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(56) Documents Cited:
GB 2443455 A JP 2000102184 A
US 5049804 A US 20070047270 A1
US 20030155889 A1

(58) Field of Search:
INT CL **H02J**
Other: **EPODOC, WPI**

(54) Abstract Title: **Battery charger having sensing wire and relay to connect/disconnect charger to mains power supply dependent if charger is connected to battery**

(57) A battery charger 1 has a sensing lead 2 and a connector 3 which is connected to a device 4 which is to have a battery therein charged. A mains supply isolating relay 5 may be energised by connecting said lead 3 to said device 4 thereby allowing mains supply to connect to enter said charger. Removal of said lead de-energises said relay and shuts off the mains power to said charger, thus the device does not draw a standby current. A manual override button 11 may be provided to allow the mains current to be supplied across the relay and hence to the charger in the event that the secondary battery 11 may be missing or not having sufficient power. A blocking diode 13 and indicating LED 12 may be provided.

Figure 1

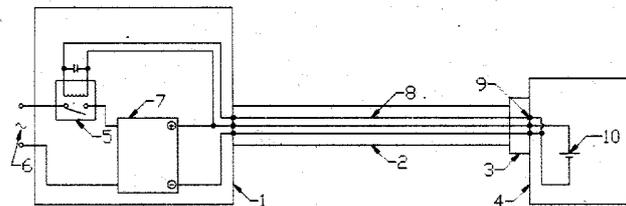


Figure 2

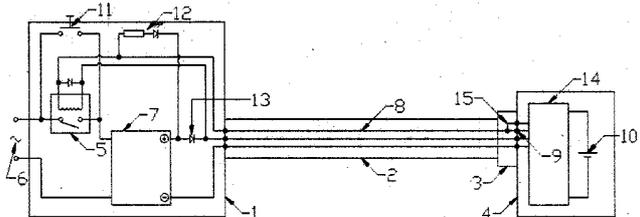


Figure 1

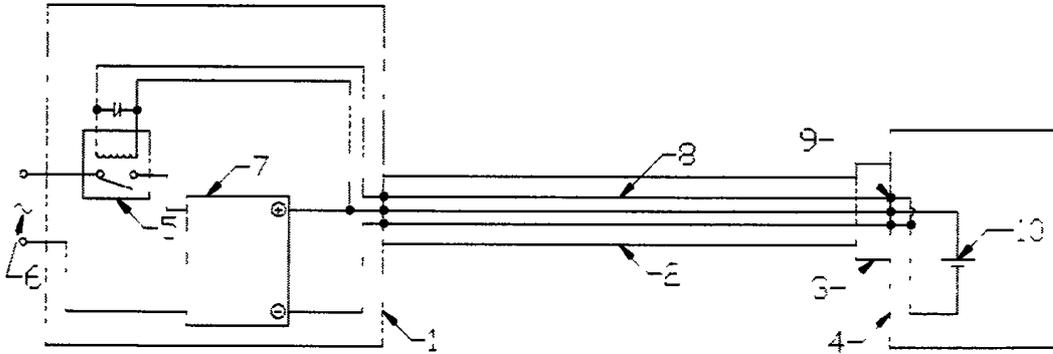
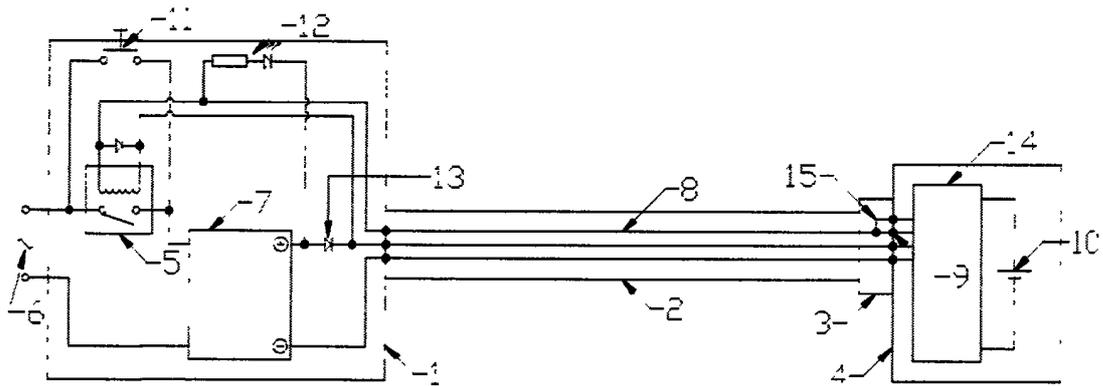


Figure 2



Method of switching on and off a secondary battery charger

The invention relates to secondary battery chargers external to a device containing secondary battery, which is being charged, and particularly to the method of switching on and off the mains alternating current supply to the charger.

Various electric and electronic devices contain rechargeable batteries that need to be charged using external charger specific to the device. It has been observed that users frequently do not unplug the chargers from the mains when the supply of power to the device is not needed. The charger itself consumes energy while not charging the secondary battery.

The method of switching on and off a charger controls the mains power supply to the external charger. The charger is switched on only when the device containing secondary battery is connected the charger.

