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Lawrence Livermore Laboratory

SEMIAUTOMATIC DOSIMETER LOADER

MASTER

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SEMIAUTOMATIC DOSIMETER LOADER

ABSTRACT

This is a brief description of the construction and operation of the semiautomatic dosimeter loader now in use at Lawrence Livermore Laboratory.

INTRODUCTION

The badge loader was developed as a means of reducing the time required to assemble the standard dosimeter worn by all Laboratory employees and visitors. Before we changed to semiautomatic loading, the TLD crystals and acetate caps were handled with tweezers. Caps were then pushed into position with a hand tool which was a laborious process. Putting the loader into operation resulted in more than a 100% increase in output plus the attendant benefits of increased cleanliness of operation and elimination of much of the accompanying tedium.

The system is "semiautomatic" because the operator is required to move the carrier which holds the packet to three positions to complete the assembly of the dosimeter.

DEFINITIONS

- Dosimeter: The assembly consisting of packet, crystals and caps (see Fig. 1).
- Packet: The main body of the dosimeter into which the crystals and caps are assembled.
- Cap: A 0.01-in.-thick-opaque acetate disc used to secure the crystal in a cavity in the packet.
- TLD crystal: A piece of LiF , ^7LiF , or CaF_2 measuring 0.125-in. square and in thicknesses of 0.030, 0.035, and 0.040 in.

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Fig. 1. Dosimeter body, acetate cap and TLD crystal (approx $2\frac{1}{2} \times$).

CONSTRUCTION

A high degree of precision was required in machining, fabricating, and assembling the loader because the acetate caps when punched out must be placed directly over the crystal depressions in the packet, and because the piston which forces the cap into the depression must align with the depressions exactly, or damage the packet.

The loader design did not require any special equipment beyond that readily available on the market such as air cylinders, solenoids and switches. The balance of the loader was fabricated in Laboratory shops. Most of the shop-fabricated parts are of aluminum because of the ease with which that material is worked, and its light weight.

For operation, the loader requires 110-V ac electrical power, a vacuum of about 30 in. of mercury, and compressed air at about 80 psig. Figure 2 is a schematic of the electrical system.

CRYSTALS AND TRAYS

The packet can accommodate three thicknesses of crystals — 0.030, 0.035, and 0.040 in. The crystals are brought to the loader in trays, each tray holding a maximum of 1416 crystals of the same thickness. In the loader, the crystal trays are secured one above the other with one row of crystals in each aligned with the crystal chute. When a row has been emptied of crystals, the tray is manually indexed to the next full row.

VACUUM-OPERATED CRYSTAL PICKUP

When the trays are aligned with the crystal chute, enough crystals slide into it to fill it. The crystals come to a stop against a barrier at the lower end of the chute. The crystal pickup shown in Figs. 3 and 4 comes through the line of crystals from behind, picking up the lowest ones from each line and placing them in the packet. A vacuum port behind each of the crystals next in line holds them in position until the vacuum head returns to its at-rest position behind the row of crystals. Figures 5 and 6 show the crystal trays in the retracted position.

Fig. 2. Electrical schematic.

Fig. 3. Overall front view of dosimeter loader.

Fig. 4. Operating area.

Fig. 5. Trays in retracted position.

Fig. 6. Crystal trays retracted.

SEQUENCE OF OPERATION

The operator places a packet onto the carrier and depresses either the hand operation switch or the foot switch. This actuates the pickup which deposits the crystals into the packet depressions.

The carrier is moved to the left of the machine to the Punch position and the foot switch is depressed, causing the pneumatically operated punch to cut three caps from the acetate strip and drop them onto respective holes in the packet. The acetate strip automatically advances to a fresh section and is held there awaiting the next packet.

As shown in Fig. 5, an arrangement of microswitches activated by the back end of the carrier handle causes only that station at which the carrier is resting to operate.

The carrier is then swung to the far right of the machine to the pressing operation. Closing the foot switch causes the pneumatically operated piston to descend and force the acetate cap into its depression. The friction between the cap and the sidewall of the hole keeps the cap in place and retains the crystal.

The finished dosimeter is removed from the carrier and the process is repeated.

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