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(54) **Automatic cleaner for swimming pools**

(57) Automatic cleaner for swimming pools comprising a body (1) driven by motor-driven wheels (2) arranged for displacement, according to preset work cycles, along the bottom, up onto the vertical walls and on the surface

of a swimming pool to aspirate debris and dirt via an aspirator (5) provided with a collecting filter (8), wherein the body (1) is kept in contact with the swimming pool's walls by a thrust exerted by two turbines (3, 4) disposed, along the longitudinal axis, on the back side of body (1).

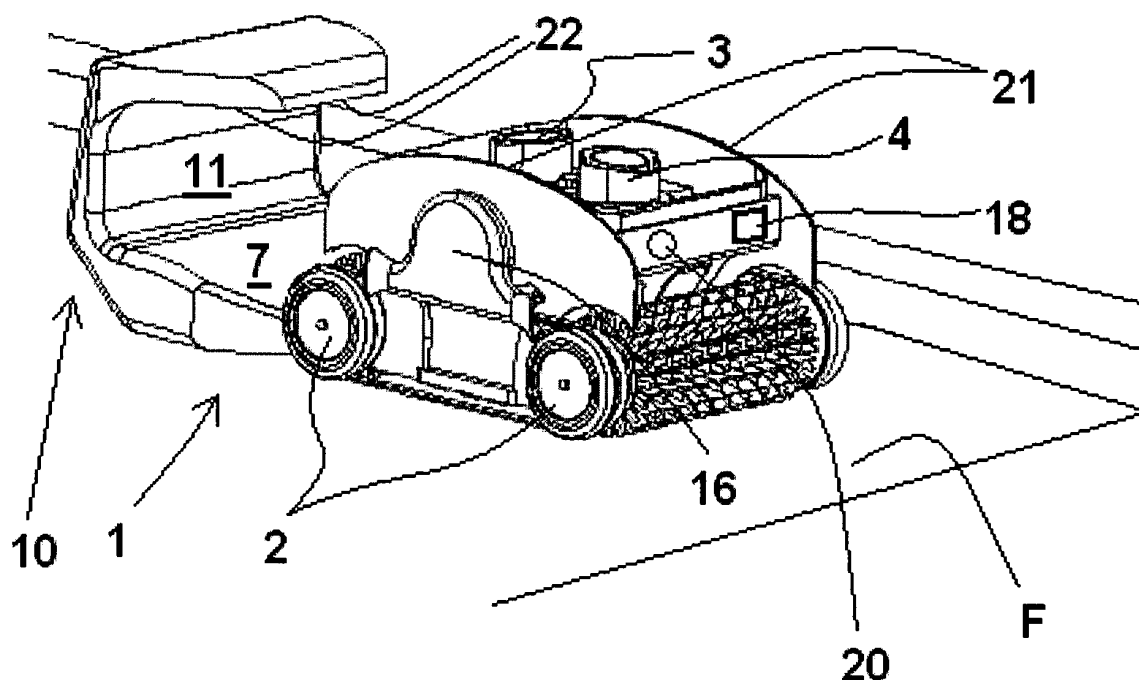


Fig.1

Description

[0001] The present invention relates to a automatic, self-propelling apparatus, or cleaning robot, for cleaning swimming pools.

[0002] At present cleaning devices of self-propelling type are known which, after being immersed into a swimming pool, are able to move on the bottom and on the walls of the latter to carry out the cleaning thereof by means of brushes and a debris-aspirating circuit.

[0003] These devices require the intervention of an operator to perform the complete working cycle and especially for cleaning the filters and/or removing the device from the swimming pool upon completion of the work.

[0004] Consequently, these known devices exhibit some drawbacks inasmuch as they need a relatively complex maintenance and manual interventions by the user.

[0005] A first object of the present invention is to propose a automatic cleaner for swimming pool which does not need any service operated by the user at the end of each work cycle.

[0006] A second object of the invention is to propose a automatic cleaner able to move onto the vertical walls of the swimming pools in an effective and safe manner to carry out the cleaning thereof.

[0007] A further object is to make it possible to clean, in addition to the walls and bottom of the swimming pool, also the surface of the water.

[0008] The above stated technical task and specified objects are substantially obtained by means of a automatic cleaner for swimming pools whose technical characteristics are set out in one or more of the appended claims.

