A further purpose is to provide a carpet having a pile in the back with a plate of elastomeric material which covers and protects a certain area of the pile adjacent to an uncovered area of the pile.

Further purposes appear in the specification and in the claims.

In the drawings I illustrate steps in the process of the invention.

FIGURE 1 is a perspective of a tray of the character which may be employed in the invention.

FIGURE 2 is a section on the line 2—2 of FIGURE 1 showing the tray partially filled with plastisol for use in the single filling layer techniques.

FIGURE 2a is a view corresponding to FIGURE 2 showing the tray filled with the first layer of plastisol which will be gelled or fused according to the two layer technique before the second layer is applied.

FIGURE 2b is a fragmentary view corresponding to FIGURE 2 showing the insertion of the second layer in the two layer technique.

FIGURE 3 is a top plan view showing the tray and plastisol inverted on the carpet.

FIGURE 4 is a vertical section corresponding to the line 4—4 on FIGURE 3, but showing the application of pressure by the press and the application of heat for fusion of the plastisol.

FIGURE 5 is a view corresponding to FIGURE 4 which shows the position of the heel pad, the carpet and the tray after fusion of the plastisol.

FIGURE 6 is a view corresponding to FIGURE 5 but showing the removal of the tray after cooling.

FIGURE 7 is a fragmentary section showing the application of heat and the deforming of the pile prior to the application of the plastisol to the pile under an optional method of procedure.

In the manufacture, particularly of automobile carpet it is desirable to place heel pads or wear pads at certain places. This has been done in some cases by sewing or cementing the heel pad to the top of the carpet. This is often unsatisfactory and is difficult to do. Heel pads have also been molded in place. This presents the difficulty that the pile of the carpet may grime through the heel pad. It also, in some cases, leads to making the heel pad penetrate the back of the carpet so that the carpet loses its resilience opposite the heel pad.

The present invention is concerned with producing an improved heel pad with less difficulty and expense.

The process of the invention employs a tray 20 suitably of metal which has a bottom 21 which is shown as being flat but may be embossed if desired and a relatively shallow rim 22 which in a suitable case may have a height of between ¾ inch and ¾ inch.

The tray 20 is firstly filled with polyvinylchloride plastisol 23, while the tray is upright and horizontal and if necessary the plastisol is levelled as by a doctor blade, or by vibration or by an air blast over the surface of the plastisol.

Other plastisols than polyvinylchloride plastisol which behave similarly in the process and other similar materials may be employed as desired. The plastisol will be sufficiently fluid to allow even distribution in the tray.

If desired an inlay of any suitable design such as plastic, metal, paper, or the like may be laid in the tray before the plastisol 23 is inserted and then it will be bonded on the surface of the finished heel pad.

The plastisol may, if desired, contain ¾ percent to 75 percent by weight of a filler such as paper, metal grit, balls of a filler material such as glass beads, paper and metallic powders or fibers, which can either be mixed with the plastisol in making the plastisol or
introduced into the tray before, after or during the introduction of the plastisol.

The plastisol in the tray is next heated by application of heat to the tray until sufficient gel has formed against the surface of the tray to allow handling and inversion of the tray if required. The heating of the initial plastisol is very important as it not only holds the plastisol at the correct level in the tray, but also forms a skin of gelled plastisol which will prevent the penetration of the carpet pile completely through the plastisol, so as to retain the surface of the finished heel pad smooth and free from imperfections. Less desirable the layer may be fused.

A skin 31 forms on the portion of the plastisol near the tray. The heating should be to a suitable gel temperature which in the example contemplated is in the range of 180 to 200 degrees F., or to fusion temperature of 325 to 400 degrees F. The time of heating should not be long enough to convert all of the plastisol to gel or fusion product but only sufficient to convert the portion near the tray. A time of heating of the order of 1 to 4 minutes is sufficient using polyvinylchloride plastisol.

As the plastisol gels or fuses, the gelling or fusion is somewhat self limiting because of the poor heat conductivity of the plastisol. For ordinary purposes a skin thickness of gel or fusion product of 0.01 inch is sufficient to prevent the pile from gripping through the heel pad and will assure a good wearing surface above the pile.

As shown in FIGURE 2, the thickness of the plastisol layer which is deposited in the tray should be in the preferred embodiment be less than the height of the tray, so that the rim of the tray will protrude slightly beyond the top of the plastisol layer at the center, and thus the rim will serve as a limiter and control of the extent of penetration of the pile into the plastisol when the tray is applied to the carpet.

