May 26, 1970 J. REINHERZ 3,514,742

ELECTRIC LAMP SOCKETS

Filed Nov. 15, 1967 5 Sheets-Sheet 1

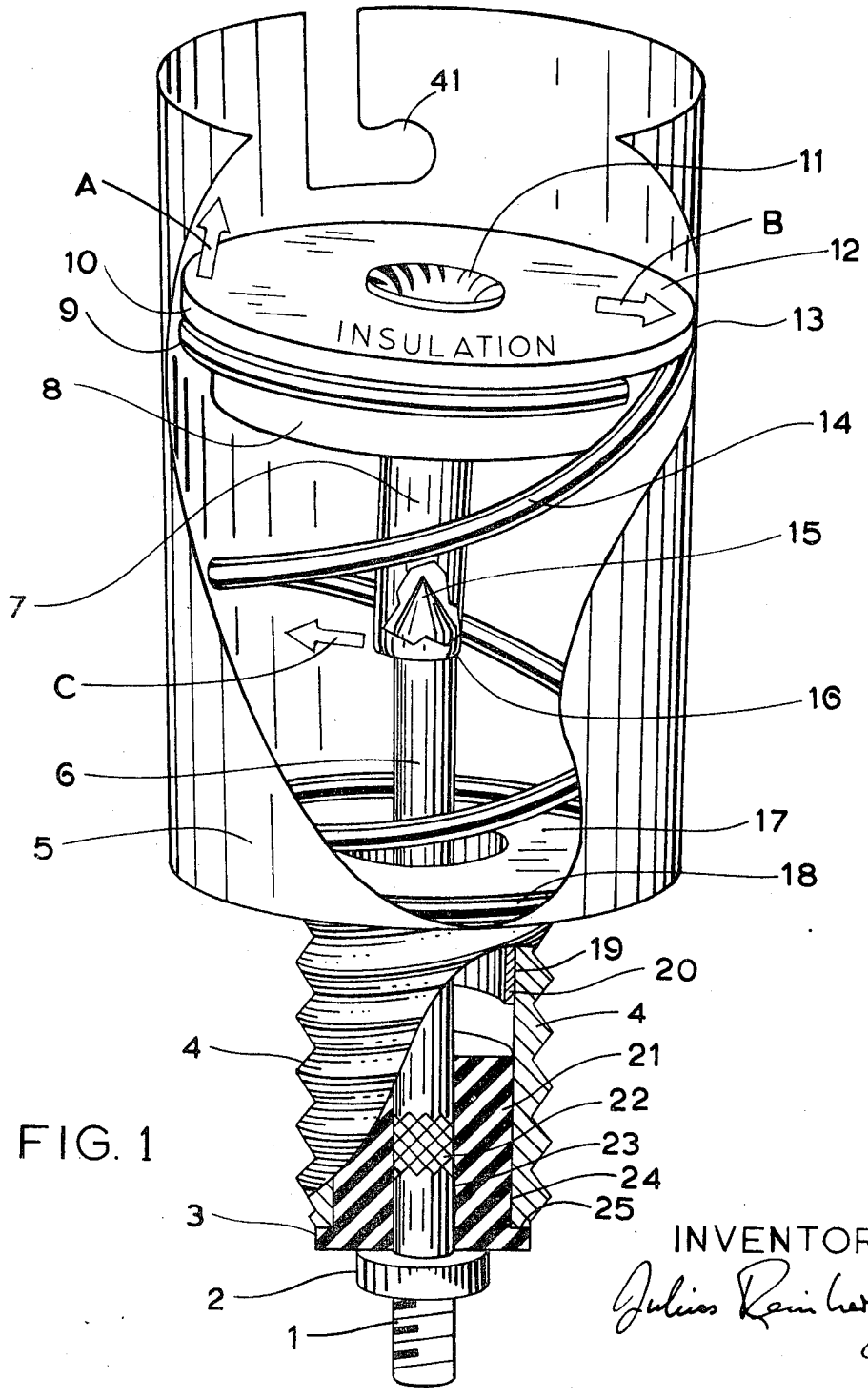


FIG. 1

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