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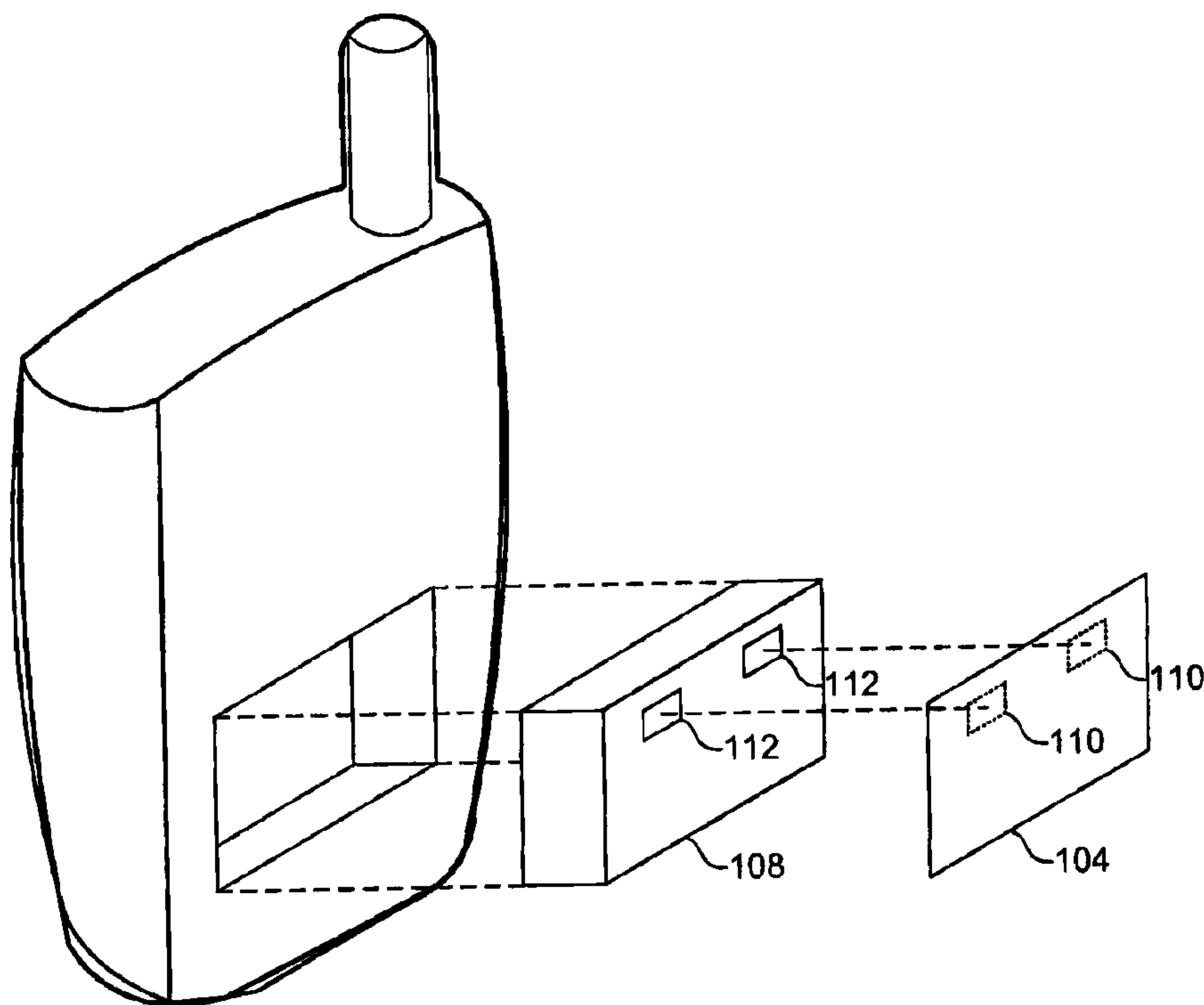
(71) Demandeur/Applicant:
THE SMART POWER INC., CA

(72) Inventeur/Inventor:
WILBY, SIMON, CA

(74) Agent: BORDEN LADNER GERVAIS LLP

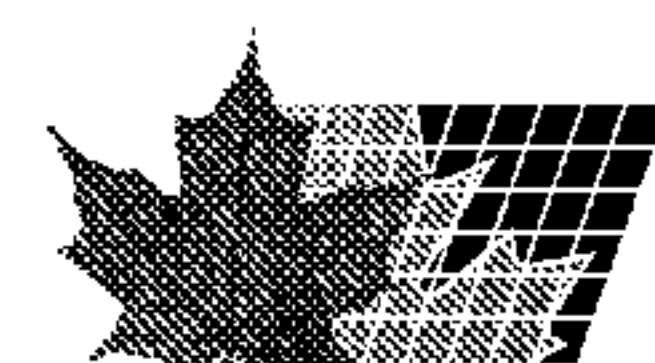
(54) Titre : CHARGEUR DE BATTERIE DE PANNEAU SOLAIRE POUR DISPOSITIF ELECTRIQUE

(54) Title: SOLAR PANEL BATTERY CHARGER FOR ELECTRICAL DEVICE



(57) **Abrégé/Abstract:**

A removable solar charger is provided to charge a battery powering an electrical device, such as a mobile device. A solar panel of the removable solar charger is preferably provided on an outside face of a user-removable battery compartment cover. Charging contacts on the inside of the battery compartment cover are in electrical communication with the battery to trickle charge the battery when the cover is closed. The solar charger battery compartment cover and/or battery for a particular device can be purchased separately from the device allowing a user to retrofit a current device not originally designed for solar charging while the battery is in place. Alternatively, a new electrical device can be manufactured with the removable solar panel charger battery cover, modified battery (or other necessary components) to allow for trickle charging.



