..... 26/18.5; 28/72 HR, 72 NW, 28/72.17; 34/115; 68/DIG. 5



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[57] **ABSTRACT**

A process for the production of felts by shrinking a continuous random web of textile material which includes the steps of heating the material to be treated shock-like to a shrinking and heat-setting temperature and drawing a heated treatment medium through the web of material while it is being conveyed on a perforated surface of at least one sieve drum means, the differential pressure across the web of material on said surface being less than the shrinkage forces whereby a uniform shrinkage of the material is obtained.


**10 Claims, 6 Drawing Figures**

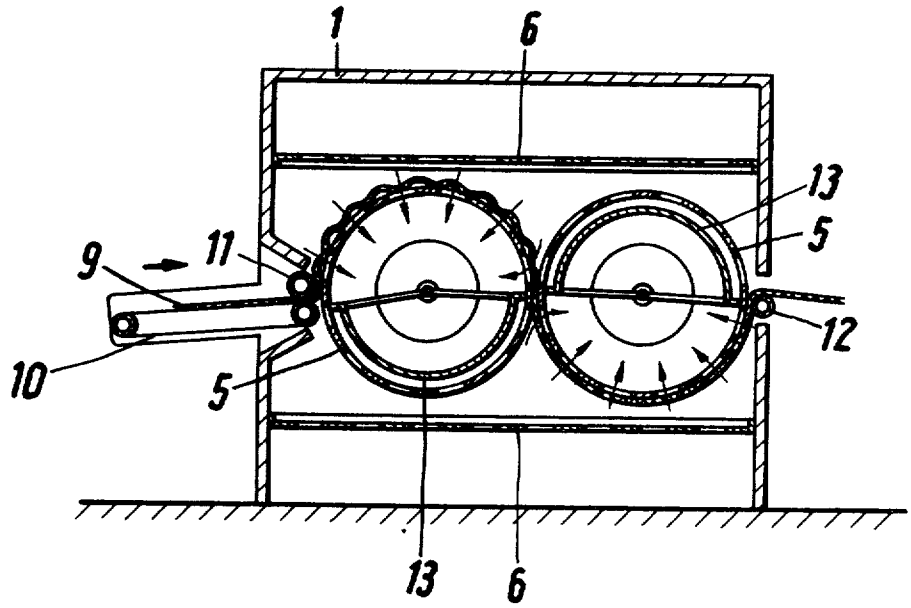


Fig.1

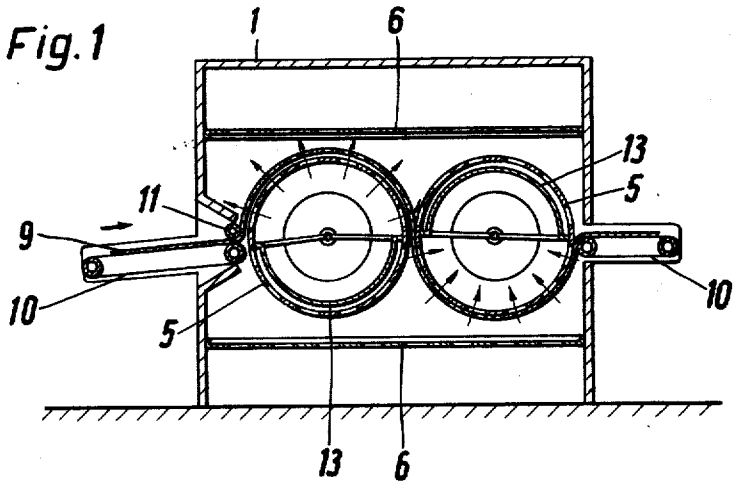



Fig.2

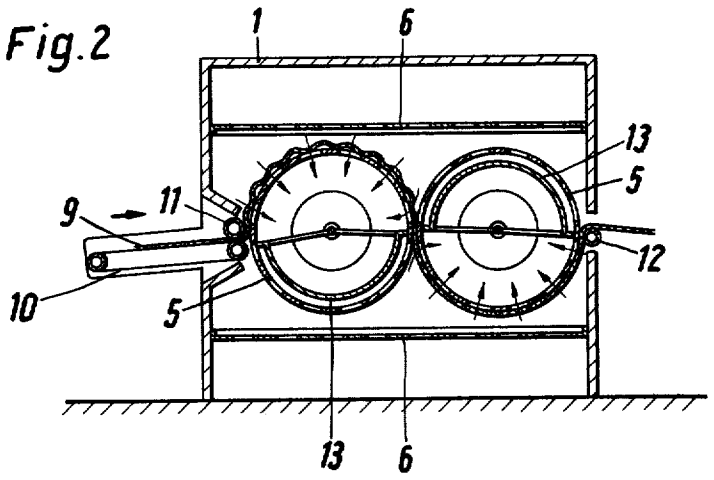
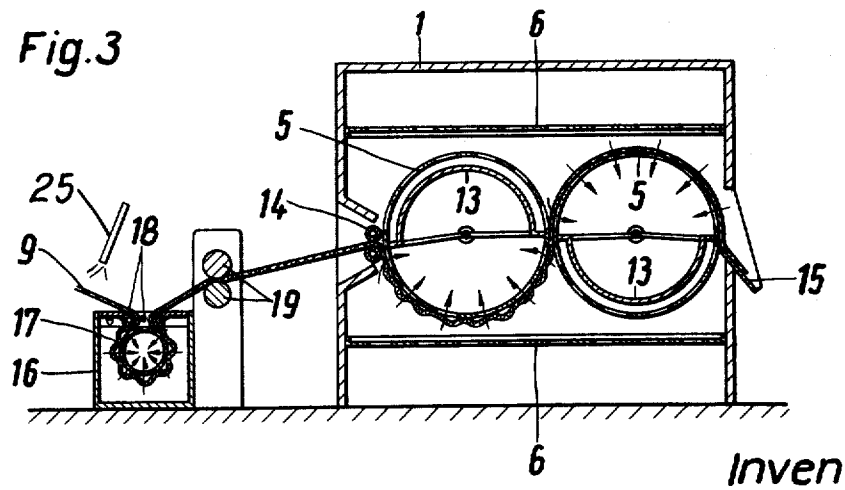



Fig.3




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Fig. 4

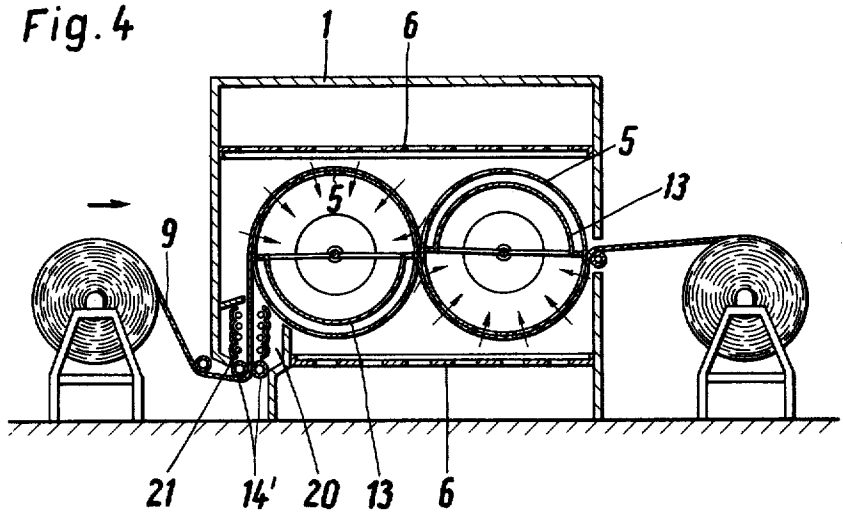
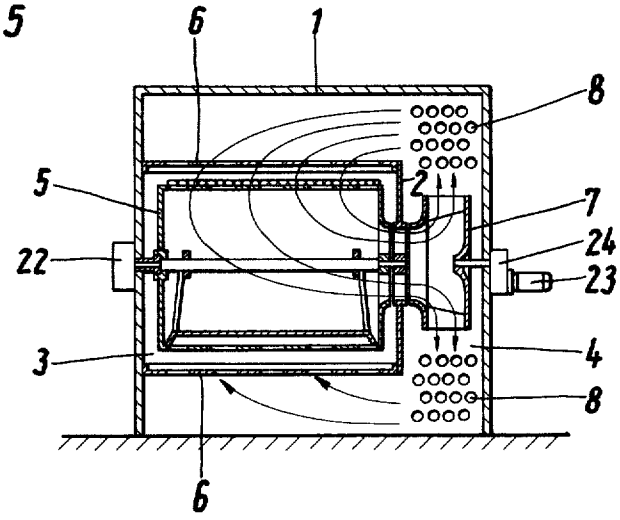



Fig. 5



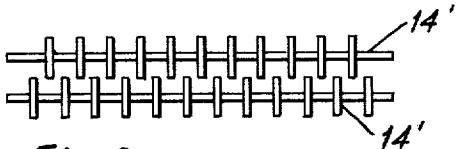




Fig. 6

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# PROCESS FOR SHRINKING NON-WOVEN WEBS

## CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation of application Ser. No. 850,549, filed Aug. 15, 1969, now abandoned.