[0009] Further characteristics and advantages of the present invention will appear more clearly from a reading of the indicative and, therefore, non-limitative description of a preferred but non-exclusive embodiment of a automatic cleaner, as illustrated in the accompanying drawings, wherein:

- Fig. 1 shows the apparatus according to the invention upon the return of same apparatus to its housing base for the automatic recharge and cleaning of the filter;
- Fig. 2 is a perspective view of the automatic cleaner according to the present invention showing separately enlarged details for the sake of clarity;
- Fig. 3 is a side view of the automatic cleaner according to the invention; and
- Fig. 4 is a top view of the cleaner of Fig. 3.

[0010] With reference to the attached figures, an automatic cleaner according to the invention substantially comprises:

- an external body or case 1 with longitudinal axis "a";
- a plurality of driving wheels 2 with transverse axis in

the direction "b" which are provided with at least an electrically powered motor 15 and having preferably an abrasive or brush-like surface S;

- at least two independent thrust turbines 3, 4 able to balance the thrusts on the machine's axis and disposed along the longitudinal axis "a" on the back side of body 1;
- one or more suction mouths disposed below the body 1 and able to convey the debris and dirt drawn by the fans of turbines 3, 4 into a collecting filter 8. In a preferred embodiment, the mouth 5 exhibits a shutter door 23 to prevent the outward reflux of the filtered water;
- control electronics interfaced with the turbines 3, 4, with the motor 15 and with possible sensors, to carry out a stored, automatic work cycle;
- one or more position sensors 18 to detect the inclination of the cleaner with respect to the vertical plane and ascertain whether the cleaning is carried out either on the bottom or on a vertical wall;
- one or more floating sensors 20 to sense the water level and disposed preferably in correspondence of the two sides 6 of body 1;
- one pair of vanes 16 located laterally and individually operable for the removal of dirt on the water surface in a given direction of movement.

[0011] With reference to Fig. 1 a cleaner 1 according to the present invention is further provided with a base 10 for the automatic return of same cleaner, which base is applicable on the surface of the swimming pool or externally thereof by means of a suitable chute.

[0012] The base 10 is provided with a power outlet, preferably at low voltage, for a plug of preferably inductive and/or capacitive type to be automatically inserted therein for powering the cleaner.

[0013] In use, the displacement of the cleaner is obtained through the motion of a pulley 14 which, via a timing belt 13, transfers the motion from a motor 15 to the wheels 2 of the apparatus.

[0014] Such technical solution allows the turbines 3, 4 to push the cleaner onto the bottom of the swimming pool against the vertical walls to be cleaned, while the actuation of the wheels 2 determines the trajectory followed by the cleaner onto the work surface.

[0015] A suitable sensor, for example an impact sensor (not shown) solid to the body 1, sends a signal to the electronics when the cleaner strikes an obstacle in front thereof; this occurs normally when the cleaner is on the bottom of the swimming pool and encounters a vertical wall as it moves on.

[0016] When reaching a vertical wall, the cleaner can start climbing the wall by deactivating or reversing the thrust action exerted from the first turbine 3 disposed in the front region of the apparatus.

[0017] The front wheels 2 then start climbing the vertical wall, while the rear wheels continue to push the machine as they are pressed onto the bottom by the action

of the second turbine 4 located at the back, until the cleaner reaches the vertical position.

[0018] At this point, the turbines 3, 4 are operated both in a thrust-mode again, to allow the cleaner to remain adherent to, and move along the wall.

[0019] The position of the apparatus, horizontal if on the bottom, or vertical if on the wall, is signalled to the control electronics by the position sensor 18, the latter being possibly of inertial type.

[0020] Upon completion of its work cycle, the cleaner starts the procedure for returning to the recharge base 10.

[0021] The cleaner then moves up to the surface level detected by the position sensor 18.

[0022] The cleaner maintains, while on the surface, a stable position by means of a floating sensor 20 which allows the vanes 16 to come into operation for maintaining a suitable distribution of the weights during the displacement on the surface.

[0023] Consequently, the control electronics activates the suitable vanes 16 located laterally of body 1, the action of vanes allowing the movement of the cleaner on the surface until it reaches the wall to move along the latter in a preset direction, for example in clockwise direction, by cleaning the critical region which corresponds to the line of water surface.

[0024] The automatic cleaning apparatus according to the invention differs from the traditional models for its fully autonomous operation, as it is able to automatically return to the base 10 disposed in the swimming pool, or on the outside thereof (Fig. 1) in combination with a suitable guide chute 7, in which base the recharge of the battery and the cleaning of the filter 8 are performed.

[0025] Moreover, advantageously, during the movement on the surface, the vanes 16 convey the dirt, for example floating leaves, through the vanes into the collecting filter 8, thereby cleaning the water surface.

