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3,194,307

INDUCTION CIRCULATOR

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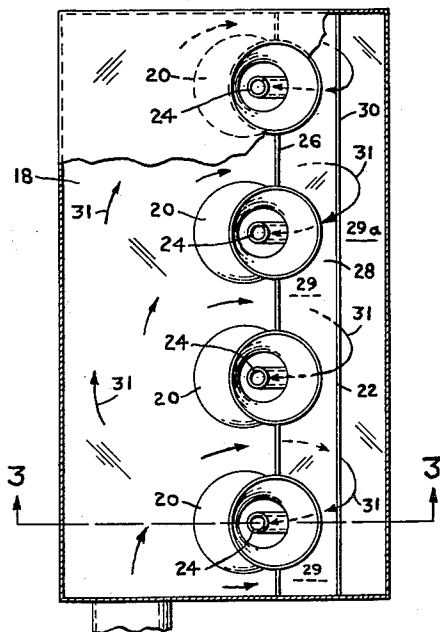
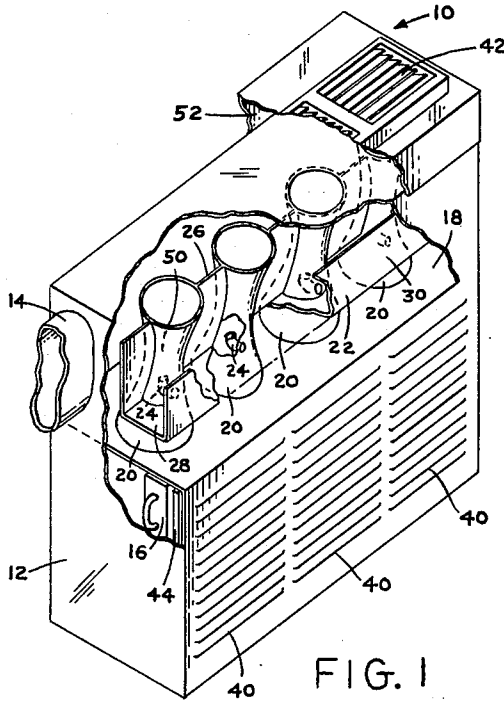


FIG. 2

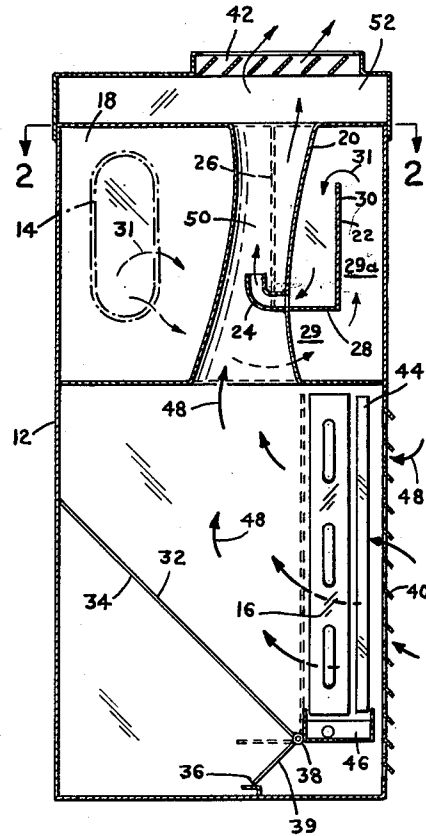


FIG. 3

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INDUCTION CIRCULATOR

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This invention relates generally to an induction circulator unit. More particularly the invention relates to induction circulator unit which uses a novel plenum therein.

The use of induction circulators is well known in the art. However, prior devices which used nozzle means for secondary air and tube means therein for primary air had the disadvantage of requiring a larger casing than that which would be otherwise necessary. Furthermore, their use created a noise problem.

It is the object of the present invention to overcome these disadvantages by providing an induction circulator unit which uses a novel plenum therein of relatively noise-free operation and is of smaller depth and height.

In accordance with the present invention an induction circulator unit for a positive pressure multi-room air conditioning system is provided which comprises:

(a) A casing having openings therein for the passage of air therethrough,

(b) A plenum disposed in said casing,

(c) Said plenum adapted to be connected to a source of conditioned primary air from said multi-room air conditioning system,

(d) Heat exchange means disposed in said casing,

(e) A plurality of spaced nozzle means extending through said plenum,

(f) Tube means disposed in each of said nozzle means to communicate primary air from said plenum to said nozzle means to induce secondary air into said nozzle means to mix with said primary air and to circulate thereinto the area being conditioned.

One of the objects of this invention is to provide an induction circulator unit which is constructed to operate efficiently while maintaining a basically simple design.

Another object of this invention is to provide an induction circulator unit in which primary air is discharged through tube means into nozzle means for the efficient induction of secondary air.

Another object of this invention is to provide an induction circulator unit which uses a novel plenum having large sound absorbing surfaces which reduce primary air noises to a minimum.

Still another object of this invention is to provide an induction circulator having a novel plenum which is operatively associated with tube means, baffle means and nozzle means.

Still another object of this invention is to provide an induction circulator unit having mixing chambers in the nozzle means thereof.

Still another object of this invention is to provide an induction circulator unit having a supplemental mixing chamber formed in the casing in superposition to the nozzle means therein.

With these and other objects in view as may appear from the accompanying specification, the invention consists of various features of construction and combination of parts which will be first described in connection with the accompanying drawings which show the preferred form of the induction circulator unit and the features forming the invention will be specifically pointed in the claims.

In the drawings:

FIGURE 1 is a perspective view partly broken away of an induction circulator unit embodying the invention.