## BACKGROUND OF THE INVENTION

The present invention relates to a process for the production of felts, particularly synthetic leather, by shrinking a continusous random web which contains at least two fiber types. Typical combinations of fiber types include for example, polypropylene and a polyamide, polypropylene and rayon staple, polypropylene and a polyester, polyamide high-shrink fibers and normal polyamide fibers, polyester high-shrink fibers and normal polyester fibers, combinations of other synthetic fibers and the like. According to the present process, one fiber of said combination of fibers shrinks substantially more under the influence of heat than the other one of said combination of fibers. Advantageously, the continuous random web is needled before shrinking.

It is well known to produce felts by shrinking wherein a certain portion high-shrink fibers are added to the felts. Shrinking is effected either in a water bowl or by jetting the web with hot air or, in the case of a polyamide, by treating said polyamide with steam. The well known processes exhibit the disadvantages that the felts are corrugated after the shrinking process and accordingly optimum shrinkage values are not obtained.

## SUMMARY OF THE INVENTION

An object of the present invention is to avoid the prior art disadvantages in processes for the production of felts.

Another object of the present invention is to provide an improved process for the production of felts wherein the production of denser and smoother felts is effected by means of shrinking.

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.

Pursuant to the present invention, it has been found that the abovementioned disadvantages may be eliminated and a much improved process for the production of felts may be obtained by heating a continuous random web shock-like or rapidly to he shrinking and/or heat-setting temperature and by drawing a gaseous and/or vaporous or liquid treatment medium around and through the web of material, at least during a portion of the shrinking and/or heat-setting treatment stage, while it rests on a plane or a curved permeable support, such as for example, a sieve drum means.

The conveying element may be a sieve subjected to a suction draft, advantageously one or more sieve drum means. As a result of the suction draft the web or the felt is forced onto the sieve drum, and thus a completely smooth felt is produced. Up to now, it was considered impossible to use conveying elements subjected to a suction draft for shrinking purposes in felt production because it was feared that the suction draft would hold the web too firmly to the sieve and also that shrinkage would not be uniform over the entire working width, that is, it was expected that the material would shrink more at the edge portions than in the middle portions of the material length. With the common treatment devices with sieve drums subjected to a suction draft, this effect actually does occur. Here the suction draft is stronger than the shrinkage forces. However, in accordance with the present invention, it has been found that a uniform shrinkage can be obtained using conveying elements subjected to a suction draft, for example, sieve drum means, if the differential pressure used in producing the suction draft at the web is lower than about **40**mm water column, preferably lower than about 20mm water column. A particularly dense felt, as is required for synthetic leather is obtained if the material being treated is first penetrated by a treatment liquid at a temperature in excess of about 90°C and subsequently by a gaseous or vaporous treatment medium, for example, air with a temperature of, for example, in excess of about 140°C, for drying and refixation. By said refixation, it is made sure that the other fiber component also shrinks. In case of polyester fibers, the refixation temperature should be about 220°C, whereas in the case polypropylene fibers a temperature of about 140°C is sufficient for said refixation.

In order to achieve a shock-like shrinkage, if shrinkage is effected by means of a liquid, it is suggested to spray a cold treatment liquor, for example, water, onto the web before the shrinking treatment. In this way, a certain pre-shrinkage by the steam rising from the treatment bowl is avoided. Such a pre-shrinkage is very detremental because the optimum shrinkage values cannot be reached with high-shrink fibers. It is well known that high-shrink fibers shrink an an amount up to about 50%.

