



(11)

EP 4 518 025 A1

(12)

EUROPEAN PATENT APPLICATION

published in accordance with Art. 153(4) EPC

(43) Date of publication:
05.03.2025 Bulletin 2025/10

(51) International Patent Classification (IPC):
H01Q 1/32 ^(2006.01) **H05K 7/20** ^(2006.01)

(21) Application number: **22943356.0**

(52) Cooperative Patent Classification (CPC):
H01Q 1/02; H01Q 1/22; H01Q 1/32; H05K 7/20

(22) Date of filing: **06.07.2022**

(86) International application number:
PCT/CN2022/104096

(87) International publication number:
WO 2023/226165 (30.11.2023 Gazette 2023/48)

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
 GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
 PL PT RO RS SE SI SK SM TR**
 Designated Extension States:
BA ME
 Designated Validation States:
KH MA MD TN

(72) Inventors:

- SHI, Peng
Chengdu, Sichuan 610002 (CN)
- ZHOU, Xiaomao
Chengdu, Sichuan 610002 (CN)
- LU, Jifa
Chengdu, Sichuan 610002 (CN)

(30) Priority: 27.05.2022 CN 202210592767

(74) Representative: **Caspary, Karsten et al**
Kroher-Strobel
Rechts- und Patentanwälte PartmbB
Bavariaring 20
80336 München (DE)

(71) Applicant: **Chengdu T-Ray Technology Co., Ltd.**
Chengdu, Sichuan 610002 (CN)

(54) **COMMUNICATIONS-ON-THE-MOVE ANTENNA AND VEHICLE**

(57) The present invention provides a satellite-communication-in-motion antenna and a vehicle, relating to the field of antennas technology. The satellite-communication-in-motion antenna - comprises: a housing and an antenna body disposed within the housing; wherein, inside the housing, there are at least two non-communicating heat dissipation channels arranged along the moving direction of the vehicle; the air inlet and outlet of each heat dissipation channel are arranged along the moving direction of the vehicle; and the at least two heat dissipation channels correspond in position to the antenna body for dissipating heat from the antenna body. In this way, on the one hand it can avoid the heated airflow from one section from baking another, and on the other hand, it can effectively shorten the flow distance of the heated airflow in each section, thereby effectively reducing the baking effect on the antenna body at the rear end caused by airflows heated at the front ends of the heat dissipation channels, which helps to improve the temperature uniformity of the antenna array surface and the radio frequency performance of the entire device.

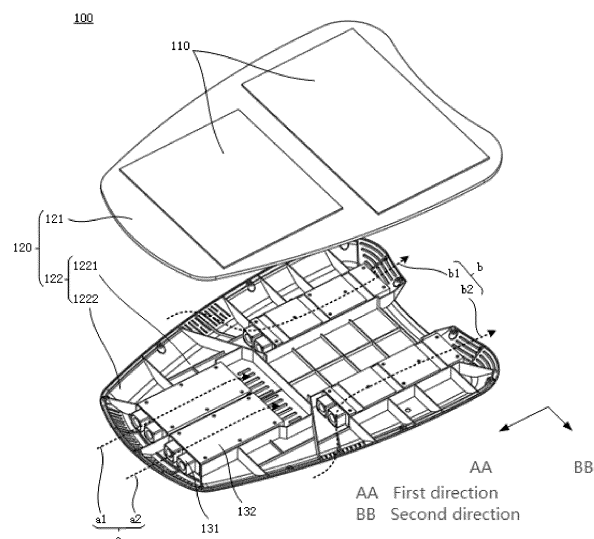


Fig. 1

Description

FIELD OF THE DISCLOSURE

[0001] This application relates to the field of antenna technology, specifically to a satellite-communications-in-motion antenna and a vehicle.

BACKGROUND OF THE DISCLOSURE

[0002] In recent years, vehicular tracking control systems using phased array antennas have become increasingly widespread in applications such as large-scale event news coverage, disaster relief reporting, and anti-terrorism activities, where vehicular satellite antennas are favored for their compact size, low cost, intelligence, high reliability, and ease of maintenance.

[0003] When using existing mobile communication phased array antennas, the antenna array faces the sky with a heat dissipation channel at the bottom. During high-speed movement of the vehicle, forced convection occurs through the heat dissipation channel, thus cooling the system and preventing overheating or even burning of electronic components in the mobile communication phased array antenna. However, the drawbacks are also apparent, as the heat dissipation channel extends from the front to the back of the mobile communication phased array antenna. Thus, the heat from the front end of the channel can cause a baking effect at the back end during transfer, thereby disrupting the temperature uniformity of the antenna array and affecting the overall radio frequency performance.

SUMMARY OF THE DISCLOSURE

[0004] The objective of this application is to address the deficiencies in the existing technology by providing a satellite-communication-in-motion antenna and a vehicle that improve the baking effect caused by the poor design of the heat dissipation channel in existing mobile communication phased array antennas, enhancing the temperature uniformity of the antenna array and the overall radio frequency performance.

[0005] To achieve the aforementioned objective, the technical solution adopted in this embodiment of the application is as follows:

[0006] One aspect of this embodiment provides a satellite-communication-in-motion antenna for installation on a vehicle, it comprises a housing and an antenna body arranged in the housing. At least two heat dissipation channels are arranged in the housing, the at least two heat dissipation channels being not communicated with each other and being arranged in the moving direction of a vehicle. An air inlet and outlet of each heat dissipation channel is arranged in the moving direction of the vehicle. The positions of the at least two heat dissipation channels correspond in position to the antenna body for dissipating heat from the antenna body.

[0007] Optionally, each heat dissipation channels comprises multiple sub-channels arranged side by side perpendicular to the moving direction of the vehicle which are not interconnected to each other; and the air inlet and outlet of each sub-channel are arranged along the moving direction of the vehicle.

[0008] Optionally, the housing comprises a bottom shell with an opening and a top plate covering the opening; the antenna body is arranged on the side of the top plate facing away from the bottom shell, the heat dissipation channels are located between the top plate and the bottom shell; and the side plate of the bottom shell comprises a windward side and a leeward side, with the air inlet of the heat dissipation channels distributed on the windward side of the side plate.

[0009] Optionally, the air outlets of the heat dissipation channels are distributed on the leeward side of the side plate and/or the bottom plate of the bottom shell.

[0010] Optionally, the windward side of the side plate is arc-shaped, triangular, or trapezoidal.

[0011] Optionally, the angle between the side plate of the bottom shell and the top plate is acute or obtuse.

