United States Patent

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[72] Inventor **Raymond J. Fox**
Glendale, Calif.

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[73] Assignee **Robertshaw Controls Company**
Richmond, Va.

[54] **FUEL CONTROL SYSTEM AND PARTS THEREFOR OR THE LIKE**
27 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** ..... **431/66,** 200/83 D, 337/309
[51] **Int. Cl.** **F23n 5/00**
[50] **Field of Search** 431/43, 45, 47, 66, 67; 337/309, 310; 200/83, 83.2, 83.31, 83.34

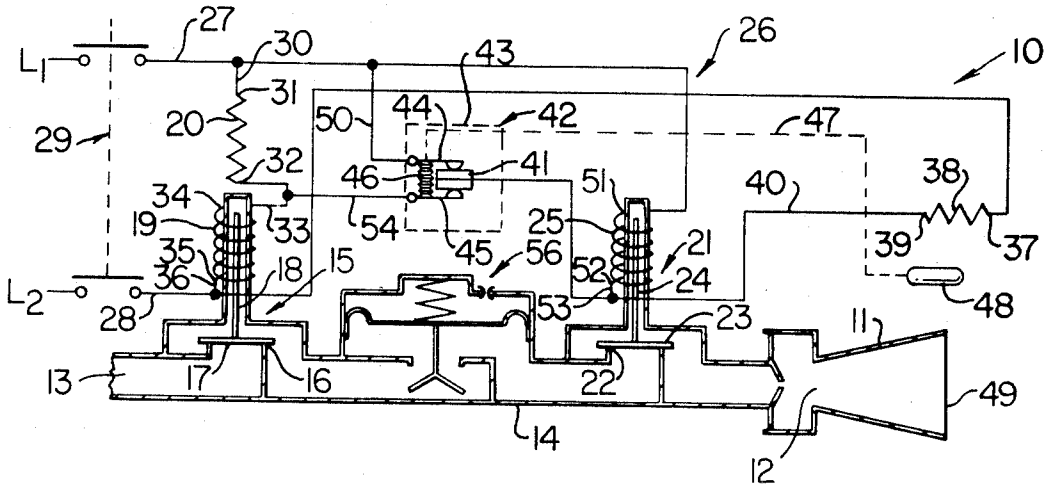
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Primary Examiner—Carroll B. Dority, Jr.
Attorneys—Auzville Jackson, Jr., Robert L. Marben and Candor, Candor & Iassone

ABSTRACT: This disclosure relates to a fuel control system for a fuel-burning apparatus wherein an electrical switch is adapted to sense the nonignition condition and ignition condition of an electrically operated ignition means for the burner means in such a manner that when the system is initially energized, the switch means opens a first valve means while energizing the ignition means and when the ignition means reaches an ignition condition, the switch means places the first valve means in a holding circuit to maintain the same in an open position and operates another valve means downstream from the first valve means to permit fuel to issue from the main burner means and be ignited by the ignition means.



