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Wilde

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[54] **PROCESS FOR MAKING TUBULAR NEEDLEFELTED MATERIAL**

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[52] **U.S. Cl.** ..... **28/72.2 R**

[51] **Int. Cl.²** **D04H 18/00**

[58] **Field of Search** ..... 28/4 R, 72.2 R; 138/144

[56] **References Cited**

UNITED STATES PATENTS

2,748,805	6/1956	Winstead	138/144
3,375,561	4/1968	Ford	28/72.2 R
3,424,204	1/1969	Sato	138/144
3,477,898	11/1969	Buff et al.	28/72.2 R
3,673,024	6/1972	Eriksson	28/72.2 R
3,758,926	9/1973	Dilo	28/72.2 R

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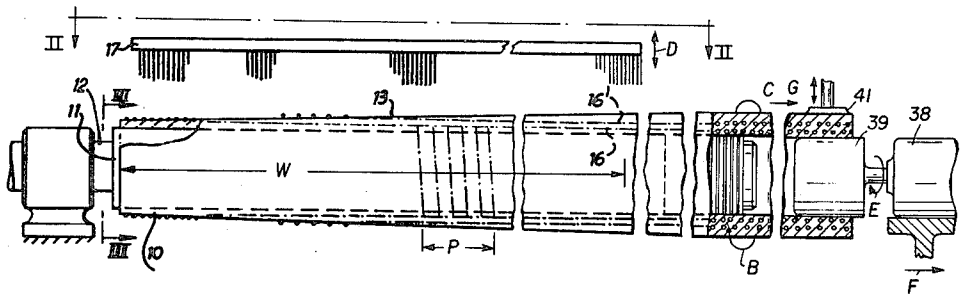
[57] **ABSTRACT**

A tubular needlefelted material is formed from a continuous web of fibres which is wound as an overlapping helix to form the tube. As the web is wound parallel reinforcing threads are supplied to wrap the tube. The wound web and threads are needlefelted and the needlefelted tube thus produced is progressively advanced in the direction of the axis of the tube. Preferably the threads lay to one side of the web so as to be located near the inner surface of the finished tube.

