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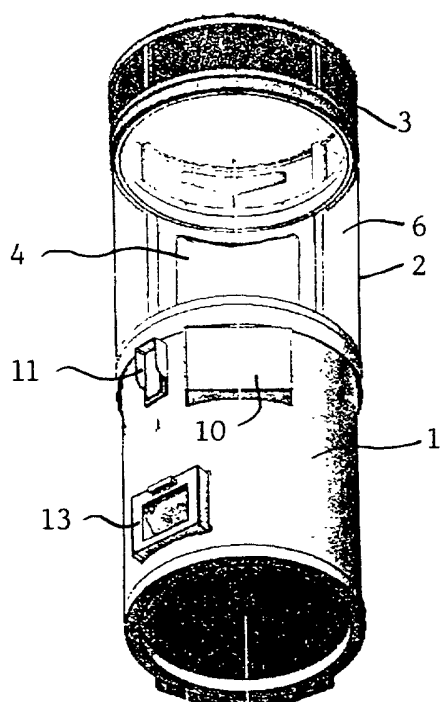
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(54) Title: VENDING MACHINE



(57) Abstract: A vending machine comprising a transparent housing (2) mounted above a base (1) and below a roof (3), which together define a cabinet (6) for displaying products, and a user-operable robot arm (7) mounted within the cabinet (6) for picking up the products, the transparent housing (2) having a cylindrical shape in which an opening (4) is provided for providing access to the cabinet (6), the vending machine further comprising a rigid back wall (5), the housing (2) being rotatably mounted between the roof (3) and the base (1) and being rotatable about its central axis between a first position in which the opening (4) is covered by the rigid back wall (5) and a second position in which the opening (4) is uncovered by the rigid back wall (5).

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Vending machine

The present invention relates to a vending machine according to the preamble of claim 1 and to a vending machine
5 according to the preamble of claim 5.

From US-A-5,855,374 a vending machine is known which comprises a transparent housing which is mounted above the base and below a roof. The housing, the base and the roof together define a cabinet for displaying products. A robot arm for picking up the
10 products is mounted within the cabinet. The products are displayed on a rotatable disc which is mounted on the base. The robot arm is operable by the user by means of a joystick, so that the free end of the robot arm can be moved by the user to a position for picking up one of the products. The rotatable disc is operable by the user by means of buttons, so that the
15 desired product can be brought under the free end of the robot arm by rotating the disc. The free end of the robot arm is equipped with vacuum pickup means.

The vending machine known from US-A-5,855,374 has the disadvantage that, because of its rectangular shape, it
20 is vulnerable towards vandalism.

The vending machine known from US-A-5,855,374 further has the disadvantage that its effective vending space is small, i.e. only a small amount of the space of the cabinet is usable for vending products.

25 It is a first aim of the present invention to provide a vending machine which is less vulnerable towards vandalism.

It is a second aim of the present invention to provide a vending machine which has more effective vending space.

The first aim is achieved according to the present invention with a first embodiment of the vending machine showing
5 the technical characteristics of the characterising part of claim 1.

This first embodiment of the vending machine according to the invention comprises a transparent housing mounted above a base and below a roof, which together define a cabinet for displaying products. A user-operable robot arm is mounted within the
10 cabinet for picking up the products. According to the invention, the transparent housing has a cylindrical shape. In this cylindrical shape, an opening is provided for providing access to the cabinet. The first embodiment of the vending machine of the invention further comprises a rigid back wall for covering the opening in the transparent housing. The
15 housing is rotatably mounted between the roof and the base and is rotatable about its central axis between a first position in which the opening is covered by the rigid back wall and a second position in which the opening is uncovered by the rigid back wall. In the second position, a supplier has access to the cabinet for refilling it with products.

20 With respect to the prior art, the cylindrical shape of the housing of the first embodiment of the vending machine invention has the advantage that the housing does not have corners, so that it is less easily grippable by vandals. Furthermore, by the cylindrical construction with the opening covered by the back wall during normal use,
25 the first embodiment of the vending machine of the invention does not have a visible door via which access to the cabinet can be obtained. It has been found that such a visible door is often subjected to violence, e.g. it is broken or forced open and the products are stolen from the cabinet. With the first embodiment of the vending machine of the invention, the way in
30 which access to the cabinet is obtained is hidden and it has been found that this is less of an invitation to violence. Furthermore, the cylindrical

construction of the transparent housing enhances the rigidity of the housing with respect to a plane construction, as a cylindrical body can sustain higher forces than a plane body having the same material thickness. Still further, the cylindrical construction can enhance the accessibility of the cabinet towards for example a supplier of products, as the opening in the housing can be rotated to any orientation.

