

Sept. 27, 1966

N. CODA ET AL
 MULTIPLE CONNECTOR WHEREIN PINS HAVE LIMITED
 MOVEMENT WITHIN HOUSING AND EACH PIN
 HAS INTEGRAL LOW-PASS FILTER
 Filed Aug. 20, 1963

3,275,954

FIG. 1

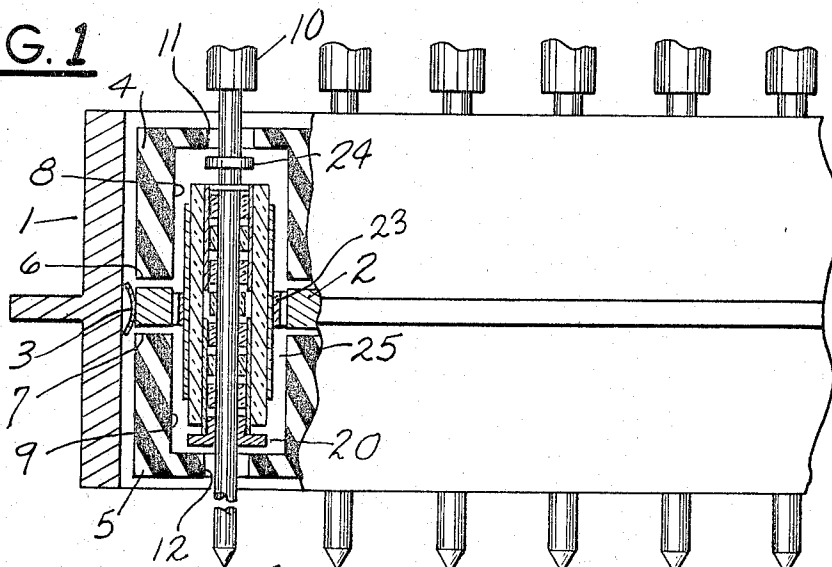


FIG. 2

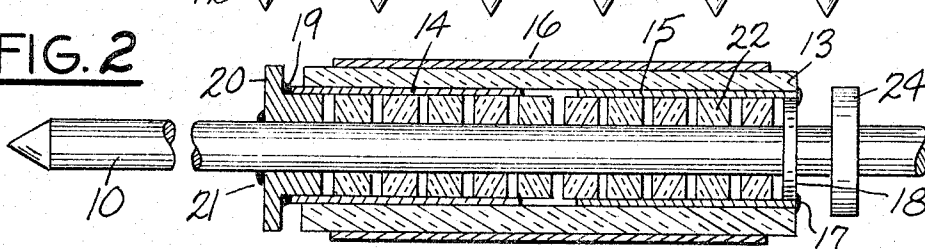


FIG. 3

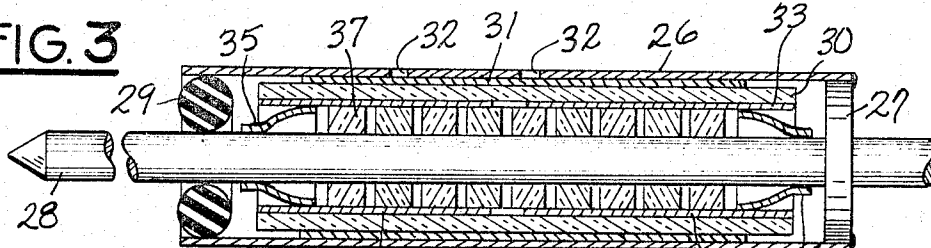


FIG. 4

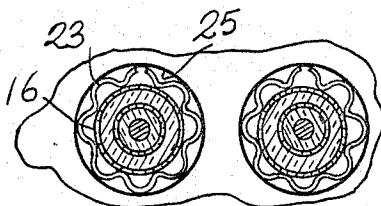
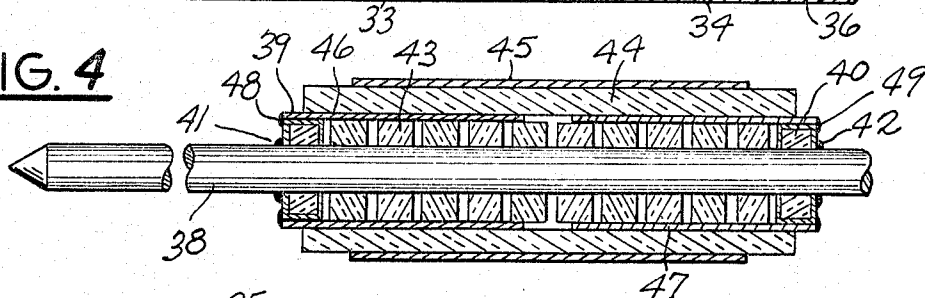


FIG. 5

INVENTORS
Nello Coda
 BY *James J. Walsh*
Ralph Hammer
 Attorneys

1

3,275,954

MULTIPLE CONNECTOR WHEREIN PINS HAVE LIMITED MOVEMENT WITHIN HOUSING AND EACH PIN HAS INTEGRAL LOW-PASS FILTER

Nello Coda, Erie, Pa., and James J. Walsh, Trenton, Ontario, Canada, assignors to Erie Technological Products, Inc., a corporation of Pennsylvania

Filed Aug. 20, 1963, Ser. No. 306,406

9 Claims. (Cl. 333-79)

This invention is a combined connector and filter assembly which eliminates the increased radiation and other complications of separate filters. The filters are solidly mounted on and float with the pins to simplify insertion and withdrawal.

