A device for safely and conveniently vacuuming up solid or liquid waste material of a hazardous or unpleasant nature. The device includes a waste receptacle, an intake operatively connected to a hose which in turn is connected to the waste receptacle, a vacuum pump for sucking material into the intake and through the hose for reception in the waste receptacle and a fluid reservoir for providing fluid to a spray nozzle for lubricating the inside of the hose. The waste receptacle may include automatically sealing removable liners.
FIG. 3

- Intake Pump
- Spray Pump
- Litter Storage Compartment
- Self Clean Compartment
- Washer Fluid Reservoir

Arrow directions indicate flow, with "Exit Hose for Sucked-In Gas" pointing out of the Litter Storage Compartment.
FIG. 29
WET-DRY VACUUM CLEANING DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of Canadian Patent Application No. 2,431,445, filed Jun. 6, 2003, which is incorporated herein by reference in its entirety.

FIELD OF THE INVENTION

[0002] The invention deals with the removal of unwanted waste, whether solid or liquid, or mixed, such as animal feces or hazardous medical spills like blood or organs, or other hazardous spills.

[0003] More specifically, the invention deals with removal of waste by a convenient specialized wet-dry vacuum system.

BACKGROUND OF THE INVENTION

[0004] In the prior art, there have been a variety of hand-held wet-dry vacuum cleaners, whose main features have been directed to the ability to operate on liquids without injecting those liquids into the vacuum’s motor or pump systems, nor through the waste receptacle or out the exhaust air vents. Chiefly, those problems have been solved by adding baffles and filters in the stream of airflow through the machines after the receptacle and before the mechanical parts, as well as after the pump and before the exhaust exits the machine. While such devices are useful for vacuuming liquids, such devices suffer from the disadvantage of having waste receptacles which must be manually cleaned, thus potentially exposing the operator to the waste material which may be hazardous.

[0005] Larger wet-dry or shop-vac vacuuming devices are arranged with relatively large waste-collection receptacles, and relatively large distances between the vacuum pump and the waste inlet into the receptacle, and with a good level of filtration at the pump, typically hanging into the receptacle’s cavity. These types of machines rely upon the power of the vacuum created and volume of airflow into the receptacle to urge waste matter up into their collector hoses and nozzles. The interior of their hoses cannot be easily cleaned or unclogged if wet or semi-solid waste is encountered. While bag inserts can be retrofitted into some of these bucket-style wet-dry vacuums, there is no method of remotely or conveniently tying or sealing the bag inserts for disposal when they are full except manually, which exposes the operator to the waste contents in the bag.

SUMMARY OF THE INVENTION

[0006] The present invention aims to overcome the shortfalls of the prior art by providing a spray nozzle within an intake and hose to cut, deteriorate, and loosen the waste during the collection phase, to lubricate the hose and passageway within the body of the device during the passage of the waste through the hose and into an included waste receptacle, and after passage of the waste, to clean and potentially disinfect or otherwise treat the internal surfaces of the nozzle, hose and device passages automatically. As well, the device is equipped with filters in addition to those found on typical wet-dry vacuum cleaners in order to eliminate or mitigate odours from the waste during collection and while stored within the device, deployed in the airflow after the vacuum pump but before air exits the device, such filters being capable of being replaced by an operator with no special tools. In addition, all air inlets and outlets are closed and sealed during times when the device is idle. The waste collection receptacle is lined with removable liners which are impervious to the type of waste being collected, and which are sealed within the airflow system of the device. It can be seen then that when the device is not in use, any waste collected is sealed from the outside atmosphere.

[0007] This is useful when the waste has unpleasant odours, but also when the waste has some other un desirable features, such as containing airborne contaminants, particles, or infectious agents.

[0008] The removable liner, when removed, may be subjected to an automated cycle within the device’s internal body which ties and seals the liner’s entry point, and permits the operator to eject the sealed liner for further handling without touching any contaminated surfaces. The liners may have a neck portion with embedded metal or plastic ties or other stiffeners which can be twisted against themselves during the removal cycle, causing the embedded stiffeners to hold the twisted neck in a closed and sealed position.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. 1 shows a side elevation rendering of an embodiment, fully closed;

[0010] FIG. 2 shows a side elevation rendering of an embodiment, deployed for use;

[0011] FIG. 3 shows a schematic representation of air and liquid flow within the device;

[0012] FIG. 3a shows a schematic representation of air and liquid flow within the device;

[0013] FIG. 4 shows a schematic representation of flows within the device when in use;

[0014] FIGS. 5 through 10 show renderings of the device in one embodiment from various angles in order to visualize their interrelationships;

[0015] FIG. 11 shows a cutaway internal view of the device in one embodiment with subcomponents;

[0016] FIG. 12 shows a cross-sectional diagram rendering of an upright embodiment to make clear internal air and liquid flows and stopper valves and controls;

[0017] FIG. 13 shows a detailed rendering of a grill segment of the intake head 27 in the upright embodiment discussed;

[0018] FIG. 14 shows details in a cross-sectional rendering of a part of a nozzle and airflow conduits internal to the device;

[0019] FIG. 15 shows a rendering much like FIG. 14 but with an added hose-washer nozzle;