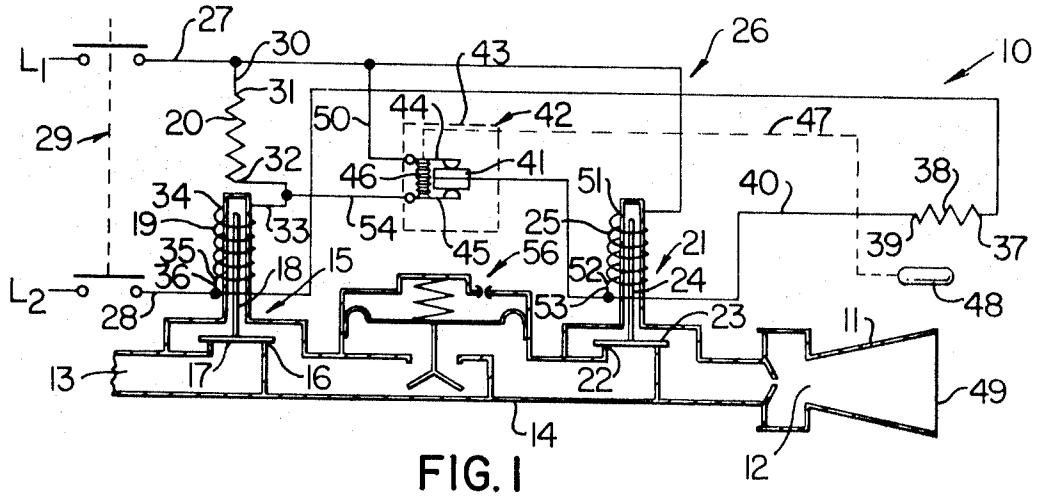


FIG. 1

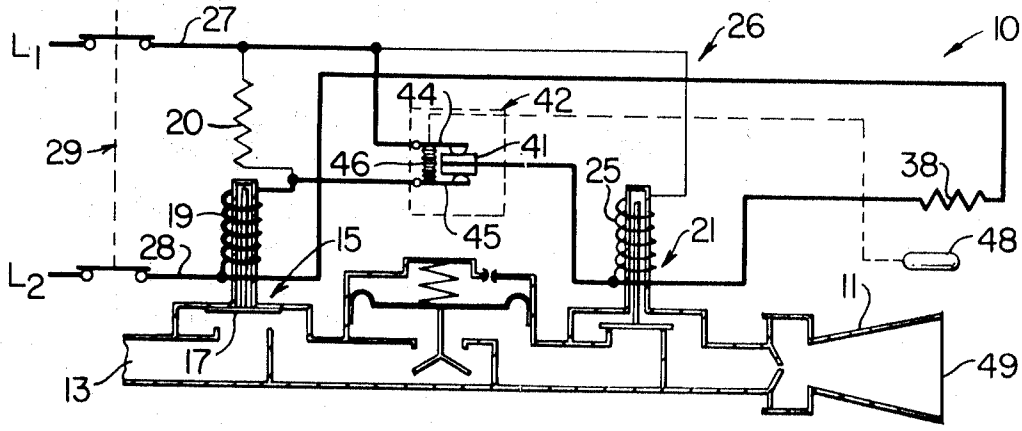


FIG. 2

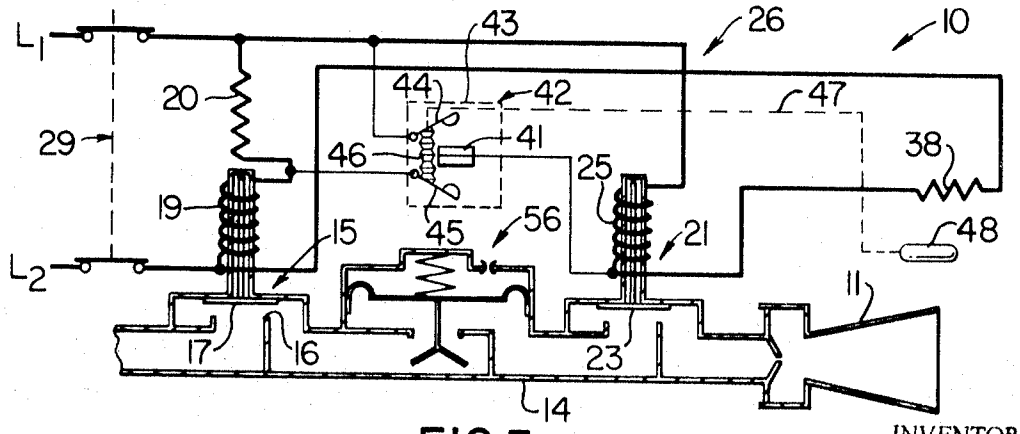


FIG. 3

INVENTOR.
RAYMOND J. FOX

BY

Cauder & Cauder

HIS ATTORNEYS

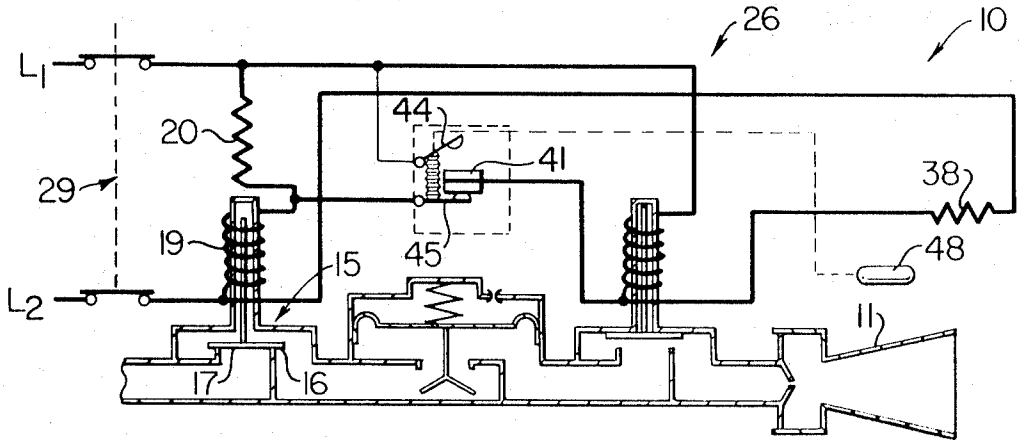


FIG. 4

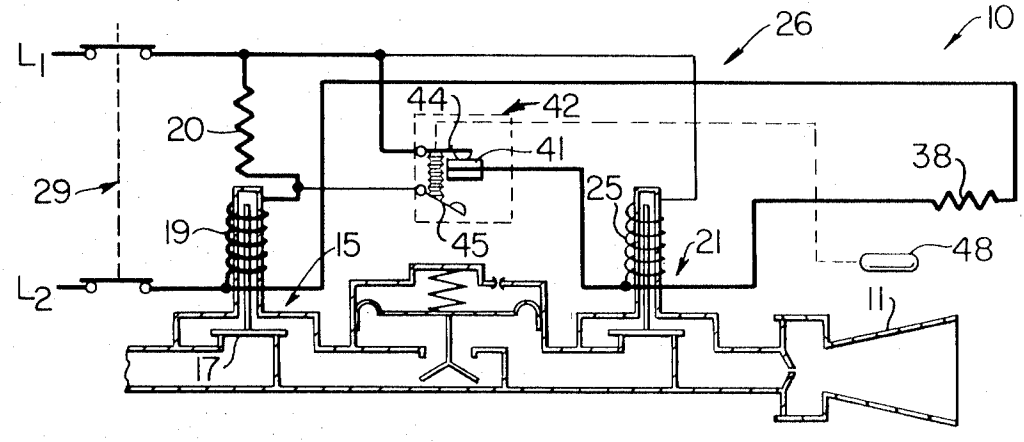


FIG. 5

INVENTOR.
RAYMOND J. FOX

BY

Cauldon & Cauldon

HIS ATTORNEYS

FUEL CONTROL SYSTEM AND PARTS THEREFOR OR THE LIKE

This invention relates to an improved fuel control system for a fuel-burning apparatus or the like as well as to an improved electrical control means for such a system or the like.

It is well known that fuel-burning apparatus require an ignition means for the main burner means thereof to effectively ignite fuel when the same first issues from the main burner means and that such ignition means can be automatically operated when the apparatus is initially turned on.

Accordingly, it is a feature of this invention to provide an electrical ignition means for such a fuel-burning apparatus wherein ignition means is automatically energized when the control means is first activated with the ignition means thereafter automatically causing the flow of fuel to issue from the main burner means only after the ignition means has reached an ignition condition.

In particular, one embodiment of this invention provides a fuel control means wherein a source of fuel is interconnected to a burner means by a conduit means having a first solenoid operated valve means therein and a second solenoid operated valve means therein disposed intermediate the first valve means and the main burner means. The electrical control system is so constructed and arranged that the same comprises an electrical switch which is disposed in one condition thereof when a sensing means determines that the ignition means is at a nonignition condition whereby the switch when interconnected to an electrical power source will only cause opening of the first valve means and the energizing of the ignition means so that the second valve means remains in its closed position to prevent the flow of fuel from the main burner means. Thereafter, when the electrical switch senses an ignition condition of the ignition means, the electrical switch causes a holding circuit to be energized to maintain the first valve means in its opened position while simultaneously energizing the solenoid coil of the second valve means to open the same so that the fuel can now issue from the burner means and will be ignited by the ignition means.

