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TIP-OVER SHUT-OFF FOR GAS HEATERS

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FIG.1

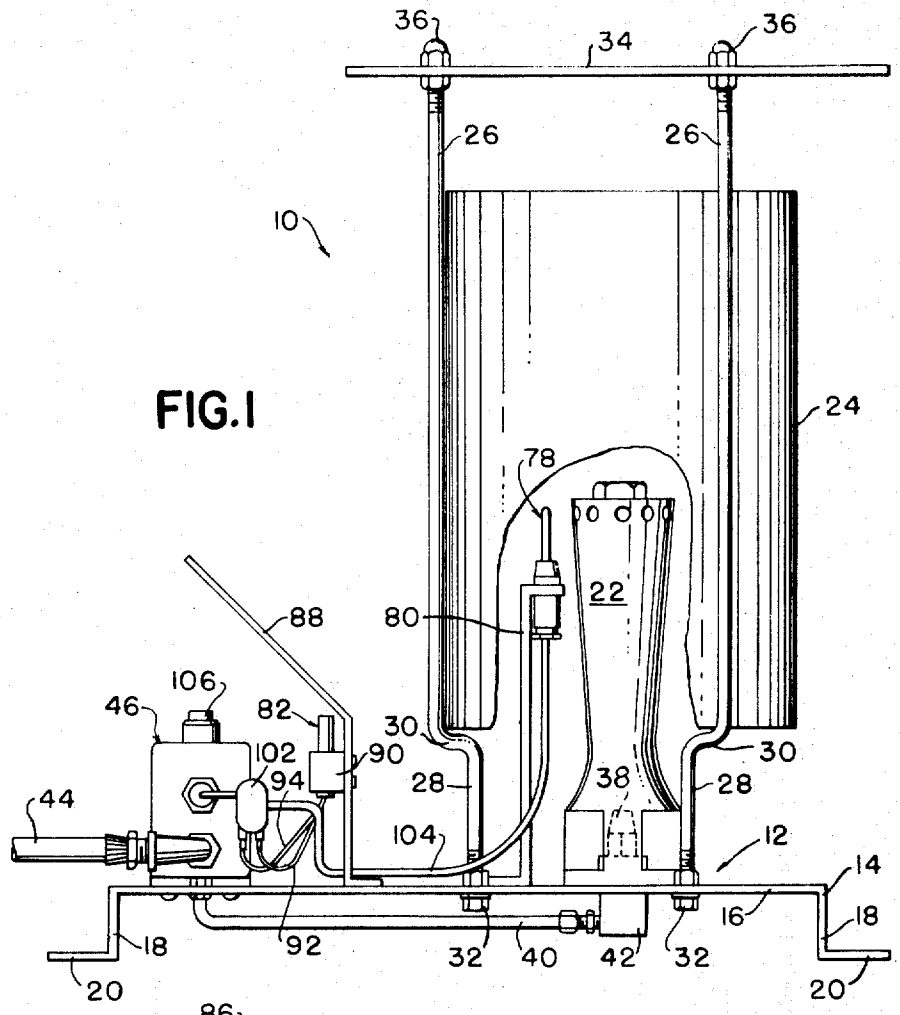
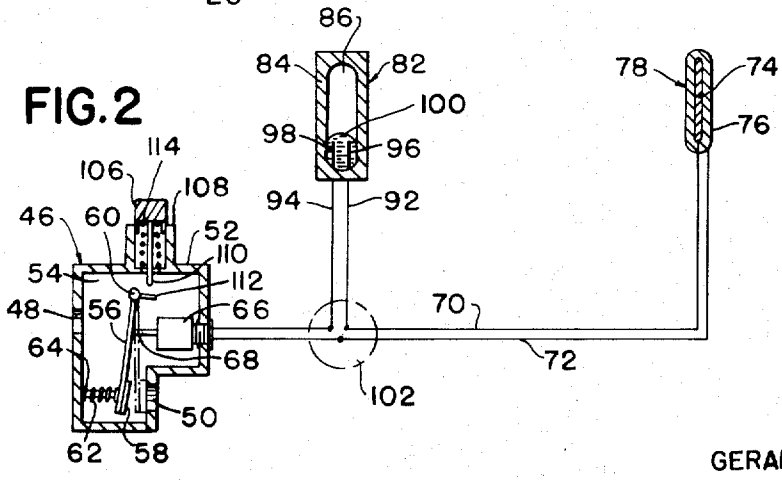


FIG.2



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TIP-OVER SHUT-OFF FOR GAS HEATERS

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U.S. Cl. 126—85 R 6 Claims

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

ABSTRACT OF THE DISCLOSURE

A portable heater assembly having a gas burner. A valve in the gas line to the burner is normally held open by an electromagnet when the burner is operating. A mercury switch is operative to deenergize the electromagnet in response to tipping of the heater assembly from upright position, whereupon the valve is closed by a spring to shut off the burner.