[0020] FIG. 16 shows an intake head having a closed grill;

[0021] FIG. 17 shows an intake head have an open grill;

[0022] FIG. 18 shows a cross-section of a nozzle and a hose with one-way flap or other valve to stop reverse flow of collected matter;
FIG. 19 shows FIG. 18 with a one-way valve deployed in an open position;

FIG. 20 shows an internal spray nozzle 45 to spray fluid inside a hose and a passageway of a collection conduit;

FIGS. 21 through 23 show a type of intake grill nozzle control device to open and close the grill;

FIG. 24 shows an example of a replenishable filter for exit air;

FIG. 25 shows an exit hose, a passageway and an electrically controlled tap or valve between them;

FIG. 26 shows a representative drawing of a waste receptacle, empty;

FIG. 27 shows an embodiment of a removable liner connection device;

FIG. 28 shows a detail of a pullout hanger for a removable liner and a connecting spout;

FIG. 29 shows a schematic of fluid flows within fluid reservoirs and sprayers;

FIG. 30 shows a schematic of a nozzle self-cleaning compartment;

FIG. 31 shows a gimbaled washbasin for cleaning a nozzle’s outermost parts within the device;

FIG. 32 shows an embodiment, in cutaway or cross-section, with a nozzle’s outermost parts bathed in the washbasin of FIG. 30;

FIG. 33 shows another detail of insertion of a nozzle’s outermost end into a washbasin before closing and sealing the device in its idle position;

FIG. 34 shows the same device as FIG. 33, but in its fully closed and idle or “stand-by” position;

FIG. 35 shows a lift device in one embodiment of the invention, for lifting the waste receptacle 148 and included installed removable liner into operational position;

FIG. 36 shows the lift mechanism of FIG. 35 with additional details to make clearer the integrated action of removing the removable liner when filled from the waste collection tubing;

FIG. 37 shows an exemplary drawing of a removable liner;

FIG. 38 shows a detailed drawing of the installation and automatic attachment of a new removable liner;

FIG. 39 shows a detailed drawing of sealing, disconnection and removal of a removable liner;

FIGS. 40 through 43 show details of a removable liner’s connecting neck and folding symmetrical coggled holder/hanger part;

FIGS. 44 through 46 show a waste receptacle drawer which permits ejection of a used removable liner; and

FIG. 47 shows details of one method of self-sealing a removable liner.

DETAILED DESCRIPTION OF THE INVENTION

The present invention generally provides a wet-dry vacuum-cleaning device for collecting solid, liquid or mixed solid and liquid waste. More specifically, the present invention will vacuum up pet stool from a surface area which may be wet, dry or sandy, or from grass or bushes. The device generally includes an intake system 20, a fluid supply system 200 and a waste litter storage and disposal system 140.

The intake system 20 further includes an intake head 27 connected to a vacuum pump 155 via a passageway 146. The vacuum pump 155 provides suction to the intake system 20 thereby allowing the intake head 27 to collect and move matter from outside the device through the passageway 146 and into the litter storage and disposal system 140.

The fluid supply system 200 may further include a fluid reservoir 212, a pump 214, a self-cleaning compartment 75 and a spray nozzle 45 for the hose 40 and an external spray wand 225 having an adjustable spray nozzle 227.

The litter storage and disposal system 140 includes a waste receptacle 148, a removable liner 143 for placement within the waste receptacle 148 and an automatic mechanism for connecting and disconnecting the removable liner 143 to and from a passageway 146. The removable liner 143 may be disconnected from the system using a screw cap 152 for preparing the removable liner 143 for discarding or disposal. The litter storage and disposal system 140 may further include a carrier drawer 156 for carrying or removing the removable liner 143 for disposing of the removable liner 143 and may still further include an ejection mechanism for ejecting the removable liner into the carrier drawer 156.

A description of the general operation of one embodiment of the system follows.

With reference to FIG. 1, an adjustable or collapsible handle 411, which may be situated at the back upper part of the device, is pulled out and upward to a desirable height as desired by the operator as shown in FIG. 2.

The operator can depress a pedal (not shown) attached to the self-cleaning compartment 75 (as shown in FIG. 2) to release the intake 25.

The vacuum pump 155 is turned on at which time the operator places the intake head 27 in the vicinity of the waste matter and the vacuum pump 155 sucks the waste into the device through the intake head 27 and into the hose 40.

The waste is pumped into the waste receptacle 148 through the passageway 146 which is located inside the waste receptacle 148. Once the waste has been vacuumed into the device, the device is turned off.

The intake is then returned to the self-cleaning compartment 75 by depressing the pedal of the self-cleaning compartment 75 where it is washed and sanitized employing an automatic process.

After the self-cleaning process, when the removable liner 143 is ready for disposal, the power is turned off and the removable liner 143 is disconnected and disposed. The hose 40 is then rolled into place at the top of the device or, alternatively, stored within the device.
A general overview of the operation of the device and the interconnection between the systems described above can generally be seen in FIGS. 3 and 4 which provide two operative embodiments. FIG. 4 shows a more compact embodiment suitable for a handheld embodiment of the present invention. A cross sectional view of the back of the device also showing various components can be seen in FIG. 11.