[0012] Optionally, a heat dissipation component is further provided within the heat dissipation channel, which corresponds to the position of the antenna body for dissipating heat from the antenna body.

[0013] Optionally, the heat dissipation component comprise fans and heat dissipation teeth positioned within the heat dissipation channels.

[0014] Optionally, dust-proof nets are installed at the air inlet and the air outlet.

[0015] Another aspect of this application provides a vehicle comprising a body and any of the aforementioned satellite-communication-in-motion antennas installed on the body.

[0016] The beneficial effects of this application include:

[0017] The present invention provided a satellite-communication-in-motion antenna and a vehicle. The satellite-communication-in-motion antenna comprises a housing and an antenna body disposed within the housing, wherein, inside the housing, there are at least two non-communicating heat dissipation channels arranged along the moving direction of the vehicle; the air inlet and outlet of each heat dissipation channel are arranged along the moving direction of the vehicle; and the at least two heat dissipation channels correspond in position to the antenna body for dissipating heat from the antenna body. In this way, on the one hand it can avoid the heated airflow from one section from baking another, and on the other hand, it can effectively shorten the flow distance of the heated airflow in each section, thereby effectively reducing the baking effect on the antenna body at the rear end caused by airflows heated at the front ends of the heat dissipation channels, which helps to improve the temperature uniformity of the antenna array surface and the radio frequency performance of the entire device.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] To clearly illustrate the technical solutions of the embodiments of this application, the following will provide a brief introduction to the drawings required for the embodiments. It should be understood that the drawings below only show some embodiments of this application and should not be seen as limiting the scope. For those skilled in the art, other related drawings can be obtained based on these without creative effort.

Figure 1 is an exploded view of a satellite-communication-in-motion antenna provided by the embodiments of this application.

Figure 2 is a schematic diagram of the bottom structure of a satellite-communication-in-motion antenna provided by the embodiments of this application.

Figure 3 is a schematic diagram of the windward side of the bottom shell side panel provided by the embodiments of this application.

Figure 4 is a side view of a satellite-communication-in-motion antenna provided by the embodiments of this application.

Figure 5 is one of the contour diagrams of the housing of the satellite-communication-in-motion antenna provided by the embodiments of this application.

Figure 6 is the second contour diagram of the housing of the satellite-communication-in-motion antenna provided by the embodiments of this application.

Figure 7 is the third contour diagram of the housing of the satellite-communication-in-motion antenna provided by the embodiments of this application.

Figure 8 is the fourth contour diagram of the housing of the satellite-communication-in-motion antenna provided by the embodiments of this application.

[0019] Reference numbers in the drawings: 100-Satellite-communication-in-motion Antenna; 110-antenna body; 120-housing; 121-top plate; 122-bottom shell; 1221-Bottom plate; 1222-side plate; 131-Fan; 132-heat dissipation teeth; 141-air inlet; 142-air outlet; 151-outward convex part; 200- vehicle; 101-first surface; 102-second surface; 103-third surface; 104-fourth surface; 105-fifth surface; 106-sixth surface; 107-seventh surface; 108-eighth surface; 109-ninth surface.

DETAILED IMPLEMENTATION OF THE DISCLOSURE

[0020] To make the objectives, technical solutions, and advantages of this application's embodiment clearer, the following will combine the drawings in this embodiment to provide a clear and complete description of the technical solutions in this embodiment. It is evident that the described embodiments are part of the embodiments of this application, not all of them. It should be noted that, where not conflicting, the various features in the embodiments of this application can be combined, and the combined

embodiments are still within the scope of protection of this application.

[0021] In the description of this application, it should be noted that terms such as "center," "top," "bottom," "left," "right," "vertical," "horizontal," "internal," and "external" indicate orientations or positional relationships based on the orientations or positions shown in the drawings, and are only for ease of description and simplification of this application, and should not be construed as limiting this application. Furthermore, terms like "first," "second," "third," etc., are used only to distinguish descriptions and should not be interpreted as indicating or implying relative importance.

[0022] In the description of this application, it should also be noted that, unless otherwise specified and limited, terms such as "set," "install," "connected," and "connection" should be understood broadly, for example, they can be fixed connections, removable connections, or integral connections; they can be mechanical connections or electrical connections; they can be directly connected, or indirectly connected through an intermediary medium, and can be internal connections between two components. For those skilled in the art, the specific meanings of the above terms in this application can be understood according to the specific circumstances.

[0023] This application provides a vehicle and a satellite-communication-in-motion antenna applied on the vehicle, through which the satellite-communication-in-motion antenna enables the vehicle to have satellite communication capabilities. The vehicle can be any type of transportation, such as motorcycles, cars, airplanes, ships, etc., and this embodiment of the application does not limit it. The following will describe the embodiment of this application in conjunction with the drawings.

[0024] Refer to Figure 1, which shows an exploded view of a satellite-communication-in-motion antenna. The satellite-communication-in-motion antenna 100 includes a housing 120 and an antenna body 110. As shown in Figure 4, the antenna body 110 is mounted within the housing 120, thus forming an integrated structure. This facilitates the installation of the housing 120 onto the vehicle 200, thereby implementing the setup of the satellite-communication-in-motion antenna 100. The antenna body 110 can be installed inside the housing 120 or on the external wall of the housing 120. When mounted in the housing 120, the antenna body 110 can be installed in a removable manner.

[0025] The antenna body 110 is used for signal transmission or data transmission, and it generates heat during operation. To prevent performance degradation due to excessive temperature, heat dissipation channels are established within the housing 120, these channels are positioned in correspondence with the antenna body 110, thus cooling the antenna body 110 through these heat dissipation channels.

[0026] Specifically, at least two heat dissipation channels are established within the housing 120. Depending on requirements, there can be two, three, four, or more

channels, with no specific limitation imposed by this application. Each heat dissipation channel has an air inlet 141 and an air outlet 142 that connect to the external environment of the housing 120, facilitating airflow and heat dissipation.

[0027] To reduce the baking effect caused by the transfer of hot air flow between the heat dissipation channels, this application ensures that each channel is relatively independent. In other words, any two heat dissipation channels within the housing 120 do not interconnect, maintaining their individual airflow independence.

