(12) **United States Patent**
Hunter et al.

(10) **Patent No.: US 9,692,256 B2**
(45) **Date of Patent: *Jun. 27, 2017**

(54) **POWER SUPPLY UNIT**

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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 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **15/160,646**

(22) Filed: **May 20, 2016**

(65) **Prior Publication Data**

US 2016/0268838 A1 Sep. 15, 2016

Related U.S. Application Data

(63) Continuation of application No. 13/928,058, filed on Jun. 26, 2013, now Pat. No. 9,391,474, which is a (Continued)

(51) **Int. Cl.**
H02J 9/06 (2006.01)
H02J 7/00 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***H02J 9/061*** (2013.01); ***G07F 17/24*** (2013.01); ***H02J 7/0021*** (2013.01);
(Continued)

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

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,161,046 A 6/1939 Hitzeman
2,822,682 A 2/1958 Sollenberger
(Continued)

FOREIGN PATENT DOCUMENTS

CA 2377010 A1 10/2001
CA 2363915 A1 5/2003
(Continued)

OTHER PUBLICATIONS

Cell Net Data Systems. First Wireless Monitoring of Parking Meters Results in Theft Arrests Using CellNet Data Systems Technology. PRNewswire, May 11, 1999, 2 pgs.
(Continued)

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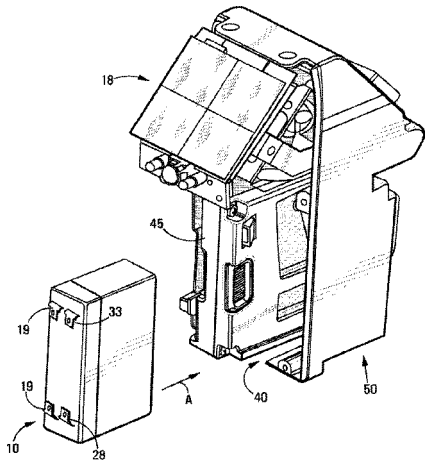
(57) **ABSTRACT**

A power supply unit for supplying power to a device has a rechargeable, main battery; a charging arrangement for charging the main battery; a non-rechargeable back-up battery; load terminals for connection to a load; and a control unit for controlling supply of power to the load primarily from the main battery and secondarily from the back-up battery. The device is, in particular, a single bay, stand alone parking meter. In the event that the main battery runs low, the control unit is configured to supply power to the load from both the main battery and the back-up battery or only from the back-up battery. The back-up battery is easily replaceable, and the power supply unit has a bay, with connectors for receiving the back-up battery. The main battery is charged from solar panels. A communication device is provided to communicate status messages wirelessly to a control system.

25 Claims, 4 Drawing Sheets



Related U.S. Application Data

continuation of application No. 12/059,909, filed on Mar. 31, 2008, now Pat. No. 8,513,832.

(60) Provisional application No. 60/909,209, filed on Mar. 30, 2007.

(51) **Int. Cl.**
G07F 17/24 (2006.01)
H02J 7/35 (2006.01)

(52) **U.S. Cl.**
CPC ***H02J 7/0024*** (2013.01); ***H02J 7/0026*** (2013.01); ***H02J 7/0044*** (2013.01); ***H02J 7/355*** (2013.01); ***H02J 9/06*** (2013.01); *Y10T 307/625* (2015.04)

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,832,506	A	4/1958	Hatcher	
2,988,191	A	6/1961	Grant	
3,183,411	A	5/1965	Palfi	
3,535,870	A	10/1970	Harold	
3,721,463	A	3/1973	Attwood et al.	
3,999,372	A	12/1976	Welch et al.	
4,043,117	A	8/1977	Maresca et al.	
4,812,805	A	3/1989	Lachat et al.	
4,823,928	A	4/1989	Speas	
4,825,425	A	4/1989	Turner	
4,875,598	A	10/1989	Dahl	
4,880,097	A	11/1989	Speas	
4,895,238	A	1/1990	Speas	
5,065,156	A *	11/1991	Bernier	G07F 17/24 340/309.16
5,222,076	A	6/1993	Ng et al.	
5,244,070	A	9/1993	Carmen et al.	
5,273,151	A	12/1993	Carmen et al.	
5,360,095	A	11/1994	Speas	
5,442,348	A *	8/1995	Mushell	G07F 17/246 194/205
5,471,139	A	11/1995	Zadoff	
5,563,491	A	10/1996	Tseng	
5,614,892	A	3/1997	Ward, II et al.	
5,617,942	A	4/1997	Ward, II et al.	
5,640,002	A	6/1997	Ruppert et al.	
5,648,906	A	7/1997	Amirpanahi	
5,659,306	A	8/1997	Bahar	
5,710,743	A	1/1998	Dee et al.	
5,737,710	A	4/1998	Anthonyson	
5,777,951	A	7/1998	Mitschele et al.	
5,778,067	A	7/1998	Jones et al.	
5,806,651	A	9/1998	Carmen et al.	
5,833,042	A	11/1998	Baitch et al.	
5,841,369	A	11/1998	Sutton et al.	
5,842,411	A	12/1998	Johnson	
5,845,268	A	12/1998	Moore	
5,852,411	A	12/1998	Jacobs et al.	
5,954,182	A	9/1999	Wei	
6,037,880	A	3/2000	Manion	
6,078,272	A	6/2000	Jacobs et al.	
6,081,205	A	6/2000	Williams	
6,111,522	A	8/2000	Hiltz et al.	
6,116,403	A	9/2000	Kiehl	
6,195,015	B1	2/2001	Jacobs et al.	
6,229,455	B1	5/2001	Yost et al.	
6,230,868	B1	5/2001	Tuxen et al.	
6,309,098	B1	10/2001	Wong	
6,312,152	B2	11/2001	Dee et al.	
RE37,531	E	1/2002	Chaco et al.	
6,373,422	B1	4/2002	Mostafa	
6,456,491	B1	9/2002	Flannery et al.	
6,457,586	B2	10/2002	Yasuda et al.	
6,505,774	B1 *	1/2003	Fulcher	G06Q 30/0284 235/379
6,697,730	B2	2/2004	Dickerson	
6,747,575	B2	6/2004	Chauvin et al.	
6,856,922	B1	2/2005	Austin et al.	
6,914,411	B2	7/2005	Couch et al.	
6,929,179	B2	8/2005	Fulcher et al.	
7,019,420	B2	3/2006	Kogan et al.	
7,019,670	B2	3/2006	Bahar	
7,027,773	B1	4/2006	McMillin	
7,183,999	B2	2/2007	Matthews et al.	
7,222,031	B2	5/2007	Heatley	
7,237,716	B2	7/2007	Silberberg	
7,388,349	B2	6/2008	Elder et al.	
7,748,620	B2	7/2010	Gomez et al.	
7,772,720	B2	8/2010	McGee et al.	
7,806,248	B2	10/2010	Hunter et al.	
7,854,310	B2	12/2010	King et al.	
7,855,661	B2	12/2010	Ponert	
7,933,841	B2	4/2011	Schmeyer et al.	
8,138,950	B1	3/2012	Leung	
8,395,532	B2	3/2013	Chauvin et al.	
8,479,909	B2	7/2013	King et al.	
8,513,832	B2	8/2013	Hunter et al.	
8,566,159	B2	10/2013	King et al.	
8,590,687	B2	11/2013	King et al.	
8,595,054	B2	11/2013	King et al.	
8,684,158	B2	4/2014	Jones et al.	
8,749,403	B2	6/2014	King et al.	
8,770,371	B2	7/2014	MacKay et al.	
8,862,494	B2	10/2014	King et al.	
9,002,723	B2	4/2015	King et al.	
9,047,712	B2	6/2015	King et al.	
9,127,964	B2	9/2015	Schwarz et al.	
9,391,474	B2 *	7/2016	Hunter	H02J 9/06
2001/0047278	A1	11/2001	Brookner et al.	
2001/0051531	A1	12/2001	Singhal et al.	
2002/0008639	A1	1/2002	Dee	
2002/0111768	A1	8/2002	Ghorayeb et al.	
2003/0092387	A1	5/2003	Hjelmvik	
2003/0112597	A1	6/2003	Smith	
2003/0121754	A1	7/2003	King	
2003/0128010	A1	7/2003	Hsu	
2003/0128136	A1	7/2003	Spier et al.	
2003/0140531	A1	7/2003	Pippins	
2003/0144972	A1	7/2003	Cordery et al.	
2003/0169183	A1	9/2003	Korepanov et al.	
2003/0179107	A1	9/2003	Kibria et al.	
2003/0220835	A1	11/2003	Barnes, Jr.	
2003/0222792	A1	12/2003	Berman et al.	
2004/0068434	A1	4/2004	Kanekon	
2004/0084278	A1	5/2004	Harris et al.	
2004/0181496	A1	9/2004	Odinotski et al.	
2004/0264302	A1	12/2004	Ward	
2005/0040951	A1	2/2005	Zalewski et al.	
2005/0178639	A1	8/2005	Brumfield et al.	
2005/0192911	A1	9/2005	Mattern	
2006/0021848	A1	2/2006	Smith	
2006/0116972	A1	6/2006	Wong	
2006/0149684	A1	7/2006	Matsuura et al.	
2006/0152349	A1 *	7/2006	Ratnakar	G07B 15/00 340/426.1
2006/0267799	A1	11/2006	Mendelson	
2007/0016539	A1	1/2007	Groft et al.	
2007/0094153	A1	4/2007	Ferraro	
2007/0114849	A1	5/2007	Falik et al.	
2007/0119682	A1	5/2007	Banks et al.	
2007/0136128	A1	6/2007	Janacek et al.	
2007/0184852	A1	8/2007	Johnson et al.	
2007/0210935	A1	9/2007	Yost et al.	
2007/0285281	A1	12/2007	Welch et al.	
2008/0071611	A1	3/2008	Lovett	
2008/0093454	A1	4/2008	Yamazaki et al.	
2008/0147268	A1	6/2008	Fuller	
2008/0208680	A1	8/2008	Cho	
2008/0238715	A1	10/2008	Cheng et al.	
2009/0109062	A1	4/2009	An	
2009/0192950	A1	7/2009	King et al.	
2009/0267732	A1	10/2009	Chauvin et al.	
2009/0284907	A1	11/2009	Regimbal et al.	
2009/0315720	A1	12/2009	Clement et al.	

