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THREE TO TWO-WIRE PLUG ADAPTER WITH GROUNDING PIGTAIL

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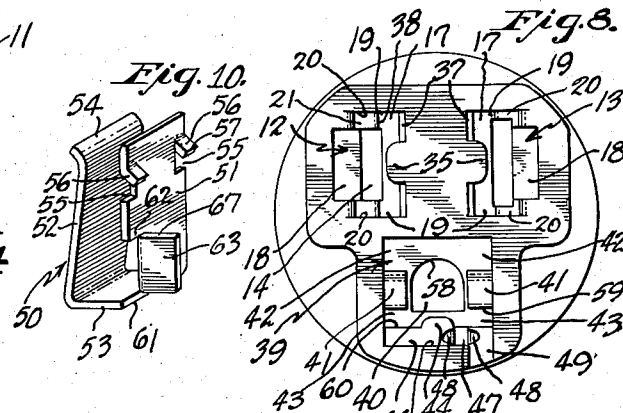
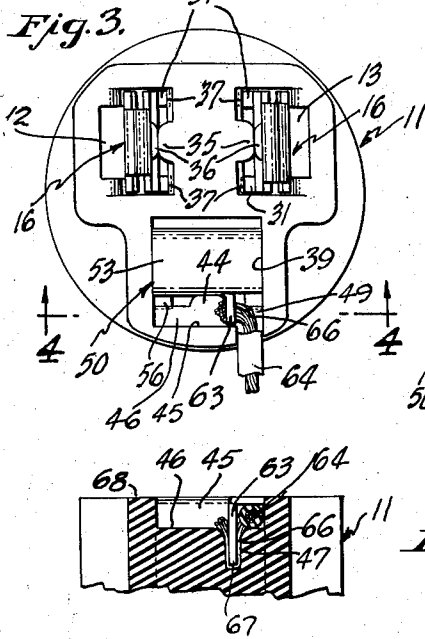
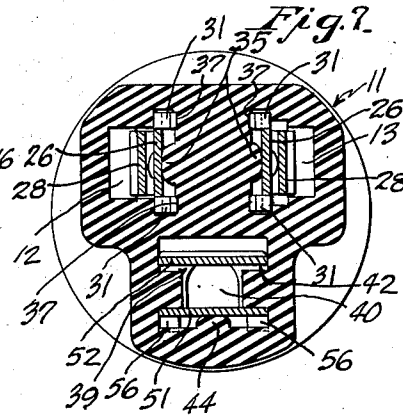
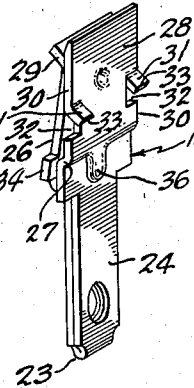
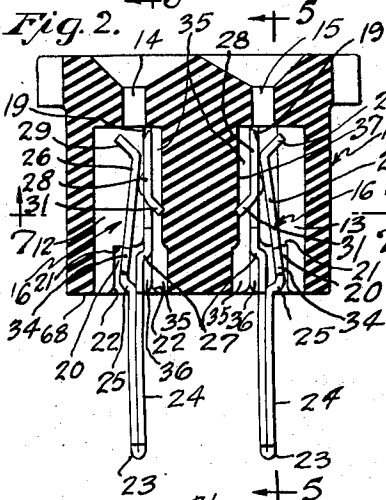
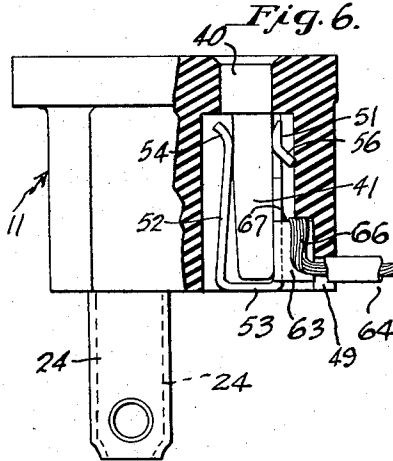
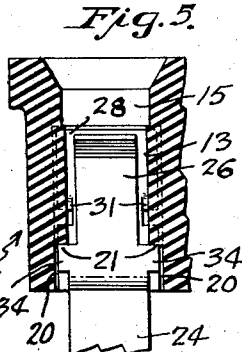
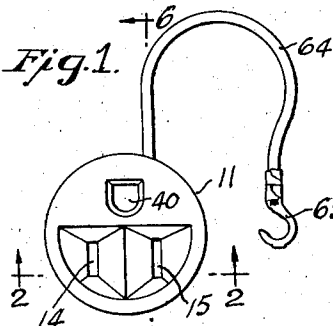


