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AUSTRALIA
Patents Act 1990

PATENT REQUEST: STANDARD PATENT AND NOTICE OF ENTITLEMENT

I/We, being the person(s) identified below as the Applicant,
request the grant of a patent to the person(s) identified below
as the Nominated Person, for an invention described in the
accompanying standard complete specification.

Full application details follow.

Applicant and Nominated Person:

THOMAS & BETTS CORPORATION
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NEW JERSEY 08807
U.S.A.

Invention Title:

FILTERED PLUG CONNECTOR.

Name(s) of actual inventor(s):

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BASIC CONVENTION APPLICATION(S) DETAILS

Application Number	Country	Country Code	Date of Application
P40 37 602.8	DE		27th November 1990

Drawing number recommended to accompany the abstract: 1

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I,
of

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being the applicant in respect of this Application state the following:-

The person(s) nominated for the grant of the patent:

The nominated person is the assignee of the inventor.

The person(s) nominated for the grant of the patent:

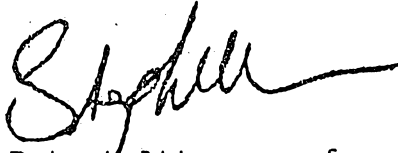
The applicant and nominated person is the basic applicant.

The basic application(s) listed above is/are the first application(s) made in a Convention country in respect of the invention.

THOMAS & BETTS CORPORATION

19th November 1991

GRIFFITH HACK & CO



Patent Attorneys for and
on behalf of the applicant.



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- (56) Prior Art Documents
US 4930200
US 4582385
US 4690479
- (57) Claim

1. A filtered plug connector of the type including a housing having a plurality of bores through which a respective plurality of pins pass, a ground plate supported by said housing and a plurality of multi-layer^{ceramic} capacitors of the type comprising a pair of spaced external electrodes, one electrode of each capacitor being in engagement with a respective pin and the other electrode of each capacitor being in engagement with the ground plate, characterized in that a plate is supported by and holds said capacitors against said housing in a non-rigid manner, and in that said ground plate comprises a resilient portion projecting outwardly from the ground plate for each capacitor, each said resilient portion resiliently engaging one of said capacitor electrodes and pressing said capacitor, so that the capacitor is located between said housing and said plate and is urged towards said pin to thereby cause engagement of said other capacitor electrode with said pin.

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ORIGINAL
COMPLETE SPECIFICATION
STANDARD PATENT

Invention Title:

FILTERED PLUG CONNECTOR.

The following statement is a full description of this invention, including the best method of performing it known to me:-

10/12/85

FILTERED PLUG CONNECTOR1 FIELD OF THE INVENTION:

The invention relates to an electrical connector and, in particular to a plug comprising a housing, a ground plate lying on the inside thereof, bores passing through the housing and openings in the ground plate, plug pins which
5 pass through the bores and the openings and which are held in the former, and multi-layer ceramic capacitors which are arranged on the inside of the housing and which are disposed electrically between the ground plate and the plug pins.

10 BACKGROUND OF THE INVENTION:

Such plugs are known, one of which is shown, for example, in U.S. 4,930,200, to Brush, et al. Plugs of that kind serve for connecting printed circuit boards to other electrical components. The plug pins thereof are inserted
15 with their one ends into the metallized holes in the printed circuit board. Their other ends extend for example to the wires of a cable. In the transmission of the useful signals from the printed circuit board to the cable, high-frequency signals or interference signals are to be removed. The
20 multi-layer ceramic capacitors which are disposed between a ground plate and the plug pins are provided for that purpose. The capacitors are of dimensions of only a very few millimeters and they are arranged on a printed circuit board which is fixed in the plug. Their metallized ends are
25 soldered to conductor tracks of the circuit board. In many cases, they are additionally glued onto the circuit board. In other words, they are rigidly connected thereto. Accordingly, they follow the movements of the circuit board, even if such movements are slight. The circuit board may be
30 twisted and flexed when it is fitted into the plug housing and when the ground plate is clamped in position. Those movements which may also be imposed on the multi-layer ceramic capacitors which could result in their being damaged. Because the capacitors are made of ceramic
35 material, the multi-layer ceramic capacitors are very brittle. In regard to the known plug, it should be noted

that the printed circuit boards represent a particular component and serve only for mechanical and electrical connection of the multi-layer ceramic capacitors.

