

Dec. 21, 1948.

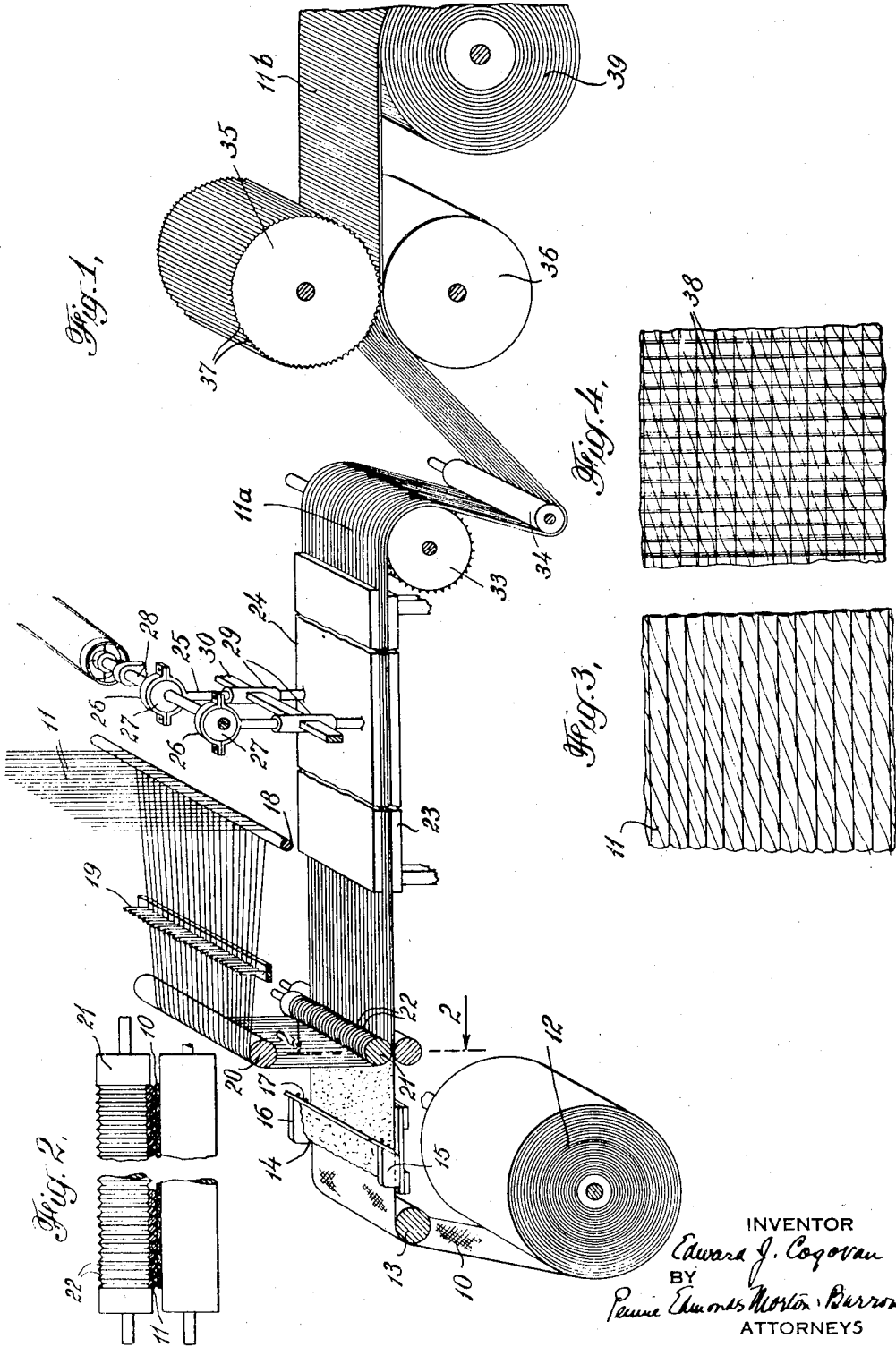
E. J. COGOVAN

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Filed March 21, 1946

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 5,

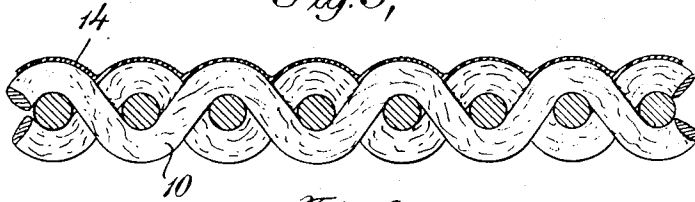


Fig. 6,

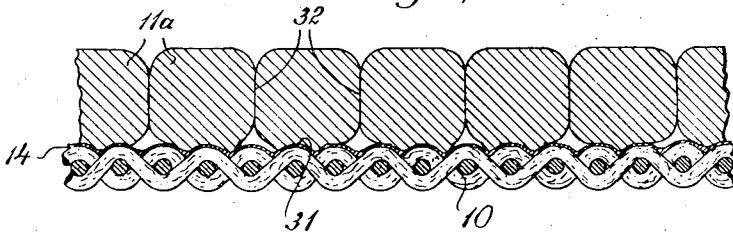


Fig. 7,

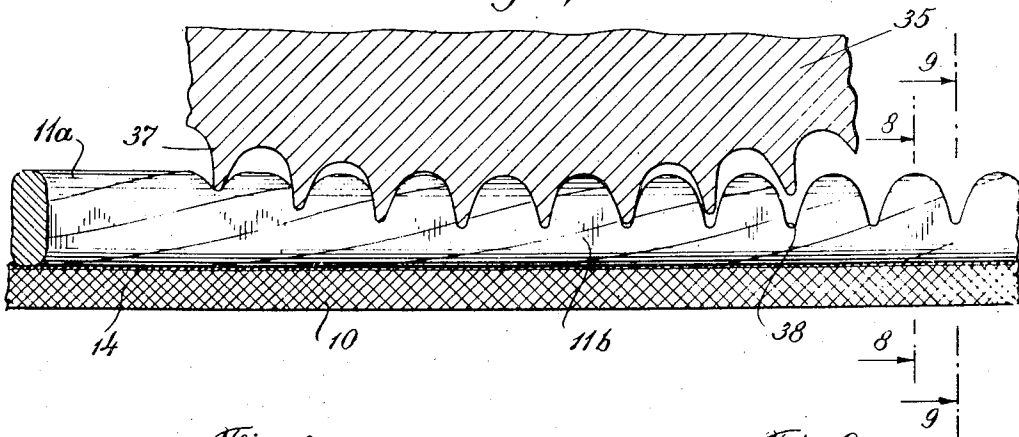


Fig. 8,

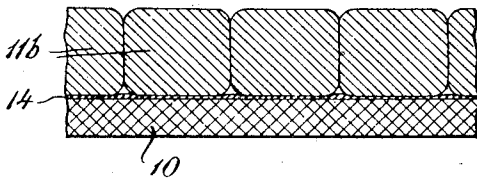
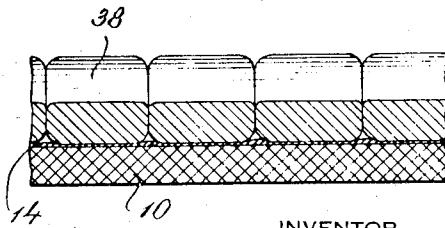


Fig. 9,



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FABRIC

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9 Claims. (Cl. 154—45.9)

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This invention relates to fabrics suitable for use as floor and wall coverings and for similar purposes and is concerned more particularly with a novel fabric which is attractive in appearance, of extraordinary resistance to wear, and capable of being manufactured rapidly, with little equipment, and at low cost. Because of its great durability, the new fabric may be advantageously employed to carpet heavy traffic areas, such as halls, aisles, entries, etc., and it is a highly satisfactory covering for the floors and the lower portions of the doors of automobiles. Its low cost also permits its use for a wide variety of purposes, for which a protective or sound deadening covering is required, as, for example, as a carpeting for the floor and a lining for the walls of the luggage compartment of an automobile, as a covering for the walls and ceilings of rooms, etc.

