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(54) **TERMINAL DEVICE**

(57) The disclosure relates to a terminal device, belongs to the field of communication. The terminal device includes: a rotating shaft part (12); a first body (11) connected to one side of the rotating shaft part (12); a second body (13) connected to the other side of the rotating shaft part (12), the first body (11) and the second body (13) being capable of being unfolded and folded by the rotating shaft part (12); a first antenna (3) on the first body (11), a second antenna (4) on the first body (11); a third antenna (5) on the second body (13); and a fourth antenna (6) on the second body (13); and the first antenna (3), the second antenna (4), the third antenna (5) and the fourth antenna (6) having the same radiation frequency band.

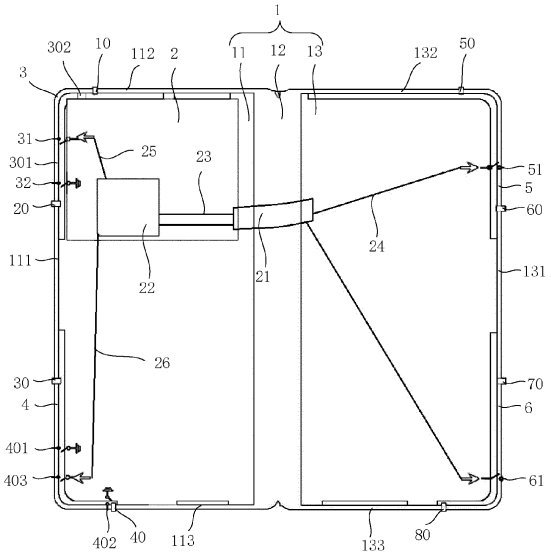

FIG. 1

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Description

TECHNICAL FIELD

[0001] The disclosure relates to the field of communication, and particularly relates to a terminal device.

BACKGROUND

[0002] Users play more attention to the 5G signal experience for electronic devices as 5G (The 5th Generation Mobile Communication Technology) becomes more popular. The degree of attenuation of low-frequency signals is small with distance, and thus the user's low-frequency signal experience may be improved by increasing the number of low-frequency antennas in a mobile terminal. However, a great number of devices are arranged in a foldable electronic device, and the foldable electronic device has a limited inner space, so that a plurality of low-frequency antennas are difficult to arrange in the electronic device. In a folding state of the electronic device, the antennas are affected by close metal, resulting in degradation of the signals of the electronic device.

SUMMARY

[0003] In view of this, the disclosure provides a terminal device, which may improve the signal strength of the terminal device.

[0004] Specifically, the following technical solutions are included.

[0005] A terminal device is provided, including:

a rotating shaft part;
a first body, connected to one side of the rotating shaft part;
a second body, connected to the other side of the rotating shaft part, the first body and the second body being capable of being unfolded and folded by the rotating shaft part;
a first antenna and a second antenna, located on the first body; and
a third antenna and a fourth antenna, located on the second body.

[0006] The first antenna, the second antenna, the third antenna and the fourth antenna have the same radiation frequency band.

[0007] Optionally, the first antenna and the third antenna are symmetrically arranged about the rotating shaft part.

[0008] The second antenna and the fourth antenna are symmetrically arranged about the rotating shaft part.

[0009] Optionally, the first antenna and the second antenna are respectively located at two corners of the first body away from the rotating shaft part, and
the third antenna and the fourth antenna are respectively located at two corners of the second body away from the rotating shaft part.

[0010] Optionally, the terminal device is configured such that a current direction of the second antenna is opposite to a current direction of the fourth antenna when the first body and the second body are folded; and
the current direction of the second antenna is the same as the current direction of the fourth antenna when the first body and the second body are unfolded.

[0011] Optionally, the second antenna is a T-antenna, which includes a first tuning point, a second tuning point, and a first feeding point. The first feeding point is between the first tuning point and the second tuning point.

[0012] The first body includes a first switch, a second switch, a first tuning circuit, and a second tuning circuit. The first switch connects the first tuning point with the first tuning circuit, and the second switch connects the second tuning point with the second tuning circuit.

[0013] Optionally, the fourth antenna is a T-antenna, and the fourth antenna includes a second feeding point that is on a side of the second body away from the rotating shaft part.

[0014] Optionally, the terminal device is configured such that a current direction of the first antenna is opposite to a current direction of the third antenna.

[0015] Optionally, the first antenna is an inverted-F antenna, which includes an antenna body and a rib. The antenna body includes a third feeding point on a side of the first body away from the rotating shaft part, and the rib is on a side of the first body close to the rotating shaft part, and is respectively connected to the antenna body and the first body.

[0016] Optionally, the third antenna is a T-antenna, and the third antenna includes a fourth feeding point on a side of the second body away from the rotating shaft part.

[0017] Optionally, the terminal device further includes a transmission line, a radio frequency module, a plurality of first feeding lines, and a plurality of second feeding lines. The radio frequency module is in the first body. The transmission line is at the rotating shaft part. Two ends of each first feeding line are connected to the radio frequency module and one end of the transmission line respectively. One end of each second feeding line is connected to the other end of the transmission line, and the other end of each second feeding line is connected to the third antenna or the fourth antenna.

