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(54) **INTELLIGENT TOILET CAPABLE OF AUTOMATICALLY RISING COVER AND SEAT BY RECOGNIZING HUMAN BODY FEATURE**

(57) The invention discloses an intelligent toilet capable of automatically rising cover and seat by recognizing human body feature, which comprising a cover, a seat and a rear box, wherein a human identification device is provided in said rear box, said human identification device comprises a body feature detecting unit, said body feature detecting unit comprises a camera; said feature detecting unit is connected to a feature tracking unit, and

then is connected a feature comparing unit; the memory unit is connected to the feature comparing unit, feature comparing unit is connected to a control unit, and the control unit is connected a drive mechanism for controlling the seat/cover; said feature detecting unit can detect the user is front to the toilet, back to the toilet or leave from the toilet.

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Description

Field of the invention

[0001] The invention relates to an intelligent toilet, in particular to an intelligent toilet capable of automatically rising cover and seat by recognizing human body feature.

Background of the invention

[0002] With the development of economy and the improvement of people's living standard, the intelligent automation of electronic toilet is becoming more and more high, automatic flip function is one example of electronic toilet automation. Today, on the market there are a lot of automatic flip device used in electronic toilet, it is provided with automatic flip through the sensor, when someone close to the toilet, the sensor feedback signal to control the motor with reduction gear movement to drive the electronic toilet cover being opened automatically. But when the cover is opened, the seat can not be opened automatically, the seat is opened by manual button or remote. i.e. most automatic flip devices just can automatically open the cover, and can not achieve more functions, thus can not meet more needs of the population.

Summary of the invention

[0003] The primary object of the invention is to provide an intelligent toilet capable of automatically rising cover and seat by recognizing human body feature. by using device of recognizing human body feature, it can induce the human body, and judge whether the user is front to or back to the toilet, then automatically lift cover and/or seat, so as to meet the demands of humans.

[0004] The object of the invention is achieved by providing:

an intelligent toilet capable of automatically rising cover and seat by recognizing human body feature, comprises a cover, a seat and a rear box, wherein a human identification device is provided in said rear box, said human identification device comprises a body feature detecting unit, said body feature detecting unit comprises a camera; said feature detecting unit is connected to a feature tracking unit, and then is connected a feature comparing unit; the memory unit is connected to the feature comparing unit, feature comparing unit is connected to a control unit, and the control unit is connected to a drive mechanism for controlling the seat/cover; said feature detecting unit can detect the user is front to the toilet, back to the toilet or leave from the toilet.

[0005] In a preferred embodiment, said drive mechanism is gear box.

[0006] In a preferred embodiment, said human identification device also comprises a detection window, when

both the cover and the seat are covered, or only the cover is lift up, or both the cover and the seat are lift, at least a part of the detection window is exposed.

[0007] The method for using an intelligent toilet capable of automatically rising cover and seat by recognizing human body feature, comprising the following steps:

- 1) the user close to the toilet;
- 2) the body feature detecting unit of the toilet capture the human action or morphology feature through the camera, the method of detecting body comprising reference template, rules, samples, skin color; the captured human action or morphology feature is dynamically tracked by the feature tracking unit;
- 3) the features captured by feature tracking unit feature is input to feature comparing unit, then compared by memory unit, and the results is input to the control unit, the control unit controls the operation of the driving mechanism, and then control the operation of the seat/cover:

When the user is facing to and close to the toilet, the feature comparing unit can judge that human body is facing the toilet, both the cover and the seat will be turned up; if the user returned and is back to the toilet, the feature comparing unit can judge that the human body is back to the toilet seat cover, the seat is laid down;

When the user is back to and close to the toilet, the feature comparing unit can judge that the human body is back to the toilet, the cover is raise, while the seat is not moved; when the user is turned and facing to the toilet, the feature comparing unit can judge that the human body is facing the toilet, then the seat is turned up; After using, the feature comparing unit judge that the user is left, then the seat and the cover automatically laid down within a certain period of time.

