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(54) **WIRELESS POWER TRANSMISSION DEVICE**

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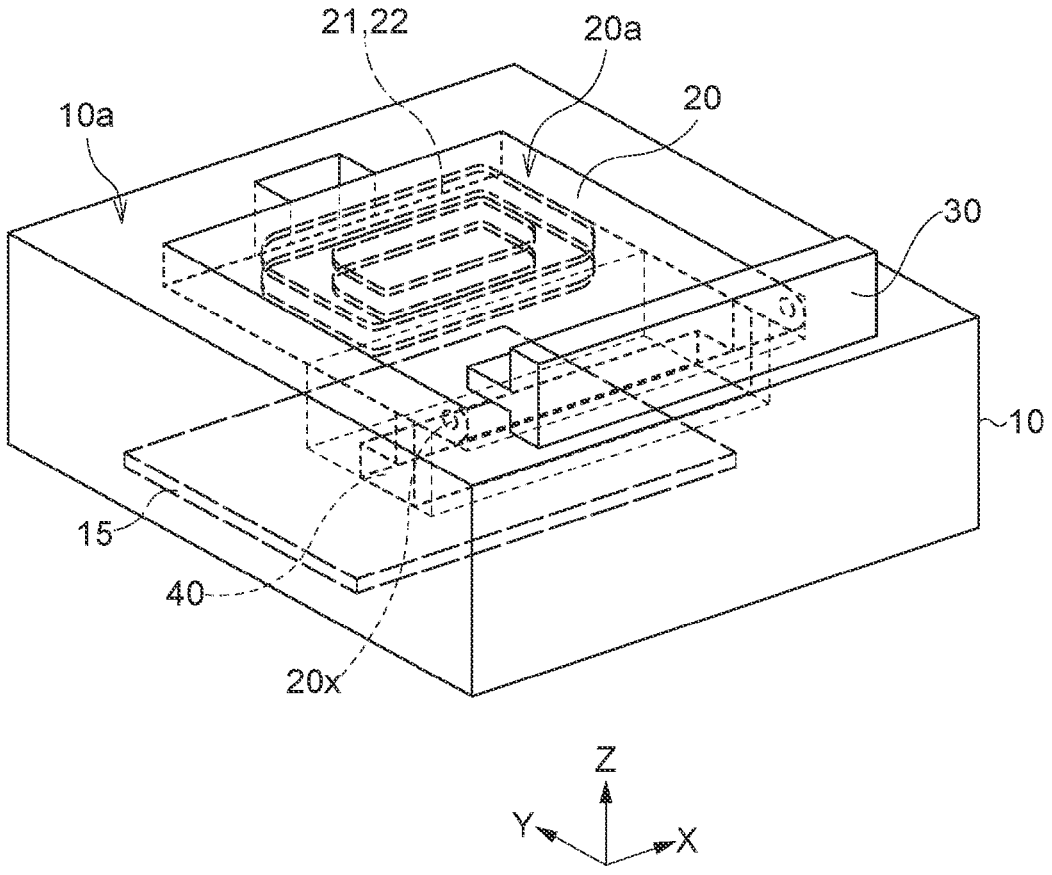
(57) **ABSTRACT**

A wireless power transmission device is provided with a coil unit having first and second main surfaces and configured to be movable between a first position as a laid position of the first main surface and a second position as an erected position of the first main surface, a first coil housed in the coil unit so as to face the first main surface, and a first support member having a facing surface disposed separated from the first main surface by a first distance when the coil unit is at the second position.

