Sept. 18, 1934. J. J. BURGESS 1,974,011

PROCESS FOR MECHANICALLY CORRODING RELIEF INTAGLIO VARIEGATED SURFACES ON METAL

Filed May 16, 1932

Fig. 1.

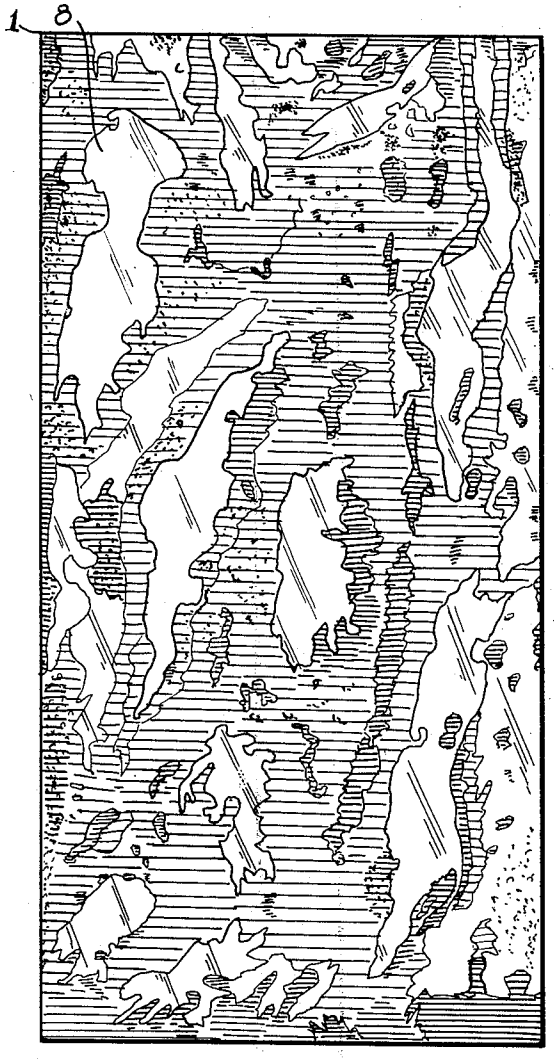


Fig. 2.

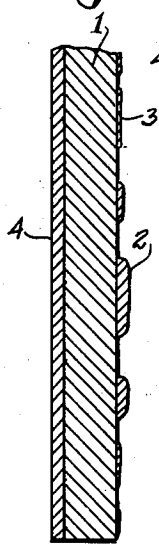


Fig. 3.

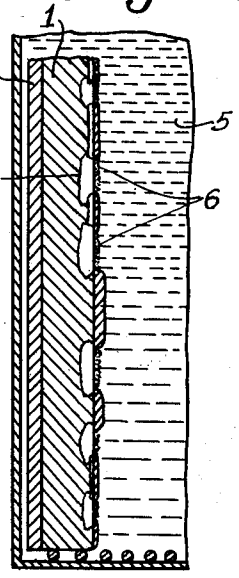
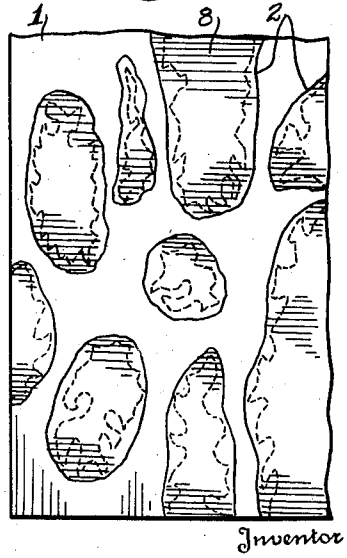


Fig. 4.



Inventor

JOHN J. BURGESS

By Mason Fenwick & Lawrence

Attorneys

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1,974,011

PROCESS FOR MECHANICALLY CORRODING RELIEF INTAGLIO VARIEGATED SURFACES ON METAL

John J. Burgess, Rock Island, Ill., assignor to Rock Island Register Company, Rock Island, Ill., a corporation of Illinois

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3 Claims. (Cl. 41—43)

This invention relates to a process for mechanically corroding relief intaglio variegated surfaces on metallic sheets or metallic articles either before or after fabrication for the purpose of producing an ornamental erratic pattern or surface in relief which is permanent, since it is etched in the metal itself, and capable of being given color effects as desired, by ordinary processes of electro-plating, the application of lacquer, etc.