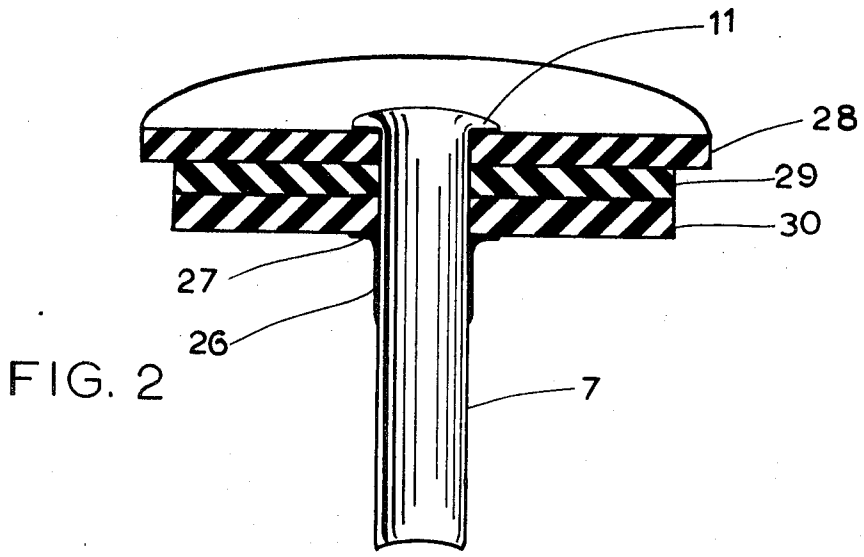


FIG. 2

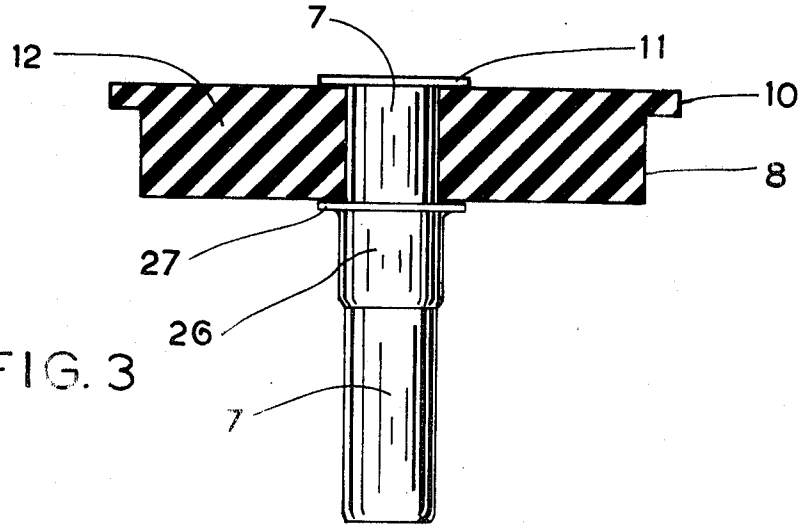


FIG. 3

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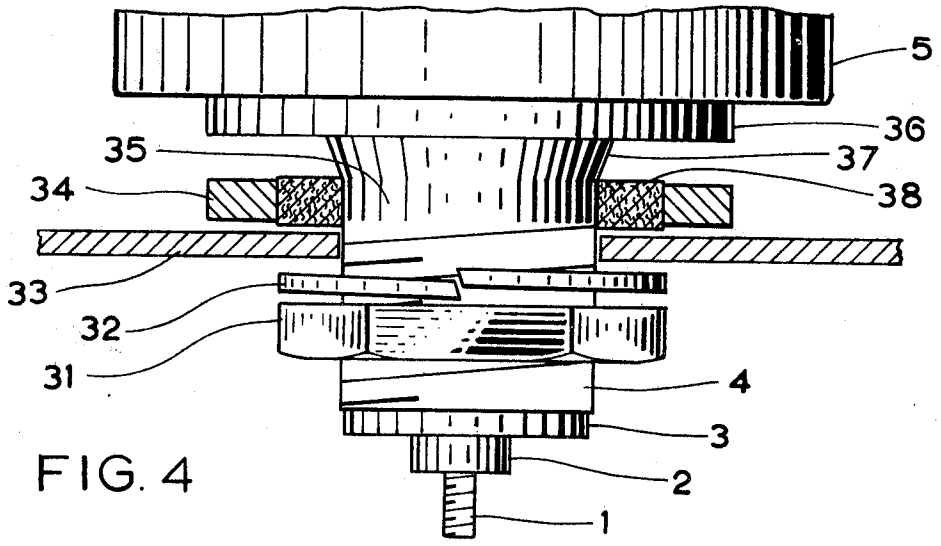


