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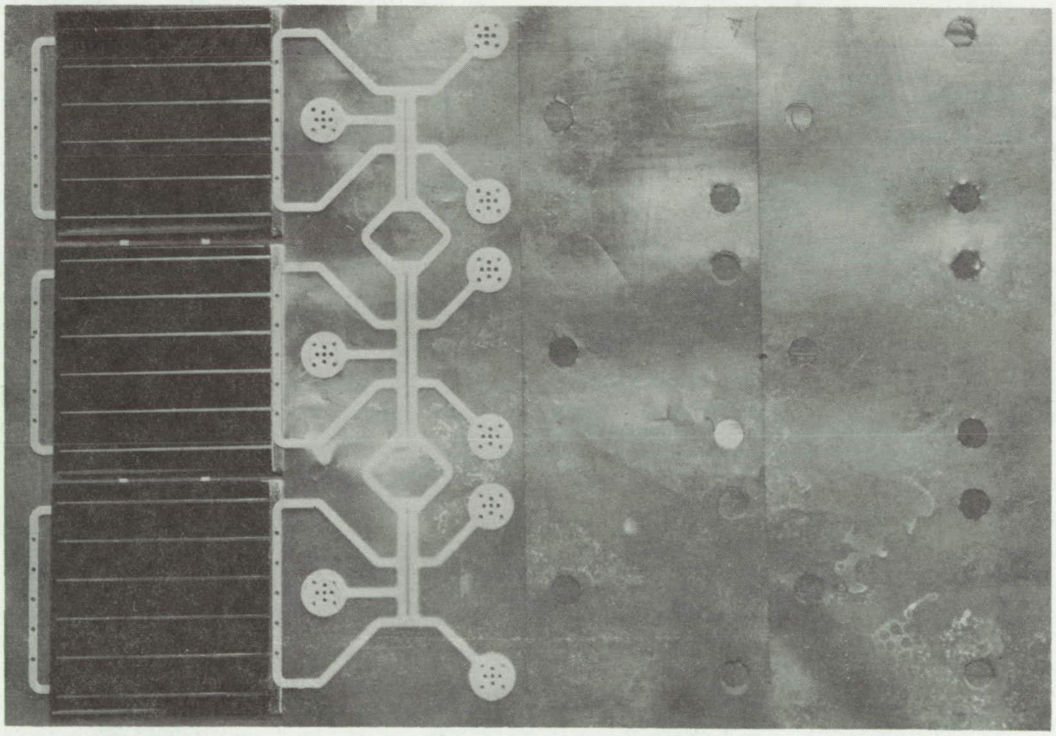
NASA TECH BRIEF

Composite Solar Cell Matrix Is Reliable, Lightweight and Flexible



12-CELL MATRIX IN EARLY STAGE OF ASSEMBLY

The problem:

To devise a method for connecting, mechanically and electrically, individual solar cells to form a solar cell matrix. Previously, strips of metal of various configurations were used to connect cells into linear submodules and then into matrices. These strips, however, were difficult to solder and did not meet the requirements necessary for use with semiautomatic fabrication equipment.

The solution:

A novel configuration of conducting strips, which mechanically and electrically connect small individual solar cells into a linear array of cells, called a solar submodule, and then connect in series two or more submodules to form a solar cell matrix. The conducting strips, usually chemically etched out of a sheet of metal, are reliable, lightweight, and flexible under stress. Tiny perforations in the conducting strip at set

(continued overleaf)

positions make it easy to solder them directly to the individual solar cells, eliminating the additional weight of mounting adhesives.

How it's done:

The composite solar cell matrix consists of individual solar cells, conducting strips, a board insulating panel, and an insulating board. The figure shows a 12-cell matrix in an early stage of assembly.

Each individual solar cell is soldered to the circular parts of the conducting strips, which are perforated to permit ease of fluxing and soldering. Three individual cells, soldered to one conducting strip, make up a submodule. Two very small segments of the conducting strip are visible between adjacent solar cells. Should the submodule be exposed to a flexing stress, it should flex at these points.

After soldering, the submodule is pasted with a silicone type adhesive to a 3-mil-thick H-film insulation sheet to protect the back of the solar cells and soldered joints from air, humidity, and corrosion. This fiberglass insulation panel has punched holes whose spacing conforms to the spacing of the circular parts of the conducting strips. These punched holes permit unsoldering of a defective solar cell. After the submodule is pasted to the panel, the panel is attached to an insulation board which protects the exposed parts of the conducting strips. Where the panels might be subjected to severe stress, a metal plate is placed below the insulation board, away from the solar cells.

A 12-cell matrix consists of 4 submodules in series, with each submodule consisting of 3 individual solar cells connected in parallel. A flexible lead is connected to each end of the matrix to complete the series connection.

To remove a defective solar cell, the bottom of each circular part of the particular conducting strip is heated while the solar cell is gently lifted, until separation is complete. Finally the horizontal perforated portion of the conducting strip is loosened by heating and the defective solar cell is removed. The removal of any individual solar cell does not affect adjacent or any other solar cells.

Notes:

1. Semiautomatic equipment can be used to solder the conducting strips to the solar cells. This feature should help generate interest in commercial applications.
2. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   NASA Pasadena Office
   4800 Oak Grove Drive
   Pasadena, California 91103
   Reference: B67-10503

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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