RECENT PUBLICATIONS ON LEAD/ACID BATTERIES AND RELATED PHENOMENA 1984-85 No. 1

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The aim of this abstracting service is to provide workers with a review of paper and patent titles in the area of lead/acid batteries, and in particular to assist those workers who do not have ready access to citation facilities. The compilation will be published half-yearly and an author index will be provided with the second issue of each year.

The publications are grouped under broad titles and, where possible, are numbered in chronological sequences that will be continued in each succeeding issue. Due to the unavoidable delay between the appearance and the citation of papers, the two issues of each year will necessarily include items published both during that year and during the previous year. This first compilation covers items published since 1 January, 1984.

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R. Stillman, R. Robins and M. Skyllas-Kazacos (*Sch. Chem. Eng. Ind. Chem., Univ. NSW, Kensington, NSW 2033, Australia*).

J. Power Sources, 13 (1984) 171-80.

A2. Effect of a gelled electrolyte on characteristics of lead-acid battery electrodes.

N.K. Grigalyuk, T.P. Chizhik and I.A. Aguf (*USSR*).

Zh. Prikl. Khim. (Leningrad), 57 (1984) 432-5.

A3. Limitations in the design of lead-acid cells with immobilized electrolyte.

S. Atlung and B. Fastrup (*Fys.-Kem. Inst., Tech. Univ. Denmark, DK-2800 Lyngby, Denmark*).

J. Power Sources, 13 (1984) 39-54.

A4. A sensor for the specific gravity of the electrolyte of a lead-acid battery.

H. Nitta, M. Tsubota and K. Yonezu (*Japan Storage Battery Co., Ltd, Kyoto, Japan*).

GS News Tech. Rep., 43 (1984) 12-17.

A5. An optical-type hydrometer for stationary lead-acid batteries and its application for control system.

Y. Makino and T. Matsui (*Takatsuki Seisakujo, Yuasa Battery Co., Ltd., Japan*).

Yuasa Jiho, 57 (1984) 19-25.

B. LEAD AND LEAD ALLOYS

B1. Effect of beryllium, selenium and their compounds on the properties of lead-antimony alloys (for use in batteries).

M. Abdel-Reihim, P. Faber, N. Hess and W. Reif (*Inst. Metallforsch.-Metallkd., Tech. Univ. Berlin, Fed. Rep. Germany*).

Metall (Berlin), 38 (1984) 28-32.

B2. Structure and mechanical properties of lead alloys for expanded metal grids after deformation and recrystallization.

M. Abdel-Reihim, B. Preibisch and W. Reif (*Inst. Metallforsch.-Metallkd., Tech. Univ. Berlin, Fed. Rep. Germany*).

Metall (Berlin), 38 (1984) 407-11.

B3. Effect of thermomechanical treatment on hardness and structure of lead-calcium-bismuth alloys.

F. Haessner, W. Wunderlich and P. Wehr (*Inst. Werkstoffe, Tech. Univ. Braunschweig, Fed. Rep. Germany*).

Metall (Berlin), 38 (1984) 411-17.

B4. A rotating ring-disk electrode study of impurity effects on lead corrosion in sulfuric acid.

M. Skyllas-Kazacos (*Sch. Chem. Eng., Univ. NSW, Kensington, NSW 2033, Australia*).

J. Power Sources, 13 (1984) 55-64.

B5. Solid state electro-oxidation processes on lead and lead alloys in the lead(IV) oxide/lead(II) sulfate regions.

E. Hameenoja and N.A. Hampson (*Dep. Chem., Univ. Technol. Loughborough, Leics., UK*).

J. Appl. Electrochem., 14 (1984) 449-58.

B6. Polarization behaviour of lead in sulfuric acid and phosphoric acid solutions.

S. Sternberg and A.G. Mateescu (*Fac. Utilaje Ing. Proces. Chim. Inst. Politeh. Bucuresti, Bucharest, Rumania*).

Rev. Chim. (Bucharest), 35 (1984) 510-14.

B7. Strain softening behaviour of Pb-0.064 Ca-0.44 Sn wrought sheet.

D.E. Kelly and P. Niessen (*Dep. Mech. Eng., Univ. Waterloo, Waterloo, Ontario, canada*).

Met. Sci., 18 (1984) 467-70.

B8. Battery lead alloys and grid technology.

Battery Society of India (*B-6/7 Shopping Centre, Safdarjung Enclave, New Delhi 110029, India*).

Battery Society of India, 1984, 86 pp.

B9. Influence of pressure during solidification on the structure of some Pb-Sn alloys.

N.A. El-Mahallawy and M.A. Taha.

11th Inter. Press. Die Cast. Conf., Lyon, 19-20 June 1984.

B10. Continuous refining of secondary lead.

J.E. Bowers and R.D. Johnston (*Grove Lab., BNF Met. Technol. Cent., Wantage, Oxfordshire, UK*).

In M.J. Jones and P. Gill (eds.), Miner. Process Extr. Metall., Pap. Int. Conf., 1984, pp. 63-71.

B11. Atomic absorption spectrometry of lead by suction-flow hydride generation-heated quartz cell atomization.

T. Kumamaru, F. Nakata, S. Hara, H. Matsuo and M. Kiboku (*Fac. Integrated Arts Sci., Hiroshima Univ., Hiroshima, Japan, 730*).

Bunseki Kagaku, 33 (1984) 624-7.

B12. Effect of structure on acoustic emission during solidification of lead-antimony alloys.

H.M. Tensi, D. Berndt and B.E. Kallup (*Inst. Werkstoff-Verarbeitungswiss., Tech. Univ. Muenchen, D-8000/2, Munich, Fed. Rep. Germany*).

Metall (Berlin), 38 (1984) 820-4.

C. POSITIVE PLATES (LEAD(IV) OXIDES)

C1. Quantitative phase analysis of crystalline and amorphous components of positive plates in lead-acid batteries operated under simulated electric-vehicle service.

K. Harris, R.J. Hill and D.A.J. Rand (*CSIRO, Div. Min. Chem., PO Box 124, Port Melbourne, Vic. 3207, Australia*).

J. Electrochem. Soc., 131 (1984) 474-82.

C2. A precharged positive plate for the lead-acid automotive battery. I. Positive plate allowing direct incorporation of lead(IV) oxide.

E.J. Taylor, G.A. Shia and D.T. Peters (*Giner Inc., Waltham, MA 02154, USA*).

J. Electrochem. Soc., 131 (1984) 483-7.

C3. A precharged positive plate for the lead-acid automotive battery. II. Effect of various lead(IV) oxide types and paste formulations on precharged positive plate performance.

E.J. Taylor, G.A. Shia and D.T. Peters (*Giner Inc., Waltham, MA 02154, USA*).

J. Electrochem. Soc., 131 (1984) 487-91.

C4. Lead-acid battery cathodes incorporating chemically prepared lead(IV) oxide.

