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LOW LIQUID LEVEL SHUT-OFF APPARATUS FOR GAS BURNER

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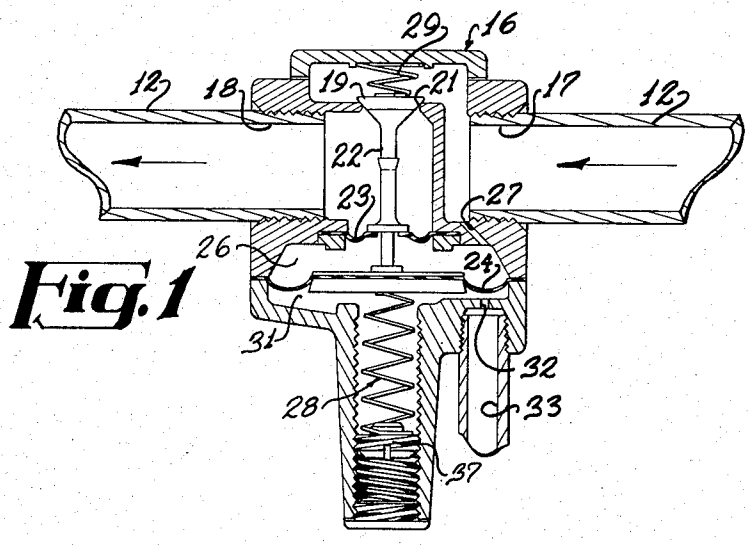


Fig. 1

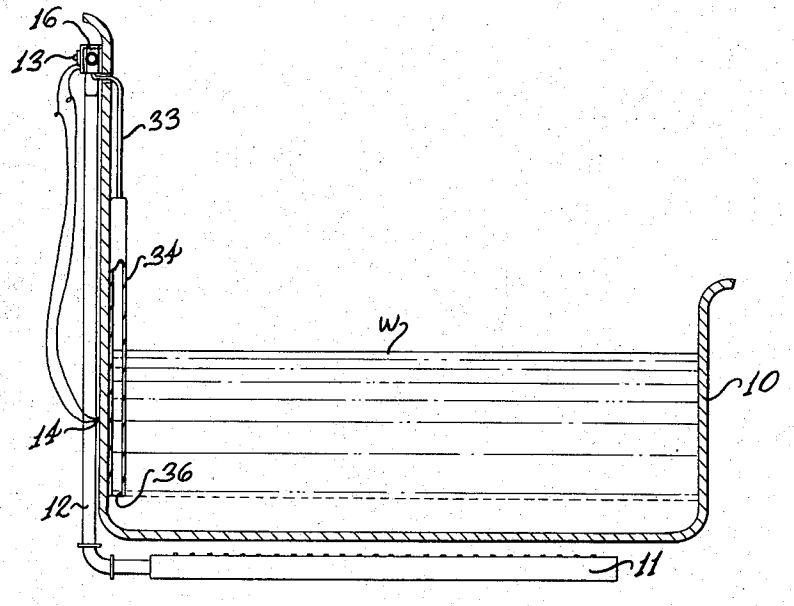


Fig. 2

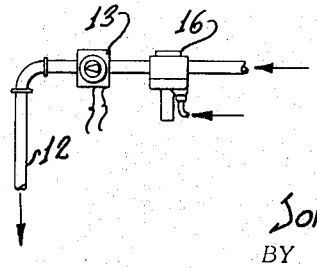


Fig. 3

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LOW LIQUID LEVEL SHUT-OFF APPARATUS FOR GAS BURNER

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ABSTRACT OF THE DISCLOSURE

Control apparatus for gas supply line to a burner heating liquid in an open vessel in which a valve in the supply line is moved toward and away from closed position by the forces of spring means and gas pressure in the supply line in response to decreases and increases in pressure in a dip tube extending downwardly into the vessel.

This invention relates to low liquid level shut-off apparatus for a gas burner and more particularly to means for closing a gas supply line to a burner for heating a liquid in a vessel in response to the liquid in the vessel dropping to a predetermined level.

An object of my invention is to provide low liquid level shut-off apparatus for a gas burner of the character designated in which the gas supply line is closed directly in response to a predetermined drop in liquid level, thereby eliminating the necessity of providing electrical current, or complicated electrical controls, bulky floats and the like.

A more specific object of my invention is to provide a low liquid level shut-off device for a gas burner of the character designated which shall be particularly adapted for use with a sink, such as the type employed to wash dishes and cooking utensils, thus preventing damage to the sink and the contents thereof due to overheating a dry sink.

Another object of my invention is to provide low liquid level shut-off apparatus for a gas burner of the character designated which is adapted to open the gas supply line to the burner when the liquid level is raised to a predetermined level.

