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(54) Lighting apparatus with duct for ventilation

(57) A lighting apparatus for installation in a ceiling, comprising a housing (1) with side faces (4,5) and a bottom face (3) connected thereto, an open face (6) located opposite the bottom face, holder elements for at least one lamp (2), and, for each lamp, a reflector (7,8) having faces along and to above the lamp, and comprising, between the faces of the reflector below the lamp, mirrors in the transverse direction, of which mirrors the sides remote from the lamp lie in or near the open face (6) of the housing, while a number of side faces of the housing are provided near the open face (6) with outwardly directed flanges (15,16), and while the apparatus is further provided with suitable openings (13,14) in the housing for extraction of air. Adjoining a number of side faces (4,5) and the flange or flanges (15,16) belonging thereto, there is provided a duct, of which duct the side face (4,5) forms a wall. The openings for air extraction are located in the duct.

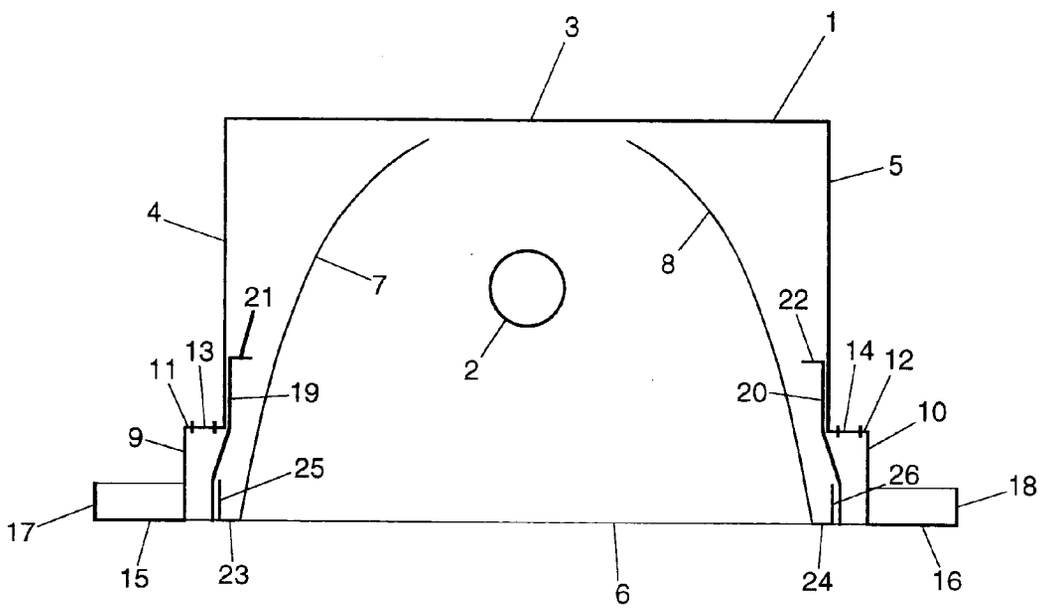

Fig. 1

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Description

The invention relates to a lighting apparatus, intended for installation in a ceiling or the like, comprising a box-shaped housing with side faces and a bottom face connected thereto, as well as an open face located opposite the bottom face, with holder elements for at least one tubular lamp and a reflector arranged in the housing for each lamp or number of lamps, which reflector comprises faces extending along and at least partly to a plane above the place of arrangement of the relevant tubular lamp or lamps, which plane lies above the place of arrangement near the bottom face of the housing, while between the faces of the reflector below the place of arrangement of the lamp or lamps a number of mirrors is arranged transversely to the reflector, of which mirrors the sides remote from the place of arrangement of the lamp or lamps lie in or near the open face of the box-shaped housing, while at least a number of the side faces of the box-shaped housing, near the open face of the housing, are provided with or connected to profiled parts having outwardly directed flanges, which are intended, after installation of the apparatus, to be flush with the ceiling, while the apparatus is further provided with suitable openings in the housing to enable extraction of air through the apparatus.

