March 13, 1962 J. H. HOPKINS 3,025,491

SOCKET AND CONNECTOR MEANS

Filed Jan. 8, 1960 3 Sheets-Sheet 1

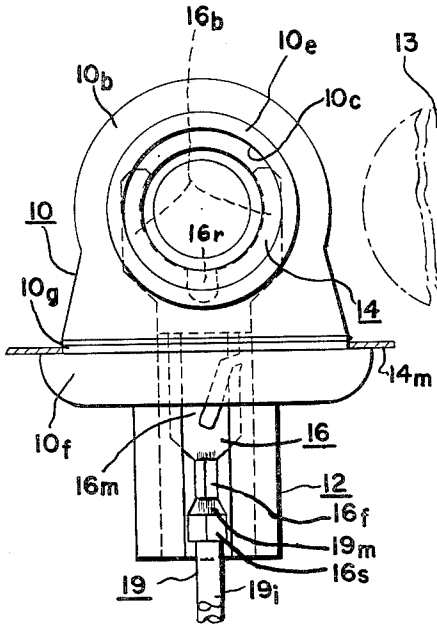


Fig. 2

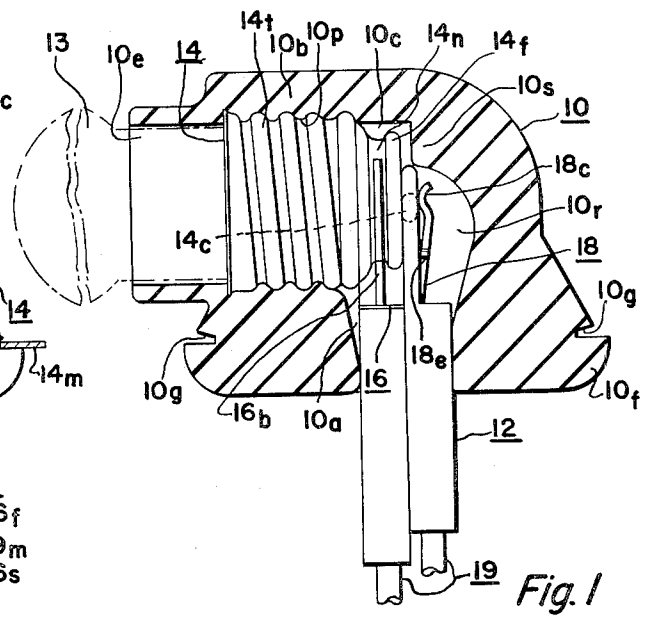


Fig. 1

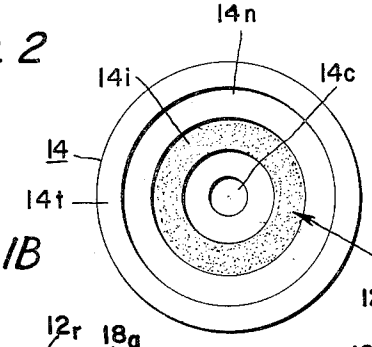


Fig. 1B

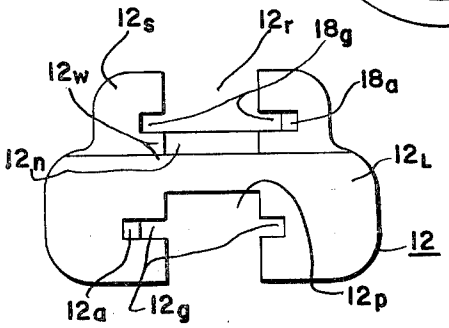


Fig. 3

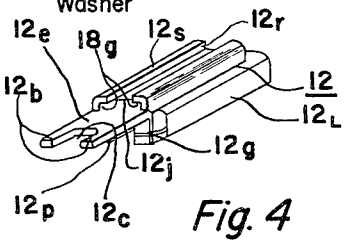


Fig. 4

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SOCKET AND CONNECTOR MEANS

