March 15, 1955 F. D. LOW 2,704,083

INLET FITTING FOR DISHWASHERS AND THE LIKE

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Fig. 1

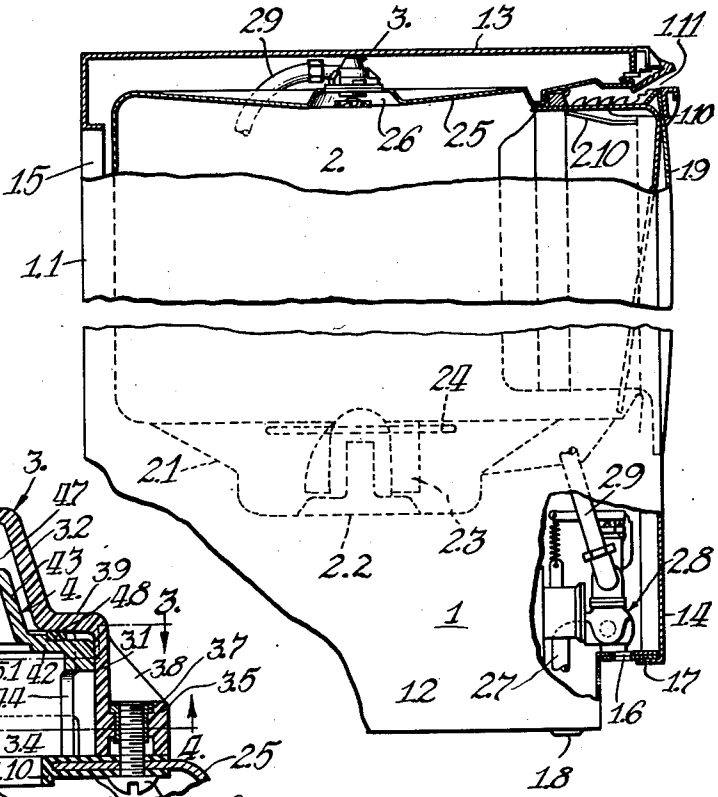


Fig. 2

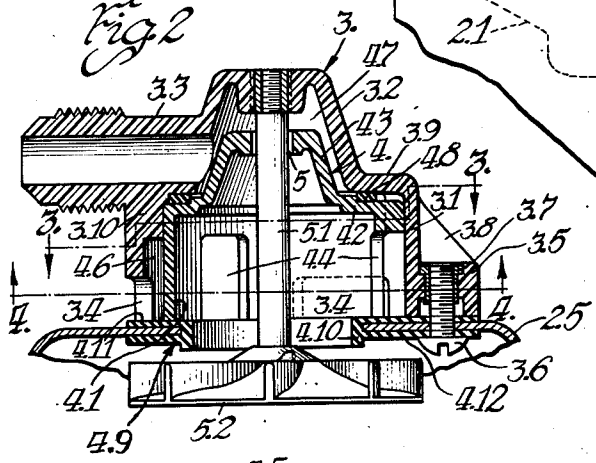


Fig. 3

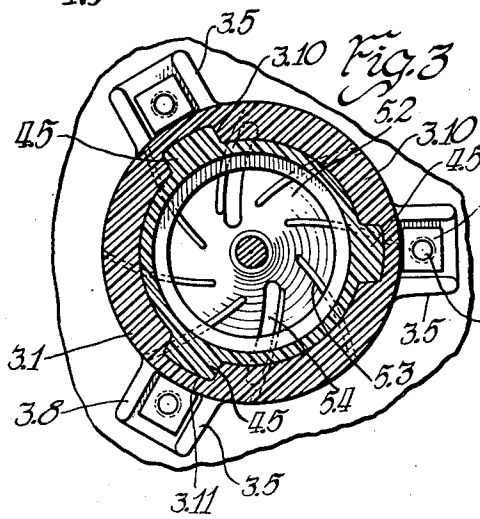
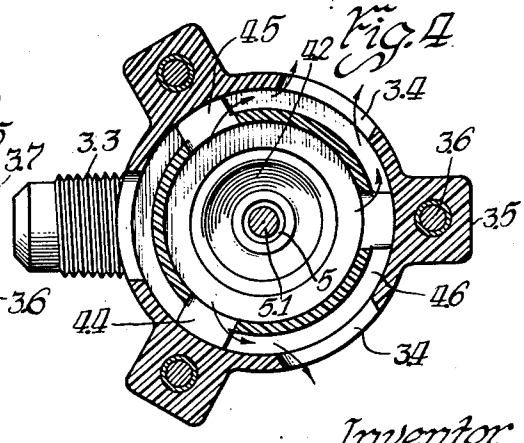


