Feb. 20, 1973 C. E. IMLER 3,717,748

HOT WATER CIRCULATOR

Filed July 2, 1971

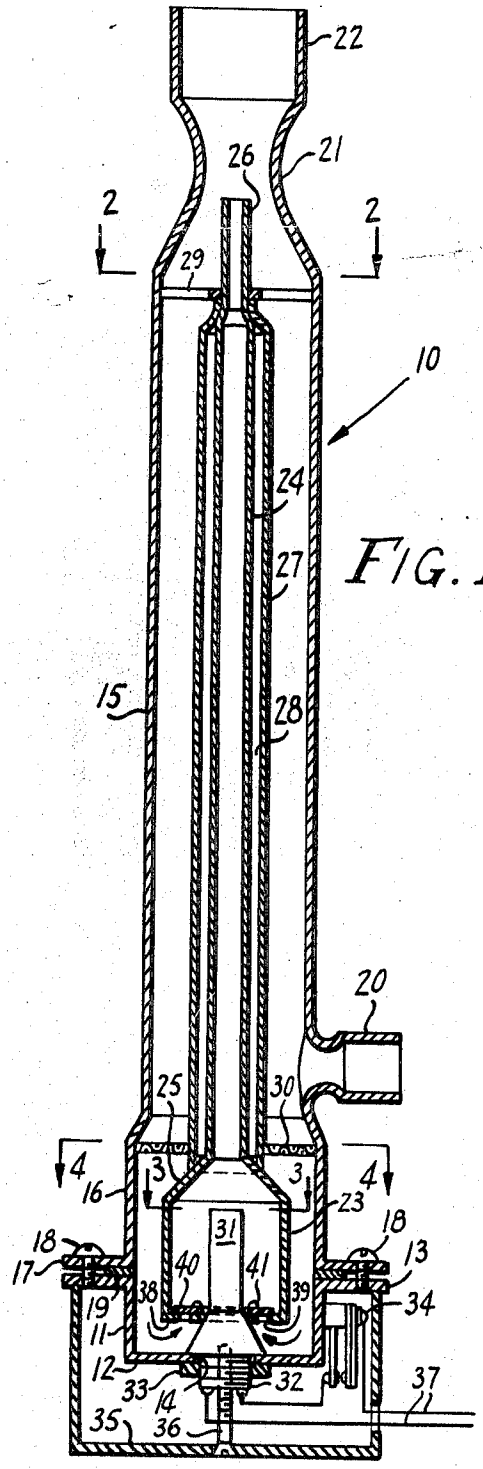

FIG. 1

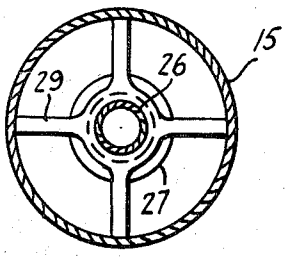

FIG. 2

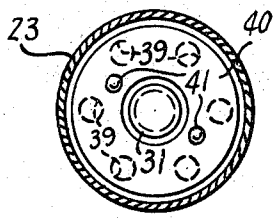

FIG. 3

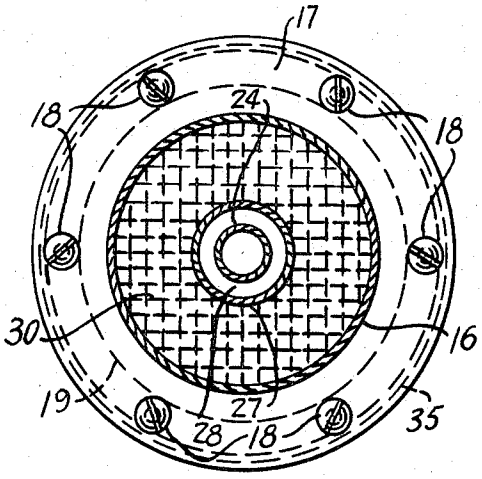

FIG. 4

INVENTOR.
CARL E. IMLER
BY Victor J. Evans & Co.
ATTORNEYS.

United States Patent Office 3,717,748 Patented Feb. 20, 1973

3,717,748

HOT WATER CIRCULATOR

Carl E. Imler, 213 W. Kirwin, Salina, Kans. 67401

Filed July 2, 1971, Ser. No. 159,148
Int. Cl. H05b 1/00; F04b 19/24
U.S. Cl. 219—306 1 Claim

