March 28, 1944. V. H. BODLE ET AL 2,345,376

METHOD OF MAKING FLOCKED FLOOR COVERING

Filed Dec. 20, 1939 2 Sheets-Sheet 1

Fig. 1

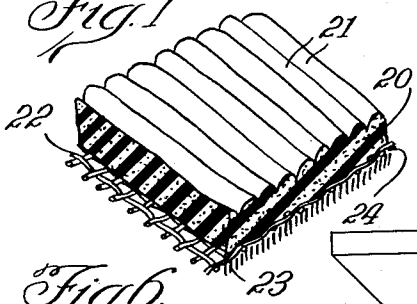


Fig. 2.

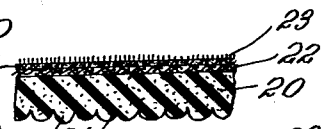


Fig. 3.



Fig. 4.



Fig. 6.



Fig. 5.

Fig. 7.

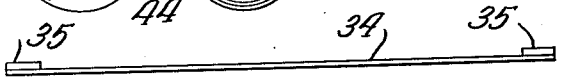


Fig. 11.

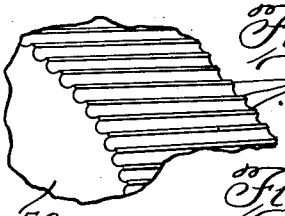


Fig. 8.

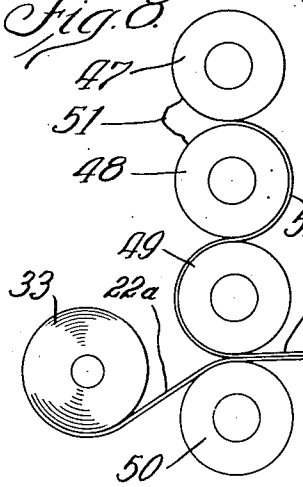


Fig. 9.

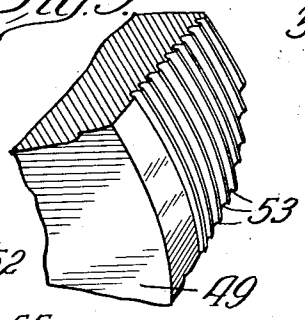
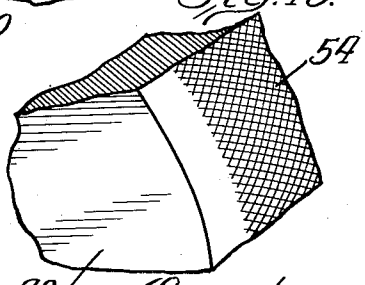


Fig. 10.



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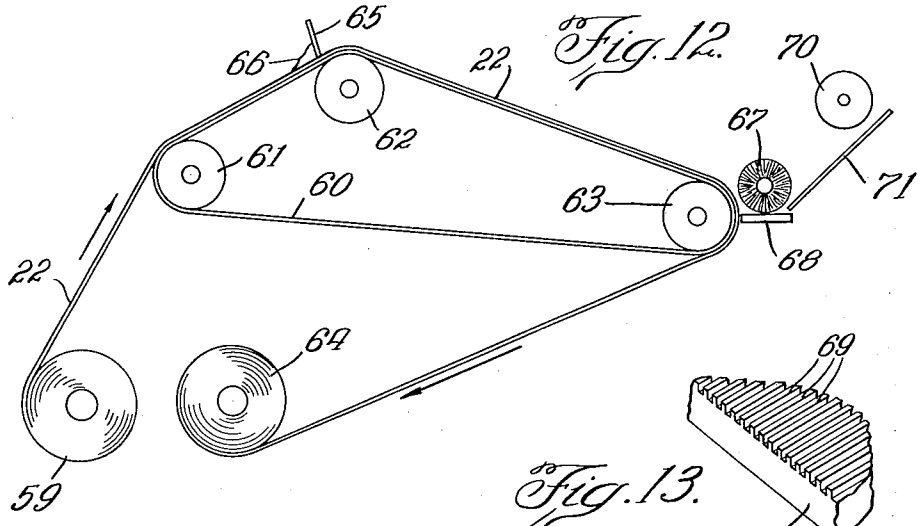


Fig. 12.

Fig. 13.

Fig. 14.