Fig. 4



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INLET FITTING FOR DISHWASHERS AND THE LIKE

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6 Claims. (Cl. 134—183)

This invention relates to an improved water inlet fitting for appliances which are served from the potable water supply system of a building. In particular, the invention relates to a combined water inlet fitting and anti-back-siphoning fixture useful with hot-water using appliances, such as a dishwasher or clothes washer, and provides a construction which serves both to prevent siphonage of liquid from the appliance into the water supply system, and to prevent the escape of steam or water vapor through the fitting into the atmosphere. This application discloses an improvement over construction described and claimed in my presently co-pending application Serial No. 157,362, filed April 21, 1950, now Patent No. 2,665,700 dated January 12, 1954, for "Vat and Combination Liquid Inlet and Anti-Back-Siphoning Fixture," said application being assigned to my assignee herein.

Domestic dishwashing machines and clothes washing machines are connected to the potable water supply system of the residence or other building by hose couplings or other fittings which in the practical sense comprise permanent connections. They use substantial quantities of water at a temperature which releases vapor or "steam" into the atmosphere. Usually, such machines are housed in an outer sheet metal cabinet with the water inlet fittings placed in some concealed location. It is now required that water-using appliances in which contaminated water may be present must have protection against back flow of water from the appliance into the water supply system. It is a well known fact that there have been occurrences in which a sub-atmospheric pressure existed in the water supply system at a time when through faulty operation of the appliance the level of water therein had been such that siphonic action had drawn the contaminated water back through the water inlet fitting into the water distribution piping. In dishwashers, where water action is violent, soiled water may actually be thrown back into the water inlet fitting.

A universally accepted standard of prevention of back flow is to terminate the water discharge spout or the like at least one inch above the maximum overflow spill level of the appliance, and in the event that the spout is housed within a casing, to provide in said casing passages communicating with the outer atmosphere and having an air inflow area greater than four times the area of the water supply connection. Such an arrangement will permit air to be drawn into the supply piping in the event of sub-atmospheric pressure therein, and thereby prevent the creation of a back-siphonage condition. In previous water inlet fitting constructions for hot-water using appliances, the rather large air flow passages have permitted the escape of steam or vapor from the tub into the cabinet space. Condensation of such vapor on the inner surface of the cabinet may cause it to rust, and it has been the practice to provide means for conducting the vapor to an appropriate point of discharge. In the disclosure of my above-mentioned application, for example, a relatively long conduit is provided for this purpose. Baffles have been employed to prevent soiled water from directly reaching the spout under other conditions of operation.

I have found that by suitably arranging the air ports, as by providing a double wall inlet fitting in which the respective walls have openings arranged in a staggered relationship, the vapors will condense on an inner wall portion of the fitting and thus prevent escape of any substantial amount of vapor. Condensation will return

through the air flow ports to the tub of the machine. A novel disposition of the inlet nozzle relative to the pattern of water distribution within the tub prevents direct flow to the nozzle.

It is therefore an object of my invention to provide a water inlet fitting having means for the prevention of the direct flow or back siphonage flow of water into the water supply conduit, and having means for condensing within the confines of the fitting steam or water vapor which may flow from the appliance into the fitting.

