

Aug. 4, 1942.

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2,292,103

METHOD AND APPARATUS FOR MANUFACTURING FLOOR MATS

Filed March 24, 1941

2 Sheets-Sheet 1

Fig. 1.

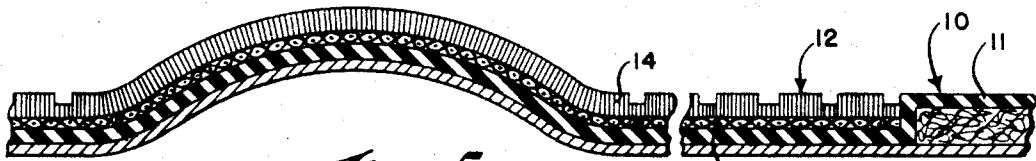


Fig. 5.

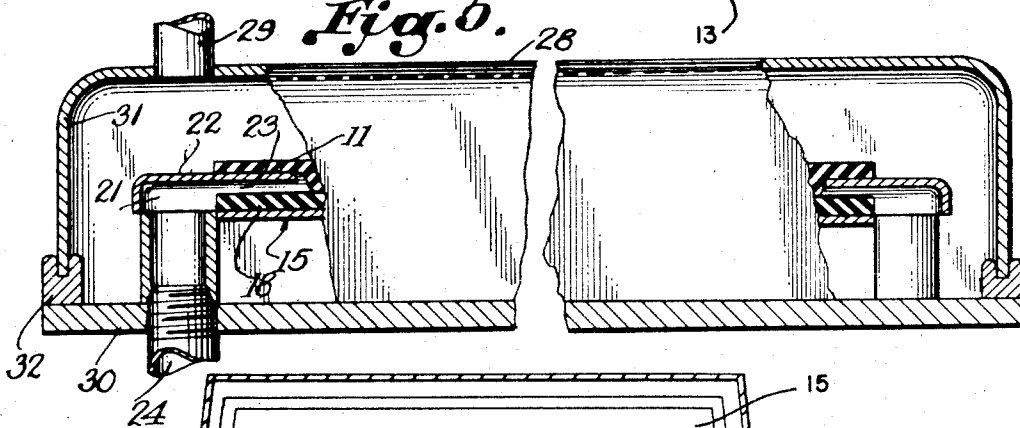
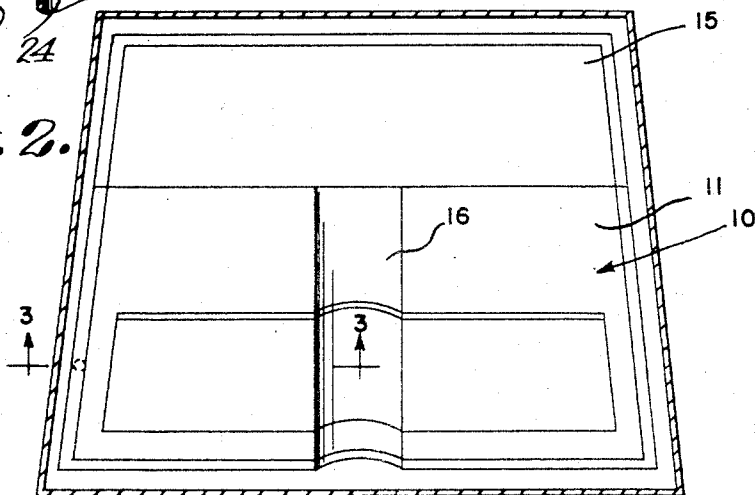


Fig. 2.



