

[54] **GROUNDING FOIL FOR ELECTRICAL CONNECTORS**

[72] Inventor: William K. Tracy, Rosemead, Calif.

[73] Assignee: International Telephone and Telegraph Corporation, New York, N.Y.

[22] Filed: Jan. 29, 1970

[21] Appl. No.: 6,900

[52] U.S. Cl. 339/143 R, 339/147 R, 339/258 A

[51] Int. Cl. H01r 23/06, H01r 23/08

[58] Field of Search. 339/258, 95, 278, 257, 152

[56] **References Cited**

UNITED STATES PATENTS

2,473,705	6/1949	George		339/143 X
2,523,664	9/1950	Minnium et al.		175/41
2,726,376	12/1955	Heath		339/278 X

Primary Examiner—Richard E. Moore

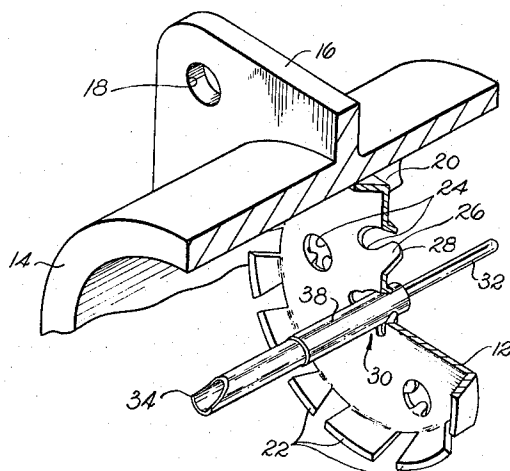
Attorney—C. Cornell Remsen, Jr., Walter J. Baum, Paul W. Hemminger, Charles L. Johnson and Thomas E. Kristofferson

[57]

ABSTRACT

A grounding foil having one or more cavities therein formed of tangs. The surface of the tangs integral with the foil members contacts electrical elements inserted in the cavities formed by the tangs. The front edge surface of the tangs do not contact the electrical elements, thus prolonging both the use of the electrical element and preventing failure of the tangs. A relatively large number of tangs may be provided which occupy a sufficient area so that should failure of one of the tangs occur, the remaining tangs will provide sufficient electric contact as well as support so that the electrical element supported in the tangs will not be displaced. The tangs may be designed so that the tang portion integral with the foil has a greater stiffness than the tip portion of the tang.

3 Claims, 3 Drawing Figures



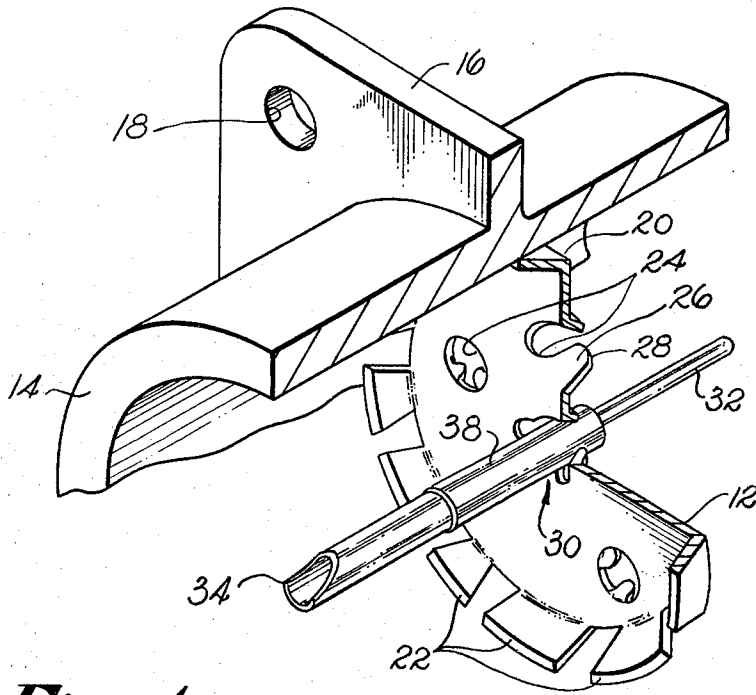


Fig. 1.

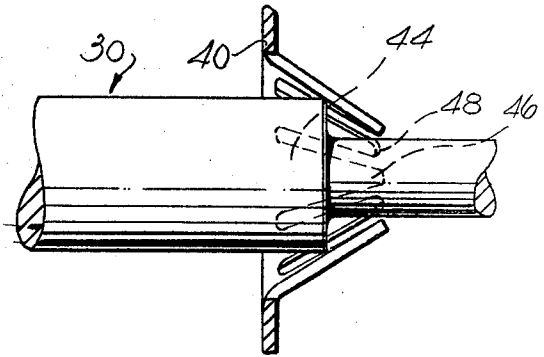


Fig. 2.

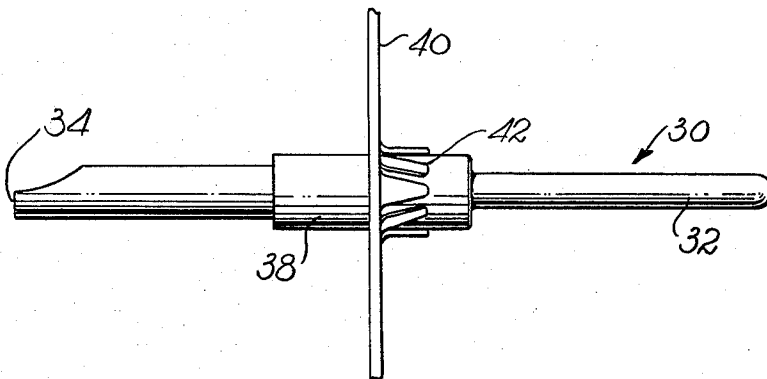


Fig. 3.

INVENTOR
 WILLIAM K. TRACY.
 BY *Harvey L. Hatz*
 ATTORNEY

GROUNDING FOIL FOR ELECTRICAL CONNECTORS

IMPROVED GROUNDING FOIL FOR ELECTRICAL CONNECTORS

The invention relates in general to an improved grounding foil for electrical connectors and, more particularly, to a foil which provides a support arrangement for removable electrical elements mounted therein.

BACKGROUND OF THE INVENTION:

The use of a foil grounding member containing one or more cavities wherein electrical elements are retained and grounded by a foil and further may be removed, are well known. A typical grounding foil is shown in U.S. Pat. application Ser. No. 759,910, filed Sept. 16, 1968, now U.S. Pat. No. 3,569,915, issued Mar. 9, 1971. In the aforementioned application, the cavities are formed in the foil member from a plurality of short tangs which are designed to form a funnel. The tangs taper inward to block or close the inside diameter of each cavity. Each tang operates independently of the other tangs and when the electrical element is inserted into the cavity, the tangs deflect over the outside diameter of the electrical element. The outer edge of the tang contacts the electrical element. Normally, this edge surface is relatively sharp and can damage the electrical element. Moreover, the contact insertion and removal of filter elements requires a sturdy tang which will not damage the electrical elements. Moreover, continued insertion of the plurality of elements can cause the ground plane to become deformed. Also, the use of a minimal number of tangs requires that each tang not only be always available for support, but also for positioning, as well as making electrical contact with the electrical element.

In order to overcome the attendant disadvantages of prior art grounding foils, utilized in combination with removable electrical elements, the present invention allows the electrical elements to be inserted and withdrawn numerous times. Moreover, the electrical element is rarely damaged by such withdrawal or insertion into the ground plane. The foil ground plane provides a sturdy, positionable element. Moreover, electrical reliability is increased and performance is always at a maximum.

The advantages of the invention, both as to its construction and mode of operation, will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings in which like referenced numerals designate like parts throughout the figures.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 depicts an electrical conductor containing the prior art grounding foil partially in section;

FIG. 2 illustrates a grounding foil for mounting electrical elements therein prior to insertion of the elements, and

FIG. 3 shows the grounding foil of FIG. 2 with an electrical element mounted in the grounding foil.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, there is shown in FIG. 1 a prior art grounding foil 12 which is mounted in a shell 14. The shell 14 which may be the outer conductor of a coaxial line, has formed integral with its outer surface a mounting flange 16 which may be secured to a rigid structure by means of a bolt (not shown) passing through a hole 18 in the flange.

The outer edge 20 of the grounding foil is generally circular in shape and has a diameter slightly less than the inner diameter of the shell 14 at a point where the foil is to be mounted. Secured along the outer periphery of the foil are a plurality of flaps 22 bent at an angle of approximately 30° prior to insertion of the foil into the shell. Each of the flaps deflect upon entering the connector shell and thus keep a constant pressure and contact within the inside of the shell. A plurality of individual cavities 24 are formed in the grounding foil. Each of

these cavities contain a plurality of short tangs 26 which are initially bent at an angle of approximately 15° to form a funnel. Each tang contains a front edge surface 28 which upon insertion of a filter element 30 or other electrical element into the foil, each tang independently deflects over the outside diameter of the elements 30, with the edge surface 28 contacting the element as it is inserted into the grounding foil.

Each element 30 comprises a terminal pin 32 at the front end and termination means 34 such as a soldering cup at the rear end. The rear end of the pin 32 and the front end of the termination means 34 are interconnected by means of an enlarged central portion 38.

As each element 30 is inserted or removed, the front edge surface 28 wears on the filter element with possible resulting damage to the electrical element. Moreover, continued insertion and removal of the electrical element can result in failure of the tang with the resultant electrical contact failure between the foil and the element as well as damage to the support function of the tang with the resultant misalignment of the element 30 and the foil.

Referring now to FIG. 2 there is shown an improved version of the grounding foil which is used in place of the grounding foil 12 of FIG. 1. The grounding foil 40 contains openings defined by a plurality of tangs 42. Each of the tangs 42 are generally pie shaped and contain a generally trapezoidal shaped outer portion 44 one end of which is integral with the foil and a triangular portion 46 which forms the tip of each tang and whose base is integral with the other end of the portion 44. Each of the tangs of the grounding foil are tempered so that the portion 44 contains a greater stiffness than the portion 46. Normally in operation it has been found that the preferred ratio is that the portion 44 have a stiffness twice that of the portion 46.

The contact 30 is arranged so that normally the front or terminal pin 32 will slip through the tangs 42 without touching them if the element 30 passes through the center of a hole defined by the front edge surface 48 of the tangs. However, the central portion 38 of the element is enlarged a sufficient amount so that its outer surface upon insertion through the opening formed by the tangs will abut the portions 44 of the tangs. Due to the relative stiffness of the portion 44 compared to that of the tip portion 46 the tangs will tend to spread in a manner as shown in FIG. 3 so that the front edge surface of each tang will not cut or scratch the surface of the elements 30. Further, the inner surface of the tang will tend to lie flat against the surface of the portion 38 of the terminal pin 30. Thus the portions 46 will provide an accurate centering surface for the terminal pins as well as providing good contact thereto without damaging the terminal pins. Moreover, the terminal pins will not tend to cause the tangs to break as the tangs are readily yieldable upon insertion of the terminal pins.

While the grounding foil has been shown to be secured to the connector shell 14 by means of flaps 22 it should be understood, of course, that the grounding foil can be soldered or brazed thereto or secured thereto by other conventional means. Moreover, stiffeners could be provided for the grounding foils which are also secured to the connector shell in order to prevent bending or deformation of the grounding foil. However, such techniques are deemed conventional and form no part of this invention. Moreover, while a relatively large number of tangs have been shown in FIGS. 2 and 3, it should be understood that such is considered a matter of choice of design. While a greater number of tangs are preferable in order to provide more accurate spacing and support, it should be understood that the greater the number of tangs the smaller each tang becomes with the resultant machining and tolerancing becoming a problem as well.

What is claimed is:

1. In combination, a grounding foil retaining removable electrical elements within a conductor and providing a ground connection between said elements and said conductor; said grounding foil being resilient sheet metal and comprising:

3

a foil member in said conductor, said foil member having means extending therefrom resiliently engaging the inner surface of said conductor;
means on said foil surface defining a plurality of cavities each formed from a plurality of short tangs, said tangs 5
deflecting over said electrical element with said electrical element inserted in said cavity; and
said tangs being angularly disposed with respect to a plane defining the surface of said foil adjacent said tangs prior to insertion of said element in said cavity;
each said electrical elements having an outer surface dimension greater than a corresponding opening defined by said tangs;
said tangs each having an edge at the tip portions thereof, 15
said tip portions bending outwardly upon insertion of said

4

elements through the cavities defined by said tangs for contacting the elements at a point remote from said tip portion upon insertion of the elements through the cavities and wherein said edge does not abut the element upon insertion of the element through the cavities but said elements being shaped so that the inner surface of said tangs lie flat against the outer surface of said elements.

2. A grounding foil member in accordance with claim 1 wherein the stiffness of the tang portion adjacent the foil is twice as stiff as said tip portion.

3. A combination in accordance with claim 1 wherein said tangs are tempered so that the portion of said tangs adjacent said foil member has a greater stiffness than said tip portion.

* * * * *

20

25

30

35

40

45

50

55

60

65

70

75