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O. F. METZ

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AIR CONDITIONER

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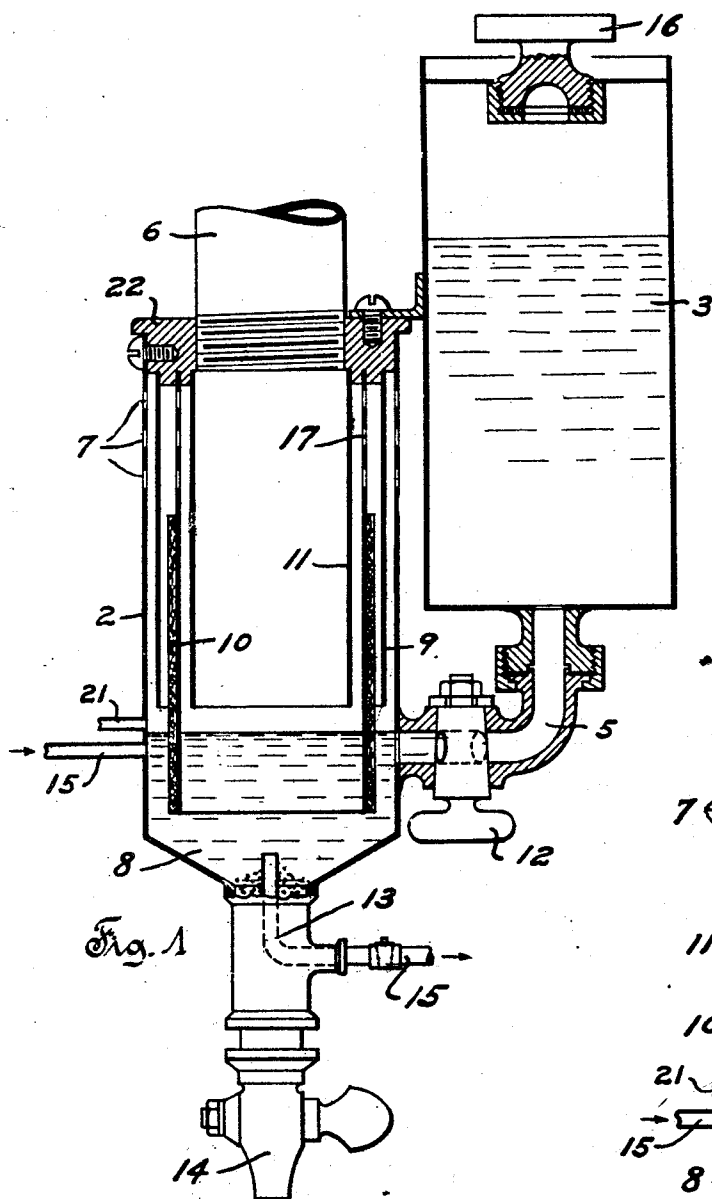


Fig. 1

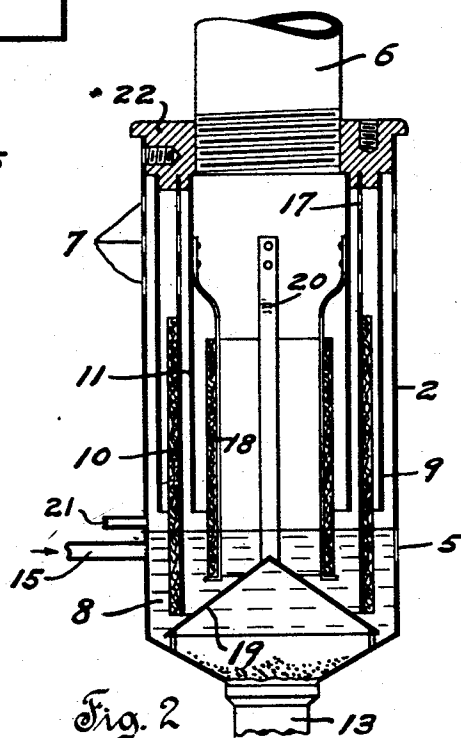


Fig. 2

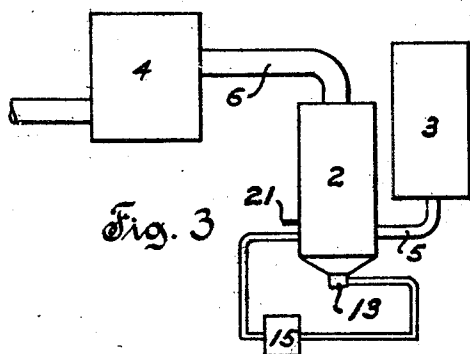


Fig. 3

Inventor
O. F. Metz
 by *G. J. DeWitt*
 Attorneys

UNITED STATES PATENT OFFICE

ORA F. METZ, OF EL PASO, TEXAS, ASSIGNOR TO ALLIS-CHALMERS MANUFACTURING COMPANY, OF MILWAUKEE, WISCONSIN, A CORPORATION OF DELAWARE

