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(54) **ROBOT CLEANER COMPRISING A BRUSH COVER LOCK MECHANISM**

(57) The present invention relates to a robot cleaner (1) comprising a brush cover (4) lock mechanism (5). The robot cleaner (1) comprises a body (2); a roller brush (3); a brush cover (4) detachably connected to the bottom of the body (2); and a locking mechanism (5) for locking/unlocking the brush cover (4) to/from the body (2)

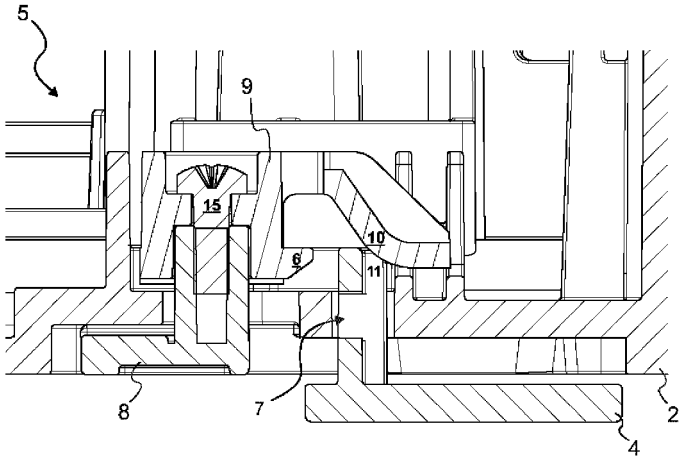


Figure 4

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## Description

### Technical Field

**[0001]** The present invention relates to a robot cleaner comprising a brush cover lock mechanism.

### Background of the Invention

**[0002]** Robot cleaners comprise a roller brush disposed in a cavity at the bottom. A brush cover with grids is mounted on the mouth of the cavity in order to protect the brush and increase cleaning performance. When there is need to take the roller brush out, such as for cleaning the brush, the cover should be demounted first. For this purpose, the brush cover is detachably mounted on the bottom of the robot cleaner body. To increase cleaning performance, robot cleaners are designed to have bases close to the surface to be cleaned, on which they move mainly in forward-rear direction. As a result of the motion and bumping with objects on the floor, the brush cover can get loose or open during cleaning, causing inconvenience for the user. Also, due limited space between the brush and the cover, it is difficult to grip and take the brush cover off from the body. Dirt accumulated on brush surface makes holding the brush cover even more inconvenient for a user.

**[0003]** In the state of the art, Chinese patent application CN203483356U discloses a vacuum cleaner comprising a rolling brush at its bottom and a rolling brush cover plate thereon. By using a locking element and a button element arranged to move in rear-forward direction, the cover plate can be locked and unlocked. In another prior art example, Chinese patent application CN210871288U discloses a robot cleaner with a rolling brush cover detachable connected to its base. The base is provided with two buckle assemblies for locking the brush cover to the base.

### Aim

**[0004]** The aim of the present invention is realization of a robot cleaner overcoming the disadvantages in the prior art in a simple and cost-effective manner. More specifically, the present invention proposes a robot cleaner wherein a brush cover is firmly secured to the base of the robot cleaner in locked state and can be conveniently removed from thereof in its unlocked state, thus increasing cleaning performance and customer satisfaction.

### Brief Description of the Invention

**[0005]** The robot cleaner realized in order to attain the aim of the present invention, defined in Claim 1 and the respective claims thereof, comprises a body, a roller brush disposed in a cavity at the bottom of the body, a brush cover detachably connected to the bottom of the body, and a locking mechanism for locking/unlocking the brush cover to/from the body. The locking mechanism comprises at least one locking hole, at least one protrusion which sits in the locking hole in locked state of the brush cover, and at least one slide button for locking and unlocking the brush cover.

**[0006]** In the preferred embodiment of the present invention, the locking mechanism further comprises a release means comprising an inclined surface, and a contact portion for abutting against the inclined surface. The release means and the contact portion are arranged such that, when the slide button is moved from a locking position to an unlocking position, the release means and the contact portion slide with respect to one another, pushing the brush cover away from the body. In this way, as the button is slid to unlock the brush cover, the brush cover is automatically made ajar and moved away from the body and the roller brush. This allows a user to hold the brush cover more easily without touching the roller brush.