P.T. Moseley and N.J. Bridger (*Mater. Dev. Div., AERE Harwell, Oxfordshire, UK*).

J. Electrochem. Soc., 131 (1984) 608-10.

C5. A model of the structure of the positive lead-acid battery active mass.

D. Pavlov and E. Bashtavelova (*Cent. Lab. Electrochem. Power Sources, 1040, Sofia, Bulgaria*).

J. Electrochem. Soc., 131 (1984) 1468-76.

C6. Structural parameters of beta-lead dioxide and their relation to the hydrogen-loss concept of lead-acid battery failure.

R.J. Hill and I.C. Madsen (*CSIRO, Div. Min. Chem., Port Melbourne, Vic. 3207, Australia*).

J. Electrochem. Soc., 131 (1984) 1486-91.

C7. Structural changes of positive active material in lead-acid batteries in deep-discharge cycling.

T.G. Chang (*Prod. Res. Cent., Cominco Ltd., Mississauga, Ontario, Canada*).

J. Electrochem. Soc., 131 (1984) 1755-62.

C8. Stationary and instationary kinetic behavior of lead(IV) oxide: the interaction of different electrode reactions.

J.P. Pohl (*Lehrstuhl fur Phys. Chem., Univ. Dortmund, D-4600 Dortmund, Fed. Rep. Germany*).

Prog. Batteries Sol. Cells, 5 (1984) 174-7.

C9. Research on lead dioxide: recent results.

R. Varma (*Argonne Natl. Lab., Argonne, Il 60439, USA*).

Prog. Batteries Sol. Cells, 5 (1984) 197-200.

C10. Concentration, mobility and thermodynamic behaviour of the quasi-free electrons in lead dioxide.

J.P. Pohl and G.L. Schlechtriemen (*Lehrstuhl fur Phys. Chem., Univ. Dortmund, 4600 Dortmund 50, Fed. Rep. Germany*).

J. Appl. Electrochem., 14 (1984) 521-31.

C11. Some characteristics of lead dioxide doped with various elements.

A. Delmastro and A. Maja (*Dip. Sci. Mater. Ing. Chim., Politec. Torino 10129, Turin, Italy*).

J. Electrochem. Soc., 131 (1984) 2756-60.

C12. Electrode processes in the lead(II) sulfate/lead(IV) oxide system.

S. Sternberg, A. Mateescu, V. Branzoi and L. Apateanu (*Polytech. Inst. Bucharest, Bucharest, Rumania*).

Rev. Roum. Chim., 29 (1984) 9-10.

C13. Positive plates in traction batteries.

W.G.A. Baldsing, J.R. Gardner, J.A. Hamilton, R.J. Hill, A.M. Jessel and D.A.J. Rand (*CSIRO, Div. Min. Chem., PO Box 124, Port Melbourne, Vic. 3207, Australia*).

ILZRO Project LE-290, International Lead Zinc Research Organization, Inc., Prog. Rep. No. 8, July-December 1984, 50 pp.

D. NEGATIVE PLATES

D1. Expander for a lead-acid battery with improved charging characteristics.

K.V. Rybalka, E.S. Livshits, E.G. Yampol'skaya, I.A. Smirnova, T.I. Mal'chevskaya, V.S. Shaldaev, A.V. Ragimov, D.T. Radzhabov and L.V. Kasparova (*USSR*).

Elektrotekh. Prom., Khim. Fiz. Istochniki Toka, 2 (1984) 20-1.

D2. The influence of organic expanders on the kinetics of the lead electrode.

G. Hoffman and W. Vielstich (*Inst. Phys. Chem., Univ. Bonn, D-5300, Bonn, Fed. Rep. Germany*).

Prog. Batteries Sol. Cells, 5 (1984) 170-3.

D3. Effect of different expanders on the performance of a lead/sulfuric acid battery studied by the microelectrode method.

S. Sternberg, V. Branzoi, I. Apateanu, C. Dobos and E. Comanescu (*Inst Politeh., Bucharest, Rumania*).

Riv. Chim. (Bucharest), 35 (1984) 427-33.

D4. The effect of the expander upon the two types of negative active mass structure in lead-acid batteries.

V. Iliev and D. Pavlov (*Cent. Lab. Electrochem. Power Sources, Bulgarian Acad. Sci., 1040 Sofia, Bulgaria*).

J. Appl. Electrochem., 15 (1985) 39-52.

D5. Copper grids in the negative electrodes of a lead acid cell: the CSM-battery.

K. Gutekunst and W. Rusch (*Hagen Batterie A.-G., D-4770, Soest, Fed. Rep. Germany*).

Prog. Batteries Sol. Cells, 5 (1984) 208-11.

D6. Lead-acid battery negative: a review.

K.B. Mahato (*Johnson Controls, Inc., Milwaukee, WI 53201, USA*).

Prog. Batteries Sol. Cells, 5 (1984) 212-18.

E. ASPECTS OF MANUFACTURE

E1. Description and design of a pilot plant for the production of active material for lead acid batteries.

C.V. D'Alkaine, J.S.D. Mattos and D.M. Machado (*Grupo Electroquim., Univ. Fed. Sao Carlos, 130560, San Carlos, Brazil*).

An. Simp. Bras. Electroquim. Electroanal., (1984) 583-8.

E2. Electrolytic method for recovery of lead from serap batteries. Scale-up study using 20-liter multielectrode cell.

A.Y. Lee, E.R. Cole Jr. and D.L. Paulson (*Rolla Res. Cent., Bur. Mines, Rolla, MO, USA*).

Rep. Invest.-U.S. Bur. Mines, No. RI. 8857, 1984, 24 pp.

E3. Lead dust sources and lead dust concentrations in lead-acid battery plants.

T. Spee (*Delft, Netherlands*).

Staub-Reinhalt. Luft, 44 (1984) 165-8.

E4. Epidermiological-environmental study of lead acid battery workers. I. Environmental study of five lead acid battery plants.

W. Jones and J. Gamble (*Div. Respiratory Dis. Stud., Natl. Inst. Occup. Saf. Health, Morgantown, WV 26505, USA*).

Environ. Res., 35 (1984) 1-10.

E5. Epidermiological-environmental study of lead acid battery workers. II. Accute effects of sulfuric acid on the respiratory system.

J. Gamble, W. Jones and J. Hancock (*Div. Respiratory Dis. Stud., Natl. Inst. Occup. Saf. Health, Morgantown, WV 26505, USA*).

Environ. Res., 35 (1984) 11-29.

E6. Epidermiological-environmental study of lead acid battery workers. III. Chronic effects of sulfuric acid on the respiratory system and teeth.

J. Gamble, W. Jones, J. Hancock and R.L. Meckstroth (*Div. Respiratory Dis. Stud., Natl. Inst. Occup. Saf. Health, Morgantown, WV 26505, USA*).