Such apparatuses are generally known and are intended for either normal or compact tubular fluorescent lamps. In this known lighting apparatus the side faces of the box-shaped housing, which often has an elongated rectangular form and then accommodates tubular fluorescent lamps, are usually flat and are perpendicular to the bottom face of the housing over their entire height. The outwardly directed flanges adjoining one or more of the side faces at the end near the open side of the housing are often parallel to the bottom face and in many cases provided with a raised edge at the end remote from the relevant side face, so that those flanges, if desired, can engage around portions of the ceiling structure of the (lowered) ceiling in which the apparatus is to be installed. When installed, the open face of the housing and the surrounding flanges are flush with the face of the ceiling directed towards the space below the ceiling.

The built-in fixtures of the above-described type are usually provided with suitable openings in the housing to enable extraction of air through the apparatus. In ceilings of the lowered type, suction elements of ventilating apparatus are often located in the space between the lowered ceiling and the ceiling proper. Such suction elements serve to suck in air from the space below the ceiling. Since the lowered ceiling impedes the free movement of air, passages must be provided for that air through that lowered ceiling. Because openings in the ceiling itself are often undesirable for aesthetic reasons, it is common practice to provide openings for sucking in air in the housing of the lighting fixtures. Such openings are usually located in the bottom face of the box-shaped housing of the lighting apparatus, which bottom face, after installation of the fixture, is the upper part of the apparatus. In such a structure, when used, the ventilating air is sucked in through the open face of the box-shaped housing and along the lamp or lamps in the housing to reach the openings in the bottom face via the usually existing space above between the reflector faces arranged along the lamp.

It has been found that air suction along the lamp or lamps is not satisfactory for all types of lamps. There is therefore a wish to provide a lighting apparatus in which suction of air through the apparatus is possible without passing that air directly along the lamp. To satisfy this wish, it could be considered to provide openings in the flanges, flush with the ceiling, at the ends of the side faces. This meets with aesthetic objections similar to those relative to openings provided in the lowered ceiling itself. Moreover, such openings would in many cases be closed by the parts of the ceiling structure on which the flanges rest. Also, it will not be easy in such a case to realize a canalized extraction.

The object of the invention is to provide an apparatus which satisfies the above-mentioned wish without involving the above-described disadvantages.

The object in view is accomplished according to the invention with a lighting apparatus in which, adjoining at least a number of the side faces and the outwardly directed flange or flanges belonging to that side face or those side faces, there is provided a duct separated from the part of the housing where the lamp is or the lamps are located, of which duct the relevant side face forms a wall, while the openings for air extraction are located in the bottom of the duct or in the part of the duct adjoining the outwardly directed flange. In a suitable manner, the above number of the side faces of the box-shaped housing may then be bent outwardly at the side of the open face of the housing, and a partition may be provided at or on the relevant side face, which partition extends from the part of the side face not bent outwardly to near the open face of the housing, in a manner such that the duct is defined by the bent part of the side face and the partition.

In another suitable embodiment, the above number of the side faces of the box-shaped housing is directed straight to the open face of the housing, and a profiled piece is attached to the relevant side face over the entire length or the major part thereof, which profiled piece consists of a part extending along the side face and an outwardly bent part adjoining the housing at the side of the open face thereof, the latter part being provided near the open face with the outwardly directed flange, in a manner such that the duct is defined by the side face and the profiled piece.

Since according to the invention one or more separate ducts, via which the extraction can be effected, are formed in the housing of the lighting apparatus, which ducts are separated from the remaining part of the housing in which the lamp or lamps are located, ei-

ther by the above-mentioned partition or by the adjacent side face, the extraction is effected in a manner such that absolutely no undesirable air flow can pass along the lamp or lamps. The openings for sucking in air are further located in the duct or ducts and are therefore not, if at all, visible at a distance, so that the above-mentioned aesthetic objections have also been met. Preferably, the openings for air extraction are provided in the portion of the bent part of the side face or the profiled piece that forms the bottom of the duct. An advantage of the presence of extraction openings in the bottom of the duct, which bottom, since the fixture is installed with the open face of the duct or ducts downwards, is located at the highest point of the duct, is the following. Usually, fixtures of the built-in type are provided with one or more fixing clamps fastened to the box-shaped housing, by means of which clamp or clamps the fixture is mounted in the ceiling. The position of the fixture relative to the lowered ceiling in which the fixture is mounted may then be adjusted by rotating a clamp screw of the clamps with which the distance from a clamp arm resting on the lowered ceiling to the box-shaped housing can be modified. In the lighting apparatus according to the invention, these clamp screws are easily accessible, via openings in the bottom of the duct, which openings are provided in suitable places.

