

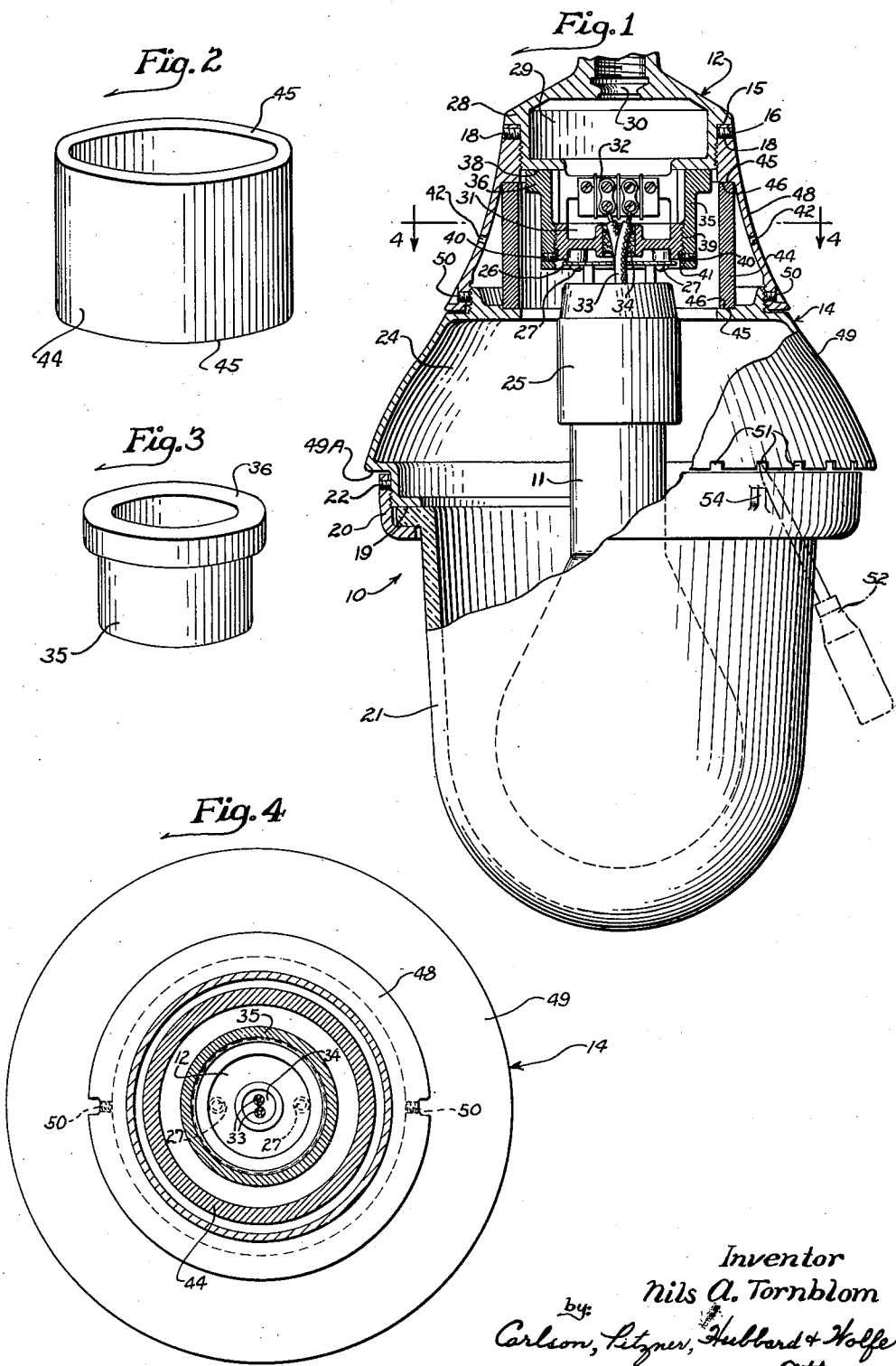
Nov. 14, 1950

N. A. TORNBLOM

2,530,135

VENTED EXPLOSION-PROOF LIGHTING FIXTURE

Filed May 7, 1948



Inventor
Nils A. Tornblom
by: Carlsson, Litgren, Hubbard & Wolfe
Attys.