12 Claims, 3 Drawing Figures



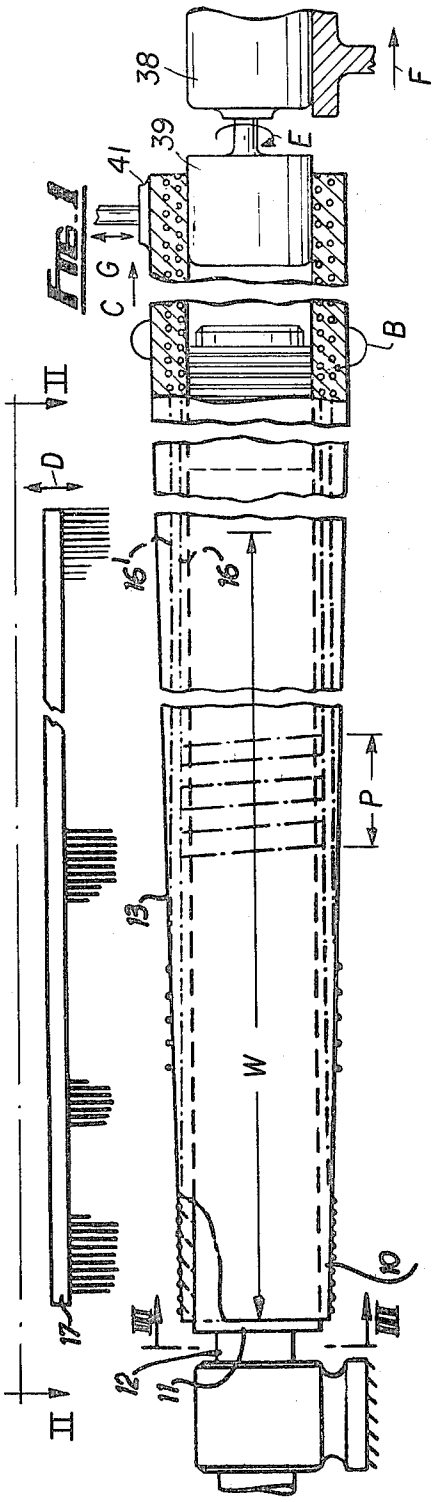


FIG. 1

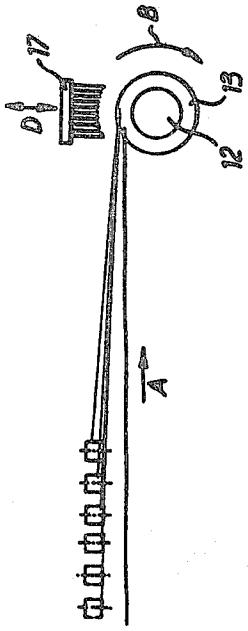


FIG. 3

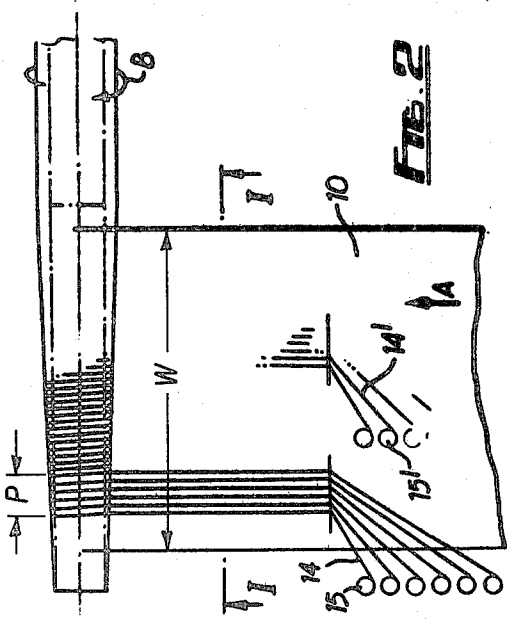


FIG. 2

PROCESS FOR MAKING TUBULAR NEEDLEFELTED MATERIAL

BACKGROUND OF THE INVENTION

This invention concerns an improved needlefelted material and in particular a needlefelted material produced in tubular form.

Tubular needlefelted materials are known and basically one manner of production comprises the continuous feeding of a web of fibres to pass over spaced parallel rolls with at least one needlebar reciprocable towards and away from the web. The needled web is progressively moved in a direction parallel to the roll axis so that an extended tube is created and its thickness is built up with the web feed. This manner of production is illustrated and described in U.S. Pat. No. **3,508,307** based on German Application No. **16,607,65.1.** Another manner of production of tubular needlefelted material is shown in U.S. Pat. No. **3,758,926** and another in U.S. Pat. No. **3,540,096.**

Whilst such a machine as that briefly described above or as shown in U.S. Pat. No. **3,758,926,** or U.S. Pat. No. **3,540,096** produces a felt which has many useful properties there are requirements for felts which cannot adequately be met by the felt normally produced in the manner set out above, primarily because the felt has neither the wearing properties nor the dimensional stability that are required.

One use for tubular felts of high quality is in the leather industry as a sleeve for a sammying machine. Such a sleeve is typically **15** cms in diameter, **15** mm thick and **180** cms long. At present most of the sammying sleeves in use are produced from woven material and whilst such a sleeve is effective for the purpose for which it is designed it may be that if improperly used the pattern of the weave of the fabric may be impressed upon the leather being treated. Clearly unless the sleeve is of constant density and strength and has a smooth surface sammying operations may be adversely affected.

Also in the leather industry there is a call for sleeves for setting out machines and these sleeves are required to withstand pressure which in some cases may be of the order of **30** tons across the width of a setting machine roll of some **180** cms in length.

In some cases it is thought to be advantageous to produce a tubular felt material which can, after production, be cut to form a flat pad and of course such a pad can be used in many industries and situations providing the initially produced tubular felt has the requisite strength and other physical properties.

It is therefore an object of the present invention to produce a felted material in tubular form in which the inherent strength of the felt is greater than that which has hitherto been achieved whilst at the same time ensuring that the properties of the felt, such as surface smoothness, density and the like are substantially unaffected.

