July 26, 1938. G. S. ROWELL 2,124,711

METHOD AND APPARATUS FOR REPRODUCING IMAGES ON CURVED SURFACES

Filed June 25, 1937 3 Sheets-Sheet 1

FIG. 1.

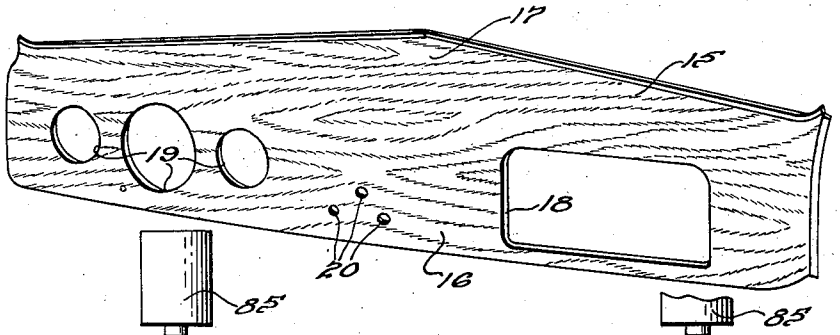
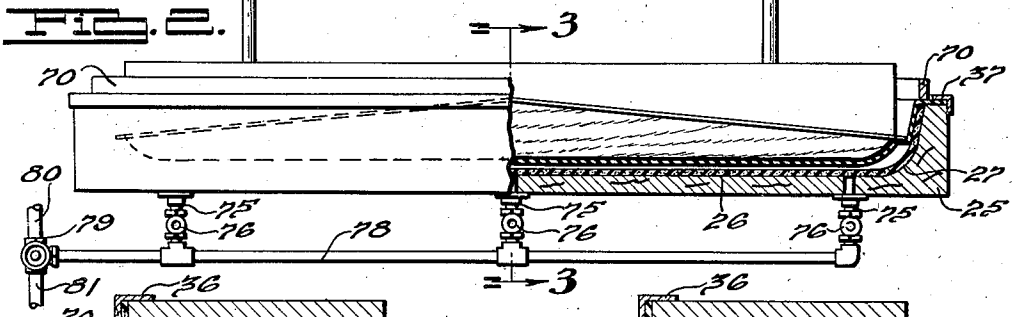


FIG. 2.



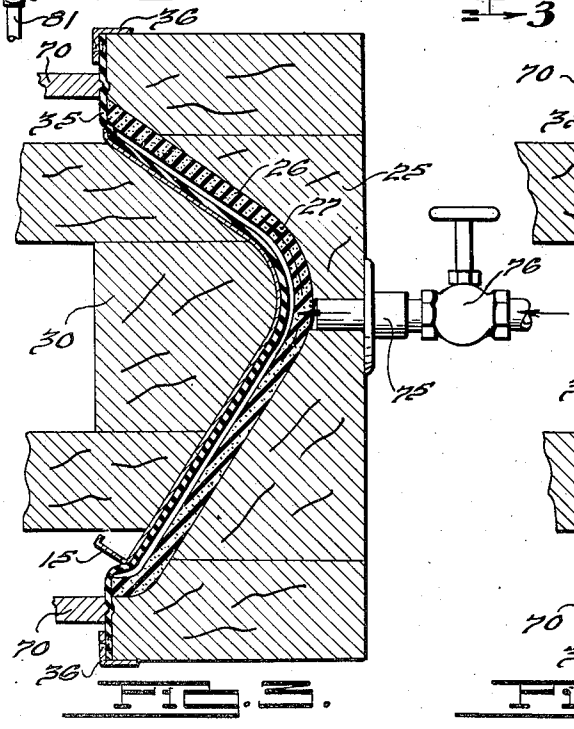


FIG. 3.

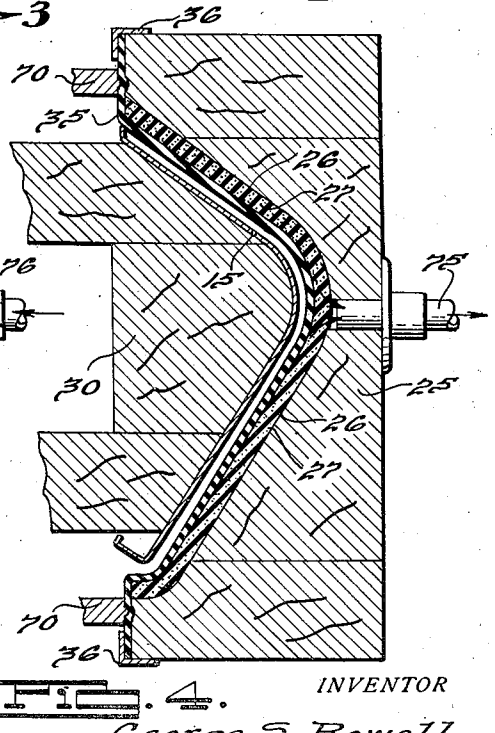


FIG. 4.