1



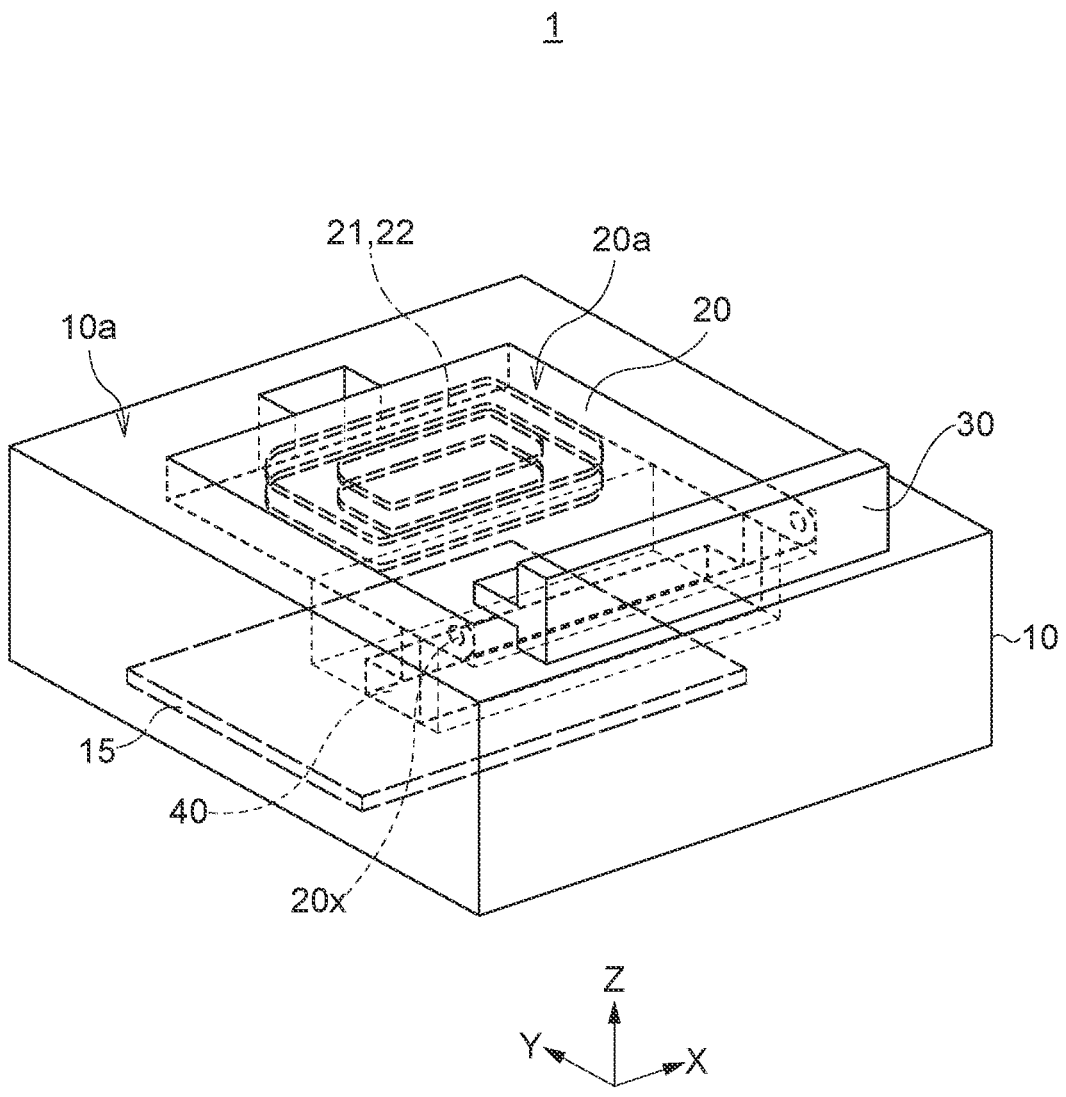


FIG.1

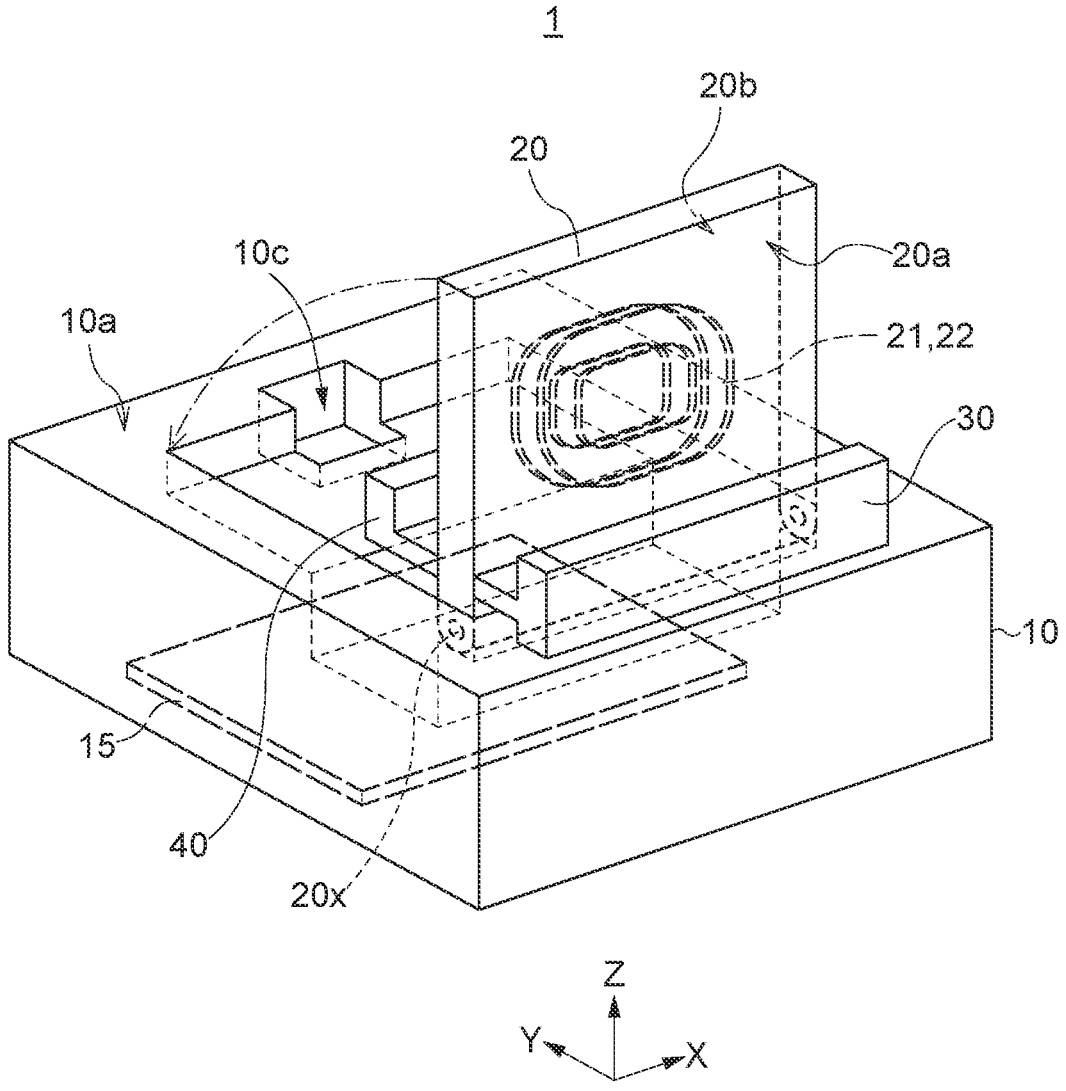


FIG.2

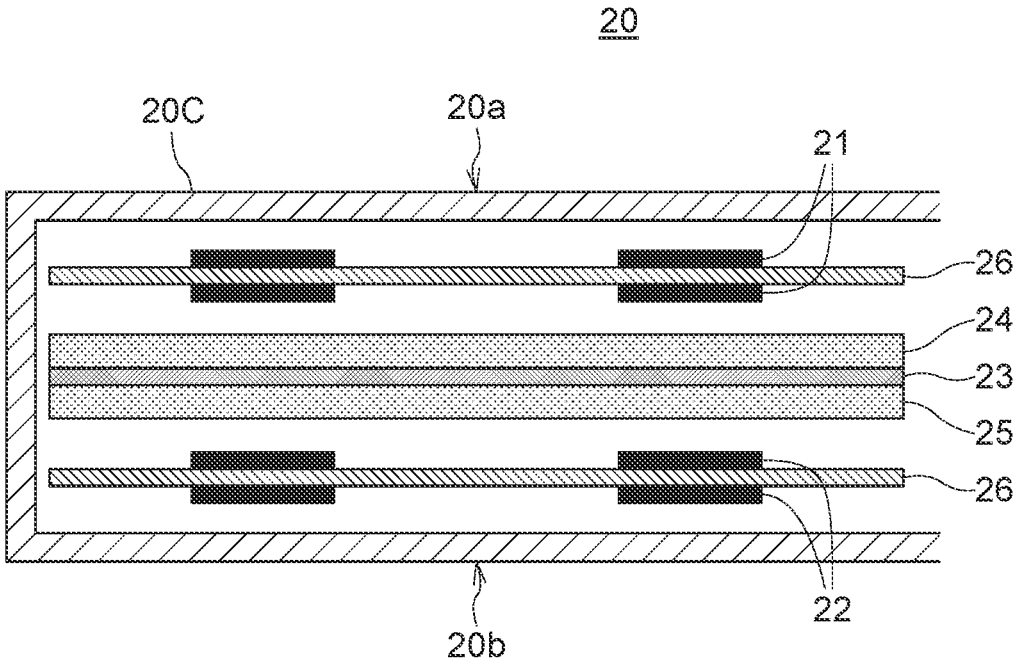


FIG.3

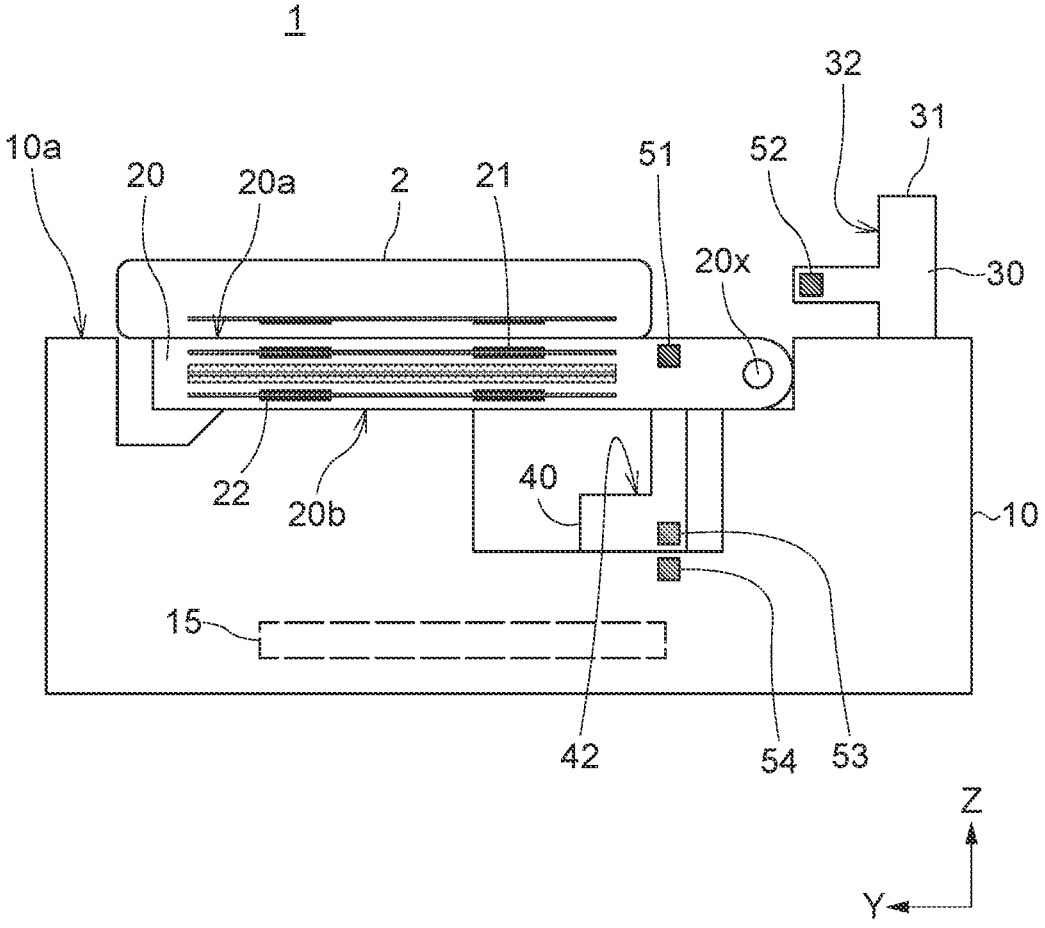