[0028] Additionally, this application arranges the air inlets 141 and air outlets 142 of each heat dissipation channel generally along the direction of travel of the vehicle 200. The heat dissipation channels extend in the direction of travel of the vehicle 200, allowing high-speed airflow to smoothly enter through the air inlet 141 during rapid movement of the vehicle 200, exchange heat with the antenna body 110, and then quickly exit through the air outlet 142, thereby effectively cooling the antenna body 110 and enhancing the efficiency of heat dissipation. As shown in Figures 1 and 2, the extension directions of heat dissipation channels a and b are roughly parallel to the direction of travel of the vehicle 200.

[0029] Based on this, the application arranges at least two heat dissipation channels along the travel direction of the vehicle 200, integrating the aforementioned settings, which can segment the area of the antenna body 110 that requires cooling along the travel direction of the vehicle 200, and each segment is independent of each other. This arrangement prevents the heated airflows of different segments from baking each other, and also effectively shortens the circulation distance of the heated airflows in each segment, thereby effectively reducing the baking effect of the airflow heated by the front end of the heat dissipation channel on the rear end of the antenna body 110, which helps to improve the temperature uniformity of the antenna array and the radio frequency performance of the entire machine.

[0030] For example, when there are two heat dissipation channels, please refer to Figures 1 and 2, where the first direction is the travel direction of the vehicle 200, and the second direction is the horizontal direction perpendicular to the travel direction of the vehicle 200. Inside the housing 120, heat dissipation channels a and b are set up, where the arrows of heat dissipation channels a and b represent the airflow direction. Heat dissipation channels a and b are arranged along the first direction, with heat dissipation channel b located behind heat dissipation channel a. Thus, the two heat dissipation channels divide the area of the antenna body 110 that requires cooling into a front and a rear section, where heat dissipation channel a is located below the front section of the antenna body 110, and heat dissipation channel b is located below the rear section of the antenna body 110. As the vehicle 200 moves in the first direction, the airflow enters through the air inlet 141 of heat dissipation channels a and b, exchanges heat with the front section of the

antenna body 110 in heat dissipation channel a and is then expelled through the air outlet 142 of heat dissipation channel a, and the airflow that enters heat dissipation channel b exchanges heat with the rear section of the antenna body 110 and is expelled through the air outlet 142 of heat dissipation channel b, thereby cooling the front section of the antenna body 110 with heat dissipation channel a and the rear section with heat dissipation channel b.

[0031] When cooling the front and rear sections of the antenna body 110, heat dissipation channels a and b are independent of each other and arranged along the first direction. Therefore, the heated airflow of heat dissipation channel a does not bake the rear section of the antenna body 110, and the heated airflow of heat dissipation channel b does not bake the front section of the antenna body 110. Additionally, the lengths of heat dissipation channels a and b are relatively short (not extending from the front to the rear section of the antenna body 110), which significantly reduces the baking effect between the front and rear ends within the same heat dissipation channel.

[0032] To provide more comprehensive coverage of the areas requiring heat dissipation on the antenna body 110, each heat dissipation channel may include multiple independent sub-channels, where any two sub-channels are not interconnected, and the multiple sub-channels included in each heat dissipation channel are arranged side by side along the vertical direction (second direction) of the vehicle 200, thereby enhancing the heat dissipation performance of the heat dissipation channel for the antenna body 110. Each sub-channel has an air inlet 141 and an air outlet 142 that are connected to the exterior of the housing 120, and both the air inlet and air outlet 142 of each sub-channel are arranged along the direction of travel of the vehicle 200. Within each heat dissipation channel, any two of the multiple sub-channels included can either be closely adjacent or spaced apart from each other.

[0033] For instance, refer to Figures 1 and 2, heat dissipation channel includes sub-channels a1 and a2, and heat dissipation channel b includes sub-channels b1 and b2. Each of these sub-channels a1, a2, b1, and b2 has its respective air inlet 141 and air outlet 142. Sub-channels a1 and a2 are arranged side by side in the second direction, as are sub-channels b1 and b2. Sub-channels a1 and a2 are located at the front section of the antenna body 110, while sub-channels b1 and b2 are located at the rear section of the antenna body 110. Consequently, sub-channels a1 and a2 cool the front section of the antenna body 110, and sub-channels b1 and b2 cool the rear section of the antenna body 110.

[0034] In this application, the antenna body 110 can be a phased array antenna, and the antenna body 110 may include one or more phased array antennas. In distribution, a heat dissipation channel can correspond to cooling a phased array antenna. For example, as shown in Figure 1, the antenna body 110 includes two phased array

antennas arranged in the first direction. Thus, heat dissipation channel a can cool the phased array antenna located at the front, and heat dissipation channel b can cool the phased array antenna located at the rear. This arrangement prevents the heated airflow in heat dissipation channel a from baking the phased array antenna located at the rear.

[0035] Refer to Figures 1 and 2, the housing 120 includes a bottom shell 122 and a top plate 121. The bottom shell 122 has an internal cavity, and the upper side of the bottom shell 122 has an opening communicating with the internal cavity. The top plate 121 covers this opening and is connected to the bottom shell 122. The bottom shell 122 includes a bottom plate 1221 and side plates 1222 set around the perimeter of the bottom plate 1221, which together with the bottom plate 1221 enclose to form a cavity with an opening.

[0036] Please refer to Figures 1 to 4, to reduce the drag caused by the housing 120 during the high-speed movement of the vehicle 200, the side panel 1222 and the top plate 121 of the bottom shell 122 can be set at an acute angle c or an obtuse angle, thus, enabling the windward side of the housing 120 to have lower wind resistance. In one embodiment, as shown in Figure 2, when the side panel 1222 and the top plate 121 of the bottom shell 122 are set at an acute angle c, the bottom shell 122 forms a truncated shape, and the area of the top plate 121 is larger than that of the bottom plate 1221, thereby, the top plate 121 can protect the air inlet 141 and the air outlet 142 set on the side plate 1222, reducing the entry of rainwater and other elements into the housing 120. In another embodiment, when the side plate 1222 and the top plate 121 of the bottom shell 122 are set at an obtuse angle, the bottom shell 122 forms a truncated shape, and the area of the top plate 121 is smaller than that of the bottom plate 1221.

[0037] The side plate 1222 of the bottom shell 122 has a windward side and a leeward side, please refer to Figure 3, which shows the windward side of the side plate 1222 of the bottom shell 122. To enhance the cooling efficiency, the air inlets 141 of each heat dissipation channel are located on the windward side, thereby facilitating the smooth entry of airflow into the heat dissipation channels. Specifically, as shown in Figure 2, the air inlets 141 of sub-channels a1, a2, b1, and b2 are all located on the windward side of the side plate 1222.

