

March 1, 1960

D. A. ZILLI

2,927,020

PHOTOGRAPHIC PROCESS

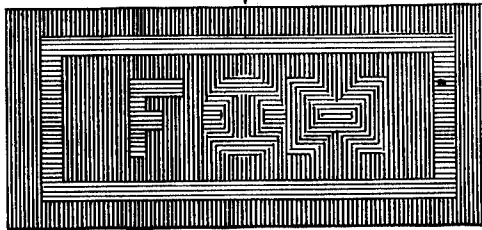
Filed Aug. 16, 1954

2 Sheets-Sheet 1



ORIGINAL COPY

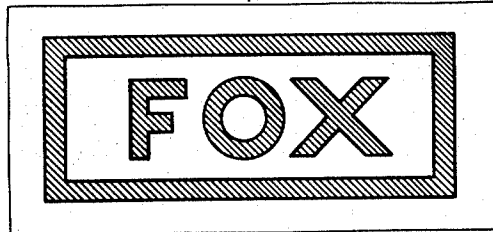
↓ photograph on film



NEGATIVE ON FILM

↓ contact print on sensitized paper with 10-50 times normal exposure. 500 watt light

four feet distance five second exposure.



KEYLINE PRINT

reduce image ↓

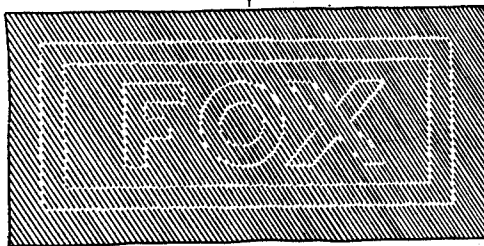
FARMER'S REDUCER

or other reducer



REDUCED KEYLINE PRINT

↓ print on film



KEYLINE NEGATIVE

INVENTOR
DAVID ZILLI

BY *Maybee & Legris*
ATTORNEYS

March 1, 1960

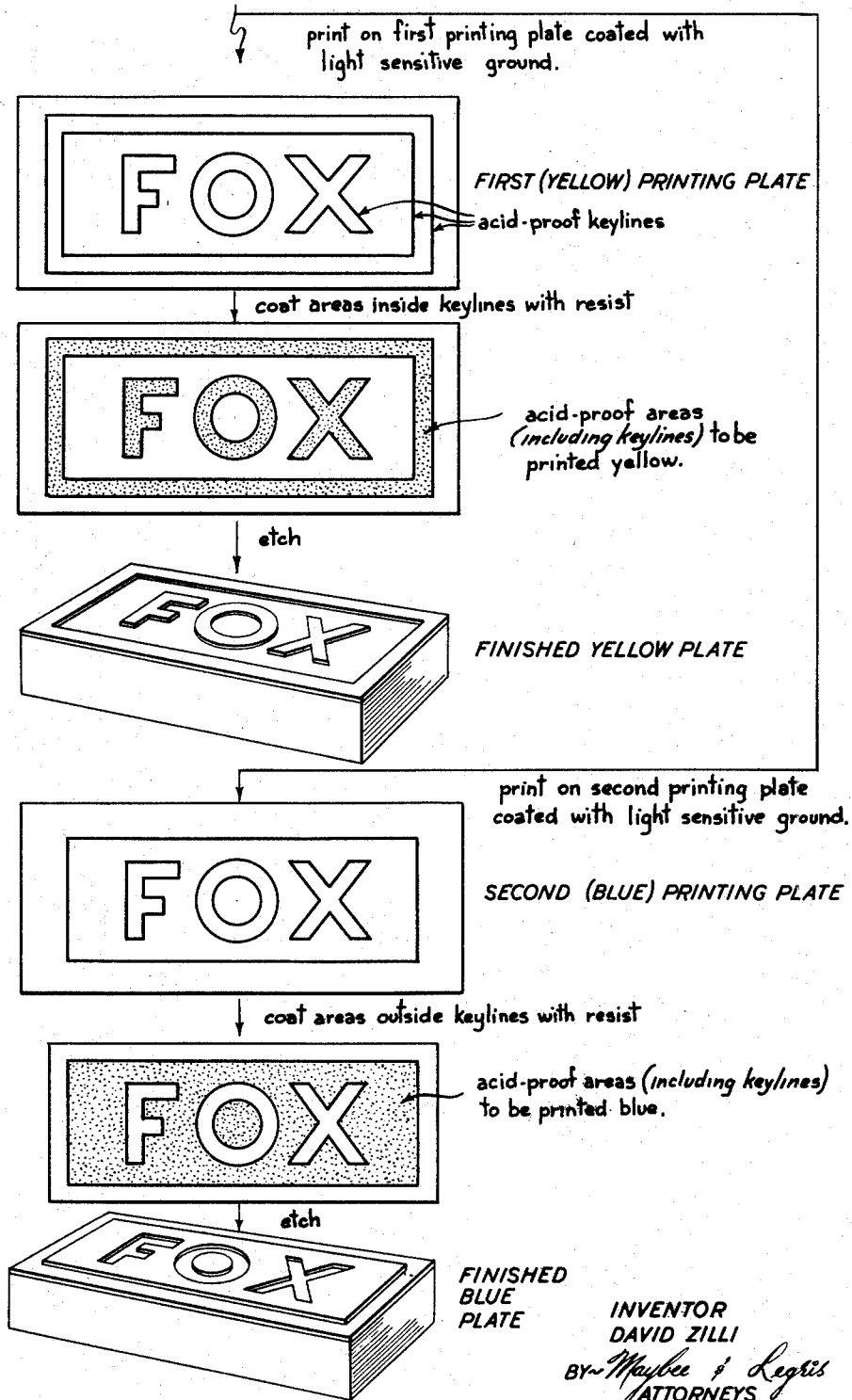
D. A. ZILLI

2,927,020

PHOTOGRAPHIC PROCESS

Filed Aug. 16, 1954

2 Sheets-Sheet 2



1

2,927,020

PHOTOGRAPHIC PROCESS

David A. Zilli, Toronto, Ontario, Canada

Application August 16, 1954, Serial No. 449,934

2 Claims. (Cl. 96—32)

This invention relates to a photographic process or method for producing a reproduction in outline of a subject having areas of two contrasting tones, and more particularly to a method of preparing keyline prints for use in photomechanical processes such as photo-engraving, photo-lithography, photo-gravure silk screen, and flexographic processes.

The principal object of the invention is to provide a simple photographic process for producing an accurate clearcut reproduction in outline of a subject which is depicted by areas of two contrasting tones, in which the width of the outline may be controlled accurately.

A further object of the invention is to provide a simple photographic process for producing keyline prints for the preparation of colour-printing plates to be used in photomechanical processes.

