NASA TECH BRIEF

Goddard Space Flight Center

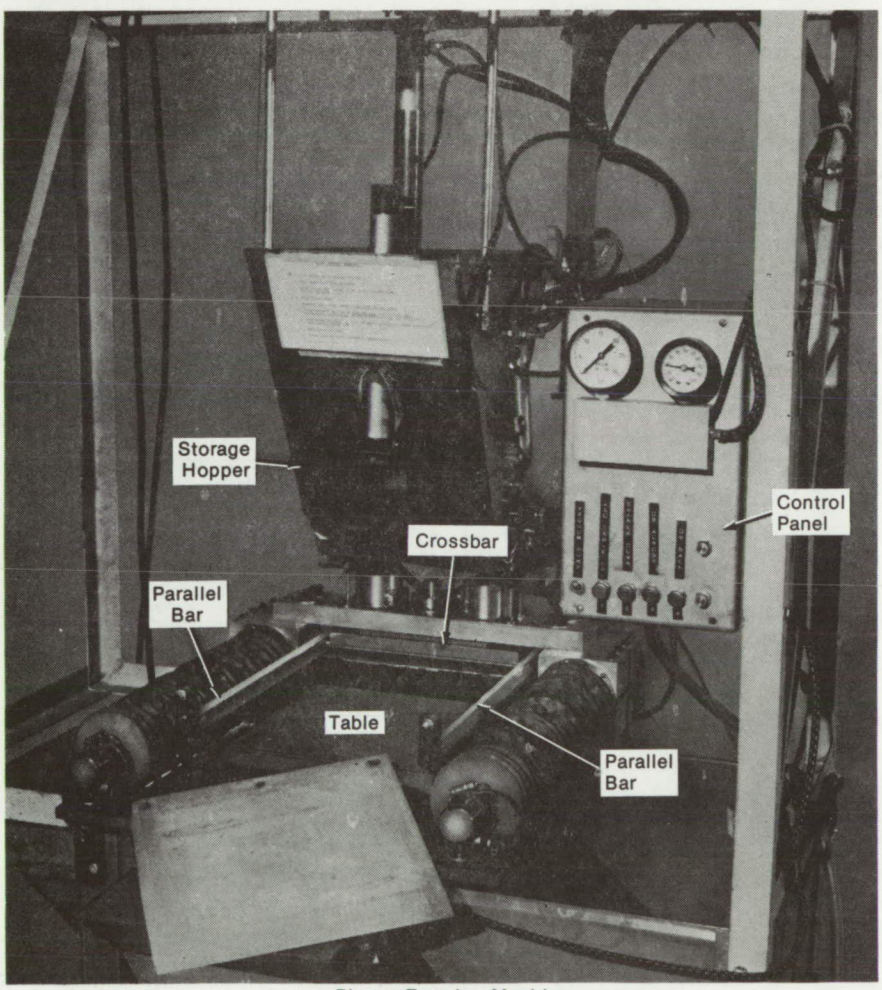
Machine for Fabrication of Battery-Electrode Plaques

The problem:

Highly-porous nickel plaques used for NiCd battery electrodes are formed by a manual method. The process is not accurate enough for the batteries to be used in critical applications. Plaque strength and thickness in a single battery may vary by as much as 2 percent. The variation from plaque to plaque is even greater.

The solution:

Dry sintered nickel plaques can be manufactured more accurately using a new semiautomatic plaque-forming machine. The functional parts in the machine are built to close tolerances of 0.001 in. (0.025 mm) and can be adjusted within the range of ±0.005 in. (±0.0127 mm).



Plaque-Forming Machine

(continued overleaf)

How it's done:

As shown in the illustration, a 1-foot square (30-cm by 30-cm) platen is formed from 0.031-in. (0.78-mm) 200 nickel sheet. The sheet is flattened by an impact press before use. A specially-structured nickel-substrate screen (not shown) is cemented on top of the plaque with a fast-setting glue. The screen is previously processed to contain embossed studs 1/8 in. (0.38 cm) in diameter. These studs hold the screen approximately 0.007 in. (0.18 mm) above the platen surface.

The platen with the screen facing up is inserted into the machine underneath the two parallel bars. A ground-steel table then is moved upward to hold the platen firmly underneath the bars. Next, a vacuum pump is turned on from underneath the table. This flattens the platen against the table surface.

Nickel powder is dispensed automatically onto the platen by activating the storage hopper. The amount of nickel is determined automatically, and the hopper retracts after depositing the right amount. The narrow pile of deposited nickel powder is situated immediately in front of the crossbar.

Carried beneath the crossbar are two semicircular polished rods mounted parallel one behind the other (not shown). The rear rod positioned 0.003 in. (0.076 mm) beneath the front one determines the final thickness of the sintered plaque. On command at the panel, the crossbar assembly is actuated to move forward. This motion pushes the nickel powder across the platen and the screen, forming the unsintered plaque. After the crossbar is returned, the plaque is removed and placed on a belt of a three-zone sintering furnace to finish the process.

The new machine is very accurate. The crossbar, the parallel bars, and the vacuum table are positioned precisely to ensure the required dimensional control. To prevent any variations in dimensions, the machine is housed in a temperature-controlled room. Variability in plaque porosity has been reduced to approximately ±0.3 percent on individual plaques and ±0.5 percent from plaque to plaque.

Note:

Requests for further information may be directed to:

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Code 704.1
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Reference: TSP75-10216

Patent status:

NASA has decided not to apply for a patent.

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Categories: 08 (Fabrication Technology)
07 (Machinery)
01 (Electronics - Components and Circuitry)
04 (Materials)