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Description**Title of the Invention**

Odourless System.



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Field of the Invention

It is a device for use with a toilet bowl assembly for eliminating unpleasant odour in the toilet by extracting the foul smelling air from within the bowl. The patent applicant is convinced that the benefit offered by this product will eventually be a standard feature in all toilets especially in luxurious apartments, commercial buildings and hotels. It will revolutionize washroom standard and bring us to the next level of quality lifestyle.

Background

The patent applicant used to be a smoker who had the habit of smoking while in the toilet. The smoke from the cigarette helped reduce the unpleasant odour within the toilet space and the patent applicant was accustomed to this less unpleasant environment. However, approximately one year ago, the patent applicant quit smoking. Without the smoke from the cigarette the patent applicant found the environment unbearable and was determined to find a solution to the problem. This had eventually led to the development of the Odourless System, which effectively eliminates the unpleasant odour while a person is performing the toilet ritual. An improvised unit was constructed and installed in the patent applicant's home. This improvised unit is constructed out of loose components readily available from the market and with some salvaged parts. Although not at its best performance compared to one using a specially moulded housing, the improvised unit has proven to be highly effective. Photographs of this improvised unit are enclosed in this application.

Brief Description of the Prior Art

The Odourless System is based on the principle of extracting foul smelling air from within the toilet bowl. It primarily consists of an Odour Extraction Unit with a Suction Hose (or pipe) and a Discharge Hose (or pipe). The Odour Extraction Unit includes an Air Extraction Device capable of inducing a flow of air. The Air Extraction Device comprised of an Outer Housing with an inlet opening and an outlet opening. Enclosed within the Outer Housing is an impeller with an Inner Housing coupled to an electric driver. The rotation of the impeller caused by the motor enable an air-suction capability at the inlet opening of the Air Extraction Device inducing a flow of air through the inlet opening of the Outer Housing and discharges through the outlet opening of the

Outer Housing. The electric motor could either be a DC motor or an AC motor. One end of the Suction Hose is connected to extract foul smelling air from a toilet bowl assembly (sitting type) while the other end is connected to the inlet end of the Air Extraction Device. One end of the Discharge Hose is connected to the outlet end of the Air Extraction Device while the other end is connected to discharge the foul smelling air to a more appropriate location such as a toilet's ventilation opening, a common ventilation trunk or WC vent. The Odour Extraction Unit includes a Transformer (In the case of a DC motor being used), an optional Cooling Fan and a Power Control Unit. The Power Control Unit may consist of all or any one or any combination of the following features:

- ON/OFF Switch.
- Timer Device.
- Remote Control Device.
- Provision for a low voltage connection to an external ON/ OFF switch.
- Motor Speed Control Device.

The ON/ OFF Switch enable the user to manually ON or OFF the Air Extraction Device. A Timer Device limiting the operation of the Air Extraction Device to approximately 10 minutes during each operation is recommended for purpose of saving electrical power and also to ensure longer motor life. A Remote Control Device for ease of activating the unit. A provision for a low voltage connection to an external ON/ OFF switch for locating the ON/ OFF switch to a location conveniently reachable by the user. Also, this provision allows the unit to be activated via a switch which sense a human weight on the toilet seat thus activating the unit only when it is in use.

Since the unit will be installed within the toilet space, it is important to keep the noise level as low as possible. It was noted that the two main sources of noise are:

- a) Air flow noise resonance at the impeller and it's housing when the air is being accelerated.
- b) Vibration resonance from the impeller and motor.

Through research and experiment, it was concluded that the use of an Inner Housing (as shown in photo page 1 & 2) and Flexible Membrane combination will effectively eliminate these two sources of noise. This is how it works:

With the use of the Inner Housing, the air-flow noise resonance is made to occur at the Impeller and the Inner Housing and is dampened by the Outer Housing.

