

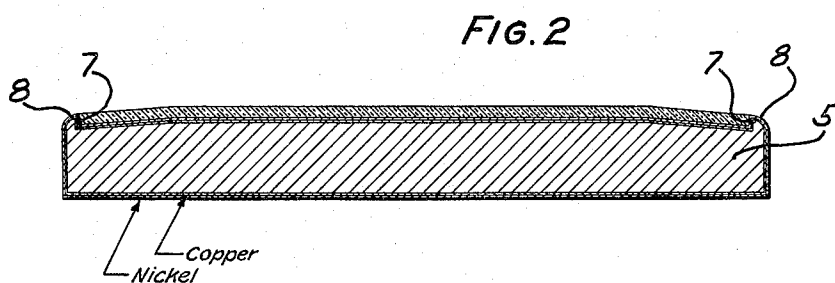
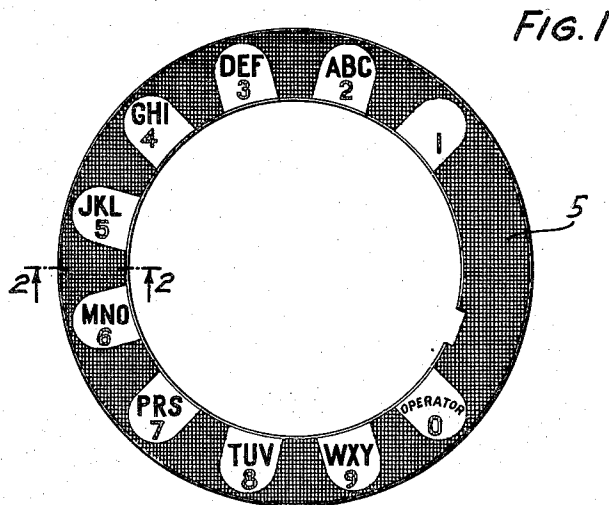
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W. J. SCOTT ET AL

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CERAMIC ARTICLE

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INVENTORS
W. J. SCOTT
S. R. MASON

BY *H. G. Whitehorn*
ATTORNEY

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CERAMIC ARTICLE

Walter J. Scott, Brookfield, and Sumner R. Mason,
Wilmette, Ill., assignors to Western Electric
Company, Incorporated, New York, N. Y., a cor-
poration of New York

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7 Claims. (Cl. 91-73)

This invention relates to ceramic articles and a method of making the articles.

Objects of the invention are to provide an article having a protective and durable coating and an effective and efficient method of making the article.

In accordance with one embodiment of the invention, grooves are placed along the edges of the articles to be coated with ceramic materials to form a sharp outline at the edges and prevent edge cracking of the enamel and a protective coating is provided under the enamel coating whereby good coverage may be obtained with a single enamel coating.

A complete understanding of the invention may be had by reference to the following description taken in conjunction with the accompanying drawing, in which

Fig. 1 is a plan view of a telephone number plate embodying the invention; and

Fig. 2 is an enlarged sectional view taken on line 2-2 of Fig. 1.

In applying an enamel coating to ceramic articles, such as number plates for telephone dials, it is frequently convenient to apply the enamel coating only upon the face of the plates because when the entire plate is coated with enamel, difficulty is often experienced in meeting the close dimensional requirements for seating the plates in the dials. The covering of only the face of the number plate with an enamel coating entails the necessity of protecting the remainder of the number plate against corrosion.

In producing a number plate, a circular plate of iron, steel, or other suitable material is made and grooves are provided along the inner and outer peripheral edges of the plate. One side of the grooves is made substantially vertical and the other side relatively flat, thus leaving ridges along the edges. The ridges are preferably rounded, as shown in Fig. 2, so that when the ceramic materials are dusted on the plate they will collect in an even layer on the plate, except for the ridges, from which the material will fall off on account of the curved or arcuate faces of the ridges. The plate is then fired to fuse the ceramic materials to form the enamel coating. A sharp outline of the enamel will be formed along the edges and the ridge will protect the edge of the enamel to prevent edge cracking of the enamel.

The provision of a ridge adjacent to the edge of the article forms no part of the present invention and is described and claimed in the copending application of W. J. Scott, Serial No. 657,251, filed February 17, 1933.

