# United States Patent [19]

**Albright et al.**

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[54] **METHOD OF MAKING JEWELRY AND THE LIKE**


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[51] **Int. Cl.** ..... **B44c 1/04;** B23p 1/02

[58] **Field of Search** ..... 204/38 C, 18 R, 129.65



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[57] **ABSTRACT**

A method of making jewelry wherein a substrate such as brass is electroplated with copper for adhesively receiving decorative bounded areas of vitreous enamel. The enamel in these areas is formed by applying glass frit and then firing the frit to form an enameled layer. Other bounded areas of the metal plating are covered with lacquer. The areas of vitreous enamel and lacquer are used as masks for deplating the exposed areas of the plated copper metal from the brass substrate.


**10 Claims, 3 Drawing Figures**

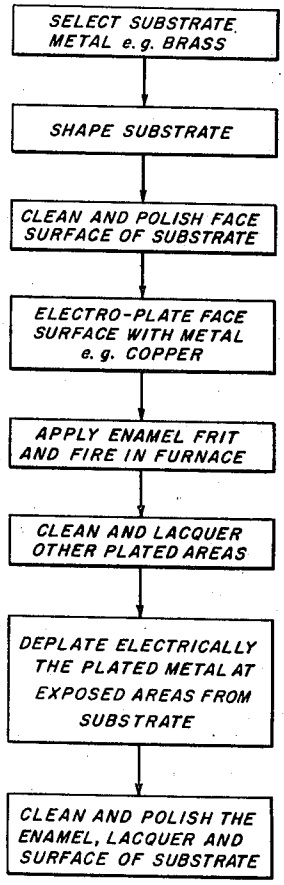


FIG. 1.

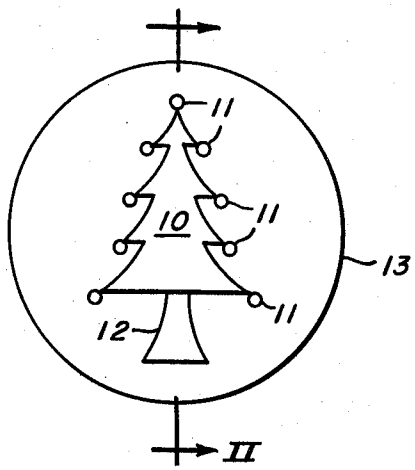



FIG. 2.

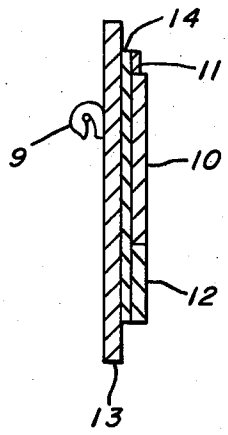
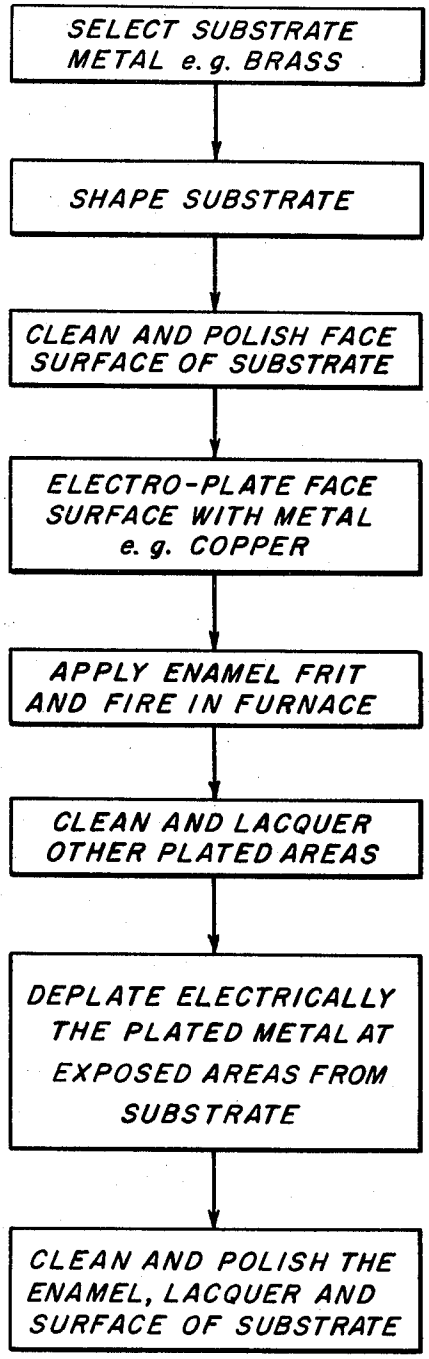



FIG. 3.