ABSTRACT

A removable solar charger is provided to charge a battery powering an electrical device, such as a mobile device. A solar panel of the removable solar charger is preferably provided on an outside face of a user-removable battery compartment cover. Charging contacts on the inside of the battery compartment cover are in electrical communication with the battery to trickle charge the battery when the cover is closed. The solar charger battery compartment cover and/or battery for a particular device can be purchased separately from the device allowing a user to retrofit a current device not originally designed for solar charging while the battery is in place. Alternatively, a new electrical device can be manufactured with the removable solar panel charger battery cover, modified battery (or other necessary components) to allow for trickle charging.

SOLAR PANEL BATTERY CHARGER FOR ELECTRICAL DEVICE

FIELD OF THE INVENTION

The present invention relates generally to the provision of power to devices. More particularly, the present invention relates to providing solar power to electrical devices.

BACKGROUND OF THE INVENTION

Many electrical devices commonly utilize batteries as a power source. However, any given battery can only supply power to a device for a limited period of time. Such electrical devices, including mobile phones, wireless messaging devices and media players, are used more and more frequently and for extended periods of time. Consequently, it may be necessary to recharge the battery very frequently. However, it is inconvenient for users to constantly carry with them spare batteries or a charger.

Alternatives to powering wireless communications device exist. Some known approaches have suggested incorporating solar panels into wireless communication devices. US Patent No. 5,898,932 discloses a mobile phone that utilizes a solar panel on the back cover of the phone to charge the battery. Some commercial examples include the Nokia 1611 and the Hitech Wealth S1156 mobile phones. Similarly, Japanese patent application publication JP2006/229741 discloses a mobile flip phone with solar panels on the top portion of the phone that is protected by a transparent cover.

US Patent Application Publication No. 2008/0061732 discloses a mobile flip phone with solar panels that fold out of the top portion of the phone. U.S. Patent No. 7,206,044 discloses a device wherein a solar panel is coupled to a liquid crystal display. The solar panels can be used to power the display or, alternatively, the entire device.

US Patent Application Publication No. 2006/000530112, Japanese publication JP2005027269 and European patent publication No. 1,274,223A1 disclose a cellular phone containing retractable solar panels for charging the phone.

However, a drawback of these technologies is that they are device specific. These technologies cannot be retrofitted into models of phones that are currently on the market. Another drawback with some of these technologies is that charging can often only take place when the device is not in use.

It is, therefore, desirable to provide a system for charging a battery in an electrical device that overcomes the drawbacks described above.

SUMMARY OF THE INVENTION

It is an object of the present invention to obviate or mitigate at least one disadvantage of previous charging arrangements for electrical devices.

In a first aspect, the present invention provides a solar charger to charge a battery that powers an electrical device, such as a mobile device. The solar charger includes a removable battery compartment cover and a solar panel. The solar panel is disposed on an outer face of the battery compartment cover to absorb light and convert solar energy to electrical energy to provide charge to the battery. Charge emitting contacts are disposed on the inner face of the battery compartment cover and in electrical communication with the solar panel and with the battery when the cover is in a closed position to trickle charge the battery while the battery remains in the electrical device.

The charge emitting contacts can be in operative connection with charge receiving contacts of the battery, for transmitting a charge to the corresponding charge receiving contacts when the cover is in the closed position. The charge receiving contacts of the battery can be integral with power delivery contacts of the battery that delivery power to the device. In that case, the charge emitting contacts can extend to and be in electrical contact with the power delivery contacts of the battery when the cover is in the closed position.

The solar charger can further include a charging circuit provided between the solar panel and the charge emitting contacts to convert the solar energy to electrical energy that is suitable for transmission in trickle charging the battery.

The solar panel can be easily manipulated by a user to be removed from the battery compartment cover, such as for replacement or for re-use in another solar charger in another device. The solar panel can cover substantially the entire external surface area of the outer face of the battery compartment cover.

In another aspect, the present invention provides an electrical device having a removable solar charger. The electrical device, which can be a mobile device, includes a battery and a removable battery compartment cover. A solar panel is disposed on an outer face of the battery compartment cover to absorb light and convert solar energy to electrical

energy to provide charge to the battery. The inner face of the battery compartment cover is in electrical communication with the solar panel and the battery to trickle charge the battery while the battery remains in the electrical device. Other features similar to those described in relation to the first aspect can be provided in this second aspect.

