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Related Art:
- AU 37302/85
- GB 5319456
- CH 371403
A flowable material dispensing system is disclosed which includes a container (5) for holding the flowable material, the container (5) having a downwardly directed lower outlet opening (510) which can be located within an outer container being either a cistern of a flushing system or within a cabinet (40, 41) that is connectable to a flushing flow path of sanitation apparatus, the container (5) being so located that a portion of flowable material within said container (5) is discharged therefrom during each flushing operation of the sanitation system.
Dispenser And Method And Valve

This invention relates to an apparatus for dispensing and a method for dispensing flowable materials particularly, but not exclusively, into sanitation systems in bathrooms, toilets and the like. The invention further relates to a valve mechanism for use in a flowable material dispensing apparatus.

As water flows through a sanitation system, it is desirable to add to the water an amount of material, such as disinfectants, detergents, deodorants, cleaning agents or the like.

In the prior art, an amount of water from the sanitation system is diverted into a container which contains the sanitation material. The water mixes with the sanitation material and a portion of the diluted sanitation material returns to the main sanitation system.

In other known apparatus, such as in International Application No. PCT/GB82/00341 (Lotti), a quantity of sanitation material is dispensed into the water. The problem with this earlier art is that the apparatus required to dispense the sanitation material into the water is complex in shape.

United Kingdom Patent 1,462,201 (Braun Company) discloses a liquid dispensing valves, but this known valve is adapted to dispense material in response to steadily rising liquid in a reservoir. The Braun patent is not adapted to being incorporated in other areas of sanitation systems in which there is no reservoir of liquid that rises steadily.

SUMMARY OF INVENTION

According to the present invention, there is provided a flowable material dispensing apparatus adapted to dispense flowable material into a sanitation system, the apparatus including:

a first container having inlet means adapted to be connected to the sanitation system in order to receive a flow condition from the sanitation system directed into the first container, and having outlet means adapted also to be connected to the sanitation system in order to permit flow of the flowable material out of the first container;

wherein the dispensing apparatus is provided with a restricted flow passage operatively adapted to connect the inlet means of the first container to the sanitation system, the restricted flow passage being restricted to such an extent that the passage is operatively adapted to direct the following flow condition from the sanitation system into the inlet means of the first container:
i) only an air current originating from the sanitation system;

the dispensing apparatus also being provided with a second container adapted to hold a quantity of said flowable material and having at least one restricted flow outlet opening adapted to face in a downward direction;

the second container being located within said first container wherein an inner surface of the first container is separated from a lower external surface of the second container by a narrow gap therebetween, the inlet means of the first container being positioned in said narrow gap immediately adjacent the restricted flow outlet opening of the second container such that the flow condition from the sanitation system flows through the inlet means into the narrow gap and flows immediately adjacent the restricted flow outlet opening of the second container;

the or each said restricted flow outlet opening of the second container being configured to allow outflow of the flowable material downwardly through the or each said restricted flow outlet opening into the narrow gap generally only when the flowable material at the or each said restricted flow outlet opening is exposed to said flow condition in the narrow gap between the first and second containers;

the outlet means of the first container also being positioned in the narrow gap to enable the flowable material that comes from the second container to exit the narrow gap through the outlet means of the first container into the sanitation system.

The restricted flow passage may be operatively adapted to direct all of the following flow conditions into the narrow gap between the first and second containers:

i) only said air current originating from the sanitation system;

ii) only a liquid current originating from the sanitation system; and

iii) only a current consisting of both air and liquid originating from the sanitation system.

In an embodiment of the invention, the flow condition from the sanitation system flows through the inlet means into the narrow gap and flows directly onto the restricted flow outlet opening of the second container.

The inlet means and said outlet means may be formed by a single aperture.

The restricted flow passage may be narrower in cross-section than part of the sanitation system that directly connects to the restricted flow passage.
Preferably, the quantity of said flowable material extractable from the second container by the flow condition in the narrow gap is determined in part by physical dimensions of the or each said restricted flow outlet opening.

The apparatus may be provided with means for altering said physical dimensions of the or each said restricted flow outlet opening.

Preferably, a localised area of low pressure is formed in the narrow gap whereby said flowable material flows from the second container toward the localised low pressure area.

The area of localised low pressure may be formed by a Venturi effect caused by flow of said flow condition in the narrow gap past the restricted flow outlet opening of the second container.

The restricted flow passage may include a valve that controls the amount of air and/or liquid in the flow condition that flows into the narrow gap between the first and second containers.

The valve may be provided with an internal duct therethrough, a cross-section of said internal duct being alterable by an aperture varying mechanism.

Preferably, said duct includes a first portion and a second portion angularly connected to the first portion and in fluid communication therewith, said aperture varying mechanism includes a hollow sleeve within said first portion, the position of said sleeve being selectively moveable such that fluid communication between the first and second portions is varied depending on the position of the sleeve.

Preferably, at least one slideable element is retained within the restricted flow passage and is capable of substantially blocking fluid communication along the flow passage and capable of sliding freely along the flow passage, wherein, in use, the flow condition from the sanitation system drives the slideable element along the restricted flow passage such that a body of air and/or liquid is forced through the inlet means to create an air and/or liquid flow condition immediately adjacent the at least one restricted flow outlet opening of the second container.
Preferably, as the air and/or liquid drains back into the sanitation system, the at least one slideable element is drawn along the flow passage toward the sanitation system creating a low pressure region between the at least one slideable element and the outlet means to urge flowable material from the narrow gap into the restricted flow passage.

The at least one slideable element may be a plastic sphere.

Preferably, liquid that flows into the first container combines with the flowable material drawn from the second container to be used as flushing liquid for the sanitation system.

Preferably, the apparatus further includes mounting means whereby said container can be mounted in said sanitation system with the or each said restricted flow outlet opening being directed in a downward direction in a position to receive said flow condition from the sanitation system upwardly against the or each said restricted flow outlet opening of the second container.

Preferably, the second container is removable from the first container.

According to another aspect of the present invention, there is provided a method of dispensing a quantity of flowable material into a sanitation system, said method including the steps of:

providing a first container having inlet and outlet means,

using a restricted flow passage to connect the inlet means of the first container to the sanitation system in order to receive a flow condition from the sanitation system directed into the first container, and

connecting the outlet means of the first container to the sanitation system in order to permit flow of the flowable material out of the first container;

providing a second container within the first container, the second container holding a quantity of said flowable material and having at least one restricted flow outlet opening that faces downwards, wherein an inner surface of the first container is separated from a lower external surface of the second container by a narrow gap therebetween, the inlet means of the first container being positioned in said narrow gap immediately adjacent the restricted flow outlet opening of the second container;

directing the following flow condition from the sanitation system through the restricted flow passage into the inlet means of the first container:
i) only an air current originating from the sanitation system, such that the flow condition from the sanitation system flows through the inlet means into the narrow gap and flows immediately adjacent the restricted flow outlet opening of the second container;

exposing the flowable material in the second container at the or each said restricted flow opening to said flow condition in the narrow gap in order to release the flowable material downwardly through the or each said restricted flow outlet opening into the narrow gap; and

releasing the flowable material to exit the narrow gap through the outlet means of the first container into the sanitation system.

The restricted flow passage may be operatively adapted to direct all of the following flow conditions into the narrow gap between the first and second containers:

i) only said air current originating from the sanitation system;

ii) only a liquid current originating from the sanitation system; and

iii) only a current consisting of both air and liquid originating from the sanitation system.

According to a further aspect of the invention, there is provided a flowable material dispensing apparatus for dispensing flowable material into a sanitation system, said apparatus including:

a first container having inlet means for permitting a fluid flow into said first container and outlet means to permit flow of the flowable material out of said first container to such a sanitation system;

a flow passage for connecting the sanitation system to said inlet means and directing said fluid flow to said inlet means; and

a second container located within said first container, said second container being adapted to hold a quantity of said flowable material and having at least one restricted flow outlet opening which, in use, faces downwardly; characterised in that

said second container is located in said first container such that the or each said restricted flow outlet opening is adjacent said inlet means, whereby in use, said fluid flow from the flow passage issued from the inlet means at a position immediately adjacent the or each said restricted flow outlet; in that
the or each said restricted flow opening is configured to prevent flow of the flowable material from the second container when the flowable material at the or each said restricted flow outlet opening is not exposed to said fluid flow issuing adjacent thereto and allowing flow of the flowable material from the second container when the flowable material at the or each said restricted flow outlet opening is exposed to said fluid flow issuing thereto; and in that said flow passage includes a flow restrictor.

According to yet a further aspect of the invention, there is provided a method of dispensing a quantity of flowable material from a container into a sanitation system, said method including the steps of:

connecting the inlet means and outlet means of a first container with said sanitation system;

placing flowable material in a second container which is disposed in said first container and is provided with at least one generally downwardly directed outlet opening arranged such that said flowable material can pass from said second container to said outlet means and characterised by the steps of providing a flow passage with a flow restriction between said sanitation system and the inlet means, positioning said inlet means adjacent the or each said outlet opening such that a fluid flow from said inlet means issues at a position immediately adjacent the or each outlet opening and causing a said fluid flow to pass through said inlet means via said flow restriction thereby exposing said flowable material at the or each said outlet opening to said fluid flow so as to cause a quantity of flowable material to pass from the or each said outlet opening to said sanitation system via said outlet means.

DRAWINGS

In order that the invention might be more fully understood, embodiments of the invention will be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a cross-sectional diagram of an example of a container that may be used in the embodiments of Figures 3 to 4;

Figure 2 illustrates the container of Figure 1 positioned partially below the waterline A-A of the sanitation system;

Figure 3 is a cross-sectional diagram of a sanitation liquid dispensing apparatus constructed according to a preferred embodiment of the invention. (For the sake of clarity, the drawings of the containers shown in Figures 1, 3, 3A and 3B are similar and use the same
reference number for similar features, however, this does not imply that the embodiments are identical);

Figures 3A and 3B illustrate another embodiment of the invention. Figure 3A shows the apparatus configuration as air and/or liquid is diverted in from the sanitation system, and Figure 3B shows the configuration as the air and/or liquid drains away from the apparatus.

Figure 4 is a schematic diagram which shows various components of the sanitation liquid dispensing apparatus of Figure 3;

Figure 5 illustrates an example of a sanitation system to which embodiments of the invention such as the apparatus of Figure 3, may be attachable; and

Figure 6 illustrates a yet further embodiment used in sanitation systems that include a reservoir or holding tank.

EMBODIMENTS

Referring to the drawings, Figure 1 illustrates a dispensing device for use with a sanitation system, the device comprising a container 5. The lower portion of the drawing shows a partial cross-sectional view.

The container 5 is used in a sanitation system which, in the present preferred embodiment, is a toilet flushing system. In the present embodiment, the container is placed in direct fluid communication with the main duct from the cistern to the toilet. The container 5 is filled with a flowable material which may be disinfectant, detergent, deodorant or other materials used for sanitation systems. The flowable material within the container 5 would usually be a liquid, but other flowable materials such as gels may also be used. When the sanitation system is in use, the water within the cistern flushes to a toilet. A portion of the water is diverted to the opening of the container where it is believed to break the film of surface tension covering the opening. A small amount of sanitising material then discharges into the diverted water because of the hydrostatic pressure of the flowable material within the container. Turbulence and diffusion assist in mixing the sanitising material with the diverted water which then drains back into the main duct from the cistern and into the toilet where it
acts to clean, disinfect and/or deodorise, depending on the characteristics of the flowable material.

Once the diverted water and sanitising material have drained away from the opening, the surface tension film soon reforms to substantially prevent any further discharge of sanitising material until next the sanitation system is in use.

The container is provided with a downwardly directed opening preferably located at its lowest point as this is the point of greatest hydrostatic pressure within the container. Therefore, the discharge of flowable material will be greatest at this point. During installation of the container, there is an initial flow of liquid through the opening. Some air may also remain in the container. After a short period of time, an equilibrium state is reached where the flow of liquid ceases. This cessation of flow is a result of surface tension across the opening.

Breaking the surface tension may be effected by bringing a fluid into contact with the opening. The fluid may be a stationary liquid, or air and/or liquid in steady state or turbulent flow.

With regard to the example shown in Figure 2, the container is placed within a cistern (not shown) such that the opening is below the surface of the water A-A of the cistern. The contact of the water with the opening breaks the film of surface tension and sanitising material flows into the cistern because of the hydrostatic pressure at the opening. Flow of material from the container reduces the pressure within the container until the pressure at the opening of the container equalises with the pressure that the water in the cistern exerts on the opening. At this stage, the flow of material from the container ceases except for negligible quantities that escape by diffusion.

When the sanitation system is next used, the water in the cistern, which has now mixed with a small quantity of the sanitising material, flushes into the toilet to clean, disinfect and/or deodorise. Meanwhile, the opening of the container has become exposed and a small quantity of air is drawn into the container to bring the pressure in the air at the top of the container to atmospheric pressure. A film of surface tension then forms across the opening to prevent further drainage of sanitising material from the container until the cistern re-fills and water again contacts the opening. At this point another quantity of material is dispensed into the cistern until the pressure reduction in the container
quantity of material is dispensed into the cistern until the pressure reduction in the container 5 again stems the flow. The process then repeats with each subsequent use of the sanitation system.

The quantity of sanitation material dispensed by the apparatus may be determined by the physical dimensions of the opening 510, for example, the length of the outlet passage 520,530 and/or cross-sectional area of the opening 510. Thus, the amount dispensed from the container may be controlled or altered with the use of different outlet openings.

Alternatively, the dispenser may be provided with means for altering the physical dimensions of the opening 510. In the present embodiment, this alteration means may be in the form of an opening 510 formed as a passage 520,530 within a cap 51. The cap 51 includes two nested cap portions 52, 53. The cap portions 52, 53 may be used singly or in combination, such that the length of the passage may be adjusted. In other embodiments, cap portions may be provided with different diameters (not shown), so that the desired diameter may be obtained by selecting the appropriate cap portion. The length and diameter of the opening 510 of the container 5 will influence the flow rate of the liquid or material through the opening. Therefore, the dimensions of the opening may be altered to control the amount of sanitation material that exits the container. The means for altering said physical dimensions of the opening 510 is not limited to the above examples. Any number of embodiments may be proposed to achieve the function of altering the dimensions and constricting the opening of the opening. For example, in a different embodiment, an opening in the form of a hole (not shown) may be provided, the diameter of which may be enlarged by forcing an awl through the hole.

More than one opening may be used, provided that the combined effect of the plurality of openings still ensures that the sanitation material remains substantially in the container once an equilibrium state is reached when the sanitation system is not in use. The provision of a plurality of openings is to allow a greater throughput of sanitation material from the container.

An advantage of the present embodiment is that a simple dispensing container may be placed in a sanitation system. Quantities of sanitation material may be dispensed simply through contact with the liquid that flows through the sanitation system. Conceivably, such
an apparatus may conveniently be positioned in a range of points in the sanitation system where contact with liquid is possible.

Preferred embodiments of the invention are illustrated in Figures 3 and 4. In the description of the embodiments, the drawings of the containers in Figures 1 and 3 are similar and use the same reference numbers for similar features for the sake of clarity. This does not imply that the containers are identical.

