



US006723466B2

(12) **United States Patent**
Oogami et al.

(10) **Patent No.:** **US 6,723,466 B2**
(45) **Date of Patent:** **Apr. 20, 2004**

(54) **STORAGE BATTERY WITH LAMINATED BATTERY ELEMENT**

6,447,946 B1 * 9/2002 Nakai et al. 429/53
6,451,473 B1 * 9/2002 Saito et al. 429/94

(75) Inventors: **Etsuo Oogami**, Kanagawa (JP); **Tatsuo Horiba**, Saitama (JP)

FOREIGN PATENT DOCUMENTS

DE 19731114 A1 * 1/1999 H01L/21/68

(73) Assignees: **Nissan Motor Co., Ltd.**, Kanagawa (JP); **Shin-Kobe Electric Machinery Co., Ltd.**, Tokyo (JP)

* cited by examiner

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 159 days.

Primary Examiner—Carol Chaney
Assistant Examiner—Dah-Wei D. Yuan
(74) *Attorney, Agent, or Firm*—McDermott, Will & Emery

(57) **ABSTRACT**

A storage battery includes a rolled, laminated battery element made up of two groups of electrode materials composed of positive and negative electrode materials, laminated together through separators, an outer sheathing enclosing therein the laminated battery element, a spindle around which the laminated battery element is wound and rolled up so that the spindle and the laminated battery element are fixedly connected to each other. One axial end of the spindle is constrained in the axial direction of the laminated battery element by the bottom of the outer sheathing, while the other axial end of the spindle is elastically supported by an upper lid portion hermetically covering the opening end, so as to stably support the laminated battery element by the spindle and to prevent displacement of the laminated battery element from its set position even during application of vibrations to the storage battery.

(21) Appl. No.: **09/804,077**

(22) Filed: **Mar. 13, 2001**

(65) **Prior Publication Data**

US 2001/0036571 A1 Nov. 1, 2001

(30) **Foreign Application Priority Data**

Mar. 15, 2000 (JP) 2000-071558

(51) **Int. Cl.**⁷ **H01M 6/10**

(52) **U.S. Cl.** **429/94; 429/96; 429/100**

(58) **Field of Search** 429/94, 96, 100

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,032,943 A * 3/2000 Yabushita et al. 271/109

