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(54) **POOL CLEANER**

(57) A pool cleaner includes a housing having a water inlet and a water outlet and further defining an accommodating chamber, and a brush head assembly connected to the housing. A filter cartridge is arranged in the accommodating chamber of the housing and is in fluid communication with the water outlet, and the filter cartridge includes an upper end surface and a lower end surface. A filter element is arranged in the accommodating chamber of the housing and abuts the lower end surface of the filter cartridge and is in fluid communication with the water inlet.

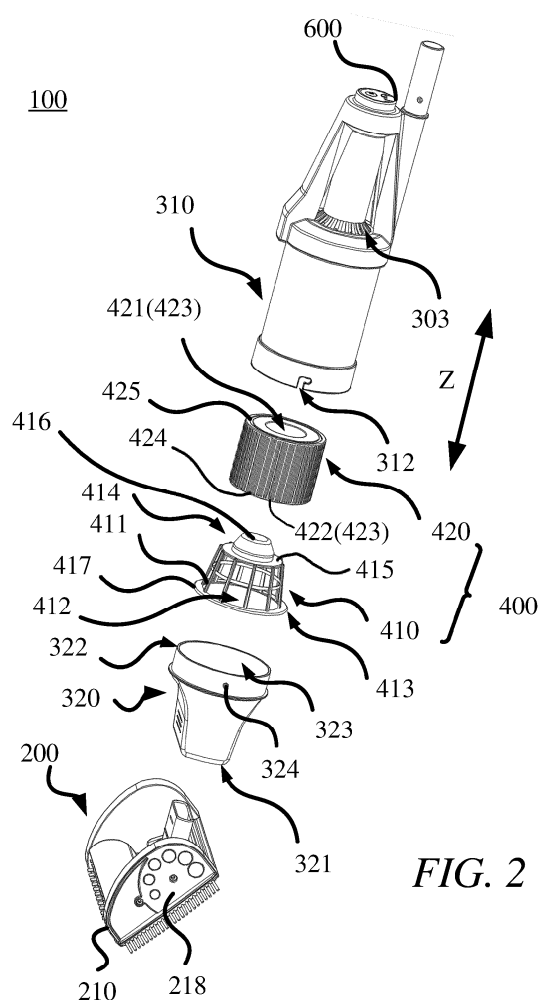


FIG. 2

Description

TECHNICAL FIELD

[0001] The present disclosure relates to pool cleaners, and in particular, to a pool cleaner including a filtration device.

BACKGROUND

[0002] Traditional pool cleaners include a motor that drives an impeller to rotate, such that rotation of the impeller generates vacuum suction. The vacuum suction generated by the impeller may cause residue and leaves at the bottom of a pool to be sucked into a filter chamber for filtration, thereby cleaning the pool and reducing water changes.

[0003] In existing pool cleaners, the water flowing through the pool cleaner is filtered only once through a filter screen, which may remove large particles or leaves but fail to capture small residues. For example, when a user pushes existing pool cleaners forward to clean the pool, a brush head of the pool cleaner causes the residues in front of the brush head to deviate from a water inlet of the pool cleaner, which may prevent the pool cleaner from effectively capturing residue within the filter chamber.

SUMMARY

[0004] An objective of the present disclosure is to provide a pool cleaner having a double filtration device that is capable of effectively removing large particulate and smaller residue from a pool. The pool cleaner described herein aims to alleviate the shortcomings of traditional pool cleaners, which implement single filter devices, such as filter screens, which are ill-equipped to remove both large particulate and small residue from a pool.

[0005] In order to solve the above technical problem, an implementation of the present disclosure discloses a pool cleaner, including: a housing, which defines an accommodating chamber and includes a water inlet and a water outlet; a brush head assembly connected to the housing; a filter cartridge, which is arranged in the accommodating chamber of the housing and in fluid communication with the water outlet, and includes an upper end surface and a lower end surface; and a filter element, which is arranged in the accommodating chamber of the housing, and abuts against the lower end surface of the filter cartridge and is in fluid communication with the water inlet.

[0006] In some embodiments, the filter cartridge includes a first through hole, and the filter element includes: a first end, which includes an annular connecting portion; and a second end, which abuts against the lower end surface of the filter cartridge and includes a positioning boss arranged in the first through hole of the filter car-

tridge.

[0007] In some embodiments, the housing includes: a first housing, which includes a step arranged on an inner sidewall of the first housing; and a second housing detachably connected to the first housing; and the annular connecting portion is arranged on the step and located between the first housing and the second housing.

[0008] In some embodiments, the first housing further includes a limiting post arranged on a top wall of the bottom portion of the accommodating chamber, the filter cartridge is mounted on the limiting post, and the upper end surface of the filter cartridge abuts against the top wall of the bottom portion of the accommodating chamber.

[0009] In some embodiments, the pool cleaner further includes a water pump assembly, the water pump assembly including: a motor; an impeller driven by the motor; and a battery supplying power to the motor.

[0010] In some embodiments, the brush head assembly includes: a brush head housing including sidewalls; gear sets arranged on the sidewalls; wheels arranged on the sidewalls and connected to the gear sets; and a roller brush connected to the gear sets.

[0011] In some embodiments, the gear set includes: a first gear connected to the roller brush; a second gear meshing with the first gear; and a third gear meshing with the second gear and arranged on the wheel.

[0012] In some embodiments, the roller brush includes a second through hole formed in an axial direction of the roller brush, and a boss is provided in the second through hole; and the first gear includes: a first extension shaft, which extends along an end surface of the first gear and arranged in the second through hole, and includes a hook connected to the boss.

[0013] In some embodiments, the sidewall of the brush head housing includes a first mounting hole in which a first bushing is arranged, and the first extension shaft extends through the first bushing and is arranged in the second through hole.

[0014] In some embodiments, a first groove is formed in an inner wall of the first mounting hole, and a first protrusion that fits with the first groove is provided on an outer wall of the first bushing.

[0015] In some embodiments, a charging port is provided on the housing, and the charging port includes a T-shaped socket and electrode posts arranged on two sides of the socket.

[0016] In another embodiment of the present disclosure, a pool cleaner is disclosed. The pool cleaner includes a housing defining an accommodating chamber, a water inlet, and a water outlet, a brush head assembly connected to the housing, a water pump assembly arranged in the accommodating chamber, a charging port provided on the housing and electrically coupled to a battery, and a protective cover configured to cover the charging port. The protective cover is movable between an open position, in which the charging port is accessible, and a closed position, in which the protective cover seals

the charging port.

[0017] In some embodiments, the charging port comprises a T-shaped socket and electrode posts arranged on a first side and a second side of the T-shaped socket.

[0018] In some embodiments, the water pump assembly comprises a motor, an impeller driven by the motor, and the battery supplying power to the motor.

[0019] In some embodiments, the pool cleaner further comprises a filter cartridge arranged at the bottom of the accommodating chamber of the housing and in fluid communication with the water outlet, the filter cartridge including an upper end surface and a lower end surface and a filter element arranged in the accommodating chamber of the housing, such that the filter element abuts the lower end surface of the filter cartridge and is in fluid communication with the water inlet.

[0020] In other embodiments of the present disclosure, a pool cleaner is disclosed. The pool cleaner includes a housing including a water inlet and a water outlet, the housing further defining an accommodating chamber, a brush head assembly connected to the housing, a filter element arranged in the accommodating chamber of the housing and in fluid communication with the water inlet, the filter element being configured to perform a primary filtering process, and a filter cartridge arranged at the bottom of the accommodating chamber of the housing and in fluid communication with the water outlet, the filter cartridge being configured to perform a secondary filtering process.

[0021] In some embodiments, the brush head assembly further includes a suction port configured to draw debris from a pool into the accommodating chamber defined by the housing.

[0022] In some embodiments, the filter cartridge includes an upper end surface and a lower end surface and the filter element abuts the lower end surface of the filter cartridge.

[0023] In some embodiments, the pool cleaner further comprises a water pump assembly, the water pump assembly comprising a motor, an impeller driven by the motor, and a battery supplying power to the motor.

[0024] According to the present disclosure, the filter element and the filter cartridge are arranged in the accommodating chamber of the housing, and the filter cartridge is arranged downstream of the filter element, so that the filter element performs primary filtration to remove large-particle residues such as leaves, and then the filter cartridge performs secondary filtration to remove algae and fine-particle residues from water, that is, the double filtration is achieved by means of the filter element and the filter cartridge, thereby effectively improving the filtering effect.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] Other features and advantages of the present disclosure will be understood from the following embodiments described in detail herein and with reference to the

accompanying drawings, in which like reference numerals represent the same or similar components.

FIG. 1 shows a perspective view of a pool cleaner, according to one or more embodiments shown and described herein;;

FIG. 2 shows an exploded view of the pool cleaner of FIG. 1, according to one or more embodiments shown and described herein;

FIG. 3 shows a cross-sectional view of the pool cleaner of FIG. 1, according to one or more embodiments shown and described herein;

FIG. 4 shows a perspective view of a charging structure of the pool cleaner of FIG. 1, according to one or more embodiments shown and described herein;

FIG. 5 shows a cross-sectional view of the charging structure of FIG. 4, according to one or more embodiments shown and described herein;

FIG. 6 shows a partial enlarged view of a filter cartridge of the pool cleaner as depicted at Part B of FIG. 3, according to one or more embodiments shown and described herein.;

FIG. 7 is a partial enlarged view of the a housing of the pool cleaner as depicted at Part A in FIG. 3, according to one or more embodiments shown and described herein;

FIG. 8 shows a perspective view of a first housing of the pool cleaner of FIG. 1, according to one or more embodiments shown and described herein;

FIG. 9 shows a bottom view of a brush head assembly of the pool cleaner of FIG. 1, according to one or more embodiments shown and described herein;

FIG. 10 shows a partial exploded view of the brush head assembly of FIG. 9, according to one or more embodiments shown and described herein;

FIG. 11 shows a perspective view of a bushing of the brush head assembly of FIG. 9, according to one or more embodiments shown and described herein;

FIG. 12 shows a cross-sectional view of the brush head assembly of FIG. 9, according to one or more embodiments shown and described herein;

FIG. 13 shows a side view of the brush head assembly of FIG. 9, according to one or more embodiments shown and described herein;

FIG. 14 shows a perspective view of a first gear of the

brush head assembly of FIG. 9, according to one or more embodiments shown and described herein; and

FIG. 15 shows a partial enlarged view of a through hole of the brush head assembly as depicted at part C in FIG. 12, according to one or more embodiments shown and described herein.

DETAILED DESCRIPTION

[0026] Embodiments of the present disclosure are illustrated below, and those skilled in the art may readily understand advantages and effects of the present disclosure from the content disclosed in the description. Although the description of the present disclosure will be introduced in conjunction with preferred embodiments, it does not mean that features of the present disclosure are limited to the implementations described herein. On the contrary, an objective of introducing the present disclosure in conjunction with the embodiments described herein is to encompass other options or modifications that may be extended on the basis of the claims of the present disclosure. The following description contains numerous specific details in order to provide deep understanding of the present disclosure. The present disclosure may also be implemented without these details. In addition, in order to avoid confusion of the present disclosure, some specific details will be omitted in the description. It should be noted that the embodiments and the features thereof in the present disclosure can be combined with each other without conflicts.

[0027] It should be noted that in the specification, like reference numerals and letters denote like items in the following drawings. Therefore, once an item is defined in one of the drawings, it is not necessary to further define and explain the item in the subsequent drawings.

[0028] In the description of the embodiments, it should be noted that the orientation or position relationships indicated by the terms, such as "upper", "lower", "inner" and "bottom", are based on the orientation or position relationships shown in the drawings or the orientation or position relationships in which a product of the present disclosure is customarily placed during use, and are only intended to facilitate description of the present disclosure and simplify the description, rather than indicating or implying that the device or element indicated must have a specific orientation or be configured and operated in a specific orientation, and thus cannot be construed as limiting the present disclosure.

[0029] The terms "first", "second", etc. are only intended to distinguish the description, and should not be construed as indicating or implying the relative importance.

[0030] In the description of the embodiments, it should also be noted that the terms "arrange", "connect", and "connection" should be understood in a broad sense, unless otherwise explicitly specified and limited. For ex-

ample, the connection may be a fixed connection, a detachable connection, or an integral connection; or may be a mechanical connection or an electrical connection; or may be a direct connection, an indirect connection by means of an intermediate medium, or internal communication between two elements. For those of ordinary skill in the art, the specific meaning of the terms mentioned above in the embodiments should be understood in specific cases.

