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L. M. NASH ETAL

3,448,478

WIPING CLOTH

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Fig. 1.

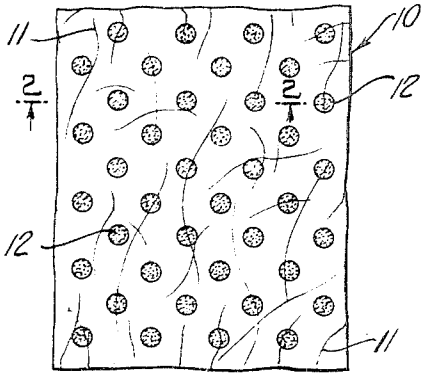


Fig. 2.

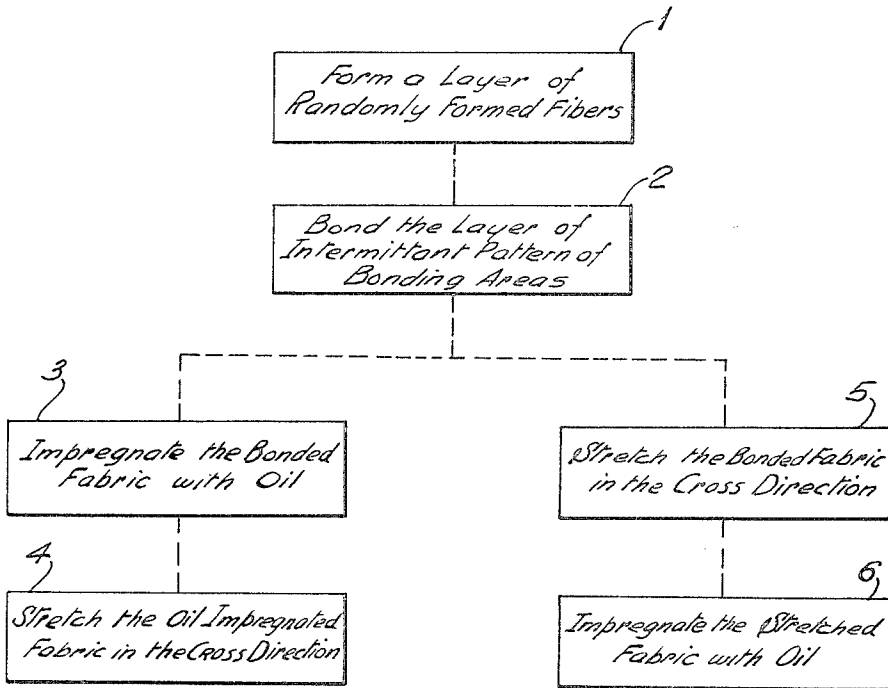
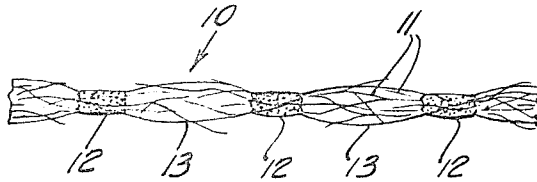


Fig. 2.

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3,448,478

**WIPING CLOTH**

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6 Claims

**ABSTRACT OF THE DISCLOSURE**

A wiping cloth with a layer of fibers with bonding material distributed throughout the layer in a discontinuous predetermined intermittent pattern of discrete binder areas. The unbonded areas between the bonded areas are puffed and fluffy and the fibers in these unbonded areas are further apart than the fibers within the bonded areas. Furthermore, the unbonded areas contain oil to aid in the pick-up of dirt.

The present invention relates to improved wiping cloths, and more particularly, to improved wiping cloths treated with oil to improve their dirt pick-up properties.

There are innumerable different types of wiping and cleaning cloths made from woven fabrics, nonwoven fabrics, paper, etc. Some of the present wiping cloths are impregnated with oils or waxes or similar materials to aid in the pick-up of dirt. Many of these wiping cloths are of course suitable for home use; however, most of them leave something to be desired when used for industrial purposes in that their capacity for picking up soil and dirt is limited. One of the more common industrial wiping cloths presently used in a nonwoven fabric bonded in an intermittent pattern and treated with oil.

We have discovered an improved wiping cloth which when treated in accordance with the present invention unexpectedly picks up twice or even more times the amount of soil than similar untreated fabrics. Furthermore, our improved cleaning cloth not only picks up much more soil in the first instance but retains this greater amount of soil as well as wiping cloths which pick up considerably less soil.

The improved cleaning cloth of the present invention comprises a layer of randomly arranged overlapping and intersecting fibers. The fibrous layer is bonded in a predetermined intermittent pattern of binder areas. The unbonded areas have been stretched and are puffed and fluffy so that the open area between fiber portions in the unbonded areas is considerably greater than the areas between fiber portions in the bonded areas. The fabric is treated with an oil to aid in the pick-up and retention of dirt.