The invention has importance for use with fibre material which does not, by its nature, felt so readily as wool fibre and which therefore is not, after needlefelting, so strong as wool felt. Typical fibre materials are polyester, polyamide and propylene.

SUMMARY OF THE INVENTION

Accordingly the present invention provides a process for manufacturing an improved tubular needlefelted material comprising:

a. forming a continuous web of fibres;
b. feeding the web as a helix to create a tube with adjacent turns of the helix overlapping:
c. causing strengthening strands to wrap said tube helically as the web is fed;
d. needlefelting said tube and strands;

and

e. progressively advancing the needlefelted tube in the direction of the axis of the tube.

whereby there is formed a needlefelted tube with helically wound strengthening strands located within the wall thickness of the tube.

BRIEF DESCRIPTION OF THE DRAWINGS.

The invention will now be described further, by way of example only, with reference to one practical form thereof, and with reference to the accompanying drawings in which:

FIG. **1** is an enlarged view on the line I — I of FIG. **2.**

FIG. **2** is a plan view on a slightly reduced scale taken in the direction of line II — II of FIG. **1.**

FIG. **3** is an end elevation view in reduced scale taken on the line III — III of FIG. **1.**

DESCRIPTION OF THE PREFERRED EMBODIMENT

A dry carded web **10** of synthetic fibres is shown being fed (arrow A) and wound in a helical fashion with overlap on the circumferentially ribbed core tube **11** supported on an overhung shaft **12** and rotating as indicated by arrow B. The web builds up to form a sleeve **13.**

Reinforcing threads **14,** which may be filament polyamide or spun natural threads for example are taken from bobbins **15** and are wound with the web **10** on to the core tube **11.** The threads build up to form a row **16** of reinforcing threads which lies nearer to the inside wall of the finished tube than the outside wall.

Similarly threads **14'** are taken from bobbins **15'** to form a further row **16'** of reinforcing threads. These may lay at the centre of the wall of the finished tube. In FIGS. **1** and **2** the letter W designates the width of the carded web **10** and the letter p designates the width occupied by a plurality of strands or threads **14.**

Above the core tube **11** there is located a reciprocating (arrow D) needle board **17.** The sleeve is drawn off the free end of the core tube **11** in the direction of arrow C by a hub **39** turned by a motor **38** at the same rotary speed as the sleeve (arrow E). The motor is carried on a plate **32** movable on a frame (not shown) axially of the sleeve as indicated by arrow F. The sleeve is clamped to the hub **39** by three clamping anvils **41** (only one shown) movable as indicated by arrow G. The needlefelted material is progressively drawn off the machine by a rotating tailstock arrangement which grips the sleeve in pneumatic jaws, the speed of rotation being identical to that of the sleeve, and this unit is continuously being driven away from the fibre input and needling unit by a variable speed chain drive unit, as detailed in FIG. **7** U.S. Pat. No. **3,758,926.** Alternatively the sleeve may be drawn off through a pair of ro-

tating nip rollers, being subsequently wound onto a spool (FIG. 1 U.S. Pat. No. 3,758,926).

A typical spacing of threads 14 lies preferably within the range of 1 to 50 mm.

The density of needling may be made variable to produce a light so ft sleeve 13 or a hard dense one, the former being very useful for filtering.

In lieu of threads 14 it is possible to use, as a reinforcing strand, tape or scrim. The tape may be of closely woven or open weave structure.

The invention could also be used to produce a larger diameter sleeve by winding a web helically over two spaced rollers in the manner disclosed in the said U.S. Pat. No. 3,508,307.

The increase in dimensional stability of the sleeves or tubular fabric produced, according to the invention, renders the fabric particularly suitable for use as a sammying sleeve since the outer surface of the tube presents the desired smooth surface and the reinforcement due to the yarns or tape incorporation in the tube enhances the effective life of the tube when being used as a sammying sleeve. In the case in which the reinforcement is provided adjacent to the inner surface of a sammying sleeve the reinforcement does not affect the outer surface of the sleeve and thus it has no adverse effect on the leather being treated.

