

June 15, 1937.

H. JOSEPH

2,083,607

AIR TREATING APPARATUS

Filed July 14, 1934

2 Sheets-Sheet 1

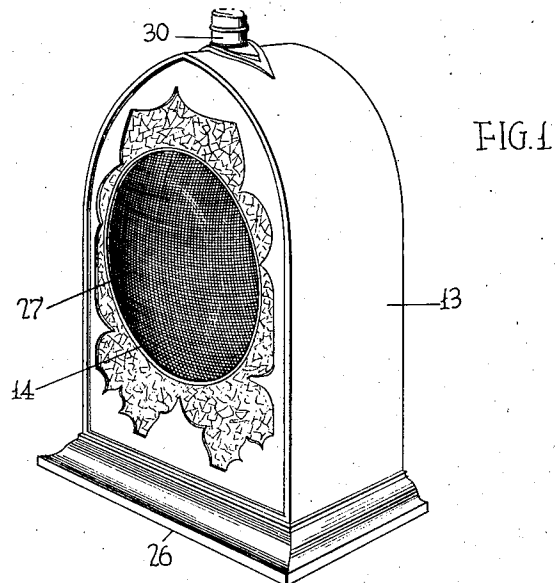
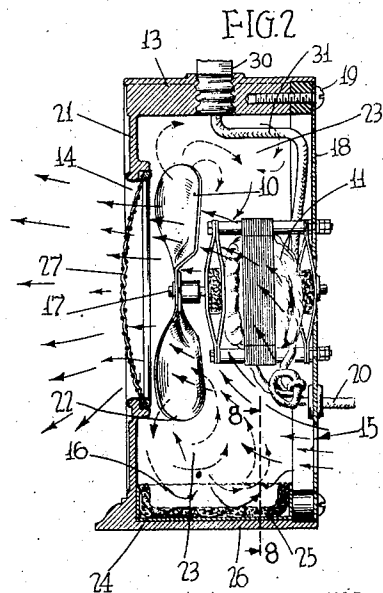
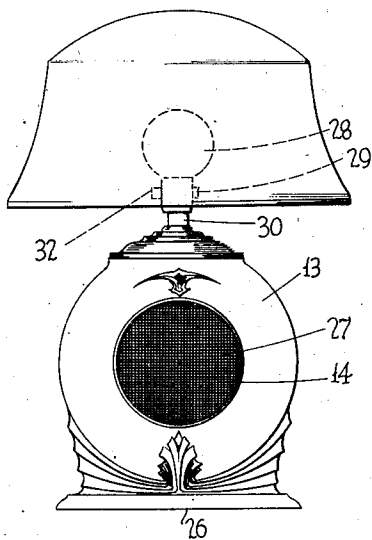


FIG. 3



INVENTOR.

HENRY JOSEPH

BY

John P. Garbo
ATTORNEY.

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2 Sheets-Sheet 2

FIG. 4.

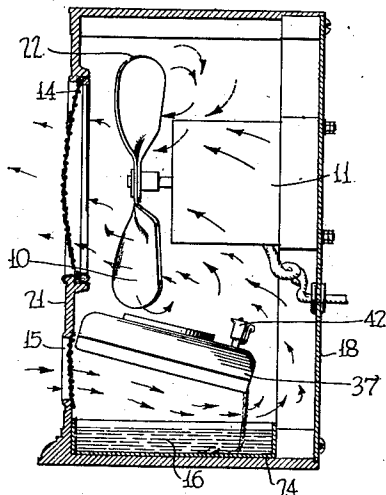
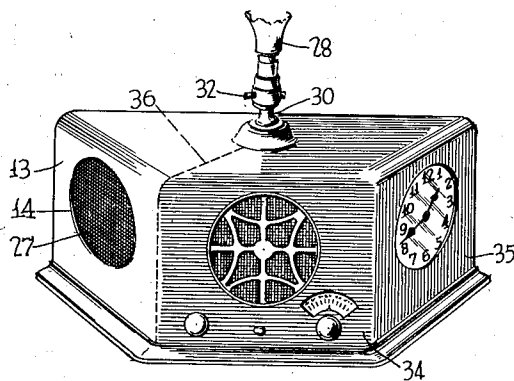


FIG. 5

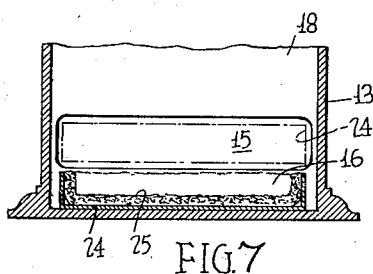


FIG. 7

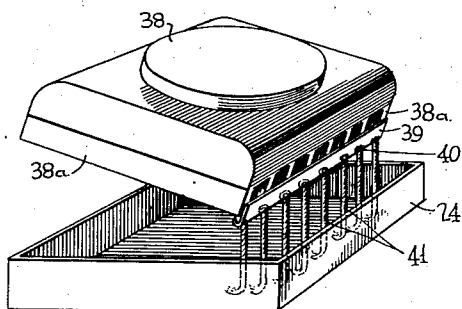


FIG. 6

INVENTOR.
HENRY JOSEPH

BY

John P. Garbo

ATTORNEY.

