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(54) POOL CLEANING APPARATUS

(57) A submersible cleaning apparatus (101) is disclosed. The apparatus (101) comprises: a cleaner head assembly (102), having: an outer housing (104), configured to provide an internal void for housing a suction producing assembly (105); and a power source port (106), for water-tight connectivity of the suction producing assembly (105) to a power source; and a means for debris collection (103), being releasably attached to the cleaner head assembly (102) and arranged to collect debris that passes through the cleaner head assembly (102) under suction, the means for debris collection (103) being provided with a means for floatation (111) and a means for releasably attachment to the cleaner head assembly (122). The apparatus (101) obviates present issues in providing a non-collapsible debris collector and means for regulating suction pressure with a single speed motor.

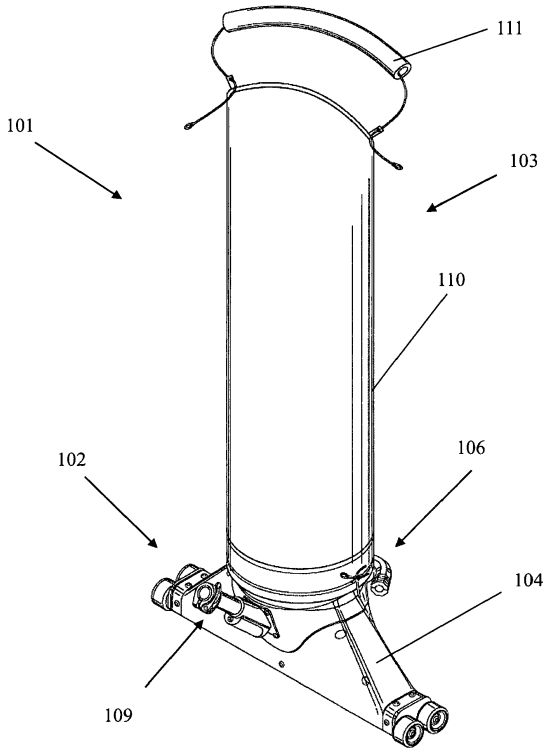

Figure 1a

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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to the field of equipment for cleaning surfaces that are beneath a body of water. More particularly, it relates to a cleaning apparatus for use in swimming pools and the like, providing both surface vacuuming and environment filtration, with improved filtration capacity and vacuum (or suction) strength regulation.

Description of the Related Art

[0002] Submersible cleaning apparatus are commonplace within the industrial and domestic pool cleaning sectors. Such cleaning apparatus can include: automatic pool cleaners (such as that of Hayward, WO2018208303); pressure pool cleaners and vacuum pool cleaners (such as that of SERVICE IND SOLUTIONS, US2018148946).

[0003] Common issues and limitations are known in the art for existing pool cleaning apparatus. Key issues which exist are: preventing any included filtration bag system from collapsing on itself; preventing any filtration bag system from being sucked back towards the motor of the vacuum head; and how to adjust / regulate the vacuum (or suction) pressure between the head of the vacuum and the surface being cleaned prior to and/or during cleaning. The common source which links the above issues is that the motor responsible for generating the vacuum (or suction) is regularly only capable of operating at one strength, thereby only providing the user with one vacuum / suction strength, which might be too strong in some environments or too weak in others.

[0004] Accordingly, it is an object of the present invention to provide a vacuum cleaning system for use in submersed environments for improved cleaning of submersed surfaces, such as the floors in swimming pools.

BRIEF SUMMARY OF THE INVENTION

[0005] According to the present invention, there is provided a submersible cleaning apparatus. Said submersible cleaning apparatus comprising: A cleaner head assembly, said cleaner head assembly comprising: an outer housing, configured to provide an internal void for housing a vacuum (or suction) producing assembly; and a power source port, for water-tight connectivity of the vacuum (or suction) producing assembly to a power source; and debris collection means, said debris collection means being releasably attached to an upper periphery of the cleaner head assembly and arranged to collect debris that passes through the cleaner head assembly under vacuum (or suction); characterised in that said debris collection means is provided with floatation means and head assembly attachment means. Through incorporation of a means of floating the debris collection means prevents the same from being sucked down toward the vacuum head when starting the equipment or during use, allowing the use of finer ppm filtration systems and obviating the issue of the collections means collapsing.

[0006] Advantageously, the debris collection means of the submersible cleaning apparatus comprises an elongate microfibre bag filter, having a proximal open end and a distal closed end. The microfibre material allows for finer filtration of collected debris and aggregates, through using different ppm filtration meshes according to the environment / cleaning requirements.

