

Memorandum

TO : NPIC/P&DS

DATE: 26 October 1966

STAT

Atten :

FROM : CSS/CASB/PD/OL

STAT

SUBJECT:

1. Enclosed is a copy of a Disclosure Data Sheet on an invention in "Electronic Image Processing System." Contractor indicates it will not file an application for patent.

2. Will you let us know whether there is sufficient Government interest in the invention to warrant Government patent action.

STAT

Distribution:

Orig - Addressee

1 - File

1 - Patent file

OL/PD/CASB/CSS/

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Declass Review by NGA.



ADMINISTRATIVE - INTERNAL USE ONLY

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I do not have the time to examine this very critically, and therefore any opinion I might have would not be very expert. I suggest we leave it alone, inasmuch as it sounds simple enough to have a dozen patents filed against the idea already.

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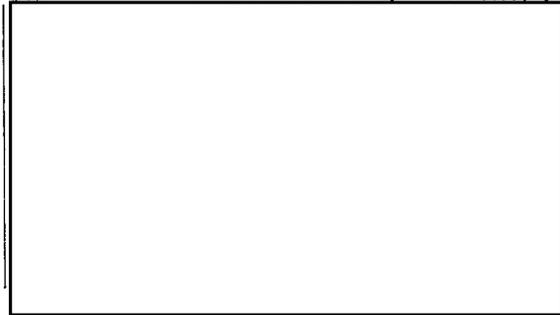
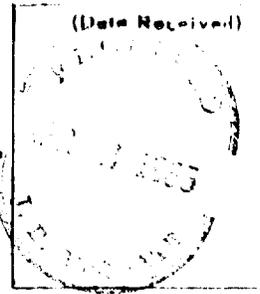
31 Oct 66
(DATE)

FORM NO. 101 REPLACES FORM 10-101
1 AUG 54 WHICH MAY BE USED.

(47)

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PATENT DISCLOSURE DATA SHEET



To: Director of Domestic Patents

DISCLOSURE ACKNOWLEDGED
DATE: 4-2-65
BY: [Signature]

The herein described invention is submitted pursuant to my employment agreement.

- 1. Date: February 26, 1965
- 2. DESCRIPTIVE TITLE: Electronic Image Processing System
- 3. PURPOSE, SUMMARY AND PROBABLE USES:

The purpose of the system is to improve the perceptibility of fine detail in photographic images.

The system employs a high-resolution CRT in conjunction with a photomultiplier as a flying spot scanner of a given photographic negative. High and low frequency information in the resulting electrical signal are separately processed (e.g., amplified, clipped, shaped, inverted) and then combined to modulate one or more additional CRT's. The modulated light, modified by the transmittance of the negative, produces an enhanced image on a final recording emulsion.

The system should prove valuable for interpretation of reconnaissance photographs and other applications requiring sharpened photographic detail.

- 4. Attached hereto is "Detailed Description" comprising Form Pat. 3010 (3) pages and the following papers, prints, samples, etc. Figures 1 and 2.
- 5. Invention conceived February 12, 19 65
- 6. Construction of the device completed on _____, 19 ____.
- 7. The completed device first tested on _____, 19 ____.
- 8. Test witnessed by _____.
- 9. Is commercial use scheduled? (Yes _____ No).

10. If answer to 9 is "Yes", explain _____ written presentation to STAT.

- 11. If this invention has been described in any publication or report, identify: Govt. (2/16/65)
- 12. Was invention conceived or first actually reduced to practice either (a) in the performance of the experimental, developmental, or research work called for or required under Government Contract (Yes _____ No) or (b) in the performance of any experimental, developmental, or research work relating to the subject matter of a Government Contract which was done upon an understanding in writing that a contract would be awarded? (Yes _____ No).