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FIGURE 2 is a section partly broken away of a view taken in the direction of line 2—2 of FIGURE 3.

FIGURE 3 is a sectional view taken in the direction of line 3—3 of FIGURE 2.

Referring more particularly to the drawings, FIGURE 1 shows an induction circulator unit designated generally as 10. The components of induction circulator unit 10 include casing 12 to which is connected conduit 14 for the delivery of primary air under pressure supplied from a conveniently located central multi-room air conditioning system (not shown). Heat exchanger 16 is disposed in casing 12 and there are tube connections (not shown) which deliver and remove heat exchange media thereto. The novel plenum 18 is connected in the casing to receive primary air from conduit 14. Embodied in the novel plenum 18 there are nozzles 20, baffle 22 and tubes 24.

The path which the primary air takes in the plenum 18 is shown in FIGURE 2 and FIGURE 3. The baffle 22 serves to guide the primary air from the conduit 14 to the tubes 24 where it is discharged into the nozzles 20. To facilitate guiding the primary air the baffle has an in-board wall 26, a bottom wall 28 and an outboard wall 30 these walls 26, 28 and 30 with the walls of the plenum 18 define passageways of successively smaller width. In this way the primary air is made to flow in the passageways 29 and 29a and passes sufficient sound absorbing surfaces which thus reduce the primary air noises to a minimum. The path that the primary air takes is indicated by the arrows designated generally as 31.

Nozzles 20 are arranged in a single row across the length of plenum 18 as illustrated in FIGURE 2. However any suitable nozzle disposition can be used such as a plurality of rows or a diagonally disposed row or rows, etc. The baffle 22 can be modified corresponding to the changed nozzle 20 arrangement. Furthermore the size and shape of either nozzles 20 or tubes 24 can be widely modified within the scope of this invention.

As illustrated in FIGURE 3 damper 32 can be rotatably connected in the casing 12 as at 38. Damper 32 has a heat exchange leg 34 and a bypass leg 36 and is adapted to be selectively positioned whereby it may regulate the flow of secondary air through either or both the heat exchanger 16 or the bypass opening 39. The control means for positioning the damper 32 do not comprise a part of the present invention and accordingly have not been shown, but it is understood that any suitable means, either manual or automatic can be used.

The casing is conveniently provided with a louvered front opening 40 and a louvered top opening 42 through which secondary air will be induced into and discharged from, respectively, the casing 12 as more fully described hereinafter.

A filter 44 is shown disposed between the heat exchanger 16 and the louvered front opening 40. Its use is well known in the art. Disposed below the filter 44 and heat exchanger 16 is a condensate pan 46 and it is understood that the use of filter 44 and condensate pan 46 is optional.

The primary air enters through conduit 14 and is guided by baffle 22 whereby it is discharged through tubes 24. On being discharged it will induce secondary air from the area adjacent the louvered front opening 40 through the heat exchanger 16 and/or bypass opening 39 into the nozzles 20. The induced secondary air is illustrated generally by the arrows 48. Once the secondary air is in the nozzles 20 above the position of the tube 24 the upper area of the nozzles will serve as a mixing chamber 50 wherein the primary air and the secondary air will be thoroughly mixed.

A supplemental mixing chamber 52 is disposed above the nozzle mixing chamber 50. This is an optional feature which is provided as an example. The use of the

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supplemental mixing chamber 52 will be determined by the condition of the primary air and will ensure that the proper mix takes place between the primary air and the secondary air prior to being discharged through the louvered top opening 42 of the casing into the area to be conditioned. It is understood that the supplemental mixing chamber 52 can be provided with partitions (not shown) therein whereby each nozzle 20 will have a separate supplemental mixing chamber in superposition to the mixing chamber 50.

It is understood that the primary air has a positive pressure and can be varied according to the desired velocity of the secondary air thereby induced. Among the controlling factors in determining the pressure of the primary air are noise, prevention of drafts in the conditioned area and efficiency. Thus, it is seen that because the plenum 18 has a large sound absorbing surface therein the pressure of the primary air can be when desired increased and no obnoxious or offensive noises will be created. This increase in pressure however is limited to the extent that drafts are undesirable and are to be avoided in the area to be conditioned.

It will be understood that this invention is not to be limited to the specific construction or arrangement of parts shown but that they may be widely modified within the invention defined by the claims.

What is claimed is:

1. An induction circulating unit for a positive pressure multi-room air conditioning system comprising:

- (a) a casing having spaced inlet and outlet openings therein for the passage of air therethrough,
- (b) a plenum having upper and lower walls disposed in said casing below said outlet openings,
- (c) said plenum adapted to be connected to a source of conditioned primary air from said multi-room air conditioning system,
- (d) heat exchange means disposed in said casing below said plenum and adjacent said inlet openings to

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allow the passage of secondary air through said heat exchange means,

- (e) a plurality of spaced nozzles extending from the lower walls of said plenum to the upper wall thereof, said nozzles having divergent openings at the lower and upper ends thereof with the wall of said nozzles being convergent toward the center thereof,
- (f) tube means disposed in each of said nozzles at the convergent portion thereof to communicate primary air from said plenum to said nozzle, to induce secondary air into said nozzle from below said plenum, to cause mixing of said primary air with said secondary air, and to transmit said mixed primary and secondary air upward through said nozzle and out said outlet openings.

2. The induction circulator of claim 1 including baffle means connected to said tubes within said plenum extending between opposite parallel side walls of said casing, said baffle means providing a passage from said source of conditioned primary air to said tubes within said plenum to direct the primary air toward said tubes for discharge therefrom to said nozzles.

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