

Aug. 16, 1938.

J. SACCO

2,127,473

ELECTRIC CONNECTER

Filed Feb. 20, 1934

3 Sheets-Sheet 1

Fig. 1.

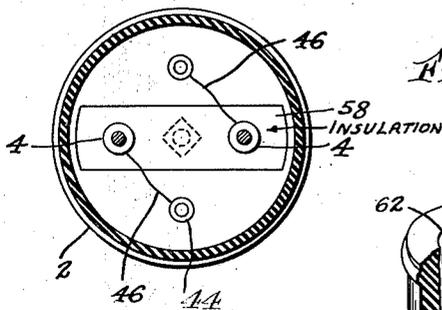


Fig. 2.

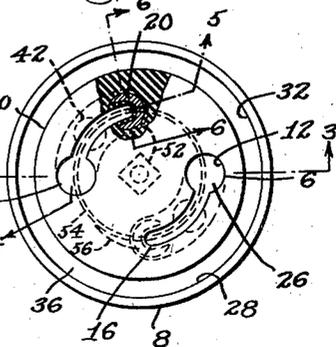


Fig. 3.

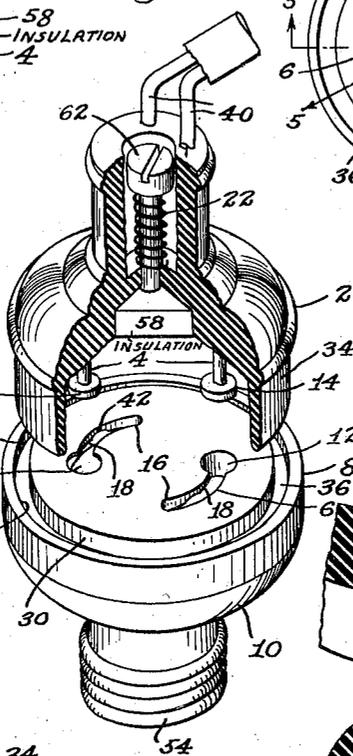


Fig. 5.

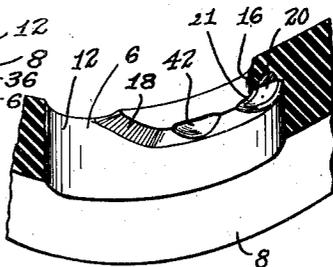


Fig. 4.

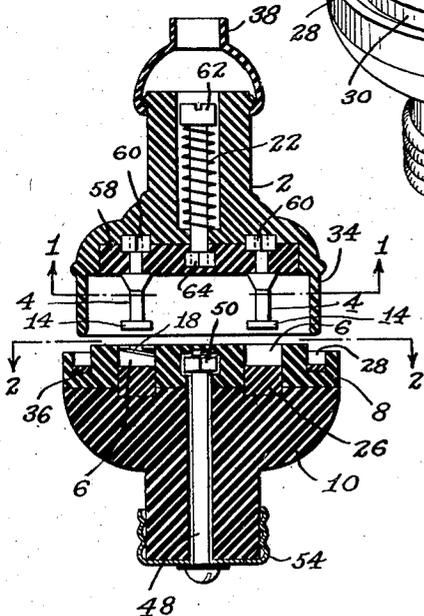
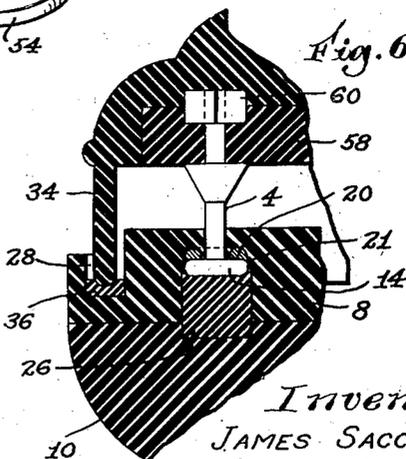


Fig. 6.