UNITED STATES PATENT OFFICE

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AIR TREATING APPARATUS

Henry Joseph, New York, N. Y., assignor to Neo-Aire, Inc., New York, N. Y., a corporation of New York

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6 Claims. (Cl. 261-30)

My invention relates to air treating apparatus particularly applicable to the small hand portable type. This type of air treating and conditioning apparatus is of a size approximating that of a small portable radio set or an electric clock. Its utilization is outstandingly the treating of air by admixing it with purifying, disinfecting, deodorizing and/or pleasant odorizing vapors or substances in vapor or other form of equivalent function. Such portable types of apparatus have their particular utilization in homes. There not only do sick rooms and special patients benefit by specially treated air and not only are various head and bronchial affections greatly alleviated by treatment of the air in the local of the person affected, not only is there stored clothing to be treated by conditioned air from time to time in certain seasons, but also in every room in the home air may be treated and conditioned at will as may be desired merely by moving the portable apparatus from one room to another and charging it with the cooling and/or vaporizing and/or other agencies desired. Thus in the latter case, in sleeping rooms in summer season, the charge may consist of dry ice for cooling and oil of pine for invigoration and refreshment.

More specifically, the apparatus comprises a small hollow casing having an outlet opening and an inlet opening removed in direction therefrom by an aggregate of at least 180°. Thus the inlet and outlet openings may be at different horizontal levels and on opposite sides of the casing and the circuitous flow be sinuous or S-shaped in path from the level of the one opening to the level of the other, or the openings may be at different levels and on the same side of the apparatus, the circuitous path then being of a bowed or U form in which the change of angularity is in one direction only. An electric fan is disposed immediately adjacent the discharge opening but the opening is constituted of a diameter less than the diameter of the fan whereby the walls of the casing restrict the full discharge and divert a portion of it into the eddying back flow. The inlet opening adjoins the bottom wall of the casing and a carrier for the liquid to be vaporized or other medium is disposed on the bottom wall or adjacent thereto horizontally transversely of the casing whereby the eddying back flow from the discharge opening sweeps rearwardly over the upper surface of the carrier and rejoins the main air stream flowing into the apparatus.

There are numerous refinements of detail of my apparatus and these will be the more fully under-

stood with the aid of the accompanying drawings to which the detailed description applies.

The drawings show several modifications of my invention as follows:—

Figure 1 is a general perspective of a form of the apparatus embodied in a casing of small radio or electric clock size taken from the front showing the screened discharge opening.

Figure 2 is a vertical cross section of this apparatus.

Figure 3 is a front elevation showing the modified casing form constituting the base of an electric lamp. The vertical section of the casing per se is identical with that of Figs. 1 and 2.

Figure 4 is a front elevation showing the invention embodied in a polygonal casing which also houses a radio and an electric clock.

Figure 5 is a vertical sectional elevation of the form of the invention disclosed in Figs. 1 to 4. New path of the air stream and a heating or cooling medium for the air stream is introduced together with a modified form of vaporizing device.

Figure 6 is a perspective view of this combined heating and cooling medium and vaporizing device.

Figure 7 is a detail on line 8/8 of Fig. 2 in the direction of the arrows.

Referring first to Figs. 1 to 4 which depict one form of the invention in each of several different forms of casing and particularly to Fig. 2 which is to be regarded as a representative vertical cross section of the apparatus, 10 designates the fan, 11 a diminutive electric motor which propels the fan, 13 the casing which encloses the fan and is provided with discharge opening 14 and inlet opening 15, and 16 designates the reservoir for the treating and conditioning medium.

The fan 10 is of the rotary type adapted to propel an air stream for discharge substantially in the direction of its axis 17. Its axis 17 is the shaft of the electric motor 11 upon which the fan is mounted. The motor in turn is mounted upon back wall 18 of the casing 13 and this back wall is removable from the casing as a unit, being secured thereto by removable machine screws 19. The back wall carries also the cord connections 20 through which connection may be made to an ordinary electric light socket. Thereby the back wall becomes a base for the power unit and fan and enables that unit to be assembled as a unit with all its appurtenances such as the means 20 for connecting with the source of power, controlling the motor, and equivalent appurtenances.