[0031] In order to make the objectives, technical solutions and advantages of the present disclosure clearer, the implementation of the present disclosure is further described in detail below with reference to the drawings.

[0032] Referring to FIGS. 1 to 3, an embodiment of the present disclosure relates to a pool cleaner 100 for cleaning a pool, such as an inflatable massage pool, a frame pool, or a road surface with excessive standing water.

[0033] As depicted in FIGS. 1 to 3, the pool cleaner 100 may include a brush head assembly 200 and a housing 300 connected to the brush head assembly 200. The brush head assembly 200 may be configured to contact a pool bottom of the pool or a pool wall of the pool to clean (e.g., remove particulate, residue, and other debris) the pool bottom or the pool wall.

[0034] Referring still to FIGS. 1 to 3, the housing 300 may be hollow and may further define an accommodating chamber 301. Advantageously, the accommodating chamber 301 may comprise a top portion 301' and a bottom portion 301". The housing 300 may also include a water inlet 302 and a water outlet 303. In these embodiments, the water inlet 302 may be configured to receive dirty water (e.g., water containing debris, leaves, and fine particulate) from the pool and allow the dirty water to enter the pool cleaner 100. For example, the pool cleaner 100 may be configured to generate a vacuum which causes water and debris to be drawn into the pool cleaner 100 via the water inlet 302, as will be described in additional detail herein. In turn, the water outlet 303 may be configured to discharge filtered water into the pool once the filtered water has cycled through the pool cleaner 100. For example, filtered water may be expelled into the pool via the water outlet 303 once the filtration process is complete.

[0035] As further depicted in FIGS. 1 to 3, the pool cleaner 100 may further include a filter assembly 400 and a water pump assembly 500. The filter assembly 400 and the water pump assembly 500 may be sequentially mounted in the accommodating chamber 301 along a water flow path from the water inlet 302 to the water outlet 303. In these embodiments, the water pump assembly 500 may include a motor 501, an impeller 502 and a battery 503. Preferably, the water pump assembly 500 may be arranged in the top portion 301' of the accommodating chamber 301. The impeller 502 may be driven by the motor 501, and the battery 503 may supply power to the motor 501.

[0036] In the embodiments described herein, the pool

cleaner 100 may further include a charging port 60 provided at an end of the housing 300 (e.g., away from the brush head assembly 200). The charging port 60 is configured to be connected to a power source to charge the battery 503. A protective cover 600 may also be provided on the charging port 60 to prevent water, dust, etc. from entering the charging port 60, so as to protect the internal circuit from damage. In these embodiments, the protective cover 600 may be a hinged cover, a plug-in (e.g., rubber or silicone) cover, a sliding cover, or any other similar cover configured to form a waterproof barrier (e.g., seal) that prevents water, dust, and/or debris from entering the charging port when the charging port 60 is not in use.

[0037] In some embodiments, such as the embodiments depicted in FIGS. 4 and 5, the charging port 60 may be configured as a socket 601, preferably having a T-shaped structure. The charging port 60 may further comprise first and second electrode posts 602. In these embodiments, first and second electrode posts 602, respectively, may protrude from a first side and a second side of the socket 601, with the electrode posts 602 being electrically connected to the battery 503. The socket 601 may be further configured to receive a plug (not shown) that matches the T-shaped structure of the socket 601.

[0038] In operation, the plug may be connected to the power source, such that electrode plates on the plug come into contact with the electrode posts 602 to achieve an electrical connection to power the battery 503. The socket 601 may be configured to receive the plug, which may allow for a stable electrical connection to be formed between the electrode posts 602 and the plug, and can also prevent water or dust from entering the charging port 60 and negatively impacting the stability of charging. It should be further appreciated that the charging port, plug, and power source described herein are intended as examples and are not limiting in terms of the forms described or illustrated. The charging port, plug and power source can be of any design without departing from the scope of the present disclosure.

[0039] Referring still to FIGS. 1 to 3, during cleaning of the pool bottom or the pool wall of the pool by the brush head assembly 200, residue, leaves and other debris at the bottom of the pool around the brush head assembly 200, particularly suction port 203, may be gathered at the suction port 203 in the brush head housing 210 of the brush head assembly 200. It should be appreciated that, by securing debris and residue adjacent the suction port 203 residue and leaves within the pool may be prevented from deviating from the suction port 203 as the pool cleaner 100 moves in the pool, which may improve the cleaning efficiency of the pool cleaner 100.

[0040] Furthermore, during operation of the pool cleaner 100, the motor 501 arranged in the housing 300 may drive the impeller 502 to rotate, such that rotation of the impeller 502 generates vacuum suction in the housing 300. In these embodiments, the vacuum suction may cause residue and leaves to be sucked into the accom-

modating chamber 301 via the suction port 203 and the water inlet 302 along with the water flowing through the accommodating chamber 301. It should be understood that, as the water, leaves, and residue are sucked into the accommodating chamber 301, the filter assembly 400 arranged in the accommodating chamber 301 may filter the water flowing through the accommodating chamber 301, so that the residues, leaves and other debris are retained in the accommodating chamber 301. With the residue, leaves, and debris filtered via the filter assembly 400, clean water filtered by the filter assembly 400 may be discharged from the water outlet 303 above the housing 300 and into the pool, thereby effectively achieving the effects of cleaning the pool and reducing water changes.

[0041] As further depicted in FIGS. 1 to 3, the housing 300 may also include a first housing 310 and a second housing 320. The second housing 320 may include a first connecting end 321 and a second connecting end 322. The first connecting end 321 may be connected to a connecting tube 201 (shown in FIG. 9) provided on the brush head assembly 200, and the second connecting end 322 may be connected to the first housing 310. The first housing 310 may define a first chamber 311. The filter assembly 400 may be mounted in the first chamber 311, and the first chamber 311 may be in fluid communication with the water outlet 303 formed in the first housing 310.

[0042] In these embodiments, the second housing 320 may further define a second chamber 323. The second chamber 323 may be in fluid communication with the water inlet 302 formed in the second housing 320. The second chamber 323 may be in fluid communication with the first chamber 311, and through the connection between the first housing 310 and the second housing 320, the second chamber 323 and the first chamber 311 may jointly define the accommodating chamber 301 of the housing 300. In this embodiment, the connecting tube 201 of the brush head assembly 200 may be rotatably arranged on the brush head housing 210 by means of dowel pins 202 (shown in FIG. 9). The housing 300 may be rotated relative to the brush head assembly 200 to change the tilt angle, making it convenient for a user to hold the pool cleaner 100 to clean the pool wall or a pool corner. Although the embodiments depicted in FIGS. 1 to 3 illustrate the brush head housing being rotatably arranged via dowel pins 202, it should be appreciated that the brush head assembly 200 may be rotatably coupled to the second housing 320 via any suitable coupling mechanism without departing from the scope of the present disclosure.

[0043] Referring now to FIG. 2, in some embodiments, a projection 324 may be provided on the second connecting end 322 of the second housing 320. In these embodiments, a slot 312 that matches the projection 324 may be formed in the first housing 310. The first housing 310 may be aligned with the second housing 320, and the first housing 310 may be rotated to enable the projection 324 to slide into the slot 312, so as to connect the second

housing 320 to the first housing 310. It should be appreciated that connection method described herein may allow for convenient separation of the first housing 310 and the second housing 320, such that a user may easily dump the residues that are retained in the accommodating chamber 301 after filtration. Those skilled in the art will appreciate that in other embodiments, other methods, such as screw connection, can also be used to achieve the detachable connection between the first housing 310 and the second housing 320 without departing from the scope of the present disclosure.

[0044] Referring again to FIGS. 1 to 3, the filter assembly 400 may also include a filter element 410 and a filter cartridge 420. The filter element 410 may be arranged in the first chamber 311 of the accommodating chamber 301 and may be positioned adjacent to the brush head assembly 200 (e.g., relative to the second connecting end 322 of the second housing 320). Furthermore, the filter element 410 may be in fluid communication with the water inlet 302.

[0045] In operation, water may flow into the accommodating chamber 301 via the water inlet 302 and flow through the filter element 410 for primary filtration. For example, in these embodiments, the filter element 410 may serve as an upstream filter element, with the water that is filtered by the filter element 410 being directed to flow through the filter cartridge 420 for secondary filtration after being filtered by the filter element 410. As described hereinabove, once the water has traversed the filter element 410 and the filter cartridge 420, the filtered water may be directed back into the pool via the water outlet 303. For example, in these embodiments, the filter cartridge 420 may act as a downstream filter element, such that the water in the pool is subjected to double filtration (e.g., first and second filtration processes) by means of the filter element 410 and the filter cartridge 420, which may aid in improving the filtering of the pool cleaner 100. Therefore, the filter element 410 is configured to perform a primary filtering process, while the filter cartridge 420 is configured to perform a secondary filtering process.

[0046] Referring still to FIGS. 1 to 3, the filter element 410 may also include a frame 411. The frame 411 may enclose a filter chamber 412, and a filter screen (not shown) may cover the frame 411. In operation, water flows into the filter chamber 412 via the water inlet 302 and flows out via mesh holes in the filter screen, with the residue, leaves and other debris being retained in the filter chamber 412. It should be appreciated that, in some embodiments, such as the embodiments depicted in FIG. 2, the frame 411 may preferably have a truncated-cone-shape. However, it should be understood that, in other embodiments, the frame 411 may be cylindrical, square, or in other suitable shapes, without departing from the scope of the present disclosure. Similarly, it should also be understood that the filter element 410 may be a mesh bag, or any other similar component capable of being mounted in the first chamber 311 to achieve a filtering

effect without departing from the scope of the present disclosure.

[0047] Turning now to FIGS. 2 and 3, the filter element 410 may include a first end 413 and a second end 414.

5 The first end 413 and the second end 414 may be arranged opposite each other in an extension direction Z (e.g., as depicted in FIG. 3) of the pool cleaner 100. In this embodiment, the first end 413 may face the water inlet 302 of the housing 300. The residues, leaves, etc. at the bottom of the pool can enter the second chamber 323 via the water inlet 302 along with the water flow, and enter the filter chamber 412 via the first end 413. The water in the filter chamber 412 then flows out of the filter chamber 412 via the mesh holes in the filter screen, with the residues, leaves, and other particulate being retained in the filter chamber 412, thereby completing the primary filtration.

[0048] Furthermore, as depicted most clearly in FIG. 3, an outer wall of the frame 411 of the filter element 410 may be spaced apart from an inner wall of the first housing 310, such that the outer wall of the frame 411 and the inner wall of the first housing 310 define a first water flow channel 330 between the filter element 410 and the first housing 310. In these embodiments, the first water flow channel 330 may be in fluid communication with the filter chamber 412. That is, the water entering the filter chamber 412 may flow out of the filter chamber 412 via the mesh holes in the filter screen and then enter the first water flow channel 330.

[0049] Referring now to FIGS. 2, 3 and 6, the filter cartridge 420 may be arranged in the accommodating chamber 301, preferably in the bottom portion 301" of the accommodating chamber 301 of the housing 300; in this way the filter cartridge 420 is in fluid communication with the water outlet 303. In these embodiments, the filter cartridge 420 may further include a lower end surface 424 and an upper end surface 425, and the filter element 410 may abut the lower end surface 424 of the filter cartridge 420. That is, the filter cartridge 420 may be arranged downstream of the filter element 410, and the filter element 410 may be located upstream of the filter cartridge 420.

[0050] In the embodiments described herein, the filter cartridge 420 may further include a first through hole 421. The first through hole 421 may extend through the upper end surface 425 and the lower end surface 424 of the filter cartridge 420 in the extension direction Z (e.g., as depicted in FIG. 3) of the pool cleaner 100. The first through hole 421 may include a first opening 422 and a second opening 423 arranged opposite each other. As shown in FIG. 6, the first opening 422 may be located at the lower end surface 424 of the filter cartridge 420 and may face the filter element 410, and the second opening 423 may be arranged at the upper end surface 425 of the filter cartridge 420 and may face the water outlet 303.

