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CONTACT DUPLICATING AND RESEAU PRINTER

AND

HIGH RESOLUTION STEP AND REPEAT PRINTER

EIGHTH MONTHLY LETTER REPORT

MARCH 10, 1965

Period: February 1, 1965, to March 1, 1965

NGA Review Complete

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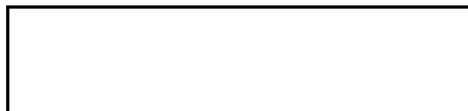


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1.0 CONTACT DUPLICATING AND RESEAU PRINTER

1.1 Purpose

The overall objective of the current contract is the design, fabrication, test, and delivery in fifteen months of a photographic Step and Repeat Contact Duplicating and Reseau Printer. Prime design goals are high speed automatic operation, variable format capability, and high resolution with minimum film distortion or damage. The deliverable equipment will be suitable for operational use. The Printer will accommodate films of 70 mm to 9-1/2" width with frame lengths up to 30 inches and will offer operation in the Reseau mode and Selective mode as options.

1.2 Activity of this Report Period

Based upon the Design Plan submitted in December 1964, the program schedule has been progressing in the areas of final testing and evaluation of the breadboard Printer, and preliminary steps have been taken toward purchase of components and fabrication of the deliverable unit. Final lay-out and detail drawings of the Printer are now well under way.

The major accomplishment of the past report period has been the large-scale demonstration of an exposure source and optical system capable of delivering the required resolution, automatic exposure control of incremental areas, and Reseau line printing. The selected configuration consists of an array of

G.E. 1385 lamps run at 15 V rather than the rated 28 V, a translucent diffuser, a blackened honeycomb collimator, and a multiple-lens system. Exposures have been conducted on an area approximately half that of the final system, and breadboard tests are now being expanded to a full 9 x 30 inch area.

Other major achievements pertain to systems for providing film clearance during transport. A mechanism has been developed for raising one idler-roll in the negative transport system to provide film-to-platen clearance during advance. To provide film-to-film clearance, a pneumatic cylinder arrangement now elevates the pressure pad and duplicating film idlers during transport. Such devices will provide maximum insurance against film or platen damage.

Interface problems and final details of construction and materials are being resolved with The full-size mock-up of the final Printer configuration is proving to be of great value in coordinating human factors and appearance concepts with functional requirements.

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Procurement of the Reseau grid and clear printing platens is about to be initiated. Specifications have virtually been resolved and details of the support frame and locator-pin devices are being finalized in drawing form.

Breadboard models of the photoelectric circuitry for automatic exposure control have been completed and are being evaluated

prior to inclusion in the Printer breadboard. Two compatible concepts are being compared before making a final selection.

An improvement in film drives has been developed such that transient film tensions will be reduced during braking. The stop-count will now be presensed, and the lower speed of a two-speed drive motor system will be engaged prior to brake application.

Lay-out drawings for the Pre-View and Punch Station have been generated and are based upon the requirements and clarifications obtained from the program technical monitors. Human factors and Industrial Design concepts will now be factored into the final configuration.

On February 16th and 17th meetings were held with the technical monitors to review the Industrial Design mock-up and to review the preliminary photographic experiments conducted on the breadboard Printer.

1.3 Plans for Next Report Period

The breadboard Printer will be reworked to include a full-scale exposure system and to include latest developments in drives, frame sensing devices, control panel circuitry, and automatic exposure control modules.

Construction of the deliverable Printer frame will be initiated, and continued progress will be made in generating final assembly and detail drawings for fabrication.

A preliminary outline for the Test Plan has been generated and will be amplified and reviewed during the next reporting period. Some of the major questions to be resolved are methods for demonstrating capabilities in automatic exposure control, incremental area exposure control, and test target formats.

A new sample Reseau grid is being obtained to demonstrate actual quality of etched-and-filled lines, as well as typical characteristics of intersections. Photographic duplicates will be made on the breadboard Printer for evaluation.