9 Claims, 6 Drawing Sheets

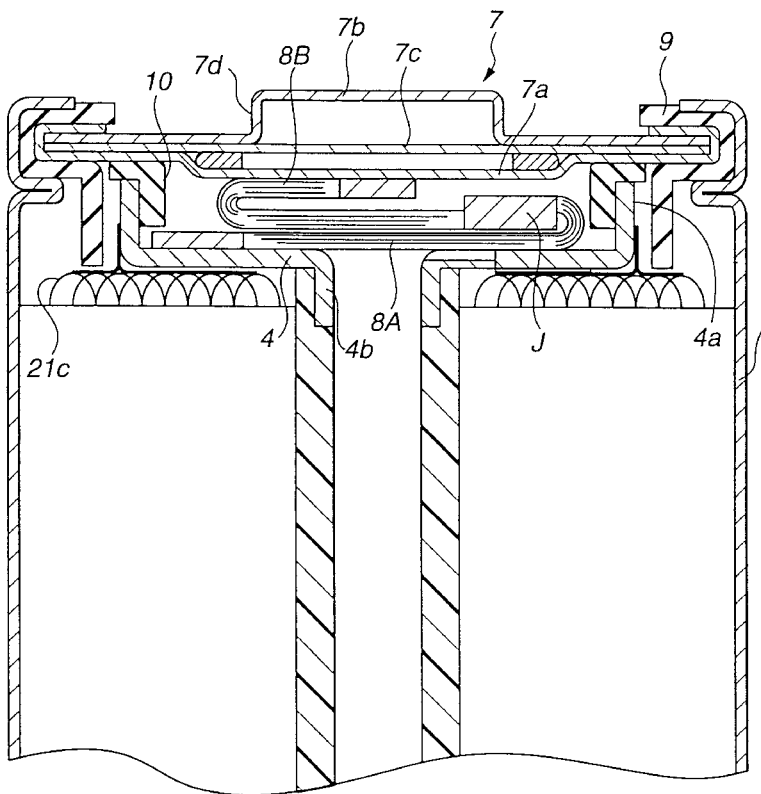


FIG. 1

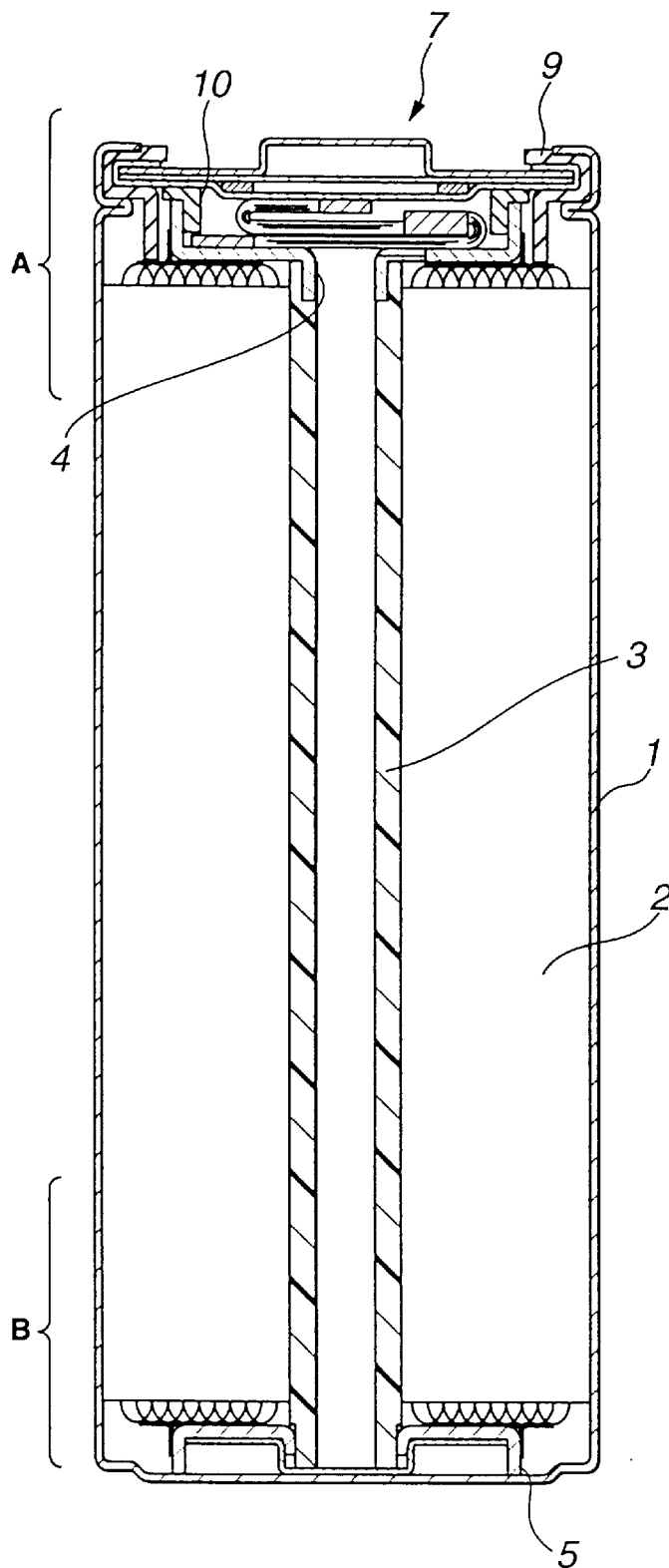


