

June 30, 1942.

D. B. NOLAND ET AL

2,288,020

METHOD OF MAKING A PRINTING SCREEN

Filed March 27, 1939

Fig. 1.

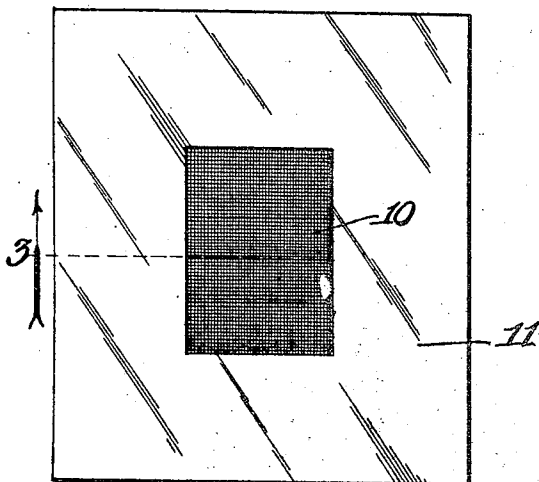


Fig. 2.

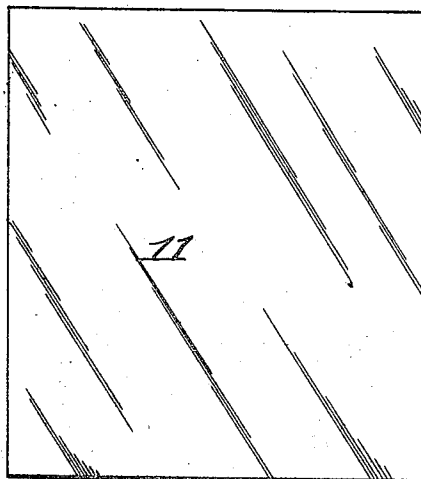


Fig. 3.

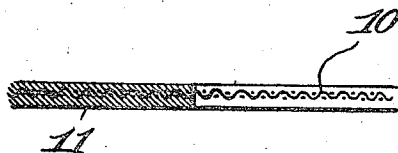
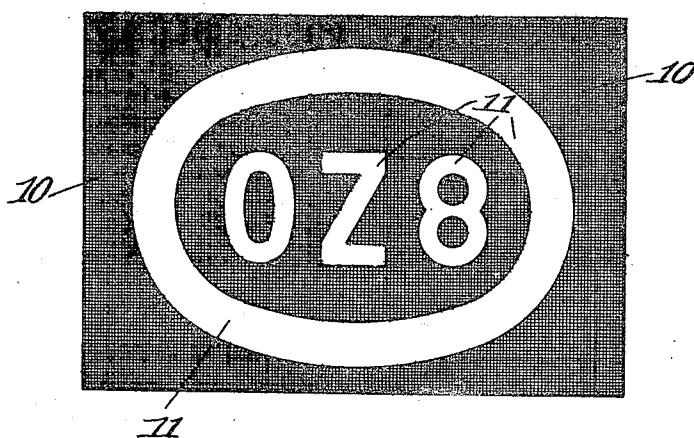


Fig. 4.



Inventors:
David B. Noland & Co
Murray L. Loftin,
By Chritton, Wiles, Davies, Kirschke & Dawson,
Attys.

UNITED STATES PATENT OFFICE

2,288,020

METHOD OF MAKING PRINTING SCREENS

David B. Noland and Murray L. Loftin,
Nashville, Tenn.

Application March 27, 1939, Serial No. 264,438

2 Claims. (Cl. 41—38.5)

This invention relates to a metallic printing screen and to the method or methods of making the same.

In the commercial printing practice as employed today, silk or metal screens are provided with a gelatin material or other protective material which blocks out areas of the screen through which coloring material is not passed, those portions of the screen which are left open for the printing of colors serving to form the design. One major difficulty is the relatively short life afforded by the glue or gelatin. Another objection is the jagged lines or irregular lines and pinholing around the edges of the design and over the entire screen due to the breaking out of the gelatin filler from the openings in the supporting screen. This necessitates stopping production to repair or exchange screens. Another objection is the oil soaking and swelling of the gelatin layer. A further objection is the fact that this type of screen is limited to certain kinds and types of paint, paste, and ink mediums and vehicles, used. It is also found that with this type of screen, there is premature wear when the screen is forced onto irregular shapes and surfaces being printed.

An object of the present invention is to overcome the above difficulties, to provide a metal screen which has a long life and which enables a sharp reproduction to be obtained, avoiding pinholes, etc. A further object is to provide an all-metal screen in which the protecting or blocking areas are formed of metal which impregnates the screen and is integrally formed therewith, the design being sharply formed through the etching of the metal blocking area without etching of the screen. Another object is to provide a simple and effective method for forming an all-metal screen wherein a screen of one metal is impregnated with a metal foil, the metal foil being etched through by a mordant which does not substantially attack or merely slightly attacks the metal screen. Other specific objects and advantages will appear as the specification proceeds.

