June 8, 1965 R. A. BRIDWELL 3,188,459

LAMP HOLDER

Filed Nov. 2, 1962 3 Sheets-Sheet 1

Fig. 1

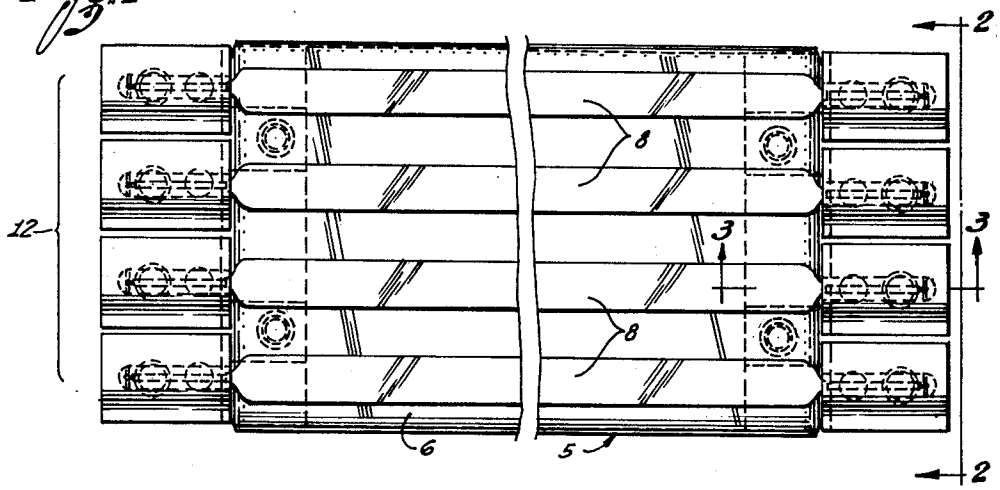


Fig. 3

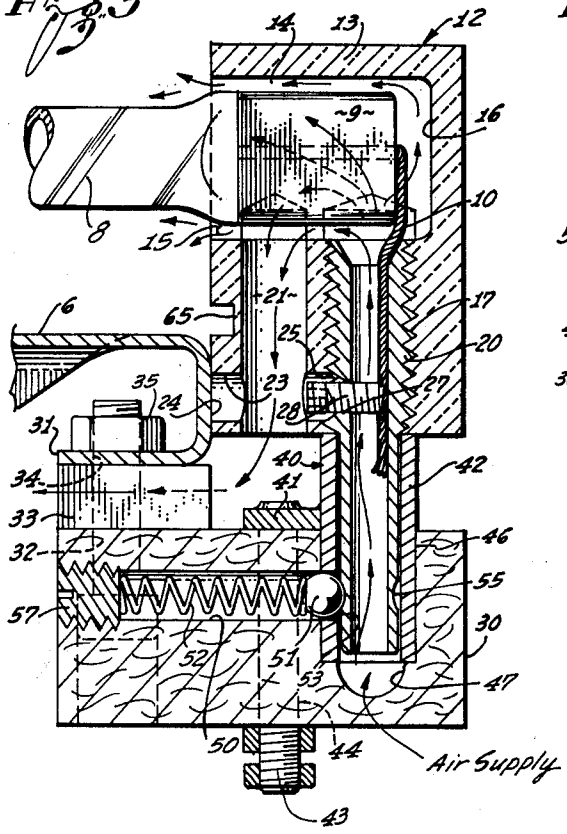
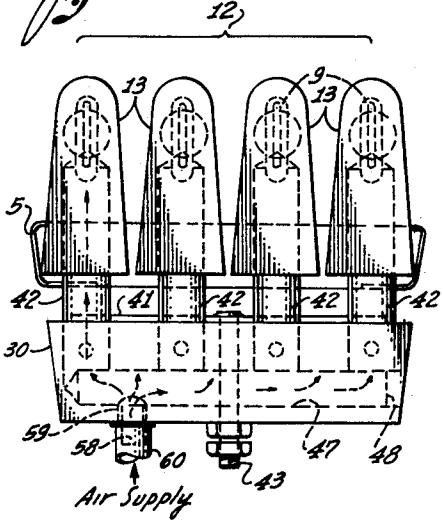


Fig. 2



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June 8, 1965 R. A. BRIDWELL 3,188,459

