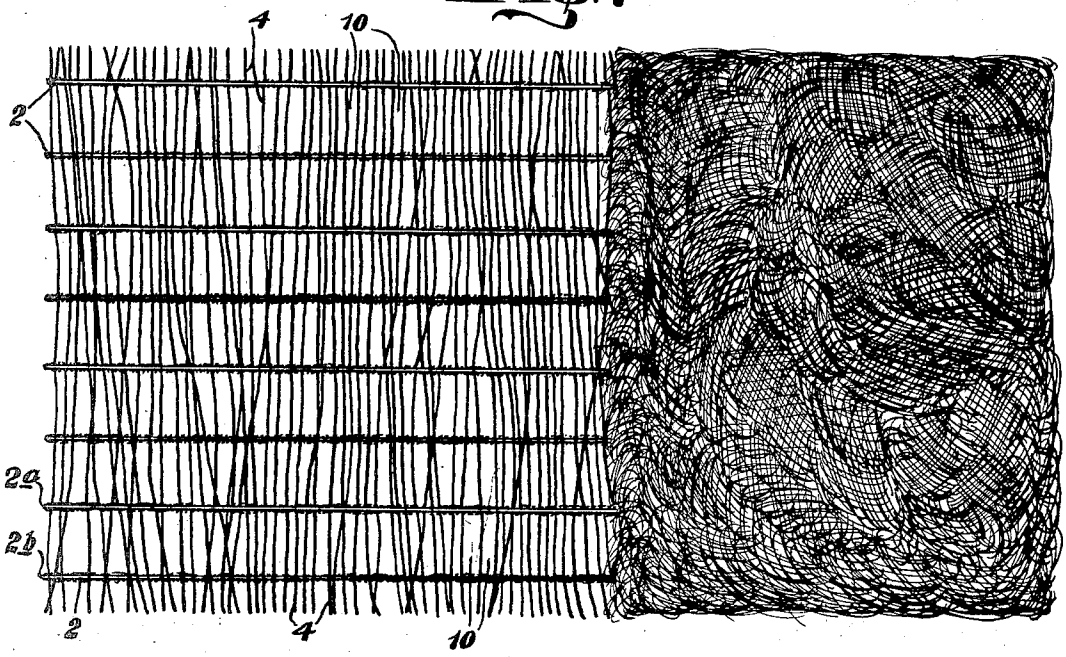
Feb. 15, 1944. P. T. JACKSON, JR., ET AL 2,341,620

NEEDLED FABRIC AND METHOD OF MANUFACTURE

Filed July 1, 1940

Fig. 1



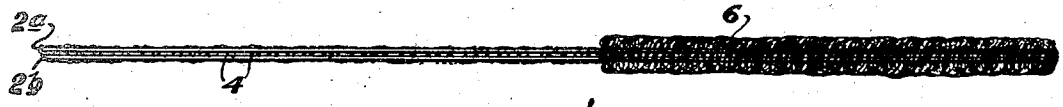


Fig. 2

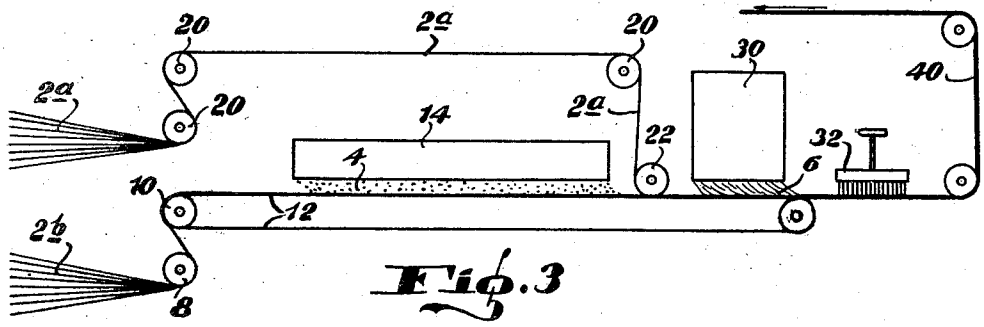


Fig. 3

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NEEDLED FABRIC AND METHOD OF MANUFACTURE

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Application July 1, 1940, Serial No. 343,318

7 Claims. (Cl. 154—33)

This invention relates to the manufacture of needled fabrics used as inexpensive floor coverings, cushion underlays for more expensive floor coverings, and the like, and its object is to improve the construction of such fabrics while reducing their cost of manufacture.

