Jan. 22, 1963 R. R. GIBSON ETAL 3,075,072

FLUORESCENT LIGHTING FIXTURES

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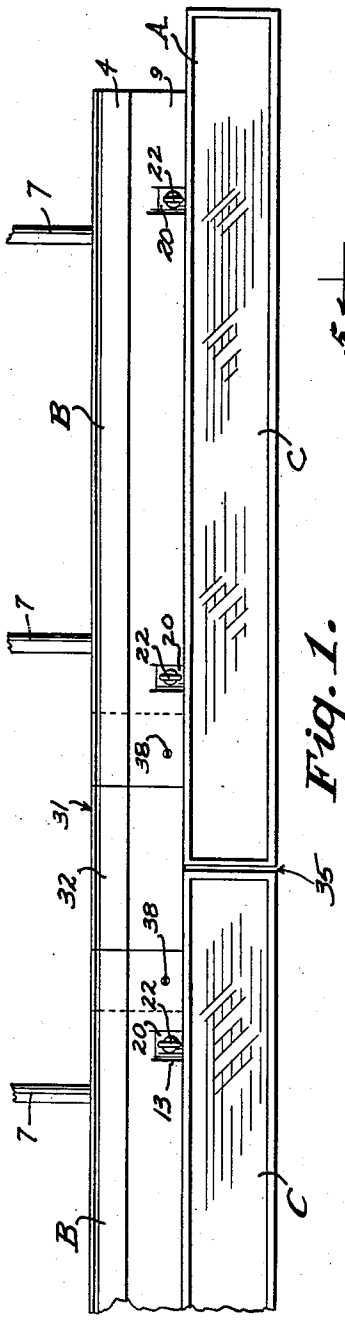


Fig. 1.

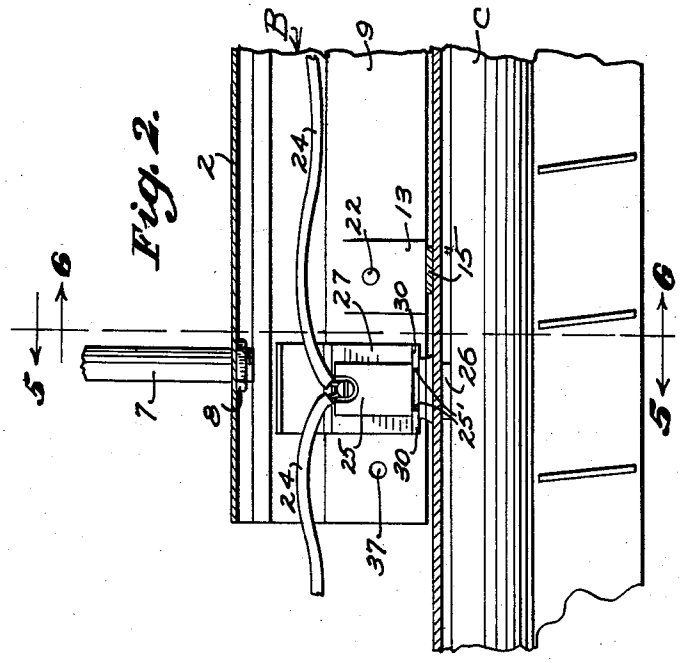


Fig. 2.

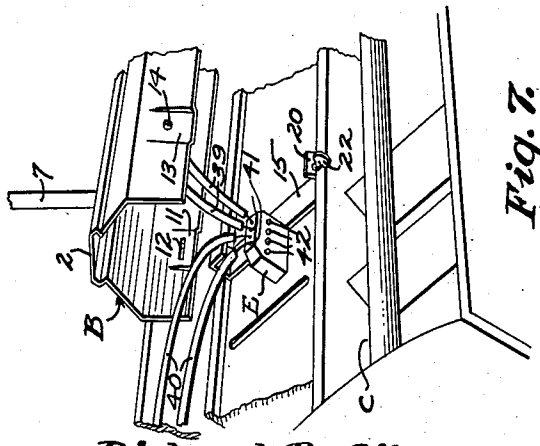


Fig. 7.

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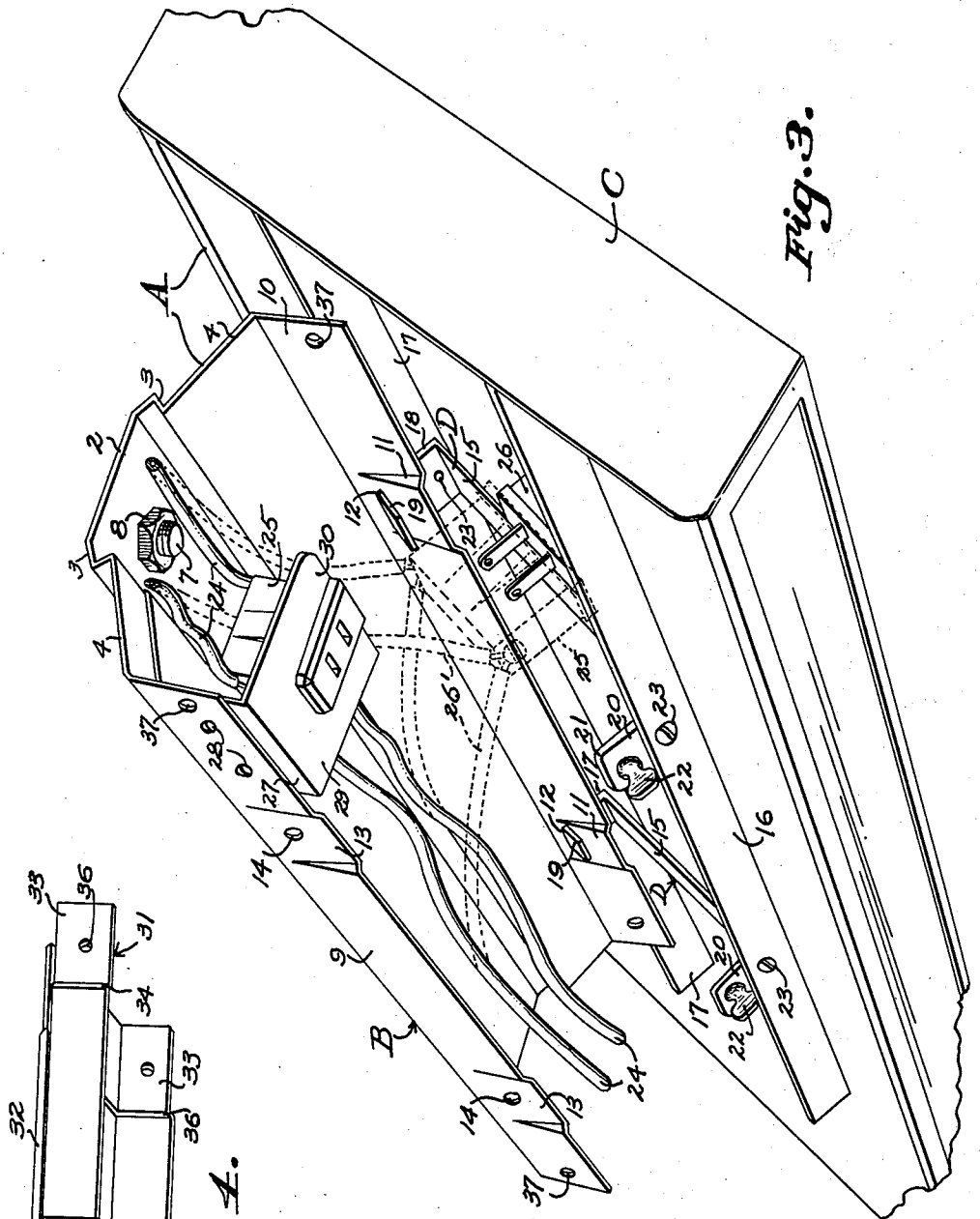


Fig. 3.