Preferably, the first embodiment of the vending machine of the invention comprises an electronic lock for locking the housing in the first position, in which the opening is covered by the rigid back wall. The electronic lock is preferably located within the rigid back wall, so that it is invisible to users, and is preferably remote controlled. In this way it can be ensured that only the person who is in possession of the remote control, e.g. the supplier, can unlock the housing and gain access to the cabinet.

Preferably, the first embodiment of the vending machine of the invention comprises drive means, such as for example an electric motor, for moving the housing between the first and second positions. This can enhance the user-friendliness of the vending machine towards for example the supplier, as he does not have to move the housing manually for gaining access to the cabinet. Furthermore, the drive means provide an additional lock to the housing, as they counteract forces in the rotational direction of the housing when they are in rest. In comparison, it is common knowledge that manually rotating the rotor of an electric motor requires an amount of force. This can further reduce the vulnerability of the vending machine towards vandalism.

The second aim is achieved according to the present invention with a second embodiment of the vending machine showing the technical characteristics of the characterising part of claim 5.

This second embodiment of the vending machine according to the invention comprises a transparent housing mounted above a base and below a roof, which together define a cabinet

for displaying products. According to the second embodiment of the invention, the transparent housing has a cylindrical shape. The vending machine further comprises a user-operable robot arm mounted within the cabinet. The robot-arm has a movable free end provided with vacuum pickup means for picking up the products and is mounted substantially centrally on a disc which is rotatably mounted in the roof of the vending machine. This disc is user-operable and rotatable over at least 360°. The robot-arm is constructed such that the free end of the robot arm is at least movable to any position in a vending area delimited by the housing, the base and a top level in between the base and the roof. This top level is preferably located about halfway between the base and the roof. The top level may however also be located higher or lower.

By the cylindrical shape of the cabinet and the central rotatable mounting of the robot-arm together, it can be achieved that the free end of the robot-arm can be moved to substantially any position within a larger area as compared with the prior art. As a result, the area in which products can be placed becomes larger as well, resulting in a larger vending area with respect to the prior art. The vacuum pickup means ensure that the free end of the robot arm has a narrow tip, so that it can access the boundaries of the vending area, i.e. it can be brought closer to the walls of the cabinet than for example a gripping device. Furthermore, by using the vacuum pickup means, the second embodiment of the vending machine of the invention is suitable for vending a large variety of products, which may vary in size and weight.

In this second embodiment of the vending machine of the invention, the base is preferably substantially centrally provided with a first hollow tube which forms an exit for products picked up by the robot arm and which extends up to the top level of the vending area. In this second embodiment, the robot arm is preferably mounted in a second hollow tube which is slidably mounted in a central opening in the rotatable disc. This second tube has a diameter substantially equal to that

of the first tube and is movable by means of drive means for raising and lowering the second tube between an upper position, in which the second tube is removed from the first tube, and a lower position, in which the second tube contacts the first tube. In this way, the robot arm can be
5 lowered to a position in which the exit of the cabinet is closed, so that cheating by a user by manipulating products by means of the robot arm until they fall into the exit can be prevented.

In the second embodiment of the vending machine of the invention, the robot arm preferably comprises first and
10 second arms which are pivotally connected to each other, the first arm being pivotally mounted on the second tube and the second arm comprising the vacuum pickup means. However, the robot arm may also be constructed in other ways known to the person skilled in the art, such as for example telescopic.

15 It is apparent that the features of the first and second embodiments according to the invention can be combined in one and the same vending machine.

The vending machine of the invention is preferably provided with user accessible operating means for operating
20 the robot arm, an electronic memory for storing data, a processor for processing the data and controlling and the robot arm in response to operations of the user. The stored data can for example be the available supply of products, settings of the robot arm, or other.

The vending machine of the invention is preferably provided with telecommunication means coupled to the
25 processor, so that telecommunication is enabled with for example a supplier or an owner. In this way, the supplier can consult the vending machine from a remote location to verify the supply of products in the cabinet or can be warned by the machine when this is almost empty. The
30 owner can remotely verify whether the machine is operational and can for example be sent a warning when vandalism is detected.

