United States Patent

[11] **3,564,234**

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[54] **INTERNAL WORK LIGHT**
3 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **240/51.11,** 240/11.2, 240/11.4, 313/22
[51] **Int. Cl.** **H05b 33/04**
[50] **Field of Search** ..... 240/51.11, 11.4, 11.2E.V., 9, 26; 313/22 (Inquired)

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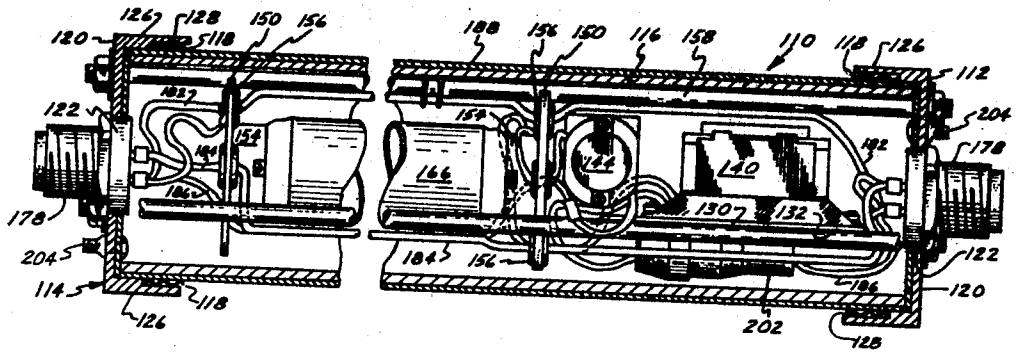
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ABSTRACT: A sealed fluorescent tube light that can be connected to other similar units to form a string of work lights. The tube light locates and seals the ballast and starter inside of its interior so as to provide compactness and safety during use. A radio frequency interference shield is provided around the tube light to prevent the radiation of electrical interference from the electrical components.