In the drawing, FIG. 1 is an elevation, partly broken away, of a connector; FIG. 2 is a longitudinal section through one of the filter assemblies; FIGS. 3 and 4 are longitudinal sections through modifications of the filter assemblies; and FIG. 5 is a transverse section showing the spring connection between the filter assemblies and the connector.

The connector shown in FIG. 1 is that typical of that used in electronic equipment and may have from 50 to 150 more pins, each representing a circuit. The male connector is shown in FIG. 1. The female counterpart is of conventional design. The term "pin" is used to designate either a male or female connector.

The connector has a metallic housing 1 having at its center a ground plate 2 connected to the inside of the housing by a spring connector 3. On opposite sides of the ground plate are members 4 and 5 of insulating material having surfaces 6 and 7 making clamping engagement with the upper and lower surfaces of the ground plate when the members 4 and 5 are bolted together. Extending from the surfaces 6 and 7 are aligned honeycomb sockets 8 and 9, each associated with a pin 10 of the connector. In the bottoms of the sockets 8, 9 are aligned clearance openings 11, 12 which provide the necessary clearance so that the pins can float to facilitate insertion and removal.

As shown in FIG. 2, each of the pins has a filter assembled thereon comprising a tubular ceramic capacitor 13 with inner electrodes 14 and 15 and an outer electrode 16. The inner electrode 15 is soldered at 17 to a collar 18 integral with the pin. The inner electrode 14 is soldered at 19 to a thimble 20 which is soldered to the pin at 21. Hermetically sealed within the bore of the capacitor are a plurality of ferrite beads 22 telescoped over the pin. The connection between the outer electrode 16 and the ground plate, as shown in FIG. 5, is made through a split metallic sleeve 23 with axially extending corrugations which provides a spring connection between the outer electrode and the ground plate. The sleeve 23 conveniently can be made of hardened shim stock.

In the assembly, the pins 10 are inserted in the recesses 8 in the member 5 which is arranged with its surface 6 presented to the upper side of the ground plate 2. The member 5 is then assembled and the parts 4 and 5 bolted together. The thrusts on insertion and removal of the pins are taken by a collar 24 on the pin and by the thimble 20. The floating of the pins permitted by the clearance between the collars 20, 24 and the bottoms of the sockets 8, 9 and by the clearance between the outer surface of the electrode 16 and the openings 25 in the ground plate facilitate insertion and withdrawal of the pins.

In FIGS. 3 and 4 are shown alternative constructions for the filter assembly. In FIG. 3, the filter assembly is contained within a metal tube 26 soldered to a collar 27 of insulating material on the pin 28. At the opposite end, the tube is sealed by an O-ring 29. Within the tube 26 is a ceramic capacitor 30 having an outer electrode 31

2

soldered to the tube 26 by solder introduced through holes 32. The capacitor has inner electrodes 33, 34 respectively connected to the pin by sleeves 35, 36. Between the sleeves are a plurality of ferrite beads 37. The FIG. 3 assembly provides a precision surface for mounting and taking the thrusts. The outer surface of the metallic tube 26 is easily controlled to the precise dimensions desirable for electrical connection to the ground plate. The ends of the tube 26 provide the thrust surfaces for insertion and removal. The fragile ceramic capacitor is completely protected.

In FIG. 4, the pin 38 has spaced metallized ceramic collars 39, 40 soldered thereto at 41, 42. Between the collars are a plurality of ferrite beads 43. Telescoped over the collars is a ceramic capacitor 44 having an outer electrode 45 and inner electrodes 46, 47 respectively soldered to the collars 39, 40 at 48, 49. The insertion and removal thrusts are taken by the collars 39, 40.

What is claimed as new is:

1. A connector having a ground plate with a plurality of openings extending through the plate, a pair of blocks of insulating material respectively on one and on the opposite side of the ground plate, each block having a plurality of sockets with each socket in one block being aligned with an associated socket in the other block and with the open end of each socket adjacent and aligned with one of said openings and with the bottom of each socket spaced axially from the opening with which it is aligned, a pin extending through each opening and through the bottoms of the associated sockets, a shoulder on the pin within each socket and in thrust relation to the bottom of the socket, a filter assembly on each pin comprising ferrite beads on the pin between the shoulders, tubular ceramic capacitor means telescoped over the pin between the shoulders and extending through each opening and having inner electrodes surrounding the beads and connected to the pin and an outer electrode, and means for electrically connecting the outer electrode to the ground plate.

2. A connector having a ground plate with a plurality of openings extending through the plate, a pair of blocks of insulating material respectively on one and on the opposite side of the ground plate, each block having a plurality of sockets with each socket in one block being aligned with an associated socket in the other block and with the open end of each socket adjacent and aligned with one of said openings and with the bottom of each socket spaced axially from the opening with which it is aligned, a pin extending through each opening and through the bottoms of the associated sockets, a shoulder on the pin within each socket and in thrust relation to the bottom of the socket, a filter assembly on each pin comprising ferrite beads on the pin between the shoulders, tubular ceramic capacitor means telescoped over the pin between the shoulders and extending through each opening and having inner electrodes surrounding the beads and connected to the pin and an outer electrode, and a spring connection between the outer electrode and the ground plate.

3. The construction of claim 2 in which the spring connection is a split metal ring with axially extending corrugations.

4. A connector having a ground plate with a plurality of openings extending through the plate, a pair of blocks of insulating material respectively on one and on the opposite side of the ground plate, each block having a plurality of sockets with each socket in one block being aligned with an associated socket in the other block and with the open end of each socket adjacent and aligned with one of said openings and with the bottom of each socket spaced axially from the opening with which it is aligned, a pin extending through each opening and through

3

the bottom of the associated sockets, a shoulder on the pin within each socket and in thrust relation to the bottom of the socket, a filter assembly on each pin comprising a metal tube extending between and united by electrically conductive material to the shoulders, ferrite beads on the pins within the tube between the shoulders, tubular ceramic capacitor means in the tube having inner electrodes connected to the pin and outer electrodes connected to the metal tube, and a spring connection between each metal tube and the opening in the ground plate with which it is associated.

5. A connector having a ground plate with a plurality of openings extending through the plate, a pair of blocks of insulating material respectively on one end and on the opposite side of the ground plate, each block having a plurality of sockets with each socket in one block being aligned with an associated socket in the other block and with the open end of each socket adjacent and aligned with one of said openings and with the bottom of each socket spaced axially from the opening with which it is aligned, a pin extending through each opening and through the bottom of the associated socket, a shoulder on the pin within each socket and in thrust relation to the bottom of the socket, a filter assembly on each pin comprising a metal tube extending between and united by electrically conductive material to the shoulders, ferrite beads on the pins within the tube between the shoulders, tubular ceramic capacitor means in the tube having inner electrodes connected to the pin and outer electrodes connected to the metal tube, an annular spring contact within each hole in the plate encircling and making electrical and mechanical connection between the plate and the outer electrode metal tube.

6. The construction of claim 5 in which the spring contact is a split metal ring with axially extending corrugations.

7. The construction of claim 1 in which the shoulders are metallized ceramic rings soldered to the pin.

8. A connector having a ground plate with a plurality of openings extending through the plate, a pair of blocks of insulating material respectively on one and on the opposite side of the ground plate, each block having a plurality of sockets with each socket in one block being aligned with an associated socket in the other block and with the open end of each socket adjacent and aligned with one of said openings and with the bottom of each

4

socket spaced axially from the opening with which it is aligned, a pin extending through each opening and through the bottoms of the associated sockets, a filter assembly on each pin comprising axially spaced shoulders on the pin in thrust relation to the bottoms of the sockets, ferrite beads on the pin between the shoulders, tubular ceramic capacitor means between the shoulders having inner electrodes electrically connected to the pin and a tubular outer metal part anchored to said shoulders and having a clearance between it and the opening in the ground plate, an annular spring within each hole in the plate encircling the metal part and making electrical and mechanical connection between it and the plate.

9. A connector having a ground plate with a plurality of openings extending through the plate, a pair of blocks of insulating material respectively on one and on the opposite side of the ground plate, each block having a plurality of sockets with each socket in one block being aligned with an associated socket in the other block and with the open end of each socket adjacent and aligned with one of said openings and with the bottom of each socket spaced axially from the opening with which it is aligned, a pin extending through each opening and through the bottoms of the associated sockets, a filter assembly on each pin comprising axially spaced shoulders on the pin in thrust relation to the bottoms of the sockets, ferrite beads on the pin between the shoulders, tubular ceramic capacitor means between the shoulders having inner electrodes electrically connected to the pin and a tubular outer metal part anchored to said shoulders and having a clearance between it and the opening in the ground plate, and the ground plate having resilient means gripping the metal part at each hole in the plate and making electrical and mechanical connection between it and the plate.

References Cited by the Examiner

UNITED STATES PATENTS

2,973,490	2/1961	Schlicke	333—79
2,983,855	5/1961	Schlicke	317—242
3,002,162	9/1961	Garstang	333—1
3,007,121	10/1961	Schlicke	333—79
3,200,355	8/1965	Dahlen	333—79

HERMAN KARL SAALBACH, *Primary Examiner.*

E. LIEBERMAN, C. BARAFF, *Assistant Examiners.*