

## **SNAKE-LIKE SEGMENTED ROBOTIC VACUUM CLEANER**

### **FIELD OF INVENTION**

The present invention here relates to the field of robotic vacuum cleaning, and more particularly, it is directed at an intelligent automatic snake-like segmented robotic vacuum cleaner, with the flexibility to move in snake-like, straight, s-curve, zigzag and coiled up locomotive movement for cleaning small corners and hard-to-reach areas as well as overcoming staircases and kerbs as compared to conventional robotic vacuum cleaners available in the market. It can also be controlled remotely by a separate device.

### **BACKGROUND OF THE INVENTION**

A general and most common problem on hard surfaces, and especially on floors is the likelihood of dust collecting on the floors in dwellings, homes, offices, laboratories etc. The collection of the dusts can be quite unpleasant and unsightly at times. Conventional vacuum cleaners as well as robotic vacuum cleaners replace the manual cleaning work and are commonly available in the commercial and consumer markets.

Robotic vacuum cleaners have been gaining interest from consumers for its simplicity and ease of use. This solution is directed at the market for robotic vacuum cleaners rather than conventional vacuum cleaners. It is well-known that dusts can collect and settle at certain odd corners of the floors that are not so easily accessible by most of the robotic vacuum cleaners that are available out there. Typical common robotic vacuum cleaners available in the market include US 8,209,053 and WO 2012/149575A2. Both

(2MBN SRVC SG)

are circular in structure and are robotic mobile vacuum cleaners with their unique cleaning abilities.

However, most of these typical common robotic vacuum cleaners are not able to effectively vacuum and clean dusts at certain odd corners of the floors, mainly due to the circular structure and can be quite bulky in terms of the diameter of the robotic vacuum cleaner.

The present invention here serves to disclose a device for vacuum cleaning using robotic snake-like movement. This device, termed as a snake-like segmented robotic vacuum cleaner, is mobile and portable to carry around. The device disclosed in the present invention has the unique ability of being able to reach and vacuum dusts due to its slim snake-like cleaning modules that can clean dusts that settle at certain odd and small corners of the floors. It is flexible enough to even climb up and down kerbs or a flight of stairs within the building enclosure (e.g. homes, offices, industrial spaces, etc.). This feature is something that most of the typical conventional robotic vacuum cleaners are not able to achieve.

The device disclosed in the present invention involves having at least four (4) segmented cleaning modules that are fastened to each other by means of an interlocking mechanism, a tower docking station with a central dust chamber for the cleaning modules to dispose off the dust and any debris collected from the cleaning and vacuuming process as well as to re-charge the segmented cleaning modules. This interlocking mechanism enables the four (4) segmented cleaning modules to be locked to each other during movement as well as to be able to be coiled up to each other. Each cleaning module has its own built-in battery that can be recharged at the tower

(2MBN SRVC SG)

docking station. The four (4) segmented cleaning modules can also coil up and rotate and moves around to clean and vacuum. When tackling corners and small enclosed areas, it uncoils to reveal a snake-like locomotive form. With such form and mechanical articulation, it can now manoeuvre up and down a flight of stairs or kerbs that can be found in some homes, offices etc. Also, each cleaning module can be customised to quietly spray anti-bacterial aroma into the environment intermittently.

Depending on the life-span of the battery within the segmented cleaning modules as well as the usage requirements, the movement can be wirelessly controlled by a remote-control device or automatically move on its own in a programmed manner by sensing the environment that the cleaning module is going to clean and vacuum.

At the bottom of each cleaning module, the cleaning and vacuuming process is carried out by at least a brush and a suction unit, as well as an agitator that acts like a wheel for the cleaning module to move and also to agitate the dust / debris from the surface in order to facilitate the cleaning and vacuum suction process. There is a filter within the cleaning module to filter out the dust and debris from the vacuumed air such that the dust and the debris are collected within the storage dust chamber area within the cleaning module. This also aids in preventing the suction motor from getting damaged from the dust and debris particles.

Once the storage area within the cleaning module is full or the cleaning module itself is running low on battery, the cleaning modules will then automatically return to the tower docking station, which has the semantic of a tree-like structure. The four (4) segmented cleaning modules will then coil around the base of the tower docking station. At this

(2MBN SRVC SG)

position, each cleaning module will then deposit the dust/debris that each has collected into the internal bag-less canister located within the main dust chamber in the tower docking station. Concurrently while the deposition is ongoing, the four (4) segmented cleaning modules are getting charged-up for the next round of cleaning and vacuuming. Once the deposition is finished, the user will then lift up the internal bag-less dust chamber to dispose off the dust/debris. The whole cleaning and vacuuming process is then repeated.