Fig. 4.

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FLUORESCENT LIGHTING FIXTURES

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Fig. 5.

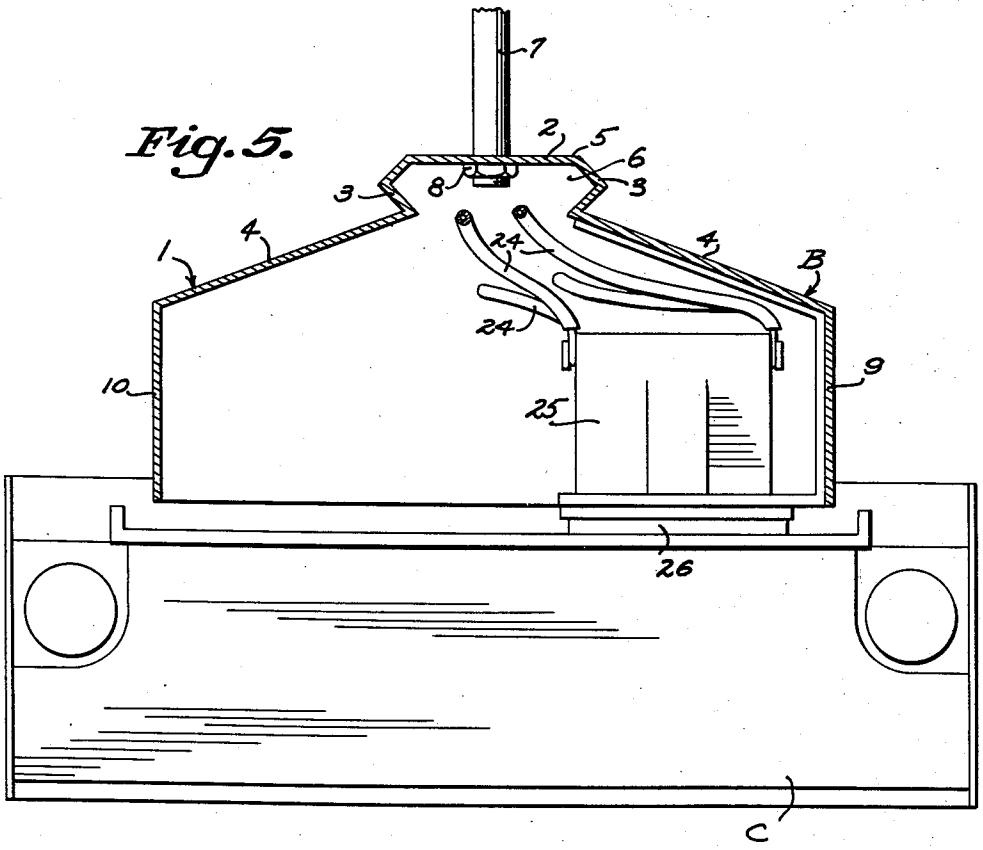
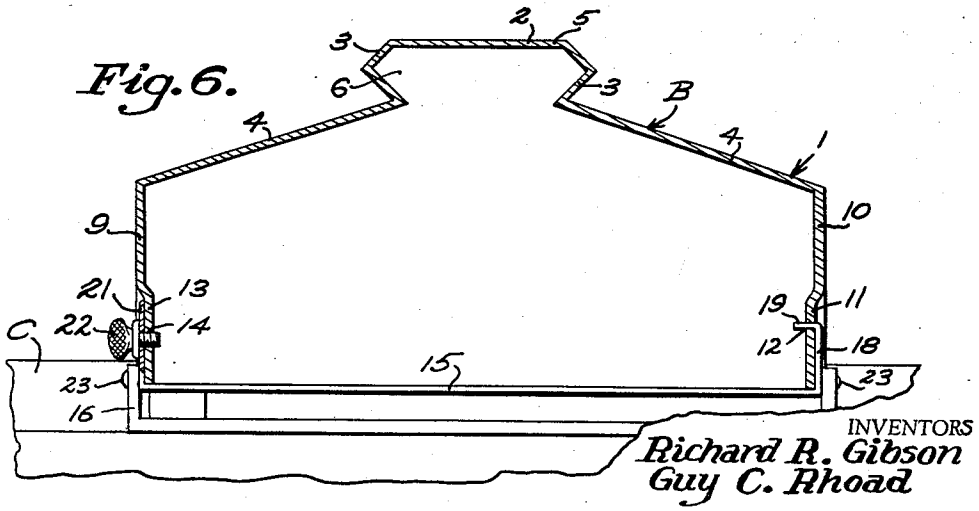


Fig. 6.



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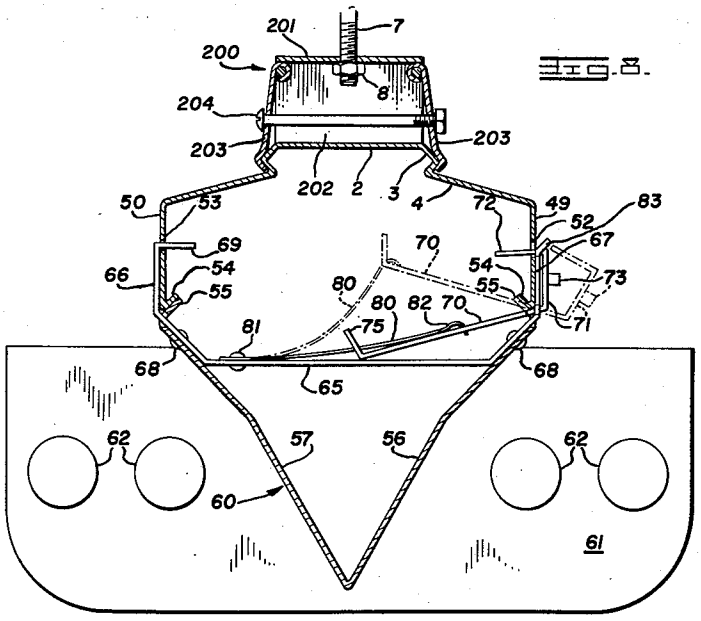
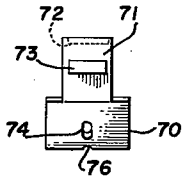


Fig. 8.

Fig. 11.



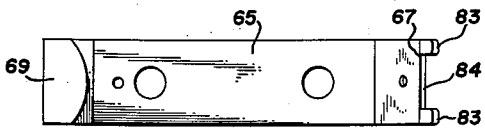


Fig. 9.

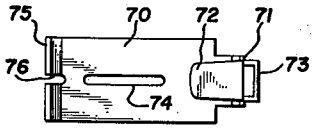


Fig. 10.

Fig. 13.

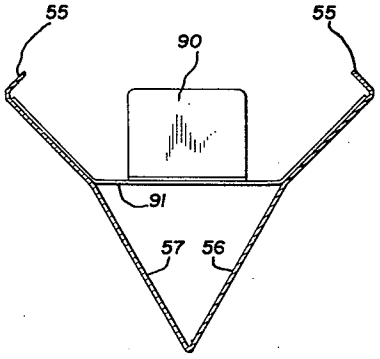
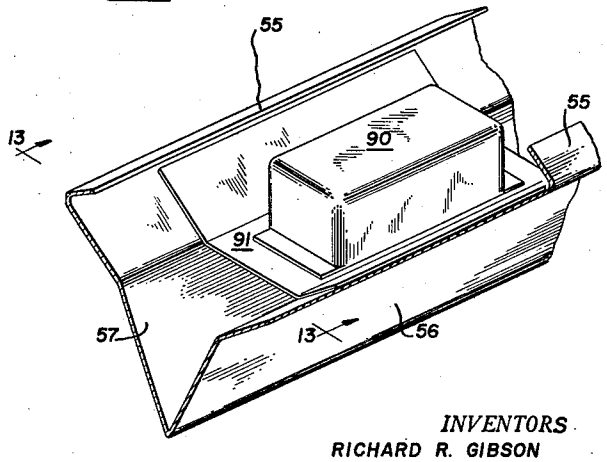


Fig. 12.