5 SUMMARY OF THE INVENTION

Taking that state of the art as its basic starting point, the invention is based on the provision of a plug in which high-frequency interference signals are carried away to ground and the multi-layer ceramic capacitors of which are not subjected to a mechanical loading and which can also be produced cost effectively.

The invention provides a filtered plug connector of the type including a housing having a plurality of bores through which a respective plurality of pins pass, a ground plate supported by said housing and a plurality of multi-layer ceramic capacitors of the type comprising a pair of spaced external electrodes, one electrode of each capacitor being in engagement with a respective pin and the other electrode of each capacitor being in engagement with the ground plate, characterized in that a plate is supported by and holds said capacitors against said housing in a non-rigid manner, and in that said ground plate comprises a resilient portion projecting outwardly from the ground plate for each capacitor, each said resilient portion resiliently engaging one of said capacitor electrodes and pressing said capacitor, so that the capacitor is located between said housing and said plate and is urged towards said pin to thereby cause engagement of said other capacitor electrode with said pin.

Such arrangement therefore omits the rigid connection to the printed circuit board and the resulting risk of breakage. Finally, the arrangement also omits the printed



circuit board itself, as an additional cost-incurring component. The elasticity of the ground plate is considered sufficient to clamp the multi-layer ceramic capacitors in position resiliently and nonetheless
5 securely. The capacitors are sufficiently securely held in place from the mechanical point of view. The pressure applied by the ground plate is also sufficient to provide a sound electrical connection. Nevertheless the manner in
10 which the multi-layer ceramic capacitors are held in position between the plug pins on one side and the ground plate on the other side is not rigid. As such, the multi-layer ceramic capacitors do not follow all possible movements, and as a result they are not subjected to a
15 mechanical loading and the risk of breakage _____



1 is reduced.

5 In order to provide a sufficiently large contact or pressure area as between the multi-layer ceramic capacitors and the ground plate, a desirable configuration provides that the openings in the ground plate are surrounded by plate portions which are bent out of the ground plate towards the housing. The height of such plate portions corresponds at least to the thickness of the multi-layer ceramic capacitors, and the latter are clamped between 10 the plate portions and the plug pins. The plate portions have a flat section extending parallel to the end faces of the multi-layer ceramic capacitors. The length of the plate portions approximately corresponds to the height or thickness of the multi-layer ceramic capacitors. The flat 15 section bears against the end faces or metallized ends of the multi-layer ceramic capacitors.

20 So that the ground plate bears in its other regions against the housing of the plug and is not held at a spacing therefrom by its outwardly bent plate portions, a further desirable configuration provides that disposed on the inside of the housing are recesses and the plate portions are bent into said recesses. Furthermore, in another advantageous configuration, a plate lies on the ground plate, the plate having protrusions which are aligned 25 with the openings in the ground plate and the multi-layer ceramic capacitors and bearing against the capacitors. The protrusions of the plate additionally fix the multi-layer ceramic capacitors. Likewise they additionally fix the ground plate.

30 The multi-layer ceramic capacitors may be arranged on one or both sides of the plug pins.

35 When a multi-layer ceramic capacitor is disposed only on one side of the plug pin, desirably, at the side of the plug pin which is remote from the multi-layer ceramic capacitor, the housing has a support which bears against the

1 plug pin. In addition at the side of the multi-layer
ceramic capacitor which is remote from the protrusion of the
plate, the housing may have a support which bears against
the capacitor. The supports are formed integrally with the
5 housing. The first-mentioned support bears against a plug
pin and the additionally mentioned support bears against a
multi-layer ceramic capacitor. By virtue of that
arrangement those components are additionally supported and
fixed in position.

10 Depending on the requirements of the respective
plug, they may also be soldered with one of their metallized
ends to a plug pin and with their other metallized end to
the inwardly bent plate portions of the ground plate.

