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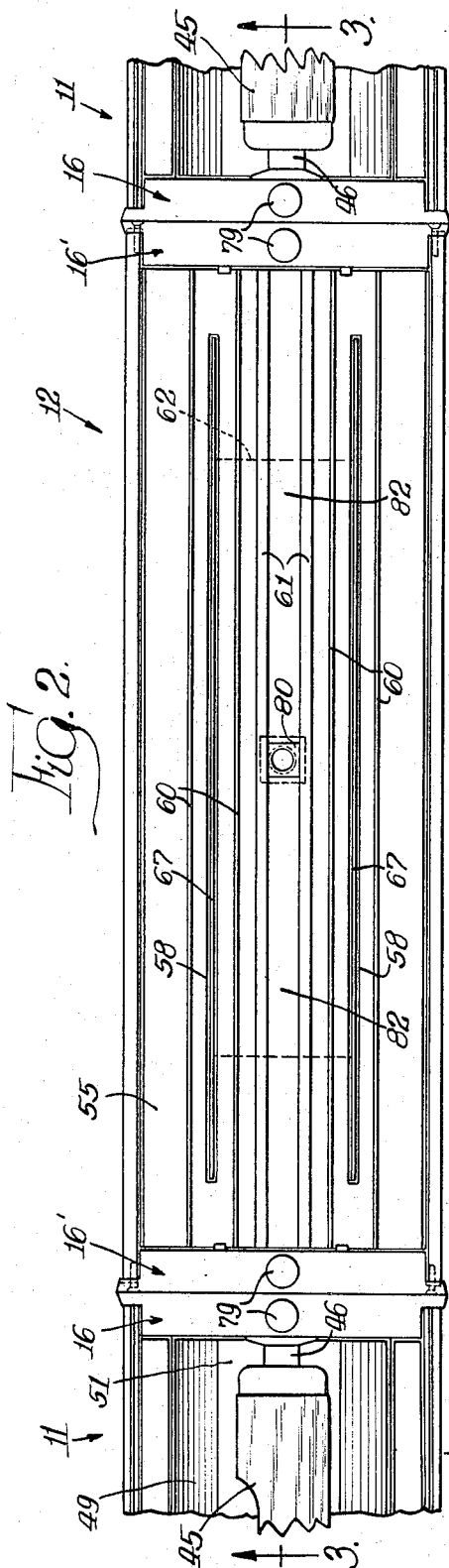
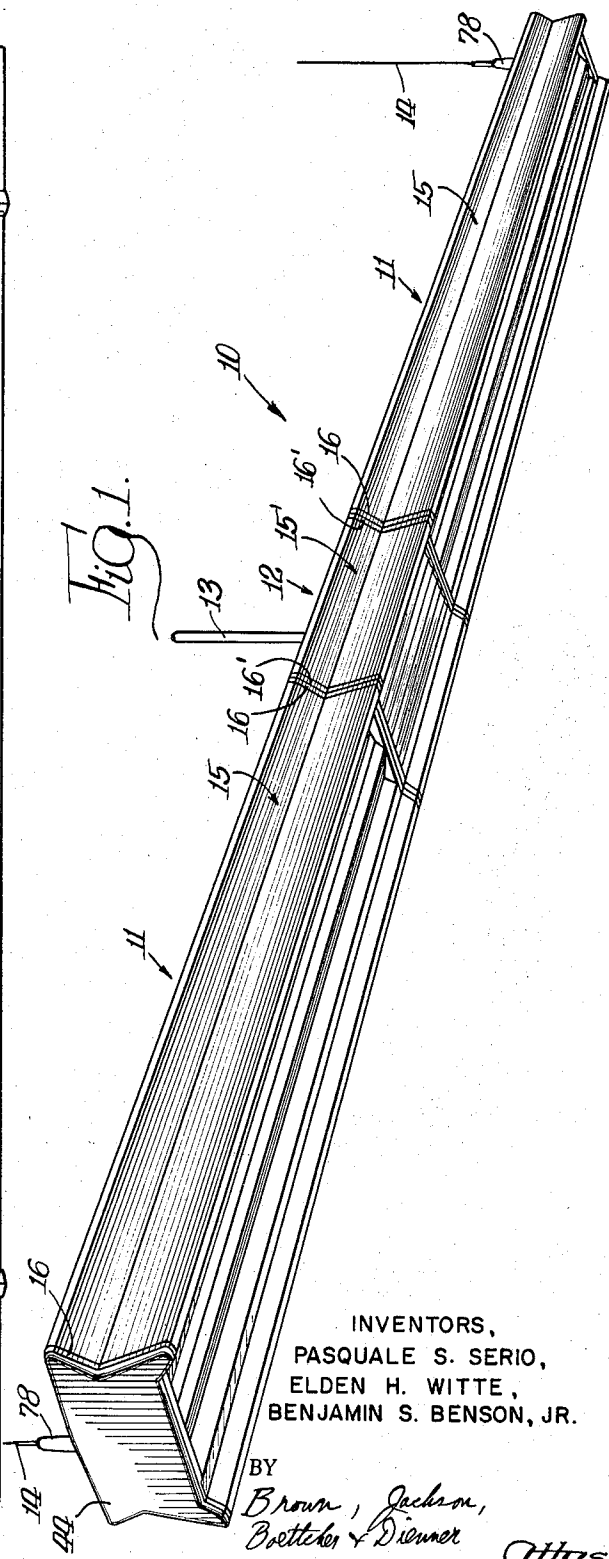
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POWER UNIT ASSEMBLY FOR FLUORESCENT LIGHTING SYSTEM

