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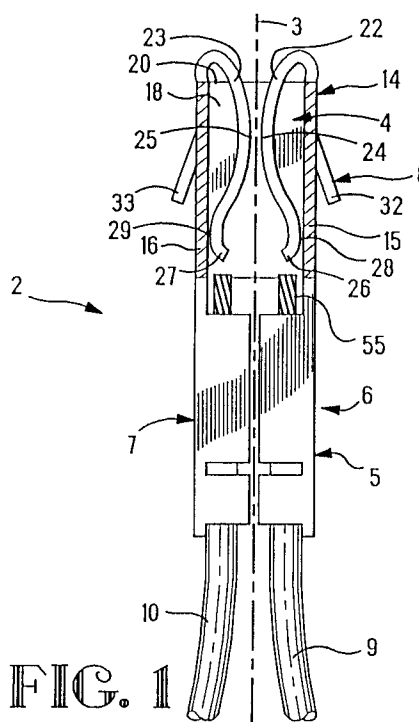
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(54) **Electrical terminal receptacle with improved means for connecting two electrical conducting cables and a method for manufacturing it.**

(57) An electrical terminal receptacle (2) is shown having a contacting section (4), a locking section (8) and a conductor attachment section (6). The terminal receptacle (2) is formed and stamped from sheet metal into a box-shaped shell (14) whereby S-shaped contacting tongues attached to a top edge (20) and bending inwards into the shell (14), receive and make contact with a tab terminal. The conductor attachment section (6) comprises two wire connecting sections (5,7) attached to a bottom edge (21) of the shell (14), the wire connecting sections (5,7) each having a crimp barrel (36,38) and a strain relief section (40,42). An insulated multi-stranded electrical wire (9) is connected to one of the wire connecting sections (5) and another insulated multi-stranded electrical wire (10) is connected to the other wire connecting section (7).

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This invention relates to an electrical terminal receptacle and a method for manufacturing it, and in particular, a receptacle for accommodating a fuse, according to the preamble of claims 1 and 7, respectively.

It is sometimes desirable in the electrical connector industry to connect more than one electrical conducting cable to an electrical terminal. A typical example of this is found in the fuse boxes of automobiles whereby the fuse is comprised of two flat tab terminals spanned by a thin bridge of conductor, one tab connected to an electrical conducting cable providing a power source and the other tab connected to one or more electrical conducting cables leading to their respective electrical appliances. To minimize the use of fuses it is common to connect related electrical appliances to the same fuse. To make electrical connection between the fuse tabs and the electrical cables, individual electrical tab type receptacle terminals are used.

The receptacles are commonly stamped and formed out of a sheet of thin conducting material comprising a receptacle shell into which are bent elongated resilient tongue contacts between which the tab is pushed and contact is made, having also locking lances that are stamped out of the receptacle shell to hold it within an associated electrical connector housing, and a wire connection section commonly having a crimp barrel to which the stranded conductors of the electrical cables are crimped. As the receptacle that connects to the output tab of the fuse sometimes has more than one electric cable attached to it, the cables are placed into the same crimp barrel and crimped together. It should also be appreciated that the conducting cables leading to various electrical appliances often have different diameters because the electrical current requirements of the appliances are different.

Crimping of the wires is a preferred method because strands of the electrical conductor are crushed together therefore providing good electrical conduction therebetween, and additionally providing a good grip on the wire.

One of the problems associated to the presently designed wire connection sections is that they do not reliably connect more than one electrical conducting wire because their design is aimed towards receiving a single generally cylindrical often multi-stranded wire. If two stranded wire connectors are placed in the same crimp barrel and crimped together, for example, the crimping may result in crushing one of the stranded wires very hard and crushing of the other stranded wire only loosely, the loose wire not only making bad electrical contact with the receptacle but also risking extraction out of the barrel by an

external pulling force on the wire. The above is especially true and difficult to control if the stranded wires are of different sizes, which is, as mentioned previously, a likely occurrence when these electrical cables lead to different electrical appliances.

With reference to the above mentioned problems, an object of the invention is therefore to provide an electrical terminal providing a reliable means to attach more than one electrical conducting wire thereto.

Another object of this invention, in conjunction with the above mentioned object, is to provide an electrical terminal that can be manufactured simply in an automated process.

