

City of New York, State of New York, County of New York

I, Jacqueline Yorke, hereby certify that the document “**CN117738506A**” is, to the best of my knowledge and belief, a true and accurate translation from Chinese into English.

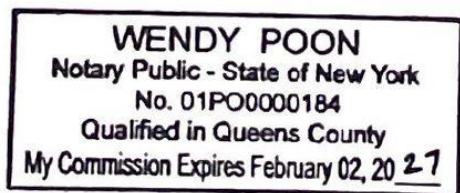


Jacqueline Yorke

Sworn to before me this
October 2, 2025



Signature, Notary Public



Stamp, Notary Public



(10) Application Publication No.
CN 117738506 A

(43) Application Publication Date
March 22, 2024

(21) Application Number 202410095060.X

(22) Date of Filing January 23, 2024

(71) Applicant: Huanxiang Robotics Technology
(Suzhou) Co., Ltd.

Address: Room 3-8235, No. 28 Jinchang
Road, Jinxi Town, Kunshan City,
Suzhou, Jiangsu Province, 215324, China
(Cluster Registration)

(72) Inventors: Guo Bao, Zhang Yanlin,
Wu Guangping

(74) Patent Agency: Suzhou Xiezhahui Jia Patent
Agency (General Partnership)
32278

Patent Agent Chen Xiaodi

(51)Int.Cl.

E04H 4/16 (2006.01)

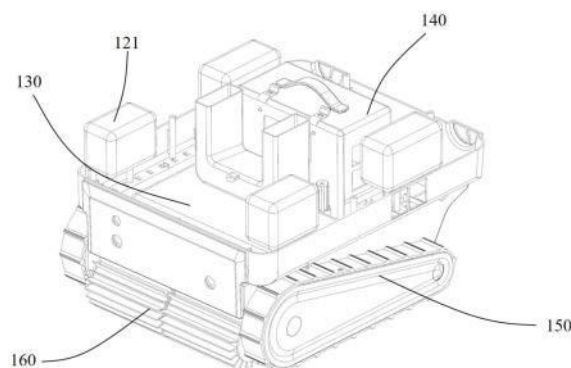
5 pages of 3 pages of Attached
1 pages of Claims Specification Drawings

(54) Title of the Invention

SWIMMING POOL CLEANING ROBOT

(57) Abstract

The present disclosure provides a swimming pool cleaning robot, comprising: A housing; and a floating and diving assembly, the floating and diving assembly being installed within the housing, the floating and diving assembly comprising an airbag and an inflation/deflation device, the inflation/deflation device being connected to the airbag via an air tube; a driving assembly, comprising a sealed driving cabin and a driving device located within the driving cabin, the driving cabin being installed inside the housing, the inflation/deflation device being located within the driving cabin, the inflation/deflation device being configured to draw gas from inside the driving cabin into the airbag, or to discharge gas from the airbag into the driving cabin. The swimming pool cleaning robot can be suspended at any position in the water, enabling cleaning of any position at the pool bottom, mid-water, water surface, and pool wall. At the same time, the driving cabin serves as a gas source, eliminating the need for additional space within the housing, thus providing strong practicality and cost-effectiveness.



