Oct. 9, 1934. H. F. HUTZEL 1,976,228

HUMIDIFIER AND THE LIKE

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Fig. 1.

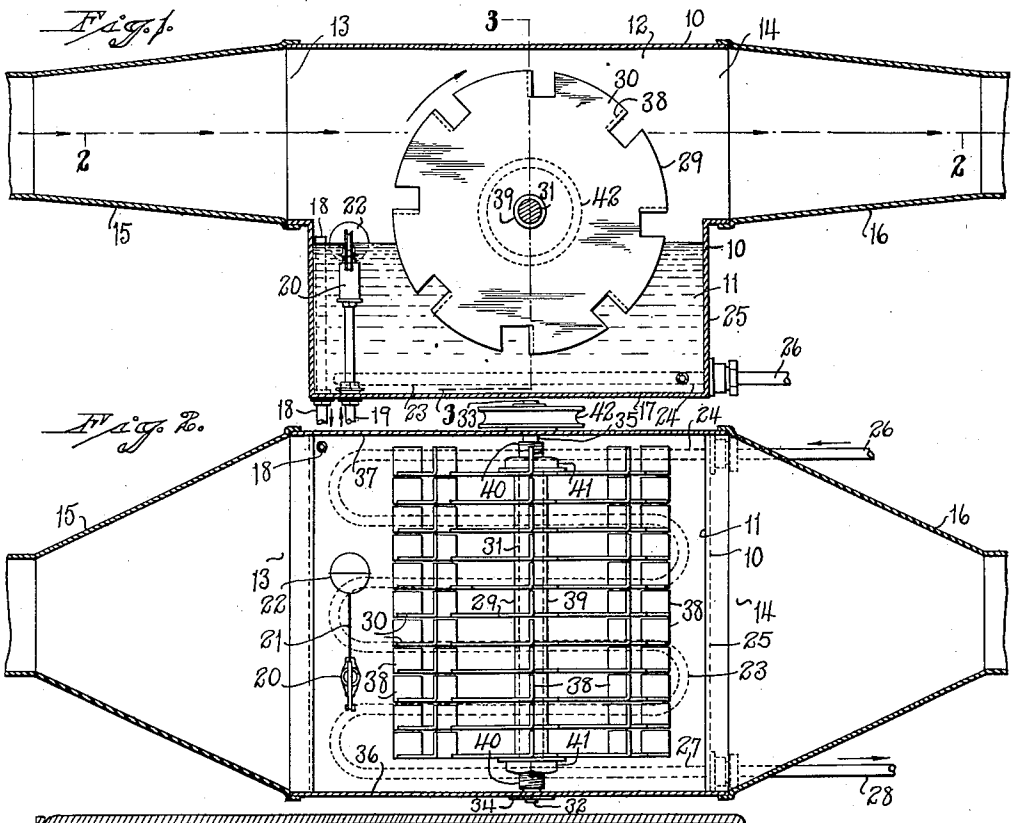
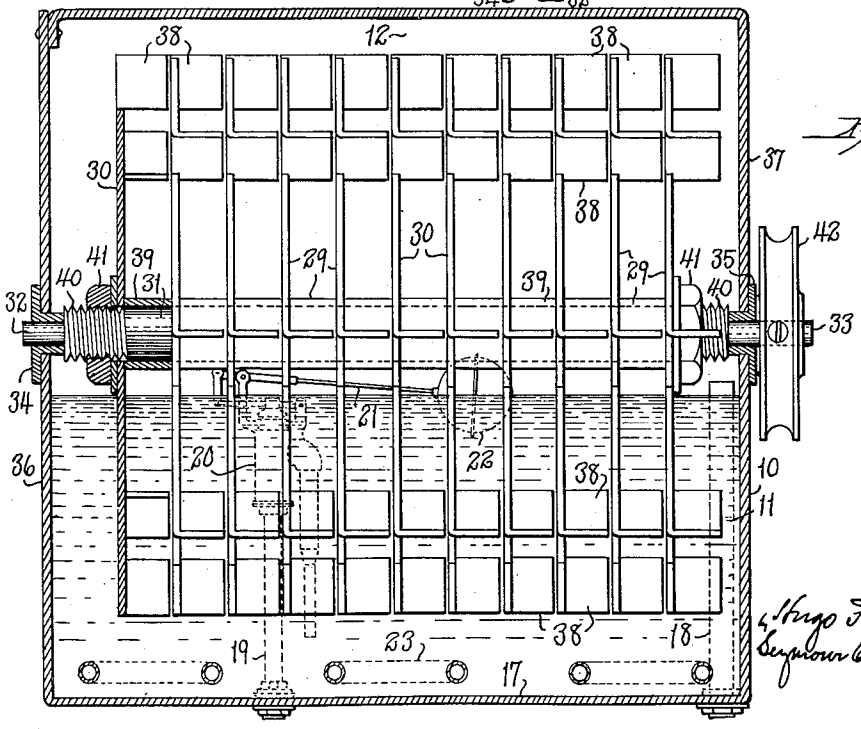