[0018] The technical solutions provided by the examples of the disclosure at least include the following beneficial effects:
In the terminal device provided by the examples of the disclosure, four antennas are disposed on the foldable terminal device, and have the same radiation frequency band, which may facilitate the improvement on the signal strength of the terminal device at a specific frequency band. Two antennas are located on the first body and the other two antennas are located on the second body, which may improve isolation between the four antennas in an unfolding state or a folding state of the first body and the second body, and improve the signal quality of

the terminal device.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] In order to illustrate the technical solutions in the examples of the disclosure more clearly, the drawings required to be used in the description of the examples will be briefly introduced below. Apparently, the drawings in the following description are only some examples of the disclosure, and those of ordinary skill in the art may obtain other drawings according to these drawings without creative work.

FIG. 1 is a schematic structural diagram illustrating a terminal device according to an example of the disclosure;
FIG. 2 is a schematic diagram illustrating a second antenna of a terminal device according to an example of the disclosure;
FIG. 3 is a schematic diagram illustrating a current direction of a terminal device in an unfolding state according to an example of the disclosure; and
FIG. 4 is a schematic diagram illustrating a current direction of a terminal device in a folding state according to an example of the disclosure.

[0020] Certain examples of the disclosure have been shown and will be described in more detail below by way of the above drawings. These drawings and written description are not intended to limit the scope of the concept the disclosure in any way, but are intended to illustrate the concept of the disclosure for those skilled in the art with reference to specific examples.

DETAILED DESCRIPTION

[0021] The technical solutions in the examples of the disclosure will be clearly and completely described below in conjunction with the accompanying drawings in the examples of the disclosure. Apparently, the described examples are part of the examples of the disclosure, rather than all of the examples. Based on the examples in the disclosure, all other examples obtained by those of ordinary skill in the art without creative work belong to the scope of protection of the disclosure.

[0022] FIG. 1 is a schematic structural diagram illustrating a terminal device according to an example of the disclosure. As shown in FIG. 1, the terminal device includes:

a rotating shaft part 12;
a first body 11, connected to one side of the rotating shaft part 12;
a second body 13, connected to the other side of the rotating shaft part 12, the first body 11 and the second body 13 being capable of being unfolded and folded by the rotating shaft part 12;
a first antenna 3 and a second antenna 4, located on the first body 11; and
a third antenna 5 and a fourth antenna 6, located on the second body 13.

[0023] The first antenna 3, the second antenna 4, the third antenna 5 and the fourth antenna 6 have the same radiation frequency band.

[0024] In the terminal device provided by the examples of the disclosure, four antennas are disposed on the foldable terminal device, and have the same radiation frequency band, which may facilitate the improvement on the signal strength of the terminal device at a specific frequency band. The first antenna 3 and the second antenna 4 are located on the first body 11, and the third antenna 5 and the fourth antenna 6 are located on the second body 13, which may improve isolation between the four antennas in a unfolding state or a folding state of the first body 11 and the second body 13, and improve the signal quality of the terminal device.

[0025] In order to make the technical solutions and effects of the disclosure clearer, the examples of the disclosure will be further described in detail below in conjunction with the drawings.

[0026] As shown in FIG. 1, a terminal device provided by an example of the disclosure includes a first body 11, a rotating shaft part 12 and a second body 13. The rotating shaft part 12 is located between the first body 11 and the second body 13 and is connected to the first body 11 and the second body 13 respectively. The rotating shaft part 12 may rotate to drive the first body 11 and the second body 13 to be unfolded or folded.

[0027] Referring to FIG. 1, the terminal device further includes a first antenna 3, a second antenna 4, a third antenna 5 and a fourth antenna 6. The first antenna 3 and the second antenna 4 are located on the first body 11, and the third antenna 5 and the fourth antenna 6 are located on the second body 13.

[0028] For example, frames of the first body 11 and the second body 13 are conductors, and the first body 11 and the second body 13 are each provided with a plurality of break joints. The break joints separate positions for the first antenna 3 and the second antenna 4 on the frame of the first body 11, and the break joints separate the positions for the third antenna 5 and the fourth antenna 6 on the frame of the second body 13. The first antenna 3, the second antenna 4, the third antenna 5 and the fourth antenna 6 have the same radiation frequency band that may be a 5G frequency band being less than 6 GHz. When the four antennas operate, a length of a radiator in which current is distributed is approximately one quarter of a wavelength corresponding to the radiation frequency band. The provision of the four antennas facilitates the improvement on the signal strength of the terminal device in this frequency band.

[0029] In some examples of the disclosure, as shown in FIG. 1, the first antenna 3 and the third antenna 5 are symmetrically distributed on two sides of an axis of the rotating shaft part 12, and the second antenna 4 and the

fourth antenna 6 are symmetrically distributed on two sides of the axis of the rotating shaft part 12. For example, the first antenna 3 and the third antenna 5 are symmetrically arranged about the rotating shaft part 12, and the second antenna 4 and the fourth antenna 6 are symmetrically arranged about the rotating shaft part 12. Projections of the first antenna 3 and the second antenna 4 on the second body 13 coincide with the third antenna 5 and the fourth antenna 6 respectively when the first body 11 and the second body 13 are folded. When a housing 1 is unfolded, a great distance is present between the first antenna 3 and the third antenna 5, and a great distance is present between the second antenna 4 and the fourth antenna 6, so that the isolation between the first antenna 3, the second antenna 4, the third antenna 5 and the fourth antenna 6 may be improved, and the first antenna 3, the second antenna 4, the third antenna 5 and the fourth antenna 6 at the same frequency are prevented from being coupled to each other.

[0030] In some examples of the disclosure, as shown in FIG. 1, the first antenna 3 and the second antenna 4 are located at two corners of the first body 11 away from the rotating shaft part 12 respectively, and the third antenna 5 and the fourth antenna 6 are located at two corners of the second body 13 away from the rotating shaft part 12 respectively.

[0031] In some examples, the break joints include a first break joint 10, a second break joint 20, a third break joint 30, a fourth break joint 40, a fifth break joint 50, a sixth break joint 60, a seventh break joint 70, and an eighth break joint 80. The frame of the first body 11 includes a first side 111 away from the rotating shaft part 12, a second side 112 and a third side 113 respectively connected to two ends of the first side 111. The first side 111 is located on a side away from the rotating shaft part 12, and the first break joint 10 is located on the second side 112. The second break joint 20 and the third break joint 30 are located on the first side 111, and the fourth break joint 40 is located on the third side 113. The second break joint 20 is close to the second side 112, and the third break joint 30 is close to the third side 113. The first antenna 3 is located between the first break joint 10 and the second break joint 20, and the second antenna 4 is located between the third break joint 30 and the fourth break joint 40. The fifth break joint 50, the sixth break joint 60, the seventh break joint 70 and the eighth break joint 80 are distributed on the frame of the second body 13 and are symmetrical to the first break joint 10, the second break joint 20, the third break joint 30 and the fourth break joint 40, respectively, about the rotating shaft part 12. The frame of the second body 13 includes a fourth side 131 away from the rotating shaft part 12, a fifth side 132 and a sixth side 133 respectively connected to two ends of the fourth side 131. The fifth break joint 50 is located on the fifth side 132, the sixth break joint 60 and the seventh break joint 70 are located on the fourth side 131, and the eighth break joint 80 is located on the sixth side 133. The sixth break joint 60 is close to the fifth side 132, and the seventh break joint 70 is close to the sixth side 133. The third antenna 5 is located between the fifth break joint 50 and the sixth break joint 60, and the fourth antenna 6 is located between the seventh break joint 70 and the eighth break joint 80.

[0032] In some examples of the disclosure, the terminal device is configured such that a current direction of the second antenna 4 is opposite to a current direction of the fourth antenna 6 when the first body 11 and the second body 13 are folded. The current direction of the second antenna 4 is the same as the current direction of the fourth antenna 6 when the first body 11 and the second body 13 are unfolded. The current direction of the second antenna 4 is opposite to the fourth antenna 6 when the first body 11 and the second body 13 are folded, so that currents in the second antenna 4 and the fourth antenna 6 are prevented from mutual coupling. The current direction here refers to the distribution of the currents over the antennas. For example, if the current direction of the second antenna 4 is downward and the current direction of the fourth antenna 6 is upward, the current of the second antenna 4 is mainly distributed at a lower end of the second antenna 4, and the current of the fourth antenna 6 is mainly distributed at an upper end of the fourth antenna 6.

[0033] In some examples of the disclosure, the terminal device is further configured such that a current direction of the first antenna 3 is opposite to a current direction of the third antenna 5. In this example, the current direction of the first antenna 3 is always opposite to the current direction of the third antenna 5 when the first body 11 and the second body 13 are in an unfolding state or a folding state.

[0034] In some examples of the disclosure, as shown in FIG. 1, the first antenna 3 is an inverted-F antenna. The first antenna 3 includes an antenna body 301 and a rib 302. The antenna body 301 is provided with a third feeding point 31 and a third tuning point 32. The third feeding point 31 is located on a side of the first body 11 away from the rotating shaft part 12, and the third tuning point 32 is close to the second break joint 20. The rib 302 is located on a side of the first body 11 close to the rotating shaft part 12, and is connected to the antenna body 301 and the first body 11 respectively. A distance from the rib 302 to the second break joint 20 is one quarter of the wavelength corresponding to the antenna radiation frequency, and the current has maximum amplitude at the rib 302 and has minimum amplitude at the second break joint 20. The rib 302 is configured to connect the antenna body 301 with a grounding point on the first body 11. The rib 302 may also be replaced by a capacitor. One pole of the capacitor is connected to the antenna body 301 and the other pole of the capacitor is connected to a main board on the first body 11.

[0035] In some examples of the disclosure, as shown in FIG. 1, the third antenna 5 is a T-antenna, and the third antenna 5 is provided with a fourth feeding point 51 that is located on a side of the second body 13 away from the

rotating shaft part 12. The fourth feeding point 51 is closer to the sixth break joint 60 relative to the fifth break joint 50. Current is distributed between the fourth feeding point 51 and the fifth break joint 50 when the third antenna 5 is in operation.

[0036] In some examples, as shown in FIG. 1, the fourth antenna 6 is a T-antenna, and the fourth antenna 6 is provided with a second feeding point 61 that is located on a side of the second body 13 away from the rotating shaft part 12. The second feeding point 61 is closer to the eighth break joint 80 relative to the seventh break joint 70. Current is distributed between the second feeding point 61 and the seventh break joint 70 when the fourth antenna 6 is in operation.

[0037] FIG. 2 is a schematic diagram illustrating a second antenna 4 according to an example of the disclosure. In some examples of the disclosure, as shown in FIG. 2, the second antenna 4 is a T-antenna, which is provided with a first tuning point 401, a second tuning point 402 and a first feeding point 403. The first feeding point 403 is located between the first tuning point 401 and the second tuning point 402. The first tuning point 401, the second tuning point 402 and the first feeding point 403 are located between the third break joint 30 and the fourth break joint 40. The first body 11 includes a first switch 41, a second switch 42, a first tuning circuit 43 and a second tuning circuit 44. The first switch 41 connects the first tuning point 401 with the first tuning circuit 43, and the second switch 42 connects the second tuning point 402 with the second tuning circuit 44.

[0038] In some examples, the first tuning circuit 43 and the second tuning circuit 44 are each provided with at least one capacitor and/or inductor, such that the first tuning point 401 and the second tuning point 402 are electrically connected to the grounding point via the capacitor and/or the inductor, or are electrically connected to the grounding point directly. The first switch 41 and the second switch 42 may have a short-circuit state, at least one capacitor switching-in state and at least one inductor switching-in state, and may be capable of switching between these states to tune the antennas.

[0039] For example, referring to FIG. 2, the first switch 41 and the second switch 42 have a capacitor switching-in state and a short-circuit state, respectively. The first switch 41 is in the short-circuit state, and the second switch 42 is in the capacitor switching-in state when the first body 11 and the second body 13 are unfolded. The first switch 41 is in the capacitor switching-in state, and the second switch 42 is in the short-circuit state when the first body 11 and the second body 13 are folded. According to the example of the disclosure, the current direction of the second antenna 4 is changed by switching the switching-in state of the tuning circuits via the two switches, such that the current direction of the second antenna 4 is the same as the current direction of the fourth antenna 6 when the first body 11 and the second body 13 are unfolded, and the current direction of the second antenna 4 is opposite to the current direction of the fourth antenna 6 when the first body 11 and the second body 13 are folded.

[0040] When the first body 11 and the second body 13 are unfolded, the palms of a user generally hold the lower left corner and the lower right corner of the terminal device, i.e., the positions close to the fourth break joint 40 and the eighth break joint 80. The palms cover the part of the antennas at the third side 113 and the sixth side 133, which may affect the signals of the second antenna 4 and the fourth antenna 6. When the first switch 41 is in the short-circuit state, and the second switch 42 is in the capacitor switching-in state, the current in the second antenna 4 is mainly distributed between the first feeding point 403 and the third break joint 30, and the current in the fourth antenna 6 is mainly distributed between the seventh break joint 70 and the second feeding point 61, such that the currents in the second antenna 4 and the fourth antenna 6 are mainly distributed at unblocked parts, improving the signals of the terminal device. Since the greater distance is present between the first body 11 and the second body 13, the degree of coupling between the second antenna 4 and the fourth antenna 6 is lower, and the current distribution of the second antenna 4 and the fourth antenna 6 does not affect the signals of the terminal device.

[0041] When the first body 11 and the second body 13 are folded, the third break joint 30 and the seventh break joint 70 are aligned with each other, and the fourth break joint 40 and the eighth break joint 80 are aligned with each other. When the first switch 41 is controlled to be in the capacitor switching-in state, and the second switch 42 is controlled to be in the short-circuit state, the current in the second antenna 4 is mainly distributed between the first tuning point 401 and the second tuning point 402, and the current in the fourth antenna 6 is mainly distributed between the seventh break joint 70 and the second feeding point 61, and the current direction of the second antenna 4 is opposite to the current direction of the fourth antenna 6, so that the degree of coupling between the second antenna 4 and the fourth antenna 6 is reduced, which is beneficial to improving the isolation of the second antenna 4 and the fourth antenna 6 so as to improve the signals of the terminal device in a folding state.

[0042] It is to be noted that, the positions of the second antenna 4 and the fourth antenna 6 in the above example may be interchanged, and the positions of the feeding points and the tuning points are adjusted simultaneously, so that the current direction of second antenna 4 is opposite to the current direction of the fourth antenna 6 when the first body 11 and the second body 13 are folded, and the currents in the second antenna 4 and the fourth antenna 6 are directed to a direction away from the third break joint 30 or the seventh break joint 70 when the first body 11 and the second body 13 are unfolded.

[0043] It is to be noted that, the positions of the first antenna 3 and the third antenna 5 in the above example may be interchanged, and the positions of the feeding points and the tuning points are adjusted simultaneously,

so that the current direction of the first antenna 3 is opposite to the current direction of the third antenna 5, so that the degree of coupling between the first antenna 3 and the third antenna 5 is reduced, which is beneficial to improving the isolation of the first antenna 3 and the third antenna 5.

[0044] In some examples of the disclosure, as shown in FIG. 1, the terminal device further includes a transmission line 21, a radio frequency module 22, a plurality of first feeding lines 23 and a plurality of second feeding lines 24. The radio frequency module 22 is located in the first body 11. The transmission line 21 is located at the rotating shaft part 12. Two ends of each first feeding line 23 are respectively connected to the radio frequency module 22 and one end of the transmission line 21. One end of each second feeding line 24 is connected to the other end of the transmission line 21, and the other end of each second feeding line 24 is connected to the third antenna 5 or the fourth antenna 6. The transmission line 21 is a bendable feeding line that may be bent as the first body 11 and the second body 13 rotate relative to each other so as to ensure the stability of the voltage supplied to the third antenna 5 and the fourth antenna 6.

[0045] For example, the terminal device further includes a main board 2, a third feeding line 25 and a fourth feeding line 26. The main board 2 is located in the first body 11 of the housing 1, and the radio frequency module 22 is located on the main board 2. One end of the third feeding line 25 and one end of the fourth feeding line 26 are connected to the radio frequency module 22, and the other end of the third feeding line 25 and the other end of the fourth feeding line 26 are connected to the first antenna 3 and the second antenna 4 respectively.

[0046] In some examples of the disclosure, the positions of the first antenna 3 and the second antenna 4, and the positions of the third antenna 5 and the fourth antenna 6 may be interchanged. When the terminal device is used, the second antenna 4 and the fourth antenna 6 are located close to a side held by the user, so that the current direction of the second antenna 4 may be adjusted when the first body 11 and the second body 13 are unfolded and folded, so as to enable the current directions of the second antenna 4 and the fourth antenna 6 to be directed away from a direction of the hand of the user when the first body 11 and the second body 13 are unfolded. When the terminal device is in a folding state, the current direction of the second antenna 4 is opposite to the current direction of the fourth antenna 6, and the current direction of the first antenna 3 is opposite to the current direction of the third antenna 5.

[0047] For example, the first antenna 3 is an inverted-F antenna, and the second antenna 4, the third antenna 5 and the fourth antenna 6 are T-antennas. FIG. 3 is a schematic diagram illustrating a current direction of the terminal device when the first body 11 and the second body 13 are unfolded according to an example of the disclosure. As shown in FIG. 3, the first antenna 3 is located at an upper left corner of the first body 11, and the second antenna 4 is located at a lower left corner of the first body 11. The third antenna 5 is located at an upper right corner of the second body 13, and the fourth antenna 6 is located at a lower right corner of the second body 13. When the first body 11 and the second body 13 are unfolded, the first switch 41 is in the short-circuit state, and the second switch 42 is in the capacitor switching-in state. The current direction of the first antenna 3 is toward the second break joint 20. The current direction of the second antenna 4 is toward the third break joint 30. The current direction of the third antenna 5 is toward the fifth break joint 50. The current direction of the fourth antenna 6 is toward the seventh break joint 70.

[0048] FIG. 4 is a schematic diagram illustrating a current direction of the terminal device when the first body 11 and the second body 13 are folded according to an example of the disclosure. As shown in FIG. 4, when the first body 11 and the second body 13 are folded, the first switch 41 is in the capacitor switching-in state, and the second switch 42 is in the short-circuit state. The current direction of the first antenna 3 is toward the second break joint 20, the current direction of the second antenna 4 is toward the fourth break joint 40, the current direction of the third antenna 5 is toward the fifth break joint 50, and the current direction of the fourth antenna 6 is toward the seventh break joint 70.

[0049] It is to be noted that "a plurality of or "at least one" mentioned in the description means one or more, and "a plurality of" or "at least two" mentioned in the description means two or more. "And/or", which describes an association relationship of associated objects, indicates that three relationships may exist, e.g., A and/or B may indicate that A exists alone, A and B exist together, and B exists alone. The character "/" generally indicates that the associated objects are in an "or" relationship.

[0050] In the description of the disclosure, it is to be noted that, unless expressly specified and limited otherwise, the terms "mount", "link" and "connect" are broadly understood. For example, the connect may be fixed connection, detachable connection or integrated connection, may be mechanical connection or electrical connection, may be direct connection or indirect connection through intermediate media, may be internal connection of two elements, or indicates an interacting relationship between two elements. Those of ordinary skill in the art may understand the specific meanings of the above terms in the disclosure according to specific conditions.

[0051] In the disclosure, unless expressly stated and defined otherwise, a first feature "above" or "below" a second feature may include that the first feature and the second feature are in direct contact, or may include that the first feature and the second feature are not in direct contact but are in contact through another feature between the first feature and the second feature. Furthermore, a first feature "above" a second feature, "above", "over", and "on" a second feature includes that the first feature is right above and obliquely above the second feature, or simply indicates that the first feature is at a

higher level than the second feature. A first feature "below", "under" and "beneath" a second feature includes that the first feature is right below and obliquely below the second feature, or simply indicates that the first feature is at a lower level than the second feature.

[0052] In the description of the disclosure, it is to be understood that, the terms "central", "longitudinal", "transverse", "length", "width", "thickness", "upper", "lower", "front", "rear", "left", "right", "vertical", "horizontal", "top", "bottom", "inner", "outer", "clockwise", "counterclockwise", "axial", "radial", "circumferential" and the like indicate an orientation or positional relationship based on the orientation or positional relationship shown in the drawings, are merely for facilitating description of the disclosure and simplifying the description, rather than indicating or implying that the device or element referred to must have a specific orientation, be constructed and operate in a specific orientation, and thus may not be construed as limiting the disclosure.

[0053] In the description of the specification, descriptions with reference to the terms "certain examples", "one example", "some examples", "illustrative examples", "examples", "specific examples", or "some examples" mean that specific features, structures, materials, or characteristics described in combination with the examples or examples are included in at least one example or example of the disclosure.

Claims

1. A terminal device, comprising:

a rotating shaft part (12);
a first body (11), connected to one side of the rotating shaft part (12);
a second body (13), connected to the other side of the rotating shaft part (12), the first body (11) and the second body (13) being capable of being unfolded and folded by the rotating shaft part (12);
a first antenna (3) on the first body (11);
a second antenna (4) on the first body (11);
a third antenna (5) on the second body (13); and
a fourth antenna (6) on the second body (13);
wherein the first antenna (3), the second antenna (4), the third antenna (5) and the fourth antenna (6) have the same radiation frequency band.

2. The terminal device according to claim 1, wherein the first antenna (3) and the third antenna (5) are arranged symmetrically about the rotating shaft part (12); and
the second antenna (4) and the fourth antenna (6) are arranged symmetrically about the rotating shaft (12).

3. The terminal device according to claim 2, wherein the first antenna (3) and the second antenna (4) are respectively at two corners of the first body (11) away from the rotating shaft part (12), and
the third antenna (5) and the fourth antenna (6) are respectively at two corners of the second body (13) away from the rotating shaft part (12).

4. The terminal device according to claim 3, wherein the terminal device is configured such that a current direction of the second antenna (4) is opposite to a current direction of the fourth antenna (6) when the first body (11) and the second body (13) are folded; and
the current direction of the second antenna (4) is the same as the current direction of the fourth antenna (6) when the first body (11) and the second body (13) are unfolded.

5. The terminal device according to claim 4, wherein the second antenna (4) is a T-antenna, which comprises a first tuning point (401), a second tuning point (402) and a first feeding point (403), the first feeding point (403) is between the first tuning point (401) and the second tuning point (402); and
the first body (11) comprises a first switch (41), a second switch (42), a first tuning circuit (43) and a second tuning circuit (44), the first switch (41) connecting the first tuning point (401) with the first tuning circuit (43), and the second switch (42) connecting the second tuning point (402) with the second tuning circuit (44).

6. The terminal device according to claim 5, wherein the fourth antenna (6) is a T-antenna, and the fourth antenna (6) comprises a second feeding point (61) that is on a side of the second body (13) away from the rotating shaft part (12).

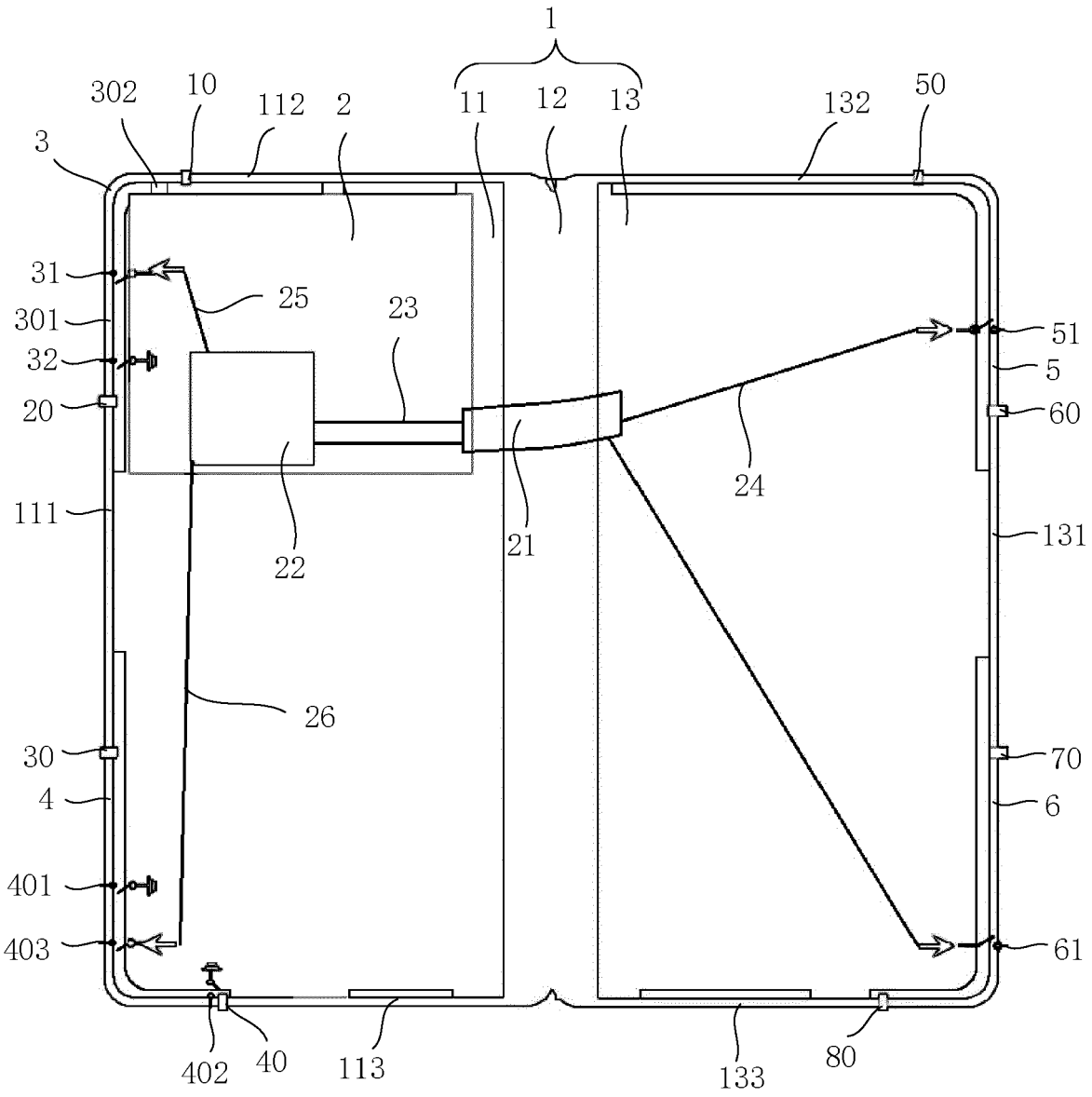
7. The terminal device according to any one of claims 3 to 6, wherein the terminal device is configured such that a current direction of the first antenna (3) is opposite to a current direction of the third antenna (5).

8. The terminal device according to claim 7, wherein the first antenna (3) is an inverted-F antenna, which comprises an antenna body (301) and a rib (302), the antenna body (301) comprises a third feeding point (31) on a side of the first body (11) away from the rotating shaft part (12), and the rib (302) is on a side of the first body (11) close to the rotating shaft part (12), and is respectively connected to the antenna body (301) and the first body (11).