The vending machine of the invention is preferably provided with a programmable display, on which for example publicity, guidelines for use, prices or any other information can be displayed. The displayed information is remotely controllable by the ability of telecommunication.

The invention will be further elucidated by means of the following description and the appended figures.

Figure 1 shows a front view of a preferred embodiment of the vending machine of the invention.

Figure 2 shows a side view of a preferred embodiment of the vending machine of the invention.

Figure 3 shows a preferred embodiment of the base of the vending machine of the invention.

Figure 4 shows a preferred embodiment of the cabinet of the vending machine of the invention.

Figure 5 shows a preferred embodiment of the robot arm of the vending machine of the invention.

Figure 6 shows a detail of the robot arm of figure 5.

Figure 7 shows a detail of the second tube on which the robot arm is mounted.

The vending machine shown in figures 1 and 2 has a substantially cylindrical shape and comprises a base 1 and a roof 3, between which a transparent housing 2 is mounted. The transparent housing 3 has an opening 4 at the back, which is covered by a rigid back wall 5 during normal operation of the machine. The housing 2, base 1 and roof 3 together define a cabinet 6, which can be filled with products. This cylindrical shape has the advantage that the grippability of the machine is reduced with respect to a for example a box-shaped machine, which reduces the risk of vandalism.

In order to gain access to the cabinet 6, for example for filling it with products, the housing 2 is rotatably mounted between the base 1 and the roof 3. Drive means (not shown) are provided in the roof 3 for rotating the housing 2 about its central axis between a first position (as shown in the figures 1 and 2), in which the opening 4 is covered by the rigid back wall 5 and invisible to users, and a second position (not shown), in which the opening is uncovered by the rigid back wall 5. The opening 4 can thus be rotated to any orientation, so that access to the cabinet 6 from substantially any direction is achieved.

For picking up products on display, a robot arm 7 is provided within the cabinet 6. This robot arm 7 has a free end 8 which is provided with vacuum pickup means 9. The position of the free end 8 in the cabinet 6 is controllable by the user. To this end, control means (not shown), such as for example a joystick, push-buttons, a knob or other, are provided on a support 10 on the outside of the base 1.

The vending machine of figures 1 and 2 comprises an electronic lock (not shown) for locking the housing 2 in the first position, in which the opening 4 is covered by the rigid back wall 5. The electronic lock is located within the rigid back wall 5 and is remote controlled. The vending machine may however also comprise other locking means for locking the housing 2 in the first position.

In the base 1, a coin deposit slot 11 is provided, in which a user can insert coins for paying for a game or buying a product from the cavity. The coin deposit slot 11 typically accepts standard currency coins, game tokens or the like. Other devices for monetary input may also be provided, such as for example a credit card device or other.

The top wall of the base 1 is provided for supporting the displayed products. The robot arm 7 is mounted centrally on a rotatable disc 12, which is provided on the bottom side of the roof 3. The rotatable disc 12 is rotatable over at least 360°, so that the robot arm

7 can be rotated to any orientation and reach any of the products on display.

The robot-arm shown in figures 5-7 is constructed such that the free end 8 of the robot arm 7 is at least movable to any position in a vending area delimited by the housing 2, the base 1 and a top level in between the base 1 and the roof 3, which is preferably located about halfway between the base 1 and the roof 3, or higher or lower. The base 1 has a central opening (not shown) through which picked up products can be delivered to a conveyor device 13 and further to the user. At the central opening, a first tube (not shown) is provided which extends from the top wall of the base 1 upwards to the top level of the vending area within the cabinet 6.

The robot arm 7 is mounted on a second tube 14 which is slidably mounted in a central opening of the rotatable disc 12. Alongside the second tube 14, drive means 15 are provided for raising and lowering the second tube 14 with respect to the first tube (not shown). The second tube 14 can be lowered to a position on top of the first tube, so that the exit opening in the base 1 is closed.

The second tube 14 comprises a bottom plate 16, on which the robot arm 7 is mounted. The robot arm 7 comprises first and second arms 17 and 18, pivotably connected to each other. The first arm 17 is pivotably mounted on the bottom plate 16 and the second arm 18 comprises the free end 8 of the robot arm 7, which is provided with the vacuum pickup means 9 for picking up the products in the cabinet 6. The second tube 14 has a peripheral slot 19, for enabling the first and second arms 17, 18 to be retracted into the second tube 14. This slot 19 extends in the bottom plate 16 of the second tube 14, which enables the free end 8 to protrude from the bottom plate 16, so that a product which has been picked up can be brought above the exit opening and dropped into it. The drive means (not shown) for driving the first and second arms may be

mechanic, hydraulic, pneumatic or other drive means known to the person skilled in the art.

