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3,369,214

CONNECTOR

Filed Oct. 27, 1965

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FIG. 1

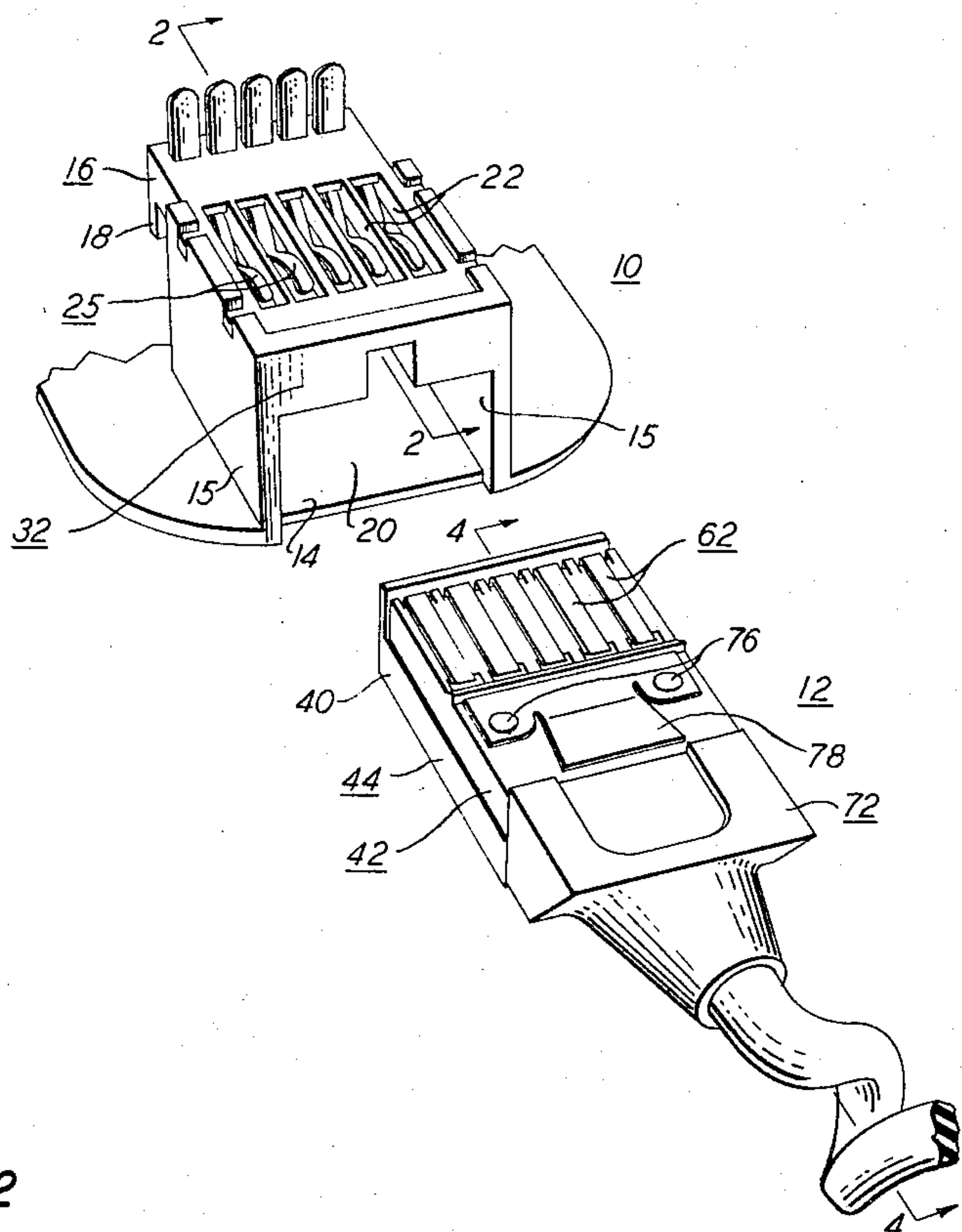
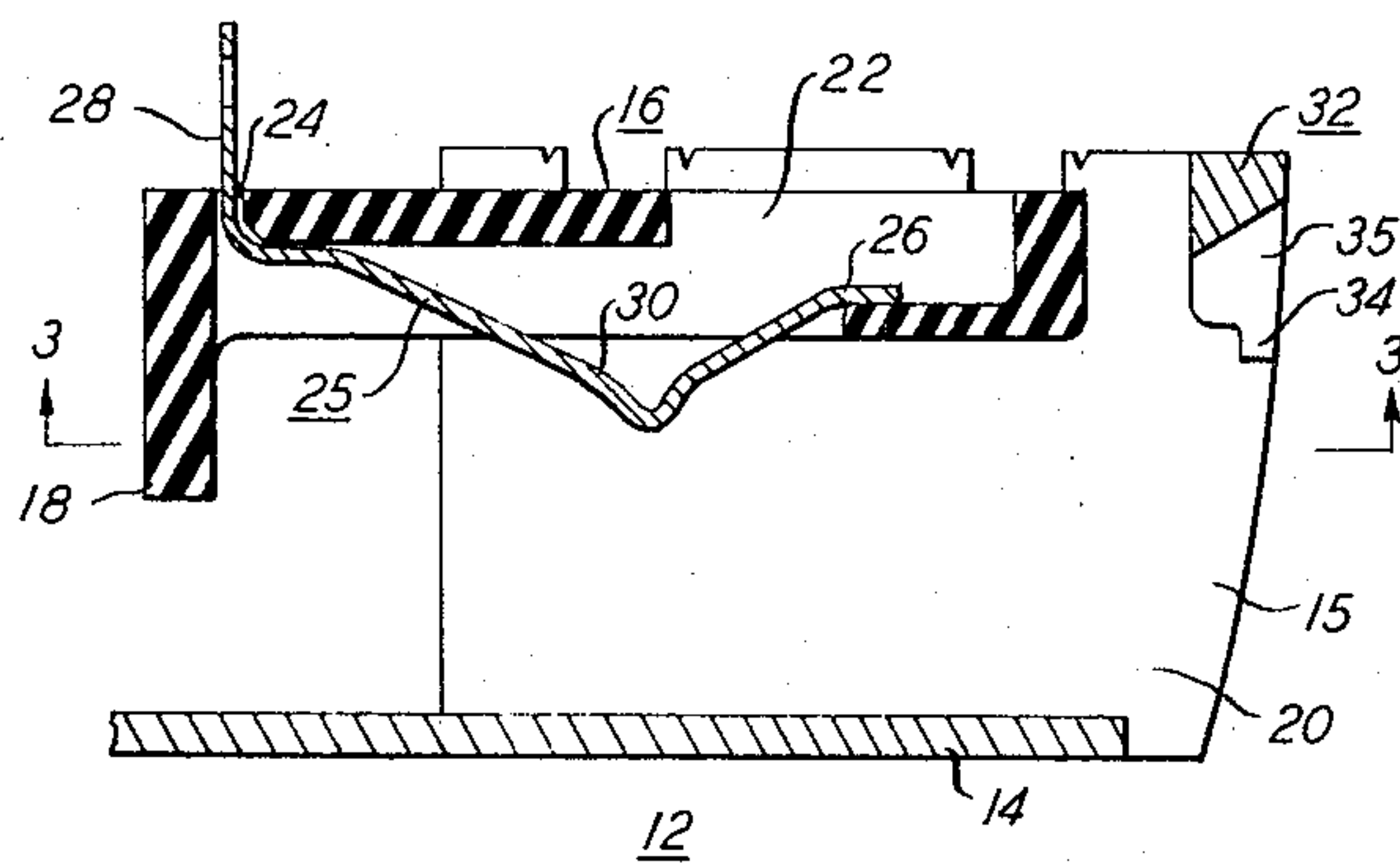