Referring to Figure 3, a container 5 is housed in a cabinet 40,41. The container 5 is used to contain flowable sanitation material. The container 5 is also provided with a downwardly directed opening 510. The same principle of extracting sanitation material from the container using a pressure differential effect, described in the above embodiments of Figures 1 and 2, is also used in this further embodiment of Figure 3.

In the preferred embodiment of Figure 3, fluid from the sanitation system is diverted through the flow passage B to flow immediately adjacent the opening 510 of the container 5. In the example of Figure 3, the fluid enters the cabinet directly under the opening 510. The flow passage of the embodiment is described as follows: fluid enters the cabinet 40,41 through a pipe 2. The pipe 2 is connected to the cabinet 40,41 by an adjustable control valve 3 in the form of an angled screw valve. Fluid from the pipe 2 enters the cabinet in a space 500 which is adjacent the opening 510. The angled screw valve 3 is fitted through a hole 400 in the base of the cabinet 40, and is fastened by a hexagonal nut 42. Although the pipe 2 is connected to the cabinet 40,41 adjacent the opening 520, it is preferred that the fluid enters the cabinet directly under the opening 510 however, it is sufficient if the fluid contacts the opening 510. However, the fluid should not generally flow into the container 5 directly, since this would lead to a progressive dilution of the sanitation material in the container 5.

It is believed that when the sanitation system is in use, fluid is diverted through the pipe 2 into the space 500 and breaks the film of surface tension across the opening 510 to initiate the flow of sanitising material from the container 5. Fluid and dispensed sanitising material mix and collect in the base of the cabinet 40,41. Once the inflow of fluid from the sanitation system has ceased, the mixture of fluid and sanitising material drain from the cabinet 40,41 to the toilet. This leaves the opening 510 again exposed to air such that the film of surface tension may re-form to stop the flow of sanitary material from the container 5 until the sanitation system is next used.
The fluid from the sanitation system is generally a turbulent mix of air and/or liquid. If the main pipe 610 pressure is high, the diverted fluid may enter the cabinet 40,41 with such force that liquid spills from the dispenser. This may be prevented with the adjustable control valve 3 whereby the flow passage is constricted to further stem the flow into the cabinet 40,41. However, this may also unduly constrict the flow of the sanitising material from the cabinet. In light of this the embodiment shown in Figures 3A and 3B has positioned one or more slideable elements such as a plastic sphere 501, in the flow passage B. The sphere 501 fits within the passage B such that the passage is substantially blocked while enough clearance is left to allow the sphere 501 to slide freely.

When the sanitation system is flushed, diverted fluid from the main pipe 610 flows rapidly along passage B pushing the sphere 501 before it. This in turn creates a piston of air which is forced along passage B and up into the cabinet 40,41. This creates a flow condition at the opening 510 of the container 5 which serves to break the surface tension film and initiate the flow of sanitary material. The flow condition may be solely air, or air and a small amount of liquid, as most, if not all of the liquid from the sanitation system is prevented from flowing to the cabinet 40,41 when the sphere lodges at the end of passage B as shown in Figure 3A. Consequently, spillage of liquid from the cabinet 40,41 is avoided.

Furthermore, as the fluid drains back into the sanitary system, the sphere 501 will tend to be drawn along with it as shown in Figure 3B. This creates a region of low pressure between the sphere 501 and the cabinet 40,41 which assists the discharge of the sanitary material through the adjustable control valve 3 into the passage B where it mixes with the liquid as it drains into the sanitary system.

Figure 5 illustrates an example of a sanitation system, in the form of a urinal 600, to which embodiments of the present invention may be connected. Water from the mains pipe 610 flows into the urinal during a flushing process. A portion of the water from the mains pipe is diverted along pipe 2 in the direction B. The flow of water in direction B is illustrated in Figure 3 to show the interrelationship of the components. The urinal in Figure 5 has been provided as an illustration only. It is clear that embodiments of the invention may also be connectable to other types of sanitation systems such as wash basins, toilet bowls and the like.
In another illustration of this further embodiment, Figure 4 is a perspective exposed diagram which illustrates the various components shown in Figure 3. As best seen in Figure 4, the container 5 is housed inside a two piece cabinet 40,41 comprising a base 40 and a slideable cover 41. The container 5 is removably positioned within base 40, and cover 41 slides onto the base 40 to enclose the container therein. The rear backing plate of the base 40 is provided with holes 45 to allow the cabinet to be mounted, for example, on a wall. In this embodiment, there is no airtight seal, and the interior of the cabinet 40,41 may be open to atmospheric air pressure.

Since the interior of the cabinet 40,41 is provided with vents in the form of ventilation holes 45 and is open to the atmosphere, the scent of the sanitation material within the cabinet is able to diffuse into the atmosphere to provide a pleasant air freshening effect.

The final proportion of sanitation material in the water that eventually leaves the dispensing apparatus to flush the sanitation system is believed to depend on two factors, namely, the amount of water or fluid entering the dispensing apparatus through the pipe 2 and on the quantity of sanitation material that is dispensed into this amount of water.

In the present embodiment, the amount of water or fluid entering the dispensing apparatus is preferably controlled by the valve 3 which has an aperture varying mechanism. The valve 3 consists of an internal duct through which water may flow. Water enters the pipe 2 and flows through the valve duct into the base of the cabinet 40. The internal duct of the valve 3 is internally screw threaded with a female thread. A hollow sleeve 31 is provided with a complementary male screw thread. The position of the sleeve 31 within the internal duct is adjustable by rotating the sleeve 31. The bottom 32 of the sleeve 31 may be raised or lowered to increase or decrease a cross-sectional area of an aperture 35 through which the water must flow. Effectively, the cross-section of the duct is alterable by the variable placement of the sleeve 31 within the duct. Construction of the valve 3 occurs by using the sleeve to close off, to varying degrees, a branch portion of the duct. In this embodiment, the branch portion is formed as a perpendicular junction within the valve 3, although the non-linear portion may also be curved.

The upper rim of the hollow sleeve is provided with an indentation or slot which enables the sleeve to be rotated by a screw driver. The size of the aperture 35 is varied by
altering the position of the bottom 310 of the sleeve 31. The size of the aperture 35 is selected to enable an appropriate amount of liquid to enter the base of the cabinet 40.

The screw-valve 3 is particularly advantageous when used in sanitation systems that have a definite flushing time. The screw valve would not be advantageous for systems where water is running continuously since the screw valve cannot cut the water flow at a predetermined amount. It relies, instead, on the premise that the flow of water is for a finite time, so that varying the aperture affects the amount of water that passes through the valve in the finite flushing period. As an example, the urinal of Figure 5 would have a flushing time of a few seconds. during this flushing period, a portion of water is diverted along the pipe 2 through the angled screw valve 3. Therefore, adjustment of the hollow sleeve 31 to vary the size of the aperture determines the amount of water that may enter the cabinet during the finite flushing time. The amount of water entering the cabinet determines the degree of dilution of the sanitation material that returns to the urinal.

Experimentation may be required to achieve the right balance of variables, so as to produce the desired dilution of sanitation material in the water in the sanitation system. Some of these variables include: the amount of water entering the cabinet, the amount of sanitation material that is dispensed into the water, the physical dimensions of the opening 510 of the container 5, the viscosity of the sanitation material. Furthermore, the pressure differential at the opening of the container 5 that extracts the sanitation material may also be influenced by the amount of water that is allowed to enter the base 40 by the aperture varying mechanism.

The aperture varying mechanism may use other mechanisms, other than screw threads, to vary the aperture 35. For example, an inner sleeve may be slideably positioned within the internal duct with a friction or press fit. Alternatively, the aperture varying mechanism may use an iris mechanism, similar to that found in apertures of photographic lenses. Hence, a number of alternative embodiments may be proposed to achieve the function of varying the aperture of the valve 3. Specifically, the aperture varying mechanism need not consist of a screw valve, but may include a number of alternative mechanisms that are able to vary the size of the aperture.

It should be noted that embodiments of the valve having an aperture varying mechanism of the present invention may be used in other types of sanitation material
dispensing apparatus. For example, embodiments of the valve having an aperture varying mechanism may be used in the apparatus of International Application No. PCT/GB82/00341 (Lotti). (The content of this prior art document is not incorporated into the present specification.) The disadvantage of the float valve found in the Lotti patent application is that there is no unrestricted flow path for water to enter the chamber. The float valve acts as an obstacle to the flow path of the water, and turbulence in the chamber is thereby minimised. In the present embodiment, there is a clear flow channel for water to enter through the pipe 2 and through the valve 3. The clear flow channel increases the likelihood of turbulence in the cabinet. An amount of turbulence may assist in creating currents of fluid past the opening of the container 5 such that the extraction of the sanitary material is enhanced by the Venturi effect which acts to lower the static pressure of the moving fluid immediately outside the opening. Turbulence may also assist in mixing the sanitation material in the water. Furthermore, a float valve used in the prior art is only capable of allowing a predetermined amount of water to enter the chamber, whereas an aperture varying mechanism allows the amount of water entering the cabinet to be altered. It may be desirable to change the amount of water, depending perhaps on the concentration or type of the sanitation material in the container. More concentrated substances may require a greater amount of water to enter the cabinet to provide a greater degree of dilution.

A further embodiment of a dispensing apparatus is illustrated in Figure 6, which is similar to the embodiment of Figure 3. However, instead of the apparatus 4 being connected to a sanitation system at the mains pipe or other liquid flow channel, the present embodiment is adapted to be used in sanitation systems that include a reservoir or holding tank. The reservoir holds a quantity of liquid that is dispensed with each flush, and the liquid level of this reservoir is illustrated in Figure 6 as water level A-A.

The apparatus 4 is provided with a depending tube 2A. The tube 2A is able to dip into the liquid in the reservoir A-A. As the liquid level in the cistern or reservoir rises and falls with each flush and refill cycle, the liquid level in tube 2A rises in tandem. Since the liquid level in tube 2A can only rise as high as the liquid level in the cistern, the liquid level in the tube 2A never reaches as high as the valve 3. However, the rise and fall of liquid in tube 2A creates an air flow condition in valve 3. As the liquid level in the tube 2A falls during flushing of the reservoir, air from the cabinet 40,41 flows past the opening 510 of the container, and into the valve 3 and tube 2A to fill the void created by the receding liquid in
the tube. This air flow condition is sufficient to draw a small quantity of sanitising material from the container 5 in the manner described above.

In a further embodiment, it may be desired to provide an area of localised low pressure within the cabinet 40,41 adjacent the opening 510. This might be achieved by providing a current of liquid in this vicinity to achieve a Venturi type effect.

In the above embodiments, the components of the cabinet 40,41, the container 5 and the cap 51 may be made of plastics material, and the cap portion 52,53 are preferably made of resilient plastics material. The angled screw valve 3 may be made of injection moulded plastics material, and the hollow sleeve 31 may be made of metal. Importantly, the components of the present invention may be made of any material which serves to fulfil the function of each component.

The liquid that flows through the sanitation system is usually water, but the invention may be useable in sanitation systems that use other types of liquids. The invention in its broadest aspect is not limited to a particular type of liquid.

The embodiments have been advanced by way of example only, and modifications are possible within the spirit and scope of the appended claims.
THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A flowable material dispensing apparatus adapted to dispense flowable material into a sanitation system, the apparatus including:
   a first container having inlet means adapted to be connected to the sanitation system in order to receive a flow condition from the sanitation system directed into the first container, and having outlet means adapted also to be connected to the sanitation system in order to permit flow of the flowable material out of the first container;
   wherein the dispensing apparatus is provided with a restricted flow passage operatively adapted to connect the inlet means of the first container to the sanitation system, the restricted flow passage being restricted to such an extent that the passage is operatively adapted to direct the following flow condition from the sanitation system into the inlet means of the first container:
   i) only an air current originating from the sanitation system;
   the dispensing apparatus also being provided with a second container adapted to hold a quantity of said flowable material and having at least one restricted flow outlet opening adapted to face in a downward direction;
   the second container being located within said first container wherein an inner surface of the first container is separated from a lower external surface of the second container by a narrow gap therebetween, the inlet means of the first container being positioned in said narrow gap immediately adjacent the restricted flow outlet opening of the second container such that the flow condition from the sanitation system flows through the inlet means into the narrow gap and flows immediately adjacent the restricted flow outlet opening of the second container;
   the or each said restricted flow outlet opening of the second container being configured to allow outflow of the flowable material downwardly through the or each said restricted flow outlet opening into the narrow gap generally only when the flowable material at the or each said restricted flow outlet opening is exposed to said flow condition in the narrow gap between the first and second containers;
   the outlet means of the first container also being positioned in the narrow gap to enable the flowable material that comes from the second container to exit the narrow gap through the outlet means of the first container into the sanitation system.

2. An apparatus of claim 1 wherein the restricted flow passage is operatively adapted to direct all of the following flow conditions into the narrow gap between the first and second containers:
3. An apparatus of either claim 1 or 2 wherein the flow condition from the sanitation system flows through the inlet means into the narrow gap and flows directly onto the restricted flow outlet opening of the second container.

4. An apparatus of any one of the preceding claims, wherein said inlet means and said outlet means are formed by a single aperture.

5. An apparatus of any one of the preceding claims, wherein the restricted flow passage is narrower in cross-section than part of the sanitation system that directly connects to the restricted flow passage.

6. An apparatus of any one of the preceding claims, wherein the quantity of said flowable material extractable from the second container by the flow condition in the narrow gap is determined in part by physical dimensions of the or each said restricted flow outlet opening.

7. An apparatus of claim 6, wherein said apparatus is provided with means for altering said physical dimensions of the or each said restricted flow outlet opening.

8. An apparatus of any one of the preceding claims, wherein a localised area of low pressure is formed in the narrow gap whereby said flowable material flows from the second container toward the localised low pressure area.

9. An apparatus according to claim 8, wherein said area of localised low pressure is formed by a Venturi effect caused by flow of said flow condition in the narrow gap past the restricted flow outlet opening of the second container.

10. An apparatus of any one of claims 2 to 9, wherein the restricted flow passage includes a valve that controls the amount of air and/or liquid in the flow condition that flows into the narrow gap between the first and second containers.
11. An apparatus of claim 10, wherein the valve is provided with an internal duct therethrough, a cross-section of said internal duct being alterable by an aperture varying mechanism.

12. An apparatus of claim 11, wherein said duct includes a first portion and a second portion angularly connected to the first portion and in fluid communication therewith, said aperture varying mechanism includes a hollow sleeve within said first portion, the position of said sleeve being selectively moveable such that fluid communication between the first and second portions is varied depending on the position of the sleeve.

13. An apparatus of any one of claims 2 to 12, wherein at least one slideable element is retained within the restricted flow passage and is capable of substantially blocking fluid communication along the flow passage and capable of sliding freely along the flow passage, wherein, in use, the flow condition from the sanitation system drives the slideable element along the restricted flow passage such that a body of air and/or liquid is forced through the inlet means to create an air and/or liquid flow condition immediately adjacent the at least one restricted flow outlet opening of the second container.