[0051] Referring still to FIGS. 2, 3, 6 and 7, the first end 413 of the filter element 410 may include an annular connecting portion 417. For example, the annular connecting portion 417 may be arranged around the first end

413 and/or may be integrally formed with the frame 411 in a circumferential direction of the filter element 410. Furthermore, in these embodiments, the annular connecting portion 417 may have a sheet-like profile and/or shape. As further illustrated in FIGS. 2, 3, 6, and 7, the first housing 310 may include a step 313 provided on an inner sidewall of the first housing 310. In particular, the step 313 may be located between the first housing 310 and the second housing 320. In this embodiment, the first housing 310 may have a circular cross-section, and the radial dimension of the end of the first housing 310 for connection with the second housing 320 may increase across the end of the first housing 310, such that the end of the first housing 310 forms step 313. It should be understood that the annular connecting portion 417 may be mounted on the step 313 and located between the first housing 310 and the second housing 320, such that the step 313 of the first housing 310 and an end portion of the second housing 320 jointly hold the annular connecting portion 417. Furthermore, when the first housing 310 and the second housing 320 are coupled, the connection between the projection 324 and the slot 312 may enable the filter element 410 to be securely mounted between the first housing 310 and the second housing 320, so as to prevent the filter element 410 from wobbling in the first chamber 311.

[0052] Referring still to FIGS. 2, 3, 6 and 7, the second end 414 of the filter element 410 may include a first abutting surface 415 and a positioning boss 416. The positioning boss 416 may protrude from the first abutting surface 415, and may be arranged in the first through hole 421 located in the first opening 422, so as to guide the mounting of the filter element 410, thereby achieving pre-positioning of the filter element 410 and the filter cartridge 420 and also preventing loosening of the fit of the filter element 410 and the filter cartridge 420 to prevent affecting the filtering effect. After the filter element 410 is mounted, the first abutting surface 415 of the second end 414 of the filter element 410 may abut the lower end surface 424 of the filter cartridge 420. The filter element 410 may support the filter cartridge 420 on a top wall 317 of the bottom portion 301" of the accommodating chamber 301 of the first housing 310, thereby preventing loosening of the filter cartridge 420 in the first housing 310.

[0053] In the embodiments described herein, after the filter element 410 and the filter cartridge 420 are mounted in the first housing 310, the positioning boss 416 may be located in the first through hole 421, and the lower end surface 424 of the filter cartridge 420 may abut the first abutting surface 415 of the filter element 410, such that the positioning boss 416 and the first abutting surface 415 jointly close the first opening 422 of the first through hole 421 to prevent the water that has undergone primary filtration from entering the first through hole 421 via the first opening 422. In these embodiments, preventing the water that has undergone primary filtration from entering the first through hole 421 may ensure that the water is

directed to the secondary filtration by the filter cartridge 420 prior to being directed into the pool via the water outlet 303.

[0054] It should be appreciated that, in this embodiment, the second end 414 of the filter element 410 may close the first opening 422 of the filter cartridge 420. That is, the water flowing through the filter chamber 412 of the filter element 410 may not directly enter the first through hole 421 via the first opening 422, but may instead flow out of the filter chamber 412 via the mesh holes in the filter screen and enter the first water flow channel 330. Once the water has entered the first water flow channel 330, the water may be directed into the second water flow channel 340 that may be formed by a gap between the filter cartridge 420 and the first housing 310. The water flows into the first through hole 421 from the second water flow channel 340, and the filter cartridge 420 may perform secondary filtration on the water to remove small residues, such as mud and sand, from the water. Subsequently, the water that has been filtered by the filter cartridge 420 flows out of the first through hole 421 via the second opening 423, and flows into the pool from the water outlet 303 of the housing 300.

[0055] Referring now to FIGS. 3, 6 and 7, in this embodiment, a limiting post 314 may be provided on the top wall 317 of the bottom portion 301" of the accommodating chamber 301. The limiting post 314 may extend toward the positioning boss 416 of the filter element 410. The filter cartridge 420 may be mounted on the limiting post 314. That is, the limiting post 314 may be inserted into the first through hole 421 from the second opening 423 of the filter cartridge 420. The filter cartridge 420 may be sleeved on the limiting post 314, and an outer wall of the limiting post 314 may abut an inner wall of the first through hole 421, such that the position of the filter cartridge 420 may be limited by the limiting post 314 to prevent the filter cartridge 420 from wobbling in a direction perpendicular to the extension direction Z (e.g., as depicted in FIG. 3) of the pool cleaner 100.

[0056] In this embodiment, the upper end surface 425 of the filter cartridge 420 may abut the top wall 317 of the bottom portion 301" of the accommodating chamber 301, which further limits the position of the filter cartridge 420 to prevent the filter cartridge 420 from loosening in the extension direction Z of the pool cleaner 100 and negatively impacting filtering of the pool cleaner 100. That is, for the filter cartridge 420, the limiting post 314 and the positioning boss 416 fit with each other in the extension direction Z of the pool cleaner 100 to hold the filter cartridge 420, which may prevent the filter cartridge 420 from moving in the first chamber 311.

[0057] Turning now to FIG. 8, in some embodiments, the limiting post 314 may be a hollow cylinder. A grate 316 may be provided at the hollow portion 315 of the limiting post 314 to prevent the residue in the accommodating chamber 301 and/or the filter chamber 412 from moving and clogging the water outlet 303. In these embodiments, the hollow portion 315 may be in communication with the

first through hole 421 of the filter cartridge 420 and the water outlet 303, such that, when the water that has undergone secondary filtration by the filter cartridge 420, the water flows into the first through hole 421 and then flows through the hollow portion 315 and into the pool from the water outlet 303.

[0058] Referring now to FIGS. 2, 3 and 6, an outer wall of the filter cartridge 420 may be spaced apart from an inner wall of the first housing 310 so as to define the second water flow channel 340 between the filter cartridge 420 and the first housing 310. In these embodiments, the first water flow channel 330 may be in fluid communication with the second water flow channel 340. In operation, the water that has undergone primary filtration by the filter element 410 may flow through the first water flow channel 330 and into the second water flow channel 340, the filter cartridge 420 may perform secondary filtration on the water, and the water that has undergone secondary filtration may flow into the first through hole 421 and into the pool via the water outlet 303.

[0059] Turning now to FIGS. 1 to 3 and FIG. 6, it should be appreciated that, by implementing the brush head assembly 200, the residue and leaves around the suction port 203 may be gathered at the suction port 203 in the brush head housing 210 of the brush head assembly 200. For example, in these embodiments, the motor 501 in the accommodating chamber 301 of the housing 300 may start to drive the impeller 502 to rotate, with the rotation of the impeller 502 being configured to generate vacuum suction in the accommodating chamber 301 of the housing 300 such that the residue and leaves around the suction port 203 are sucked into the accommodating chamber 301 of the housing 300 via the water inlet 302 along with the water from the pool. In these embodiments, the water, residue, and leaves may then enter the filter chamber 412 from the first end 413 of the filter element 410, and the water in the filter chamber 412 may flow out of the filter chamber 412 via the mesh holes in the filter screen such that the residue, leaves, and other particulate drawn into the pool cleaner 100 are retained in the filter chamber 412, thereby completing the primary filtration. Once the primary filtration process is complete, the water that has been filtered by the filter element 410 flows out of the filter chamber 412 and flows through the first water flow channel 330 and the second water flow channel 340 and into the first through hole 421. As the water flows from the second water flow channel 340 into the first through hole 421, the filter cartridge 420 may perform secondary filtration on the water to remove mud, sand, algae, and other small residues. The water that has undergone secondary filtration may then flow out of the first through hole 421 via the second opening 423 and may flow out of the accommodating chamber 301 of the housing 300 from the water outlet 303, and into the pool.

[0060] Accordingly, it should be appreciated that, in the embodiments described hereinabove, the filter element 410 performs primary filtration to remove leaves and

other residue, and then the filter cartridge 420 performs secondary filtration to remove mud, sand, algae, and other small residues from water. That is, in the embodiment described herein, double filtration may be achieved by means of the filter element 410 and the filter cartridge 420, thereby effectively improving the filtering effect of the pool cleaner 100.

[0061] Turning now to FIGS. 2, 9 and 10, the brush head assembly 200 will be described in additional detail. In these embodiments, the brush head assembly 200 may include a brush head housing 210, a plurality of wheels 220, a plurality of gear sets 230, and a roller brush 270. The brush head housing 210 may include a plurality of sidewalls 211, and the plurality of gear sets 230 may be arranged on the respective plurality of sidewalls 211, such that the plurality of gear sets 230 are configured to rotate relative to the plurality of sidewalls 211. Furthermore, the plurality of wheels 220 may be arranged on the respective plurality of sidewalls 211 and may be configured to rotate relative to the sidewalls 211, with the plurality of wheels being rotatable relative to the plurality of sidewalls by coupling the plurality of wheels 220 to the gear sets 230. It should be further appreciated that, in these embodiments, the roller brush 270 may be connected to the plurality of gear sets 230. Accordingly, when the user pushes the pool cleaner 100 forward or backward, the plurality of wheels 220 rotate and drive the plurality of gear sets 230 to rotate. In these embodiments, the plurality of gear sets 230 may further drive the roller brush 270 to rotate, and the roller brush 270 may remove the residues at the bottom or sidewalls of the pool during the movement of the pool cleaner 100.

[0062] Referring still to FIGS. 2, 9 and 10, in some embodiments, the plurality of sidewalls 211 of the brush head housing 210 may include two sidewalls 211, such as a first sidewall and a second sidewall. The two sidewalls 211 may be respectively located on two sides (e.g., a first side and a second side) of the roller brush 270 in an axial direction X. At least one wheel 220 of the plurality of wheels and at least one gear set 230 of the plurality of gear sets may be provided on each sidewall 211. A cover 218 may be further provided on at least one of the first sidewall and/or second sidewall 211. It should be appreciated the cover 218 may cover the plurality of wheels 220 and the plurality of gear sets 230 on each of the plurality of sidewalls 211, thereby improving the aesthetics of the pool cleaner 100 and also preventing the residues in the pool from affecting the normal operation of the plurality of wheels 220 and the plurality of gear sets 230. During the movement of the plurality of wheels 220 at two ends of the roller brush 270 in the axial direction X, the plurality of wheels 220 drive the plurality of gear sets 230 to rotate and in turn provide a driving force for rotation. As a result, the roller brush 270 rotates to clean the pool.

[0063] Referring now to FIGS. 10, 12 and 13, each of the plurality of gear sets 230 may include a first gear 231, a second gear 232 and a third gear 233. The third gear 233 may mesh with the second gear 232. The third gear

233 may be arranged on each of the plurality of wheels 220. In these embodiments, the second gear 232 may mesh with the first gear 231. The first gear 231 may be connected to the roller brush 270. As further depicted in FIGS. 10, 12, and 13 each of the plurality of wheels 220 and the third gear 233 of each of the plurality of gear sets may be arranged integrally and coaxially. However, it should be further appreciated that, in some embodiments, the wheel 220 and the third gear 233 may also be arranged separately and coaxially without departing from the scope of the present disclosure.

[0064] In operation, as the user pushes the pool cleaner 100, the rotation of the plurality of wheels 220 enables the third gear 233 of each of the plurality of gear sets 230, which may be integrally connected to each of the plurality of wheels, to rotate accordingly, such that the rotation of the third gear 233 drives the second gear 232 to rotate synchronously. In these embodiments, the rotation of the second gear 232 may also drive the first gear 231, which meshes with the second gear, to rotate synchronously, so that the first gear 231 drives the roller brush 270 to rotate. In these embodiments, the brush head assembly 200 may transmit power layer-by-layer by means of the gear sets 230 to enable the roller brush 270 to rotate such that the residues in the pool are gathered at the suction port 203 of the brush head housing 210, and under the action of the vacuum suction generated by the motor 501, the residues enter the accommodating chamber 301 of the housing 300 via the water inlet 302, so as to filter the water in the pool to achieve the effect of cleaning the pool.

[0065] As shown in FIGS. 10 and 11, a third extension shaft 212 may be provided on each of the plurality of sidewalls 211. A third protrusion 213 may be provided on the third extension shaft 212. The third bushing 240 may include a third mounting hole 241, a third connecting portion 242 and a third limiting portion 243. The third mounting hole 241 runs through the third connecting portion 242 and the third limiting portion 243, and a third groove 244 may be formed in the wall of the third mounting hole 241.

[0066] Referring now to FIGS. 10, 11 and 12, a second center hole 221 may be formed at the center of each of the plurality of wheels 220, such that the third connecting portion 242 of the third bushing 240 passes through the second center hole 221 and may be sleeved on the third extension shaft 212. Furthermore, the third protrusion 213 may be embedded in the third groove 244 in the third bushing 240. The third limiting portion 243 of the third bushing 240 may have a larger cross-sectional area than the second center hole 221 of each of the plurality of wheels 220. That is, the third bushing 240 may be connected to the third extension shaft 212 by means of the third protrusion 213 being embedded into the third groove 244. The third limiting portion 243 of the third bushing 240 may have a larger cross-sectional area than the second center hole 221 of each of the plurality of wheels 220. Accordingly, the plurality of wheels 220 may be arranged between the plurality of sidewalls 211 and the third limit-

ing portion 243 of the third bushing 240. The third limiting portion 243 may prevent the wheel 220 from moving in the axial direction X of the roller brush 270 and slipping off the third bushing 240. It should be appreciated that the plurality of wheels 220 may rotate around the third connecting portion 242, so that the plurality of wheels 220 may rotate relative to the plurality of sidewalls 211, and the user can push the pool cleaner 100 to move in the pool to clean the pool bottom or the pool wall of the pool.

[0067] Referring now to FIGS. 10, 12 and 13, a second extension shaft 214 may be provided on each of the plurality of sidewalls 211. A second protrusion 215 may be provided on the second extension shaft 214. In this embodiment, the second bushing 250 has the same structure as the third bushing 240. The second bushing 250 may include a second mounting hole 251, a second connecting portion 252 and a second limiting portion 253. The second mounting hole 251 runs through the second connecting portion 252 and the second limiting portion 253. A second groove 254 may be formed in the wall of the second mounting hole 251. A first center hole 234 may be formed at the center of each second gear 232. The second connecting portion 252 of the second bushing 250 passes through the first center hole 234 and may be sleeved on the second extension shaft 214. The second protrusion 215 may be embedded into the second groove 254. The second limiting portion 253 of the second bushing 250 has a larger cross-sectional area than the first center hole 234 of the second gear 232. Accordingly, it should be appreciated that the second gear 232 may have a structure the same as that of any of the wheels of the plurality of wheels 220 being arranged on the plurality of sidewalls, and thus may be arranged on any of the plurality of sidewalls 211. The second bushing 250 may be arranged on the second extension shaft 214 by means of the second protrusion 215 fitting with the second groove 254. The second limiting portion 253 of the second bushing 250 has a larger cross-sectional area than the first center hole 234 of the second gear 232. Accordingly, the second gear 232 may be arranged between the sidewall 211 and the second limiting portion 253 of the second bushing 250 and can rotate around the second connecting portion 252. The second limiting portion 253 can prevent the second gear 232 from moving in the axial direction X of the roller brush 270 and even slipping off the second bushing 250.

[0068] As shown in FIGS. 10, 12 and 15, the roller brush 270 may include a second through hole 271 that runs through the roller brush 270 along the axial direction X thereof, and a boss 272 may be provided in the second through hole 271.

[0069] As shown in FIGS. 10, 14 and 15, the first gear 231 may include a first extension shaft 235. The first extension shaft 235 may be arranged in the second through hole 271 and extends along an end surface of the first gear 231. The first extension shaft 235 may include a hook 236. The hook 236 may be connected to the boss 272 in a snap-fit manner to limit the movement

of the first extension shaft 235 in the axial direction X (e.g., as depicted in FIGS. 10 and 15) thereof. The first extension shaft 235 may be inserted into the second through hole 271, and the hook 236 may be connected to the boss 272 in a snap-fit manner, so that the first extension shaft 235 may not disengage from the second through hole 271, thereby improving the stability and reliability of the connection between the first gear 231 and the roller brush 270.

[0070] It should be appreciated that, in this embodiment, the first gear 231 may be connected to the roller brush 270 by means of the hook 236 fitting with the boss 272. However, in other embodiments, other methods, such as screw connections and riveting, can be chosen to achieve the connection between the first gear 231 and the roller brush 270 without departing from the scope of the present disclosure.

[0071] Continuing to refer to FIGS. 10 and 14, the sidewall 211 of the brush head housing 210 may include a first mounting hole 216, a first bushing 260 may be provided in the first mounting hole 216. The first extension shaft 235 may extend through the first bushing 260 and may be arranged in the second through hole 271. A first groove 217 may be formed in an inner wall of the first mounting hole 216. A first protrusion 261 that fits with the first groove 217 may be provided on an outer wall of the first bushing 260. In these embodiments, the first extension shaft 235 may pass through the first mounting hole 216 in the sidewall 211 and may be arranged in the second through hole 271 of the roller brush 270. The first bushing 260 may be arranged in the first mounting hole 216 by means of the first protrusion 261 fitting with the first groove 217. Accordingly, the first gear 231 can drive the first extension shaft 235 to rotate around the first bushing 260 and in turn drive the roller brush 270 to rotate to clean the pool, as has been described in detail hereinabove.

[0072] In this embodiment, the roller brush 270 may be configured such that the residue around the brush head assembly 200 may be directed toward the suction port 203 in advance, which prevents the brush head housing 210 of the brush head assembly 200 from pushing the residue to both sides of the brush head assembly 200 and, in turn, allows the suction port 203 to effectively draw the residue into the accommodating chamber 301 for filtration.

[0073] It should be further appreciated that, in this embodiment, power may be transmitted from the wheel 220 to the roller brush 270 via the first gear 231, the second gear 232 and the third gear 233. However, in other embodiments, other methods, such as a chain, can be used to achieve the transmission connection between the wheels 220 and the roller brush 270 without departing from the scope of the present disclosure.

[0074] In view of the foregoing, it should be appreciated that the present disclosure is directed to the structure of the pool cleaner 100. In the embodiments described herein, the pool cleaner 100 may be provided with a double filtration device, which can effectively and suc-

cessively remove large particles and small residue. The brush head assembly 200 of the pool cleaner 100 may be provided with a roller brush 270, and the pool cleaner 100 may be pushed to move to drive the roller brush 270 to rotate, and at this time the roller brush 270 may bring leaves and residue to the suction port 203, so that the residue and other particulate may be easily collected.

[0075] Although the present disclosure has been illustrated and described with reference to some preferred implementations of the present disclosure, those of ordinary skill in the art should understand that the above contents are further detailed descriptions for the present disclosure with reference to specific implementations. The foregoing descriptions are only embodiments of the present disclosure and are not intended to limit the present disclosure. Those skilled in the art can make various changes in form and details, including several simple deduction or substitutions, without departing from the scope of the present disclosure.

[0076] The scope of the present disclosure is defined by the appended claims rather than the above-mentioned description, and therefore it is intended that all changes which fall within the meaning and range of equivalents of the claims are embraced in the present disclosure. Any reference signs in the claims should not be construed as limiting the claims involved. In addition, it is apparent that the word "comprise/include" does not exclude other elements or steps, and the singular does not exclude the plural. The terms first, second, etc. are used for designations and do not represent any particular order.

[0077] It should be understood that the embodiments as shown in the drawings only show the optional shapes, sizes and arrangements of optional components of the air valve and inflatable products according to the present disclosure, which are merely illustrative but not restrictive, and other shapes, sizes and arrangements may be employed without departing from the scope of the present disclosure.

Claims

1. A pool cleaner comprising:

- a housing (300) including a water inlet (302) and a water outlet (303), the housing (300) further defining an accommodating chamber (301);
- a brush head assembly (200) connected to the housing (300);
- a filter cartridge (420) disposed in the accommodating chamber (301) of the housing (300) and in fluid communication with the water outlet (303), the filter cartridge (420) including an upper end surface (425) and a lower end surface (424); and
- a filter element (410) disposed in the accommodating chamber (301) of the housing (300), such that the filter element (410) abuts the lower end

- surface (424) of the filter cartridge (420) and is in fluid communication with the water inlet (302).
2. The pool cleaner according to claim 1, wherein the filter cartridge (420) comprises a first through hole (421), and the filter element (410) comprises:
 - a first end (413) having an annular connecting portion (417); and
 - a second end (414) abutting the lower end surface (424) of the filter cartridge (420) and comprising a positioning boss (416) disposed in the first through hole (421) of the filter cartridge (420).
 3. The pool cleaner according to claim 2, wherein the housing (300) comprises:
 - a first housing (310) including a step (313) disposed on an inner sidewall of the first housing (310); and
 - a second housing (320) detachably connected to the first housing (310); and
 - the annular connecting portion (417) is disposed on the step (313) and located between the first housing (300) and the second housing (300).
 4. The pool cleaner according to claim 3, wherein the first housing (300) further comprises a limiting post (314) disposed on a top wall (317) of the bottom portion (301") of the accommodating chamber (301), the filter cartridge (420) is disposed on the limiting post (314), and the upper end surface (425) of the filter cartridge (420) abuts the top wall (317) of the bottom portion (301") of the accommodating chamber (301).
 5. The pool cleaner according to claim 1, wherein the pool cleaner (100) further comprises a water pump assembly (500), the water pump assembly (500) comprising:
 - a motor (501);
 - an impeller (502) driven by the motor (501); and
 - a battery (503) supplying power to the motor (501).
 6. The pool cleaner according to claim 1, wherein the brush head assembly (200) comprises:
 - a brush head housing (210) having a plurality of sidewalls (211);
 - a plurality of gear sets (230) disposed on the plurality of sidewalls (211);
 - a plurality of wheels (220) disposed on the plurality of sidewalls (211) and connected to the plurality of gear sets (230); and
 - a roller brush (270) connected to each of the
- plurality of gear sets (230).
7. The pool cleaner according to claim 6, wherein each of the plurality of gear sets (230) comprises:
 - a first gear (231) connected to the roller brush (270);
 - a second gear (232) meshing with the first gear (231); and
 - a third gear (233) meshing with the second gear (232) and disposed on at least one of the plurality of wheels (220).
 8. The pool cleaner according to claim 7, wherein the roller brush (270) comprises a second through hole (271) extending in an axial direction of the roller brush (270), and a boss (272) is disposed in the second through hole (271); and
 - the first gear (231) comprises:
 - a first extension shaft (235) extending along an end surface of the first gear (231) and disposed in the second through hole (271), the first extension shaft (235) further including a hook (236) connected to the boss (272).
 9. The pool cleaner according to claim 8, wherein each of the plurality of sidewalls (211) of the brush head housing (300) defines a first mounting hole (216), a first bushing (260) is disposed in the first mounting hole (216), and the first extension shaft (235) extends through the first bushing (260) and into the second through hole (271).
 10. The pool cleaner according to claim 9, wherein a first groove (217) is formed in an inner wall of the first mounting hole (216), and a first protrusion (261) configured to mate with the first groove (217) is disposed on an outer wall of the first bushing (260).
 11. The pool cleaner according to claim 1, wherein a charging port (60) is disposed on the housing (300).
 12. The pool cleaner according to claim 11, wherein the charging port (60) comprises a T-shaped socket (601) and electrode posts (602) disposed on a first side and a second side of the T-shaped socket (601).
 13. The pool cleaner according to claims 5 and 11, wherein the charging port (60) is electrically coupled to a battery (503).
 14. The pool cleaner according to the preceding claim, wherein the pool cleaner further comprises
 - a protective cover (600) configured to cover the charging port (60);
 - the protective cover being movable between an open position, in which the charging port (60) is

accessible, and a closed position, in which the protective cover seals the charging port (60).

- 15.** The pool cleaner according to claim 1, wherein the brush head assembly (200) further includes a suction port (203) configured to draw debris from a pool into the accommodating chamber (301) defined by the housing (300).