[0007] Advantageously, the microfibre bag filter is releasably attachable to the cleaner head assembly about either one of or each of two circumferential port flanges. Releasable attachment allows replacement and maintenance of the bag filter, whilst attaching to two circumferential port flanges gives greater binding to the apparatus, preventing the bag filter accidentally detaching whilst in use.

[0008] Advantageously the two circumferential port flanges are arranged about a central port and are laterally spaced apart. Arrangement allows for easier attachment of the bag filter, providing the open end over the central port. Vertical spacing of the flanges facilitates either double attachment of the bag, or for selective higher or lower attachment of the bag relative to the housing, which in turn adjust the suction power of the vacuum (or suction), which further allows for tailoring the setup relative to the cleaning environment and demands.

[0009] Preferably, the floatation means is releasably attached to the microfibre bag filter. This allows for replacement of the float, or for using larger/smaller floats relative to the micron levels and size of the bag to which they are to be attached, allowing for further tailoring of the filtration capabilities and buoyancy of the bag setup. This is further useful in salt water pools vs freshwater pools.

[0010] Advantageously, the floatation means is releasably attached to the microfibre bag filter adjacent its distal end. Locating the float towards the distal end of the bag filter increases the floats ability to lift the bag away from the vacuum head.

[0011] Advantageously, the head assembly attachment means comprises a cord and releasable fastening member, said cord passing through a peripheral channel adjacent the proximal open end of the debris collection means. The use of cord and fastener allows for infinite attachment points along the length o said cord, thereby allowing the bag to be attached to different sized housings and retrofittable as an individual item.

[0012] More advantageously, the vacuum (or suction) producing assembly is releasably housed within the outer housing and comprises interchangeable propellors. Releasable attachment of the vacuum (or suction) producing assembly allows removal for maintenance or replace-

ment.

[0013] Most advantageously, the vacuum (or suction) producing assembly is configured to facilitate the use of different sized interchangeable propellors. Use of different sized propellors allows for further alteration of the suction power of the apparatus, allowing for further regulation of filtration and cleaning capabilities relative to the requirements of the job at hand.

[0014] Preferably, the cleaner head assembly further comprises transportation means arranged about an underside of the cleaner head assembly. The transportation means separating an underside of the vacuum head from the pool surface and facilitating easier movement of the head across the pool surface.

[0015] More preferably, the cleaner head assembly is provided with means for adjusting the ride height of the assembly with respect to the surface being cleaned. For further adjustment of the suction power and facilitation further modulation of bag size and bag filtration material for finer particulates.

[0016] More preferably, the outer housing is provided with a plurality of transportation means fixing points. Allows for selective location of the transportation means relative to the shape of the cleaning head. This allows for adjustment of the cleaner dimensions, through use of smaller or larger wheels.

[0017] More preferably, the transportation means fixing points are provided within at least one of two transportation means mounting brackets. Use of mounting brackets allows the user to have pre-set wheel arrangements on different brackets and to exchange brackets and or wheels for more prompt setup between cleaning scenarios / environments.

[0018] More advantageously, the transportation means mounting brackets are releasably attached to first and second lower edges of the outer housing. This location allows the user to remove one set of wheels if cleaning steps of a pool.

[0019] Most advantageously, the transportation means fixing points are spatially arranged to provide alternate fixing points, both vertically and horizontally about an outer face of the respective mounting bracket. Further allowing adjustment of ride height and number / size of wheels, allowing further adjustment to suction and filtration capabilities.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] The invention will now be described by way of example only with reference to the accompanying drawings, which are purely schematic and not to scale, of which:

Figure 1a is a perspective view of the submersible cleaning apparatus of the present invention, idle and ready for use;

Figure 1b is a perspective view of the cleaner head of the submersible cleaning apparatus shown Figure 1a, isolated;

Figure 1c is a perspective view of the bag filter of the submersible cleaning apparatus shown in Figure 1a, isolated;

Figure 2a is a plan view of the rear of the cleaner head of the submersible cleaning apparatus shown Figure 1a;

Figure 2b a plan view from above the cleaner head of the submersible cleaning apparatus shown Figure 1 a; and

Figure 2c is an exploded view of the cleaner head of the submersible cleaning apparatus shown Figure 1a.

DETAILED DESCRIPTION OF EXAMPLE EMBODIMENTS

Figures 1a to 1c

[0021] An example of the present invention is illustrated in Figures 1a to 1c. A submersible cleaning apparatus (indicated generally at 101), comprises a cleaner head assembly (indicated generally at 102) an a debris collection assembly (indicated generally at 103).