Environ. Res., 35 (1984) 30-52.

E7. Selective leaching of lead battery slime in acidic ferrous chloride solutions.

K. Arai, T. Arikawa, M. Kato and T. Izaki (*Fac. Eng., Toyama Univ., Takaoka, Japan*).

Nippon Kinzoku Gakkaishi, 48 (1984) 1075-80.

E8. A rapid method for quantitative determination of lead sulfate in the manufacturing control of lead acid batteries.

M. Dreux, M. Lafosse, M. Pequignot, L. Morin-Allory and M. Douady (*UER Sci., Univ. Orleans, F-45046, Orleans, France*).

HRC CC, J. High Resolut. Chromatogr. Chromatogr. Commun., 7 (1984) 712-13.

F. CHARGING AND DISCHARGING

F1. Rythmic gas-bubble formation in lead batteries under potentiostatic charging conditions.

E. Maier (*Varta Batterie A.-G., Kelkheim/Taunus, Fed. Rep. Germany*).

Electrochim. Acta, 29 (1984) 195-201.

F2. Effect of self-discharge in lead batteries on gas evolution under galvanostatic charge conditions.

E. Maier (*D-1000/65, Berlin, Fed. Rep. Germany*).

Electrochim. Acta, 29 (1984) 333-8.

F3. Measuring the charge condition of wheelchair batteries.

N.D. Durie and R.L. Farley (*Medical Engng. Section, Nat. Res. Council, Ottawa, Canada*).

Med. and Biol. Eng. and Comput. (GB), 22 (1984) 184-6.

F4. Effect of iron on the self-discharge of a lead-acid battery.

A.G. Gerasimov, V.I. Barkovskii, Z.I. Krasnolobova and A.I. Rusin (*USSR*).

Elektrotekh. Prom., Khim. Fiz. Istochniki Toka, 2 (1984) 10-12.

F5. Effect of iron on the capacity and charging characteristics of a lead battery with electrode grids of low-antimony and lead-calcium alloys.

A.G. Gerasimov, V.I. Barkovskii, L.A. Tomilina and A.I. Rusin (*USSR*).

Elektrotekh. Prom., Khim. Fiz. Istochniki Toka, 1 (1984) 21-3.

F6. Circuit indicates battery-charge status.

J.P. Bruniquol (*Motorola Corp., Toulouse, France*).

EDN (USA), 29 (1984) 332.

F7. Trickle maintenance charge of lead batteries using R-20 primary cells.

R. Bellmann.

Elektron Int. (Austria), No. 6-7 (1984) 153-4.

F8. The influence of pulsed discharge on the capacity of lead/acid batteries.

L.B. Harris and J.P.D. Martin (*Dept. Appl. Phys., Univ. NSW, Kensington, NSW 2033, Australia*).

J. Power Sources, 12 (1984) 71-80.

F9. Relation between AH charging rate and WH charging rate.

S. Higuchi, S. Takahashi and S. Okazaki (*Gov. Ind. Res. Inst., Osaka, Japan*).

Prog. Batteries Sol. Cells, 5 (1984) 190-192.

F10. Analyses of reaction distribution in lead-acid cell and estimation of its discharge characteristics.

K. Asai and T. Hatanaka (*Japan Storage Battery Co., Ltd., Kyoto, Japan*).

Prog. Batteries Sol. Cells, 5 (1984) 201-203.

G. TESTING AND PERFORMANCE

G1. Results of electric-vehicle propulsion system performance on three lead-acid battery systems.

J.G. Ewashinka (*Natl. Aero. Space Admin., Lewis Research Center, Cleveland, OH 44135, USA*).

Proc. 19th Intersoc. Energy Conv. Eng. Conf., San Francisco, 2 (1984) 727-35.

G2. Effects of standtime on the available capacity of lead-acid and nickel/iron electric vehicle batteries.

W.H. DeLuca, A.F. Tummillo, R.L. Biwer and N.P. Yao (*Argonne Natl. Lab., Argonne, Il 60439, USA*).

Proc. 19th Intersoc. Energy Conv. Eng. Conf., San Francisco, 2 (1984) 773-78.

G3. Capacity of lead batteries and desulfation problems.

Kh. K. Yavruyan and F.I. Kukoz (*Rostov. Inst. Inzh. Zheleznodorozhn. Transp., Rostov-on-Don, USSR*).

Izv. Sev.-Kavk. Nauchn. Tsentra Vyssh. Shk., Tekh. Nauki, 1 (1984) 73-6.

G4. Development of lead-acid battery thermal management systems.

W.C. Delaney, B.L. McKinney, E.N. Mrotek and C.E. Weinlein (*Johnson Controls, Inc., Milwaukee, WI 53201, USA*).

Proc. 19th Intersoc. Energy Conv. Eng. Conf., San Francisco, 2 (1984) 779-785.

G5. Effect of elevated temperature and variable temperature on the performance of lead-acid batteries operated under simulated electric-vehicle service.

D.C. Constable, J.R. Gardner, K. Harris, R.J. Hill, D.A.J. Rand and L.B. Zalcman (*CSIRO, Div. Min. Chem., Port Melbourne, Vic. 3207, Australia*).

J. Electroanal. Chem. Interfacial Electrochem., 168 (1984) 395-414.

G6. Effects of electrolyte agitation on the performance of lead-acid traction batteries at various temperatures.

K. Tomantschger (*K.E. Johnson Environ. Energy Cent., Univ. Alabama, Huntsville, AL 35899, USA*).

J. Power Sources, 13 (1984) 137-49.

G7. Methods of electrolyte agitation and effects on the discharge and charge behavior of lead-acid batteries.

K. Tomantschger (*K.E. Johnson Environ. Energy Cent., Univ. Alabama, Huntsville, AL 35899, USA*).

Prog. Batteries Sol. Cells, 5 (1984) 181-186.

G8. Analysis of lead-acid battery deep-cycle accelerated testing data.

J.E. Clifford and R.E. Thomas (*Battelle Columbus Labs., Columbus, OH, USA*).

Sandia Natl. Lab., USA, Report No. SAND-84-7105, 1984, 65 pp.

G9. Testing, data analysis and engineering services on lead-acid load leveling batteries.

W.P. Sholette (*Exide Manag. and Technol. Co., Yardley, PA, USA*).

Sandia Natl. Lab., USA, Report No. SAND-84-7104, 1984, 42 pp.

G10. Testing of sealed lead-acid batteries.

D.M. Bush, J.D. Sealey and D.W. Miller (*Sandia Natl. Lab., Albuquerque, NM, USA*).

Sandia Natl. Lab., USA, Report No. SAND-83-2334, 1984, 18 pp.

G11. The operating characteristics of sealed recombination automotive batteries.

K. Peters (*Chloride Technical Ltd., Manchester, UK*).

Prog. Batteries Sol. Cells, 5 (1984) 193-196.