It is observed that British patent 897 760 discloses a lighting apparatus in which a lighting unit is combined with a ventilating unit. The ventilator part is built around the lighting part, in a manner such that along at least a number of the side faces of the housing of the lighting part ducts are provided, the bottoms of which have air passage openings. Unlike in the apparatus according to the present invention, the wall of a duct at the side of the lighting unit is not defined by the wall of the housing itself or by a partition connected to that wall, but by the edge of the cover of the housing of the lighting unit, which cover may consist of a plate or of a louver system. In none of both cases, and certainly not in the latter, it can be avoided that when air is sucked in via the ventilating part, air is also sucked in along the lamp or lamps. However, the apparatus does not seem to be intended for sucking in air but, on the contrary, for blowing air downwards out of the apparatus. For that purpose, it is not so bad that there is no proper seal between the duct and the lighting unit.

It is observed that U.S. patent 3 644 727 also discloses a combined apparatus for air conditioning and lighting, in which along the edges of the housing for the lamp or lamps elongated slots are provided which are coupled to an air supply opening. This is also an apparatus for blowing air into the space below the apparatus and not for extracting air from that space. Apart from this, the structure is quite different from that of the apparatus according to the invention.

The invention relates both to fixtures for straight tubular lamps and to fixtures for other types of tubular lamps, such as compact lamps. When straight lamps are used, the box-shaped housing is more or less elongated, in which preferably at least the side faces along the long sides each contribute to defining a duct.

In a suitable embodiment of the apparatus according to the invention with an elongated box-shaped housing, the place of arrangement for the lamp or lamps preferably extends virtually parallel to the long side faces of the box-shaped housing, and the faces of the reflector extending along the place of arrangement of the lamp therefore extend virtually parallel to those long side faces, and the wall of the duct at the side of the reflector faces is connected to the reflector face at that side so close to the lower end that no light can pass between the wall of the duct and the reflector face. The result of the latter is that the occurrence of undesirable light spots and scattered rays at the back of the reflectors, seen from the lamp, is avoided.

According to yet another embodiment of the lighting apparatus according to the invention, the box-shaped housing is virtually square, ducts being provided along at least one pair of opposite sides.

In a further suitable embodiment of the lighting apparatus according to the invention, the box-shaped housing is connected at the side of the side faces and the bottom face to an extraction chamber or damper chamber, in a manner such that the openings for air extraction terminate in that chamber. Thus it is possible to directly extract air from the space below the apparatus via the ducts of the apparatus (when an extraction chamber is used), or the occurrence of disturbing noises, e.g. cross talk between adjacent spaces, is avoided (by means of a damper chamber).

It is further observed that the form of the openings or slots in the duct in the lighting apparatus according to the invention is not of essential importance, as long as the total surface of the openings is large enough to ensure proper air suction.

The invention will be illustrated with reference to the accompanying drawings, in which:

Fig. 1 is a cross-sectional view of an embodiment of the lighting apparatus according to the invention,
Fig. 2 is a bottom plan view of the embodiment of the lighting apparatus shown in Fig. 1,
Fig. 3 is a cross-sectional view of a part (wall portion plus duct) of another embodiment of the lighting apparatus according to the invention, and
Fig. 4 is a similar view of yet another embodiment of the lighting apparatus according to the invention.

In the Figures similar or corresponding parts are provided with the same reference numerals.

The embodiment of the lighting apparatus according to the invention, shown in Figs. 1 and 2, is of the elongated type with a box-shaped housing 1, in which a lamp 2 can be fixed in suitable holder elements not discussed. The apparatus may also comprise holder elements for two lamps to be arranged one above the oth-

er. This is not shown in Fig. 1.

The housing 1, which may be made from steel plate, plastic or another suitable material, comprises a bottom face 3 and side faces connected thereto at virtually right angles. In the cross-sectional view of Fig. 1, the long side faces 4 and 5 are shown. The face 6 opposite the bottom face 3 of the housing 1 is open. In use, light from the lamp 2 can emerge from the lighting apparatus through the open face 6. Fig. 1 shows the apparatus in the position in which it will be installed in, e.g., a lowered ceiling. In this position the "bottom face" 3 of the housing 1 is the upper part of the apparatus. The open face 6 is virtually the lower part of the apparatus and will, after installation, be flush with the lower face of the relevant ceiling.

