

[54] **FILTERED CONNECTOR WITH BARREL SPRING CONTACT**

[75] Inventor: **Ferdinand William Schor**, Altadena, Calif.

[73] Assignee: **AMP Incorporated**, Harrisburg, Pa.

[22] Filed: **July 15, 1971**

[21] Appl. No.: **162,864**

[52] U.S. Cl. **333/79, 333/70, 339/143 R, 339/252 P**

[51] Int. Cl. **H01h 7/14**

[58] Field of Search **333/70, 79; 339/143, 339/143 R, 252 P**

[56] **References Cited**

UNITED STATES PATENTS

3,200,355	8/1965	Dahlen.....	333/79
3,447,104	5/1969	Schor.....	333/79

3,539,973	10/1970	Antes et al.....	333/79
3,535,676	10/1970	Schultz	333/79

Primary Examiner—Rudolph V. Rolinec

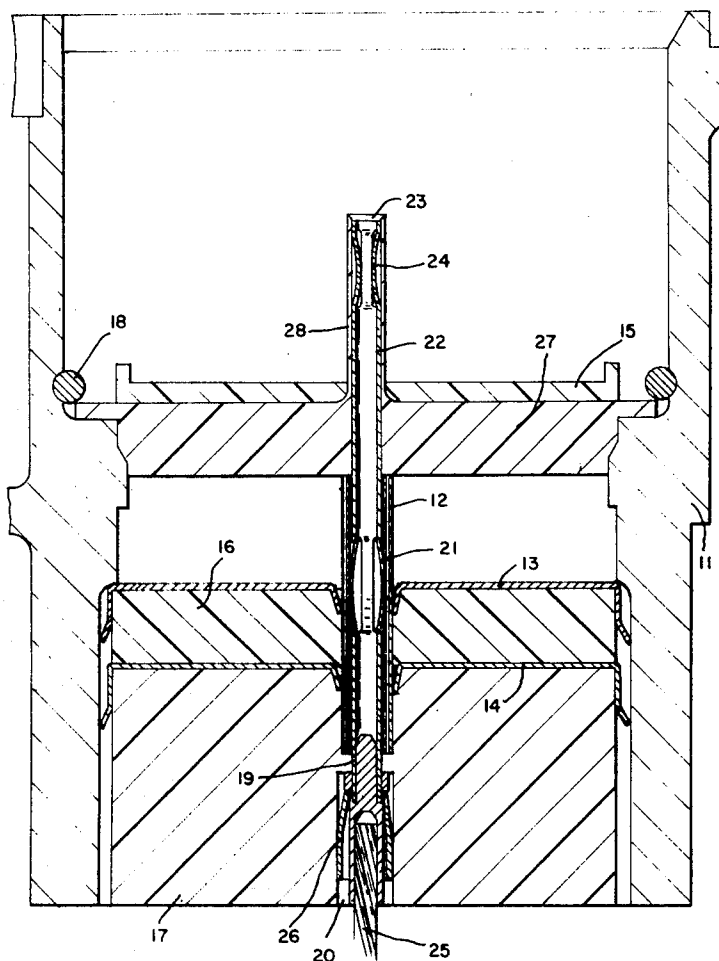
Assistant Examiner—Saxfield Chatmon, Jr.

Attorney—William J. Keating, Jay L. Seitchick et al.

[57] **ABSTRACT**

In a filtered connector a conductive metal tube has a barrel spring contact for receiving a mating pin and another spring contact for making electrical connection to the inside conductive surface of the pin filter. Both of the aforesaid spring contacts are formed from wall portions of the metal tube, and are therefore integral with the tube itself. A wire well at the end of the tube receives the wire which is crimped into the well. A molded plastic jacket has protruding hollow cylinders which form a jacket for the tube. The tube has an open end which receives the pins of a mating connector.

