

United States Patent Tesch

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[54] FLEXIBLE MATERIALS

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Mar. 26, 1968 Switzerland4565/68

[52] U.S. Cl.161/109, 161/164, 161/167

[51] Int. Cl.B32b 3/10

[58] Field of Search161/109, 82-85, 161/167, 164, 112, 113, 406; 264/DIG. 70

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Primary Examiner—Willard E. Hoag

Attorney—Arthur Schwartz

[57] ABSTRACT

A sheet material having at least one adhesive surface or one non-slip surface, respectively, and provided with slits which allow the sheet material to expand in at least one direction.

5 Claims, 52 Drawing Figures

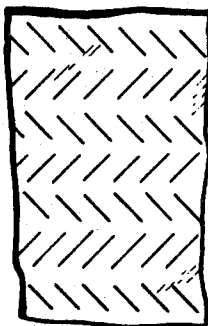


Fig.1



Fig.2

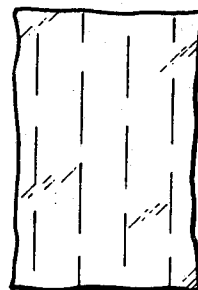


Fig.3

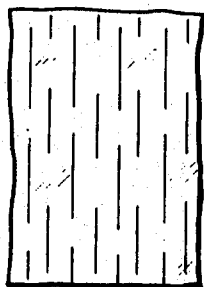


Fig.4



Fig.5



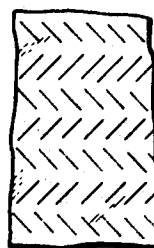
Fig.6



Fig.7



Fig.8



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Fig.9

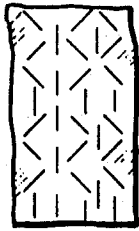


Fig.10

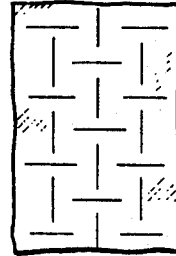


Fig.11

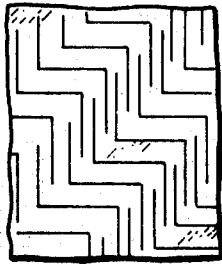


Fig.12

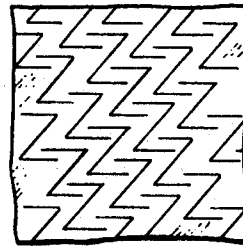


Fig.13

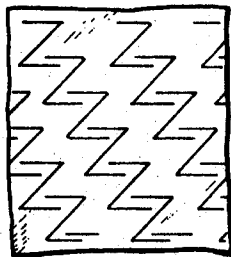


Fig.14

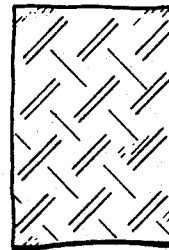


Fig.15

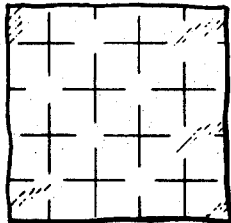


Fig.16

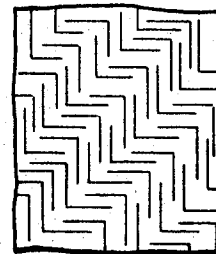


Fig.17

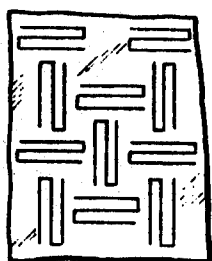


Fig.18

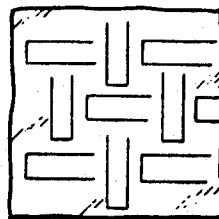


Fig.19

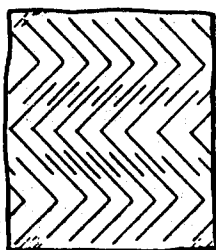


Fig.20

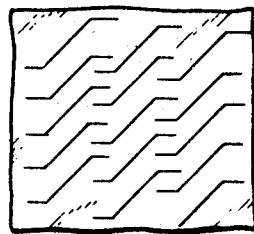


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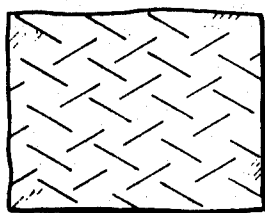