(2MBN SRVC SG)

## **BRIEF DESCRIPTION OF THE DRAWINGS**

The drawings attached here are to aid in better understand the description of the invention here. The drawings are not to scale and they are to be used for merely illustrating the principles and concepts of the invention.

To aid in the description of the invention, the drawings are broken up into the various Figures as described below:

**Fig 1** illustrates a perspective view of the embodiment of the present invention, with the bag-less canister being extended.

**Fig 2A – 2B** illustrate a perspective view of the embodiment of the present invention, highlighting close-up top view of the remote control device and its mounting on the top portion of the central dust chamber.

**Fig 3** illustrates a side view of a cleaning module of the present invention.

**Fig 4** illustrates a cross-sectional side view of the docking station with one of the docked cleaning module of the present invention.

**Fig 5** illustrates how the embodiment of the present invention can be applied onto hard-to-reach areas to be cleaned and vacuumed.

**Fig 6** illustrates how the embodiment of the present invention can be applied to climb up and down a flight of stairs in a home or office environment.

**Fig 7** illustrates how the cleaning module of the present invention can be interlocked to each other to aid in the cleaning and vacuuming process.

(2MBN SRVC SG)

**Reference numbers**

- |    |                              |
|----|------------------------------|
| 1  | Docking Station              |
| 2  | Central Dust Chamber         |
| 3  | Cleaning Module              |
| 4  | Base of docking station      |
| 5  | Main filter chamber          |
| 6  | Handle                       |
| 7  | Remote Control Device        |
| 8  | Bag-less Canister            |
| 9  | Motor                        |
| 10 | Brush                        |
| 11 | Dust Chamber                 |
| 12 | Agitator                     |
| 13 | Filter                       |
| 14 | Air Outlet (Cleaning Module) |
| 15 | Dust Transfer Connector      |
| 16 | Air Outlet (Docking Station) |
| 17 | Interlocking mechanism       |

(2MBN SRVC SG)

## **DETAILED DESCRIPTION OF PREFERRED EMBODIMENT OF THE PRESENT INVENTION**

In the following description, details are provided to describe the embodiment of the application. It shall be apparent to the person skilled in the art, however, that the embodiments may be practiced without such details.

The present invention here relates to the field of robotic vacuum cleaning, and more particularly, it is directed at an intelligent automatic snake-like segmented robotic vacuum cleaner, with the flexibility to move in snake-like, straight, s-curve, zigzag and coiled up locomotive movement for cleaning small corners and hard-to-reach areas as well as overcoming staircases and kerbs as compared to conventional robotic vacuum cleaners available in the market. It can also be controlled remotely by a separate device.

**Figure 1** illustrates a side view of the embodiment of the present invention with the device termed as “snake-like segmented robotic vacuum cleaner” consisting of a docking station **1**, an upright central dust chamber **2** attached to the base of the docking station **4** with the four (4) cleaning modules **3** attached to the base of the docking station **4** by encircling round the central dust chamber **2**. The whole device shown in **Figure 1** can be lifted up by means of a handle **6** at the top end of the central dust chamber **2**. In addition, **Figure 1** also illustrates how the bag-less canister **8** can be lifted up with the aid of handle **6**, whereby a main filter chamber **5** is located within the bag-less canister **8**, and a remote control device **7** can be placed on the exterior enclosure located at the top portion bag-less canister **8**. The base of the docking station **4** serves as a charging station for the four (4) cleaning modules **3** as well as enabling the dust and debris

(2MBN SRVC SG)

collected to be deposited within the bag-less canister **8** located inside the central dust chamber **2** as well as. Once the deposition process is completed or if the bag-less canister **8** within the central dust chamber **2** is full with dust/debris, the user can then lift up using handle **6** to remove the bag-less canister **8** so as remove the dust/debris presented inside before starting the whole cleaning and vacuum suction process.

**Figure 2A** illustrates how the remote control device **7** looks like when it is being removed from the top enclosure located at the top portion bag-less canister **8**, with the close-up view shown in **Figure 2B**. When placed on the top enclosure, it will charge the remote control device **7** as well as the cleaning module **3** at the same time. The remote control device **7** is a touch-screen device, with the ability to wirelessly control the movement of the cleaning modules **3** shown in **Figure 1**. Moreover, the remote control device **7** can also set the cleaning modules **3** to be in auto-mode such that the cleaning modules **3** can sense the environment that it is going to clean and vacuum. In addition, the remote control device **7** can also control the cleaning module to change from snake-like locomotive form to a coiled-up form to clean while quietly spraying anti-bacterial aroma into the environment intermittently.