[0008] In a preferred embodiment, said detecting unit further comprising a foot pressure sensing device which can identify whether the human body is facing to or back to the ceramic body of the toilet;

The cover and the seat are laid down in the initial state;

When the human body moves towards the toilet seat and stands on the foot pressure sensing device, the control unit will detects and judges through the pressure sensor based on the foot pressure sensing device

A, the human body is facing the toilet, then the control unit issued a signal to make the cover and the seat turned up simultaneously by the driving mechanism, when the user is turned, the control unit judged that the human body is back to the toilet, the seat is laid

down. After the using; the foot pressure sensing device sense no pressure, the control unit sends out a signal, the seat and the cover automatically laid down within a certain period of time;

B, the human body is back to the toilet, then the control unit issued a signal to let the cover turned up by the driving mechanism, while the seat no action; when the body turned, the control unit judged that the human body is facing the toilet, the seat turned up; after using, After the using; the foot pressure sensing device sense no pressure, the control unit sends out a signal, the seat and the cover automatically laid down within a certain period of time;

In a preferred embodiment of the present invention, in order to avoid misuse, the toilet is set that it started to rise up the cover and the seat when the human body rests on the foot pressure sensing device for more than a set value time.

[0009] In a preferred embodiment of the present invention, the set value is 5-10s.

[0010] In a preferred embodiment of the present invention, the foot pressure sensing device is preferably disposed on the side and/or front of the toilet ceramic body.

[0011] In a preferred embodiment of the invention, The intelligent toilet capable of automatically rising cover and seat by recognizing human body feature according to claim 5, wherein said foot pressure sensing device judging that the human body facing or back to the toilet, is by that whether the human foot palm is face or back to the toilet the toilet based on the load distribution.

[0012] In other preferred embodiment of the invention, wherein the foot pressure sensing device judging that the human body is facing or back to the toilet, is by the human foot palm is face or back to the toilet based on the number and location of compression area of the pressure sensor.

[0013] A method for using an intelligent toilet capable of automatically rising cover and seat by recognizing human body feature, comprising:

The cover and the seat are laid down in the initial state;

When the human body moves towards the toilet seat and stands on the foot pressure sensing device, the control unit will detects and judges through the pressure sensor based on the foot pressure sensing device

A, the human body is facing the toilet, then the control unit issued a signal to make the cover and the seat turned up simultaneously by the driving mechanism, when the user is turned, the control unit judged that the human body is back to the toilet, the seat is laid down. After the using; the foot pressure sensing device sense no pressure, the control unit sends out a signal, the seat and the cover automatically laid down within a certain period of time;

B, the human body is back to the toilet, then the con-

trol unit issued a signal to let the cover turned up by the driving mechanism, while the seat had no action; when the body turned, the control unit judged that the human body is facing the toilet, the seat turned up; after using, After the using; the foot pressure sensing device sense no pressure, the control unit sends out a signal, the seat and the cover automatically laid down within a certain period of time;

The invention provided a human body feature recognition device on the toilet, which can be used for image acquisition to capture the human body characteristics, such as the facial features, the features of the back of the head, the characteristics of the limbs and the like. And a human body characteristic database is established in the device, whether the user is front or back to the toilet can be judged by the comparison of the image capture and the database. When a person is close to the toilet, the human body feature recognition device automatically induces the human body is close, and the internal program sends a command to control the driving mechanism to run, then the cover and the seat can be opened automatically both or just open the cover only. After using, the human body feature recognition device judge that the user is left, the seat and cover laid down automatically within a certain period of time.

[0014] In another embodiment of the present invention, and the invention provided with foot pressure sensing device to determine the human body is facing or back to the toilet, thus to judge the user is want to have a piss or have a bowel movement, and then decide whether to lift the seat or cover down.

