Sept. 22, 1942. D. R. COTTERMAN 2,296,502

METHOD OF MANUFACTURING FLOOR MATS

Filed Oct. 16, 1939 2 Sheets-Sheet 1

Fig. 1.

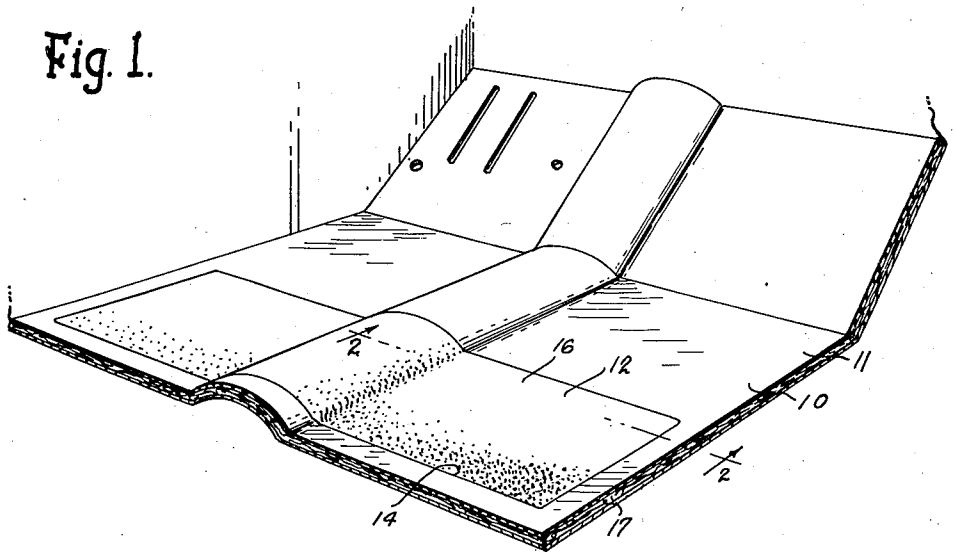


Fig. 2.

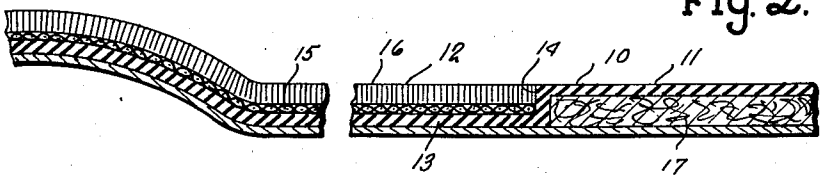
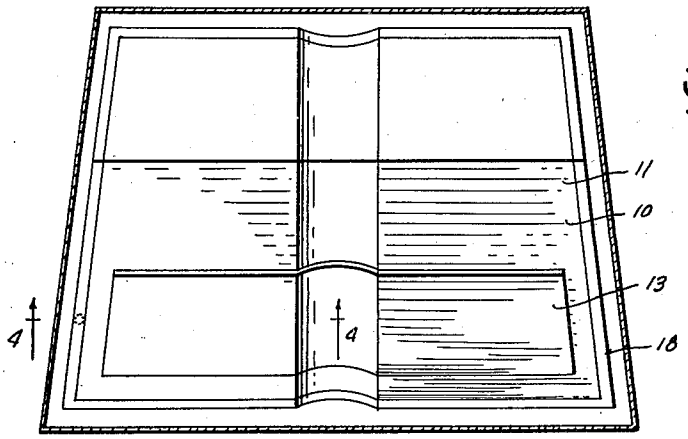


Fig. 3.