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FLUORESCENT LIGHTING FIXTURES

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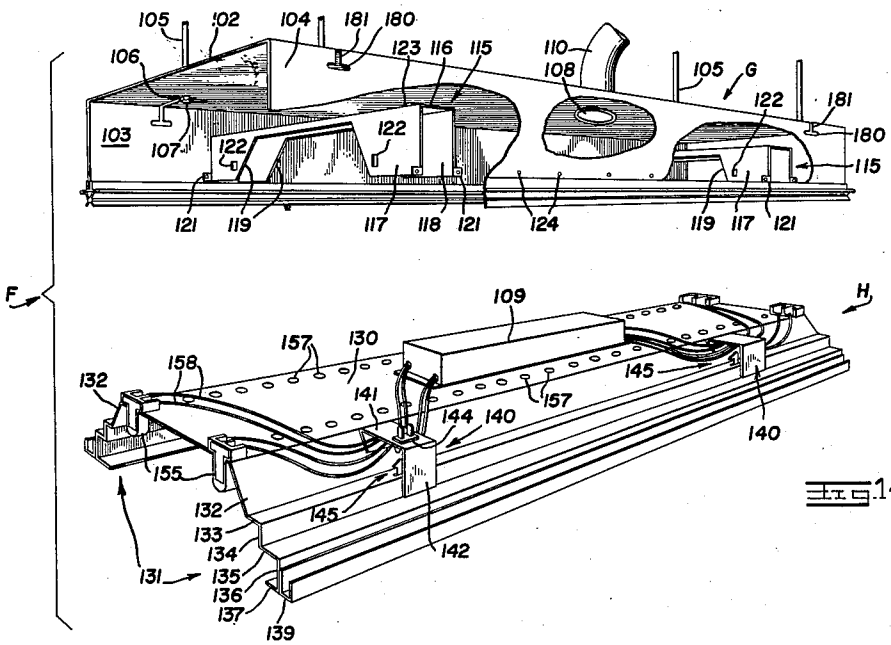


Fig. 14.

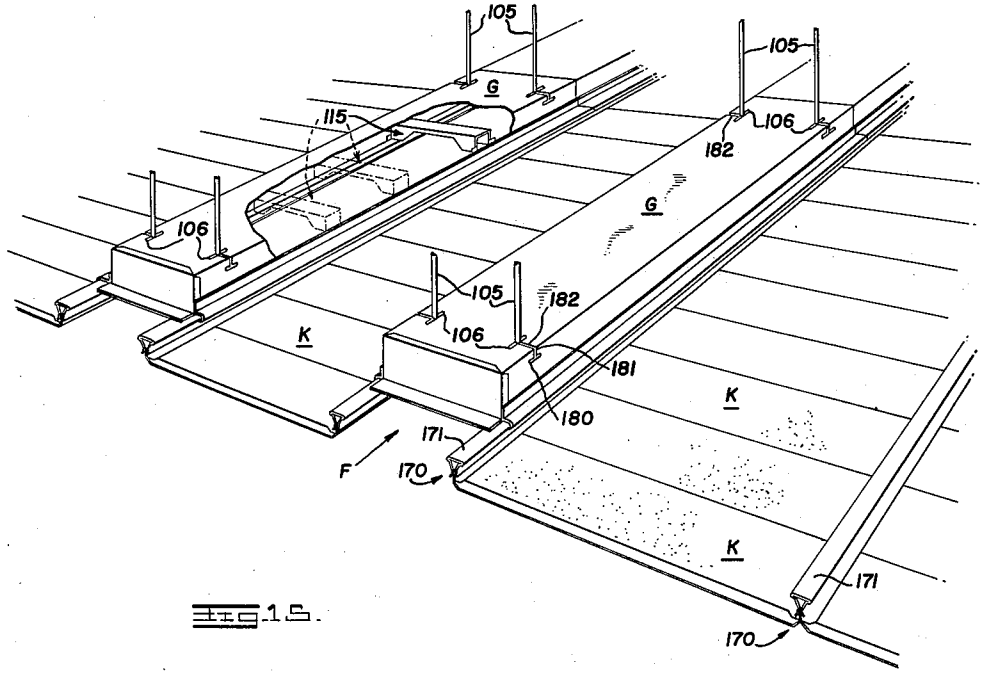


Fig. 15.

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FLUORESCENT LIGHTING FIXTURES

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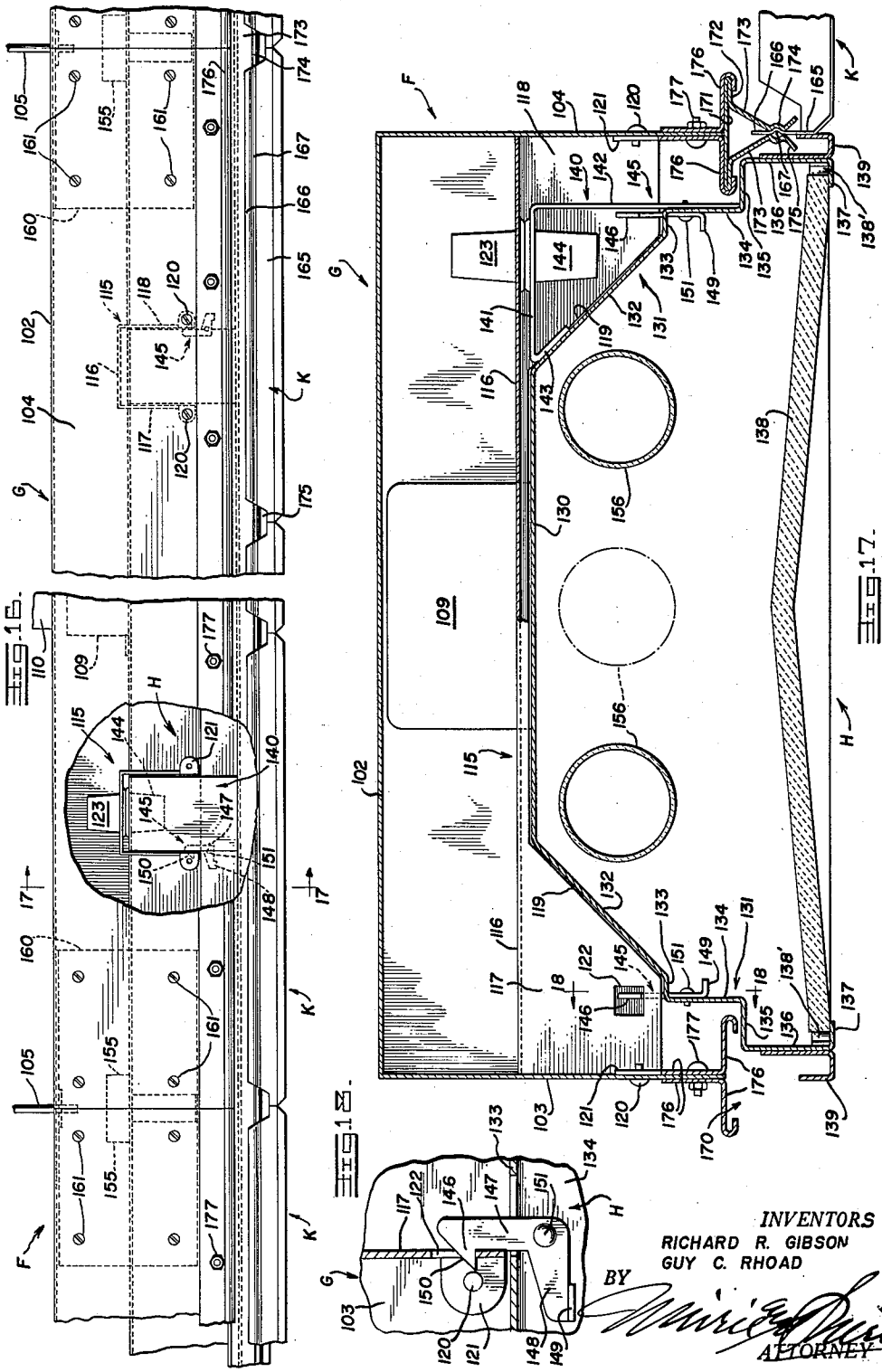


FIG. 16.

