Dec. 1, 1964 A. ZULIAN 3,159,203

PILOT BURNER

Filed Aug. 11. 1961

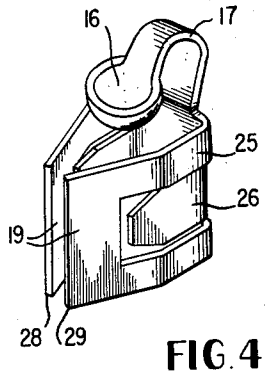


FIG. 4

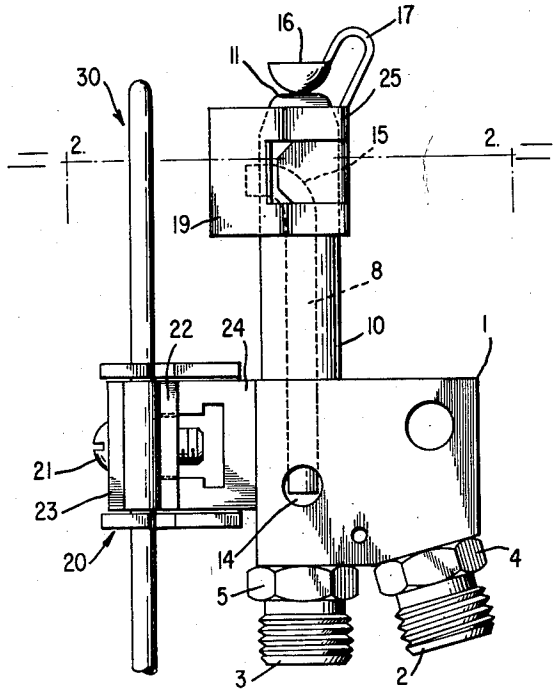


FIG. 1

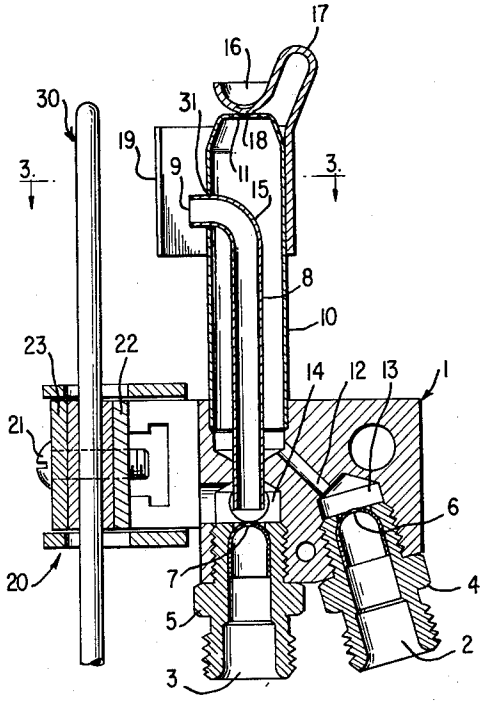
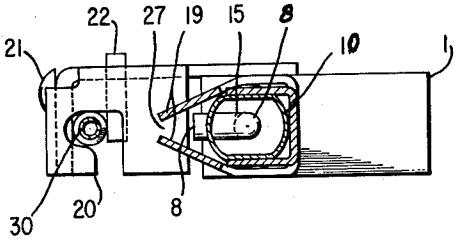


FIG. 2

FIG. 3



INVENTOR.
ALDO ZULIAN

BY Mead, Browne, Schuyler and Beveridge
ATTORNEYS

United States Patent Office 3,159,203 Patented Dec. 1, 1964

3,159,203

PILOT BURNER

Aldo Zulian, Yukon, Pa., assignor to Robertshaw Controls Company, Richmond, Va., a corporation of Delaware

Filed Aug. 11, 1961, Ser. No. 130,979
11 Claims. (Cl. 158—123)