[0022] In the example, the cleaner head assembly 102 primarily comprises: an outer vacuum / suction housing 104; a vacuum (or suction) producing assembly (indicated generally at 105); a power source port (indicated generally at 106); first and second wheel assemblies (indicated generally at 107 and 108); and a pole connection port (indicated generally at 109). The debris collection assembly 103 comprises: an elongate bag filter 110, having an open end and a closed end (remote from the first); and a bag float 111.

[0023] The vacuum housing 104 of the cleaner head assembly 102 is profiled and dimensioned so as to provide an internal void for housing the vacuum (or suction) producing assembly 105. The vacuum housing 104 is made of plastics in the present example for the primary properties of: speed and cost of manufacture; cleanliness; resistance to breakage. Other materials such as metals might reasonably be used. The vacuum (or suction) producing assembly 105 is typical of that known in the art, with the exception that said assembly may be disassembled by the user, so as to allow the user to use different sized propellors (not shown) within the housing (referenced in later figures) of the vacuum (or suction) assembly 105. The vacuum (or suction) assembly 105 is of the motor type assembly, capable of producing a vacuum (or suction) through a central bore in the cleaner head once connected to a power supply by way of the power source port 106.

[0024] Accordingly, the vacuum (or suction) assembly 105 is designed to provide a vacuum (or suction) to remove debris from the surface of a pool floor and project said debris through the central bore to be collected in the debris collection assembly 103. It will be understood that the vacuum (or suction) assembly has conventional func-

tion, with a motor, propellors or blades, and a means for mounting the vacuum (or suction) assembly to an interior surface of the vacuum housing 104 within the internal void of said housing. As will be discussed in greater depth with reference to Figures 2a to 2c, the motor housing is provided with a power inlet port and a stabilising bracket and a mounting bracket.

[0025] The elongate bag filter 110 of the debris collection assembly 103 comprises a micro fibre mesh bag filter. Various sizes and grades of bag filter may be provided, so as to give the user the ability to tailor the finer degree of filtration of the bag system (the pore size of the mesh) and the size required of the filter (smaller pools and / or less soiled pools will not require a larger bag). Furthermore, through use of finer or coarser filtration bags gives the user the ability to modulate the suction of the vacuum system (with finer filters leading to stronger vacuums/ suctions power and coarser filters leading to weaker vacuums / suction power). This gives the ability to increase or decrease the cleaning power of the system, relative to whether it is primarily intended to remove large debris such as leaves, or finer debris such as mud or silt.

[0026] The elongate bag filter 110 is provided with a means for releasably attaching said bag 110 to the vacuum head (indicated generally at 122). In this regard, the bag filter 110 is provided with a peripheral channel 112 running about its circumference at the open end. This channel has two openings (113, 114) adjacent one another on an external surface of the bag filter 110. A cord or length of rope 115 is passed through this channel 112, leaving first and second remote ends (116, 117) of said cord / rope hanging from the respective first and second openings (113, 114) of the channel. The cord / rope 115 is provided with a releasable fastening member 118 (such as a toggle), which is passed over the first and second remote ends 116, 117 of the cord / rope 115, allowing the user to manually narrow the opening of the bag filter by adjusting the position of the togger (which has a manually depressible releasing member for positioning said toggle about the length of rope / cord). The user can thus releasably attach the bag filter 110 to the vacuum head 102 by passing the open end of said bag 110 over the central bore of the vacuum head 102 and tightening the opening of the bag 110 to said bore by way of the cord 115 and fastener 118.

[0027] Regarding the fastening of the bag filter 110, the central bore or central port of the vacuum head (indicated generally at 119) is provided with two circumferential port flanges (120, 121) about its outer body. These circumferential flanges 120, 121 extend the entire diameter of the outer body of the central bore 119 and are laterally (or vertically) spaced apart. The user may therefore select which flange 120, 121 to releasably attach the bag filter 110 over, giving the choice of a higher or lower mounting position of the bag 110 relative to the body of the vacuum head 102. This gives further modulation of the vacuum / suction strength exerted by the apparatus 101 for further adjustment of the cleaning properties of the apparatus 101 relative to the demands of the job at hand. Moreover, should the user need to, they can attach the bag by way of both flanges, providing a back-up attachment system to the bag filter should one fail. In this case, either a bag with two channels, cords and toggles could be used (with the second channel, cord & toggle assembly provided at a pint intermittent the first end and the second end of the bag filter 110), or the user can attach a second corded system external to the bag 110 (such additional cord and toggle systems might reasonably be provided as a kit of parts).