Fig.22

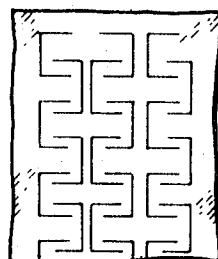


Fig.23

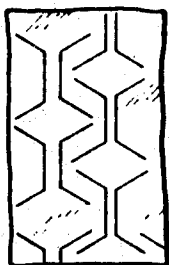


Fig.24

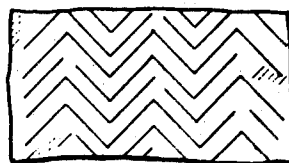


Fig. 25

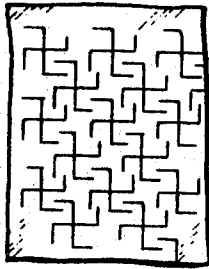


Fig. 26

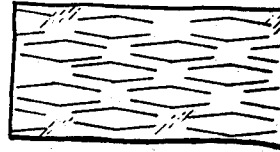


Fig. 27

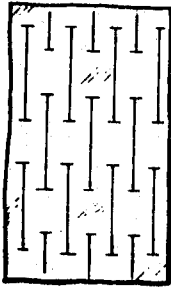


Fig. 28

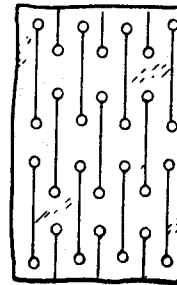


Fig. 29

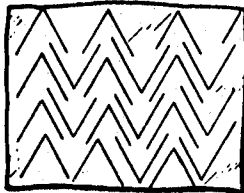


Fig. 30

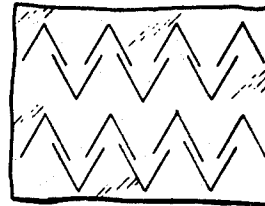


Fig. 31

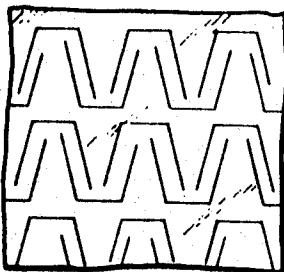


Fig. 32

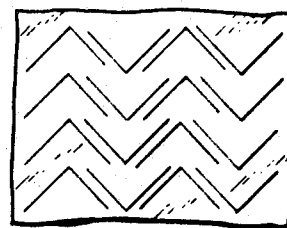


Fig.33

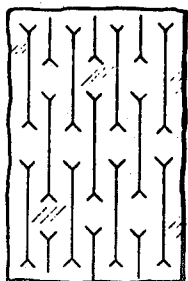


Fig.34

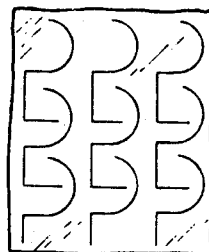


Fig.35

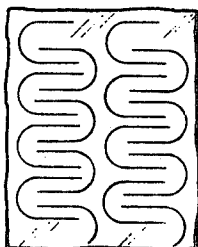


Fig. 36

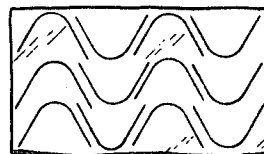


Fig.37

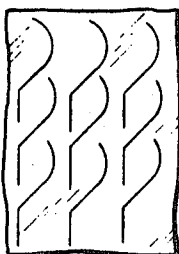


Fig.38

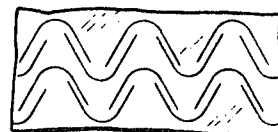


Fig.39

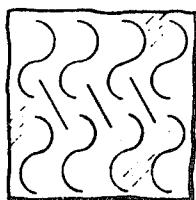
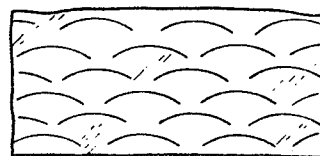