- 13. Numbers of Contracts referred to in 12: (a) _____ (b) _____
- 14. Is the invention embodied in any material furnished or to be furnished under a Government Contract? (Yes _____ No _____)
- 15. Numbers of Contracts referred to in 14: _____

- 16. Security classification of (a) applicable Contract(s) _____ and (b) the Invention _____ STAT
- 17. Invention disclosed in Engineering Notebook No. G-3774, Pages 11 through 19

18. Type or print full name(s), home address(es), occupation number(s), place of employment, etc.

(1) Name _____
Street _____
Div. or S _____
Occ. No _____

(2) Name _____
Street _____
Div. or S _____
Occ. No _____

19. Sign full n _____

SPACE BELOW RESERVED FOR WITNESS

(An effort should be made to obtain the signature of the person to whom the inventor(s) first disclosed the invention)

- 20. The invention was first explained to me by the above identified inventor(s) on February 15, 19 65 and is understood _____



[Signature] _____, 19 65
Date of Signature

STAT

For Domestic Patents Use Only

PATENT DISCLOSURE DATA SHEET

(Date Received)

(For Acknowledgment and Atty. Assignment)

Patent No. 3,200,000

STAT

To: Director of Domestic Patents

[Redacted]

The herein described invention is submitted pursuant to my employment agreement.

- Date February 26, 1965
- DESCRIPTIVE TITLE: Electronic Image Processing System
- PURPOSE, SUMMARY AND PROBABLE USES:

- Attached hereto is "Detailed Description" comprising Form Pat. 3010 () pages and the following papers, prints, samples, etc. _____
- Invention conceived _____, 19 ____
- Construction of the device completed on _____, 19 ____
- The completed device first tested on _____, 19 ____
- Test witnessed by _____
- Is commercial use scheduled? (Yes ____ No ____)
- If answer to 9 is "Yes", explain _____
- If this invention has been described in any publication or report, identify: _____
- Was invention conceived or first actually reduced to practice either (a) in the performance of the experimental, developmental, or research work called for or required under Government Contract (Yes ____ No ____) or (b) in the performance of any experimental, developmental, or research work relating to the subject matter of a Government Contract which was done upon an understanding in writing that a contract would be awarded? (Yes ____ No ____)
- Numbers of Contracts referred to in 12: (a) _____ (b) _____
- Is the invention embodied in any material furnished or to be furnished under a Government Contract? (Yes ____ No ____)
- Numbers of Contracts referred to in 14: _____
- Security classification of (a) applicable Contract(s) _____ and (b) the Invention _____
- Invention disclosed in Engineering Notebook No. _____, Pages _____
- Type or print full name(s), home address(es), occupation number(s) _____

(3) (X) Name _____
 Street _____
 Div. or _____
 Occ. No. _____

(2) Name _____ Citizen of _____
 Street _____ City _____ County _____ State _____
 Div. or Subsidiary _____ Bldg. No. _____ Floor _____ City _____ State _____ Tel. No. _____
 Occ. No. _____ Occ. Title _____

19. Sign full name(s) _____ (2) _____

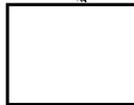
RESERVED FOR WITNESS

(An effort should be made to obtain the signature of the person to whom the inventor(s) first disclosed the invention)

20. The invention was first explained to me by the above identified inventor(s) on _____, 19 ____, and is

[Redacted Signature]

1 April, 19 65
Date of Signature



PATENT DISCLOSURE DATA SHEET



6280

DESCRIPTIVE TITLE: Electronic Image Processing System

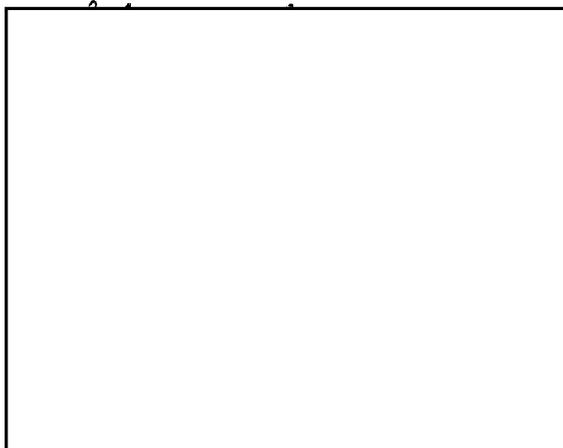
3. DETAILED DESCRIPTION:

Photographic positives made from negatives displaying slightly-blurred images (because of system effects like lens aberration and flare) can be modified to improve fine-detail perceptibility. Under certain conditions, this result may be achieved with photographic techniques using, for example, adjacency effects and emulsion thresholds. Application of the latter requires density sectioning and masking (or equivalent processing) to first reduce all the high spatial-frequency elements to a common base-density level. In general, photographic processing requires many time-consuming steps as well as careful selection of emulsions and development for thresholding.