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2 Sheets-Sheet 1



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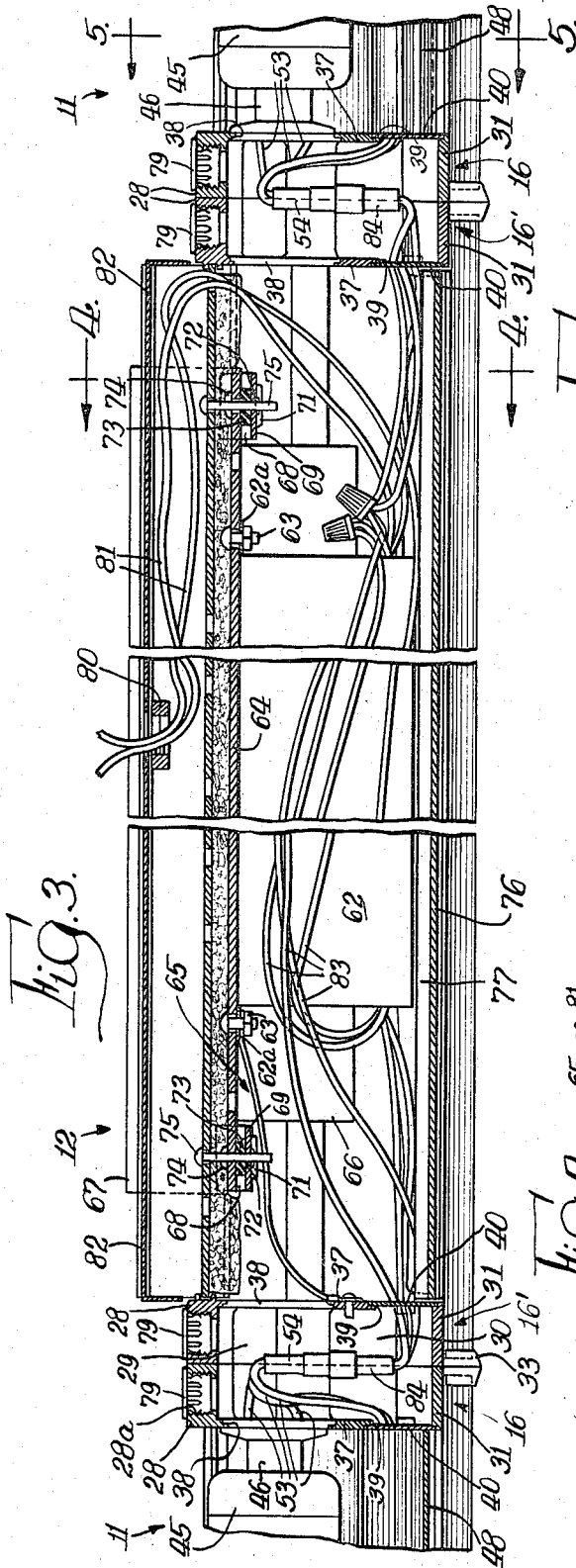
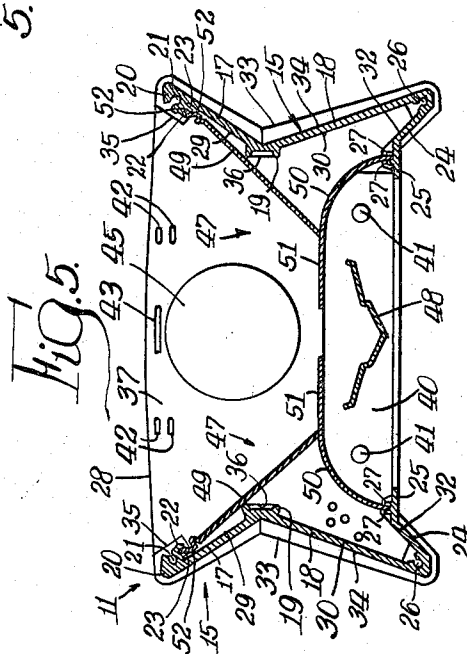
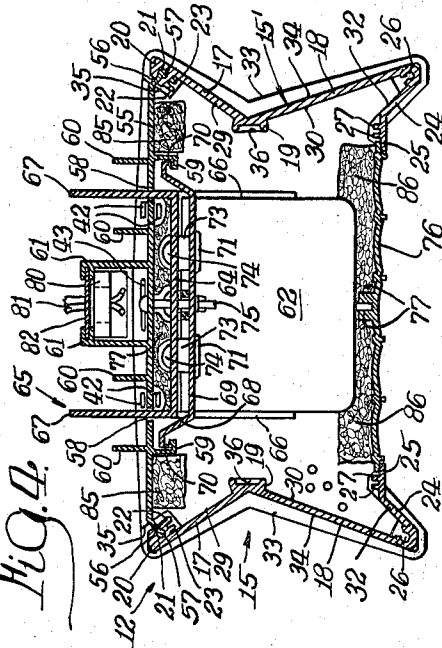
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## POWER UNIT ASSEMBLY FOR FLUORESCENT LIGHTING SYSTEM

