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APPARATUS FOR FORMING AUTOMOBILE FLOOR MATS

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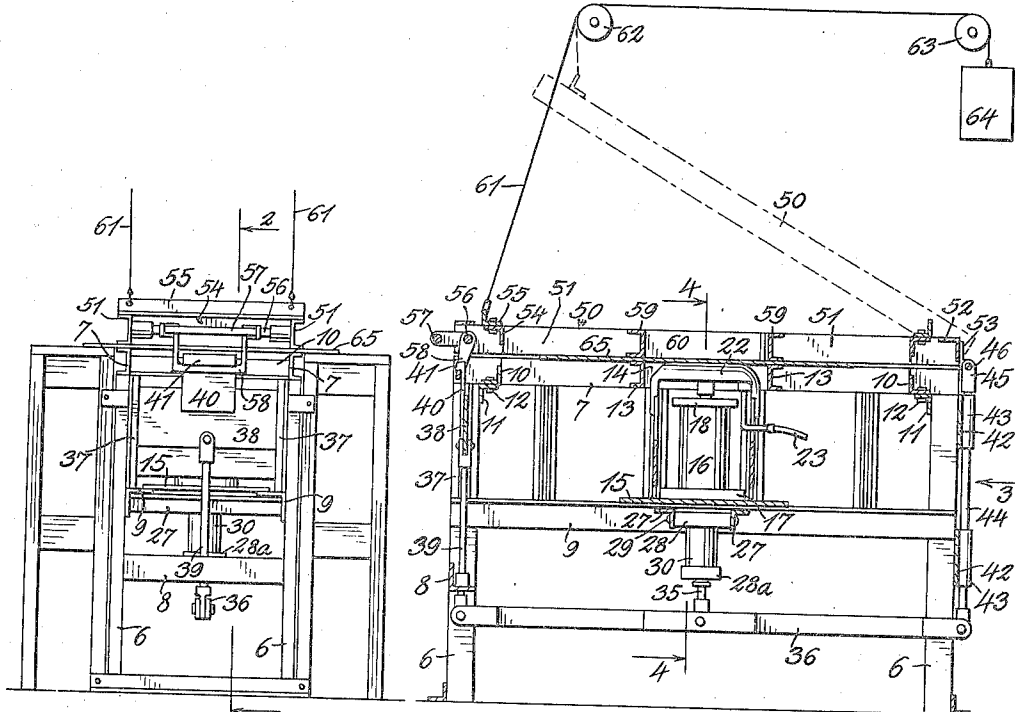


Fig. 1.

Fig. 2.

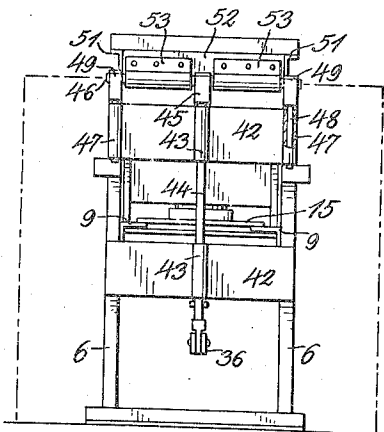


Fig. 3.

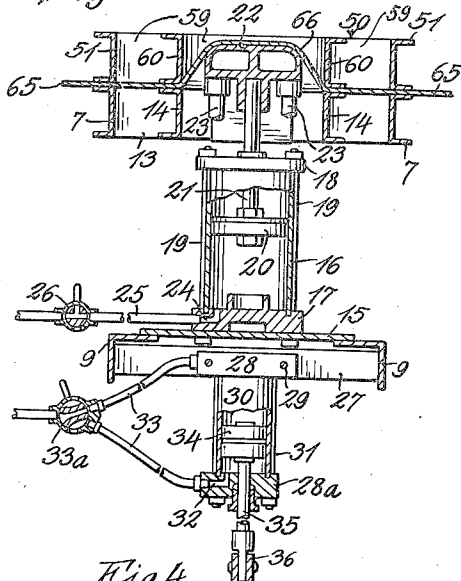


Fig. 4.

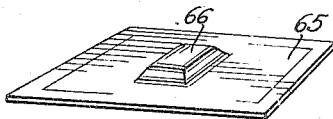


Fig. 5.

