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MAT-BASE ASSEMBLY

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The present invention relates to a mat-base assembly in which the operation of attaching and detaching a dust-controlling mat is simple and can be carried out repeatedly over a long period of time.

A dust-controlling mat is widely used to prevent dusts adhering to shoe soles from entering a room. The dust-controlling mat is placed and held at a predetermined position, such as the entrance, and it must not easily be moved even if it is violently wiped with the sole of a shoe or if many persons walk thereon. Furthermore, the end or a corner of the mat should not easily be lifted off or rolled up.

To satisfy these requirements, an assembly of such dust-controlling mat and a mat-supporting base has been used. Japanese Utility Model Publication No. 1606/74 proposes an assembly comprising a sheet of a thermoplastic resin such as a vinyl chloride resin having an oblong, oval or other optional form and a mat detachably fitted inside a picture frame-like engaging projection formed on the periphery of the sheet.

However, if the mat is merely placed within the engaging projection formed on the periphery of the base, the object of preventing the mat from moving or preventing the corner portion of the mat from getting turned up is not satisfactorily attained. With a dust-controlling mat, there has been adopted a system in which a mat is leased to a user for a certain time, the soiled mat is washed and regenerated by an oil impregnation treatment or the like and the regenerated mat is leased to a user again. As this cycle of using-regeneration is repeated, the mat shrinks and the peripheral size of the mat is no longer in agreement with the size of the engaging projection of the base. In view of this, it is preferred to provide a temporary mechanism between the mat and the supporting base.

As such a temporary anchoring mechanism, there has been used a so-called magic tape, that is, a combination of an anchoring element including engaging pieces implanted on a base fabric and a fiber loop element. Satisfactory results
5 can be obtained by such magic tape when soft materials such as fiber fabrics are fitted together, but if a magic tape is used in conventional manner in a mat-base assembly, the anchoring mechanism does not have satisfactory durability and its adaptability to the operation of attaching and detaching
10 the mat is degraded within a short period.

In accordance with the present invention, there is provided a mat-base assembly which comprises a base including a sheet and a picture frame-like projection formed on the periphery of the sheet defining a mat-containing portion on
15 the inner side of said peripheral projection, the sheet and peripheral projection being integrally formed of an elastomeric polymer, a dust-controlling mat contained in said mat-containing portion and an anchoring mechanism for anchoring detachably said base and mat at a plurality of
20 points around the peripheral edge of the mat, said anchoring mechanism comprising an anchoring element having engaging pieces implanted on a base fabric fixed to said sheet and a fiber loop element engageable with said engaging pieces sewn to said mat, wherein the peripheral portion of the anchoring
25 element is fusion-bonded to the sheet while in a central portion of the anchoring element, the engaging pieces remain unaltered, fusion bonding between said peripheral portion and said sheet having been carried out at a temperature higher than the softening point of the polymer constituting the
30 sheet but lower than the melting or softening point of the base fabric of the anchoring element.

The present invention will now be described in detail by reference to the drawings in which:

Fig. 1 is a sectional view showing a mat-supporting
35 base.

Fig. 2 is a sectional view showing a dust-controlling mat.

Fig. 3 is a partial perspective view showing a mat-base assembly in the state where one end of the mat is lifted.

5 Referring to Fig. 1 a base 1 comprises an oblong or oval sheet 2 and a picture frame-like projection 3 formed on the periphery of the sheet 2. The sheet 2 and projection 3 are integrally formed of an elastomeric polymer, and together provide a concave vacant portion 4 for receiving the
10 dust-controlling mat on the inner side of the projection 3.

As the elastomeric polymer, there can be mentioned, for example, a soft vinyl chloride resin composition, chlorinated polyethylene, chlorinated polypropylene, an
15 ethylene-propylene rubber, an ethylene-propylene-diene rubber, polyisobutylene, a butyl rubber, polybutadiene, a styrene-butadiene rubber, a nitrile-butadiene rubber and polyurethane. The sheet formed of an elastomeric polymer preferably is heat sealable. From this viewpoint, it is preferred that a soft vinyl chloride resin be used as the
20 elastomeric polymer.

Referring to Fig. 2 a dust controlling mat 5 comprises a base fabric 6, pile yarns 7 formed by tufting fibers to the base fabric 6 and trimming the top ends of the pile yarns 7 and a packing layer 8 for fixing the pile yarns 7 to the base
25 fabric 6. The pile yarns 7 may be spun yarns or multi-filament yarns composed of, for example, cotton fibers, rayon fibers, polyvinyl alcohol fibers, acrylic fibers or nylon fibers. The base fabric 6 may be a knitted or woven fabric, non-woven fabric or netting composed of fibers such
30 as mentioned above, or a plastic net. The packing layer 8 is formed by coating a synthetic rubber latex such as a nitrile-butadiene rubber latex on the back side of the tufted base fabric and drying the coated latex.

