surface barrier contacts onto cleaned germanium surfaces. A brief review of pertinent work function theory of contacts is included.

Low values of resistance are measured which indicate atomic contact between the metal and the semiconductor. Certain metallographic photographs reveal pockets of what may be considered to have been oxide layers swept into microcrevices formed by geometrical mismatch between the two materials being joined.

Tables of metals and the nature of their contacts to each of the above semiconductor materials of p and o n-type are included.

The shear seizure phenomenon can be utilized to form contacts either ohmic or rectifying as required to small volumes of silicon and of silicon carbide for the fabrication of diodes and to silicon and silicon carbide materials into which one to four junctions have been introduced from a gaseous phase for the fabrication of drift transistors, negative resistance and other semiconducting devices.

Heat applied during the formation of the contact permits compensation for materials which are extermely brittle or overly elastic and facilitates the fabrication of mechanically compatible contacts between less suited materials. Shear seizure contacts have been made at room temperatures. In all cases, the applied temperatures can be about 100°C less than the eutetic temperature of the materials to be joined. The external application of heat is not considered an integral part of the process but rather a fortunate condition which facilitates contact fabrication. Study of shear seizure contacts leads now in two directions. New device concepts arise from utilization of these techniques. For example, the use of these contacts on wide gap materials which afford the possibility of large changes in the Fermi level with temperature bring the possibility of a device which changes from resistor to diode or from passive to active device with temperature changes. Such a device would have many uses in temperature control circuits, temperature compensation, switching application for alarms, and other low frequency power uses. In a second area, the study of this and related phenomena can lead to a much clearer understanding of many surface phenomena. This work is of great interest to us as device people and it is in this area that we plan to expend future effort.

STORAGE TUBES AND ELECTRON PANEL DEVICES—SESSION III-C

Session Chairman—J. W. Schwartz
Session Organizer—J. W. Schwartz

1) X-Ray Properties of High-Resolution Light Amplifiers—*B. Kazan, Radio Corporation of America, Princeton, N. J.* (Now with *Hughes Research Laboratories, Culver City, Calif.*)

With improved solid-state amplifier panels, about twice resolution of previous amplifiers has been obtained using finer photoconductive grooves and improvements in construction. Such amplifiers can intensify input images of either light or X rays. The output images produced on the amplifier with X-ray excitation are compared to the images on the conventional fluoroscope and film. Although the present experimental panels have inherent graininess, their gamma or contrast is comparable with X-ray film, enabling the perception of small differences in object thickness. Data is given showing the amount of X-ray exposure required to excite the amplifier compared to film at different X-ray voltages. Calculated curves are also presented indicating the X-ray absorption of typical photoconductive layers at various X-ray voltages. Although the amplifier has a decay extending over many seconds, it can be erased at an arbitrary moment by electrical means and re-excited with a new image without waiting for the photoconductor to decay normally. Curves are shown indicating the rate at which successive images can be erased.

2) The Properties of Cadmium Sulfide Photorectifier Arrays and Their Possible Influence on Computer Design*—*F. L. McNamara and R. R. Billups, Lincoln Laboratory, Lexington, Mass.*

Arrays of sintered cadmium sulfide photorectifiers form a new device exhibiting unique properties, and should have many intriguing applications in the computer field. As the name implies, the photorectifier has diode characteristics under illumination, however, (unlike a photodiode) it is an open circuit (50 meg ohms) in the dark.

Rectification stems primarily from the use of ohmic and rectifying contracts, and ratios of better than 1000:1 are obtained with an illuminance of 100 lumens/ft.^{2} at the ohmic contact. While the optical response is in the order of milliseconds, the electrical response is less than 0.1 μ.

Large inexpensive arrays of photorectifiers can be made with packing densities of greater than 256 cells per square inch. Because of this, many problems whose solution was not possible because the fixed storage requirements were too large or too costly, can be re-examined. An additional degree of freedom results from the fact that the information stored can be altered by selecting a different set of photorectifiers to be illuminated (using a different mask) rather than changing the array. Immediate application should be found in function tables, computer program storage, language translation, picture quantizing, character recognition studies, etc.

The feasibility of such applications has been demonstrated by using an array, in conjunction with an IBM punch card to generate a set of functions for a character display. Life-test data will be given.

3) Pick-Up Display—*A. Bramley, Stromberg-Carlson, San Diego, Calif.*

This discussion is mainly concerned with pick-up displays using optical read-out from electroluminescent cells. The parameters governing their performance are compared with those of the photoconductor class of pick-up devices. These are reviewed very briefly for the case of photoconductor elements arranged in blocks at the intersection of a crossed grid array of conductors to form an electrical pick-up device for information presented as a light pattern. The standard modes of presentation discussed are: 1) Constant illumination at the point of information with electrical read-out. 2) Electrical read-out after completion of optical write-in, the read-out being carried out during the decay period of the photoconductor.

In the first pick-up display considered here, the information is written in with a UV beam. The read-out is presented as an optical flash initiated by applying a voltage across the appropriate conductor of a crossed grid array. Storage up to 12 hours is practical. Rejuvenation of the stored energy in the trapped states may be realizable with UV feedback.

In the second example, the information is written in electrically and then read out optically at a later time. Proper choice of parameters controls the storage period within a range at the operator's discretion. The factors influencing this choice are presented. The storage is achieved by a balance between the optical feedback of the electroluminescent cell with its associated photoconductive element and the natural decay of the conductivity of that element.

4) New Radechon Storage Tube—*R. L. Stow and A. S. Jensen, Westinghouse Electric Corp., Elmira, N. Y.*

Recently developments have been made in the design of the barrier-grid storage tube known as the Radechon. Several improved performance characteristics have been obtained as a result. In particulars, a gun designed with a higher current density and a target with an area larger by 30 per cent than any tube made heretofore has resulted in considerable improvement in resolution. A new design for the structure of the target assembly has provided a very rugged structure and a coaxial output which is particularly suited to the better circuit designs into which the tube fits. A new technique for stretching the barrier grid has contributed to this design. The structure of the gun has also been improved to make it quite rugged.

Developments in the theory of the target operation and in the techniques for processing the target have resulted in an output signal which is extremely uniform over the target surface and contains little screen disturbance. Careful tube design to maintain cleanliness has contributed to the uniformity of the output signal by eliminating blemishes.

This storage tube is in the pre-production stage.

5) Development of a New Iatron Storage Cathode Ray Display Tube with Coaxial Writing and Flooding Guns—*M. F. Toohig, Farnsworth Electronics Co., Fort Wayne, Ind.*

A new Iatron storage cathode ray display

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