Pasquale S. Serio, Prospect Heights, and Elden H. Witte, Wauconda, Ill., and Benjamin S. Benson, Jr., New Haven, Conn., assignors to Thomas Industries Inc., Louisville, Ky., a corporation of Delaware  
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6 Claims. (Cl. 174-52)

Our present invention relates generally to fluorescent lighting systems, and, more particularly, to a power unit assembly for use in connection with such systems.

In the operation of a fluorescent lamp, it is necessary to connect in the circuit therewith a ballast. According to present practices, the ballast is mounted directly and rigidly to a supporting structure adjacent the fluorescent lamp. Now when a ballast is electrically energized vibrations are set up therein which cause an emission of distractive sound. This sound is intensified by the rigid mounting of the ballast. That is, since the amount of surface radiating sound is increased by the supporting structure, the volume or amplitude of the sound is correspondingly increased. As a consequence, this type of mounting for a ballast has undesirable sound characteristics. Moreover, in general the intensity of the vibrations and of the resultant sound varies in proportion to the capacity of the ballast. Thus, as the capacity of the ballast is increased, the level of sound becomes increasingly objectionable.

For aesthetic reasons, the necessary ballast is usually enclosed, and may, for example, be mounted within the lighting fixture housing or within a separate power unit housing. Upon electrical energization of the ballast heat is generated thereby. The concentration of heat about the ballast within its enclosing housing has an injurious effect upon the ballast itself and adjacent components. Existing ballast enclosures have proved unsatisfactory in dissipating heat generated therewithin and thus have undesirable thermal characteristics. As will be readily appreciated, the more complete the enclosure of the ballast the greater will be the intensity of heat concentration.

It is a primary object of our present invention to provide improved mounting and enclosure means for a fluorescent ballast which will obviate the afore-noted disadvantages of existing mounting and enclosure means and thus promote satisfactory sound and thermal operation of the ballast.

It is another object of our present invention to provide mounting means for a fluorescent ballast which will maintain the ballast out of direct contact with its supporting structure so as to prevent the latter from increasing the area of surface radiating sound caused by vibrations of the ballast.

It is still another object of our present invention to provide resilient mounting means for a fluorescent ballast which will substantially dampen the vibrations of the ballast and thus minimize the level of sound caused by such vibrations.

