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Recovery of Atmospheric Humidity (Air Wells)

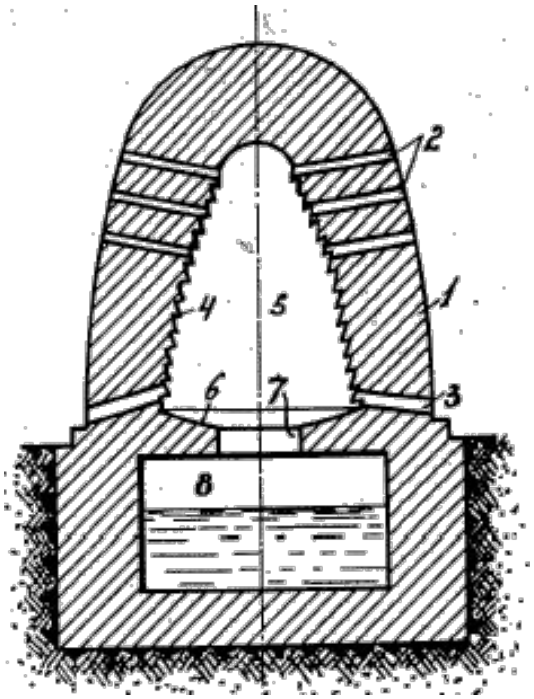
Patents

See also: [Air Wells, Dew Ponds & Fog Fences](#) ~ [Klaphake: Air Wells](#)

US Patent # 1,816,592

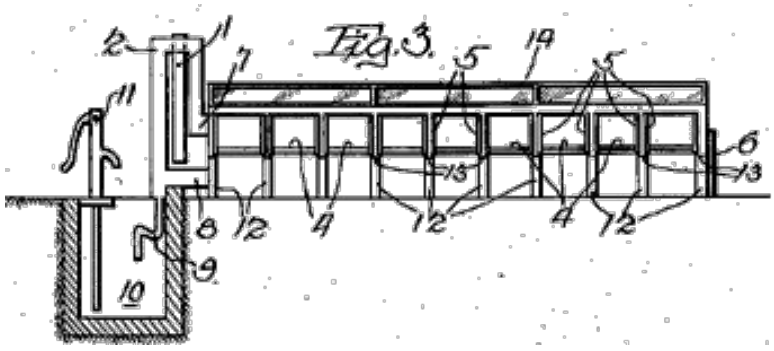
Means to Recuperate the Atmospheric Moisture
Achille Knapen

Abstract --- This invention relates to means for recuperating atmospheric moisture by condensing the gaseous mixture carried by warm air. Atmospheric air is caused to circulate in a closed structure the inner walls of which are covered with stones or other materials forming sharp edges and projections. Gaseous moisture and the water vapor contained in the air condenses on coming in contact with these sharp edges and deposits the water of condensation, which is collected in a tank at the base of the structure.



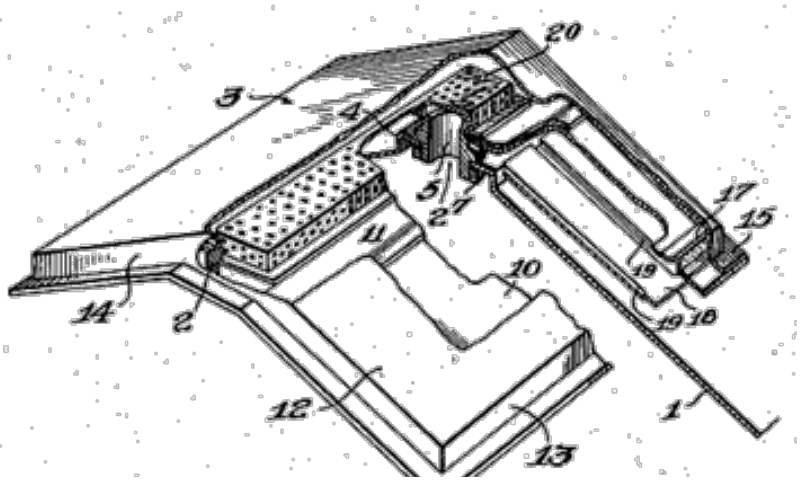
US Patent # 2,138,689
Method for Gaining Water out of the Atmosphere
Edmund Altenkirch

Abstract --- Water may be regained out of the atmosphere air by exposing hygroscopic substances to the atmosphere at night so that water is thereby absorbed, and subsequently subjecting the substance to the sun's rays during the daytime so that the absorbed water is evaporated into an air current which is cooled in order to liquify the water.



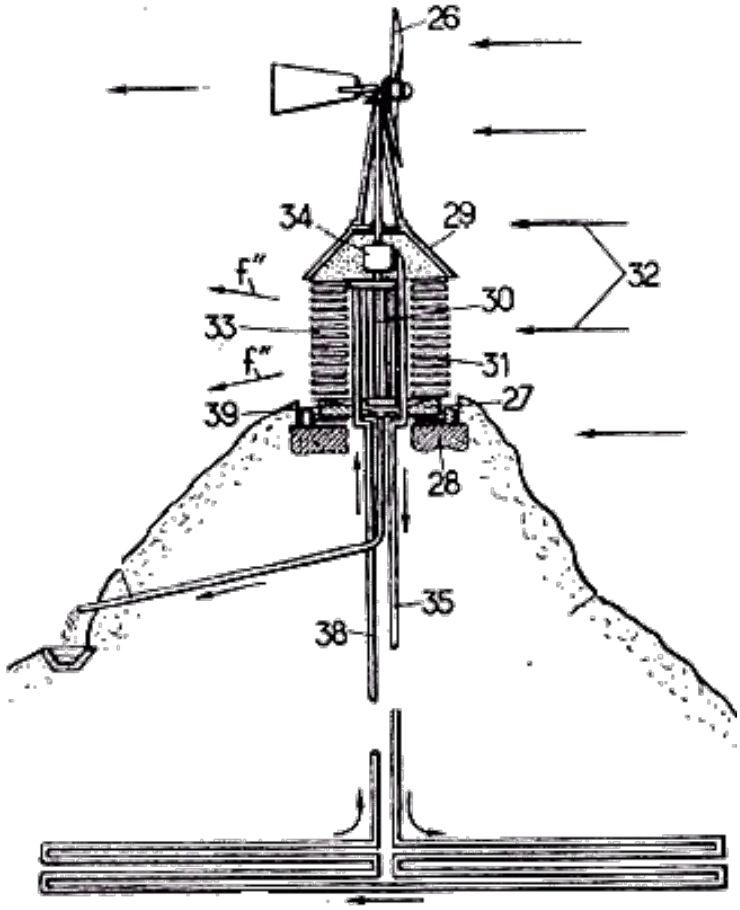
US Patent # 2,462,952
Solar Activated Dehumidifier
Elmer Dunkak

Abstract --- This invention relates in general to the heat activation of moisture-absorbing material such as silica gel and its regeneration.



US Patent # 2,761,292
Device for Obtaining Fresh Drinkable Water
Henri Coanda

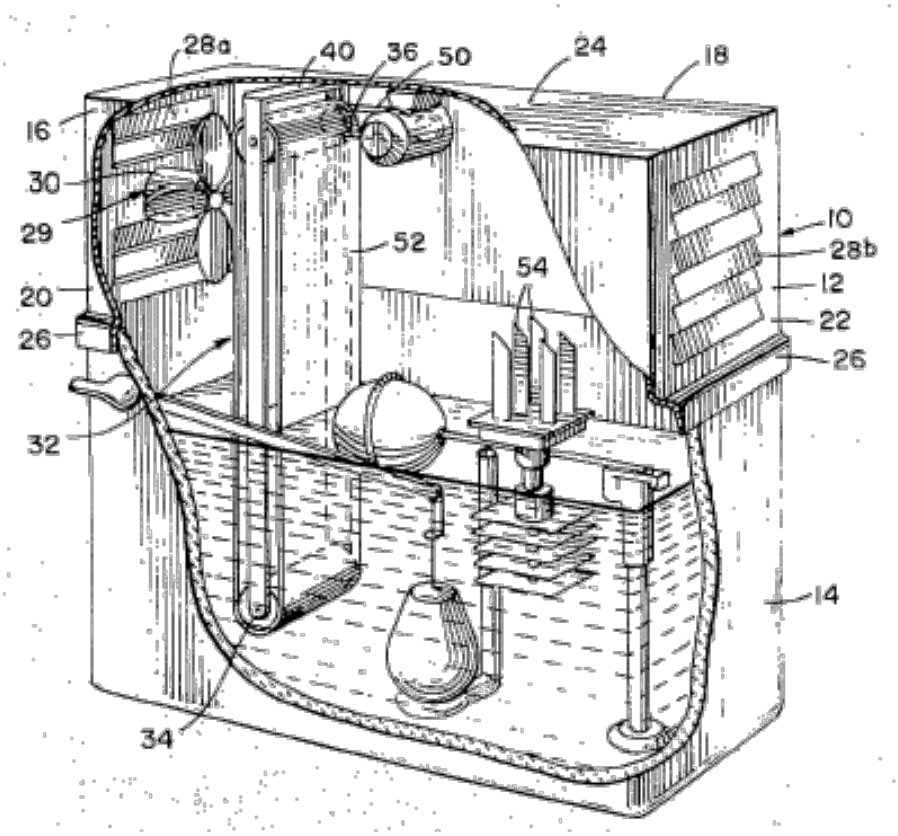
Abstract --- The invention relates to a device for obtaining fresh drinking water, especially in places where the commodity is lacking, and this under very economical conditions by utilizing the available natural sources of energy such as wind.



US Patent # 3,740,959
Humidifier-Dehumidifier Device
Frank Foss

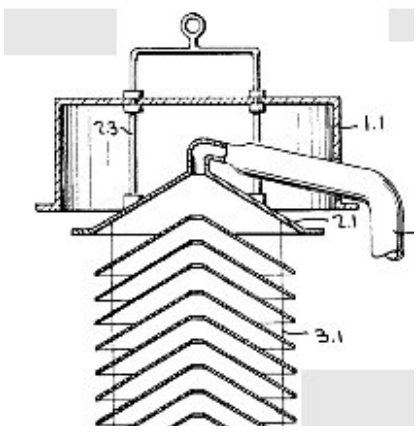
Abstract --- A humidifier-dehumidifier device operates in combination with a water closet. The device includes a housing with a fanmounted therein. The fan blows air through water transfer means and cooling fins positioned within the housing. Control means alternatively energize the water transfer means to humidify the air, or the cooling fins to dehumidify the air. The water closet acts as a cycling water reservoir in

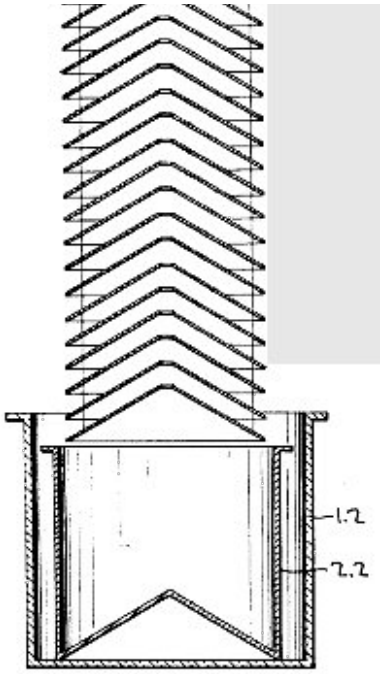
the humidifying mode of operation and as a catch basin in the dehumidfying mode of operation.



US Patent # 3,400,515
Production of Water from the Atmosphere

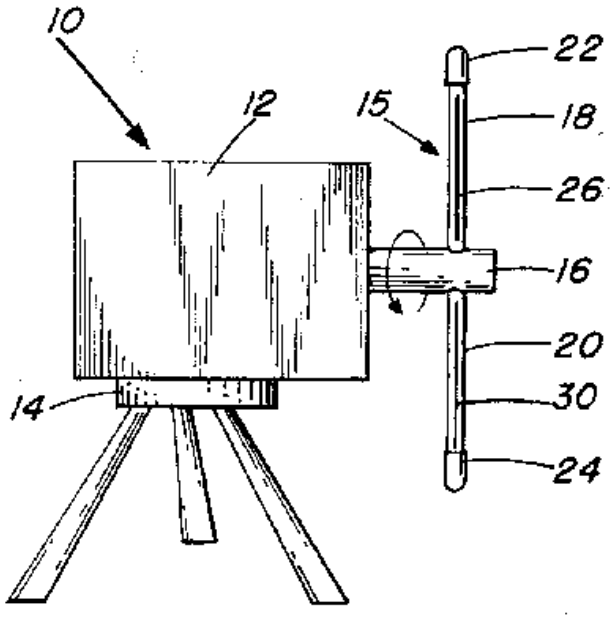
Abstact --- An apparatus for recovering potable water from the atmosphere is described. The apparatus is based on the principle that the air in a given environment will be saturated and produced water vapor provided the air space is minimized. The device permits exposing large surface areas of a hydrophilic material to the atmosphere to collect water and the enclosure of the hydrophilic material containing the collected water in a minumum air space to produce liquid water.





US Patent # 3,889,532
Fog Water Collector
Roland Pilie & Eugene Mack

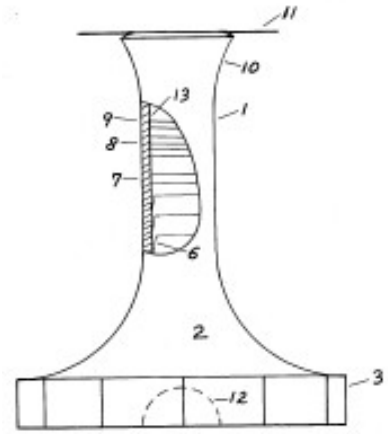
Abstract --- Apparatus for collecting fog water consists of a slotted stainless steel rotatable tube. The tube is rotated and fog droplets are collected by impaction on the tube. Centrifugal force causes the water to flow outward toward the ends of the tube where it is collected in small vials.



US Patent # 4,080,186

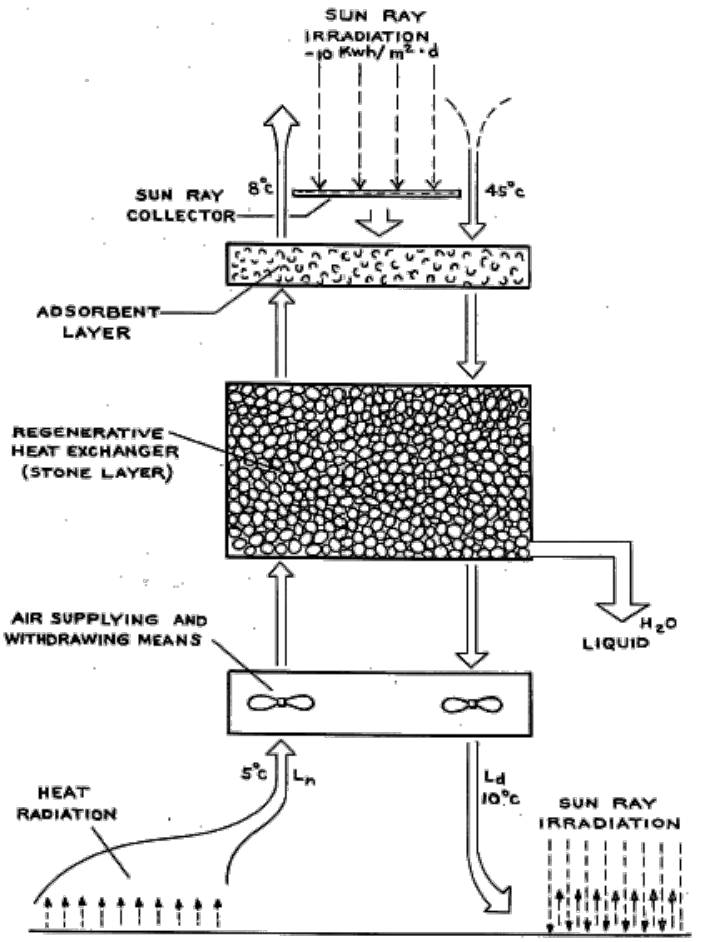
Device for Extracting Energy, Fresh Water and Pollution from Moist Air
Carl Ockert

Abstract --- This disclosure describes a device to extract useful energy and fresh water from moist air, with an associated removal of pollutant particles entrained in the extrcted water. The device comprises an enclosure with a tall stack and an extended base which has means for the creation and utilization of a contained tornado which is powered by the energy release associated with the rapid condesnation of water from the incoming moist air.



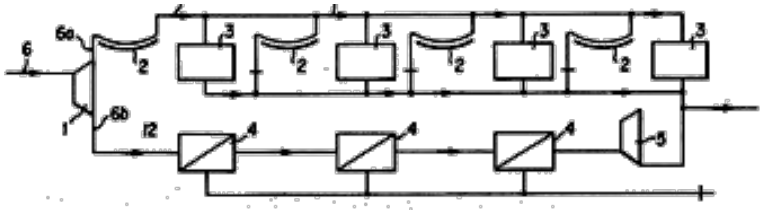
US Patent # 4,146,372
Process and System for Recovering Water from the Atmosphere
Wilhelm Groth / Peter Hussmann

Abstract --- Water is recovered from air by a process utilizing the differences in the day-time and night temperatures of such air. The process is especially useful in subtropical desert areas. It consists in alternately removing the moisture from the cool night air by adsorption on suitable adsorbing agents and especially on silica gel and by utilizing the hot day-time air and, if desired and available, the radiation energy of the sun for desorption of the water stored in the adsorbing agent and for condensing the desorbed water by means of the cold stored during the night. An especially suitable silica gel is used for adsorption of the water contained in the air. The energy required for operating the plant is produced by passing the recovered water through energy producing installations such as turbines before it is used as drinking water or for irrigation. The process is very economical and, in contrast to seawater desalination processes, does not require additional thermal energy.



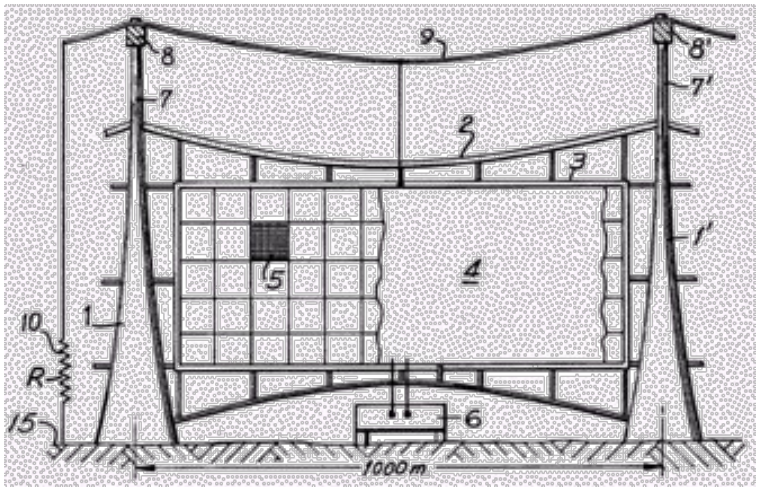
US Patent # 4,185,969
Process and Plant for Recovering Water from Moist Gas
Wolfgang Bulang

Abstract --- A process and an apparatus for recovering water from moist gas, e.g., humid air, are disclosed. The apparatus comprises fans, solar energy collectors, moisture absorber beds, and heat-accumulators which are connected by conduit means in such a manner that in a first reaction stage, e.g., at night time, moist gas, e.g., humid air, is sucked into the apparatus, is divided into two partial flows, the first of which is passed through the absorber beds in parallel or in series, whereby water is absorbed in the absorber beds, and then discharged and the second of which is passed through the heat-accumulators in series and then discharged, and that in a second reaction stage, e.g., during the daytime, a flow of gas is, preferably repeatedly, circulated in series from the fan through the solar energy collectors and absorber beds which are connected in alternating sequence and then through the heat-accumulators in series and back to the fan, whereby water is re-desorbed from the absorber beds and condensed on the surfaces of the heat-accumulators.



US Patent # 4,206,396
Charged Aerosol Generator with Uni-Electrode Source
Alvin Marks

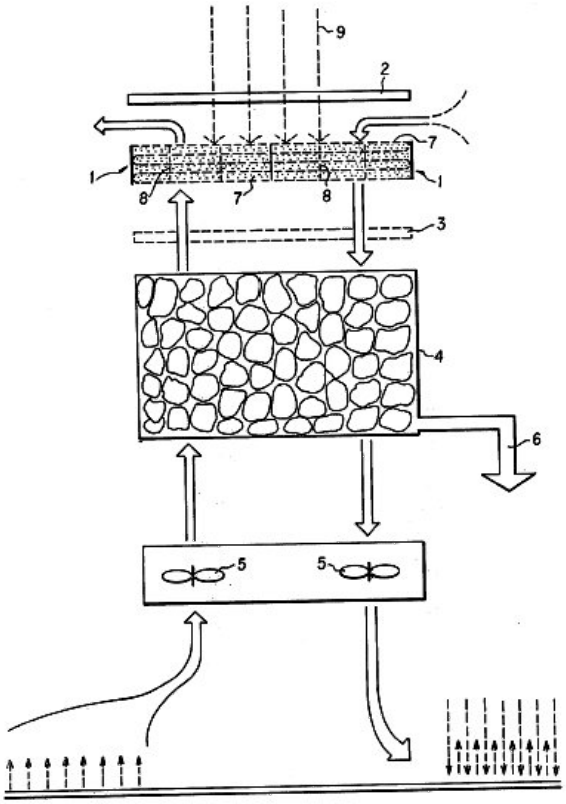
Abstract --- This invention relates to novel charged aerosol sources for diverse applications in Heat/Electric Power Generation, weather modification, airport fog clearance, dispersed chemical reactions, and other uses; and in particular, to a Wind/Electric Power Generator deriving electric power from wind power directly without moving mechanical parts through the medium of charged water droplets introduced into the airstream from a charging electrode, the charged droplets eventually discharging to ground, the electrical load being connected between the charging electrode and ground to complete the circuit...



US Patent # 4,219,341
Process and Plant for the Recovery of Water from Humid Air
Wilhelm Groth / Peter Hussmann

Abstract --- Disclosed are a process and plant for the recovery of water from humid air, in which at night cool humid air is passed through an adsorbent medium layer which adsorbs water from the air and in which, by day, air heated by solar energy up to a temperature which is above the ambient temperature is passed first through this layer to absorb water from the layer and then is cooled

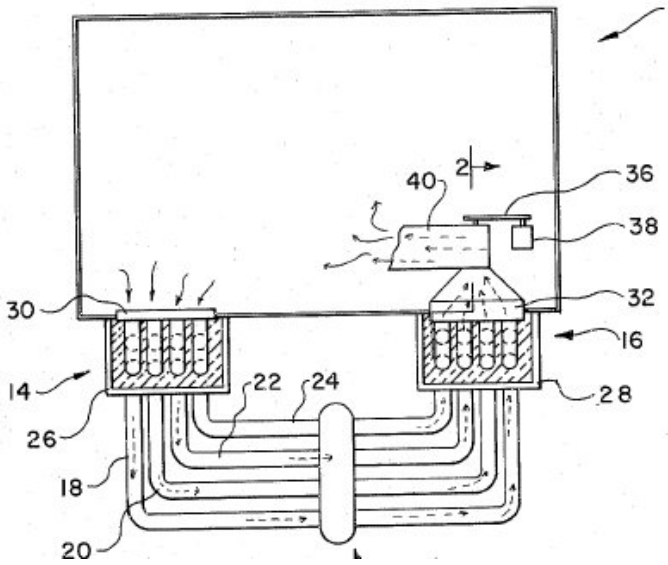
down so that the water condenses. The daytime air, when entering the adsorbent layer, is heated by solar energy with a radiator which is preferably a black anodized aluminum web in which the adsorbent medium may be embedded and/or by the adsorbent medium layer which is colored black for better absorption of sun rays. By using reflectors, the solarization upon the adsorbent medium layer and/or the radiator may be intensified.



US Patent # 4,234,037
Underground Heating and Cooling System
Walter Rogers & Preston Midgett

Abstract --- The present invention relates to a heating and cooling system for structures such as residential dwellings. More particularly, the heating and cooling system includes one or more conduits disposed approximately six (6) feet underground and having opposite end extremities communicatively connected to the structure so as to define a closed air circulation system through the structure and one or more conduits. A fan assembly including appropriate controls is provided to induce and circulate air through the structure and through the one or more conduits such that a system of air may be continuously circulated from the structure through the underground disposed conduits and back through the structure. When the temperature of ambient air is significantly

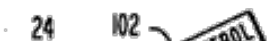
greater than or less than the temperature of the earth or ground around the conduits, a temperature gradient is established and the earth around and in the vicinity of the conduits becomes a medium of heat exchange relative to air passing through the one or more conduits. Thus, depending on the ambient air temperature, the system of the present invention will either heat or cool the structure. In a preferred embodiment of the present invention, there is provided in association with the conduits a water trap that enables water and condensation to be removed from the system of circulating air.



US Patent # 4,242,112
Solar Powered Dehumidifier Apparatus
Robert Jebens

Equivalents: DE3003320, FR2458034, JP55162583, JP59025136B

Abstract --- A thermally insulated light transmitting housing forms a chamber containing a desiccant and having a first gas port open to the ambient and a second gas port connected by a two way valve to a volume to be dried. Solar energy transmitted through the housing heats and dries the desiccant. The increased air pressure due to the heating of the volume to be dried causes the air from the volume to be expelled through the valve into the chamber. The desiccant is then cooled by shielding it from solar energy before the volume cools thereby increasing its moisture absorbing capacity. Then the volume is allowed to cool drawing dehumidified air through the desiccant and the valve into the volume to be dried. This cycle is then repeated.



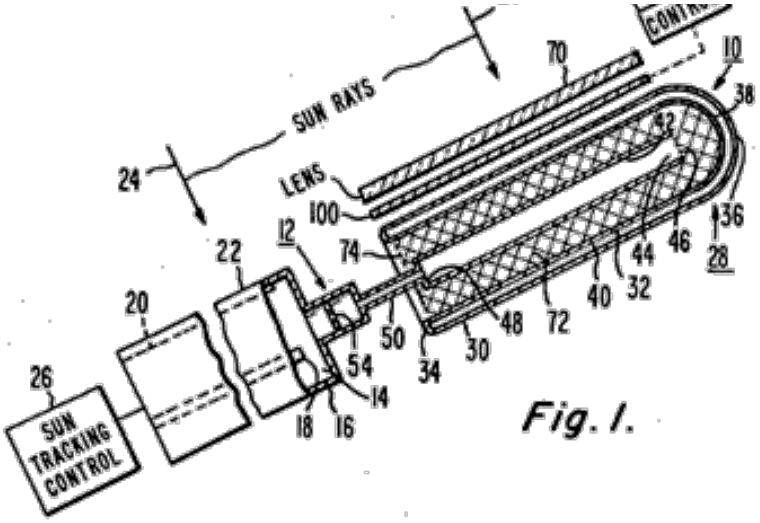
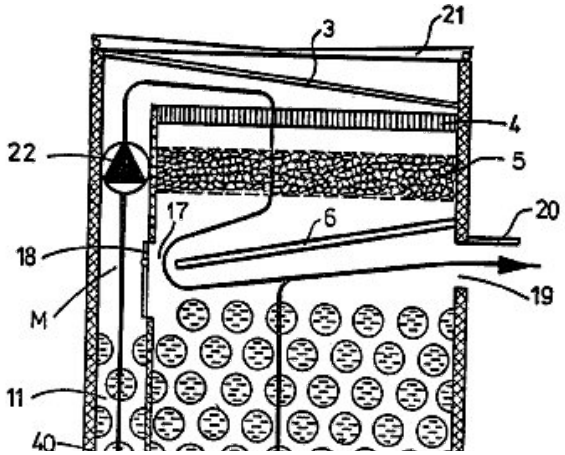
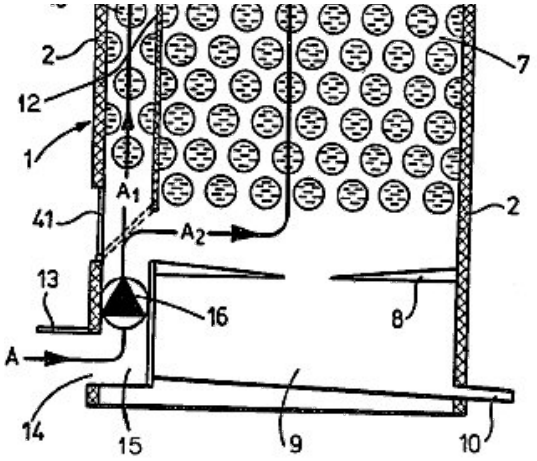


Fig. 1.

US Patent # 4,285,702
Method and Apparatus for the Recovery of Water from Atmospheric Air
Helmut Michel / W. Bulang

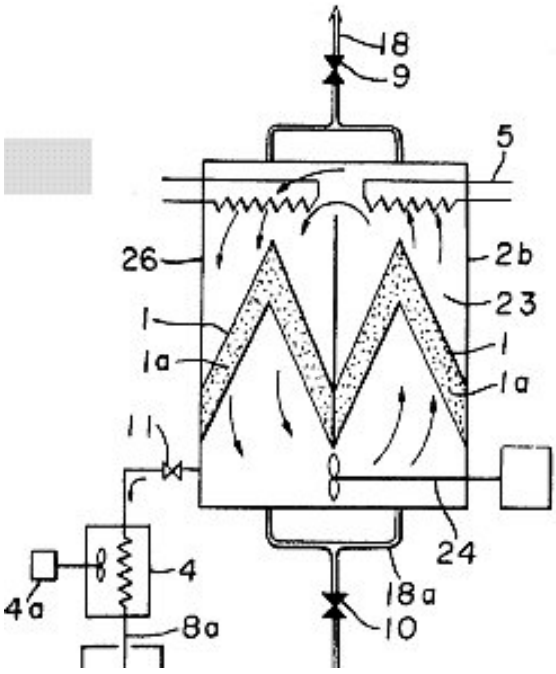
Abstract --- A method of recovering water from atmospheric air wherein during an adsorption phase, cool, humid air is transported through a water-adsorbent material for adsorption of water vapor therefrom and wherein during a desorption phase warmer, drier air is transported through the adsorbent material for pickup of water from said adsorbent material, said desorption phase comprising the steps of generating a first air stream in a closed-loop path through a heater for heating the first air stream and thence to the adsorber material and back through heater, continuing step (a) for a predetermined time, generating a second air stream by divering a portion of the first air stream for circulation from the adsorber material through a condenser for yielding water therefrom by condensation, and joining the second air stream to the first air stream after passage of the second air stream through the condenser, whereby the second air stream may be heated by the heater and passed through the adsorbent material.

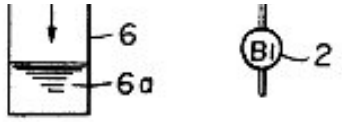




US Patent # 4,304,577
Water Producing Apparatus
Toshio Ito, et al.

