United States Patent [19]

Gorman

[11] **3,791,401**

[45] **Feb. 12, 1974**

[54] **VENTED SANITARY TRAP UNIT**

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[22] Filed: **June 14, 1971**

[21] Appl. No.: **152,560**

[52] **U.S. Cl.**..... **137/216.2,** 137/247, 137/49

[51] **Int. Cl.**..... **F16k 45/00**

[58] **Field of Search**..... 137/247.41, 247.49, 247.51, 137/216, 216.1, 216.2, 217, 526

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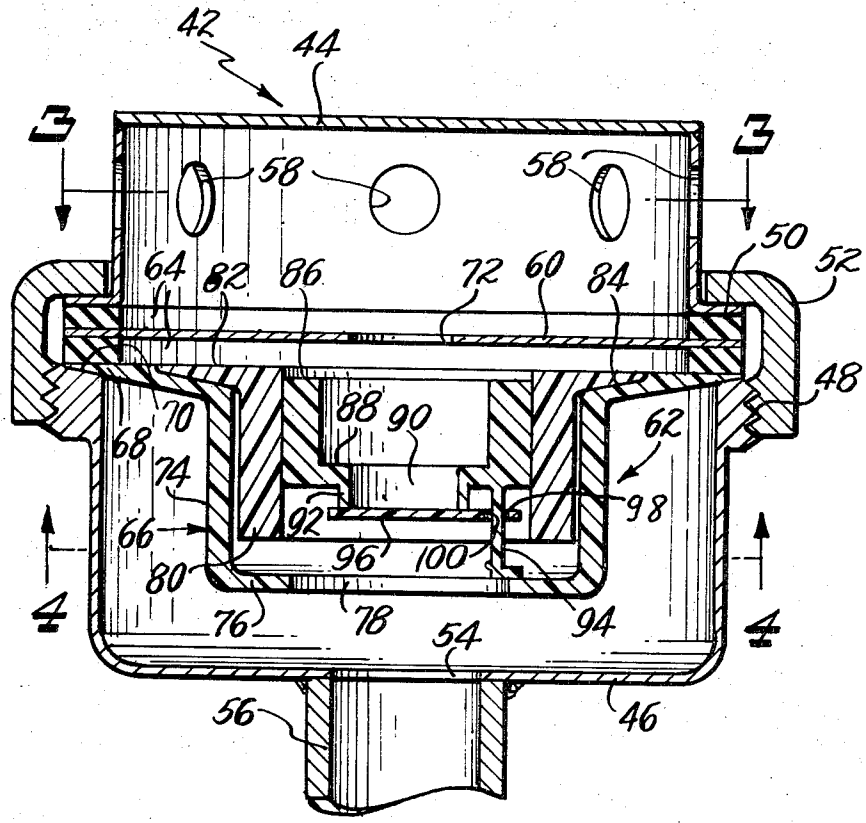
Primary Examiner—Henry T. Klinksiek

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[57] **ABSTRACT**

A trap unit for installation into a sanitary drainage system, including a generally U-shaped trap body having a vent element mounted on the inlet leg. The vent element has a check valve to prevent overflows, and the trap unit functions to prevent self siphonage of its liquid seal.