Accordingly, it is an object of this invention to provide an improved fuel control system for a fuel-burning apparatus or the like, the system of this invention having one or more of the novel features set forth above or hereinafter shown or described.

Another object of this invention is to provide an improved electrical control means for such a control system or the like.

Another object of this invention is to provide an improved electrical switch means for such a control system or the like.

Other objects, uses and advantages of this invention are apparent from a reading of this description which proceeds with reference to the accompanying drawings forming a part thereof and wherein:

FIG. 1 is a schematic view illustrating the control system of this invention with the control system being in its off position.

FIG. 2 is a view similar to FIG. 1 and illustrates the control system in its initial operating condition, the electrical circuit for the system illustrating in bold lines the effective parts of the electrical circuit.

FIG. 3 is a view similar to FIG. 2 and illustrates the control system in its full on condition, the electrical circuit illustrating in bold lines the effective electrical circuit for the control system in the condition of FIG. 3.

FIG. 4 is a view similar to FIG. 1 and illustrates a failure condition of one of the movable contacts of the switch means of the control system, the effective parts of the electrical control circuit being illustrated in bold lines.

FIG. 5 is a view similar to FIG. 4 and illustrates the control system in a condition provided by the failure of the other contact means of the electrical switch, the effective parts of the electrical circuit being indicated in bold lines.

While the various features of this invention are hereinafter described and illustrated as being particularly adapted to provide a control means for a fuel-burning apparatus, it is to be understood that the various features of this invention can be utilized singly or in any combination thereof to provide control means for other types of apparatus as desired.

Therefore, this invention is not to be limited to only the embodiment illustrated in the drawings, because the drawings are merely utilized to illustrate one of a wide variety of uses of this invention.