1. A swimming pool cleaning robot, characterized by comprising:
a housing; and
a floating and diving assembly, the floating and diving assembly being installed within the housing, the floating and diving assembly comprising an airbag and an inflation/deflation device, the inflation/deflation device being connected to the airbag via an air tube;
a driving assembly, comprising a sealed driving cabin and a driving device located within the driving cabin, the driving cabin being installed inside the housing;
the inflation/deflation device being located within the driving cabin, wherein the gas inside the driving cabin can be drawn into the airbag via the inflation/deflation device, or the gas inside the airbag can be discharged into the driving cabin via the inflation/deflation device.
2. The swimming pool cleaning robot according to Claim 1, characterized in that the floating and diving assembly comprises at least two airbags, the plurality of airbags being distributed in the upper part of the housing, and the floating and diving assembly further comprises a protective cover, the protective cover being sleeved over the airbags, and the protective cover being provided with several openings.
3. The swimming pool cleaning robot according to Claim 2, characterized in that the plurality of airbags are commonly connected to one inflation/deflation device, and the inflation/deflation device inflates or deflates the plurality of airbags simultaneously.
4. The swimming pool cleaning robot according to Claim 2, characterized in that each airbag is individually connected to one inflation/deflation device, and each inflation/deflation device independently controls the inflation or deflation of each airbag.
5. The swimming pool cleaning robot according to Claim 3 or 4, characterized in that the inflation/deflation device comprises a first air pump, a first air valve, a second air pump, and a second air valve, the airbag being sequentially connected to the first air pump and the first air valve via one air tube, and sequentially connected to the second air pump and the second air valve via another air tube, the first air pump and the first air valve being configured to draw gas from the driving cabin into the airbag, and the second air pump and the second air valve being configured to discharge gas from the airbag into the driving cabin.
6. The swimming pool cleaning robot according to Claim 3 or 4, characterized in that the inflation/deflation device comprises an air pump and a one-way valve, the airbag being connected to the air pump via one air tube, and to the one-way valve via another air tube, the air pump being activated to draw gas from the driving cabin into the airbag, and the one-way valve being opened to discharge gas from the airbag into the driving cabin.
7. The swimming pool cleaning robot according to Claim 3 or 4, characterized in that the power mechanism of the inflation/deflation device comprises at least one of a peristaltic pump, gear pump, or Roots blower, the airbag being connected to the power mechanism, wherein when the power mechanism rotates in the forward direction, gas from the driving cabin is introduced into the airbag, and when the power mechanism rotates in the reverse direction, gas from the airbag is discharged into the driving cabin.
8. The swimming pool cleaning robot according to Claim 7, characterized in that the inflation/deflation device further comprises a solenoid valve, the solenoid valve being connected to the power mechanism, wherein when the power mechanism operates, the solenoid valve opens, and when the power mechanism is not operating, the solenoid valve closes.
9. The swimming pool cleaning robot according to Claim 1, characterized in that the housing comprises a first housing and a second housing, the first housing being located above the second housing, and the airbag being located within the first housing.
10. The swimming pool cleaning robot according to Claim 1, characterized in that the driving device comprises at least one of a battery, a mainboard, or a drive motor.

SWIMMING POOL CLEANING ROBOT

Technical Field

[0001] The present disclosure relates to the field of underwater robots, and more particularly to a swimming pool cleaning robot.

Prior Art

[0002] Underwater cleaning robots are devices used for automatically cleaning swimming pools. They are capable of autonomous movement underwater and clean the pool bottom and walls using brushes and other cleaning tools.

[0003] Conventional underwater cleaning robots lack the capability for automatic diving and surfacing, and typically can only clean the pool bottom and certain areas of the pool wall. Some underwater robots with diving and surfacing functions have recently appeared on the market. However, underwater cleaning robots with such functions often require the installation of relatively large air storage devices inside the main body, which occupies installation space for other components, resulting in a larger overall robot size and increased manufacturing costs.

[0004] In view of the above, there is a need to provide a swimming pool cleaning robot capable of autonomous floating and diving, while being more compact in size, to address the aforementioned issues.

Summary of the Invention

[0005] The objective of the present disclosure is to provide a swimming pool cleaning robot capable of autonomous floating and diving underwater, with a compact structure.

[0006] To achieve the above objective, the present disclosure provides a swimming pool cleaning robot, comprising:

[0007] a housing; and

[0008] a floating and diving assembly, the floating and diving assembly being installed within the housing, the floating and diving assembly comprising an airbag and an inflation/deflation device, the inflation/deflation device being connected to the airbag via an air tube;

[0009] a driving assembly, comprising a sealed driving cabin and a driving device located within the driving cabin, the driving cabin being installed inside the housing, the inflation/deflation device being located within the driving cabin, the inflation/deflation device being configured to draw gas from inside the driving cabin into the airbag, or to discharge gas from the airbag into the driving cabin.

[0010] As a further improvement of the present disclosure, a plurality of airbags are distributed in the upper part of the housing, and the floating and diving assembly further comprises a protective cover, the protective cover being sleeved over the airbags, and the protective cover being provided with several openings.

[0011] As a further improvement of the present disclosure, the plurality of airbags are commonly connected to one inflation/deflation device, and the inflation/deflation device inflates or deflates the plurality of airbags simultaneously.

[0012] As a further improvement of the present disclosure, each airbag is individually connected to one inflation/deflation device, and each inflation/deflation device independently controls the inflation or deflation of each airbag.

[0013] As a further improvement of the present disclosure, the inflation/deflation device comprises a first air pump, a first air valve, a second air pump, and a second air valve, the airbag being sequentially connected to the first air pump and the first air valve via one air tube, and sequentially connected to the second air pump and the second air valve via another air tube, the first air pump and the first air valve being configured to draw gas from the driving cabin into the airbag, and the second air pump and the second air valve being configured to discharge gas from the airbag into the driving cabin.

[0014] As a further improvement of the present disclosure, the inflation/deflation device comprises an air pump and a one-way valve, the airbag being connected to the air pump via one air tube, and to the one-way valve via another air tube, the air pump being activated to draw gas from the driving cabin into the airbag, and the one-way valve being opened to discharge gas from the airbag into the driving cabin.

[0015] As a further improvement of the present disclosure, the power mechanism of the inflation/deflation device comprises at least one of a peristaltic pump, gear pump, or Roots blower, the airbag being connected to the power mechanism, wherein when the power mechanism rotates in the forward direction, gas from the driving cabin is introduced into the airbag, and when the power mechanism rotates in the reverse direction, gas from the airbag is discharged into the driving cabin.

[0016] As a further improvement of the present disclosure, the inflation/deflation device further comprises a solenoid valve, the solenoid valve being connected to the power mechanism, wherein when the power mechanism operates, the solenoid valve opens, and when the power mechanism is not operating, the solenoid valve closes.

[0017] As a further improvement of the present disclosure, the housing comprises a first housing and a second housing, the first housing being located above the second housing, and the airbag being located within the first housing.

[0018] As a further improvement of the present disclosure, the driving device comprises at least one of a battery, a mainboard, or a drive motor.

[0019] The beneficial effects of the present disclosure are as follows: Compared with the prior art, in the swimming pool cleaning robot of the present disclosure, the airbag is connected to the driving cabin via the inflation/deflation device, and the driving cabin of the swimming pool cleaning robot serves as the gas source for the floating and diving assembly. When it is necessary to control the robot to surface, the inflation/deflation device draws gas from the driving cabin into the airbag. When it is necessary to control the robot to dive, the inflation/deflation device discharges gas from the airbag into the driving cabin. In this way, the robot can be made to surface or dive as required. At the same time, since the driving cabin also serves as the compartment for installing the driving assembly, there is no need to occupy additional space within the housing, resulting in a more compact overall layout, a smaller overall size, improved flexibility, and reduced manufacturing costs for the swimming pool cleaning robot.

Brief Description of the Drawings

[0020] FIG. 1 is a perspective structural view of a preferred embodiment of the swimming pool cleaning robot according to the present disclosure.

[0021] FIG. 2 is a perspective structural view of the swimming pool cleaning robot of FIG. 1 with the first housing removed.

[0022] FIG. 3 is another perspective structural view of the swimming pool cleaning robot of FIG. 1 with the first housing removed.

[0023] FIG. 4 is an assembly view of the floating and diving device and the driving assembly in the swimming pool cleaning robot of FIG. 2.

[0024] FIG. 5 is a schematic view showing the positions of the floating and diving device and the driving device after the driving cabin is removed from FIG. 4.

[0025] Description of Reference Numerals in the Drawings:

[0026] 100 - Swimming pool cleaning robot;

[0027] 110 - Housing, 111 - First housing, 112 - Second housing, 120 - Floating and diving assembly, 121 - Airbag, 122 - Inflation/deflation device, 123 - Air tube, 130 - Driving assembly, 131 - Driving cabin, 132 - Driving device, 140 - Debris bin, 150 - Walking device, 160 - Roller brush.

Detailed Description

[0028] In order to make the objectives, technical solutions, and advantages of the present disclosure more apparent, the present disclosure will be described in detail below with reference to the accompanying drawings and specific embodiments.

[0029] It should be noted that, in order to avoid obscuring the present disclosure with unnecessary details, only structures and/or processing steps closely related to the solutions of the present disclosure are illustrated in the drawings, while other details not closely related to the present disclosure are omitted.

[0030] In addition, it should be further noted that the terms "comprise," "include," or any other variants thereof are intended to cover non-exclusive inclusion, such that a process, method, article, or device that comprises a list of elements not only includes those elements, but may also include other elements not expressly listed, or further includes elements inherent to such process, method, article, or device.

[0031] Please refer to FIGS. 1–5, which illustrate a preferred embodiment of the swimming pool cleaning robot 100 according to the present disclosure. The swimming pool cleaning robot 100 comprises a housing 110 and a floating and diving assembly 120 disposed within the housing 110. The floating and diving assembly 120 is configured to drive the swimming pool cleaning robot 100 to ascend, descend, or suspend vertically.

[0032] The housing 110 includes a first housing 111 and a second housing 112. The first housing 111 is positioned above the second housing 112. When maintenance of the internal components of the swimming pool cleaning robot 100 is required, the first housing 111 can be separated from the second housing 112 and removed, enabling quick and convenient access for maintenance of the internal structural components.

[0033] The floating and diving assembly 120 comprises an airbag 121 and an inflation/deflation device 122. The inflation/deflation device 122 is connected to the airbag 121 via an air tube 123. The swimming pool cleaning robot 100 further includes a driving assembly 130, which comprises a sealed driving cabin 131 and a driving device 132 disposed within the driving cabin 131. The driving cabin 131 is installed inside the housing 110, and the inflation/deflation device 122 is also installed within the driving cabin 131. The inflation/deflation device 122 is configured to draw gas from the driving cabin 131 into the airbag 121, or to discharge gas from the airbag 121 into the driving cabin 131.

[0034] In the swimming pool cleaning robot 100 of the present disclosure, the airbag 121 is connected to the driving cabin 131 via the inflation/deflation device 122, and the driving cabin 131 of the swimming pool cleaning robot 100 serves as the gas source for the floating and diving assembly 120. When it is necessary to control the robot 100 to surface, the inflation/deflation device 122 draws gas from the driving cabin 131 into the airbag 121. When it is necessary to control the robot 100 to dive, the inflation/deflation device 122 discharges gas from the airbag 121 into the driving cabin 131. In this way, the robot 100 can be made to surface or dive as required. At the same time, since the driving cabin 131 also serves as the compartment for installing the driving assembly 130, there is no need to occupy additional space within the housing 110, resulting in a more compact overall layout, a smaller overall size, improved flexibility, and reduced manufacturing costs for the swimming pool cleaning robot 100.

[0035] The housing 110 is made of lightweight material to reduce the overall weight of the swimming pool cleaning robot 100, so that a smaller number of airbags 121 can sufficiently enable the swimming pool cleaning robot 100 to ascend smoothly.

[0036] The floating and diving assembly 120 comprises at least two airbags 121. In this embodiment, the floating and diving assembly 120 includes four airbags 121, which are arranged in parallel in the horizontal direction and distributed at the upper part of the housing 110. The parallel arrangement of the airbags 121 is more conducive to maintaining balance during ascent and descent, making it less prone to capsizing and improving stability. In some embodiments, the number of airbags 121 may be set to one, with a single larger airbag 121. The present disclosure is not limited in this regard.

[0037] A protective cover (not shown) is sleeved over the airbag 121, and the protective cover is provided with several openings. Since the material of the airbag 121 is relatively soft, the protective cover can effectively prevent the airbag 121 from being punctured by foreign objects.

[0038] In other embodiments, multiple airbags 121 are jointly connected to a single inflation/deflation device 122, i.e., a single inflation/deflation device 122 inflates or deflates multiple airbags 121 simultaneously. In this way, inflation and deflation of the multiple airbags 121 are synchronized, making overall control more convenient and also reducing costs.

[0039] In some embodiments, each airbag 121 is individually connected to an inflation/deflation device 122, and each inflation/deflation device 122 independently controls the inflation or deflation of each airbag 121. This allows more precise control of the gas content in each airbag 121, and thus more precise control of the ascent or descent speed of the underwater cleaning robot.

[0040] The following describes several specific embodiments of the inflation/deflation device 122.

[0041] Embodiment 1

[0042] In this embodiment, the inflation/deflation device 122 comprises a first air pump, a first air valve, a second air pump, and a second air valve. The airbag 121 is connected in sequence to the first air pump and the first air valve via one air tube 123, and to the second air pump and the second air valve via another air tube 123. When it is necessary to control the swimming pool cleaning robot 100 to ascend, the first air pump and first air valve are activated to draw gas from the driving cabin 131 into the airbag 121. When it is necessary to control the swimming pool cleaning robot 100 to descend, the second air pump and second air valve are activated to discharge gas from the airbag 121 into the driving cabin 131.

[0043] By means of the first air pump and first air valve, as well as the second air pump and second air valve, the amount of gas in the airbag 121 can be precisely controlled, thereby enabling accurate control of the ascent and descent of the swimming pool cleaning robot 100. This ensures the operational stability of the swimming pool cleaning robot 100 and avoids instability caused by uneven gas distribution.

[0044] Embodiment 2

[0045] In this embodiment, the inflation/deflation device 122 includes an air pump and a one-way valve. The airbag 121 is connected to the air pump via one air tube 123 and to the one-way valve via another air tube 123. The one-way valve is configured such that gas can only flow from the airbag 121 into the driving cabin 131. The air pump is activated to draw gas from the driving cabin 131 into the airbag 121, and the one-way valve is opened to discharge gas from the airbag 121 into the driving cabin 131.

[0046] By controlling the switching of the air pump and the one-way valve, inflation and deflation of the airbag 121 can be conveniently achieved. The one-way valve effectively prevents backflow of gas, ensuring unidirectional gas flow. The overall structure is simple and easy to assemble.

[0047] Embodiment 3

[0048] In this embodiment, the inflation/deflation device 122 comprises a power mechanism, which may be a peristaltic pump, a gear pump, or a Roots blower. The airbag 121 is connected to the power mechanism, which is capable of rotating in both forward and reverse directions. When it is necessary to control the swimming pool cleaning robot 100 to ascend, the power mechanism rotates forward, causing gas from the driving cabin 131 to be injected into the airbag 121. When it is necessary to control the swimming pool cleaning robot 100 to dive, the power mechanism rotates in reverse, causing the gas in the airbag 121 to be discharged into the driving cabin 131.

[0049] To further enhance the sealing performance of the driving cabin 131, in this embodiment, the inflation/deflation device 122 further comprises a solenoid valve connected to the power mechanism. When the power mechanism is operating, the solenoid valve is open; when the power mechanism is not operating, the solenoid valve is closed, thereby ensuring better sealing of the driving cabin 131.

[0050] Since the power mechanism can rotate in both forward and reverse directions, it allows for flexible control of the gas flow direction, meeting the control requirements for both ascending and diving. The linkage between the solenoid valve and the power mechanism ensures the stability and accuracy of gas flow, preventing errors and instability caused by sealing issues.

[0051] In the swimming pool cleaning robot 100, the airbag 121 is located within the first housing 111, i.e., at the upper part of the entire housing 110, which better maintains the stability of the swimming pool cleaning robot 100 in water and prevents capsizing.

[0052] The driving device 132 installed within the driving cabin 131 includes a battery, mainboard, and drive motor, etc. The driving device 132 provides power for the swimming pool cleaning robot 100 to ascend, dive, or move. By placing the driving device 132 inside the sealed driving cabin 131, the driving device 132 is protected from water ingress, effectively extending its service life.

[0053] The swimming pool cleaning robot 100 further comprises a walking device 150. To facilitate movement at the bottom of the pool, the walking device 150 is installed on both sides of the housing 110, enabling the swimming pool cleaning robot 100 to move. In this embodiment, the walking device 150 is a track, which can traverse debris-laden pool bottoms effectively and is not easily entangled. In other embodiments, it may be wheels or other devices, and the present disclosure is not limited thereto.

[0054] A debris bin 140 is also installed in the housing 110. The debris bin 140 is used to filter the water flow drawn into the swimming pool cleaning robot 100. Debris in the water flow is temporarily stored in the debris bin 140. After cleaning is completed, the debris bin 140 can be lifted out for cleaning, which is convenient and quick.

[0055] The swimming pool cleaning robot 100 further comprises a roller brush 160 disposed at the bottom of the housing 110. The roller brush 160 extends partially beyond the housing 110 in the direction of movement of the swimming pool cleaning robot 100. The roller brush 160 can be used to clean the bottom and walls of the pool.

[0056] In summary, the swimming pool cleaning robot 100 of the present disclosure is internally provided with a floating and diving assembly 120 and a driving cabin 131. The floating and diving assembly 120 includes an airbag 121 and an inflation/deflation device 122. The driving cabin 131 is sealed from the outside and houses the driving device 132, with the inflation/deflation device 122 also sealed within the driving cabin 131. When it is necessary to control the swimming pool cleaning robot 100 to ascend, the inflation/deflation device 122 draws gas from the driving cabin 131 into the airbag 121. When it is necessary to control the swimming pool cleaning robot 100 to dive, the inflation/deflation device 122 discharges gas from the airbag 121 into the driving cabin 131, i.e., the driving cabin 131 serves as the gas source for the airbag 121. This arrangement does not occupy additional space within the housing 110, allowing for better control of the overall volume of the swimming pool cleaning robot 100, making its body more compact and its movement in water more agile, while also reducing costs.

[0057] The above embodiments are intended to illustrate the technical solutions of the present disclosure rather than to limit them. Although the present disclosure has been described in detail with reference to preferred embodiments, those skilled in the art should understand that modifications or equivalent substitutions may be made to the technical solutions of the present disclosure without departing from the spirit and scope of the present disclosure.

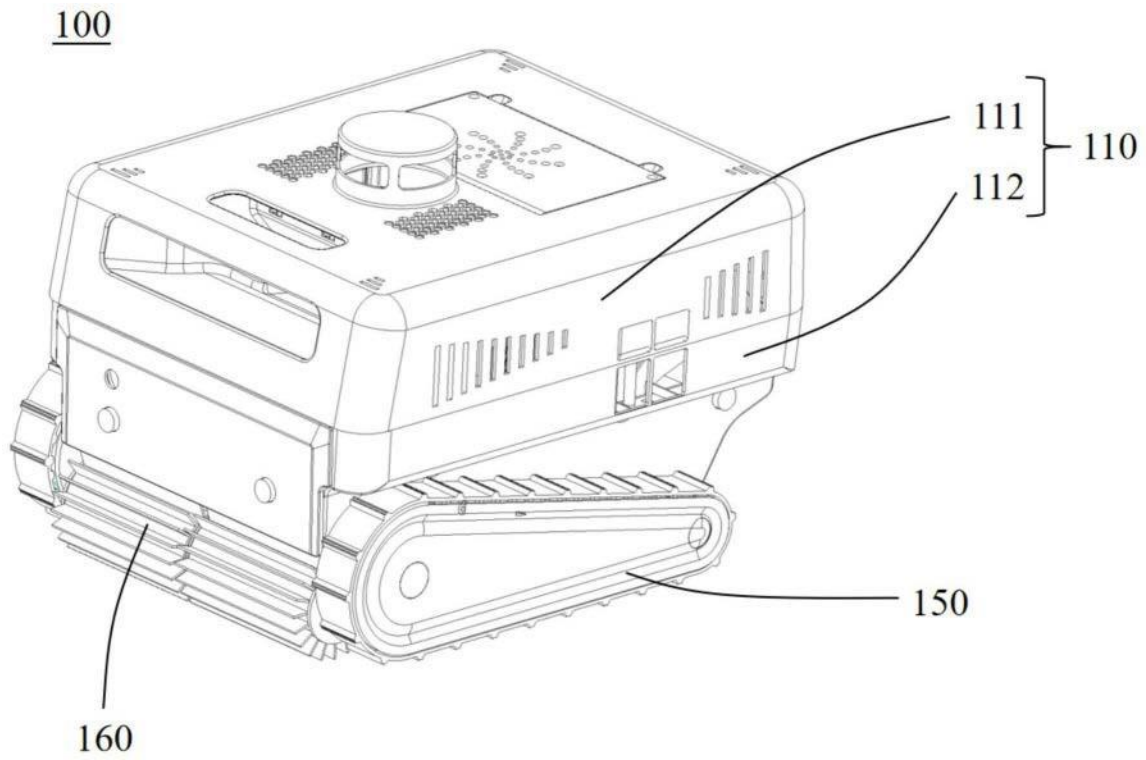


FIG. 1

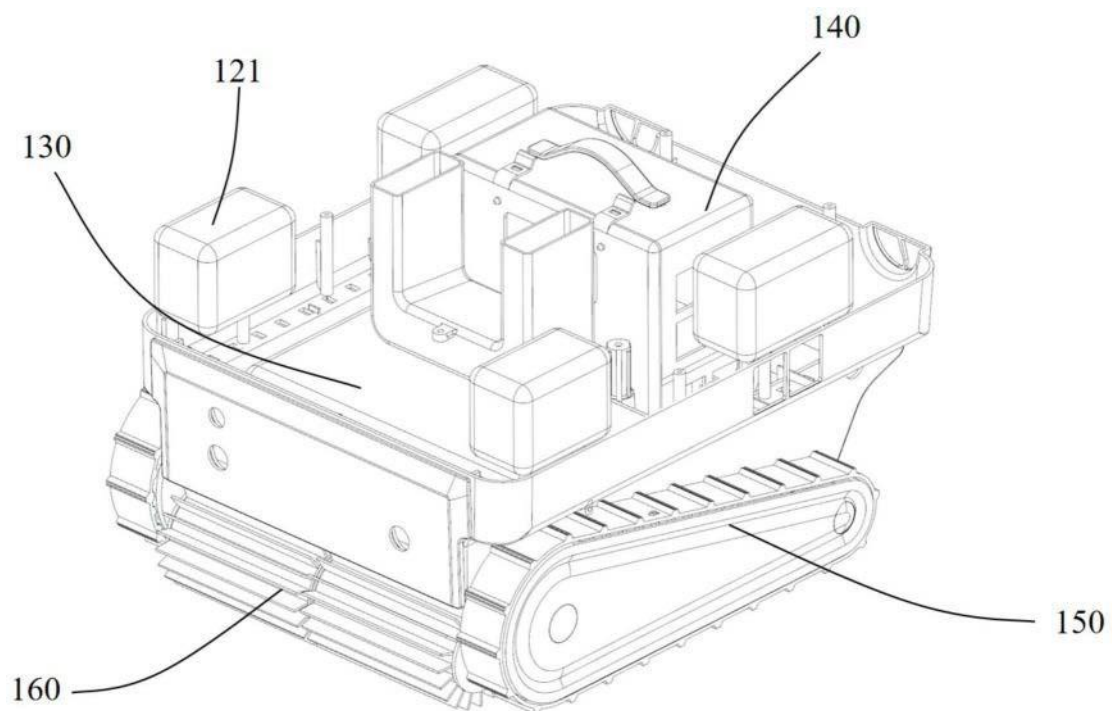