In the accompanying drawings, Fig. 1 is a fragmentary side elevation of a dishwasher utilizing a water inlet fitting pursuant to the present invention, certain portions of the dishwasher being broken away and other portions being in section; Fig. 2 is a vertical sectional elevation of the inlet fitting showing a method of application to the tub of the dishwasher; Fig. 3 is a plan section taken on lines 3—3 of Fig. 2; and Fig. 4 is a section taken on lines 4—4 of Fig. 2 and looking in the direction of the arrows thereof.

A conventional domestic dishwasher of well known manufacture includes a sheet metal outer casing **1** having a rear panel **1.1**, side panels **1.2**, a top panel **1.3**, and a front panel characterized by the lower transverse portion **1.4** and appropriate side marginal panels not shown. The rear panel **1.1** has a very large area opening **1.5**, and this opening plus a plurality of holes **1.6** in the upper toe space panel **1.7**, and an open casing bottom supported off the floor by suitable feet **1.8** provide amply for the inflow of atmospheric air into the space within the casing. A front door **1.9** has louvers **1.10** providing vent passages communicating with the outer air through a throat **1.11** which extends the full width of the door. Suitably rigidly secured within the casing in spaced relation to the walls thereof is a washing tub **2** which has a front opening registering with the door **1.9**. The bottom wall **2.1** is shaped to provide a sump **2.2** within which is located an impeller **2.3** driven by a motor (not shown). Disposed about said impeller is a heating coil **2.4** of the well known sheathed conductor type. The top wall **2.5** slopes downwardly toward a centrally apertured pocket **2.6** from which water or other cleaning fluid is introduced into the tub, as later explained. It will be noted from Fig. 1 that the depth of the pocket **2.6** is such that its top wall is in the plane of the periphery of the top wall **2.5** of the tub. Cleaning fluid—usually water—is brought into the machine through one or more supply pipes **2.7** under control of a solenoid actuated inlet valve **2.8** having the outlet conduit **2.9** through which the water in introduced into the tub. Supply pipe **2.7** of course connects to the water supply piping (not shown) of the building and is thus supplied with water at above-atmospheric pressure. A suitable time-cycle switch (not shown) controls the operation of the valve **2.8** and other mechanical components of the machine, as is now well understood in the art. The foregoing description is intended generally to describe a typical dishwashing machine available in commerce, and as such forms no part of my invention. For that reason, the representations of the various components may be considered as schematic and do not in any sense comprise limitations of, or essential requirements of, the water inlet and anti-back-flow fitting **3** forming the present invention.

In domestic dishwashers of the illustrated type, the door **1.9** opens to a substantially horizontal position and dish-receiving racks (not shown) are drawn out on to the door and dishes and other utensils to be cleaned are placed therein. The racks are returned to position within the tub **2** and the door closed, whereupon the knob or other control device of the timing means (not shown) is operated to begin the operational cycle. There is usually a preliminary rinse cycle followed by the washing cycle, in which hot washing water is introduced through the inlet fitting. By suitable means (not shown) the water inlet valve is closed when the desired level of water is reached. Usually, this water level does not extend above the upper rim of the sump. During the washing stage and a subsequent rinsing cycle the water in the tub is at a temperature of about 120 degrees F. and a relatively large volume of water vapor is released. The tub is vented to the atmosphere through the louvers

1.10 and the throat 1.11, and in order to prevent the escape of steam into the atmosphere the door 1.9 has a baffle 2.10 on which the moisture content of the vapor condenses for return to the tub. As the pressure within the tub builds up to greater than atmospheric pressure, it is obvious that vapor may try to escape not only through the louvers 1.10, but through the water inlet fitting 3; and as previously stated, earlier constructions have provided a conduit for conveying this water vapor to a point outside of the casing so as to avoid condensation on the inner walls of the casing structure. As will presently appear, the instant invention precludes escape of water vapor through the water inlet fitting.

