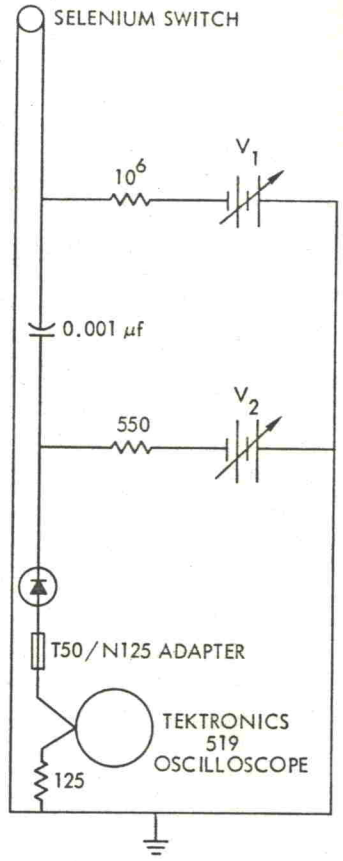

FIG. 2. An electrical circuit used to test the selenium switch.

We used vacuum evaporation to deposit the selenium and metallic leads onto mica. Connection to the selenium was made with gold to avoid unwanted chemical reactions. The switches were tested to 20 kV under oil, and when failure occurred it was in the region where the leads were soldered. The switch, used successfully in high explosive experiments, will withstand several kilovolts in air at atmospheric pressure.

The electrical circuit used to test the switch is shown in Fig. 2. Most components were enclosed in coaxial configurations to minimize circuit risetime. Coaxial cables with 50 Ω impedance were used. This circuit is similar to circuits commonly used with shorting pins and switches, but has a higher voltage source V_1 and the additions of the source V_2 and a rectifier. Since the circuit risetime is insensitive to the peak voltage, a given signal level will be attained more rapidly with greater voltage. The signal applied to the oscilloscope was limited by diode action. The diode provides clipping of the high voltage pulse generated by switch closure and determines the signal decay time. The diode used was a Semtech silicon rectifier rated for 45 kV peak inverse voltage. Voltage source V_2 provides a variable forward bias for the diode. The peak signal voltage is adjustable to values greater than a few volts.

An oscilloscope record (Fig. 3) was obtained in an impact experiment using a 0.90 caliber gun. In this case, V_1 was 1 kV and V_2 was 36 V. With suitable calibration, the

FIG. 3. Tektronix 519 oscilloscope record. Deflection factor, 9 V/div; sweep rate, 5 nsec/div.

arrival time of the signal can be determined to within a fraction of a nanosecond. Time intervals can be determined with subnanosecond accuracy by displaying two signals on a single oscilloscope.

* Work performed under the auspices of the U. S. Atomic Energy Commission.

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uhv Evaporation Source for Aluminum and Other Metals*

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THE object of the research project here reported upon was the vapor deposition of aluminum films in the best vacuum obtainable, given reasonable limitations on the modification of an existing vacuum system and on total processing time required to obtain the final vacuum.

The oldest and probably most common technique of vacuum evaporation of aluminum is the evaporation of the metal directly from resistance heated coils or wire baskets. But molten aluminum, unfortunately, alloys with the refractory metal and also flows over its surface erratically so as to produce filament thinning, hot spots, and resultant gassing. Only a vacuum on the fringe of the ultrahigh vacuum was obtained with this technique.

A new approach, emphasized by the presence of a number of commercially available systems, is to heat the aluminum or other metal directly by a well focused electron beam of several kilowatts power. Although attractive, these systems were too bulky and also too expensive for present purposes and budget. Moreover, it seemed possible that a better vacuum could be obtained by designing for a lower power requirement to produce less gassing.

The design eventually settled upon is a hybrid configuration with special provision for insertion of charge subsequent to outgassing of the heaters.