FIG. 17.

FIG. 18.

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United States Patent Office 3,075,072
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3,075,072

FLUORESCENT LIGHTING FIXTURES

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Filed Dec. 30, 1960, Ser. No. 79,776
3 Claims. (Cl. 240—51.11)

This invention relates to lighting equipment and more particularly to fluorescent fixtures adapted for individual, dual or infinite line mounting either recessed within or suspended from a ceiling.

The present application is a continuation-in-part of application Serial No. 752,378, filed July 31, 1958, now abandoned which is a continuation of application Serial No. 373,633, filed August 11, 1953; and it should be further noted that copending application Serial No. 107,611, filed March 27, 1961, now Patent No. 3,018,363, issued January 23, 1962 is a continuation of these two earlier filed applications. These applications disclose a fluorescent lighting fixture wherein a lightweight channel or wire containing raceway, formed in sections which may be assembled to any desired length, is provided for mounting below and supported by a ceiling. A separate or plurality of lamp housings are operatively connectible to the raceway without tools in a matter of seconds. Each lamp housing carries lamps, ballast and auxiliary electric circuit elements including a male connector plug for completing the circuit to a mating female socket carried by a raceway section and connected to the power source by wiring in the raceway. This construction enables the saving of considerable labor and time in mounting the fixture over conventional fixtures in which the ceiling raceway carries ballast and auxiliary components which must be wired to the lamp housing units so that the complete fixture must be supported during the mounting operation until the installation is completely wired.

The lamp housings and raceway sections are provided with interfitting tongue and groove parts which enable their complete separation and the selective positioning of lamp housing units anywhere along the elongated raceway. Partial separation of a lamp unit by swinging movement of the housing with respect to the raceway is also possible, whereby the housing may be swung to an open position for replacement of ballasts, checking wiring or the like. When the housing is swung to closed position, the raceway is mechanically locked thereto and electrical connections to the lamps are automatically made by engagement of male and female connectors.

A plurality of ceiling raceway sections may be assembled on the floor connected by spacer coupler members which telescopically engage in the meeting ends of contiguous raceway sections to align them into an infinite raceway with the predetermined spacing between sections. The integrated raceway sections may then be lifted to the ceiling for installation as one raceway to which a plurality of lamp housing may be operatively assembled.

The present invention relates to improvements in such fixture which enables the modified fixture to retain all its advantages plus additional features, including the permitting of the installation of the fixture as a troffer recessed within a ceiling structure. For such troffer construction, the lamp housings must be assembled to or detached from the raceway by pivotal or swinging movement. Alternatively, the improved structure of the fixture is such as to permit installation of the lighting fixture suspended below a ceiling if so desired.

Accordingly, the principal object of the invention is to provide a fluorescent lighting construction embodying a plurality of raceway sections capable of being joined to

any desired length and supported within or below a ceiling for power wiring carried to socket type receptacles in each section, combined with one or more lamp housing units each containing all necessary electrical components wired to a plug type connector which may be readily attached to or detached from selected sections of the raceway, without the need for tools or further electrical work, to provide any desired level of lighting intensity.

Another object of the invention is to provide in a fluorescent lighting fixture a plurality of simple ceiling raceway sections each carrying electric power wiring connected to a female type connector receptacle, and complemental lamp housing units adapted to be partially received within the raceway and carrying male plug connectors, the construction of the parts being such that a variety of lamp housings of varying lighting intensity and design can be operatively attached to or detached from the ceiling raceway at any interval, additional units plugged-in, moved from one space to another or removed for repair, in a matter of seconds without the use of any tool, the lamp housings being adapted to be vibrationlessly locked to the raceway.

A further object of the invention is to provide ceiling raceway sections of the above character, and a spacer coupler member telescopically engageable in the meeting ends of contiguous raceway sections to automatically and perfectly align them into an infinite raceway in a manner to properly space the meeting ends of the lamp housing units when operatively secured to the aligned raceway sections.

Another object of the invention is to provide a ceiling raceway section, of the above character, and coacting latch means between the raceway and lamp housing for readily effecting attachment and detachment of the lamp housing without the use of tools, the latching means including slots formed in one edge of the raceway and latch tongues carried by the lamp housing and insertable in the raceway slots to attach and support the housing while permitting swinging of the lamp housing to a tilted position for electrical check and maintenance thereof or complete removal of the housing by simply lifting the latch tongues from the raceway slots.

Yet another object of the invention is to provide a lighting fixture assembly comprising a simple lightweight ceiling raceway section having therein only electric power wires connected to a detachable female receptacle, and a lamp housing carrying all necessary lamp and auxiliary components including a male plug connector engageable with said female receptacle to complete the lamp circuit, the male plug being normally disconnected when the lamp housing is partially or completely separated from the raceway and the detachable female receptacle being removable from the raceway to engage the male plug to effect testing of the lamp circuit while the lamp housing is partially separated and swung to an open position.

A further object of the invention is to provide a ceiling raceway section mounted within or forming a supporting part of a ceiling structure and adapted to support a lamp housing nested therein, and coacting latch means between the raceway and a lamp housing for readily effecting attachment and detachment of the lamp housing without the use of tools, the latching means including windows carried by a part of the raceway section and pivoted, counterbalanced latch members carried by the lamp housing which automatically swing into said windows for releasably attaching the housing, and the housing being completely removable from the raceway by manually shifting the latch members from the raceway unit windows.

A still further object of the invention is to provide a troffer raceway unit which is so configured as to enable nesting receipt of a lamp housing within its confines with

additional space in the raceway unit for wiring not only of the lighting fixture itself but such other wiring as may be desired to be installed within the ceiling structure.

Yet a further and perhaps primary object of the invention is to provide a troffer raceway unit of the described character which is also adapted to releasably support a ceiling panel between adjacent raceway units in parallel spaced relation, whereby a plurality of raceway units, lamp housings and ceiling panels may be assembled to define a ceiling structure of pleasing design and required illuminating capability and configuration.

Another object of the invention is to provide a troffer comprising a raceway and a lamp housing nested therein both being provided with means for venting the heated air generated by electrical operation of the lighting fixture so as to increase the efficiency and life of the fixture lamps and other circuit elements, the venting means also permitting salvage of the heated air for use as an auxiliary heating means elsewhere in the building in which the lighting fixture is installed.