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APPARATUS FOR FORMING AUTOMOBILE
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6 Claims. (Cl. 18—19)

This invention relates to improvements in methods for forming and shaping sheets of rubber composition.

The present day automobile is constructed so as to make it low, in fact the floors are now so low that special housings must be provided for the torque tube and in most of the newer models portions of the engine, such as the transmission casing, project above the upper surface of the foot boards, which are cut out to accommodate such projections.

It is customary to cover the foot boards with a mat of rubber composition, partly for appearance sake and partly to keep out cold in winter and heat in summer and partly for other reasons that need not be mentioned.

Sheet rubber coverings for the foot boards of automobiles have been used for many years, but such sheets have been made to rest on a flat surface and have required no forming.

An ordinary flat sheet is not suitable for use in connection with the latest model automobiles because of the projections referred to above, which require that the sheets be formed with a hump or bulged portion to receive them.

It is the object of this invention to produce a method whereby rubber mats can be cheaply manufactured and provided with the required "hump" or bulge for the reception of the projecting portions of the automobile engines.

In order to most clearly explain this invention one form of apparatus, by, means of which the method can be carried out, has been illustrated on the accompanying drawing to which reference will now be had and in which;

Figure 1 is an end elevation of the machine;
Figure 2 is a section taken on line 2—2 of Fig. 1;
Figure 3 is an end elevation of the machine, looking in the direction of arrow 3 in Fig. 2;
Figure 4 is a section taken on line 4—4 of Fig. 2 and shows the air pistons for operating the machine; and

Figure 5 is a perspective view showing the mat after it has been subjected to treatment in accordance with this method.

The machine comprises a framework of any suitable design and which has been illustrated as having four corner posts 6 to the tops of which are secured side channel bars 7 that extend the entire length of the frame. The corner posts at each end are connected by means of an angle iron 8 and the opposite end posts on each side are connected by similar angle irons 9. The ends of the channel irons 7 are connected by transverse angle irons 10 whose flanges are connected to similar

angle irons 11, connected with the corner posts by means of bolts or rivets 12.

Channel irons 13 connect the sides 7 at equal distances from the middle points of the frame. Channels 13 are connected by similar channels 14, in the manner shown in Fig. 4, leaving a rectangular opening whose length and width are shown respectively in Figs. 2 and 4.

Secured to the upper flanges of the angle irons 9, as by electro-welding, is a plate 15, and attached to the upper surface of this plate, and extending upwardly therefrom, is the cylinder 16, which has been shown in section in Fig. 4. The lower end of this cylinder is closed by a cylinder-head 17 and the upper end by a cylinder-head 18. The two cylinder-heads are clamped in position by bolts 19 which may also serve to secure the cylinder to the plate 15. A piston 20 is slidable in the cylinder and from it a piston rod 21 extends upwardly through an opening in the cylinder head 18. A hollow plunger 22 is removably attached to the upper end of the piston rod. Steam pipes 23 communicate with the interior of the plunger for conveying steam therein. The lower cylinder head (17) has an opening 24 that communicates the interior thereof with the air pressure pipe 25. The flow of air into and from the interior of the cylinder 16 is controlled by means of an ordinary three way valve 26.

Angle iron bars 27 connect the vertical flanges of the side angle irons 9 and to the vertical flanges of these bars, a cylinder head 28 is connected, as by bolts 29. A cylinder 30 is clamped between the cylinder heads 28 and 28a by means of bolts 31. Each of the cylinder heads 28 and 28a are provided with openings 32 that communicate the interior of the cylinder with the air pressure pipes 33. The flow of air into and from the ends of the cylinder is controlled by a four way valve 33a. A double acting piston 34 is slidably mounted in the cylinder 30 and has a piston rod 35 that projects through a suitable stuffing box in the lower cylinder head. The lower end of the piston rod 35 is pivotally connected with the middle point of a beam 36.

The end posts shown in Fig. 1, and to the left in Fig. 2, are provided with guideways 37 in which the ends of plate 38 are slidably mounted. A rod 39 connects the lower edge of plate 38 with the corresponding end of beam 36. A plate 40 is welded to plate 38 and is provided near its upper edge with a hook 41. At the opposite end of the frame (right end in Fig. 2) the end posts are connected by two plates 42. Tubular guides 43 are welded to both plates and a rod 44 is slidably

mounted in these guides. The lower end of bar 44 is pivotally attached to the corresponding end of beam 36 and the upper end carries a head 45 that is perforated for the reception of the hinge pin 46. The upper plate 42 is also provided at opposite ends with tubular guides 47 in which are slidably mounted pins 48. Each of which has its upper end provided with a head 49 that has a bearing for the hinge pin 46.

10 A frame 50, comprising sides 51, formed from channel iron is positioned above the supporting frame that has just been described. Side members 51 are connected at one end (right in Fig. 2) by an angle iron 52 to which the spaced hinge members 53 are connected. The other end of the side members 51 are connected by means of an angle iron 54, to the upper flange of which a similar angle 55 is bolted. A shaft 56 extends between the ends of side members 51 and supports a latching member having a handle 57 and a latching loop 58 that interlocks with the hook 41 on plate 40. Side members 51 are connected near their middle points by channel irons 59 that are positioned above the corresponding channel irons 13 and these in turn are connected by channel irons 60 that lie directly above the corresponding channel irons 14. (See Fig. 4.) Ropes 61 are connected to opposite ends of the angle iron 55 and pass over pulleys 62 and 63 to a counterweight 64 which serves to hold frame 50 in the position shown by dotted lines in Fig. 2. The lower corners of channel irons 59 and 60 are rounded in the manner shown in Fig. 4.

When compressed air is admitted to the lower end of cylinder 16, by opening valve 26, piston 20 and plunger 22 will be moved upwardly into the position shown in Fig. 4. Suitable stops may be provided, to limit the upward movement, but these have not been shown.

When air under pressure is admitted to the lower end of cylinder 31, it will move piston 34 upwardly and this in turn will move the hinge pin 46 and the plate 40 upwardly. And when the pressure is admitted to cylinder 31, above the piston, it will move it, and the connected parts, downwardly thereby forcing frame 51 against the upper surface of the channel irons 7, 13 and 14, of the supporting frame.

Let us now assume that the machine just described, is to be employed to put a "hump" or bulge in a partially pre-cured rubber mat 65 intended to cover the foot boards of an automobile.

The mats, are first formed in the usual way from rubber composition, being partly cured in steam heated moulds. The curing is never made complete, but the mats leave the moulds in slightly undercured condition. If the mats are permitted to cool after they are removed from the curing mould, they must be reheated to such a temperature that the rubber will flow readily under the application of force and be re-formed to the desired shape.

Plunger 22 is connected with a source of steam and is kept heated during the operation. The temperature is sufficient to make the slightly undercured rubber plastic so that the material can be stretched and given a permanent set without tearing.

70 The machine with frame 51 in elevated position is positioned adjacent the heater and a mat is transferred from the heater and positioned on top of the supporting frame. Frame 51 is now pulled down and bar 58 put into position under hook 41. The three way valve 33 is now manipu-

lated so as to connect the space above piston 34 with the source of compressed air, and this moves the piston 34 downwardly and forces the upper frame (51) against the supporting frame so as to clamp the mat 65 in the manner indicated in Figs. 2 and 4. Air is now admitted to cylinder 16 which moves piston 20 and plunger 22 upwardly, thereby deforming the mat and forming a "hump" or bulge 66. Since rubber composition, when heated above a predetermined temperature, whose value depends on several variable factors, is stretched and held in stretched position for a short time, somewhere above two minutes, it will have received a permanent set and will not return to its original shape when the strain is removed. The mat is removed after the required time has elapsed and permitted to cool.

This method permits the mats to be cured in the usual way and by means of the machinery employed for manufacture of the ordinary mats, 20 which effects a great saving in the cost of tools. This method also makes it possible to produce mats with different sizes and shapes of humps by merely altering the shape and size of the plunger and the surrounding clamping frames. As no two makes of automobiles are exactly alike, the apparatus herein described and the method employed makes it possible for a manufacturer, at a comparatively small cost, to equip his factory to make mats for all standard makes of cars.

The apparatus shown on the drawing and described herein is illustrative only and can be altered as required to form any shape or size "hump", but it shows the several steps of the method and serves to visualize the several steps.

Having described the invention what is claimed as new is:

1. An apparatus for use in deforming precured sheets of rubber composition, comprising, a supporting frame having an opening, a movable clamping frame having an opening that corresponds in shape and size to the opening in the supporting frame, a hinge connected with the supporting frame, the clamping frame being connected with the hinge and tiltable relative to the supporting frame, a latch element movably attached to the supporting frame for engagement with a cooperating latch element on the tiltable clamping frame, means for moving the latch element downwardly to force the clamping frame against the upper surface of a sheet of rubber composition resting on the supporting frame, a heated plunger positioned underneath the opening in the supporting frame for movement upwardly through this opening, and means for moving the plunger upwardly whereby the sheet will be deformed.

2. In a rubber mat forming machine, in combination, a support, a mat supporting frame carried thereby, said frame having an opening, a clamping frame positioned above the supporting frame, said clamping frame having an opening of substantially the same size and shape as the opening in the supporting frame, a hinge means carried by the support one side of the clamping frame being connected with the hinge means for pivotal movement, a latch element carried by the support for relative vertical movement, a cooperating latch element carried by the clamping frame, and means for moving the latch element downwardly relative to the support whereby the clamping frame will be moved downwardly towards the supporting frame and into engagement with the upper surface of the mat to clamp the latter in position, a plunger positioned beneath

the mat, and means for moving the plunger upwardly beyond the plane of the upper surface of the supporting frame to distort the mat.

3. In a rubber mat forming machine, in combination, a support, a mat supporting frame carried thereby, said frame having an opening, a clamping frame positioned above the supporting frame, said clamping frame having an opening of substantially the same size and shape as the opening in the supporting frame, a hinge means carried by the support for vertical movement, one side of the clamping frame being connected with the hinge means for pivotal movement, a latch element carried by the support for relative vertical movement, a cooperating latch element carried by the clamping frame, means for simultaneously moving the hinge means and the latch element vertically relative to the support and for proportioning the downward pressure exerted on the clamping frame, a plunger carried by the support for vertical movement relative thereto, positioned beneath the opening in the mat supporting frame, and means for effecting an upward movement of the plunger, the upper end of the plunger being normally below the plane of the mat supporting frame.

4. In a rubber mat forming machine, in combination, a support, a mat supporting frame carried thereby, said frame having an opening, a clamping frame positioned above the supporting frame, said clamping frame having an opening of substantially the same size and shape as the opening in the supporting frame, a hinge means carried by the support for vertical movement, one side of the clamping frame being connected with the hinge means for pivotal movement, a latch element carried by the support for relative vertical movement, a cooperating latch element carried by the clamping frame, means for simultaneously moving the hinge means and the latch element vertically relative to the support and for proportioning the downward pressure exerted on the clamping frame, a plunger carried by the support for vertical movement relative thereto, positioned beneath the opening in the mat supporting frame, means for effecting an upward movement of the plunger, the upper end of the plunger being normally below the plane of the mat supporting frame, and means

for effecting a circulation of heating fluid through the plunger.

5. In a rubber mat forming machine, in combination, a support, a mat supporting frame carried thereby, said frame having an opening, a clamping frame positioned above the supporting frame, said clamping frame having an opening of substantially the same size and shape as the opening in the supporting frame, a hinge means carried by the support for vertical movement, one side of the clamping frame being connected with the hinge means for pivotal movement, a latch element carried by the support for relative vertical movement, a cooperating latch element carried by the clamping frame, means for simultaneously moving the hinge means and the latch element vertically relative to the support, a plunger carried by the support for vertical movement relative thereto, positioned beneath the opening in the mat supporting frame, and means for effecting an upward movement of the plunger, the upper end of the plunger being normally below the plane of the mat supporting frame.

6. A rubber mat forming machine, in combination, a support, a mat supporting frame carried thereby, said frame having an opening, a clamping frame having an opening of substantially the same size and shape as the opening in the supporting frame, a hinge having one part connected with the supporting frame and the other part connected with the clamping frame whereby the clamping frame can be raised and lowered by a pivotal movement, a latch element carried by the support for relative vertical movement, a cooperating latch element carried by the clamping frame, means for moving the latch element vertically relative to the supporting frame, means for effecting an adjustment of the relative positions of the supporting and the clamping frames to effect a uniform distribution of pressure on a mat interposed between the frames, a plunger positioned beneath the opening in the supporting frame, and means for moving the plunger upwardly beyond the common plane of the frames.

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