

[72] Inventors **Dieter Bischoff  
Hofenweg;  
Harald Hordt, Am Drachenstein, both of  
Germany**  
[21] Appl. No. **696,744**  
[22] Filed **Jan. 10, 1968**  
[45] Patented **Sept. 21, 1971**  
[73] Assignee **Carl Freudenberg  
Weinheim, Germany**  
[32] Priority **Jan. 12, 1967**  
[33] **Germany**  
[31] **F 51237**

[56]

References Cited

UNITED STATES PATENTS

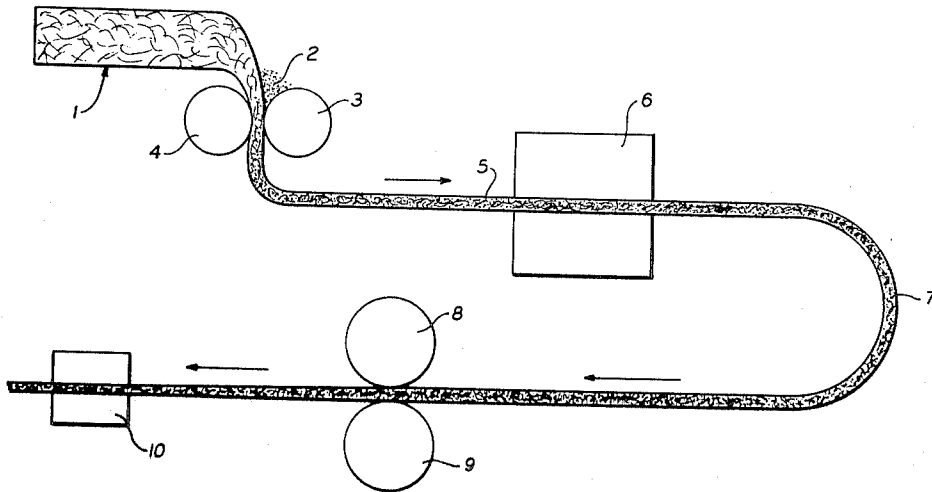
2,149,750	3/1939	Schwartz.....	117/163 X
2,261,769	11/1941	Jordan.....	117/163 UX
1,411,593	4/1922	Subers.....	117/65.2
2,064,360	12/1936	Schur.....	117/65.2
2,320,536	6/1943	Pollack et al. ....	117/65.2
2,715,591	8/1955	Graham et al. ....	117/140 X
2,719,795	10/1955	Nottebohm .....	117/140 X
2,725,309	11/1955	Rodman.....	117/140 X
3,006,338	10/1961	Davies.....	117/140 UX
3,034,922	5/1962	Boe.....	117/140 UX
3,336,183	8/1967	Larner et al. ....	117/140 X
3,083,137	3/1963	Fairclough et al. ....	117/140 X

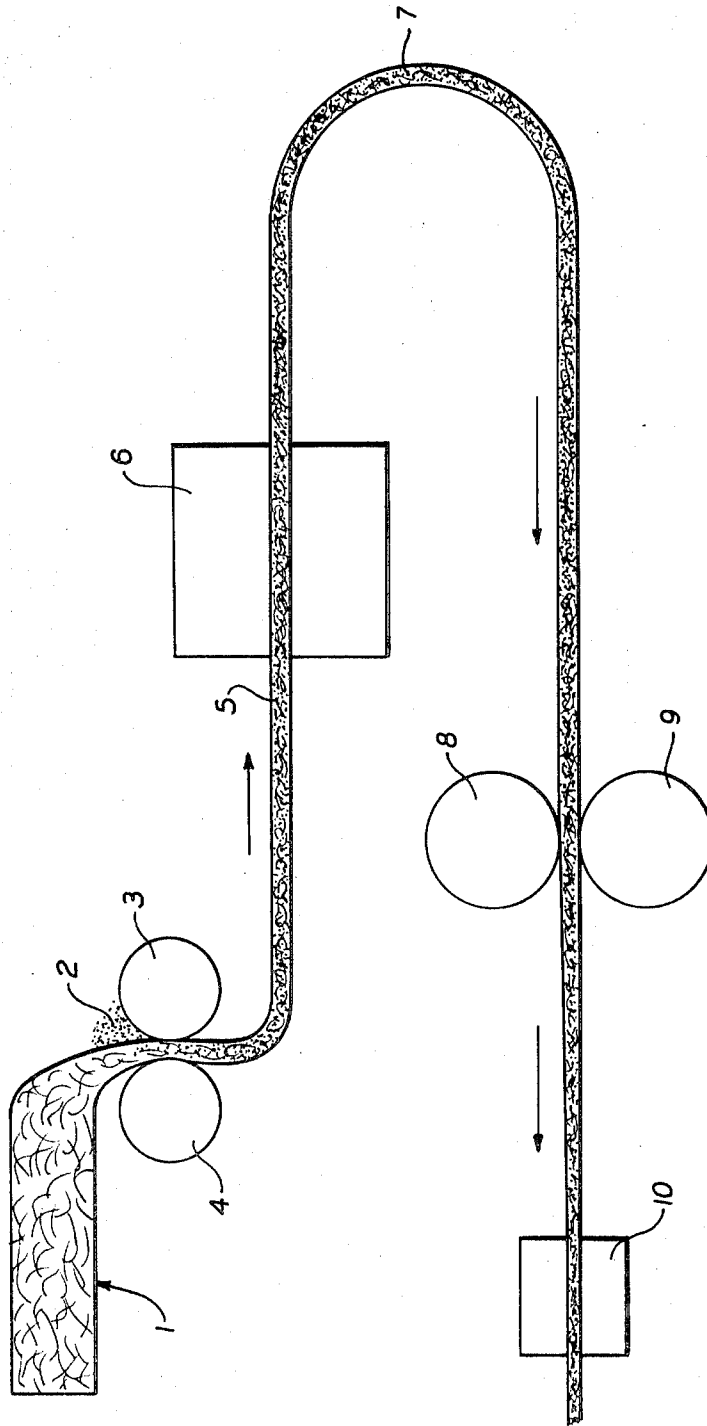
Primary Examiner—William D. Martin  
Assistant Examiner—Harry J. Gwinnell  
Attorney—Burgess, Dinklage & Sprung