Fig. 4. Charles Theodore Von Holtz
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THREE TO TWO-WIRE PLUG ADAPTER WITH GROUNDING PIGTAIL

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5 Claims. (Cl. 339-14)

This invention relates to an electrical adapter, particularly to a three-to-two wire adapter, which may be used with a grounding pigtail, and has for an object to provide a device of this character of a very simple and improved construction and by which a three-wire attachment plug including a grounding contact may be plugged into a two-wire receptacle.

A particular object is to provide an adapter of this character which requires a minimum number of parts, and which parts are constructed and arranged for easiest assembly, and in which all the parts may be assembled or put together to complete the adapter, in a single operation.

Another object is to provide an improved form of contact for such a device, and also provide improved means for securing the contacts in the insulating body member.

A further object is to provide a construction not requiring the use of screws or other separate securing elements for the contacts of the adapter, thus greatly reducing the number of parts and the number of operations required in assembling the adapter, and reducing the cost of manufacture.

A still further object is to provide an improved electrical grounding device having means for securing a grounding pigtail to the grounding contact of the device and establishing electrical connection therewith without requiring the use of a binding screw, soldering or similar means.

With the foregoing and other objects in view, I have devised the construction illustrated in the accompanying drawing forming a part of this specification. It is, however, to be understood the invention is not limited to the specific details of construction and arrangement shown, but may embody various changes and modifications within the scope of the invention.

In this drawing:

Fig. 1 is a top plan or front view of the device looking toward the top of Fig. 2 on a smaller scale;

Fig. 2 is a vertical or longitudinal section on a larger scale taken substantially on line 2-2 of Fig. 1;

Fig. 3 is a bottom view looking toward the bottom of Fig. 2;

Fig. 4 is a detail section substantially on line 4-4 of Fig. 3;

Fig. 5 is a detail section substantially on line 5-5 of Fig. 2;

Fig. 6 is a partial side view and partial longitudinal section, the section being substantially on line 6-6 of Fig. 1, but on a larger scale;

Fig. 7 is a transverse section substantially on line 7-7 of Fig. 2;

Fig. 8 is an end view looking toward the bottom of the insulating body member with the contacts removed;

Fig. 9 is a perspective view of one of the combined receptacle and blade contacts, and

Fig. 10 is a perspective view of the grounding contact.

The device comprises an insulating body member 11 molded of suitable insulating material, such, for example,

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as "Bakelite" or similar material, and provided with a pair of laterally spaced chambers or sockets 12 and 13 opening through the lower or inner end, and the body is provided with elongated slots 14 and 15 in its upper or outer end leading to the chambers or sockets 12 and 13 respectively for insertion of the blade contacts of an attachment plug (not shown) to engage receptacle contacts 16 mounted in the chambers 12 and 13. The adapter may be polarized by making one of the slots longer than the other, in this case the slot 15. The chambers 12 and 13 are of general rectangular shape, and each on its inner side 17 is wider than the body portion 18, see Fig. 8, thus providing channels 19 at the opposite edges of the wider body portions 17 and beyond the narrower body portions 18, the body portions 18 being of a width substantially the length of the shorter entrance slot 14. At the lower end and at the opposite sides of the narrower portions 18 are formed recesses 20 opening through the lower end of the body and extending upwardly or inwardly from this end a short distance, as indicated in Figs. 2 and 5, and ending in a shoulder 21 at the inner or upper end forming a limit stop to limit the insertion of the contacts into these chambers, as will later be described. At the entrance to these recesses there is preferably a rounded edge or corner 22 to also facilitate insertion of contacts.