14. An apparatus of claim 13, wherein, as the air and/or liquid drains back into the sanitation system, the at least one slideable element is drawn along the flow passage toward the sanitation system creating a low pressure region between the at least one slideable element and the outlet means to urge flowable material from the narrow gap into the restricted flow passage.

15. An apparatus according to either of claims 13 or 14, wherein the at least one slideable element is a plastic sphere.

16. An apparatus of any one of the preceding claims, wherein liquid that flows into the first container combines with the flowable material drawn from the second container to be used as flushing liquid for the sanitation system.

17. An apparatus according to any one of the preceding claims, wherein the apparatus further includes mounting means whereby said container can be mounted in said sanitation system with the or each said restricted flow outlet opening being directed in a downward direction in a position to receive said flow condition from the sanitation system upwardly against the or each said restricted flow outlet opening of the second container.
18. An apparatus according to any one of the preceding claims, wherein the second container is removable from the first container.

19. A method of dispensing a quantity of flowable material into a sanitation system, said method including the steps of:

   providing a first container having inlet and outlet means,

   using a restricted flow passage to connect the inlet means of the first container to the sanitation system in order to receive a flow condition from the sanitation system directed into the first container, and

   connecting the outlet means of the first container to the sanitation system in order to permit flow of the flowable material out of the first container;

   providing a second container within the first container, the second container holding a quantity of said flowable material and having at least one restricted flow outlet opening that faces downwards, wherein an inner surface of the first container is separated from a lower external surface of the second container by a narrow gap therebetween, the inlet means of the first container being positioned in said narrow gap immediately adjacent the restricted flow outlet opening of the second container;

   directing the following flow condition from the sanitation system through the restricted flow passage into the inlet means of the first container:

   i) only an air current originating from the sanitation system,

   such that the flow condition from the sanitation system flows through the inlet means into the narrow gap and flows immediately adjacent the restricted flow outlet opening of the second container;

   exposing the flowable material in the second container at the or each said restricted flow opening to said flow condition in the narrow gap in order to release the flowable material downwardly through the or each said restricted flow outlet opening into the narrow gap; and

   releasing the flowable material to exit the narrow gap through the outlet means of the first container into the sanitation system.

20. A method of claim 19 wherein the restricted flow passage is operatively adapted to direct all of the following flow conditions into the narrow gap between the first and second containers:

   i) only said air current originating from the sanitation system;

   ii) only a liquid current originating from the sanitation system; and
iii) only a current consisting of both air and liquid originating from the sanitation system.

21. A method of either claim 19 or 20 wherein the flow condition from the sanitation system flows into the narrow gap through the inlet means and flows directly onto the restricted flow outlet opening of the second container.

22. A method according to any one of claims 19 to 21, wherein said flow condition in the narrow gap immediately adjacent the or each said restricted flow outlet opening creates an area of localised low pressure which assists flow of the flowable material therethrough.

23. A method according to claim 22, wherein said area of localised low pressure is created by a Venturi effect.

24. A method according to any one of claims 19 to 23 wherein the method includes the step of controlling the flow condition that flows immediately adjacent the or each said restricted flow outlet opening of the second container by varying the cross section of the restricted flow passage.

25. A flowable material dispensing apparatus adapted to dispense flowable material into a sanitation system, the apparatus substantially as hereinbefore described and illustrated with reference to Figures 3 to 4 of the accompanying drawings.
26. A flowable material dispensing apparatus for dispensing flowable material into a sanitation system, said apparatus including:

   a first container having inlet means for permitting a fluid flow into said first container and outlet means to permit flow of the flowable material out of said first container to such a sanitation system;

   a flow passage for connecting the sanitation system to said inlet means and directing said fluid flow to said inlet means; and

   a second container located within said first container, said second container being adapted to hold a quantity of said flowable material and having at least one restricted flow outlet opening which, in use, faces downwardly; characterised in that

   said second container is located in said first container such that the or each said restricted flow outlet opening is adjacent said inlet means, whereby in use, said fluid flow from the flow passage issued from the inlet means at a position immediately adjacent the or each said restricted flow outlet; in that

   the or each said restricted flow opening is configured to prevent flow of the flowable material from the second container when the flowable material at the or each said restricted flow outlet opening is not exposed to said fluid flow issuing adjacent thereto and allowing flow of the flowable material from the second container when the flowable material at the or each said restricted flow outlet opening is exposed to said fluid flow issuing thereto; and in that

   said flow passage includes a flow restrictor.

27. Apparatus as claimed in claim 26, wherein said inlet means and said outlet means are defined by a common flow passage.

28. Apparatus as claimed in claim 26 or 27, further including means for altering the physical dimensions of the or each said restricted flow outlet opening.

29. Apparatus as claimed in claim 26, 27 or 28, further including means for forming a localised area of low pressure adjacent a downstream end of the or each said restricted flow outlet opening whereby said flow of said flowable material from the or each said restricted flow outlet opening is assisted.
30. Apparatus as claimed in claim 29, wherein said means for forming a localised area of low pressure includes means for causing a Venturi effect using said fluid flow issuing from said inlet means.

31. Apparatus as claimed in any one of the preceding claims, wherein said flow restrictor includes a valve for controlling the amount of said fluid flow issuing from said inlet means.