In accordance with the preferred embodiment of our invention the fabric is made by needling one or more bats of vegetable or animal fibers through a novel reenforcing reticulum composed of a set of sparsely distributed generally parallel fibrous strands superposed over another set of such strands and with both sets secured together, if at all, only by adhesive disposed at the strand intersections.

Our experiments have shown that the fibrous strands, lying in a generally straightened condition within the needled fabric as contrasted particularly with the crimped and interlaced yarns of the conventional woven burlap reenforcing, are better able to resist extrusion of the needled fabric under the pressure of traffic which heretofore has caused needled fabrics to become enlarged in service substantially beyond their original dimensions.

Where adhesive is employed, as is preferred, to secure together the superposed strands at their intersections, we may use an adhesive which is thermoplastic in nature so that the heat generated in the subsequent embossing operation causes the adhesive to become plasticized thereby binding in the needled fibers and stiffening the fabric generally.

The needled fabric made in accordance with our invention is accordingly not only better than the conventional needled fabric, but it is also cheaper because of the comparative low cost of materials employed and the savings in manufacturing costs.

In the drawing:

Fig. 1 is a plan view of the fabric produced in accordance with our invention;

Fig. 2 is a side elevation view thereof, and

Fig. 3 is a diagrammatic elevation view illustrating steps in a desirable method of manufacture.

Our novel fabric is composed of lengthwise reenforcing strands 2 and transverse reinforcing strands 4 through which is needled one or more bats of animal or vegetable fibers, indicated at 6. The strands 2 and 4 may be of any desired material, but we preferably employ sisal, jute or the like, as such material is very inexpensive and is exceptionally strong and of low extensibility when the fabric is either tensioned as it is being laid or flattened under pressure in service. Either set of strands may be of spun or of unspun material as desired, but for a purpose which will appear we preferably employ spun strands for at least one of the sets, and in the embodiment illustrated the strands 2 running lengthwise are of spun sisal and the strands 4 running crosswise are of unspun sisal. The transverse strands 4 are disposed generally parallel with each other and spaced apart as indicated. The lengthwise strands 2 are likewise disposed in spaced, generally parallel relationship and are positioned alternately above and below the plane of the transverse strands 4, as indicated at 2*a* and 2*b*, to form a network having apertures 10 through which the fibers 6 may readily be needled.

In making a fabric in accordance with our invention, we prefer to assemble the strands into reticulum form prior to the needling operation and we may do so in the manner illustrated in Fig. 3 as a part of the operation of manufacturing the needled felt. As there shown, the lower lengthwise strands 2*b*, fed from a suitably supply, are guided around rolls 8 and 10 to a belt conveyor 12 where they lie in a single plane suitably spaced from each other. The transverse strands 4, cut to lengths proper for the width of needled fabric being made, are dropped on the lower lengthwise strands 2*b* by any suitable apparatus 14. If desired, continuous filaments can be employed for the crosswise strands and deposited on the lower lengthwise strands by "camel back" or other apparatus of conventional character.

The upper lengthwise strands 2*a*, delivered from a supply, are guided around rolls 20 and under the roll 22 where they are laid on the transverse strands, being suitably guided in parallel spaced relationship alternating with the lower strands 2*b* as explained with reference to Fig. 1.

At 30 the fibers 6 to be needled are laid from a garnet or suitable roll supply onto the novel reticulum thus formed. 32 designates needling apparatus of conventional character adapted to punch the fibers 6 into and through the reticulum. The needled fabric thus made is indicated at 40 and passes around suitable guide rolls to a further fiber applying and needling operation, if more than one bat is used, and finally to hot press rolls or, if the fabric is to be used for a rug underlay, to embossing rolls adapted to impress the fabric with a waffle-like impression which enhances its resiliency for that purpose.

Except where an occasional strand 4 may cross through the planes of the strands 2a and 2b as the result of the way the cross strands are dropped in place, or except where the strands may become disarranged somewhat as the result of the needling operations, each set of strands is confined to a single plane and the sets are not interlaced as in a woven fabric. Our experiments have shown that this straightened condition of the fibers minimizes their ability to stretch so that the original dimensions of the punched fabric are preserved under forces tending to enlarge it. Any tendency of the reenforcing strands to be punched through during the needling is minimized by the use of spun strands running in at least one direction, alternating above and below the plane of the crossing strands. To insure proper stripping of the punched fibers from the needles, we have found that the lengthwise and transverse strands should not be separated from each other by a distance greater than about one half inch.