Referring now to Fig. 2, the respective casing and nozzle structures of the fitting may advantageously comprise metal castings or molded phenolic condensation products. The outer or casing structure has a substantially cylindrical cup-like body portion 3.1 which supports a frusto-conical head 3.2 into which the water flows through the sidewardly extending branch 3.3 to which the conduit 2.9 is attached, as shown in Fig. 1. I consider it preferable to secure the conduit to the branch 3.3 by conventional threaded connection fittings. The lowermost side-wall portion of the body is formed with a plurality, illustratively three, of air inlet ports 3.4, which are advantageously elongate notches extending from the bottom edge thereof. These notches collectively have an area greater than four times that of the water inflow passage of the branch 3.3. As a convenient means of securing the fitting to the upper tub wall 2.5, I provide radially extending lugs 3.5 to receive screws 3.6. When the body portion 3.1 is a molded phenolic part suitable tapped metal inserts 3.7 are provided for the proper reception of the screws 3.6. The gussets 3.8 add advantageously to the heat radiating area of the body side wall, as will later appear. The upper portion of the body immediately below the shoulder 3.9 has a thickened wall portion 3.10 formed with grooves 3.11 which serve to locate the nozzle member 4, as presently described.

The nozzle forming structure 4 has a shape which is complementary to the body and head portions of the casing. That is to say, the nozzle structure has a cylindrical, cup-like body portion 4.1, from the shoulder 4.2 of which rises the head 4.3. The body portion and head define a relatively large nozzle chamber. The side wall of the nozzle body portion has air inflow notches or ports 4.4 which also have a combined area greater than four times the area of the bore of the branch 3.3. Preferably, the number of ports 4.4 is equal to the number of the ports 3.4, and as best appears in Fig. 4, the respective ports are in staggered relation so that there is no direct path from the interior of the nozzle body portion to the outer atmosphere. To establish and maintain the staggered relationship of inflow ports, the upper body wall portion of the nozzle is provided with the radially extending lugs 4.5 which seat within the grooves 3.11 of the body 3.1.

It will be noted from Figs. 3 and 4 that the thickened wall portion 3.9 rather closely surrounds the body portion 4.1 of the nozzle structure, and that as a result there is provided an annular passage 4.6 between the respective walls of the casing and nozzle structures. This passage extends about the full circumference of the nozzle body portion and provides a path of communication between the respective ports 3.4 and 4.4 which has an air flow capacity greater than four times the area of the conduit 3.3. The respective heads 3.2 and 4.3 are so sized as to provide an adequate water inlet chamber 4.7, as presently described. It will be noted that between the respective body and nozzle shoulders 3.9 and 4.2 there is a sealing gasket 4.8 which effectively prevents water flow between the chamber 4.7 and passage 4.6. The depth of the nozzle body portion 4.1 and thickness of the gasket 4.8 are such, relative to the depth of the casing body 3.1, that when the screws 3.6 are made up tight to secure the inlet fitting to the tub, the gasket 4.8 will be placed suitably under compression to provide a leakproof joint. For the double purpose of protecting the finish of the tub and serving as a sealing gasket between the inlet fitting and the tub, there is provided the resilient gasket 4.9 about the aperture in the upper wall of the pocket 2.6. The gasket has a central sleeve 4.10 which defines the actual water inlet passage to the tub, and upper and lower flanges 4.11 and 4.12 which respectively overlie the upper and lower surfaces of the tub top 2.5.

Water entering the fitting 3 passes from the chamber 4.7 through the annular orifice 5 established by the opening at the top of the nozzle head portion 4.2 and the stem 5.1 on which a spinner 5.2 is mounted for free rotation. The bottom edge of orifice 5 is at least one inch above the surface of gasket part 4.11. The combination of the annular orifice and the spinner stem so controls the pattern of the incoming water stream as to prevent it from spreading or spraying through the several ports 4.4. As the water stream impinges against the curved blades 5.3, the spinner rotates rapidly and distributes the water over dishes and utensils within the tub. Water also passes through the openings 5.4 to wet dishes placed within an area beneath the spinner.

Considering first the anti-siphonage feature of the water inlet fitting, it is assumed under certain plumbing code test requirements that it is possible to fill the tub with water until it overflows through the opening 4.10 and through the ports 4.4 and 3.4. In other words, the conditions of test assume that the maximum overflow spill level for the apparatus is defined by the upper surface of the gasket portion 4.11. If under such overflow conditions subatmospheric pressure is suddenly applied to the inlet branch 3.3, air from within the wall spaces between the tub and housing will flow through the ports 3.4 and 4.4 to the orifice 5 and thence through chamber 4.7 to the inlet branch. This air movement prevents any flow of water into the inlet branch, as is well understood in the art. The staggered arrangement of the respective ports and the area thereof relative to the area of the inlet branch 3.3 reduces the velocity of the inflowing air to a degree which prevents the air stream from lifting the water through the one-inch gap between the overflow spill level and the orifice 5. It may be noted here that although for manufacturing convenience the respective air ports extend from the rims of the body portions, they may with equal efficiency comprise body wall openings or other formations, so long as they provide the one-inch air gap required by plumbing codes.

The staggered arrangement of ports and wall portions of the body and nozzle members effectively prevents the escape of steam into the space between the casing and tub. As has been mentioned, vapor is released during the hot water operations of the diswasher, producing a superatmospheric pressure within the tub. There is therefore a tendency for steam to escape from the tub through every available port. During the periods when hot water is flowing through the orifice 5, its velocity and stream pattern are thought to produce an aspirating action drawing in air through the system of ports, for careful examination reveals no escape of steam therefrom. After termination of water flow, however, the absence of steam or vapor leakage from the fitting 3 results from the body wall arrangement of the outer casing relative to the nozzle body ports and the condensation of water vapor on the said body wall. The outer casing has a relatively large heat radiating area exposed to the atmosphere within the casing, and therefore wall portions thereof are at a relatively lower temperature than any escaping vapor and provide effective condensing surfaces.

Specifically, as shown by comparison of Figs. 2 and 4, water vapor may pass through the opening 4.10 into the nozzle chamber only by flowing over and around the spinner 5.2, and then may reach the outer atmosphere by passage through the relatively tall and narrow ports 4.4, flow along the passage 4.6, and then pass through the relatively low and wide ports 3.4. Since direct passage of vapor from the tub into the nozzle chamber is substantially prohibited by the restrictive effect of the spinner, the vapor enters the chamber at a relatively low rate. It is also possible that there is a slight expansion of the vapor within the comparatively spacious nozzle chamber. In any event, the vapor will drift slowly through the ports 4.4 and will first strike the casing body wall area immediately adjacent said ports. Because of the height of ports 4.4, vapor immediately contacts the underside of the thickened portion 3.10 of the body element as well as the adjacent vertical walls. It will be noted that the radiating surface of the wall portions first engaged by the vapor is increased by the gussets 3.8. It is thought that the major part of water condensation occurs immediately after the vapor escapes through the ports 4.4, although there is substantial condensing wall surface on each side of, and above, the ports 3.4. Thus, the condensate is confined within the fitting from which the greater of it will

return to the tub and the balance evaporate into the air during the idle periods of the machine.

As is well known, the washing water is thrown violently about in the tub **2** by the action of the impeller, and in service, the load of dishes act as baffles and deflectors to distribute the water in an effective washing pattern in which little, if any, water would actually reach the opening **4.10**. However, plumbing code tests are often carried out with an empty tub, and although the vertical space above the impeller would not receive any forceful streams of water because of the impeller hub itself, sprays or water streams thrown at an angle might pass through the tub opening **4.10**. Even if such vagrant streams or sprays passed through the ports **4.4**, the blank wall of the casing opposite said ports would stop outflow. The height of the orifice **5** and the sloping walls of the nozzle head **4.3** preclude either the direct entry of water into the orifice, or the accumulation of drops of water on the wall of the head about the orifice. The lip defining the bottom of the orifice serves as an effective drip guard.

