Feb. 25, 1964 F. E. WATTIER 3,122,436

MAKING ROTOGRAVURE CYLINDERS OR PLATES

Filed June 11, 1958 4 Sheets-Sheet 1

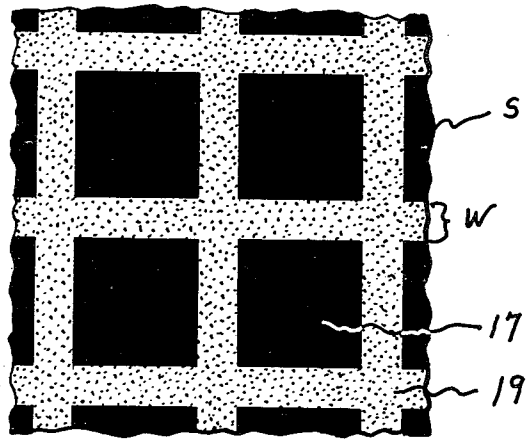

Fig. 1

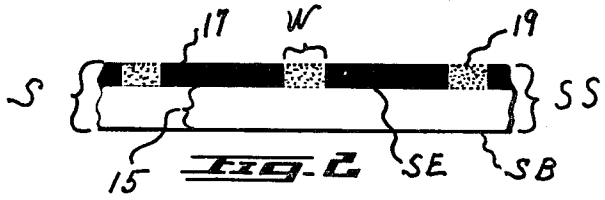

Fig. 2

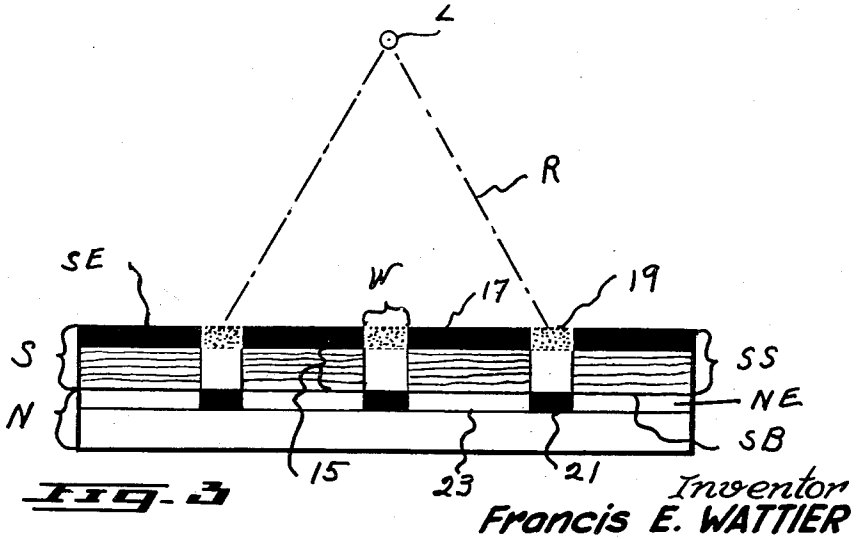

Fig. 3

Inventor
Francis E. WATTIER

BY

ATTORNEYS

Feb. 25, 1964 F. E. WATTIER 3,122,436

MAKING ROTOGRAVURE CYLINDERS OR PLATES

