

May 2, 1939.

R. G. DREW

2,156,279

MEANS FOR STENCILING

Filed Sept. 11, 1930

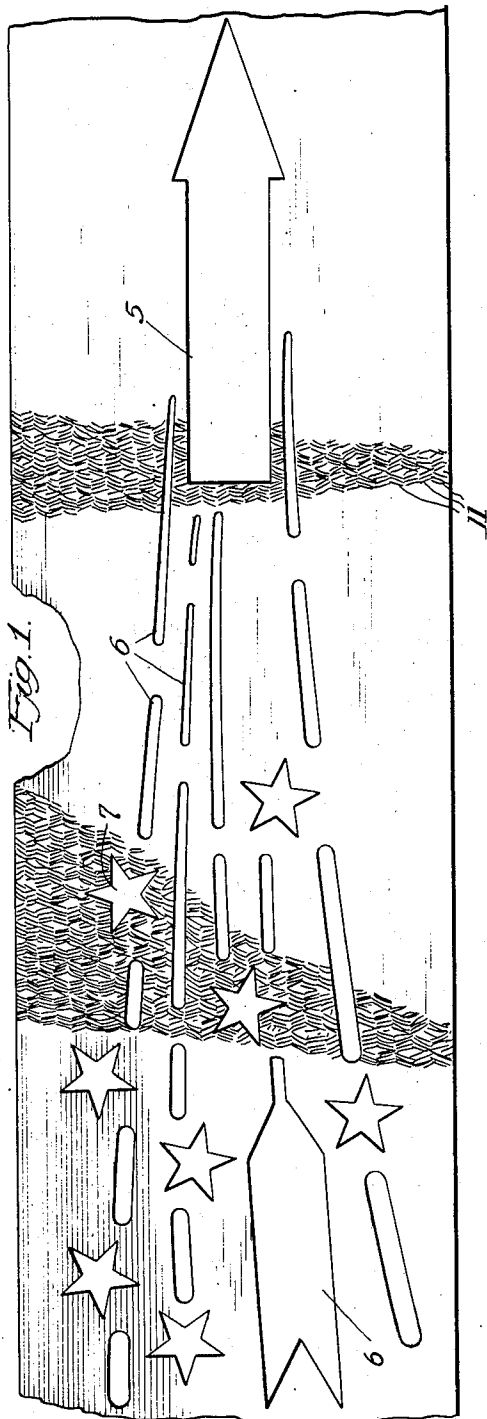


Fig. 1.

Witness
A. B. Davison.

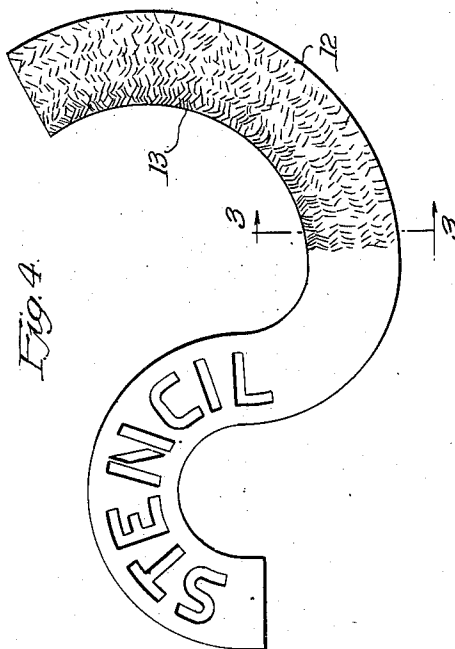


Fig. 4.

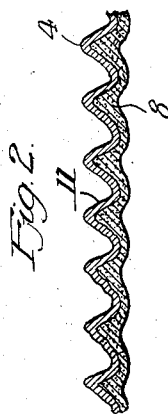


Fig. 2.

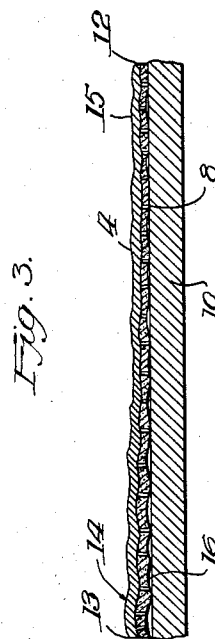


Fig. 3.