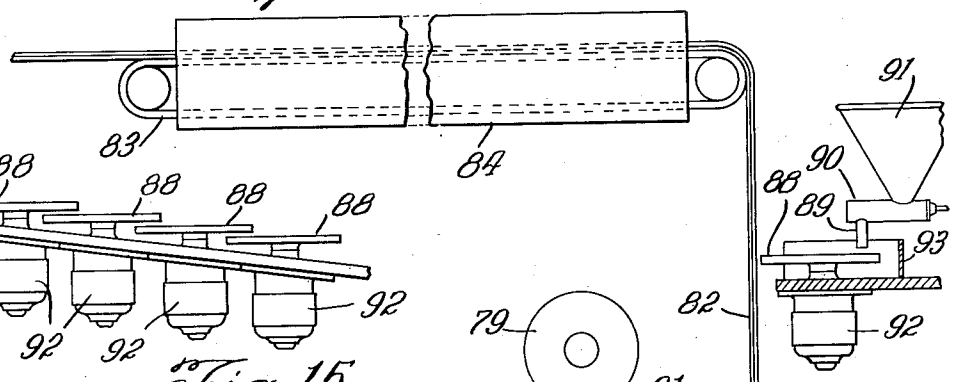


Fig. 15.

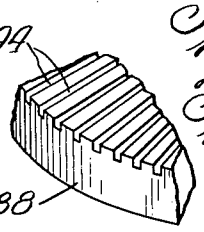
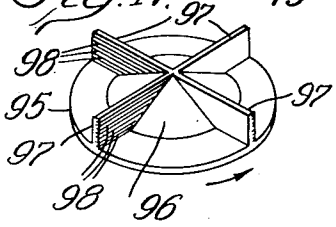


Fig. 16.

Fig. 17.



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METHOD OF MAKING FLOCKED FLOOR COVERINGS

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Application December 20, 1939, Serial No. 310,112

5 Claims. (Cl. 117—16)

Our invention relates to floor coverings or the like wherein a cushiony base is surfaced with a wear resisting or decorative layer or coating and has reference more particularly to a composite material of this character having a sponge rubber base and a surfacing of flock or short fibres.

In many cases it is desirable to provide a relatively inexpensive material for floor covering and similar purposes which not only has the appearance and feel of fabric carpeting of substantial depth but also has wearing properties which will withstand prolonged hard usage. This is accomplished in accordance with the present invention by employing a sponge rubber like backing, preferably with ribs or projections on the under side freely expanded to an especially soft cushiony texture and provided with a top covering of flock, preferably composed of or including fibres of sufficient length arranged to simulate a napped or pile fabric, a reinforcing of fabric or the like being preferably interposed between the flocking and the top surface of the sponge rubber backing.

The principal objects of our invention are to provide an improved sponge rubber backed flock surfaced material suitable for use as carpeting or the like; to utilize a cushion backing which not only imparts to the composite material the feel of fabric carpeting of substantial depth but also minimizes wear on the tread surface, serves as effective heat insulation and is advantageous from a sanitary standpoint; to provide a flocked surface which imparts a fabric like appearance; to apply flock composed of fibres of appreciable length endwise to the surface so that they project outwardly therefrom; and in general to provide an improved sponge rubber backed flock surfaced material which is comparatively inexpensive and durable and an acceptable substitute for fabric carpeting, as well as improved ways of making same, these and other objects being accomplished as pointed out hereinafter and as shown in the accompanying drawings in which,

Fig. 1 is an inverted perspective view of a small section of carpeting material made in accordance with our invention;

Fig. 2 is a sectional view of the material of Fig. 1;

Figs. 3 and 4 are sectional views showing modified forms of the material;

Fig. 5 is a view somewhat diagrammatic and partly broken away showing a device which may be employed for flocking or applying fibres to the surface of the material;

Fig. 6 is a fragmentary detail view of the screen through which the fibres are supplied to the surface of the material;

Fig. 7 is a transverse sectional view of a liner which may be employed to wind the flocked material in separated convolutions on a drum;

Fig. 8 is a view, somewhat diagrammatic showing calendering and vulcanizing equipment for making the material;

Figs. 9 and 10 are fragmentary detail views of two of the calendering rolls;

Fig. 11 is a fragmentary view of the roll for applying the flocked sheet to the calendered rubber;

