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3,586,610

METHOD OF MAKING A PRINTING PLATE FROM A SCREENLESS PATTERN

Filed Sept. 26, 1968

2 Sheets-Sheet 1

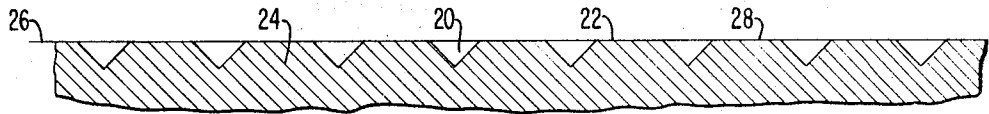


FIG. 1



FIG. 2

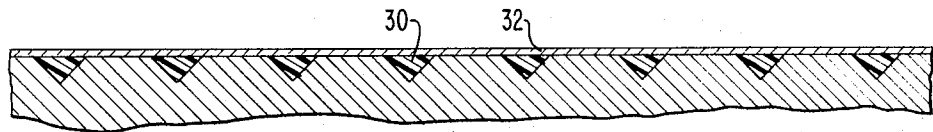


FIG. 3

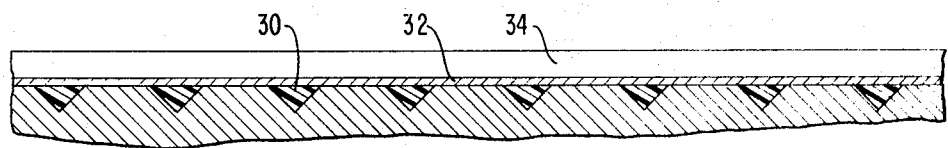


FIG. 4

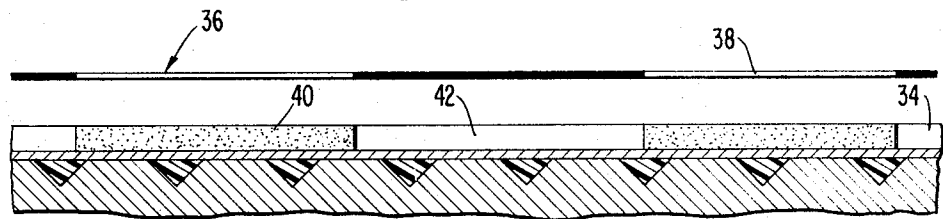


FIG. 5

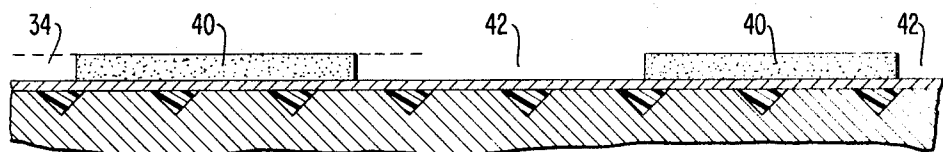


FIG. 6

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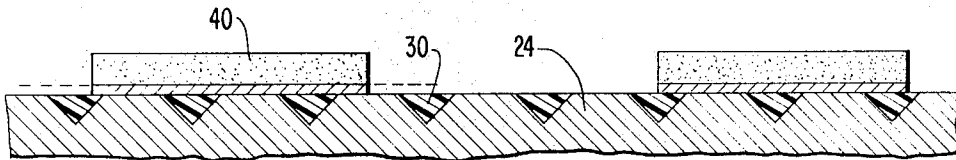