The present invention provides an electrical terminal as defined in claim 1 and a method as defined in claim 7. Preferred embodiments are defined in the dependent claims.

The above mentioned objects have been accomplished by providing an electrical terminal having an electrical conductor attachment section and a contacting section such that the terminal is stamped and formed out of a sheet of conducting material, whereby the conductor attachment section comprises more than one electrical wire connecting section to which associated electrical conducting cables may be electrically connected.

The preferred embodiment of this invention will now be described by way of reference to the drawing figures, where;

Figure 1 is a side view in partial section, of a tab type terminal receptacle with two electrical conducting cables crimped thereto in accordance with the preferred embodiment of the invention;

Figure 2 is a top view of a partially manufactured electrical terminal receptacle from a strip of thin sheet metal, the carrier strip thereof being shown;

Figure 3 is a detailed view of a jigsaw interconnection that holds the receptacle outer shell together in accordance with the preferred embodiment of the invention;

Figure 4 is a view of the receptacle along the line 4-4 of Figure 2 whereby the receptacle is lying on a die and a ram is about to engage the surface of the receptacle;

Figure 5 is a similar view to that of Figure 4 but showing the ram in its lowest position having partially bent the receptacle base along a perforated bending line in accordance with the preferred embodiment;

Figure 6 is a similar view to those of Figures 4 and 5 showing crimp dies engaging opposite sides of the receptacle to complete the bending, achieving the finished receptacle illustrated in Figure 1.

With reference to Figure 1 an electrical tab receptacle terminal is shown generally at 2, comprising a longitudinal axis 3, a conductor attachment section 6, a contacting section 4, a locking section 8, and two electrical conducting cables 9 and 10.

In the preferred embodiment of the invention, a box-shaped shell 14 of the receptacle 2 joins the conductor attachment section 6 to the contacting section 4, and is bent from the base 14' of Figure 2 into its box shape, having two opposing side walls 15,16 attached to adjacent opposing walls 17,18. The adjacent wall 17 is split into two half walls 17',17". To a top edge 20 of the walls 15,16, are attached S-shaped tongue contacts 22,23 bent inwardly of the box shaped shell 14, disposed about the longitudinal axis 3 in mirror imaged S-shapes whereby the contacting surfaces 24,25 are in a close relationship such that a mating electrical tab receptacle is thicker than the distance between the contacting points 24,25 thereby pushing the contacting tongues 22,23 resiliently apart when inserted into the receptacle terminal. It should be appreciated that when a tab terminal is inserted into the receptacle terminal 2 the tongues 22,23 are resiliently biased towards the walls 15,16 of the shell 14 respectively, such that their free ends 26,27 respectively make contact with the walls 15,16 at the points 28,29 thereby rigidifying the tongue contacts' resiliency.

In the preferred embodiment stamped out locking lances 32,33 as shown in Figure 1, are attached at one of the ends to the side walls 15,16 respectively departing rearwardly outwards therefrom, the locking lances serving to retain the receptacle by abutting against a shoulder within a terminal receiving cavity of an associated housing (not shown).

In the preferred embodiment, the conductor attachment section 6 has two wire connection sections 5,7, comprising respectively a first crimp barrel 36 attached to an associated strain relief section 40 and a second crimp barrel 38 attached to an associated strain relief section 42, the wire connection sections 5,7 attached to a bottom edge 21 of the base 14'.

With respect to Figure 2, a partly manufactured receptacle 2' is shown still attached to a carrier strip 48, the carrier strip serving to transport the strip of metal from which the receptacle 2 is stamped and formed during its manufacturing process, whereby the hole 49 serves to locate the strip accurately, as well as to feed the strip in the stamping and forming machines. Tabs 50 of the strain relief section 40 wrap around the insulation of an electrical conductor 10 so as to grip it firmly, as shown in Figure 1 and side walls 52 of the crimp barrel 36 crimp onto the conductors 55 of the electrical conductor 10. To ensure good electrical

conductivity the crimp barrel 36 has a size designed to suitably match that of the electrical conductor 55. Similarly, the crimp barrel 38 and its associated strain relief section 42 is attached to an electrical conductor 9. The electrical conducting cable 9 and the electric conducting cable 10 lead to different electrical appliances which define different electrical current needs, the cable 9 therefore carrying a different level of electric current to the cable 10. As the electrical current carrying capabilities of an electrical conductor is in part determined by the cross sectional area of the conductor one generally implements a conductor with larger cross sectional area when the amplitude of electrical current to be carried is greater. This means that in the preferred embodiment the crimp barrel 36 and its associated strain relief section 40 is matched to crimp on the cable 9 and the crimp barrel 38 and its associated strain relief section 42 is matched to crimp on the cable 10, which may be a different size to that of the cable 9.