The contacts 16, as indicated, each have the same construction and size within the chambers 12 and 13 except that their projecting blade contact portions 24 are of different widths corresponding with the lengths of the slots 14 and 15 for a polarizing effect. Each contact comprises a one-piece member and is formed from a strip of sheet metal folded upon itself at substantially its midlength, as indicated at 23, with the opposite sides lying close together and side by side to form a blade contact portion 24. At the upper or inner end of this blade portion the outer side is inclined or offset outwardly, as indicated at 25, and then is extended upwardly and inwardly to form the spring finger 26 of a receptacle contact portion. The other upper end portion of the blade is offset inwardly or in the opposite direction, as indicated at 27, somewhat inwardly of or above the offset 25, but the remainder of this portion is substantially straight as shown at 28, and is seated at its opposite edges in the channels 19 at the opposite sides of the chamber with its outer surface seated against the outer sides of these channels. The other portion 26 is inclined toward the upper end of the portion 28, as indicated in Fig. 2, and is inclined upwardly and laterally at its free end 29 to form guide means to guide the plug contact blades into position between the portions 26 and 28 when these contact blades of the attachment plug are inserted into the slots 14 and 15 to engage these receptacle contacts and form electrical connection between the cap contacts and the receptacle contacts. The finger portions 26 and 28, as seen in Fig. 2, are side by side and form a substantially U-shaped receptacle contact to receive a blade contact of the plug between them, and when the blade is inserted the outer portion 26 will be forced outwardly by the camming action of the blade contact against the inclined end portion 29, the portions 18 of the chambers forming sufficient clearance for this operation, and the resilient or spring action of the portion 26 will cause it to grip the blade contact to effect good electrical contact therewith. The finger portion 28 is somewhat wider than the portion 26. That is, the finger portion 28 is substantially the width of the wider portion 17 of the chambers 12 and 13 in the body member, while the other finger portion 26 is substantially the width of the narrower portion 18 of these chambers or sockets. The wider finger 28 is provided on its opposite edges 30 with holding lugs 31 formed by transversely and longitudinally

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slitting the finger, as indicated at 32, leaving the lug 31 which is bent laterally into a downwardly and outwardly inclined position, and which is also provided at its free end with a sharp outer edge 33. The narrower finger portion 26 is provided at its opposite edges just above the offset portion 25 with lugs 34, which in the form shown project outwardly from the opposite edges of the finger portion 26. The sockets or chambers 12 and 13 are each provided with a longitudinal rib 35 projecting into the sockets or chambers 12 and 13 from the inner wall of these chambers. The wider finger portion 28 of each contact member is provided with a short rib or lug 36 extending downwardly from the offset 27 at the outer side of this finger.

When this contact is inserted in the chambers or sockets 12 and 13 the wider finger portion 28 is in the wider portion 17 of the chamber with its opposite edges 30 in the grooves 19 at the opposite edges of this wider portion and the holding lugs 31 are also in these channels 19 and their free sharp edges 33 are in engagement with and grip the opposite or inner surfaces 37 of these channels, the edges of the contact lying alongside of the surface 38 at the other side of these channels and the central body portion of the finger resting against the free edge of the rib 35 to be supported by it, the lug 36 also engaging this rib at the outer end of the chamber, as indicated in Fig. 2. These channels 19 are of such width that when the contact is inserted in the chamber 12 or 13 these holding lugs 31 are shifted inwardly somewhat against the resilient action of the metal and their free or sharp edges 33 are therefore held tightly against the surfaces 37, so that any tendency to push or pull the contacts 16 out of their sockets or chambers 12 and 13 causes the free ends 33 of these lugs to dig slightly into the material of the body 11 and securely lock or hold the contacts 16 within the chambers 12 and 13. As the contact 16 is inserted in the chamber the lugs 34 on the other finger 26 are guided into the recesses 20 by the bevels or rounded walls 22 with the upper edges of these lugs 34 engaging the inner wall 21 of the recesses, to limit movement of the contact into the chamber or socket 12 or 13 and position it therein. It will be seen that when the contact 16 is in its chamber the two spring fingers 26 and 28 are at the inner end of the blade contact entrance slot 14 or 15 in position to receive the blade contacts of the attachment plug inserted in these slots, and which blades are guided to a position between them by the inclined guide portions 29 of the fingers 26. The chambers 12 and 13 are wide enough so that although the spring finger 26 is normally close to the finger 28 it may be sprung outwardly or shifted outwardly by the blade contact inserted between them, thus effecting a firm spring grip on the blade contact. Also these recesses 20 are of sufficient width to form clearance for the lugs 34 to permit them to shift outwardly on an outward shifting movement of the finger 26 permitting the finger to flex about the offset 25. When the contacts 16 are in this position in the body member the blade contact portions 24 project from the lower end of the body 11 in a position where they may be plugged into any suitable type of receptacle, such, for example, as an outlet receptacle mounted in the wall outlet box of a house wiring system. The lugs or short ribs 36 rest against the lower end portion of the ribs 35 as shown in Fig. 2, and they therefore support the blades 24 and resist any tendency there might be for the free ends 23 of these blades to shift laterally or inwardly toward each other as the cap blades are inserted into the receptacle contacts to a position between the fingers 26 and 28.