**[0007]** In a preferred embodiment, the button is arranged to slide in right-left direction. Since this is perpendicular to the main moving direction (rear-front) of a robot cleaner, chances of the brush cover getting loose or open during cleaning is minimized.

**[0008]** The locking mechanism may further comprise at least one flexible arm extending from the release means and at least two seats for accommodating the free end of said arm, respectively, in locked and unlocked positions. Accordingly, the sliding parts of the locking mechanism can be hold firmly in both locked and unlocked positions without using additional biasing means such as springs. Use of arms and seats also allows a more compact locking mechanism design.

**[0009]** In preferred embodiments, the button is slidably mounted on the body. The protrusion may be disposed on a part of the locking mechanism arranged to slide with the sliding movement of the button, and the hole may be disposed on the brush cover or on an extension thereof. The release means may be disposed on a part of the locking mechanism arranged to slide with the sliding movement of the button, and the contact portion may be disposed on the brush cover or on an extension thereof. The seats may be disposed on the body, for example on an inner surface of its base. The locking mechanism may further comprise at least one stopper for limiting the sliding movement of the button in the direction of unlocking. The stopper provides additional means for limiting the sliding movement of the button, in addition to or as an alternative to arm-seat structure.

**[0010]** The release means is preferably mechanically coupled to the button to slide with the button, such that the release means remains within the body. As a result, while the button is visible and accessible from bottom of the body, the release means is not. The locking mechanism may further comprise a connecting means, such as a screw, for connecting the release means and the button. The release means and the button may also be connected via a snap-fit connection. The release means is

preferably formed as one piece with the protrusion and/or at least one flexible arm extending from the release means.

## Brief Description of the Drawings

**[0011]** The robot cleaner realized in order to attain the aim of the present invention is illustrated in the attached figures, where:

Figure 1 is a perspective view of a robot cleaner according to an embodiment of the invention,
Figure 2 is a bottom view of region A in Figure 1, without the roller brush,
Figure 3 is a section view of locking mechanism according to an embodiment of the invention, wherein the brush cover is in locked state,
Figure 4 is a section view of locking mechanism according to an embodiment of the invention, wherein the brush cover is in unlocked state,
Figure 5 is a top view of the locking mechanism from inside the body, according to an embodiment of the invention,
Figure 6 is a top view of the locking mechanism from inside the body, according to another embodiment of the invention.

## List of Parts

**[0012]** The elements illustrated in the figures are numbered as follows:

1. Robot cleaner
2. Body
3. Roller brush
4. Brush cover
5. Locking mechanism
6. Protrusion
7. Hole
8. Button
9. Release means
10. Inclined surface
11. Contact portion
12. Seat
13. Arm
14. Stopper
15. Connecting means

## Detailed Description of the Invention

**[0013]** The robot cleaner (1) comprises a body (2); a roller brush (3) disposed in a cavity at the bottom of the body (2); a brush cover (4) detachably connected to the bottom of the body (2); and a locking mechanism (5) for locking/unlocking the brush cover (4) to/from the body (2) (Figure 1). The brush cover (4) comprises grids to partly cover the opening of the cavity, to protect the roller brush (3) while allowing the roller brush (3) touch the surface to be cleaned (Figure 2). The locking mechanism (5) comprises at least one locking hole (7), at least one protrusion (6) which sits in the locking hole (7) in locked state of the brush cover (4), and at least one slide button (8) for locking and unlocking the brush cover (4). The slide button (8) is arranged to be moved with respect to the body (2) and the brush cover (4), between locking and unlocking positions.

**[0014]** In the preferred embodiment, the locking mechanism (5) further comprises a release means (9) comprising an inclined surface (10), and a contact portion (11) for abutting against the inclined surface (10). The release means (9) and the contact portion (11) are arranged such that, when the slide button (8) is moved from a locking position to an unlocking position, the release means (9) and the contact portion (11) slide with respect to one another, pushing the brush cover (4) away from the body (2).