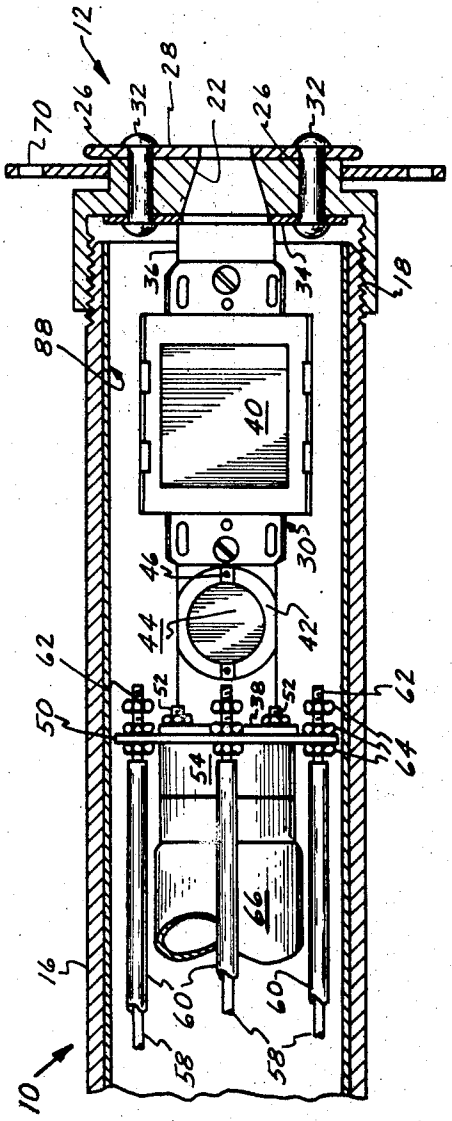


FIG. 1

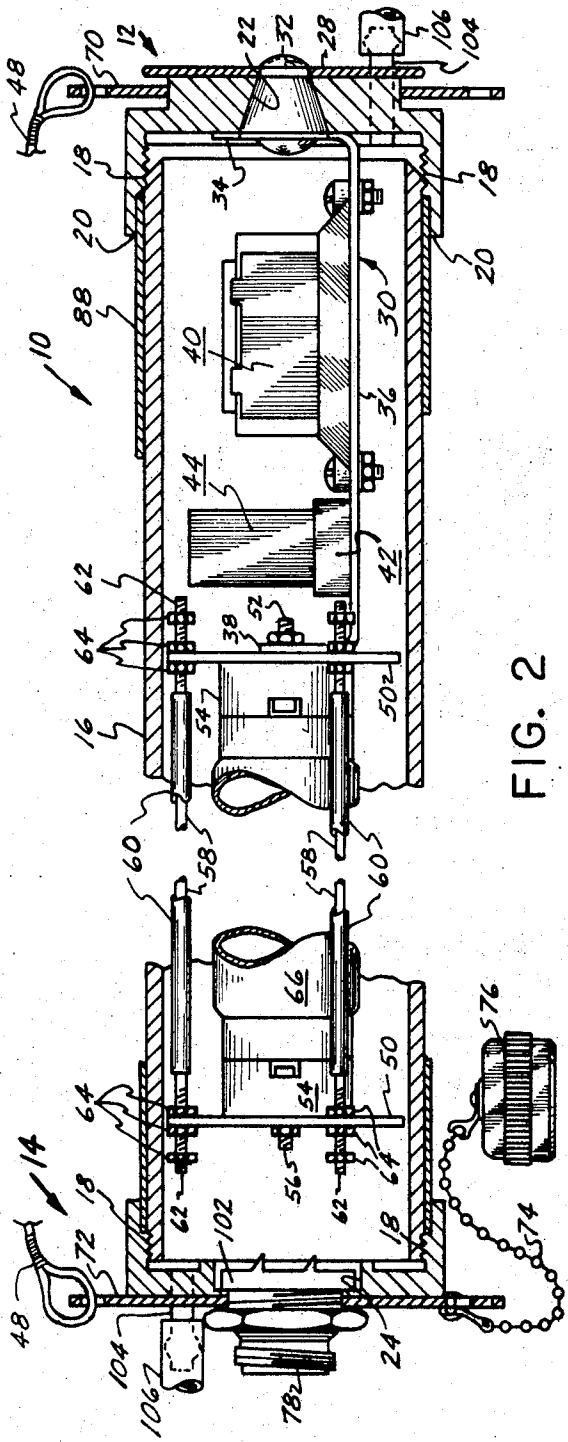


FIG. 2

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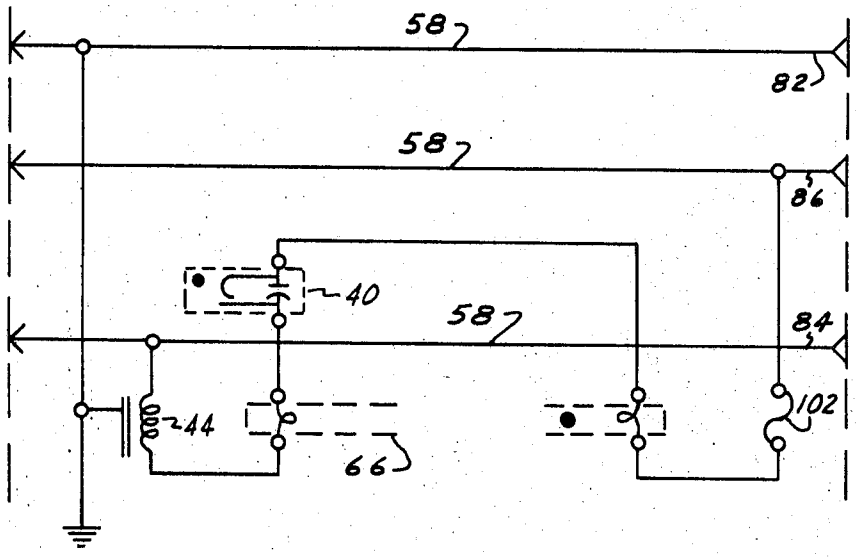