# METHOD OF MAKING JEWELRY AND THE LIKE

## BACKGROUND OF THE INVENTION

The present invention relates to a method of making jewelry using a substrate which is impervious to the adherence of fusible enamel frit. More particularly, the present invention relates to electroplating a substrate with a metal layer to adhesively receive on the plated surface bounded areas of vitreous enamel and then using the vitreous enamel within the bounded areas as a mask while electrically deplating the plated layer from the substrate, thereby making available the substrate for its intrinsic benefit to the jewelry-making art.

The theory of adherence is not profoundly uniform in the enameling art to explain why fired enamel films will adhere to certain metal surfaces and not others. In the jewelry-making art, metals such as copper, are known to exhibit properties which are compatible for adhesively receiving fired enamels. This has placed severe restrictions on the selection of materials to be used as a substrate for an article of jewelry. Frequently, the substrate for the jewelry is hand-shaped into intricate designs and its facing surface may be stamped or cast with cavities and ridges. Enamel frit is then deposited on the face of the substrate within bounded areas. The substrate with the frit located on it is then fired to fuse the frit into enamel or glaze while forming an adhesive bond to the substrate. When transparent frit is used, the coloration of the substrate forms part of the jewelry design. Copper and bronze metal have been used as a substrate but these materials are becoming increasingly expensive and they are difficult to work with. These metals are easily oxidized and to avoid this a protective coating is used because such a tarnished appearance cannot be tolerated for articles of jewelry.

The method of the present invention enables the use of metals for substrates which have previously been considered unsatisfactory for enameling processes, principally because fusible enamel frit will not adhere to such metals. This greatly expands the variety of materials which can be selected as a substrate. The expense of the substrate material can be reduced and the substrate utilized to a greater extent as part of the intrinsic effect by the article of jewelry.

## SUMMARY OF THE INVENTION

It is an object of the present invention to provide a method of supporting a vitreous enamel upon a substrate by plating the facing surface of the substrate before forming the vitreous enamel within a bounded area on the plated surface and then deplating the plated metal from the substrate while using the vitreous enamel as a mask.

It is a further object of the present invention to provide an improved method of making jewelry articles and the like using substrate metals which are less expensive and not limited to selecting materials which will adhesively receive fused enamel frit.

In one form of the present invention, there is provided a method of supporting a vitreous film upon a substrate including the steps of selecting a substrate having an electrically conductive facing surface, electroplating the facing surface with a metal layer for the adherence of a vitreous film, forming a bounded area of vitreous film upon the electroplated metal layer and using the bounded area of vitreous film as a mask to electrically deplate the plated metal layer at exposed areas from the conductive facing surface of the substrate.



In its preferred form, the substrate is a brass plate which is plated with a layer of copper. The vitreous film includes fusible enamel frit. Transparent and/or opaque frits may be used along with, if desired, lacquer at separate bounded areas. In such instances, both the fused enamel frit and the lacquer within bounded areas form the mask during deplating the plated metal from exposed areas of the substrate.

These features and advantages of the present invention as well as others will be more readily understood when the following description is read in light of the accompanying drawings, in which:

FIG. 1 illustrates an article of jewelry after manufacture according to the method of the present invention;

FIG. 2 is a sectional view taken along line II—II of FIG. 1; and

FIG. 3 is a flow diagram of preferred steps of the present invention.

With reference now to FIGS. 1 and 2, there is illustrated an article of jewelry for attachments to wearing apparel of a person by a pin-type fastener 9. An enameled outline of a Christmas tree 10 is shown with ornaments 11 disposed at the branch ends. The tree outline may be enameled with selected opaque colors of fused enamel frit within a bounded area represented by the outline of the Christmas tree. The ornaments 11 define a plurality of other bounded areas containing fused transparent frit sometimes referred in the art as glazes. Preferably, however, a clear lacquer is used in these areas. A tree trunk 12, as shown, forms still another bounded area wherein opaque fused enamel frit is located.

The described ornamental design is supported by a metal substrate 13 sculptured from a brass plate, for example. Between the Christmas tree design and the substrate 13, a plated copper metal interface 14 is used for the adherence of the vitreous enamel frit within the bounded areas of 10 and 12 to the substrate. The plated interface underlies only the bounded areas 10,11 and 12. At all other places the face surface of the substrate is exposed and may be artistically covered, if desired. The exposed substrate may be coated with lacquer whereby the metallic appearance of both the substrate 13 and the interface 14 at the areas 11 will be exposed to the eyes of the viewer.