The vending machine of figures 1 and 2 comprises computer means (not shown), such as for example an electronic memory for storing data, a processor for processing the data and controlling and the robot arm 7 in response to operations of the user. The vending machine of figures 1 and 2 further comprises telecommunication means (not shown) connected to the processor, by means of which a supplier or owner can consult the memory of the vending machine from a remote location. In this way, the supplier can consult the vending machine to verify the supply of products in the cabinet 6 or can be warned by the machine when this is almost empty. The owner can remotely verify whether the machine is operational and can for example be sent a warning when vandalism is detected. The telecommunication means may be wireless means or an internet connection or other telecommunication means known to the person skilled in the art.

The vending machine of figures 1 and 2 may be provided with a programmable display (not shown), on which for example publicity, guidelines for use, prices or any other information can be displayed. The displayed information is remotely controllable by the presence of the telecommunication means. The display may be mounted on the back wall 5 of the cabinet 6, on the periphery of the roof 3 or elsewhere on the vending machine.

The vending machine of figures 1 and 2 is provided with a plurality of sensors (not shown). A first sensor is provided on the free end 8 of the robot arm 7 for detecting contact with the housing 2. If contact is detected, the movement of the free end 8 is stopped to avoid damage. A second sensor is provided on vacuum pickup means for detecting picking up of a product. If a product has been picked up, the free end 8 of the robot arm 7 is moved to a position above the exit opening for

delivery to the user. A third sensor is provided in the conveyor device for detecting if the picked up product is actually delivered to the user and not dropped back into the cabinet 6. A fourth sensor is provided for example in the roof 3 for detecting shocks, so that possible vandalism can be detected and a warning sent to the owner of the vending machine. Further sensors may be provided for keeping track of the position of the rotatable disc and the second tube, for keeping track of the orientation of the robot arm 7 and the position in height direction, so that correct operation of the vending machine can be ensured.

10 The vending machine of figures 1 and 2 is provided with electric powering means (not shown). These may comprise: a solar panel on the roof 3 of the vending machine, a mains voltage connection, a rechargeable battery or any other electric powering means known to the person skilled in the art.

15 The vending machine of figures 1 and 2 is suitable for use as both a selling automat, such as for example a can dispenser, and a game or fairground attraction. It can be used for selling food products, such as for example candy, soft drinks, crisps or other food, and also for selling non-food products, such as for example teddy bears or other toys, watches or other non-food products. Optionally, a cooling device can be provided in the machine, for example when the vending machine is used for selling cold drinks. When used as a game, this game can be based on the skill of the user for being able to pick up what he wants in a given time period, rather than on chance as is known in most prior art games of this type.

25 In case the vending machine is used as a selling automat, its operation is preferably as follows. The user inserts one or more coins in the coin deposit slot 11. The control means are activated and the user selects a product from the cabinet 6 which he wants to obtain. Depending on the embodiment of the vending machine, the user can then operate the control means to move the free end 8 of the robot

30

arm 7 to the selected product, or key in a code corresponding to the selected product, after which the microprocessor controls the robot arm 7 to pick up the selected product. When the product has been picked up, the microprocessor moves the free end 8 of the robot arm 7 to a position
5 above the exit opening, after which the product is dropped and delivered to the user via the conveyor device 13.

In case the vending machine is used as a game, its operation is preferably as follows. The user inserts one or more coins in the coin deposit slot 11. The control means are activated and the
10 user selects a product from the cabinet 6 which he wants to obtain. The user is then given a predetermined amount of time for picking up one of the products from the cabinet 6, for which he operates the control means to move the free end 8 of the robot arm 7 to the desired product. Once a
15 sensor on the free end 8 of the robot arm 7 senses that a product has been picked up, the microprocessor takes over control and moves the free end 8 of the robot arm 7 to a position above the exit opening, after which the product is dropped and delivered to the user via the conveyor device
20 13. If no product is picked up in the given time, a consolation prize is given to the user. These consolation prizes are stored in a cavity in the back wall 5 of the cabinet 6 and are preferably visible towards the user.