This invention relates generally to heaters and refers more particularly to a portable gas heater.

Portable heaters of this type have a great many uses. They are used a great deal in winter construction work. They may be used to keep concrete from freezing while it cures, or simply to keep the workers warm. Such heaters are sometimes used by farmers in the wintertime.

An essential object of this invention is to provide safety means for automatically shutting off the heater in case it should be accidentally tipped over. The main purpose of shutting off the heater when it tips over is to eliminate the danger of fire.

Another object of the invention is to provide a portable heater having a valve in the gas line to the burner, and means responsive to the tipping of the heater from an upright position for closing the valve.

Another object is to provide a heater having means for controlling the valve including an electric circuit, an electromagnet energized by the circuit and operative to hold the valve open, a mercury switch responsive to tipping of the heater from upright position for opening the circuit and thereby rendering the electromagnet inoperative, and resilient means for closing the valve when the electromagnet is inoperative.

Other objects and features of the invention will become apparent as the description proceeds, especially when taken in conjunction with the accompanying drawings wherein:

FIGURE 1 is a side elevational view with parts broken away of a portable gas heater having the safety means for shutting off the gas to the burner when the heater is tipped from upright position, all constructed in accordance with the invention.

FIGURE 2 is a diagrammatic view, in partial section, of the safety mechanism.

Referring now more particularly to the drawings, the portable gas heater assembly is generally designated **10** in FIGURE 1 and comprises a support structure **12** on which the various components are mounted.

The support structure **12** includes a base **14** which preferably is of sheet metal construction and has a flat horizontal plate portion **16** terminating at the opposite ends in depending angle supports **18**. These angle supports have horizontal flanges **20** provided to support the support structure in the upright position shown in FIGURE 1 when resting upon a flat horizontal surface.

Mounted upon the plate portion **16** of base **14** is a burner **22**. The burner is mounted in fixed position on the plate portion **16** and extends vertically upward therefrom. A vertical combustion cylinder **24** surrounds the burner **22** and is supported by the vertical rods **26**. Preferably there are three such rods **26** spaced angularly with respect to each other and extending along the outer surface of the cylinder. The lower end portions **28** of these rods are offset radially inwardly to provide supporting portions **30** upon which the lower end of the cylinder **24** rests. The portions **28** of the rods are secured at their lower ends by fasteners **32** to the plate portions **16** of the base, and a hood **34** is secured to the upper ends of the rods **26** by fasteners **36** in a position over the upper end of the cylinder.

Gas is admitted to the burner **22** by a jet **38** extending upwardly into the lower end of the burner. Gas is delivered to the jet through the fuel tube **40** and the burner base **42**. The burner **22** is threaded to burner base **42**, and the plate portion **16** is clamped between the burner and burner base. The gas enters the fuel tube by way of a hose **44** and a valve assembly **46** mounted on plate **16** of the base. The hose **44** connects into the valve assembly through port **48**, and the fuel tube **40** connects into the valve assembly through port **50**. During normal operation of the burner, the valve assembly **46** is open to admit a continuous flow of gas to the burner through the hose **44**, fuel tube **40** and jet **38**.

The valve assembly **46** comprises a housing **52** having a chamber **54**. The ports **48** and **50** are formed in the walls of the housing. Within the housing chamber there is a valve member **56** in the form of an elongated arm having a valve element **58** at the lower end. The valve member **56** turns on a fixed pivot **60** at its upper end. A compression coil spring **62**, surrounding a pin **64** fixed within chamber **54**, imposes a constant pressure on the valve member **56** tending to move it to the right in FIGURE 2 to the dotted line position in which it would close port **50** and shut off the flow of gas to the burner.

An electromagnet **66** is mounted on housing **52** within chamber **54** and has a core **68**. When the electromagnet is energized, the core shifts to the left and engages valve member **56**. The electromagnet **66** is strong enough to hold the valve member **56** in the open or solid line position.

The electromagnet is adapted to be energized by a circuit including the leads **70** and **72**. These leads are respectively connected to the two dissimilar metal elements **74** and **76** making up the thermocouple **78**. The thermocouple **78** is supported on a bracket **80** fixed to plate portion **16** of the base in a position opposite the burner so that the thermocouple is heated when the burner is in operation. The heating of the thermocouple by the burner is sufficient to generate a milliamp current in the circuit including leads **70** and **72** sufficient to energize the electromagnet **66**.