9. The terminal device according to claim 8, wherein the third antenna (5) is a T-antenna, and the third antenna (5) comprises a fourth feeding point (51) on a side of the second body (13) away from the rotating

shaft part (12).

10. The terminal device according to any one of claims 1 to 9, further comprising a transmission line (21), a radio frequency module (22), a plurality of first feeding lines (23), and a plurality of second feeding lines (24), wherein the radio frequency module (22) is in the first body (11), the transmission line (21) is at the rotating shaft part (12), two ends of each first feeding line (23) are respectively connected to the radio frequency module (22) and one end of the transmission line (21), one end of each second feeding line (24) is connected to the other end of the transmission line (21), and the other end of each second feeding line (24) is connected to the third antenna (5) or the fourth antenna (6).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302
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112
2
11
12
13
132
50
3
31
25
23
301
32
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51
5
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111
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131
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70
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6
401
403
61
402
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113
133
80

FIG. 1

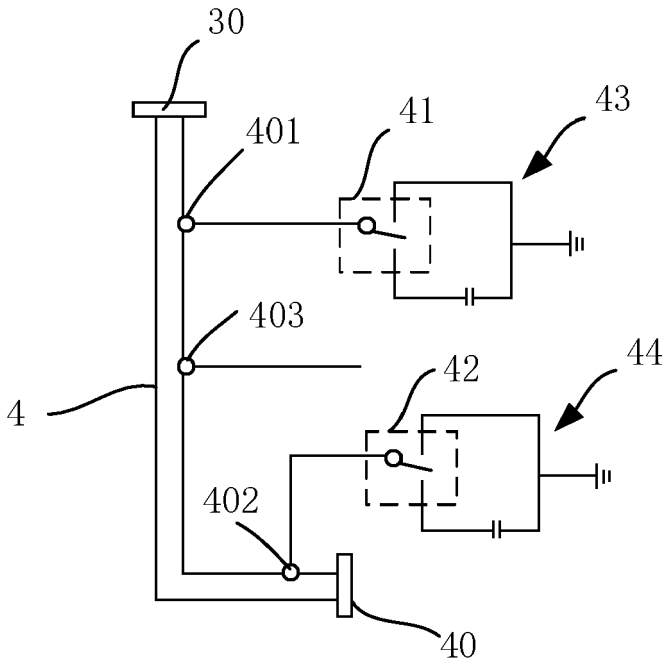

FIG. 2

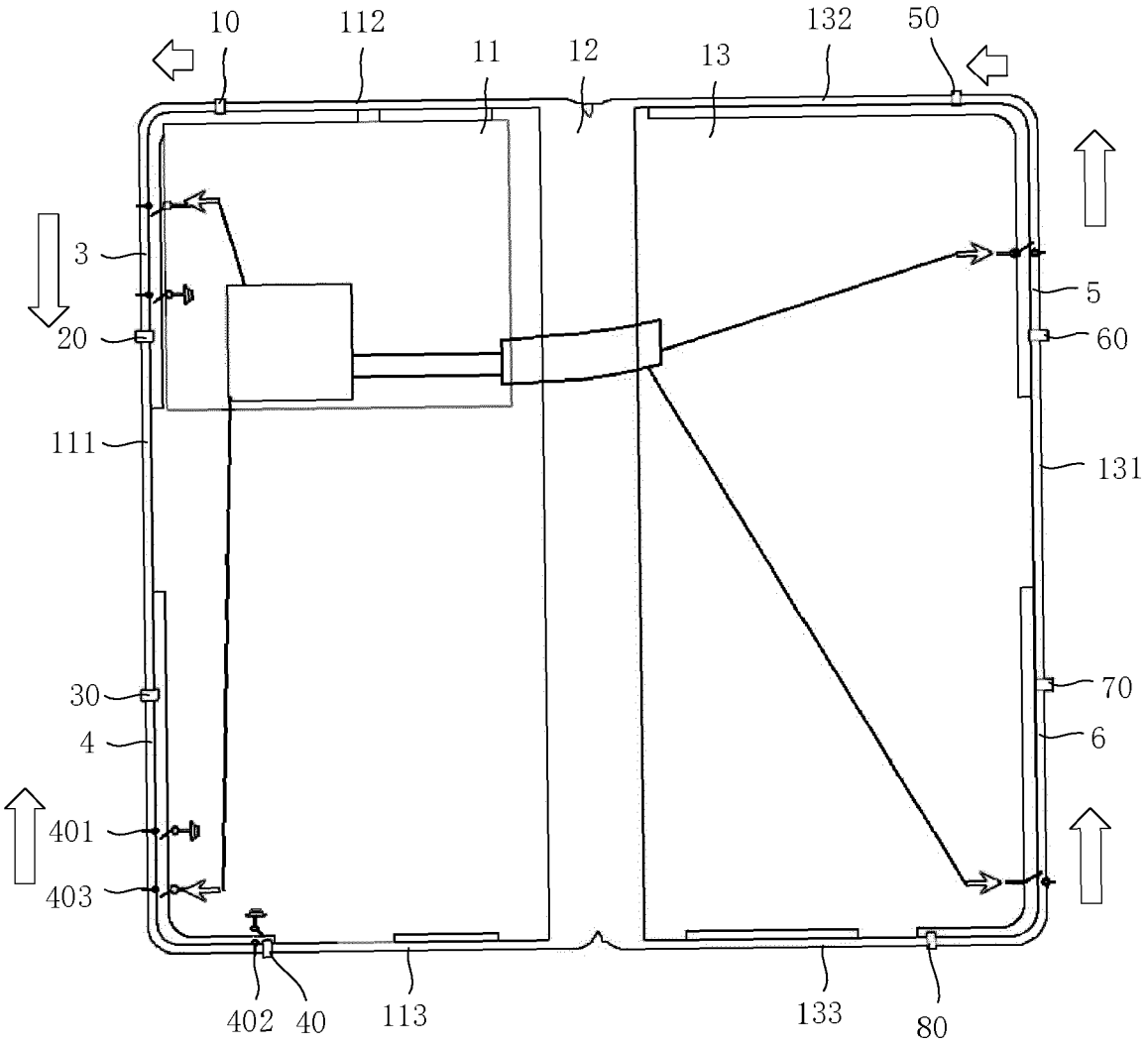
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FIG. 3

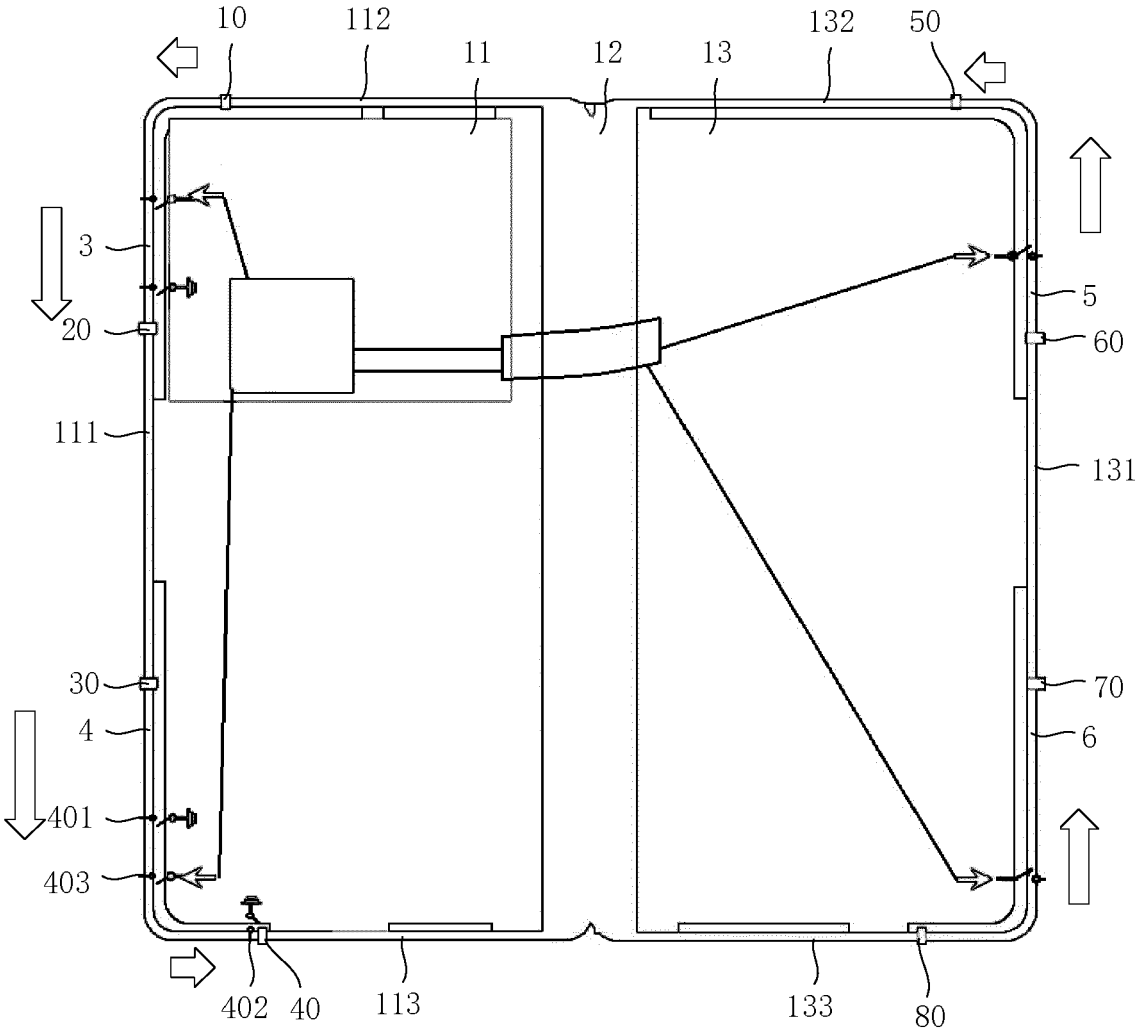
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FIG. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 23 18 8680

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2022/255216 A1 (ZHAO JUNSHENG [US] ET AL) 11 August 2022 (2022-08-11) * paragraphs [0002], [0005] - [0007], [0011], [0023], [0033], [0041], [0042], [0045] - [0047]; figures 1-4C * * paragraphs [0056] - [0060] *	1-10	INV. H01Q1/24 H01Q1/52 H01Q5/328 H01Q9/04 H01Q9/26 H01Q9/42
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TECHNICAL FIELDS SEARCHED (IPC)

H01Q

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	29 August 2024	Ali, Ahmed

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29-08-2024

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		WO 2022086089 A1	28-04-2022

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