FIG. 3

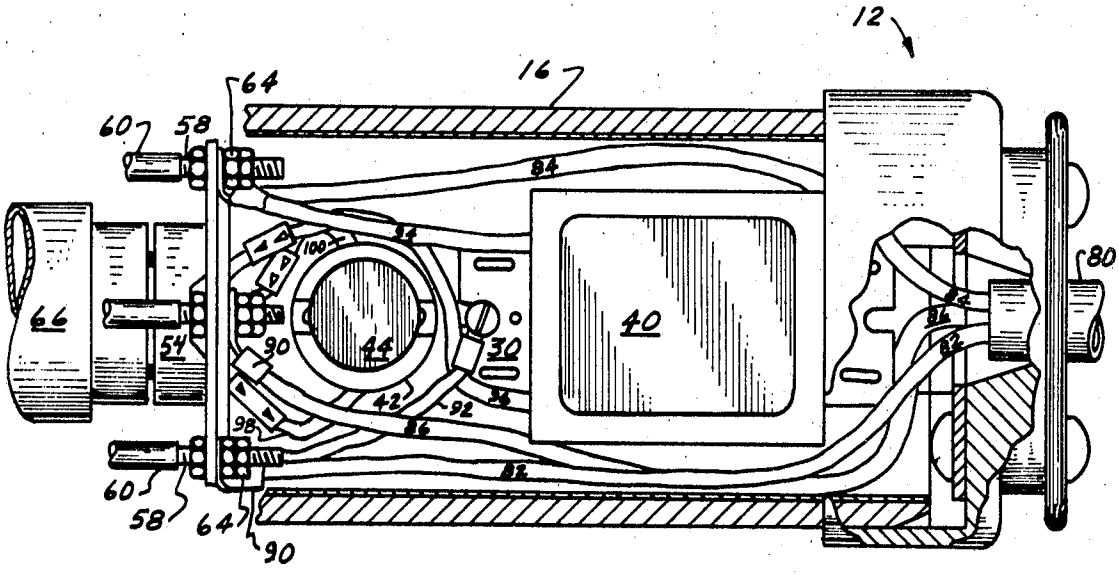


FIG. 4

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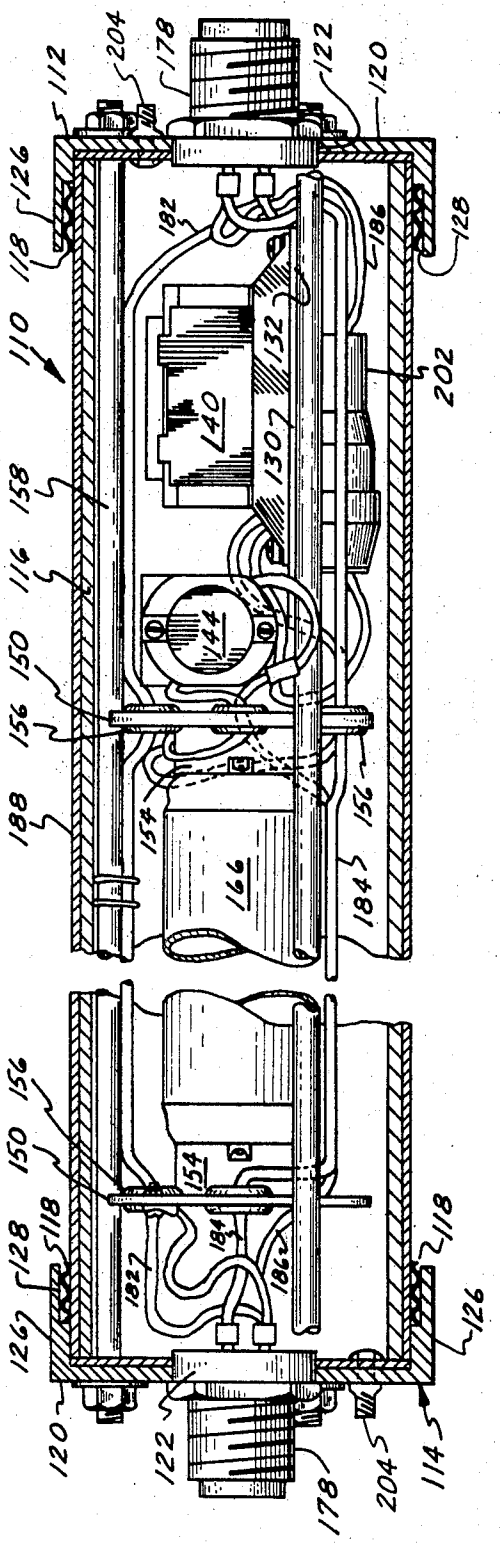


FIG. 5

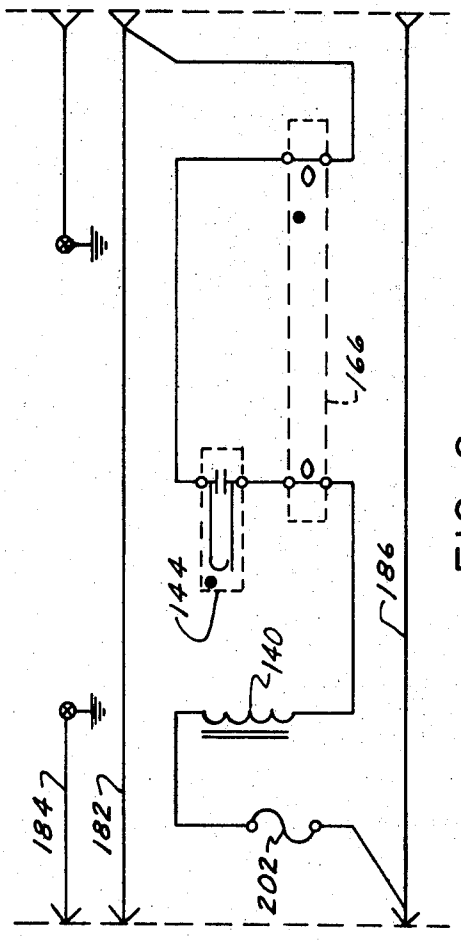


FIG. 6

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INTERNAL WORK LIGHT

The invention described herein was made by an employee of the United States Government and may be manufactured and used by or for the Government for governmental purposes without the payment of any royalties thereon or therefor.

This invention relates generally to a fluorescent light fixture and, more particularly, to such a light fixture wherein all components are housed within tube light units.

The construction, maintenance and modification of space vehicles and launch vehicles necessarily requires that activities take place within the vehicles themselves and there normally is insufficient lighting to adequately perform these functions within the vehicles. Furthermore, existing light fixtures require the use of individual extension cords which results in a mass of tangled and crossed electrical conduits when it is necessary to utilize several such light fixtures. It has also been known to mold the ballast for a fluorescent light into a cord connected with the light fixture itself. These devices necessarily have the disadvantage of wearing and deteriorating to the extent they become hazardous. Although light fixtures have been connected in a string to provide a long light source, it has not been possible to individually fuse the lamps. Another disadvantage of the known lamp fixtures has been the inability to completely house all of the elements within a single unit and thereby avoid any hazardous sparks or electrical shocks that might cause fires or explosions in the hazardous environment existing in a space vehicle.

In order to overcome the disadvantages of the prior art, the instant invention contemplates a light fixture including a tubular member which houses all of the light unit elements and seals them to the ambient environment by utilizing end caps having fittings thereon for receiving electrical conduits and purge gas fittings.

It is an object of the instant invention to provide a fluorescent light device that can be connected to similar units to form a light string.

Another object of this invention is to provide a fluorescent light fixture that completely houses the elements necessary for operation within each tube light unit to thereby provide a strong and easily maintained light source without encountering unduly hazardous conditions.

Still another object of the instant invention is to provide several tube lights interconnected with one another while maintaining electrically parallel operation of each light as well as permitting the individual tube lights to be purged with dry nitrogen to prevent hazardous gases from leaking into the lights and causing an explosion.

A still further object of this invention is to provide a tube light having a substantially tubular member sealed by end caps and within which a fluorescent bulb and all electrical elements are mounted to provide a substantially hazard free lighting fixture.

Still another object of the instant invention is to provide a tubular member having end caps for tightly sealing the interior of the tubular member with a fluorescent bulb and a chassis mounted within tubular member to support a portion of the electrical elements and having supports in the tubular member for mounting the chassis and bulb.

A still further object of this invention is to provide a tube light having a substantially light transparent tubular member having end caps sealing the interior thereof and which utilizes a chassis mounted on one end cap and attached to a stabilizer plate mounted on electrically conductive rods with a second stabilizer plate at the opposite end of the rods to permit mounting of a fluorescent bulb between the stabilizer plates and interior of the electrically conductive rods with a ballast and starter socket mounted on the chassis and having electrical conduits entering the tubular member through the end caps and connected with the electrical elements housed within the tubular member to permit end-to-end connection of a plurality of tube lights while maintaining electrically parallel operation of each light and also including purge gas fittings through each end cap such that the string of lights may be purged with an inert gas to prevent hazardous gases from leaking into the lights and causing an explosion.

Still another object of the instant invention is to provide a tube light having a substantially light transparent tubular member having end caps sealing the interior thereof with stabilizer plates adjacent opposite ends of the tube to permit mounting of a fluorescent bulb between the stabilizer plates and inwardly of a plurality of rods extending through the end caps with a chassis having a ballast and starter attached thereto and mounted on a pair of the rods and having electrical conduits entering the tubular member through the end caps and connected with the electrical elements housed within the tubular member to permit end-to-end connection of a plurality of tube lights while maintaining electrically parallel operation of each light and also including purge gas fittings through each end cap such that the string of lights may be purged with an inert gas to prevent hazardous gases from leaking into the lights and causing an explosion.

A more complete appreciation of the invention and many of the attendant advantages thereof will be readily apparent as the same becomes better understood by reference to the following description when considered in connection with the accompanying drawings wherein:

FIG. 1 is a top sectional view of a portion of the instant inventive tube light;

FIG. 2 is an elevational sectional view of the tube light partially shown in FIG. 1;

FIG. 3 is an electrical schematic of the circuitry utilized in the tube light shown in FIGS. 1 and 2;

FIG. 4 is a partial top sectional view of one end of the tube light of FIG. 1 showing the wiring arrangement for operation of the instant invention;

FIG. 5 is an elevational partial sectional view of an alternative embodiment of the tube light of FIGS. 1—4; and

FIG. 6 is an electrical schematic of the circuitry utilized in the tubelight shown in FIG. 5.

Referring now to the drawings, and more particularly to FIGS. 1 and 2, wherein tube light **10** is shown to include one end cap **12** and a second end cap **14** that are attached to a substantially light transparent plexiglas tube **16** by threads **18**. Grooves **20**, see FIG. 2, may be provided in end caps **12** and **14** for a purpose to be more fully understood hereinafter. End cap **12** has central aperture **22** and apertures **26** which provide access for rivets **32** to fixedly attach retainer plate **28**, end cap **12**, and chassis **30** to one another.

Chassis **30** includes longer upright flange **34** and shorter upright flange **38** extending from body **36**. Flange **34** attaches to end cap **12** by rivet **32**. Ballast **40** and starter socket **42** are rigidly secured to body **36** of chassis **30** and are supported thereby. Starter **44** is mounted in socket **42**. Starter socket **42** and ballast **40** are attached to chassis body **36** by conventional devices.

Bipin lamp holders **54** are connected to a pair of stabilizer plates **50**, slightly less in diameter than the inner diameter of tube **16**, by nuts and bolts **56**. One stabilizer plate **50** is secured to shorter upright flange **38** by bolts **52** to thereby provide a rigid connection between that stabilizer plate **50**, chassis **30**, and end cap **12**.

Three longitudinal, electrically conductive rods **58** have heat shrinkable tubing **60** substantially covering their length between stabilizer plates **50**. Threads **62** on the ends of rods **58** receive nuts **64** to securely and fixedly attach stabilizer plates **50** to one another and to chassis **30** as noted hereinabove. Fluorescent tube **66** is mounted in bipin lamp holders **54** to complete the inner structure of tube light **10**.