FIG. 2

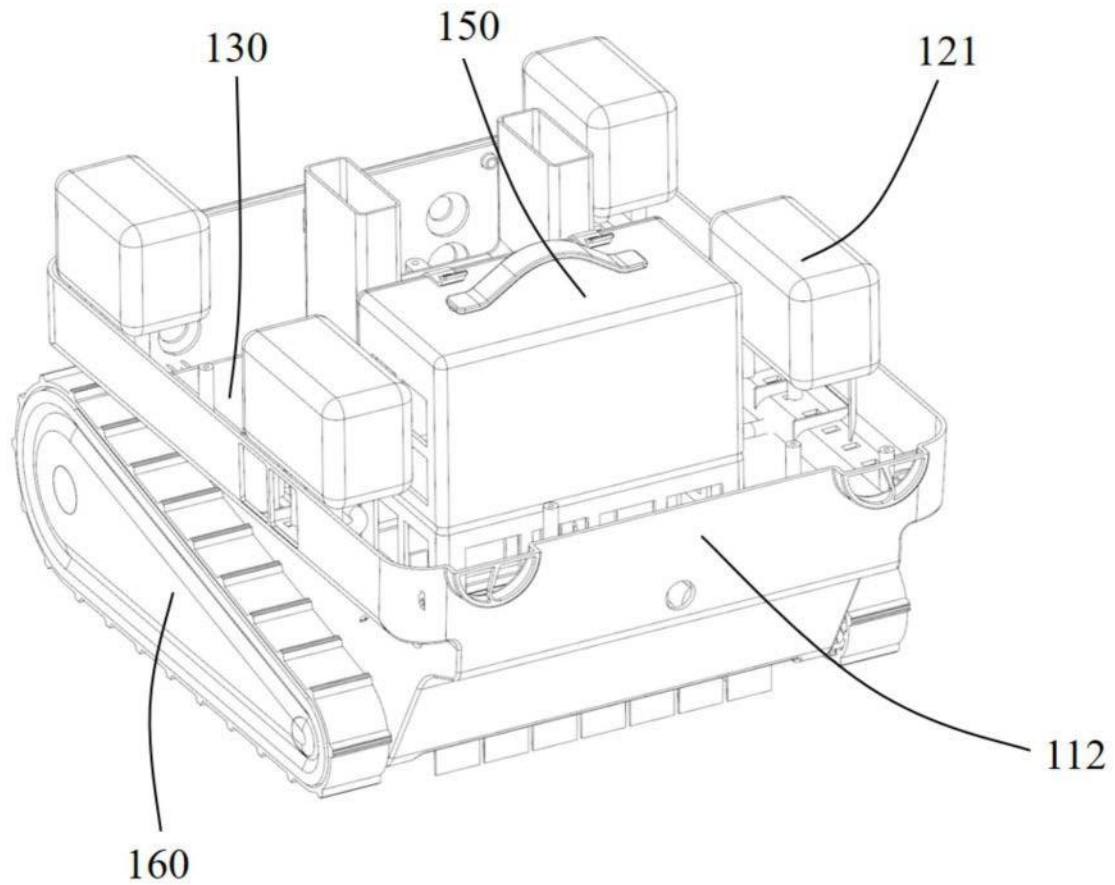


FIG. 3

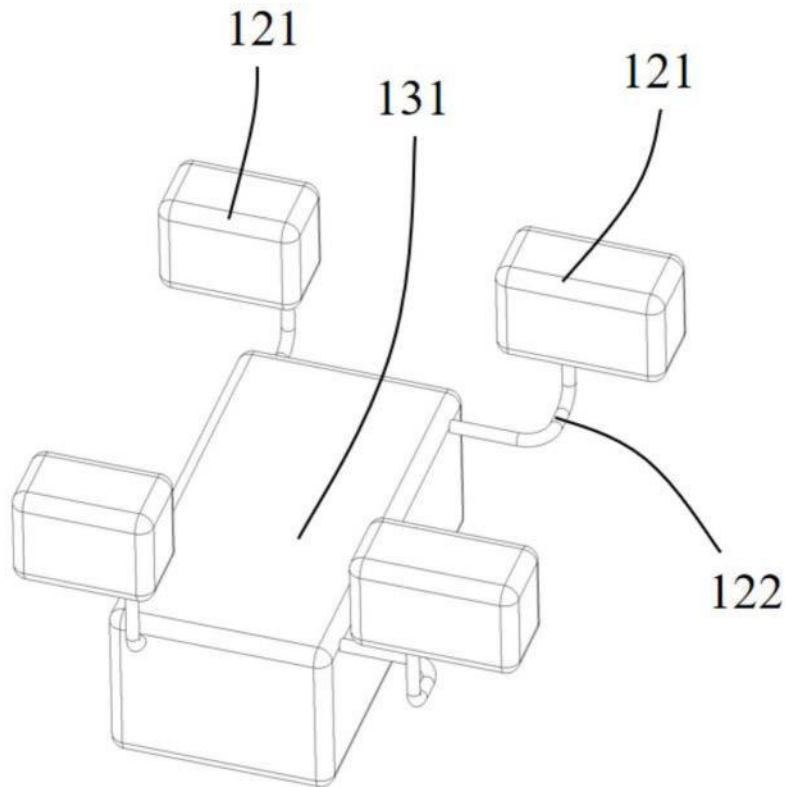


FIG. 4

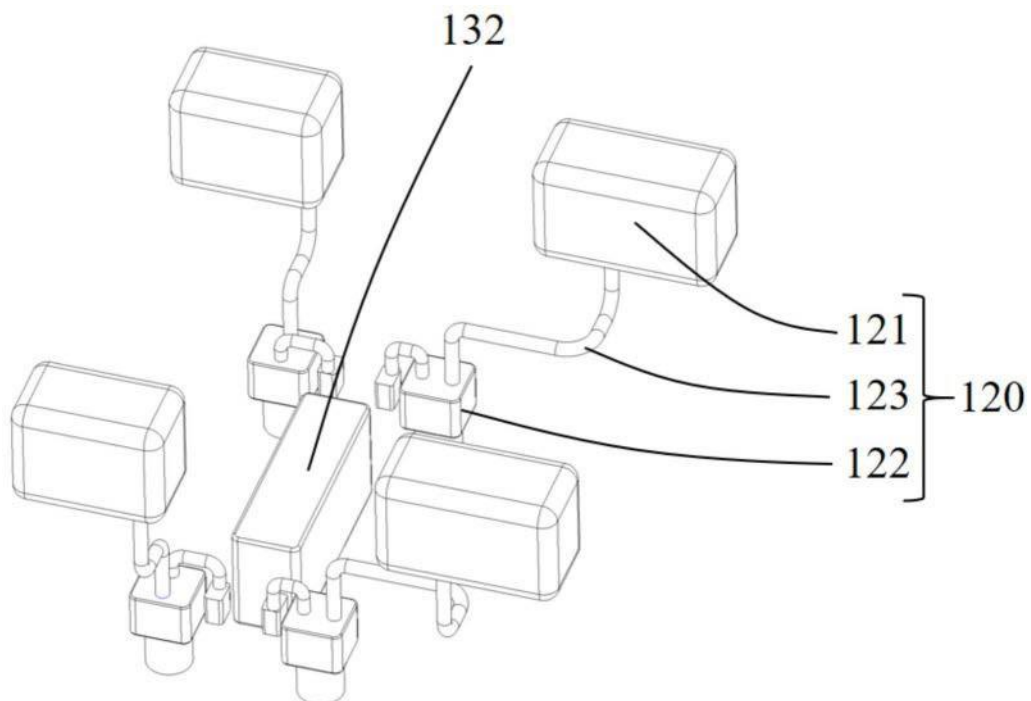


FIG. 5