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CONTACT DUPLICATING AND RESEAU PRINTER → 997093

AND

HIGH RESOLUTION STEP AND REPEAT PRINTER → 997113

SEVENTH MONTHLY LETTER REPORT

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February 10, 1965

Period: January 1, 1965 to February 1, 1965

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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

Primary activity during the past month has been concentrated in two areas -- exposure source with automatic control, and Industrial Design plus human factors engineering.

In the first area, breadboard experiments conducted both at STAT and at the subcontractor's facility have refined the multiple exposure source configuration to a point where capabilities and limitations can now be evaluated. An arrangement of G.E. No. 1385 incandescent lamps and a similar arrangement of G.E. No. AR-1 Argon lamps have been utilized with a diffusion glass and a length of blackened honeycomb collimator material. Levels of resolution, uniformity, Reseau line printing, and dodging effectiveness have been achieved, and are expected to satisfy customer requirements.

The primary objectives have been to achieve dodging without patterning, and without loss of resolution and Reseau line acuity.

A meeting with our consultants, [redacted] was held on STAT January 15th to assist in evaluation of several exposure source and control systems in terms of sensitometry and practical implementation.

Several new concepts for pre-exposure and separate simultaneous exposure of the Reseau grid have been considered and evaluated. Advantages and disadvantages will be discussed with the program technical monitors at a future meeting. In the meantime, procurement activities for the Reseau grid are underway and details of the specification are being evaluated in terms of available glass manufacture and the state of the art in ruling techniques. The sensor and logic circuitry for automatic exposure control has been breadboarded and is now awaiting final choice and configuration of components based upon the intended exposure system. A one-to-one ratio of sensors to lamps is anticipated, but further experiments are necessary to define the limits of crosstalk, sensor area, and spectral response.

STAT In the second area, [redacted] has completed a full-size mock-up of the intended printer in collaboration with [redacted] STAT

STAT [redacted] Although constructed primarily of wood and cardboard, the mock-up is realistic and will be an invaluable tool in establishing operator functions, RFI sealing, environmental considerations, and maintenance accessibility.

Control Panel functions and sequence of operations have been determined and displayed on the model. Roll-out film transports are operative, and the details of frame and cover construction are now tentatively resolved.

1.3 Plans for Next Report Period

A meeting with the program technical monitors is planned with two objectives in mind: to display and discuss the Industrial Design mock-up described herein and the photographic results of the breadboard testing program. At the meeting, a discussion of alternate Reseau printing techniques is also planned.

Conceptual lay-outs of the Pre-View and Punch Station are nearing completion and will be submitted to [redacted] and to [redacted] during the coming report period.

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A simulated target format for Printer evaluation has been determined and components for making the 9 1/2" x 30" array are on order. The format will include multiple resolution targets, multiple step-wedges, and half-tone areas for determining uniformity of contact pressure.

Further investigations are underway to determine availability of higher wattage argon sources to improve printing speed on the slower duplicating films.

Final design and incorporation of the automatic exposure control circuitry into the breadboard exposure system is planned pending results of the preliminary tests.

1.4 Problems

Initial tests of the multiple exposure source have been promising; however, selection of an efficient light source is still a problem. The small tungsten lamps tested generate large amounts of heat which must be dissipated. They also present additional problems in power switching at line voltages. Higher wattage argon lamps and low voltage tungsten lamps will be procured and tested during the next reporting period.

1.5 Documentation

No major changes or clarifications to the Printer specification were recorded during this report period with the exception of verbal agreement to assume 3 feet of working space on all sides of the Printer at customer installation, and verbal agreement to a pre-installed base for the Printer through which all utility connections will be made.

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 pre-selected frame lengths from 2 1/4" up to a maximum of 30".

This program will include a six-month Feasibility Study followed by a Breadboard Phase. Following design approval, a prototype Printer will be produced in accordance with the Design Plan.

2.2 Activity of this Report Period

Additional breadboarding was started during this reporting period, and all breadboard schedules and budgets were prepared. A simplified PERT system has been initiated and is being used to track daily progress. The following is a description of the progress made in each breadboard area to date:

2.2.1 Exposure Control and Light Source

Black-light sample fluorescent lamps have been obtained from General Electric for tests. Aperture-type sample lamps, both black-light and red will be furnished in February by both General Electric and Westinghouse. Two starting circuits for D.C. operation have been tested and found to function; however, circuit modifications are in process to improve starting reliability.

Preliminary resolution tests with a mock-up black-light lamp have been started and indicate that 400 lines/mm resolution is obtainable along the length of the format but not along the width. Additional methods of source collimation are under investigation. Component parts for lamp voltage-reversal circuits have been ordered, and delivery is on schedule.

Initial tests of the E.G.&G. photosensors indicate good output-linearity over wide ranges of input light. When they were used to measure low incident light, however, wide measurement tolerances were evident which may present a problem. Further tests are being conducted.

Fabrication of a scanning lamphouse which will contain a U.V. blacklight aperture fluorescent and a red aperture fluorescent lamp is contemplated after initial optical configuration has been determined. This lamphouse will later be mocked-up with the breadboard gate and photosensor assembly for exposure control tests.

2.2.2 Film Drive and Transport

Most of the breadboard components have been selected and ordered from vendors. Two methods of capstan drive are being considered: a servo-control D.C. motor and a stepper motor drive.

Two motors for the spool drive will be tried: a series wound D.C. motor and a printed circuit motor.

Breadboard drawings are approximately 80% complete and fabrication has been initiated. It is expected that breadboard tests will start in mid-March.

A problem area presently exists in film edge sensing for edge guiding. Two techniques are under investigation: a photoelectric approach using four sensors and two differentiating circuits; and a pneumatic or vacuum sensing technique which senses without contacting the film.

All phases of the task are on schedule.

2.2.3 Film Gate

Film cleaning-station drawings are 90% complete and all parts have been ordered for the breadboard. An anti-static device has been selected and ordered for testing.

The film gate capstan lift and lower mechanism has been designed, and drawings are expected to be completed by mid-February.

Conceptual design for two basic gating mechanisms has been completed. These are: a rolling inflatable plastic cylinder and a dual neoprene roller system. The first technique looks most promising and is being pursued, with the second technique being reserved as a back-up. Vendors are presently being sought as a source of plastic material to meet the design objectives.

Procurement for the glass platen will be initiated in February.

2.2.4 Code Reader

A test fixture has been fabricated, and a film strip with test codes has been prepared. A light source is under fabrication and should be completed so that testing will start early in February. One vendor's photosensor has been received for test, but two from other vendors have not arrived on schedule; however, the overall task should be completed on schedule.

2.2.5 Electronic Packaging

A major decision in the selection of a microcircuit manufacturer has held up the design phase of this study. Inability of the manufacturers to deliver on schedule has prompted a rescheduling of this task. It is expected that design will be initiated early in February and will not cause slippage in other phases.

2.3 Plans for Next Report Period

Breadboard designs should be nearing completion and fabrication started for most phases. It is contemplated that code reader tests will be completed during February and that final assembly of the film transport will be started.

2.4 Problems

Problems presently exist in the collimation of the fluorescent source and in providing reliable lamp starting. Numerous circuits and collimation techniques will be tested in February. An adequate anti-Newton fringe coating has not yet been found which will withstand the abrasion of the film. Additional coating manufacturers will be contacted during the coming period.

2.5 Documentation

At a meeting with the technical monitor held in Washington on January 27, 1965, the following decisions were made on film coding:

2.5.1 Film frames will be numbered consecutively starting with Number 1 in ascending order.

2.5.2 The outside frame of the film roll, as normally spooled, will be Frame No. 1.

2.5.3 The clear spacing between frames will vary widely in spacing.

2.5.4 The film edge to be coded will be clear for the entire length of the film.

2.5.5 Image orientation for viewing the film during encoding is of no importance.

2.5.6 Both edges of all 70 mm film will always be clear for approximately 1/4 inch along the entire length of the roll.

2.5.7 One edge of all 9-1/2 inch film will always be clear for $1/2^{+0}_{-1/8}$ inches along the entire length of the roll. When the film is unrolled from left to right, as normally spooled, and the film is held such that it is viewed through the base, the clear edge will be along the bottom.

