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(54) **BROADBAND ANTENNA COMPRISING AT LEAST TWO WINGS**

(57) The present disclosure relates to an antenna, in particular, to a broadband antenna. The antenna of this disclosure may radiate with a linear polarization or with a circular polarization. The antenna comprises two or more wings, each wing comprising one or more conductive elements. The conductive elements of the two or

more wings are connected to each other, and each conductive element has a bent shape. While the antenna has a large antenna bandwidth, the antenna has also a small size. This makes it well suited for being integrated into a vehicle, in particular, an airborne vehicle like an airplane, a helicopter, or a drone.

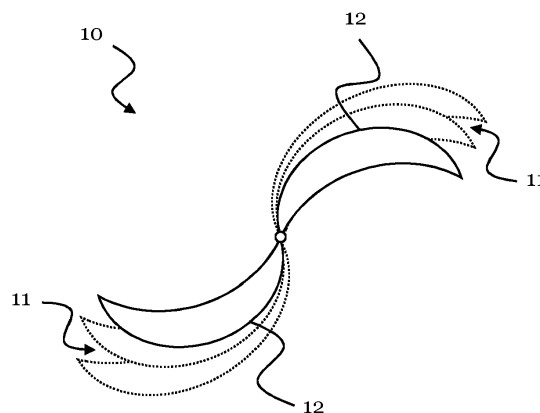


FIG. 1

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Description

TECHNICAL FIELD

[0001] The present disclosure relates to an antenna, in particular, to a broadband antenna. The antenna of this disclosure may radiate with a linear polarization or with a circular polarization. The antenna is designed with at least two wings, each having one or more conductive elements configured to radiate. The antenna has a large antenna bandwidth, while it also has a small size. Therefore, the antenna may be integrated into a vehicle, in particular, into an airborne vehicle like an airplane, a helicopter, or a drone.

BACKGROUND

[0002] Different types of antennas have been used for integration into vehicles, in particular, into airborne vehicles. For example, an omnidirectional antenna, and a planar antenna (e.g., a patch antenna), and a planar antenna array have been used to this end.

[0003] The drawback of these types of antennas is that they are typically of rather large size - in particular when also broadband characteristics are required - and the integration into the above-mentioned types of vehicles is thus difficult. Due to their large size, these types of antennas are also quite heavy, which is a particular disadvantage for the use in small airborne vehicles like drones.

[0004] Moreover, these types of antennas, and respectively their integration into said vehicles, is rather expensive.

SUMMARY

[0005] In view of the above, embodiments of this disclosure aim to provide an improved broadband antenna, which is suitable for integration into a vehicle, particularly, into an airborne vehicle. An objective thereby is to provide a new antenna design for the broadband antenna, which has a smaller size (footprint) than a conventional type of antenna, while having a similar or larger antenna bandwidth. Accordingly, another goal of this disclosure is to provide the broadband antenna with an increased antenna bandwidth, while at the same time not increasing the size beyond that of a conventional antenna. Another aim of this disclosure is to make the broadband antenna low of weight, in order to allow its integration into small airborne vehicles like drones. Furthermore, the broadband antenna should be easy to manufacture with low costs.

[0006] These and other objectives are achieved by the embodiments of this disclosure provided in the independent claims. Advantageous implementations of the embodiments are further defined in the dependent claims.

[0007] A first aspect of this disclosure provides a broadband antenna comprising: two or more wings, each wing comprising one or more conductive elements, wherein the conductive elements of the two or more

wings are connected to each other, and wherein each conductive element has a bent shape.

[0008] An antenna bandwidth of the broadband antenna of the first aspect is comparatively large, in particular, the broadband antenna may radiate in a frequency range of between 5-50 GHz or larger. This bandwidth is particularly achieved by the arrangement of the two or more wings, each having the one or more conductive elements with the bent shapes.

[0009] The broadband antenna of the first aspect may be capable of radiating with a linear polarization or with a circular polarization, for example, depending on how the conductive elements are connected to each other, and how the two or more wings are fed, when the antenna is operated. In particular, the broadband antenna may be a broadband linear polarized dipole (LPD) antenna.

[0010] The broadband antenna of the first aspect has a small size, while having a large antenna bandwidth. In particular, the broadband antenna has a smaller size than a conventional antenna with a comparable bandwidth, or has a larger bandwidth than a conventional antenna with a comparable size.

[0011] In an implementation form of the broadband antenna of the first aspect, the broadband antenna has four wings.

[0012] Four wings is a beneficial number of wings for the broadband antenna. The four wings achieve very good broadband characteristics, while the antenna design is of low complexity and small size. Also, manufacturing of the antenna is simple and inexpensive. With its four wings, the antenna may radiate with two different linear polarizations or with a circular polarization. Of course, it is also possible to provide the broadband antenna with a different number of wings, for instance, with two wings, or five wings, or more wings.

[0013] In an implementation form of the broadband antenna of the first aspect, the two or more wings are arranged around a central connection, and the conductive elements of the two or more wings are connected to each other by the central connection.