Brief description of the drawings

[0015]

Figure 1 is the perspective view that the cover is laid down in embodiment 1;

Figure 2 is the perspective view that both the cover and the seat are raise in embodiment 1;

Figure 3 is the perspective view that the cover is raise while the seat is laid down in embodiment 1;

Figure 4 is the schematic diagram of the present invention

- 1- human body feature recognition device
- 10- recognition window 11-camera 12-feature detecting unit 13-feature tracking unit 14- feature comparing unit 15- memory 16-control unit 17-driving mechanism
- 2- cover 21- cover window
- 3- seat 31- seat window
- 4- rear box

Fig. 5 is a perspective view of the toilet in embodiment 2;

Figure 6 is the structure of the foot pressure sensor in embodiment 2;

Figure 7 is a status view when the foot pressure sensing device which is subjected to the pressure of the human body in embodiment 2

Figure 8 is an example of the principle of the foot pressure sensing device. in embodiment 2

100- cover

200- seat

300- foot pressure sensing device 310- film layer

320- pressure sensitive material layer 330- conductive electrode 311-row conductive electrodes 312 column conducting electrodes 321

pressure sensitive sensor being pressured 322

pressure sensitive sensor not being pressured

400- control unit

Preferred embodiments of the invention

Embodiment 1

[0016] As shown in Figure 1-3, an intelligent toilet capable of automatically rising cover and seat by recognizing human body feature, comprises a cover 2, a seat 3 and a rear box, wherein the rear box 4 is disposed at the bottom of the back end of the seat 4. At the back end of the seat 3, the front side of the rear box 4 is provided with a human body feature recognition device 1.

wherein, the human body feature recognition device 1 comprised a detection window 10, in this embodiment, the recognition window 10 is made of transparent material, the upper part of the detection window 10 is 3-5cm higher than the upper surface of the cover 2, thus when the cover is laid down, the recognition window 10 can not to be covered. The back end of the cover is provided with a cover window 21, and the rear end of the seat 3 is provided with a seat window. When both the cover and the seat are lift up, the lower part of the detection window 10 will not be covered, because of the existence of the cover window 21 and the seat window 31. When the cover is turned over and the seat is laid down, the detection window 10 will not be covered also. As shown in Figure 4, the human body feature recognition device 1 comprises a camera 11, which is mounted on rear side of the detection window 10. The camera 11 is connected with the feature detecting unit 12, said feature detecting unit can use the reference template, rules, sample learning, skin model etc. to detect human body feature; feature detecting unit 12 is connected to the feature tracking unit 13, and then is connected with the human feature comparing unit 14.

[0017] The memory 15 is connected to the feature comparing unit 14, the morphological parameters are provided in memory 15, such as morphological parameters including body front, back, movement and so on, the feature comparing unit 14 connected to a control unit 16, and the control unit 16 connected to a driving mechanism

17, to control the movement of the seat and cover by the driving mechanism 17.

[0018] The work step of the invention is as follows:

5 When the user is close to the toilet, the human body feature recognition device 1 on the rear box will capture body movements or morphology by the camera 11 and the feature detecting unit 12, feature tracking unit 13 input the captured features into the feature comparing unit, and then compared by the memory 15, the result is input to the control unit 16, the control unit 16 controls the driving mechanism 17, then control the seat 3 and the cover operation. In this embodiment, the driving mechanism is a gear box. In other embodiments, it can also be a hydraulic mechanism, etc..

[0019] At the initial position, both the cover 2 and the seat 3 are covered on the toilet body. When the user is facing and close to the toilet, both the seat 3 and cover 2 are turn up at the same time; when the user is near enough to the toilet, if the user is facing the toilet, human body feature recognition device 1 collected the characteristic information of the user, judged that the human body is facing the toilet, the seat 3 does not move. When the human body is turned, human body feature recognition device 1 judges that the user is back to the toilet, and the seat 3 is laid down. After using, the human body feature recognition device 1 judge that the user is left, the seat 3 and the cover 2 laid down automatically within a certain period of time.

[0020] In another case, when the user is back towards the toilet, the feature comparing unit judges that the user is back to the toilet, the cover is raise and the seat 3 does not move. When the human body is turned, human body feature recognition device 1 judges that the user is facing to the toilet, and the seat 3 is raise. After using, the human body feature recognition device 1 judge that the user is left, the seat 3 and the cover 2 laid down automatically within a certain period of time.

Embodiment 2

[0021] Refer to figure 5, the intelligent toilet capable of automatically rising cover and seat by recognizing human body feature comprises a cover 100, a seat 200 and a foot pressure sensing device 300, and a control unit 400 is arranged at the rear part of the seat 200. In the present embodiment, the human body feature detection unit 12 in embodiment 1 is further comprises the foot pressure sensing device 300. In the present embodiment, the camera can be used or not.