A further object of my invention is to provide low liquid level shut-off apparatus for a gas burner of the character designated which modulates the gas input at liquid levels between gas shut-off level and a predetermined higher level at which full input of gas is obtained whereby reduced gas input is provided at very low levels and higher gas input is provided at higher levels.

A further object of my invention is to provide low liquid level shut-off apparatus of the character designated which shall be extremely simple of construction, economical of manufacture and one which is sanitary in every respect.

As is well known in the art to which my invention relates, difficulties have been encountered in providing effective low liquid level shut-off means for sinks employed to wash dishes and cooking utensils due to the fact that any control means positioned within the sink must be free of any recesses, cavities or the like in which residual deposits can collect over a period of time. That is, all surfaces of the control mechanism must be accessible for a thorough cleaning in an efficient manner. Difficulties have also been encountered due to the fact that the control means for shutting off the gas supply must operate independently of the heat of the solution being heated whereby the gas supply is cut off immediately upon a predetermined drop in liquid level regardless of the temperature thereof.

To overcome the above and other difficulties, I provide a valve housing in the gas supply line having a valve

which is adapted to move selectively from a closed, seated position to an open position. A first diaphragm is operatively connected to the valve and defines a seal for one side of the valve housing. A second diaphragm is operatively connected to the valve and spaced from the first mentioned diaphragm to define a closed chamber therebetween. A tap passageway communicates the closed chamber with the gas inlet for the housing whereby the gas pressure at the gas inlet exerts force to aid in closing the valve. Spring means is provided for urging the valve toward and away from closed position and a second closed chamber is provided at the opposite side of the second mentioned diaphragm from the first mentioned closed chamber. Communicating with the second closed chamber is a conduit having a depending dip tube at the lower end thereof which is disposed to extend downwardly into the liquid in the vessel and trap air within the dip tube so that pressure is increased and decreased within the second mentioned closed chamber in response to a rise and fall, respectively in the liquid level in the vessel being heated.

Apparatus embodying features of my invention is illustrated in the accompanying drawing, forming a part of this application, in which:

FIG. 1 is a vertical sectional view through the valve housing showing the manner in which the conduit for the dip tube is connected thereto;

FIG. 2 is a vertical sectional view through a sink, drawn to a smaller scale, showing my improved apparatus associated therewith, and,

FIG. 3 is a fragmental view showing a gas supply line having a thermostat control valve therein and my improved low liquid safety valve therein.

Referring now to the drawing for a better understanding of my invention, I show a sink **10**, such as a conventional type sink employed to wash dishes, cooking utensils and the like. The sink is heated by a gas burner **11** which is connected to a gas supply line **12**. The water W in the sink **10** is maintained at a desired temperature by a thermostat controlled valve **13**. The valve **13** is connected to a thermostat indicated at **14** which is mounted on the side of the sink **10**, as shown in FIG. 2.

My improved apparatus for closing the gas supply line **12** in response to the liquid in the sink **10** dropping to a predetermined level comprises a valve housing **16** having a gas inlet **17** and a gas outlet **18**. A valve **19** is provided in the housing **16** in position to cooperate with a valve seat **21** whereby the valve **19** is moved selectively from a closed, seated position to an open position. A valve stem **22** is formed integrally with the valve **19**, as shown in FIG. 1. A diaphragm **23** is carried by the valve stem **22** and is secured to the housing **16** to define a seal for one side thereof. A second diaphragm **24** is carried by the valve stem **22** in spaced relation to the diaphragm **23** to define a closed chamber **26** therebetween. A tap passageway **27** communicates the closed chamber **26** with the gas inlet **17** whereby the gas pressure at the inlet **17** exerts a force to increase the pressure within the chamber **26** and thus aid in closing the valve **19**.

An adjustable spring unit **28** is mounted at the opposite side of the diaphragm **24** from the closed chamber **26** in position to urge the valve stem toward open position. A counter spring **29** is interposed between the valve **19** and the inner surface of the housing **16**, as shown in FIG. 1, whereby the spring **29** urges the valve **19** toward closed position.

The diaphragm **24** is spaced from the lower portion of the housing **16** to define a second closed chamber **31** therebetween which is at the opposite side of the diaphragm **24** from the closed chamber **26**. A passageway **32** is provided in the housing **16** in communication with the closed

chamber **31**, as shown in FIG. 1. Communicating with the passageway **32** is the upper end of a conduit **33** which is threadedly connected to the housing **16**, as shown. The lower end of the conduit **33** is secured to the upper end of a depending dip tube **34** having an opened lower end **36**. The internal, cross sectional area of the dip tube **34** is greater than the internal cross sectional area of conduit **33**.