The novel features that are considered characteristic of the invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and its method of operation, together with additional objects and advantages thereof, will best be understood from the following description of specific embodiments when read in connection with the accompanying drawings, wherein like reference characters indicate like parts throughout the several figures and in which:

FIG. 1 is a side elevation of a complete fixture constructed in accordance with one embodiment of the invention and in operative position suspended from a ceiling;

FIG. 2 is a fragmentary, longitudinal, vertical sectional view through the assembled device showing the light circuit plug-in connectors in operative engagement;

FIG. 3 is a perspective view of the ceiling raceway and lamp housing hingedly connected in open testing position illustrating the plug-in connectors disconnected and showing in broken lines the socket detached from the raceway and operatively engaged with the male connector plug of the lamp housing;

FIG. 4 is a perspective view of the raceway section coupler device;

FIG. 5 is a cross sectional view taken on line 5—5 of FIG. 2 looking in the direction of the arrows;

FIG. 6 is a fragmentary cross sectional view taken on the line 6—6 of FIG. 2 looking in the direction of the arrows and showing the latching arrangement with the lamp housing in operative locked position;

FIG. 7 is a fragmentary perspective view of a modification showing, instead of the plug-in connector, a terminal block main circuit line connector;

FIG. 8 is a cross-sectional view similar to FIG. 5 of a modified fixture having an automatic latching means shown in elevation in solid lines when in locked condition and in broken lines when in unlocked condition;

FIG. 9 is a top plan view of the combination lamp housing brace and latch member of FIG. 8;

FIG. 10 is a top plan view of the latching pawl used in FIG. 8;

FIG. 11 is an end elevational view of the latching pawl of FIG. 10;

FIG. 12 is a reduced fragmentary perspective view of a ballast mounted on a frame portion of the lamp housing of the fixture shown in FIG. 8;

FIG. 13 is a cross-sectional view taken on line 13—13 of FIG. 12;

FIG. 14 is an exploded perspective view of a troffer, constructed in accordance with the invention, portions of which are broken away to reveal internal details;

FIG. 15 is a perspective view of a portion of a ceiling structure incorporating the troffer shown in FIG. 14;

FIG. 16 is a side view in elevation of the troffer shown in FIGS. 14 and 15;

FIG. 17 is a fragmentary cross-sectional view taken along line 17—17 of FIG. 16 and looking in the direction of the arrows, and

FIG. 18 is an enlarged, fragmentary cross-sectional view taken on line 18—18 of FIG. 16.

Referring now to the drawings, FIGS. 1–6 illustrate one embodiment of the invention adapted to be suspended from a ceiling or other overhead medium and comprising a fluorescent lighting fixture A formed by a ceiling raceway B and one or more lamp housings or units C. The raceway B is constructed from a plurality of one-piece blanks 1 of relatively lightweight metallic or plastic material joined into an elongated channel or raceway formation. Each blank of section 1 is bent or otherwise formed to provide a centrally disposed longitudinal flat top surface 2 with outwardly and downwardly extending V-shaped side walls 3 below which are the oppositely outwardly and downwardly extending top section walls 4.

The foregoing construction provides an exterior longitudinal crown or domelike formation 5 and an interior channel space 6 in which terminate the lower threaded ends of the supporting rods 7 and the threaded nuts 8 for supporting the raceway B and lamp housing member C carried thereby. Alternatively the V-shaped walls 3 provide for use of side clamps, as will be more fully described hereinafter, that can slide to any position along the raceway and thus support the fixture from stem hangers. The top sections or portions 4 of the raceway units terminate at their outer edges in the downwardly extending, substantially vertical side walls 9 and 10. The wall 10 is formed with small inwardly extending offset portions 11 respectively spaced from each end, each having a horizontal slot 12. The opposite wall 9 is formed with similar spaced and indented offset portions 13, each having a threaded opening 14.

The lamp unit C is provided with latching and locking means D cooperative with the slots 12 and openings 14 for hingedly securing and locking the lamp unit C to the raceway A. This means D includes a pair of U-shaped strips 15, which are mounted between the inner upper edges of the longitudinal upstanding sustaining ribs or frame members 16 and 17 of the lamp unit C. Members 16 and 17 are spaced laterally with respect to each other, and inwardly relative to the longitudinal sides of the lamp housing C. The vertical leg portions 18 and 20 of the U-shaped strips 15 project above the upper edges of the frame members 16 and 17, and the legs 18 terminate in inwardly projecting right angular latching tongues 19 while the legs 20 carry thumb screws 22.

Slots 12 in the offset portions 11 in the side walls 10 of the raceway sections are adapted to hingedly receive the latching tongues 19 to suspend the lamp housing C in open position (see FIG. 3) during installation or subsequently for repairs or replacement of lighting elements. It will be noted that when the lamp housing C is in open position, the tongues 19 are inclined downwardly and thereby preclude accidental removal from the slots 12. The other vertical legs 20 of the U-shaped strips 15 terminate in slightly rounded extremities 21 and are adapted, when the lamp housing is in closed position, to engage in the offset portions 13 of the raceway side wall 9. Thumb screws 22, carried by the vertical portions 20, are engageable by suitable manipulations in the threaded openings 14 of the side wall 9 to rigidly interlock the raceway B and the lamp housing C and prevent undesired separation or loosening even under extreme vibration conditions. The members 15 are secured to the lamp housing frame members 16 and 17 by screws 23.

The channel raceway B is of lightweight construction so as to admit of easy installation even when formed of a large number of separate sections. Only the main circuit wires 24 are mounted in the raceway and each section

carries a socket connector member 25 for plug-in engagement with the complemental male plug connector member 26 suitably mounted in the lamp housing C and connected in circuit with the lamp elements and ballast, not shown.

A bracket 27, shown as L-shaped but which may be straight or otherwise shaped, is secured to the inner surface of the raceway side wall 9, adjacent to one end of the raceway section, by screws 28 or other fastening means. The horizontal portion 29 of said bracket is recessed to form spaced arms 30 which are adapted to slidably and detachably engage in recesses 25' formed in opposite sides of the socket 25 to support the socket (FIG. 3). Thus the socket 25, although rigidly supported, is removable for plug-in connection with the male plug connector member 26 when the lamp housing is in open position.

When the raceway B and the lamp housing C are in open position as shown, the wiring can be checked or repairs made with the lamps disengaged from the circuit and without having to manually hold the housing during such operations. Replacement of inoperative units can be made in a moment rather than doing this work on the job as necessitated with conventional equipment. Also, the latching means D permit the housing to be swung upwardly into engagement with the raceway B and at the same time automatically effects the plug-in engagement of the male plug connector 26 with the female connector member 25, thus completing the wiring circuit to the housing and closing the lamp circuit (not shown). During such movement, the latch ends 21 seat in the indented portions 13, and all that is then necessary to rigidly secure the parts B and C in locked engagement is to project the thumb screws in the openings 14.

It will be apparent that to install the lamp housing C by virtue of the unique latching arrangement, it is only necessary to lift the housing C and insert the latch tongues 19 in the slots 12, which will hold the housing sufficiently open to permit such manipulations with respect thereto as may be necessary in connection with the installation operations. To complete the installation, it is only necessary to swing the housing upwardly bringing the lug ends 21 into registering engagement with seats 13 and then lock B and C in operative association by manually engaging the thumb screws 22 with the openings 14, and without the need for or use of any tools.

During the initial installation of the housing C or at any subsequent time when the housing is in open position to test the circuits or make repairs, or replace defective units, it is only necessary to detach the female connector 25 from its supporting bracket 27 and bring it into plug-in engagement with the male plug connector 26, as shown in dotted lines 26' in FIG. 3. This closes the lamp circuit for the test. After conclusion of test or repair, all that is necessary is to return the female connector to its supporting bracket 27 and move the lamp housing to closed operative illuminating position, locking it in this position by manipulation of thet thumb screws 22.

In the conventional type of ceiling lighting fixture, the complete fixture must be raised to supporting members and wired at the ceiling, which, owing to its weight, and elevation from the floor is difficult and time consuming. However, in the instant invention, such difficulty has been overcome by the provision of the lightweight inverted troughlike ceiling raceway B and the latching and locking means D between the raceway B and the lamp housing C which permits the raceway unit B to be separately assembled and wired on the floor to lengths of 48' or more and raised as a complete assembled unit to ceiling supports. The lamp housing is then detachably connected to the raceway unit at any convenient time after building construction is completed thus eliminating storage, contamination and damage.

The raceway section B is designed as a separate part of the fixture device A, its cross sectional shape being such as to provide, even with the use of a substantially thin lightweight material, a strong nondeformable open ended channel raceway forming a conduit for electric power lines and the like. A raceway comprising many joined sections, nevertheless, may be joined and mounted easily owing to its light weight as compared to the conventional fixtures wherein the complete fixture must be supported until the whole installation is wired.