Fig. 12 is a view, somewhat diagrammatic showing another form of device which may be employed to apply the flocking to the surface of the material;

Fig. 13 is a fragmentary detail view of a portion of the discharge plate of the device of Fig. 12;

Fig. 14 is a view somewhat diagrammatic showing calendering, flocking and vulcanizing facilities with flocking instrumentalities all arranged to apply the flocking after the rubber and fabric layers are combined;

Fig. 15 is a detail view showing a series arrangement of flocking units which may be employed to supply flock throughout the width of the sheet;

Fig. 16 is a fragmentary detail view of a portion of the spinner used in the flocking devices of Figs. 14 and 15; and

Fig. 17 is a perspective view of another form of spinner which may be employed in the devices of Figs. 14 and 15.

Referring first to Figs. 1 and 2 of the drawings which show our preferred material, the reference numeral **20** indicates the sponge rubber backing which is preferably ribbed on the under side as shown at **21**. A reinforcing fabric **22** which may be of any desired kind and weight, but preferably a coarse open mesh burlap, is attached to the top surface of the sponge rubber backing **20** and this fabric **22** has an outer surfacing **23** of flock, preferably composed of short fibres of appreciable length, attached endwise to the outer surface of the fabric **22** by a suitable bonding medium **24** so that the short fibres project outwardly therefrom.

It is to be noted that the sponge rubber backing or base **20** constitutes the major portion of the thickness of the composite material, a substantial thickness of sponge rubber being desirable not only to give a satisfactory depth of cushioning to impart to the composite material the desirable feel of a high grade thick carpeting but also to safeguard the tread surface against excessive wear

which would otherwise occur if the tread surface were inadequately cushioned against the impact and pressure of shoes thereon. This thickness of sponge rubber backing is also advantageous for heat and sound insulation purposes when the material is used, as for example, for floor mats for automobiles or the like.

The sponge rubber backing 20 may be made in any desired manner and have the fabric 22 cemented thereto either before or after the top surface thereof is flocked, but it is preferred, to utilize a sponge rubber backing made as described in our application, Ser. No. 158,465 filed August 11, 1937 and to calender the sponge rubber in the unblown and unvulcanized condition onto the fabric.

In making the sponge rubber backing 20 according to our above mentioned application, the milled rubber containing appropriate compounding ingredients and a blowing agent is calendered between rolls, one of which is provided with grooves or other recesses which produce on the calendered sheet incipient ribs, projections or other formations which in a subsequent blowing operation are expanded in the open without any confinement which would interfere with the freedom of expansion thereof, thus providing a self assumed or self determined external shape and surfacing of the ribs or projections without any mold restriction, thereby affording a finished vulcanized product of an exceedingly soft spongy character which is especially desirable for our present purpose.

In utilizing this procedure in making our present material we calender the unblown sponge rubber onto the fabric 22 either before or after the flocking 23 has been applied to the fabric.

The flocking material may be of any desired kind and applied in any conventional manner as for example by rotary brushes which discharge the flock onto the surface of the fabric 22 which has been previously cement coated or provided with an adhesive surfacing to which the particles of flock or fibres will adhere. We prefer however, to use a flocking material consisting of or including fibres of sufficient length to afford a napped or pile like surface and to apply these fibres forcibly and in an endwise manner to the adhesive surface so that they adhere firmly and extend outwardly from the surface to a sufficient extent to give a nap or pile like effect.

To accomplish this endwise application of the fibres to the coated surface a device such as shown somewhat diagrammatically in Fig. 5 may be employed comprising rotary brushes 25 to which a regulated quantity of flock is supplied in any conventional manner from the hopper 26 and from which said brushes 25 the flock is discharged through a vibrating screen 27 onto the previously adhesive coated surface of the fabric 22.

In this illustrated device of Fig. 5 the fabric 22 is fed from a roll 28 over the rollers 29 and 30 and the distant roller 31 in advance of which last mentioned roller 31 the flocking occurs, and the flocked fabric 22a, which may first pass through a drying zone, is preferably wound on a reeling device similar to that shown in Hunt Patent No. 1,908,425 having two reels 32 and 33, the former of which carries a liner 34 with raised margins 35 between convolutions of which the flocked fabric 22a is wound on the reel 33 with the flocked surface facing outwardly and devoid of pressure thereon due to the spacing of the liner convolutions by the raised margins 35 thereof.