Referring now to FIG. 1, the improved fuel control system of this invention is generally indicated by the reference numeral **10** and comprises a main burner means **11** for a fuel-burning apparatus, the burner means **11** having its inlet side **12** interconnected to a fuel source conduit or manifold **13** by a conduit means **14**.

A first valve means **15** is provided in the conduit means **14** and comprises a valve seat **16** adapted to be opened and closed by a valve member **17** that has an armature **18** interconnected thereto and adapted to be influenced by a solenoid coil **19** and a holding coil or resistance **20** in a manner hereinafter described.

A second valve means **21** is disposed in the conduit means **14** and comprises a valve seat **22** adapted to be opened and closed by a valve member **23** carrying an armature **24** adapted to be influenced by a solenoid coil **25** in a manner hereinafter described, the second valve means **21** being disposed intermediate the first valve means **15** and the burner means **11**.

If desired, a pressure regulator means **56** can be provided in the conduit means **14** intermediate the valve means **15** and **21** so as to maintain a constant pressure of the fuel issuing to the burner means **11** when both valve means **15** and **21** are disposed in the open position as illustrated in FIG. **3** in a manner hereinafter described.

An electrical power source is provided and is indicated by terminal leads L^1 and L^2 adapted to be interconnected to leads **27** and **28** by a switch means **29** in a conventional manner. For example, when the switch means **29** is moved to the off position as illustrated in FIG. **1**, the power source L^1 and L^2 are disconnected respectively from the leads **27** and **28** and when the switch means **29** is moved to its on position as illustrated in FIG. **2** to initiate the operation of the control system **10** illustrated in FIG. **2**, the same interconnects the power source leads L^1 and L^2 to the respective leads **27** and **28** until the switch means **29** is moved to its off position by manually or timer operated means (not shown).

The lead **27** is interconnected by a lead **30** to one side **31** of the holding circuit means **20** for the first valve means **15** while the other side **32** of the holding circuit means **20** is interconnected by a lead **33** to one side **34** of the solenoid coil **19**. The other side **35** of the solenoid coil **19** for the first valve means **15** is interconnected by a lead **36** to the lead **28**.

The lead **28** is interconnected to one side **37** of an electrical ignition coil or resistance **38** while the other side **39** of the electrically operated ignition means **38** is interconnected by a lead **40** to a central contact means **41** of an electrical switch **42** of this invention.

The electrical switch **42** comprises a housing means **43** carrying the central and fixed contact means **41** and a pair of movable contact means **44** and **45** respectively disposed on opposite sides of the central fixed contact means **41** and normally being adapted to be disposed in engagement with the central contact means **41** through the natural resiliency of the movable contact means **44** and **45** as illustrated in FIG. **1**. However, an expansible and contractable power element means **46** is operatively disposed between the movable contact means **44** and **45** and has the interior thereof interconnected by suitable conduit means **47** to a flame-sensing bulb means **48** which when sensing an ignition condition of the electrically operated ignition means **38** and/or fuel-burning at the outlet end **49** of the main burner means **11** will cause expansion of the power element **46** to the position illustrated in FIG. **3** whereby the movable contact means **44** and **45** are respectively moved out of engagement with the central fixed contact means **41** of the switch means **42** for a purpose hereinafter described.

The movable contact means 44 of the switch means 42 is interconnected by a lead 50 to the lead 27 which is interconnected to one side 51 of the solenoid coil 25 the second valve means 21, the other side 52 of the solenoid coil 25 being interconnected by a lead 53 to the lead 40 intermediate the ignition means 38 and the central contact 41 of the switch means 42. The other movable contact 45 of the switch means 42 is interconnected by a lead 54 to the lead 33 intermediate the end 32 of the holding circuit means 20 and the solenoid coil 19 of the first valve means 15.

When the flame-sensing means 48 senses that the ignition means 38 is not at an ignition condition, and/or that no fuel is burning at the outlet end 49 of the burner means 11, the flame sensing means 48 causes the power element 46 to collapse to the condition illustrated in FIGS. 1 and 2 whereby the natural resiliency of the movable contact means 44 and 45 simultaneously places and maintains the contact means 44 and 45 into electrical contact with the central contact 41.

The operation of the fuel control system 10 and the electrical control means 26 of this invention will now be described.

With the switch means 29 disposed in its off position as illustrated in FIG. 1, it can be seen that the electrical circuit means 26 is not energized whereby both valve members 17 and 23 are disposed in their closed position so that no fuel can issue from the burner means 11 and since the ignition coil 38 is not energized, the flame sensing means 48 maintains the movable contacts 44 and 45 of the switch means 42 in their closed condition as illustrated in FIG. 1.

