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(54) Title: WINDOW-CLEANING ROBOT AND METHOD FOR CONTROLLING THE SAME

(57) **Abrégé/Abstract:**

The present disclosure provides a window-cleaning robot and a method for controlling the same. The robot includes: a body (10); a vacuum suction port (20) disposed on the body (10); a suction detector configured to detect a vacuum suction value generated at the vacuum suction port (20); a light-emitting assembly (40) disposed on the body (10), a light-emitting area of the light-emitting assembly (40) being configured corresponding to the vacuum suction value; and a controller, connected with the suction detector and the light-emitting assembly (40) respectively and configured to light all or a part of light-emitting area of the light-emitting assembly (40) according to the vacuum suction value, for reminding the user.



ABSTRACT

The present disclosure provides a window-cleaning robot and a method for controlling the same. The robot includes: a body (10); a vacuum suction port (20) disposed on the body (10); a suction
5 detector configured to detect a vacuum suction value generated at the vacuum suction port (20); a light-emitting assembly (40) disposed on the body (10), a light-emitting area of the light-emitting assembly (40) being configured corresponding to the vacuum suction value; and a controller, connected with the suction detector and the light-emitting assembly (40) respectively and configured to light all or a part of light-emitting area of the light-emitting assembly (40) according to the vacuum
10 suction value, for reminding the user.

WINDOW-CLEANING ROBOT AND METHOD FOR CONTROLLING THE SAME

TECHNICAL FIELD

The present disclosure relates to the field of electrical appliance technology, and more
5 particularly relates to a window-cleaning robot and a method for controlling the same.

BACKGROUND

The popularity of window-cleaning robots has brought much convenience for people. A vacuum
suction port is generally disposed at a middle position of a bottom of the window-cleaning robot in the
10 related art. A suction motor drives a fan to rotate with high-speed and then vacuum is generated via
the vacuum suction port, such that the robot may suck on the window. When a vacuum suction force
decreases, the robot is likely to fall off from the window. At this case, a user may be reminded of
potential dangers by raising an alarm via a state indicator lamp 1' (as shown in Fig. 1) or a buzzer.
However, this reminding manner is not obvious for the user. A visual area of the state indicator lamp is
15 usually small, and the alarm of the buzzer is also possible to lose effectiveness in noisy environment,
thereby being unable to remind the user effectively.

SUMMARY

The present disclosure aims to solve at least one of the problems in the related art to some extent.
20 For this, a first objective of the present disclosure is to provide a window-cleaning robot. The
window-cleaning robot enables a user to monitor a vacuum suction value in real time when the
window-cleaning robot is operating, thereby reducing a risk of sudden falling of the window-cleaning
robot due to being unable to monitor the vacuum suction value, and improving using experience of the
window-cleaning robot.

25 A second objective of the present disclosure is to provide a controlling method for a
window-cleaning robot.

To achieve above objectives, embodiments according to a first aspect of the present disclosure
provide a window-cleaning robot. The window-cleaning robot includes: a body; a vacuum suction
port disposed on the body; a suction detector configured to detect a vacuum suction value generated at

the vacuum suction port; a light-emitting assembly disposed on the body, in which a light-emitting area of the light-emitting assembly is configured corresponding to the vacuum suction value; and a controller, connected with the suction detector and the light-emitting assembly respectively and configured to light all or a part of the light-emitting area according to the vacuum suction value, for reminding a user.

With the window-cleaning robot according to embodiments of the present disclosure, the suction detector detects the vacuum suction value generated at the vacuum suction port when the window-cleaning robot is operating, and the controller lights all or a part of the light-emitting area of the light-emitting assembly according to the vacuum suction value detected by the suction detector, such that the user may monitor the vacuum suction value in real time when the window-cleaning robot is operating, thereby reducing a risk of sudden falling of the window-cleaning robot due to being unable to monitor the vacuum suction value, and improving using experience of the window-cleaning robot.

In at least one embodiment, the light-emitting assembly includes a plurality of indicator lamps and the plurality of indicator lamps are arranged in a ring shape, in a rectangular shape or in a triangular shape.

In at least one embodiment, the body includes an upper cover and a transparent display frame disposed on the upper cover, and the light-emitting assembly is disposed below the transparent display frame.

In at least one another embodiment, the body includes an upper cover, the upper cover is made of transparent material, and the light-emitting assembly is disposed below the upper cover.

In at least one embodiment, the window-cleaning robot further includes a voice reminding device. The controller is further configured to control the voice reminding device to issue a voice reminder if the vacuum suction value is less than a preset threshold.

To achieve above objectives, embodiments according to a second aspect of the present disclosure provide a method for controlling a window-cleaning robot, in which a light-emitting assembly is disposed on the window-cleaning robot, and the method includes: detecting a vacuum suction value generated at a vacuum suction port of the window-cleaning robot; and lighting all or a part of a light-emitting area of the light-emitting assembly according to the vacuum suction value, for

reminding a user.

With the method for controlling a window-cleaning robot of embodiments of the present disclosure, when the window-cleaning robot is operating, the vacuum suction value generated at the vacuum suction port is detected and the corresponding light-emitting area of the light-emitting assembly is lighted according to the detected value, such that the user may monitor the value of the vacuum suction force in real time when the window-cleaning robot is operating, thereby reducing a risk of sudden falling off of the window-cleaning robot due to being unable to monitor the vacuum suction value, and improving using experience of the window-cleaning robot.

In at least one embodiment, the light-emitting assembly includes a plurality of indicator lamps and the plurality of indicator lamps are arranged in a ring shape, in a rectangular shape or in a triangular shape.

In at least one embodiment, the window-cleaning robot includes an upper cover and a transparent display frame disposed on the upper cover, and the light-emitting assembly is disposed below the transparent display frame.

In at least one another embodiment, the window-cleaning robot includes an upper cover, the upper cover is made of transparent material, and the light-emitting assembly is disposed below the upper cover.

In at least one embodiment, the method further comprises: controlling the window-cleaning robot to issue a voice reminder if the vacuum suction value is less than a preset threshold.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic diagram illustrating a window-cleaning robot in the related art;

Figs. 2A and 2B are schematic diagrams illustrating a structure of a window-cleaning robot according to an embodiment of the present disclosure;

Fig. 3A is a schematic diagram illustrating a structure of a light-emitting assembly according to an embodiment of the present disclosure;

Fig. 3B is a schematic diagram illustrating a transparent display frame according to an embodiment of the present disclosure;

Fig. 3C is a schematic diagram illustrating indication signs on an upper cover of a

window-cleaning robot according to an embodiment of the present disclosure;

Fig. 4A is a schematic diagram illustrating a display effect of a light-emitting assembly according to a specific embodiment of the present disclosure;

Fig. 4B is a schematic diagram illustrating a display effect of a light-emitting assembly according to another specific embodiment of the present disclosure;

Fig. 4C is a schematic diagram illustrating a display effect of a light-emitting assembly according to still another specific embodiment of the present disclosure;

Fig. 5 is a flowchart showing a method for controlling a window-cleaning robot according to an embodiment of the present disclosure.

Elements list:

state indicator lamp	1'
body	10
upper cover	11
transparent display frame	12
vacuum suction port	20
light-emitting assembly	40
indicator lamp	41

DETAILED DESCRIPTION

Embodiments of the present disclosure will be described in detail in the following descriptions, examples of which are shown in the accompanying drawings, in which the same or similar elements and elements having same or similar functions are denoted by like reference numerals throughout the descriptions. The embodiments described herein with reference to the accompanying drawings are explanatory and illustrative, which are used to generally understand the present disclosure. The embodiments shall not be construed to limit the present disclosure.

