Claims

1. A lead-acid battery comprising a battery case and an electrode group housed in the battery case together with an electrolyte, the electrode group being formed by stacking a negative electrode and a positive electrode via a separator, the negative electrode including a negative current collector on which a negative active material is held, the positive electrode including a positive current collector on which a positive active material is held, the positive current collector being made of a lead alloy, wherein:

the lead alloy contains 0.05 to 0.1% by mass of Ca, 1.2 to 2.2% by mass of Sn, and 0.002 to 0.03% by mass of In and contains, as unavoidable impurities, at least Bi, the remainder being Pb;

characterized in that:

the lead alloy contains 0.001 to 0.04% by mass of Bi as unavoidable impurities; and

the lead alloy is subjected to a rolling process at a draft rate of 80 to 97.5%.

2. The lead-acid battery according to claim 1, wherein

the lead alloy further contains 0.003 to 0.2% by mass of Ag.

3. The lead-acid battery according to claim 1 or 2, wherein

the lead alloy is continued to be subjected to the rolling process until a maximum elongation rate of the lead alloy becomes

150% or more of a maximum elongation rate at the time when a strength of the lead alloy reaches a maximum strength.

4. The lead-acid battery according to claim 1 or 2, wherein:

the lead alloy is continued to be subjected to the rolling process until a maximum elongation rate of the lead alloy becomes 150% or more of a maximum elongation rate at the time when a strength of the lead alloy reaches a maximum strength; and

the lead alloy is further subjected to an expanding process.

5. The lead-acid battery according to claim 1 or 2, wherein:

the lead alloy is continued to be subjected to the rolling process until a maximum elongation rate of the lead alloy becomes 150% or more of a maximum elongation rate at the time when a strength of the lead alloy reaches a maximum strength;

the lead alloy is further subjected to an expanding process; and

the tensile strength of the lead alloy before the expanding process is 52 MPa or less.

6. An electrode current collector for a lead-acid battery, wherein:

the electrode current collector is made of a lead alloy containing 0.05 to 0.1% by mass of Ca, 1.2 to 2.2% by mass of Sn, and 0.002 to 0.03% by mass of In and containing, as unavoidable impurities, at least Bi, the remainder being Pb;

characterized in that:

the lead alloy contains 0.001 to 0.04% by mass of Bi as unavoidable impurities; and

the lead alloy is subjected to a rolling process at a draft rate of 80 to 97.5%.

7. The electrode current collector for a lead-acid battery according to claim 6, wherein

the lead alloy further contains 0.003 to 0.2% by mass of Ag.

8. The electrode current collector for a lead-acid battery according to claim 6 or 7, wherein

the lead alloy is continued to be subjected to the rolling process until a maximum elongation rate of the lead alloy becomes 150% or more of a maximum elongation rate at the time when a strength of the lead alloy reaches a maximum strength.

9. The electrode current collector for a lead-acid battery according to claim 6 or 7, wherein:

the lead alloy is continued to be subjected to the rolling process until a maximum elongation rate of the lead alloy becomes 150% or more of a maximum elongation rate at the time when a strength of the lead alloy reaches a maximum strength; and

the lead alloy is further subjected to an expanding process.

10. The electrode current collector for a lead-acid battery according to claim 6 or 7, wherein:

the lead alloy is continued to be subjected to the rolling process until a maximum elongation rate of the lead alloy becomes 150% or more of a maximum elongation rate at the time when a strength of the lead alloy reaches a maximum strength;

the lead alloy is further subjected to an expanding process; and

the tensile strength of the lead alloy before the expanding process is 52 MPa or less.