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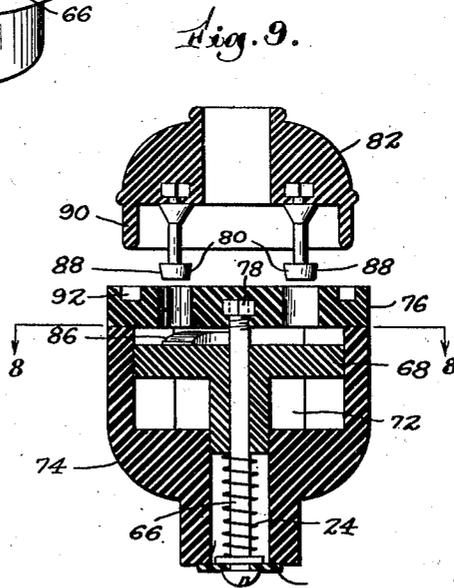
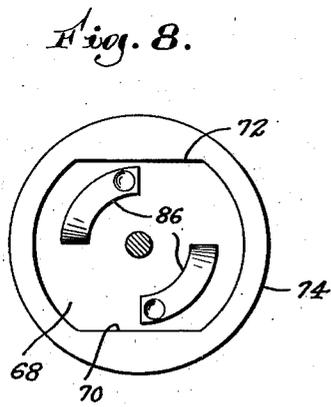
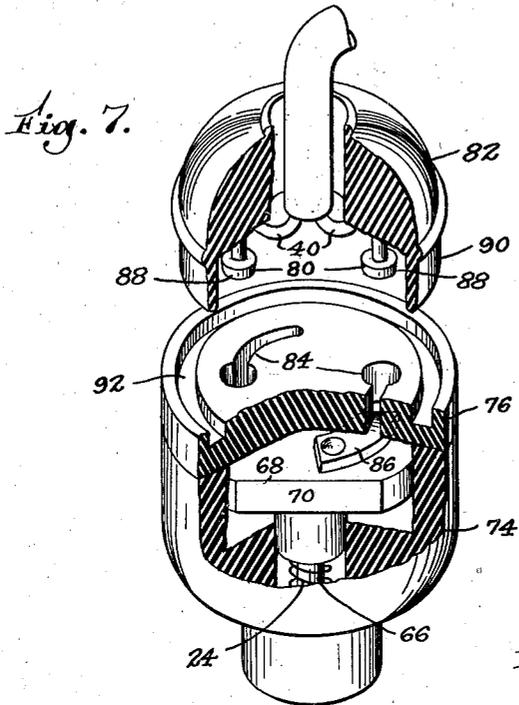
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ELECTRIC CONNECTER

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3 Sheets-Sheet 2



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Fig. 10.

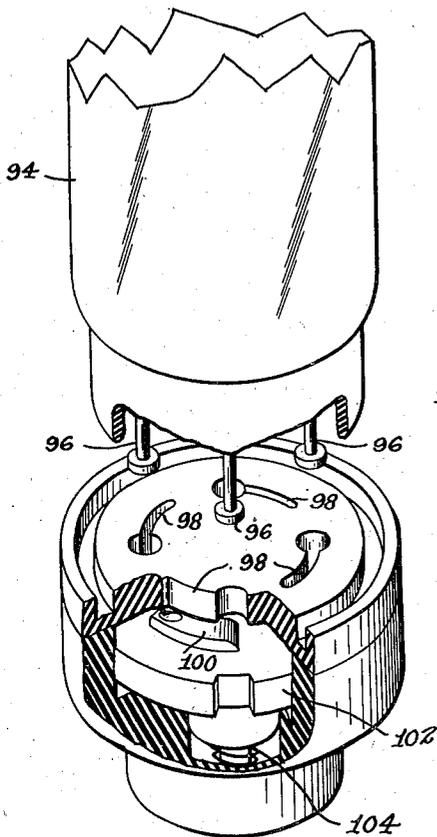


Fig. 13.

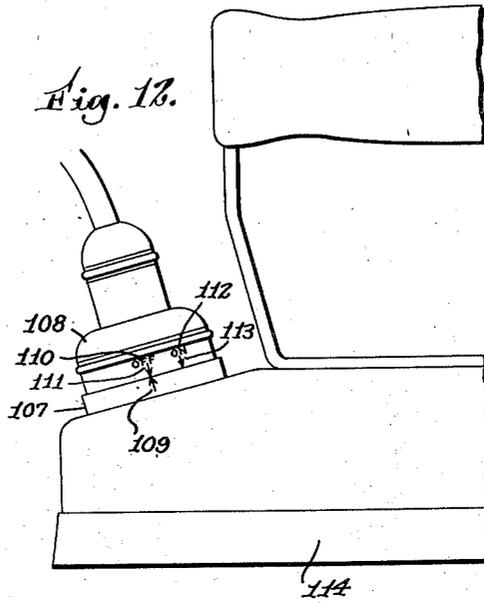


Fig. 13.