The principal object of the invention is the provision of an etching process for producing the ornamental intaglio surface as above described, characterized by the fact that while the general motif of the design or pattern is controlled by a protective spotting, manually applied, and of such elemental nature as to require but a modicum of skill on the part of the operator, the conditions of the etching are such as to cause the acid to break from the restraint imposed by the manual spotting and to underbite said spotted areas imparting irregular, indented, devious outline to the high relief areas produced by the spotting, materially changing their shapes so that they are by no means replicas of the original spotting, but assuming shapes which are practically inimitable by hand work, and depending but little upon the skill of the operator who did the spotting. At the same time, the acid bites depthwise in an erratic manner into the unprotected areas producing reliefs of different levels and leaving the contours of the surface in a very irregular condition.

Another object of the invention is the provision of the process as above described in which by applying the protective coating in spots of different degrees of coverage, different and vagarious relief effects are obtained.

A further object of the invention is the provision of an etching process including in combination with the spotting of the surface to be processed, as described, the step of coating the unprotected portion of the surface with sponge copper autogenously derived from the etching bath, said coating accelerating the corrosive action of the acid, and causing the erratic and irregular biting of the underlying surface and the lateral biting of the margins beneath the spotted areas.

Other objects of the invention will appear as the following description of a preferred and practical embodiment thereof proceeds.

In the drawing which accompanies and forms a part of the following specification and throughout the several figures of which the same characters of reference have been employed to designate identical parts:

Figure 1 is a plan view of a metal sheet illustrating somewhat diagrammatically the nature of the variegated surface;

Figure 2 is a vertical section through a portion of a metal plate showing one side covered by a protective coating and the other side interspersed with spots of the protective coating, of various degrees of continuity of coverage;

Figure 3 is a sectional view showing the metal in the etching bath; and

Figure 4 is a plan view partly diagrammatic illustrating the manner in which the acid underbites the edges of the original spotting.

Referring now in detail to the several figures, the numeral 1 represents a metal sheet, steel for example. To prepare it for the process, it is first cleaned in any suitable known manner in order to free it from grease. The back surface or those parts which it is desired shall be left in their original state is coated with a suitable protective material such for instance, as asphalt or bitumen. The face side or that surface which is to be processed is spotted with various small areas of asphalt or the like, preferably, although not necessarily, applied with a stiff bristled brush and in different degrees of coverage, that is to say, some of the spots being solid unbroken areas while others are striated by the bristles of the brush. The asphalt is dried either at atmospheric temperature in the air or in an oven at a suitable heat. In the illustrative embodiment of the invention as herein described, an air drying for two hours or drying for one-half hour at a temperature of 200° F. is recommended.

The metal sheet thus prepared is then subjected to a bath in an aqueous solution of copper sulphate and sulphuric acid. The solution may be made by dissolving the copper sulphate in water until the solution stands at from 12° to 20° Baumé, or until the solution is saturated. The sulphuric acid is then added, stirring it in until the solution stands at from 20° to 30° Baumé.

In Figure 2, the solidly spotted areas are designated by the reference character 2, while the reference numeral 3 indicates a spotted area less solidly coated and which will eventually be undercut by the acid and bitten to a lower relief than the surface underlying the more solid coating 2.

The back of the plate 1 is shown protected

by a uniform layer 4 of bitumen or any suitable acid-resistant coating.

When the sheet prepared with the protective spotting is immersed in the etching bath, a thin spongy coating of copper will form on that part or those parts not covered by the asphaltum and will stay on the unprotected surface as long as the operation is in progress. The copper sponge acts by capilarity to bring and hold the solution against the material, making it active and erratic, causing a corrosion which leaves the attacked surface in a very irregular condition.