More specific embodiments and particular features of the present invention will now be described.

**INTAKE SYSTEM**

The vacuum pump 155 is used to provide suction to suck various types of solid, liquid or mixed solid and liquid matter into the intake system 20 and deposit the matter into the waste or litter storage and disposal system 140 for disposal.

In operation, the hose 40 is removed (FIG. 6) and then the intake head 27 is removed as shown in FIG. 7. The intake head 27 is placed in the vicinity of the matter which the operator wishes to vacuum up, such as pet litter. The vacuum pump 155 sucks the matter into the intake head 27 and through the hose 40 for deposit into the removable liner 143.

To clean and sanitize the intake system 20, the intake head 27 is placed in the self-cleaning compartment 75 as shown in FIG. 10. In one embodiment the intake head 27 includes a lid 28 as shown in FIG. 8 for reception into the self-cleaning compartment 75 and for covering the self-cleaning compartment 75. The lid 28 is then inserted into a slot 77 defined by the self-cleaning compartment 75 as shown in FIG. 10. Once the intake head 27 is fully inserted and locked in the self-cleaning compartment 75, the pump 214 automatically draws fluid from the fluid reservoir 212 and dispenses fluid through the spray hose 220 into the self-cleaning compartment 75 for cleaning and sanitizing the intake head 27. During the automatic self-cleaning process, the hose 40 is shut off.

Once the intake head 27 is cleaned and sanitized or after a preprogrammed period of time, the pump 214 and the spray hose 220 are shut off and the vacuum pump 155 then sucks in any waste or litter cleaned off the intake head 27 together with the cleaning fluid, and deposits the waste or litter and fluid into the removable liner of the collection system 143 for disposal. This self-cleaning system ensures that the entire intake system 20 is cleaned and sanitized.

In some cases the waste may be hard, dry or frozen. In these cases, an operator may use a detachable intake head 27 having rotating blades (not shown) as shown in FIGS. 14 and 15. Typically these blades (not shown) are located outside a protective cover or grill 30 of the intake head 27 (see FIGS. 13 and 16) such that the incoming waste is already cut into manageable pieces before being sucked into the intake system 20. Power for the blades (not shown) may be provided from the device's main power supply 400 and controlled through a control panel 26 located on the intake 25. In this embodiment, the intake head 27 may be lined with noise reduction material (not shown) such as soft thick rubber for reducing the noise during processing of the waste.

In one embodiment, the intake head 27 may include wheels 31 as shown in FIG. 12 to conveniently allow forward and backward movement of the intake head 27 during operation. These wheels 31 may be connected to each other by a connecting rod (not shown) and the rod (not shown) may include blades (not shown) in a fan formation. The blades (not shown) allow free rotating movement of the connecting rod for ensuring that the wheels 31 are turned when the intake head 27 is inserted inside the self-cleaning compartment 75 for cleaning. More particularly, spray from a spray jet in the self-cleaning compartment 75 hits the blades (not shown) on the fan thereby rotating the rod (not shown) which in turn rotates the wheels 31 for thorough cleaning.

In another embodiment, the inside of the walls of the hose 40 and the intake head 27 include a spray nozzle 45 as shown in FIG. 20 (which also forms part of the fluid supply system 200 described below). The spray nozzle 45 allows the walls of the hose 40 to be washed and lubricated during operation thereby making it easier for the vacuum pump 155 to suck up the litter by clearing the hose 40 for incoming material.

The spray hose 220 may be activated from the control panel 26, but should only be activated when the vacuum pump 155 is in use.

As described above, the intake head 27 may be protected by a cover grill 30 to prevent larger waste material from being sucked into the intake system 20. Further, the grill 30 may be flipped open or closed by the operator as shown in FIG. 17, either by manually opening the grill 30 or through the use of a control handle located on the intake. This is useful in the event that larger material is stuck to the grill 30 owing to the suction power of the intake/vacuum pump 155.

More specifically, the grill 30 includes a lock or hook 30a to keep the grill 30 closed. A thin rod 30b as shown in FIG. 21 connects the lock or hook 30a of the grill to the control panel 26. The thin rod 30b can then unlock or push open the grill 30 for pushing any larger material 30 that is too large to pass through the grill 30 off. When the thin rod 30b is no longer depressed then the grill 30 returns to a closed position through the use of a return spring 30c which pushes the thin rod 30b upward to its normal position.

In another embodiment as shown in FIGS. 18 and 19, the inside of the intake head 27 includes a flap 30 which acts as a check valve to allow waste to flow unidirectionally toward the waste receptacle 148. A second flap (not shown), attached to the opposite wall of the first flap 30, acts as a redundancy system for the first flap 30 and further ensures the unidirectional flow of the waste, which incidentally also segregates the inner portion of the system from the cut position, to provide a secondary system to isolate the vacuumed waste from the outside environment.

The flap 30 also prevents waste from falling out of the hose 40 before the hose 40 is placed in the self-cleaning compartment 75. When the vacuum pump 155 is switched on the flap 30 is opened by the suction power of the vacuum pump 155 to allow incoming material to be sucked into the hose 40.

