

Sept. 20, 1966

H. PUTTFARCKEN

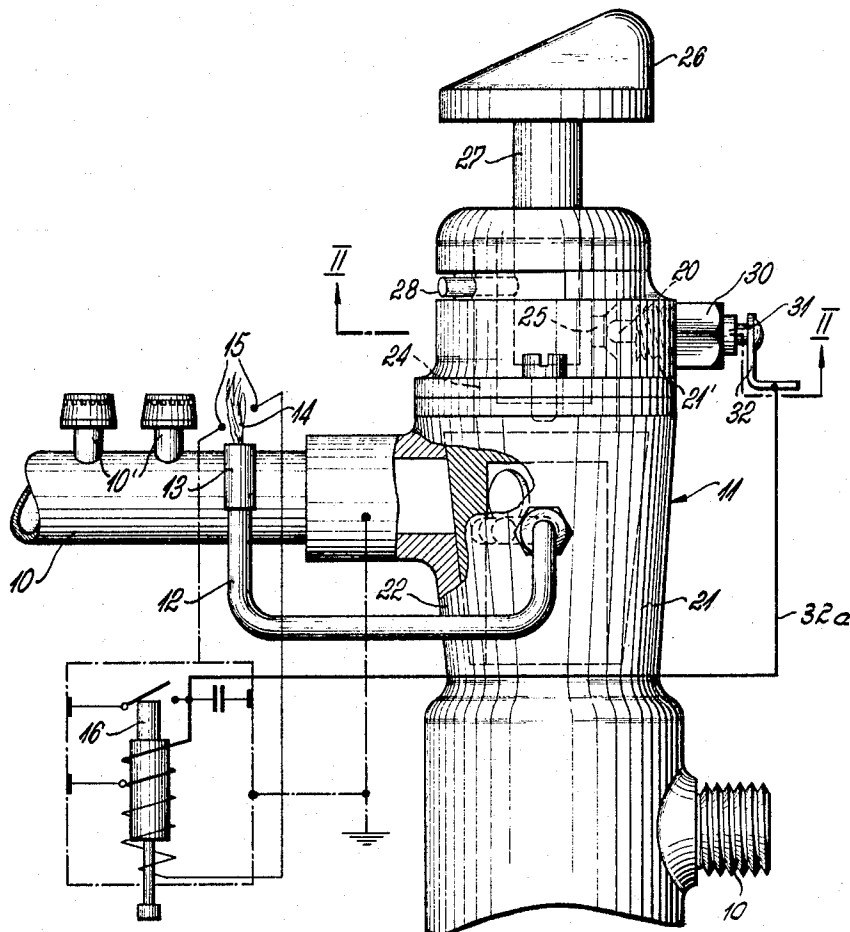
3,273,628

INTERRELATED GAS VALVE AND MANUAL IGNITER CONTROL

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2 Sheets-Sheet 1

FIG. 1



INVENTOR
HEINRICH PUTTFARCKEN

by Michael S. Striker

HIS ATTORNEY

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H. PUTTFARCKEN

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FIG. 2

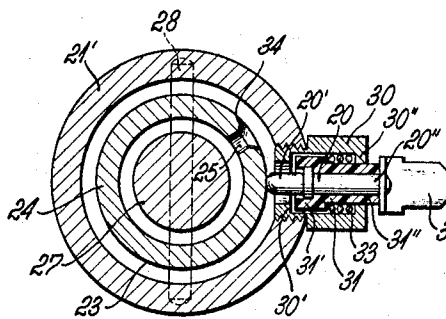


FIG. 3

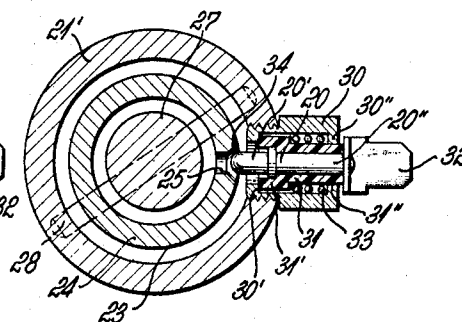
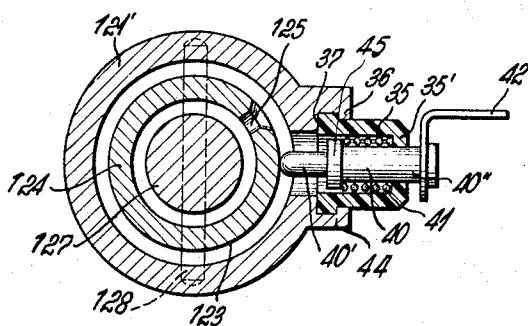


FIG. 4



INVENTOR

HEINRICH PUTTFARCKEN

by Michael S. Striker

his ATTORNEY

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INTERRELATED GAS VALVE AND MANUAL IGNITER CONTROL

Heinrich Puttfarcken, Wernau (Neckar), Germany, assignor to Junkers & Co., G.m.b.H., Wernau (Neckar), Germany

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7 Claims. (Cl. 158—115)

The present invention relates to valves in general, and more particularly to a valve which regulates the flow of gaseous fuel to one or more burners in a gas burning apparatus. Still more particularly, the invention relates to a valve which controls the ignition of a pilot burner in a gas range or another gas burning apparatus.

It is known to equip a gas burning apparatus with an electrical control circuit wherein an electromagnetic igniting device causes ignition of the pilot burner when the gas valve permits gaseous fuel to flow into the orifice or orifices of the pilot burner. The present invention is concerned with an improvement in such types of gas burning apparatus and one of its objects is to provide a highly reliable, comparatively simple and easy-to-install gas valve which may be utilized in many types of existing apparatus without necessitating substantial alternations in the construction and design of such apparatus.

Another object of the invention is to provide a control circuit for gas burning appliances which is constructed and assembled in such a way that it becomes effective only in a given position of the valve which controls the admission of gaseous fuel to a burner and which automatically prevents the igniter from producing a spark when the valve is manipulated to move its valve member to another position.

A further object of the invention is to provide a gas valve which is provided with a novel short circuit and which serves to automatically short out the igniter of a pilot burner excepting at the time when the operator expects the igniter to produce a spark which will ignite the pilot burner.

An additional object of the invention is to provide a novel electric switch which forms a component part of the aforementioned short circuit, which is embodied in a valve of the above outlined characteristics, and which is fully protected from the atmosphere so that its operation cannot be affected by moisture or dust and that it may remain operative for long periods of time.

A concomitant object of the invention is to provide a gas burning apparatus which embodies a gas valve and a control circuit of the above outlined characteristics.

With the above objects in view, one feature of the invention resides in the provision of a fuel burning apparatus, such as a gas range or the like, which comprises a fuel supply conduit, a burner in communication with the conduit, a valve provided in the conduit upstream of the burner and comprising a housing and a valve member being movable in the housing between a first, a second and a third position in which the valve respectively prevents the flow of fuel to the pilot burner and the main burner, permits flow of fuel to the pilot burner, and permits flow of fuel at least to the main burner, and a control circuit including an electrical igniter for the burner, an electromagnetic current generating device,

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first circuit means for applying the energy across the igniter so that the latter may ignite the burner when the pilot burner receives fuel, and second circuit means for shorting the current generating device so as to prevent ignition of the burner. The second circuit means includes a normally closed switch including a first contact secured to the valve member in the housing and a second contact engaging the first contact in all but the second position of the valve member so that the switch is open and the current generating device may ignite the pilot burner only at the time the valve member is moved to its second position.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The improved valve itself, however, both as to its construction and its mode of operation, together with additional features and advantages thereof, will be best understood by perusing the following detailed description of certain specific embodiments with reference to the accompanying drawings, in which:

FIG. 1 is a fragmentary side elevational view of a fuel burning apparatus including a valve which embodies one form of my invention;

FIG. 2 is an enlarged transverse section through the valve as seen in the direction of arrows from the line II—II of FIG. 1 and showing the valve member in the third (open) position;

FIG. 3 is a similar transverse section through the valve wherein the valve member is shown in the second (igniting) position; and

FIG. 4 is a transverse section through a slightly modified valve with the valve member shown in a position corresponding to that of FIG. 2.

Referring to FIG. 1, there is shown a portion of a fuel burning apparatus, for example, a gas range with two main burners 10' and a pilot burner 13. The main burners 10' are mounted on and communicate with a gas supply conduit 10 which accommodates a novel valve 11 located upstream of the main burners. The housing 21 of the valve 11 communicates with a branch line 12 which leads to the pilot burner 13. The discharge orifice of the pilot burner 13 is located between a pair of spaced electrodes 15 forming part of an electrical igniter which will produce a spark in a given position of a valve member 22 in the housing 21. The pilot burner 13 is located sufficiently close to the main burners 10' so that its flame 14 will ignite the gas streams escaping from the main burners when the valve member 22 permits gaseous fuel to flow through the housing 21 and to the main burners. The electrodes 15 form part of a control circuit which further includes an electromagnetic current generating device 16 as a source of electrical energy.

Such current generating devices are known, for instance from German Patent No. 965,121. They produce the required ignition energy in form of a high-voltage, but low-amperage current which, on its way to ground, jumps the spark gap and thereby produces the desired spark.

The current generating device used in the present instance, and indicated in FIG. 1 by reference numeral 16, may comprise a housing of insulating material which contains, among other items, a powerful permanent magnet together with magnetic flux conductors, a primary and a secondary winding which in the drawing are respectively shown in heavy and light lines, a circuit breaker, and a condenser. The magnetic flux conductor

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or plunger is arranged within the primary and secondary windings and is axially movable through manual manipulation by means of an externally arranged handle, lever or other actuator. The arrangement is such that manual actuation of the device causes a sudden and very rapid movement of the plunger towards the circuit breaker, which results in an air gap within the magnetic circuit of the ignition coil and in sudden weakening of the magnetic flux. This, in turn, produces a flow of current in the primary winding of the ignition coil, and this current flow is promptly interrupted by the circuit breaker. The resulting voltage surge in the secondary winding causes current to jump the spark gap, thereby producing the desired ignition spark. A capacitor is connected in parallel with the circuit breaker to suppress sparking at the breaker contacts, and a return spring serves to return the plunger to its initial position after each ignition episode is completed. The control circuit is connected with the ground and includes a shorting circuit which comprises a normally closed switch having a first contact 23 provided on a neck portion 24 of the valve member 22 in the housing 21. The switch further includes a second contact here shown as a pin 20 which normally engages the contact 23 to form therewith a shorting connection which prevents the electrodes 15 from igniting the pilot burner 13 by shorting the circuit breaker of the generating device, thus maintaining it closed and preventing generation of the high-voltage impulse which would result from an interruption of current flow by said circuit breaker. The arrangement is such that the normally closed switch including the contacts 20, 23 will allow ignition of the pilot burner 13 only in a predetermined angular position of the valve member 22, and such position is illustrated in FIG. 3. In other words, that circuit which applies the energy across the electrodes 15 may be completed only when the contact 20 is spaced from the contact 23 or vice versa; in all other positions of the valve member 22, the circuit breaker is bypassed by the circuit including the switch 20, 23 and the electrodes cannot ignite the gas which might be admitted to the pilot burner 13. One of the electrodes 15 is grounded and the other electrode is connected with the coil of the electromagnetic igniting device 16.

The contact 20 is movable radially with reference to the axis of the valve member 22 and is supported by a bonnet-shaped cover 21' of the housing 21. The valve member 22 is of the non-rising type and is rotatable between a number of positions including a first position (not shown) in which it prevents fuel from flowing to the burners, a second position which is illustrated in FIG. 3, a third fully opened position shown in FIG. 2 and a fourth bypass position (not shown). The contact 23 is grounded and resembles an annulus which is concentric with the valve member 22 and which is provided with a single radially inwardly extending peripheral recess 25 bounded at its outer end by two inclined cam faces 34 which enable the rounded tip 20' of the contact 20 to enter with play and to be expelled from the recess 25. As a rule, the tip 20' will engage the peripheral surface of the contact 23 so that the circuit breaker is shorted and the electrode 15 cannot ignite the pilot burner 13. It will be noted that the contact 23 is fully concealed in the interior of the valve housing 21 so that it cannot be exposed to dirt, moisture and other foreign substances which could affect the function of the shorting circuit including the switch 20, 23. In the igniting position of FIG. 3, the contacts 20, 23 are out of engagement and the switch is open because the diameter of the recess 25 (which is a radially extending bore) exceeds the diameter of the tip 20' so that the recess 25 may receive this tip with some play.

The stem 27 of the valve member 22 extends through the cover 21' and is connected with an actuating member here shown as a knob 26 which may be turned by hand. The connection between the stem 27 and the valve

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member 22 comprises a diametrically extending motion transmitting pin 28 whose terminal portions may be moved into and out of abutment with suitable stops provided on the cover 21'. The stops determine the extent to which the valve member 22 may be rotated between two spaced end positions. The pin 28 traverses the bifurcated neck portion 24 of the valve member 22.