I claim:

1. In combination with the tub of a dishwasher or like appliance in which are performed operations using quantities of water at steaming temperature: a water inlet fitting comprising an inverted, cup-like body portion having means defining a water inlet chamber and a tubular branch communicating with said chamber and arranged to be connected to a source of hot water having a pressure above atmospheric; an inverted, cup-like nozzle-forming portion disposed within said body portion with corresponding side wall means of said body and nozzle portions being in spaced relationship, said nozzle portion having an orifice directly communicating with said water inlet chamber; the side wall of said nozzle portion having a plurality of mutualy spaced, relatively tall, narrow, air ports having a collective area at least four times that of said branch and the bottom of each of said air ports being at least one inch below said orifice and the side wall of said body portion having a plurality of relatively low, wide air ports disposed in mutually spaced relation about said wall, said ports having a collective area at least that of the nozzle ports and the bottom of said body wall ports also being at least one inch below said orifice; means for establishing an angular relationship of said body and nozzle portions to dispose a relatively large imperforate wall area of said body portion in front of and above each nozzle portion air port; means for securing said inlet fitting to an outer surface of a wall of said tub with the peripheral edge of said nozzle portion side wall in fluid tight relation to said tub wall, said tub wall having an aperture concentric with and of smaller diameter than said nozzle portion; the body portion being exposed to temperatures substantially below the temperature of water vapor in the tub during the hot-water using operations thereof, whereby the said imperforate wall areas of said body portion adjacent said nozzle air ports may serve to condense water vapor which may be flowing from said tub outwardly through said nozzle portion air ports.

2. The combination as in claim 1, in which said body and nozzle portions are provided with mutually interfitting members serving to establish and maintain the relative position of said body portion air ports and said nozzle portion air ports.

3. The combination as in claim 1, in which said body portion water inlet chamber is a domed structure disposed above and concentric with said orifice.

4. The combination as in claim 1, in which a rod is secured to a wall of said water inlet chamber and passes through the orifice of said nozzle portion in spaced relation to the wall thereof, said rod extending into said tub and having a water deflection member disposed on said rod within the tub in the path of water flow from said orifice into said tub.

5. In combination with a washing machine tub in which are performed operations using water at steaming temperature, said tub having a wall opening disposed above the operating water level of said machine; a water inlet fitting for introducing water into said tub through said opening, comprising an outer casing structure including a cup-like body portion having a side wall formed with a plurality of relatively wide equi-angularly spaced air ports extending from the rim thereof; wall means defining a water inlet chamber extending from the base of the body portion, and a tubular fitting communicating with said water inlet chamber and adapted for connection to a source of water at above-atmospheric pressure; heat-radiating wall means projecting from said body portion; a nozzle-forming structure including a cup-like body portion having a side wall formed with a plurality of equi-angularly spaced air ports extending from the rim thereof and a hollow head portion extending from said body portion, said head portion having an orifice coaxial with said body portion and in communication with said inlet chamber; means on the respective casing and nozzle-forming structures cooperating to position said nozzle-forming structure within said casing structure with the respective side walls of the body portions thereof in spaced relationship and the respective air ports in mutually offset relationship; means for preventing liquid flow from said inlet chamber to the space between said side walls; and means for securing said inlet fitting with the rims of said casing and nozzle body portions in the same plane and in fluid-tight relationship with said tub wall about the opening therein, whereby water discharging through said orifice will enter the tub through said opening.

6. The combination as in claim 5, in which the securing means includes a gasket member having resilient wall portions overlying the upper and lower surfaces of said tub wall and a cylindrical portion defining the water passage into said tub, and means passing through said resilient gasket wall portions into said casing structure to draw said casing and nozzle-forming structures into fluid-tight relationship with one of said gasket wall portions.

No references cited.