

[54] **COMBINED LIGHTING AND VENTILATING FIXTURE**

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[58] Field of Search 240/9 A, 78, 47, 2 V; 98/40 DL

[56] **References Cited**

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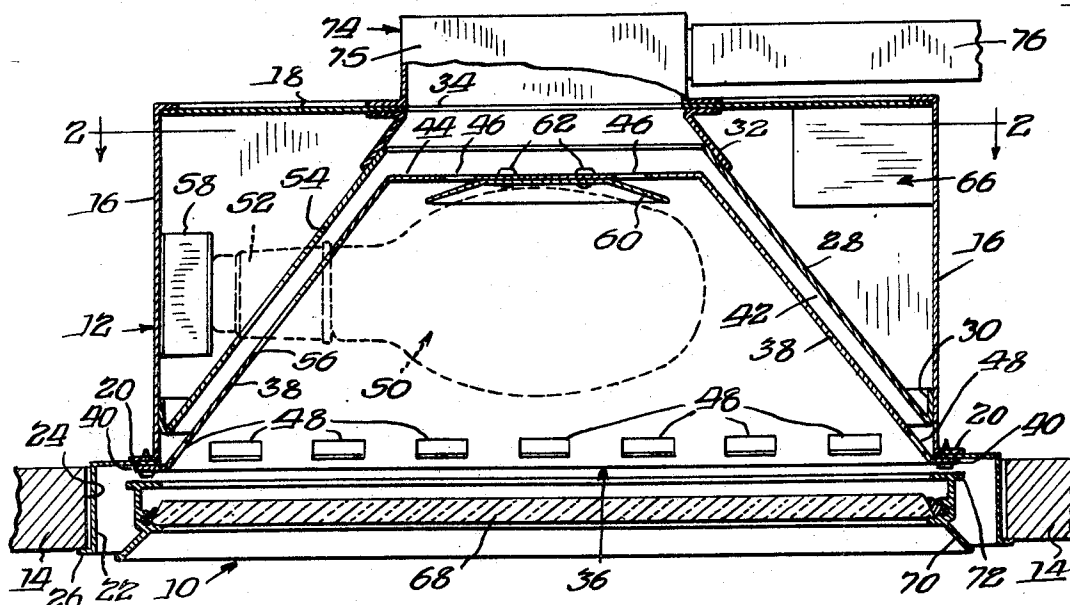
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[57] **ABSTRACT**

A luminaire having a housing for mounting in the plenum area above a ceiling and including a reflector supported generally within the housing for reflecting light from a light source supported therein. The housing and reflector establish primary and secondary air flow paths for removing heat from the light source and from ballast means and related electrical components supported by the housing.