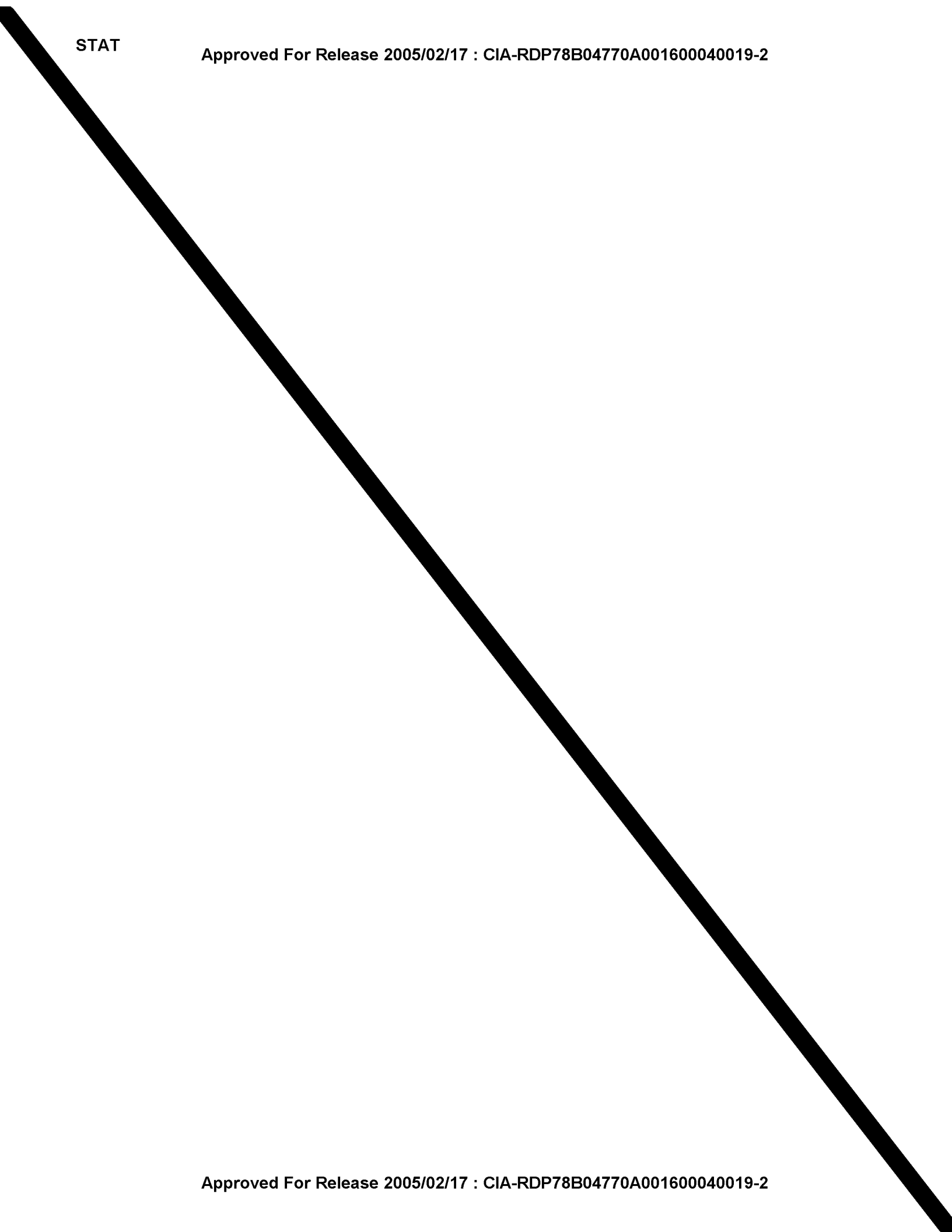
2.6 Questions Outstanding

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.



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