Nov. 12, 1940. A. E. PELZ 2,221,651

PIN SOCKET

Filed Jan. 21, 1939

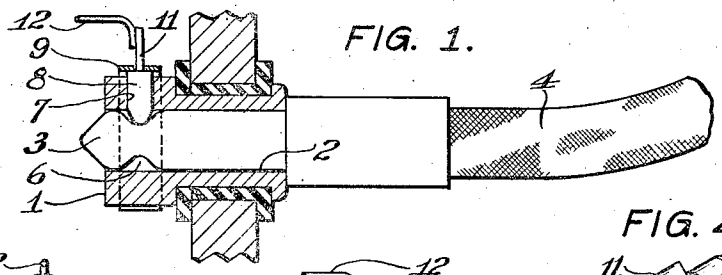


FIG. 1.

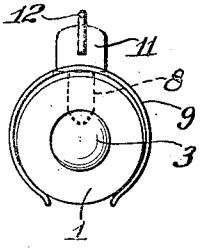


FIG. 2.

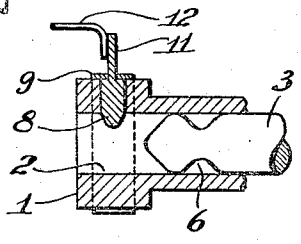


FIG. 3.



FIG. 4.

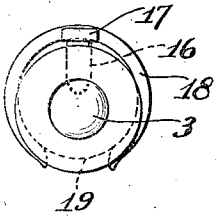


FIG. 5.

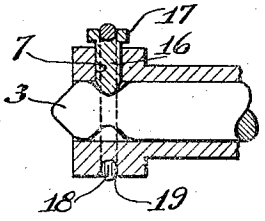


FIG. 6.

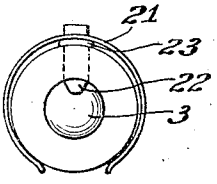


FIG. 7.

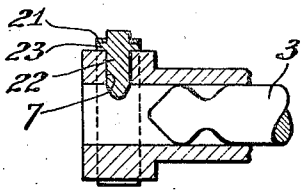


FIG. 8.

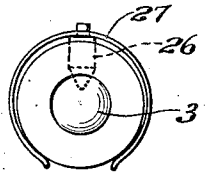


FIG. 9.

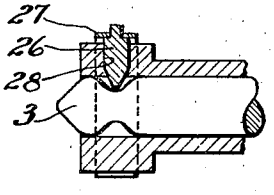


FIG. 10.

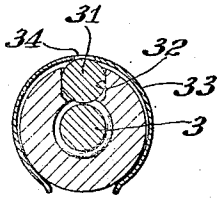


FIG. 11.

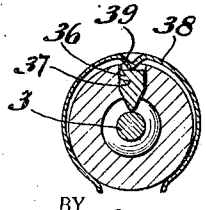


FIG. 12.

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UNITED STATES PATENT OFFICE

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PIN SOCKET

Alfred E. Pelz, Mount Lebanon, Pa., assignor to E. A. Myers & Sons, Mount Lebanon, Pittsburgh, Pa., a partnership consisting of Edward A. Myers, Edwin J. Myers, Alfred E. Pelz, and Samuel F. Lybarger

Application January 21, 1939, Serial No. 252,172

6 Claims. (Cl. 173—363)

This invention relates to plug and socket connections for electric circuits, and more particularly to means for detachably retaining a plug in a socket.

Various means have been proposed and used for detachably retaining electric plugs in electric sockets. A common expedient is to provide either the plug or the socket with a spring action preferably of the snap type, for holding the plug in place. In most cases no particular problem is involved, but in apparatus such as hearing-aid equipment in which space is very limited and the electrical contact must be very good, it is difficult to provide suitable spring action for holding the plug. Besides the difficulty of providing a spring which is both small and strong enough, further difficulties arise in connection with assembling the extremely small parts forming the jack.

It is among the objects of this invention to provide a plug and socket connection of extremely small size in which the plug is securely but removably retained in the socket, in which the spring does not materially increase the over-all size of the socket, and in which the socket and plug-retaining means can be quickly and easily assembled.

In accordance with this invention a socket having a plug-receiving opening therein is also provided with a lateral passage communicating with this opening. Slidably disposed in the lateral passage in the socket is a retaining member which is biased inwardly by means of a spring. This spring is in the form of a clip that partially surrounds the socket with its ends substantially opposite to the retaining member. Thus, the intermediate portion of the spring bears against the outer end of the retaining member, and the clip slides on the socket when the retaining member is pushed outwardly by the entering end of the plug. When the peripheral groove with which the plug is provided reaches the inner end of the lateral passage of the socket, the spring clip snaps the retaining member into the groove and thereby detachably locks the plug in the socket. The retaining member may take various forms, a preferred one being a pin having an extension projecting through an aperture in the spring clip.

The invention is illustrated in the accompanying drawing in which Fig. 1 shows my plug and socket assembly with the socket in vertical section; Fig. 2 is a view of the inner end of the socket; Fig. 3 is a vertical section through the socket with the plug in retracted position; Fig. 4 is a perspective view of the plug-retaining pin; Fig. 5 is an end view similar to Fig. 2 of a modification of this invention; Fig. 6 is a view, similar to Fig. 1, of the embodiments shown in Fig. 5; Fig. 7 is an end view of the socket with the plug removed; Fig. 8 is a vertical section, similar to Fig. 3, of the modification shown in Fig. 7; Figs. 9 and 10 are views similar to Figs. 5 and 6, respectively, of another embodiment of the invention; and Figs. 11 and 12 are transverse sections through sockets and retaining members of two further modifications of this invention.

Referring to Figs. 1, 2 and 3 of the drawing, a socket 1 which is preferably circular in cross section is provided with a cylindrical axial opening 2 extending therethrough. One end of the socket may be reduced in diameter to permit it to be inserted in an opening in a supporting member, the reduced end of the socket then being upset to lock it in place as shown in Fig. 1. The plug 3 which is inserted in socket opening 2 for completing an electrical circuit is connected at its outer end to an electric wire 4, and its inner end is preferably tapered. Immediately behind its tapered end the plug is provided with a peripheral groove 6 having diverging sides.

It is a feature of this invention that means is provided for detachably retaining this plug in the socket. Accordingly, the socket is provided with a lateral or radial passage 7 opening into plug-receiving opening 2 at a point opposite groove 6 in the plug when the latter is in its innermost position. Slidably disposed in this passage is a retaining member or pin 8 the inner end of which is tapered for registering with the plug groove. The pin is held in socket passage 7 and also biased inwardly by means of a spring clip 9 that is nearly circular and partially encircles the socket. The intermediate portion of this clip bears against the projecting portion of the pin, and its ends therefore engage the side of the socket substantially opposite to the pin. With this arrangement the free ends of the clip slide on the socket when the pin is pushed outwardly by the entering end of the plug, and there is therefore no relative movement between the clip and pin that might cause binding.

As shown in Fig. 4, the outer end of the pin is provided with a flattened extension 11 which may be made by merely flattening a portion of the pin. The spring clip is provided with a slot through which this extension projects, whereby the clip can not slip sideways off the end of the pin. The slot is as large as the extension so that the latter can be freely slipped in and out

of the slot before assembling with the socket, but if desired, after the pin and clip have been assembled the extension 11 may be provided with detents or the like for positively locking them together. Likewise, extension 11 being wider than the body of the pin, it limits the movement of the pin into passage 7. This connection of pin and clip also facilitates assembling them with the socket. That is, pin extension 11 is first inserted through the slot in the clip, is then gripped by a pair of tweezers, and the ends of the spring clip are then pressed against the socket while the pin is held in line with the radial passage therein. The socket forces apart the clip ends, which are turned outwardly (Fig. 2) to prevent them from binding on the socket, and as they pass the widest point of the socket they tend to pull together and thereby snap the pin into passage 7. If desired, the electric wire 12 that is to complete the circuit with the socket can be connected to it by soldering the wire to the flattened extension of the pin. Such a connection may also be made to the socket either directly or through a terminal attached to it under its socket when it is riveted in place in its supporting member.

In the modification shown in Figs. 5 and 6 the outer end of the plug-retaining pin 16 is provided with a head 17 that limits movement of the pin inwardly of radial passage 7 in the socket. The spring clip 18 is made from a resilient wire instead of from a flat strip of metal, and its intermediate portion rests in a transverse groove in the pin head to keep the pin and clip connected together. Preferably, the socket is provided with a peripheral groove 19 in the plane of radial passage 7 for receiving the spring clip and preventing its ends from being swung out of this plane.

In the embodiment shown in Figs. 7 and 8 the same type of spring clip 21 is used as shown in the first embodiment, but the outwardly projecting end portion of the plug-retaining pin 22 is not flattened. This end of the pin projects through an opening in the clip, and between the clip and socket the pin is provided with a radial flange 23 for limiting movement of the pin inwardly in radial passage 7.

Figs. 9 and 10 disclose a modification of this invention in which the projecting end portion of the pin 26 is reduced in diameter to form a shoulder for the spring clip 27 to engage for urging the pin inwardly of the socket's radial passage 28. To limit inward movement of this pin in the passage, the inner end of the latter is reduced in diameter and the inner end of the pin is tapered. When the plug 3 is removed from the socket, the pin moves inwardly until it strikes the tapered wall of the radial passage. If desired, the end portions of the pins of Figs. 7 and 9 which project through the spring clips may be upset slightly to positively lock them together.

Fig. 11 illustrates a jack in which a ball 31 is used as the plug-retaining member. Inward movement of the ball is limited by the small inner end of radial passage 32. To hold the intermediate portion of the spring clip 33 against the ball, it is provided with an opening 34 into which the ball projects.

The embodiment shown in Fig. 12 utilizes a pin 36 and a radial passage 37 similar to that shown in Fig. 10, but the outer end of the pin has no extension. Instead, the spring clip 38 is provided with an inwardly projecting detent 39 that engages the flat outer end of the pin. The pin does not project from the outer end of the passage, so the detent can not slip off the pin and permit it to escape.

According to the provisions of the patent statutes, I have explained the principle and construction of my invention and have illustrated and described what I now consider to represent its best embodiments. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. A plug-retaining device for use with a socket having a lateral passage opening into its plug-receiving opening, comprising a pin adapted to be slidably disposed in said passage and provided with a lateral projection for limiting its movement inwardly thereof, and a spring clip at least partially surrounding the socket to resiliently grip the outside of the socket and bias the pin inwardly, the body of said clip between its ends being provided with an opening for receiving the outer end of the pin, and the portion of the pin adjoining the inner surface of the clip being larger than said opening.

2. A plug-retaining device for use with a socket having a lateral passage opening into its plug-receiving opening, comprising a pin adapted to be slidably disposed in said passage and provided with an extension, and a spring clip at least partially surrounding the socket to resiliently grip the outside of the socket and the body of the clip between its ends being provided with an opening for receiving said pin extension, said pin being provided with a shoulder at at the base of said extension for engaging the inner surface of the clip whereby the clip urges the pin into the passage.

3. A plug-retaining device for use with a socket having a lateral passage opening into its plug-receiving opening, comprising a pin adapted to be slidably disposed in said passage and provided with an outwardly extending flattened portion projecting laterally beyond its sides, said flattened portion being thinner than the adjoining portion of the pin to form a shoulder at its junction therewith, and a spring clip at least partially surrounding the socket to resiliently grip the outside of the socket and the body of said clip between its ends having a slot through which said flattened portion of the pin projects, said clip bearing against said shoulder to bias the pin inwardly of said passage.

4. A plug-retaining device for use with a socket having a lateral passage opening into its plug-receiving opening, comprising a retaining member adapted to be slidably disposed in said passage, and a spring clip partially surrounding the socket with its intermediate portion bearing against the retaining member for biasing it inwardly, said intermediate portion being provided with an opening into which said retaining member projects whereby the clip is held against rotation around the socket.

5. A plug-retaining device for use with a socket having a lateral passage opening into its plug-receiving opening, comprising a pin adapted to be slidably disposed in said passage and provided with a lateral projection that limits its movement inwardly thereof, and a spring slip at least partially surrounding the socket and resiliently gripping the outside of the socket and bearing against the pin to bias it inwardly, the body of said pin between its ends being provided

with an opening into which the outer end of said pin projects for holding the clip against rotation around the socket.

6. A plug-retaining device for use with a socket having a lateral passage opening into its plug-receiving opening, comprising a retaining member adapted to be slidably disposed in said passage and a spring clip partially surrounding the socket with its ends substantially opposite to said member and with its intermediate portion bearing against the retaining member for biasing it inwardly, said intermediate portion being provided with an opening into which said retaining member projects for holding the clip against rotation around the socket, and the inner end of said passage being reduced in diameter to limit inward movement of the retaining member.

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