

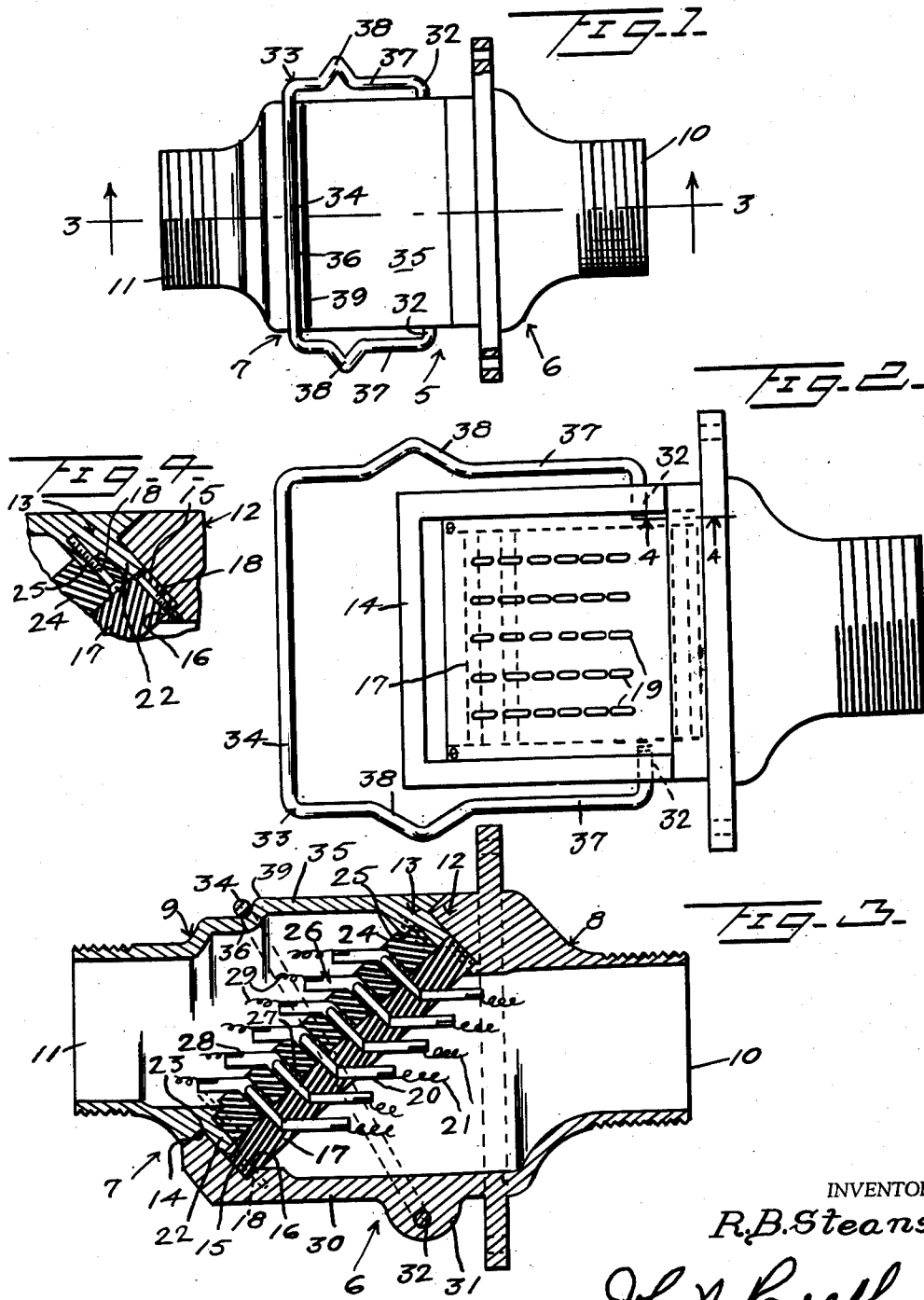
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ELECTRICAL CONNECTOR

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ELECTRICAL CONNECTOR

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This invention relates to a novel electrical connector formed of male and female sections having mating surfaces disposed substantially at an oblique angle to the longitudinal axis of the connector whereby a substantial increase in area available for mounting of the connector pins and sockets is realized without enlargement of the over-all cross sectional size of the connector.

Another object of the invention is to provide an electrical connector wherein the plates of insulating or dielectric material are disposed at an angle substantially oblique to the axis of the connector for accommodating therein pins and sockets of angular configuration providing a cascade arrangement on the wire sides of the insulating plates to facilitate securing conductor wires to the pins and sockets by either soldering or staking.

Still another object of the invention is to provide an electrical connector which, due to the angular disposition of the mating surfaces thereof relative to the axis of the connector, enables use of an extremely simple locking device for effectively securing the connector halves detachably together.

Still a further object of the invention is to provide an electrical connector possessing greater tensile strength in a direction longitudinally thereof, due to the angular disposition of its mating surfaces, than is possessed by conventional electrical connectors, to minimize the possibility of separation of the connector halves in response to pulling forces exerted longitudinally of the connector.

Various other objects and advantages of the invention will hereinafter become more fully apparent from the following description of the drawing, illustrating a presently preferred embodiment thereof, and wherein:

Figure 1 is a plan view of the assembled electrical connector, partly in section;

Figure 2 is a plan view on an enlarged scale;

Figure 3 is a longitudinal sectional view taken substantially along a plane as indicated by the line 3-3 of Figure 1, and

Figure 4 is an enlarged detailed vertical sectional view of a part of the connector, taken substantially along a plane as indicated by the line 4-4 of Figure 2.

Referring more specifically to the drawing, the electrical connector in its entirety is designated generally 5 and includes a section or half 6, and a section or half 7. The section 6 includes a hollow shell 8 and the section 7 includes a hollow shell 9. The shells 8 and 9 have open ends, and the open remote ends 10 and 11, respectively, thereof through which the conductor wires extend into the shells may be of any conventional size and configuration. However, the opposite open mating inner ends 12 and 13 of the shells 8 and 9, respectively, are of unique construction and are disposed preferably at substantially oblique angles to the longitudinal axis of the connector 5 rather than at right angles thereto, as is conventional.

The inner end 12 of the shell 8 includes a substantially flat marginal surface 14 surrounding the open inner end of the bore of the shell 8 which is defined by walls 15 which are disposed approximately at right angles to the marginal surface 14. The shell 8 is provided with internal shoulders 16 at the inner ends of the walls

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15 which face outwardly of the inner end 12. A relatively thick plate 17 of a dielectric or electrical insulating material fits snugly within the open inner end 12 of the shell 8 against the walls 15 and has marginal portions thereof abutting the shoulders 16 and preferably secured thereto by screw fastenings 18, as best seen in Figure 4. The plate 17 is of substantial thickness but is of a thickness substantially less than the width of the walls 15 as measured between the marginal surface 14 and shoulders 16, so that the outer side of the plate 17 is considerably recessed or countersunk relative to said marginal surface 14.

A plurality of contact pins 19 are embedded in and project perpendicularly from the outer side of the dielectric plate 17. The inner end of each pin 19, which is embedded in the plate 17, joins with an end of a wire connector 20 which is likewise embedded in the plate 17. The wire connectors 20 constitute parts of the pins 19 and project from the opposite inner side of the plate 17 and are disposed with their axes parallel to the axis of the connector 5 and at substantially oblique angles to the plane of the plate 17 and the axes of the pins 19 or the portions 19 of the pins which project from the outer side of the plate 17 and are disposed perpendicular to the plane thereof. Conductor wires 21 are connected to the outer ends of the wire connectors 20, which extend from the plate 17, as by soldering or staking, and are adapted to extend, in a conventional manner, not shown, through the outer end 10 of the shell 8.

The inner end 13 of the shell 9 has a rectangular portion 22 which projects from a surrounding flat marginal surface 23. The rectangular frame or boss 22 is sized and shaped to fit snugly within the open inner end of the shell 8 as defined by the outer portions of the walls 15 disposed beyond the dielectric plate 17 and when the boss 22 is fully seated therein, as seen in Figures 3 and 4, the marginal surface 23 will rest against the marginal surface 14. A relatively thick plate of dielectric material 24 fits snugly within the boss or frame 22 and has marginal portions seating against outwardly facing shoulders 25 of the shell 9 and secured thereto by additional fastenings 18, as seen in Figure 4, to support the outer face of the insulating plate 24 nearly flush with the outer edge of the boss 22.

A plurality of socket connectors 26 are mounted in and extend through the plate 24 and are each provided with a socket end 27 which is embedded in the plate 24, perpendicular thereof, and which opens through the outer side of said plate, and an opposite wire connector end 28. Said wire connector ends 28 are disposed at oblique angles to the socket ends 27 and to the plane of the plate 24 and are thus positioned with their axes disposed parallel to the axes of the wire connector ends 20 and to the axis of the connector 5. Conductor wires 29 are connected to the outer ends of the wire connectors 28, which protrude from the inner side of the plate 24, and which wires are adapted to extend in a conventional manner, not shown, through the outer shell end 11.

The angular construction of the intermediate portions of the pins 19, 20 which are embedded in the plate 17 and the angular construction of the intermediate portions of the socket elements 26 which are embedded in the plate 24 prevents said elements 19, 20 and 26 from being accidentally pulled out of the insulating plates 17 and 24, respectively. The cascade disposition of the connected pins and sockets as seen in Figure 3 together with the fitting of the boss 22 in the inner end 12 of shell 8 effectively resists disconnection of the connector halves 6 and 7 by a pulling force in a direction longitudinally of the connector 5. In addition, the cascade disposition of the wire connectors 20 and 28 relative to the insulator plates 17 and 24 affords adequate space for soldering or staking

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the conductor wires 21 and 29 to the conductor ends 20 and 28, respectively. It will be understood that such connections are made prior to insertion of the insulator plates containing the pins and sockets through the open inner ends of the shell halves 8 and 9.

It will also be readily obvious that by disposing the insulator plates 17 and 24 at oblique angles to the axis of the connector 5 that the size of said plates will materially increase relative to the size of plates which could be employed with a connector of the same size and where the plates are disposed crosswise of the axis of the connector. The additional insulating plate area thus provided enables a greater number of pins and sockets to be mounted in a connector of any cross sectional size. Further, the larger insulating plates afford greater areas of insulation between the individual pins and sockets. While the connector halves 6 and 7 have been shown as being square or rectangular in cross section, it will be understood that the connector can be constructed of various cross sectional shapes with obliquely disposed insulating plates.

