Sept. 6, 1932. J. G. G. FROST 1,875,721

SUPERPOSED ENAMEL

Filed June 21, 1928

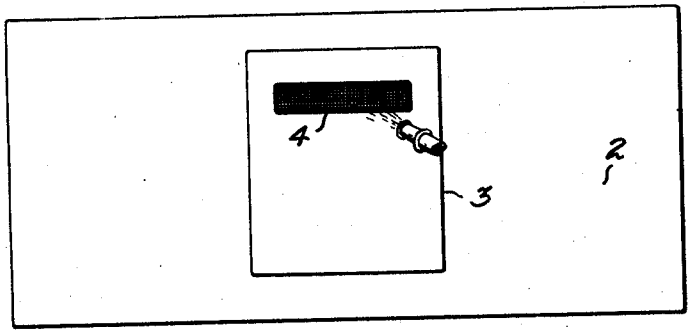


Fig. 1.

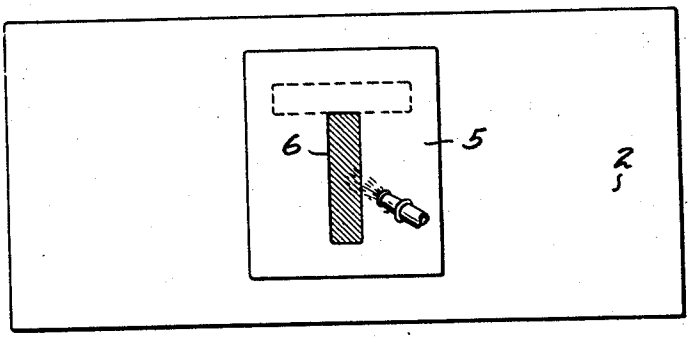


Fig. 2.

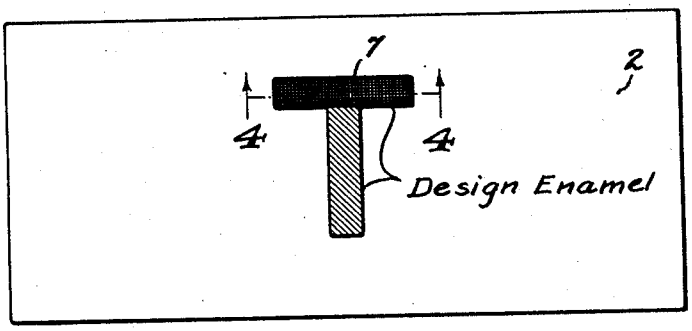


Fig. 3.

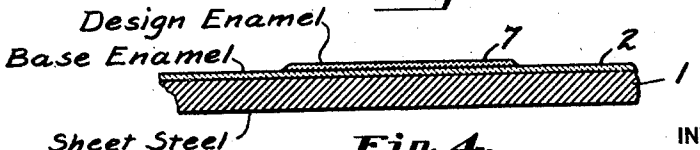


Fig. 4.

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UNITED STATES PATENT OFFICE

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SUPERPOSED ENAMEL

Application filed June 21, 1928. Serial No. 287,355.

This invention relates to vitreous enameling, and more particularly to a method of and means for disposing enamel upon surfaces such as of sheet steel.

In the past, in producing vitreous enameled surfaces having vitreous enameled designs thereon, it has been ordinarily the practice to burn an enamel coating upon the surface as a whole, and subsequently to spray upon the section of the surface to be decorated an aqueous suspension of suitably colored enamel. This colored enamel has been permitted to dry thoroughly, whereupon excess enamel has been brushed off to leave a remainder of the desired configuration. This design enamel has then been burned and any additional colored enamel or enamels similarly individually applied and burned. It has not ordinarily been possible with such aqueous suspensions satisfactorily to form a design by spraying through a stencil.