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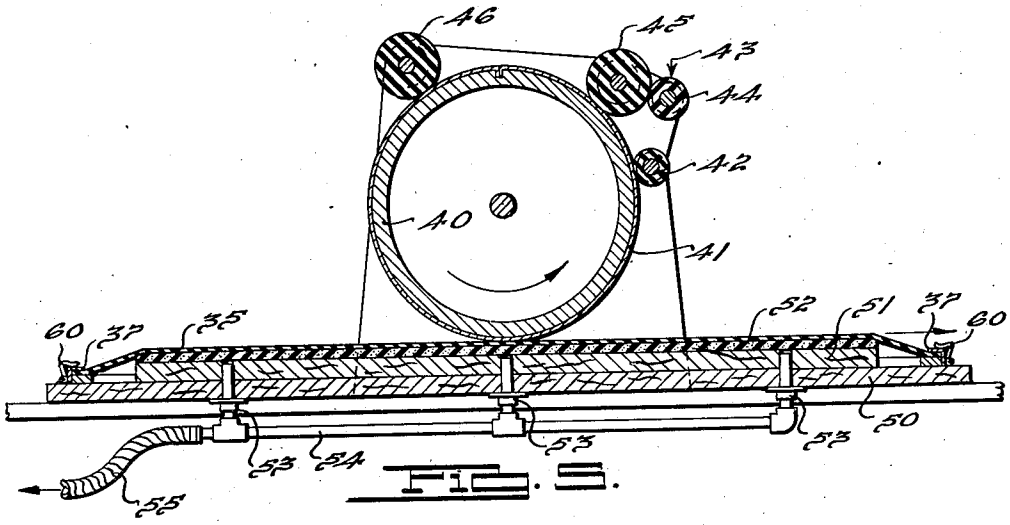


FIG. 5.

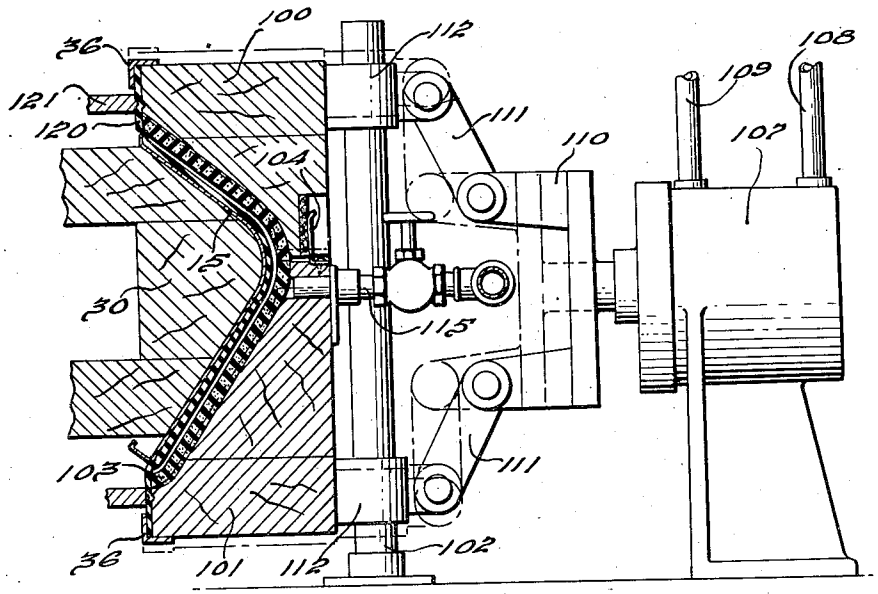


FIG. 6.

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METHOD AND APPARATUS FOR REPRODUCING IMAGES ON CURVED SURFACES

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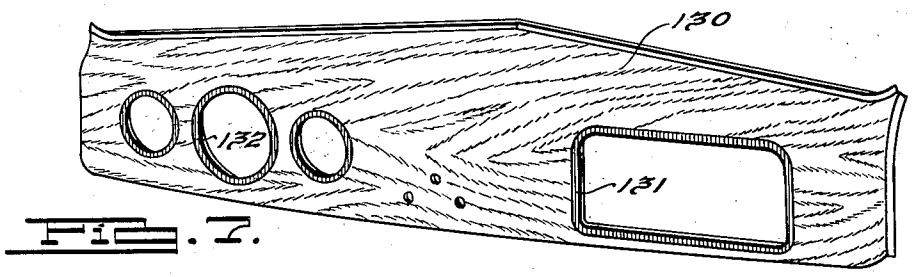


Fig. 7.

