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PUBLICATION



A Selective Roll-to-Roll Printer for Producing Duplicate Microfilm Copies

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

NATIONAL BUREAU OF STANDARDS

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¹ Headquarters and Laboratories at Gaithersburg, Maryland, unless otherwise noted; mailing address Washington, D.C. 20234.

² Located at Boulder, Colorado 80302.

³ Located at 5285 Port Royal Road, Springfield, Virginia 22151.

UNITED STATES DEPARTMENT OF COMMERCE
Maurice H. Stans, Secretary
NATIONAL BUREAU OF STANDARDS ● Lewis M. Branscomb, Director



TECHNICAL NOTE 516

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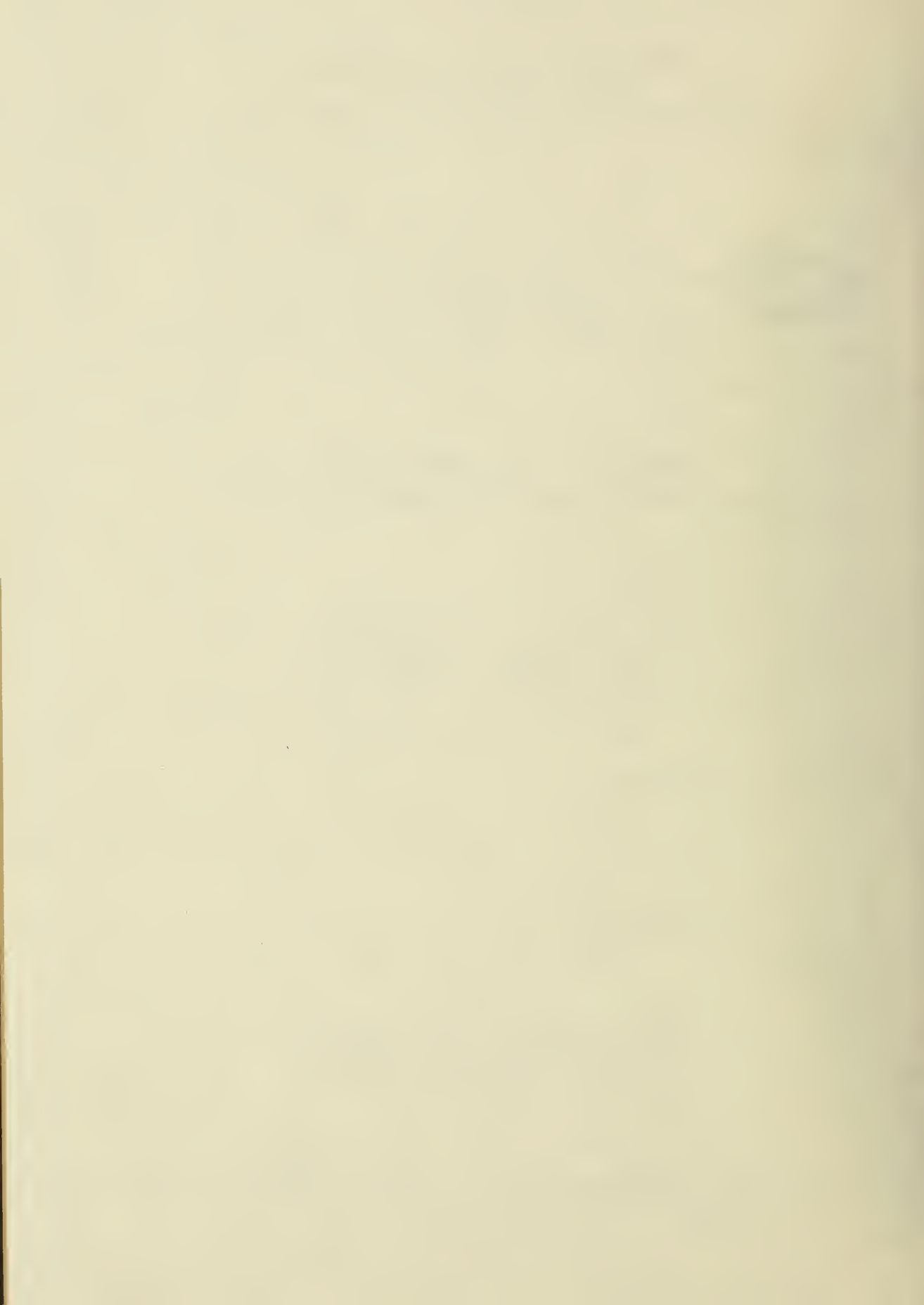
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A Selective Roll-to-Roll Printer for Producing Duplicate Microfilm Copies

James N. Strohlein and Thomas C. Bagg
Information Processing Technology Division
Center for Computer Sciences and Technology
National Bureau of Standards
Washington, D.C. 20234

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A Selective Roll-to-Roll Printer for
Producing Duplicate Microfilm Copies*

"SELECTAFRAME" PRINTER

James N. Strohlein and Thomas C. Bagg

The "Selectaframe" printer, a convenient device for copying onto roll film selected frames from other rolls of film for subsequent automatic enlargement printing is described in detail.

Key words: Information retrieval device;
microcopier; microfilm duplicator;
reader-printer; selective copier

One widely used method to cope with the vast quantities of printed information is to microfilm originals and retain only the filmed copies. This has been commercially practiced for more than 40 years and many organizations have extensive film holdings in their libraries. Reference may be made to the information contained on these stored reels of film by viewing them on microfilm readers, and enlarged paper copies may be made if one uses a microfilm reader-printer. The latter is suitable to meet the needs of individuals who normally copy a small number of pages. However, for organizations which have large volume requirements for the selection and production of enlarged paper copies of references contained in their microfilm holdings, conventional reader-printers are not satisfactory. (Each print requires one cycle of operation usually requiring a fraction of a minute and as single sheets are used, the cost per sheet is high, depending on coating.)

The National Library of Medicine is developing a large file of microimages of deteriorating paper documents, in roll form. As part of its interlibrary loan and reference services enlargement prints are frequently required of selected articles from this file. The commercial copying devices available are designed to copy entire rolls to either film or paper. The conventional reader-printers are slow to operate, use costly paper and require great care to insure no damage to the master films. To overcome these difficulties,

* Work sponsored by the National Library of Medicine,
Washington, D.C. 20514

the National Bureau of Standards was asked to design and build a prototype "Selectaframe" printer as shown in figure 1. Basically it is a roll-to-roll printer specifically designed to generate duplicate frames on diazo film. As with conventional 35 mm roll film readers, the optics permit viewing the image on a large screen. The operator locates the desired frame in the usual manner either manually or by semi-automatic means such as using an odometer, electric frame counter, or such. When the desired frame is located, the operator presses the copy button which closes the gate to hold the original image film tightly to the copy film and activates the shutter for exposure. This film gate was designed to minimize the possibilities of scratching the film and yet obtain adequate contact pressure between the films for maximum information transfer. The film gate also contains a mask for adding a cut mark to each frame in the lower left hand corner. This cut mark permits automatic cutting of the enlargement prints. A single mercury lamp is used for both viewing and printing. The shutter is an ultraviolet filter which transmits only visible light to the projection system for viewing. During exposure the filter is flipped out of the optical path by a time controlled solenoid. For a typical diazo emulsion, the exposure time is about 3 seconds. After the exposure is completed and the shutter is closed, the film gate opens so the exposed diazo film can be automatically advanced for the next frame.

Upon completion of a series of exposures the exposed diazo film is removed from the printer and may then be developed in a diazo processor. Enlargement prints are made on an electrostatic roll-film printer and the pages cut and stacked automatically.

Figure 2 shows the completed machine in operation, with an image to be copied displayed on the screen. The operator's right hand is on the traversing lever, his left is near the "copy button". The cartridges shown were also fabricated at NBS by modifying 16 mm cartridges so that they would accept 35 mm film. On the panel to the left of the viewing screen is an alarm which signals depletion of the copy film supply, a counter which indicates the number of frames copied, and the main power "on-off" switch.

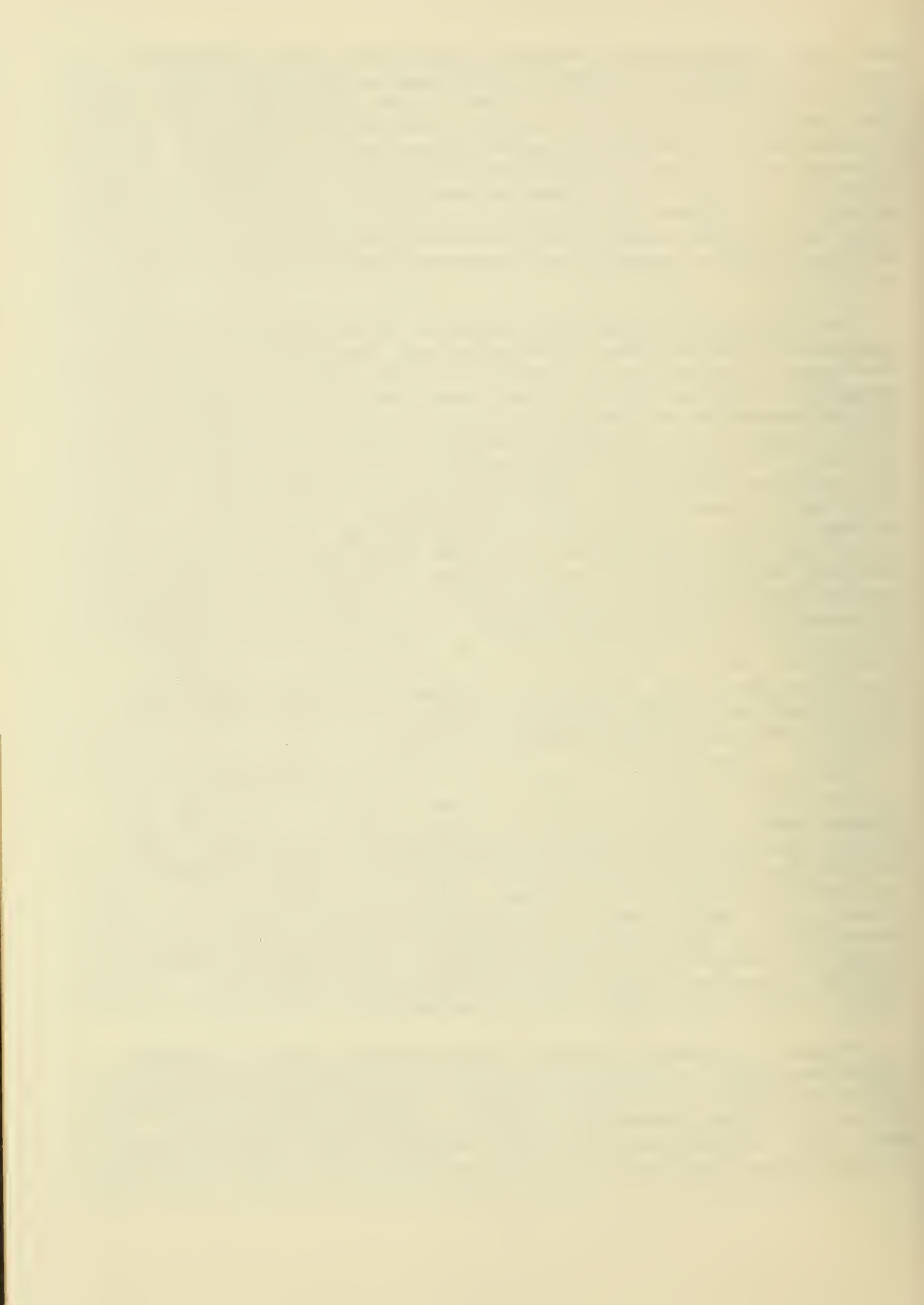
Figure 3 shows NBS instrument maker Charles Summers making an adjustment. This view, made with the upper housing (which contains the mirrors and viewing screen) removed shows the main components. The working master may be on conventional 100 foot reels or in 35 mm cartridges. The transparent copy film is shown feeding from the supply reel (which will accept 500 foot cored rolls) through the film

