Nov. 10, 1970 N. H. CAMIRE 3,539,954

REMOVABLE ELECTRICAL CONNECTOR FILTER ASSEMBLY

Filed July 29, 1969 2 Sheets-Sheet 1

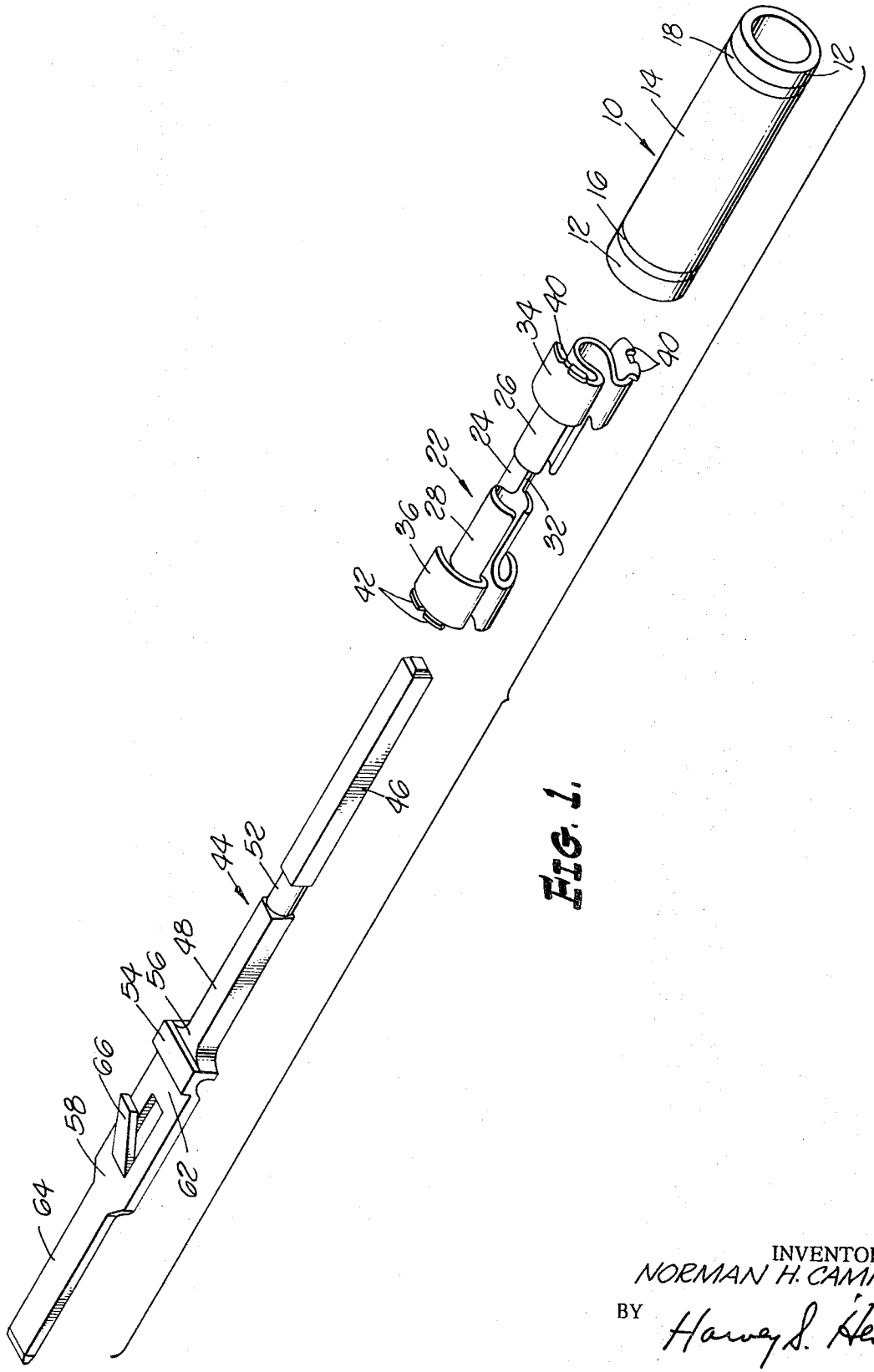


FIG. 1.