The first position of the valve member 22 is not illustrated. In this first position the pin 28 abuts against the cover 21' and the valve member prevents any flow of gaseous fuel to the main burners 10' and to the bypass line 12 (pilot burner 13). If the operator thereupon rotates the knob 26 in a sense to turn the valve member 22 in an anti-clockwise direction, as viewed in FIG. 3, the recess 25 will be moved into registry with and will receive the tip 20' of the contact 20 so that the shorting circuit of the switch 20, 23 is open whereby the energy generated by actuation of the electromagnetic igniting device 16 is applied across the electrodes 15 and the electrodes produce a spark which will ignite the pilot burner 13 to produce a flame 14. This is possible because, as soon as the valve member 22 is turned out of the zero position and toward or into the igniting position of FIG. 3, the valve 11 allows fuel to flow to the bypass line 12 so that the pilot burner 13 receives fuel. When the valve member 22 is turned out of the igniting position of FIG. 3 into the fully opened position of FIG. 2, the valve 11 allows fuel to flow also to the main burners 10'. The flame 14 ignites the main burners 10' and these burners will remain in operation when the operator decides to decrease the flow of fuel through the valve 11 by rotating the valve member 22 beyond the position of FIG. 2 and toward a shorting end position in which the pin 28 abuts against another stop on the cover 21'. The generating device 16 is shorted in a fully automatic way as soon as the recess 25 advances beyond the tip 20' because the tip then reengages the contact 23 and the igniter is inoperative. However, this does not affect the burners because the valve member 22 continues to permit flow of gaseous fuel to the burners and because each of these burners is ignited. The arrangement may be such that the valve member 22 will connect the main supply conduit 10 with the bypass line 12 only in a given angular position of the knob 26, i.e., when the recess 25 is in registry with the tip 20'. However, this is not important since any fuel escaping from the pilot burner 13 will be ignited as long as the main burners 10' remain ignited.

When the tip 20' enters into or is expelled from the recess 25, its rounded surface travels along the inclined cam faces 34 so that a small force suffices to turn the valve member 22 between its end positions and through the intermediate position of FIG. 3.

The major part of the contact 20 is accommodated in a small sleeve-like casing 30 and its outer end portion 20' which projects beyond the casing 30 is connected to a current-conducting clamp 32 secured to a conductor 32a which leads to one pole of the coil of the electromagnetic igniting device 16. The contact 20 is surrounded by and is reciprocable axially with a sleeve 31 which consists of insulating material and whose inward movement (i.e., toward the contact 23) is limited by an inwardly extending collar 30' of the casing 30. This collar is surrounded by a threaded portion which is screwed into a tapped bore provided in the cover 21' so that the casing 30 may be readily detached from the valve housing 21. The outwardly extending portion of the casing 30 is preferably of non-circular outline so that it may be engaged by a suitable tool which enables an operator to rotate the casing with reference to the valve housing. In the position of FIG. 3, the inner end face 31' of the insulating sleeve 31 abuts against an internal shoulder formed by the collar 30' to limit the forward progress of the contact 20 in response to the bias of a compressed helical spring 33 which operates between a shoulder of the insulating

sleeve 31 and an inwardly extending collar 30'' at the outer end of the casing 30. It will be noted that a smaller-diameter portion of the sleeve 31 extends through and is slidable with respect to the collar 30'' so that this sleeve shares all reciprocatory movements of the contact 20. The sleeve 31 insures that the conductor 32a cannot come in direct or indirect contact with a grounded part of the valve 11 so that the circuit of the switch which includes the contacts 20, 23 will be the sole means of bypassing the electrodes 15. The contact 20 is preferably press-fitted in the sleeve 31. The provision of contacts 20, 23 in and on the valve housing 21 adds very little to the space requirements of the valve 11 because these parts form a very compact switch which is fully protected from damage or foreign matter.