The above discussion in regard to FIGURE 2 has concerned itself particularly with a single layer technique. In many cases it is advantageous to employ a two layer technique as shown in FIGURES 2a and 2b. FIGURE 2a shows the initial deposit in the tray of sufficient plastisol 23', substantially less than the total quantity, to form an adequate layer over the bottom of the tray, which will in the final heel pad extend above the top of the carpet pile. This initial layer is then converted to gel or fusion product, by heating as explained above. The time of heating is no longer an important feature, however, as the entire initial layer 23' is being converted to the gel or less desirably to the fusion product at that time.

After the conversion of the initial layer 23' which is shown in FIGURE 2a, a further increment of plastisol 23 is introduced in the tray on top of the now converted initial layer, and this plastisol remains unconverted at the time the tray is applied to the pile of the carpet.

Thus, whether a single layer technique is used as in FIGURE 2 or a two layer technique is used as in FIGURES 2a and 2b, the final product of the steps just described is a bottom layer which has been converted and adjoins the bottom of the tray and an upper layer which has not been converted. The unconverted upper layer will be the one which will be embedded in the pile.

There are some instances, depending upon the character of the carpet pile construction and also depending upon the character of the fiber used in the face of the carpet, and the desired thickness of the heel pad, in which preliminary treatment of the face of the carpet at the point at which the heel pad is to be applied will be desirable. This preliminary treatment may take the form of compacting to deflect or deform the pile, from an upright position, preferably with the application of sufficient heat to drive off moisture so as to promote adhesion of the plastisol to the pile of the carpet, and also avoid the possibility of forming voids in the heel pad due to the presence of excess moisture.

This procedure is shown in FIGURE 7 according to the preferred form, in which a plate 34 slightly smaller than the final desired size of the heel pad, is placed on the area where the heel pad will be formed. The plate 34 will preferably be heated to a temperature which, with due consideration to the time of its application, will effectively drive off moisture from the pile of the carpet. The plate will iron or compress the pile at 35.

The open top of the tray containing the plastisol as in FIGURE 2 or FIGURE 2b is then placed against the carpet of FIGURE 3 at the proper point, the carpet being disposed horizontally with the pile 24 in the open tray and the backing 26 beyond the tray. The carpet will be woven, knitted, tufted or nonwoven as desired.

In most instances it is preferable to invert the carpet so that the pile is down rather than to invert the tray of plastisol, in which case the carpet will be disposed horizontally with the pile 24 down and the backing 26 up.

The tray at this stage is pushed down to embed the rim in the carpet and the protruding edges of the tray rest on the backing and serve to limit the extent of penetration of the pile into the plastisol.

A press head 27 is brought down as indicated by the arrow 28 of FIGURE 4 until its lower surface touches the upwardly directed horizontal surface of the tray if the tray is inverted, or the bottom of the carpet if the carpet is inverted. Heat is applied from the heater 30 to the back of the tray and the press head moves downward to compress the pile, it being understood that the back of the carpet in the form shown in the drawing rests on the lower press platen not shown. This downward motion forces the rim of the applied pile and the skin layer 31 somewhat compresses the pile. However, the penetration of the tray is limited by the rim of the tray which rests against the backing of the carpet.

The heating is now increased to fusion temperature, of the order of 325 to 400 degrees F., and the time of heating will be sufficient to convert the gelled and unmerged plastisol into the fused heel pad 32, a time of three minutes being usually sufficient.

The press head is then removed as shown in FIGURE 5 and the tray allowed to cool or artificially cooled and stripped from the carpet. This is illustrated in FIGURE 6. The heel pad extends down into the pile but does not allow the pile to extend clear through to the top of the heel pad. Thus the heel pad is firmly anchored to the pile but remains very resilient because the heel pad is not cemented to the carpet backing.

Various plastisol compositions can be employed and the following examples give suitable plastisol compounds for the purposes of the present invention, in parts by weight.

Example 1

| Parts | | | | |
|-------|-------|-------|-------|
|Vinyl chloride resin QYNV or Geon 121 | 100 |
| Plivico AO | | | |
| Diocetyl phthalate | 80 |

Geon 121 is a polyvinyl chloride resin of high molecular weight in the form of stir-in powder 99% of which passes through a 200 mesh screen having a specific gravity of 1.4, ash content of 0.5% maximum and a specific viscosity of 0.57 to 0.63.

Plivico AO is a copolymer of vinyl chloride 90% and vinyl maleate 10%, having an intrinsic viscosity of 0.85%, specific gravity of 1.39% and a particle size of 1 to 2 microns.

Example 2

| Parts | | | | |
|-------|-------|-------|-------|
|Vinyl chloride resin QYNV | 100 |
| Diocetyl adipate | 60 |
Example 3

Vinylic chloride resin QYNV .......................... 100  
Diocetyl phthalate ..................................  40  
Diocetyl adipate .....................................  30  

Example 4

Vinylic chloride resin QYNV .......................... 100  
Di-isocetyl phthalate .................................  70  

The vinyl resin should be an initial resin.