AIR CONDITIONER

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This invention relates in general to improvements in the art of conditioning gases, and relates more specifically to improvements in the construction and operation of air purifying and humidifying devices or the like.

An object of the invention is to provide an air conditioner which is simple in construction and efficient in operation. Another object of the invention is to provide a combined air purifier and humidifier which is continuous and automatic in operation. A further object of the invention is to provide an air conditioner operable by the flow of air induced by the suction of an internal combustion engine or the like. Still another object of the invention is to provide an air conditioning device operable in conjunction with the propelling motor of a tractor or an automobile, which may be conveniently installed, readily maintained in efficient operation, and rapidly dismantled for inspection and cleaning. These and other objects and advantages of the present invention will be apparent in the course of the following description.

A clear conception of several embodiments of the invention and of the operation of gas conditioning devices constructed in accordance therewith may be had by referring to the drawings accompanying and forming a part of this specification in which like reference characters designate the same or similar parts in the several views.

Fig. 1 is a part sectional side view of an improved air conditioning device.

Fig. 2 is a fragmentary part sectional side view of another form of improved air conditioning device.

Fig. 3 is a diagrammatic view showing the disposition of the air conditioner relatively to a flow producing device.

The form of air conditioner specifically illustrated in Fig. 1 comprises in general an outer casing 2 of cylindrical form having a liquid basin 8 in the lower portion thereof, a liquid supply tank 3 located adjacent to the casing 2 and communicating with the liquid basin 8 through a liquid supply pipe 5, and a conditioned gas discharge pipe 6 communicating with the interior of the casing

2. The upper portion of the casing 2 is provided with a plurality of inlet openings 7 which may if desired be disposed tangentially relatively to the main casing in order to produce whirling motion of the entering gas. A cover 22 is detachably secured to and closes the upper extremity of the casing 2 and provides a support for a series of depending annular walls 9, 10, 11. The outermost annular wall 9 is located closely adjacent to the interior of the main casing 2 and extends downwardly in close proximity to the interior of the main casing 2, the lower end of the wall 9 being preferably located slightly above the level of the liquid in the basin 8. The intermediate wall 10 projects downwardly into the liquid in the basin 8 and may be provided with an annular wick projecting upwardly from the liquid basin 8 and in close proximity to the inner surface of the wall 9. The upper portion of the intermediate wall 10 is provided with a series of gas conducting openings 17. The inner depending wall 11 extends downwardly in close proximity to the interior of the intermediate wall 10 and has its lower end preferably located slightly above the level of the liquid in the basin 8. The lower extremities of the depending walls 9 and 11 may however extend slightly below the level of the liquid in the basin 8. The space within the wall 11 communicates directly with the discharge pipe 6 which is shown as being attached to the cover 22.

The portion of the main casing 2 below the liquid basin 8, is provided with an impurities collecting receptacle 13 which may be made of any desired capacity depending upon the use to which the apparatus is to be put. The receptacle 13 is provided with a discharge valve 14 for effecting removal of accumulated impurities and for permitting drainage of the liquid from the basin 8. The basin 8 is also preferably provided with a heating means or device 15 comprising a source of heat and pipes communicating with portions of the basin 8 located at different level whereby circulation of the liquid from within the basin 8 through the heating device may be effected automatically. When the apparatus

is used in connection with an internal combustion engine, the exhaust manifold of the engine may be readily employed as a heater.

The liquid supply reservoir 3 may contain any suitable cleansing liquid such as water or oil and should be hermetically sealed in order to prevent undesirable entry of air. The reservoir 3 may be filled by removal of the supply plug 16 and the discharge of liquid from the reservoir 3 is automatically controlled by removal of liquid from the basin 8 although the plug valve 12 located in the pipe 5 provides additional means for controlling the discharge of liquid from the reservoir 3 to the basin 8. The liquid level in the basin 8 is ordinarily maintained automatically but an overflow 21 is preferably provided in order to prevent undesirable rising of the liquid.