A thresholding process operating on an electronic signal can probably be accomplished with considerably more accuracy and flexibility. The light derived from this processed electronic signal can be added to (superimposed on) the information in the film to produce a sharpened image which can be recorded without a threshold process in the recording medium. Hence with respect to photographic processing, electronic processing can reduce the number of steps required to produce a sharpened photographic copy. As few as one step may only be necessary.

One conceptual system for implementation of these processes is shown in Figure 1.

The fine-spot ultra-violet CRT #1 is used to generate a signal by scanning the original photograph. This signal is picked up by a photo-multiplier sensitive only to the ultra-violet light. (A minus-U.V. filter is used to prevent this signal from exposing the copying emulsion).

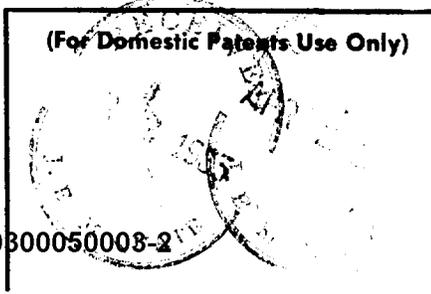


10 March 1965

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Date

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PATENT DISCLOSURE DATA SHEET



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56280

DESCRIPTIVE TITLE: Electronic Image Processing System

3. DETAILED DESCRIPTION:

Low frequency information is removed from the electronic signal by a high-pass filter, and the resulting signal is now put through a uniform threshold process, amplified and limited (or clipped) to provide pulses as shown. Note that clipped pulses are only one variant of the many types of pulses which can be provided to produce special effects. The point-by-point product of the light intensity pulses (as generated by CRT #2) and the transmittance of the original film will provide a sharpened optical signal for recording on the copying emulsion.

The original electronic signal when put through a low-pass filter, inverted, and applied to CRT #3 (which has a diffuse spot) can provide dodging, that is, a compression of low-frequency contrast. The low-pass filter is in fact not required as a separate component since the diffuse spot is itself a low-pass filter. (This low-frequency modification is not required for sharpening; however, it is frequently a desired addition to the processing system.)

Another conceptual system is shown in Figure 2. This appears to be less complex mechanically, and may provide even more flexibility in operation. The high frequency information for sharpening, and the low frequency information (inverted) for automatic dodging, are added and applied to a single fine-spot CRT. The electrical filter band-passes and the signals through each band could be separately adjusted.

It should be noted that scanning in one direction provides the capability of processing only the signal variations which occur in that direction. It would therefore be proposed that either system be implemented with scans which alternate, frame-by-frame, to produce lines first

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<u>10 March 1965</u>
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PATENT DISCLOSURE DATA SHEET

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DESCRIPTIVE TITLE: Electronic Image Processing System

3. DETAILED DESCRIPTION:

in the x-direction, and then in the y-direction.

The copying film integrates the results of the two sets of scans.

Because there is in fact no closed feedback loop in the system, problems of stability, as encountered in a closed-loop system, should be substantially eliminated. (Note that CRT #1 is unmodulated.)

Misregistry of the probing and recording beams resulting from propagation delays can be corrected by a mechanical displacement of the CRT's. Correction in this manner cannot be applied with isotropic (box) scan. If isotropic scan were desirable, the scanning rate should be kept low so that propagation delays would be negligible.

The systems which have been described could be adapted for real-time viewing of sharpened images under certain limitations. Because scanning speeds need to be sufficiently fast to avoid flicker, format size would have to be greatly reduced to avoid very high video bandwidths. Propagation delays could not be made negligible, and would require compensation by mechanical means, as has been described, or perhaps by use of a video recorder unit.