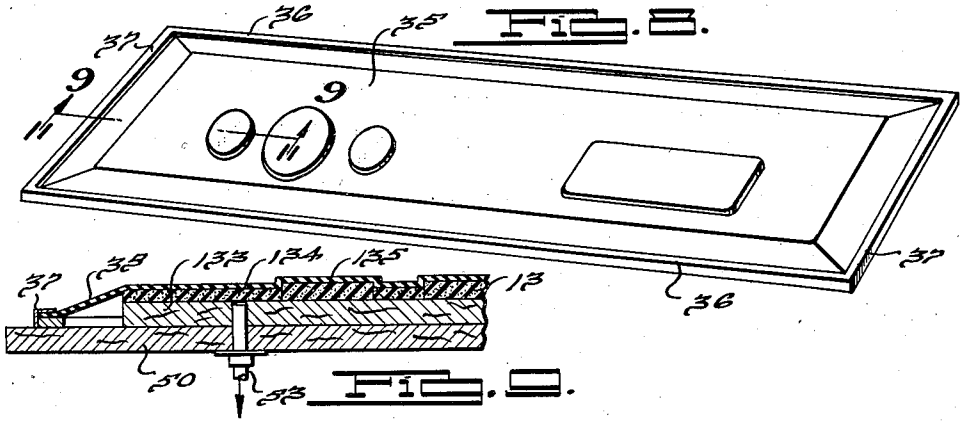


Fig. 8.

Fig. 9.

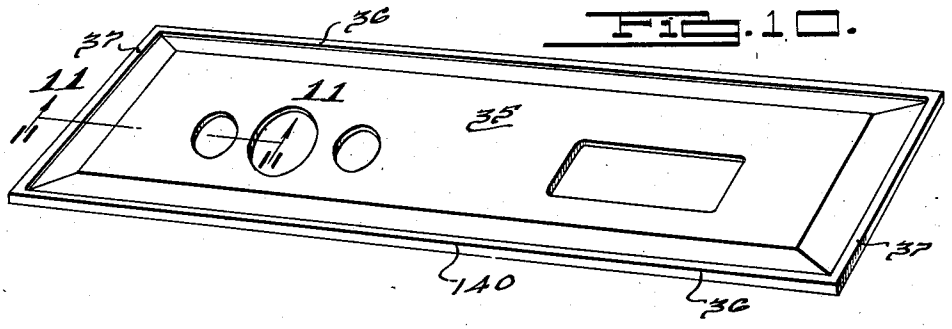


Fig. 10.

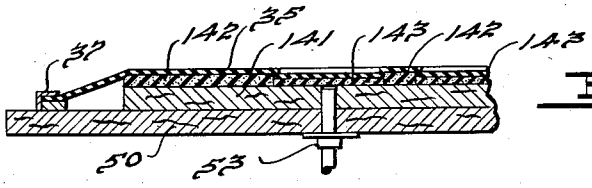


Fig. 11.

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UNITED STATES PATENT OFFICE

2,124,711

METHOD AND APPARATUS FOR REPRODUCING IMAGES ON CURVED SURFACES

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Application June 25, 1937, Serial No. 150,287

13 Claims. (Cl. 101—41)

The present invention relates to a process for reproducing images or decorations upon curved surfaces. More particularly the present invention relates to a novel proces of, and apparatus for easily and conveniently, as well as rapidly, reproducing exceptionally faithful images upon articles which may have irregularly curved surfaces.

While it will be readily apparent that the inventive principles set forth in the present application, as well as the novel apparatus disclosed therein, will find broad and practical utility in many and various different fields, the particular specific form of the invention illustrated in the accompanying drawings, and described below, is directed specifically to the problem of reproducing exceptionally faithful wood-grain imitations upon curved sheet metal articles, such for example as instrument boards or other sheet metal parts commonly used in automotive vehicles.

The present invention contemplates the provision of a mold member having an interior configuration substantially the same as the surface configuration of the article to which the decorations are to be applied. This mold member is preferably lined with some relatively porous and preferably resilient material, such for example, as sponge rubber. A plurality of ports communicate with the rear surface of this porous lining material and means are provided for supplying fluid under pressure to said ports or connecting said ports to a source of suction. In accordance with the teachings of the present invention, a highly flexible elastic membrane, such for example as a sheet of rubber, is disposed over the surface of the mold member and has its marginal portions secured in sealed relation to the marginal portions of the mold member. As suction is transmitted to the lining of the mold, the air between the membrane and the interior surface of the mold will be withdrawn and the pressure of the air on the exposed surface of the membrane will serve to force the membrane to assume a configuration lying closely, and tightly in engagement with the interior surface of the mold.

It is a primary object of the present invention to provide a mold having a lining therein which is of such construction that it serves to distribute the fluid pressure or suction supplied to the mold by one or more parts relatively uniformly throughout the entire interior surface of the mold in order that as the elastic membrane is drawn into the mold the suction will be sufficiently uniformly distributed to make the membrane lie smoothly over the interior surface of the mold.

The invention contemplates the provision of means for inking the membrane with the desired image prior to the positioning of the membrane upon the mold member. This permits the ink to be applied to the membrane while the membrane is retained in a flat position. After the membrane has been drawn to lie closely adjacent the interior surface of the mold, an article to be decorated is moved into proximity with but slightly spaced from the inked surface of the membrane. At this point fluid pressure may be supplied to the interior of the mold, thus forcing the membrane into printing contact with the surface of the article on which it is desired to reproduce the image, and consequently the ink carried by the membrane will be quickly, efficiently and automatically transferred to the surface of the article on which it is desired to reproduce the decorations.