Inventor:
Richard G. Drew
by attorney
Paul Carpenter

UNITED STATES PATENT OFFICE

2,156,279

MEANS FOR STENCILING

Richard Gurley Drew, St. Paul, Minn., assignor
to Minnesota Mining & Manufacturing Com-
pany, St. Paul, Minn., a corporation of Dela-
ware

Application September 11, 1930, Serial No. 481,090

10 Claims. (Cl. 101—127)

This invention relates in general to methods and means for stenciling and, more particularly, to an improved form of distortible stencil incorporating therein a novel form of backing or sheet perforated to form the stencil, and a novel form of adhesive for permitting application to and retention of the stencil and its removal from surfaces to be stenciled, whether regular or irregular in contour.

While the invention has a broad field of usefulness, I have found it of peculiar utility as an adhesive coating for limiting the application of liquid in the form of spray, or otherwise, to a finished material such as, for example, lacquering or painting operations in automobile paint shops or in the application of various painted or lacquered designs to regular or irregular surfaces, such, for example, as in the application of paints and lacquers to furniture, upholstery, or the application of other coating of particular design or shape. It will be understood, however, that such limited fields of specific description are employed purely for purposes of illustration of an example of the utility of the invention in its several phases, besides such other novel fields of utility as may appear or hereinafter be pointed out.

In the prior forms of stencils known to me, the shape or outline to be stenciled or coated on the particular surface is formed by the provision of an aperture or apertures in a relatively non-distortible sheet, and the painter then holds this sheet on the surface to receive the stenciled image or figure, and a coating material, such as paint or other substance, is then applied to the stencil, leaving the outline of the figure on the surface exposed through the aperture or apertures. However, in this type of stencil, the stencil itself is relatively inflexible and non-distortible, is not adhesively held, that is, the painter must employ one hand for holding it, and it will not conveniently adapt itself to irregularly shaped surfaces.

I employ a pressure sensitive adhesive coating on one surface of a stenciled sheet, preferably of a creped or towed paper, the adhesive coating being characterized by tackiness and yet possessed of the further characteristic of leaving no deposit on the surface to which the stencil is applied when the latter is removed. Such an adhesive is particularly suitable in retaining the stencil of this invention on a surface, regular or irregular in shape and affords a stencil in which margins of the apertures are sharply defined and thus leave a sharply defined figure on the surface which is coated thereby.

The principal objects and advantages of this invention reside in the provision of an improved method of stenciling regular or irregular shaped surfaces; the provision of an improved distortible stencil which is composed of a material producing a sharp definition of the stenciled figure; the pro-

vision of an improved stencil which may be snugly applied to a surface to receive a stenciled figure and which will retain its position on said surface without the necessity of the operator holding the stencil in position; the provision of an improved stencil which, when applied to a surface, regular or irregular, will adhere snugly thereto by distortion thereof in various directions in the plane of its body when subjected to external pressure for sharply defining the margins of the apertures therein; and the provision of an improved stencil of the character referred to which may be employed repeatedly, similarly to stencils of the prior art; the provision of a stencil which finds particular utility in employment in stenciling irregular surfaces in that, owing to the distortibility of the stenciled sheet, it may be compressed into snug engagement with a surface to be stenciled and will firmly adhere to such surface and yet, when removed, will leave no undesirable marks on the stenciled surface.

The foregoing and such other objects and advantages as may appear as this description proceeds are attained in the structural embodiment of this invention illustrated in the accompanying drawing, in which:

Figure 1 is a plan view of the stencil sheet embodying the improvements of this invention;

Figure 2 is a longitudinal fragmentary sectional view of the article of this invention;

Figure 3 is a longitudinal fragmentary sectional view similar to Figure 2 showing the stencil applied to a surface to be treated; and

Figure 4 is a schematic view illustrating an irregular design which this invention is capable of producing.

The article of this invention includes a sheet of paper, 4 preferably corrugated though, for some purposes, this sheet may be calendered smooth. This sheet is perforated with the particular design which it is desired to stencil on a surface such, for example, as the arrow, and its tail portions and stars, shown at 5, 6 and 7 in Figure 1.

Ordinarily with the prior art stencils known to me, the sheet 4 is of a stiff cardboard, or similar non-distortible material, which will not conform readily to irregular surfaces and cannot be made to conform to such irregular surfaces.

The sheet 4 is a corrugated paper which may be of the character commonly known as a creped or towed paper, and may be produced in a number of ways well known in the art.

To one surface of the sheet 4, as best shown in Figure 2, indicated at 8 in Figure 2, I apply a coating of pressure sensitive adhesive which is possessed of the characteristics of substantially permanent tackiness, which will not injure or mar the surface to which it is applied, and will

not leave a deposit on such surface when the stencil is removed.

