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**Suzuki et al.**

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(54) **FLAT NON-AQUEOUS ELECTROLYTE SECONDARY CELL**

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(65) **Prior Publication Data**

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**Related U.S. Application Data**

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(51) **Int. Cl.**

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<b>H01M 2/08</b>	(2006.01)
<b>H01M 4/58</b>	(2006.01)
<b>H01M 10/40</b>	(2006.01)

(52) **U.S. Cl.** ..... **429/162**; 429/94; 429/127; 429/124; 429/185; 429/128; 429/176; 429/175

(58) **Field of Classification Search** ..... None  
See application file for complete search history.

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

2,971,999 A 2/1961 Jacquier

(Continued)

**FOREIGN PATENT DOCUMENTS**

EP	1 011 163 A1	6/2000
JP	08-031394	2/1996
JP	10-255733	9/1998
JP	10-289707	10/1998
JP	2001-164259	6/2000

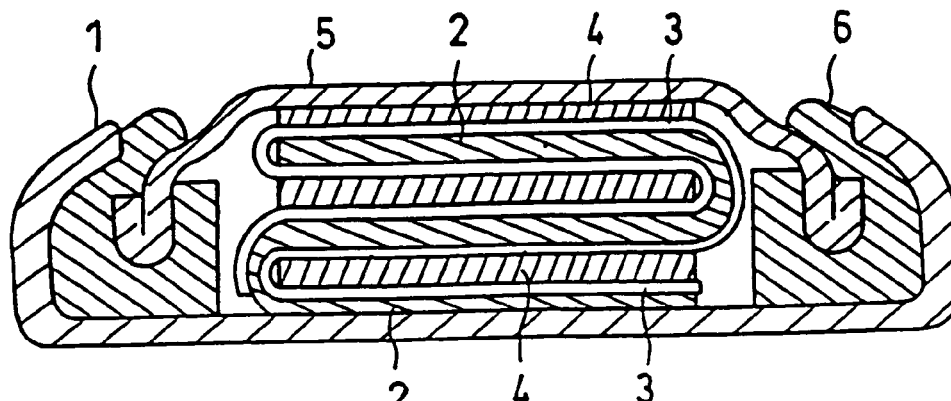
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(57) **ABSTRACT**

A non-aqueous electrolyte secondary cell containing an electricity-generating element with at least a cathode, a separator and an anode and a non-aqueous electrolyte inside a cathode case, electrode units each consisting of the cathode and the anode opposite to each other via the separator laminated to form an electrode group, or an electrode unit in a sheet form consisting of the cathode and the anode opposite to each other via the separator wound to form an electrode group, or a sheet-shape cathode wrapped with the separator except for a part contacting at inner face of cathode case and a sheet-shaped anode set on the sheet-shaped cathode in a right angled position each other and bent alternately to form an electrode group, and the total sum of the areas of the opposing cathode and anode in the electrode group larger than the area of the opening of an insulating gasket in a sealed portion in the cathode case or than the area of an opening in a sealed plate in a sealed portion in the cathode case.

**33 Claims, 13 Drawing Sheets**



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## U.S. PATENT DOCUMENTS

4,356,240 A 10/1982 Dey et al.  
4,830,940 A 5/1989 Keister et al.  
5,707,756 A 1/1998 Inoue et al.

6,312,848 B1 \* 11/2001 Kilb et al. .... 429/162  
6,617,074 B1 \* 9/2003 Watarai et al. .... 429/231.95  
6,638,662 B2 10/2003 Kaneda et al.