The present invention contemplates the provision of easy, simple and conveniently operated mechanism for mounting and moving the article to be decorated whereby the same may be accurately positioned within the mold in such a way that the exterior surface of the article to be decorated lies closely adjacent to, but in slightly spaced relation with respect to the inked membrane, so that as fluid pressure is supplied to the mold, the membrane may be forced into uniform contact under uniform pressure with the article to be printed and by restoring the suction may be quickly and uniformly withdrawn therefrom.

The present invention contemplates the provision of the process which is relatively simple and fool-proof in operation, and yet at the same time is capable of reproducing images with faithful detail upon relatively abruptly and irregularly curved objects to be decorated.

It is a primary object of the present invention to provide an extremely simple and easily operated process by which such images may be easily and faithfully reproduced upon curved surface articles.

Still another object of the present invention resides in the provision of relatively porous lining materials for molds of the general type disclosed in the present application whereby the fluid under pressure, or suction which may be applied to the interior of the mold, will be substantially uniformly distributed throughout the entire interior surface of the mold structure thereby insuring a proper positioning of the

inked membrane within the mold prior to the commencement of the actual printing operation.

Still further the present invention contemplates the provision of a modified form of the above described process whereby a plurality of separate and entirely distinct designs may be simultaneously reproduced upon the surface of an article to be decorated. The present invention contemplates the provision of means for selectively inking portions of the transfer membrane in order that after these portions have been separately inked the membrane may be used for the purpose of simultaneously transferring both of the inked images to the article to be decorated.

Yet another object of the invention resides in the provision of a mold structure having relatively movable portions in order that the mold itself may be utilized to take an actual part in the printing operation.

Many other and further objects, advantages, and features of the present invention will become clearly apparent to those skilled in the art upon a consideration of the following specification when taken in connection with the accompanying drawings forming a part thereof.

In the drawings:

Figure 1 is a perspective view of a conventional instrument board which illustrates a typical example of a curved surfaced panel to which decorations have been applied;

Fig. 2 is a top plan view of one form of the apparatus of the present invention, portions being broken away to illustrate the interior configuration thereof;

Fig. 3 is a transverse sectional view taken substantially on the line 3—3 of Fig. 2, illustrating an instrument board in printing position within the mold and illustrating the transfer membrane in engagement with the instrument board to apply the image thereto;

Fig. 4 is a transverse sectional view similar to Fig. 3, illustrating in detail the manner in which the elastic transfer membrane is retained within the mold prior to and subsequent to the actual printing operation;

Fig. 5 is a more or less diagrammatic sectional view taken through a rotary printing machine, illustrating one manner in which an image may be applied to the elastic transfer membrane for subsequent application to the curved surfaced article to be decorated;

Fig. 6 is a transverse sectional view through a modified form of the present invention illustrating a sectional mold structure whereby mechanical means may be utilized in addition to fluid pressure to aid the printing operation;

Fig. 7 is a perspective view of an instrument board illustrating a modified decorative surface finish which has been applied thereto by means of the improved apparatus of the present invention;

Fig. 8 is a perspective view of a bed for utilization in connection with the printing machine shown in Fig. 5, illustrating a type of bed which may be utilized when it is desired to print a plurality of separate or different images in a single operation;

Fig. 9 is a fragmentary transverse sectional view taken substantially on the line 9—9 of Fig. 8, illustrating in detail the manner in which the elastic transfer membrane is retained in position upon the bed;

Fig. 10 is a perspective view similar to Fig. 8, illustrating a printing bed complemental to the bed illustrated therein; and

Fig. 11 is a fragmentary sectional view similar to Fig. 9, illustrating in detail the manner in which the elastic transfer membrane is retained in position upon the bed illustrated in Fig. 10.

With more particular reference to the drawings, it will be readily apparent that the generic inventive principles set forth in this application and disclosed in the accompanying drawings illustrate merely a specific embodiment of the invention presented. It will be readily appreciated that upon modification of the specific apparatus shown, the apparatus, as well as the process, will find broad and practical utility in many and various different fields wherever it is desired to apply surface decorations to articles having irregularly curved surfaces, or in fact to the surfaces of any articles in which the printing is not done in a single common plane.

For purposes of illustration, the present application discloses a vehicle instrument board generally designated as 15 which comprises a front portion 16 and a generally horizontal rearwardly extending top portion 17. Dashboards of this general character are adapted for use in connection with V-type windshields and consequently have very substantial curvature formed by the deep draw in their central portions. As is conventional in constructions of this general character, the instrument board is provided with an opening 18 adapted to receive a door to close the glove compartment as is customary, and in addition with openings 19 for various instruments as well as suitable control-receiving apertures 20. While it will of course be readily understood that the particular type of decorations which may be applied to the exposed surface of this instrument board are entirely immaterial as far as the present invention is concerned, it may be assumed for purposes of illustration that the instrument board shown is to have reproduced thereon an imitation of wood grain.

