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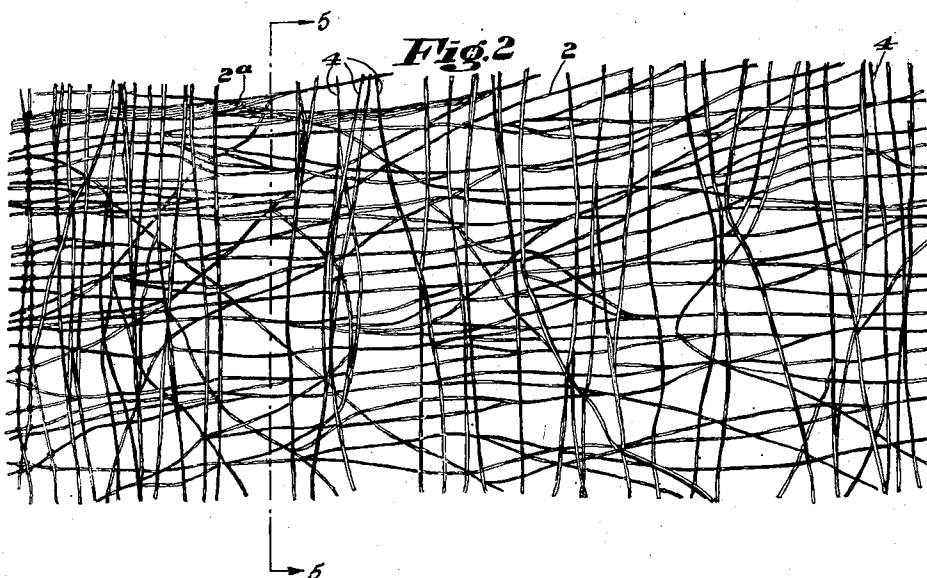
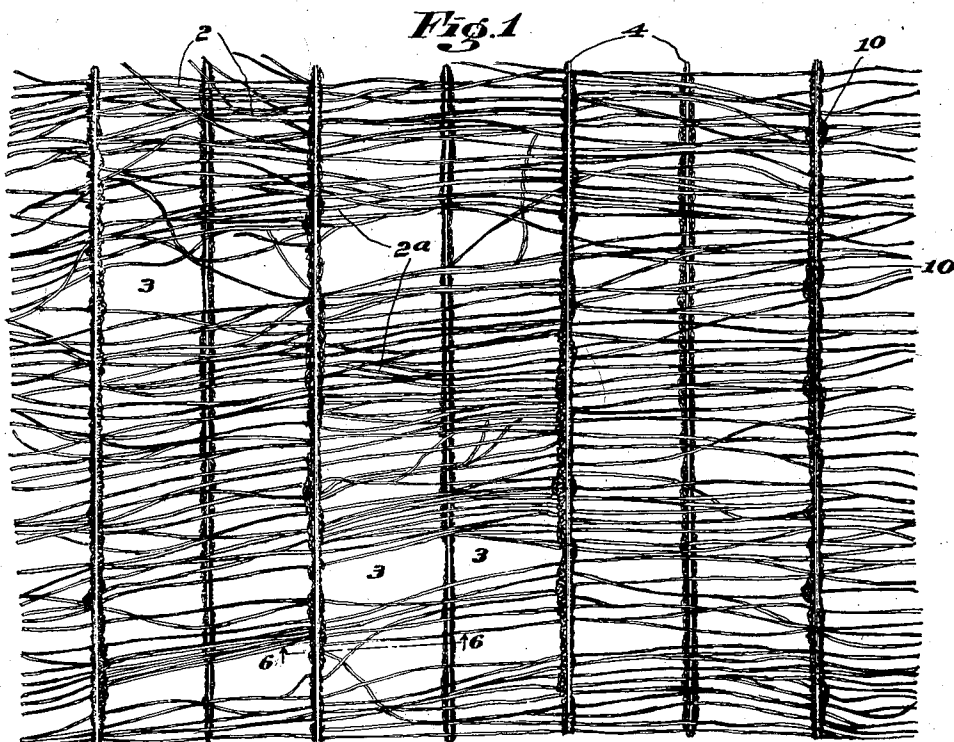
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2,266,761

FIBROUS SHEET

Filed April 16, 1940

2 Sheets-Sheet 1



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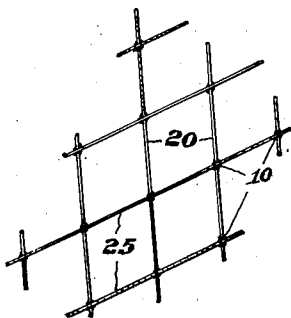
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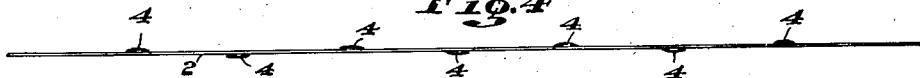
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2 Sheets-Sheet 2

