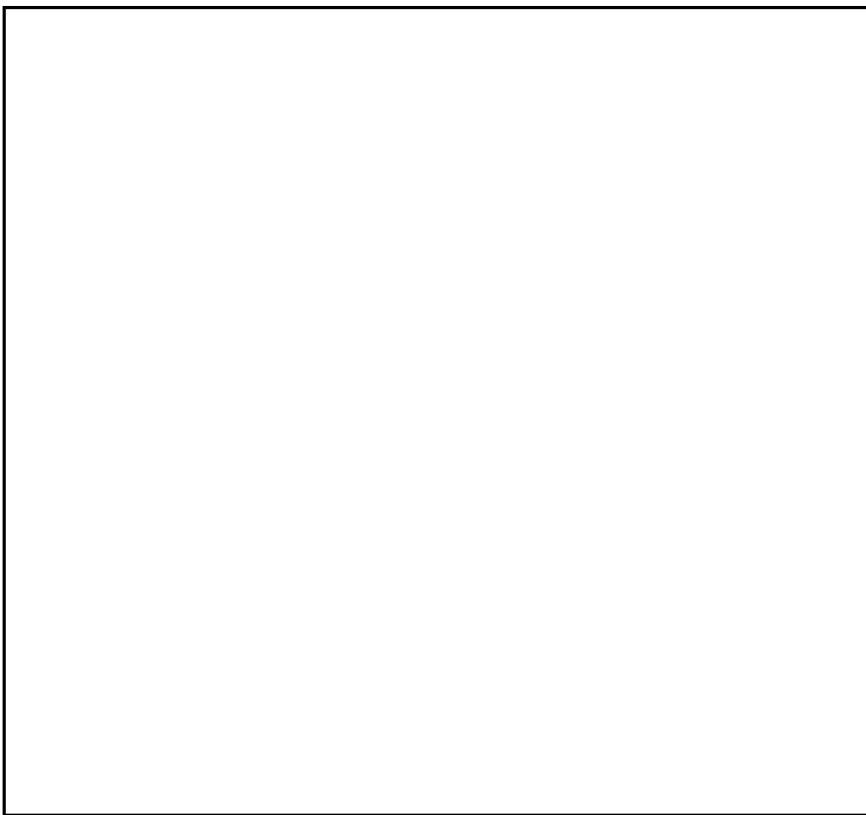


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Declass Review by  
NIMA/DOD

September 18, 1968

Reference 12017

U. S. Government

Attention: Contracting Officer

Subject: Contract

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Gentlemen:

Enclosed are the second reports (one copy each) of progress and expenditures of subject contract.

If you have any questions, please contact the undersigned.

Very truly yours,

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Manager, Contracts

WCS/efd

Enclosure

cc;

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R-104-68

PROGRESS REPORT NO. 2  
ADVANCED LIGHT TABLE

Report Period: 1 August 1968 to 9 September 1968

Contract

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9 September 1968

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1. OBJECTIVES

STAT The Advanced Light Table to be designed and developed under Contract [redacted] will meet the following objectives:

- 1) Table-top viewer with advanced features for film in widths from 70mm to 9-1/2 inches
- 2) Simplified transport system with quick switching from motor-drive to manual mode
- 3) Light-weight design for portability
- 4) Operation in both horizontal and vertical modes of film travel
- 5) Low cost due to a minimum number of parts and extensive use of sheet-metal construction
- 6) Quiet operation to eliminate operator disturbance
- 7) Practical human factors design to permit the table to be used for extended periods by an operator in comfortable viewing positions.

2. SUMMARY OF PROGRESS

STAT Due to the fact that [redacted] had a scheduled plant shutdown from 16 August through 3 September 1968, the report period was arbitrarily lengthened to be more consistent with normal progress. During this period the mechanical breadboard was completed and demonstrated to [redacted] Sponsor Project Supervisor. [redacted] facility on 9 September 1968 and reviewed the progress of the project to date. Additionally, a full-size aluminum sheet-metal box was completed, closely representing the upper light box portion of the light table. The box was tested for rigidity and a decision was made to use thicker sheet metal in some areas to provide additional rigidity and resistance to handling abuse. The project was estimated to be approximately 5 percent complete at the end of the report interval.