9 Claims, 4 Drawing Figures



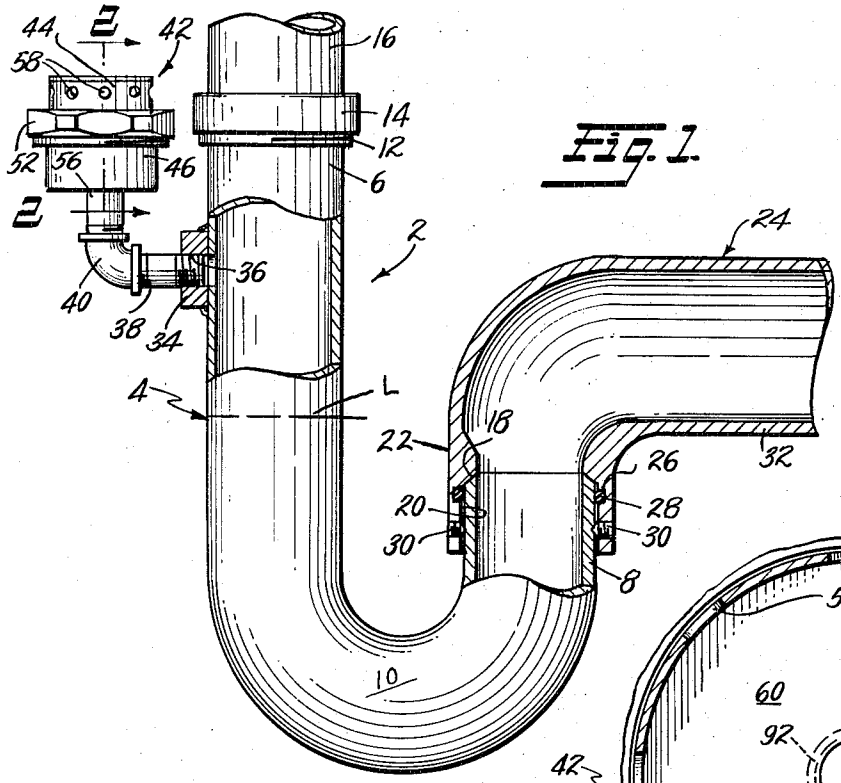


Fig. 1.

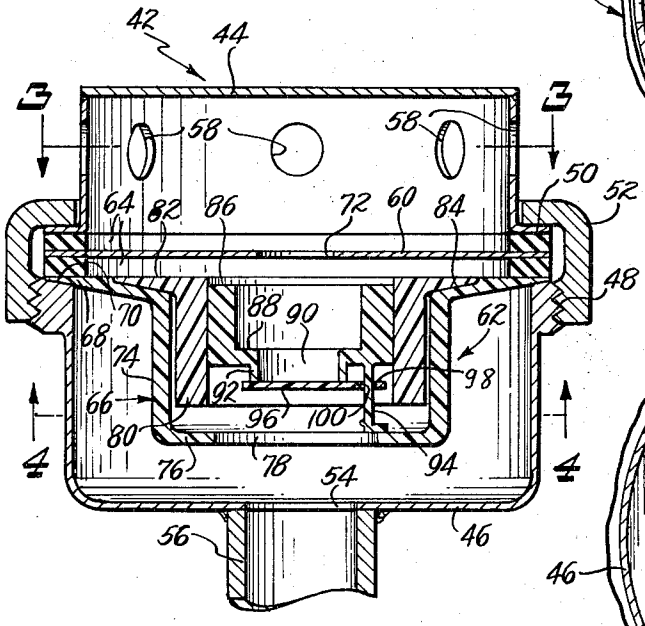


Fig. 2.

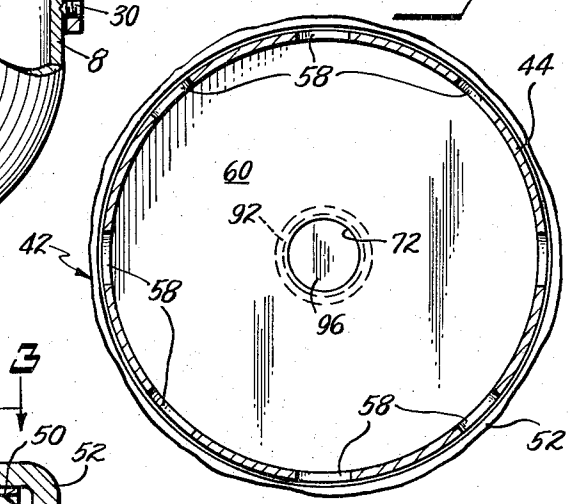


Fig. 3.

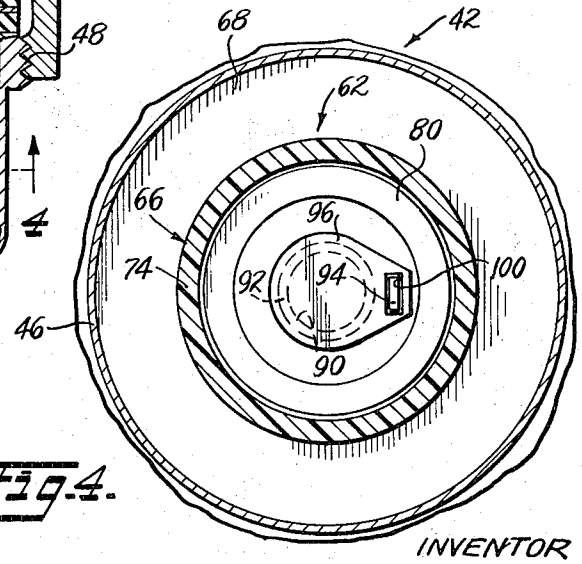


Fig. 4.

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VENTED SANITARY TRAP UNIT

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to traps for installation in a sanitary drainage system, and more particularly to a novel self-contained trap unit including means to prevent self siphonage or loss of the trap's liquid seal.