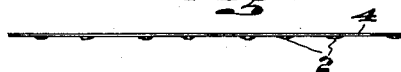
*Fig. 3*



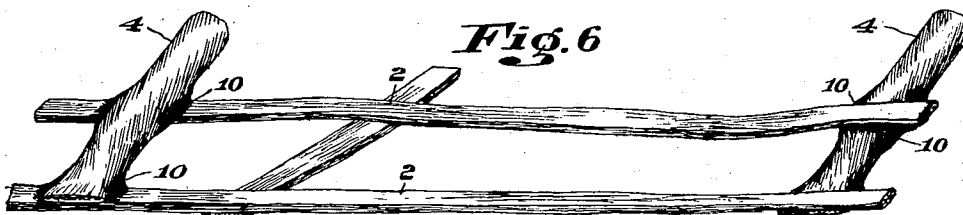
*Fig. 4*



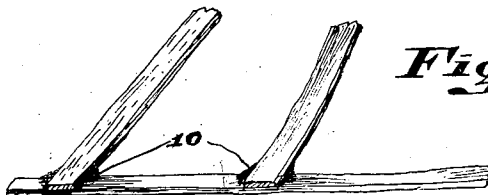
*Fig. 5*



*Fig. 6*



*Fig. 7*



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## UNITED STATES PATENT OFFICE

2,266,761

## FIBROUS SHEET

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to American Reinforced Paper Company,  
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setts

Application April 16, 1940, Serial No. 329,884

6 Claims. (Cl. 154—46)

This invention relates to a self-sustaining but unwoven fibrous sheet of novel properties and characteristics which is adapted to be used as an element in the manufacture of a large variety of articles such, for example, as punched felts, clothing and plastics.

The object of our invention is to provide such a sheet of cheap materials but with adequate tensile strength formed of superposed sets of sparsely distributed fibrous strands united by adhesive at the points where the strands of one set cross those of another to form an integral retiform unit which can be packaged and sold at low cost for use in the manufacture of other articles.

In the preferred form of our sheet one of the sets or layers at least is composed of sisal fibers laid more or less parallel to one another, but so spaced apart as to provide wide apertures between separate fibers or groups of fibers. The other layer or layers may be composed of the same material or of different materials as will be described, the strands of which, however, are also separated widely from one another. Thus the sheet embodying our invention is preferably composed of a minimum number of strands for its purpose, crossing one another and leaving large spaces between them so that it is very thin. It may be quite frail in construction, but yet can be handled as a unit and is highly useful in the manufacture of other articles because of its tensile strength and low cost.

In the drawings:

Fig. 1 shows diagrammatically a sheet made in accordance with our invention;

Fig. 2 shows a modified embodiment of our invention;

Fig. 3 shows a further form of sheet;

Fig. 4 is an edgewise view of the sheet shown in Fig. 1;

Fig. 5 is a section on the line 5—5 of Fig. 2;

Fig. 6 is a greatly magnified perspective view taken on the line 6—6 of Fig. 1, and

Fig. 7 is a view similar to Fig. 6, but showing the embodiment of Fig. 2.

The sheet illustrated in Fig. 1 consists of a large number of strands 2 running in a transverse direction and strands 4 running in a lengthwise direction, with alternate strands 4 extending below the plane of the strands 2 and alternate strands above it as shown in Fig. 4. The strands 2 are preferably composed of long unspun fibers, such as sisal, jute, ramie or the like, which have been drawn out from a supply into a thin sheet and dropped either onto a tem-

porary carrier, after which the longitudinal strands are applied, or onto the bottom longitudinal strands 4 after which the top strands 4 are applied. The strands 2, generally parallel with each other, are widely spaced apart except that owing to the lack of control of individual strands in dropping, some of the strands may be closely bunched as indicated at 2a. Others may be very widely spaced, as indicated by the gaps 3.

The lengthwise strands 4 may be of the same material as the transverse strands, namely, unspun fibers of sisal, jute, ramie or the like, attenuated into a thin sheet as shown in Fig. 2, or they may be strands or filaments of spun threads of such material or other material such as cotton, or they may be of paper or the like. In any case, the lengthwise strands are preferably widely separated from each other so that in the retiform sheet made from the combined strands the aggregate area of the spaces separating the strands is as great and preferably much greater than the aggregate of the areas occupied by the strands themselves, although the ratio may vary somewhat depending upon the strength desired. The strands, whether lengthwise or transverse, may be disposed on either or both sides of the other set of strands.