Claims

1. A vending machine comprising a transparent housing (2) mounted above a base (1) and below a roof (3), which together define a cabinet (6) for displaying products, and a user-operable robot arm (7) mounted within the cabinet (6) for picking up the products, characterised in that the transparent housing (2) has a cylindrical shape in which an opening (4) is provided for providing access to the cabinet (6), the vending machine further comprising a rigid back wall (5), the housing (2) being rotatably mounted between the roof (3) and the base (1) and being rotatable about its central axis between a first position in which the opening (4) is covered by the rigid back wall (5) and a second position in which the opening (4) is uncovered by the rigid back wall (5).

2. A vending machine according to claim 1, characterised in that the vending machine comprises an electronic lock for locking the housing (2) in the first position, in which the opening (4) is covered by the rigid back wall (5).

3. A vending machine according to claim 2, characterised in that the electronic lock is located within the rigid back wall (5) and is remote controlled.

4. A vending machine according to any one of the claims 1-3, characterised in that the vending machine comprises drive means for moving the housing (2) between the first and second positions.

5. A vending machine according to any one of the claims 1-4, characterised in that the robot arm (7) is mounted substantially centrally on a disc (12) which is rotatably mounted in the roof (3) of the vending machine, the disc (12) being user-operable and rotatable over at least 360°, the robot arm (7) having a free end (8) with vacuum pickup means (9) for picking up products, the robot arm (7) being constructed such that the free end (8) of the robot arm (7) is at least movable to any position in a vending area delimited by the housing (2), the base (1) and a top level in between the base (1) and the roof (3).

6. A vending machine according to claim 5, characterised in that the top level is located substantially halfway between the base (1) and the roof (3).

5 7. A vending machine according to claim 5 or 6, characterised in that the base (1) is substantially centrally provided with a first hollow tube which forms an exit for products picked up by the robot arm (7) and which extends up to the top level of the vending area, and that the robot arm (7) is mounted in a second hollow tube (14) which is slidably mounted in a central opening in the rotatable disc (12), the
10 second tube (14) having a diameter substantially equal to that of the first tube, the vending machine further comprising drive means (15) for raising and lowering the second tube between an upper position, in which the second tube (14) is removed from the first tube, and a lower position, in which the second tube (14) contacts the first tube.

15 8. A vending machine according to claim 7, characterised in that the robot arm (7) comprises first (17) and second arms (18) which are pivotally connected to each other, the first arm (17) being pivotally mounted on the second tube (14) and the second arm (18) comprising the free end (8) with the vacuum pickup means (9).

20 9. A vending machine comprising a transparent housing (2) mounted above a base (1) and below a roof (3), which together define a cabinet (6) for displaying products, and a user-operable robot arm (7) mounted within the cabinet (6), the robot arm having a movable free end (8) provided with vacuum pickup means (9) for picking
25 up the products, characterised in that the transparent housing (2) has a cylindrical shape and that the robot arm (7) is mounted substantially centrally on a disc (12) which is rotatably mounted in the roof (3) of the vending machine, the disc (12) being user-operable and rotatable over at least 360°, the robot arm (7) being constructed such that the free end (8)
30 of the robot arm (7) is at least movable to any position in a vending area

delimited by the housing (2), the base (1) and a top level in between the base (1) and the roof (3).

10. A vending machine according to claim 9, characterised in that the top level is located substantially halfway between
5 the base (1) and the roof (3).

11. A vending machine according to claim 9 or 10, characterised in that the base (1) is substantially centrally provided with a first hollow tube which forms an exit for products picked up by the robot arm (7) and which extends up to the top level of the vending area,
10 and that the robot arm (7) is mounted in a second hollow tube (14) which is slidably mounted in a central opening in the rotatable disc (12), the second tube (14) having a diameter substantially equal to that of the first tube, the vending machine further comprising drive means (15) for raising and lowering the second tube (14) between an upper position, in which the
15 second tube (14) is removed from the first tube, and a lower position, in which the second tube (14) contacts the first tube.

12. A vending machine according to claim 11, characterised in that the robot arm (7) comprises first (17) and second arms (18) which are pivotally connected to each other, the first arm (17)
20 being pivotally mounted on the second tube (14) and the second arm (18) comprising the free end (8) with the vacuum pickup means (9).