[0022] The foot pressure sensing device 300 is provided with a U shaped groove, thus the foot pressure sensing device 300 can be arranged on the front and the side of the ceramic body of the toilet, as shown in figure 5. In other embodiments, the invention can only be laid in front of the toilet body 500.

[0023] Refer to figure 6, the foot pressure sensing device 300 comprises: an upper film layer 310 on the upper surface, a pressure sensitive material layer 320 in the middle, and a lower film layer 330 located on the lower surface. Wherein, the lower surface of the upper thin film layer 310 is provided with a plurality of pressure sensor 340 which are arranged in parallel, and the upper surface of the lower film layer 350 is provided with a plurality of pressure sensor which is arranged in parallel. Refer to figure 4, the pressure sensitive sensors adjacent to each other in row on upper thin film layer 310 is connected with the row conducting electrodes 311, the upper and the lower pressure sensors are connected with the column conductive electrode 312. The lower film layer 330 is also set.

[0024] Referring to Fig 7, pressure sensitive material layer 320 is provided with multi parallel rows of pressure sensitive sensor, each row includes a plurality of spaced pressure-sensitive sensor 322, each pressure sensitive sensor connected to its adjacent(left, right, before and rear) sensitive sensor, to form into a grid shape. foot pressure sensing device 300 can induce the human body pressure distribution on the station status, referring to Fig 8, the induction principle is: the sensor pressure value detection can be proceed by the scanning detection circuit. Scan conventions: columns are set as switch control columns, rows are set as pressure scan line. When a column switch is connected and the remaining columns electrodes are in off state, connected a row of electronic switch, and the remaining rows are shut off; then the sensor electrode row in connected status is in the detection circuit, so that the sensor resistance change of the contact surface can be detect through the scanning detection circuit, namely the pressure value of the foot. Maintain the connected state of the column, and then the row afore is disconnected, the next row of electronic switch is connected, scan the corresponding point sensor resistance, and so on, until the last row. Then disconnect the previous column, connected the next column, and then repeat the scan in the above manner. Through the open and connected scanning of the row and column, the change of the resistance value of each sensor on the whole pressure sensor is detected, thus the pressure value and the pressure distribution of the sole can be measured.

[0025] According to ergonomics, the pressures bear by foot palm and heel are different in human normal standing, the pressure bear by foot palm is greater than the heel pressure. The pressure information of each pressure-sensitive sensor is transfer to the control unit 400 by pressure sensitive material layer 320, according to the analysis of the pressure sensor location and compression area of the foot pressure sensing device 300, the control unit 400 judge that human foot palm is towards to the toilet or backwards to the toilet, thus to judge that whether the user is towards to the toilet or backwards to the toilet.

[0026] In another embodiment, because the area of the foot palm is bigger than the area of the heel, according

to the number and locations of compression pressure areas of pressure sensor, control unit can calculate human foot palm is towards to the toilet or backwards to the toilet, thus to judge that whether the user is towards to the toilet or backwards to the toilet.

[0027] The film layer has the functions of insulation protection, wear resistance and water resistance, and also plaid s a role in the fixing of electrode and pressure sensitive material layer.

[0028] The invention may be summarized as follows: The invention discloses an intelligent toilet capable of automatically rising cover and seat by recognizing human body feature, which comprising a cover, a seat and a rear box, wherein a human identification device is provided in said rear box, said human identification device comprises a body feature detecting unit, said body feature detecting unit comprises a camera; said feature detecting unit is connected to a feature tracking unit, and then is connected a feature comparing unit; the memory unit is connected to the feature comparing unit, feature comparing unit is connected to a control unit, and the control unit is connected a drive mechanism for controlling the seat/cover; said feature detecting unit can detect the user is front to the toilet, back to the toilet or leave from the toilet.

Claims

1. Intelligent toilet capable of automatically rising cover and seat by recognizing human body feature, comprising a cover, a seat and a rear box, wherein a human identification device is provided in said rear box, said human identification device comprises a body feature detecting unit, said body feature detecting unit comprises a camera; said feature detecting unit is connected to a feature tracking unit, and then is connected a feature comparing unit; a memory unit is connected to the feature comparing unit, said feature comparing unit is connected to a control unit, and said control unit is connected to a drive mechanism for controlling the seat/cover; said feature detecting unit can detect the user is front to the toilet, back to the toilet or leave from the toilet.
2. The intelligent toilet capable of automatically rising cover and seat by recognizing human body feature according to claim 1, wherein said drive mechanism is gear box.
3. The intelligent toilet capable of automatically rising cover and seat by recognizing human body feature according to claim 1 and/or 2, wherein said human identification device also comprising a detection window, when both the cover and the seat are covered, or only the cover is raise, or both the cover and the seat are raise, at least a part of the detection window is exposed.

4. The method for using an intelligent toilet capable of automatically lifting cover and seat by recognizing human body feature, in particular, according to any one or more of claims 1 to 3, comprising the following steps:

1) the user close to the toilet;
 2) the body feature detecting unit of the toilet capture the human action or morphology feature through the camera, the method of detecting body comprising reference template, rules, samples, skin color; the captured human action or morphology feature is dynamically tracked by the feature tracking unit;
 3) the features captured by feature tracking unit feature is input to feature comparing unit, then compared by memory unit, and the results is input to the control unit, the control unit controls the operation of the driving mechanism, and then control the operation of the seat/cover:

if the user is facing to and close to the toilet, the feature comparing unit can judge that human body is facing the toilet, both the cover and the seat will be turned up; if the user returned and is back to the toilet, the feature comparing unit can judge, that the human body is backward to the toilet, the seat is laid down;

if the user is back to and close to the toilet, the feature comparing unit can judge that the human body is back to the toilet, the cover is raise, while the seat is not moved; when the user is turned and facing to the toilet, the feature comparing unit can judge that the human body is facing to the toilet, then the seat is turned up; after using, the feature comparing unit judge that the user is left, then the seat and the cover automatically laid down within a certain period of time.

5. The intelligent toilet capable of automatically rising cover and seat by recognizing human body feature according to any one or more of claims 1 to 4, wherein said detecting unit further comprising a foot pressure sensing device which can identify whether the human body is facing to or back to the ceramic body of the toilet;
 the cover and the seat are laid down in the initial state;
 if the human body moves towards the toilet and stands on the foot pressure sensing device, the control unit will detects and judges through the pressure sensor based on the foot pressure sensing device:

A, the human body is facing the toilet, then the control unit issued a signal to make the cover

and the seat turned up simultaneously by the driving mechanism, when the user is turned, the control unit (4) judged that the human body is back to the toilet, the seat is laid down; after the using; the foot pressure sensing device sense no pressure, the control unit sends out a signal, and then the seat and the cover automatically laid down within a certain period of time;

B, the human body is back to the toilet, then the control unit issued a signal to let the cover turned up by the driving mechanism, while the seat no action; when the body turned, the control unit judged that the human body is facing the toilet, the seat turned up; after using, the foot pressure sensing device sense no pressure, the control unit sends out a signal, the seat and the cover automatically laid down within a certain period of time.

6. The intelligent toilet capable of automatically rising cover and seat by recognizing human body feature according to claim 5, wherein said foot pressure sensing device judging that the human body facing or back to the toilet, is by that whether the human foot palm is face or back to the toilet the toilet based on the load distribution.
7. The intelligent toilet capable of automatically rising cover and seat by recognizing human body feature according to any one or more of claims 1 to 6, wherein the foot pressure sensing device judging that the human body is facing or back to the toilet, is by the human foot palm is face or back to the toilet based on the number and location of compression area of the pressure sensor.