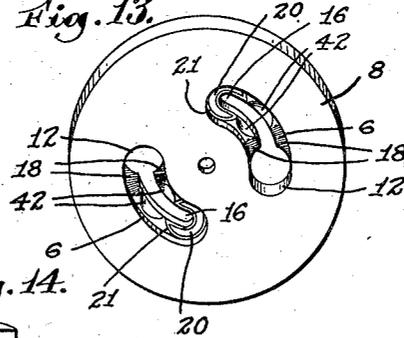


Fig. 14.

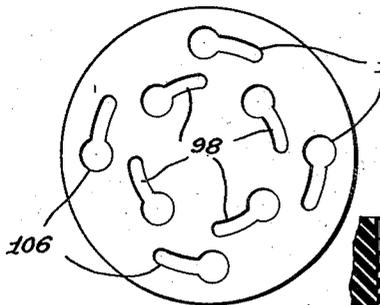


Fig. 15.

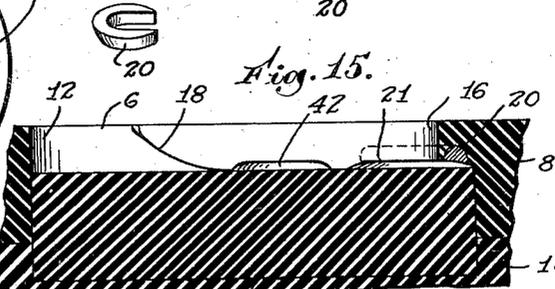
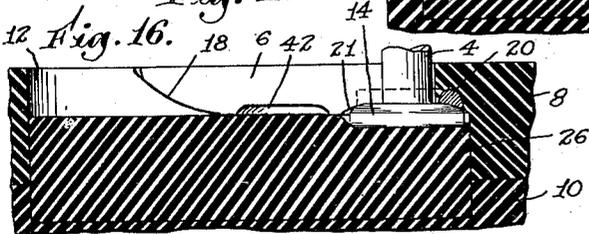


Fig. 11.

Fig. 16.



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ELECTRIC CONNECTER

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Application February 20, 1934, Serial No. 712,178

17 Claims. (Cl. 173—328)

The present invention relates to electric connectors, and more particularly to connectors of the separable type, comprising a plug having projecting terminals adapted to be received in corresponding openings of a base.

An object of the invention is to provide a novel electric connecter the separable parts of which may be positively locked together by strong spring action independent of the tension of the cooperating contact members.

Another object is to provide a new and improved waterproof connecter.

A further object is to simplify the constructions of connectors of the above-described character, to the ends that their cost of manufacture may be reduced, while their efficiency and ruggedness is increased.

Still a further object is to provide a new and improved, separable, electric connecter the parts of which may be readily guided into cooperative relation, even in places difficult of access.

Another object is to prevent accidental detachment of the parts of the connecter when the contact members thereof are either engaged or disengaged.

Other and further objects will be explained hereinafter and will be particularly pointed out in the appended claims.

The invention will now be more fully described in connection with the accompanying drawings, in which Fig. 1 is a horizontal section, taken upon the line 1—1 of Fig. 4, looking upward in the direction of the arrows; Fig. 2 is a similar section taken upon the line 2—2 of Fig. 4, looking downward in the direction of the arrows; Fig. 3 is a broken perspective of an electrical connecter embodying the invention; Fig. 4 is a vertical section of the connecter shown in Fig. 3, Figs. 3 and 4 both showing also a threaded member 54, useful in some applications of the invention; Fig. 5 is a fragmentary section, taken upon the line 5—5 of Fig. 2, looking in the direction of the arrows; Fig. 6 is a fragmentary, vertical section similar to Fig. 4, but upon a larger scale and with the parts occupying different relative positions; Fig. 7 is a broken perspective, similar to Fig. 3, of a modification; Fig. 8 is a horizontal section taken upon the line 8—8 of Fig. 9, looking downward, in the direction of the arrows; Fig. 9 is a vertical section, similar to Fig. 4, of the modification shown in Fig. 7; Fig. 10 is a broken perspective of a radio tube having projecting terminals similar to those illustrated in Figs. 3, 4, 7 and 9, together with a radio-tube socket embodying the present invention; Fig. 11 is a plan of a modi-