13. A vending machine according to any one of the claims 9-12, characterised in that the transparent housing (2) has an opening (4) for providing access to the cabinet (6), the vending machine
25 further comprising a rigid back wall (5), the housing (2) being rotatably mounted between the roof (3) and the base (1) and being rotatable about its central axis between a first position in which the opening (4) is covered by the rigid back wall (5) and a second position in which the opening (4) is uncovered by the rigid back wall (5).

14. A vending machine according to claim 13,
30 characterised in that the vending machine comprises an electronic lock for

locking the housing (2) in the first position, in which the opening (4) is covered by the rigid back wall (5).

5 15. A vending machine according to claim 14, characterised in that the electronic lock is located within the rigid back wall (5) and is remote controlled.

16. A vending machine according to any one of the claims 13-15, characterised in that the vending machine comprises drive means for moving the housing (2) between the first and second positions.

10 17. A vending machine according to any one of the previous claims, characterised in that a cooling device is provided in the base (1).

15 18. A vending machine according to any one of the previous claims, characterised in that the vending machine is provided with user accessible operating means for operating the robot arm (7), an electronic memory for storing data, a processor for processing the data and controlling and the robot arm (7) in response to controls of the user on the operating means.

20 19. A vending machine according to claim 10, characterised in that the vending machine comprises telecommunication means connected to the processor.

20. A vending machine according to claim 10 or 11, characterised in that the vending machine comprises a programmable display.

