

Nov. 27, 1962

R. S. GEOCARIS

3,065,686

LIGHTING AND VENTILATING FIXTURE

Filed April 29, 1960

3 Sheets-Sheet 1

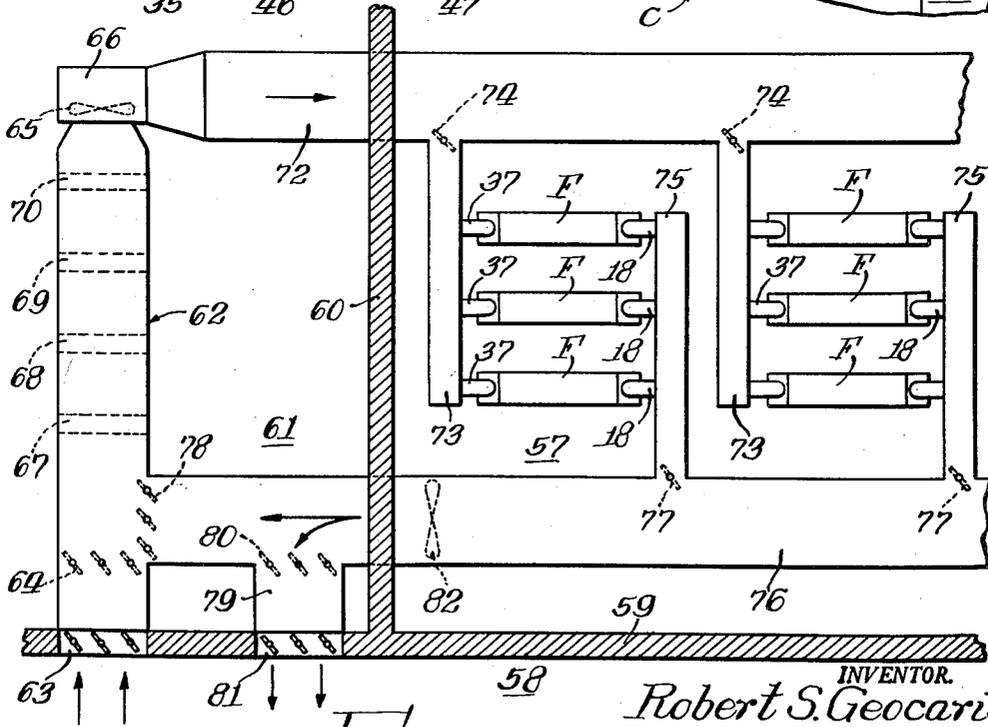
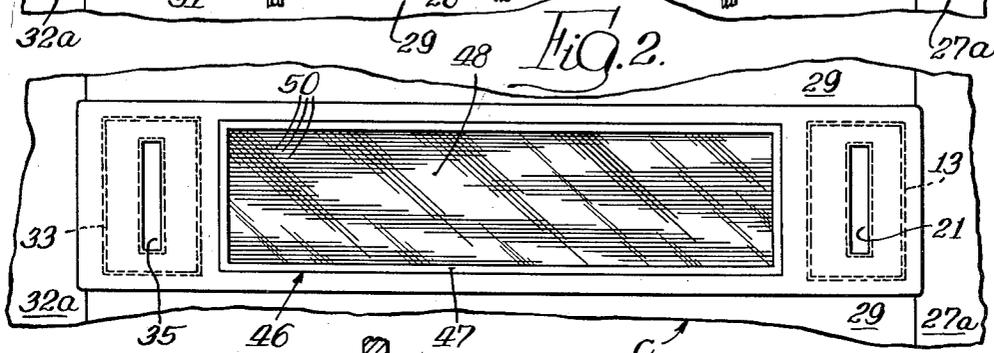
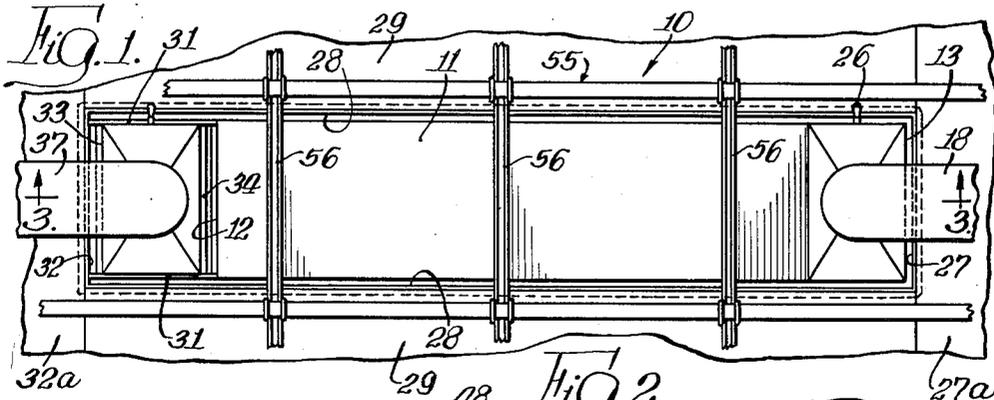