fied socket; Fig. 12 is a modification applied to electric irons; Fig. 13 is a perspective showing the under side of a plate shown in Figs. 2 to 6; Fig. 14 is a perspective of a detail; and Figs. 15 and 16 are sections similar to Fig. 5, but showing the parts in different positions.

The electric connecter illustrated in Figs. 1 to 6 comprises a plug 2 having projecting terminals 4 adapted to be received in openings 6 extending through a circular plate 8 of a base 10. The openings 6 are arcuate in shape, so as to permit the plug 2 and the base 10 to be relatively rotated while the terminals 4 are disposed in the openings 6. The openings 6 are provided with ends 12 that are of greater width than the heads 14 of the terminals 4, in order to permit entry of the heads 14 therein. The arcuate openings 6 taper gradually from the larger ends 12 toward the opposite ends 16. The width of the openings 6 at their narrow ends 16 is considerably smaller than the diameter of the heads 14 to permit the heads 14 to become locked behind the walls at the lower, or under, or inner face of the plate 8, near said smaller portions 16 of the openings 6. The said lower, or under, or inner face of the plate 8 is wedge shaped, along the walls of the openings 6, as illustrated at 18, Figs. 5, 13, 15, and 16, in order that the said heads 14 may ride up on the wedges 18, and into contact with contact members 20. During such riding up on the wedges 18, a spring 22 becomes tensioned to hold the parts together very firmly. The wedges 18 taper from the larger ends 12 to the narrow ends 16 of the arcuate openings 6, and the contact members 20 are situated at the said larger ends, on the wedges 18 on the inner side of the plate 8 adjacent to the opening 6. The contact members 20 cooperate with the terminal-head contact members 14 to establish an electric circuit. The heads 14 and the contact members 20 are so designed as to provide for a very effective cooperative contacting engagement, the heads 14 becoming seated in recesses 21 in the contact members 20. When the contact members 14 and 20 are thus in engagement with each other, the plug 2 and the base 10 are locked in such position of rotatable adjustment by the spring 22, which is strong, separate, and made of steel. The positive, strong, spring action thus obtained is much superior to the weak locking of the parts together by means of the inherent tension in springy contact members, such as are constituted of phosphor bronze, that lose their springiness by some accidentally high current that may happen to pass through the contact members at a time

when the contact between them is not very secure.

The spring 22 is shown in Figs. 3 and 4 housed by the plug 2, but it may be housed in the base 10, instead, as illustrated in Figs. 7 and 9 at 24. It is possible also to employ springs 22 and 24 in both the plug 2 and the base 10.

A rubber or other insulating member 26 yieldingly engages the inner side of the plate 8 in order to maintain the opening 6 closed, and thus render the base 10 waterproof when it is disconnected from the plug 2. The terminals 4 easily move the rubber members 26 away, when they are forced into the openings 6, so that access to the contact members 20 is thus easily and readily permitted.

The plate 8 is provided with an annular channel 28 for receiving an annular guide 34. The channel 28 is bounded by an annular inner wall 30 and an annular outer wall 32, the latter of which is below the former, as illustrated more particularly in Fig. 4. The inner wall 30 is adapted to be engaged by the annular guide 34 that projects from the plug 2, in order to guide the movement of the guide 34 into the channel, by contact with the inner wall 30, during the movement of the plug 2 toward the base 10, downward, as viewed in Fig. 4. The annular guide 34 houses the terminals 4 and is longer than the terminals 4, so as to project down below the terminals 4, as viewed in Fig. 4. By reason of these relative dimensions, the guide 34 is enabled to engage the inner annular wall 30 of the channel 28 prior to the entry of the terminals 4 into the openings 6, during the downward movement of the plug 2 towards the base 10. It is thus possible to assemble the plug 2 and the base 10 without interference by the terminals 4 engaging some part of the base 10, and thus obstructing the proper alinement of the plug 2 and the base 10. This is a very important consideration when the base 10 happens to be located at some inaccessible spot, and when one has to rely upon guesswork, and not the eye, for the assembly of the plug 2 with the base 10. One does not have to try to put the terminals 4 into the openings 6,—one merely engages the guide 34 against the annular, inner wall 30, and then merely turns the plug until the terminals 4 find their way into the openings 6.