Filed June 11, 1958 4 Sheets-Sheet 2

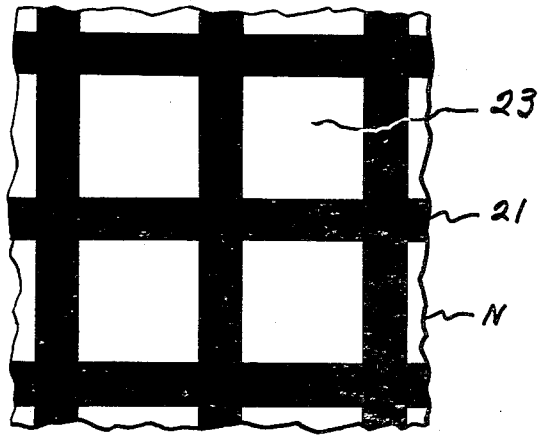

Fig. 4

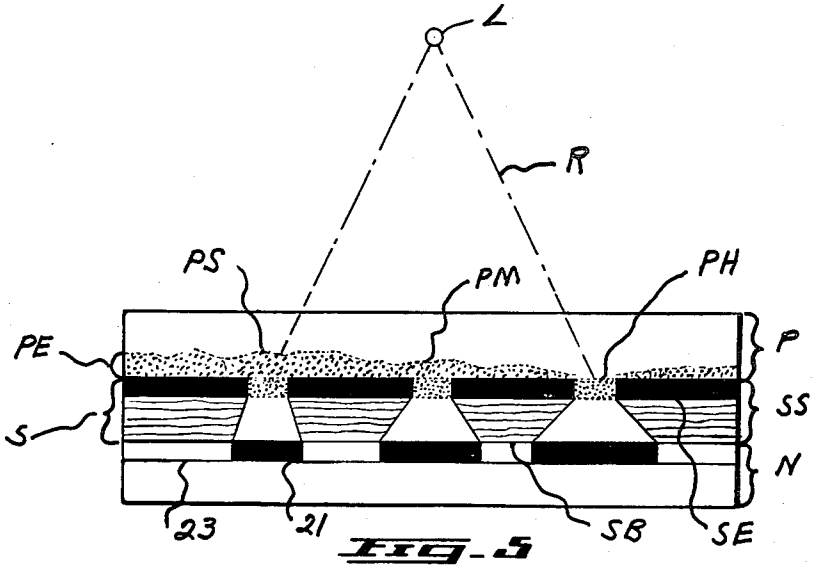

Fig. 5

Inventor
Francis E. WATTIER
BY
ATTORNEY

Feb. 25, 1964 F. E. WATTIER 3,122,436

MAKING ROTOGRAVURE CYLINDERS OR PLATES

Filed June 11, 1958 4 Sheets-Sheet 3

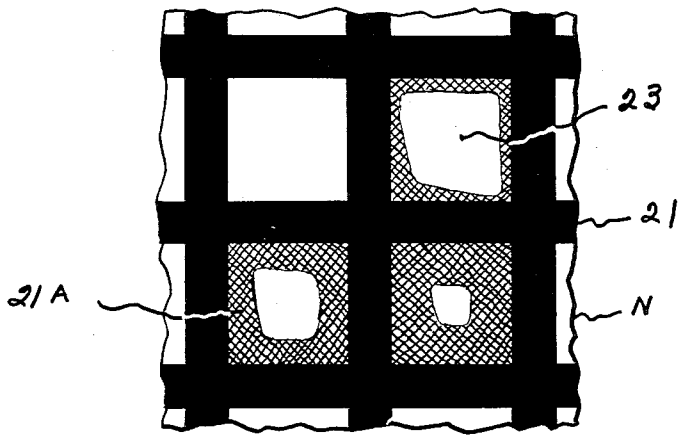

Fig. 6

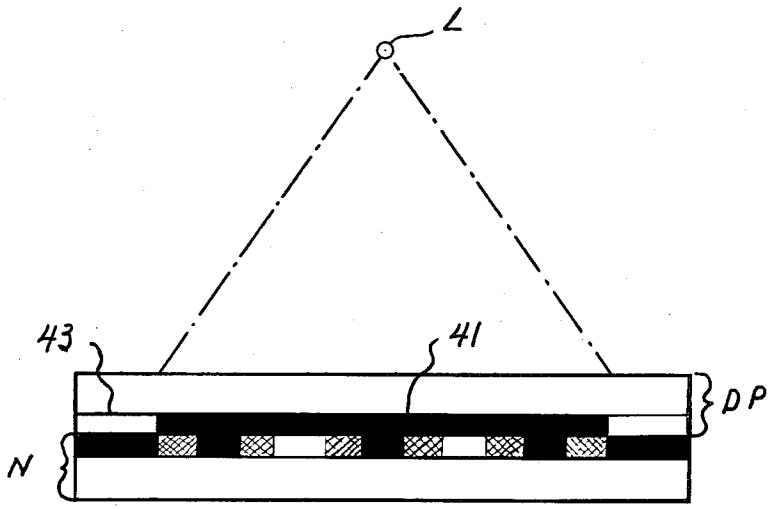

Fig. 7

Inventor