Fig.40



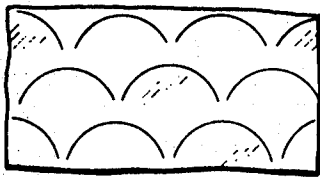


Fig. 41

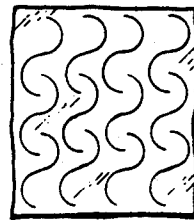


Fig. 42

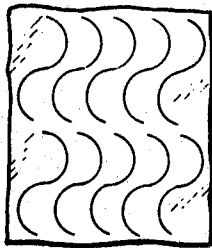


Fig. 43

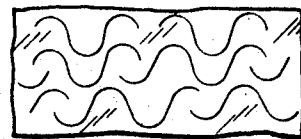


Fig. 44



Fig. 45

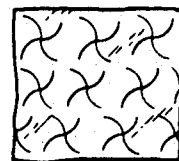


Fig. 46



Fig. 47

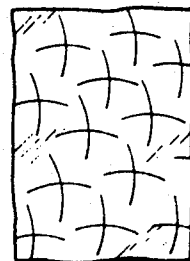


Fig. 48

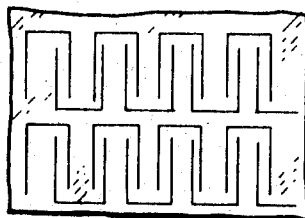


Fig. 49

Fig.50

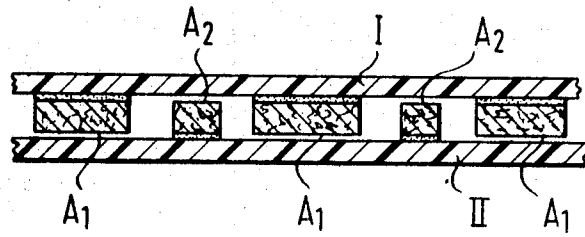


Fig.51

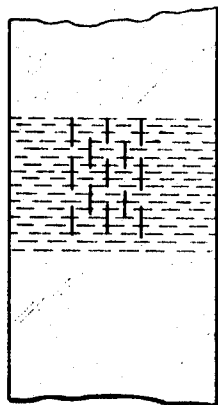


Fig.52



FLEXIBLE MATERIALS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention concerns expandable sheet material having at least one adhesive or non-slip rubber like surface thereto.

2. Description of the Prior Art

Sheet material of this type are, for example, the generally known band or sheet shaped adhesive bands or creped material having a limited stretch characteristic.

Furthermore, double adhesive bands are known which comprise an inner foil or woven insert and an adhesive layer at each side thereof. These bands are used to connect two surfaces together, for example for securing a floor covering to a floor. Having regard to the expensive character of the materials, it is usual to provide such material in strip form only and to secure the floor covering only along spaced lines, this requires a great deal of labor and great difficulties are encountered in avoiding a waviness or undulations in the fitted floor covering.

Heat sensitive connecting sheets are also known, such sheets are placed between two articles, softened by the application of heat, to render them tacky, and allowed to cool and solidify to connect the two articles together.

The application of a pressure sensitive adhesive to the whole of a surface, and especially to a part of the surface, such as on the back of carpets, requires that a pre-treatment be carried out on the said surface possibly as a manufacturing step in the production of the carpet. It is preferable to apply a pressure sensitive adhesive in strip form to the back of carpets, but such a course is not possible owing to problems of transportation, the strips of pressure sensitive adhesive, generally 2 to 5 mm wide, cause difficulties in transportation. Finally carpet underlays are known which are produced by interweaving threads particularly jute threads in leno weave and subsequent impregnating such threads with latex, the impregnated sheet being vulcanized to give an adhesive rubber like net, which laid between the carpet and the floor, should prevent slipping. However, the net easily displaces.

SUMMARY OF THE INVENTION

The primary object of the invention is to provide a sheet material of the aforementioned type having some or all of the following characteristics.

