Dec. 4, 1934. B. L. SITES 1,982,967

PRINTING ELEMENT AND PROCESS OF MAKING SAME

Filed Oct. 9, 1931

Fig. 1.

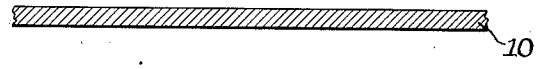


Fig. 2.

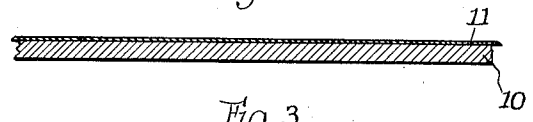


Fig. 3.

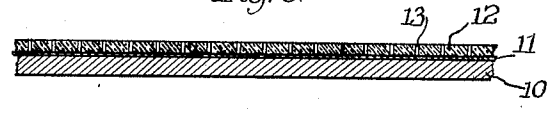


Fig. 4.

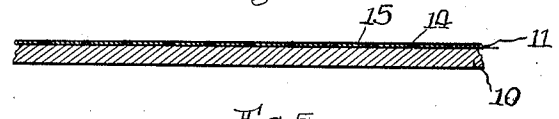


Fig. 5.

Fig. 6.

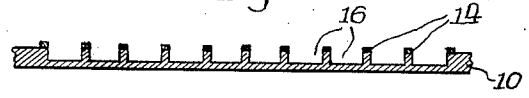


Fig. 7.

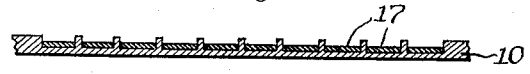


Fig. 8.

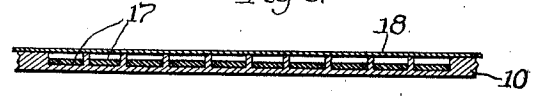
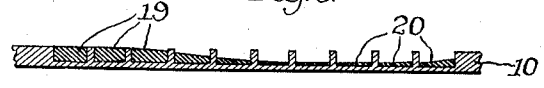


Fig. 9.



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Patented Dec. 4, 1934 1,982,967

UNITED STATES PATENT OFFICE

1,982,967

PRINTING ELEMENT AND PROCESS OF MAKING SAME

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Application October 9, 1931, Serial No. 567,776

5 Claims. (Cl. 95—5.6)

My invention pertains to printing surfaces and more specifically relates to a process of producing printing elements such as are used in rotogravure i. e. intaglio printing.

On printing surfaces used in that method of printing, the subject matter or image to be printed is represented by ink retaining cells of a depth that will vary in accordance with the depth of the color tones to be reproduced, that is to say, the deep tones of a print will be produced by those cells which carry most ink, while the lighter tones are represented by the shallow, less ink carrying cells.

Heretofore intaglio printing surfaces were produced by the delicate and cumbersome carbon tissue method according to which method a carbon tissue, such as regular commercial carbon paper, after it has been sensitized, is exposed through a screen and through a photographic transparency. The exposed tissue is then squeegeed onto a carefully prepared base such as a sheet of copper, whereupon the base is subjected to a dissolution treatment and etching process as is well known in the art.

The principal object of my invention is to eliminate the use of carbon tissue and to thereby very substantially simplify the old methods of producing intaglio printing elements.

According to my invention, it will also be possible to correct errors that might occur during the preparation of a printing element, or to change designs by retaining the same base, a feature which it was impossible to accomplish heretofore. In order to attain these and other objects which will become apparent from the following description and appended claims, I conceived a scheme of providing the surface of a printing element with ink carrying cells which are all of the same, or approximately the same, depth, and to then determine the ink carrying capacity of the cells by applying thereto a material different from that of which the base itself is made, preferably a photographic emulsion which, after having been exposed and developed, will leave in the cells deposits of unequal depth corresponding to the various color tones required.

According to my invention I propose to proceed for example by flowing a printing base such as a sheet of copper or a copper cylinder with a film of bichromated gelatin or bichromated albumen, generally termed bichromated colloid, which film I subsequently expose through a rotogravure screen and then develop it with warm water in the usual manner, so that a screen image will remain on the base. Preferably the developed screen image is then baked so as to form a permanent resist. Thereupon I etch the base with ferric chloride which will produce ink retaining cells, all of which are of approximately the same depth.

It will be readily understood that instead of providing the screen image on the printing base by the etching method as explained above, the same result could be accomplished mechanically such as by impressing or rolling a screen image into the surface of the base. If produced in this manner, the walls of the cells become hardened by the physical contact of the tool used for this purpose.

This would afford a decided advantage over the etching process because thereby the surface of the printing element will be rendered more resistant to the wear of the doctor blade which is generally used for scraping the surplus ink off the printing surface of the element prior to effecting the impression.

The cells of the screen image are then flowed with a silver bromide gelatin photographic emulsion in a dark room and squeegeed off so that the emulsion will remain in the cells only. This emulsion will then be shrunk and thus solidified by drying or by any other practical method so that eventually its level will be below the plane of the screen image.

After this silver bromide gelatin emulsion is shrunk i. e. solidified, I expose it through a design carrying transparency such as by contact in a vacuum frame, which exposure requires but a few seconds.

After exposure the emulsion in the cells of the copper plate or the like will be developed by any desired method, for instance in a photographic developer so that the emulsion remaining in the cells will be of varying thickness in proportion to the exposure received, and after developing the emulsion which remains in the cells will be swelled either with an alkaline or an acid solution. I have found that the swelled condition of the silver bromide gelatin emulsion can be rendered permanent by immersing the plate i. e. exposed surface into a solution of alcohol, alum and formaline. Subsequent drying of the surface by heat will cause the swelled emulsion to become hardened. By this swelling process the emulsion in those cells which correspond with the high lights of the subject, will completely fill said cells, so that no ink retaining depth will be provided in these cells.