My improved product may be also applied in such manner that its external portions will coincide, for example, with the portions of the arrow form shown, or otherwise, and be applied to a surface in a subsequent step so that the lacquer spray or painting to be applied to this surface may be different from that previously applied to a complemental stencil so that a mingling of the colors may be prevented as, for example, in two color work.

I find it desirable to apply the adhesive over all of the surface to which it is applied on the stencil sheet, though it will be understood that for some purposes it may be applied adjacent to the margins only of the apertures in the stencil sheet which may further facilitate the distortion of the sheet to conform to irregular surfaces, practically impossible to accomplish with stencils previously to this invention.

The adhesive 8 employed in this invention is of a nature similar to that set forth in my co-pending application, Serial No. 182,893, filed April 11, 1927, if desired, or such as that set forth in my Patent No. 1,760,820, the adhesive, or so-called glue, being of a nature that it may be applied to paper, cloth or the like or may be applied to leather or other porous material without infiltration thereof, and which is capable of removal, from the surface to be stenciled, without deposition of the adhesive on, or injury to, such surface. Obviously, the adhesive possessing the characteristics of the invention set forth in the application S. N. 182,893 and in the Patent 1,760,820 referred to above make it possible to furnish the stenciling sheet to the trade in the form of rolls without the employment of any slip sheeting. Furthermore, the stencil may be applied to a surface to be stenciled and allowed to remain there for a considerable time before application of the stenciling coat and removed after the stenciling coat is dry, without injury either to the figured stencil or the surface to which it is applied.

The adhesive 8, as exemplified in my co-pending application S. N. 182,893, is made from a solution of the following composition:

250 pounds of glue (dry)
250 pounds of water
750 pounds of glycerine
187½ pounds of granulated sugar, or 75% of the dry glue weight.

The adhesive 8, exemplified in my application S. N. 281,104, now Patent 1,760,820, may be made from the following formulae.

Example A

A rubber compound and tackiness augmenting agent in the form of a synthetic resin. Proportions suitable for ordinary temperate climates may comprise:

10 pounds of plasticized, first quality plantation rubber, such as clear crepe or smoked sheets.
2 pounds of cumaron gum or resin
½ pound of zinc oxide pigment.

Example B

2 pounds of plantation rubber
5 pounds of Mexican or wild rubber, high in natural resin content
1 pound of zinc oxide pigment.

The form of the sheet 4 is preferably that of a

creped material or towed paper. The corrugations in such a sheet of paper are illustrated in Figure 2, of course greatly exaggerated, and I have found that this form of paper, particularly when employed with a glue of the character described, makes it possible to distort the sheet temporarily to conform to the surface to which it is applied, and it is even possible to produce designs similar to that shown in Figure 4 which, within my knowledge, has not heretofore been possible with ordinary stencils.

Due to the nature of the paper sheet 4 and by virtue of the crimping or creping effect given to it in the course of manufacture, the body of the paper consists of a plurality of corrugations, ridge rugosities or the like 11, which are more or less unsymmetrical and of indefinite dimensions, such, for example, as shown in the drawing.

It is to be noted that these rugosities 11 do not necessarily extend continuously across the entire surface of the sheet in each case, but the whole surface is filled with the corrugations or rugosities 11, the adhesive being applied in a thin coat as indicated at 8 similarly largely conforms to these rugosities so that the adhesive surface is not, except when pressure is applied to the sheet, a regular or symmetrical surface.

However, the intimacy of contact between the adhesive surface and a surface of an article indicated at 10 to which the stencil is applied is sufficient to prevent paint or other fluids from flowing beneath the margins of the stencil. It will be observed that the presence of the rugosities in the sheet lends to the sheet the property of being distensible in different directions in different portions so that the irregular shaped form shown in Figure 4 may be obtained by applying pressure to the stencil, and at the same time tending to curve the same along its length, greater pressure being applied to the outside portions 12 of the curve such as shown in Figure 4, than the pressure applied to the inside portion 13 of the curve as shown in Figure 4. Where this condition exists, it will be observed that the portion of the stencil sheet indicated at 14 in Figure 3 adjacent to the margin 13, will have a greater number of rugosities extant in it than the portion 15 adjacent to the margin 12 and that thus curved margins may be attained. In this way the stencil sheet, it will be noted, is distensible in different directions in the plane of its surface so that it may be applied in irregular forms to surfaces of different contours. That is, distortion of the sheet is accomplished by virtue of the nature of the adhesive coupled with the function of the rugosities or crepings afforded in the body of the sheet.

