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NON-WOVEN WEBS

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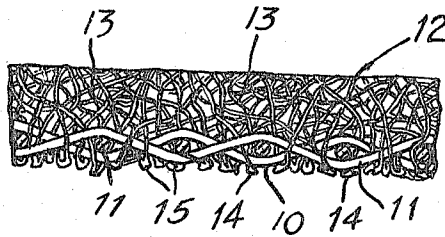


Fig. 1

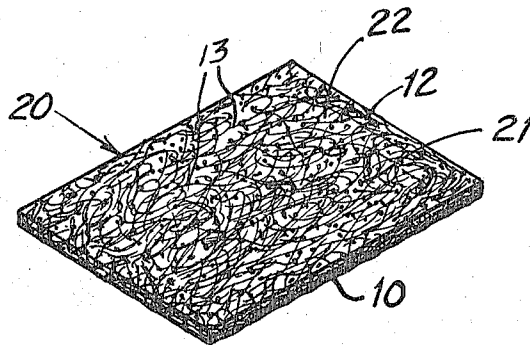


Fig. 2

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NON-WOVEN WEBS

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3 Claims. (Cl. 51-400)

The present invention relates in general to a non-woven web and more specifically to an improved non-woven web of the "needled" type especially adaptable for use as a carrier for adhesive-bonded abrasive grains.

"Needled" or needle-punched fabrics are old and well-known to the art. Generally, with reference to needled non-woven fabrics, such materials are produced by subjecting a non-woven web formed in any conventional manner to the action of a needle board in a needle loom. This needle board contains a plurality of barbed needles which engage the fibres of the non-woven web on their downward passage, push such fibres through the web and then release the fibres on the upward movement thereof. It is also an accepted practice to reinforce the web by punching the fibres engaged by the needles through a reinforcing backing of scrim, burlap or the like.

It is to this reinforced type of needled non-woven fabric that the present invention is directed and more particularly to such a combined fabric wherein the retention of loft in the non-woven web portion of the combination is of a high degree of importance.

One problem which has been common to all such reinforced needled fabrics has been that of retention of the fibres by the reinforcement, i.e. prevention of the fibres pulling back through the reinforcing material upon tension being applied to the non-woven face of the combination. Efforts to overcome this have included the use of "potentially adhesive" fibres which are subjected to heat and pressure to cause them to adhere to the reinforcement as described in the patents to C. S. Francis, Jr., U.S. 2,437,689 and U.S. 2,528,129. Such treatments have been of value where the density of the non-woven was too high to be crushed by the required pressure or where the maintenance of loft was not important. A further suggestion was the incorporation of an additional layer of material, e.g. sponge thermosetting compound, on the opposite side of the reinforcement from the non-woven so that after the fibres were punched through, the thermoset material could be swollen by heat to anchor the fibres in place. This approach is described in U.S. 2,429,486 to H. A. Reinhardt.

An object of the present invention is to provide a reinforced product of the needled non-woven type wherein the non-woven component is of extremely low density and high loft and where the portions thereof punched through the reinforcement are firmly anchored without destroying or in anyway impairing the high loft of the low density web.

A further object of the present invention is to provide a combination non-woven web of high loft and low density firmly anchored to a reinforcing web, the composite material being capable of standing up to the severe usage resulting from use of the material as a carrier for abrasive grains.

Additional objects, if not specifically set forth herein will be readily apparent to one skilled in the art from the following detailed description of the invention:

In the drawings:

FIGURE 1 is a cross-sectional view of a piece of material produced in accordance with the present invention.

FIGURE 2 is an illustration of a rectangular abrasive pad made in accordance with the present invention.

Generally, the invention comprises the combination with a woven reinforcing web of the nature of burlap, scrim or the like, of a lofty, low density non-woven web formed of fusible synthetic fibres in such a fashion that a portion of the fusible fibres forming the non-woven web penetrate through the woven reinforcing web and are anchored by flame-induced fusion.