The invention is illustrated, in a preferred embodiment, by the accompanying drawing, in which—

Figure 1 is a view of a composite metal plate with a screen embedded therein which is employed prior to the forming of the printing screen, the central part of the plate being cut away to expose the screen embedded therein; Fig. 2, a metal foil sheet which is placed on the screen for forming the composite plate shown

in Fig. 1; Fig. 3, an enlarged transverse sectional view, the section being taken as indicated at line 3 of Fig. 1; and Fig. 4, a plan view of a printing screen embodying our invention.

In the practice of our invention, we select a screen 10 which is not affected or only slightly affected by a selected mordant, and impregnate the screen thoroughly with a metal foil which is readily attacked by the mordant, the metal foil being indicated by the numeral 11. Any suitable method for applying the metal foil to the screen and incorporating it therewith may be employed. If desired, a sheet of metal foil 11, as illustrated in Fig. 2, may be placed upon the screen and the screen with the foil sheets is then passed between compacting rollers which press the metal foil about the screen and incorporate it so firmly therewith that it is substantially integral in effect. The result is a composite metal plate in which the metal foil becomes a substantially integral part thereof with the screen embedded in the metal.

The screen is preferably located in the upper part of the composite plate so that there is left below the screen a space which is substantially equal to the entire thickness of the plate less the thickness of the screen. This space below the screen aids in giving a sharp separation, as will be later described.

After the composite plate is completed, we use a procedure similar to that used in the production of half-tone intaglio plates. The composite plate is treated, sensitized, exposed with the desired design, developed, made resistant to an etching mordant, and then exposed to the etching process. The selected mordant will attack readily the metal filler, leaving only slightly attacked the screen structure. The desired design is etched through the metal filler and the resultant screen is stretched on a special frame and tested. The joint formed by the screen and the edge of the frame is then sealed with paper tape so as to form a well for the printing inks or pastes that are used. The subject is printed from the bottom of the resultant screen.

The metal used for the wire screen and the metal used for the filler may be selected from a number of available materials. The two metals forming the composite sheet may be combined by either dipping, rolling, spraying, scraping, etc., any metals, such as zinc, aluminum, solder, or alloys, or similar metals into the mesh of a bronze, copper, Monel, stainless steel, steel,

etc., or alloys of metal cloth of the desired weave, mesh, and thickness, so as to completely cover and fill the entire openings or meshes of the screen or wire cloth. The important requirement is that the screen not be affected by the mordant which is used for etching the filler. For example, a wire screen of cloth or bronze or other metals may be used in combination with a foil or filler of zinc, aluminum, copper, or alloys of these and other metals. In combining the filler with the screen, a number of methods may be used. Pressing the foil about the wire is effective in that it produces a smooth surface, free of blemishes, with the screen structure embedded therein and preferably on the top side of the sheet. The composite sheet can also be made by spraying the metal filler on to the wire by the process known as metalizing. The resultant plate is then rolled to give the smooth surface desired. Another method is to coat the wire mesh on one side with a metallic paint of electrolytic conductance properties. The coated screen is then plated through the wire screen by the electrolytic process. The metallic paint is stripped off and the plated screen, if necessary, rolled to give the smooth surface desired. It is obvious that many other methods may be used.

The principal property desired and obtained in the composite sheet or plate is the intricate bond between the wire screen and the material used as a filler and the resultant smooth surfaces on the sheet. It is necessary that the wire mesh be embedded and locked in the foil, the sprayed metal, or the plating, etc. A definite thickness of metal exists beneath the wire screen and the outside or bottom foil surface. This thickness of metal is substantially the difference in the thickness of the composite material and the thickness of the embedded wire screen. It is an important factor that contributes to the clean, sharp lines of the printed design because after the printing inks or pastes have been forced through the open screen of the design, they have space to heal the break caused by the screen. This thickness of metal enables a smooth, uniform deposit of ink or paste to be made when printing. It also helps control the thickness of the application which gives a heavy or thin coverage.

The following may be given as a specific example of a method which may be employed in forming the printing screen after the composite metal plate has been formed.