FIG. 4

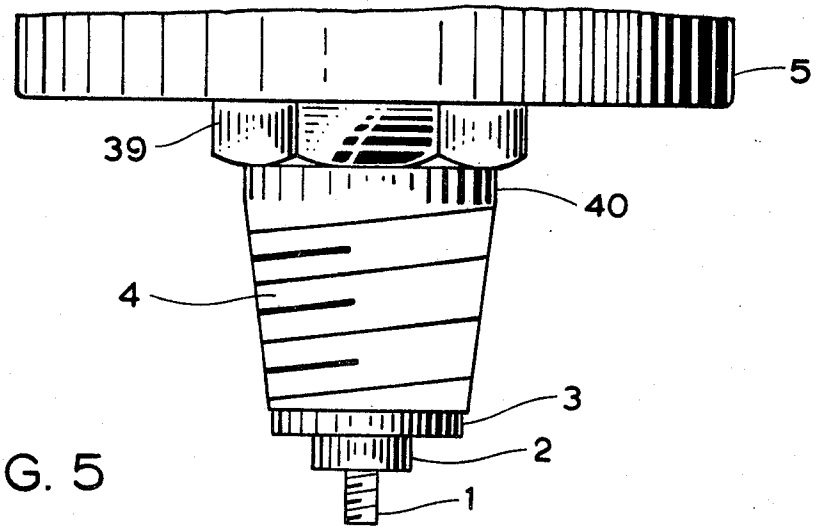


FIG. 5

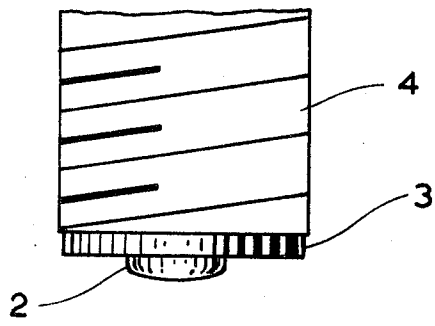


FIG. 6

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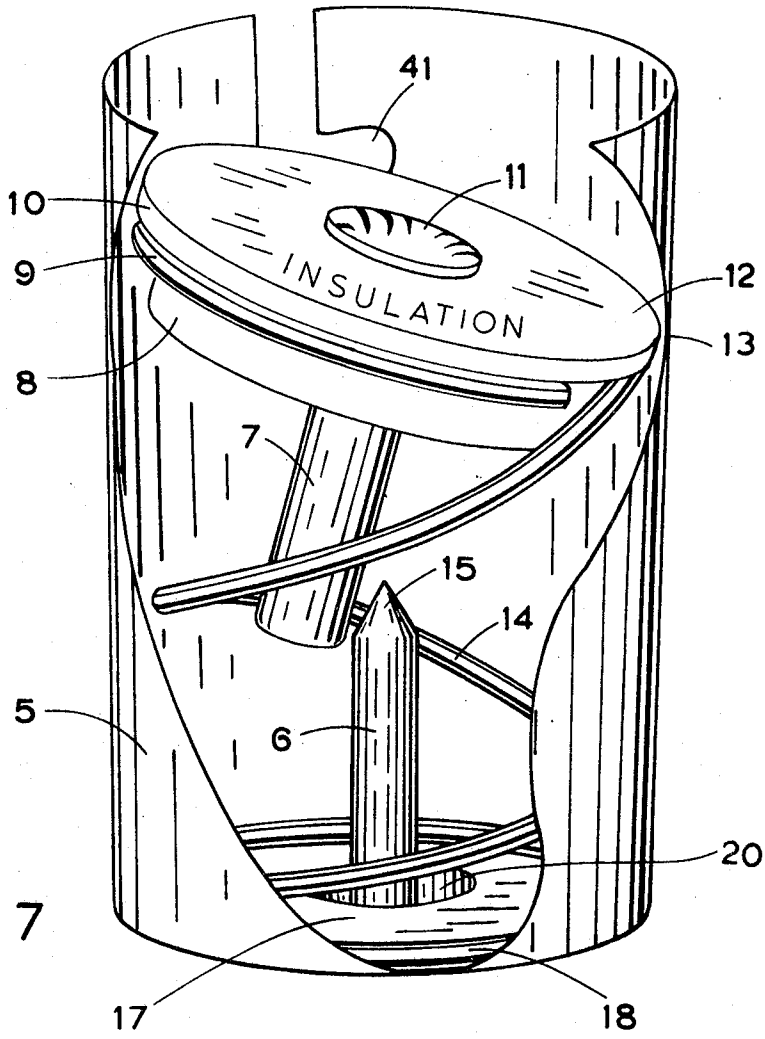