It will be apparent that the oblique disposition of the insulating plates and the open inner ends of the shell halves 8 and 9 enables said shell halves to be connected and disconnected by movement of one or the other of the shell halves or both shell halves in a direction or directions obliquely to the axis of the connector and perpendicular to the plane of the open inner ends 12 and 13. This construction also enables the connector halves 6 and 7 to be held connected by an extremely simple and positive locking device in lieu of the threaded and other complex fastening devices conventionally employed. For this purpose, the underside 30 of the shell half 8 is provided with depending transversely apertured bosses or projections 31 in which are journaled complementary aligned portions 32 of a bail 33 which straddles the sides of the shell 8 and which has an intermediate portion 34 overlying the shell 8 and which may be swung upwardly and rearwardly away from the open inner side 12. With the bail 33 swung upwardly and away from the open inner side 12 of the connector half 6, in a direction to the right as seen in Figures 1, 2 and 3, the open side 13 of the connector section 7 can be moved perpendicularly toward the plane of the open side 12 for connecting the two halves of the connector, as seen in Figures 1 and 3, after which the bail 33 is swung from right to left across the top wall 35 of the shell 9 and sprung into engagement with a grooved or recessed portion 36 thereof, which extends crosswise of the top wall 35 and faces away from the shell 8, for securely locking the connector halves 6 and 7 together. With the bail 33 in a locked position, as seen in Figures 1 and 3, the plane of said bail is disposed nearly at a right angle to the plane of the open inner sides 12 and 13 for effectively retaining the shell halves against displacement away from one another. Thus, the novel construction of the connector halves enables use of the bail 33 which provides an extremely simple form of positive lock for the connector 5. The side legs 37 of the bail 33 are provided with complementary outwardly offset portions 38, located adjacent the outer intermediate portion 34 of the bail, to form finger-holds which may be readily engaged for swinging the bail to a released position, from its locked position of Figures 1 and 3, or to a locked position. Said portions 38 also permit the legs 37 to be extended slightly so that the intermediate bail portion 34 can be sprung over the ridge 39 in swinging into and out of engagement with the groove or recess 36.

Various modifications and changes are contemplated and may be resorted to, without departing from the function or scope of the invention as hereinafter defined by the appended claims.

I claim as my invention:

1. An electrical connector comprising two connector halves each including a hollow shell having open ends, said connector being elongated and substantially straight

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and the shells thereof being disposed substantially in alignment with one another, said shells having adjacent open mating ends disposed substantially at oblique angles to the axis of the connector, the mating end of one shell fitting into the mating end of the other shell, and shells being movable only in directions normal to the axes of said mating ends into and out of engagement with one another, plates of dielectric material mounted in said mating ends and disposed in abutting engagement with one another when the connector is assembled, a plurality of conductor pins mounted in and projecting outwardly from the dielectric plate of one shell and disposed within the open mating end of said shell, a plurality of sockets mounted in and opening outwardly through the dielectric plate of the other shell and in which the pins are received when the dielectric plates are in abutting engagement, said dielectric plates being disposed at substantially an oblique angle to the longitudinal axis of the connector, said sockets and the portions of the pins engaged thereby being disposed substantially perpendicular to the planes of the dielectric plates and at oblique angles to the axis of the connector, said pins and sockets each having a wire connecting end projecting from the inner side of the dielectric plate thereof, said wire connecting ends having portions embedded in and projecting from said dielectric plates and disposed substantially at oblique angles relative to the inter-engaging pin and socket portions and substantially parallel to one another and to the axis of the connector.

2. An electrical connector as in claim 1, a bail swingably connected to and supported by one of the shells, the other shell having an external recess extending transversely of the connector and opening in a direction away from the shell on which the bail is supported and in which a part of the bail engages for locking the connector halves together, said bail being disposed substantially crosswise of the dielectric plates in the locking position thereof.

3. An electrical connector half comprising an elongated hollow shell having an open inner end, a plate of dielectric material detachably mounted in said open end, a plurality of electrical contact elements embedded in and projecting perpendicularly from an outer side of the plate, each of said contact elements including a wire connecting end projecting from the inner side of the plate, said wire connecting ends being disposed substantially parallel to one another and at approximately oblique angles to the plane of the plate in a cascade formation whereby a substantial side portion of each wire connecting end is exposed to facilitate attaching a conductor wire thereto.

4. An electrical connector half comprising an elongated hollow shell having an open inner end, a plate of dielectric material detachably mounted in said open end and disposed at approximately an oblique angle to the axis of the shell, a plurality of electrical contact elements embedded in and projecting perpendicularly from an outer side of the plate, each of said contact elements including a wire connecting end projecting from the opposite inner side of the plate, said wire connecting ends being disposed substantially parallel to one another and at approximately oblique angles to the plane of the plate and in stepped formation relative to one another whereby a substantial side portion of each wire connecting end is exposed to facilitate attaching a conductor wire thereto.

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