- a. it should only be applied on part of the surface of the substratum
- b. it should be compact and readily and easily transportable
- c. it should allow of the attainment of a satisfactory connection between carpet and floor
- d. it should, in certain embodiments only, adhere temporarily and then be capable of being removed
- e. it should be durable
- f. it should be light
- g. it should be of a favorable price.

According to the present invention a sheet material has slits passing therethrough which allow an enlargement of the initial surface of the sheet material in at least one direction.

Within the meaning of the present invention a slit is to be understood as being a cut through the material having an opening dimension in the transverse direction of the cut or slit substantially equal to zero.

The adhesive sheet material may consist of a web like carrier having a plurality of slits, provided on one or both surfaces with an adhesive substance, or a self supporting track or rib pattern in sheet or foil form. In the latter case the track or ribs itself has a suitably high cohesion or it contains material non-adhesive per se such as loose fibers. These self supporting adhesive substances may be sticky and sensitive to pressure at room temperature or they may be non-adhesive at room temperature, activation of the adhesive being possible by means of, for example, solvents, heat or other treatments known per se and including activating means such as high frequency radiation or ultrasonics. The sheet material can have adhesive

at one surface and one anti-slip surface. For example, the structures may comprise carpet underlays thin or insulating carrier material (foam material, felt, rubber) which are inherently superior to known loose nettings as regards anti-slip properties, the sheet material being capable of ready attachment to a floor and receiving the carpet to be held loosely and in non-slip relationship thereon.

Such a product can be produced by suitable impregnation of the two opposite faces of a suitable flat carrier material or by coating one side of a sheet material, itself having non-slip properties, with a pressure sensitive adhesive for example with a latex bonded or a latex impregnated fibrous fleece, or with a sheet of latex or resilient plastic, for example a vinylacetate ethylene co-polymer onto which a pressure sensitive adhesive can be applied.

Should the adhesive sheet material be produced in roll form, which is particularly favourable, particularly with products having adhesive coating on both sides known non-adhesive separation layers are provided. In this case the slits can be made either before or after application of the separation layer. If the slits are made after application of the non-adhesive separation layer or layers the laminated product is first stretched and one side of the exposed adhesive surface thereof is then secured to the substratum, for example a parquet flooring material, by pressure, and after removal of the separating sheet covering the adhesive surface thus exposed adhesive surface is pressed against the old floor and holds the new flooring material in place on the floor that is being covered.

If only the adhesive coated sheet material is provided with slits, it can be drawn from a supply roll and separated from the unslitted separator sheet whilst being stretched to the required dimension as, the separator sheet is drawn off in the opposite direction. This method has the advantage of easier withdrawal from the roll and if, for covering a space some 6 meters in length, a slit adhesive in its unstretched state is stretched threefold, a separation sheet, for example a silicon paper, of only 2 meters has been required. Naturally the adhesive power of the drawn out adhesive coated sheet is reduced by, in the ratio of the initial surface to the final surface, in this case 1:3. However, as it is known that layers of pressure sensitive adhesive generally used are too adhesive for a full surface adhesion (for this reason so far practically only strips have been used with the disadvantage of waves forming in the floor covering at the unglued positions) the said layer of adhesive of less adhesion as described is not only completely satisfactory for such purposes, but offers besides the considerable advantage that at the slits it is freely permeable to air, steam and moisture so that the floor can breathe freely and is particularly convenient for sound insulation, particularly for lessening the noise of footsteps, so that for the first time, a technically correct sound absorbing rough surface (for example concrete) can be provided.

Various possibilities exist with respect to the application of the slits. Thus products can be produced which are expendable in one or more directions and may be capable of remaining extended or relatively resilient.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects and advantages of this invention will become apparent from a study of the following specification, the claims and the attached drawings in which:

FIGS. 1 - 49 show a selection of possibilities for design and arrangement of the slits,

FIG. 50 shows a partial elevational section of an embodiment of a sheet material according to the invention,

FIG. 51 shows a plan view of another embodiment of a sheet material, and

FIG. 52 shows a section taken along the line 52-52 of FIG. 51.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the parallel arrangement of the slits in the sheet material shown in FIG. 1, the slits of any given row being staggered relative to those of an adjacent row, on drawing out two or threefold length, erection of the ribs or track edges surrounding the slits occurs. These raised edges can be returned to the plane of the sheet by a suitable direction of pull to obtain an optimum surface adhesion when applied to a floor covering. Therefore in this case, and in all other embodiments having edge arching, a relatively soft sheet material which is capable of expansion is suitable, for example light fleece materials, soft or creped sheets, crepe paper, sheets of foam material and so on.