LAMP HOLDER

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Fig. 4

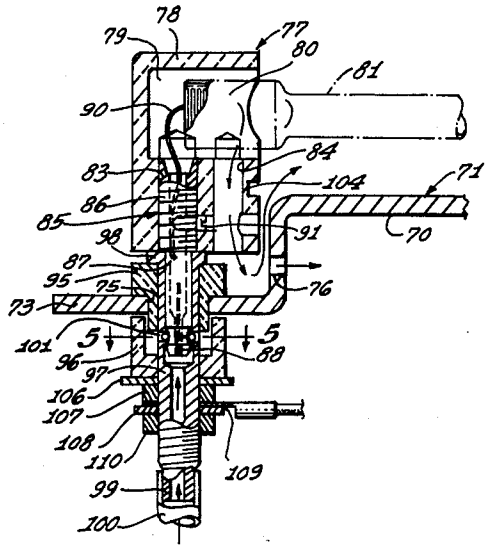


Fig. 5

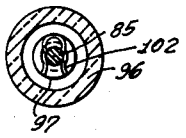
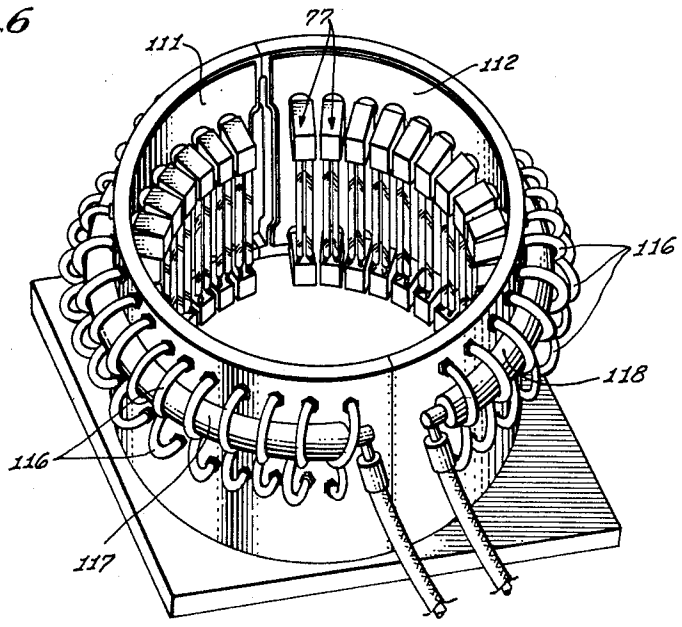


Fig. 6



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June 8, 1965 R. A. BRIDWELL 3,188,459