The conditioned gas discharge pipe 6 communicates with flow producing means 4 as shown in Fig. 3, for inducing a flow of gas through the conditioner. When utilizing the apparatus in connection with an internal combustion engine, the flow inducing means 5 may consist of the engine itself, although a pump or any other form of flow producing means may be substituted.

In the modified form of air conditioner disclosed in Fig. 2, the structure of Fig. 1 is substantially duplicated, but in addition an annular wick 18 is located within the interior annular wall 11. The wick 18 may be suspended from the wall 11 by means of supports 20 and preferably extends below the level of the liquid in the basin 8 and closely adjacent to the inner surface of the wall 11. The conditioner disclosed in Fig. 2 is also provided with a cone baffle 19 located within the liquid reservoir 8 and serving to prevent upward withdrawal of impurities from within the receptacle 13 in case the liquid in the basin 8 is not properly maintained.

During normal operation of the conditioner disclosed in Fig. 1, a continuous flow of air through the device is being maintained by the flow producing means 4. The liquid basin 8 is filled to the level indicated and the annular wick associated with the intermediate partition 10 is maintained in moist condition by capillary attraction of liquid from the basin 8. The liquid in the basin 8 is being heated by the heating device 15, the degree of heating of this liquid being controllable by means of a check valve in the pipe line associated with the heating device. The heating of the liquid may in some instances be carried on to the extent of producing vapor above the basin 8, such operation being desirable when operating in conjunction with gasoline or kerosene engines. Atmospheric air enters the upper portion of the main casing 2 through the inlet openings 7 and is immediately deflected downwardly toward the surface of the liquid in the basin 8, by

means of the outer annular baffle wall 9. As the air approaches the heated liquid in the basin 8, its direction of travel is abruptly reversed from downward to upward. During such reversal of flow most of the impurities contained in the air are discharged from the moving current and are deposited in the liquid of the basin 8. The separated impurities settle in the collecting receptacle 13 below the basin 8, from which the accumulated impurities may be withdrawn at intervals by means of the discharge valve 14. The current of air passing along the surface of the heated liquid in the basin 8 and subsequently traveling upwardly along the surface of the wetted wick 10, automatically absorbs more or less liquid depending upon the extent of heating of the liquid. In traveling upwardly along the outer surface of the annular wick secured to the intermediate wall 10, the air besides having its humidity increased, is further cleaned by deposition of particles of impurities upon the wetted surface of the wick. As the current of air reaches the upper portion of the intermediate wall 10, its direction of flow is again reversed while passing through the openings 17 into the annular space between the walls 10, 11. The air in moving downwardly between the walls 10, 11 eventually again impinges against the surface of the heated liquid in the basin 8 and again has its direction of flow abruptly reversed from downward to upward. The final conditioning is effected during this latter reversal and the conditioned air is drawn off through the discharge pipe 6. The impurities removed during final cleaning likewise settle into the receptacle 13 from which the accumulated impurities are removable as heretofore indicated. In this manner the air entering the cleaner in a continuous stream is automatically cleaned and humidified and is delivered to the discharge pipe 6 in a properly conditioned state.

The operation of the cleaner disclosed in Fig. 2 is substantially similar to that of the device disclosed in Fig. 1, except that the final conditioning is effected by the second annular wick 18 which is likewise maintained in wetted condition by capillary attraction. In the modified device, the separated impurities which settle in the liquid basin 8, descend along the upper surface of the cone baffle 19 and pass into the collecting receptacle 13 through the annular gap between the periphery of the baffle 19 and the conical bottom of the casing 2.

As the air current continues to flow along the surfaces of the basin 8 and of the wetted wicks, considerable of the liquid is evaporated thereby continually reducing the level of the liquid in the basin 8. This evaporation of liquid produces proper humidity of the air passing through the apparatus. As

the level of the liquid in the basin 8 is lowered below the upper edge of the liquid supply opening of the pipe 5, air percolates through the liquid in the pipe 5 and in the supply receptacle 3 and is discharged into the space above the liquid in the sealed receptacle 3. The air thus admitted above the liquid in the sealed receptacle 3 causes liquid to flow from the receptacle 3 through the pipe 5 into the basin 8. The liquid level in the basin 8 is thus automatically maintained regardless of the amount of liquid removed from the basin 8 by evaporation. If the delivery of liquid from the receptacle 3 to the basin 8 is found to be too rapid, the plug valve 12 may be manipulated to effect control of the flow. The rate of evaporation of the liquid may also be controlled by varying the degree of heating of the liquid in the basin 8 and the reservoir 3 may be made of any convenient size suitable for the particular purpose to which the apparatus is to be applied.