There are uses in which the plugs are exposed to
15 shocks, shaking movements and/or vibration. For such uses,
an embodiment is recommended in accordance with the
invention in which depressions are provided on the inside of
the housing to receive the multi-layer ceramic capacitors
and the latter are disposed in the depressions. The
20 dimensions of the depressions are so matched to those of the
multi-layer ceramic capacitors that they are positively held
in the depressions.

The above-described manner of mounting the multi-
layer ceramic capacitors in a plug, in accordance with the
25 invention, may also be used in relation to other components.
It is also part of the present invention if other components
such as inductors, resistors or capacitors of another type
are held in the plugs in the described manner.

BRIEF DESCRIPTION OF THE DRAWING:

30 The invention will now be further described by way
of example by means of the embodiments shown in the drawing
in which:

Figure 1 is a partly sectional side view of a
first embodiment of a plug connector.

35 Figure 2 is a partly sectional side view of a
second embodiment illustrating the depression accommodating

1 a multi-layer ceramic capacitor, and

Figure 3 is a view taken along line III-III in Figure 1.

5 Figure 1 shows a part of a printed circuit board 12 with metallized holes 14. Plug pins 16 are fitted into the latter. Some of the plug pins 16 are held together and fixed with a plate portion 18.

10 Figure 1 shows the housing 20, insofar as is essential for the present invention. Bores 22 pass through the housing 20 and accommodate the plug pins 16. A plate 26 lies on the inside 24 of the housing 20, with the interposition of the ground plate which is to be described hereinafter. The plate 26 has protrusions 28. The protrusions 28 bear against the multi-layer ceramic
15 capacitors which are to be described hereinafter. Figure 1 also shows rivet heads 30 which are formed integrally with the housing 20. They pass through openings in the plate 26 and fix the plate 26 to the housing 20.

20 Figure 1 shows three plug pins 16. In regard to the two upper plug pins 16, the multi-layer ceramic capacitors to be described hereinafter are disposed only at the top side thereof. In the case of the lower plug pin 16, the multi-layer ceramic capacitors are disposed on both sides thereof. IN the case off the two upper plug pins 16
25 the housing 20 has supports 32 which are formed integrally therewith. The supports 32 engage under and fix the plug pins 16. In that way the pins are protected from being bent.

30 In the case of all plug pins 16 or multi-layer ceramic capacitors, the housing further has supports or protuberances 34. The supports 34 are also formed integrally with the housing 20 and bear against the left-hand side of the multi-layer ceramic capacitors. In that way the capacitors are fixed in a lateral direction between
35 the protrusions 28 and the supports 34.

1 A ground plate 36 lies on the inward side 24 of
the housing 20. A front plate 40 is disposed on the other
side of the housing 20. A ground conductor 38 which is
5 connected to the ground plate 36 is inserted into a
metallized hole 14. The ground plate 36 also bears with
resilient ends against the inward side of the front plate
40. The ground plate 36 has openings surrounding the plug
10 pins 16. The openings have plate portions 42 which are bent
out towards the left, when looking at Figure 1. The plate
portions include flat sections which lie against an end of
the above-mentioned multi-layer ceramic capacitors 44.

 As shown in Figure 1, the multi-layer ceramic
capacitors 44 are respectively disposed between a plug pin
16 and a plate portion 42. In that arrangement, a
15 respective multi-layer ceramic capacitor bears against each
of the two upper plug pins 16 while two such capacitors bear
against the lower plug pin 16. The multi-layer ceramic
capacitors 44 have metallized ends 46. They can be soldered
20 to the plug pins 16 and the outwardly bent plate portions
42, thereby providing solder locations 46.

 As shown in Figure 2, provided in the inward side
of the housing 20 are depressions 50. The dimensions
thereof are practically identical to those of a multi-layer
ceramic capacitor 42. Each capacitor is pressed into a
25 depression 50 in the direction of the arrow shown i Figure
2 and then positively held therein. Figure 3 shows a region
from Figure 1. When looking at the drawing, multi-layer
ceramic capacitors 44 each bear from above against a plug
pin 16, by way of one of their metallized ends 46.