INVENTOR
NORMAN H. CAMIRÉ
BY Harvey S. Hertz
ATTORNEY

Nov. 10, 1970 N. H. CAMIRE 3,539,954

REMOVABLE ELECTRICAL CONNECTOR FILTER ASSEMBLY

Filed July 29, 1969 2 Sheets-Sheet 2

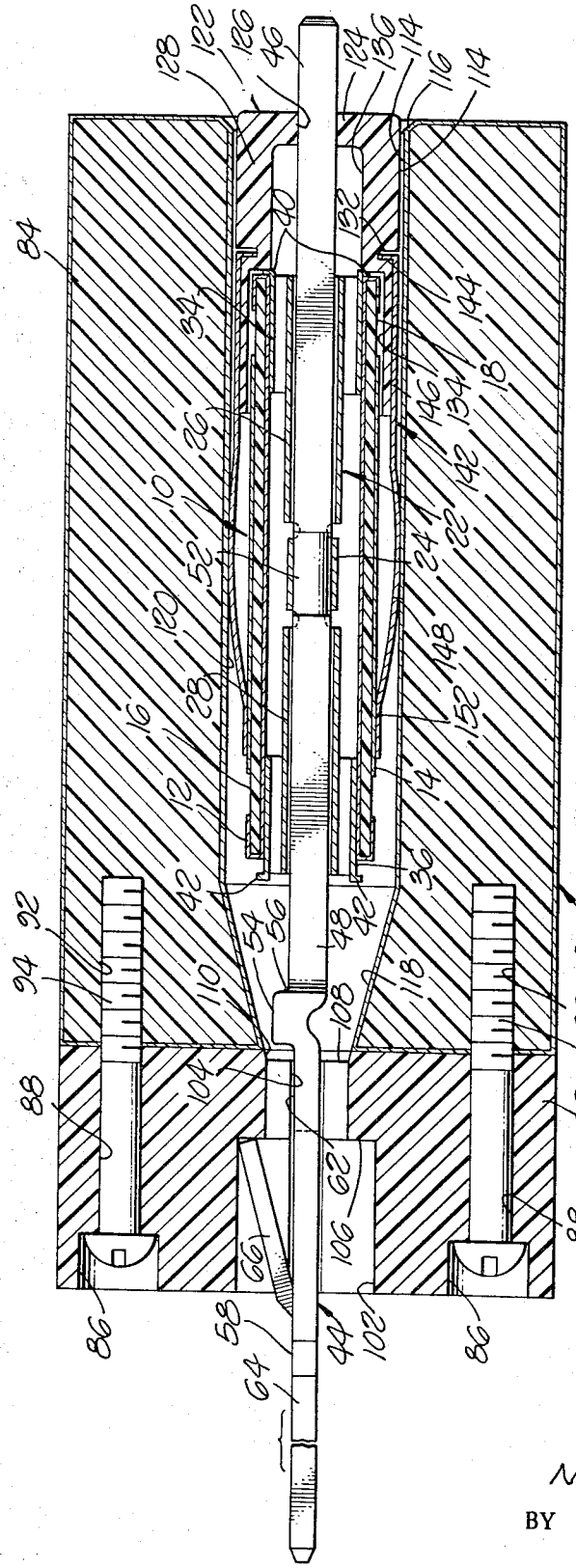


FIG. 2.

INVENTOR
NORMAN H. CAMIRÉ
BY Harvey L. Hertz
ATTORNEY

United States Patent Office 3,539,954 Patented Nov. 10, 1970

3,539,954

REMOVABLE ELECTRICAL CONNECTOR FILTER ASSEMBLY

Norman H. Camire, Hollywood, Calif., assignor to International Telephone and Telegraph Corporation, New York, N.Y., a corporation of Delaware

Filed July 29, 1969, Ser. No. 845,859
Int. Cl. H04b 15/02; H03h 7/04
U.S. Cl. 333—79 5 Claims

ABSTRACT OF THE DISCLOSURE

A removable electrical connector filter assembly comprising an electrically conductive clip for mounting on a terminal pin member. The clip has a reduced central portion and adjacent enlarged portions with a spring member externally secured to each of the enlarged portions. An electrical filter member formed of dielectric material has a conductive inner surface portion removably secured on the clip with the spring members secured to the filter member inner surface. The terminal pin member may contain a reduced diameter central undercut portion, the clip being removably mounted on the terminal pin member with the reduced central portion of the clip being normally secured to the terminal pin member undercut portion.