The flap 30, where attached, defines an opening to ensure that during the cleaning process the fluid by through both sides of the flap 30 thereby cleaning the flap 30.
The general operation of the intake system 20 is as follows:

The main power button 405 is turned on thereby providing power to the system. Once the system is powered up, a two-way electric motor (not shown), which can be used to either open or close the self-cleaning compartment 75, opens the self-cleaning compartment 75 thereby releasing the intake 25 from the self-cleaning compartment 75. The operator removes the intake 25 from the compartment allowing the compartment to close and return to a closed position.

The operator then switches on the intake 25 using the control panel 26 to activate the vacuum pump 155, open the exit port 147 in the passageway 146 and open an exit hose 149 inside the waste receptacle 148 described more particularly below.

Next, the flap 30 within the intake is forced opened by the suction of the vacuum pump 155 and the pump 214 is turned on to dispense pressurized fluid into the hose 40 to lubricate the inside of the hose 40.

The operator places the intake head 27 in the vicinity of waste or pet litter or stool thereby sucking the waste into the intake head 27 and further into the hose 40. Once inside the hose 40, the spray nozzle 45 inside the hose 40 sprays fluid at the waste to further soften or break down the waste, make the waste less sticky, and to wash and lubricate the hose 40 thereby making it easier for the vacuum pump 155 to further suck in the waste. The spray may be continuous or intermittent, and may be automatic when the power is on to the suction pump 214 or manually triggered by the operator. By making it easier for the pump 214 to vacuum up the waste, the present invention reduces the need for a high-powered pump 214, and reduces clogging of the hose 40. Further, the fluid cleans the hose thus permitting the system to be used for the cleanup of hazardous or other undesirable waste.

The diluted waste travels through the hose 40 of the vacuum pump 155 and is discharged into the removable liner 143 through the passageway 146.

After use, the operator turns off the vacuum pump 155, which in a preferred embodiment turns off the pump 214 and the electric control valve 147. The operator presses an auto clean button (not shown) on the control panel 26 which causes the self-cleaning compartment 75 to open and allow the operator to insert and lock the intake 25 into the self-cleaning compartment 75. When the intake 25 is nearly fully inserted, the intake 25 depresses a control button (not shown) that turns on the electric motor (not shown) for causing the self-cleaning compartment 75 to close. The self-cleaning compartment 75, upon closing, causes the intake 25 to depress a second control button (not shown) which switches on the pump 214 and switches off the electric control valve 147 of the pressurized spray nozzle 45. The pump 214 supplies fluid to a spray jet 240 inside the self-cleaning compartment 75. The spray jet 240 sprays fluid at the intake head 27, thereby washing and disinfecting the head. The spray jet 240 sprays a preset volume of spray for a preset time and then turns off the pump 214. When the pump 214 is deactivated, the vacuum pump 155 is switched on for vacuuming the dirty fluid from a washbasin 232 in the compartment into the removable liner 143. The fluid travels through the intake head 27, through the hose 40, through the vacuum pump 155 and is finally deposited into the removable liner 143, thereby cleaning the entire intake system 20 as the fluid travels through and sanitizes the intake system 20. After completing this self-cleaning process the device automatically turns off, and the dirty fluid and waste material are contained within the removable liner 143.

THE FLUID SUPPLY SYSTEM

The fluid supply system 200 includes at least one fluid reservoir 212 for containing fluid for the pump 214 to be dispersed to required areas through the hose 40. The device may include two separate and independent reservoirs (FIG. 29) which connect with each other through a supply hose (not shown) for alleviating the need to constantly refill a single reservoir. Further, each fluid reservoir 212 may contain a different fluid or liquid. For instance, one reservoir may contain washer fluid for cleaning or lubricating the intake system 20 and the other reservoir may contain liquid fertilizer or herbicide as required by the operator so that the operator does not have to empty the fluid reservoir 212 in order to pour in household chemicals for external use when required. A worker skilled in the art will appreciate that the reservoirs may also contain suspensions, fine powders, gels or other substances which can be used to clean or treat the system or for external uses.

The fluid supply system 200 may also include an external spray wand 225 for dispensing a variety of desired fluids or household chemicals like liquid fertilizer, herbicide or pesticide, functionally unrelated from the cleansing, lubricating, breaking-down or sanitizing functions. For instance, if the operator is removing pet litter from a lawn, the operator may dispense water or dilute chemicals on the grass where the pet litter was removed to dilute or wash or fertilize and thus prevent the grass from dying, as pet litter can be toxic to plants.

The external spray wand 225 includes an adjustable spray nozzle 227 which is controlled by the operator using the control panel 26 or which may be controlled by the operator using a trigger on the intake (not shown). The external spray wand 225 also includes a switch button 229 to shut off the electric control valves (not shown) of the spray hose 220 to prevent supplying the spray nozzle 45 inside the hose 40 and the spray jets 240 inside the self-cleaning compartment 75 with fluid. The external spray wand 225 is connected to the fluid supply hose 40 and to the electrical wiring of the device 1.