FRONCIS E. WATTIER
BY
ATTORNEY

Feb. 25, 1964 F. E. WATTIER 3,122,436

MAKING ROTOGRAVURE CYLINDERS OR PLATES

Filed June 11, 1958 4 Sheets-Sheet 4

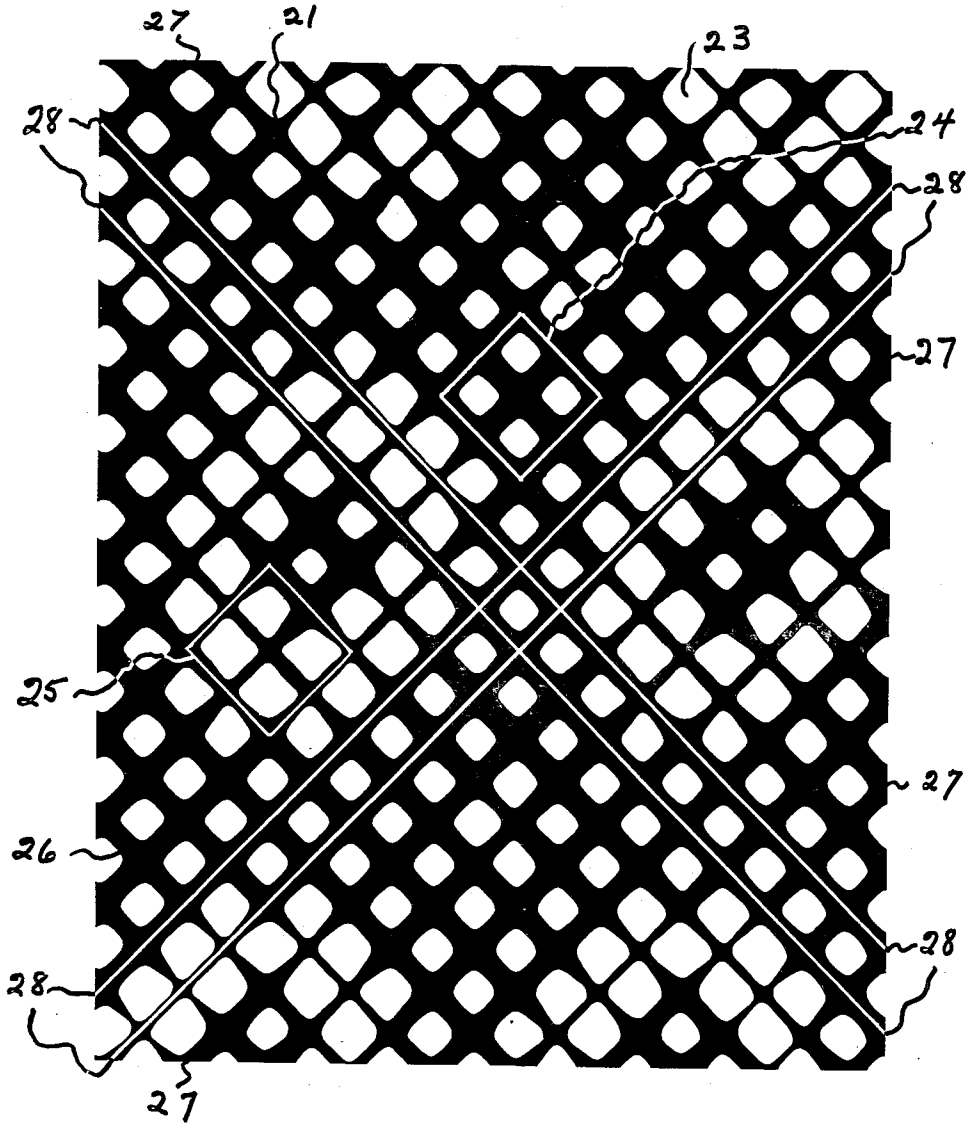

Fig. 8

Inventor
Francis E. WATTIER
BY
ATTORNEY

United States Patent Office

3,122,436

Patented Feb. 25, 1964

3,122,436

MAKING ROTOGRAVURE CYLINDERS OR PLATES

Francis E. Wattier, 345 W. 58th St., New York, N.Y.

