METHOD OF ETCHING GLASS

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ABSTRACT

A method of etching glass, and particularly relatively large glass plates, to provide art form panels. A material resistant to acid, such as asphaltum, is applied to a surface of the glass plate with the exposed portion of the surface constituting the pattern to be etched. The backside and edges of the plate are masked with a coating of an elastomer covered with an acid resistant material, such as asphaltum. The panel is placed in a bath of hydrofluoric acid having a concentration of 20 percent to 30 percent with the surface to be etched facing downwardly. During the etching process the bath is maintained at a temperature of about 80°F and the panel is maintained in the bath for the desired period of time to obtain a deeply etched pattern. After etching the panel is removed, neutralized and rinsed with water.

8 Claims, 3 Drawing Figures
METHOD OF ETCHING GLASS

BACKGROUND OF THE INVENTION

Glass articles have normally been etched in the past by masking certain portions of the glass article with acid resistant material, such as asphaltum, and then subjecting the exposed surfaces to hydrofluoric acid which will attack and etch the exposed glass.

In the traditional methods hydrofluoric acid is applied to the glass article by pouring or brushing the acid on the surface to be etched, or in some cases, the article is placed in an acid bath. In the techniques used in the past, the article was normally subjected to the action of the acid for a period of only several minutes to provide a generally matte finish for the exposed portions of the glass.

SUMMARY OF THE INVENTION

This invention relates to a method of etching glass and particularly to etching relatively large glass plates for use as art form panels. In accordance with the process of the invention, a material which is resistant to acid, such as asphaltum, is applied to a surface of the glass plate in a desired pattern with the exposed portions of the glass surface constituting the design to be etched. The backside of the plate is coated with an emulsion of an elastomer, such as latex or acrylic resin, and after drying, a layer of asphaltum is applied to the dried coating of the elastomer. The edges of the plate can be masked either by acid resistant tape, or applying coatings of the elastomer and asphaltum to the edges.

After proper masking, the plate is placed in a bath of hydrofluoric acid with the surface to be etched facing downward. The acid preferably has a strength in the range of 20 percent to 30 percent and is maintained at a temperature of about 80°F. To provide the desired deeply etched pattern, the plate is maintained in the bath for a period of 17 to 24 hours and after this period, the plate is removed from the bath, neutralized and rinsed with water. The masking is then removed from the plate.

The process of the invention provides a deeply etched pattern, which has unusual edge contours providing a very striking appearance for the panel. The downward disposition of the surface to be etched in the acid bath is particularly important in providing this unusual etched contour.

The plates etched in accordance with the process of the invention can be used for windows, dividers, or decorative panels in churches, office buildings, schools, hospitals, theatres, or the like. While the invention has particular application to the etching of glass plates, it can also be used to etch mirrors or other glass articles.

Other objects and advantages will appear in the course of the following description.

The drawings illustrate the best mode presently contemplated of carrying out the invention.

In the drawings:

FIG. 1 is a perspective view of a glass panel etched in accordance with the process of the invention;

FIG. 2 is a cross section of the glass panel showing the etched contours; and

FIG. 3 is a fragmentary vertical section showing the glass plate located within the acid bath.

FIG. 1 illustrates a glass plate, which is etched in accordance with the process of the invention. The etched pattern in the glass can be any desired design or configuration, and may take the form of figures, landscapes, abstract designs, or the like.

In accordance with the process of the invention, a coating of an acid resistant material, such as asphaltum, wax or the like, is initially applied to one surface of the glass plate in the form of a pattern or design. The exposed portion of the glass surface constitutes the pattern to be subsequently etched. If a specific design or figure is to be applied to the surface of the plate, a convenient method of applying the same is to position a drawing of the design beneath the transparent glass plate. The drawing can then be traced on the upper surface of the plate using the asphaltum or wax. On the other hand, if an abstract design is to be applied to the surface of the plate, the asphaltum can be applied directly to the surface of the plate in the desired pattern.

Various surface textures can be achieved in the final etched product by varying the manner in which the acid resistant material is applied to the plate surface.

For example, if the acid resistant material is applied to certain areas of the plate as a continuous dense coating, etching of these masked areas will be prevented. A stippled pattern of etching can be achieved by applying the acid resistant material with a sponge or foam rubber. In addition, the material can be applied to the surface by use of strings, squeegees, rollers, crinkled paper, or any other manner to provide an interesting abstract design.

The backside 4 of the glass plate is preferably protected during the etching process by applying a suspension of an elastomer 5, such as a rubber latex or acrylic resin, to the backside of the plate. After drying, an outer protective coating of asphaltum of wax 6 can be applied over the elastomeric layer. The use of the elastomer on the backside has an advantage in that after the etching process has been concluded, the elastomeric coating can be stripped from the glass surface in the form of a single sheet, as opposed to the asphaltum, which must be scraped from the glass surface.

The edges 7 of the glass plate can be protected by either using an acid resistant tape which is applied to the edge surfaces, or alternately, by applying coatings of the elastomer and asphaltum to the edges in a manner similar to that described with respect to the back surface.