More specifically, the preferred combination comprises a non-woven web composed of nylon fibres which have been laid down in any known manner to form a high loft, low density web, combined with a woven reinforcement by needle-punching. The portions of the fibres of the non-woven web which extend through the reinforcing backing are flame-fused to melt the individual fibres and cause the ends to form globules or to fuse with each other in such a manner as to resist separation of the non-woven web from the reinforcing web.

The fibres used may be of any synthetic material such as nylon, Dacron, Dynel or the like which fuses upon being subjected to an open flame. The denier of the fibre may vary as desired from about 3 denier up to 40 denier with about 15 denier being preferred.

The non-woven web may be formed on a Rando-Webber unit (produced by the Curlator Corporation of Rochester, N.Y.) or may be formed by conventional carding procedures or otherwise so long as the web produced is relatively lofty. By "lofty" is meant in the area of one-quarter inch or more in thickness. The webs should also be of low density, a typical web formed from 15 denier nylon fibres in a thickness of 1/4 inch having a density of 3 oz. per square yard. Webs of this type are further illustrated in the patent to E. N. Maisel, U.S. 2,784,132. The non-woven web component may be adhesively bonded as in the Maisel patent before being needled to the felt or may be free of adhesive as desired.

The finished web possesses the necessary strength to find utility as an abrasive article after being coated with abrasive and adhesive. The non-woven web may be first coated with the abrasive and adhesive and then combined with the reinforcing backing or the combination may take place prior to the application of abrasive and adhesive to the non-woven web. The actual formation of the abrasive article may take place in any of the well-known manners described in the prior art, as for example in U.S. 2,958,593 to Hoover et al., in Camp et al., U.S. 3,020,139 or in the patent to Rimer, U.S. 2,375,585.

Referring now to the drawings, FIGURE 1 illustrates a cross-section of a material formed according to this invention. A burlap backing 10 formed of woven fibres 11 forms the reinforcing web. Attached to one side of the backing 10 by a needle-punching technique is a high loft, low density non-woven web 12 formed of nylon fibres 13. Some of the fibres 13 will be seen to extend through the backing 10. Where these fibres protrude from backing 10 they have been fused as at 14 to form expanded diameters which will resist pulling back through backing 10 or have fused to each other as at 15 to accomplish the same result.

FIGURE 2 shows a material such as that of FIGURE 1 made into an abrasive pad 20. The abrasive grain 21 is bonded to the nylon fibres 13 of the non-woven web 12 by a suitable adhesive 22.

In operation, the two webs are combined as through the use of a James Hunter Machine Company needle loom or any other conventional needle-punching operation and then the nylon or other fusible fibres extending through the back surface of the reinforcing web are fused by passing a flame over such back surface. The use of the open-flame method to fuse these fibres avoids the necessity of pressure as would be the case with the use

3

of hot plates or other types of heat sealing methods, and thereby permits retention of the high loft and low density of the non-woven web portion of the combination. Likewise, use of the flame fusion is much faster and more effective than heated elements. The use of heated air or other gases effects either incomplete fusion or because of the time period required has an adverse effect on the non-woven web affixed to the other surface of the reinforcing web.

The finished composite material, when coated with abrasive and the abrasive binder adhesive, has particular utility as a floor polishing material.

We claim:

1. A combination woven and non-woven material suitable for abrasive use which comprises:

- (a) A lofty, low density non-woven web formed entirely of fusible synthetic fibres;
- (b) A reinforcing woven web coextensive with said non-woven web;
- (c) a plurality of the fusible fibres of said non-woven web extending through the said reinforcing woven web; and

4

(d) The ends only of said fusible fibres extending through and beyond said reinforcing woven web being flame-fused to a condition which resists withdrawal of said fibres from said reinforcing web.

2. A material as in claim 1 wherein said fusible synthetic fibres are nylon.

3. A material as in claim 1 wherein said non-woven web carries a plurality of abrasive grain adhesively bonded to said fusible synthetic fibres.

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