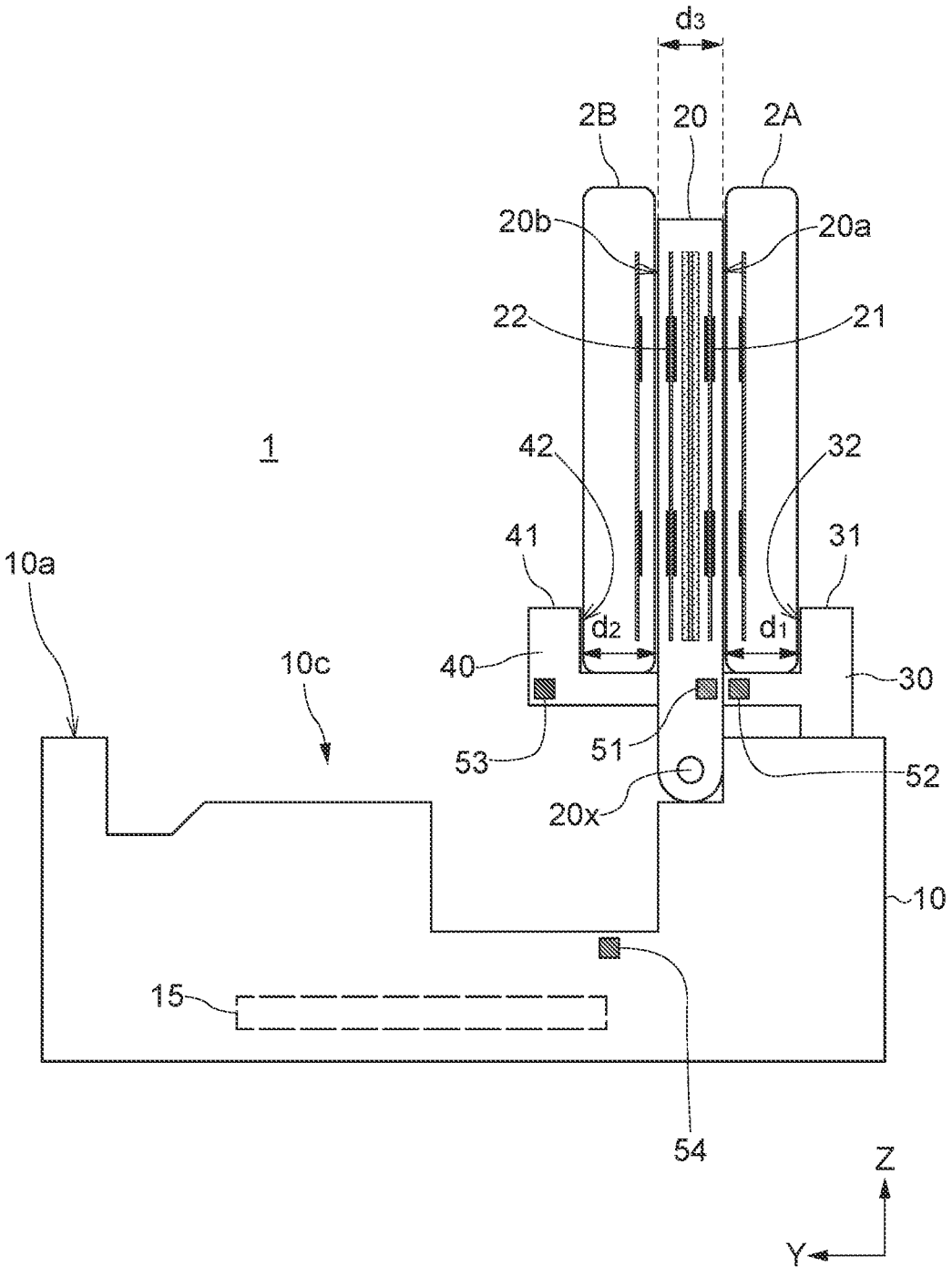


FIG.4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2B
20
2A
20b
20a
22
21
1
42
32
41
31
10a
d2
d1
10c
40
30
53
51
52
20x
10
15
54
Z
Y