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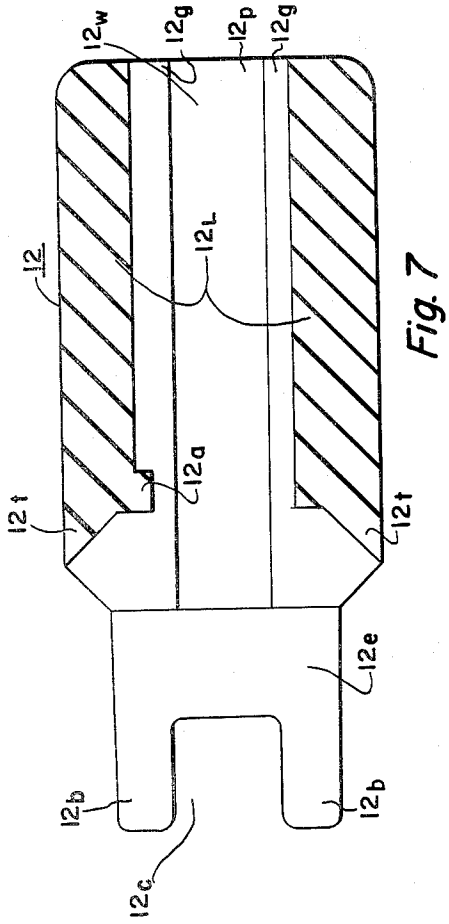


Fig. 7

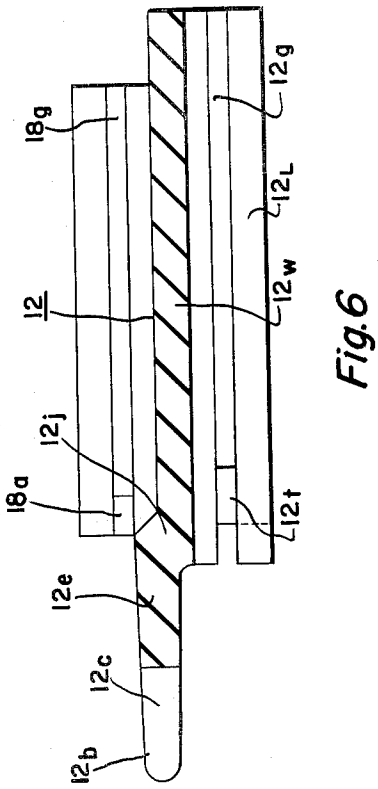


Fig. 6

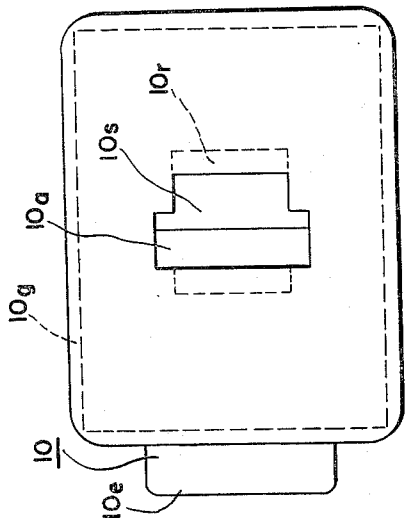


Fig. 1A

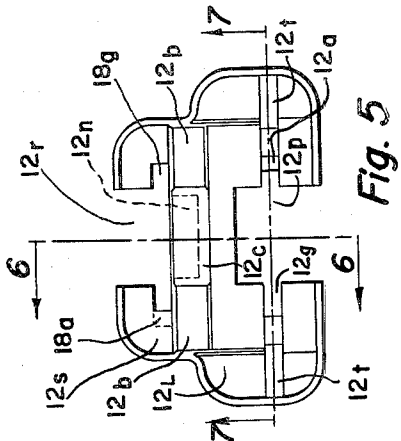


Fig. 5

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SOCKET AND CONNECTOR MEANS

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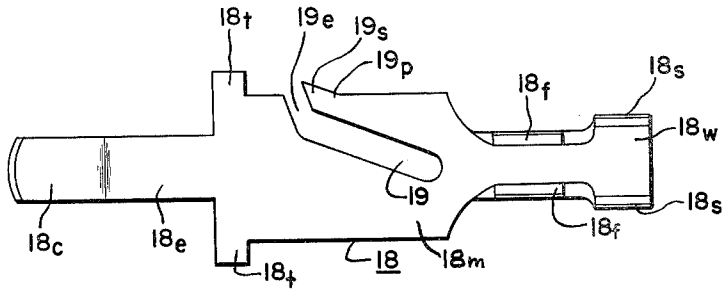