The present invention relates to pilot burners for use in fluid fired appliances such as gas ranges, refrigerators, broilers, dryers and the like wherein the pilot burner serves to turn on the main gas supply and to ignite the same, by usually a conventional thermoelectrically responsive control device. It is, more generally, applicable to operation of a thermally actuated electrical control for any purpose upon demand signal actuation of flow of fuel. The invention pertains more particularly to the type of burner and burner control device employing a constant low rate non-aerated pilot flame for igniting a main burner and a low rate aerated pilot flame ignited thereby in response to the initiation of intermittently supplied gas or other fluid fuel under control of some demand signal of external origin. It pertains to safety control of the primary fuel supply inasmuch as the main burner fuel supply is turned on preferably only in response to the heating of a temperature sensitive control following the ignition of the aerated fuel supply positioned adjacent to the constant pilot flame.

Various arrangements are known for employing a heater burner supplied intermittently with fuel to heat a control element by means of which a main burner fuel supply controlled. In such arrangements it is conventional for a constant burning pilot flame to be employed for ignition of the intermittent burner which serves to actuate a control initiating the supply of fuel to a main burner and thereafter to ignite the fuel at the main burner.

The primary object of the invention is to provide a safer unit which is also easy and inexpensive to manufacture while employing very low rates of consumption of fuel both in the constant burner and the intermittent burner units.

A further object of the invention is to provide for ready adjustability of the flame from both intermittent and steady burner units in accordance with the type of gas or fluid fuel employed, over a wide range of pressures.

A still further object of the invention is to provide a unitary flame control structure which is easily disassembled for cleaning of those parts which may come in contact with the intermittent or the constant burner flames.

Other objects will be apparent as the description proceeds, and by reference to the drawings in which:

FIG. 1 is an elevational view of a burner control unit incorporating this invention;

FIG 2 is a sectional view of the burner unit taken along line 2—2 of FIG. 1;

FIG. 3 is a plan sectional view taken through the device of FIG. 2 along lines 3—3; and

FIG. 4 is a perspective view of a portion of the device of this invention showing a constant burner flame retainer and heater burner flame spreader as an integral unit.

This invention provides a compact structure which is easily adjusted and variably useful for the control of the intermittent and constant burning pilot burner portions of the device. A structure is provided to assure stable operation both of the intermittent pilot and the constant burning pilot at very low rates of fuel consumption. This contributes to safety of the device for the reason that very little fuel is permitted to escape even though unignited fuel might be issuing from both the intermittent and standby fuel nozzles if the constant flame should be

extinguished. The pilot burner unit hereof further has means for conserving fuel for the intermittent or heater unit and has a highly effective constant flame retainer unit which is particularly stable against atmospheric shock or variations in fuel supply and is adjustable for fuel of many kinds. The improved structure so provided permits simplicity and economy of manufacture, ease of cleaning and ready adjustment to accommodate various pressures and types of fuel which may be employed.

In the preferred embodiment illustrated in the drawings a common support and body member 1 is shown equipped with fittings 2 and 3 connected when in operation, respectively, to a steady fuel supply and to an intermittent fuel supply, the latter under control of a demand signal by which it is desired to initiate operation of a main burner (not shown) or other thermally actuated device. The constant fuel supply at 2 would normally be supplied through a shutoff valve for elimination of the constant flame in periods of non-use. The fuel supplied to fitting 3 is intermittent in character and is controlled in accordance with the purposes to which the safety pilot unit may be put. For example, when the unit is intended to ignite the main burner for a gas hot water heater, or like device, the fuel may reach fitting 3 by way of a valve from a main supply, which valve may be under thermostatic control, either to open or close the same in accordance with demand indicated by a temperature sensitive element associated with the device to be heated. When the unit is applied to the ignition of a heater in an oven, broiler, clothes dryer or the like, control of the fuel to fitting 3 may be by way of a switch-operated solenoid valve, or the like. Details of these connections do not form a part of this invention and are, therefore, not described in further detail.