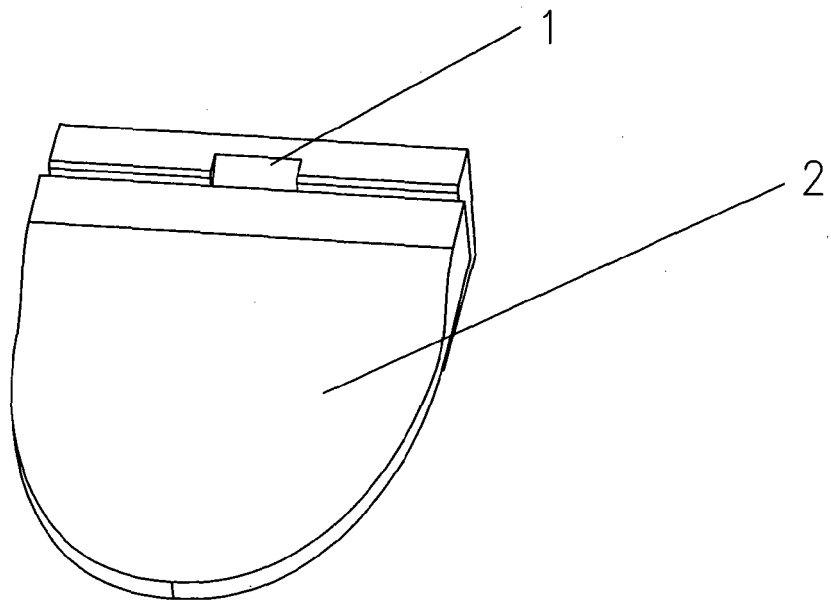


FIG.1

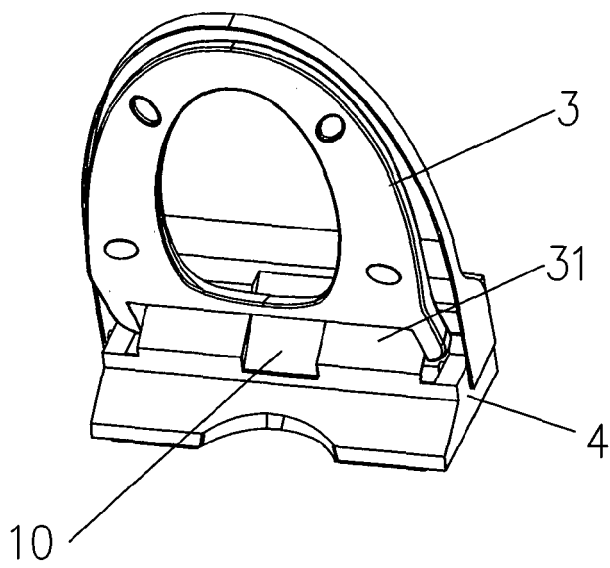


FIG.2

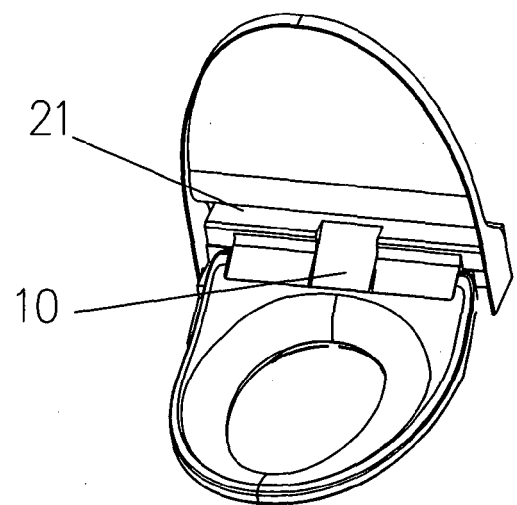


FIG. 3

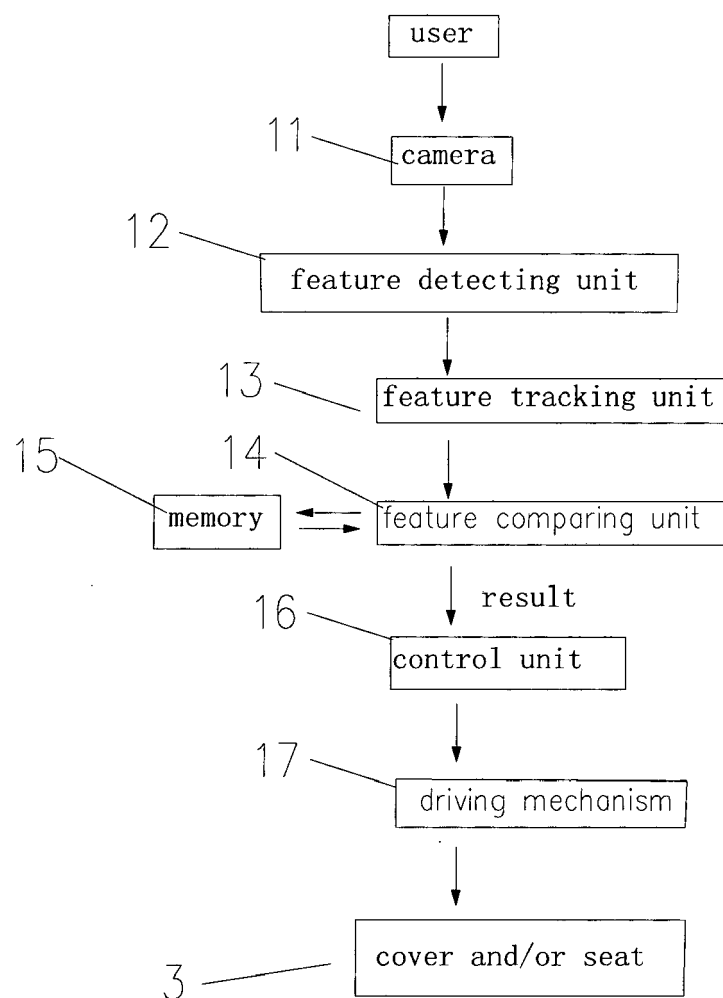


FIG. 4