2. Description of the Prior Art

In a conventional sanitary drainage system a plumbing fixture is connected to a building drainage sewer by a line having a generally U-shaped trap therein, a portion of the discharged waste liquid being retained in the bend of the trap to form a liquid seal that prevents sewer gas and objectionable odors from entering into the building proper through the fixture drain. Where the plumbing fixture is not itself protected by a vent, loss of the liquid seal in the trap can occur through self siphonage when a volume of waste liquid is discharged.

There is need for a self-contained trap unit that can be used with all plumbing fixtures, vented or not, and which is designed to prevent such self siphonage from occurring. The present invention satisfies that need.

SUMMARY OF THE INVENTION

The present invention relates to sanitary drainage for all types of buildings, the plumbing fixtures in a building normally being connected onto a building drainage system that in turn empties into a sanitary sewer. Because the use of a main trap at the point where the building drainage system empties into the sanitary sewer is either discouraged or simply prohibited by local codes, for a variety of reasons, the building drainage system is open to gases from the sanitary sewer.

To dissipate the sewer gases from the system, a vent stack extending to the roof of the building is normally employed. The gases are thus discharged into the atmosphere, where they are dissipated. However, it is still necessary to guard against such gases getting into the interior of the building through plumbing fixtures connected to the system, and for this purpose individual traps are placed between each fixture and its point of connection with the building sanitary drainage system.

The self-contained trap unit of the present invention is intended to be so installed, and effectively maintains a liquid seal, whether or not the plumbing fixture is vented. It thus assures a properly functioning drainage system and provides a wider choice of plumbing fixtures. By allowing a wide choice of fixtures, both those which are vented and those which are not, it allows the builder to effect maximum economy in the plumbing system, thereby helping to reduce the cost of construction.

The trap unit of the invention includes a generally U-shaped trap body having inlet and exit legs, the legs being connected at their lower ends by a U-bend portion. The outer ends of the trap body are adapted for connection into a drainage line, and when waste liquid is discharged through the trap body a quantity thereof is retained in the U-bend area to form a liquid seal, which seal prevents sewer gases and odors from escaping through the attached plumbing fixture into the building.

The liquid seal of the present trap unit will normally extend upwardly to a predetermined, normal level in the inlet leg. The inlet leg of the present invention extends vertically several inches above said level and has a vent port therein spaced above said level. A vent element is connected to the vent port and is designed to allow air to flow into the inlet leg, where it aerifies the effluent, retards its velocity, and prevents self siphonage from occurring. The vent element is designed with a check valve arrangement that is automatically closed if the liquid level in the inlet leg rises too high, whereby overflows are prevented.

By thus venting the trap unit so that the liquid seal is not siphoned off, assurance is obtained that sewer gases cannot escape into the building through the plumbing fixture. The present invention can be used with all plumbing fixtures to produce a reliable drainage system for a building.

It is the principal object of the present invention to provide a trap unit for use with all types of plumbing fixtures, both vented and unvented, and which is designed to prevent self siphonage.

Another object is to provide a vented trap unit designed to prevent accidental overflows of waste liquid therefrom.

A further object is to provide a trap unit that is easily installed and simple to maintain.

Yet another object is to provide an economical vent element for a trap unit.

Other objects and many of the attendant advantages of the present invention will become readily understood from the following Description of the Preferred Embodiment, when taken together with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of the present trap unit, partially broken away to show details thereof, the trap unit being shown connected into a building drainage system;

FIG. 2 is an enlarged vertical sectional view of the vent element, taken on the line 2—2 of FIG. 1;

FIG. 3 is a horizontal sectional view, taken on the line 3—3 of FIG. 2; and

FIG. 4 is a horizontal sectional view taken on the line 4—4 of FIG. 2, showing in particular the valve element and its relationship to the valve port and its guide post.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, the trap unit of the invention is indicated generally at **2**, and includes a generally U-shaped trap body **4** comprising a generally vertical inlet leg **6**, a shorter, generally vertical exit leg **8**, and a connecting U-bend portion **10**. The upper end **12** of the inlet leg **6** is threaded, and is connected by a screw thimble **14** to a discharge pipe **16** leading from a plumbing fixture (not shown). The upper end **18** of the exit leg **8** is chamfered, and is telescopically received within a socket **20** formed in the downturned leg **22** of a discharge pipe **24** leading to the building sewerage discharge line (not shown), the telescopic joint being sealed by an O-ring **26** carried in a groove **28** formed in the sidewall of the socket **20**, and the exit leg **8** being secured in place by set screws **30** carried in threaded bores through the socket sidewall.

