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**PHOTOGRAPHIC IMAGE REDUCTION METHOD**  
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No Drawing. Filed May 22, 1968, Ser. No. 731,313  
Int. Cl. G03f 5/00; G03c 11/00

U.S. Cl. 96-45

3 Claims

## ABSTRACT OF THE DISCLOSURE

Continuous tone images are optically converted to half tone images of a reduced size that is convenient for use in storage and retrieval systems. The quality and tonal gradations of the original continuous tone image are maintained in the reduced half tone film record. When desired, this reduced half tone record of original continuous tone image, may be reconstituted by suitable optical and/or photographic means to obtain an eye readable image of the original subject matter.

The invention described herein may be manufactured, used, and licensed by or for the Government for governmental purposes without the payment to me of any royalty thereon.

## BACKGROUND OF THE INVENTION

This invention relates in general, to the art of microphotography, and in particular to a method of reducing the size of continuous tone images while maintaining image quality and tonal gradations.

The subject of micro-recording or reduction of line copy material for micro filming use is a well established science. Equipment, materials and techniques exist that enable an experienced operator to reduce line copy (black and white) material as much as 300 times. The materials used include copy film such as commercially available Eastman Kodak High Resolution Plates or micro file material. In both cases the images when developed as recommended are very high contrast. This very high contrast, though desirable in line work, is a serious disadvantage in continuous tone recording. That is, the small latitude of the high contrast film makes it impractical to record the wide range of tones that are inherent in continuous tone images.

Accordingly, the general object of this invention is to provide a method of reducing the size of continuous tone images while maintaining image quality and tonal gradations using a high contrast, high resolution film. A more particular object of this invention is to provide such a method wherein the resulting recorded image can be reconstructed optically and/or photographically to provide duplicate copies of the original stored continuous tone information or visual presentation in eye readable form.

## SUMMARY OF THE INVENTION

The method of the invention involves the following:

(a) A conventional continuous tone image either positive or negative, is screened by photographic means, using the finest screen available.

(b) This half tone image is now optically reduced and recorded on high contrast, high resolution film.

(c) When desired, the recorded image is then optically restored to provide eye readable copy or photographically reproduced to provide permanent copies of the stored continuous tone information. The limiting size of the enlarge-

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ments reproduced from the micro images stored on film, will be determined by the screen pattern used. The limit will be reached when the reconstructed photograph loses the quality of being a continuous image and appears as a dot pattern when viewed with the unaided eye.

The half tone image may also be prepared using micro recording material with a screen built in (auto-screen). Such materials are presently available for conventional half tone applications. In this instance image reduction would be performed in a subsequent operation. The continuous tone image may be screened by contact printing or during the reduction process.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

If the imagery to be microphotographed is a positive reflection copy, such as an 8" x 10" photograph having good tonal range, a preferred method of approach is as follows:

The print is mounted on a copy board having a vacuum back and/or glass platen to provide an extremely flat copy surface. Illumination of the copy must be uniform and non-glaring such as to prevent reflections on the image surface from deteriorating the quality of the copy. The imagery is then copied at a 2 to 1 reduction ratio using a copy camera of the type used in graphic arts process work such as the Chempco graphic arts process camera, and Kodalith, ortho film which is a graphic low speed, fine grain orthochromatic sensitive film. The copy film is used in conjunction with a negative magenta contact screen having 200 lines per inch. The resulting product when processed in lithographic high contrast developer such as E. K. Kodalith Developer is a 4" x 5" screen half tone negative containing a 200 line per inch pattern.

This screened half tone negative is now microphotographed using equipment such as Borrowdale Miniaturization Camera using a reduction ratio of 10 to 1 which results in a reduced positive half tone record containing approximately 2000 lines per inch. This practical limit is established by the resolution of the film used for microphotography.

The choice of positive or negative original copy, positive or negative intermediates, positive or negative half tones and positive or negative reductions would depend upon availability of materials and the type of end product desired. For reproduction purposes a micro record negative is desirable, for direct projection viewing a micro record positive is desirable. The method used would be only a modification of the preferred embodiment. Although the preferred embodiment describes a contact screen of 200 lines per inch, an operator skilled in the art can choose appropriate screens and appropriate reduction ratios of both copy procedures to provide the desired micro record that is within the practical limit of resolution of the film used.

The method of the invention as herein described is also considered applicable for use as a means of producing micro motion pictures wherein the images are contained on a narrow web of film or a cylinder of film.

The foregoing is to be considered merely as illustrative of the invention and not in limitation thereof.

What is claimed is:

1. A method of reducing the size of continuous tone images while maintaining image quality and tonal gradations so that the reduced continuous tone images are suitable for microrecording use, said method including the steps of (A) screening the continuous tone image with a

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contact screen of 200 lines per inch to obtain a half tone image no larger in size than the original continuous tone image, and (B) optically reducing the half tone image at a reduction ratio of 10 to 1 to obtain a reduced half tone record containing approximately 2000 lines per inch.

2. A method according to claim 1 wherein the continuous tone image is a positive image.

3. A method according to claim 1 wherein the continuous tone image is a negative image.

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U.S. Cl. X.R.

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