A venting system is disclosed. The system includes an exhaust fan connected to a discharge outlet as well as central and branch conduits for collecting odors or fumes. The system includes an electric power supply and switches for activating and de-activating the exhaust fan.
FIG. 5
BOTTOM VENT INTEGRAL DESIGN

FIG. 6
REAR VENT INTEGRAL DESIGN
SECTION D-D INTEGRAL DESIGN

SECTION E-E MODULAR DESIGN
CENTRAL TOILET/BATHROOM VENTING
CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority of provisional application No. 60/538,045, filed on Jan. 21, 2004.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] Not Applicable.

APPENDIX


BACKGROUND OF THE INVENTION

[0004] 1. Field of the Invention

[0005] The present invention relates generally to venting a toilet assembly, and more particularly to venting via the tank or water closet portion of the toilet assembly.

[0006] 2. Related Art

[0007] A typical toilet assembly is composed of a bowl, tank and lid. The bowl functions as support for a seat assembly on which a typical user sits. In a two-piece assembly the bowl also functions as a support for the tank while in a single piece design the bowl and tank are molded as one piece. The bowl contains passages under the rim for transporting water from the tank into the bowl for flushing waste and cleaning the walls of the bowl.

[0008] The tank functions as support for a cover or lid as well as being a reservoir for water used to flush waste into the sewer system. The tank also supports a fill valve, a flush valve and a flushing actuation lever. The fill valve is used for supplying water and shutting off water after it reaches a predetermined level in the tank. The flush valve is composed of a fill tube and a flapper valve. The fill tube functions as a conduit for water into the bowl during initial tank fill. The flapper valve is actuated into an open position by a lever and flexible chain or other connector thereby allowing water from the tank to rush into the bowl to carry and flush waste down the sewer or drain.

[0009] Typically the bottom of the tank has a hole for installing a flush valve through which the water is channeled to the bowl to flush waste down the sewer. A typical tank also has three other holes at the bottom or base of the tank. One of the holes, to the left of the centerline of the tank, is used to install a fill valve. The location of the hole for the fill valve is standard on toilets and provides those skilled in the art of building or remodeling homes and other buildings with a known standard location for routing of the water supply line or other plumbing based on the planned location of the toilet in the bathroom. The last two holes at the bottom of a typical toilet are used for mounting the tank to the bowl in a two-piece toilet bowl and tank assembly. The tank mounting holes are not present in the case of a single piece bowl and tank assembly. In accordance with a typical bowl, tank and cover designs there is no provision for exhausting or handling odors from waste or cleaning products and chemicals in the bowl.

[0010] It is generally known that waste and or bowl cleaning chemicals generate odors which are offensive or harmful when breathed in by those using the toilet or using chemicals to clean the bowl. In a typical toilet or bathroom these odors are allowed to rise and fill the room before they are exhausted to the atmosphere by a ceiling mounted exhaust fan.

BRIEF SUMMARY OF THE INVENTION

[0011] It is in view of the above problems that the present invention was developed. The invention is a tank with provision for collecting and exhausting odors at the source. This means that odors will not be allowed to fill the room before being exhausted. The intention and purpose of this invention is to provide the toilet with a feature to vent the fumes or odors to the outside for the comfort of the person using or cleaning the bowl.

[0012] This invention will also facilitate attachment of energy recovery systems in which the exhausted interior air is channeled through a heat exchanger where the energy from the exhausted air is recovered by the incoming air from outside. The energy exchange also facilitates indoor air quality improvement and circulation. This feature is important because most modern buildings and houses are built more tightly to promote energy efficiency. It is intended to accomplish this by providing a tank with a venting hole at the base of the tank or on the back wall of the tank. It is also the intention of this invention that the means for collecting and channelling the odors out of the tank provide the option of being manufactured integral to the tank or modular assembly of odor collecting and channelling components.

[0013] Odor collecting components will be designed or assembled such that odor-collecting points will tower above the designated tank waterline or level, and above the top of the fill tube. This will prevent the exhaust system from ingesting water. Odor collecting points and components will also be located lower than the top rim of the tank while leaving enough clearance with the lid or cover to provide free flow of air to the suction or collecting points.

[0014] This invention is intended to vent odors or fumes by providing another hole at the bottom of the tank or on the back of the tank. It is anticipated to locate the vent holes or outlets to the right of the centerline of the toilet assembly. By locating the vents to the right of the centerline of the toilet; this invention provides those skilled in the art of building or remodeling homes and other buildings with a known standard location for routing of the odor collecting lines, conduits or other plumbing based on the planned location of the toilet in the bathroom. Those skilled in the art of building or remodeling homes and other buildings will also be obligated or directed to provide space behind the wall free of internal structural reinforcement to facilitate easy installation of venting lines or conduits during or after completion of construction of the premises. The option of locating the vent hole at the bottom or back of the tank is intended to account for the difference in current and future tank styles without changing the design or profile. While the size of the vent holes may vary depending on the features and shape of the tank it is advised to be the same size as the flush valve installation hole to simplify installation components and tools.