Fig. 7

INVENTOR.
Robert S. Geocariss
BY *Brown, Jackson,*
Bottcher & Klemmer,
Attys.

Nov. 27, 1962

R. S. GEOCARIS

3,065,686

LIGHTING AND VENTILATING FIXTURE

Filed April 29, 1960

3 Sheets-Sheet 2

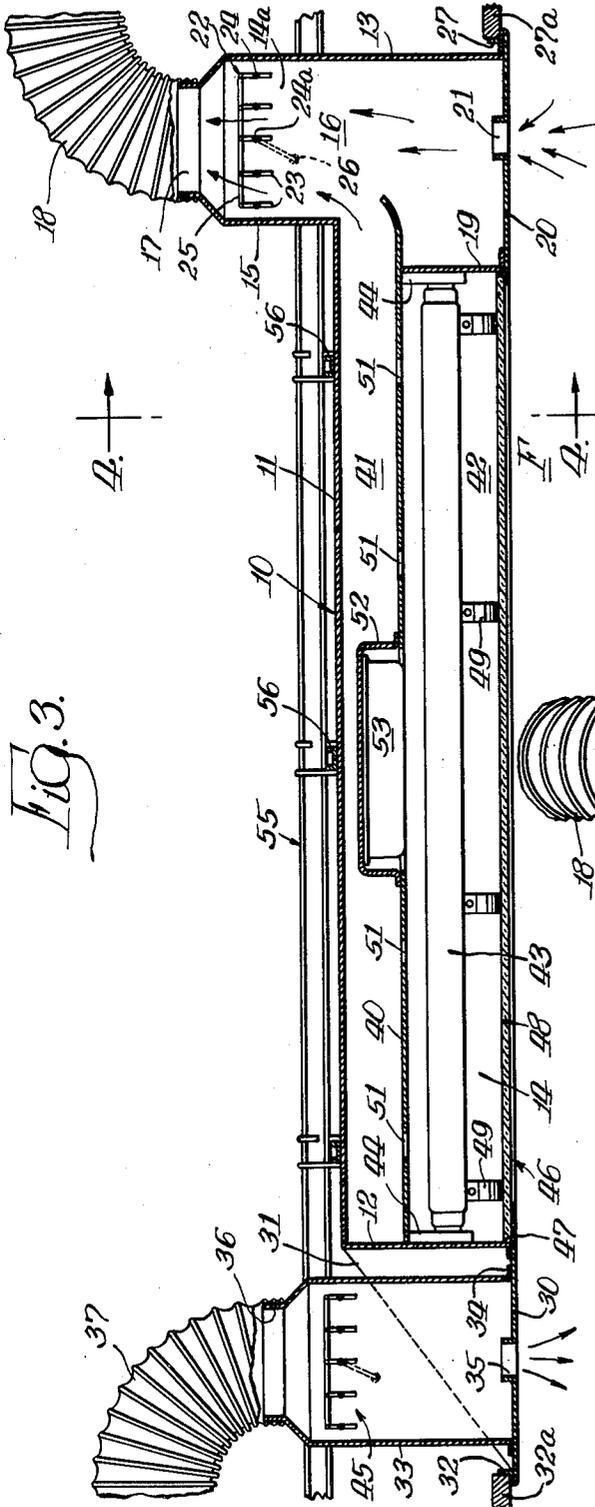


Fig. 3.

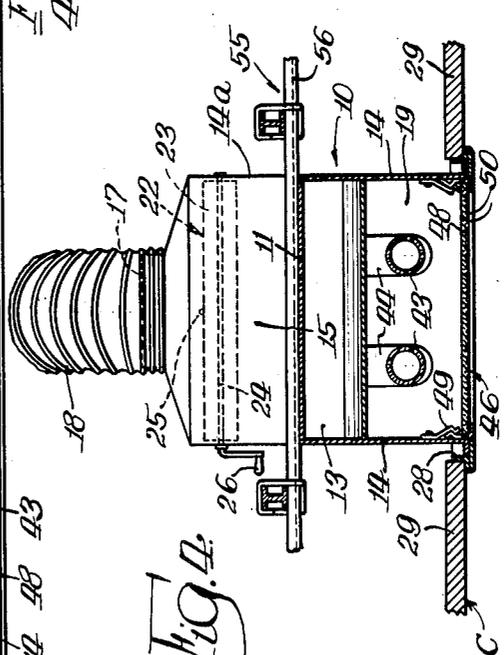


Fig. 4.