When only the face of the number plate is covered with enamel, it is necessary to protect the rest of the plate against corrosion. This may be accomplished by providing the entire plate with a protective black iron oxide coating by a process sometimes known as "Bower-Barffing." The application of the black iron oxide coating is more fully described in the copending application of W. J. Scott for ceramic articles, now Patent No. 1,962,751, issued June 12, 1934. An alternative method of protecting the portion of the number plate which is not enameled is to copper plate the number plate and then apply a nickel plating over the copper plate. The ceramic materials may then be dusted on the face of the plate and fused to form an enamel coating. It has been found that when it is attempted to use only a copper plating over the iron base, the copper tends to oxidize and burn off during the fusing of the enamel. If a nickel coating is used alone under the enamel coating, it appears that the nickel reacts with the iron to form gases which cause a blistering of the enamel coating. By first copper plating the number plate and then nickel plating over the copper plate, these difficulties are avoided and a firm adherent enamel coating may then be applied to the nickel coating. The copper and nickel coatings may be applied by any well known method, preferably by electroplating. The nickel coating over the copper coating provides a highly protective covering against corrosion of that portion of the surface of the number plate which is not covered by enamel.

While the best results are obtained by placing the copper coating under the nickel coating, good results are also obtained by placing the nickel coating under the copper coating. In practice about 25 milligrams of copper per square inch are plated on the base over which is plated about 30 milligrams per square inch of nickel.

The enamel coating may be applied as a single coating or in some cases it may be desirable to apply several coatings. When several coatings are applied to the number plate, a tacky substance, such as ceramic ink varnish, may or may not be applied between the successive layers of enamel. After the enamel coating is applied, the character, background, or ornamental markings are applied. It has been found that when a single coating of enamel is used, it is desirable to use an opacifier in the ink varnish for the markings. Suitable opacifiers that may be used are tin oxide, arsenic oxide, or cryolite.

After the enameling material has been dusted on the number plate, the enamel is fired at a

temperature of approximately 1575° F. for a period of about two minutes. This temperature is sufficiently high to fuse the enamel and render it quite fluid. No blistering of the enamel is experienced during this firing operation. However, during the later firing of the article to fuse the character, background, or ornamental ceramic markings into the enamel, the temperature may not be raised to the firing temperature above mentioned and under these conditions the enamel has a tendency to blister. After the enamel has been formed on the number plate, the enamel is provided with character markings. In some cases a background color is applied to the enamel and characters consisting of numbers and letters are applied to the enamel. The background color is formed by applying a colored enamelling material or a ceramic ink to the enamel surface. After the background color has been applied, the plate is placed in an oven and baked at a temperature of about 300° F. to harden the colored enamel so that it will not become marred in subsequent printing operations. The letters of the number plate are usually in black and are printed on the number plate with a ceramic ink. The plate is then again baked at a temperature of about 300° F. The letters of the number plate are usually colored red and are applied by printing the letters with a ceramic ink of a red color. After the red characters have been applied, the entire plate is again fired. This firing temperature for fusing the characters and background onto the enamel is carried out at a lower temperature than the firing of the original enamel coating, since otherwise the characters tend to run or spread on the enamel. It has been found that by firing the plates for the background and character fusing operations at a uniform low temperature, there is a tendency for blisters to form in the enamel coating. This tendency has been overcome by firing the number of plates at an initial temperature of 1160° F. and increasing the temperature to a final temperature of approximately 1310° F. during a period of about 4.4 minutes.

While the invention has been described in connection with the manufacture of number plates for telephone dials, it will be understood that the

invention is equally applicable to enameling other types of articles and providing character markings thereon. It will be understood, therefore, that the nature and embodiment of the invention described herein is merely illustrative and that many changes and modifications may be made therein without departing from the scope and spirit of the invention.

What is claimed is:

1. A method of forming a ceramic article which comprises copper plating a ferrous metal base, nickel plating thereover, and applying an enamel coating over the nickel plate.

2. A ceramic article comprising a ferrous metal base, a copper coating thereon, a nickel coating on the copper coating, and an enamel coating over the nickel coating.

3. A ceramic article comprising an iron base, a copper plated coating thereover, a nickel plated coating over the copper plated coating, and an enamel coating over the nickel plated coating.

4. A ceramic article comprising a ferrous metal base, copper and nickel coatings on said base, and an enamel coating over said coatings.

5. A method of forming a ceramic article which comprises successively applying a copper and nickel coating on a ferrous metal base, applying ceramic material to the coated base, and firing the article to fuse the material and form an enameled coating.

6. A method of forming a ceramic article which comprises successively applying a copper and a nickel coating to an iron base, applying ceramic material to the base, and firing the article at a temperature of the order of 1575° F. to fuse the material and form an adherent coating.

7. A method of forming a ceramic article which comprises successively applying a copper and a nickel coating to an iron base, applying ceramic material to the base, firing the article at a temperature of the order of 1575° F. to fuse the material and form an adherent coating, applying a second coating of ceramic material, and firing the article at a lower temperature and at a slower rate.

WALTER J. SCOTT.
SUMNER R. MASON.