In accordance with the present invention a layer of randomly arranged, overlapping and intersecting fibers is formed. A bonding material is applied to the layer in a predetermined intermittent pattern of binder areas. The fabric is dried to form a bonded nonwoven fabric. The intermittently bonded fabric is treated by impregnating the fabric with a suitable oil for picking up dirt and stretching the fabric to puff and fluff the unbonded areas and create considerably more spaces between the fiber portions in the unbonded areas than there are between fiber portions in the bonded areas.

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Other objects and advantages of this invention will become apparent as this description progresses when taken in connection with the several figures in the drawing wherein:

FIGURE 1 is a plan view of a wiping cloth made according to the present invention.

FIGURE 2 is an enlarged cross-sectional view taken along line 2—2 of FIGURE 1, and

FIGURE 3 is a flow sheet diagrammatically showing several processes by which the present invention may be carried into practice.

Referring to the drawings in FIGURES 1 and 2, there is shown an improved wiping cloth 10 according to the present invention. The wiping cloth comprises fibers 11 arranged in a layer of randomly overlapping, intersecting fibers. The layer is bonded in a pattern of dots 12. The fibers in these dots 12 are quite close together as compared to the fibers in the unbonded areas 13 which contain considerable open areas between fiber portions. The entire fabric is impregnated with oil to aid in the soil pick-up.

Referring to FIGURE 3, there is shown a flow sheet for carrying out the method of manufacturing the improved wiping cloth. A layer of randomly arranged fibers is formed (Box 1). The fibers used may be any of the known natural, artificial or synthetic fibers. For economic reasons it is preferred that the cheaper fibers be used for industrial wiping cloths. Specific fibers found suitable for use in the wiping cloth of the present invention are rayon and cotton. The length of the fibers may vary, but it is preferred that they are in the textile-length range of at least ¼ inch; however, in many instances a percentage, even up to 50 percent, of the shorter papermaking or cotton linter type fibers of less than ¼ inch in length may also be utilized in forming the initial fibrous layer. The layer may be formed by any of the means well known in the art, such as, air-laying, papermaking techniques, carding machines, etc.

Depending upon the end use, the weight of the fibrous layer used in producing the wiping cloth may vary from a few hundred grains up to 600 or 700 grains or even more.

A binder is applied to the fibrous layer in a predetermined intermittent pattern (Box 2). Many of the well-known nonwoven fabric binders may be utilized, such as, polyvinyl alcohol, polyvinyl chlorides, polyvinyl acetates, the acrylate resins, polystyrene viscose, etc.

It is essential to the present invention that binder be applied in a discontinuous pattern of discrete binder areas, that is, the binder should not be applied in a continuous manner across the width of the web, such as, in lines. Suitable binder areas are dots, donuts, rectangles, squares, hexagons, other multi-sided figures or any of the other various well-known shapes. The binder may be applied to the fibrous web by printing the binder in emulsion or solution form onto the web or spraying liquid binder onto the web or any of the other similar techniques. The amount of binder applied to the web may vary from about 5 per cent or even less up to about 20 or 25 percent of the weight of the final fabric.

The area of the fabric covered by the discrete binder areas should not exceed about 35 percent of the total lateral surface of the fabric. Preferably the binder area should cover from about 5 percent to 25 percent of the

total lateral surface of the fabric. It is preferred that the discrete binder areas be arranged in a staggered pattern with their centers located approximately at the inner sections of an imaginary diamond grid pattern.

The fabric is dried to set the binder. The bonded fabric is finished by impregnating the fabric with any of the well-known dust collecting oils, such as Kex oil (an emulsified mineral oil) or other drying oils, wax emulsions, etc. (Box 3) which improve the dust pick-up properties of the cloth. The oil-impregnated fabric is stretched in the widthwise direction to increase the fabric width at least 10 percent of its original width to puff and spread the fibers in the unbonded areas (Box 4). It is preferred that the fabric be stretched at least 18 percent of its original width so that when it is finally rolled and packaged, it will maintain at least a 10 percent stretch when being used. If desired, the fabric may be stretched 50 percent or even more of its original width.

The fabric may be stretched utilizing any of the known stretching mechanisms, for example, a standard tenter frame which comprises diverging chain conveyors which grip the edges of the fabric and as the chains diverge, stretch the fabric, or it may be done by a fluted roll or other stretching mechanisms as are known.

If desired, the fabric after being bonded may be first stretched (Box 5), and then the oil applied to the stretch fabric (Box 6). When the fabric is treated in this manner, care should be taken not to compress the fabric too much as this will take away from its dust pick-up properties and hence, it is preferred that the oil be first applied and then the fabric stretched as this produces a softer, bulkier cleaning cloth.

Unexpectedly the stretched fabric containing the oil will pick up twice as much or even more dirt than the unstretched fabric. And even more unexpectedly this is true at the relatively low degree of 10 percent or 15 percent stretch. Furthermore, the dirt that the stretched fabric picks up is retained by the fabric to at least the same degree as is retained by the unstretched fabric.

The invention will be further illustrated in greater detail by the following specific examples. It should be understood however that although these examples may describe in particular detail some of the more specific features of the invention, they are given primarily for purposes of illustration, and the invention in its broader aspects is not to be construed as limited thereto.

