

April 12, 1966

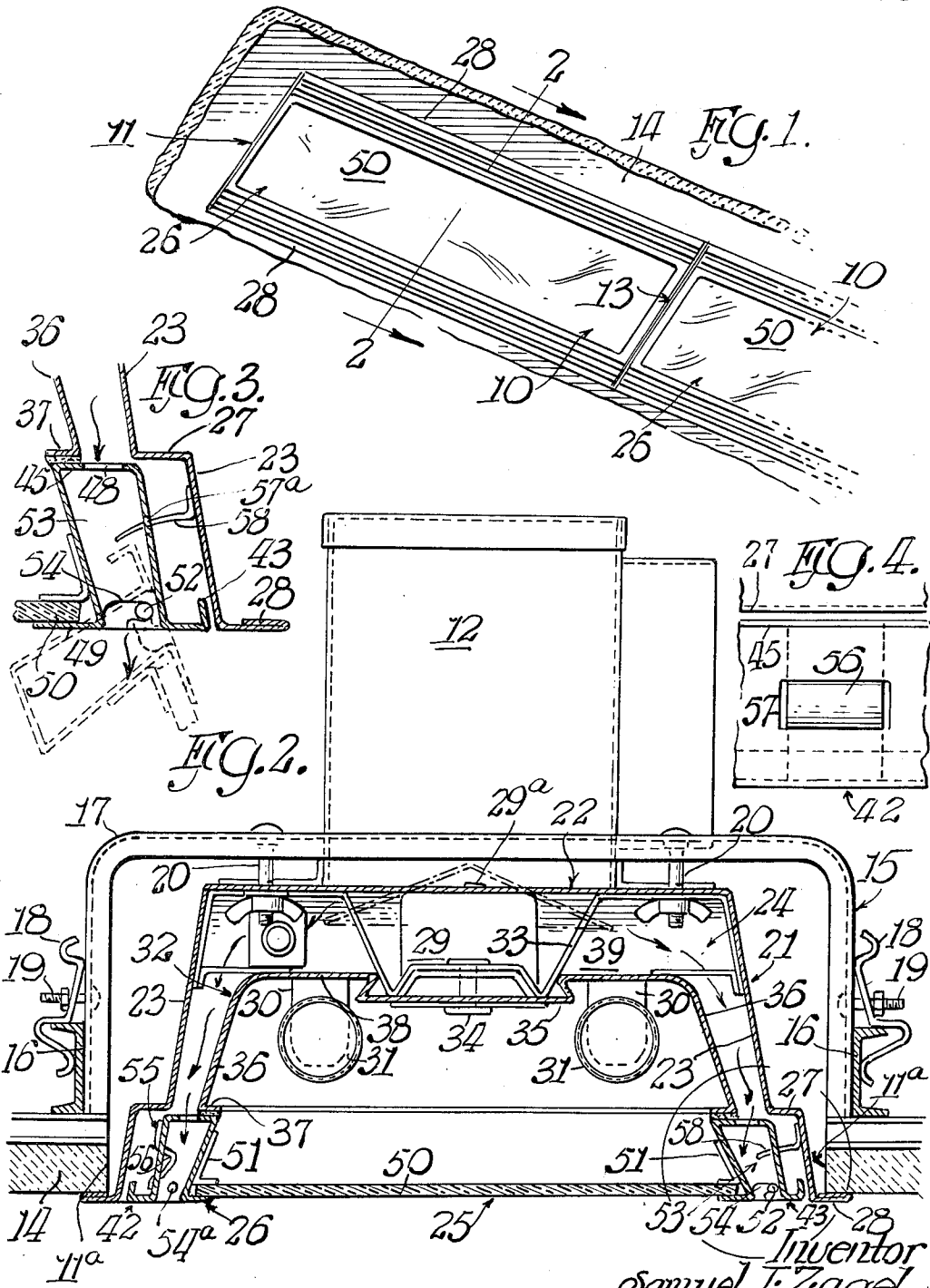
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3,246,137

