Aug. 14, 1956 A. F. HUBBARD 2,758,640

HEATER CONTROL MANIFOLD

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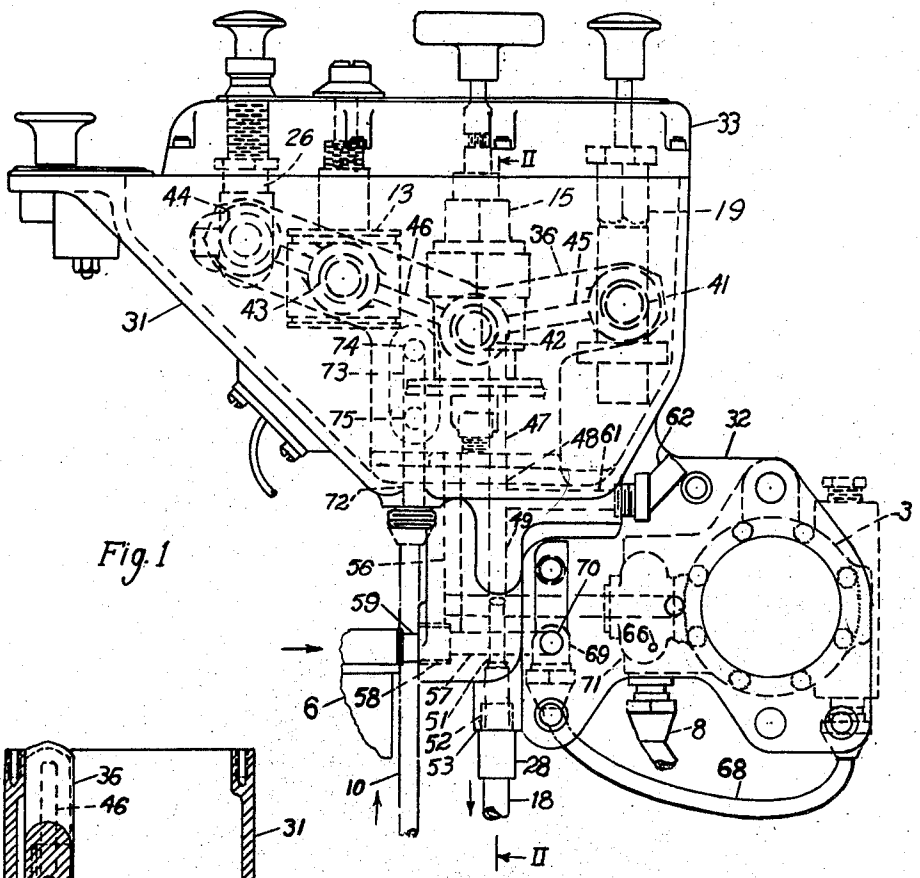


