May 20, 1947. A. VANG 2,420,691

EVAPORATOR

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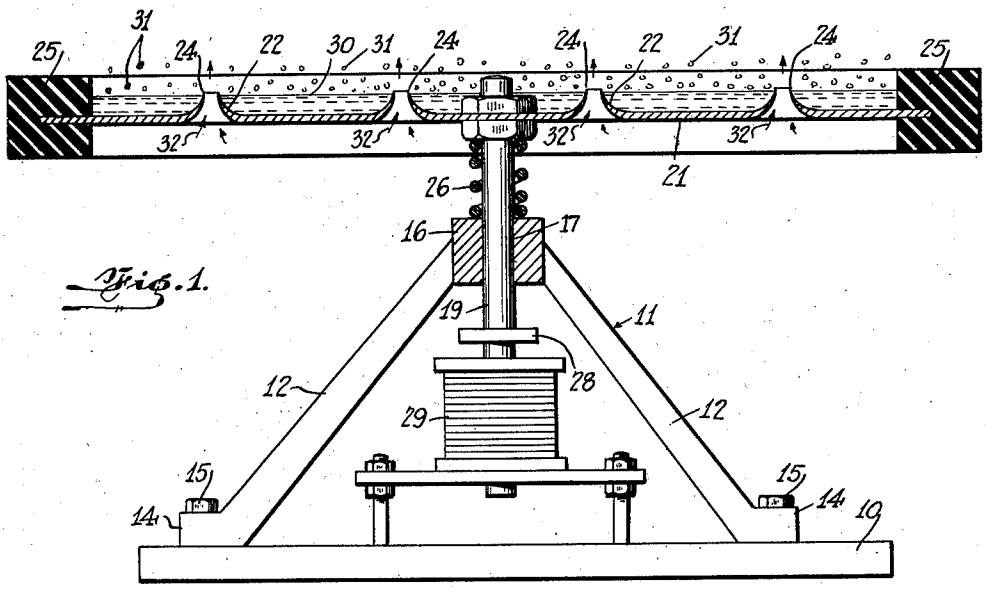


Fig. 1.

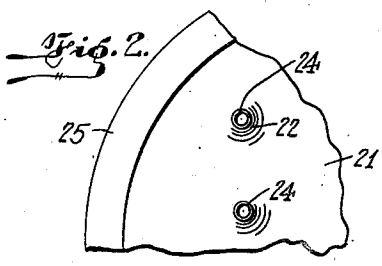


Fig. 2.

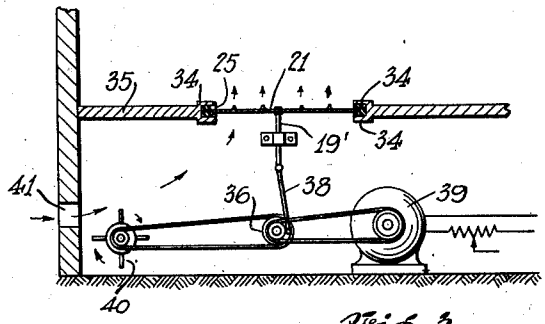


Fig. 3.

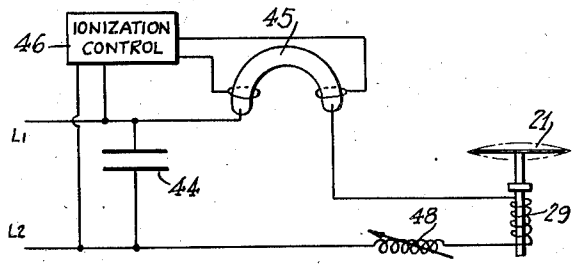


Fig. 4.

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EVAPORATOR

Alfred Vang, New York, N. Y.

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2 Claims. (Cl. 261—81)

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This invention relates to new and useful improvements in evaporators and to means and methods for cooling air and other gases by evaporating liquids, and more particularly to apparatus and devices for agitating the surface of a liquid and reducing the pressure thereon by evaporating means.

One object of the invention is to provide an improved device or apparatus of this kind, which may be used in ordinary dwelling houses without special fixture for its operation and which may be used for cooling effects or for humidifying air.

Another object of the invention is to provide a refrigerator for use in railway cars, both passenger and freight. Its use in the latter type will not only keep a lower temperature, but will prevent the drying out of fruits and vegetables and retain the natural flavor therein.

Other objects of the invention are to provide an improved device which is adapted to operate at high frequency and under extremely heavy loads.

Additional objects of the invention are to effect simplicity and efficiency in such methods and apparatus and to provide an extremely simple device or apparatus of this kind, which is economical, durable, and reliable in operation, and economical to manufacture and install.

Still other objects of the invention will appear as the description proceeds; and while herein details of the invention are described in the specification and some of the claims, the invention as described in some of the broader claims is not limited to these, and many and various changes may be made without departing from the scope of the invention, as claimed in said broader claims.

The inventive features for the accomplishment of these and other objects are shown herein in connection with an evaporator which, briefly stated, includes a vibratory pan or plate adapted to have a liquid retained thereon and means for vibrating the pan.

In the accompanying drawing showing, by way of example, two of many possible embodiments of the invention:

Figure 1 is a transverse vertical sectional view, partly in elevation, showing one form of the evaporator.

Figure 2 is a fragmental plan of peripheral portion of the pan.

Figure 3 is a schematic representation of another form of the evaporator; and

Figure 4 is a wiring diagram, showing a means for energizing the evaporator.

The evaporator, as shown in Figure 1, comprises

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a flat horizontal base 10 and a spider member 11, having downwardly turned legs 12, provided with feet 14, mounted on the upper face of the base, as by screws 15. The hub portion 16 of the spider member is provided with an axially vertical aperture 17, through which a vertical rod 19 is disposed and adapted to reciprocate therein.

A vibratory pan 20 is secured fast on the upper end of the rod and above the hub portion and comprises a disk or plate 21 of thin substantially rigid material provided with upward indentations to form cones 22, each having a hole 24 at the apex; the marginal portions of said hole being sharp and projecting substantially vertically. A thick rim 25 of rubber or other suitable resilient material is secured on and around the peripheral portion of the disk for purposes described later herein. A helical spring 26 of sufficient strength, wound around the upper end portion of the rod and slightly compressed between the disk 21 and hub portion 16, carries the weight of the pan. An armature 28 on the lower end portion of the rod is actuated by a solenoid 29, fixedly mounted on the base 10.

In operation, if the evaporator is to be used for domestic purposes, the pan 20 is filled with a liquid 30, such as water, until the liquid level is slightly below the holes 24 in the cones 22. The terminals (not shown) of the solenoid 29 are connected to a suitable source of current, such as 60 cycle A. C., whereupon the pan is vibrated and the liquid 30 therein is continually agitated, causing droplets 31 of liquid to be thrown into the air space about the pan.

At the same time, with each downward movement of the pan, the funnel shaped underside of the indentations causes a relatively large amount of air to be funneled upwardly through the disk, while on each upward movement the relatively small effective pressure area causes but little air to flow downwardly. The net effect is an upward movement of air, as shown by the arrows 32, through the disk, which movement has definitely been demonstrated by smoke trails. Because of the movement of air as described, the cones 22 act as Venturi or Pitot tubes, causing a reduced pressure on the liquid 30, thereby increasing the rate of evaporation of the liquid and lowering the temperature of the surroundings.

The rubber flange 25, in addition to retaining the liquid on the disk 21, reduces noise from the vibrating pan in the form of the invention, as shown in Figure 1. In this form the evaporator is especially adapted to home use, since it is portable and can be located in any suitable and con-

venient place. In other installations, other suitable liquids may be used instead of water, such as ammonia.

In the embodiment of the invention, as shown in Figure 3, the rubber flange **25** may be mounted by retaining rings **34** to hold the disk in a large hole in a horizontal wall **35**. This wall may be the floor of a room or a cover of a closed compartment. In this embodiment, the disk **21** is vibrated by a rod **19'** connected to an eccentric **36** by means of a connecting rod **38**. The eccentric **36** is driven preferably by a variable speed motor **39**, which also may drive a fan **40** for drawing fresh air through a duct **41**, such as from the exterior of a building if desired, or the duct may lead from any other locality, such as another part of the space to be cooled. Obviously, the disk **21** as mounted in Figure 3 may be vibrated by a solenoid as shown in Figure 1.

The current supplied to the solenoid **29** may be taken from any suitable source, but for heavy duty work I prefer to discharge a large capacity condenser through the solenoid to energize same. By such action a high peak voltage may be applied to cause sudden downward movement of the disk and high velocity air passage through the cone holes **24**, thereby obtaining a maximum Venturi effect to lower the pressure on the evaporating liquid **30** and enhance the evaporation and cooling effect. The disk is restored to its upper position relatively slowly by the spring **26** or resilience of the rubber flange **25**, if the latter is mounted on a rigid support, as in Figure 3.

A wiring diagram for condenser discharge supply of current is shown in Figure 4, wherein a large capacity condenser **44** is charged by a suitable source of direct current L_1L_2. The terminal ends of the solenoid **29** are connected to the respective sides of the condenser and a mercury vapor discharge tube switch **45**, as described in Patent No. 2,287,541, is interposed between the solenoid and condenser. The ionization of the vapor in the switch may be controlled by a suitable control **46** to produce discharges at a determined frequency, or if the ionization of the switch **45** is continuous and the circuit is oscillatory, the reactance of the circuit may be varied as by a variable inductance **48** to control the frequency. Thus the frequency of the current and the vibration of the plate or pan may be varied over a wide range into the order of several kilocycles per second.

It is obvious that slight changes may be made in the form, construction, and arrangement of the several parts, as shown, within the scope of the appended claims, without departing from the spirit of my invention, and I do not, therefore, wish to limit myself to the exact construction and arrangement shown and described herein.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States, is:

1. An evaporator and humidifier comprising a mounting member, having an axially vertical bearing aperture, a vertical rod disposed through the aperture and adapted to reciprocate vertically therein, a vibratory pan fixedly secured on the upper end of the rod and above the mounting member, said pan comprising a disk of thin substantially rigid material, provided with upward indentations to form cones, each having a hole at the apex, the marginal portions of the hole being sharp and projecting substantially vertically, a thick upstanding rim of resilient material around the peripheral portion of the disk, a helical spring around the upper end portion of the rod and slightly compressed between the disk and mounting member, and means for reciprocating said rod, substantially as shown and described.

2. In combination a flat horizontal base, a spider member having downwardly turned legs provided with feet mounted on the upper face of said base, the hub portion of the spider member having an axially vertical aperture, a vertical rod disposed through said aperture and adapted to reciprocate therein, a vibratory pan fixedly secured on the upper end of the rod and above the hub portion, said pan comprising a disk of thin substantially rigid material provided with upward indentations to form cones, each having a hole at the apex, the marginal portions of the hole being sharp and projecting substantially vertically, a thick upstanding rim of resilient material disposed around the peripheral portion of the disk, a helical spring around the upper end portion of the rod and slightly compressed between the disk and the hub portion, an armature on the lower end portion of the rod, a solenoid fixedly mounted on the base for actuating the armature, a condenser having each side thereof connected to each respective end terminal of the solenoid, a mercury vapor discharge tube interposed between one side of the condenser and one terminal of the solenoid, and means for controlling the ionization of the vapor in the tube.

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