[0038] As shown in Figures 1 and 2, when the heat dissipation channels include heat dissipation channel a and heat dissipation channel b, for ease of setup, the air inlet 141 of heat dissipation channel a is located on the side plate 1222 at the front end of the housing 120, the air outlet 142 of heat dissipation channel a is located on the bottom plate 1221 of the housing 120, the air inlet 141 of heat dissipation channel b is located on the side plate 1222 of the side of the housing 120, and the air outlet 142 of heat dissipation channel b is located on the side plate 1222 at the rear of the housing 120.

[0039] Consequently, when the vehicle 200 travels at

high speed, the windward side of the side plate 1222 of the bottom shell 122 reduces the pressure difference resistance between the windward side and the rear through the Coanda effect and streamlined design, preventing direct forced convection between the high-speed airflow and the heat dissipation components and channels, thereby reducing wind noise.

[0040] Due to the Coanda effect, the high-speed fluid adheres to the side plate 1222 of the bottom shell 122, deviating from its original direction. Meanwhile, according to Bernoulli's principle, the airflow speed on the windward side decreases, increasing the static pressure from the air inlet 141 to the air outlet 142 on the windward side, while the airflow speed below the air outlet 142 on the bottom plate 1221 remains unaffected. Therefore, the airflow speed below the air outlet 142 on the bottom plate 1221 is high, but the static pressure is low. The tail air outlet, due to the high-speed travel of the vehicle 200, creates a negative pressure area, thus increasing the static pressure at the air inlet 141 on the windward side, while decreasing the static pressure at the air outlet 142 on the leeward side or bottom plate 1221. This increases the static pressure difference between each air inlet 141 and air outlet 142 of the heat dissipation channels, enhancing the airflow speed through the heat dissipation components, improving the cooling efficiency, and rapidly removing heat, thereby enhancing the overall cooling efficiency.

[0041] Based on the aforementioned principles, please refer to Figure 5, which illustrates the external contour of a satellite-communication-in-motion antenna 100. The left side of the dashed line d is the leeward side, and the right side of the dashed line d is the windward side. As shown in Figure 5, the windward side is trapezoidal and includes sequentially connected first surface 101, second surface 102, and third surface 103. All these surfaces are curved, and the junctions between adjacent surfaces are curved transitions. Thus, through the Coanda effect, this windward side reduces the pressure difference resistance between the windward and tail sides, preventing direct forced convection between the high-speed airflow and the heat dissipation channels, as well as the heat dissipation components within the heat dissipation channels, thereby reducing wind noise.

[0042] Additionally, the tail of the housing 120 features an outward convex part 151, as shown in Figure 5. The tail of the housing 120 protrudes outward, thereby further reducing the wind noise generated during high-speed travel.

[0043] Refer to Figure 6, which shows the outline of a satellite-communication-in-motion antenna 100, where the left side of the dashed line d is the leeward side, and the right side of the dashed line d is the windward side. As shown in Figure 6, the windward side is trapezoidal, including sequentially connected fourth surface 104, fifth surface 105, sixth surface 106, and seventh surface 107. Both fourth surface 104 and seventh surface 107 are curved, while fifth surface 105 and sixth surface 106 are

slanted, with curved transitions between adjacent surfaces. This design, through the Coanda effect, reduces the pressure drag between the windward side and the tail, preventing direct forced convection between high-speed airflow and the heat dissipation channels, as well as with the heat dissipation components within, thereby reducing wind noise.

[0044] Refer to Figure 7, which shows the outline of a satellite-communication-in-motion antenna 100, where the left side of the dashed line d is the leeward side, and the right side of the dashed line d is the windward side. As shown in Figure 7, the windward side is triangular, including sequentially connected eighth surface 108 and ninth surface 109, both of which are curved. This design, through the Coanda effect, reduces the pressure drag between the windward side and the tail, preventing direct forced convection between high-speed airflow and the heat dissipation channels, as well as with the heat dissipation components within, thereby reducing wind noise. Additionally, both eighth surface 108 and ninth surface 109 can be slanted; alternatively, eighth surface 108 can be slanted while ninth surface 109 remains curved. This application does not limit their combination forms.

[0045] Refer to Figure 8, which shows the outline of a satellite-communication-in-motion antenna 100, where the left side of the dashed line d is the leeward side, and the right side of the dashed line d is the windward side. As shown in Figure 8, the windward side is curved. This design, through the Coanda effect, reduces the pressure drag between the windward side and the tail, preventing direct forced convection between high-speed airflow and the heat dissipation channels, as well as with the heat dissipation components within, thereby reducing wind noise.

[0046] To further enhance the cooling capability of the heat dissipation channels for the antenna body 110, heat dissipation components can be installed in each heat dissipation channel. When the heat dissipation components are active heat dissipation components, they can ensure the cooling needs of the antenna body 110 even when the vehicle 200 is stationary, through active cooling by the heat dissipation components.

[0047] As illustrated in Figure 1, heat dissipation components are installed in sub-channels a1, a2, b1, and b2, each comprising a fan 131 and heat dissipation teeth 132. Thus, the heat generated by the antenna body 110 is quickly conducted to the heat dissipation teeth 132. Forced convection and fan 131 enable the airflow to pass through the heat dissipation teeth 132 and exchange heat with them, thereby expelling the heat-carrying airflow through the air outlet 142.

[0048] In one embodiment, the fan 131 can be either an axial fan 131 or a centrifugal fan 131. When it is an axial fan 131, it can also adjust the airflow speed within its respective sub-channel.

[0049] Certainly, in one embodiment, the heat dissipation component of this application can be a water cooling

unit, which includes a circulation pipeline set within the heat dissipation channel and a pump body installed in the pipeline. A cooling medium is also placed within the circulation pipeline. Additionally, an expansion tank connected to the circulation pipeline is included, allowing the expansion tank to replenish the cooling medium in the pipeline.

[0050] Refer to Figures 1 to 4, where each heat dissipation channel or sub-channel has dust screens at both the air inlet 141 and air outlet 142. This arrangement reduces the mechanical impact on fan 131 from high-speed airflow passing through the dust screen, and also prevents corrosion to the heat dissipation teeth 132, fan 131, and heat dissipation channels from dust, insects, and other foreign objects in the airflow, thus avoiding reduced cooling efficiency and mechanical damage.