Other aspects and features of the present invention will become apparent to those ordinarily skilled in the art upon review of the following description of specific embodiments of the invention in conjunction with the accompanying figures.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the present invention will now be described, by way of example only, with reference to the attached Figures, wherein:

Figs. 1 and 2 are front and rear perspective views, respectively, of a known mobile device;

Fig. 3 is a rear perspective view of a mobile device comprising a removable battery cover charger according to an embodiment of the present invention;

Fig. 4 illustrates the inside of the removable battery cover charger of Fig. 3 as well as a battery to be charged; and

Fig. 5 is an exploded view illustrating a mobile device, battery and removable battery cover charger according to an embodiment of the present invention.

DETAILED DESCRIPTION

Generally, the present invention provides a removable solar charger to charge a battery powering an electrical device, such as a mobile device. A solar panel of the removable solar charger is preferably provided on an outside face of a user-removable battery compartment cover. Charging contacts on the inside of the battery compartment cover are in electrical communication with the battery to trickle charge the battery when the cover is closed. The solar charger battery compartment cover and/or battery for a particular device can be purchased separately from the device allowing a user to retrofit a current device not originally designed for solar charging while the battery is in place. Alternatively, a new electrical device can be manufactured with the removable solar panel charger battery cover, modified battery (or other necessary components) to allow for trickle charging.

While some known approaches provide solar panels on mobile devices, such as mobile phones or smart phones, these are typically provided in a mobile device specifically adapted for that purpose. Embodiments of the present invention provide a solar charger for a mobile device that is easily user-removable and user-replaceable, and can be retrofitted to existing mobile devices that were not originally intended to allow the user to charge the battery using solar power while it is in the device.

While embodiments of the present invention are described herein primarily in relation to a mobile device, a worker skilled in the art will appreciate that the solar panel charger system can be used for any electrical device from alarm clocks to desk clocks to virtually any device containing a battery or backup battery and having a battery compartment cover. Of particular value to a user is when the system is used to trickle-charge portable devices such as cell phones, mobile messaging devices, or media players where the ability to charge the device is limited or inconvenient and where high demands are placed on the battery.

Figs. 1 and 2 are a front and rear perspective views, respectively, of a known mobile device 100. While this mobile device is a mobile phone, it is to be understood that an electrical device or mobile device as referred to herein can include any portable device powered by battery including a mobile phone, smart phone, wireless communications device, media player, or any other similar device as known to one of ordinary skill in the art. Fig. 2 shows a conventional removable battery cover 102 having no other functionality than to cover and protect the battery and other internal circuitry in the battery compartment.

Fig. 3 is a rear perspective view of a mobile device comprising a removable battery cover solar charger 104 according to an embodiment of the present invention. In this embodiment, the solar charger includes a solar panel 106 provided on an outside facing portion of the removable battery cover. Preferably, the solar panel 106 covers substantially the entire external surface area of the battery cover. The solar panel 106 absorbs light and converts solar energy to electrical energy, which is then used to charge the mobile device's battery while the battery remains in the mobile device, and can be while the device is operating.

In another embodiment (not shown), the solar panel 106 is removable from the battery compartment cover. When an electrical device reaches end of life, rather than

disregarding the solar panel, it can be reused on another electrical device's battery cover compartment. From a manufacturing perspective, manufacturers can make battery compartment covers and solar panels removable therefrom, (and the components could be sold separately) to maximize the re-use of the solar panels.

Fig. 4 illustrates the inside of the removable battery cover charger 104 of Fig. 3 as well as a battery 108 that it covers. When the battery compartment cover 104 is secured in place (e.g. in a closed position), the inside thereof is in electrical communication with the battery 108 to trickle charge the battery. As shown in Fig. 4, the inside of the battery compartment cover can comprise charge emitting contacts 110, in operative connection with the solar panel, for transmitting a charge to corresponding charge receiving contacts 112 of the battery within the battery compartment. In the embodiment shown in Fig. 4, there are two charge emitting contacts 110 and two charge receiving contacts 112. The number and placement of the charge emitting and charge receiving contacts can be varied as long as they correspond with one another such that they can provide electrical contact for transmission of the charge from the solar charger to the battery when the cover is closed.

A charging circuit (not shown) can be provided between the solar panel 106 and the charge emitting contacts 110 to convert the solar energy to electrical energy that is suitable for transmission in trickle charging the battery. Such charging circuits are known to those of ordinary skill in the art, and can include such functionality as a maximum power point tracker. The charging circuit can be provided in the body of the removable battery cover, or on the inside or outside thereof.

In operation, when the solar charger battery compartment cover is in place, the solar panel, when receiving light, trickle-charges the battery so that the electrical device's operating time can be extended. The solar panel charges the battery by way of contacts on the battery which come into direct contact with the inside of the battery compartment cover which comprises the solar panel itself. The battery can be designed specially for this arrangement of trickle charging via the solar charger. In other words, the charge receiving contacts can be different from power delivery contacts on the battery, which are used to deliver power to the device.