FIG.5

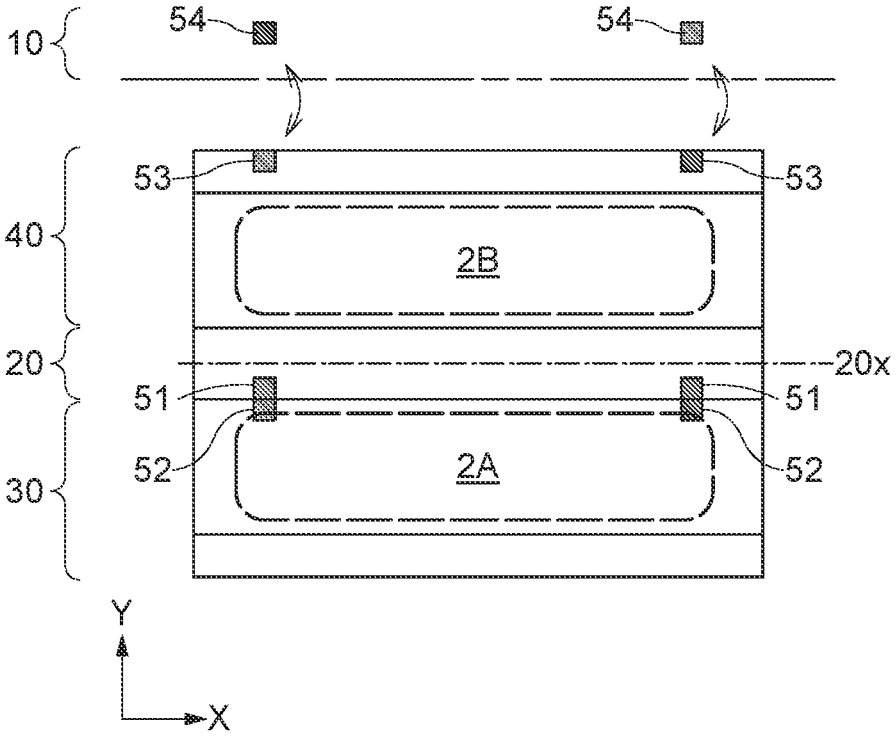
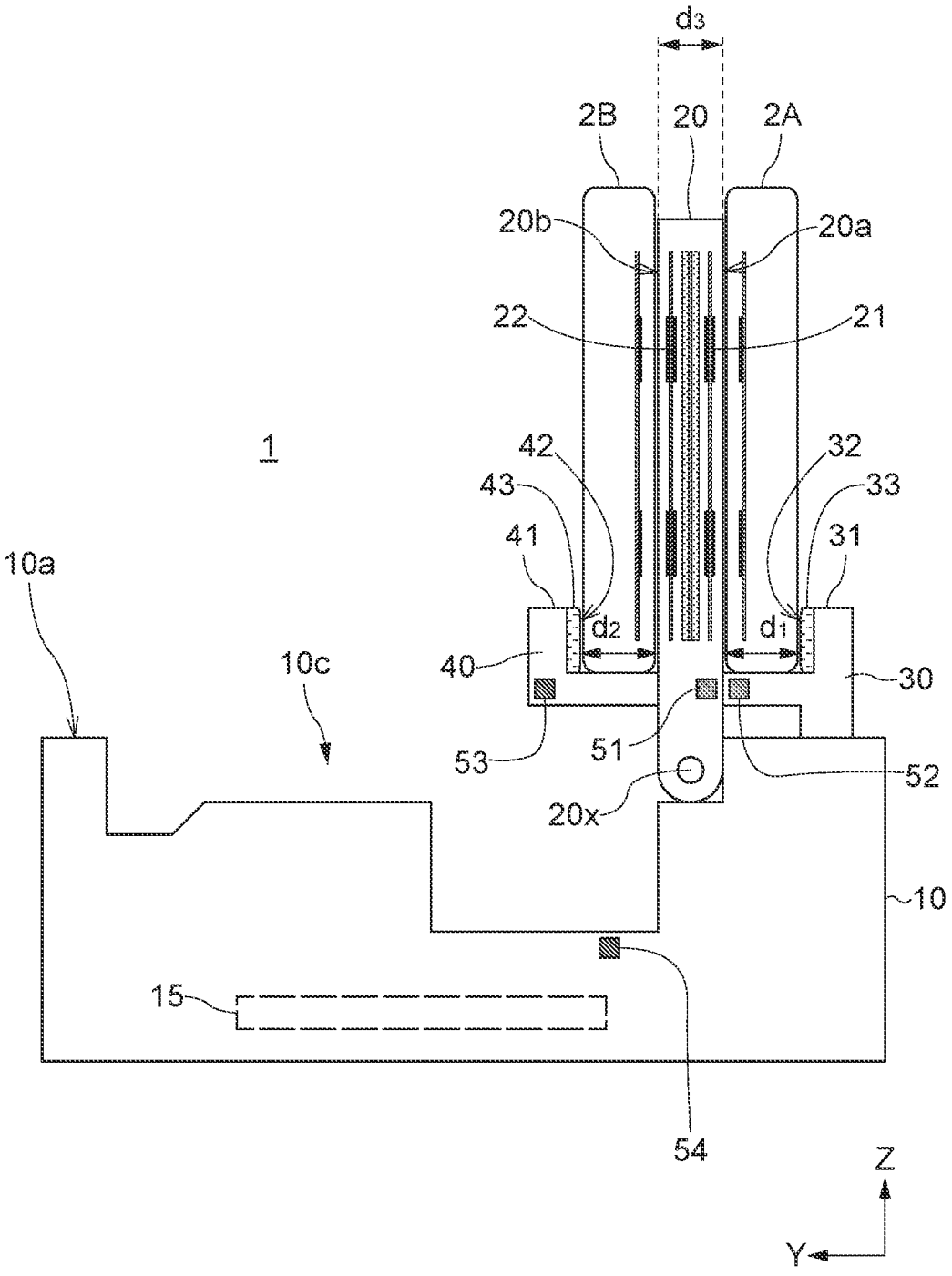


FIG.6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2B
20
2A
20b
20a
22
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1
42
32
43
33
41
31
10a
d2
d1
10c
40
30
53
51
52
20x
10
15
54
Z
Y

FIG.7

WIRELESS POWER TRANSMISSION DEVICE

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of Japanese Patent Application No. 2022-049248, filed on Mar. 25, 2022, the entire disclosure of which is incorporated by reference herein.

BACKGROUND

[0002] The present disclosure relates to a wireless power transmission device.

[0003] A wireless charger is known as a charger for charging a battery of a mobile device such as a smartphone. The wireless charger can charge an electronic device without cable connection, so that a use enjoy much convenience.

[0004] As for such a wireless charger, JP 2018-075875A describes that a portable electronic device is charged by a noncontact power feeder housed in a holder for holding the electronic device. The electronic device is charged in a so-called flatbed position. Further, J P 2021-013292A describes a wireless charger capable of efficiently charging a plurality of user terminals using a tilt function at a portion where the user terminals are installed.