FIG. 7

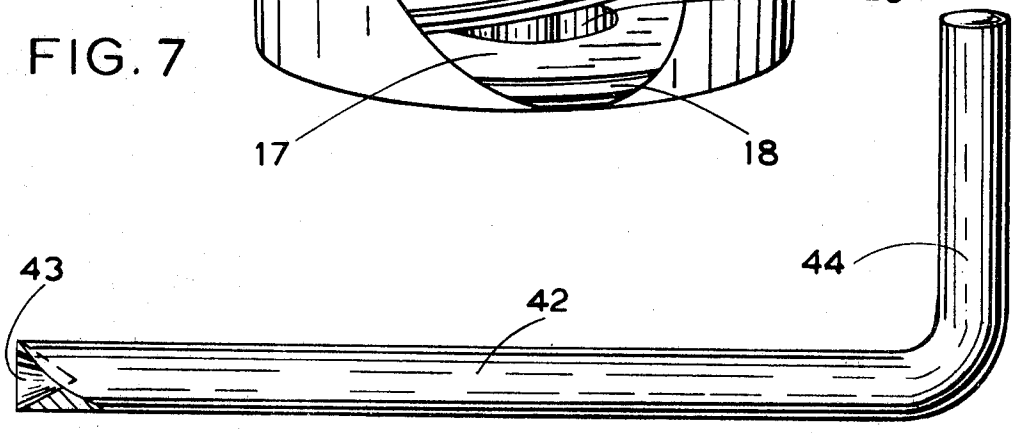


FIG. 8

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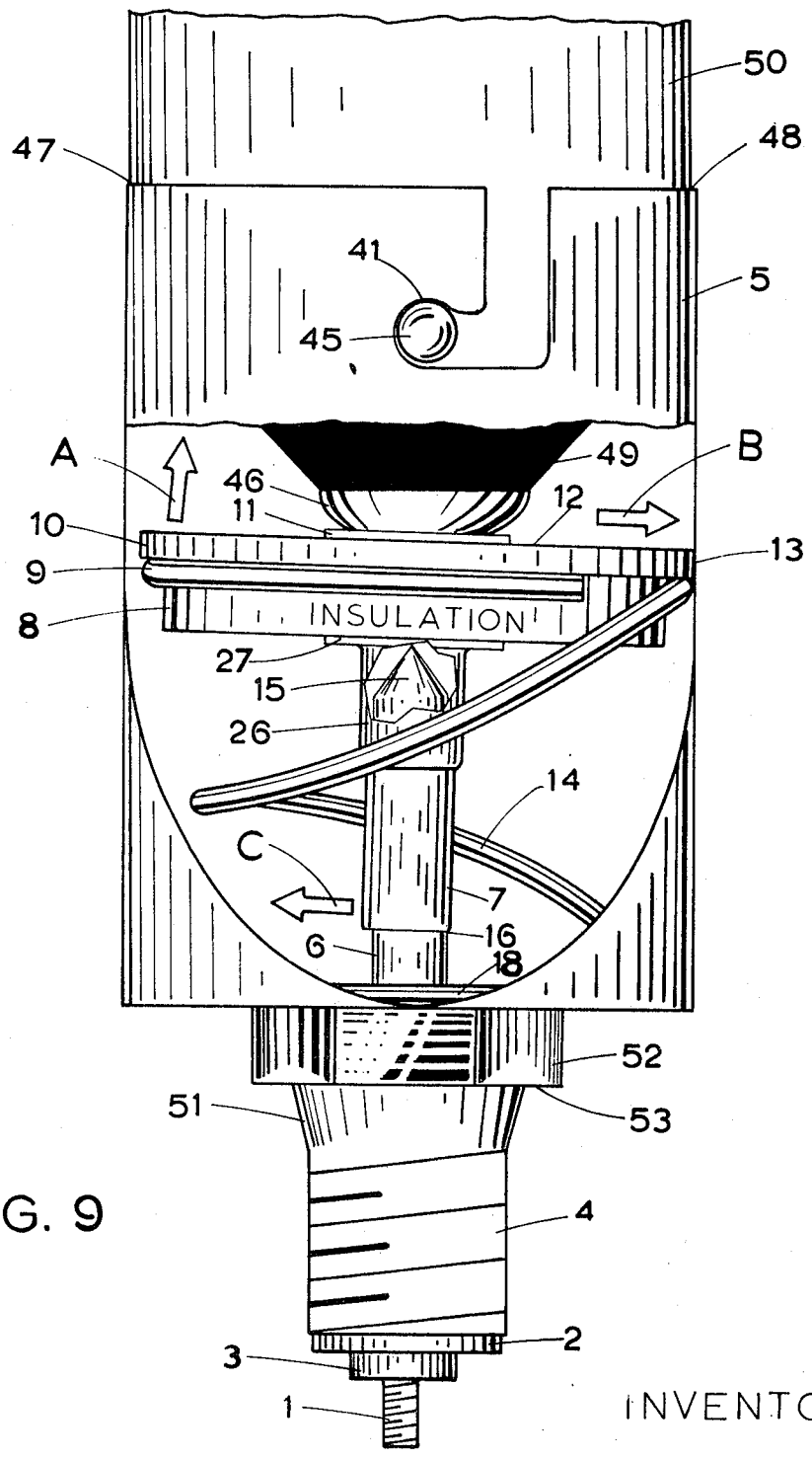


FIG. 9

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United States Patent Office 3,514,742
Patented May 26, 1970

3,514,742

ELECTRIC LAMP SOCKETS

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Filed Nov. 15, 1967, Ser. No. 683,310
Int. Cl. H01r *13/24, 13/22*
U.S. Cl. 339—88 11 Claims

ABSTRACT OF THE DISCLOSURE

This specification discloses a lamp socket having two rigid conductors, at least one tubular, maintained in sliding-conductive-contact by lateral, spring-derived pressure; use of an oversize lower-loop for compression spring retention; use of one eyelet pressed over another eyelet as a conductor and retaining means; use of a stepped-diameter, movable-insulator, for conductor support and transmission of oblique spring forces; a socket with a sealed type base; specially adapted, socket-base mounting and sealing means; socket construction for high temperature use; and a tool for assembling socket components.