For the purpose of illustration, the application of the invention to the preparation of keyline prints for use in the preparation of photo-engraved colour plates for two-colour printing. Other applications will be obvious from this illustration. In colour printing generally, a number of printing plates are used for each reproduction; each plate printing its respective colour or tint over a certain area or areas in which the colour is to appear. The successive printing plates must be in as accurate register as is possible in order that each colour will cover its proper area on the paper being printed. However, as perfect registry is not possible, or at least cannot be depended upon, the colour areas are made to overlap slightly to ensure that there will be no gaps between adjacent colours. In this overlapping it is preferable to cause a darker colour to overlie a lighter colour.

Such printing plates with a slight overlap between colours are made from what are called "keyline" negatives, in which there are no areas of solid contrasting tone but rather narrow line outlines between areas which are to print in different colours. The keyline negative is used to prepare a printing plate for printing each colour, coated with photo-sensitive "ground" which becomes acid-proof on exposure to light. Areas adjacent the exposed acid-proof lines to be printed in one colour are coated with acid-proof "resist" and the plate is etched in an appropriate manner by an acid, this process being well known in the art. In order to obtain the keyline negative, however, it is necessary that a special outline drawing of the subject be made for use as the copy from which the negative is made, or that all but the outline of solid area in the copy be accurately blanked out, usually with white ink, leaving narrow keylines representing the outlines of the subject. It will be appreciated that this is a long and tedious process requiring the services of a highly skilled workman or artist.

According to the invention it is possible to produce a keyline negative from the subject by photographic means thereby reducing the time necessary for the operation and dispensing with the services of the artist. This, of course, greatly reduces the cost of producing the colour printing plates.

