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# NASA TECH BRIEF



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## Hermetically Sealed Cells Protected from Internal Gas Pressure

### The problem:

To prevent damage to hermetically sealed nickel-cadmium secondary cells by buildup of gas pressure during overcharging and reversed charging conditions.

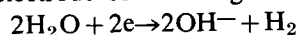
### The solution:

The cells are manufactured with less charge capacity in the positive electrode than in the negative electrode, and two additional electrodes are added; one to detect the evolution of oxygen during overcharge at the positive electrode, the second to recombine hydrogen evolved at the positive electrode during overdischarge. The second electrode is connected to the negative electrode by a diode which disconnects it during normal charge and discharge conditions.

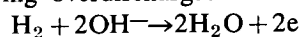
### How it's done:

During normal charge, no gas is evolved at either electrode. When the positive electrode becomes fully charged it generates oxygen. The oxygen is detected by the first auxiliary electrode which develops a control signal to the battery charging power supply.

During normal discharge no gas is generated at either electrode. When the smaller capacity positive electrode has discharged, current continues to flow due to the potential of series-connected cells still having some charge remaining. This causes overdischarge of the positive electrode so that it generates hydrogen:



This hydrogen is recombined by the second auxiliary electrode during overdischarge:



the electrons being fed to the external circuit. Thus,

no permanent buildup of hydrogen occurs in operation, and the cell cannot be harmed by prolonged overdischarge.

An additional benefit is the capability to erase the memory effect displayed by NiCd batteries when employed at lower than full capacity. This is accomplished by periodically subjecting the battery to overdischarge for a short time.

The use of two auxiliary electrodes can be applied to other alkaline type cells such as silver-cadmium and silver-zinc.

### Note:

Inquiries concerning this invention may be directed to:

Technology Utilization Officer  
Goddard Space Flight Center  
Greenbelt, Maryland 20771  
Reference: B66-10692

### Patent status:

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

Source: W. N. Carson  
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Category 01