In another embodiment, the solar charger battery compartment cover can include charge emitting contacts that extend to and are in electrical contact with the power

delivery contacts of the battery when the cover is closed. This arrangement is possible in cases where the power delivery contacts of the battery can also be used for trickle charging. In this case, the charge receiving contacts and the power delivery contacts of the battery are the same. This can eliminate the need for providing the user with a retrofit cover and retrofit battery, as only a retrofit cover would be required.

Embodiments of the present invention can provide a significant advantage by enabling the retrofitting of existing electrical devices for use with a solar panel charger. By simply replacing an existing battery compartment cover for the electrical device with a solar panel charger battery cover according to an embodiment of the present invention, the ability to charge the battery by solar power can be imparted on any number of devices. Since the space between the inside of the battery cover and the battery and the device's internal circuitry is usually limited, embodiments of the present invention can provide a solar charger battery compartment cover that is slightly thicker in profile than a battery compartment cover it is replacing, in order to fit the device while providing any extra space needed for the charging circuit.

A solar panel charger according to an embodiment of the present invention can be modified in size and shape to correspond to the shape of existing battery compartment covers and to make suitable electrical contact with the battery and/or battery contacts.

Fig. 5 is an exploded view illustrating a mobile device, a battery 110 and removable battery cover solar charger 104 according to an embodiment of the present invention. In this view, only the outer side or face of the solar charger which bears the solar panel is shown. The inner face of the charger that makes electrical contact with the battery is not shown in Fig. 5, but is shown in Fig. 4.

In an exemplary embodiment, the battery is a Lithium 3.7v / 850mAh battery, and the solar panel has 5.5v / 30mA characteristics. In another exemplary embodiment, the battery is a Lithium 3.7v/1000mA battery, and the solar panel has 5.5/60mA characteristics, and the battery door has the following measurements: 59 x 51 x 1.5mm. An additional car charger with USB connectivity can also be provided when selling the solar panel charger to a consumer, to provide a complete charging solution including the solar charger according to an embodiment of the present invention.

In another embodiment, the battery compartment cover and solar panel can extend to cover a significant portion of the face of the electrical device on which it is provided,

and can cover substantially the entire face. For example, the battery compartment cover for some mobile phones takes up a substantial part of the back of the phone; some even have the battery compartment cover taking substantially all of the real estate of the back of the mobile phone.

In the preceding description, for purposes of explanation, numerous details are set forth in order to provide a thorough understanding of the embodiments of the invention. However, it will be apparent to one skilled in the art that these specific details are not required in order to practice the invention. In other instances, well-known electrical structures and circuits are shown in block diagram form in order not to obscure the invention. For example, specific details are not provided as to whether the embodiments of the invention described herein are implemented as a software routine, hardware circuit, firmware, or a combination thereof.

The above-described embodiments of the invention are intended to be examples only. Alterations, modifications and variations can be effected to the particular embodiments by those of skill in the art without departing from the scope of the invention, which is defined solely by the claims appended hereto.

CLAIMS:

1. A removable solar charger to charge a battery that powers an electrical device, comprising:
 - a removable battery compartment cover;
 - a solar panel disposed on an outer face of the battery compartment cover to provide charge to the battery; and
 - charge emitting contacts disposed on the inner face of the battery compartment cover and in electrical communication with the solar panel and with the battery when the cover is in a closed position to trickle charge the battery while the battery remains in the electrical device.
2. The solar charger of claim 1 wherein the charge emitting contacts are in operative connection with charge receiving contacts of the battery, for transmitting a charge to the corresponding charge receiving contacts when the cover is in the closed position.
3. The solar charger of claim 2 wherein the charge receiving contacts of the battery are integral with power delivery contacts of the battery that delivery power to the device, and wherein the charge emitting contacts extend to and are in electrical contact with the power delivery contacts of the battery when the cover is in the closed position.
4. The solar charger of claim 1 further comprising a charging circuit provided between the solar panel and the charge emitting contacts to convert the solar energy to electrical energy that is suitable for transmission in trickle charging the battery.
5. The solar charger of claim 1 wherein the solar panel is easily manipulated by a user to be removed from the battery compartment cover.
6. The solar charger of claim 1 wherein the solar panel covers substantially the entire external surface area of the outer face of the battery compartment cover.
7. The solar charger of claim 1 wherein the electrical device is a mobile device.

8. An electrical device having a removable solar charger, comprising:
a battery;
a removable battery compartment cover;
a solar panel disposed on an outer face of the battery compartment cover to absorb light and convert solar energy to electrical energy to provide charge to the battery; and
charge emitting contacts disposed on the inner face of the battery compartment cover and in electrical communication with the solar panel and with the battery when the cover is in a closed position to trickle charge the battery while the battery remains in the electrical device.
9. The electrical device of claim 8 wherein the battery comprises charge receiving contacts, and the charge emitting contacts are in operative connection with the solar panel and with the charge receiving contacts of the battery when the cover is in the closed position, for transmitting a charge to the corresponding charge receiving contacts.
10. The electrical device of claim 9 wherein the charge receiving contacts of the battery are integral with power delivery contacts of the battery that delivery power to the device, and wherein the charge emitting contacts extend to and are in electrical contact with the power delivery contacts of the battery when the cover is in the closed position.
11. The electrical device of claim 8 further comprising a charging circuit provided between the solar panel and the charge emitting contacts to convert the solar energy to electrical energy that is suitable for transmission in trickle charging the battery.
12. The electrical device of claim 8 wherein the solar panel is user-removable from the battery compartment cover.
13. The electrical device of claim 8 wherein the solar panel covers substantially the entire external surface area of the outer face of the battery compartment cover.
14. The electrical device of claim 8 wherein the electrical device is a mobile device.

