May 18, 1954 E. W. FUERST ET AL 2,678,510

METHOD OF MAKING RELIEF PRINTING PLATE MATRICES AND ARTICLE

Filed March 20, 1952

FIG. 1.

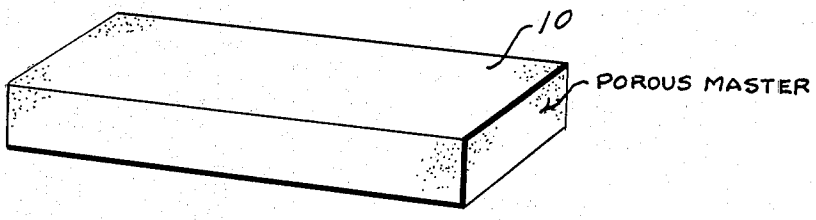


FIG. 2.

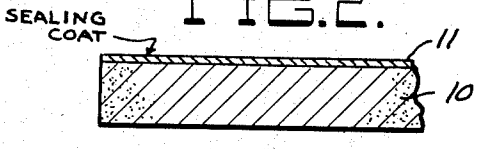


FIG. 3.

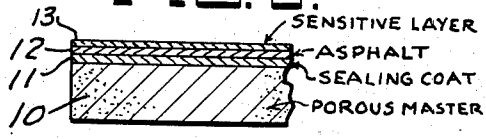


FIG. 4.

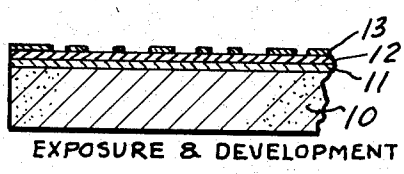


FIG. 5.

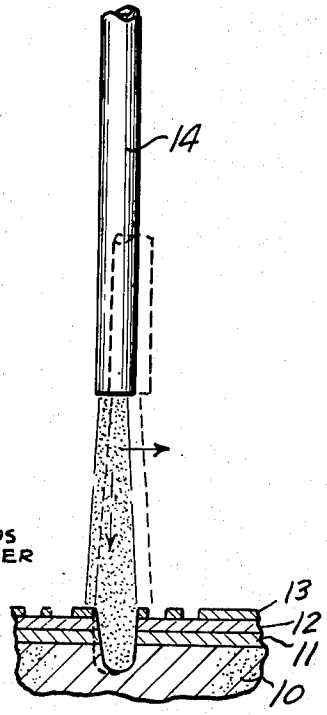
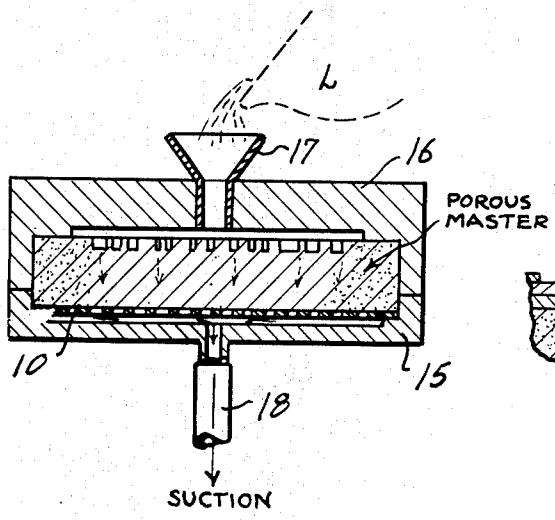


FIG. 6.



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METHOD OF MAKING RELIEF PRINTING PLATE MATRICES AND ARTICLE

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5 Claims. (Cl. 41—39)

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This invention relates to the art of relief printing.

In one aspect, this invention consists in a new and improved method for photomechanically making masters for printing plates in an efficient and economical manner, greatly reducing the time and cost herebefore required for this purpose. It is particularly advantageous in the production of printing plates in which the relief pattern is of quite considerable depth and where greater fidelity than has heretofore been possible is of importance. The well-known acid etching process, as well as attempts in this direction from the use of sandblasting, have not resulted in achieving the desired depth of cut. One major difficulty has resided in the undercutting of the pattern when effort has been to produce a design of an unusual depth. This difficulty is obviated according to this invention, and a commercially satisfactory method is produced by which rubber printing matrices, for example, can be made in a practical, efficient and economical manner so that a faithful and sharp reproduction results, in which the relief is much deeper than could heretofore be produced, so far as we are aware.

An object is to produce a new and improved method of photomechanically making a self-sustaining master in which the relief image is formed unusually deep without objectionable undercutting and from which a matrix may be formed.

Another object is to produce a novel method of producing printing plate matrices involving the use of a porous bat or master, forming a relief image thereon photomechanically, and finally casting die metal on the master while the porous master is subjected to subatmospheric pressure.

A further object is to produce an improved method of etching by sandblasting in such manner that not only may the relief image be unusually deep, but uniformly sharp and accurate.

Other objects and advantages will hereinafter appear, and for purposes of illustration but not of limitation, an embodiment of the invention is shown on the accompanying drawings, in which

Figure 1 is a perspective view of a porous master or bat from which the printing plate matrix is formed;

Figure 2 is a fragmentary sectional view showing the porous master with its upper face or surface coated with a sealing layer;

Figure 3 is a fragmentary sectional view showing a succeeding step in which the master having a sealing coat, is successively coated with an asphaltic and a light-sensitive layer;

Figure 4 is a fragmentary sectional view showing the next succeeding step in which the light-sensitive layer is exposed and developed and the undeveloped portions removed to form the stencil;

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Figure 5 is a fragmentary view partly in section showing the action of the sandblasting; and

Figure 6 is a sectional view showing the manner in which the master is utilized in the casting of the matrix and with the porous master subjected to suction or subatmospheric pressure.

In accordance with this invention, the first step is to produce a bat or master of porous material, such as indicated at 10 on the drawings. One satisfactory material is made from plaster of Paris and water, the mixture being cast on plate glass so that the surface is entirely flat and smooth. After the bat is cast, it must be thoroughly and properly dried in order to achieve uniform hardness throughout. The size of the bat may be varied in accordance with the size and shape of the printing die to be produced. After the plaster bat has been properly dried, a sealing coat 11 is applied to the flat surface, i. e. that surface which has been in contact with the plate glass and which, as indicated, is entirely smooth and flat. As will hereinafter appear, an asphalt layer or resist is applied to the sealing coat and the sealing coat must be such as to prevent any penetration of the asphalt coat into the plaster bat. Furthermore, the sealing coat must not penetrate the plaster bat itself. Furthermore, the sealing coat must be softer than the plaster bat in order to provide less resistance than the bat to the action of sandblasting. An exceedingly satisfactory material for the sealing coat is a mixture of starch containing about fifteen percent by weight of glycerin, the starch being first cooked on the slow fire until it jells and thereafter the glycerin being added while hot. Glycerin is found to be desirable since it has a greater affinity for water than does starch and it serves to militate against the plaster bat 10 absorbing the water from the starch. After the mixture has been prepared, the sealing coat is applied to the flat surface of the plaster bat or master and is allowed to air dry for approximately two days.

Another material which has been found satisfactory for use as a sealing coat is a wax emulsion containing the same proportion of glycerin as above mentioned.

After the sealing coat is properly dried, a relatively thin asphalt coat 12 is sprayed upon the sealing coat. The asphalt coat must have a controlled hardness and to achieve this result, asphalt and Gilsonite are mixed together, a suit-

able composition consisting of half of each of these ingredients. Upon the asphalt coat is applied a layer 13 of light-sensitive material. We have found that bichromated glue and bichromated gelatin containing a rubber latex is satisfactory for this purpose, but since this material per se forms no part of the present invention, detail description of same is not considered necessary, it being regarded as sufficient to make reference to the United States Patent to Staehle, No. 2,533,530, dated December 12, 1950.

The light-sensitive layer is exposed to light and a relief image is consequently formed in the sensitive layer, soluble portions of the gelatin being washed away to produce the desired stencil as indicated on Figure 4.