When the intake 25 is connected to the device for operation, the switch button 229 is switched on which starts the pump 214 and shuts off the pump valves (not shown) to prevent the pump 214 from providing fluid to the rest of the device to ensure that fluid is pumped from the fluid reservoir 212 to the intake 25 when the operator pulls the control trigger to dispense fluid. When the switch button 229 is switched off, the pump valves (not shown) are opened thereby permitting regular use of the device.

The fluid supply system 200 may include a washbasin 232 as shown in FIG. 31. The washbasin 232 is a cylindrical barrel or tub received within the self-cleaning compartment 75. The washbasin 232 is suspended on gimbals within the self-cleaning compartment 75 thereby allowing the washbasin to freely rotate within the self-cleaning compartment.
compartment 75 which is meant to ensure that the opening of the washbasin is always facing up. The washbasin 232 allows the intake head 27 to be compactly stored within the device.

[0083] The washbasin 232 includes a rotating spray jet (not shown) as shown in FIG. 30 for dispensing fluid to wash the intake head 27 when placed within the self-cleaning compartment 75 for cleaning.

[0084] The rim of the basin mates with the attached lid (not shown) to form a watertight seal when the attached lid (not shown) is slid within a slot 77 defined by the basin.

[0085] Various means known to those skilled in the art may be used to automatically or manually open and close the self-cleaning compartment 75.

[0086] The self-cleaning process described above is generally shown in FIGS. 32-34.

THE LITTER STORAGE AND DISPOSAL SYSTEM

[0087] The passageway 146 includes an electric control valve 147 which is opened to allow the incoming waste and gases to be deposited into the removable liner 143. The gases leave the waste receptacle 148 through an exit hose 149. The exit hose 149 includes a filter 360 such as an activated charcoal filter, HEPA filter or other similar filter or combination of filters for absorbing toxic or foul smelling components of vacuumed air prior to release of the exhaust air to the atmosphere.

[0088] The device may include a second exit hose 150 which is connected to the overflow protection compartment to ensure that any gases in the overflow protection compartment are also treated by the filter 360 before entering the atmosphere. The exit hose 149 is opened and closed by electric tap/valve controls (not shown) to ensure that the liquid content of the removable liner 143 does not flow out through either of the exit hoses when the equipment is turned off.

[0089] The passageway 146 connects the vacuum pump 155 to the removable liner 143 through the use of a screw cap 152. An electric tap/valve control (not shown) controls the flow of waste into the removable liner 143 and further ensures that the liquid material inside the removable liner cannot escape. The tap is electrically controlled by switching on the intake button. That is, when the vacuum pump 155 is activated, the tap opens to allow waste to flow into the removable liner 143 and when the vacuum pump 155 is turned off the tap closes or stops to ensure that the waste inside the removable liner 143 cannot flow out of the removable liner 143 into the passageway 146 or back into any other part of the system. The tap simultaneously controls the opening and closing of the exit hose 149. This tap may be comprised of any one of a number of taps, valves, one-way valves and the like known generally in the prior art.

[0090] Waste remains in the removable liner 143 until disposal. The electric control valves 147 are turned off when the vacuum pump 155 is off to ensure that waste already sucked into the device remains in the removable liner 143.

[0091] Once the removable liner 143 is full of waste (which may be determined by an electronic monitor within the waste receptacle 148 and read by a gauge on the exterior of the waste receptacle 148 or as gauged by visual inspection), the operator turns on a removal switch (not shown) which causes a motor (not shown) to connect and disconnect the screw cap 152 of the removable liner 143 from the passageway 146. As the screw cap 152 is being removed from the removable liner 143, the removable liner 143 is being sealed. More specifically, the removable liner 143 may have a neck 165 which includes integrated “twist tie” material or embedded metal or plastic ties or other stiffeners 160. When being removed, the screw cap 152 untreads the screw cap 152 and engages a ratchet (not shown) to turn the removable liner’s neck 165 at the same time, thereby causing the stiffeners 160 to twist closed and be secured closed by the neck and its included stiffeners 160.

[0092] After the screw cap 152 is disconnected from the passageway 146, the motor automatically turns off and an optional signal light (not shown) indicates that the removable liner 143 is sealed.

[0093] The waste receptacle 148 includes a handle 154 for allowing an operator to pull out or disconnect the tied up removable liner 143 from the connecting screw cap 152 as shown in FIG. 46. A rear view of the device showing the waste receptacle 148 can be seen in FIG. 26. The removable liner 143 falls into a removable drawer 156 in the waste receptacle 148 which allows the operator to dispose of the removable liner 143 without coming into contact with the removable liner 143.

[0094] Once the removable liner 143 is disposed of, the operator installs a new clean disposable removable liner 143 in the drawer 156 and returns the drawer 156 back into the waste receptacle 148. The drawer 156 is slid into the waste receptacle 148 and as the drawer 156 is secured in place, a switch (not shown) is activated which turns on an electric motor, causing the screw cap 152 to be connected to the removable liner 143. As the removable liner 143 is being installed, the screw cap 152 turns to thread onto the passageway 146 but the removable liner’s neck 165 is not turned.

[0095] The walls of the waste receptacle 148 may be watertight.