In order to achieve this result, a mold generally designated as 25 is provided. This mold is provided with a cavity 26 in its front face, the interior configuration of which cavity is complemental to the instrument board, the surface of which is to be decorated. The cavity 26 in the mold member 25 is preferably provided with a lining of sponge rubber 27 clearly seen in Figures 2, 3, and 4. While many and various different substances may readily be utilized for the purpose of lining the mold member, it has been found particularly desirable and is considered an important feature of the present invention to provide a lining material for the mold member which is definitely porous in order, as will hereinafter be seen, to uniformly distribute fluid pressure and suction throughout substantially the entire interior surface of the mold member.

A support member 30 is provided which has an exterior configuration substantially complemental to the instrument board to which the decorations are to be applied and serves to firmly and rigidly support the instrument board in predetermined position during the time the actual printing of the decorations thereon takes place. As is clearly seen in Figures 2, 3, and 4, the support member 30 is adapted to carry the instrument board 15 and move the same into printing position within the mold member 25.

The actual application of the decorations to the exposed surface of the instrument board 15 is achieved by use of a flexible elastic membrane 35 which is preferably formed from sheet rubber or suitable similar material. This rubber mem-

ber 35 is preferably formed relatively thin, highly flexible, and of great elasticity.

In order that the elastic member 35 may be easily and conveniently handled, it is provided with a pair of frame members 36 which constitute marginal portions therefor, which frame members are illustrated as metallic strips of angle sections which extend throughout the lateral side edges of the elastic membrane and are permanently secured thereto. While in many instances the frame structure serving to support and position the elastic transfer member 35 may consist solely of the frame members 36 extending along the lateral sides thereof. In some instances it is desirable to provide a complete rectangular frame structure and to achieve this end, additional frame members 37 may be connected to the marginal edges of the elastic membrane, which members 37, together with the members 36, form a relatively rigid generally rectangular supporting frame to which all of the marginal edges of the elastic membrane 35 are secured.

The image to be reproduced upon the surface of the instrument board member may be applied in paint or ink to the surface of the elastic transfer membrane in any suitable and convenient manner. One particularly simple and satisfactory method by which this result may be achieved is by the utilization of the rotary printing machine diagrammatically illustrated in Figure 5 of the drawings. This printing machine comprises a roll 40 which has secured to the surface thereof a lithographic plate 41 which is maintained clean and moist by means of a roller 42. Ink is applied from a series of fountains 43 to an inking roller 44 which spreads the ink substantially uniformly over the surface of the roller 45 engaging the surface of the lithographic plate 41. A roller 46 may also be used to distribute the ink uniformly over the surface of the lithographic plate 41.

The printing machine includes a movable bed member 50 which, as is conventional in constructions of this general character, is adapted to travel horizontally in timed relation with the roll 40 in order that the inked image on the plate 41 will be transferred to the surface of the article carried by the bed member 50. The bed member 50 includes a support member 51 which has a plain upper surface on which is disposed a sheet of relatively coarse, resilient material 52, such, for example, as sponge rubber. A plurality of ports 53 open through the bed 50 and support member 51 in order to communicate with the under side of the sheet of sponge rubber 52. These ports or ducts 53 are all preferably connected to a common conduit 54 which, by means of a suitable flexible conduit 55, communicates with a source of suction.

Suitable means, such, for example, as the clips 60, may be provided upon the bed 50, which clips serve to anchor the frame members 37, to which the elastic membrane is secured, in position upon the bed in order that the membrane will be disposed over the surface of the sponge rubber member 52. When the elastic transfer membrane 35 is in this position, suction may be transmitted to the sponge rubber pad 52 by means of the conduits 55, 54, and ports 53, in order that the source of suction will serve to retain the elastic transfer member in smooth, tightly gripped relation with respect to the sponge rubber surface of the bed member 50. In this connection it will be readily seen that the sponge rubber pad serves to make the suction applied available to all portions of the membrane disposed on the bed.

It will be readily appreciated that this construction serves to positively retain the elastic transfer membrane in predetermined position upon the bed member 50 and, consequently, as the bed is fed through underneath the roll 40, the inked image upon the plate 41 will be transferred to the membrane 35. It will readily be appreciated by those skilled in the art that the utilization of a lithographic plate for the purpose of applying the inked image to the elastic transfer member 35 is merely illustrative of one satisfactory means by which this result may be accomplished and that substantially equivalent satisfactory results may be obtained by the use of many other and different forms of printing apparatus so long as the printing process serves to transfer to the surface of the elastic transfer membrane an inked image such as is desired to be reproduced upon the surface of the article to which the decorations are to be applied.

After the bed 50 is passed through the printing machine and the image has been transferred from the surface of the plate 41 to the surface of the elastic transfer membrance, the frame 36 is removed from the bed 50 and placed in position on the mold member 25 in order that the inked membrane will lie over the cavity in the face of the mold member 25. A generally rectangular frame member 70 is then urged by suitable means (not shown) into engagement with the marginal portion of the elastic membrane, clamping the marginal portions of this membrane firmly in engagement with the adjacent portions of the mold structure 35, thus positively sealing the elastic transfer membrane with respect to the mold member 25 on which it is mounted. A plurality of conduits 75 extend through the rear of the mold member 25 and communicate with the resilient, porous lining material 27 interiorly of the mold. Each of the conduits 75 is preferably provided with an individual valve 76 which may be adjusted in order to control the particular desired proportion of fluid pressure or suction, which may be transmitted to various portions of the interior of the mold as hereinafter described in detail.

All of these conduits 75 are preferably connected to a common conduit 78 which communicates with a two-way valve 79, which two-way valve is in communication with a conduit 80, and the conduit 81, the conduit 80 serving to connect the system to a source of suction, and the conduit 81 serving to connect the system to a source of fluid pressure, such for example as compressed air, the purpose and function of which will hereinafter become more clear.

After the elastic transfer membrane 35 has been mounted in position on the mold member 25 and the marginal portions of this elastic transfer membrane have been sealed with respect to the mold by means of the sealing frame 70, the valve 79 may be opened to establish communication between the conduits 78 and 80, thereby evacuating the interior of the mold and drawing the membrane 35 closely into engagement with the surface of the porous resilient lining material 27, forming the interior surface of the mold. Inasmuch as it has been explained above that this lining material 27 is preferably formed of sponge rubber, it will be seen that this porous resilient lining material serves to distribute the suction applied to the interior of the mold substantially uniformly

throughout the interior surface of the mold member. Likewise it will be readily seen that if the suction is materially greater in certain areas of the interior of the mold than in certain other areas, this difficulty may be overcome by properly adjusting the various valves 76 in order that the suction will be distributed substantially uniformly throughout the entire surface of the porous resilient lining material 27. It has been found that the proper distribution of the suction throughout the entire interior surface of the mold is an important factor in obtaining a uniform stretching and disposition of the elastic transfer membrane interiorly of the mold.

After the interior of the mold has been evacuated sufficiently so that the elastic transfer membrane 35 lies smoothly over the surface of the porous resilient lining material 27, as seen in Fig. 4, the support member 30 carrying an instrument board 15, to which decorations are to be applied, may be moved inwardly into the mold. This movement of the instrument board to be decorated into predetermined desired position may be accomplished in any one of various different ways. By way of illustration the drawings show a construction utilizing a pair of hydraulic cylinders 85 which serve to force the support member 30 into the mold in substantially the position shown in Figs. 3 and 4. It has been found extremely desirable to move the instrument board or other curved surfaced article to be decorated into the mold in order that the surface of the article will be in extremely close proximity, but entirely out of contact with the surface of the elastic transfer membrane.

After the instrument board on which the decorations are to be applied has been moved into the mold, in substantially the position shown in Figs. 3 and 4 of the drawings, the valve 79 is turned to establish communication between the conduit 81 and the conduit 78, thus substituting a supply of fluid pressure for the suction formerly applied to the interior of the mold. This operation is preferably performed momentarily, and serves to positively urge the elastic transfer membrane uniformly into engagement with the entire exposed surface of the instrument board to which the decorations are to be applied. It will be readily apparent that the ink carried by the elastic transfer membrane by means of the printing machine shown in Fig. 5, will be immediately transferred to the surface of the dash board.

Inasmuch as the dash board was arranged in relatively closely spaced relation with respect to the membrane within the mold, practically no relative movement of the membrane and the engaged surface of the instrument board will take place. Consequently it will be readily appreciated that the image applied to the surface of the elastic transfer membrane will be faithfully reproduced on the surface of the instrument board being decorated.

The valve 79 may then again be turned, serving to evacuate the mold and withdraw the membrane into substantially the position shown in Fig. 4, thus drawing the membrane completely out of contact with the dash board to which the decorations have been applied. The support member 30 may then be withdrawn from the mold and the image from the lithographic plate 41 will be found to be faithfully reproduced upon the surface of the dash board member.

The above described process is extremely simple and has been found to produce exceptionally faithful reproductions of the particular design it is sought to obtain. Further it will be readily appreciated that the results obtained by the present invention may be easily and quickly accomplished. Thus it will be seen that the process readily lends itself to production of identical images upon identical parts in relatively large quantities.

In Fig. 6 of the drawings is illustrated a modified form of the invention, which lends itself particularly well to the reproduction of images upon the surfaces of articles which have very great surface curvature. The apparatus shown in Fig. 6 is particularly designed for printing on curved surface articles where the arcs of curvature of the surfaces are of relatively short radius, or in instances where the angle of the surfaces to be printed is substantially inclined with respect to the other surface to be printed. It will be readily understood that the construction shown in Fig. 6 has many features in common with that disclosed in the preferred embodiment of the invention illustrated in Figs. 1 to 5 of the drawings, and it will, of course, be readily understood that the elastic transfer membrane used may be inked in the conventional manner described above.

In the form of the invention shown in Fig. 6 a composite mold structure is used comprising an upper portion 100 and a lower portion 101, both of which portions are supported upon pedestals 102. These portions 100 and 101 are preferably movable with respect to each other and slidably mounted vertically on the pedestals 102.

