June 8, 1965 H. M. LAZERSON 3,187,660

THREE-SHELL CONSTRUCTION FOR COMBINATION VENTILATING AND ILLUMINATING UNITS

Filed Oct. 12, 1961 3 Sheets-Sheet 1

FIG. 1

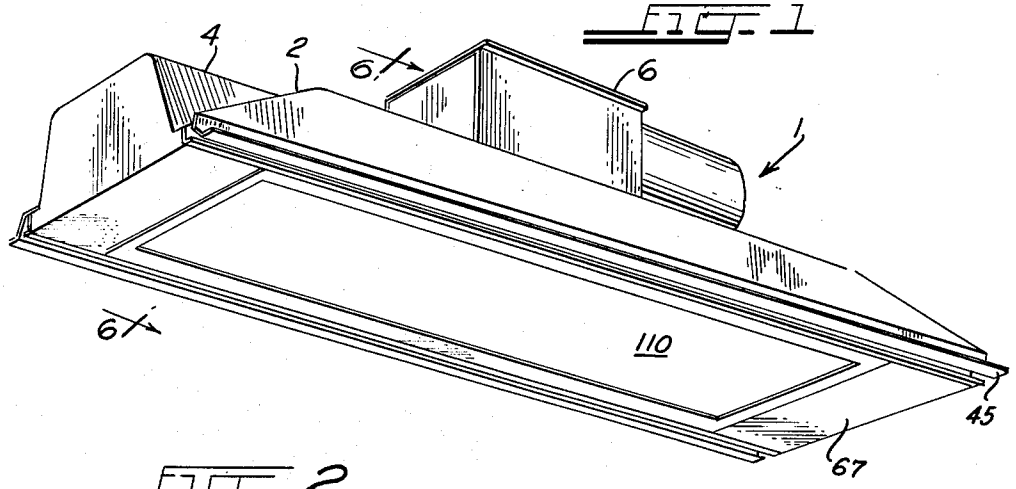

FIG. 2

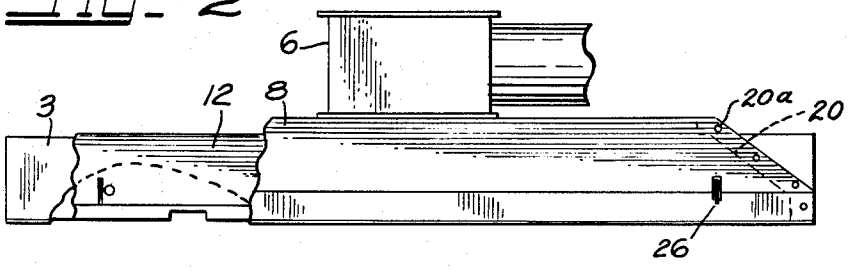

FIG. 3

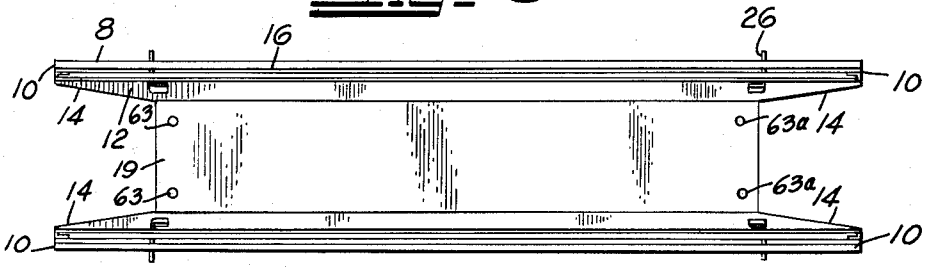

FIG. 1A

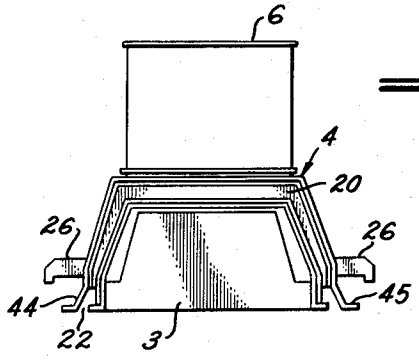

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FIG. 4

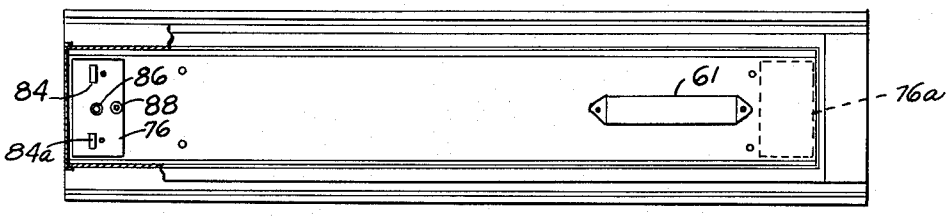

FIG. 5

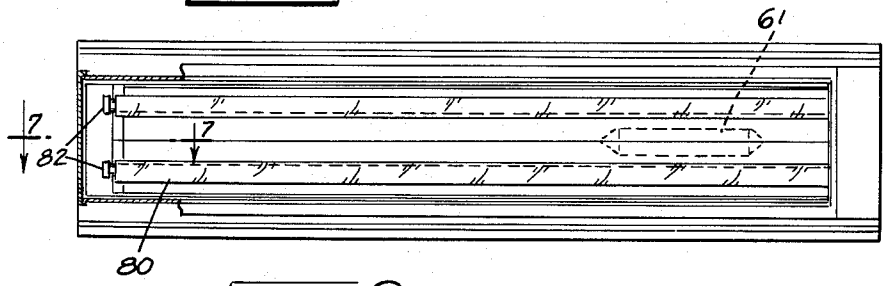

FIG. 6

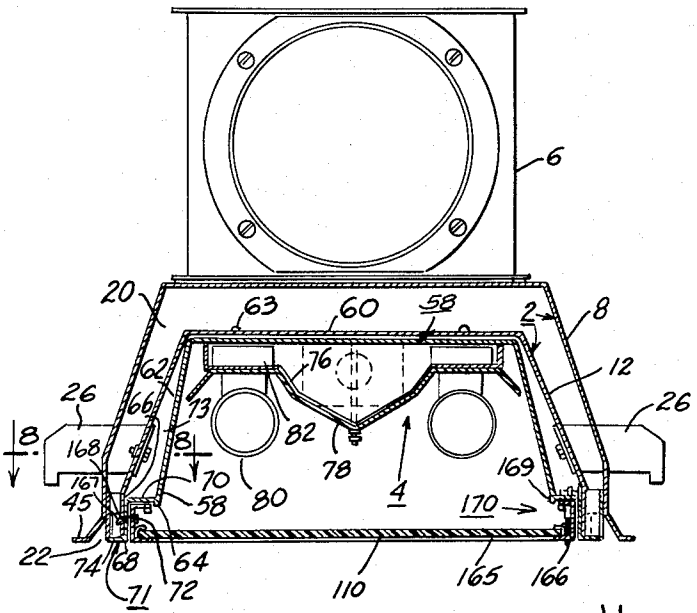

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FIG. 7

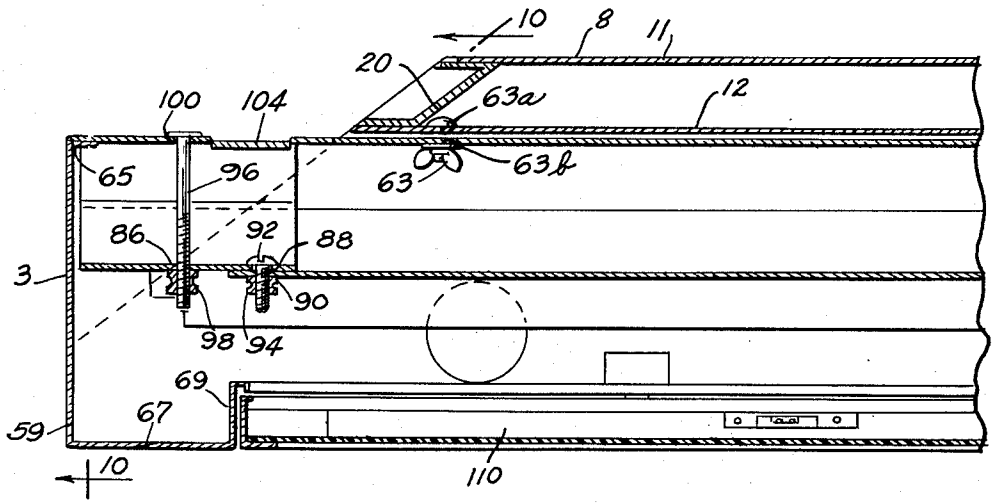


FIG. 8

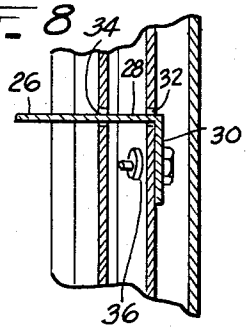


FIG. 9

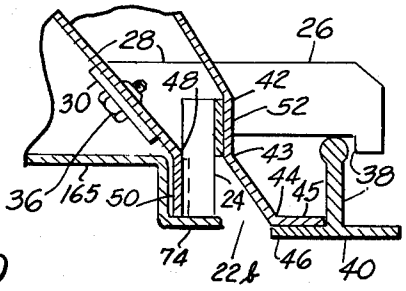
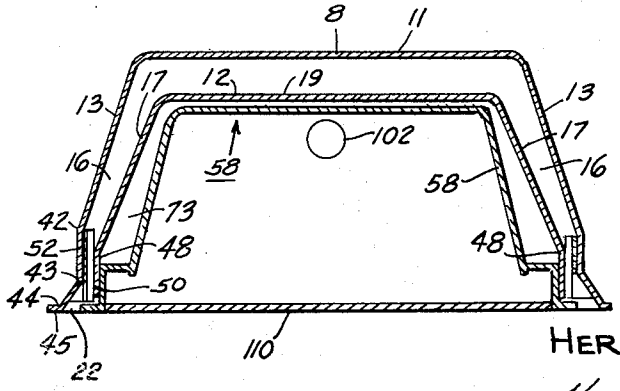


FIG. 10



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3,187,660

THREE-SHELL CONSTRUCTION FOR COMBINATION VENTILATING AND ILLUMINATING UNITS

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Filed Oct. 12, 1961, Ser. No. 144,698
3 Claims. (Cl. 98—40)

The present invention relates generally to combination ventilating and illuminating units and more particularly to a three-shell construction thereof to present detachable troffer and lighting components.

