

[54] **RADIANT HEAT BOILER**

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[22] **Filed:** Oct. 1, 1973

[21] **Appl. No.:** 402,063

Related U.S. Application Data

[62] Division of Ser. No. 196,478, Nov. 8, 1971, Pat. No. 3,800,528.

[52] **U.S. Cl.** 219/275; 122/234; 159/DIG. 6; 219/301; 219/311; 219/338; 219/354; 219/365
 [51] **Int. Cl.** H05b 1/00; F22b 1/28
 [58] **Field of Search** 219/310-312, 219/271-276, 296-299, 301-305, 347, 354, 365, 405, 411; 222/146 H, 146 HE; 159/DIG. 1, DIG. 6; 122/234, 233

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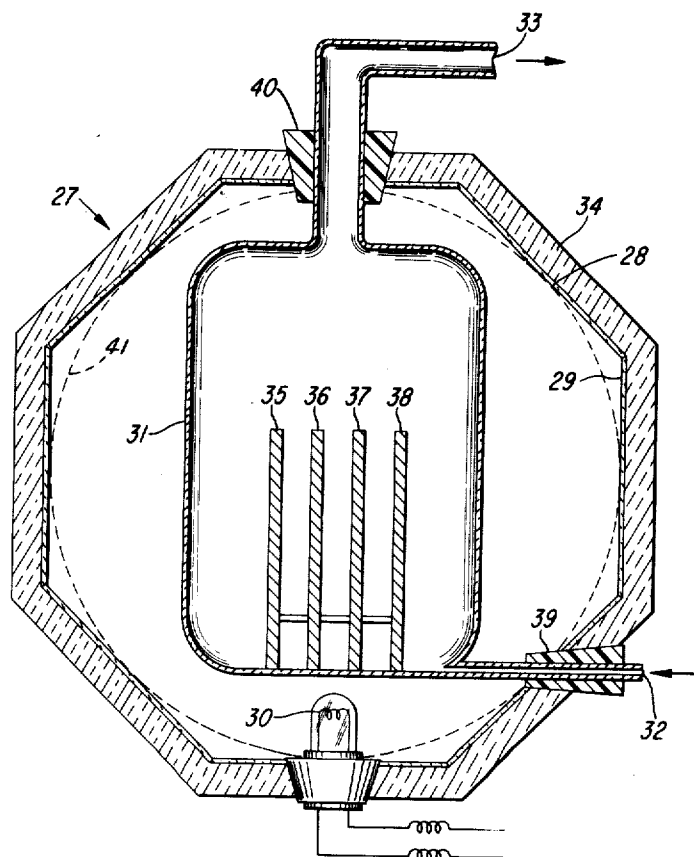
Attorney, Agent, or Firm—Gordon W. Hueschen

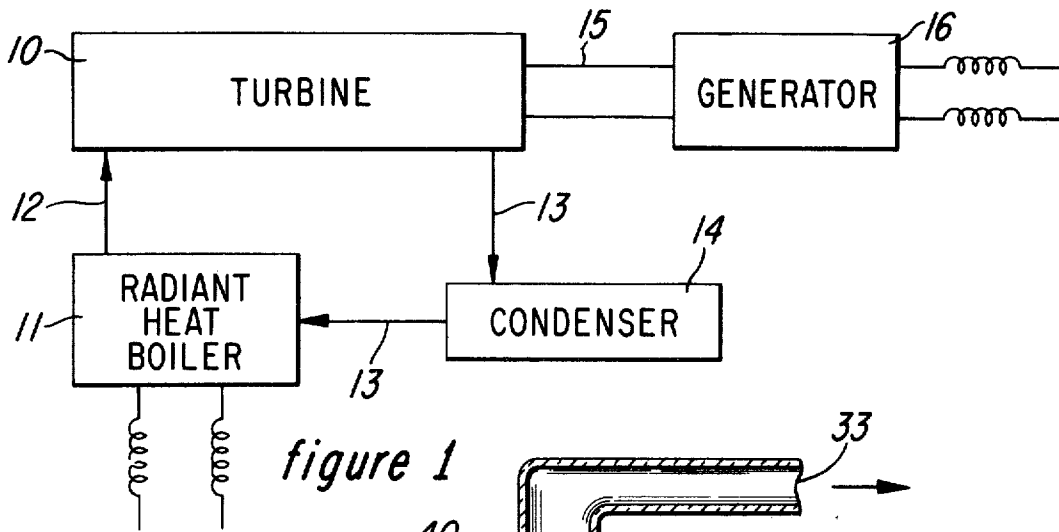
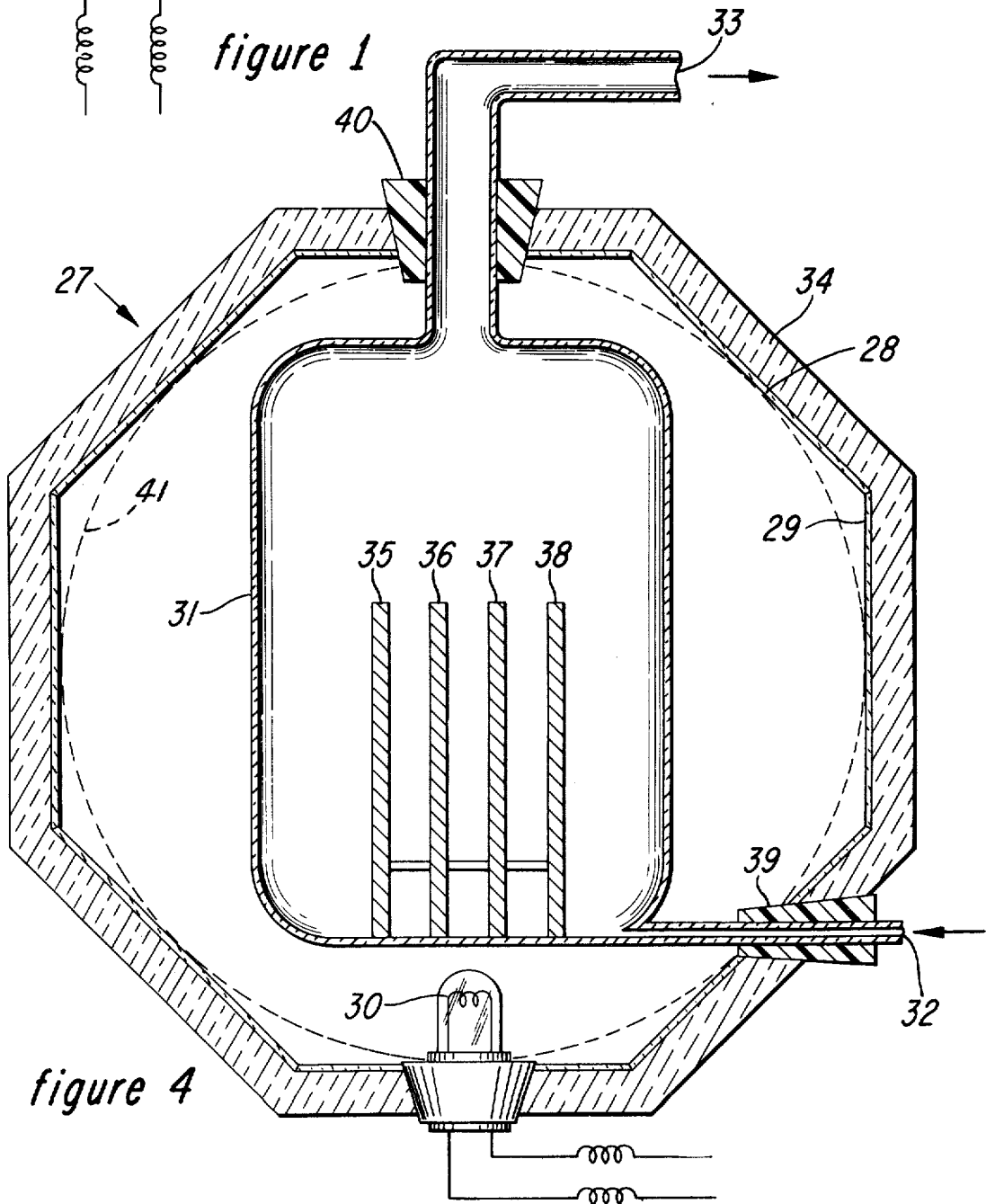
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ABSTRACT

A radiant heat boiler comprises a heat insulated enclosure adapted to maintain a sub-atmospheric pressure. Radiant heat reflecting surfaces are arranged as the faces of a regular polyhedron on the inner surfaces of the enclosure. A pressure vessel is centrally situated within the polyhedral enclosure in spaced relation to the reflecting surfaces. The vessel is provided with a fluid inlet and a fluid outlet. A localized radiant heat source, such as a radiant heat lamp, is mounted within the enclosure in the space between the reflecting surfaces and the pressure vessel. The pressure vessel may be transparent or opaque. If transparent, radiant heat absorptive plates may be provided within the vessel.

9 Claims, 4 Drawing Figures





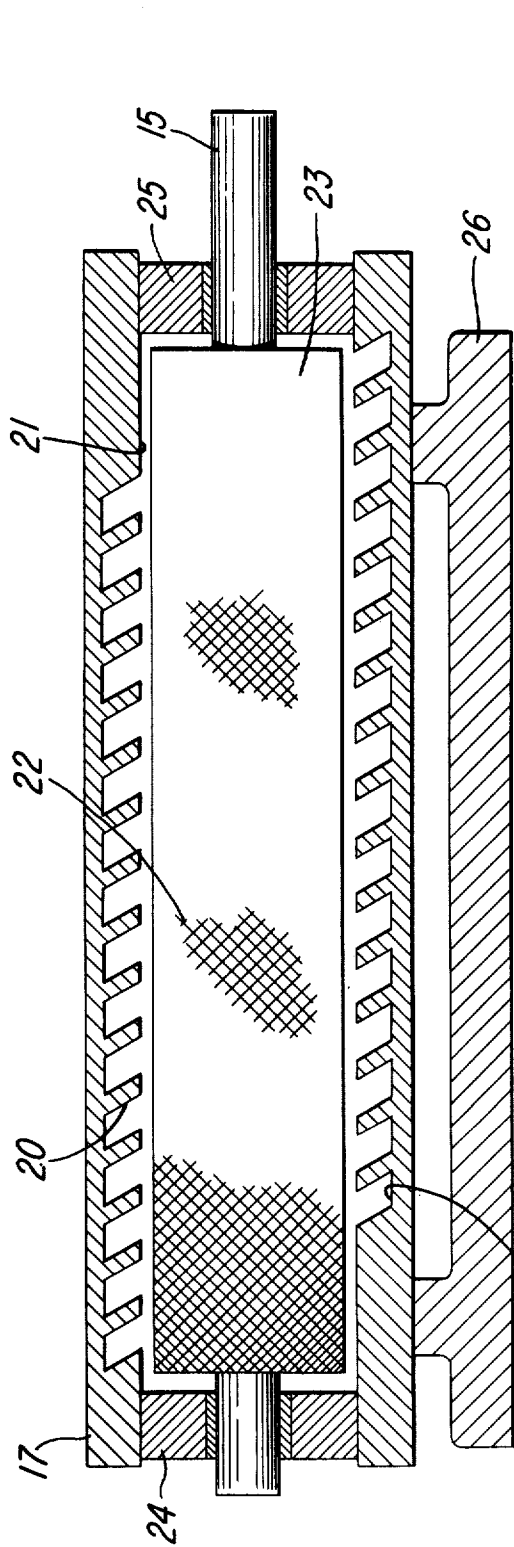


figure 3

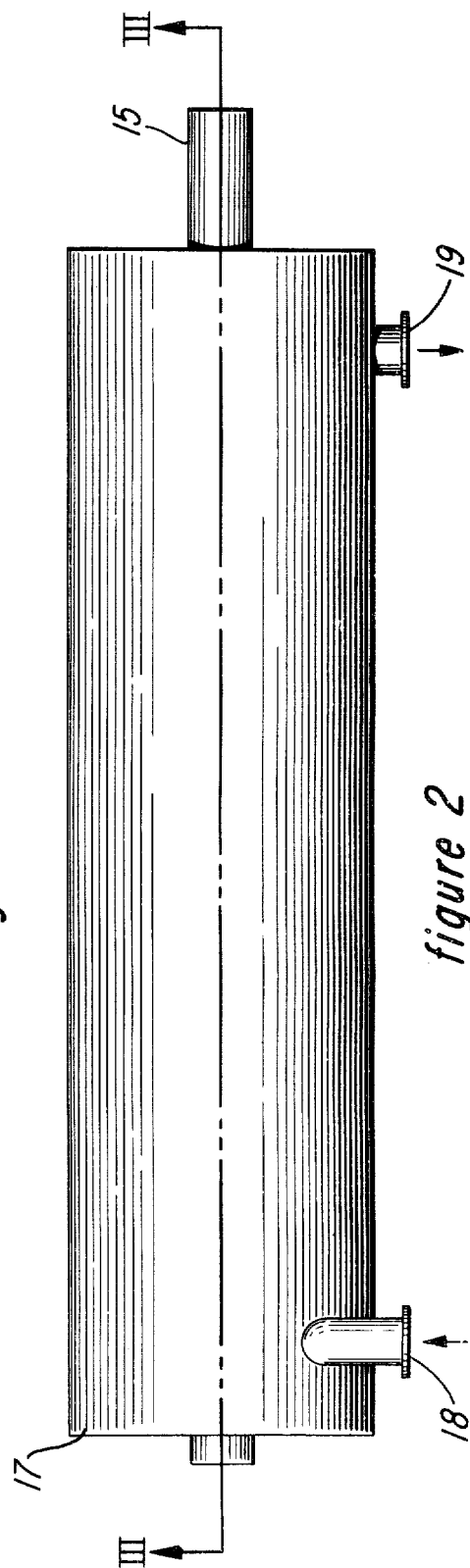


figure 2

RADIANT HEAT BOILER

This application is a division of application Ser. No. 196,478, filed Nov. 8, 1971, now U.S. Pat. No. 3,800,528, granted Apr. 2, 1974.

BACKGROUND OF THE INVENTION

This invention relates to prime movers actuated by a motive fluid, usually in a gaseous form, and has for its principal object the provision of an efficient.

Another object of this invention is to provide an efficient radiant heat boiler which serves as motive fluid source for the turbine.

Yet another object is to provide a radiant heat boiler which is efficient and easy to maintain.

Still other objects will readily present themselves to one skilled in the art upon reference to the ensuing specification, the accompanying drawings, and the claims.

SUMMARY OF THE INVENTION

The present invention contemplates a power generating system which includes a turbine and a radiant heat boiler.

The radiant heat boiler of this system comprises a hermetically sealed enclosure adapted to maintain sub-atmospheric pressure, radiant heat reflecting surfaces on the inner walls of the enclosure arranged as the faces of a regular polyhedron, a radiant heat source mounted within said polyhedral enclosure, and a pressure vessel centrally situated within said polyhedral enclosure and provided with a fluid inlet means and, if desired, having a heat accumulator therein and a fluid outlet means.

The motive fluid circulates within the system in a closed loop. That is, the fluid outlet means of the pressure vessel communicates with the motive fluid inlet port of the turbine stator and the motive fluid outlet port of the turbine stator communicates with the fluid inlet means of the pressure vessel.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings,

FIG. 1 is a block diagram showing one embodiment of the power generating system of this invention;

FIG. 2 is a top view of a turbine of this invention;

FIG. 3 is a sectional side elevation of the turbine shown in FIG. 2 taken along line III - III; and

FIG. 4 is a sectional side elevation of an embodiment of a radiant heat boiler of this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, source of motive fluid for turbine 10 is radiant heat boiler 11 which can be fired by any suitable radiant heat source. The motive fluid is transferred from radiant heat boiler 11 to turbine 10 via conduit or line 12 and returned from turbine 10 to radiant heat boiler 11 via line 13. If desired, condenser 14 can be provided in line 13 to assist in condensation of the motive fluid for reuse; however, if the boiling point of the particular motive fluid that has been selected is sufficiently high, condensation can take place in line 13 without the need for an auxiliary condenser. Cooling fins can be provided on line 13 for that purpose, if desired. Turbine output shaft 15 can be connected to

electrical generator 16 or to any other power takeoff means.

As shown in FIG. 2, turbine stator 17 can also serve as a casing for the turbine. Stator 17 is provided with motive fluid inlet port 18 and motive fluid outlet port 19. Both inlet port 18 and outlet port 19 communicate with a continuous helical groove 20 in the inner wall of stator 17 (FIG. 3). Groove 20 can be machined into the wall of cylindrical stator bore 21 or a separate helix can be inserted in bore 21 and then secured in place so as to become part of the stator inner wall.

Helical groove 20 is substantially coextensive with lateral surface 22 of turbine rotor 23, and one end of groove 20 communicates with inlet port 18 and the other end of groove 20 communicates with outlet port 19.

Rotor 23 of the turbine has a cylindrical configuration and is journaled within cylindrical bore 21 of stator 17 by means of suitable bearings 24 and 25. Output shaft 15 is secured to rotor 23 and projects axially from one end of the rotor.

Lateral surface 22 of rotor 23 has a relatively high drag coefficient vis-a-vis the motive fluid; that is, lateral surface 22 is substantially uniformly rough. Lateral surface 22 can be knurled, or the like, or can be provided with a plurality of closely-spaced blind holes over the surface area.

The relative dimensions of rotor 23 and stator bore 21 are chosen so that the clearance between the stator inner wall and the rotor is very small, usually of the order of about 0.01 inch for efficient operation.

Motive fluid inlet port 18 is situated in turbine stator 17 near one end of rotor 23 and preferably is substantially tangential to lateral surface 22 of turbine rotor 23 so that a relatively high-velocity stream of the motive fluid can be passed through helical groove 20 in close proximity to lateral surface 22.

Turbine stator 17 can be supported on a suitable cradle or support such as turbine bed 26.

Radiant heat boiler 27 suitable for use in the present power generating system is shown in FIG. 4. Boiler 27 comprises hermetically sealed regular polyhedral enclosure 28 provided with heat-reflecting surfaces or mirrors 29 arranged as the faces of a regular polyhedron, radiant heat source 30, and pressure vessel 31 adapted to receive and dispense a motive fluid through fluid inlet 32 and fluid outlet 33, respectively. Fluid inlet 32 and fluid outlet 33 are mounted in the walls of enclosure 27 by means of insulating seals 39 and 40, respectively, and can also serve to hold vessel 31 in a central position within enclosure 27. The polyhedral enclosure has a substantially globular inner surface and can have any number of reflecting surfaces 29 up to an infinite number in which event the polyhedral enclosure is a sphere as illustrated by the dotted line 41 in FIG. 4.

Radiant heat source 30 can be a halogen lamp, or the like. Source 30 is mounted within enclosure 27 so that the radiant heat therefrom is directed to pressure vessel 31 either directly or reflected by means of mirrors 29. A plurality of radiant heat sources can also be employed, if desired. As shown in FIG. 4, radiant heat source 30 is mounted in a wall of polyhedral enclosure 27; however, the radiant heat source, or sources, can be suspended within the enclosure so as to minimize heat loss to the surroundings by conduction, if desired.

Also, in order to minimize heat losses, polyhedral enclosure 27 can be provided with heat-insulating layer

34 on the outside thereof. Suitable materials for this purpose are ceramic foams, polyurethane foam, styro-foam, and the like. In order to reduce heat losses due to gas convection and conduction within the enclosure, preferably enclosure 27 is maintained at a subatmospheric pressure. More preferably enclosure 27 is evacuated and vacuum is maintained therein.

Pressure vessel 31, containing the motive fluid, is centrally situated within polyhedral enclosure 27. Vessel 31 is substantially globular in shape and can be transparent or opaque, depending upon the heat absorptive characteristics of the motive fluid. Preferably vessel 31 is provided with radiant heat absorbing surfaces which can constitute the outer shell of vessel 31 or which can be in the form of heat absorptive plates such as metal plates 35, 36, 37 and 38 situated within a transparent vessel.

Any suitable motive fluid that can be readily vaporized and condensed can be employed. Typical of such fluids, and preferred for the purposes of this invention are halogenated hydrocarbons such as trichloromonofluoromethane (Freon 11), dichloromonofluoromethane (Freon 21), dichlorotetrafluoroethane (Freon 114), trichlorotrifluoroethane (Freon 113), and the like. Other motive fluids such as water, or the like, can also be used.

In operation the motive fluid in liquid form is converted into gaseous form in radiant heat boiler 27. A relatively high velocity gas stream emanating from boiler 27 is then introduced into helical groove 20 of turbine stator 17. As the gas stream speeds along the passageway defined by groove 20, the gas stream brushes past the rough lateral surface 22 of turbine rotor 23 and, because of the drag characteristics thereof, imparts relatively high rotational speed and torque to rotor 23. The spent motive fluid is condensed upon leaving turbine 10 and is returned to radiant heat boiler 27 for reuse.

The foregoing disclosure and the accompanying drawings are illustrative of the present invention but are not to be construed as limiting. Still other variations and rearrangements of parts within the spirit and scope of the present invention are possible and will readily

present themselves to the skilled artisan.

I claim:

1. A radiant heat boiler which comprises a hollow hermetically-sealed, heat-insulated enclosure, the interior of which is evacuated to a subatmospheric pressure, said enclosure having a substantially globular inner surface; radiant heat reflecting surfaces covering the inner surface of the enclosure;
- a hollow substantially globular pressure vessel centrally situated within said enclosure, said vessel including an outer shell provided with a fluid inlet means and a fluid outlet means, said pressure vessel having its outer shell about the entire periphery thereof spaced apart from the reflecting surfaces; and
- at least one localized radiant heat source within the enclosure in the space between the reflecting surfaces and the outer shell of the pressure vessel.
2. The radiant heat boiler in accord with claim 1 wherein the pressure vessel is transparent.
3. The radiant heat boiler in accord with claim 2 wherein the pressure vessel is provided with a radiant heat absorbing plate within the pressure vessel.
4. The radiant heat boiler in accord with claim 1 wherein the outer shell of the pressure vessel constitutes a radiant heat absorbing surface.
5. The radiant heat boiler in accord with claim 1 wherein the reflecting surfaces are arranged as the faces of a regular polyhedron.
6. The radiant heat boiler in accord with claim 5 wherein there is an infinite number of reflecting surfaces, that is, the polyhedron is a sphere.
7. The radiant heat boiler in accord with claim 1 wherein at least some of the reflecting surfaces are diametrically opposed parallel plane surfaces.
8. The radiant heat boiler in accord with claim 7 wherein the reflecting surfaces are the faces of a regular polyhedron.
9. A radiant heat boiler in accord with claim 1, wherein the at least one radiant heat source comprises a radiant heat lamp.

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