It will be obvious that the wicks may be omitted entirely and that the device will perform both cleaning and humilifying functions without these wicks. If the wicks become heavily coated with impurities, they may be readily removed, cleaned and reinserted in order to maintain the apparatus in efficient operating condition. The outer casing 8 and the baffle walls 9, 10, 11 as well as the reservoir 3, may be formed of sheet metal and most of the other parts of the apparatus may be formed of standard fittings and connections. The apparatus is entirely automatic in operation and requires no personal attention other than to supply liquid to the reservoir 3 and to remove impurities from the collecting receptacle 13, after being once installed. The apparatus is especially adapted for application to automobiles and tractors and may be readily applied to existing machines. The apparatus is moreover devoid of moving parts which might interfere with normal operation.

It should be understood that it is not desired to limit the invention to the exact details of construction and operation herein shown and described, for various modifications within the scope of the claims may occur to persons skilled in the art.

It is claimed and desired to secure by Letters Patent:

1. In combination, a casing having a liquid basin therein, an annular wall forming a relatively thin annular conduit directed toward the surface of the liquid in said basin, an annular wick formed to withdraw liquid from said basin and disposed within and closely adjacent to said wall, means for admitting gas to said conduit through the upper portion of said casing, and means for creating a suction within said conduit whereby said gas is caused to reverse its direction of flow directly above the surface of said

liquid and to travel along the surface of said wick.

2. In combination, a casing having a liquid basin therein, means for heating said liquid, an annular wall forming a relatively thin annular conduit directly within said casing and directed toward the upper surface of the liquid in said basin, means for admitting gas to said conduit through the upper portion only of said casing, an annular wick disposed within and closely adjacent to said wall to provide a second relatively thin annular conduit directed away from the surface of the liquid in said basin, and means for creating a suction within said casing to cause said gas to flow successively through said conduits.

3. In combination, a casing having a liquid basin therein, means for automatically maintaining a predetermined level of liquid in said basin, means for heating said liquid, a wall having one side spaced from said casing to form a relatively thin annular inlet conduit directed toward the liquid in said basin, a wick extending into said liquid and spaced from the opposite side of said wall to provide a relatively thin annular discharge conduit directed away from said basin, said wall being spaced from said liquid to provide a flow reversing passage connecting said conduits directly above said liquid, and means for producing a flow of gas through said inlet conduit, said passage and said discharge conduit in succession.

4. In combination, a casing having a liquid basin in the lower end thereof and having a cover at the upper end thereof, a plurality of annular walls within said casing, alternate ones of said walls having perforations adjacent to said cover and the intermediate walls being spaced from the liquid in said basin to provide an unobstructed annular flow reversing passage, means for causing liquid from said basin to travel upwardly along one of said perforated walls to produce a wetted surface, and means for producing a flow of gas through said perforations and the spaces between said walls and along said wetted surface.

5. In combination, a casing having a liquid basin therein, an annular wall forming a relatively thin annular conduit directed toward the surface of the liquid in said basin, an annular member disposed within and closely adjacent to said wall for withdrawing liquid from said basin by capillary attraction, means for admitting gas to said conduit through the upper portion of said casing, and means for creating a suction within said conduit whereby said gas is caused to reverse its direction of flow directly above the surface of said liquid and to travel along the surface of said member.

6. In combination, a casing having a vertical axis and a liquid basin at the lower end thereof, a wall cooperating with said cas-

ing to form a relatively thin conduit adjoining said basin and surrounding and disposed with its axis substantially parallel to the axis of said casing, a wick surrounding said axis and extending from within said basin along said conduit for withdrawing liquid by capillary attraction, means for admitting air to said casing and toward said basin, and means for creating a suction within said conduit to cause said air to reverse its direction of travel directly above said liquid and to subsequently flow through said conduit in the direction of the axis thereof and in contact with said wick at all points around said axis.

7. In combination, a casing having a vertical axis and a liquid basin, a wall cooperating with said casing to form a relatively thin annular conduit surrounding and having its axis substantially parallel to that of said casing and adjoining the liquid in said basin, a porous member extending from within said basin along said conduit for withdrawing liquid by capillary attraction, means for admitting air to said casing, and means for creating a suction within said conduit to cause said air to reverse its direction of travel directly above said liquid and to subsequently flow in the direction of the axis of said conduit and in contact with said member at all points around said axis.

In testimony whereof, the signature of the inventor is affixed hereto.

ORA F. METZ.

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