30 The true scope of the invention is set forth in
the claims appended hereto.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A filtered plug connector of the type including a housing having a plurality of bores through which a respective plurality of pins pass, a ground plate supported by said housing and a plurality of multi-layer^{ceramic} capacitors of the type comprising a pair of spaced external electrodes, one electrode of each capacitor being in engagement with a respective pin and the other electrode of each capacitor being in engagement with the ground plate, characterized in that a plate is supported by and holds said capacitors against said housing in a non-rigid manner, and in that said ground plate comprises a resilient portion projecting outwardly from the ground plate for each capacitor, each said resilient portion resiliently engaging one of said capacitor electrodes and pressing said capacitor, so that the capacitor is located between said housing and said plate and is urged towards said pin to thereby cause engagement of said other capacitor electrode with said pin.

2. A filtered plug connector as claimed in claim 1, characterized in that said ground plate has a plurality of openings through which said respective plurality of pins extend, said ground plate being interposed between said housing and said plate.

3. A filtered plug connector as claimed in claim 2, characterized in that said plate is secured to said housing.

4. A filtered plug connector as claimed in claim 3, characterized in that said pins are generally elongate defining a longitudinal axis, said multi-layer^{ceramic} capacitors



being of parallelepiped configuration and supported between said housing and said plate in a direction generally transverse to the axis of a respective pin, said housing and said plate bearing against each said capacitor on opposite surfaces thereof and substantially preventing movement of each said capacitor in a direction along the pin axis, the resilient portion of the ground plate providing resilient clamping of the capacitor against the pin in a direction transverse to each said pin axis.

5. A filtered plug connector as claimed in claim 4, characterized in that said resilient portions 42 are adjacent the respective openings in the ground plate and are bent out of the ground plate towards the housing.

6. A filtered plug connector as claimed in claim 5, characterized in that recesses are provided on the inside of the housing and the plate portions are bent into said recesses.

7. A filtered plug connector as claimed in claim 4, characterized in that said plate has protrusions which are aligned with and extend into the openings in the ground plate and bear against one surface of the multi-layer^{ceramic} capacitors.

8. A filtered plug connector as claimed in claim 7, characterized in that at the surface of the multi-layer ceramic capacitors which is opposite the protrusion of the plate, the housing has a support bearing against such surface of the capacitors.

9. A filtered plug connector as claimed in claim 4, characterized in that at a side of ~~the plug~~^{each} pin which is



remote from the multi-layer ceramic capacitor; the housing has a support which bears against such side of ^{each} ~~the plug~~ pin.

10. A filtered connector as claimed in claim 4, characterized in that depressions are provided on the inside of the housing receiving respectively the multi-layer ceramic capacitors.

11. A filtered plug connector as claimed in claim 1, characterized in that the multi-layer ceramic capacitors are soldered with a metallized electrode to the plug pins.

12. A filtered plug connector as claimed in claim 11, characterized in that the multi-layer ceramic capacitors are soldered with another metallized electrode to the plate portions of the ground plate.

Dated this 4th day of May 1993

THOMAS & BETTS CORPORATION

By Its Patent Attorneys:

GRIFFITH HACK & CO.

Fellows Institute of Patent
Attorneys of Australia.

FILTERED PLUG CONNECTOR

1 ABSTRACT:

The invention concerns a filtered plug connector comprising a housing and plug pins which are held therein. The filtering of high-frequency signals to ground is achieved by multi-layer ceramic capacitors electrically connected between the plug pins and a ground plate. For mechanically fixing same, the capacitors are resiliently clamped between the plug pins and bent, resilient portions which project from the ground plate adjacent openings in the ground plate through which the pins pass.