[54] **PROCESS FOR THE MANUFACTURE OF  
UNWOVEN FABRICS BONDED WITH A BINDING  
AGENT AND HAVING A SMOOTH SURFACE**  
3 Claims, 1 Drawing Fig.

[52] U.S. Cl..... 117/65.2,  
117/140 R, 117/163  
[51] Int. Cl..... B44d 1/44,  
B32b 27/12  
[50] Field of Search..... 117/65.2,  
140 R, 163; 260/29.6 PT

**ABSTRACT:** Production of bonded nonwoven fabrics with a latex coagulated at relatively low temperature, where coagulation is followed by passing the fabric latex between heated rollers and then subjecting the fabric latex to vulcanization.





INVENTORS  
DIETER BISCHOFF  
HARALD HÖRDT  
BY  
*Burgess, Hinckley & Sprung*  
ATTORNEYS.

**PROCESS FOR THE MANUFACTURE OF UNWOVEN FABRICS BONDED WITH A BINDING AGENT AND HAVING A SMOOTH SURFACE**

The invention relates to a process for the manufacture of a nonwoven fabric bonded with a binding agent and having a smooth surface, as well as high resistance to wear and tear.

It is in the prior art to impregnate nonwoven batting with a binding agent, especially a latex, thereafter to dry the wet fibrous sheet material thus produced, and then heat it to temperatures of about 120° C. This vulcanizes the binding agent. In this manner, a nonwoven fabric is obtained which is commercially available under the name VLIESELINE, for example. Details on the production of such nonwoven fabrics can be seen in the book entitled, "Textilverbundstoffe," by Dr. R. Kroma, VEB-Verlag Leipzig, 1963.

It has already been proposed to use sensitized coagulatable latices for the impregnation of fiber batting. According to the prior art, the batting is first impregnated at room temperature and then the latex-wet batting material is heated to at least about 60° C., whereupon the latex coagulates in the form of many small spherules of rubber. Under the microscope, the coagulated binding agent then looks something like caviar, or an agglomeration of shot pellets. One speaks therefore of a binding agent having a caviar structure after coagulation.

It is an object of this invention to provide a novel latex impregnation process for use with nonwoven fabrics.

It is another object of this invention to produce latex bonded, nonwoven fabrics having a higher tear strength and a smoother surface than those known in the art.

Other and additional objects of this invention will become apparent from a consideration of this entire specification, including the claims and drawing hereof.

In accord with and fulfilling these objects, one aspect of this invention resides in a process of binding a nonwoven fabric comprising impregnating the fabric with a rubber latex having the capability of coagulating at up to about 35° C.; coagulating such latex at about 5° to 35° C.; passing said nonwoven fabric containing coagulated latex through the nip of a pair of rolls at about 80° to 120° C., preferably about 100° C., at a nip pressure of about 20 to 60 kg./cm.<sup>2</sup>; and then simultaneously drying the fabric and vulcanizing the coagulated latex at about 120° to 130° C.

The latices which are used in the process of this invention are generally known—these being categorized as "low temperature sensitized latices."

The latex is suitably impregnated into the nonwoven fabric in foam-form by processes which are generally known in the art, for example, German Pat. No. 920,211 and German Auslegeschrift 232,544.