In the next step, the master is subjected to etching by sandblasting and for this purpose, a relatively long nozzle 14 is employed which is relatively movable with respect to the master 10. It is found that satisfactory results can be accomplished by forcing the sand through the nozzle under an air pressure of approximately six pounds per square inch when employing a $\frac{3}{16}$ inch nozzle. The depth of the cut in the master may be controlled either by varying the blasting pressure or the time during which the master is subjected to the blast. The purpose of a relatively long nozzle is to straighten the trajectory of the grains of sand so that they impinge against the master in an almost straight vertical fashion. The relatively low air pressure employed is to prevent undesired fanning of the stream issuing from the nozzle 14, and thereby militate against undercutting. Figure 5 diagrammatically illustrates the action of the sandblast as above described. The sand is blasted through the several layers as defined by the stencil and when directly over the area to be blasted, it wears away a groove or cavity, the side walls of which are slightly tapered. However, as the relative movement occurs between the nozzle 14 and the master 10, the slight fanning which occurs in the stream and which is of less intensity, not only straightens out the sides of the cut, but also effects a deeper cut.

One important feature resides in controlling the degree of hardness of the several layers and the master. In the ideal situation, the resistance to the sandblast should range from the plaster master as the greatest, to the asphalt as the least. It is most important that the plaster should be the most resistant of these layers, it being manifest that the sandblast should pass readily through the asphalt layer as well as the sealing coat. In this manner, an unusually deep relief image may be produced with exceedingly sharp and accurate pattern. This unusual depth is of particular importance in the ultimate production of a rubber printing plate, as will be readily recognized by those skilled in this art.

After the sandblasting, the several layers are removed, as for example by immersion in hot water. In this connection, since the starch sealing coat is quickly removed by hot water, the superposed asphalt coat is more readily removed.

Thereafter, the master bat 10 with the relief image sandblasted on the flat surface thereof, is placed in a receptacle 15 and upon the upper surface of the master is placed a cope 16 which is also of porous plaster of Paris. Molten metal is poured from a ladle L into a sprue 17, substantially filling the sprue and at the same time, the under side of the master 10 is subjected to subatmospheric pressure or suction through the tube 18. In view of the porosity of the master and cope, the master cavity is evacuated, and this not only produces a printing plate matrix which is homogeneous throughout, but also facilitates the casting operation.

It is to be understood that numerous changes in details of construction, arrangement, operation and choice of materials may be effected without departing from the spirit of the invention especially as defined in the appended claims.

What we claim is:

1. An article for use in the production of relief printing plates, comprising; a master of air pervious, friable material; a sealing coat on the master, an undercoat of asphalt on the sealing coat, and a layer of light-sensitive material on the undercoat, whereby a relief image may be formed in said master by exposure of the layer to light, washing away unhardened portions thereof and removing the coat, layer and a portion of the master by sandblasting through those parts of the layer where portions thereof have been removed.

2. The combination claimed in claim 1, said sealing coat being less resistant to sandblast than said master, and said asphalt layer being less resistant to sandblast than the sealing coat.

3. The method of making masters for use in the production of relief printing plates which consists in producing a master of air pervious, friable material, coating the surface of the master successively with a sealing coat, an undercoat of asphalt and a layer of light-sensitive material containing rubber latex, forming a relief image in said layer by exposure to light and washing away unhardened portions thereof, and removing the coat, undercoat, layer and a portion of the master by sandblasting in those parts of the layer where portions thereof have been removed with a stream perpendicular to the master under air pressure which is equivalent to that of approximately six pounds per square inch when employing a $\frac{3}{16}$ inch nozzle.

4. The method of making matrices for relief printing plates which consists in producing a porous master having a relief image sandblasted therein, casting the printing plate matrix, and concomitantly with the casting step, evacuating the master through the porous structure thereof.

5. The method of making a matrix for relief printing plates which consists in producing a master of air pervious friable material, coating the surface of the master successively with a sealing coat, an undercoat of asphalt and a layer of light-sensitive material containing bichromated gelatin, glue and rubber latex, forming a relief image in said layer by exposure to light, removing unhardened portions of the light-sensitive material by immersion in a solvent, sand blasting through those part of the layer where portions thereof have been removed thereby to form the relief image in the master, removing the coat, undercoat and layer, casting the printing plate matrix on the master, and concomitantly with the casting step evacuating the master by applying suction to the reverse side thereof.

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