The vibration (in all directions X, Y, Z plane) from the Impeller and Motor transmitted to the Inner Housing is absorbed by the Flexible Membrane. The Flexible Membrane is a highly elastic material such as those thin rubber used to make balloons. It is as though the Impeller, its Motor and the Inner Housing assembly is floating without any physical link to the Outer Housing.

Drawing number MT-DWG-OS-004 rev.1 shows one of the preferred constructions of the Odour Extraction Unit with a Casing suitable for wall mounting and protection against ingress of water. The Transformer and Timer and Power Control Unit may also be housed within the Air Extraction Device to increase cooling to these devices (especially the transformer) and also eliminate the need for an external casing.

Drawing number MT-DWG-OS-001 shows one of the ways it may be connected to a typical toilet bowl assembly having a flush water supply from a Water Tank located above the toilet bowl. Details of how it works are as follows:

Foul smelling air in the toilet bowl is sucked by the powerful air extraction device into the water tank through passage within the toilet bowl (This is the same passage where the flush water travels from the water tank enters into the toilet bowl during flushing). The foul smelling air then travels through the vent of the water tank (a standard feature in most water tanks) into the suction hose and then into the air extraction device before eventually being discharged to the atmosphere through the toilet ventilation opening. Alternatively, the foul smelling air may be discharged into a ventilation trunk or a common WC vent. The WC vent is common in all HDB apartment, private estates, buildings and hotels. In the case of discharging the foul smelling air into a common WC vent, a mechanical or an electrically operated non-return valve is required to prevent escape of the foul smelling air from the WC vent.

To enhance the effectiveness of the Odourless System, it may be necessary to do air sealing at the top cover of the water tank. Also, the toilet seat has to match the toilet bowl rim profile to minimize leakage of foul smelling air otherwise some modification or air sealing would be necessary.

For a toilet bowl assembly which is without a water tank but having a pressurized flush water supply piped directly onto the toilet bowl via a manual or automatic valve, a Y-joint is used to extract the foul smelling air from the bowl. The Y-joint is located on the flush water pipe before the flush water entry to the bowl but after the manual or automatic valve. Drawing number MT-DWG-OS-002 shows how it works:

During operation of the Odour Extraction Unit and when there is no flushing of water into the toilet bowl, the portion of the flush water pipe after the manual or automatic valve is empty allowing foul smelling air to be sucked from within the bowl into the Odour Extraction Unit via the Y-joint. It is preferred to have the Odour Extraction Unit de-activated prior to flushing the bowl. However, flushing the bowl during operation of the Odour Extraction Unit should not damage the Odour Extraction Unit since it is located well above the Y-joint and the Air Extraction Device is designed not to have self-priming capability as to suck the flush water up to the Odour Extraction Unit.

Regardless of the flushing method required by the toilet bowl assembly, the foul smelling air may be extracted from within the toilet bowl by a Suction Adaptor installed on the rim of the toilet bowl. The Suction Adaptor is a hollow body having an inlet opening extending beyond the rim of the toilet bowl and an outlet opening connected to the suction hose or pipe of the air extraction device. Drawing number MT-DWG-OS-003 shows how it works:

Foul smelling air is being drawn into the inlet opening of the Suction Adaptor which is extended beyond the rim of the toilet bowl and flows out through the outlet end of the Suction Adaptor into the suction hose of the Air Extraction Device before being discharged to the more appropriate location.

The Claim

1. An apparatus comprising an Air Extraction Device for use with a toilet bowl assembly for extracting odour from within the toilet bowl and discharging it to a more appropriate location. The Air Extraction Device comprising an Outer Housing having an inlet opening and an outlet opening, an Impeller with an Inner Housing coupled to a DC (or AC) Motor within the Outer Housing so that the operation of the Motor enable the Impeller to rotate creating air suction capability at the inlet opening of the Outer Housing inducing a flow of air through the Outer Housing and discharging it through the outlet opening of the Outer Housing. The Inner Housing is supported by a Flexible Membrane within the Outer Housing. The use of an Inner Housing and a Flexible Membrane eliminate noise and vibration resonance thus enable the device to be extremely quiet suitable for installation within a toilet space.
2. An apparatus as defined in claim 1 including Transformer for the motor (In the case of a DC motor being used), an optional Cooling Fan and a Power Control Unit comprising all or any one or any combination of the following features:
 - a) Manual ON/OFF switch means a switch which enable manual ON or OFF of the Air Extraction Device.
 - b) Timer device means a device limiting the operation of the Air Extraction Device to a particular duration during each activation.
 - c) Remote Control device means enabling the Air Extraction Device to be activated by a remote controller.
 - d) Motor speed control device means enabling the speed of the motor in the Air Extraction Device to be variable.
 - e) Provision for a low voltage connection to an external ON/ OFF switch means a switch can be brought out via hardwire to a location reachable by the user or to self-activate when sensed a human weight on the toilet seat.
3. An apparatus as defined in any one of the above claims wherein, the Air Extraction Device, the Transformer (In case of DC motor being used), the Power Control Unit and the optional Cooling Fan are enclosed in a common Casing suitable for wall mounting. The Casing complete with the Air Extraction Device, the Transformer (In the case of a DC motor), the optional Cooling Fan and the Power Control Unit is being referred to as an Odour Extraction Unit. The Transformer and/ or the Power Control Unit may also be installed within the Air Extraction Device.
4. An apparatus as defined in any of the claim 1, 2 and 3 wherein, the said more appropriate location means a toilet ventilation opening, a ventilation trunk or a WC vent.

5. An apparatus as defined in any one of the above claims, wherein, the said toilet bowl assembly means including a bowl having a plurality of flush water outlet holes located therein, a Toilet Seat and a flushing water supply from a Water Tank.
6. An apparatus as defined in any of the above claims, wherein, the said extracting odour from within the toilet bowl means having the inlet end of the Air Extraction Device in communication with a vent pipe connection at the bottom of the Water Tank or any opening or connection on the Water Tank allowing foul smelling air to flow from within the toilet bowl through the flush water outlet holes into the Water Tank and out of the Water Tank through the Vent Pipe or any opening or connection on the Water Tank.
7. An apparatus as defined in any one of the claim 1 to 4, wherein, the said toilet bowl assembly means including a bowl having a plurality of flush water outlet holes located therein, a Toilet Seat and a flushing water supply from an external pressurized water source and control via a Manual or Automatic Valve.
8. An apparatus as defined in any of claim 1,2, 3, 4 and 7 wherein, the said extracting odour from within the toilet bowl means having the inlet end of the Air Extraction Device in communication with a Y-joint means located on the flush water pipe before the entry into the toilet bowl but after the Manual or Automatic Valve adapted for foul smelling air communication between the toilet bowl and the Air Extraction Device when flush water is not entering the toilet bowl.
9. An apparatus as defined in any claim 1,2,3, 4, 5 or 7 wherein, the said extracting the odour from within the toilet bowl means having the inlet end of the Air Extraction Device in communication with a outlet opening of a Suction Adaptor means includes a hollow body having an inlet and an outlet opening the hollow body secured on a toilet bowl rim with its inlet opening extending beyond the toilet bowl rim adapted for foul smelling air communication between the toilet bowl and the Air Extraction Device.
10. An apparatus as defined in any one of the claim 1 to 9 including a Mechanical Non-return Valve or an Electrically Operated Valve wherein, the said discharge to a more appropriate location refers to a WC vent pipe.
11. An apparatus as defined in any one of the claim 1 to 10 whereas, the Air Extraction Device is mounted separately from the Transformer (In the case of a DC motor being used), the Optional Cooling Fan and the Power Control Unit or any separate mounting configuration.
12. An apparatus as defined in claim 10 whereas, the Air Extraction Device, the Transformer (In the case of a DC Motor being used), the optional Cooling Fan and the Power Control Unit are integrated onto the toilet bowl assembly.