**[0015]** One of the release means (9) and the contact portion (11) is disposed on a part of the locking mechanism (5) arranged to slide with the sliding movement of the button (8), for example on an extension of the button (8) or a part connected to the button (8), and the other is disposed on the brush cover (4), for example on an extension of the brush cover (4) or a part connected to the brush cover (4). The inclined surface (10) is inclined with respect to the sliding direction. The sliding direction is preferably parallel to the base of the body (2). While one of the release means (9) and the contact portion (11) can make a sliding motion, the other is displaced in a direction orthogonal to the sliding direction (Figures 3 and 4). The contact portion (11) is positioned to abut against the inclined surface (10) all along the sliding movement. As a result, the sliding motion of one of the inclined surface (10) and the contact portion (11) over the other during unlocking causes the brush (4) cover to be displaced away from the bottom of the body (2). In the same way, the brush cover (4) can be properly placed on the base of the body (2) by moving the button (8), hence the inclined surface (10) or the contact portion (11), in the locking direction.

**[0016]** The robot cleaner (1) preferably comprises at least two wheels extending in rear-front direction. The main direction of movement is therefore forward and rearward. The button (8) is arranged to slide in a direction perpendicular to main movement direction of the robot cleaner (1), for instance sliding in left-right direction.

**[0017]** The locking mechanism (5) further comprises at least one flexible arm (13) extending from the release means (9) and at least two seats (12) for accommodating the free end of said arm (13), respectively, in locked and unlocked positions. In preferred embodiments, there are at least two arms (13) extending from two opposite sides of the release means (9). Said arms (13) extend laterally with respect to the sliding direction (Figures 5 and 6).

**[0018]** The button (8) is slidably mounted preferably on the body (2). That is, the button (8) is fixed to the body (2) even when the brush cover (4) is removed therefrom.

Alternatively, the button (8) may be slidably mounted on the brush cover (4), being attached to and detached from the body (2) with the brush cover (4).

**[0019]** The protrusion (6) is preferably disposed on a part of the locking mechanism (5) arranged to slide with the sliding movement of the button (8), that is, directly on, on an extension of, or on a part mechanically coupled to the button (8). In this embodiment, the hole (7) is disposed on (or on an extension of) the brush cover (4). Alternatively, the hole (7) may be coupled to a sliding part and protrusion to the brush cover (4).

**[0020]** The release means (9) is preferably disposed on a part of the locking mechanism (5) arranged to slide with the sliding movement of the button (8), that is, directly on, on an extension of, or on a part mechanically coupled to the button (8). In this embodiment, the contact portion (11) is disposed on (or on an extension of) the brush cover (4). The seats (12) are disposed on the body (2). Alternatively, the contact portion (11) may be coupled to a sliding part and the release means (9) to the brush cover (4).

**[0021]** The locking mechanism (5) may further comprise at least one stopper (14) for limiting the sliding movement of the button (8) in the direction of unlocking. In some embodiments, a rectangular housing is provided on an inner surface of body (2), wherein the seats (12) are formed at the side walls of the housing and a rear wall of the housing functions as the stopper (14).

**[0022]** As shown in Figures 3 and 4, the release means (9) may be mechanically coupled to the button (8) to slide with the button (8), such that the release means (9) remains within the body (2). The locking mechanism (5) may further comprise a connecting means (15), such as a screw, for connecting the release means (9) and the button (8). When the brush cover (4) is placed properly on the cavity, the only part of the locking mechanism (5) visible and accessible from outside is the button (8) and no part of the locking mechanism (5) protrudes outwards from the bottom of the body (2).

**[0023]** The robot cleaner (1) of the present invention provides a simple and cost-effective solution for conveniently locking a cover plate (4) on the body (2), and likewise easily unlocking and removing the cover plate (4) therefrom. Owing to the inclined surface (10) and the contact portion (11) as described herein, the sliding movement of the button (8) in locking direction provides a concurrent locking and placement of the brush cover (4), whereas the sliding movement of the button (8) in unlocking position provides a concurrent unlocking and displacement of the brush cover (4) for a more convenient removal of the same.