Basically, the subject combination ventilating and illuminating unit comprises an air fixture shaped to receive a light fixture and is made up of an outer shell comprising a sheet of suitably shaped and bent metal and an inner shell comprising a sheet of suitably shaped and bent metal, the two shells being nested one within the other and having a separate channel-like closure member for each end which has flanges affixed to the respective inner and outer shells to seal the ends space between the shells. Additionally, a single air opening to the top surface of the outer shell supplies air into the chamber contained within the unitary air structure for delivery downwardly through both hollow side portions thereof for discharge from each.

In addition to the nested two shell combination which defines the air troffer, a third light housing shell is nested within the two nested air troffer shells and comprises a lighting unit housing, which may be detachably retained within the two nested shells comprising the air troffer.

Architectural standards have necessitated the development of both ventilating and illuminating units which may be flush mounted within a wall or ceiling to afford a generally planar configuration for the recessed units. For obvious reasons of economy, an art has developed for combining both ventilating and illuminating structures into a compacted unitary device capable of coactively performing both ventilating and illuminating functions. For example, reference is made to the construction described in the co-pending application entitled Troffer Construction for Combination Ventilating and Illuminating units, Serial No. 123,511, filed July 12, 1961 now U.S. Patent No. 3,045,577.

As desirable as these unitary structures may be for the consumer, some peculiar problems have arisen in the course of their commercialization. For one thing, the mutual functions of the apparatus may under certain circumstances be antagonistic as, for example, the off-color developed by a fluorescent light emitter which is cooled by ventilating air. Moreover, in the installation of the devices, serious labor difficulties have been encountered in the form of jurisdictional disputes as to whether ventilating or electrical craftsmen are to perform the installation, since a combination unit of the type described often falls within both of their respective domains.