[0026] Along its return path, the cleaner comes sooner or later across the recharge base 10, the latter being housed in a seat 11 horizontally disposed and anchored at the wall of the swimming pool by a mechanism allowing it to remain aligned with the water level all the time.

[0027] The base is opened at least on the side of the incoming cleaner (in the illustrated case being the left side) which automatically moves into it and exits therefrom according to a programmed work cycle.

[0028] According to the invention, the apparatus is provided with a plug which fits automatically into an outlet of the base for the electric power supply.

[0029] Advantageously, the recharge may take place by using electrical connections 21 formed directly on the back side of body 1.

[0030] In particular, when the cleaner returns to the base 10, the above connections 21 come in contact with respective connections 22 formed inside the same base 10 and which are in turn connected to the supply outlet.

[0031] The power is preferably supplied by a plug/outlet coupling of inductive type of low voltage (e.g., 12 - 24 V) to avoid any possible contact between metal parts and

electric lines in the presence of water.

[0032] Once in the base 10, the cleaner starts recharging the battery and carries out the automatic cleaning of the filter 8.

[0033] Preferably, the cleaning of filter 8 takes place with a reversal of the thrust direction of turbines 3, 4 which carry out a counter-washing of the filter 8 by discharging the filtrate into a disposal container.

[0034] The turbines 3, 4 may be mounted as in Fig. 3, that is, with the blades in correspondence of the top side of the cleaning apparatus, or overturned with respect to the configuration of Fig. 3 in order to attain a more convenient point of suction height for the upward thrust during the surfacing movement, as well as to activate a water flow during the stage of counter-washing of filter 8.

[0035] Moreover, the base 10 is such constructed as to collect the dirt in a deposit easily accessible from the outside of the swimming pool.

[0036] When the battery of the cleaner is fully charged and the preset working time starts, the cleaner exits automatically out of base 10 to start a fresh work cycle.

[0037] It should be clear from the aforementioned that the present cleaner is advantageous over the traditional cleaners which require the intervention of the user both at the start (the cleaner has to be immersed in the water) and at the end (the cleaner has to be pulled out) of the cleaning cycle, and the manual cleaning of the filter.

[0038] The cleaner according to the present invention solve these problems by means of a mechanism allowing automatic procedures, by causing the cleaner to go back to the recharge base 10 upon completion of the work cycle.

Claims

1. Automatic cleaner for swimming pools comprising:

- a body provided with motor-driven wheels arranged for displacement on a travel plane (F);
- at least a suction mouth (5) disposed in correspondence of a lower surface of the body (1);
- at least an exit mouth (19);
- at least two control-operated turbines (3, 4) for activation thereof between said suction mouth (5) and said exit mouth (19);
- a collecting filter (8) located between said suction mouth (5) and said exit mouth (19);
- a control-operable motorization for driving the wheels (2);
- at least a battery for electrically powering the said motorization and the turbines (3, 4);
- an electronic control unit for driving the wheels (2) and determining the displacement of the cleaner along the travel plane (F), and for activating the turbines (3, 4) to allow the latter to exert a thrust able to keep the body (1) in contact with the plane (F).

2. Cleaner according to claim 1, wherein provision is made for position sensors (20) for detecting the horizontal/vertical position of the cleaner.
3. Cleaner according to claim 1 or 2, wherein sensors (18) are provided for detecting the presence of the water surface. 5
4. Cleaner according to any of the preceding claims, comprising an outlet for the electrical recharge of power supply. 10
5. Cleaner according to claim 1, wherein said power supply outlet is of inductive and/or capacitive type. 15
6. Cleaner according to any of the preceding claims, further comprising a pair of vanes (16) sideway of body (1) which are individually control-operable for the movement in a given direction at the water surface and the removal of any surface dirt. 20
7. Cleaner according to any of the preceding claims, wherein said electronic unit is programmable according to preset work cycles. 25
8. Cleaner according to any of the preceding claims, wherein said turbines (3, 4) are offset disposed along a longitudinal run axis (a) of body (1) and individually control-operable to change the relevant thrust with respect to the plane (F). 30
9. Cleaner according to any of the preceding claims, wherein at least one of said turbines (3, 4) is disposed with its blades in correspondence of the lower part of the cleaning apparatus in order to obtain a more convenient point of suction height. 35
10. Apparatus for cleaning swimming pools according to one of claims 1-9 and further comprising a base (10) for the automatic return of the cleaner, said base being provided with a body (1)-housing seat (11) which is open at a side for the admittance of same body (1) into the seat (11). 40
11. Apparatus according to claim 10, comprising means for keeping said base (10) at the level of water surface. 45
12. Apparatus according to claim 10 or 11, wherein said base (10) is provided with an external power supply of inductive and/or capacitive type. 50

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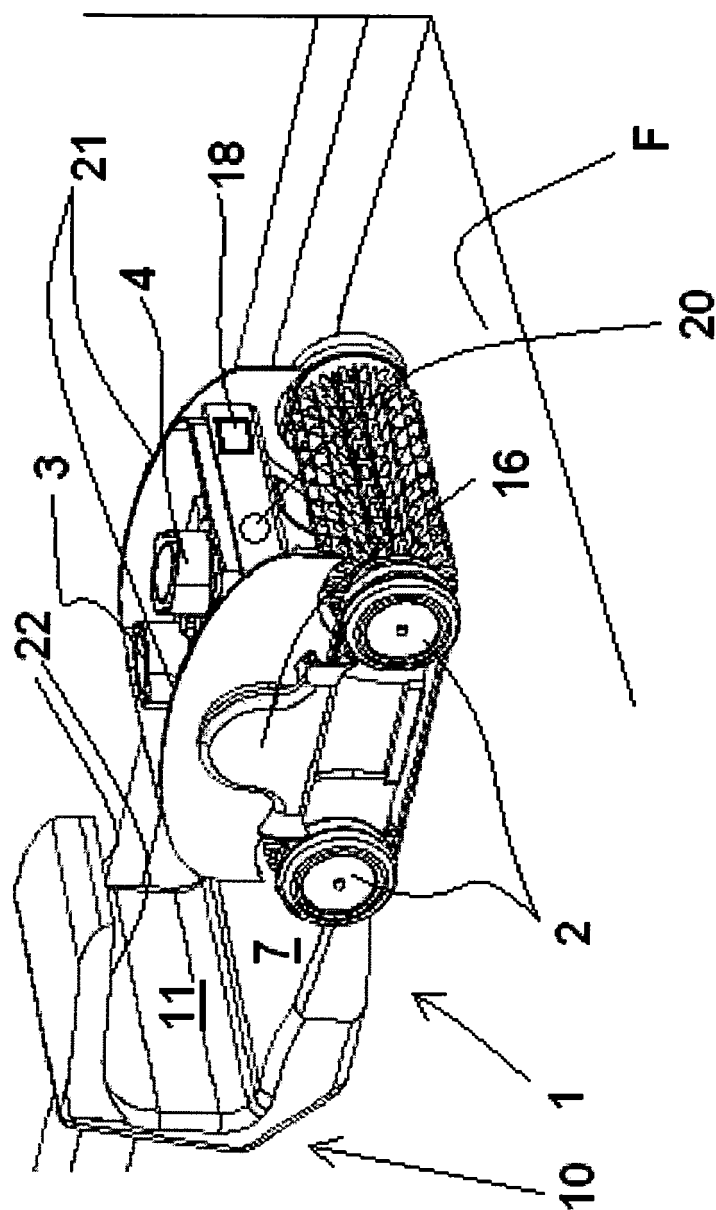