gate to a conventional take-up reel driven by a modified microfilm camera film advance mechanism. The film gate consists of two optical flats which are held apart when the master film is moving for the selection scanning. If a frame is selected for copying, the flats are forced together by the cams which are actuated by a solenoid connected to the cable shown alongside the projection lens. In addition, there are adjustable masks in the gate to block out partial images of adjoining pages which appear due to the close spacing of images of small pages on the original film.

As the copy film is transparent, light for projection of the masterfilm image passes through both films for viewing on the screen. A single 400 watt high intensity mercury source is used. Since the diazo film is exposed with ultraviolet radiation, either movement of one of the films or the use of separate light sources is avoided by employing an ultraviolet filter which is interposed during the scanning mode (thus permitting only visible light to pass) and automatically retracted during the copy or exposure cycle. In Figure 3 the filter is shown in its retracted position between the film gate and the lamp housing, which contains a parabolic reflector and a quartz window supported by the lamp holders, all of which are enclosed in a shroud (not shown) to shield the light from the operator and to distribute the required cooling air. A bi-metal switch is provided to insure that the blowers remain on after the machine is turned off until the housing has cooled, and also a thermal fuse to turn the lamp off if the housing becomes excessively hot.

The master film is driven by a single motor with a clutch-brake linkage to the two reel shafts. Slow and fast, forward and reverse movement is controlled by a single toggle switch conveniently located on the base plate. The take-up reel drive is actuated as part of a cycle which is initiated by the operator when it is desired to copy a frame. The 'copy' push-button causes (1) the flats to press the two film emulsion surfaces together, (2) the U.V. filter to retract, (3) the initiation of a pre-set timer for the exposure length, (4) the film to advance one frame length upon completion of exposure.

Figure 4 shows the electrical circuits, covering the items described and also an alarm to signal depletion of the supply film, indicator lights to show cycle function and an auxiliary momentary contact switch to advance copy film without exposure when required for spacing runs or loading.