Filed June 11, 1958, Ser. No. 741,245

5 Claims. (Cl. 96—45)

This invention relates to making gravure cylinders or plates.

More specifically, it is directed to an improved process of making, from retouched continuous tone positives (by contact), halftone negatives and subsequently (by contact), halftone positives, as steps in making the cylinder or plate.

The method of the invention for making gravure halftone negatives from a retouched continuous tone positive employs a special contact film screen. This contact film screen is made up of opaque isolated dots on a translucent field, both being on a transparent film base. The thickness of the transparent film base, which will vary from $\frac{4}{1000}$ of an inch for a 150 line screen to $\frac{1}{1000}$ of an inch for a 75 line screen, is of special importance, as it acts as screen separation. The opaque isolated dots are square in overall outline. The translucent field is adjacent to the sides of the square dots.

The ratio of the crossing translucent field to the isolated opaque dots, is based upon the number of lines per inch in the screen. With all screen rulings from 150 to 75 lines to the inch, the crossing translucent field will have lines of $\frac{2}{1000}$ of an inch in width and the width of the isolated opaque square dots will vary accordingly.

For example, a 100 line screen, having crossing translucent lines of $\frac{2}{1000}$ of an inch in width, and corresponding isolated opaque square dots of $\frac{8}{1000}$ of an inch in width will be of a ratio of 1 to 4, whereas, a 150 line screen having crossing translucent lines of $\frac{2}{1000}$ of an inch will be closer to a 1 to 2½ ratio.

The screen is composed of two uniform densities, one opaque, which will entirely obstruct the passage of light, and the other translucent, which will slightly scatter the rays of light that pass through it. The opaque square dots have a uniform density of 4.00. The adjacent translucent field has a uniform denstiy of 0.20.

According to the method of the invention, the gravure halftone negative is made as follows. The transparent base side of the gravure contact film screen is placed in contact with the emulsion side of a non-exposed contrast process or lith halftone film or plate.

The contrast process or lith halftone film or plate is first exposed through the gravure contact film screen to a single source of light. This exposure is to establish the bridge on the gravure halftone negative and to isolate the cells one from the other in the etched cylinder.

Then, with the gravure contact film screen exactly in the same position, the emulsion side of the retouched continuous tone positive is placed in contact with the emulsion side of the gravure contact film screen. A second exposure is then made to the single source of light through the retouched continuous tone positive and the gravure contact film screen, to obtain a gravure halftone negative.

To drop out unwanted color, such as a white background in the gravure halftone negative, both the retouched continuous tone positive and the gravure contact film screen are removed and a line dropout plate is placed in register, emulsion-to-emulsion, with the exposed gravure halftone negative, and a third exposure is made.

The additional steps, which are conventional, are as follows. A contact print is made from the halftone negative on a contrast process or lith halftone plate to obtain a halftone positive. Then the halftone positive is surprinted in register over the printed, retouched, continuous tone positive, on the carbon tissue.

The invention has been generally described and will now be referred to in more detail by reference to preferred embodiments which are illustrated in the accompanying drawings.

In the drawings:

FIG. 1 is a face view of the special contact film screen of the invention.

FIG. 2 is a diagrammatic side elevation of the screen shown in FIG. 1.

FIG. 3 is a diagrammatic side elevation showing the relationship of the contact film screen and a non-exposed contrast process or lith halftone film or plate in the initial step of the method of the invention, to make the bridge exposure.

