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(54) **METHOD FOR PRODUCING MOLYBDENUM METAL AND MOLYBDENUM METAL**

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2,402,084 A	6/1946	Rennie
3,264,098 A	8/1966	Heytmeijer
3,865,573 A	2/1975	Neumann et al.
4,045,216 A	8/1977	Meyer et al.
4,547,220 A	10/1985	Carpenter et al.
4,595,412 A	6/1986	Brunelli et al.
5,330,557 A	7/1994	May
6,626,976 B2 *	9/2003	Khan et al. 75/369
2001/0049981 A1	12/2001	Mccormick

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 518 days.

This patent is subject to a terminal disclaimer.

FOREIGN PATENT DOCUMENTS

DE	74082 A	6/1970
EP	1162281 A1	12/2001
GB	932 168 A	7/1963
WO	WO 98/24576	6/1998

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B22F 9/22 (2006.01)

(52) **U.S. Cl.** **75/369; 75/363; 75/623**

(58) **Field of Classification Search** **75/369, 75/363, 623**

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,398,114 A 4/1946 Rennie

OTHER PUBLICATIONS

European Patent Office, European Search Report, Application No. EP 02 02 2649, Examiner M. Alvazzi Delfrate, Jan. 21, 2003.
Studies in Inorganic Chemistry 19 "Molybdenum: An Outline of its Chemistry and Uses" by E. R. Braithwaite and J. Haber, 1994. pp. 14-15, 20-26, 58-68, 147, 148, 150, Dec. 1994.

* cited by examiner

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(57) **ABSTRACT**

Novel forms of molybdenum metal, and apparatus and methods for production thereof. Novel forms of molybdenum metal are preferably characterized by a surface area of substantially about 2.1 m²/g to substantially about 4.1 m²/g. Novel forms of molybdenum metal are also preferably characterized by a relatively uniform size.

14 Claims, 5 Drawing Sheets