UNITED STATES PATENT OFFICE

2,530,135

VENTED EXPLOSION-PROOF LIGHTING
FIXTURENils A. Tornblom, Chicago, Ill., assignor to Apple-
ton Electric Company, Chicago, Ill., a corpora-
tion of Illinois

Application May 7, 1948, Serial No. 25,731

7 Claims. (Cl. 240—11.2)

1

The present invention relates to electric lighting fixtures in general and more specifically to a novel explosionproof lighting fixture which finds particular but by no means exclusive utility in places such as refineries, chemical plants, and hospital operating rooms.

In the design of lighting fixtures of this nature, consideration must be given to even remote possibilities of failure. For example, an electrical breakdown occurring within the fixture or the conduit leading thereto could result in the establishment of an arc. Since explosionproof fixtures are commonly used in applications where they are surrounded by atmosphere containing inflammable and even explosive mixtures of gases, vapors or dust particles, an internal electrical failure in an improperly designed fixture could easily lead to an explosion or a serious fire. To guard against contingencies of this nature, the potential arcing portions of the fixture are completely housed and segregated from the surrounding atmosphere so as to preclude the ignition of inflammable or explosive gases in the latter due to arcing or to the ignition within the fixture of inflammable or explosive gases which might have filtered in from the surrounding atmosphere.

One of the objects of the invention is to provide an explosionproof lighting fixture of extremely light weight but which can be used with absolute safety in applications where such fixtures are required.

Another object is to provide a fixture of the character set forth and capable of dissipating gas pressure from the interior of the fixture at a rate approaching that at which such pressure builds up, thus keeping the peak pressure within the fixture at a minimum.

A further object is to provide an explosionproof lighting fixture of the type set forth and which will be capable of dissipating internal gas pressure without permitting the leakage of any flame from the fixture.

Another object is to provide a fixture of the above type which can be quickly installed and readily adapted for use with lamps of various sizes.

Still another object is to provide a fixture of relatively simple construction and wherein a substantial number of standard parts are utilized, thus rendering such fixture susceptible of economical manufacture.

Further objects and advantages of the invention will become apparent as the following detailed description proceeds, taken in the light of the accompanying drawing, wherein:

2

Figure 1 is an elevational view of a fixture embodying the invention, a portion of the external wall being broken away and shown in vertical section along with certain interior partition walls.

Fig. 2 is a perspective view of one of the porous metallic collars housed within the fixture of Fig. 1.

Fig. 3 is a perspective view of another porous metallic collar housed within the fixture of Fig. 1.

Fig. 4 is a horizontal sectional view taken transversely through the fixture of Fig. 1 and in the plane of the line 4—4.

While the invention is susceptible of various modifications and alternative constructions, a preferred embodiment has been shown in the drawings and will be described below in considerable detail. It should be understood, however, that there is no intention to limit the invention to the specific form disclosed, but on the contrary, the intention is to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

Upon more specific reference to the drawings, it will be noted that the invention is there exemplified in the form of a fixture 10 which in the present instance is adapted to house an incandescent lamp 11. The fixture 10 is organized upon a canopy 12 which can be mounted on any appropriate overhead or wall support (not shown). Detachably secured to the canopy 12 as by threaded engagement therewith and arranged in surrounding relationship with the lower portion of the canopy is a bell shaped housing 14. The latter has a carefully machined upper edge portion 15 arranged to sealingly engage a stop shoulder 16 on the canopy, the housing being locked in place on the latter as by means of set screws 18. Mounted in sealing abutment with an annular face 19 at the lower end of the housing 14 and secured in place by means of a suitably threaded retainer ring 20 is a globe 21 of heat resistant glass. The ring 20 may, of course, be locked in position by the use of a set screw 22. The globe 21 of the illustrative fixture 10 is fashioned in the shape of an inverted dome and, together with the housing 14, defines an enclosed lamp chamber 24. Depending upon the application of the fixture, the globe 21 may be transparent, translucent, or colored. To support the lamp 11 within the chamber 24, a socket 25 is provided. The latter is dependably mounted upon the underside of the canopy 12 in any appropriate manner, as by means of a mounting plate 26 and a series of mounting screws 27.

3

The canopy 12 is of somewhat conventional shape, comprising a hollow body 28 which contains a terminal chamber 29 arranged to communicate with a power supply conduit via a threaded opening 30. Depending from the upper portion of the body 28 is a unitary cage 31 partially enclosing the lower region of the terminal chamber and of smaller diameter than the upper portion of the body. Housed within the terminal chamber 29 and rigidly fixed to the cage 31 is a terminal block 32 to which the power supply leads can be connected, access to the block 32 being had by way of the openings in the canopy walls defining the cage 31. The block 32, in turn, is connected to the lamp socket 25 by means of insulated leads 33 which pass through a sealing well 34 in the bottom wall of the cage 31. The well 34 may be filled with material such as porcelain cement which will be capable of effecting a gas tight and flame tight seal between the leads 33 and the surrounding bore of the well 34.

Provision is made for isolating the terminal chamber 29 from the lamp chamber 24 as to the passage of flame theretbetween yet permitting the venting into the lamp chamber of gas pressure generated within the terminal chamber 29 or the power supply conduit leading thereto. This is accomplished in the present instance by interposing between the chambers 29 and 24 a partition wall of a porous material having high heat conductivity. Preferably, such material is embodied in a generally cylindrical collar 35 of sintered metal such as bronze. In the illustrative fixture 10, the collar 35 is arranged to take advantage of an annular shoulder 38 defined in the canopy wall as a result of the difference between the diameters of the cage 31 and the upper portion of the canopy. Accordingly, one of the end faces of the collar 35 is enlarged as at 36 to form a relatively wide annular surface adapted to sealingly abut against the shoulder 38 when the collar is disposed in surrounding relationship with the cage 31. To maintain the collar 35 in such condition and thus block off the cage openings which would normally communicate with both the chambers 24 and 29, the lower peripheral portion of the cage 31 together with a portion of the bore in the collar 35 are provided with coacting threads 39. The latter are, of course, machined with sufficient accuracy to constitute a satisfactory gas tight seal between the collar and the cage. Positive means such as one or more set screws 40 may be utilized for preventing the collar from being unscrewed, the screws being located so as to engage a relieved annular portion 41 immediately below the threads on the cage 31.

Means is provided for dissipating gas pressure occurring within the lamp chamber 24 into the atmosphere surrounding the fixture without the leakage of flame from the latter and without danger of igniting such atmosphere. This is accomplished in the present instance by perforating the wall of the housing 14 with one or more relatively small vent holes 42 and by interposing between such holes and the lamp chamber 24 an additional partition wall of porous material having a high heat conductivity. The holes 42 are preferably arranged in circumferentially spaced relation about the upper portion of the housing, being blocked off by means of a porous metallic collar 44. The latter is similar in character to the collar 35 but is of sufficiently larger diameter to permit being mounted in surrounding relationship with re-

4

spect to the collar 35. In the illustrative fixture 10, the collar 44 assumes the shape of a hollow cylinder having smoothly finished annular end faces 45 disposed in abutment with corresponding annular sealing faces 46 formed within the lamp chamber 24. Thus it will be appreciated that any gas vented into the surrounding atmosphere from the lamp chamber 24 must first pass through the tortuous frictional path presented by the collar 44, subsequently entering the holes 42 which offer further friction to the flow of gas.

To make certain that gas pressure generated within the lamp chamber 24 will be vented to the atmosphere outside the fixture rather than into the terminal chamber 29, the collar 44 is formed with a lower frictional resistance to the flow of gas than the collar 35. This is conveniently accomplished in the present instance by making the collar 44 more porous and the collar 35 less porous. By the same token, the decreased porosity of the collar 35 gives it better machining properties than it would ordinarily have, thus insuring a tight seal along the threads 39 which secure the collar 35 to the canopy.