[0051] The above descriptions are merely preferred embodiments of this application and are not intended to limit the scope of this application. For those skilled in the art, various modifications and changes can be made within the spirit and principles of this application. Any modifications, equivalent substitutions, and improvements made should be included within the scope of protection of this application.

Claims

1. A satellite-communication-in-motion antenna for installation on a vehicle, **characterized in that** it comprises:

a housing and an antenna body disposed within the housing;
wherein, inside the housing, there are at least two non-communicating heat dissipation channels arranged along the moving direction of the vehicle;
the air inlet and outlet of each heat dissipation channel are arranged along the moving direction of the vehicle; and
the at least two heat dissipation channels correspond in position to the antenna body for dissipating heat from the antenna body.

2. The satellite-communication-in-motion antenna according to claim 1, **characterized in that**:

each heat dissipation channel comprises multiple sub-channels arranged side by side perpendicular to the moving direction of the vehicle, which are not interconnected to each other; and
the air inlet and outlet of each sub-channel are arranged along the moving direction of the vehicle.

3. The satellite-communication-in-motion antenna according to claim 1 or 2, **characterized in that**:

the housing comprises a bottom shell with an opening and a top plate covering the opening; the antenna body is arranged on the side of the top plate facing away from the bottom shell; the heat dissipation channels are located between the top plate and the bottom shell; and the side plate of the bottom shell comprises a windward side and a leeward side, with the air inlet of the heat dissipation channels distributed on the windward side of the side plate.

4. The satellite-communication-in-motion antenna according to claim 3, **characterized in that** the air outlets of the heat dissipation channels are distributed on the leeward side of the side plate and/or the bottom plate of the bottom shell.
5. The satellite-communication-in-motion antenna according to claim 3, **characterized in that** the windward side of the side plate is arc-shaped, triangular, or trapezoidal.
6. The satellite-communication-in-motion antenna according to claim 3, **characterized in that** the angle between the side plate of the bottom shell and the top plate is acute or obtuse.
7. The satellite-communication-in-motion antenna according to claim 1, **characterized in that** a heat dissipation component is further provided within the heat dissipation channel, which corresponds to the position of the antenna body for dissipating heat from the antenna body.
8. The satellite-communication-in-motion antenna according to claim 7, **characterized in that** the heat dissipation component comprises fans and heat dissipation teeth positioned within the heat dissipation channel.
9. The satellite-communication-in-motion antenna according to claim 1, **characterized in that** dust-proof nets are respectively installed at the air inlet and the air outlet.
10. A vehicle **characterized in** comprising a body and a satellite-communication-in-motion antenna as described in any one of claims 1 to 9 installed on the body.