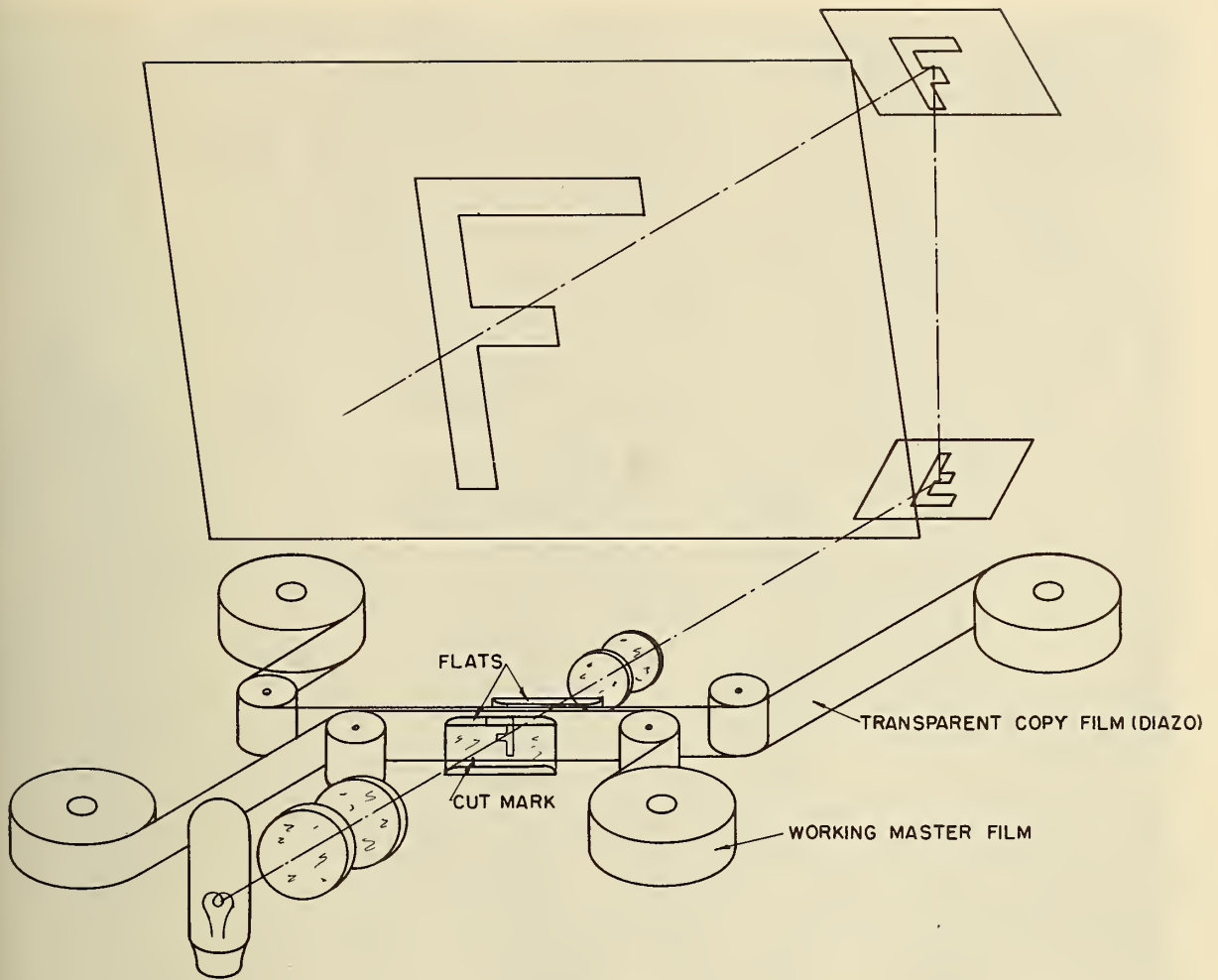


Figure 1. Basic scheme as proposed to NLM



Figure 2. "SELECTAFRAME" in operation