After the desired design has been applied to the surface 3 of the plate, and the edges 7 and back surface 4 have been satisfactorily masked, the plate is placed in a vat or tank 8 containing hydrofluoric acid 9, as illustrated in FIG. 3. The construction of the vat 8 itself forms no part of the invention, and the inner surface of the vat is preferably lined with lead or other material which will resist the corrosive attack of the hydrofluoric acid. As shown in FIG. 3, the plate 1 is submerged within the hydrofluoric acid bath 9 and the surface to be etched faces downward toward the bottom of the vat and is spaced from the bottom surface by a series of supports 10. While FIG. 3 shows a single glass plate 1 located in the vat, in practice, racks containing a series of plates can be positioned in the vat.

While the thickness of the glass plate 1 is not critical to the invention, it has been found that a deeply etched pattern is most striking, and therefore, the glass preferably has a thickness in the range of three-eighths to one-half inches and it is preferred that the etched areas have a depth up to one-fourth inches.

The acid preferably has a concentration in the range of 20 to 30 percent by weight, and during the etching
process higher concentration acid can be added to the bath, if necessary, to maintain the concentration in the desired range.

Most favorable etching results when the bath is maintained at a temperature in the range of 50°F to 100°F, and preferably about 80°F.

As a deeply etched pattern is preferred, the plate is usually maintained in the bath for a period of about 17 to 24 hours, with approximately 20 hours being preferred.

In order to provide the desired etching pattern, the surface 3 to be etched should face downwardly in the bath. This downward disposition of the surface to be etched has advantages in that it results in the formation of tapered or sloped areas connecting the unetched and fully etched regions. As shown in FIG. 2, the portion of the surface 3 covered by the asphaltum 2 will not be attacked by the acid. As the surface to be etched faces downwardly, the exposed glass is etched away in a sloping pattern as indicated by the areas 11. This etching action is different from that which occurs if the surface to be etched faces upwardly, in which case the acid would attack and undercut the area beneath the protected portions 2, so that the sloping areas 11 would not be present. Facing the surface to be etched downwardly has the added advantage that any glass particles which are dislodged by the corrosive attack of the acid will fall downwardly by gravity and will be removed from the surface to be etched.

After the etching operation has been concluded, the glass plate 1 is removed from the acid bath and preferably neutralized with lime or other alkaline material and then rinsed with water. After rinsing, the plate is cleaned of all the asphaltum and the elastomer, rinsed again, dried, and is then ready for installation. As previously noted, the layer of the elastomer enables the entire protective film on the backsurface of the plate to be readily stripped therefrom, while the asphaltum on the opposite surface must be scraped away.

The glass panels produced by the method of the invention have a deeply etched pattern with unusual striated contours interconnecting the fully etched and unetched portions of the surface. Any desired pattern or design can be etched in the glass surface such as portraits, figures, landscapes, abstract designs, and the like.

The panels produced by the process of the invention can be used as windows, decorative panels, or dividers, in churches, office buildings, schools, hospitals, theatres, or the like. While the process has particular application to the etching of large glass plates, it can also be used for smaller glass objects.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention. I claim:

1. A method of etching glass, comprising the steps of applying a pattern to a surface of a glass article with an acid resistant material, with the remaining exposed portion of the glass surface constituting the area to be etched, positioning the glass article in a bath of an acid capable of attacking the glass with the exposed portion of the glass article facing downwardly within the bath, maintaining the temperature of the bath in the range of 50°F to 100°F, said acid acting to attack and etch the exposed portion of the glass to provide the desired etched pattern, and removing the article from the bath.

2. The method of claim 1, wherein the bath is an aqueous solution of hydrofluoric acid having a concentration in the range of 20 percent to 30 percent by weight.

3. The method of claim 1, and including the step of maintaining the glass article in the bath for a period of 17 to 24 hours.

4. The method of claim 1, wherein said glass article is a glass plate having a front surface to be etched and having a back surface and having edges connecting the front and back surfaces, said acid resistant material being applied to the edges and the back surface to completely cover the same.

5. A method of etching a surface of a glass plate having a first surface, an opposed second surface and edges connecting said first and second surfaces, comprising the steps of applying a pattern to the first surface of the glass plate with an acid resistant material, the remaining exposed portion of said first surface constituting the area to be etched, applying an acid resistant material to the edges of the plate, applying a coating of an elastomer to the second surface of the plate, applying a coating of an acid resistant material over said elastomer on said second surface, positioning the plate generally horizontally in an aqueous bath of hydrofluoric acid having a concentration in the range of 20 percent to 30 percent by weight and facing said first surface downwardly within said bath, maintaining said plate in said bath for a period of 17 to 24 hours to cause said acid to attack and etch the exposed portions of the first surface, and removing the plate from the bath.

6. The method of claim 5, wherein said bath is maintained at a temperature of about 50°F to 100°F.

7. The method of claim 5, wherein said acid resistant material applied to the edges of the plate comprises an acid resistant tape.

8. The method of claim 5, wherein said acid resistant material is asphaltum.

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