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Bennett

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[54] **DUCTED AIR CONDITIONING SYSTEM AND COMBINATION DUCT THEREFOR**

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[52] **U.S. Cl.** ..... **98/33 A,** 165/22, 138/116, 138/DIG. 4

[51] **Int. Cl.** **F24f 13/00**

[58] **Field of Search** ..... 138/111, 115, 116, 117, 138/DIG. 4; 165/22; 98/38, 33 A

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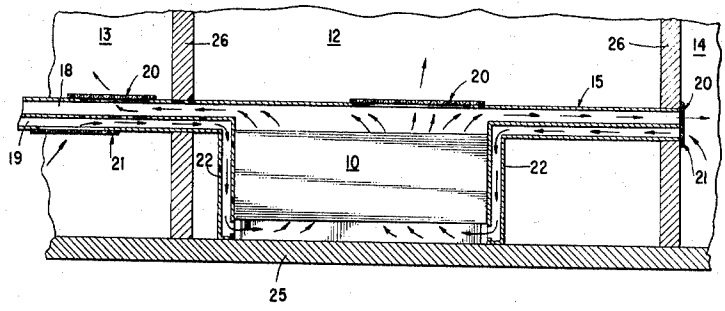
Primary Examiner—William J. Wye

Attorney, Agent, or Firm—Marshall J. Breen; Chester A. Williams, Jr.; Joel Halpern

[57] **ABSTRACT**

An air conditioning system for supplying conditioned air to a plurality of zones. A combination supply and return air duct connects the fan coil unit of either an incremental air conditioner or a central system with each of the zones to be supplied with conditioned air. The combination duct comprises a length of conduit having a partition extending therethrough to thus form supply and return air sections which are substantially completely sealed from each other, each of such sections being provided with a plurality of openings therein communicating the respective sections with the ambient environment in the zones and the return air section communicating with the fan coil unit for recycling of return air thereto.

9 Claims, 5 Drawing Figures



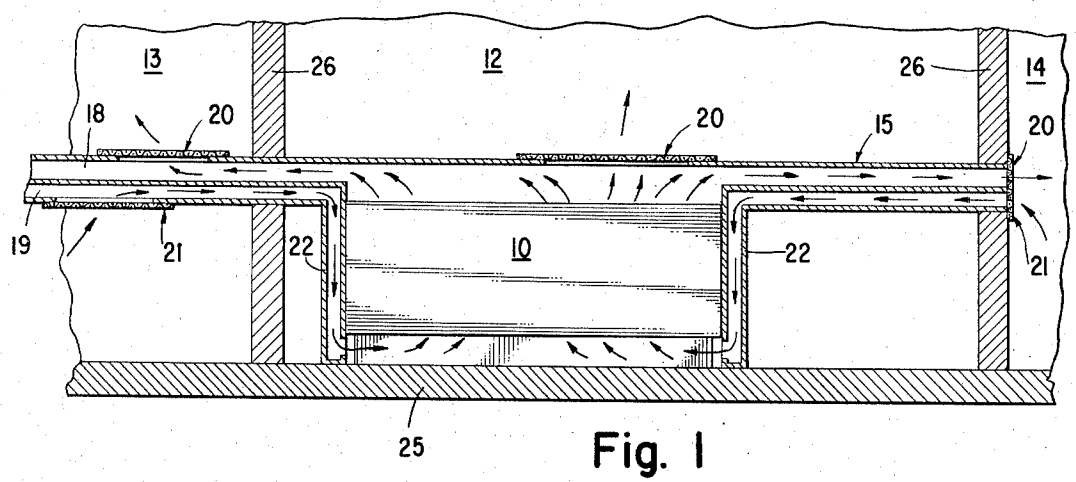


Fig. 1

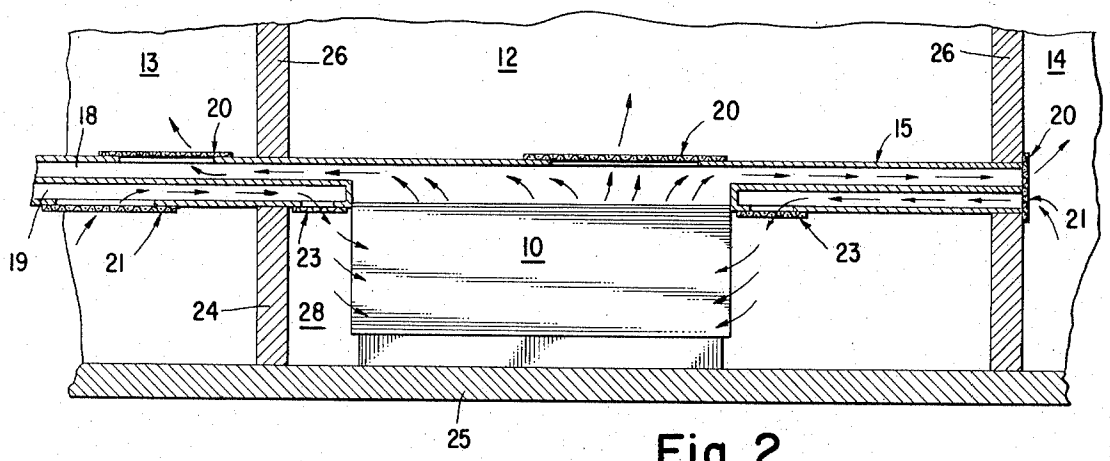


Fig. 2

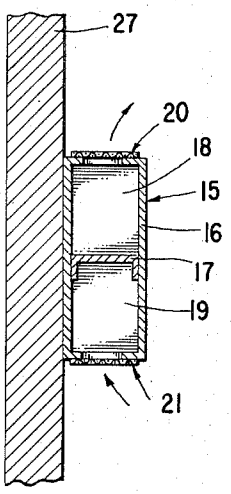


Fig.3

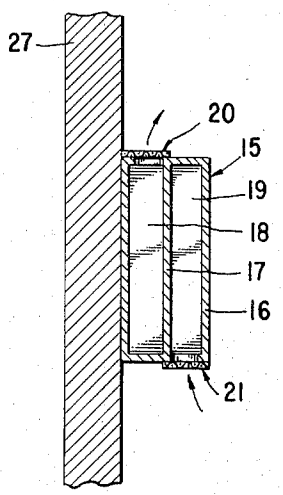


Fig. 4

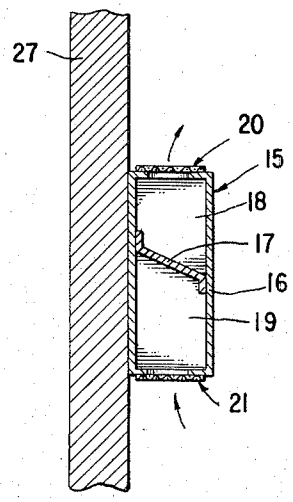


Fig. 5

DUCTED AIR CONDITIONING SYSTEM AND COMBINATION DUCT THEREFOR

BACKGROUND OF THE INVENTION

It is known to supply conditioned primary or fresh air to a room or zone and to withdraw return air from said room or zone for reconditioning and recirculation. Conventionally, the conditioned air is supplied to the room or zone by means of a self-contained or incremental unit in which there is provided the necessary means for drawing fresh outside air to the unit and for conditioning such air as may be desired, e.g., heating, cooling, dehumidifying, etc. Such units are also equipped to induce "used" air from the room or zone being conditioned and to admix such "used" or secondary air with the primary air for recirculation to the room or zone subsequent to the desired additional conditioning.

It is also known to provide air conditioning systems whereby a plurality of spaced zones are supplied with conditioned air. One expedient employed has been to install separate self-contained or incremental air conditioning units in each such room or zone. However, quite obviously the expense is generally high and resort is frequently had to central air conditioning systems in which a central conditioning unit, frequently positioned on the roof of the building, conditions the air and, through a network of ducts, distributes the conditioned air to the plurality of rooms or zones to be serviced by means of diffusers or other air distribution means. One such means is a terminal fan coil unit which is generally positioned in the wall of the room or zone to be provided with conditioned air and which is adapted to withdraw "used" or secondary air from the room or zone for further conditioning, as hereinabove described, prior to being recirculated in admixture with fresh or primary air.