LAMP HOLDER

Filed Nov. 2, 1962 3 Sheets-Sheet 3

Fig. 7

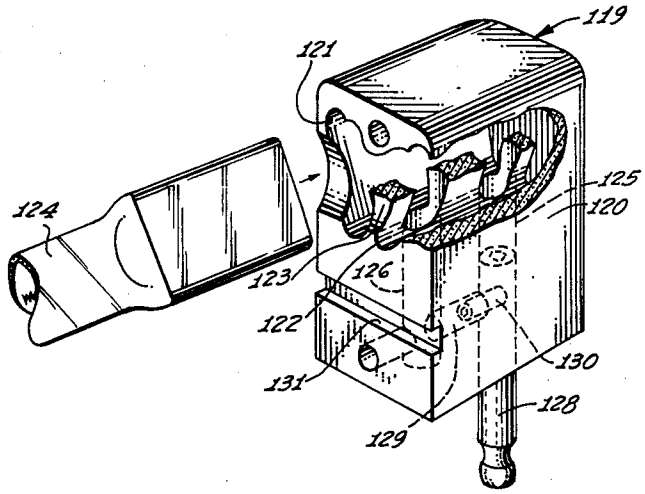


Fig. 8

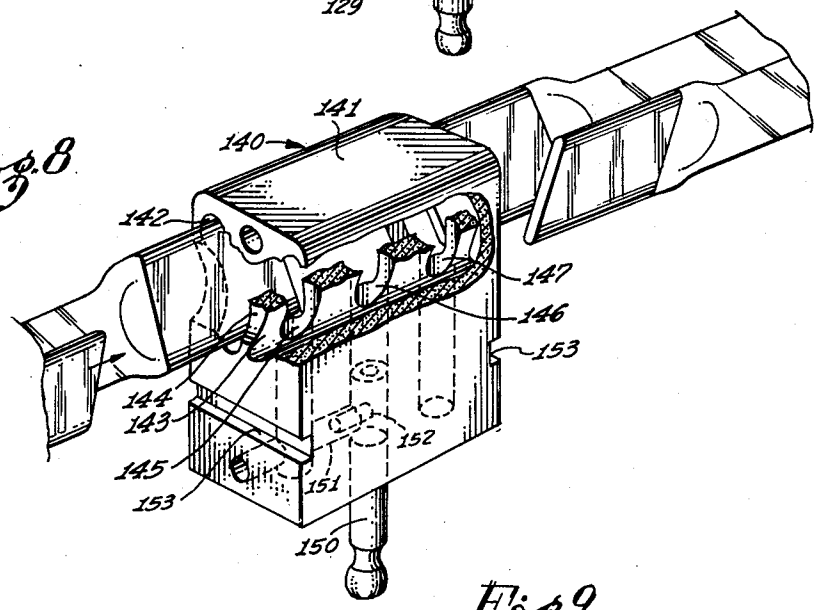
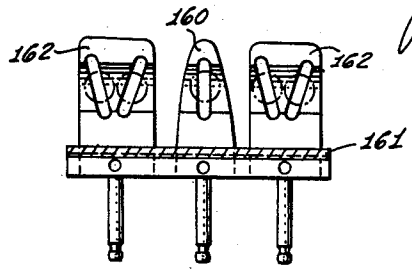


Fig. 9



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United States Patent Office 3,188,459 Patented June 8, 1965

3,188,459

LAMP HOLDER

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Filed Nov. 2, 1962, Ser. No. 235,066
10 Claims. (Cl. 240—47)

My present invention relates to electric lamps, and more particularly to a snap-in lamp holder for high intensity quartz lamps.

A serious problem with the industrial application of high-temperature quartz lamps of the tubular type used, for example, in enamel baking, material drying, heat treatment of metal, metal-to-metal brazing, etc., is the high incidence of failure of such lamps after a relatively short operating life due to rapid deterioration and destruction of the lamp end-seals and terminals which are exposed to the high operating temperatures. Some lamps burn at 1000 watts per inch of lamp length. A 10" lamp, for example, operates with as high as 10,000 watts of power.

Presently available reflector fixtures are usually provided with ventilating openings intended to permit the circulation of ambient air around the lamps for cooling purposes.

While such openings generally satisfy cooling requirements for illuminating lamps, it is not possible to reduce the exposure environment of the vulnerable parts of high temperature infrared lamps to nondestructive temperatures with such openings.

Moreover, it is found that whatever cooling is achieved with the openings in conventional reflector fixtures also tends to reduce the temperature of the lamp envelope as well as the lamp terminal parts subject to deterioration and failure. It is highly desirable, where heat is the primary objective rather than illumination, to maintain the lamp bulb at a high temperature approaching its melting or softening point; cooling the lamp terminals only.

A further disadvantage found in the more efficient lamp fixtures available is the undue complexity and high initial cost of the units. Substantial disassembly of conventional reflector fixtures is usually required to replace a burnt-out lamp. Thus lamp replacement, up to the time of my invention of the lamp holder described and claimed herein, has been unnecessarily expensive and time-consuming, particularly where large banks of lamps are employed.

In view of the present state-of-the art, it is an object of my invention to provide a lamp holder having means for accommodating a highly efficient cooling system.

It is another object of my invention to provide a snap-in lamp holder and reflector fixture combination that is universally suitable for most radiant heating applications.

It is a further object of my invention to provide a relatively inexpensive snap-in lamp holder that is individually, quickly, and easily removable without disassembly of the reflector assembly.

It is a still further object of this invention to provide a lamp holder and reflector fixture that will safely permit watt densities to be increased by a substantial margin over the tightest spacing of lamps now possible with current infrared lamp fixtures.

Yet another object is to provide a heat lamp end holder having the electrical contact elements covered and protected by an insulating enclosure.

Briefly, the snap-in lamp holder of my present invention comprises a body of material having good dielectric and heat-dissipating characteristics, the body having a lamp socket therein provided with a system of interconnected, internal forced-air passages within which the lamp end seal is supported and fastened solely by the lamp terminal wire.

