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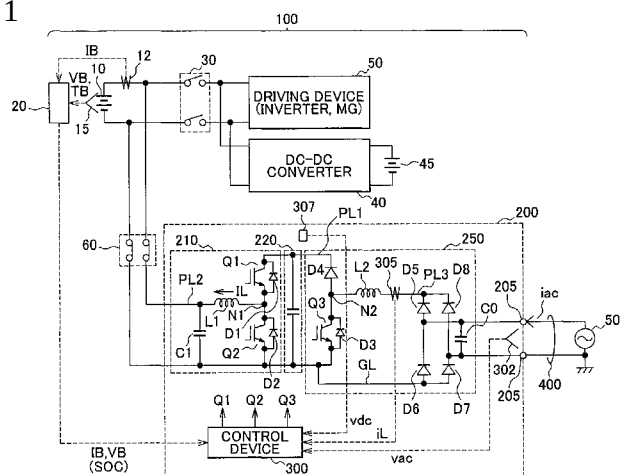
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(54) Title: CHARGING DEVICE FOR ELECTROMOTIVE VEHICLE

FIG. 1



(57) **Abstract:** An AC-DC converter (250) converts an alternating-current voltage (vac), supplied from an external power supply (500), to a direct-current voltage higher than a peak voltage of the alternating-current voltage, and outputs the direct-current voltage to a first power supply line (PL1). In a normal control mode, a DC-DC converter (210) steps down a voltage of the power supply line (PL1) through on/off control over a switching element (Q1) to charge a main battery (10). On the other hand, in an upper arm ON control mode, the DC-DC converter (210) charge the main battery (10) while the switching element (Q1) is kept in an on state. On the basis of a state of external charging, a control device (300) applies the upper arm ON control mode when a condition that upper arm ON control is applicable is satisfied, and applies the normal control mode when the condition is not satisfied.

INTERNATIONAL SEARCH REPORT

International application No

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A. CLASSIFICATION OF SUBJECT MATTER
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 ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 2 178 189 A1 (TOYOTA MOTOR CO LTD [JP] ; TOYOTA JIDOSHOKKI KK [JP]) 21 April 2010 (2010-04-21)	1-3 ,5-8
Y	abstract; figures 10, 13 paragraph [0110] - paragraph [0115] ; figures 1-4 paragraph [0161] - paragraph [0187] ; figures 10-14	4
Y	----- US 2006/245219 A1 (LI YONG [US]) 2 November 2006 (2006-11-02) abstract; figures 1, 1A	4
A	----- EP 1 662 641 A2 (TOYOTA MOTOR CO LTD [JP]) 31 May 2006 (2006-05-31) abstract; figures 1, 3, 4, 5A, 5B, 6 ----- -/-	2, 3



Further documents are listed in the continuation of Box C.



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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2009/033304 A1 (BENEDICT ERIC L [US]) 5 February 2009 (2009-02-05) abstract; figures 1,2 -----	2, 3

INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2178189	AI	21-04-2010	EP 2178189 AI 21-04-2010
			JP 2009033785 A 12-02-2009
			US 2010181829 AI 22-07-2010
			Wo 2009013975 AI 29-01-2009

US 2006245219	AI	02-11 -2006	CN 101185044 A 21-05-2008
			EP 1880261 A2 23-01-2008
			JP 2008539692 A 13-11-2008
			US 2006245219 AI 02-11-2006
			Wo 2006116548 A2 02-11-2006

EP 1662641	A2	31-05 -2006	EP 1662641 A2 31-05-2006
			JP 4665569 B2 06-04-2011
			JP 2006187186 A 13-07-2006
			US 2006114702 AI 01-06-2006

US 2009033304	AI	05-02 -2009	NONE