FIG. 4 is a face view of the halftone negative after the "bridge" exposure is made with the screen in the position of FIG. 3.

FIG. 5 is a diagrammatic side elevation of the contact film screen in position with relation to a retouched continuous tone positive for a further step of the invention, to make the halftone exposure.

FIG. 6 illustrates the face of the halftone negative after both the bridge and halftone exposures are made.

FIG. 7 is a diagrammatic side elevation showing the relationship of the drop out line plate in contact with the halftone negative after the contact film screen and continuous tone positive are removed.

FIG. 8 is a face view, of an actual photograph, greatly enlarged, of a section of a gravure halftone negative made according to the invention.

More specific reference will now be made to the drawings:

FIGS. 1 and 2 illustrate the special contact film screen S of the invention. This is made photographically on lined film by contact from a master engraved ruled screen, the contact film screen being made up of a transparent backing portion **15** on the face of which appears a grid of opaque squares **17** intervened by crossing translucent lines **19**. The master engraved ruled screen used to make the contact film screen is composed of crossed opaque lines at a 90° angle and of transparent square openings.

The width of the crossing opaque lines of the master screen is $\frac{2}{1000}$ of an inch. The transparent square openings will vary according to the ruling of the screen.

The first step in making the contact film screen is to expose the line film overall to obtain a uniform density of 0.20; then with the master engraved ruled screen in contact with the exposed line film, a second exposure is made to obtain opaque isolated square dots having a uniform density of 4.00.

The purpose of using a screen with a translucent field instead of one with a transparent field, is that when used in making a gravure halftone negative, according to the method of the invention, the screen with the translucent field, due to its slight scattering of light, produces a negative with much better highlight detail than a screen with a transparent field.

The operation of the screen and its function will be further understood by reference to the description of the method which follows.

In the first step of the invention, a gravure halftone negative is made as follows: The scren base SB of the screen S in FIG. 2 is placed in contact with the emulsion side NE of a non-exposed contrast halftone film or plate N, as shown in FIG. 3.

The screen separation SS as shown in FIG. 3 between SE and NE is parallel overall and is automatically set by the thickness of the transparent base **15** of the contact screen S. With the screen S and the film or plate N in position, as shown in FIG. 3, an exposure is made through the screen to a single source of light L. This exposure is for the purpose of establishing a bridge on

the eventual gravure halftone negative and for isolating the cells one from the other in the etched cylinder or plate.

There is only sufficient exposure at this stage to keep the bridge the same width as the translucent width W of the screen S or 2/1000 of an inch.

The exposed bridge on the halftone negative N is denoted by 21 and the non-exposed sections by 23. A face view of this exposure is shown in FIG. 4. Then, with the screen S in exactly the same position as FIG. 3, the emulsion side PE of a retouched continuous tone positive P is placed in contact with the emulsion side SE of the contact screen S, and a second exposure is made on the negative N as shown in FIG. 5.

In FIG. 5, the varying densities PE or depth of the silver grains in the emulsion of the continuous tone positive P are shown diagrammatically. These densities PE control the intensity of the light from the light L, resulting in obtaining a halftone negative N with transparent areas 23 and opaque areas 21. These areas will correspond in area and shape to the tone values of the retouched continuous tone positive.

The transparent areas 23 in turn become the cells in the etched cylinder or copper plate. A face view effect of both bridge and halftone exposure on halftone negative N is shown in FIG. 6, 21 representing the bridge exposure, and 21A, the shaded areas, representing the halftone exposure.

In order to drop out unwanted color, as for example, a white background in a gravure halftone negative, both the retouched continuous tone positive P and the contact film screen S are removed and a line drop out plate DP placed in register, emulsion-to-emulsion, with the exposed gravure halftone negative N, as illustrated in FIG. 7. The drop out plate DP has apoque areas 41 and transparent areas 43. Then a third exposure is made to complete the halftone negative.

A gravure halftone negative made according to the invention will have a halftone formation, whereby the contour of both the transparent areas 23 and the opaque areas 21 will follow exactly the tone values of the retouched continuous tone positive (see FIG. 8). Furthermore, the contrast between both areas will be clean cut and sharply defined without "featheredge."

The additional steps which are conventional are important aspects of the process and should be noted. A contact print is made from the halftone negative (see FIG. 8) on a contrast process or lith halftone plate to obtain a halftone positive. The contact positive obtained will contain all of the detail of the halftone negative (see FIG. 8). The opaque halftone dot formation will be of uniform density with hard edges and sharp clear line separation in between them.

This stencil or "hard dot" in the gravure halftone positive, when combined with the retouched continuous tone positive by surprinting one over the other on the carbon tissue, will produce a superior form of halftone image on the carbon tissue, which, in turn, will facilitate the operation of obtaining consistent results in etching the cylinder.

The method of the invention for making gravure halftone negatives (due to the physical structure of the contact screen S, for example, the uniform and automatic fixed screen separation set by the thickness of the screen base 15, the predetermined bridge and cell ratio in the solid or 100 percent tone values, the complete control over both bridge and halftone exposure) is greatly simplified and ensures consistent results. The results, as to halftone balance, may be more nearly obtained by different operators, as compared to the conventional method of making halftone reproductions in the camera.

Important aspects of the function of the screen should be noted as follows (see FIG. 5):

The emulsion side PE of the continuous tone positive P and the emulsion side SE of the screen S, are placed in close contact and both work as a unit to produce a halftone negative.

The reason for this is that the rays of light R traveling from the single source of light L used in making the exposure are specular in character, but when they pass through the continuous tone positive PE, which positive consists of fine grains of silver of different densities PS, PM, and transmit light as a translucent body, the specular rays of light R, after passing through the continuous tone positive PE, are converted to slightly scattered rays of light.

It is this scattering of the light rays which takes place at the point of contact between the continuous tone positive PE and the screen SE, plus the screen separation SS that makes it possible to obtain a halftone negative consisting of opaque areas 21 and of transparent isolated areas 23 which areas 21 and 23 will vary in size and contour and conform to the tone densities of the continuous tone positive (see FIG. 8).

Due to the continuous tone positive having very little silver in the highlight region PH, FIG. 5, this part of the positive remains fairly transparent and allows the specular light to pass through quite freely and more or less allows the highlights of the continuous tone positive to be photographed with specular light resulting in a flattening and loss of detail in the highlight regions of the halftone negative.

Therefore, by the use of a screen having a translucent field 19, FIGS. 1 and 2, this translucency will convert the specular light passing through the highlight region PH, FIG. 5, of the continuous tone positive to a slightly scattered light, resulting in better tone values and better detail in the highlight regions of the halftone negative.

In the present invention, the tone values, modeling and detail in the continuous tone positive control the exposed areas 21 and the non-exposed areas 23 in the halftone negative. See FIG. 8.

Where there are flat tones of uniform densities in the continuous tone positive, the exposed areas 21 and the non-exposed areas 23 in the halftone negative will be of a symmetrical formation 24, FIG. 8.

However, where there is detail and modeling in the continuous tone positive, the exposed areas 21 and the non-exposed areas 23 will be of a non-symmetrical formation 25, FIG. 8. That is, the contour of the exposed and non-exposed areas 26, FIG. 8, will vary in shape, and conform to the detail and modeling of the continuous tone positive. Therefore, the exposed or opaque areas of the halftone negative will be composed of a series of irregular lines 27, FIG. 8, crossing at 90° angle. The center or axes 28, FIG. 8, of the exposed or opaque lines will be parallel one to the other in both directions. The non-exposed or transparent areas of the halftone negative will conform in shape and contour according to the exposed areas.

A gravure etching made according to the invention, will contain all of the characteristics as shown in the half-tone negative, FIG. 8. The exposed areas of the negative 21, represent the bridge, and the non-exposed areas of the negative 23, represent the etched cells in the cylinder or plate.

