United States Patent

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[54] **PANEL ARRANGEMENTS**
1 Claim, 5 Drawing Figs.

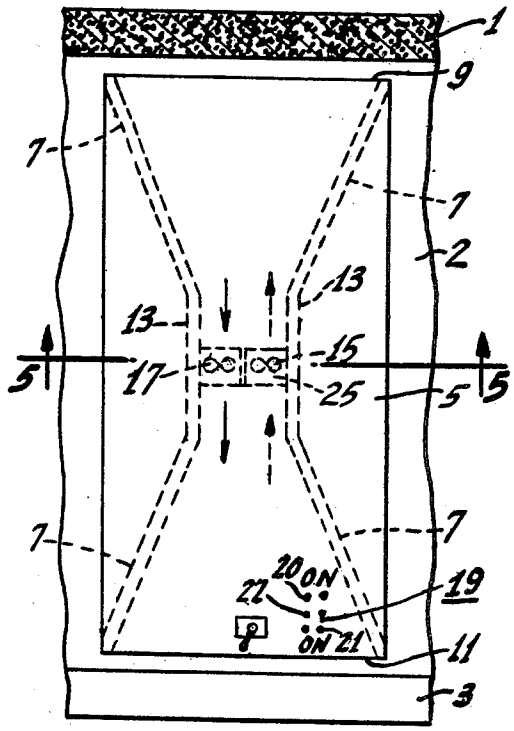
[52] **U.S. Cl.** **165/55,** 165/122
[51] **Int. Cl.** **F24h 9/04**
[50] **Field of Search** 165/48, 50, 57, 122, 55; 95/44

[56] **References Cited**
UNITED STATES PATENTS

1,989,337	1/1935	Roe	165/48
2,021,583	11/1935	Whiteley	165/57
3,090,434	5/1963	Benson, Jr. et al.	165/50

Primary Examiner—Charles Sukalo

ABSTRACT: A room air circulator which may comprise a panel spaced from a wall forms a duct or air channel through which air is passed or circulated upward or downward in warm weather or cool weather respectively by electrically powered air moving means such as a reversible fan or blower positioned in the duct formed between wall and panel, thereby providing for less stratification of room air, viz, providing for relatively uniform temperature uniformity from ceiling to floor.



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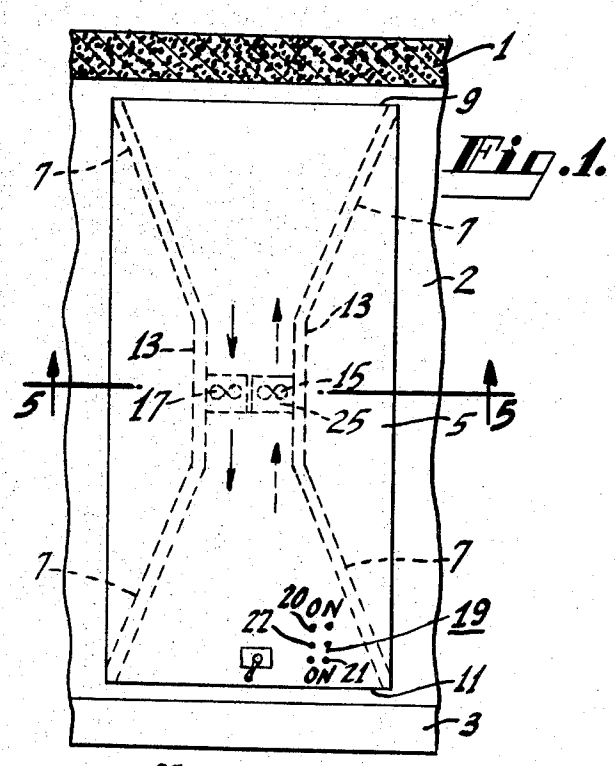


Fig. 1.

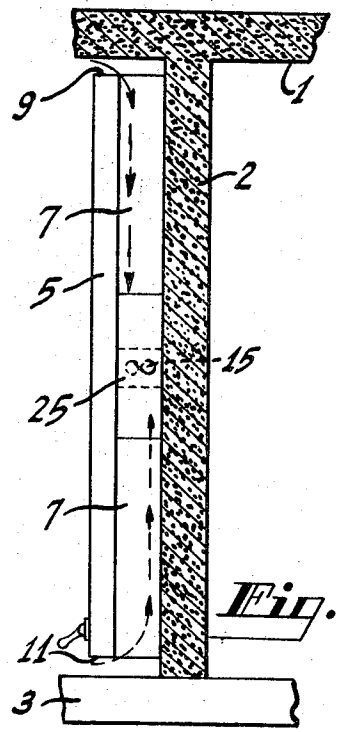


Fig. 2.

