

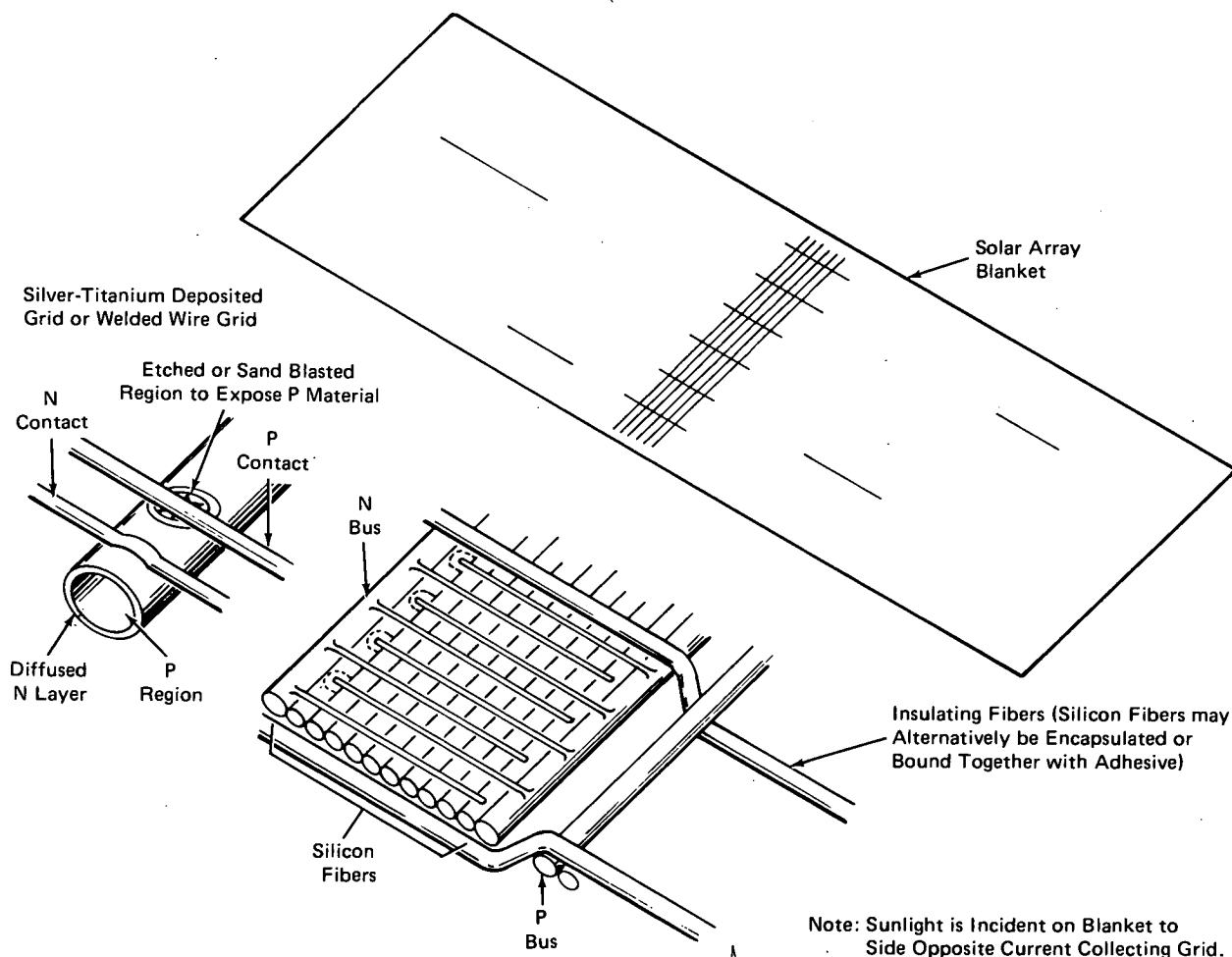
NASA TECH BRIEF

Marshall Space Flight Center



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Silicon-Fiber Blanket Solar-Cell Array Concept



The problem:

Scientists have been aware of the photovoltaic effect for over a century. It has been understood and explained in the early part of the 20th Century and put to use only recently. Indeed, the conversion of light into electric energy first became available several decades

ago to photographers who began using selenium light meters to determine exposure settings for their cameras. The Space industry advanced this technology and introduced solar cells as compact means of electrical power for space vehicle systems. At the present time, scientists are considering solar-cell arrays as a possible

source of electrical power for homes. Yet significant progress is needed to reduce the production costs of such arrays.

The solution:

The proposed parallel weaving of doped silicon fibers promises significant reduction in costs of manufacturing of solar-cell arrays.

How it's done:

The proposed economical manufacture of solar-cell arrays involves a parallel, planar weaving of filaments made of doped silicon fibers with a diffused radial junction (see figure). Each filament is a solar cell connected either in series or parallel with others to form a blanket of deposited grids or attached electrode wire mesh screens. Cells or arrays can be made larger or smaller by making the grid electrodes in different ways, by weaving suitable wires among the silicon filaments to act as buses, and by varying the dimensions of the blanket. The filament is fabricated by current state-of-the-art techniques. The silicon filament is flexible and of high strength; hence, it can be wound on drums for storage in either filament or blanket form. Because of the high strength and small size (diameter ranges from 0.001 to 0.010 inch or 0.025 to 0.25 mm, respectively) of the fiber, the array will have high redundancy. The blanket processing can be automated by using lasers or rf induction heating (from formation of the silicon filament, diffusing, to weaving and attaching electrodes) instead of painstaking hand lay-down and inspection.

The unique features of this approach stem from the silicon filament itself. Because of its high strength, flexibility, and potentially excellent crystal structure, the filament is processed, stored, and handled with minimum effort. Comparison with the present cost of fiberglass cloth indicates that the potential cost of an array could be reduced by factor of 100 to 1000 to make solar-cell power competitive with other power sources. As with fiberglass, it is possible to incorporate the silicon array as part of the structural material.

Note:

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Patent status:

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