However, the present invention obviates these difficulties by the provision of a novel three-shell nested assembly, the outer two shells of which define an air troffer and the inner shell of which defines a lighting unit housing. The respective shells are peculiarly arranged and designed to afford a composite light and air fixture which has a minimum of interconnections so that the maximum of insulation can be obtained therebetween and so that the respective craftsmen can install first the air unit and then the nested light unit to yield the desired composite device without the wasteful jurisdictional difficulties of labor relations.

Thus, a primary object of this invention is to provide a combination ventilating and illuminating unit which is characterized by a minimum of intereffects from the respective functioning of the ventilating and lighting operations.

Also, an object of this invention is to provide such a combination unit the components of which may be installed severally so as to avoid jurisdictional disputes among the installing mechanics.

Another object of this invention is to provide the combination unit with a design such that the wiring for the lighting components can be installed within the lighting housing without in any way interfering with the installed troffer unit.

A related object of this invention is to provide a simple and expeditious wiring system for combination ventilating and illuminating units.

These and other objects, advantages, and features of construction will hereinafter become apparent from consideration of the following detailed description of an illustrative and exemplary embodiment of the invention, as shown in the accompanying drawings, in which:

FIG. 1 is perspective view from below of a three-shell combination ventilating and illuminating unit embodying the concepts of this invention;

FIG. 1A is an end view of the unit shown in FIG. 1;

FIG. 2 is a front elevational view, partially broken away, of the unit shown in FIG. 1;

FIG. 3 is a bottom plan view of the troffer subassembly which comprises the two outer shells;

FIG. 4 is a similar view showing the lighting unit subassembly installed within the troffer and partially broken away to show details of construction;

FIG. 5 is a view similar to FIG. 4 showing the lighting elements and light reflector installed in place;

FIG. 6 is a sectional view taken along the line **6—6** of FIG. 1;

FIG. 7 is an enlarged fragmentary sectional view taken along the line **7—7** of FIG. 5;

FIG. 8 is an enlarged fragmentary sectional view taken along the line **8—8** of FIG. 6 and showing the details of attachment for the ceiling mounting brackets;

FIG. 9 is an enlarged sectional view corresponding to the lower right hand portion of FIG. 6; and

FIG. 10 is an oblique sectional view taken along the line **10—10** of FIG. 7.

As shown in the drawings, the novel three-shell combination unit **1** is seen to comprise an inverted trough-shaped air troffer **2**, a trough-shaped lighting unit **4** disposed within the trough of the troffer, and an air supply damper box **6** above the troffer.

The troffer **2** comprises an inverted trough-shaped outer shell **8** having open ends **10**, a top wall **11**, and side walls **13** extending downwardly therefrom. A similar inverted trough-shaped inner shell **12** having open ends **14**, a top wall **19**, and side walls **17** is nested within the outer shell **8** to define air passages **16** therebetween. In the preferred embodiment of the invention, each shell **8, 12** has a trapezoidal cross section in the transverse direction as defined by the area encompassed by the projection of the open ends **10, 14** onto a plane transversely perpendicular to the unit **1** and a trapezoidal cross section in the longitudinal direction as defined by the area encompassed by the projection of the side walls **13, 17** onto a plane longitudinally perpendicular to the unit **1**.

The outer shells **8, 12** may be aligned in spaced nested juxtaposition by spacing elements (not shown) suitably placed between the shells to provide an overall rigidity to the structure. However, in many instances, the end plates **20** which are suitably fashioned plates positioned between the shells **8, 12** at the respective ends thereof, can constitute the desired spacing means. The end plates

20 may be welded or mechanically secured by means of sheet metal screws 20*a* in position to seal off the air passages 16 defined between the shells 8, 12 so that the air supply from the damper box passes into the region between the shells 8, 12 and out of the troffer 2 via the discharge ports 22, which extend longitudinally usually along the entire length of the troffer 2.

As best seen in FIG. 9, Z-bars 24 are provided between the shells 8, 12 adjacent the discharge ports 22 to position the spaced shells in a rigidifying and minimum air obstructing fashion, as described in the aforementioned co-pending application, now U.S. Patent No. 3,045,577.