In the following, a window-cleaning robot and a method for controlling a window-cleaning robot provided by embodiments of the present disclosure will be described in detail with reference to accompanying drawings.

Figs. 2A and 2B are schematic diagrams illustrating a structure of a window-cleaning robot

according to an embodiment of the present disclosure. As shown in Figs. 2A and 2B, the window-cleaning robot according to embodiments of the present disclosure includes a body 10, a vacuum suction port 20, a suction detector (not shown), a light-emitting assembly 40 and a controller (not shown).

5 The vacuum suction port 20 is disposed on the body 10.

Specifically, as shown in Fig. 2B, the vacuum suction port 20 may be disposed at a middle position of a bottom of the body 10.

The suction detector 30 detects a vacuum suction value generated at the vacuum suction port 20.

10 The light-emitting assembly 40 is disposed on the body 10. A light-emitting area of the light-emitting assembly 40 is configured corresponding to the vacuum suction value.

In an embodiment of the present disclosure, as shown in Fig. 3A, the light-emitting assembly 40 includes a plurality of indicator lamps 41. The plurality of indicator lamps 41 may be arranged in a ring shape, in a rectangular shape or in a triangular shape. For example, the plurality of indicator lamps 41 may be arranged in a ring shape, as shown in Fig. 3A.

15 As shown in Figs. 3B and 3C, in an embodiment of the present disclosure, the body 10 includes an upper cover 11 and a transparent display frame 12 (as shown in Fig. 3B) disposed on the upper cover 12. The light-emitting assembly 40 is disposed below the transparent display frame 12.

20 As shown in Fig. 3C, indication signs (for example, low suction force, middle suction force and high suction force) may be set on the upper cover 11 and configured to indicate a level of the vacuum suction value.

The controller 50 is connected with the suction detector 30 and the light-emitting assembly 40 respectively. The controller 50 is configured to light all or a part of the light-emitting area of the light-emitting assembly 40 according to the vacuum suction value, for reminding the user.

25 For example, as shown in Figs. 4A-4C, the controller controls all of the indicator lamps 41 to light (i.e., as shown in Fig. 4A, the light-emitting area at this time is corresponding to all of the indicator lamps 41) when determining that the vacuum suction value is at a maximum value; the controller controls half of the indicator lamps 41 to light (i.e., as shown in Fig. 4B, the light-emitting area at this time is corresponding to half of the indicator lamps 41) when determining that the vacuum suction value is at a middle value, that is, the solid circles on the left half of the light-emitting

assembly 40 shown in Fig. 4B refer to lighted indicator lamps 41; the controller 50 controls one indicator lamp 41 to light (i.e., as shown in Fig. 4C, the light-emitting area at this time is corresponding to one indicator lamp 41) when determining that the vacuum suction value is at a minimum value. Therefore, the controller 50 controls the light-emitting assembly 40 to emit different
5 light combinations dynamically when the vacuum suction value of the window-cleaning robot changes dynamically. With this display manner, it is convenient for the user to monitor the vacuum suction value in real time when the window-cleaning robot is operating, thereby reducing a risk of sudden falling off of the window-cleaning robot due to being unable to monitor the vacuum suction value, and improving using experience of the window-cleaning robot.

10 In another embodiment of the present disclosure, the body 10 includes an upper cover 11. The upper cover 11 is made of transparent material. The light-emitting assembly 40 is disposed below the upper cover 11.

Specifically, if the upper cover 11 is entirely made of transparent material, the transparent display frame 12 may be not set and the light-emitting assembly 40 is disposed directly below the upper cover
15 11.

In another embodiment of the present disclosure, the window-cleaning robot further includes a voice reminding device 60. The controller 50 is further configured to control the voice reminding device 60 to issue a voice reminder if the vacuum suction value is less than a preset threshold.

Specifically, when the controller 50 determines that the window-cleaning robot is likely to fall
20 off (i.e. the vacuum suction value is less than the preset threshold), the controller 50 controls the voice reminding device 60 to raise the voice reminder, so as to reminder the user of potential danger.

With the window-cleaning robot according to embodiments of the present disclosure, the suction detector detects the vacuum suction value generated at the vacuum suction port when the window-cleaning robot is operating, and the controller lights all or a part of the light-emitting area of
25 the light-emitting assembly according to the vacuum suction value detected by the suction detector for reminding the user, such that the user may monitor the vacuum suction value in real time when the window-cleaning robot is operating, thereby reducing a risk of sudden falling of the window-cleaning robot due to being unable to monitor the vacuum suction value, and improving using experience of the window-cleaning robot.

In order to realize the above embodiments, embodiments of the present disclosure also provide a method for controlling a window-cleaning robot.

Fig. 5 is a flowchart showing a method for controlling a window-cleaning robot according to an embodiment of the present disclosure. A light-emitting assembly is disposed on the window-cleaning robot. As shown in Fig. 5, the method for controlling a window-cleaning robot according to an embodiment of the present disclosure includes following steps.

In step S1, a vacuum suction value generated at a vacuum suction port of the window-cleaning robot is detected.

For example, the vacuum suction port may be disposed at a middle position of a bottom of the body. A suction motor drives a fan to rotate with high-speed and then vacuum is generated via the vacuum suction port, such that the window-cleaning robot may suck on the window.

Specifically, the vacuum suction value generated at the vacuum suction port of the window-cleaning robot is detected in real time when the window-cleaning robot is operating.

In step S2, all or a part of a light-emitting area of the light-emitting assembly is lighted according to the vacuum suction value, for reminding the user.

In an embodiment of the present disclosure, as shown in Fig. 3A, the light-emitting assembly includes a plurality of indicator lamps. The plurality of indicator lamps may be arranged in a ring shape, in a rectangular shape or in a triangular shape.

As shown in Figs. 3B and 3C, in an embodiment of the present disclosure, the window-cleaning robot includes an upper cover and a transparent display frame (as shown in Fig. 3B) disposed on the upper cover. The light-emitting assembly is disposed below the transparent display frame.

As shown in Fig. 3C, indication signs (for example, low suction force, middle suction force and high suction force) may be set on the upper cover and configured to indicate a level of the value of the vacuum suction force.

Specifically, when the window-cleaning robot is operating, a corresponding light-emitting area of the light-emitting assembly is lighted according to the detected vacuum suction value, for reminding the user.

For example, as shown in Figs. 4A-4C, the controller controls all of the indicator lamps 41 to light (i.e., as shown in Fig. 4A, the light-emitting area at this time is corresponding to all of the

indicator lamps 41) when determining that the vacuum suction value is at a maximum value; the controller controls half of the indicator lamps 41 to light (i.e., as shown in Fig. 4B, the light-emitting area at this time is corresponding to half of the indicator lamps 41) when determining that the vacuum suction value is at a middle value, that is, the solid circles on the left half of the light-emitting assembly 40 shown in Fig. 4B refer to lighted indicator lamps 41; the controller 50 controls one indicator lamp 41 to light (i.e., as shown in Fig. 4C, the light-emitting area at this time is corresponding to one indicator lamp 41) when determining that the vacuum suction value is at a minimum value. Therefore, the controller 50 controls the light-emitting assembly 40 to emit different light combinations dynamically when the vacuum suction value of the window-cleaning robot changes dynamically. With this display manner, it is convenient for the user to monitor the vacuum suction value in real time when the window-cleaning robot is operating, thereby reducing a risk of sudden falling off of the window-cleaning robot due to being unable to monitor the vacuum suction value, and improving using experience of the window-cleaning robot.

