

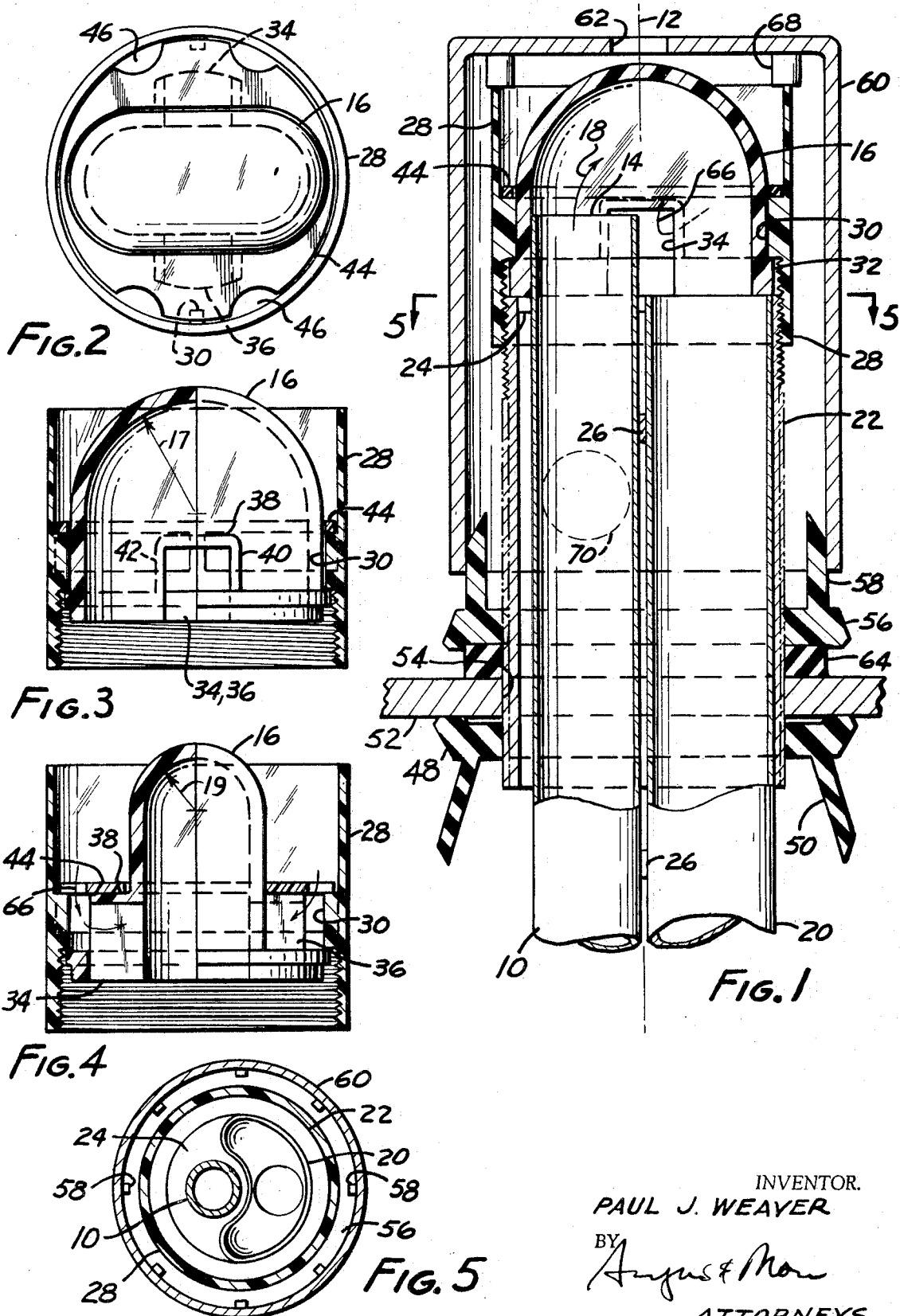
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P. J. WEAVER

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AIRGAP

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INVENTOR.
PAUL J. WEAVER
BY *August & More*
ATTORNEYS.

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AIRGAP

Paul J. Weaver, Pasadena, Calif., assignor to Granning Enameling Company, El Monte, Calif., a corporation of California

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ABSTRACT OF THE DISCLOSURE

An airgap device according to the present disclosure comprises a supply tube which receives waste water and any entrained waste material from an appliance and discharges it into a vented return dome which in turn discharges it to a return tube. The return tube includes a kidney-shaped portion to receive waste from the return dome.

