Inductive Charging for Stacked Computing Devices

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Inductive Charging for Stacked Computing Devices

ABSTRACT

This disclosure describes techniques to wirelessly charge and provide software updates to multiple computing devices stored in a densely packed configuration. Inductive charging coils are provided within each computing device that enable wireless charging and signaling between proximate devices. The coils are positioned at a predetermined offset from a corner of the device and are placed within the lid and/or the base of the device such that when one or more compliant devices are stacked vertically or horizontally, the coils from one device are in alignment with the coils of its neighboring devices. The stack of devices can be charged by an external power source with similar coil placement. Each device also includes associated logic components that support coordination of charging between devices, communication of charging status and/or state of charge, waking up the device when receiving wireless power, coordination of secure updates/reconfiguration, etc. The described techniques enable software update configuration and power management of multiple devices that are in storage and/or packaging with minimal disruption.

KEYWORDS

- Power management
- Security update
- Induction coil
- Charging coil
- Rechargeable battery
- Laptop storage
BACKGROUND

Computing devices such as laptops are sometimes positioned in densely packed configurations for extended periods. For example, laptops are stored in warehouses before being shipped to customers, distributors, etc. In another example, at locations such as educational institutions, laptops are shelved in a compact configuration during a break such as summer recess. While stored in this manner, rechargeable batteries in the computing devices can undergo unnecessary wear and/or be damaged permanently and become unrecoverable when drained beyond critical levels.

In some situations, firmware or other device software needs to be updated on multiple devices when the devices are in storage. Traditional methods such as updating each device individually (e.g., via USB) can be cost prohibitive, especially when such updates require unpacking and repacking the device. Periodically waking the devices for such purposes can also lead to a higher battery discharge rate. The need for physical access to the device also reduces device security.

DESCRIPTION

This disclosure describes techniques to wirelessly charge and provide software updates in bulk to computing devices that are stored in a densely packed configuration. Per techniques of this disclosure, inductive charging coils are positioned within each computing device that enable wireless charging and signaling between proximate devices.
**Fig. 1: Laptops stacked during storage charged using wireless inductive charging**

Fig. 1 depicts an example laptop storage rack in use. As illustrated in Fig. 1, multiple laptops are shelved on the storage rack for storage.

**Fig. 2: An induction coil positioned at a fixed offset from a corner of the device**

Fig. 2 illustrates an example computing device configured for wireless charging, per techniques of this disclosure. As illustrated in Fig. 2, inductive charging coil(s) are positioned at a predetermined offset from a corner of the device. The inductive coils are placed within the lid and/or the base of the device such that when one or more compliant devices are stacked vertically or horizontally, the coils from one device are in alignment with the coils of its
neighboring devices. In some configurations, the inductive coils can also be positioned centrally or towards the sides of the device.

The stack of devices can be charged by an external power source, such as another device with similar coil placements. A cart with fixed charging coils placed at suitable locations or a portable charger placed above, below, or between the stack of devices can also be used as a power source. For wireless charging of the stack of devices in a warehouse context, thin packaging is utilized to enable a device to receive from and/or provide a charge to proximate devices.

Each computing device also includes associated logic components to support functionality such as coordination of charging between devices, communication of charging status and/or state of charge, waking up the device when receiving wireless power, coordination of security updates/reconfiguration, etc.

Techniques of this disclosure can enable software update configuration and power management of multiple devices that are in storage and/or packaging with minimal disruption.

CONCLUSION

This disclosure describes techniques to wirelessly charge and provide software updates to multiple computing devices stored in a densely packed configuration. Inductive charging coils are provided within each computing device that enable wireless charging and signaling between proximate devices. The coils are positioned at a predetermined offset from a corner of the device and are placed within the lid and/or the base of the device such that when one or more compliant devices are stacked vertically or horizontally, the coils from one device are in alignment with the coils of its neighboring devices. The stack of devices can be charged by an external power source with similar coil placement. Each device also includes associated logic
components that support coordination of charging between devices, communication of charging status and/or state of charge, waking up the device when receiving wireless power, coordination of secure updates/reconfiguration, etc. The described techniques enable software update configuration and power management of multiple devices that are in storage and/or packaging with minimal disruption.