FIG.2

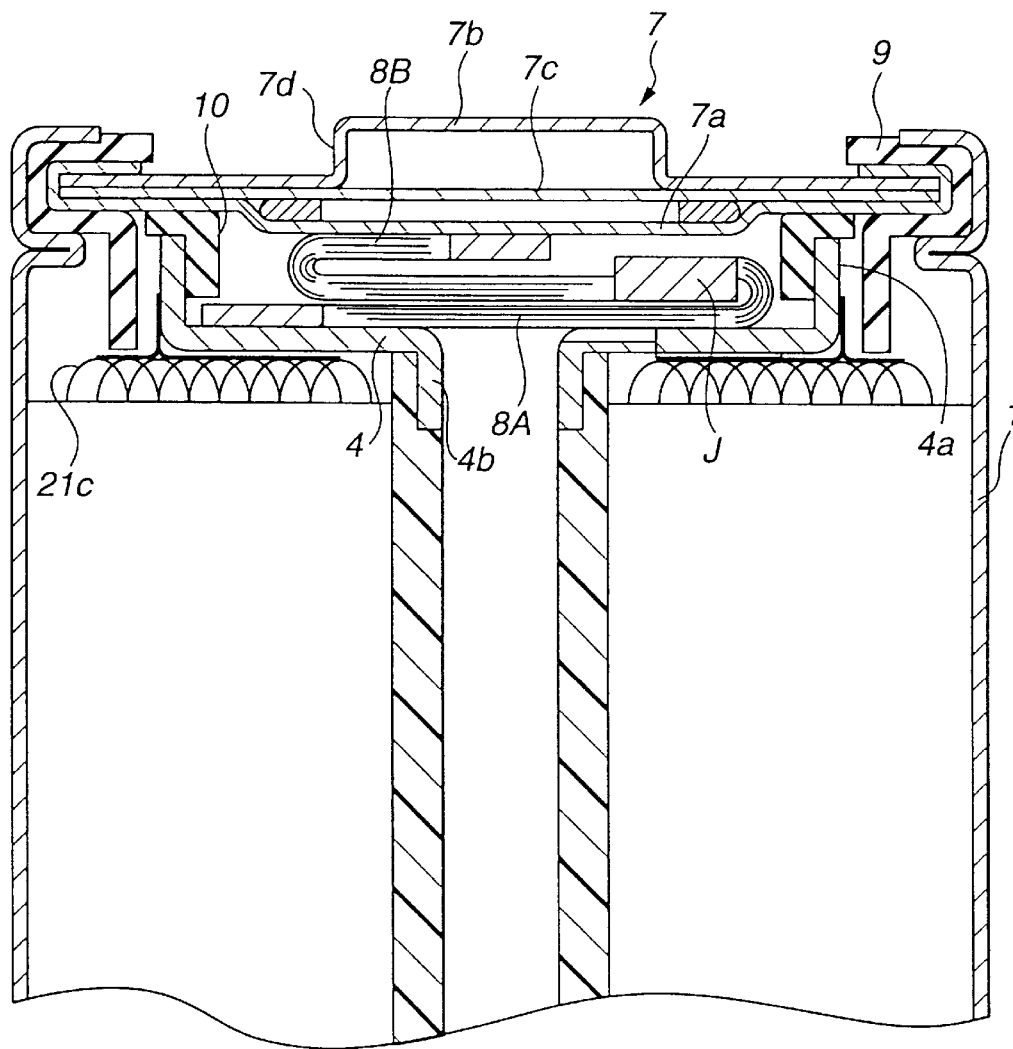


FIG.3

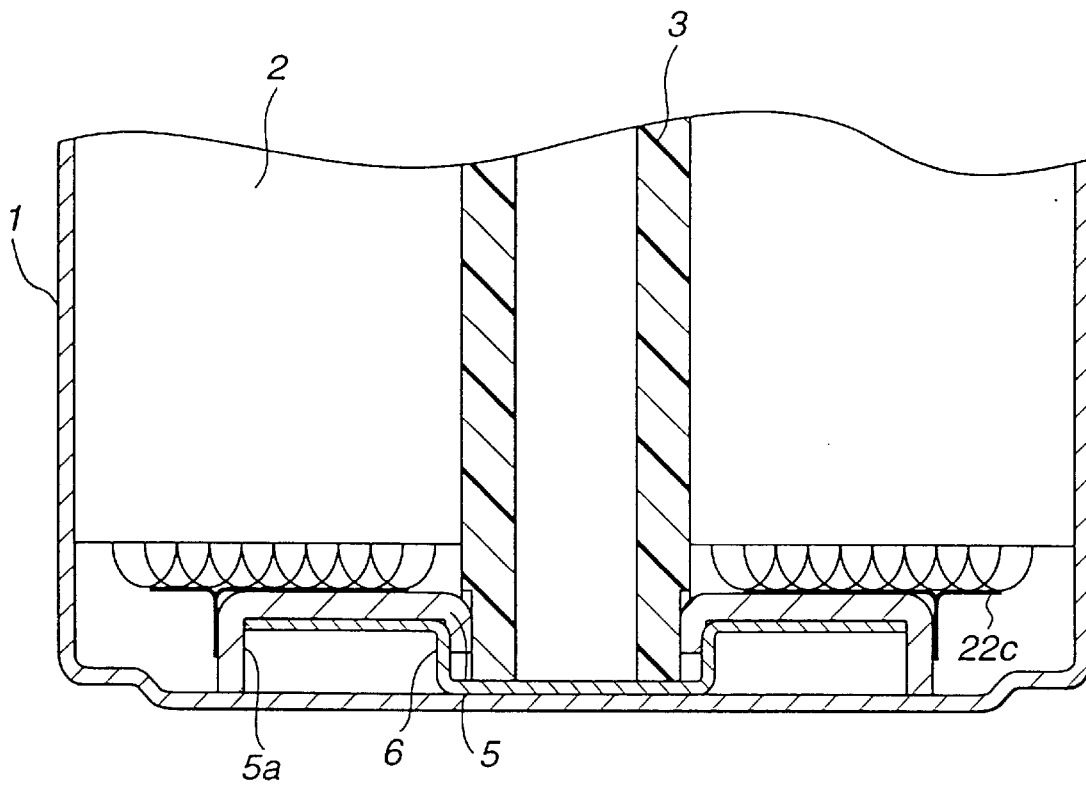