This invention relates to bayonet type, electric lamp sockets. This type of socket is not only suitable for use with a wide range of sizes and types of electric lamps but is also suitable for use with various devices, of sundry sorts, which are equipped with lamp type bases so as to use bayonet type sockets as connectors and as convenient means for incorporating removable and replaceable components in electrical assemblies.

One objective of the present invention is to provide a socket having superior resistance to failure because of internal corrosion.

Another objective is to provide a socket which has superior resistance to failure because of flexural strain on the internal conductor.

Another objective is to provide a lamp socket without soldered connections which, when made with high temperature insulation and cements, in the manner to be described herein, will be capable of withstanding much higher temperatures than most lamps can tolerate and thus permitting use of special high temperature lamps where elevated temperatures are involved.

Another objective is to provide a socket having a sealed base which can be used to advantage in locations involving high humidity, contaminated or exotic atmospheres, and where there may be pressure differentials between the socket and its base terminal.

Another objective is to provide a socket which can be repaired easily, under most circumstances, by extraction and replacement of its moving parts through the lamp opening.

Another objective is to provide a socket which can be easily removed and replaced or relocated, in its entirety.

Other objectives and advantages of the present invention will become apparent in the course of the following description and claims, made in conjunction with the accompanying drawings in which:

FIG. 1 is an inclined elevation view of one embodiment of the present invention, with portions cut away and with portions of the base in axial section.

FIG. 2 is an inclined, axial-section view of an alternative embodiment of a floating insulation assembly.

FIG. 3 is a more detailed view, in elevation and section, of a floating insulation assembly of the type shown in situ in FIG. 1.

FIG. 4 is an elevation view of the lower portion of a socket and its base showing one embodiment of an alternative base in loose assembly. Some of the components shown in FIG. 4 are in section to facilitate explanation and comprehension of their functions.

FIG. 5 is an elevation view of the lower portion of a socket and its base showing another alternative base construction.

FIG. 6 is an elevation view of a portion of a different, alternative socket base construction.

FIG. 7 is an inclined, elevation view of a socket similar to the view of FIG. 1 except that the base and a portion of the socket neck have not been shown and also the floating insulation assembly has not been shown in situ, but in a freely suspended position, for the intended purpose of facilitating explanation of the forces acting on the floating insulation assembly.

FIG. 8 is a partially inclined, elevation view of a tool designed to facilitate assembly of sockets of the present type. A small part of the indented end of the tool is shown in axial section for clearer comprehension.

FIG. 9 is an elevation view of one embodiment of the present invention with portions cut away to better illustrate the positions of internal members when compressed as in use.

Referring now to FIG. 1 we see a standard socket shell **5** having a short neck **20** to which is brazed, soldered, or otherwise firmly joined physically, conductively, and with good seal throughout their junction **19**, as externally threaded base **4**. Said threaded base has, within its lower part, an electrical insulator **21** which is made of rigid material such as hard rubber, phenolic plastic, or ceramic material such as steatite. The insulation **21** has within it, and passing through it axially, a conductor **6** having a pointed tip **15**, a collar **2**, and a threaded lower end **1**. A portion of the conductor **6**, where it passes through the insulator **21**, is knurled **22** to provide a more rigid assembly. The insulator **21** must be firmly vulcanized, molded, pressed, or cemented in place so as to rigidly support the conductor **6** and also to provide good seal at all points of junction with both the base **4** and the conductor **6** as exemplified by the indicators **23**, **24**, and **25**. All of the components, thus far described, are rigid and are assembled in fixed relationship to each other and remain in constant fixed position, relative to each other, under all conditions of normal function. This group of assembled components will be referred to, on later occasion, as the rigid socket assembly.

Ordinary eyelets, as referred to in this specification, are small tubes, flanged at one end. The tubular portion of an eyelet is termed its body. The flanged portion is simply referred to as the flange.

The body of an eyelet normally has a very slight taper. It is largest just under the flange. When reference is made to the diameter of an eyelet, without specific reference otherwise, that reference is to the average outside diameter of the body of the eyelet.

In the claims, for clarity, the phraseology "a tube, flanged at one end" is used instead of the term "eyelet."