The lengthwise and transverse strands thus disposed are secured together into a self-sustaining retiform sheet by adhesive bonding the strands at their crossings as shown at 10 in the greatly magnified views of Figs. 6 and 7. In the embodiment of our invention shown in Fig. 1 the adhesive may conveniently be provided as a coating applied to the longitudinal strands 4 prior to their assemblage with the transverse strands 2, and we have effectively used asphalt for the purpose, although other adhesives may be employed. In the embodiment of Fig. 2 an adhesive such as latex may conveniently be sprayed onto the strands after they have been assembled, or thermoplastic adhesives in powdered form may be used, dusted onto the sheet and subsequently plasticized by heating.

Although for most uses we greatly prefer a sheet made of longitudinal and transverse strands composed of long unspun fibers extending in either or both directions, this construction is not always essential. For some uses we may employ, as shown in Fig. 3, strands 20, which may be spun, extending in one diagonal direction and similar strands 25 extending in the opposite diagonal directions, alternately on one side and on the other of the strands 20 and

secured thereto by adhesive at the intersections. But such construction is less desirable and more expensive to make than our preferred sheet with unspun strands extending in a longitudinal or a transverse direction, or in both directions.

Our novel sheet, being made of a minimum number of strands preferably of unspun fibers sparsely distributed as shown is extremely thin so that preferably each transverse strand, for example, contacts the adhesive carried by each longitudinal strand which crosses it. Except for some randomness in the fiber distribution as a result of the way they are deposited, the strands of each set or layer stay in their own plane without crossing through the plane of the other layers of strands as in a woven fabric. Thus, as shown in Fig. 4, the upper strands 4, the intermediate strands 2 and the lower strands 4, being deposited independently or superposed on each other, constitute separate sets of strands and the strands of each set do not cross through the strands of any other set. The unspun strands preferably average as much as several feet in length.

A sheet made in accordance with our invention is well adapted for use in the manufacture of a large variety of articles. Thus, it is a low cost substitute for burlap in the manufacture of punched felt fabrics where its wide interstices and the looseness of its strands allow the garnetted fibers to be punched through readily with a minimum of fiber rupture producing such interfelting of the punched fibers as avoids lamination of the punched fabric. Its pliability and stretchability commends it for that use as well as for a low cost interliner between plies of fabric. It has many uses in the manufacture of plastic materials of all sorts where its extreme thinness and wide apertures effect good bonding with the plastic.

Because of the low quality of the adhesive which we preferably use and the widely dispersed points of fiber adhesion, our sheet may be secured together with only sufficient strength to enable it to be packaged and incorporated in another article. Because of this and its wide interstices, it may be quite frail in construction with little bursting strength rendering it unfit for most uses for which fabrics or woven nets are adapted. But by our invention we have made available to manufacturers a fibrous sheet which dispenses with the need for using comparatively expensive fabrics or costly equipment for laying individual strands.

The embodiments of our invention above specifically described can be further modified without departing from the spirit of our invention which is to be limited only as the appended claims require.

We claim:

1. A self-sustaining unwoven material having a layer of unspun fibrous strands extending in

a generally parallel direction adhesively secured in widely and irregularly spaced relationship to filaments crossing the strands and extending along one side of the layer of fibrous strands without crossing to the other side thereof to form a thin self-sustaining reticulum having wide irregular apertures.

2. A self-sustaining unwoven material composed of a layer of unspun fibrous strands, the thickness of said layer not substantially exceeding that of a single strand, adhesively secured in widely and irregularly spaced relationship to parallel spaced spun filaments crossing the strands and extending along a side of the layer of fibrous strands without crossing to the other side thereof to form a thin retiform sheet having wide irregular apertures.

3. A self-sustaining retiform sheet having a set of widely spaced generally parallel unspun strands superposed over a set of widely spaced parallel spun strands arranged at approximately right angles to the strands of the first set and contacting therewith all on the same side thereof the strands of the two sets being secured together by adhesive at their points of contact to form an integral unit, the combined area of the openings in which is several times greater than the combined area occupied by the strands themselves.

4. A self-sustaining unwoven retiform sheet having one attenuated set of sparsely distributed generally parallel strands of unspun fiber superposed over another set, with strands of one set crossing those of the other set without passing through them and united by adhesive at their points of contact into an integral self-sustaining unit having irregularly shaped openings, the combined area of which is several times greater than the combined area occupied by the strands themselves.

5. A self-sustaining retiform sheet composed of superposed sets of sparsely distributed fibrous strands, the strands of one set crossing those of another set without passing through them and weakly united solely by adhesive which secures them at their crossings into a frail structure having large irregular openings and of a strength not substantially greater than that enabling the sheet to be handled as a unit without separating.

6. A self-sustaining unwoven retiform sheet having a layer of unspun fibrous strands extending in the same general direction and with openings separating the strands, a set of spaced apart generally parallel spun strands on one side of said layer of unspun strands and a second set of spaced apart generally parallel spun strands on the other side thereof, the strands of one of said sets alternating with the strands of the other set and the strands of both of said sets crossing said layer and being united thereto by adhesive.

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