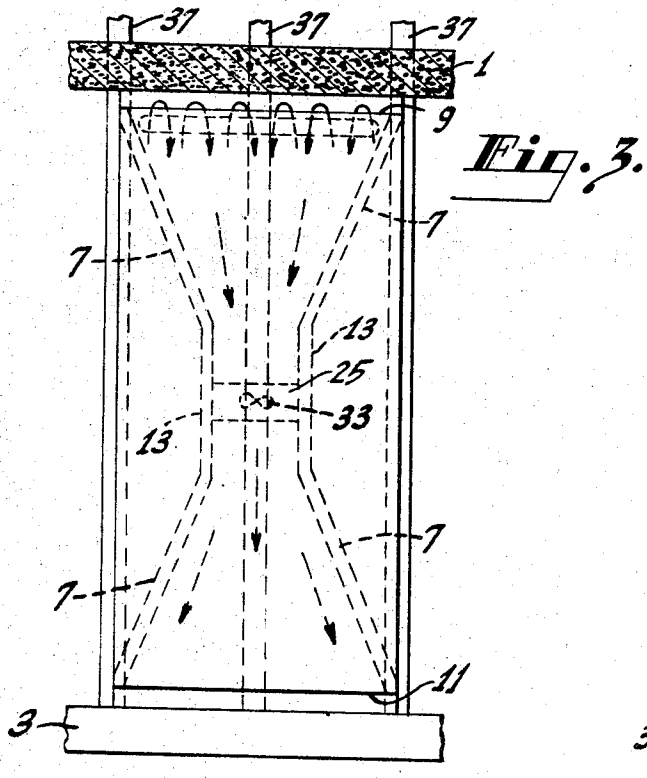


Fig. 3.

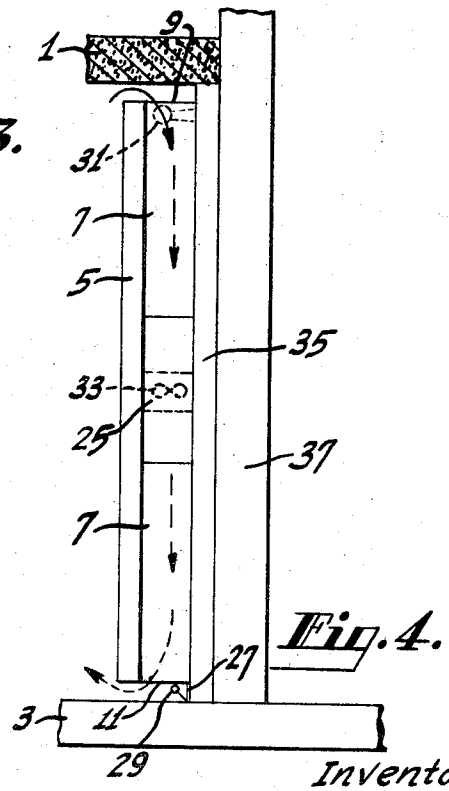


Fig. 4.

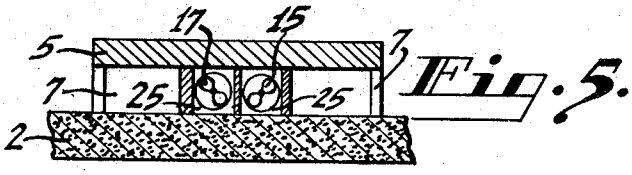


Fig. 5.

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PANEL ARRANGEMENTS

PANEL ARRANGEMENTS

This invention relates to room heating and cooling systems and more particularly to an arrangement which improves the effectiveness of previous heating and/or cooling systems by reducing stratification. With the heating systems in present use, warm air rises quickly to the ceiling of the room, leaving the areas toward the floor cooler. With the present air-conditioning systems, cool air sinks quickly to the lower areas of the room and warm air is found at the ceiling. This undesirable stratification of air at different levels of the room at different temperatures results in discomfort, and heating and cooling inefficiencies result since more heating or cooling capacity is required and used in order to try to achieve the desired comfortable temperature at all zones of the room from floor regions to ceiling regions. The present systems in general use (gas or oil fired hot water radiator or forced air, and electric heat) all cause undesired stratification of air into zones of increasing temperature up towards the ceiling of the room heated. The present air-conditioning arrangement of room air conditioners and central air-conditioning systems result in cool air at lower levels with warmer or hot air rising to the higher parts of the room.