Fig. 8

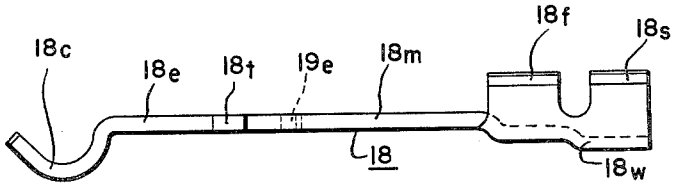


Fig. 8A

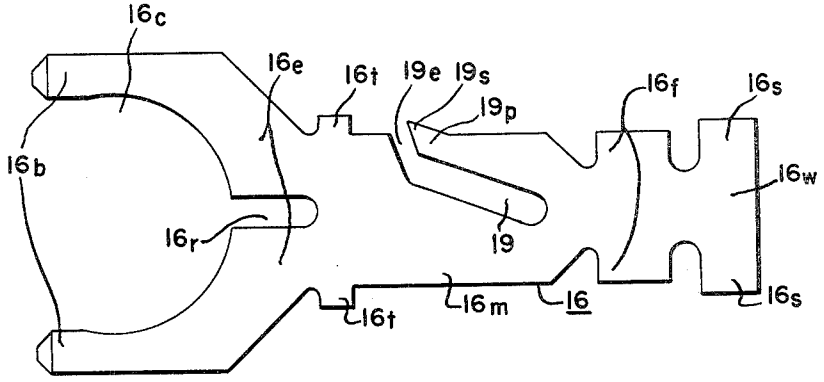


Fig. 9

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3,025,491

SOCKET AND CONNECTOR MEANS

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6 Claims. (Cl. 339—176)

This invention relates to multi-terminal connector and socket means, and particularly, to a pair of insulating bodies having complementary terminal and socket means therein.

An object of this invention is to provide a new and improved multi-terminal connector and socket means involving a minimum number of parts economical to produce and adapted to require minimum mounting space relative to an apertured mounting panel.

Another object of this invention is to provide a combination plug, terminal and socket assembly including a pair of mating insulating bodies one of which is socket-like and has a longitudinally and laterally open cavity in which a lamp bulb support is provided with metal portions insulated from each other and separately engageable by complementary contact portions of a C-shaped end of one terminal and a bifurcated end of another terminal maintained in a predetermined spaced relation to the first terminal by the second plug-like insulating body having a pair of longitudinally extending undercut slots therein to carry the terminals separated from each other by an intermediate wall portion or partition extended adjacent to one end by a bifurcated portion of insulating material also adapted to complement and engage the lamp bulb support inside the socket-like insulating body.

Another object of this invention is to provide a pair of terminal means adapted to be held in spaced relation substantially parallel to each other and having wire-connecting as well as laterally-slotted mounting portions along adjacent ends while opposite ends differ in that one has a bifurcated contact portion open centrally thereof at a location in axial alignment with a transverse C-shaped contact portion adapted to establish electrical engagement with a lamp-shell base including metal portions insulated from each other.

A further object of this invention is to provide a plug-like insulating body having a pair of longitudinally extending under-cut slots for mounting a pair of electrical terminals on opposite sides of an intermediate wall portion or partition that is extended adjacent to one end into a bifurcated portion of insulating material also adapted to complement laterally one of the terminals to be mounted relative thereto.

Another object of this invention is to provide a combination plug, terminal and socket assembly including a pair of mating insulating bodies one of which is socket-like and includes a main hollow portion adapted to receive a lamp-bulb-base-mounting metal sleeve spaced concentrically outwardly from a central contact for the lamp bulb base which is laterally exposed together with a portion of the metal sleeve as well as a lateral flange portion of insulating material integral with the main hollow portion and adapted to fit in locking engagement with a peripheral edge of an aperture in a mounting panel such as a side wall of a refrigerator cabinet, a vehicle body interior panel, an appliance housing and the like through which electrical connection is made using a plug-like insulating housing having a pair of under-cut recesses or slots adapted to receive a pair of terminal means insulated from each other by an intermediate wall portion or partition of the insulating housing that includes a bifurcated extension longitudinally to one side of the partition and adapted to engage one side of a peripheral groove or neck portion of the metal sleeve that is electrically connected by a bifurcated end portion of one of the terminal means while adjacent thereto on an opposite side of the bifurcated extension of the insulating housing there is a C-shaped contact portion of the other terminal means adapted to contact electrically the central contact for the lamp bulb base, the plug-like housing fitting at least in part into the lateral opening surrounded by the flange portion of the one insulating body.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein preferred embodiments of the present invention are clearly shown.

In the drawings:

FIGURE 1 is a partially-sectioned side view of an assembly in accordance with the present invention.

FIGURE 1–A is an end view of a socket-like body of the assembly of FIGURE 1.

FIGURE 1–B is a plan view of a socket portion inside the assembly of FIGURE 1.

FIGURE 2 is an end view of the assembly of FIGURE 1.

FIGURE 3 is an end view of a plug-like housing for use in the assembly of FIGURES 1 and 2.

FIGURE 4 is a perspective view of the housing of FIGURE 3.

FIGURE 5 is another end view of the housing of FIGURES 2 and 3.

FIGURE 6 is an elevational view partly in cross section taken along line 6—6 in FIGURE 5.

FIGURE 7 is a cross-sectional view taken along line 7—7 in FIGURE 5.

FIGURE 8 is a plan view of one terminal means for the housing of FIGURE 4.

FIGURE 8–A is a side view of the terminal means of FIGURE 8.

FIGURE 9 is a plan view of another terminal means for use in accordance with the present invention.

FIGURE 1 illustrates a socket and connector means assembly in accordance with the present invention including a pair of mating insulating bodies generally indicated by numerals 10 and 12 respectively. Each of these bodies can be formed or molded of nylon, Teflon, Bakelite or some other suitable plastic as well as rubber-like elastomeric material. The insulating body 10 includes a main hollow body portion 10*b* having a cavity 10*c* therein longitudinally open at one end 10*e* and having a shoulder 10*s* provided adjacent to an opposite end thereof. A lamp bulb 13 outlined in FIGURE 1 is adapted to have a base portion inserted through the open end 10*e* relative to a lamp-bulb-base-mounting metal sleeve or support means generally indicated by numeral 14 adapted to fit into the cavity 10*c* of insulating body 10. The sleeve 14 is substantially cylindrical and includes a threaded portion 14*t* electrically engaged by complementary threads on a metal base of lamp bulb 13. The metal sleeve 14 further includes a reduced diameter groove or neck portion 14*n* as well as a radially larger flange portion 14*f*. The metal sleeve 14 can be threaded or press-fitted into engagement with an inner peripheral surface 10*p* defining part of the cavity 10*c* in the insulating body 10.

On end view of the annular or cylindrical sleeve 14 is shown in FIGURE 1–B wherein there is a showing of an annular washer or insulating portion 14*i* held or crimped into position at a location radially inside the flange portion 14*f* and having a central aperture in which a button or lamp contact 14*c* is mounted in predetermined spaced relation to neck portion 14*n* and the threaded portion 14*t* of sleeve 14. The purpose of the groove or neck portion 14*n* as well as flange 14*f* and the central lamp contact such as 14*c* will become apparent from the following description in accordance with the present invention.

Integral with and extending laterally from the main hollow body portion **10***b* of the insulating body **10**, there is a side flange portion **10***f* of insulating material surrounding a side opening or aperture **10***a* into which the second insulating body **12** fits in mating relationship thereto. The flange portion **10***f* includes a peripheral groove **10***g* adapted to fit a peripheral edge of an aperture in a mounting panel outlined in FIGURE 2 and identified by reference numeral **14***m*. It is noted that the flange portion **10***f* can have a round, square as well as rectangular configuration and the latter is illustrated in a plan view of the insulating body **10** alone as seen in FIGURE 1–A. The aperture **10***a* as seen in FIGURE 1–A is T-shaped and is located substantially in lateral alignment with the shoulder portion **10***s* referred to earlier. Adjacent to the end of cavity **10***c* and shoulder **10***s* there is an auxiliary chamber or curved recess portion **10***r* visible in both views of FIGURES 1 and 1–A.

The second insulating body **12** is illustrated in mating relationship with the first insulating body **10** in views of FIGURES 1 and 2. FIGURE 2 is taken looking into chamber **10***c* from the open end **10***e*. First and second terminal means generally indicated by numerals **16** and **18** are partially visible in the assembly of FIGURE 1. An outline of the first terminal means **16** is also provided in FIGURE 2. FIGURE 3 is an end view of the second insulating body **12** alone as seen from a position outside the assembly of FIGURES 1 and 2. The second insulating body **12** has a T-shaped configuration and extends substantially parallel and longitudinally relative to the first and second terminal means **16** and **18**. The second insulating body **12** includes a relatively larger body portion **12L** joined by an integral intermediate wall or partition **12***w* relative to a smaller body portion **12***s*. First terminal means **16** is adapted to fit in locking relation to an inner peripheral surface of a pair of under-cut grooves or slots **12***g* extending laterally outwardly from a laterally open and longitudinally extending passage **12***p*. One groove **12***g* has a projection or laterally inwardly extending abutment **12***a* provided therein for engagement by the first terminal means **16** for positioning thereof in accordance with the present invention. Similarly, the smaller body portion **12***s* also includes under-cut grooves or slots **18***g* extending laterally outwardly from a laterally open passage or recess **12***r* extending longitudinally relative to the second insulating body **12**. A notch or cut-out portion **12***n* is provided adjacent to the passage or recess **12***r* to accommodate a portion of second terminal means **18**. The second terminal means **18** is adapted to fit in locked relationship relative to the grooves **18***g* and to abut against an inwardly projecting stop or abutment shoulder **18***a* visible in FIGURES 3 and 5. FIGURE 4 is a perspective view of the second insulating body **12** taken alone and FIGURE 5 is an end view of structure of the insulating body **12** including an extension **12***e* of insulating material terminating in bifurcated longitudinally parallel portions **12***b* on opposite sides of a slot or cut-out **12***c*. One end of the extension **12***e* is integral with the intermediate wall or partition **12***w* at an offset juncture **12***j* visible in FIGURES 4 and 6. Passages **12***p* and **12***r* are open longitudinally and laterally in opposite directions so as to facilitate insertion of first and second terminal means relative to the under-cut grooves in spite of the fact that the terminal means have been previously secured or crimped relative to conductor metal **19***m* having an insulating covering **19***i* as part of wiring or conductors generally indicated by numeral **19** in FIGURES 1 and 2. As seen in view of FIGURES 5, 6 and 7, the second insulating body **12** includes a pair of integral longitudinally projecting triangular flanges located in pairs adjacent to grooves **12***g* and indicated by reference numeral **12***t*. These triangular portions **12***t* engage one side of the first terminal means **16** relative to tabs **16***t* extending laterally in opposite directions from a mounting or body portion **16***m* of the terminal means visible in FIGURES 2 and 9. The terminal means **16** further includes a ferrule or wire connecting portion **16***w* integral at one end with the mounting portion **16***m*. The wire connecting portion includes first and second pairs **16***f* and **16***s* of tabs adapted to be crimped relative to metal conductor **19***m* and insulation **19***i* respectively as visible in FIGURE 2. The first terminal means **16** further includes an extension **16***e* integral with separate bifurcated portions **16***b* located on opposite sides of a cut-out **16***c* that extends and terminates in a recess **16***r* substantially intermediate the tabs **16***t* and longitudinally or axially in alignment with the mounting portion **16***m* and wire connecting portion **16***w* for establishing electrical connection between the wires such as **19** and a lamp-bulb-base sleeve and contact such as provided relative to the neck portion or groove **14***n* complementary to an inner periphery of the bifurcated portion **16***b* of first terminal means **16**. The mating relationship of the terminal means **16** along the bifurcated portion **16***b* is indicated in the views of FIGURES 1 and 2. The bifurcated end portion of the terminal means **16** is made more resilient by the recess **16***r* such that the ends **16***b* are resiliently deflectable to engage a periphery of the neck portion **14***n*. Terminal **16** in FIGURE 9 is illustrated as a blank and it is to be understood that the wire connecting portion is bent in a manner similar to that illustrated in FIGURES 8 and 8–A. The second terminal means generally indicated by numeral **18** can be fitted relative to grooves **18***g* of the second insulating body **12**. A wire or conductor is secured to conductor receiving portion **18***w* including first side wings **18***f* as well as second side wings **18***s* adapted to be crimped into engagement with the metal conductor and insulated portion of the wires. The second terminal means **18** includes a main or mounting body portion **18***m* integral with a pair of laterally outwardly extending tabs **18***t* provided for stability and engagement of the abutment or stop **18***a* as well as the grooves **18***g*. Integral with the mounting portion **18***m*, there is an extension **18***e* extending longitudinally in alignment with the wire connecting portion **18***w* and mounting portion **18***m*. The extension **18***e* terminates in a C-shaped contact portion **18***c* adapted to engage the lamp contact such as **14***c*. The electrical engagement of both terminal means **16** and **18** can be best seen in FIGURE 1 which represents the assembly of components in accordance with the present invention. Each of the mounting portions **16***m* and **18***m* of the terminal means includes a longitudinally and laterally extending resilient prong **19***p* formed integral at one end with the mounting portion and defined by a slot **19** having an entry or open end **19***e* along one side or edge of the mounting portions in a location to one side of the wire connecting portions of each of the terminal means. The resilient prong is yieldable relative to the mounting portion and a sharp end **19***s* is adapted to serve as a barb that digs into a side surface of one of the grooves such as **18***g* or **12***g* in the second insulating body **12**, for example.