Particularly with very wide material lengths of about 1.5m and more, it is advantageous if the web is exposed to the influence of the treatment medium before it is supported on the sieve means. Here it is particularly desirable if the web is overfed in a wave-like manner before it is deposited on the sieve means subjected to a suction draft, that is, generally a sieve drum means subjected to a suction draft. An overfeeding of the material in the lengthwise direction according to the desired shrinkage values must, of course, be insured. Such an overfeed in width and an overfeed of the material in length can, for example, be achieved by means of a pair of rollers which are provided with annular grooves and rings which are arranged in such a way that a ring of one roller is situated above a recess of the other roller. By the displacement of the one roller against the other roller, the individual rings engage, more or less, with the recesses, that is, with the annular grooves of the other roller and the needled web is thus passed into the treatment medium atmosphere and/or passed to the conveying element subjected to a suction draft in a more or less corrugated condition. The other surface of the rings should be bulged and/or have the shape of a torus in order to avoid marking the edge of the material.

After the webs are fully shrunk they are generally impregnated with bonding agents, for example, with synthetic latex, in order to obtain a leather-like structure. Another possibility of bonding the felt according to the present invention is to add melt fibers to the continuous

random web of material and to effect bonding simultaneously with the shrinking and/or heat-setting treatment. If the felts are to be used for the production of synthetic leather, the bonded felts can be subsequently impregnated with a latex, if necessary. However, in many cases such a latex impregnation is no longer necessary. The felts can be subsequently coated or further processed in the usual way.

As an apparatus for carrying out the process according to the present invention, a device is suggested which comprises at least one sieve means subjected to a suction draft, for example, at least one sieve drum means subjected to a suction draft, which is provided with an inlet unit which permits the feeding and/or passage of the web of material with a variable overfeed (wave-like) in length and/or in width. Furthermore, a variable speed drive for establishing variations in the pump and/or fan speeds, is to be correlated to the pump and/or the fan for the production of the suction draft.

It has been found that it is of particular advantage for treating thin webs of material to use a sieve roller subjected to a preferably strong suction draft as an inlet unit, since such a roller ensures an absolutely uniform overfeed of the material over the entire working width.

It is advantageous if the sieve drum heat-setting means is combined with a sieve drum bowl in which the web is freely guided in the treatment liquor over a distance of at least 5cm, preferably about 10cm or more, before it is deposited on the sieve drum. Also, it is desirable to pass the web, with an overfeed in width (wave-like) into the treatment liquor.

Instead of the synthetic fibers which have been mentioned above, any other suitable synthetic fibers can, of course, be used for producing the felts of the present invention. Suitable fibers include, for example, polyvinyl chloride, polyvinyl alcohol, polyacrylonitrile, and the like.

## BRIEF 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 and thus are not limitative of the present invention and wherein,

FIG. 1 is a longitudinal suction of a sieve drum apparatus according the present invention;

FIG. 2 is a longitudinal section of another sieve drum apparatus according to the present invention;

FIG. 3 is a longitudinal section of a combination of a sieve drum bowl with a sieve drum heat-setting means;

FIG. 4 is a longitudinal section of still another sieve drum apparatus according to the present invention;

FIG. 5 is a cross sectional view of the aforementioned sieve drum apparatus, and;

FIG. 6 shows a pleating roller having rings to effect lateral overfeeding of the textile material.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings, wherein like reference numerals are used throughout the various views to designate like parts, the apparatus of the present invention comprises a heat-insulated housing 1 which is subdivided by a partitions means 2 into a treatment chamber 3 and a fan chamber 4. In the treatment chamber 3 sieve drums 5 for guiding the material are disposed as well as sieve sheets 6 which are provided above and beneath the sieve drums 5. The sieve sheets serve for equalizing the treatment medium flow. A fan 7 is correlated to at least one face of each sieve drum 5. This fan 7 draws the treatment medium out of the sieve drums and recirculates it back into the treatment chamber 3 via heater batteries 8 so that a constant circulation of the treatment medium is ensured. If the treatment medium is air, some fresh air is generally drawn into the device at the discharge end of the apparatus. An equal amount of the stale, moisture enriched air is discharged above the inlet of the apparatus.

In the apparatus according to FIGS. 1 and 2, a web 9 to be shrunk is fed to the first sieve drum 5 by means of conveyor belt 10 and roller 11. In the apparatus according to FIG. 1 the treatment medium is blown out of the first sieve drum. In this way an unrestricted shrinkage of the web 9 is ensured. With the second sieve drum 5 the treatment medium flows from the outside to the inside of the sieve drum and thus the web 9 is held to said sieve drum. At the same time, an ironing effect is obtained by the suction draft. At the outlet of the apparatus according to FIG. 1 a conveyor belt 10 is again arranged. The device according to FIG. 2 is provided with a roller 12 at the discharge end of the apparatus.

In the apparatus according to FIG. 2 the first sieve drum 5 is also subjected to a suction draft. Here, material shrinkage can be obtained in an effective way by having the conveyor belt 10 and the roller 11 rotate at a higher speed than the sieve drum 5, so that the web is fed wave-like to the sieve drum and allowed to shrink freely. By the utilization of a pair of rollers provided with rings and annular grooves which are staggered with respect to each other, it is possible to obtain a corresponding overfeed in the width.

In each sieve drum a stationary baffle 13 is provided at that side of the sieve drum which is not covered with the material being treated, said stationary baffle means interrupting the suction draft and/or the blowing effect at that side of the sieve drum means.

The apparatus according to FIG. 3 is of similar design as that of FIG. 2 with the exception that at the inlet of the heat-setting chamber a pair of rollers 14 are arranged whereas at the outlet of said chamber a chute 15 is arranged. To the heat-setting apparatus a bowl 16 with a sieve drum 17 subjected to a suction draft is correlated and a spray means 25 is provided for spraying water onto the web 9 before the shrinkage treatment. Also, in this case it is possible to overfeed the needled web 9 to the sieve drum 17 by means of a pair of rollers 18. Subsequently, the web 9 which has been shrunk in the bowl is squeezed by means of a squeezer 19 and is dried and refixed on a subsequent sieve drum heat-setting means.

The apparatus according to FIG. 4 is of similar design as that according to FIG. 2 with the exception that the needled web 9 is passed to the first sieve drum 5 through a vertical duct 20. In this duct steam is sprayed onto both sides of the material by means of jet tubes 21. Also, here it is advantageous if the pair of inlet rollers 14' is provided with rings and/or annular grooves in order to achieve a wave-like feeding of the materials and thus a more uniform shrinkage (as shown in FIG. 6).

As may be gathered from FIG. 5, a drum drive 22 is arranged at one side of the housing and a fan drive 23 with a variable speed gear 24 is provided at the other side of the housing.

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

What is claimed is:

1. A continuous process for the production of felts by shrinking a continuous random web of textile material which comprises overfeeding a web of textile material to a perforated surface of at least one sieve drum means subjected to a suction draft, conveying said web of textile material on said perforated surface, said web being retained on said perforated surface only by said suction draft, heating the textile material to a shrinking temperature by drawing a heated treatment medium through the web of material while the web is being conveyed on the perforated surface, the differential pressure across the web of material on said perforated surface being lower than about 40 mm. water column which is less than the shrinkage forces acting on said web of textile material whereby a uniform shrinkage of the web of material is obtained on said perforated surface, and further heating the web of shrunk textile material on a perforated surface of at least one other sieve drum means subjected to a suction draft to effect heat-setting of said textile material while said web is in a smoothed-out condition.

2. The process of claim 1, wherein the differential pressure at the web of material is lower than about 20mm water column.

3. The process of claim 1, comprising overfeeding the web of material to the surface of the first sieve drum longitudinally and laterally such that the width and the length of said web of material is conveyed on said sieve drum in a corrugated state.

4. The process of claim 1, wherein the continuous random web comprises at least one synthetic fiber type selected from the group consisting of polyvinyl chloride, polyvinyl alcohol and polyacrylonitrile.

5. The process of claim 1, wherein steam is blown against both sides of the web of material before the material is placed on the perforated surface of the sieve drum means through which said treatment medium is drawn to effect shrinkage of said material.

6. The process of claim 1, wherein the textile material consists of at least two different types of fibers, one fiber type shrinking substantially more under the influence of heat than the other.

7. The process of claim 1, wherein the web of textile material is first penetrated by a treatment liquid with a temperature greater than about 90°C. to effect shrinkage of said material on said perforated surface of said at least one sieve drum means and thereafter the web of material is heated by a gaseous treatment medium to a higher temperature for drying and refixing of said material on the perforated surface of said at least one other sieve drum means.

8. The process of claim 7, wherein the gaseous treatment medium is heated to a temperature ranging from 140° to 220°C.

9. The process of claim 7, wherein the web of material is sprayed with cold water before it is penetrated by the treatment liquid.

10. The process of claim 7, wherein the continuous random web comprises at least two different fiber types selected from the group consisting of polypropylene and a polyamide, polypropylene and a rayon staple, polypropylene and a polyester, polyamide high-shrink fibers and normal polyamide fibers, polyester high-shrink fibers and normal polyester fibers.

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