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Marsden et al.

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- (54) **PROCESS FOR MULTIPLE STAGE DIRECT ELECTROWINNING OF COPPER**
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- (52) **U.S. Cl.** **205/580**; 205/574; 205/581; 205/584; 205/585; 205/586; 74/740; 74/743
- (58) **Field of Classification Search** 205/584, 205/586, 574, 280, 581, 585; 75/740, 743
See application file for complete search history.

- (56) **References Cited**
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- (*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 867 days.

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- CL 1657-2000 6/1999
- WO WO 01/00890 1/2001

This patent is subject to a terminal disclaimer.

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- OTHER PUBLICATIONS
- PCT International Preliminary Examination Report, PCT/US01/23366, Date of Completion of Report: Oct. 23, 2002.

- (65) **Prior Publication Data**
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Related U.S. Application Data

- (63) Continuation-in-part of application No. 10/737,420, filed on Dec. 15, 2003, now Pat. No. 6,972,107, which is a continuation of application No. 10/238,399, filed on Sep. 9, 2002, now Pat. No. 6,663,689, which is a continuation of application No. 09/912,921, filed on Jul. 25, 2001, now Pat. No. 6,451,089, application No. 10/976,481, which is a continuation-in-part of application No. 10/756,574, filed on Jan. 12, 2004, now Pat. No. 7,341,700, which is a continuation of application No. 09/915,105, filed on Jul. 25, 2001, now Pat. No. 6,676,909.
- (60) Provisional application No. 60/517,171, filed on Nov. 3, 2003.

- (57) **ABSTRACT**
A system and process for recovering copper from a copper-containing ore, concentrate, or other copper-bearing material to produce high quality cathode copper from a leach solution without the use of copper solvent/solution extraction techniques or apparatus. A process for recovering copper from a copper-containing ore generally includes the steps of providing a feed stream containing comminuted copper-containing ore, concentrate, or other copper-bearing material, leaching the feed stream to yield a copper-containing solution, conditioning the copper-containing solution through one or more physical or chemical conditioning steps, and electrowinning copper directly from the copper-containing solution in multiple electrowinning stages, without subjecting the copper-containing solution to solvent/solution extraction prior to electrowinning.

- (51) **Int. Cl.**
C25C 1/12 (2006.01)

50 Claims, 3 Drawing Sheets