The reflector fixture of my invention comprises a reflector panel that is susceptible of many forms and shapes having means for mounting the lamp holder used in combination therewith in a number of possible lamp arrangements.

Other objects and advantages inherent in the lamp holder and reflector fixture of my invention will readily be seen by reference to the appended detailed specification and drawings wherein:

FIGURE 1 is a diagrammatic plan view showing lamp holders made according to my present invention in combination with a reflector fixture.

FIGURE 2 is a diagrammatic end view of the reflector assembly and lamp holders viewed as indicated by the line 2—2 of FIGURE 1.

FIGURE 3 is an enlarged fragmentary view in cross-section, taken as indicated by the line 3—3 of FIGURE 1, showing the construction of the lamp holder and end portion of the reflector assembly shown in FIGURES 1 and 2.

FIGURE 4 is a diagrammatic view in cross-section showing the construction of the lamp holder and end portion of a different reflector assembly.

FIGURE 5 is a diagrammatic cross-sectional view taken on line 5—5 of FIGURE 4.

FIGURE 6 is a diagrammatic three-quarter view of a circularly formed reflector fixture and lamp.

FIGURE 7 is a diagrammatic three-quarter view in perspective of another form the lamp holder of my present invention may take with portions cut away to show the interior adapted to hold two lamps.

FIGURE 8 is a diagrammatic three-quarter view in perspective showing still another embodiment of my lamp holder with portions thereof cut away to show the interior adapted to hold lamps in tandem.

FIGURE 9 is a diagrammatic end view of a typical lamp holder for a five-lamp combination.

In FIGURES 1 and 2 a reflector fixture 5 is shown, formed of a sheet of high-temperature resistant material having a highly polished surface 6 preferably gold-fired with a ceramic material in the usual manner. The size and shape of the reflector is of course governed by the size and number of lamps to be accommodated.

As illustrated, the reflector 5 is generally rectangular to accommodate a bank of elongated infrared lamps of a well-known model and make employing an elongated tubular envelope 8 of quartz, the envelope 8 being pinched or flattened at each end and wrapped with foil or thin sheet material, such as Nichrome, Inconel, or like high temperature resistant metal, to form an end seal 9.

The lamp filament assembly (not shown) is supported in the envelope 8 and extends coaxially therethrough from end to end, each end being connected to a flexible stranded terminal wire 10 the inner end of which is mounted and sealed within the end seal 9. The outer end of the terminal wire 10 extends outside of the end seal 9 to be electrically connected as will be described below.

Mounted at each end of the reflector 5 are a number of lamp holders 12 within which the lamps are supported a desired distance over the reflector surface 6.

In FIGURE 3 the construction of a typical lamp holder holder 12 is shown in detail. The body 13 of lamp holder 12 is molded or otherwise formed of a material having satisfactory thermal shock resistant characteristics, such as hydrous aluminum silicate for example. The interior of the body 13 is hollowed out to form a lamp socket 14, having an opening 15 at one end thereof, within which the end seal 9 of the lamp can be enclosed. The dimensions of socket 14 are purposely made substantially larger than the dimensions of the end seal 9 so that no portion

of the end seal surface contacts any surface of the socket 14.

Near the closed end 16 of socket 14 a threaded bore 17 is provided, the bore 17 opening at one end thereof in the bottom of socket 14, the other end of the bore opening at the bottom of body 13.

An externally threaded hollow terminal stud 20 is threadably mounted in bore 17, the stud 20 preferably being made of brass or other material having satisfactory electrical conducting properties.

The opening at the upper end of stud 20 can be coterminus with the opening of bore 17 in socket 14, and internally flared or chamfered for easier insertion of lamp terminal wire 10 thereinto.

Adjacent opening 15 of socket 14, a second bore 21 is provided to exhaust heated air from socket 14.

In this holder, as well as the subsequent holders to be described herein, the diameters of the air passages should be slightly greater than the width of the socket supplied thereby.

Near the bottom of body 13, another bore 23 is provided extending in the same direction as socket 14, and intersecting bore passages 21 and 17, bore 23 having an opening 24 at the exterior of body 13 and an opening 25 in the wall of threaded bore 17.

The exterior of the hollow terminal stud 20 preferably is threaded about half of its length, and a lateral threaded bore 27 is drilled through the wall thereof to accommodate a set screw 28 mounted in bore 23 adjacent the inner opening 25 thereof.

When inserted, the lamp terminal wire 10 is entirely recessed within the interior of hollow stud 20 and tightly clamped in lamp-supporting position therein by set screw 28, as shown. It is reiterated that terminal wire 10 is adjustably clamped within the interior of the hollow terminal stud so that no portion of lamp end seal 9 is permitted to come in contact with the interior surface of socket 14. The size and relative rigidity of the wire 10 helps make this possible.

The remaining portion of the exterior surface of terminal stud 20, below the threaded portion, is purposely left unthreaded for easy insertion into and withdrawal from a suitable snap-in receptacle to be described below.

The holder 12 is thus seen to cover and enclose the otherwise exposed electrical contact surfaces of the end seal 9 and terminal wire 10, to protect against accidental shock to personnel and damage to equipment by inadvertent short circuiting or grounding.

For support of the lamp holders 12 at each end of reflector 5, a mounting block 30 is attached in any convenient manner, the block 30 being made of material having good heat and electrical insulating characteristics.

In FIGURE 3, the reflector 5 is formed at each end with a double flange 31, the block 30 being attached by a bolt 32 provided therein and extending through a spacer 33 and a hole 34 in flange 31 and fastened thereto with a nut 35.

Mounted in block 30, a receptacle assembly 40 is provided, comprising a flat metal plate that defines a bus bar 41 along one edge of which a number of tubular receptacles 42 are fastened in spaced relation for support, the bar 41 and receptacles 42 preferably being made of metal having satisfactory electrical conducting properties such as stainless steel for example.

A terminal post 43, made of highly conductive material, is mounted and fastened to bus bar 40 and is extended perpendicularly therefrom through a bore 44 drilled through block 30.

To recess and support the receptacles 42 in block 30, corresponding pockets 46 are provided, each of the pockets 46 intersecting a main air passage defined by bore 47 extending lengthwise through block 30. The open end 48 of bore 47 can be plugged in any convenient manner.

As best shown in FIGURE 3, ball detent bores 50 are provided in block 30, extending into block 30 from one side thereof to open in each respective receptacle pocket 46. A detent ball 51 and back-up spring 52 are provided in each bore 50, a single typical example being shown, the ball 51 extending through a lateral bore 53 provided in the wall of receptacle 42, to engage an external circumferential groove 55 that extends around terminal stud 20 near its lower end. The external opening around bore 53 in the wall of receptacle 42 should be chamfered to permit detent ball 51 to engage the entire surface of groove 55.

Each detent ball 51 and back-up spring 52 is retained in its respective bore 50 in any well known manner, a threaded plug 57 being shown in the present example.

Cool air is supplied to lamp socket 14 through a nipple 58 fitted into a short bore 59 in the bottom of block 30 that opens into bore passage 47, the nipple 58 being connected to a conduit 60 carrying cool air from a source (not shown) provided therefor. An air blower may be connected to the far end of the conduit 60.

The cool air flows through air passage 47 and passes though terminal stud 20 and into socket 14 to be circulated freely over the entire end seal 9 surface. The heated air is exhausted from socket 14 through opening 15 and air passages 21 and 23. Appreciable cooling of the lamp envelope 8 is avoided, while the end seal is continuously subjected to a fresh supply of cool air to effectively maintain the end seal environment at a non-destructive temperature.

Lamp power is supplied by connecting post 43 to a source of electricity (not shown) provided therefor. The electricity is conducted through bus bar 41, receptacles 42 and terminal studs 20 to the lamp terminal wire 10 in the conventional manner.

A tool slot 65 can be provided in the holder body 13, if desired, by which means a suitable prying tool or lever may be inserted for easier disengagement of the lamp holder from its receptacle.

Another form the reflector assembly may take is shown in FIGURES 4 and 5 wherein a reflector 70, having a highly polished surface 71 finished with a gold fired ceramic coat, is joggled at each end to provide a mounting flange 73 to support a quantity of holder and receptacle assemblies, only a fragmentary portion of one end being shown.

As many adaptor holes 75 as are needed are drilled in the mounting flange 73 at each end of reflector 70, and an equal number of openings 76 are provided in the end leg of the reflector to pass exhaust air therethrough.

Individual receptacle assemblies are provided for each lamp holder, a typical assembly being shown in detail in FIGURE 4.