From the foregoing description, the operation of my improved apparatus will be readily understood. With no liquid, such as water, in the sink **10**, the valve **19** is held closed by the counter spring **29** and the build-up of pressure within the closed chamber **26** due to the tap passageway **27** which communicates the chamber **26** with the gas inlet **17**. Upon adding liquid to the sink **10**, the liquid level rises to thus trap air within the dip tube **34**. This air is compressed by the upwardly moving liquid within the dip tube **34**. The build up of pressure within the dip tube **34** exerts a force on the under side of the diaphragm **24**, as viewed in FIG. 1, due to the increase of pressure within the closed chamber **31**. This increase in pressure within the closed chamber **31** overcomes the pressure exerted by the gas through tap passageway **27** and the force exerted by the counter spring **29** to thus force the valve **19** to open position whereupon the gas flows through the supply line **12** and the valve housing **16** in the direction of the arrows. The apparatus is thus adapted to reopen the gas supply line to the burner, after being shut off, when the water level is raised by admitting more water to sink **10**.

In the event the sink **10** is drained or for some reason the water leaks out or is evaporated to a predetermined lower level, the pressure within the dip tube **34** and the closed chamber **31** is reduced whereupon the valve **19** is then forced to seated position by the force exerted by counter spring **29** and the build up of pressure within the closed chamber **26** through tap passageway **27**. The predetermined level at which the valve **19** is closed may be readily adjusted by means of a suitable adjusting nut **37** which increase or decrease the tension applied by the spring **28** in a manner well understood in the art.

The apparatus also modulates the gas input at liquid levels between gas shut-off level and a predetermined higher level at which full input is obtained. That is, reduced gas input is provided at very low levels and higher gas input is provided at higher liquid levels.

From the foregoing, it will be seen that I have devised an improved apparatus for closing a gas supply line to a burner immediately upon the liquid level in the vessel dropping to a predetermined point. By providing a low liquid level shut-off unit which directly controls the operation of the shut-off valve, I eliminate entirely the necessity of providing an electrical current to the shut-off valve or complicated electrical controls, bulky floats and the like. Furthermore, by providing a low liquid level shut-off unit which has a smooth, continuous exterior surface, the unit may be kept in a clean and sanitary condition at all times with a minimum of effort. Furthermore, by providing a low liquid level shut-off unit which operates entirely by a differential in pressure created by the rise and fall in liquid level within the vessel, my improved apparatus may be readily applied to conventional type sinks without modification of the sinks in any way.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications without departing from the spirit thereof,

and I desire, therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

What I claim is:

1. In combination, a vessel open to the atmosphere and adapted to contain a liquid to be heated, a burner for heating the liquid, and a gas supply line to the burner,

(a) a valve housing in said gas supply line having a gas inlet and a gas outlet and having a valve therein disposed to move selectively from a closed, seated position to an open position,

(b) a valve stem connected to said valve,

(c) a first diaphragm carried by said valve stem and defining a seal for one side of the valve housing,

(d) a second diaphragm carried by said valve stem and spaced from said first diaphragm to define a closed chamber therebetween,

(e) there being a tap passageway communicating said closed chamber with the gas inlet so that the gas pressure at said inlet exerts a force to aid in closing said valve,

(f) adjustable spring means urging said valve toward open position,

(g) counter spring means urging said valve toward closed position,

(h) a second closed chamber at the opposite side of said second diaphragm from the first mentioned closed chamber,

(i) a conduit communicating with said second closed chamber, and

(j) a depending dip tube having a lower open end and communicating at its upper end with the lower end of said conduit in position to extend downwardly into the liquid in said vessel and trap air within said dip tube so that pressure is increased and decreased within said second closed chamber in response to a rise and fall, respectively, in the liquid level in said vessel, whereby above a predetermined liquid level in the vessel pressure within said second chamber overcomes the pressure of the inlet gas and the force exerted by said counter spring to open said valve and below said predetermined level in the vessel pressure is reduced within said second chamber and the pressure of the inlet gas and the force exerted by said counter spring closes said valve.

2. The combination as defined in claim **1** in which the vessel is a sink which is maintained at a predetermined temperature by a thermostat controlled valve.

3. The combination as defined in claim **1** in which the internal, cross sectional area of the dip tube is greater than the internal cross sectional area of said conduit.

4. The combination as defined in claim **1** in which the forces of said adjustable spring means, said counter spring means and the gas pressure are so selected relative to the pressure produced in said dip tube to modulate the gas input at liquid levels between gas shut-off level and a predetermined higher level to reduce gas input at low levels and increase gas input at higher levels.

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