The pile yarns 7 of the dust-controlling mat adsorb
35 dusts adhering to shoe soles by sliding contact with the shoe soles and holding these dusts on the pile yarns 7. In order

to enhance the dust adsorbing and holding action of the pile yarns 7, a dust adsorbing liquid may be coated on the pile yarns 7 or the pile yarns 7 may be impregnated with such liquid. As the dust adsorbing liquid, there can be mentioned, for example, mineral oils, synthetic oils and vegetable oils such as fluid paraffin, spindle oil, alkylbenzene oil, diester oil and castor oil, and aqueous dust adsorbing agents disclosed in Japanese Patent Publications No. 10194/78 and No. 37471/78.

10 In the present invention, instead of the above-mentioned tufted mat, there may be used a mat formed by electrostatically implanting fiber flocs on a base fabric.

According to the present invention, an anchoring mechanism is disposed to detachably anchor the base 1 and mat 15 5 to each other at a plurality of points on the peripheral edge of the mat 5.

As shown in Figs. 1 and 3, the anchoring mechanism comprises an anchoring element 11 including hook-like or mushroom-like engaging pieces 10 implanted on a base fabric 9 20 and a fiber loop element 12 engageable with the engaging pieces 10. The combination of the anchoring element 11 and fiber loop element 12 is known as "magic tape", and is marketed under the tradename of, for example, "Velcro (RTM) Fastener". The engaging pieces 10 of the anchoring element 25 11 suitably are formed of nylon or polypropylene and they are implanted on a base fabric of nylon fibers or other thermoplastic fibers while the opposite side of the base fabric can be coated with a resin such as polyurethane so as to prevent fall-out of the engaging pieces. The fiber loop 30 element 12 is formed by implanting fibrous yarns in loopy configurations on a similar base fabric.

In the present invention, this loop element 12 is fixed to the back face of the mat 5 through stitches 13, and the anchoring element 11 is fusion-bonded to the sheet portion 2 35 of the base 1 so that, as shown in Fig. 1, the peripheral

portion 14 of an anchoring element 11 is fusion-bonded to the base sheet 2, while the engaging pieces 10 are left in a central portion of the engaging element 11 as they are.

According to the present invention, by fusion-bonding
5 the peripheral portion of the anchoring element 11 to the base sheet 2, a very high bonding strength (peel strength) can be attained, and there can be formed a bonded structure which can sufficiently resist prolonged repetition of attaching and detaching, outdoor exposure and dipping in
10 water or hot water.

In the peripheral portion 14 of the anchoring element 11, since the anchoring element is fusion-bonded to the base sheet 2, the engaging pieces 10 are crushed or stuffed toward the base sheet. However, in a central portion 15 of the
15 anchoring element 11, the engaging pieces 10 are left as they are and a necessary anchoring effect can be attained between these anchoring pieces 10 and the fiber loop element 12.

Indeed, one reason why a bonded structure of excellent resistance characteristics is formed between the base 1 and
20 the anchoring element 11 is that the polymer constituting the base sheet 2 is fusion bonded to the base fabric or engaging pieces of the anchoring element 11 or the packing. However, it is believed that another important reason is that the elastomeric polymer constituting the base sheet 2 is intruded
25 into the base fabric of the anchoring element 11 and the engaging pieces 10 of the anchoring element 11 are intruded into the base sheet 2 through the base fabric of the anchoring element 11, and a mechanical engaging or anchoring effect is provided between the base sheet 2 and the anchoring
30 element 11.

Fusion bonding of the anchoring element 11 to the mat base 1 can easily be accomplished by piling the anchoring element and base and pressing the piled assembly under heat by a pair of heat seal bars. The heating temperature is
35 above the softening point of the polymer constituting the

base sheet 2 but below the melting or softening point of the base fabric of the anchoring element 11. A pressure sufficient to crush or stuff the engaging pieces 10 of the anchoring element 11, for example, 0.1 to 20 Kg/cm² (gauge),
5 may be applied. Heating is advantageously performed by high frequency heating means.

When a polyurethane adhesive is interposed between the anchoring element and the base to be fusion-bonded, the adhesion strength on the interface can further be increased.
10 If the packing of the anchoring element is composed of a polyurethane resin, the adhesion strength is increased by this polyurethane resin.,

As the polyurethane resin, there is preferably used a polyurethane resin having terminal groups blocked by an
15 alcohol, phenol or amine, that is, a heat-sensitive adhesive polyurethane resin.