In order to readily adapt the fixture 10 for use with lamps of various sizes, the housing 14 is split into an upper skirt 48 and a lower skirt 49 detachably connected thereto. The skirts 48 and 49 may conveniently be threaded together and retained in such condition as by means of set screws 50. With this arrangement, a given fixture can be quickly conditioned to accommodate various sizes of lamps merely by interposing lower skirts of various lengths between the upper skirt 48 and the glass globe 21. Such construction also provides a ready expedient for clamping the second or outermost porous metallic collar 44 securely in place.

For the purpose of obtaining a gas tight seal between the globe 21 and the lower skirt 49 without the use of special tools, the marginal edge portion of a shoulder 49A on the lower skirt is formed with a plurality of circumferentially spaced notches 51, any one of the latter being adapted to serve as a fulcrum point for the end of a screwdriver 52. By the same token, the ring 20 is equipped with a radially projecting lug 54 underlying the shoulder 49A and the notches 51. Thus, it is possible to either tighten or loosen the ring 20 by merely inserting the tip of the screwdriver 52 into one of the notches 51 and pushing the screwdriver in a generally horizontal direction so as to accost the lug 54. By the use of this arrangement, sufficient torque can be applied to the ring 20 to obtain a very satisfactory seal between the globe 21 and the surface 19 of the lower skirt 49.

In operation, any gas under pressure developed within the supply conduit or the terminal chamber 29 must pass through the porous metallic collar 35 on its way to the lamp chamber 24. Due to the tremendous friction presented by the collar 35 to the flow of gas therethrough, a certain amount of pressure will be immediately dissipated in overcoming such friction. Furthermore, any flame within the chamber 29 will be denied escape by the collar 35, since any burning gas entering the latter will be immediately cooled well below its ignition temperature due to the rapid heat conduction properties of the material in the collar and also to the large heat transfer area presented by the labyrinths in its structure. Gas under pressure within the chamber 24, on the other hand, must pass through the tortuous path pre-

sented by the collar 44 and the holes 42 before venting to the atmosphere. Here again a certain amount of pressure will be dissipated within the collar 44 in overcoming the internal friction of the latter, while still additional pressure will be dissipated due to frictional loss in the vent holes 42. Should the gas within the lamp chamber 24 become ignited, the porous metallic collar 44 will rapidly conduct heat away in the same manner as the collar 35 so as to cool the gas below its ignition point and safely preclude the escape of flame from the fixture.

While the friction presented by both of the collars 35 and 44 to the flow of gas therethrough is far from negligible, such friction is sufficiently low to permit the dissipation of gas pressure from the fixture 10 at a rate approaching that at which such pressure could build up should any gas therein become ignited. Thus the peak pressure due to an explosion or ignition of gas within either chamber of the fixture can be held down to a safe minimum. As a result of the foregoing, it becomes possible to effect very substantial savings in the weight and manufacturing cost of an explosionproof lighting fixture by reducing the thickness of both the glass and the metallic wall members, at the same time simplifying the construction of the joints between these members. Furthermore, such savings are accomplished with absolute safety since fixtures embodying the invention are arranged to quickly dissipate internal pressure rather than to confine such pressure as is commonly done in earlier fixtures.

A further contribution toward economical construction is realized by the use of a substantial number of conventional or standard parts within the fixture 10. Not only does this reduce manufacturing costs, but in addition, tends to keep mounting costs down since installing personnel will to a large extent be handling simple parts with which they already have a large degree of familiarity.

I claim as my invention:

1. An explosionproof lighting fixture having terminal and lamp chambers therein and comprising, in combination, a housing, a first porous metallic wall totally enclosed within said housing and interposed between said terminal and lamp chambers, said first porous metallic wall being adapted to permit the dissipation of gas pressure from the former into the latter, and a second porous metallic wall also totally enclosed within said housing but located so as to block off direct communication between the lamp chamber and the exterior of said housing, said second porous metallic wall being adapted to conduct gas under pressure from the lamp chamber into the atmosphere surrounding said fixture while precluding the leakage of flame from said lamp chamber.