In order to provide for the addition of one or more raceway sections B to form a continuous conduit, each raceway is provided with means for joining aligned raceways together. In the present instance, this means comprises openings 37 for connection with a specially designed spacer coupler member 31 (FIG. 4). At the end of a conduit, so formed, or if a raceway section B constitutes a single fixture, end closures may be secured by means of the openings 37. The coupler is formed with a crown portion 32 and downwardly stamped, or otherwise formed, are the downwardly offset portions 33 and the shoulders 34 at each end of the downturned sides. The shoulders 34 predeterminedly limit the telescoping movement of the portions 33 into the ends of contiguous raceway sections B and automatically effect a predetermined space 35 (FIG. 1) between the ends of contiguous lamp housing units in an aligned continuous row. Since the slots 12 in each of the raceway sections B are spaced an exact distance from their ends, the insertion of latch tongues 19 of respective contiguous lamp housings therein provide the spaces 35 which enable any lamp housing C in the row to be swung to open position or to be removed and replaced without rubbing against the housing on either side.

The ends 33 of the spacer coupler 31 are formed with openings 36 near their end edges and adapted to register with openings 37 formed in the ends of the sides 9 and 10 of the raceway section B. These openings receive screws 38 for locking the coupler 31 and contiguous raceway units B into a rigid raceway of any desired length. The offset screw hole alignment pulls the raceway sections tight against the coupler shoulders when the screws are mounted providing rigid, straight alignment. It will also be noted that the raceway spacer coupler member 31 owing to its configuration corresponding to that of the units B, when operatively positioned, presents an unbroken surface area of the raceway channel. Because of the designed dimensional accuracy of the raceway parts, the lamp fixtures in continuous runs are automatically spaced to exact tolerances and held in perfect longitudinal alignment without requiring measurement by the installer.

FIG. 7 illustrates a modified form of connector which may be employed instead of the plug-in connectors 25 and 26, if desired under certain operational conditions. Terminal block connector E is suitably mounted in the lamp housing C, in the present instance, adjacent to a latch bar member 15, and is designed to make a positive connection with wires 39 to the main circuit in the raceway units B and to an adjacent fixture by wires 40. The block E is formed with four openings 41 to receive the ends of the wires 39 and 40 and mounted in the block at right angles to said openings are a like number of screws 42 adapted to clampingly engage the ends of the respective wires to secure them in the block.

It will be apparent that the described lighting fixture comprises lightweight ceiling raceway sections, a spacer coupler member adapted to accurately position the connectible sections in any desired number and, at the same time, provide spaces between the lamp housings to render installation and manipulation of the housings easy; a lamp housing adapted to contain all components except the main circuit wires; a female connector in each raceway section permits the automatic connection to the complemental male plug carried by the lamp housing and is detachable to make test connection when the latter is in open position; a unique latching arrangement enables ready and complete attachment and detachment of one or more housing units or types of housings to the ceiling

raceway in any desired interval of spacing, and particularly it will be noted that the lamp housing repairs may be made and the circuit tested while the lamp housing is in open position, or housings replaced or respaced without cutting the main circuit, which has been incapable of accomplishment by the prevalent types of lighting fixtures heretofore in use.

FIGURES 8–13 illustrate a modified lighting fixture in which the raceway section and lighting unit automatically latch together upon pivoted movement toward each other. This lighting unit comprises a raceway 1′ and a centrally disposed longitudinally extending housing 60. The raceway 1′ is basically similar to the raceway 1 and includes a longitudinally extending crown formed by the top wall 2 and V-shaped side walls 3, and providing grooves between the lower portions of the side walls 3 and the top section walls 4. As previously indicated, the structure, as best shown in FIG. 8, is adapted to cooperate with supporting clamps, such as a box clamp 200, which are carried by the hanger rods 7 and bolts 8. These clamps may comprise a rigid inverted U-shaped portion forming a top wall 201 having a central aperture for receiving the rod 7, and opposed side walls 202 the free extremities of which substantially engage or rest on the top wall 2 of the raceway. Opposed side walls 203 are pivotally connected at their upper edges to the lateral edges of the top wall 201 and their lower edge portions extend below the fixed side walls 202 and are inturned to nest in the grooves between the walls 3 and 4. These pivotal side walls are secured together and clamped to the raceway crown by a cross bolt 204. This clamp arrangement is slidable along the raceway crown to facilitate location of the hanger rods 7.

The housing 60 carries at each end a lamp supporting or end unit 61 between which extend, in the usual manner, the fluorescent lamps 62, four being shown. Obviously, longitudinal side walls, diffusers or the like may also extend between the end units 61 in the usual manner. The housing 60 includes a V-shaped reflector or frame member having diverging upstanding walls 56 and 57, the upper edges of which are bent inwardly and upwardly to form flanges 55 which bear against similar inwardly and upwardly turned flanges 54 along the bottom edges of side walls 49 and 50 of the raceway section.

The seating of flanges 54 and 55 against each other provides a seal against entrance of dust, moisture and heat in the closed position of the lamp housing against the raceway and prevents entrance of such within the raceway channel. In addition, this construction aids self-cleaning of the fixture by permitting unobstructed rise of dust carried by hot air rising from lamps of the fixture without possibility of diversion and entrapment within the fixture or raceway.

The automatic latching structure in this embodiment includes a brace member 65 of generally U-shape having upstanding legs 66 and 67. The member 65 is secured to the frame walls 56 by rivets 68, and the legs 66, 67 pass through openings in the flange wall portions 55, so that inturned tongues 69 on the legs 66 may be inserted in openings 53 of the raceway wall 50 to hingedly connect the raceway to the lamp housing. Brace member 65 further serves to dimensionally hold the lateral tolerance of the walls 56 and 57 to the exact degree required to match the width of the channel in the raceway.

The leg 67 of the brace member is provided with ears 83, FIGURE 9, at its upper end defining a seat 84 between the ears for a latch pawl 70. The pawl 70 also extends, with the leg 67, through the opening in flange portion 55 and rests in the seat 84 at an angle in the locking position, shown in full line in FIG. 8, with the outer portion 71 extending vertically exteriorly of the leg 67 and the inner end seated on the horizontal surface of member 65 and held downwardly by a spring 80 having a hooked end 82 riding in a slot 74 in the pawl. The mid-portion of the spring 80 is guidingly seated in slot 76 in the inner upturned end 75 of the pawl. The opposite end of the spring 80 is anchored to member 65 by a rivet 81 or the like. A latch tongue 72 is inturned from the angle side 71 of latch pawl 70 and seats in a slot 52 in the raceway wall 49 to lock the lamp housing to the raceway. A finger grip 73 is formed on the outer side of vertical wall 71 of the latch pawl.

When it is desired to release the lamp housing, grip 73 is pulled outwardly and downwardly to remove tongue 72 from the opening 52 and tilt the latch pawl 70 on the seat 84 to the position shown in broken lines in FIG. 8, where it is held by the hooked end 82 of spring 80. This releases the lamp housing for pivotal movement on tongue 69 to its open position for test or repair. If desired, the housing may be completely detached by removal of tongue 69 from opening 53. When it is desired to lock the housing to the raceway, the latter is swung upwardly on pivot tongue 69 until the lower end of raceway wall 49 strikes the tilted latch pawl 70 causing the spring 80 to quickly snap the pawl 70, rocking it on seat 84 into its locking position with the tongue 72 moving into the opening 52. Thus, the mere turning movement of the housing toward the raceway automatically moves the described latch parts into locking position.

FIGS. 12 and 13 illustrate a means for supporting a ballast 90 on the lamp housing. The ballast is secured on a plate 91 having upturned sides which are in turn secured to the upper edges of the housing frame walls 56, 57. The plate serves to retain the frame walls properly spaced apart to exact spacing with minimum tolerance and also radiates the heat conducted from the ballast to dissipate such heat more effectively.