A reflector is arranged in the housing 1 at some distance therefrom, partly along each side thereof, and extends partly to above the lamp 2. As shown in Fig. 1, the reflector consists of two parts 7 and 8, each essentially consisting of a curved reflecting plate, e.g. of aluminum, extending parallel to the lamp in the longitudinal direction. In the embodiment shown, the parts 7 and 8 terminate at a distance from each other in a plane above the lamp 2, which plane is close to the bottom face 3 of the housing 1.

Placed at intervals over the entire length of the reflector are small transverse mirrors. These are not shown in the cross-sectional view of Fig. 1. The transverse mirrors terminate at their lower ends in or near the open face 6.

According to the invention, the long side faces 4 and 5 of the housing 1 are laterally bent outwards at the side of the open face 6, so that the strips 9 and 10, which terminate in the open face 6, extend parallel to each other and to the parts of the faces 4 and 5 not laterally bent, but are placed at larger intervals than the unbent parts of the faces 4 and 5. These unbent parts themselves will be designated below by 4 and 5.

The strips 9 and 10 are connected to the faces 4 and 5, respectively, by means of flat parts 11 and 12, respectively. The flat parts 11 and 12 mainly extend parallel to the bottom face 3 and the open face 6 of the housing 1, but this is not an absolute requirement. They form the bottom of the ducts discussed below and are provided with suitable openings or slots 13 and 14, respectively, for air to be sucked in therethrough.

At the side of the open face 6, the strips 9 and 10 are provided with outwardly directed flanges 15 and 16, respectively, which are each provided at their outer ends with raised edges 17 and 18, respectively. These flanges 15 and 16 with raised edges 17 and 18 serve to suitably install the apparatus in a (lowered) ceiling. The manner in which this can be done is known to a person skilled in the art and needs no further explanation.

Attached to the end of each of the faces 4 and 5 not bent outwardly, directed towards the open face 6, is a partition 19 and 20, respectively, which may consist of a suitably profiled strip of a suitable material, such as metal. The attachment can be realized in any suitable manner, depending on the materials used, e.g. by welding, gluing together or by means of a screw connection. If required, the face 4 and the partition 19, and the face 5 and partition 20, respectively, may be integrally formed, e.g. by extrusion. At the upper side the strips 19 and 20 are provided with inwardly directed flanges 21 and 22, respectively. The flanges 21 and 22 participate in holding back scattered light reflected from the lamp 2 against the bottom face 3 and passing the openings between the upper ends of the reflector plates 7 and 8 and the bottom face 3.

In the embodiment shown, the reflector plates 7 and 8 are provided at their lower ends in the face 6 with outwardly directed flanges 23 and 24, respectively, having raised edges 25 and 26, respectively. The strip 19 can be suitably connected at the lower end to or lie against the raised edge 25, and the strip 20 can be similarly connected at the lower end to or lie against the raised edge 26, in a manner such that no light possibly moving along behind the reflector plates 7 and 8 can emerge there from the open face 6.

Defined by the strip 19, the strip 9 of the outwardly bent side face 4, and the connecting part 11 is a duct extending along the long side of the lighting apparatus between the flange 15 and the reflector plate 7. Similarly, the strip 20, the strip or wall portion 10, and the connecting part 12 define a duct which correspondingly extends along the other long side of the fixture. The above ducts are separated from the part of the housing where the lamp 2 is arranged. Air suction, e.g. for ventilating purposes, from the space below the ceiling where the apparatus is installed in practice, to the space above the (lowered) ceiling where the ventilating ducts and suction means are located, is effected via the ducts in which, as observed before, suitable openings 13 and 14 are provided, without the occurrence of any air movement through the part of the housing 1 where the lamp 2 is arranged.