Approximate dimensions of screen ratio and screen separation:

Screen	Translucent Area	Opaque Area	Screen Separation
150 lines per inch	2/1000	4.67/1000	1/1000
120 lines per inch	2/1000	6.33/1000	
100 lines per inch	3/1000	9/1000	
75 lines per inch	2/1000	11.33/1000	19/1000

Although the screen formation is particularly applicable to gravure printing, with slight modification in the bridge exposure, it can be used to advantage in coarse screen

letter press color work for newspaper and also for fine screen color work in offset reproduction.

While there has been herein described a preferred form of the invention, it should be understood that the same may be altered in details and in relative arrangement of parts within the scope of the appended claims.

Having now particularly described and ascertained the nature of the invention, and in what manner the same is to be performed, what is claimed is:

1. In a method of making a halftone negative for gravure printing, using a screen member having a screen image-bearing emulsion on a transparent base from four to ten one-thousandths of an inch in thickness having a screen supported on said base composed of opaque dots having a density of about 4.0, separated by translucent, light-diffusing lines having a density of about 0.20 formed in the screen layer, and a contrast halftone plate which had not been exposed, which comprises positioning the base of the screen against the emulsion side of the halftone plate, exposing the contrast halftone emulsion through the screen to a single source of light to obtain a negative image of the screen and establish a bridge pattern on the emulsion, and with the screen in the same position of register making another exposure of the contrast emulsion with a continuous tone positive in emulsion-to-emulsion contact with the screen using a single source of light to obtain a negative halftone screened image of the continuous tone positive.

2. In a method of making a halftone negative, the steps of placing the base side of a halftone film screen having an emulsion layer with a screen image composed of opaque dots having a density of about 4.0, separated by translucent, light-diffusing lines having a density of about 0.20 formed in said emulsion layer and supported on a transparent base, said base having a thickness within the range from four one-thousandths of an inch to about ten one-thousandths of an inch, in contact with the emulsion side of a non-exposed contrast halftone plate, and exposing the contrast halftone plate through the film screen to a single source of light to obtain a negative image of the screen pattern and thereby to establish a bridge pattern on the plate, then with the film screen in the same position placing the emulsion side of a continuous tone positive in contact with the emulsion side of the said film screen, and exposing the halftone plate a second time through the said film screen and said continuous tone positive to a single source of light to obtain a negative halftone image of the continuous tone positive.

3. A method of making a halftone negative comprising placing the emulsion side of a continuous tone positive in close contact with the emulsion side of a film screen, composed of isolated opaque elements having a density of about 4.0 intervened by a uniform translucent light diffusing field having a density of about 0.20, both the emulsion of the continuous tone positive and the emulsion of the film screen being in close contact to work as a unit to produce a halftone negative.

4. A halftone screen, comprising a transparent film base having a thickness within the range from about four one-thousandths of an inch to about ten one-thousandths of an inch, and an exposed image on one surface of the film having a grid pattern including isolated opaque square dots having a uniform density of 4.00 intervened by a translucent light diffusing field having a uniform density of 0.20, the width of the intervened translucent field being two one-thousandths of an inch and the width of the opaque square dots to vary according to the ruling of the screen.

5. A halftone screen, comprising a transparent film base having an exposed image on one surface of isolated uniform opaque elements of about 4.00 density, and intervened by a uniform translucent light diffusing field of about 0.20 density.

References Cited in the file of this patent

UNITED STATES PATENTS

735,142	Palmer	Aug. 4, 1903
2,010,042	Stirling	Aug. 6, 1935
2,150,805	Meulendyke	Mar. 14, 1939
2,159,588	Gorig	May 23, 1939
2,315,101	Zukmann	Mar. 30, 1943
2,362,826	Huttkay	Nov. 14, 1944
2,446,193	Rice	Aug. 3, 1948
2,528,007	Kubeserian	Oct. 31, 1950
2,532,701	Falconer et al.	Dec. 5, 1950
2,596,115	Austin	May 13, 1952
2,692,198	Whitney	Oct. 19, 1954
2,767,093	Bilhoefer	Oct. 16, 1956
2,912,327	Maurer	Nov. 10, 1959
2,984,566	Caine	May 16, 1961