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PORCELAIN ENAMEL FINISH

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This invention relates as indicated to porcelain enamel finishes and more particularly to a method of producing a useful and decorative effect on all or preferably only a portion of the surface of the enamel by an expedient which prevents the formation, during the normal firing operation, of the usual smooth glassy surface of the enamel. There are many cases where the protective or decorative properties of conventional porcelain enamel are desirably utilized but which, for certain reasons, require an ultimate finish which is not the smooth glassy surface of porcelain enamel in its normal fired state.

When the work-piece is a structural element such as a shingle or roofing piece, architectural considerations require that for best results the surface be a very fine matte finish. In other cases, such as in the floors of bath tubs, shower stalls, and the like, the glassy smooth surface of porcelain enamel is objectionable because of the slipping hazard. Here again, there is a requirement that the enamel finish have a fine matte surface and one which may be readily cleaned.

It is a principal object of my invention to provide a porcelain enamel finish and an improved method for producing the same characterized in an improved matte surface texture and one which may be secured at an unusually low cost.

Other objects of my invention will appear as the description proceeds.

To the accomplishment of the foregoing and related ends, said invention then comprises the features hereinafter fully described and particularly pointed out in the claims, the following description setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principle of the invention may be employed.

Broadly stated, this invention comprises the discovery that an improved matte finish for porcelain enamels may be provided by first applying to the work a continuous layer of porcelain enamel forming material of such composition that when fired under normal conditions it will yield a smooth glassy surface, and then depositing on such layer, prior to firing, a relatively thin coating of a very finely divided material which is substantially infusible in the firing range of the enamel forming material. This composite coating is then fired in the normal firing range of the porcelain enamel forming material. The applied thin second coat is preferably of such fineness that substantially all will pass through a 200 mesh sieve and preferably through a 325 mesh sieve.

The materials used in carrying out my invention may be divided into two general classes, i. e. the porcelain enamel forming materials and the matte surface forming materials.

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The porcelain enamel forming materials may be any conventional porcelain enamel of which there are many available on the market today. Any porcelain enamel, whether white or with added color, or whether it be adapted for direct application to the work, or as a cover coat over a ground coat, may be employed. While thus any conventional porcelain enamel may be used, generally best results will be secured by the use of an acid resistant enamel since this type has greater durability under most conditions. It is believed unnecessary to give the formula for any of the enamels which may be used since there are a number of publications and prior art patents from which a wide variety of compositions may be secured.

The porcelain enamel forming materials are generally applied to the work in a conventional fashion as by first forming a slip and then applying the same to the previously cleaned work-piece, either by brushing, spraying, or dipping. The thickness of the porcelain enamel forming material coat will be determined by the usual considerations such as the nature of the enamel itself and the nature of the use for which the work-piece is designed.

The matte surface forming materials which may be applied to the coated work-piece prepared as just described, either before or after drying, will now be briefly explained.

The matte surface forming materials useful in carrying out my invention should be substantially infusible in the firing range of the enamel forming materials. That is, my invention does not rely on an interfusion of the porcelain enamel and the matte forming materials, but rather upon the matte forming materials because of their presence exerting a physical action on the surface of the enamel during the firing operation and preventing the same from becoming glassy smooth.

Materials useful for this purpose are most of the well-known enamelers' clays. These are selected for use because of considerations such as low cost, the fact that they are substantially infusible in the firing range of the enamel, and because they are in their natural state in extremely finely sub-divided form requiring no grinding as such for the purpose of reducing the particle size. While clay is thus an admirable material for this purpose, it is, nevertheless, possible to use any other mineral substance which is substantially infusible in the temperature range at which the enamel is fired and which may be conveniently reduced as by grinding in a ball mill to a particle size such that substantially all will pass through a 200 mesh sieve and preferably to a fineness such that all will pass through a 325 mesh sieve. At this point, I might explain that for best results I prefer the very finest particle size materials obtainable.