The circuit includes a mercury switch **82** which includes an elongated housing **84** having an elongated chamber **86**. The housing **84** is mounted in vertical upright position on a panel **88** by a clip **90** so that chamber **86** is also vertical. The panel **88** is secured to the plate portion **16** of the base. The lead **70** in the circuit has portions **92** and **94** terminating in contacts **96** and **98** in the lower end of vertical chamber **86**. A ball of liquid mercury **100** lies in the bottom of chamber **86** covering the contacts **96** and **98** to complete the circuit across the contacts. The lead portions **92** and **94** are connected into the circuit at the junction **102**. The leads **70** and **72** are insulated from one ancther and are carried in a single conductor **104**.

In order to start the burner, a manual valve element **106** is provided which is slidably mounted in a hollow

boss **108** formed in the upper wall of valve assembly housing **52**. The manual valve element **106** has a pin **110** depending from the head of the valve element into the chamber **54** opposite the lever **112** which is rigidly connected to valve member **56** to pivot as a unit therewith. A compression coil spring **114** in boss **108** normally holds the manual valve element **106** in its upper retracted position.

When the manual valve element **106** is depressed the lower end of pin **110** engages lever **112** to pivot the valve member **56** to the solid line position against the action of spring **62**, opening the valve for the flow of gas therethrough to the burner. After the burner has ignited for a short period of time, a milliamp current will be generated in the circuit by the heating of the thermocouple, the current being sufficient to energize the electromagnet **66** and project its core member **68** to the left and engage the valve member **56**. The electromagnet is sufficiently strong to hold the valve member **56** open against the action of spring **62**. Accordingly the manual valve element **106** may be released. The circuit to the electromagnet is through the mercury switch **82**.

The circuit through the mercury switch will remain completed so long as the heater is in the upright position shown in FIGURE 1. In the event the heater should be accidentally tipped from the upright position shown, the ball of mercury **100** will roll away from one or the other of contacts **96** and **98**, breaking the circuit to the electromagnet. Upon de-energization of the electromagnet, the valve member **56** will instantly be pivoted to its dotted line position by spring **62**, closing off the flow of gas to the burner. Accordingly, whenever the heater is tipped from its upright position the burner will be shut off and the danger of fire will be eliminated.

The burner can be again ignited by restoring it to an upright position, depressing the manual valve element **106** to open the gas line to the burner, lighting the burner and holding the manual valve element depressed long enough to generate an energizing current in the circuit so that the electromagnet may thereafter hold the valve element in open position.

What I claim as my invention is:

1. A portable heater assembly adapted to rest upon a supporting surface in an upright position, said heater assembly including a gas burner, a gas line leading to said burner for delivering gas thereto for combustion, a valve in said gas line, means for controlling said valve including an electric circuit, means energized by said circuit operative to hold said valve open, [means] *a mercury switch* responsive to tipping of said heater assembly from upright position for opening said circuit and thereby rendering said holding means [inopeartive] *inoperative,* and means for closing said valve when said holding means is inoperative.

2. A portable heater assembly adapted to rest upon a supporting surface in an upright position, said heater assembly including a gas burner, a gas line leading to said burner for delivering gas thereto for combustion, a valve in said gas line, means for controlling said valve including an electric circuit, electromagnetic means energized by said circuit and operative to hold said valve open, a mercury switch mounted on said heater assembly and responsive to tipping of said heater assembly from upright position for opening said circuit and thereby rendering said holding means inoperative, and resilient means for closing said valve when said holding means is inoperative.

3. A portable heater comprising a support structure having a base for supporting the same upright on a supporting surface, a gas burner mounted on said support structure, a gas line leading to said burner for delivering gas thereto for combustion, a valve in said gas line, means for controlling said valve including an electric circuit, a thermocouple in said circuit adapted to be heated when said heater is operated so as to generate a current in said circuit, electromagnetic means energized by said circuit and operative to hold said valve open, a mercury switch mounted on said support structure and responsive to tipping of said support structure from upright position for opening said circuit and therey rendering said holding means inoperative, and resilient means for closing said valve when said holding means is inoperative.

4. A portable heater assembly adapted to rest upon a supporting surface in upright position, said heater assembly including a gas burner, a gas line leading to said burner for delivering gas thereto for combustion, a valve in said gas line, means for closing said valve, electrically operated means for holding said valve open against the action of said closing means, and a mercury switch mounted on said heater assembly for rendering said electrically operated means inoperative in response to tipping over of said heater assembly from upright position.

5. A portable heater assembly adapted to rest upon a supporting surface in upright position, said heater assembly including a gas burner, a gas line leading to said burner for delivering gas thereto for combustion, a valve in said gas line, a mercury switch mounted on said heater assembly and operative to open in response to the tipping over of said heater assembly, and means for closing said valve when said mercury switch opens.

6. A portable heater assembly adapted to rest upon a supporting surface in upright position, said heater assembly including a gas burner, a gas line leading to said burner for delivering gas thereto for combustion, a valve in said gas line, a mercury switch mounted on said heater assembly and operated in response to the tipping over of said heater assembly, and means for closing said valve when said mercury switch is operated.

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