The new fabric is of the laminated type and it includes a backing sheet, which may be of paper, felt, etc., but is preferably made of fibrous textile material, such as burlap, and a layer of yarns affixed to one face of the sheet in parallel contacting relation by adhesive. The yarns employed may be made of fibres of different kinds and may include any of the usual textile fibres, natural or synthetic, or a mixture thereof, but I prefer to use a yarn having a substantial proportion of wool fibres, because of both the wearing qualities and appearance of yarns made of such fibres.

I am aware that it has been proposed heretofore to make laminated fabrics by affixing a layer of yarns in parallel relation to one surface of a backing sheet and it is evident to any one familiar with the production of fabrics in general that it should be possible to make such fabrics at low cost, since the operations involved require little equipment and are not comparable in cost with those employed in producing woven materials. However, despite their apparent advantages for many purposes, such laminated fabrics have not heretofore come into wide use, at least for floor coverings, so far as I am informed, and I believe that the reason is that the proposed fabrics have not had the desired durability.

In producing a laminated fabric for use as carpet, it would seem obvious that its durability would depend on the use for the exposed surface of yarns of good wearing qualities and that the best yarns for the purpose would be tightly twisted wool yarns of appropriate size. It has been proposed to give such laminated fabrics a surface appearance simulating that of woven goods by transversely indenting the surface yarns at a

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close spacing and it would appear that, for this purpose, the yarns should be bound to the backing sheet by a layer of adhesive of substantial thickness, so that the yarns could be forced into the layer at the desired intervals.

I have found, however, that, contrary to expectation, the use of tightly twisted yarns or cords, that would be necessary for the production of woven fabrics of good durability, is undesirable in such laminated fabrics, for the following reasons. If a thin film of adhesive is applied to the backing and the tightly twisted yarns are pressed against the film, the yarns will not be securely bound in place, because each yarn will make contact with the film over only a narrow area and the adhesive cannot penetrate among the tightly twisted fibres. If the adhesive layer is of substantial thickness and the yarns are embedded in it, again there is little penetration of the adhesive and the yarns will be scuffed free of the adhesive in a relatively short time by the action of the rubber heels now commonly worn.

In the new fabric, I overcome the difficulties above pointed out in the following way. I employ for the wear surface of the laminated fabric a layer of heavy loosely twisted readily distortable yarns, preferably plied yarns, and I affix these yarns by means of a thin film of adhesive. The yarns are laid side by side and in lateral contact with one another on the film and are then subjected to the repeated application of pressure over a large area of the yarn layer. The pressure is sufficient to distort and flatten the yarns and force them into lateral contact over greater areas, so that each yarn is in contact with the film over an area extending throughout the length of the yarn and of a width equal to at least half the width of the yarn and is in contact with the yarns on either side thereof over areas of similar width. By reason of the distortion and compacting of the yarns as above described, each yarn has a wide area of adhesion to the backing and, since the yarn is loosely twisted, the adhesive can penetrate among the fibres in the yarn adjacent to the surface of the backing sheet and obtain a good grip on the yarn. In addition, the forcing of the yarns against one another, so that they make contact over wide lateral areas with one another, causes the yarns to provide mutual support for one another, so that they resist displacement by scuffing action.

While a laminated fabric as above described is suitable for many purposes, it can be substantially improved in wearing qualities by incorporating in the surface yarns means for binding

together the fibres thereof. For this purpose, I prefer to make the yarns of fibres, which are not potentially adhesive, as, for example, wool, cotton, jute, or mixtures of such fibres, and to incorporate in the yarns a material which is capable of being rendered adhesive and is distributed throughout each yarn. The adhesive material may most conveniently be employed in the form of fibres, which are blended with the other fibres to make up the yarn, after which the mixture is spun in the usual way. Various kinds of potentially adhesive fibres may be employed for the purpose, as, for example, fibres of plasticized cellulose acetate and of synthetic resins, such as polystyrene, vinyl copolymers, etc. Such potentially adhesive material may be one that can be rendered adhesive by means of a solvent, but I prefer to employ a material that may be rendered tacky by heating. The material is employed in the yarn in insufficient amount to change the appearance of the yarn, and, when potentially adhesive fibres are used, they are present in an amount of the order of 25%.