FIG. 7

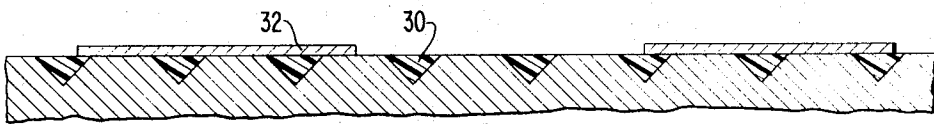


FIG. 8

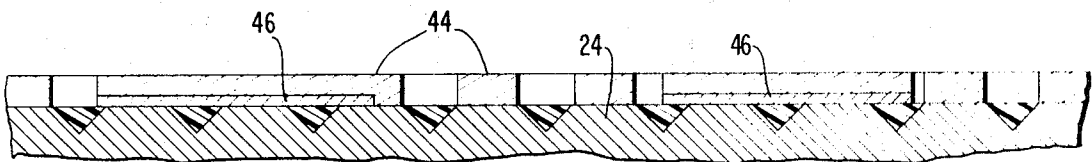


FIG. 9

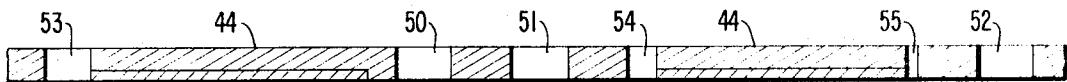


FIG. 10

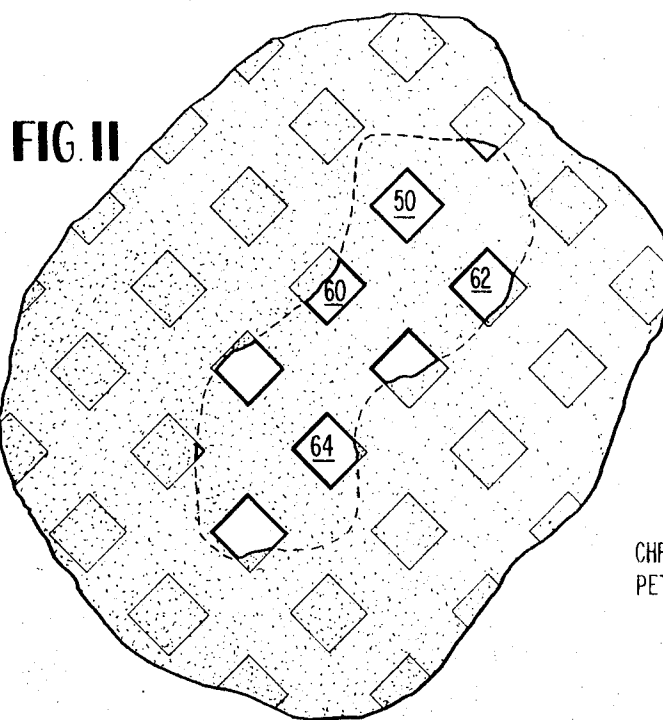


FIG. 11

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METHOD OF MAKING A PRINTING PLATE FROM A SCREENLESS PATTERN

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U.S. Cl. 204—11

9 Claims

ABSTRACT OF THE DISCLOSURE

A printing plate is made in the following steps: filling the screen-like arranged depressions of a metal cylinder with an electrically insulating material, coating the entire cylinder with silver and then with a copying lacquer; reproducing the pattern on the lacquer; removing portions of the lacquer and then the silver coating beneath those portions according to the pattern; nickel-plating the cylinder and removing the nickel shell therefrom.

BACKGROUND OF THE INVENTION

This invention relates to a method of making a printing plate which may be used in various printing processes, such as paper printing, but which is particularly adapted to be utilized in the printing of textiles.

It is well-known to prepare screen-type printing plates by painting them with copying lacquer so that the lacquer fills the meshes of the fine lattice and then illuminating the lacquer according to the pattern. Thereafter, the plate is washed to remove the lacquer from the meshes corresponding to the configuration of the pattern.

In order to increase the surface to be printed per unit of time, that is, the printing speed, the rotary printing process has been introduced where, instead of a fine-mesh wire screen, a foil is used which is perforated in a screen-like manner and which is made on a knurled steel cylinder by means of a galvanic process. The screen-like arranged depressions in the cylinder surface are filled with a lacquer, while the non-depressed portions of the cylinder surface remain lacquer free. Thus, as the result of a galvanizing process (nickel-plating), a screen foil is obtained. Screen foils made with this process and further modifications thereof, however, require costly equipment at the location of their use, that is, in the printing shop.

OBJECT AND SUMMARY OF THE INVENTION

It is an object of the invention to provide an improved process of making a novel screen-type printing plate from a screenless pattern in a simple manner and without substantial technical equipment.

The method of making a printing plate from a screenless pattern according to the invention comprises the following successive steps:

(1) The screen-like arranged depressions on the outer face of a metallic cylinder are filled with an electrically insulating material;

(2) The outer faces of at least these fillings are provided with an electrically conductive layer so that the entire surface of the cylinder is rendered electrically conductive;

(3) The conductive surface is coated with a protective layer according to the negative of the pattern to be printed;

(4) The surface is submitted to an etching treatment during which the conductive layer is removed from over

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these fillings not covered by the etch-resistant protective layer;

(5) The protective layer is removed;

(6) The surface of the cylinder is treated in an electrolytic plating bath in such a manner that on the electrically conducting areas of the surface which is now screened according to the pattern, a coherent cylindrical foil is formed; and

(7) The cylindrical foil is removed from the metal cylinder.

The afore-outlined process permits a more accurate reproduction of the details of the original because, contrary to the known screen printing, dots may be split so that, according to the shading, screen dots of different magnitude may be obtained.

The invention will be better understood and further objects as well as advantages will become more apparent from the ensuing detailed specification of a preferred, although exemplary, embodiment taken in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. 1-9 are greatly enlarged axial sectional views of a portion of the outer surface of the steel cylinder showing the successive steps of the process according to the invention;

FIG. 10 is a greatly enlarged axial sectional view of a portion of the finished screen foil; and

FIG. 11 is a plan view of the article shown in FIG. 10.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning now to FIG. 1, the depressions 20 in the surface 22 of steel cylinder 24 form the dots of a screen and are surrounded by the non-depressed surface portions 28 forming the lattice. It is noted that the axis (not shown) of the cylinder extends parallel with the generatrix 26. The depressions 20 are formed preferably by means of a knurling tool; they also may be made with an etching process or other method.

As a first step in the novel process, the depressions 20 are filled with an electrically insulating lacquer that dries without shrinking. As seen in FIG. 2, the lacquer material forms lacquer fillings 30. After applying the lacquer, the surface 22 is cleaned and degreased. Thereafter, the entire surface of the cylinder, including the outer face of fillings 30, is rendered electrically conductive by applying thereto, for example, a silver layer 32 by means of contact silver plating, preferably spraying, or by means of vapor deposition (FIG. 3). Thereafter, the silver-plated cylinder is coated with a copying solution 34 as shown in FIG. 4. Thus, at this stage, the cylinder carries on its surface a coherent conductive layer which is formed of silver layer 32 and a layer of copying lacquer 34.

Thereafter, the pattern to be printed is copied onto the cylinder from an unscreened diapositive generally indicated at 36 (FIG. 5), for example, by means of contact illumination. Instead of a transparent slide 36, the positive may be drawn directly on the layer 34. Through the non-printing areas 38 of the slide 36 light impinges on the copying layer 34 rendering those areas thereon non-soluble for a rinsing or washing material. FIG. 6 illustrates the next step in the process: The cylinder is washed and, as a result, those portions of the copying layer 34 that correspond to the printing areas are washed away exposing areas of silver layer 32, while those portions of the copying layer 34 that correspond to the non-printing areas remain bonded to the silver coating 32. In FIG. 6 the non-removed portions of layer 34 are designated at 40, while the locations of the dissolved portions are given the reference numeral 42.