It is to be understood that the upper ends of the inlet and exit legs **6** and **8** can be joined into the discharge line by the use of connectors other than those shown, if desired. When waste liquid is discharged through the

trap body 4, such will flow down through the inlet leg 6 into the U-bend portion 10, and will then rise in the shorter exit leg 8 until the level of the generally horizontal but inclined leg 32 of the discharge pipe 24 is reached, whereupon the liquid will flow into the building sewerage discharge line. When waste liquid ceases to flow into the inlet leg 6, a residual amount of liquid will be trapped in the U-bend portion 10 to form a liquid seal between the pipe 24 and the plumbing fixture. The liquid seal will rise normally in the inlet leg 6 to a predetermined level corresponding to the level of the bottom of the interior surface of the leg 32 of discharge pipe 24, such level being indicated in FIG. 1 by the line L.

The purpose of the liquid seal formed in the trap body 4 is to prevent sewer gases and odors passing from the building sewerage discharge line to the plumbing fixture, and thus it is important that such seal be established and maintained. The liquid trap seal can be removed through self siphonage, pressure or aspiration unless precautions are taken thereagainst, it being the purpose of the invention to prevent such from occurring.

Referring again to FIG. 1, the heights of the inlet leg 6 and the shorter exit leg 8 are chosen so that the inlet leg 6 will extend vertically for some distance above the predetermined liquid trap level L, typically about 3 or 4 inches. At a distance of about 2 or 3 inches above the level L, the inlet leg 6 has a boss 34 formed thereon, through which extends a threaded vent port 36 that is inclined at a slight angle, say about 5°, to the horizontal, so as to induce drainage into the trap body. One end of a nipple 38 is threaded into the vent port 36, the other end of said nipple having a 90° elbow 40 thereon that supports a vent element 42.

The vent element 42 is designed to readily admit air to the inlet leg 6, and yet to be closed should liquid rise in the inlet leg 6 above the level of the vent port 36, so that overflows can be avoided. The vent element 42 includes upper and lower cup-shaped body portions 44 and 46, respectively, the upper end 48 of the lower body portion 46 being externally threaded, and the lower end of the upper body portion 44 having a flange 50 thereon that supports a screw thimble 52 utilized to secure the body portions 44 and 46 together in confronting relationship. The bottom wall of the lower body portion 46 has a central opening 54 therein, from which a connector nipple 56 extends for securing the vent element 42 to the elbow 40, and the sidewall of the upper body portion 44 has a plurality of circumferentially spaced vent openings 58 therein.

Clamped between the confronting body portions 44 and 46 are an orifice plate 60 and a check valve unit 62, the periphery of the orifice plate 60 being received between annular resilient washers 64, and the check valve unit 62 including a valve body 66 having a tapered flange 68 thereon that is received between the lower washer 64 and the chamfered upper end surface 70 of the lower body portion 46. The orifice plate 60 has an orifice 72 located centrally therein, chosen to admit the desired amount of air to the valve unit 62 and ultimately the inlet leg 6.

The valve body 66 includes an outer cup-shaped member 74 having the flange 68 on the upper end thereof, and including a bottom wall 76 having a relatively large circular opening 78 therein. Received within the outer member 74 is an intermediate sleeve 80 having a tapered flange 82 on its upper end, the flange 82 being secured, as by adhesive, within a tapered recess 84 in the upper face of the member 74. A generally cylindrical inner member 86 is secured within the sleeve 80, and includes a bottom wall 88 having a valve port 90 extending therethrough.

A cylindrical rim valve seat 92 is formed on the undersurface of wall 88 about the valve port 90, and a rectangular supporting post 94 is spaced outwardly from the rim 92 and extends downwardly into engagement with the bottom wall 76 of the outer member 74. A flat valve element 96 is positioned beneath the rim valve seat 92, and includes a radial tab 98 that has a rectangular opening 100 therein for loosely receiving the supporting post 94. Obviously, more than one supporting post 94 can be employed, if desired, the purpose of the post being to retain the valve element 96 in proper position, and to guide it through its allowable range of vertical movement. The diameter of the valve element 96 is substantially less than the inner diameter of the intermediate sleeve 80, so that when it is in its lowered position substantially full flow through the valve port 90 is allowed.

The check valve unit 62 allows air to freely enter the inlet leg 6 of the trap body 4, under normal conditions. Should the liquid level in the inlet leg 6 rise above the vent port 36, so that waste liquid enters into and rises within the lower body portion 46 of the vent element 42, the valve element 96 is designed so that it will rise with the level of such liquid until it seats on the rim 92 to thereby close the valve port 90. This action will prevent unwanted overflows of waste liquid. When conditions in the trap body 4 return to normal, the liquid will drain from the vent element 42, and the valve element 96 will return to its open position, the slight incline of the vent port 36 aiding in such drainage.