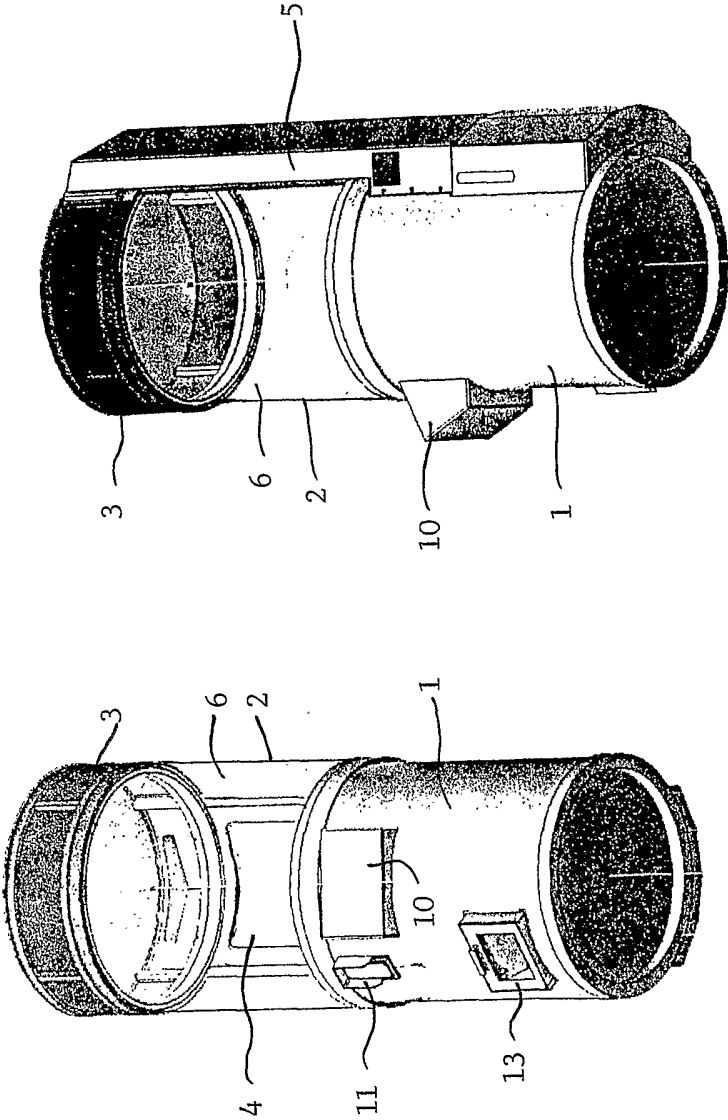


FIG. 1

FIG. 2

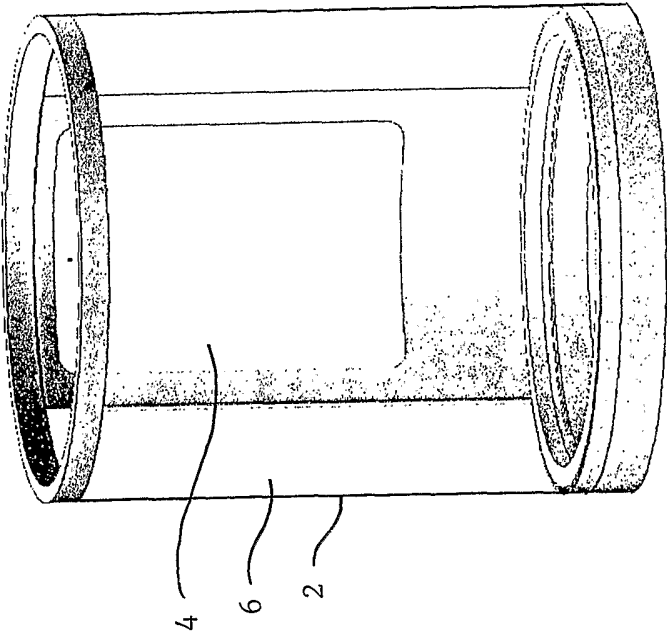


FIG. 4

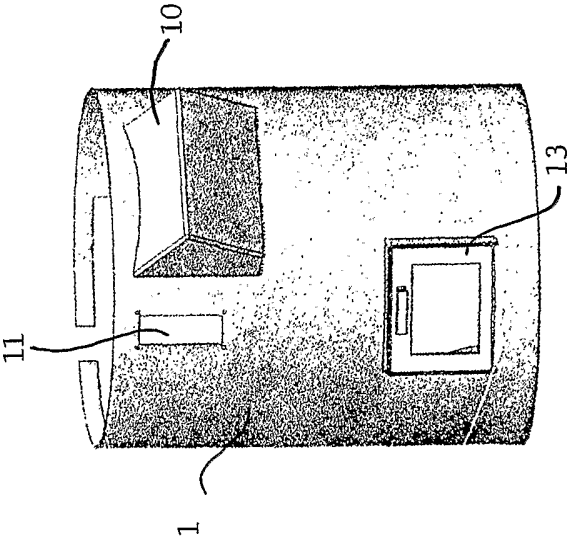
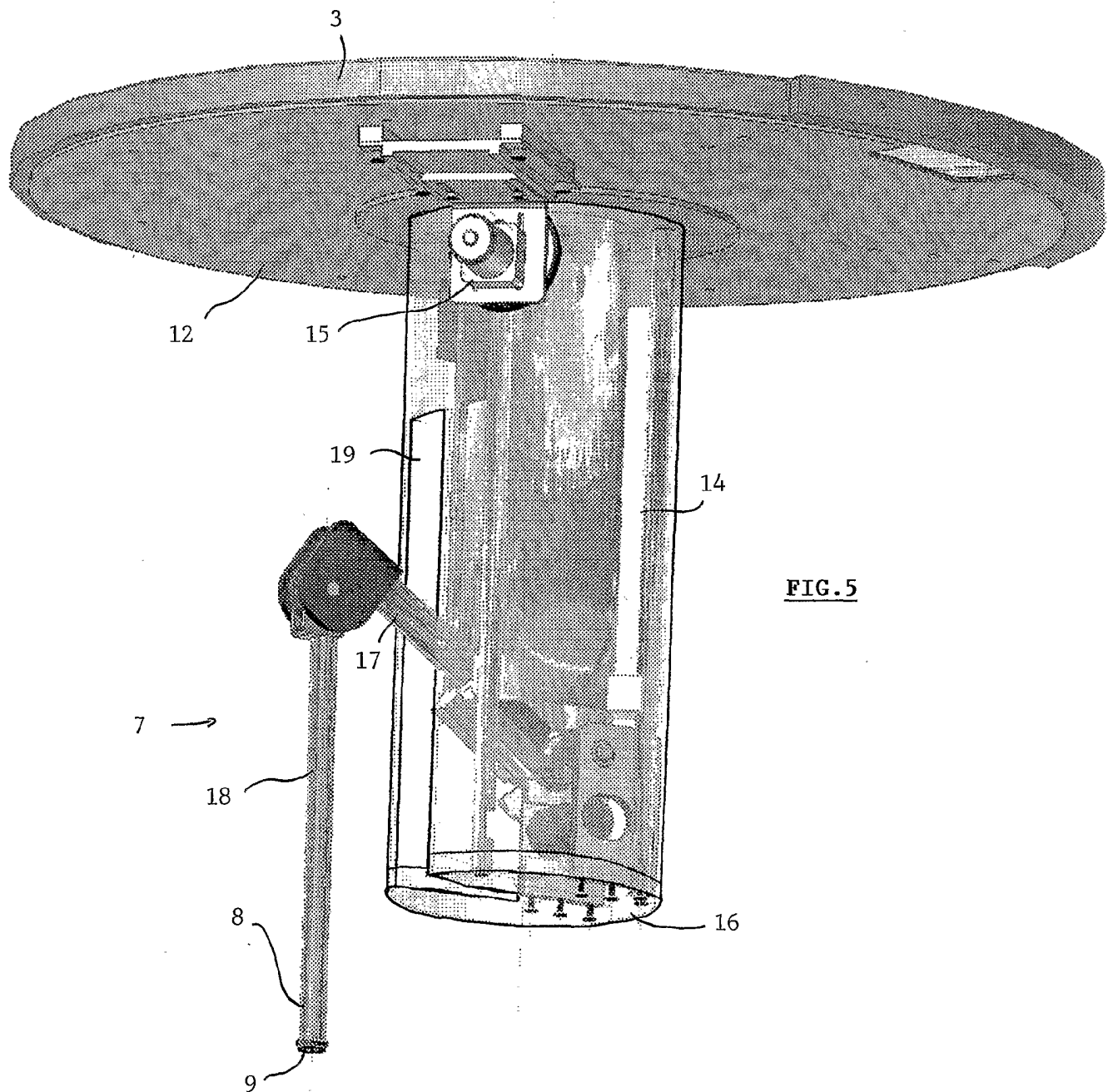