To switch the mains alternating current supply to the charger a relay is introduced into it. The relay coil is linked in such a way that it can close its contacts and switch on the mains power supply to the charging circuit only when the device containing the secondary battery is connected to the charger. To control the relay coil and therefore the mains power supply to the charger the lead between the charger and device contains an additional wire and the connector between the lead and the device contains an additional electrical contact. Initially when the device and the charger are connected the relay coil is powered by the secondary battery however as soon as the charger powers up it will supply the current to the relay coil.

Preferably an override button is introduced to supply the power to switch on the charger in case the secondary battery is missing or not able to provide enough power to operate the relay. Preferably the charger contains a LED indicator to indicate that the mains power is being applied to the charger. Preferably the device with the secondary battery contains a control circuit to control the relay based on the state of charge of the secondary battery.

Since the mains alternating current supply to the charger is switched off when the device containing the secondary battery is not connected to the charger, the invention avoids unnecessary power consumption even when the charger remains plugged in a mains socket.

The method may be applied to chargers used with various electric and electronic devices equipped with secondary battery.

The method of switching off the charger when not connected to the device comprises an additional safety feature; the charger is not on needlessly thus reducing the danger of causing a fire. Furthermore the method has the advantage of causing less stress to the charger components thus increasing the life expectancy of the charger.

In order to illustrate the explanation of these and other features, aspects, and advantages of preferred embodiments of the invention, a sheet of drawings is enclosed with this descriptive report.

Figure 1 shows a schematic drawing of the preferred embodiment.
Figure 2 shows preferable additional features.

The charger (1) is always switched off when the lead (2) with the connector (3) is not connected into the device (4); in such case the relay (5) isolates the mains alternating current supply (6) to the charger (1).

When the connector (3) is connected to the device (4) the additional wire in the lead (8) together with additional contact (9) supply current from the secondary battery (10) to the relay (5) coil therefore mains alternating current is allowed into the charger (1).

When the charger (1) is switched on it powers the relay (5) coil as well as charges the secondary battery (10). The remaining parts of the charger (1) are of a well-known design (represented by 7).

When the connector (3) is disconnected from the device (4) the relay (5) coil becomes isolated from the circuit and therefore the relay (5) isolates the mains alternating current supply (6).

Additional features in figure 2 include an override button (11), which allows the mains alternating current to the charger (1) momentarily in case the secondary battery (10) is missing or unable to provide enough power to operate the relay (5). When the button (11) is depressed the charger (1) will be always on however when released the charger (1) will stay on only if the connector (3) is connected to the device (4). When the charger (1) is on the LED (12) with a resistor will light up. The diode (13) ensures that the LED (12) will not be powered by the secondary battery (10).

An additional control circuit (14) and accompanying contact (15), which senses whether the connector (3) is connected to the device (4) operates the relay (5) according to the state of charge of the secondary battery (10). When the connector (3) is connected the control circuit (14) operates the relay (5) and the secondary battery (10) starts charging. When the battery (10) is fully charged the control circuit (14) switches the relay (5) off. When the charger (1) is not plugged into the mains socket but the connector (3) is connected to the device (4) the control circuit (14) will momentarily operate the relay (5) and sense whether the charger (1) is supplying current at set intervals in order to change to on state when the charger (1) is plugged into the mains and to protect the secondary battery (10) from fully discharging. The control circuit (14) will not operate the relay (5) if the battery (10) voltage is too low. In this case the override button (11) is used to switch the charger (1) on.

The present invention has been described in detail. However, it should be understood that the disclosed embodiments are merely exemplary of the invention that may be embodied in various forms. These and other variations, which will be understood by those skilled in the art, are within the intended scope of the invention as claimed below.

Claims

- 1. A secondary battery charger external to a device with a secondary battery comprising: a relay, additional wire applied in the lead connecting the charger and the device, an additional electrical contact applied in the connector at the lead, and an additional electrical contact applied in the device connected in such a way that a closed electrical circuit is created that switches the relay on when the connector is plugged into the device, the relay switches the mains power supply to the charger on only when the charger is connected to the device equipped with a secondary battery and isolates the mains power supply when not connected.**
- 2. A secondary battery charger external to a device with a secondary battery according to claim 1, in which a control circuit applied in the device operates relay in order to supply mains power to the charger or isolate the charger from the mains power supply according to the state of charge of the secondary battery.**
- 3. A secondary battery charger external to a device with a secondary battery according to claim 2, where an additional contact applied to the connector between the charger and the device senses whether the charger is connected to the device.**
- 4. A secondary battery charger external to a device with a secondary battery according to either claim 1 or claim 2, where an override button applied in the charger is used to supply mains power to the charger and therefore switch the relay on when the charger and the device are connected.**

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Application No: GB0710289.0

Examiner: Gareth Jones

Claims searched: 1 - 4

Date of search: 29 September 2008

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1 - 4	US 2003/0155889 A1 (HOWARD et al) See whole document especially paras (0024, 0028) and Fig. 4.
A	-	US 2007/0047270 A1 (MAKINO et al) See whole document
A	-	GB 2443455 A (BESWICK) See whole document espically figure 2.
A	-	JP 2000102184 A (KOYO KK) 07.04.2000. See all figures and WPI Abstract Accession No. 2000-325651[28].
A	-	US 5049804 A (HUTCHINGS) See whole document especially figure 2.

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X :

Worldwide search of patent documents classified in the following areas of the IPC

H02J

The following online and other databases have been used in the preparation of this search report

EPODOC, WPI

International Classification:

Subclass	Subgroup	Valid From
H02J	0007/00	01/01/2006