

DECLARATION OF SIMON EDMUNDS

I, Simon Edmunds, pursuant to 28 U.S.C. § 1746, hereby declare as follows:

1. I am a Freelance translator at TransPerfect, Inc.
2. I submit this declaration to certify the accuracy of the English translation of JP_2003307049_A.
3. My statements are based on personal knowledge and my review of JP_2003307049_A and its Japanese to English translation. If called as a witness about the facts contained in these statements, I could testify competently based on such personal knowledge and the investigation I have conducted.
4. Attached as Exhibit A is a true and accurate copy of JP_2003307049_A.
5. Attached as Exhibit B is a true and accurate copy of an English translation JP_2003307049_A.
6. JP_2003307049_A Translation is a true and accurate translation of JP_2003307049_A from Japanese to English.
7. All statements made herein of my own knowledge are true, and all statements made on information and belief are believed to be true. Further, I am aware that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001. I declare under penalty of perjury that the foregoing is true and correct.
8. I also understand that by submitting this declaration I may be asked to appear for a deposition asking me questions limited to the material in my declaration. With my signature below, I agree to make reasonable efforts to make myself available for such a deposition at a reasonable place and time of my choosing.

* * *

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge. Executed on 02/05/2026 at Wiltshire, United Kingdom.



Simon Edmunds

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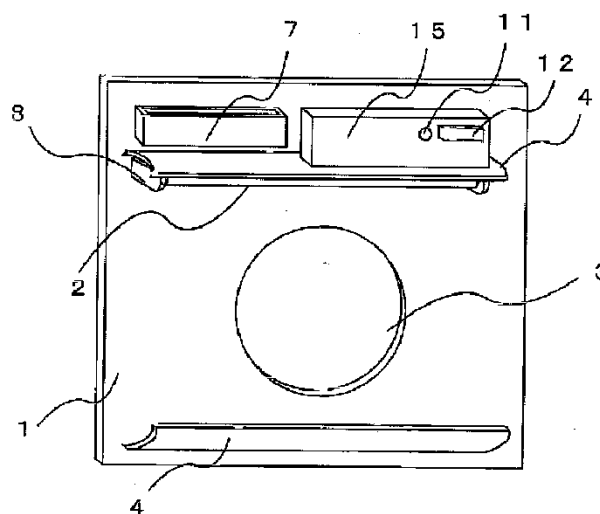
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(54) [Title of the Invention] Sterilization Device for a Doorknob, and Sterilization System for a Doorknob, etc.

(57) [Abstract]

[Problem] To provide a sterilization device for a doorknob that is attached to an arbitrary door such as in a toilet or a kitchen, and which sterilizes bacteria adhered to the surface of the doorknob of the door.

[Means for Solving] The device comprises a base having, on a rear surface thereof, attachment means for attachment to an arbitrary door and having an opening through which an arbitrary doorknob can pass, a substrate provided on the base and configured, in an attached state, so as to emit irradiation light toward the direction of the arbitrary doorknob, a sterilization lamp provided on the substrate, reflection means for reflecting irradiation from the sterilization lamp toward the direction of the arbitrary doorknob, shielding means for preventing irradiation light from the sterilization lamp or the reflection means from reaching the eyes of a user, power supply means for supplying power to the sterilization lamp, and irradiation control means for controlling an irradiation operation of the sterilization lamp.



[Claims]

[Claim 1] A sterilization device for a doorknob, etc., comprising a sterilization device main body, a sterilization lamp attached to the sterilization device main body and capable of sterilizing the doorknob, etc., by irradiating the doorknob, etc., with irradiation light, an irradiation direction adjustment tool capable of directing irradiation from the sterilization lamp toward the doorknob direction, a power supply attached to the sterilization device main body and configured so as to supply electricity to the sterilization lamp, and irradiation control means attached to the sterilization device main body and configured so as to control the irradiation operation of the sterilization lamp.

[Claim 2] The sterilization device for a doorknob, etc., according to claim 1, further comprising a shielding means for preventing irradiation light from the sterilization lamp from reaching the eyes of a user.

[Claim 3] The sterilization device for a doorknob, etc., according to claim 1 or 2, wherein the sterilization device main body is a fixture that opens and closes such as a door or a door leaf.

[Claim 4] The sterilization device for a doorknob, etc., according to claim 1, 2, or 3, wherein the power supply is a solar cell having a solar panel.