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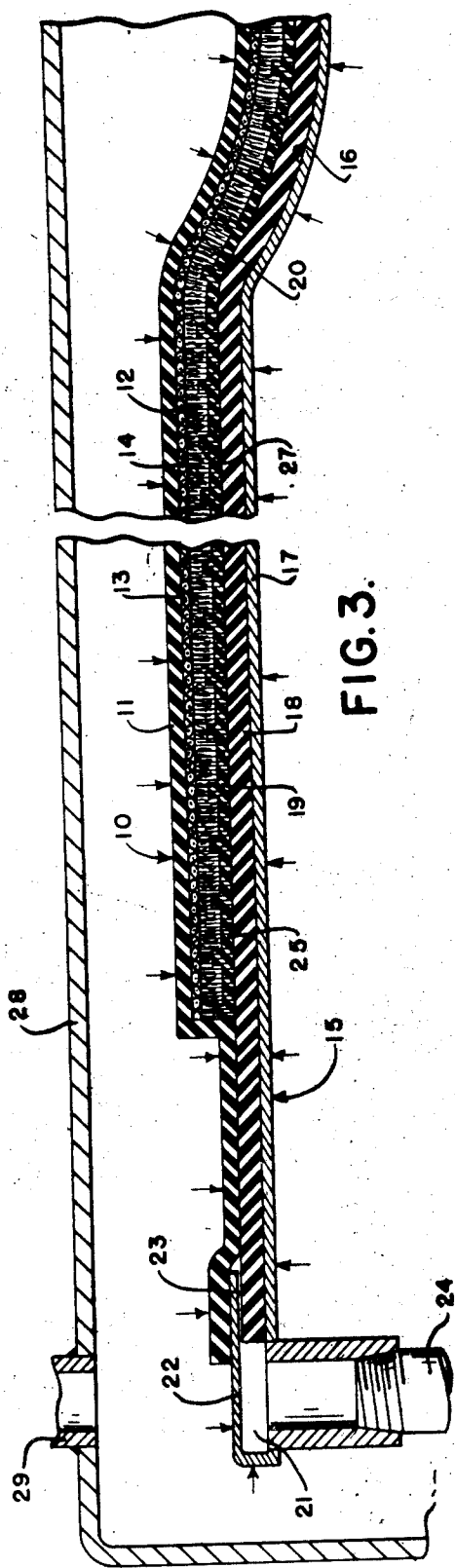


FIG. 3.

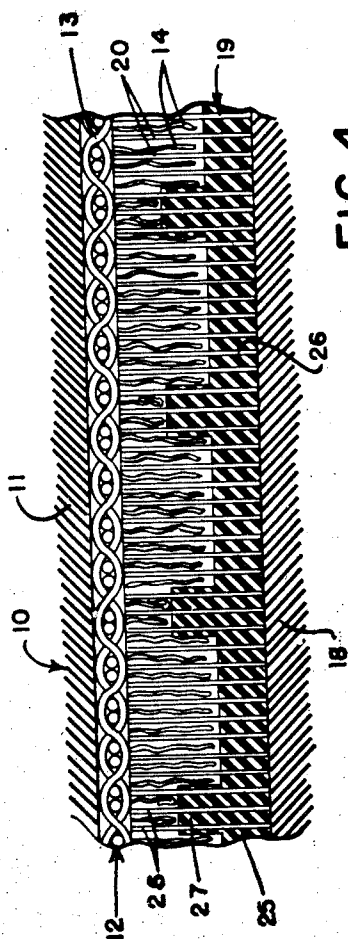


FIG. 4.

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2,292,103

METHOD AND APPARATUS FOR MANUFACTURING FLOOR MATS

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Application March 24, 1941, Serial No. 384,991

7 Claims. (Cl. 154—1)

This invention relates to a method and apparatus for manufacturing composite floor coverings.

More particularly, the present invention relates to an improved method and apparatus for manufacturing floor coverings having a flexible covering sheet of vulcanizable material and having a sheet of pile fabric secured to the top surface of the flexible covering sheet with the pile extending upwardly.

One of the principal features of this invention is to provide a simple, inexpensive method and apparatus for manufacturing composite floor coverings of the above type with an embossed design in the pile.

In the manufacture of composite mats of the type set forth, it has been proposed to place a sheet of carding material on the contoured surface of a mold form with the rigid pile on the carding material extending upwardly into engagement with the base of a sheet of pile fabric which is placed over the carding material in an inverted position so that the pile on the fabric extends downwardly between the rigid pile on the carding sheet. A sheet of vulcanizable material is placed over the mold form in contact with the base of the pile fabric and a heated fluid under pressure is applied to the vulcanizable material to cure the latter to the contour of the form. During this curing operation, the sheet of pile fabric is vulcanized to the sheet of vulcanizable material and the pile is prevented from matting against the form by the rigid pile on the carding sheet.

With the above in view, it is a further object of this invention to form an embossed design on the pile fabric sheet by permitting certain areas of the pile to mat under the influence of the pressure of the fluid applied to the vulcanizable sheet and by preventing matting of the adjacent areas of the pile. As a result, designs of various configurations may be formed in the floor mat without increasing the cost or time of manufacture.