Thereafter, the cylinder is subjected to the effect of an etchant, and, as a result, the previously exposed portions of silver layer 32 are etched away. The removal of the silver occurs very rapidly, since the silver coating is very thin. Thus, at these locations the lacquer fillings 30 re-appear and again form the external surface on the cylinder, whereas in the non-printing areas, the silver layer 32 has been preserved under the protective layer (copying layer) 40, 34 (FIG. 7). Then, the illuminated layer portions 40 are removed by means of a solvent (FIG. 8). Thereafter, the cylinder is placed in a nickel bath for performing a nickel-plating process. As a result, a nickel coating will cover the electrically conductive surface areas. Thus, as well seen in FIG. 9, at the printing areas the exposed fillings 30 do not carry any nickel, while the non-printing areas, due to the residual silver coating 46, are entirely covered by the nickel skin 44.

As the last step of the process according to the invention, the nickel skin or shell 44 is removed from the metal cylinder. Turning now to FIG. 10, the apertured nickel skin 44 thus represents a true reproduction of the conductive condition of the cylinder surface. At all locations where the surface of the cylinder is conductive, the nickel skin is closed, whereas in areas where the lacquer dots were entirely or partially exposed, the nickel skin 44 has discontinuities or openings. Thus, for example, in FIG. 10 the openings 50, 51 and 52 are the reproduction of entirely open screen dots, whereas the openings 53, 54 and 55 expose only one part of the surface of an entire dot. It is seen that the residual silver coating 46 remains at least partially bonded to the nickel skin 44 and in these areas the combined thickness of skin 44 and coating 46 equals the thickness of skin 44 in areas where no coating is present (i.e. in the printing areas).

FIG. 11 shows in a plan view a portion of the finished nickel plate from the side which was in contact with the steel cylinder. With the exception of screen dot 50, all other dots, such as 60, 62, 64, are only partially open, depending upon the course of boundary or contour line of the printing areas. Even in the surface portions which are entirely closed, the screens pattern remains recognizable although this has no effect on the printing.

With the afore-described process, screen-type nickel printing plates may be prepared, since each screen dot may be split one-half or even one-fourth of its entire area, which truly reproduce all minute details of the screenless pattern. In case of known lacquer plates such true reproduction has not been possible since there each screen dot has to be either entirely open or entirely closed.

That which is claimed is:

1. A method of making a screen-type printing plate from a screenless pattern comprising the following successive steps:

- (a) providing the surface of a metal cylinder with a plurality of screen-like arranged depressions,
- (b) filling the screen-like arranged depressions in the surface of a metal cylinder with an electrically insulating material,

- (c) coating at least the areas of the filled depressions with an electrically conductive layer to render the entire cylinder surface electrically conductive,
- (d) applying a protective coating or mask to said electrically conductive layer according to the negative of said pattern,
- (e) subjecting said cylinder to an etching treatment to remove the portions of said electrically conducting layer not protected by said protective coating,
- (f) removing said protective coating,
- (g) subjecting said cylinder to an electrolytic depositing process to provide a coherent cylindrical foil over the electrically conductive areas of said cylinder surface, and
- (h) removing said foil from said cylinder.

2. A method as defined in claim 1, wherein said electrically conductive layer is applied by spraying.

3. A method as defined in claim 1, wherein said electrically conductive layer is applied by vapor deposition.

4. A method as defined in claim 1, wherein said electrically conductive layer is silver.

5. A method as defined in claim 1, wherein said metal cylinder is made of steel.

6. A method as defined in claim 1, wherein said electrolytic depositing process is nickel plating.

7. A method as defined in claim 1, wherein said protective mask on said electrically conductive layer is obtained by the following successive steps:

- (a) applying a coherent copying layer to said electrically conductive layer,
 - (b) illuminating said copying layer according to said pattern, and
 - (c) washing away those portions of said copying layer which were not exposed to light.
8. A method as defined in claim 7, wherein said copying layer is illuminated through a diapositive.
9. A method as defined in claim 7, wherein said copying layer is exposed to contact illumination.

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101—128.4, 395, 401.1