AIR DIFFUSING LIGHT FIXTURE

Filed Aug. 14, 1962

3 Sheets-Sheet 1



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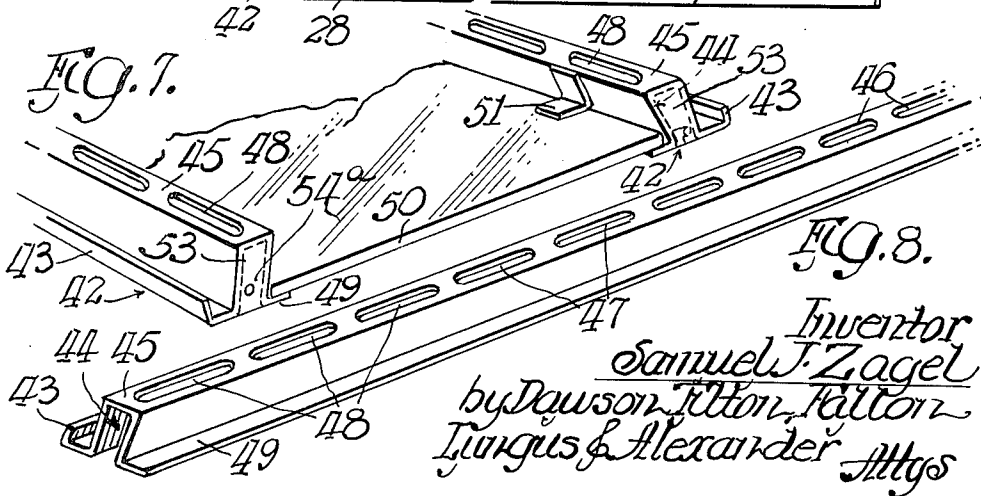
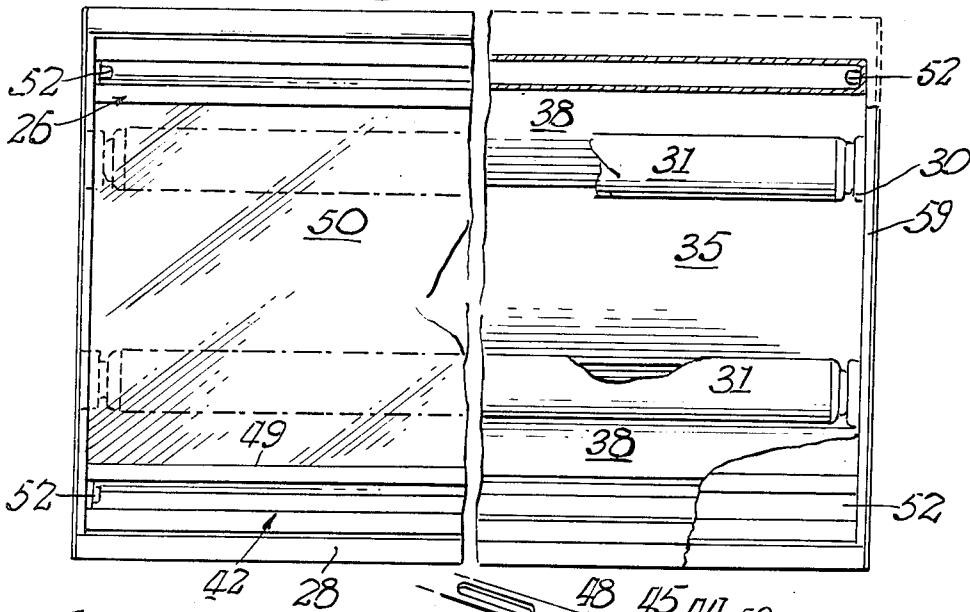
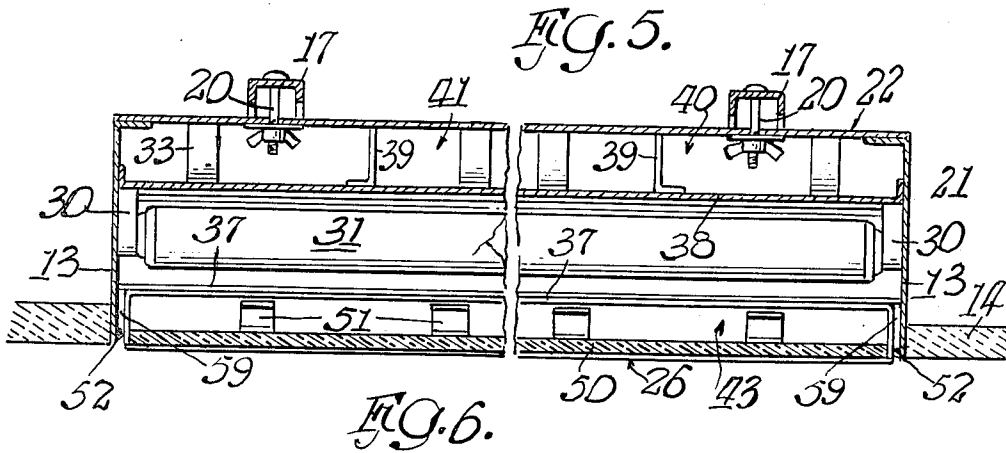
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3 Sheets-Sheet 2