Mounting brackets 26 are provided for retaining the troffer 2 within a recess in a ceiling so that a substantially flush mounted appearance is presented. The brackets 26 are shown to comprise a bar 28 and a flange 30, perpendicular thereto. The bar 28 extends through aligned receiving slots 32, 34 of shells 8, 12 respectively, and the flange 30 is connected to the inner shell 12, as by a nut and bolt fixture 36. The bar 28 is also provided with a detent 38 for engagement with a suitable bearing support in the ceiling structure, as for example the T-bar 40.

It is desirable to provide the side walls 13 of the outer shell 8 with suitable bends, such as 42, 43, and 44 so that extension flange 45 will be defined adjacent the discharge ports 22. The flanges 45, as best seen in FIG. 9, may extend adjacent the leg 46 of the T-bar 40, so that the desired flush mounted appearance is achieved.

The side walls 17 of the inner shell 12 may likewise be provided with a bend 48 so that extension flanges 50 are defined substantially parallel to portion 52 of outer side walls 13, defined between bends 42 and 43 thereof. This fashioning and appropriate bending of the respective side walls 13, 17, along with the positioning of the Z-bars 24, provides the unique flush-mounted directionally oriented air discharge pathways, as explained in detail in the aforementioned co-pending application, now U.S. Patent No. 3,045,577. FIGURE 7 of applicant's co-pending application No. 123,511, now U.S. Patent No. 3,045,577 illustrates the hinge and latch means utilized in the subject or instant application.

The lighting unit 4 comprises a third trough-shaped shell housing 58 having a top wall 60, side wall 62, and end plates 59, the said shell housing 58 being adapted for nesting within the nested shells 8, 12. The shell housing 58 is nested within nested shells 8, 12 via wing nut assemblies 63 positioned axially through corresponding apertures 63*a* of inner shell 12 and 63*b* of shell housing 58.

The side walls 62 of shell housing 58 extend downwardly and outwardly from the top wall 60 thereof and are formed with suitable bends 64, 66 and 68 to present the Z-shaped end portions 71, which comprise flanges 70, 72, and 74. The portions 71 are adapted for adjacent positioning to inner shell 12 by contiguous contact of extension flanges 50 of inner shell 12 with flanges 72 of Z-shaped portions 71, such that the flanges 74 of Z-shaped portions 71 lie substantially in the same plane as extension flanges 45 of outer shell 8 to define the flush mounted air discharge ports 22 therebetween.

As shown in FIGS. 6 and 10, the depending side walls 62, 17 of shells 58 and 12 may respectively extend downwardly and outwardly from the top walls 60, 19 at different angles so as to define the generally triangular insulation chambers 73 therebetween when the shell housing 58 is nested within the nested shells 8, 12.

The end plates 59 for the shell housing 58 are provided with perpendicular flanges 65, 67 and 69 so as to define a generally channeled configuration for the end plates 59 for suitable positioning and fastening within the shell housing 58. The flanges 67 may serve as an overlap to obscure the lighting attachments within the lighting unit 4, as shown in FIGS. 1 and 7. The flanges 69 serve, along with the flanges 74 of the Z-shaped portions 71, to define the exposed perimeter of the lighting unit 4 and to house the light panel 110 therebetween.

FIG. 6 shows the light panel 110 of lighting unit 4 hingedly mounted on the shell housing 58. Light panel 110 comprises a glass plate 165 mounted in a peripheral frame 166. One of the longitudinal side portions of frame 166 contains a pair of hinges 167 that are arcuate in shape and are constructed for insertion through two pairs of aligned slots 168, one pair being in the vertical flange 72 of a Z-shaped portion 71 of shell housing 58, and the other pair being in a mounting strip 169 attached to the inner surface of the vertical flange 72. Hinges 167 engage vertical flanges 72 in hook fashion to hingedly mount light panel 110 on the troffer. The opposite longitudinal side portion of frame 166 carries a pair of conventional latches indicated generally at 170, each of which extends through a slot (not shown) in another mounting strip 169 attached to the other vertical flange 72 of a Z-shaped portion 71 of shell housing 58, thereby to detachably engage the mounting strip 169.