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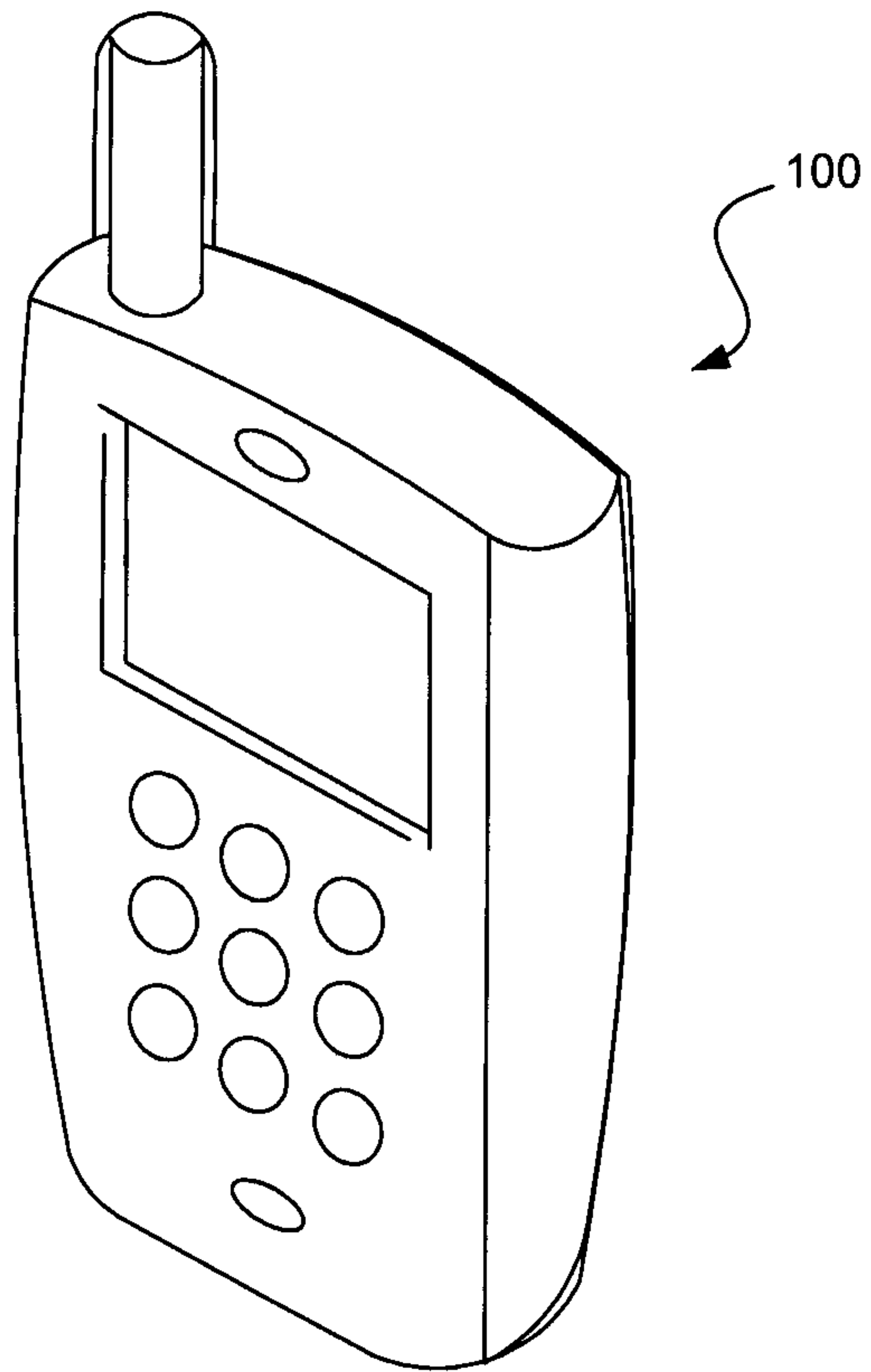


FIG. 1

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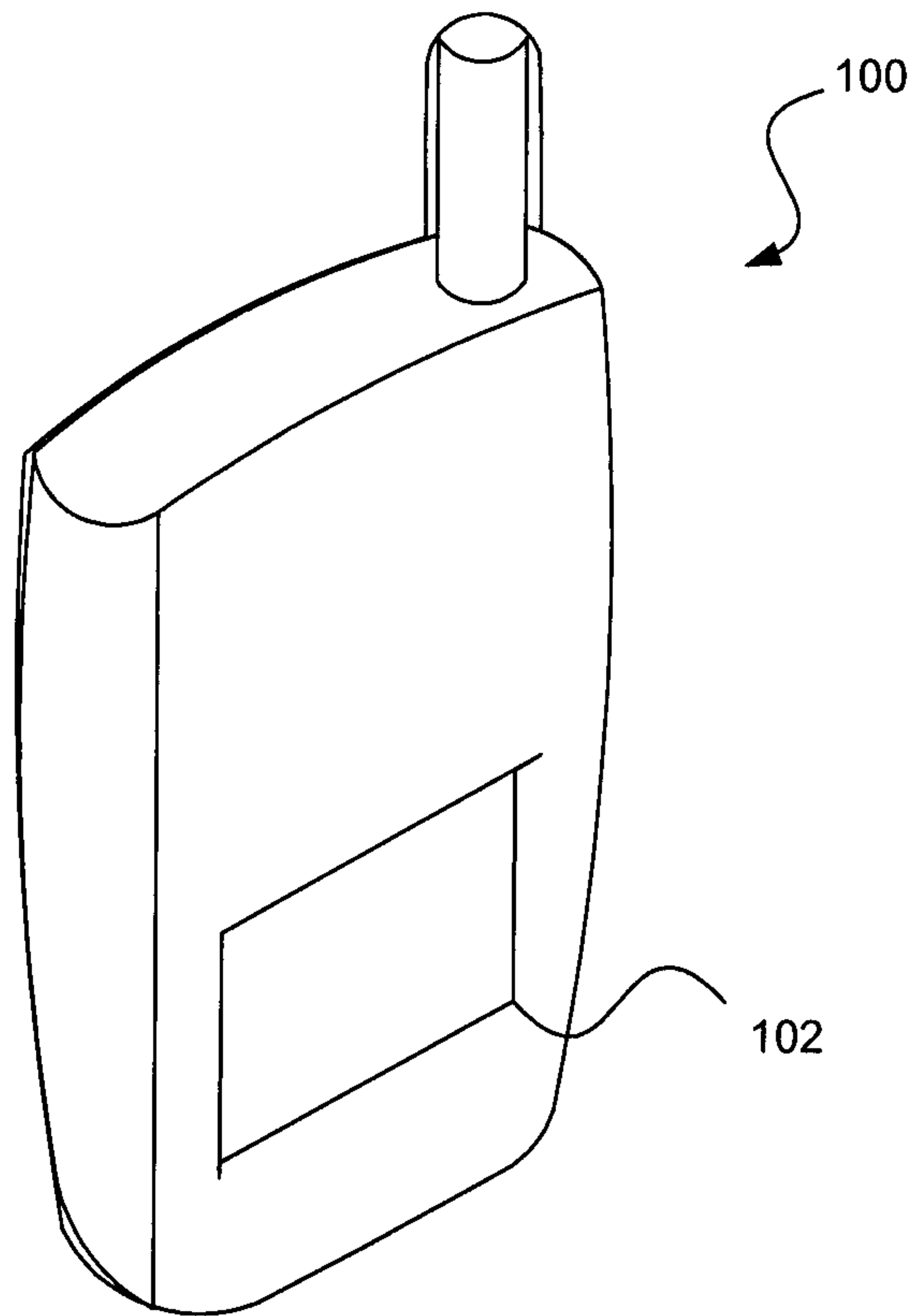


