June 2, 1970 A. B. SCHEU ET AL 3,515,121

PIPELINE CONVERSION DEVICE FOR FIELD HEATERS

Filed June 17, 1968

FIG. 1.

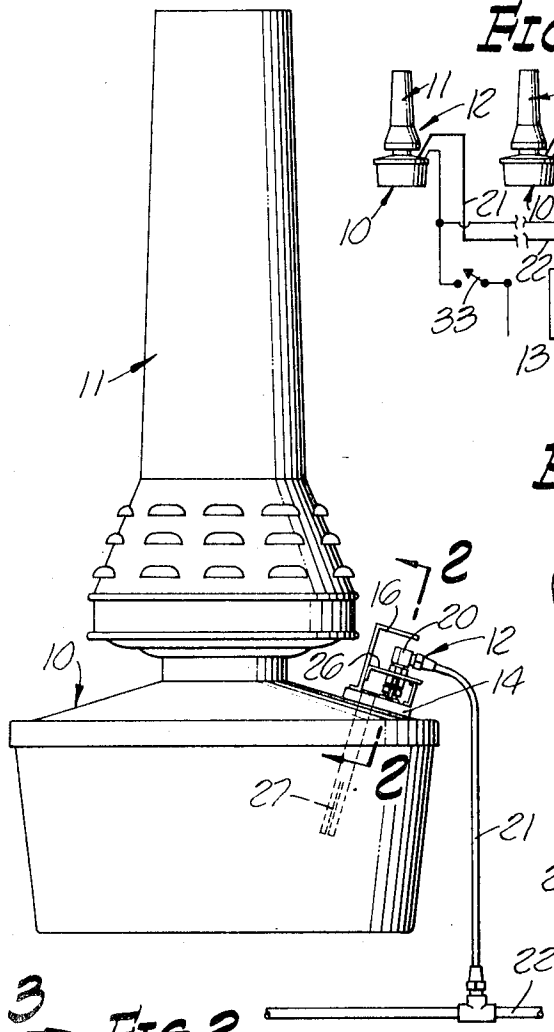


FIG. 6.

FIG. 3.

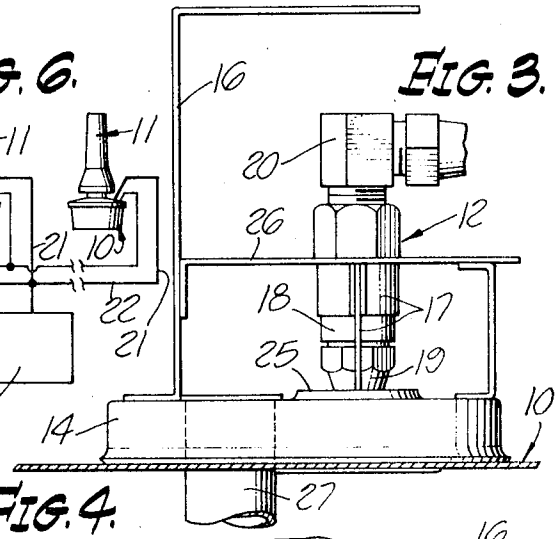


FIG. 4.

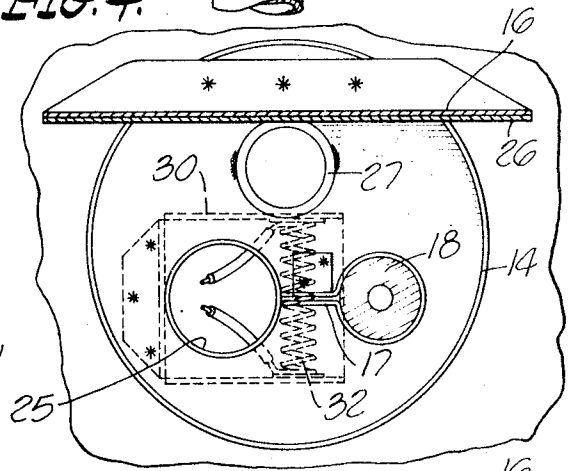
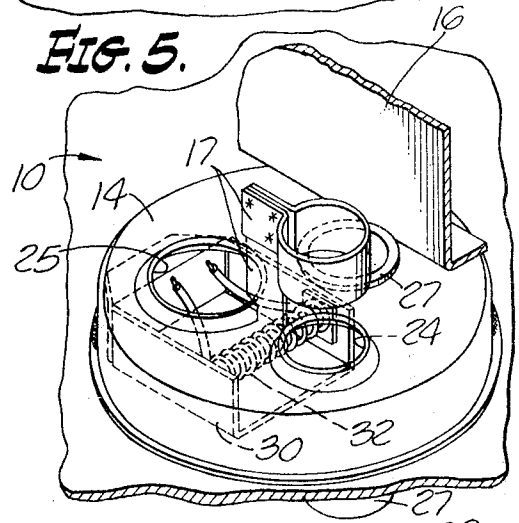
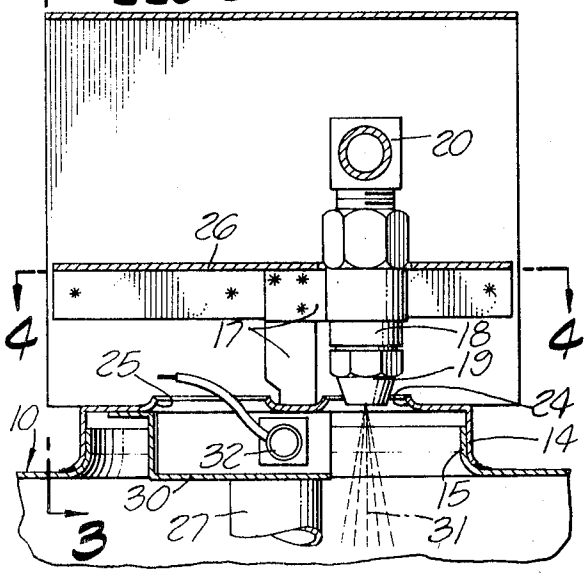


FIG. 5.



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FIG. 2.



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PIPELINE CONVERSION DEVICE FOR FIELD HEATERS

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U.S. Cl. 126—59.5 10 Claims

ABSTRACT OF THE DISCLOSURE

A conversion device and system for converting existing field heaters to centrally fueled heaters. A nozzle assembly is provided which is attached at the filler opening of a field heater. The nozzle assembly includes a spray nozzle and draft deflector arrangement therefor. The assembly may include an igniter for enabling ignition of the fuel automatically.

This invention relates to field heaters of the pot-type, and more particularly to a relatively simple nozzle assembly for use with such heaters for converting the same to a centrally fueled system.

Protection against frost damage is important with many crops. For years, smokeless pot-type field heaters have been used in orchards and the like for protection. Such heaters are separate and spaced units and require individual fueling and ignition. Several systems whereby heating units may be fueled from a central location have been devised; however, such systems have several disadvantages including the need for a high pressure fuel supply along with inefficient combustion in the heating units.

It is accordingly an object of the present invention to provide a novel conversion device for field heaters.

It is another object of this invention to provide an improved field heater system.

A further object of this invention is to provide a field heater system which is relatively inexpensive and reliable.

An additional object of this invention is to provide a field heating system which can be completely controlled from a central location.

These and other objects and features of the present invention will become better understood through a consideration of the following description taken with the drawing in which:

FIG. 1 is an elevational view of a typical field heater having a nozzle assembly according to the present invention mounted thereon;

FIG. 2 is a cross-sectional view of the nozzle assembly taken along a line 2—2 of FIG. 1;

FIG. 3 is a cross-sectional view of the nozzle assembly taken along a line 3—3 of FIG. 2;

FIG. 4 is a cross-sectional elevational view taken along a line 4—4 of FIG. 2;

FIG. 5 is a partial perspective view of the nozzle assembly; and

FIG. 6 is a diagram of a heater system.

According to the concepts of the present invention, a nozzle assembly is provided for existing field heaters for converting such heaters to a centrally controlled system. This enables a substantial reduction, and virtual elimination, of the labor necessary to fuel and/or ignite and control the heaters. With the present system, the fuel supply may be varied over a wide range, and the heaters can be ignited in a relatively simple manner, or remotely if desired, and extinguished from a central location. The present nozzle assembly and system may be constructed relatively inexpensively, and are reliable over long periods

of time even when exposed to the elements. The assembly and system are essentially immune to the effects of sunlight, overheating, weathering, weed growth, animals and insects. The nozzle assembly is easily mounted at the filler cap opening of a conventional field heater, and a fuel line is connected from each nozzle assembly to a fuel trunk line which is in turn connected to a central fuel supply. In this manner, refueling, regulation and extinguishing of each heater can be accomplished from a central location. Each nozzle assembly further may include igniting means which enables the heaters to be ignited from a remote location. The particular construction of the nozzle assembly provides for efficient combustion while preventing the fuel nozzle thereof from excessive heating, and is constructed and arranged in a manner to obviate the effects of water and moisture thereon, such as freezing which may clog the nozzle. Of particular significance, is the provision of a low pressure fueling and combustion system to minimize not only the loss of fuel but the danger occasioned thereby.

Turning now to the drawing, FIG. 1 illustrates a conventional pot-type field heater having a bowl **10** and stack **11**, and a nozzle assembly **12** mounted thereon. A field heater of this nature usually includes a supply of oil within the bowl **10**, and a primary fire exists on the surface of the oil which provides gas to an upper combustion chamber thereby providing complete combustion. Heat is provided by radiation from the heater. Typical heaters of this nature must be individually filled, regulated, and turned off. They must be opened for lighting.

According to the concepts of the present invention, the nozzle assembly **12** is mounted at the conventional filler opening of the field heater, the nozzle assembly being connected to a central fuel supply. The nozzle assembly **12** includes an adapter or conversion cap **14** which mounts at a filler opening **15** (FIG. 2) on the heater bowl **10**. A heat shield **16** is secured to the cap **14**. A bracket **17** is secured to the cap **14** and receives an adapter body **18** into which a conventional furnace type spray nozzle tip **19** is fitted. The body **18** and tip **19** may be conventional Delevan components. An elbow fitting **20** is coupled to the adapter body **18** and enables the nozzle assembly to be coupled to a fuel line **21**. The fuel line **21** is connected to a fuel trunk line **22** which in turn is connected to a pressurized oil supply source **13** (FIG. 6) situated remotely from the heater. As diagrammatically illustrated in FIG. 6, the nozzle assemblies of a number of heaters may be coupled with the trunk line **22**. Although not shown, a conventional control valve pressure regulator, pump, reservoir and the like are provided at the oil supply source **13**.

The adapter cap **14** includes an opening **24** for the nozzle **19**. The nozzle may be positioned within or above the hole **24**, or the end of the nozzle may be flush therewith. The cap also includes an air draft hole **25**. Both of the holes **24** and **25** include upturned lips as best seen in FIG. 2 to prevent water from running into the bowl **10** of the heater. A water shield **26** also may be provided if desired to keep water out of the bowl. A down draft tube **27** is affixed to and extends through the cap **14** for purposes which will be described subsequently.

A draft deflector **30** is secured to the underside of the cap **14** to provide an air passageway for allowing air to be blown across the oil spray **31** emanating from the nozzle **19**. This deflector is essentially closed on three sides and provides a passageway from the opening **25** in the cap **14** to the vicinity of the oil spray **31**.

With the exception of the nozzle **19**, adapter **18** and fitting **20**, the above-described components of the nozzle assembly **12** may be fabricated from sheet metal and

secured together in any suitable manner, such as by spot welding. A coil **32** of resistance wire, such as Nichrome wire, may be mounted in, and insulated from the draft deflector **30** to enable remote ignition of the spray from the nozzle. The coil **32** is coupled through a switch **33** to a source of current (not shown). If the fuel line system is metal, it may be used as one conductor for the coil **32**.

The heater is started by supplying oil thereto from the supply source. When the oil spray **31** (FIG. 2) commences, a small amount of oil vapor impinges on the draft deflector **30**, and some vapor drifts at low speed toward the air draft hole **25** and out through this hole. The heater can then be lit easily by a match or torch at the air draft hole **25**, or by supplying current to the heater coil **32**. When the flame catches, the air flow reverses almost instantaneously, and air is pulled into the air draft hole **25** and toward the spray **31** thereby cooling this region of the nozzle assembly. This cooling action prevents excess heat from the vicinity of the nozzle **19**, and air flow also occurs through the hole **21** about the nozzle **19**, the air flow helping to cool the nozzle **19** thereby preventing cracking of the oil in the nozzle. Cracking of the oil would cause undesirable deposits to be formed. The air flow also cools the coil **32** and increases the life thereof. The shield **16** prevents heat radiated from the body of the heater from impinging on the nozzle. The air passing through the hole **25** and the deflector **30** also blows across the oil spray **31** thereby stabilizing the flame and attaching it to the edge of the deflector. This air movement further imparts a swirling action to the gases in the bowl **10**.

Generally, the down draft tube **27** is used, but it is not necessary with all field heaters. This tube is used to ensure that all oil within the bowl is consumed in cases where a good draft is not available in the heater. Essentially, the down draft tube supplies more air to the interior of the bowl, and ensures that any unburned oil collecting in the bottom of the bowl is burned. The down draft tube preferably includes a slit therein for air dispersion and to provide a place to which the flame may attach.

A heater employing the nozzle assembly of the present invention may be considered to utilize two combustion principles. A low pressure, such as 25 to 100 pounds per square inch, may be used for the fuel supply. The oil spray **31** in this case provides a cloud of vaporized and partially burned oil, the unburned oil collecting in the bowl and then being further burned in a conventional manner. Also, the nozzle assembly in combination with a heater can provide a turn down ratio because at low firing rates, when the spray nozzle is ineffective and oil comes out of the nozzle in a stream or in large droplets, oil can then burn from a pool in the bottom of the bowl instead of vaporizing from a droplet cloud. The entire device may thus operate at very low pressures, and still provide good regulation safely. Present day field heater systems typically use very high pressure sources, such as 80 to above 200 pounds per square inch in order to obtain good regulation, but such high pressures are dangerous in the event of line breakage, leaks, and so forth, and because high pressures increase the stress in the line. Also, conventional systems generally utilize merely a nozzle pointed straight up or straight down and close to the ground. It has been found that if the nozzle is so pointed, water from condensation may form on the tip of the nozzle which, under the freezing conditions under which heater operation is required, may clog the nozzle. Accordingly, the nozzle of the present invention is preferably inclined at a small angle with respect to the vertical as best seen in FIG. 1. Additionally, the use of a conventional furnace nozzle sprayed in open air gives a very dirty flame; whereas excellent combustion is achieved with the arrangement of the present invention.

As noted earlier, the nozzle should not be overheated. This can occur in many prior art devices most readily after the heater is shut down. The nozzle assembly of the present invention enables the nozzle to be located away from heated earth to metal surfaces which may overheat the nozzle by reradiation. Additional reliability is provided because if ignition is not obtained, oil is sprayed into the heater bowl **10** where it collects instead of being sprayed into the orchard where it may affect crops adversely as well as cause a fire hazard. Furthermore, if the system fails because of line breakage, power failure, clogging, or other difficulties to which fluid systems are vulnerable, the nozzle assembly may be quickly removed and the field heater operated in a conventional manner.

The present embodiment of the invention is to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims therefore are intended to be embraced therein.

What is claimed is:

1. A field heating system comprising

a plurality of field heaters each having a bowl, each of said field heaters including a nozzle assembly coupled with said bowl, and each of said nozzle assemblies including a cap member and a fuel nozzle for spraying fuel through said cap member into the bowl of said heater, each of said cap members having an air draft opening therein, and each of said nozzle assemblies including a draft deflector coupled with the respective cap member providing an air passageway from said draft opening toward the fuel outlet path of the respective nozzle, and

a remote fuel source, said fuel source being coupled to the nozzle assemblies of each of said heaters and enabling said heaters to be refueled, regulated and extinguished.

2. A field heating system comprising

a plurality of field heaters, each of said field heaters including a nozzle assembly, and each of said nozzle assemblies including a cap member and a fuel nozzle for spraying fuel through said cap member into said heater, each of said cap members having an air draft opening therein, and each of said nozzle assemblies including a draft deflector coupled with the respective cap member providing an air passageway from said draft opening toward the fuel outlet path of the respective nozzle, and each of said nozzle assemblies including ignition means mounted between said deflector and cap member in said air passageway for igniting fuel from said nozzle,

a remote fuel source, said fuel source being coupled to the nozzle assemblies of each of said heaters and enabling said heaters to be refueled, regulated and extinguished, and

means near said fuel source coupled with the ignition means of each of said nozzle assemblies for enabling said heaters to be electrically ignited from a remote location.

3. A heating device comprising

a pot-type field heater having a covered bowl and a stack extending upwardly from the cover of said bowl, said bowl forming a primary combustion chamber within which vaporized fuel is partially burned and unburned fuel is gasified and allowed to flow upwardly into said stack for complete combustion of said fuel, and

a nozzle assembly coupled with said bowl, said nozzle assembly including a fuel nozzle for supplying said vaporized fuel into said bowl, said nozzle assembly having an air draft opening for enabling air to enter into said primary combustion chamber, and said nozzle assembly including a draft deflector mounted adjacent said opening for affecting the air entering said

opening for stabilizing the flame resulting from said vaporized fuel.

4. A heating device as in claim 3 wherein

said nozzle assembly includes a cap member coupled with said cover and supporting said fuel nozzle with the outlet thereof facing downwardly at a small angle with respect to the axis of said heating device, and said air draft opening is in said cap member and said draft deflector is affixed to said cap member and extends downwardly therefrom.

5. A heating device as in claim 3 including

electrical ignition means mounted between said deflector and said nozzle in the air path from said draft opening for igniting vaporized fuel from said nozzle.

6. A heating device as in claim 4 including

down draft tube means coupled to said cap member and providing an air passageway through said cap member to the interior of said bowl.

7. A heating device as in claim 4 including

electrical ignition means mounted between said deflector and said nozzle in the air path from said draft opening for igniting vaporized fuel from said nozzle.

8. A nozzle assembly for use with the bowl of a pot-type field heater for providing a vaporized spray of fuel into said bowl, said bowl providing a primary combustion chamber for gasifying unburned fuel in said bowl to allow said gasified fuel to flow upwardly into a stack coupled above said bowl and to burn therein to thereby provide complete combustion of said fuel, comprising

a cap member having first and second openings therein, said cap member being adapted to be coupled with said bowl,

a fuel nozzle having a fuel outlet, said nozzle serving to provide a spray of vaporized fuel into said bowl,

a bracket member coupled with said cap member and supporting said fuel nozzle with the fuel outlet thereof adjacent said first opening in said cap member, and

a draft deflector coupled to the bottom of said cap member and extending downwardly therefrom for affecting air flow from said second opening toward the spray of fuel from said nozzle for stabilizing the flame provided by said vaporized fuel.

9. A field heating system comprising

a plurality of field heaters situated in spaced apart locations, each of said heaters being a pot-type field heater having a covered reservoir forming a primary combustion chamber and including a stack extending upwardly from the cover of said reservoir forming a secondary combustion chamber, said primary combustion chamber receiving vaporized fuel which is partially burned in said primary combustion chamber and unburned fuel is gasified therein and allowed to flow upwardly into said stack and into said secondary combustion chamber for providing complete combustion of said fuel, and each of said heaters including a nozzle assembly coupled with said reservoir, said nozzle assembly including a fuel nozzle for spraying said vaporized fuel into said reservoir, there being an air draft opening for enabling air to enter into said primary combustion chamber and a draft deflector mounted adjacent said opening for affecting the air entering said opening for stabilizing the flame resulting from said vaporized fuel, and

a remote fuel source, said fuel source being coupled to the nozzle assemblies of each of said heaters and enabling said heaters to be refueled, regulated and extinguished.

10. A field heating system as in claim 9 wherein

each of said nozzle assemblies includes electrical ignition means mounted near the outlet of the fuel nozzle thereof for igniting fuel from the nozzle, and

electrical circuit means coupled with the ignition means of each of said nozzle assemblies for enabling said heaters to be electrically ignited from a remote location.

References Cited

UNITED STATES PATENTS

2,286,366	6/1942	Lea et al.	126—59.5
2,966,941	1/1961	Breese et al.	431—262
2,966,943	1/1961	Breese	431—262 X
3,134,423	5/1964	Smith	431—263 X

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431—262, 341