## Claims

1. A robot cleaner (1) comprising a body (2); a roller brush (3) disposed in a cavity at the bottom of the body (2); a brush cover (4) detachably connected to the bottom of the body (2); and a locking mechanism (5) for locking/unlocking the brush cover (4) to/from the body (2); wherein the locking mechanism (5) comprises at least one locking hole (7), at least one protrusion (6) which sits in the locking hole (7) in locked state of the brush cover (4), and at least one slide button (8) for locking and unlocking the brush cover (4); **characterised in that** the locking mechanism (5) further comprises a release means (9) comprising an inclined surface (10), and a contact portion (11) for abutting against the inclined surface (10), wherein the release means (9) and the contact portion (11) are arranged such that, when the slide button (8) is moved from a locking position to an unlocking position, the release means (9) and the contact portion (11) slide with respect to one another, pushing the brush cover (4) away from the body (2).

2. The robot cleaner (1) according to claim 1, wherein the button (8) is arranged to slide in right-left direction.

3. The robot cleaner (1) according to claim 1 or 2, wherein the locking mechanism (5) further comprises at least one flexible arm (13) extending from the release means (9) and at least two seats (12) for accommodating the free end of said arm (13), respectively, in locked and unlocked positions.

4. The robot cleaner (1) according to any one of preceding claims, wherein the button (8) is slidably mounted on the body (2).

5. The robot cleaner (1) according to claim 4, wherein the protrusion (6) is disposed on a part of the locking mechanism (5) arranged to slide with the sliding movement of the button (8), and the hole (7) is disposed on the brush cover (4).

6. The robot cleaner (1) according to claim 4 or 5, wherein the release means (9) is disposed on a part of the locking mechanism (5) arranged to slide with the sliding movement of the button (8), and the contact portion (11) is disposed on the brush cover (4).

7. The robot cleaner (1) according to claim 6, when dependent on claim 3, wherein the seats (12) are disposed on the body (2).

8. The robot cleaner (1) according to claim 7, wherein the locking mechanism (5) further comprises at least one stopper (14) for limiting the sliding movement of the button (8) in the direction of unlocking.

9. The robot cleaner (1) according to any one of preceding claims, wherein the release means (9) is mechanically coupled to the button (8) to slide with the button (8), such that the release means (9) remains

within the body (2).

**10.** The robot cleaner (1) according to claim 9, wherein the locking mechanism (5) further comprises a connecting means (15) for connecting the release means (9) and the button (8).

**11.** The robot cleaner (1) according to claim 9 or 10, wherein the release means (9) is formed as one piece with the protrusion (6) and/or at least one flexible arm (13) extending from the release means (9).