FIG. 2



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FIG. 3

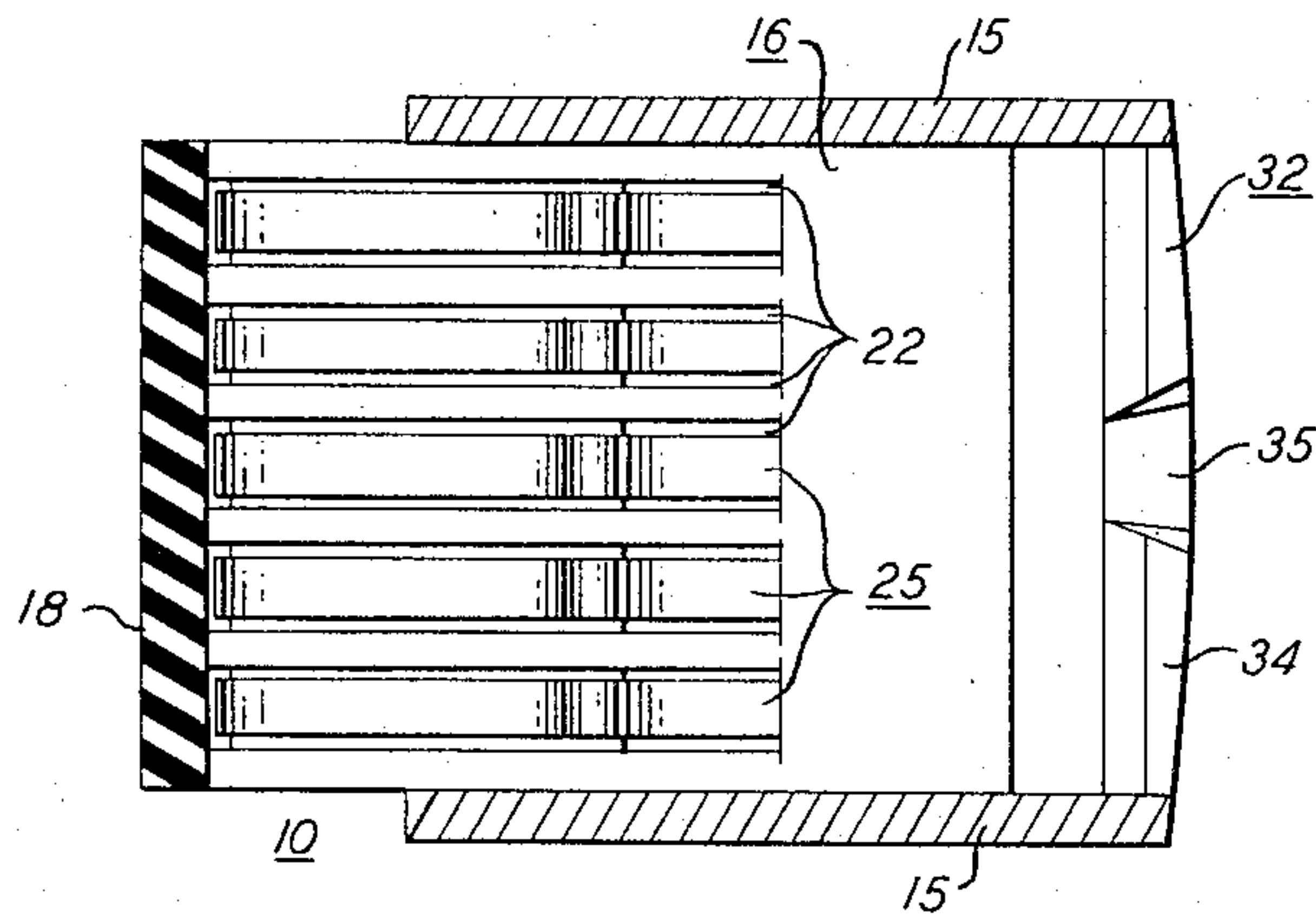