The vent port 36 and its attached vent element 42 function to admit air to the inlet leg 6 of the trap body 4, where it aerifies the effluent, retards the velocity thereof, and breaks any partial vacuums that might tend to form. The air thus induced into the effluent, in the form of air bubbles, is liberated downstream in the building drainage system, and the result is to protect the liquid trap of the unit 2 against destruction from self-siphonage or the like, as well as to contribute to the maintenance of other trap seals in the system.

The trap unit 2 is self-contained, and can be used with vented or unvented plumbing fixtures. The position of the vent port 36, at about 2 or 3 inches above the level L of the liquid seal, is chosen to provide optimum blending of air with effluent flowing through the trap body 4, and to allow the check valve unit 62 to remain open under most operating conditions. It should also be noted that the vent port 36 should be positioned some distance below the upper end 12 of the inlet leg 6, so that the falling waste liquid can gain momentum before passing the vent port, whereby the suction of air into the trap unit is enhanced. Indeed, the trap unit 2 should itself be installed a substantial distance below the fixture drain to further enhance a build-up of momentum and the suction or aspiration effect on the vent element 42. The failure to provide for such a momentum build-up is one reason why those ports commonly provided as an integral part of some plumbing fixtures are ineffective in preventing self-siphonage of trap units.

Obviously, many modifications and variations of the present invention are possible.

It should be understood that the system permits unlimited horizontal piping runs to fixtures from the atack, and there is no need for the limiting of offsets or changes in direction for piping serving fixtures equipped with the trap unit of this invention.

I claim:

1. A trap unit for connection to a plumbing fixture having an outlet with a substantially vertically extending end portion, said unit including: a trap body, including a substantially vertical inlet leg and an exit leg connected at their lower ends by a U-shaped bend portion, said inlet leg being adapted for direct connection to said vertically extending end portion, said bend portion being designed to retain a portion of liquid flowing through said trap body to form a seal between said exit leg and said inlet leg, said liquid seal normally extending to a predetermined height in said inlet leg, and said inlet leg having a lateral trap body port therein spaced vertically above said predetermined liquid seal height such that liquid entering said trap unit flows past said port in a substantially vertical direction; means on the outer ends of said inlet and exit legs for connecting said trap body into a drainage system; and a vent element secured to said port.

2. A trap unit as recited in claim **1,** wherein said trap body port is spaced about 2 inches above said predetermined liquid seal height.

3. A trap unit as recited in claim **1,** wherein said vent element is arranged to admit air to said inlet leg when the vent element is substantially free of liquid, and includes valve means arranged to close in response to liquid rising within said vent element.

4. A trap unit as recited in claim **1,** wherein said vent element comprises: an upper body portion having a vent opening therein; a lower body portion having a port therein, said lower body port being connected with said trap body port; means detachably securing said body portions together; and a valve unit removably mounted between said body portions, and including a valve element arranged to be closed by liquid rising within said lower body portion and open when said lower body portion is substantially free of liquid.

5. A trap unit according to claim **4** wherein said body portions are cup shaped and are secured together rim-to-rim so as to form a chamber.

6. A trap unit as recited in claim **5,** wherein said valve unit includes: a valve body having a valve port therein, said valve element being positioned beneath said valve port to confront said valve port; and guide means attached to said valve body for guiding said valve element between an upper position wherein it seals said valve port, and a lower position wherein said valve port is open, said valve element being movable from said lower position to said upper position by liquid rising within said lower body portion.

7. a trap unit as recited in claim **6,** wherein said valve element has at least one opening therein spaced outwardly from a sealing area thereof, and wherein said guide means includes a vertical guide post extending through said opening.

8. A trap unit according to claim **6** wherein said valve body comprises a cup-shaped outer member having a base with an opening therein larger than the sealing area of said valve element, and a tapered flange extending from its rim, said flange being secured between the rims of said upper and lower body portions with the remainder of said cup-shaped outer member extending into said lower body portion, said valve body further including a generally cylindrical inner member supported in said cup-shaped outer member above the base, said valve port being formed on the end of said inner member closest to said base.

9. A trap unit according to claim **8** wherein said vent element further includes an orifice plate secured between said upper and lower body portions above said valve unit, and a generally L-shaped conduit having its vertical leg attached to the port of said lower body portion and its horizontal leg attached to the trap body port of said inlet leg.

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