INVENTOR.
Robert S. Geocariss,
BY *Brown, Jackson,*
Britcher & Blenner,
Attys.

Nov. 27, 1962

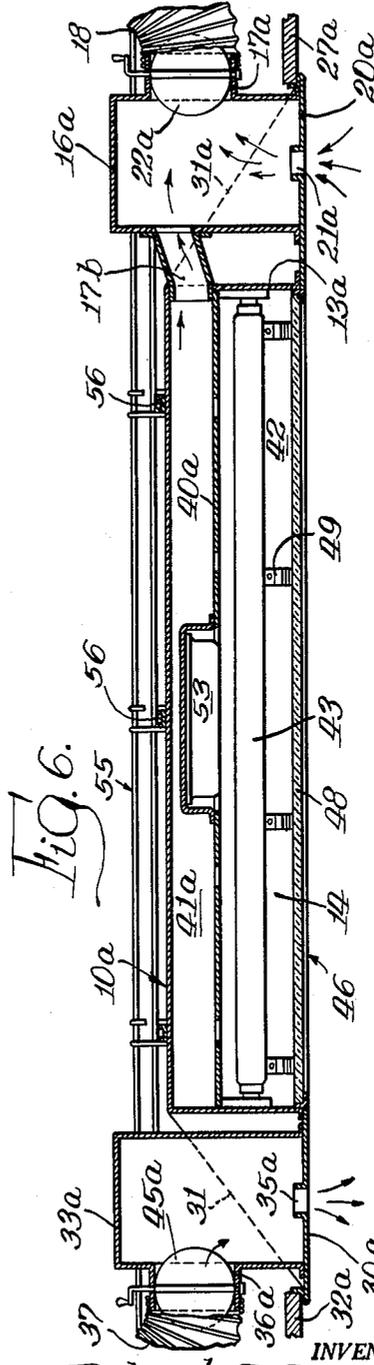
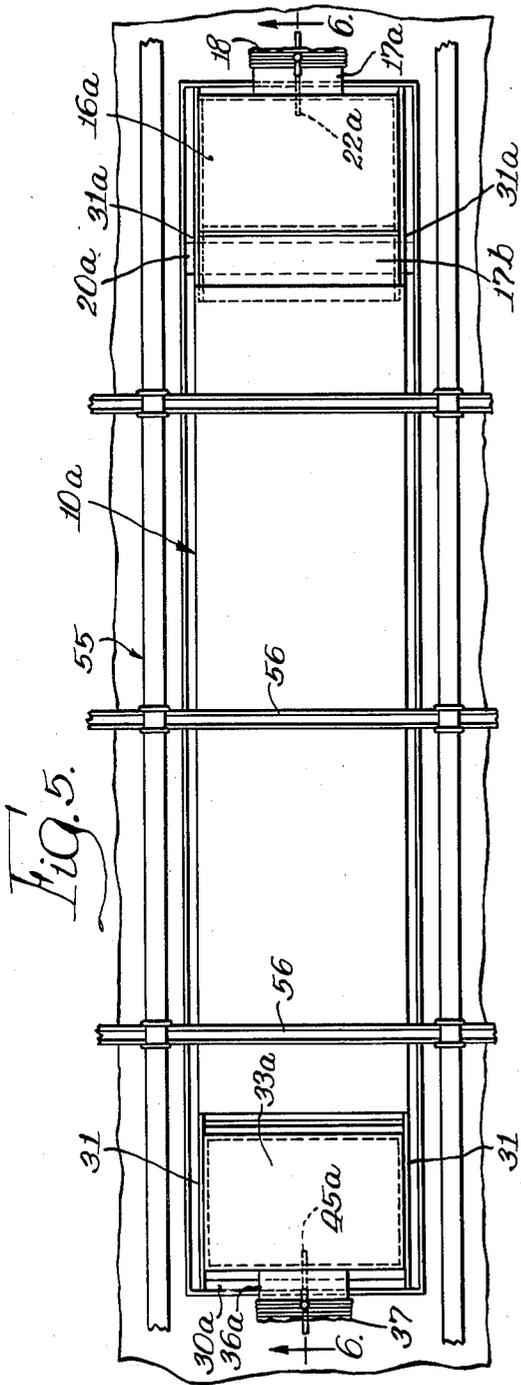
R. S. GEOCARIS

3,065,686

LIGHTING AND VENTILATING FIXTURE

Filed April 29, 1960

3 Sheets-Sheet 3



INVENTOR.
Robert S. Geocaris,
BY

Brown, Jackson, Peltcher & Wimmer,
Attys.

1

3,065,686

LIGHTING AND VENTILATING FIXTURE

Robert S. Geocaris, Broadview, Ill., assignor, by mesne assignments, to Thomas Industries, Inc., Louisville, Ky., a corporation of Delaware

Filed Apr. 29, 1960, Ser. No. 25,662

7 Claims. (Cl. 98-40)

This invention relates to lighting and ventilating fixtures for use in false or drop ceilings and similar structures, though adapted for other purposes, and particularly suited to air conditioning systems.

Fixtures of the general type mentioned, frequently referred to as troffers, are known and extensively used. Such fixtures usually employ fluorescent tubes as the light source. In the known fixtures with which I am familiar difficulty frequently is experienced due to over-cooling of the tubes by air flowing through the fixture, resulting in reduced lighting efficiency, and the flow of air through the fixture is not controlled to best advantage for assuring optimum performance of the tubes with a minimum of lamp discoloration and efficient flow of air into and from the room or space being lighted and air conditioned.

My invention is directed to a fixture of the above character which is of comparatively simple and inexpensive construction and avoids the above noted objections to the known fixtures. To that end I provide a fixture in which the major portion of the air flowing therethrough, to and from the room, is diverted away from the tubes and the air heated by the tubes and accessories is withdrawn from the room with the room air, either to be utilized therewith for assisting in heating the room or space in cold weather, or to be discharged exteriorly of the room or space in warm weather, to facilitate and reduce the cost of cooling thereof. A further and important feature of my invention resides in the provision of an air conditioning system comprising fixtures embodying my invention. Further objects and advantages of my invention will appear from the detail description.

In the drawings:

FIGURE 1 is a top plan view of a lighting and ventilating fixture embodying my invention, with the supporting means therefor shown fragmentarily;

FIGURE 2 is an underneath view of the fixture of FIGURE 1, but showing fragmentarily acoustic panels used in a false ceiling comprising a plurality of such fixtures;

FIGURE 3 is a sectional view, on an enlarged scale, taken substantially on line 3-3 of FIGURE 1, but showing fragmentarily acoustic panels used in a false ceiling comprising a plurality of such fixtures;

FIGURE 4 is a sectional view, on an enlarged scale, taken substantially on line 4-4 of FIGURE 1 but showing fragmentarily acoustic ceiling panels;

FIGURE 5 is a view similar to FIGURE 1, but showing a modified form of fixture embodying my invention;

FIGURE 6 is a sectional view taken substantially on line 6-6 of FIGURE 5; and

FIGURE 7 is a schematic view of a lighting and air conditioning system comprising fittings embodying my invention.

The fixture of my invention comprises a housing 10 formed of any suitable material and of any suitable shape. It may be assumed, for purposes of description, that the housing 10 is formed of sheet metal fabricated in any suitable known manner and is of rectangular shape in plan and of box-like construction. The housing 10 comprises a top wall 11, and end walls 12 and 13 joined by side walls 14, together providing a downwardly opening box-like housing. The end wall 13 is extended upward a substantial distance above top wall 11, as are the adjacent