In an attempt to reduce the cost of multi-zone installations utilizing self-contained conditioning units, and to broaden their field of application, the use of ducted incremental units has become popular. Thus, a unit ventilator or air conditioner may be installed at one location with ducts extending laterally to remote locations for the purpose of providing more uniform and effective air conditioning throughout one or more zones. However, return air is frequently withdrawn from the room or zone at the conditioning unit only, which results in the requirement for greater air induction in the vicinity of the unit. This has led to draughty conditions within the room. When provision is made for the withdrawal of return air from locations distant from the incremental conditioner, it has been necessary to install separate supply and return air ducts. Such separate duct systems are similarly required with a central air conditioning unit and terminal fan coil units in each room or zone to be air conditioned. The fabrication and installation of such separate return air ducts necessitates substantially increased labor costs and also requires modification of the fan coil unit to generally include either a straight through return grille or a connecting undercut door. Such modifications have also proven costly.

SUMMARY OF THE INVENTION

It is, therefore, one object of the invention to provide an air conditioning system for supplying conditioned air to a plurality of rooms or zones in which a self-contained fan coil unit may be utilized and return air withdrawn from each of the zones being conditioned and which may be installed at substantially decreased cost.

It is another object of the invention to provide an air conditioning system for supplying conditioned air to a plurality of zones which eliminates the requirement for separate and costly supply and return air ducts.

Other objects and advantages of the invention will become readily apparent from the detailed description of the invention hereinafter set forth.

In accordance with the present invention, there is provided an air conditioning system for supplying conditioned air to a plurality of zones, comprising air distribution means in a first of said zones adapted to supply conditioned air thereto and to receive return air therefrom, said distribution means having at least one combination supply/return air duct connected thereto and extending therefrom to at least one other zone to be air conditioned, said duct being internally partitioned lengthwise to provide a first section adapted to convey supply air from said distribution means to each of said other zones and a second section adapted to convey return air from each of said other zones to said distribution means, the said first section of said duct being provided with at least one opening therein in each of said other zones in communication with the respective zones and said second duct section having at least one opening therein in each of said other zones in communication with the respective zones, said first and second sections being substantially completely sealed from each other.

In accordance with the present invention, there is also provided a combination supply and return air duct for an air conditioning system, comprising a length of conduit consisting essentially of an outer casing and an interior partition dividing said casing into first and second substantially airtight lengthwise extending sections, at least one opening being provided in each of said sections.

BRIEF DESCRIPTION OF THE DRAWINGS

In order that the invention may be more fully understood, it will now be described, by way of example, with reference to the accompanying drawings in which:

FIG. **1** is a front elevational view of an incremental unit and its associated supply and return air ducts according to one embodiment of the invention;

FIG. **2** is a view similar to FIG. **1**, illustrating a second embodiment; and

FIGS. **3–5** are side elevational views of three alternate forms of the combined supply/return air duct of the invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. **1** of the drawings, there is shown the console **10** of an incremental air conditioner situated within a room **12** and positioned on the floor **25.** Adjacent rooms **13, 14** to be furnished with conditioned air are separated from room **12** by wall partitions **26.** A combination supply/return air duct **15** extends laterally from the console into the adjacent rooms and is adapted as will be hereinafter described, to supply each of the rooms with conditioned air and to withdraw from each such room air to be reconditioned and then recycled.

The combination duct, as can be seen more clearly from FIGS. 3, 4 and 5, is formed with an outer casing 16 and a lengthwise extending interior partition 17. The partition divides the duct into two substantially air-tight sections 18 and 19.

As shown by the arrows in FIGS. 1 and 2, section 18 serves to convey supply air to each of the rooms to be conditioned. The section is provided with at least one opening 20 in each such room communicating the interior of section 18 therewith in order to furnish supply air to the room. Section 19 of the combination duct is employed as the return. As can be seen from FIGS. 1 and 2, section 19 is provided with at least one opening 21 in each of the rooms to be conditioned so that return air may be withdrawn from the room for passage back to the console 10 for reconditioning and recirculation. As shown in FIGS. 3–5, the casing 16 is carried by the walls 27 of the rooms through which the laterally extending ducts traverse.

FIG. 1 illustrates a specific embodiment of the invention, wherein the laterally extending combination duct extends between the furthest zones or rooms to be air conditioned and the sides of the console. A vertically extending branch 22 leads from the return section at each side of the console to the bottom of the console where an opening is provided to accept the return air. A second embodiment of the invention is shown in FIG. 2 wherein the combination duct extends to the sides of the console. The return section 19 is provided with openings 23 for returning the air to the console via a space 28 between partitions 24, which may be the wall of the room, and the sides of the console. Although not shown in FIG. 2, both sides of the console are provided with space 28 defined by an adjacent partition and the side of the console. The console sides may be open or they may be provided with louver arrangements whereby the return air may be induced into the console for recycling.

FIGS. 3–5 show alternate dispositions for the partition 17. As depicted in FIG. 3 the partition is a horizontal one; in FIG. 4, the partition is vertical, and as illustrated in FIG. 5, the partition may be angularly inclined within the outer casing. In all embodiments, however, it is important that the sections be substantially air-tight such that there is no premature mixing of the supply and return air in the laterally extending regions of the duct.

From the foregoing description, it will be seen that by combining the supply and return air conduits into a single duct it has made possible the use of either a single incremental conditioning unit or a single terminal fan coil unit of a central conditioning system in the air conditioning of a plurality of rooms or zones. The high costs of duct fabrication and installation have been considerably reduced by the present invention, this being a major contributing factor in the current practicality of such use.

It will be understood that various changes in the details, materials, arrangements of parts, and operating conditions which have been herein described and illustrated in order to explain the nature of the invention, may be made by those skilled in the art within the principles and scope of the invention.

Having thus set forth the nature of the invention, what is claimed herein is:

1. An air conditioning system for supplying conditioned air to a plurality of zones, comprising air distribution means in a first of said zones adapted to supply conditioned air thereto and to receive return air therefrom, said distribution means having at least one combination supply/return air duct connected thereto and extending therefrom to at least one other zone to be air conditioned, said duct being internally partitioned lengthwise to provide a first section adapted to convey supply air from said distribution means to each of said other zones and a second section adapted to convey return air from each of said other zones to said distribution means, the said first section of said duct being provided with at least one opening therein in each of said other zones in communication with the respective zones and said second duct sections having at least one opening therein in each of said other zones in communication with the respective zones, said first and second sections being substantially completely sealed from each other.

2. An air conditioning system according to claim 1, wherein said air distribution means comprises a self-contained fan coil unit.

3. An air conditioning system according to claim 1, wherein said air distribution system means comprises the terminal fan coil unit of a central system.

4. An air conditioning system according to claim 2, wherein said fan coil unit is incorporated in a console which is mounted in an exterior wall of said first zone, said duct extending laterally from said unit into at least one adjacent zone separated from said first zone by a wall partition.

5. An air conditioning system according to claim 4, wherein the combination duct extends between the furthest zones to be air conditioned and the sides of the console, said return sections being provided with vertical branches connected adjacent their lower ends to the bottom of said console to direct return air from said other zones to the interior of said console.

6. An air conditioning system according to claim 3, wherein said terminal fan coil unit is positioned within an enclosure therefor, said enclosure being mounted in an exterior wall of said first zone, said duct extending laterally from said enclosure into at least one adjacent zone separated from said first zone by a wall partition.

7. An air conditioning system according to claim 6, wherein the combination duct extends between the furthest zones to be air conditioned and the sides of said enclosure, said return section being provided with at least one opening adjacent each side of the enclosure for directing return air to an intermediate opening in the sides thereof, a partition being located adjacent each side of said enclosure so as to define an enclosed space therebetween, the said at least one opening in the return section being located within said space.

8. An air conditioning system according to claim 4, wherein the combination duct extends between the furthest zones to be air conditioned and the sides of said console, said return section being provided with at least one opening adjacent each side of the console for directing return air to an intermediate opening in the sides thereof, a partition being located adjacent each side of said console so as to define an enclosed space therebetween, the said at least one opening in the return section being located within said space.

9. In an air conditioning system according to claim 6, wherein the combination duct extends between the furthest zones to be air conditioned and the sides of the enclosure, said return sections being provided with vertical branches connected adjacent their lower ends to the bottom of said enclosure to direct return air from said other zones to the interior of said enclosure.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,817,159 Dated June 18, 1974

Inventor(s) James H. Bennett

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 4, line 22, delete - - system - - after "distribution"

Signed and sealed this 24th day of December 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents