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F. A. KORN

2,465,540

ELECTRICAL CONNECTOR

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FIG. 1

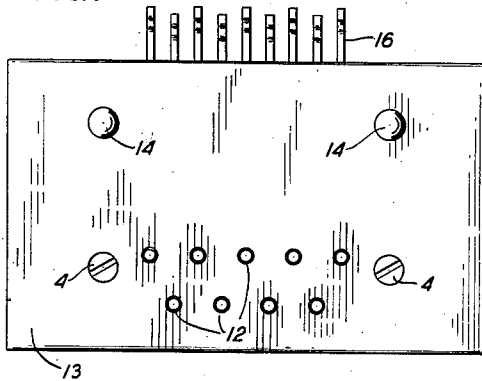


FIG. 2

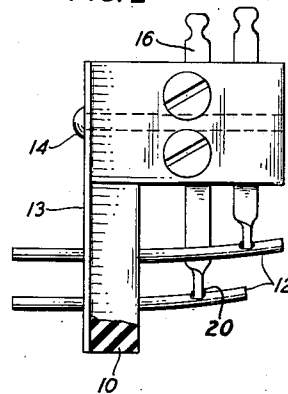


FIG. 3

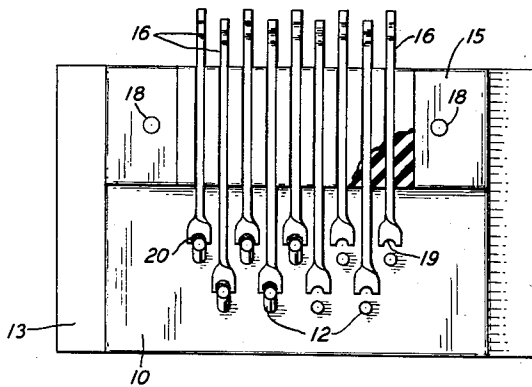


FIG. 4

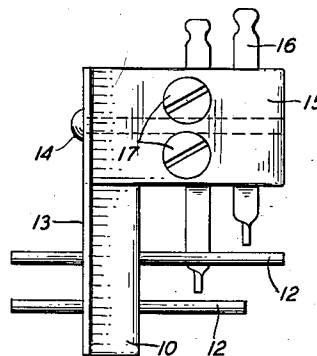
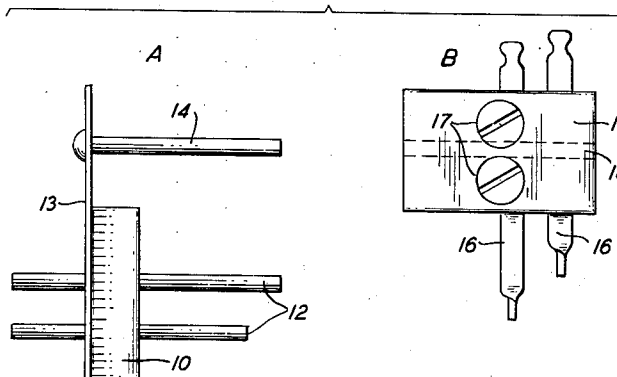


FIG. 5



INVENTOR
F. A. KORN

BY *A. J. Kane*

ATTORNEY

UNITED STATES PATENT OFFICE

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ELECTRICAL CONNECTOR

Franklin A. Korn, Westfield, N. J., assignor to
Bell Telephone Laboratories, Incorporated, New
York, N. Y., a corporation of New York

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3 Claims. (Cl. 173-328)

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This invention relates to electrical connectors and particularly to multilead connectors of the jack and plug type.

Jack and plug type connectors are commonly used to interconnect various types of apparatus and circuits employed in electrical systems and are characterized by a sliding engagement of the corresponding spring elements thereof. Such connectors are quickly separable and facilitate the making and breaking of circuits interconnected thereby. The trend in the design of electric systems in general and of automatic telephone switching systems particularly is in the direction of unit design. That is, a system is divided into a plurality of independent, but mutually cooperable units each of which may be enclosed in a container and, in some cases, hermetically sealed. With such type of construction each outgoing lead from a unit would be terminated on a contact of a connector, the primary role of which would be to disconnect and break circuits fairly rapidly and to permit removal and replacement of the unit in case this becomes necessary for maintenance reasons. The connector simplifies such a procedure for wiring and servicing operations compared to the conventional type terminal strip. It has the advantage of eliminating the danger of rewiring leads incorrectly and also avoids the possibility of damage to the connecting wires should it become necessary to change a unit more frequently than might otherwise be expected under ordinary conditions. The life objective for sealed electrical equipment units, particularly for telephone central office equipment, is forty years and it has been found that considerable trouble could be expected to develop in the nature of open, or high resistance contacts if the conventional sliding type terminal connections were depended upon.

It is the object of this invention to provide an electrical connector of the jack and plug type which permits rapid disassociation of the plug from the jack and which, at the same time, insures reliable electrical contact between the corresponding spring elements thereof which is not attained by the conventional sliding type of terminal connections.

This object is attained in accordance with a feature of the invention by utilizing, in an electrical connector, terminal connections which embody the electrical reliability and permanence of soldered connections and which, at the same time, permit the terminal connections to be conveniently and rapidly broken and thereby to

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render the jack and plug elements of the connector quickly separable. More particularly, the connector of this invention is made up of two parts which, for convenience, may be designated a jack and a plug, each of which is provided with a plurality of cooperable contact springs having terminal ends to which individual conductors may be secured and mutually engageable ends normally tinned. Unlike the conventional type of plug and jack connector the contact springs of each element of the connector of this invention are so disposed that when the plug element is inserted in the jack element no physical contact is made between the respective springs. The arrangement is such that the plug springs must be manually flexed in the direction of the jack springs in order to effect contact therebetween. When this contact is effected the tinned ends of the springs are soldered together so that a permanent engagement between the springs is obtained with the plug springs under tension. This type of terminal connection imparts to the connection the contact reliability and permanence of soldered connections and at the same time serves to permit quick and convenient separation of the two elements of the connector. When it is desired to separate the jack and plug elements it is only necessary that a hot soldering iron be applied to the soldered connections to fuse the solder, whereupon the plug springs, having been held under tension, snap out of engagement with their corresponding jack springs and assume their normal untensioned condition. Thus the connections may be rapidly broken and the plug withdrawn from the jack.

The invention will be better understood from the following detailed description when read in connection with the accompanying drawing, in which:

Fig. 1 is a front view of the connector of this invention;

Fig. 2 is a side view of the connector shown in Fig. 1;

Fig. 3 is a rear view of the connector shown in Fig. 1 and illustrates certain of the plug and jack springs in electrical contact and certain others in their normal disengaged relationship;

Fig. 4 is a side view of the connector showing the normal clearance between the jack and plug springs prior to the soldering operation; and

Fig. 5 is an exploded view of the connector showing the jack and plug elements of the connector separated.

The plug element of the connector as shown at A in Fig. 5 comprises an insulating block

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which is rectangular in form, a plurality of pin-type plug contacts 12 arranged in two superposed rows and supported in the block 10 in any well known manner. If desirable the plug elements 10 and 12 may be combined in a molding process. As clearly indicated in Figs. 1 and 3, the plug springs 12 of one row are arranged in staggered relation to the springs of the other row. A plate 13 is fixed by means of screws 4 to the front face of the block 10 and projects vertically beyond the upper edge of the block. As will appear hereinafter, the extent to which the plate 13 extends above the block 10 corresponds to the height of the jack insulating block. Substantially mid-way of the vertically extending portion of plate 13 and located near each end thereof is a hole which accommodates a guide pin 14. The plug springs 12 project forwardly and rearwardly from the block 10 and the springs of the upper row extend rearwardly further than the springs of the lower row. The ends of the rearwardly projecting portions of springs 12 are tinned. The forward ends of the springs provide terminals to which individual wires may be connected.

The jack element of the connector shown at B in Fig. 5 comprises an insulating block 15 which supports two rows of equi-spaced flat contact springs 16 which are held in position in any suitable manner. If desirable the jack element may be made up of alternate springs and insulating spacers held together as a unitary structure by screws 17. The insulator 15 is provided with two centrally located cylindrical bores or holes 18 which snugly accommodate the guide pins 14 of the plug.

The upper ends of the jack springs are provided with terminals to which external wiring may be connected and their lower ends are twisted at right angles to the normal plane of the springs and are tinned. As more clearly disclosed in Fig. 3 the lower edge of each jack spring is provided with a concave or semicircular slot 19, the inner peripheral contour of which is such as to conveniently accommodate the circularly sectioned plug springs 12. The arrangement of the jack springs corresponds to that of the plug springs, that is, the springs of the two rows are arranged in staggered relation.

When the connector is to be assembled, the guide pins 14 of the plug are inserted in the holes 18 of the jack insulator 15 and the plug is pushed inwardly until the projecting portion of the plate 13 abuts the forward face of the jack insulator. It will be observed that in this position of the connector elements, the forward end of the jack insulator 15 rests upon the upper face of the plug insulator. This construction together with the confinement of the guide pins 14 in the holes 18 fix the two elements of the connector in position. It will be further noted, with particular reference to Fig. 4 that when this assembly is effected the plug springs 12 do not engage their corresponding jack springs and that there is a clearance between the upper edge of the plug springs and the edge of the slots 19 in the jack springs. However, the plug springs are in alignment with their corresponding jack springs so that contact therebetween is effected by flexing the plug springs upwardly until the edges thereof enter the slots 19 in the corresponding jack springs. Thus, in this position the plug springs are under tension. While thus in contact the tinned ends of corresponding jack and plug springs are soldered together, the solder being indicated at 20 in Fig. 3.

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It will be observed that the two elements of the connector are effectively physically joined by the soldered connections of their respective springs and that the electrical continuity between such springs is assured by the solder, and that the connector is thus assured of reliable electrical contacts which are impervious to the effects of dirt and dust and which will not accidentally become separated. Such undesirable features are characteristic of the conventional sliding type of jack and plug connectors.

To effect the separation of the jack and plug elements, it is only necessary that a hot soldering iron be applied to the solder at the junction of the jack and plug springs so that as the solder fuses the plug springs snap away from their corresponding jack springs and resume their normal spaced relation thereto. The electrical continuity of the jack and plug springs is thus interrupted as is also the permanent physical connection between the jack and plug elements. The plug may then be withdrawn from the jack.

It is apparent that the connector of this invention combines reliability of contact with facility of separation of the two elements thereof and thereby satisfies essential requirements for such a device when employed with unitary circuit and apparatus assembly units whose anticipated service life is such as to preclude the use of sliding terminal connections which are subject to opens and faults caused by dirt, dust, etc.

While the foregoing description deals primarily with the soldering of the plug and jack contacts while under tension it is to be understood that such contacts may be soldered untensioned and when it is desired to separate them the contacts may be placed under tension by means of a suitable tool and a hot soldering iron applied to the soldered connections. Upon fusing of the solder, the now tensioned contact members would automatically separate.

What is claimed is:

1. In combination, a plug having a plurality of equi-spaced contact springs, a jack having a plurality of equi-spaced contact springs, co-operable means on said plug and jack units for supporting one unit on the other unit so that the contact springs of one of said units are normally in disengaged relation to the contact springs of the other unit and require flexing in the direction thereof to effect engagement therebetween, and fusible solder connecting the flexed springs of the said one of said units with the springs of the other of said units.

2. In combination, a plug unit comprising an insulator, a plurality of plug springs horizontally disposed and mounted in said insulator, a jack unit comprising an insulator, a plurality of jack springs vertically disposed and mounted in said jack insulator, a guide pin associated with said plug unit, the insulator of said jack unit having a hole therein for the reception of said guide pin when said plug and jack units are assembled, and the relative disposition of the springs on their respective blocks being such that upon assembly of said plug and jack units the said vertically disposed jack springs have their end edges in spaced alignment with the horizontally disposed plug springs so that said plug springs require manual tensioning in the direction of said jack springs to effect engagement therebetween, and a fusible material joining the tensioned plug springs with the inner edges of corresponding jack springs.

3. In combination, a pair of mutually coopera-

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ble electric circuit connector units each comprising a plurality of spaced contact springs, means mounting said units relative to one another so that the engageable ends of the springs thereof are mutually disposed at right angles when said units are in assembled relation, and means comprising fusible solder electrically joining individual cooperating spring ends of said units, the springs of said units being mutually flexible relative to one another whereby, when so flexed, corresponding spring ends of said units are held in engagement under tension by said solder means and are automatically spatially separated upon fusing of said solder means.

FRANKLIN A. KORN. 15

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