The lamp holder 77 is identical in construction to the holder 12 shown in FIGURES 1–3, comprising a body 78 of thermal shock resistant ceramic material having a socket 79 in which the end seal 80 of a lamp 81 is housed, the end seal 80 being cooled by cool air supplied through air passage 83.

The hollow terminal stud 85 of the holder is threadably mounted in the air supply passage 83, the stud 85 having external threads 86 on the upper portion thereof, the lower portion 87 being unthreaded with an external circumferential groove 88 adjacent its lower end.

The terminal wire 90 of the lamp 81 is inserted into the interior of the hollow terminal stud 85 and clamped therein with a set screw 91 in lamp supporting position so that no part of the end seal 80 contacts any surface of the holder socket 79 as in the holder 12 of FIGURES 1–3.

The receptacle assembly comprises a hollow male 95 and female 96 ceramic insulator coupled together on each side of mounting flange 73 by a partially externally threaded hollow core bolt 97. A circumferential flange 98 is provided around the upper opening of core bolt 97, the diameter of the lower portion thereof being reduced to define a nipple 99 over which an air supply hose 100

is connected to carry cool air from a source (not shown) provided therefor.

A pair of opposed key slots 101 are cut through the wall of core bolt 97 in which a U-shaped spring key 102, preferably made of piano wire, is retained, the legs of spring key 102 extending into the interior of core bolt through the slots 101 on each side of the bolt to engage the circumferential groove 88 of terminal stud 85.

I have found that by slotting the wall from the opening at lower portion 87 of terminal stud 85, on each side thereof with slots 103, a spring action is provided whereby the stud is more easily snapped into and out of spring key 102.

If desired, a tool slot 104 can be provided in lamp holder body 78 as in the holder of the previous example.

Final securing of the receptacle assembly is accomplished by mounting a washer 106 and nut 107 on the lower end of core bolt 97.

Lamp power is supplied to the terminal wire 90 in the usual manner, a solderless terminal 109 retained on core bolt by a washer 108 and nut 110 being shown for example.

Thus any number of lamp holders 77 required may be mounted on the mounting flange 73, each holder 77 being separately connected to a source of electricity, or commonly connected to a bus bar (not shown) in the conventional manner.

The path of forced air through the hollow terminal stud 85 into socket 79 is traced by arrows wherein it can be seen that substantially all of the fixture parts and the entire surface of the lamp end seal are cooled by the air. The air is supplied by hose 100, being blown or otherwise forced from a supply which can be refrigerated in any convenient manner if desired.

It will be readily seen that the reflector fixture of my present invention can be designed in any practical size to hold as many lamps as may be needed for any given application. Each lamp end seal 80 is, in essence, individually, separately and efficiently cooled.

The lamp holder and reflector fixture of my invention have many possible forms, another form being shown in FIGURE 6 wherein a two-part reflector surface 111, 112 is made of any suitable high temperature resistant material and assembled in a circular shape, the lamp holders 77 being mounted on the reflector in substantially the same manner as described above and shown in FIGURE 4. The lamp holder 77 and receptacle assembly of FIGURE 4 are highly suitable for the circularly shaped reflector, the receptacle assemblies being mounted in adaptor holes circumferentially spaced adjacent the upper and lower edges of the reflector.

The lamp holders can be connected to a power supply individually or commonly through a bus bar, such connections being omitted in the drawing as they are deemed to be well known in the art.

Cool air is supplied to each holder by tubes 116 fitted over the ends of their respective hollow terminal studs, the other ends of the tubes being connected to one of a pair of main air conduits or manifolds 117 and 118 carrying cool air from a source (not shown) thereof.

While thus far I have shown the lamp holder of my present invention adapted to hold a single lamp, a modified embodiment of the holder is shown in FIGURE 7 wherein a lamp holder 119 having a body 120 is provided with two sockets 121 and 122 separated by a web 123. Closer spacing of the lamps 124 (only one being shown for example) can be achieved by canting the sockets 121 and 122 with respect to each other. Moreover, by canting sockets 121 and 122 so that the narrowest section of web 123 is located at the bottom of the sockets as seen in FIGURE 7, single air passage 125 and 126 open into both sockets to supply and exhaust air therefrom, respectively, thus eliminating the necessity for two separate air passages to each socket.

Lamp holder 119 is in all other respects identical with

the holders described above, being equipped with a single terminal stud 128, set screw bore 129 and set screw 130, and tool slot 131, all constructed and assembled in the same manner.