Fig. 1

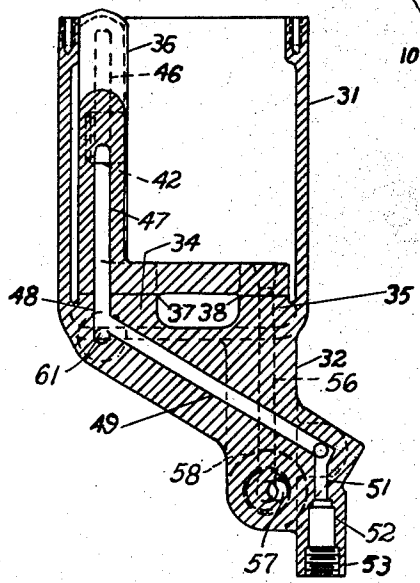


Fig. 2

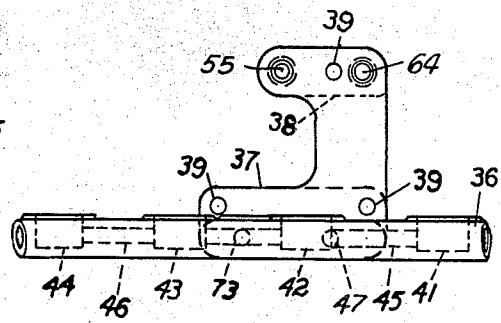


Fig. 3

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Fig. 4

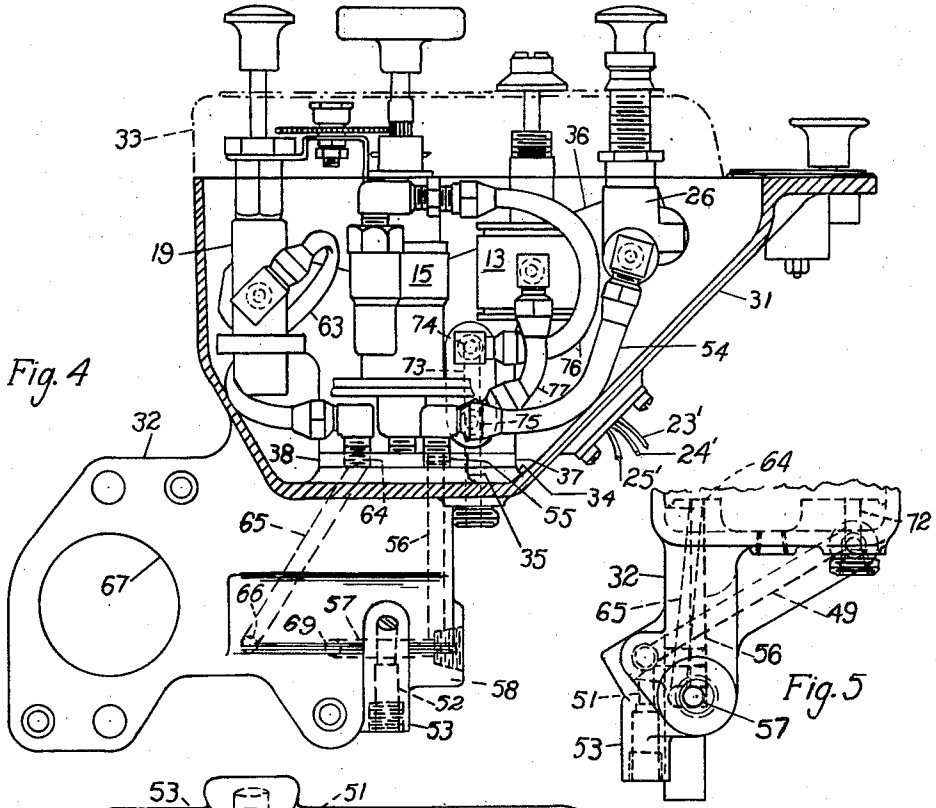


Fig. 5

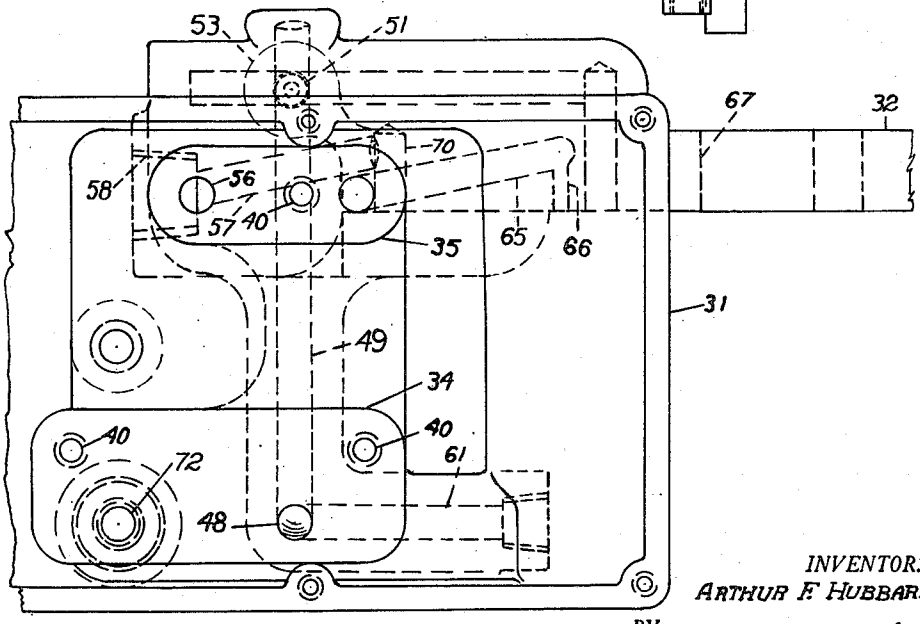


Fig. 6

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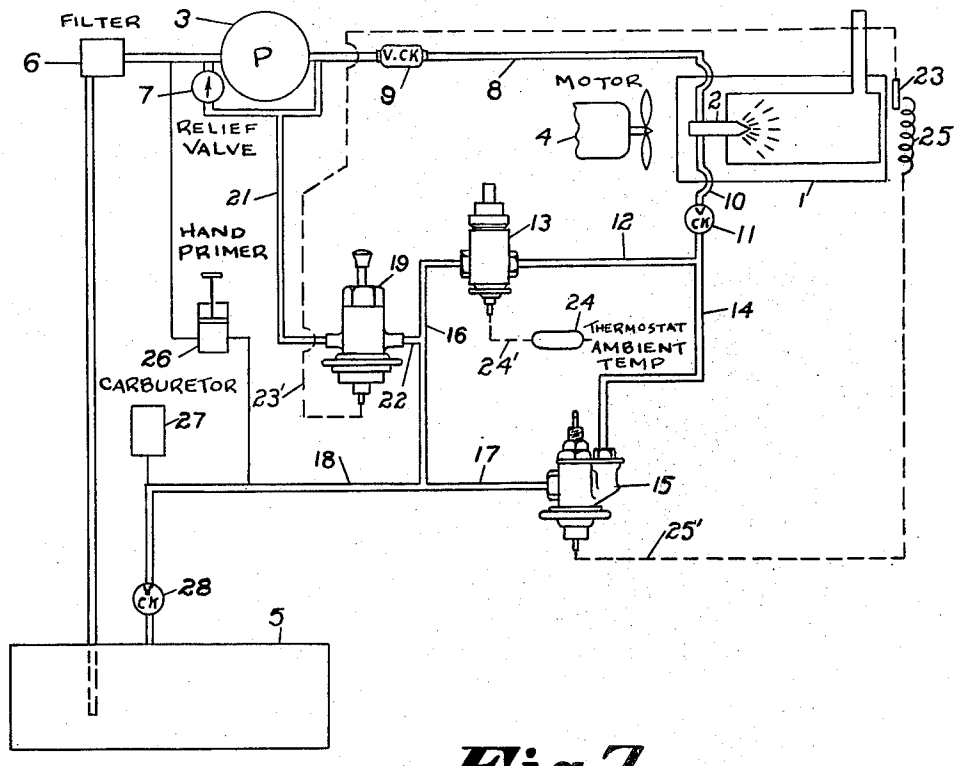


Fig. 7

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United States Patent Office 2,758,640 Patented Aug. 14, 1956

2,758,640

HEATER CONTROL MANIFOLD

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Application September 19, 1952, Serial No. 310,482

4 Claims. (Cl. 158—36.3)

This invention relates to air heaters, and relates in particular to a control unit for such heaters.

In my application, Serial No. 276,664, filed March 14, 1952 for Heater Control System I show and claim a fuel control system for a heater. The present invention is for an improvement involving a compact unit for supporting and housing the control members in such a system.

Heaters of this type frequently are employed in arctic climates and for emergency situations in military operations, and should a heater get out of order, the cold weather may preclude repairing the heater at its site while the emergency situation may not allow time for removal of the heater to indoors and its repair there. For these reasons, it is desirable to have the parts which are liable to get out of order in a readily detachable unit so that the unit can be replaced quickly by an operative unit, thus allowing time to repair the defective unit.

The present invention relates to a control unit for such a heater which is arranged in a compact manner so as to require only a small number of pipe connections for connecting it into the fuel system.