It will be understood, of course, that the spaces 16 illustrated in Figure 3, are greatly exaggerated, and that in the actual sheet as employed these spaces are of relatively small size and are not disadvantageous in defining margins of the stencil, and thus, by virtue not only of the distensibility of the sheet, but the resiliency and distensibility of the adhesive, an intimate contact with a surface to be painted or otherwise treated with lacquers and the like is attained.

It will also be understood that the sheet 4 can, for some purposes, be saturated with a material which will prevent adhesion of the adhesive coated side to the plain side of the sheet so that it may be made up in rolls and shipped in this form, and yet may be separated without tearing the adhesive coating or splitting the paper base.

In preparing the stencil of this invention, I

prefer to provide a paper base or sheet which is preferably absorbent, approaching blotting paper, calendered or uncalendered. It will be understood, of course, that the paper base is of the unsized, uncalendered variety and is either pressed, molded or otherwise formed (such, for example, by my method set out in co-pending application serial number referred to above) in order to have the appearance of towed fabric, the crimping or creping of the same being accomplished in any one of the ways set out above.

For some purposes the paper so provided is first submitted to a preliminary treatment by a saturating solution having as part thereof a glue base. An example of such a saturating medium is set out in my co-pending application Serial No. 182,893.

36 pounds of dry glue

72 pounds of water

108 pounds (approx. 16 degrees Twaddell) glue solution

Complete swelling is permitted, assisted by warming.

To this is then added 108 pounds of yellow glycerine.

108 pounds (approx. 16 degrees Twaddell) glue solution

108 pounds pale yellow glycerine

216 pounds glue-glycerine water solution.

To this is added 216 pounds of water.

216 pounds glue-glycerine water solution

216 pounds water

432 pounds.

The paper above described is preferably continuously submerged and passed through a bath of the saturating solution as above prepared and then passed through pressure rolls to squeeze off the excess and then dried by heating.

Prior to the drying step above mentioned, in one form of the practice of my invention, after the paper has been saturated and passed through the pressure rolls, the web of material is subjected to a treatment tending to insolubilize or tan the glue. The insolubilizing or tanning agents may be formaldehyde in solution or as a vapor, sodium carbonate solution of gallic and tannic acids, chromium trioxide and chrome alum or other chrome and aluminum salts.

It is preferred, however, to submit the formaldehyded web to a heat treatment. A temperature of 140 to 160 degrees F. is used to thoroughly dry and volatilize all surplus formaldehyde.

It will be observed that I have described the saturation and the insolubilizing or tanning of the glue base as separate steps. However, the tanning or insolubilizing agent may be incorporated in the saturating solution above described, the tanning action or insolubilizing action of the glue being accomplished simultaneously with the drying of the saturating solution. For this purpose there is added to the saturating solution the tanning or insolubilizing agent. Where I use formaldehyde, I put an aldehyde compound into the glue solution prior to the saturation step. It is preferred to retard the action of the aldehyde so that the insolubilizing or tanning of the glue is accomplished in the drying step. This retarding activity is accomplished by taking any aldehyde compound, such as formaldehyde, and adding ammonia thereto. In practice, equal molecular percentages of formaldehyde and ammonia

are used in amounts equivalent to 5% of the aldehyde to the dry weight of the glue.

The saturating solution thus modified is used in the manner previously described. In the drying of the paper, the aldehyde-ammonia compound breaks down to liberate formaldehyde, setting up, insolubilizing or tanning the glue.

Though mere exposure by air drying of the saturated paper will sufficiently insolubilize the glue, due to the decomposition of the ammonia-formaldehyde compound, to liberate formaldehyde, however, it is preferred to hasten this decomposition by heating the saturated web. Ordinarily, a temperature of approximately 80 degrees C. will be sufficiently rapid. However, it is preferred to use a temperature between 100 and 120 degrees C., which has been found to sufficiently set the glue with a speed of operation conducive to best practice.

After the paper has thus been treated, it may be dried and then will be found to have the fibres thereof locked to materially strengthen the paper web and provide a highly flexible distortible sheet.