[0005] JP 2013-158148A describes a charger capable of charging two electronic devices simultaneously through noncontact power feeding utilizing electromagnetic induction. This charger has two housing parts formed in a cabinet of a charging base. Two portable electronic devices are housed in the two respective housing parts, and reception coils of the respective portable electronic devices are disposed facing each other across a power feeding coil.

[0006] WO 2018/092569 A1 describes an electronic device having a configuration in which a first body incorporating a first coil antenna and a display and a second body incorporating a second coil antenna are connected to each other through a hinge part, and a metal layer is interposed between the first and second coil antennas when the first and second bodies are made to overlap each other.

[0007] JP 2015-121377A describes a so-called dual-coil type power transmission coil unit including a first spiral coil formed on a first surface of a multilayer substrate, a second spiral coil formed on a second surface on the opposite side of the first surface, and a layer with a large dielectric loss tangent provided between the first and second spiral coils.

[0008] With the recent spread of battery mounting devices including smartphones, many users own a plurality of devices to be charged. Further, various charging forms are required (charging in a vertical position, charging in a flatbed position, etc.) according to the use purpose during charging. Under such circumstances, there is required a multifunctional wireless power transmission device capable of meeting such various needs.

SUMMARY

[0009] A wireless power transmission device according to one embodiment of the present disclosure includes a coil unit, a first coil, and a first support member. The coil unit has first and second main surfaces and configured to be movable between a first position as a laid position of the first main surface and a second position as an erected position of the first main surface. The first coil is housed in the coil unit so as to face the first main surface. The first support member has a facing surface disposed separated from the first main surface by a first distance when the coil unit is at the second position.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIG. **1** is a schematic perspective view illustrating the configuration of a wireless power transmission device according to one embodiment of the present disclosure, and specifically showing a state where a coil unit is in a laid position.

[0011] FIG. **2** is a schematic perspective view illustrating the configuration of a wireless power transmission device according to one embodiment of the present disclosure, and specifically showing a state where the coil unit is in an erected position.

[0012] FIG. **3** is a schematic cross-sectional view illustrating the configuration of the coil unit **20**.

[0013] FIG. **4** is a schematic cross-sectional side view of the wireless power transmission device and illustrates a state where the coil unit is in the laid position.

[0014] FIG. **5** is a schematic cross-sectional side view of the wireless power transmission device and illustrates a state where the coil unit is in the erected position.

[0015] FIG. **6** is a schematic diagram illustrating setting positions of the magnets.

[0016] FIG. **7** is a schematic cross-sectional side view illustrating a modification of the first and second support members.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0017] An object of the present disclosure to provide a highly convenient wireless power transmission device capable of simultaneously charging a plurality of devices to be charged and responding to both charging in a flatbed position and charging in a vertical position.

[0018] Hereinafter, preferred embodiments of the present disclosure will be described in detail with reference to the accompanying drawings.

[0019] FIGS. **1** and **2** are schematic perspective views illustrating the configuration of a wireless power transmission device according to one embodiment of the present disclosure. FIG. **1** illustrates a state where a coil unit is in a laid position, and FIG. **2** illustrates a state where the coil unit is in an erected position.

[0020] As illustrated in FIGS. **1** and **2**, a wireless power transmission device **1** according to the present embodiment includes a device body **10** and a coil unit **20** freely turnably provided with respect to the device body **10**. The coil unit incorporates a planar loop coil (power transmission coil) for wireless power feeding, and the device body **10** houses therein elements (e.g., a drive circuit **15** for the power transmission coil) required to constitute the wireless power transmission device **1**, excluding the power transmission coil.

[0021] The coil unit **20** is a plate-like movable member having an almost rectangular shape. The coil unit **20** is axially supported at its one end portion (base end) in the width direction perpendicular to the longitudinal direction by a turning support shaft **20***x* and can thereby turn about the turning support shaft **20***x*. That is, the coil unit **20** is configured to be foldable with respect to the device body **10**.

[0022] In a state where the coil unit **20** is in a folded state (in the laid position) as illustrated in FIG. **1**, the coil unit **20** is housed in a housing space **10***c* (cavity) provided in an upper surface **10***a* of the device body **10**. In this state, one main surface (first main surface **20***a*) of the coil unit **20** is flush with the upper surface **10***a* of the device body **10**. When the coil unit **20** is in the laid position, it is possible to charge a device to be charged such as a smartphone on the first main surface **20***a* of the coil unit **20** in a flatbed position. When the device body **10** is installed such that the upper surface **10***a* thereof is parallel to a horizontal plane, the laid position of the coil unit **20** is a horizontal position.

[0023] On the other hand, when the end portion of the coil unit is lifted from the laid position (first position) illustrated in FIG. **1**, the coil unit **20** turns by 90° about the turning support shaft **20***x* to assume the erected position (second position), as illustrated in FIG. **2**. When the coil unit **20** is in the erected position, wireless charging can be performed in a state where a device to be charged is in a vertical position. The erected position of the coil unit **20** need not strictly be vertical but may be slightly tilted. However, when double-sided charging is performed, the coil unit **20** is preferably not tilted.

[0024] Although details will be described later, a first support member **30** is provided on the upper surface **10***a* of the device body **10**. When a device to be charged is put in the vertical position on the first main surface **20***a* side in a state where the coil unit **20** is in the erected position, the first support member **30** holds the device to be charged. The first support member **30** is disposed close to the end portion of the coil unit **20** on the side opposite to the housing space **10***c* of the coil unit **20** with respect to the turning support shaft **20***x*.

[0025] Further, a second support member **40** is provided on a second main surface **20***b* of the coil unit **20**. The second main surface **20***b* is the surface opposite to the first main surface **20***a*. When a device to be charged is put in the vertical position on the second main surface **20***b* side in a state where the coil unit **20** is in the erected position, the second support member **40** holds the device to be charged. Unlike the first support member **30**, the second support member **40** is fixed to the coil unit **20**, so that it turns together with the coil unit **20**, that is, when the coil unit **20** is in the laid position, the second support member **40** is housed in the housing space **10***c*. As described above, the second support member **40** moves in conjunction with the coil unit **20**.

[0026] FIG. **3** is a schematic cross-sectional view illustrating the configuration of the coil unit **20**.

[0027] As illustrated in FIG. **3**, the coil unit **20** includes a thin coil case **20**C having the first and second main surfaces **20***a* and **20***b*, a first coil **21** housed in the coil case **20**C so as to face the first main surface **20***a*, a second coil **22** housed in the coil case **20**C so as to face the second main surface **20***b*, a conductor sheet **23** provided between the first and second coils **21** and **22**, a first magnetic sheet **24** provided between the first coil **21** and the conductor sheet **23**, and a second magnetic sheet **25** provided between the second coil **22** and the conductor sheet **23**. Although the first and second coils **21** and **22** have substantially the same shape and size in the present embodiment, they may differ from each other in shape and size.