FIG. 2

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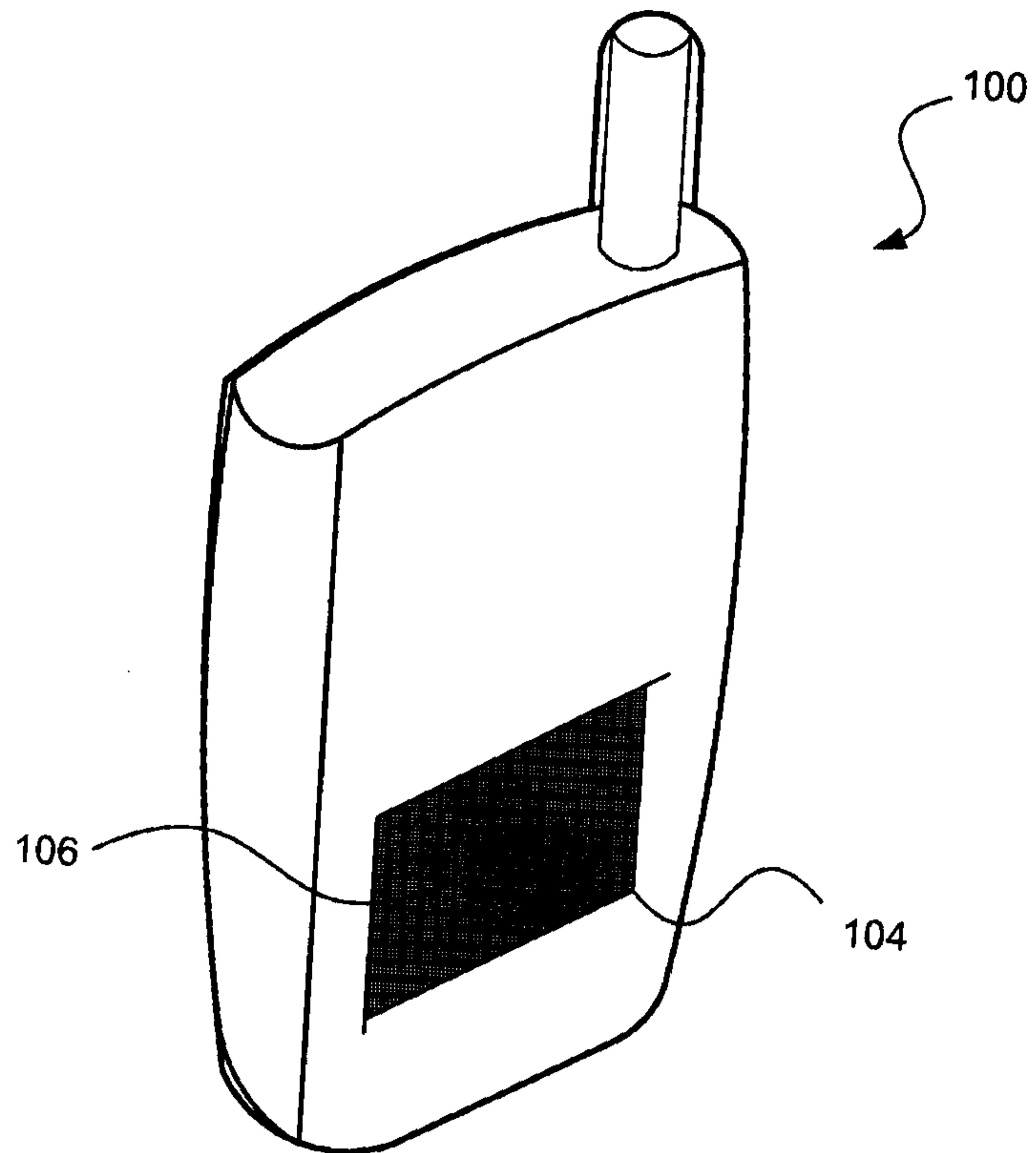


FIG. 3

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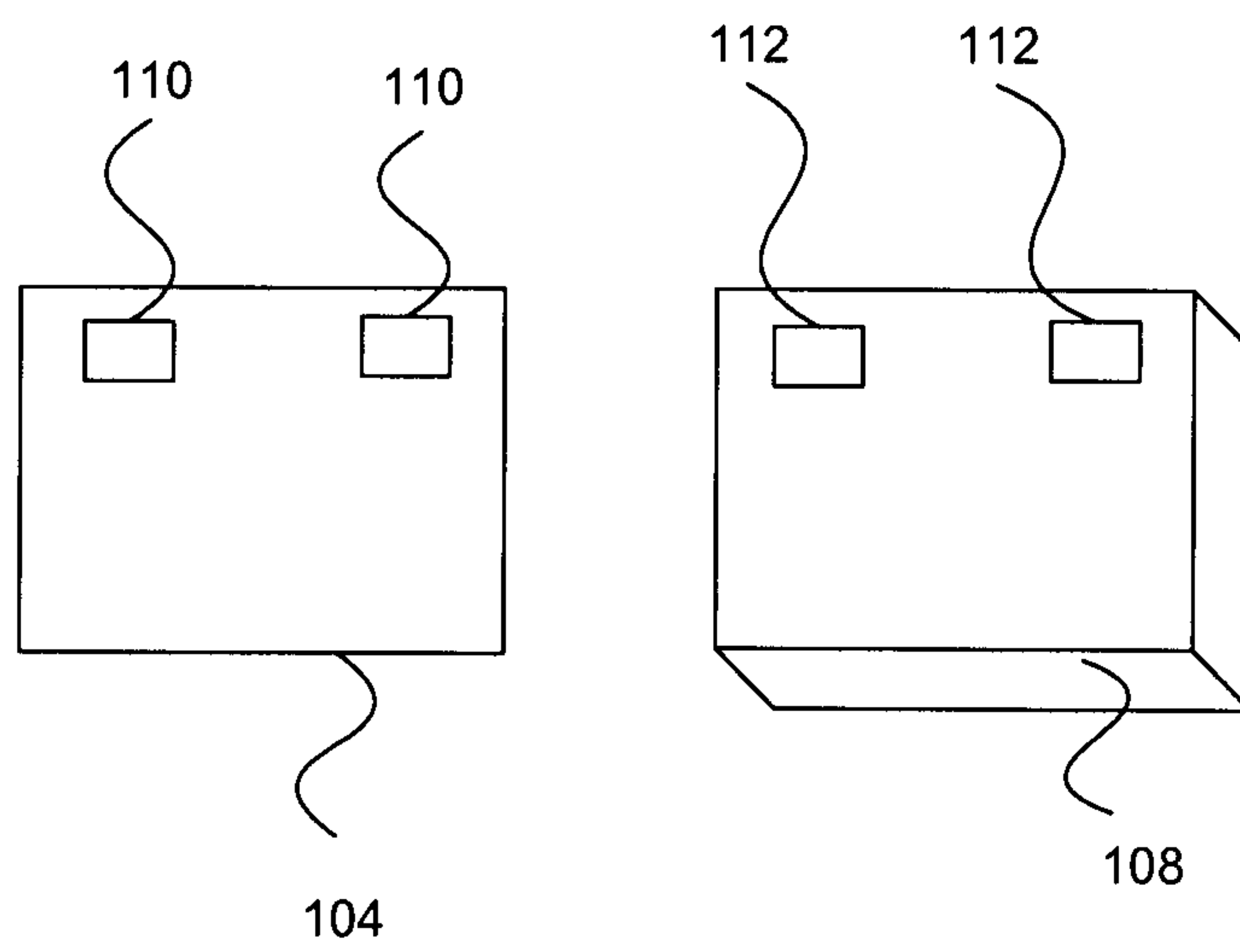