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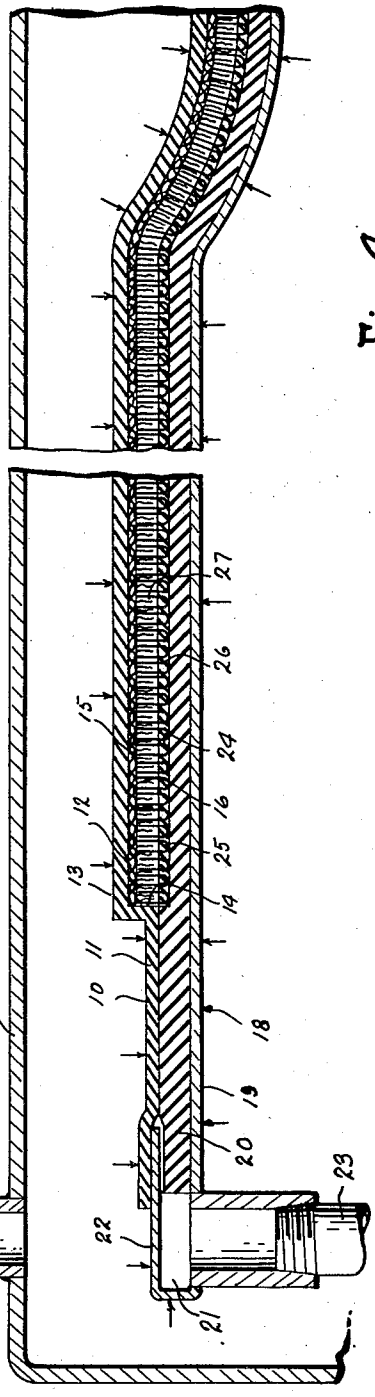


Fig. 4

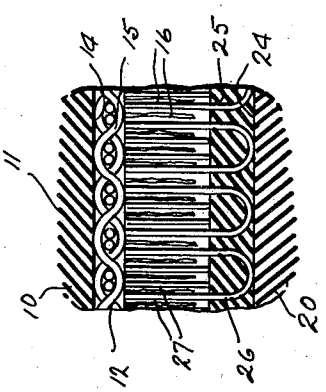


Fig. 5

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2,296,502

METHOD OF MANUFACTURING FLOOR MATS

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Application October 16, 1939, Serial No. 299,730

8 Claims. (Cl. 154—2)

This invention relates to floor coverings and refers more particularly to an improved method and apparatus for manufacturing floor coverings.

It is one of the principal objects of this invention to provide a composite mat having a flexible covering sheet and having a sheet of pile fabric secured to the covering sheet to form a unitary construction.

Another object of this invention resides in the provision of a composite mat of the type set forth above wherein the covering sheet comprises vulcanizable stock cured to the particular contour of the floor surface to be covered thereby and wherein the pile fabric sheet is secured to the covering sheet during the curing operation so that both sheets conform in contour to the shape of the floor surface. As a result, the mat may be prefashioned to neatly cover highly irregular flooring surfaces, such as usually employed in vehicle bodies.

A further object of this invention consists in the novel method employed for manufacturing the mat previously discussed. This method comprises a relatively few simple steps capable of being inexpensively carried out at a rate conducive to large production manufacture and with relatively simple apparatus.

Another advantageous feature of my improved method of manufacture consists in securing the pile fabric to the covering material during the interval the covering material is cured to the contour of the flooring and to accomplish this result without injuring or matting the pile.

In accordance with the present method, a section of carding material is positioned on the form with the rigid projections of teeth thereof extending from the surface of the form. A tread sheet of pile fabric is then positioned on the carding material with the bottom surface of the base of the pile fabric facing upwardly and with the teeth of the carding material extending between the fabric pile into engagement with the adjacent surface of the base of the pile fabric to support the latter above the form. A covering sheet of vulcanizable stock is then positioned on the form over the sheet of pile fabric and is cured to the contour of the form by subjecting the exposed surface of the covering to the action of the curing medium under pressure. The rigidity of the teeth on the carding material is sufficient to withstand the pressure of the curing medium and, as a result, the pile of the fabric tread sheet is prevented from matting against the form under the pressure of the curing medium. During the curing operation, the base of the pile fabric is in contact with the stock and is permanently secured to the latter.

In addition to the above, the invention contemplates a relatively simple apparatus for expediently carrying out the several steps of the method and this apparatus, as well as the foregoing features and other objects, will be made more apparent as the description proceeds, especially when considered in connection with the accompanying drawings, wherein:

Figure 1 is a perspective view of a vehicle body flooring covered with a mat constructed in accordance with this invention;

Figure 2 is a sectional view taken substantially on the plane indicated by the line 2—2 of Figure 1;

Figure 3 is a plan view of the molding form and illustrating a mat in association therewith;

Figure 4 is a sectional view taken substantially on the plane indicated by the line 4—4 of Figure 3;

Figure 5 is an enlarged sectional view of a portion of Figure 4.

The mat forming the subject matter of this invention is especially designed for use as a covering for the irregular surface of a typical vehicle body floor, designated in Figures 1 and 2 by the reference character 10. The flooring 10 is illustrated as having a "hump" or "tunnel" intermediate the opposite side edges for the purpose of accommodating parts (not shown) of the vehicle driving mechanism, and it will be observed from Figure 1 that the mat is tailored to neatly fit the irregular floor surface.

In detail, the mat comprises a covering sheet 11 of vulcanizable material, such as rubber, and an insert 12 of a different material, such as pile fabric. The covering sheet 11 is fashioned with a depressed portion 13 forming a recess 14 in the top surface thereof. The depth of the recess 14 approximates the thickness of the pile of the fabric sheet 12 and the latter is secured within the recess.

Upon reference to Figure 2, it will be noted that the pile fabric has a base 15 secured to the upper surface of the recess and is further provided with pile 16 projecting above the base to a position substantially flush with the top surface of the covering 11 surrounding the pile fabric. As will be more fully hereinafter set forth, the covering sheet 11 is cured while in contact with a form corresponding exactly to the surface contour of the floor to be covered thereby and the pile fabric 12 is secured to the covering sheet

during the curing operation so that both sheets will neatly fit the flooring surface.

It will also be observed from Figure 2 that a fibrous backing 17 may be secured to the covering sheet 11. This backing may be in the form of jute, flock or similar materials and is applied in a manner to compensate for the difference in elevation between the base of the recessed portion 14 of the covering sheet and the portions surrounding this recess.

The various steps in the method of manufacturing a composite mat of the type previously described will be more fully understood upon considering the apparatus selected herein for the purpose of illustration. It should be understood, however, that various different types of apparatus may be employed to carry out the several steps of the method, but I prefer the general arrangement shown because it has proved both simple and effective in actual practice.

Upon reference to Figures 4 and 5, it will be noted that the apparatus comprises a mold 18 having a sheet metal supporting plate 19 corresponding in contour to the shape of the flooring adapted to be covered by the mat and having a sheet 20 preferably of hard rubber secured to the top surface of the plate. The marginal edge portions of the plate 19 project beyond the adjacent edges of the sheet 20 and are returnbent to provide a continuous chamber 21 extending around the marginal edge of the sheet 20. The upper wall 22 of the chamber overlaps the top surface of the marginal edge portion of the sheet 20 and the interior of the chamber 21 communicates with the exhaust side of a suitable pump (not shown) through the medium of a conduit 23.

The sheet 20 corresponds to the contour of the plate 19 and is provided with a recess 24 in the top surface thereof having an area corresponding to the area of the mat occupied by the pile fabric tread sheet 12. Supported within the recess 24 is a section of carding material 25 having the base portion 26 suitably anchored in the recess and having rigid teeth 27 projecting above the top surface of the sheet 20. The base 26 of the carding sheet 25 is preferably formed of a heat resisting material, such as rubber or rubber substitutes, and a plurality of staples or closely spaced pins are suitably anchored in the sheet while the latter is in its uncured state to form the teeth 27. The length of the portions of the staples or pins extending above the carding sheet is slightly greater than the depth of the pile 16 on the fabric sheet 12 so that when the sheet 12 is located in an inverted position on the carding cloth (Figure 5), the pile 16 is, in effect, suspended or held against matting against the form 18.