The composite metal plate is laid on a suitable block, plate, or frame, and the surface is cleaned with powdered pumice-stone and water until bright metal appears which will hold water and shows no signs of grease or fingerprints or any foreign matter. While still wet, the surplus water is run off by flowing a generous amount of albumen ammonium bichromate sensitizing solution or any of the well known copper or zinc plate coating solutions known to the photo-engraving trade as cold top enamel. This is then placed in the whirler in a dark room and whirled and heated at the same time, taking care to get a smooth, even coating over the entire surface. As soon as the solution becomes dry, an opaque negative of the regular type or opaque drawing is laid with the face side of the negative or drawing in contact with the solution side of the metal and exposed to a carbon arc-light for seven minutes which sets up the solution where the light penetrates the negative, and where the

light does not contact the solution or under the opaque portion of the negative, the solution is unexposed. Then the metal is covered with a thin coating of etching ink or similar material and then placed under a stream of running water which washes away the ink and solution from the unexposed portion of the solution, leaving the design showing with the bare metal exposed where the light did not contact or under the opaque portion of the negative. After the solution is completely developed, dry off with a chamois by blotting the surface softly. The surface is then covered with a coating of dry dragon's blood, asphaltum, or rosin, or any of the well known etching or topping powders and then the surface is brushed lightly so as to brush all of the excess dragon's blood off of the clean portion of the metal, taking care to leave a generous amount clinging to the etching ink. This is then placed in an oven or can be held over an open flame face up until the powder has melted and sealed all small pinholes and around the edges of the design so that the etching mordant cannot etch away the original sharpness of the design. The back side of the metal is then painted or blocked out with a suitable material, such as asphaltum, rosin, shellac, or lacquer, so as to have no metal showing. This is then dried and tacked on a suitable frame. It is now ready for etching.

The design can also be obtained by painting or laying the design with any acid resisting material so as to leave the portion of the screen which is required to print unpainted and then backed up or blocked out on the back side in the regular way. Or by a previously sensitized and exposed sheet of gelatin or carbon tissue which is laid upon the metal and then squeezed into place in such a manner as to get an acid-resisting background.

The composite metal screen is then placed in a suitable container containing a suitable etching mordant. A mordant for etching aluminum interlocked with bronze wire is one part nitric, one-half part iron chloride, 40° Baumé, two parts water, one-half part saturated solution gum arabic, the strength depending on the weather and on the type of metal being etched away from the screen and the kind of screen being used. A mordant consisting of 2% nitric acid solution is suitable for etching zinc interlocked with bronze or stainless steel or steel. After the mordant has etched away the metal so that the screen can be seen from the face side, it is then removed from the etching bath and dried off, then reheated so as to remelt the protecting etching ink and dragon's blood over the edges of the design so as to hold them sharp and prevent undercutting of the design. It is then replaced in the etching bath and with a small amount of agitation will soon etch all of the remaining metal from between the meshes of the wire screen or cloth. As soon as the etching action has stopped, the screens should be removed from the etching bath and rinsed off with clear water, dried, and the protective backing and etching ink removed with gasoline or similar solvents and removed from the etching frame.

The screen is then placed on a suitable frame with the face side opposite the frame. The frame should be of the stretcher type on which the screen can be stretched at any given point. After all the slack has been removed and the screen stretched reasonably tight, it is ready for use in the usual way.

By incorporating only one sheet of foil with the wire cloth, we are able to form the wire on one side with the foil material on the other, the foil metal, however, penetrating between the openings in the wire cloth and forming on the other side a smooth even surface, with, however, a part of the wire cloth surface being visible. Other methods of impregnating the cloth may be used, as before stated.

The mordant described slightly affects the screen, but because of the fact that the wire side of the screen is blocked off with a suitable material, such as asphaltum, etc., the mordant does not have much opportunity to attack the screen. Since the etching is done from the metal foil side of the wire, the plate is etched about 35% through before the mordant comes in contact with the wire screen. From this point, the filler metal is attacked by the mordant at so much greater rate of speed than is the wire screen that there is very little or no effect on the screen.

The new screen has a decided advantage over the silk screen in that it lends itself readily to be pre-formed so as to conform to irregular shapes and surfaces. Where pre-forming is practical, unusual stress and strain on the screen is avoided.

The results obtained with the metallic screen made by this process are safe. The edges of the designs are smooth in comparison with the ragged effects heretofore produced, thus producing a more pleasing appearance in the design, a smoother effect, and a much more perfect and neatly printed design. A longer period of service is obtainable under the same conditions. Temperature and atmospheric conditions do not affect

the new screen. A greater variety of inks, paints, and pastes may be employed without affecting the filler.

While in the foregoing description, we have set forth certain specific examples, it will be understood that such examples may be omitted and well known equivalents substituted therefor, and other details in the methods and steps employed may be varied widely in accordance with well known practice and without departing from the spirit of our invention.

We wish it to be understood that we do not desire to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

We claim:

1. A method of forming a printing screen, comprising impregnating a wire screen of bronze with aluminum foil, forming a protective thermoplastic layer about said foil, etching the composite sheet with a mordant for said aluminum foil, drying the plate, heating the same to melt the protective layer, and then re-etching the same in the mordant bath while agitating the bath.

2. A method of forming a printing screen, comprising impregnating a metal wire screen with a filler consisting of a different metal, forming a protective thermoplastic layer about said filler metal, etching the composite sheet with a mordant for said metal filler, drying the plate, heating the same to melt the protective layer, and then re-etching the same in the mordant bath.

DAVID B. NOLAND.
MURRAY L. LOFTIN.