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G. S. BRAZNELL ET AL

3,103,168

PRINTING PLATES

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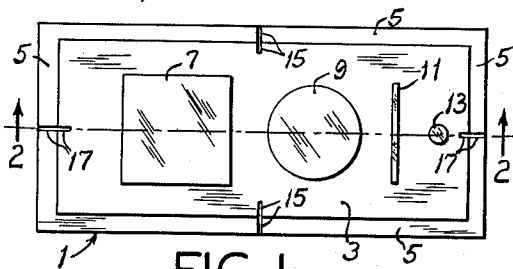


FIG. 1.

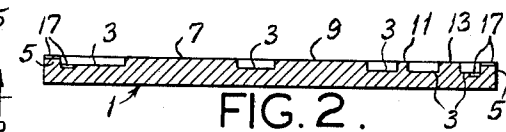


FIG. 2.

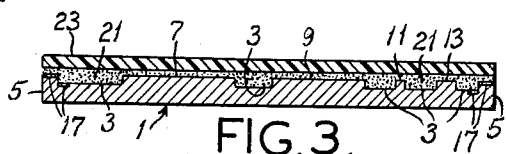


FIG. 3.

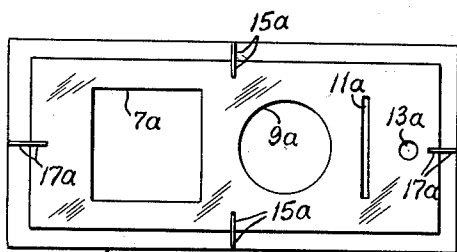


FIG. 4.

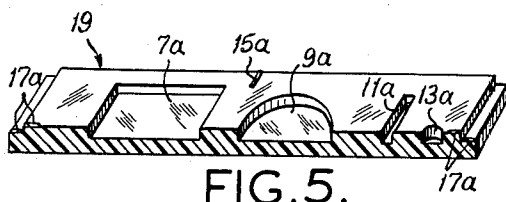


FIG. 5.

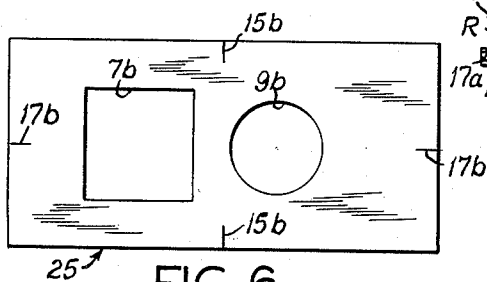


FIG. 6.

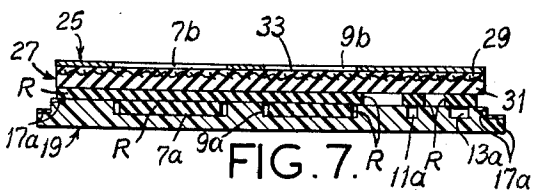


FIG. 7.

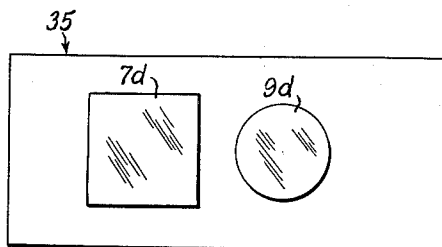


FIG. 9.

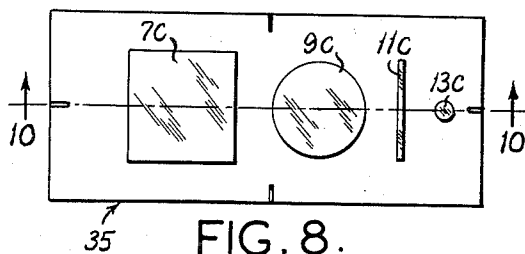


FIG. 8.

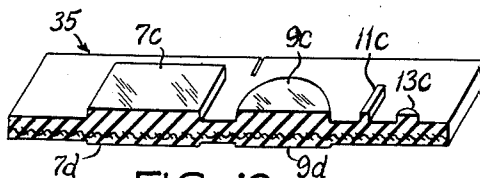


FIG. 10.

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3,103,168

PRINTING PLATES

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This invention relates to methods of making rubber printing plates, and more particularly to a method of making what may be referred to as a made-ready rubber printing plate.