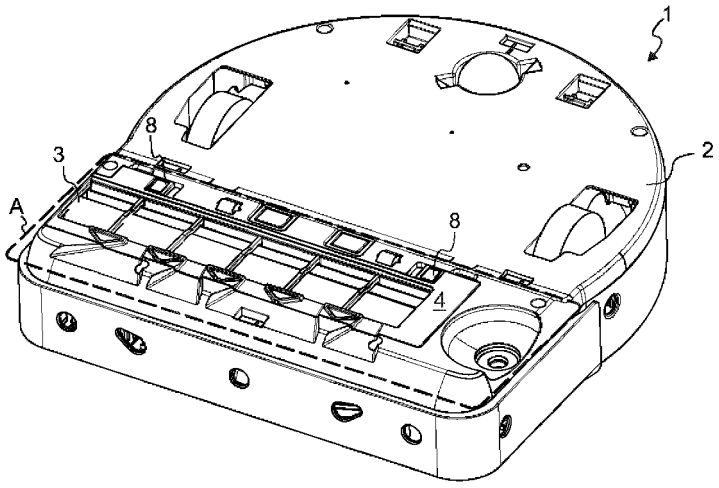


Figure 1

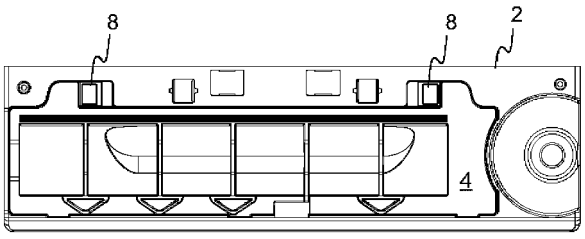


Figure 2

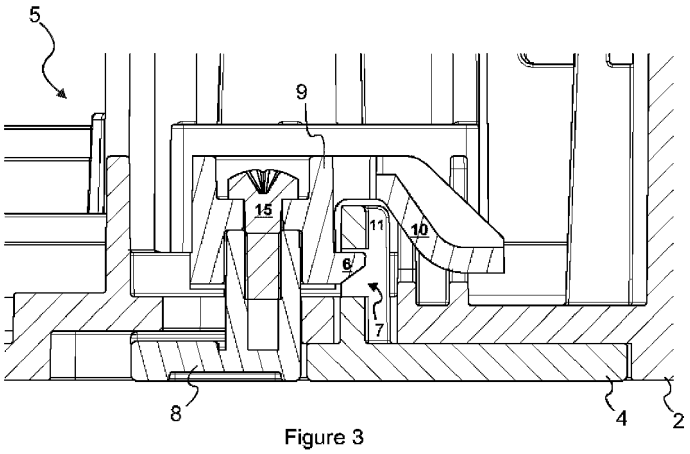


Figure 3

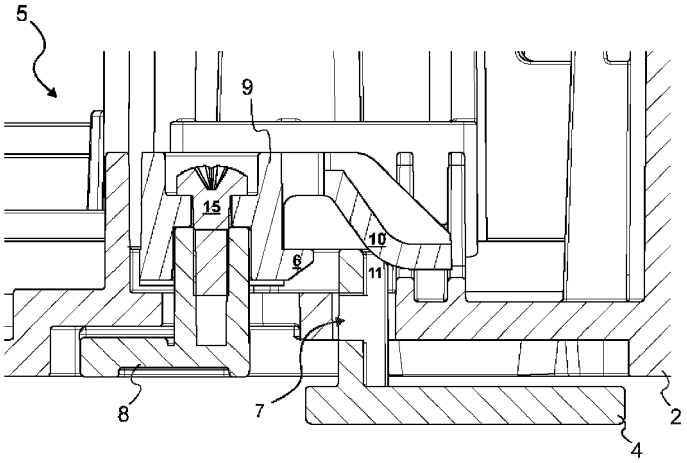


Figure 4

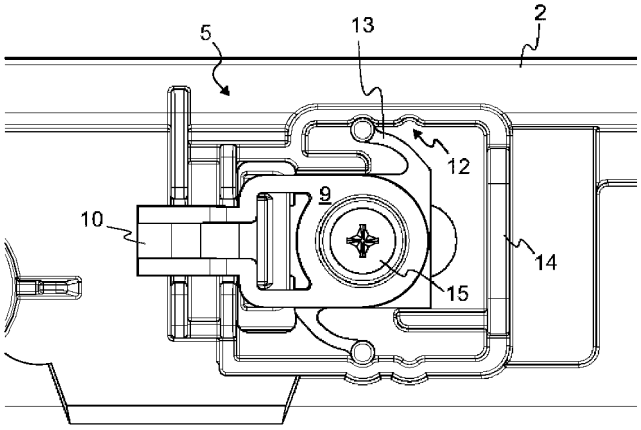


Figure 5

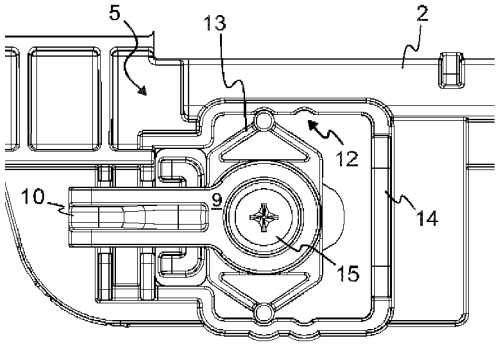


Figure 6

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# EUROPEAN SEARCH REPORT

Application Number
EP 22 15 8715

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
|---|---|---|---|
| A,D | CN 210 871 288 U (SUZHOU DIBEI ELECTRICAL TECHNOLOGY CO) 30 June 2020 (2020-06-30)<br>* figures 1-4 * | 1-11 | INV.<br>A47L9/04<br>A47L9/06 |
| A | EP 2 954 814 A1 (PANASONIC IP MAN CO LTD [JP]) 16 December 2015 (2015-12-16)<br>* paragraphs [0013] - [0017] * | 1-11 | |

TECHNICAL FIELDS SEARCHED (IPC)

A47L

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| Munich | 17 August 2022 | Eckenschwiller, A |

CATEGORY OF CITED DOCUMENTS

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## REFERENCES CITED IN THE DESCRIPTION

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