According to the process described in German Pat. No. 910,960, these latices are first whipped to a foam. This cold foam is pressed into a loose fiber batting with the aid of rollers. Then, the wet batting thus impregnated is passed under an infrared radiator, thereby achieving a rapid heating to the coagulation point. Needless to say, an ordinary hot-air drying chamber can be used instead of an infrared radiator, the important thing being that the raising of the temperature to the coagulation point be accomplished as rapidly as possible. After coagulation, it has hitherto been customary to pass the wet batting through cold rolls, thereby squeezing excess binding agent and water out of the batting. According to the invention, however, the wet batting is run through a pair of steel rolls, the temperature on the roll surface preferably amounting to about 100° C. The pressure in the roll gap amounts to about 20–60 kg./cm.<sup>2</sup>. These figures, however, can be exceeded. Then, the hot calendered fabric is dried at temperatures of 120°–130°, vulcanization occurring simultaneously.

By the combination of the features of the invention, that is, impregnation with a low temperature sensitized binding agent in the form of foam, rapid coagulation, followed by hot calendering, it is possible to manufacture nonwoven fabrics whose tear strength is 35 to 50 percent higher than the tear strength

of nonwoven fabrics manufactured by prior art methods. Furthermore, such fabrics have a smoother surface and are therefore also very resistant to wear.

The fiber content of the nonwoven fabric may be any conventional fiber material such as, for example, cellulose acetate, rayon, polyester, polyamide, acrylic, modacrylic, cotton, etc. The nonwoven fabric may be made by substantially any technique according to standard practice.

The so-called low temperature sensitized latex suitably contains a desirable rubber or rubbery polymeric material; a nonionic surfactant, a cationic surfactant and a suitable coagulant. The rubbery base material may be exemplified by a product sold under the trade name N4 M by Farbenfabriken Bayer in Leverkusen, Deutschland. The nonionic surfactant may be exemplified by a product sold under the trade name Produkt LA 140 by Rudolf and Company in Geretsried/Oberbayern (Germany). The cationic surfactant may be exemplified by a product sold under the trade name Silastan DG by Schill and Sailacher Stuttgart/Böblingen Germany. The coagulant may be exemplified by ammonium chloride and/or formaldehyde.

Understanding of this invention will be facilitated by reference to the drawing, which is a schematic flow sheet of the process described.

Referring now to this drawing, a batting 1 is impregnated with foam-form latex 2 by passing such between a pair of rollers 3 and 4. The impregnated batting 5 is passed through heating means 6, which serves to coagulate the binder. The batting impregnated with the coagulated binder 7 is then passed through a pair of heat rolls 8 and 9 and then through a drying chamber 10.

The following Example is illustrative of the practice of this invention without being limiting thereon.

**EXAMPLE**

A fiber batting consisting of polyamide fibers of a length of 40 mm. and 3 deniers is impregnated with a mixture of the following composition:

100 parts Perbunan N4 M  
5 parts zinc oxide  
4 parts nonionic wetting agent (commercial name: La 140)  
2 parts cation-active wetting agent (commercial name: Silastan DG)  
1.5 parts formaldehyde  
4 parts ammonium chloride as coagulant  
200 parts water

in such manner that a fiber-to-binding agent ratio of approximately 50:50 is achieved.

The batting thus impregnated passes beneath infrared radiators, thereby producing coagulation of the rubber on the fiber. Then the wet batting is passed through a pair of steel rolls, the temperature on the roll surface amounting to about 100°. The pressure in the roll gap amounts to 50 kg./cm. Then the material is dried at 130°.

What is claimed is:

1. Process of producing a bonded nonwoven fabric which comprises impregnating a nonwoven batting with a latex bonding agent coagulatable at about 5° to 35° C.; rapidly heating said impregnated batting to about 5° to 35° C. to coagulate the latex into small spherules distributed through the interstices of said fabric; passing said batting coagulated latex through the nip of a pair of heated rolls at about 80° to 120° C. which nip exerts a pressure of about 20 to 60 kg./cm.<sup>2</sup> whereby squeezing water and excess binder out of said fabric and simultaneously hot calendering such; and then drying said fabric and vulcanizing said binder.

2. Process as claimed in claim 1 wherein said rolls are at about 100° C.

3. Process as claimed in claim 1 wherein said drying and vulcanizing is carried out at at least about 120° C.

UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 3,607,359 Dated September 21, 1971

Inventor(s) DIETER BISCHOFF and HAROLD HORDT

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 49, "232,544" should be --1,232,544--;  
column 1, line 52, "form" should be -- foam--

Signed and sealed this 21st day of March 1972.

(SEAL)  
Attest:

EDWARD M. FLETCHER, JR.  
Attesting Officer

ROBERT GOTTSCHALK  
Commissioner of Patents