Fittings 2 and 3 are preferably removable for cleaning, being generally screw-connected into base 1, as indicated by nuts 4 and 5. In order to effect a low rate of fuel consumption and to provide clean burning flames, fittings 2 and 3 are provided at the inner ends thereof, respectively, with fluid limiting orifices or jets 6 and 7 of small diameter relative to the dimensions of the burner orifices about to be described. Aligned with fuel jet 7 there is a duct or conduit 8 which terminates in nozzle opening 9 disposed to face a control element 30 which, when heated may be arranged to actuate a main burner fuel supply or other controlled unit. Conduit 8 is mounted on base 1 in axial alignment with fitting 3 adjacent to jet 7. Concentrically disposed about the longitudinal axis of conduit 8 is a second conduit 10 preferably surrounding conduit 8 as shown in FIGS. 1 and 2. Conduit 10 terminates in a burner orifice 11 generally of circular form and of substantially greater diameter than jet 6 in order to provide a lowered exit velocity for the fuel delivered thereto. Channel 12 suitably formed, as by boring, in base 1 connects conduit 10 to receptacle 13 into which fitting 2 is secured.

The fuel for orifice 11 is preferably not aerated, and receptacle 13 is accordingly not opened to the ambient atmosphere. Fitting 3 conducts gas through jet 7 into receptacle 14 which is preferably freely open to the ambient atmosphere whereby air is entrained in conduit 8 by conventional injector action. The duct or conduct 8 is conveniently of tubular form and of uniform diameter throughout to avoid any back pressure which would tend to spoil the injector action at jet 7 in receptacle 14. Nozzle 9 and orifice 11 are the respective outlets of the concentric conduits and require separation sufficiently to keep the flames therefrom separate. It is also convenient to construct conduit 8 of tubing disposed within a tubular conduit 10, conduit 8 being brought out the side of conduit 10 with a smooth bend 15 permitting unimpeded flow

of fuel therein. It may be a simple bent tube supported by base 1 in a press fitting or may be screw threaded thereinto as desired. The simple construction illustrated provides good entrainment of air at chamber 14 and effects burning gaseous fuel with a small blue flame adjacent nozzle 9.

Orifiice 11 may be formed by turning in the ends of conduit 10 as when the latter is formed of tubing, and may be concentrically disposed with respect to conduit 10 at the outer end thereof. In order to provide a clean burning blue flame from orifice 11 there is shown a circular arcuately formed flame holding member 16, conveniently pressed from thin metal sheet or plate which may be cup-shaped or hemispherical with a convex face disposed across orifice 11 adjusted in proximity thereto and supported thereover by any convenient means such as metallic loop 17, which is variably secured in adjustable relation to the outer conduit as illustrated. In order to provide more complete control of the flame from orifice 11 there is provided a circular protrusion 18 in the convex face of the cupped plate element 16. This protrusion may be embossed or otherwise formed and is of circular form somewhat less in diameter than orifice 11. It is preferably disposed within or adjacent to orifice 11 so as to control the flow of gas therefrom and disperse it radially. The size and character of the opening may be modified at will by positioning the protrusion 18 on cupped element 16 within, adjacent to, or more remotely from orifice 11. This placement may be regulated to suit any fuel by adjustment of curvature 17 or by modifying the location of the unit mounting on conduit 10. Disposition of the cupped element 16 across the exit orifice 11 forms a convenient means of spreading gas exiting from 11 whereby when it is lighted a circular blue flame arises around element 16. This cupped flame spreading or flame holding unit is thereby heated and serves dual purposes, first of retaining the flame against accidental momentary cessation of fuel flow from 11, and also of preventing shock waves in the vicinity thereof from forcing gas back into conduit 10 thereby to extinguish the constant pilot flame. This construction has been found to provide a very stable flame surrounding cupped element 16 which is not easily extinguished by pressure waves or by blowing from any side, inasmuch as the opposite side remains protected to cause relighting of any extinguished portion of the ring of flame. Furthermore, element 16 is easily cleaned of any lint or carbon which may form thereon and is of a construction which does not tend to clog from these or other causes.