[Claim 5] The sterilization device for a doorknob, etc., according to claim 1, 2, 3, or 4, wherein the irradiation control means is an on-off switch.

[Claim 6] The sterilization device for a doorknob, etc., according to claim 1, 2, 3, or 4, wherein the irradiation control means is a timer switch.

[Claim 7] The sterilization device for a doorknob, etc., according to claim 1, 2, 3, or 4, wherein the irradiation control means is a sensor that detects the operation of the doorknob, etc., by a user.

[Claim 8] A sterilization system for a doorknob, etc., according to any one of claims 1, 2, 3, 4, 5, 6, or 7, wherein a door is provided with a catalytic layer formed of a photocatalyst or a charge-transfer catalyst.

[Detailed Description of the Invention]

[0001]

[Technical Field to Which the Invention Belongs] The present invention relates to a sterilization device for a doorknob that is attached to an arbitrary door such as in a toilet, a kitchen, or a hospital, and which sterilizes bacteria adhered to the surface of the doorknob of the door.

[0002]

[Background Art] In facilities used by the public, a doorknob of a door is a location that is touched by anyone. Bacteria constantly accumulate on them, causing hygiene problems. In order to avoid this, it has been necessary to perform the work of sequentially wiping with a disinfectant solution. As techniques for avoiding this, there are techniques in which a cover is placed over a doorknob of a door, or antibacterial processing using zeolite or the like is applied to the doorknob body itself. In addition, there has been a technique in which a sterilization lamp is built into the doorknob itself to perform sterilization.

[Patent Literature 1] JP-A-H07-071143

[Patent Literature 2] JP-A-H07-327763

[Patent Literature 3] JP-A-H07-331933

[0003]

[Problem to Be Solved by the Invention] In techniques based on antibacterial processing, such techniques are limited to suppressing the propagation of bacteria and do not provide a fundamental solution. In techniques in which a sterilization lamp is incorporated inside the doorknob body, irradiation over the entirety of portions that come into contact with the hand, including the rear side of the doorknob, is not possible, and sterilization could be performed only partially. With respect to installation as well, there has been a problem in that installation work is required. In addition, there is a problem in that the shape is limited, and the places where the device can be used are limited depending on each shape. The present invention has been made in order to solve the above problems.

[0004]

[Means for Solving the Problem] The device is attached so as to surround the doorknob of an arbitrary door, has an opening for operation on a front surface of a cover body, and sterilizes bacteria on the doorknob surface by irradiating the doorknob surface with a sterilization lamp inside the cover body. Inside the cover, a reflecting plate is provided so as to irradiate the entire doorknob with this irradiation light. Further, an irradiation control means for controlling an irradiation operation of the sterilization lamp is provided, thereby enabling control according to circumstances. The present invention is constituted by the above configuration.

[0005]

[Mode for Carrying Out the Invention] Hereinafter, a mode for carrying out the present invention will be described. The present invention is a sterilization device for a doorknob that is attached around a doorknob of a door and sterilizes bacteria on the doorknob surface by irradiation using a sterilization lamp. A basic configuration of the sterilization device will be described with reference to FIG. 1. At a center of a base (1) having attachment means such as double-sided tape or an adhesive on the rear surface thereof, a base opening (3) is provided. This base opening (3) has a size and shape that allow an arbitrary doorknob to pass therethrough. A sterilization lamp (2) is detachably mounted on a sterilization-lamp mounting portion (8) at an upper position of the base opening (3) on the substrate. As the sterilization lamp, various sterilization lamps conventionally used can be employed, but a lamp that causes no harm even when irradiated onto the skin is preferable. Furthermore, the sterilization lamp mounting portion (8) has a structure in which the sterilization lamp (2) emits light using electric power supplied from a power source. A reflecting plate (4) is provided above the sterilization lamp (2). This reflects irradiation light emitted upward from the sterilization lamp (2) downward. Note that although the upper reflecting plate is described in this example as having reflectivity, it may also be one that does not have reflectivity. A lower reflecting plate (4) is also provided at a lower position of the base opening (3) on the substrate. This receives irradiation light from the sterilization lamp (2) side and reflects the light upward. In the drawing, the shape is such that the front side is inclined upward. However, the lower reflecting plate is not limited to this shape, and any shape may be used as long as it reflects irradiation light so as to irradiate as uniformly as possible the lower surface side of the doorknob protruding from the base opening. A battery box (7) and a control box (15) are provided at an upper position of the sterilization lamp (2). The battery box uses batteries as a power source and has a shape