Fig.1

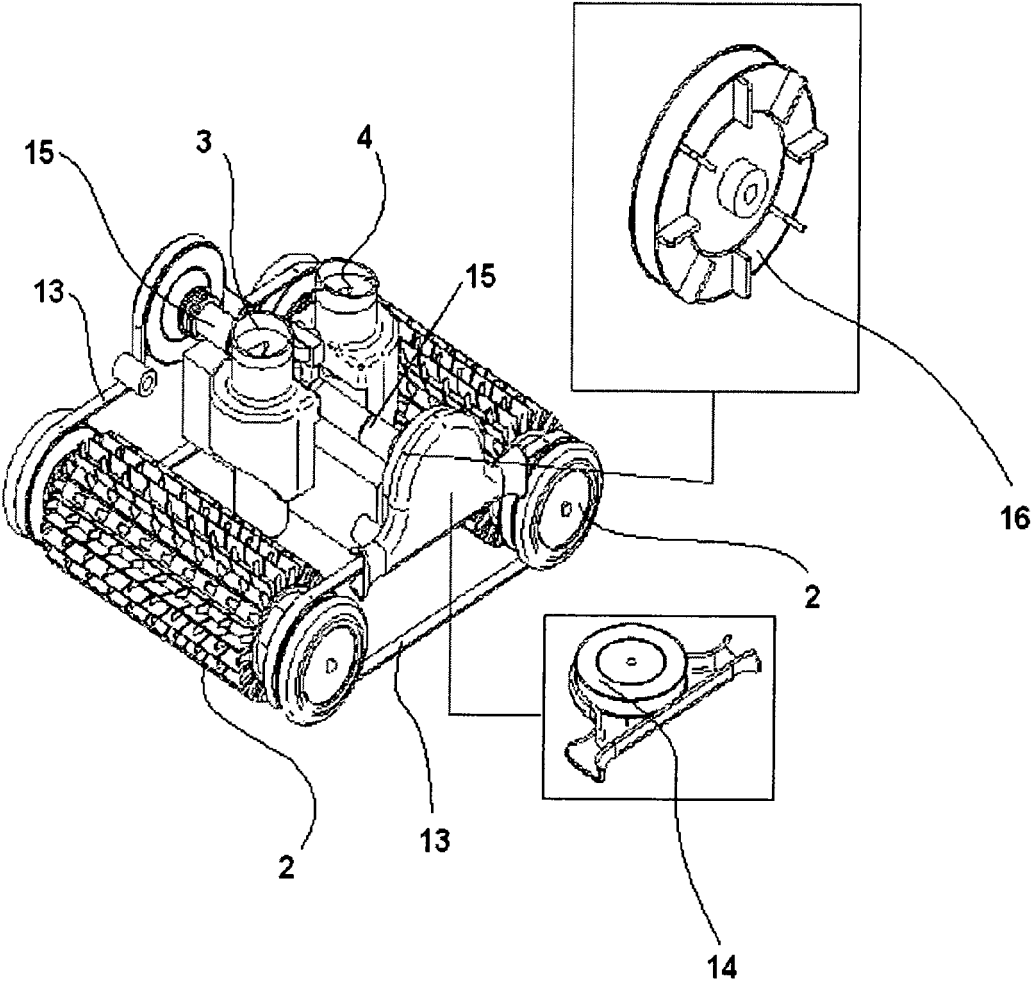


Fig.2

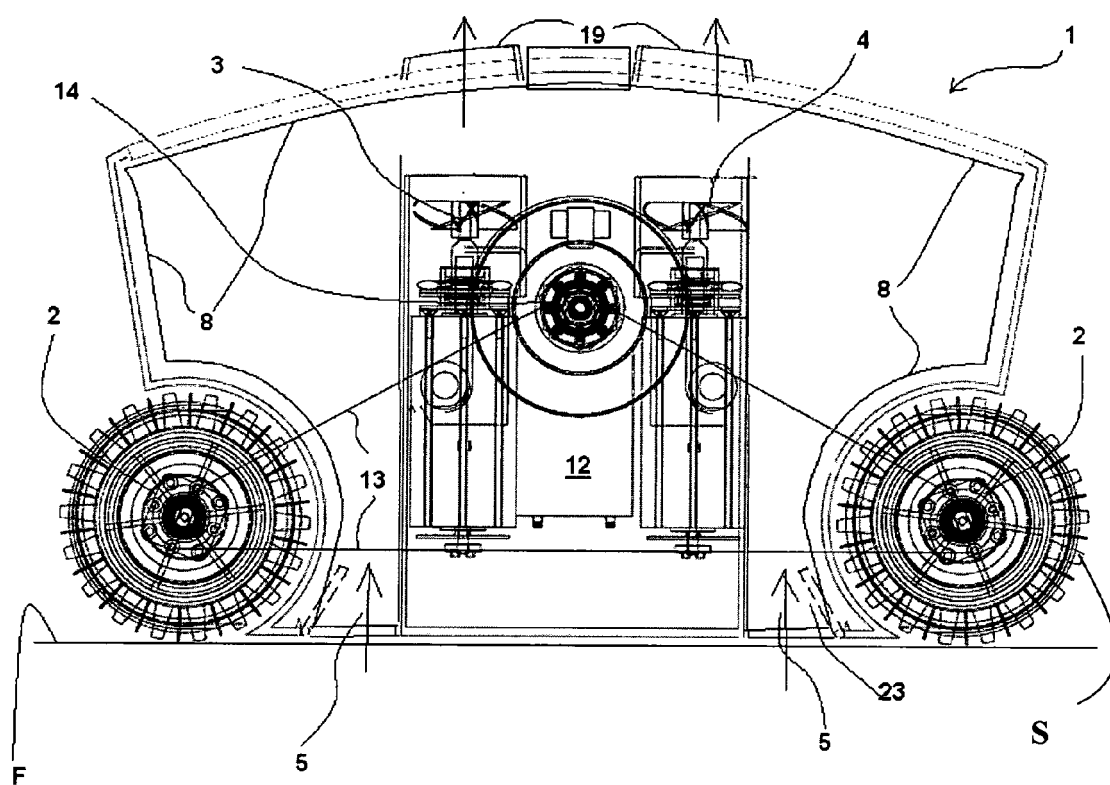