It is a further object of our present invention to provide sound absorbing material within the ballast enclosure for absorbing sound emitted from the ballast.

It is a still further object of our present invention to provide a ballast and an enclosure therefor wherein frame means is secured to the ballast and has projections extending through the enclosure for dissipating heat developed by the ballast.

A still further object of our present invention is to provide a ballast and an enclosure therefor with the enclosure being formed with exterior projections for dissipating heat developed within the enclosure.

Now in order to acquaint those skilled in the art with the manner of constructing and using fluorescent lighting

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systems in accordance with the principles of our present invention, we shall describe in connection with the accompanying drawings, a preferred embodiment of our invention.

In the drawings:

FIGURE 1 is a perspective view of one form of fluorescent lighting system embodying the principles of our present invention;

FIGURE 2 is a partial plan view, on an enlarged scale, of the central portion of the fluorescent lighting system of FIGURE 1;

FIGURE 3 is a longitudinal sectional view, on a still further enlarged scale, taken substantially along the line 3-3 in FIGURE 2, looking in the direction indicated by the arrows;

FIGURE 4 is a transverse sectional view taken substantially along the line 4-4 in FIGURE 3, looking in the direction indicated by the arrows; and

FIGURE 5 is a transverse sectional view taken substantially along the line 5-5 in FIGURE 3, looking in the direction indicated by the arrows.

Referring now to FIGURE 1, there is indicated generally by the reference 10 one form of lighting system embodying the principles of our present invention. The lighting system 10 comprises a pair of lighting fixture units 11 interconnected in longitudinal alignment by a central power unit assembly 12. The fixture and power units 11 and 12 are adapted to be suspended from the ceiling of a room by means of a central tube 13 and outer cables 14.

As shown in FIGURES 1 and 2, each of the lighting fixture units 11 comprises a housing having a pair of laterally spaced longitudinally extending side panel members 15 and a pair of transverse end members 16, and the power unit assembly 12 comprises a housing having a pair of side panel members 15' and a pair of end members 16'. To provide a lighting system 10 having a pleasant aesthetic appearance and to permit standardization of parts, the side panel members 15 and 15' preferably are identical in cross-sectional configuration and differ in length only, while the end members 16 and 16' preferably are identical in both size and shape.

Each of the several side panel members 15 and 15', as shown in FIGURES 4 and 5, has a re-entrant side wall comprised of inwardly inclined upper and lower portions 17 and 18, and an intermediate horizontal generally C-shaped reinforcing rib 19. Extending along the upper edge of the upper panel portion 17 is an inwardly facing flange portion 20 which is formed with a keyhole slot 21 open along one side in an inclined upward direction, and with a pair of ridges 22 and 23 projecting downwardly in an inclined direction parallel to the upper panel portion 17. The ridge 22 is preferably formed with a longer profile in cross section than the ridge 23. Extending along the lower edge of the lower panel portion 18 is an upwardly inclined wall portion 24 to which is joined along the upper edge an inwardly directed horizontal support ledge 25. Formed along the right portion of the junction of the wall portions 18 and 24 is a keyhole slot 26 which is open along one side in an inclined upward direction, and formed along the upper surface of the support ledge 25 are a pair of parallel vertical ridges 27.

Each of the several end members 16 and 16', as shown in FIGURES 3, 4 and 5, is comprised of a transverse upper wall portion 28, re-entrant side walls each with inwardly inclined upper and lower portions 29 and 30, a transverse lower wall portion 31, and inclined wall portions 32 interconnecting the inclined wall portions 30 with the lower wall portion 31. The transverse upper wall portion 28 is formed with a central threaded opening 28a. Each end member 16 and 16' is further provided at each side with a marginal flange portion 33 that extends along the one edge of the wall portions 29, 30 and 32. The mar-

ginal flange portions 33 are suitably recessed along their entire lengths as at 34 to receive the one ends of said panel members 15 or 15'. In this connection, suitable recesses 35 and 36 are also formed in the re-entrant side wall portions of the end members 16 and 16' for accommodating, respectively, the flanged portions 20 and the re-enforcing ribs 19 of side panel members 15 or 15'. The end members 16 and 16' each further include a transverse vertical wall portion 37 having formed therein a central generally circular opening 38 and a lower generally oblong opening 39. The oblong opening 39 is adapted to be substantially closed by a closure plate 40 removably held in position by means of fasteners 41 frictionally engageable with suitable openings in a stationary portion of the end member. The vertical wall portions 37 of the end members 16 and 16' are each provided adjacent the upper end thereof with two pairs of vertically spaced lugs 42 and an intermediate abutment 43.

