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Brazee

[11] **3,794,461**

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[54] **MOTOR MEANS FOR SPACE HEATER AND METHOD OF USE**

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[52] **U.S. Cl.** **432/29,** 432/222

[51] **Int. Cl.** **F23l 9/04**

[58] **Field of Search** 432/222, 29; 418/187, 188

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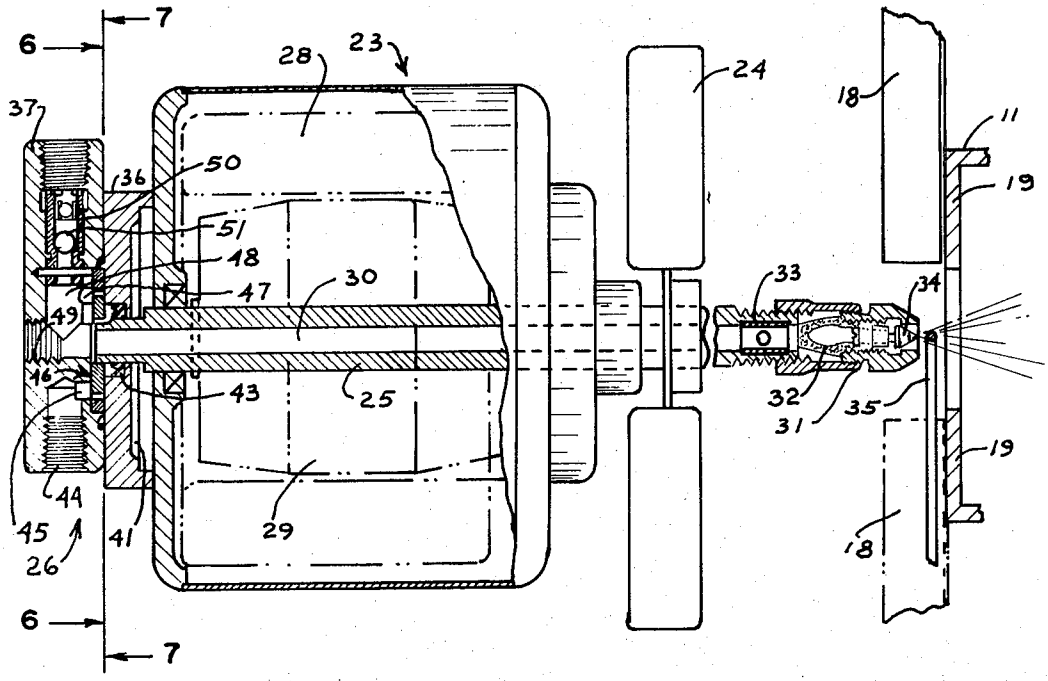
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[57] **ABSTRACT**

In a space heater incorporating a motor driven fan blade for propelling an ignitable fuel through an ignition means and into a heating chamber for generating heat for discharge into a space to be warmed, the motor incorporates a rotor means having a channel or passageway formed axially therein, with the fan blade mounted on one end of said rotor and a pump operatively associated with the other end of said rotor. Upon energization of the motor, the pump transfers the fuel from a reservoir through the rotor channel for discharge through the ignition means creating combustion in the heating chamber.

32 Claims, 7 Drawing Figures



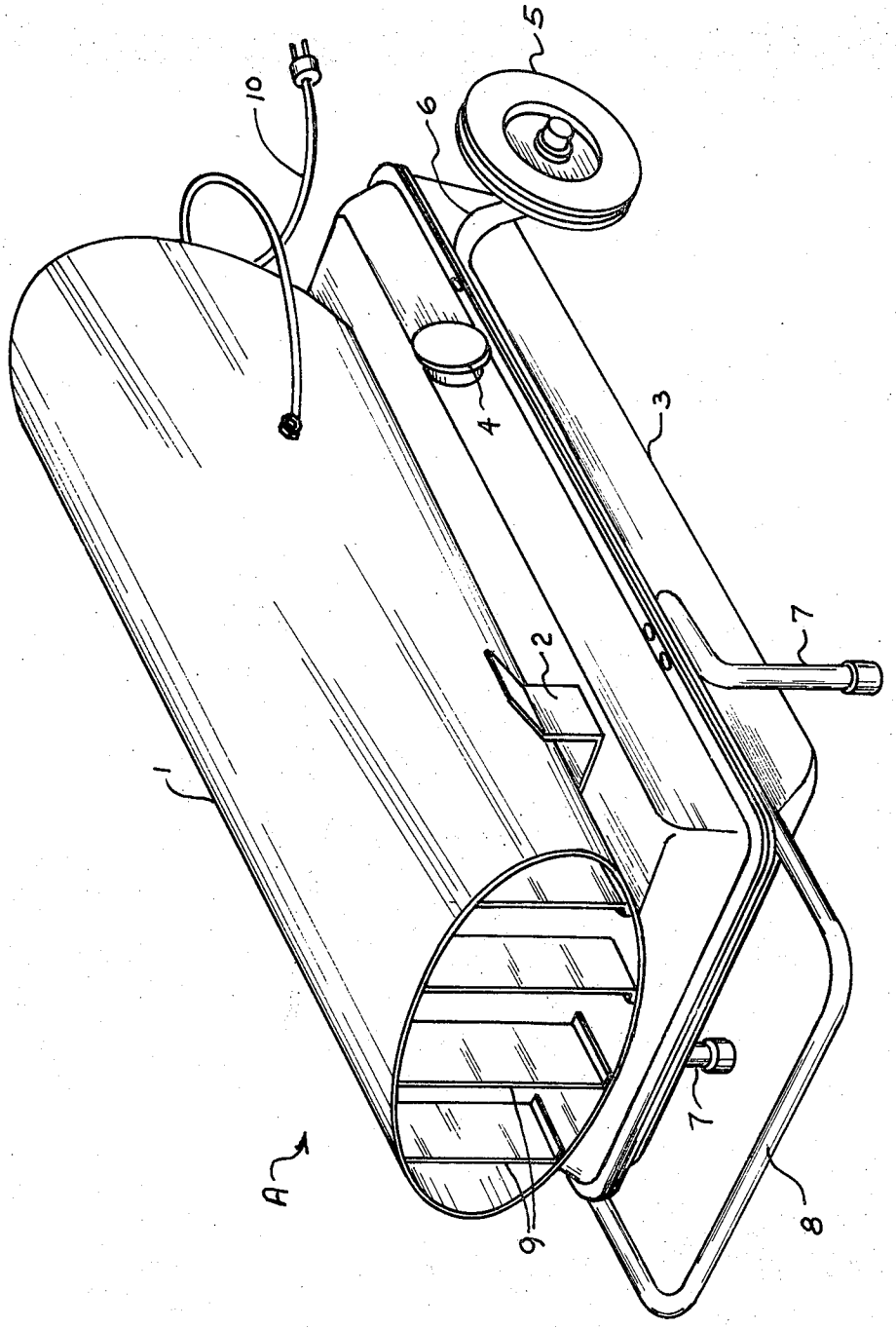


FIG. 1.

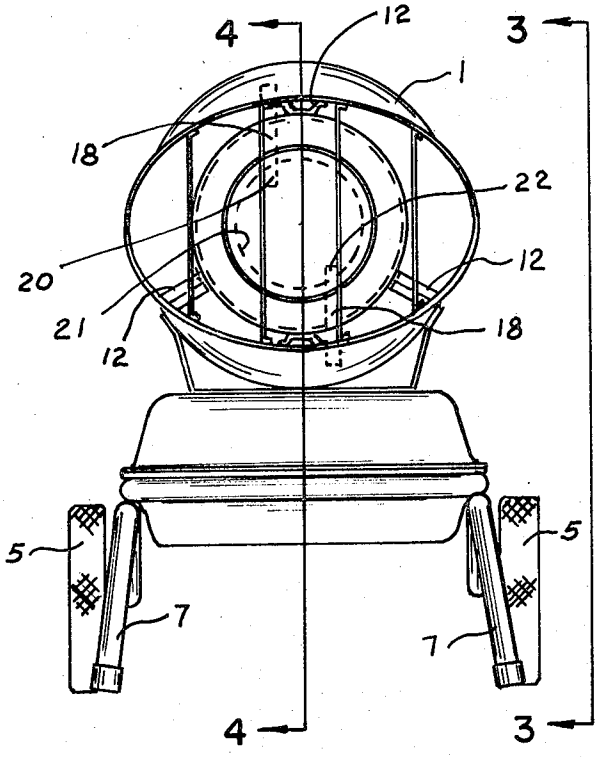

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FIG. 2.

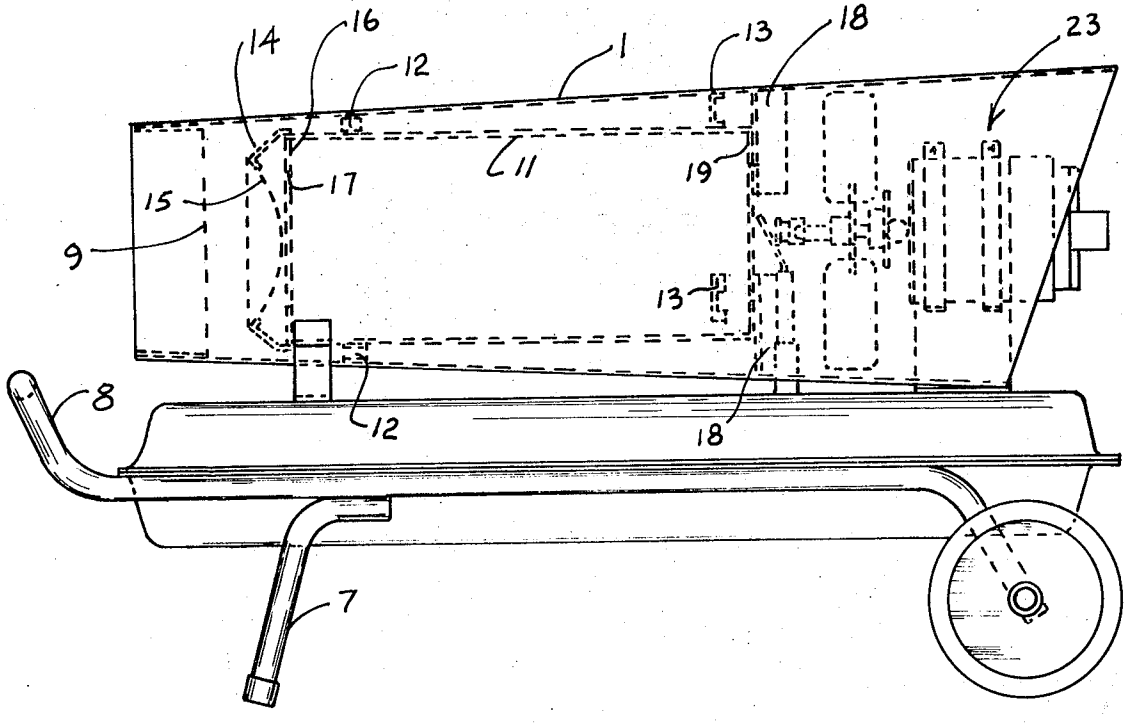

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FIG. 3.

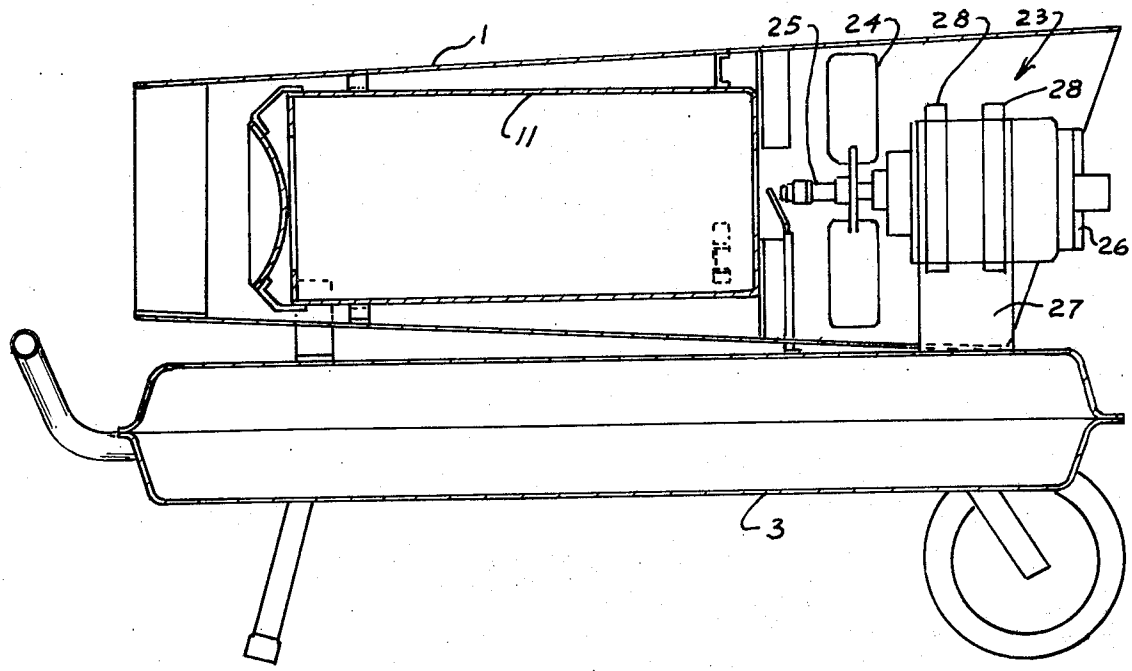

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FIG. 4.

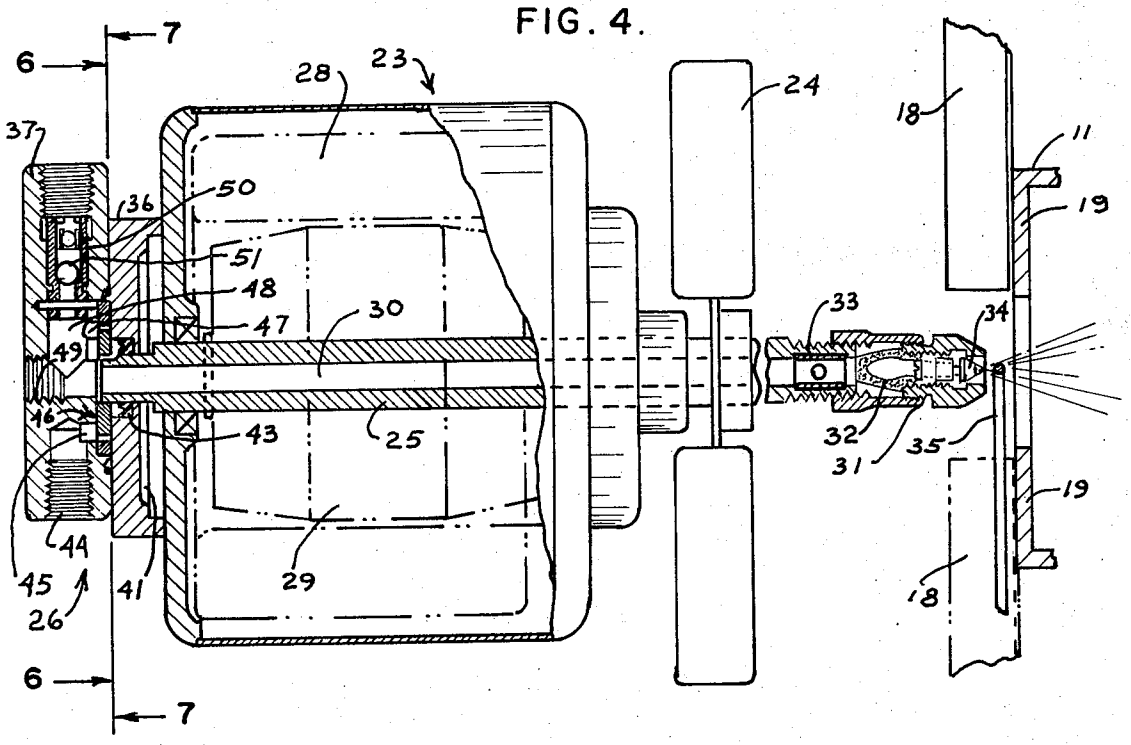

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FIG. 5.

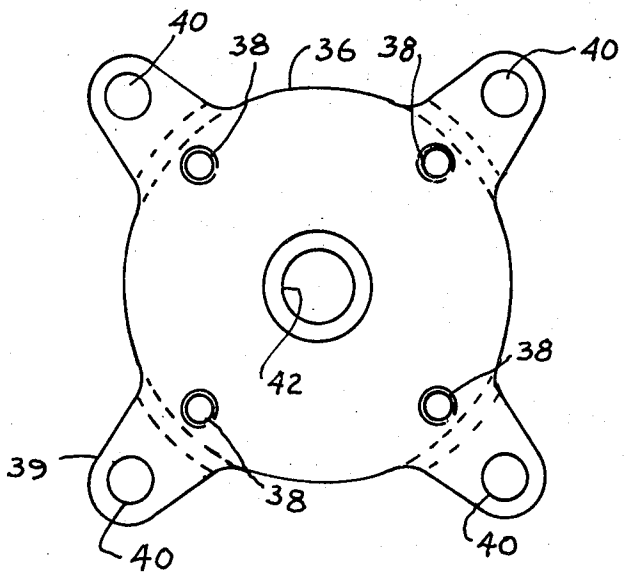

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FIG. 6.

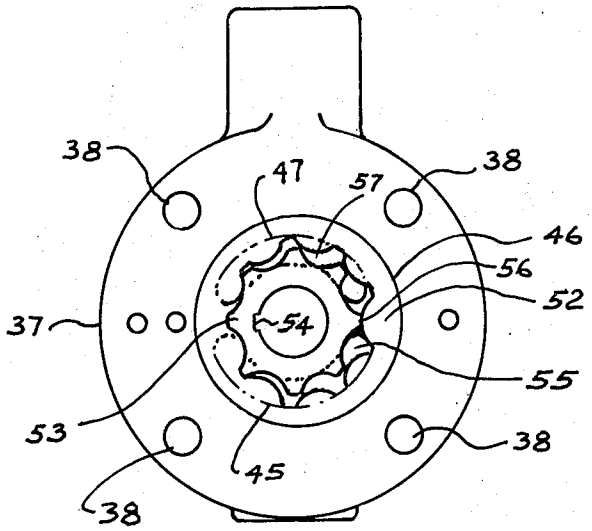

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FIG. 7.

MOTOR MEANS FOR SPACE HEATER AND METHOD OF USE

BACKGROUND OF THE INVENTION

This invention relates generally to a space heater, but more particularly pertains to a novel motor-pump combination which compactly provides for both transfer of a fuel by means of the pump through the rotor of the motor and causing its controlled discharge through the influence of a fan blade associated with said rotor means.

Various types of space heaters have been available in the prior art, designed principally for providing portability in furnishing heat to an area where little or no heat is available from any other source. Such space heaters normally include the usual motor and pump for transferring a supply of ignitable fuel through an ignition means, with a separate fan blade designed for urging the ignited fuel into a heating chamber and immediately thereafter forcing it into the area being warmed. There are a variety of these space heaters available upon the market, which operate in principle to that just previously described, and probably the more pertinent prior art is shown in U.S. Pat No. 2,606,014, upOn a space heater which turns a fan blade rotatably mounted upon a fuel conduit through the use of an associated motor and fan belt. While such a space heater is probably effective in achieving its particular purposes, it does necessitate the addition of an extra drive means for pumping of the fuel to achieve its passage and discharge into the combustion chamber, while a separate drive means must be employed for independently operating the associated fan.

In view of the foregoing, it is the principal object of this invention to provide a space heater incorporating a novel motor means which simultaneously operates both the fan means and a pump for forcing transfer and discharge of fuel into the influence of the air currents generated by said fan means.

Another object of this invention is to provide a motor-fan combination for use in a space heater which employs the rotor means of the motor for both operating the fan and a pump in forcing the movement of the ignitable fuel of the heater.

An additional object of this invention is the provision of a motor means, as aforesaid, wherein the ignitable fuel travels through a channel or passageway formed axially within the rotor means of said motor.

A further object of this invention is to provide an arrangement of controls or valve means for regulating the degree of pressure exerted upon the ignitable fuel being discharged into the combustion chamber of a space heater.

Another object of this invention is to provide vane members useful for controlling the turbulence of the air currents generated by the fan means operating within a space heater.

Other objects will become more apparent to those skilled in the art upon reviewing the summary of this invention, and upon a reading of the description of the preferred embodiment in view of the accompanying drawings.

SUMMARY OF THE INVENTION

In accordance with this invention, generally stated, a space heater is designed to provide both efficiency in operation, and compactness in size, so as to improve upon related heaters disclosed in the prior art. The efficiency in operation is essentially achieved through a reduction in the operative components of the motor, fan, and fuel ejecting means incorporated in such devices, with these components being used in combination with a specially constructed combustion chamber that is mounted in a manner that reduces the air turbulence, or back drafts, that are customerily encountered in heaters of this type. The compactness of this design is provided in operating both the fan means and the fuel pumping and ejecting means simultaneously through the use of the accompanying motor, and more specifically, through the operation of its rotor means during energization of said motor. All of this is achieved without use of any supplementary drive means such as belts, sprockets, chain drives, or the like, but rather, both the fuel pumping means and the fan are securely fixed to the rotor means to achieve a functioning of this invention.

The rotor means of this invention is naturally rotated through the energization of its motor, and said rotor incorporates a channel or passageway formed axially and integrally centrally along its length, with a nozzle or other fluid dispersing means being provided at one end of said motor to provide for a sprayed ejection of the ignitable fluid from the same. A fan blade is mounted directly upon the approximate end of said rotor means and provides for propelling of the ejected fluid forwardly through electrodes or other igniting means to achieve combustion of the fuel within a combustion chamber for generating the source of heat that is driven from the space heater by means of said fan. At the opposite end of the rotor means is provided a pump means whose operative components are fixed directly to said rotor, and due to the revolving of said rotor provides the fluid pressure build up in said pump for driving the fuel under pressure through the rotor means passageway for its eventual discharge, as aforesaid.

As an example of the relative capacities of the various components utilized in the space heater, one has been designed having a 140,000 B.T.U. heating capacity which is generated from one-fourth horsepower motor constructed having the rotor means and other components as just described. Such a heater has been studied to determine that it can circulate approximately 900 cubic feet of heated air per minute. Kerosene is utilized as the ignitable fuel, although other forms of combustible fuels can be utilized in this invention. It is estimated that a space heater incorporating the components in the way as described can achieve a B.T.U. rating of approximately 200,000 if a one-third horsepower motor is incorporatd into this invention, while on the other hand, it is just as likely that a one-eighth horsepower motor could provide a quantity of heat somewhere in the vicinity of 70,000 B.T.U. where the space heating requirements are of a lesser demand.

Frequently in space heaters of this type wherein a combustion chamber is arranged concentrically within an outer heating chamber, when a fan means is operated four urging the generated heat out of the space heater and to achieve its circulation within the space being warmed, usually the rotation of the fan blade causes various turbulences in the nature of back drafts, or draws the air in a reverse direction, quite contrary to the desired flow of the heated air out of the forward end of the space heater. To rectify this problem, the

combustion chamber of this invention is mounted through the use of a series of vane like members, which mount to the end of the combustion chamber proximate the motor means, and which are also fixed to the interior surface of the heating chamber. It has been found that through the use of at least a pair of vanes of this nature arranged substantially vertical and off center, while extending partially across the open end of the combustion chamber, there is a tendency to reduce any back drafts, deplete air turbulence at this location, and to provide a continuous forward thrust of the fan generated air for moving both the ignitable fuel through the ignition means and then into the combustion chamber, and subsequently outwardly of the space heater.

While this invention as described herein is analyzed as being adapted for space heating purposes, and essentially one having enhanced portability, it is just as likely that the compactness that is designed into the fan, pump, and motor means of this invention provides for its application in other types of heaters, as for example, the built-in heaters used in mobile homes, or any other similar type pumping applications.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings, FIG. 1 provides a perspective view of the portable space heater of this invention;

FIG. 2 provides a front end view of the space heater shown in FIG. 1;

FIG. 3 provides a side view of the space heater taken as along the line 3—3 of FIG. 2;

FIG. 4 provides a longitudinal partial sectional view of the space heater taken along the line 4—4 of FIG. 2;

FIG. 5 provides a longitudinal sectional view of the combination fan, pump, and motor means of the invention shown in FIG. 4;

FIG. 6 provides a transverse sectional view of the rotor end intermediate housing taken along the line 6—6 of FIG. 5; and

FIG. 7 provides a transverse sectional view of the valve and pump housing taken along the line 7—7 of FIG. 5.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the drawings, and referring particularly to FIG. 1, there is shown a perspective view of the space heater of this invention generally designated at A, and which incorporates a heating chamber 1 which is mounted by means of a series of brackets, one as shown at 2, to the upper surface of a fuel tank 3, said fuel tank having the usual intake line covered by a cap 4 providing access fo periodically replenishing the fuel supply, as required. In a space heater, as previously described, incorporating a one-fourth horsepower motor, a fuel tank having a capacity of approximately twelve gallons provides adequate fuel for sustaining the operation of a heater for a substantial period of time. In addition, the type of fuels that may be utilized in this heater may be any form of the usual fuels having sufficient octane or combustibility rating to readily support ignition, and kerosene has proven to be an adequate ignitable fuel. To provide portability to this heater, there are provided a pair of wheels, one shown at 5, being rotatably supported by an axle 6, with one of these combinations being provided on either side of the fuel tank. In addition, front supports 7 provide stability for the heater when resting upon the ground, as when in operation. Furthermore, a handle bar 8 projects forwardly of the heater, and obviously provides convenience and facility in the movement of this portable space heater. Vertically spanning across the front opening of the heating chamber 1 are a series of braces 9, which structurally reinforce thechamber at this location, in addition to preventing any unauthorized access into the chamber, particularly when operating. There is also shown extending from the side of the chamber 1 a utility cord 10, which provides electrical energy for operation of both the motor and the ignition means as will be hereinafter described.

By referring to FIGS. 2 through 4, various sectional views, or hidden line outlines, of the internal components of this space heater are disclosed. Particularly, these components are mounted substantially within the heating chamber 1 of this invention. Within this heating chamber there is provided a combustion chamber 11 which is substantially cylindrical in shape, and is arranged approximately concentric within the said heating chamber. The forward portion of the chamber 11 is fixed to the inner surface of said heating chamber by means of a series of braces, as shown at 12, while the back end of said combustion chamber is fixed in place also by a series of spaced braces, as at 13. On the forward end of the combustion chamber 11 there is provided a series of braces 14, which connect to the end of said chamber 11, and are designed for retaining a concave dispersing plate, as at 15, to provide proper dispersing of the heat being forced out of said combustion chamber and forwardly of the space heater. To provide further control in the discharge of the generated heat, the forward end of the combustion chamber 11 is provided with an additional marginal lip, as at 16, which extends slightly across this open end of the chamber, and also has an aperture 17 provided therethrough for passage of the generated heat.

In addition to the back end of the combustion chamber 11 being braced by means of the brackets 13 to the inner surface of the heating chamber 1, there are also provided a series of vane like members 18 which are secured to the lip 19 formed at this end of the chamber 11, in addition to being fixed to, or extending into proximity with, the inner surface of the heating chamber 1. A pair of vanes are shown in this particular style of space heater, and it should be noted from FIG. 2, that the upper vane 18 is arranged substantially vertical, being arranged slightly off center of the space heater, and projecting at its lower end 20 partially across the open end 21 of the combustion chamber 11. In addition, the lower vane like member 18 is of similar construction to the vane member just described, also being arranged vertically and slightly off center, and having its upper end 22 projecting partially within the opening 21 provided at this back side of the combustion chamber 11. To briefly expound upon and reiterate the reasoning for these vane like members as previously described in the summary of this invention, it has been experienced that without these vanes 18, arranged as shown, that as the fan means of this invention is operated, there is a tendency for air turbulence to occur at this location of the combustion chamber, effecting a form of back draft or decrease in the efficiency of the air entrained fuel to travel forwardly into the combustion chamber 11. As a result, to much combustion occurred just at the nozzel end of the motor means, de-

creasing the efficiency of operation of this space heater, and causing excessive warming of the heater components.

In the rearward portion of the space heater is disposed the motor means **23** which, as previously described, provides the drive for operation of the fan means **24,** mounted approximately at the forward portion of the rotor means **25,** while the pump means **26,** providing the pressure for transfer of the fuel, is operatively mounted to the opposite end of said rotor. The motor means shown may comprise any form of standard electrical motor presently available, and preferably may comprise an alternating current motor that is operative from standard alternating current, although a direct motor could just as likely be utilized in this invention. The motor is mounted to the upward portion of the fuel tank **3** by means of a pair of legs, one shown as at **27,** which connect to a series of bands, as at **28,** for holding the motor firmly in place, to stabilize it during its energization, and to reduce vibrations. Referring also to FIG. **5,** a more detailed sketch of the motor means **23** is more accurately shown and includes the usual stator **28** having the rotor **25** and its armature **29** disposed for rotation therein when exposed to the usual electromotive forces. As previously described, the rotor means **25** has a channel or passageway **30** extending axially and centrally along its length, and in this particular embodiment, said passageway opens at both ends of said rotor. On the portion of rotor extending forwardly of the motor means there is mounted the fan blade **24,** and at the forwardmost portion of the rotor there is disposed a nozzle means **31** providing for a controlled discharge of the fuel traversing through said rotor passageway **30.** This nozzle is of the usual type, is threadedly engaged with the end of the rotor means, ad includes a ceramic or other material filter **32,** and further incorporates a check valve, as at **33,** designed to provide a slight pressure build up of the fuel before it is discharged from said nozzle, with the frontal portion of the nozzle containing the usual core **34** which may or may not spin to provide for a sprayed discharge of the pressurized fuel. It might be commented that while the nozzle is shown as beng threadedly engaged to the end of the rotor means **25,** to dispose it axially in line with its passageway **30** therethrough, it is just as likely that other forms of fluid communications between the rotor means into the nozzle may be achieved, as for example, by having the rotor project interiorly of the nozzle, and with the passageway **30** bifurcating approximately at the end of said rotor, and opening laterally out of the sides of said rotor means. Hence, the passageway need not extend specifically from end to end of the rotor means, and need not necessarily only open axially from the end of said rotor.

Disposed intermediate the end of the nozzle **31** and the opening through the lip **19** of the combustion chamber **11** is an ignition means **35** comprising a pair of electrodes across which a high potential is charged to provide adequate sparking to achieve firing of the fuel emitting from the end of said nozzle. It can be seen that the discharge of this fuel from the end of the nozzle, and its immediate passage between said electrodes, such occurring as a result of the fuel being pressure discharged from the end of said nozzle and being exposed to the air currents generated from the fan means **24,**provides for almost total entrance of the igniting fuel into the combustion chamber **11.** These electrodes **35** extend downwardly for mounting to either the heating chamber **1** or on to the top of the fuel tank. Circuit lines from the electrodes, not shown, connect with the usual transformer, which in this case may be mounted between the motor legs **27,** with said transformer being energized along with the motor from the current traversing the cord **10.** The transformer may be of a size to convert one hundred ten standard voltage to approximately 10,000 volts, which develops a potential across the pair of electrodes and induces the necessary arcing to provide continuous ignition of the nozzle ejected fuel.

As further shown in FIG. **4,** at the rearward end of the rotor means **25** there is provided the pump means **26** that pumps the fuel from the fuel tank to the aforesaid nozzle. The pump means is confined in an intermediate pump housing **36** and a valve housing **37,** both of said housings being rigidly secured to the back side of the motor **23.** By also referring to FIGS. **6** and **7,** it can be seen that a series of fasteners may project through the aligned apertures **38** provided through both said housings, to fasten them tightly to the back side of said motor. In addition, the intermediate housing **36** is provided with a series of ears **39** which may also contain apertures **40** through which other fasteners may secure for holding said housing to the motor casing. The intermediate housing is milled to provide clearance, as at **41,** to allow for its flush mounting against the back side of the motor **23,** without interfering with the rotor means **25** projecting rearwardly therefrom. The housing **26** has an opening **42** disposed centrally therethrough to allow for the projection of the rotor **25** therethrough, and a seal **43** provides a fluid tight relationship between these two components to prevent any of the fuel being pumped from gaining entrance to the motor **23.** The pump housing **37** is provided with an inlet **44** which communicates by means of a fuel line (not shown) with the fuel tank **3.** Said inlet **44** is in communication with an intake port **45** that exposes the fuel to the pump **46,** with said pump communicating with an outlet port **47** that further communicates with a chamber **48.** The chamber **48** is in fluid passing communication with the passageway **30** disposed axially within the rotor means **25.** The pump housing **37** has an opening, as at **49,** which is axially aligned with the rotor passageway **30,** with this former opening being threaded to receive a plug that normally maintains it in closure. But, the plug can be removed and a pressure gauge inserted as during servicing of the pump to check its discharge pressure. And, in addition, when it is desired to clean the rotor passageway, the plug (not shown) may be removed and a brush inserted and manipulated therein. An additional passage **50** extends upwardly from the chamber **48,** and inserted within this passage is a check valve **51** which is designed to provide discharge of any overflow fuel, with the passageway **50** also communicating by means of another fuel line (not shown) back to the fuel tank **3** for returning any excess pumped fuel. It might be remarked that in the preferred operation of this invention, the check valve **33** disposed within the nozzle **31** may be set to pass fuel that exceeds a pressure of 100 p.s.i. while the overflow check valve **51** may be set to return the pumped fuel to the fuel tank when it exceeds a pressure of 117 p.s.i. Obviously the pressures delineated have only been determined to work adequately in the size of space heater described in the preferred embodiment,

and said check valves are of the adjustable type, to provdie for their resetting and functioning at other pressures.

The pump means **46** is more accurately disposed in FIG. **7**, and said pump may comprise a gear or screw type rotary pump that furnishes axial flow of the fluid through the passageway **30** of the rotor means **25.** The specific type of pump disclosed in the preferred embodiment comprises a gerotor type pump, having an outer gear **52** which is slidably mounted for eccentric rotation within a cut out portion provided in the face of the pump housing **37,** with said outer gear having an inner gear **53** disposed for rotating in unison with said outer gear, with said inner gear being fixed to the rotor **25** to rotate simultaneously therewith. A key may fit within the slot **54** to provide this securement of the inner gear to the rotor end. The arcuately shaped intake port **45** of the pump housing is shown at the downward portion of the inner and outer gears and is arranged in overlying relationship with the somewhat meshing relationship between said pair of gears, with the arcuately shaped outlet port **47** maintaining a similar relationship with the upward portion of said gears. As is known in the operation of a gerotor pump, the pair of gears as they revolve through their intake cycle expand or separate their spacing with respect to each other, in this particular instance, the intake cycle being the turning through the lower segment of the pump, with said expansion between the pair of gears shown as at **55,** but as each inner gear teeth becomes horizontally disposed, as the one shown at **56,** the gear teeth reach a point of maximum separation for drawing in fuel through the intake port **45,** and during continued rotation, as through the upper cycle, a contraction of the space **57** forces the fuel out of said pump and into and through the outlet port **47.** Hence, it can be seen that the gerotor type pump operatively mounted to the back end of the rotor means **25** provides an effective and compact means for pumping the fuel from its tank directly into the rotor means **25** for eventual discharge from its nozzled end.

In the description of the preferred embodiment, the invention has mainly been analyzed as a portable space heater, but the motor means, pump means, and fan relationship, being so compact in design, can just as easily be embodied within other types of heating devices, or the relationship of a pump means to the back side of a motor for forcing some form of a fuel or fluid through a rotor can obviously have other applications than in the heating field. In addition, various type of thermostatic controls can be utilized in conjunction with the space heater described, so that the device may be operated automatically in response to the ambient temperature within the surrounding space being warmed. Furthermore, such a thermostat may control any type of switch means that may provide for a starting or stopping of the operation of the motor means, in addition to precharging the electrodes to provide for instant ignition of the fuel as soon as it is discharged from the nozzle. Furthermore, such a switch means may be responsive to some form of a flame out or other control that determines when the flame has become extinguished, so that the heater may be shut off and the fuel supply curtailed. These type controls are believed to be readily available in the art.

Numerous variations in the construction of the pump and motor means of this invention, in addition to the space heater generally described, within the scope of the appended claims, may occur to those skilled in the art in light of the foregoing disclosure. The described embodiment is merely illustrative of the principle of the invention.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent is:

1. In a space heater of the type incorporating a motor driven fan means for propelling ignitable fuel through an ignition means and into a heating chamber for generating heat to be discharged into a space to be warmed, the improvement comprising said motor having a rotor means extending therethrough and being rotated upon energization of its motor, said fan means being fixed to said rotor means and caused to turn through the rotating of said means, and said rotor means having a channel formed axially therein and opening approximately at the end of said rotor means proximate said fan means for providing passage of the ignitable fuel therethrough.

2. The invention of claim **1** and including a pump means operatively associated with the approximate opposite end of said rotor means to provide pressure for urging said ignitable fuel through the rotor means channel.

3. The invention of claim **2** and including a nozzle operatively associated with the open end of said rotor means to provide for a controlled discharge of the ignitable fuel from said channel.

4. The invention of claim **3** and including a valve means provided in said rotor channel proximate said nozzle to provide for the discharge of the ignitable fuel under pressure.

5. The invention of claim **2** and including a fuel supply communicating with said pump means, said pump means having an intake port for drawing fuel therein, and said pump means having an outlet communicating with said rotor channel providing for the forced passage of the fuel therethrough.

6. The invention of claim **5** and including a valve means provided in the rotor channel proximate the open end of said rotor means, said valve providing for the discharge of the ignitable fuel under pressure.

7. The invention of claim **6** and including a fuel overflow communicating with the outlet of the pump means.

8. The invention of claim **7** including a second valve means operatively associated with the overflow for regulating the discharge of excess fuel from the same.

9. The invention of claim **8** wherein said first and second valve means are adjustable.

10. The invention of claim **9** wherein the operative setting of the first valve means is adjusted to pass fuel under low pressure than the pressure operative setting of the second valve means.

11. The invention of claim **2** wherein said pump means comprises a rotary pump.

12. The invention of claim **11** wherein said rotary pump comprises an internal gear rotary pump.

13. The invention of claim **12** wherein said internal gear rotary pump comprises a gerotor pump.

14. The invention of claim **13** wherein the inner gear of the gerotor pump is mounted upon the opposite end of said rotor means.

15. The invention of claim **2** wherein said heating chamber includes an inner combustion chamber fixed approximately concentrically within said heating cham-

ber and forming a spacing intermediate therewith, the fuel discharging from the rotor means channel being ignited as it flows into said combustion chamber.

16. The invention of claim **15** and including electrodes located approximately intermediately the open channel end of the rotor means and said combustion chamber, said electrodes when energized furnishing ignition for the discharging and flowing fuel.

17. The invention of claim **15** and including at least one vane like member extending at least partially across the open end of the combustion chamber proximate the rotor end, said member providing for control of air currents caused by the rotation of the fan blade upon said rotor means.

18. The invention of claim **17** and including a pair of said vane like members being arranged substantially vertical, each member extending at least partially across the open end of said combustion chamber proximate the rotor end and each member arranged laterally of the center of said combustion chamber.

19. The invention of claim **18** wherein said vane like members structurally fix the inner combustion chamber to the heating chamber.

20. The invention of claim **18** wherein one of said vane like members is arranged above the center of said combustion chamber, and the other of said members is arranged below the center of said combustion chamber.

21. In the process of operating a space heater incorporating a motor driven fan means for prepelling ignitable fuel through an ignition means and into a chamber for generating heat for discharge into a space to be warmed, including the steps of energizing the motor to induce rotation of its rotor means, thereby simultaneously rotating a fan blade fixed to said rotor means, simultaneously operating a pump means through the rotation of said rotor means, thereby forcing the ignitable fuel under the influence of the pressure of said pump means through the channeled interior of the rotor means, thereafter discharging the pumped fuel from the end of said rotor means for passage through the ignition means to effect its combustion as it enters the chamber, and through the force of said fan means urging the generated heat out of the heater and into the space to be warmed.

22. A motor-pump combination for use in moving a fluid substance including a motor incorporating a rotor means being rotated upon the energization of said motor, said rotor means having a passageway formed therein, a pump means operatively associated with said rotor means and upon actuation causing movement of said fluid substance, whereby upon energization of said motor its rotor means effects the operation of the pump means thereby inducing transfer of the fluid substance through said rotor passageway.

23. The invention of claim **22** wherein said rotor means passageway extends approximately from end to end of the rotor, said pump means being operatively associated at approximately one end of said rotor means, and said pump means inducing transfer of the fluid substance into the proximate end of the rotor passageway for transfer therethrough and discharge out of its other end.

24. The invention of claim **23** and including a fluid reservoir for holding the fluid substance, said pump means having an intake port and an outlet, said reservoir communicating with the intake port, a fluid chamber communicating with the pump outlet and with the proximate end of the rotor means passageway, whereby upon energization of said motor the pump means induces the transfer of the fluid substance from the reservoir for transfer through the rotor means passageway and discharge out of its other end.

25. The invention of claim **24** and including a nozzle provided on the other end of said rotor means to control the pattern of the fluid substance discharged from its passageway.

26. The invention of claim **25** and including a valve means provided in said other end of said rotor passageway to provide for the pressure discharge of the fluid substance from said rotor means.

27. The invention of claim **24** and including a valve means communicating with said fluid chamber and operating to provide for the release of the overflow of said fluid substance.

28. The invention of claim **23** and including a fan means mounting to approximately the other end of said rotor means, whereby upon energization of said motor the fan influences the movement of the fluid substance as it discharges from the end of said rotor means.

29. The invention of claim **24** wherein the pump means comprises a rotary pump.

30. The invention of claim **29** wherein said rotary pump comprises an internal gear rotary pump.

31. The invention of claim **30** wherein said internal gear rotary pump comprises a gerotor pump.

32. The invention of claim **31** wherein the inner gear of the gerotor pump is mounted for rotation upon the one end of said rotor means.

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