9 Claims, 2 Drawing Figures



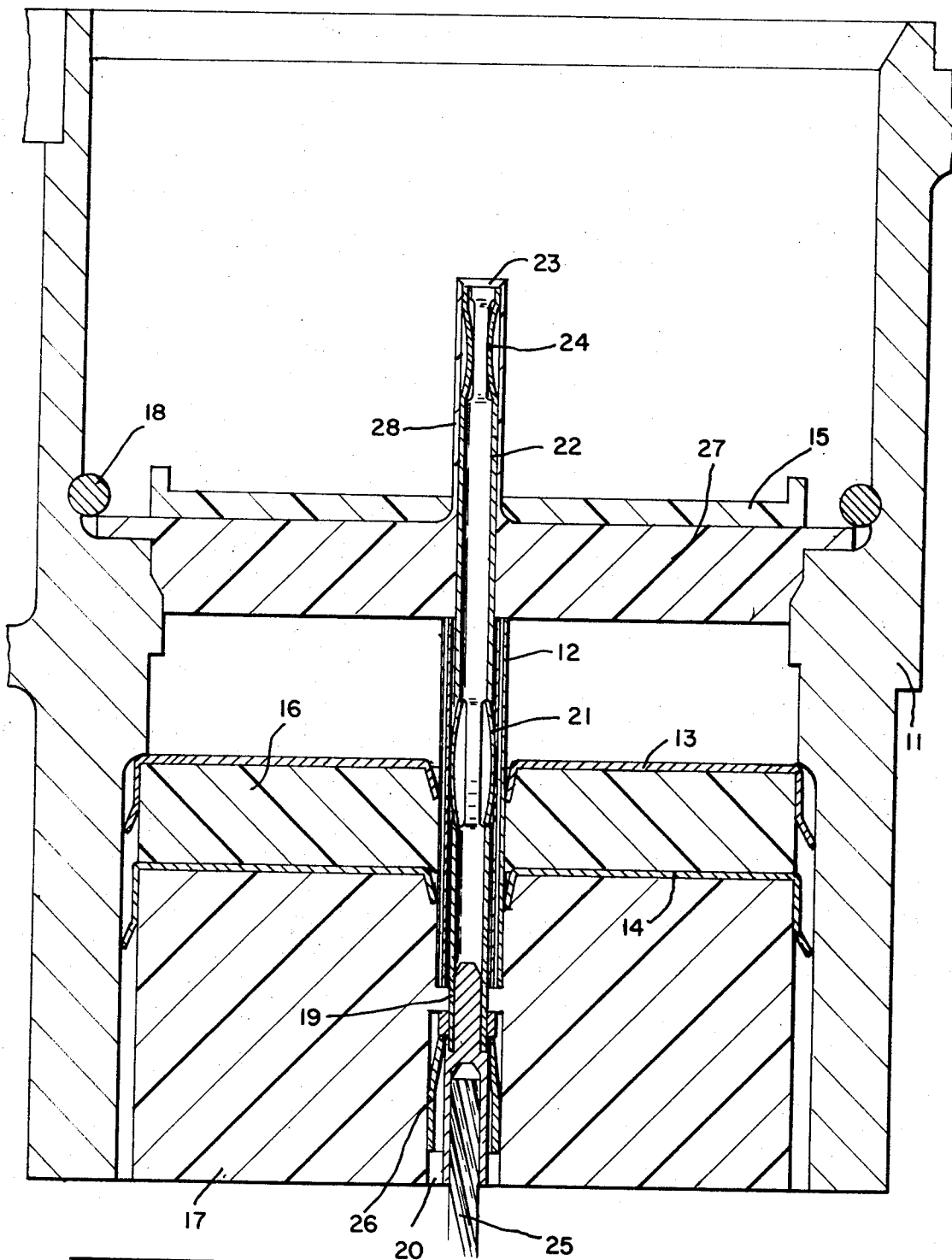


FIG 1

Patented July 3, 1973

3,743,979

2 Sheets-Sheet 2

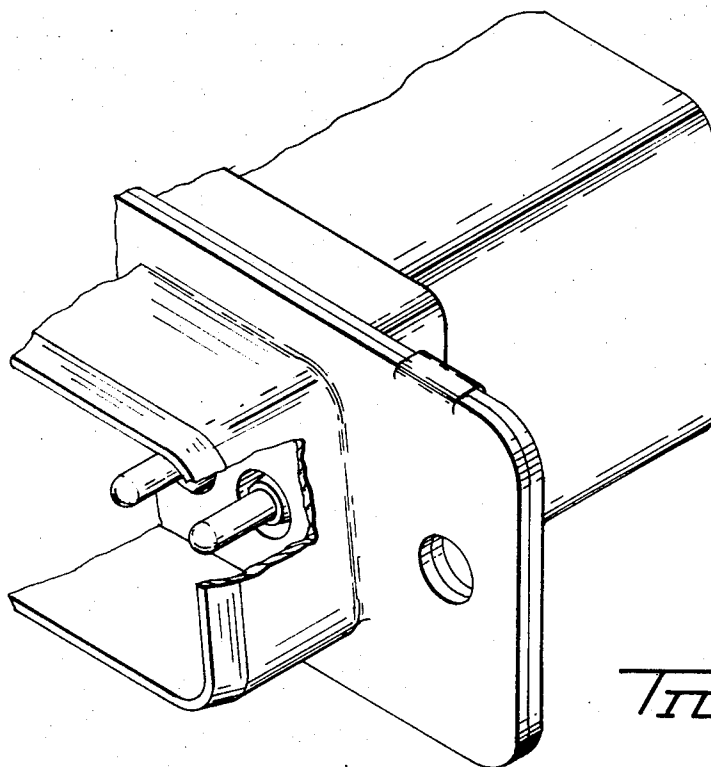


FIG 2

FILTERED CONNECTOR WITH BARREL SPRING CONTACT

BACKGROUND OF THE INVENTION

This invention relates to filtered connectors and more particularly to a connector in which a tubular member provides spring contact for both the mating pin and the filter.

Connector pin filters are shown in U.S. Pat. Nos. 3,447,104 Schor, 3,435,387 Reinke et al., 3,002,162 Garstang. Copending application Ser. No. 883,501, filed Dec. 9, 1969, in the name of William B. Fritz, describes a particularly advantageous pin filter.

These filters commonly include an extruded tube of ferrite. The pin is inserted in the extruded tube and makes contact with an inner conducting layer deposited on the ferrite. A dielectric layer is coated on the ferrite and an outer conductive layer is deposited, as by plating or painting, on the dielectric. This outer conductive layer is generally the common or ground terminal for all filters in a connector. A ground plane in the connector provides a common connection to all of the outer conductors of the filters in the connector.

Some connectors have extremely small, closely spaced pins. In some connectors of this type, the filters have been assembled to the contact pin. Such a connector has the disadvantage that breakage of the filter pin assemblies sometimes occurs while crimping on the lead-in wires. Since the filter pin assemblies are relatively expensive, this is a decided disadvantage.

SUMMARY OF THE INVENTION

In accordance with an important aspect of this invention the wire is pre-crimped into the wire well of the tubular member having two spring contacts. Thereafter the tube is inserted through the filter which is permanently assembled in the connector body. The protruding end of the tube is relatively thick and is not subject to breakage. However, even if there is breakage, the tube can be withdrawn and another inexpensive tube can be inserted in the connector.

The protruding end of the tube has an opening to receive the thin pins of a mating connector. These pins are recessed so that they are not as subject to breakage as would otherwise be the case. The protruding, or contact end of the tube has a barrel spring integral with the tube itself, which spring exerts pressure against the mating pin. The center of the tube has another integral spring which makes contact with the filter. In this manner, electrical connection is made to the pin and the filter by the same conductive metal tube.

In accordance with another aspect of this invention, a molded plastic jacket has a plurality of protruding hollow cylinders which fit over the protruding metallic tubes of the connector. These form a jacket for the contact section of the metal tube.

The foregoing and other objects, features and advantages of the invention will be better understood from the following more detailed description and appended claims.

DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a cross-section of a portion of the connector; and

FIG. 2 shows a perspective view of the connector and the mating pins.

DESCRIPTION OF A PARTICULAR EMBODIMENT

The connector assembly of the invention comprises a connector shell 11. A plurality of pin filters are mounted in the shell, only one of the filters 12 being shown for clarity. These filters are tubular and are commonly an extruded tube of ferrite coated with a dielectric, commonly a barium titanate compound. An outer conductive layer is deposited on the barium titanate. The outer conductive layer on the filter is usually the common connection. A pair of ground planes 13 and 14 of conductive metal provide a low impedance common connection to the outer conductors of all filters. This ground plane arrangement is more fully described in a copending application entitled "Filter Pin Connector Having Low Ground Return Impedance," application Ser. No. 109,423, filed Jan. 25, 1971, Fritz and Schor.

The connector assembly further includes a front insulator 15 and rear insulators 16 and 17 which are of hard phenolic material. A retention spring 18 holds the front assembly in place.

In accordance with this invention a conductive metal tube 19 makes electrical contact with the inside conductor of the filter 12 and with the mating pin. Commonly the tube 19 will be constructed of hard beryllium copper. The tube 19 has a wire receiving portion at one end comprising, for example, a wire well 20 which is crimped onto the tube 19.