32. Apparatus as claimed in claim 31, wherein said valve is provided with an internal duct extending therethrough and an aperture varying mechanism for altering the cross-section of said internal duct.

33. Apparatus as claimed in claim 32, wherein said internal duct includes a first portion and a second portion angularly connected to the first portion and in fluid communication therewith, said aperture varying mechanism includes a hollow sleeve within said first portion and said sleeve is selectively moveable such that fluid communication between the first and second portions is varied.

34. Apparatus is claimed in any one of the preceding claims, further including at least one slideable element retained within the flow passage, the or each said slideable element being slideable between positions in which fluid flow along said flow passage is blocked or allowed.

35. Apparatus as claimed in claim 34, wherein the at least one slideable element is a plastic sphere.

36. Apparatus as claimed in any one of the preceding claims, wherein the first container and said second container form a sub-assembly and said flow passage is adapted for connection to a liquid flow path in a sanitation flushing system whereby air and/or liquid in said flow passage can flow into said first container via said inlet means.

37. Apparatus as claimed in any one of the preceding claims wherein said inlet means is disposed opposite the or each said restricted flow outlet opening.
38. Apparatus as claimed in claim 37, wherein said inlet means and the or each said restricted flow outlet opening are defined by respective axially parallel apertures.

39. A sanitation system provided with a flowable material dispensing apparatus as claimed in any one of the preceding claims.

40. A sanitation system provided with a flowable material dispensing apparatus as claimed in claim 1 and arranged such that said fluid flow is a flow of air, liquid or air and liquid.

41. A sanitation system as claimed in claim 40, further including a slideable element retained within said flow passage, wherein, in use, a fluid flow from said sanitation system acts on a upstream side of said slideable element causing said slideable element to move along said flow passage towards said inlet means and drive fluid in said flow passage downstream of the slideable element through said inlet means to provide said fluid flow issuing immediately adjacent the or each said restricted flow outlet opening.

42. A system as claimed in claim 41, arranged such that in use, as the fluid flow acting on said downstream side of the slideable element drains back into the sanitation system, said slideable element is drawn back along the flow passage towards the sanitation system thereby creating a low pressure region between the slideable element and said outlet means to assist the flow of flowable material from said first container into said flow passage.

43. A system as claimed in any one of claims 39 to 42, wherein the or each said restricted flow outlet opening is arranged at a lowermost end of said second container.

44. A system as claimed in any one of claims 39 to 43, wherein said containers are mounted in said sanitation system with the or each said restricted flow outlet opening positioned such that said fluid flow issuing from the inlet
means is directed upwardly towards the or each said restricted flow outlet opening.

45. A method of dispensing a quantity of flowable material from a container into a sanitation system, said method including the steps of:

- connecting the inlet means and outlet means of a first container with said sanitation system;
- placing flowable material in a second container which is disposed in said first container and is provided with at least one generally downwardly directed outlet opening arranged such that said flowable material can pass from said second container to said outlet means and characterised by the steps of providing a flow passage with a flow restriction between said sanitation system and the inlet means, positioning said inlet means adjacent the or each said outlet opening such that a fluid flow from said inlet means issues at a position immediately adjacent the or each outlet opening and causing a said fluid flow to pass through said inlet means via said flow restriction thereby exposing said flowable material at the or each said outlet opening to said fluid flow so as to cause a quantity of flowable material to pass from the or each said outlet opening to said sanitation system via said outlet means.

46. A method as claimed in claim 45, wherein said fluid flow issuing from said inlet means is:

i) air from the sanitation system;
ii) liquid from the sanitation system; or
iii) air and liquid from the sanitation system.

47. A method as claimed in claim 45 or 46, further including arranging for said fluid flow issuing adjacent the or each said outlet opening to create an area of localised low pressure adjacent the or each said outlet opening to assist flow of the flowable material from the or each outlet opening.

48. A method as claimed in claim 47, wherein said area of localised low pressure is formed by a Venturi effect.
49. A method as claimed in any one of claims 45 to 48, further including the step of controlling the amount of said air and/or liquid from said inlet means by varying the cross section of the flow restriction.

50. A method as claimed in claim 49, wherein the flow restriction is varied by an apparatus varying mechanism.

51. A flowable material dispensing apparatus substantially as described herein with reference to Figs. 1 and 2 of the drawings.

52. A flowable material dispensing apparatus substantially as described herein with reference to Fig. 3 and Fig. 4 of the drawings.

53. A flowable material dispensing apparatus substantially as described herein with reference to Figs. 3A and 3B of the drawings.

54. A flowable material dispensing apparatus substantially as described herein with reference to Fig. 6 of the drawings.

55. A flowable material dispensing apparatus substantially as described herein with reference to any one of Figs. 3 to 6, and Fig. 5, of the drawings.

56. A sanitation system including a flowable material dispensing apparatus according to any one of claims 51-55.

57. A method of dispensing a quantity of flowable material into a sanitation system substantially as described herein with reference to Figs. 3, 4 and 5 of the drawings.

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SPRUSON & FERGUSON
Figure 2
Figure 3A
Figure 3B
Figure 5