[0096] The litter and disposal storage system may include a carrier hanger 158 as shown in FIG. 35. The carrier hanger 158 raises a suspending hanger 171 to allow the screw cap 152 to connect with the passageway 146.

[0097] The carrier hanger 158 includes a mounted lift gear which threadably runs through a gear. This mounted lift gear engages the motor driving gear which also drives the screw cap 152 gear. Accordingly, as the motor driving gear turns the gear of the screw cap 152 to connect the screw cap 152 with the passageway 146, the motor driving gear also turns the mounted lift gear in the same direction thereby raising the carrier hanger 158 and the suspending hanger up in a coordinated way.

[0098] When the removable liner 143 is being prepared for removal, the electric motor turns the motor gear in the direction opposite as when the screw cap 152 is being connected to the passageway 146. The motor gear turning in the opposite direction causes the screw cap 152 to disconnect from the passageway 146 and, simultaneously causes the mounted lift gear to turn in the opposing direction thereby lowering the carrier hanger 158, thereby lowering the
suspending hanger to coordinate with the unscrewing of the screw cap 152. The cooperating relationship between the gears can be seen in FIGS. 27, 38 and 39. There are, of course, other conceivable workshop improvements which could coordinate or perform these same tasks (such as by more motors, fewer gears, and some sensors and control logic onboard the system) which would be obvious to one designing similar automated connecting systems.

[0099] The litter storage and disposal system 140 may include a pullout hanger as shown in FIGS. 28 and 36 for pulling the removable liner 143 away from the screw cap 152. The pullout hanger also includes a gear which is driven by the motor gear.

[0100] Once the screw cap 152 is disconnected from the passageway 146 and the removable liner 143 is sealed, the carrier hanger 158 still suspends the screw cap 152 hanger. The motor gear continues to turn. As the pullout hanger gear travels downward, a push rod attached to the pullout hanger engages the pullout hanger thereby causing the pullout hanger to travel in the same direction as the pullout hanger gear.

[0101] The pullout hanger pivots between the space between the suspending hanger and the top walls of the carrier drawer 156. The suspending hanger continues to be upheld by the spout of the removable liner 143 which is, at this point, still installed in the screw cap 152 and is already tied up.

[0102] The pullout hanger continues to move forcing the attached seal of the removable liner 143 spout to pull out of the screw cap 152. The electric motor is timed to ensure that the pullout hanger does not continue to pivot further than necessary.

[0103] After the removable liner 143 spout is sealed, the removable liner 143 is still suspended or hanging inside the screw cap 152 by the hanger which is fitted into the filling space of the seal of the screw cap 152. Accordingly, the removable liner 143 is not removed from the screw cap 152 until the drawer 156 is pulled out which pulls the pullout hanger away from the device. The pullout hanger then hooks or pulls the removable liner 143 spout away from the screw cap 152 after the screw cap 152 has been disconnected and after the removable liner 143 spout is sealed or tied up.

[0104] A spring attached to the pullout hanger as shown in FIG. 36 biases the pullout hanger to its original position once the removable liner 143 drops into the drawer 156 of the waste receptacle 148 awaiting disposal.

[0105] Once the removable liner 143 separates from the screw cap 152, the pullout hanger returns to its original position which adjusts the other gears.

[0106] The spout of the removable liner 143 that is disconnected or pulled out from the screw cap 152 now falls inside the carrier drawer 156 where it is ready for disposal. When the operator pulls out the carrier drawer 156 from the waste receptacle 148 the removable liner is already tied up and fully disconnected from the screw cap 152 assembly equipment, ready for the operator to carry the carrier drawer 156 with the removable liner 143 away for disposal of the removable liner 143.

[0107] When the operator returns the carrier drawer 156 into the waste receptacle 148, after the installation of a new removable liner 143, the drawer 156 depresses a switch inside the waste receptacle 148 which starts or turns on the electric motor (two-way) to connect the independent screw cap 152 and the removable liner 143 with the passageway 146.

[0108] On insertion into the waste receptacle 148, the carrier hanger 158 slides underneath the suspending hanger such that when the drawer 156 electric motor starts turning, the mounted lift rises to carry the suspending hanger up while connecting the screw cap 152 with the passageway 146. The electric motor will turn the pullout hanger gear upward but does not perform any function when the screw cap 152 is being connected.

[0109] The removable liner 143 may be comprised of durable, puncture-resistant and waterproof or otherwise impermeable material to prevent breakage and leakage as the removable liner 143 is filled up. The removable liner 143 may also be comprised of a biodegradable material if the device is used for pet litter to reduce the environmental impact of that use of the device. If the removable liner 143 is biodegradable then it may be composed of a material such that the removable liner 143 degrades or decays from the outside—in. Still further, the removable liner 143 may be comprised of medical-grade waste disposal material to provide maximum protection against removable liner breakage or puncture where the waste being handled is a biohazard or includes sharps.

[0110] The removable liner 143 may also be opaque such that an operator does not see the contents of the removable liner 143 upon disposal.

