

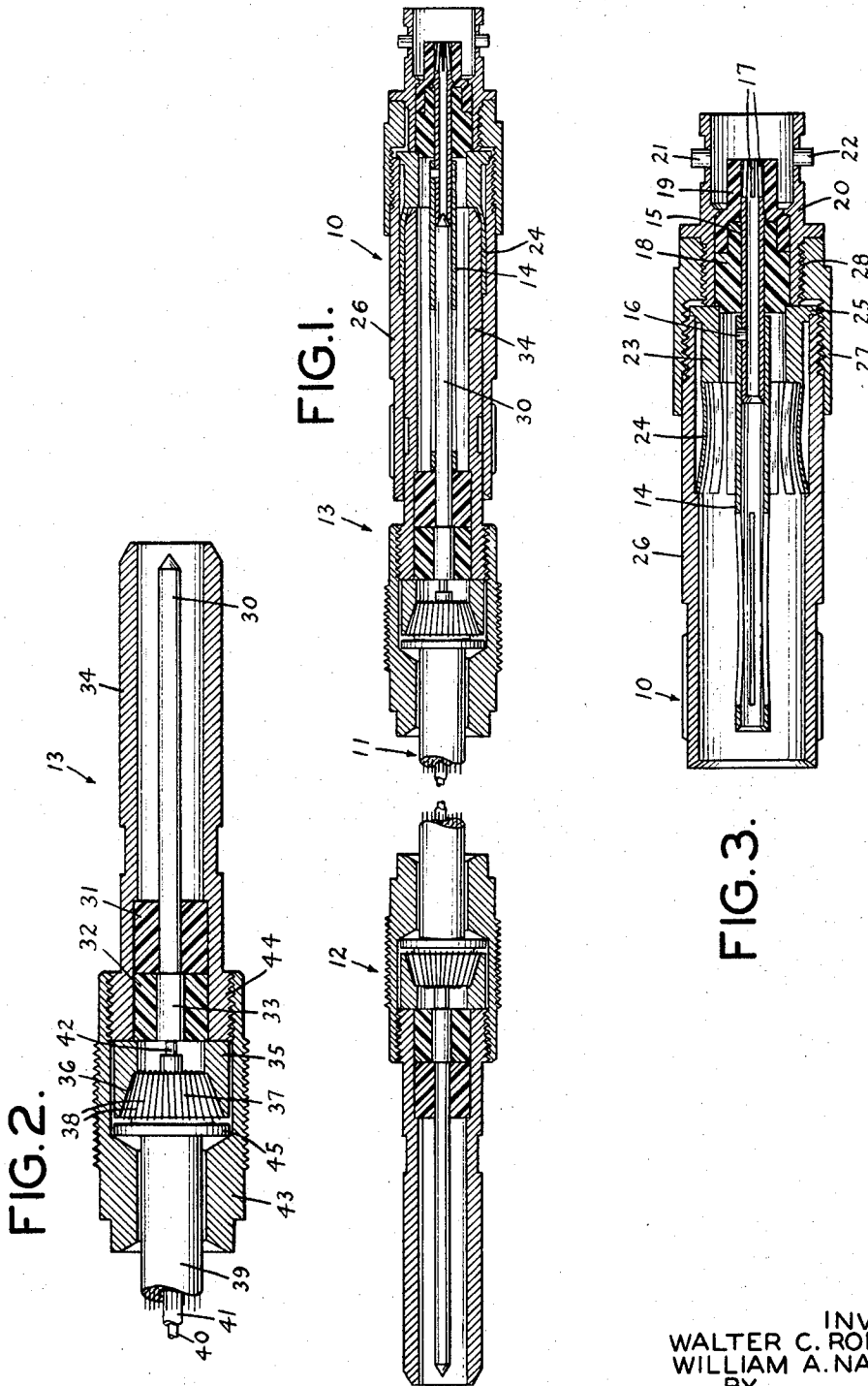
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W. C. ROBINSON ETAL

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JACKS AND PLUGS FOR ELECTRONIC EQUIPMENT

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INVENTORS:
WALTER C. ROBINSON
WILLIAM A. NAGEL, JR.

BY

Brunn, Free, Francis & Associates
THEIR ATTORNEYS

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JACKS AND PLUGS FOR ELECTRONIC EQUIPMENT

Walter C. Robinson, Cherry Hill, N.J., and William A. Nagel, Jr., Silver Spring, Md., assignors, by mesne assignments, to Defense Electronics Inc., Rockville, Md., a corporation of Delaware

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1 Claim. (Cl. 339-143)

This invention relates to improvements in jacks and plugs for electronic equipment and more particularly to jacks and plugs for use in television and telemetry and other high frequency circuitry.