This invention relates to airgaps for appliances which discharge water to sewers or drains.

It is a uniform practice to discharge waste from certain appliances such as dishwashers to the inlet side of a garbage disposer. In such a case, an airgap device is often placed in the drain pipe from the appliance to the garbage disposer to prevent water that might be in the sink above the garbage disposer from back-flooding into the appliance. Devices for this purpose have been long known, but recent requirements that an airgap be capable of passing a $\frac{1}{16}$ inch diameter ball to the drain, have made the older designs unacceptable in the more modern installations. Thus, with the increasing use of dishwashers to discharge waste with the water (thereby acting in part as a garbage disposer) the airgap must be large enough to pass the waste or it might become clogged with waste, which clogging would render the airgap useless.

Some previous airgaps utilize a Venturi principle, requiring a lessening of the flow cross-section as the flow of water approaches the Venturi. These previous devices require either an enlargement of the hole in the sinkboard in order that the constriction will pass particles of a given size, or utilize a smaller size opening for waste particles to pass, which limits the utility of the device. The present device utilizes a standard supply tube and a return tube large enough to accommodate waste material which can pass through the supply tube, but which does not require an enlargement of the mounting hole in the sinkboard. The flow section of the return tube may be greater than that of the supply tube, but the total mounting area necessary for mounting the two tubes together is not increased.

One reason for the unsuitability of the prior designs is that although they are adaptable to being enlarged in size to meet the modern requirements, such an enlargement would unnecessarily clutter up a sinkboard to which it is customary to mount the airgap device.

It is an object of the present invention to provide an airgap device which can be mounted to a sinkboard, there to fit in a hole of minimum diameter while passing particles as large as can enter the supply tube.

Another object of the present invention is to provide an airgap device having a return portion which is capable of being removed for cleaning and other servicing purposes.

Another object of the present invention is to provide an airgap device having a transparent portion so that the operation of the device may be inspected visually.

Another object of the present invention is to provide an airgap device having guards to prevent splashing or spraying of waste water discharged through the device.

An airgap device according to the present invention includes a supply tube which receives the waste water

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and any entrained waste from an appliance and discharges it into a return dome, and then downwardly into a return tube. The upper end of the return tube is preferably kidney-shaped. An airgap is formed in the return dome to break any vacuum between the supply tube and the return tube.

According to one optional and desirable feature of the present invention, the return dome is removable so that the device may be cleaned and serviced without disrupting the plumbing connections.

According to another optional and desirable feature of the present invention, guards are incorporated on the return dome to prevent spraying of water passing through the airgap device.

According to another optional and desirable feature of the present invention, the return dome is constructed of a transparent material so that the operation of the device may be inspected visually.

The above and other features of this invention will be more fully understood from the following detailed description and the accompanying drawings, in which:

FIG. 1 is a side view elevation in cutaway cross-section of the presently preferred form of an airgap device according to the present invention;

FIG. 2 is a top view elevation of a return dome for use in the airgap device illustrated in FIG. 1;

FIG. 3 is a side view elevation, partly in cutaway cross-section, of the return dome illustrated in FIG. 2;

FIG. 4 is an end view elevation partly in cutaway cross-section of the return dome illustrated in FIGS. 2 and 3; and

FIG. 5 is a cross-section taken at line 5—5 in FIG. 1.

In the drawings there is illustrated a supply tube 10 which is generally circular in cross-section and which extends vertically upward along vertical axis 12. The upper end 14 of tube 10 terminates at a selected elevation within return dome 16. Dome 16 may conveniently take on the form of one-half of a closed torus, so that the water will flow as indicated by arrow 18 originating in supply tube 10.

A return tube 20 rises parallel to axis 12. Where the return tube passes through the drainboard it is kidney-shaped, and preferably this shape extends to its upper end. The term "kidney-shaped" is used herein to refer to a shape which has a significant length of arc on two sides, which arcs differ in radii by a substantially constant increment, and which are spaced apart by at least some minor dimension. The minor dimension of the return tube is preferably at least as great as the least diameter of supply tube 10 in order that particles of the size of the supply tube will be passed by the return tube, but the area will be larger, and the axial flow rate can be slower.

As best illustrated in FIGS. 3 and 4, dome 16 has a greater radius 17 preferably at least as large as the diameter of the supply tube, and a lesser radius 19 preferably at least as large as the radius of the supply tube.