2

The invention will now be described in detail with reference to a specific example. Such an example is illustrated in the accompanying flow diagram, which depicts the operations by which according to the invention the word FOX is printed by photo-engraved plates in yellow letters on a blue background with a yellow border surrounding the sheet.

As shown in the flow diagram the word FOX has been made up of dark-toned letters of the appropriate size and type on a suitable light-toned sheet to form the copy. This copy is now photographed with a camera preferably using film of high contrast, a border being produced by photographing the sheet against a dark background. The resulting negative when dry, is placed in a conventional contact printing frame over a piece of sensitized photographic paper, for example, the type sold as Kodabromide No. 1 or No. 2. A paper with a low contrast emulsion has been found to be most satisfactory.

The negative covered paper is now exposed to light to produce a contact print. To produce a conventional print on the Kodabromide No. 1 or No. 2 paper, the intensity of the light would be in the order of that produced by a 60 watt bulb at about 3 feet distance, and the exposure would be about 5 seconds. According to the present invention, however, the light intensity used is that produced by a bulb of about 500 watts or a No. 2 Photoflood lamp at about 4 feet distance with an exposure of from 5 to 25 seconds. Thus it will be seen that the exposure according to the invention is from 10 to 50 times the conventional exposure, and this relationship applies for other suitable photographic papers. In general terms the overexposure must be great enough to solarize the emulsion and produce a relatively low degree of developability, while not being so great as to fog the paper through the dense parts of the negative to a serious extent.

The print is developed for about three minutes at about 68° F. in a vigorous high-contrast developer, preferably one such as those sold under the names Kodalith (Kodak) or Reprodol (AnSCO), under a recommended safe light. Another suitable developer is that known as Kodak D-85, which has the formula:

45	Water -----	cc--	500
	Sodium sulfite, desiccated -----	g--	30
	Paraformaldehyde -----	g--	7.5
	Sodium bisulfite -----	g--	2.2
	Boracic acid, crystals -----	g--	7.5
50	Hydroquinone -----	g--	22.5
	Potassium bromide -----	g--	1.6
	Water to make -----	cc--	1000

The white light may then be turned on and the developing completed to the density desired. The print is then fixed as usual and thoroughly washed, producing a print with a marginal line or keyline enclosing a fogged, low-density exposed area corresponding to each dark area in the original subject. Normally, the fogging will be sufficiently light to enable this print to be used to produce a keyline negative, but if desired the fogged areas within the keyline may be cleared with a reducer, preferably a contrast increasing cutting reducer such as that known to the trade as "Farmer's reducer," which may for example be composed of sodium thiosulphate (hypo) and potassium ferricyanide in equal proportions mixed in the ratio of one to five with water. This leaves the relatively high-density marginal line or keyline particularly sharp and clear; that is, the contrast between the fogged areas and the keyline is heightened by the reducer. At this point the reduction is arrested by thorough washing and the print is dried.

The effect of the reducer is to cut away the fogged areas within the keylines leaving a sharp outline.

The keyline print produced as described corresponds to prior art keyline drawings and the subsequent steps for producing printing plates are conventional ones and will merely be summarized. A keyline negative is made from the keyline print, dried and placed over a first printing plate, to be used in printing yellow, which has been previously coated with a ground which becomes acid-proof on exposure to light, and preferably exposed. This produces in the sensitized ground an acid-proof positive image of the keyline. Assuming that this plate is to be used to print the letters and border, the areas within the keylines are coated with an acid-proof resist and the plate is etched with acid. The letters and border are coated up to the keyline and since the keyline is also acid-proof the effective area of the resist is that of the letters plus the keyline. On the finished plate after the etching process, the letters and borders are raised above the background area which has been eaten away by the acid.

To produce the blue background printing plate, a second plate is printed from the keyline negative, and the background portion of the plate is coated up to the keyline with the resist. Again since the keyline itself is acid-proof the effective area of the resist is that of the background plus the keyline. The second plate is then etched with acid and on the resulting plate the background is raised for printing blue and the letters and border dropped.