[0014] The two or more wings may be arranged in a regular angular arrangement around the central connection. For instance, the wings of the antenna may be arranged around the central connection with a regular angular offset between each two adjacent wings. In case of four wings, this regular angular offset may be substantially 90° between each two adjacent wings, i.e., wings that are not opposite to each other. The arrangement of the two or more wings may provide the broadband antenna with the shape of a windmill or a wind turbine (particularly, the radiating part of the antenna).

[0015] The central connection may comprise a conductive element, e.g., may be a metal connection. The central connection may comprise one or more conductive parts, wherein the conductive parts may or may not be electrically connected to one another. The central connection may be mechanically connected to each conductive element. Thus, it may serve as a supportive element

for the wings of the antenna.

[0016] The central connection may further be electrically connected to each conductive element, wherein different parts of the central connection may connect to different wings and/or to different conductive elements. The central connection may be used to electrically connect an antenna feed to the conductive elements, for instance, an antenna feed comprising one or more coaxial cables. This enables a feeding of the conductive elements of the wings, in order to cause the antenna to radiate. Depending on the design of the connection element and its connection to the individual wings and/or conductive elements of the antenna - e.g. wings may be fed together or individually - the antenna may radiate with different kinds of linear and circular polarizations.

[0017] In an implementation form of the broadband antenna of the first aspect, each wing comprises at least two stacked conductive elements.

[0018] Each wing may act as a dipole configured to radiate. The stacking of the two or more conductive elements of a wing widens the respective dipole. This allows increasing the broadband characteristics of the antenna of the first aspect, i.e., to increase its bandwidth.

[0019] For each wing, the two or more conductive elements of the wing may be stacked by arranging them one after the other (or one above the other) along a certain direction. The direction may be different for each wing. The two or more conductive elements of a wing may be stacked at regular intervals along the respective direction, i.e., with a constant distance between adjacent conductive elements, or may be stacked with different distances between adjacent conductive elements. Regular intervals or irregular distances between the stacked conductive elements may also differ from one wing to the other.

[0020] In an implementation form of the broadband antenna of the first aspect, adjacently arranged conductive elements of the at least two stacked conductive elements of each wing are separated from each other by an insulating element.

[0021] The one or more insulating elements, which are accordingly arranged between the two or more stacked conductive elements of a wing, may provide additional stability to the wing and thus the antenna of the first aspect in its entirety. Further, the insulating elements may electrically isolate the conductive elements of a wing from one another, although the conductive elements may be electrically connected to each other, for example, by means of the central connection. The insulation elements may also isolated different wings from another. The insulating elements may be formed by a dielectric and/or by a substrate material. The insulation elements may also be formed by a glue, resin, or epoxy having electrically insulating behavior.

[0022] In an implementation form of the broadband antenna of the first aspect, the insulating element is made of at least one of TSM30, Teflon, and ceramic.

[0023] Generally, any insulating element may be made

of a substrate material, wherein the substrate material may generally be a dielectric material that has a dielectric constant in a range of 2-4.

[0024] In an implementation form of the broadband antenna of the first aspect, each of the at least two stacked conductive elements of each wing has a different size; and the at least two stacked conductive elements are stacked according to decreasing size.

[0025] Accordingly, the two or more conductive elements of a wing may be arranged one after the other starting with the smallest conductive element, which is followed by the second-smallest conductive element, which is again followed by the next larger conductive element, and so on. The different sizes of the stacked conductive elements of a wing allow increasing the broadband characteristics of the wing, and thus the antenna. This is mainly based on different resonant frequencies of the differently-sized conductive elements of the wing.

[0026] In an implementation form of the broadband antenna of the first aspect, each wing comprises at least two conductive elements bent with a different radius of curvature.

[0027] The differently bended conductive elements further support an increase of the broadband characteristics of the antenna of the first aspect. This is due to the fact that the resonating frequencies of the individual conductive elements of the wing may be adjusted based on their radius of curvature.

[0028] In an implementation form of the broadband antenna of the first aspect, a larger conductive element of the wing is bent with a smaller radius of curvature than a smaller conductive element of the wing.

[0029] That is, for the conductive elements of the antenna, a radius of curvature of curvature may generally decrease the larger the size of the conductive element. Conductive elements may thus have different shapes, e.g., the L-shapes, U-shapes, or even spiral shapes.

[0030] In an implementation form of the broadband antenna of the first aspect, the broadband antenna further comprises: an antenna feed including a coaxial cable, wherein the coaxial cable is connected to the smallest conductive element of each wing.

[0031] In particular, for each of the two or more wings of the antenna, the smallest conductive element (and first conductive element in the stack) of the stacked conductive elements may be fed via the antenna feed, in order to operate the antenna. Thereby, oppositely arranged wings of the antenna may be used for causing a vertical or horizontal polarized radiation of the antenna. However, with an individual feeding of the wings, a circular polarization of the radiation of the antenna may also be caused. It is moreover possible to switch the broadband antenna between a circular polarization and a linear polarization, for instance, by changing a feeding scheme of the wings and their conductive elements via the antenna feed.