2

end portions 14a of the side walls 14, which portions 14a are connected at their inner edges by an upward extension 15 of the top wall 11. The end wall 13 together with the upward extension 15 of top wall 11 and the end portions 14a of the side walls 14 define an upwardly opening room air return passage or stack 16 provided at its upper end with a circular collar 17 for attachment of one end of a flexible duct or conduit 18 of suitable known type. A transverse partition 19, of materially less height than the side walls 14 extends between the latter and is spaced a substantial distance inward from end wall 13 and parallel therewith. A finishing strip or plate 20 closes the lower end of chamber 16 with the exception of an opening or slot 21 therein for admission of room air. Stack 16 is provided, a short distance above top wall 11 of housing 10, with a damper 22 of suitable known type. The damper shown by way of illustration comprises a plurality of strips 23 pivotally mounted at their midwidth on rods 24 suitably mounted for turning movement in chamber 16. The strips 24 are loosely connected at one edge by a rod 25 and the pivot rod 24a of one of the strips extends through the wall of chamber 16 and is formed at its outer end portion to provide a crank 26. The damper 22 is a known shutter type of damper and may be closed or opened to desired extent by turning of the crank 26, as will be understood. The finishing strip or plate 20 is extended outward a short distance beyond end wall 13 and is bent back upon itself and then upward to provide an L-shaped flange 27 for reception of the edge portion of an acoustic panel 27a disposed between the ends of adjacent fixtures included in a false or drop ceiling structure, as is known. The side walls 14 of housing 10 may also be provided at the lower edges thereof with outward extensions bent to provide flanges 28 for receiving the edge portions of acoustic panels 29 disposed between the sides of the fixtures in a false or drop ceiling. End wall 12 of housing 10 is provided at its lower edge with an outwardly extending finishing strip or plate 30 preferably secured, at its side edges, to triangular supporting plates 31 extending from the side walls 14. The outer end portion of plate 30 is bent to provide a flange 32 of L-shape in cross section, similar to flange 27, for receiving the edge portion of an acoustic panel 32a. A tubular neck or stack 33 of rectangular cross section, defining an air supply passage or chamber, seats at its lower end on the upper face of plate 30, between the supporting members or plates 31, stack 33 being provided at its lower end with an outwardly extending flange 34 seating on the upper face of plate 30 and suitably secured thereto, conveniently by welding. The lower end of stack 33 overlies an opening or slot 35 in plate 30 for discharge into the underlying room or space of air delivered under pressure to the stack 33. At its upper end stack 33 is provided with a circular collar 36 for attachment of one end of a flexible duct or conduit 37 of suitable known type.

A horizontal partition 40 is secured in housing 10 a material distance below the top wall 11 thereof and extends between the side walls 14 and from the end wall 12 to and a short distance beyond the transverse partition 19, the latter extending upward to partition 40 as shown more clearly in FIGURE 4. The partition 40 defines with the housing 10 an upper air compartment or space 41 and a lower lamp receiving compartment 42, which receives two fluorescent tubes 43 mounted in sockets 44 which are mounted on the end wall 12 and the cross partition 19. The air heated by the lamps flows freely from compartment 41, which opens at one end into the passage or chamber 16, the air flow through passage or chamber 16 to conduit 18 being controlled by the damper 22, as will be understood. In that connection, the stack 33 is provided with a damper 45, similar to damper 22,

3

for controlling air flow therethrough. The partition 40 extends somewhat beyond partition 19 with its extended portion curved upward for directing lamp heated air from space compartment 41 upward along the inner portion of the passage or chamber 16, as will be understood from FIGURE 4. A guard member or door 46, comprising a frame 47 of substantially L-shape in cross section and a panel 48, is removably mounted in the lower end of compartment 42, conveniently by spring clips 49 suitably disposed and secured to the side walls 14 of housing 10. The guard member or door 46 has a loose fit in the lower end of compartment 42 to accommodate restricted flow of air into the latter, for a purpose to be explained presently. The panel 48 may be formed of glass, plastic, or any suitable material, either translucent or transparent and preferably is provided, at its underface, with transverse ribs 50 for distributing uniformly the light from the lamps or tubes 43. The underface of partition 40 and the inner faces of side walls 14 and end wall 12 and partition 19 are suitably finished to provide light reflecting surfaces, and the partition 40 is provided with restricted openings 51 for flow of heated air from compartment 42 into space 41. Preferably, though not essentially, the openings 51 are covered with fine mesh screen (not shown) similar to that used in miner's lamps to comply with underwriter's requirements. It will be understood that there is restricted flow of air about the door or closure member 46 into compartment 42, this air being heated by the tubes 43 and flowing through the openings 51 into the lamp heated air space or compartment 41, openings 51 preferably being disposed in overlying relation to tubes 43. The partition member or panel 40 is also provided with a central opening and with a flanged cup member 52 which receives a ballast 53 for the tubes 43. The ballast 53 generates a certain amount of heat which is absorbed by the air flowing through space 41 thereby increasing somewhat the temperature of such air which, as above noted, flows into the room air return passage or chamber 16 and thence into the conduit 18.

