MOBILE ROBOTIC VACUUM CLEANER WITH A OBSTACLE SENSING FUNCTION

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ABSTRACT

A mobile robotic vacuum cleaner with obstacle sensing function is disclosed to include a machine body, a first running wheel and a second running wheel mounted in the machine body at two opposite sides in such a position that the extension line of the wheel shafts of the first and second running wheels divides the machine body into a front part and a rear part, and one or multiple rear obstacle sensors mounted in the rear part of the machine body to detect rear obstacles, avoiding the mobile robotic vacuum cleaner from falling down the stairs or dropping in a hole during its backward movement.
MOBILE ROBOTIC VACUUM CLEANER WITH A OBSTACLE SENSING FUNCTION

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to mobile robotic vacuum cleaner technology and more specifically, to a mobile robotic vacuum cleaner with obstacle sensing function.

[0003] 2. Description of the Related Art

[0004] A conventional mobile robotic vacuum cleaner is known comprising a machine body, a directional wheel mounted in the front part of the machine body, a left running wheel and a right running wheel respectively mounted in the machine body at rear-left and rear-right sides relative to the direction wheel, and a plurality of obstacle sensors spaced around the front side of the machine body. During operation of the aforesaid conventional mobile robotic vacuum cleaner, the direction wheel controls the steering direction, and the left and right running wheels are controlled to move the machine body forwards or backwards. During forward movement of the mobile robotic vacuum cleaner, the obstacle sensors detect any obstacle in the forward path, for example, elevation difference. When an obstacle is sensed, one of the left and right running wheels will be kept immovable, and the other of the left and right running wheels will be rotated backwards to change the steering direction of the mobile robotic vacuum cleaner and to avoid the obstacle. However, the aforesaid conventional mobile robotic vacuum cleaner does not have any sensor means to detect backward obstacles. Thus, when the mobile robotic vacuum cleaner moves backwards to avoid a front obstacle, it cannot detect any rear obstacle and may fall down the stairs or drop in a hole.

SUMMARY OF THE INVENTION

[0005] The present invention has been accomplished under the circumstances in view. It is the main object of the present invention to provide a mobile robotic vacuum cleaner with obstacle sensing function, which detects any rear obstacles when moving backwards.

[0006] To achieve these and other objects of the present invention, a mobile robotic vacuum cleaner with obstacle sensing function comprises a machine body, a first running wheel and a second running wheel mounted in the machine body at two opposite sides in such a position that the extension line of the wheel shafts of the first and second running wheels divides the machine body into a front part and a rear part, front obstacle sensors mounted in the front part of the machine body and adapted for sensing front obstacles, and at least one rear obstacle sensor mounted in the rear part of the machine body and adapted for sensing rear obstacles. Subject to the functioning of the at least one rear obstacle sensor, the mobile robotic vacuum cleaner will not fall down the stairs or drop in a hole when moving backwards.

[0007] Further, the at least one rear obstacle sensor can be mounted in the periphery of the rear part of the machine body at a rear side relative to the first running wheel. Alternatively, the at least one rear obstacle sensor can be mounted in the periphery of the rear part of the machine body at a rear side relative to the second running wheel. Alternatively, the at least one rear obstacle sensor can include two rear obstacle sensors mounted in the periphery of the rear part of the machine body and respectively disposed at a rear side relative to the first running wheel and the second running wheel.

[0008] Other and further advantages and features of the present invention will be fully understood by reference to the following specification in conjunction with the accompanying drawings, in which like reference signs denote like elements of structure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. 1 is an oblique top elevation of a mobile robotic vacuum cleaner having obstacle sensing function in accordance with the present invention.

[0010] FIG. 2 is an oblique bottom elevation of the mobile robotic vacuum cleaner having obstacle sensing function in accordance with the present invention.

[0011] FIG. 3 is a schematic bottom view of the mobile robotic vacuum cleaner having obstacle sensing function in accordance with the present invention, illustrating the arrangement of the obstacle sensors in the rear part of the machine body.

DETAILED DESCRIPTION OF THE INVENTION

[0012] Referring to FIGS. 1-3, a mobile robotic vacuum cleaner 10 in accordance with the present invention is shown comprising a machine body 20, a first running wheel 30, a second running wheel 40 and two obstacle sensors 50.

[0013] The machine body 20 is shaped like a flat cylinder movable on a surface, for example, the floor. The machine body 20 is formed of a plastic housing, a power drive and a control circuit. The power drive and the control circuit are housed inside the plastic housing. Because the power drive and the control circuit are of the known art and not within the scope of the claims of the present invention, no further detailed description in this regard is necessary.

[0014] The first running wheel 30 and the second running wheel 40 are symmetrically mounted in the machine body 20. Further, the extension line L of the wheel shafts of the first and second running wheels 30, 40 divides the machine body 20 into a front part 21 and a rear part 23. The machine body 20 is equipped with a directional wheel 211 in the front part 21. The directional wheel 211 is rotatable through 360-degrees to control the steering direction of the machine body 20. Further, three front obstacle sensors 213 are equiangularly spaced along the periphery of the front part 21 for sensing obstacles in the front side of the machine body 20. The directional wheel 211 and the front obstacle sensors 213 are of the known art, no further detailed description in this regard is necessary.

[0015] The main feature of the present invention is the arrangement of the two obstacle sensors 50. In this embodiment, these two obstacle sensors 50 function in the same manner as the aforesaid front obstacle sensors 213, i.e., using a light emitter to emit light toward the surface in the forward path and a light receiver to receive reflected light for determining the surface status in the forward path. With respect to the principle of work of these obstacle sensors 50, please refer to U.S. Pat. No. 7,411,744. One of these two obstacle sensors 50, as shown in FIG. 2, is installed in the periphery of the rear part 23 of the machine body 20 at a rear-right side relative to the second running wheel 40 and adjacent to the second running wheel 40. The other end of these two obstacle sensors 50 is installed in the periphery of the rear part 23 of the machine body 20 at a rear-right side relative to the first running wheel 30 and adjacent to the first running wheel 30. Thus, the obstacle sensors 50 detect obstacles in the rear side...
when the mobile robotic vacuum cleaner 10 moves backwards to avoid a rear obstacle.

[0016] Further, the number of the obstacle sensors 50 is not limited to 2, i.e., the number of the obstacle sensors 50 may be changed subject to actual requirements. For example, only one obstacle sensor 50 is installed in one lateral side of the rear part 23 of the mobile robotic vacuum cleaner 10 at a rear-right side relative to the first running wheel 30 or rear-right side relative to the second running wheel 40 and adjacent to the first running wheel 30 or second running wheel 40.

[0017] When the mobile robotic vacuum cleaner 10 is moving forward during operation, the front obstacle sensors 213 detect any obstacle, for example, elevation different in the forward path in front of the machine body 20. When an obstacle is sensed, one of the first and second running wheels 30,40 will be kept immovable, and the other of the left and right running wheels 30,40 will be rotated backwards to change the steering direction of the mobile robotic vacuum cleaner 10 and to avoid the obstacle. During a backward movement of the mobile robotic vacuum cleaner 10, the obstacle sensors 50 detect any rear obstacles. Subject to the detection of the obstacle sensors 50, the mobile robotic vacuum cleaner 10 is controlled to keep moving backwards or to change the steering direction.

[0018] In conclusion, the mobile robotic vacuum cleaner with obstacle sensing function has sensors installed in the rear part of the machine body thereof to detect rear obstacles, avoiding the mobile robotic vacuum cleaner from falling down the stairs or dropping in a hole during its backward movement.

[0019] Although a particular embodiment of the invention has been described in detail for purposes of illustration, various modifications and enhancements may be made without departing from the spirit and scope of the invention. Accordingly, the invention is not to be limited except as by the appended claims.

What is claimed is:
1. A mobile robotic vacuum cleaner, comprising:
   a first running wheel and a second running wheel mounted in said machine body at two opposite sides; said first running wheel and said second running wheel each having a wheel shaft, the extension line of the wheel shafts of said first running wheel and said second running wheel dividing said machine body into a front part and a rear part;
   at least one front obstacle sensor mounted in said front part of said machine body and adapted for sensing the presence of an obstacle in front of said machine body;
   wherein the mobile robotic vacuum cleaner further comprises at least one rear obstacle sensor mounted in said rear part of said machine body and adapted for sensing the presence of an obstacle behind said machine body.

2. The mobile robotic vacuum cleaner as claimed in claim 1, wherein said at least one rear obstacle sensor is mounted in the periphery of said rear part of said machine body at a rear side relative to said first running wheel.

3. The mobile robotic vacuum cleaner as claimed in claim 1, wherein said at least one rear obstacle sensor is mounted in the periphery of said rear part of said machine body at a rear side relative to said second running wheel.

4. The mobile robotic vacuum cleaner as claimed in claim 1, wherein said at least one rear obstacle sensor comprises two rear obstacle sensors mounted in the periphery of said rear part of said machine body and respectively disposed at a rear side relative to said first running wheel and said second running wheel.

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