[0111] The removable liner 143 may include a square (or other “grippable” and symmetrical shape) holder 162 which is hinged in middle of the opening of the removable liner 143 as shown in FIGS. 37 and 40. A square holder 162 may fold into an arrow shape (FIG. 41) for insertion into the screw cap 152 during installation. The removable liner 143 is slid within a slot 77 in the screw cap 152 (FIG. 42) at which time the holder 162 expands into a flat shape which is engaged within a shaped slot 77 defined by the screw cap 152 as shown in FIG. 43. As the screw cap 152 tightens, the shaped wrench-like gripping and turning slot 77 flattens thereby holding the folded holder 162 in its flattened state.

[0112] The holder 162 may be any shape that fits into the shaped slot 77 of the screw cap 152 provided that when fitted into the shaped slot 77, the holder will turn when the screw cap 152 turns for sealing the removable liner 143.

[0113] The holder 162 and the screw cap 152 form a watertight or functional seal once the holder is flattened within the screw cap 152 and secured.

[0114] The removable liner 143 is sealed, closed or tied up during the disconnection of the screw cap 152 from the passageway 146. More specifically, when disconnecting the screw cap 152 from the passageway 146, the motor gear turns the screw cap 152. The screw cap 152, having the holder sealed within the shaped slot 77, begins to turn the holder and the removable liner 143. However, the weight of the waste within the removable liner or shape of the liner 143 prevents it from turning or continuing to turn with the holder and, accordingly, the spout continues to turn but the removable liner 143 does not. The walls of the spout of the removable liner 143 are lined with flexible wire which holds
its shape when bent or deformed. When the spout is twisted but the removable liner 143 remains stationary, the wire biases the spout in a closed or sealed position. As a result, the removable liner 143 is sealed sufficient for disposal.

[0115] The suspending hanger as shown in FIG. 47 is connected to a connecting rod which is disposed within the walls of the drawer 156. The connecting rod includes a return spring 30c which biases the suspending hanger such that the screw cap 152 is properly aligned with the passage way 146 prior to connecting the screw cap 152 with the passageway 146.

[0116] An outside wall of the screw cap 152 forms a gear for engagement with the motor gear. In addition, the screw cap 152 includes an interior gear towards or at the bottom of the screw cap 152 for engaging the gear of the screw cap 152 seal. Above the inside gear of the screw cap 152 are threads for engaging the passageway 146.

[0117] The seal of the screw cap 152 extends and opens to the other side of the screw cap 152. The seal of the screw cap 152 has a gear on its outside surface but to allow the inside gear at the screw cap 152 to travel in a single direction, this seal is suspended inside the screw cap 152 and allows the screw cap 152 to travel/rotate around the seal in a single direction. As the screw cap 152 rotates or travels in the same single direction, the seal (the screw cap 152 seal inside the cap) remains stationary. The outside gear of the screw cap 152 turns/rotates or drives the screw cap 152 around its seal in a single direction. The driven gear of the cap, or the outside gear of the screw cap 152 moves the cap around its containing seal and the inside gear of the screw cap 152 becomes the driving gear of its seal when caused to travel in opposite directions.

[0118] Hence the inside gear of the screw cap 152 and the gear outside its containing seal are for driving the rotation in opposite directions during rotation. The gear of the screw cap 152 can travel around the gear of the seal in a single direction. When its direction is reversed it catches the gear of the seal inside causing the seal to travel the same direction with the cap making the inside gear of the screw cap 152 the drive gear for its containing seal’s gear (drive gear).

[0119] The seal of the screw cap 152 has fitting space on the top side (connecting side). The fitting space is for the attached seal of the removable liner 143 spout to fit into when installed.

[0120] The drive gear, its containing seal and the fitting space of the seal for the fixed attached seal of the removable liner’s spout becomes the driving gear to twist or turn the spout of the removable liner 143, twisting it in, thereby tying the filter removable liner’s spout by the attached seal of the filter spout inside the screw cap 152 lifted into its seal (screw cap 152 seal).

[0121] That is, when the screw cap 152 is disconnecting from the passageway 146, the gear (inside gear) of the cap is made to travel in the direction of the opposing gear of its containing seal, and it catches the gear, which then makes or causes the seal to travel in the same direction. When the screw cap 152 is connecting or being screwed onto the passageway 146 it travels freely to connect with the passageway 146 because the direction of the gear of its containing seal is not opposing this movement.

[0122] The present device includes many portability and storage features designed to improve the convenience of use for the operator. Some of these features and embodiments are described in more detail below.

[0123] The device may include a clamp (not shown) to securely hold the intake when the device is not in use.

[0124] The device may include a strap 410 which may be attached at both sides of the device for allowing the system to be carried by the operator. Alternatively, the strap 410 may be attached at the top and bottom of the device thereby allowing an operator to carry the device over the operator’s shoulder like a backpack. Still further, the device may include a plurality of strap 410 to distribute the weight of the device thereby increasing the portability of the system when the operator is walking around.

[0125] Further, the adjustable handle 411 may be used for steering the system and may be adjusted to a desirable height. When collapsed, the adjustable handle 411 is level with the top of the device thereby improving the portability of the system.

[0126] The device may include wheels 420 underneath allowing an operator to conveniently roll the device around.

[0127] In order to improve the portability of the system, the device may include an electric/rechargeable battery 414 or dry cell for providing power to the device. The battery 414 may include an indicator (not shown) for alerting the operator when the battery 414 needs to be recharged.

[0128] The above-described embodiments of the present invention are intended to be examples only. Alterations, modifications and variations may be effected to the particular embodiments by those of skill in the art without departing from the scope of the invention, which is defined solely by the claims appended hereto.

What is claimed is:
1. A wet-dry vacuum cleaning device for collection of solid, liquid or mixed matter comprising:
   - a fluid reservoir;
   - a pump in fluid communication with the fluid reservoir for pressurizing fluid in the fluid reservoir;
   - an intake for accepting the solid, liquid or mixed matter;
   - a waste receptacle to collect the solid, liquid or mixed matter;
   - a vacuum pump for providing suction to the intake and for collecting and moving the solid, liquid or mixed matter from outside of the intake into and through the intake and into the waste receptacle;
   - a passageway connecting the intake and the waste receptacle;
   - a conduit to deliver fluid from the fluid reservoir into the passageway to at or near the intake; and
   - a filter for cleansing and deodorizing air taken through the intake prior to venting the air to the atmosphere.
2. A device as in claim 1 wherein the waste receptacle includes a removable liner.
3. A device as in claim 2 wherein the removable liner is self-sealing.
4. A device as in claim 3 wherein the removable liner includes a neck portion, the neck portion including stiffeners which seal the removable liner when the neck portion is twisted.

5. A device as in claim 2 wherein the liner may be removed after being remotely sealed at the device operator’s command thereby minimizing exposure of the operator to the liner’s content(s).

6. A device as in claim 1 wherein the fluid is sufficiently pressurized and delivered and sprayed into the passageway such that when sprayed into the passageway there is sufficient volume of fluid for lubrication of the passageway to ease the passage of the solid, liquid or mixed matter there-through to the receptacle.

7. A device as in claim 1 wherein the delivery of fluid to near the intake is controllable by the device’s operator.

8. A device in claim 1 wherein the fluid is a cleaning agent.

9. A device in claim 1 wherein the fluid is a disinfecting agent.

10. A device in claim 1 wherein the solid or liquid matter targeted for pickup is animal feces.

11. A device in claim 1 wherein the solid or liquid matter targeted for pickup is toxic or dangerous waste.

12. A device in claim 6 wherein the fluid is also delivered near the intake at the device’s operator’s control and is sprayed just ahead of the intake’s effective range of suction.

13. A device in claim 1 wherein the motive power operating the vacuum pump is electricity.

14. A device in claim 13 wherein the electricity is provided by on-board storage battery.

15. A device in claim 1 wherein the filter has activated charcoal as an element.

16. A device in claim 1 wherein the device is self-contained and human portable.

17. A device in claim 1 wherein the device is arrayed in components operatively connected and is vehicle-mounted.

18. A device in claim 10 wherein the animal feces is from household pets.

19. A device in claim 11 wherein the toxic or dangerous waste is from a medical facility.

20. A device in claim 11 wherein the toxic or dangerous waste is from an industrial process.

21. A device in claim 11 wherein the toxic or dangerous waste is from a chemical or other unintentional spill.

22. A device in claim 16 deployed like an upright vacuum cleaner or spray-and-clean rug cleaner.

23. A device in claim 16 deployed in a hand-held unit.

24. A device in claim 1 wherein the intake is sealed from the environment when not in use.

25. A device in claim 24 wherein the intake sealing means includes means to deliver fluid from the reservoir to wash the intake during the sealing phase of its operational shutdown.

26. A device in claim 25 wherein during the sealing phase of its operation the passageway is also sprayed with fluid and thereby cleaned.

27. A device in claim 1 wherein the passageway includes a hose from the intake to the rest of the device when the intake is formed by a nozzle or attachment, and the nozzle or attachment is removed from but operatively connected to, the device’s main body by the hose portion of the passageway and used remotely from the body of the device, as when using a hose-and-wand type of conventional wet-dry vacuum system.

28. A device in claim 1 wherein the exit-air filter is replaceable.

29. A device in claim 1 wherein the exit-air vent is closed automatically during a shutdown procedure, thus sealing the receptacle from the device’s environment when not in use.

30. A device in claim 1 wherein the device further includes a wheeled body to permit ease of movement by its operator.

31. The device of claim 1 wherein the passageway includes a one-way valve to check outbound flow of fluid or material within the passageway.

32. A wet-dry vacuum cleaning device for collection of solid, liquid or mixed matter comprising:

   a fluid reservoir;

   a pump in fluid communication with the fluid reservoir for pressurizing fluid in the fluid reservoir;

   an intake for accepting the solid, liquid or mixed matter;

   a waste receptacle to collect the solid, liquid or mixed matter;

   a vacuum pump for providing suction to the intake and for collecting and moving the solid, liquid or mixed matter from outside of the intake into and through the intake and into the waste receptacle;

   a passageway connecting the intake and the waste receptacle;

   a conduit to deliver fluid from the fluid reservoir to at or near the intake;

   a second conduit to deliver fluid from the fluid reservoir to the interior of the passageway; and

   a filter for cleansing and deodorizing air take in through the intake prior to venting the air to the atmosphere.

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