The mold member formed by the members 100 and 101 is preferably provided with a porous resilient lining 103 substantially similar in construction and function to the lining 27 disclosed in connection with the preferred embodiment of the invention. The adjacent portions of members 100 and 101 are provided with sealing means comprising a strip 104 which overlaps a surface of one of the mold members providing a relatively tight joint between the mold members despite the minor relative movement taking place therebetween. The members 101 and 102 are moved relative to each other by means of a hydraulic cylinder 107 having ducts 108 and 109 communicating therewith, which serve to control the movement of this hydraulic means. The piston of the hydraulic device has connected thereto a fitting 110 which provides means for pivotally mounting the toggle links 111, which toggle links are pivoted to members 112 which slidably serve to support the mold members 100 and 101 upon the pedestal 102. Consequently it will be apparent that when fluid under pressure is admitted through the conduit 108 into this hydraulic cylinder construction 107, the piston therein will be moved forwardly, moving the fitting 110 forwardly and causing the mold members 101 and 100 to be moved apart slightly as a result of the action of the toggle links 111. Likewise, when fluid under pressure is admitted through the conduit 109, these mold members 100 will be moved toward each other.

As was the case in the preferred embodiment of the invention described above, the mold structure as a whole is provided with a conduit 115 for establishing communication with the interior cavity thereof, in order that the suction interiorly of the mold and the fluid pressure supplied thereto will be uniformly distributed throughout the interior of the mold. The flexible rubber transfer membrane 120 is sealed in relation to the mold members by means of a suitable sealing frame 121, similar in construc-

tion and function to the sealing frame 70 described in connection with the preferred embodiment of the invention. The apparatus is operated in substantially the same way as that described above except that during the printing operation the separable portions of the composite mold structure may be moved toward each other in order that the printing pressure to which the article being decorated is subjected will be substantially uniformly distributed throughout the entire surface of the article as a whole. Consequently it will be seen that the mold member portions may be moved toward each other at substantially the same instant as the fluid pressure is applied to the interior of the mold to bring the membrane into contact with the work.

Figs. 7 to 11, inclusive, illustrate in detail a modified form of the present invention in which means are provided for selectively inking portions of the surface of the elastic transfer membrane in order that a design embodying a plurality of different colors, or a plurality of different designs may be simultaneously reproduced upon the article to be decorated. While it will be readily apparent that the modified form of the invention disclosed in Figs. 7 to 11 is susceptible of many and wide variations depending upon the particular results sought to be produced, in Fig. 7 is illustrated a vehicle dash board 130 which has an opening for the glove compartment 131, and openings for various instruments 132. In the particular form shown, it is assumed that it is desired to provide marginal decorations around the openings 131 and 132, which decorations are different in color or character from the decorations applied to the remaining surface of the instrument board as a whole.

In order to achieve this result, the bed member 50, which is utilized for inking the elastic transfer membrane, is provided with a support member 133 which has thereon a composite sponge rubber pad 134, portions 135 of which are raised above the remaining portions of the pad. Consequently it will be readily apparent that when the elastic transfer membrane 35 is stretched over this bed member and suction is applied through the ports 53, the membrane will be drawn down so that its surface follows closely the configuration of the exposed surface of the pad 134. Consequently only the raised portion 135 of the bed will be exposed to the action of the inking roll 41, when passed through to ink the membrane. After the membrane has thus been inked, it is transferred from the bed member disclosed in Fig. 8 to the bed member 140 disclosed in Fig. 10. This bed member 140 comprises a base member 53, a support member 141, and a sponge rubber pad 142 which is of composite construction, including portions 143 which are complemental in size and shape to the portions 135 except in the bed illustrated in Fig. 10, these portions 143 having their upper surfaces disposed below the plane of the remainder of the pad rather than above the plane of the remainder of the pad, as was the case in the construction disclosed in Figs. 8 and 9. Consequently it will be seen that the bed shown in Figs. 10 and 11 may be passed through a printing machine similar to that illustrated in Fig. 5, and the exposed portions of the membrane will be inked, and the portions which were inked in the prior inking process will not come in contact with the inking roll. After the membrane has thus been selectively inked in two different areas with two different types or colors of ink, the membrane as a whole may be transferred to the apparatus shown in Figs. 1 to 4, inclusive.

In this manner it will be appreciated that the elastic transfer membrane will have applied to the exposed surfaces thereof two separate designs which together make up the entire inked surface of the membrane. The membrane may then be used to print the surface of a curved surface of the article to be decorated in substantially the manner as has been described above.

It will be readily appreciated that the specific embodiments of the invention illustrated in the accompanying drawings and described above are merely illustrative of the generic inventive concept presented in this application.

Many other and further modifications thereof falling within the scope of the subjoined claims will become clearly apparent to those skilled in the art.

What I claim is:

1. The method of applying images to curved surfaces which comprises applying an image upon an elastic transfer membrane, disposing said transfer member across a mold member having a configuration complemental to the surface configuration of the article to be decorated. locking the marginal portions of said transfer member in sealed engagement with the marginal portions of said mold member, evacuating said mold to cause said membrane to assume the conformation thereof, moving an article to be decorated into proximity to said inked membrane and releasing the suction caused by said evacuation to permit the membrane to engage the article to be decorated.