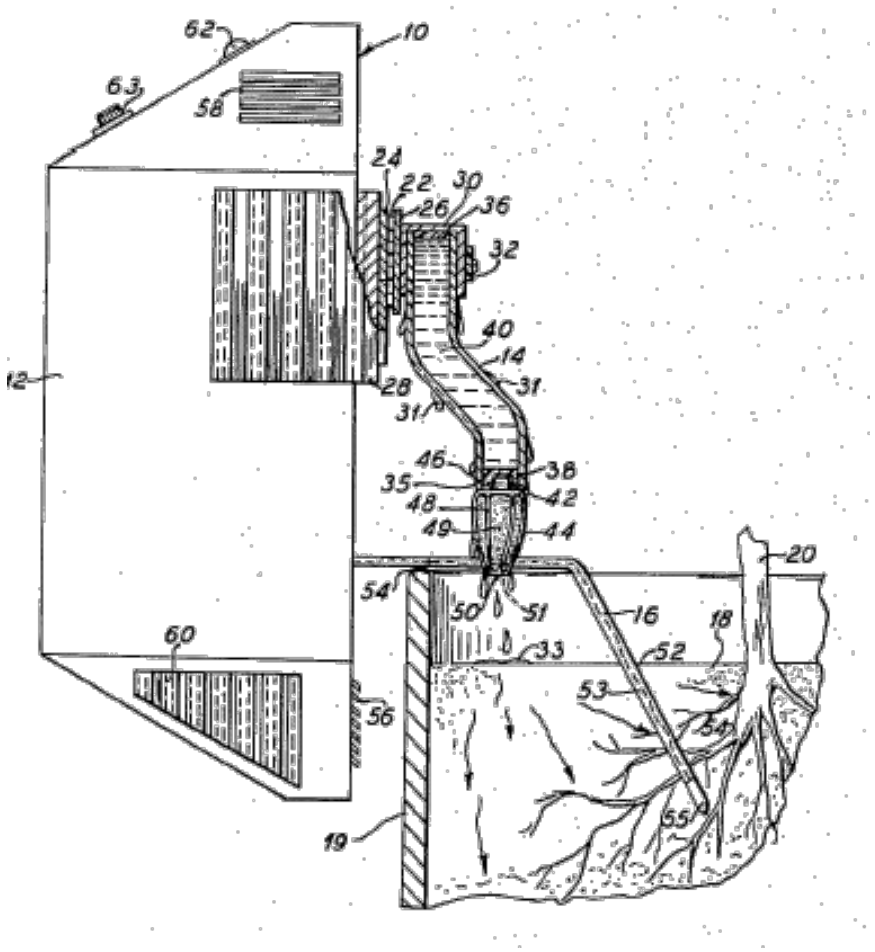
Abstract --- A water producing apparatus is, as a principle, to produce liquid water from moisture in the air by adsorbing the moisture on an adsorbent and then desorbing water from the adsorbent by heating it and condensing steam into liquid water. The water producing apparatus comprises a recycling passage for recycling steam through an adsorbent column in the desorbing step, a heater for heating the steam in the recycling passage; and a condenser branched from the recycling passage. In the desorbing step, steam in the recycling passage is heated by the heater to heat the adsorbent and to desorb water from the adsorbent and excess of steam corresponding to the desorbed steam is passed from the recycling passage to the branched condenser and is condensed to obtain liquid water in high efficiency.





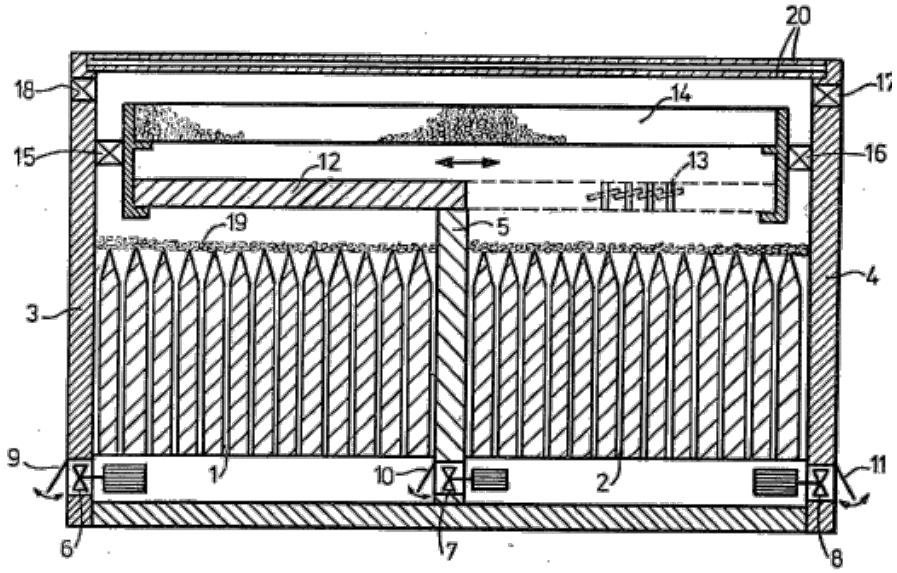
US Patent # 4,315,599
Apparatus and Method for Automatically Watering Vegetation
Robert Biancardi

Abstract --- A method and apparatus for automatically watering vegetation whereby the water requirement of vegetation is constantly monitored and selectively condensing water vapor out of the atmosphere onto cooled condensation member and collecting the condensed moisture for application onto soil containing vegetation. Various accessories are provided to automatically feed the vegetation and distribute water to the soil containing the vegetation.



US Patent # 4,342,569
Method and Apparatus for Abstracting Water from Air
Peter Hussmann

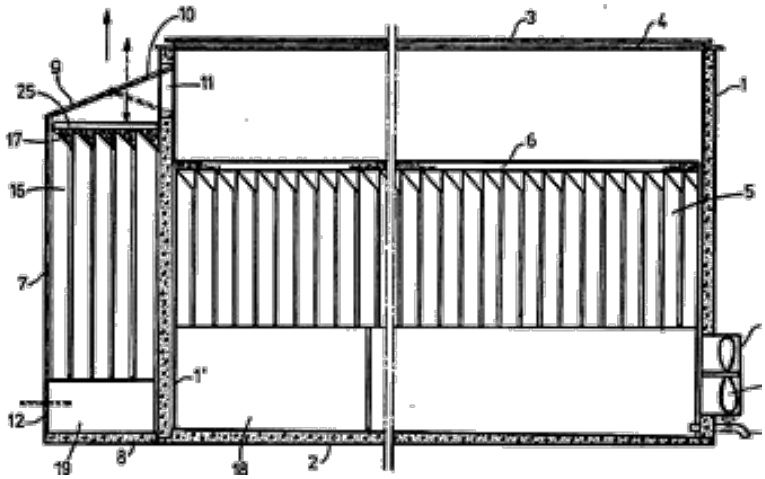
Abstract --- Method and apparatus for abstracting water from air wherein in a first phase of a recurring cycle a stream of cool, moist air from the atmosphere first cools a first heat storage condenser (1) and then humidifies a hygroscopic medium (14); in a second phase a stream of warm air additionally heated by solar radiation expels moisture from the hygroscopic medium and carries the moisture into said first heat storage condenser (1) where it condenses, releasing condensation heat, and drains away; in a third phase another stream of cool, moist air from the atmosphere first cools a second heat storage condenser (2) and then rehumidifies the hygroscopic medium, and in a fourth phase another stream of warm air heated by solar energy again expels the moisture from the hygroscopic medium and carries the moisture to said second heat storage condenser where it condenses and drains away, and wherein the warm air streams of the second and fourth phases, are preheated using the heat of condensation picked up by the said second heat storage condenser (2) in the fourth phase and the heat of condensation picked up by said first heat storage condenser (1) in the second phase, respectively, before being additionally heated by solar radiation and being used to expel moisture from the hygroscopic medium.



US Patent # 4,345,917
Method and Apparatus for Recovery of Water from the Atmosphere
Peter Hussmann

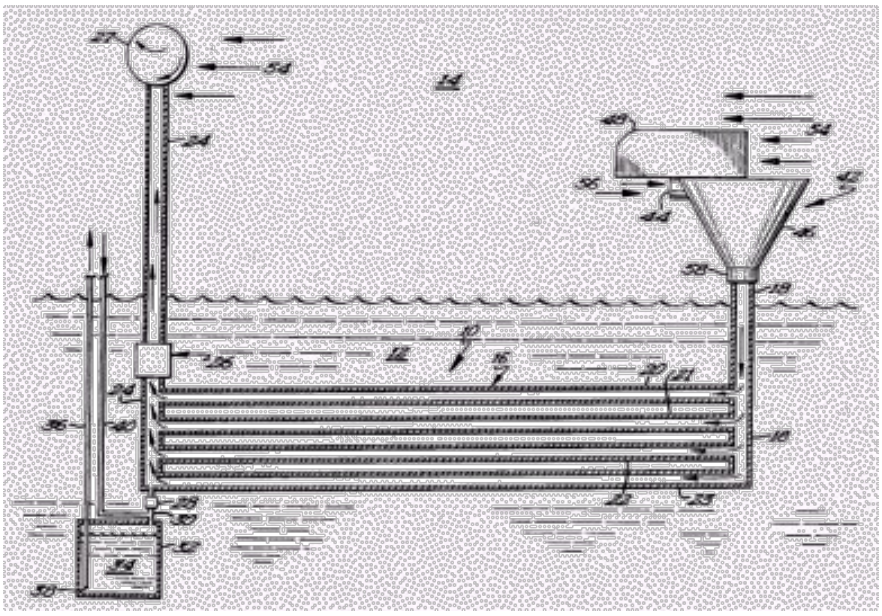
Abstract --- Water recovery apparatus having a main heat reservoir and an adsorbent material, the apparatus operable in an adsorbent phase of operation for adsorption of water from the atmosphere into the

adsorbent material using relatively humid, cool air and operable in a desorption phase of operation for the desorption of water therefrom using relatively drier, warmer air, the apparatus comprising an auxiliary heat reservoir, means for connecting the auxiliary heat reservoir in a first air flow path downstream of the main heat reservoir at the end of a desorption phase of operation, whereby said auxiliary heat reservoir stores energy from the main heat reservoir, and means for connecting the auxiliary heat reservoir in a second air flow path upstream of the main heat reservoir during the next succeeding desorption phase of operation whereby the auxiliary heat reservoir transfers heat energy stored therein to the air passing therethrough for pre-heating the air prior to passage through the adsorbent material and main heat reservoir.



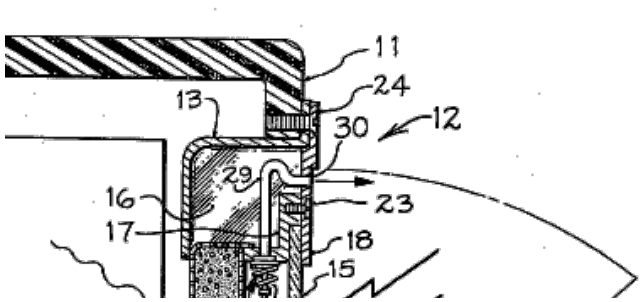
US Patent # 4,351,651
Apparatus for Extracting Potable Water
Calice Courneya

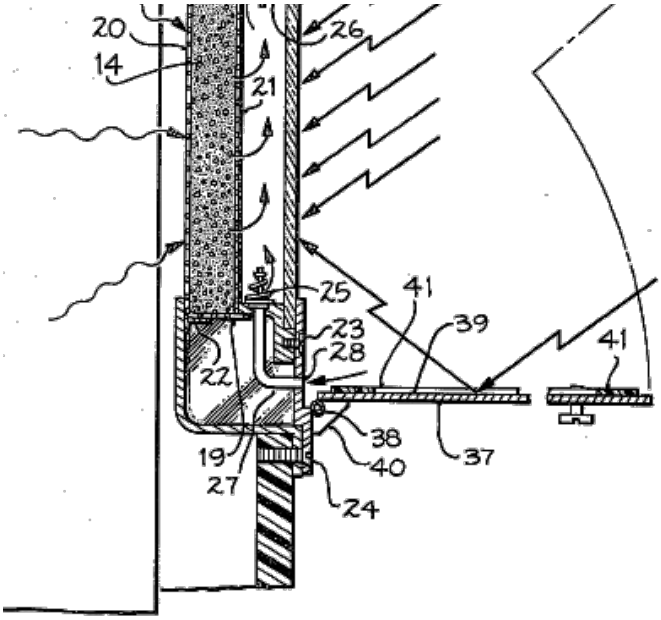
Abstract --- Apparatus and method for extracting potable water are disclosed in preferred form as extracting drinking water from moisture-laden air at atmospheric temperature through the use of a heat exchanger at or near subsurface temperature which is in air communication with the atmosphere for allowing atmospheric moisture-laden air to enter, pass through, cool, arrive at its dew point, allow the moisture in the air to precipitate out, and allow the air to pass outward to the atmosphere again. Suitable apparatus may be provided to restrict air flow and allow sufficient residence time of the air in the heat exchanger to allow sufficient precipitation. Further, filtration may be provided on the air input and a means for creating a movement pressure, in the preferred form of a turbine, may be provided on the output. The water from the system of the present invention may then be collected and provided for human consumption in conventional manner.



US Patent # 4,374,655
Humidity Controller
Philomena Grodzka, et al.

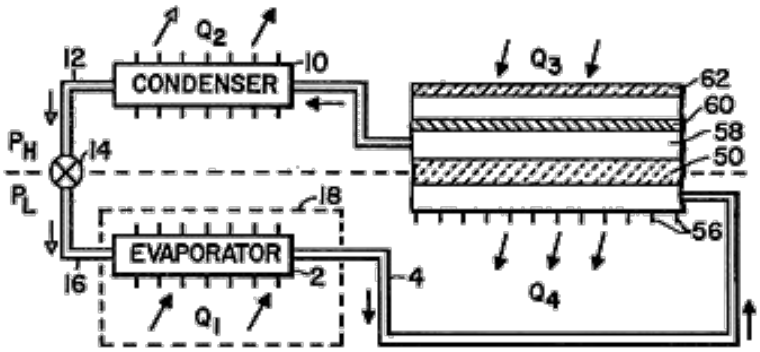
Abstract --- A humidity controller (12) for an outdoor storage container (10) is installed with a clearance fit in an apertured portion of a vertical wall (11) of the container (10). The humidity controller (12) comprises a frame assembly (13) to which a bed of solid desiccant material (14) and a transparent cover (15) are secured. Solar energy incident upon the transparent cover (15) is transmitted into a passageway between the bed of desiccant material (14) and the transparent cover (15), thereby heating air in the passageway and also heating a surface of the bed of desiccant material (14) exposed to the air in the passageway. Moisture adsorbed on bed of desiccant material (14) is vaporized by the solar energy, thereby establishing a concentration gradient for moisture in the bed of desiccant material (14) such that moisture is drawn toward the passageway for vaporization. Lower and upper valves 25 and 26, respectively, provide a natural convection current whereby cooler ambient air is drawn into the passageway and the solar heated moisture-laden air in the passageway is passed to the environment outside the container.





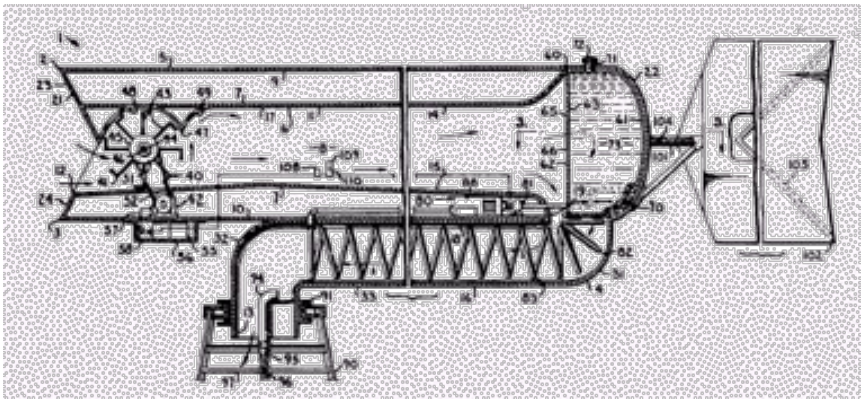
US Patent # 4,377,398
Heat Energized Vapor Adsorbent Pump
Charles Bennett

Abstract --- A solid matrix of microporous adsorbent is utilized to provide a barrier between two bodies of a gaseous mixture of which at least one constituent is a sorbable vapor. Appropriate application of heat at the opposing interfaces of the adsorbent barrier produces a partial pressure differential across the barrier. The adsorbent material is energized from a convenient heat source; for example, solar energy. The vapor pump of the invention may be used for environmental refrigeration and may be of the open or closed type. Other uses for the vapor pump are for producing a supply of pure water from low vapor content air or for drying air by removing the vapor content.



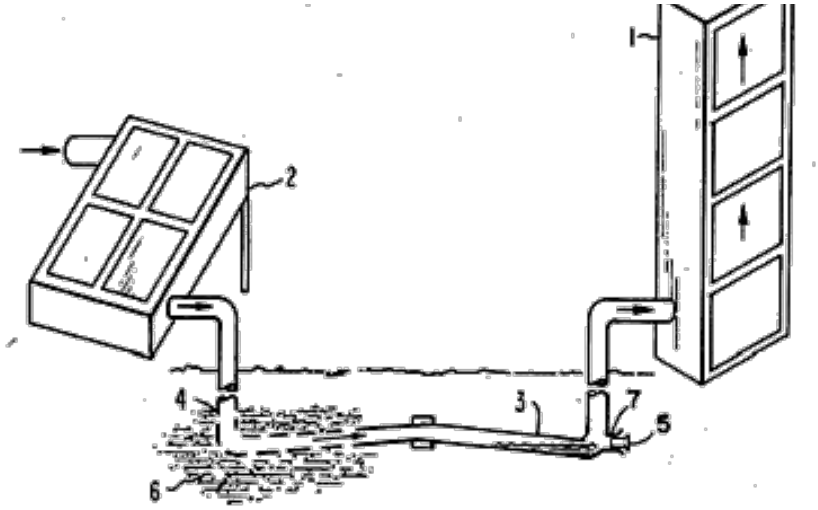
US Patent # 4,433,552
Apparatus and Method for Recovering Atmospheric Moisture
Raymond Smith

Abstract --- An apparatus and method for recovering atmospheric moisture utilizing a wind driven electrical generator for powering a mechanical refrigeration system for condensing atmospheric moisture. A housing is provided forming an atmospheric duct with a turbine mounted therein and drivingly connected to the electrical generator. The refrigeration system includes an evaporator positioned in the atmospheric duct whereon water vapor is condensed. In the practice of the method for recovering atmospheric moisture, electrical current is generated from wind and powers the refrigeration system which includes the evaporator. Atmospheric moisture is condensed on the evaporator and collected.



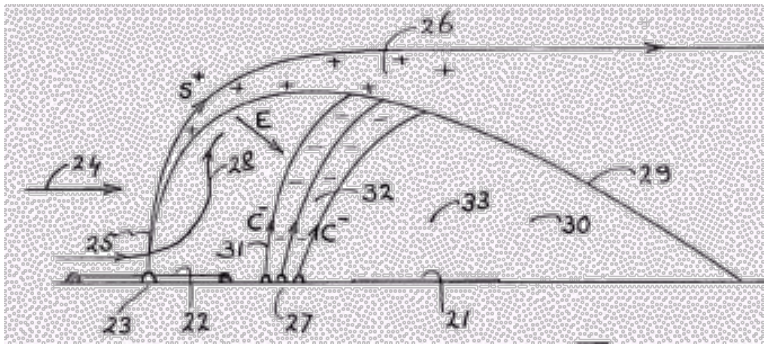
USP # 4,459,177
Ground Moisture Transfer System
Louis O'Hare

Abstract --- A method and an apparatus is disclosed in which solar heated air is drawn down a hole in the earth by a draft from a solar heated convection column located above the surface of the earth, the hot air being initially drawn downwards to a depth at which damp, moist earth is encountered with the hot air thereby evaporating water from the damp earth and producing water vapor and increasing the moisture content of the heated air and as this damp air is subsequently drawn back to the surface by the draft from the same solar heated convection column, it is allowed to contact cooled plates near the surface, the water vapor thereby condensing on the plates from which it is collected for irrigation or other purposes. In various embodiments either vertical or horizontal porous tubes in the ground contact the moist earth to bring the moisture of the earth into contact with the heated air flowing through the tube.



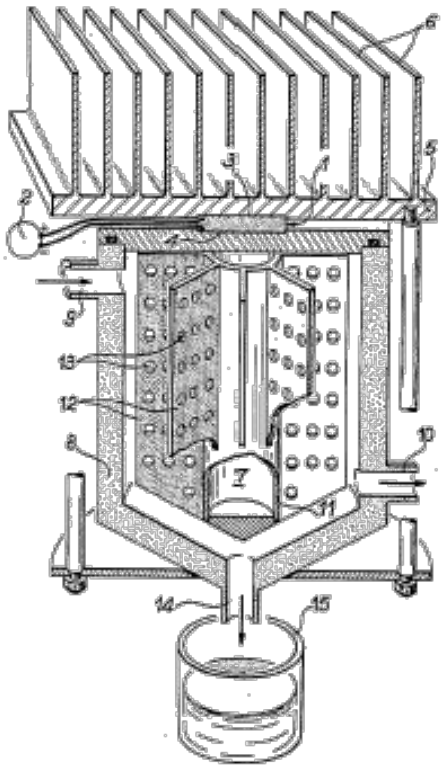
US Patent # 4,475,927
Bipolar Fog Abatement System
Hendricus Loos

Abstract --- A method and system for the abatement of fog in a designated air space over an aircraft approach zone and runway, consisting of gapped air jets laden with electrically charged droplets of low mobility, a ground corona guard in the form of a shallow water-and-oil basin, and a charged-collector-drops emitting device on the ground, arranged in such a manner that the low-mobility charged droplets blown aloft by the air jets form a virtual electrode suspended at appropriate height above the ground, toward which the oppositely charged high-mobility collector drops move, thereby collecting the neutral fog drops in their paths. The perforation ratio of the gapped air jet array is chosen such that the wind flux which penetrates the jet array is substantially equal to the entrainment flux at the lee side of the jets, thereby providing for a virtual canopy over the spatial region in which the fog is to be abated. A corona guard prevents neutralization of the collective electric field set up by the charged droplets blown aloft by the air jets, and also prevents premature neutralization of these droplets.



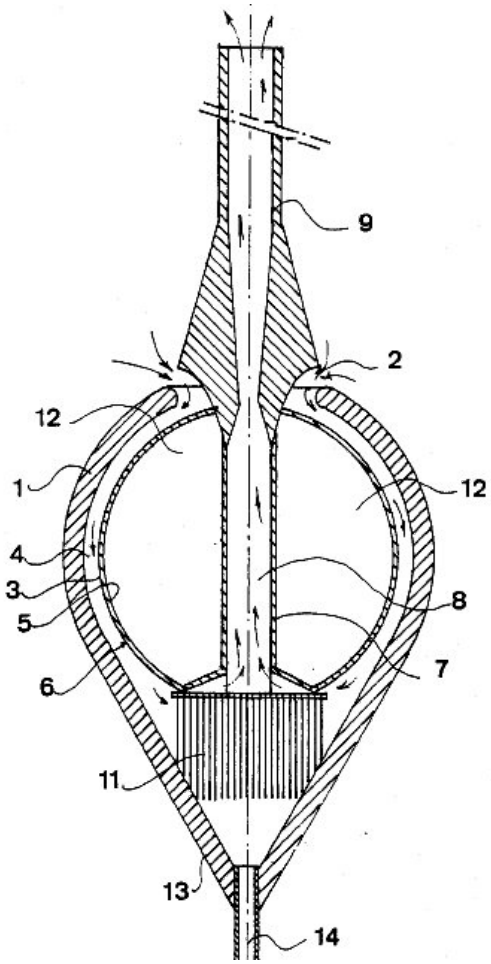
US Patent # 4,506,510
Apparatus for Continuously Metering Vapors Contained in the Atmosphere
Michel Tircot

Abstract --- Apparatus for the continuous metering of the vapors contained in the atmosphere. It comprises a thermoelectric module subject to the Peltier effect, which is supplied with electric power and whose hot face is in contact with a heat-dissipating radiator and whose cold face is in contact with a thermally insulated condensation chamber in which circulates the atmosphere charged with the vapors to be condensed, said chamber having a conductive metal structure provided with perforated ribs, the flow of the atmosphere and the temperature being permanently controlled at values such that the condensed vapor remains in the liquid state, the liquid condensate obtained flowing by gravity into the lower part of the chamber which, for this purpose, has a liquid phase discharge port.



US Patent # 4,726,817
Method and Device for Recovering in Liquid Form the Water Present in the Atmosphere in Vapor Form
Roger Rippert

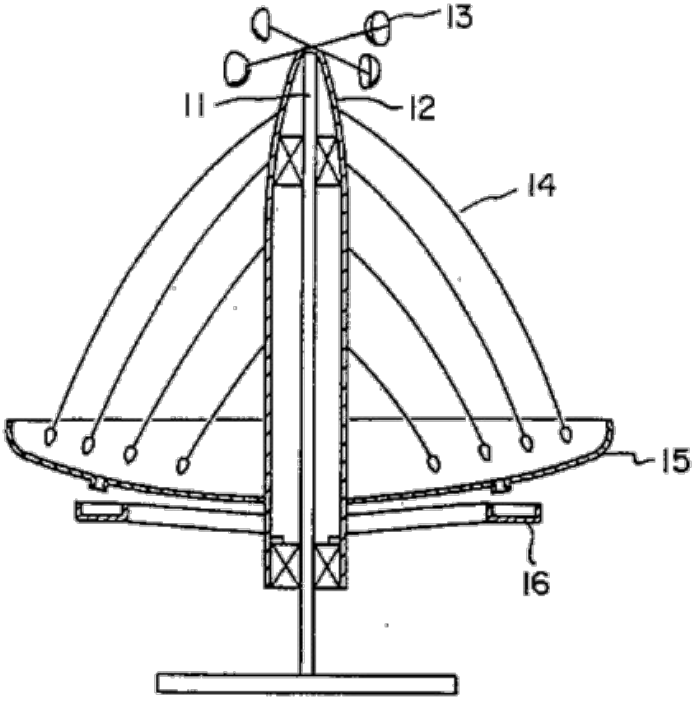
Abstract --- Ambient air (2) is canalized and cooled in a free space (4) delimited by a thermally insulated enclosure (1) and a radiating heat exchanger (3) of which the outer face (6) is heat-absorbing and the inner face (5) is heat-radiating. Air is then passed through a curtain of hygroscopic fibres (11) where water vapor condensates into liquid water which is evacuated through a conduit (14) and, once dried, air is heated by flowing at the inside (8) of a radiator (7) recovering thermal energy emitted by the face (5) of the heat exchanger (3) through a transparent thermally insulating volume (12). Dry air is then exhausted through a vent (9) to the atmosphere. Since air circulates naturally, it is possible to recover, autonomously and without any other energy supply, water contained in vapor form in the atmosphere of the implantation site.



US Patent # 5,275,643
Fog Water Collecting Device.
Yoshio Usui

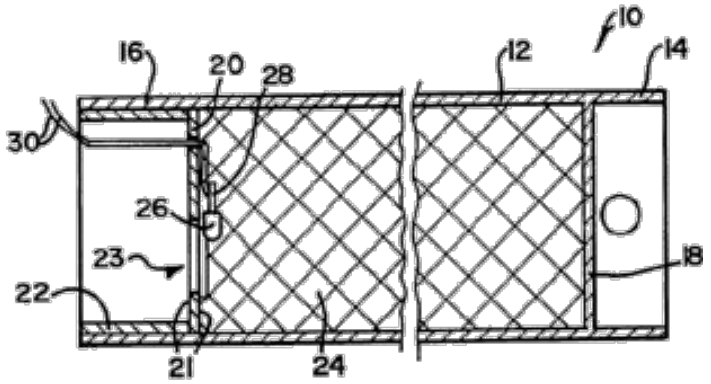
Abstract --- The present invention is a device that can obtain fresh water from fog. The fog water collecting device comprises a vertical shaft (11), windmill elements (13) for producing rotational force from

wind, a cylindrical rotating structure (12) supported so as to rotate about the said vertical shaft, a water collecting vessel (15) secured at the bottom of this rotating structure, a plurality of flexible rods (14) one end of each is fixed at the upper portion of said rotating structure and the other end of each is directed toward said water collecting vessel and, a receiving conduit for obtaining water collected in the said water collecting vessel. When the said rotating structure turns from fog containing wind, water droplets sequentially adhere and accumulate on the said flexible rods, then collect in the said water collecting vessel, and are subsequently directed toward an external destination via the said conduit.



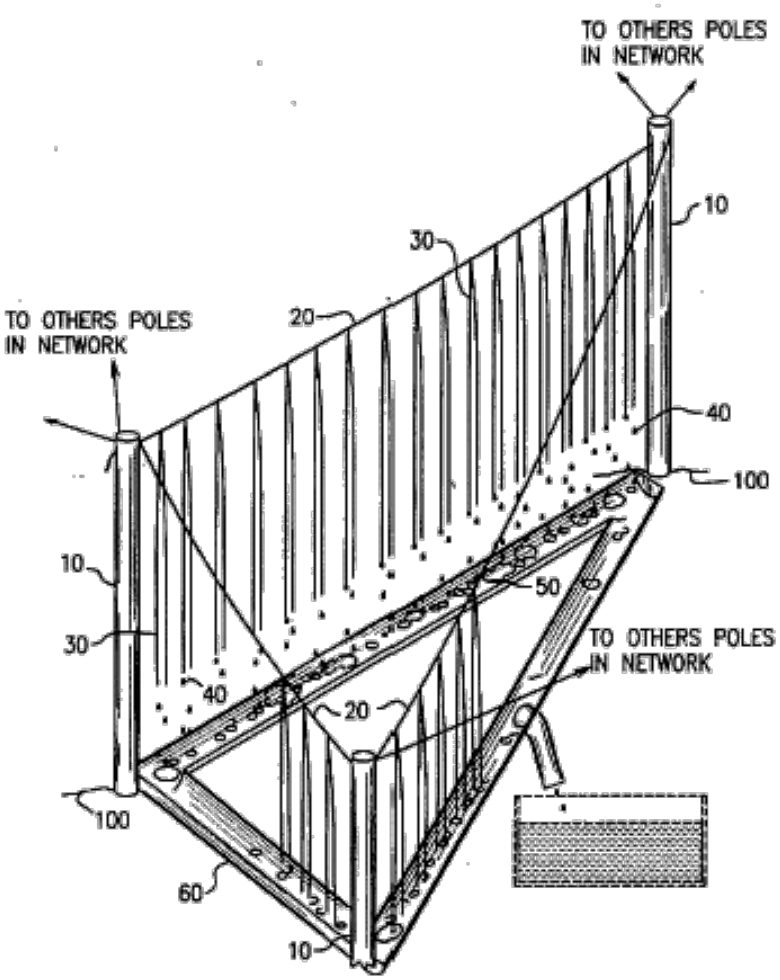
US Patent # 5,357,865
Method of Cloud Seeding
Graeme Mather

Abstract --- A method of cloud seeding for precipitation enhancement comprises releasing hygroscopic seeding particles from a seeding flare 10. The particles are obtained by burning, in the flare, a pyrotechnic composition which includes, as an oxidizing agent, a compound selected from the group consisting in potassium chlorate and potassium perchlorate. The particles are allowed to enter a suitable cloud formation. The particles act as seeds or nuclei for precipitable water drop formation, thereby to enhance precipitation from the cloud formation.



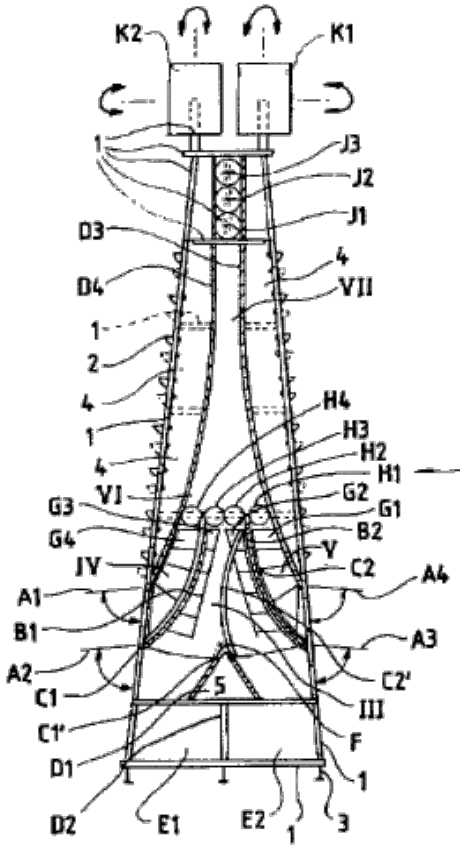
US Patent # 5,626,290
Rain Making System
Donald Kuntz

Abstract --- An embodiment of this invention comprises a plurality of mono-filaments as condensation collectors. Plurality of filaments are connected to hang vertically from this horizontal cord, cable, rope on either side. A network of any size can be built. On a clear night the dew condenses on the collectors and makes rain. The condensate collector only works when there are no clouds to obstruct the heat radiation of the earth into the outer space.



US Patent # 5,729,981
Method and Apparatus for Extracting Water
Michael Braun, Wolfgang Marcus

Abstract --- The invention relates to a method of extracting water from the ambient air by condensation of air moisture, characterized in that a heat-insulating partition is cooled on one side and heated on the other side by external supply of energy, creating a natural convective air draft on the heated side of the partition, the convective air draft being channelled substantially like a chimney draft and used to recover part of the energy while water is extracted on the cooled side by condensation of air moisture. The invention further relates to an apparatus for carrying out said method. The object underlying the invention is to ensure an appropriate afflux of air and a high degree of efficiency by optimum exploitation of energy.



US Patent # 5,846,296
Method and Device for Recovering Water from a Humid Atmosphere
Per Krumsvik

Abstract --- In a method for recovering and/or purifying water which is absorbed from a humid atmosphere, the moisture from the air is adsorbed on a suitable medium (3) in a defined space, whereupon by the application of heat the moisture is brought to a condenser (1) where it passes into a liquid state (10) and is collected in a suitable manner. In order to improve the efficiency of this method the defined, sealed space is opened for the adsorbing medium (3), for free access to air at night-time and is closed during the hot day-time period. Condensed water is passed out through a collecting funnel (2) and a channel (5) to a collection container (6). A device is also described in the form of a housing with walls (7) which can be opened and closed, in which there is located an adsorbing medium (3). In the upper part of the housing there is provided a condenser equipped with a drop collector (2) which is connected to an outlet pipe (5) to a collection container

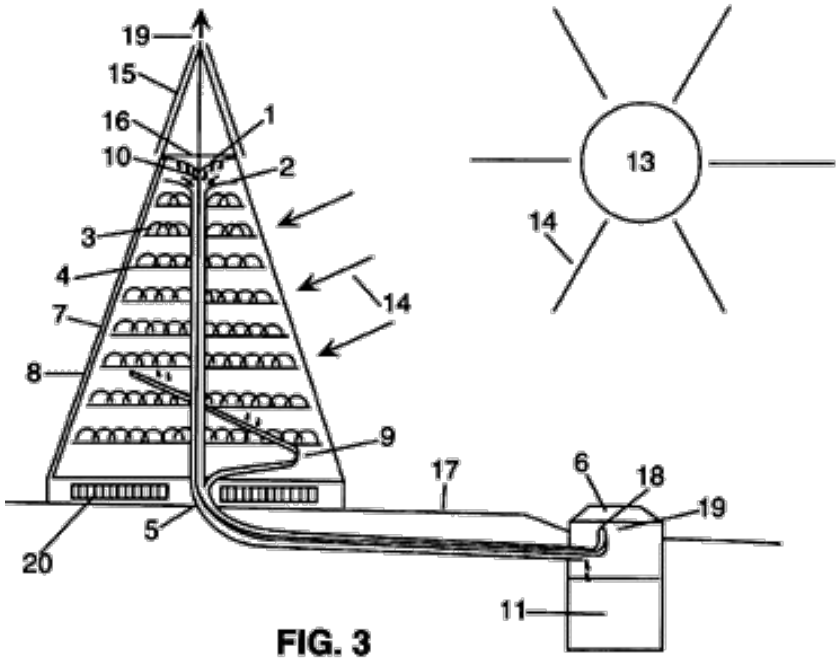
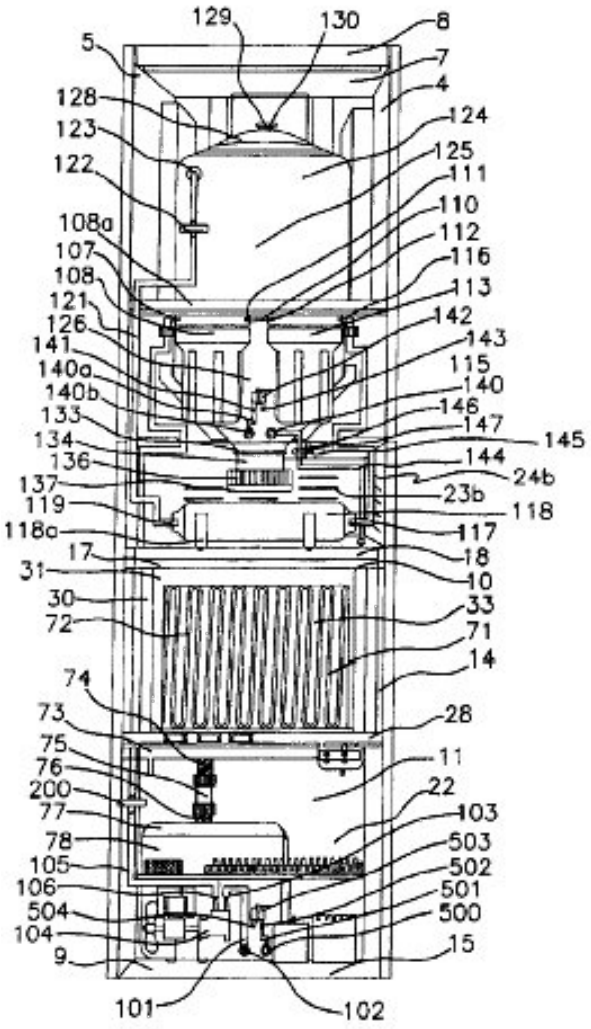


FIG. 3

US Patent # 6,490,879
Water Generating Machine
Siegfried Baier & Douglas Lloyd

Abstract --- This invention is directed to a water generating apparatus for extracting water from ambient air. The apparatus provides a condensing surface which is maintained during the operation of the apparatus at a temperature which is below the dew point of the ambient air. The presence of contaminants within the extracted water are reduced by filtering the ambient air prior to its processing by the apparatus and subsequently filtering the condensate. The apparatus is constructed from components which

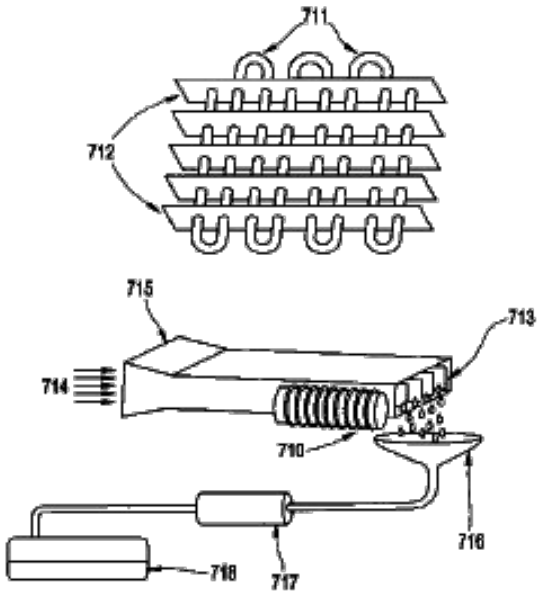
produce minimal particulate matter. The use of such components minimizes the likelihood of those components contributing to the contamination of the water generated from the apparatus. Bacteriological contamination in the condensed water is reduced by constructing the apparatus from components that retard bacteria growth. Further diminution of bacterial growth is achieved by maintaining a continuous flow of water condensate through the apparatus.



USP # 6,574,979
Production of Potable Water and Freshwater Needs for Human, Animal and Plants from Hot and Humid Air
Abdul-Rahman Faqih

Abstract --- Systems and methods are disclosed for extracting freshwater from atmospheric humidity in extremely hot and humid climates and supplying freshwater to a small group of people, a building, a farm, or forestation area. The freshwater is treated to

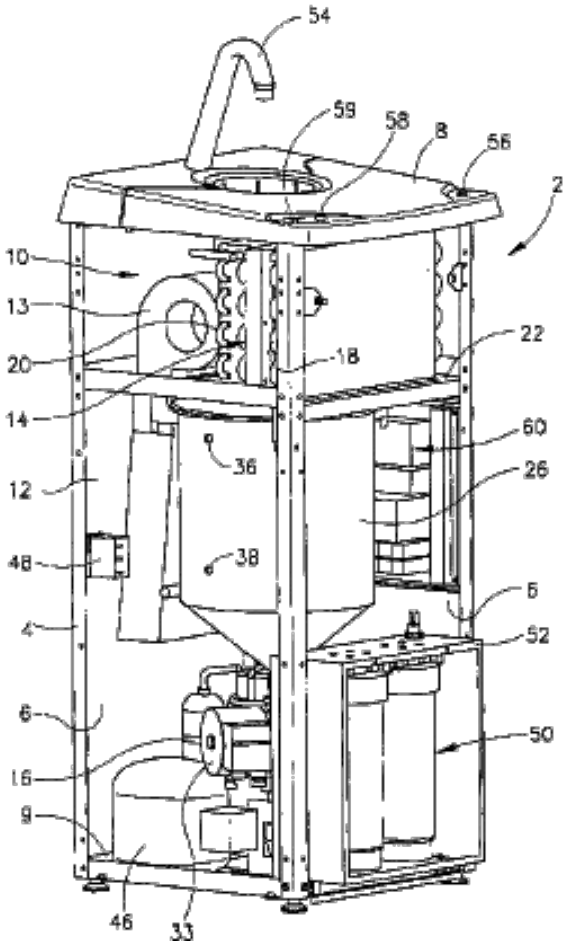
provide drinking water by disinfecting to eliminate microorganisms and filtration to remove suspended particulates from air, erosion or corrosion products, and disinfected waste. Compact units provide drinking water for individuals, passengers in cars, vans, trucks, or recreational boats, or crewmembers on a seagoing cargo ship whether from atmospheric humidity or from moisture-laden gases. Furthermore, systems are disclosed for the ample supply of freshwater with minimal treatment for small- to large-sized buildings in a manner that alleviates the heat load on buildings. Collection of freshwater from hot humid ambient air is also provided for other uses, such as irrigation and farm animal drinking. Various methods are used for condensation of water vapor suspended in the air as alternative to conventional refrigeration cycles using CFC refrigerants. Devices are disclosed using naturally occurring brackish cold water, circulation of cooling water cooled by thermoelectric cooling or thermoacoustic refrigeration as well as evaporative cooling and transpiration cooling. Water produced by the systems may flow under gravitational forces entirely or with the assistance of boosting pumps.



US Patent # 6,644,060
Apparatus for Extracting Potable Water from the Environment Air
Amir Dagan

Abstract --- An apparatus for extracting potable water from the environment air comprises a moisture collecting system having dew-forming surfaces and disposed so that the air drawn into the apparatus passes therethrough and moisture from the air condenses in the dew-forming surfaces. The apparatus also comprises a water reservoir

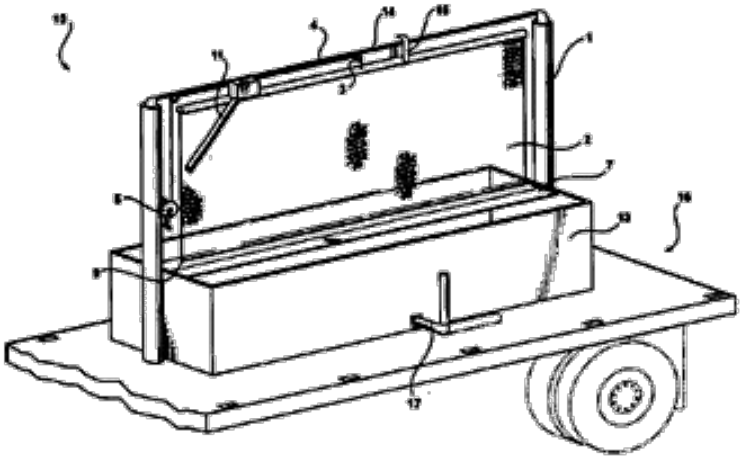
capable of receiving water collected as moisture in the moisture collecting system. The water reservoir has a bottom and a side surface constituting a surface of revolution around a longitudinal axis of the reservoir, the reservoir having an outlet port formed at the bottom thereof along the longitudinal axis, for the withdrawal of water from the reservoir, and a circulation inlet port formed in the side surface. The circulation inlet port is designed so as to enable the introduction of water into the reservoir tangentially to the surface. The apparatus further comprises a water circulation line extending from the outlet port to the circulation inlet port of the water reservoir through a water filtration and sterilization system to provide the circulation of water through the reservoir by means of a pumping device, and a water dispensing valve for the external dispensing of water from the circulation water line.



USP # 6,869,464
Atmospheric Water Absorption and Retrieval Device
John Klemic

Also published as: US6869469 // US6485854 // JP2002177720 // DE10151665

Abstract --- A device for absorbing atmospheric moisture includes a support member with a net extending therefrom. The net includes a super absorbent polymer that has the property of being able to absorb a multiple of the polymer mass in atmospheric water and to thereafter release the water in response to an external stimulus. The device is in this way reusable. The device has particular application in the clearing of fog, manure odor clearance, and collection of potable water in remote locations. A process for extracting atmospheric moisture is also detailed that includes the step of extending a super absorbent polymer net into contact with an atmosphere. Thereafter, with that being in contact with the atmosphere for a sufficient amount of time moisture is absorbed from the atmosphere. The application of a stimulus to the super absorbent polymer containing atmospheric moisture causes the release of liquid water therefrom. The super absorbent polymer is then suitable for reuse to again absorb atmospheric water.



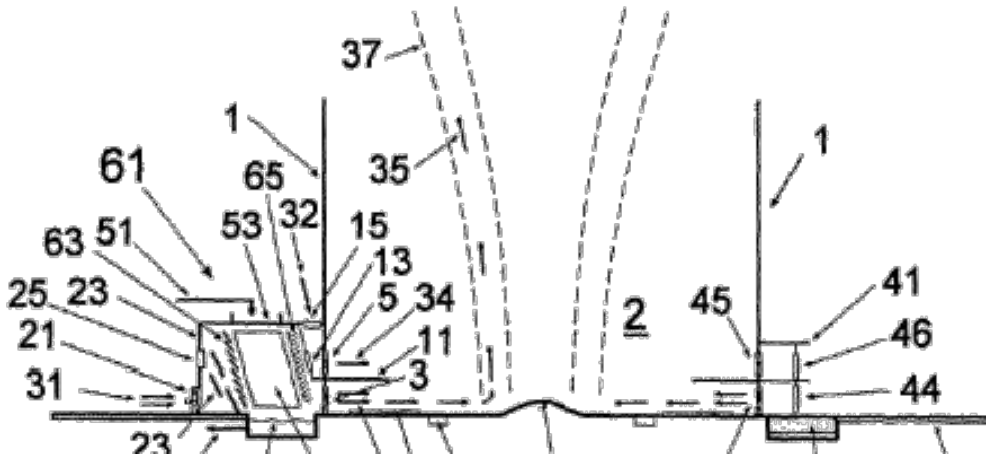
US 6,957,543
Air Cycle Water Producing Machine
Igor Reznik

Also published as: US 6,360,557

US Patent Application # 2004 112055
Atmospheric Vortex Engine
Louis Michaud

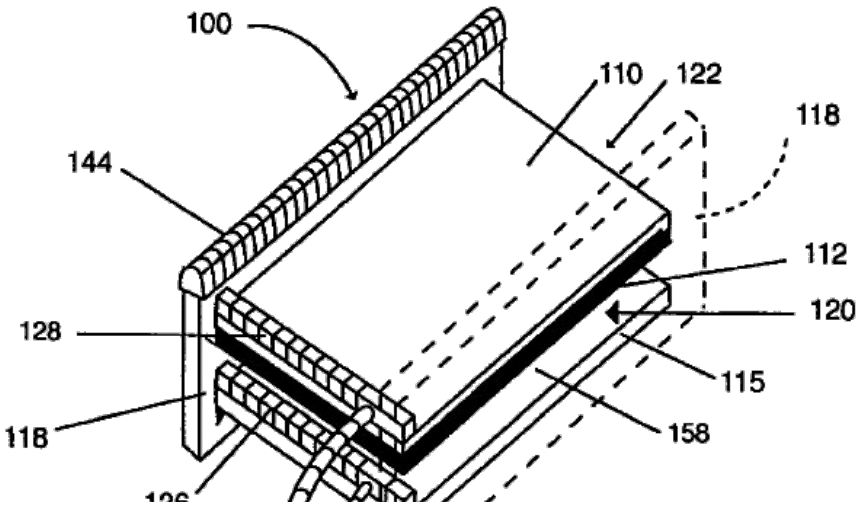
Abstract --- The invention describes the Atmospheric Vortex Engine in which a tornado-like convective vortex is produced by admitting air tangentially in the base of a cylindrical wall. The vortex is started by

heating the air within the circular wall with fuel.... The vortex process could also be used to produce precipitation...



USP Appln # 2004 000165
Apparatus and Method for Harvesting Atmospheric Moisture
Michael Max

Abstract --- An atmospheric water harvester extracts water from high relative humidity air. The temperature of the surface of a condensation member is lowered in the presence of moist air to promote condensation of water vapor on its surface, and the water so obtained by condensation is collected. The atmospheric water harvester includes a photovoltaic member that generates electricity to power the refrigeration of the condensation member. At least as much electrical power is produced as is used to condense the water vapor so that no additional sources of electrical power are required. Each atmospheric water harvester (or array of harvesters) is rapidly installed and then operated in an unattended state for considerable periods of time. Arrays of autonomous atmospheric water harvesters can be installed as free-standing units or as roofs on either new or existing buildings.



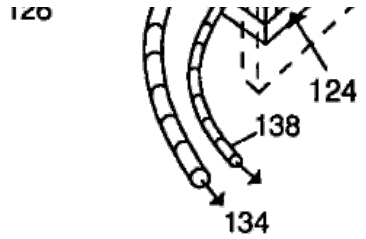
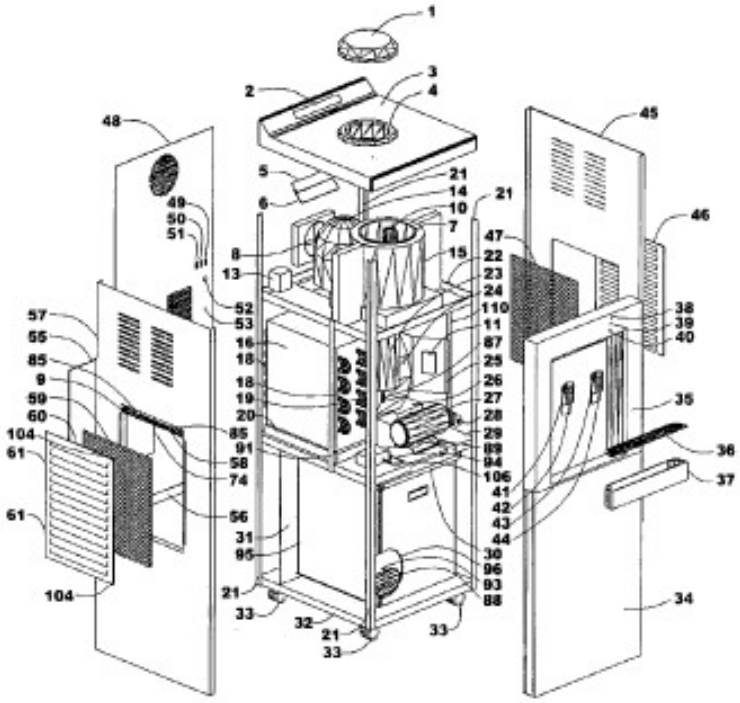


Figure 1

US 2005 284167
Combination Dehydrator, Dry Return Air and Condensed Water Generator/Dispenser
Michael Morgan

Abstract --- A portable, combination dehydrator, dry return air and condensed water generator dispenser configured to alternately provide water from a reservoir of condensed water or from an alternative source of water. In one embodiment, the alternative source comprises a 5-gallon bottle of water and the mounting to the bottle includes a removable cover for preventing contamination of the system when the bottle is not in place. In one embodiment, the system provides purified dry make-up air to a home or office air-conditioning system and dehydration cabinet, while producing pure atmospheric condensation from humidity found in air and purifying the air and water for breathing, dispensing and drinking purposes.

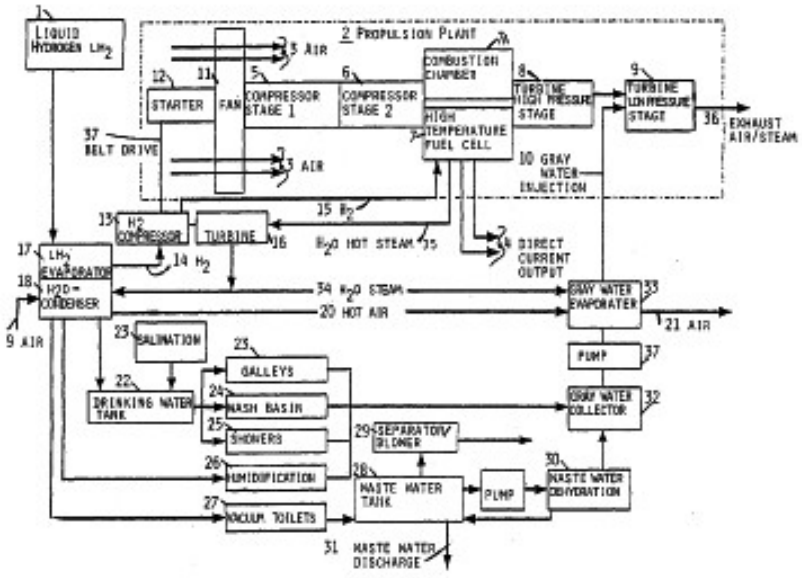


US 2005 266287
Device for Producing Water on Board of an Airplane

Claus Hoffjann & Hans-Juergen Heinrich

Also published as: WO 2004040680 // WO 2004040680 // EP 1567412 // EP 1567412 // EP 1567412

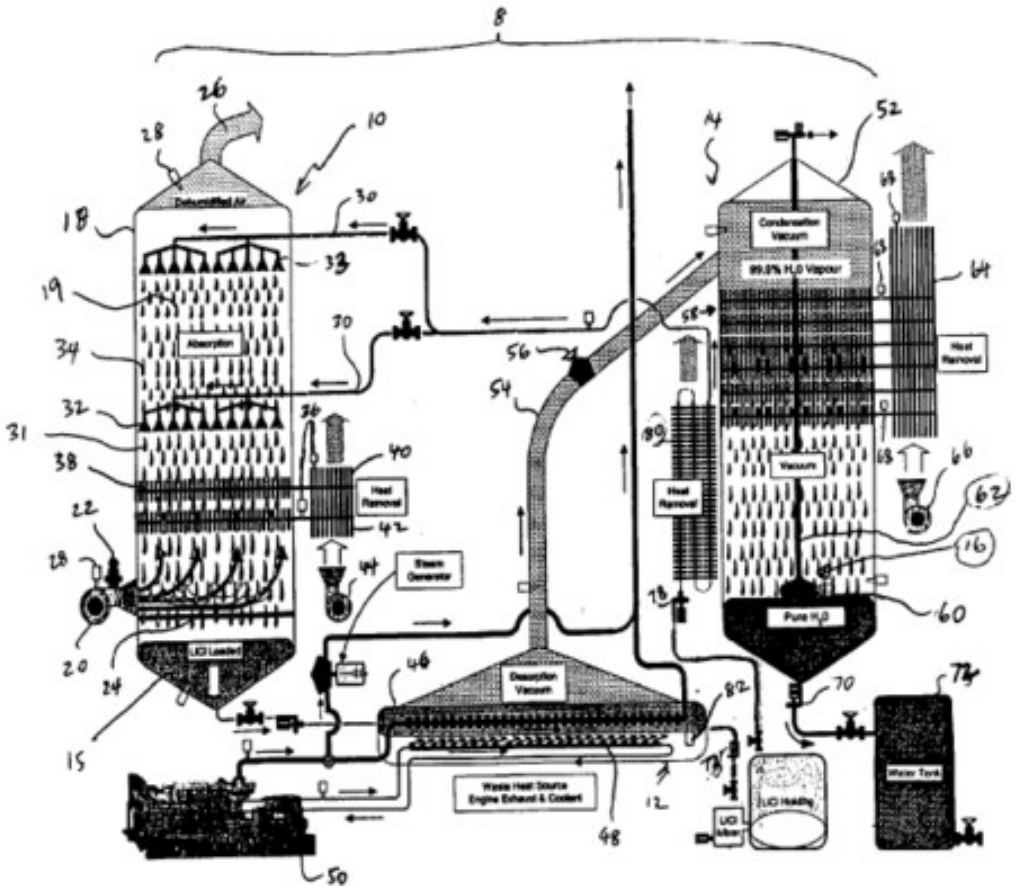
Abstract --- This invention relates to a device for producing water on board of an airplane by means of one or several fuel cells. The inventive water producing device is emboies in the form of one or several high temperature fuel cells and entirely or partially integrated into a jet power unit of the airplane in such a way that the combustion chambers of said jet power unit are entirely or partially substituted by said high temperature fuel cells. The aim of said invention is to develop a combination of fuel cells and a gas turbine which operates exclusively with atmospheric hydrogen and oxygen and is embodied in the form of a jet power unit and/or an auxiliary jet power unit (on board auxiliary power unit: APU) used for producing compressed air for a cabin and a power supply. For this purpose, said high temperature fuel cells are fed with pure hydrgen on an anode side and with air on a cathode side. The combustion chambers are fed with an air-hydrogen mixture, enabling at least the hydrogen supply to be adjusted or completely shut off.



US 2006 130654
Method and Apparatus for Recovering Water from Atmospheric Air
Ronald King & Norman Arrison

Abstract --- A method of separating water from air is provided comprising the steps of (a) contacting air having water vapour with an

hygroscopic liquid mixture to produce a water rich hygroscopic liquid mixture, (b) heating at least a portion of the mixture to produce a gaseous mixture including water vapour and at least one other gaseous component, (c) condensing at least of portion of the water vapour in the gaseous mixture to produce liquid water and a depleted gaseous mixture at a first pressure, and (d) removing at least a portion of that at least one other gaseous component to maintain the first pressure below a predetermined pressure, wherein the depleted gaseous mixture is in fluid communication with the water rich hydroscopic liquid mixture. An absorber vessel is also provided for effecting the method of separating water from air.

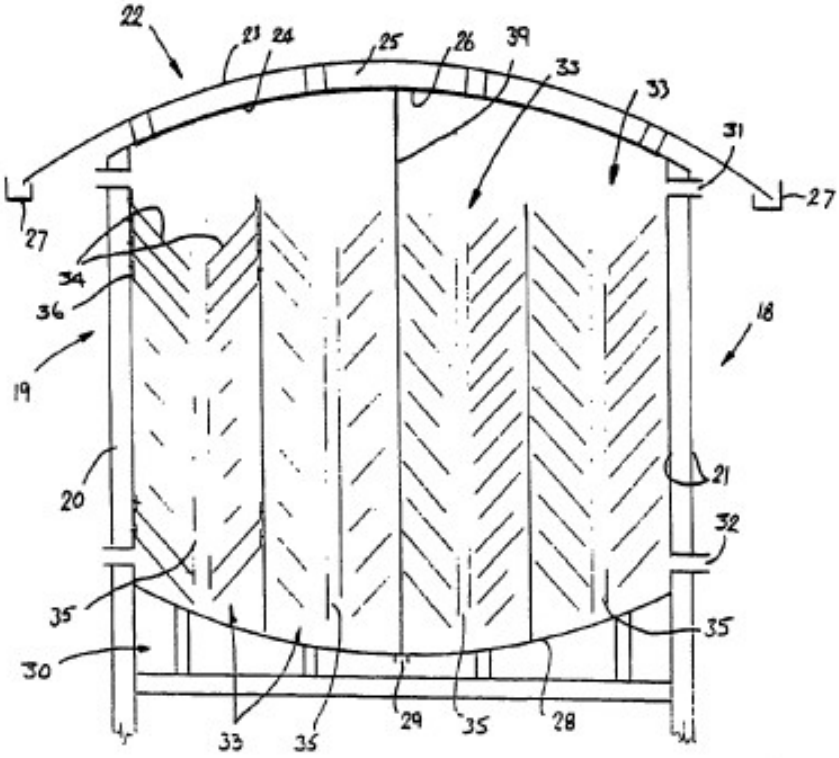


US 2006 112709
Method and Apparatus for Collecting Atmospheric Moisture
Peter Boyle

Also published as: WO 2004029372

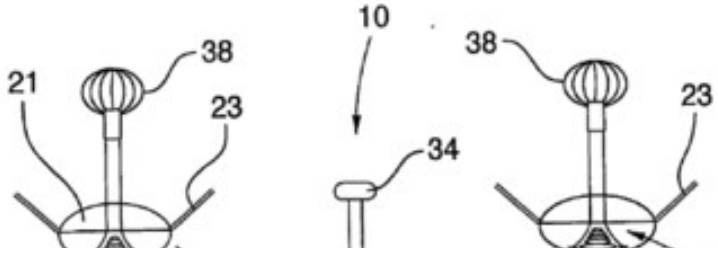
Abstract --- A number of apparatii for condensng water from the atmospher are described, whereby atmospheric water is drawn through an enclosed space and moisture condesnses on plated or similar contained within the enclosed space and subsequently collected. Most

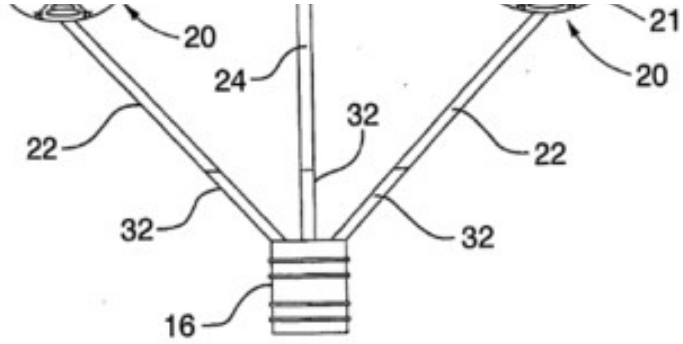
of the apparatii include means to increse the flow of air through the enclosed space to increase the eficiency of moisture collection. A typical apparatus includes a body supporting condesner plated of conical or frust-conical configuration. Extractor fans, the operation of which are controlled by humidity snesing switches and temperature sensors, provide the increased flow. To promote condensation, typically, cooling ducts are provided through which air-conditioned cool air is passed.



US 2006 032493
Device for Collecting Atmospheric Water
Jonathan Ritchey

Abstract --- The Present invention is directed at a water collection device which condenses water vapour in atmospheric air to water. The device comprises means for drawing the atmospheric air into the device; means for condensing the moisture vapour in the atmospheric air into water, and means for collecting the water.

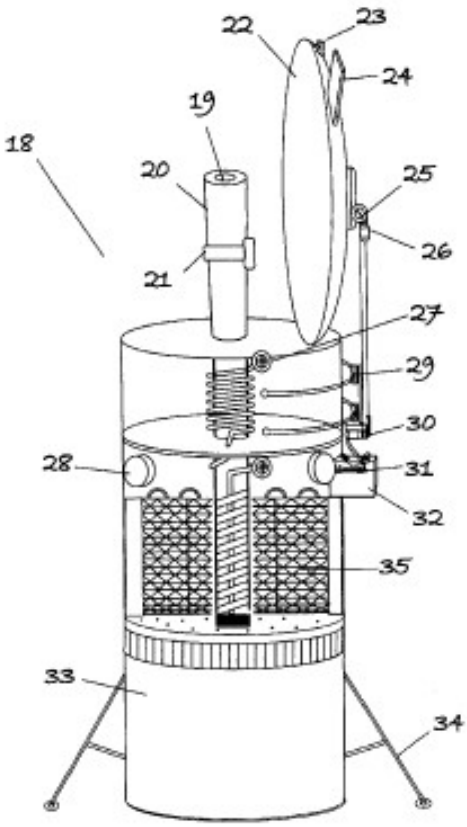




USP Appln # 2005 103615
Atmospheric Water Collection Device
Johnathan Ritchy

Classification:- international: B01D5/00; F24J2/07; B01D5/00; F24J2/06; (IPC1-7): B67D5/00; - european: B01D5/00B10; B01D5/00F12; B01D5/00H14; B01D5/00K10; F24J2/07

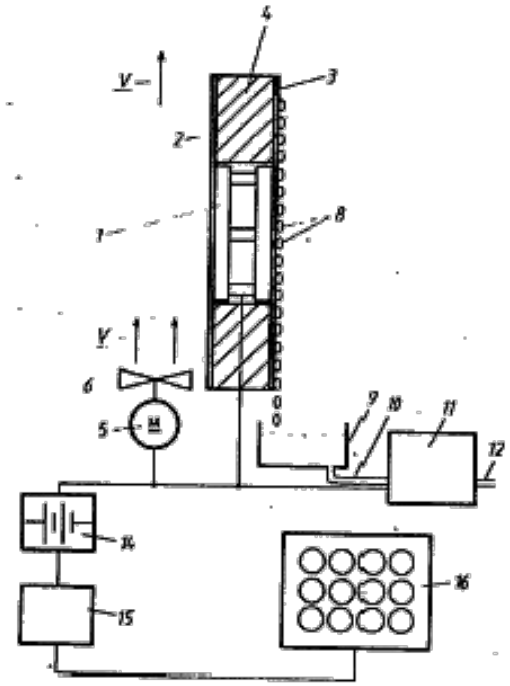
Abstract --- The present invention is directed at a solar powered heat exchange system preferably used to drive a water collection device, which condenses water vapour in atmospheric air to water. The device comprises means for drawing the atmospheric air into the device; means for condensing the moisture vapour in the atmospheric air into water; and means for collecting the water.



FOREIGN PATENTS

German Patent # 3,313,711
Process and Apparatus for Obtaining Drinking Water
Rudolf Gesslauer

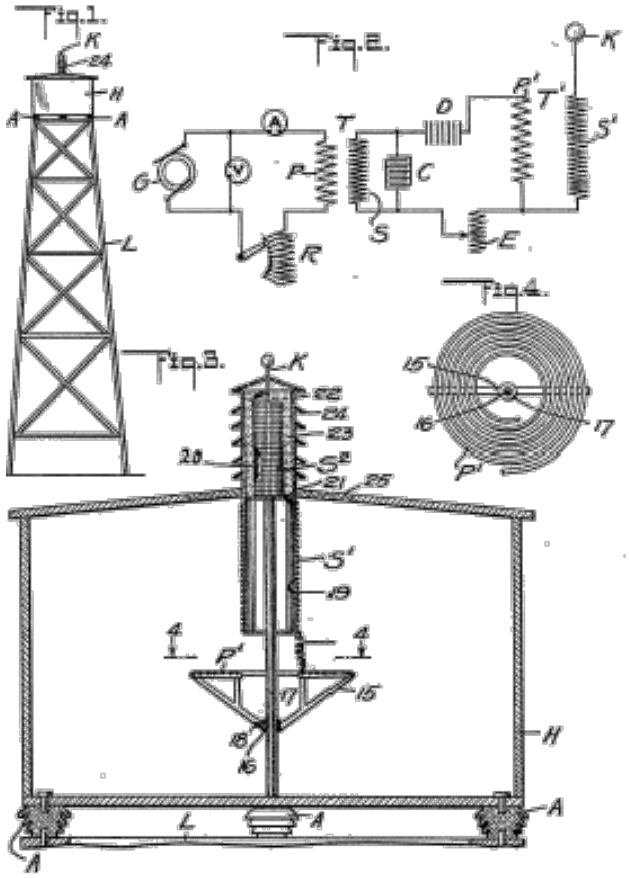
Abstract --- The invention relates to a process and an apparatus for obtaining drinking water. The drinking water is obtained from air containing moisture by at least partially condensing the moisture by cooling the air to below its dew point, collecting the water thus obtained and treating it to provide water of drinking quality. The apparatus has a cooling element (3), which is kept at a temperature below the dew point of the surrounding area, and a collecting device (9) for the water condensing on the cooling element (3), the collecting device (9) being in connection with a treating unit (11), intended for treating the collected water to produce water of drinking quality.



British Patent # 251,689
Method of and Apparatus for Causing Precipitation of Atmospheric Moisture and for Kindred Purposes
William Haight

Abstract --- An adjustable high-frequency transformer for use with apparatus for discharging high-frequency alternating currents into the atmosphere for the purpose of precipitating moisture, forming

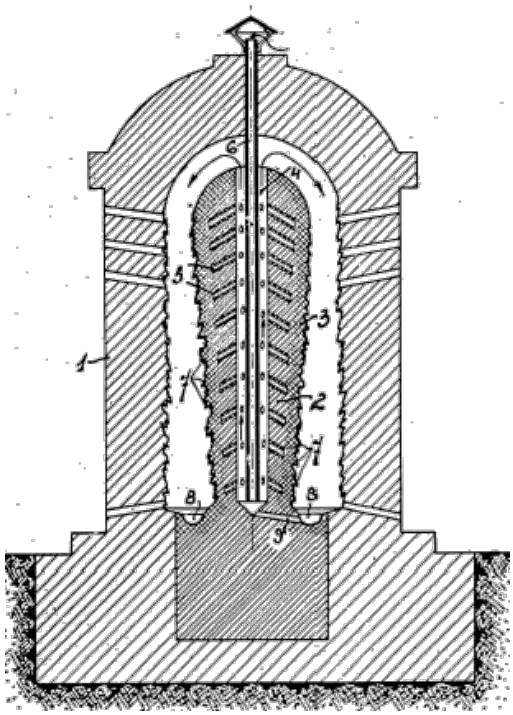
clouds or dispersing fogs, comprises a primary winding carried by a frame 15 adjustably mounted on an insulating post 17, and a secondary winding in two parts connected together in series. One part of the secondary winding is carried by a drum 19 fixed to the post 17, while the other post is mounted on a smaller drum 20 in an oil-filled casing 22, which is made of insulating-material and provided with downwardly directed flanges 24 to shed moisture. One end of the secondary winding is connected to one end of the primary winding, the other end of the secondary being connected to a conducting member K from which brush discharges of high-frequency alternating current pass to the atmosphere.



British Patent # 319,778
Improved Means for Collecting Moisture from the Atmosphere
Achille Knapen

Abstract --- Means for collecting atmospheric moisture comprises an outer envelope 1 within which is a mass 2 of circular or angular section and formed of material such as concrete, clay, earthenware, or masonry; a pipe 6 depends through the envelope 1 into a central opening 4 in the mass 2, from which opening passages 5 extend downwardly into the mass. The passages 5 may be formed by earthenware &c. pipes. The density of the outer portion of the mass

is greater than that of the inner portion. The outer surface ot the mass is provided with projections 7 of stone, slate, glass, metal &c. In use., cool night air circulates in the direction shown by the arrows, cooling the mass and causing condensation of atmospheric moisture, which is led through a trough 8 to a reservoir.



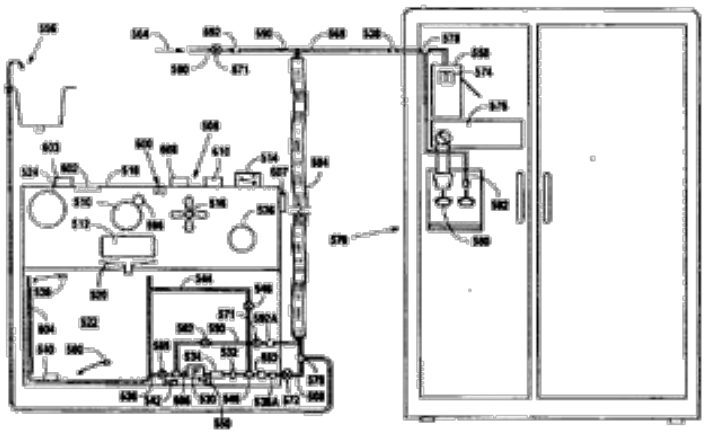
British Patent 1,164,119
Device for Modifying Atmospheric Conditions for example, for the Inhibition or Dispersal of Fog or Mist, or to Induce Rain
Edmund Updale

Abstract --- A method of fog dispersal comprises contacting a mass of suspended atmospheric particles with a polymer in particulate form, the polymer having a molecular weight of at least 30,000. The polymer may have a charge which is opposite or different in magnitude from the suspended particles. The polymer may be watersoluble or water swellable and delivered in the form of dust or aqueous mist of average particle diameter 10-300 microns. The preferred polymers are: alkylenimine polymers, partially hydrolyzed acrylamide polymers, styrene sulphonate polymers and polyalkylene polyamines. The polymers may be polyelectrolytes, or non-ionic. They can also be hydrophilic.

European Patent # 1,142,835
Portable, Potable Water Recovery and Dispensing Apparatus

Francis Forsberg

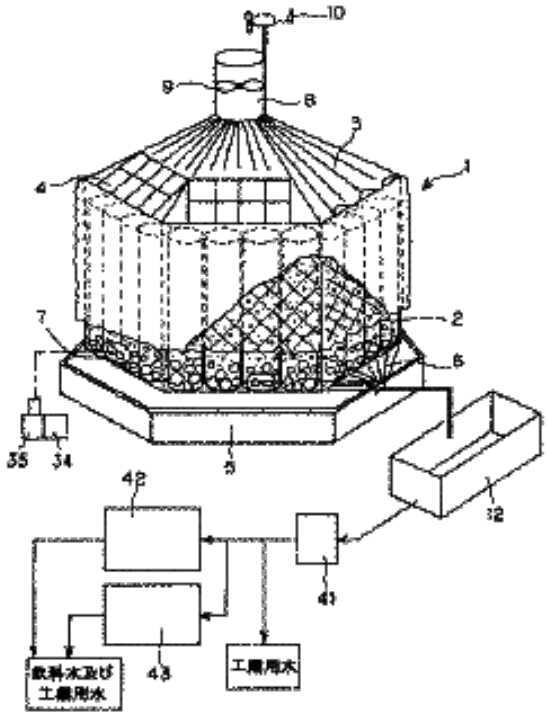
Abstract --- The invention relates to a potable water recovery and dispensing apparatus for producing high-purity liquid water by condensation of dew from ambient air. The apparatus employs an air filter (518) to remove and trap particulates of diameter larger than 1-100 microns dispersed in ambient air. An enclosed cooling means includes dew-forming surfaces adapted to cool the ambient air to below its equilibrium dewpoint. The surfaces are formed and positioned for gravity flow of liquid water collected on the dew-forming surfaces into a combined condensate collection and storage vessel (522). Before being discharged by means of a discharge line (536) the liquid water is filtered through an activated-carbon porous VOC filter-absorber (532) and treated in a UV treatment zone (534) where it is continually exposed to radiation of sufficient energy and appropriate wavelength to kill adventitious bacteria and viruses. If there is insufficient liquid water in the combined condensate collection and storage vessel (522) then municipal water (564) can be introduced to an external appliance or dispenser through the temporarily deactivated pump (530), the activated-carbon porous VOC filter-absorber (532) and the UV treatment zone (534). A check valve (566) prevents the municipal water (564) from entering the condensate collection and storage vessel.



Japan Patent # 2004 316183
Equipment & Method for Producing Fresh Water from Atmospheric Moisture Content
Aoki Kazuhiko, et al.

Abstract --- To optimize a condensed material in a self-contained fresh water producing system which collects water by causing dew condensation of an atmospheric moisture content on a surface of the condensed material, without requiring an artificial energy source. This

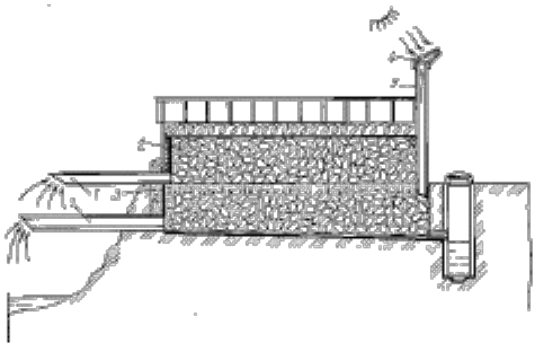
equipment, inside which a condenser is installed, comprises: a means for forcedly leading an atmospheric flow from a lower part; a duct for exerting a stack effect of the atmospheric flow on an upper part; a means for collecting water, dripped by the condenser, on a bottom part; a moisture content forced-cooling means which is inserted into the condenser; and a solar and/or wind energy generating means as a power means. The condenser is constituted as a one-tier or multitier structure in such a manner that many condensed material units, wherein a cage filled with the condensed material of a porous material is further reinforced by a frame body, are arranged, coupled, stacked and fixed at variable intervals so that the atmospheric flow can be sufficiently absorbed into the condensed material.



Russian Patent # 2,190,448
Independent Complex for Separating Moisture from Air
O. A. Bernikov

Abstract --- Moisture separating equipment used in regions, where desert and saline lands adjoin sea. Complex has readily built hangar-type construction wherein heat and water sealed pebble beds are arranged at two levels, with pebble bed levels being separated with water-permeable floor. Wet air is pumped from surface through intake pipes, cavities in pebble beds by low pressure created in sun-heated suction pipes. Moisture saturated

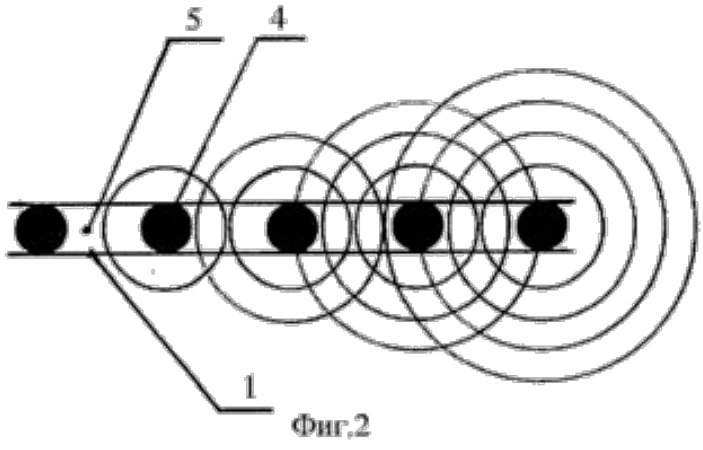
with water sucked from floor between said levels settles on "endless" surface of pebble beds. Because floor is constantly in wet state, it reduces temperature of lower (working) level to and below dew point, which results in intensive backflow of moisture into water collector. Depending on meteorological conditions, complex is capable of providing water supply for at least 1,000 men at daily water consumption of 1,000 liters



Russian Patent # 2,235,454
Method & Apparatus for Producing Acoustic Effect upon Atmospheric Formations
E. T. Protasevich & S.A. Ryzhkin

Abstract --- Controlling of meteorological conditions, in particular, acoustic methods and equipment for acting upon heat clouds and other atmospheric formations. Method involves transporting several elongated explosive charges into upper part of cloud in case heat cloud water content exceeds 0.5 g/m3, sizes of substantial amount of moisture drops exceed 19 microns and in case of favorable meteorological conditions, each explosive charge being composed of several small concentrated charges; orienting elongated charges according to direction of spreading of cloud and positioning substantially in parallel with and at distance of several hundred meters from one another; providing end initiation for simultaneous explosion of all elongated explosive charges; providing explosion of concentrated explosive charges in elongated charge with short lagging of one explosion with respect to the other. Apparatus has elongated detonating explosive charge enclosed in flexible light-weight strong enclosure, initiating detonation device with remote or automatic control system, and air balloons for raising of charge systems into atmosphere. Elongated explosive charge is combination of small concentrated explosive charges separated from one another by air gaps or partitions made of coagulant reactant. Length of elongated charge is 100-200 m, total weight of explosive in charge is from 15-20 kg to 30-40 kg. Diameter

of charge is 3-5 cm. Air balloons are filled with hydrogen. Usage of elongated explosive charges composed of concentrated charges, certain arrangement thereof in rain cloud and detonation method allows dimensions of acoustic field to be increased in direction of spreading of cloud, process for creating of turbulent flows in cloud air medium to be intensified and process duration to be increased. Method and apparatus may be used for creating of artificial rain, settling of pollution, including radiation pollution, and carrying out of scientific researches.



Фиг.2

Russian Patent # 2,278,790
Method & Apparatus for... Extraction of Water from Atmosphere...
Vladimir Krjukovskij, et al.

Abstract --- FIELD: mechanical engineering; air conditioning systems. ^ SUBSTANCE: invention comes to delivery of air, its cooling to temperature below dew point with condensing, separation, accumulation cleaning and enriching of condensate. Air conditioning is carried out to standardized parameters with simultaneous removal of condensate. Separation of condensate from flow of atmospheric air is done by increasing section of inlet channel of heat exchanger-evaporator Omega2 relative to cross section of inlet channel of evaporating unit of air conditioner Omega1 with account of value 1/cosalpha where alpha is angle of tilting of inlet surface of heat exchanger-evaporator relative to plane of cross section of inlet channel of evaporator unit of air conditioner at 0 DEG <alpha<90 DEG and braking of flow passing through heat exchanger-evaporator. Condensate is cleaned and mineralized at pressure up to 1 bar. Proposed device contains evaporator unit air conditioner consisting of fan, heat exchanger-evaporator and sump, moisture collector, filter and condensate saturation unit. Heat exchanger-evaporator arranged before fan is installed at angle 0 DEG <alpha<90 DEG relative to direction of inlet channel of air conditioner evaporator unit, and fine-mesh gauze is

tightly secured at outlet of heat exchanger-evaporator. Mineralizer is used as condensate filtering and saturating unit. ^ EFFECT: provision of required microclimate in saloon of vehicle with simultaneously obtaining water from atmospheric air in amounts sufficient for practical use.

Russian Patent # 2,278,929
Vortex System for Condensing Moisture from Atmospheric Air
Vjacheslav Alekseev, et al.

Abstract --- FIELD: plants for getting sweat water of atmospheric air. ^ SUBSTANCE: vortex system for condensing moisture from atmospheric air has water collector and dew condenser which has set of vertical rods. Lengths of rods are much longer than their lateral sizes and distance among rods is approximately equal to their lateral sizes. Vertical rods are placed in such a way that they form tangential plates; surfaces of plates are made of mineral fibers. Vertical pipe is disposed along central axis. Vertical pipe is provided with fan or with heating elements disposed onto its inner surface. Tangential plates are made for adjustment of angle of inclination of the plates to vertical surface of vertical pipe. Set can have several levels of tangential plates separated by horizontal plates. Basalt fiber is used as mineral fiber. ^ EFFECT: improved efficiency of operation; increased condensing surface; uniform controlled flow of moistened air.

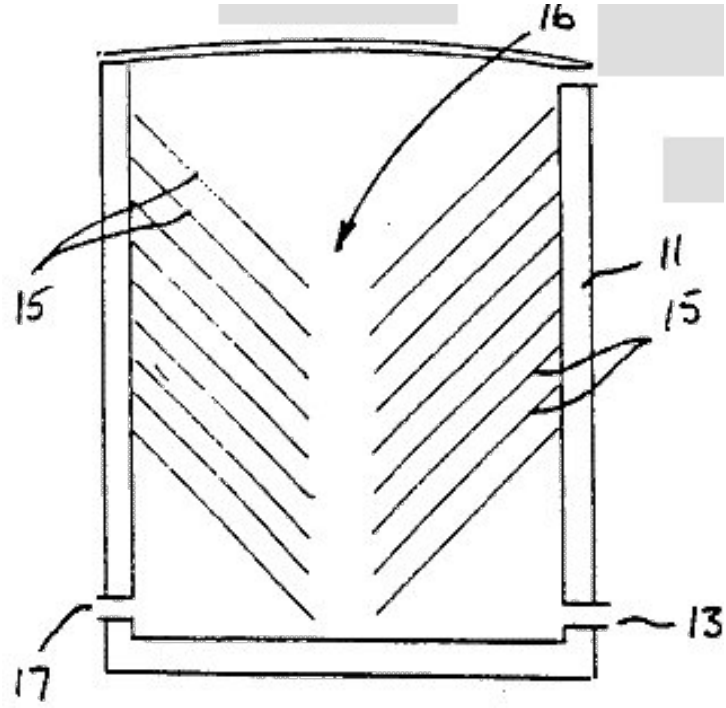
Russian Patent # 2272877
Method for Obtaining Water from Air
Jurij Aristov, et al.

Abstract --- FIELD: obtaining fresh water from atmospheric air in remote, dry or arid zones. ^ SUBSTANCE: method involves creating air flow with air blower; supplying air flow through air ducts, valves and heat-exchangers; absorbing water steam from air flow by sorbent at absorption stage; heating sorbent layer at desorption stage by heat generators arranged directly in sorbent layer; removing desorbed water steam from sorbent layer; condensing water steam in condenser and accumulating thereof in storage vessels. The heat generators are heat-exchangers with developed surfaces distributed in sorbent layer and sorbent heating is performed due to water steam condensation on heat-exchanger surfaces. Besides, electric heaters may be used as the heat generators. The electric heaters are also distributed in sorbent layer and

are heated by alternating current supplied thereto. The heat generators may be formed as current-conducting sorbent layer heated by electric current. Catalyst may be also used as the heat generators. The catalyst is located in sorbent layer and adapted to provide hydrocarbon oxidation reaction. ^ EFFECT: increased quality of obtained fresh water and reduced power consumption for fresh water obtaining.

WO Patent # 2004 029,372
Method & Apparatus for Collecting Atmospheric Moisture
Peter H. Boyle

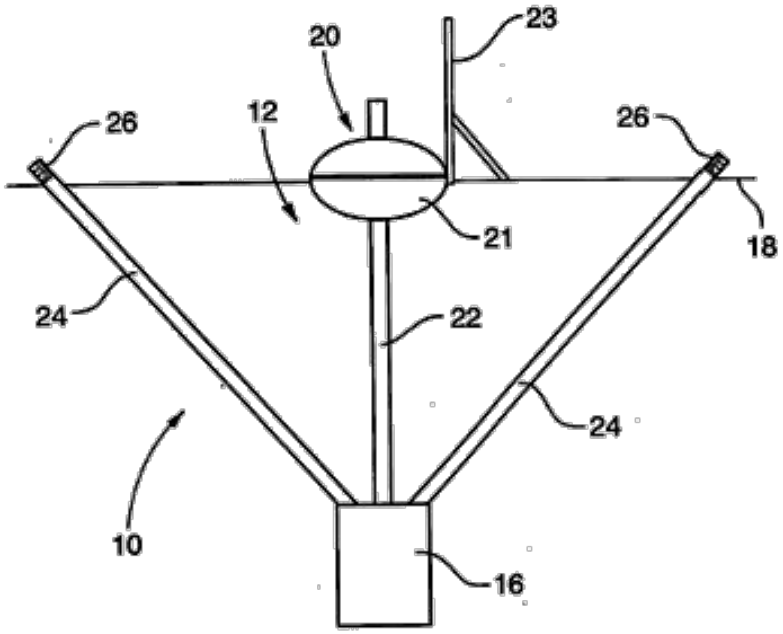
Abstract --- A number of apparatii for condensing water from the atmosphere are described, whereby atmospheric air is drawn through an enclosed space and moisture condenses on plates or similar contained within the enclosed space and subsequently collected. Most of the apparatii include means to increase the flow of air through the enclosed space to increase the efficiency of moisture collection. A typical apparatus includes a body (11) supporting condenser plates (15) of conical or frusto-conical configuration. Extractor fans, the operation of which are controlled by humidity sensing switches and temperature sensors, provide the increased flow. To promote condensation, typically, cooling ducts (49) are provided through which air-conditioned cool air is passed.



WO Patent # 2003 104,571

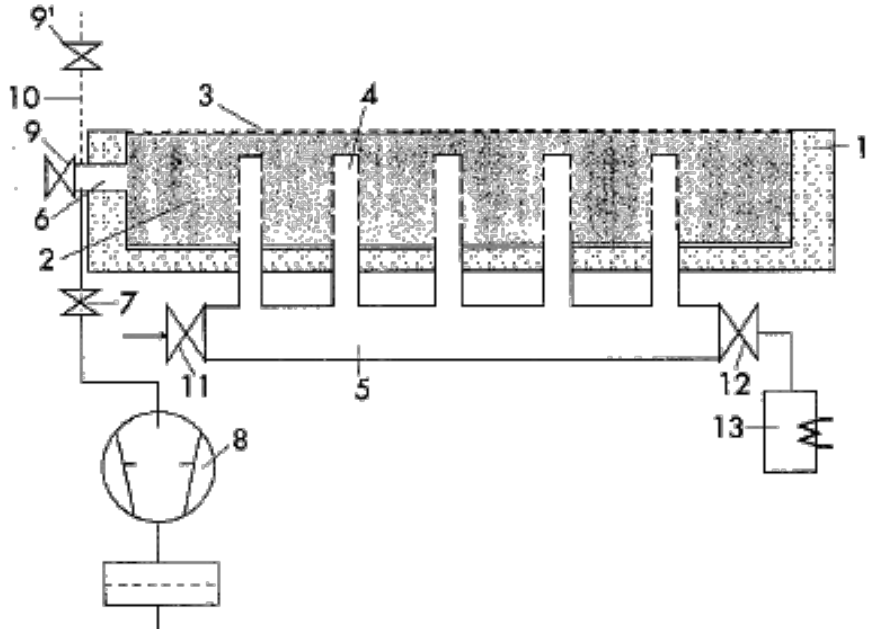
Device for Collecting Atmospheric Water
Jonathan Ritchey
Equivalent: AU2003240324

Abstract --- The present invention is directed at a water collection device which condenses water vapour in atmospheric air to water. The device comprises means for drawing the atmospheric air into the device; means for condensing the moisture vapour in the atmospheric air into water; and means for collecting the water.



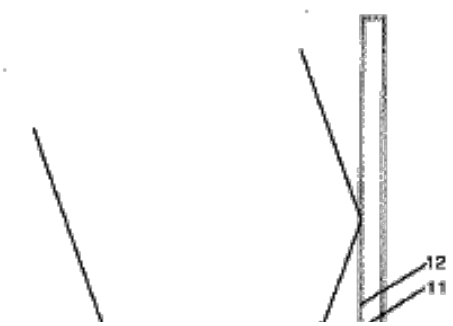
German Patent # 19,734,887
Device for Obtaining Water from Air
Heinz-Dieter Buerger & Yourii Aristov
Equivalent: WO9907951

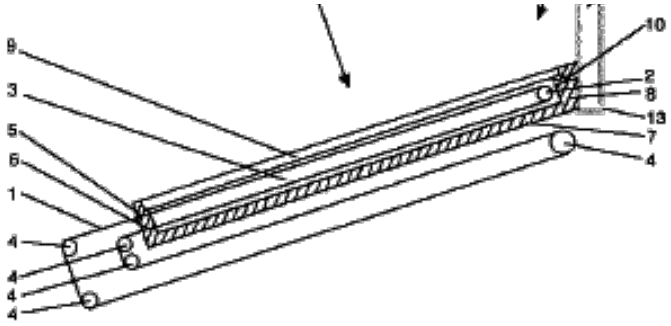
Abstract --- The invention relates to a device for obtaining water from air by means of a hygroscopic absorption material which is intermittently charged with humid air or subjected to a heat source. The device comprises a tightly sealed container for the absorption material with at least one means for supplying humid air and removing water vapour to a condenser and with an opening for evacuating dry air. The invention is characterized in that a vacuum pump is connected to the container and that processor-controlled valves are provided for which allow for a two-phase operation. The first phase involves feeding humid air into the container and the second phase consists of regeneration of the absorption material and condensation of the water vapour.



French Patent # 2,813,087
Unit Recovering Atmospheric Moisture from Vapor or Mist...
Jacques P. Beauzamy

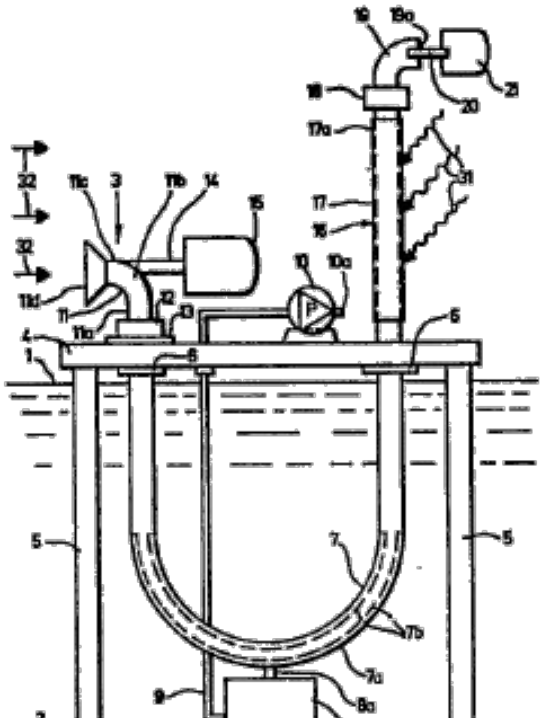
Abstract --- Reversible absorption properties of compounds for liquid- or vapor phase water are exploited. Lithium bromide, lithium chloride, calcium bromide and calcium chloride are examples of suitable compounds absorbing water from the vapor or liquid state. A solar still releases the water absorbed. The solar still comprises an oven with a fabric band recirculating continuously or intermittently between its interior and the ambient air. The band is impregnated with an absorbent chemical composition, e.g. one listed above. Absorption is continuous, and takes place simultaneously with water production. Operation alternatively follows the diurnal cycle, with absorption at night and water production during the day. The unit is orientated to face the sun, following its relative motion by manual or automatic means. An equatorial mounting is used. Fabric advance is manually- or automatically controlled, as a function of the oven temperature. The solar still has a condenser cooled by ambient air. It is alternatively cooled by water, seawater, brackish water or polluted water.





Swiss Patent (CH) # 608,260
Process for Obtaining Service Water or Drinking Water...
Gotthard Frick

Abstract --- An apparatus for obtaining service water or drinking water from the air moisture in the vicinity of a body of water, in particular in the vicinity of the sea, has a U-shaped condenser which dips into the body of water during operation. Above the body of water, said condenser is provided with a supply line, having an inlet opening, and a discharge line having an outlet opening. In this arrangement, the outlet opening is situated at a higher level than the inlet opening and, between the condenser and the outlet opening, there is arranged a vertical discharge-line portion which is sheathed by a layer which absorbs solar radiation. During operation, the vertical discharge-line portion is heated up by solar radiation, with the result that a convection current is obtained and air, containing water vapour, from the surroundings is sucked through the condenser. The water vapour is then liquefied in the condenser and pumped upwards by means of a pump.

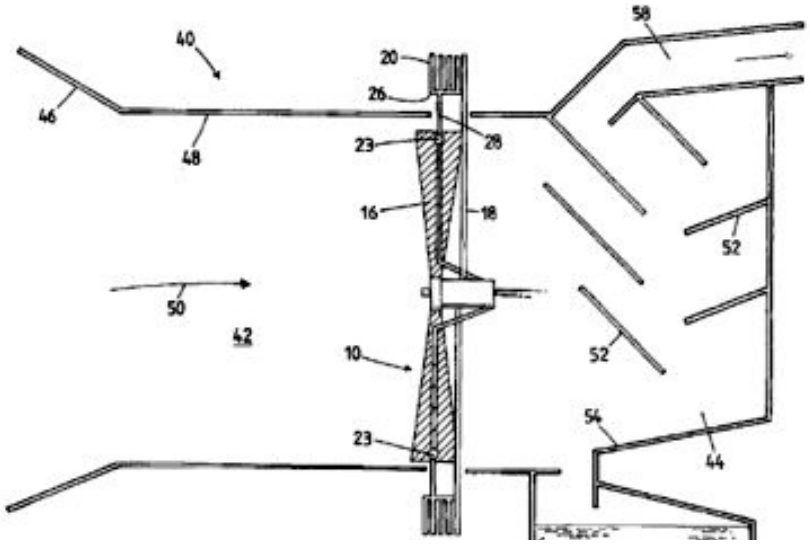


WO2007009184
Gust Water Trap Apparatus
Maxwell Whisson
1-25-2007

Abstract --- A Gust Water Trap Apparatus comprises means (9, 42, 52) for receiving air from ambient wind and means for feeding the received air into a compression chamber (46, 56). Restriction means (21, 41) leads from the compression chamber into a condensation chamber (18). The apparatus leads to an increase in the pressure of air from wind gusts so that the air loses energy and is cooled further in the condensation chamber so as to deposit liquid water in the condensation chamber.

WO2006017888
Apparatus & method for Cooling of Air
Maxwell Whisson
2-23-2006

Abstract --- A wind turbine apparatus (40) for cooling of air having a wind turbine (10) axially connected to a refrigeration compressor (13) arranged to compress refrigerant, means (18) for conducting compressed refrigerant centrifugally outwards, means for causing the compressed refrigerant to lose pressure (23) so as to cool fades (16) of the wind turbine (10), and means for returning spent refrigerant centripetally to the compressor (13).



Canadian Patent # 2,478,896
Combination Dehydrator & Condensed Water Dispenser
Janet Morgan

Also published as: WO03078909 // CN 1,643,320 // MXPA 04008899 // AU 2003 213855

Canadian Patent # 774,391
Method for Precipitating Atmospheric Water Masses
David Glew & Andrew Watson

WO 2006 040370
Method of Obtaining Water from an Atmospheric Air Mass...
Alexander Ermakov

WO 2006 028287
Method of Water Extraction... from Atmospheric Air
Hideya Koshiyama

European Patent (EP) 1629157
Device for the Extraction of Water from Atmospheric Air
Frank Thielow

Netherlands (NL) Patent # 1030069
Atmospheric Water Collector...
Ghassan Hanna

British (GB) Patent # 1,214,720
Fog Abatement & Cloud Modification