Another embodiment of holder has been made wherein three socket spaces are provided in one holder in a generally triangular arrangement, two spaced closely on one level and one centered between these two but slightly above or below them. Thus the generated heat is further concentrated, or as termed previously, the watt density is further increased.

In certain installations it may be desired to mount banks of lamps in series, i.e., end-to-end relationship, or in a long line wherein a tandem arrangement of the lamps is necessary.

Such an arrangement can be achieved with still another modified form of my lamp holder 140 and shown in FIGURE 8 wherein the holder body 141 is provided with canted sockets 142 and 143 which extend entirely through the body 141, being open at each end thereof.

As in the case of the holder 119 of FIGURE 7, the air passages 145, 146 and 147 extend through the thinnest section of the web 144 and thus open into each socket 142 and 143, one additional passage 147 being provided over those in the previously described holder 119.

The holder body 141 is provided with a terminal stud 150, set screw bore 151 and set screw 152, and tool slots 153 at each end, all constructed and arranged the same as in the holders of the previous figures.

The receptacles (not shown) for holders 119 and 140 can be of the type described above and shown in FIGURES 1–5.

It will be immediately apparent that combinations of holders can be employed to provide predetermined heat concentration, one of a number of such combinations being shown in the end view of FIGURE 9 wherein a single lamp holder 160 mounted on a reflector 161 is flanked with double lamp holders 162 on each side, to provide a five lamp combination.

Thus, the holder of my invention gives rise to enumerable modifications wherein even threee or more lamps can be supported on a reflector of any given size and shape, all such modifications and combinations being deemed to fall within the spirit and scope of my invention as recited in the appended claims.

I claim:

1. A holder for the support and temperature control of each end of a tubular lamp having at each end thereof an end seal and terminal wire, comprising:

(a) a body of dielectric material completely enclosing said end seal and terminal wire,

(b) means defining an open socket in said body to recess the end seal and terminal wire of said lamp,

(c) means defining an air supply passage in said body opening substantially perpendicular into the side of said socket,

(d) a hollow terminal stud securely mounted in said supply passage and having a projecting end portion for fitting into a receptacle, said lamp terminal wire extending from said socket into said stud with substantial space around said wire for cooling air flow through said stud,

(e) screw fastening means in the side of said supply passage and through said stud to clamp said terminal wire in the interior of said stud,

(f) a mounting block of electrical insulating material,

(g) an electrical conducting receptacle attached to said block and having resilient retention means adapted to engage said projecting end portion for supporting said holder body,

(h) means defining an additional air passage in said block to communicate with said hollow terminal stud,

(i) an air inlet connected to said additional air passage, and

(j) electrical connector means secured to said receptacle for connecting said receptacle to a source of electric power for operation of said lamp.

2. Apparatus in accordance with claim 1 wherein said socket is larger than said end seal to provide air circulation space around said end seal, and including means defining an air exhaust passage in said body connecting the interior of said socket with ambient outside air.

3. A dual lamp holder for one end of a pair of lamps each having a flattened rectangular end seal and a terminal wire, comprising:

(a) a body of dielectric material,

(b) a pair of side-by-side, open end socket spaces in said body generally fitting over said end seals, respectively, but substantially larger around than said end seals, said socket spaces being slanted toward each other in cross section to form two sides of an open-bottomed V,

(c) a single air supply passage in said body opening substantially perpendicular into both said sockets at the lower sides thereof,

(d) a hollow terminal stud mounted in said supply passage and having a projecting plug end portion for electrically connecting into a mounting receptacle, and

(e) fastening means in the side of said stud for securing the terminal wires of said lamps therein, the hollow interior of said stud being substantially larger than the two terminal wires whereby cooling air can circulate through said hollow stud and said socket spaces around said lamp end seals.

4. A double-ended lamp holder for holding one end of each of two end-to-end lamps each having an end seal and a terminal wire, comprising:

(a) a body of dielectric material,

(b) a continuous socket space of uniform diameter through said body long enough to contain one lamp end seal inserted from one end of said space and a second lamp end seal inserted from the other end of said space, said space being of sufficient diameter to provide a clearance around said end seals,

(c) an air supply passage leading into said socket space with its opening adjacent to said lamp end seals,

(d) a single hollow terminal stud mounted in said passage and having a projecting snap-in portion for electrical connection in a mounting receptacle, and

(e) fastening means in the side of said stud for locking the terminal wires of said lamps therein, the hollow interior of said stud being substantially larger in diameter than the two terminal wires whereby cooling air can flow through said stud and said socket space around said lamp end seals.

