Feb. 22, 1966 A. M. POINDEXTER ETAL 3,236,746

ELECTRICALLY HEATED STILL WITH AIR CONDENSER

Filed Jan. 22, 1962

3 Sheets-Sheet 1

FIG. 1

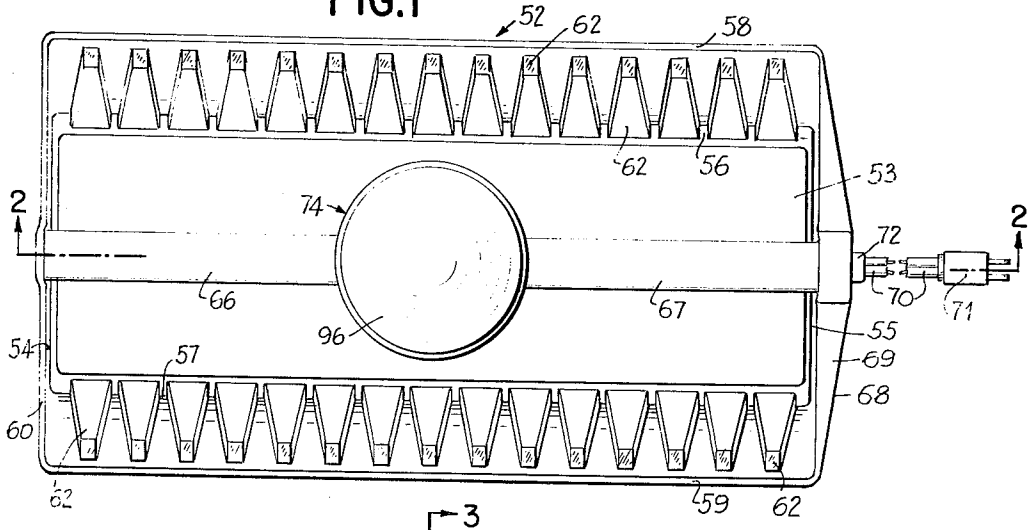
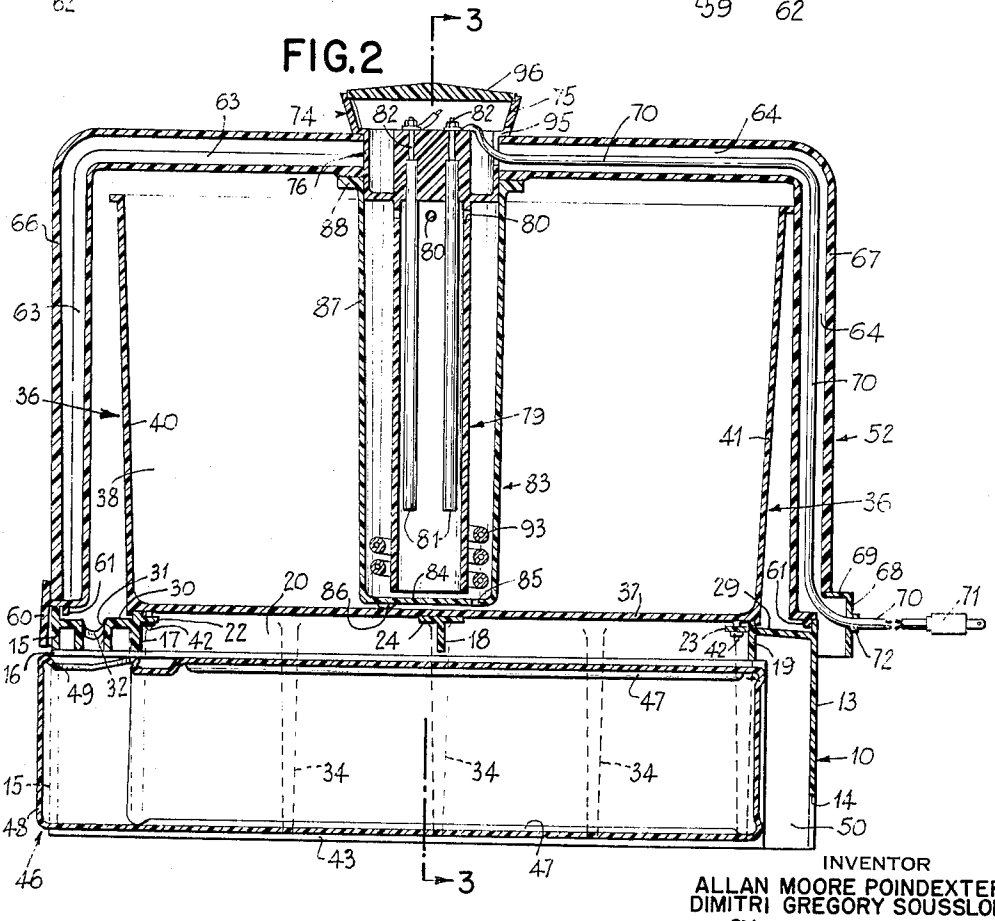


FIG. 2



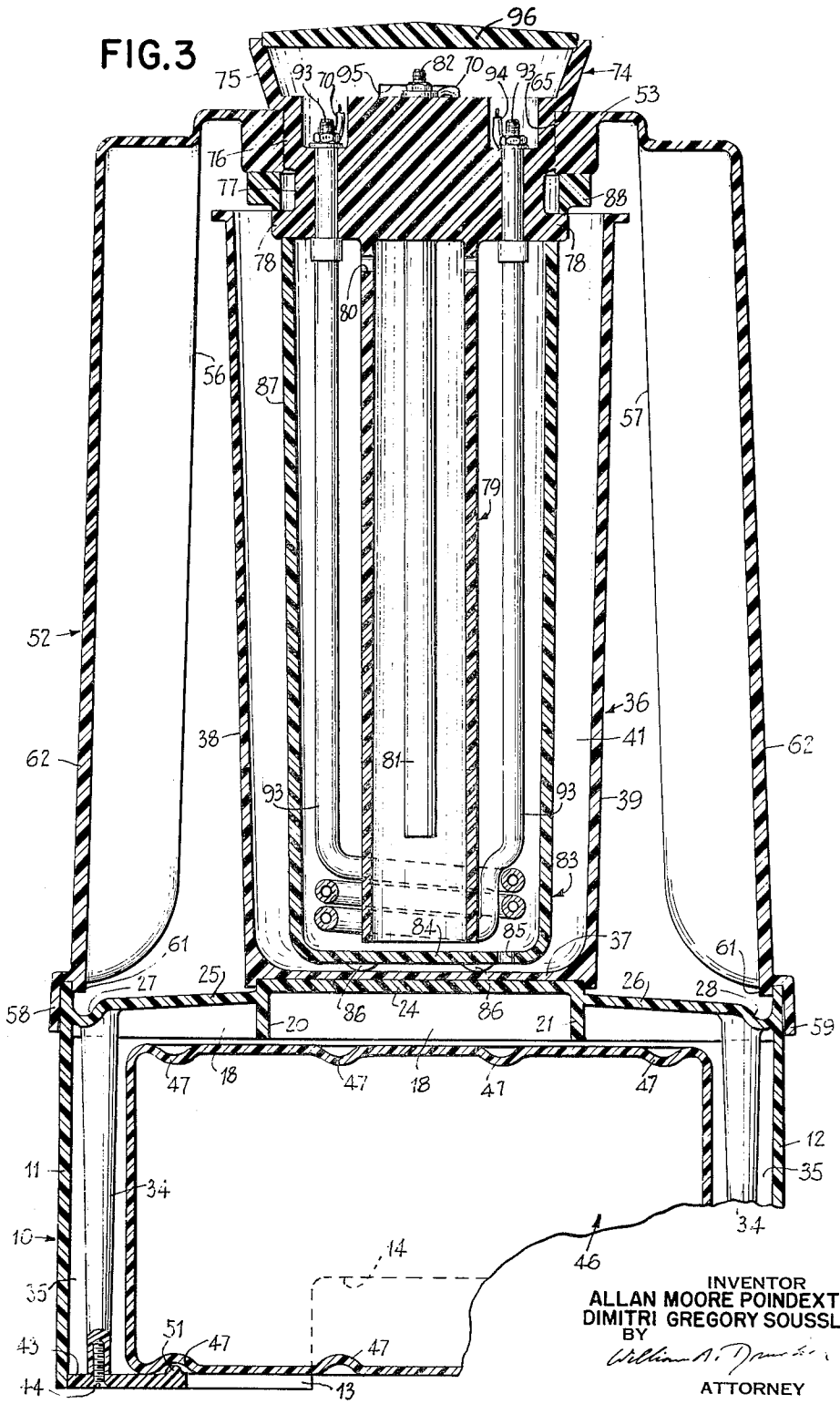
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FIG.3



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FIG.4

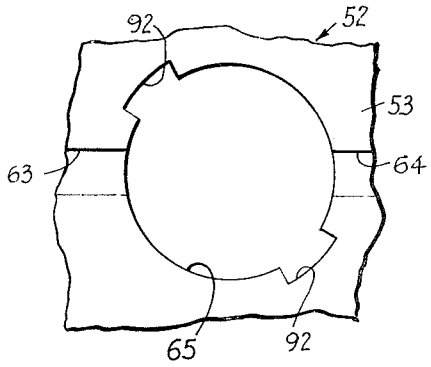


FIG.5

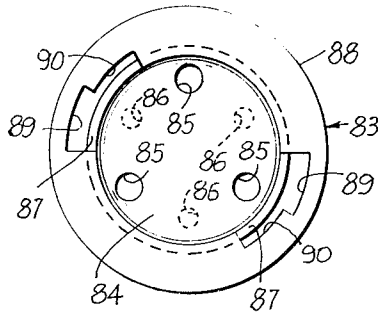


FIG.6

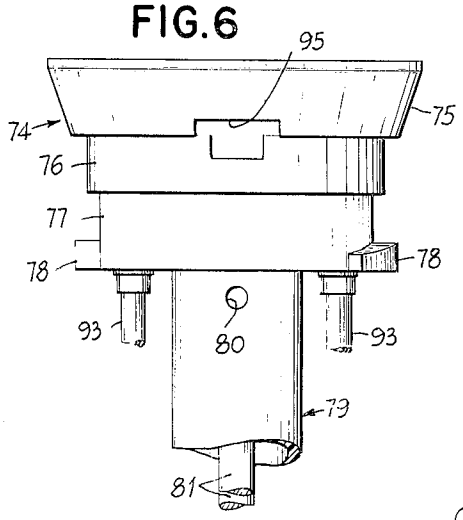


FIG.7

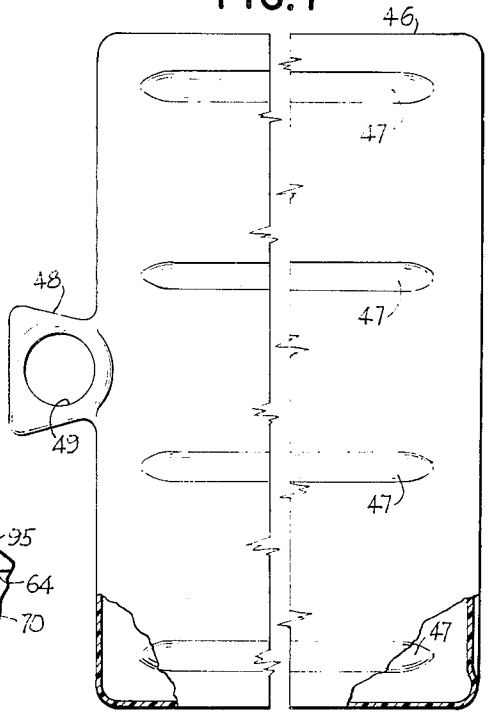
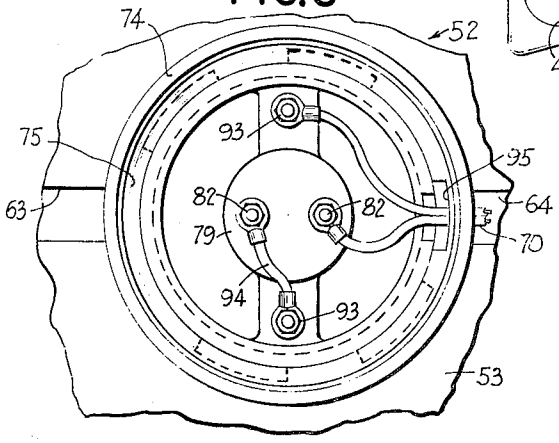