It is therefore an object of the present invention to provide a simple and inexpensive arrangement for a room which circulates the air in a room in a manner which tends to maintain the temperature uniform from floor to ceiling, thereby increasing comfort because of air circulation and uniformity of temperature.

It is a further object of this invention to provide an air circulating arrangement for a room which tends to increase heating and/or cooling efficiency by circulating the hottest and/or coldest air from the ceiling or floor respectively along the walls thereby overcoming a principal source of heat exchange, namely at the walls.

It is yet another object of this invention to provide air circulating means for a room which may be fastened directly to the walls of a room such as a basement recreation room and which circulates the air therein thereby aiding in removing mustiness or dampness which results from lack of normal amounts of air circulation.

It is still a further object of this invention to provide light weight and outwardly visibly attractive panel arrangements for paneling walls which also provide air circulating ducts of shallow depth which do not substantially lessen room volume.

It is still another object of this invention to provide an air circulating arrangement for a room which does not require any modification of the existing wall structure of the room and is useful with any type of heating and/or air conditioning arrangement already present in the room without modification thereof.

It is yet a further object of this invention to provide air circulating means in the form of an attractive finished paneling arrangement.

It is still an additional object of this invention to provide a panel arrangement which can be fastened on studding and provide at least several of the following features: finished wall, lighting, heating, air circulation, insulation, electrical outlets, and air filtration in an attractive and yet inexpensive and simple assembly.

The above-mentioned objects are achieved according to a preferred embodiment of the invention by a finished wood panel mounted on a wall closely spaced therefrom by spacer means comprised of wooden strips, at least some of the wooden strips forming with the panel and adjacent wall surface a vertically extending duct having reversible air moving means positioned therein to move air selectively upward or downward through the duct from the room. The finished wood panel may instead be supported on and spaced from an unfinished panel forming the duct therebetween and the entire assembly which may also support heating and/or lighting and/or electrical outlets and/or air filtration equipment may

be fastened directly against the studdings of the wall. The finished wood panel in either case is cut off short of the ceiling and short of the floor to provide the openings to the duct at the ceiling area and at the floor area.

Additional objects and advantages of this invention will become apparent when the following specification is read in connection with the drawings in which:

FIG. 1 illustrates one embodiment of the invention showing a single panel mounted in spaced relationship from a wall, the spacing means also forming with the panel and wall a duct extending from near the ceiling to close to the floor surface and along which duct intermediate the ends thereof is positioned air moving or circulating means for causing air from the room to flow or be pulled through the duct in either direction as desired.

FIG. 2 is a side view of the arrangement of FIG. 1 showing more clearly the relationship of the arrangement with respect to floor, wall, and ceiling.

FIG. 3 shows another embodiment of the invention where the arrangement comprises front and rear panels which form the front and rear walls of the duct, the rear wall of the arrangement being mounted or fastened directly on the studding thereby forming also the wall of the room.

FIG. 4 is a side view of the composite panel arrangement of FIG. 3 showing more clearly the relationship of front and rear panels to the studding, ceiling, and floor.

FIG. 5 is a sectional view on line 5–5 of FIG. 1.

In FIG. 1 of the drawings there is illustrated an embodiment of the invention which is especially suitable for use in a room already having finished walls 2 and ceiling 1 (the embodiment shown in FIG. 3 in contrast being especially desirable in new construction since applicable by direct attachment to the wall studding and also completing the inner wall construction). In FIG. 1 (and also in FIG. 2 showing a side view for further clarification and understanding) there is shown a panel 5 mounted closely spaced (e.g. 2 inches) from the wall 2 of the room by mounting means comprising spacer elements or mounting strips 7. A duct is formed at the rear by the wall 2, in front by the panel 5, and the strips 7 form the sidewalls of the duct. The panel 5 has its top edge spaced from the ceiling and its bottom edge spaced up from the floor (e.g. by 2 inches in each case) in order to form the duct openings for ceiling or upper room levels air and floor or lower room level air. The upper strips 7 fan out toward the ceiling as far as the upper corners of the panel 5 and the lower strips 7 fan out toward the floor 3 as far as the lower corners of the panel 5. This fan out at ceiling and floor to the full width of the panel provides a continuous air flow slot or opening along both the ceiling and floor for circulating air from ceiling area to floor area by way of the duct when fan 17 is energized or circulating air from floor area to ceiling area by way of the duct when the fan 15 is energized. The fan 17 is energized by moving switch 19 to its downward position so that D.P.D.T. switch 17 connects the source (not shown) which is connected to center poles 22, to the leads 21 of electric fan 17. It is desirable in the winter to energize fan 17 in the above manner so that the warmest air present in the room adjacent the ceiling due to undesired stratification is brought in from the ceiling area in an air flow path as indicated by the solid arrows shown in FIGS. 1 and 2 through the duct and passed out to the cooler floor area. A thermostat on the front of panel 5 near the bottom or floor area can be used for further controlling fan 17 so that it is turned on only when the floor area temperature is below a desired level. Uniformity between ceiling area and floor area temperature could be approached or a desired differential in temperatures obtained depending upon size of room, c.f.m. capacity of fan 17 in each panel, number of walls lined with panel arrangements according to this invention, heat input to room, heat loss by room, and whether the fan 17 in each panel is kept continuously on or thermostatically controlled. In the summer the direction of air flow is reversed by selectively energizing fan 15 instead of fan 17 and the resulting air flow path is represented by the dotted arrows in FIGS. 1 and 2.

When central air conditioning or room air conditioners are used, the cooler air in the lower portions of the room and adjacent the floor area is (with the fan **15** energized) brought up through the duct formed by the panel arrangement and passed into the upper portions or stratum of the room by way of the outlet or slot between edge **9** and ceiling **1** and more uniform and in this manner more effective and comfortable cooling is achieved at all levels or stratum within the room.

Although a single panel arrangement or unit is shown in FIG. **1**, a plurality of such units would normally be used along the entire length of a wall which had no windows. The advantages of a continuous distribution along the different walls of a room include the provision of a more even distribution of indirect air current flow in the room to the added comfort of the occupants. Also the fans can have a lower c.f.m. capacity rating and consequently are physically smaller in size permitting a thinner spacing between panel **5** and wall **2**. Each section or unit as shown in FIG. **1** would be placed with vertical edges (longitudinal sides) of the panels **5** of the units abutting, although a single panel spaced from the wall without fan may be interspersed among the above type units or at the ends to form a completed outer wall spaced and supported from the inner wall **2**. A single panel spaced from the wall **2** may be cut to any desired size and may be used at areas around doors or windows as a "fill-in" to complete the entire paneling of a room while using the paneling arrangements of the present invention thereby completing a paneled wall surface supported and evenly spaced from the inner wall **2** of the room. The space between a single panel and wall without fan termed "fill-in" and the space outside the air flow duct in the panel arrangements of the invention herein described (the space between wall **2** and panel **5** outside strips **7** and **13**) termed "dead air space" since not constituting air flow ducts containing air propelling means, may be filled with insulation of known type such as insulation of the fiber glass type. The spacer strips **7** and **13** may be screwed into the wall **2** and the panel **5** glued or nailed to the spacer elements, panel **25** (which supports the fans centrally located over holes in the panel **25**) being supported horizontally and parallel with respect to the floor at its ends by screwing to middle strips or spacer means **13**. The panel **5** may be made of fibre board, attractive translucent plastic, or attractive finished wood paneling. Attractive translucent plastic may be desirable especially where lighting (e.g. fluorescent tube **31** as shown in the embodiment of FIGS. **3** and **4**) is incorporated as a part of the paneling unit. While one specific form of duct arrangement, mounting arrangement, and fan arrangement is shown in FIGS. **1** and **2**, it will be recognized by those skilled in the art that various modifications thereof can be made depending upon the particular requirements of the kind of installation where this invention is to be used.

Where fast and simple installation techniques are most important, the upper strip segment **7**, middle strip segment **13**, and lower strip segment **7** forming each side of the duct may simply comprise a single straight piece of wood which extends vertically from ceiling surface to floor surface and the assembly being fastened or mounted only at the ends of these pieces which are exposed beyond the upper edge **9** and lower edge **11** of the panel **5**, the panel **5** and supporting panel **25** for fans **15** and **17** being already glued to these two single straight pieces of wood as a prefabricated completed assembly which requires only (1) fastening of the four ends of the pair of supporting single straight pieces mentioned above to the wall **2** and (2) wiring the center poles **22** to the source required to drive the fan motors. A single reversible fan could be used instead of the fans **15** and **17**. One or more fans supported in corresponding holes distributed along panel **25** which all blow air in the same direction (upward or downward) could be used and would provide desirable indirect air circulation in a room without the uneven air circulation and direct drafts which result when ordinary fans are positioned in a room to provide air circulation. If a downward flow arrangement only is used great advantages result in winter, but such air circulation in itself would still provide some cooling effect due to air movement on occupants of the room in summer even though no air conditioning arrangements are also used in conjunction therewith. The panel **25** supporting fans **15** and **17** could be tilted at an angle other than the 90° angle shown with respect to the panel **5** and wall **2** in order to decrease the duct thickness (between panel **5** and wall **2**) and thereby conserve room space since then the duct would not have to be as wide as the fan blade diameter. A plurality of ducts could be formed by placing several vertically extending strips behind each panel **5**, each duct if desired having its own air moving means, which air moving means may include a plurality of miniature fans to draw a stream of air from the inlet opening at one end of the duct and force it along through the duct and out of the opposite end outlet or exhaust back into the room. The c.f.m. capacity of the fan or fans used and the spacing between front panel **5** and wall **2** and consequent size of the ducts depends upon the volume of air in the room and the rate at which it is desired to recirculate the air within the room. It it is desired to recirculate the air in a room at a high rate for example where heat output units are poorly located and provide very uneven heating in the various parts of the room, then of course higher capacity fan or fans and larger duct or ducts would be used in the panel arrangements according to this invention which line the wall or walls of the room. Although a higher capacity fan which has a consequently larger dimension may require larger spacing between panel **5** and wall **2** (duct thickness) in order to fit it in (if not tilted as mentioned earlier), the cross section of the duct can be varied as desired by bringing in or out the sides of the duct formed by the vertically extending strips **7** and **13**. Various types of fans or motor blower combinations may be used or adapted for use in practicing this invention, e.g. the **25**, its intake coming from the side of panel **25** opposite from that where the outlet air passes from the hole in panel **25**. drum-type fan may be used depending upon air flow desired, duct width permissible, etc. A drum-type fan can be mounted to the rear or inside surface (wall **2** side) or panel **5** so that its outlet is fastened or coupled by suitable duct coupling means to pass air through a hole in the panel **25**. The use of a flat drum fan positioned in the correspondingly flat duct formed between wall **2** and panel **5** requires that the space between the inner surface of panel **5** and outer surface of wall **2** is larger than the distance between the flat sides of the drum fan so that air flow intake through a side of the drum fan is not impeded by an above-mentioned surface adjacent the intake side of the drum fan.

FIG. **3** shows another embodiment of the invention which provides an assembly for circulating air in a room in only one direction as shown by the dotted arrows since only a single fan **33** for blowing air in the direction shown is used. Such an air flow is desirable in winter to bring the warmer ceiling air back along the cooler wall and out onto the floor and also for its tendency toward evening the room temperature throughout its volume thereby preventing the inefficiencies and discomforts of room air stratification. If fan **33** is made a reversible fan then summer and winter use with optimum efficiency is provided. Even where fan **33** provides air flow in only the single direction most desirable in winter as shown, turning the fan **33** on in summer will provide air circulation and therefore some degree of increased comfort to the occupants of the room.

Instead of the panel **5** being supported by the duct forming spacing strips **7** and **13** directly on the finished wall **2** of a room as in the embodiment of FIGS. **1** and **2**, the panel **5** in FIGS. **3** and **4** is supported by the duct forming spacing strips from a further panel **35** which extends flush against floor and ceiling and which further panel **35** can be nailed directly to the studding **37**. The complete assembly shown in FIGS. **3** and **4** can be assembled and glued together at the factory and the back panel **35** may be of standard size, e.g. 4 feet wide by 8 feet —6 inches in height, the extra height being provided so that the panel may be trimmed to provide an exact fit between ceiling and floor in the standard size room. The back panel or further panel **35** can be of rough unfinished plywood since the

forwardly supported panel 5 extends to within about 2 inches of ceiling and floor and therefore hides the rear panel 35 from the viewer or occupant of the room. The forwardly supported panel 5 is in full view and is advantageously attractively finished. The assembly shown in FIGS. 3 and 4 also includes a fluorescent lighting arrangement 31 of known type (which is connected through a switch to a source of power therefor) which is supported on the back panel 35, and behind the front edge 9 of front panel 5 so that it cannot be seen by persons in the room in order to provide indirect lighting. The arrangement may include further lighting structures of the same or other type distributed along the duct and provide illumination in the room through the panel 5 if made of translucent material, the air circulation since through the lighting also thereby providing heating in the room. An individual heating element 29 extending along the length of the bottom of panel 35 and supported in front of a reflector 27 on the back or further panel 35 can be utilized to provide heating for the room (the heating element being connected through a control switch to a power source), the air flow through the duct helping to circulate the heat developed from element 29.

When the principles of the present invention are recognized from this disclosure, further embodiments thereof will become obvious to those skilled in the art for use in specific applications such as in offices or rooms in large buildings or auditoriums or in conference rooms (which are sometimes crowded with many people and there is consequent inadequate air circulation), with modifications of panel size, fan capacity, duct size or fastening means for example being required. Increase in duct width from front to back to 3 or 4 inches may be accompanied by increased slot opening (distance between top and bottom edges of panel 5 from ceiling and floor respectively) to about 3 inches in order to provide unrestricted flow of air ingress and egress at the slots. A "winter-summer" air circulating arrangement may be provided in FIGS. 3 and 4 when selectively reversible air flow propelling means is incorporated therein instead of the air flow propelling means shown which provide a "winter" air circulating arrangement only. Lighting and/or heating may be incorporated in different embodiments as desired in the manner shown and described in the embodiment of FIGS. 3 and 4. Air processing means such as a dust collecting filter or smoke cleaning element may be incorporated in the air circulating duct of the embodiments of this invention in place of or above and adjacent to element 29 when the panel arrangements are desired to be advantageously utilized in crowded smoking or convention rooms, halls or areas. The air moving means may comprise a blower having a high pressure side and a low pressure side located on respective sides of the panel 25, the lower air pressure side drawing air from the inlet opening (at the ceiling end of the duct in the case of "winter" mode of operation) and the high pressure side forcing the stream of air out of the exhaust opening (at the floor end of the duct). The motor for the blower may be located inside or partly or entirely outside the duct in certain installations depending upon thickness of duct, size of motor and blower. In the embodiment of FIGS. 3 and 4 the motor can protrude to the rear of the duct between the studding since it will not be visible there and would take up only unused space. Curved deflectors may be used at the ends of the duct to direct the air outward at ceiling and floor if desired. The means for mounting panel 5 spaced from wall 2 or further panel 35 may include a plurality of metal U-shaped brackets for in effect suspending or "hanging" panel 5 with its air propelling means and duct forming strips on the wall 2 or further panel 35, one side of the U-shaped bracket being fastened to the inside of the panel 5, the other side extending above the edge 9 and being fastened to the wall 2 or further panel 35, the brackets being distributed along and adjacent the top edge portion 9 of panel 5 the number required depending upon the weight of panel 5 with its air propelling means and duct forming strips. The embodiments of the invention and modifications thereof as described represent only preferred examples of the invention and it is obvious that structural changes and variations thereof may be made without departing from the spirit of this invention.

I claim:

1. An air circulating arrangement for a room comprising a panel, means for mounting said panel inside the volume of said room in spaced relationship to a wall of said room so that said panel and said wall include therebetween at least one air duct of shallow depth which does not substantially lessen said room volume, said panel being visible from inside said room volume, the upper and lower edges of said panel being spaced predetermined distances respectively from the ceiling and floor respectively, thereby forming slot openings at the ceiling and floor for said at least one air duct, said at least one air duct extending in a generally vertical direction between the floor and ceiling of said room, means positioned intermediate the ends of said at least one air duct for causing air to be moved through said duct, said means for mounting said panel includes a plurality of spacer strips comprising upper strips which fan out toward the ceiling and lower strips which fan out toward the floor, said plurality of spacer strips being fastened to one side of said panel, said panel, spacer strips, and the outer wall surface of said wall forming said at least one air duct.