In another embodiment of the present disclosure, the window-cleaning robot includes an upper cover. The upper cover is made of transparent material. The light-emitting assembly is disposed below the upper cover.

Specifically, if the upper cover is entirely made of transparent material, the transparent display frame may be not set, and the light-emitting assembly 40 is disposed directly below the upper cover.

In another embodiment of the present disclosure, the method for controlling a window-cleaning robot further includes: controlling the window-cleaning robot to issue a voice reminder if the vacuum suction value is less than a preset threshold.

Specifically, when the window-cleaning robot is likely to fall off (i.e. the vacuum suction value is less than the preset threshold), the window-cleaning robot is controlled to issue the voice reminder, so as to remind the user of potential danger.

With the method for controlling a window-cleaning robot of embodiments of the present disclosure, when the window-cleaning robot is operating, the vacuum suction value generated at the vacuum suction port is detected and the corresponding light-emitting area of the light-emitting assembly is lighted according to the detected value, such that the user may monitor the value of the vacuum suction force in real time when the window-cleaning robot is operating, thereby reducing a

risk of sudden falling off of the window-cleaning robot due to being unable to monitor the vacuum suction value, and improving using experience of the window-cleaning robot.

In the specification, unless specified or limited otherwise, relative terms such as “central”, “longitudinal”, “lateral”, “front”, “rear”, “right”, “left”, “inner”, “outer”, “lower”, “upper”, “horizontal”, “vertical”, “above”, “below”, “up”, “top”, “bottom” as well as derivative thereof (e.g., “horizontally”, “downwardly”, “upwardly”, etc.) should be construed to refer to the orientation as then described or as shown in the drawings under discussion for simplifying the description of the present disclosure, but do not alone indicate or imply that the device or element referred to must have a particular orientation. They cannot be seen as limits to the present disclosure.

In addition, terms such as “first” and “second” are used herein for purposes of description and are not intended to indicate or imply relative importance or significance. Thus, the feature defined with “first” and “second” may comprise one or more this feature. In the description of the present disclosure, “a plurality of” means two or more, unless specified otherwise.

In the description of the present disclosure, it should be understood that, unless specified or limited otherwise, the terms “mounted,” “connected,” and “coupled” and variations thereof are used broadly and encompass such as mechanical or electrical mountings, connections and couplings, also can be inner mountings, connections and couplings of two components, and further can be direct and indirect mountings, connections, and couplings, which can be understood by those skilled in the art according to the detail embodiment of the present disclosure.

In the description of the present disclosure, a structure in which a first feature is “on” a second feature may include an embodiment in which the first feature directly contacts the second feature, and may also include an embodiment in which an additional feature is formed between the first feature and the second feature. Furthermore, a first feature “on,” “above,” or “on top of” a second feature may include an embodiment in which the first feature is right “on,” “above,” or “on top of” the second feature, and may also include an embodiment in which the first feature is not right “on,” “above,” or “on top of” the second feature, or just means that the first feature is at a height higher than that of the second feature. While a first feature “beneath,” “below,” or “on bottom of” a second feature may include an embodiment in which the first feature is right “beneath,” “below,” or “on bottom of” the second feature, and may also include an embodiment in which the first feature is not right “beneath,”

“below,” or “on bottom of” the second feature, or just means that the first feature is at a height lower than that of the second feature.

Reference throughout this specification to “an embodiment”, “some embodiments”, “one embodiment”, “an example”, “a specific examples”, or “some examples” means that a particular
5 feature, structure, material, or characteristic described in connection with the embodiment or example is included in at least one embodiment or example of the disclosure. Thus, the appearances of the phrases such as “in some embodiments”, “in one embodiment”, “in an embodiment”, “an example”, “a specific examples”, or “some examples” in various places throughout this specification are not necessarily referring to the same embodiment or example of the disclosure. Furthermore, the
10 particular features, structures, materials, or characteristics may be combined in any suitable manner in one or more embodiments or examples.

Although embodiments of the present disclosure have been illustrated and described above, it can be understood that, the above embodiments are exemplary, and shall not be construed to limit the present disclosure, and various changes, modifications, alternations and variations can be made to
15 above embodiments by those skilled in the art within the scope of the present disclosure.

WHAT IS CLAIMED IS:

1. A window-cleaning robot, comprising:
 - a body;
 - a vacuum suction port disposed on the body;
 - a suction detector configured to detect a vacuum suction value generated at the vacuum suction port;
 - a light-emitting assembly disposed on the body, wherein a light-emitting area of the light-emitting assembly is configured corresponding to the vacuum suction value; and
 - a controller, connected with the suction detector and the light-emitting assembly respectively and configured to light all or a part of the light-emitting area of the light-emitting assembly according to the vacuum suction value, for reminding a user.
2. The window-cleaning robot according to claim 1, wherein the light-emitting assembly comprises a plurality of indicator lamps and the plurality of indicator lamps are arranged in a ring shape, in a rectangular shape or in a triangular shape.
3. The window-cleaning robot according to claim 2, wherein the body comprises an upper cover and a transparent display frame disposed on the upper cover, and the light-emitting assembly is disposed below the transparent display frame.
4. The window-cleaning robot according to claim 2, wherein the body comprises an upper cover, the upper cover is made of transparent material, and the light-emitting assembly is disposed below the upper cover.
5. The window-cleaning robot according to claim 1 or 2, further comprising a voice reminding device,
 - wherein, the controller is further configured to control the voice reminding device to issue a voice reminder if the vacuum suction value is less than a preset threshold.

6. A method for controlling a window-cleaning robot, wherein, a light-emitting assembly is disposed on the window-cleaning robot and the method comprises:

detecting a vacuum suction value generated at a vacuum suction port of the window-cleaning robot; and

lighting all or a part of a light-emitting area of the light-emitting assembly according to the vacuum suction value, for reminding a user.

7. The method according to claim 6, wherein the light-emitting assembly comprises a plurality of indicator lamps and the plurality of indicator lamps are arranged in a ring shape, in a rectangular shape or in a triangular shape.

8. The method according to claim 7, wherein the window-cleaning robot comprises an upper cover and a transparent display frame disposed on the upper cover, and the light-emitting assembly is disposed below the transparent display frame.

9. The method according to claim 7, wherein the window-cleaning robot comprises an upper cover, the upper cover is made of transparent material, and the light-emitting assembly is disposed below the upper cover.

10. The method according to claim 6 or 7, further comprising:
controlling the window-cleaning robot to issue a voice reminder if the vacuum suction value is less than a preset threshold.

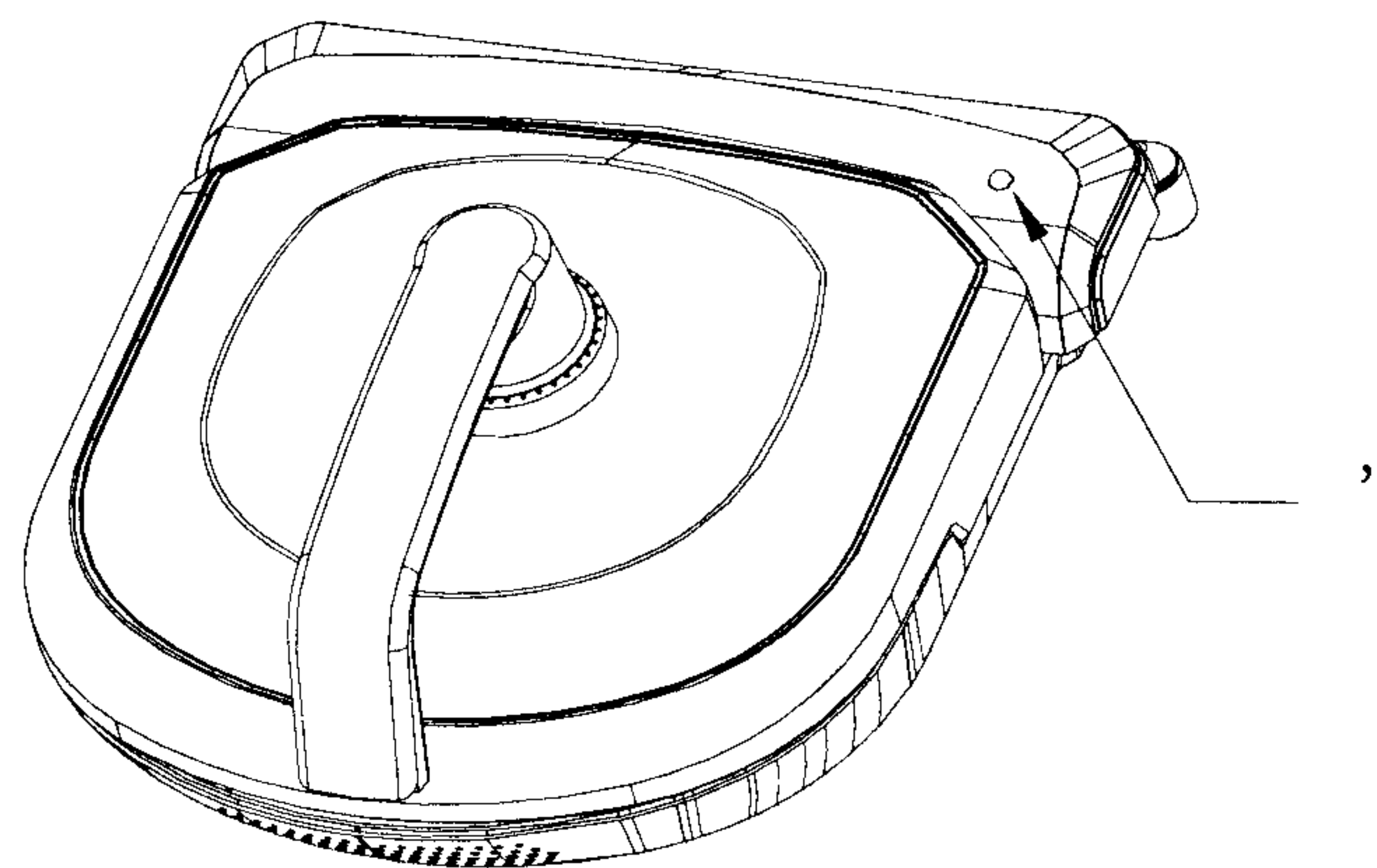


Fig. 1

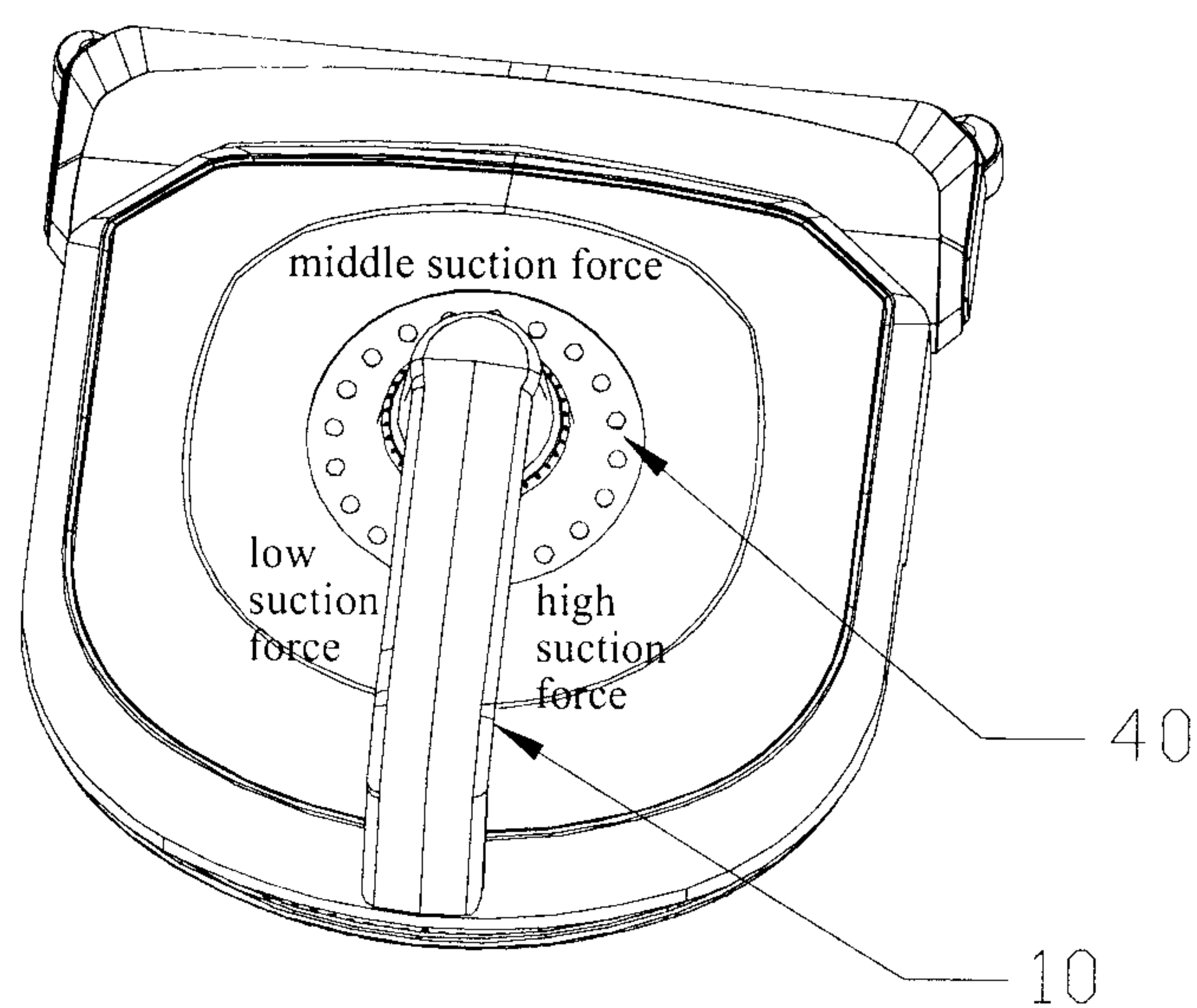


Fig. 2A

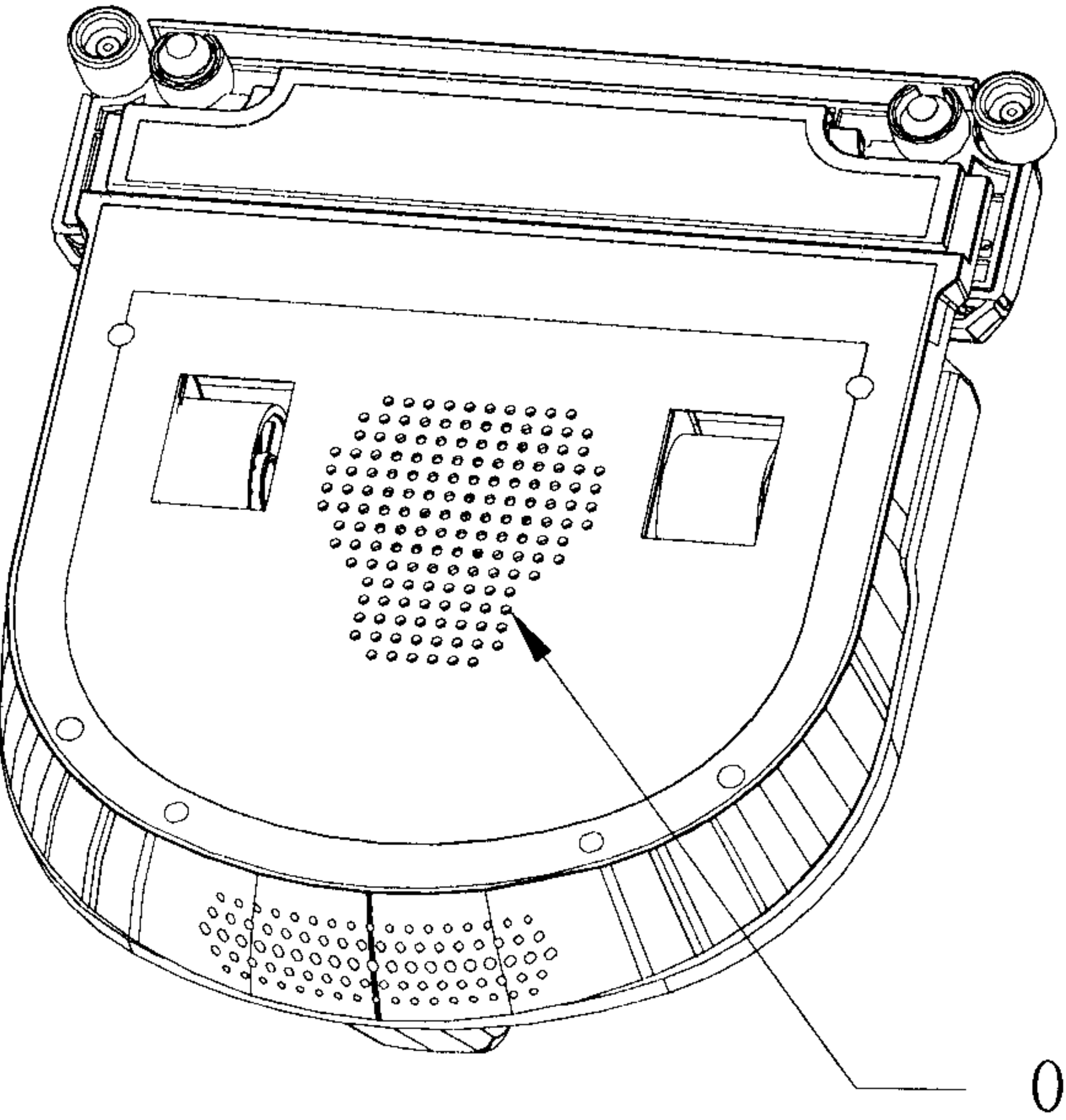


Fig. 2B

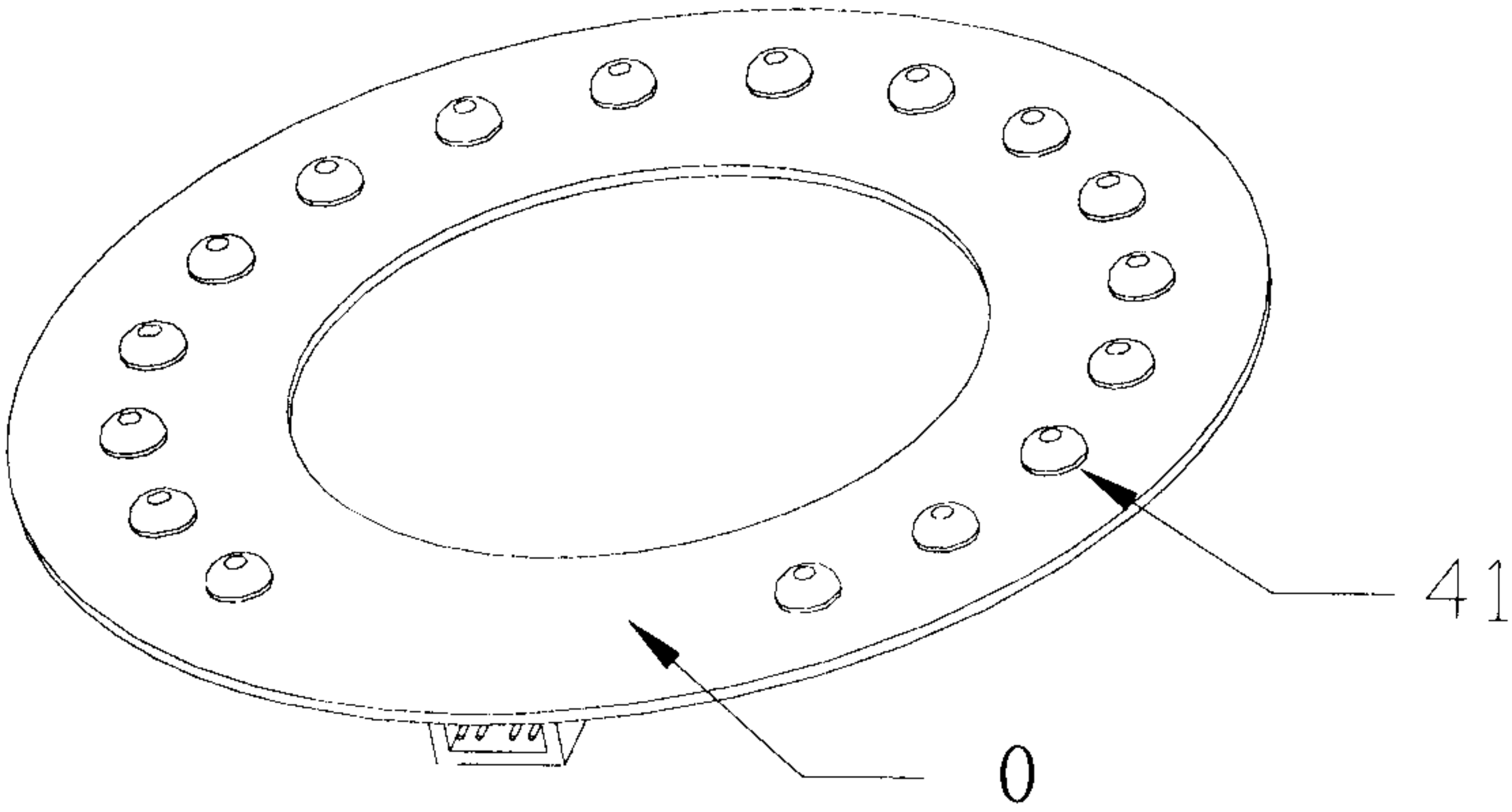


Fig. 3A

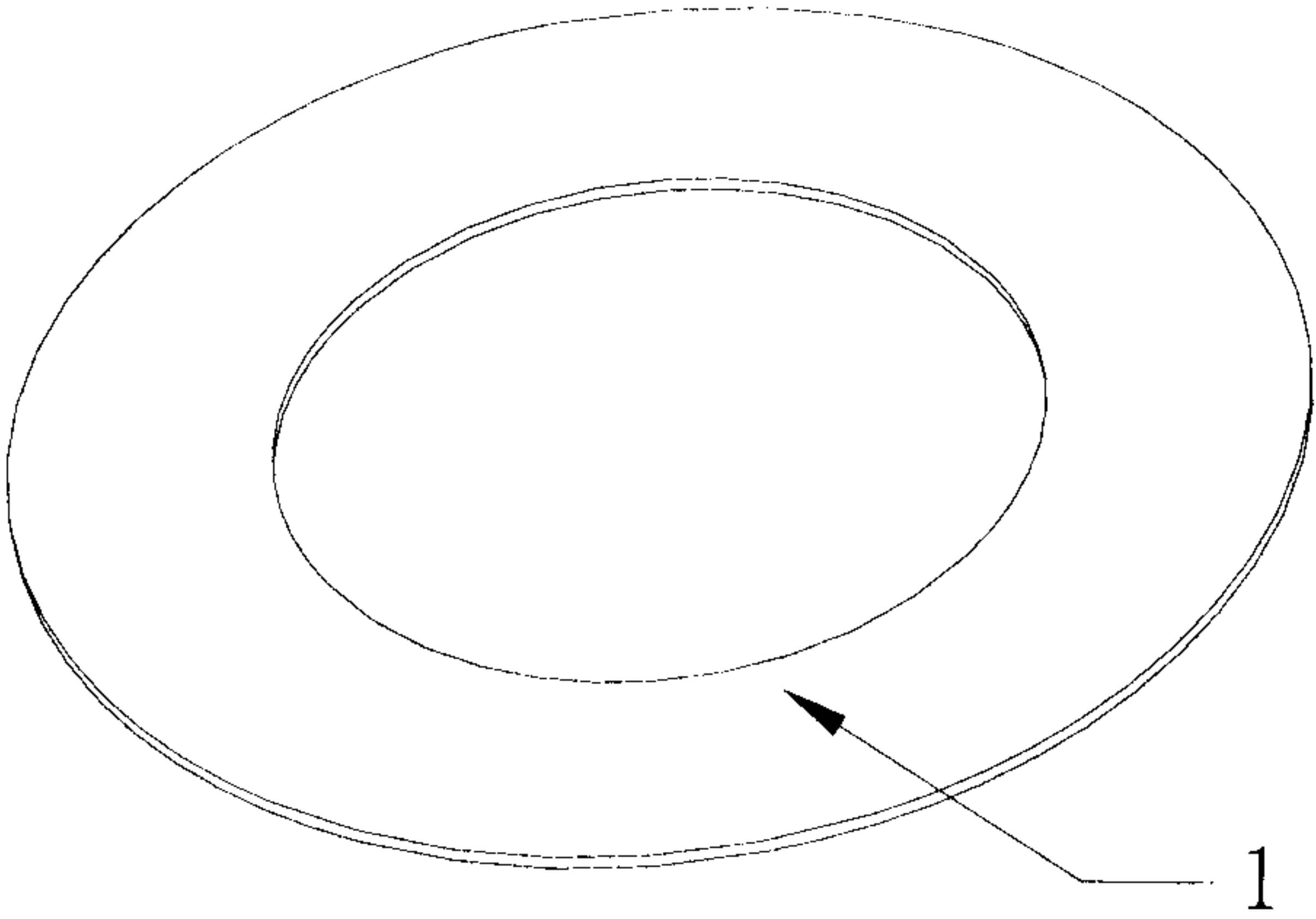


Fig. 3B

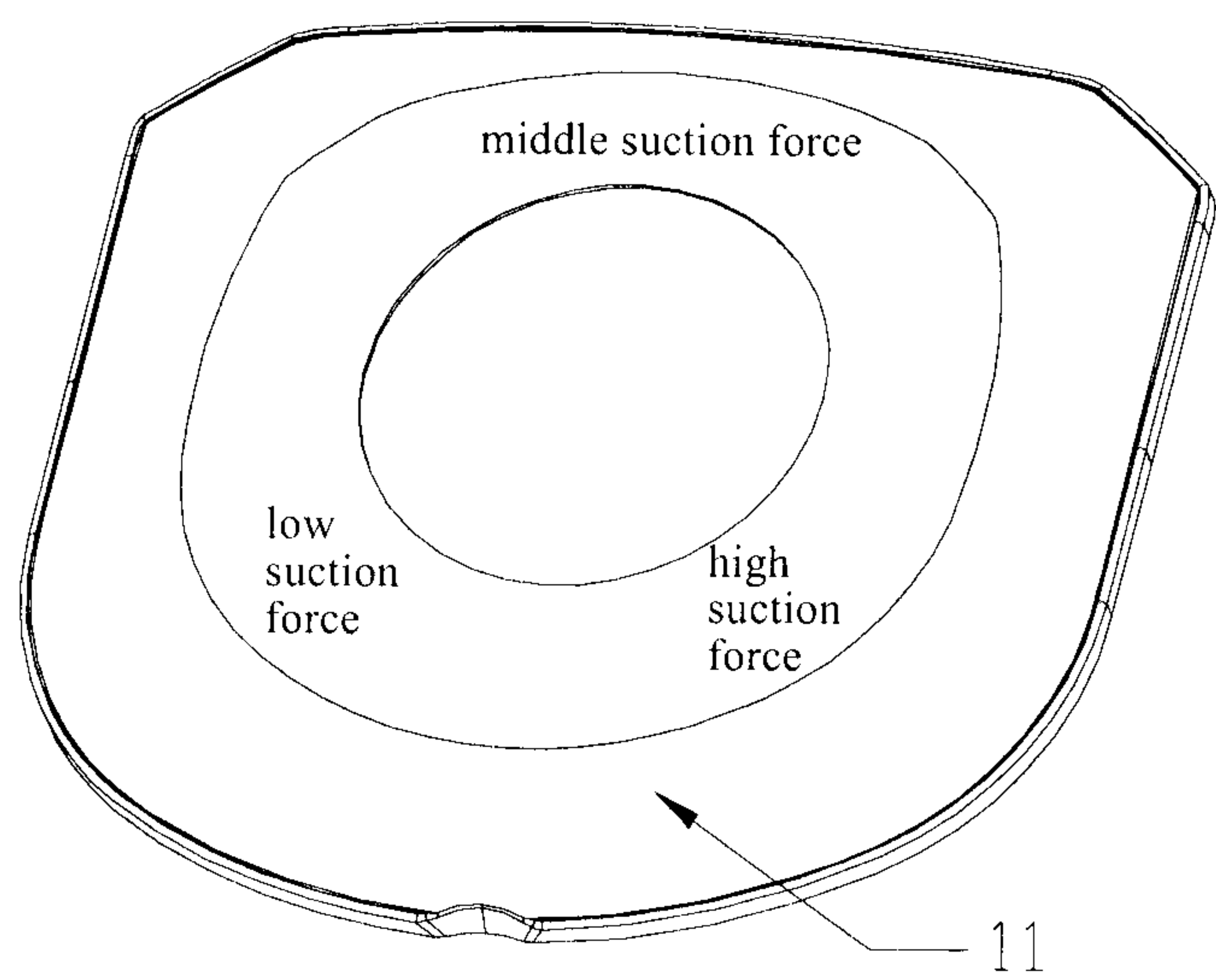


Fig. 3C

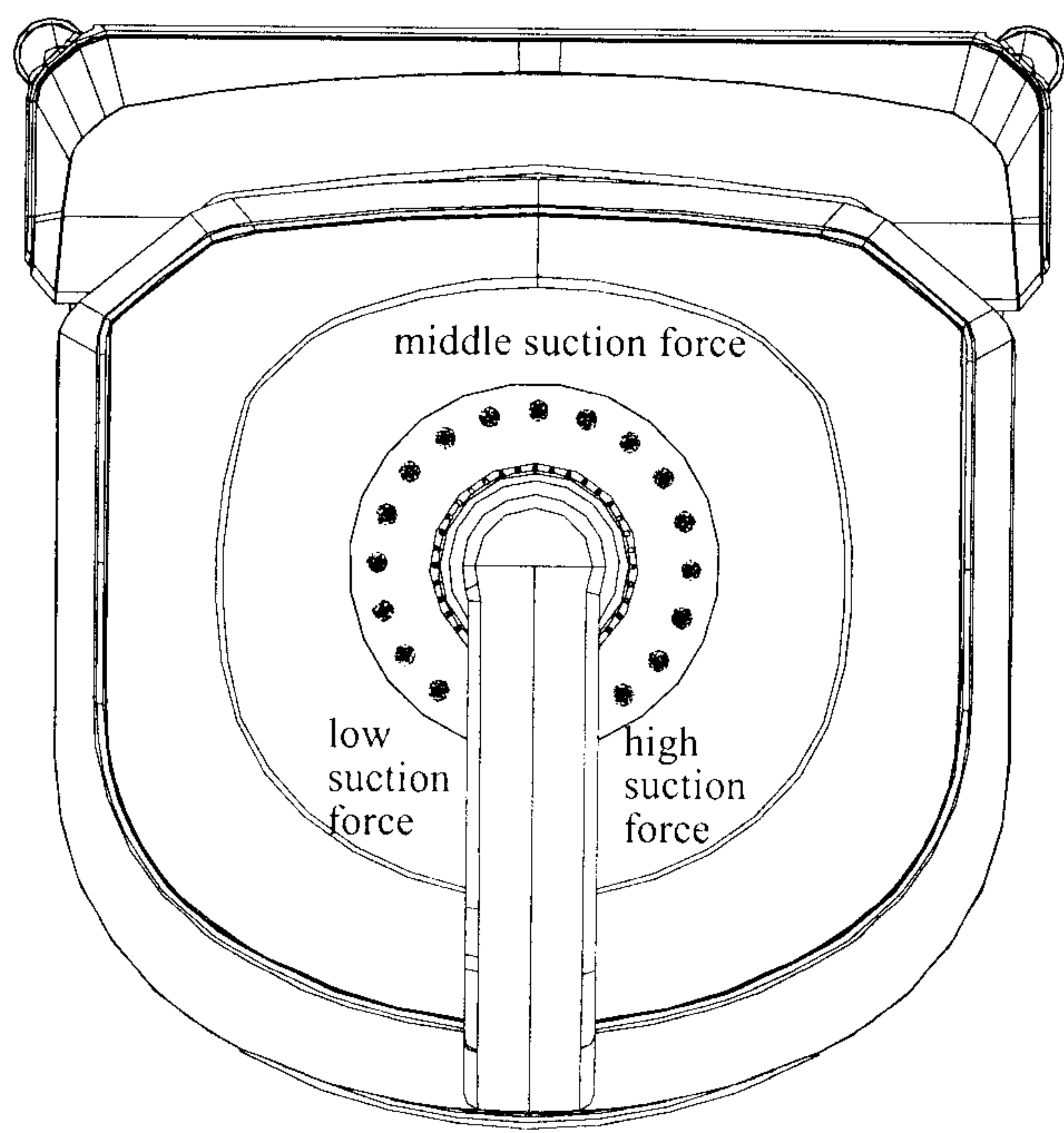


Fig. 4A

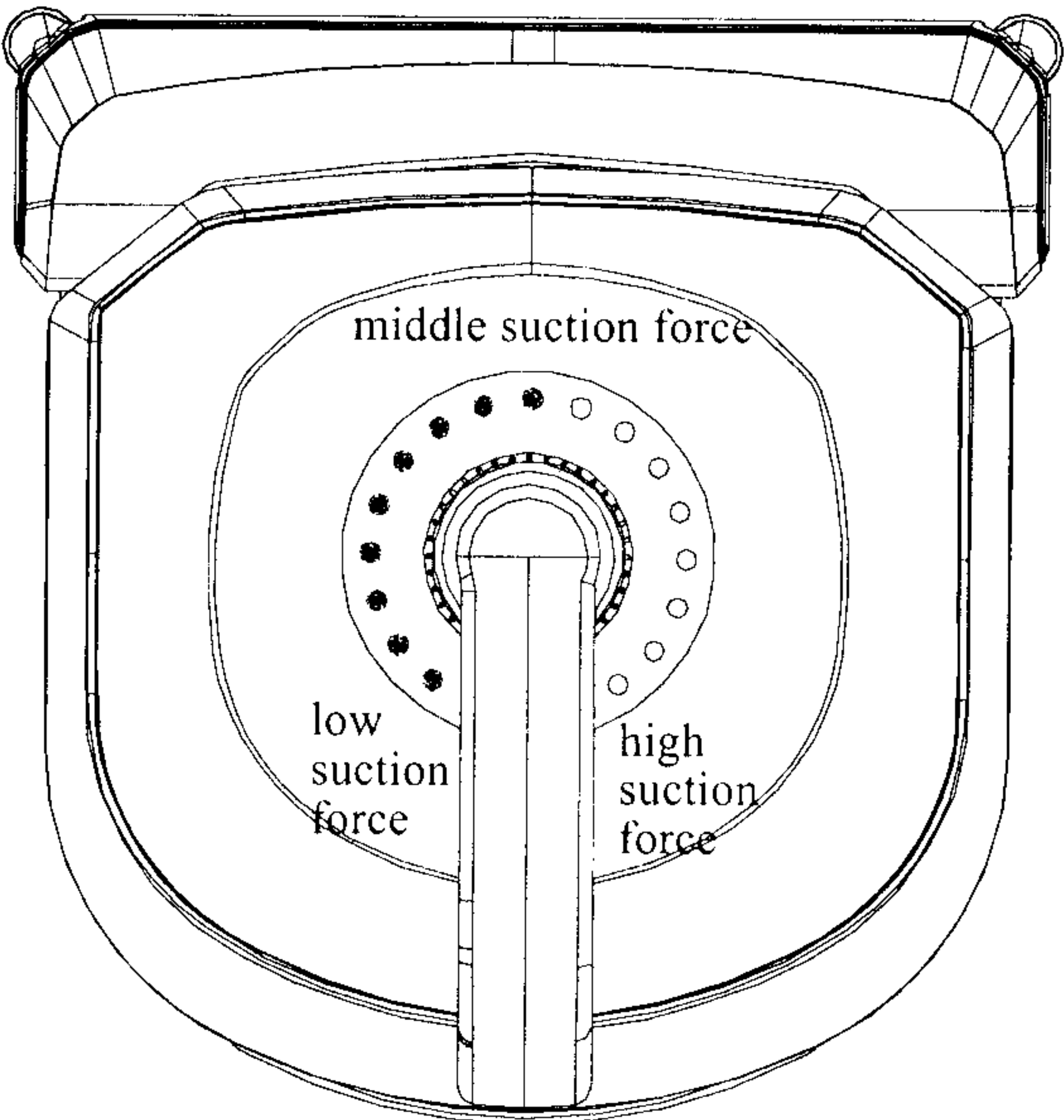


Fig. 4B

