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### Published

With international search report.

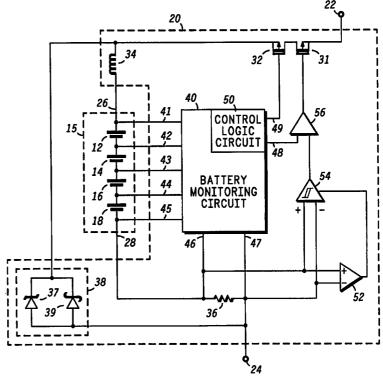
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23 December 1998 (23.12.98)

### (54) Title: BATTERY PROTECTION SYSTEM

### (57) Abstract

A battery protection system (20) controls a process for charging a battery pack (15). A hysteresis comparator (54) senses a charging current flowing through the battery pack (15) and switches off a charging switch (31) to interrupt the charging current when the charging current reaches an upper limit. A transient current is then generated by an inductor (34). The hysteresis comparator (54) senses the transient current flowing through the battery pack (15) and switches on the charging switch (31) to regenerate the charging current when the transient current decreases substantially to zero. Periodically, a battery monitoring circuit (40) switches off the charging switch (31) and measures an open circuit voltage across each battery cell in the battery pack (15). In response to the open circuit voltage of a battery cell reaching a fully charged voltage, the battery monitoring circuit (40) switches off the charging switch (31) to terminate the charging process.



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# INTERNATIONAL SEARCH REPORT

Intern nal Application No PCT/US 98/05968

A. CLASSIF IPC 6	FICATION OF SUBJECT MATTER H02J7/00		~
According to	o International Patent Classification (IPC) or to both national classificat	ion and IPC	
B. FIELDS	SEARCHED		
Minimum do IPC 6	ocumentation searched (classification system followed by classification H02J	ı symbols)	
	tion searched other than minimum documentation to the extent that su		
Electronic d	data base consulted during the international search (name of data base	e and, where practical, search terms used)	
C. DOCUM	NENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the rele	vant passages	Relevant to claim No.
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А	EP 0 588 613 A (SONY CORP ;MOTORO (JP)) 23 March 1994 see abstract; figures 3A,3B	DLA JAPAN	1-7
A	EP 0 762 593 A (RAY O VAC CORP) 12 March 1997 see page 4, line 46 - page 5, lir figure 11	ne 42;	1-7
A	DE 35 33 437 A (TELEFUNKEN ELECTI GMBH) 26 March 1987 see the whole document	RONIC	1-7
Fur	rther documents are listed in the continuation of box C.	X Patent family members are listed	in annex.
"A" docum cons "E" earlier filing "L" docum	categories of cited documents :  ment defining the general state of the art which is not sidered to be of particular relevance  r document but published on or after the international date  nent which may throw doubts on priority claim(s) or  th is cited to establish the publication date of another	"T" later document published after the inte or priority date and not in conflict with cited to understand the principle or th invention  "X" document of particular relevance; the cannot be considered novel or canno involve an inventive step when the de "Y" document of particular relevance; the	the application but learn underlying the claimed invention to considered to be considered to be comment is taken alone
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	e actual completion of the international search	Date of mailing of the international sea	arch report
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Name and	d mailing address of the ISA  European Patent Office, P.B. 5818 Patentlaan 2  NL - 2280 HV Rijswijk  Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  Fax: (+31-70) 340-3016	Authorized officer  MOYLE, J	

International application No.

# INTERNATIONAL SEARCH REPORT

PCT/US 98/05968

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)	
This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:	
Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:	
Claims Nos.: because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:	
3. Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).	
Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)	
This International Searching Authority found multiple inventions in this international application, as follows:	
1. Claims: 1-7 Battery pack with charge circuit	
2. Claims: 8-10 Battery charge process	
As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.	
2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.	
3. As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:	
4. X No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:  1-7	
Remark on Protest  The additional search fees were accompanied by the applicant's protest.  No protest accompanied the payment of additional search fees.	

# INTERNATIONAL SEARCH REPORT

Information on patent family members

Intern dal Application No PCT/US 98/05968

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