Referring now to FIG. 3 we see a detailed view of a floating insulation assembly of the type shown in FIGS. 1, 7, and 9. This is a rigid assembly of a disk or washer-shaped insulator **12** having an axial hole through which

is passed a long eyelet **7** that is securely affixed to the insulator by a short eyelet **26** which has been pressed over its body on the underside of the insulator. The eyelets are both made of light gauge copper, brass or similar conducting metal. The inside diameter of the short eyelet **26** is .0005" to .002" smaller than the outside diameter of the long eyelet. When the short eyelet is pressed over the long eyelet, the short eyelet stretches a little and the long eyelet compresses a little and once pressed into their location, as shown in FIG. 3, the insulator **12** is tightly bound between the flange **11** of eyelet **7** and the flange **27** of eyelet **26**.

Referring now to FIG. 2 we see a detailed view of an alternate type of floating insulation assembly. Being in inclined, axial-section, this view shows the tubular nature of the eyelets **7** and **26** clearly. This alternate assembly is made with insulation having the same gross shape as the insulator **12**, illustrated as a one piece unit in FIG. 3, but is made of a number (in this instance 3) of stamped washers **28, 29,** and **30** of insulation material which are bound together in the same manner as the insulator **12** is held, between the flanges of eyelets **7** and **26**. The type of construction shown in FIG. 3 is generally superior, however the laminated construction is less expensive, materialwise and permits use of some types of materials which can not be molded.

Referring again to FIG. 1 we see that within the socket assembly, is a spring **14** with its lower loop **18** pressed to the bottom **17** of the socket shell **5**. The loop **18**, when freely expanded, has an outside diameter which is larger than the inside diameter of the socket shell **5**. Therefore it must be compressed before it can be inserted to its operating position, as shown. Once in place, it will not shift its position, either rotationally or axially, under normal functioning conditions. It can, however, be removed at will, for servicing, by means of a hooked piece of music wire or any similar device. The entire spring **14**, above the lower loop **18**, is of smaller diameter and easily clears within the wall of the socket shell **5** permitting free axial movement.

The upper loop **9** of the spring has an inside diameter which is smaller than the outside diameter of the body **8** of the insulator **12** of the floating insulation assembly, FIG. 3. The lip **10** restrains the upper loop **9** of the spring from slipping over the top of the insulator **12** when depressed.

The spring **14** assembled together with the floating insulation assembly, as shown in detail in FIG. 3, comprise the moving parts of the inner socket. This combined assembly of the spring together with the floating insulation assembly will be referred to, on later occasion, as the dynamic socket assembly.

Referring now to FIG. 7 we see the dynamic socket assembly with loop **18** properly seated at the bottom **17** of the socket shell **5**; however, the conductor **6** is not within the eyelet **7** as it should be for proper functioning of the socket. Because of this the dynamic socket assembly is free to assume its position of natural equilibrium, as shown. To properly assemble the dynamic socket assembly within the socket, it is necessary to guide the eyelet **7** over the point **15** of the conductor **6** while it is being depressed into the socket shell **5**.

Referring now to FIG. 8 we see one embodiment of a tool designed to seat the dynamic socket assembly properly within the socket shell. The tool is illustrated as a rod **42** having a depression **43** at one end and a bend **44** at its other end. The rod could just as well be a piece of thin tubing with a bend at one end. The bend simply provides a means to hold the tool and to depress it in use. The bend could just as well be a loop or knob.

To use the tool, as shown in FIG. 8, the depressed end **43** is inserted through flange **11** of eyelet **7** of the assembled dynamic socket assembly. The tool is then pushed all the way in, until the bend and the arm **44** touch the flange **11**. Holding the tool together with the dynamic

socket assembly in the above position, the depression **43** is placed over the tip **15** of the conductor **6** within the rigid socket assembly. The tool is held in this position by depressing the arm **44** axially towards the depressed end **43** and holding it firmly against the tip **15** of the conductor **6**. While holding the tool thus, the dynamic socket assembly is pushed down until the loop **18** reaches the top of the socket shell **5**. At this point the loop **18** is partly slipped into the socket shell and the rest of loop **18** is pressed against the inner wall of the shell **5**, thus compressed, and the entire floating insulation assembly is pushed downward as far as it can go. Upon removal of the tool **42** the socket will be completely assembled as shown in FIG. 1. It is, of course, essential that the outside diameter of the rod **42** be of smaller dimension than the inside diameter of the eyelet **7**.

Referring again to FIG. 7 it will be seen that, in the incorrect assembly shown, we are able to see the freely extended position of the dynamic socket assembly when loop **18** is in position, but with the lower end of eyelet **7** not restrained by the conductor **6**. This reveals the true essence of the present invention as it shows that the spring is not only exerting an upward force, as in most prior sockets, but also exerting an additional lateral-rotational force on the floating insulation assembly.