**Figure 3** illustrates a side view of a typical cleaning module **3** of the present invention. Each cleaning module **3** can be interlocked to each other via the interlocking mechanism **17**. The cleaning module **3** can move forward or backward, depending on how it is being programmed. As it moves across the floor surface, the agitator **12** serves to agitate the dust and debris particles so that it can be effectively sucked into the cleaning module **3** with the help of a motor **9** located inside cleaning module **3**. Filter **13** serves to prevent the dust/debris particles from entering into the motor **9**, such that the solid dust/debris

(2MBN SRVC SG)

particles are deposited inside the dust chamber **11**, with the suction air exiting air outlet **14**. Concurrently, brush **10** creates the necessary cleaning action when the cleaning module **3** glides over hard surface of the floor.

**Figure 4** illustrates a cross-sectional side view of the docking station **1** with one of the docked cleaning module of the present invention. A dust transfer connector **15** provides the connection for the dust/debris collected from the cleaning module **3** to be sucked out to the bag-less canister **8** present within the central dust chamber **2**. Main filter chamber **5** prevents the solid dust/debris particles from reaching the suction component, with the suction air exiting air outlet **16**.

**Figure 5** illustrates how the embodiment of the present invention, i.e. cleaning module **3** can be applied onto hard-to-reach areas or corners to be cleaned and vacuumed. Its segmented snake-like locomotive movement provides the flexibility for the vacuum cleaner to reach those hard-to-reach areas or small corners of a typical house/home/office environment enclosure.

**Figure 6** illustrates how the embodiment of the present invention, i.e. cleaning module **3** can be applied to climb up and down a flight of stairs in a home or office environment. This is possible due to the snake-like locomotive movement and its segmented construction for the vacuum cleaner. Hence this makes it ideal for use in indoor home or office environment with multiple storeys.

**Figure 7** illustrates how the cleaning module **3** of the present invention can be interlocked to each other to aid in the cleaning and vacuuming process. This means

(2MBN SRVC SG)

having each cleaning module **3** to be interlocked to each other via the interlocking mechanism **17** shown previously in **Figure 3**, and the whole interlocked cleaning module will then rotate, clean and vacuum at the same time. Hence, this makes it suitable for use in a typical indoor home or office environment.

While what has been described hereinabove is the preferred embodiment of the invention, those skilled in the art will understand that numerous modifications may be made without departing from the spirit and scope of the invention. The embodiments described herein are meant to be illustrative only and should not be taken as limiting the invention, which can be expressly set forth in the following claims.

(2MBN SRVC SG)

## **CLAIMS**

What is claimed is:

1. A robotic vacuum cleaner assembly, comprising of:
  - segmented cleaning modules that are fastened to each other by means of an interlocking mechanism and the flexibility to move in snake-like, straight, s-curve, zigzag and coiled up locomotive manner;  
wherein each cleaning module comprises of at least an agitator, a vacuum suction unit and a brush for cleaning; and  
wherein each cleaning module has a built-in rechargeable battery to power up;
  - a tower docking station with a central dust chamber for the cleaning modules to dispose off the dust and any debris collected from the cleaning and vacuuming process as well as to recharge the segmented cleaning modules;
  - a remote control device for wireless-control of the movement of the segmented cleaning modules, wherein the remote control device can be recharged at the tower docking station.
2. A robotic vacuum cleaner, comprising of:
  - segmented cleaning modules that are fastened to each other by means of an interlocking mechanism and the flexibility to move in snake-like, straight, s-curve, zigzag and coiled up locomotive manner, wherein each cleaning module comprises of at least an agitator, a vacuum suction unit and a brush for cleaning, and wherein the segmented cleaning modules are able to climb up and down the flight of stairs or kerbs.

(2MBN SRVC SG)

3. A robotic vacuum cleaner, comprising of:
- segmented cleaning modules that are fastened to each other by means of an interlocking mechanism and the flexibility to move in snake-like, straight, s-curve, zigzag and coiled up locomotive manner;
- wherein the shape and form of each cleaning module is slim enough to be able to clean and vacuum dust and debris that settle in odd small corners and hard-to-reach areas of the floor; and
- wherein each cleaning module comprises of at least an agitator, a vacuum suction unit and a brush for cleaning.

**THE END**