The invention will be described in greater detail in the following specification taken in connection with the accompanying drawing illustrating a preferred embodiment of the invention by way of example, and wherein:

Figure 1 is a side elevation of the invention;

Figure 2 is a section taken on line II—II of Figure 1;

Figure 3 is a plan view of the return manifold member;

Figure 4 is a fragmentary sectional obverse view of Figure 1;

Figure 5 is a fragmentary end elevation;

Figure 6 is a fragmentary plan view of Figure 1 with the cover and manifold removed; and

Figure 7 is a diagrammatic view showing the control connections.

Referring to the drawing, Figure 7 illustrates diagrammatically an air heater 1 operated by a fluid fuel burner 2 to which the present invention is applied. When pump 3 and motor 4, which drives the pump, are operating, fuel is drawn from tank 5 through filter 6 to the pump. The pump incorporates a relief valve bypass 7 between the pump outlet and inlet that opens at a predetermined outlet pressure so as to maintain a substantially constant outlet pressure. A conduit 8 having a check valve 9 therein supplies fuel to the burner 2, which is of the bypass type, and the burner bypass return line 10 has a check valve 11 therein. This return line has a branch 12 passing to an atmospheric-temperature-pressure throttle valve 13 and a branch 14 passing to a modulating valve 15. These valves have outlet conduits 16, 17 joining a conduit 18 returning to the tank 5. A third, open or shut valve 19 has its inlet connected by a pipe 21 to the pump outlet, and its outlet connects by a pipe 22 to pipe 16. A temperature responsive bulb 23 at the heated air outlet is connected by a capillary tube 23' to valve 19 and opens this valve if the air overheats, to bypass

fuel through pipe 21, valve 19 and pipes 22, 16 and 18, to shut off flow of fuel to the burner. This valve must be manually closed to restore flow to the burner. A temperature responsive element 24 connected by a capillary tube 24' to the valve 13 modulates this valve in accordance with atmospheric temperature, and a manual adjustment varies the valve inversely to atmospheric pressure. The valve 15 remains closed until a predetermined air temperature at the heater is reached and then the temperature responsive element 25 connected to the valve by a capillary tube 25' regulates the valve 15 to keep the temperature of the heated air within desired limits. If desired, a manually operated primer pump 26 is provided to supply fuel to the engine carburetor 27 to start the engine 4, and check valve 28 in the return line assures flow to the carburetor. Motor 4 may be an internal combustion engine, or an electric motor. The mounting of these control members now will be described.

A housing 31 is provided in the form of a hollow casting or base member having an integral bottom web 32 and a removable cover 33. The bottom of the housing has raised pads 34 and 35 (Fig. 6) which have their upper surfaces smoothly finished. A manifold member 36 has a base providing pads 37 and 38 having bottom surfaces machined smooth, and the manifold member is detachably held with the smooth surfaces of pads 37, 38 engaging the surfaces of pads 34, 35 respectively by means of suitable clamping screws in holes 39 threaded into holes 40 in the base. The manifold member has a plurality of threaded sockets 41, 42, 43, and 44, four being shown, and sloping bores or passages 45, 46 connect the four sockets with passage 47. Passage 47 terminates in a port in the surface of pad 37 which registers with a port in pad 34 forming one end of a passage 48 in the base, which in turn joins the diagonal passage 49 that connects with vertical passage 51 terminating in screw threaded socket 52 in a boss 53 on the web. A tube 18 (Figs. 1 and 7) having a spring loaded check valve 28 therein, connects passage 49 back to the fuel tank.

The manifold sockets receive the discharge or down stream ends of the control members which comprise the manually operated primer pump 26 connected to socket 44, the atmospheric pressure regulated throttle valve 13 connected to socket 43, the thermostat operated regulator valve 15 connected to socket 42, and the open or shut control valve 19 connected to socket 41, these members being connected to the sockets in the manifold by suitable pipe unions. The construction and operation of these members is explained in my copending application referred to above. Thus all the control members are connected to the common return passage 47 in the manifold member, and the single tube 18 returns the flow from all the control members back to the tank.