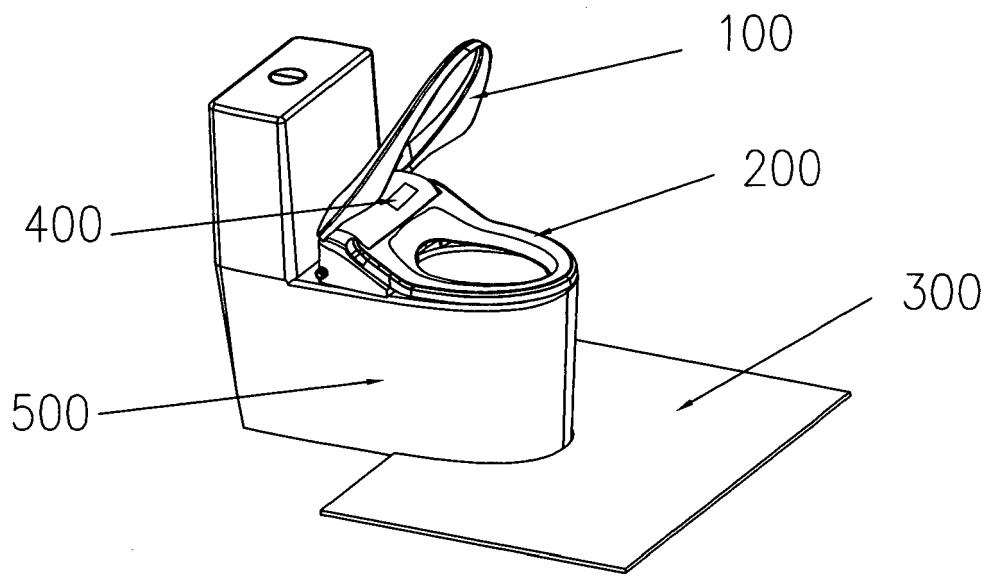


FIG. 5

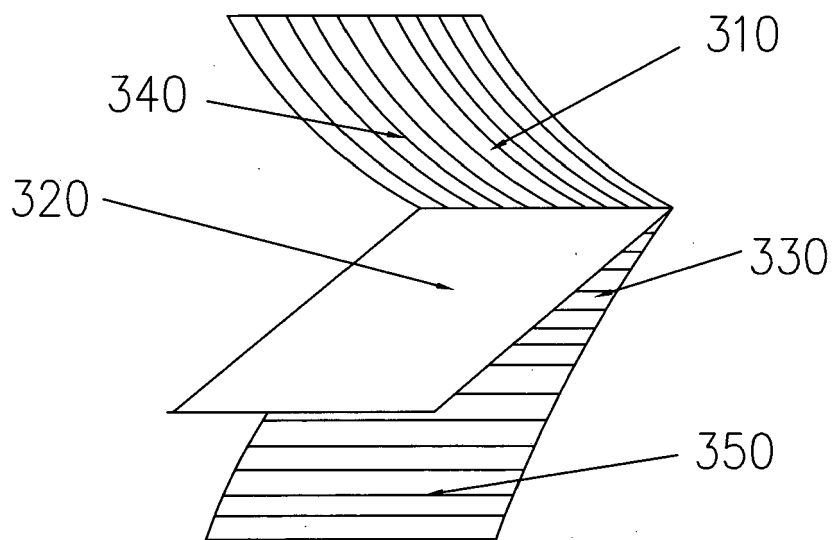


FIG. 6

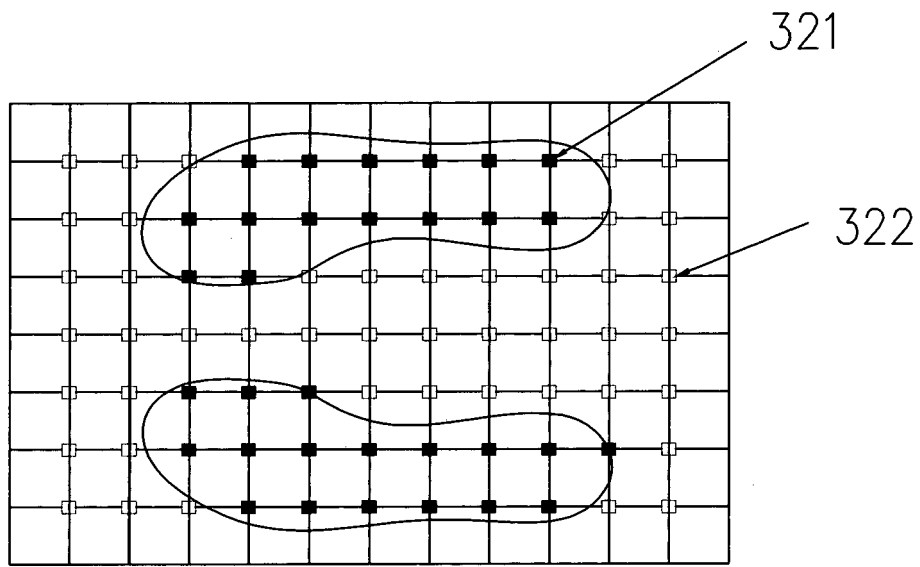


FIG. 7

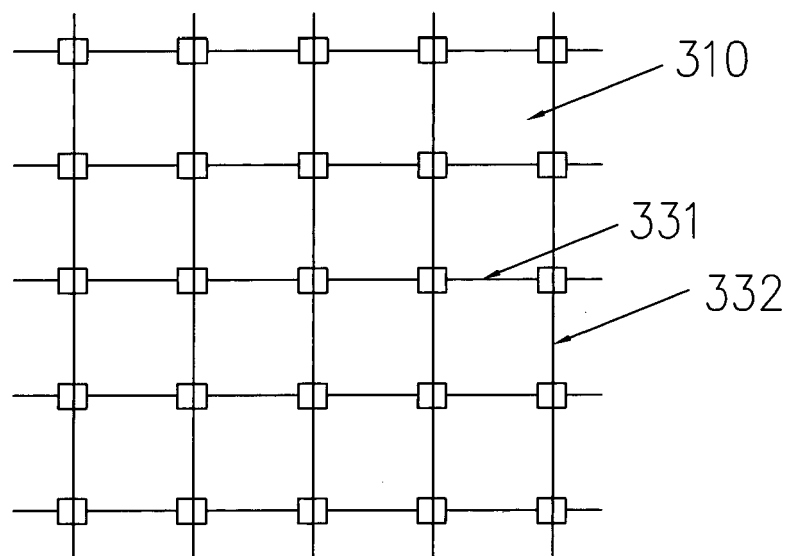


FIG. 8



EUROPEAN SEARCH REPORT

 Application Number
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Place of search The Hague		Date of completion of the search 18 July 2017	Examiner Schikhof, Arnout
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