FIG.8



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3,236,746
ELECTRICALLY HEATED STILL WITH AIR CONDENSER

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Filed Jan. 22, 1962, Ser. No. 167,775
2 Claims. (Cl. 202—187)

This invention relates in general to distillation apparatus, and, more particularly, to low cost distillation apparatus which is particularly adapted to be used in the home.

In many places the potable water supply is contaminated by salts and substances in solution which impart an unpleasant taste and order to water and which render it unpleasant to drink. In other areas where there is a clear and adequate supply of drinking water for the majority of the population, specific individuals may have to distill or import drinking water to avoid harmful reactions produced by particular ingredients of the drinking water. Even when it is not required for regular or special drinking purposes, distilled water should be used in the home to fill such appliances as steam irons and the like and distilled water should be used to replenish fluid lost through evaporation from automobile storage batteries.

It is, therefore, a principal object of this invention to provide a low cost and a safe distillation apparatus.

Another object of this invention is to provide a distillation apparatus which automatically shuts off when its fluid supply is exhausted or if it is accidentally knocked over or upset when left unattended.

A further object of this invention is to provide an extremely simple home distillation apparatus which will not burn anyone who accidentally touches it while it is in use.

Yet another object of this invention is to provide a more simple and less expensive home distillation apparatus which may be fabricated almost entirely from molded plastic.

Still another object of this invention is to provide a distillation apparatus having an air cooled condenser which is transparent to radiations of about eight angstrom units in wave length so as to dissipate heat from condensing steam by direct radiation through the walls of the condenser.

Many other objects, advantages and features of invention reside in the construction, arrangement and combination of parts involved in the embodiment of the invention and its practice as will be understood from the following description and the accompanying drawing of a preferred embodiment of the invention wherein:

FIGURE 1 is a plan view of the distillation apparatus;

FIGURE 2 is a longitudinal vertical section through the distillation apparatus taken on line 2—2 of FIGURE 1;

FIGURE 3 is a vertical section taken on lines 3—3 of FIGURE 2;

FIGURE 4 is a top view of a fragment of the condenser showing the aperture through which the handle is secured;

FIGURE 5 is a top view of the heater sleeve;

FIGURE 6 is a side view of the handle with a lower portion broken away;

FIGURE 7 is a top view of the product water bottle with a central portion broken away and with two corners broken away in horizontal section; and

FIGURE 8 is a top view of a fragment of the condenser with the handle shown fixed in place with the handle cover removed.

Referring to the drawing in detail, FIGURES 2 and 3 show the base **10** which has two vertical side walls **11** and

12 extending along its entire length. A rear wall **13** extends between the ends of the side walls **11** and **12** and contains a cutout **14** in its lower centrally located portion. The front wall **15** contains a large rectangular cutout portion **16** which extends from the bottom of wall **15** almost to its top and substantially across its entire width.

Three transverse braces **17**, **18** and **19** extend between the tops of the side walls **11** and **12**. Two longitudinal braces **20** and **21** extend between the transverse braces **17** and **19** and intersect the transverse brace **18**. Horizontal flanges **22** and **23** extend inward from the transverse braces **17** and **19** between the longitudinal braces **20** and **21**. A single horizontal flange **24** extends outward across the top of the transverse brace **18** between the longitudinal braces **20** and **21**. Two drain decks **25** and **26** slope downward and outward from the longitudinal braces **20** and **21** towards the side walls **11** and **12**. The drain decks **25** and **26** may terminate in the flutters **27** and **28**. At the rear of the base **10** the drain deck **29** extends from the transverse brace **19** and slopes towards the rear wall **13**. The drain deck **29** communicates with the side drain decks **25** and **26** may terminate in the gutters **27** and **28**. drain deck **30** containing the gutter **31**. The central portion of gutter **31** terminates in the opening **32** so that fluid falling on the drain decks will flow into the gutters **27** and **28** which lead to gutter **31** to flow through opening **32**.

Referring further to FIGURES 2 and 3, a number of tapered projections **34** extend downward from the drain decks **25** and **26** alongside the side walls **11** and **12**. A suitable web **35** may extend between each tapered projection **34** and the adjacent side wall. The entire base **10** may be molded in a two part mold from a suitable thermoplastic.

As shown in FIGURES 2 and 3, a tank **36** has a bottom wall **37** fixed to the horizontal flanges **22** and **23** by means of nipples **42** which extend downward from it. The side walls **38** and **39** and the end walls **40** and **41** extend beyond and slightly below the longitudinal braces **20** and **21** and the central portions of the transverse braces **17** and **19**.

Two bottles support strips **43** are fixed to the bottoms of the tapered projections **34** to extend inward from the side walls **11** and **12** by means of suitable fastening means **44** such as drive screws or the like.

Referring now to FIGURES 2, 3 and 7, a product or distilled water bottle **46** is blow molded or otherwise fabricated from polyethylene or any other suitable material. The water bottle **46** is generally rectangular in shape and has stiffening corrugations **47** formed in its top and bottom surfaces. A wedge-shaped neck **48** extends from one end of bottle **46** and contains an aperture **49** formed in a depression in its top surface. The bottle **46** is slipped like a drawer through the opening **16** in front wall **15**. The bottom surface of the bottle **46** is supported by the bottle support strips **43**. As shown in FIGURE 2, two web members **50** extend forward from the rear wall **13** on either side of the cutout portion **14**. These web members **50** serve as stops to limit the rearward motion of bottle **46** within the base. As shown in FIGURE 3, two small projections or lugs **51** extend upward from the rearwardly disposed inside edges of the bottle support strips **43**. The end of the bottle **46** rides over these projections **51** which then fall into the two lower outside corrugations **47** to secure the bottle **46** in position within the base **10**. The bottle may be easily removed as it may be urged outward for a short distance by inserting a finger through the opening **14** in rear wall **13**. After the bottle is urged outward a short distance, it may be easily grasped by its neck **48** and removed.

Referring now to FIGURES 1, 2 and 3, the condenser **52** has a top wall **53**, two end walls **54** and **55** and the side walls **56** and **57**. The side walls **56** and **57** slope downward and then extend outward to terminate in the downwardly bending skirts **58** and **59**. The end wall **54** terminates in a skirt **60**. A short distance inward from each skirt **58**, **59** and **60** and from the lower edge of the end wall **55** there is a small downwardly extending strip **61** which extends completely around the inner upper edges of the side walls **11** and **12**, the rear wall **13** and the front wall **15**. As may be seen in FIGURES 1 and 3, vertical projections **62** are formed to extend outward from the side walls **56** and **57** to increase the total inside and outside surface area of the condenser **52**.

Referring now to FIGURES 1, 2 and 4, the channels **63** and **64** extend from a large central aperture **65** in the top wall **53**. The channels **63** and **64** extend to the ends of the top wall **53** and then extend downward in the end walls **54** and **55** respectively. Suitable channel-shaped strips **66** and **67** are snapped, glued or otherwise fixed over the channels **63** and **64**. These strips **66** and **67** serve a decorative purpose in that they enhance the overall appearance of the condenser **52**. A projecting skirt **68** having a top wall **69** is molded to extend rearwardly from the bottom portion of end wall **55**. An electric cord **70** having a plug **71** extends through both an aperture in skirt **68** and a strain relief bushing **72** to extend within channel **64** and be covered by strip **67**.

Referring now to FIGURES 2, 3, 4, 5, 6 and 8, a handle member **74** has an outward flaring upper portion **75** a cylindrical portion **76**, a smaller cylindrical portion **77** carrying the lugs **78**, and a switch tube **79** extending downward from the cylindrical portion **77**. The switch tube **79** is open at its lower end and contains a number of small apertures **80** formed in its upper portion. As shown in FIGURE 2, two carbon rods **81** are fixed within the handle member **74** to extend downward parallel to each other within the switch tube **79**. Suitable conducting members **82** are fixed to the tops of the rods **81** and extend upward within the outwardly flaring upper portion **75**.

As shown in FIGURES 2, 3 and 5, a heater sleeve **83** has a bottom wall **84** containing the apertures **85**. Small projections **86** extend downward from bottom wall **84** to position it above the bottom wall **37** of tank **36** so that the bottom wall **37** will not close the apertures **85**. The slightly tapering side wall **87** extends upward to terminate in the flange **88**. As shown in FIGURE 5, wide slots **89** are cut downward through the flange **88** and the upper portion of the side wall **87**. Also formed through the side wall **87** and the flange **88** are narrower slots **90** which are disposed alongside the wide slots **89**.

The handle member **74** and the heater sleeve **83** are secured to the condenser **52** in the following manner. Referring to FIGURES 4, 5 and 6, the heater sleeve **83** is placed below the top wall **53** of condenser **52** with the wide slots **89** disposed directly beneath corresponding slots **92** formed in the top wall **53**. The handle member **74**, which already has the heating element **93** and the carbon rods **81** fixed to it, has its switch tube **79** extended downward through the aperture **65**. The lugs **78** are aligned with the slots **92** and **89**. The handle member **74** is moved downward until the lugs **78** pass through the slots **92** and **89** and the lugs **78** are below flange **88**. At this time the handle member **74** is turned clockwise so that the lugs **78** move beneath the flange **88** adjacent to the narrower slots **90**. Therefore, as shown in FIGURE 3, the top wall **53** of the condenser is clamped between flange **88** and the outwardly flaring upper portion **75** of the handle member **74**.

Referring now to FIGURE 8, the electric cord **70** is connected to one end of the heating element **93** and to one of the conducting members **82** leading to a carbon rod **81**. A small lead **94** connects the other conducting element **82** with the other end of heating element **93**. A

suitable cutout **95** is formed in the outwardly flaring portion **75** of handle member **74** in line with channel **64** so that the wire **70** may extend through the cutout **95**.

The bottle **46**, the tank **36** and the condenser **52** are best formed from polyethylene or polypropylene while the handle member **74**, the heater sleeve **83**, and the base **10** may be molded from a suitable phenolic plastic. A small disk-shaped plastic or rubber cover **96** is glued or otherwise secured over the outwardly flaring upper portion **75** to cover the electrical connections.

This distillation apparatus is used in the following manner. An empty bottle **46** is slid into the base **10**. The upper portion **75** of the handle member **74** is grasped to remove the entire condenser **52**. Water or other liquid to be distilled is then poured directly into tank **36**. If the apparatus is being used for the first time, a pinch of salt to provide electrical conductivity is thrown into tank **36**. The condenser **52** is then placed over the base **10** and the plug **71** is inserted into a suitable electric outlet. Water within tank **36** will flow through the apertures **85** to seek its own level within the heater sleeve **83** and the switch tube **79**. Since, as shown in FIGURE 8, the carbon rods **81** are connected in series with the heating element **93**, water to be distilled containing a trace of salt will conduct current between the rods **81** to activate the heating element **93**. Heating element **93** will boil water within the heater sleeve **83** and steam will escape from within the heater sleeve **83** through that portion of the slot **89** which is cut in the side wall **87**. This steam rapidly fills the space between the tank **36** and the side walls of the condenser.

Upon contact with the cooler electrically insulating molded plastic condenser **52**, the steam will condense to run down its inner surfaces onto the drain decks **25**, **26**, **29** and **30**. There the gutters **27**, **28** and **31** will conduct condensed moisture to the aperture **32** through which it drops into the bottle **46**. Since the condenser **52** is made with a relatively large inner and outer surface area, it is rapidly cooled by direct contact with and the conduction of heat to surrounding air. Vertical convection currents will then be set up in the surrounding air to draw new and unheated air into contact with the outer surface of the condenser **52**. In addition, since condenser **52** may be made of polyethylene, heat may be directly radiated through the walls of condenser **52**. This results from the fact that most of the heat radiated from steam at atmospheric pressure is within a range close to eight angstrom units in wave length. The polyethylene plastic of condenser **52** may be selected to be over 80% transparent to radiation of about eight angstrom units of wave length.

As fluid boils away from within tank **36**, its level falls until the carbon rods **81** in switch tube **79** are no longer immersed. When electric current can no longer flow through fluid between the carbon rods **81**, the heating element **93** is disconnected and the apparatus automatically ceases to function. Thus it is impossible to burn out the heating element **93** by operating it when its lower convolutions are not immersed in water. This feature also automatically shuts off the heating element **93** as a safety measure when the condenser **52** is removed to fill the tank or for any other purpose. In addition, should the distillation apparatus be accidentally upset, as when left unattended in the presence of children in a home, water would rapidly flow from about the carbon rods **81** and shut off the electric current flowing to the heating element **93**. In operation the hottest exposed part of this distillation apparatus is the polyethylene condenser **52**. However, since polyethylene has a relatively low thermal diffusivity, accidental direct contact with the condenser **52** will not produce a burn. This is a particular advantage of a plastic condenser acting also as a cover and avoids the need for further enclosure.

While this invention has been disclosed in the best form known, it will nevertheless be understood that this is purely exemplary and that modifications in the con-

struction, arrangement, and combination of parts, the substitution of material and the substitution of equivalents mechanically and otherwise may be made without departing from the spirit of the invention.

We claim:

1. A distillation apparatus comprising in combination:

(a) a base having an upper surface forming a drain deck, said deck containing a drain aperture, and said deck extending about the upper surface of said base, said deck being pitched and inclined to lead liquid thereon into said drain aperture, side walls on said base, a front wall in said base containing a large cut-out portion;

(b) a detachable tank mounted upon said base and extending upward from said base, said tank being at least partially surrounded by said drain deck;

(c) a detachable liquid container disposed within said base below said drain deck, said container being slidably removable from said base through the opening in said front wall, said container having an opening therein into which fluid drains from said aperture in said drain deck;

(d) a detachable condenser shell, having multiple external projecting fins for air cooling, disposed over said drain deck and around said tank and supported upon said base means; and

(e) electric conducting means including elements extending from said detachable condenser shell downward into said tank, said conducting means comprising electric resistance heating means connected electrically in series with said conducting means and a switch means operable electrically in series with said conducting means, said switch being exposed within said tank to allow liquid to flow onto said switch and to bridge the conducting elements at said switch, whereby current flows through said switch only when electrically conducting liquid bridges said switch.

2. A distillation apparatus comprising in combination:

(a) a base having an upper surface forming a drain deck, said deck containing a drain aperture, and said deck extending about the upper surface of said base, said deck being pitched and inclined to lead liquid thereon into said drain aperture, side walls on said base, a front wall in said base containing a large cut-out portion;

(b) a detachable tank mounted upon said base and extending upward from said base, said tank being at least partially surrounded by said drain deck;

(c) a detachable liquid container disposed within said base below said drain deck, said container being slidably removable from said base through the opening in said front wall, said container having an opening therein into which fluid drains from said aperture in said drain deck;

(d) a detachable condenser shell, having multiple external projecting fins for air cooling, disposed over said drain deck and around said tank and supported upon said base means; and

(e) electric conducting means including elements extending from said detachable condenser shell downward into said tank, said conducting means comprising electric resistance heating means connected electrically in series with said conducting means and a switch means operable electrically in series with said conducting means, said switch being adapted to connect said elements electrically in series when said switch is submerged in liquid and to disconnect said elements in the absence of liquid.

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