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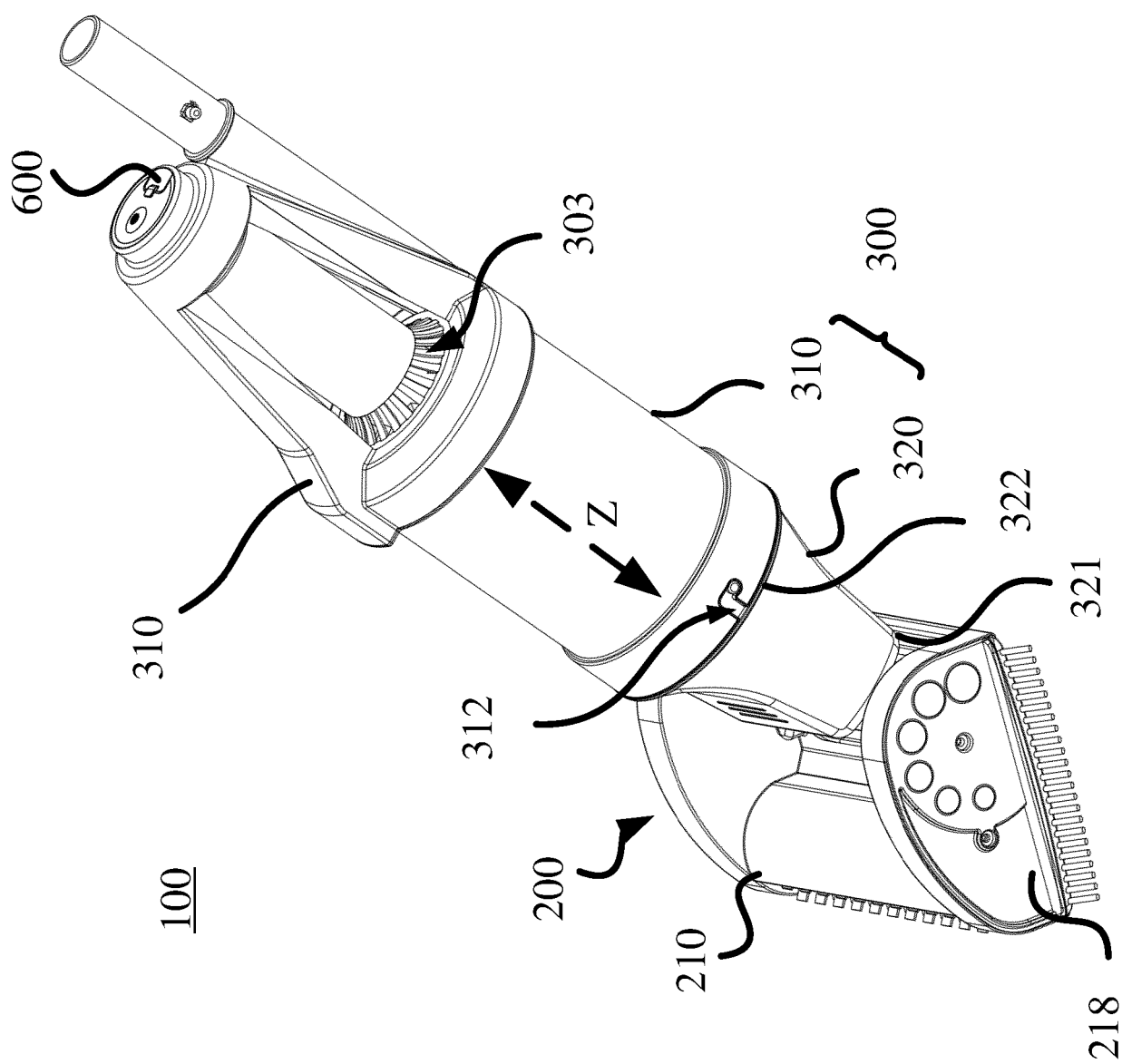
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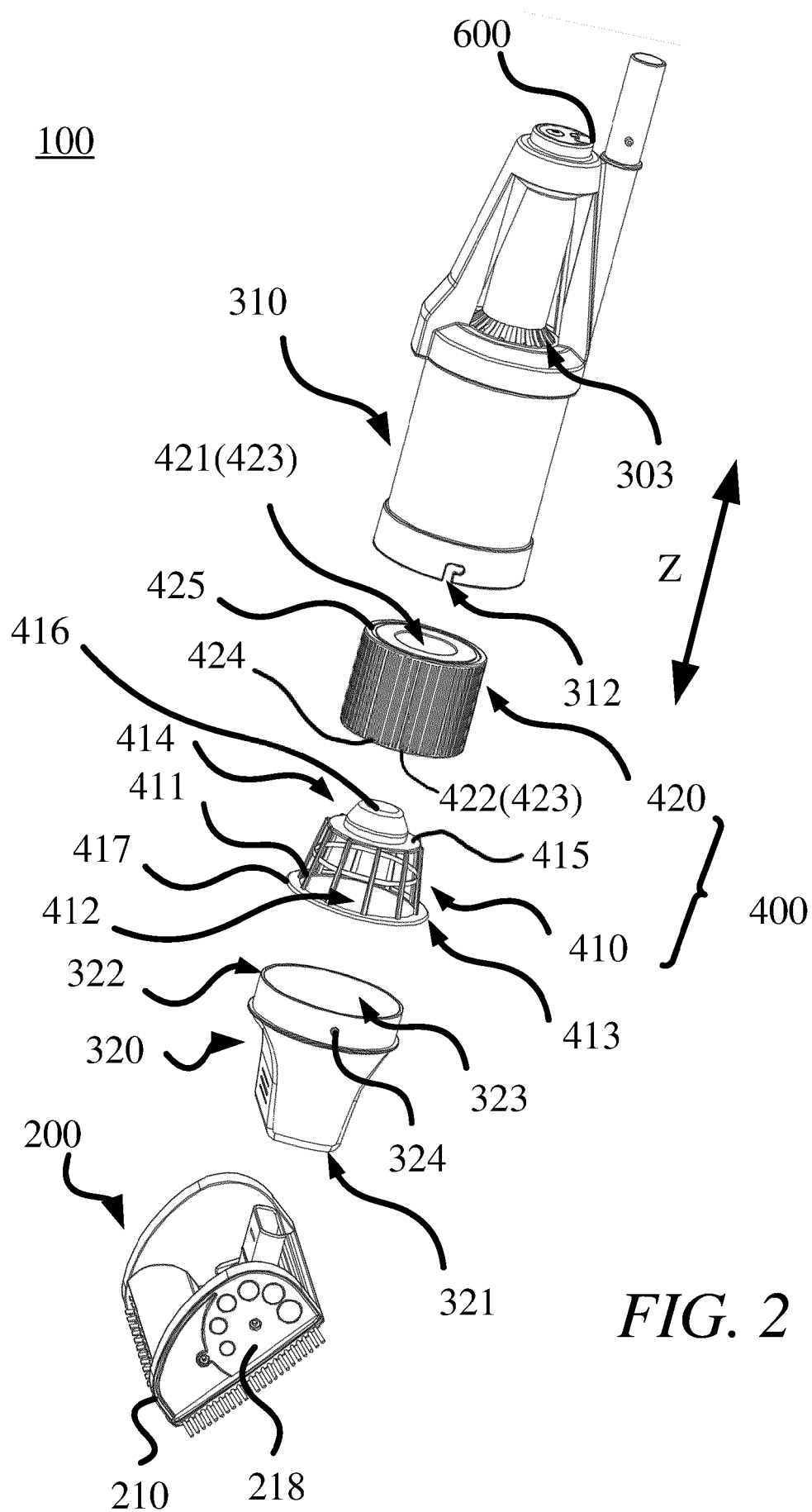
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FIG. 1





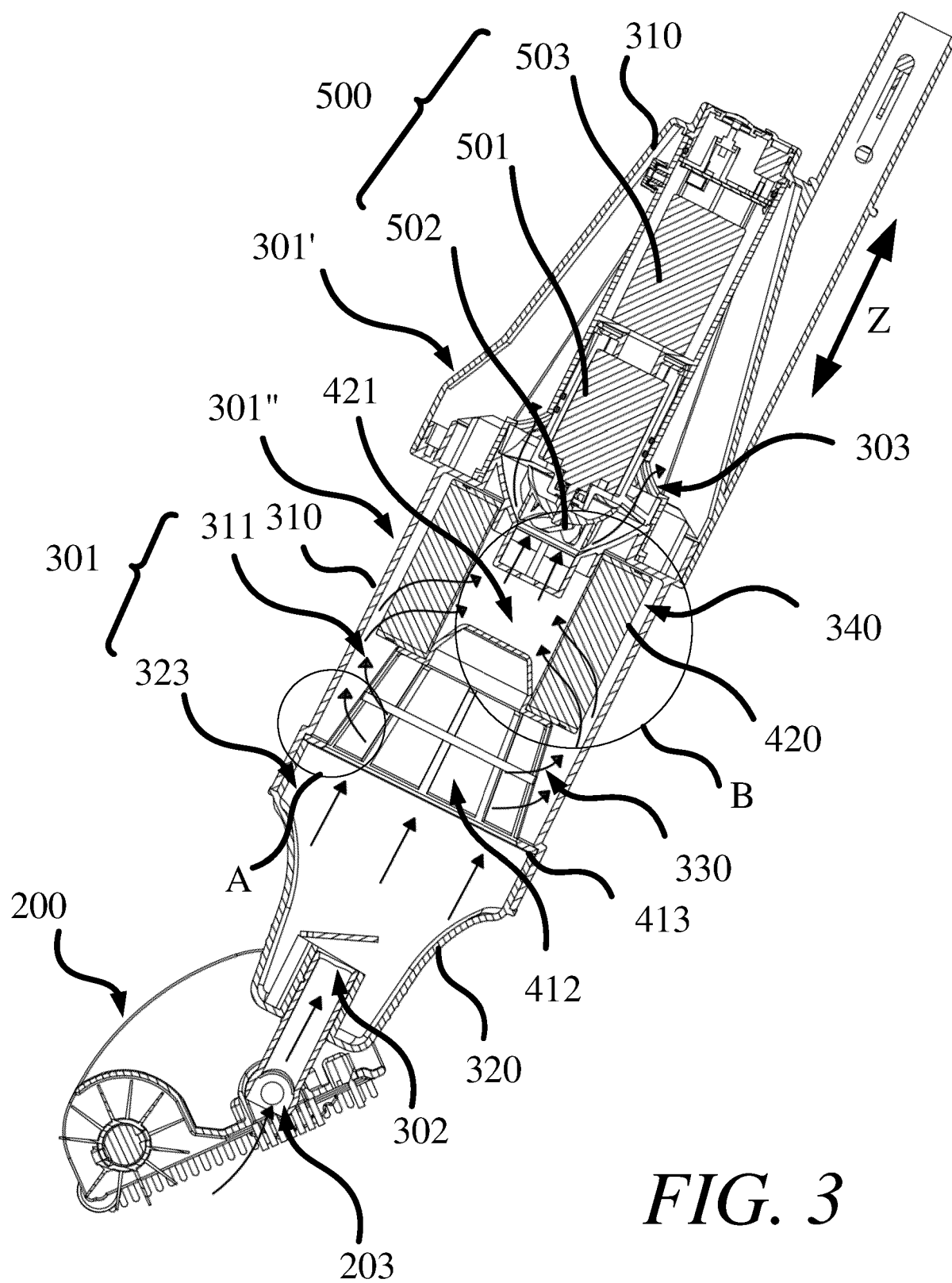
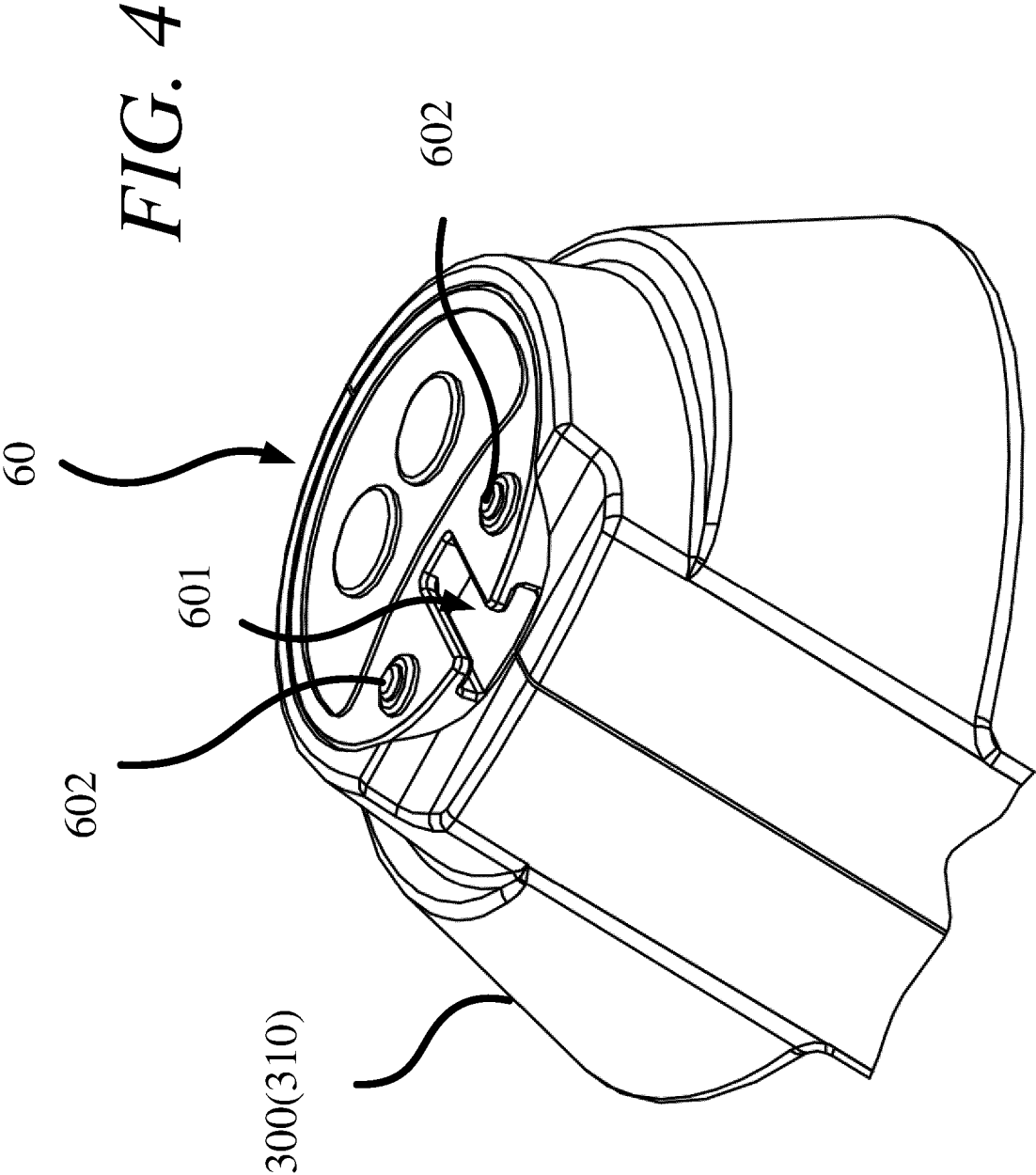


FIG. 3



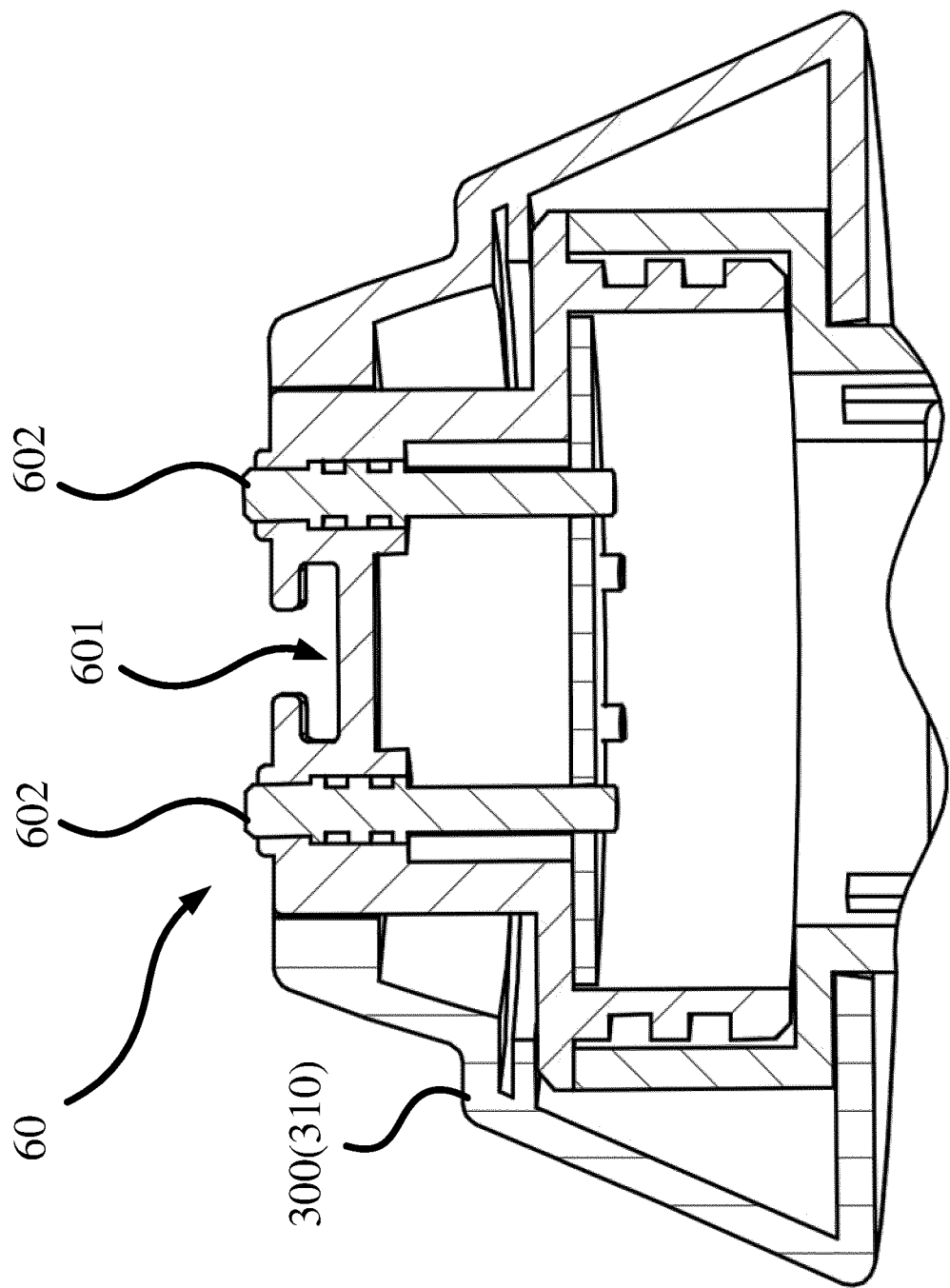


FIG. 5

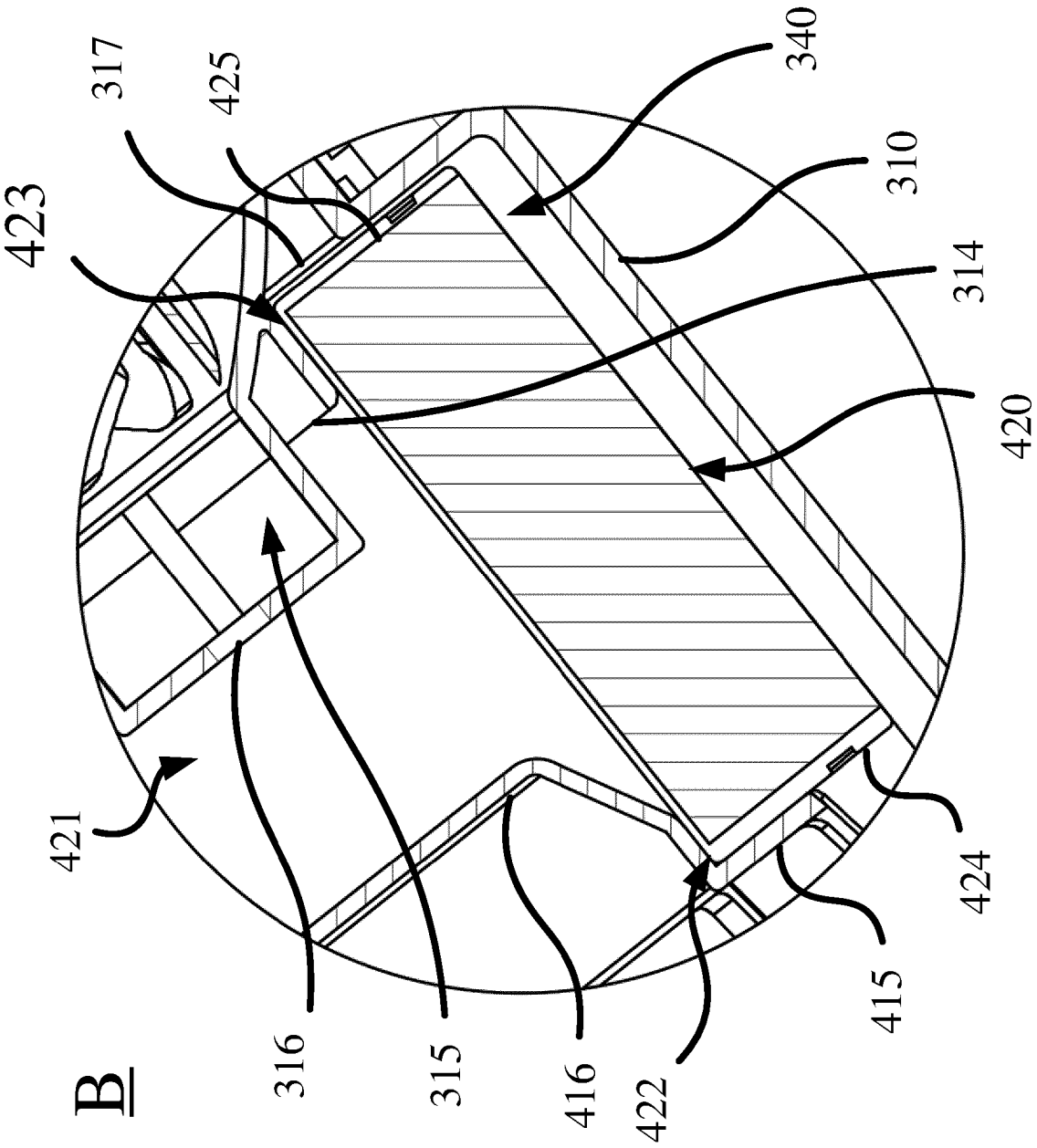


FIG. 6

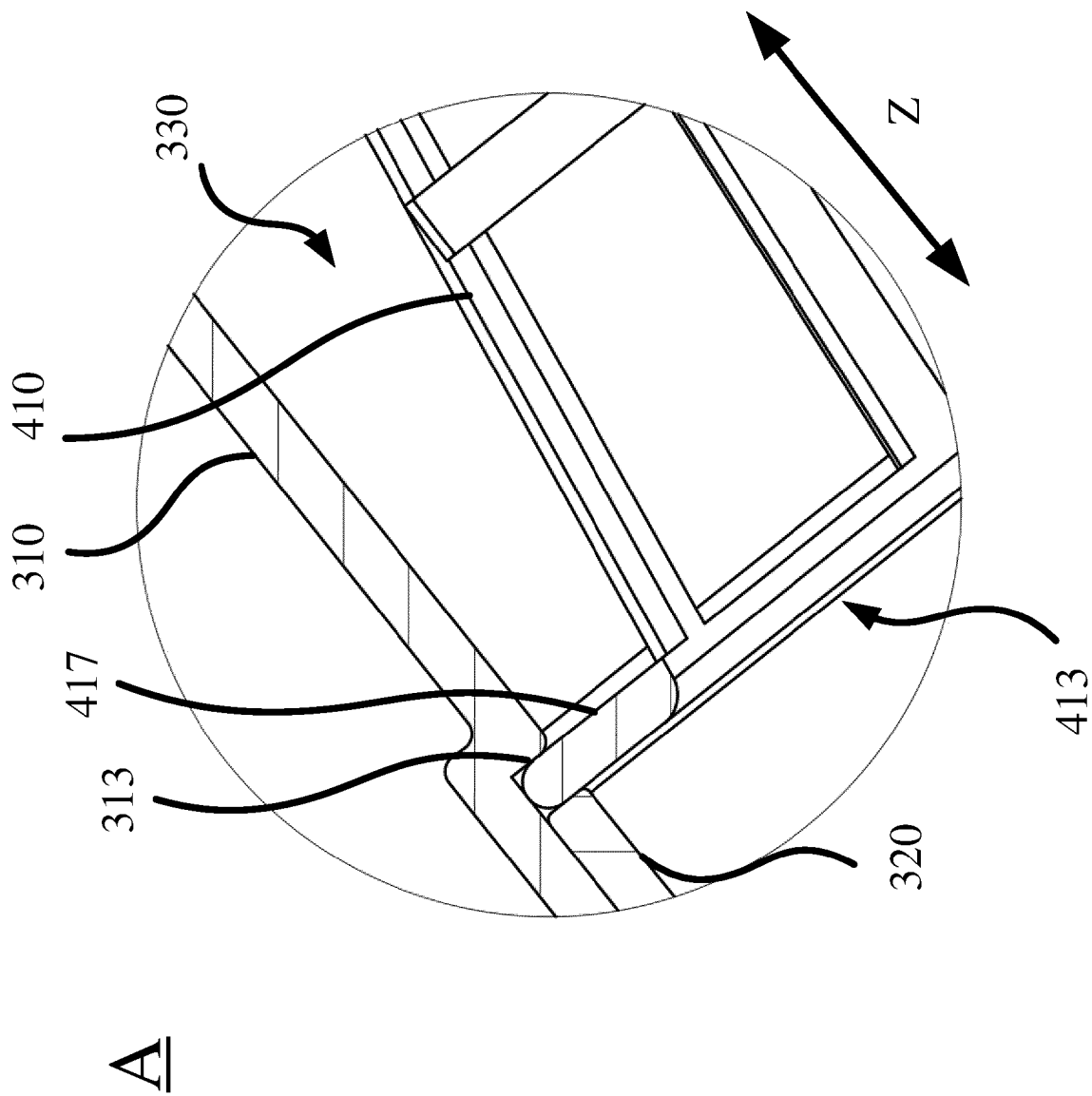


FIG. 7

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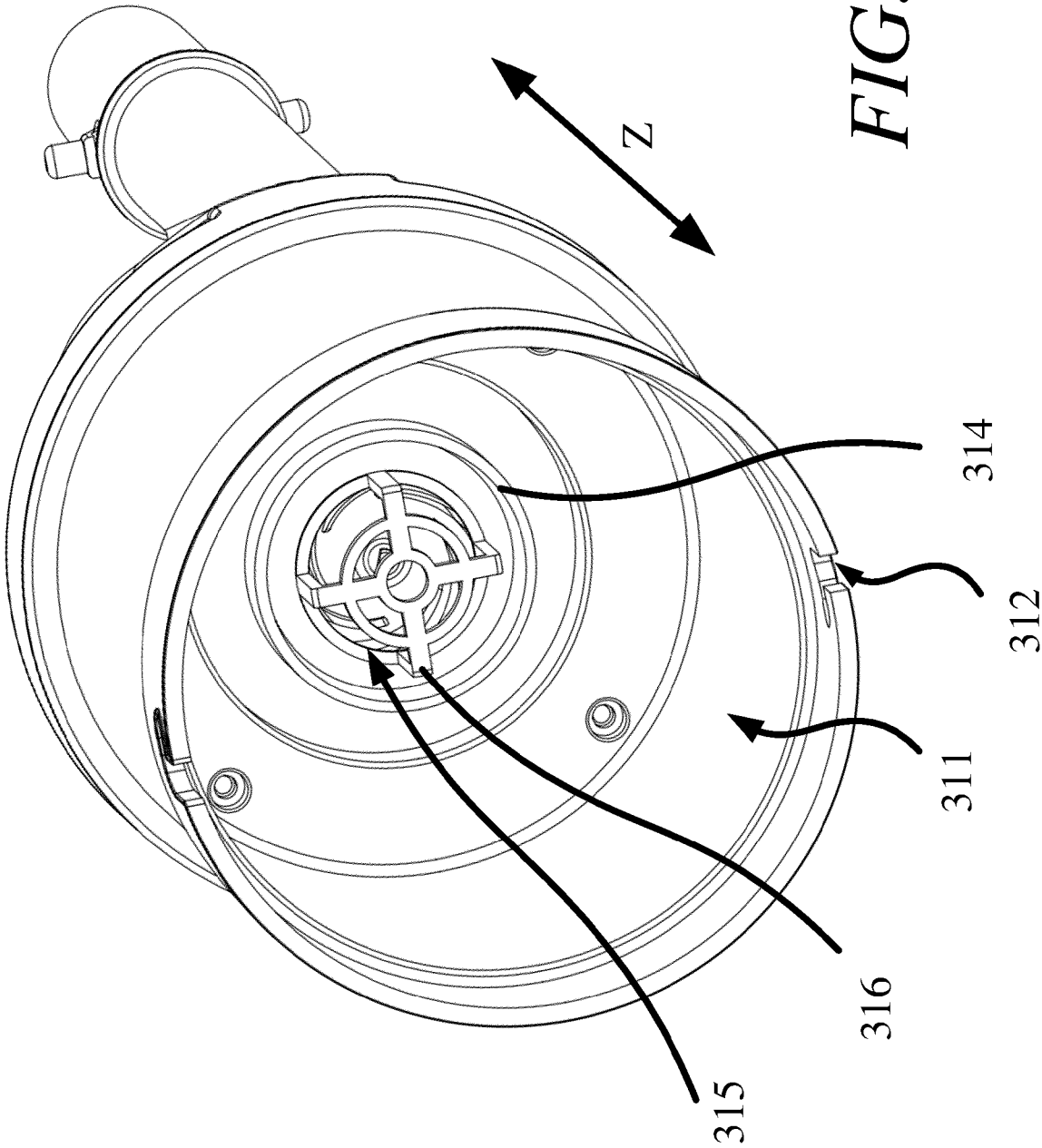
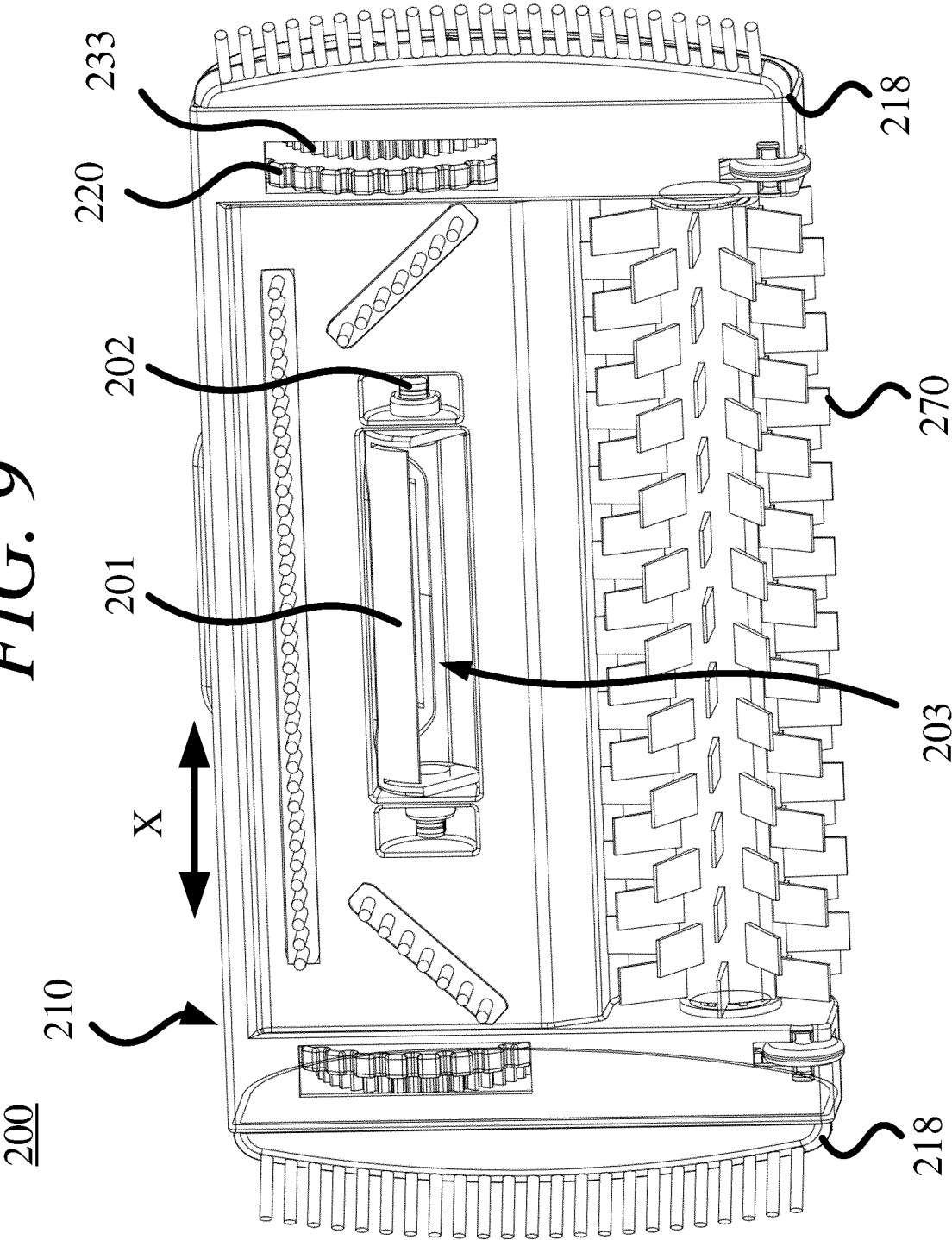


FIG. 9



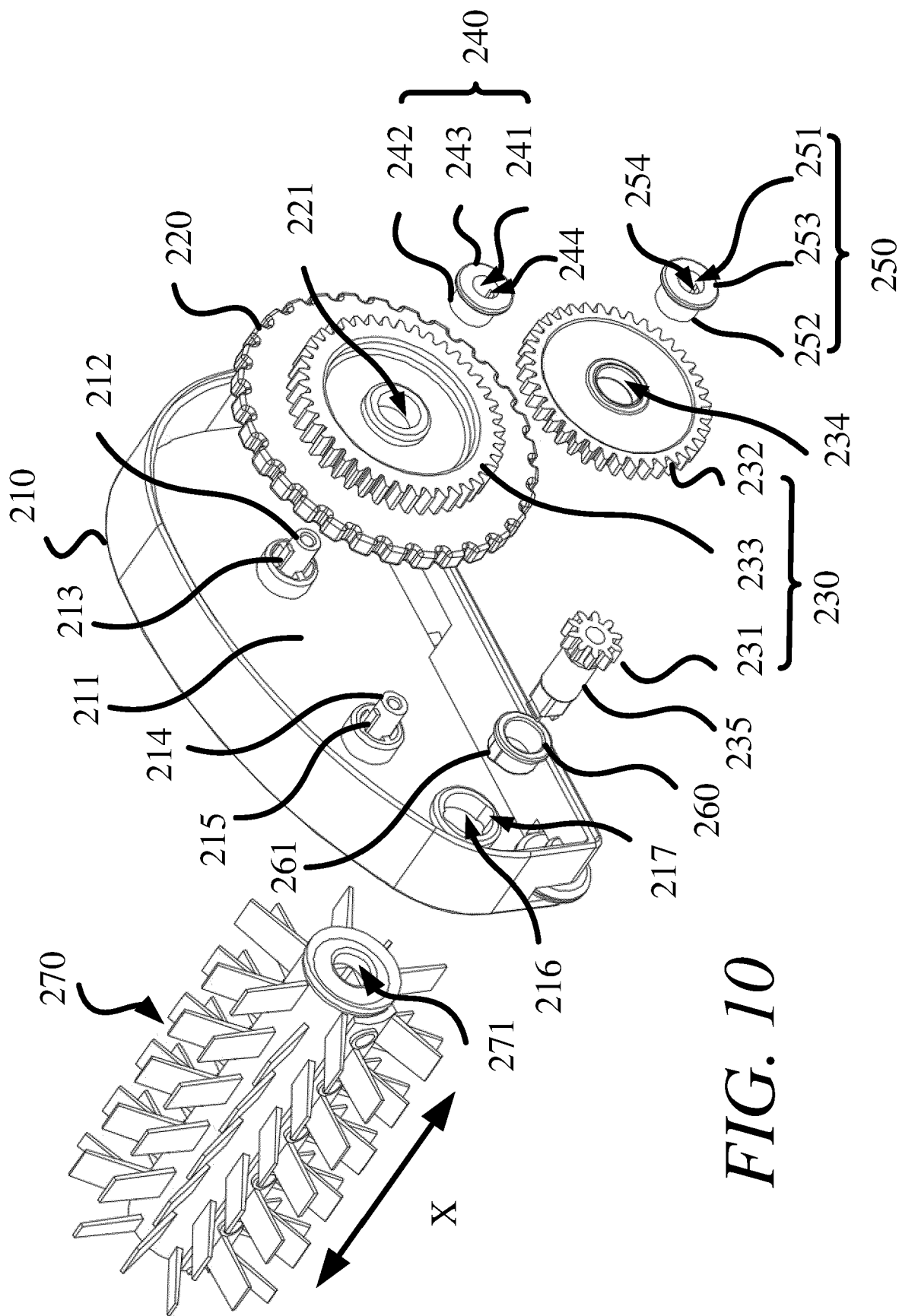


FIG. 10

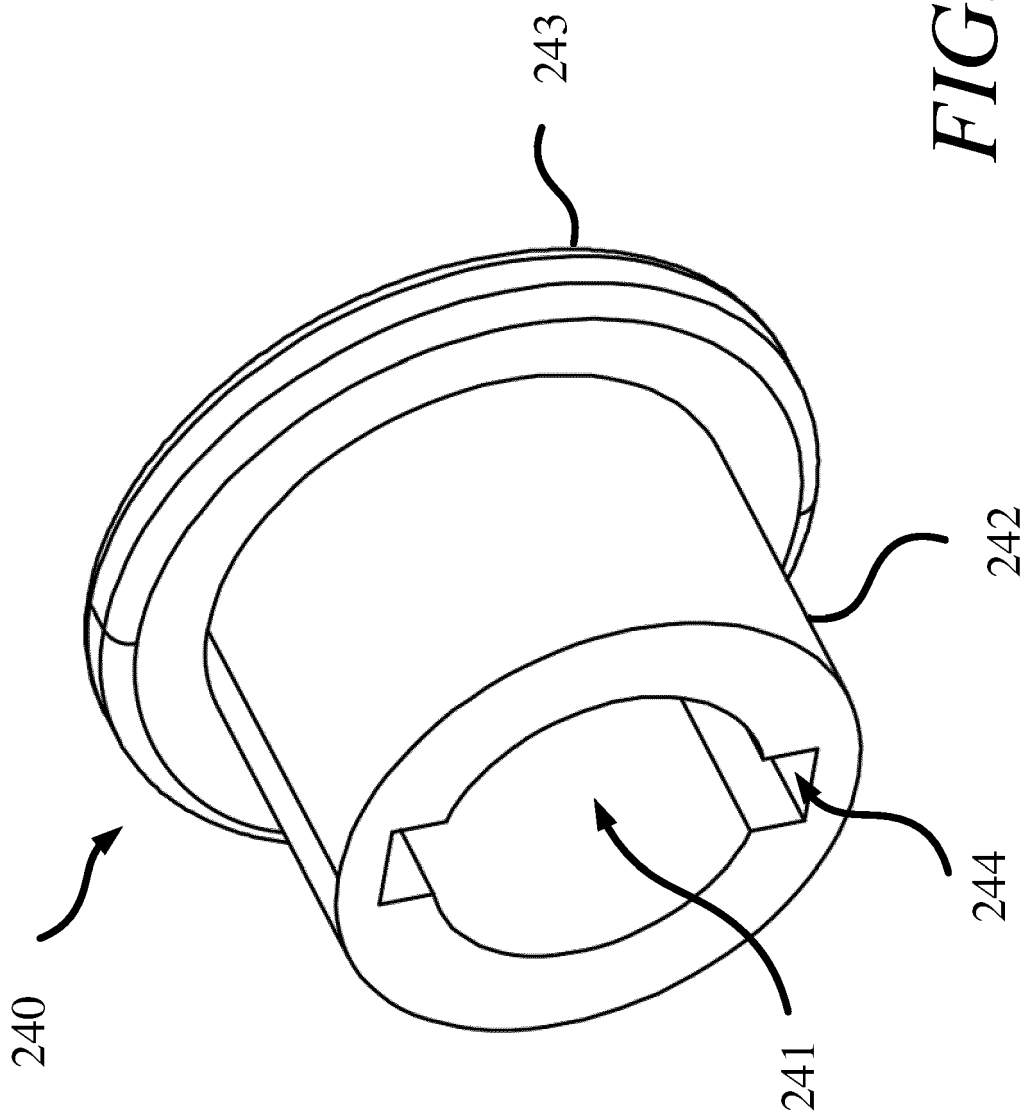


FIG. 11

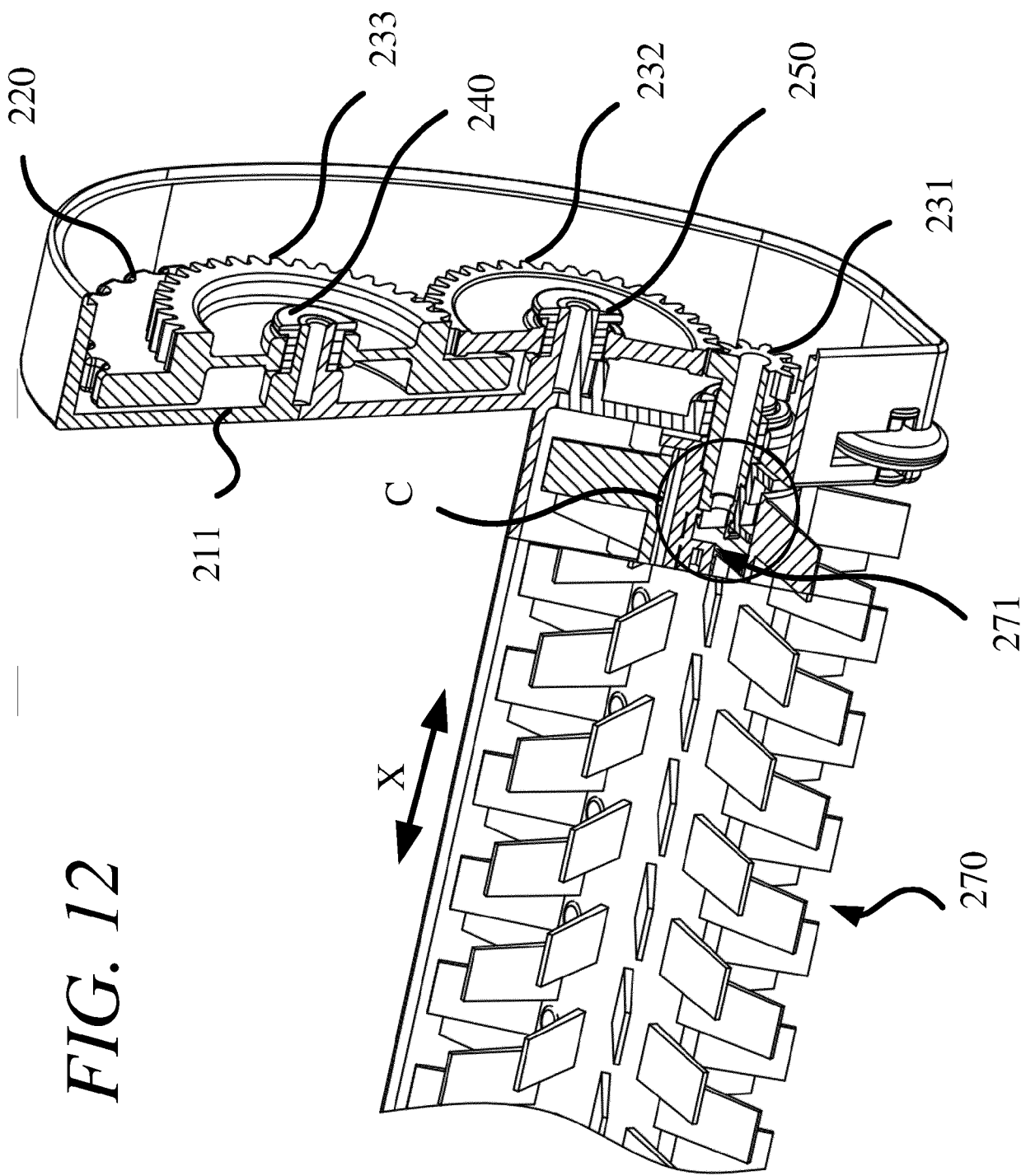


FIG. 12

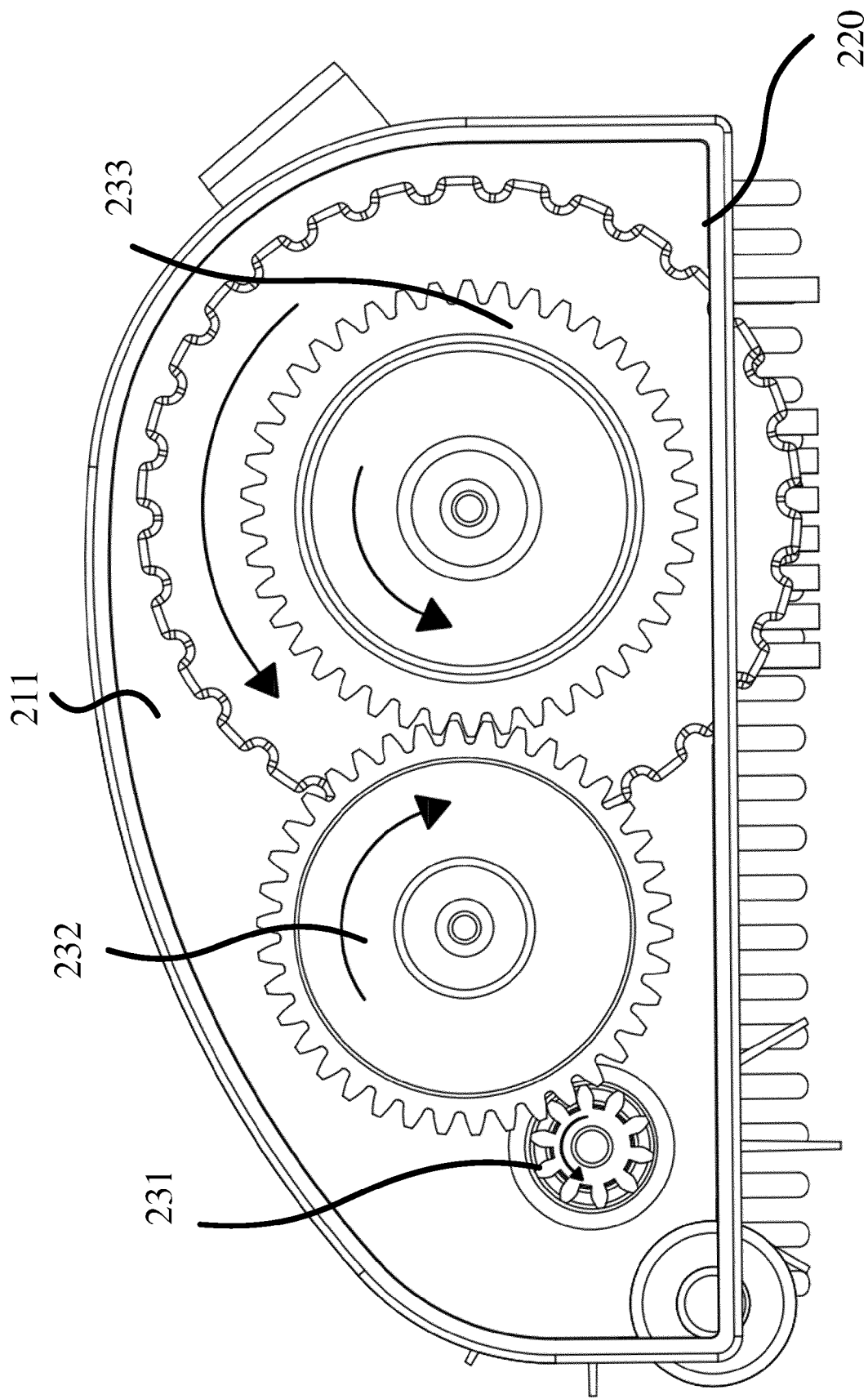


FIG. 13