The fixture of FIGURES 5 and 6 is similar to that of FIGURES 1 to 4, inclusive, differing therefrom in details only, a brief description of which will suffice. The housing 10a has end walls 12 and 13a, the latter extending from partition 40a to finishing strip or plate 20a. The cross partition 19 of FIGURE 3 is omitted, the tubes 43 extend from end wall 12 to end wall 13a, and partition 40a terminates at the latter; as shown in FIGURE 6. A box-like room return air stack 16a seats at its lower end on plate 20a, the latter constituting an extension of housing 10a and preferably, though not necessarily, being secured thereto by triangular side supports 31a. The stack 16a is closed at its upper end and is provided at its lower end with an outer peripheral flange providing means for securement to plate 20a by soldering, welding, or in any suitable manner. Stack 16a is provided at its outer end with a cylindrical outlet collar 17a for attachment of the flexible duct 18. A damper 22a, of conventional type, is mounted in collar 17a for controlling flow of air therethrough. Room air is admitted to stack 16a through an opening 21a in plate 20a, as before. As will be understood from the above, air space 41a is open at the end thereof at the end wall 13a. That end of air space 41a snugly receives the inner end portion of a short duct 17b the outer end of which seats on the inner end wall of stack 16a in register with a corresponding opening in that wall. Preferably, the outer end of duct 17b is provided with an outer peripheral flange for securement by soldering, welding, or in any suitable manner, to the inner end wall of stack 16a. The inner end of duct 17b may be secured to housing 10a by soldering, welding, or in any suitable manner. The stack 16a provides means for taking off room air and the duct 17b provides means for taking off heated air from space 41a and mixing it with room air, as before, as will be understood. The air supply stack or chamber 33a is similar

4

to the room air return stack 16a and is similarly mounted on the plate or extension 30a of housing 10a. Stack 33a is provided at its outer end wall with a cylindrical air inlet collar 36a for attachment of the flexible conduit 37 and has a continuous inner end wall. The collar 36a is provided with a conventional damper 45a for controlling air flow therethrough and plate 30a is provided with an opening 35a for admission of air to the room or space underlying the fixture. The modified form of fixture of FIGURES 5 and 6 is, with the exceptions above noted, the same as that of FIGURES 1 to 4, inclusive, and may be used in the same manner and for the same purposes as the latter.

The fixture of FIGURES 5 and 6 has certain advantages in respect to installation. In fixtures of this general type jurisdictional disputes may arise between the sheet metal trade and the electrical trade as to which one should install the fixture and to what extent. Such jurisdictional disputes can be avoided to large extent by having the fixture, without the stacks 33a and 16a and duct 17b, installed by the electrical trade, the sheet metal trade then applying to the installed fixture the air stacks 33a and 16a and duct 17b incident to other sheet metal work required in a lighting and air conditioning system such as that shown in FIGURE 7.

In FIGURE 7 I have shown a plurality of fixtures F included in a drop or false ceiling C and spaced apart by acoustical panels 27a, 29 and 32a. The fixtures F are similar to the fixture of FIGURES 1 to 4, inclusive, and may be supported in any suitable manner from an overlying main ceiling or similar structure (not shown). In FIGURE 1 I have shown fragmentarily a grid structure 55, which may be supported from the main ceiling by suitable hangers or wires, suitably disposed brackets 56 being secured to the grid 55 and to the respective fixtures F. The ceiling C overlies a space or room 57 in a building 58 having an exterior wall 59 and an interior partition 60 providing at opposite sides thereof room 57 and an equipment area or room 61. The latter room is intended for accommodation of heating equipment including furnaces, boilers and the usual accessories, and cooling or refrigerating apparatus and the usual accessories, all of which may be of standard type and need not be shown nor described in detail. A main or trunk air conduit 62 is mounted in room 61 and opens at one end to atmosphere through the building wall 59 at one side thereof, at 63. The trunk conduit is provided with a damper 64 of suitable known type disposed a short distance inward from the opening 63. It is also provided with a fan or blower 65 of suitable known type, including a housing 66 into which the inner end of trunk conduit 62 opens. Trunk conduit 62 is further provided with a preheater 67, an air filter 68, a cooling coil 69 and a reheater 70, disposed therein in the order stated from the damper 64. The preheater 67 and the reheater 70 may be of any suitable known type, preferably being steam coils, though electrical coils or any suitable heating means may be employed within the broader concept of my invention. The cooling coil may be of any suitable known type and receives a suitable coolant circulated therethrough in a known manner, and the air filter 68 may also be of any suitable known type.

The discharge of the blower housing 66 is connected to a main air supply conduit 72 into which open subsidiary conduits 73. The latter conduits are provided with dampers 74 of suitable known type and are connected to the flexible conduits or ducts 37 of fixtures F. The flexible conduits or ducts 18 of the fixtures F open into subsidiary conduits 75 opening into a main room air return conduit 76, conduits 75 being provided with dampers 77 of suitable known type. The conduit 76 opens into the main trunk conduit 62 between damper 64 and preheater 67 thereof, communication between the two being controlled by a damper 78 of suitable known type, which may be similar to the damper 22 of the room air return

5

passage or chamber 16. The conduit 76 is provided with an arm or branch 79, provided with a damper 80 similar to damper 78 and opening to atmosphere through wall 59 at 81. The conduit 76 also preferably is provided with a fan or blower 82 therein in advance of branch conduit 79.

During summer or warm weather operation of the system, with the blowers 65 and 82 in operation, damper 64 is opened, as is damper 80, and damper 78 is closed, the preheater 67 and the reheater 70 are shut off and coolant is circulated through the cooling coil 69, the dampers 74 and 77 being appropriately adjusted in opening direction. Under the conditions stated, atmospheric air is drawn through the trunk conduit 62 and over the cooling means or coil 69, the cooled air being delivered to the space or room 57 through the openings or slots 35 of the air passages or stacks 33, it being understood that valves 45 thereof are appropriately adjusted to that end. The heated air withdrawn from space 41 and the warm air withdrawn from the room 57, through the chamber or stack 16, is then drawn through the conduit 76 by blower 82 therein and is discharged to atmosphere. That contributes to cooling of the room 57, in that the warm air withdrawn from the room and from the fixtures is discharged to atmosphere, thereby effecting a material saving in the cost of cooling of the room or space being air conditioned. During cold weather or winter operation of the system, the dampers 64 and 80 are closed and damper 78 is opened, the other dampers of the system being appropriately adjusted as above described. The cooling coil 69 is then shut down and the preheater 67 and reheater 70 are placed in operation. The warm air withdrawn from the room and from the fixtures is then delivered to the trunk conduit 62 and flows over the preheater 67 and reheater 70 so as to be heated thereby to appropriate temperature, such warmed air being discharged into the space or room 57 in the same manner as cooled air is discharged into the room during warm weather or summer operation. In that manner the heat contained in the warm air withdrawn from the room and from the fixtures is utilized for heating the room 57, thereby effecting a substantial saving in the cost of heating. Obviously, the dampers of the system may be appropriately adjusted for supplying to the room 57, when the system is used for heating purposes, a suitable amount of atmospheric air as may be desired or necessary. Further, by appropriate adjustment of the dampers, the proportions of withdrawn heated air and atmospheric air delivered to the trunk conduit 62 may be varied to suit requirements, as will be understood.

The system shown in FIGURE 7 and described above is similar in general to that disclosed in the copending application of myself and Benjamin S. Benson, Jr., for Combination Lighting and Ventilating Fixture, Serial No. 6,948, filed February 5, 1960, but differs therefrom in respect to the fittings and their incorporation into the system.

As above indicated, and as will be understood, changes in detail may be resorted to without departing from the field and scope of my invention, and I intend to include all such variations, as fall within the scope of the appended claims, in this application in which the preferred form only has been disclosed.

I claim:

1. In a lighting fixture, a downwardly opening box-like housing comprising a top and side and end walls, a substantially horizontal partition member extending between said side walls and from one of said end walls and terminating short of the other end wall, a substantially vertical partition member extending between said side walls and downward from said horizontal partition member, said vertical partition member in cooperation with said other end wall and contiguous portions of said side walls defining an air passage opening through the top of said housing and said horizontal partition member separating said housing interiorly into a lower lamp compart-

6

ment and an upper compartment opening into said air passage, said horizontal partition member having openings therein for flow of heated air from said lamp compartment into said upper compartment, and guard means for said lower compartment accommodating flow of air into the latter.

2. In a lighting fixture, a downwardly opening box-like housing comprising a top and side and end walls, a substantially horizontal partition member extending between said side walls and from one of said end walls and terminating short of the other end wall, a substantially vertical partition member extending between said side walls and downward from said horizontal partition member, said vertical partition member in cooperation with said other end wall and contiguous portions of said side walls defining an air passage opening through the top of said housing and said horizontal partition member separating said housing interiorly into a lower lamp compartment and an upper compartment opening into said air passage, said horizontal partition member having openings therein for flow of heated air from said lamp compartment into said upper compartment and said air passage having a bottom opening for entry of room air, and guard means for said lower compartment accommodating flow of air into the latter.

3. In a lighting fixture, a downwardly opening box-like housing comprising a top and side and end walls, a substantially horizontal partition member extending between said side walls and from one of said end walls and terminating short of the other end wall, a substantially vertical partition member extending between said side walls and downward from said horizontal partition member, said vertical partition member in cooperation with said other end wall and contiguous portions of said side walls defining an air passage opening through the top of said housing and said horizontal partition member separating said housing interiorly into a lower lamp compartment and an upper compartment opening into said air passage, said horizontal partition member having openings therein for flow of heated air from said lamp compartment into said upper compartment and said air passage having a bottom opening for entry of room air, a door for said lower compartment having a loose fit therein accommodating flow of air into the latter, and a downwardly opening air supply stack adjacent said one end wall and closed to said housing.

4. In a lighting and ventilating fixture, a downwardly opening box-like housing comprising a top and side and end walls, a substantially horizontal partition member extending between said side walls and from one of said end walls and terminating short of the other end wall, a substantially vertical partition member extending between said side walls and downward from said horizontal partition member, said vertical partition member in cooperation with said other end wall and contiguous portions of said side walls defining a return air stack at the end of said housing remote from said one end wall, said horizontal partition member separating said housing interiorly into a lower lamp compartment and an upper compartment opening into said stack, said horizontal partition member having openings therein for flow of heated air from said lamp compartment into said upper compartment, guard means for the lower end of said lower compartment accommodating restricted flow of air into the latter from the space therebelow, and an air take-off conduit opening into said return air stack.

5. In a lighting and ventilating fixture, a downwardly opening box-like housing comprising a top and side and end walls, a substantially horizontal partition member extending between said side walls and from one of said end walls and terminating short of the other end wall, a substantially vertical partition member extending between said side walls and downward from said horizontal partition member, said vertical partition member in cooperation with said other end wall and contiguous por-

7

tions of said side walls defining a return air stack at the end of said housing remote from said one end wall, said horizontal partition member separating said housing interiorly into a lower lamp compartment and an upper compartment opening into said stack, the latter having a bottom air inlet opening, said horizontal partition member having openings therein for flow of heated air from said lamp compartment into said upper compartment, guard means for the lower end of said lower compartment accommodating restricted flow of air into the latter from the space therebelow, and an air take-off conduit opening into said return air stack.

6. In a lighting and ventilating fixture, a downwardly opening box-like housing comprising a top and side and end walls, a substantially horizontal partition member extending between said side walls and from one of said end walls and terminating short of the other end wall, a substantially vertical partition member extending between said side walls and downward from said horizontal partition member, said vertical partition member in cooperation with said other end wall and contiguous portions of said side walls defining a return air stack at the end of said housing remote from said one end wall, said horizontal partition member separating said housing interiorly into a lower lamp compartment and an upper compartment opening into said stack, said horizontal partition member having openings therein for flow of heated air from said lamp compartment into said upper compartment, guard means for the lower end of said lower compartment accommodating restricted flow of air into the latter from the space therebelow, an air take-off conduit opening into said return air stack, a downwardly opening air supply stack mounted on said housing exteriorly thereof and adjacent said one end wall, and an air supply conduit opening into said air supply stack.

8

7. In a lighting and ventilating fixture, a downwardly opening box-like housing comprising a top and side and end walls, a substantially horizontal partition member extending between said side walls and from one of said end walls and terminating short of the other end wall, a substantially vertical partition member extending between said side walls and downward from said horizontal partition member, said vertical partition member in cooperation with said other end wall and contiguous portions of said side walls defining a return air stack at the end of said housing remote from said one end wall, said horizontal partition member separating said housing interiorly into a lower lamp compartment and an upper compartment opening into said stack, the latter having a bottom air inlet opening, said horizontal partition member having openings therein for flow of heated air from said lamp compartment into said upper compartment, a door loosely mounted in the lower end of said lower compartment for restricted flow of air into the latter from the space therebelow, a downwardly opening air supply stack mounted on said housing exteriorly thereof and adjacent said one end wall, and an air supply conduit opening into said air supply stack.

References Cited in the file of this patent

UNITED STATES PATENTS

2,327,664	Otis	Aug. 24, 1943
2,359,021	Campbell et al.	Sept. 26, 1944
2,564,334	Kennedy	Aug. 14, 1951
2,593,094	Blue	Apr. 15, 1952
2,845,855	Burns	Aug. 5, 1958
2,960,602	Kurth	Nov. 15, 1960

FOREIGN PATENTS

1,182,753	France	Jan. 19, 1959
-----------	--------------	---------------