It is to be noted that, in FIGURE 1, the lamp contact **14***c* is located substantially coplanar with the bifurcated end **12***e* and legs **12***b* integral with the second insulating body **12**. This bifurcated extension **12***e* serves to align the second insulating body **12** relative to the aperture **10***a* and the recess **10***r* is sufficiently large to permit flexing of the C-shaped contact end of the second terminal means **18**. The first and second terminal means can easily inserted together with the second insulating body **12** relative to the aperture **10***a* for establishing electrical engagement of the lamp-bulb-base-connecting sleeve and a lamp contact. It is to be understood that the surface portions of the integral flange **10***f* surrounding the aperture **10***a* are in sealing engagement with an outer peripheral portion of the larger section **12L** as well as the smaller section **12***s* of the second insulating body **12**. Thus, as the groove arrangement **10***g* provided in the flange portion **10***f* engages a periphery of an aperture

in a mounting panel 14*m*, only the main hollow portion or body of insulating material 10*b* relative to which the lamp bulb 13 is inserted projects into a chamber or space such as inside a motor vehicle, inside a refrigerator cabinet, inside a deep freeze unit, or other appliance wherein internal illumination is to be provided. A suitable on-off switch can be provided adjacent to a closure member or door for the cabinet such that the light is energized by a circuit in series with such a switch whenever opening and closing of the door is to coincide with lamp bulb energization. It is to be understood that any other manual switch can also be provided for operating and energizing the lamp bulb 13. Also, it is to be understood that the passages 12*p* and 12*r* can be made to be closed laterally rather than open and then the passages will extend only longitudinally relative to the second insulating body 12 having the central partition or wall 12*w*.

