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**A DRYING CHAMBER FOR
RAPID-ACCESS FILM PROCESSING**

Livermore, California

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A DRYING CHAMBER FOR RAPID-ACCESS FILM PROCESSING*

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Programmers who are engaged in "short-shot" and "debugging" routines requiring the use of a photo-recording unit on a high speed computer are vexed by the time — real time — loss they experience while waiting for their few frames of photo-data to be made available via regular distribution channels.

In an attempt to remedy this situation, the so-called Rapid-Access Film Processors are finding increasing and successful application. However, much of this success is attributable to the thin, pre-hardened film emulsions such as Ansco HYSCAN and Eastman Kodak DACOMATIC, which stand up under the extremely rigorous treatment inherent in this kind of "off-line" film processing technique.

When used as adjuncts to computers, these processing units are usually operated at the upper limits of their capabilities, and, as a consequence, the latitudes and tolerances of conventional processing parameters must be more carefully evaluated. A common source of difficulty in the film processing sequence is that of drying it. A given processor may have a disproportionate amount of space allotted to the drying phase or, more commonly, possess an inadequate drying means which prevents utilizing the full production capacities

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of the previous processing steps. It is to this particular difficulty that the film drying chamber subsequently described here is addressed.

In this device, the objective is to achieve an intensive, accelerated drying effect upon wet film while in continuous transit through an essentially closed chamber of small dimensions. In the chamber, the film is subjected to a significant reduction in gas pressure. This pressure difference is sufficient to create a jet stream which, in turn, can be heated, rendered turbulent to a degree and constrained to exert upon an emulsion surface a controllable, sustained pressure gradient. A further consideration is to exploit, in a single heat source, not only the intensified heat transfer characteristics of a jet stream but, particularly, the natural selectivity of water vapor for infra-red radiation which lies within the $1.5\text{-}10\mu$ region.

The dryer box illustrated in the photograph is rectangular with wall of $1/4$ -in. aluminum plate. The inside dimensions are $7\text{-}3/8$ in. $\times$ 1 in. $\times$ $1\text{-}13/32$ in. The front wall is perforated by a $3/8$ -in. slotted aperture with the lower edge of the slot about $1/4$ in. above the "floor" level. Affixed to this opening, and machine-mated so as to make a hermetic seal, is a $3/4$ -in. -O. D. pipe with a matching slot. This pipe is the jacket for a G. E. 1000 W, 230-250 V, Infra Red Fuser, and it is equal in length to the quartz glass fuser tube. Within the jacket, the glass tubing is prevented from making contact with it by two encircling, off-center, perforated, asbestos-board rings which fit snugly and hold the fuser tube in close proximity to the gas entry slot so as to effect a maximum heat transfer to the aspirated air. Leaving sufficient space for the free admission of air, the exposed metal seals and terminals of the fuser are covered with suitable thermal and electrical insulation. The heater is controlled by a 10-A, 115-V, Variac transformer. A thin sheet of copper, in a plane parallel to the "floor," divides the interior of the box into an upper

and lower chamber. The edges of this sheet fit tightly into wall recesses except for the front edge, which has two elongated, curved sections cut away. These serve as airflow pathways and permit the fuser to "see" the film. Adjacent to the walls, and resting upon the copper sheet, are four sections of 1/4-in. Teflon rod. The two lengthwise sections contain re-enforcing steel rods and they are so positioned as to limit film contact of the emulsion surface to the sprocket hole area. Two short lengths at either end of the chamber act as spacers and reduce air leakage into the film entry and exit port. Approximately at midpoint, another section is fitted crosswise in mortar and tenon relation. Each space bounded by Teflon rods contains a movable thick metal plate which partially covers an air passageway. The metal plates in a choice of characteristics with respect to thickness, width and edge contour, serve as damper-deflectors to create a variety of jet stream conditions. The slotted vent in the rear wall has its lower edge slightly higher than the Teflon rod in contact with it. A pipe with matching slot is machine-mated hermetically to this vent. The ends of the pipe are closed except for one of the closures which is provided with a threaded hole large enough to accommodate the stem of a dial type thermometer. At mid-position on the tubular exhaust, there is a 90° "L" which at its "off" end leads into a short pipe section. This section contains a Pitot tube, and is connected to the Dwyer airflow gauge. The short pipe section joins a flexible, heat dissipating, metal tube which, in turn, is connected to a famous brand vacuum cleaner. A small rubber "bleeder" hose connected to this tube permits regulation of air pressure. The cover of the chamber is 3/8-in. Plexiglas, hinged at the rear. When closed, it rests snugly on the walls. On the under side of the cover, as an integral part of it, are two hollow rectangular projections. The lower surface of each is cut away so as to allow the Teflon rod contained therein to make rotatable

contact with the back surface of the film. With the cover closed, these rods and the ones directly beneath leave slits sufficient for film passage. On the upper surface of the cover is a distortion preventing metal bar, and at the front edge is a small handle. The entire dryer box is supported so that it can be critically aligned to the film plane. A "pre-heater" in the form of a 40-W tubular-type incandescent lamp is mounted immediately under the dryer box. The lamp burns continuously and provides illumination for the airflow gauge as well as "back lighting" for image inspection of film entering the drying chamber.

A pair of highly polished aspirator tubes — only the top one in contact with the film — remove the occasional large drops of water. The same famous brand vacuum cleaner with an interposed moisture trap furnishes the requisite suction.

In operation, a pressure difference considerably less than atmospheric is established within the chamber. The resulting jet stream flow is channeled mainly through the narrow space between the damper-deflector plates and the emulsion surface. By proper regulation of airflow volume and velocity, a force is exerted on the film which causes a pronounced lifting effect at the film edge nearest the vent. Thus, in effect, the film is made to "gate" the jet stream flow into the vent. With cover closed, fuser ON and damper-deflector plates positioned, film from our fixed speed — 4 fpm — processor comes out dry in 9 seconds. Our conventional processor operated at the same speed, for purposes of comparison, requires 54 seconds, the ratio of film lengths being 7 in. to 43 in. respectively.

Acknowledgement. I should like to express my sincerest thanks for the assistance of Mr. Eugene Herring, who most capably transformed my verbal descriptions and crude sketches into a functional device.

Fig. 1. Continuous film drying chamber (front view; bottom view of open cover). The exhaust pipe is not shown. (Drawing not to scale).

GLL-644-1008

Fig. 2. End view of continuous film drying chamber. The damper-deflector plates are not shown. (Drawing not to scale).

GLL-644-1009

Fig. 3. Top view (cover not shown). (Drawing not to scale).

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Fig. 4. Elevated front view of the drying chamber; heat-jacket cover removed.

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