The tube 19 has a barrel-type outer spring 21 in the middle. The tube is inserted in the filter 12. This spring 21 exerts pressure against the inner surface of the filter to make a good electrical connection to it.

A contact section 22 at the outer end of tube 19 extends from the front assembly. This section has an end opening 23 adapted to receive a pin of the mating conductor. The contact section 22 has an inner, barrel-type, spring 24 which exerts pressure against the mating pin to establish a good electrical connection to the pin. As an important aspect of the invention, each of the two spring contacts 21 and 24 is formed by cutting a number of narrow parallel slots in the wall of tube 19, directed along the longitudinal axis of the tube, and bending or bowing the arms thus formed between the slots away from the surface of the tube to serve as spring contact elements 21a and 24a. The contact 21 of course has the elements 21a thereof bent outwardly of the tube and the other contact 24 has its elements 24a bent inwardly. It should be noted that the protruding contact section 22 is of larger size than the mating pin and hence is more sturdy. Furthermore, the mating pins are recessed so that they are not as subject to breakage, as is seen in FIG. 2.

In assembling the connector, the wire 25 is first crimped into the wire well 20 before the tube is inserted therein. A retaining spring 26 snaps over a shoulder of the wire well to hold the tube in place in the connector. Even if the tube 19 is bent or damaged during assembly, it can be easily removed without damage to the filter 12.

In accordance with another aspect of this invention, a soft plastic insulator 27 has a plurality of protruding plastic cylinders, the cylinder 28 being shown. These protruding cylinders form jackets for the contact section 22 of the tube. This is particularly advantageous in a water-proof type connector.

A defective filter 12 can also be easily replaced by releasing spring 18 and removing elements 15 and 27,

thus gaining access to the filter array. The filter in question is removed from its tube 19 and replaced.

While a particular embodiment has been shown and described, it will be understood that various modifications are within the true spirit and scope of the invention. The appended claims are intended to cover these modifications.

What is claimed is:

1. A filtering connector assembly comprising, a tubular conductive shell open at its ends and provided with insulation means therewithin, the insulation means having a longitudinally extending bore therethrough, an elongated hollow tubular filter removably held within at least one portion of the bore, an elongated tubular contact element removably mounted within the filter and conductively engaged with the inner wall thereof, the ends of the contact element being accessible at both ends of the bore within the insulation means for engagement with mating contacts, and means within the shell for grounding the outer wall of the filter to the shell.
2. A filtering connector assembly according to claim 8 including means for retaining the contact element within the filter.
3. A filtering connector assembly according to claim 8 wherein the insulation means is provided with a plurality of bores therethrough, there being a said filter within each bore and a said contact element within each filter mounted in the said manner, the means within the shell for grounding the outer wall of a filter being a substantially conductive planar element extending in a plane normal to that of the filters and in direct contact with the outer wall of each of the filters.
4. A filtering connector assembly according to claim 10 and in which at least one further conductive planar element is in direct contact with the outer wall of each of

the filters for grounding them to the shell.

5. A filtering connector assembly according to claim 8 wherein the insulator means is comprised of a pair of longitudinally spaced sections,

one of said sections being removably mounted within the shell and substantially thereacross, the filter being mounted within the other insulator section with one end protruding therefrom and against the adjacent wall of the first insulator section, whereby removal of the first section permits removal of the filter from the shell.

6. A filtering connector assembly according to claim 12 wherein the insulation means is provided with an outwardly protruding insulating cylindrical member secured thereto in coaxial alignment with the bore therein,

at least one end of the contact element normally extending through the insulation means and within the cylindrical member and terminating at the free end thereof.

7. A filtering connector assembly according to claim 13 wherein the cylindrical member protrudes from the first section.

8. A filtering connector assembly according to claim 8 wherein an exposed end of the insulation means within an exposed end of the insulation means within the shell is provided with a protruding insulating cylinder secured thereto and coaxial with the bore therein, the contact member extending in said cylinder and substantially terminating at its free end.

9. A filter assembly according to claim 8 in which the elongated contact member is substantially hollow, an intermediate section thereof being formed with longitudinal slits angularly spaced thereabout, the material between the slits being bowed outwardly to form spring members for engaging the inner wall of the filter.

* * * * *

40

45

50

55

60

65