A doctor blade 36 extends across the surface of the fabric 22 and in close proximity thereto as shown in Fig. 5 to spread a coating of a heavy cement on the top surface of the fabric 22, the cement being poured or otherwise supplied on fabric as indicated at 37 immediately ahead of the doctor blade 36 which distributes the cement uniformly throughout the width of the fabric.

Beyond the doctor blade 36, the fabric passes over a series of rapidly rotated beaters 38 which vibrate the stretch of fabric vertically as it travels thereover and located approximately over the first beater 38 is the flock feeding device comprising a series of opposed pairs of brushes 25 all rapidly rotated in the directions indicated by the arrows, to which said brushes flock is supplied as aforesaid from the hopper 26. Located near the end of the beater area is a suction funnel 39 under which the fabric passes, this funnel being connected with a suction blower (not shown) which serves to remove excess unattached flock from the traveling flocked fabric 22.

The wire screen 27 which is preferably of a mesh to have relatively long narrow openings 40 as shown in Fig. 6 which extend lengthwise in the direction of travel of the fabric 22, is disposed below the brushes 25 rather closely above the traveling cement surfaced fabric 22 and extends entirely thereacross. This screen is secured along its rear edge to a fixed cross bar 41 of the machine and has its forward edge sprung upwardly and provided on the under side with a reinforcing impact strip 42 which rests on a rapidly rotated square shaft type of vibrator 43 by which the screen 27 is rapidly vibrated in a direction substantially perpendicular to the coated surface of the fabric 22 thereunder.

This screen 27 and the rapid vibration thereof serves to up-end the fibres discharged therethrough by the brushes and by reason thereof the fibres are applied and attached to the coated surface largely in an upwardly projecting position.

Because of the coarse open texture of the fabric 22, cement may penetrate therethrough and collect on the rollers 29, 30, 31 and other parts of the machine and to avoid this we employ a sheet 44 of any suitable material such as paper or close woven fabric, or the like, as a liner under the fabric 22 and traveling synchronously therewith. This sheet 44, which is of a width corresponding to the width of the fabric 22, may be endless with return length leading back to the roller 29, but we have found it convenient to feed the liner from a roll 45 at the front end of the machine and wind it from the machine on a roll 46 which is interchangeable with the roll 45.

The flocked sheet 22a may, if desired, be cemented onto the sponge base 20 after the latter is blown and cured but we prefer to calender the unblown rubber compound onto the back side of the flocked sheet and thereafter expand and cure the rubber compound attached to the flocked sheet and vulcanize the blocked adhesive 24 at the same time.

This flocked sheet 22a which has been wound on the roll 33 of a portable reel as indicated in Fig. 5 may be fed from the reel 33 to the calender which is shown somewhat diagrammatically in Fig. 8, or if preferred the reel may be omitted and the flocked sheet fed directly from the flocking device to the calender, which of course would be suitably synchronized with the flocking device.

For attaching the calendered rubber to the

flocked fabric 22ª, it is desirable to previously coat with a light cement the surface of the fabric to which the calendered rubber is to be applied. This may be done by looping the fabric 22, before the flock is applied, through a bath of the cement which is dried before the fabric is supplied to the flocking machine, or the cement may be applied by running the fabric between rolls such as shown at 73 and 74 in Fig. 14 one of which has the cement applied on the surface thereof, likewise as shown in connection with the roll 73 of Fig. 14, the latter method being preferred as it is only necessary to cement coat one side of the fabric and both sides become coated in the bath method above mentioned.

The calender is of common form comprising superposed rolls, for example the rolls 47, 48, 49 and 50, by which the unblown rubber compound indicated at 51 is formed in a sheet 52 and applied to the flocked sheet 22ª, the roll 49 being engraved with suitable recesses or grooves, as for example at 53 to provide one face of the rubber sheet 52 with incipient ribs or other projections which subsequently are blown and expanded to form cushioning elements, and this ribbed sheet is applied on the cemented back of the flocked sheet 22ª as the latter and the rubber sheet 52 pass between the rolls 49 and 50.

In the subsequent blowing of the rubber compound of the sheet 52 it is desirable to permit escapement of any gas which may be emitted from the rubber between the rubber sheet and the fabric sheet 22ª, in order to avoid blistering which might otherwise occur, and accordingly it is preferred that the cement coating for attachment of the calendered rubber be applied so that it does not prevent such gas escapement. If the fabric is cement coated by the bath method hereinbefore mentioned it accordingly is preferable to pass the fabric, after looping in the cement bath, between pressure rolls so as to compress the fabric and squeeze out excess cement. In addition we prefer to provide the rubber sheet 52 with a knurled surface for attachment to the fabric and for this purpose the roll 48 is engaved with a knurled surface 54 to imprint a knurled surfacing to the rubber sheet before the latter is applied on the fabric. This knurled surface of the rubber not only facilitates the attachment of the rubber to the fabric but also provides channels through which gas may permeate and escape to and through the fabric 22 in the subsequent blowing.

After the rubber sheet 52 is attached to the flocked fabric 22ª the composite material, indicated at 55, is subjected to vulcanization, preferably by passing through a long heated compartment 56 in which appropriate different temperatures are provided throughout the length of the compartment as explained in our above mentioned application Serial No. 158,465 to properly effect complete blowing or expansion of the rubber compound and curing thereof as the material passes through the heated compartment 56, the cement being cured at the same time. Preferably, in its passage through the compartment 56 the material is supported on a belt 57 of wire mesh or the like with the flocked surface facing upwardly or downwardly as preferred, it being shown in the latter position in Fig. 8.

The roll 50 of the calender may be a plain roll, but it is advantageous to provide same with longitudinal corrugations or ribs 58 which bear against the flocked side of the fabric 22ª and impart transverse markings to the sheet which give the flocked surface an appearance simulating tuft rows which are more or less visible in tufted carpeting.

Other facilities may be employed for flocking the fabric, as for example as shown in Fig. 12 in which the fabric 22 is fed from a roll 59 onto a traveling apron or belt 60, which is trained above the rolls 61, 62 and 63, and after flocking is wound in a roll 64 preferably with a raised edge liner like that shown in Fig. 7.

A doctor blade 65 is provided above the fabric 22 near the top of the inclination between the rolls 61 and 62 to spread the flocking cement 66 on the fabric 22 in the same manner as in the structure of Fig. 6 after which the cement coated fabric passes around the roll 63 where the flocking is applied.

For flocking a cylindrical brush 67 of a length to extend across the width of the moving sheet 22 may be employed and rapidly operable in the indicated direction over a plate 68 which extends horizontally to a point close to the curved coated surface of the sheet 22 on the roll 63, and this plate 68 has narrow channels or grooves 69 in the upper surface extending from the brush to the discharge edge of the plate 68. Flock is supplied to the surface of the plate 68 immediately behind the brush 67, as for example by a rotary screen feed 70 and apron 71, and the brush 67 which operates at high speed in the direction indicated by the arrow, and which engages slightly in the grooves or channels 69, impels the flock fibres outwardly along the channels 69 in an endwise manner and discharges them endwise against the coated surface of the sheet 22. An endwise tapping or vibratory effect may be imparted to the plate 68 if desired in any well known manner to facilitate the laying of the fibres longitudinally in the grooves or channels 69.

The plate 68, it will be observed, extends radially from the roll 63 about which the coated fabric 22 is curvedly shaped so that the flock is applied to a curved surface, which is advantageous as it permits fuller application of flock with a resultant more compact flocking when the fabric is straightened out.

Another method of flocking is shown in Fig. 14 in which the flock is applied to the fabric 22 after the calendered rubber is attached thereto. In this method the fabric 22 is first led from the roll 72 between the rolls 73 and 74, the former of which has a hopper like cement holder 75 at one side with an open side next to the roll 73 and a bottom serving as a doctor blade permitting application on the roll 73 of a thin coating of cement which is transferred to one side of the fabric 22 as the latter passes between the rolls 73 and 74, this cement coating being on the side of the fabric to which the calendered rubber is thereafter applied.

After this cement coating the fabric 22 is passed between the rolls 76 and 77 of a calender which has the calender rolls 78 and 79 operable in conjunction therewith to calender the sponge rubber compound 80 and apply it on the cemented side of the fabric 22.

The roll 78 of the calender is preferably knurled like the roll 48 of Fig. 8 to impart a knurled surface to one side of the calendered rubber sheet 81 while the roll 77, like the roll 49 of Fig. 8 is circumferentially grooved to impart ribs or projections to the other side of the rubber sheet 81, which is attached to the fabric

sheet 22 as the latter passes between the rolls 77 and 76, the latter of which may be a plain roll.