The lighting unit 4 contains a lighting element in the form of fluorescent tubes 80 carried by tube sockets 82 which are mounted on the support plates 76, 76*a* via the slots 84, 84*a* therein. The plates 76, 76*a* are disposed at either end of the light unit 4 and are interconnected via mutual attachment to reflector plate 78, by means of the slots 90 of reflector plates 78 aligned with the slots 88 of support plates 76, with bolts 92 axially aligned therethrough and nuts 94 retaining the bolts 92 in position.

A ballast 61 is electrically connected to flourescent tubes 80 through tube sockets 82 in a well known manner, the ballast 61 being suitably attached to the reflector plate 78, as seen in FIG. 4. A source of electrical energy (not shown) is also electrically connected to the ballast and tube socket whereby the lighting element may be energized.

The combined plates 76, 76*a*, and 78 are maintained within shell housing 58 by nuts 98 and bolts 96 axially aligned through apertures 100 of top wall 60 of third shell 58 and corresponding apertures 86 of support plates 76, 76*a* at either end of the light unit 4. The reflector plate 78 is thus located within shell housing 58 in spaced relation to top wall 60 thereof and in proximate relation to side walls 62 thereof between the top wall 60 and the flourescent tubes 80. The reflector plate 78 functions to reflect both visible and invisible radiant energy downwardly and away from the air chamber defined between the top walls 11 and 15 of outer shell 8 and inner shell 12 respectively, and the reflector 78 further serves to physically isolate the environs adjacent the flourescent tubes 80 from the environs between top wall 19 of inner shell 12 and the reflector plate 78. Thus, an insulating layer of relatively static air is formed between the top wall 19 and reflector plates 78 whereby heat transfer is minimized between the troffer unit 2 and the lighting unit 4.

In addition to the insulating features achieved by the mounting of the lighting element as described, the static insulating chambers 73, located between inner shell 12 and shell housing 58, provide an additional strata of dead insulating space between the lighting unit 4 and the air passages 16 of the troffer 2. This insulating space may comprise air, or a specific insulating material such as asbestos, glass fiber, or the like may be placed within the chamber 73 to effect the desired insulation. By the use of such a structure, any electric light emitter such as electric light bulbs or flourescent tubes included within the inner space defined by the lighting unit 4 is not subjected to the cooling effect of direct contact with the air which is caused to flow through the air passage, which cooling effect is of course greatest when the air being discharged comprises cooled air for the usual room-cooling or air-conditioning purposes. This cooling effect may be disadvantageous to many types of light emitters, but it is most pronounced for flourescent tubes, which

are readily cooled to such an extent that the amount of color composition, or both, of the emitted light is adversely affected to a great and readily observable degree.

The air supply damper box **6** is of conventional construction and is attached to the outer shell **8** in a well known manner for supplying air to the air passages **16**.

It is apparent that a very simple operation is required for detachably mounting the lighting unit **4** within the troffer **2**. After the ventilating craftsmen have completed their installation of the troffer **2** within a suitable recess in a ceiling, an electrician need only connect the shell housing **58** to the inner shell **12** by appropriately fastening the wing nut assemblies **63** through the aligned slots **63***a*, **63***b* of the respective shells. The lighting element is then installed within the shell housing **58** by attachment of the bolts **96** through the aligned slots **100**, **96** of shell housing **58** and support plates **76** respectively. Where desired, the wing nut assemblies **63** may be dispensed with, as by providing an additional aligned aperture (not shown) in the top wall of inner shell **12** for axial alignment of the bolts **96**. In this modification, the bolts **96** would simultaneously interconnect the plate assembly **76**, **76***a* and **78** with the shell housing **58** and the inner shell **12**. In either modification the lighting unit **4** is detachably mounted within the troffer **2** such that it may conveniently and expeditiously be installed or removed relative to the installed troffer **2**.

The end plates **59** and the top wall **60** of shell housing **58** are provided with electrical knock-out plugs **102** (FIG. 10) and **104** (FIG. 7) respectively, so that the electrician has the option of leading his wire connections through the nested shells either from the end or through the top.