The method of the present invention provides for the manufacture of the jewelry article such as just illustrated and described in regard to FIGS. 1 and 2. The method of the present invention includes numerous steps which are exemplified in FIG. 3. The initial step is to select a suitable substrate which is preferably a solid metal and as indicated heretofore may be selected as brass-plate. Brass is a metal which, prior to the present invention, was considered an unacceptable substrate for jewelry incorporating fused enamel frit because the enamel would not adhere to brass. It is pointed out that other materials may be selected for the substrate including non-metallic substances such as plastic provided with a facing surface which has been coated with an electrically conductive material. After selecting the substrate material, it is shaped into the desired design which, as illustrated in FIGS. 1 and 2, is circular, although any desired shape may be used in the method of the present invention. The shaping operations when carried out, particularly with brass metal,

usually contaminate the facing surface with an oil film. The facing surface must be thoroughly cleaned and polished to be free of foreign substances. After these operations have been carried out, the shaped substrate is immersed in an aqueous solution in an electroplating tank. The solution is prepared as a salt of the metal to be plated on the facing surface of the substrate and may include a small amount of acid to enhance the plating operation. When a copper interface is to be formed, the salt solution may be copper sulphate in which event the plating tank will also include a copper ingot. The plating operation is carried out using a direct current supply and attaching the lead wires so that the substrate is defined as the cathode and the copper ingot is the anode. The current is then applied in the usual fashion for a given period of time to form the electrically deposited copper interface about the entire face of the substrate.

The plated substrate is then removed from the plating tank and cleaned to remove the plating solution. Fusible enamel frit is applied to form the bounded areas **10** and **12**, as illustrated in FIG. **1**. The application of the frit may be carried out using any conventional well-known technique including the use of a colloidal dispersion or dry-frit powder. Solid pieces of glass may be used in place of or in addition to frit. The plated substrate with the bounded areas of frit are then loaded into a furnace and the frit is fired into fused enamel. The enameled substrate is then removed from the furnace and exposed plated areas **11** are cleaned to brighten the plating assuming these areas were not glazed. Lacquer is then applied in bounded areas to form the ornaments **11**.

After the lacquering operations have been completed, the jewelry article is then returned to the plating tank where it is submerged in the aqueous solution after the leads from the power supply are attached. In this instance, however, the positive lead is now attached to the plated copper metal surface and thus forms the anode, and the negative electrical lead is attached to the the copper ingot, thus forming the cathode. The current supply is then turned ON to electrically deplate the plated metal from the substrate while using the enamel in the bounded areas **10** and **12** as well as the lacquer in the bounded areas **11** as masks. The plated metal at all areas on the substrate which are not masked is removed so that the substrate forms part of the face surface of the article of jewelry. The article of jewelry is then removed from the plating tank, cleaned to remove the plating solution and polished to enhance the luster of the enameled surface, the lacquer and the exposed face surface of the substrate. The article of jewelry may, of course, receive additional decorations and it may be further processed as desired.

Although the invention has been shown in connection with a certain specific embodiment, it will be readily apparent to those skilled in the art that various changes in form and arrangement of parts may be made to suit requirements without departing from the spirit and scope of the invention.

We claim as our invention:

1. A method of supporting a vitreous film upon a substrate including the steps of:
   - selecting a substrate having an electrically conductive facing surface,
   - electroplating said facing surface with a metal layer for adherence of a vitreous film,
   - forming a bounded area of vitreous film upon the electroplated metal layer, and
   - electrically deplating only the exposed area of the plated metal layer from the substrate by using the bounded area of the vitreous film as a mask to thereby expose areas of said conductive facing surface distinct from said bounded areas of vitreous film, said electrically deplating including establishing said electrically conductive facing surfaces of the substrate as an electrode.

**2.** The method according to claim **1** wherein said vitreous film is further defined to include fused enamel frit.

**3.** The method according to claim **2** including the further steps of:
   - applying enamel frit to a bounded area to the electroplated substrate, and
   - firing said enamel frit in a furnace to form said bounded areas of vitreous film.

**4.** The method according to claim **1** wherein a plurality of discrete bounded areas of vitreous film is formed upon the electroplated metal layer.

**5.** The method according to claim **4** wherein fused enamel frit defines said vitreous film in at least one of said plurality of discrete bounded areas, and a lacquer film defines the vitreous film at other of said plurality of discrete bounded areas.

**6.** The method according to claim **1** wherein said substrate is a brass metal plate with a predetermined shape for use as an article of jewelry.

**7.** The method according to claim **6** wherein the electroplated metal layer is copper metal.

**8.** The method according to claim **1** including the further steps of submerging said substrate in a plating tank containing an aqueous salt solution of said metal layer, introducing a metal ingot of said metal layer in said plating tank and passing electric current between the substrate and the ingot by connecting the leads from an electrical current supply in such a manner that the facing surface of the substrate forms the cathode and the metal ingot forms the anode.

**9.** The method according to claim **8** including the further steps of immersing the substrate with the plated metal layer supporting formed bounded areas of vitreous film in a plating tank containing an aqueous salt solution of said plated metal layer, introducing an ingot of the plated metal in the plating tank, and passing electric current between the plated metal layer on the substrate and the metal ingot by using the plated surface as the anode and the ingot as the cathode.

**10.** The method according to claim **9** including the further steps of cleaning and polishing the deplated surface of the substrate, the bounded areas of vitreous film and the bounded areas of lacquer.

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