In the preferred embodiment, perforations 62 shown in Figure 2 extend at a distance D parallel to the longitudinal axis 3, from the top edge 20 of the base 14' to the bottom edge 21, thereby defining two parallel bending lines 64,66 that separates respectively side wall 15 to adjacent wall 18 respectively adjacent wall 18 to side wall 16 of the shell 14 of the receptacle 2. The perforations 62 not only facilitate bending of the walls 15,16 around their respective bending axes 64,66 but also ensure that the deformation occurs therearound; deformation preferentially occurring in the most supple regions.

The receptacle 2 shown in Figure 1 is formed by a series of manufacturing steps illustrated in Figures 4,5 and 6 from the partly manufactured receptacle 2' shown in Figure 2, whereby, as shown in Figure 4, the partly manufactured receptacle 2' is placed on a die 70 (partly shown) with the adjacent half walls 17',17" facing upwards away from the die. A cavity 76 in the die 70 is situated under the end wall 18 of the base 14', spanning from one bending line 64 to the other bending line 66, upper edges 78 of the cavity 76 having rounded corners to facilitate pivoting of the side walls 15,16 of the base 14' around the bending lines 64,66 respectively.

A ram 80, almost as wide as the distance separating the bending lines 64,66, is moved vertically down towards the die as shown by the arrow A in Figure 4, and stamps the end wall 18 between the bending lines 64,66 into the cavity 76 of the die 70, whereby the side walls 15,16 are forced to pivot around the upper edges 78 of the cavity 76, thereby bending the side walls 15,16 around the bending lines 64,66; perforations 62 situated along the bending lines 64,66 facilitating the bending therearound. At the end of the downward move-

ment the ram 80 is pressing the end wall 18 onto the floor 77 of the die cavity 76 and the side walls 15,16 are only partially bent, extending obliquely away from the end wall such that the ram 80 can be retracted vertically past free edges 90,92 of the half walls 17',17" respectively and also avoiding interference with the contacting tongues 22,23 as shown in Figure 5.

In the next step the ram 80 is retracted past the free ends 90,92 of the half walls 17',17" and opposing crimp dies 81,82 are moved horizontally together, pushing corners 94,96 of the side wall 17',17" respectively, causing the side walls 15,16 to pivot about their respective bending lines 64,66 thereby approaching the free edges 90,92 of the half walls 17',17" respectively until they meet as shown in Figure 6.

To hold the half walls 17',17" together, a jigsaw interconnection 98, as illustrated in Figure 3, is foreseen. The jigsaw interconnection 98 consists of a T-shaped tab 96 attached to the free edge 92 of the wall 17" and a corresponding T-shaped hole 94 departing from the free edge 90 inwards of the wall 17', whereby when the free edges 90,92 have met, the tab 96 is located within the hole 94 thereby preventing separation thereof. Insertion of the tab 96 into its corresponding hole 94 is possible with the manufacturing steps described above and illustrated by Figures 4,5 and 6 because the free edges 90,92 describe a roughly arcuate movement around the bending lines 64,66 respectively, which allows the tab 96 to overlappingly approach the free edge 90 and seat itself into the hole 94 just as the free edges 90 and 92 meet.

It should be appreciated that the terminal 2 as described herein is only representative of the preferred embodiment of the invention and should not be limiting to the claimed invention. More specifically: the wire connecting sections 5,7 could be of the insulation displacement type as opposed to crimp barrels 36,38; the number of wire connecting sections 5,7 could be increased by lengthening the side walls 15,16 and placing additional wire connecting sections therealong; and the contacting tongues could be stamped and formed directly from the side walls 15,16 instead of feeding off the top edge 20. One could also imagine the electrical terminal 2 to be a male electrical terminal tab insertable into a female electrical terminal receptacle (such as described in the preferred embodiment), by for example forming the contacting tongues into a tab.