7 Claims, 3 Drawing Figures



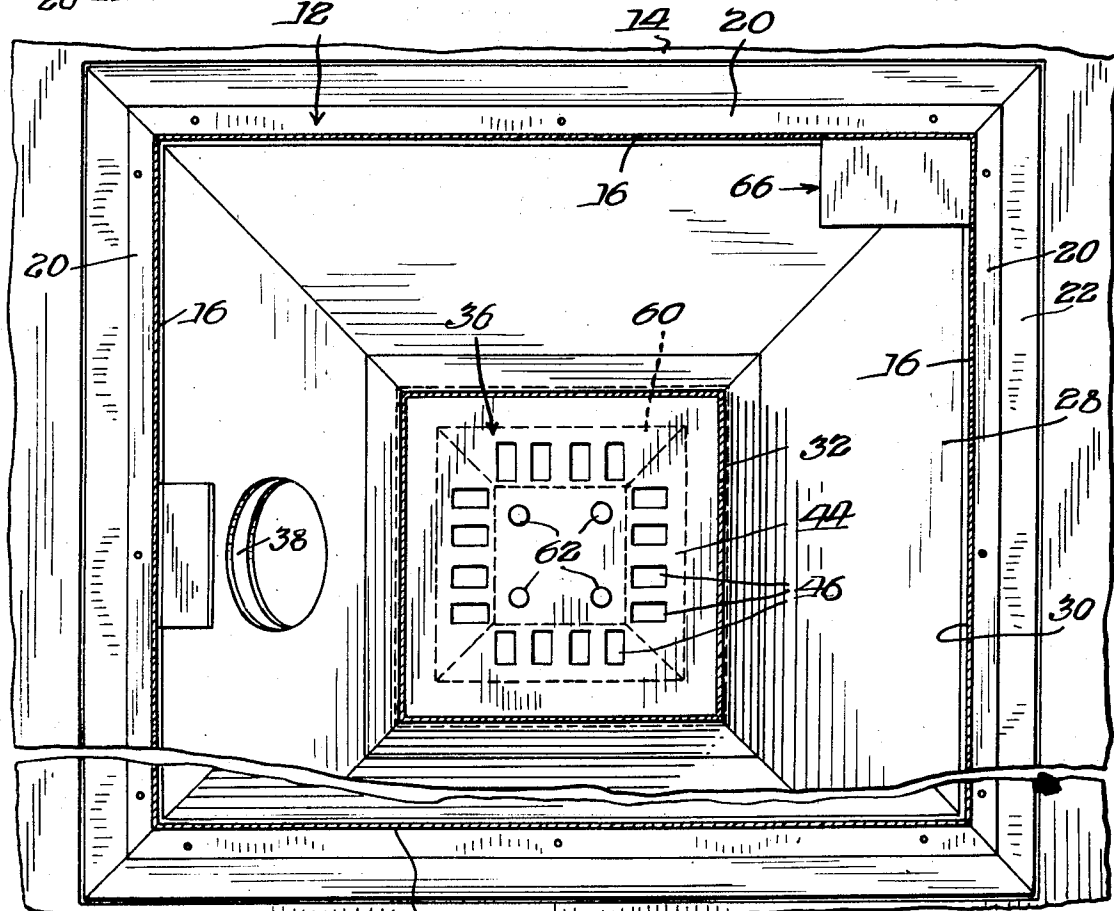
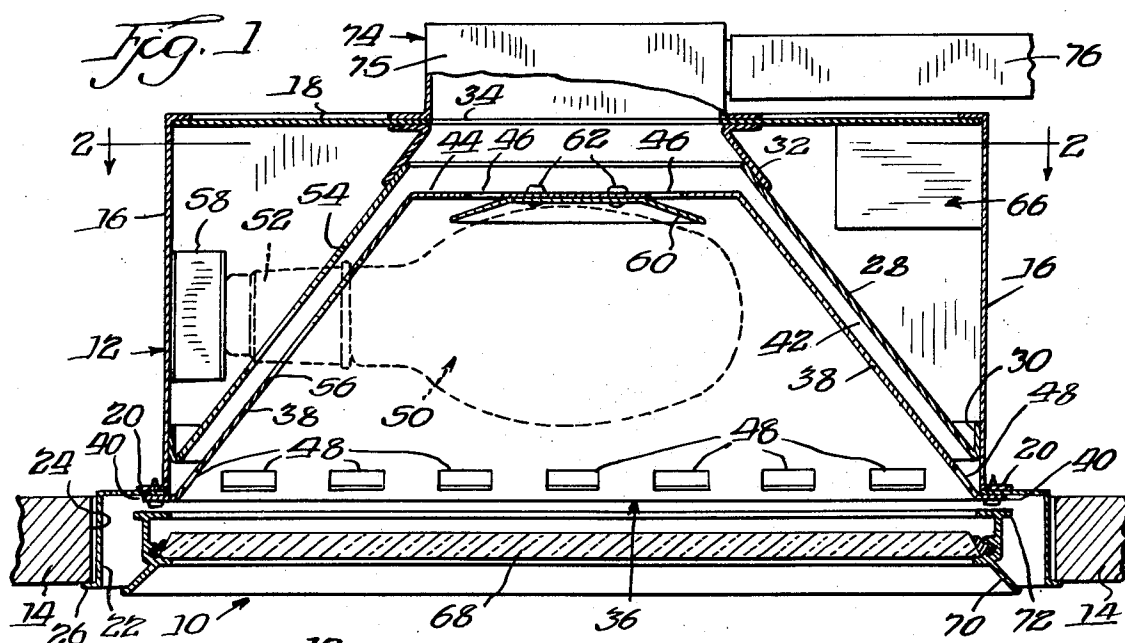