Still another object of this invention is to provide a sheet of carding material having a plurality of closely spaced pins projecting upwardly therefrom with the upper ends of the pins arranged in a common plane parallel to the plane of the form and having raised portions reducing the effective length of the pins projecting from the raised portions so that the pile registering with the raised portions is matted to some extent.

The foregoing as well as other objects will be made more apparent as this description proceeds, especially when considered in connection with the accompanying drawings, wherein:

Figure 1 is a sectional view through a floor

covering manufactured in accordance with this invention;

Figure 2 is a plan view of a mold form employed in the method of manufacturing the mat shown in Figure 1;

Figure 3 is a sectional view taken on the line 3—3 of Figure 2 and showing the mold form with the several parts of the mat thereon in a vulcanizing chamber; and

Figure 4 is an enlarged sectional view of the apparatus shown in Figure 3.

Figure 5 is a fragmentary diagrammatic sectional view illustrating one type of pressure chamber that may be employed with the apparatus forming the subject matter of this invention.

The floor covering shown herein is in the form of a mat especially designed for use as a covering for vehicle body flooring of the type designated generally in Figure 1 by the reference character 10. It will be observed from Figure 1 that the flooring 10 has a "hump" intermediate opposite side edges thereof for the purpose of providing clearance for certain parts (not shown) of the vehicle driving mechanism which extends beneath the flooring of the vehicle. As will be more fully hereinafter set forth, the mat is cured to the contour of the flooring 10 so as to provide a neat and pleasing appearance.

In detail, the floor mat comprises a flexible covering sheet 11 of vulcanizable material and a pile fabric sheet 12 having the base 13 secured to the top surface of the covering sheet with the pile 14 extending upwardly. The pile 14 has a design of any suitable configuration embossed therein, and this design is formed during the vulcanizing operation by permitting certain areas of the pile to mat against the form to a greater extent than adjacent areas of the pile. This method of forming the design is highly advantageous in that it permits decorating the floor mat without increasing the time or cost of manufacture of the floor mat.

The various steps in the method of manufacturing a floor mat of the general type previously described will be more fully understood upon considering the preferred apparatus for carrying out the various steps of the method. It should be understood, however, that various different types of apparatus may be employed to perform the several steps of the method, but I prefer the general construction shown in the drawings because it has proved both simple and effective in actual practice.

Upon reference to Figures 2 to 4, inclusive, it will be noted that the apparatus comprises a mold form 15 having a recess 16 intermediate opposite side edges thereof and corresponding to the "hump" previously described as formed in the flooring 10. As shown particularly in Figure 4,

the mold form 15 comprises a metal supporting plate 17 having a hard rubber covering sheet 18 secured to the top surface thereof and having a sheet of carding material 19 positioned on the top surface of the rubber sheet 18 in such a manner that the rigid pile 20 of the carding material extends upwardly.

The marginal edge portions of the metal supporting plate 17 project beyond the adjacent edges of the rubber sheet 18 and are return bent to provide a continuous chamber 21 extending around the marginal edge of the mold form 15. The top wall 22 of the chamber 21 overlaps the top surface of the rubber mold sheet 18 and is spaced above the latter a sufficient distance to provide a passage 23.

The above arrangement is such that when the flexible covering sheet 11 of the mat is placed on the top surface of the mold form, the marginal edges of the covering sheet 11 overlap the top surface of the walls 22 in such a manner that the passage 23 establishes communication between the interior of the marginal chamber 21 and the joint between adjacent surfaces of the sheet 11 and the mold form 15. In the present instance, the marginal chamber 21 communicates with the exhaust side of a suitable pump (not shown) through the medium of a conduit 24. The pump is operated as soon as the sheet 11 is placed on the mold form and effects a tight seal around the marginal edges of the sheet 11.

It has also been stated above that the mold form 15 comprises the sheet of carding material 20. The area of the carding sheet corresponds to the area of the pile fabric sheet 12 it is desired to secure to the covering sheet 11. As shown in Figure 4, the sheet of carding material 20 has a base 25 which may be vulcanized or otherwise suitably secured to the top surface of the rubber mold sheet 18, and the rigid pile extending upwardly from the base 25 is preferably in the form of a series of pins 26 anchored in the base 25. The upper ends of the pins are included in a plane parallel to the plane of the contoured mold form and are adapted to engage the base 13 of the pile fabric sheet 12 between the pile 14 so as to control matting of the pile 14 against the top surface of the form during the vulcanizing operation to be presently described.