From the foregoing description, it will be appreciated that each of the fixture and power units 11 and 12 is comprised of a housing having a pair of side panel members 15 and 15' and a pair of end members 16 and 16'. In assembled relation, the ends of the side panel members 15 and 15' are received in the marginal flange recesses 34 of the adjacent end members 16 and 16' respectively, with the side panel flange portions 20 and side panel re-enforcing ribs 19 fitting, respectively, in the recesses 35 and 36 of the re-entrant sides of the end members. To maintain the side panel members 15 and 15' in assembled relation with the adjacent end members 16 and 16', suitable screws (not shown) may be inserted through the end members and threaded into the ends of the circular portions of the keyhole slots 21 and 26 of the side panel members. The lighting fixture units 11 and the power unit assembly 12, in turn, may be secured in longitudinal alignment to form a lighting system 10 by suitably bolting together the adjoining pairs of end members 16 and 16'. As shown at the left end of FIGURE 1, the outboard end members 16 of the lighting fixture units 11 are preferably enclosed by suitable end closure plates 44.

As illustrated in FIGURES 3 and 5, each lighting fixture unit 11 is provided with a single longitudinally extending fluorescent lamp or tube 45 which is removably retained at its ends in lamp holders 46 suitably mounted in the openings 38 of the end members 16. The lighting fixture units 11, along their top sides, are open and, along their undersides, may be provided with light diffuser means or light reflecting baffles, or both, to control the relative proportion of light that is directed upwardly and downwardly. In the specific embodiment of light fixture unit 11 shown in the drawings, there is employed light reflecting baffle means consisting of a pair of side reflecting baffles 47 and a lower generally V-shaped reflecting baffle 48.

Each side reflecting baffle 47 has an inclined upper wall portion 49, a lower arcuate wall portion 50 and an intermediate lateral wall portion 51. The lower edge of the arcuate wall portion 50 is received between the vertical ridges 27 on the support ledge 25 of the adjacent side panel member 15, and the upper edge of the upper wall portion 49, which is preferably formed with a longitudinal side flange portion 52, is received within the space between the upper wall portion 17 and the ridge 22 of the adjacent side panel member 15. During assembly of the side reflecting baffle 47, the lower edge of the arcuate wall portion 50 is first disposed between the vertical ridges 27, and then the upper wall portion 49 is pressed slightly downwardly until the flange 52 snaps into position behind the ridge 22 engagement with the ridge 23. With the side reflecting baffles 47 in assembled position, the lateral wall portions 51 lie in spaced relation immediately below the lamp 45. The V-shaped reflecting baffle 48 lies immediately below the longitudinal opening defined by the edges of the lateral wall portions 51 of the side baffles 47, and the ends of the baffle 48 are suitably secured by means of

projecting lugs or the like to the closure plates 40 of the associated end members 16. It will be understood that the reflecting baffles 47 and 48 of each fixture 11 are substantially coextensive in length with the longitudinal distance between the vertical walls 37 of the end members 16. Due to the provision of the baffles 47 and 48 beneath the lamps 45, and because the light fixtures 11 are spaced from the ceiling, the ceiling itself acts as a light reflector for most of the light emitted by the lamps 45. In this manner the light is diffused for an optimum visual environment. Also, since the lighting fixture units 11 are open along their top sides, the lamps 45 may be easily installed and replaced from above. In addition, air is permitted to flow up through the longitudinal openings in the light fixtures defined by the edges of the lateral wall portions 51 of the side baffles 47 and around the lamps 45. Thus, the temperature of the lamps 45 is maintained at maximum operating efficiency and dust accumulation is minimized.

As shown in FIGURE 3, each of the lamp fixtures 11 is provided with suitable electrical conductors 53. The conductors 53 are secured, at their one ends, to the terminals of the lamp holders 46, and, at their other ends, in a pin connector plug 54 arranged to lie within the confines of the adjacent pair of end members 16 and 16'. The two conductors 53 of each lamp fixture 11, which connect with the lamp holder 46 at the end of the fixture remote from the power unit assembly 12, are preferably arranged to extend lengthwise of the fixture through the space provided between one of the side panel members 15 and the adjacent side reflecting baffle 47. The pin connector plugs 54 serve to electrically connect the fluorescent lamps 45 with the intermediate power unit assembly 12 in a manner to be more fully described hereinafter.

Having completed a description of the lighting fixture units 11, we shall now describe the construction and operation of the power unit assembly 12. Referring to FIGURES 2, 3 and 4, it will be seen that the housing of the power unit assembly 12 comprises, in addition to the side panel members 15' and end members 16', a top wall 55. The sides of the top wall 55 are inclined downwardly as at 56 and along the outer edges thereof are formed with longitudinally extending bead portions 57 which are received in the keyhole slots 21 of the adjacent side panel members 15'. The ends of the top wall 55 are received between the respective pairs of lugs 42, and lie below the abutments 43, of the end members 16'. The top wall 55 is formed with a pair of transversely spaced longitudinally extending narrow parallel slots 58, and is provided with a pair of depending longitudinally extending transversely spaced L-shaped flange members 59. The top wall 55 is also provided with a plurality of vertically upwardly extending longitudinal fin members 60 and a pair of vertically upwardly extending generally F-shaped longitudinal flange member 61.

Disposed within the confines of the housing of the power unit assembly 12 is a conventional fluorescent ballast 62 having mounting feet 62a at its opposite ends. The mounting feet 62a are suitably secured, as by means of screw and nut assemblies 63, to the central horizontal wall portion 64 of a longitudinally extending generally H-shaped frame member 65. The lower vertical flange portions 66 of the frame member 65 are arranged to frictionally engage the sides of the ballast 62, while the upper vertical flange portions 67 of the frame member 65 are arranged to project with clearance through the slots 58 in the top wall 55. As will be observed, the horizontal wall portion 64 and the upper vertical flange portions 67 of the H-shaped frame member 65 have a slightly greater longitudinal extent than the lower vertical flange portions 66.

The frame member 65 and the ballast 62 are suspended from the top wall 55 by mounting means comprising a pair of transversely extending strap members 68. Each strap member 68 has a central horizontal depressed portion 69 that underlies the adjacent projecting end of the

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horizontal wall portion of the frame member 65, and turned-down ends 70 that engage and are supported on the flange members 59 of the top wall 55. Formed in the central portion 69 are a pair of laterally spaced pockets 71 and a central aperture 72. Resilient shock dampening members 73 are seated within and supported by the pockets 71 of the strap members 68, and are formed with upper button-end portions 74 that are suitably disposed through openings formed in the horizontal wall portion 64 of the frame member 65.

To restrict relative movement between, and prevent possible resultant damage to, the ballast 62 and the power unit assembly housing during shipment and installation thereof, screws 75 are preferably inserted downwardly through the top wall 55 and the projecting ends of the horizontal wall portion 64 of the frame member 65, and are threaded into the central apertures 72 of the strap members 68. During assembly of the power unit 12, the screws 75 are tightened until the upper surfaces of the ends of the strap members 68 engage the underside of the top wall 55. In this position of the strap members 68, the turned-down ends 70 are maintained out of contact with the flange members 59 of the top wall 55, and the mounting of the ballast 62 is substantially rigidified. At the time of installation of the power unit 12, the screws 75 are removed and the strap members 68 are permitted to return to their normal positions (FIGURE 4) with their turned-down ends 70 being supported on the flange members 59 of the top wall 55.

The bottom of the housing of the power unit assembly 12 is closed by a removable lower cover member 76 which has central longitudinal upper ribs 77 and which is supported along its sides on the ledges 25 of the side panel members 15'. Removal of the lower cover member 76 may be easily effected by pushing upwardly along one side thereof while shifting the same sidewardly so as to displace the other side from engagement with the adjacent supporting ledge 25, and then withdrawing the tilted cover member 76 downwardly through the opening defined by the edges of the ledges 25. Reinsertion of the cover member 76 to a closing position may be effected by moving it angularly upwardly through the bottom housing opening until the lower edge thereof is above the adjacent supporting ledge 25, and then permitting it to swing downwardly until the respective side bottom edges of the member 76 engage and rest upon the ledges 25. By providing this easily removable lower cover member 76, access may be quickly and conveniently gained to the interior of the power unit assembly housing thus simplifying maintenance of the ballast 62 and the associated electrical wiring.

As previously described, the lighting fixture units 11 and the power unit assembly 12 are adapted to be secured in longitudinal alignment to form a lighting system 10 by suitably bolting together the adjoining pairs of end members 16 and 16', and these joined units are adapted to be suspended from the ceiling of a room by the central tube 13 and outer cables 14 shown in FIGURE 1. More specifically, the outer cables 14 are provided at their lower ends with connectors 78 that are threaded into the openings 28a in the end members 16 remote from the power unit assembly 12. The openings 28a in the adjacent pairs of end members 16 and 16', as shown in FIGURE 3, are closed with plug buttons 79. The lower end of the central tube 13 has a connecting portion (not shown), which is received between the flange members 61 of the top wall 55, and which has threaded thereon a square nut 80 that is retained between the flange members 61 for supporting, in conjunction with the outer cables 14, the lighting system 10.

As shown in FIGURE 3, the ballast 62 is provided with a pair of electrical conductors 81 that extend initially upwardly through an opening in the top wall 55, then generally horizontally between the flange members 61 for approximately half the length thereof, and finally

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upwardly through the support nut 80 and the central tube 13. The conductors 81 at their upper ends are adapted to be connected with a ceiling outlet box. The wire ways defined by the flange members 61 of the top wall 55 are substantially enclosed by a pair of generally L-shaped closure members 82. The long leg portions of the closure members 82 at their sides are slidably received between the lateral projections of the flange members 61 and at their ends terminate short of each other to thereby define an opening through which the connecting portion of the central tube 13 may extend for threading engagement with the support nut 80. The short leg portions of the closure members 82 serve to close the ends of the flange members 61. The ballast 62 is also provided with a series of electrical conductors 83 that have connection with a pair of pin connector sockets 84 one each arranged to lie within the confines of each of the adjacent pairs of end members 16 and 16'. When the pin connector plugs 54 of the lighting fixture units 11 are inserted in the pin connector sockets 84, the fluorescent lamps 45 are electrically connected with the ballast 62.

When the ballast 62 is electrically energized for effecting operation of the fluorescent lamps 45 the normal vibrations of the former are dampened by the resilient mounting means comprising the resilient shock dampening members 73. By dampening vibrations of the ballast 62 in this manner, the level of sound caused by such vibrations is minimized. It is to be also noted that the resilient shock dampening members 73 maintain the ballast 62 and the associated frame member 65 out of direct contact with the enclosing housing. Thus, the vibrations of the ballast 62 are not transmitted directly to the ballast housing where the sound caused by the vibrations would otherwise be amplified as in conventional structures. To further promote quiet operation of the power unit assembly 12, strips of sound absorbing material, such as Fiberglass, are affixed, within the power unit housing. It has been found advantageous to cement or otherwise affix strips of sound absorbing material 85 to the underside of the top wall 55 intermediate of the depending flange members 59 thereof and the side panel members 15', and to similarly affix strips of sound absorbing material 86 to the upper side of the lower cover member 76 at opposite sides of the ribs 77 thereof. Portions of the strips 86 are compressed slightly by the underside of the ballast 62 when the lower cover member 76 is in its normal closing position. Isolation of the ballast 62 within the substantially closed power unit housing, together with the use of resilient mounting means and sound deadening material as described, results in a quietly operating power unit assembly.

During operation of the ballast 62 heat is generated thereby. To prevent an undesirable concentration of heat about the ballast within its enclosing housing, we have provided for the dissipation of heat by the frame member 65 and the fin members 60 of the top wall 55. In the case of the frame member 65, a portion of the heat generated by the ballast 62 is transmitted by conduction from the upper and side walls of the ballast 62 to the horizontal wall portion 64 and the lower vertical flange portions 66. Heat is then conducted through the frame member 65 and is finally dissipated in the air by radiation from the surfaces of the upper vertical flange portions 67 projecting exteriorly of the power unit housing. In the case of the projecting fin members 60, heat developed within the power unit housing and reaching the top wall 55 by convection and radiation is transmitted by conduction through the fin members and is dissipated by radiation from the surface area provided by the fins. It will be appreciated that the rate of radiation may be altered by varying the surface area of the fins 60. The flange members 61 of the top wall 55 also cooperate with the fins 60 in dissipating heat developed with the power unit housing.

The above described mounting and enclosure means for the ballast 62 serves to promote satisfactory sound

and thermal operation of the ballast 62. Moreover, the ballast 62, due to the arrangement of its mounting and enclosure means, operates more quietly with a superior thermal performance than ballasts of comparable rating used in existing fluorescent lighting systems.

To facilitate the manufacture of the basic components of the fixture and power units 11 and 12, the side panel members 15 and 15', the reflecting baffles 47 and 48, the top wall 55, the lower cover member 75, and the H-shaped frame 65 are preferably fabricated by extrusion of the metal such as aluminum; and the end members 16 and 16' are preferably fabricated as die castings of a metal such as aluminum. However, those skilled in the art will readily recognize that the designated components may be fabricated by other methods and of other materials. It will also be appreciated that the principles of our present concerning the mounting of the ballast 62 may be embodied in fluorescent lighting systems having a physical environment other than that specifically disclosed herein. By way of illustration, the power unit assembly 12 may be used in conjunction with lighting fixtures having a style different from that of the fixtures 11, or with lighting fixtures each having more than one fluorescent lamp; and the ballast 62 and mounting means therefor may be enclosed with a housing having a different style, or having a different manner of connection with the light fixtures, than that disclosed herein.

While we have shown and described what we believe to be a preferred embodiment of our present invention, it will be understood by those skilled in the art that various rearrangements and modifications may be made therein without departing from the spirit and scope of our invention.

We claim:

1. A fluorescent lamp power unit assembly comprising a housing having a top wall, ballast means within said housing, a pair of strap member suspended from said top wall transversely of said housing, frame means secured to said ballast means, said frame means extending longitudinally of said housing and having ends overlying said strap members, and resilient means alone interposed between said strap members and the ends of said frame means for supporting said ballast means and for dampening vibrations of the latter.

2. A fluorescent lamp power unit assembly comprising a housing having a generally rectangular top wall, said top wall having at least one longitudinally extending slot formed therethrough, a longitudinally extending frame member, having at least one vertical flange portion, a longitudinally extending ballast within said housing and secured to said frame member, and means for mounting said frame member relative to said housing so that said vertical flange portion projects upwardly through said slot in said top wall for dissipating heat developed by said ballast.

3. A fluorescent lamp power unit assembly comprising a housing having a generally rectangular top wall, said top wall having at least two transversely spaced longitudinally extending slots formed therethrough, a longitudinally extending generally H-shaped frame member, a longitudinally extending ballast within said housing and secured to said frame member in contact with the

lower vertical flange portions thereof, and means for mounting said frame member relative to said housing so that the upper vertical flange portions thereof project upwardly through said slots in said top wall for dissipating heat developed by said ballast.

4. A fluorescent lamp power unit assembly comprising a housing having a top wall, ballast means within said housing, frame means secured to said ballast means, means including unrestrained resilient means for mounting said frame means relative to said housing whereby to dampen vibrations of said ballast means, and said frame means having projections extending through said top wall and unconnected with the latter for dissipating heat developed by said ballast means.

5. A fluorescent lamp power unit assembly comprising an enclosed housing having a top wall, ballast means within said housing, frame means secured to said ballast means, means including unrestrained resilient means mounting said frame means relative to said housing whereby to dampen vibrations of said ballast means, said frame means having projections extending through said top wall and unconnected with the latter for dissipating heat developed by said ballast means, and means within said housing for absorbing sound emitted from said ballast means.

6. A fluorescent lamp power unit assembly comprising a housing having a generally rectangular top wall, said top wall having exterior projecting fins for dissipating heat developed within said housing, said top wall having at least two transversely spaced longitudinally extending slots formed therethrough, a pair of strap members suspended from said top wall, a longitudinally extending generally H-shaped frame member, a longitudinally extending ballast within said housing and secured to said frame member in contact with the lower vertical flange portions thereof, said frame member having ends overlying said strap members, resilient means interposed between said strap members and the ends of said frame member for supporting said frame member and ballast and for dampening vibrations of the latter, and the upper vertical flange portions of said frame member projecting upwardly through said slots in said top wall for dissipating heat developed by said ballast.

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