[0028] The first coil **21** serves as a power transmission coil used for charging a device to be charged put on the first main surface **20***a* side of the coil unit **20**. Thus, the first coil **21** is used both when the coil unit **20** is in the laid position and when it is in the erected position.

[0029] The second coil **22** serves as a power transmission coil used for charging a device to be charged put on the second main surface **20***b* side of the coil unit **20**. Thus, the second coil **22** is used only when the coil unit **20** is in the erected position and not used when it is in the laid position. When the coil unit **20** is in the laid position, the second coil **22** is housed in the housing space **10***c*.

[0030] The conductor sheet **23** is provided between the first and second coils **21** and **22**, so that it is possible to prevent mutual interference between the first and second coils **21** and **22** to thereby achieve stable charging of a plurality of devices to be charged. Further, the first magnetic sheet **24** that forms a magnetic path for magnetic flux generated from the first coil **21** is provided between the first coil **21** and the conductor sheet **23**, and the second magnetic sheet **25** that forms a magnetic path for magnetic flux generated from the second coil **22** is provided between the second coil **22** and the conductor sheet **23**, whereby charging efficiency can be improved.

[0031] In the present embodiment, the first and second coils **21** and **22** each include two series-connected planar coil patterns on the respective front and back surfaces of a substrate **26** to constitute a single coil. The planar coil patterns are each a conductor pattern made of a good conductor such as copper and wound in a plurality of turns in a planar shape around the coil axis. For example, the two planar coil patterns on the respective front and back surfaces of the substrate **26** are connected to each other at the inner peripheral ends. However, the first and second coils **21** and **22** may each include a single planar coil pattern. With this configuration, a very thin coil having large inductance can be achieved. The substrate **26** is not particularly limited in material and may be made of a transparent or translucent flexible insulating material such as PET (Polyethylene Terephthalate) resin. Alternatively, the substrate **26** may be a flexible substrate obtained by impregnating glass cloth with epoxy-based resin.

[0032] More specifically, the first and second coils **21** and **22** are each constituted by a planar loop coil (planar coil) having a roughly oval or elliptic shape with different dimensions in the vertical and horizontal directions in a plan view. The major axis direction of the planer loop coil is parallel to the extending direction (X-direction) of the turning support shaft **20***x* of the coil unit **20**. That is, the first and second coils **21** and **22** are each housed in the coil case **20**C such that the longitudinal direction thereof is perpendicular to the normal direction of the first and second main surfaces **20***a* and **20***b* and is directed to a direction perpendicular to the erected direction in a state where the coil unit **20** is in the erected position. The first and second coils **21** and **22** may each have a shape with different dimensions in the vertical and horizontal directions in a plan view, other than the oval or elliptic shape. The vertical dimension of each of the first and second coils **21** and **22** is defined as the dimension thereof in the vertical direction (erected direction) when the coil unit **20** is in the erected position, and the horizontal dimension of each of the first and second coils **21** and **22** is defined as the dimension thereof in a direction perpendicular to the erected direction, i.e., in the horizontal direction when the coil unit **20** is in the erected position.

[0033] FIGS. **4** and **5** are schematic cross-sectional side views of the wireless power transmission device. FIG. **4** illustrates a state where the coil unit is in the laid position, and FIG. **5** illustrates a state where the coil unit is in the erected position.

[0034] As illustrated in FIGS. **4** and **5**, the base end of the coil case **20**C of the coil unit **20** is axially supported on the device body **10**, whereby the coil unit **20** can be freely turned about the turning support shaft **20***x*. As illustrated in FIG. **4**, when the coil unit is in the laid position, the first main surface **20***a* of the coil unit **20** is flush with the upper surface **10***a* of the device body **10**, and thus a device **2** to be charged, such as a smartphone, can be charged in a state where it is put in the flatbed position on the first main surface **20***a* of the coil unit **20**.

[0035] The first support member **30** is vertically installed on the upper surface **10***a* of the device body **10**. The first support member **30** is disposed on the side opposite to the housing space **10***c* of the coil unit **20** with respect to the turning support shaft **20***x* of the coil unit **20** and close to the outer peripheral end of the device body **10**. Thus, in a state where the coil unit **20** is in the erected position, the height of the center position of the first coil **21** is higher than the height of a leading end engagement part **31** of the first support member in the erected direction. As a result, when a device **2**A to be charged is set in the first support member **30**, the center thereof is brought close to the center of the first coil **21**, so that it is possible to perform efficient charging while stably holding the device **2**A to be charged.

[0036] The leading end engagement part **31** of the first support member **30** has a facing surface **32** separated from the first main surface **20***a* by a predetermined distance d_1 (first distance) when the coil unit **20** is in the erected position and thereby holds the side end portion of the device **2**A to be charged between itself and the first main surface **20***a*. This maintains the erected position of the device **2**A to be charged placed on the first main surface **20***a* side of the coil unit **20**. As an alternative, the lower end portion of the device **2**A to be charged may be held between the first support member **30** and the first main surface **20***a* of the coil unit **20**.

[0037] In the present embodiment, the first coil **21** is housed in the coil case **20**C such that the longitudinal direction thereof is perpendicular to the normal direction of the first and second main surfaces **20***a* and **20***b* and is directed to a direction perpendicular to the erected direction in a state where the coil unit **20** is in the erected position. Thus, in a configuration where the side end portion of the device **2**A to be charged is held, reduction in charging efficiency can be suppressed even if the device **2**A to be charged shifts in position in the extending direction (X-direction) of the turning support shaft **20***x* of the coil unit **20**.

[0038] Although the leading end engagement part **31** of the first support member **30** has a portion that protrudes toward the first main surface **20***a* of the coil unit **20** in the present embodiment, but this configuration is not essential. That is, the device **2**A to be charged may be held between the first support member and the first main surface **20***a* of the coil unit **20** with the side end or lower end portion of the device **2**A to be charged contacting the upper surface **10***a* of the device body **10**. Further, when the wireless power transmission device **1** is provided in a console box of a vehicle, the first support member **30** may be constituted by an inner wall of the console box.

[0039] In the present embodiment, a magnet **51** (first magnet) is provided on the first main surface **20***a* side of the coil unit **20**, and a magnet **52** (second magnet) corresponding to the magnet **51** is provided in the first support member **30**. The magnet **52** is disposed at a position opposite to the magnet **51** in a state where the coil unit **20** is in the erected position, thus generating attraction force between the magnets **51** and **52**, which can make the erected position of the coil unit **20** stable.

[0040] As illustrated in FIG. **6**, a plurality of the magnets **51** may be provided in the coil unit **20** and disposed at both the left and right positions of the coil case **20**C which are closer to both end portions thereof in the width direction (X-direction) than to the center in the same direction. More specifically, the magnets **51** are disposed close to both end sides of the coil case **20**C in a direction perpendicular to the normal direction of the first and second main surfaces **20***a* and **20***b* of the coil unit **20** and in a direction perpendicular to the erected direction in a state where the coil unit **20** is in the erected position than to the center of the coil case **20**C in the same direction. The magnets **52** of the same number as the number of the magnets **51** may be provided at positions in the first support member **30** that are opposite to the magnets **51**. In the present embodiment, two pairs of magnets **51** and **52** are respectively provided in the vicinity of one end portion and the other end portion of the coil case **20**C in the width direction.

[0041] The second support member **40** is provided on the second main surface **20***b* of the coil unit **20**. The second support member **40** is disposed closer to the turning support shaft **20***x* than to the center of the coil unit **20**. Thus, in a state where the coil unit **20** is in the erected position, the height of the center position of the second coil **22** is higher than the height of a leading end engagement part **41** of the second support member **40** in the erected direction. As a result, when a device **2**B to be charged is set in the second support member **40**, the center thereof is brought close to the center of the second coil **22**, so that it is possible to perform efficient charging while stably holding the device **2**B to be charged.

[0042] The leading end engagement part **41** of the second support member **40** has a facing surface **42** separated from the second main surface **20***b* by a predetermined distance d_2 (second distance) when the coil unit **20** is in the erected position and thereby holds the side end portion of the device **2**B to be charged between itself and the second main surface **20***b*. This maintains the erected position of the device **2**B to be charged placed on the second main surface **20***b* side of the coil unit **20**. As an alternative, the lower end portion of the device **2**B to be charged may be held between the second support member **40** and the second main surface **20***b* of the coil unit **20**.

[0043] In the present embodiment, a magnet **53** (third magnet) is provided on the second main surface **20***b* side of the coil unit **20**, and a magnet **54** (fourth magnet) corresponding to the magnet **53** is provided in the device body **10**. The magnet **53** may be disposed at the end surface of the second support member **40**, and the magnet **54** is disposed at a position opposite to the magnet **53** in a state where the coil unit **20** is in the laid position. The magnets **53** and **54** may be disposed with polarities attracting each other or with polarities repelling each other. In the former case, it is possible to make the laid position stable and to prevent unintended erection of the coil unit **20**, thus stabilizing a

state where the coil unit is folded. In the latter case, repelling force is generated between the magnets **53** and **54** when the coil unit is in the laid position to thereby achieve smooth erection of the coil unit **20** from the device body **10**. Further, in the latter case, repelling force is generated between the magnets **53** and **54** during the operation of folding the coil unit **20** from the erected position to the laid position to thereby prevent damage of the coil unit **20** due to contact with the device body **10**.

[0044] As illustrated in FIG. **6**, a plurality of the magnets **53** may be provided in the coil unit **20** and disposed at both the left and right positions of the second support member **40** which are closer to both end portions thereof in the width direction (X-direction) than to the center in the same direction. More specifically, the magnets **53** are disposed close to both end sides of the second support member **40** in a direction perpendicular to the normal direction of the first and second main surfaces **20***a* and **20***b* of the coil unit **20** and in a direction perpendicular to the erected direction in a state where the coil unit **20** is in the erected position than to the center of the second support member **40** in the same direction. The magnets **54** of the same number as the number of the magnets **53** may be provided at positions in the device body **10**. In the present embodiment, two pairs of magnets **53** and **54** are respectively provided in the vicinity of one end portion and the other end portion of the second support member in the width direction.

[0045] In the present embodiment, the coil case **20**C is very small in thickness. Thus, a distance d_3 between the first and second main surfaces **20***a* and **20***b* of the coil case **20**C may be smaller than the first distance d_1 between the first main surface **20***a* and the first support member **30** and the second distance d_2 between the second main surface **20***b* and the second support member **40**. This can reduce the size and weight of the movable part of the coil case **20**C.

[0046] FIG. **7** is a schematic cross-sectional side view illustrating a modification of the first and second support members **30** and **40**. As illustrated, the first and second support members **30** and **40** may each have a part (e.g., facing surface **32**, **42**) that is made of an elastic member (**33**, **43**) such as rubber, and the first and second distances d_1 and d_2 may be made variable by the elastic deformation of the elastic member. By thus using a flexible material for the first and second support members **30** and **40**, it is possible to respond to various devices to be charged of different thicknesses to thereby perform stable and efficient charging without involving a change in the transmitting/receiving distance.

[0047] As described above, the wireless power transmission device **1** according to the present embodiment includes the device body **10** and the coil unit **20** freely turnably provided with respect to the device body **10**. The coil unit **20** has the first and second main surfaces **20***a* and **20***b* and configured to be movable between the first position as the laid position of the first main surface **20***a* and the second position as the erected position of the first main surface **20***a*. The coil unit houses therein the first coil **21** facing the first main surface **20***a* and the second coil **22** facing the second main surface **20***b*, and the device body **10** has the first support member **30** disposed separated from the first main surface **20***a* by the predetermined first distance d_1 when the coil unit **20** is at the second position. With this configuration, there can be achieved a highly convenient wireless power transmission device capable of responding to both charging in a flatbed position and charging in a vertical position.

[0048] Further, the wireless power transmission device **1** according to the present embodiment has the second support member **40** which is fixed to the coil unit **20** so as to be disposed separated from the second main surface **20***b* by the predetermined second distance d_2 when the coil unit **20** is at the second position. Thus, it is possible to perform double-sided charging in which, in a state where the coil unit is at the second position, two devices to be charged are vertically set on the respective sides of the first and second main surfaces **20***a* and **20***b* and charged simultaneously.

[0049] While the preferred embodiment of the present disclosure have been described, the present disclosure is not limited to the above embodiment, and various modifications may be made within the scope of the present disclosure, and all such modifications are included in the present disclosure.

[0050] For example, although the coil unit **20** is provided with the second coil **22** facing the second main surface **20***b*, and the second main surface **20***b* of the coil unit **20** is provided with the second support member **40** in the above embodiment, it is not essential to provide the second coil **22** and second support member **40**. Further, although the coil unit **20** is provided with the magnets **51** and **53**, the first support member is provided with the magnet **52** in the above embodiment, and the device body **10** is provided with the magnet **54**, it is not essential to provide the magnets **51** to **54**.

[0051] The technology according to the present disclosure includes the following configuration examples, but not limited thereto.

[0052] A wireless power transmission device according to the present disclosure includes a coil unit, a first coil, and a first support member. The coil unit has first and second main surfaces and configured to be movable between a first position as a laid position of the first main surface and a second position as an erected position of the first main surface. The first coil is housed in the coil unit so as to face the first main surface. The first support member has a facing surface disposed separated from the first main surface by a first distance when the coil unit is at the second position.

[0053] With the above-described configuration, there can be achieved a highly convenient wireless power transmission device capable of responding to both charging in a flatbed position and charging in a vertical position.