2. An explosionproof lighting fixture having a canopy with a terminal chamber therein, said fixture comprising the combination of an upper skirt and a lower skirt, one of said skirts having a perforated wall portion, a globe detachably fixed to said lower skirt and defining therewith a lamp chamber, a first porous metallic collar disposed in surrounding relationship with a portion of said canopy and threadedly secured thereto, said first collar being interposed between said terminal and lamp chambers and having a relatively high heat conductivity to permit a flow of gas without flame from said terminal chamber into said lamp chamber, and a second porous metallic collar interposed between the lamp chamber and the perforated wall portion of said one of

said skirts, said second porous collar also having a relatively high heat conductivity to permit a flow of gas without flame from said lamp chamber into the atmosphere surrounding said fixture via the perforated wall portion of said one skirt.

3. An explosionproof lighting fixture having a canopy with a terminal chamber therein, said fixture comprising the combination of an upper skirt having vent holes in the wall thereof and carried by said canopy, a lower skirt dependably supported by said upper skirt, a globe detachably fixed to said lower skirt and defining a lamp chamber within said skirts, a first porous metallic collar interposed between said terminal and said lamp chambers and threadedly secured to said canopy, said first porous collar having a relatively high heat conductivity to permit a flow of gas without flame from said terminal chamber into said lamp chamber, and a second porous metallic collar housed within said upper skirt and secured in place by means of said lower skirt, said second porous collar being interposed between said lamp chamber and the vent holes in said upper skirt and having a relatively high heat conductivity to permit a flow of gas without flame from said lamp chamber into the atmosphere surrounding said fixture via the vent holes in said upper skirt.

4. In an explosionproof lighting fixture having a terminal chamber and a lamp chamber, the combination of a canopy, an upper skirt mounted on said canopy and having vent holes in the wall thereof and an annular sealing surface therein, a lower skirt dependably supported by said upper skirt and having an annular sealing surface along its upper end portion underlying the annular sealing surface of said upper skirt, and a porous metallic collar of hollow cylindrical shape interposed between said upper and lower skirts so as to block off from the lamp chamber the vent holes in said upper skirt, said porous collar having end surfaces adapted to abuttingly engage the annular sealing surfaces in said skirts.

5. In an explosionproof lighting fixture of the character set forth, the combination of a canopy having a stepped terminal chamber therein defining an annular shoulder on the underside thereof, a depending cage portion unitary with said canopy and partially enclosing said terminal chamber, said cage portion having threads thereon and being surrounded by said annular shoulder, and a sintered metallic collar threadedly secured to said cage portion, said collar being adapted to complete the enclosing of the terminal chamber by seating tightly against said annular shoulder.

6. In an explosionproof lighting fixture having a terminal chamber and a lamp chamber, the combination of a first porous partition wall of sintered metallic construction interposed between said chambers and adapted to permit gas to flow therebetween, a second porous partition wall also of sintered metallic construction interposed between one of said chambers and the exterior of said fixture, said second partition wall having a greater porosity than said first partition wall so as to vent gas from said one of said chambers to the exterior of said fixture rather than to the other of said chambers.

7. An explosionproof lighting fixture having an enclosure including a terminal chamber adapted to communicate with a lamp chamber, the latter being vented to the surrounding atmosphere via one or more holes in said enclosure, said fixture comprising the combination of a first sintered

7

metallic collar disposed in surrounding relation with the terminal chamber and adapted to conduct a flow of gas therefrom, a second sintered metallic collar mounted in spaced apart concentric relation to said first collar and interposed between the lamp chamber and the vent holes in said enclosure, said second collar having a lower frictional resistance to the flow of gas than said first collar and being adapted to vent gas from the lamp chamber to the atmosphere rather than to the terminal chamber.

NILS A. TORNBLOM.

5

Number
489,150
2,089,049
2,131,117
2,339,670

15

Number
26,978
365,648
640,249

8

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
489,150	Keil	Jan. 3, 1893
2,089,049	Benjamin	Aug. 3, 1937
2,131,117	Phillips	Sept. 27, 1938
2,339,670	Benson	Jan. 28, 1944

FOREIGN PATENTS

Number	Country	Date
26,978	Holland	June 15, 1927
365,648	Italy	Dec. 9, 1938
640,249	France	Mar. 24, 1928