Tubular reinforced fabrics produced as described above may be used for other purposes such as sleeves for setting out machines used in the leather industry and in fact as roller sleeves for use in other industries.

Additionally the fabric may be used in tubular form as bearing material and it may also be used, when cut longitudinally and opened out into flat form as a press pad or bearing material.

The material may be impregnated and typically it may be impregnated with a lubricant such as graphite to function as a bearing material. The material may also be impregnated with a resin. The method of impregnation is such that a liquid resin is introduced through a pressurized jet spray system into the center of the tube and is directed at the wall of the sleeve where it is absorbed by the needlefelted material. The point of impact of resin onto the surface is varied along the length of the sleeve by a reciprocating device. The control of the degree of penetration of the resin is to some extent dependent upon the type of resin and is known to masters of the art of textile finishing. The function of the impregnation is to give the sleeve increased resistance to longitudinal extension and thickness compaction during use as well as increasing abrasion resistance. These are factors in the improvement of working life and result from a degree of chemical bonding of the fibres due to the impregnation.

Where a sleeve is built up between two spaced rollers the inside of the sleeve may be sprayed with a resin, preferably so that the resin does not reach the outer regions of the sleeve. This can provide further strengthening without disturbing the nature of the outer surface of the sleeve. Sleeves produced according to the invention not only have the requisite surface smoothness and density, but also have a strength, due to the reinforcement given by the yarns or tape, which serves to resist deformation by way of extension diametrically or lengthwise.

In the case in which a sleeve is required to be tightly held in position on a roller it is possible to produce the sleeve with inherent shrinkage properties by the use of heat shrinkable fibres so that when the sleeve is in position on the roller its size can be reduced to cause it to grip the roller tightly by the application of heat, such as a hot water spray.

A sleeve made in accordance with the invention and needles to produce a dense felt and made of heat shrinkable fibres will, when cut to form a flat pad and hot pressed to flatten, create a very dense high strength pad.

I claim:

1. A process for manufacturing an improved tubular needlefelted material comprising:

a. forming a continuous web of fibres of predetermined width;

b. feeding the web as a helix to create a tube with adjacent turns of the helix overlapping by a major part of said predetermined width;

c. causing a plurality of strengthening strands to wrap said tube helically as the web is fed, said strands occupying a width which is less than said predetermined width of said web;

d. needlefelting said tube and strands

and

e. progressively advancing the needlefelted tube in the direction of the axis of the tube,

whereby there is formed a needlefelted tube with helically wound strengthening strands located within the wall thickness of the tube.

2. The process of claim **1** in which the strands comprise parallel filaments.

3. The process of claim **2** in which the strands are provided by a tape.

4. The process of claim **2** in which the strands are provided by scrim.

5. The process of claim **1** in which the strands are fed, relative to the web of fibres, so as to lay to one side of the web thereby forming a needle felted tube with helically wound strengthening strands which lie nearer to the inside wall of the tube than the outside wall.

6. The process of claim **1** in which an additional step of causing strengthening strands to wrap said tube helically is performed whereby there is formed a needlefelted tube with helically wound strengthening strands located at two depths within the wall thickness of the tube.

7. The process of claim **1** in which the carded fibres are of heat shrinkable material.

8. The process of claim **7** in which the tube formed by the process is cut to produce a sheet and the sheet is heat pressed to flatten and shrink it.

9. The process of claim **1** in which the needlefelted tube is impregnated by spraying with a substance which adds a desired property thereto.

10. The process according to claim **9** wherein said substance comprises graphite.

11. The process according to claim **9** wherein said substance comprises resin.

12. A process for manufacturing tubular needlefelted material comprising:

a. forming a continuous web of base fibres of predetermined width;

b. feeding said web over spaced rollers having free ends as a helix with adjacent turns overlapping by a major part of said predetermined width;

c. needlefelting the overlapping turns to form a sleeve;

d. causing a series of parallel strengthening filaments to wrap said sleeve helically as it is being formed, said filaments occupying a width which is less than said predetermined width of said web;

e. needlefelting the wrapped sleeve;

and

f. causing the sleeve to move axially as web is fed so that the needlefelted wrapped sleeve leaves the rollers at the free ends thereof.

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