An arrangement of slits as shown in FIG. 4 gives products with less stretchability but an exceptionally high capability to stretch with less tendency to further tearing for use where curves, contours and difficult surfaces and room shapes are connected together or on use of materials having adhesive on one side only for reinforcing, for example an air-permeable wrapping to reinforce pipes. This reinforcement may be used to advantage if a reinforced product has to have further layers applied which are to only partially cover the existing layers. This bonding between successive layers is, for the first time, possible through the slits, for example in sculpture work with plaster, on continuous application of several layers of plastic, foamed materials and so on. Interesting possibilities of stretching and expanding result from the various altered slit structures indicated in FIGS. 5, 6 to 8 and 10 to 13. As the slits are brought from the parallel arrangement into more inclined, overlapped and angular arrangements shown, so the expansion characteristics vary to give a capability for expansion in more than one direction.

The arrangement of straight lines and angled slits shown in FIGS. 17, 18, 21, 22, 15 and 32 produce structures capable of expanding in at least two directions, whilst FIG. 25 in particular has a capability of expansion in nearly all directions.

The use of bent, S- and Z-shaped wavy or otherwise curved slits is also apt for certain purposes. The arrangements of FIGS. 35, 36 and 38 and 42 to 47 show a range of possibilities without forming any restriction for the most suitable shape for each case. Finally, a group of arrangements of slits is shown in FIGS. 29 to 31 and 49 and 50. These arrangements produce on drawing out in a particularly favourable direction a group of large ribs and small ribs which, particularly on heavy drawing out around 180° are turned round and then offer resistance to drawing out further. In this way an expansion to an extent which can be substantially established beforehand is obtained and the disadvantages of the rib parts arched out of the horizontal are avoided. Due to the said turning round, the rearside of the turned rib is directed upwardly and on negligible surface parts a doubling which can in general be ignored. In structures having adhesive on both sides and having the same characteristics of adhesion at each side there is no change in the expected adhesive properties, however with products having an adhesive surface at one face only, in a surprising manner after the turning round of the rib both sides exhibit adhesive surfaces and indeed in the ratio of the widths of the ribs to one another. This ratio can be varied by suitable constructive arrangement of the slits for example from a ratio of 50:50 to one of 90:10. The advantages stemming from the use of a sheet material coated with adhesive on one side only, yet which can be expanded to give adhesive properties at each face, are readily apparent, as are the advantages which would result from the use of two different adhering surfaces which, by a variation in the amount and type of adhesive, would allow of the production of exceptionally interesting compound products. For example one side pressure sensitive adhesive, the other side a water soluble glue, or alternatively a structure consisting of an adhesive which is solid at room temperature, yet which can be activated, and a coating of pressure sensitive adhesive at one side of the structure; this allows, after the slitting and stretching the material the oppositely facing two

tracks I and II, to be provisionally connect mutually the the pressure sensitive adhesive surfaces as shown in FIG. 50 and after a subsequent activating process, by making sticky the surfaces A₁ and A₂ a permanent connection of the three layers. This activating is possible in the known manner by heating, high frequency radiation, ultra sonics, solvents and so on.

In the same way these expandable adhesive coated sheet materials can be used for making prefabricated products sticky, for example for material in plates, rolls or sheets, in order, for example, to allow a partial surface coating with adhesive without the necessity of employing a special coating machine. In this case on delivery, preferably in rolls, the adhesive coated sheet material is slit and is pulled apart before application to the substratum, and it is then firmly connected by one side in a continuous operation, if desired with prior activation of one side and simultaneous application of a non-adhesive sheet corresponding to giving it a partial surface stickiness.