A stencil made according to this invention, wherein the adhesive of the character referred to is incorporated, serves to prevent the underflowing of a coating material such as paint or lacquer beyond the confines of the stencil aperture due to the function of the adhesive as a dam adjacent the margins of the openings. This adhesive, while tenaciously adhering to a surface to which the stencil is applied, thus positively prevents spreading of the paint or lacquer or other coating material beyond the limits of the particular design desired, though the characteristics of the adhesive employed are such that it does not separate itself from the paper or backing of the stencil when removed from the stenciled surface. Owing to the elasticity of the adhesive, it will evenly distribute itself with the spreading or distortion of the sheet and thus, in Figure 3, when the sheet is subjected to external pressure, the normal corrugations thereof become flattened and the sheet in cross section takes substantially the form shown in Figure 3, this form illustrating the stencil greatly enlarged when applied to a surface for stenciling, the surface to be treated being illustrated at 10. As referred to in my co-pending application Serial No. 182,893, where an unsized Kraft paper, or the creped or towed paper above referred to, is used, it is preferable to interpose a priming coat, though this has not been illustrated in the drawing, as this coat is largely absorbed by the paper backing of the stencil and serves the purpose of binding together the fibres of the paper backing, thus enhancing the strength of the backing and increasing its durability and permitting the repeated use of the stencil without damage thereto.

The method of stenciling according to this invention involves the steps of placing the improved corrugated stencil to a surface to be treated, applying external pressure to the exposed surface of the stencil to remove some of the corrugations therefrom and cause the same to form dams between the margins of the openings in the stencil and the surface to be treated, and then applying, either by a paint brush or by a forced blast, finely divided particles of coating material to the surface so treated through the openings in the stencil. The stencil, when the coating material is dried, is then removed from the surface without disturbing the coating as applied through said openings. It will be under-

stood, further, that as pressure is applied to the stencil, certain of the corrugations will be temporarily removed, but, owing to the nature of the sheet forming the stencil, when the latter is removed from the surface to be treated, the corrugations return to substantially their original form. It will also be understood that, owing to the provision of the corrugations in the stencil, it permits of formation of curved contours such as shown in Figure 4, being extended with the corrugations. On the one hand, only one margin will be extended while, on the other hand, the corrugations will either remain substantially in their normal position or be extended to a lesser degree than on the other edge, or in some cases may even be brought closer together than the normal form. Owing to this extreme flexibility and distortibility of the sheet, figures of the form, such as shown in Figure 4, are made possible, which, within my knowledge, has not been heretofore possible with stencils.

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

1. As an article of manufacture a stencil comprising a flexible sheet provided with apertures, said sheet being further provided with a pressure sensitive adhesive at the margins of said apertures, said sheet being distensible longitudinally and transversely to clearly define said apertures upon application of pressure thereto.

2. As an article of manufacture a stencil comprising a flexible sheet provided with apertures, said sheet being further provided with a pressure sensitive adhesive at the margins of said apertures, said sheet being distensible in various directions in the plane of its body when subjected to external pressure to cause it to conform snugly to irregularities in a surface to which it is applied for clearly defining said apertures.

3. As an article of manufacture, a stencil comprising a flexible corrugated sheet capable of distension in more than one direction in the plane of its body, said sheet having an aperture therein, a coating of a pressure sensitive adhesive applied to one surface of said sheet and of a nature to accurately define the margin of said aperture and cause said margin to be brought

into close contact with an irregular surface upon application of pressure thereto.

4. As an article of manufacture, a stencil comprising a creped or towed sheet of fabric provided with apertures, said sheet being further provided with a pressure sensitive adhesive adjacent to the margins of said apertures, said sheet being distortible upon the application of pressure thereto to temporarily remove the corrugations therefrom and cause the same to adhere to a surface to which it is applied.

5. As a new article of manufacture, a unitary stencil comprising a distensible sheet having a stenciling aperture therein, one surface of said sheet being provided with an adhesive.

6. As a new article of manufacture, a unitary stencil comprising a distensible sheet having a stenciling aperture therein, one surface of said sheet being provided with a pressure-sensitive adhesive.

7. As an article of manufacture, a stencil comprising a distensible sheet provided with a stenciling aperture, said sheet being further provided with an adhesive which is distensible with the sheet in use for causing the same to firmly adhere and conform to the contour of a surface to which the same is applied.

8. As a new article of manufacture, a unitary stencil comprising a distensible sheet of paper having a stenciling aperture therein, one surface of said sheet being provided with an adhesive.

9. As a new article of manufacture, a stencil comprising a creped or towed sheet provided with a stenciling aperture, said sheet being further provided with an adhesive on one surface, said sheet being distensible upon the application of pressure thereto to temporarily remove the corrugations therefrom to cause the same to adhere to a surface to which it is applied.

10. As an article of manufacture, a stencil comprising a flexible sheet provided with a stenciling aperture, said sheet being further provided with an adhesive on one surface thereof, said sheet being distensible in various directions in the plane of its body when subjected to external pressure to cause it to conform snugly to irregularities in a surface to which it is applied for clearly defining said apertures.

RICHARD GURLEY DREW.