Fig.3

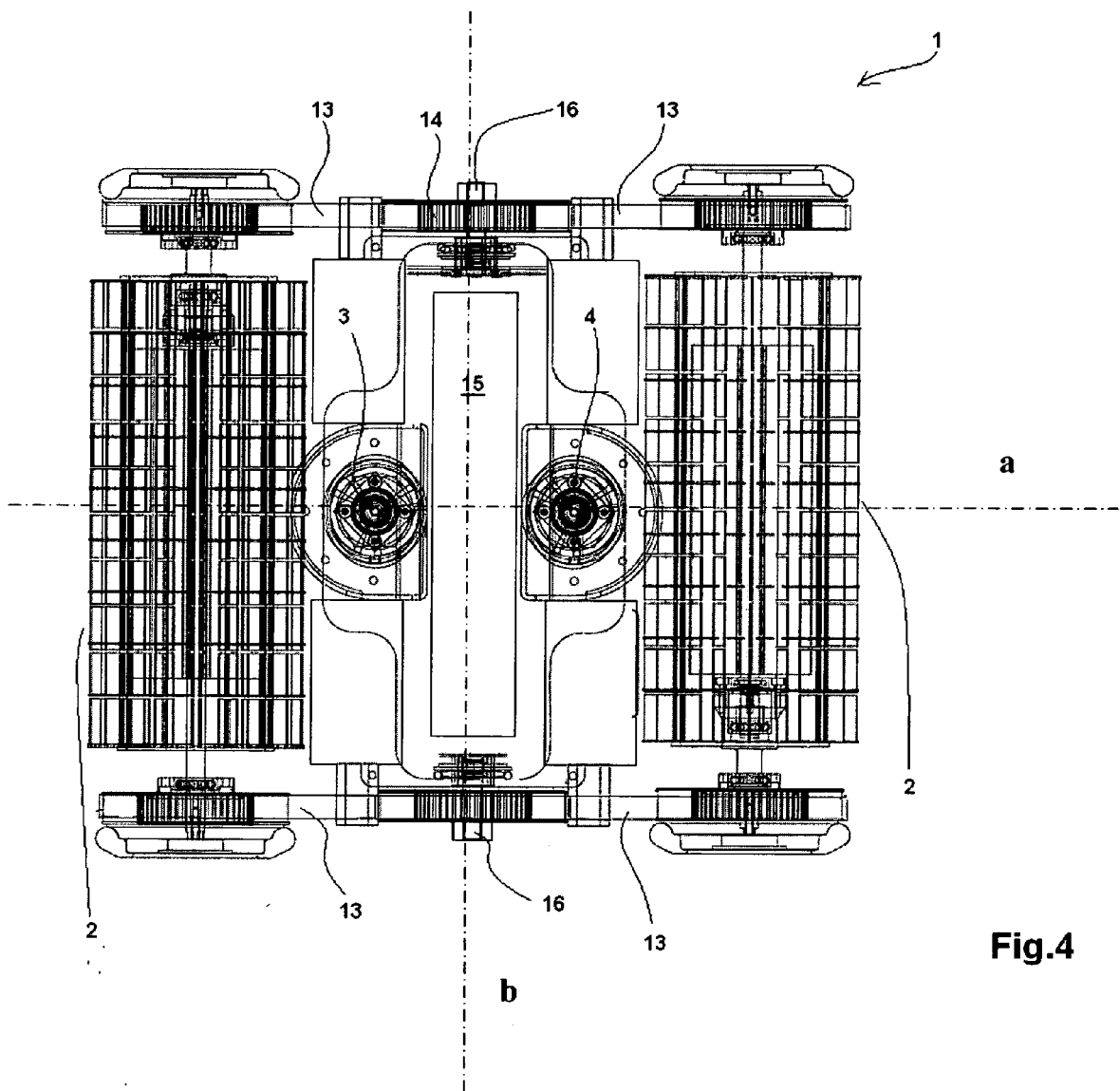


Fig.4