I will prefer a phthalate, also a polymeric plasticizer, say 12 parts by weight of an alkyl reaction product of a dibasic acid such as maleic anhydride and a polyhydric alcohol such as diethylene glycol.

Such materials are available on the market in the form of Rohm and Haas Paraplex G-23 and Monoplex S-73 (the monomer) and Paraplex G-62 (the polymer, see U.S. Patent 2,822,368).

It will be evident that the two layer method, as described above, lends itself to the use of somewhat different compositions for the two different layers, as long as they are sufficiently compatible to bond effectively. Thus, the formulation which is utilized for the initial layer may be compounded for toughness and abrasion resistance, and may, if desired, be of a relatively high resin content, whereas the added layer which is to bond to the first layer and to penetrate the pile may be more highly filled formulation, which does not require the abrasion resistance and the toughness of the outer layer.

It has previously been indicated that a sheet of material may be introduced in the tray at the beginning of the operation, and the material for this first sheet may be specially selected from the standpoint of wear resistance, toughness and abrasion resistance as desired.

It will be evident that the angle of the edge with respect to the plane of the carpet may be selected as desired, choosing anyone of a wide variety of angles, and not necessarily providing an abrupt right angle as shown in the drawings.

In view of my invention and disclosure variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art to obtain all or part of the benefits of my invention without copying the process shown, and I, therefore, claim all such insofar as they fall within the reasonable spirit and scope of my claims.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. The method of forming and affixing a carpet protecting heel pad to reinforce a pile carpet surface on an automobile mat, which comprises

(a) depositing a layer of liquid plastisol in an open tray shaped like the protecting heel pad to be formed and having a rim surrounding the tray,

(b) heating the plastisol in contact with the tray to at least gelling temperature by application of heat only to the tray for a time period sufficient to gell a layer portion of at least 0.010 inch of the plastisol near the surface of the tray, the layer portion of the plastisol remote from the surface of the tray remaining liquid,

(c) pressing the tray and the liquid plastisol against the carpet and bringing said rim into pressure engagement with the carpet thus closing the tray, to cause the pile to at least partially penetrate the ungelled layer portion of the plastisol which is in contact with the pile, the gelled layer portion acting to partly crush any pile which penetrates and to confine the adjacent liquid,

(d) applying heat to the tray and heating all the plastisol to a fusion temperature to bond the plastisol protecting heel pad to the pile of the carpet,

(e) and cooling the tray and the fused protecting heel pad sufficient to allow stripping the molding tray from the fused heel pad thus formed.

2. The method of claim 1, in which the plastisol which forms the protecting heel pad and bonding agent is a polyvinyl chloride formulation.

3. The method of claim 1, which comprises forcing the tray and ungelled plastisol far enough into the pile to flatten the pile by the layer of gelled plastisol prior to fusion of the plastisol around the pile.

4. The method of claim 1, which comprises pre-heat and compressing the pile to a flattened condition in the area where the heel pad is to be formed before it is brought into contact with the plastisol in the tray.

5. The method of forming and affixing a carpet protecting heel pad to a pile carpet surface on an auto mat, which comprises

(e) depositing a first layer of liquid plastisol at least 0.010 inch thick and only partially filling an open tray shaped like the carpet protecting pad to be produced and having a rim surrounding the tray,

(b) heating the said plastisol to a gelling temperature by application of heat to the tray and plastisol for a sufficient time,

(c) depositing a second layer of liquid plastisol on top of the first gelled layer to form the full thickness of the final protecting pad,

(d) placing the tray and plastisol in contact with the carpet pile and bringing said rim into pressure engagement with the carpet thus closing the tray,

(e) pressing the plastisol in the tray against the carpet to cause the pile to penetrate said layer of plastisol, and forcing the tray far enough against the pile to flatten the pile by the gelled plastisol of the first said layer, said gelled plastisol confining the adjacent liquid,

(f) applying heat to the tray only and so heating all the plastisol to a fusion temperature to bond the plastisol protecting heel pad to the pile of the carpet,

(g) and cooling the fused protecting heel pad sufficient to allow stripping the molding tray away from the finished heel pad thus formed.

6. The method of claim 5, in which the plastisol which forms the protecting heel pad and bonding agent is a polyvinyl chloride formulation.

7. The method of claim 5, which comprises pre-heating and compressing to a flattened condition the pile of the carpet in the area where the heel pad is to be formed before it is brought into contact with the plastisol.

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