Fig. 2

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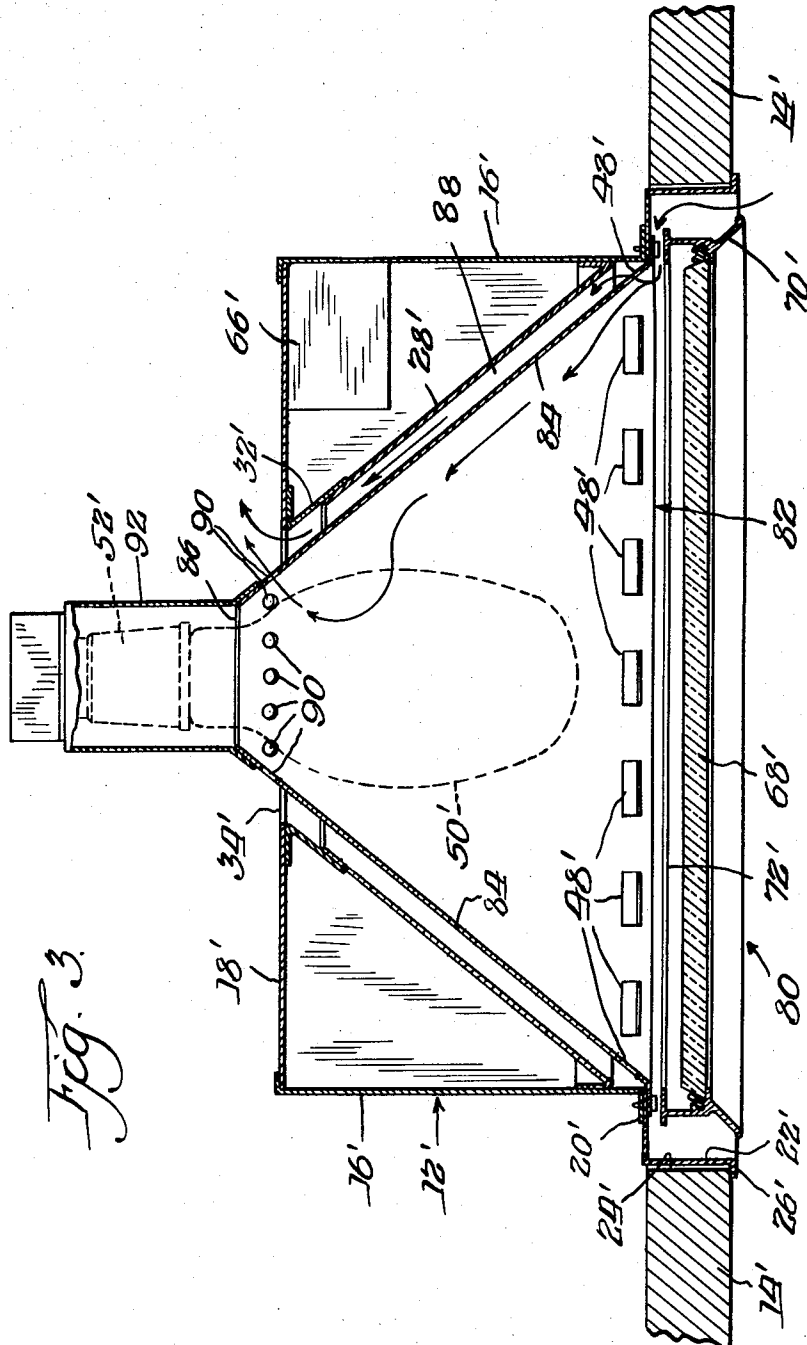


Fig. 3.