A unit comprising flame keeper 16, frame 25, clamps 26 and flame spreader 19 is a separable unit slidably mountable on a tubular body having a pilot burner opening at the end. When adjusted to have the opening 11 partially filled by the protuberancy 18, mechanical shocks are restrained laterally by the portion 18 being within the opening 11. Air shocks in the region surrounding the burner frequently are observed to extinguish pilot flames and are caused at times by the slamming of doors in the vicinity or resonant effects in the chimney, and the like. Such air shocks, along with more steady wind effects, are prevented from extinguishing the flame held by the structure described since the orifice 11 can neither be completely closed nor the flame swept from the hemispherical surface around which it is rising.

Nozzle 9 is preferably disposed at an angle to the main portion of conduit 8, shown concentrically within conduit 10 but extending laterally therefrom. In order to minimize the quantity of fuel required at nozzle 9, paired flanges 19 are preferably disposed laterally of conduit 10 and laterally enclosing nozzle 9 whereby the flame issuing therefrom may be longitudinally spread and directed as desired along any suitable elongated thermo-responsive device shown generally at 30.

The control element 30 may usually be employed for the purpose of operating a main gas supply valve in response to an electrical signal generated therein upon the heating of the element 30 by the flame from nozzle 9. Accordingly, the device 30 is preferably disposed parallel to conduits 8 and 10 and the flanges 19 are positioned in close proximity to the latter as hood means or flame spreading means directing all flame usefully upon element 30 in order that a small quantity of aerated pilot gas will be sufficient for prompt heating and operation of the device 30. The device 30 is preferably mounted on base 1 by means of a clamping device shown generally at 20 and is secured therein by a screw fitting in adjustable position with respect to the nozzle 9 and flanges 19. The device 30 may conveniently be clamped between elements 22 and 23 by screw 21, one of which is attached to bracket 20, which in turn is preferably arranged for slidable mounting on a protrusion 24 extending from base 1. Control of the distance from nozzle 9 to device 30 is thus achieved.

In order to provide fine adjustment of the direction of passage 27 formed by jaws 28 and 29 at the extremities of flanges 19, there are attached thereto spring members 26 suitably arranged to engage in slidable contact the exterior of conduit 10. For ease in manufacture, flanges 19 and elements 26 may be formed of a single piece by stamping or other suitable operation and loop 17 bearing element 16 is attached to the base of flanges 19, as at 25 to form a separable flame control unit. In a preferred construction, the spring clip elements 26 are integrally formed from the same piece as flanges 19, loop 17 and element 16, and the flanges 19 terminate in jaws 28 and 29. The pair of spring clips 26 thus form the sliding contact with conduit 10 and may be adjusted therealong as desired to secure variations in the opening at orifice 11. When conduit 10 is of circular tubular form, as shown, flanges 19 may be rotated about conduit 10 in lateral adjustment to direct flame from nozzle 9 precisely upon control element 30. To avoid leakage of fuel from the outer conduit around nozzle 9 of the inner duct, duct 8 may be pressfitted or welded into an aperture in the outer conduit wall as at 31. The combined structure comprising conduits 8 and 10 may be removed for servicing from their concentric seats in base 1 when held therein merely by close friction fitting.

So constructed and assembled, the safety burner pilot assembly may be varied to suit differing fuels and differing rates of burning being adjustable with respect to flow of gas from both the constant orifice 11 and the intermittent heater nozzle 9, by varying the position of clips 26 on conduit 10, by varying the support loop 17, and by changing the gap between jaws 28 and 29. The flame holding and directing features are combined in a single removable unit of simple manufacture and efficient fuel conserving design, which provides one of the safety features of the unit since so little gas need be employed for either or both pilots, that fire danger is minimized should the gas to the pilot flame around holder 16 be accidentally turned off and later turned on again without relighting at orifice 11. Under these conditions, the main burner would not be lighted because of failure to operate device 30, but the minute stream of gas to the pilot would remain unconsumed and pass harmlessly through the chimney.