When the surface yarns of the new fabric include a material that may be rendered adhesive by heat, it is possible to obtain embossed and indented effects by means of a heated roll or plate, which both produces the desired effects and also causes the material to be tacky. In such embossing or indenting operations, the fibres in the yarns are displaced from their original positions and they then become bound in their new positions, when the adhesive material sets. The result is that the embossed or indented effects are much more permanent in character than those produced by embossing or indenting yarns embedded in a thick layer of adhesive.

For a better understanding of the invention, reference may be made to the accompanying drawings, in which

Fig. 1 is a diagrammatic perspective view showing the method of producing the fabric of the invention;

Fig. 2 is a sectional view on the line 2—2 of Fig. 1;

Fig. 3 is a plan view of one form of the new fabric;

Fig. 4 is a plan view of a modified form of the new fabric;

Fig. 5 is a longitudinal sectional view, on an enlarged scale, of a backing sheet which may be employed in the fabric;

Fig. 6 is a transverse sectional view, on an enlarged scale, of the fabric;

Fig. 7 is a longitudinal sectional view illustrating the indenting operation; and

Figs. 8 and 9 are sectional views on the lines 8—8 and 9—9, respectively, of Fig. 7.

The fabric of the invention includes a backing sheet 10, which may be made of paper, felt, etc., but is preferably a plain woven fabric. Burlap of the type used for bagging is suitable for the purpose and another fabric that is satisfactory, is one loosely woven of heavy cotton yarns, such as one plied of three strands of .70's count, the fabric being subsequently calendered to flatten the yarns and close the interstices between them. If desired, the sheet may be similar in construction to the back or body portion of certain pile fabrics, in which jute and paper yarns are employed. The choice of the material used for the backing sheet will depend on the desired weight of the final product and also on the purpose for which the product is to be employed and the conditions under which it will be used.

The backing sheet has a layer of yarns 11

affixed adhesively to one face thereof, the yarns lying side by side in closely contacting relation throughout their lengths and wholly concealing the sheet. The yarn used for the purpose is heavy, loosely twisted, and readily distortable and it is preferably plied of a number of strands and has a weight from 10 to 45 yards to the ounce. The yarn may be made of various fibres, such as wool, cotton, jute, and synthetic fibres, or combinations of such fibres in varying proportions. For a fabric of good wearing qualities, the yarn used may be about 50% wool with the remainder made up of other fibres mentioned. Preferably, the yarn includes a proportion of the order of 25% of fibres that are potentially adhesive and examples of such fibres have been given above. The yarn is dyed the desired color before incorporation in the fabric and desirable color effects may be obtained by dyeing the strands to be plied together to make the yarn in different colors.

In the production of the fabric, the backing sheet 10 is drawn from a supply roll 12 and passes around a guide roller 13 and then to a station where the adhesive coating 14 is applied to one face. The adhesive preferred is of the type known commercially as "pressure sensitive," that is, one that sets quickly upon application of pressure, and it may include natural or synthetic latex or ethyl cellulose, for example, together with other ingredients. The adhesive may be applied to the backing sheet in various ways, as, for example, by spraying, but I prefer to maintain a pool 15 of adhesive on the surface of the sheet between edge guides 16 and limit the thickness of the film of adhesive applied by means of an adjustable doctor blade 17. In practice, the doctor blade is set very close to the surface of the sheet, so that the film of adhesive is about as thick as a coat of paint. In passing beneath the pool of adhesive, the backing sheet, if it is of the right kind, will take up adhesive, and, when burlap is used for the sheet, the burlap is likely to be thoroughly impregnated.

The yarns 11 to be affixed to the sheet are drawn from a suitable supply, which may be a beam, on which the yarns have been wound, or a plurality of spools or other packages mounted in a creel. The yarns from the supply pass around a guide roller 18 and thence through a comb or reed 19, which keeps the individual yarns parallel and prevents their crossing. Beyond the reed, the yarns pass around a guide roller 20, and thence beneath a light floating roller 21, which is formed with circumferential corrugations of V-shape for receiving the individual yarns. The corrugations are of such shape and arrangement that the yarns seated in them lie in lateral contact. The roller 21 lays the yarns lightly on the adhesive film on the sheet but is not heavy enough to distort the yarns to any substantial extent or to cause them to be firmly seized by the adhesive.