FIG. 4 illustrates a portion of a modified valve including a cover 121', a valve member having a neck portion 124 which is provided with an annular contact 123 having a radial recess 125 and which is rotatable by a stem 127 secured thereto by a diametral pin 128. The other contact is formed by a pin 40 whose tip 40' normally engages the peripheral surface of the contact 123 and which may extend into the recess 125 in a given angular position of the valve stem 127. The cover 121' is provided with a radially outwardly extending boss 44 whose outer end is bent inwardly to form a flange 36 which holds an insulating sleeve 35. This sleeve has an inner end face which abuts against a radial shoulder 37 of the boss 44 so that the sleeve is held against axial movement. The outer end portion of the sleeve 35 forms an inwardly extending collar 35' slidably receiving a portion of the contact 40 so that the latter may reciprocate radially toward and away from the axis of the valve stem 127. A compressed helical spring 41 operates between a collar 45 on the contact 40 and the aforementioned collar 35' so that the contact 40 is permanently biased radially inwardly and its tip 40' normally abuts against the contact 123. The outer end portion 40'' of the contact 40 is connected with a current-conducting clamp 42 which corresponds to the clamp 32 of FIGS. 1 to 3. The clamp 42 also serves as a stop to limit the inward movement of the contact 40. Thus, when the tip 40' enters the recess 125, the clamp 42 abuts against the flange 35' and prevents further expansion of the spring 41.

The operation of the valve shown in FIG. 4 is analogous to the operation of the valve which is illustrated in FIGS. 1 to 3. Thus, the electrodes 15 will produce a spark only when the tip 40' enters the recess 125 and is out of engagement with the contact 123. In all other angular positions of the valve stem 127, the switch including the contacts 40, 123 will short the circuit breaker so that the electrodes cannot produce a spark.

The valve of FIGS. 1 to 3 and 4 may be modified in a number of ways without departing from the spirit of my invention. Thus, the contact 23 or 123 need not extend around the entire neck portion 24 or 124 but only through a distance which corresponds to the angle between the two end positions of the valve member. Also, the position of the contacts 20, 23 or 40, 123 may be reversed and one of each pair of cooperating contacts may be mounted on the stem or another movable part of the valve member. Furthermore, it is equally possible to provide a separate housing for the contact 23 or 123.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic and specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. In a gas burning apparatus, in combination, a gas

supply conduit; a first and a second burner communicating with said conduit, said burners being sufficiently close to each other so that ignition of one burner results in automatic ignition of the other burner; a valve provided in said conduit upstream of said burners, said valve comprising a housing and a valve member being movable in said housing between a first position, a second position and a third position in which said valve respectively prevents flow of gas to both of said burners, permits flow of gas to said one burner, and permits flow of gas at least to said other burner; and a control circuit including a hand-powered high tension electromagnetic current generator including a coil having a primary circuit and a circuit breaker arranged in said primary circuit, electrode means defining a spark gap adjacent to said one burner, conductor means connecting said current generator with said electrode means, and short-circuiting means for short-circuiting said circuit breaker and including a normally closed switch arranged in parallel with said circuit breaker, said switch comprising a first contact located in said housing and secured to and movable with said valve member, and a second contact engaging said first contact in all but said second position of the valve member, so that the switch is closed in said first and third positions of said valve member and is open to enable ignition of said one burner by said current generator only when said valve member is moved to said second position and the current generator generates a current which suffices to produce a spark across said gap.

2. A structure as defined in claim 1; and further comprising a casing sealingly surrounding the major part of said switch.

3. A structure as defined in claim 2, wherein said second contact comprises a pin extending radially with reference to said valve member, and wherein said first contact has a peripheral surface provided with a recess, said pin being normally in engagement with said peripheral surface and being in registry with said recess spaced from said peripheral surface in said second position of said valve member.

4. A structure as defined in claim 3; and further comprising insulator means supported by said valve housing and surrounding a portion of said pin for insulating the same from said casing.

5. A structure as defined in claim 4, wherein said pin is reciprocable radially of said valve member and wherein said insulator means is a sleeve secured to and surrounding a portion of said pin, said pin having a first end portion extending beyond one end of said sleeve and a second end portion extending beyond the other end of said sleeve, and a current-conducting member connected with the second end portion of said pin, said casing comprising a collar adjacent to said first contact and said sleeve comprising an end face abutting against said collar to limit the progress of said pin into the recess of said first contact; and further comprising spring means provided in said casing and arranged to bias said pin so that said first end portion thereof normally engages the peripheral surface of said first contact.

6. A structure as set forth in claim 3, wherein said pin extends into said recess with play when said valve member is in said second position thereof.

7. A structure as defined in claim 3, wherein said valve member comprises a manually operable knob, and said housing comprises stop means for arresting said valve member in two end positions one of which corresponds to said first position, said second position of said valve member being located between said end positions and said valve member being arranged to permit more fuel to flow through said housing in response to rotation beyond said second position and toward the other end position.

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FREDERICK KETTERER, *Primary Examiner.*
FREDERICK L. MATTESON, JR., *Examiner.*
M. L. BATES, *Assistant Examiner.*