Method of manufacture

The first step in the method of manufacture consists in placing a pile fabric sheet of the proper size on the teeth of the carding material in an inverted position so that the teeth of the carding material contacts the top surface of the base 15 of the pile fabric sheet. When positioned in this manner, the pile 16 on the fabric sheet, in effect, extends between the rigid teeth 27 of the carding material in the manner designated by the enlarged sectional view shown in Figure 5.

After the pile fabric sheet is properly positioned on the carding material, a sheet of vulcanizable material, such as uncured rubber, is placed over the mold form 18 with the marginal edge portions overlapping the continuous flange 22 and with the intermediate portion extending over the underside of the base 15 on the pile fabric in contact with the base. The mold form 18 is then located within a pressure chamber 28 communicating with a source of preheated fluid under pressure through the medium of a conduit 29. The fluid under pressure is applied to the exposed surface of the uncured sheet in the manner designated by the arrows in Figure 4 and the pressure is sufficient to conform the uncured sheet to the contour of the top surface of the mold form 18. Also, the fluid under pressure is preheated to vulcanize or cure the rubber sheet to the contour of the form which, as stated above, corresponds to the contour of the flooring. It may be pointed out at this time that the teeth 27 of the carding material possesses sufficient rigidity to withstand the pressure of the vulcanizing fluid medium applied to the uncured sheet and, accordingly, the pile 16 of the fabric sheet 12 is prevented from matting during the application of the vulcanizing pressure.

It has previously been stated that the carding sheet has a base of uncured rubber or rubber-like material. However, during the interval the rubber covering sheet 11 is cured, the base of the carding sheet is also cured and after repeated use becomes thoroughly vulcanized to the contour of the mold.

In order to maintain the vulcanizable material in proper position on the contoured form prior to introducing the form into the pressure chamber 28 and at the same time exhaust any air that may be trapped between the adjacent surfaces of the form and vulcanizable material, the marginal chamber 21 is exhausted. As stated above, the marginal portions of the vulcanizable material extend over the flange 22 and the resulting suction effected through the chamber 21 provides an effective seal around the material. Accordingly, the material will accurately conform to the contoured surface of the mat under the pressure of the fluid medium in the chamber 28. It will, of course, be understood that any tendency for the suction action to draw the pile fabric sheet toward the contoured surface of the form is prevented by the rigid teeth 27 on the carding sheet 25.

During the interval the uncured sheet is vulcanized to the contour of the mold form 18, the base 15 of the pile fabric is permanently united to the adjacent surface of the uncured sheet. This may be accomplished by vulcanizing the uncured sheet directly to the base of the pile fabric, or by applying a curing cement to the undersurface of the base prior to placing the uncured sheet of stock over the mold form 18. On the other hand, a bituminous binder may be employed, instead of cement, and, in such a case, a binder is selected which will become tacky during the vulcanizing temperatures. In any event, the pile fabric is secured in place on the sheet of vulcanizable material during the time the latter is cured to the contour of the mold form and this, of course, is desirable in that it not only reduces the cost of manufacture, but also appreciably expedites the time required to make the mat.

When the vulcanizing process previously referred to is completed, the mold form 18 is removed from the pressure chamber 28 and a mat is produced which corresponds exactly to the contour of the flooring to be covered thereby and which is provided with an insert of fabric pile.

The backing material 17 is then cemented or otherwise suitably secured to the undersurface of the mat and the latter is ready for installation.

What I claim as my invention is:

1. Those steps in the method of manufacturing a composite mat which consist in positioning a sheet of carding material on a contoured mold form with the rigid teeth of the carding material extending upwardly, placing a sheet of pile fabric in an inverted position on the rigid teeth of the carding material, positioning a sheet of flexible stock over the contoured form with a portion of the stock extending over the base of the pile fabric in contact with the bottom surface of the said base, applying an adhesive material to one of the adjacent surfaces of the latter sheets, and securing the sheets together by exerting a fluid under pressure on the exposed surface of the flexible sheet of stock in a direction to urge the same toward the contoured form.

2. Those steps in the method of manufacturing a composite mat which consist in placing a strip of carding material on a contoured form with the rigid teeth of the carding material extending upwardly, placing a sheet of pile fabric in an inverted position on the carding material, positioning a sheet of vulcanizable material over the contoured surface of the form and over the base of the pile fabric, curing the vulcanizable material to the contour of the form and securing the base of the pile fabric to the vulcanizable material by applying a heated fluid under pressure against the exposed surface of the material.

3. Those steps in the method of manufacturing a composite mat which consist in relatively positioning a sheet of vulcanizable stock and a sheet of pile fabric on a contoured form with the pile on the fabric extending toward the contoured surface of the form and with the bottom surface of the base of the fabric contacting with the adjacent surface of the vulcanizable material, subjecting the joint between the vulcanizable material and contoured surface of the form to the action of suction to draw the vulcanizable material against the form, curing the vulcanizable material to the contoured form and securing the pile fabric to the material by applying a heated fluid under pressure on said material in a direction toward the form, and subjecting the base of the pile fabric to a force opposed to the curing pressure to relieve the pile from said curing pressure and thereby prevent matting of the pile against the form.

4. Those steps in the method of manufacturing a composite mat which consist in placing a strip of carding material on the contoured surface of a form with the rigid teeth of the carding material extending upwardly, positioning a sheet of pile fabric on the rigid teeth of the carding material with the pile on the fabric extending toward the contoured surface of the form, placing a sheet of vulcanizable material over the contoured surface of the form and over the base of the pile fabric, subjecting the joint between the vulcanizable material and contoured surface of the form to the action of suction to draw the material against the form, curing the vulcanizable material to the contour of the form and securing the base of the pile fabric to the vulcanizable material by applying heated fluid under pressure against the vulcanizable material in a direction toward the form.

5. Those steps in the method of manufacturing a composite mat which consist in relatively positioning a flexible sheet of stock and a pile fabric sheet on a contoured form with the pile extending toward the contoured surface of the form and with the bottom surface of the base contacting the surface of the stock facing the form, applying a pressure on the sheet of stock in a direction toward the mold form to conform both of said sheets to the contoured surface of the mold form, and subjecting the pile side of the pile fabric to a force sufficient to prevent matting of the pile against the form under the action of said pressure.

6. Those steps in the method of manufacturing a composite mat which consist in relatively positioning a sheet of vulcanizable material and a pile fabric sheet on the contoured surface of a mold form with the pile extending toward the contoured surface and with the base contacting the adjacent surface of the vulcanizable material, curing the sheet of vulcanizable material to the contour of the mold form and securing the base of the pile fabric to the adjacent surface of the vulcanizable material by applying heated fluid under pressure against the material in a direction toward the form, and subjecting the pile side of the pile fabric to a force sufficient to prevent matting of the pile against the form under the action of the heated fluid under pressure.

7. In a method of forming a composite mat to the contour of a mold form having closely spaced teeth projecting from the contoured surface of the mold form and having the free ends of the teeth lying in a plane parallel to the plane of the contoured surface of the form, those steps which consist in placing a sheet of pile fabric over the contoured surface of the mold form with the pile projecting toward the contoured surface of the mold form and extending between the teeth on the mold form, placing a sheet of vulcanizable material over the sheet of pile fabric, and curing the sheet of vulcanizable material to the contour of the mold form.

8. Those steps in the method of manufacturing a composite mat which consist in relatively positioning a sheet of vulcanizable material and a sheet of pile fabric on the contoured surface of a mold form with the pile extending toward the contoured surface and with the bottom surface of the base of the pile fabric contacting the surface of the sheet of vulcanizable material facing the form, conforming both of the sheets to the contour of the form and curing the sheet of vulcanizable material to the contour of the mold form by applying a heated fluid under pressure against vulcanizable material in a direction toward the contoured surface of the mold form, and opposing the curing pressure with a force acting independently of the pile on the pile side of the pile fabric sheet and being sufficient to maintain the base portion of the pile fabric sheet spaced above the mold form a distance approximating the length of the pile during the curing operation to thereby prevent matting of the pile against the form under the action of the heated fluid under pressure.

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