Under certain conditions of use, we have found that the reenforcing reticulum above described is improved by securing it together with adhesive into a structure that is self-sustaining prior to its use in the manufacture of a needled fabric. For that purpose we secure together the crossing sets of reenforcing strands by adhesive disposed at their intersections, and in practice we have produced this result by coating the strands 2a and 2b with an adhesive which is plastic at the time the transverse strands 4 are deposited on them. Such a self-sustaining reticulum may be packaged and stored and when used in the manufacture of a needled fabric it may be introduced into the conventional needling machine in place of the burlap.

The adhesive which we preferably employ is desirably thermoplastic in character so that it may be plasticized by the heat of the pressing or embossing operations to which the fabric is subjected after needling. This application of temperature causes the adhesive to flow within the structure of the needled fabric and to bind its component parts together while stiffening the fabric to give it a better handle.

We claim:

1. A reenforced needled fabric having little extensibility in the direction of its reenforcement composed of fibers needled through a plurality of sets of reenforcing fibrous strands, each set of strands lying in a common plane and extending in a direction to cross over one side of another set, the strands in each set being disposed generally parallel with each other and laterally spaced, whereby the combined sets form a multi-directional reenforcement having wide openings through which said fibers are needled.

2. A reenforced needled fabric having little extensibility in the direction of its reenforcement composed of fibers needled through a plurality of sets of reenforcing fibrous strands, each set of strands lying in a common plane and extending in a direction to cross over one side of another set, the strands in each set being disposed generally parallel with each other and laterally spaced, and the strands in at least one set being composed of thinly scattered unspun fibers, whereby the combined sets form a multi-directional reenforcement having wide openings through which said fibers are needled.

3. A reenforced needled fabric having little extensibility in the direction of its reenforcement composed of fibers needled through a plurality of sets of reenforcing fibrous strands, each set of strands lying in a common plane and extending in a direction to cross over one side of another set, the strands in each set being disposed generally parallel with each other and laterally spaced, and at least one of said sets being composed of spun fibers, whereby the combined sets form a multi-directional reenforcement having wide openings through which said fibers are needled, said strands being held in place within the bulk of the needled fibers solely by the intertwining of the needled fibers therewith.

4. A reenforced needled fabric having little extensibility in the direction of its reenforcement composed of fibers needled through a base layer comprising a multitude of fibrous strands, said base layer having strands extending in one general direction and crossing other strands extending in another general direction and including on each surface of the base layer strands extending along that surface only without crossing through the base layer to the opposite surface thereof, the strands extending in any one direction being disposed generally parallel with each other and laterally spaced so that the base layer has wide openings through which the fibers are needled.

5. A reenforced needled fabric having little extensibility in the direction of its reenforcement composed of fibers needled through a base layer including a set of unspun strands disposed intermediate an upper and a lower set of spun strands, the strands of said upper set extending substantially parallel with each other and with the strands of said lower set and said unspun strands of the intermediate set extending across the strands of said upper and lower sets, the strands of said upper set alternating with the strands of said lower set and the strands of each set being laterally spaced whereby the combined sets form a net-like structure having wide openings through which said fibers are needled.

6. The method of manufacturing a needled fabric which consists in arranging successive sets of fibrous strands to cross each other with the strands of each set extending in generally parallel spaced relationship and lying in a common plane to form with the other sets a reenforcement having wide openings bounded by loose strands, and immediately thereafter needling fibers through the said openings to form a needled fabric.

7. A reenforced needled fabric having little extensibility in the direction of its reenforcement composed of fibers needled through a base layer comprising a multitude of fibrous strands, said base layer having strands extending in one general direction and crossing in contact with other strands extending in another general direction and secured thereto by adhesive at the crossings, said base layer including on each surface thereof strands extending along that surface only without crossing through the base layer to the opposite surface thereof, the strands extending in any one direction being disposed generally parallel with each other and laterally spaced so that the base layer has wide openings through which the fibers are needled.

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