FIG. 4

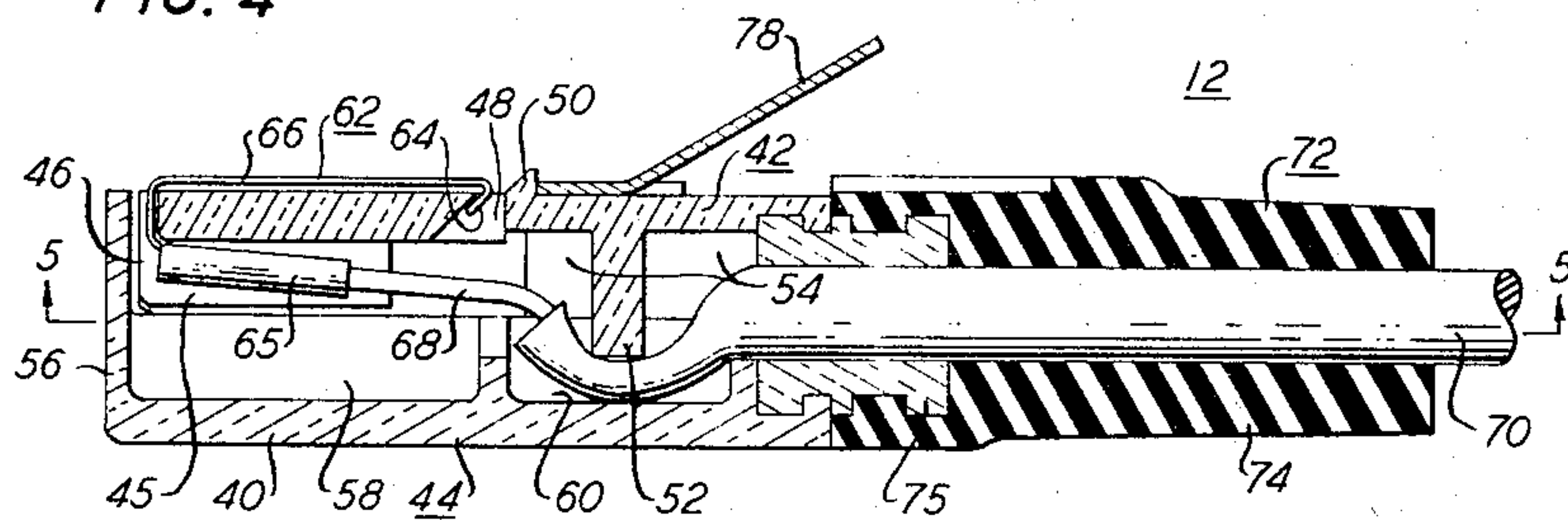
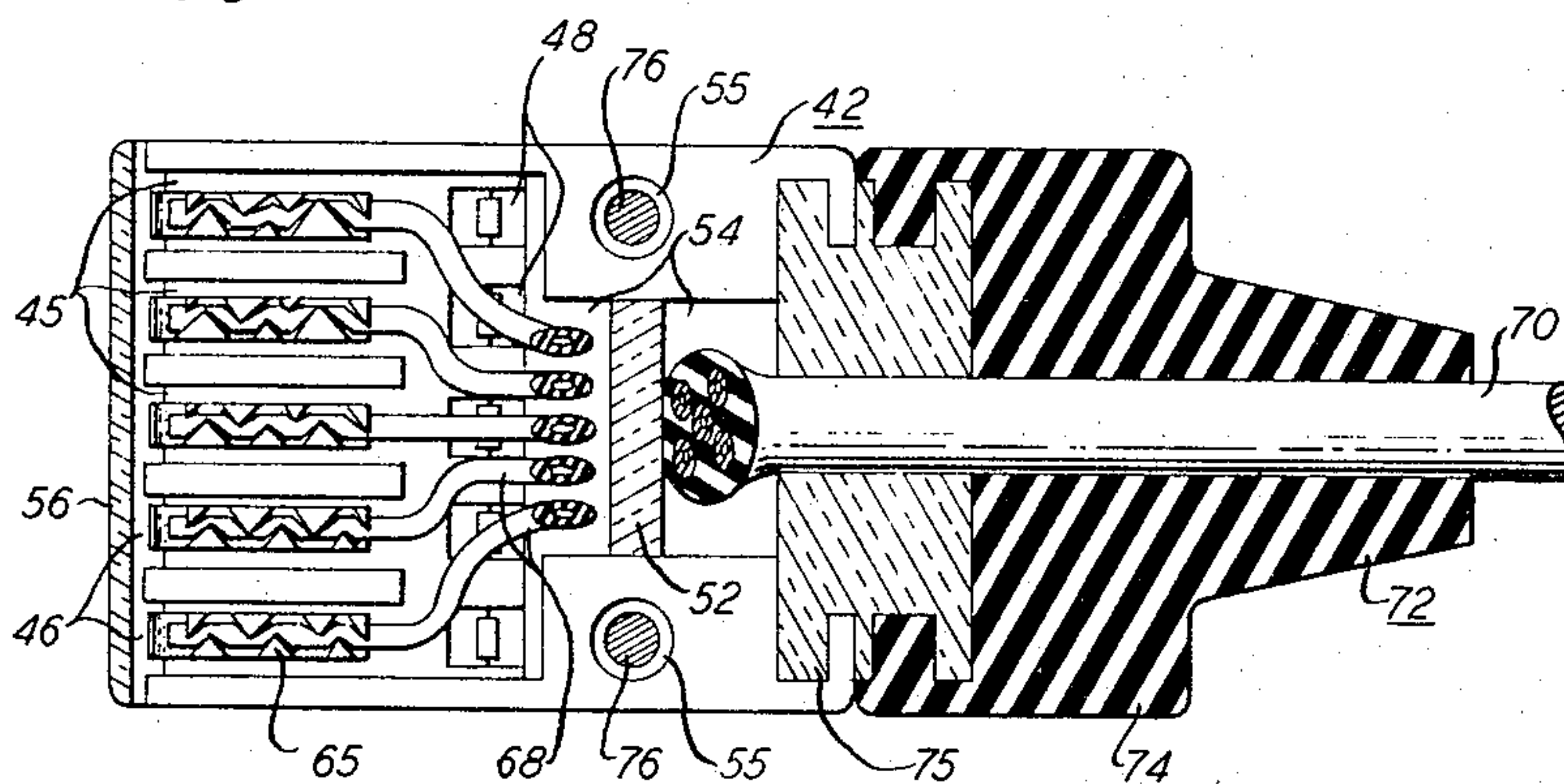