Any finely divided mineral material or synthetic refractory material, which is substantially infusible in the firing range of the enamel, may be employed. Examples of such materials are kaolin, calcined kaolin, feldspar, silica, aluminum silicate, and zircon sand, i. e. zirconium silicate.

These matte surface forming materials may be applied either by dusting or spraying. When these materials are applied to the coat of enamel forming materials before the latter is dried, then the matte surface forming materials may be in a dry state, whereas, if the enamel forming coat has first been dried or even when it is in the undried state, the matte surface forming materials may be applied by means of a spray having first been formed into a slurry by the addition of a sufficient amount of water.

The weight of application of the matte surface forming materials should be as thin as possible. The theoretically perfect weight of application is a coating of one particle thickness. It will generally be found that best results will be secured if the firing operation and weight of application are so controlled that at the conclusion of the firing only the first layer of particles of matte surface forming material will adhere to the fired enamel. The excess may either be removed as by washing or brushing or, if there is no objection, the article may be placed into use with the loosely adherent excess of matte surface forming material thereon, since, if the article is exposed to the weather or to the flow of water thereover, it will be found that the excess is soon washed off.

In the preferred embodiment of my invention, the matte surface forming material is applied not as a continuous layer but instead as a stipple coat. A stipple coat may be conveniently applied by the use of a conventional spray gun and by adjusting the nozzle so that instead of ejecting a stream of finely divided particles, the gun will project large globules which may be splattered on the work-piece to provide the stipple deposit.

I have discovered that a very desirable surface for many purposes may be provided by the application of a stipple coat of the matte surface forming materials such that only a minor proportion of the entire surface of the article has the matte finish, whereas, the remainder of the article surface is the conventional glassy smooth surface of the fired porcelain enamel. A stipple coat thus applied breaks up reflectance areas to such an extent that even when viewed in reflected light the entire surface of the article has the appearance of a matte finish, even though only a minor proportion of the entire surface actually has the matte finish. This is also true when providing non-slip surfaces for the floors of shower stalls and bath tubs. It has been found that a surface on which the matte finish is provided by means of a stipple coat, comprising only a minor proportion of the entire surface, provides as much anti-skid or anti-slip protection as though the entire surface were a matte finish.

The area between the stippled areas being glassy smooth may be cleaned as readily as conventional porcelain enamel, thus providing a surface which combines all of the ease of cleaning of a glassy smooth surface with the full non-slip protection of a full matte surface. By a selection of proper color combinations, for the body of

the enamel surface and the stippled areas where the matte finish is provided, one may select a combination which is entirely pleasing to the eye even though the segregated matte surfaces may change their color during use.

In addition to the use of my improved finish as a coating for non-slip surfaces such as in bath tubs and the like, I have found a wide field of use for such finish in the architectural field and particularly as a means for providing a protective and decorative coating on corrugated sheet iron roofing. In such cases, as well as flat panels applied to the walls, either interior or exterior, of a building, the relatively small proportion of the matte finish areas when applied as a stipple coat are effective to break up the large reflectance areas giving the appearance of a full matte finish while at the same time preserving, however, all of the advantages of a smoothly fired finish such as ease of cleaning and the color effects which may be secured with smooth surfaces and which are not possible with surfaces which have a matte finish throughout their extent.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims or the equivalent of such be employed.

I therefore particularly point out and distinctly claim as my invention:

1. A porcelain enamelled article comprising a workpiece with an adherent coating of porcelain enamel, the surface of which is glassy smooth but which has a matte finish stippling of clay, the total area of which is a minor proportion of the whole surface.

2. A porcelain enamelled article comprising a workpiece with an adherent coating of porcelain enamel, the surface of which is glassy smooth but which has a matte finish stippling of finely divided mineral material which is substantially infusible in the firing range of said enamel and has a fineness such that substantially all will pass through a 200 mesh sieve, the total area of which is a minor proportion of the whole surface.

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