Referring now to FIG. 1, we see a properly assembled socket, with the lower end of eyelet **7** restrained by the conductor **6**. In assembly, we have rotated the dynamic socket assembly away from the position of equilibrium, as shown in FIG. 7, in a direction opposite that in which the arrows A, B, and C point. This sets up latent forces exerting pressures in the directions in which the arrows A, B, and C point. Since the inner wall of the socket shell **5** restrains movement of the insulator lip **10**, or the edge of the upper loop **9**, at the point of contact **13**, the final effect is a constant pressure, exerted by the spring **14**, transmitted through the movable insulator **12**, to the conductor **7**, which must therefore exert a lateral force, at its lower portion, in the direction of arrow C. This force is exerted at all times that the upper conductor **7** and the lower conductor **6** are in their normal, slidingly-variable relationship after proper assembly, as shown in FIG. 1, and results in a constant, positive, conductive-contact between the inner-lower-edge of eyelet **7** and the conductor **6** at point **16**.

Referring now to FIG. 9 we see a properly assembled socket with its dynamic socket assembly depressed by a lamp, of which only a lower base portion **50** is shown, as would occur in use. The same forces, indicated by A, B, and C are in effect, as were in effect in FIG. 1; however, a force in the direction of arrow B is also effected on the lamp contact **46**. This is translated through the lamp pins **45**, rotating within the pin detents **41**, acting as a fulcrum and tilts the lamp base slightly to contact the socket shell **5** at point **47** and away from the shell at point **48**. If, for any reason, the lamp contact will not permit the insulator lip **10** to contact the shell **5** at point **13** then the lamp contact **46** assumes the role of fulcrum and a similar force will still be applied to the lower end of eyelet **7** assuring good contact at point **16**.

It will be pointed out that, in any case, the position of a lamp in a socket of the present type is maintained under constant tension in a fixed position. This can be turned to particular advantage, in some instances, where lamps of prefocused filament are used.

Due to the constant pressure of eyelet **7** against the conductor **6**, a contact cleaning effect takes place each time a lamp is inserted or extracted from the socket. If the floating insulation assembly is rotated slightly within the upper loop **9** and the lower loop **18** is also slightly rotated, then both the conductor **6** and the eyelet **7** present different points of contact to each other. It should be apparent that the ease with which this type of socket can be rejuvenated, or if necessary, have parts removed and replaced, is an appreciable advantage.

Referring now to FIG. 5 we see a base **4** which is threaded with a standard pipe thread and has been machined out of hexagonal stock **39** providing a grip for a wrench to tighten or loosen the socket without any strain on the socket shell **5**. The pipe thread can easily provided a good seal in such applications as are indicated for this type of base.

Referring now to FIG. 4 we see another type of base which can provide a seal between the inner and outer walls of a pressure vessel. The section **33** represents the vessel wall. The wall is drilled, or otherwise perforated, and the base **4** is inserted as shown. When the nut **31** is tightened, the gasket washer **38** is forced upward, beyond the unthreaded portion **35** of the base, on to the outward tapered portion **37** where it is compressed and forced to fill all of the adjoined junctions thus making a good seal. The retaining washer, made of steel, or any suitable metal, is the same thickness as the height of the tapered or flared portion **37** and makes it possible ot use stamped, inexpensive, gasket materials to do a job which would require much more expensive materials if the reinforcing washer **34** were not used. The stamped gasket is always used in a thicker dimension than the metal washer **34** so as to insure adequate material to fill all joints sufficiently to make a good seal. The flange **36** is adequate to perform its function under most conditions, however the use of hexagonal stock, as is shown **52** on the base illustrated in FIG. 9 will permit a wrench to be applied to the base and relieve the socket shell of any stress due to assembly or disassembly of the socket unit within equipment.

Referring now to FIG. 6 we see a base designed to serve as an adapter to make possible the use of bayonet type lamps in systems originally intended for screw base lamps. The thread on the base **4** illustrated in FIG. 6 would be the same as that on a threaded lamp base and the lead connection **1**, shown on other bases, would be eliminated and the collar would be rounded and a bit smaller to permit its use as a contact similarly to the center contact on a lamp base.

The base shown on the socket in FIG. 1 is of simple threaded design and not intended for specific seal applications. It permits of rigid connection to a fixture, or equipment, by tightening it into a threaded opening with a nut at either side of the opening, or if inserted into a non-threaded opening, it can be secured by tightening **2** nuts on the base; one on each side of the opening.

The base shown on the socket in FIG. 9 is a modified version of the socket base shown in FIG. 4. It permits a modest seal where the base is used in a threaded opening or with a nut on the lower portion of the base pulling the rest of the base into a non-threaded opening. The flared area **51** will provide good seal against dust and other particulate contaminants. Use of a copper clad gasket, such as a spark plug gasket, between the flat area **53** below the hexagonal section **52** and the wall of the fixture or equipment into which the base is inserted, will provide a good seal under a wide variety of conditions.

In the claims, a reference to a "sealing-surface" infers a smooth surface, free of deformities or defects, which is suitable for the sealing purpose of the flange, or flared area, referred to.

Combinations of different portions of the material described herein and obvious applications of the devices mentioned, but not fully treated in this specification, will occur to those skilled in the art. It is therefore desired to be understood that this invention is not to be limited to the particular embodiments treated.

What I claim is new and desire to secure by Letters Patent of the United States is:

1. In a lamp socket comprising; a tubular upper shell; a base, integral with said upper shell; and an internal conductor train; improvements comprising in combination:

(a) a rigid base-conductor, rigidly-affixed within said base, insulated from said upper shell, and extending into said upper shell,

(b) a compression spring in said upper shell,

(c) a movable insulator, said spring surrounding and attached to said movable insulator,

(d) a rigid upper-conductor, affixed within said movable insulator and movable therewith,

(e) the axis of said upper-conductor is at an oblique angle to the axis of said rigid base-conductor,

(f) at least one of said conductors being tubular, and one of said conductors passing within the other,

(g) at least a portion of the upper coil of said spring being axially divergent from the lower coils in order to maintain the axis of said upper conductor at an angle to the axis of said base conductor.

2. In a lamp socket, as claimed in claim **1**; wherein said portion of the upper coil is at least 50% of the upper coil.

3. In a lamp socket as claimed in claim **1**;

(a) said compression spring having a lower loop of greater outside diameter than the inside diameter of said shell,

(b) said lower loop securing the position of said spring within said shell, after insertion, by the expansive forces of said lower loop against the inner surfaces of said shell.

4. In a lamp socket, as claimed in claim **1**;

(a) a conducting-metal tube, flanged at one end, serving as a member of the conducting-train of said socket,

(b) an insulator, within said socket, having an axial hole,

(c) said flanged-tube inserted within said axial hole of said insulator, up to its flange, and having its non-flanged end protruding some distance beyond said insulator,

(d) a short tube, flanged at one end,

(e) said short-flanged-tube pressed over the protruding portion, of said inserted-flanged-tube, so that said insulator is bound between the flanges of said flanged tubes.

5. In a lamp socket as claimed in claim **1**;

(a) a washer-shaped movable-insulator having stepped outside diameters, a greater-diameter-portion above a lesser-diameter-portion,

(b) a compression-spring having an upper-loop encircling more than 50% of the circumference of the lesser-diameter-portion of said insulator.

(c) said upper-loop having a smaller, free-state inside-diameter than the outside-diameter of the lesser-diameter-portion of said insulator,

(d) said upper-loop retaining said insulator by constrictive-forces upon said lesser-diameter-portion of said insulator,

(e) said greater-diameter-portion of said insulator preventing said insulator from being forced through said upper-loop of said spring by upward-forces of said spring opposed to downward-forces upon said insulator when depressed in service.

6. In a lamp socket, as claimed in claim **5**;

said insulator comprising a plurality of washer-shaped individual-component-insulators, of greater and lesser diameters, assembled and laminated-together by fastening means.

7. In a lamp socket comprising; a tubular upper-shell; a tubular base-shell, integral with said upper-shell; and an internal conductor-train; improvements comprising in combination;

(a) a rigid base-conductor, passing-axially-through and rigidly-affixed within, and insulated from said base-shell,

(b) said insulation sealed at all points of contact between itself and said base-conductor and between itself and said base-shell,

(c) said base-shell externally-threaded and having a

non-threaded, outwardly-flared, sealing-surface above said externally-threaded portion.

8. In a lamp socket, as claimed in claim **7**; improvements comprising in combination;

(a) a flanged-portion above said non-threaded, outwardly-flared, sealing-surface of said base-shell,

(b) the under-portion of said flanged-portion having a sealing-surface.

9. In a lamp socket, as claimed in claim **8**; improvements comprising in combination;

(a) an annular gasket, encircling said base-shell immediately below said non-threaded, outwardly-flared sealing-surface,

(b) an annular metallic-reinforcing-washer, encircling said annular-gasket,

(c) fastening means, for drawing said base-shell tight, on the opposite side of a wall from said gasket and said outwardly-flared sealing-surface.

10. In a lamp socket, as claimed in claim **8**; an improvement comprised of;

peripheral flats upon said flanged-portion of said base-shell.

11. In a lamp socket, as claimed in claim **10**; an improvement comprised of;

said base-shell externally-threaded with pipe-thread.

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J. H. McGLYNN, Assistant Examiner

U.S. Cl. X.R.

339—130, 188, 217