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COMBINED LIGHTING AND VENTILATING FIXTURE

BACKGROUND OF THE INVENTION

The present invention relates generally to lighting and ventilating fixtures of the recessed type, and more particularly to a novel lighting and ventilating fixture which establishes air flow upwardly through separate paths to effect cooling of the light source, ballast and capacitor means, and other related electrical components.

Lighting fixtures of the "recessed" type are generally known and extensively used. Such fixtures conventionally employ a housing adapted to be supported within the plenum area above a ceiling, and have a light reflector supported within the housing to reflect light downwardly from a light source to the space below the fixture through a lens or other suitable light control device supported generally adjacent the lower edge of the housing. In the case of fluorescent and metallic vapor lamps, the housing additionally supports ballast, capacitor means, and other related electrical components which are connected in the lamp circuit. Both the ballast and the light source create substantial amounts of heat energy which must be removed to maintain optimum operating temperatures and thus high operating efficiency. Recent advances in lighting fixture designs have incorporated means whereby air from the room space disposed below a lighting fixture is caused to move upwardly through the lighting fixture whereupon it is conveyed to an air recirculating temperature control device or to an exhaust area removed from the room. An example of a lighting and ventilating fixture of the aforescribed type is disclosed in U. S. Pat. No. 3,010,378, dated Nov. 28, 1961, and assigned to the assignee of the present invention. While the lighting and ventilating fixture of the referenced patent has proven to be adequate for its intended use, the present invention provides a more simplified construction which includes means for establishing air flow upwardly through two separate air paths to more efficiently remove heat created by the light source, the ballast and capacitor means, and related electrical components.

SUMMARY OF THE INVENTION

One of the primary objects of the present invention is to provide a novel lighting and ventilating fixture for mounting within the plenum area above a ceiling, and which effects removal of air from the room below the fixture and causes the air to move upwardly through a plurality of air passages to remove heat from the light source, the ballast, the capacitor and other related electrical components supported within the fixture housing.

Another object of the present invention is to provide a lighting and ventilating fixture which includes housing and light reflector means, the light reflector means having air passage openings selectively positioned therein to establish primary air flow passage means interiorly of the reflector, and the light reflector and housing cooperating to establish secondary air flow passage means therebetween.

Another object of the present invention is to provide a lighting and ventilating fixture as described which may be readily adapted to effect upward passage of air

through the fixture by means of convection or by means of negative pressure established by suction means.

In carrying out the objects and advantages of the present invention, I provide a lighting and ventilating fixture which includes a housing adapted for mounting within the plenum area above a ceiling. The housing has a generally central downwardly directed opening which receives a light reflector therein. The housing supports ballast and capacitor means and other related electrical components outwardly of the reflector for circuit connection with one or more light sources supported within the envelope of the reflector. The reflector has a plurality of openings adjacent its upper end which communicate with the space above the housing and establish primary air flow passage means upwardly within the reflector. The reflector is spaced from the housing and defines secondary air passage means therebetween, the reflector having a plurality of circumferentially spaced openings adjacent its lower edge portion which allow upward air flow into the secondary air passage means. A light control device and associated support frame are optionally spaced below the housing and reflector to allow upward flow of air through the primary air flow path interiorly of the reflector to remove heat from the light source. Air also passes upwardly through the secondary passage means between the reflector and housing for removing heat created by the ballast and capacitor means and other related electrical components, the upwardly moving air from both the primary and secondary passage means passing outwardly of the top of the fixture. One embodiment of my lighting and ventilating fixture employs suction duct means to withdraw air from the primary and secondary air passages by negative pressure, while another embodiment effects upward flow of air by convection. In the latter static condition, without negative pressure producing means in the plenum space, the primary air passage effects removal of heat from the light source while the secondary air passage effects removal of heat from the ballast and related electrical components. The movement of air in the primary air passage generated by convection from the heat of the light source aids in drawing air through the secondary air passage means.