G12. Battery lifetime prediction by pattern recognition. Application to lead-acid battery life-cycling test data.

S.P. Perone and W.C. Spindler (*Chem. Mater. Sci. Dep., Lawrence Livermore Natl. Lab., Livermore, CA 94550, USA*).

J. Power Sources, 13 (1984) 23-38.

G13. UPS batteries - testing and maintenance.

A. Freund.

Electr. Constr. and Maint. (USA), 83 (1984) 67-71.

G14. Tentative results of R & D of improved lead-acid battery for energy storage.

M. Fukunaga (*Japan Storage Co., Ltd., Kyoto, Japan*).

Prog. Batteries Sol. Cells, 5 (1984) 187-189.

H. THEORETICAL ASPECTS AND REVIEWS

H1. Mathematical model for design of battery electrodes. II. Current density distribution.

W.G. Sunu and B.W. Burrows (*Gould Res. Center, Rolling Meadows, Il 60008, USA*).

J. Electrochem. Soc., 131 (1984) 1-6.

H2. Review of lead-containing porous electrodes.

G.E. Mayer and R.F. Dvorak (*St. Joe Miner. Corp., Monaca, PA 15061, USA*).

Proc. Electrochem. Soc., Vol. 84-8, Porous Electrodes, 1984, pp. 85-120.

H3. A short review of electrocrystallization and its applications to the lead-acid battery.

S. Webster, P.J. Mitchell, N.A. Hampson and J.I. Dyson (*Dep. Chem., Univ. Technology, Loughborough, Leics., UK*).

Surf. Technol., 23 (1984) 105-16.

H4. Application of diffraction techniques in studies of lead/acid battery performance.

R.J. Hill (*CSIRO, Div. Min. Chem., Port Melbourne, Vic. 3207, Australia*).

J. Power Sources, 11 (1984) 19-32.

H5. New ideas on the lead-acid battery.

K. Julian (*Chloride Tech. Ltd., Swinton, Manchester, UK*).

J. Power Sources, 11 (1984) 47-61.

H6. Lead/Acid - still top of the galvanic traction pile in 1983.

D.A.J. Rand (*CSIRO, Div. Min. Chem., PO Box 124, Port Melbourne, Vic. 3207, Australia*).

J. Power Sources, 11 (1984) 119-26.

H7. Future outlook for lead/acid batteries in Japan.

K. Yamasaki and K. Takashima (*Yuasa Battery Co. Ltd, Osaka, Japan*).

J. Power Sources, 11 (1984) 195-8.

H8. Centenarians that keep going: Pb batteries.

J. Equip. Electr. and Electron. (France), 508 (14 May 1984) 29-30.

H9. The ultimate lead-acid battery.

N.E. Bagshaw (*Chloride Power Storage, Manchester, England*).

Electron and Power (GB), 30 (1984) 638-9.

H10. Aqueous electrolyte batteries: lead/acid.

D. Pavlov (*Cent. Lab. Electrochem. Power Sources, 1040, Sofia, Bulgaria*).

In B.D. McNicol and D.A.J. Rand (eds.), Power Sources for Electric Vehicles, Elsevier, Amsterdam, 1984, pp. 111-511.

H11. Advanced lead-acid batteries.

D.E. Bowman (*Johnson Controls, Inc., Milwaukee, WI 53201, USA*).

Prog. Batteries Sol. Cells, 5 (1984) 19-22.

I. APPLICATIONS (TRACTION, AUTOMOTIVE, STATIONARY, ETC.)

I1. Power sources for electric vehicles.

B.D. McNicol (*Shell Research Centre, Thornton, UK*) and D.A.J. Rand (*CSIRO, Port Melbourne, Australia*).

Elsevier, Amsterdam, 1984, 1066 pp.

I2. Battery options for electric vehicles.

B.A. Askew (*EPRI, Palo Alto, Ca, USA*) and P.C. Symons (*Electrochem. Eng. Consultants, Inc., USA*).

Elec. Veh. Dev., 18 (1984) 8-10.

I3. The development of a high energy density tubular lead-acid battery for electric vehicles.

D.W.H. Lambert (*Oldham Batteries Ltd., Manchester, UK*).

Prog. Batteries Sol. Cells, 5 (1984) 204-207.

I4. State of the art of storage batteries for electric vehicles.

H.A. Kiehne (*Varta Batterie, A.G., D-3000 Hannover, Fed. Rep. Germany*).

Prog. Batteries Sol. Cells, 5 (1984) 224-228.

I5. Development of modular electrochemical storage system for road electric vehicles.

G. Brusaglino and P. Montalenti (*Cent. Ric., FIAT S.p.A., 10043, Torino, Italy*).

Comm. Eur. Cummunities, (Rep.) EUR, 1984, No. EUR 8660, Energy Conserv. Energy Storage, Adv. Batteries Fuel Cells, pp. 104-19.

I6. A technical description of the traction system for electrically propelled vehicles.

J. Jensen.

Elteknik (Denmark), 1 (1984) 6-11.

I7. Electrically powered cars on the way.
B. Gustrin.
ERA (Sweden), 57 (1984) 40-1.

I8. Battery power begins to roll at airports.
S. Bridge.
Electr. Rev., 215 (1984) 20-1.

I9. European cooperation in the field of electric transport vehicles.
J.C. Aquarone.
Bull. Assoc., Suisse, 75 (1984) 1101-5.

I10. Tests of electrically driven transport vehicles under practical conditions.
W. Klingler.
Bull. Assoc. Suisse Electr., 75 (1984) 1105-8.

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H. Payot.
Bull. Assoc. Suisse Electr., 75 (1984) 1108-11.

I12. Development and marketing of electrically driven vehicles in the USA.
P.J. Brown, F. Kalhammer, C. Hayden and J. Mader.
Bull. Assoc. Suisse Electr., 75 (1984) 1112-18.

I13. State of development of electrically driven road vehicles in West Germany.
F. Gunter.
Bull. Assoc. Suisse Electr., 75 (1984) 1119-22.

I14. The future of battery driven buses.
H. Gerndt.
Bull. Assoc. Suisse Electr., 75 (1984) 1123-7.

I15. High power lead/acid batteries.
J. Howlett (*Dunlop Batteries, Sandringham, Vic. 3193, Australia*).
J. Power Sources, 11 (1984) 43-5.

I16. Non-antimonial batteries for cycling applications.
J.S. Enochs, R.M. Meighan, C.W. Fleischmann and D.P. Boden (*C & D Power Systems, Plymouth Meeting, Pa 19462, USA*).
Proc. 19th Intersoc. Energy Conv. Eng. Conf., San Francisco, 2 (1984) 850-856.

I17. A long-life deep cycle tubular, lead-acid battery.

M. Eggers (*KW Battery Co., USA*).

Proc. 19th Intersoc. Energy Conv. Eng. Conf., San Francisco, 2 (1984) 868-74.

I18. Countermeasures for electric vehicle lead-acid battery in low temperature use.

K. Nishida (*Japan Storage Battery Co., Ltd., Kyoto, Japan*).

Prog. Batteries Sol. Cells, 5 (1984) 219-220.

I19. Despite intensive research - lead batteries dominate in cars.

M. Markow.

Eltek. Aktnell Elektron. (Sweden), 8 (1984) 24-7.

I20. Underground locomotives - battery operated braking considerations.

A. De K. Coetzee.

Certif. Eng. (S. Africa), 57 (1984) 85-7.

I21. Technique of propulsion of battery driven wheelchairs - positions and prospects.

R.-D. Weege.

Biomed. Tech. (Germany), 29 (1984) 95-103.

I22. Maintenance-free batteries for automotive uses.

H. Furukawa and T. Shimada (*Yuasa Denchi Co Ltd, Japan*).

Yuasa Jiho, 56 (1984) 6-12.

I23. Flame trap for SLI batteries.

H.J. Golz (*Varta Batterie A.G., D-3000 Hannover, Fed. Rep. Germany*).

Prog. Batteries Sol. Cells, 5 (1984) 178-180.

I24. Stationary batteries.

H. Willmes (*Varta Batterie A.G., Hagen, Germany*).

Elektrotech. Z. ETZ (Germany), 105 (1984) 608-9.

I25. Electrotechnology, Volume 3. Stationary lead-acid batteries, applications and performance.

E.J. Friedman, G.E. Mouchahoir, O.G. Farah, R.P. Ouellette and P.N. Cheremisinoff.

Ann Arbor Science Publishers, Inc., Ann Arbor, Michigan, USA 1984.

I26. Economic analysis of specific customer-side-of-the-meter applications for battery energy storage. Vols. I, II.

Electr. Power Res. Inst., Palo Alto, CA, USA, 1984, 80 pp (Vol. I), 328 pp (Vol. II).

I27. Reliability and maintenance procedures for static batteries.
D. Berndt and H.A. Kiehne
Elektromeister and Dtsch. Eleecktrohandwerk (Germany), 59 (1984) 1231-5.

I28. A lead-graphite battery using aqueous hydrofluoric acid.
F. Beck and H. Krohn (*Fachgebiet Elektrochem., Univ. Duisburg, D 4100/1, Fed. Rep. Germany*).
J. Power Sources, 12 (1984) 9-30.

J. PATENTS

J1. Lead alloy.
P. Balzanka (*Czechoslovakia*).
Czechoslovakia; CS 213077 B; 1 January, 1984.

J2. Cathodes for lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8400865 A2; JP 5900865; 6 January, 1984.

J3. Anodes for lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8400868 A2; JP 5900868; 6 January, 1984.

J4. Cathodes for lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8400869 A2; JP 5900869; 6 January, 1984.

J5. Sealed lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8400870 A2; JP 5900870; 6 January, 1984.

J6. Lead-acid battery having horizontal plates.
J.F. Dittmann, E.M. Morse, E.S. Carr (*Eagle-Picher Industries, USA*).
US 4425412 A; 10 January, 1984.

J7. Lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8405562 A2; JP 5905562; 12 January, 1984.

J8. Conversion treatment of lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8405563 A2; JP 5905563; 12 January, 1984.

J9. **Mold-releasing agents for casting of lead-battery grids.**
Japan Storage Battery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8407459 A2; JP 5907459; 14 January, 1984.

J10. **Lead-acid batteries.**
Yuasa Battery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8408268 A2; JP 5908268; 17 January, 1984.

J11. **Lead-acid batteries.**
Japan Storage Battery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8409875 A2; JP 5909875; 19 January, 1984.

J12. **Lead-acid batteries.**
Matsushita Electric Industrial Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8403026 B4; JP 5903026; 21 January, 1984.

J13. **Lead-acid batteries.**
Japan Storage Battery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8414266 A2; JP 5914266; 25 January, 1984.

J14. **Tubular cathodes for lead-acid batteries.**
Japan Storage Battery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8414267 A2; JP 5914267; 25 January, 1984.

J15. **Tubular cathodes for lead-acid batteries.**
Japan Storage Battery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8414268 A2; JP 5914268; 25 January, 1984.

J16. **Lead-acid batteries.**
Sanyo Electric Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8416279 A2; JP 5916279; 27 January, 1984.

J17. **Battery with reserve capacity indicator.**
Matsushita Electric Industrial Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8416283 A2; JP 5916283; 27 January, 1984.

J18. **Cathodes for lead-acid batteries.**
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8418570 A2; JP 5918570; 30 January, 1984.

J19. **Cathodes for lead-acid batteries.**
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8418571 A2; JP 5918571; 30 January, 1984.

J20. Anodes for lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8423462 A2; JP 5923462; 6 February, 1984.

J21. Anodes for lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8423469 A2; JP 5923469; 6 February, 1984.

J22. Anodes for lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8423470 A2; JP 5923470; 6 February, 1984.

J23. Multicell lead battery with fixed plate blocks.
H.J. Golz (*Varta Batterie A.G., Fed. Rep. Germany*).
Germany Offen.; DE 3228328 A1; 9 February, 1984.

J24. Cathodes for lead-acid batteries.
Furukawa Battery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8427458 A2; JP 5927458; 13 February, 1984.

J25. Composite grids for lead-acid batteries.
Matsushita Electric Industrial Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8427459 A2; JP 5927459; 13 February, 1984.

J26. Sealed lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8429360 A2; JP 5929360; 16 February, 1984.

J27. Cathodes for lead-acid batteries.
Matsushita Electric Industrial Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8429364 A2; JP 5929364; 16 February, 1984.

J28. Cathodes for lead-acid batteries.
Matsushita Electric Industrial Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8429365 A2; JP 5929365, 16 February, 1984.

J29. Paste-type cathodes for lead-acid batteries.
Matsushita Electric Industrial Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8429366 A2; JP 5929366; 16 February, 1984.

J30. Paste-type electrodes for lead-acid batteries.
Japan Storage Battery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8429370 A2; JP 5929370, 16 February, 1984.

J31. Sealed lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8429375 A2; JP 5929375; 16 February, 1984.

J32. Sealed lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8429383 A2; JP 5929383; 16 February, 1984.

J33. Fine-grained lead alloy.
W. Reif, M. Abdel-Reihim and P. Faber (*Fed. Rep. Germany*).
Germany Offen., DE 3228154 C1; 16 February, 1984.

J34. Low antimony lead-based alloys and their use.
P. Rao and J.F. Trenter (*Gould Inc., USA*).
Canada; CA 1162424 A1; 21 February, 1984.

J35. Lead-acid battery.
Sanyo Electric Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8433754 A2; JP 5933754; 23 February, 1984.

J36. Electrodes for lead-acid batteries.
Yuasa Battery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8433760 A2; JP 5933760; 23 February, 1984.

J37. Sealed lead-acid batteries.
Matsushita Electric Industrial Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8437655 A2; JP 5937655; 1 March, 1984.

J38. Electrodes for lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8437656 A2; JP 5937656; 1 March, 1984.

J39. Alloys for lead-acid battery grids.
Yuasa Battery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8437660 A2; JP 5937660; 1 March, 1984.

J40. Lead-acid batteries.
Matsushita Electric Industrial Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8437665 A2; JP 5937665; 1 March, 1984.

J41. Device for predicting the end of lifetime of a lead-acid battery.
A. Winsel (*Varta Batterie A.G., Kelkheim/Taunus, Fed. Rep. Germany*).
Germany Often.; DE 3231363 A1; 1 March, 1984.

J42. Lead-acid batteries.
Matsushita Electric Industrial Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8420970 A2; JP 5920970; 2 March, 1984.

J43. Cathodes for sealed lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8440463 A2; JP 5940463; 6 March, 1984.

J44. Anodes for sealed lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8440464 A2; JP 5940464; 6 March, 1984.

J45. Lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8440465 A2; JP 5940465; 6 March, 1984.

J46. Electrodes for lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8440467 A2; JP 5940467; 6 March, 1984.

J47. Cathodes for lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8442771 A2; JP 5942771; 9 March, 1984.

J48. Cathodes for lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8442772 A2; JP 5942772; 9 March, 1984.

J49. Cathodes for lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8442773 A2; JP 5942773; 9 March, 1984.

J50. Cathodes for lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8442774 A2; JP 5942774; 9 March, 1984.

J51. Lead alloys for lead-acid batteries.
Matsushita Electric Industrial Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8446761 A2; JP 5946761; 16 March, 1984.

J52. Lead-acid batteries.
Matsushita Electric Industrial Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8446772 A2; JP 5946772; 16 March, 1984.

J53. Electrode grid for batteries.

G. Piske (*Accumulatorenfabrik Sonnenschein G.m.b.H., Fed. Rep. Germany*).

Germany Offen.; DE 3234342 A1; 22 March, 1984.

J54. Cathodes for lead-acid batteries.

Japan Storage Battery Co., Ltd.

Japan Kokai Tokkyo Koho; JP 8451466 A2; JP 5951466; 24 March, 1984.

J55. Grids for lead-acid batteries.

Shin-Kobe Electric Machinery Co., Ltd.

Japan Kokai Tokkyo Koho; JP 8451468 A2; JP 5951468; 24 March, 1984.

J56. Charging of sealed lead-acid batteries.

Japan Storage Battery Co., Ltd.

Japan Kokai Tokkyo Koho; JP 8451485 A2; JP 5951485; 24 March, 1984.

J57. Sealed lead-acid batteries.

Japan Storage Battery Co., Ltd.

Japan Kokai Tokkyo Koho; JP 8451486 A2; JP 5951486; 24 March, 1984.

J58. Sealed lead-acid batteries.

Matsushita Electric Industrial Co., Ltd.

Japan Kokai Tokkyo Koho; JP 8456356 A2; JP 5956356; 31 March, 1984.

J59. Lead-acid batteries.

Japan Storage Battery Co., Ltd.

Japan Kokai Tokkyo Koho; JP 8456358 A2; JP 5956358; 31 March, 1984.

J60. Lead-acid batteries.

Japan Storage Battery Co., Ltd.

Japan Kokai Tokkyo Koho; JP 8456359 A2; JP 5956359; 31 March, 1984.

J61. Rejuvenation of lead-acid batteries.

Japan Storage Battery Co., Ltd.

Japan Kokai Tokkyo Koho; JP 8456368 A2; JP 5956368; 31 March, 1984.

J62. Sealed lead-acid batteries.

Japan Storage Battery Co., Ltd.

Japan Kokai Tokkyo Koho; JP 8456372 A2; JP 5956372; 31 March, 1984.

J63. Lead-acid batteries.

Matsushita Electric Industrial Co., Ltd.

Japan Kokai Tokkyo Koho; JP 8458764 A2; JP 5958764; 4 April, 1984.

J64. Battery grids of a lead alloy with a low antimony content.
P. Rao and N.W. Joy (*GNB Batteries, Inc., USA*).
France Demande; FR 2534070 A1; 6 April, 1984.

J65. Cathodes for lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8460964 A2; JP 5960964; 7 April, 1984.

J66. Lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8460965 A2; JP 5960965; 7 April, 1984.

J67. Lead-acid batteries.
B. Culpin, K. Peters and N.R. Young (*Chloride Group PLC, UK*).
Britain UK Pat. Appl.; GB 2127613 A1; 14 April, 1984.

J68. Lead battery.
R. Kiessling (*Accumulatorenfabriken Wilhelm Hagen A.G., Fed. Rep. Germany*).
Germany Offen.; DE 3237828 A1; 12 April, 1984.

J69. Reference electrode for lead-acid batteries.
Japan Storage Battery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8471272 A2; JP 5971272; 21 April, 1984.

J70. Low-antimony lead alloy.
V. Paetzold, G. Kaden, R. Pfannkuchen and B. Beyer (*VEB Bergbau - und Huettenkombinat "Albert Funk", German Dem. Rep.*).
Germany (East); DD 209360 A3; 25 April, 1984.

J71. Collectors for plates of storage batteries.
J.B. Mackaness.
PCT Int. Appl. WO 84 01,668; 26 April, 1984.

J72. Titanium wire reinforced lead composite electrode structure.
N.C. Otto, H.K. Giess and J.W. Mainzer (*GNB Batteries, Inc., USA*).
PCT International; WO 84 01,667 A1; 26 April, 1984.

J73. Stacked lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8475579 A2; JP 5975579; 28 April, 1984.

J74. Lead-based pigments from lead paste from used batteries.

R. Teodorescu, M.E. Dietrich, I.D. Ioanide and A.V. Belea (*Intreprinderia Metalurgica "Neferal", Romania*).

Romania; RO 81691 B; 30 April, 1984.

J75. Multicell electric storage batteries.

E.J. Pearson (*Chloride Group PLC*).

Eur. Pat. Appl. EP. 107,517; 2 May, 1984.

J76. Support for active compositions of lead batteries.

R. Aumayer and W. Eisenacher (*Bosch, Robert, G.m.b.H., Fed. Rep. Germany*).

Germany Offen.; DE 3239755 A1; 3 May, 1984.

J77. Cathodes for lead-acid batteries.

Shin-Kobe Electric Machinery Co., Ltd.

Japan Kokai Tokkyo Koho; JP 8479969 A2; JP 5979969; 9 May, 1984.

J78. Conversion treatment of lead-acid batteries.

Shin-Kobe Electric Machinery Co., Ltd.

Japan Kokai Tokkyo Koho; JP 8479970 A2; JP 5979970; 9 May, 1984.

J79. Conversion treatment of lead-acid batteries.

Shin-Kobe Electric Machinery Co., Ltd.

Japan Kokai Tokkyo Koho; JP 8479971 A2; JP 5979971; 9 May, 1984.

J80. Anodes for sealed lead-acid batteries.

Shin-Kobe Electric Machinery Co., Ltd.

Japan Kokai Tokkyo Koho; JP 8479973 A2; JP 5979973; 9 May, 1984.

J81. Multicell electric storage batteries.

E.J. Pearson (*Chloride Group PLC, UK*).

Eur. Pat. Appl. EP 107,976; 9 May, 1984.

J82. Electric storage batteries.

E.J. Pearson (*Chloride Group PLC, UK*).

Brit. UK Pat. Appl. GB 2129191; 10 May, 1984.

J83. Recombination electric storage batteries.

E.J. Pearson (*Chloride Group PLC, UK*).

Britain UK Pat. Appl.; GB 2129192 A1; 10 May, 1984.

J84. Electric storage batteries.
E.J. Pearson (*Chloride Group PLC, UK*).
Brit. UK Pat. Appl. GB 2129194; 10 May, 1984.

J85. Electric storage cells.
E.J. Pearson (*Chloride Group PLC, UK*).
Brit. UK Pat. Appl. GB 2129197; 10 May, 1984.

J86. Expanded electrodes for electric storage batteries.
E.J. Pearson (*Chloride Group PLC, UK*).
Brit. UK Pat. Appl. GB 2129198; 10 May, 1984.

J87. Assembling multicell electric storage batteries.
E.J. Pearson (*Chloride Group PLC, UK*).
Britain UK Pat. Appl.; GB 2129200 A1; 10 May, 1984.

J88. Profile-stamped grid electrodes.
G. Terzaghi and P. Faber (*Rheinisch-Westfaelisches Elektrizitaetswerk A.G.*).
Germany Offen.; DE 3240711; 10 May, 1984.

J89. Lead alloy for battery grids.
Yuasa Battery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8483737 A2; JP 5983737; 15 May, 1984.

J90. Manufacturing of sealed lead-acid batteries.
Matsushita Electric Industrial Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8486165 A2; JP 5986165; 18 May, 1984.

J91. Lead-acid batteries.
Matsushita Electric Industrial Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8487765 A2; JP 5987765; 21 May, 1984.

J92. Manufacture of paste-type electrode for lead-acid battery.
Japan Storage Battery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8491666 A2; JP 5991666; 26 May, 1984.

J93. Apparatus and method for treating lead oxide wastes.
I. Horvath, L. Pozsar and F. Rippel (*Akkumulator-es Szarazelemgyar*).
Hungary Teljes; HU 31601 O; 28 May, 1984.

J94. Charging of lead-acid battery.
Furukawa Battery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8494367 A2; JP 5994367; 31 May, 1984.

J95. Electrodes for lead-acid batteries.
Japan Storage Battery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8496652 A2; JP 5996652; 4 June, 1984.

J96. Manufacturing of paste-type lead-acid battery electrodes.
Japan Storage Battery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8496653 A2; JP 5996653; 4 June, 1984.

J97. Lead-acid battery electrode grids.
Matsushita Electric Industrial Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8496660 A2; JP 5996660; 4 June, 1984.

J98. Manufacture of electrodes for sealed lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8498457 A2; JP 5998457; 6 June, 1984.

J99. Anodes for sealed lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8498462 A2; JP 5998462; 6 June, 1984.

J100. Sealed lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8498474 A2; JP 5998474; 6 June, 1984.

J101. Manufacture of lead-battery anodes.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8499668 A2; JP 5999668; 8 June, 1984.

J102. Lead-acid battery grids.
Matsushita Electric Industrial Co., Ltd.
Japan Kokai Tokkyo Koho; JP 8499674 A2; JP 5999674; 8 June, 1984.

J103. Tubular cathode.
Japan Storage Battery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 84101769 A2; JP 59101769; 12 June, 1984.

J104. Lead battery.
Matsushita Electric Industrial Co., Ltd.
Japan Kokai Tokkyo Koho; JP 84105266 A2; JP 59105266; 18 June, 1984.

J105. Electrode plates for lead-acid batteries.
Matsushita Electric Industrial Co., Ltd.
Japan Kokai Tokkyo Koho; JP 84105267 A2; JP 59105267; 18 June, 1984.

J106. Manufacturing electrodes for lead-acid batteries.
Matsushita Electric Industrial Co., Ltd.
Japan Kokai Tokkyo Koho; JP 84105268 A2; JP 59105268; 18 June, 1984.

J107. Lead battery.
Matsushita Electric Industrial Co., Ltd.
Japan Kokai Tokkyo Koho; JP 84105276 A2; JP 59105276; 18 June, 1984.

J108. Lead battery.
Matsushita Electric Industrial Co., Ltd.
Japan Kokai Tokkyo Koho; JP 84108266 A2; JP 59108266; 22 June, 1984.

J109. Tubular battery cathodes.
R. Kiessling, K.F. Zimmermann (*Accumulatorenfabriken Wilhelm Hagen A.G., Fed. Rep. Germany*).
Germany Offen.; DE 3247787 A1; 28 June, 1984.

J110. Method for manufacturing cathodes for lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 84114758 A2; JP 59114758; 2 July, 1984.

J111. Method for manufacturing cathodes for lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 84114759 A2; JP 59114759; 2 July, 1984.

J112. Method for manufacturing cathodes for lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 84114760 A2; JP 59114760; 2 July, 1984.

J113. Method for manufacturing cathodes for lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 84114761 A2; JP 59114761; 2 July, 1984.

J114. Method for the manufacture of cathode plates for lead batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 84114762 A2; JP 59114762; 2 July, 1984.

J115. Process for manufacture of lead battery electrodes.
Matsushita Electric Industrial Co., Ltd.
Japan Kokai Tokkyo Koho; JP 84114763 A2; JP 59114763; 2 July, 1984.

J116. Lead battery.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 84117063 A2; JP 59117063; 6 July, 1984.

J117. Secondary lead storage battery with liquid electrolytes.
GES Gesellschaff fur Elektrischen Strassenverkehr m.b.H., Fed. Rep. Germany.
Germany; DE 3300466 A1; 12 July, 1984.

J118. Process for manufacture of lead battery cathode plate.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 84121781 A2; JP 59121781; 13 July, 1984.

J119. Cathode substrates for lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 84121783 A2; JP 59121783; 13 July, 1984.

J120. Conductive partition in lead-acid battery with high polar electrodes.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 84121787 A2; JP 59121787; 13 July, 1984.

J121. Antimony-containing lead for storage batteries.
V. Fiedler, F. Kalab, J. Malik, M. Matejka, J. Pucherna and K. Vurm (*Czechoslovakia*).
Czechoslovakia; CS 212401 B; 15 July, 1984.

J122. Sandwich electrode for a lead acid battery.
O. Nilsson (*Sweden*).
PCT International; WO 8402806 A1; 19 July, 1984.

J123. Lead battery.
Matsushita Electric Industrial Co., Ltd.
Japan Kokai Tokkyo Koho; JP 84128769 A2; JP 59128769; 24 July, 1984.

J124. Grids for lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 84130071 A2; JP 59130071; 26 July, 1984.

J125. Lead-acid battery.
Matsushita Electric Industrial Co., Ltd.
Japan Kokai Tokkyo Koho; JP 84112570 A2; JP 59112570; 29 July, 1984.

J126. Plate for lead batteries.
G. David and L. Papp (*Hungary*).
Hungary Teljes; HU 32460 O; 30 July, 1984.

J127. Lead batteries.
Sanyo Electric Co., Ltd.
Japan Kokai Tokkyo Koho; JP 84132561 A2; JP 59132561; 30 July, 1984.

J128. Manufacture of lead batteries.
Mitsubishi Electric Corp.
Japan Kokai Tokkyo Koho; JP 84132562 A2; JP 59132562; 30 July, 1984.

J129. Coating for lead-casting molds.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 84133935 A2; JP 59133935; 1 August, 1984.

J130. Lead-acid storage batteries.
E. Nann (*Accumulatorenfabriken Wilhelm Hagen A.G., Fed. Rep. Germany*).
Germany Offen.; DE 3303142 A1; 2 August, 1984.

J131. Lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 84138061 A2; JP 59138061; 8 August, 1984.

J132. Lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 84138062 A2; JP 59138062; 8 August, 1984.

J133. Electrodes for lead-acid batteries.
Matsushita Electric Industrial Co., Ltd.
Japan Kokai Tokkyo Koho; JP 83139560 A2; JP 59139560; 10 August, 1984.

J134. Electrodes for lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 84139563 A2; JP 59139563; 10 August, 1984.

J135. Lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 84139564 A2; JP 59139564; 10 August, 1984.

J136. Electrodes for lead-acid batteries.
Shin-Kobe Electric Machinery Co., Ltd.
Japan Kokai Tokkyo Koho; JP 84139565 A2; JP 59139565; 10 August, 1984.

J137. Electrodes for lead-acid batteries.
Matsushita Electric Industrial Co., Ltd.
Japan Kokai Tokkyo Koho; JP 84148275 A2; JP 59148275; 24 August, 1984.

J138. Sealed lead-acid batteries.

Yuasa Battery Co., Ltd.

Japan Kokai Tokkyo Koho; JP 84151772 A2; JP 59151772; 30 August, 1984.

J139. Lead-acid batteries.

Shin-Kobe Electric Machinery Co., Ltd.

Japan Kokai Tokkyo Koho; JP 84151773 A2; JP 59151773; 30 August, 1984.

J140. Self-supporting perforated substrate mat or fabric from heat-shrinking plastic fibers for plates of lead-acid batteries.

G. Terzaghi (*Italy*).

Germany Offen.; DE 3307873 A1; 6 September, 1984.

J141. Manufacture of lead-acid battery.

Matsushita Electric Industrial Co., Ltd.

Japan Kokai Tokkyo Koho; JP 84157957 A2; JP 59157957; 7 September, 1984.

J142. Electrodes for lead batteries.

Shin-Kobe Electric Machinery Co., Ltd.

Japan Kokai Tokkyo Koho; JP 84157958 A2; JP 59157958; 7 September, 1984.

J143. Lead-acid batteries.

Shin-Kobe Electric Machinery Co., Ltd.

Japan Kokai Tokkyo Koho; JP 84157959 A2; JP 59157959; 7 September, 1984.

J144. Lead-acid battery.

Matsushita Electric Industrial Co., Ltd.

Japan Kokai Tokkyo Koho; JP 84157960 A2; JP 59157960; 7 September, 1984.

J145. Lead-acid batteries.

Shin-Kobe Electric Machinery Co., Ltd.

Japan Kokai Tokkyo Koho; JP 84157961 A2; JP 59157961; 7 September, 1984.

J146. Electrode grid for lead-acid batteries.

Shin-Kobe Electric Machinery Co., Ltd.

Japan Kokai Tokkyo Koho; JP 84157962; JP 59157962; 7 September, 1984.

J147. Sealed lead-acid batteries.

Shin-Kobe Electric Machinery Co., Ltd.

Japan Kokai Tokkyo Koho; JP 84157967 A2; JP 59157967; 7 September, 1984.

J148. Manufacture of sealed lead-acid battery.

Shin-Kobe Electric Machinery Co., Ltd.

Japan Kokai Tokkyo Koho; JP 84157968 A2; JP 59157968; 7 September, 1984.

J149. Lead-acid batteries.

Shin-Kobe Electric Machinery Co., Ltd.

Japan Kokai Tokkyo Koho; JP 84157969 A2; JP 59157969; 7 September, 1984.

J150. Age hardening of lead alloy sheet for batteries.

Matsushita Electric Industrial Co., Ltd.

Japan Kokai Tokkyo Koho; JP 84162263 A2; JP 59162263; 13 September, 1984.

J151. Rolling of lead-calcium alloys for batteries.

Matsushita Electric Industrial Co., Ltd.

Japan Kokai Tokkyo Koho; JP 84162264 A2; JP 59162264; 13 September, 1984.

J152. Protective device for a lead storage battery.

Y. Ishikura, A. Watanabe and T. Matsumoto (*Sanyo Electric Co., Ltd*).

Germany Offen.; DE 3409765 A1; 20 September, 1984.

J153. Preparation of paste-type lead battery plate.

Matsushita Electric Industrial Co., Ltd.

Japan Kokai Tokkyo Koho; JP 84173956 A2; JP 59173956; 2 October, 1984.

J154. Anodes for lead-acid batteries.

R. Kiessling (*Accumulatorenfabriken Wilhelm Hagen A.G., Fed. Rep. Germany*).

Germany Offen.; DE 3312550 A1; 11 October, 1984.

J155. Paste-type lead cathode for lead-acid batteries.

Matsushita Electric Industrial Co., Ltd.

Japan Kokai Tokkyo Koho; JP 84180971 A2; JP 59180971; 15 October, 1984

J156. Lead battery.

Matsushita Electric Industrial Co., Ltd.

Japan Kokai Tokkyo Koho; JP 84184453 A2; JP 59184453; 19 October, 1984.

J157. Electrodes for lead-acid batteries.

Japan Storage Battery Co., Ltd.

Japan Kokai Tokkyo Koho; JP 84184454 A2; JP 59184454, 19 October, 1984.

J158. Pasted type lead-acid battery.
A. Tokunaga (*Japan Storage Battery Co., Ltd.*).
United States; US 4485156 A; 27 November, 1984.