In the preferred embodiment of the three-shell composite unit structure, the troffer **2** is constructed with a trapezoidal cross section in the longitudinal direction, the area of which is less than the area of the corresponding cross section in the longitudinal direction of the nested lighting unit **4**. For example, as best seen in FIG. 1, the lighting unit **4** may have a generally rectangular cross section in the longitudinal direction which has an area greater than the generally trapezoidal cross section in the corresponding longitudinal direction of the troffer **2**. In short, a profile view of the composite ventilating and illuminating units reveals that the troffer is sloped about 45 degrees from a point near the bottom of the fixture all the way to the top.

This construction greatly facilitates the separate installation of the air and the light fixtures in that the elecrician can make his wiring connections from either the end or the top of the lighting unit without in any way interfering with the air fixture, as would be the case if the air fixture were the same length as the light fixture, as in conventional practice.

Moreover, the minimum of interconnection between the light and the air fixtures and the fact that the air-handling structure is complete within itself insure that the shell or formed sheet which comprises the main body of the light fixture can be very nearly out of contact at all points with the inner shell of the air fixture and thus provide an insulating space between them, the underlying purpose being to insure that there is insufficient heat transference between the light fixture and the air fixture so as to avoid any adverse cooling effect on the lighting elements contained within the light fixture.

There has thus been shown an air fixture which is entirely complete within itself and which is installable as an air fixture with or without a light fixture, the light fixture being installable within the workable air fixture by the use of screws which fasten it into place by attaching it directly to the previously installed air fixture without making any alteration whatsover in the air direction or delivery through the air mixture. It is to be expressly understood that the embodiment shown and described herein is merely illustrative of one of the many forms which the present invention may take in practice without departing from the scope of the invention as defined in the appended claims. The invention claimed is:

1. A three-shell combination ventilating and illuminating fixture comprising a self-contained two-shell ventilating troffer adapted to receive a single third shell illuminating unit therein in nesting relation therewith, said fixture comprising:

a trough-shaped first shell having open ends;

a trough-shaped second shell having open ends and disposed in nesting relation within said first shell to define air passages therebetween,

each of said first and second shells having a substantially rectangular top wall,

a pair of inclined trapezoidal wall portions extending downwardly and outwardly from a first pair of respective opposite side edges of each of said rectangular top walls,

and a pair of vertical wall portions each extending downwardly from the lower extremity of each of a respective said inclined trapezoidal wall portions of each of said first and second shells and terminating in a plane common with the surface of a ceiling to form an air outlet between said first and second shells;

a pair of generally vertically disposed sheet-like yoke-shaped spacing members defining end walls of said air passages between said first and second shells, each said spacing members located adjacent a second pair of respective opposite side edges of each of said rectangular top walls of said nesting first and said second shells and constituting end plates of said ventilating troffer to close the open ends of said first and second shells and to seal off the air passage defined between the ends of said first and second nested shells;

means connecting said spacing members to each of said nesting first and second shells;

comprising Z-shaped spacing members between said vertical wall portions of said first and second shells to provide an air channel between said vertical wall portions of said first and second shells communicating with said air passage between said first and second shells,

each said Z-shaped spacing member having a first flange abuting a respective said vertical wall portion of said first shell,

a second flange abutting a respective said vertical wall portion of said second shell,

and a web extending between said first and second flanges;

duct means on said first shell for receiving an air supply such that air introduced therethrough into the air passage and communicating air channel between the nested first and second shells is directed outwardly and downwardly to exit from the troffer to constitute said first and said second shells a ventilation troffer;

a third shell disposed in said second shell of said troffer in nesting relation therein;

third shell mounting means on said ventilation troffer for supporting said third shell in said nesting relation within said ventilation troffer;

said third shell having a substantially rectangular top wall, and having substantially rectangular side wall portions each inclined to extend downwardly and outwardly from opposed edges of said last-mentioned top wall;

a pair of end walls each located at a respective opposite end of said top wall of said third shell of said fixture,

each said end wall having a peripheral configuration

conforming substantially to the cross-sectional configuration of said third shell,

means on said third shell for accommodating a lighting element to constitute said third shell an illuminating unit.

2. A combination ventilating and illuminating fixture as recited in claim 1 wherein said third shell is detachably retained on said second shell.

3. A combination ventilating and illuminating fixture as recited in claim 1 wherein said third shell disposed in said second shell defines insulating passages therebetween, and wherein insulation is positioned in said passages.

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