Inquiries are being made of highly specialized manufacturers in an effort to procure, for the printing platens, substrate material of the highest possible quality glass with the least number of imperfections.

Further progress is anticipated in preparing test target formats for demonstration of Printer resolution, contact pressure, automatic exposure control, and incremental area control. Resolution targets and calibrated step wedges are being procured.

1.4 Problems

No major problems are anticipated that will delay scheduled program progress. The automatic exposure control circuitry and components have yet to be proven in a large-scale demonstration. Anticipated problems are photocell balancing and cross-talk, and response under imposed conditions.

1.5 Documentation

Tentative agreement was reached with the technical monitors for a masking system using separate thin-sheet masks for each particular frame size. These will be retained by the platen frame and will be located beneath the negative film.

It has been resolved by the technical monitors that compliance with the RFI design requirements will be in the reduction of conducted RFI by means of power line filters to be installed in the Printer. RFI gasketing and shielded switches will not be required.

1.6 Questions Outstanding

STAT submitted its Design Plan for the Contact Duplicating and
STAT Reseau Printer on December 11, 1964. Therefore, due to this
excessive review period, requires immediate approval of
the Design Plan in order to avoid possible delivery delays,
and the possibility of additional costs.

2.0 HIGH RESOLUTION STEP AND REPEAT PRINTER

2.1 Purpose

The purpose of this effort is to design, fabricate, test and deliver in twenty months a high-precision Step and Repeat Photographic Contact Printer. This Printer will be capable of producing photographic contact prints of the highest possible quality, resolution and acutance from roll films of width varying from 70 mm to 9-1/2" and in preselected frame lengths from 2-1/4" up to a maximum of 30".

2.2 Activity of this Report Period

Lay-out drawings were started on all breadboard phases, and procurement and fabrication have been initiated. The following is a description of the progress made in each breadboard area to date.

2.2.1 Exposure Control and Light Source

Optical design for the scanning lamp house was completed, and the final mechanical design was started. The lamps and beam-splitting mirror have been received, and a cylindrical lens is now on order. The G.E. lamps are undergoing energy distribution tests. Delivery of the Westinghouse lamps was delayed and is now expected in mid-March.

Lamp starting circuits are under test and should be completed in two weeks. Electronic components for lamp reversal circuits have been received and construction and test have been started. The modulator design is in progress and parts have been ordered. The circuit design for the sensors and log amplifier is completed, and testing is under way. The completed circuit and sensors will be available early in March.

2.2.2 Film Drive and Transport

Fabrication has started on the idler roller, spool drive, spool support, and edge guide assemblies. Drawings for the storage loop pick-up, drive, and capstan transmission assemblies have been completed and released for fabrication. Assembly of the major sub-assemblies onto the structural frame will be started in mid-March, and testing will commence shortly thereafter.

The response of the D.C. capstan motor has been measured and found to be satisfactory, and tests of stepper motor response are being conducted. The spool drive printed circuit motors have also been checked for response and found to be satisfactory. A preliminary test indicated that a Westamp amplifier would not be adequate, and other amplifiers are being investigated.

A back-up servo control design for a D.C. motor drive and brake system has been initiated and will be completed by the end of March. The servo analysis has been completed.

All phases of this breadboard are proceeding satisfactorily and appear to be on schedule.

2.2.3 Film Gate

The lay-out for this design including an air-actuated parallelogram frame to raise and lower the air bag and a linear bearing arrangement to guide it is 75% complete. This will be completed by mid-March.

All purchased parts and components have been ordered except for the glass platen. Delivery on all ordered parts has been scheduled for late March for completion of procurement. The glass platen will be ordered in March; the plan is to use standard uncoated plate glass for the breadboard tests. To prove the wear characteristics and Newton fringe prevention properties of coated glass, it is planned to inlay a 10" x 10" x 1/8" sample in a metal plate and substitute this for the approximate 31" x 11" x 3/8" glass platen.

2.2.4 Code Reader

A film test target for measuring film code yaw tolerance and for testing the edge sensor was designed and procured. The balance of the photosensitive detectors was received, completing procurement of these items. A code on the test target film was successfully read using the T.I. phototransistor; however, the output current was found to be inadequate for driving the low impedance gates which will be used in the printer. It is

anticipated that amplifying stages will be required, and these will be designed and breadboarded during March.

The overall effort has been expanded to include the development of an edge sensor which will provide an output proportional to the film edge position for driving edge-positioning mechanisms. Components have been procured and fabrication of an edge-sensing station has started.

During the next reporting period it is anticipated that the best suited photodiode will be selected, and the film code yaw tolerance will be measured. Design and testing of the edge-sensing station will be started, and the amplifying stage will be designed and breadboarded.

2.2.5 Electronic Packaging

Sylvania microcircuits were selected on the basis of performance and delivery. Breadboard quantities have been procured, and breadboard fabrication has been started on various logical functions. Preliminary lay-outs for the microcircuit boards have been made, and the matrix etched universal card looks promising.

Procurement of the illuminated pushbutton switches and indicators for the control panel mock-up has been held up pending the final decision on the RFI requirements. Switches meeting RFI requirements have been found to require up to 4 lbs. of operating pressure, which is incompatible with the human factors concept.

It is expected that, during the next reporting period, design and fabrication for the etched cards and selection and procurement of connectors will be completed. The final selection decision on the control panel switches will be made and procurement will be initiated.

2.2.6 Human Factors

STAT A preliminary concept and several alternate proposals were presented by The concept is a design as identical in structure to the Reseau Printer as possible. It is evident that problems might occur with respect to the film loading and threading operations if strict adherence to the frame design of the Reseau Printer is to be maintained. It appears desirable to modify the design somewhat in order to relieve the structure of the areas of the spools and to allow better access to the film path. The alternate designs seem to fulfill this requirement better, and further work is now underway to provide a frame which meets the human factors requirements and still use the Reseau Printer structure from the driving modules back.

Since the RFI specification for the Reseau Printer has been relieved, it is hoped that similar action will be taken here, thus permitting far greater freedom in the selection of control panel components, finishes and assembly techniques. Microswitch has demonstrated a new KB line of switches which

appear to offer exciting possibilities. As yet these components are not RFI suppressed, but information on this is expected shortly. In any case, if the RFI specification is relieved, serious consideration of the switches is possible.

2.3 Plans for Next Report Period

Breadboard fabrication should be nearing completion and testing started for most phases. Final assembly of the film transport will be started and the Code Reader tests should be finished.

2.4 Problems

2.4.1 Edge Sensing

Film edge sensing capabilities are unknown at this time and may require the use of a modified pneumatic device which would complicate the film transport mechanism.

2.4.2 Film Coding

Circuit logic design and component selection are proceeding rapidly and could be seriously affected by major changes in concept. It is therefore imperative that customer approval of the coding format and techniques described in the feasibility study be forwarded as soon as possible.

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2.5 Documentation

A meeting was held with the technical monitor on 2/15/65 and a number of conflicts were discussed regarding previously agreed-to specification changes. These will be reviewed by the new technical monitor and will be discussed again in March.

2.6 Questions Outstanding

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2.6.1 List of spool sizes and format dimensions to be furnished by the technical monitor. These are urgently needed to complete industrial design studies and in design considerations in film transport and masking.

2.6.2 Document procurement to be furnished by the technical monitor: AD-439 600L Test and Evaluate the Kalvar 70 mm and 5 inch Roll to Roll Contact Printer/Processor (EN-85). This is of particular interest because of similar collimation problems encountered with a tubular light source.

2.6.3 [] submitted the Feasibility Study for the High Resolution Step and Repeat Printer on January 19, 1965. Therefore, due to this reasonable review period, [] requires the immediate approval of the Feasibility Study in order to avoid possible delivery delays, and the possibility of additional costs.

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