[0054] The wireless power transmission device according to the present disclosure may further include a second coil housed in the coil unit so as to face the second main surface and a second support member fixed to the coil unit and having a facing surface disposed separated from the second main surface by a predetermined second distance when the coil unit is at the second position, and the second support member may move in conjunction with the coil unit. With this configuration, it is possible to perform double-sided charging in which, in a state where the coil unit is at the second position, two devices to be charged are vertically set on the respective first and second main surface sides and charged simultaneously.

[0055] The wireless power transmission device according to the present disclosure may further include a conductor disposed between the first and second coils, a first magnetic sheet disposed between the first coil and the conductor, and a second magnetic sheet disposed between the second coil and the conductor. This makes it possible to prevent mutual interference between the first and second coils to thereby

achieve stable charging of a plurality of devices to be charged. Further, charging efficiency of the first and second coils can be improved.

[0056] In the wireless power transmission device according to the present disclosure, a distance between the first and second main surfaces of the coil unit may be smaller than the first and second distances. This can reduce the size and weight of the coil unit as a movable part.

[0057] In the wireless power transmission device according to the present disclosure, the first and second coil may each be constituted by a planar coil having a shape with different dimensions in the vertical and horizontal directions in a plan view and may each be housed in the coil unit such that the longitudinal direction thereof is perpendicular to the normal direction of the first and second main surfaces and is directed to a direction perpendicular to an erected direction in a state where the coil unit is at the second position. This can suppress reduction in charging efficiency even if a device to be charged shifts in position.

[0058] In the wireless power transmission device according to the present disclosure, in a state where the coil unit is at the second position, the height of the center position of each of the first and second coils may be higher than the height of a leading end portion of the second support member in an erected direction. With this configuration, when a device to be charged is set in the first support member, the center thereof is brought close to the center of the first coil, so that it is possible to perform efficient charging while stably holding the device to be charged.

[0059] In the wireless power transmission device according to the present disclosure, the first support member may have an elastic member by which the first distance can be changed, and the second support member may have an elastic member by which the second distance can be changed. By using such an elastic member, it is possible to respond to various devices to be charged of different thicknesses to thereby perform stable and efficient charging without involving a change in the transmitting/receiving distance.

[0060] In the wireless power transmission device according to the present disclosure, the coil unit may have a first magnet on the first main surface side thereof, and the first support member may have a second magnet positioned opposite to the first magnet when the coil unit is at the second position. Thus, attraction force is generated between the first and second magnets when the coil unit is at the erected position, so that an erected position of the coil unit can be made stable.

[0061] In the wireless power transmission device according to the present disclosure, a plurality of the first magnets may be provided in the coil unit and may be disposed close to both end sides of the coil unit in a direction perpendicular to the normal direction of the first and second main surfaces of the coil unit and in a direction perpendicular to the erected direction in a state where the coil unit is at the second position than to the center of the coil unit in the same direction. This suppresses influence on a magnetic field generated from the first coil.

[0062] The wireless power transmission device according to the present disclosure may further include a device body having a housing space capable of housing a part of the coil unit and the second support member when the coil unit is at the first position. This prevents the surface on which a device to be charged is placed from having a level difference when the device is charged in a flatbed position, thus achieving stable charging.

[0063] In the wireless power transmission device according to the present disclosure, the device body may house therein a drive circuit for driving the first and second coils as a power transmission coil. This can reduce the size and weight of the coil unit as a movable part.

[0064] In the wireless power transmission device according to the present disclosure, the second support member may have a third magnet on the side opposite to the second main surface of the coil unit, and the device body may have a fourth magnet which is disposed at a position opposite to the third magnet when the coil unit is at the first position. In this case, the third and fourth magnets may be disposed with polarities repelling each other. When the third and fourth magnets are disposed with polarities attracting each other, it is possible to make the laid position stable and to prevent unintended erection of the coil unit, thus stabilizing a state where the coil unit is folded. When the third and fourth magnets are disposed with polarities repelling each other, repelling force is generated between the third and fourth magnets during the operation of folding the coil unit **20** from the erected position to the laid position to thereby prevent damage to the coil unit due to contact with the device body.

What is claimed is:

1. A wireless power transmission device comprising:

a coil unit having first and second main surfaces and configured to be movable between a first position as a laid position of the first main surface and a second position as an erected position of the first main surface;

a first coil housed in the coil unit so as to face the first main surface; and

a first support member having a facing surface disposed separated from the first main surface by a first distance when the coil unit is at the second position.

2. The wireless power transmission device according to claim **1** further comprising:

a second coil housed in the coil unit so as to face the second main surface; and

a second support member fixed to the coil unit and having a facing surface disposed separated from the second main surface by a predetermined second distance when the coil unit is at the second position, wherein

the second support member moves in conjunction with the coil unit.

3. The wireless power transmission device according to claim **2** further comprising:

a conductor disposed between the first and second coils;

a first magnetic sheet disposed between the first coil and the conductor; and

a second magnetic sheet disposed between the second coil and the conductor.

4. The wireless power transmission device according to claim **2**, wherein a distance between the first and second main surfaces of the coil unit is smaller than the first and second distances.

5. The wireless power transmission device according to claim **2**, wherein

each of the first and second coil is constituted by a planar coil having a shape with different dimensions in the vertical and horizontal directions in a plan view, and is housed in the coil unit such that the longitudinal direction thereof is perpendicular to the normal direc-

tion of the first and second main surfaces and is directed to a direction perpendicular to an erected direction in a state where the coil unit is at the second position.

6. The wireless power transmission device according to claim **2**, wherein,

in a state where the coil unit is at the second position, the height of the center position of each of the first and second coils is higher than the height of a leading end portion of the second support member in an erected direction.

7. The wireless power transmission device according to claim **2**, wherein,

the first support member has an elastic member by which the first distance can be changed, and

the second support member has an elastic member by which the second distance can be changed.

8. The wireless power transmission device according to claim **2**, wherein,

the coil unit has a first magnet on the first main surface side thereof, and

the first support member has a second magnet positioned opposite to the first magnet when the coil unit is at the second position.

9. The wireless power transmission device according to claim **8**, wherein,

a plurality of the first magnets is provided in the coil unit and is disposed close to both end sides of the coil unit in a direction perpendicular to the normal direction of the first and second main surfaces of the coil unit and in a direction perpendicular to an erected direction in a state where the coil unit is at the second position than to the center of the coil unit in the same direction.

10. The wireless power transmission device according to claim **2** further comprising a device body (a fourth member) having a housing space capable of housing a part of the coil unit and the second support member when the coil unit is at the first position.

11. The wireless power transmission device according to claim **10**, wherein,

the device body houses a drive circuit for driving the first and second coils as a power transmission coil.

12. The wireless power transmission device according to claim **10**, wherein,

the second support member has a third magnet on the side opposite to the second main surface of the coil unit, and

the device body has a fourth magnet which is disposed at a position opposite to the third magnet when the coil unit is at the first position.

13. The wireless power transmission device according to claim **12**, wherein,

the third and fourth magnets are disposed with polarities repelling each other.

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