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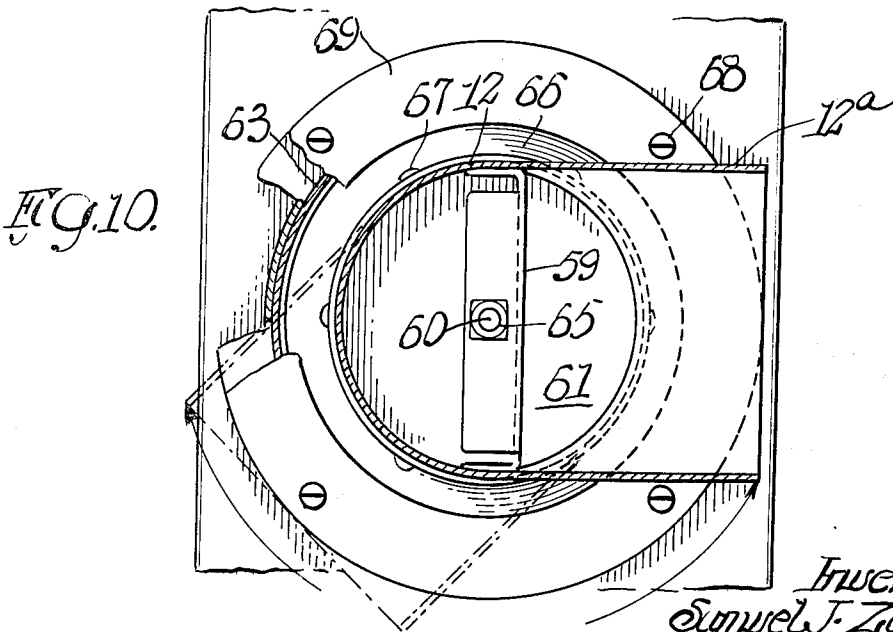
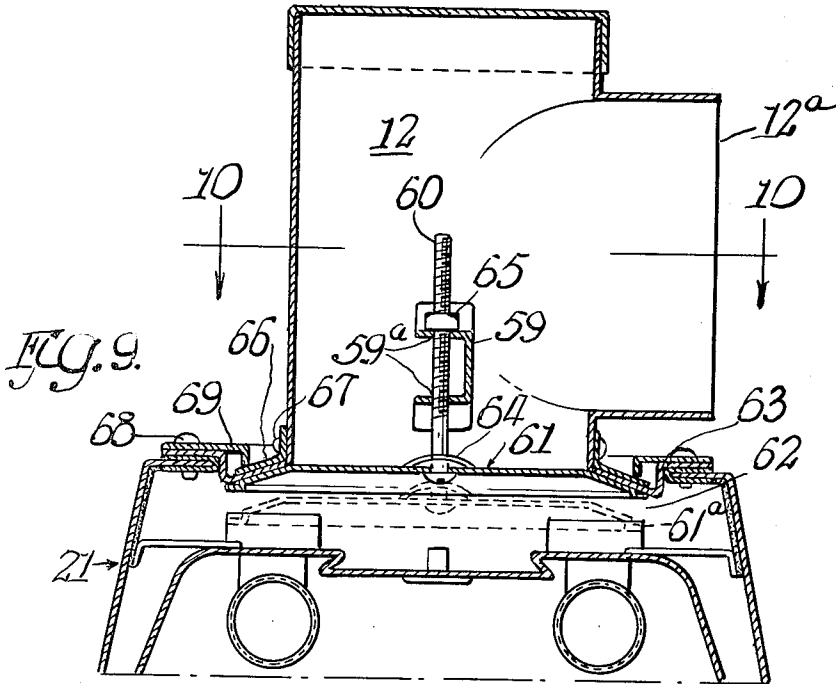
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AIR DIFFUSING LIGHT FIXTURE

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3 Sheets-Sheet 3



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3,246,137

AIR DIFFUSING LIGHT FIXTURE

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 5 Claims. (Cl. 240-9)

This invention relates to an air diffusing light fixture, and, more particularly, to an air diffusing troffer.