Finally it should be further pointed out that the selection of the direction of the slits is to be adjusted according to the purpose desired, particularly to an expansion in the longitudinal direction, in the transverse direction or in some other direction. The slits may also be distributed diversely over the surface, let out or arranged to form stripes or patterns, combinations of slits of different sizes and shapes are possible with for example long slits small slits or so called micro-slits.

A favourable embodiment consists of a carpet underlay of soft foam material about 6 mm thick coated on one or both sides with pressure sensitive adhesive, and in the case of one sided adhesive coating the other side is rubber-like so that it prevents slip or is sufficiently adhering by its pores, that the loose laying of this layer on the floor and an adhesive connection of the floor covering or vice versa appears favourable. The main advantage here, in addition to the saving of material by the enlargement of the sheet coverage area, is in the particularly soft and comfortable tread and in the increased sound insulation of footsteps in that a part of the noise can be absorbed through the open slits by a rough or porous sub-floor.

A further embodiment of one sided adhesive web is as court-plaster or wound plaster. In both cases a resilient sheet material adapting to the shape of the body and to movement is in general desired (which so far has been achieved only by use of a resilient carrier), as well as the breathing and aeration necessary for healing the wound, the latter being achieved by utilizing a porous carrier and/or by providing air holes in the carrier. For this the sheet material according to the invention can provide a remedy in the simplest manner without any loss of material and using the cheapest impermeable carrier material such as sheet plastic. In this either the carrier material is slit before coating with the adhesive substance and the same applied full face or both are slit together, and preferably with the so-called micro-slits and also arranged in rows only where expansion and permeability are desired and in an arrangement of slits which allows expansion in one or more directions. FIGS. 51 and 52 show a combination of so-called micro-slits with larger slits for additional aeration.

The sheet material according to the invention is also suitable for application in the context of clothing.

For example, an acceptable insert for shirt collars and outer garments is obtained if a thermoplastic sheet which has been expanded in the width or stretched in the direction of the slits is laminated, when in a transversely stretched state, with a cotton fabric.

The possibility exists of compressing the slit plastic sheet during the laminating whereby a good dimensional stability is produced, sheets of polyamide 11 and 12 are particularly suitable for this.

Adhesive inserts in which the layer of adhesive is a slit plastic sheet have the great advantage of limited stiffness in the direction of the slits and much greater flexibility in the direction transverse to the slits. This is very important in col-

lars on dress shirts, which should be relatively stiff in the longitudinal direction (so that varied shrinkage of the outer material on washing does not lead to puckering of the collar) but soft in the transverse direction so that the collar fits well. In mens suits stiffness in the longitudinal direction is also very desirable so that the product always appears ironed, on the other hand the suit should be supple, soft and resilient in the width so that the jacket does not sit like armour.

If a slit, thermoplastic sheet expanded in the width is laminated between two non-thermoplastic sheets and the sheets are then allowed to shrink by heat treatment a cloque effect is obtained.

The sheet material according to the invention is not only suitable for the purposes described above, but also for various others, particularly for insulation, sound damping and for decorative purposes.

We claim:

1. A sheet of material adapted to be used as an underlay for a floor covering, said sheet having two surfaces, at least one of said surfaces having thereon means for effecting adhesion of said one surface to another surface, said sheet having at least

two sets of plural spaced slits therein, the slits of one of said sets being parallel to each other but other than parallel to the slits of the other of said sets, the slits of the second of said sets all being parallel to each other, said slits of said two sets defining a plurality of rib portions therebetween, said rib portions being adapted for arching movement away from the plane of said sheet whereby the initial surface of said sheet may be enlarged in at least two directions.

2. A sheet material, as set forth in claim 1, wherein one side is provided with a layer of adhesive and the other side with a non-slip rubber like surface.

3. A sheet material, as set forth in claim 1, wherein said adhesive layer is non-adhesive at room temperature and able to be adhesively activated by heat or solvent action.

4. A sheet material, as set forth in claim 1, wherein a rubber-like non-slip carrier is laminated with a pressure sensitive adhesive.

5. The sheet material of claim 1, which has at least one non-slip rubber-like surface.

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