The body 11 is also provided with a third chamber or socket 39 at one side of and intermediate the sockets 12 and 13. It is substantially rectangular in shape, as shown in Fig. 8, and opens through the lower or inner end of the body, and the body is provided with an entrance opening 40 in its top or outer end wall leading to this

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chamber or socket. This socket is provided on its opposite spaced side walls with longitudinally extending ribs 41 thus providing two pairs of aligned longitudinal channels 42 and 43 at the opposite sides of these ribs. Its outer wall is also provided with a longitudinal rib 44 intermediate the ribs 41, and the outer end portion is recessed at 45 with a transverse wall 46 forming the bottom of this recess. There is also a narrower recess 47 leading inwardly from this bottom wall 46 at one side of the rib 44, with curved notches 48 at the opposite edges of the entrance to this recess 47, and the end wall of the body is provided with a channel 49 leading from its outer wall to one of the channels 43 at one side of the recess 47.

This socket or chamber 39 is adapted to receive a receptacle grounding contact 50, shown in perspective in Fig. 10, comprising two spring fingers 51 and 52 side by side and connected by the cross connection or end wall 53, this contact being thus substantially U-shape, and the free end of the finger 52 is inclined outwardly and upwardly, as indicated at 54. Also, the finger 51 is lanced at its opposite edges, as indicated at 55, thus forming lugs 56 which are bent outwardly and downwardly inclined and provided with sharp free edges 57, these lugs being similar to the lugs 31 of the contacts 16. This contact 50 is inserted in the socket or chamber 39 from its lower open end with the opposite edges of the finger 51 in the channels 43 and the opposite edges of the finger 52 in the channels 42, so that the ribs 41 are located between these two fingers. The channels 42 are wide enough to permit the finger 52 to yield laterally or inwardly to the left as viewed in Fig. 6 when a contact of an attachment plug is inserted into the receptacle through the opening 40. This contact could be of any desired shape, but preferably it is substantially U-shape for insertion in the opening 40, this opening being substantially rectangular and rounded at one side 58, to correspond with the curvature of the U-shaped contact, and the inclined upper end portion 54 of the finger 52 acts as a guiding means to guide this cap contact into position between the two fingers 51 and 52 to form electrical contact therewith. As previously indicated, when this contact is in the chamber 39, the opposite edges of the finger 51 are in the channels 43. The inner surface of this finger therefore lies against the inner surfaces 59 of these channels, while the free edges of the spring lugs 56 rest against the opposite surfaces 60 of these channels. The lugs 56 are of a length and extend laterally a sufficient amount so that the distance between their free edges 57 and the opposite surface of the finger 51 is somewhat greater than the width of the channels 43, so that as the finger is inserted in these channels these lugs 56 are forced inwardly somewhat against the resilient action of the metal, which therefore causes the sharp free edges 57 to grip the outer surfaces 60 of these channels, and any tendency to force this contact 50 out of the chamber or socket 39 causes these sharp free edges to grip or dig somewhat into the surface of the channel and lock the contact against movement out of the chamber. It is therefore automatically locked in the chamber as it is inserted therein.

One edge of the finger 51 is also lanced transversely inwardly at 61 and 62, forming a lug 63 which is bent laterally outwardly at substantially right angles to the plane of the finger 51, and it is therefore spaced from this edge of the finger an amount to be in alignment with the recess 47 at the outer side of the channels 43 and will slide into this recess when this contact is inserted in the chamber or socket 39.