The jacks in switchboards and plugs on patch cords and the like for radio, television and other electronic equipment are commonly connected to shielded or coaxial cables to prevent spurious signals being induced in adjacent cables.

The above-mentioned jacks and plugs usually include an outer tubular sleeve to which a cable shield is connected by soldering or other means and an inner pin in the plug and a complementary tubular socket in the jack, the pin and socket being connected also by soldering or other means to the conductors in the shielded cables. The sleeves and the pin and socket are telescopically engaged to connect the cable shields and the conductors, respectively.

For use with electronic equipment involving high frequencies, it has been customary to form the conductive portions, e.g., sleeves, pin and socket of the jacks and plugs of brass. Because of the low corrosion-resistance of brass, the brass portions are plated with a layer of silver and an exterior layer of gold about 40 millionths of an inch thick. So long as the plating on the conductive portions is intact, the brass parts do not corrode, even under severe conditions. However, the gold and silver layers are thin and soft and after a short time are worn off exposing the underlying brass which then may and frequently does corrode, changing the electrical resistance of the jack and plug connection. Also, the gold and silver particles abraded from the parts may collect in the bottom of the jack and form a leakage path between the conductor and the shield within the jack.

It has been suggested that the brass parts of the jack and plug could be plated with a harder wear and corrosion-resistance material, such as rhodium, and rhodium-plated jacks and plugs have been produced. However, even the use of rhodium on brass plugs and jacks has not overcome all of their disadvantages. For example, they can be damaged or deformed easily by accidental impact and/or abrasion.

The unsatisfactory physical characteristics of the prior brass jacks and plugs led us to conclude that they should be formed of harder and more corrosion-resistant material than brass, such as stainless steel. However, tests of jacks and plugs made of stainless steel show that while the resistance to corrosion, wear and deformation were greatly improved, the electrical characteristics suffered, particularly in a sharp and undesirable change in their conductivity at high frequencies. Replacement of stainless steel pins and sockets in the plug and jack with gold plated brass pins and sockets did not completely restore the conductivity at high frequencies.

In accordance with the present invention, we have provided jacks and plugs which have greatly improved resistance to corrosion, wear and deformation and a conductivity and voltage standing wave ratio (V.S.W.R.) entirely satisfactory for use at high frequencies.

More particularly, the new jacks and plugs have telescoping tubular portions formed of stainless steel for connection with the shields of shielded cables and rho-

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dium plated copper pins and sockets for connection with the conductors in the cables. Such jacks and plugs are highly resistant to deterioration and damage and have excellent conductivity at high frequencies and a V.S.W.R. of 1.5-1 to 4 kmc.

The presence or absence of rhodium plating on the copper pins and sockets has no appreciable effect on the conductivity and V.S.W.R. of the jack and plug, but it imparts a high resistance to corrosion and abrasion to the softer copper parts so that repeated insertion of the plug in and removal of the plug from the jack does not appreciably change their fit or the electrical characteristics of electronic circuits containing the new jacks and plugs.

For a better understanding of the present invention, reference may be had to the accompanying drawings, in which:

FIGURE 1 is a view in longitudinal section of a jack and a patch cord having plugs at its opposite ends embodying the present invention;

FIGURE 2 is a view in longitudinal section and on enlarged scale of one of the plugs shown in FIGURE 1;

FIGURE 3 is a view in longitudinal section and on enlarged scale of the jack shown in FIGURE 1.

For purposes of illustration, a single jack 10 is illustrated in combination with a patch cord 11 having plugs 12 and 13 at its opposite ends. It will be understood that in a typical switchboard or connector panel for electronic equipment, a plurality of jacks and a plurality of patch cords 11 will be provided for making connections between pairs of jacks in the switchboard.

The mechanical structures of the patch cord and jack are largely conventional, as illustrated, although some structural features thereof may not have been combined heretofore in prior jacks and plugs. The jack 10 includes a central, slotted tubular socket 14 having a reduced tubular extension 15 inserted within and connected to the socket by means of a pin 16 to enable the central conductor of a shielded cable to be connected to it. The right-hand end of the tubular extension 15 is provided with a plurality of slots 17 so that the end of the extension can be sprung inwardly to make contact with a pin soldered to or otherwise connected to the central conductor of the shielded cable.