It will be understood that a rubber printing plate essentially comprises a rubber plate having on one face thereof a pattern in relief of the matter which is to be printed by means of the plate. When a pattern includes both large printing areas and small printing areas (such as fine lines or dots, for example), it is usually necessary in order to obtain a proper impression in the printing operation that provision be made for applying less pressure on the small areas than the large areas, otherwise, if sufficient pressure is applied for proper impression of the larger areas, the small areas will be undesirably distorted. Heretofore various expedients have been used for making ready to provide such differentiation in pressure, but these have usually involved operations subsequent to formation of the rubber printing plate, and have involved procedures making accurately controlled differentiation in amount and location of pressure difficult to obtain. Accordingly, among the several objects of this invention may be noted the provision of a method of making rubber printing plates whereby the plates are made ready (i.e., formed so as to provide for pressure differentiation between large and small printing areas) during the production of the plates; and the provision of a method such as described which, in economical manner as regards time and materials, enables accurate built-in make-ready control. Other objects and features will be in part apparent and in part pointed out hereinafter.

The invention accordingly comprises the methods hereinafter described, the scope of the invention being indicated in the following claims.

In the accompanying drawings, in which one of various possible embodiments of the invention is illustrated,

FIG. 1 is a plan of a so-called master metal engraving;

FIG. 2 is a section on line 2—2 of FIG. 1;

FIG. 3 is a view similar to FIG. 2 showing how a so-called matrix is made using the master engraving;

FIG. 4 is a plan of the matrix;

FIG. 5 is a half-section in perspective of the FIG. 4 matrix;

FIG. 6 is a view of a so-called stencil sheet or template used in the method of this invention;

FIG. 7 is a section showing certain initial steps in the formation of a rubber printing plate according to this invention, using the matrix of FIGS. 4 and 5 and the stencil sheet of FIG. 6;

FIG. 8 is a view of the printing face of the completed rubber printing plate;

FIG. 9 is a view of the other face (or back face) of the completed rubber printing plate; and,

FIG. 10 is a half-section in perspective of the rubber printing plate of FIGS. 8 and 9.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

Referring to FIGS. 1 and 2 of the drawings, there is indicated at 1 what is referred to as a master engraving. As shown, this consists of a rectangular metal plate, for example, which has one face routed out as indicated at 3 to provide a desired printing pattern in relief, and a peripheral retaining wall 5 all around the plate. For purposes of simplified illustration, the printing pattern is

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shown as comprising two relatively large printing areas, a square area 7 and a circular area 9, and two relatively small printing areas, a fine-line area 11 and a dot 13. This is illustrative of conventional printing patterns which will include designs, trademarks, etc. The master engraving 1 is made in well-known conventional manner. The routing at 3 may be uniform in depth throughout, corresponding to the thickness in relief desired for the printing areas on the printing face of the rubber printing plate to be made. The master engraving 1 is also shown as formed with grooves as indicated at 15 and 17 for forming centering lines 15a and 17a (see FIGS. 4 and 5) in a matrix 19 (see FIGS. 4 and 5) to be made using the master engraving.

As shown in FIG. 3, the matrix is made using master engraving 1 in conventional manner by packing a thermosetting resin powder as indicated at 21 into the routed cavity 3 in the master engraving, and covering the faces of peripheral wall 5 and of areas 7, 9, 11 and 13 with this powder to a predetermined depth. The powder may be a phenol-formaldehyde resin powder such as sold under the trade designation "Bakelite" conventionally used for making such matrices. A plate 23 of thermosetting resin is applied over the powder. This plate may be a plate of phenol-formaldehyde resin such as sold under the trade designation "Bakelite" conventionally used for making such matrices. It will be understood that a parting compound will usually be applied to the master engraving to enable the matrix to be stripped from the engraving. Heat and pressure are applied to set and cure the resin powder and bond it to plate 23, thereby to form a matrix 19 having impressions in reverse of relief of the printing areas 7, 9, 11 and 13 of the master engraving. Referring to FIGS. 4 and 5, the impressions or cavities in the matrix 19 are respectively designated 7a, 9a, 11a and 13a. These are all of substantially the same depth. By reason of the provision of grooves 15 and 17 in the master engraving, centering lines 15a and 17a are formed as ridges on the matrix 19. FIGS. 4 and 5 show the matrix 19 stripped from the master engraving 1.

As shown in FIG. 6, a so-called stencil sheet or template 25 is prepared having openings 7b and 9b corresponding in outline to the large areas 7 and 9 of the master engraving 1 and to the large areas 7a and 9a of the matrix 19, but without any openings corresponding to small areas 11 and 13. This sheet or template may be made of paper, sheet metal, or any other suitable material, and may be easily and accurately prepared simply by taking an ink impression (a proof) on the stencil sheet or template off the master engraving 1, then cutting out the areas printed on the sheet or template by contact with ink on areas 7 and 9 of the master engraving. Centering lines 15b and 17b are marked on the stencil sheet or template, being accurately located thereon relative to openings 7b and 9b from grooves 15 and 17 of the master engraving.