Among the advantages of the assembly in accordance with the present invention are the following. The insulating body 12 together with a pair of terminal means therein can be easily connected and disconnected along with electrical wires relative to a molded lamp socket directly relative to a lamp shell and center lamp contact. It is possible to take advantage of the neck or groove 14*n* formed as the flange 14*f* is crimped relative to an insulating washer 14*i* for the purpose of permitting electrical engagement of the bifurcated end of terminal means 16 relative to the metal shell 14. In effect, the second insulating body 12 together with the terminal means forms a plug-like means adapted to be fitted into mating engagement with the first insulating body 10 including the lamp socket structure. There is no fastening by welding, brazing, soldering, or crimping of parts to the lamp shell 14 and center lamp contact such that difficulty in assembly is avoided and a minimum number of parts are required at a minimum cost for establishing electrical connection relative to a lamp bulb.

It is to be understood that the sleeve 14 could be modified to accommodate other lamp bulb base structures such as bayonet fastening means on an unthreaded base, spring-biased so as to urge bayonet lugs into locking engagement with J-shaped slots. The T-shaped configuration of aperture 10*a* is adapted to provide polarization of terminals in body 12 relative to the sleeve 14 and it is to be noted that diamond or elliptical shapes as well as rounded, square, or rectangular configurations and the like can be used, as suitable. Also for the terminal means 16 and 18, it is to be understood that tabs 16*t* and 18*t* can abut against an end of body 12 so as to locate the terminal means by engagement with an outer portion of the insulating material in alignment with grooves therein. Sharp end 19*s* of prong 19*p* can locate the terminal means further relative to an internal shoulder such as 12*a* or 18*a* in addition to digging into a side surface of the body along the grooves.

While the embodiments of the present invention as herein disclosed constitute preferred forms, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. A combination plug, terminal and socket assembly, comprising a pair of mating insulating bodies one of which is socket-like and has a longitudinally and laterally outwardly open cavity, a metal lamp support means fitted into the cavity so as to have a central lamp contact located generally radially inwardly adjacent to one end thereof, a groove portion formed adjacent to the lamp contact end of said lamp support means, a pair of terminals individually engageable electrically relative to said groove portion and the central lamp contact, and passage-forming means included with the second of said pair of mating insulating bodies for mounting of said terminals thereto.

2. A combination plug, terminal and socket assembly for use relative to a lamp-bulb base, comprising, a pair of mating insulating bodies one of which is socket-like and includes a main hollow portion, a lamp-bulb-base-mounting metal sleeve spaced concentrically outwardly from a central contact for the lamp-bulb base and which is laterally exposed in part by a side aperture, a mounting flange portion integral with said main hollow portion and surrounding the side aperture, the other of said mating insulating bodies having a pair of longiutdinally extending passages separated by an intermediate wall such that one end thereof is plug-like to fit into mating engagement relative to the side aperture, and a pair of terminal means mounted in said passages and having free ends projecting therefrom to engage said metal sleeve and the lamp contact.

3. The combination of claim 2 wherein said terminal means are locked into lateral grooves of the passages and wherein one of said terminal means has a bifurcated end portion to complement and engage a groove of said metal sleeve while the other of said terminal means has a C-shaped end portion to engage the lamp contact.

4. The combination of claim 2 wherein said intermediate wall has a bifurcated extension adapted to straddle the lamp contact so as to separate and insulate one terminal means from the other maintained in substantially parallel relationship to each other for transversely engaging said metal sleeve and the lamp contact.

5. The combination of claim 1 wherein said passage-forming means are substantially T-shaped to complement the laterally outwardly open portion of the cavity into which said terminals are fitted for electrical engagement relative to said lamp support means.

6. A plug-like insulating body for use in a plug, terminal and socket assembly including an annular lamp-base contact means, comprising, a longitudinally extending central partition to separate a pair of substantially parallel opposite axially and laterally open passages, a bifurcated extension longitudinally in alignment with said partition at one end thereof and joined integrally therewith, and passage-forming means including undercut grooves for mounting of terminal means longitudinally therein, said bifurcated extension as well as terminal ends separated thereby from each other being adapted to be plugged laterally into a lamp socket which surrounds the passages at least in part though the passages permit prior fitting of terminal means thereto due to being axially and laterally open to facilitate terminal access.

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