In the preferred embodiment of the present invention, the blocked isocyanate and a polyol such as polyether polyol and polyester polyol are mixed at a stoichiometric ratio, the
20 mixture (wherein each component is preferably solid and the mixture is also preferably solid at a room temperature) is applied in solution or in molten state at a temperature not higher than 95°C. to the back surface of the anchoring element, the anchoring element is positioned at a
25 predetermined position on the base sheet such that the applied surface contacts with the surface of the base sheet, and the combination of the anchoring element and the base sheet is heated at a temperature of 170 to 190°C. under a pressure of 0.1 to 20 Kg/cm² (gauge) by means of high
30 frequency heating, whereby the dissociation of the blocked isocyanate to a free isocyanate and then the reaction between the reactivated isocyanate group with the coexisted polyol is caused to form a polyurethane resin in situ and increase of adhesion strength is attained.

35 For example, Collonate^R AP (Nippon Polyurethane

Industries Co.), which is obtained by a reaction of tolylene diisocyanate and trimethylolpropane and followed by the addition of phenol to block the remaining isocyanate groups, is mixed with Placel^R 220 (Daicel Chem. Industries Co.), which consists of polyesterpolyol formed by ring-opening polymerisation of caprolactone, at a mixing ratio by weight of 1:2, and this mixture is mixed with 0.33 % by weight of cobalt octenoate, and then melted at about 95°C. This melted composition is applied on the back face of the anchoring element with the coating thickness of 0.1 to 0.8 mm. This applied anchoring element is laid on the predetermined position of the base that the applied surface contacts with the base and heated by high frequency heating means for 5 seconds at about 185°C. under a pressure of 2 Kg/cm². By this procedure, the anchoring element is bonded completely with the base surface and cannot be peeled off by 20 Kg/cm² of peeling.

The blocked isocyanate and polyol can be applied to the back of the anchoring element can be attained in solution in tetrahydrofuran or methylethylketone, and after the application the solvent can be evaporated.

As the other blocked isocyanates, we can use 4,4'-disocyanate-diphenylethane blocked by xylenols or methylethylketone-oxime and trimethylolpropane-tolylene-diisocyanate-adduct blocked by 2,4-dichlorophenol.

After the other polyol, we can use "Desmophen" 650 (Bayer GmbH) and Nippolan 4009 or 4010 (Nippon Polyurethane Industries Co.) as the polyester polyol and also can use "Pluronic" Polyol (Wyandotte Chem. Corp.) as the polyether polyol. ("Desmophen" and "Pluronic" are Registered Trade Marks.) Those polyol must be solid under the room temperature in order to be reserved safely through all seasons.

In the mat-base assembly of the present invention, the peripheral portion of the anchoring element, which is

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important from the viewpoint of the mechanical strength or prevention of rolling-up, is fusion-bonded to the base sheet in the state embedded therein, while the engaging pieces of a central portion of the anchoring element are left as they are. Accordingly, the mat-base assembly of the present invention is advantageous in that the anchoring action is stably maintained over a long period even if the operation of attaching and detaching is repeated many times.



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CLAIMS

1. A mat-base assembly which comprises a base including a sheet and a picture frame-like projection formed on the periphery of the sheet defining a mat-containing portion on the inner side of said peripheral projection, the sheet and peripheral projection being integrally formed of an elastomeric polymer, a dust-controlling mat contained in said mat-containing portion and an anchoring mechanism for anchoring detachably said base and mat at a plurality of points around the peripheral edge of the mat, said anchoring mechanism comprising an anchoring element having engaging pieces implanted on a base fabric fixed to said sheet and a fiber loop element engageable with said engaging pieces sewn to said mat, wherein the peripheral portion of the anchoring element is fusion-bonded to the sheet while in a central portion of the anchoring element, the engaging pieces remain unaltered, fusion bonding between said peripheral portion and said sheet having been carried out at a temperature higher than the softening point of the polymer constituting the sheet but lower than the melting or softening point of the base fabric of the anchoring element.
2. A mat-base assembly according to claim 1, wherein fusion bonding between said peripheral portion and said sheet has been carried out through a polyurethane resin layer interposed between the base fabric of the anchoring element and the sheet.
3. A mat-base assembly according to claim 2, wherein the polyurethane resin has been formed in situ by reaction of an isocyanate blocked by an alcohol, phenol or amine with a polyol.
4. A mat-base assembly according to claim 1 substantially as described with reference to, and as illustrated by, the accompanying drawings.