On those parts which are coated with the asphalt, the corrosion takes place at a rate varying with the nature of the spotting. The parts to which the asphalt has been applied solidly, will be less attacked depthwise by the solution, than parts where it is applied in striated areas, and of course, where there is no asphalt the solution attacks the surface a great deal faster, thus bringing out the many and varied designs and figures. The margins of the coated areas will be attacked laterally by the acid, the latter eating in under the asphalt and defining shapes which are quite different from the shapes of the areas as spotted. Some parts of the unprotected surface will be under-bitten by the acid, thus leaving lights and shadows in the finished product. The surface will be left in reliefs of different elevations, those parts which are the more completely protected by the asphalt being in high relief while the parts less fully protected will stand at a lower level.

There is not much left to the skill of the operator. The chemical action of the solution reacts differently over the entire surface of the material. No two pieces are exactly alike and never like the designs applied with the asphalt or bitumen, even though the asphalt spotting on two pieces were done substantially alike.

Figure 3 illustrates what takes place in the acid bath. The sheet 1 is shown immersed in the etching solution 5. The unprotected surface 6 is shown covered with a layer of sponge copper. Beneath this layer the surface is shown at 7 eaten away both depthwise and laterally beneath the adjacent protected areas.

In Figure 4 the areas 2 represent the original coated spotting. The areas 8 bounded by the broken lines indicate the shapes of the eventuating reliefs caused by the lateral biting of the acid beneath the protected areas. The transversely shaded areas in Figure 1 represent the originally unprotected surface of the sheet plus the laterally attacked margins of the spotted areas, differences in character of the hatching indicating the vagarious irregularities incident to the action of the acid through the sponge copper.

The sheets are left in the solution from six to twelve hours, depending upon the desired effects. Upon removal from the bath, the sheets or articles are immersed, in a hot lye solution for the removal of the asphalt. They are then brushed with pumice and water or an equivalent detergent which removes the copper sponge, cleanses the surface and leaves it in the relief intaglio variegated condition to be considered either a finished product, or ready for any further finish or color application that one may desire to apply.

While the drawing illustrates the processing of only one side of the sheet, it is obvious that both sides can be processed by spotting each side and treating the material in every way the same as has already been described.

It is also possible to nickel-plate that side or those parts of the material which it is not desired to process, by first coating with the bitumen or asphalt the portions which it is desired to process and then electroplating the exposed surfaces with nickel. This will prevent action of the etching solution upon the parts so plated. The asphalt is then cleaned from the side intended for processing, and it is then spotted and processed in the manner hereinbefore described.

While I have in the above specification disclosed what I believe to be a preferred and practical embodiment of the invention, it is to be understood that the specific requirements of the process such for instance, as the drying time, the nature of the material used for the protective coating, the strength of the solution, and the expedients employed to protect the parts not to be processed and to remove the sponge copper and the asphalt or bitumen from the processed surface after the completion of the etching, are merely illustrative and not to be considered as limiting the scope of the invention as claimed.

What I claim is:

1. Process for chemically corroding relief intaglio variegated surfaces on metallic bodies comprising applying to a metallic surface a desultory spotting of acid resistant material, and subjecting the resist spotted plate to a solution of a metallic salt and acid whereby a pervious coating of sponge metal is formed on the exposed portion of the surface and an irregular etching of said exposed surface depthwise and laterally beneath the margins of the spotted areas is produced through the erratic accelerating capillary action of the pervious sponge metallic coating.

2. Process for chemically corroding relief intaglio variegated surfaces on metallic bodies comprising applying to a metallic surface a desultory spotting of said resistant material and subjecting the resist spotted plate to a solution of copper sulphate and sulphuric acid whereby a pervious coating of copper derived from said solution is formed on the exposed portion of said surface, and an irregular etching of the exposed surface depthwise and laterally beneath the margins of the spotted areas is produced through the erratic accelerating capillary action of the pervious copper coating.

3. Process for chemically corroding relief intaglio variegated surfaces on metallic bodies comprising spotting a metallic surface in desultory manner with acid resistant material in areas of different degrees of coverage, and subjecting the resist spotted plate to a solution of copper sulphate and sulphuric acid thereby simultaneously forming a pervious coating of copper on the exposed portion of the surface, and irregularly etching the exposed surface depthwise and laterally beneath the margins of the spotted areas, through the erratic accelerating capillary action of the pervious copper coating, and continuing the etching until the spots of least coverage have been under eaten by the acid.

JOHN J. BURGESS.