\* cited by examiner

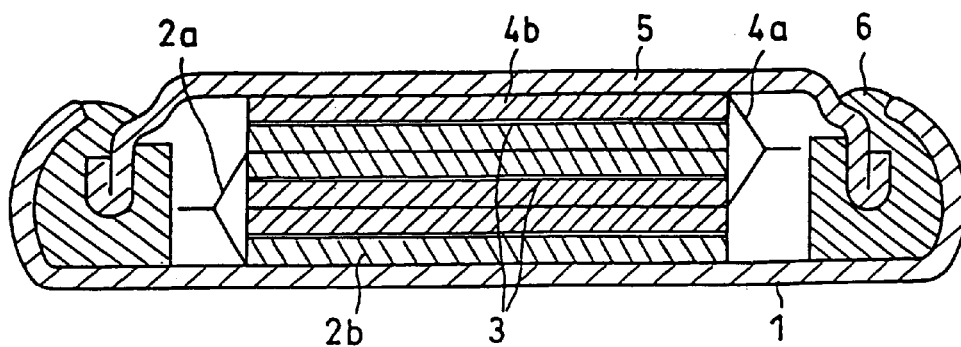


FIG. 1

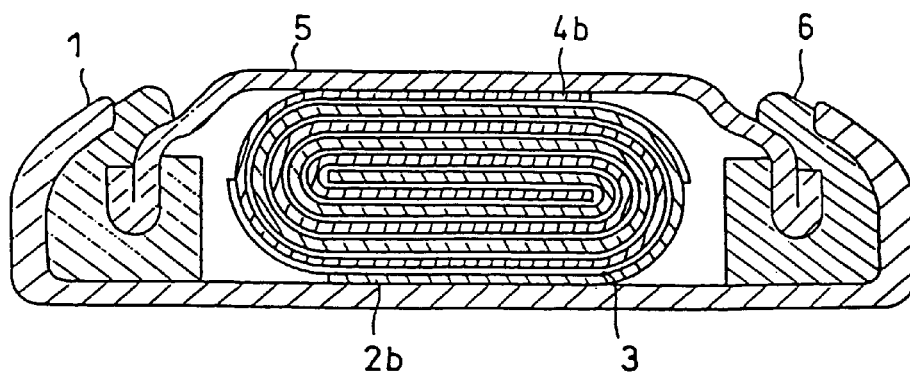


FIG. 2

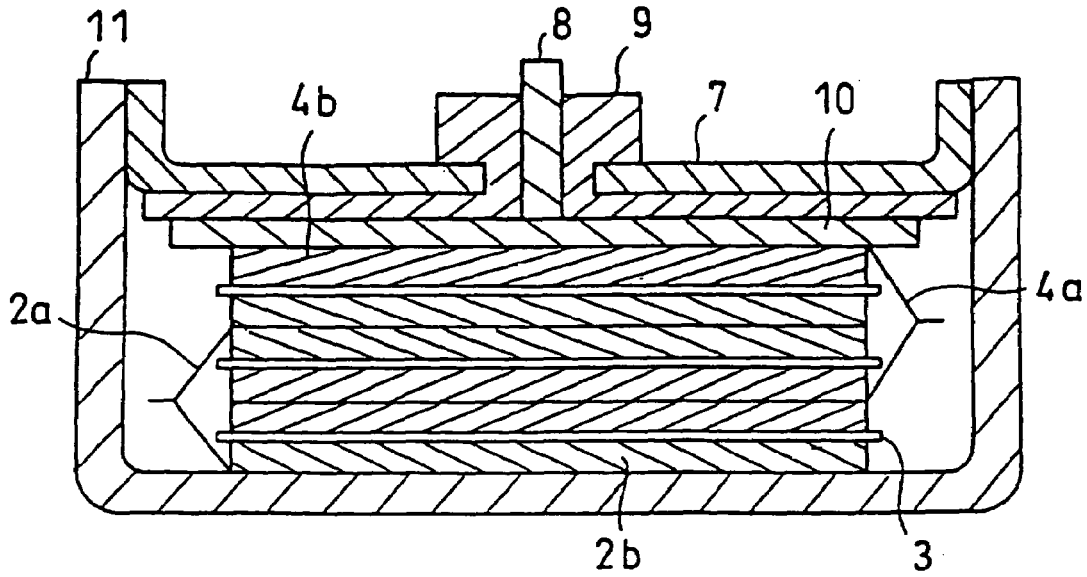


FIG. 3