Beyond the roller 21, the backing sheet with the yarns in place thereon and lying in lateral contact is acted on by means for insuring that the yarns will be tightly affixed to the sheet. In the apparatus illustrated, such means take the form of a table 23 supporting the sheet from beneath and a pressing plate 24, which is at least as wide as the sheet and is of substantial length, for example, 6 feet. The plate is mounted on rods 25 attached to straps 26 encircling eccentric discs 27 on a driven shaft 28 and the rods are guided for vertical movement in guides 29 mounted on a cross-bar 30 of a suitable support-

ing structure (not shown). The plate 24 is reciprocated vertically, when shaft 28 is driven, and the adjustments of the parts are such that the plate flattens the yarns by repeatedly pressing or patting them, as the sheet travels along. Initially, the yarns are of substantially circular cross-section but, as a result of the action of the plate, the yarns assume the shape indicated at 11a (Fig. 6). Each flattened yarn 11a makes contact with the backing sheet over an area 31 on its under surface, which is equal in width to at least half the diameter of the yarn, and the yarn makes contact laterally with adjacent yarns over areas 32, the width of which is equal to at least half the yarn diameter.

During the repeated action of the plate 24 on the yarns, the yarns gradually assume their flattened compacted condition and, while the yarns lying in contact with the adhesive are approaching the plate 24 and in the initial stages of the action of the plate, the adhesive penetrates the fibres of the yarns. When the yarns pass from beneath the plate, the adhesive has a firm grip on the yarns over areas of substantial width, which extend the entire lengths of the yarns, and the fabric may be passed over a driven spike roll 33, which pulls it through the apparatus, and then wound into rolls and left to stand until the adhesive has fully set. However, when the yarns employed include potentially adhesive material, the fabric is given further treatments as follows.

Beyond the spike roll 33, the fabric passes around a guide roll 34 and thence beneath a heavy floating roll 35, which presses the fabric against a roll 36 in fixed bearings. The roll 35 is heated, as, for example, by steam, to a temperature sufficient to insure that, as the fabric passes between rolls 35 and 36, the potentially adhesive fibres in the yarn will become tacky and will firmly adhere to adjacent fibres. The weight of the roll 35 is such that the yarns are further flattened against the backing sheet and forced against one another, until they assume a substantially square cross-section as indicated at 11b (Fig. 8). In such flattening of the yarns, their areas in contact with the backing sheet are increased, until substantially their entire bottom sides are affixed to the sheet. The fibres in the yarns are forced into intimate contact by the pressure and the fibres are then held in such condition by the setting of the bonding fibres within the yarns.

If desired, the roll 35 may have means on its surface for embossing or indenting the yarns 11 to produce various surface effects and the roll illustrated is formed with thin longitudinal flutes 37. As the fabric passes beneath such a fluted roll, the flutes form indentations 38 in the yarns, so that the finished fabric has lines across its surface somewhat resembling the lines between rows of tufts in the surface of a pile fabric. Since the yarns are not tightly twisted, the fibres therein can be displaced to provide the indentations and the fibres are then bound in place in their new positions by the bonding fibres within the yarns.

The fabric passing from rolls 35, 36 is wound into rolls 39, which are then stored until the adhesive binding the yarns to the backing sheet has fully set. Such storage or ageing time varies with the adhesive but is relatively short.

The new fabric can be made rapidly, as, for example, 30 or 40 yards per minute, and, as the yarns and backing sheet are relatively inexpensive and little equipment and labor are required, the cost of the product is very low. At the same

time, the new fabric has wearing qualities much superior to those of low cost pile fabrics, which, however, are much more expensive than the new fabric, and of flock surfaced fabrics.

I claim:

1. A fabric which comprises a backing sheet, a thin film of adhesive on one surface of the sheet, and a plurality of loosely-twisted heavy yarns on the sheet, said yarns having flattened surfaces on opposite sides extending lengthwise of the yarns and of a width equal at least to half the width of the yarns, the yarns lying side by side with the flattened surface of each yarn lying in contact with like flattened surfaces of adjacent yarns, said yarns also having flattened surfaces of substantial width extending the full length of the yarns and lying in the plane of said film of adhesive and affixed to the sheet thereby along the entire length of the yarns, said film of adhesive forming the sole means for securing the yarns to said backing sheet, each yarn including a major proportion of fibres which are not potentially adhesive and a minor proportion of material distributed throughout it and binding the fibres which are not potentially adhesive.