It will be obvious that the same result may be attained by constructing the channel 28 on the plug 2 and the guide 34 on the base 10, provided that the guide 34 shall engage the inner, annular wall 30 before the terminals 4 can enter the opening 6.

The guide 34 is of such length or depth as to engage tightly against a rubber or other gasket 36 at the bottom of the channel 28 when the heads 14 contact with the contact members 20, as before described. The same spring 22 or 24 that then holds the plug 2 and the base 10 together will render the thus-assembled connector water-tight.

The connector is thus rendered waterproof when assembled and the base is rendered waterproof when disassembled. It is often desirable also to render the connector vaporproof when the terminals are out of contact with the contact members 20. For example, it may be desirable, as in factories where inflammable stores are kept, to avoid the formation of an arc outside the connector at the moment when the contact members 20 and the heads 14 of the terminals 4 become separated. The present construction effects this result also, for the rubber 26 seals the openings 6

as soon as the heads 14 leave the contact members 20, and the arc is extinguished wholly in the closed chamber formed by the plug 2 and the base 10, and does not reach outside.

To aid in waterproofing the connector, the plug 2 may be provided with a rubber jacket 38 at its free end, as illustrated in Fig. 4, for housing the wires 40 leading to and from the connector. These wires 40 may connect with junctions 44 that, in turn, are connected with the terminals 4 by wires 48.

It is frequently desirable to retain the plug 2 on the base 10 against accidental separation, even though the heads 14 and the contact members 20 are out of engagement. This may be brought about by providing, at the wedges 18, intermediate points of depressions 42 into which the heads 14 may seat. The chamber formed between the plug 2 and the base 10 thus remains closed.

The circular plate 8 may be held on the cap 10 by a bolt 48 and nut 50 as illustrated, for example, in Fig. 4. One of the contact members 20 may be connected with the bolt 48 by a wire 52, as illustrated in Fig. 2. The other contact member may be connected to any desired outside, metal part, as the threaded member 54, by a wire 56 (shown in Fig. 2) or by a strip of metal of high conductivity.

The terminals 4 may be held in place on an insulating member 58 by nuts 60, as illustrated in Fig. 4. The insulating member 58 may be held in the plug 2 by a bolt 62 and a nut 64. The spring 22 may surround the bolt 62. By reason of this construction, as before stated, the guide 34 will tend to be kept by the strong, coiled, steel spring 22 in form engagement with the gasket 36. Unauthorized detachment of the parts and waterproofing are effected by the same construction.

If waterproofing is not considered to be necessary or desirable for some uses, the construction illustrated in Figs. 7, 8 and 9 may be employed. The spring 24 surrounds a bolt 66 so as to tend to press upward, as viewed in Figs. 7 and 9, a plate 68 having flat sides 70, so as to be guided in its up-and-down movements in a corresponding shaped pocket 72 in a base 74. The plate 68 is thus slidable on the bolt 66 in the pocket 72, its upward movement being limited by a plate 76 that is held on the base 74 by a nut 78 on the bolt 66.

Terminals 80, carried by a plug 82, enter openings 84 that extend through the plate 76 in order to engage against wedges 86 on the plate 68. The openings 84 are arcuate, like the openings 6, and the terminals 80 have heads 88 that are adapted to lock behind the lower side of the plate 76 near the narrower portions of the openings 84. The plug 82 has a projecting guide 90 for entering a channel 92 in the plate 76. In the present case, however, the wedges 86 are themselves the contact members.

In this case, there is a tendency for the spring 24 to push upward on the plug 82, tending to separate it from the base 74 instead of, as in Figs. 1 and 4, tending to hold the plug 2 and the base 10 more firmly together; but, in other respects, the advantages of employing a strong, steel, coil spring are retained, and the plug 82 and the base 74 are locked firmly together, but yieldingly, by the spring, with the contact members 88 and 86 in contact with each other and the heads 88 locked behind the walls of the portions of the openings 84 of smaller width.