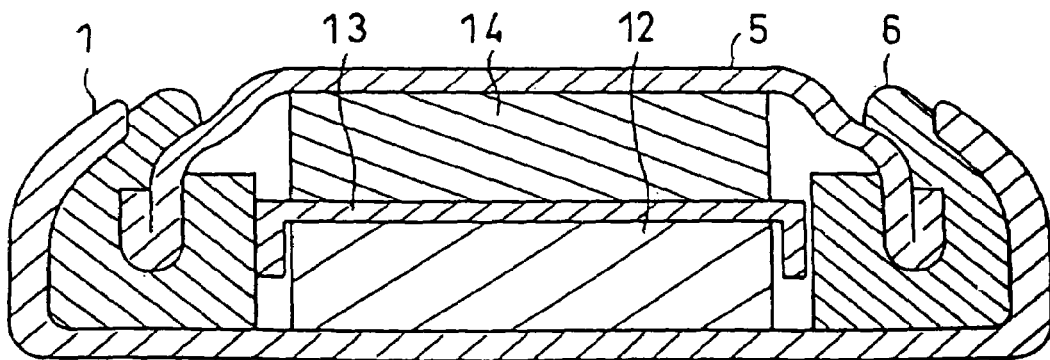


FIG. 4

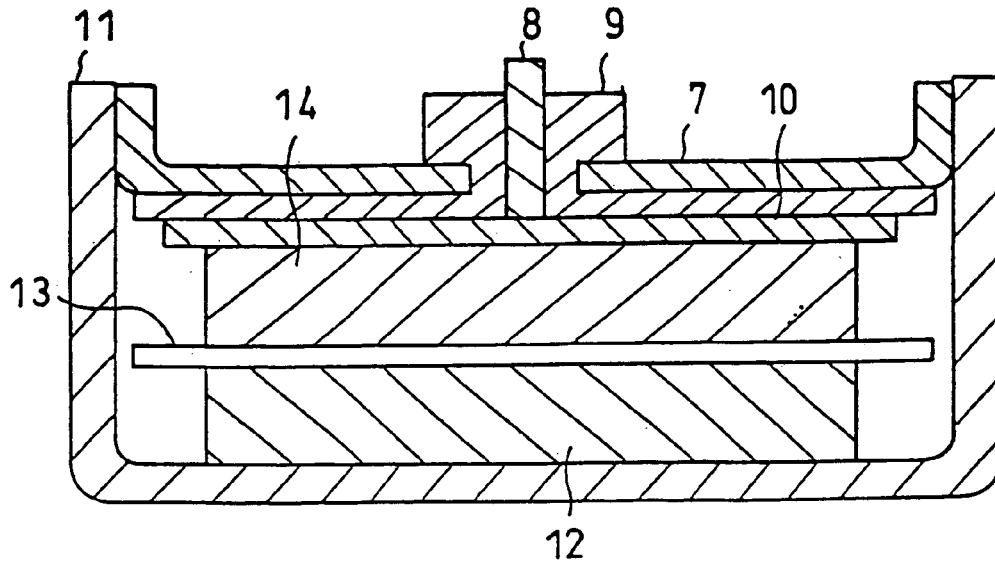


FIG. 5

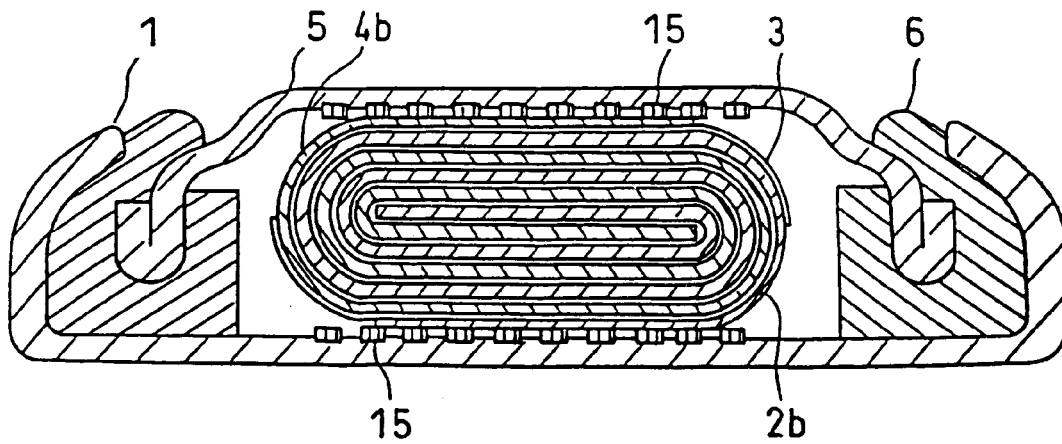


FIG. 6

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