Fig. 2 is a diagrammatic bottom view of the apparatus shown in Fig. 1. It may be seen that the flanges 15 and 16 along the long sides of the fixture at both sides adjoin similar flanges 28 and 29 along the short sides. The lamp 2 is located in the central portion of the fixture and extends parallel to the reflector plates 7 and 8 arranged at both sides thereof. Placed at regular intervals are transverse mirrors 27. The manner of constructing a fixture with a lamp, longitudinal reflectors, and transverse mirrors is generally known. Novel according to the invention are the ducts 11 and 12 which extend in the longitudinal direction between the flanges 15 and 16, respectively, and the space in which the lamp 2 and the reflectors 7, 8 and 27 are arranged. Formed in the bottom of the ducts 11 and 12 are the suitably formed openings or slots 13 and 14, respectively.

Fig. 3 is a cross-sectional view of a part of another embodiment of the lighting apparatus according to the invention. In this embodiment, the partition 19 (and the

partition 20 not shown) is directed straight downwards. The end of the partition 19 at the lower side extends into the duct formed by the reflector plate 7, the flange 23, and the raised edge 25. In the embodiment of Fig. 1, as shown therein, the partition 19 extends at the lower end along the side of the raised edge 25 facing away from the reflector plate 7. Also in the embodiment of Fig. 3, the partition 19 may lie against or may be attached to the edge 25, provided no light from the lamp is admitted via the space between the reflector plate 7 and the side face 4 to the duct with openings 13.

Fig. 4 is a cross-sectional view of a part of yet another embodiment of the lighting apparatus according to the invention. In this embodiment, the side face 4 is directed straight downwards into the duct defined by the reflector plate 7, the flange 23, and the raised edge 25. The side face 4 lies against or is attached to the raised edge 25. Attached to the side face 4, at the outer side, is a suitable profiled piece consisting of a strip 30 parallel to the face 4, a part 31, 32 laterally bent outwards, and, at the lower side of the part 32 of the laterally bent piece extending virtually parallel to and at a distance from the face 4, the outwardly directed flange 15 with the raised edge 17. Defined by the side face 4 and the profiled piece is a duct, the part 31 of which, provided with openings 13, forms the bottom. The profiled piece may be attached to the side face 4 in any suitable manner, e.g. by welding or gluing together.

The invention has been explained above with reference to an embodiment essentially comprising an elongated rectangular fixture. The inventive concept, namely the forming of an extraction duct along one or more sides of the fixture, which duct or ducts is or are, in principle, separated from the space in which the lamp or lamps are arranged, may, however, also be used in fixtures of a different shape, e.g. fixtures for bent tubular lamps.

Claims

1. A lighting apparatus, intended for installation in a ceiling or the like, comprising a box-shaped housing with side faces and a bottom face connected thereto, as well as an open face located opposite the bottom face, with holder elements for at least one tubular lamp and a reflector arranged in the housing for each lamp or number of lamps, which reflector comprises faces extending along and at least partly to a plane above the place of arrangement of the relevant tubular lamp or lamps, which plane lies above the place of arrangement near the bottom face of the housing, while between the faces of the reflector below the place of arrangement of the lamp or lamps a number of mirrors is arranged transversely to the reflector, of which mirrors the sides remote from the place of arrangement of the lamp or lamps lie in or near the open face of the box-shaped housing, while at least a number of the side faces of the box-shaped housing, near the open face of the housing, are provided with or connected to profiled parts having outwardly directed flanges, which are intended, after installation of the apparatus, to be flush with the ceiling, while the apparatus is further provided with suitable openings in the housing to enable extraction of air through the apparatus,
characterized in that, adjoining at least a number of the side faces and the outwardly directed flange or flanges belonging to said side face or said side faces, there is provided a duct separated from the part of the housing where the lamp is or the lamps are located, of which duct the relevant side face forms a wall, while the openings for air extraction are located in the bottom of the duct or in the part of the duct adjoining the outwardly directed flange.

2. A lighting apparatus according to claim 1, characterized in that the above number of the side faces of the box-shaped housing may then be bent outwardly at the side of the open face of the housing, and a partition may be provided at or on the relevant side face, which partition extends from the part of the side face not bent outwardly to near the open face of the housing, in a manner such that the duct is defined by the bent part of the side face and the partition.

3. A lighting apparatus according to claim 1, characterized in that the above number of the side faces of the box-shaped housing is directed straight to the open face of the housing, and a profiled piece is attached to the relevant side face over the entire length or the major part thereof, which profiled piece consists of a part extending along the side face and an outwardly bent part adjoining the housing at the side of the open face thereof, the latter part being provided near the open face with the outwardly directed flange, in a manner such that the duct is defined by the side face and the profiled piece.

4. A lighting apparatus according to claims 1-3, characterized in that the box-shaped housing is more or less elongated, in which preferably at least the side faces along the long sides each contribute to defining a duct.

5. A lighting apparatus according to claim 4, characterized in that the place of arrangement for the lamp or lamps extends virtually parallel to the long side faces of the box-shaped housing, and the faces of the reflector extending along the place of arrangement of the lamp therefore extend virtually parallel to the long side faces, and the wall of the duct at the side of the reflector faces is connected to the reflector face at said side so close to the lower

end that no light can pass between the wall of the duct and the reflector face.

6. A lighting apparatus according to claims 1-3, characterized in that the box-shaped housing is virtually square, ducts being provided along at least one pair of opposite sides.

7. A lighting apparatus according to claims 1-6, characterized in that the box-shaped housing is connected at the side of the side faces and the bottom face to an extraction chamber or damper chamber, in a manner such that the openings for air extraction terminate in said chamber.

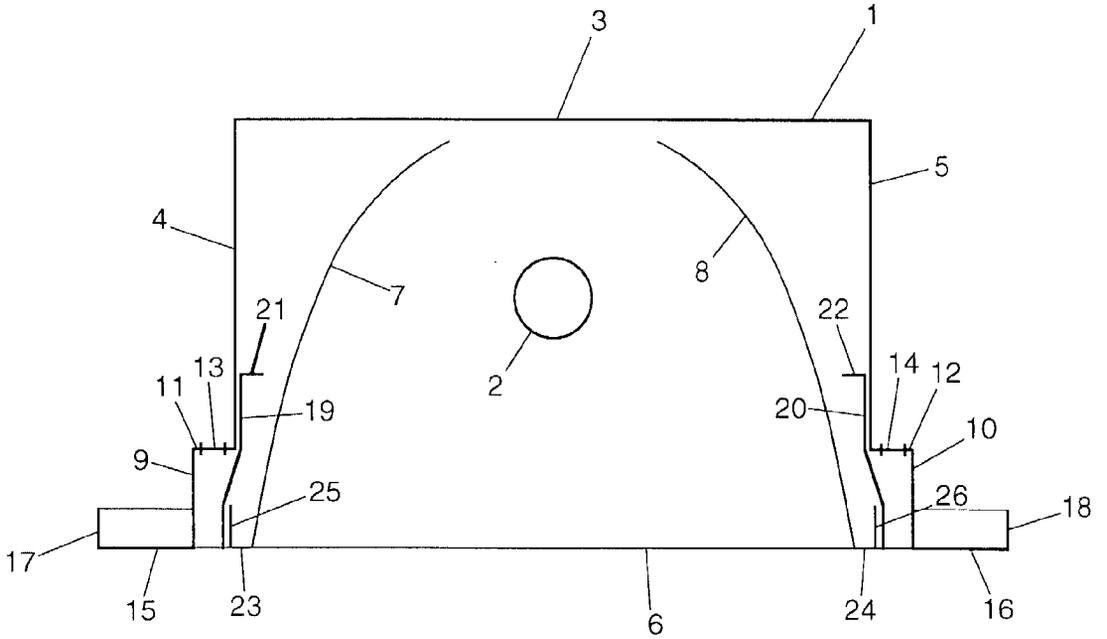
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Fig. 1

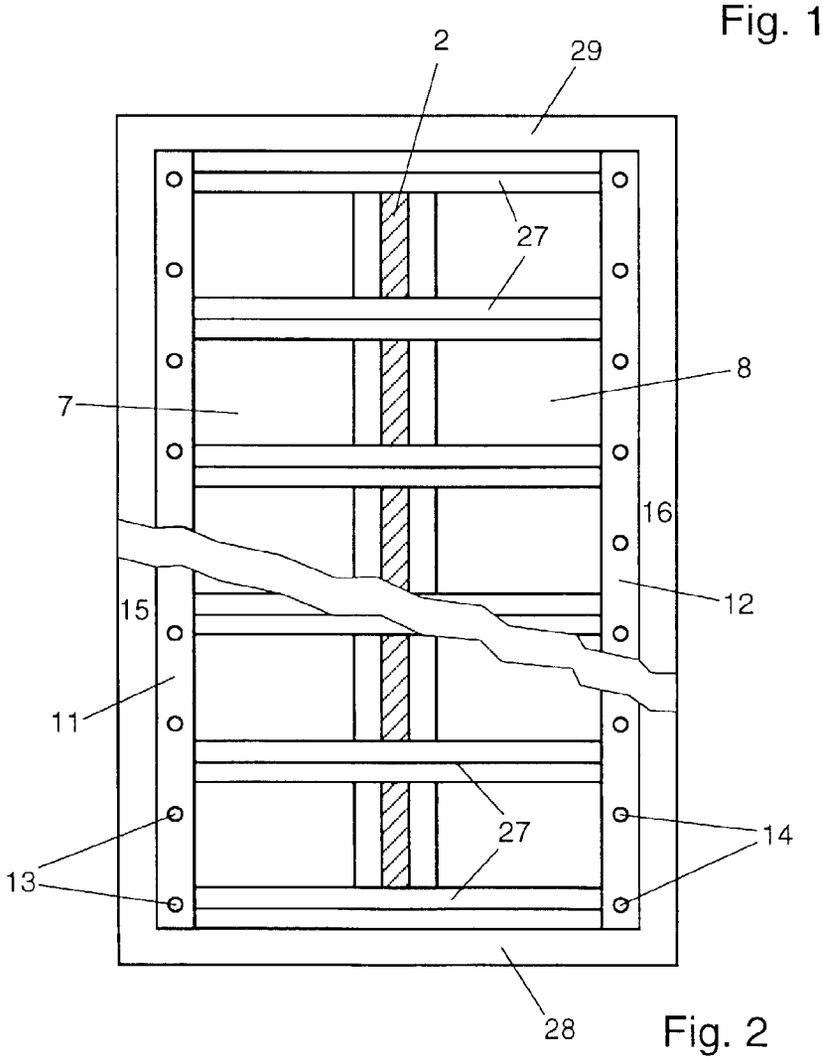
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Fig. 2

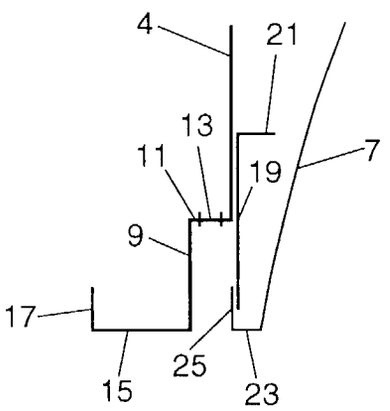

Fig. 3

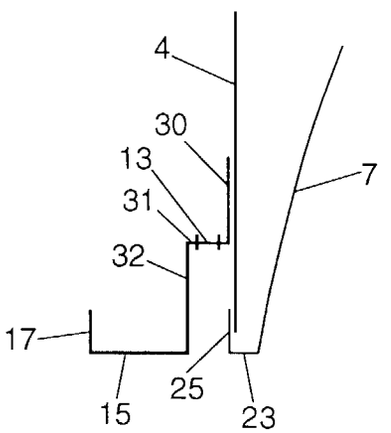

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 98 20 0233

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
D,X	US 3 644 727 A (GARRETT ROBERT E ET AL) 22 February 1972 * column 2, line 27 - column 4, line 21; figures 1-4 *	1,6,7	F21S3/02
D,X	GB 897 760 A (DAY-BRIGHT LIGHTING INC.) 30 May 1962 * page 2, line 77 - page 3, line 115; figures 1-9 *	1,2,4,5, 7	
A	DE 20 34 221 A (ZUMTOBEL KG) 11 February 1971 * the whole document *	1,3-7	
A	DE 14 89 375 A (LICENTIA PATENT-VERWALTUNGS GMBH) 3 July 1969 * figure 1 *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6) F21V F21S F24F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	4 May 1998	Van Overbeeke, J

CATEGORY OF CITED DOCUMENTS

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