However, when the operator or the like initially moves the open switch means 29 to its closed position as illustrated in FIG. 2, the electrical circuit 26 is energized in the manner illustrated in bold lines in FIG. 2 whereby the closed movable contact means 44 and 45 effectively place the solenoid coil 19 of the first valve means 15 across the power source leads L^1 and L^2 to sufficiently energize the same so that the first valve member 17 is moved to the open position as illustrated in FIG. 2 while effectively shunting out the holding circuit means 20 so that the same is ineffective to hold the open valve member 17 in its opened position. Simultaneously with the energizing of the solenoid coil 19 to open the valve member 17 of the first valve means 15 which permits fuel to flow from the source 13 to the closed valve means 21, the closed contact means 44 and 45 of the switch means 42 effectively place the ignition coil 38 across the power source leads L^1 and L^2 to energize the ignition coil 38 while effectively shunting out the solenoid coil 25 of the second valve means 21 so that the same is ineffective and the valve means 21 remains in its closed position.

Thus, the control system 10 remains in the condition illustrated in FIG. 2 until the continuous energizing of the electrically operated ignition means 38 brings the temperature thereof up to an effective ignition temperature which is sensed by the flame means 48. At this time, the flame sensing means 48 causes the power element 46 to expand in the manner illustrated in FIG. 3 to move the movable contacts 44 and 45 simultaneously out of contact with the fixed central contact means 41 to now energize the electrically operated means 26 of this invention in the manner illustrated in bold lines in FIG. 3.

In particular and as illustrated in FIG. 3, when the ignition means 38 is at an ignition condition, the opening of the contact means 44 and 45 of the switch means 42 effectively places the solenoid coil 19 and the holding circuit means 20 in series across power source leads L^1 and L^2 whereby the holding circuit means 20 is now effective to maintain the valve member 17 of the first valve means 15 in its open position as long as the control means 26 is in the condition illustrated in FIG. 3. Simultaneously, the opening of the movable contacts 44 and 45 of the switch means 42 effectively places the solenoid coil 25 of the second valve means 21 and the ignition means 38 in series across the power source leads L^1 and L^2 so that the solenoid coil 25 is energized sufficiently to move the valve member 23 to its open position as illustrated in FIG. 3 so that fuel can now issue from the main burner means 11 and be ignited by the ignition means 38.

As long as fuel is issuing from the burner means 11 and remains in a burning condition, the flame sensing means 48 maintains the movable contacts 44 and 45 in the open condition as illustrated in FIG. 3 so that the control system 10 remains in the condition illustrated in FIG. 3 until the operator, timer or the like moves the switch means 29 from its on or closed position of FIG. 3 back to the off or open position of FIG. 1 to deenergize the electrical circuit 26 so that the valve members 17 and 23 will move back to their closed condition to terminate the supply of fuel to the burner means 11.

If during the operation of the control system 10 as illustrated in FIG. 3, there should be a temporary power failure in the power source L^1 and L^2 so as to temporarily deenergize the electrical system 26 so that both valve members 17 and 23 would move to their closed position to interrupt the flow of fuel to the burner means 11 so that the flame at the burner means 11 would go out and then the interrupted power source L_1 and L^2 would be turned back on before the flame sensing means 48 has cooled sufficiently to cause the movable contact means 44 and 45 to move back to their closed position against the central fixed contact means 41, the reactivated power source L^1 and L^2 cannot cause reopening of the first valve means 15 because with the contact means 44 and 45 still in their open position as illustrated in FIG. 3, the solenoid coil 19 and holding circuit means 20 are still in series across the power source leads L^1 and L^2 and because of the voltage drop through the series hold circuit means 20, the solenoid coil 19 cannot be energized sufficiently to move the closed valve member 17 to its opened position.

Thus, it can be seen that upon any temporary power interruption, reignition of fuel control system 10 cannot occur until the flame sensing means 48 has caused the switch means 42 to return to its cold condition wherein the movable contact means 44 and 45 are placed into electrical contact with the fixed contact means 41 and the ignition means 38 is again energized in the manner previously described to ignition condition to cause the movable contact means 44 and 45 of the switch means 42 to again open as illustrated in FIG. 3.

Also, if during the initial startup of the control means 10 of this invention, the contact means 44 and 45 fail to move away from the fixed contact means 41 for any reason, such as by both the contact means 44 and 45 being welded to the fixed contact means 41, even though the ignition means 38 has been heated to ignition condition as illustrated in FIG. 2, the solenoid coil 25 remains shunted so as not to be effectively placed across the power source leads L^1 and L^2 whereby the second valve means 21 will remain in its closed position and the main burner means 11 cannot be operated.