A body tube 22 surrounds the upper portion of supply tube 10 and return tube 20. Seal 24 fills the region between supply tube 10 and return tube 20 within body tube 22, preferably near their upper ends. The seal 24 prevents leakage of water in this region. The supply tube and return tube may be held together within body tube 22 by suitable tack welds 26.

Dome 16 is held in place over supply tube 10 and return tube 20 by means of retainer ring 28. Dome 16 is retained in registration with the upper ends of the supply and return tubes, and is prevented from rotation about axis 12 by engagement with the upper end of supply tube 10. Retainer ring 28 includes shoulder 30, which abuts shoulder 32 of return dome 16. The retainer ring 28 is threaded on body tube 22 to the position shown in FIG. 1, thereby sealing the lowermost portion of the return dome

16 against body tube 22. Thus, supply and return tubes 10 and 20 are sealed to body tube 22 by seal 24, and body tube 22 is sealed to return dome 16. It is to be understood that although seal 24 is illustrated at the top of body tube 22, it may be desirable to recess seal 24 in the body tube to divert any splashed liquid to the return tube.

Return dome 16 is vented to the exterior through vents 34 and 36. Vents 34 and 36 are disposed at the sides of the closed torus adjacent to its lesser radius so that as water passes from supply tube 10 to return tube 20 in the direction of arrow 18, little or no water will escape through the vents, because centrifugal force tends to keep the water contiguous to the outer, larger radius. The upper and side edges of each vent are surrounded at the outside of dome 16 by upper wall 38 and side walls 40 and 42, forming a vent channel for each vent. As shown particularly in FIGS. 3 and 4, the lower portion of each vent channel will be diverted back into the dome area and into return tube 20 along the surface of seal 24. The uppermost portion of vents 34 and 36 are preferably at least of equal or slightly greater elevation than the upper end 14 of tube 10. This arrangement permits air to enter return dome 16 through the vents even if return tube 20 becomes clogged with waste and the return dome fills with water to a level equal to the height of supply tube 10. The uppermost surface of wall 38 of the vent channels is approximately equal in elevation to the upper elevation of shoulders 30 on ring 28.

Splash guard 44 is mounted to dome 16 at the upper surface of walls 38 and is adapted to abut the upper of shoulder 30 of retainer ring 28. Splash guard 44 includes vent openings 46 offset from vents 34 and 36 and disposed through the splash guard to permit air to flow through vent openings 46 and vents 34 and 36 to the interior of dome 16, as shown by arrows 66.

Nut 56 is threadably mounted to body tube 22 and includes spring fingers 58 to which cover 60 may be attached by pressing the cover over the free ends of the spring fingers. The cover includes a vent port 62 to admit air thereto. Spacers 68 are provided on cover 60 to abut the upper portion of retainer ring 28 so as to provide a space between the cover and retainer ring.

The airgap device is mounted to a sinkboard or countertop 52 by means of nut 48. As illustrated in FIG. 1, nut 48 may be identical to nut 56 and have spring fingers 50. Sinkboard or countertop 52 is provided with an aperture having a diameter slightly greater than the outer diameter of body tube 22. The airgap device is mounted to the sinkboard or countertop by passing a portion of body tube 22 through aperture 54 and sandwiching the sinkboard or countertop between nuts 48 and 56. Preferably, lock washer 64 is provided between the sinkboard and nut 56 to prevent relative rotation of the nuts about axis 12. Preferably, lock washer 64 is constructed from soft rubber to prevent liquid from leaking past the lock washer, through aperture 54 to the region below the sinkboard.

For purposes of illustration, a ball 70 is illustrated upwardly bound in supply tube 10 and it will be seen that there is a clearance at least this great at the top thereof. The ball will be deflected by dome 16 along with the fluid toward the upper portion of return tube 20. Upon entering return tube 20, ball 70 will proceed downwardly through the return tube and will be discharged to waste. The return tube may, if desired, bend away from the supply tube and/or be formed to any desired diameter after it leaves the body tube.

If the diameter of the supply tube is $\frac{7}{16}$ inch, and the minimum dimension of the return tube is likewise at least $\frac{7}{16}$ inch, it is evident that waste of the major dimension of $\frac{7}{16}$ inch and smaller, and of any configuration, can be discharged through this airgap device. Should a vacuum tend to form, it will be broken by drawing air through the vents 62 in cover 60 and from between the fingers 58 of nut 56, and thence through vent opening 46

in splash guard 44, thence through vents 34 and 36 to the interior of dome 16.

Inspection of FIGS. 1 and 5 will disclose that the total diameter of opening 54 which needs to be cut in sinkboard 52 is a minimum, requiring only such size as to accommodate body tube 22. This diameter need be only slightly greater than the diameter of the supply tube plus the minimum dimension of the return tube, which is the difference between the greater and lesser arcs of the kidney-shaped region.

Should system pressure fail, and suction be exerted in the supply line, any back-siphoning action will be prevented by air which enters through the vents, which prevents reverse flow from the return tube. The vents are positioned above the anticipated maximum height of water in the sink.

Supply tube 10 and return tube 20 are preferably constructed from copper tubing or other piping material suitable for plumbing. Body tube 22 may be constructed from brass, and nuts 48 and 56 may be constructed from hard plastic. Return dome 16, retainer ring 28 and splash guard 44 are preferably constructed from transparent plastic so that the operation of the airgap device may be readily observed when cover 60 is removed. The return dome and splash guard may be assembled to the retainer ring by slipping the return dome into the retainer ring so that shoulder 32 abuts shoulder 30 and then slipping splash guard 44 over the return dome and into the retainer ring to abut shoulder 32. The splash guard is cemented or otherwise fastened to the upper surfaces of walls 38. Cover 60 may be constructed from any suitable material, chrome-plated steel and polished aluminum being examples.

The airgap device according to the present invention provides optimal results requiring a minimum hole size in the sinkboard for mounting. The device is of simple configuration and is expedient and inexpensive to manufacture.

What is claimed is:

1. An airgap device for a liquid discharge comprising: a supply tube; a return tube; said tubes both having upper ends, the upper end of the supply tube being substantially cylindrical, a portion of the return tube being kidney-shaped, whose minor dimension is at least as great as the least diameter of the supply tube; a body tube surrounding and enclosing a portion of the kidney-shaped portion of the return tube and a portion of the supply tube; seal means mounted within said body tube for sealing said supply and return tubes to said body tube; retainer means threadably mounted to said body tube; a return dome mounted to said retainer means, said dome being in registration with the upper ends of said supply and return tubes and adapted to receive and deflect flow from the supply tube to the return tube, the return dome having the shape of one-half of a closed toroid with a greater radius and a lesser radius; and a vent port through a side of the return dome between the upper ends of the supply and return tubes adjacent to the lesser radius of the said toroidal shape.

2. An airgap device according to claim 1 wherein said return dome and retainer ring are constructed from transparent plastic.

3. An airgap device according to claim 1 wherein said return dome includes a vent channel having upper and side walls disposed at the upper and side portions of said vent and outside said return dome.

4. An airgap device according to claim 3 further including a splash guard having vent passages therethrough mounted to the upper wall of said vent channel in said retaining means, said vent passages being disposed in offset relationship with said vent channel.

5. An airgap device according to claim 4 wherein said return dome, retainer means and splash guard are constructed from transparent plastic.

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6. An airgap device according to claim 5 further including mounting means threadably mounted to said body tube for mounting the body tube to an apertured surface.

7. An airgap device according to claim 5 further including nut means threadably mounted to said body tube, a plurality of fingers integrally supported by said nut means, and a cover supported by said fingers, said cover surrounding and covering the upper ends of said supply and return tubes, said return dome and said retainer means, said cover including a vent port to provide air to the airgap.

8. An airgap device according to claim 7 further including mounting means threadably mounted to said body tube for mounting the body tube to an apertured surface.

9. An airgap device for a liquid discharge comprising: a supply tube; a return tube; said tubes both having upper ends, the upper end of the supply tube being substantially cylindric, a portion of the return tube being kidney-shaped, whose minor dimension is at least as great as the least diameter of the supply tube; a body tube surrounding and enclosing a portion of the kidney-shaped portion of the return tube and a portion of the supply tube; seal means mounted within said body tube for sealing said supply and return tubes to

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said body tube; retainer means threadably mounted to said body tube; a return dome mounted to said retainer means, said dome being in registration with the upper ends of said supply and return tubes and adapted to receive and deflect flow from the supply tube to the return tube; a vent port through a side of the return dome between the upper ends of the supply and return tubes; and a cover mounted to said body tube, said cover surrounding and covering the upper ends of the supply and return tubes, said return dome and said retainer means, said cover including a vent port to provide atmospheric air to the vent port.

References Cited

UNITED STATES PATENTS

758,188	4/1904	Miller	137—216
3,038,495	6/1962	Fortin	137—559
3,155,106	11/1964	Baron	137—216
3,183,923	5/1965	Henrikson	137—216

ROBERT G. NILSON, Primary Examiner

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