Fig. 2.

Fig. 3.



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Fig. 5.

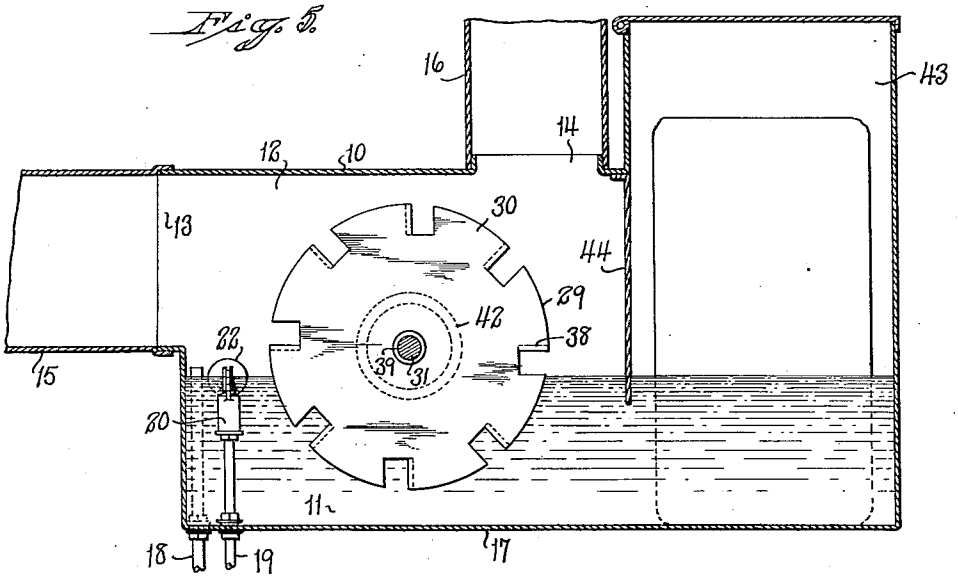


Fig. 4.

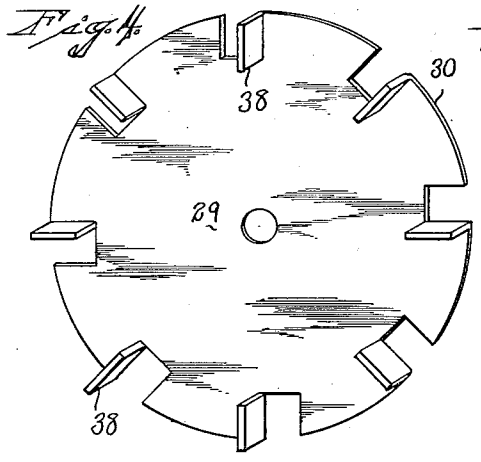
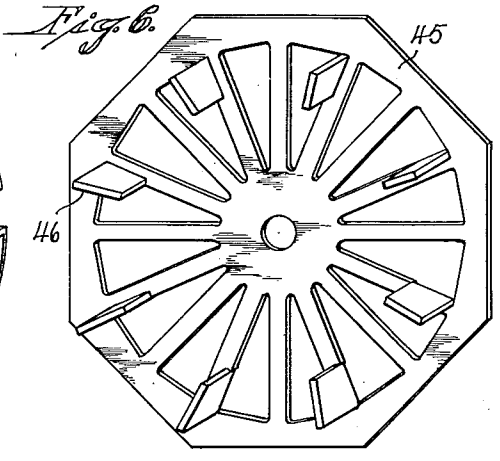


Fig. 6.



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HUMIDIFIER AND THE LIKE

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Application June 24, 1933, Serial No. 677,364

2 Claims. (Cl. 261—92)

This invention relates to an improvement in that type of air-conditioning apparatus designed for adding moisture to or removing moisture from the air in enclosed spaces such, for instance, as residences, factories, etc., and which for convenience of description will be herein referred to as "air-conditioning apparatus."

One of the objects of the present invention is to provide a simple and effective air-conditioning apparatus constructed with particular reference to reliability.

A further object is to provide an apparatus of the type referred to having superior capacity for removing dust from air passing therethrough without thereby becoming clogged or otherwise rendered ineffective.

A further object is to provide an air-conditioning apparatus which may be motivated by air currents, if desired, to thereby increase its efficiency.

A still further object is to provide an air-conditioning apparatus which may be conveniently driven and which will be effective at such relatively-slow speeds as not to occasion undue wear or noise.

Other objects and advantages will be apparent to those skilled in the art from the following, considered in conjunction with the accompanying drawings and appended claims.

In the accompanying drawings:

Fig. 1 is a vertical, longitudinal, sectional view through one form of air-conditioning apparatus embodying the present invention;

Fig. 2 is a horizontal, sectional view taken on the line 2—2 of Fig. 1;

Fig. 3 is a vertical, transverse, sectional view taken on the line 3—3 of Fig. 1, but on a larger scale;

Fig. 4 is a perspective view of one of the moisture-carrying plates, detached;

Fig. 5 is a vertical, longitudinal, sectional view corresponding to Fig. 1, but showing another form of air-conditioning apparatus embodying the present invention; and

Fig. 6 is a perspective view of another form of moisture-carrying plate.

The embodiment of the present invention herein chosen for illustration in Figs. 1 to 4 of the accompanying drawings includes a suitable rectangular housing generally designated by the reference character 10 and so shaped as to provide in its lower end a water-chamber 11 and in its upper end an air-passage 12, arranged in line with which latter is an ingress-opening 13 and an oppositely-located egress-opening 14. A suitable ingress-duct 15 is attached to the housing 10 in registration with the ingress-opening 13 and, similarly, an egress-pipe or -duct 16 is connected to the said housing in registration with the egress-opening 14 thereof.

Extending through the bottom-wall 17 of the housing 10 and projecting thereabove is an overflow-pipe 18 designed to permit water to overflow from the water-chamber 11 in the event that the level thereof rises above a predetermined point. Also extending through the bottom-wall of the housing 10 is a water-supply pipe 19 carrying at its upper end a float-valve mechanism 20 of any approved form and requiring no detailed description herein, inasmuch as it is a common article of commerce, other than to say that it includes a lever-arm 21 carrying at its outer end a float 22 which acts in the usual manner of such mechanisms to automatically admit water when the water level falls below a predetermined point, and to automatically shut off the inflow of water when the water level rises to a predetermined point.

Located adjacent the bottom of the water-chamber 11, in substantial parallelism with the bottom-wall 17 of the housing 10, is a temperature-control coil 23 having one of its terminals 24 extended through the end-wall 25 of the housing 10 and coupled to a supply-pipe 26. The complementary terminal 27 of the coil 23 also extends through the end-wall 25 of the housing 10, adjacent the opposite wall of the latter, and has attached to it a return-pipe 28.

Mounted within the housing 10 is a rotary moisture-carrier, generally designated by the reference character 29, and in the structure now being described comprising a series of corresponding moisture-carrying disks or plates 30 formed of sheet-metal and each centrally perforated so as to be sleeved over a shaft 31 having bearing-portions 32 and 33 respectively located at its opposite ends and rotating in bushing-like bearings 34 and 35 respectively secured to the respective opposite side-walls 36 and 37 of the housing 10.

Each moisture-carrying plate 30 preferably is provided near its periphery with a plurality of integral laterally-offsetting vanes 38 and is spaced from its neighbor by a spacing-ring 39 sleeved over the shaft 31 before referred to. Each of the opposite ends of the shaft 31 of the moisture-carrier 29 is provided with a threaded portion 40, receiving a clamping-nut 41 serving, together with its complementary clamping-nut on the opposite side of the unit, to firmly bind the plates 30 and spacing-rings 39 in place upon the shaft

31. If desired, one of the ends of the shaft 31 may have secured to it a pulley 42 by means of which the moisture-carrying unit 29 may be rotated by an electric motor or other positive driving-means.