FIGS. 14–17 illustrate still another modified fluorescent lighting fixture or troffer F designed for embedding in or forming a constructional element of a ceiling structure. If desired, this fixture may instead be suspended from a room ceiling or other overhead supporting medium. The fixture may be employed as a single unit or with a plurality of units arranged in an infinite line and, as illustrated, may employ a plurality of ceiling raceway sections G spaced apart laterally to provide constructional support elements for the ceiling panels K.

The lighting fixture F comprises a ceiling raceway G and a complemental lamp housing H adapted to nest substantially within the raceway. The raceway G is constructed from a one-piece blank of relatively lightweight metallic or plastic material and is formed into an elongated channel or raceway formation, having an inverted U-shape cross section, by bending or otherwise forming the material to provide a longitudinal flat top surface 102 with the downwardly extending side walls 103 and 104.

The raceway is adapted to be supported from or within a ceiling structure by suitable means, such as hanger stems, side clamps or threaded rods 105 which pass through slots 106 in wall 102 and retain the raceway G by means of nuts 107 threaded on the rod ends. The raceway upper wall 102 is preferably pierced by an aperture 108 located centrally over the ballast 109 carried by the lamp housing H. If desired, a flexible tube or duct 110 may be utilized to carry the heated air for exhaust outside the building or to be redirected within the building to augment the normal building heating system.

The depending side walls 103 and 104 of raceway G are braced by laterally extending brackets 115 which are longitudinally spaced in the raceway and which cooperate with the lamp housing H to position the latter and detachably lock it in place in a manner to be described. Each bracket 115 comprises a channeled member having an inverted U-shape cross section formed by the upper, substantially horizontal wall 116 and spaced, parallel depending walls 117 and 118.

The walls 117 and 118 are provided with large, longi-

tudinally aligned recesses 119 having outwardly and downwardly inclined side walls adapted to guide and receive the lamp housing H into assembled position within the raceway. The brackets 115 are secured to the raceway side walls by screws 120 threadedly engaging openings in outturned ears 121 at each end of the bracket walls 117 and 118. Pairs of openings 124 in the raceway side walls 103 and 104 receive the screws 120 and may be suitably spaced in measured units, for example every 12 inches, to enable change or addition of brackets 115 to vary the spacing of supported lamp units. A latch window or slot 122 is provided at each side of recess 119 in one of the bracket walls, such as wall 117. The upper wall 116 is provided with an opening in which is removably secured a female plug connector 123.

The lamp housing H is preferably an elongated inverted troughlike member of substantially the same length, or units thereof, as raceway unit G and is also open at both ends. The housing is shaped and dimensioned to fit substantially completely within the raceway but spaced from the walls thereof, and to accomplish this, the lamp housing has a horizontal upper wall 130 and a pair of outwardly and downwardly sloping side walls 131. Each side wall comprises sloping portions 132 at the bottom edge of which the wall has a stepped configuration with horizontal land portions 133, 135 and alternate riser portions 134 and 136, and inturned flanges 137 at the bottom. A trim channel 139 of L-shaped cross section extends from the outside of the lower vertical portions 136 of each side wall 131.

A light transmitting cover 138, which may be the usual translucent panel, egg crate or the like, is removably supported by the flanges 137. This cover 138 is of a width greater than the spacing between the flanges 137 but less than that of the vertical walls 136. Thus, the cover 138 may be installed or removed by pressing one edge against the adjacent wall 136 and swinging the other edge past the adjacent flange 137. The cover is centered on the flanges by bowed leaf springs or the like 138 between the cover edges and the wall portions 136.

On one side wall 131 of the lamp housing are affixed angle brackets 140 spaced so as to align with and enter the channels of brackets 115 in the raceway. Each bracket 140 comprises a substantially horizontal wall 141, a vertical wall 142 affixed to the riser portion 134 of the housing side wall 131, and an inclined wall 143 secured to the sloping portion 132 of the housing wall. A male plug connector 144 is secured in an opening in the upper horizontal wall 141 of the bracket in such position as to cooperatively engage its male prongs in the sockets of connector 123 when the lamp housing H is elevated and inserted in the raceway G. As this is being done, the edges of openings 119 in the brackets 115 engage the sloping wall portions 132 of the lamp housing and guide it into final position, while a similar longitudinal guidance and positioning is provided by the channels of brackets 115 in which the housing brackets 140 are received.

To retain the housing assembled in the raceway and to positively but releasably lock it in such position, a plurality of latches 145, preferably four for each fixture unit, are hingedly mounted on the housing H. Each latch 145 comprises a hook end 146 adapted to enter in the latch window 122 and engage a wall thereof to prevent gravity separation of the raceway and lamp housing. The latch further comprises a vertical arm 147, see FIGS. 16 and 17, a horizontal counterweight arm 148, an inturned flange 149 for finger engagement, and a cam surface 150 on the upper side of the hook end. Each latch 145 is pivoted at 151 to wall portion 134 of the lamp housing and the weight of the arm 148 tends to turn the latch in a direction to retain the hook end 146 in the latch window 122. Thus the lamp housing and raceway are normally locked in assembled condition.

When it is desired to remove the lamp housing, the latch arm flanges 149 are moved upwardly by finger to pivot the hooks 146 out of windows 122 and release the housing H for separation from the raceway. Upon inserting the housing in the raceway, the bracket walls 117 strike the cam surfaces 150 swinging the latches on pivots 151 to permit the housing to be pushed into final seating position in the brackets 115. When this occurs, the weight of arms 148 will automatically turn the latches 145 on pivots 151 to engage the hook ends 146 in windows 122 thus locking the housing and raceway together.

A plurality of lamp sockets 155 are secured in notches in housing wall 130 to fit flush with the ends of the housing. The sockets 155 seat a pair of fluorescent lamps 156, see FIG. 17, parallel to each other and under upper housing wall 130. If desired, three or more lamps 156 may be employed, one such alternative construction being illustrated by the third lamp shown in broken lines in FIG. 17. Directly over each lamp 156, the housing wall 130 is pierced by an aligned series of apertures 157 which serve to vent the heated air trapped in the lamp housing H to the space under wall 102 of the raceway. From this space, the heated air is vented through opening 108 and duct 110 as previously described. The opening 108 is preferably centered over ballast 109 which is a prime source of heat generation in the operation of the fixture.

The ballast 109 and sockets 155 together with starters, not shown, are wired to each other by wiring 158 in a conventional circuit whose power source is the male plug connector 144. When a ceiling troffer installation is made, the branch wiring from one or more fixed power sources is carried in the raceway units G and connected to the female plug connectors 123. More than ample space is provided in the raceway above brackets 115 to carry such wiring and the excess space is available for running of wire other than that required by the lighting installation.

In order to install an additional or plurality of fixtures F in alignment, a coupler member 160, FIG. 16, is provided. The coupler 160 is preferably formed of heavy gauge material and is of inverted U-shape cross section of such size as to telescope within and closely fit the raceway units G when butted end-to-end. Tapped holes are provided in the coupler which register with apertures in the ends of raceway units G to receive the screws 161 which firmly secure the contiguous raceway units and coupler together into a rigid raceway of any desired length. In the illustrated embodiment of the invention, the raceway unit G and lamp housing H are of equal length and therefore the coupler 60 is completely telescoped within the butting raceway ends.

If it should be desired to utilize lamp housings longer than the raceway units, couplers may be used having outwardly offset portions for alignment with the sides 103 and 104 and shoulders which predeterminedly limit the telescoping movement of the coupler as taught in FIG. 4. In either case, it will be noted that the raceway spacer coupler member 160, owing to its configuration corresponding to that of the units G, when operatively positioned presents an unbroken surface area of the raceway line, and due to the designed dimensional accuracy of the raceway parts, the lamp fixtures in continuous runs are automatically spaced to exact tolerances without requiring measurement by the installer.