compatible with the shape of the batteries used. The control box (15) incorporates a circuit for controlling the irradiation of the sterilization lamp (2). In the drawing, a switch (12) and an LED that lights up during operation are provided on the surface. By pressing this switch (12), various types of control can be performed. Although wiring from the battery box (7) is not shown in the drawing, the wiring is provided within the base (1), within each component, or within partition walls, so as to supply power to the respective component. A cover (5) is detachably attached to the base (1) so as to cover these various components. An operation window (6) is provided at a position of the cover where the switch (12) and the LED (11) are exposed. Further, a cover opening (10) is provided for operating the doorknob. This cover opening (10) has a size and shape such that hands or arms do not come into contact with the cover within a range allowing for the manual operation of the doorknob. In addition, as shown in FIG. 4, the structure is configured so as to shield irradiation from the sterilization lamp (2) such that the irradiation does not reach the eyes of a user. The present invention is constituted by the above configuration. When using this, the doorknob is fixed to the door so as to pass through the base opening of the base. Thereafter, the cover is attached to the base. In the attached state, when the sterilization lamp emits light, the light irradiates the upper surface of the doorknob and eliminates bacteria present at that position. Irradiation light that reaches the lower reflecting plate from the sterilization lamp is reflected by the reflecting plate and irradiates a lower surface of the doorknob, thereby eliminating bacteria on surfaces at positions to which irradiation light from the sterilization lamp does not directly reach. Various control mechanisms for controlling these irradiation timings can be considered. In a household application, as the frequency of use is lower than in public places, irradiation is automatically performed for an arbitrary period of time exhibiting a sterilization effect at intervals of two to four hours. In addition, during times of high usage frequency such as morning and night, irradiation can be separately performed only at that time by pressing the switch. Further, in public places, it is desirable to set the irradiation setting time to be shorter and to perform sterilization frequently. As another control method, it is conceivable to provide a sensor that detects a hand inserted into the opening and to perform irradiation when the hand is removed so as to immediately sterilize. In addition, when using the sensor, it is also possible to add a function that interrupts irradiation when a hand is inserted.

[0006] As a form of the cover, it is also possible to provide the cover as an upper cover (16) and a lower cover (17) separated from each other, as shown in FIGS. 5 to 6. In this case, it is important that the shape and mounting position be such that the reflected light from the sterilization lamp and the reflecting plates does not reach the eyes of a user. In the example of FIG. 6, the structure is adapted to a rod-shaped doorknob. In this manner, by changing the shape of the base opening (3) in accordance with the shape of the doorknob, it is possible to accommodate various doorknobs.

[0007] Another embodiment of the present invention will be described. In FIGS. 7 to 8, a shielding plate (9) is provided at a lower edge of the cover opening (10) in order to more efficiently shield reflected light originating from the lower reflecting plate (4) from reaching the eyes. This makes it possible to further prevent the diffusion of irradiation light by inwardly bending back the lower edge of the cover opening. Further, in order to narrow the irradiation angle of the irradiation light, the invention

shown in FIGS. 9 to 10 limits the irradiation angle by surrounding the sterilization lamp and reflected light with a box. In this configuration, a bottom surface is provided on an upper cover, and an irradiation opening (18) for irradiating the doorknob is provided in this bottom surface. In addition, a lower cover (17) has a box-like shape with an upper surface, so as to surround the lower reflecting plate (4). On the upper surface, an irradiation opening (18) is provided in order to allow irradiation light from the sterilization lamp (2) to enter the interior and for reflecting the reflected light toward the doorknob. At this time, each irradiation light is narrowed in the irradiation angle so that the sterilization light is irradiated over the entire surface of the doorknob and the sterilization light does not reach the eyes of a user. As described above, in each embodiment, a rod-shaped sterilization lamp is illustrated and described as the sterilization lamp; however, a curved sterilization lamp may also be used so long as it has a function of irradiating the front surface of the doorknob and a shielding function for preventing the sterilization light from reaching the eyes.