5. Apparatus in accordance with claim 4 including an air exhaust passage through said body on each opposite side of said supply passage, said exhaust passages connecting the respective ends of the interior of said socket space with ambient outside air.

6. Apparatus in accordance with claim 1 including a plurality of said bodies, terminal studs and receptacles, said block being large enough to contain said plurality of receptacles, air manifold means interconnecting the open ends of all said hollow terminal studs to a single outer air supply connection, and electrical bus means connecting all said receptacles for one end of a plurality of lamps to a single electrical supply connector.

7. A reflector assembly for elongated tubular lamps that have an end seal and terminal wire at each end thereof, comprising:

(a) means defining a reflecting surface,

(b) means at each end of said reflecting surface to enclose and support respective ends of said lamps, said enclosure and support means comprising

(1) an electrical conductive receptacle having air passage means therethrough,

(2) means including insulated mounting means attaching said receptacle to said reflecting surface,

(3) a hollow snap-in stud removably mounted in said receptacle,

(4) a lamp end holder of dielectric material having at least one socket cavity therein to receive and enclose a lamp end seal, said cavity being substantially larger than said end seal to allow forced air to flow therearound, said stud attached in said holder with its inner end in communication with said cavity near the terminal wire from said end seal,

(5) means in said stud for locking said terminal wire therein so that said terminal wire provides the sole support for its associated lamp end in said cavity, the hollow interior of said stud being large enough to carry adequate cooling air flow around and past said wire,

(c) cooling air supply conduit means connected to said air passage in each said receptacle for flow through said stud and cavity and around each said lamp end seal, and

(d) means connected to each said receptacle for conducting lamp operating current thereto.

8. A holder for the support and temperature control of each end of a tubular lamp having at each end thereof and end seal and terminal wire, comprising:

(a) a body of dielectric material,

(b) a socket in said body and having an opening at one end of said body to receive and completely enclose at least a major portion of said end seal of said lamp, the inside dimensions of said socket being larger than said end seal to provide a clearance therebetween,

(c) an air supply passage having an opening in said socket adjacent to said end seal,

(d) a hollow stud to receive and retain said terminal wire and mounted in said air supply passage to define a conduit to direct forced air into said socket for circulation around said end seal,

(e) screw means to fasten said terminal wire in the interior of said hollow stud,

(f) and means adapting the free end of said stud for connection with a source of electricity and forced air.

9. A holder for the support and temperature control of each end of a tubular lamp having at each end thereof an end seal and terminal wire, comprising:

(a) a body of dielectric material,

(b) a socket in said body and having an opening at one end thereof to receive and surround a major portion of said end seal of said lamp, the dimensions of said socket being larger than said end seal to provide a clearance therebetween,

(c) an air supply passage leading into said body and opening in said socket adjacent to said end seal,

(d) a hollow stud to receive and retain said terminal wire and mounted in said air supply passage to define a conduit to direct forced air into said socket for circulation around said end seal.

(e) screw means mounted in the wall of said stud to fasten said terminal wire in the interior thereof,

(f) and snap-in means for connecting said stud to a supporting base, source of electricity, and a source of forced air.

10. A holder for the support and temperature control of each end of a tubular lamp having at each end thereof an end seal and terminal wire, comprising:

(a) a body of dielectric material,

(b) a socket in said body and having an opening at one end of said body to receive and enclose the end seal of said lamp, the inside dimensions of said socket being relatively larger than said end seal to provide a clearance therebetween,

(c) an air supply passage in a wall of said body and

having an opening in said socket adjacent to said end seal,

(d) an exhaust passage leading from said socket and having an opening exterior of said body,

(e) a hollow stud mounted in said air supply passage to receive and retain said terminal wire, the interior of said terminal wire retaining stud further defining a conduit to direct air into said socket for circulation around said end seal,

(f) screws means to fasten said terminal wire in the interior of said hollow stud,

(g) and snap-in means for adapting said stud for installation in the receptacle of a supporting base, said

base providing connections with a source of electricity, and a source of forced air.

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NORTON ANSHER, *Primary Examiner.*