Further objects and advantages of my invention, together with the organization and manner of operation thereof, will become apparent from the following detailed description of the invention when taken in conjunction with the accompanying drawings wherein like reference numerals designate like parts throughout the several views.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a longitudinal vertical sectional view of a lighting and ventilating fixture in accordance with one embodiment of the present invention wherein negative pressure means are provided for effecting upward air flow through the fixture.

FIG. 2 is a foreshortened horizontal sectional view taken substantially along the line 2—2 of FIG. 1 with the light source removed; and

FIG. 3 is a longitudinal vertical sectional view generally similar to FIG. 1 but illustrating an alternative embodiment of the lighting and ventilating fixture wherein upward air flow is effected by convection.

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring now to the drawings, and in particular to FIGS. 1 and 2, a lighting and ventilating fixture in accordance with one embodiment of my invention is indicated generally at 10. The lighting and ventilating fixture 10 is of the "recessed" type in that it is adapted to be mounted in the plenum area above a ceiling wherein substantially all of the fixture except the light lens or reflector element is hidden from normal view. To this end, the lighting and ventilating fixture 10 includes housing means, indicated generally at 12, adapted to be mounted within the plenum area above a ceiling 14 which is spaced vertically downwardly from the uppermost construction members of a room or the like. The ceiling member 14 is conventionally termed a dropped ceiling.

The housing means 12 is illustrated as being generally square or rectangular in plan configuration and has four upstanding vertical side wall portions 16 connected at their upper edges to a horizontal upper end plate 18. The lowermost edge portions of the vertical side walls 16 are turned outwardly to establish horizontal flange portions 20 which are coplanar and are secured to a generally rectangularly shaped mounting bracket or channel 22. The mounting bracket 22 of the housing means is adapted to be secured within a correspondingly shaped opening 24 in the ceiling 14, the mounting bracket having a lower horizontal flange portion 26 which engages the lowermost surface of the ceiling member 14. The mounting flange 22 may be secured within the opening 24 of the ceiling member 14 through any suitable means such as attaching screws or friction detent means (not shown).

The housing means 12 further includes an inner casing comprising a truncated pyramidal shaped member 28 open at its lower and upper ends. The inner casing 28 is suitably secured at its lower edge to the inner surfaces of the upstanding side walls 16 through an upwardly directed flange portion 30, and is secured at its upper edge to a suitable connecting bracket 32 attached to the upper end plate 18 of the housing. The upper end plate 18 has a generally square opening 34 centrally therein which provides communication between the area above the upper plate 18 and the area interiorly of the inner casing 28.

The lighting and ventilating fixture 10 includes light reflector means, indicated generally at 36, which is supported within the recess defined by the inner casing 28 of the housing means 12. The light reflector means 36 comprises a truncated generally pyramidal-shaped reflector member having inclined side walls 38. The light reflector means 36 may be made of a suitable light weight, light-reflecting material such as aluminum and preferably has its inner surface polished to maximize light reflection. The lower edge portions of the inclined side walls 38 terminate in horizontal flanges 40 which are secured to the mounting brackets 22 in underlying relation to the flange portions 20 of the housing means 12. In this manner, the reflector extends upwardly within the housing casing 28 with the inner walls 38 of the reflector being parallel to and spaced inwardly from the inclined walls of the inner casing 28.

The upper ends of the inclined walls 38 terminate in a horizontal upper plate member 44 which has a plurality of suitable air passage openings 46 therethrough. The openings 46 provide air flow communication

between the interior area of the reflector means 36 and the upper opening 34 in the housing means 12. A plurality of circumferentially spaced openings 48 are provided in the light reflector means 36 generally adjacent the lower edge surfaces of the inclined walls 38 thereof. The openings 48 provide air flow communication between the interior of the reflector means and the passage area defined between the inclined walls 38 of the reflector means and the inner casing 28 of the housing means.

With the upper openings 46 providing air flow communication between the interior of the reflector means 36 and the upper opening 34 in the housing means 12, a primary air flow path or passage is established interiorly of the reflector means 36 whereby air may flow upwardly from the area below the fixture 10 through the openings 46 and outwardly of the housing through the upper opening 34 thereof. Spacing the inclined walls 36 of the light reflector means 36 inwardly from the inclined walls of the inner casing 28 of the housing means 12 establishes a secondary air flow passage 42 between the inclined walls of the light reflector means and the inner casing of the housing means such that air may be caused to flow upwardly from the area below the room through the openings 48 and upwardly through the secondary air flow passage 42 whereupon it passes outwardly from the housing through the opening 34.

The housing means 12 supports a suitable light source, indicated generally at 50, which may comprise one or more lighting lamps, such as metallic vapor lamps, of known construction. The light source 50 has a socket portion 52 which extends through suitable aligned openings 54 and 56 provided in the inner casing 28 and the corresponding light reflector wall 38, respectively, and is secured in horizontal relation within the reflector element to a suitable bracket 58 attached to an upstanding side wall 16 of the housing means. A polished concave reflector 60 of rectangular plan configuration is secured to the upper horizontal plate 44 of the light reflector means, as through rivets 62, to overlie the light source 50 when inserted within its socket 52.

Conventional ballast and capacitor means, indicated generally at 66, are supported within the housing means 12 outwardly of the reflector means 36 as shown in FIGS. 1 and 2, and are connected in circuit with the mercury vapor lamp 50 in a known manner to control the energy input to the mercury vapor lamp during operation.

In lighting fixtures of the type herein described, a light control device, such as a light diffusing lens, may be desired below the light source to diffuse light rays which emanate from the light source. To this end, the lighting and ventilating fixture 10 may include a light diffusing lens 68 which is supported by the support bracket 22 through a suitable support frame 70 to underlie the lower opening of the light reflector means 36. The lens support frame 70 includes a generally horizontal flange portion 72 which is supported in downwardly spaced relation from the horizontal flange 40 of the light reflector means 36 such that air may readily flow upwardly between the lens support frame 70 and the mounting bracket 22 into the spatial interior of the light reflector means.

In the embodiment illustrated in FIGS. 1 and 2, negative pressure means, indicated generally at 74, may be secured to the upper horizontal plate 18 of the housing means 12 to establish an air pressure differential between the opening 34 in the upper plate 18 and the atmosphere of the room below the lighting and ventilating fixture 10. The negative pressure means 74 may comprise a casing 75 connected to an air duct 76 which may form a portion of a ventilating system connected to conventional exhaust fan means (not shown). Alternatively, the opening 34 in the upper end plate 18 may be directly open to the plenum area within which the fixture housing means 12 is mounted. In the latter arrangement the plenum area is vacuumized to establish a negative pressure within the upper portion of the housing means 12.

In operation, when the light source 50 is energized to effect lighting of the room in which the lighting and ventilating fixture 10 is installed, and with the negative pressure means 74 establishing a negative pressure above the opening 34 in the housing means 12 so that an air pressure differential is created between the upper opening 34 and the area below the lighting fixture, air is caused to flow up-wardly between the lens support frame 70 and the mounting bracket 22 and into the interior of the light reflector means 36. A portion of the air passing upwardly from the room below the lighting fixture passes through the primary air passage interiorly of the light reflector 38 about the light source 50 and upwardly through the openings 46 in the upper plate portion 44 of the light reflector means. The air passing upwardly through the primary air passage within the light reflector means 36 removes heat created by the light source 50 and is thereafter removed through the opening 34 in the top of the fixture. A portion of the air passing upwardly from the room below the light fixture passes through the lower openings 48 in the light reflector walls 38 and into the secondary air passage 42 defined between the light reflector and the inner casing 28 of the housing means 12. The air passing upwardly within the secondary air passage 42 removes heat from the housing means which is created by the ballast and capacitor means 66 and other electrical components as may be connected in circuit with the light source 50. The heated air passing upwardly through the secondary air passage 42 passes upwardly through the opening 34 in the top of the fixture where it may be removed through the duct 76. Thus, the lighting and ventilating fixture 10 illustrated in FIGS. 1 and 2 establishes two separate and distinct air flow paths upwardly through the fixture to simultaneously remove air from the light source 50 and the ballast and capacitor means 66, the heated air there-after being removed from the fixture. The heated air so removed may be recirculated interiorly of the room or exhausted exteriorly.