While many uses are contemplated, the safety burner will often be operated with gas continuously emitted from orifice 11 and burned around flame holder 16. Upon demand of an external control device gas is admitted at 3, passing through jet 7 to entrain air at 14 which mixes with the fuel in conduit 8 which is of small diameter and thermal conductivity such that flame does not propagate therein, and exists at 9 where it is ignited by the flame surrounding 16. The flame at 9 is directed in a variable channel against control unit 30. Upon the heating of 30 a main supply of gas is turned on by control mechanism not a part of this invention and not herein illustrated since it may be of many kinds. When a burner is to be ignited thereby, it would normally be disposed to emit fuel in the immediate vicinity of the flame about 16 for ignition

thereby when control unit 30 operates a fuel valve in the supply line thereto.

The safety control unit herein described is equally useful for initiating any other action produced by the heating of the control element 30 in response to any external intermittent actuation of a fuel supply to fitting 3, and while the invention is described with particular reference to a gas heating device, other uses are contemplated. Many modifications of the structure illustrated are contemplated within the scope of the invention.

What I claim is:

1. In a safety-control for a gaseous fuel pilot burner, means defining a constant flame orifice connected by a first conduit to a constant fuel supply, a cupped flame spreading element having substantially vertical outer peripheral portions and arranged across and proximate to said orifice as a flame holding device, an air injector jet member connected to an intermittent fuel supply, a second conduit arranged coaxially adjacent said jet member to receive aerated fuel therefrom, said first and second conduits being concentrically arranged one within the other, a lateral extension of the second conduit opening at one side of said burner proximate to said constant flame orifice, flame-spreading hood means adjustably attached to said first conduit for directing the flame from said aerated fuel when ignited by the constant flame, and thermally responsive means disposed in the path of said directed flame as said intermittent supply is actuated.

2. In a burner control having a temperature responsive device for turning on a main burner in response to actuation of an auxiliary burner upon demand signal actuation, a base, means in said base for receiving fuel controlled by said demand signal, a constant fluid fuel supply, an aerating jet member operatively connected at said base to fuel receiving means, a conduit mounted on said base aligned to receive aerated fuel from said jet member and terminating in a laterally extending auxiliary burner, a second conduit mounted on said base and disposed concentrically with first said conduit, being connected to said constant supply and terminating in a burner orifice, hemispherically formed flame holding means disposed adjacent said orifice in flame spreading relation thereto, spring clip means engaging the outer one of said conduits and bearing said holding means in adjustable relation to said orifice, and flame spreading flanges arranged to distribute the flame from said auxiliary burner along said temperature-sensitive element for the actuation thereof in response to auxiliary burner ignition.

3. In a safety pilot burner unit for intermittent actuation of thermal control means mounted on a common base therefor, a burner nozzle for intermittently supplied fuel arranged facing said control means, means at said base for connecting an intermittent fuel supply to said nozzle including a first conduit mounted proximately to the control means, a second conduit mounted on said base to concentrically surround said first conduit and terminate therebeyond in a low pressure orifice, said second conduit being connected at said base to a constant fuel supply fitting, said nozzle protruding laterally from said second conduit proximate to said orifice, flame spreading flanges variably attached to the outer said conduit to variably spread flame from said nozzle along said thermal control device, and a flame holding element of substantially spherically convex form extending across said orifice to receive a flame thereabout when fuel supplied thereto is ignited.

4. In a safety pilot burner unit for operating a thermal control element in response to initiation of fuel flow thereat and including an intermittent fuel burner directed toward said control element and a pilot orifice supplied from a constant fuel source, duct means carrying the intermittently supplied fuel to said intermittent burner, second duct means concentrically surrounding first said duct means terminating at said orifice, paired flange means attached to second said duct means arranged to direct fuel effluent from said intermittent burner along said control element, and convexly formed flame control means disposed across said orifice to radially distribute fuel flowing therefrom for production of a stable circular flame thereabout when the fuel is ignited.

5. In the burner unit of claim 4 said flame control means being of cupped shape and having a circular protrusion of less diameter than said orifice adjustably arranged for controlled partial closure thereof.