The inlet of the hand operated primer pump has connected thereto a tube 54 connected to a socket 55 in pad 38. This socket connects to vertical bore 56 in the web and base, and in turn connects with horizontal bore 57 connected to socket 58. A pipe 59, which may include the filter 6 leads to the fuel tank. When primer 26 is operated it draws fuel from pipe 59 by passages 56 and tube 54; and the primer discharges into passages 46, 47 and 48, and a bore 61 connected to bore 48 receives a fitting 62 connected by a tube (not shown) to the carburetor of the engine. The check valve 28 provides a sufficient back pressure to insure flow of fuel to the carburetor when the primer pump is operated.

The inlet of control valve 19 has a tube 63 coupled thereto from a socket 64 in pad 38. This socket connects with a sloping bore 65 in the base, that connects with cross bore 66 terminating in the side of the web. The motor operated fuel pump 3, shown in dotted lines in

Figure 1, is attached to the web **32** and is driven by a shaft extending through hole **67** in the web. A tube **68** is connected from the pump inlet to a hollow fitting **69** bolted to the web. This fitting **69** communicates with a transverse passage **70** which in turn connects to diagonal passage **57** that ends in socket **58** for supplying fuel to the pump from the tank. Thus passage **57** serves the dual purpose of supplying fuel to the hand primer pump **26** and to the motor operated pump **3**. The pump includes a spring seated pressure limiting valve in bypass **7** (Fig. 7) so as to maintain a substantially constant outlet pressure. A branch of the bypass from the pump, is provided in the base, by passage **66** (corresponding to conduit **21**) and connects with passage **65**, leading to socket **64** to which tube **63** is coupled. Thus, the bypass pressure from the motor is transmitted to member **19**. The tube **8** connected to the outlet fitting **71** of the pump supplies fuel to the burner **2**, and a tube **10** having the check valve **11** therein returns bypass flow from the burner to vertical passage **72**. Passage **72** connects with a short vertical passage **73** in the manifold member, and sockets **74** and **75** are provided in the manifold member connecting with passage **73**. A tube **76** connected to upper socket **74** connects with the inlet side of regulator valve **15**, and a tube **77** connected to lower socket **75** connects to the inlet of atmospheric throttle valve **13**. The capillary tubes to control these members extend through an opening in the housing as seen in Figure 4.

From the above description it will be seen that the control members are all mounted upon a single return manifold which is detachably secured in the housing. These control members can be removed with the return manifold as a unit without disconnecting any external piping or the entire housing can be removed with the pump, return manifold and control members as a unit.

I claim as my invention:

1. A panel for a fuel burner control apparatus comprising: a base member forming a housing and having a machined sealing surface in said housing, said surface having at least two ports therein: a manifold member having a cooperating sealing surface with ports therein registering with the ports in the sealing surface of the base member; means for detachably securing the manifold member and base member together with the respective ports in registry; said manifold member having a body providing a plurality of sockets adapted to couple to fluid conduit extensions of a plurality of fluid control elements; passageways within said manifold member connecting with said sockets and one of the ports in said manifold member; said other port in the manifold member being formed adjacent one end for connection to a tubular conduit.

2. A panel as specified in claim 1 wherein: said other port is one of a plurality of ports in said manifold member, in addition to said one port; said manifold member having separate short passageways, one for each of said plurality of ports, connected thereto at one end and formed at the other end for connection, each to a tubular conduit; and said base member has a corresponding number of ports in the base sealing surface registering with the ports in the sealing surface of the manifold member.

3. A panel as specified in claim 2 in combination with: a plurality of fluid control elements connected to said sockets in said manifold member, and conduits extending from said elements connected to those short passageways in the manifold member formed for connection to a tubular conduit, whereby, said manifold member and control elements are removable as a unit from said base member.

4. A panel as specified in claim 2 wherein: the base member includes an additional sealing surface adapted to receive a pump, with a port in said additional surface adapted to connect to the pump outlet, and wherein said base member has a passage from said latter port connecting to one of said plurality of ports in the base member.

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