INDUCTIVE CHARGING BETWEEN ELECTRONIC DEVICES

CROSS-REFERENCES TO RELATED APPLICATIONS

[0001] This application is a continuation of U.S. patent application Ser. No. 15/925,410, filed Mar. 19, 2018 and titled "Inductive Charging Between Electronic Devices," which is a continuation of U.S. patent application Ser. No. 14/731,280, filed Jun. 4, 2015 and titled "Inductive Charging Between Electronic Devices," which is a non-provisional patent application of and claims the benefit to U.S. Provisional Patent Application No. 62/056,827, filed Sep. 29, 2014 and titled "Inductive Charging Between Electronic Devices," the disclosures of which are hereby incorporated by reference in their entirety for all purposes.

BACKGROUND

[0002] The disclosure relates generally to electronic devices and, more specifically, to wirelessly charging a first electronic device using a second electronic device.

[0003] Some electronic devices include one or more rechargeable batteries that may require external power to recharge. Often, these devices may be charged using a common or standardized electrical connector or cable. For example, some devices may be charged using a universal serial bus ("USB") connector or cable. However, despite having standardized connectors and cable, each device may require a separate or dedicated power supply to charge. In some cases, having separate power supplies for each device may be burdensome to use, store, and/or transport.

SUMMARY

[0004] Generally, embodiments discussed herein are related to an electronic device configured to inductively or wirelessly transfer power to a second, external electronic device. The wireless power transfer may be used to charge the battery of the first and/or second electronic device. The electronic devices may include inductive coils which may be configured to be in electrical communication with inductive coils of external electronic devices. In some embodiments, the electrically communicative inductive coils may act as transmitting coils and/or receiving coils capable of transmitting power between the electronic devices. This transmission of power may increase a charge of a battery of the electronic device receiving the power, while simultaneously decreasing the charge of a battery transmitting the power. The inductive coils of the electronic devices capable of transmitting power to external electronic devices may allow for the charging of the battery of an electronic device using only another electronic device. As such, only a single power cord or no power cords may be needed to charge one or more of a group of devices that include electrically communicative inductive coils.

[0005] Some example embodiments are directed to portable electronic device that include an enclosure defining an opening, a display positioned or disposed within the opening, a user input device positioned on an external surface of the display, and a battery positioned within or on the enclosure. The battery may be configured to provide electrical power to the display. The device may also include a transmit inductive coil within the enclosure and configured to wirelessly transmit power to an external device that is positioned proximate to the enclosure. In some embodiments, the transmit inductive coil is operatively coupled to the battery and is configured to wirelessly transmit power from the battery to the external device. In some embodiments, the device also includes a receive inductive coil that is positioned or disposed within the enclosure and configured to wirelessly receive power from the external device that is positioned proximate to the enclosure. In some embodiments, the portable electronic device includes a speaker within the enclosure and electrically coupled to the battery. The portable electronic device may also include a microphone within the enclosure and electrically coupled to the battery. In some cases, the user input device is a touch sensor or touch screen positioned on an exterior surface of the device.

[0006] Some example embodiments are directed to an electronic device, including an enclosure, a battery within the enclosure and an inductive coil within the enclosure and coupled to the battery. The inductive coil may be configured to operate in two or more operational modes that include: a power receiving mode for wirelessly receiving power from an external device; and a power transmitting mode for wirelessly transmitting power to the external device.

[0007] The device may also include a controller that is coupled to the inductive coil and configured to select the operational mode of the inductive coil. In some cases, the controller is in electronic communication with the battery and configured to monitor a charge of the battery. In some embodiments, the device may include a display, a touch sensor, a speaker disposed or positioned within the enclosure and electrically coupled to the battery, and a microphone disposed or positioned within the enclosure and electrically coupled to the battery.

[0008] In some embodiments, the inductive coil is an inner inductive coil and the device includes an outer inductive coil surrounding the inner inductive coil. In some cases, while in the power transmitting mode, both the inner and outer inductive coils are activated to transmit wireless power. In some cases, while in the power receiving mode, only the inner inductive coil is activated to receive wireless power.

[0009] In some embodiments, the electronic device includes an alignment magnet that is positioned adjacent the inductive coil. The alignment magnet may be configured to assist in positioning the external device relative to the electronic device.

[0010] In some embodiments, the electronic device is one of: a first mobile phone, a first smart phone, a first tablet computer, or a first notebook computer and the external device is one of: a second mobile phone, a second smart phone, a second tablet computer, or a second notebook computer.

[0011] In some embodiments, the battery of the electronic device is configured to be charged by the external device in the power receiving mode. In some embodiments, the battery of the electronic device is configured to charge the external device in the power transmitting mode.

[0012] Some example embodiments are directed to a method of inductively wirelessly coupling a first and a second electronic device. A first inductive coil of the first electronic device may be positioned relative to a second inductive coil of the second electronic device. Using a first controller of the first electronic device, an operational mode of the first inductive coil may be selected. The first inductive coil may be configured to operate in two or more modes,