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10 March 1965

10 March 1965
Date

1 April 1965

Date

(For Domestic Patents Use Only)



5628 STAT

DESCRIPTIVE TITLE: Electronic Image Processing System

3. DETAILED DESCRIPTION:

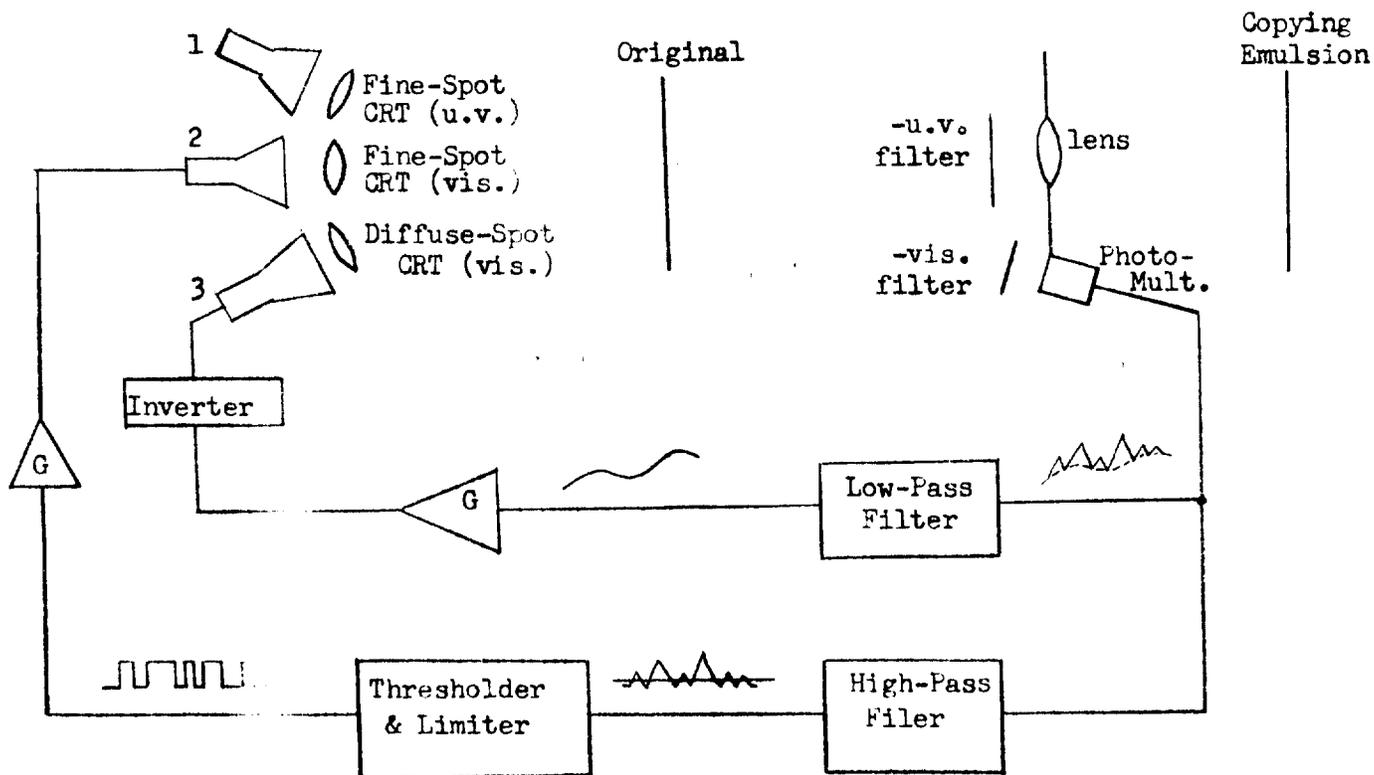


Figure 1. Block Diagram of Electronic Blur-Reduction System (Including Automatic Dodging)

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10 March 1965

10 March 1965
Date

1 April 1965
Date



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