[0028] To obviate the issue of the bag filter 110 collapsing on itself during start up, or indeed, from collapsing under the strength of the vacuum / suction passing through the system, the bag filter 110 is provided with the bag float 111. The bag float 111 comprises any buoyant material (such as cork or foam) and is releasably attached to the bag filer 110 at its distal (closed) end. The releasable attachment in the present case is a cord system. In particular, the bag float 111 comprises a cylindrical foam with central channel. The cylindrical foam has a length of cord/rope 125 pass through it, and is tied to securing tabs (123, 124) situated at the upper corners of the bag filter 110, adjacent its distal (closed) end. Said securing tabs 122, 124 are sewn to the bag filter 110 and have apertures for receiving the cord/cable which passes through the cylindrical foam float 111. Other systems might reasonably - be used, such as hook and loop fasteners.

Figures 2a to 2c

[0029] The submersible cleaning apparatus 101 previously identified in Figures 1a to 1c is shown in a plan and exploded views in figures 2a to 2c, for better representation and disclosure of internal components.

[0030] The motor 201 is provided with: a power inlet port 202; a stabilising bracket (not shown); and a mounting bracket 203. The stabilising bracket provides a framework for supporting the motor housing 201 within the void of the vacuum housing 104. The power inlet port 202 is slotted through

[0031] The motor 201 may be powered by an external power source (in particular, a battery). In this regard, the power inlet port 202 passes through an aperture 209 in the vacuum housing 104 and is connected to a power supply assembly 204 which is in turn provided with a quick release system 205 for connection to a waterproof power cable (which in turn is connected to a power supply, such as a battery, above ground and away from water). Each of these connections are completely watertight. Accordingly, power is supplied through the body of the vacuum head 104 in a water-tight manner so as to power the vacuum / suction motor 201.

[0032] The motor 201 is further fixed in place by way of its mounting bracket 203. Said mounting bracket 203 is disposed at an upper end of the motor 201 and is reliably fixed to the inner body of the vacuum housing 104

by way of a mounting plate and screws (206, 207). Furthermore, the mounting plate 206 is arranged so as to also facilitate attachment of a handle attachment port 208, thereby allowing the user to attach any reasonable sized handle / telescopic handle to the vacuum head 102 by way of the handle attachment port 208.

[0033] With regards to the first and second wheel assemblies (107, 108), said assemblies each comprise: a pair of wheels (210, 211 and 212, 213 respectively) and first and second wheel mounting brackets (214, 215 respectively). Each of the wheel mounting brackets 214, 215 are provided with a plurality of fixing points for attachment of the respective wheels. In this regard, the user may choose whether: to attach single or multiple wheels each side or both sides, as well as whether to locate the wheels centrally, or further up or down the respective brackets. Through having multiple attachment points (spaced both horizontally and vertically), the user is able to vary: the size of wheels that are attached; the number of wheels that are attached; and the location of the wheels that are attached relative to the bracket 214, 215. In doing this, the user is able to adjust the ride-height of the vacuum head 102 relative to the surface being cleaned, which again modulates the strength of the vacuum / suction and the finer or coarser nature of filtration / cleaning provided. Moreover, the user can remove one bracket entirely and / or wheels from one bracket to give a single wheeled variant for step cleaning. Even further, the user can have multiple brackets pre-set, so that the user can inter-change said brackets for quicker and easier setup relative to the cleaning task / environment at hand, giving further refinement and speed of transition.

Claims

1. A submersible cleaning apparatus (101) comprising:

a cleaner head assembly (102), said cleaner head assembly (102) comprising: an outer housing (104), configured to provide an internal void for housing a suction producing assembly (105); and a power source port (106), for water-tight connectivity of the suction producing assembly (105) to a power source; and
debris collection means (103), said debris collection means (103) being releasably attached to an upper (in use) periphery of the cleaner head assembly (102) by way of head assembly attachment means (122) and arranged to collect debris that passes through the cleaner head assembly (102) under suction;
characterised in that
said debris collection means (103) is provided with floatation means (111).

2. The submersible cleaning apparatus (101) of claim 1, wherein the debris collection means (103) comprises an elongate microfibre bag filter (110), having a proximal open end and a distal closed end.

3. The submersible cleaning apparatus (101) of claim 2, wherein the microfibre bag filter (110) is releasably attachable to the cleaner head assembly (102) about either one of, or each of two circumferential port flanges (120, 121).

4. The submersible cleaning apparatus (101) of claim 3, wherein the two circumferential port flanges (120, 121) are arranged about a central port (119) and are laterally spaced apart.

5. The submersible cleaning apparatus (101) as claimed in any of claims 2 to 4, wherein the floatation means (111) is releasably attached to the microfibre bag filter (110).