FIG. 3 illustrates an alternative embodiment of the lighting and ventilating fixture in accordance with the present invention. For purposes of description, the elements of the embodiment illustrated in FIG. 3, which are common to the embodiment illustrated above with respect to FIGS. 1 and 2, are indicated with a prime notation. The lighting and ventilating fixture of FIG. 3 is indicated generally at 80 and is adapted to be mounted within the plenum area above the ceiling

member 14' in similar fashion to the above described lighting and ventilating fixture 10. The lighting and ventilating fixture 80 differs from the above described lighting and ventilating fixture 10 primarily in the positioning of the light source and slight variations in constructional detail. Also, the lighting and ventilating fixture of FIG. 3 is not illustrated as employing a negative pressure means as is described with respect to the fixture of FIGS. 1 and 2. It will, however, be understood that in the case of either the lighting and ventilating fixture 10 or the lighting and ventilating fixture 80, a negative pressure producing means may be used.

The lighting and ventilating fixture 80 includes housing means 12' having upstanding side wall portions 16' and an upper horizontal plate 18' which has a generally central square opening 34' therein. The housing means 12' is supported within an opening 24' within the ceiling 14' by a mounting bracket 22'. The housing means 12' supports ballast and capacitor means 66', as well as other related electrical components as necessary (not shown), between the outer upstanding walls 16' and a truncated pyramidal-shaped inner casing 28'. The lighting and ventilating fixture 80 further includes light reflector means 82 which comprises a truncated generally pyramidal-shaped reflector member having inclined walls 84 secured at their lower edge portions to the mounting bracket 22'. The upper edge portions of the walls 84 define an opening 86 which lies in a plane spaced above the plane of the upper horizontal plate 18'. The inclined walls 84 of the light reflector means 82 have a plurality of circumferentially spaced openings 90 therethrough slightly below the upper edge portions of the walls, the openings 90 providing air communication between the interior of the light reflector means 82 and the space above the housing means 12'. In this manner, a primary air passage is established within the interior of the light reflector means 82 allowing air flow from the area below the light fixture upwardly through the interior of the light reflector means and outwardly through the openings 90 into the plenum area above the light fixture.

The inclined walls 84 of the light reflector means 82 are parallel to and spaced inwardly from the inner casing 28' of the housing means 12' and define secondary air flow passage means 88 between the light reflector means and the inner casing. A plurality of suitable air passage openings 48' are disposed in circumferentially spaced relation about the lower edge portions of the inclined walls 84 of the light reflector means, and provide air communication between the lower interior of the light reflecting means and the secondary air passage means 88. In this manner, air flow can be established from the area below the light fixture upwardly through the openings 48', through the secondary air passage 88', and through the opening 34' into the plenum area above the fixture. The lighting and ventilating fixture 80 includes a light source 50' which may comprise a metallic vapor lamp, or other suitable light source which is supported by a socket 52' retained within a lamp mounting casing 92 mounted on the upper edge portions of the walls 84. The light source 50' is connected in circuit in a known manner to establish selective energizing of the light source. A light control device, such as a light diffusing lens 68', may be supported in spaced relation below the light reflector

means 82 to allow upward air flow between the lens support frame 70' and the reflector means 82. During operation, heat is created by the light source 50' and by the ballast means 66' and other related electrical components. The heat so created increases the temperature of the air within the lighting and ventilating fixture 80 and establishes upward convection of air from the space below the ceiling member 14' into the lower end of the light reflector means 82' between the mounting bracket 22 and the lens support frame 70'. A portion of the air passing upwardly into the light reflector means 82 passes upwardly through the primary air flow passage about the light source 50' and outwardly through the openings 90 into the plenum space above the housing means 12'. The air passing upwardly through the primary air passage within the reflector means 82 removes heat created by the light source 50' and assists in maintaining the temperature within the light reflecting means at an optimum for maximum light efficiency.