The invention relates in general to removable electrical connector filter assemblies, and, more particularly, to a snap-in filter element for use in coaxial lines.

BACKGROUND OF THE INVENTION

Typical removable electrical connector filters are depicted in U.S. patent application 55,398 filed June 6, 1966, now Pat. No. 3,462,715; U.S. patent application 793,264 filed Jan. 23, 1969, and U.S. patent application 819,692 filed Apr. 28, 1969. In each of these patent applications, means are provided for slidably moving a filter member along a terminal pin so that the filter is easily removable from the pin. When the filter is placed on the terminal pin, it has been found that damage would occur should the filter be incorrectly positioned on the terminal pin for mounting on a final assembly, such as in an insulator housing. Moreover, should the filter move, it has been found that the filter characteristics could vary sufficiently to cause adverse operation of the circuit to which the filter is connected. Further, the slidable filter would vary in the amount of strength needed to remove the filter from the terminal pin and thus damage might occur, should overexertion be required in moving the filter.

In order to overcome the attendant disadvantages of prior art removable electrical connector filters, the present invention provides a relatively simple filter assembly which is positioned on an electrical terminal member in a positive manner. The filter assembly can be used as a self-centering device and a transfer device for attaching of a filter tube to the contact. Moreover, the assembly is adaptable to terminal pins having different cross sections.

The advantages of this invention, both as to its construction and mode of operation will be readily appreciated as the same become 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 the removable electrical filter assembly disassembled prior to mounting on a terminal pin; and

FIG. 2 depicts the filter assembly of FIG. 1 on the terminal pin and mounted in a connector assembly.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, there is shown in FIG. 1, an electrical connector filter assembly in accordance with the invention. The assembly comprises a ceramic tubular filter member **10** made up of a high dielectric constant material such as barium titanate. The member **10** is coated on its inner surface by a conductive layer **12** such as a silver frit which extends around the ends of the member **10** and covers the outer end portion thereof. Further, the outer central surface of the member **10** contains a conductive layer **14** which is separated from the outer end portion of the layer **12** by air gaps **16** and **18**.

An electrically conductive clip **22** is formed of a central portion **24** and a pair of end portions **26, 28**. The central portion **24** may be of spring-like material and have a reduced diameter as compared to the adjacent portions **26, 28**. A longitudinal seam **32** is formed along the clip. The portions **26** and **28** contain, at its outer ends, spring-like members **34, 36**, respectively, folded back along its edges. Along the outer end surface of the spring-like members **34, 36** there may be formed ears **40, 42**. The spring-like members **34, 36** may be compressed slightly so that the diameter of the clip **22** is reduced sufficiently so as to allow the clip to pass through the inner surface of the member **10**. Once the clip has been centered in the tube **10**, pressure on the springs **34, 36** may be released so as to enable the ears **40, 42** to abut the end portions of the member **10**.

An electrical terminal member **44** contains a front square cross-sectional contacting portion **46** and a rear square cross-sectional contacting portion **48** which are interconnected by a circular undercut portion **52**, whose diameter is slightly smaller that the diagonal of the portions **46, 48**. The terminal member further comprises a shoulder **54** which is secured to a transitional portion **56** at the rear end of the square contacting portion **48**. Further, the rear end of the shoulder is connected to a flat tab member **58** whose width is equal to the width of the shoulder **54** at the front end **62** thereof, and has a reduced width **64** at the rear end thereof. At the enlarged portion **62**, there is formed a tang member **66** whose purpose will be explained hereinafter. The portion **24** of the clip **22** is secured to the undercut **52** and forms a position stop when the clip is slipped over the terminal. A slight force is necessary to remove the clip from the terminal and in its normal use, the clip has sufficient spring-like qualities to positively secure the clip to the terminal.

Referring now to FIG. 2 there is shown the electrical filter assembly of FIG. 1 assembled and mounted on the terminal pin and the entire assembly mounted on a connector block. The connector block **80** is formed of a rear dielectric block portion **82**, and a front dielectric block portion **84**. The rear portion **82** contains counter bores **86** which open to the rear of the block and are contiguous at the front end thereof with a reduced diameter portion **88**. Further, a threaded bore portion **92** is formed in the rear end of the forward block **84** and forms a continuation of the bore **88** so as to allow bolts **94** to be inserted through the counter bore **86** and secure the block **82** to the block **84** when inserted in the bores **88** and **92**.