5

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FIG. 1

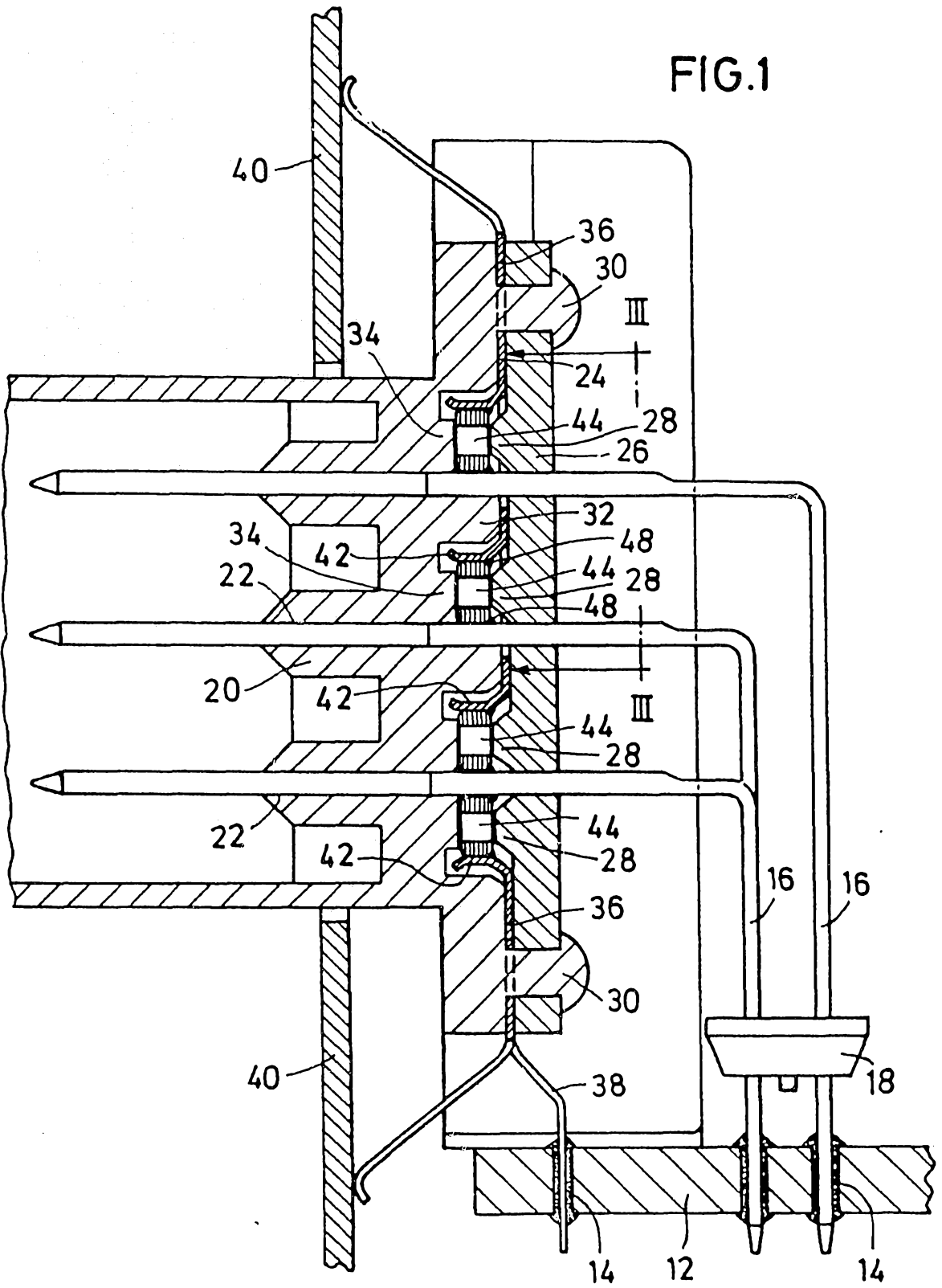


FIG. 2

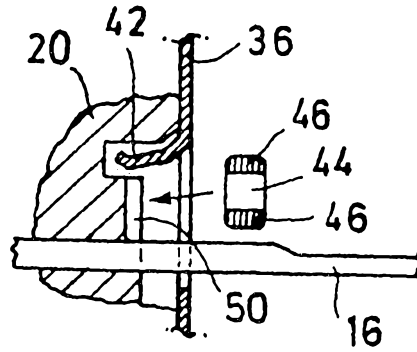


FIG. 3