FIG. 3



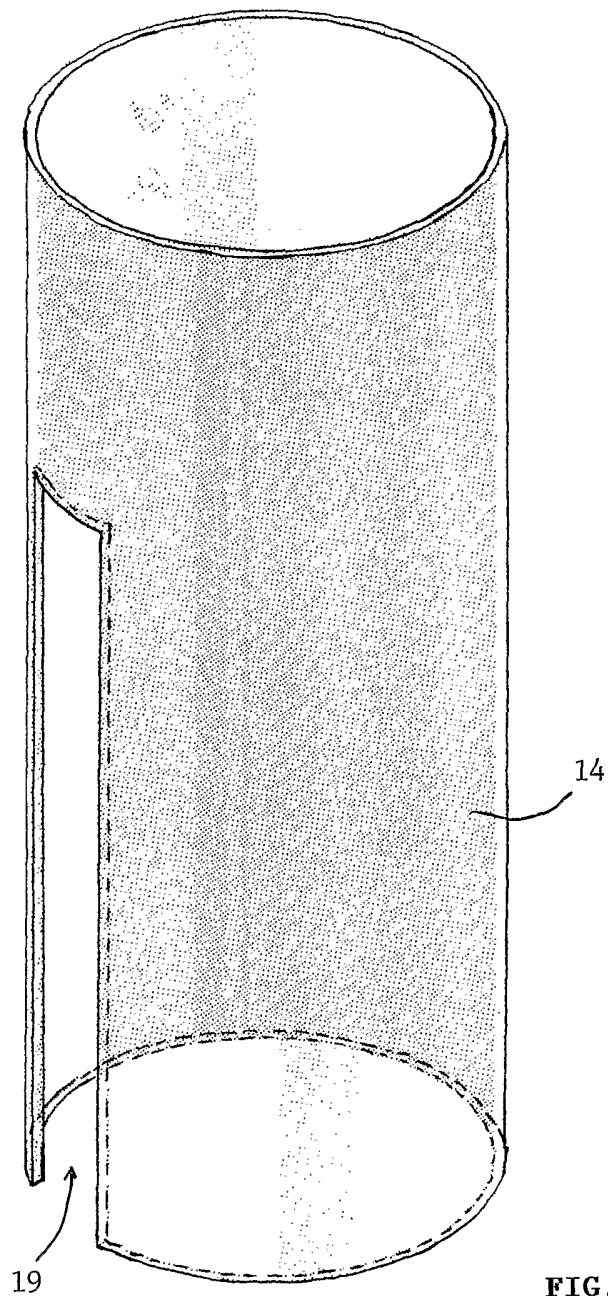


FIG. 7

FIG. 6