### 3. ACTIVITY DURING REPORT INTERVAL

#### 3.1 Mechanical Breadboard

The mechanical breadboard, as shown in photographs 8319 through 8322, was completed 6 September 1968 just prior to the visit of  facility. The unit was loaded with a 500-foot spool of 5-mil thick film, and transport tests were conducted. It functioned quite well and performed to specifications regarding film transport and switching from manual to power drive.

**3.1.1 Rewind.** The 500 feet of film was transported in 40 seconds, which is greatly in excess of the specification requirement of 500 feet in 2 minutes. The rewind performance approaches that of a high-speed rewind device and will reduce film rewind and handling time. It was noted that the spools must be fairly well balanced or excessive vibration occurs in the machine at this rewind speed. However, vibration should not be any real problem with the completed machine as the transformers in the base will act as a ballast.

The running tension adjustment was found to be important during high-speed rewind to prevent loop throwing when rocking the control knob from one direction to another as rapidly as possible. With moderate tension on 9-inch film, there was no tendency for loops to be thrown in this extreme type of operation.

**3.1.2 Manual Film Drive.** The manual film drive worked well with approximately 1/16 inch of backlash being observed on the circumference of the 4-inch diameter hand-wheel for a shift from one direction of film travel to the other. This is well within the stated goal of approximately 1/8 inch of backlash. A small amount of back tension supplied by the

opposite motor, can be applied to the film during manual rewind to keep the film from rubbing against the glass while it is being transported. This tension will be controlled by a manual tension knob and will be different from the running tension.

3.1.3 Noise Level. The breadboard utilized steel roller chain of 1/4-inch pitch for the film drive. When operated with steel sprockets, the chain proved to be somewhat noisy. It is believed that changing to nylon sprockets will reduce the noise to an acceptable level. Nylon sprockets will be tried in the coming period; but if these are not satisfactory, a change will be made to neoprene timing belts.

### 3.2 Prototype Light Box Structure

As shown in photographs 8323 and 8324, the upper structure of the light table which holds the film transport mechanism and the lamp assembly was constructed of sheet aluminum and is very close to the final design. The gauges of the top and bottom portions were 0.060-inch and 0.090-inch respectively. Twist tests were made to determine the stiffness of the box and it was found to be essentially satisfactory. However, further evaluation indicated that stiffer construction should be used to provide a better mounting area for the plate glass top which would prevent undue strain on the glass whenever the operator leaned on the assembly. Consequently, a decision was made to increase the material thickness of the top section of the structure to 0.090-inch and the bottom section to 0.10-inch. The additional thickness should provide a greater safety factor for the case.

The thick pads welded to the ends of the box provide machining surfaces so that the sheet metal structure can be trued and the mounting planes of the spindle brackets made parallel to each other within a few thousandths of an inch. This concept provides the accuracy of a casting with the lightness of a sheet metal structure and will make precision alignment of the spindles fairly easy.

### 3.3 Tilt Mechanism

A preliminary design has been completed on the tilt mechanism and final layouts are in progress. Ten seconds has been chosen as a reasonable operating time to completely elevate the table from a horizontal position to a 70-degree tilt angle. An appropriate motor size has been calculated to accomplish this elevation time. There has been some difficulty, however, in obtaining a motor and attached gear reducer that will accomplish this operation in the required time; most available motors are higher than the base structure of the light table. Spring counterbalancing to reduce the motor torque requirement is being considered.

### 3.4 Illumination Grid

A cold cathode light source has been delivered with attached metal backing plate and proper transformers to operate the grid. The goal of 2500 foot-lamberts is being specified for the grid. An electronic dimmer will be constructed to check the dimming ratio.



4. PROGRAM FOR NEXT INTERVAL

The following activity is scheduled for the next interval:

1) A revised layout will be made of the top portion of the lamp box relocating the shade.

2) A new mechanism layout will be made to study the increase space requirement of timing belts replacing roller chain.

3) A layout will be completed of the base including the belt mechanism and location of electronic components.

4) A layout drawing showing the proposed location of controls will be submitted to the sponsor for review and evaluation.

5. UNRESOLVED PROBLEM AREAS

5.1 Elevation Device Motor

In the elevation device, the problem is to obtain a motor with suitable gear reducer that will provide an elevation time of 10 seconds and is physically small enough to fit inside the light table base structure.

5.2 Light Grid Dimming

The problem in this area is to determine the exact level to which the grid can be reliably dimmed, considering all the variables that might be obtained in the components.

6. ORAL AGREEMENTS ON TECHNICAL MATTERS

In the conference between Messrs. [REDACTED]

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[REDACTED] on 9 September 1968, the following agreements were made regarding some minor technical points.

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6.1 Shade Location

It was agreed that the shade should be located between the diffuser and the glass as per the specification. [redacted] suggested that their usual practice of locating the shade below the diffuser would be satisfactory as this location makes for a simpler design; but after discussion, it was agreed that the specified location would be retained.

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6.2 Lock On Movable Spindle

The method of film loading was outlined using one fixed and one movable spindle head. This design is similar to that of the large Eastman Kodak film handling tables. The movable head is spring-loaded toward the fixed head thus providing all the adjustment for spools of various sizes as well as for long-edge films. It was agreed to add some type of a lock that will prevent the spool from accidentally slipping off the movable head if it were jarred. This location would still allow both spindles, at each end of the table, to be laterally shifted plus or minus 1/8-inch to accommodate long-edge film. It was additionally agreed to look for some type of indicator that could be added to the adjustment mechanism so that the mid-position might be indicated.

6.3 Hand Wheel

It was agreed that the design of the hand-wheel knob should be provided by the sponsor's human factors consultants and that [redacted] [redacted] would provide whatever type of handle they specify, unless there is some valid objection to the design in terms of cost or complexity.

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ILLUSTRATIONS

Photograph 8319, Mechanical Breadboard Model of Advanced Light Table,  
Manual Drive Mode

Photograph 8320, Mechanical Breadboard Model of Advanced Light Table,  
Power Drive Mode

Photograph 8321, Mechanical Breadboard Model of Advanced Light Table,  
Film Transport Mechanism

Photograph 8322, Mechanical Breadboard Model of Advanced Light Table,  
Control Box (Includes all Functional Controls)

Photograph 8323, Prototype Light Box Structure for Advanced Light Table,  
Lid Closed

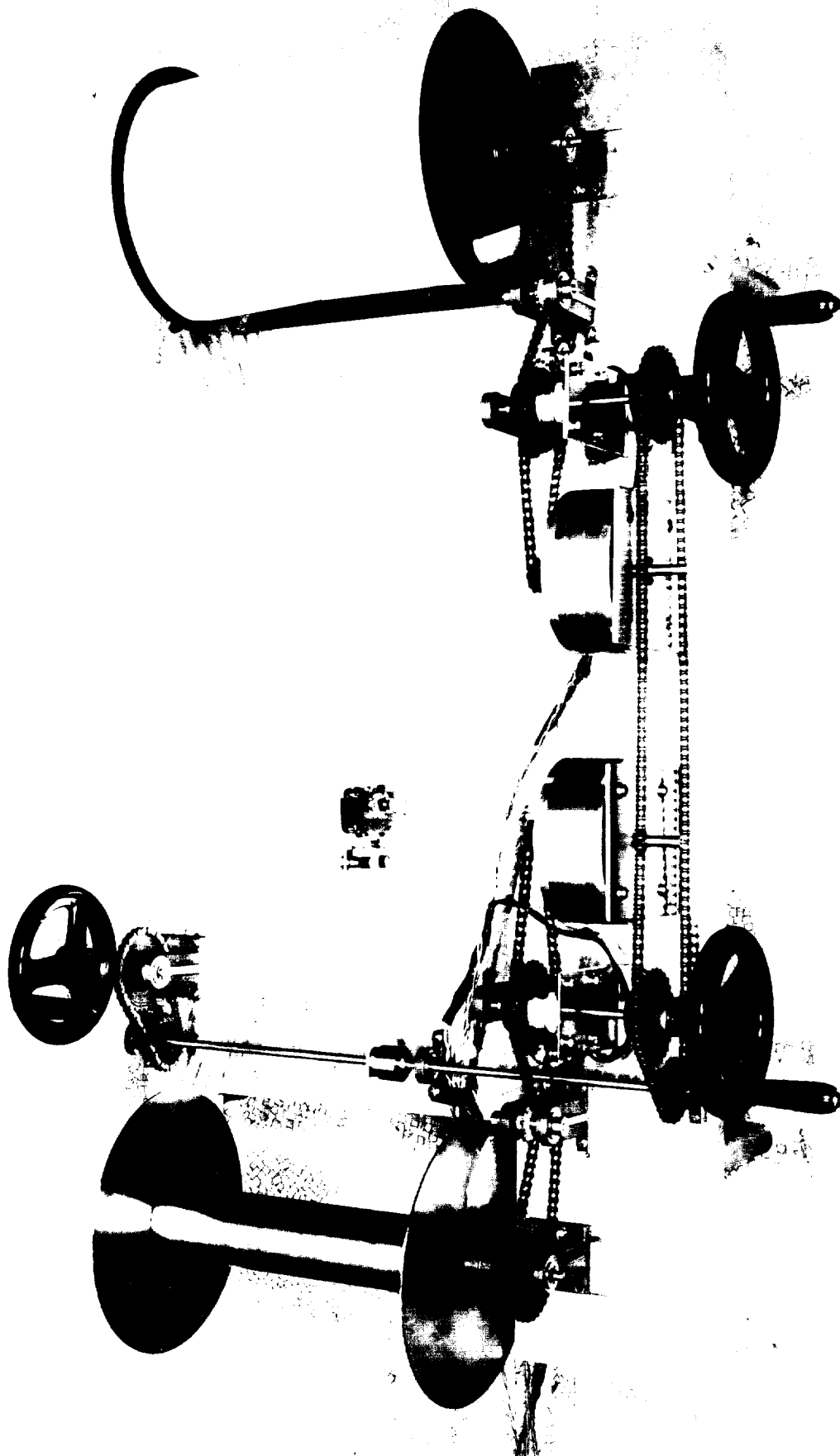
Photograph 8324, Prototype Light Box Structure for Advanced Light Table,  
Lid Open

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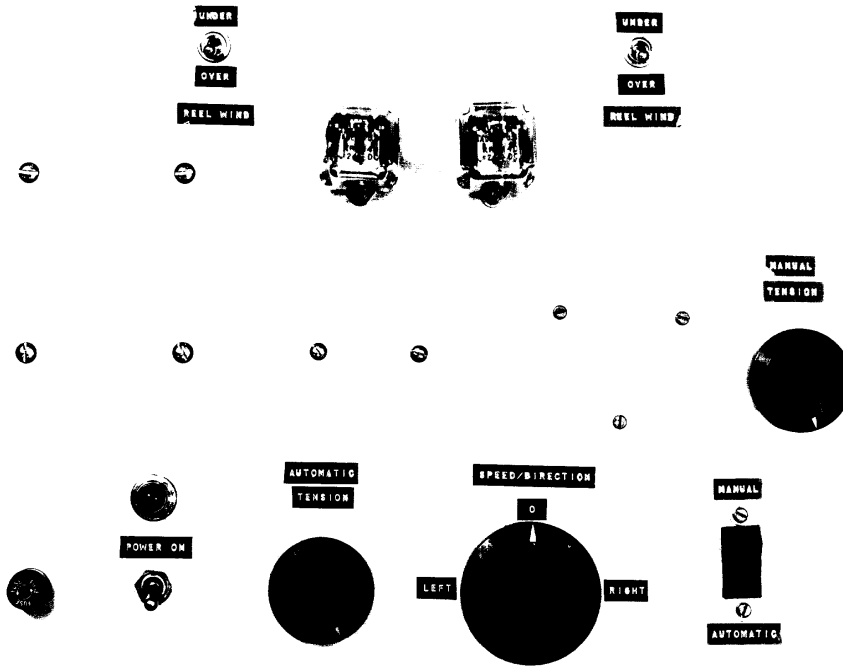
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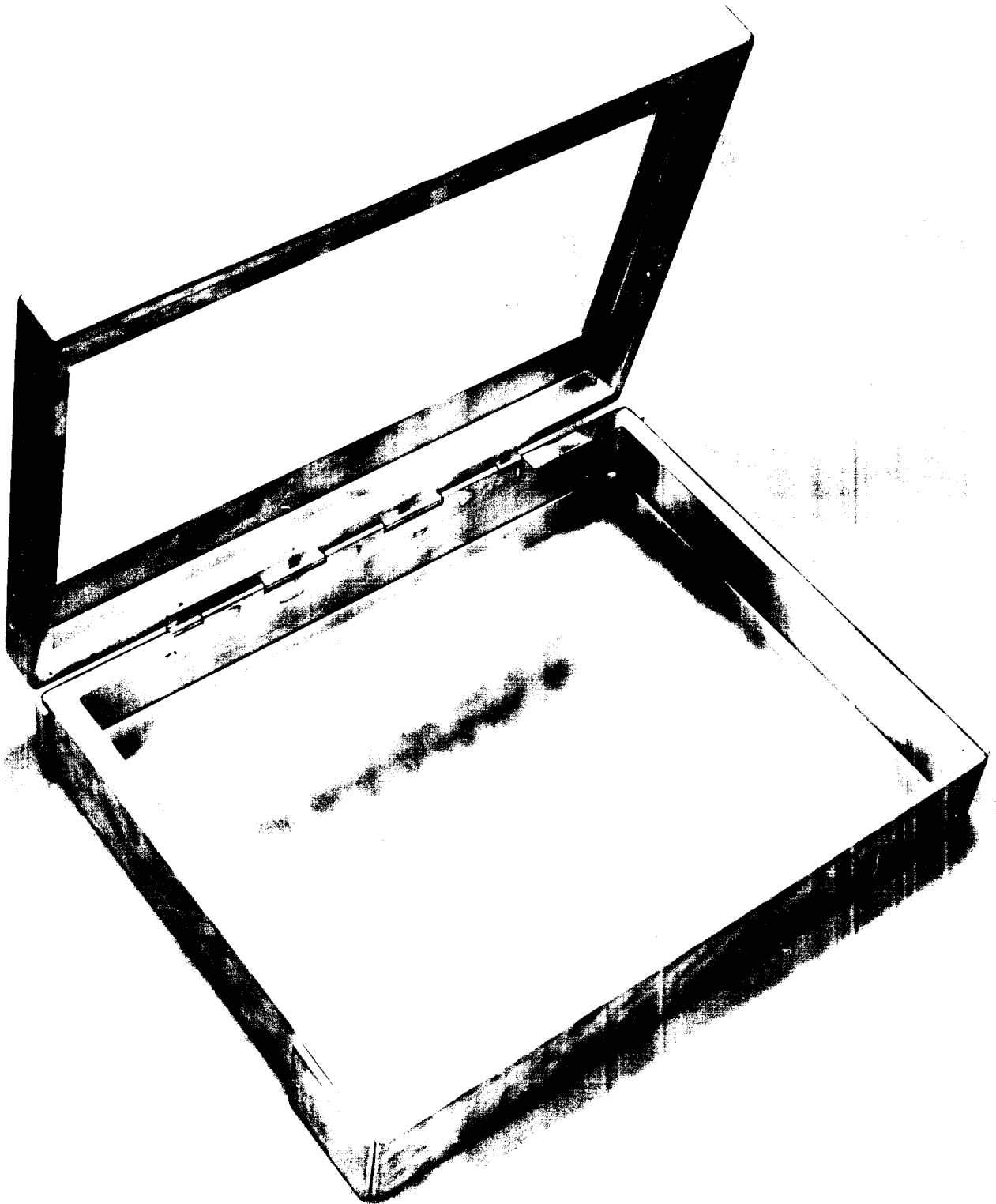




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