It has also been pointed out above that an embossed design is formed in the floor mat during the vulcanizing operation by permitting certain areas of the pile 14 on the sheet 12 to mat against the adjacent surface of the form. For accomplishing this result, the base 25 of the carding sheet 20 is embossed to form a matrix of the design it is desired to form in the pile 14 of the fabric sheet 12.

With the above construction, it will be noted that when the strip of pile fabric 12 is placed in an inverted position on the carding sheet 20 and is urged downwardly toward the carding sheet, the pile 14 registering with the raised portions 27 of the embossed design on the carding sheet is matted against the surfaces of the raised portions, whereas the remaining area of the pile is prevented from matting by the pins projecting from the areas of the carding sheet adjacent the raised portions. As will be presently described, the above action takes place during the vulcanizing operation and, accordingly, a permanent embossed design is formed in the pile 14 of the fabric sheet 12.

As will be more fully hereinafter set forth, the form 15 is adapted to be supported in a pressure

chamber 28 shown diagrammatically in Figure 5 as comprising a base 30 and a cover 31 removably supported on the base 30. A suitable sealing strip 32 is secured to the base 30 and is channel-shaped in cross section for receiving the marginal edge of the cover. The base is apertured to receive the suction conduit 24 and the cover is also apertured to receive a fluid pressure conduit 29. The above construction is merely shown for the purpose of illustration and forms no part of the present invention.

Method of manufacture

The first step in the method of manufacture consists in placing a pile fabric sheet of the proper size on the carding sheet 20 in an inverted position so that the pile 14 on the fabric sheet extends between the rigid pins 26 on the carding sheet. After the pile fabric sheet 12 is positioned in the above manner on the carding sheet 20, a flexible sheet of vulcanizable material 11 is placed over the base 13 of the pile fabric sheet 12. The flexible sheet of vulcanizable material 11 has an area which is greater than the area of the pile fabric sheet so that the marginal edges thereof overlap the walls 22 of the marginal chamber 21 in the manner clearly shown in Figure 3.

When the two sheets are positioned on the mold form 15 in the manner specified above, the mold form is located in a chamber 28 which is adapted to communicate with a source of heated fluid under pressure through the medium of a conduit 29. Before admitting fluid under pressure into the chamber 28, the marginal chamber 21 is exhausted so as to not only remove any air that may be trapped between the covering sheet 11 and adjacent surface of the mold form but to also provide an effective seal around the marginal edge portions of the covering sheet 11.

As fluid under pressure is introduced into the chamber 28, it acts upon the exposed surface of the covering sheet of vulcanizable material in the manner indicated by the arrows in Figure 3 and urges this sheet downwardly toward the contoured surface of the mold form 15. As stated above, the pile fabric sheet 12 is urged against the upper ends of the pins 26 on the carding sheet 20, and since the upper ends of these pins are included in a plane parallel to the plane of the contoured surface of the form, it follows that the fabric sheet as well as the covering sheet assume the same contour under the action of the fluid under pressure.

The temperature of the fluid under pressure admitted to the chamber 28 is sufficient to cure the covering sheet 11 to the contour of the mold form and to vulcanize the covering sheet to the undersurface of the base 13 on the pile fabric sheet. It will also be noted that the above vulcanizing operation has the effect of deforming the pile fabric material to the contour of the mold form 15.

The pins 26 which project upwardly from the portions of the carding sheet 20 adjacent the raised portions 27 are of sufficient length to prevent matting of the pile 14 against the form 15 under the pressure of the fluid. However, the portions of the pile registering with the raised portions is matted against the top surfaces of the raised portions to an extent determined by the height of the raised portions, and an embossed design is formed in the pile 14 during the vulcanizing operation. The depth of the embossed design may, of course, be varied by changing the height of the raised portions 27, and the config-

uration of the design may be altered to suit different specifications by merely changing the arrangement of the raised portions 27 on the carding sheet 20.

What I claim as my invention is:

1. Those steps in a method of manufacturing a composite mat which comprise relatively positioning a sheet of vulcanizable material and a pile fabric sheet on a form with the pile extending toward the form and with the bottom surface of the pile fabric contacting the adjacent surface of the material, curing the sheet of vulcanizable material while the latter is in contact with the bottom surface of the pile fabric by applying heat under pressure against the top surface of the sheet of vulcanizable material, and forming an embossed design in the pile fabric sheet by matting certain areas of the pile under the action of the fluid under pressure to a greater extent than adjacent areas of pile.

