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The Files - Project 2153

26 March 1959

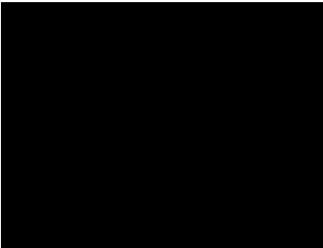
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Conference Report - Photographic Encipher System

1. On 13 February 1959 a conference was held with representatives of the National Cash Register Company to discuss recent NCR developments in graphic reproduction and their possible applications in the Photographic Encipher System. Present at the conference in Room 2405 "I" Building were:

Mr. Harry K. Green - Director of Chemical Research, National Cash Register

Mr. Lowell Schleicher - Head, Fundamental Research Department, NCR



- Chief, OC-S

OC-S

OC-S

SFB

- TSS

TSS

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2. NCR has developed and is now commercially marketing a "carbon-less" carbon paper which permits pressure print-through with several layers of paper, and yet eliminates the need for an interstitial layer of carbon paper. The back of each NCR sheet is coated with a layer of microscopic gelatin globules containing a colorless dye. When pressure is applied to the paper surface, the globules are broken and the dye is transferred to the surface of the facing page where it reacts with another chemical coating, turning the colorless dye to blue.

3. An NCR extension to this process which may be adaptable to the photographic encipher system utilizes a metachromic dye within the gelatin globules. This dye, suspended in an oil base within the globule, reacts to the stimuli of different light frequencies. Exposure to a yellow light turns the dye colorless, while exposure to an ultraviolet light turns the dye blue. This color reversal can be repeated indefinitely so long as the globules remain unbroken. When these globules are crushed or broken, the dye is released and dries to the color held at that time. There are several characteristics of this process that make it especially intriguing. First, the metachromic dye can be driven to its end point relatively easily. The NCR representatives indicated that no special problems should be experienced in driving the dye either all the way colorless or all the way blue. Elimination of

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the in-between shades is absolutely essential to the security of the system. Secondly, the process is effectively dry, light and pressure being the only quantities required for image formation and fixation. Thirdly, the paper is stable. Exposure to room light or daylight before use will not affect the quality of the finished copy. Fourth, definition should be very good. The globules can be reduced in size to particles as small as 1 micron in diameter.

4. One other interesting characteristic of the NCR paper, which may permit a sandwich construction for production of the cipher copy, is that the globules can be induced to release the dye by application of heat as well as by pressure. This technique, which consists basically of melting the gelatin around the dye, has only been investigated to a limited extent. As a result, it is impossible to draw final conclusions as to the value of this characteristic. If it is found feasible to fix the metachromic dye by application of heat, the technique shown on the attached sheet could be used to form the cipher copy.

5. The NCR representatives did not have samples of the paper to show, but their description of the print quality obtainable has promoted considerable interest in the possibilities of using the NCR paper in the cipher system. It would appear advisable for the interested personnel to visit the National Cash Register Company as soon as possible to further investigate the potentialities of this paper.

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The B... is... present... in...
of the... eye.

B	B	B	B

Plain Text
NCR Paper
Key Text

A sandwich construction is assembled with the KEY and PLAIN on both sides of the NCR paper. The NCR paper must be in the blue condition.

STEP 2

C	B	C	C

Plain Text
NCR Paper
Key Text

The assembled sandwich is exposed to yellow light from both sides, turning some areas of NCR paper from blue to colorless.

STEP 3

CF	BF	CF	C

Plain Text
NCR Paper
Key Text

The sandwich is then exposed to infra-red light from both sides. The globules on those areas adjacent to a black surface are melted, fixing the dye permanently.

STEP 4

CF	BF	CF	B
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NCR Paper

The NCR paper is exposed once again to ultra-violet light, turning the unfixed areas blue.

Step 5

CF	BF	CF	BF
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NCR Paper

The paper is either run through a pressure feller, or exposed to a heat source to develop or fix the remaining unfixed areas. The result is cipher copy.

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