The rear block **82** contains an enlarged rear bore **102** and a reduced diameter forward bore **104**. A rearward facing shoulder **106** is formed at the junction of the bores **102** and **104**. At the front end of the bore **104** there is formed a forward facing shoulder **108**. Further, a slight flared opening **110** commences at the front end of the outer surface of the bore **104** and terminates at the front surface of the block **82**.

The block **84** contains an enlarged forward bore **114** which terminates at the front end of the block in a flared

opening **116**. The rear end of the block **84** contains a tapered bore **118** which forms a continuation of the flared opening **110** of the block **82** and which is a maximum width at its junction at the rear end fo the bore **114**. The entire block **84** is aluminum plated along the bore surfaces **114** and **118** as well as along the outer surfaces of the block **84** to form a grounding plane.

After the filter member **10** has been mounted on the clip **22** and the terminal member **44** inserted in the clip **22**, a dielectric insulator bushing **122** is slipped over the front end of the terminal pin. The bushing **122** is cup-shaped and contains a front wall **124** having an opening **126** therethrough through which the portion **46** of the terminal member extends and a side wall **128** integral with the front wall **124**. An annular groove **132** is cut into the outer surface of the side wall of the bushing at the center thereof. Further, the inner surface of the side wall **128** contains an enlarged rear diameter bore **134** and a reduced diameter forward bore **136**. A ground spring **142** is secured to the bushing and comprises a cylindrical shaped shell having a lip **144** at its front end which extends into and is secured in the groove **132**. The ground spring **142** contains a front end portion **146** which extends from the lip **144** rearwardly along the outer surface of the bushing **128** and contains an outward bowed portion **148** whose outer surface contacts the aluminum plated bore **120** of the block **84**. Further, the bowed portion terminates inwardly at the rear end **152** thereof, the inner surface thereof being secured to the outer central layer **14** of the filter.

The entire filter assembly including the bushing **128** and spring **148** are inserted through the front end of the block **84** and the tang member **66** of the terminal member **44** is depressed inwardlly so as to allow the terminal member to pass through the bore **104**. When the tang member **66** has passed through the bore **104**, it is released automatically and the front end thereof abuts the rearward facing shoulder **106**, preventing the terminal member from moving in a forward direction. Further, the shoulder **54** prevents the assembly from movement in a rearward direction.

Further, while the filter member **10** has been depicted as a capacitor connected between the terminal member and ground, it should be understood that other arrangements are possible. For example, the filter could be a pi-

filter as depicted in the previously mentioned patent applications.

What is claimed is:

1. A removable electrical filter assembly comprising:

an electrically conductive clip for mounting on a terminal pin member, said clip having a reduced central portion and adjacent enlarged portions, a spring member externally secured to each of said enlarged portions; and

an electrical filter member formed of dielectric material having a conductive inner surface portion removably secured on said clip wherein said spring members are secured to said filter member inner surface.

2. A removable electrical filter assembly in accordance with claim **1** wherein said filter member is cylindrically shaped and wherein said spring members have outwardly extending portions along the outer ends thereof which abut the ends of said filter member when said filter member is counted on said clip.

3. A removable electrical filter assembly in accordance with claim **1** wherein said spring member may be depressed inwardly for mounting and removing said filter member from said clip.

4. A removable electrical filter assembly in accordance with claim **1** wherein said terminal pin member contains a reduced diameter central undercut portion, said clip being removably mounted on said terminal pin member with said reduced central portion of said clip being normally secured to said terminal pin member undercut portion.

5. A removable electrical filter in accordance with claim **4** wherein said terminal member contains means for preventing axial movement of said assembly when mounted in a connector assembly.

References Cited

UNITED STATES PATENTS

3,200,355	8/1965	Dahlen	333—79
3,462,715	8/1969	Schor	333—79

ELI LIEBERMAN, Primary Examiner

M. NUSSBAUM, Assistant Examiner

U.S. Cl. X.R.

339—258

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,539,954 Dated November 10, 1970

Inventor(s) Norman H. Camire

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 4, line 19, "counted" should read -- mounted --.

Signed and sealed this 13th day of April 1971.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

WILLIAM E. SCHUYLER,
Commissioner of Pater