2. Those steps in a method of manufacturing a composite mat which comprise relatively positioning a flexible sheet of stock and a pile fabric sheet on a mold form with the pile extending in a direction toward the form and with the bottom surface of the pile fabric contacting the adjacent surface of the flexible sheet, urging the sheets toward the form by applying a fluid under pressure to the opposite surface of the stock, and forming a design in the pile fabric sheet during the application of the fluid under pressure by matting certain areas of pile against the form and by holding the remaining area of the pile spaced from the form.

3. Those steps in a method of manufacturing a composite mat which comprise relatively positioning a sheet of vulcanizable material and a pile fabric sheet on the contoured surface of a form with the pile extending toward the contoured surface of the form and with the bottom surface of the pile fabric contacting the adjacent surface of the material, curing the sheet of vulcanizable material to the contour of the form and uniting the bottom surface of the pile fabric sheet to the sheet of vulcanizable material by applying heated fluid under pressure against the surface of the sheet of vulcanizable material opposite the surface contacting the bottom surface of the pile fabric, and forming a design in the pile fabric sheet during the application of the fluid under pressure by matting certain areas of the pile against the form and by holding certain other areas of the pile spaced from the form.

4. Those steps in a method of manufacturing a composite mat which comprise relatively positioning a sheet of vulcanizable material and a pile fabric sheet on the contoured surface of a form with the pile extending toward the contoured surface of the form and with the bottom surface of the pile fabric sheet contacting the adjacent surface of the material, curing the sheet of vulcanizable material to the contour of the form by applying heated fluid under pressure against the surface of the sheet by vulcanizable material opposite the surface contacting the bottom surface of the pile fabric, and forming an embossed design in the pile fabric sheet by matting certain areas of the pile under the action of the fluid under pressure to a greater extent than adjacent areas of pile.

5. In apparatus for making floor coverings embodying a sheet of vulcanizable material and a

sheet of pile fabric having a base portion united at its underside to the sheet of vulcanizable material, a form over which the sheets are placed with the pile on said fabric sheet extending toward the form, means for applying heat under pressure on the sheet of vulcanizable material to conform the sheets to the contour of the form, a plurality of closely spaced rigid pins projecting from the form between the pile and engageable with the base of the pile fabric sheet to counteract the heat under pressure applied to the sheet of vulcanizable material and thereby control matting of the pile against the form, and raised portions on the form engageable with adjacent portions of the pile to mat the latter under the action of the heat under pressure and thereby form a design on the pile surface of the fabric sheet.

6. In apparatus for making floor coverings embodying a sheet of vulcanizable material and a sheet of pile fabric having a base portion united at its underside to the sheet of vulcanizable material, a form over which the sheets are placed with the pile on said fabric sheet extending toward the form, means for applying fluid under pressure on the sheet of vulcanizable material to conform the sheets to the contour of the form, a strip of carding material having a base secured to the form and having an embossed design on the surface adjacent the pile fabric, closely spaced rigid pins extending from the embossed surface of the carding material and having the free ends included in a common plane parallel to the plane of the form, raised portions of the embossed design on the carding material having a height so determined that the pile on the pile fabric sheet registering with the raised portions is matted against the raised portions under the action of the fluid pressure to such an extent that an embossed design is formed in the pile of the fabric sheet.

7. In apparatus for making contoured floor coverings embodying a sheet of vulcanizable material and a sheet of pile fabric having a base portion united at its underside to the sheet of vulcanizable material, a form having a contoured surface over which the sheets are placed with the pile on the fabric sheet extending toward the contoured surface of the form, means for applying a heated fluid under pressure to the sheet of vulcanizable material to conform said sheets to the contour of the form and to vulcanize the sheets together, a strip of carding material having a base positioned on the contoured surface of the form and having an embossed design on the opposite surface thereof, a plurality of closely spaced rigid pins extending from the embossed surface of the carding strip and having the free ends included in a common plane parallel to the plane of the contoured surface of the form, the projecting portions of the pins adjacent the raised portions of the embossed design on the carding strip having a length approximating the length of the pile on the fabric sheet to prevent matting of the pile under the action of the fluid under pressure and the projecting portions of the pins extending from the raised portions of the embossed design on the carding strip having a length less than the length of the pile to permit the pile registering with the raised portions to mat against the latter.

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