6. The submersible cleaning apparatus (101) as claimed in any of claims 2 to 4, wherein the floatation means (111) is releasably attached to the micro fibre bag filter (110) adjacent its distal end.

7. The submersible cleaning apparatus (101) as claimed in any preceding claim, wherein the head assembly attachment means (122) comprises a cord (115) and releasable fastening member (118), said cord (115) passing through a peripheral channel (112) adjacent the proximal open end of the debris collection means (103).

8. The submersible cleaning apparatus (101) as claimed in any preceding claim, wherein the suction producing assembly (105) is releasably housed within the outer housing (104) and is provided with interchangeable propellors.

9. The submersible cleaning apparatus (101) as claimed in any preceding claim, wherein the suction producing assembly (105) is configured to facilitate the use of different sized interchangeable propellors.

10. The submersible cleaning apparatus (101) as claimed in any preceding claim, the cleaner head assembly (102) further comprising transportation means (107, 108) arranged about an underside of the cleaner head assembly (102).

11. The submersible cleaning apparatus (101) as claimed in claim 10, wherein the cleaner head assembly (102) is provided with means for adjusting the ride height of the assembly (102) with respect to the surface being cleaned.

12. The submersible cleaning apparatus (101) of claim 11, wherein the outer housing (104) is provided with a plurality of transportation means fixing points

(216,217).

13. The submersible cleaning apparatus (101) of claim 12, wherein the transportation means fixing points (216, 217) are provided within each of two transportation means mounting brackets (214, 215).

14. The submersible cleaning apparatus (101) of claim 13, wherein the transportation means mounting brackets (214, 215) are releasably attached to first and second lower edges of the outer housing (104).

15. The submersible cleaning apparatus (101) of any of claims 12 to 14, wherein the transportation means fixing points (216, 217) are spatially arranged to provide alternate fixing points, both vertically and horizontally about an outer face of the respective mounting bracket (214, 215).