The assembled back wall base 18, motor 11 and fan 10 are then applied to the casing as a unit. They may likewise be removed as a unit in case of need for repairs to the power unit or other parts of the apparatus.

The casing 13 except for the back wall 18 is an integral whole fabricated of any suitable materials in any suitable manner. While it may be made of cast metal, I prefer molded or organic material such as bakelite or one of the many beautiful ornamental compounds the base of which is formaldehyde of urea. Inasmuch as when bereft of the back wall 18, the casing 13 is entirely open at the back, it is especially susceptible to casting or molding. It likewise lends itself to small compass in diminutive size and to the many beautiful ornamental designs which are prevalent in electric clocks, radios, bases of ornamental lamps and the like, certain of which are depicted in the views of Figs. 1, 3, and 4.

The front wall 21 of the casing contains the discharge opening 14 in axial alignment in the form of Fig. 2 with the axis 17 of the fan 10 and motor 11. The opening 14 is of less diameter than the diameter of the enclosed fan 10. Being of less diameter the joining margins of the front wall 21 are constituted a means for diverting a part of the discharge from the fan interiorly of the casing. From another angle the tip portions 22 of the fan are so located with respect to the opening 14 that they can discharge air within the casing only. In furtherance of these ends the fan 10 is located closely adjacent to the front wall 21 of the casing.

The top, bottom and side walls of the casing are respectively spaced laterally of the fan 10 an appreciable distance and there are afforded between them and the tips 22 of the fan and between them and the motor 11 spaces 23 of appreciable volume.

In that one of these spaces 23 which adjoins the inlet opening 15, in this case the bottom one of these spaces, is located the reservoir 16 containing the medium for treating and/or conditioning the air. In this case the reservoir consists of a pan 24 which contains a thick mat-like wick 25 adapted to be impregnated by liquid treating and/or conditioning medium subject to evaporation by the air. A mat 25 is shown as covering not only the bottom of the pan 24 but also its side walls thereby exposing the maximum of upper surface to the air. The bottom per se of the casing 13 designated as a bottom 26 is also pan shaped in this region, the front, back and side walls of the casing constituting the front, sides and back side walls of the pan shape. The inlet opening 15 terminates short of the bottom of the back plate 18. Thus in case of placement of excess liquid in the reservoir 24 or accidental spilling or seepage, the pan formed bottom of the casing constitutes a reservoir in and of itself and a safeguard against leakage to the exterior. The pan 24 is freely removable from the casing through the opening 15 which is large enough to admit the pan, as explained hereinafter in connection with Figure 8.

The inlet opening 15 in this form of the invention illustrated in Figs. 1 to 4, particularly Fig. 2, is located in the back plate 18 between the motor 10 and the reservoir 16. The air stream entering passes over a portion at least of the reservoir 16. In this modification of the invention there is no other inlet opening. The discharge opening 14 is located at an elevation above the inlet opening 15, in this case entirely above it. There is thus an

aggregate change of direction of the air stream from inlet to discharge of approximately 180°, 90° in one direction as the stream turns inwardly and upwardly, and 90° in the opposite direction as the stream is turned upwardly and outwardly to its discharge.

So organized the manner in which the apparatus performs the method of my invention as the fan functions to propel the air stream can be most readily discerned by following the arrows which have been drawn in Fig. 2 to show the paths of flow respectively of the main fan blown air stream and the eddying back flow which is diverted from the main air stream. To make this the clearer, solid line arrows are utilized to represent the main fan blown air stream and dotted line arrows are utilized to represent the eddying back flow.

The main fan blown air stream is caused to traverse the circuitous path indicated by the solid line arrows. It will be observed that in the form of Fig. 2 due to the fact that the air is caused to enter the inlet 15 at an elevation below the discharge opening 14, that even though the air stream to be treated enters and leaves the casing in the same general direction, between its entry and its leaving it twice changes direction, first vertically 90° and then laterally 90°, affording an S shape or sinuous path indicated by the solid line arrows.

In the outskirts or peripheral portions of the main air stream adjoining the zone of its discharge, through the overlapping of the path of revolution of the tips 22 of the fan 10 by the margins of the front wall 21 surrounding the discharge opening 14, I divert the peripheral portions of the main air stream from the discharge opening 14, and convert these portions of the main air stream into the eddying back flow illustrated by the arrows in dotted lines. It will be observed that this eddying back flow travels a completely circuitous path of 360°, traveling back upon itself and reentering the main air stream and admixing therewith.