[0032] In an implementation form of the broadband antenna of the first aspect, the antenna is configured to radiate with a linear polarization and/or with a circular

polarization.

[0033] In particular, it may be possible to switch between linear polarization(s) and circular polarization, in which case the antenna is configured to radiate with a linear polarization and with a circular polarization (at different times).

[0034] In an implementation form of the broadband antenna of the first aspect, the antenna is configured to radiate in a frequency range of 5-50 GHz.

[0035] Thus, the antenna has a high antenna bandwidth, while it has at the same time a small size (or footprint, or form factor).

[0036] In an implementation form of the broadband antenna of the first aspect, at least one conductive element of at least one wing is provided with a top capacity.

[0037] The use of one or more top capacities may further increase the capacitive behavior of the antenna.

[0038] A second aspect of this disclosure provides an antenna array comprising two or more broadband antennas, wherein each broadband antenna is configured according to the first aspect or an of its implementation forms.

[0039] Due to the small broadband antennas, a compact antenna array can be designed. The antenna array may be integrated into a vehicle, for instance, an airborne vehicle. The antenna array may have a very large gain, i.e., larger than the bandwidths of the individual antennas of the array.

[0040] In an implementation form of the antenna array of the second aspect, at least two of the broadband antennas have a different size.

[0041] The two or more broadband antennas of the array can, in particular, be arranged in a regular pattern, for instance, on a ground plane. For instance, the two or more broadband antennas may be arranged in one or more rows and/or one or more columns, to form a regular array.

[0042] However, the two or more broadband antennas may also be arranged in a different manner - like in an irregular pattern - to produce, for example, a sparse antenna array.

[0043] A third aspect of this disclosure provides a method for manufacturing an antenna, the method comprising: forming two or more wings by arranging one or more conductive elements for each wing, wherein each conductive element has a bent shape; and forming the antenna by connecting the conductive elements of the two or more wings to each other.

[0044] In an implementation form of the method of the third aspect, the method comprises forming the antenna by arranging the two or more wings of the antenna around a central connection of the antenna, and by connecting the conductive elements of the two or more wings to each other by means of the central connection.

[0045] The method of the third aspect may have further implementation, adapted for manufacturing the different implementation forms of the antenna of the first aspect described above.

[0046] The method of the third aspect and its implementation forms may accordingly achieve the same advantages as the antenna of the first aspect and its respective implementation forms described above.

BRIEF DESCRIPTION OF THE DRAWINGS

[0047] The above described aspects and implementation forms (embodiments of this disclosure) are explained in the following detailed description with respect to the enclosed drawings, wherein:

FIG. 1 shows a broadband antenna according to an exemplary embodiment of this disclosure with two wings, each wing having one or more conductive elements.

FIG. 2 shows a broadband antenna according to an exemplary embodiment of this disclosure with four wings, each wing having two conductive elements.

FIG. 3 shows another broadband antenna according to an exemplary embodiment of this disclosure with four wings, each wing having twelve conductive elements.

FIG. 4 shows another broadband antenna according to an exemplary embodiment of this disclosure with four wings, which are embedded into a substrate block.

FIG. 5 shows an antenna array according to an exemplary embodiment of this disclosure, the antenna array comprising multiple broadband antennas.

FIG. 6 shows a frequency-dependent gain of a broadband antenna according to an exemplary embodiment of this disclosure over a bandwidth of the broadband antenna.

DETAILED DESCRIPTION OF EMBODIMENTS

[0048] The FIGs. 1-5 show broadband antennas 10 according to exemplary embodiments of this disclosure. The broadband antennas 10 may have a large antenna bandwidth, i.e., they may each be configured to radiate in a frequency range of 5-50 GHz. Thereby, the broadband antennas 10 may be configured to radiate, for instance selectively, with a linear polarization or with a circular polarization. For example, it may be possible to switch the antennas 10 to radiate with either the linear polarization or the circular polarization. Due to their small size, the broadband antennas 10 are well suited to be integrated or attached to a vehicle, in particular, to an airborne vehicle like an airplane, a helicopter, or a drone.

[0049] Generally, a broadband antenna 10 according

to an embodiment of this disclosure has two, or three, or more wings, wherein each wing comprises one or more conductive elements, wherein the conductive elements are connected and each have a bent shape (e.g., a flat and curved shape). Notably, the number of conductive elements may be the same for each wing, but may also differ from one wing to the other. Each of the wings may extend outward from a common connection point, so that the radiating part of the broadband antenna 10 resembles a windmill or wind spinner.

[0050] FIG. 1 shows, in particular, a broadband antenna 10 according to an exemplary embodiment with two wings 11. Each wing 11 may have one conductive element 12 (as indicated with solid line), or may have two, three (as indicated with dotted line) or even more conductive elements 12, i.e., a wing is an arrangement of one or more conductive elements 12. Each conductive element 12 may be flat or sheet-like and may exhibit a curvature along its length (e.g., each conductive element 12 may be a curved blade). In the case that each wing 11 has one conductive element 12, each wing 11 is formed by the conductive element 12. Each conductive element 12 may function as a radiative dipole, and thus also each wing 11 may function as a radiative dipole. In case of two or more conductive elements 12 per wing 11, the dipole area is widened and the dipole may thus radiate in a larger frequency range.