#### Example I

A card web weighing 670 grains per square yard and containing 50 percent by weight of reworked rayon fiber and 50 percent by weight of cotton fiber approximately 1/2 to 1 inch in length is bonded in an intermittent pattern of donuts. The donuts have an outer diameter of 0.070 inch and an inner diameter of 0.047 inch. The donuts are spaced in staggered rows approximately on 0.210 inch centers and the rows are spaced .105 inch apart. 110

stantially uniformly applying 25 grams of soil composed of 70 percent talc (Vermont 150) and 30 percent grit (AC Spark Plug dust CL-2) on a floor area of 36 square feet. A piece of fabric weighing 109 grains is used to wipe the 36-square foot area. The fabric picks up 88 grains of soil or 81 percent of its weight. A second piece of fabric is used to wipe the same area. The second piece weighs 109 grains and picks up 72 grains of soil or 66 percent of its weight. A third piece weighing 110 grains is used to wipe the area, and picks up 76 grains or 69 percent. A fourth piece of 112 grains is used and picks up 39 grains of soil or 35 percent of its weight and a fifth piece of 113 grains picks up 24 grains of soil or 21 percent of its weight so that the five samples pick up a total of 299 grains of soil from the 36-square foot area.

#### Example II

A bonded nonwoven fabric prepared as described in Example I and impregnated with oil is stretched to 31 percent of its original width. This sample is tested as described in Example I. The first wipe picks up 97 grains or 97 percent. A second 100-grain sample picks up 76 grains or 76 percent. A third 98-grain sample picks up 69 grains or 70 percent. A fourth 100-grain sample picks up 49 grains or 49 percent, and a fifth 100-grain sample picks up 31 grains or 31 percent for a total pick-up of the five samples of 322 grains.

#### Example III

Another sample of nonwoven fabric made as described in Example I is impregnated with oil and stretched to 50 percent of its original width. When tested as described in Example I, this sample had the following results. The first piece 96-grain weight picks up 109 grains or 104 percent. The second 100-grain piece picks up 83 grains or 83 percent. The third piece picks up 74 grains or 74 percent. A fourth 97-grain sample picks up 33 grains or 34 percent, and the fifth 96-grain weight sample picks up 26 grains or 27 percent for a total pick-up of 325 grains.

#### Example IV

A control sample was also tested. This control sample was made as described in Example I with the exception that the oil-impregnated fabric is not stretched. The fabric is tested as described in Example I. The first sample weighs 120 grains and picks up 41 grains of soil or 34 percent. The second sample weighs 120 grains and picks up 39 grains of soil or 33 percent. The third sample weighs 118 grains and picks up 40 grains of soil or 34 percent. The fourth sample weighs 118 grains and picks up 27 grains of soil or 23 percent, and the fifth sample weighs 121 grains and picks up 21 grains of soil or 17 percent for a total of 168 grains of soil picked up.

The following table compares the dirt pick-up properties of the various fabrics described in the previous examples.

Example No.	Amount of stretch (percent of original fabric width)	Amount of dirt pick-up (percent of original fabric weight)					Total
		1st wipe	2nd wipe	3rd wipe	4th wipe	5th wipe	
I.....	12.5	81	66	69	35	21	272
II.....	31.0	97	76	70	49	31	323
III.....	50.0	104	83	74	34	27	322
IV.....	0	34	33	34	23	17	141

grains of binder is used so that approximately 15 percent of the lateral surface area of the web is covered. The binder used is an acrylic emulsion of about 46 percent solids sold by the B. F. Goodrich Company under the trade name Hycar 2671.

The fabric is dried and padded with Kex oil so that the fabric picks up 120 grains per square yard of the oil.

The impregnated fabric is stretched in the crosswise direction to increase its width 12 1/2 percent. The fabric is then tested for soil pick-up. This test comprises sub-

Although several specific examples of the inventive concept have been described, the same should not be construed as limited thereby nor to the specific features mentioned therein, but to include various other equivalent features as set forth in the claims appended hereto.

What is claimed is:

1. A wiping cloth comprising a layer of randomly arranged, overlapping and intersecting fibers, bonding material distributed throughout the fibrous layer in a discontinuous predetermined intermittent pattern of dis-

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crete binder areas, the unbonded areas between said discrete areas being puffed and fluffy and the fibers in said unbonded areas being spaced farther apart than the fibers within the bond areas, and said unbonded areas containing an oil to aid in the pick-up of dirt when used as a wiping cloth.

2. A wiping cloth according to claim 1 wherein the bonding material covers less than 35 percent of the total lateral surface of the wiping cloth.

3. A wiping cloth according to claim 1 wherein the bonding material covers from about 5 percent to 25 percent of the total lateral surface of the wiping cloth.

4. A wiping cloth according to claim 1 wherein the fibers are cellulosic fibers.

5. A wiping cloth according to claim 1 wherein the bonding material is distributed throughout the fibrous layer in a pattern of dots.

6. A wiping cloth according to claim 1 wherein the

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bonding material is distributed throughout the fibrous layer in a staggered pattern of discrete binder areas.

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