Conversely, if at the startup time of the control system 10, the movable contact means 44 and 45 should be in an opened condition away from the fixed contact means 41, such as is illustrated in FIG. 3, except that the valve means 15 and 21 are initially in their closed condition when the switch means 29 is moved to its closed condition, the voltage drop across the series resistor or holding circuit means 20 prevents the solenoid coil 19 from being energized sufficiently to open the valve member 17 from the valve seat 16 so that no fuel can issue to the burner means 11.

Also, if during startup of the control system 10 the movable contact means 45 should be welded to the fixed contact means 41 so that only the movable contact means 44 can be moved to its open position when the sensing means 48 senses an ignition condition of the ignition means 38 or the movable contact means 44 should remain in its open condition as illustrated in FIG. 4, the low resistance of the ignition means 38 will be in parallel with the solenoid coil 19 of the first valve means 15 and causes a large voltage drop across the solenoid coil 19 and holding circuit means 20 so as to prevent the solenoid coil 19 from being energized sufficiently to open the valve member 17 away from the valve seat 16 so that no fuel can issue from the main burner means 11. In addition, such large voltage drop prevents the ignition coil 38 from heating sufficiently to rise to ignition temperature.

Conversely, should the movable contact means **44** be welded to the fixed contact means **41** or the other movable contact means **45** remain in its open condition for any reason, the solenoid coil **19** being in series with the holding circuit **20** as illustrated in FIG. **5** prevents sufficient energizing of the solenoid coil **19** to move the valve member **17** from its closed position to its open position. In addition, the electrical switch means **42** is effectively shunting the solenoid coil **25** of the second valve means **21** from the power source leads L^1 and L2 so that the second valve means **21** also remains in its closed condition.

Also, it can be seen that the unique arrangement of the movable contact means **45** and **44** being respectively disposed on opposite sides of the fixed contact means completely prevents the movable contact means **44** and **45** from staying closed together without involving the fixed center contact means **41**.

Should the ignition means **38** fail for some reason, it can be seen that during startup of the control system **10**, the failure of the ignition means **38** when being initially energized in a manner illustrated in FIG. **2** will not cause the sensing means **48** to move the contact means **44** and **45** of the switch means **42** away from the fixed contact means **41** so that the switch means **42** remains in the condition of FIG. **2** and maintains the shunt across the solenoid coil **25** so as to prevent opening of the valve means **21**.

Also, should the holding circuit **20** for the first valve means **15** fail for any reason, the valve member **17** of the first valve means **15** will move to its closed position because the series relationship of the solenoid coil **19** and holding circuit means **20** will be broken across the power source leads L^1 and L^2.

Therefore, it can be seen that the control system **10** and electrical means **26** of this invention are so constructed and arranged that the same provice substantially failproof operation in the above manner.

While the ignition means **38** of the control system **10** of this invention can be formed in any suitable manner, the same can be a ceramic glow bar, glow coil, or other such igniter having a low resistance operable at line voltage for accomplishing the above function. Similarly, the flame sensing electrical switch means **42**, **48** of this invention can be formed in any suitable manner to be sensitive to radiant heat and also be ambient compensated so as to have a break-break contact arrangement upon temperature rise.

Accordingly, it can be seen that this invention not only provides an improved fuel control system for a fuel burning apparatus or the like, but also this invention provides an improved electrically operated control means for such a system as well as an improved electrical switch means for such a fuel control system or the like.

What is claimed is:

1. In a fuel control system having a source of fuel adapted to be interconnected by conduit means to a burner means, the improvement comprising a first valve means in said conduit means for controlling fuel flow therethrough, a second valve means in said conduit means for controlling fuel flow therethrough and being disposed intermediate said first valve means and said burner means, and electrically operated means operatively interconnected to said valve means so that when said electrically operated means is initially energized the same initially opens said first valve means while maintaining said second valve means in its closed position to prevent fuel flow to said burner means, said electrically operated means having electrically operated ignition means which when subsequently energized to ignition condition causes opening of said second valve means while holding said first valve means in its opened position whereby said ignition means ignites fuel issuing from said burner means said electrically operated means having a solenoid coil for operating said first valve means and a holding circuit for maintaining said first valve means in its opened position after said coil has been energized to open said first valve means, said electrically operated means only effectively operating said holding circuit for maintaining said first valve means in its opened position after said ignition means is energized to ignition condition.

2. In a fuel control system as set forth in claim **1**, said electrically operated means having an electrical power source and having switch means placing said coil across said power source when said electrically operated means is initially energized to cause opening of said first valve means.

3. In a fuel control system as set forth in claim **2**, said switch means effectively shunting out said holding circuit from said power source when said switch means places said coil across said power source and before said ignition means is energized to ignition condition.

4. In a fuel control system as set forth in claim **2**, said switch means being adapted to place said coil and said holding circuit in series across said power source when said ignition means is subsequently energized to ignition condition.

5. In a fuel control system as set forth in claim **4**, said holding circuit when placed in series with said coil across said power source being energized to a condition to maintain said first valve in its open condition.

6. In a fuel control system as set forth in claim **1**, said electrically operated means having a solenoid coil for operating said second valve means.

7. In a fuel control system as set forth in claim **6**, said electrically operated means having an electrical power source and having switch means placing said ignition means across said power source when said electrically operated means is initially energized to cause opening of said first valve means whereby said ignition means is energized.

8. In a fuel control system as set forth in claim **7**, said switch means effectively shunting out said coil from said power source when said switch means places said ignition means across said power source whereby said coil is ineffective for opening said second valve means.

9. In a fuel control system as set forth in claim **7**, said switch means being adapted to place said coil and said ignition means in series across said power source when said ignition means is subsequently energized to ignition condition.

10. In a fuel control system as set forth in claim **9**, said coil when placed in series with said ignition means across said power source being energized to a condition to open said second valve means.

11. In a fuel control system having a source of fuel adapted to be interconnected by conduit means to a burner means, the improvement comprising a first valve means in said conduit means for controlling fuel flow therethrough, a second valve means in said conduit means for controlling fuel flow therethrough and being disposed intermediate said first valve means and said burner means, and electrically operated means operatively interconnected to said valve means so that when said electrically operated means is initially energized the same initially opens said first valve means while maintaining said second valve means in its closed position to prevent fuel flow to said burner means, said electrically operated means having electrically operated ignition means which when subsequently energized to ignition condition causes opening of said second valve means while holding said first valve means in its opened position whereby said ignition means ignites fuel issuing from said burner means, said electrically operated means having an electrical power source and having switch means, said electrically operated means having a first solenoid coil for operating said first valve means and having a holding circuit for maintaining said first valve means in its opened position after said first coil has been energized to open said first valve means, said electrically operated means having a second solenoid coil for operating said second valve means, said switch means having means for sensing an ignition condition of said ignition means, said switch means when sensing a nonignition condition of said ignition means and when said electrically operated means is initially energized placing said first coil across said power source to cause opening of said first valve means while simultaneously placing said ignition means across said power source to energize said ignition means and effectively shunting

out said holding circuit and said second coil so that said second valve means remains closed.

12. In a fuel control system having a source of fuel adapted to be interconnected by conduit means to a burner means, the improvement comprising a first valve means in said conduit means for controlling fuel flow therethrough, a second valve means in said conduit means for controlling fuel flow therethrough and being disposed intermediate said first valve means and said burner means, and electrically operated means operatively interconnected to said valve means so that when said electrically operated means is initially energized the same initially opens said first valve means while maintaining said second valve means in its closed position to prevent fuel flow to said burner means, said electrically operated means having electrically operated ignition means which when subsequently energized to ignition condition causes opening of said second valve means while holding said first valve means in its opened position whereby said ignition means ignites fuel issuing from said burner means, said electrically operated means having an electrical power source and having switch means, said electrically operated means having a first solenoid coil for operating said first valve means and having a holding circuit for maintaining said first valve means in its opened position after said first coil has been energized to open said first valve means, said electrically operated means having a second solenoid coil for operating said second valve means, said switch means having means for sensing an ignition condition of said ignition means, said switch means when sensing a nonignition condition of said ignition means and when said electrically operated means is initially energized placing said first coil across said power source to cause opening of said first valve means while simultaneously placing said ignition means across said power source to energize said ignition means and effectively shunting out said holding circuit and said second coil so that said second valve means remains closed, said switch means thereafter when sensing an ignition condition of said ignition means placing said first coil and said holding circuit in series across said power source so that said holding circuit maintains said first valve means in its open position while simultaneously placing said ignition means and said second coil in series across said power source to cause opening of said second valve means so that fuel can issue from said burner means and be ignited by said ignition means.

13. In a fuel control system as set forth in claim 12, said switch means having a fixed contact means electrically interconnected to one side of said second coil and to one side of said ignition means, the other side of said second coil being electrically interconnected to one lead of said power source and the other side of said ignition means being electrically interconnected to the other lead of said power source, said holding circuit having one side thereof electrically interconnected to said one power source lead and the other side thereof electrically interconnected to one side of said first coil, the other side of said first coil being electrically interconnected to said other power source lead, said switch means having a pair of movable contact means respectively cooperable with said fixed contact means, one of said movable contact means being electrically interconnected to said one power source lead and the other movable contact means being electrically interconnected between said other side of said holding circuit and said one side of said first coil.