[0051] The wings 11 of the antenna 10 may be of the same size and/or shape, and may be connected to each other in a central connection point, which may be arranged in a geometrical center of the antenna 10. From this connection point, the wings 11 may extend outwards (along their length), for example, into roughly opposite directions, such that they resemble wings. Each conductive element 12 may also individually have the shape of a wing. With the at least two wings 11, which extend outward from the central connection point, the broadband antenna 10 may in its entirety have the shape of a wind wheel or wind spinner, as schematically illustrated in FIG. 1.

[0052] In any case, each of conductive element 12 of the antenna 10 has a bent shape. That means, each conductive element 12 exhibits a curvature. Any conductive element 12 maybe a planar conductive element. For instance, a conductive element 12 may be made of a flat metal sheet, wherein the metal sheet is arched, as schematically illustrated in FIG. 1. In particular, a conductive element 12 maybe curved along its length. Furthermore, the width of the conductive element 12 may vary over its length, as schematically illustrated in FIG. 1.

[0053] FIG. 2 shows a broadband antenna 10 according to another exemplary embodiment. Same elements in FIG. 1 and FIG. 2 are labelled with the same reference signs, and may be implemented in an identical manner.

[0054] In particular, the broadband antenna 10 of FIG. 2 has four wings 11, and each wing 11 comprises two conductive elements 12. Again each wing 11 may, however, comprise any number of conductive elements 12.

The two or three or more conductive elements 12 of each wing 11 may be stacked, i.e., they may be arranged one after another (or one above the other) along a certain direction. That is, each wing 11 is, in this example, an arrangement of one or more stacked conductive elements 12 (e.g., curved blades 12). Thereby, a distance between the two or more conductive elements 12 may be constant or not, and may be the same for each wing 11 or not. The two or more conductive elements 12 of each wing 11 may be separated from each other by air or by an insulating element. The insulating element may be a substrate layer, for instance, made of ceramic, Teflon, or TSM30, or may be a glue, an epoxy, or a resin. TSM30 describes a polyamide 66/6 copolymer (nylon 66/6) material filled with 30% mineral.

[0055] As also shown in FIG. 2, the conductive elements 12 of each wing 11 may be of a similar shape. However, they can also have completely different shapes. Further, the conductive elements 12 of each wing 11 may be bent with a different radius of curvature. For example, as schematically illustrated in FIG. 2, the two stacked conductive elements 12 of each wing 11 may have a different size and curvature.

[0056] As also schematically illustrated in FIG. 2, the wings 11 of the antenna 10 may be arranged around a central connection 20 - which is similar to the central connection point illustrated in FIG. 1. The central connection 20 maybe made of a conductive material, like a metal, and may connect the conductive elements 12 of the wings 11 to each other. This central connection 20 may also serve for feeding of the conductive elements 12 of the wings 11. For instance, an antenna feed comprising at least one coaxial cable may be connected to the central connection 20, for instance, by means of the coaxial cable. In particular, the coaxial cable may be connected to the smaller/smallest conductive element 12 of each wing 11, and from there may be further connected to the larger/largest conductive element 12 of the wing 11.

[0057] FIG. 3 shows a broadband antenna 10 according to another exemplary embodiment of this disclosure. Same elements in FIG. 1 and/or FIG. 2, and in FIG. 3 are labelled with the same reference signs, and may be implemented in an identical manner.

[0058] Like the broadband antenna 10 of FIG. 2, also the broadband antenna 10 of FIG. 3 comprises four wings, which are arranged around the central connection 20. In particular, the four wings 11 may be arranged in a regular manner around the central connection 20, such that adjacent (non-opposite) wings 11 have roughly an angular offset of 90° between each other. The four wings 11 may further form two pairs of oppositely arranged wings 11, wherein each pair may be responsible for different linear polarization, which the broadband antenna 10 is configured to radiate with. In particular, the broadband antenna 10 may radiate with a vertical and a horizontal linear polarization, respectively, using the two pairs of wings 11. However, also a circular polarization is possible, for instance, if the wings 11 are fed individually. To this end,

an antenna feed connected to the central connection 20 may comprise one or more coaxial cables, each coaxial cable being adapted to feed a different wing 11.

[0059] Furthermore, as schematically illustrated in FIG. 3, each wing 11 comprises a plurality of conductive elements 12. In particular, each wing 11 may comprise more than 10 conductive elements 12, for instance, twelve conductive elements twelve as shown. Thereby, each of the conductive elements 12 of each wing 11 may have at least one of a different radius of curvature, a different shape, or a different size. This may increase the broadband characteristics of the antenna 10, such that the broadband antenna 10 may be configured to radiate in a frequency range of 5-50 GHz.