Simultaneously, a portion of the air passing upwardly into the light reflector means 82 passes through the openings 48' into the secondary air passage means 88 between the light reflector means and the inner casing 28' of the housing means and thereafter passes outwardly through the opening 34' in the upper plate 18'. As air passes upwardly through the secondary air passage means 88, it removes heat created by the ballast and capacitor means 66', as well as heat from other related electrical components that may be supported within the housing means. The flow of air passing upwardly through the primary air flow path within the light reflector means aids in drawing air through the secondary air passage 88. The heated air passing upwardly and outwardly of the light reflector openings 90 and the opening 34' in the upper plate 18' of the housing means may be removed from the plenum area above the ceiling member 14' by means (not shown) in a known manner wherein the warmed air may be returned to the room or exhausted as desired.

Having described two embodiments of my lighting and ventilating fixture, it can be seen that I have provided within my heating and lighting and ventilating fixture two paths of air travel, a primary air path being directly over the light source to remove heat created thereby, and a secondary air path exterior of the walls of the light reflecting means to absorb and remove heat created by the ballast and capacitor means 66'. In this manner, I maintain the heat within my lighting and ventilating fixture at an optimum for maximum operating efficiency. It will be understood that the above described principles of effecting air passage upwardly through the lighting fixture by means of establishing negative pressure or by convection may be applied to either of the lighting and ventilating fixtures described, and further that mounting of the light source in either horizontal or vertical relation may be accomplished without departing from the invention in its broader aspects.

Thus, while I have described in detail two embodiments of my invention, it will be understood to those skilled in the art that changes and modifications may be made therein without departing from the invention in

its broader aspects. For example, I have described the inner casing of my lamp housing means and the light reflecting means as having generally truncated pyramidal configurations. The present invention is not to be limited to a pyramidal configuration for the light reflector means and the inner casing of the housing, but rather, may take on other configurations without departing from the broad concept of the invention.

I claim:

1. A luminaire for a ceiling comprising, in combination, a housing including a casing supported therein and having inclined opposed walls, a light reflector supported within said casing having inclined opposed walls spaced generally parallel to the inclined walls of the casing and defining a narrow air passage therebetween and about the reflector, said air passage and interior of the reflector being vented through the top of the housing, means for supporting a lighting lamp within the interior of the reflector, said housing also supporting heat creating electrical components which are related to the lighting lamp, said components being located outside of said casing, and the inclined walls of the reflector having spaced openings adjacent the lower larger end thereof for admittance of air to said passage from the reflector interior, air entering the luminaire through the lower larger end of the reflector thereby flowing upwardly in separate paths on both sides of the inclined reflector wall and venting through the top of the luminaire housing in order to remove heat created by the related electrical components as heat from the lighting lamp is removed from the interior of the reflector.

2. The luminaire of claim 1 including means communicating with the top of the housing to effect an air pressure differential therebetween and a space below the housing to establish air flow upwardly through the housing in said separate paths along both sides of the inclined reflector wall.

3. The luminaire of claim 2 wherein said means to effect an air pressure differential includes negative pressure producing means supported by the luminaire housing in communication with said air passage and interior of the reflector.

4. The luminaire of claim 1 wherein the interior of the reflector is vented by openings adjacent the upper end of the reflector and above the lighting lamp.

5. The luminaire of claim 1 wherein the interior of the reflector is vented by spaced openings adjacent the upper end of the inclined reflector wall and the venting of the air passage through the top of the luminaire housing.

6. The luminaire of claim 1 wherein lens means underlie the lower larger end of the reflector and means are provided at the periphery thereof for admittance of air into the interior of the reflector immediately adjacent the lower end of the reflector inclined wall and below the spaced openings therein which admit air to the passage between the inclined walls of the reflector and casing.

7. The luminaire of claim 1 wherein a metallic vapor lamp is supported within the reflector and the heat creating electrical components include ballast means in the circuit of said lamp.

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