In the present embodiment it is the bottom portion of this eddying back flow (which extends around the periphery of the entire air stream) which is utilized to convey to the main air stream the treating and/or conditioning medium. The bottom portion traverses the upper surfaces of the impregnated wick type reservoir 16, whips up and carries along the medium through evaporation, and charged with the vapor re-enters the main air stream. The eddying in such a back flow greatly improves the efficiency of its vapor charging and conveying action, not only through the more thorough admixture of the vapor with the eddying back flow, but also because the eddying back flow may be relied upon to reach every part of the reservoir 16 irrespective of its contour or the contour of the casing and the shape of the spaces and closed in the region of the reservoir 16.

In the next phase, the eddying back flow in this bottom region rejoins and admixes with the main air stream (shown by the interspersing of the dotted line arrows depicting the eddying back flow and the full line arrows depicting the main air flow) in the region of the ingress of the main air stream and throughout that region. I confine the region of ingress of the main fan blown air to be treated to that region or those regions of the eddying back flow which are utilized to convey the treating and/or conditioning medium to the main air stream. This confinement or convergence of the entire incoming air stream

with the entire vapor conveying back flow, markedly improves the efficiency. It assures a uniform distribution of vapor in the air stream and commences the ultimate general and thorough admixture. The uniform distribution is furthered by the co-extensiveness in width of the incoming main fan blown air stream and the rejoining eddying back flow. This co-extensiveness is attained by making the inlet opening 15 substantially of the same linear extent as the reservoir 16 as will be perceived by reference to Fig. 7 which is a section on line 8-8 of Fig. 1 looking in the direction of the section line arrows.

As turned through the first 90° of change in direction of its course, the main fan blown air stream shown by the full line arrows passes over and around the motor 18, in which region the admixture of the treating and conditioning mixture is furthered by the diffusing action of both the fixed and the rapidly rotating motor parts.

However, in the next phase the eddying back flow shown by the dotted line arrows in other regions, at elevations above the elevation of ingress of the main stream at the inlet 15 and above the region of the reservoir 16—collectively have the effect of producing eddies and cross currents and generally agitating the main air stream and perfecting the thorough admixture of the treating and/or conditioning medium with the main fan blown air stream. A uniform treatment and/or conditioning of the air stream results. If the medium is a vapor, this may also result in more complete vaporization. If liquid particles have been whipped into the air stream by chance or by design, these particles are reduced to ultimate fineness completely vaporized.

A guard and screen 27 extends across the discharge opening 14. A similar screen may be utilized in connection with the inlet opening 15.

In Figs. 3 to 4 I have shown the casing 13 affording a base for an electric lamp designated generally 28. The socket 29 of this lamp is connected with its base by a nipple 30 through which the current conductors 31 reach the lamp by way of the interior of the casing 13. Conductor 31 traverses the top one of the spaces 23 occupied by the eddying back flow. Conductor 31 receives power from the same cord connection 20 which supplies the motor 11. By use of separate control switches 32 and 33 respectively from the lamp or the motor, either may receive power independently of the other.

The form of Fig. 3 constitutes the casing circular in front elevation as distinguished from generally rectilinear, as that in Figs. 1 and 2. The form of Fig. 4 combines casing 13 with the casings 34 and 35 of a radio and an electric clock respectively. There will of course be appropriate internal partitions as requisite such as that illustrated by dotted line 36, requisite to appropriately segregate the air treating and conditioning chamber from that of the radio or clock mechanisms and to insure the carrying out of the method steps of imposition of circuitous pathway to the main fan blown air stream and the development of the eddying back flows.

In the form of Fig. 5 the apparatus in vertical elevation is very similar to that of the other forms. However, the inlet opening 15 is located on the same side of the casing as the outlet opening 14, that is to say, it is located in the front wall 21 instead of in the back wall 10. Here too in addition to the reservoir 16 containing air treating and/or conditioning medium in the form of a liquid maintained in a pan 24 with