[0015] Further features and advantages of the present invention, as well as the structure and operation of various
embodiments of the present invention, are described in detail below with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] The accompanying drawings, which are incorporated in and form a part of the specification, illustrate the embodiments of the present invention and together with the description, serve to explain the principles of the invention. In the drawings:

[0017] FIG. 1 is a top view of a toilet and a tank in a first embodiment;

[0018] FIG. 2 is a top view of a toilet and a tank in partial section in a second embodiment;

[0019] FIG. 3 is a sectional view taken along line A-A in FIG. 1;

[0020] FIG. 4 is a sectional view taken along line C-C in FIG. 2;

[0021] FIG. 5 is a top view of the FIG. 1 embodiment;

[0022] FIG. 6 is a top view of the FIG. 2 embodiment;

[0023] FIG. 7 is a sectional view taken along line B-B in FIG. 5;

[0024] FIG. 8 is a sectional view taken along line F-F in FIG. 6;

[0025] FIG. 9 is a cross-sectional view of an integral embodiment taken along line D-D in FIG. 8;

[0026] FIG. 10 is a cross-sectional view of a modular embodiment taken along line E-E in FIG. 9;

[0027] FIG. 11 is a side view of a venting system; and

[0028] FIG. 12 is an illustration of a modular port plug.

DETAILED DESCRIPTION OF THE INVENTION

[0029] In accordance with a first embodiment of the present invention, there is provided a venting system as depicted in FIG. 11. The venting system includes toilet assemblies having special features in terms of a venting opening at the bottom of the tank, FIG. 11A and/or a venting opening at the back of the tank as in, FIG. 11B. The venting system also includes branch conduits 23 which are connected to a larger central venting conduit 24. The larger conduit 24 is connected to an electrically driven or powered fan/blower or energy recovery exhaust system 25. The venting system and assembly has a final discharge outlet 26 which is equipped with a back draft prevention damper 27. The purpose of the back draft damper is to prevent reverse flow of what the fan is exhausting through the ducts and conduits when the fan is off.

[0030] FIG. 11 shows one of the most efficient modes for utilizing this invention by connecting appropriate exhaust lines to outlet connectors 20 so that the odors will be exhausted to the atmosphere through individual or secondary branch conduits 23 and via the primary or main conduit 24 to the local or remotely mounted exhaust fan/blower or energy recovery exhaust system 25.

[0031] The exhaust outlet of the fan is equipped with the damper 27 or air check valve which prevents back draft or reverse exhaust or ingestion of outside air when the fan/blower or energy recovery exhaust system 25 is not functioning or switched off. A centrally mounted air check valve or damper controls flow from two or more toilets; a local damper or check valve controls only one. The check valve may be on either side of the exhaust fan. Local dampers in branch conduits remain within the scope of the present invention. The exhaust fan may be actuated by manual, automatic heat or motion sensing-switches 21 which are commercially available on the open market. The switches 21 are connected to the exhaust fan by electrical lines 22. The switches are connected to the exhaust fan such that the fan will continue to operate until the last energized switch cuts off the electrical current or power.

[0032] The views in FIG. 1, FIG. 2, FIG. 5 and FIG. 6 are top views of typical toilet assemblies with the cover lid removed. For the purpose of illustrating the functionality, FIG. 1 shows a tank 3 with a bottom vent 9 for assembly of vent components or modules, herein referred to as modular design. FIG. 2 shows a tank of modular design with a rear vent 18. Cross sectional views A-A, F-F and E-E have been shown in FIG. 3, FIG. 4, FIG. 8 and FIG. 10 respectively in a modular design, showing components needed to carry out the functions. Cross sectional views of an integral design are shown in sections B-B, F-F and D-D in FIG. 7, FIG. 8 and FIG. 9 respectively. This is intended to allow the venting features to be accommodated within the current and future dimensions, styles, profiles and shapes of toilet tanks without being overly conspicuous.

[0033] A flush valve 2 has a fill tube 6. The fill tube 6 functions as a passage for water from the supply line into the bowl as well as preventing water overflow over the walls of the tank. The size and/or numbers of the fill tube 6 can be increased to enhance the airflow without affecting the functionality of the system. Here the fill tube 6 also acts as a conduit for odor, indicated by arrow 17, from waste or cleaning chemicals in the bowl. A fill valve 4 typically fills the tank with water for flushing waste. In order to carry out the functionality it is necessary to install a standpipe 12 in the hole 9 or, alternatively, a specific connector 19 in hole 18. The connection of the standpipe 12 through the bottom of the tank or connector 19 through the back of the tank has a watertight seal to hold water in the tank while allowing flow of waste or chemical odors 17 mixed in the air, indicated by arrow 16. The odor and air mixture above water level 18 flows through the standpipe 12 or connector 19 and is exhausted to the atmosphere by a central exhaust fan (see FIG. 11) through appropriate conduits connected to outlet fitting 20. Odor (arrow 17) is drawn through the fill tube 6 by the suction power of the fan/blower or energy recovery exhaust system 25, which creates low pressure in the space above the water level 15, when the tank lid or cover is in place.