A depression similar to the depressions 42 may be employed in this modification also.

In Figs. 10 and 11, the invention is illustrated as applied to use for radio tubes 94 provided with terminals 96 adapted to enter arcuate openings 98 of the same type as those indicated at 94. The terminals 96 may engage wedge contacts 100, of the same or similar character as those shown at 86, carried upon a slidable plate 102, controlled by a spring 104 in a manner similar to the plate 68 and its control by the spring 24. The modification of Fig. 10 contemplates the use of four arcuate openings 98. As shown in Fig. 11, however, there may be two sets of arcuate openings, one of which is shown at 98 and the other at 106, for use with two different-size tubes 92, or there may be any number of additional sets of such openings 98, for multiple connections such as may be employed in radio work.

A plug 108, like that shown at 2, Figs. 3 and 4, may be used to cooperate with a base 107 on a flat iron 114, as illustrated in Fig. 12, or any other electrical device. The base 107 may be provided with an index 109, for cooperation with either of two indices 111 and 113, marked "Off" and "On", as illustrated at 112 and 110, respectively. The same spring-holding action and other advantages before described may thus be utilized in flat irons or such other electrical devices. These indices may, of course, be provided on the connectors shown in Figs. 1 to 11.

Other and further modifications will occur to persons skilled in the art and all such are considered to fall within the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. An electric connector comprising two relatively pivotally movable members, namely, a plug having projecting, headed terminals and a base having arcuate openings in which the terminals are adapted to be received, the openings having portions of greater width than the heads of the terminals to permit entry of the heads in said portions, and the openings having also portions of smaller width than the heads of the terminals to permit the heads to become locked behind the walls of said portions of the openings of smaller width, the terminals being adapted to be moved from the portions of greater width to the portions of smaller width of the openings by relative pivotal movement of the members, one of the members having a spring for locking the members together with the heads locked behind the walls of said portions of the openings of smaller width, and means whereby the spring forces the heads into locking engagement with the said walls of said portions of the openings of smaller width.

2. An electric connector comprising two relatively pivotally movable members, namely, a plug having projecting, headed terminals and a base having arcuate openings in which the terminals are adapted to be received, the openings having portions of greater width than the heads of the terminals to permit entry of the heads in said portions, and the opening having also portions of smaller width than the heads of the terminals to permit the heads to become locked behind the walls of said portions of the openings of smaller width, the terminals being adapted to be moved from the portions of greater width to the portions of smaller width of the openings by relative pivotal movement of the members, the base having wedges along the walls of the openings along which the heads may ride up, the base being provided with contact members near the larger ends

of the wedges for cooperatively engaging said heads, one of the members having a spring for locking the members together with the heads locked behind the walls of said portions of the openings of smaller width, and means whereby the heads may ride up along the walls of the said wedges in opposition to the action of the spring.

3. An electric connector comprising two relatively pivotally movable members, namely, a plug having projecting, headed terminals and a base having arcuate openings in which the terminals are adapted to be received, the openings having portions of greater width than the heads of the terminals to permit entry of the heads in said portions, and the openings having also portions of smaller width than the heads of the terminals to permit the heads to become locked behind the walls of said portions of the openings of smaller width, the terminals being adapted to be moved from the portions of greater width to the portions of smaller width of the openings by relative pivotal movement of the members, the base having wedge contact members for cooperatively engaging said heads, one of the members having a spring for locking the members together with the heads locked behind the walls of said portions of the openings of smaller width, and means whereby the heads may ride up along the wedge contact members in opposition to the action of the spring.

4. An electric connector comprising two relatively pivotally movable members, namely, a plug having projecting, headed terminals and a base having arcuate openings in which the terminals are adapted to be received, the openings having portions of greater width than the heads of the terminals to permit entry of the heads in said portions, and the openings having also portions of smaller width than the heads of the terminals to permit the heads to become locked behind the walls of said portions of the openings of smaller width, the terminals being adapted to be moved from the portions of greater width to the portions of smaller width of the openings by relative pivotal movement of the members, the plug having a spring for locking the members together with the heads locked behind the walls of said portions of the openings of smaller width, and means whereby the spring forces the heads into locking engagement with the said walls of said portions of the openings of smaller width.