(56) **References Cited**

U.S. PATENT DOCUMENTS

2010/0106517	A1	4/2010	Kociubinski et al.
2010/0188932	A1	7/2010	Hanks et al.
2010/0332394	A1	12/2010	Ioli
2011/0313822	A1	12/2011	Burdick
2012/0158466	A1	6/2012	John
2012/0285790	A1	11/2012	Jones et al.
2012/0285792	A1	11/2012	Jones et al.
2012/0285793	A1	11/2012	Jones et al.
2013/0005445	A1	1/2013	Walker et al.
2013/0285455	A1	10/2013	Hunter et al.
2014/0040028	A1	2/2014	King et al.
2014/0108107	A1	4/2014	Jones et al.
2014/0129158	A1	5/2014	Shea
2014/0172518	A1	6/2014	King et al.
2014/0174881	A1	6/2014	King et al.
2014/0289025	A1	9/2014	King et al.
2015/0084786	A1	3/2015	King et al.
2015/0106172	A1	4/2015	Salama
2015/0235503	A1	8/2015	King et al.
2015/0332587	A1	11/2015	Schwarz et al.
2016/0321714	A1	11/2016	King et al.
2017/0034600	A1	2/2017	King et al.

FOREIGN PATENT DOCUMENTS

EP	0329129	A2	8/1989
EP	0980055	B1	9/2001
FR	2837583	A1	9/2003
JP	2002099640	A	4/2002
JP	2005267430	A	9/2005
KR	20050038077	A	4/2005
WO	WO-03005324	A1	1/2003
WO	WO-2005031494	A2	4/2005
WO	WO-2006095352	A2	9/2006
WO	WO-2009154787	A2	12/2009

OTHER PUBLICATIONS

Co-pending U.S. Appl. No. 14/979,104, filed Dec. 22, 2015.
Decision Denying Institution of Inter Partes Review dated Mar. 30, 2016 of U.S. Pat. No. 7,854,310. IPR Case No. IPR2016-00068.
Decision Denying Inter Partes Review dated Apr. 1, 2016 of U.S. Pat. No. 8,595,054. IPR Case No. IPR2016-00069.
Decision Denying Inter Partes Review dated Apr. 1, 2016 of U.S. Pat. No. 8,595,054. IPR Case No. IPR2016-00070.
Fidelman. Time's Running Out for Parking Meters at Present Locations: $270,000 Cited as Replacement Cost. City Employees Who Ticket Motorists Find Electronic Meters Unsuitable. The Gazette, Final Edition, Montreal, Quebec, Canada, Nov. 12, 2002, p. A7.
Flatley. In San Francisco, Hackers Park for Free. Read filed under Misc. Gadgets, downloaded from www.engadget.com website on May 3, 2010, originally posted on Jul. 31, 2009, 5 pages.
Howland. How M2M Maximizes Denver's Revenue. Field TechnologiesOnline.com, Oct. 2011, pp. 9-12 [online] [retrieved Mar. 5, 2013], Retrieved from http://www.fieldtechnologiesonline.com/doc.mvc/How-M2M-Maximizes-Denvers-Revenue-0001.
Institution of Inter Partes Review dated Mar. 30, 2016 of U.S. Pat. No. 7,854,310. IPR Case No. IPR2016-00067.
Meter Solutions, Single-Space Meters brochure, downloaded from www.duncansolutions.com website, revised Apr. 2006, 2 pages.
PCT/IB2006/054574 International Preliminary Report on Patentability dated Mar. 10, 2009.
PCT/IB2006/054574 International Search Report dated Oct. 27, 2008.
PCT/US2010/047906 International Preliminary Report on Patentability dated Mar. 6, 2012.
PCT/US2010/047906 International Search Report dated Mar. 30, 2011.
PCT/US2010/047907 International Preliminary Report on Patentability dated Mar. 15, 2012.
PCT/US2010/047907 International Search Report dated Apr. 26, 2011.
PCT/US2012/048190 International Search Report dated Jan. 22, 2013.
Petition for Inter Partes Review of U.S. Pat. No. 7,854,310. IPR Case No. IPR2016-00067, filed Oct. 22, 2015.
Petition for Inter Partes Review of U.S. Pat. No. 7,854,310. IPR Case No. IPR2016-00068, filed Oct. 22, 2015.
Petition for Inter Partes Review of U.S. Pat. No. 8,595,054. IPR Case No. IPR2016-00069, filed Oct. 22, 2015.
Petition for Inter Partes Review of U.S. Pat. No. 8,595,054. IPR Case No. IPR2016-00070, filed Oct. 22, 2015.
Spyker et al. Predicting Capacitor Run Time for a Battery/Capacitor Hybrid Source. Power Electronic Drives and Energy Systems for Industrial Growth. 1998. Proceedings. 1998 IEEE International Conference, pp. 809-814.
The U.S. Conference of Mayors Presents 'Best Practice' Awards, Los Angeles, New Orleans, Elizabeth, N.J. and Long Beach, CA Honored for Excellence & Innovation in Public-Private partnerships, Press Release Jan. 20, 2012.
Tung. Design of an advanced on-street parking meter. RIT Scholar Works. Thesis/Dissertation Collections (2001).
Co-pending U.S. Appl. No. 15/443,734, filed Feb. 27, 2017.
Co-pending U.S. Appl. No. 15/465,165, filed Mar. 21, 2017.
Final Written Decision of U.S. Pat. No. 7,854,310. IPR Case No. IPR2016-00067 dated Mar. 27, 2017.

* cited by examiner

FIG. 1

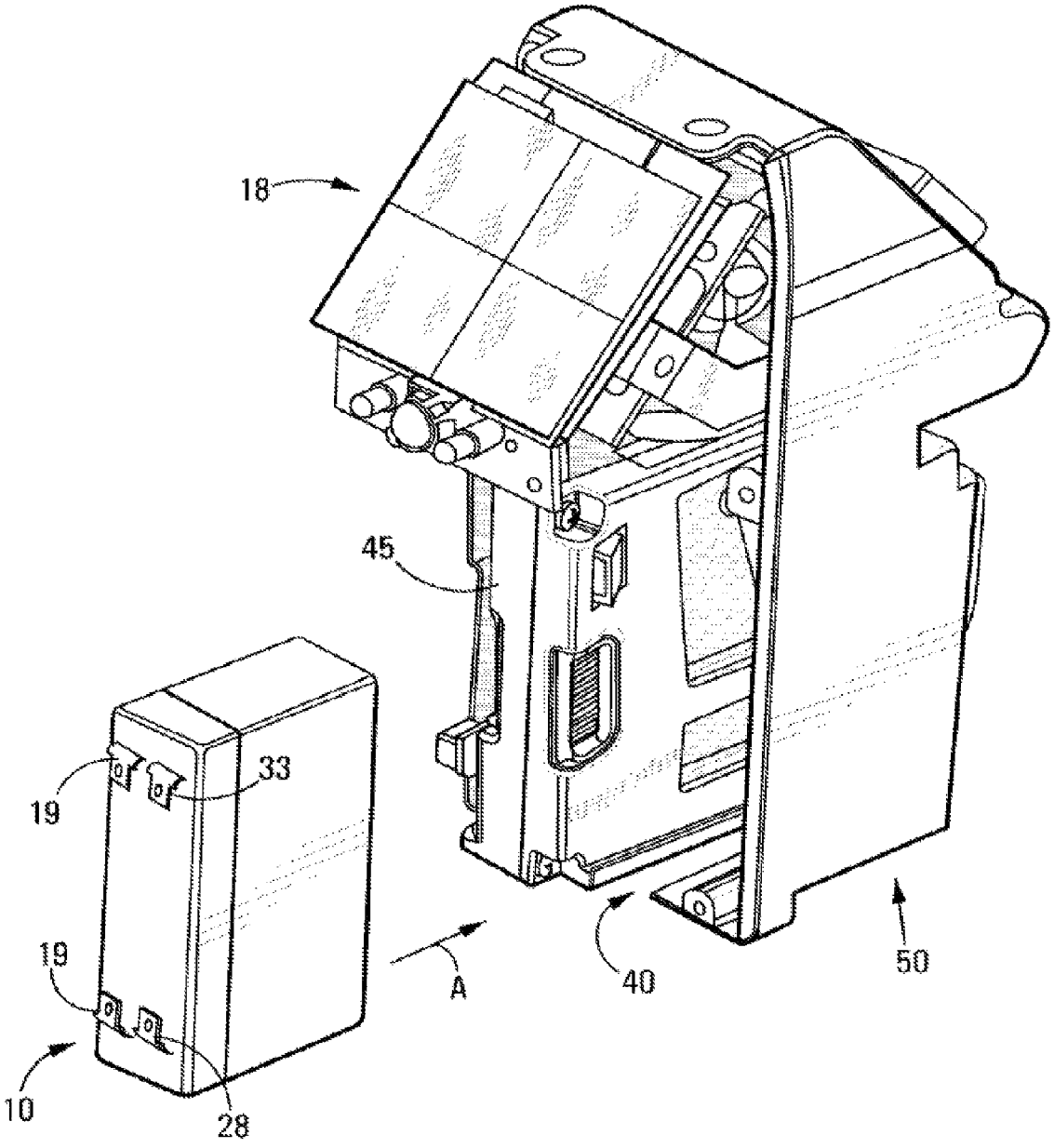


FIG. 2

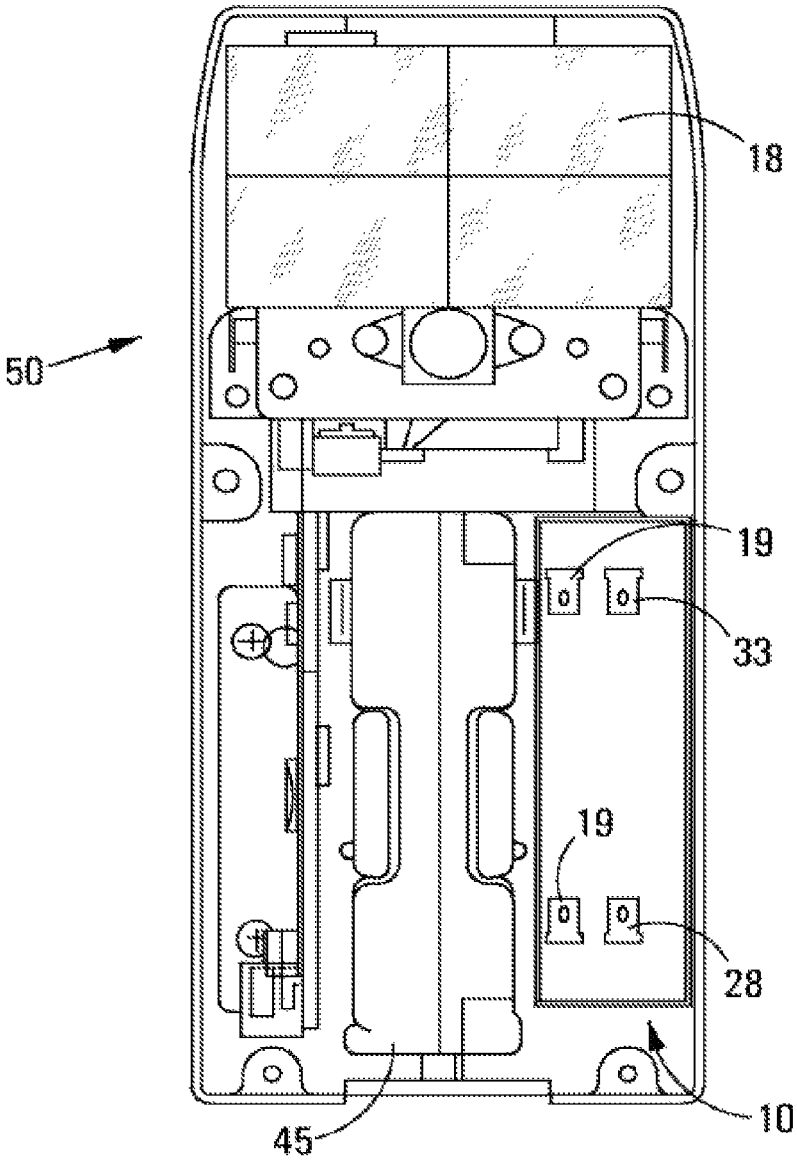


FIG. 3

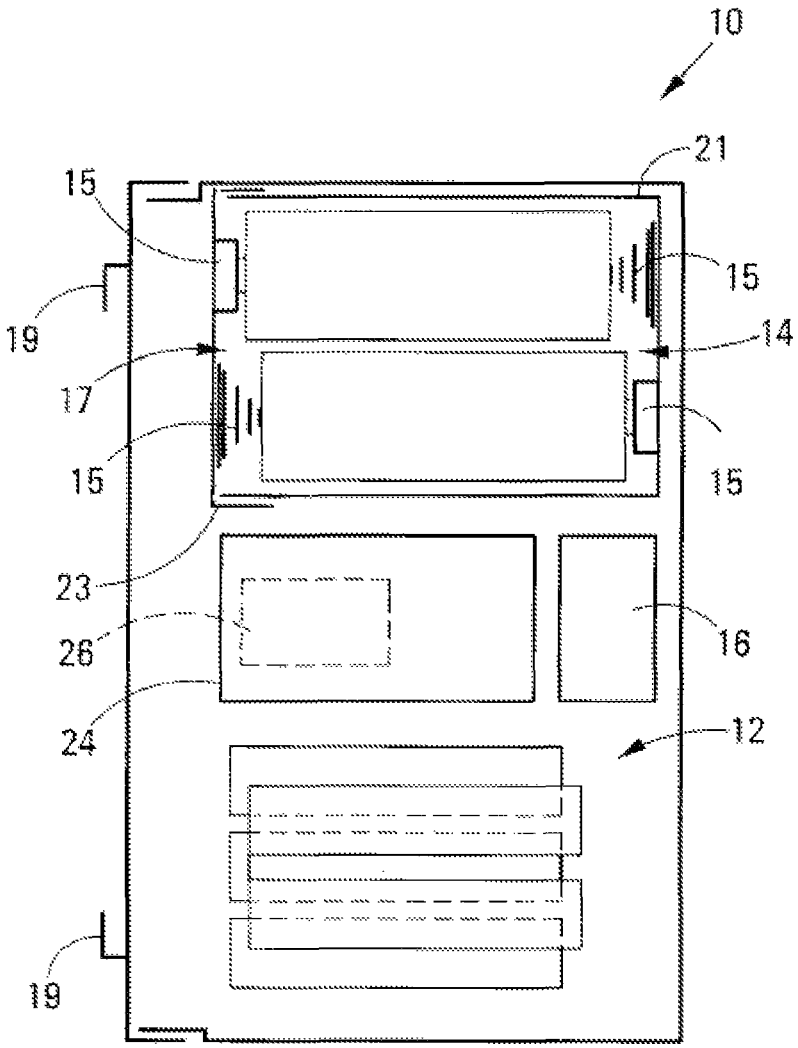
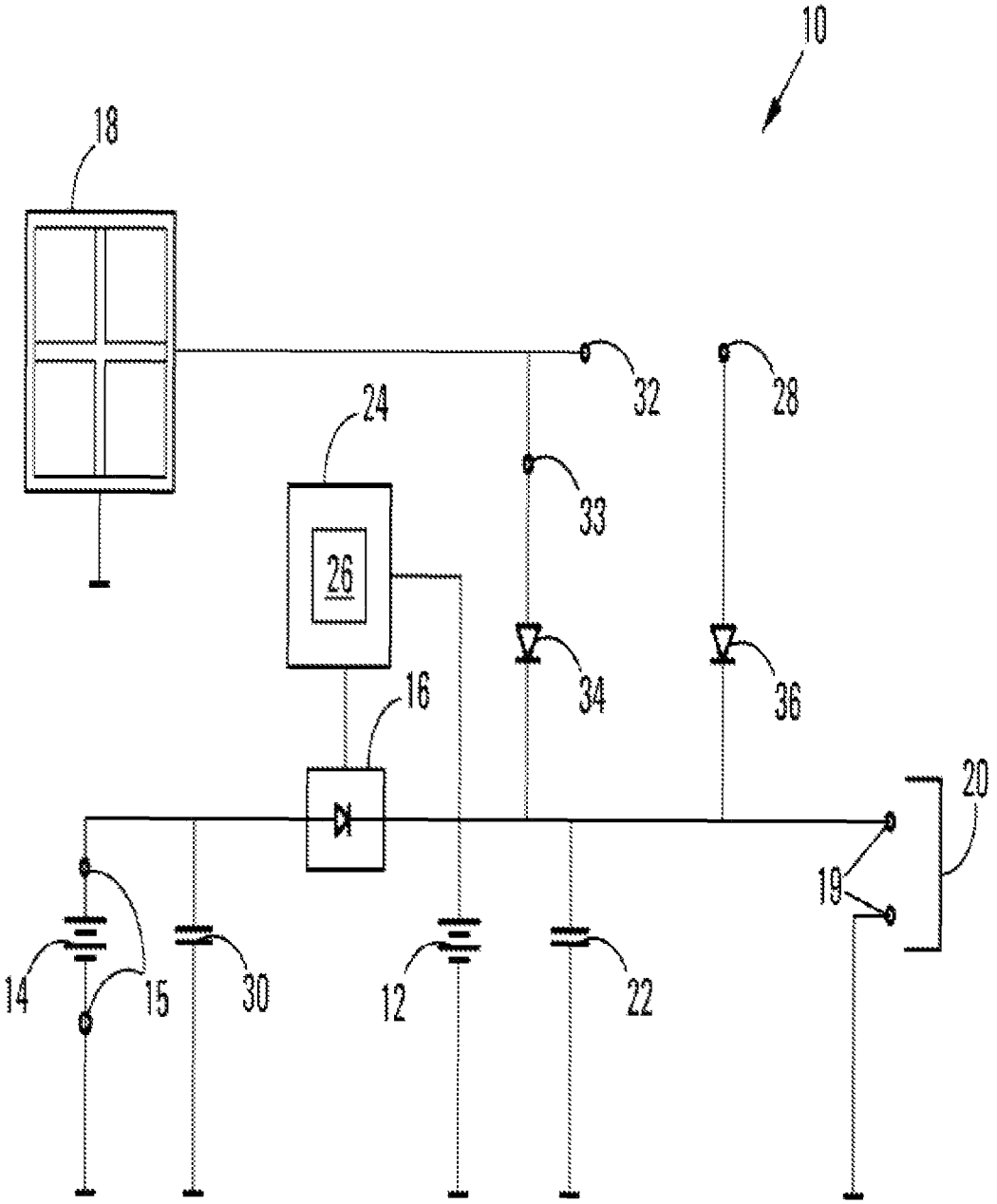


FIG. 4



POWER SUPPLY UNIT

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of U.S. patent application Ser. No. 13/928,058 filed Jun. 26, 2013, which is a continuation of U.S. patent application Ser. No. 12/059,909 filed Mar. 31, 2008 and issued as U.S. Pat. No. 8,513,832 on Aug. 20, 2013, which claims the benefit of U.S. Provisional Application No. 60/909,209, filed Mar. 30, 2007, each of which is incorporated in its entirety herein by reference.

FIELD OF THE INVENTION

THIS INVENTION relates to a power supply unit and to a device, in particular a single bay parking meter, having the power supply unit.

SUMMARY OF THE INVENTION

According to the invention, there is provided a power supply unit for supplying power to a device, the power supply unit including

a rechargeable, main battery;

a charging arrangement for charging the main battery;

a set of connectors for connection to a back-up battery;

a set of load terminals for connection to a load; and

a control unit for controlling supply of power to the load primarily from the main battery and secondarily from the back-up battery.

In an embodiment of the invention the power supply unit has the main battery and the back-up battery. The back-up battery is preferably non-rechargeable.

It will be appreciated that power is taken, in use, from the backup battery in the event that the main battery is inadequate.

Further according to the invention there is provided a device, in particular a parking meter, which has a power supply unit in accordance with the invention.

In the event that the main battery runs low, the control unit is configured to supply power to the load from both the main battery and the back-up battery or only from the back-up battery.

In a preferred embodiment, the back-up battery is easily replaceable. In this embodiment, the power supply unit has a bay for receiving the back-up battery and the connectors are spaced and are such as to permit easy removal and replacement of the back-up battery.

In another embodiment of the invention, the power supply unit further includes a communication device, for communicating messages to a control system. Such messages are selected from the group consisting of: notification that the main battery has been insufficiently recharged, and a notification that power is being supplied from the backup battery.

In a further embodiment of the invention, the communication device may be operable in a wireless manner, and utilizes a cellular telephone network. Thus, with this embodiment, the communication device may have a cellular telephone module.

In an embodiment of the invention, the charging arrangement includes charging terminals for connecting the unit to a solar panel. The device then incorporates the solar panel.

It will be appreciated that in normal operation power is supplied only from the main battery. However, if the main battery is insufficiently recharged, or it is unable to supply the power required by the load, then supplementary power is supplied, partially or totally, from the backup battery, as determined by the control unit.

Preferably, the nominal supply voltage of the backup battery is slightly greater than that of the main battery.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention is now described, by way of example only and without limiting the scope of the invention, with reference to the accompanying figures, wherein:

FIG. **1** is an isometric view of a power supply unit in accordance with the invention, shown in alignment with part of a parking meter body;

FIG. **2** is a rear view of the part of the parking meter body, depicting the power supply unit when inserted fully therein;

FIG. **3** is a schematic sectioned view of the power supply unit; and

FIG. **4** is a circuit diagram of the power supply unit.

DETAILED DESCRIPTION

In the accompanying figures, the power supply unit is generally designated by reference numeral **10** and comprises a rechargeable, main battery **12**, a charging arrangement in the form of a diode **34** for charging the main battery **12**, a replaceable back-up battery **14**, load terminals **19** and a control unit **16** for controlling supply of power to a load **20** connected via the load terminals **19** primarily from the main battery **12** and secondarily from the back-up battery **14** in the event that the main battery **12** is inadequate. The power supply unit **10** further has a solar panel terminal **33** and an auxiliary charging terminal **28**.

The power supply unit **10** further includes a bay **17** which contains the replaceable backup battery **14**. The bay **17** is illustrated in FIG. **3**, where it is seen to be defined by a compartment **21** with a lid **23** within the power supply unit **10**. The bay **17** has spaced connectors **15** for the backup battery **14**. Also shown in FIG. **3** is a communication device **24** with a cellular telephone module **26**.

More specifically, in a preferred embodiment of the invention, the main battery **12** comprises an arrangement of five "AA" size nickel cadmium rechargeable cells, which cells are coupled to each other and recharged by solar panels **18** via the solar panel terminal **33**. The backup battery **14** comprises a coupled arrangement of two non-rechargeable, disposable "C" size lithium-thionyl chloride cells, and the control unit **16** is a conventional linear, low dropout control unit, known in the trade as the Linear Technology™ model LT1529-5. The control unit **16** controls the supply of power to the load **20** from the main battery **12** and the backup battery **14**, in the manner described below.

It is not only the power supply unit **10** itself that is the subject of this invention. This invention extends to include a device, in particular a single bay stand alone parking meter **50**, having the power supply unit **10** as described above. This is illustrated in FIGS. **1** and **2**, in which FIG. **1** depicts the power supply unit **10** aligned for insertion into a complementary dimensioned and configured recess **40** within parking meter **50**. The power supply unit **10** is moved into position, in the direction of arrow "A," to fit snugly within the recess **40**, as is depicted in FIG. **2**. A coin validation unit **45** of the parking meter **50** is not a part of the present invention, but is mentioned for completeness, since the validation unit **45**, and other components, such as a timer and a display (not shown) are powered by the power supply

unit **10**, being connected thereto via the load terminals **19**. The parking meter **50** has the solar panels **18** which are connected to the solar panel terminal **33**.

The power supply unit **10** is operated as follows. Under favorable conditions, with the main battery **12** being sufficiently charged and with the voltage across the main battery **12** being greater than a predetermined threshold value, the control unit **16** is configured to permit only the main battery **12** to supply power to the load **20**. Conversely, under unfavorable conditions, when the main battery is not sufficiently charged, the supply voltage of the main battery **12** is lower than the threshold value, and in such conditions, the control unit **16** is configured to permit power to be supplied also, or only, from the backup battery **14** to the load. It will be appreciated that, in this way, use of the backup battery **14** occurs only when strictly necessary, namely when the voltage across the main battery **12** falls below a predetermined level.

In the particular instance where the power supply unit **10** is for a stand alone parking meter, the nominal supply voltage of the main battery **12** is 6.0V and of the back-up battery **14** 7.2V. The control unit **16** is configured to permit power to be supplied from the backup battery **14** when the voltage across the main battery **12** measures 5.5 V or less.

Capacitor **30** is provided to assist during peak power demand and capacitor **22** assists with stability of the regulator **16** and with peak power demand. In alternative embodiments of the invention, a further, external recharging source, such as a portable charger, may be connected via terminal **28**. It will be appreciated that the extent of reliance on the backup battery **14** to supply current to circuit **20**, is minimized. This, in turn, extends the lifespan of the backup battery **14**.

The power supply unit **10** further includes diodes **34** and **36**, which serve to prevent reverse current from flowing into the solar panels **18** and an external auxiliary recharging source via terminal **28** respectively.

The communication device **24** communicates notifications to a control system (not shown). Typically, such notifications relate to the state of the main battery **12** and of the backup battery **14**. Notifications that are communicated are that the voltage across the main battery **12** has fallen below the predetermined minimum level, and that power is being supplied from the backup battery **14**. The communication device **24** communicates these notifications in a wireless manner across a telecommunications network via the cellular telephone module **26**.

It will be appreciated by the person skilled in the art that application of this invention is not limited to parking meters only, but that this invention also has application to a multitude of power supply units used to supply current to electrical circuits.

What is claimed is:

1. A method for controlling the supply of power to a parking meter comprising:

a) monitoring, by a control unit, the status of a main battery which is rechargeable and a back-up battery which is replaceable and non-rechargeable;

b) charging at least partially, by the control unit, the main battery via one or more charging sources;

c) supplying power, by the control unit, to the parking meter primarily from the main battery;

d) switching the supply of power, by the control unit, to come from the back-up battery when the voltage across the main battery falls below a predetermined level; and

e) signaling, by the control unit, a wireless communication device to communicate a status message to a control system external to the parking meter regarding the state of the main battery, the back-up battery, or the one or more charging sources;

wherein the main battery, the back-up battery, the wireless communication device, and the control unit are received within the parking meter.

2. The method of claim **1**, wherein the status message comprises one or more of: battery charge rate, remaining battery charge, remaining battery life, real-time current supplied by a charging source, average current supplied by a charging source, error messages indicating battery failure, error messages indicating charging source failure, real-time power consumption, and average power consumption.

3. The method of claim **1**, wherein the wireless communication device communicates the status message over a telecommunications network.

4. The method of claim **1**, further comprising switching the supply of power, by the control unit, back to the main battery when the main battery is sufficiently recharged.

5. The method of claim **4**, further comprising minimizing the supply of power from the back-up battery after switching the supply of power to come from the main battery.

6. The method of claim **1**, wherein the main battery consists of one to five cells.

7. The method of claim **1**, wherein the back-up battery consists of one to five cells.

8. The method of claim **1**, wherein the one or more charging sources comprises one or more solar panels.

9. The method of claim **8**, wherein the parking meter comprises a diode coupled to the one or more solar panels to prevent reverse current from flowing into the one or more solar panels.

10. The method of claim **1**, wherein the predetermined level is 5.5V.

11. The method of claim **1**, wherein the back-up battery has a nominal supply voltage greater than that of the main battery.

12. The method of claim **1**, wherein the parking meter is a single space parking meter or a dual space parking meter.

13. The method of claim **1**, wherein the parking meter is a multi-space parking meter.

14. A power supply for supplying power to a parking meter comprising:

a) a main battery which is rechargeable;

b) a charging arrangement for connecting the main battery to one or more charging sources;

c) a back-up battery which is replaceable and non-rechargeable;

d) a connection to a wireless communication device for communicating a status message regarding the state of the power supply, the main battery, the back-up battery, or the one or more charging sources to a control system external to the parking meter; and

e) a connection to a control unit for controlling supply of power to the parking meter primarily from the main battery and secondarily from the back-up battery;

wherein the main battery, the back-up battery, the wireless communication device, and the control unit are received within the parking meter.

15. The power supply of claim **14**, wherein the status message comprises one or more of: battery charge rate, remaining battery charge, remaining battery life, real-time current supplied by a charging source, average current supplied by a charging source, resistance at various sections within the power supply, error messages indicating battery failure, error messages indicating charging source failure,

real-time power consumption of the parking meter, and average power consumption of the parking meter.

16. The power supply of claim **14**, wherein the wireless communication device communicates the status message over a telecommunications network.

17. The power supply of claim **14**, the control unit is configured to switch the supply of power back to the main battery when the main battery is sufficiently recharged.

18. The power supply of claim **17**, wherein the control unit is configured to minimize the supply of power from the back-up battery after switching the supply of power to come from the main battery.

19. The power supply of claim **14**, wherein the main battery consists of one to five cells.

20. The power supply of claim **14**, wherein the back-up battery consists of one to five cells.

21. The power supply of claim **14**, wherein the one or more charging sources comprises one or more solar panels.

22. The power supply of claim **21**, wherein the power supply comprises a diode coupled to the one or more solar panels to prevent reverse current from flowing into the one or more solar panels.

23. The power supply of claim **14**, wherein the back-up battery has a nominal supply voltage greater than that of the main battery.

24. The power supply of claim **14**, wherein the parking meter is a single space parking meter or a dual space parking meter.

25. The power supply of claim **14**, wherein the parking meter is a multi-space parking meter.

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