6. In the burner of claim 4 said flange means and flame control means having common means of support on said duct means for simultaneous variable control of fuel effluent from said intermittent burner and said orifice.

7. In a gaseous fuel ignition device responsive to intermittent control of fuel in an auxiliary line and including a temperature responsive device for controlling an associated fuel supply, a nozzle arranged facing said device, a conduit connecting said auxiliary line to said nozzle, a second conduit concentrically surrounding for part of its length first said conduit and connected at one end to a a constant fuel supply fitting, a burner orifice formed at the other end of said second conduit proximate to said nozzle, first conduit being formed to cause said nozzle to protrude laterally from a side wall of the second conduit, and flame holding means of convex form adjacent said orifice for circularly spreading flame as the fuel from the orifice is ignited.

8. In a fuel ignition device including a thermal safety control device and an intermittent auxiliary burner disposed on a common base for actuation of the control device, a tubular conduit connected to a constant fuel supply fitting mounted on said base, a burner orifice at one end of said conduit, a fuel duct concentrically mounted in said conduit arranged to receive aerated fuel from an intermittent auxiliary supply and having a smooth flow lateral extension protruding from said conduit toward said control device, and a flame holding member of cupped form having a convex face disposed across said orifice to circularly spread fuel flowing from the orifice, said face having a protrusion thereon arranged to partially close said orifice.

9. In a fuel ignition device including a thermal safety control device and an intermittent auxiliary burner disposed on a common base for actuation of the control device, a tubular conduit connected to a constant fuel supply fitting mounted on said base, a burner orifice at one end of said conduit, a fuel duct concentrically mounted in said conduit arranged to receive fuel from an intermittent auxiliary supply and having a smooth flow lateral extension protruding from said conduit toward said control device to form said auxiliary burner, flame control means adjustably clamped by spring jaws on said conduit including flame spreader flanges positioned to spread flame from said auxiliary burner along said control device, and a hemispherical flame holding member disposed with a convex face thereof in adjustably close abutting relation to said orifice for spreading fuel effluent therefrom circularly about said member for stable retention of flame when ignited, said face having a protrusion thereon positioned within said orifice, thereby to prevent substantial lateral displacement from a centered position.

10. In a fuel ignition device including a pair of parallel fuel conduits terminating, respectively, one in a continuously supplied burner orifice and the other in a lateral burner nozzle adjacent said orifice adapted to intermittently heat a control element proximate thereto in response to a demand signal controlling the fuel supply to said nozzle, a flame control unit, comprising a base of sheet metal, a pair of flanges laterally extending from said base portion to form a narrow linear flame channel beyond said burner nozzle facing the control element, an arm extending from said base portion beyond said orifice, a cupped flame spreader supported by said arm at said end of said one conduit to partially close said orifice and retain a continuous flame therearound, and paired

flange jaws laterally extending from said base portion for adjustable engagement with the sides of one conduit, said jaws being resiliently disposed for adjustment longitudinally of the conduit engaged.

11. A flame control unit according to claim 10 wherein said cupped flame spreader is substantially a hemispherical member of diameter less than said engaged conduit whereby a small steady flame from the orifice envelopes said spreader.

References Cited in the file of this patent

UNITED STATES PATENTS

160,789	Neff	Mar. 16, 1875
1,853,568	Morick	Apr. 12, 1932
2,142,418	Stocker	Jan. 3, 1939
2,258,924	Brumbaugh et al.	Oct. 14, 1941
2,363,072	Mantz	Nov. 31, 1944
2,384,696	Ray	Sept. 11, 1945
2,665,321	Flagg	Jan. 5, 1954
2,677,004	Biggle	Apr. 27, 1954
2,707,516	Smoot	May 3, 1955
2,905,235	Dolly	Sept. 22, 1959

FOREIGN PATENTS

663,067	Germany	July 28, 1938

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,159,203 December 1, 1964

Aldo Zulian

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the grant (only), line 1, name of inventor, for "Aldo Julian" read -- Aldo Zulian --.

Signed and sealed this 6th day of April 1965.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents