

Aug. 20, 1974

K. DEWEGELI
WATER DISTILLER

3,830,705

Filed Oct. 16, 1972

2 Sheets-Sheet 1

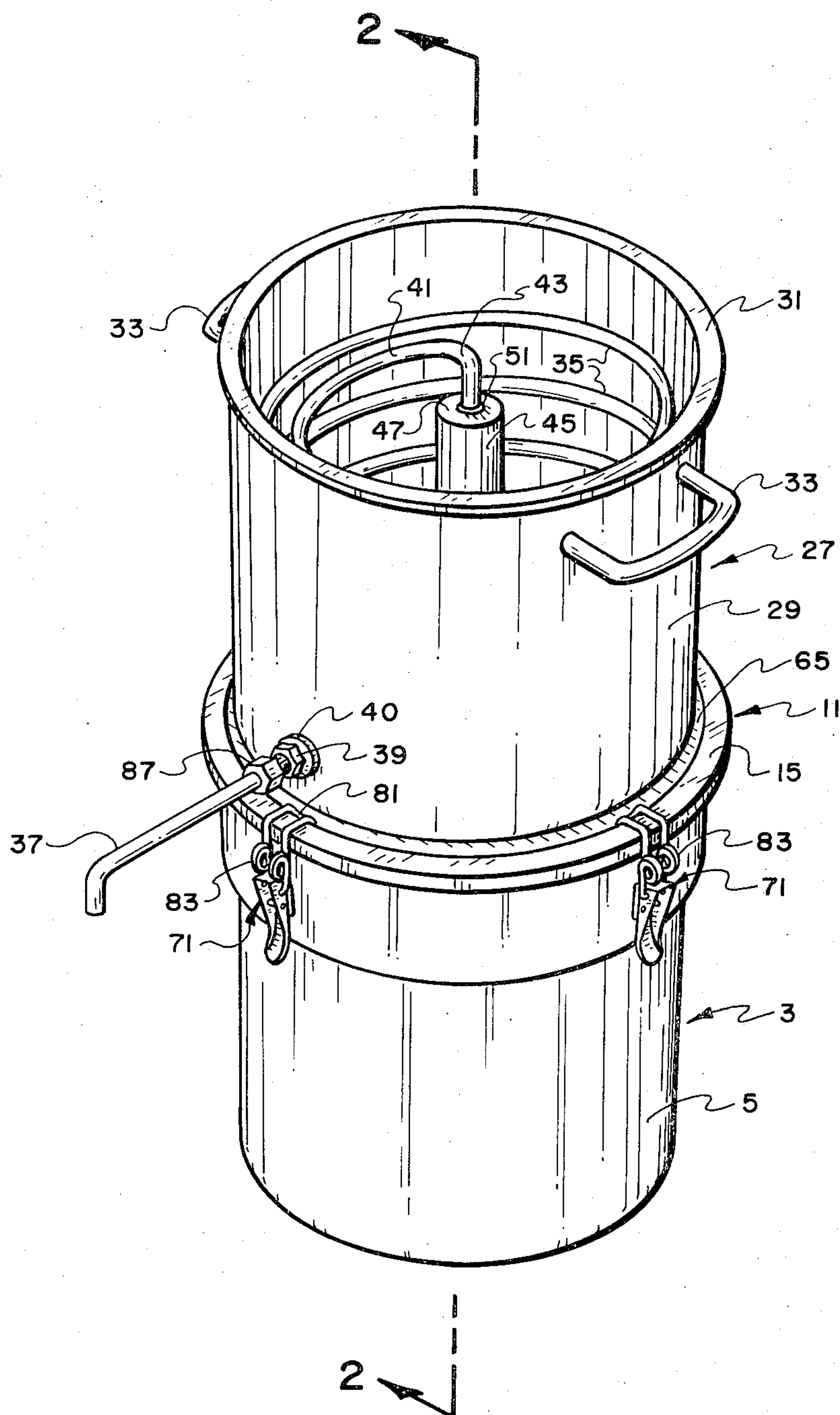


FIG. 1

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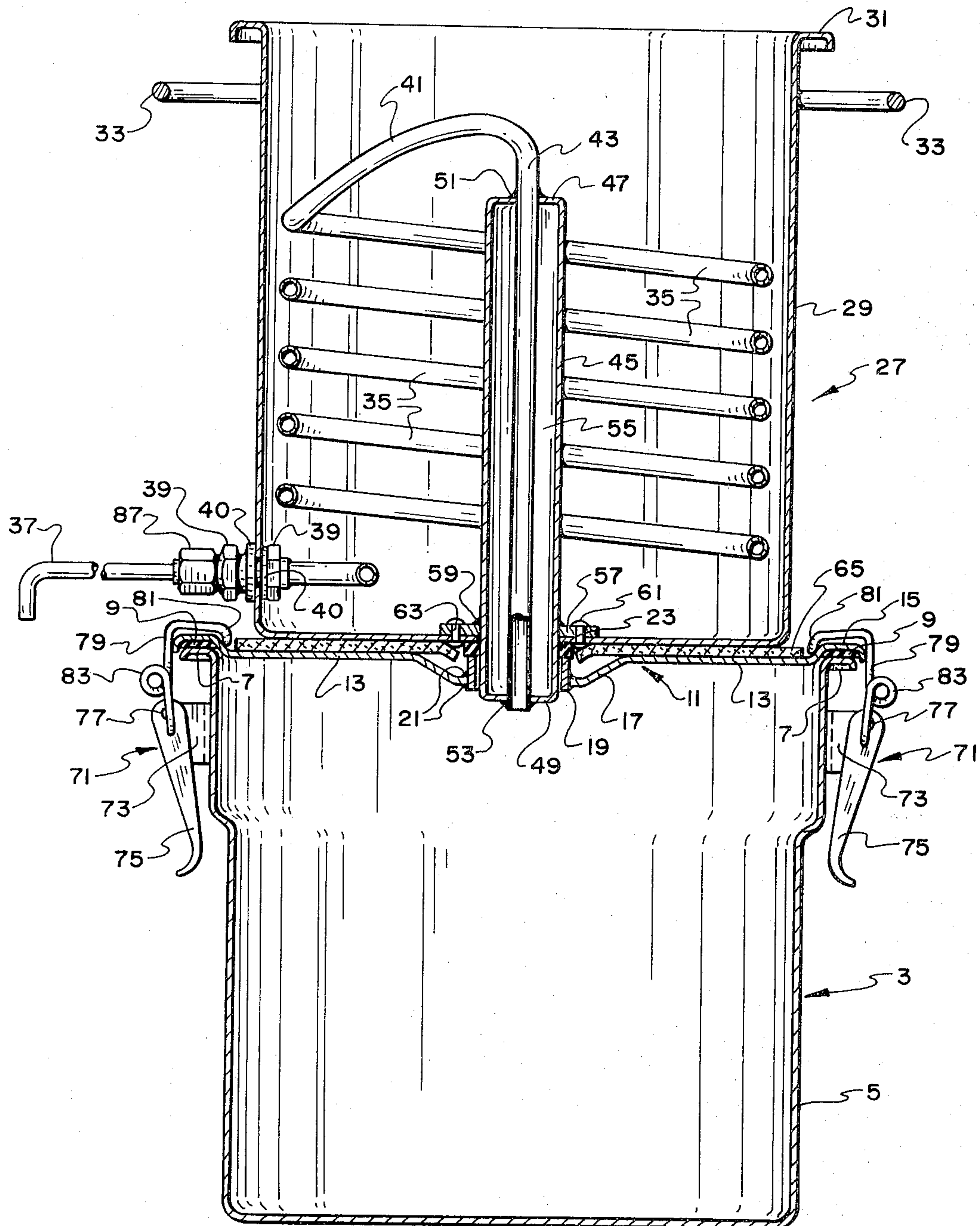


FIG. 2

1

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WATER DISTILLER
Karl Dewegeli, 9411 South 1025 East,
Salt Lake City, Utah 84070
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ABSTRACT OF THE DISCLOSURE

A domestic water distilling apparatus adapted for use in generating distilled water in the home comprises a boiler section consisting of a kettle-like container cover section releasably engagable thereto by spring clamps which also serve release to the top section in the event of a buildup of an undue amount of pressure within the boiler section. The cover is arranged to receive a condenser section placed vertically above the boiler section and insulated therefrom by an insulation means such as an asbestos mat. A vertically extending portion of a tube which receives steam from the boiler section and delivers it to a coil in the condenser section is insulated from the coolant water reservoir of the condenser section, such as by a fully enclosed air filled chamber. The condenser section may be stored within the boiler section.

BACKGROUND

Field of Invention

This invention relates to the distilling of water, and more particularly to water distilling apparatus particularly adapted for home use.

Prior art

There are numerous occasions of a need arising for an adequate and readily available supply of distilled water in the home. The principles of providing this distilled water are well known: water is boiled so as to provide clean steam, undesirable matter remaining in the unvaporized water, and the steam is condensed so as to provide distilled water. However, it is also known that the use of rudimentary articles found about the home, such as a teakettle with a tube leading from the spout thereof into a pan for collecting distilled water, cannot provide an adequate supply of water in a reasonable time. Specifically, it is known that reasonable preparation of distilled water requires that a condensing section be provided with adequate heat exchange surfaces, such as are provided by well known condensation coils, and preferably includes some affirmative cooling medium in thermal exchange with the condensing coil, such as a cold water reservoir or bath in which the condensation coil may be immersed.

Heretofore, there have certainly been provided many elaborate forms of distilling units, both for water and otherwise, but such devices have not served the needs of the homeowner. Since a need for distilled water about the home may be relatively infrequent and of a small scale, elaborate and costly units are not feasible. Further, such units should be easily disassembled for cleaning and capable of compact arrangement for ease of shipment and storage. Necessarily, such units should provide efficient operation at low cost.

SUMMARY OF THE INVENTION

The primary object of the present invention is to provide improved distilling apparatus adapted for distilling water in the home.

Another object of the invention is to provide distilling apparatus of improved efficiency.

Other objects of the invention include provision of

2

distilling apparatus which is principally adapted for use in distilling water in the home; which is capable of disassembly for cleaning and for ease of storage and shipment; and which, although capable of implementation at relatively low cost, includes means to insure against explosion of the boiler vessel as a result of too high a build-up of pressure therein.

According to a principal aspect of the present invention a distilling apparatus, of the type having a boiler section supplying steam through a vertically extending conduit to a condensation coil immersed in a coolant, is provided with insulation means to thermally isolate the vertically extending conduit from the coolant. According further to the invention, the condensation coolant is thermally isolated from the boiler section by an insulating means interposed therebetween. In still further accord with the present invention, a condenser section of water distilling apparatus is adapted to be releasably engaged with the upper portion of a boiler section. In accordance still further with the present invention, a boiler section of water distilling apparatus includes a removable cover which is releasably held thereon by means of spring clamps, said spring clamps also serving to act as pressure responsive release members to allow the cover of the boiler vessel to be released therefrom in the event of a buildup of excess pressure therein, thereby to avoid explosion of the boiler section.

The present invention provides a highly efficient distilling apparatus which is particularly well suited for home use. Apparatus in accordance with the present invention may be implemented at relatively low cost, and it is easily disassembled for cleaning and for efficient shipment and storage. While implementable at low cost, the invention provides extremely efficient distillation of water by insulating the condensation coolant from the boiler section, and by minimizing condensation of the water at points in the condensation apparatus where recondensed water could return to the boiler section. The use of pressure releasable clamps to engage a cover on the vessel of the boiler section reduces the cost thereof by eliminating the need for special pressure release mechanisms.

Other objects, features and advantages of the present invention will become more apparent in the light of the following detailed description of a preferred embodiment thereof, as illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a preferred embodiment of water distilling apparatus in accordance with the present invention; and

FIG. 2 is a sectioned, side elevation view of said preferred embodiment taken along the line 2—2 in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, a preferred embodiment of water distilling apparatus in accordance with the present invention comprises a boiler section 3, including a kettle-like vessel 5 adapted to contain boiling water which is to be distilled. The upper perimeter is fixed with an outwardly extending peripheral flange 7 upon which a suitable seal or gasket 9 is disposed in order to provide a steam-tight seal with a cover assembly 11, preferably a shaped disc member 13 including a lipped portion 15 and a dished portion 17. The dished portion 17 includes an aperture into which is fitted a cylindrical member 19 which may be affixed thereto in any suitable fashion such as by fillet welds 21. Disposed above the cylindrical member 19 is a cylindrical seal or gasket 23 which, along with the gasket 9, may comprise any suitably resilient material, such as neoprene.

A condenser section 27 is removably disposed above the boiler section 3 and includes a kettle-like vessel 29 with an outwardly extending flange 31 at the open, upward perimeter thereof. The vessel 29 may be suitably fitted in any well known fashion with handles 33 as desired. A condenser coil 35 disposed within the vessel 29 terminates at its downward end in an outlet 37 which passes through an aperture in vessel 29 and is provided with a liquid seal thereat by suitable fixtures 39 and gaskets 40 of any well known type. An upper end 41 of the coil 35 is formed contiguously with a vertical conduit portion 43 which extends downwardly below the bottom wall of the vessel 29. Integrally joined with the vertically extending conduit portion 43 is an insulation means which may preferably comprise a walled structure 45, which may suitably be in the form of a cylinder having inwardly extending top and bottom walls 47, 49 which are joined in fluid-tight relationship with the conduit portion 43, such as by fillet welds 51, 53 so as to provide a fluid seal thereat. The structure 45 provides an insulating void 55 which may simply comprise a dead air space, or may be evacuated if desired. Insulation provided by the structure 45-49 serves to insulate the vertically extending conduit portion 43 from coolant contained within the vessel 29, which should be maintained at a level no higher than the upper wall 47. This is an important aspect of the present invention since it minimizes condensation of steam within the vertically extending conduit portion 43, thereby efficiently providing for a greater portion of the steam which is generated in the boiler section 3 becoming available for use at the outlet 37, rather than having it simply return to the boiler section 3 as a result of gravity. The cylindrical structure 45 passes through a centrally-disposed aperture in, and is suitably affixed to, a bottom wall of the vessel 29. This may be achieved by means of a flange 57 affixed in some suitable fashion, such as by a fillet weld 59 to the structure 45. The flange 57 is, in turn, fixed in a suitable fashion, such as by rivets 61, 63 to the bottom wall of the vessel 29. If desirable and necessary, a suitable sealant may be interposed between the flange 61 and the bottom wall of the vessel 29 so as to provide a suitable fluid seal in order to prevent leakage of coolant from the vessel 29.

In accordance with another important aspect of the present invention, the hot water and steam within the boiler section 3 are thermally isolated from the colder coolant in the condenser section 27 by an insulation means, which may take the form of a mat of insulation material 65 which may comprise asbestos, expanded polyurethane foam, or any other suitable insulating material. The mat 65 is preferably in the shape of a disc having a centrally disposed circular aperture therein to permit fitting of the mat 65 over the seal or gasket 23.

In accordance with still another aspect of the present invention, the cover assembly 11 is caused to releasably engage the gasket or seal 9 in a substantially steam-tight relationship by means of a plurality of spring clamps 71, each of which includes a frame portion 73 suitably affixed to the wall of the vessel 5, upon which a handle portion 75 is rotatably disposed such as by a pin or rivet 77. A spring member 79 is formed of a suitably springy wire folded back on itself (as at 81) so as to provide two vertically extending portions including loops 83 and inwardly extending horizontal portions (not clearly shown in the Figures) which extend into suitable holes in the handle portion 75. The spring members 79, by being made of a suitable spring material and having the loops 83 therein, provide sufficient spring tension to resiliently seal the cover assembly 11 to the gasket 9 so as to provide a steam-tight seal thereat. In addition, utilization of the spring clamp 71 also provides fail-safe protection against explosion occurring as a result of a buildup of excessive steam pressure within the boiler section 3 since the looped back sections 81 will be forced upwardly as a result of excessive pressure, thereby destroying the seal of the gasket 9 to allow excess steam to escape. In addition, the spring clamp mem-

bers 79 are easily replaced if necessitated by bending to release pressure.

The vessels 5 and 29, the cover assembly 11, and the structure 45-49 (and appurtenant structures) may preferably be comprised of stainless steel since this is an easily cleaned, stain resistant durable material and since it has a relatively low thermal conductivity. On the other hand, the condenser coil 35 should preferably be comprised of a material, such as copper, having a relatively high thermal conductivity in order to insure a good heat exchange between the steam contained therein and the coolant within the vessel 29. Of course, other suitable materials may be used, in which case forms of fastening other than welding should be used as appropriate.

The boiler section 3 and the condenser section 27 are completely separable, simply by lifting the condenser section upwardly away from the boiler section 3. In addition, by providing an outlet 37 which is formed of separate tubing from that of the condenser coil 35, and releasably securing the outlet 37 to the fixtures 39 by a suitable fitting, such as a flared or compression fitting 87, the outlet 37 may be removed from the vessel 29. In such a case, and by providing suitable dimensions to the vessel 29 and the vessel 5, the condenser section 27 may be substantially completely disposed within the boiler section 3, even with the handles 33 disposed on the vessel 29. By providing for the removal of the handles 33 or by providing folding handles (of the type commonly found on trunks and ashcans), suitably dimensioned apparatus would permit complete containment of the condenser section 27 within the boiler section 3, even with the cover assembly 11 clamped in place as shown in the Figures. This greatly facilitates shipment and storage of the device which not only renders it more useful for home use, but also reduces the cost thereof making it more suitable for use in the home.

In use, the vessel 5 would be filled to a suitable level (such as that shown in the drawing) with water which is to be distilled (preferably previously heated water). Then the cover assembly 13 would be clamped in place as shown in the drawing. Thereafter the condenser section would be disposed on top of the boiler section 3, with the insulation matting 65 suitably interposed therebetween, and the vessel 29 would be filled to a level no higher than the upper wall 47 with a suitable coolant, such as cold water. Heat is then applied to the bottom of the vessel 5, such as by an ordinary stove or hotplate, thereby to cause the water in the vessel 5 to boil and steam to pass upwardly through the vertically extending conduit portion 43, with substantially no condensation therein, and to condense against the walls of the condenser coil 35 and the extension 41, the condensed water passing by force of gravity downwardly therethrough and outwardly to the outlet 37, for collection in any suitable container.

Thus there has been described an embodiment of the invention which has various advantageous aspects rendering it most suitable for use in distilling water in the home. The insulation means provided by the structure 45-49 substantially eliminates wasteful condensation of steam vertically in-line with the boiler section 3, thereby materially increasing the efficiency of the apparatus. Similarly, by providing a measure of thermal isolation between the boiler section 3 and the condenser section 27, such as by means of an insulating matting 65, the coolant is not directly heated by the hot water and steam in the vessel 5, nor is heat intended for use in creating steam within vessel 5 dissipated upwardly into the coolant 29; this feature also greatly increases the efficiency of the apparatus in accordance with the present invention. In addition, the complete separability of the two parts, in an easy fashion, by means of simple spring clamps greatly facilitates separation for cleaning and for ease of transportation and storage. In addition, by suitably dimensioning the boiler section 3 with respect to the condenser section 27, and adequately providing for the outlet 37 and the

5

handles 33, the entire condenser section may be stored partially or wholly within the boiler section 3. The simple spring clamps also provide steam-tight integrity without necessitating the use of special pressure relief mechanisms in order to insure against explosions as a result of excess pressure (which may, for instance, be caused by a blockage occurring within the condenser coil 35).

Although the invention has been shown and described with respect to a preferred embodiment thereof, it should be understood by those skilled in the art that the foregoing and various other changes and omissions in the form and detail thereof may be made therein without departing from the spirit and scope of the invention.

Having thus described a typical embodiment of my invention, that which I claim is new and desire to secure it by United States Letters Patent is:

- 1. Apparatus for distilling water, comprising:
 - a boiler section comprising one open top vessel, the open top having an outwardly projecting radial lip; lid means spanning and substantially closing the open top of the vessel and resting upon the radial lip, the lid means having a central opening therein;
 - a condenser section comprising a second open top vessel adapted to be rest by gravity vertically above said boiler section when in use therewith, said condenser section including a condenser coil within the vessel having an upper end connected to an upper end of a vertically extending conduit portion which has a lower end extending below the bottom of the condenser section and through said central opening in the lid means in fluid communication with said boiler section when said condenser section is disposed for use with said boiler section, said second vessel adapted to contain a coolant about the coil when in use; and
 - an enlarged tubular member surrounding in spaced relation said vertically extending conduit portion along substantially the entire length thereof, the ends of said tubular member being closed said air space within the tubular member serving to insulate said vertically extending conduit portion from coolant within the second vessel comprising said condenser section, thereby to minimize condensation of steam passing

6

upwardly in said vertically extending conduit portion to materially increase the efficiency of said distilling apparatus, the lower end of the tubular member being sized and shaped to fit snugly within the central opening of the lid means.

2. The distilling apparatus according to claim 1 additionally comprising a layer of insulation interposed between said lid means and the bottom of said condenser section for providing substantial thermal isolation therebetween.

3. The distilling apparatus according to claim 2 wherein said layer of insulation comprises a mat of asbestos.

4. The distilling apparatus according to claim 1 additionally comprising pressure release clamping means carried by said boiler section and adapted to engage said lid means against the radial lip said one vessel so as to provide a substantially steam-tight seal therebetween to allow the clamping means to open if steam pressure within the one vessel exceeds a predetermined maximum.

5. The distilling apparatus according to claim 4 wherein said clamping means are comprised of wire spring material and a fulcrumed handle.

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NORMAN YUDKOFF, Primary Examiner

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202—83; 292—247