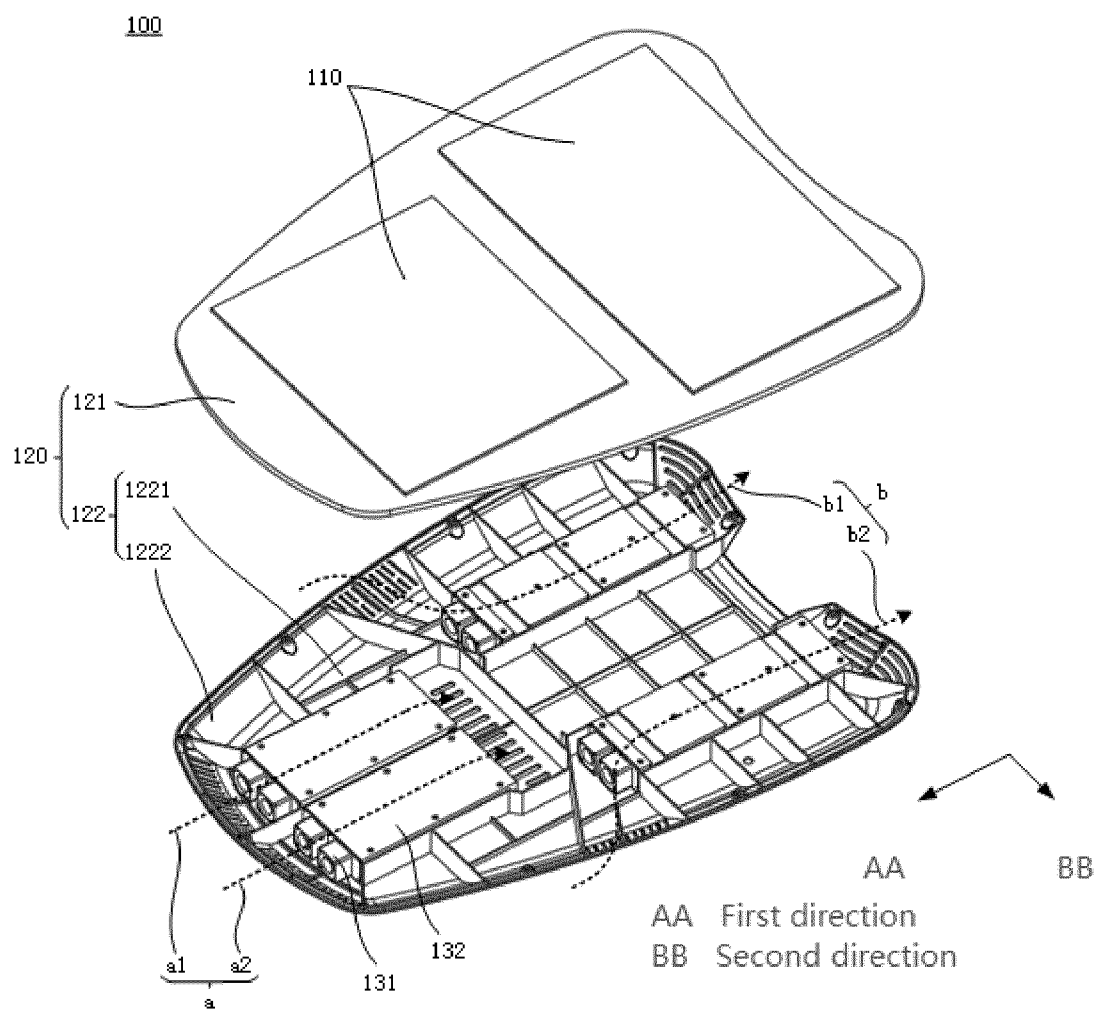


Fig. 1

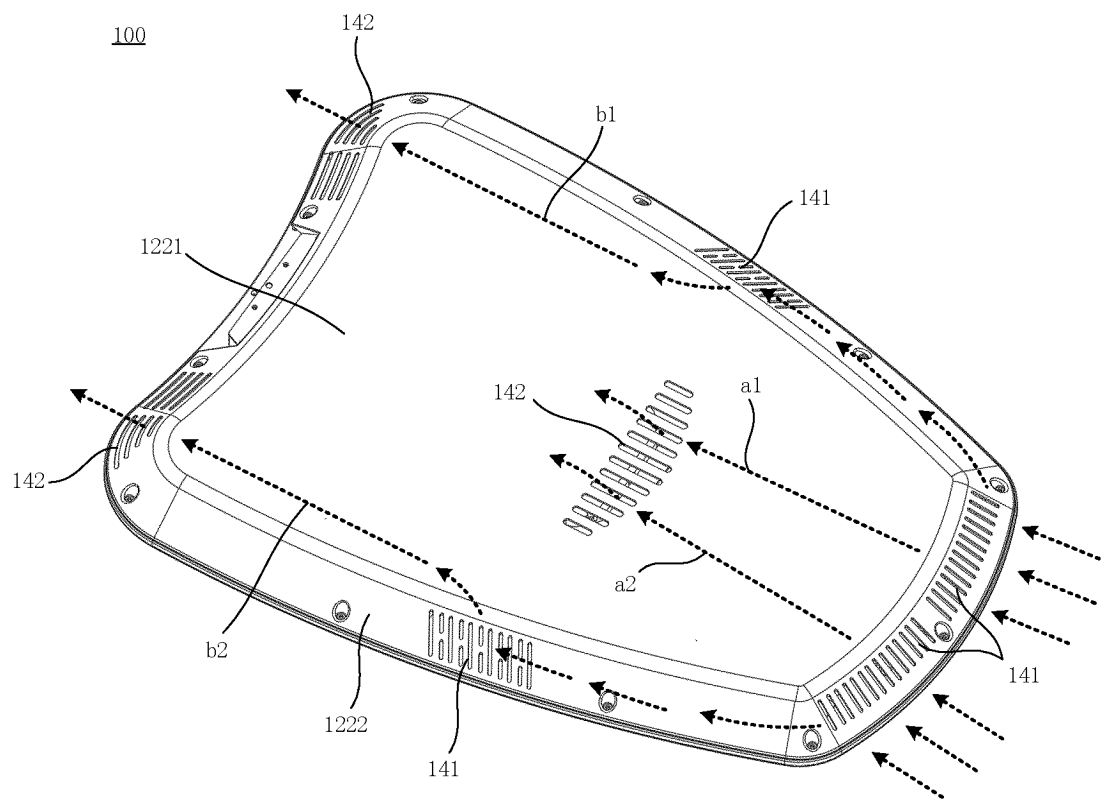


Fig. 2

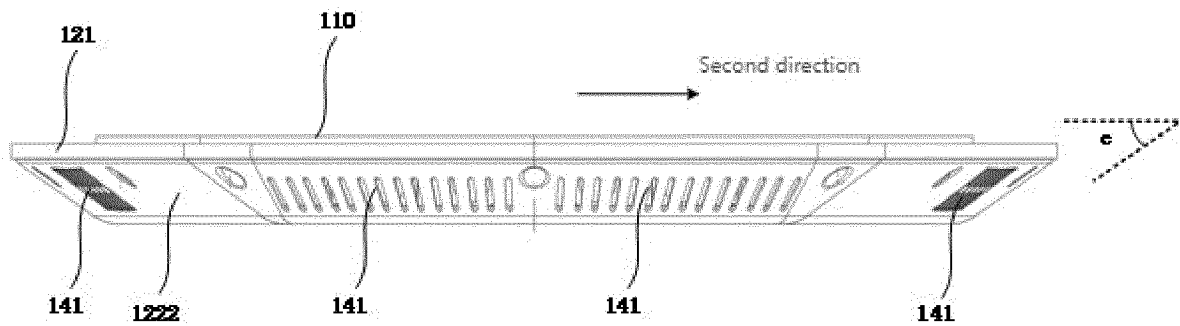


Fig.3

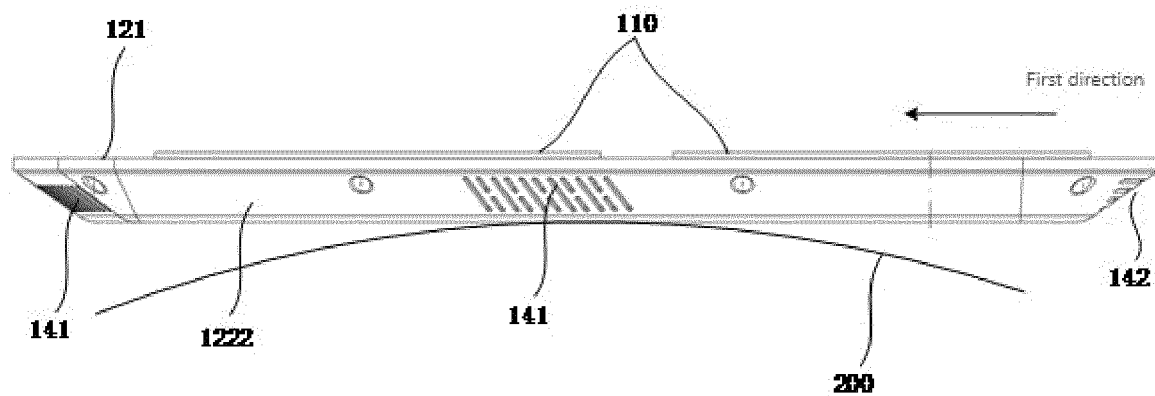


Fig.4

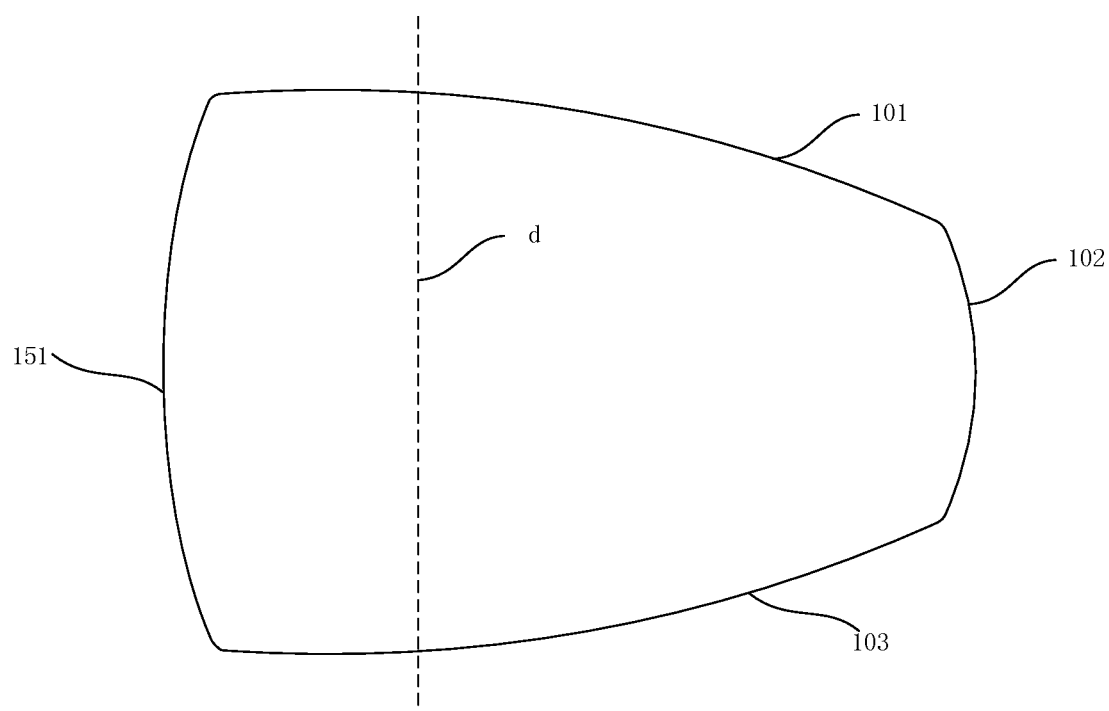


Fig.5

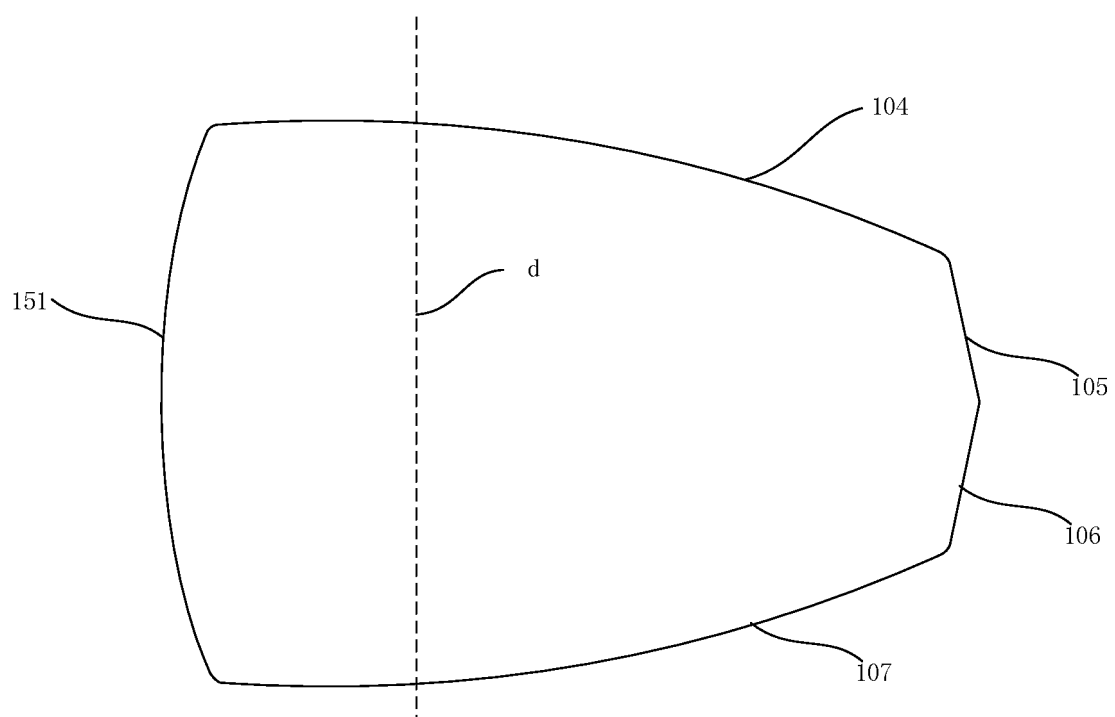


Fig.6

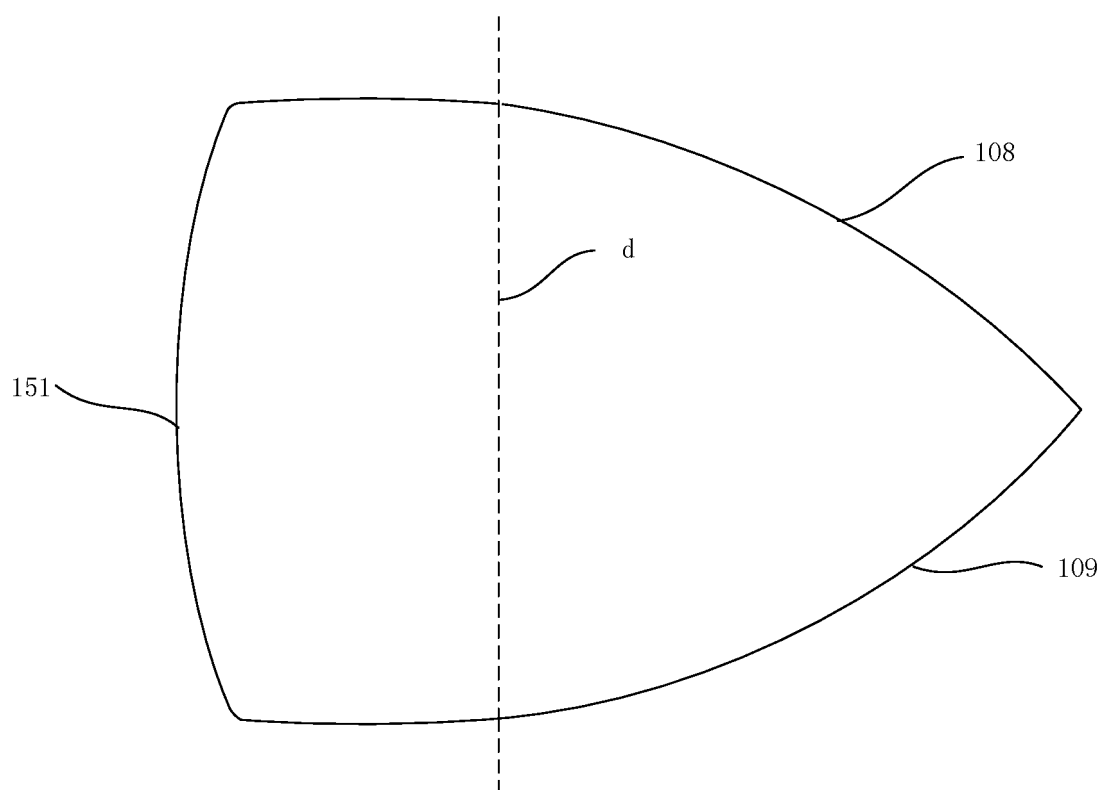


Fig.7

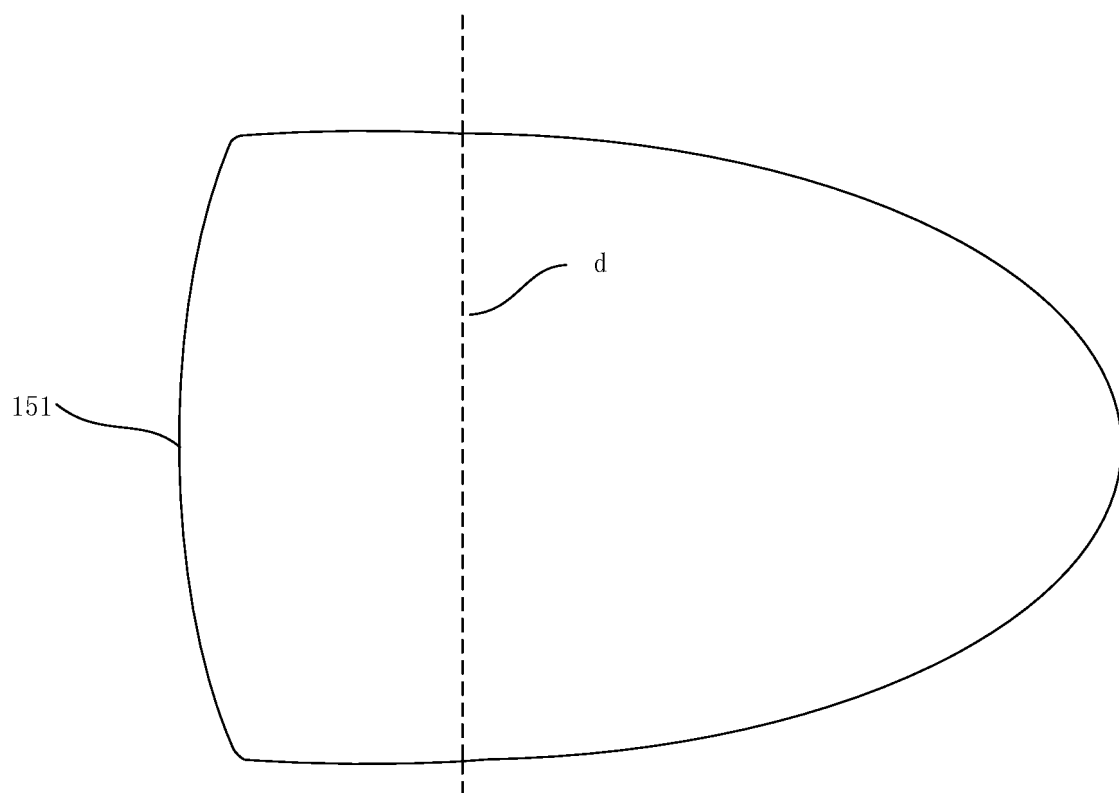


Fig.8

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2022/104096

A. CLASSIFICATION OF SUBJECT MATTER

H01Q1/32(2006.01);H05K7/20(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H01Q,H05K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNABS, CNTXT, VEN, USTXT, EPTXT, WOTXT, CNKI, IEEE: 天线, 动中通, 散热, 通道, 进气口, 出气口, 隔离, 不连通, 独立, antenna, communication in motion, heat dissipation, channel, air inlet, air outlet, isolation, disconnected, independent

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CN 112103612 A (CHENGDU T-RAY TECHNOLOGY CO., LTD.) 18 December 2020 (2020-12-18) description, paragraphs [0023]-[0048], and figures 1-6	1-10