[0008] Another embodiment will be described below with reference to FIGS. 11 to 12. In the present embodiment, a ring-shaped sterilization lamp (2) is used. A sterilization-lamp housing portion (20) having a function of holding the sterilization lamp in a hollow portion and causing the sterilization lamp to emit irradiation is fixedly provided around the base opening (3) of the base (1). A reflecting function is provided inside the sterilization-lamp housing portion (20), and irradiation light is repeatedly reflected on an inner wall inside the sterilization-lamp housing portion. Further, an upper cover in which a power supply, various control units, switches, and the like are integrally assembled is provided. Further, on an inner side of the sterilization-lamp housing portion (20), an irradiation opening (18) is provided in a slit form for irradiating the irradiation light of the sterilization lamp toward the doorknob. The irradiation light that passes through this slit is irradiated over the entire surface of the doorknob. In addition, irradiation toward the front direction is adjusted by this irradiation opening (18) so that the irradiation does not reach the eyes of a user. The control method is carried out in the same manner as in the above embodiments.

[0009] Next, a mode using a solar-cell system will be described. As shown in FIG. 13, a solar panel (21) is provided on a door (19). This collects light from indoor lighting. The solar panel is wired inside the door, and supplies power to the sterilization lamp (2) via a battery, an inverter, and a control unit built into the base or the door. With respect to the solar panel (21), it is also possible to wire a solar panel provided outdoors in order to further enhance light-collecting capability. In this case, it is also conceivable that the battery, the inverter, and the control unit are provided externally. This power supply system is incorporated and implemented in a configuration other than the power supply means of each of the above modes.

[0010] Next, a mode using an AC outlet power supply will be described. As shown in FIG. 14, a cord having a plug (23) is wired to the door. This cord is wired inside the door and supplies power to the sterilization lamp (2) via a control unit. The control unit in this case may be a known unit that supplies AC power.

When using this configuration, by inserting the plug (23) into an outlet (22), the present system is operated using AC power.

[0011] Next, a mode for a doorknob (13) fixedly attached to a door (19) will be described. As shown in FIG. 15, a cover (5) is attached to an upper portion of the doorknob (13). The cover (5) is configured such that two members are opened left and right at an opening/closing portion (26) by a hinge. As a fixing means during attachment, as shown in the drawing, a fixing member (24) is disposed so as to span the left and right members, and is fixed with screws (25) in alignment with the screw holes provided in the cover. A power supply and an operation unit are attached to the door (19). Power is supplied from the power supply to a sterilization lamp (2) attached inside the cover (5) via a cord (27). In the drawing, the cord (27) is fixed by a belt (28) so that the cord (27) does not hang down. As shown in FIG. 16, the cover (5) is provided with an arc-shaped sterilization lamp (2) inside so as to surround the doorknob (13). At this time, as the cover (5) is divided into left and right parts, the sterilization lamp (2) is provided in each of the left and right covers (5), and it is preferable that, when in a closed state, the covers form a substantially ring shape so as to surround the doorknob (13). A lower portion of the cover (5) surrounds the sterilization lamp (2) so that the irradiation light from the sterilization lamp (2) does not reach the eyes of a user. It is also possible to provide a reflecting plate inside the cover (5), whereby the irradiation light from the sterilization lamp can be irradiated onto the doorknob more efficiently. The control means and the power supply means may be those used in each of the above modes.

[0012] Although the various modes have been described above, as an application example that can be commonly used for these modes, use of a photocatalyst or a charge transfer catalyst may be mentioned. This involves providing a catalytic layer formed of a photocatalyst, a charge transfer catalyst, or the like on a surface of the doorknob that receives irradiation light. The charge-transfer catalyst mentioned here refers to techniques such as those described in JP-A-2002-001121. Accordingly, a synergistic effect is obtained from the sterilization effect of the sterilization lamp and the effect of the catalyst, making it possible to perform sterilization more efficiently. Note that when these catalysts are used, the irradiation light is not limited to that from a sterilization lamp, and various ordinary lamps capable of obtaining the catalyst effect can be used. When these catalysts are used, the irradiation light is not limited to that from a sterilization lamp, and various ordinary lamps capable of obtaining the catalyst effect can be used.

[0013]

[Effects of the Invention] By using the present invention, it becomes possible to efficiently sterilize various bacteria adhered to an entire surface of a doorknob. By adopting a structure that can be attached to an existing door, the device can be easily installed without replacing an existing doorknob, making it possible to implement the invention at a low cost. By providing shielding means, safety can be ensured by preventing the irradiation light from the sterilization lamp from entering the eyes of a user. By providing a manual control switch, sterilization can be performed as needed in accordance with usage. By using a timer as a control method, irradiation can be

automatically performed without human intervention, making it possible to reliably carry out sterilization work and to set the operation in accordance with the environment. By controlling operation using a sensor, irradiation processing can be reliably performed each time the device is used. By providing a catalytic layer on the door, the effect of the sterilization lamp and the effect of the catalyst can be synergistically obtained.