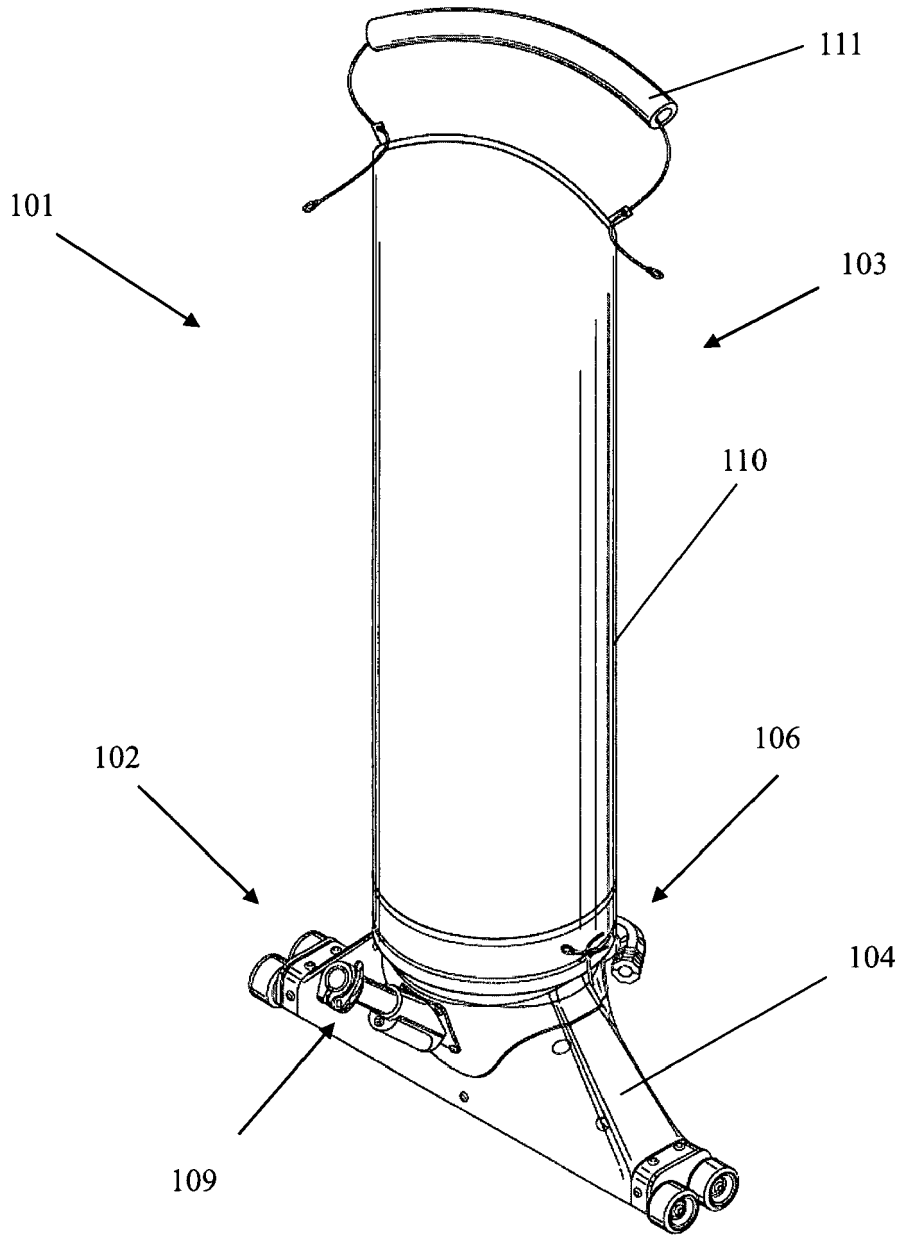

Figure 1a

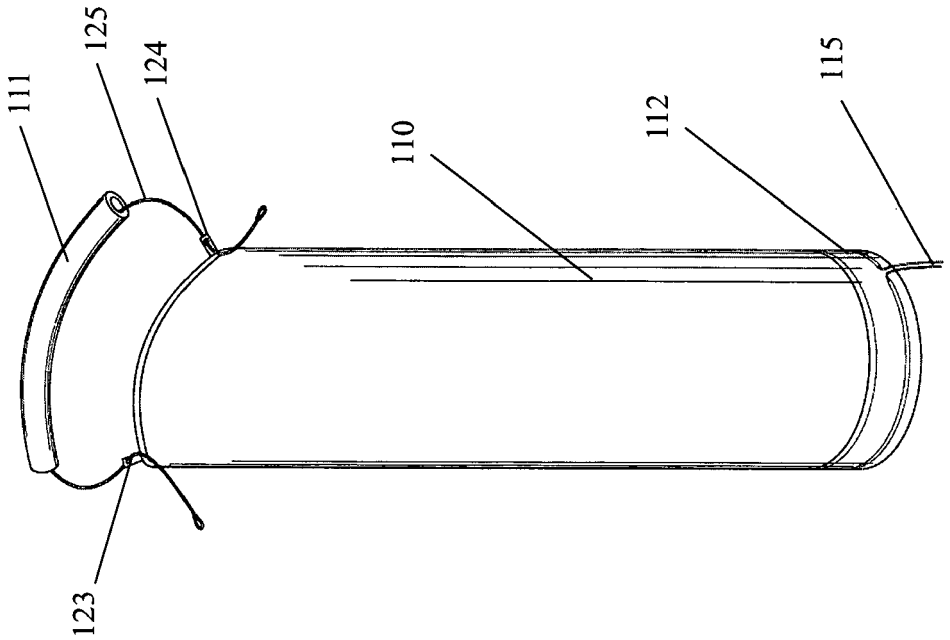

Figure 1c

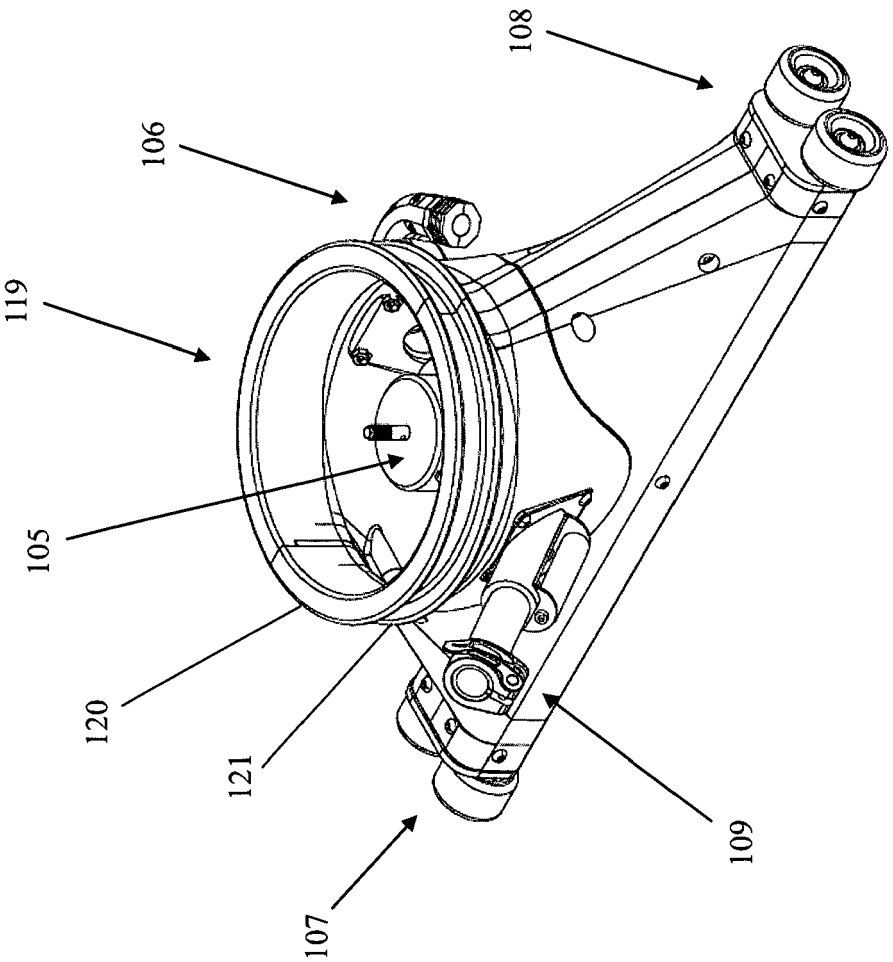

Figure 1b

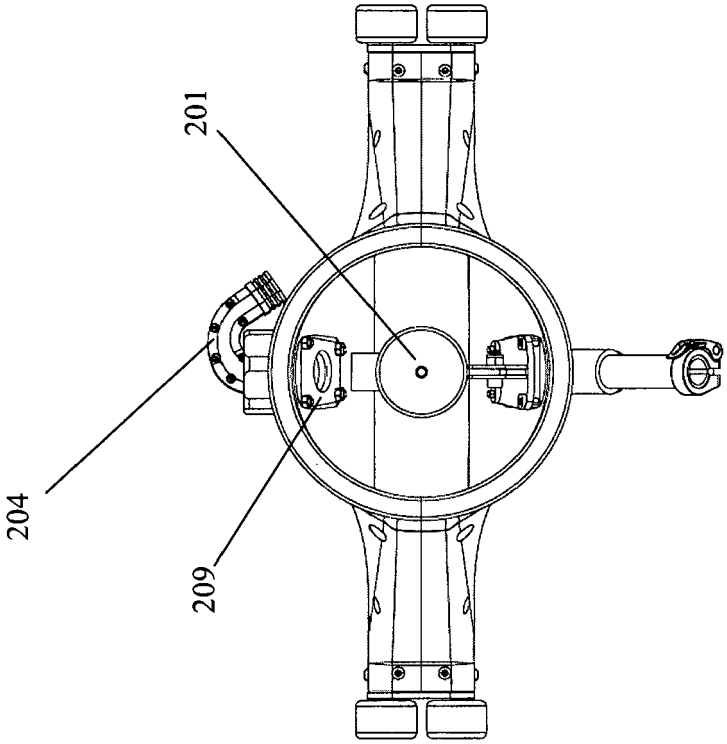

Figure 2b

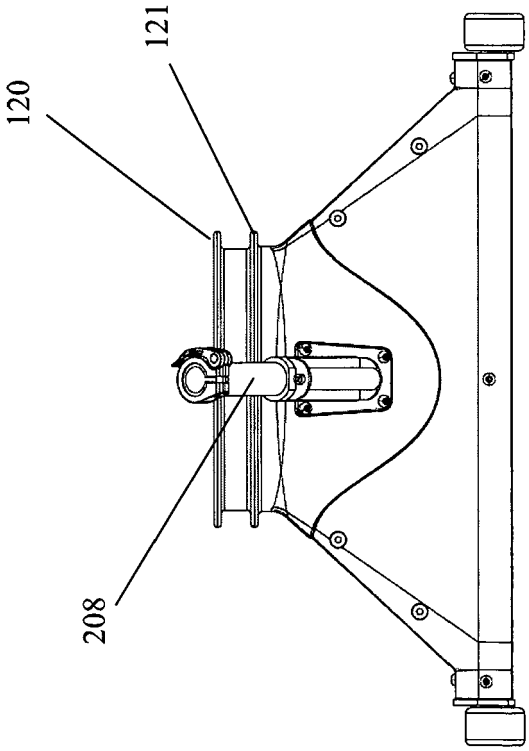

Figure 2a

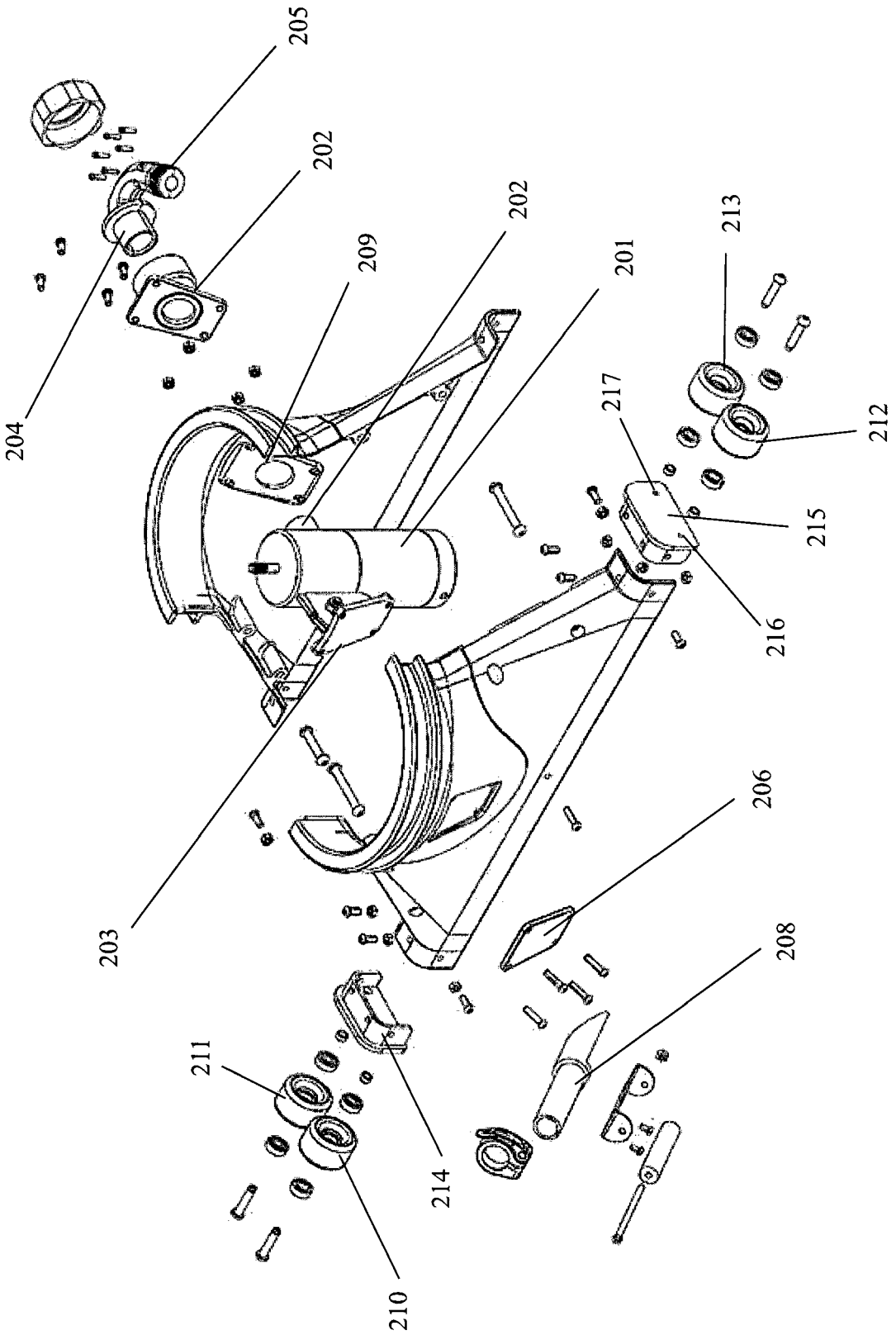
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Figure 2c

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EUROPEAN SEARCH REPORT

Application Number
EP 20 00 0465

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y A	US 2020/080331 A1 (DUFILHO MICHAEL TODD [US] ET AL) 12 March 2020 (2020-03-12) * figures 1-4 * -----	1-3,5,6, 9-15 1-6,8-15 7	INV. E04H4/16
X	US 6 942 790 B1 (DOLTON EDWARD [US]) 13 September 2005 (2005-09-13) * figures 1-4 * -----	1,8-10	
Y A	WO 2020/072200 A1 (WATER TECH LLC [US]) 9 April 2020 (2020-04-09) * figures 1-16 * -----	1-6,8-15 7	

TECHNICAL FIELDS SEARCHED (IPC)

E04H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	6 May 2021	Decker, Robert

CATEGORY OF CITED DOCUMENTS

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2020080331 A1	12-03-2020	NONE	
US 6942790 B1	13-09-2005	NONE	
WO 2020072200 A1	09-04-2020	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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