An object of this invention is to provide an advantageous method for disposing enamel upon surfaces to be vitreous enameled. Other objects of my invention are to provide a method for disposing enamel upon a surface whereby such enamel will dry extremely rapidly without running or dripping. Other objects are to provide a method whereby designs consisting of several colors may be disposed upon a surface without requiring a burning operation after each application of colored enamel. A further object is to provide a method whereby a vitreous enameled article including colored designs may be formed without requiring burning of the base enamel coating before application of the design.

Other objects will be apparent to those skilled in the art from the disclosures herein made.

By my invention I associate the enamel frit to be employed for application to the surface to be enameled with an organic binder which may preferably be dissolved in a rapid drying or volatile solvent. This association, to give thorough mixing, is preferably accomplished by grinding the materials composing the frit in the binder. I have found that by such grinding, the frit and the binder are most readily associated for the purpose in hand.

The consistency of the suspension will depend in part upon the mode of application of the enamel to the surface. Thus, for application of the enamel through a stencil by means of a brush, the suspension is preferably of a fairly thick consistency. For application of the enamel by free hand brushing, the suspension is preferably of a consistency to permit some degree of flow of the enamel, as in the case of the brushing of paint.

For application by spraying, and in particular for application by spraying through a stencil and in the formation of designs consisting of several colors, the suspension preferably includes a sufficiently rapid drying or volatile solvent to cause the suspension to dry very rapidly, and without running or dripping. By virtue of the characteristics of the dissolved organic binder employed, which binder will be hereinafter more fully disclosed, the enamel suspension dries substantially immediately without any running or dripping, whereby the enamel conforms exactly to the configuration desired, thus eliminating any necessity for wiping. Other colored enamels may be subsequently applied to the article until the design is completed. Since no wiping of the added enamel is necessary, the added color or colors may be disposed upon a base coat of enamel before said base coat is burned. The base coat and the subsequently disposed portions of colored enamel may thus be vitrified in one burning. It may be convenient, however, to apply the design enamel, which may consist of several colors, to a burned enamel surface. In such case, of course, any accidentally applied excess design enamel may be readily removed to correct the design without requiring the re-application of enamel to the entire surface.

A convenient method of applying the colored enamel is illustrated in the accompanying drawing, in which

Figure 1 is a plan view of an enameled steel sheet, showing a method of applying a portion of a colored design through a stencil;

Fig. 2 is a similar view showing the method

of applying another portion of the design through a different stencil;

Fig. 3 is a plan view of an enamel steel plate provided with a multi-colored enamel design; and

Fig. 4 is a fragmentary, enlarged cross-sectional view on the line 4—4 of Fig. 3.

Referring to the drawing, the numeral 1 designates a steel plate upon which a layer of enamel 2 is applied. In applying a multi-colored design upon the enameled surface a stencil 3 having a cut-out portion 4 of the desired configuration is superimposed upon the enameled surface 2 and enamel of the desired color is sprayed through the openings in the stencil upon the enameled surface. Stencil 3 is then removed and a stencil 5 having cut-out portion 6 of a different configuration is placed upon the enameled surface and an enamel of a different color is sprayed through the opening of the stencil 5 to form the remainder of the design. By utilizing such a method it will be apparent that a multi-colored design 7 of any desired configuration may be applied to the enameled surface 2. It will, of course, be understood that instead of spraying the colored enamel through the openings in the stencil it may be applied by any suitable means, such as by brushing, and if desired a single color may be employed, in which case it will only be necessary to utilize one stencil, or, if preferred, different colors may be applied through different openings in the same stencil.

In certain cases, I may carry out my invention by applying an organic binder to the surface to be coated, dusting or otherwise disposing a dry comminuted enamel upon said binder-coated surface, and subsequently vitrifying said applied enamel.

During the burning of the enamel the organic binder is substantially completely burned out, leaving no residue which materially affects the color or constituency of the enamel.

Various materials may be employed to form the dissolved organic binder contemplated by this invention. By way of example, and without limiting the generality of this disclosure, I have found satisfactory the use of a nitrocellulose lacquer such as of the type comprising nitrocellulose or a derivative thereof dissolved in butyl alcohol, acetone or other suitable solvent. As solvents may be employed various materials such as methyl, ethyl or butyl alcohol, acetone, or diethylene glycol.