A radio frequency interference (RFI) shield **88** having an outer diameter substantially equal to the inner diameter of tube **16** may be utilized within tube **16** and surrounding the hereinabove described internal structure of tube light **10**. Alternatively, RFI shield **88** could be of slightly greater diameter than the external diameter of tube **16** and held in place by grooves **20** in end caps **12** and **14**. This construction prevents radiation of radio frequency interference which is created by fluorescent lamps and which would otherwise cause discrepancies in the electronic recording and other equipment utilized in the vicinity of space vehicles where tube lights **10** may be used.

As best seen FIG. 2, floating end ring 70 fits around and is slidable on end cap 12. Fixed end ring 72 fits on end cap 14 by a threaded engagement with bulkhead connector 78. Fixed end ring 72 has chain 74 attached thereto with receptacle protection cap 76 attached to the end of chain 74 to provide an easily and readily accessible protector for connector 78 when the latter is not in use.

Referring now to FIGS. 3 and 4, electrical conductor 80, leading from an electrical power source, not shown, into and through aperture 22 in end cap 12 is composed of three wires, green wire 82 which extends to one of the rods 58, black wire 84 which extends to a second of the three rods 58, and a white wire 86 which comes from conduit 80 and connects with the third rod 8. It is to be understood that a conventional bulkhead connector, such as 78 in end cap 14, could be utilized in end cap 12 instead of extending conductor 80 therethrough. Each of the wires 82, 84 and 86 may be provided with terminal lugs 90 for rapid and easy connection to rods 58 by nut 64. Green wire 92 and black wire 94 lead from their respective rods 58 to connect with ballast 40 on chassis 30 and white wire 96 leads from lamp socket 54 to ballast 40. White wire 98 leads from lamp socket 54 to starter socket 42 and white wire 100 leads from lamp socket 54, shown in FIG. 4, to the lamp socket at the opposite end of rods 58 and bulb 66. A slow blow fuse 102, FIG. 4, is inserted in the circuitry and attached to end cap 14 to prevent overload of the electrical circuitry and the existence of hazardous conditions.

Referring again to FIG. 2, purge gas fittings 104 extend through end caps 12 and 14 and permit connection of purge gas conduits 106 to thereby permit purge gas, such as dry nitrogen, to flow into the interior of tube 16 and thereby provide an inert ambient environment for the electrical system of the tube light 10. It is to be understood that conduits 106, as do conduits 80, extend from some conventional source, not shown, into a first tube light 10 and from that tube light to the next tube light 10 in the string. Such system may be continued to the extent desired with observance of electrical principles to prevent overload of any power system or circuitry being used to operate the system.

As best seen in FIG. 2, lanyard 48 may be attached to and extend between floating end ring 70 and fixed end ring 72 to provide for suspension of tube light 10 in any given work area.

Referring now to FIGS. 5 and 6 wherein alternative embodiment of tube light 10 is designated by the numeral 110. Tube light 110 includes end caps 112 and 114 at respectively opposite ends of plexiglas tube 116. Each end cap 112 and 114 includes base member 120 having a central aperture 122 for a purpose to be more fully understood hereinafter. Three spaced apertures extend through base 120 slightly inwardly of the projected diameter of plexiglas tube 116. Flanges 126 extend toward one another from each of the end caps 112 and 114 and are provided with grooves 128 for receiving seal 118 as will be more fully understood hereinafter.

Three rods 158 of slightly greater length than tube 116 extend between and through end caps 112 and 114 and are secured thereto by conventional nuts mounted on the threaded ends of rods 158.

Chassis 130 is mounted between a pair of rods 158 as by welding at 132 to provide a rigid base for receiving ballast 140 and starter 144.

Mounted inwardly of end plates 112 and 114 is a pair of stabilizer plates 150 of a diameter less than the internal diameter of tube 116. Three notches equally spaced about the periphery of stabilizer plates 150 permit accurate location of the stabilizer plates in the vicinity of rods 158. Apertures with insulators 156 in stabilizer plates 150 are utilized to permit the wiring, to be described more fully hereinafter, to pass therethrough and extend through tube light 110. Bipin lampholders 154 are mounted interiorly or centrally of stabilizer plates 150 to permit mounting of conventional fluorescent tube 166 therebetween and establish the source of light.