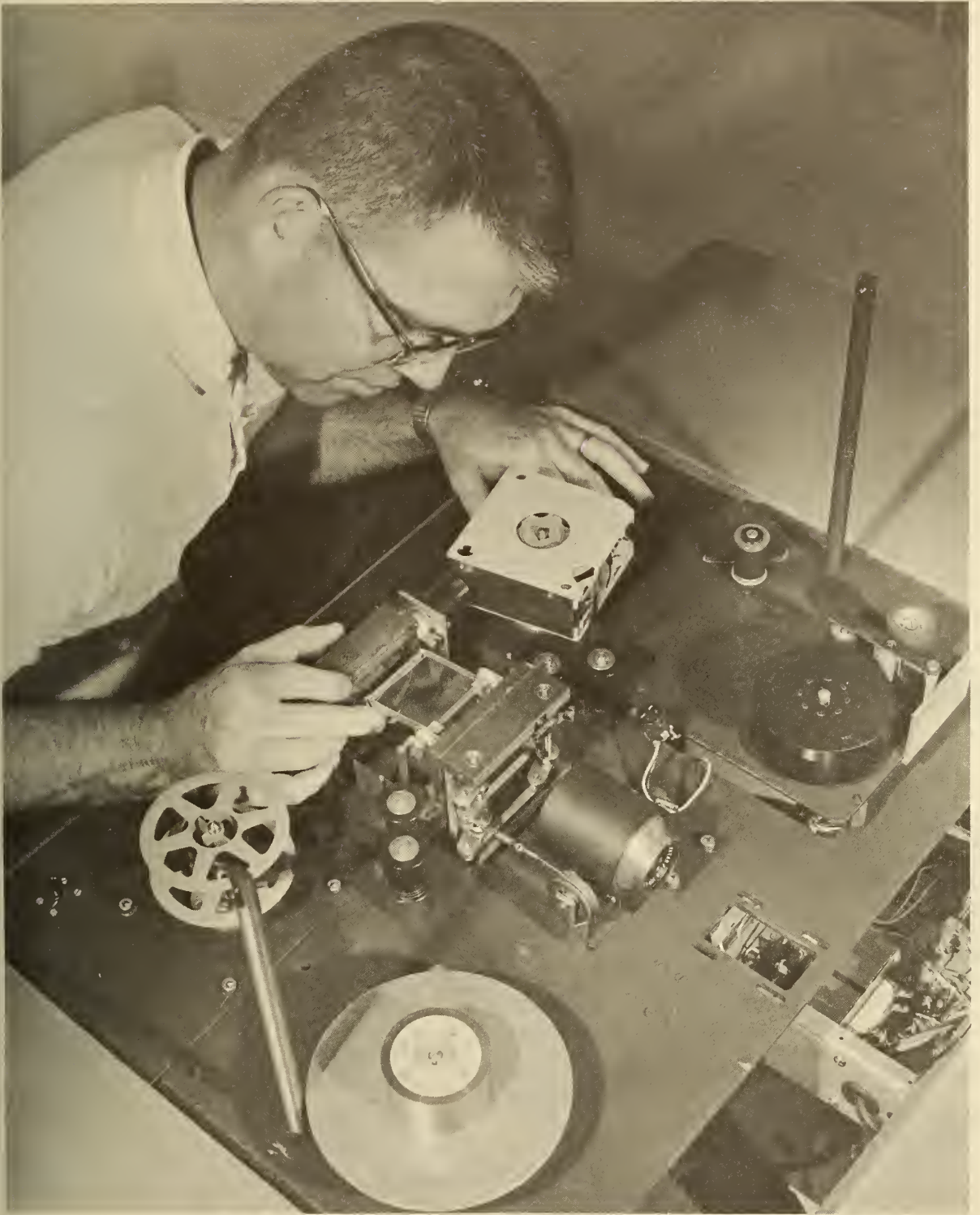


Figure 3. Main plate showing light source, filter-shutter, film gate, projection lens

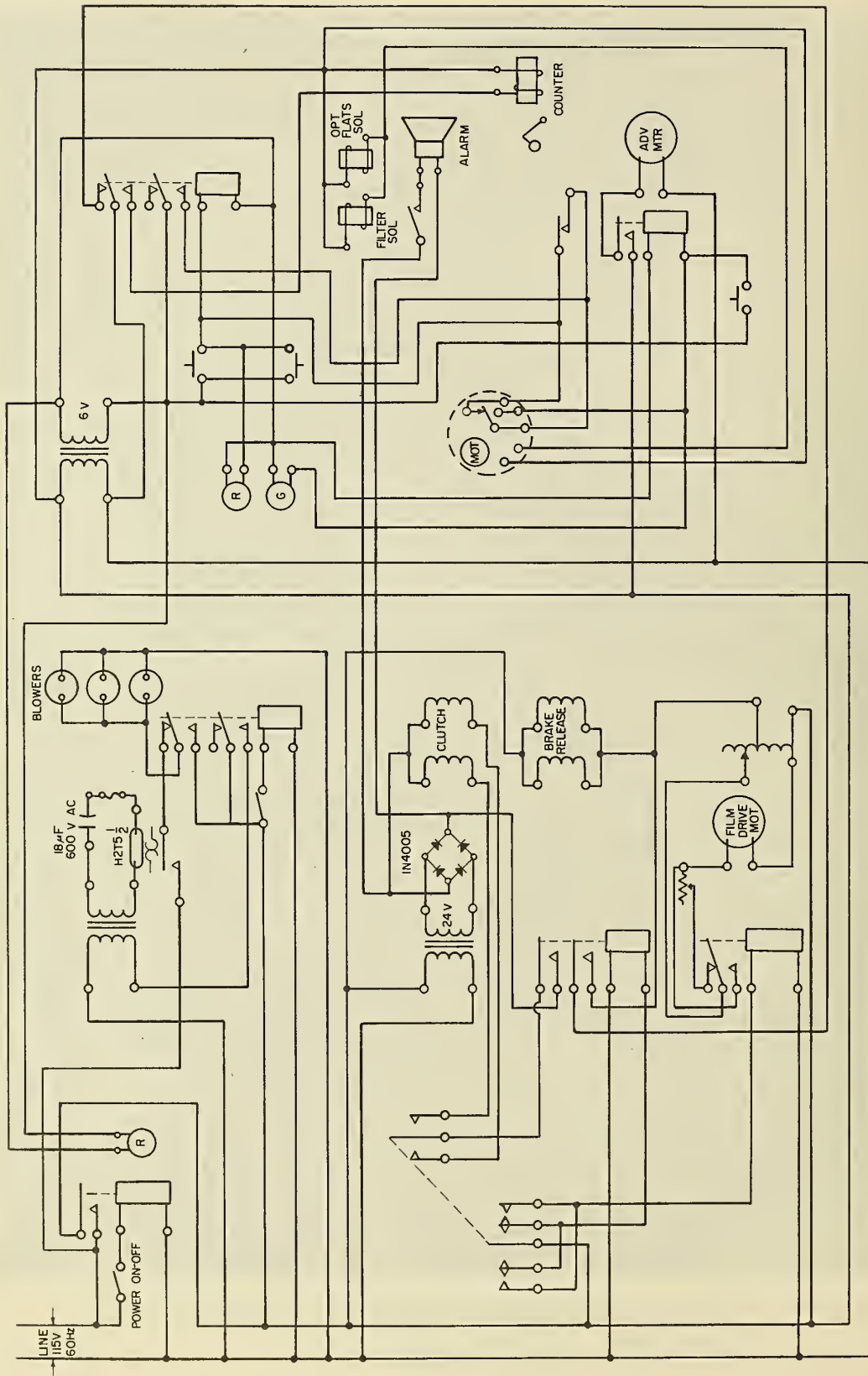


Figure 4. Schematic diagram of selective roll-printer

THE NATIONAL ECONOMIC GOAL

Sustained maximum growth in a free market economy, without inflation, under conditions of full employment and equal opportunity

THE DEPARTMENT OF COMMERCE

The historic mission of the Department is "to foster, promote and develop the foreign and domestic commerce" of the United States. This has evolved, as a result of legislative and administrative additions, to encompass broadly the responsibility to foster, serve and promote the nation's economic development and technological advancement. The Department seeks to fulfill this mission through these activities:



MISSION AND FUNCTIONS OF THE DEPARTMENT OF COMMERCE

"to foster, serve and promote the nation's economic development and technological advancement"

Participating with other government agencies in the creation of national policy, through the President's Cabinet and its subdivisions.

Cabinet Committee on Economic Policy

Urban Affairs Council

Environmental Quality Council

Promoting progressive business policies and growth.

- Business and Defense Services Administration
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- Economic Development Administration
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- Office of Minority Business Enterprise

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- Bureau of International Commerce
- Office of Foreign Commercial Services
- Office of Foreign Direct Investments
- United States Travel Service
- Maritime Administration

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- Environmental Science Services Administration
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- National Bureau of Standards
- Office of Telecommunications
- Office of State Technical Services

Acquiring, analyzing and disseminating information concerning the nation and the economy to help achieve increased social and economic benefit.

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NOTE: This schematic is neither an organization chart nor a program outline for budget purposes. It is a general statement of the Department's mission in relation to the national goal of economic development.

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