ON-LINE DOCUMENTATION

Print Output: Alkaline Technical Bulletin

Chapter: 4

Pages: 3 (not including this page)

Table of contents

4 Construction

Although the active materials in alkaline cells are basically the same as in zinc carbon cells, the significant differences are in the electrolyte and cell construction. Its more sophisticated design, combined with the alkaline electrolyte, accounts for its superior performance.

The construction of alkaline-manganese dioxide cells and batteries explained in Sections 4.1 through 4.3 are specific to the products manufactured or distributed by Duracell.

4.1 Cylindrical Cell Construction

A typical cell is designed with active materials and alkaline electrolyte contained in a nickel plated steel can. The manganese dioxide cathode powder mix is pressed against the inner surface of the steel can by one of two processes: pressing the loose cathode powder against the inner steel wall under high pressure; or by preforming the loose cathode powder into high density annular pellets which are inserted into the can and then recompacted to make contact with the cell wall. With this intimate cathode-to-cell wall contact, the steel case becomes the cathode current collector and serves as the positive terminal of the cell.

A precise amount of the zinc anode powder is dispensed into the center cavity, located in such a manner as to ensure desired capacity and surface area (a gelling agent is used to help control porosity of the zinc anode structure).

An anode current collector, welded to the external anode cap, extends through a plastic cap into the center of the anode powder mix maintaining intimate contact.

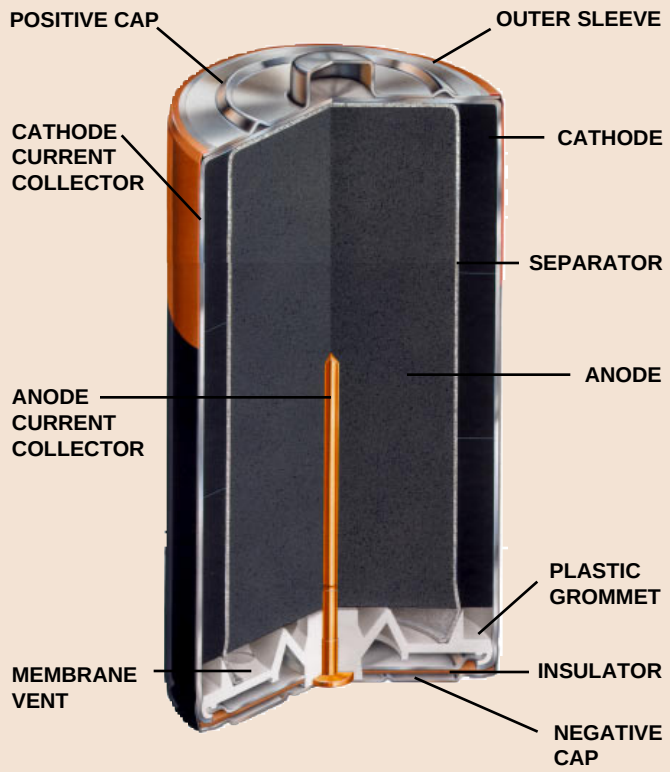
The separator is an essential component which isolates the electrodes. It is a highly absorbent, ion-permeable, and chemically inert material which blocks the migration of anode particles and prevents self-discharge of the cell during periods of non-use.

The porous nature of the anode, cathode, and separator materials allows them to be thoroughly saturated with the alkaline electrolyte solution. The high conductivity of the electrolyte enables the cell to perform well at high discharge rates and continuous service. It is also responsible for the low internal resistance and good low temperature performance.

A plastic cap or grommet is sealed to the cell case by means of radial crimping pressure and a sealant. This resilient material ensures a tight seal to prevent loss of electrolyte. The anode cap is isolated from the positive cell case with an insulator.

A vent mechanism is incorporated into the plastic grommet to protect against cell rupture and damage in the event of misuse under abusive conditions. This vent is designed to relieve excessive gas pressure that may be generated by prolonged short-circuiting, improper disposal in fire, charging, or incorrect insertion in devices. Shown in **Figure 1** is a cutaway of a DURACELL® cylindrical alkaline cell.

Figure 1



DURACELL® cylindrical alkaline cell.

Construction (cont.)

4.2 Multicell Construction

Multicell DURACELL alkaline batteries are designed with two or more alkaline cells in series or parallel connection. All series and parallel connections, as well as cell-to-terminal connections, are welded using a nickel-plated steel tab material. This all-welded construction enhances the reliability of the battery's performance in comparison to pressure-type contacts. The battery assembly cases are typically made of injection molded plastic or steel.

4.3 Button Cell Construction

The button cell construction consists of an anode subassembly, cathode subassembly and a separator to form a layered design. The anode subassembly includes the cell top, which is made of a bimetal laminate of nickel-plated steel and either copper or tin; a plastic grommet, used to insulate the positive and negative terminals; a pelleted zinc anode, which is placed inside the top; and an absorbent material saturated with electrolyte.

The cathode subassembly includes the cell can; the manganese dioxide cathode consolidation; and a barrier/separator, which allows current to flow but blocks any migration of material.

The cathode subassembly is placed over the anode subassembly and is sealed by crimping the edge of the can over the grommet.