Claims

1. An electrical terminal (2) having an electrical conductor attachment section (6) and a contacting section (4), the terminal being a unitary

part stamped and formed out of a sheet of conducting material, characterized in that the conductor attachment section (6) comprises more than one electrical wire connecting section (5,7) to which associated electrical conducting wires (9,10) may be electrically connected.

2. The terminal of claim 1 characterized in that the wire connecting sections (5, 7,) are for crimping to their associated wires (9, 10).
3. The terminal of claims 1 or 2 characterized in that the terminal (2) is a receptacle to receive a male tab terminal, the terminal receptacle (2) having a substantially box shaped shell (14) that joins the contacting section (4) to the wire connection sections (5,7).
4. The terminal of claim 3 characterized in that the contacting section (4) is disposed substantially within the receptacle shell (14).
5. The terminal of any of claims 1 to 4 characterized in that the contacting section (4) has two opposed S-shaped contacting tongues (22,23) that are attached to a top edge (20) of the shell (14) the contacting tongues (22, 23) being in close relationship to resiliently receive an electrical tab terminal and make electrical contact therebetween.
6. The terminal of any of claims 1 to 5 characterized in that the conductor attachment section (6) comprises two wire connecting sections (5,7), the wire connecting sections (5,7) in an opposed relation one to the other.
7. A method of forming an electrical receptacle terminal (2) profiled for receiving a tab, and for interconnection of more than one electrical conducting cable (9,10) the method being characterized by the steps of:
 - (a) providing a terminal base plate (14') having more than one electrical wire connecting section (5,7) extending therefrom, and at least one contact section (4), the base plate (14') being deformable into a receptacle configuration for receiving the tab;
 - (b) connecting the electrical conducting wires (9,10) to their associated wire connecting section; and
 - (c) forming the base plate (14') into the shape of a receptacle with the contacting section (4) disposed within a receptacle shell (14).

8. The method of claim 7, characterized in that the base plate (14') is substantially rectangular in shape, consisting of a top edge (20), a bottom edge (21), whereby the said wire connection sections (5,7) extend from the bottom edge (21). 5
9. The method of claim 7 or 8 characterized in that the base plate (14') prior to the forming step is substantially flat and the wire connecting sections (5,7) are facing in the same direction and are moved into opposing directions during the forming step. 10
10. The methods of any of claims 7 to 9 characterized in that the base plate (14') has a plurality of perforations that define bending lines (64,66) along which the base plate (14') is bent during the forming step. 15

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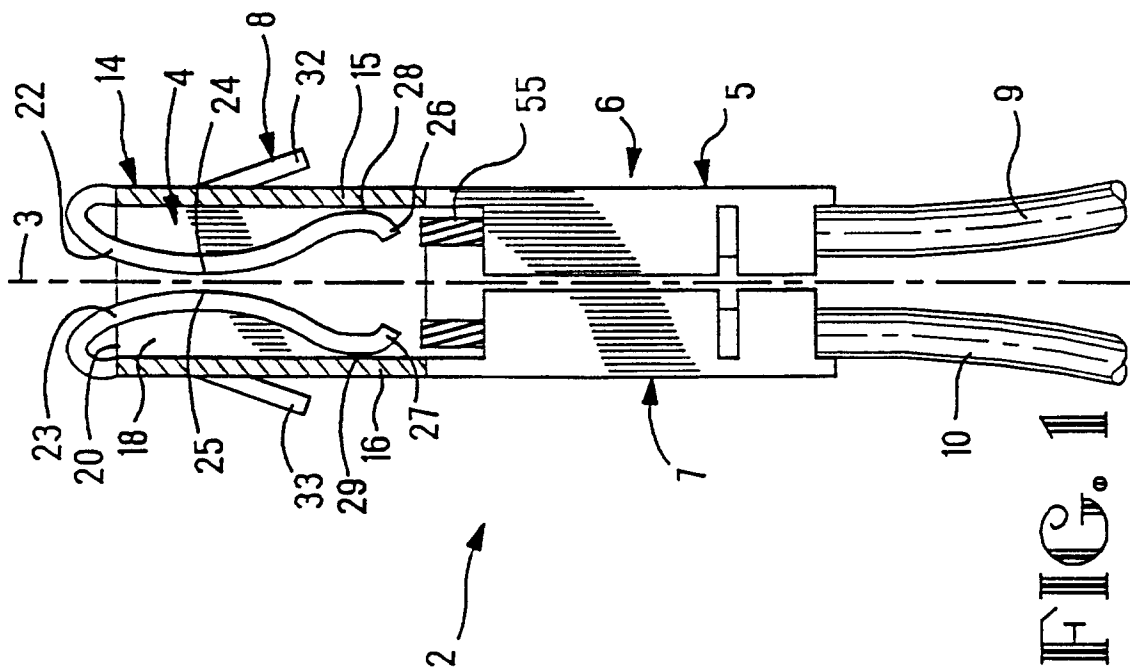
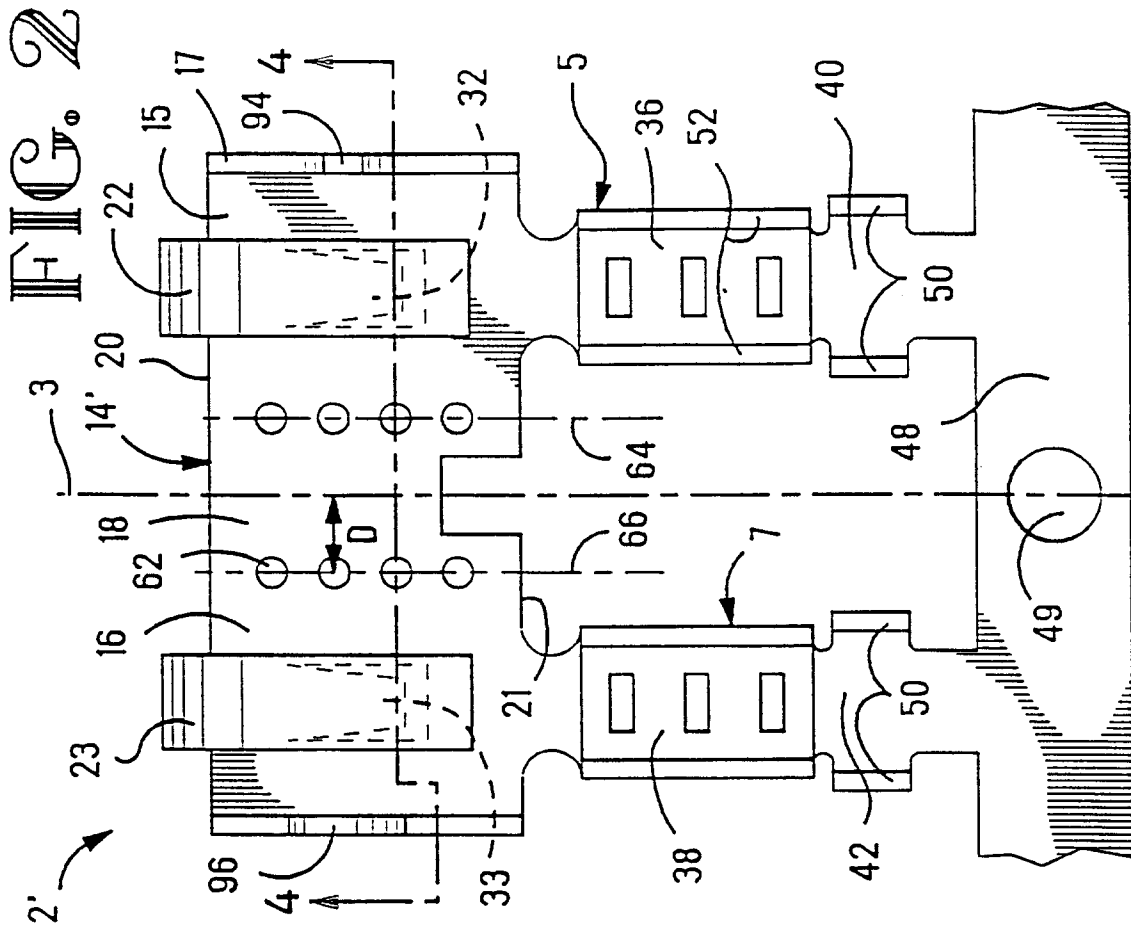
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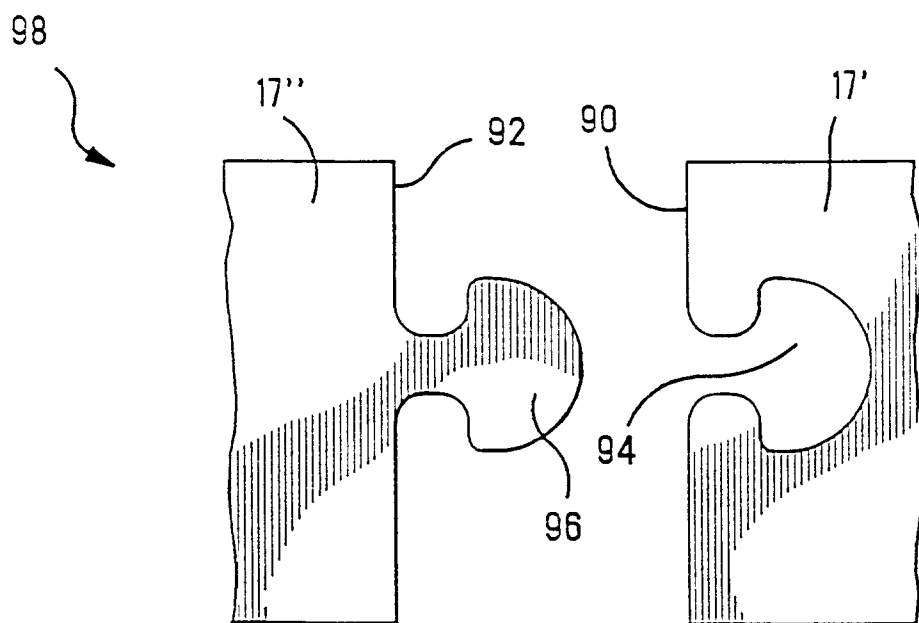