Each end plate 112 and 114 is provided, in apertures 122, with an electrical connector 178 which is fixedly attached to base 120 by conventional means. These connectors permit rapid attachment of electrical leads form a power source to equipment and elements housed within tube 116. Conventional electrical wiring is connected in the interior of tube 116 as is well-known and shown in the electrical schematic of FIG. 6. Wires 182, 184 and 186, neutral, ground and line, respectively, extend from connectors 178 to the various elements within tube light 110. For example, the wires lead from one connector 178 to the various elements and then along rods 158 to connector 178 at the other end of tube light 110. In order to prevent the wires from becoming overheated or contacting fluorescent tube 166, they should be laced to rods 158 with some material such as nylon lacing and preferably are laced so as to be interiorly of rods 158. This construction permits rods 158 to be relatively close to tube 116 and thus provide some support or strength to tube 116 in the event tube light 110 should be dropped or impinged by some relatively sharp object.

By providing substantially rectangular bases 120 on end caps 112 and 114 with apertures in the corners thereof it is possible to rapidly connect lanyard 48, see FIG. 2, between end caps 112 and 114 to thereby provide a method of hanging tube light 110 from the structure in the area where work is to be done.

A conventional radio frequency interference shield 188 of a diameter slightly greater than the external diameter of tube 116 is mounted thereover and held in place in groove 128 in flanges 126 of end caps 112 and 114. Seals 118 function not only to assist in maintaining the interior of tube light 110 airtight but also to locate and maintain shield 188 in its desired position. This location of the RFI screen prevents shorting of internal components and also affords some physical protection to the transparent tube against scratching and breaking. In the event tube 116 is broken, most of the pieces thereof would be retained within shield 188 and end caps 112 and 114 and thus prevented from falling into undesirable locations.

Tube light 110 is generally provided with purge gas fittings 204 extending through end caps 112 and 114. This construction, as with tube light 10, permits connection of a group of tube lights in a string with a purge gas system connected with a source of inert gas, not shown, to substantially eliminate hazardous conditions.

Thus it is seen that the instant invention provides alternative embodiments of tubelights capable of end-to-end connection with power being fed through while each operates electrically parallel with each lamp individually fused to permit greater flexibility of suspension and utilization of a single or group of tube lights 10 or 110. These new tube lights can be used in hard to reach, unlighted areas where maintenance, assembly, or other operations might be performed. No part of tube lights 10 or 110 is molded unit thereby making it possible to easily replace parts by disassembling a defective unit. Use of lanyards 48 provides additional flexibility in the location of the tube lights within a given position.

Obviously many modifications and variations of the subject invention are possible in light of the above teachings. It is therefore to be understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.

I claim:

1. A tube light comprising:

a. a substantially light transparent tubular member;

b. end caps tightly sealing the interior of said tubular member;

c. a plurality of rods extending through said tubular member and said end caps;

d. said plurality of rods having threaded ends receiving nuts for attaching said end caps to said tubular members;

e. a pair of stabilizer plates supported by said plurality of rods;

f. bulb sockets mounted on the opposite interior faces of said stabilizer plates for receiving a fluorescent bulb;

g. electrical wires interconnecting said bulb sockets;

h. a chassis mounted on said plurality of rods; and

i. a ballast and starter mounted on said chassis and electrically connected with said electrical wires for operating said fluorescent bulb.

2. A tube light as defined in claim 1 further comprising:

a. an electrical connector extending through an opening in each of said end caps; and

b. said electrical wires connected to said electrical connectors and arranged so as to permit electrically parallel circuit operation of said tube light with other similarly connected tube lights.

3. A tube light as defined in claim 1 further comprising:

a. a radio frequency interference shield surrounding said transparent tubular member; and

b. said radio frequency interference shield being held in place by said end caps.