The term "troffer" pertains to an elongated fluorescent light fixture adapted for flush mounting in the ceiling. Necessarily, therefore, a hole must be made in the ceiling for mounting the troffer, and this has been found to be a convenient way of distributing air. However, a problem has arisen in the use of such an apparatus, since the air must be diverted around the fluorescent tubes, otherwise rapid deterioration of the tubes occurs, i.e., principally discoloration. This has meant that the air was restricted to specific outlet openings along the side and therefore nonuniform air distribution patterns resulted.

It is, therefore, a principal object of this invention to solve the foregoing problem, i.e., to provide a uniform air distribution pattern utilizing a troffer, yet one in which the sensitive fluorescent tubes are properly shielded from direct contact with the flowing air.

Further in this connection, the object can be stated to provide an air diffusing light fixture capable of delivering a uniform pattern of air a short distance therebelow but which meets underwriters' standards in maintaining electrical components out of the direct path of air.

Another object of the invention is to provide a novel air flow troffer in which uniform air distribution is achieved within a few feet of the discharge so as to meet the critical requirements of comfort conditioning.

A further object is to provide a novel baffling and outlet arrangement to protect the electrical components yet achieve uniform air distribution.

A still further object is to provide a novel door arrangement in combination with an air flow troffer which cooperates therewith in achieving the objectives outlined above.

A yet further object is to provide a novel door-latching, hinging and lock arrangement for use in connection with a fluorescent light fixture.

Other objects of the invention, both general and specific, can be seen in the details of structure and operation set down in this specification.

The invention, in an illustrative embodiment, will be explained in conjunction with the accompanying drawing, in which:

FIG. 1 is a perspective view, in fragmentary form, showing a ceiling having the inventive fixtures installed therein;

FIG. 2 is a sectional view in enlarged form of one of the inventive diffusers and corresponds to the view taken along the sight line 2-2 applied to FIG. 1;

FIG. 3 is an enlarged fragmentary sectional view of the portion of FIG. 2 encircled;

FIG. 4 is an enlarged fragmentary elevational view of the left-hand portion of FIG. 2;

FIG. 5 is a fragmentary side elevational view, partially in section, of the fixtures of FIG. 1;

FIG. 6 is a bottom plan view of the fixtures of FIG. 5;

FIG. 7 is a perspective view of the end of the door applied to a fixture;

FIG. 8 is a perspective view in fragmentary form of one of the side edges of the door of FIG. 7;

FIG. 9 is a fragmentary elevational view, partially in section, of the fixture, similar to FIG. 2 but showing details of a valve construction; and

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FIG. 10 is a sectional view taken along the sight line 10-10 applied to FIG. 9.

In FIG. 1, the numeral 10 designates generally the inventive troffer, which is seen to be positioned immediately below a ceiling opening 11. The troffer includes a duct connection 12 for supplying air thereto from a blower (not shown). It will be appreciated that the air supplied may be conditioned according to seasonal dictates, i.e., cooled, heated, or untempered, as the case may be. Also, because of the flush end walls as at 13, it is possible to mount a plurality of troffers 10 in end-to-end, abutting relation so as to develop a continuous light fixture and air outlet. Normally, the outside length dimensions of the generally rectangular troffer will be in increments of 24", 36" or 48" to facilitate this multiple mounting.

The mounting is conveniently achieved in the ceiling 14 (see FIG. 2) through the provision of suitable framing as at 15. For this purpose, the building contractor may install a 1½" channel 16 along the sides 11a of the opening 11. At longitudinally spaced points along the channels 16, there are provided yoke hangers 17 which may be suitably secured to the channel 16 by means of clamps 18 and nut and bolt assemblies 19.

The troffer 10 is supported within the ceiling opening by means of wing nut and bolt assemblies 20 extending between the yoke hangers 17 and the housing 21 of the troffer 10.

The housing 21, as best seen in FIG. 2, includes a generally rectangular-shaped casing defined by a generally flat top wall 22, side walls 23, and end-walls 13, as previously referred to. This necessarily defines an interior chamber designated 24 having an open bottom as at 25. The open bottom is closed by a swinging door panel generally designated 26, to which a more detailed reference will be made later in this specification.

The side walls 23 are equipped with longitudinally-extending step portions as at 27 having a generally "Z" shape to define a horizontally-extending flange 28 which abuts the underside of the ceiling 14.

The inside face of the top wall 22 supports a ballast 29 as at 29a which is suitably wired to electrical sockets 30 mounted on the end walls 13 and which support the fluorescent tubes 31 (see also FIG. 5). It will be noted that the fluorescent tubes 31 are positioned a spaced distance below the top wall 22 and interposed between the tubes 31 and the top wall 22 is a reflector generally designated 32. The reflector is supported from the top wall 22 by means of the previously referred-to wing nut and bolt assemblies 20 which, on the interior face of the top wall 22, carry a generally W-shaped bracket 33. The bracket 33 carries a threaded rivet-like element 34 which also is secured to the reflector 32. The reflector 32 is equipped with a longitudinally centrally depressed portion as at 35 to accommodate the wiring and ballast 29, i.e., an electrical element well being defined by the recessed portion 35.

The reflector 32 is seen to be equipped with downwardly curved, longitudinally-extending side walls 36 which, in cooperation with the side walls 23 of the housing 21, develop outlet passages for air indicated by the wavy arrows applied to FIG. 2. The lower edge of the reflector 32, as at 37, is inwardly turned to develop a flange and which serves to provide an abutment for the door 26.

The reflector 32 is equipped in its top wall 38 with transverse, spaced-apart ribs 39 defining end plenum portions 40 and a central plenum portion 41, the latter communicating with the duct connector 12. The end plenums 40 are employed for the electrical connections, i.e., particularly the ballast 29, so as to maintain the same outside the direct path of air flow.

As seen in FIGS. 3 and 7, the door 25 includes a frame 42 of perimetric nature, i.e., being generally rectangular, and which includes an upstanding flange portion 43 closely spaced to the side walls 23 as at the Z-shaped stepped portion 27 and flange 28. Spaced inwardly of the frame 42 from the upstanding flange 43, is an upstanding portion 44 (see FIG. 8) which, in its top wall 45, is equipped with a plurality of longitudinally-extending slots. Reference to FIG. 8 shows that the top wall 45 is equipped with slots 46, 47 and 48 of different lengths but of the same width ($\frac{3}{8}$ "'). In the illustration given, the slots 46 centrally disposed (relative to the length of the door 26), are about $1\frac{1}{2}$ " long, eight such slots being provided on each side in a 48" long door, while between these slots 46 and the end slots 48 are provided six slots 47 which are $2\frac{1}{4}$ " long. The end slots 48, four of which are provided (two at each end) are $3\frac{1}{8}$ " long. Thus, as the ends of the door are approached, the slots become increasingly longer, the spacing between all slots being about the same, i.e., of the order of $\frac{1}{2}$ ".

The upstanding portion 44 is equipped with an inwardly-extending flange 49 (see FIG. 2), and the flange 49 supports a $\frac{1}{8}$ " thick glass panel 50. To permanently secure the glass panel in place, clip angles 51 are provided on the inside of the frame 42.

The door is hingedly secured to the housing 21 by means of pins 52 and apertured hinge plates 53, the latter being provided in the upstanding portion 44, while the pins 52 are provided on the housing 21, i.e., the side walls 23 thereof. The hinge plates 53 are equipped with L-shaped openings as at 54 in which the pins 52 are received. The door 26 is releasably locked in place by means of a touch latch 55 provided on the side wall 23 and which is constructed of a spring-like metal having a detent portion as at 56 fitting within a slot 57 in the upstanding portion 44 of the frame 42.

As can be seen from the dotted line configuration of the door in FIG. 3, removal thereof is restricted until the door is swung more than 90° from its closed position by virtue of a stop bracket 58 which is secured to the inside of the side wall 23 and which extends through a slot 57a in the upstanding portion 44 of the door 26. As the door is rotated, but short of the above-mentioned 90° position, any attempt to elevate the door so as to disengage the pin 52 from the slot 54 is resisted by the abutment of the flange 43 with the stop bracket 58—until the door is rotated to the dotted line position wherein the frame 42 effectively clears the stop bracket 58. Thus, the door can hang open without being detachable.

In the operation of the device, the troffer 10 will normally be employed to distribute both air and light. However, these distributions can be selective. For this purpose, suitable switches (not shown) can be employed to activate the air blower and the fluorescent tubes 31. When the air blower is actuated, air is delivered through ducts (not shown) to the duct connector 12, whereupon it enters the central plenum 41 for further flow first laterally and then downwardly, as shown by the arrows in FIG. 2. As the air reaches the slots 46-48, it flows there-through and at the same time flows longitudinally in the upstanding portions 44 to exit at the ends of the door 25, particularly in the spaces 59 at the ends of the door (see FIGS. 5 and 6), which are of the order of $\frac{1}{8}$ " or so. A 48" troffer having a 12" width was found to develop a uniform air pattern about three feet below the door 26, with velocities of about 40 feet per minute, within measurements taken at the ends and along the sides of the troffer at the distance indicated. Thus, a comfortable air distribution is afforded very close to the surface of the troffer.

Access to the interior of the housing 21 is readily obtained merely by depressing the detent 56 so as to disengage the same from its associated slot 57. Normally, I provide two slots 57 along each side of the door 25 and align the stop bracket 58 with one of the latches 55 so

that the door panels 25 may be mounted in either position, i.e., the ends thereof thereby being interchangeable. For the same purpose, I provide the mounting pins 52 at each end and on each side.

As can be seen from FIGS. 2 and 7, the reverse mounting of the door 25 is facilitated by virtue of the fact that the L-shaped slot 54 is provided at one end of one of the upstanding portions 44, while at the corresponding end of the other upstanding portion 44 an opening 54a is provided. At the other end of the door (not shown), the slot and opening 54 and 54a, respectively, are reversed.

The duct connection 12 (as seen in FIG. 9) includes means for regulating the flow of air into the troffer. For this purpose, the connection 12 is equipped with a cross strut 59 suitably anchored therein and which is apertured as at 59a for the receipt of a bolt 60. The bolt 60, at its lower end, carries a valve or damper of conical shape generally designated 61. A lowered position of the damper 61 is shown in dotted line and designated 61a to define an annular opening 62 with an outwardly and downwardly-extending flange 63.

To accommodate movement of the damper 61, the bolt is equipped with a spring-nut 64 and positioned above the strut 59 is another nut 65, the bolt 60 being threadedly received within the nut 65. Thus, as the bolt 60 is turned, the damper 61 is raised or lowered, as the case may be, to alter the height of the annular opening or space 62.

To support the flange 63, the duct connection 12 is equipped with its own flange 66, which is anchored thereto by means of sheetmetal screws 67. The flange 63 is essentially Z-shaped and is boltably secured by means of bolts 68 to an angle bracket 69. By loosening the bolt 68, the gripping engagement of the flange 66 by the bracket 69 and Z-shaped flange member 63 is relieved so that the duct connection 12 can be rotated to various angular positions and thus accommodate the branch 12a to the most suitable connection to an air supply duct (not shown), an alternate position being shown in dotted line in FIG. 10.

The bolts 68 extend into the top of the housing 21 to support the flange member 63 and the bracket 69 which, in turn, positionably support the duct connection 12 in the desired angular position.

While in the foregoing specification a detailed description of an embodiment of the invention has been set down for the purpose of illustration thereof, many variations in the details herein given may be made by those skilled in the art without departing from the spirit and scope of the invention.

I claim:

1. In apparatus of the character described, an elongated housing having top, side and end walls defining an open bottom, said end walls being flat to accommodate the mounting of a plurality of housings in end-to-end, abutting relation, each of said side walls having a Z-shaped step along the open bottom, bolt means extending through said top wall for securing said housing to a supporting structure, a W-shaped bracket supported by said bolt means interiorly of said housing, a reflector elongated lengthwise of said housing and secured to said bracket a spaced distance below said top wall, said reflector being equipped with a pair of upstanding transverse ribs defining with said top wall end and central plenums, said reflector having downwardly curving side walls spaced from corresponding side walls of said housing to provide a pair of air outlet passages, said reflector side walls being equipped with inwardly-directed flanges at their lower ends horizontally aligned with said Z-shaped step, a ballast secured to said top wall and positioned in one of said end plenums, a duct connected to said top wall and communicating with said central plenum,

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a pair of fluorescent tube sockets on each end wall positioned below said reflector, said reflector having end slots affording means for passing said reflector past said sockets for mounting said reflectors, a pair of fluorescent tubes extending between said pairs of sockets, means electrically coupling said tubes to said ballast, a door releasably mounted on said housing and, in its closed position, abutting said reflector flanges, said door including an elongated perimetric frame supporting a light-transmitting panel with said frame being received in said Z-shaped step of said housing when said door is in closed position, said door, at the ends thereof, providing with said end walls a discrete space, said frame being equipped with an upstanding flange along the lower sides thereof and an inverted U-shaped upstanding portion parallel to and spaced inwardly of said upstanding flange, a plurality of slots in each U-shaped portion, with the slots increasing in length as the frame ends are approached, apertured hinge plates closing the ends of said U-shaped portions, a pair of hinge pins mounted on said housing end walls and received in the apertures of said hinge plates, one of said apertures being L-shaped to permit removal of said door, said U-shaped portions being equipped with outwardly-facing, spaced-apart openings, a spring latch on one of said housing side walls releasably received within the opening of one of said U-shaped portions and when said door is in closed position, and a stop bracket on the other of said housing side walls received within the opening of the other U-shaped portion when said door is in closed position, said stop bracket cooperating with said upstanding flange to prevent door removal until said door has been pivoted open more than 90° from its closed position.

2. The structure of claim 1 in which said discrete space is of the order of $\frac{1}{8}$ ".

3. The structure of claim 1 in which one of said hinge pin plates in each U-shaped portion is equipped with a circular aperture while the other hinge pin plate has said L-shaped aperture, whereby said door is mountable in reverse positions.

4. In apparatus of the character described, an elongated housing having top, side and end walls defining an open bottom, said end walls being flat to accommodate a mounting of a plurality of housings in end-to-end, abutting relation, bolt means extending through said top wall for securing said housing to a supporting structure, a reflector elongated lengthwise of said housing and secured thereto a spaced distance below said top wall, said reflector being equipped with a pair of upstanding transverse ribs defining with said top wall end and central plenums, said reflector having downwardly curved side walls spaced from corresponding side walls of said housing to provide a pair of air outlet passages, said reflector side walls being equipped with inwardly directed flanges at their lower ends, a ballast secured to said top wall and positioned at one of said end plenums, a duct connected to said top wall and communicating with said central plenum, a plurality of fluorescent tube sockets on each end wall positioned below said reflector, said reflector having end slots affording means for passing said reflector past said sockets for mounting said reflectors, a plurality of fluorescent tubes extending between said

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sockets, means electrically coupling said tubes to said ballast, a door releasably mounted on said housing and, in its closed position, abutting said reflector flanges, said door including an elongated perimetric frame supporting a light-transmitting glass panel, said door, at the ends thereof, providing with said end walls a discrete space, said frame being equipped with an upstanding flange along the lower sides thereof and an inverted U-shaped upstanding portion parallel to and spaced inwardly of said upstanding flange, and a plurality of slots in each U-shaped portion, with the slots increasing in length as the frame ends are approached.

5. In apparatus of the character described, an elongated housing having top, side and end walls providing an open bottom, said end walls being flat to accommodate the mounting of a plurality of housings in end-to-end, abutting relation, each of said side walls having a Z-shaped step along the open bottom, bolt means extending through said top wall for securing said housing to a supporting structure, a reflector elongated lengthwise of said housing and secured thereto a spaced distance below said top wall, said reflector being equipped with a pair of upstanding transverse ribs defining with said top wall end and central plenums, said reflector having downwardly curving side walls spaced from corresponding side walls of said housing to provide a pair of air outlet passage, said reflector side walls being equipped with inwardly directed flanges at their lower ends horizontally aligned with said Z-shaped step, a ballast secured to said top wall and positioned in one of said end plenums, a duct connected to said top wall and communicating with said central plenum, a plurality of fluorescent tube sockets on each end wall positioned below said reflector, said reflector having end slots affording means for passing said reflector past said sockets for mounting said reflectors, a plurality of fluorescent tubes extending between said pairs of sockets, means electrically coupling said tubes to said ballast, a door releasably mounted on said housing and, in its closed position, abutting said reflector flanges, said door including an elongated perimetric frame supporting a light-transmitting glass panel with said frame being received in said Z-shaped step of said housing when said door is in closed position, said door, at the ends thereof, providing with said end walls a discrete space, said frame being equipped with an upstanding flange along the lower sides thereof and an inverted U-shaped upstanding portion parallel to and spaced inwardly of said upstanding flange, and a plurality of slots in each U-shaped portion, with the slots increasing in length as the frame ends are approached.

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NORTON ANSHER, *Primary Examiner.*