

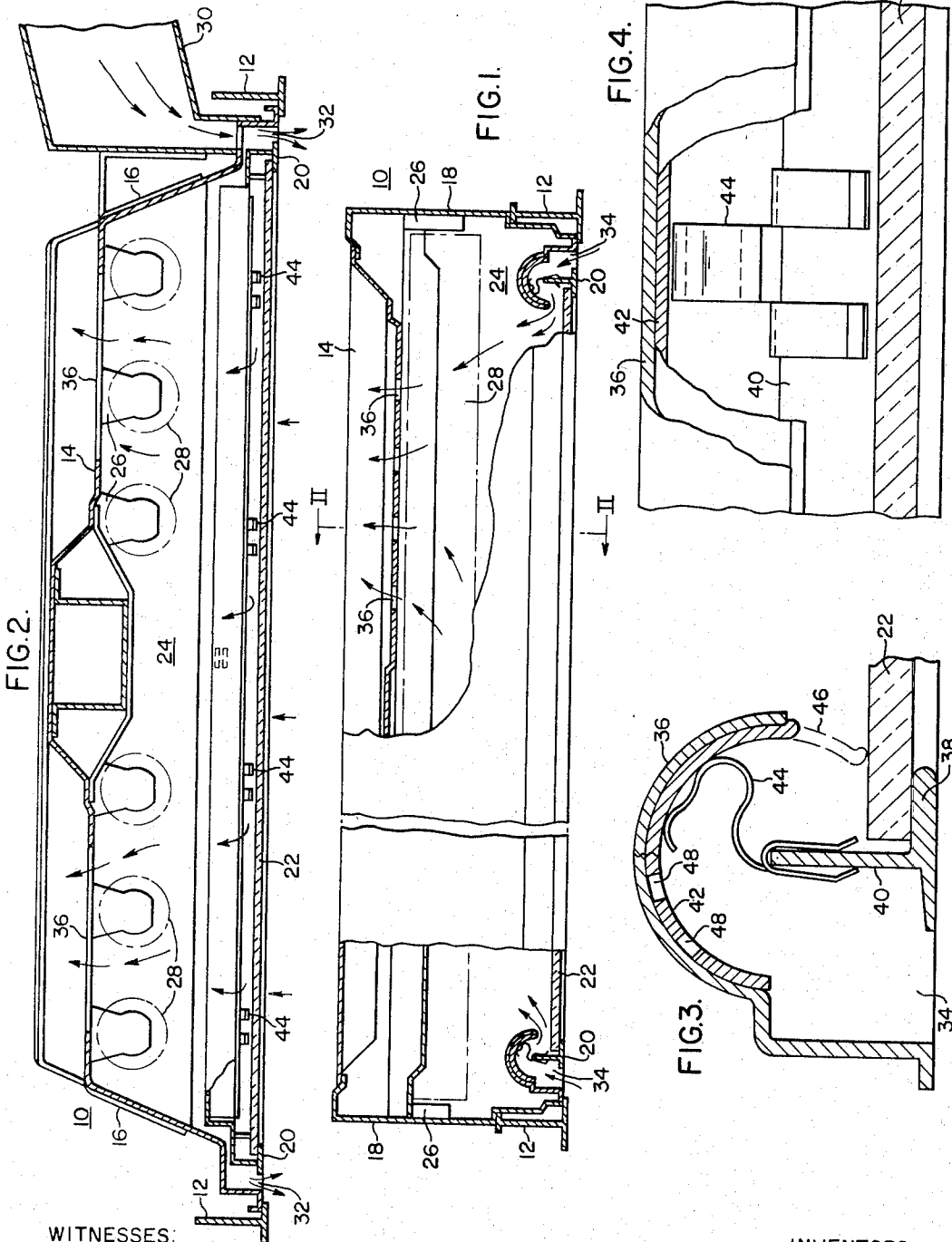
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J. P. WOTOWIEC ETAL
AIR HANDLING LIGHT FIXTURE

3,375,773

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2 Sheets-Sheet 1



WITNESSES:

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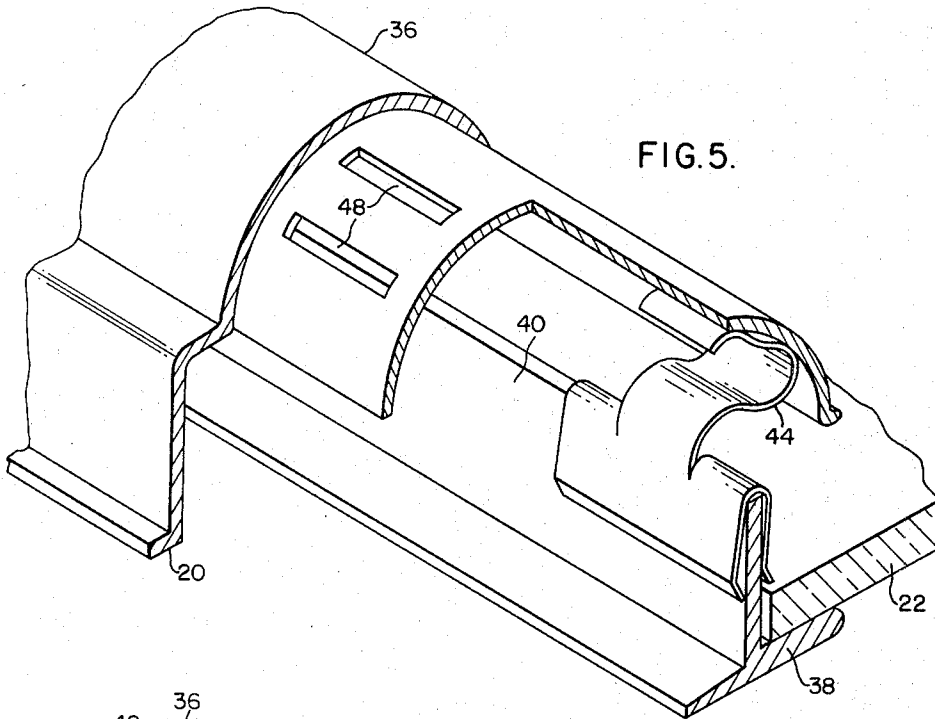


FIG. 5.

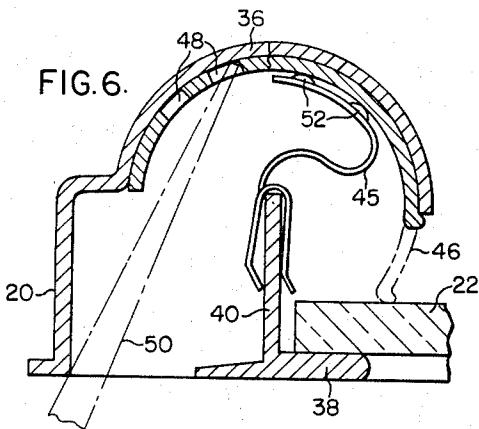


FIG. 6.

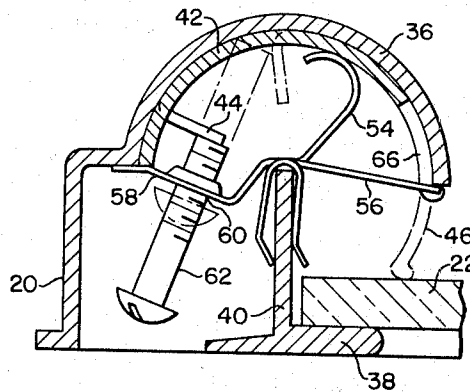


FIG. 7.

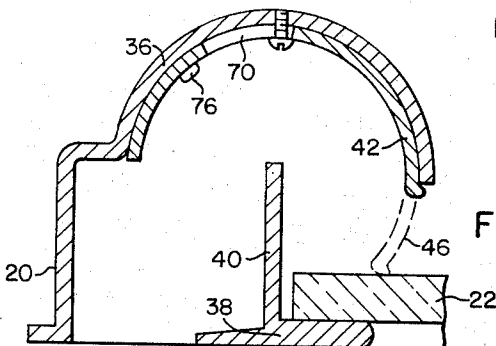


FIG. 8.

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AIR HANDLING LIGHT FIXTURE

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ABSTRACT OF THE DISCLOSURE

An air handling luminaire including a housing which, in conjunction with a refractor door assembly, defines an enclosure in which the heat generating light sources are mounted. The refractor door assembly includes an air entrance duct on one or both ends thereof which has a curved arcuate shape in cross-section and is so shaped to minimize air turbulence while minimizing the exit of light from the light sources through the air entrance duct. The air entrance duct is further provided with a semi-circular, in cross-section, vane rotatable within the duct to vary the area of the entrance and accordingly the amount of air traversing the heat generating light sources.

Background of the invention

Heat rejection type lighting fixtures are designed in such a manner that air from the occupied space of a room is drawn through the lamp cavity of the fixture and into the plenum space of the building. Some means must be provided for the air to enter the fixture but which will prevent an objectionable amount of light from the lamps in the interior of the fixture from escaping through the air entrance means. The shapes of many air entrance ducts employed today cause excessive air turbulence and consequently generate undesirable noise as well as create an undesirably high static pressure drop across the fixture. It is important that the static pressure drop be kept as low as possible since the higher the static pressure drop the larger the partial vacuum which has to be developed in the plenum space above the fixture in order to pull the air through the fixture. When large static pressure drops are created in the plenum space, there is a tendency for the ceiling tiles to be lifted causing the ceiling to leak air. Where this occurs, it is necessary to increase fan horsepower, duct sizes, and therefore operating costs. It is also important that noise generation be kept to a minimum in order to keep additive noise levels in the occupied space of a room as low as possible.

Additionally, in order that a well balanced system can be established, it is highly desirable that the return air duct through the lighting fixture and particularly the air entrance duct be provided with some means of controlling or restricting the air flow into the fixture. Some light fixtures having the facility for dampering adjustments in the air entrance ducts but require extensive dismantling of the fixture to reach the dampering mechanism. For example, the luminaire door must be opened and a number of screws loosened and re-tightened to make adjustments. During this operation, the pressure drop characteristics of the fixture are drastically altered when the door is open so that effective damper adjustment cannot be monitored with any significant accuracy while the door is open.

Summary of the invention

It is an object of the present invention to provide an air handling light fixture having an air entrance duct which serves as a satisfactory light trap box while providing a significant reduction in air turbulence.

It is another object of the present invention to provide an air handling luminaire having an air entrance duct that minimizes air turbulence, reduces the static pressure drop across the light fixture, and generates as little noise as possible.

A further object of the present invention is to provide an air handling light fixture wherein the air entering the fixture can be controlled or dampered from the exterior of the fixture without the requirement of opening the door or substantially dismantling the fixture.

The foregoing objects are accomplished in accordance with the present invention by providing an air handling luminaire which comprises a lamp containing housing and at least a partially light transmitting closure member sealing off the bottom opening of said housing to define an enclosure. The closure member includes an air entrance means provided along at least one edge of the light transmitting closure member and defined by an upper curved member of semicircular cross-section and a lower, vertically extending flange projecting in a direction opposite that of the downwardly projecting lower edges of the curved member approximately midway between said edges to provide a smooth conduit for transmission of air into the enclosure while minimizing the exit of light from the enclosure through said air entrance means. The air handling luminaire further includes adjustable damper means within the air entrance means for adjustably controlling the amount of air entering the enclosure. The adjustable damper means includes a semi-circular vane rotatable within the upper curved member and selectively positionable from the exterior of said housing to control the size of the opening in the air entrance means.

Brief description of the drawings

The above recited objects, and others, along with many of the attendant advantages of the present invention will become more rapidly apparent and better understood as the following detailed description is considered in connection with the accompanying drawings, in which:

FIG. 1 is an elevational side view, partly in section, of an installed luminaire;

FIG. 2 is a sectional view taken along the line II-II of FIG. 1;

FIG. 3 is an enlarged sectional view of the adjustable air entrance ducts illustrated in the lower corners of the luminaire of FIG. 1;

FIG. 4 is an enlarged view of a portion of the bottom edge of the FIG. 2 embodiment with portions thereof partially broken away;

FIG. 5 is a perspective view of a portion of the adjustable air duct with portions thereof broken away;

FIG. 6 is an enlarged view of the adjustable air duct similar to FIG. 3 illustrating another form which the spring retaining clip may take;

FIG. 7 is a sectional view similar to FIG. 6 illustrating another form the adjustment mechanism for the adjustable air duct may take; and

FIG. 8 is a sectional view similar to FIG. 6 illustrating yet another form which the damper mechanism of the present invention may take.

Description of the preferred embodiments

Referring now in detail to the drawings, wherein like reference characters represent like parts throughout the several views, there is shown in FIG. 1 an air handling luminaire generally designated 10. The luminaire 10 is mounted on conventional ceiling cross supports 12 and comprises a luminaire housing formed by a top member 14, side walls 16 and end walls 18. The side walls 16 and end walls 18 define a bottom opening which is closed off by a light transmitting door including a frame 20 and a light transmitting refractor 22. The housing and the light

transmitting door form an enclosure 24 in which is contained lampholders 26 for mounting the heat generating light sources, generally fluorescent lamps, 28.

The luminaire 10 is also equipped to handle conditioning air being transmitted to the room through a duct 30 and air exit slots 32 provided along one or both sides of the luminaire.

To remove air from the room and also cool the heat generating light sources 28, air entrance ducts 34 are provided in the ends of the door 20 to permit air to enter the enclosure of the luminaire, traverse the heat generating light source, and exit into the plenum area above the luminaire through a plurality of transverse exit slots 36. The path of this cooling air may best be seen in FIG. 1 as indicated by the arrows.

Although air entrance ducts have previously been provided in luminaire door frames, they have generally provided tortuous paths for the air to traverse thus creating turbulence which has led to undesirable noise generation, high static pressure drop across the fixture and the necessity for increased fan horsepower to provide proper cooling for the lamps. The air handling door frame of the present invention, as best shown in FIGS. 3 and 5, includes an upper curved member 36 in the form of a sector of a hollow right circular cylinder preferably traversing slightly more than 180°. In cross-section this upper curved member has a semi-circular shape with the ends directed downwardly. A refractor support member 38 having an inverted T shape with the upwardly extending projection 40 positioned approximately equidistant between the downwardly extending ends of the curved top cover member 36 completes the air entrance duct and provides a light trap which prevents unrefracted light from exiting from the enclosure 24.

To control the flow of air through the air entrance duct, a curved vane or damper 42 also having the form of a sector of a hollow right circular cylinder with its upper surface complementary to the under surface of the air entrance duct is resiliently secured within the air entrance duct by a plurality of resilient spring clip members 44. The spring clip members 44 are secured over the upwardly extending member or projection 40 and resiliently contact the inner surface of the vane 42 forcing it into intimate contact with the under side upper curved surface of the duct 36. The vane 42 is rotatable within the upper member 36 and may be adjustably positioned therein to vary the entrance area 46 into the enclosure 24 by means of one or more centrally located slots 48 in the vane 42. As illustrated in FIG. 6, a conventional screwdriver 50, employing the edge of the door frame 20 as a fulcrum, may engage one of the slots 48 to adjust the vane 42 and hence the air entrance area 46 without opening the door 20. The resilient spring members 44 preferably each contact the inner surface of the vane or damper 42 in at least two places. This can be accomplished by the multi-curved spring 44 illustrated in FIG. 3 or an arcuate spring 45 as illustrated in FIG. 6, having a plurality of pressure detents 52 thereon.

The adjustment slots 48 located centrally of the elongated vane 42 may be replaced, if desired, by a more elaborate spring clip 54 (FIG. 7) which is similar to the spring clips 44 but additionally includes a pair of arms 56, 58 which coact with the edges of the curved cover plate to maintain the clip in a fixed position. The leg 58 further includes a threaded opening 60 through which a threaded bolt 62 is adjustable to coact with an inwardly directed flange 64 on a vane 42 which operates to rotate the vane 42 and hence reduce the entrance area 46 into the enclosure 24. In this embodiment, however, in order to reopen the duct, the door frame must be opened and the vane 42 manually returned to its original position. Once the luminaire flow rate is set, readjustment is not generally necessary and hence the single direction adjustment of the FIG. 7 embodiment poses no particular

difficulties. A slot 66 in the vane 42 permits the vane to pass the retaining arm 56 of spring 54.

FIG. 8 illustrates yet another form which the damper mechanism may take. In this embodiment one or more, and preferably at least two, slots 70 are provided in the vane 42 and extend for a slightly greater arcuate distance than that traversed by the end of vane 42 as it moves from the full line position to the dotted line position in closing opening 46. A retaining bolt 72 extends through each of the slots 70 and is threaded into a complementary threaded hole 74 in the upper curved member 36. The bolts 72 are tightened sufficiently to maintain the vane 42 in contact with the underside of curved member 36 but not to an extent which will inhibit relative sliding movement between the two members. A gasket may be employed between the vane 42 and upper member 36 to facilitate relative sliding movement therebetween if desired. Instead of slots 48, one or more raised ribs 76 may be employed to facilitate rotation of the vane 42. Of course, slots 48 or ribs 76 may be used on either of the FIG. 3, 6 or 8 embodiments interchangeably as each are acted upon with a common screwdriver or similar instrument to cause rotation of the vane.

As will be apparent from the foregoing, the air handling luminaire of the present invention is provided with an air entrance duct which provides a smooth generally unobstructed path for air entering the luminaire to traverse. It is additionally provided with a readily adjustable damper or vane which controls the amount of air permitted to enter the lamp enclosures and hence cool the lamps.

Since numerous changes may be made in the above described apparatus and different embodiments may be made without departing from the spirit thereof, it is intended that all matter contained in the foregoing description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

We claim as our invention:

1. An air handling luminaire comprising:

- (a) a housing having a top member and walls affixed thereto, said walls generally defining a bottom light opening;
- (b) an at least partially light transmitting closure member disposed within said bottom opening and forming an enclosure within said housing;
- (c) lampholder means mounted in said housing and adapted to support heat generating light source means within said enclosure;
- (d) air exit means in said housing for removing air from said enclosure;
- (e) air entrance means provided along at least one edge of said light transmitting closure member defining an opening into said enclosure, said air entrance means including an upper curved member with the ends thereof directed downwardly and a lower vertically extending flange projecting in a direction opposite that of the downwardly directed ends of said upper member approximately midway between said ends to thereby substantially eliminate the exit of light from said enclosure through said air entrance means; and
- (f) adjustable damper means disposed within said air entrance means for adjustably controlling the amount of air entering said enclosure, said adjustable damper means including a semi-circular vane mounted for rotation within said upper curved member to vary the air entrance area into said enclosure.

2. An air handling luminaire according to claim 1 wherein a spring clip is mounted on said vertically extending flange and resiliently urges said vane against said upper curved member.

3. An air handling luminaire according to claim 1 wherein said vane is secured in sliding relation to said upper curved member by at least one bolt threaded into the underside of said upper curved member and extending through a circumferentially extending slot in said vane.

4. An air handling luminaire according to claim 1

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wherein said vane further includes means thereon accessible from the exterior of said luminaire to facilitate rotation thereof.

5. An air handling luminaire comprising:

- (a) a housing having a top member and walls affixed thereto defining a bottom light opening;
- (b) an at least partially light transmitting closure member disposed within said bottom opening forming an enclosure within said housing;
- (c) lampholder means mounted on said housing and adapted to support heat generating light source means within said enclosure;
- (d) air exit means in said housing top member for removing air from said enclosure;
- (e) air entrance means provided along at least one edge of said light transmitting closure member, said air entrance means forming a light trap box having an upper member in the form of a hollow cylinder half and a lower vertically extending flange member extending above a plane defined by the lower edges of said cylinder half; and
- (f) a rotatable semi-circular vane mounted within said light trap box and having its upper curved surface in mating relationship with the under surface of said upper member.

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6. An air handling luminaire according to claim 5 wherein a plurality of spring clips are secured to said vertically extending flange and resiliently maintain said vane in intimate contact with the under surface of said upper member.

7. An air handling luminaire according to claim 5 wherein said vane includes adjusting means thereon accessible from the exterior of said luminaire, and said vane secured in sliding relationship to said upper member by at least one bolt extending through a circumferential slot in said vane and threaded into the underside of said upper member.

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