The device above described may be employed for either humidifying or de-humidifying the air-stream passing therethrough. For purposes of description, let it be presumed that the device is to be employed as a humidifying unit, and that it is desired to rely upon the kinetic energy of the air flowing therethrough to revolve the moisture-carrier 29.

Under these conditions, air may be forced or drawn through the ducts 15 and 16 and the air-passage 12 of the housing in the direction, for instance, indicated by arrows in Fig. 1. The moving air will impinge upon the vanes 38 of the various moisture-carrying plates 30 and cause the same to revolve as a unit, thereby continuously presenting the freshly-wetted surface of the plates to the draft of air flowing through the air-passage 12 and through the spaces between the respective plates 30 which preferably extend parallel with the air-stream and rotate about an axis at substantially a right angle to the air-stream, so as to impede the said air-stream to a minimum degree. As the air-stream flows through the spaces between the plates 30, it will have a large percentage of its dust content extracted and deposited on the said plates to be subsequently washed therefrom as the said plates revolve in the water in the chamber 11.

If desired, steam or other heating fluid may be passed through the coil 23 to raise the temperature of the water in the water-chamber 11 and thus prevent too marked a decrease in temperature of the said water, due to evaporation, or to heat the said water to such a degree as to markedly increase its rate of evaporation.

If desired, the moisture-carrier 29 may be positively rotated by connecting a suitable source of power, such as an electric motor, to its shaft 31 through the intermediary of the pulley 42, in which case the vanes 38 may be omitted.

If, on the other hand, it is desired to use the device above described as a de-humidifier, the water in the water-chamber 11 of the housing 10 may be chilled by passing a refrigerating fluid through the temperature-control coil 23, to thus in turn chill the plates 30 and cause the deposition of moisture thereon from the air passing through the air-chamber 12.

In Fig. 5 is shown an air-conditioning device primarily designed for de-humidifying and which corresponds generally to the device shown in the preceding figures, save that its egress-opening 14 is located in the top-wall of the housing 10 and also differing from the preceding form in that it is provided with an ice-chamber 43 separated from the air-chamber 12 by a baffle 44 extending downward below the normal water level in the chamber 11.

In Fig. 6 of the accompanying drawings is shown a skeletonized moisture-carrying plate 45 having a polygonal periphery and provided with laterally-offsetting vanes 46 if it is to form a part of an air-driven unit, but which may be omitted in case of a positive drive.

By the arrangement shown, the air passes through the spaces between the respective plates of the moisture-carrier and may have moisture added to it or removed from it as desired. Whether the device is employed for humidifying or de-humidifying, it provides reliable means not only for changing the moisture content of the air, but also for removing dust therefrom without, however, having the dust blockade the air-passages and thus render the unit less efficient or totally ineffective as has been the case in some of the prior types of air-conditioning apparatus.

Furthermore, by the arrangement shown, a minimum resistance is offered to the passage of air through the device, while at the same time a maximum degree of wetted surface is exposed to such air.

The invention may be carried out in other specific ways than that herein set forth without departing from the spirit and essential characteristics of the invention, and the present embodiment is therefore to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

I claim:

1. A device of the class described, comprising a housing having a water-chamber and an air-passage extending therethrough above said water-chamber; a rotary moisture-carrier located in said housing and comprising a series of spaced-apart planar plate-like moisture-carrying members positioned so as to rotate partly in the water-chamber and partly in the air-passage in the said housing, and having its axis of rotation disposed transversely to the air-stream flowing through the said air-passage in such manner as to mainly present the edges of the said plate-like members to the air-stream; a plurality of said plate-like members being provided with cuts and having integral portions adjacent said cuts bent to laterally offset from said plate-like members to provide air-vanes.

2. A device of the class described, comprising a housing having a water-chamber and an air-passage extending therethrough above said water-chamber; and a rotary moisture-carrier located in said housing and comprising a series of spaced-apart skeletonized planar plate-like moisture-carrying members having radial spokes, and air vanes laterally offsetting therefrom and positioned so as to rotate partly in the water-chamber and partly in the air-passage in the said housing, and having its axis of rotation disposed transversely to the air-stream flowing through the said air-passage in such manner as to mainly present the edges of the said laterally-perforated or skeletonized plate-like members to the air-stream.

HUGO F. HUTZEL.