FIG. 4

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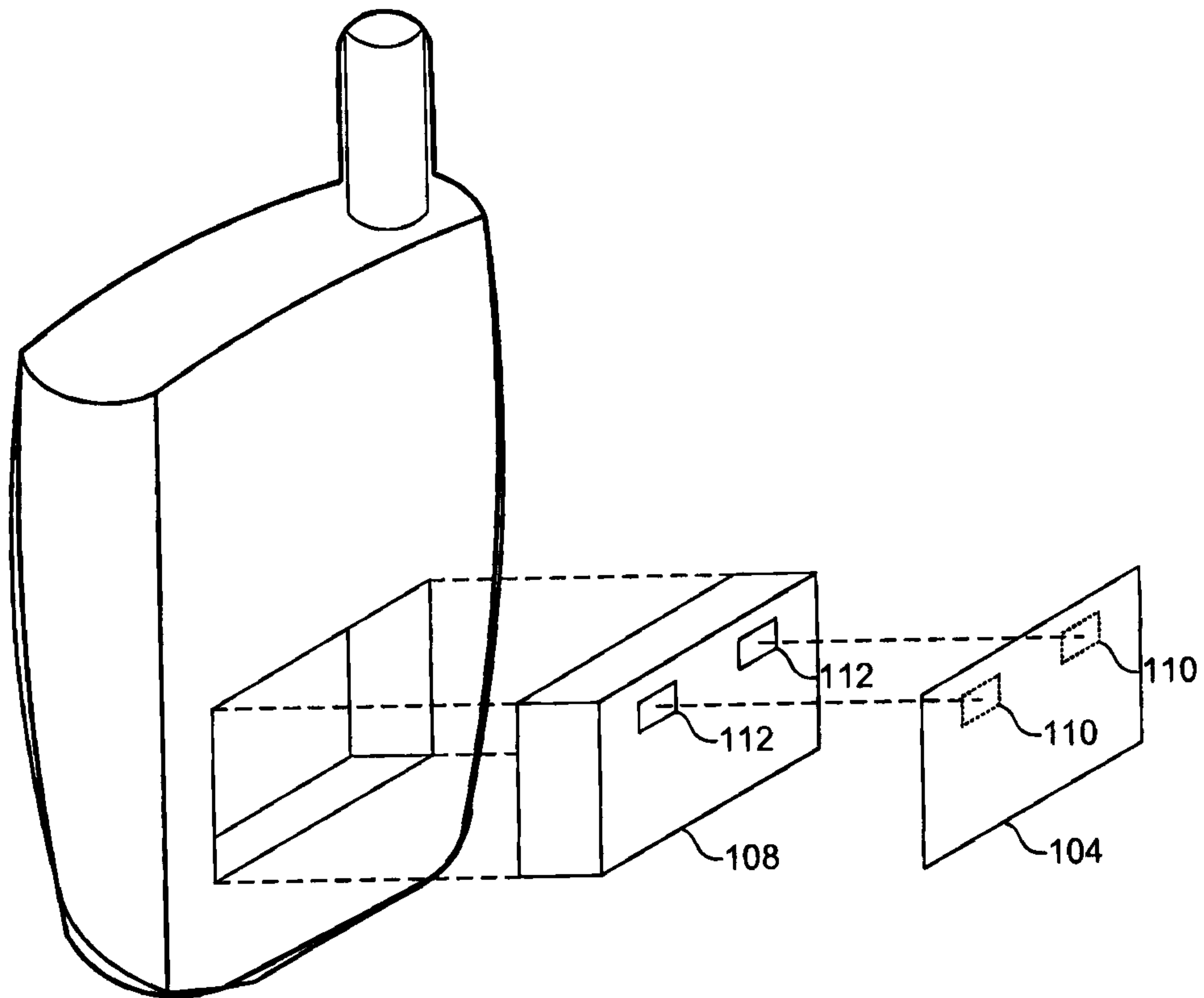


FIG. 5