Y	CN 101754644 A (HUAWEI TECHNOLOGIES CO., LTD.) 23 June 2010 (2010-06-23) description, paragraphs [0023]-[0030], and figures 3a-7	1-10
Y	CN 112038747 A (CHENGDU T-RAY TECHNOLOGY CO., LTD.) 04 December 2020 (2020-12-04) description, paragraphs [0033]-[0064], and figures 1-7	1-10
Y	CN 105453257 A (HUAWEI TECHNOLOGIES CO., LTD.) 30 March 2016 (2016-03-30) description, paragraphs [0023]-[0034], and figures 4-5	1-10
A	CN 112310593 A (CHENGDU T-RAY TECHNOLOGY CO., LTD.) 02 February 2021 (2021-02-02) entire document	1-10
A	US 6668915 B1 (Peter Albert Materna) 30 December 2003 (2003-12-30) entire document	1-10

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

“A” document defining the general state of the art which is not considered to be of particular relevance

“D” document cited by the applicant in the international application

“E” earlier application or patent but published on or after the international filing date

“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

“O” document referring to an oral disclosure, use, exhibition or other means

“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&” document member of the same patent family

Date of the actual completion of the international search

03 February 2023

Date of mailing of the international search report

15 February 2023

Name and mailing address of the ISA/CN

China National Intellectual Property Administration (ISA/
CN)
China No. 6, Xitucheng Road, Jimenqiao, Haidian District,
Beijing 100088

Facsimile No. (86-10)62019451

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2022/104096

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	112103612	A	18 December 2020	CN	112103612	B	26 February 2021
CN	101754644	A	23 June 2010	CN	101754644	B	02 January 2013
CN	112038747	A	04 December 2020	CN	212323194	U	08 January 2021
CN	105453257	A	30 March 2016	WO	2015022032	A1	19 February 2015
				CN	105453257	B	07 December 2018
CN	112310593	A	02 February 2021	CN	112310593	B	23 March 2021
US	6668915	B1	30 December 2003	None			

Form PCT/ISA/210 (patent family annex) (July 2022)