As this contact 50 is a grounding contact, there is provided a grounding pigtail 64 which is a short piece of insulated wire, preferably a stranded wire made up of a bunch of small wires which makes it more flexible than a single wire. This pigtail has electrical connection at one end with the contact 50, and at its other end is provided with means 65 such as a hook, as indicated, for

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connecting it to some grounded element such, for example, as a securing screw for a flush or face plate of the outlet receptacle into which the blade contacts 24 of this adapter may be plugged to provide an electrical connection from this outlet receptacle to a three-wire attachment plug plugged into this adapter, and including a third or grounding wire. The lug or ear 63 on the contact 50 and the recess 47 in the insulating body are used for electrically connecting and securing this grounding pigtail to the contact 50. In making this connection the free ends of the wires, indicated at 66, are stripped of the insulation, and the thus bared ends of the wires are laid across the entrance to the recess 47 over the notches 48. Then as the contact 50 is forced into the socket 39, the inner or upper edge 67, as viewed in Figs. 6 and 10, or the lower edge as viewed in Fig. 4, of the lug 63 will engage these bared wires over the entrance to the recess 47. Then as the contact 50 passes into the chamber or socket 39, this lug 63 passes into the recess 47, as shown in Fig. 4, carrying with it the bared ends 66 of the wires. As it does so, the wires are bent or folded around the edge 67 of the lug 63 and clamped by this lug against the opposite sides of the recess 47, as shown in Fig. 4. The free bared ends of the wire should be left straight and parallel, or that is, not twisted, during this operation, as otherwise, if they crossed each other they might cause scoring and failure. The rounded notches 48 at the opposite edges of the entrance to the recess 47 permits these wires to bend over them without breaking or cutting the wires, as the lug 63 is forced into the recess. This action forms a tight grip of the lug 63 on the wires, securely connecting the pigtail to this adapter and the grounding contact 50, and at the same time provides an effective electrical connection between the wires and the contact without the use of any other securing means, such as binding screws or soldering, and this connection between the wires and the contacts is effected automatically as the contact 50 is inserted in the chamber 39 in the insulating body to mount it therein. The secured wire 64 may then be bent and seated in the channel 49 leading to the outside of the body, as shown in Figs. 3, 4 and 6, where it does not project beyond the inner end of the body member.

In use, as above indicated, this adapter may be plugged into any two-wire receptacle or connector by inserting the blade contacts 24 into the slots leading to the receptacle contacts in the receptacle, and then the grounding contact 50 may be grounded by the pigtail 64 by inserting its hooked end 65 under the head of some suitable grounding screw, such, for example, as a retaining screw for the flush or face plate of the receptacle. Then a three-wire attachment plug (not shown) may be plugged into this adapter by inserting its blade contacts into the slots 14 and 15, and its third or grounding contact into the opening 40, the blade contacts thus engaging the receptacle contacts 16, and thus they are electrically connected to the receptacle contacts in the outlet receptacle, and the grounding contact of the cap engaging the grounding contact 50 of this adapter and being grounded by the pigtail 64.

It will be seen that this is a very simple construction, involving a minimum number of parts. In other words, it comprises the least number of parts and easiest assembly. As will be seen, outside of the pigtail 64 it comprises only the insulating body 11 and the three contacts 16 and 50. It is also to be understood that the contacts may be mounted and automatically secured in the body member by merely inserting them into their chambers or sockets in the body from the open lower ends thereof, and they will be automatically locked and effectively secured in these chambers by the lugs 31 and 56; also that the electrical connection from the grounding pigtail to the contact 50 is effected in a similar simple manner, as this contact is forced into position in its chamber or socket 39. Thus no binding screws or other

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securing means are required. As the contacts are automatically locked in their chambers in the body no cover plate or similar protecting means is required at the inner or lower end of this body for covering or closing the entrances to these chambers. This novel construction and arrangement also greatly facilitates the assembly of these elements within the body member, and the assembly of all of these parts may be accomplished in one single operation in a foot press, for example.

In effecting this assembly the contacts are placed in an upright position in a fixture on the bed of a foot press and the bared end of grounding wire 64 properly positioned across the top edge of lug 63. Then the body member, held in an upright position in the upper die or plunger of the press, is lowered over them forcing all three contacts into their proper positions in their chambers or sockets in the body member through the lower entrance openings thereto, with a single operation, which completes the entire assembling operation, including folding the bared ends 66 of the grounding wires over the edge of lug 63, with no other operation required. The adapter is then complete and ready for use as above indicated.

Having thus set forth the nature of my invention, I claim:

1. In an electrical receptacle, an insulating body member provided with a chamber opening through its rear wall and an entrance opening for an attachment plug blade contact in its front wall leading thereto, said chamber including longitudinal channels in opposite side walls, a receptacle contact in the chamber including opposed spring fingers closely adjacent and side by side which are adapted to receive and clamp therebetween an attachment plug blade contact which is inserted through said opening, one of said fingers being wider than the other and having its side edges located in the channels and the other finger being free of the channels and yieldable laterally, said wider finger being lanced at its side edges providing resilient holding lugs inclined downwardly and laterally each having a relatively sharp free end engaging one side of its channel to grip the material of the body while the edge portion of the finger rests against the opposite side of the channel and restrains the holding lugs compressed in the holding position, and the narrower finger having positioning lugs which cooperate with shoulders on said body member to position the receptacle contact in the body member.

2. In a grounding adapter, an insulating body member provided with a pair of laterally spaced chambers and an intermediate chamber each opening through its rear wall and said body also provided with attachment plug contact entrance openings in its front wall leading to said chambers, receptacle contacts in said chambers each comprising spring fingers closely adjacent side by side to receive and clamp between them attachment plug contacts inserted in said openings, the contacts in the first two chambers including blade contacts projecting from the rear wall of the body and adapted for insertion in the entrance slots of an outlet receptacle to engage the receptacle contacts therein and the third receptacle contact forming a grounding contact that is adapted to be connected to an external grounded element, and a finger of each receptacle contact provided with resilient laterally extending gripping lugs on one side engaging sides of the respective chambers to retain the contacts in these chambers, said chambers including walls engaging the sides of each of said last mentioned fingers which are opposite from the lugs and thereby retaining them in the gripped position, the other finger of each contact being mounted in a chamber so as to be free to yield laterally on the insertion of attachment plug contacts into said receptacle contacts.

3. In an adapter of the character described, an insulating body member provided with a chamber opening through its rear wall and a blade contact entrance slot

in its front wall leading thereto, a combined receptacle and blade contact mounted in the chamber comprising a strip of metal folded upon itself at its midlength with the portions on the opposite sides of the fold side by side forming a blade contact projecting from the rear wall of the body and the free end portions of the folded strip comprising spring fingers closely adjacent side by side in the chamber forming a receptacle contact adapted to receive and clamp between said fingers a blade contact inserted in said slot, said chamber including longitudinal channels in its side walls, and one of the fingers of the receptacle contact having its side edges resting against one of the side walls of the channels in the chamber and lanced with the cut portion inclined downwardly and laterally providing retaining lugs having free ends engaging the opposite sides of the channels to retain the contact in the chamber, the other finger being free of the channels and mounted in the chambers so as to be yieldable away from the first finger on insertion of the blade contact into said receptacle contact.

4. A grounding adapter comprising: an insulating body member provided with a chamber opening through its rear wall for receiving a receptacle grounding contact, and an attachment plug blade contact entrance opening in its front wall communicating with said chamber; said chamber provided with a pair of spaced side walls; a longitudinal inwardly extending rib formed on each side wall which cooperates with said side walls to form two pairs of aligned channels; a recess formed in said body member and extending from the rear end in a side wall thereof and communicating with one channel of one of said pairs of channels; a U-shaped receptacle grounding contact mounted in said chamber and including a spring finger having its side edges firmly seated in said one of said pairs of channels; said receptacle grounding contact having a second spring finger mounted in the

other pair of channels and of such a width relative thereto that it is capable of yielding laterally on insertion of an attachment plug grounding blade contact between the spring fingers; a projecting lug formed on said receptacle grounding contact and disposed thereon to extend into said recess when said receptacle grounding contact is mounted in said chamber; an elongated grounding conductor having a bared end folded around the portion of said lug that is disposed in said recess in position between said lug and the sides of said recess, said recess and lug being dimensionally related so that said conductor is securely clamped; and means at the free end of said conductor for connection to an external grounded element.

5. A device as defined in claim 4 wherein curved notches are formed at the entrance of said recess to facilitate the securement of said bared end in said recess and prevent damage to it during securement.

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