2. A fabric which comprises a backing sheet, a thin film of adhesive on one surface of the sheet, and a plurality of loosely-twisted heavy yarns on the sheet, said yarns having flattened surfaces on opposite sides extending lengthwise of the yarns and of a width equal at least to half the width of the yarns, the yarns lying side by side with the flattened surfaces of each yarn lying in contact with like flattened surfaces of adjacent yarns, said yarns also having flattened surfaces of substantial width extending the full length of the yarns and lying in the plane of said film of adhesive and affixed to the sheet thereby along the entire length of the yarns, said film of adhesive forming the sole means for securing the yarns to said backing sheet, each yarn including a major proportion of fibres which are not potentially adhesive and a less but substantial proportion of other fibres distributed throughout the yarn and adhering to and binding together the fibres which are not potentially adhesive.

3. A fabric as set forth in claim 1 in which the flattened surfaces at opposite sides of the yarns are at least half the width of the yarns.

4. A fabric as set forth in claim 1 in which the yarns are substantially square in cross-section.

5. A fabric which comprises a backing sheet, a thin film of adhesive on one surface of the sheet, and a plurality of loosely-twisted heavy yarns on the sheet, said yarns having flattened surfaces on opposite sides extending lengthwise of the yarns and of a width equal at least to half the width of the yarns, the yarns lying side by side with the flattened surfaces of each yarn lying in contact with like flattened surfaces of adjacent yarns, said yarns also having flattened surfaces of substantial width extending the full length of the yarns and lying in the plane of said film of adhesive and affixed to the sheet thereby along the entire length of the yarns, said film of adhesive forming the sole means for securing the yarns to said backing sheet, each yarn including a major proportion of fibres which are not potentially adhesive and a minor proportion of material distributed throughout it and binding the fibres which are not potentially adhesive, the fibres of the yarns being distorted to form indentations in the yarns and the fibres of the several yarns being set in their indented

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condition by the adhesive material which is distributed throughout the yarns.

6. A fabric as set forth in claim 5 in which the indentations extend continuously across the group of yarns.

7. A fabric which comprises a backing sheet, a thin film of adhesive on one surface of the sheet, and a plurality of loosely-twisted heavy yarns on the sheet, said yarns having flattened surfaces on opposite sides extending lengthwise of the yarns and of a width equal at least to half the width of the yarns, the yarns lying side by side with the flattened surfaces of each yarn lying in contact with like flattened surfaces of adjacent yarns, said yarns also having flattened surfaces of substantial width extending the full length of the yarns and lying in the plane of said film of adhesive and affixed to the sheet thereby along the entire length of the yarns, said film of adhesive forming the sole means for securing the yarns to said backing sheet, each yarn including a major proportion of fibres which are not potentially adhesive and a less but substantial proportion of fibres which are potentially adhesive and are distributed throughout the yarn, the fibres of all of the yarns having been distorted to form indentations in the yarns and the fibres of the several yarns having been set in their indented condition by a portion of the potentially adhesive fibres having been rendered actively adhesive and compressed into contact with and bound in their compressed state to the fibres which are not potentially adhesive.

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8. A fabric which comprises a backing sheet, a thin film of adhesive on one surface of the sheet, and a plurality of loosely-twisted heavy yarns on the sheet, said yarns having flattened surfaces on opposite sides extending lengthwise of the yarns and of a width equal at least to half the width of the yarns, the yarns lying side by side with the flattened surfaces of each yarn lying in contact with like flattened surfaces of adjacent yarns, said yarns also having flattened surfaces of substantial width extending the full length of the yarns and lying in the plane of said film of adhesive and affixed to the sheet thereby along the entire length of the yarns, said film of adhesive forming the sole means for securing the yarns to said backing sheet.

9. A fabric as set forth in claim 8 in which the yarns are substantially square in cross-section.

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