ABSTRACT OF THE DISCLOSURE

A domestic hot water circulator for a loop type domestic hot water system includes an upright cylindrical conduit having a venturi formed as an upward extension thereof. An inlet pipe communicates with the lower end of the conduit and an outlet fitting is formed on the upper end of the venturi. An annular flange is provided on the lower end of an enlarged collar section integrally formed on the lower end of the conduit and a generally cylindrical housing underlies the conduit. The housing has a hollow base member formed therein corresponding in diameter to the collar section and an annular flange on the base member is detachably secured to the flange on the collar section. An electric heater is mounted on the bottom wall of the base member and extends axially upwardly in the base member and collar section. A cylindrical pot encompasses the heater and a tube extending coaxially with the conduit is connected at its lower end to the pot. A nozzle forming a reduced upper end portion on the tube terminates in the venturi. The heater extends through and is secured to a lower wall on the pot. A flexible valve plate secured to the lower wall covers a plurality of water flow apertures in the wall. A screen in the collar section beneath the inlet pipe filters the water flowing from the inlet pipe to the apertures. An insulating tubular housing surrounds the tube. The conduit is normally filled with water flowing therein by convection and the water in the pot is heated by the heater and expelled through the tube into the venturi to induce increased flow through the system with replacement water flowing into the pot through the apertures past the check valve plate.

BACKGROUND OF THE INVENTION

Field of the invention

The present invention relates to devices for maintaining the flow of hot water in a domestic hot water loop system.

SUMMARY OF THE INVENTION

A domestic hot water circulator for loop type domestic hot water systems including an upright cylindrical conduit, a venturi formed as an upward extension of the upper end of the conduit, an outlet pipe fitting formed on the upper end of the venturi, an inlet pipe fitting secured to and communicating with the conduit adjacent the lower end thereof, an enlarged collar section integrally formed in the lower end of the conduit, an annular flange formed on the lower end of the collar section, a generally cylindrical housing underlying the conduit and having a cylindrical hollow base member formed therein corresponding in diameter to the collar section, a bottom wall on the base member, an annular flange formed on the base member detachably secured to the annular flange formed on the collar section, an electric heater mounted on the bottom wall and extending axially upwardly in the base member and the collar section, a cylindrical pot encompassing the heater, a cylindrical tube extending coaxially with the conduit and connected at its lower end to the pot, a nozzle forming reduced upper end portion on the tube terminating in the venturi, a spider secured to the tube and the conduit to support the tube in the conduit, a lower wall on said pot with said heater extending through and secured thereto, a plurality of apertures in the lower wall, a flexible valve plate secured to the lower wall to cover the apertures to prevent a back flow from the pot through the lower wall, a screen in the collar section beneath the inlet pipe fitting to screen the water flowing from the inlet pipe fitting downwardly to the apertures in the lower wall and an insulating tubular housing closely surrounding the tube to provide an air space therebetween, the conduit normally being completely filled with water flowing upwardly therein from convection currents with water in the pot being heated by the heater and expelled through the tube into the venturi to induce and increase flow in the hot water system with replacement water flowing into the pot through the apertures past the flexible check valve plate.

The primary object of the invention is to provide a system which utilizes the heat from the electric heater to enhance the circulation flow of hot water in a loop hot water system.

Other objects and advantages will become apparent in the following specification when considered in light of the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates the invention by means of a vertical section;

FIG. 2 is an enlarged fragmentary horizontal sectional view taken along the line 2—2 of FIG. 1 looking in the direction of the arrows;

FIG. 3 is an enlarged fragmentary horizontal sectional view taken along the line 3—3 of FIG. 1 looking in the direction of the arrows; and

FIG. 4 is an enlarged fragmentary horizontal sectional view taken along the line 4—4 of FIG. 1 looking in the direction of the arrows.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings in detail wherein like reference characters indicate like parts throughout the several figures, the reference numeral **10** indicates generally a domestic hot water circulator constructed in accordance with the invention.

The domestic hot water circulator **10** includes a generally cylindrical base member **11** having a bottom wall **12** and an annular flange **13** integrally formed thereon. An axial opening **14** is formed in the bottom **12** for reasons to be assigned. An upstanding cylindrical conduit **15** has an enlarged collar section **16** integrally formed thereon and carrying an annular flange **17** on its lower end. The annular flange **17** is adapted to be secured to the annular flange **13** by a plurality of cap screws **18**. A sealing gasket **19** is engaged between the flanges **13** and **17** to form a watertight connection therebetween.

An inlet fitting **20** is connected to the lower portion of the conduit **15** above the enlarged portion **16** thereof. The upper end portion of the conduit **15** is necked down to form a venturi at **21** which opens into a cylindrical fitting **22** of a diameter greater than the venturi **21** but less than the conduit **15**.

A generally cylindrical pot **23** is positioned centrally of the lower portion **16** of the conduit **15** and has a relatively small upstanding tube **24** secured thereto by means of an inverted funnel-shaped connector **25**. The tube **24** has a reduced upper end portion **26** for increasing the velocity of fluid flowing upwardly therethrough. A generally cylindrical insulating housing **27** completely surrounds the tube **24** and is sealed thereto providing an air space **28** therebetween.

A spider **29** is mounted in the upper end portion of the conduit **15** just below the venturi **21** to encompass and support the upper end of the tube **24**. A strainer screen **30** extends horizontally across the juncture of the conduit **15** with its enlarged lower end portion **16** and engages the outer circumference of the housing **27** to strain out large pieces of polluting material as well as maintain the pot **23** in a central position in the enlarged portion **16** of the conduit **15**.