[0034] In the case of the integral designs, FIG. 5 and FIG. 6, the standpipe can be molded integral to the tank 3 and over the exhaust vents or holes 9 or 18, or integrated into any of the walls surrounding the holes. FIG. 7 and FIG. 9 show one way in which the standpipe can be molded into the tank to provide a snorkel function similar to the standpipe 12 or elbow 19. Items 12 and 19 are also designed to be retrofit in older toilets by addition of mounting holes items 9 and 18, respectively.
A tank with odor collecting conduits integrated into the walls as in FIGS. 7, 8 and 9 has the versatility of working like a regular toilet such that an odor collecting system can be installed at a later date. This versatility can also be included in the modular design by installation of a watertight threaded plug 30, a seal 33 and a nut 36 in vent hole 9 or 18 as seen in FIG. 12.

The modular design requires installing components, such as item 12, for bottom exhaust and item 19 for rear exhaust, in the tank 3 using watertight connections. The openings of item 12 and item 19 into the headspace of the tank 3 become the odor collecting points. The exact location of the holes 9 or 18 is intended to provide adequate clearance to the toilet bowl on which the tank is attached or integrally mounted. The style of the tank may also dictate the exact location of the vent.

As hereafter described, certain features are emphasized by numerals in parentheses. This embodiment of the invention is designed to provide a toilet venting system, FIG. 11, which (1) uses less energy and (2) has lower unit cost because one fan/blower or an energy recovery exhaust system can be used to handle multiple rooms or toilet assemblies. Low energy cost has been demonstrated with the use of one fan rated 20 watts for three toilets versus a typical 70 watts per bathroom for a regular or typical ceiling mounted exhaust fan. This embodiment facilitates the use of a central energy or heat recovery attachment to increase the efficiency of the central heating or cooling system.

This also (3) provides safety and health factors for those who use chemicals to clean toilets by exhausting chemical fumes from cleaning agents in the bowl before the cleaning person can inhale the fumes. This is also an advantage in cases where one has to vomit in the toilet by exhausting the odors before they are inhaled. This embodiment (4) prevents distribution of odors into the bathroom through (5) faster and (6) precise extraction and exhaustion of odors at the source allowing the fan to run for a shorter time. The precise and fast exhaustion of odor also (7) provides a social benefit by catering to situations where large crowds can use the toilet without experiencing nauseating odors from use by multiple users in a short period of time. This embodiment also (8) is easy to use because activation of the exhaust system can be activated using switches 21 which are commercially available on the open market with a manual or, alternatively, (9) hands free/fully automatic motion or heat sensing activation and/or switching off.

By designing the features to be capable of integration in current and future toilet tank dimensions, styles, profiles and shapes of toilet tanks, there is provided (10) opportunities for ease of production due to minimum modification requirements. The features (11) can be incorporated in toilet tanks without changing to aesthetics of current production or future designs of the toilet assemblies. This (12) minimizes maintenance or repair requirements because the only moving parts are the exhaust fan, which (13) can be remotely located in an easily accessible location. This provides opportunities of high (14) durability and (15) reliability because the fan can be equipped with high durability and reliability components such as a ball bearing mounted motor since the same fan can service one or more toilets. This (16) generates lower noise because the fan/blower or energy recovery exhaust system can be remotely mounted such as in the attic of a dwelling or commercial building. Venting components can be located in areas where they are (17) not conspicuous or noticeable from a common view. This feature allows the general (18) viewability of the toilet to remain the same. By providing odor removal apparatus connections predictably on the right side of the toilet, there is provided an opportunity (19) to set an industry standard for incorporating odorless toilet tanks in new and future toilet assemblies in households or other buildings. With the use of snorkel pipe 12 and connecting elbow 19, older toilets are (20) adaptable to incorporate an embodiment of the invention with the addition of mounting holes 9 or 18. The exhaust fan/blower or energy recovery exhaust system can be connected to provide a single venting system for the toilet as well as the main bath and shower to provide (21) system versatility. This is accomplished by additional conduit branch to ceiling mounted exhaust vents and/or grilles.