FIG. 5



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CONNECTOR

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7 Claims. (Cl. 339-105)

ABSTRACT OF THE DISCLOSURE

A plug and socket connector is described in which the plug is rectangular and includes a row of U-shaped contacts mounted thereon and extending parallel to the length thereof. One leg of each contact extends along the surface of the plug and provides the engaging portion, while the other leg of each contact is contained within the plug and is attached to a conductor. The socket includes a rectangular opening and a row of cantilever contacts that extend parallel to the length of the opening. The free ends of the socket contacts are bowed so as to protrude into the opening and engage the plug contacts when the plug is inserted into the opening.

This invention relates to electrical connectors and particularly to the plug and socket type connector.

In one specific embodiment, the invention comprises a rectangular socket including a dielectric support having a plurality of parallel channels extending therethrough in an offset fashion to provide a portion that faces the interior of the socket and a portion that faces exterior to the socket. The interior portion of each channel extends from a point adjacent to the rear end of the socket to a point intermediate the entrance and the rear end, while the exterior portion of each channel extends from a point intermediate the entrance and the rear end to a point adjacent to the entrance.

A contact member is positioned in each channel, and each contact member includes a terminal portion at one end adapted to be secured to a conductor, a stop portion at the other end, and a nose-shaped contact portion intermediate the terminal portion and the stop portion. The terminal portion extends through the support from the interior side to the exterior side thereof. The stop portion is positioned in the exterior portion of the channel and is biased toward the support, and the contact portion is positioned in the interior portion of the channel and protrudes into the interior of the socket.

The socket accommodates a rectangular plug including a dielectric support having a side facing the interior of the plug and a side facing the exterior of the plug. The side of the support facing the interior of the plug has a plurality of channels corresponding in number to the channels in the support of the socket, the channels extending from a point adjacent to the forward end of the plug to a point intermediate the forward and rearward ends of the plug. A first plurality of apertures corresponding in number to the channels extend through the support in alignment with and at the forward end of the channels. A second plurality of apertures corresponding in number to the channels extend through the support in alignment with and at the rearward end of the channels, the forward edges of the second apertures being beveled.

The plug further includes a plurality of contact members corresponding in number to the plurality of channels, each contact member having a terminal portion at one end thereof, a hook portion at the other end thereof, and a contact portion intermediate the terminal portion and the hook portion. Each contact member is bent back on itself intermediate the contact portion and the terminal

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portion, and each contact member is mounted on the support with the terminal portion positioned within an individual channel on the interior side of the support. The bend in each contact member extends through the first aperture of the channel with which it is associated. The contact portion extends along the exterior side of the support parallel to and in alignment with the channel, and the hook portion engages the forward end of the second aperture of the channel.

In the drawing:

FIG. 1 is a perspective view of the plug and socket of this invention;

FIG. 2 is a sectional view of the socket taken along line 2-2 of FIG. 1;

FIG. 3 is a sectional view of the socket taken along line 3-3 of FIG. 2;

FIG. 4 is a sectional view of the plug taken along line 4-4 of FIG. 1; and

FIG. 5 is a sectional view of the plug taken along line 5-5 of FIG. 4.

Referring to the drawing and FIGS. 1, 2, and 3 in particular, the connector of this invention comprises a socket 10 and a plug 12 adapted to be inserted into the socket and make electrical connection therewith.

The socket 10 includes a base 14, a pair of side walls 15 upstanding from the base, and a support 16 extending between the side walls parallel to and a preselected distance from the base. The support 16 has a rear wall 18 depending therefrom and the support and rear wall in conjunction with the base 10 and the side walls 15 define a rectangular cavity 20.

The support 16 is formed of a dielectric material, and it has a plurality of parallel channels 22 therein that extend perpendicular to the entrance of the cavity 20. As shown most clearly in FIG. 2, each channel 22 extends through the support 16 in an offset fashion to provide a portion that faces the interior of the cavity 20 and a portion that faces the exterior of the cavity. The interior portion of each channel 22 extends from a point adjacent to the rear end of the support 16 to a point intermediate the front and rear ends, while the exterior portion of each channel extends from a point intermediate the front and rear ends of the support to a point adjacent to the front end.

A plurality of spaced slots 24 also extend through the support 16, the slots being located in a row adjacent to the rear end of the support. Each slot 24 is aligned with an individual channel 22, and each channel and associated slot accommodates a contact member 25.

Each contact member 25 includes a stop portion 26 at one end thereof, a terminal portion 28 at the other end thereof, and a contact portion 30 intermediate the stop and terminal portions. The stop portion 26 is positioned within the exterior portion of the channel 22 and is biased toward the support 16, the bias being due to deformation of the contact member 30 at the junction of the contact portion 30 with the terminal portion 28. The contact portion 30 is nose-shaped, and when the stop portion rests on the support 16, the contact portion protrudes from the interior portion of the channel 22 into the cavity 20. The terminal portion 28 of each contact member 25 extends through the slot 24 from the interior portion of the channel 22 to the exterior side of the support. The terminal portion 28 is staked in the slot 24 to secure the contact member 25 in place, and the exterior end of the terminal portion is adapted to be secured to a conductor (not shown) by soldering or wire wrapping. Since the support 16 is made of a dielectric material, each of the contact members 25 and thereby the conductors secured to the contact members are electrically insulated from one another.

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The socket 10 further includes a front piece 32 at the forward end of the cavity 20 that extends parallel to the support 16. The front piece 32 includes a ridge 34 along one edge thereof and a groove 35 that extends through the ridge transverse thereto.

Referring now to FIGS. 1, 4, and 5, the plug 12 includes a rectangular dielectric housing 40 that is of substantially the same height and width as the cavity 20 of the socket 10, the housing comprising a support 42 and a cover 44. The support 42 has a plurality of spaced parallel channels 45 in the side thereof facing the interior of the housing 40, the channels corresponding in number and spacing to the channels 22 and the support 16 of socket 10. The channels 45 extend perpendicular to the forward end of the housing 40 from a point adjacent to the forward end to a point intermediate the forward and rearward ends thereof.

A slot 46 extends through the support 42 at the forward end of each channel 45 and a slot 48 extends through the support at the rearward end of each channel, the forward edge of each slot 48 being beveled. In addition, a ridge 50 protrudes from the exterior side of the support 42 rearward of the slots 48, the ridge 50 extending generally parallel to the forward end of the support.

Finally, a wall 52 protrudes from the interior side of the support 42 and a recess 54 is located on both the forward and rearward sides of the wall. The wall 52 and recesses 54 are intermediate the slots 48 and the rearward end of the support 42, and as seen most clearly in FIG. 5, the wall and recess extend briefly on each side of the longitudinal axis of the support, a hole 55 extending through the support adjacent to each end of the wall.

The cover 44, which couples with the support 42 to form the housing 40, includes a front wall 56 projecting from the forward end thereof and a pair of recesses 58 and 60 in the side thereof facing the interior of the housing. When the cover 44 is properly positioned on the support 42, the front wall 56 extends in front of the forward end of the support 42 while the recess 58 is in juxtaposition with the channel 45 and the recess 60 is in juxtaposition with the wall 52 and the recess 54 of the support. In addition, when the cover 44 is properly positioned on the support 42 the cover has a pair of spaced holes therein (not shown) that are in registration with the holes 55 in the support.

A plurality of contact members are mounted on the support 42 of the housing 40, the contact members 62 corresponding in number to the contact members 25 of the socket 10. Each contact member 62 includes a hook portion 64 at one end thereof, a terminal portion 65 at the other end thereof and a contact portion 66 intermediate the terminal and hook portions. Furthermore, each contact member 62 has a U-shaped configuration, it being bent back on itself intermediate the terminal portion 65 and the contact portion 66.

Each contact portion 62 is positioned on the support 42 with the hook portion 64 engaging the beveled forward edge of the slot 48, with the contact portion 66 extending along the exterior side of the support parallel to and above a channel 45, with the bend in the contact member extending through the slot 46, and with the terminal portion 65 positioned within the channel beneath the contact portion.

The terminal portion 65 is advantageously of the insulation piercing type whereby the terminal is electrically connected to an insulated conductor 68 in the process of being crimped thereabout. The insulated conductors 68, which are themselves advantageously encased within a dielectric sheath to form a cord 70, enter the housing 40 through a grommet 72 mounted to the rear end of the housing, the grommet comprising a flexible portion 74 and a rigid portion 75.

The rigid portion 75 of the grommet 72 has three flanges spaced along the length thereof, and the flexible portion 74 is molded thereabout so that the forward face of the

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flexible portion is flush with the forward face of the middle flange. The flexible portion 74 and the rigid portion 75 are thereby affixed together. The forwardmost flange of the rigid portion 75 is accommodated by complementary grooves in the support 42 and the cover 44, and when the forwardmost flange is so situated, the forward face of the middle flange and the flexible portion 74 butt against the rear end of the support and cover. Consequently when the support 42 and cover 44 are fastened together to form the housing 40, the grommet 72 is captured and held securely to the rear end thereof.

In addition, when the support 42 and cover 44 are fastened together the cord 70 is forced to follow a tortuous path to get around the wall 52 of the support, the cord proceeding from the rearward recess 54 in the support, into the recess 60 in the cover, and then into the forward recess 54 in the support. This arrangement prevents tension on the cord 70 from being transmitted to the terminal portions 65.

The support 42 and cover 44 are fastened together by means of rivets 76, the rivets extending through the holes 55 in the support and the holes in the cover in registration therewith. The rivets 76 also secure one end of a spring detent 78 to the exterior surface of the support 42, the other end of the detent being normally spaced from the support.

As the plug 12 is inserted into the cavity 20 of the socket 10, the contact portions 66 of the contact members 62 on the plug engage the contact portions 30 of the contact members 25 in the socket and deflect the contact portion 30 upward. Further movement of the plug 12 into the cavity thereafter results in a rubbing together of the two contact portions 30 and 66. This movement of the two contact portions 30 and 66 against one another, together with the contact force generated by the deflection of the contact portion 30, provides a good electrical connection between the contact members 25 and 62.

In addition, as the plug 12 is inserted into the cavity 20 of the socket 10 the free end of the detent 78 is deflected downward by the ridge 34 of the front piece 32. Then when the plug 12 is fully inserted into the cavity 20, the free end of the detent 78 moves behind the ridge 34 and latches the plug into the cavity. To remove the plug 12 from the cavity 20 it is necessary to insert a stiff wire or similar implement through the groove 35 in the front piece 32, deflect the free end of the detent 78 below the crest of the ridge 34, and pull on the plug.

What is claimed is:

1. A pair of cooperating electrical connectors comprising:

a rectangular socket including
a dielectric support having a plurality of parallel channels each extending therethrough in an offset fashion to provide a portion that faces the interior of the socket and a portion that faces exterior to the socket, the interior portion of each channel extending from a point adjacent to the rear end of the socket to a point intermediate the entrance and the rear end, the exterior portion of each channel extending from a point intermediate the entrance and rear end to a point adjacent to the entrance;

a contact member positioned in each channel, each contact member including a terminal portion at one end adapted to be secured to a conductor, a stop portion at the other end thereof, and a nose-shaped contact portion intermediate the terminal portion and the stop portion, the terminal portion extending through the support from the interior side to the exterior side thereof, the stop portion being positioned in the exterior portion of the channel and being biased toward the support, and the contact portion being positioned in the interior portion of the channel and protruding into the interior of the socket;

a rectangular plug including

a dielectric support having a side facing the interior

of the plug and a side facing the exterior of the plug, the side of the support facing the interior of the plug having a plurality of channels corresponding in number to the channels in the support of the socket, the channels extending from a point adjacent to the forward end of the plug to a point intermediate the forward and rearward ends of the plug, a first plurality of apertures corresponding in number to the channels and extending through the support in alignment with and at the forward end of the channels, a second plurality of apertures corresponding in number to the channels extending through the support in alignment with and at the rearward end of the channels, the forward edges of the second apertures being beveled; a plurality of contact members corresponding in number to the plurality of channels, each contact member including a terminal portion at one end thereof, a hook portion at the other end thereof, and a contact portion intermediate the terminal portion and the hook portion, each contact member being bent back on itself intermediate the contact portion and the terminal portion, each contact member being mounted on the support with the terminal portion positioned within an individual channel on the interior side of the support, the bend in the contact member extending through the first aperture associated with the channel, the contact portion extending along the exterior side of the support parallel to and in alignment with the channel, and the hook portion engaging the forward edge of the second aperture associated with the channel.

2. A pair of cooperating electrical connectors as in claim 1 wherein the plug further includes a cover adapted to be positioned in juxtaposition with the support and secured thereto, the cover combining with the support to form an enclosure for the terminal ends of the contact members.

3. A pair of cooperating electrical connectors as in claim 2 wherein the interior surface of the cover has a large rectangular recess therein in juxtaposition with the channels in the support.

4. A pair of cooperating electrical connectors as in claim 2 wherein the support of the plug includes a wall projecting from the interior side thereof adjacent to the rearward end thereof and a recess on each side of the wall, and the cover includes a recess in the interior surface thereof in juxtaposition with the wall and recesses of the support, the combination thereof providing a tortuous path that clamps the cordage between the support and the cover.

5. A pair of cooperating electrical connectors as in claim 2 further including a grommet clamped between the support and the cover at the rearward ends thereof.

6. A plug comprising:

a planar dielectric support having a side facing the interior of the plug and a side facing the exterior of the plug, the side of the support facing the interior of the plug having a plurality of channels therein extending from a point adjacent to the forward end of the plug to a point intermediate the forward and rearward ends of the plug, a first plurality of slots corresponding in number to the channels and extending through the support in alignment with the channels and at the forward end of the support, a second plurality of slots corresponding in number to the channels extending through the support in alignment with and at the rearward end of the channels, the forward edges of the second slots being beveled, and a wall projecting from the interior side of the support to the rear of the second slots, a recess being located on each side of the wall;

a plurality of contact members corresponding in num-

ber to the plurality of channels, each contact member including a terminal portion at one end thereof, a hook portion at the other end thereof, and a contact portion intermediate the terminal portion and the hook portion, each contact member being bent back on itself intermediate the contact portion and the terminal portion, each contact member being mounted on the support with the terminal portion positioned within an individual channel on the interior side of the support and the bend in the contact member positioned in the first slot associated with the channel, the contact portion extending along the exterior side of the support parallel to and in alignment with the channel, and the hook portion engaging the forward edge of the second slot associated with the channel; and

a dielectric cover attached to the interior side of the support, the cover having a front wall that extends in front of the forward end of the support, the cover further having a first recess located in juxtaposition with the channels in the support to form an enclosure for the terminal ends of the contact members, and a second recess located in juxtaposition with the wall and recesses in the support to form a tortuous path for clamping conductors secured to the terminal ends of the contact members.

7. A socket comprising:

a pair of spaced generally parallel side walls;

a base surface extending from one side wall toward the other side wall, the base surface extending perpendicular to both side walls;

a rear wall extending perpendicular to the base surface;

a dielectric support extending between the side walls parallel to and spaced from the base surface, the support having a plurality of parallel channels formed therein to provide a channeled portion that faces the interior of the socket and a channeled portion that faces exterior to the socket, the interior portion of each channel extending from a point adjacent to a first end of the support to a point intermediate the ends and the exterior portion of each channel extending from a point intermediate the ends to a point adjacent to the second end;

an individual contact member positioned within the interior and exterior portions of each channel, each contact member including a terminal portion at one end adapted to be secured to a conductor, a stop portion at the other end, and a nose-shaped contact portion intermediate the terminal portion and the stop portion; and

a front piece at the entrance of the socket, the front piece extending parallel to the support and the base surface, the front piece including a ridge along one edge thereof and a groove extending transversely through the ridge.

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RICHARD E. MOORE, *Primary Examiner*.