When the printing is to be done the first plate is coated with yellow ink and impressed upon the paper. Next the second plate is coated with blue ink and impressed over the paper which has already received the first plate. Since the blue background extends to the inside of the keyline and the yellow letters extend to the outside of the keyline there will be an overlap of the thickness of the line with the blue overlying the yellow. This will ensure that there will be no blank area between adjacent colours and the overlap being a dark colour over a light colour will not be noticeable. Furthermore, the apparent size of the letters, being dictated by the margins of the relatively dark background rather than by those of the light letters, are the same size as the dark-toned letters of the original copy. This is because the keyline produced by practicing this invention will lie slightly outside the original margin of the relatively dark-toned areas of the copy, and the blue background extends to the inside of the keyline. In the event that the letters in the original work are light on a dark background then the keyline made according to the invention will lie slightly within the margins of the original letter. This type of copy is therefore preferred when the inks of the final printing are to be dark in the lettering and light in the background. If it is desired in either case to reverse the tonal relationships of the copy a second negative is produced by a simple contact exposure to transpose the light and dark areas. This will compensate for the difference in size of the letters which would otherwise be caused by the position of the keyline, and the print which is finally produced will reproduce the size of the letters accurately.

It will be appreciated that the original subject from which it is desired to produce the coloured reproduction need not, itself be in colour but may be black and white. It may be a print, drawing, photograph or painting or a reproduction of any of these.

It is thought that the process according to the invention may operate according to the following theory. The extreme overexposure to which the print is subjected causes the central portion of the emulsion to be solarized and limits the density produced in that area to a low level. There has been, however, a diffusion of light around the marginal edges of the letters. This diffused light was not as strong as the direct light and produces a thin line of substantially normal exposure along the marginal edges

of the letters. This normally or nearly normally exposed portion of the print is affected by the reducer to a relatively slight extent and remains as a keyline on the print. By varying the length of the exposure the width of the keyline can be varied from a relatively thin line at a five second exposure to a relatively thick line at a twenty-five second exposure.

From the foregoing description it may be seen that a method has been discovered for producing a keyline print by a purely photographic process. While the foregoing description has described the process in relation to a specific example it is to be appreciated that this is not to be construed as limiting, for the invention obviously contemplates the use of any combination of different printing papers, exposure times, developers and reducers as will produce clear sharp keylines by extreme over-exposure through a photographic negative or reversal negative made from the copy. Minor modifications may be made within the scope of the invention as defined in the sub-joined claims, and in particular, the reduction step may be omitted if, as will normally be the case, a sharp keyline negative can be produced without it.

What I claim as my invention is:

1. A photographic process for producing photo-engraved color plates for two color printing of a subject having two areas of contrasting tonal values, comprising the steps of photographing the subject on film and developing the film to produce a relatively transparent film area corresponding to one of the said areas of the subject and a relatively opaque film area corresponding to the other of the said areas of the subject, and making a contact print on photographic paper from the film with about 10 to 50 times the normal exposure for the paper to produce a sharp key line image of substantially uniform density along the outside of the boundary between the area of the print overexposed through the said relatively transparent film area and the area of the print under the said dense film area and to produce a density less than that of the line image in the said overexposed area of the print without appreciably fogging the paper through the said dense film area, photographing the print to produce a key line negative in which the said key line image is transparent, and exposing a printing plate, coated with a ground which becomes acid proof on exposure to light, through the negative to produce in the sensitized ground an acid-proof positive image of the key line image, coating the ground area on one side of the key line with an acid-proof resist, and etching the plate with acid, whereby the other ground area of the plate is etched and the surface of the plate under the key line and under the coated area is protected from etching.

2. A photographic process as claimed in claim 1 comprising the step of applying a cutting reducer to the said contact print to increase the contrast between the said overexposed area and the said key line image, and then washing the print, before photographing the print to produce the key line negative.

References Cited in the file of this patent

UNITED STATES PATENTS

2,251,965	Verkinderen	Aug. 12, 1941
2,438,494	Bullock	Mar. 30, 1948
2,509,232	Coote	May 30, 1950

OTHER REFERENCES

British Journal of Photography, August 14, 1936, pages 510-511.

Clerc: Photography—Theory and Practice, 2nd ed., 1937, publ. by Sir Isaac Pitman & Sons, Ltd., N.Y., pages 142, 231, 232.

Stevens et al.: (British) The Photographic journal, vol. 77, May 1937, pages 314-317.