By installing snorkel pipe 12 and connecting elbow 19 or having these items molded into the design, the amount of water used to flush the toilet is reduced by the underwater volume displaced by the components. Therefore these embodiments will (22) use less water per flush than the standard toilet. By facilitating the use of a central energy or heat recovery system, (23) clean and improved air quality supply and circulation in tightly sealed dwellings is provided along with energy savings and a healthier environment.

Other aspects, objects and advantages of the present invention can be obtained from a study of the drawings, the disclosure and the accompanying claim. The invention in its broader aspects is not limited to the specific steps and apparatus shown and described.

1. For a toilet having a tank, a bowl and a fill tube where there is fluid communication between the tank and the bowl through the fill tube, a ventilator comprising:
   a pipe, said pipe having a first end disposed to open above a full water line in the tank and a second end opening outside the tank at a level below said full water line;
   an exhaust fan, said exhaust fan being remote from the toilet;
   a conduit putting said second end opening in operative communication with said exhaust fan such that said exhaust fan draws air from said toilet bowl, through said fill tube, through said tank, through said pipe and through said conduit;
   a central air check valve disposed to prevent back flow through said conduit; and
   an automatic sensor for automatically activating said fan.

2. The ventilator of claim 1 further comprising a second toilet;
   a second pipe, said second pipe having a first end disposed to open above a full water line in the second tank, and a second end opening outside the second tank at a level below said full water line of said second tank;
   a second conduit putting said second end of said second pipe in operative communication with said exhaust fan;
   a second air check valve preventing backflow along said second conduit; and
   a second sensor for automatically activating said fan.
3. The ventilator of claim 2 having only a single air check valve, said single air check valve being positioned to prevent backflow along both said first conduit and said second conduit.

4. The ventilator of claim 3 wherein said central air check valve is positioned after said exhaust fan.

5. The ventilator claim 1 wherein said sensor is selected from the group consisting of:

   a motion sensor and a heat sensor.

6. The ventilator of claim 1 wherein said automatic sensor is a manual switch.

7. The ventilator of claim 1 wherein said second end opening of said second pipe is on a right hand side of said tank, from a perspective facing the tank.

8. The ventilator of claim 1 wherein said sensor is configured to deactivate said exhaust fan at a preconfigured time after an actuation of said exhaust fan.

9. The ventilator of claim 1 wherein said second opening of said pipe is on a back of the tank.

10. The ventilator of claim 1 wherein said second opening of said pipe is in a bottom of said tank.

11. The ventilator of claim 1 wherein said pipe is a separate pipe adapted for retrofitting a preexisting tank, and further comprising a sealing fitting between said second opening of said pipe and adapted for mounting said second opening of said pipe to open to the outside of the tank.

12. The ventilator of claim 1 wherein said pipe is a conduit integrally formed with the wall of the tank.

13. The ventilator of claim wherein said exhaust fan rated at less than 70 watts per toilet.

14. A method of retrofitting a toilet having a tank, a bowl, and fill tube connecting the tank and the bowl, said method comprising:

   creating a hole in the tank below a full water mark of the tank;

   mounting a pipe in said hole in the tank, said mount being sealed against fluid leakage and said mount disposing an opposite end of said pipe above a full water line in the tank;

   connecting said hole in the tank, and thereby said pipe, to an exhaust fan remote from said toilet via a conduit;

   disposing an air check valve along said conduit to prevent backflow of air; and

   wiring in operative communication between said exhaust fan and an automatic sensor for activating and deactivating said exhaust fan.

15. The method of claim 14 further comprising a second toilet;

   mounting a second pipe, said second pipe having a first end disposed to open above a full water line in the second tank, and a second end opening outside the second tank at a level below said full water line of said second tank;

   a second conduit putting said second end of said second pipe in operative communication with said exhaust fan;

   a second air check valve preventing backflow along said second conduit; and

   a second sensor for automatically activating said fan.

16. The method of claim 14 having only a single air check valve, said single air check valve being positioned to prevent backflow along both said first conduit and said second conduit.

17. The method of claim 14 wherein said central air check valve is positioned after said exhaust fan.

18. The method of claim 14 wherein said sensor is selected from the group consisting of:

   a motion sensor and a heat sensor.

19. The method of claim 15 wherein said second end opening of said second pipe is on a right hand side of said tank, from a perspective facing the tank.

20. The method of claim 14 wherein said sensor is configured to deactivate said exhaust fan at a preconfigured time after an activation of said exhaust fan.

21. The method of claim 15 wherein said second end opening of said second pipe is on a back of the tank.

22. The method of claim 15 wherein said second end opening of said pipe is in a bottom of said tank.

23. The method of claim 14 wherein said pipe is a separate pipe adapted for retrofitting a preexisting tank, and further comprising a sealing fitting between said second opening of said pipe and adapted for mounting said second opening of said pipe to open to the outside of the tank.

24. The ventilator of claim 1 wherein said pipe is a conduit integrally formed with the wall of the tank.

* * * * *