[Brief Description of the Drawings]

FIG. 1 is a perspective view of the present invention.

FIG. 2 is an exploded perspective view of the present invention.

FIG. 3 is a perspective view of the present invention.

FIG. 4 is a cross-sectional view of the present invention.

FIG. 5 is a perspective view showing another mode of the present invention.

FIG. 6 is a perspective view showing another mode of the present invention.

FIG. 7 is a perspective view showing another mode of the present invention.

FIG. 8 is an exploded view showing another mode of the present invention.

FIG. 9 is a perspective view showing another mode of the present invention.

FIG. 10 is a cross-sectional view showing another mode of the present invention.

FIG. 11 is a perspective view showing another mode of the present invention.

FIG. 12 is a cross-sectional view showing another mode of the present invention.

FIG. 13 is an enlarged view of a principal part showing another mode of the present invention.

FIG. 14 is a perspective view showing another mode of the present invention.

FIG. 15 is a perspective view showing another mode of the present invention.

FIG. 16 is an enlarged view of a principal part showing another mode of the present invention.

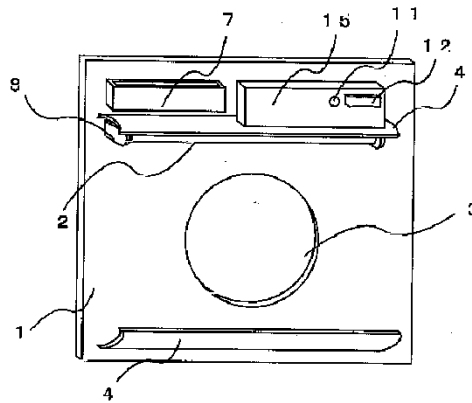
[Explanation of References]

- 1 Base
- 2 Sterilization lamp
- 3 Base opening
- 4 Reflecting plate
- 5 Cover
- 6 Operation window
- 7 Battery box
- 8 Sterilization lamp mounting portion
- 9 Shielding plate
- 10 Cover opening
- 11 LED
- 12 Switch
- 13 Door knob
- 14 Lid
- 15 Control box
- 16 Upper cover
- 17 Lower cover
- 18 Irradiation opening
- 19 Door

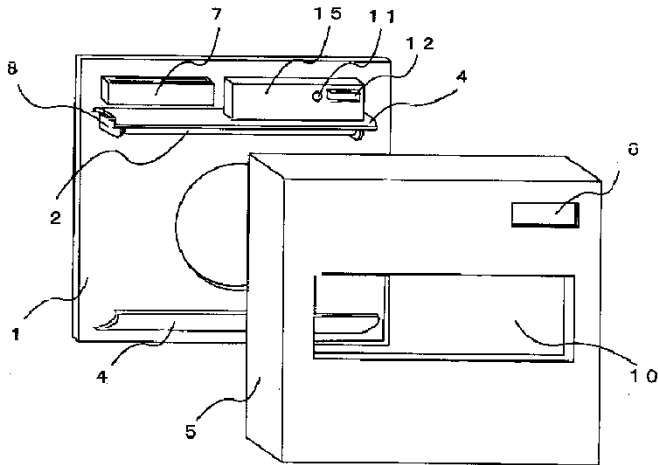
- 20 Sterilization lamp housing portion
 21 Solar panel
 22 Outlet
 23 Plug

- 24 Fixing member
 25 Screw
 26 Opening/closing portion
 27 Cord
 28 Belt

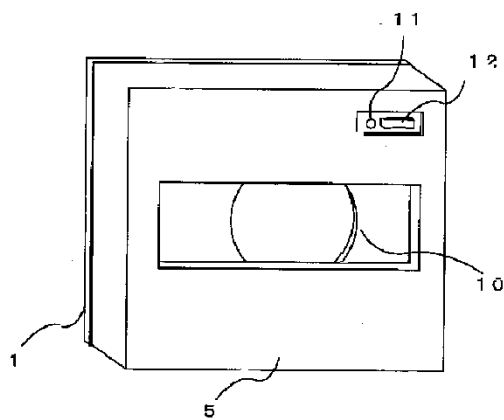
[FIG. 1]