An electric heater **31** is mounted centrally in the pot **23** and is secured thereto. The electric heater **31** has an externally threaded lower extension **32** which extends through the bottom wall **12** of the cylindrical member **11** and is secured thereto by a nut **33** engaged thereover. An aquastat circuit controlled device **34** is mounted on the outer face of the member **11** so as to be affected by the temperature of the water therein.

A generally cylindrical housing **35** extends downwardly from the flange **13** and is secured to the heater **31** by a bolt **36**. Wires **37** extend to the aquastat **34** and the electric heater **31** from a source of electricity (not shown).

The lower wall **38** of the pot **23** has a plurality of circumferentially spaced apertures **39** extending upwardly therethrough and covered by a flexible check valve plate **40**. The check valve plate **40** is secured to the lower wall **38** by rivets **41**.

In the use and operation of the invention the fitting **20** is connected to the return side of the domestic hot water loop and fitting **22** is connected to the supply side of the same domestic hot water loop. In the normal operation of a domestic hot water loop system, the heated water will create convection currents which will cause a flow of water in the loop so that all of the water in the loop will be maintained at approximately the same hot temperature. In some instances it has been found that the natural convection currents are insufficient to maintain the desired circulation and in many prior art devices mechanical pumps have been used to enhance the convection current circulation.

In the present device water in the pot **23** is quickly heated by the electric heater **31** and flows upwardly through the tube **24** gaining velocity as it moves through the reduced diameter portion **26**, until is is finally expelled therefrom and moves on upwardly through a venturi **21** formed in the upper end of the conduit **15**.

As water flows out of the pot **23** new water flows into the pot **23** through the apertures **33** and past the flexible valve **40**. The conduit **15** being completely filled with water provides a water supply which is aspirated by the flow of water through the tube **24** and through the venturi **21**. The housing **27** insulates the tube **24** from the surrounding water to prevent the dissipation of the heat from the water in the tube **24**. As the water is caused to circulate within the loop eventually rapidly heated water will flow into the chamber surrounding the pot **23** and cause the aquastat **34** to deenergize the electric heater **31**. As the water in the system cools the aquastat **34** will again energize the electric heater **31** and the circulation process will be continued.

Having thus described the preferred embodiments of the invention it should be understood that numerous structural modifications and adaptations may be resorted to without departing from the spirit of the invention.

I claim:

1. A domesic hot water circulator for loop type domestic hot water systems comprising an upright cylindrical conduit, a venturi formed as an upward extension of the upper end of said conduit, an outlet pipe fitting formed on the upper end of said venturi, an inlet pipe fitting secured to and communicating with said conduit adjacent the lower end thereof, an enlarged collar section integrally formed on the lower end of said conduit, an annular flange formed on the lower end of said collar section, a generally cylindrical housing underlying said conduit and having a cylindrical hollow base member formed therein corresponding in diameter to said collar section, a bottom wall on said base member, an annular flange formed on said base member detachably secured to said annular flange formed on said collar section, an electric heater mounted on said bottom wall and extending axially upwardly in said base member and said collar section, a cylindrical pot encompassing said heater, a cylindrical tube extending coaxially with said conduit and connected at its lower end to said pot, a nozzle forming reduced upper end portion on said tube terminating in said venturi, a spider secured to said tube and said conduit to support the tube in said conduit, a lower wall on said pot with said heater extending through and secured thereto, a plurality of apertures in said lower wall, a flexible valve plate secured to said lower wall to cover said apertures to prevent a back flow from said pot through said lower wall, a screen in said collar section beneath said inlet pipe fitting to screen the water flowing from said inlet fitting downwardly to the apertures in said lower wall and an insulating tubular housing closely surrounding said tube to provide an air space therebetween, said conduit normally being completely filled with water flowing upwardly therein from convention currents with water in said pot being heated by said heater and expelled through said tube into said venturi to induce an increased flow in said hot water system with replacement water flowing into said pot through said apertures past said flexible check valve plate.

References Cited

UNITED STATES PATENTS

2,686,863	8/1954	Chandler	219—306 X
2,663,787	12/1953	Alexander	219—314
1,526,229	2/1925	Perkinson	417—209
1,034,952	8/1912	Ball	219—314
582,188	5/1897	Dunlap	417—209 X
1,573,668	2/1926	Wood	417—209 X
1,684,242	9/1928	Randolph	417—209
519,887	5/1894	Davis.	
1,994,765	3/1935	Harvey	219—306 X
2,720,154	10/1955	Graham	417—208 X
2,784,678	3/1957	Graham	99—310

FOREIGN PATENTS

775,929	10/1934	France	237—60

ANTHONY BARTIS, Primary Examiner

U.S. Cl. X.R.

126—101; 165—106; 219—308, 314, 341; 237—60; 417—209