5. An electric connector comprising two relatively pivotally movable members, namely, a plug having projecting, headed terminals and a base having arcuate openings in which the terminals are adapted to be received, the openings having portions of greater width than the heads of the terminals to permit entry of the heads in said portions, and the openings having also portions of smaller width than the heads of the terminals to permit the heads to become locked behind the walls of said portions of the openings of smaller width, the terminals being adapted to be moved from the portions of greater width to the portions of smaller width of the openings by relative pivotal movement of the members, the base having a spring for locking the members together with the heads locked behind the walls of said portions of the openings of smaller width, and means whereby the spring forces the heads into locking engagement with the said walls of said portions of the openings of smaller width.

6. An electric connector comprising two relatively pivotally movable members, namely, a plug having projecting, headed terminals and a base

having arcuate openings in which the terminals are adapted to be received, the openings having portions of greater width than the heads of the terminals to permit entry of the heads in said portions, and the openings having also portions of smaller width than the heads of the terminals to permit the heads to become locked behind the walls of said portions of the openings of smaller width, the terminals being adapted to be moved from the portions of greater width to the portions of smaller width of the openings by relative pivotal movement of the members, the base having a plate provided with wedge contact members for cooperatively engaging said heads, the plate being movable toward and from the plug, and means for forcing the plate yieldingly toward the plug to lock the members together with the heads locked behind the walls of said portions of the openings of smaller width.

7. In an electric connector, a base having a plate provided with an opening therethrough, the plate having a wedge along the wall of the opening on one side of the plate and a contact member adjacent to the opening near one edge of the wedge, and an insulating member for yieldingly engaging the said side of the plate to maintain the opening closed, the insulating member being adapted to be moved away from the plate yieldingly to permit access to the contact member.

8. An electric connector comprising two relatively movable members, namely, a plug having projecting terminals and a base having openings in which the terminals are adapted to be received, the base having an annular, guiding channel and the plug having an annular, projecting guide housing the terminals and adapted to be received in the channel and to be guided by contact with the inner wall of the channel during the relative movement of the members, the projecting guide being longer than the projecting terminals to permit it to engage said inner wall of the channel prior to entry of the terminals into said openings during the relative movement of the members toward each other, means for locking the relatively movable members together with the guide in the channel and with the terminals in the openings, one of the relatively movable members having a spring, and means whereby the spring acts to force the relatively movable members yieldingly toward each other.

9. An electric connector comprising two relatively rotatable members, namely, a plug having projecting, headed terminals and a base having arcuate openings in which the terminals are adapted to be received, the openings having portions of greater width than the heads of the terminals to permit entry of the heads in said portions, and the openings having also portions of smaller width than the heads of the terminals to permit the heads to become locked behind the walls of said portions of the openings of smaller width, the terminals being adapted to be moved from the portions of greater width to the portions of smaller width of the openings by relative rotation of the members, and means for forcing the relatively rotatable members yieldingly toward each other.

10. An electric connector comprising two relatively movable members, namely, a plug having projecting terminal contact members and a base having openings in which the terminal contact members are adapted to be received and contact members for cooperating with the terminal contact members, the contact members of one of

the relatively movable members being adapted to be moved behind the cooperating contact members of the other relatively movable member in response to relative pivotal movement of the relatively movable members to cause the relatively movable members to become locked together with the cooperating contact members in contact with each other, one of the relatively movable members having a guiding wall and the other relatively movable member having a projecting guide adapted to engage the guiding wall and to be guided by contact with the guiding wall during the relative movement of the relatively movable members, the projecting guide being longer than the projecting terminal contact members to permit it to engage the guiding wall prior to the entry of the terminal contact members into said openings during the relative movement of the relatively movable members toward each other, one of the relatively movable members having a spring, and means whereby the spring acts to force the cooperating contact members yieldingly toward each other.

11. An electric connector comprising two relatively pivotally movable members having cooperating contact members, the contact members of one of the relatively movable members being adapted to be moved behind the cooperating contact members of the other relatively movable member in response to relative pivotal movement of the relatively movable members to cause the relatively movable members to become locked together with the cooperating contact members in contact with each other, and separate spring means for forcing the cooperating contact members yieldingly toward each other, one of the relatively pivotally movable members having depressions for loosely receiving the contact members of the other relatively pivotally movable member to cause the relatively pivotally movable members to be held loosely together without accidental separation of the relatively pivotally movable members when the cooperating contact members are disengaged from each other.

12. An electric connector comprising two relatively pivotally movable members, namely, a plug and a base, each having a face disposed opposite to the face of the other member, the base having wedges disposed more distantly from the plug than the said face of the base and having contact members disposed adjacent to the wedges, the plug having projecting headed terminal contact members the heads of which may ride up along the said wedges into contact with the first-named contact members in response to relative pivotal movement of the relatively movable members to cause the relatively movable members to become locked together with the first-named contact members and the terminal contact members in contact with each other, one of the relatively movable members having a spring, and means whereby the spring forces the heads into locking engagement with the said walls of the openings.

13. An electric connector comprising two relatively pivotally movable members, namely, a plug having projecting terminals and a base having arcuate openings in which the terminals are adapted to be received, the openings having portions through which the terminals are adapted to be entered into the openings, the base being provided with contact members near parts of the openings for cooperatively engaging the terminals, the base having depressions near parts of the openings other than the said portions and

the contact members for loosely receiving the terminals to cause the relatively pivotally movable members to be held loosely together without accidental separation of the relatively pivotally movable members when the contact members are disengaged from the terminals, the terminals being adapted to be moved from the said portions, past the depressions, to the contact members by relative pivotal movement of the members, and means for locking the relatively pivotally movable members together when the contact members are cooperatively engaged with the terminals and when the terminals are received in the depressions.

14. An electric lamp comprising a lamp tube having projecting, headed terminal contact members and a base having arcuate openings in which the terminal contact members are adapted to be received, the openings having portions of greater width than the said heads to permit entry of the said heads in the said portions, and the openings having also portions of smaller width than the said heads to permit the heads to become locked between the walls of the said portions of the openings of smaller width, the base having wedges along the walls of the openings along which the heads may ride up and contact members disposed adjacent to the wedges, the base having a spring, and means whereby the spring acts to force the contacting contact members yieldingly toward each other.

15. An electric connector comprising two relatively rotatable members, namely, a plug having projecting, headed terminal contact members and a base having cooperating contact members, the heads of the terminal contact members being adapted to be moved behind the cooperating contact members of the base in response to relative rotatable movement of the members to cause the heads to become locked behind the cooperating contact members of the base, the engaging surfaces of the heads and the cooperating contact members extending substantially at right angles to the axis of the relative rotatable movement of the members and additional means for forcing the relatively rotatable members yieldingly toward each other and maintaining the heads locked yieldingly behind the cooperating contact members of the base.

16. An electric connector comprising two relatively pivotally movable members, one of the members having a plurality of single contact

members, the other member having a plurality of cooperating contact members, one only to correspond to each of the single contact members, whereby each single contact member and its corresponding cooperating contact member constitute a pair of contact members, the second-named contact members being adapted to be moved each behind its corresponding cooperating contact member in response to relative pivotal movement of the relatively movable members to cause the relatively movable members to become locked together with the corresponding contact members of each pair of contact members in contact with each other, the engaging surfaces of the pairs of contact members extending substantially at right angles to the axis of relative pivotal movement of the relatively movable members, one of the relatively movable members having a spring, and means whereby the spring acts to force the corresponding contact members of each pair of contact members yieldingly toward each other and to maintain the corresponding contact members of each pair of contact members yieldingly locked together.

17. An electric lamp comprising a lamp tube having projecting single terminal contact members and a base having openings in which the terminal contact members are adapted to be received and single contact members for respectively cooperating with the single terminal contact members, whereby each lamp-tube contact member and its corresponding cooperating base contact member constitute a pair of contact members, the lamp-tube contact members being adapted to be moved each behind its corresponding cooperating base contact member in response to pivotal movement of the lamp tube to cause the lamp tube to become locked to the base with the corresponding lamp-tube contact members and base contact members of each pair of contact members in contact with each other, the engaging surfaces of the pairs of contact members extending substantially at right angles to the axis of pivotal movement of the lamp, the base having a spring, and means whereby the spring acts to force the corresponding contact members of each pair of contact members yieldingly toward each other and to maintain the corresponding contact members of each pair of contact members yieldingly locked together.

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