FIG. 3

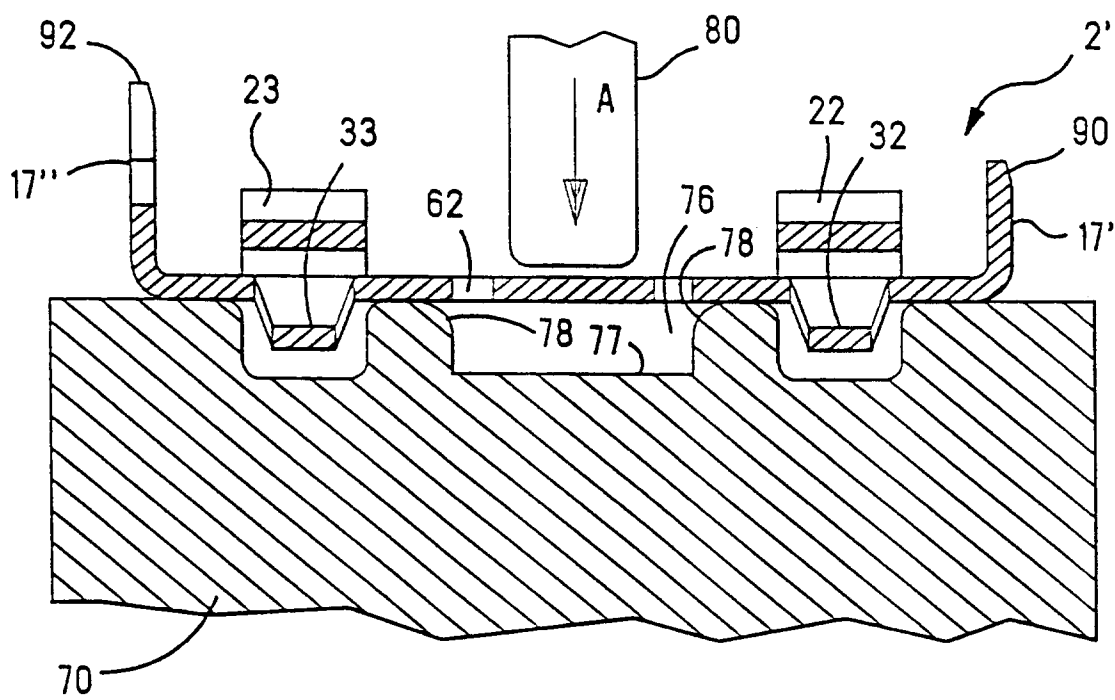


FIG. 4