The combined fabric and calendered rubber sheet, indicated at 82, is then directed upwardly to the receiving end of a conveyor 83 which like the conveyor 57 of Fig. 8 operates in a vulcanizer 84 in which temperatures are provided to sponge and cure the calendered rubber and to cure the cement.

At the outer fabric side of the upwardly traveling length of the calendered rubber fabric 82 a cement hopper 85 is provided closed at one side by the material 82 so as to subject the fabric side of the material to the heavy cement 86 in the hopper, a doctor blade 87 being provided above the hopper close to the fabric surface to regulate the amount of cement coating provided on the fabric and to spread the cement uniformly.

Above the doctor blade 87, flock is applied to the thus cement coated surface of the fabric 22 of the upwardly traveling material 82. The flock may be applied in any convenient manner, as for example with a flocking device like that shown in Fig. 12 or as shown in Fig. 14 by one or more rotary spinners 88. The spinners 88 are arranged horizontally as shown with the periphery spaced from but close to the cemented surface of the material 82.

Flock is fed onto the top surface of each spinner from the spout 89 of a screw feed 90 or other suitable feeding device which leads from a supply hopper 91 and each spinner 88 is operated in any convenient manner, as for example by a motor 92 direct connected therewith, at high speed so that the flock deposited thereon is discharged by centrifugal force against the coated surface of the fabric 22, the discharge from the spinner being controlled by proper location of the spout 89 with respect thereto and a guard band 93 in a manner well known so as to confine the discharge to that side of the spinner 88 nearest to the sheet material 82.

The spinner 88 preferably has the top surface provided with narrow radial channels 94 through which the flock is discharged and these channels serve as guides in and by which the short pieces of fibres are caused to assume an endwise position as they are impelled outwardly, thus insuring endwise discharge and endwise application against the surface of the material 82.

As an alternative the spinner may be constructed as shown at 95 in Fig. 17 with a central radially sloping or conical surface 96 onto which the flock is discharged from the spout 89 and this cone 96 has blades 97 extending radially outward therefrom and each provided with a plurality of small radial channels 98, like the channels 69 of Fig. 13 or V-shaped if desired, in which the flock fibres are caused to assume a radial position as they are impelled outwardly and discharge endwise against the material 82. With this spinner 95 a substantial width of discharge is afforded depending upon the vertical width of the blades 95 and accordingly the flocking is accomplished more rapidly on account of the area over which the flock is applied.

A single spinner 88 or 95 may be employed and mounted to reciprocate back and forth across the surface of the material 82 but it is preferred to employ a battery of spinners in overlapping vertically staggered relation as shown in Fig. 15 so as to simultaneously flock the entire width of the material 82. Any desirable reinforcing material 22 may be employed, or instead of the fabric 22 a sheet 99 of solid rubber may be employed as shown in Fig. 3 and the latter provided with a flocked outer surface 23 or the flocking may be applied directly to the top surface of the sponge rubber base 20 if desired as shown in Fig. 4.

While we have shown and described our invention in a preferred form, we are aware that various changes and modifications may be made therein without departing from the principles of our invention, the scope of which is to be determined by the appended claims.

We claim as our invention:

1. The method of making a fibrous surfaced material which comprises mechanically propelling relatively straight fibres of appreciable length forcibly against an adhesive coated surface of the material, and physically guiding the propelled fibres along a series of laterally adjacent channels in an endwise direction toward the material.

2. The method of producing a fibrous surfaced material which said method comprises centrifugally impelling fibres of appreciable length endwise through a series of laterally adjoining channels against the adhesive surface of a base.

3. The method of making fibrous surfaced floor covering or the like, which said method comprises centrifugally impelling and physically guiding relatively straight fibres of appreciable length endwise along a series of laterally adjoining channels against an adhesive surfaced base.

4. The method of producing fibrous surfaced material which comprises centrifugally impelling fibres of appreciable length against an adhesively surfaced base and guiding the fibres in a series of laterally adjoining channels between the zone of centrifugal impelling and the base.

5. The method of producing a fibrous surfaced material which said method comprises forcing relatively straight individual pre-cut fibres of appreciable length endwise against the adhesive surface of a base, and includes sliding the fibres endwise along a series of narrow laterally adjoining channels toward the base.

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