[0060] As also illustrated in FIG. 3, the conductive elements 12 may again be arranged in a stack for each wing 11. Thereby, the conductive elements 12 are preferably stacked according to their size. That is, the stack may start with the smallest conductive element 12 of the wing 11, and each further conductive element 12 of the stack 12 may have a larger size than the previous conductive element 12 of the stack. Moreover, the antenna feed, comprising the at least one coaxial cable, may be connected to the smallest conductive element 12 of each wing 11, and the larger conductive elements 12 of each wing 11 may be connected from there by the central connection 20.

[0061] FIG. 3 also shows schematically that each of the conductive elements 12, i.e., each element/layer in the stack of the wing 11, may have a similar shape. However, the shapes of the individual conductive elements 12 can also differ significantly from each other. For instance, the first conductive element 12 of the stack of a wing 11 may have only a very small bend, for example, a bend below 90°. The next conductive element 12 in the stack of the wing 11 may have a larger bend, for instance, one that is roughly 90°. The next conductive element 12 of the wing 11 may have a bend that curves even more, for instance, by more than 90°. The next conductive element 12 of the wing may then have a bend that curves by roughly 180°, and further conductive elements 12 of the wing 11 could even curve by more than 180°, or by roughly 270°, or by more than 270°, or by roughly 360°, or even more. The curvature of the bends may, for instance, increase with size. A conductive element 12 of a wing 11 may even have a spiral shape. Accordingly, the broadband antenna, or each wing 11 thereof, may be considered as a stacked spiral antenna or a stacked sinusoidal antenna.

[0062] In addition, the conductive elements 12 of the wings 11 may be provided with at least one top capacity. For instance, there may be a top capacity provided per each wing 11, for example, at the ends of the conductive elements 12 of the wing. However, not each wing 11 or not each conductive element 12 is necessarily provided or connected individually to such a top capacity.

[0063] FIG. 4 shows a broadband antenna 10 according to another exemplary embodiment of this disclosure.

Same elements as in the previous figures are again labelled with the same reference signs, and may be implemented in an identical manner.

[0064] Just as example, the broadband antenna 10 of FIG. 4 is again shown with four wings 11. The broadband antenna 10 of FIG. 4 further comprises a substrate block 40, into which the wings 11 and conductive elements 12 are embedded. The substrate material of the substrate block may have an insulating behavior. Accordingly, an insulating material may be formed between each two adjacent conductive elements 12 of a wing 11, and between the wings 11 of the antenna 10.

[0065] FIG. 4 further shows schematically that the wings 11 may be exposed at a front side of the substrate block 40. The wings 11 may not be exposed at the opposite back side of the substrate block 40. However, at least one coaxial cable may extend through and from the back side of the substrate block 40, in order to allow feeding of the antenna 10.

[0066] FIG. 5 shows an antenna array 50 according to an exemplary embodiment of this disclosure. The antenna array 50 comprises two or more broadband antennas 10. Each of these antennas 10 is designed and configured according to any one of the previously described exemplary embodiments. However different broadband antennas 10 of the array may have at least one of different sizes and different shapes. FIG. 5 shows, for example, that the antenna array 50 includes at least one broadband antenna 10 of a large size, at least one antenna 10 of a medium size, and at least one antenna 10 of a small size (sizes relative to another).

[0067] The antenna array 50 may also comprise at least two broadband antennas 10, of which each broadband antenna 10 has a different number of wings 11 and/or a different number of conductive elements 12 per wing 11. Also the shapes and/or the curvatures of the wings 11, and their respective conductive elements 12, may differ from one antenna 10 to the other. Thereby, an antenna array 50 with a pronounced gain is achievable by combining multiple broadband antennas 10.

[0068] FIG. 6 shows, in this respect, the broadband characteristics of an antenna 10 according to an exemplary embodiment of this disclosure. In particular, the radiation characteristics of this exemplary broadband antenna 10 are shown to be in a frequency range between 5-50 GHz. FIG. 6 demonstrates that the gain of the antenna 10 is above 4 dB over the entire frequency range of 5-50 GHz, and is even above 5 dB, or even close to 6 dB over most of the frequency range (10-50 GHz).

[0069] In summary, embodiments of this disclosure present a broadband antenna 10 and/or an antenna array 50, which has a large antenna bandwidth and gain, respectively, while having a comparatively small size. This is enabled by the design of the antenna 10 with the two or more wings 12 and one or more conductive elements 12. Thus, the broadband antenna 10 and antenna array 50 are well suited for the integration into vehicles like airborne vehicles.

Claims

1. A broadband antenna (10) comprising:

two or more wings (11), each wing (11) comprising one or more conductive elements (12), wherein the conductive elements (12) of the two or more wings (11) are connected to each other, and wherein each conductive element (12) has a bent shape.

2. The broadband antenna (10) according to claim 1, wherein the broadband antenna (10) has four wings (11).

3. The broadband antenna (10) according to claim 1 or 2, wherein the two or more wings (11) are arranged around a central connection (20), and the conductive elements (12) of the two or more wings (11) are connected to each other by the central connection (20).

4. The broadband antenna (10) according to one of the claims 1 to 3, wherein each wing (11) comprises at least two stacked conductive elements (12).

5. The broadband antenna (10) according to claim 4, wherein adjacently arranged conductive elements (12) of the at least two stacked conductive elements (12) of each wing (11) are separated from each other by an insulating element (40).

6. The broadband antenna (10) according to claim 5, wherein the insulating element (40) is made of at least one of TSM30, Teflon, and ceramic.

7. The broadband antenna (10) according to one of the claims 4 to 6, wherein:

each of the at least two stacked conductive elements (12) of each wing (11) has a different size; and the at least two stacked conductive elements (12) are stacked according to decreasing size.

8. The broadband antenna (10) according to one of the claims 1 to 7, wherein each wing (11) comprises at least two conductive elements (12) bent with a different radius of curvature.

9. The broadband antenna (10) according to claim 8, wherein a larger conductive element (12) of the wing (11) is bent with a smaller radius of curvature than a smaller conductive element (12) of the wing (11).

10. The broadband antenna (10) according to claim 9, further comprising:

an antenna feed including a coaxial cable, wherein the coaxial cable is connected to the smallest conductive element (12) of each wing (11).

11. The broadband antenna (10) according to one of the claims 1 to 10, wherein the broadband antenna (10) is configured to radiate with a linear polarization and/or with a circular polarization.

12. The broadband antenna (10) according to one of the claims 1 to 11, wherein the broadband antenna (10) is configured to radiate in a frequency range of 5-50 GHz.

13. The broadband antenna (10) according to one of the claims 1 to 12, wherein at least one conductive element (12) of at least one wing (11) is provided with a top capacity.

14. An antenna array (50) comprising two or more broadband antennas (10), wherein each broadband antenna (10) is configured according to one of the claims 1 to 13.

15. The antenna array (50) according to claim 14, wherein at least two of the broadband antennas (10) have a different size.

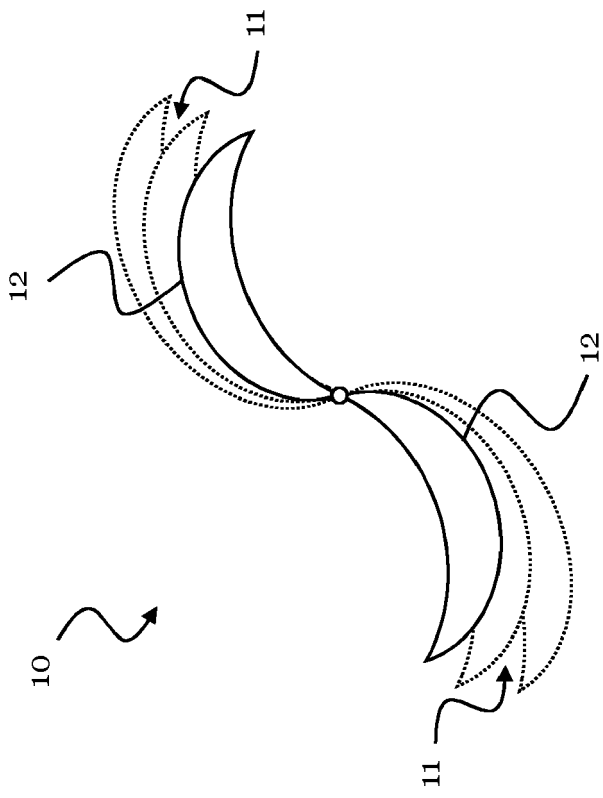
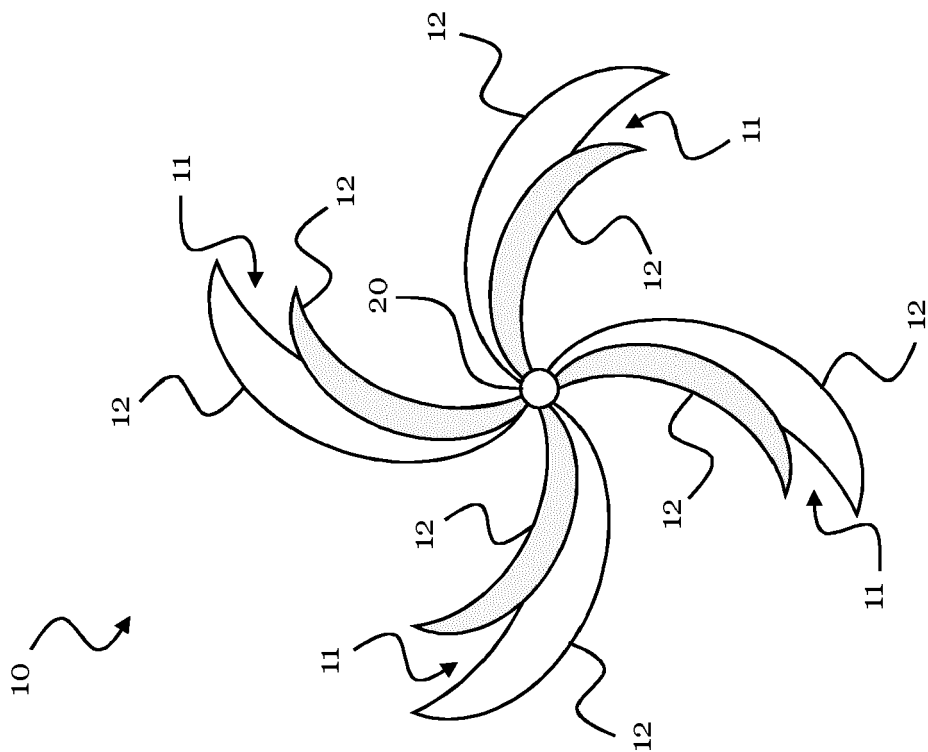


FIG. 1



11 **FIG. 2**

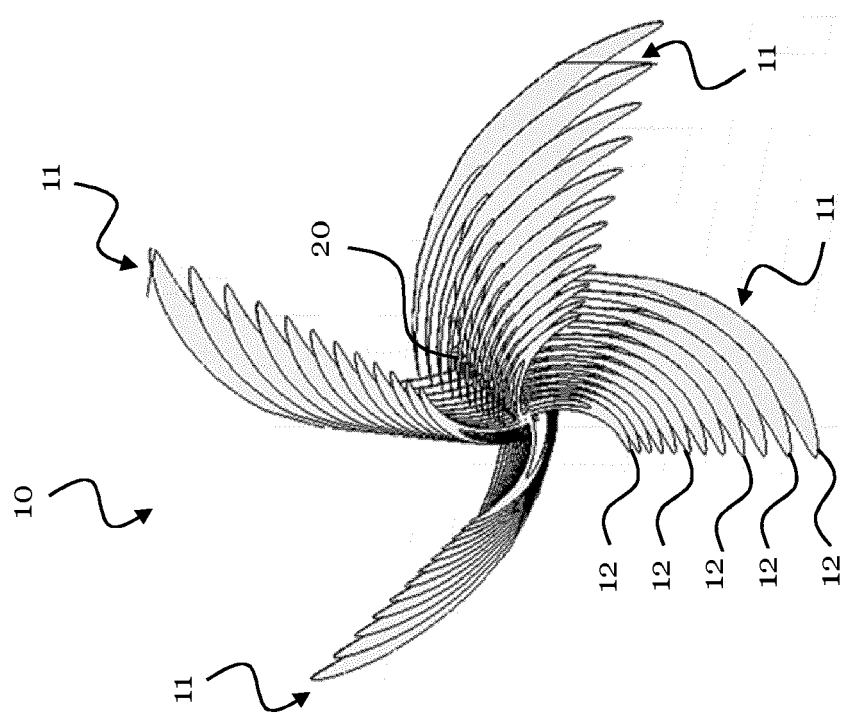


FIG. 3

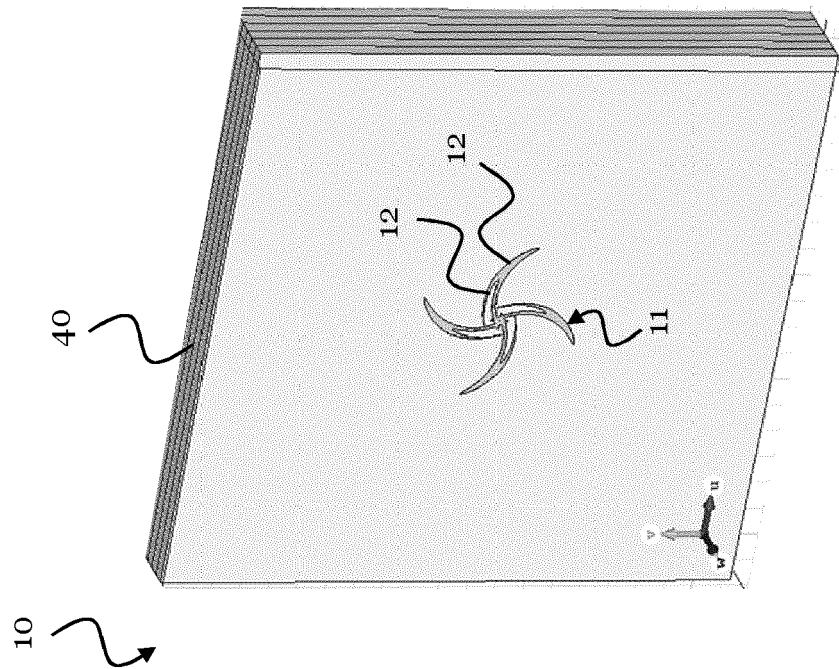


FIG. 4

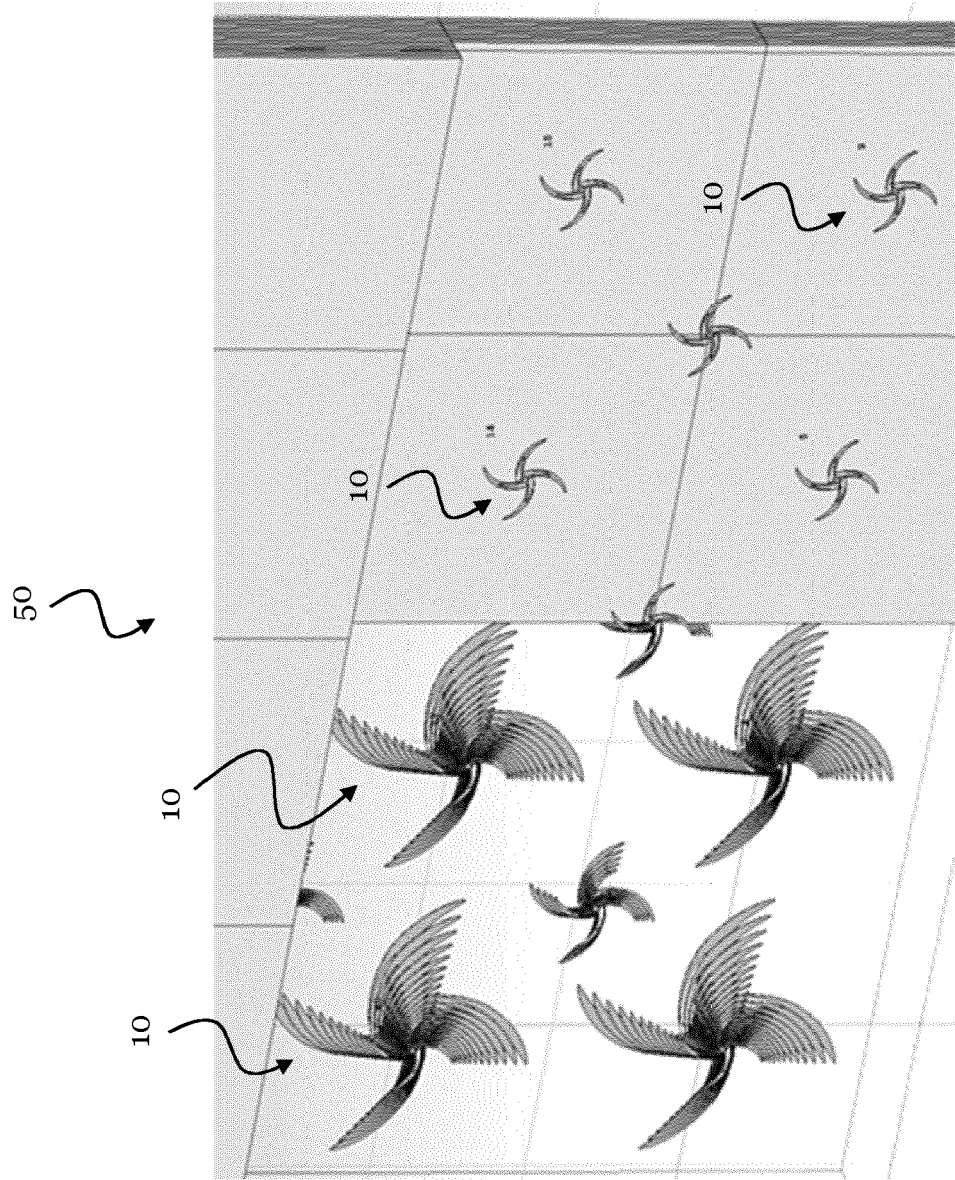


FIG. 5

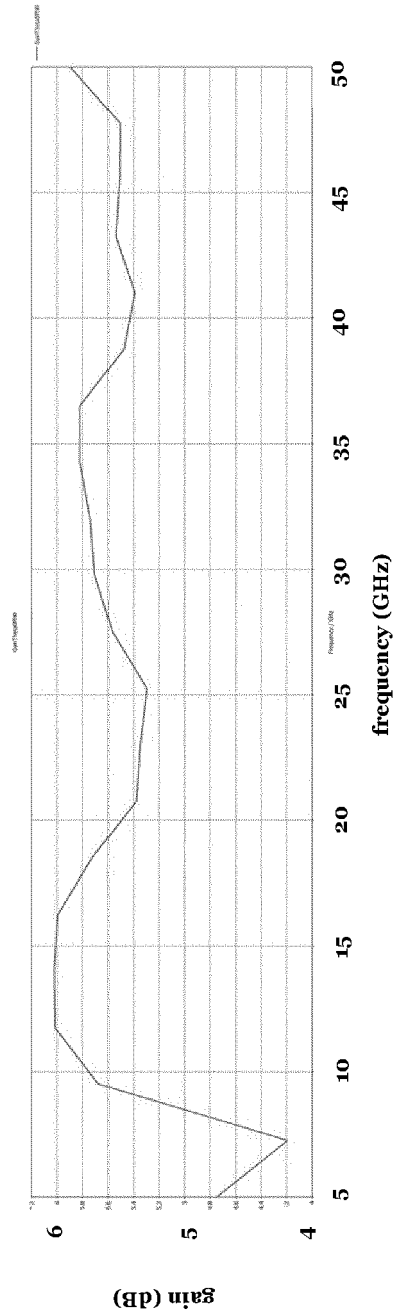


FIG. 6



EUROPEAN SEARCH REPORT

Application Number

EP 21 18 0723

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EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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