or without the mat 25 illustrated in Fig. 2, I have shown a reservoir 37 for heat. This is in the form of a closed metal container having a removable cap 38 through which may be inserted a means for either absorbing heat or giving it out. Thus dry ice inserted in the container 37 will absorb heat from the air to be treated rendering it colder and thus certain of the chemical pack materials inserted in the container 37 will give out heat and transmit it to the air stream to be treated. To facilitate this absorption or giving out of heat to the air stream, I locate the container 37 just above the main fan blown air stream in its ingress to the casing, the reservoir 16 of the vapor medium being located just below it. Further, to facilitate this, I incline the reservoirs 37 downwardly from the top of the inlet 15 causing the main air stream to be directed downwardly. This also causes all drip from the reservoir 37 occasioned by evaporated or melted frost which may be formed upon it from the use of a means such as dry ice to absorb heat, to be swept inwardly and to drop to the pan 24. Still further, to facilitate the absorption and/or giving out of heat, I provide the bottom of the reservoir 37 with a plurality of longitudinally extending radiating fins 38. These fins terminate inwardly of the casing above a transversely extending trough 39 suitably secured to the ends of the fins as by soldering, brazing or the like. This trough receives the drip directly, holes 40 in its bottom permitting the drip to fall toward the pan 24 and perhaps into the pan. However, I prefer to drop cord wicks 41 through these holes, knotting their upper ends or perhaps enlarging the wicks to support them suspended from the trough with their lower ends projecting into the liquid in pan 24 as shown in dotted lines. Thus the upper ends of the wicks are moistened by the dripping from the fins 38 and this moisture is evaporated by the incoming air stream to improve the condition thereof as it traverses the casing. Thus, the lower ends of these wicks are moistened by the liquid in the pan reservoir 16 and by this treating (which may be of any desired function, cleansing, deodorizing, exhilarating or other), and the main air stream is charged, treated and conditioned by this vapor likewise.

A relief valve 42 is provided to prevent accumulation of too great a pressure within the reservoir 37.

The reservoirs 16 including the pans 24 are of such dimension that they can be readily inserted into and removed from the casings through the inlet openings 15 in the forms of Figs. 2 and 5. This relative dimension clearly appears from the dotted line showing of the transverse dimension of the pan 24 appearing in Fig. 7.

Obviously my invention has many, many modifications within its generic spirit. All of them are expected to be comprehended in the annexed claims, nor should terminology having genesis in the circumstantial evolution of the several forms adopted limit the scope of this comprehension.

What I claim is:

1. A small portable apparatus for treating and/or conditioning air comprising a fan adapted to propel an air stream, a casing completely enclosing the fan except for an inlet and an independent discharge opening for the air stream, and a reservoir for treating and/or conditioning medium located within the casing and resting freely upon the bottom of said casing in the vicinity of the inlet opening, said air inlet

openings being of dimensions permitting the free passage of said reservoir therethrough for insertion and removal and the free space within said casing between said reservoir in operative position and said inlet opening being of such dimensions that the reservoir may be moved from said operative position to and from and through said opening without meeting obstruction.

10 2. A portable apparatus for conditioning air comprising a casing having an air inlet opening and an independent air discharge opening and a fan enclosed by said casing except for said openings, the bottom of said casing being formed to receive a pan, and a pan with a conditioning medium insertable on and removable from said bottom through the inlet opening without changing the casing or changing the fan.

15 3. An air conditioning apparatus comprising a casing having a fan mounted therein with means for driving the fan, a circular outlet opening in the casing opposite the fan but smaller in diameter than the fan, an intake opening in the opposite wall of the casing and below the fan, and a removable reservoir for holding the conditioning medium in the bottom of the casing and substantially on a level with the low side of said intake opening said reservoir being of a size that is removable through one of said openings.

20 4. An air conditioning apparatus comprising a casing having a fan mounted therein with means for driving the fan, a circular outlet opening in the casing opposite the fan but smaller in diam-

eter than the fan, an intake opening in the opposite wall of the casing and below the fan, and a reservoir for holding the conditioning medium in the bottom of said casing, the intake opening being sufficiently larger than the reservoir to permit the reservoir to be freely replaced through the intake opening.

5 5. An air conditioning apparatus comprising a casing having a fan mounted therein with means for driving the fan, a circular outlet opening in the casing opposite the fan but smaller in diameter than the fan, an intake opening in the opposite wall of the casing and below the fan, the bottom of said casing having the form of a pan, and a reservoir for holding the conditioning medium made to conform to the bottom of the casing, and located in said pan.

6. A portable apparatus for conditioning air comprising a casing having a reservoir at the bottom thereof adapted to contain an air conditioning medium and a single air inlet immediately above said reservoir, an air discharge opening in said casing, a fan in said casing located above said air inlet and adapted to set up a main air stream to be conditioned through said discharge opening, the discharge opening being of less diameter than the diameter of the enclosed fan so as to direct a portion of the fan discharge from the main stream into eddying back flow within the casing over the reservoir whereby any air conditioning medium therein will be evaporated.

HENRY JOSEPH.