A portion of a ceiling formed by troffer units F utilized in a plurality of parallel lines to support ceiling panels and thus form substantially a complete ceiling structure is illustrated in FIG. 15. The ceiling portions between parallel lines of troffer units comprise a plurality of pan-shaped panels K formed of metal, plastic or other material which may be sound absorbing, if desired. The shape and size of panels K may be chosen such as to give a tilelike appearance to the ceiling be-

tween the illuminated strips defined by the transparent troffer closures **138**. Some or all of the panels may be pierced by a plurality of small openings **125** to admit entrance or exit of heated or cooled air to the room.

To support the ceiling pans K, the rim flanges **165** on opposite sides are formed with upstanding extensions **166** having a detent bead **167** formed therein, as best seen in FIG. 17. To cooperate with bead **167** in latching engagement, the depending sides **113** and **114** of raceway units G are provided with clamps **170** extending completely or partially the length of their lower edges. The clamps **170** each comprise a horizontal strip **171** whose sides are folded under at **172** and prolonged in converging flanges **173**.

The flanges **173** are formed with semicylindrical portions or beads **174** which meet to form a latch cylinder. Below portions **174**, each flange **173** terminates in an outwardly flared end portion **175**. The clamp portions **173** are formed of metal or other resilient material which inherently provides tension for holding the portions **174** together. The clamp strip **171** is secured to the bottom of the raceway walls by means of a pair of similar brackets **176** and the mounting screws **177**.

It will be apparent that all that is necessary to install the ceiling pans K between raceway units G is to lift the pans so that the rim extensions **166** enter the mouth between clamp ends **175**. Exertion of further upward pressure on the pan K will cause the detent **167** to cam the flanges **175** apart so that the detent will enter between the separated semicylindrical portions **174**, at which time they will spring back together and clasp the detent bead **167** to hold the ceiling pan latched to the raceway.

When it is desired to detach a ceiling pan, it is merely necessary to pull it downwardly with sufficient pressure to enable the bead **167** to overcome the resilient pressure of the clamp portions **170** and cam the portions **174** apart. Since the pans K, lamp housing closures **138**, and housing trim channels **139** when assembled and latched to the raceway units G fall in substantially one ceiling plane, it may be necessary to remove a lamp housing or to insert a thin tool between the lamp housing and ceiling pan K in order to grasp the latter and detach it from the clamps **170**.

The channel raceway G is of lightweight construction, weighing approximately 6 pounds per four foot unit, so as to admit of easy installation. In the conventional type of lighting troffer, the complete fixture must be supported until the installation is mounted and wired, which, owing to its weight of approximately 40 pounds, has proven quite difficult and time consuming. In the instant invention, such difficulty has been overcome by the provision of the lightweight inverted troughlike ceiling raceway G and the latching and locking means **145** between the race way G and the lamp housing H which permits the raceway unit G to be separately installed and enables each lamp housing to be detachably connected to the raceway unit.

Preferably, in installing a combined fixture and ceiling structure as illustrated and described herein, the raceway units G are first joined in end-to-end alignment by use of the heavy gauge couplers **160**. These joined raceway runs are then lifted and installed by means of the support rods **105**. The branch wiring necessary to connect the female plug connectors **123** to a single or plurality of fixed power sources, together with any additional wiring desired for other than illuminating purposes, is laid and connected in the raceway runs above the brackets **115**. Next, the ceiling is completed by installation of the pans K. Thus, the walls and ceiling of a room may be completed and painted before it is necessary to remove the lamp housings H from their factory cartons.

Desirably the side walls **103** and **104** of the raceway units G are provided with slots **180** parallel to slots **106**, see FIG. 15, and communicating cross slots **181**, **182** to provide easy mounting of the raceway on the rod hangers **105**. Thus the rods may be suspended from a suitable supporting structure and the raceway can be mounted by alignment of the slots **180**, **181** with one set of rods, pushed in one direction laterally to receive the rods and support nuts **107**, tilted upwardly to align the other set of hanger rod nuts with slots **180** and then pulled in the opposite lateral direction to seat the raceway. The entire ceiling may be leveled by adjustment of the hanger rod nuts **107** from the interior of the raceway after the ceiling pans K are installed, without removing any ceiling material, it being necessary only to gain access to selected hanger rods by detachment of appropriate lamp units H.

By shifting the brackets **115** to different spaced locations along the raceway, see broken lines FIG. 15, the lamp units may be changed or moved in position to yield any desired or optimum lighting pattern for a given installation. The spaces between lamp units along a raceway may be closed by any suitable closures similar to the ceiling panels K and may comprise vents for the passage of heated or cooled air to or from the ducts formed by the raceways G and lamp units H. The T-shaped clamp **171**, supported by suitable means not shown, may be utilized to support ceiling pans K on each side and thus widen the spacing between raceway runs.

As apparent from the preceding description, the lamp housings are easily installed by untrained workmen and without the need for special tools by merely lifting them into the support brackets **115** of the raceways whereby they are automatically guided and locked by the operation of the counterbalanced latches **145**. Maintenance operations may be easily accomplished by unlatching the lamp housings and removing them to a work bench for convenient repair.

Although certain specific embodiments of the invention have been shown and described, it is obvious that many modifications thereof are possible. The invention, therefore, is not to be restricted except insofar as is necessitated by the prior art and by the spirit of the appended claims.

What is claimed is:

1. Fluorescent lighting fixture means of the character described comprising a ceiling raceway of troughlike form and extended length arranged for inverted mounting at a fixed overhead position, a conventional lighting power circuit suitable for operating fluorescent lamp units, said circuit being housed in said raceway and wired in parallel to a plurality of connector fittings carried by said raceway in spaced relation lengthwise thereof, a separately constituted fluorescent lamp unit that is complete and self-contained so as to be capable of operation upon energizing connection to any lighting power circuit suitable therefor, said lamp unit incorporating a complementary connector fitting engageable with any of said plurality of connector fittings carried by said raceway, means incorporated in said raceway for carrying each of said plurality of connector fittings interchangeably at a plurality of locations spaced lengthwise thereof for accommodating selective localized positioning of said lamp unit, and means for removably attaching said lamp unit on said raceway selectively in relation to any of said plurality of connector fittings, as located lengthwise on said raceway, so that the complementary connector fitting incorporated in said lamp unit is engaged in connecting relation with the selected raceway connector fitting as an incident of the attachment of said lamp unit on said raceway.

2. Fluorescent lighting fixture means of the character described comprising a ceiling raceway of troughlike form and extended length, hanger means engageable with said raceway for inverted mounting thereof at a fixed and leveled overhead position, a conventional lighting power circuit suitable for operating fluorescent lamp units, said circuit being housed in said raceway and wired in parallel to a plurality of connector fittings carried by said raceway in spaced relation lengthwise thereof, a plurality of separately constituted fluorescent lamp units for installa-

tion on said raceway, said plurality of lamp units not exceeding in number the number of said plurality of raceway connector fittings and the spacing of any two adjacent raceway connector fittings not being less than the length of a lamp unit of said plurality selected for installation on said raceway at said spacing, each of said fluorescent lamp units being complete and self-contained for operation upon energizing connection to any lighting power circuit suitable therefor, and each of said lamp units incorporating a complementary connector fitting engageable with any of said raceway connector fittings, each of said raceway connector fittings being carried by said raceway on respective bracket structures mounted in said raceway interchangeably at one of a plurality of locations spaced lengthwise thereof selected for a desired localized positioning of said lamp units, and means for removably attaching each of said plurality of lamp units on said raceway in relation to one of said plurality of raceway connector fittings, as positioned by the respective bracket structures carrying the same on said raceway, so that the

complementary connector fittings incorporated in said lamp units are engaged with a related raceway connector fitting for operating said lamp units from said power circuit as an incident of the attachment of the lamp units on said raceway.

3. Fluorescent lighting fixture means as defined in claim 1 and further characterized in that said raceway additionally incorporattes means for supporting a ceiling structure extending from each side thereof and selectively covering the bottom face of said raceway at any lengthwise portion thereof not occupied by a lamp unit installed thereon.

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