2. The method of applying images to curved surfaces which comprises applying an image to an elastic transfer membrane, sealing the marginal portions of said transfer membrane to a mold having a configuration complemental to the configuration of the surface of the article to be decorated, utilizing fluid pressure to conform said membrane to the configuration of said mold, moving the article to be decorated into proximity to said membrane and utilizing fluid pressure to bring said membrane into printing engagement with the surface of said article.

3. The method of applying images to articles having curved surfaces which comprises disposing an inked membrane over a mold having an interior configuration complemental to the surface to which the image is to be applied, sealing the marginal portions of said membrane to the marginal portions of said mold, utilizing fluid pressure to bring said membrane into intimate contact with the interior surface of said mold and bringing the articles to be decorated into engagement with said membrane to transfer the image from said membrane to the article to be decorated.

4. The method of applying images to articles having curved surfaces which comprises disposing an inked elastic membrane over a mold having an interior configuration complemental to the surface to which the image is to be applied, sealing the marginal portions of said membrane to the marginal portions of said mold, evacuating said mold to force said membrane into intimate engagement with the interior of the surface of said mold, positioning an article to be decorated in proximity to said membrane, supplying fluid under pressure to said mold to urge the inked surface of said membrane into

contact with the surface of the article to be decorated, and subsequently evacuating said mold to draw said membrane out of contact with said article.

5. The method of applying decorations to articles having curved surfaces, which comprises, applying an image to a flexible elastic transfer member, disposing said transfer member over a mold having an interior configuration complemental to the configuration of the article to be decorated, evacuating said mold from a plurality of separate spaced points whereby to draw said transfer member into said mold and tension the same in intimate engagement with the interior surface of said mold, and bringing the article to be decorated into engagement with said transfer member within said mold.

6. The method of applying decorations to articles having curved surfaces, which comprises, applying an image in ink to a transfer membrane, disposing said membrane over a mold having an interior configuration complemental to the configuration of the article to be decorated, evacuating said mold from a plurality of separate spaced points whereby to draw said transfer membrane into said mold and tension the same in intimate engagement with the interior surface of said mold bringing an article to be decorated into proximity with said transfer membrane, applying fluid pressure to the interior of said mold cavity to urge said transfer membrane into engagement with the surface of the article to be decorated whereby the inked image from said membrane will be transferred with substantially uniform pressure to the surface of the article to be decorated.

7. The method of applying decorations to articles having curved surfaces, which comprises, applying an image in ink to a flexible elastic transfer membrane, disposing said membrane over a composite mold having an interior configuration complemental to the configuration of the article to be decorated, evacuating said mold from a plurality of separate spaced points whereby to draw said transfer membrane into said mold and tension the same in intimate engagement with the interior surface of said mold, bringing an article to be decorated into proximity with said membrane within said mold and moving portions of said mold toward each other to bring the transfer membrane into contact with the article to be decorated.

8. The method of applying decorations to articles having curved surfaces, which comprises, applying an image in ink to portions of the surface of a flexible, elastic transfer membrane, applying still other decorations in ink to other portions of the surface of said elastic transfer membrane, disposing said membrane over a mold having an interior configuration complemental to the article to be decorated, evacuating said mold to draw said membrane into intimate engagement with the interior surfaces of said mold, bringing an article to be decorated into close proximity to the membrane while thus retained, and urging said membrane into printing engagement with the surface of the article to be decorated.

9. The method of selectively inking a transfer membrane which comprises retaining portions of said membrane on a bed at an elevation slightly above other portions of said membrane, inking said elevated portions, disposing said membrane on second bed with the portions thereof which were formerly elevated disposed in a plane below the remaining portions of said membrane, inking said elevated portions, and subsequently transferring the images from said membrane to the surface of an article.

10. A mold structure for use in printing articles having curved surfaces, comprising a mold member having an interior configuration complemental to the surface of the article to be decorated, a membrane for use with said mold and means for clamping said membrane in sealed relation to the marginal edges of said mold.

11. A mold structure for use in printing articles having curved surfaces comprising a mold member having an interior surface complemental to the surface of the article to be decorated, a membrane disposed across said mold and releasable means for securing said membrane in sealed relation with respect to said mold.

12. Printing apparatus for applying decorations to articles having curved surfaces including a mold member having an interior configuration complemental to the surface of the article to be decorated, an elastic transfer member disposed across said mold and sealed to the marginal edges thereof and a plurality of ports for controlling the fluid pressure within said mold, and selective means for controlling said ports.

13. Printing apparatus for applying decorations to articles having curved surfaces including a mold member having an interior configuration complemental to the surface of the article to be decorated, an elastic transfer member disposed across said mold and sealed to the marginal edges thereof and a plurality of ports for controlling the fluid pressure within said mold, and a porous lining for said mold for distributing fluid pressure applied to said ports.

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