As shown in FIG. 7, strips of unvulcanized rubber R are placed in the cavities 7a and 9a of the matrix, and over these cavities and other portions of the matrix. Strips of unvulcanized rubber may also be placed over cavities 11a and 13a. A backing plate 27 is applied over rubber R on the matrix. This backing plate 27, as appears in FIG. 7, may consist of a piece of fabric 29 having layers 31 and 33 of unvulcanized rubber on both faces thereof. Layer 31 is shown as thicker than layer 33, and layer 31 is applied face down over rubber R on the matrix. It will be understood that a suitable parting material is applied to the matrix prior to application of rubber R and the backing plate 27. The rubber used at R and in plate 27 may have a durometer in the range from 20–80, for example. Also as shown in FIG. 7, stencil sheet or template 25 is applied over the backing plate 27, and is centered by registering lines 15b and 17b on the stencil sheet

or template with lines 15a and 17a on the matrix so that openings 7b and 9b in the stencil sheet or template register at least approximately (if not perfectly) with cavities 7a and 9a in the matrix. The stencil sheet or template is substantially thinner than the rubber.

Then, the assembly of the matrix 19, rubber R, backing plate 27 and stencil sheet or template 25 is placed in a vulcanizing press, and heat and pressure are applied to cause filling of the cavities 7a, 9a, 11a and 13a in the matrix with rubber (from strips R, possibly also some rubber from layer 31 of the backing plate), also to cause filling of the openings 7b and 9b of the stencil sheet or template with rubber from layer 33 of the backing plate, bonding of the rubber in the cavities of the matrix with the backing plate, and vulcanization of the rubber. It will be understood that the pressure causes squeeze-out of rubber from layer 33 into openings 7b and 9b of the stencil sheet or template, the rubber leveling off flush with the outer face of the template. This results in formation of the rubber printing plate 35 shown stripped from the matrix in FIGS. 8-10, and with stencil sheet or template 25 removed, having the printing pattern comprising printing areas 7c, 9c, 11c and 13c (corresponding to areas 7, 9, 11 and 13 of the master engraving) on its printing face (see FIGS. 8 and 10), and integral raised areas 7d and 9d on its other face (see FIGS. 8 and 9). Areas 7d and 9d correspond in outline to and are at least approximately in register with areas 7c and 9c. The faces of areas 7d and 9d are offset from the back face of plate 35 by an amount equal to the thickness of the stencil sheet or template 25, and the amount of this offset may be made as desired by using a stencil sheet or template of appropriate thickness. When the plate 35 is used on the printing cylinder of a printing press, for example, raised areas 7d and 9d effect impression of ink on the work over areas 7c and 9c at higher pressure than over areas 11c and 13c (the latter not being backed by any raised areas). The differentiation in pressure may be accurately controlled in amount by suitable preselection of the thickness of the stencil sheet or template to determine the thickness of raised areas 7d and 9d and is accurately controlled as to location as will be evident.

It will be understood that a rubber printing plate may be made in accordance with the invention with raised areas of different thickness on the back of the plate by using a plurality of appropriate stencil sheets or templates of different thickness to provide the desired differentiation in thickness of the raised areas. In this manner, variable pressure may be obtained on different printing areas of the same plate for proper impression of all the printing areas.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above methods without departing from the scope of the invention, it is intended that all matter contained in the above descrip-

tion or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. The method of making a made-ready rubber printing plate having on the printing face thereof a printing pattern in relief in rubber, said pattern having first and second printing areas as to which higher printing pressure is required for the first than for the second for proper printing impression, said method comprising forming a matrix having an impression of said pattern in reverse of relief with the areas thereof corresponding to both said first and second printing areas of substantially the same depth, applying unvulcanized rubber over the matrix, applying over the back of the rubber a flat template which is substantially thinner than the rubber, said template being of such outline and so positioned relative to the matrix as to leave uncovered by the template an area at the back of the rubber having a boundary such as to circumscribe the boundary of the first printing area while covering a portion of the back of the rubber in register with said second printing area, applying heat and pressure to the rubber to mold the rubber in the matrix to form the printing plate and to vulcanize the rubber, pressure being applied against the template to cause the rubber to fill the areas of reverse relief in the matrix thereby to form said printing pattern in relief in rubber at the printing face of the printing plate, with substantially uniform projection of the entire printing pattern in relief from the plate at its printing face, and to cause the uncovered rubber at the opposite face thereof from the matrix to level off flush with the outer face of the template, thereby to form offset rubber areas at the back of the plate with the area of the rubber lying beneath the template at the back of the plate inwardly offset from the area of the rubber levelled off with the outer face of the template at the back of the plate a distance corresponding to the thickness of the template, and stripping the template from the back of the plate.

2. The method of claim 1 wherein the template is constituted by a sheet having an opening therein of such outline as to circumscribe said first printing area, and is applied over the rubber with said opening substantially in register with said first printing area.

3. The method of claim 2 wherein the matrix and template are formed with corresponding centering lines and the template is positioned over the rubber with said opening therein substantially in register with said first printing area by registering said lines.

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