14. In a fuel control system as set forth in claim 13, said fixed contact means of said switch means being a central contact means and said movable contact means respectively being disposed on opposite sides of said central contact means.

15. An electrical control system for a fuel burning apparatus or the like comprising a first solenoid coil for operating a first valve means, a second solenoid coil for operating a second valve means, and electrically operated means operatively interconnected to said coils so that when said electrically operated means is initially energized the same initially energized said first coil for opening said first valve means while maintaining said second coil in a condition to prevent opening of said second valve means, said electrically operated means having electrically operated ignition means which when subsequently energized to ignition condition is adapted to cause energizing of said second coil to open said second valve means while holding said first valve means in its opened position said electrical operated means having a holding circuit for maintaining said first valve means in its open position after said first coil has been energized to open said first valve means, said electrically operated means only effectively operating said holding circuit by placing said holding circuit and said first coil in electrical series for maintaining said first valve means in its open position after said ignition means is energized to ignition condition.

16. An electrical control system as set forth in claim 15, said electrically operated means having a pair of power source leads and having switch means for placing said first coil across said power source leads when said electrically operated means is initially energized to cause opening of said first valve means.

17. An electrical control system as set forth in claim 16, said switch means being adapted to effectively shunt out said holding circuit from said power leads when said switch means places said first coil across said power source leads and before said ignition means is energized to ignition condition.

18. An electrical control system as set forth in claim 16, said switch means being adapted to place said first coil and said holding circuit in series across said power source leads when said ignition means is subsequently energized to ignition condition.

19. An electrical control system as set forth in claim 18, said holding circuit when placed in series with said first coil across said power source leads by said switch means being adapted to be energized to a condition to maintain said first valve means in its opened condition.

20. An electrical control system as set forth in claim 15, said electrically operated means having a pair of power source leads and having switch means adapted to place said ignition means across said power source leads when said electrical operated means is initially energized to cause opening of said first valve means whereby said ignition means is adapted to be energized.

21. An electrical control system as set forth in claim 20, said switch means being effective to shunt out said second coil from said power leads when said switch means places said ignition means across said power source whereby said second coil is ineffective for opening said second valve means.

22. An electrical control system as set forth in claim 20, said switch means being adapted to place said second coil and said ignition means in series across said power source leads when said ignition means is subsequently energized to ignition condition.

23. An electrical control system as set forth in claim 22, said second coil when placed in series with said ignition means across said power source leads by said switch means being adapted to be energized to a condition to open said second valve means.

24. An electrical control system for a fuel burning apparatus or the like comprising a first solenoid coil for operating a first valve means, a second solenoid coil for operating a second valve means, and electrically operated means operatively interconnected to said coils so that when said electrically operated means is initially energized the same initially energizes said first coil for opening said first valve means while maintaining said second coil in a condition to prevent opening of said second valve means, said electrically operated means having electrically operated ignition means which when subsequently energized to ignition condition is adapted to cause energizing of said second coil to open said second valve means while holding said first valve means in its opened position, said electrically operated means having a pair of power source leads and having switch means, said electrically operated means having a holding circuit for maintaining said first valve means in its open position after said first coil has been energized to open said first valve means, said switch means having

means for sensing an ignition condition of said ignition means, said switch means when sensing a nonignition condition of said ignition means and when said electrically operated means is initially energized placing said first coil across said power source leads to be adapted to cause opening of said first valve means while simultaneously placing said ignition means across said power source leads to be adapted to energize said ignition means and effectively shunt out said holding circuit and said second coil from said power source leads so that said second valve means would remain closed.

25. An electrical control system as set forth in claim **24**, said switch means thereafter and when sensing an ignition condition of said ignition means being adapted to place said first coil and said holding circuit in series across said power source leads so that said holding circuit is adapted to maintain said first valve means in its open position while simultaneously placing said ignition means and said second coil in series across said power source leads to cause opening of said second valve means so that fuel can be ignited by said ignition means.

26. An electrical control system as set forth in claim **25**, said switch means having a fixed contact means electrically interconnected to one side of said second coil and to one side of said ignition means, the other side of said second coil being electrically interconnected to one power source lead and the other side of said ignition means being electrically interconnected to the other power source lead, said holding circuit having one side thereof electrically interconnected to said one power source lead and the other side thereof electrically interconnected to one side of said first coil, the other side of said first coil being electrically interconnected to said other power source lead, said switch means having a pair of movable contact means respectively cooperable with said fixed contact means, one of said movable contact means being electrically interconnected to said one power source lead and the other movable contact means being electrically interconnected between said other side of said holding circuit and said one side of said first coil.

27. An electrical control system as set forth in claim **26**, said fixed contact means of said switch means being a central contact means and said movable contact means respectively being disposed on opposite sides of said central contact means.

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