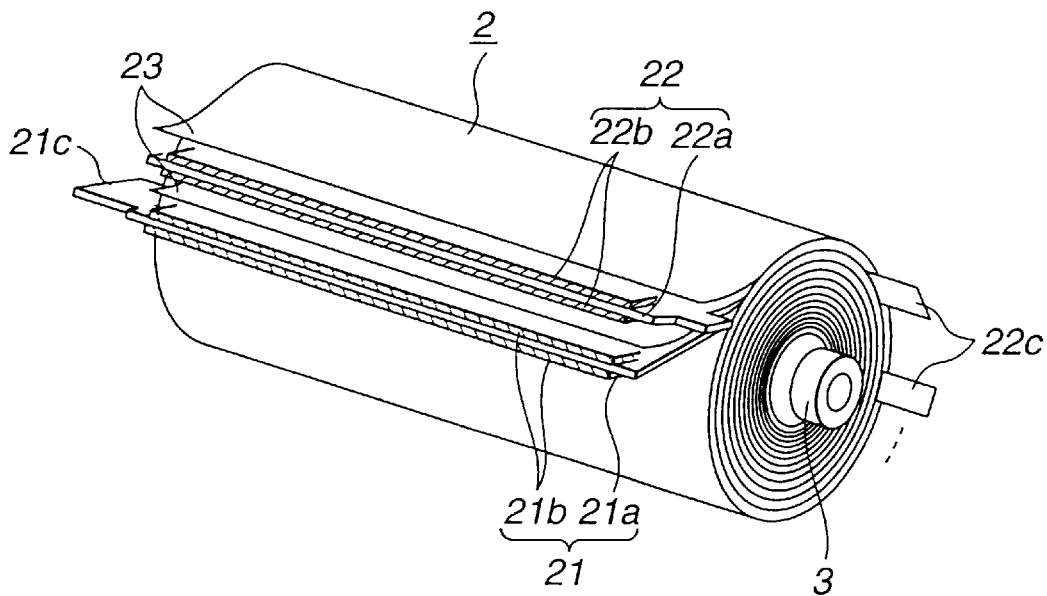


FIG.4



Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.