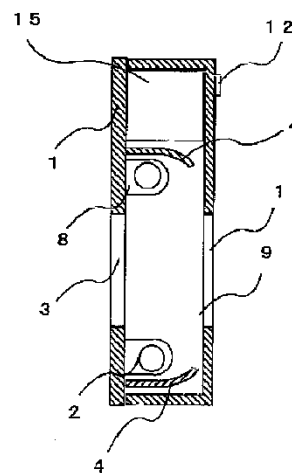
[FIG. 2]



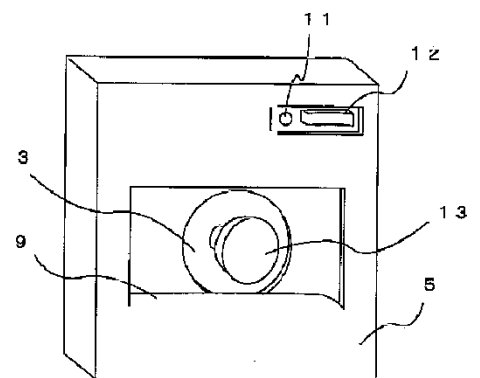
[FIG. 3]



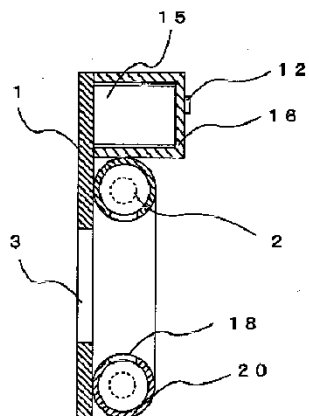
[FIG. 4]



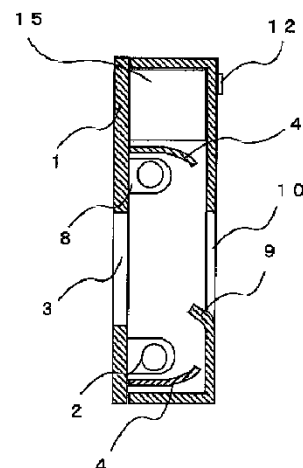
[FIG. 7]



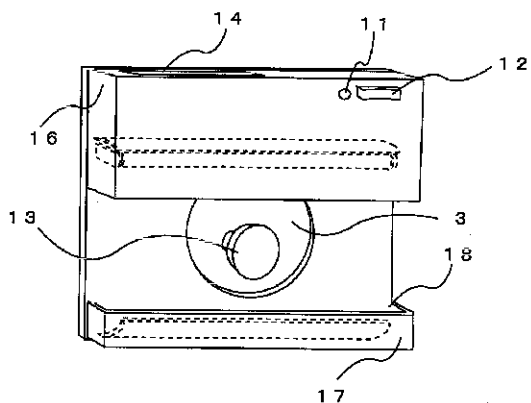
[FIG. 12]



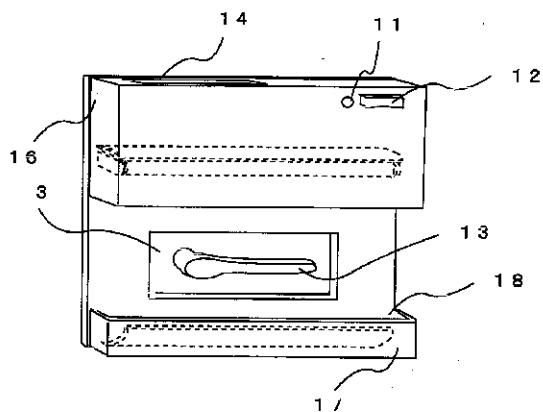
[FIG. 8]



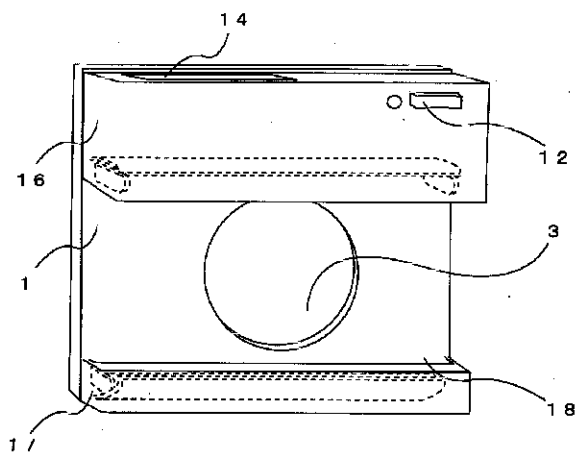
[FIG. 5]



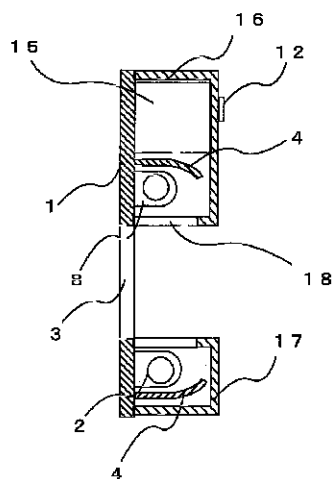
[FIG. 6]



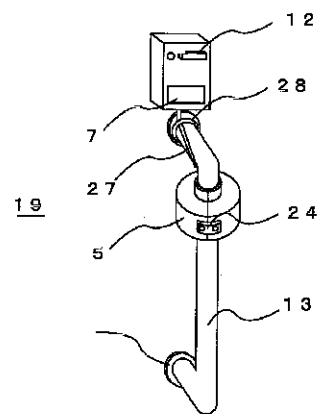
[FIG. 9]



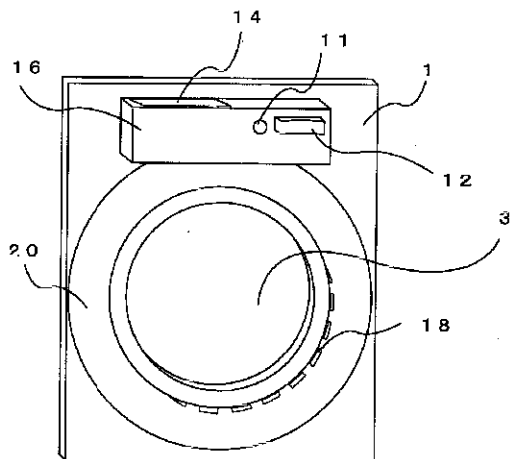
[FIG. 10]



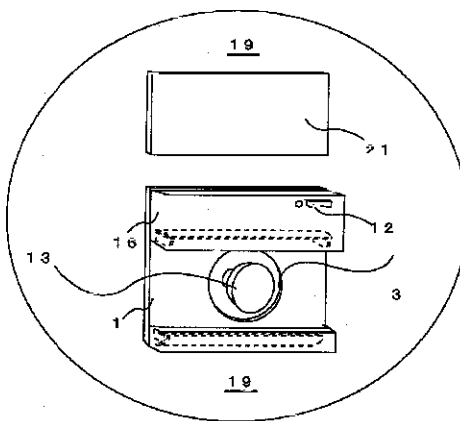
[FIG. 15]



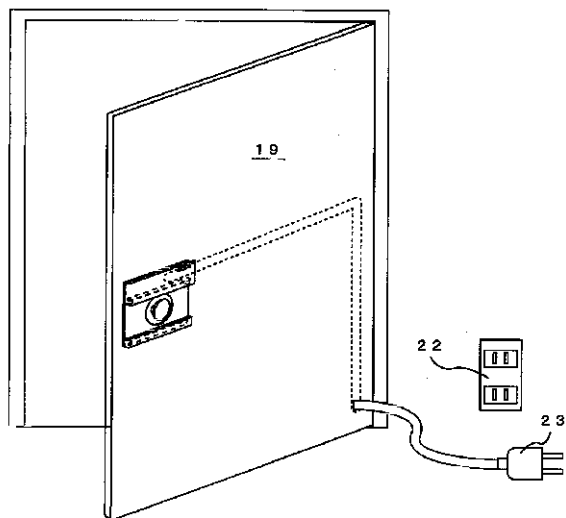
[FIG. 11]



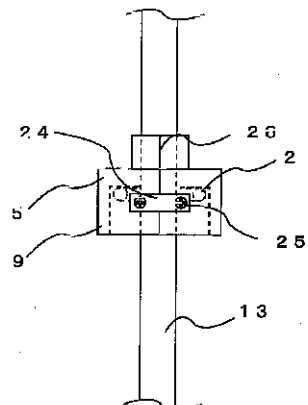
[FIG. 13]



[FIG. 14]



[FIG. 16]



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