Another method whereby the swelling of the emulsion can be arrested i. e. rendered permanent is that of saturating the swelled emulsion with a solution of sodium silicate and subsequently precipitating silica in the gelatin with acid; or, saturating the swelled emulsion i. e. gelatin with a solution of a salt and subsequently precipitating an insoluble compound by the addition of a precipitating agent.

In Figures 1 to 9 of the accompanying draw-

ing, I have illustrated one manner of carrying out my invention according to which the base 10 such as a copper plate, is flowed with a coating 11 of bichromated gelatin or bichromated albumen, see Figure 2, whereupon this coating 11 is exposed through a rotogravure screen 12 having transparent portions 13, see Figure 3.

Figure 4 illustrates the printing element after it has been exposed through a screen; the portions 14 representing the exposed areas while the portions 15 show the unexposed areas, which corresponded with the opaque sections of the screen and which during the development process will dissolve so that the exposed portions 14 only remain on the base, such as is shown in Figure 5.

After developing, the plate will then be subjected to the etching process during which the ink carrying cells 16, see Figure 6, will be formed. These cells, as explained above, will all be of the same, or approximately the same depth and will then be flowed with a silver emulsion such as a silver bromide gelatin photographic emulsion 17, see Figure 7. This emulsion, after having been thoroughly dried and thus solidified, will then be exposed through a photographic transparency 18, Figure 8, and then developed and swelled as explained above, whereby the high lights i. e. light tones will be represented by the areas 19, which carry little or no ink at all, whereas the deeper tones will be represented by the more ink carrying cells 20 as shown in Figure 9.

While I prefer to etch all the cells of the screen image to an even depth, it is not essential to devote much care to that part of the process, because the ink retaining capacity of each cell is determined by the emulsion as explained, and therefore minor variations in the depth of these cells will not affect the ultimate result.

It will be apparent that my process of making rotogravure printing elements will offer the following principal advantages:

1. The use of carbon tissue will be entirely dispensed with.

2. Errors may be readily corrected, or new designs applied, by washing out the emulsion in the ink carrying cells and by repeating the flowing of the cells with emulsion and subsequently exposing and developing. This does not destroy the copper cells.

3. The etching of the base does not require the usual skill since a slight variation in the depth of the cells produced does not result in any defect in the finished plate.

4. The swelling action of the gelatin can be controlled with less skill than is now required for etching through carbon tissue.

5. The exposure of a plate can be readily accomplished in a step and repeat machine, thereby attaining perfect register for multicolor work.

As an alternative, that is to say, instead of flowing the ink carrying cells by a silver emulsion and then swelling that emulsion as hereinabove described, I find that equally satisfactory results can be obtained by flowing said cells with bichromated gelatin, in which case, however, the cells would have to remain filled, that is to say, the gelatin in the cells must not be below the plane of the printing element i. e. screen image when the gelatin is dry i. e. solidified and at the time when it is exposed through a photographic transparency.

According to this scheme, instead of the emulsion in the cells becoming swelled as explained above, those portions of the screen image which during the exposure through the photographic transparency were not exposed to the light will dissolve and wash out so that a printing element identical to that illustrated in Figure 9 will be produced.

It is therefore my intention to cover any such modifications in the process of making printing elements that will come within the scope and essence of the appended claims.

I claim:—

1. The process of making intaglio printing elements, consisting in flowing a metal base with a light sensitive coating capable of producing an etching resist, exposing said coating through a screen, developing said coating, drying the screen image remaining on said base, etching said base to provide ink retaining cells therein, applying a photographic emulsion to said cells, drying said emulsion, exposing said emulsion through a photographic transparency, developing the exposed emulsion to produce varying thickness in said cells in proportion to the exposure received, and drying the emulsion in said cells.

2. The process of making intaglio printing elements, consisting in flowing a metal base with a light sensitive coating capable of producing an etching resist, exposing said coating through a screen, developing said coating, drying the screen image remaining on said base, etching said base to provide ink retaining cells of substantially uniform depth therein, applying a photographic emulsion to said cells, drying said emulsion, exposing said emulsion through a photographic transparency, developing the exposed emulsion to produce varying thickness in said cells in proportion to the exposure received, and swelling and drying the emulsion in said cells.

3. The process of making intaglio printing elements, consisting in flowing a metal base with a light sensitive coating capable of producing an etching resist, exposing said coating through a screen, developing said coating, drying and baking the screen image remaining on said base, etching said base to provide ink retaining cells therein, applying a photographic emulsion to said cells, drying and shrinking said emulsion, exposing said emulsion through a photographic transparency, developing the exposed emulsion to produce varying thickness in said cells in proportion to the exposure received, and swelling and drying the emulsion in said cells.

4. The process of making intaglio printing elements, consisting in providing a metal base with ink retaining cells of substantially uniform depth, applying a photographic emulsion to said cells, drying said emulsion, exposing said emulsion through a photographic transparency, developing the exposed emulsion to produce varying thickness in said cells in proportion to the exposure received, and swelling and drying the emulsion in said cells.

5. The process of making intaglio printing elements, consisting in providing a metal base with ink retaining cells of substantially uniform depth, applying a photographic emulsion to said cells, drying and shrinking said emulsion, exposing said emulsion through a photographic transparency, developing the exposed emulsion to produce varying thickness in said cells in proportion to the exposure received, and swelling and drying the emulsion in said cells.

BENJAMIN L. SITES.