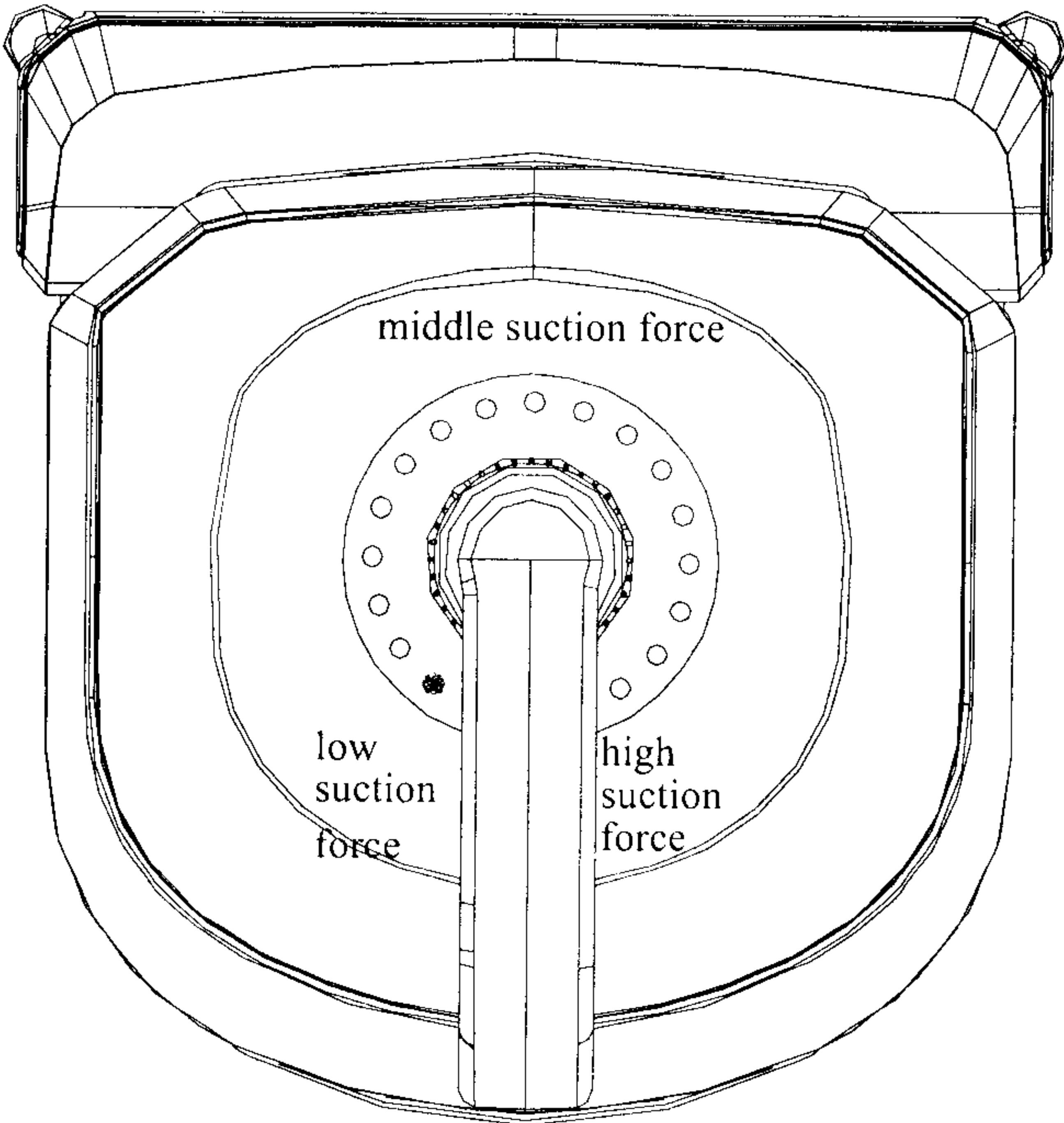


Fig. 4C

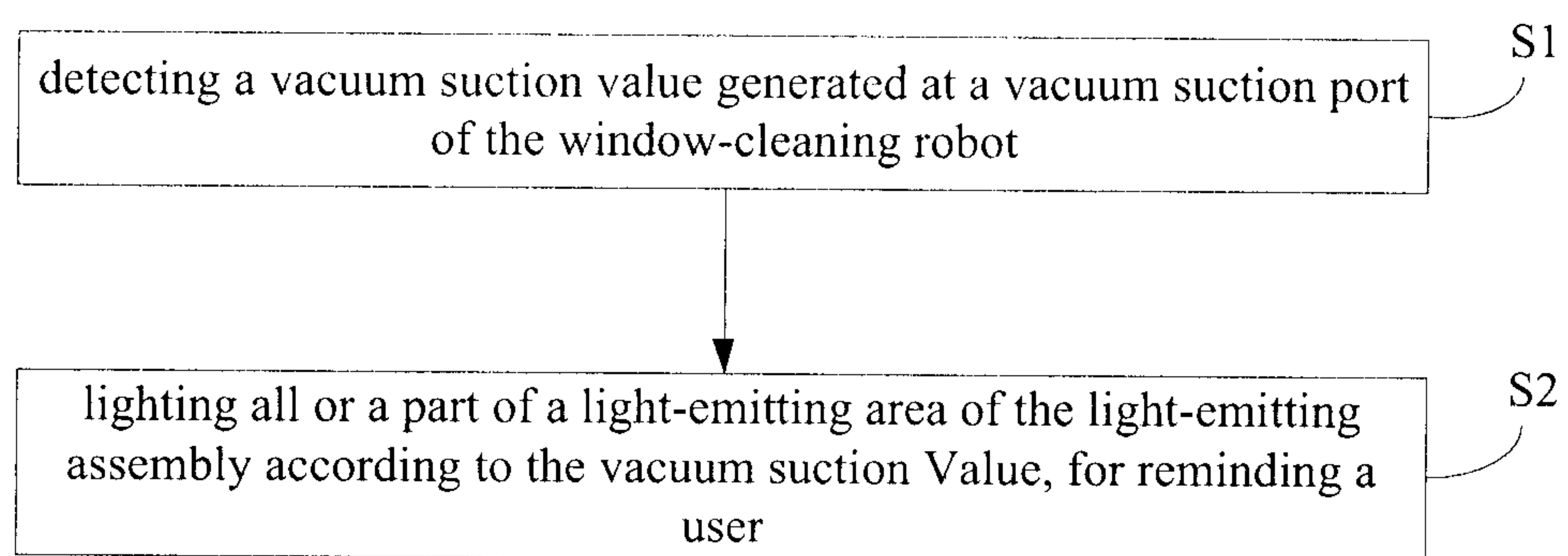


Fig. 5