It will be seen that I have provided an advantageous and economical method of disposing enamel upon surfaces to be vitreous enameled.

It will also be noted that I have provided a method whereby vitreous enamel may be advantageously applied to sheet metal, such as sheet steel, to cover the surface of said metal wholly or in part, and with one or more complete or partial layers.

It will further be noted that by my invention enamel may be applied as by spraying to form layers having indefinite borders, or designs having edges intermerging with a base coat of enamel. Furthermore, by my invention enamel may be readily sprayed through stencils to form designs of sharply defined characteristics or otherwise. Moreover, design portions of various colors may be applied serially without delay before the application of each subsequent design portion. In addition, configurations including several colors may be formed upon a surface without requiring the burning of the enamel of one color before the application of another color, whereby the colored enamels constituting the design may be vitrified in a single burning operation.

It will further be seen that by my invention the amount of labor involved in disposing designs on articles to be vitreous enameled is materially reduced. Furthermore, a material decrease in drying time and number of burnings may be effected.

To those skilled in the art many modifications of and widely differing embodiments and applications of my invention will suggest themselves, without departing from the spirit and scope thereof. My disclosures and the descriptions herein are purely illustrative and are not intended to be in any sense limiting.

What I claim is:

1. The method of vitreous enameling, which comprises spraying a suspension of vitreous enamel in a binder dissolved in a highly volatile solvent upon a dry, unburned enamel-coated surface in desired configuration and permitting said solvent to evaporate without the application of heat to the object to be enameled, whereby said enameled coatings may be burned in one operation.

2. The method of vitreous enameling, which comprises applying a suspension of vitreous enamel in a binder dissolved in an organic solvent to a dry, unburned enamel-coated surface and permitting the fluid portion of said suspension to evaporate before lateral spreading of the superposed enameled coat over the underlying enamel portions can occur, whereby clear-cut unsmeared enameled designs may be produced.

3. The method of vitreous enameling, which comprises applying a fluid suspension of vitreous enamel in a binder dissolved in an organic solvent to a surface to be coated and permitting the fluid portion of said suspension to evaporate before lateral spreading of the superposed enamel over the underlying surface can take place, whereby said enamel may be applied to conform to any desired contour.

4. The method of vitreous enameling,

which comprises applying a suspension of vitreous enamel in a cellulosic binder dissolved in a volatile solvent through a stencil upon a dry, unburned enamel-coated surface, permitting said volatile solvent to evaporate rapidly, whereby lateral spreading of the superposed enamel over the underlying enamel surface cannot take place and whereby sharp definition between the two enamel surfaces may be had.

5. The method of vitreous enameling, which comprises applying a suspension of vitreous enamel in a binder dissolved in a highly volatile solvent to an enameled surface in desired configuration, and permitting said solvent to evaporate rapidly whereby said applied enamel may retain said configuration, and vitrefying said applied enamel.

6. The method of forming multicolored vitreous enamel designs, which comprises serially applying suspensions of each colored vitreous enamel in a binder dissolved in a highly volatile solvent upon a surface in desired configuration to form separately the portions of the design of each color, permitting the volatile solvent of each suspension to evaporate rapidly before the application of the next subsequent suspension, and vitrefying the enamel of the design in a single burning operation.

7. The method of forming multi-colored vitreous enamel designs, which comprises spraying a suspension of colored vitreous enamel in a binder dissolved in a highly volatile solvent through a stencil to form the portion of the design to be constituted of that color, permitting said volatile solvent to evaporate rapidly whereby additional design portions may be substantially immediately applied, repeating the operation for each additional color of the design, and vitrefying the enamel of the design in one burning operation.

8. The method of vitreous enameling, which comprises applying a fluid suspension of vitreous enamel in a binder of cellulosic material dissolved in a volatile solvent to an enameled surface in the desired configuration, permitting said solvent to evaporate, and vitrefying the applied enamel.

In testimony whereof I affix my signature.

JOHN G. G. FROST.