A pair of interfitting generally ring-shaped insulating members 18 and 19 formed of Teflon, polyethylene, polypropylene or the like are mounted on the tubular extension and hold the socket 14 and extension 15 in spaced relation to a sleeve 20 having at its right-hand end a pair of pins 21 and 22 which cooperate with a socket-type connector, not shown, having bayonet slots for receiving the pins. The connector is soldered or otherwise secured to the sheath of the cable.

Surrounding the inner end of the socket 14 and engaging the insulating ring 18 is a sleeve 23 having a plurality of resilient fingers 24 which are bowed inwardly for engagement with the plug 13 as will be described hereinafter. A flange 25 on the sleeve 23 is held in engagement with a tubular outer sleeve 26 by means of a collar 27 which is threaded on the right-hand end of the sleeve 26.

The collar 27 is also threaded on a threaded portion 28 of the sleeve 20 so that its end engages the sleeve 23 with the latter also engaging the innermost insulating ring 18 and thereby holding all of the elements described in assembled relation.

A typical plug includes a center pin 30 which has its inner end slidable received in a pair of insulating sleeves 31 and 32, the sleeve 32 surrounding a tubular extension 33 which is telescoped over the pin 30 and pinned or otherwise secured thereto. The ring-like insulators 31 and 32 hold the pin 30 concentrically and coaxially within the

outer sleeve 34 of the plug. Abutting the left-hand end of the sleeve 34 is a ring-like connector member 35 having a conical inner surface 36 for receiving a complementary conical plug 37. The conical surface 36 and the plug 37 serve as a means for connecting the shield wires 38 of a shielded conductor 39 to the sleeve 34. The insulation is removed from the outside of the cable 34 and the conductors 38 frayed out and bent back against the conical surface 37 and the latter is then forced into the conical recess 36 to grip the shield wires 38 therebetween.

A central conductor 40 surrounded by a layer of insulation 41 extends through a central opening, not shown, in the plug 37, and the bared end 42 of the conductor 40 is soldered or otherwise connected to the extension 33.

An outer clamping sleeve 43 is threaded on a threaded portion 44 on the sleeve 35 and can be tightened to engage a rim 45 on the conical member 37 to force it toward and the shield wires tightly against the conical surface 36, thereby establishing a good electrical connection between the tubular sleeve 34 and the shield wires 38 which does not require soldering. This type of connection is particularly useful in the field where soldering equipment sometimes is not readily available.

In the jack and plug illustrated, the insulating rings 18 and 19 and the rings 31 and 32 can be formed of any suitable insulating material such as, for example, Teflon, polyethylene, polypropylene or the like.

In accordance with the invention, all of the other parts of the jack and plug except the socket 14, extension 15, pin 30 and extension 33 may appropriately be formed of stainless steel in order to produce a sturdy wear, corrosion and impact resistant structure. The socket 14 and its extension 15 and the pin 30 and its extension 33 are formed of a good machining type of copper or beryllium copper, for example, copper containing 2% lead and are plated with rhodium. If desired, the sleeve 23 and its fingers 24 may be formed of rhodium plated beryllium copper which is inherently a springy material. By providing jacks and plugs with a copper or beryllium copper socket 14 and a copper or beryllium copper pin 30, respectively, the conductivity of the jacks and plugs is superior at high frequencies. Accordingly, not only do the

new jacks and plugs have greatly improved physical resistance to damage, but their electrical properties are markedly enhanced.

While a typical jack and plug structure has been described herein, it will be understood that the manner in which the pin and socket of the plug and jack are mounted in the outer tubular shells and the structure of the outer tubular shells may be modified widely in size and relationship without departing from the invention. Accordingly, the form of the invention should be considered as illustrative and not as limiting the scope of the invention as defined in the claim.

We claim:

1. Plug and jack for shielded cable connection in high frequency circuitry, each comprising a rigid, nonplated stainless steel sleeve for direct steel-to-steel, telescoping engagement with one another, connecting means for coupling a sheath of a cable, shielding a conductor therein, associated with each of said stainless steel sleeves, a copper-bearing contact member of higher electric conductivity than stainless steel within each sleeve, means for connecting a conductor to each said contact member, insulating means interposed between each said contact member and sleeve, and contact-effecting means of higher conductivity material than stainless steel intermediate the plug and jack and engaging portions of the outer stainless steel surface of the plug and the inner stainless steel surface of the jack, when they are in assembled relation, to provide a supplemental path of higher conductivity therebetween.

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RICHARD E. MOORE, *Primary Examiner*.